



Lasair[®] III
Particle Counter
Operations Manual

Without measurement there is no control.



Lasair[®] III Particle Counter

Operations Manual



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Lasair III Particle Counter Operations Manual
P/N 1000012958 Rev K
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Quality Statement

The Quality Policy of Particle Measuring Systems is to strive to meet or exceed the needs and expectations of our customers, and to align the activities of all employees with the common focus of customer satisfaction through continuous improvement in the quality of our products and services.

Environmental Information



There are no potential means by which asbestos exposure is possible because there are no materials in the design or manufacture of the Lasair III containing asbestos.

This equipment must be properly disposed of at end-of-life by means of an authorized waste management system. Contact our Customer Response Center at (877) 475-3317 or (303) 443-7100 (International Telephone +01 3034437100) for dismantling and disposal information.

Battery Disposal

Lithium ion batteries are classified by the U.S. federal government as non-hazardous waste and are safe for disposal in the normal municipal waste stream. Lithium ion batteries contain recyclable materials and are accepted by some of regional recycling programs.

Particle Measuring Systems, Inc. encourages users to check with their local municipality for lithium ion battery recycling. In North America, contact the Rechargeable Battery Recycling Corporation (RBRC) at www.rbrc.org. In Europe, contact the European Portable Battery Association. (EPBA) www.epbaeurope.org.



For California consumers, contact Particle Measuring Systems, Customer Service Department at (877)-475-3317 for instructions on returning used, rechargeable batteries for reuse, recycling, or proper disposal at no cost.

Patent Information

U.S. 6167107; Europe 1196832; Japan 3559782

U.S. and foreign patents for the Lasair III particle counter pending.

Manual Conventions

WARNING

A warning in the text is used to notify the user of the potential for bodily injury or death.

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.

— — NOTICE — —

A notice in the text is an instructional communication regarding requirements or policies issued by Particle Measuring Systems.

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

It is important that you observe cautions and warnings while performing the procedures described in this manual. Caution and warning labels are located on and inside the instrument to alert you to potentially hazardous conditions. Please familiarize yourself with this information.



CE - Declaration of Conformity

Application of Council Directive(s):	2004 / 108 /EC, 2006 / 95 /EC
Standard(s) to which Conformity is Declared:	EMC EN 61326-1: 2013
	Safety EN 61010-1: 2010, 3rd Ed. EN 60825-1: 2007
Manufacturer's Name:	Particle Measuring Systems, Inc.
Manufacturer's Address:	5475 Airport Boulevard, Boulder, CO 80301 USA
Manufacturer's Telephone/FAX:	+01 3034437100 / +01 3034496870
Distributor's Name:	Particle Measuring Systems, S.R.L.
Distributor's Address	Via Aurora, 27 Fonte Nuova RM Italy
Distributor's Telephone/FAX:	+ 39 06 90530130 / + 39 06 9051315
Type of Equipment:	Particle Counter
Model No:	Lasair III
I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).	
Signature:	Signature:
	
Full Name: Kathy Campitelli	Full Name: Giovanni Scialo
Position: Director of Engineering	Position: Vice President EMEA
Place: Boulder Date: August 21, 2013	Place: Malvern Date: August 21, 2013

CAUTION

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 the factory for details.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



Brief Contents

Table of Contents	vii
List of Figures	xv
List of Tables	xix
Chapter 1: Introduction	1-1
Chapter 2: Getting Started	2-1
Chapter 3: Taking a Sample – Quick Reference	3-1
Chapter 4: Communicating with a Computer	4-1
Chapter 5: Using the Particle Counter	5-1
Chapter 6: Setting Sampling and Alarm Parameters	6-1
Chapter 7: Setting General Parameters	7-1
Chapter 8: Setting Data and Reporting Parameters	8-1
Chapter 9: Creating Recipes	9-1
Chapter 10: Statistics Mode	10-1
Chapter 11: Performing Routine Maintenance	11-1
Appendix A: International Precautions	A-1
Appendix B: Electrical Connections	B-1
Appendix C: Configuring Communications	C-1
Appendix D: Downloading to PMS Control Software	D-1
Appendix E: Comma Separated Value (CSV) Format	E-1
Appendix F: TouchRAM	F-1



Appendix G: Working with a Web Browser	G-1
Appendix H: PMS Multi-Drop Protocol (MiniLaz Emulation)	H-1
Appendix I: Native Serial RS-232 Communications	I-1
Appendix J: 4-20 mA Input	J-1
Appendix K: HHIPA Accessory	K-1
Appendix L: Ethernet Communications Overview	L-1
Appendix M: Serial Communications Overview	M-1
Appendix N: 有毒或有害的物质和元素	N-1
Index	Index-1



Table of Contents

Quality Statement - - - - -	ii
Environmental Information- - - - -	ii
Battery Disposal - - - - -	ii
Patent Information - - - - -	iii
Manual Conventions - - - - -	iii
Declaration of Conformity - - - - -	iv
Chapter 1: Introduction - - - - -	1-1
Description - - - - -	1-2
Standalone or Portable Use - - - - -	1-2
Data Storage and Analysis- - - - -	1-3
How the Particle Counter Works - - - - -	1-3
The Particle Counter Instrument - - - - -	1-4
Electrical Connections - - - - -	1-4
Sample Probes- - - - -	1-5
Optional Probes - - - - -	1-5
Optional Sensors - - - - -	1-5
Positioning Accessories - - - - -	1-5
Tripods - - - - -	1-5
Wall/Hand/Tripod Adapters - - - - -	1-6
Battery - - - - -	1-6
TouchRAM Supplies and Accessories - - - - -	1-6
Other Supplies and Accessories - - - - -	1-6
Flow Rate and Sizing Sensitivities - - - - -	1-7
Lasair III Options - - - - -	1-7
Specifications- - - - -	1-8
Environmental Conditions - - - - -	1-9
Chapter 2: Getting Started- - - - -	2-1
Unpacking Instructions - - - - -	2-1
Inspecting for Any Shipping Damage - - - - -	2-1
Packing List - - - - -	2-1
Storing Shipping/Packing Materials - - - - -	2-2
Assembly and Installation Instructions - - - - -	2-3
Connecting Sample Probes - - - - -	2-3
Connecting Sensors - - - - -	2-5
Powering the Unit- - - - -	2-5
Auxiliary Power Ouput- - - - -	2-6
Installing the Battery Packs - - - - -	2-6



Connecting to an AC power source ----- 2-7

Attaching Computer Connections (Optional) ----- 2-8

 Ethernet Bridge Operational Theory ----- 2-9

 Configuring the Ethernet Bridge ----- 2-9

Chapter 3: Taking a Sample – Quick Reference ----- 3-1

 Quick Reference Summary ----- 3-1

 Sampling Setup Screen ----- 3-1

 Quick Reference – Step-by-Step Instructions ----- 3-2

Chapter 4: Communicating with a Computer ----- 4-1

 Control Software and Data Interface Options ----- 4-1

 PMS Software and Communication Protocols ----- 4-2

 PMS Data Management and Instrument Control ----- 4-2

 Communication Protocol ----- 4-2

 Configuring Communications ----- 4-2

 Third Party Control Software ----- 4-3

 Web Browser ----- 4-3

Chapter 5: Using the Particle Counter ----- 5-1

 Navigating the Touch Screen ----- 5-1

 Return to the Main Display screen ----- 5-2

 Hierarchical Chart of Buttons on the Navigation Panel ----- 5-3

 Main Display Screen ----- 5-4

 Status Indicators – Sampling ----- 5-5

 Control Buttons ----- 5-6

 Statistics Mode Control Buttons ----- 5-6

 Status Indicators – Instrument ----- 5-7

 Data Displays – Options ----- 5-8

 Cumulative Only Table ----- 5-8

 Differential and Cumulative Display ----- 5-9

 Environment Display ----- 5-10

 Histogram Chart ----- 5-11

 Trend Graph ----- 5-12

 Example Output ----- 5-13

 Example Print Output ----- 5-13

 Final Sample Report ----- 5-13

 Example USB Output ----- 5-16

 Final Sample Report ----- 5-16

Chapter 6: Setting Sampling and Alarm Parameters ----- 6-1

 Sampling Setup Screen ----- 6-1

 Quick Tab ----- 6-2

 Advanced Tab ----- 6-3

 Sample Size ----- 6-3

 Delay ----- 6-4



Units - - - - -	6-4
Start - - - - -	6-5
Options - - - - -	6-5
Locations Tab - - - - -	6-6
Actions - - - - -	6-7
Alarm Setup Screen- - - - -	6-8
Particles Tab - - - - -	6-9
Environment Tab - - - - -	6-10
Trend Tab - - - - -	6-11
Chapter 7: Setting General Parameters - - - - -	7-1
Display Setup Screen- - - - -	7-1
Graphs Tab - - - - -	7-2
Trend Channels - - - - -	7-2
Trend - - - - -	7-3
Histogram Tab - - - - -	7-4
Cumulative/Differential - - - - -	7-4
Display Mode - - - - -	7-4
Options Tab - - - - -	7-5
System Setup Screen - - - - -	7-6
Options Tab - - - - -	7-6
(General) Options - - - - -	7-7
Date format - - - - -	7-7
Settings and Clone - - - - -	7-8
Channels Tab - - - - -	7-9
Serial Number Output to Pharmaceutical Net - - - - -	7-9
Calibration Warning Tab- - - - -	7-10
Security Setup Screen - - - - -	7-11
Logout Tab - - - - -	7-13
Advanced Tab - - - - -	7-14
Chapter 8: Setting Data and Reporting Parameters - - - - -	8-1
Data Screen - - - - -	8-1
Options Tab - - - - -	8-2
Format Table - - - - -	8-2
Order - - - - -	8-2
Data - - - - -	8-3
Data Table Tab - - - - -	8-4
Invalid and Out-of-Tolerance Indicators - - - - -	8-5
Select: Locations Tab - - - - -	8-6
Select: Time Tab - - - - -	8-7
Start - - - - -	8-7
End - - - - -	8-8
Report Setup Screen - - - - -	8-9



Chapter 9: Creating Recipes	9-1
Recipe Database	9-1
Recipe Data (Sample)	9-1
Recipe Data (Statistics)	9-2
Information Not Saved (Statistics)	9-3
Recipe Setup Screen	9-3
Recipe Names	9-3
Setup Tab	9-4
View Tab	9-6
Assign Tab	9-7
Recipe Importing and Exporting Information	9-8
Chapter 10: Statistics Mode	10-1
Statistics Mode Features	10-1
Statistics Mode Screens	10-2
Screen Detail	10-2
Sample Setup Screen	10-2
Main Display Screen	10-3
Results Tab	10-4
Data Tab	10-5
Cleanliness Standards	10-6
ISO 14644-1 Standard	10-6
EU GMP Annex 1 Standard and China GMP	10-7
Simultaneous EU GMP Annex 1 and ISO	10-7
FS-209E Standard	10-8
Alarms in Statistical Mode	10-9
Communications in Statistics Mode	10-9
Statistics Setup	10-9
Sampling Tab	10-10
Sampling Plan	10-10
Options	10-10
Statistics Mode	10-10
More Options	10-11
Standards Tab	10-11
Flow	10-11
Units	10-13
µm	10-13
About Location Numbers	10-13
Printing a Statistics Report	10-14
Printout and Legend	10-14
Sample Statistics Report	10-14
Chapter 11: Performing Routine Maintenance	11-1
Cleaning and Disinfecting the Enclosure	11-1
Recommended Cleaning Agents	11-1
Replacing the Printer Paper Roll	11-2



Reconditioning the Battery - - - - -	11-3
Battery Disposal - - - - -	11-3
Calibration Reminder - - - - -	11-3
Other Maintenance - - - - -	11-3
Appendix A: International Precautions - - - - -	A-1
WARNING - - - - -	A-1
AVERTISSEMENT - - - - -	A-1
WARNUNG - - - - -	A-1
ATTENZIONE - - - - -	A-1
ADVERTENCIA - - - - -	A-1
Hazard Symbols - - - - -	A-2
Symboles de risque - - - - -	A-2
Warnschilder - - - - -	A-2
Simboli di pericolo - - - - -	A-3
Simbolos de peligro - - - - -	A-3
Appendix B: Electrical Connections - - - - -	B-1
Electrical Connections - - - - -	B-1
Cable Pin-outs - - - - -	B-2
Appendix C: Configuring Communications - - - - -	C-1
Comm/Port Setup - - - - -	C-2
Network Tab - - - - -	C-3
Serial Tab - - - - -	C-4
Fixed Parameters - - - - -	C-5
Environmental Tab - - - - -	C-5
Appendix D: Downloading to PMS Control Software - - - - -	D-1
Preparations for Setup - - - - -	D-1
Configuring Communication - - - - -	D-1
Downloading Data - - - - -	D-2
Control Software Configuration - - - - -	D-2
Appendix E: Comma Separated Value (CSV) Format - - - - -	E-1
Appendix F: TouchRAM - - - - -	F-1
Comm/Port Setup - - - - -	F-2
TouchRAM Tab - - - - -	F-2
TouchRAM Button Data Format - - - - -	F-3
Model Compatibility - - - - -	F-5
Appendix G: Working with a Web Browser - - - - -	G-1
Using Browser Software - - - - -	G-1
Web Browser Interface Advantages - - - - -	G-1
Web Browser Interface Functions - - - - -	G-1



Establishing Communications - - - - -	G-1
Operating from a Web Browser - - - - -	G-3
Web Page Encoding - - - - -	G-3
Saving Sample Data File - - - - -	G-3
Deleting Sample Data Records - - - - -	G-3
Recipe Importing and Exporting - - - - -	G-4
Appendix H: PMS Multi-Drop Protocol (MiniLaz Emulation)- - - - -	H-1
Tested RS-232/RS-485 Converters - - - - -	H-1
Multi-Drop Command Coding - - - - -	H-2
Formatting Command Codes - - - - -	H-2
Multi-Drop Commands - - - - -	H-3
Multi-Drop CTD Command Data Format - - - - -	H-5
Multi-Drop CTD2 Command Data Format - - - - -	H-6
Appendix I: Native Serial RS-232 Communications - - - - -	I-1
Native Serial Protocol Fundamentals - - - - -	I-1
Serial (RS-232) Output Format - - - - -	I-1
Native Serial Protocol Error Messages - - - - -	I-2
Upgrade Information - - - - -	I-2
C Commands - - - - -	I-3
Supported C Commands - - - - -	I-3
Unsupported C Commands - - - - -	I-4
C Command Table Format - - - - -	I-5
Command List - - - - -	I-5
Serial (RS-232) Output Format - - - - -	I-8
Appendix J: 4-20 mA Input - - - - -	J-1
4-20 mA Input - - - - -	J-1
4-20 mA Input Setup Values - - - - -	J-2
Examples of Setup of the TRH Accessory for the Lasair III - - - - -	J-2
Appendix K: HHIPA Accessory - - - - -	K-1
Application - - - - -	K-1
Appendix L: Ethernet Communications Overview - - - - -	L-1
IT Department - - - - -	L-1
Ethernet Addressing Basics - - - - -	L-1
IP Address - - - - -	L-1
Network Mask - - - - -	L-2
Gateway Address - - - - -	L-3
Multicast Address - - - - -	L-3
MAC Address - - - - -	L-3
Static IP Addresses versus DHCP Addresses - - - - -	L-4
Troubleshooting Ethernet Connectivity - - - - -	L-4
Instrument to Laptop Ethernet Setup - - - - -	L-6



Method 1: Modifying the IP Settings on a PC-----	L-6
Method 2: Modifying the Settings on an Instrument -----	L-8
Appendix M: Serial Communications Overview -----	M-1
Adapters and Cables -----	M-2
Useful Serial Adapters -----	M-2
USB Serial Port Adapter-----	M-2
USB driver for Windows XP -----	M-3
Serial Cable -----	M-3
RJ-12 Cable and Adapter -----	M-3
Connector Signals-----	M-4
Communication Software Options -----	M-5
HyperTerminal -----	M-5
PuTTY-----	M-6
Tera Term -----	M-7
Communications Configuration-----	M-8
ENODE Specific Settings -----	M-8
Troubleshooting Serial Communications -----	M-8
No Communications-----	M-8
Dropped Characters or Strange Characters-----	M-8
Unexpected Characters -----	M-8
Appendix N: 有毒或有害的物质和元素 -----	N-1
Index -----	I-1



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List of Figures

Chapter 1: Introduction	1-1
Figure 1-1 Lasair III	1-2
Figure 1-2 Electrical connections – back panel	1-4
Chapter 2: Getting Started	2-1
Figure 2-1 Sample probe-to-tubing adapter	2-4
Figure 2-2 Connectors on back panel	2-5
Figure 2-3 Insert one or two lithium battery packs	2-6
Figure 2-4 Connecting the DC power plug	2-7
Figure 2-5 Ethernet connectors	2-8
Chapter 3: Taking a Sample – Quick Reference	3-1
Figure 3-1 Quick tab of the Sampling Setup screen	3-1
Figure 3-2 Location of the Main Display tab	3-2
Figure 3-3 Buttons on the navigation panel of the Main Display screen	3-3
Figure 3-4 Sampling Setup screen	3-3
Figure 3-5 Touch keyboard for entering the value	3-4
Chapter 4: Communicating with a Computer	4-1
Chapter 5: Using the Particle Counter	5-1
Figure 5-1 Main Display tab	5-1
Figure 5-2 Navigation panel	5-1
Figure 5-3 Return button	5-2
Figure 5-4 Navigation panel buttons	5-3
Figure 5-5 Main Display screen	5-4
Figure 5-6 A Cumulative Only table display	5-8
Figure 5-7 A Differential and Cumulative table display	5-9
Figure 5-8 Environment table display	5-10
Figure 5-9 Histogram chart display	5-11
Figure 5-10 Trend graph display	5-12
Figure 5-11 Final Sample report, USB output	5-16
Chapter 6: Setting Sampling and Alarm Parameters	6-1
Figure 6-1 Quick tab of the Sampling Setup screen	6-1
Figure 6-2 Advanced tab of the Sampling Setup screen	6-3
Figure 6-3 Locations tab of the Sampling Setup screen	6-6
Figure 6-4 Particles tab of the Alarm Setup screen	6-8



Figure 6-5 Environment tab of the Alarm Setup screen - - - - - 6-10

Figure 6-6 Trend tab of the Alarm Setup screen - - - - - 6-11

Chapter 7: Setting General Parameters - - - - - **7-1**

Figure 7-1 Options tab of the Display Setup screen - - - - - 7-1

Figure 7-2 Graphs tab of the Display Setup screen - - - - - 7-2

Figure 7-3 Histogram tab of the Display Setup screen - - - - - 7-4

Figure 7-4 Options tab of the Display Setup screen - - - - - 7-5

Figure 7-5 Options tab of the System Setup screen - - - - - 7-6

Figure 7-6 Channels tab of the System Setup screen - - - - - 7-9

Figure 7-7 Channels tab of the System Setup screen - - - - - 7-10

Figure 7-8 Logout tab of the Security Setup screen - - - - - 7-11

Figure 7-9 Advanced tab of the Security Setup screen - - - - - 7-14

Chapter 8: Setting Data and Reporting Parameters - - - - - **8-1**

Figure 8-1 Options tab of the Data screen - - - - - 8-1

Figure 8-2 Data Table tab of the Data screen - - - - - 8-4

Figure 8-3 Select: Locations tab of the Data screen - - - - - 8-6

Figure 8-4 Select: Time tab of the Data screen - - - - - 8-7

Figure 8-5 Report Setup screen - - - - - 8-9

Chapter 9: Creating Recipes - - - - - **9-1**

Figure 9-1 Setup tab of the Recipe Setup screen - - - - - 9-3

Figure 9-2 View tab of the Recipe Setup screen - - - - - 9-6

Figure 9-3 Assign tab of the Recipe Setup screen - - - - - 9-7

Chapter 10: Statistics Mode - - - - - **10-1**

Figure 10-1 Main Display screen, Statistics mode - - - - - 10-3

Figure 10-2 Results tab of the Statistics Summary screen - - - - - 10-4

Figure 10-3 Data tab of the Statistics Summary screen - - - - - 10-5

Figure 10-4 Sampling Plan area in Sampling tab of Statistics Setup screen - - 10-9

Figure 10-5 Standards tab of the Statistic Setup screen - - - - - 10-11

Chapter 11: Performing Routine Maintenance - - - - - **11-1**

Appendix A: International Precautions - - - - - **A-1**

Appendix B: Electrical Connections - - - - - **B-1**

Figure B-1 Electrical connections – back panel - - - - - B-1

Appendix C: Configuring Communications - - - - - **C-1**

Figure C-1 Network tab of the Comm/Port Setup screen - - - - - C-2

Figure C-2 Serial tab of the Serial tab of the screen - - - - - C-4

Figure C-3 Environmental tab of the Comm/Port Setup screen - - - - - C-5



Appendix D: Downloading to PMS Control Software	D-1
Appendix E: Comma Separated Value (CSV) Format	E-1
Appendix F: TouchRAM	F-1
Figure F-1 TouchRAM tab of the Comm/Port Setup screen	F-2
Appendix G: Working with a Web Browser	G-1
Figure G-1 Example IP address for a Lasair III particle counter.	G-2
Figure G-2 Enter Network Password window	G-2
Figure G-3 Recipe Setup screen	G-4
Figure G-4 Second method for importing and exporting recipes	G-4
Appendix H: PMS Multi-Drop Protocol (MiniLaz Emulation)	H-1
Appendix I: Native Serial RS-232 Communications	I-1
Appendix J: 4-20 mA Input	J-1
Figure J-1 Connectors on back panel of Lasair III particle counter	J-1
Figure J-2 Environmental tab of the Comm/Port Setup screen	J-1
Appendix K: HHIPA Accessory	K-1
Figure K-1 Hand-Held Isokinetic Probe Attachment (HHIPA)	K-1
Appendix L: Ethernet Communications Overview	L-1
Figure L-1 Ethernet port connectivity LED	L-4
Figure L-2 Example for ping test	L-5
Figure L-3 Example for ipconfig command	L-5
Figure L-4 Local Area Connection Properties window	L-7
Figure L-5 IP address and subnet mask defined	L-7
Appendix M: Serial Communications Overview	M-1
Figure M-1 USB serial adapter	M-2
Figure M-2 Serial cable with DE-9 male and female connectors	M-3
Figure M-3 RJ-12 adapter and cable	M-3
Figure M-4 HyperTerminal window	M-5
Figure M-5 PuTTY Configuration window	M-6
Figure M-6 PuTTY Main window	M-6
Figure M-7 Tera Term Setup window	M-7
Figure M-8 Tera Term Main window (colors reversed)	M-7
Appendix N: 有毒或有害的物质和元素	N-1



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List of Tables

Chapter 1: Introduction - - - - -	1-1
Table 1-1 Flow rates and channel thresholds - - - - -	1-7
Chapter 2: Getting Started - - - - -	2-1
Table 2-1 Sample Packing List - - - - -	2-2
Chapter 3: Taking a Sample – Quick Reference - - - - -	3-1
Chapter 4: Communicating with a Computer - - - - -	4-1
Chapter 5: Using the Particle Counter - - - - -	5-1
Table 5-1 Status Indicators – Sampling - - - - -	5-5
Table 5-2 Control buttons - - - - -	5-6
Table 5-3 Statistics mode control buttons - - - - -	5-6
Table 5-4 Status Indicators – Instrument - - - - -	5-7
Table 5-5 Field definitions in the Histogram chart display - - - - -	5-11
Table 5-6 Field definitions in the Trend graph display - - - - -	5-12
Table 5-7 Printout legend- - - - -	5-14
Table 5-8 USB output legend - - - - -	5-17
Chapter 6: Setting Sampling and Alarm Parameters - - - - -	6-1
Table 6-1 Buttons on the Quick tab - - - - -	6-2
Table 6-2 Buttons in Sample Size area of Advanced tab on Sampling Setup screen	6-3
Table 6-3 Buttons in Delay area of Advanced tab on Sampling Setup screen - - - - -	6-4
Table 6-4 Buttons in Units area of Advanced tab on Sampling Setup screen- - - - -	6-4
Table 6-5 Buttons in Start area of Advanced tab on Sampling Setup screen - - - - -	6-5
Table 6-6 Buttons in Options area of Advanced tab on Sampling Setup screen - - -	6-5
Table 6-7 Buttons in Actions area of Locations tab on Sampling Setup screen- - -	6-7
Table 6-8 Buttons and fields in the Particles tab of the Alarm Setup screen - - - - -	6-9
Table 6-9 Buttons and fields in the Environment tab of the Alarm Setup screen - - - -	6-10
Table 6-10 Buttons and fields in the Trend tab of the Alarm Setup screen - - - - -	6-12
Chapter 7: Setting General Parameters - - - - -	7-1
Table 7-1 Buttons and fields in Trend Channels area of Graphs tab on Display Setup screen - - - - -	7-2
Table 7-2 Buttons and fields in Trend area of Graphs tab on Display Setup screen - -	7-3
Table 7-3 Options in Cumulative/Differential area of Histogram tab on Display Setup screen 7-4	7-4
Table 7-4 Options in Display Mode area of Histogram tab on Display Setup screen	7-4
Table 7-5 Buttons and fields in Options tab on Display Setup screen- - - - -	7-5
Table 7-6 Buttons and fields in Options tab on System Setup screen- - - - -	7-7



Table 7-7 Button in **Date format** area of **Options** tab on **System Setup** screen ----- 7-7

Table 7-8 Buttons on **Settings and Clone** area of **Options** tab on **System Setup** screen7-8

Table 7-9 Buttons on **Calibration Warning** tab in **System Setup** screen----- 7-10

Table 7-10 **Main Display** buttons enabled and disabled ----- 7-12

Table 7-11 Buttons and fields in **Logout** tab on **System Setup** screen ----- 7-13

Table 7-12 Buttons and fields in **Advanced** tab on **System Setup** screen ----- 7-14

Chapter 8: Setting Data and Reporting Parameters ----- 8-1

Table 8-1 Buttons in **Format Table** area of **Options** tab on **Data** screen ----- 8-2

Table 8-2 Buttons in **Order** area of **Options** tab on **Data** screen ----- 8-2

Table 8-3 Buttons in **Data** area of **Options** tab on **Data** screen ----- 8-3

Table 8-4 Buttons and fields in **Data Table** tab on **Data** screen ----- 8-5

Table 8-5 Buttons and fields in **Select: Locations** tab on **Data** screen ----- 8-6

Table 8-6 Buttons and fields in Start area of Select: Time tab on Data screen ----- 8-7

Table 8-7 Buttons and fields in End area of Select: Time tab on Data screen ----- 8-8

Table 8-8 Fields on **Report Setup** screen ----- 8-9

Chapter 9: Creating Recipes ----- 9-1

Table 9-1 Buttons in **Options** area of **Setup** tab on **Recipe Setup** screen ----- 9-4

Table 9-2 Buttons and fields in **View** tab on **Recipe Setup** screen ----- 9-6

Table 9-3 Buttons and fields in **Assign** tab on **Recipe Setup** screen ----- 9-7

Chapter 10: Statistics Mode ----- 10-1

Table 10-1 Maximum particles – ISO 14644-1 Standard ----- 10-6

Table 10-2 EU GMP Grade and ISO classes ----- 10-7

Table 10-3 Maximum particles — Simultaneous standards----- 10-7

Table 10-4 Maximum particles per unit volume ----- 10-8

Table 10-5 Buttons in **Sampling Plan** area of **Sampling** tab on **Statistic Setup** screen 10-10

Table 10-6 Buttons in **Options** area of **Sampling** tab on **Statistic Setup** screen----- 10-10

Table 10-7 Buttons in **Statistics Mode** area of **Sampling** tab on **Statistic Setup** screen10-10

Table 10-8 Buttons in **Sampling** tab on **Statistic Setup** screen ----- 10-11

Table 10-9 Buttons and fields in **Standards** tab on **Statistic Setup** screen ----- 10-11

Table 10-10 Buttons in Flow area of Standards tab on Statistic Setup screen----- 10-11

Table 10-11 Buttons in **Units** area of **Standards** tab on **Statistic Setup** screen ----- 10-13

Table 10-12 Buttons in **µm** area of **Standards** tab on **Statistic Setup** screen ----- 10-13

Table 10-13 Statistics Printout legend----- 10-15

Chapter 11: Performing Routine Maintenance ----- 11-1

Appendix A: International Precautions----- A-1

Appendix B: Electrical Connections----- B-1

Appendix C: Configuring Communications ----- C-1

Table C-1 Fields in the **Network** tab of the **Comm/Port Setup** screen ----- C-3

Table C-2 Fields in the **Serial** tab of the **Comm/Port Setup** screen ----- C-4

Table C-3 Columns and fields of the **Environmental** tab of the **Comm/Port Setup** screenC-5



Appendix D: Downloading to PMS Control Software	D-1
Appendix E: Comma Separated Value (CSV) Format	E-1
Table E-1 CSV value format and description	E-1
Appendix F: TouchRAM	F-1
Table F-1 Fields in the TouchRAM tab of the Comm/Port Setup screen	F-2
Table F-2 Data written on Lasair III buttons	F-3
Appendix G: Working with a Web Browser	G-1
Appendix H: PMS Multi-Drop Protocol (MiniLaz Emulation)	H-1
Appendix I: Native Serial RS-232 Communications	I-1
Table I-1 Commands supported from the Lasair Particle Counter	I-2
Appendix J: 4-20 mA Input	J-1
Appendix K: HHIPA Accessory	K-1
Appendix L: Ethernet Communications Overview	L-1
Table L-1 Private IPv4 Network Ranges	L-2
Table L-2 Default Network Mask Values	L-2
Appendix M: Serial Communications Overview	M-1
Table M-1 Recommended Serial Adapters	M-2
Table M-2 Standard PC Serial Port (DE-9)	M-4
Table M-3 RJ-12 Instrument Connector	M-4
Table M-4 Communication parameters	M-8
Appendix N: 有毒或有害的物质和元素	N-1



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Chapter 1

Introduction

This chapter is a brief introduction to the Lasair[®] III particle counter and is intended to provide you with an overall description of the particle counter, a summary of technical specifications, and a range of environmental conditions for which the equipment is designed. More extensive details are included in the additional chapters of this manual, and are organized as follows:

- **Chapter 2** Getting Started
- **Chapter 3** Taking a Sample – Quick Reference
- **Chapter 4** Communicating with a Computer
- **Chapter 5** Using the Particle Counter
- **Chapter 6** Setting Sampling and Alarm Parameters
- **Chapter 7** Setting General Parameters
- **Chapter 8** Setting Data and Reporting Parameters
- **Chapter 9** Creating Recipes
- **Chapter 10** Statistics Mode
- **Chapter 11** Performing Routine Maintenance
- **Appendix A**, International Precautions
- **Appendix B**, Electrical Connections
- **Appendix C**, Configuring Communications
- **Appendix D**, Downloading to PMS Control Software
- **Appendix E**, Comma Separated Value (CSV) Format
- **Appendix F**, TouchRAM
- **Appendix G**, Working with a Web Browser
- **Appendix H**, PMS Multi-Drop Protocol (MiniLaz Emulation)
- **Appendix I**, Native Serial RS-232 Communications
- **Appendix J**, 4-20 mA Input
- **Appendix K**, HHIPA Accessory
- **Appendix L**, Ethernet Communications Overview
- **Appendix M**, Serial Communications Overview
- **Appendix N**, 有毒或有害的物质和元素

If you are already familiar with the introductory information in this chapter, and are ready to unpack and install your instrument, you may want to proceed directly to **Chapter 2** Getting Started.



Description

The Lasair III particle counter is a portable, lightweight, and durable airborne-particle counter. Its compact size and comfortable carrying handle enhances its portability. The Lasair III particle counter is especially useful in applications where portability is important, such as:

- Cleanroom monitoring
- Facility certification
- Troubleshooting
- Trending analysis
- Statistical process control

The particle counter's touch screen controls and intuitive user interface make setup for particle sampling simple.

You can easily:

- Set the start and stop time intervals for particle sampling
- Display sampling results
- Set alarm parameters
- Review counter status and analog data.



Figure 1-1 Lasair III

Standalone or Portable Use

The Lasair III particle counter can be used as either a standalone or portable device.

As a standalone particle counter, you can position the unit in a permanent sampling location or connect tubing to collect air samples from a remote location, such as a cleanroom or isolator.

The Lasair III particle counter is also portable and you can easily transport it from one location to another to sample a specific area. This method, for example, is ideal for verifying multiple areas. The data can then be printed from the unit's built-in printer, downloaded from the USB port to a portable storage device (jump drive), transferred to a computer via Ethernet or RS-232, and/or connected to a control software.



Data Storage and Analysis

The Lasair III particle counter has the memory capacity to store 3000 complete data sets, which cannot be edited or altered (thereby meeting 21 CFR 11 compliance). You can connect the particle counter to a computer using a control software to facilitate long term memory storage, as well as data analysis. The software also facilitates the generation of ISO, EU GMP, China GMP, and FS 209E reports.

Refer to **Chapter 4** Communicating with a Computer for additional information. You can communicate with a computer using the Lasair III particle counter as a standalone (stationary) instrument, or as a portable instrument while in the **Remote** mode. In this mode, you can temporarily disconnect from a control software, collect sampling data in a portable mode, and then connect to a computer to download the information.

How the Particle Counter Works

As air moves from the sample inlet through the sample chamber, a laser beam is projected through the sample chamber so that any particles in the sample will scatter the light. This scattered light is picked up by the collecting optics and converted to a voltage pulse. The amplitude of the voltage pulse corresponds to the size of the particle. The number of pulses corresponds to the number of particles.

The incoming particle data is allocated according to size to the appropriate channel for counting. Both differential and cumulative counts can be displayed.

Once sampled, air leaves the sampling chamber through the pump and travels to a HEPA filtered exit, that removes 99.97% of particles 0.3 μm or larger.



The Particle Counter Instrument

The particle counter has a large, 8.4-inch color touch screen that makes it easy to see data, and includes an intuitive and easy-to-use navigation structure. Information can also be entered using a USB keyboard.

The Lasair III particle counter's internal software for collecting, displaying, analyzing, storing, and reporting data is 21 CFR Part 11 compliant. The software stores up to 3,000 samples, and 50 sampling recipes and 400 locations can also be stored to reduce labor time and potential errors.

NOTE: The maximum number of locations when using Facility Net or Pharmaceutical Net is 250.

The software can be easily configured to display information in 1 of 11 languages.

The instrument has a built-in thermal printer for the immediate printing of data.

Electrical Connections

There are three USB ports on the Lasair III, one on the front and two on the back of the unit for exporting sampling data and/or connecting a USB keyboard.

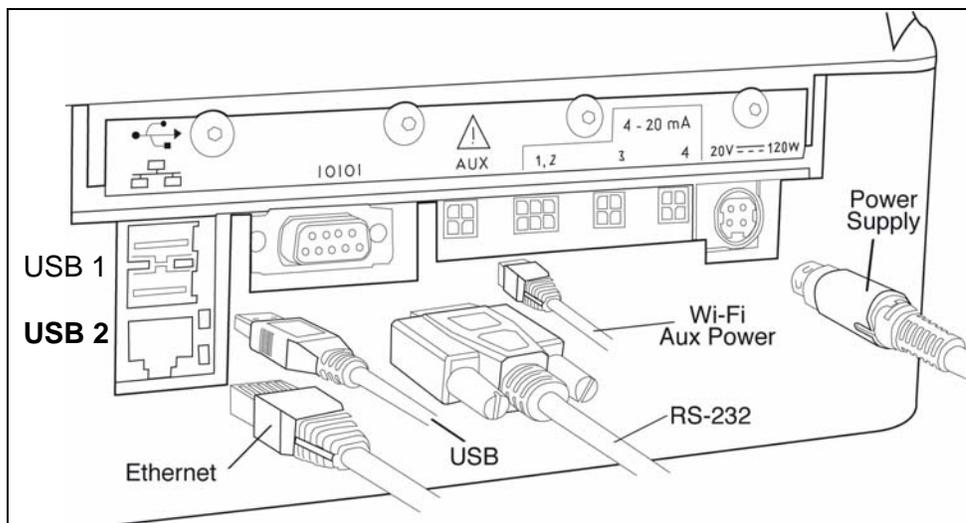


Figure 1-2 Electrical connections – back panel

NOTE: The Lasair III particle counter does not support USB hub devices, memory card readers, or printers.

Electrical connections located on the back panel of the unit include:

- Two (2) USB ports
- Ethernet port
- RS-232 connection
- Auxiliary power output (5VDC 500mA or lower)
- Two (2) – single channel 4-pin 4-20 mA connections
- One (1) – dual channel 6-pin 4-20 mA connection
- DC Input (+20VDC 120 watts)

Refer to **Appendix B**, Electrical Connections for cable pin-out information.



Sample Probes

A standard isokinetic sampling probe (ISP), constructed out of Ultem® 1000, is included¹ with the particle counter that can be mounted directly onto the instrument's sample inlet. Or, to extend the reach of the sample probe, sample tubing can be added.

Optional Probes

The following isokinetic sampling probes (ISPs) are available and are dependent on the unit's configuration.

- ISP, stainless steel (1 CFM) – P/N 1000012952 (optional)
- ISP, stainless steel (50 LPM) – P/N 1000012953 (optional)
- ISP, stainless steel (100 LPM) – P/N 1000012954 (optional)
- ISP, Ultem 1000 (1 CFM) – P/N 1000012579 (standard)
- ISP, Ultem 1000 (50 LPM) – P/N 1000012578 (standard)
- ISP, Ultem 1000 (100 LPM) – P/N 1000012577 (standard)

Optional Sensors

In addition to connecting a probe to collect air flow for particle counting, you can connect up to four analog environmental sensors using the 4-20 mA input connections, such as:

- Temperature/Relative Humidity (T/RH) sensor – P/N 501050-01
- An air velocity sensor that provides a 4-20 mA output
- A differential pressure sensor that provides a 4-20 mA output

The particle counter has two four-pin and one six-pin channel input connections for a 4-20 mA input. Max. 40 mA, 50 mA resettable fuse.

Sensor Connectors are available to adapt other supplier sensors for the Lasair III particle counter's 4-20 mA channel input connections.

- 4-contact plug (P/N 1000008464)
- 6-contact plug (PN 1000004257)
- Contact pin (PN 1000013095)

Positioning Accessories

For more precise positioning, the following accessories are available from Particle Measuring Systems:

Tripods

- Floor tripod – P/N MI008
- Table tripod – P/N 1000000979 (Not for use with the Lasair III 5100 unit)

1. For a complete list of parts and supplies included with the Lasair III particle counter, see the Packing List section in **Chapter 2 Getting Started**



Wall/Hand/Tripod Adapters

A wall/hand/tripod adapter, specific to the particle counter model, is included and shipped with each Lasair III particle counter. Additional adapters are available for purchase, if needed:

- Wall/hand/tripod adapter (1 CFM) – P/N 1000012955
- Wall/hand/tripod adapter (50 LPM) – P/N 1000012956
- Wall/hand adapter (100 LPM) – P/N 1000012957

Battery

The Lasair III particle counter requires 100-240 50/60Hz volt AC power for the power supply that is converted into 20VDC. Optional lithium batteries and Lasair III battery chargers are also available from Particle Measuring Systems.

- Lithium battery – P/N 1000012758
- Lasair III Battery Charger with one (1) bay, 115VDC – P/N 90101118-10
- Lasair III Battery Charger with one (1) bay, 230VDC – P/N 90101118-20
- Lasair III Battery Charger with four (4) bays non-CE, 115VDC – P/N 90101119-10
- Lasair III Battery Charger with four (4) bays non-CE, 230VDC – P/N 90101119-20

For a 1 CFM unit, a single battery runs for approximately three hours, and dual (using two) batteries run for approximately six hours based on continuous sampling and printing every minute. Battery run and charging times vary with conditions, such as tube length, sample time, and use of the built-in thermal printer.

TouchRAM Supplies and Accessories

The following TouchRAM supplies and accessories are available from Particle Measuring Systems (unless otherwise noted):

- TouchRAM wand (reader) – P/N 1000013035
- TouchRAM button (memory storage) – P/N 1000013036
- USB adapter for TouchRAM Wand – P/N 1000013034

Other Supplies and Accessories

The following optional items for the Lasair III particle counter are also available from Particle Measuring Systems:

- Wi-Fi Wireless Ethernet Bridge – P/N 90101290
- USB storage drive – P/N 1000004753
- Additional¹ Zero count filters
 - Zero count filter (1 CFM) – P/N 90104050
 - Zero count filter (50 LPM) – P/N 90104052
 - Zero count filter (100 LPM) – P/N 90104055
- *Lasair III Particle Counter Validation Manual* – P/N 90104052

1. One zero count filter is included with the initial particle counter shipment.



Flow Rate and Sizing Sensitivities

The Lasair III particle counter is ISO 21501-4 compliant and comes in three different models with a flow rate of **1 CFM (310B or 310C)**, **50 LPM (model 350L)**, or **100 LPM (model 5100)**. The particle counter measures particle sizes ranging from 0.3 μm to 25 μm , depending on the model selected. Each model has six channels with preset thresholds. These channels are listed in **Table 1-1**.

Table 1-1 Flow rates and channel thresholds

Model No.	Pre-set Channel Thresholds	Flow Rate
310B	0.3, 0.5, 1.0, 3.0, 5.0 10.0 μm	1.00 CFM \pm 5% (28.3 LPM)
310C	0.3, 0.5, 1.0, 5.0, 10.0, 25.0 μm	1.00 CFM \pm 5% (28.3 LPM)
350L	0.3, 0.5, 1.0, 5.0, 10.0, 25.0 μm	50 LPM \pm 5%
5100	0.5, 1.0, 2.0, 5.0, 10.0, 25.0 μm	100 LPM \pm 5%

Additionally, a two-channel user-selectable pharma mode, that uses only the 0.5 μm and 5.0 μm channels, is available in each unit.

Lasair III Options

For those situations where the existing alarms are not sufficient there is an optional alarm siren available. This siren is a hardware addition to the unit and adds the capability of a fourth level of sound to the alarm settings. It measures up to 104 dB at one meter from the unit.



Specifications

	310B, 310C	350L	5100
Channels	310B 0.3, 0.5, 1.0, 3.0, 5.0 10.0 µm 310C 0.3, 0.5, 1.0, 5.0, 10.0, 25.0 µm	0.3, 0.5, 1.0, 5.0, 10.0, 25.0 µm	0.5, 1.0, 2.0, 5.0, 10.0, 25.0 µm
Flow rate	1.0 CFM ± 5% (28.3 LPM)	50 LPM ± 5%	100 LPM ± 5%
Calibration	Meets ISO 21501-4 requirements		
Maximum concentration^a	> 1,380,270/ft ³	> 832,599/ft ³	> 688,495/ft ³
Counting efficiency	50% ± 20% for most sensitive threshold.		
Zero count	< 7.07 counts/m ³	< 4.00 counts/m ³	< 2.00 counts/m ³
Data storage	3000 complete data sets. Data cannot be edited or altered meeting 21 CFR 11 compliance.		
Communication modes	Ethernet or RS-232; USB data downloading; optional wireless Ethernet		
Controlling software	DataAnalyst, Facility Net, Pharmaceutical Net, Microsoft [®] Internet Explorer [®] 5.0+, Firefox [®]		
Remote operation	Remote web browser operation Real-time download to Facility or Pharmaceutical Net; USB download		
Reports	USB reports; sample printouts; cleanroom certification reports for ISO, EU GMP, China GMP, and FS209E; averaging		
Environmental sensors	Four 4-20 mA inputs, 40 mA each. 50 mA resettable fuse.		
Languages	English, French, German, Italian, Japanese (Kanji), Korean, Mandarin Chinese (Traditional or Simplified), Spanish, Russian, Portuguese		
Display and printer	8.4" color VGA display (640 x 480); IR touch screen (IP65 rated); built-in thermal printer		
External surface	Polycarbonate (PC)		
Enclosure cleaning materials	Bleach, ethyl/isopropyl alcohol, peroxide/quaternary ammonium solutions		
Sample tubing ID^b	3/8" 8m max. length	1/2" 8m max. length	3/4" 8m max. length
Sample output filtering	Internally filtered to > 99.97% at 0.3 µm		
External power supply	Input: 100-240V~, 50/60 Hz; Output: 20VDC, 6A (minimum). Class I Equipment (Requires a grounded electrical supply for safety.)		
Optional battery	Lithium battery: Estimated continuous operation is 3 hr (single) and 6 hr (dual) for 1 CFM unit. 2.5 hr (single) for 50 LPM. 3 hr for 100 LPM (dual)		
Optional alarm siren	100 dB Alarm Siren		
Dimensions (h, w, d)	11.9 x 12.9 x 10.2 in (30.1 x 32.7 x 25.9 cm)		
Weight	13.2 lb (6 kg) without battery, 16.5 lb (7.5 kg) with two optional batteries		
Operating environment	Temperature: 0-30°C; Humidity: 5-95% RH non-condensing		

a. Less than 10% coincidence loss at maximum recommended concentration.

b. For pharmaceutical applications, tubing length should equal 2m maximum.



Environmental Conditions

The following environmental conditions apply to the Lasair III particle counter:

Operating temperatures	0 – 30°C
Humidity conditions	5 – 95% RH non-condensing
Storage and transportation temperature	-30° – 50°C
Maximum altitude	9,842 ft. (3000m)
Installation requirements	<ul style="list-style-type: none">• Indoor use only• Pollution degree 2• Over voltage category II• Ordinary protection (not protected against harmful ingress of moisture)
Laser classification	Class I per EN60825-1 Internally, a Class III B laser is used, per EN60825-1



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Chapter 2 Getting Started

This chapter includes:

- Unpacking Instructions, this page
- Assembly and Installation Instructions on page 2-3

Unpacking Instructions

Inspecting for Any Shipping Damage

Before you begin, perform a visual inspection to see if the shipping container was damaged during shipping. If the shipping container is damaged, STOP unpacking and notify the shipper immediately.

If the shipping container appears to be in good condition, continue to carefully unpack the container and inspect the contents for any damage. If you identify any damage during this inspection process, notify the shipper.

Packing List

Review the Packing List sent with your shipment to ensure that all the items listed are included in your shipment. If any items are missing, contact Particle Measuring Systems Customer Service Center at (877) 475-3317 or (303) 443-7100.

A packing list is provided **Table 2-1** on page 2-2 as an example only. The list included with your shipment will be specific to your order and the model ordered.

**Table 2-1** Sample Packing List^a

Item	Quantity
Lasair III particle counter	1
Isokinetic sampling probe with cap	1
Wall/tubing/tripod adapter	1
Sample tubing – 10 ft. (3.05 meters)	1
USB jump drive	1
Zero-count filter	1
Power supply with U.S. power cord (with plug) or international power cord	1
Connectors and pins for terminating auxiliary power and 4-20 mA accessories: <ul style="list-style-type: none">• 4 contact (P/N 1000008464)• 6 contact plug (P/N P/N 100004257)• Female, gold plated contacts for 20-24 AWG wire (P/N 1000013095)	3 1 24
Battery	1 ^b
Thermal printer paper	3
<i>Lasair III Particle Counter Operations Manual</i>	1

- a. Refer to the actual Packing List enclosed with your shipment. The items and quantity may differ slightly according to the Lasair III model ordered.
- b. Two batteries standard for 100 LPM units

Storing Shipping/Packing Materials

After unpacking the instrument, make sure to save and store *all* the shipping and packing materials for future use. These shipping containers and packing materials are made specifically to protect the Lasair III particle counter during initial shipments, as well as future calibration or return servicing shipments.

CAUTION

To protect the instrument, always pack and ship the Lasair III particle counter using its original packing materials and shipping container. Failure to do so may void the warranty, and additional charges may be assessed for replacement containers reissued for return shipments.



Assembly and Installation Instructions

The Lasair III particle counter requires minimal assembly for use. Some of these assembly tasks include:

- Connecting Sample Probes, this page
- Connecting a Temperature/Relative Humidity (T/RH) Sensor (optional), page 2-5
- Powering the Unit on page 2-5
- Attaching Computer Connections (Optional) on page 2-8
- Installing the Battery Packs on page 2-6

Connecting Sample Probes

Use this instruction to connect an Isokinetic Sample Probe (ISP) to the Lasair III particle counter. You can connect a sample probe directly to the particle counter's sample inlet, or extend the reach of the sample probe by connecting sample tubing.

Additional accessories for mounting the particle counter on a tripod or wall are available to help with proper cleanroom isolation and precise positioning. Refer to **Positioning Accessories** on page 1-5 for a complete list.

>> To connect the sample probe directly to the sample inlet:

- 1 Remove the protective cap from the particle counter's sample inlet.
- 2 Position the ISP over the sample inlet of the particle counter (located on the top of the unit).
- 3 Gently—but firmly—press downward on the sample probe until it reaches the base of the sample inlet.

>> To connect the sample probe to tubing:

Each Lasair III particle counter comes with 10 ft. (3.05 meters) of sample tubing.

You can cut the tubing to a smaller length, if needed. For tubing longer than 10 ft (3.05 meters), use a continuous length of tubing, up to a maximum 26 ft (8 meters).

NOTE: If you intend to sample for particles greater than 5 μm , it is recommended to use the minimum length required to reach the sampling area. In pharmaceutical applications, tubing length should be a maximum of two meters.

- 1 Remove the protective cap from the particle counter's sample inlet.
- 2 Place one end of the tubing over the Lasair III sample inlet and press down (while gently moving it side-to-side) until it reaches the base of the inlet.
- 3 Insert the free end of the tubing into one end of a Wall/Hand/Tripod adapter (supplied with each ISP Lasair III).
- 4 Place the sample probe on the other end of the Wall/Hand/Tripod adapter.



5 Mount the adapter using the two 1/4-20 screw holes as necessary.

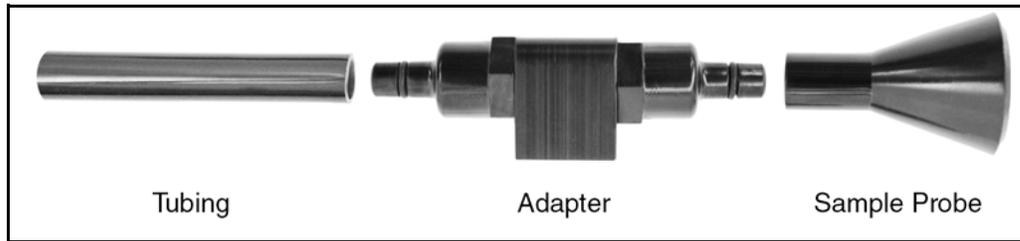


Figure 2-1 Sample probe-to-tubing adapter

NOTE: The adapter's O-ring will hold the sample probe securely to the adapter.

>> To secure the sample probe to a tripod:

- 1 Place the Wall/Hand/Tripod adapter¹ on top of the tripod base, aligning the adapter's screw openings with the tripod screws.
- 2 Tighten the screw wheel to secure the adapter to the tripod.
- 3 To connect the tubing, first remove the protective cap from the particle counter's sample inlet.
- 4 Place one end of the sample tubing (provided with the unit) over the sample inlet and press down (while gently move it side-to-side) until it reaches the base of the inlet.
- 5 Insert the free end of the tubing into one end of adapter that you mounted on the tripod in steps 1-2.
- 6 Place the sample probe on the other end of the adapter
- 7 Position the tripod at your sampling point.

1. The appropriate Wall/Hand/Tripod adapter is included with each Lasair III ordered.



Connecting Sensors

You can connect up to four analog environmental sensors using the Lasair III particle counter's 4-20 mA input connectors. These input connectors are located on the back panel of the particle counter as shown in **Figure 2-2**.

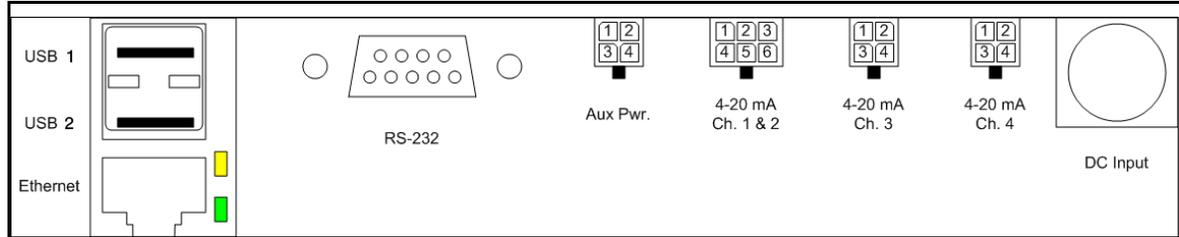


Figure 2-2 Connectors on back panel

>> To connect a 4-20 mA sensor:

- 1 If using another supplier's sensor, terminate and replace any attached connectors with Lasair III particle counter 4-20 mA connectors.
Refer to the pin-out information located in **Appendix B**, Electrical Connections.
Otherwise, if using a Particle Measuring Systems TRH sensor, go to step 2.

NOTE: Each Particle Measuring Systems TRH sensor is pre-assembled with the corresponding 4-20 mA input plug connector. For sensors from other suppliers, Sensor Connectors (4-contact [P/N 1000008464], 6-contact [P/N 1000004257], and contact pin [P/N 1000013095]) are available to adapt sensors for connection to Lasair III particle counter.

- 2 Lift the connection shield on the lower back panel of the particle counter to locate the appropriate 4-20 mA input.
There are two 4-pin connectors and one 6-pin connector. See **Figure 2-2** on page 2-5.
- 3 Plug the sensor into the connector.

Powering the Unit

The Lasair III particle counter is rated at 20 VDC (120 W) and can be operated from an AC source or internal batteries. When using the AC source, the external power supply requires 100-240 Volt 50/60 Hz AC power to produce the 20 VDC, which powers the particle counter.

CAUTION

The AC Mains supply voltage fluctuations are not to exceed +10% of the rated supply voltage range.



Auxiliary Power Output

The particle counter also has an auxiliary output power connector on the back panel capable of supplying 500 mA at 5 VDC. You can, for example, connect a Wi-Fi accessory (Ethernet to Wi-Fi bridge).

CAUTION

This is a LOW POWER DEVICE. Connect ONLY low voltage (5VDC 500mA or lower) power accessories to the auxiliary power output to avoid damage to the unit. This is not intended to power devices, such as a pressure transmitter or air velocity sensor, that require considerable power.

Installing the Battery Packs

Insert one or two lithium battery packs into the Lasair III particle counter to enable portable operation.

NOTE: The 100 LPM units must be powered by two batteries.

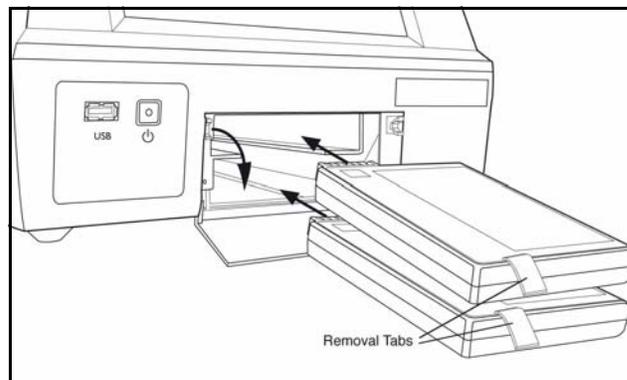


Figure 2-3 Insert one or two lithium battery packs

>> To install a battery pack:

- 1 Remove the battery from its packaging.
- 2 Pre-charge the battery using the Lasair III External Battery Charger (optional).

NOTE: Lasair III External Battery Charger is an optional accessory available from Particle Measuring Systems. The batteries can also be charged inside the unit by connecting to a main power supply^a.

- a. When using the Lasair III particle counter to re-charge batteries while also sampling, the available power to charge may be reduced during sampling operation. Therefore, it may take longer to recharge the batteries if you are also simultaneously sampling.
- 3 Press the battery door latch down to open the door.
 - 4 Hold the battery with the removal tab on the left side.
 - 5 With the battery contacts entering first, slide the battery pack into one of the particle counter's battery chamber slots (located on the lower front of the unit) until it stops.
 - 6 If using two batteries in the particle counter, repeat steps 1-5 for the second battery.
 - 7 Use the side latch to secure the battery(ies) in place.
 - 8 Close the battery door.

NOTE: To completely remove Lasair III particle counter's power, the battery pack(s) must be removed in addition to disconnecting the power cord.



Connecting to an AC power source

Before you begin to connect to an AC power source, you will need the following items:

Item	Comments
External AC to DC power supply	Standard U.S. Government Energy Information Administration (EIA) power input of 100-240VDC, 50–60 Hz. Only use the included power supply to prevent damage and assure proper operation.
U.S. power cord with plug	Included with U.S. shipments only.
International power cord (included)	The power cord for international shipments does not come assembled with a plug. You will need to connect an applicable power plug, configured for your country’s voltage and frequency specifications.
Surge protector (recommended)	To protect the unit from any voltage spikes, use a good quality surge protector.

NOTE: Ensure that the power supply is connected to a properly grounded Mains receptacle.

>> To connect to the external AC to DC power supply:

WARNING

Before you begin, ensure that the external AC to DC power supply has been properly grounded.

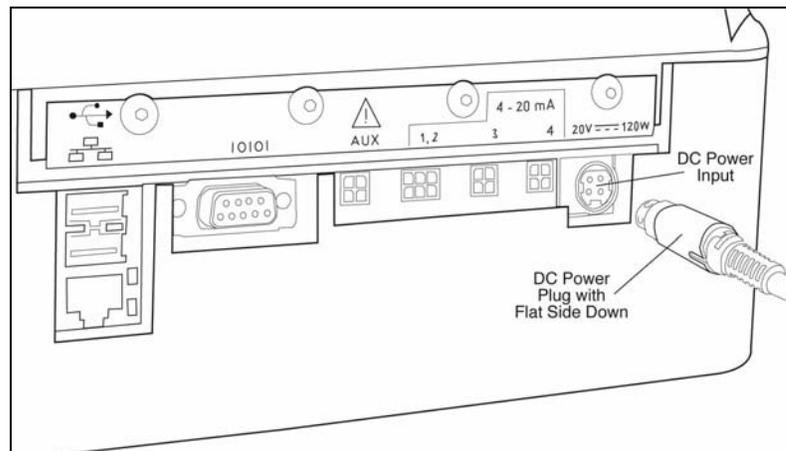


Figure 2-4 Connecting the DC power plug

- 1 For non-U.S. locations, connect the correct AC power plug to the provided international power cord.
For U.S. locations, use the U.S. AC power cord.
- 2 Insert the DC power plug (with the flat side facing down) into the DC power input, as shown in **Figure 2-4**.
- 3 Plug the AC power cord into a surge protector, and then into the external AC to DC power supply.

CAUTION

The main power disconnect is the power cord. Ensure that it is easily accessible. Also remove the lithium batteries (if installed) to remove all power.



Attaching Computer Connections (Optional)

If you are connecting the Lasair III particle counter to a computer directly or indirectly, you will need the appropriate cabling or bridge:

- **Crossover cable** (P/N AE1938) or straight-through (Ethernet) cable (P/N CD22) – Use when connecting *directly* to a computer without going through an Ethernet network (optional).
- **Straight-through (Ethernet) cable** (P/N CD22) – Use when connecting *indirectly* to a computer through a hub or other device on an Ethernet network. Connect the straight-through cable between the Lasair III particle counter and the hub.
- **Wi-Fi Wireless Ethernet Bridge** (P/N 90101290) – Use to connect to a wireless network.

>> To connect a cable:

- 1 Locate the correct cable for your installation (as discussed above).
- 2 Lift the connection shield on the lower back panel of the particle counter to locate the Ethernet port (shown in **Figure 2-2** on page 2-5).
- 3 Insert the cable into the Ethernet port on the back of the Lasair III particle counter.
- 4 Connect the other end of the cable into the Ethernet port of the computer or hub.

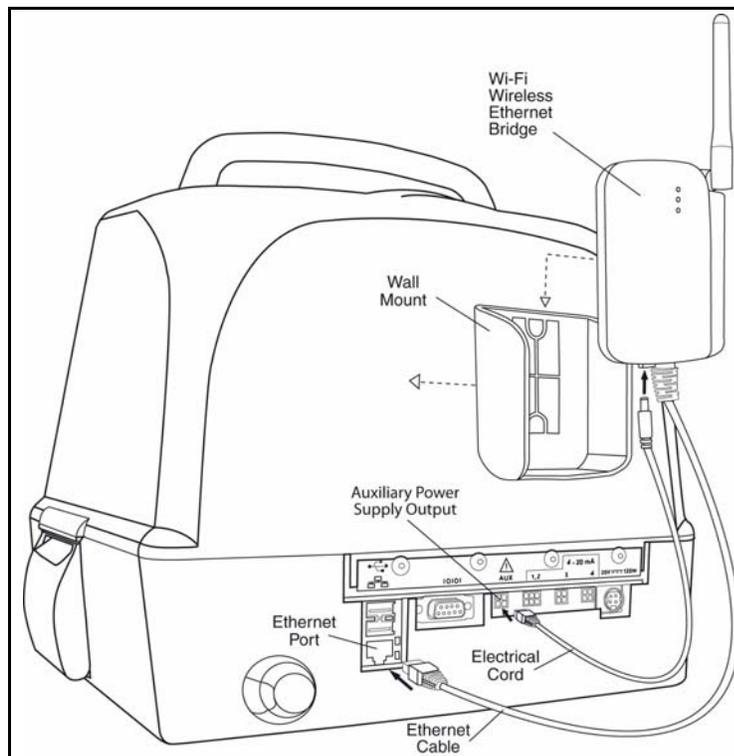


Figure 2-5 Ethernet connectors

**>> To connect a Wi-Fi Wireless Ethernet bridge:**

You can connect the main power supply of the bridge unit into a wall electrical outlet or directly to the Lasair III particle counter (as described in the following steps).

WARNING

Make sure to observe electrical safety cautions when modifying electrical parts. If you are unsure about electrical procedures, refer the rewiring steps to qualified personnel.

- 1 Configure the Ethernet bridge to your company's network.
- 2 Locate the wall mount bracket of the Wi-Fi Wireless Ethernet bridge.
- 3 Attach the wall mount bracket to the back of the particle counter (above the auxiliary power input), using Velcro[®] or another self-stick adhesive product.
- 4 Connect the DC power cord between the auxiliary power output and the Wi-Fi Wireless Ethernet Bridge.
- 5 Slide the Wi-Fi Wireless Ethernet Bridge into the wall mount bracket.
- 6 Plug the Ethernet cable into the Ethernet port on the Lasair III particle counter.

NOTE: Your IT department can obtain a user's manual for the Wi-Fi Wireless Ethernet Bridge from the manufacturer, Quatech. at www.quatech.com or (800) 553-1170.

Ethernet Bridge Operational Theory

The Quatech ABDG-BR-DP501 is designed to drop in as a wireless extension of an Ethernet connection. In its factory configuration, when the device is attached to a laptop (or Lasair III) in an unprotected Wi-Fi environment, it will automatically attach to the Wi-Fi network. Regardless of whether a static IP address or DHCP is used, the device will configure itself to the host's address as soon as a packet is sent from the host.

To use the Ethernet bridge in a typical secure environment with a Lasair III, the device must be configured to understand the Wi-Fi security in place. Furthermore, it is helpful to configure the Ethernet bridge to match the Lasair III TCP/IP communication parameters. This avoids any delay in establishing communications

Configuring the Ethernet Bridge

The Quatech Wi-Fi Wireless Ethernet Bridge (ABDG-BR-DP501) can be configured either with Airborne Management Center tool from Quatech, or with the built-in Web server. The remainder of these instructions provide a basic explanation of using the Web server. To use the Airborne Management Center tool, and for additional information, please see the Quatech documentation, or contact quatech at www.quatech.com or (800) 553-1170.

Wireless communications can be complex to configure. IT should be involved with the process.



>> To configure the Quatech Wi-Fi Wireless Ethernet Bridge:

- 1** Attach the Ethernet port to your laptop. Configure the TCP/IP settings on the laptop for IP = 169.254.2.1 and Mask = 255.255.0.0.
- 2** You should now be able to attach to the Ethernet bridge (with its factory settings intact), at the address 169.254.2.100.
Set your web browser to that address to talk to it.
- 3** You will need to enter a username and password to attach to the Web browser.
Type **dpac** for both entries.
- 4** Navigate to the **Configuration** settings. Most changes can be done on the **Express Setup** page.
- 5** The WLAN network settings can be left on DHCP, but this will result in some delay before the Ethernet bridge automatically configures itself.
To avoid this delay, disable WLAN DHCP, and enter the IP address, mask, and gateway that will be used on the Lasair III.
- 6** Set the Wireless communication settings such as SSID, and security parameters.
- 7** The Lasair III will communicate with Pharmaceutical Net with no other settings, but some additional settings are needed for additional connectivity to the instrument.
 - a.** To use the Lasair III web interface, change the Ethernet bridge HTTP port from 80 to 8080.
 - b.** To use the Lasair III service interface via Telnet, change the Telnet port from 23 to 8023.
 - c.** To attach to the Lasair III with Data Analyst, change the FTP port from 21 to 8021.
- 8** After all settings are made, press the **Commit** button at the bottom of the screen
- 9** Press the **Restart** button.
Depending on the what parameters were changed, the Ethernet bridge may no longer communicate with the laptop once it reboots.

The Ethernet bridge should now be configured to work with the Lasair III.



Chapter 3 Taking a Sample – Quick Reference

Want to take a quick sample with the Lasair III particle counter, without connecting to a computer or additional setup? Use the following Quick Reference Summary or Quick Reference – Step-by-Step Instructions on page 3-2 to guide you through the process.

Quick Reference Summary

Main Display > Sample > Sampling

Sampling Setup Screen

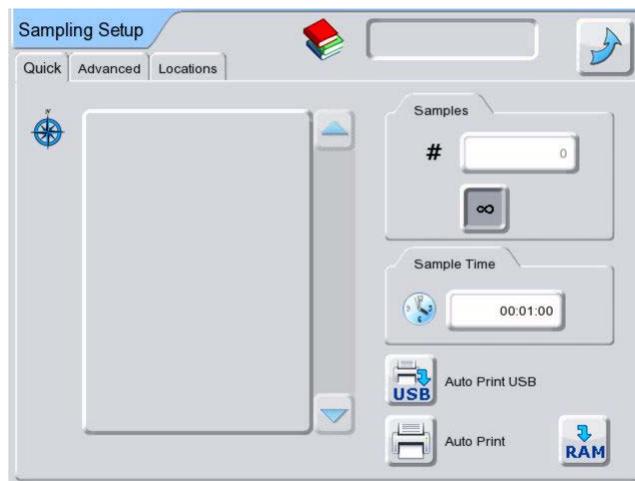


Figure 3-1 Quick tab of the **Sampling Setup** screen

The **Quick** tab of the **Sampling Setup** screen has the following fields and buttons:

- Enter the number of samples to be taken.
- Enter the sample time length (or volume, if selected).
- Enable the **Auto Print** button (optional).
- Return to the **Main Display**.



Quick Reference – Step-by-Step Instructions

Before you begin:

- 1 Review the safety information (**Chapter 1** Introduction and **Appendix A**, International Precautions).
- 2 Assemble the particle counter (**Chapter 2** Getting Started).

>> **To take a quick sample:**

- 1 Press the green  **Standby/On** button on the front of the instrument to turn on the particle counter.
The **Main Display** with the data display region appears.
- 2 Press the **Main Display** tab (located on the upper left corner of the display) to show the navigation panel (see **Figure 3-2**).

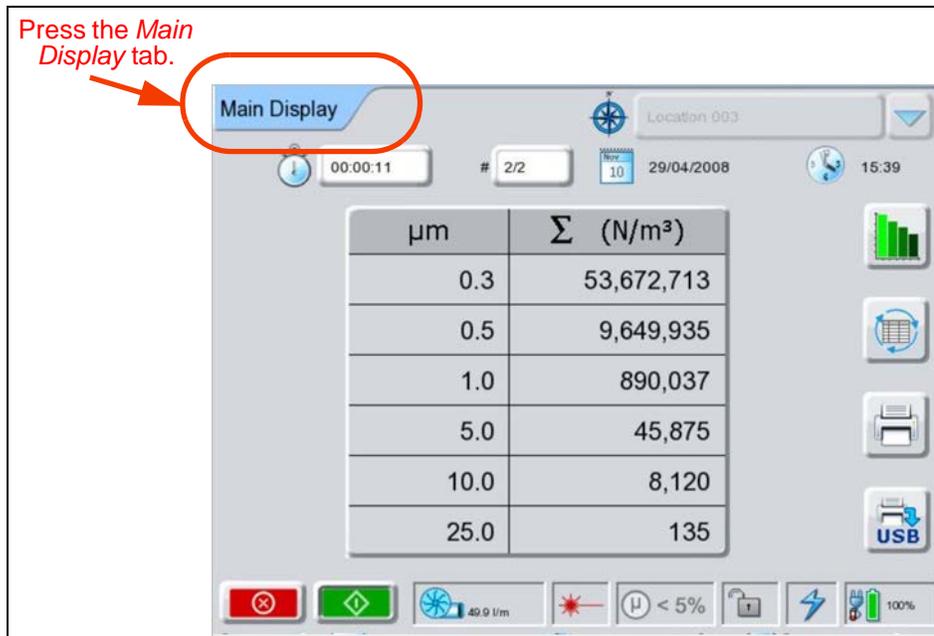


Figure 3-2 Location of the **Main Display** tab

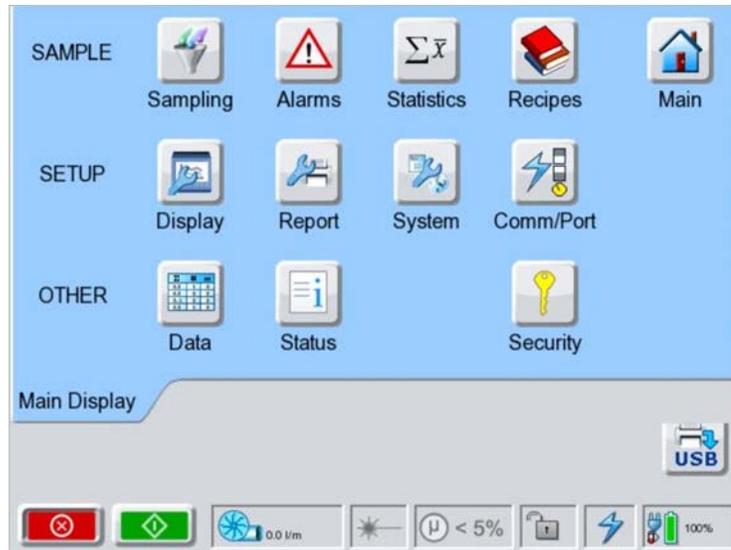


Figure 3-3 Buttons on the navigation panel of the **Main Display** screen

- 3 Press the **Sampling** button  to display the **Sampling Setup** screen.

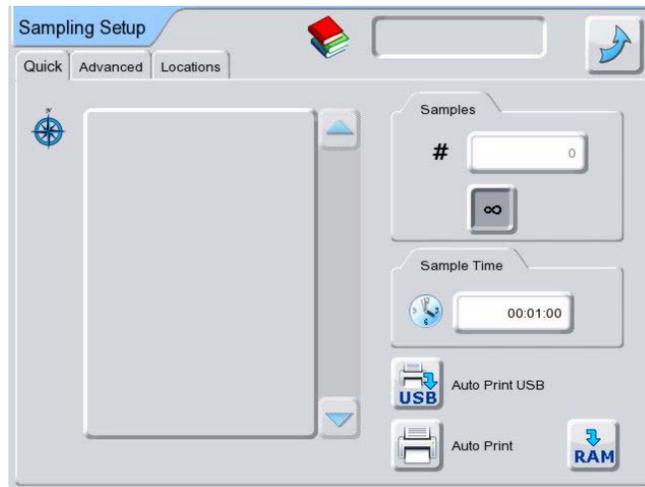


Figure 3-4 **Sampling Setup** screen

- 4 Press the **Sample #** field to enter a new number of samples to take, or leave the default value (1).

**5** Do one of the following:

- To run a sample based on length of time, press the **Sample Time** field to enter a new length of time for the sample, or leave the previous sample time.
- To run a sample based on volume, press the **Sample Volume** field to enter a new measurement, or keep the previous volume measurement.
- To run continuous sampling, press the Continuous Sampling  button.

NOTE: Either the **Sample Time** or **Sample Volume** field displays depending on the selection in the **Advanced** tab. For more information, see Advanced Tab on page 6-3.

6 If you press the **Sample Time** or **Sample Volume** field, a **Touch** keyboard displays for entering new information.

Enter a new value and press **OK**, or press **Cancel** to exit.

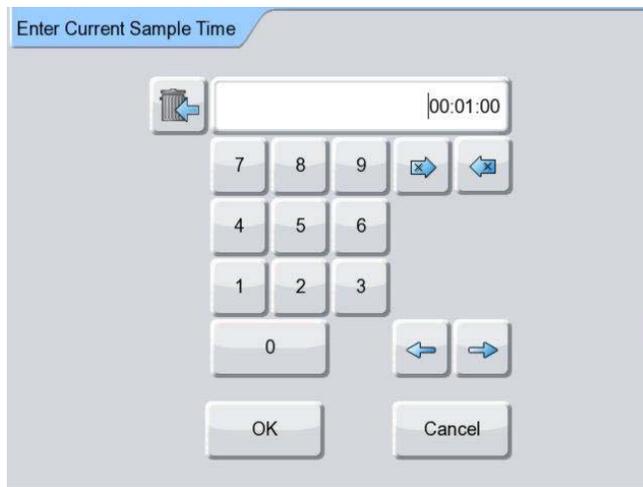


Figure 3-5 Touch keyboard for entering the value

7 Select one of the following, as needed:

- To automatically print to a USB key, insert the USB key into the **USB port** (located on the front of the particle counter) and press the **Automatically print to USB** key



button.

- To automatically print to particle counter's thermal printer, press the **Auto Print**



button.

NOTE: Either button will appear darker when it is enabled.

8 Press the **Return**  button to return to the **Main Display**.**9** Press the **Start Sampling**  button.

The particle counter will begin sampling and print the data to the USB key or thermal printer, if selected in step 7.

Otherwise, press the **Printer** or **USB** button located on this screen to print at any time during the measurement cycle.



Chapter 4 Communicating with a Computer

This chapter includes information for computer communications with the Lasair III particle counter. Although the Lasair III is a standalone instrument with its own built-in firmware, you can also control the instrument with optional software or through a Web browser.

In **Remote** mode (operation independent of a supplemental computer), the Lasair III particle counter has the memory capacity to store 3000 complete data sets, which cannot be edited or altered (thereby meeting 21 CFR 11 compliance). Once this memory is full, the instrument automatically erases memory in order to add additional sampling data. The oldest data is erased first.

Connecting the Lasair III particle counter to a computer provides the capability for increased memory capacity and long term data storage. Additional software also provides the added ability to analyze the data.

It is also possible to use the Lasair III particle counter with a Web browser. A Web browser allows the ability to control the particle counter from a separate location, as well as obtain the data.

When using an external software or Web browser, you also have the flexibility to activate a **Remote** mode that temporarily disconnects communication to the computer for portable sampling. After collecting the samples, you can then download the data to the computer.

Control Software and Data Interface Options

There are three types of options for communicating with a computer from the Lasair III particle counter, including:

- Particle Measuring Systems (PMS) Software and Communication Protocols
- 3rd Party Serial Communication Interfaces
- Web Browser



PMS Software and Communication Protocols

Particle Measuring Systems offers various control/data management software and communication protocol solutions.

The following data management and facility monitoring software systems have been customized to work specifically work with PMS instrumentation:

PMS Data Management and Instrument Control

- **DataAnalyst¹** – This software stores data from a Lasair III particle counter and provides additional analysis and reporting options that are 21 CFR Part 11 compliant. This application will support connecting to multiple Lasair III particle counters, store the data from each instrument, and then allow for analysis of the raw data in tabular and graphical formats. DataAnalyst has the capability of generating reports, as recreating room certification reports to meet ISO, EU GMP, China GMP, and FS209E standards. For more information on configuring DataAnalyst to work with Lasair III particle counters, see the *DataAnalyst User's Manual*. Note that Lasair III firmware version 1.3.000 or later requires DataAnalyst Version 2.
- **Facility Net, Pharmaceutical Net, or FacilityPro** – These control software systems (optional purchases from Particle Measuring Systems, Inc.) control the Lasair III particle counter, as well as store and analyze data to provide a comprehensive view of the environmental and process monitoring conditions of a facility. You can collect, display, analyze, store, and report data collected from the Lasair III particle counter.
- **Lasair Serial Interface** – The RS-232 serial protocol allows you to transfer data from the Lasair III particle counter, and write your own routines to control the particle counter.
- **PMS Multi-Drop Protocol** – This serial protocol facilitates communicating in a multi-drop environment, such as an RS-485 system, containing more than one Lasair III particle counter. In addition to transferring data from several particle counters, you can write your own routines to control the particle counters.

Communication Protocol

Use PMS TCP/IP protocol to transmit data between the Lasair III particle counter to DataAnalyst², Facility Net, or Pharmaceutical Net via an Ethernet network. For more information, see **Appendix D**, Downloading to PMS Control Software.

Configuring Communications

After you have set up and configured the communication protocol to connect the particle counter to a computer, you must also configure communications on the Lasair III particle counter. Refer to **Appendix C**, Configuring Communications.

-
1. For the remainder of this manual, wherever you see DataAnalyst, you can also use Facility Net or Pharmaceutical Net.
 2. For the remainder of this chapter, wherever you see DataAnalyst referenced, either DataAnalyst, Facility Net, or Pharmaceutical Net applies.



Third Party Control Software

You can also export data collected with the Lasair III particle counter to your Facility Management System (FMS) using third party software:

- **USB Port** – There are three USB ports, one on the front and two on the back panel, for transferring data from the Lasair III particle counter to your computer via USB mass storage device.
- **Native Serial Interface** – This RS-232 protocol allows you to write your own communications routine to communicate with the particle counter, including feedback messages.
- **PMS Multi-Drop Protocol** – This is another RS-232 protocol that allows communicating in a multi-drop environment (like a telephone party-line), such as Configuring Communications (Control Software).

Web Browser

- **Web Browser** – This Web interface runs with a Web browser, such as Internet Explorer® or Firefox®. The interface looks and functions similar to the front panel screen, allowing you to remotely control and view sampling. Additionally, data can be quickly transferred to a computer. For information on how to setup and configure the Lasair III particle counter to work with a Web browser, see **Appendix G**, Working with a Web Browser.



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Chapter 5 Using the Particle Counter

This chapter discusses navigating the touch screen and the **Main Display** screen, where you can view your sample data in a variety of formats.

Setup for the various screens, as well as other operating options, are covered in subsequent chapters.

In this chapter describes:

- Navigating the Touch Screen (this page)
- Main Display Screen on page 5-4
- Example Output on page 5-13

Navigating the Touch Screen

The **Navigation** panel allows you to quickly access any screen in the system. It also allows you return to the screen you were viewing with a single press.

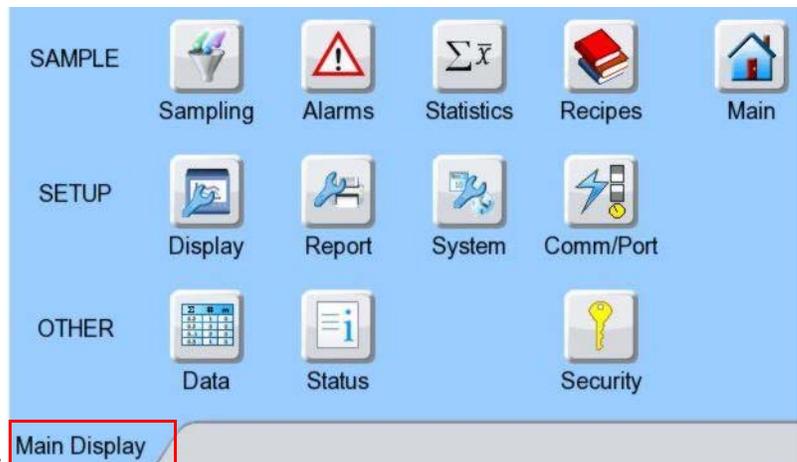
>> **To display the Navigation panel, press the tab in the upper left corner of any screen.**

- 1 Press this tab to open the **Navigation** panel.



Figure 5-1 Main Display tab

The **Navigation** panel has buttons for all the screens in system.



- 2 Press this tab to close the **Navigation** panel.

Figure 5-2 Navigation panel



In the navigation panel, you can:

- Press a button to display the screen you want.
- Press the **Main** button to go to the **Main Display** screen.
- Press the tab in the lower left corner to return to the screen you are viewing.

Return to the Main Display screen

When you are viewing a setup screen (such as the **Sampling Setup** screen in the example below), you can return to the **Main Display** screen by pressing the **Return** button.



Press the **Return** button to return to the **Main Display** screen.

Figure 5-3 Return button



Hierarchical Chart of Buttons on the Navigation Panel

This chart shows the buttons for the screens that you can access through the **Navigation** panel as well as the tabs in each screen.

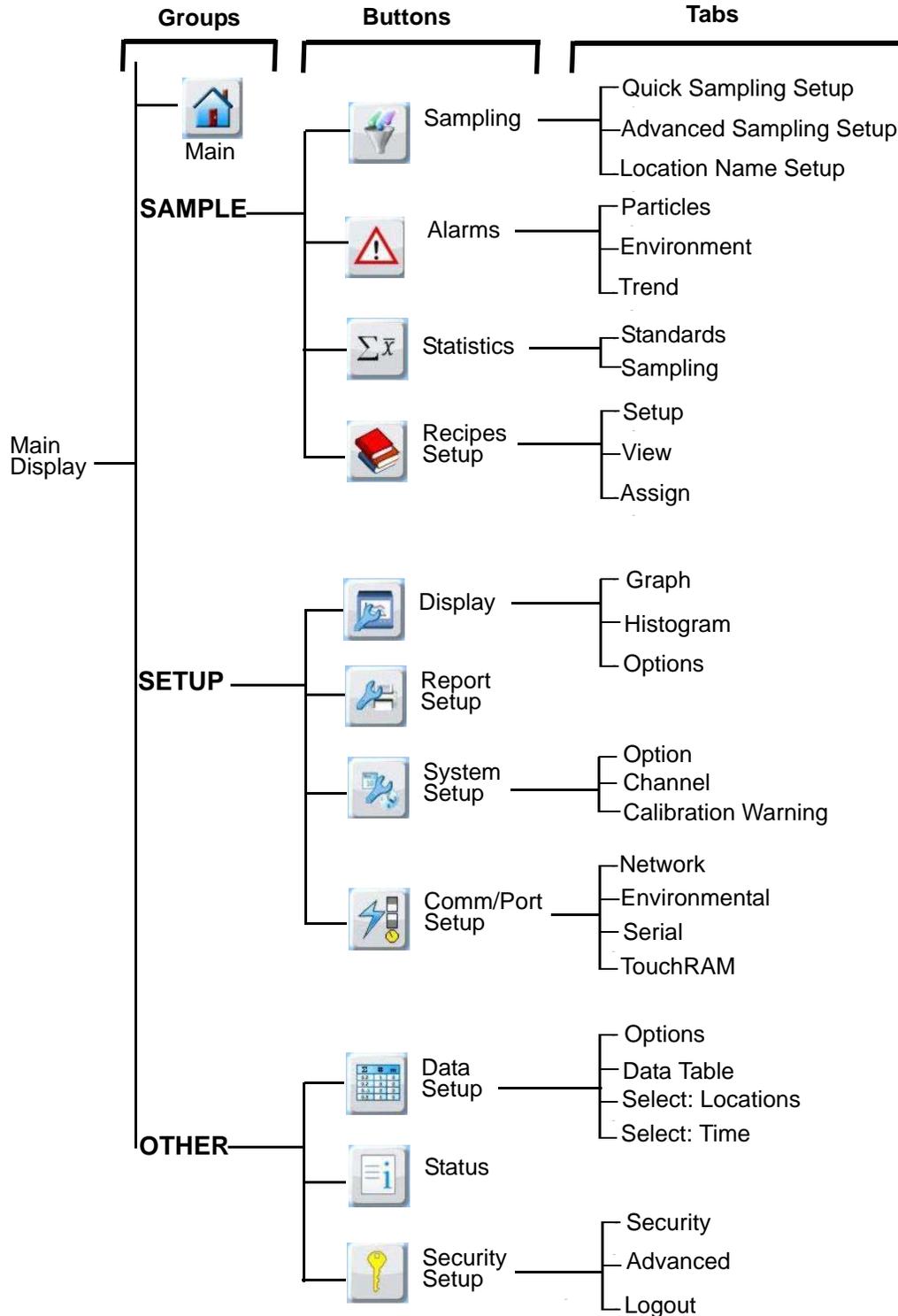


Figure 5-4 Navigation panel buttons



Main Display Screen

When you first turn on the Lasair III particle counter, the **Main Display** screen displays.

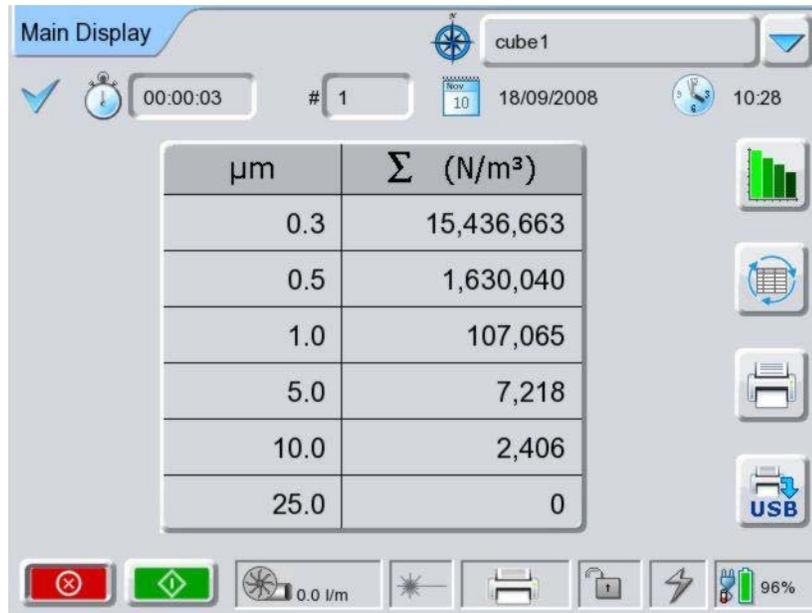


Figure 5-5 Main Display screen

Use the **Main Display** screen for viewing sampling data in a variety of formats, monitoring the status of the Lasair III particle counter, and printing your sampling results.

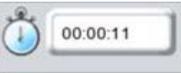
The screen displays data collected from the current sample. Data remains on the screen until a new sample is started. The data on this screen is automatically saved and stored in the Lasair III particle counter's memory. You have the option to display sample data in several formats or display environmental information. For information about the displays available, see Data Displays – Options on page 5-8.

The **Table 5-1** on page 5-5 defines the fields, buttons, and status alerts on the **Main Display** screen. Some buttons and fields on the **Main Display** screen are different in **Statistics Mode**. For information about these differences, see Main Display Screen on page 10-3 in **Chapter 10** Statistics Mode



Status Indicators – Sampling

Table 5-1 Status Indicators – Sampling

	Success Status Indicator	When displayed, indicates the sampling was successful.
	Failure Status Indicator	When displayed, indicates the sampling failed.
	Acknowledge Alarm	When displayed, indicates that the sampling has exceeded limits you have set for particle and environment values. The background of the Main Display screen also flashes red to indicate the alarm status. Press this button to turn the alarm off.
	Location List	Selectable list of stored locations. A scroll bar is included to help navigate through the list.
	Sample Time	Time length for the sample or time remaining in current sample. <hr/> NOTE: Depending on the parameters set on the Advanced tab of the Sampling Setup screen, either the Sample Volume indicator or the Sample Time field displays. <hr/>
	Sample Volume	Volume amount to sample or volume remaining in current sample. <hr/> NOTE: Depending on the parameters set on the Advanced tab of the Sampling Setup screen, either the Sample Volume indicator or the Sample Time field displays. <hr/>
	Inter-Sample Time Remaining	Time between samples.
	Inter-Sample Delay	Initial delay before beginning sample.
	Sample Number	The number of the sample and the total samples planned. In continuous sampling, only the current sample number displays.
	Current Date	The current date. This field is view-only.
	Current Time	The current time, updated every second.



Control Buttons

Table 5-2 Control buttons

	Histogram	Displays sampling in a graphical bar format. See Histogram Chart on page 5-11.
	Trend Graph	Displays sampling data in a graphical chart format. See Trend Graph on page 5-12.
	Change Display	Switches data display among the Cumulative Only , the Differential and Cumulative , and the Environment display formats. NOTE: Because the Change Display button switches between these display formats, you may need to press this button more than once to display the format you want.
	Print	Prints sampling results to thermal printer. See Example Print Output on page 5-13.
	Save to USB	Saves sampling results to a USB key. See Example USB Output on page 5-16.
	Start	Starts the sampling process. NOTE: For information about the behavior of Start and Stop buttons in Continuous Pump mode, see Sampling Setup Screen on page 6-1.
	Stop	Stops the sampling process.

Statistics Mode Control Buttons

The buttons described in **Table 5-3** display when the unit is in **Statistics** mode. For more information about the **Main Display** in **Statistics** mode, see **Main Display Screen** on page 10-3.

Table 5-3 Statistics mode control buttons

	Statistics Mode	Replaces the Trend or Histogram button when the unit is in Statistics Mode . Press this button to exit Statistics Mode .
	Statistics Summary Mode	Replaces the Change Display button when the unit is in Statistics Mode . Press this button to display the Statistics Summary screen. The Statistics Summary is only available in Statistics Mode .



Status Indicators – Instrument

Table 5-4 Status Indicators – Instrument

	Flow Status with Normal Pump Operation	<p>Shows the current state of the pump and its flow rate. The following indicators show the flow status under normal operation:</p> <ul style="list-style-type: none"> • If the pump indicator is blue, the pump is operating normally and is active. • If the pump indicator is gray, the pump is operating normally and is inactive.
	Flow Status with Faulty Pump Operation	<p>Indicates that the pump is operating incorrectly and the airflow deviates more than 5% from the device sampling rate during the sampling process.</p> <ul style="list-style-type: none"> • If the pump indicator is blue and has a red X, the pump is on but operating incorrectly. • If the pump indicator is gray and has a red X, the pump is off and operating incorrectly. • If the pump indicator is gray and has a black X, the pump is out of order, typically because of over-current errors.
	Normal Laser Operation Indicator	<p>Shows laser status when it is operating normally.</p> <ul style="list-style-type: none"> • If this laser indicator is red, the laser is operating properly. • If this laser indicator is gray, the laser is inactive.
	Faulty Laser Operation Indicator	<p>Shows laser status when it is operating incorrectly.</p> <ul style="list-style-type: none"> • If the laser indicator is red and has a red X, the laser is on but operating incorrectly. • If the laser indicator is gray and has a red X, the laser is off and operating incorrectly.
	Print Queue Indicator	<p>Indicates the current state of the print queue.</p> <ul style="list-style-type: none"> • If the indicator is gray, the print queue is operating properly. • If the indicator displays with a black X, the print queue is operating incorrectly.
	Password Protection – Disabled	<p>When the indicator is gray, indicates password protection is disabled.</p>
	Administrator Enabled	<p>When the indicator is blue, indicates password protection has been enabled, but can be bypassed by the Administrator currently logged onto the system.</p>
	Password Protection – Enabled	<p>Indicates password protection is enabled and the current (non-Administrator) user cannot make changes.</p>
	Communications Status Indicator	<p>The communications status.</p> <ul style="list-style-type: none"> • If this indicator is blue, the device is connected to DataAnalyst, FacilityNet, or PharmaceuticalNet.
	Power Indicator – AC Power	<p>Lasair III particle counter is powered using AC power. No batteries are inserted.</p>
	Power Indicator – Battery	<p>Lasair III particle counter is powered by the batteries. The fill level indicates battery power remaining, in percent increments.</p>
	Power Indicator – Battery Charging	<p>Lasair III particle counter is powered by AC power and is charging the batteries. The fill level indicates battery power remaining.</p>



Data Displays – Options

You can view sample data in a number of ways on the **Main Display** screen. The table in the center of the screen changes based on your selection:

- Cumulative only (see below)
- Differential and Cumulative (see page 5-9)
- Environment Display (see page 5-10)
- Histogram Chart (see page 5-11)
- Trend Graph (see page 5-12)

You can also display Environmental data when using environmental sensors.

Cumulative Only Table

Press the **Cumulative Only Table** button  on the **Main Display** screen to rotate through three views:

- Cumulative
- Differential and Cumulative
- Environment



Figure 5-6 A **Cumulative Only** table display

Use the **Cumulative Only** table to monitor sample data by the number of particles of a certain size or larger for each particle size.

The **Cumulative Only** table on the **Main Display** screen has the following columns:

- Particle size
- Cumulative count

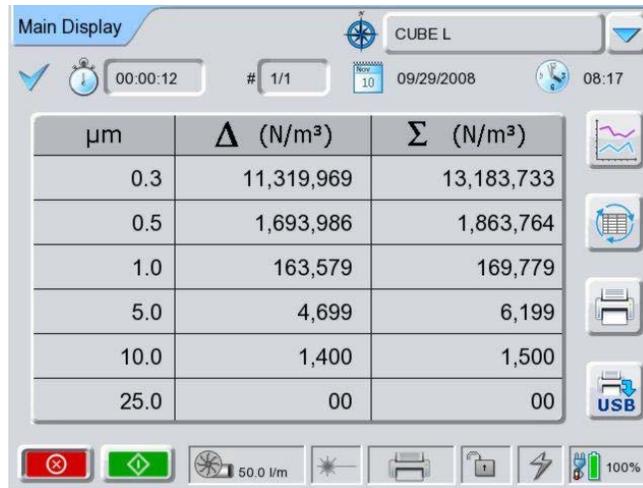
The **Particle Size** for each channel enabled and the cumulative particle count from the most recent sample display side-by-side in the center of the screen. You set the parameters for a cumulative or differential format, and unit of measure, on the **Advanced** tab of the **Sampling Setup** screens.

Cumulative count refers to a number of particles of certain size *and larger* that are found in one sample.



Differential and Cumulative Display

Press the **Cumulative Only Table** button  on the **Main Display** screen to view the **Differential and Cumulative** table.



µm	Δ (N/m ³)	Σ (N/m ³)
0.3	11,319,969	13,183,733
0.5	1,693,986	1,863,764
1.0	163,579	169,779
5.0	4,699	6,199
10.0	1,400	1,500
25.0	00	00

Figure 5-7 A **Differential and Cumulative** table display

Use the **Differential and Cumulative** table to monitor sample data by the number of particles of a certain size or larger and number of particles of a specific size for each particle size.

The **Differential and Cumulative** table on the **Main Display** screen has the following columns:

- Particle size
- Cumulative count
- Differential count

Differential refers to a number of particles of a specific size that are found in one sample. **Particle Size** and **Cumulative Count** are the same as in the **Cumulative Only** display.



Environment Display

Press the **Cumulative Only Table** button  on the **Main Display** screen to view the **Environment** table.

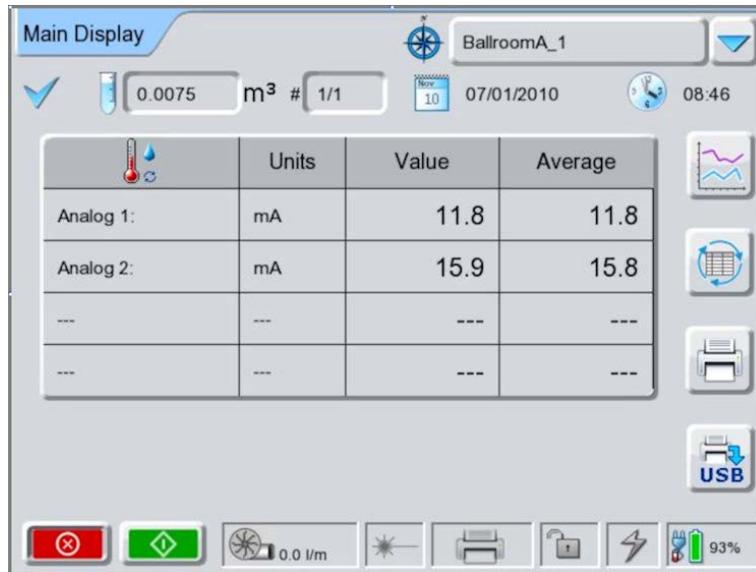


Figure 5-8 Environment table display

Use the **Environment** table on the **Main Display** screen to view data collected by any environmental sensors (such as a temperature and relative humidity sensor). The table contains four rows for each available analog channel and the following four columns:

- Name – Name set for the channel
- Units – Unit name set for the channel
- Value – Current calculated value for the channel
- Average Value – Average calculated value for the channel



Histogram Chart

Press the **Histogram Chart** button  on the **Main Display** screen to view the **Histogram** chart.

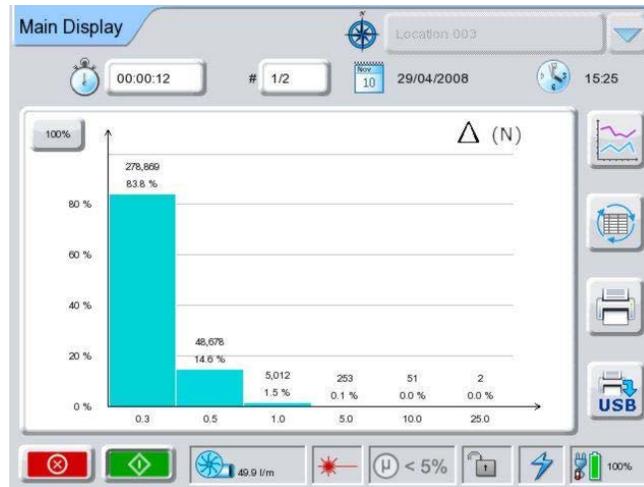


Figure 5-9 Histogram chart display

Use the **Histogram** chart on the **Main Display** screen to monitor all the channels in a graphical bar format. The chart can display differential or cumulative count using percent full, linear, or log scales depending on the current setting for sampling. You set the parameters for the chart display using the **Display Setup** screen (see **Display Setup Screen** on page 7-1). This section describes the chart region of the Histogram chart. For other field definitions, see **Main Display Screen** on page 5-4.

The X-Axis (horizontal) labels the bars with the channels. The Y-Axis (vertical) represents the scale (percent full, linear, or log).

The **Histogram** chart updates each second.

Above each bar are view-only data. The data depends on the scale used.

- Percent full scale – Channel's percentage of current maximum value
- Log and Linear scale – Channel's value compared to current maximum value

Table 5-5 Field definitions in the **Histogram** chart display

	Maximum Value	Displays the maximum value. Press this button to change the maximum value.
---	----------------------	--



Trend Graph

Press the **Trend Graph** button  on the **Main Display** screen to view the **Trend** graph.

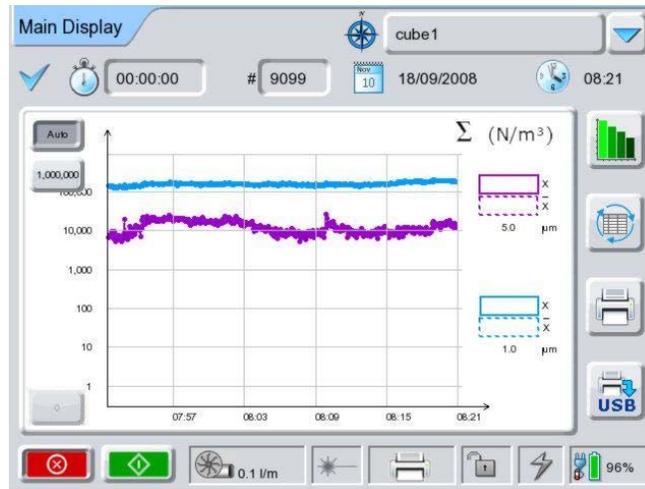


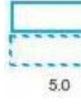
Figure 5-10 Trend graph display

Use the **Trend** graph on the **Main Display** screen to monitor up to two channels that you specify. The graph displays cumulative count of raw or normalized data depending on the current setting for sampling. You set the parameters for the Trend graph using the **Graph** tab of the **Display Setup** screen. This section describes the Trend graph's fields. For other field definitions, see Main Display Screen on page 5-4.

The X-Axis is a linear time scale from 5 to 120 minutes. The Y-Axis is either logarithmic or linear. The line colors indicate the channels while the line patterns indicate the following:

- Thick line – Threshold alarm level
- Normal thickness line – Cumulative particles count
- Dashed line – Moving average
- Line pattern and color for the moving average line

Table 5-6 Field definitions in the **Trend** graph display

	Auto Scaling	Enables you to see all the sampling data when the maximum value is changing during sampling.
	Maximum Value	Displays the maximum value set in the Graphs tab of the Display Setup screen. Press this button to change the maximum value and disable auto-scaling.
	Minimum Value	Displays the minimum value set in the Graphs tab of the Display Setup screen. Press this button to change the minimum value and disable auto-scaling.
	Legend	For each channel, displays information about the graph lines. There are two legends, one for each channel. Each legend has the following information: <ul style="list-style-type: none"> • Solid box – Line color and style for actual line count • Dashed box – Line color and style for moving average value • x (next to solid box) – Most recent value • x (next to dashed box) – Moving average value



Example Output

You can output sampling results to:

- The built-in thermal printer
- A USB key
- PMS software – DataAnalyst, Facility Net, and Pharmaceutical Net

For information about transferring sampling data to PMS software, see the user guide that comes with the software.

Example Print Output

Press the **Print** button  on the **Main Display** screen to print messages and data.

This section describes the messages and data that appear on the printout generated by the Lasair III particle counter's thermal printer. The descriptions are listed by line number, from top to bottom in the order the lines appear on the printed output.

NOTE: This numbering is for description purposes only and does NOT appear on the actual printer output.

Final Sample Report

1	Final Sample Report				
2	Heading one				
3	Heading two				
4	Instrument ID:				Lasair III
5	Serial Number:				PrePro09
6	Calibrated:				01/01/1970
7	Batch ID:				Batch ID
8	Operator:				Operator name
9	Location:				#001
10	Recipe				RecipeName
11	Room:				
12	02/25/2000 04:35:30				
13	02/25/2000 04:36:30#1				
14	Sample Status: Valid				
15	Particle Data				
16	μ	Δ N/m ³			Σ N/m ³
16	0.5	881337			976833
16	1.0	47836			95496
16	2.0	39828			47660
16	5.0	5539			7832
16	10.0	2222			2293
16	25.0	71			71
17	Environmental Data				
18		Avg	Min	Max	
19	Analog 1 mA	8.2	8.1		8.4
19	Analog 2 mA	15.8	15.8		15.9
19	Analog 3 mA	NaN	NaN		NaN
19	Analog 4 mA	NaN	NaN		NaN
20	00:01:00 1.001 cfm				

**Table 5-7** Printout legend

Line No.	Text or Data	Description
1	Final Sample Report	Title of Report. Possible values: <ul style="list-style-type: none">• Final – Report printed after the sampling completed.• Partial – Report printed during the sampling process.
2	Heading One	Heading 1 text specified in the Report Setup screen. Not shown if Heading One field is blank.
3	Heading Two	Heading 2 text specified in the Report Setup screen. Not shown if Heading Two field is blank.
4	Instrument ID	Name/ID of the particle counter that produced the data.
5	Serial Number	Serial number of the particle counter that produced the data.
6	Calibrated	Date on which the particle counter was last calibrated.
7	Batch ID	Batch ID text specified in the Report Setup screen. Not shown if Batch ID field is blank.
8	Operator	Operator text specified in the Report Setup screen. Not shown if Operator field is blank. Set on Report Setup screen or Security screen.
9	Location	Location.
10	Recipe	Name of the recipe used, if any. This field is not saved with data, and will only print from the Main screen, not from the saved Data Table . Sample Data that has been collected with a recipe will not indicate the recipe if the data is printed from the Data Table Screen. If there is no recipe, this line is blank.
11	Room	Room is specified in the Statistics Setup screen and only displays in Statistics mode.
12	02/25/2000 04:35:30	Start date/time stamp
13	02/25/2000 04:36:30#1	Date stamp (day/month/year) followed by a time stamp (hour:minute:second) when the sample ended, and the number of the sample.
14	Sample Status	Status of sample. Possible values: <ul style="list-style-type: none">• Valid – Particle counter did not detect any condition that would invalidate the sample.• Invalid – Particle counter detected a condition that invalidates the sample.
15	Particle Data	Header for particle data report that follows.



Table 5-7 Printout legend (Continued)

Line No.	Text or Data	Description
16	μ ΔN ΣN or μ $\Delta N/m^3$ $\Sigma N/m^3$	Column headers: <ul style="list-style-type: none"> • μ – Particle size in microns • Δ – Number of particles detected of that size. When followed by N, indicates raw counts. When followed by N/m^3, indicates normalized cubic meters. • Σ – Sum of all particles of particle size and larger counted. When followed by N, indicates raw counts. When followed by N/m^3, indicates normalized cubic meters.
16	0.5 88137 976833	Channel and channel data. For column definitions, see line 15 above.
17	Environmental Data	Header for analog data that follows. This information displays only if there are analog sensor and only of one or channels is enabled.
18	Avg Min Max	Column headers for average, minimum, and maximum values for analog
19	Analog 4 mA 8.2 8.1 8.4	Average, minimum, and maximum values for the analog channel. If a channel is enabled, but a sensor is not attached, the value is NaN.
20	00:01:00 or 1.001 cfm	Sample time and sample size
	Alarm: Pump	(Not shown) This line prints when the particle counter senses that the flow rate is outside the boundary of 1 cfm \pm 5%.
	Alarm: Laser	(Not shown) This line prints when the particle counter senses that the laser power is out of the specified range.

NOTE: When the Lasair III particle counter is operated in **Statistics** mode, the printout includes different data than the example shown. For information about the messages and data on the statistics mode printout, see Printing a Statistics Report on page 10-14.



Example USB Output

Press the **USB** button  on the **Main Display** screen to save data to a USB key.

The data format of the .MHT files saved to a USB key depends on the data display format that is displayed on the **Main Display** screen at the time you press the USB Output button. The following sample report describes the messages and data that appear when a report is generated when the **Main Display** screen shows the **Cumulative** or **Differential and Cumulative** data display. Other displays provide different information, although the first eleven items appear on all reports. The descriptions are listed by line number, from top to bottom in the order the lines appear on the printed output.

NOTE: The numbers on the example report are for description purposes only and do NOT appear on the actual file output.

Final Sample Report

Page 1 of 1

21 CFR 11 Compliant 

Final Sample Report

Heading Number One
Heading Number Two

Instrument ID: Lasair III
Serial Number: Gamma #2
Calibrated: 05/01/2010

Batch ID: Batch Name
Operator: Operator Name
Location: BallroomA_2
Recipe: Recipe Name

Date & Time: 01/20/2012 11:34:38
Sample: 1
Sample Status: VALID

Particle Data

Normalized Counts Time: 00:01:00

μm	$\Delta \text{N/m}^3$	$\Sigma \text{N/m}^3$
0.3	6939	14639
0.5	2420	7699
1.0	3580	5280
5.0	700	1700
10.0	560	1000
25.0	440	440

Volume: 0.0500 m³ Flow: 0.0500 m³/min

Environmental Data

		Avg	Min	Max
Analog 1	mA	11.4	11.1	11.9
Analog 2	mA	6.6	6.4	7.1
Analog 3	mA	NaN	NaN	NaN
Analog 4	mA	NaN	NaN	NaN

Figure 5-11 Final Sample report, USB output

**Table 5-8** USB output legend

Line No.	Text or Data	Description
1	Final Sample Report	Title of Report. Possible values: <ul style="list-style-type: none"> • Final – Report printed after the sampling completed. • Partial – Report printed during the sampling process.
2	Heading one	Heading 1 text specified in the Report Setup screen.
3	Heading two	Heading 2 text specified in the Report Setup screen.
4	Instrument ID	Name/ID of the particle counter that produced the data.
5	Serial Number	Serial number of the particle counter that produced the data.
6	Calibrated	Date on which the particle counter was last calibrated.
7	Batch ID	Batch ID text specified in the Report Setup screen.
8	Operator	Operator text specified in the Report Setup or Security screens.
9	Location	Location.
10	Recipe	Name of the recipe used, if any. This field is not saved with data, and will only print from the Main Display , not from the saved Data Table . Sample Data that has been collected with a recipe will not indicate the recipe if the data is printed from the Data Table screen.
11	Date & Time	Date and time at which the sample was taken.
12	Sample	Number of the sample.
13	Sample Status	Status of sample. Possible values: <ul style="list-style-type: none"> • Valid – Particle counter did not detect any condition that would invalidate the sample. • Invalid – Particle counter detected a condition that invalidates the sample.
14	Particle Data	Header for particle data report that follows.
15	Normalized Counts Time	Type of data and time within sampling when data captured. Possible values for type of data: <ul style="list-style-type: none"> • Normalized – Counts of particles displayed per unit of volume. • Raw – Counts of particles displayed as basic count.
16	μ Δ N Σ N or μ Δ N/m ³ Σ N/m ³	Column headers: <ul style="list-style-type: none"> • μ – Particle size in microns • Δ – Number of particles detected of that size. When followed by N, indicates raw counts. When followed by N/m³, indicates normalized cubic meters. • Σ – Sum of all particles of particle size and larger counted. When followed by N, indicates raw counts. When followed by N/m³, indicates normalized cubic meters.
17	0.5 88137 976833	Channel and channel data. For column definitions, see line 13 above.
18	Volume	Volume sampled.



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Chapter 6 Setting Sampling and Alarm Parameters

The Lasair III particle counter's large touchscreen display and intuitive screens make sampling and alarm setup easy. During this setup process, you will define the parameters that will be used when collecting sample data and set alarm limits and features for all available particle channels.

The following sections provide an overview of the Sampling and Alarm setup screens, and definitions for the fields and buttons on each screen to help assist you in the setup process.

- Sampling Setup Screen  (begins on this page)
- Alarm Setup Screen on page 6-8 

Sampling Setup Screen

Main Display > Sample > Sampling

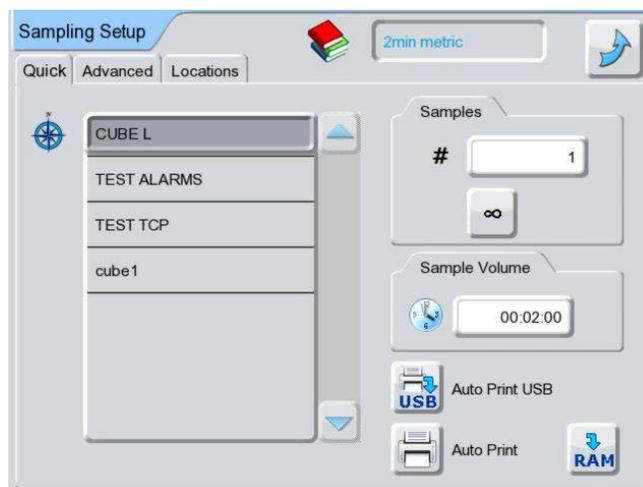


Figure 6-1 Quick tab of the Sampling Setup screen

Use the **Sampling Setup** screens to set up the parameters that will be used for collecting sample data. These sampling parameters are assigned to specific sampling locations.

The **Sampling Setup** screen is comprised of three tabs:

- **Quick** tab (see page 6-2)
- **Advanced** tab (see page 6-3)
- **Locations** tab (see page 6-6)



Quick Tab

See **Figure 6-1** on page 6-1.

Table 6-1 Buttons on the **Quick** tab

	Recipe Name	This field is blank during initial setup. However, after you set up recipes (Chapter 7, “Recipes”) the name of the recipe which is being used displays in the top-right area of the Sampling Setup screen. This is a view only field. If any sampling parameters are changed, then this field is blank.
	Location List	This field is blank during initial setup. However, once you set up locations, a selectable list of stored locations displays. A scroll bar is included to help navigate through the list.
Samples #	Number of Samples	Count of samples taken (0-3000) in a sequence. The default value is 0. <hr/> NOTE: This field is disabled if continuous sampling is selected. <hr/>
	Continuous Sampling	Use to switch to toggle continuous sampling On or Off . used for switching on/off continuous sampling.
 Sample Time OR  Sample Volume	Sample Size by Time or Volume Defined size of sample. The size can be defined in by time (default option) or by volume. The size type is selected on the Advanced tab. Length of Time for Sampling The time format is 00:00:00 representing hours, minutes, and seconds. The minimum Sample time is 00:00:06 and the maximum time is 24:00:00. The default value is the last used value which is stored in the battery- backed memory. Volume of Sample The volume format is 0.0000 m ³ or 0.00 ft ³ or 0.00 L, depending on the current units. The allowed range of values is 0.0047 to 71.99949 for m ³ , 0.1640 to 2547.63824 for ft ³ , and 4.6667 to 71999.497 for liters. The volume unit of measure displays next to the numerical value. The unit of measure is selected on the Advanced tab. <hr/> NOTE: This field (Time or Volume) is disabled in Statistics mode. <hr/>	
	Auto Print USB	Prints sampling results to a USB key. This button is only activated when a USB key is inserted.
	Auto Print	Automatically prints sampling results after each sample to the Lasair III thermal printer.
	RAM	Write to TouchRAM Writes all current settings to TouchRAM button.



Advanced Tab

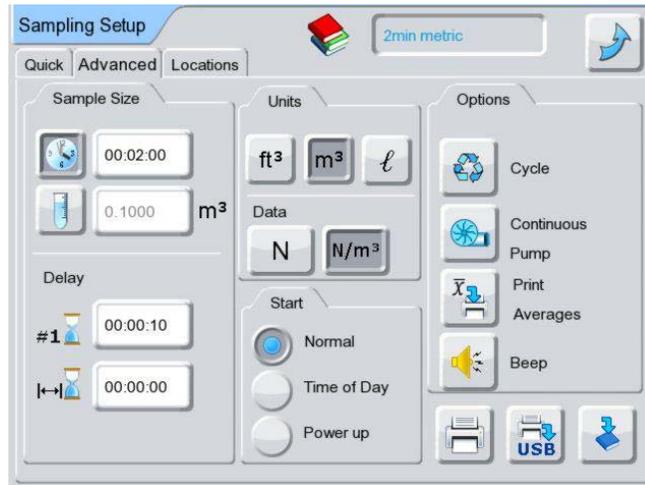


Figure 6-2 Advanced tab of the **Sampling Setup** screen

Sample Size

Table 6-2 Buttons in **Sample Size** area of **Advanced** tab on **Sampling Setup** screen

 <p>Sample Time</p>	<p>Time Length of Sample</p>	<p>The format for Sample Time is 00:00:00 representing hours, minutes, and seconds. The minimum Sample time is 00:00:06 and the maximum time is 24:00:00. The default value is the last used value which is stored in battery- backed memory. This field is only activated if the Sample Time mode is selected.</p>
 <p>Sample Size</p>	<p>Sample Volume</p>	<p>Selects volume for the method of sample sizing, and activates Sample Volume fields on both the Advanced and Quick tabs. Once the unit of measure in selected on the Units mini tab, the unit of measure (such as ft³) displays next to the numerical value.</p>
<p>Sample Volume</p>	<p>Volume of Sample</p>	<p>The format for Sample Volume is 0.0000 m³ or 0.00 ft³ or 0.00 L, depending on the current units. The maximum volume is dependent on the instrument model and is the equivalent to 24:00:00. The minimum volume is equivalent to 00:00:06 in time. The volume unit of measure displays next to the numerical value. The unit of measure is selected on the Advanced tab. This field is only active if the Sample Volume mode is selected.</p>



Delay

Table 6-3 Buttons in **Delay** area of **Advanced** tab on **Sampling Setup** screen

 Delay	Initial Delay	Amount of time the pump will run before the particle counter begins to sample. The format is 00:00:00 for hours, minutes, and seconds. The maximum value is 99:59:59.
 Delay	Inter-Sample Delay	The wait time between samples. The format is 00:00:00 representing hours, minutes, and seconds. The maximum value e is 99:59:59.

Units

Table 6-4 Buttons in **Units** area of **Advanced** tab on **Sampling Setup** screen

 Units (US)	Cubic Foot	Selects cubic foot (ft ³) as the unit of measure for the sample.
 Units (metric)	Cubic Meter	Selects cubic meter (m ³) as the unit of measure for the sample.
 Units	Liter	Selects Liter (ℓ) as the unit of measure for the sample.
 Data Type	Raw Data	Selects raw data as the data type for the sample.
 Data Type	Normalized Data	Selects normalized data as the data type for the sample. Normalized data is shown with: <ul style="list-style-type: none"> • 2 decimal digits if liters are selected, • 1 decimal digit if feet are selected, and • 0 decimal digits if meters are selected



Start

Table 6-5 Buttons in **Start** area of **Advanced** tab on **Sampling Setup** screen

	Start	Normal	Designates the Start button on the Main Display screen to activate sampling when pressed. This is the default option.
	Start	Time of Day	Activates the particle counter to start sampling at the pre-designated time of day. When selected, a dialog box for Time of Day entry appears on the Main screen.
	Start	Power Up	Causes the particle counter to start sampling immediately after turning the instrument on. If calibration is needed, the Calibration Prompt/Reminder dialog displays as the sampling commences.

Options

Table 6-6 Buttons in **Options** area of **Advanced** tab on **Sampling Setup** screen

	Cycle	Continuously collects a finite number of samples. <hr/> NOTE: Typically the Sample Average is also activated with this Cycle Mode. The Cycle Mode setting is saved in both TouchRAM buttons and recipes. <hr/>
	Continuous Pump	Enables or disables a Continuous Pump mode. Start and Stop buttons on the Main Display activate as follows: <ul style="list-style-type: none"> • When the Start button is first pressed, it will start the pump. Press it a second time and it will begin the sampling process. • If the Stop button is pressed <i>during</i> sampling, then the sampling will be stopped. If the Stop button is pressed <i>before</i> sampling, the pump will be stopped.
	Print Averages	Causes the particle counter to print average values at the end of sampling. When measuring normalized counts the Print Averages only prints normalized results. If the measurement is being done in raw counts the Print Averages will print both raw and normalized counts.
	Beep	Enables the particle counter to make an audio signal (beep) when some amount of particle is counted. When enabled, a pop-up selection box is shown on the main screen allowing the operator to set the number of particles per beep, (1, 10, 100...100,000), or turn the mode off.
	Auto Print USB	Automatically prints sampling results to a USB key. This button is only activated when a USB key is inserted.
	Auto Print to Default Printer	Automatically prints sampling results after each sample to the Lasair III thermal printer. This button is selected by default.
	Save Recipe	Saves the current sampling parameters to a recipe. The default name is whatever recipe currently selected. If an existing recipe name is used, that recipe name is replaced with the new parameters. A statistics recipe may be re-written with a sampling recipe, and vice-versa.



Locations Tab

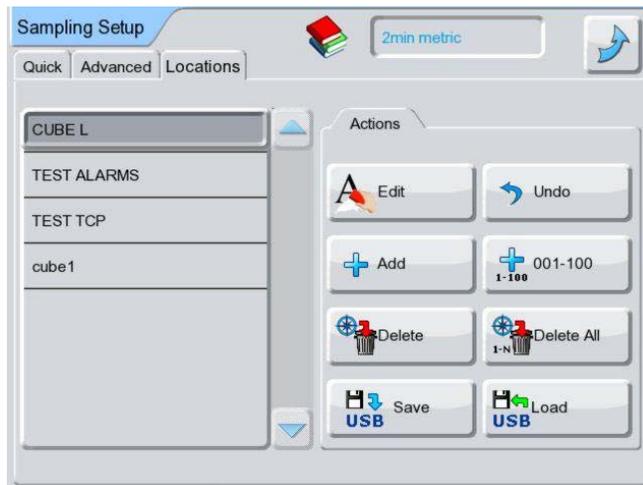


Figure 6-3 Locations tab of the **Sampling Setup** screen

If you are moving the instrument to different sampling locations, the Lasair III particle counter lets you name those locations in the Location Name Setup Screen. Once you have the locations named, you can select a location name to label the sampling data.

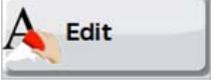
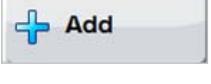
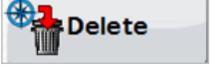
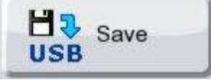
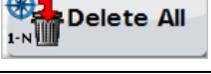
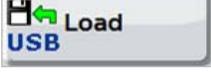
Initially, no location names will appear in the list box on the left side of the screen. Location names can be added individually, or locations numbered 1–100 can be added automatically. You can store up to 400 locations.

NOTE: Only 250 locations may be used with Facility Net or Pharmaceutical Net software.



Actions

Table 6-7 Buttons in **Actions** area of **Locations** tab on **Sampling Setup** screen

	Edit Location	Allows the changing of the selected location. Displays a touch pad keyboard (with alpha and numeric characters) for entering the name. The current name displays on the input field of the keyboard for changing.
	Add Location	Allows the entry of a new location. Displays a touch pad keyboard (with alpha and numeric characters) for entering the name. The input field is initially blank.
	Delete Location	Deletes the current location selected.
	Save to USB	Saves location settings to a USB key. This button is only activated when a USB key is inserted.
	Undo	<p>Restores the previous location after the following operations:</p> <ul style="list-style-type: none"> • Edit Location • Add Location • Delete Location • Delete All Locations • Create Numbered Locations <hr/> <p>NOTE: Undoes one previous action only and only while in this screen.</p> <hr/>
	Create Numbered Locations	Automatically numbers new locations with names starting with 001 to 100. This button is enabled only if the list is empty.
	Delete All Locations	Deletes all locations in the list. A message displays to prompt the operator for confirmation.
	Load USB	Loads locations from the USB key to the particle counter.



Alarm Setup Screen

Main Display > Sample > Alarm Setup

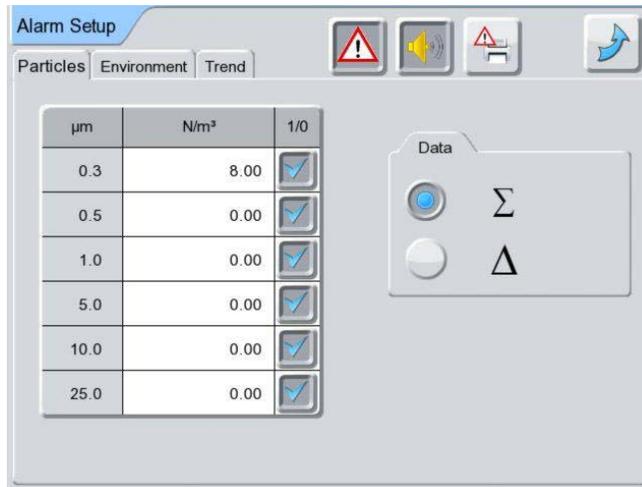


Figure 6-4 Particles tab of the Alarm Setup screen

Press the **Alarm Setup** button  on the **Main Display** screen to view the **Alarm Setup** screen.

Use the **Alarm Setup** screens to set alarm limits for all available particle channels. You can set one (1) to six (6) particle alarms – up to one for each particle size channel. The number of available channels depends on current setup.

NOTE: The Lasair III particle counter automatically adjusts alarm settings according to the changes you made in the sample settings so that the proportions will remain constant.

NOTE: When changing between 6-channel mode and 2-channel mode the alarm settings will not transfer properly. Alarm settings will need to be reestablished when changing between modes.

NOTE: Alarm activation
Once an alarm indication occurs on the display during operation the alarm will remain active until it is acknowledged by the user.

The **Alarm Setup** screen is comprised of three tabs:

- **Particles** tab (see page 6-9)
- **Environment** tab (see page 6-10)
- **Trend** tab (see page 6-11)



Particles Tab

See **Figure 6-4** on page 6-8.

Table 6-8 Buttons and fields in the **Particles** tab of the **Alarm Setup** screen

 <p>Particle Alarms Table</p>	<p>The Particle Alarms Table defines alarms for each available channel. Each row represents one channel. There will be always 6 rows in the table.</p> <p>The table contains the following columns:</p> <ul style="list-style-type: none"> • The left column is particle size. • The middle column is the <i>triggering value</i> (to sound the alarm) for the channel (with a format of 00,000,000 and moving point. The unit of measure for that value depends on the current sample setup. It can be N, N/ft³, N/m³, and liters. <hr/> <p>NOTE: The triggering value is automatically adjusted according to changes to the unit of measure on the Sampling Setup Screen.</p> <hr/> <ul style="list-style-type: none"> • The right column is a toggle button to turn the alarm On (a check mark displays) or Off (a blank button displays).
 <p>Cumulative Count</p>	<p>Bases alarms on cumulative particle counts. Cumulative Count is a number of particles of certain size <i>and bigger</i> that are found in one sample.</p>
 <p>Differential Count</p>	<p>Bases alarms on differential particle counts. Differential count refers to a number of particles of certain size that are found in one sample.</p>



Environment Tab

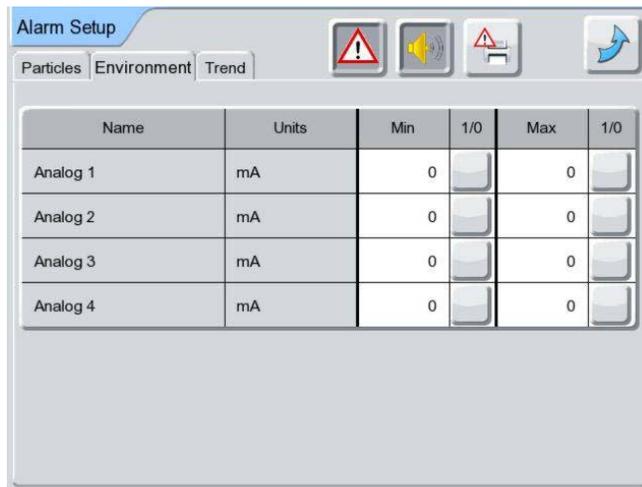


Figure 6-5 Environment tab of the Alarm Setup screen

Table 6-9 Buttons and fields in the Environment tab of the Alarm Setup screen

Name	Units	Min	1/0	Max	1/0
Columns (left to right)					
Name Display name (up to 16-characters) for the channel.					
Units Display units (up to 10 characters) for the channel.					
Min Allows entry of minimum value (with a format of 0.00) for alarm.					
1/0 A toggle button to turn the alarm On for the low value (a check mark displays) or Off (a blank button displays).					
Max The Low triggering value allows the user to set maximum value for alarm. The field initially set to 0 (zero).					
1/0 A toggle button to turn the alarm On (a check mark displays) for the high value or Off (a blank button displays).					



Trend Tab

You can define alarms with using time frame window. The triggering value of the alarm will be displayed on the trend graph, and you can set alarms for each channel. When the alarm for a channel is set, it will display as a horizontal line on the graph with the color of the channel it belongs to. The vertical position of the line will correspond to the alarm limit value. When the trend alarm condition is reached, the particle counter will react with a sample alarm.

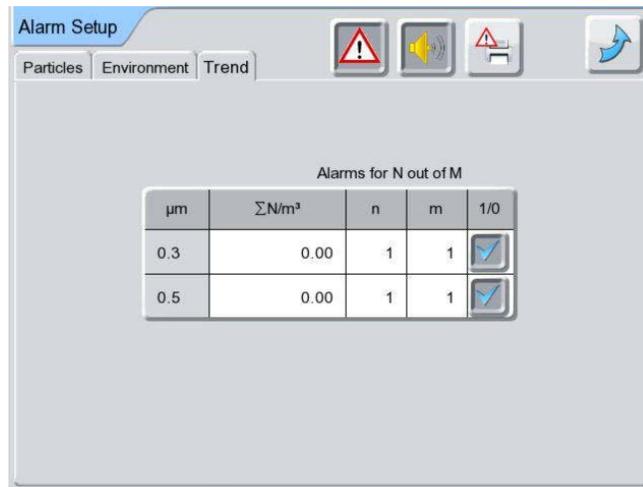


Figure 6-6 Trend tab of the Alarm Setup screen

**Table 6-10** Buttons and fields in the **Trend** tab of the **Alarm Setup** screen

μm	ΣN	n	m	1/0																																																												
The table will contain two rows with the first row representing the first trend channel count, and the second row representing the second trend graph channel count.																																																																
Fields in each row (from left to right)																																																																
μm																																																																
The size of particles (with a format of 000.0) collected by channel. The field is view only.																																																																
ΣN																																																																
Allows setting triggering value (in a format of 00,000,000 and moving point) for the channel. The cumulative data is used for the value. The unit of measure for the value depends on the current sample setup. It can be N, N/ft ³ , N/m ³ , liters. The trigger value will be automatically adjusted according to the changes, which are made in the sample settings so that the proportions will remain constant. By default, the trigger value is zero (0).																																																																
Triggered Samples Count (n)																																																																
Allows entry of the number of samples (1 to 35) that should have exceeded the alarm limit value to turn on the alarm. The value of this field should be less or equal to the Last Number of Samples value (m).																																																																
Last Number of Samples (m)																																																																
Allows entry of the time frame (1 to 35) windows for the alarm. The value in the field shows how many last samples will be used for determining alarm condition. The value of this field should be greater or equal to the Triggered Samples Count value (n). If the Enable Flag is set and Last Number of Samples value (m) is less than Triggered Samples Count value (n), then (n) is set equal (m). The label for the column is (m) string. The default value is 1.																																																																
1/0																																																																
A toggle button to turn the Enable Flag On (a check mark displays) or Off (a blank button displays). The Enable Flag enables using the alarm for the channel.																																																																
Alarm Condition																																																																
The alarm goes on if there are at least n samples from last m samples where the alarm limit value exceeded. The following table shows an example of the state of alarm after different samples with an alarm limit value is 1000.																																																																
<table border="1"> <thead> <tr> <th>Sample #</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>Sample Count</td> <td>900</td> <td>1100</td> <td>1100</td> <td>1100</td> <td>900</td> <td>900</td> <td>1100</td> </tr> <tr> <td>n</td> <td>m</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>1</td> <td>Off</td> <td>On</td> <td>On</td> <td>On</td> <td>Off</td> <td>Off</td> <td>On</td> </tr> <tr> <td>1</td> <td>3</td> <td>Off</td> <td>On</td> <td>On</td> <td>On</td> <td>On</td> <td>On</td> <td>On</td> </tr> <tr> <td>2</td> <td>3</td> <td>Off</td> <td>Off</td> <td>On</td> <td>On</td> <td>On</td> <td>Off</td> <td>Off</td> </tr> <tr> <td>3</td> <td>3</td> <td>Off</td> <td>Off</td> <td>Off</td> <td>On</td> <td>Off</td> <td>Off</td> <td>Off</td> </tr> </tbody> </table>					Sample #	1	2	3	4	5	6	7	Sample Count	900	1100	1100	1100	900	900	1100	n	m							1	1	Off	On	On	On	Off	Off	On	1	3	Off	On	On	On	On	On	On	2	3	Off	Off	On	On	On	Off	Off	3	3	Off	Off	Off	On	Off	Off	Off
Sample #	1	2	3	4	5	6	7																																																									
Sample Count	900	1100	1100	1100	900	900	1100																																																									
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2	3	Off	Off	On	On	On	Off	Off																																																								
3	3	Off	Off	Off	On	Off	Off	Off																																																								



Chapter 7 Setting General Parameters

This chapter will show you how to use the **Display Setup**, **System Setup**, and **Security Setup** screens.

Typically, you will use these when you initially set up the system for setting one time settings like trend channels, and general settings such as screen brightness and date/time. You may also want to set user passwords for added security.



• Display Setup Screen on page 7-1



• System Setup Screen on page 7-6



• Security Setup Screen on page 7-11

Display Setup Screen

Main Display > Setup > Display

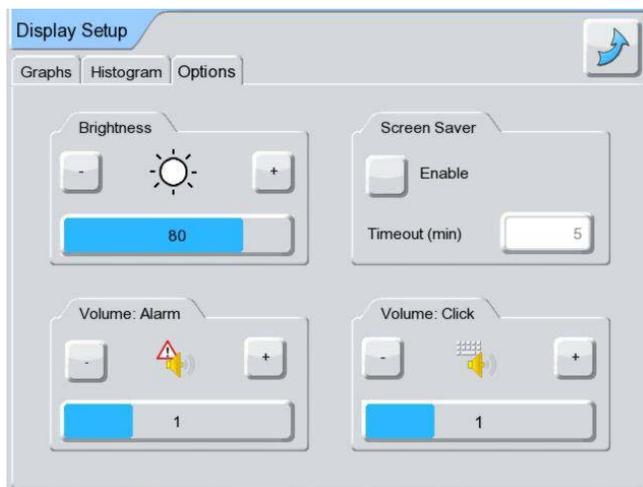


Figure 7-1 Options tab of the **Display Setup** screen

Use the **Display Setup** screen  to set up options for the LCD screen and graph drawing.

The **Display Setup** screen is comprised of three tabs:

- **Graphs** tab (see page 7-2)
- **Histogram** tab (see page 7-4)
- **Options** tab (see page 7-5)



Graphs Tab

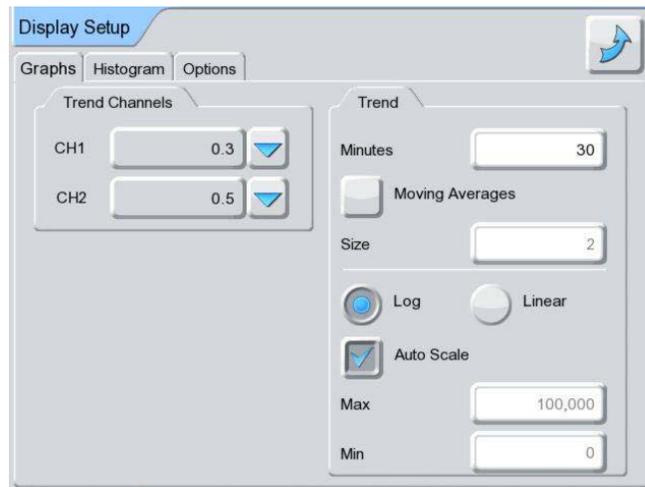


Figure 7-2 Graphs tab of the **Display Setup** screen

This tab is for setting parameters for the trend graph and histogram, which can be displayed on the **Main Display** screen.

Trend Channels

Table 7-1 Buttons and fields in **Trend Channels** area of **Graphs** tab on **Display Setup** screen

Trend Channels		
CH1	Channel Size	Press the down arrow (located to the far right of the CH1 button) to display a list of available channels. Press one of these channels to select it as the <i>first</i> channel to display on the graph.
CH2	Channel Size	Press the down arrow (located to the far right of the CH2 button) to display a list of available channels. Press one of these channels to select it as the <i>second</i> channel to display on the graph.



Trend

Table 7-2 Buttons and fields in **Trend** area of **Graphs** tab on **Display Setup** screen

Minutes	Minutes	The interval to display on the graph (5-120). The default value is 30.
Moving Averages	Moving Average Option	Displays the moving average value on the graph for two channels. The moving average value is the mean value for the N last samples, where N is the Moving Average Size.
Size	Moving Average Size	Defines how many last samples are to be used for calculating the Moving Average (2-10). The default value is 5. The value for this field should be less than the number of samples for the X-axis. This field only displays when the Moving Average Option is enabled.
Log	Scale Type	This option sets the logarithmic scale for the Y-axis where 0 (zero) is the minimum value, from 0 to 1 the scale is linear, and from 1 to maximum the scale is logarithmic when any next point is a factor of 10. The minimum value cannot be changed. The maximum value depends on the Auto Scale option.
Linear	Scale Type	This option represents linear scale for the Y-axis. The minimum and maximum value depend on the Auto Scale option.
Auto Scale	Auto Scale	This option allows the whole sampling data to be displayed on the graph. This is done by correcting maximum value for linear scale and logarithmic scale during sampling. When this option is enabled, the Auto Toggle button on the graph appears pressed (activated).
Max	Maximum Value	The maximum value (with a format 00,000,000) for linear and logarithmic scale when the Auto Scale option is Off . This field is only active when the Auto Scale option is Off .
Min	Minimum Value	The minimum value (with a format 00,000,000) for linear scale when the Auto Scale option is Off . This field is only active when the Auto Scale option is Off .



Histogram Tab

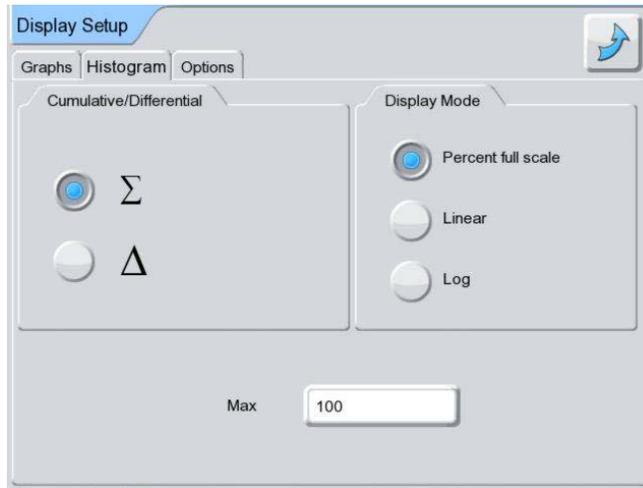


Figure 7-3 Histogram tab of the **Display Setup** screen

Cumulative/Differential

Table 7-3 Options in **Cumulative/Differential** area of **Histogram** tab on **Display Setup** screen

	Cumulative Data	Sets cumulative as the type of data to be used for the histogram graph. Cumulative Count is a number of particles of certain size <i>and bigger</i> that are found in one sample.
	Differential Data	Sets <i>differential</i> as the type of data to be used for the histogram graph. Differential count refers to a number of particles of certain size that are found in one sample.

Display Mode

Table 7-4 Options in **Display Mode** area of **Histogram** tab on **Display Setup** screen

Percent full scale	Percent full scale. Sets the histogram to show the percentages for all enabled channels. The minimum setting is 0 and the maximum setting is 100.
Linear	Linear scale. Represents linear scale for the Y-axis. The minimum value is 0 and cannot be changed.
Log	Log scale. Represents the logarithmic scale for the Y-axis. The minimum value is 1.
Max	Maximum value. The maximum Y-axis value for Percent full, linear and logarithmic scale. When the Percent Full scale is On, this field displays the maximum value (5-100) for this display mode. Initially, the default value is 100, with subsequent default values reflecting the last used value. When the Linear or Log scale mode is On , the field displays the maximum value (with a format of 00,000,000) for these modes. The factory default value for these modes is 100,000, with subsequent default values of the last used value.



Options Tab

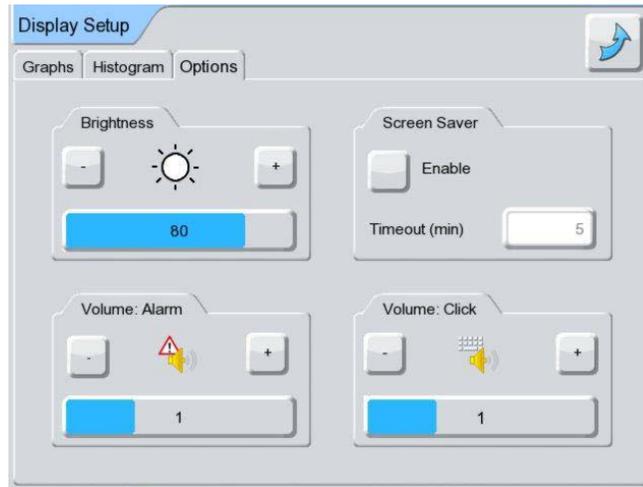


Figure 7-4 Options tab of the **Display Setup** screen

Use the **Options** tab to adjust the display brightness, screen saver, alarm signal volume, and click button volume.

Table 7-5 Buttons and fields in **Options** tab on **Display Setup** screen

 <p>Brightness</p>	 <p>Use the minus and plus buttons to decrease and increase the brightness of the LCD display. As you decrease or increase the brightness, a bar graph (0-3) and number indicate the amount of brightness.</p> <hr/> <p>NOTE: This setting affects battery life.</p>
 <p>Volume: Alarm</p>	<p>Use the minus and plus buttons to decrease and increase the volume of the alarm signal. As you decrease or increase the volume, a bar graph (0-3) and number (percentage) indicate the volume level. For units with the optional Alarm Siren, the volume bar graph is from 0 – 4 levels. The 4th level is used to activate the 100 dB alarm siren.</p>
 <p>Enable Screen Saver</p>  <p>Timeout (Min)</p>	<p>Press the Enable button to activate or deactivate the screen saver feature. When activated, a check mark appears on the button.</p> <p>Press the Timeout (Min) button to access a touch keyboard for entering the number of minutes (1-60) of inactivity required before the screen saver is automatically activated. The screen saver option saves device power by turning off the backlight, while the device continues working. To reactivate the screen, touch any area of the screen.</p>
 <p>Volume: Click</p>	<p>Use the minus and plus buttons to decrease and increase the volume of the beep generated with each click. As you decrease or increase the volume, a bar graph (0-3) indicates the amount of volume.</p>



System Setup Screen

Main Display > Setup > System

Use the **System Setup** screen  to set general system options such as device ID, date and time formats, and language. You also set the All Channels mode or Pharmaceutical Two-Channel mode using the **Channels** tab of this screen.

The **System Setup** screen is comprised of three tabs:

- Options Tab (described on this page)
- Channels Tab on page 7-9
- Calibration Warning Tab on page 7-10

Options Tab

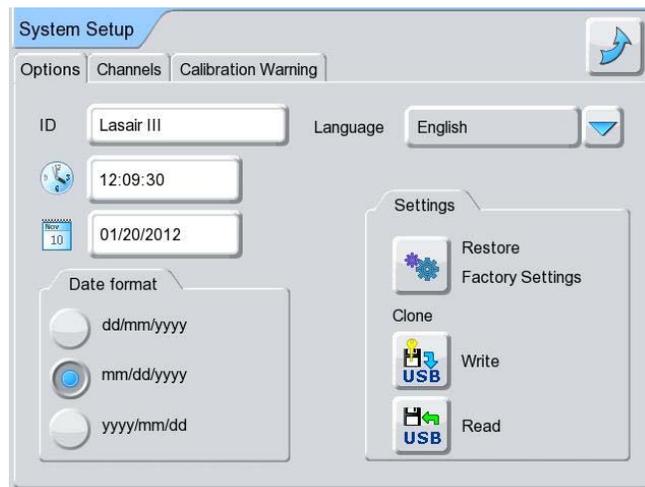


Figure 7-5 Options tab of the **System Setup** screen

Use the **Options Setup** tab to set miscellaneous system options, such as:

- Current date
- Current time
- Device ID
- Language
- Cloning
- Restore Factory Defaults



(General) Options

Table 7-6 Buttons and fields in **Options** tab on **System Setup** screen

ID	Device ID	Name assigned to a Lasair III particle counter (up to 16 alphanumeric characters).
Language	Language	<p>Select one of the following languages, or leave the default of English.</p> <ul style="list-style-type: none"> • English • French • German • Italian • Japanese (Kanji) • Korean • Mandarin traditional (classical) • Mandarin simplified (nw) • Russian • Spanish • Portuguese <p>This language setting affects field names, prompts, and user messages. Data remains in English.</p>
	Current Time	<p>Set the current time for your time zone.</p> <p>The time displays in a format of HH:MM:SS for hours, minutes, and seconds.</p>
	Current Date	<p>Set the current date. You can change the format for the date display in the Date format mini tab.</p>
	Previous Screen	Returns you to the previous screen.

Date format

Table 7-7 Button in **Date format** area of **Options** tab on **System Setup** screen

Date format	Heading 1	<p>You can select one of the following formats:</p> <ul style="list-style-type: none"> • dd/mm/yyyy • mm/dd/yyyy • yyyy/mm/dd <p>Where yyyy is year, mm is month, and dd is day.</p>
--------------------	------------------	---

**Settings and Clone****Table 7-8** Buttons on **Settings and Clone** area of **Options** tab on **System Setup** screen

 Settings	Restore Factory Settings	Purges all data and settings on the device and loads the factory default settings. The system displays a confirmation message before completing the action.
 Settings	Write	Clones the following device parameters into a file that can be transferred to another Lasair III particle counter: <ul style="list-style-type: none"> • Channel settings • Sampling parameters • Statistics settings • Security settings • Comm/port setup • Location names • Recipes • Location/recipe relations • Language settings • Analog channel setting • Display/volume setting • Graph settings • Unit ID <hr/> NOTE: Before transferring this information to another Lasair III model, consider different software configurations, such as 2/3/6i12 channel, particle sizes supported. <hr/>
 Clone 	Read	Allows reading a clone file from USB key and loading it to the current device. A warning/confirmation message displays (as shown to the left). <ul style="list-style-type: none"> • Enter a name for the file in the File Name field. Also select or deselect the following options, as needed: <ul style="list-style-type: none"> • Read Comm Parameters – Overwrites current communication parameters with those on the file. • Read Unit ID – Overwrites current Unit ID with those on the file.



Channels Tab



Figure 7-6 Channels tab of the **System Setup** screen

Use the **Channels** tab to support some pharmaceutical applications. The Lasair III particle counter can be configured to use 0.5 μm and 5.0 μm channels only.

NOTE: Changing between two-channel mode and All Channels mode will cause the unit to reboot. All existing data is DELETED when the unit reconfigures itself. All recipes must be manually exported (via USB or the Web Server) before changing modes, and then re-imported after the mode change is made. If this is not done, alarm settings in sample recipes will be incorrect, and channel sizes for statistics recipes will be incorrect

Serial Number Output to Pharmaceutical Net

The Lasair III particle counter serial number is sent to Pharmaceutical Net during initial communications over TCP/IP. It is not, however, stored.

The following illustrates the format and content of the two-channel (0.5 and 5.0 μm) print output:

1	Final Sample Report		
2	Heading one		
3	Heading two		
4	Instrument ID: Lasair III		
5	Serial Number: PrePro09		
6	Calibrated: 01/01/1970		
7	Batch ID: Batch ID		
8	Operator: Operator name		
9	Location: #001		
10	Room:		
11	02/25/2000 04:36:41#1		
12	Sample Status: Valid		
13	Particle Data		
14	Normalized Counts (N/cm)		
15	μ	Δ	Σ
16	0.5	881337	976833
16	5.0	5539	7832
17	0.0283 cm 0.100047 cmm		



Calibration Warning Tab



Figure 7-7 Channels tab of the **System Setup** screen

Use the **Calibration Warning** tab to set up a reminder when it is time to re-calibrate the Lasair III.

Table 7-9 Buttons on **Calibration Warning** tab in **System Setup** screen

6 Month	Set warning based on 6 month calibration cycle.
12 Month	Set warning based on 12 month calibration cycle.
 Disable Warning	Prevents pop-up warning message when the instrument boots. The warning message will be re-enabled automatically after a calibration.



Security Setup Screen

Main Display > Other > Security

Use the **Security Setup** screen  to enable security for limiting access to setup screens by setting a password for a user. Non-password holders will still be able conduct sampling and view data and status screens, but they will not be able to enter or change setup parameters.



Figure 7-8 Logout tab of the **Security Setup** screen

The **Security Setup** screen is comprised of two tabs:

- **Logout** tab (see page 7-13)
- **Advanced** tab (see page 7-14)

Table 7-10 shows which **Main Display** buttons are enabled, and which are disabled, when password security is enabled.



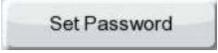
Table 7-10 Main Display buttons enabled and disabled

Enabled Buttons	Disabled Buttons
 Sampling	 Alarms
 Data	 Statistics
 Status	 Recipes
 Security	 Display
 Main	 Report
<hr/> NOTE: Security settings can only be reset by the user with the active password. <hr/>	 System  Comm/Port



Logout Tab

Table 7-11 Buttons and fields in **Logout** tab on **System Setup** screen

User	User Name	A user name can be entered here, but is not required. This user name will also be shown on the report setup screen. Editing the name in either location will update the other location.
	Set Password or Login	<p>Allows you to set the password to restrict other users' access to ONLY sampling and view-only screens. Access to setup screens is disabled.</p> <p>Select the Set Password button to display the touchpad keyboard to type and enter a password.</p> <p>Passwords must have a minimum length of six (6) characters. The maximum password length is 16 characters. Valid characters ar:</p> <ul style="list-style-type: none"> • 0-9 • A-Z • a-z • - • _
	Logout	<p>Logout Button</p> <p>This button is only active if a password has been created. Press this button to logout. This action will disable the setup buttons.</p> <p>The Logout button will be replaced with the Login button.</p>



Advanced Tab

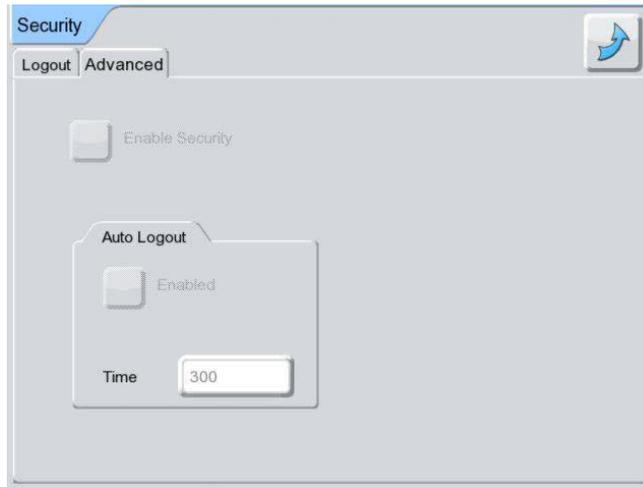


Figure 7-9 Advanced tab of the **Security Setup** screen

Table 7-12 Buttons and fields in **Advanced** tab on **System Setup** screen

	Enable Security	Activates security by requiring a password after the Logout button has been activated. When security is enabled this button will display a check mark. The Web interface always uses the security password.
 Auto Logout	Enabled	Automatically logs the user out at the end of a specified time period. When this button is enabled, it displays a check mark.
 Auto Logout	Time	Sets the time period at which users are automatically logged out. Press the Time button to display the Touch keyboard, and enter the number of minutes to lapse before the user is logged out.



Chapter 8 Setting Data and Reporting Parameters

This chapter describes the screens and buttons used in setup for the **Data** screen and **Report Setup** screen.

- Data screen  (begins on this page)
- Report Setup  (begins on page 8-9)

Data Screen

Main > Other > Data

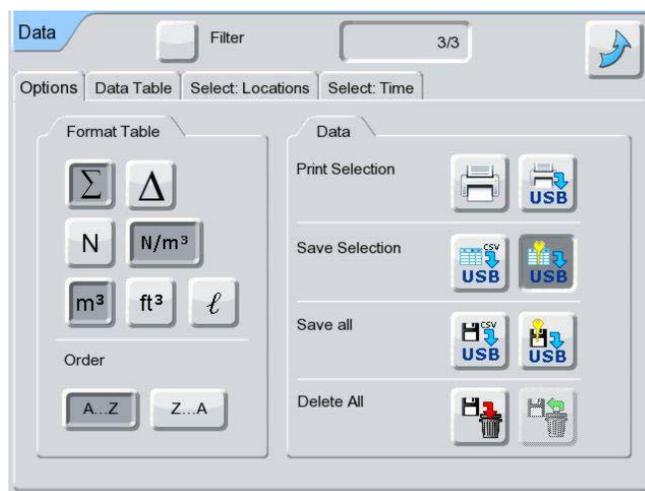


Figure 8-1 Options tab of the **Data** screen

Use the **Data** screens  to set up the parameters for the format, order, and export of sampling data.

The **Data** screen is comprised of four tabs:

- **Options** tab (see page 8-2)
- **Data Table** tab (see page 8-4)
- **Select: Locations** tab (see page 8-6)
- **Select: Time** tab (see page 8-7)



Options Tab

Format Table

Table 8-1 Buttons in **Format Table** area of **Options** tab on **Data** screen

	Cumulative Count	Bases alarms on cumulative particle counts. Cumulative Count is a number of particles of certain size <i>and bigger</i> that are found in one sample.
	Differential Count	Bases alarms on differential particle counts. Differential count refers to a number of particles of certain size that are found in one sample.
	Raw Data	Selects raw data as the data type for the sample.
	Normalized Data	Selects normalized data as the data type for the sample.
	Cubic Meter	Selects cubic meter (m ³) as the unit of measure for the sample.
	Cubic Foot	Selects cubic foot (ft ³) as the unit of measure for the sample.
	Liter	Selects Liter (ℓ) as the unit of measure for the sample.

Order

Table 8-2 Buttons in **Order** area of **Options** tab on **Data** screen

	Displaying Order A-Z	Displays data in ascending A-Z order (oldest data first).
	Displaying Order Z-A	Displays data in descending Z-A order (newest data first).



Data

Table 8-3 Buttons in **Data** area of **Options** tab on **Data** screen

 <p style="text-align: center;">Print</p> <p>The following Print Data dialog box displays:</p> 	<p>Prints selected sampling data to the Lasair III thermal printer.</p> <p>Start – Number of first record to be printed.</p> <p>Number – Number of records to be printed.</p> <p> – Prints the selected record averages.</p> <p> – Prints selected records.</p>
	<p>Save Selection to CSV</p> <p>Stores <i>selected</i> (data which passed filter) sample data in CSV format.</p>
	<p>Save Selection to Secure USB</p> <p>Stores <i>selected</i> (data which passed filter) sample data in a secure (21 CFR 11 compliant) format for DataAnalyst.</p>
	<p>Save Data File to CSV USB</p> <p>Stores <i>all collected</i> sample data in CSV format. The system also prompts you whether to import the file into Microsoft Excel.</p>
	<p>Save Secure Data File to USB</p> <p>Stores <i>all collected</i> sample data in a secure (21 CFR 11 compliant) format for DataAnalyst. The system also prompts you whether to import the file into Microsoft Excel.</p>
	<p>Erase Data</p> <p>Erases all stored sample data. This button is disabled when Statistics Mode is enabled.</p>
	<p>Recover Data</p> <p>This button is displayed ONLY after data has been erased. It allows recovery of data that is erased in error with the Erase Data button. This data recovery function will work even after the LASAIR III has been powered off and back on. However, once a new sample has been taken, old data cannot be recovered. In this case, the button is disabled.</p>



Data Table Tab

	10					
0001	06/06/2008	11:14:52		00:01:00	0.1000 m ³	
0002	06/06/2008	11:15:52		00:01:00	0.1000 m ³	
0003	06/06/2008	11:16:52		00:01:00	0.1000 m ³	
0004	06/06/2008	11:17:52		00:01:00	0.0999 m ³	
0005	06/06/2008	11:18:52		00:01:00	0.1000 m ³	
0006	06/06/2008	11:19:52		00:01:00	0.0999 m ³	
0007	06/06/2008	11:20:52		00:01:00	0.1000 m ³	
0008	06/06/2008	11:21:52		00:01:00	0.0999 m ³	
0009	06/06/2008	11:22:52		00:01:00	0.0999 m ³	
0010	06/06/2008	11:23:52		00:01:00	0.0999 m ³	
0011	06/06/2008	11:24:52		00:01:00	0.0999 m ³	
0012	06/06/2008	11:25:52		00:01:00	0.0999 m ³	

Figure 8-2 Data Table tab of the **Data** screen

You can view data stored in your Lasair III particle counter on the **Data Table** tab, which automatically updates each time a new sample is completed.

All stored data displays unless filters have been set. You can set these filters using the **Select Locations** and **Select Time** tabs.

Each row represents one collected sample. Additionally there can be up to four columns for environment data. The headings of these columns are the names given for environment channels (during the setup process) using the Environmental tab.

You can determine the order of the data by displaying data in an ascending A-Z or descending Z-A order. All information displayed on this tab is *view only*.

There is a vertical and/or horizontal (displays only when data extends beyond the screen) scroll bar, as well as page up and page down arrows (on the top and lower right) to reveal additional rows and columns.



Invalid and Out-of-Tolerance Indicators

Invalid samples are indicated when the entire row of data is masked in gray. Environment or particle alarms that occurred during the sample will display the out-of-tolerance number in red.

Table 8-4 Buttons and fields in **Data Table** tab on **Data** screen

	Enable Location Filtering	Allows applying filtering data by location. A check mark displays on the button when selected. When selected, only the data gathered from the filtered location displays.
	Sample Number	The number of samples out of the total number.
No icon (First column on left)	Row Index	The first column on the left (no heading) contains the number of the current row (1-3000).
	Date	The date the sample was completed. The date displays in one of the following formats (as set on the System Setup > Options tab): <ul style="list-style-type: none"> • YYYY/MM/DD • MM/DD/YYYY • DD/MM/YYYY Where YYYY is year, MM is month, and DD is day.
	Time	The time the sample was completed. The time displays in a format of HH:MM:SS for hours, minutes, and seconds.
	Location	Name of Location associated with the sample data.
	Sample Duration	The length of the sample duration, expressed as HH:MM:SS for hour, minutes, and seconds.
	Sample Volume	The volume of air expressed in the unit selected on the Sample Setup screen. The format for volume is 0.0000 m ³ or 0.00 ft ³ or 0.0 l, depending on the current units.
Particle Data (Heading Varies with Settings)	Particle Data	These fields show the particle count data. The data display and headings vary according to the settings on the Standards tab of the Statistics Setup screen. For example, data display may be set to include: Analog 1, Analog 2, Analog 3, Analog 4 <i>and</i> 0.5 µm, 1.0 µm, 2.0 µm, 5.0 µm, 10.0 µm, 25.0 µm



Select: Locations Tab

Use this tab to filter the data to be displayed on the **Data Table** tab by location. A button displays for each location in the system. You can select or deselect one or more locations in the location list to be used in the filtering process.

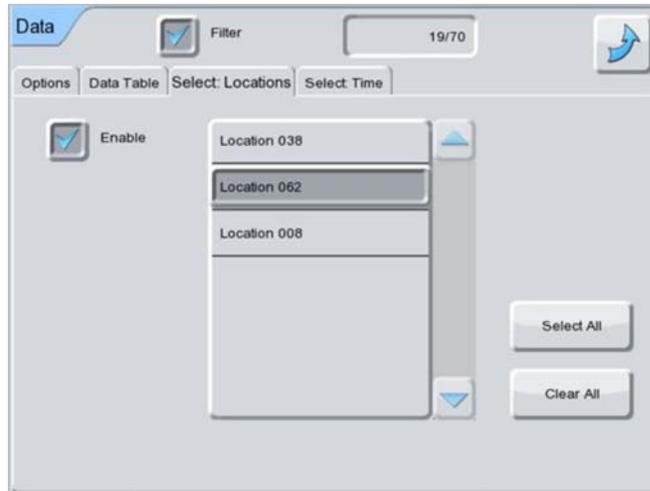


Figure 8-3 Select: Locations tab of the Data screen

Table 8-5 Buttons and fields in **Select: Locations** tab on **Data** screen

 	Enable Location Filtering	Applies a filter to data to display data for ONLY those locations selected on this tab. A check mark displays on the button when the filter is currently selected.
	Location	Press one or more location buttons to include in the filtering process. The button appears darker when selected. Press again to deselect.
	Select All	Includes all locations in the Location List for the location filter. Therefore, all data for all locations will be displayed.
	Clear All	Deselects all selected records in the Location List.



Select: Time Tab

Use this tab to filter the data to be displayed on the **Data Table** tab by start and end times.

Figure 8-4 Select: Time tab of the Data screen

Start

Table 8-6 Buttons and fields in *Start* area of *Select: Time* tab on *Data* screen

	Enable Start Time Filtering	Applies a filter to data for displaying ONLY data that meets the Start date and time criteria entered on this tab. A check mark displays on the button when it is selected.
Row	Start Index	The record (0-3000) that the filtering will start from. This field overrides the Date and Time field settings.
Date	Start Date	The beginning date of the sample record files to include in the filtering process. The date displays in one of the following formats (as set on the System Setup > Options tab): <ul style="list-style-type: none"> • YYYY/MM/DD • MM/DD/YYYY • DD/MM/YYYY Where YYYY is year, MM is month, and DD is day.
Time	Start Time	The beginning time of the sample record files to include in the filtering process. The time displays in a format of HH:MM:SS for hours, minutes, and seconds.

**End****Table 8-7** Buttons and fields in *End* area of *Select: Time* tab on *Data* screen

	Enable End Time Filtering	Applies a filter to data for displaying ONLY data that meets the End date and time criteria entered on this tab. A check mark displays on the button when it is selected.
Row	End Index	The last record (0-3000) to include in the filtering process. This field overrides the Date and Time field settings.
Date	End Date	The last date of the sample record files to include in the filtering process. The date displays in one of the following formats (as set on the System Setup > Options tab): <ul style="list-style-type: none">• YYYY/MM/DD• MM/DD/YYYY• DD/MM/YYYY Where YYYY is year, MM is month, and DD is day.
Time	End Time	The last time of the sample record files to include in the filtering process. The time displays in a format of HH:MM:SS for hours, minutes, and seconds.



Report Setup Screen

Main > Setup > Report

Figure 8-5 Report Setup screen

Use the **Report Setup** screen  to configure the report layout for **.MHT** files generated from the system.

Table 8-8 Fields on **Report Setup** screen

Heading 1	Heading 1	Heading to display on the <i>first</i> line of the reports (maximum 42 alphanumeric characters).
Heading 2	Heading 2	Heading to display on the <i>second</i> line of the reports (maximum 42 alphanumeric characters).
Batch ID	Batch ID	Batch identifier (maximum 16 alphanumeric characters) to display on the reports.
Operator	Operator Name	Name of the operator (personnel) to display on the reports (maximum 16 alphanumeric characters). The Operator Name can also be entered or edited in the Report Setup screen.
	Room or Location Name	Name of active sampling location. This field is <i>view only</i> and that automatically displays. This Room Name prints on the reports. You can change the active sampling location on either the Sampling Setup or the Statistics Setup screen.
	Previous Screen	Returns you to the previous screen.



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Chapter 9 Creating Recipes

A recipe is a set of sampling or statistical parameters which can be saved and recalled by name or by location. Recipes not only save time and effort, but add a quality control measure to ensure consistency between locations and among employees. Additionally, password protection can be added to restrict changes to the settings.

Recipes can be created and retrieved using the touchscreen panel on the Lasair III particle counter, using a PMS control software, or from the Web browser interface.

This chapter describes the Recipe screens and functionality for the Lasair III particle counter.

Recipe Database

The recipe database can hold any combination of fifty sample or statistics recipes. You can associate a recipe to one or more locations.

Recipe Data (Sample)

The following is a list of all the parameters saved in a sample recipe:

- Recipe Name
- Sample Type (volume or time)
- Sample Size (volume or time)
- Initial Purge Delay (seconds)
- Start by Time Of Day, ON/Off (Overwrites Purge Delay if ON)
- Inter-Sample Delay (seconds)
- Number of Samples
- Continuous Sampling (ON/OFF)
- Group Repeat Mode (ON or OFF)
- Sample Units (cfm, m³, or l)
- Data Display (raw or normalized)
- Auto-Print Sample
- Auto-Print Sample Average (for two or more samples)
- Auto-Print to USB Key (Beep mode on/off)
- Alarms On/Off



- Alarm Buzzer On/Off
- Particle Alarm Type (Differential/Cumulative)
- For Each Particle Size:
 - Alarm Setting
 - Alarm On/Off
- For Each Analog Channel:
 - Min Alarm Setting
 - Max Alarm Setting
 - Min Alarm On/Off
 - Max Alarm On/Off

Recipe Data (Statistics)

The following is the list of all parameters saved for a statistics recipe:

- Recipe Name
- Room Name
- Statistics Type:
 - ISO-14644-1
 - EU GMP
 - EU GMP and ISO
 - China GMP
 - FS-209E
- Average of Locations
- Purge Delay (seconds)
- Inter-Sample Delay (seconds)
- Auto-Track Mode (On/Off)
- Confirm Sample Mode (On/Off)
- Units (ft./m) Valid for FS-209E or Average only
- Class: (Except for Average)
- Auto-Increment Location (On/Off)
- Sample Acknowledge (On/Off)
- Sample Location Type (Names/Numbers)
- Particle Sizes
- Flow: (Uni-directional/multi-directional) (FS-209E only)
- Room Area (Except Average)
- Number of Locations to Sample
- Volume per Sample
- Number of Samples per Location



Information Not Saved (Statistics)

- Statistics User Name
- Sampling Setup Screen Parameters – The number of samples is automatically set when statistics are enabled, except for average mode. In average mode, the current sample count is used.
- Alarm settings – Default alarms are disabled during statistics.
- Lasair II to Lasair III Recipes – Lasair II recipes can be saved in the Lasair III particle counter, however Lasair III recipes *cannot* be saved in the Lasair II particle counter.

Recipe Setup Screen

Main Display > Sample > Recipes

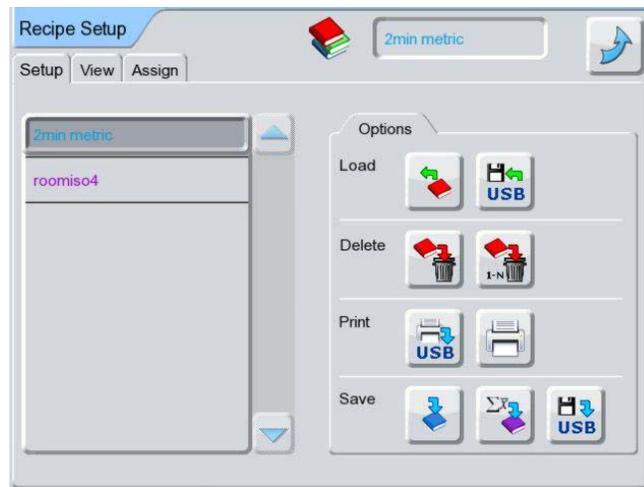


Figure 9-1 Setup tab of the Recipe Setup screen

The **Recipe Setup**  screen has three tabs:

- **Setup** tab (see page 9-4)
- **View** tab (see page 9-6)
- **Assign** tab (see page 9-7)

Recipe Names

Recipe names can include up to 16 characters.

The following characters are not valid in recipe names: \, /, *, ?, ", <, >, :, and |.



Setup Tab

A selection list of stored recipe names displays on the left of the **Setup** tab. Sample recipe names display in a blue color and Statistics recipe names display in a purple color. The last loaded recipe is the selected default, or you can use the scroll bar located at the right of the list to select another recipe name.

NOTE: Enter your selections carefully. There is NO undelete functionality.

Table 9-1 Buttons in **Options** area of **Setup** tab on **Recipe Setup** screen

	Load	Load Recipe	Loads selected recipe into current (default) settings for the Lasair III particle counter.
	Load	Read Names from USB	Loads stored recipes, locations and links from the USB device to a single file. The recipe name must be unique or the information will not transfer. NOTE: If loading a recipe from a Lasair particle counter that contains a non-supported particle size, the particle counter will automatically assign the next smallest particle size that is supported.
	Delete	Delete Recipe	Erases the selected recipe from the Lasair III particle counter. NOTE: A recipe cannot be erased if it is attached to one or more locations. The location attachments must first be deleted.
	Delete	Delete All Recipes	Erases all recipes from the Lasair III particle counter. A warning/confirmation prompt is displayed before the recipes are erased. NOTE: If locations are attached to recipes, then either the attachments must be deleted, or the locations must be deleted before the recipes can be deleted.
	Return	Return to Main Display	Returns to Main Display.
	Print	Print to USB Key	Prints selected recipe to the USB key. The button is enabled only when a USB key is attached.
	Print	Print	Prints the selected recipe to the Lasair III thermal printer.



Table 9-1 Buttons in **Options** area of **Setup** tab on **Recipe Setup** screen (Continued)

 Save	Save Recipe	<p>Saves the current sampling parameters to a recipe. The default name is whatever recipe currently selected. If an existing recipe name is used, that recipe name is replaced with the new parameters. A statistics recipe may be re-written with a sampling recipe, and vice-versa.</p>
 Save	Save Statistics Recipe	<p>Saves the current statistics parameters to a recipe. The default name is whatever recipe is currently selected. If an existing recipe name is used, the recipe is replaced with the new parameters. A statistics recipe may be re-written with a sampling recipe, and vice-versa.</p>
 Save	Save to USB	<p>Saves all recipes, locations and associations to a Lasair III recipe file on the USB key. The button is enabled only when the USB key is attached.</p>

NOTE: Enter your selections carefully. There is NO undelete functionality.



View Tab

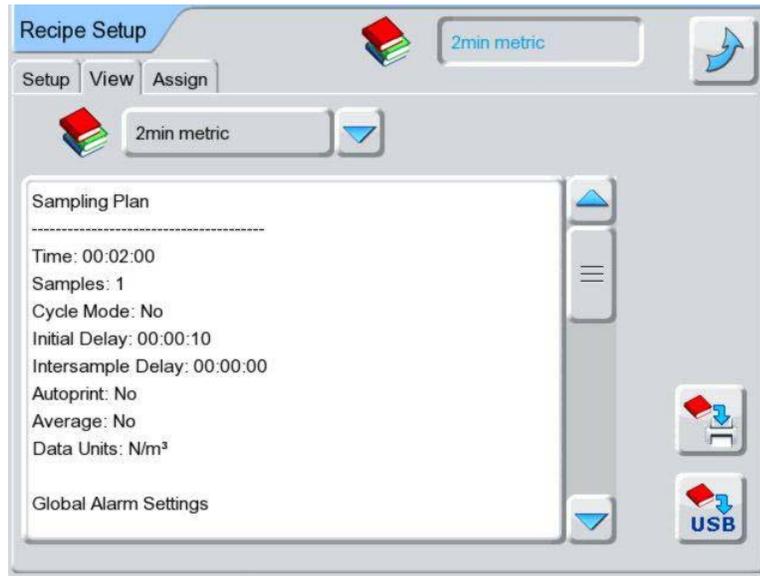


Figure 9-2 View tab of the Recipe Setup screen

Use the **View** tab to view the contents of the selected recipe.

Table 9-2 Buttons and fields in **View** tab on **Recipe Setup** screen

	Loaded Recipe Names	Press this button to display a list of recipes loaded in the particle counter. The name of the selected recipe displays to the left of this button. Press a name in the list to display the contents of the selected recipe in the view area.
 Print	Print to USB Key	Prints selected recipe to the USB key. The button is enabled only when the USB key is attached.
 Print	Print to Default Printer	Prints the selected recipe to the Lasair III thermal printer.



Assign Tab

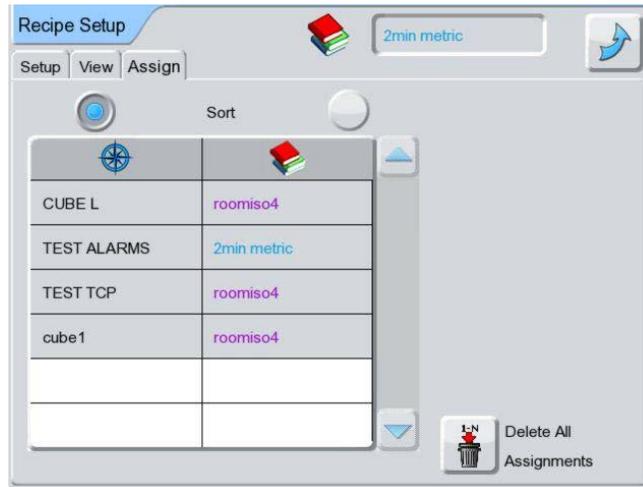


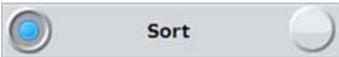
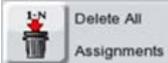
Figure 9-3 Assign tab of the Recipe Setup screen

Use the **Assign** tab to associate a recipe to a location or locations. When a recipe is associated to a location, whenever you select that location the associated recipe always loads.

NOTE: If password protection is enabled, the recipe automatically loads. Otherwise, without password protection, the system displays a dialog box prompting the user whether or not to load the recipe.

All locations automatically display on this screen. To assign a recipe to a location, click a location and then select a recipe from the drop-down list. The Location and its associated Recipe will display next to each other on the same line. Select the blank entry from the drop down list for a location where no recipe is associated with it.

Table 9-3 Buttons and fields in **Assign** tab on **Recipe Setup** screen

 <p>Sort buttons</p>  <p>Location Name</p>  <p>Recipe Name</p>	<p>Press the button on the left to sort the list by Location Name, or press the button on the right to sort the list by Recipe Name.</p> <p>Location names are in the left column of the list. Recipe names are in the right column of the list.</p>
	<p>Deletes All Associations</p> <p>Erases the association between the selected location and recipe for all locations listed.</p>



Recipe Importing and Exporting Information

The Lasair III recipe feature allow importing and exporting of recipes between different instrument types.

When importing and exporting recipes, note the following:

- 1** Moving a recipe between instruments with different flow rate may result in unexpected sample times or sample volumes.

The Lasair III can sample by time or by volume, and this information is recorded in sample recipes.

For example if a one minute sample recipe is exported from a 310C and imported to a 5100, then the sample volume on the 5100 will be 100 liters rather than 1cf, in order to keep the time the same.

- 2** Moving a recipe between instruments with different channel sizes may result in missing alarms.

For instance a recipe created on a 310C, with an alarm of 1000 counts @ 0.3um, will be unable to import that alarm setting properly on a 5100, since there is no 0.3um channel.

- 3** Moving a statistics recipe between instruments with different channel sizes may result in some adjustments to the statistics, if the channel size is not supported in the new instrument.

- 4** Recipes, locations, and location assignment files from a Lasair II may be imported into a Lasair III. This can only be done via the Web Server interface.

See **Appendix G**, Working with a Web Browser for additional details on this feature.

Recipes cannot be exported from a Lasair III back to a Lasair II.



Chapter 10 Statistics Mode

This chapter describes setup and operation of the Lasair III particle counter for use with certification statistics. When used for this purpose, it is said to be in the **Statistics Mode**. Depending on the chosen certification standard and other variables, the Lasair III particle counter will determine the minimum requirements to certify a cleanroom.

Lasair III particle counter supports the following standards:

- ISO 14644-1
- EU GMP Annex 1
- China GMP (when in Chinese language)
- Simultaneous EU GMP Annex 1 and ISO 14644-1
- FS-209E

In addition, the Average mode (standard mode) calculates simple statistics on data from one or more locations.

The settings that may be changed vary with the Average mode. If the selected standard does not allow change to a variable, that variable is disabled in the setup screen.

Statistics Mode Features

The Lasair III particle counter provides the following features while in Statistics mode:

- Auto-Increment to Auto Track.
- Automatic calculation of valid parameter ranges
- Room name saved as part of the data set – This is useful for performing certifications of several areas at one time, then downloading Comma Separated Value (CSV) data at a later time for off-line calculations.
- A Sample Acknowledge mode – This mode allows you to verify each sample before accepting it as valid data. Rejecting the sample results will prevent its use in the statistical calculations.
- An Auto-Location-Increment mode – In this mode, the system automatically selects the next location number, without the user manually setting it.
- An Auto-Track mode – This mode enables the system to auto increment names/ numbers of the next location to be selected for sampling.



Statistics Mode Screens

- **Statistics Setup** screen – Select the type of statistics to collect, set the appropriate parameters for the statistical method, and enable or disable the Lasair III particle counter Statistical mode.
- **Statistics Summary** screen – View on-the-fly statistics as each sample is completed as well as a location by location data table.
This screen is available only in **Statistics Mode**.
- **Sampling Setup** screen – Select the correct location name, and to set initial and inter-sample delays.

Screen Detail

The following screens are functionally changed when the **Statistics** mode is enabled. The differences for each screen in the **Statistics** mode are provided below.

Sample Setup Screen

- Sample size is locked when the **Statistics** mode is enabled. Also, samples are listed by volume, not time.
- You can only display normalized counts, not raw counts.
- Units cannot be changed while **Statistics** mode is enabled.
- Continuous sampling cannot be selected.
- Group repeat mode cannot be selected.
- The # Samples range is restricted depending on the standard selected.
If **Sample Acknowledge** is ON, only one sample may be taken at a time.
- When numeric locations are used, the location list is replaced by an Integer box.



Main Display Screen



Figure 10-1 Main Display screen, **Statistics** mode

In **Statistics Mode**, some buttons and fields are different in the **Main Display** screen:

- The **Statistics Off** button  replaces the **Trend** or **Histogram** button. Press this button to exit **Statistics Mode**.
- The **Summary Statistics** button  replaces the **Change Display** button. Press this button to view summaries of statistics results, data, and environment.
- The **Differential Counts** column is replaced with a **Concentration Limit Target** column or, if the **Average** mode is selected, a **Mean Value** column.
- The standard and class is printed above the data table.



Results Tab

Statistics Summary

Results Data Environmental FS209 / M1 #001: 0/1

μm		Max	Mean
0.3 μm	31	0	-----
0.5 μm	10	0	-----
1.0 μm	-----	0	-----
5.0 μm	-----	0	-----
10.0 μm	-----	0	-----
25.0 μm	-----	0	-----

USB

Figure 10-2 Results tab of the **Statistics Summary** screen

Use the **Results** table to view statistics summary data. Any out-of-range values that would cause the statistics certification to fail are shown in red in the table. The **Results** table has the following columns:

- Particle size
- Target maximum value concentration (except for average mode)
- The maximum concentration of all sampled locations
- Mean value (for average mode only)



Data Tab

No	Location #	#	0.3 Avg	0.5 Avg
1	#001	1	45,278	1,552
2	#002	1	706	35
3	#003	1	1,059	35
4	#004	1	1,164	0

Figure 10-3 Data tab of the **Statistics Summary** screen

Use the **Data** table to view statistics data at specific locations. The **Data** table has the following columns:

- **No** – Row Number
- **Location #** – Location
- **#** – Number of samples taken, displayed in red if the value is ≥ 1 but less than the number of samples needed in the plan
- **0.3 Avg, 0.5 Avg** – Particle counts by particle size, displayed in red if they are above the statistical target



Cleanliness Standards

The standards tables are reproductions of the targets for each of the international standards supported by the Lasair III particle counter. The blank areas of the tables represent invalid settings. For example, the ISO 14644-1 standard does not allow certification of a Class 1 cleanroom using a 0.3+ μm particle size.

ISO 14644-1 Standard

The document, ISO 14644-1 (1999-05-01), was used when designing the ISO 14644-1 module. Only the classes specified in the document's tables have been implemented; The Lasair III particle counter does not support intermediate class sizes or intermediate particle sizes.

Table 10-1 Maximum particles – ISO 14644-1 Standard

Maximum Particles per M ³						
Class	0.1 μm	0.2 μm	0.3 μm	0.5 μm	1.0 μm	5.0 μm
ISO 1	10	2				
ISO 2	100	24	10	4		
ISO 3	1,000	237	102	35	8	
ISO 4	10,000	2,370	1,020	352	83	
ISO 5	100,000	23,700	10,200	3,520	832	29
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO 7				352,000	83,200	2,930
ISO 8				3,520,000	832,000	29,300
ISO 9				35,200,000	8,320,000	293,000

Use the following sources for more information about ISO 14644-1:

International Standards Organization

Web Site: www.iso.org

Institute of Environmental Sciences and Technology

940 East Northwest Highway

Mount Prospect

Illinois, 60056

USA

Tel: 0101 708 255 1561

Fax: 0101 708 255 1699

e-mail: Publicationsales@iest.org or iest@iest.org

Web Site: www.iest.org



EU GMP Annex 1 Standard and China GMP

The EU GMP Annex 1 standard is based on the document “EC Guide to Good Manufacturing Practice; Revision to Annex 1.” This document is based on the ISO-14644 standard and describes modifications to the standard for EU GMP Annex 1 classifications.

The China-GMP standard follows the same requirements as the EU-GMP requirements and is covered in this section.

As a derivative of the ISO standard, the EU GMP Annex 1 standard uses most of the ISO rules. However, a comparison of maximum particle counts between the two standards shows that the EU GMP Annex 1 is slightly different. The minimum sample volume is also different between the two standards. For Grade A, the sample volume is a minimum of 1 m³ for each location of all samples taken.

Simultaneous EU GMP Annex 1 and ISO

The EU GMP Annex 1 & ISO mode allows the user to sample the cleanroom one time, then generate reports for *both* the EU GMP Annex 1 and the ISO-14644 standards.

Table 10-2 shows EU GMP Annex 1 and corresponding ISO classes that can be calculated concurrently with the Lasair III particle counter

Table 10-2 EU GMP Grade and ISO classes

EU GMP Annex 1 Grade	At Rest	In Operation
A	ISO 5	ISO 5
B	ISO 5	ISO 7
C	ISO 7	ISO 8
D	ISO 8	N/A

Table 10-3 Maximum particles — Simultaneous standards

Maximum Particles per M ³				
	At Rest		In Operation	
Grade	0.5 µm	5.0 µm	0.5 µm	5.0 µm
A	3,520	20	3,520	20
B	3,520	29	352,000	2,900
C	352,000	2,900	3,520,000	29,000
D	3,520,000	29,000	not defined	not defined



FS-209E Standard

The document, FED-STD-209E (11 September 1992), was used when designing the FS-209 module, and only the classes specified in the document's tables have been implemented.

If the number of locations is less than five, the number of samples required at each location is increased to a minimum of five samples. This may result in more samples being taken so that the Lasair III particle counter will accept the result.

Table 10-4 Maximum particles per unit volume

Maximum Particles Per Unit Volume											
Class		0.1 μm		0.2 μm		0.3 μm		0.5 μm		5.0 μm	
SI	English	m^3	ft.^3								
M1		350		75.7		30.9		10.0			
M1.5	1	1,240	35.0	265	7.50	106	3.00	35.3	1.00		
M2		3,500		757		309		100			
M2.5	10	12,400	350	2,650	75.0	1,060	30.0	353	10.0		
M3		35,000		7,570		3,090		1,000			
M3.5	100			26,500	750	10,600	300	3,530	100		
M4				75,700		30,900		10,000			
M4.5	1,000							35,300	1,000	247	7.00
M5								100,000		618	
M5.5	10,000							353,000	10,000	2,470	70.0
M6								1,000,000		6,180	
M6.5	100,000							3,350,000	100,000	24,700	700
M7								10,000,000		61,800	

Use the following sources for more information about ISO-14644-1 (which has replaced the FS-209E standard):

Institute of Environmental Sciences and Technology
 940 East Northwest Highway
 Mount Prospect, Illinois, 60056
 USA
 Tel: 0101 708 255 1561
 Fax: 0101 708 255 1699
 e-mail: Publicationsales@iest.org or iest@iest.org
 Web Site: www.iest.org



Alarms in Statistical Mode

When the **Statistics** mode is enabled, global alarms are automatically disabled as well as the **Alarm Setup** screen. You must exit **Statistics** mode to change alarm parameters.

When the **Statistics** mode is disabled, global alarms will not be automatically re-enabled. If the global alarms function is desired, it must be manually enabled.

Communications in Statistics Mode

When the **Statistics** mode is enabled, TCP/IP is disabled.

Statistics Setup

Main Display > Sample > Statistics

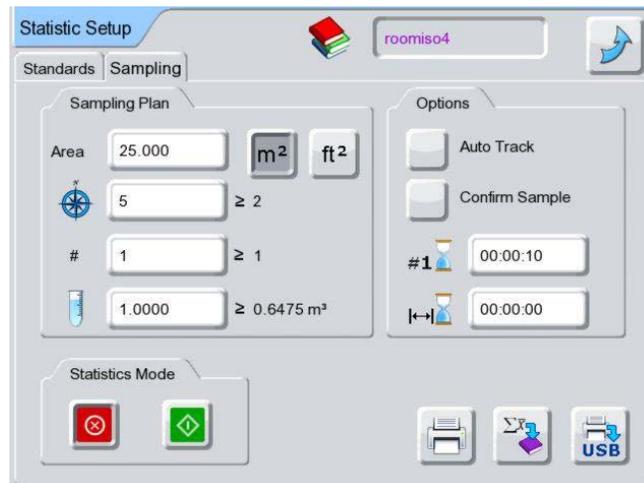


Figure 10-4 Sampling Plan area in Sampling tab of Statistics Setup screen

Use the **Statistic Setup** $\sum \bar{x}$ screen to enter settings for the area where sampling will take place.

The **Statistics Setup** Screen has two tabs:

- **Standards** tab (see page 10-11)
- **Sampling** tab (see page 10-10)

Enter the appropriate information on both tabs, and then press the green Enable button on the Sampling/Statistics Mode tab.



Sampling Tab

Sampling Plan

Table 10-5 Buttons in **Sampling Plan** area of **Sampling** tab on **Statistic Setup** screen

Area	 	Input the area of the room to be certified in square meters or square feet. You cannot change this parameter once statistics is enabled.
	Location Count	The minimum number of the locations to be sampled. You can increment, but not decrement, this value once statistics is enabled.
#	Samples Count	Number of samples to be taken at each location.
	Sample Volume	The minimum sample volume collected at each location.

Options

Table 10-6 Buttons in **Options** area of **Sampling** tab on **Statistic Setup** screen

Auto Track	Auto Track	Enable to auto increment numbers of the next location to be selected for sampling.
Confirm Sample	Confirm Sample	Enable to prompt user for an acknowledgement after each sample.

Statistics Mode

Table 10-7 Buttons in **Statistics Mode** area of **Sampling** tab on **Statistic Setup** screen

	Disable	Use to go back to Particle Counting mode.
	Enable	Use to switch to the Statistics mode.



More Options

Table 10-8 Buttons in **Sampling** tab on **Statistic Setup** screen

	Print to Default Printer	Automatically prints sampling results after each sample to the Lasair III thermal printer. This button is selected by default.
	Save Statistics Recipe	Saves the current statistics setup as a recipe.
	Auto Print USB	Prints sampling results to a USB key. This button is only activated when a USB key is inserted.

Standards Tab

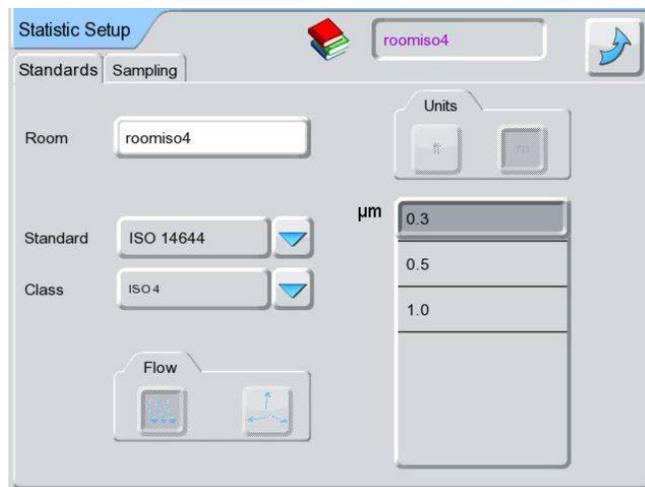


Figure 10-5 Standards tab of the **Statistic Setup** screen

Table 10-9 Buttons and fields in **Standards** tab on **Statistic Setup** screen

Room	Room	Name of room to sample.
Standard	Standard	Title of cleanliness standard (ISO 14644, EU GMP, etc.)
Class	Class	Available classes for the selected standard.
μm	Channels	Particle Size

Flow

Table 10-10 Buttons in *Flow* area of *Standards* tab on *Statistic Setup* screen

	Unidirectional Airflow	Defines the type of airflow as unidirectional. <hr/> NOTE: FS-209E only. <hr/>
---	-------------------------------	--

**Table 10-10** Buttons in *Flow* area of *Standards* tab on *Statistic Setup* screen

	Multidirectional Airflow	Defines the type of airflow as multidirectional. <hr/> NOTE: FS-209E only. <hr/>
---	---------------------------------	--



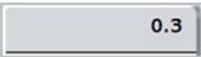
Units

Table 10-11 Buttons in **Units** area of **Standards** tab on **Statistic Setup** screen

	<p>Feet</p>	<p>Selects feet as the unit of measure.</p>
	<p>Meters</p>	<p>Selects meters as the unit of measure.</p> <hr/> <p>NOTE: Settings for ISO-14644-1 and EU GMP standards force the use of meters.</p> <hr/>

µm

Table 10-12 Buttons in **µm** area of **Standards** tab on **Statistic Setup** screen

	<p>Channels</p>	<p>For the FS-209 and ISO-14644-1 standards settings or for the Averaging function, you can select the particle size for the certified room. The Channels controls is a multi-selection vertical list with scroll bar.</p> <hr/> <p>NOTE: For EU GMP, China-GMP, and EU GMP and ISO standards, the list contains only 0.5 and 5.0. The control is disabled if any other standard is chosen.</p> <hr/>
---	------------------------	---

About Location Numbers

In **Statistics** mode, you select locations by number rather than name.



Printing a Statistics Report

Press the **Print** button on the Lasair III particle counter, to print a report with details of the sampling results, or download the data to a computer for viewing and analysis.

Printout and Legend

The following is an example of the Lasair III particle counter's **Statistics Report** generated when a room is certified to the ISO 14661-1 standard. The lines have been numbered to allow a more comprehensive description of the information provided below the printout.

Sample Statistics Report

1	Cleanroom Certification Report			
2	Heading number one			
3	Heading number two			
4	Instrument ID:	Lasair III		
5	Serial Number:	PrePro09		
6	Calibrated:	08/04/2008		
7	Batch ID:	Batch ID		
8	Operator:	Operator name		
9	Room:			
10	Recipe:			
11	02/25/2000 04:32:48			
12	Certification Standard			
13	Standard:	ISO 14644		
14	Class:	ISO 7		
15	Particle Sizes:	0.5µm		
16	Certification Results:			
	FAIL			
17	Sampling Plan			
18		Min	Plan	Actual
19	Area: (m ²)	----	1.0	----
20	Locations/Rooms:	2	2	2
21	Samples/Location	1	1	2
22	Total Samples	2	2	2
23	Min. Volume: (m ³)	0.0283	0.0283	0.0283
24	Particle Data			
25		µ	(N/m ³)	
26	Target:	0.5	352000.00	
27	Max	0.5	925124.00	
28	95% U.C.L	0.5	0.00	
29	Mean	0.5	925124.00	
30	S.D.	0.5	0.00	
31	Location Averages			
32	Location	#	µ	Σ(N/m ³)
33	#001	2	0.5	925124.00
33	#002	2	0.5	925124.00



34 Deleted Samples: 0

Table 10-13 Statistics Printout legend

Line No.	Text or Data	Description
1	Cleanroom Certification Report	Title of Report.
2	Heading one	The Heading 1 text specified in the Report Setup screen.
3	Heading two	The Heading 2 text specified in the Report Setup screen.
4	Instrument ID:	The name/ID of the particle counter that produced the data.
5	Serial Number:	The serial number of the particle counter that produced the data.
6	Calibrated:	The date on which the particle counter was last calibrated.
7	Batch ID:	The Batch ID text specified in the Report Setup screen.
8	Operator:	The Operator text specified in the Report Setup screen.
9	Room:	The Room specified in the Statistics Setup screen.
10	Recipe:	The Recipe name specified in the Recipe Setup screen.
11	02/25/2000 04:32:48	A date and time stamp when the sample ended, printed in the date format specified in the System Setup screen.
12	Certification Standard	Header for the certification standard information that follows.
13	Standard:	The certification standard chosen. Possible values: ISO 14644-1 EU GMP Annex 1 Simultaneous EU GMP Annex 1 and ISO 14644-1 FS-209E
14	Class:	The classification the room is being tested to meet.
15	Particle Sizes:	Particle size of interest.
16	Certification Results:	Results of certification. Possible values: <ul style="list-style-type: none"> • PASS – Sampling met certification standards. • FAIL – Sampling did not meet certification standards. • INCOMPLETE – Sampling was not completed.
17	Sampling Plan	Header for sampling plan that follows.
18	Min Plan Actual	Number of samples to be taken. <ul style="list-style-type: none"> • Min – Minimum number of samples to be taken. • Plan – Number of samples planned to be taken. • Actual – Actual number of samples taken.
19	Area:	The area of cleanroom being certified.
20	Locations/Rooms:	The number of locations to be sampled. For column definitions, see line 18 above.
21	Samples/Location	Number of samples taken at each location. For column definitions, see line 18 above.
22	Total Samples	Total number of samples taken.
23	Min. Volume	Minimum volume to be sampled.
24	Particle Data	Header for the particle data that follows.

**Table 10-13** Statistics Printout legend (Continued)

Line No.	Text or Data	Description
25	μ (N/m ³)	Column headers: <ul style="list-style-type: none"> • μ – Particle size in microns. • N/m³ – Normalized particle counts per cubic meter.
26	Target:	The particle size of interest. For column definitions, see line 25 above.
27	Max	The maximum value of the samples averaged.
28	95% U.C.L.	Statistical Upper Confidence Limit (for 2–9 locations only). For column definitions, see line 25 above.
29	Mean	Mean of all locations. For column definitions, see line 25 above.
30	S.D.	Standard Deviation of all location means. For column definitions, see line 25 above.
31	Location Averages	Header for the location data that follows.
32	Location # μ $\Sigma(N/m^3)$	Column headers for data that follows. <ul style="list-style-type: none"> • Location – Location of sample • # – Number of samples taken at location. • μ – Particle size sampled. • $\Sigma(N/m^3)$ – Number of particles detected and normalized per cubic meter.
33	#001 2 0.5 925124.00	Summary of sample at each location for the particle size chosen. For column definitions, see line 32 above.
34	Deleted Samples:	Number of samples removed from statistical summary.



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Chapter 11 Performing Routine Maintenance

This chapter describes the maintenance you can perform at your location, and includes information for:

- Cleaning and Disinfecting the Enclosure, this page
- Replacing the Printer Paper Roll on page 11-2
- Reconditioning the Battery on page 11-3
- Calibration Reminder on page 11-3
- Other Maintenance on page 11-3

NOTE: There are no user-serviceable parts inside the Lasair III particle counter case.

Cleaning and Disinfecting the Enclosure

The Lasair III particle counter is streamlined design minimizes particle traps and makes the unit easy to clean.

The enclosure case is made of polycarbonate with carbon nano tubes. The tempered glass display screen is sealed around its edges to IP65.

CAUTION

Although the Lasair III particle counter is resistant to liquids, it is NOT liquid proof. Do not submerge the particle counter in any liquid or apply large amounts of liquid to the instrument to prevent ingress of liquid. Always wipe away free standing liquid and wet wipe the particle counter after applying a cleaner. Never put liquids into the air intake port.

Never wipe the display screen with anything that is hard or sharp.

Recommended Cleaning Agents

The following cleaning agents are recommended to clean and disinfect the enclosure case of the particle counter:

- Bleach, typically 0.5%-1% concentration
- Ethyl/isopropyl alcohol (in a solution of less than 70 percent)
- Peroxide/quaternary ammonium solutions

Call Instrument Service and Support at Particle Measuring Systems (1-800-557-6363) for advice about other cleaning chemicals.

**>> To clean the enclosure case:****WARNING**

Always wear eye protection when working with cleaning chemicals.

- 1 Turn the particle counter off, unplug the power cord from the power source and particle counter, and remove the battery.
- 2 Disconnect all other cables and tubes.
- 3 Remove the sample probe and cover the sample inlet.
- 4 Dampen a cleanroom wipe or other cloth with the cleaning solution and then wipe the enclosure case.
You can also wipe the printer cover and sample probes in this manner.
- 5 Follow this cleaning solution wipe, with a wipe or cloth damped with water.

CAUTION

Although we recommend the wipe method, you can use a spray solution on the front, sides, and top of the enclosure. However, do NOT use a spray on the back of the case to avoid reaching the electrical connections.

Replacing the Printer Paper Roll

>> To load the paper roll:

- 1 With one hand, grasp the printer enclosures by the two top tabs on each side, and while pushing down pull out to flip the cover open.
- 2 Remove the old paper roll and insert a new roll of paper, with the end of the paper coming toward you off the top of the roll.
- 3 Ensure that about one inch (2.5 cm) of paper extends beyond the cutter at the top of the paper enclosure and that the paper roll is not crooked in the enclosure.
- 4 While holding the end of the paper in place against the instrument case, close the cover until it clicks to ensure that it is completely closed.
- 5 Press the **Print** key to test the paper installation and that the paper advances correctly.

NOTE: The paper rolls have a pink indicator strip near the end of the roll. When you see the pink strip, you have only a few feet of paper remaining on the roll. Replace the expended roll to ensure that you have enough paper for the next printing.



Reconditioning the Battery

Over time, the battery charge level indicator will cease to accurately indicate the actual battery charge. This can also be indicated with a B1E, B2E, or BBE message on the instrument status screen.

>> To maintain the accuracy of the charge indicator:

- 1 The external battery charger should be used to condition the battery.
- 2 Press and hold the button on the external batter charger to begin a conditioning cycle. This cycle can take from 1-8 hours.

Reconditioning of the battery can also be done directly with the Lasair III. To accomplish this, the battery should be fully charged to 100% and then discharged completely without shutting the unit off or any recharging of the battery. This can be accomplished by running the unit only on battery power without the mains power connected until the unit automatically shuts off. Once the battery is fully discharged, recharge the battery to 100% without turning the unit on. This can be accomplished by charging the unit for 6-8 hours.

Battery Disposal

At end-of-life, batteries should be recycled or discarded safely. The batteries used can typically be disposed in municipal waste. However, you need to follow your local guidelines for battery disposal. Your local waste authority will have information on return and collection systems in your area.

Calibration Reminder

Calibration should be performed once each year. Particle Measuring Systems provides calibration services at our Boulder, Colorado facility. You can schedule your calibration in advance to ensure that you can use your instrument up to the scheduled servicing. Turnaround time for calibration is typically five business days when service work is scheduled at least four 4 weeks in advance.

The calibration reminder can be set for either a 6 month notification or a 12 month notification, or it can be disabled and no notification is provided.

Schedule the calibration online at <http://www.pmeasuring.com/services> or call Instrument Service and Support 1 (800) 557-6363 or (303) 443-7100.

Other Maintenance

For other maintenance needs, including ALL servicing inside the instrument, contact Instrument Service and Support at Particle Measuring Systems at 1 (800) 557-6363 or (303) 443-7100.



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Appendix A International Precautions

WARNING

This instrument is designated as a Class I laser product and complies with US 21 CFR 1040.10 and EN 60825-1. Use of controls, or adjustment, or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

AVERTISSEMENT

Cet appareil est classé comme produit laser de Catégorie I et est conforme aux normes US 21 CFR 1040.10 et EN 60825-1. L'utilisation de commandes, de réglages ou l'exécution de procédures autres que celles spécifiées dans le présent document peut provoquer une exposition à des radiations dangereuses.

WARNUNG

Bei diesem Gerät handelt es sich um ein Laserprodukt der Klasse I, welches den Normen US 21 CFR 1040.10 und EN 60825-1 entspricht. Das Justieren der Lasereinheit, das Verändern des Gerätes oder Einsatzbereiche, die nicht den Vorgaben dieser Anleitung für das Gerät entsprechen, können dazu führen, dass gefährliches Laserlicht austritt.

ATTENZIONE

Lo strumento è classificato come prodotto laser di Classe I e rispetta l'US 21 CFR 1040.10 e l'EN 60825-1. L'uso dei comandi o la regolazione dello strumento, o l'esecuzione delle procedure con metodi non conformi a quanto specificato in questo manuale possono provocare una pericolosa esposizione alle radiazioni.

ADVERTENCIA

Este instrumento está catalogado como producto láser de Clase I y cumple con las normativas US 21 CFR 1040.10 y EN 60825-1. El uso de controles o el ajuste o la realización de procedimientos que no sean los especificados en este manual pueden provocar la exposición a radiación peligrosa.



Hazard Symbols

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

Symbol	Nature of hazard
	Attention, consult accompanying documents.
	Dangerous High Voltage
	Warning – Laser radiation! Avoid exposure to beam.

Symboles de risque

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

Symbole	Nature du risque
	Attention, consulter les documents d'accompagnement
	Danger Electricite
	Avertissement – Rayonnement laser ! Éviter toute exposition au faisceau.

Warnschilder

Die, an dem Gerät angebrachten Warnschilder haben folgende Bedeutungen:

Symbol	Gefahrenart
	Achtung! In den beiliegenden Unterlagen nachschlagen
	Achtung Hochspannung
	Warnung – Laserstrahlung! Nicht in den Strahl blicken.



Simboli di pericolo

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

Simbolo	Natura del pericolo
	Attenzione. Consultare i documenti allegati
	Tensione Pericolosa
	Avvertenza – Radiazione laser! Evitare l'esposizione ai raggi.

Simbolos de peligro

Los simbolos de peligro que aparecen en el equipo significan:

Símbolo	Naturaleza del Peligro
	Atención, consultar los documentos adjuntos.
	Peligro alto voltaje.
	Advertencia – ¡Radiación láser! Evite exponerse al rayo.



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Appendix B Electrical Connections

Electrical Connections

There are three USB ports on the Lasair III particle counter for exporting sampling data and/or connecting a USB keyboard:

- One on the front panel
- Two on the back panel

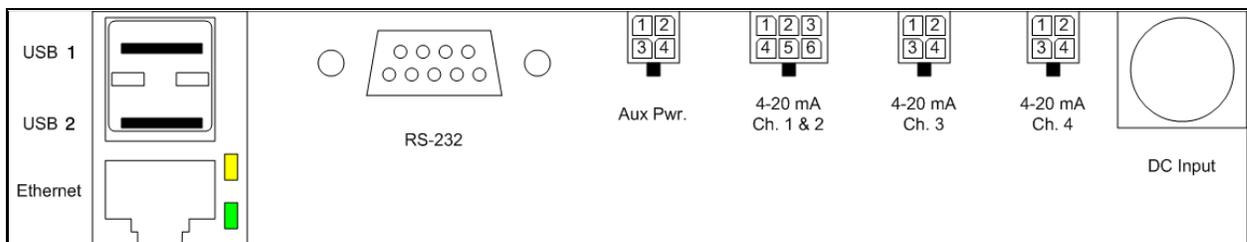


Figure B-1 Electrical connections – back panel

NOTE: The Lasair III particle counter DOES NOT support USB hub devices or memory card readers.

Electrical connections are located on the back panel of the unit, and include:

- Ethernet port
- Two (2) USB connections
- RS-232 connection
- Auxiliary power output (5VDC 500mA or lower)
- Two (2) – single channel 4-pin 4-20 mA connections
- One (1) – dual channel 6-pin 4-20 mA connection
- DC Input (+20VDC 120 watts)

CAUTION

This is a LOW POWER DEVICE. Connect ONLY low voltage power accessories to the auxiliary power output to avoid damage to the unit.



Cable Pin-outs

Following is the cable pin-out information for the Lasair III particle counter.

RS-232	
Pin Number	Signal
1	NC
2	TxD
3	RxD
4	NC
5	Gnd
6	NC
7	CTS
8	RTS
9	NC

Aux. Power	
Pin Number	Signal
1	+5 VDC
2	+5 VDC
3	Gnd
4	Gnd

4-20 mA Ch 1 & 2	
Pin Number	Signal
1	+24 VDC
2	Ch 1 In
3	Gnd
4	+24 VDC
5	Ch 2 In
6	Gnd

4-20 mA Ch 3	
Pin Number	Signal
1	+24 VDC
2	Ch 3 In
3	Gnd
4	Gnd

4-20 mA Ch 4	
Pin Number	Signal
1	+24 VDC
2	Ch 4 In
3	Gnd
4	Gnd

Input Power DIN	
Pin Number	Signal
1	+20 VDC
2	+20 VDC
3	Gnd
4	Gnd



Appendix C Configuring Communications

This appendix includes information for configuring communications for both:

- PMS Software and Communication Protocols
- 3rd Party Serial Communication Interfaces

Use the **Comm/Port Setup** screens on the Lasair III particle counter to set addressing parameters, and to enable/disable various network communication protocols (described in Comm/Port Setup on page C-2).

The fixed parameters that cannot be adjusted are described in Fixed Parameters on page C-5)

The **Comm/Port Setup** screens are also used for configuring a Web Browser and TouchRAM. However, directions for configuring these options are covered in separate appendices to allow for inclusion of more extensive information specific to these options. Refer to the following appendices for additional information:

- Web Browser – **Appendix G**, Working with a Web Browser
- TouchRam – **Appendix F**, TouchRAM



Comm/Port Setup

Main Display > Setup > Comm/Port

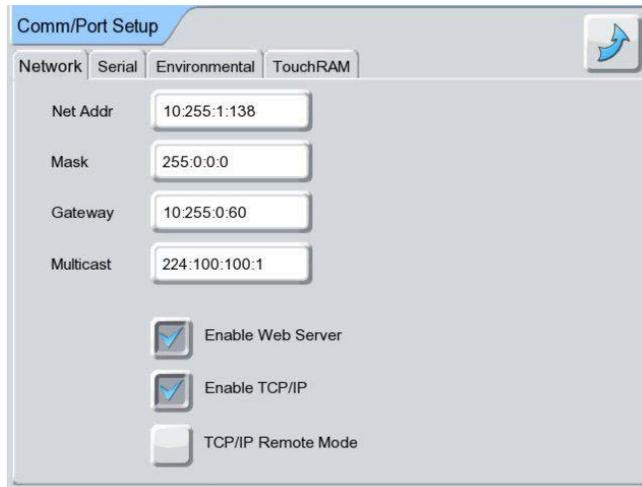


Figure C-1 Network tab of the Comm/Port Setup screen

Use the **Comm/Port Setup** screen  to set up the COMM port

There are four setup tabs in the **Comm/Port Setup** screen:

- **Network** tab (see page C-3)
- **Serial** tab (see page C-4)
- **Environmental** tab (see page C-5)
- **TouchRAM** tab (see Appendix F, TouchRAM)



Network Tab

Table C-1 Fields in the **Network** tab of the **Comm/Port Setup** screen

Net Addr	IP Address	Unique IP address of the Lasair III particle counter in the form of aaa.bbb.ccc.ddd. Each 3-digit series is a value of 0–255, separated by a colon (:).
Mask	Net Mask	The mask that separates the network address from the host address, allowing the instrument to communicate outside of its local network. Enter as aaa.bbb.ccc.ddd . Each 3-digit series is a value of 0–255, separated by a colon (:).
Gateway	Gateway	Gateway used when communicating across networks. Enter as aaa.bbb.ccc.ddd. Each 3-digit series is a value of 0–255, separated by a colon (:).
Multicast	Multicast	Used when using PMS control software (DataAnalyst, Facility Net, or Pharmaceutical Net). Enter as in a form of aaa.bbb.ccc.ddd. Each 3-digit series is a value of 0–255, separated by a colon (:).
Enable Web Server	Enables Web Server	Allows connection to from a Web browser such as Internet Explorer or Firefox. (Disabling this function prevents remote control and data viewing.)
Enable TCP/IP	Enable PMS TCP/IP Protocol	Enables the PMS TCP/IP protocol that attaches the instrument to PMS control software. Disabling this function prevents the use of these applications.
TCP/IP Remote Mode	Enable Remote Mode	Enables the particle counter for temporary use as a Remote instrument away from PMS control software. When connected back to the control software, it will download data collected and stored in the particle counter. <hr/> NOTE: Enable TCP/IP must also be checked. <hr/>

For more information:

- Refer to **Appendix L**, Ethernet Communications Overview
- Refer to **Appendix M**, Serial Communications Overview



Serial Tab



Figure C-2 Serial tab of the **Serial** tab of the screen

Use the **Serial** tab of the **Comm/Port Setup** screen to select the RS-232 port interface protocol, as well as set additional parameters associated with serial communications.

For information on basic details, refer to **Appendix M**, Serial Communications Overview.

NOTE: When the serial interface mode is changed, the changes happen immediately.

Table C-2 Fields in the **Serial** tab of the **Comm/Port Setup** screen

Lasair	Native Lasair Communication Protocol	Allows starting and stopping the instrument, collecting data, and setting various configuration parameters.
PMS Multi-Drop	Multiple Instrument Protocol	Requires a unique address for each instrument.
PMS Address	PMS Multi-Drop Address	Unique address for each instrument in the form of a 2-digit number. The PMS Multi-Drop mode must first be enabled to activate this field.
Service	PMS Use	Service mode reserved for use by PMS Service personnel.
SIO Baud	Port Baud	Baud rate for serial I/O port.



Fixed Parameters

The following communication parameters are fixed, and cannot be adjusted:

- Parity: none
- Stop bits: 1
- Data bits: 8

Flow Control: depends on protocol. “Lasair III” mode uses software flow control (CTRL-Q/CTRL-S). “PMS Multi-Drop” mode does not have flow control.

Environmental Tab



Figure C-3 Environmental tab of the **Comm/Port Setup** screen

Use the of the **Comm/Port Setup** screen to assign the Lasair III particle counter the ability to attach up to four (4) sensors and set the parameters for these analog input channels. These parameters are used to convert input analog signal to a readable value.

For more information refer to **Appendix J**, 4-20 mA Input.

Each row defines the parameters for an input channel.

Table C-3 Columns and fields of the **Environmental** tab of the **Comm/Port Setup** screen

Name	Analog Channel Name	Name for the analog channel (up to 16 alphanumeric characters). The default value is "AnalogN," where N is the number of the analog channel.
Units	Unit Measurement	Measurement units that will print for analog channel (up to 10 alphanumeric characters). The default value is <i>mA</i> .
Scale	Scaling Factor	Scaling factor for analog channel. The field is initially 1. <hr/> NOTE: Scale = Total sensor range / 16. <hr/>

**Table C-3** Columns and fields of the **Environmental** tab of the **Comm/Port Setup** screen

Offset	Offset Factor	Offset factor for analog channel. The field is initially 4. <hr/> NOTE: Offset = Minimum sensor value. <hr/>
 Checkbox disabled	I/O (Disabled)	Individual sensor is disabled. (Default)
 Checkbox enabled	I/O (Enabled)	Individual sensor is enabled. If the sensor is enabled, its measurements will be displayed on the screen, included in the printouts and the data record or output, and can be used to trigger alarms.



Appendix D Downloading to PMS Control Software

Data on a Lasair III particle counter can be downloaded to PMS control software, including DataAnalyst, Facility Net, or Pharmaceutical Net, by means of either a Real-Time-Station or a Network Station.

Consider the following two cases when planning for downloads:

- **Case A** – The Lasair III particle counter is used as a mobile monitor; data may come from multiple locations.
- **Case B** – The Lasair III particle counter is in a fixed monitoring position; all data comes from the same location.

Preparations for Setup

- Verify that the particle counter ID for each Lasair III particle counter used is unique.
- Verify that each location name is unique.
- Obtain a unique, static IP address, Subnet Mask, and Gateway from your IT Department.
- If using Facility Net or Pharmaceutical Net, ensure that you are using version 3.1 or later.

Configuring Communication

Verify that the Lasair III particle counter is not already connected to the PMS control software (or to any other communications or control network).

>> To verify the Lasair III is not already connected to PMS control software:

- 1 Set the Lasair III particle counter to the unique IP address, Net Address, and Mask provided by your IT Dept.
- 2 Verify that the Lasair III particle counter is set to the standard Multicast number: **224.100.100.1** or as set by end user.
- 3 Enable the following options on the **Comm/Port Setup** screen, **Network** tab:
 - Case A** – For mobile monitoring: 1) Enable TCP/IP
2) TCP/IP Remote Mode
 - Case B** – For fixed monitoring: 1) Enable TCP/IP ONLY.
- 4 Reboot the particle counter.



Downloading Data

Case A: Mobile monitoring from multiple locations:

- 1 Manually collect sample data with the Lasair III particle counter.
- 2 Connect the Lasair III particle counter to the PMS control software via Ethernet ports on the particle counter and the computer.
- 3 Configure the control software for the Lasair III particle counter.
- 4 The system creates automatic sampling points for all Lasair III particle counter location names, and the data is automatically downloaded to the PMS control software.
- 5 The system prompts you with the option to either automatically or manually erase all historical data in the Lasair III particle counter.
- 6 The PMS software automatically disconnects from the particle counter.

Control Software Configuration

Refer to the *DataAnalyst User's Manual* (or *User's Manual* for the PMS control software you are using) for information on configuring the control software.

Case B: Fixed collection from a single location:

- 1 Connect the particle counter to the PMS control software via Ethernet ports on the particle counter and the computer.
- 2 Configure the PMS control software for the Lasair III particle counter.

The PMS control software directs the Lasair III particle count to periodically/continuously sample, and automatically download to the software in real time.

NOTE: Historical data in the particle counter must be erased manually.



Appendix E Comma Separated Value (CSV) Format

With this file format, you can properly label the value headings. The following items are numbered in the order that they will appear in the CSV file. The CSV file, however, will not include the order numbers.

Table E-1 CSV value format and description

Ref. No	Value Heading	Data Description
1	Sample Date	Formatted YYYY/MM/DD
2	Sample Time	Formatted HH:MM:SS {End of Sample}
3	Sensor Name	User entered name. Up to 16 characters. Name is delimited by quotation (") marks.
4	Sensor Type	Hard coded value. Example: "Lasair-III-310C"
5	Sensor S/N	This value programmed during initial calibration.
6	Statistics	This field is a "" if statistics are not used. If they are used, then the field contains both the name of the room in which the statistics were taken and, the type. The type can be FS-209E, ISO-14644-1, EU GMP, ISO and EU GMP, or AVERAGE. The room name is prepended before the statistics type with a "--" separating the two. An example is "BallroomA--FS209E". Maximum room name length is 16 characters, thus the maximum string length is less than 32 characters.
7	Loc Chg	When outputting a CSV block, this field will be set to a "*" if the location has changed from the last record printed. Otherwise, this field will be a ".".
8	Location	User location name. Up to 16 characters. The name will be delimited by " marks.
9	Manifold	The manifold position. The value will be zero (0) if no manifold exists. With a manifold, lowest number will be one (1).
10	Laser OK	1 = OK, 0 = bad. (Language independent)
11	Flow OK	1 = OK, 0 = bad. (Language independent)

**Table E-1** CSV value format and description (Continued)

Ref. No	Value Heading	Data Description
12	Sample Valid	The sample will be declared invalid if the laser current is bad during the sample, or if the sample flow falls outside the 5% ISO limit, or if the user invalidates the sample manually (only under statistics mode).
13	Sample Interval	In time. Format is HH:MM:SS
14	Volume Units	CF, CM, or L
15	Sample Volume	Floating point value. In "Volume Units" given above.
16	Number Channels	6 or 2. Normal output has 6 channels. If Pharmaceutical Two-Channel mode is enabled, (00.5 and 5.0 only), then output has 2 channels. If Pharmaceutical Two-Channel mode is enabled, data output will be different than the Lasair II particle counter.
17	Size 1	Particle size for channel 1.
18	Counts 1	The total differential raw count value.
19	Size 2	See above.
20	Counts 2	See above.
21	Size 3	See above. Not used in 2 channel mode.
22	Counts 3	See above. Not used in 2 channel mode.
23	Size 4	See above. Not used in 2 channel mode.
24	Counts 4	See above. Not used in 2 channel mode.
25	Size 5	See above. Not used in 2 channel mode.
26	Counts 5	See above. Not used in 2 channel mode.
27	Size 6	See above. Not used in 2 channel mode.
28	Counts 6	See above. Not used in 2 channel mode.
29	Number Analog	This can vary from 0 to 6. In RS-232 data output, the number is always 6 to maintain compatibility with the Lasair II particle counter. In USB or Web file downloads, the value will be between 0 and 4 depending upon the number of analog channels use. The Lasair III particle counter only has 4 analog channels. The last two channels are placeholders for compatibility with the Lasair II particle counter. When CSV data is output via RS-232 communications, placeholders are used to fill 6 channels.

**Table E-1** CSV value format and description (Continued)

Ref. No	Value Heading	Data Description
30	Name 1	User defined name (16 char max) for the analog channel. If the first character of the name is a "?," that indicates the name has changed since the data sample was saved. (The data sample only has an index to the name.)
31	Units 1	User name (10 char max) for sensor units. If the first character of the units is "?," that indicates the units has changed since the data sample was saved. (The data sample only has an index to the units.)
32	Avg 1	Average value for channel. Internally, the box will save the data as a 10 bit integer, and then apply the scale and offset when dumping the data.
33	Min 1	Minimum value for channel. Stored internally as a 10 bit integer.
34	Max 1	Maximum value for channel. Stored internally as a 10 bit integer
35	Name 2	See above.
36	Units 2	See above.
37	Avg 2	See above.
38	Min 2	See above.
39	Max 2	See above.
40	Name 3	See above.
41	Units 3:	See above.
42	Avg 3:	See above.
43	Min 3:	See above.
44	Max 3:	See above.
45	Name 4:	See above.
46	Units 4:	See above.
47	Avg 4:	See above.
48	Min 4:	See above.
49	Max 4:	See above.
50	Name 5:	Text is "n/a." Placeholder for compatibility with the Lasair II particle counter.
51	Units 5:	Text is "n/a." Placeholder for compatibility with the Lasair II particle counter.
52	Avg 5:	Text is "n/a." Placeholder for compatibility with the Lasair II particle counter.



Table E-1 CSV value format and description (Continued)

Ref. No	Value Heading	Data Description
53	Min 5:	Text is “n/a.” Placeholder for compatibility with the Lasair II particle counter.
54	Max 5:	Text is “n/a.” Placeholder for compatibility with the Lasair II particle counter.
55	Name 6:	Text is “n/a.” Placeholder for compatibility with the Lasair II particle counter.
56	Units 6:	Text is “n/a.” Placeholder for compatibility with the Lasair II particle counter.
57	Avg 6:	Text is “NaN.” Placeholder for compatibility with the Lasair II particle counter.
58	Min 6:	Text is “NaN.” Placeholder for compatibility with the Lasair II particle counter.
59	Max 6:	Text is “NaN.” Placeholder for compatibility with the Lasair II particle counter.



Appendix F TouchRAM

The Lasair III particle counter can be used with an optional Touch RAM wand to add the convenience of accessing pre-programmed sampling recipes specific to various facility locations.

A small memory button is programmed with sampling parameters and a location name. The button can be permanently attached to the wall near a sample point location. When the button is read with a special wand reader, the sampling parameters and location information are loaded into the Lasair III particle counter, eliminating the need to manually enter the data.

This helps to eliminate operator entry errors, and prevents an operator from mistakenly using a recipe for the wrong location.

The memory button is programmed by setting the desired sampling plan in the Lasair III particle counter, and then using the touch-wand to write this information to a memory chip in a data storage button.

NOTE: TouchRAM supports the use of most but not all Lasair III particle counter features. Statistical standards settings, for example, are not compatible with Touch RAM.



Comm/Port Setup

Main Display > Setup > Comm/Port

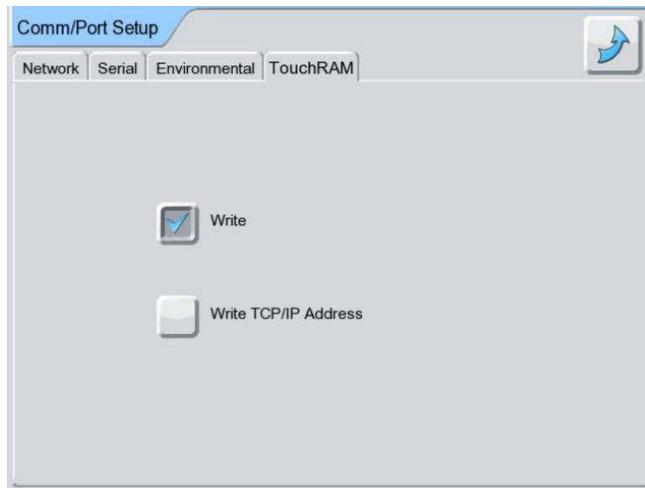


Figure F-1 TouchRAM tab of the Comm/Port Setup screen

TouchRAM Tab

Use the **TouchRAM** tab of the **Comm/Port Setup** screen  to set up the COMM port for accessing pre-programmed sampling recipes.

Table F-1 Fields in the **TouchRAM** tab of the **Comm/Port Setup** screen

Write	Enables TouchRAM functionality, including activating the Quick tab on the Sampling setup screen.
Write TCP/IP Address	<p>Writes the current TCP/IP address of device to TouchRAM buttons.</p> <p>When a TouchRAM button contains a TCP/IP Address, data sampled from various locations can be conveniently downloaded to Pharmaceutical Net, and then analyzed and archived.</p> <p>In large facilities with several Pharmaceutical Net installations, it may be beneficial to be able to automatically change the TCP/IP address of the LASAIR when it is moved from one Pharmaceutical Net area to another.</p> <hr/> <p>NOTE: The Enable TouchRAM Write option must be activated before you can enable this Write TCP/IP Address option.</p> <hr/>



Setup for TouchRAM Wand Operation

>> To set up TouchRAM wand operation:

- 1 On the **Lasair III Comm/Port Setup** screen, enable the Write mode on the **TouchRAM** tab.
- 2 Attach the TouchRAM wand to the to any connection (depending upon your setup) located on the back or front of the Lasair III particle counter.
- 3 Transfer the recipe from the wand to the TouchRAM button (typically mounted to a wall in a sampling point location).
The TouchRAM button is now ready to be read, as needed, when sampling n the corresponding area.
- 4 Position and hold the TouchRAM wand over the TouchRAM button to retrieve the sampling recipe for that particular area.

TouchRAM Button Data Format

The following data is written on Lasair III particle counter buttons:

Table F-2 Data written on Lasair III buttons

Item	Name	Comments
Sample Parameters		
1	Location Name	
2	Sample Volume	Sample Time is not saved. Consequently, units with different flow rates will be programmed for the same volume, but not the same time.
3	Sample by volume or time	
4	Purge Delay (in sec)	Also sets Sample By Time of Day
5	Inter-Sample Delay (in sec)	
6	Volume Units (ft,m,l)	The liter setting is not compatible with the Lasair II.
7	Normalized or Raw Data Setting	
8	Group Repeat (on/off)	on/off
9	Number of Samples	Also sets continuous sampling
10	Print Sample Average (on/off)	
11	Auto Print Thermal Report (on/off)	Thermal print report
12	Trh Units	Not used in the Lasair III. Written for Lasair II compatibility. Set to degC, if sample volume is in m. Otherwise written as degF.
General Alarm Settings		
13	Global Alarms on/off	
14	Alarm Buzzer on/off	

**Table F-2** Data written on Lasair III buttons (Continued)

Item	Name	Comments
Particle Alarm Settings		
15	Particle Alarms differential/ cumulative	
16	Particle Alarm, Channel 1	For the 310C and 350L, this channel is the 0.3µm channel. For the 5100, this channel is the 0.5 µm channel for the 5100. In Pharma mode (2 channels) alarm channels 1 and 2 are used. This is the 0.5 channel alarm in two-channel pharma mode.
17	Particle Alarm, Channel 2	This channel used for 5.0 µm Channel Alarm in two-channel pharma mode
18	Particle Alarm, Channel 3	
19	Particle Alarm, Channel 4	
20	Particle Alarm, Channel 5	This channel used for 5.0 µm Channel Alarm in two-channel pharma mode.
21	Particle Alarm, Channel 6	
22	Chan 1 Alarm on/off	This channel used for 0.5 µm Channel Alarm in two-channel pharma mode.
23	Chan 2 Alarm on/off	This channel used for 5.0 µm Channel Alarm in two-channel pharma mode.
24	Chan 3 Alarm on/off	
25	Chan 4 Alarm on/off	
26	Chan 5 Alarm on/off	
27	Chan 6 Alarm on/off	
Analog Alarm Settings		
28	Rh High Alarm on/off	Not read in the Lasair III. Written for Lasair II compatibility only. Set to off.
29	Rh Low Alarm on/off	Not read in the Lasair III. Written for Lasair II compatibility only. Set to off.
30	Temp High Alarm on/off	Not read in the Lasair III. Written for Lasair II compatibility only. Set to off.
31	Temp Low Alarm on/off	Not read in the Lasair III. Written for Lasair II compatibility only. Set to off.
32	Temp Low Alarm Value	n/a Lasair II only
33	Temp High Alarm Value	n/a Lasair III only
34	RH Low Alarm Value	n/a Lasair III only
35	RH High Alarm Value	n/a Lasair III only
36	Analog1 Low Alarm Value	
37	Analog1 High Alarm Value	

**Table F-2** Data written on Lasair III buttons (Continued)

Item	Name	Comments
38	Analog2 Low Alarm Value	
39	Analog2 High Alarm Value	
40	Analog3 Low Alarm Value	
41	Analog3 High Alarm Value	
42	Analog4 Low Alarm Value	
43	Analog4 High Alarm Value	
44		
45	Analog 1 Low Alarm on/off	
46	Analog 1 High Alarm on/off	
47	Analog 2 Low Alarm on/off	
48	Analog 2 High Alarm on/off	
49	Analog 3 Low Alarm on/off	
50	Analog 3 High Alarm on/off	
51	Analog 4 Low Alarm on/off	
52	Analog 4 High Alarm on/off	
Pharm-Net Communications		
53	Multi-Drop Serial Protocol Address	
54	TCP/IP Address	Optionally written if "Write TCP/IP TouchRAM" is set.
55	Network mask	Optionally written if "Write TCP/IP TouchRAM" is set.
56	TCP/IP Remote Mode (on/off)	Optionally written if "Write TCP/IP TouchRAM" is set.
57	Checksum	

Model Compatibility

When reading a TouchRAM button, ensure that the button was written with the same model of Lasair III particle. Particle alarms are written and read in the buttons for each channel. The particle counter alarms are set on a channel by channel basis. For example, the first channel alarm on a Lasair III-510 particle counter (0.5 μm) is read as the first channel alarm on the Lasair III-310 particle counter (i.e., 0.3 μm).

Therefore, TouchRAM buttons written and read on different models may not give the expected results. TouchRAM buttons do not contain any information about the particle sizes and flow rate of the instrument.



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Appendix G Working with a Web Browser

Using Browser Software

You can use your Web browser software to control the Lasair III particle counter from a separate computer through one of two kinds of connections:

- A direct cable connection to a computer
- A connection over an Ethernet network to a computer

Web Browser Interface Advantages

Using a computer-browser to access and control a Lasair III particle counter has the following advantages:

- The Lasair III particle counter can be accessed and controlled from a separate location.
- A keyboard and mouse can be used for data entry and editing.
- More data can be displayed on a larger screen.
- Data can be copied from the particle counter directly to the computer's hard drive, spreadsheet software, or database software.

Web Browser Interface Functions

- Display the particle and analog data from the Lasair III particle counter
- Configure the setup screens for sampling
- Start or stop sampling
- Download, save, or delete sample data
- Detect alarms
- Print reports
- Import and export recipes
- Import recipes from a Lasair II

Establishing Communications

The same steps will be used to connect with a Lasair III particle counter whether connecting over an Ethernet network or directly from a computer.



NOTE: If someone else has control of the Lasair III particle counter either directly or from a Facility Management System (FMS) or computer, you will be unable to gain control of the particle counter.

NOTE: Leaving the Lasair III particle counter edit screens active can also interfere with a remote connection. The Lasair III particle counter should always be left with the Main Display Screen open.

>> To establish communications:

Follow these steps to establish communications between a computer and the Lasair III particle counter.

- 1 Start the particle counter and the computer.
- 2 If communicating directly to a computer, connect the Lasair III particle counter to the computer's Ethernet connection.
- 3 Open the browser software.
- 4 Click on the IP address field to select the entire address.
- 5 Type the Lasair III particle counter's IP address into the IP address field, and press **Enter**. The **Enter Network Password** window displays.

You do not need to type "http://" or the non-significant zeros in the IP address. The address will be similar to the following example:



Figure G-1 Example IP address for a Lasair III particle counter.



Figure G-2 Enter Network Password window

- 6 The **User Name** field will accept any string for the User Name. The Password is still required, as discussed below.
If a username was used to create a password on the Lasair III, enter that name here.
- 7 If password control is enabled and passwords have been assigned, type your Password and then click the **OK** button. Otherwise, click **OK**.
The Lasair III **Main Display** appears.

NOTE: If a password has been assigned, it is always enabled in the Web browser even if it is disabled on the Main Setup Screen.



Operating from a Web Browser

You can now navigate to Lasair III Setup pages, start or stop a sampling run, display the current or previous data for display, and refresh the display.

Like the touch screen of the Lasair III particle counter, the Sample and Setup pages of and the Web browser are intuitive to use. However, unlike the data displayed on the Lasair III instrument, the data displayed on the Web browser is **not** real-time. While sampling, the data on the **Main Display** is updated every 10 seconds.

Web Page Encoding

The Lasair III V1.3.xxx firmware uses UTF8 (a form of Unicode) for all web pages. Safari and Firefox work without any Encoding issues. Internet Explorer has the capability of "Auto-Select" Encoding. If this is enabled, it may cause character translation issues. Incorrect character translation results in accented characters, Asian characters and mathematical symbols showing up as pairs or triplets of accented, meaningless characters. If this occurs, manually select "UTF8" character encoding for your browser.

Saving Sample Data File

Using Lasair III's Save feature , the data file for a sample can be copied to another file so it can be saved for long-term retention or for data analysis.

>> To save sample data to another file:

- 1 On the **Data** page, click the **Download Data** (Save) icon to open the sample data file. The data displays in the following format:

```
"Sample Date", "Sample Time", "Sensor Name"
1970/01/01, 04:17:48, "", "LasairIII-310C", 0000
1970/01/01, 22:20:10, "", "LasairIII-310C", 0000
1970/01/04, 02:24:37, "", "LasairIII-310C", 0000
```

NOTE: The data starts with a header line. Each line after the header line is one sample record.

NOTE: The entire file is created in a Comma Separated Value (CSV) format with the date stored in a year/month/day format. For details about this format, see **Appendix E**, Comma Separated Value (CSV) Format.

- 2 Click on **File > Save As** in the browser's menu bar.
- 3 Complete the file name and file location information, and click **Save**.
- 4 Navigate to the file to verify that the save was completed.

Deleting Sample Data Records

After saving the data records using a Web browser, make sure to delete those same records from the Lasair III particle counter's memory to avoid duplication of data.



Recipe Importing and Exporting

The Web Server feature has two separate screens that allow importing and exporting recipes. On the Recipe Setup screen (see **Figure G-3** on page -4), recipes may be saved as an all-in-one file. This file contains all recipes, locations and associations in a single file.

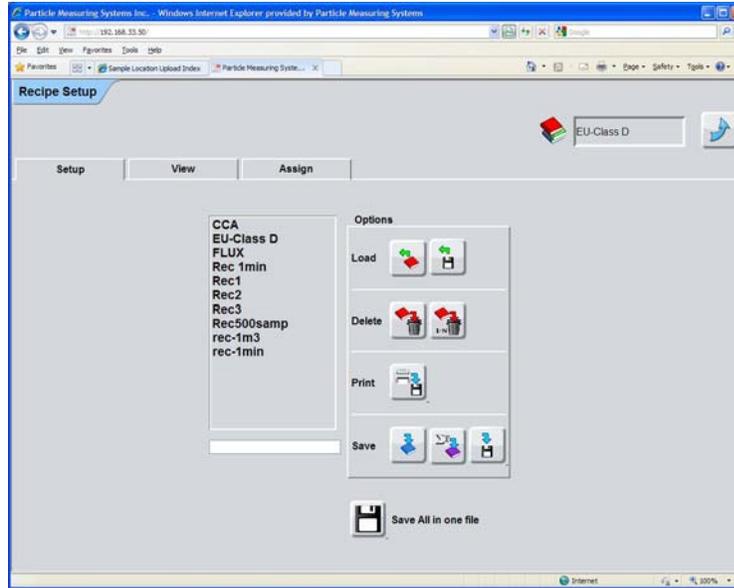


Figure G-3 Recipe Setup screen

Figure G-2 shows the second method for importing and exporting recipes. This screen is accessed via the **System Setup**. Recipes, Locations, and recipe-location association files may be imported and exported individually to a PC using this screen.

The individual import feature supports importing the recipes, locations and associations previously saved from a Lasair II. Note that the recipes exported on this screen cannot be imported back to a Lasair II.

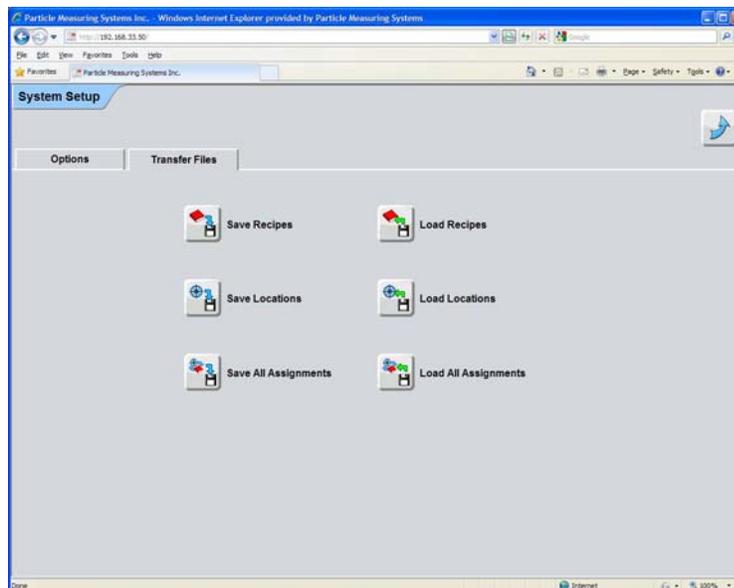


Figure G-4 Second method for importing and exporting recipes



Appendix H PMS Multi-Drop Protocol (MiniLaz Emulation)

This protocol is designed to be used on an RS-485 based system, with multiple individually addressable instruments. All communications are polled with a sensor address. The host program must take care of querying the unit for data.

RS-485 communications require an external RS-232 to RS-485 converter. The converter must support automatic send data control. Older converters that require CTS control (hardware flow control) will not work properly.

Tested RS-232/RS-485 Converters

Both of these models have been tested with the Lasair particle counter in MiniLaz emulation mode connected to Pharmaceutical Net.

NOTE: A null modem is required to connect between these models and the Lasair III particle counter.

- RS-232 to RS-485 converter with automatic send-data control and opto isolation: P/N 485OT9L
- RS-232 to RS-485 Converter with automatic send-data control and quick-disconnect terminal block: P/N 485PTBR

Both of the preceding models are available from:

B & B Electronics
707 Dayton Rd.
P. O. Box 1040
Ottawa, IL 61350

Phone: (815) 433-5100
Web: <http://www.bb-elec.com>

Both models require external 12 VDC power @ 100 mA. One solution is the 120 VAC to 12 VDC supply P/N 485PS2.

The Lasair particle counter provides an extended version of the command set used in the obsolete MiniLaz instrument, and offers backward compatibility. This protocol allows a Lasair particle counter to be a drop-in replacement for a MiniLaz on a Facility-View installation.



Multi-Drop Command Coding

Commands in the PMS protocol are formatted in the manner described below. For users wishing to write their own drivers, basic communication routines are available from Particle Measuring Systems.

Formatting Command Codes

>> To properly format a command code:

- 1 Add the address of the instrument to the beginning of the command string.
The address is an unsigned 16-bit integer between 0 and 99.
- 2 Add a 16-bit checksum of the data and address to the end of the packet.
The checksum is an unsigned sum of every address and data byte.

The packet should appear as follows:

```
ADDR_HIGH_BYTE | ADDR_LOW_BYTE | DATA_1 | DATA_2 | ... |
DATA_N | CHECKSUM_HIGH_BYTE | CHECKSUM_LOW_BYTE
```

- 3 ASCII characters not in the range of 0x20 to 0x7E must be converted to a 2-byte sequence using the following table:

Original BYTE	Transmitted BYTES
byte < 0x20	0x7B, byte+0x20
0x7B <= byte < 0x80	0x7C, byte-0x5B
0x80 <= byte < 0xC0	0x7D, byte-0x60
0xC0 <= byte	0x7E, byte-0xA0

- 4 Pre-append an ASCII <STX> character (0x02) to the data stream, and post-append an ASCII <ETX> character (0x03) to the data stream.
- 5 Data is ready to transmit.



Multi-Drop Commands

CCAL	Response: " RCAL yyyy/mm/dd " Returns the last calibration date. (The Lasair III particle counter should be calibrated at least once a year).
CCONT n	Response: " RCONT m "
CDT yy mm dd hh mm ss	Response: " RDT " Set date and time. Either two-digit or four-digit year is okay.
CES	Response: " RES 1 " (success) or " RES 0 " (failure). End Sampling.
CFQ	Response " RPQ 1 " or " RPQ 0 " Flush data queue—erase all data.
<hr/> <p>NOTE: The particle counter can un-erase data from this command if no samples are taken, and locations are not erased.</p> <hr/>	
CID name	Response: " RID name " Set sample ID (location) to given string. This command translates all characters to upper case. The only legal characters in this command are A-Z, a-z, and 0-9 . Other characters that are legal for Lasair particle counter location names are not legal here.
CISDELAY sec	Response: " RISDELAY sec " Set inter-sample delay in seconds. Delay is from end-to-start.
CKB n	Response: " RKB m " Lock/unlock the keyboard (1/0). If the keyboard is not locked, the instrument can be stopped or controlled from front panel.
CNOS nnn	Response " RNOS mmm " Set total number of samples. Setting to -1 causes continuous sampling. If the operation is successful, nnn = mmm .
CPDELAY sec	Response: " RPDELAY sec " Set purge delay in seconds.



CPQ	Response “ RPQ 1 ” or “ RPQ 0 ” Pop oldest sample off of data queue. This command will un-erase the oldest sample data if no samples are taken, and locations are not erased.
CQC	Response “ RQC nnn m ” Get number of samples in queue, and 0/1 for sampling (1) or not sampling (0).
CSN	Response: “ CSN s_n ” Returns the Lasair particle counter’s serial number.
CSR	Response “ RSR ” Causes instrument to reboot about 1.5 seconds after receiving the command. It takes several seconds to recover communications.
CSS	Response: “ RSS 1 ” (success) or “ RSS 0 ” (failure) Start Sampling.
CTD	Response “ RTD data_packet ” Transmit data in MiniLaz compatible format. Only 5 particle channels are sent. The extra channel is merged in as well as possible. Only temp/rh analog channels sent. Additional Lasair particle counter analog channels are not reported. The time stamp in the data packet is at the sample’s start. The normal Lasair particle counter time stamp is at the end of the sample.
CTD2	Response: “ RTD2 data_packet ” or “ RND2 ” if no data available Transmit Lasair III particle counter CSV packet. The packet is broken into several lines. The time stamp is at the end of the sample.
CTIM secs	Response “ RTIM secs ” Set sample time in seconds. Sets sampling to “by time”. Does not change sample units. Maximum value = 86399 Minimum value = 6
CVER	Response “ RVER LasairIII-model firmware_version ” Get Lasair particle counter model and firmware version.
CVOL nnnn.n	Response “ RVOL ” Set sample volume to nnnn.n in feet ³ (CF). (Causes the Lasair particle counter to sample by CF and to sample by volume.) Maximum value is 1439 CF Minimum value is 0.1 CF



Multi-Drop CTD Command Data Format

This data format is identical to the MiniLaz output. The six particle counter channels are converted to 5 channels for this report. The largest two data channels are merged. In two-channel mode the last three reported channels will be reported as 0's (zeroes). See the "CTD" command CTD on page H-4 description for additional details.

RTD	Description
TI hh:mm:ss	Time (Start of sample)
DA yy/mm/dd	Date (Start of sample)
ID Loc_str	Sample Location
SN s/n	Sensor Serial Number
LS #	Laser Status (1 = good / 0 = bad)
FR ###.##	Flow Rate (cfm)
VL ###.##	Sample Volume (cfm)
C1 #####	Channel 1 Raw Differential Counts
C2 #####	Channel 2 Raw Differential Counts
C3 #####	Channel 3 Raw Differential Counts
C4 #####	Channel 4 Raw Differential Counts
C5 #####	Channel 5 Raw Differential Counts
	NOTE: The last two channels are merged



Multi-Drop CTD2 Command Data Format

The data format for the **CTD2** command is essentially the CSV format.

All analog data channels are printed regardless of how many are enabled.

Unused analog channels will print “**Nan**”. To maintain compatibility with the Lasair II, six analog channels are always printed.

In pharma mode only two particle channels are reported.

See **Appendix E**, Comma Separated Value (CSV) Format.

RTD2
Date, Time, Sensor_Name, Sensor_Type, Sensor_S/N,
Statistics, Loc_chg, Location, Manifold_Index,
Laser_OK, Flow_OK, Sample_Valid, Sample_time, Volume_Units, Volume,
Num_Particle_Channels, Size_1, Counts_1, S2, C2, S3, C3, S4, C4, S5, C5, S6, C6,
Num_Analog_Chan,
A_Name1, A_Units1, A_Avg1, A_Min1, A_Max1,
A_Name2, A_Units2, A_Avg2, A_Min2, A_Max2,
A_Name3, A_Units3, A_Avg3, A_Min3, A_Max3,
A_Name4, A_Units4, A_Avg4, A_Min4, A_Max4,
A_Name5, A_Units5, A_Avg5, A_Min5, A_Max5,
A_Name6, A_Units6, A_Avg6, A_Min6, A_Max6



Appendix I Native Serial RS-232 Communications

The Lasair III particle counter's native communications mode is a simple RS-232 point-to-point protocol, with no addressing or checksum overhead. It can be used with a simple terminal emulator program, or as a basis for instrument control. It is an upgrade path for users with older Lasair particle counters.

Pin	Pin Function
2	TX
3	RX
5	GND

Native Serial Protocol Fundamentals

- All characters are echoed.
- Software flow control (**CTRL-Q/CTRL-S**) is used.
- A command prompt of “>” is output between commands and data packets.
- Automatic data output is generated.
- All commands return either an “OK” or an error response followed by a <CR>.
- All commands except Lasair “C” commands return current parameter values. This can be used for sanity checking.
- Many commands are similar to older Lasair serial commands.

Serial (RS-232) Output Format

The data output via the serial port are identical in content and order to those output in CSV format. See **Appendix E** for details.



Native Serial Protocol Error Messages

- Error --No C Command** The “C” command was given with no arguments.
- Error --Not Supported** An invalid or unsupported “C” command was sent.
- Error --Parameter** A command was sent with an insufficient number of parameters.
- Error** A command failed due to other circumstances. The most likely cause is that the serial interface did not execute the “**KB 1**” command to lock-out keyboard control, and someone is using the front panel controls.
- This message can also be caused by a parameter out of range.
- Error --Range** The following commands have a parameter out-of- range:
- TN
 - ANID
 - AUTOSTART
 - C 10

Upgrade Information

For users upgrading their own software, the following information is provided regarding fundamental interface changes. The following is a quick list of supported commands from the Lasair particle counter, with notes about any differences.

Table I-1 Commands supported from the Lasair Particle Counter

SS	Start Sampling.
ES	End Sampling.
SN	Set to continuous sampling.
C	Change/setup command (see additional information below).
KB	Keyboard lockout command. This is retained through a power cycle.
KG	Keyboard lockout until power cycle.
TI	Set sample interval.
TD	Set time/date.
ID	Set instrument ID.

The following command is not supported:

- R** Retransmit sample in last group.



C Commands

Supported C Commands

C 0 yy	Set Date-Year. Two-digit year.
C 1 mm	Set Date-Month.
C 2 dd	Set Date-Day.
C 3 hh	Set Time-Hour. Use 24-hour format.
C 4 mm	Set Time-Minute.
C 5 sec	Set Time-Second.
C 6 id_string	Set Instrument ID.
C 7 num	Set Number of Samples.
C 8 hh	Set Sample Time-Hour. Set sample time in order of hours, minutes, and seconds to avoid problems.
C 9 min	Set Sample Time-Minutes. Set sample time in order of hours, minutes, and seconds to avoid problems.
C 10 sec	Set Sample Time-Seconds. Set sample time in order of hours, minutes, and seconds to avoid problems. This command returns a Range Error if sec < 6, and min = 0, and hours = 0.
C 11 [1/0]	Set Sample Print on/off.
C 12 hh	Set Delay Time-Hours. Set delay between samples.
C 13 min	Set Delay Time-Minutes. Set delay between samples.
C 14 sec	Set Delay Time-Seconds. Set delay between samples.
C 16 [1/0]	Set continuous (repeat) mode on/off. When turned off, the number of samples is set to 1.
C 21 chan name	Set Analog ID Label. Set name for user analog channel 1-4
C 22 chan min	Set Analog 4 mA value. Set user analog channel minimum engineering unit value.
C 23 chan max	Set Analog 20 mA value. Set user analog channel maximum engineering unit value.
C 24 chan units	Set Analog Units. Set name for analog channel units.
C 25 chan [1/0]	Enable/disable analog channel.
C 32 hh	Set Purge Delay Time-Hours.
C 33 min	Set Purge Delay Time-Minutes.
C 34 sec	Set Purge Delay Time-Seconds.
C 38 [1/0]	Start sampling on Power Up.



Unsupported C Commands

C commands dealing with alarms and manifold control are not supported. (Manifold control with the Lasair particle counter requires an AM-II and Ethernet control.)

15 Group print
17 Count Alarm Enable
18 Count Alarm Print Enable
19 Count Alarm Size
20 Count Alarm Value
27 Manifold Sequence
28 Mixed-air Alarm Value
29 Search Alarm Value
30 Search Length Minutes
31 Search Length Seconds
37 Audible Alarm On/Off
39 Power Interrupt Print
41 Count Alarm Diff/Accum
43 Count Alarm Conc
44 Analog Avg On/Off
45 Analog Alarm Enable
46 Analog Alarm Max Value
47 Analog Alarm Min Value
48 Analog Alarm Print On/Off
50 Laser Warning Print
52 Flow Error Print
54 Time Series Channel
56 Manifold Sequence Enable
57 Manifold Sequence Length
58 Alarm Count Port Num.
59 Search Length Hours
60 Mixed Air Alarm Enable
61 Mixed Air Alarm Print
63 Search Alarm Print On/Off



C Command Table Format

These commands are from the C command above. All of these commands are redundant, and are provided for users of existing Lasair particle counters who want to simplify their upgrade path. Some of these commands split internal variables into several pieces. For instance “C 0” through “C 6” are used to set date and time. Because of the variable split, unexpected results can be obtained if the user is not careful with software coding. For instance, setting the date and time in multiple parts has the possibility of time-rollover in-between settings. In other words, if the Lasair particle counter’s seconds rolls over from 59 to 0, then at a minimum the minutes will also change, and if this occurs right after setting the minutes, then the expected time will be wrong.

Command Format

C nn sssssssssss

where:

C nn = command # (0-38)

ssssssssss = any alphanumeric entry appropriate to the parameter being defined.

Command List

All commands are case-insensitive. Text variables in commands do retain capital and lowercase letters.

AALARM [n],min, [1/0],max,[1/0]	Set analog alarm for specified channel. Channel is 1–4 for user analog inputs. min is a floating point value for alarm minimum, and max is a floating point value for the alarm maximum. The min and max alarms are enabled or disabled individually.
ANID n,name_string	Set name for user analog channel n . Channel is 1–4, name_string is maximum of 16 characters.
ANENABLE n,[1/0]	Enable or disable data collection for analog channel. Channel is 1–4.
ANLIMITS n,min,max	Set calibration parameters for 4–20 mA analog input channel. Min value is engineering units value at 4 mA, and max is engineering units value at 20 mA.
ANSCALE n,scale	Set 4–20 mA scale for analog input channel.
ANOFFSET n,offset	Set 4–20 mA offset for analog input channel.
ANUNITS n, units_string	Set units title for analog channel. Channel is 1–4, units string is maximum of 8 characters.



AUTOSTART [1/0]	Enable or disable autostart feature. When enabled, the instrument will begin sampling when it powers up.
BATCH ID ccccccc	Set Batch Name ID string using maximum of 16 characters.
BUZZER [1/0]	Enable/disable buzzer during alarms.
C nn	Change setup parameter. See separate table below for details.
CLEARALL	Deletes all sample data and all location names. This command should be used with caution. If the command is executed while the instrument is running, it will return an error. This command may be used to facilitate an interface to a barcode reader.
DS	Get number of data samples.
ERASEDATA	Erase all data samples in instrument.
ES	End sampling.
GALARM [1/0]	Enable or disable global alarm setting. When disabled, all alarms are off. When enabled, individual alarm settings are in effect.
ID cccccccccc	Set instrument identification using maximum of 16 characters.
ISAVAIL	Check if instrument control is available. The Lasair III particle counter has multiple methods of communications, as well as the front panel control. To prevent confusion, only one user is allowed to control the instrument at a time. This command will return a 0 if the serial communications is unable to take control of the instrument. This can be used as a check if an error occurs while executing another command. Using the KB or KG commands ensures that the serial communications will have control of the instrument.
ISDELAY secs	Set inter-sample delay. This is the delay between the end of one sample, and the start of the next. The maximum value is 86399 seconds (23:59:59).
ISON	Return the sampling state of the box (1/0).
ITYPE	Return the instrument model.
IVER	Return the instrument firmware version.



KB [1/0]	Keypad lockout enable/disable. Lockout is retained through a power cycle. If this lockout is disabled with the “ KG 0 ” command, it will be re-enabled when the power is cycled.
KG [1/0]	Keypad lockout enable/disable. Lockout lasts until “ KG 0 ”, “ KB 0 ”, or a power cycle.
LOCID name	If needed, creates and sets the current location ID to name. If name already exists, the front panel screen will change the ID. If the name does not exist, and there are less than 200 names currently defined, then the new name will be created, and the current location will be set to this string. If the instrument is taking a sample, this command will return an error. This command is used to facilitate an interface to a barcode reader.
OPER name	Set operator name using maximum of 16 characters.
NORMDATA [1/0]	Set normalized/raw particle display. If particle display is set to 0, then data is shown in raw counts on the display. In addition, if particle alarms are used, the alarms automatically change with sample time changes.
PALARM chan,value,[1/0]	Set particle alarm for specified channel. Channel is 1–6. Alarm value is any number greater than or equal to 0. <hr/> NOTE: if value is set to 0, channel must be disabled. An error will be returned if setting is to enable a channel with 0 as the value. Particle alarms are internally modified depending on sampling parameters. If the box displays data in a normalized output, then this is not an issue. Otherwise, changing the sample size (either by time or volume) will ratio-metrically change the alarm setting. <hr/>
PALARMTYPE [C/D]	Select particle alarm type. This is either cumulative or differential.
PDELAY secs	Set the purge delay. This is the time to wait before the beginning of the first sample. The maximum value is 86399 seconds (23:59:59). (Even if this is set to 0, there will be some delay before a sample for the pump to spin up.
POP	This command erases the oldest sample in the data buffer. The command may be used in conjunction with the TF command to send the complete data buffer, sample by sample.



PRALARM [1/0]	Enable or disable print on alarm feature. When enabled, the following conditions will cause an immediate printout: analog alarm, particle alarm, pump error, laser failure. The printout lists the alarm condition, the location, and date/time.
SS	Start sampling.
SN	Set to continuous sampling, with group size = 1.
SPRINT [1/0]	Enable/disable the print at end of sample feature.
SVOL <i>cf_volume</i>	Set sample volume in feet ³ . This command does not change the display units from cm, if they are set that way. The smallest sample volume is 0.1. The largest sample volume is 1439.98.
TI <i>secs</i>	Set sample interval to <i>nnn</i> seconds. maximum interval is 86399 seconds (23:59:59). Smallest interval is 6 seconds.
TIME	Print the current date and time. Output format is “YYYY/MM/DD hh:mm:ss.”
TD <i>yy/mm/dd hh:mm:ss</i>	Set the date and time. Any non-digit is considered a delimiter. Years can be entered as either two digits or four digits. The seconds may be omitted, and will default to 0.
TF	Transmit first data sample (i.e. earliest time). The data is transmitted in standard CSV format. This command may be used with the POP command to systematically transmit all the stored data on a Lasair particle counter.
TL	Transmit the last data sample (i.e. latest time). Data is sent in standard CSV format.
TN <i>n</i>	Transmit data sample <i>n</i> . Sample <i>n</i> must be a valid sample. The variant “ TN 1 ” is equivalent to TF . Data is sent in standard CSV format.
UNITS [F/M]	Set particle volume units to either feet ³ (F) or meters ³ (M). This affects displaying normalized data on the LCD, and setting alarms in normalized data mode. This command is independent of the SVOL command which always sets volume in feet ³ .

Serial (RS-232) Output Format

The data output via the serial port are identical in content and order to those output in CSV format. See **Appendix E**, Comma Separated Value (CSV) Format for details.



Appendix J 4-20 mA Input

4-20 mA Input

Up to four optional sensors can be connected to a Lasair III particle counter's 4-20 mA connectors (type DB15F) on the rear of the case.

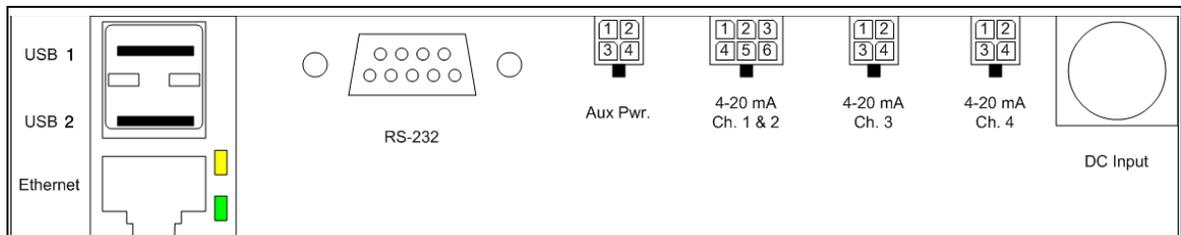


Figure J-1 Connectors on back panel of Lasair III particle counter

Use this appendix to determine how to set up the analog input values in the **Environmental** tab of the **Comm/Port Setup** screen.

Main Display > Setup > Comm/Port

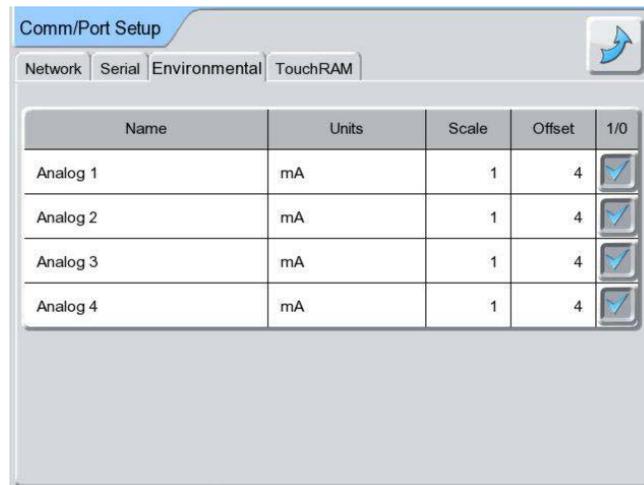


Figure J-2 Environmental tab of the **Comm/Port Setup** screen

Each analog input can have a different value of the **Scale** and **Offset** values. These values are determined by the range of the sensors that are being used.



4-20 mA Input Setup Values

Name — Can be changed to name of the sensor such as Temperature or Humidity.

Units — Can be used to identify the units of measure related to the 4-20 mA value, such as degrees C or percent (%) humidity.

Scale — Is the total measurement range \div 16. 16 is the number of mA's between 4 and 20 that will be used to create the measurement range.

Offset — Is the minimum value of the measurement device. For example, if the lowest value of a temperature probe is 32, the value of 32 would be entered into the **Offset** field.

I/O — A selection box to activate or de-activate this analog input.

Examples of Setup of the TRH Accessory for the Lasair III

For our example, we will be setting up the TRH accessory for the Lasair III particle counter with the following specifications:

- Temperature range of measurement: 32 – 122 °F
- Relative humidity range: 0 – 100%

The scale and offset values are calculated as follows.

>> To calculate the temperature settings:

For the scale value:

- 1 The range of temperature measurement is $122 - 32 = 90$ degrees of measurement between 32 and 122
- 2 The value of $90 \div 16 = 5.625$ scale
This value is to be entered into the **Scale** field of the **Environmental** tab of the **Comm/Port Setup** screen.

For the offset value:

- 3 The **Offset** value should be 32, since the probe begins measurements at 32°.

>> To calculate the humidity settings:

For the scale value:

- 1 The range of humidity is $100 - 0 = 100$ degrees of measurement between 0 and 100
- 2 The value of $100 \div 16 = 6.25$ scale
This value is to be entered into the second **Scale** field of the **Environmental** tab of the **Comm/Port Setup** screen.

For the offset value:

- 3 The **Offset** value should be 0, since the measurement begins at 0% humidity.

All other types of 4-20 mA inputs should be configured in a similar fashion for the remaining sensors.



Appendix K HHIPA Accessory

For users who desire to use the Isokinetic Sampling Probe (ISP) remotely with a hand-held accessory, there is the option of using a Hand-Held Isokinetic Probe Attachment (HHIPA). The HHIPA is ideally designed for filter scanner applications where the standard ISP is not suitable. The HHIPA meets the requirements of ISO 14644-3 Section B.6.2.4 *Determination of Probe Size* and can be used for filter scanning applications.

The HHIPA probe is available in three different flow rate configurations, depending on the flow rate of your Lasair III Particle Counter. Those flow rates are:

- 28.3 LPM (1.0 CFM)
- 50 LPM
- 100 LPM

Depending on the flow rate of the Lasair III Particle Counter, the size and the shape of the HHIPA horn are slightly different as well as the size of the barb fitting and tubing ID. However, all units are supplied with the same ergonomic handle, a barb fitting to attach tubing and 10 feet of tubing to connect to the Lasair III Particle Counter.

Each of the probes is supplied with 10 feet of tubing, but it can be replaced with tubing up to the maximum length of tubing allowed by the Lasair III Particle Counter, which is 8 meters of tubing. The user should take into account particle transport losses when using longer lengths of tubing and should minimize the length of tubing between the HHIPA and the particle counter whenever possible.



Figure K-1 Hand-Held Isokinetic Probe Attachment (HHIPA)

Application

Tubing is connected to the barb fitting located on the rear of the HHIPA. The other end of the tubing connects to the Lasair III Particle Counter's sample inlet.



For filter scanning applications it is most common to utilize the audio beep function of the Lasair III Particle Counter. This feature allows the user to scan a filter without looking at the screen of the Lasair III, and to hear an audio sound when particles are detected. Additional setup information is located in **Chapter 6 Setting Sampling and Alarm Parameters, Table 6-6** on page 6-5 for how to set up the audio *beep* function on the particle counter.

Additionally, ordering the optional 100 dB Alarm Siren for the Lasair III Particle Counter provides the loudest and easiest-to-hear sound during this type of use. It is highly recommended to order the Lasair III with this additional feature if you are going to be using the HHIPA accessory.



Appendix L Ethernet Communications Overview

This Appendix provides the following basic details on Ethernet communications:

- Ethernet Addressing Basics, this page
- MAC Address on page L-3
- Static IP Addresses versus DHCP Addresses on page L-4
- Troubleshooting Ethernet Connectivity on page L-4
- Instrument to Laptop Ethernet Setup on page L-6

IT Department

The Information Technology or IT department of an organization is responsible for configuring and controlling the corporate network. Any time an Ethernet enabled instrument is attached to a corporate network, IT must be involved, since a static (i.e., fixed) IP address is required by the instrument. The IT department is responsible for assigning fixed addresses.

Ethernet Addressing Basics

Particle Measuring Systems instruments must be properly configured for Ethernet communications in order to work. There are multiple numeric parameters required to properly configure an instrument and a small error in one or more of these parameters can result in no communications, or worse—sporadic communications.

All instruments support the common IPv4 standard. Valid addresses are in the range of 0.0.0.0 to 255.255.255.255. The number 255 corresponds to the special value of 0xFF in hexadecimal. Numbers 256 or larger are not valid. Each number in the dot sequence is sometimes called an octet.

There are four different parameters to configure:

- IP Address—*Required*
- Network Mask—*Required*
- Gateway Address—*Depends on network. May be blank or 0.0.0.0*
- Multicast Address—*Used only in Facility Net. Default value is generally OK.*

These parameters are described in detail below.

IP Address

The Internet Protocol (IP) address consists of two portions:

- a network portion
and
- a location portion



In the analogy of a telephone number, there is an area code and a phone number. Unlike a telephone number, the network (or area code) portion of an IP address can be set to different numbers of digits. It is not a fixed size like an area code. The location portion is the rest of the number – everything that is not part of the network portion. The definition of what is network and what is location is done by the network mask, described below.

Although there are a great many numbers in the range of 0.0.0.0 to 255.255.255.255, in almost all circumstances instruments are placed on a segregated private network that uses a greatly reduced set of numbers. The valid ranges are shown in **Table L-1**.

Table L-1 Private IPv4 Network Ranges

Address Class	Start	End
A (24 Bit Range)	10.0.0.0	10.255.255.255
B (20 Bit Range)	172.16.0.0	172.31.255.255
C (16 Bit Range)	192.168.0.0	192.168.255.255

Particle Measuring Systems provides a unique default address in the Class A range for every instrument. Whenever the instrument is set to default parameters or factory defaults, this address is restored.

Network Mask

The network mask is used to discern the network portion of the IP address from the location portion. From a telephone number analogy, it segregates the area code from the phone number. It is easy to set the mask incorrectly, and when it is incorrect, it can result in sporadic communication problems. For example, in Facility Net an instrument can be seen as available via a Multicast probe, but trying to control the instrument causes a communications error.

The mask is actually a 32 bit binary number consisting of some number of 1's followed by enough 0's to make 32 bits. The length of the 1's depends on the network Address Class (i.e., area code size) as well as sub-netting (i.e., something done by IT). **Table L-2** shows the default network mask for each address class.

Table L-2 Default Network Mask Values

Address Class	Default Network Mask
A (24 Bit Range) (e.g., 10.X.X.X)	255.0.0.0
B (20 Bit Range) (e.g., 172.16.X.X)	255.240.0.0
C (16 Bit Range) (e.g., 192.168.X.X)	255.255.0.0

When a Particle Measuring Systems instrument is set to default parameter or factory defaults, the network mask is set to **255.0.0.0**. This corresponds with the **10.X.X.X** address which is also set.

For large systems, IT personnel will dictate a network mask value, and the value may be different from what is shown in the table. Make sure the network mask is set as specified by IT. All PCs, routers and instruments on a network must use exactly the same network mask, or communication problems will arise.



Gateway Address

The gateway address is a special address used to allow communications outside of the local network. In the telephone analogy, it allows placing long distance calls. In many (if not most) situations, a gateway address is not required.

The default gateway address set when restoring defaults to a Particle Measuring Systems instrument is **10.255.0.60**. This address should be cleared or set to whatever is required by IT.

Multicast Address

The multicast address is used by Facility Net and Pharmaceutical Net to query all instruments attached to a local network. The valid multicast address range is defined as **224.0.0.0** to **239.255.255.255**. From a practical standpoint addresses in the **224.0.X.X** range should not be used as many of them are reserved for other communications.

Particle Measuring Systems assigns a factory default multicast address of **224.100.100.1** to all instruments. This address generally does not need to be changed. The exception is when sensors are integrated into a large network. In this situation, IT may recommend an alternative multicast address to avoid network conflicts.

MAC Address

All Ethernet devices have a MAC (Media Access Control) address. This address may be thought of as an Ethernet serial number. It is unique for all devices. If an instrument needs to be replaced with a different instrument for either calibration or service, the service technician will duplicate the old instrument's IP address into the new instrument. However, the MAC address of the new instrument will be unique.

In Particle Measuring Systems instruments the MAC address is set during production. The value is permanently stored in non-volatile memory on the main processor circuit board. (The MAC address will change if the main circuit board is replaced.) The MAC address may be displayed via the HyperTerminal (i.e., RS-232 service interface) by using the **status** command.

Routers and switches keep track of which MAC address is attached where. For that reason, it is important for the instrument to tell a router or switch who is attached. For all Particle Measuring Systems instruments, this is done at least once when the instrument boots. In some newer instruments, the MAC address is announced to the switch or router every time a network connection is detected. Without this mechanism, it would be possible for routers to operate for an extended period of time without recognizing which MAC address is mapped to which IP address.



Static IP Addresses versus DHCP Addresses

All Particle Measuring Systems use a static IP address. This means the address is predefined. The address is used to identify the instrument when data is collected. In contrast, many computers use a dynamic IP address (i.e., DHCP or Dynamic Host Configuration Protocol). In order for dynamically configured devices and statically configured devices to be mixed on the same network, some mechanism must be used to segregate the DHCP address range from the static address range. This mechanism is a standard configuration parameter set in the router. IT is typically responsible for delineating the address range. If static and dynamic addresses are not properly segregated, it may result in duplicate addresses, and unexpected network behavior.

Troubleshooting Ethernet Connectivity

These steps may be used to check communications to an Ethernet device.

- 1 Check for light on LEDs of the Ethernet connector. There should be at least one light lit solid to indicate a connection. If not, there is hardware connection problem



Figure L-1 Ethernet port connectivity LED

- a. Is the cable bad?
 - a.1 Try a different cable.
 - a.2 If a direct laptop to instrument connection is being done, a cross-over cable may be required. Cross-over cables are specially marked as such. Particle Measuring Systems p/n 1000011477 is a cross-over cable.
- b. Is the other end of the cable alive?

Does a known good device work when connected instead?



- 2 Verify the device can talk using **ping**.
 - a. Open a command shell on a PC, and type **ping aaa.bbb.ccc.ddd** where aaa.bbb.ccc.ddd is the address of the device. If there is no response, then there is an addressing problem.

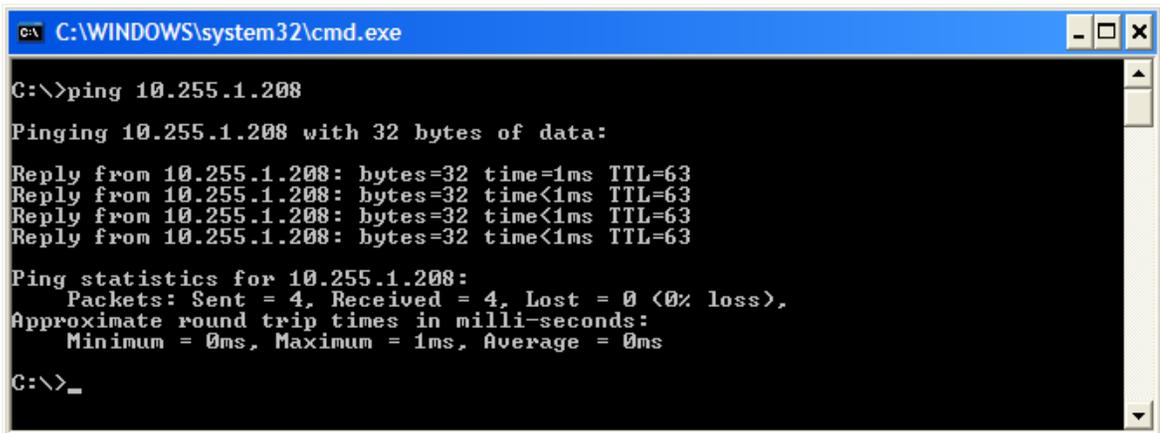


Figure L-2 Example for **ping** test

- b. Make sure the PC and the device being talked to are on the same network.
- c. Check the PC’s address by opening a command shell and typing **ipconfig**.
 - c.1 Is the Mask the same on both the PC and the device?
 - c.2 Is the network portion of the address the same on both the PC and the device?

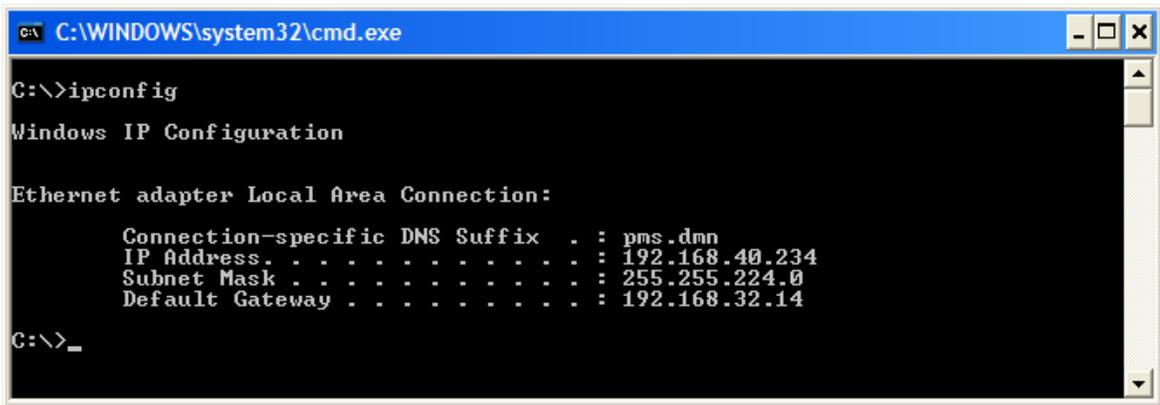


Figure L-3 Example for **ipconfig** command

- d. Does an LED on the device’s Ethernet connector blink when a ping is transmitted to it? If not there may be an addressing error with the device, or a configuration problem with the router or switch the device is attached to.
 - d.1 Try repowering the device to re-establish communications with the router or switch.



Instrument to Laptop Ethernet Setup

There are two ways to establish a direct Ethernet link between a laptop (or other PC) and a Particle Measuring Systems instrument. The first way is to modify the PC Ethernet settings to work with the existing instrument settings. The second way is to modify the instrument settings to work with the existing PC settings. Since PCs are typically configured for DHCP, this method is less obvious; however for certain applications (such as demos or testing) this method may be advantageous.

Cabling between a laptop and instrument can often be done with a standard Cat 5 Ethernet cable. Older computers and older instrument designs may require an Ethernet cross-over cable to communicate properly. This is available from Particle Measuring Systems as p/n 1000011477. Newer computers use a mechanism called Auto-MDIX to do the cross-over within the computer or instrument automatically.

Method 1: Modifying the IP Settings on a PC

This method allows using the existing instrument address. At the end of the communications session, the laptop will contain an address that will prevent normal communications to the corporate network. The procedure must be undone after the session.

- 1 Retrieve the network address parameters from the instrument. This can be done using a HyperTerminal serial link and the “**status**” command.
- 2 Determine a compatible network address and mask to set the PC.
For example, an instrument has address **10.12.43.217** and mask value **255.255.0.0**. The PC must use exactly the same mask value (i.e., **255.255.0.0**). The address can be selected as any valid address so long as the network portion is kept the same. Therefore, **10.12.43.216** would be acceptable, and **10.12.0.1** could also be used.
- 3 Configure the PC to talk at the selected address:
 - a. Navigate to the **Local Area Connection Properties** window.

In Windows XP	In Windows 7
Start Control Panel Network Connections	Start Control Panel Network and Internet Network and Sharing Center Change Adapter Settings

- a.1 There may be more than one choice to select at this step. Choose the item labeled **LAN** or **Local Area Connection**.

NOTE: Do not select anything with the word “Wireless” or the word “Virtual”.

- a.2 Right click on the adapter, and then select **Properties**.
A window similar to that shown below should be displayed

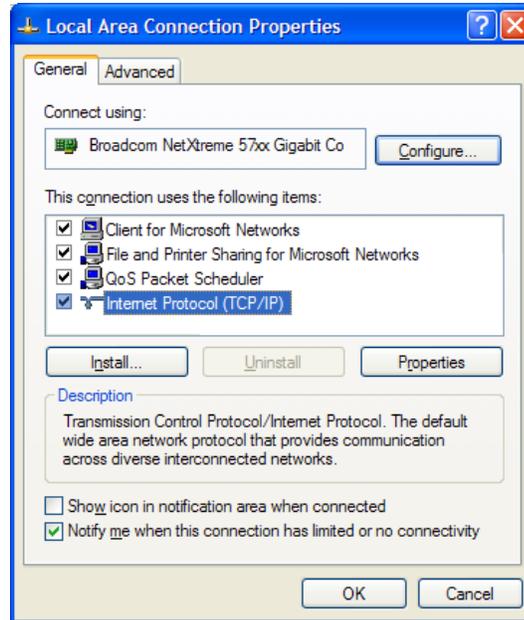


Figure L-4 Local Area Connection Properties window

- b. Select the item **Internet Protocol (TCP/IP)**. If given an option for **Version 4** or **Version 6**, select the one titled **Internet Protocol Version 4**.
- c. Click the **Properties** button.
- d. Record the existing settings on the pop-up **Internet Protocol (TCP/IP) Properties** window.
These settings will need to be restored after the instrument communication session is complete.
- e. Change the settings on the **Internet Protocol (TCP/IP) Properties** window to use the network address and mask determined above. See **Figure L-5** for an example. The **Default gateway** and **DNS server** values should be left blank.

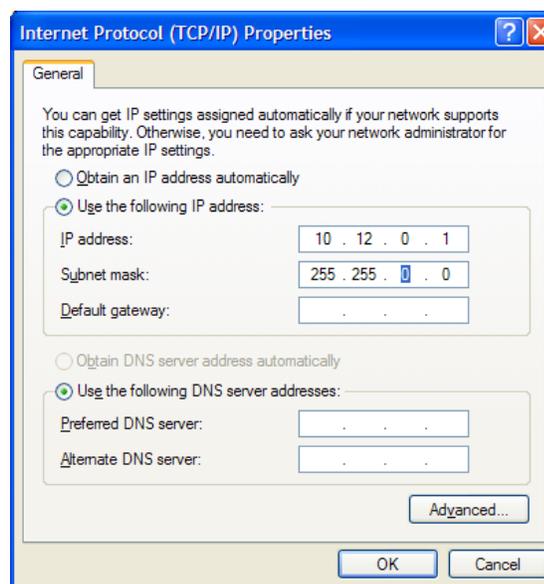


Figure L-5 IP address and subnet mask defined



- f. Click the **OK** button to close the **Internet Protocol (TCP/IP) Properties** window.
 - g. Click the **OK** button to close the **Local Area Connection Properties** window.
- 4 The PC is now configured.
 - 5 Attach a network cable between the PC and the instrument.
 - 6 Use the procedure Troubleshooting Ethernet Connectivity on page L-4 to check the connection is functioning.

Method 2: Modifying the Settings on an Instrument

This method takes advantage of a Microsoft Windows feature called Automatic Private IP Addressing or APIPA. APIPA allows a PC to automatically assign itself an IP address even when no DHCP server is present to provide an address to the PC. Translated this means that by assigning the right address to an instrument, it will talk one to one with a Windows machine without setting an address on the Windows machine.

The address range of **169.254.0.1** through **169.254.255.254** is reserved for APIPA.

- 1 Attach the instrument to a HyperTerminal link.
- 2 Set the instrument addresses as follows:

IP address	169.254.0.1
Mask	255.255.0.0
Gateway	0.0.0.0 (or blank)
- 3 After setting the addresses, use the **write** command to save the addresses.
The instrument will reboot and apply the new address settings.
- 4 Attach a network cable between the PC and the instrument.
- 5 Use the procedure Troubleshooting Ethernet Connectivity on page L-4 to check the connection is functioning.



Appendix M Serial Communications Overview

The elimination of a serial port on laptop computers and the elimination of HyperTerminal software in Windows 7 requires that service personnel prepare beforehand to have the right tools for serial communications.

This Appendix includes the following sections that describe set up and troubleshooting for serial communications:

- Adapters and Cables on page M-2
 - Useful Serial Adapters on page M-2
 - USB Serial Port Adapter on page M-2
 - Serial Cable on page M-3
 - RJ-12 Cable and Adapter on page M-3
- Connector Signals on page M-4
- Communication Software Options on page M-5
 - HyperTerminal on page M-5
 - PuTTY on page M-6
 - Tera Term on page M-7
- Communications Configuration on page M-8
 - ENODE Specific Settings on page M-8
- Troubleshooting Serial Communications on page M-8
 - No Communications on page M-8
 - Dropped Characters or Strange Characters on page M-8
 - Unexpected Characters on page M-8



Adapters and Cables

Several hardware items are needed for attaching PCs to various Particle Measuring Systems instruments. Not all the items are required all the time; however, having all the items shown will provide a reasonably complete serial connection tool suite.

The standard PC serial port is a male DE-9. The DE-9 is sometimes referred to as a DB-9 or DB9 in documentation. Historically PCs used a DB-25 connector with 25 pins. The “B” refers to the physical size of the connector. Current generation PCs use the smaller “E” size connector with 9 pins. Hence DE-9 is the correct name, but the term DB-9 is a common misnomer.

Useful Serial Adapters

All three adapters shown in **Table M-1** are useful in different situations. The complete set allows attaching to any DE-9 serial port regardless of gender or pinout.

Table M-1 Recommended Serial Adapters

DE-9 Female-Female Gender Changer L-Com p/n DGB9F or Similar	
DE-9 Male-Male Gender Changer L-Com p/n DGB9M or Similar	
DE-9 Null Modem L-Com p/n DMA060MF or Similar	

USB Serial Port Adapter

Newer computers (especially laptops) no longer include a serial port.

USB to Serial adapters are available to resolve this issue. Particle Measuring Systems has p/n 1000016655 (see **Figure M-1**).



Figure M-1 USB serial adapter



USB driver for Windows XP

Windows XP machines will require a driver to be installed for the USB serial adapter. The drivers are specific to the model of adapter used. Incorrect drivers can occasionally be a problem. If the adapter does not operate correctly, the driver is usually at fault.

Serial Cable

Serial cables are available in assorted varieties. The most useful version is a “straight” or “straight-through” cable with DE-9 male and female connectors (see **Figure M-2**).



Figure M-2 Serial cable with DE-9 male and female connectors

There are numerous variants on serial cables including null-modem (also called cross-over) cables. In addition, some cables have DB-25 or other less useful connectors.

The recommended straight cable will not require m/m or m/f or null modem adapters for most Particle Measuring Systems instruments.

RJ-12 Cable and Adapter

Some Particle Measuring Systems instruments (usually those with smaller form factors) use an RJ-12 modular adapter for serial communication.

The adapter and cable may be purchased from Particle Measuring Systems as p/n PMS-CD1995 (see **Figure M-3**). The DE-9 side of the adapter will attach directly to a PC serial port or a USB to serial adapter.



Figure M-3 RJ-12 adapter and cable



Connector Signals

Table M-2 shows the standard PC serial port connection. The highlighted signals (RX, TX and Ground) are required signals for Particle Measuring System instruments. The signals shown in italics are not used.

Table M-2 Standard PC Serial Port (DE-9)

Pin	In/Out	Description
1	<i>In</i>	<i>DCD (Data Carrier Detect)</i>
2	In	RX (Receive)
3	Out	TX (Transmit)
4	<i>Out</i>	<i>DTR (Data Terminal Ready)</i>
5		Ground
6	<i>In</i>	<i>DSR (Data Set Ready)</i>
7	<i>Out</i>	<i>RTS (Request to Send)</i>
8	<i>In</i>	<i>CTS (Clear to Send)</i>
9	<i>In</i>	<i>RI (Ring Indicator)</i>

Table M-3 shows the RJ-12 connector pinout for many Particle Measuring Systems instruments. Pins shown as *instrument dependent* are not usually available. On some instruments, the pins may be tied together to simulate hardware flow control. On other instruments, the pins are not used at all. See instrument-specific documentation to verify the details.

An adapter cable is provided with instruments that use this interface. Order p/n PMS-CD1995.

Table M-3 RJ-12 Instrument Connector

Pin	In/Out	Description
1	<i>In</i>	<i>DSR (instrument dependent)</i>
2	Out	TX (Transmit)
3	In	RX (Receive)
4	<i>Out</i>	<i>RTS (instrument dependent)</i>
5	<i>In</i>	<i>CTS (instrument dependent)</i>
6		Ground



Communication Software Options

Users of Windows XP can use the built-in program HyperTerminal for configuring serial communications. Windows 7 no longer includes this program. The following alternative utilities available as downloads are discussed:

- HyperTerminal, this page
- PuTTY on page M-6
- Tera Term on page M-7

HyperTerminal

Due to its use in Windows XP (as well as older versions) HyperTerminal remains the most ubiquitous program available for serial communications. It is available for Windows 7 users as a purchased download from Hilgraeve (<http://www.hilgraeve.com>) as well as other sites.

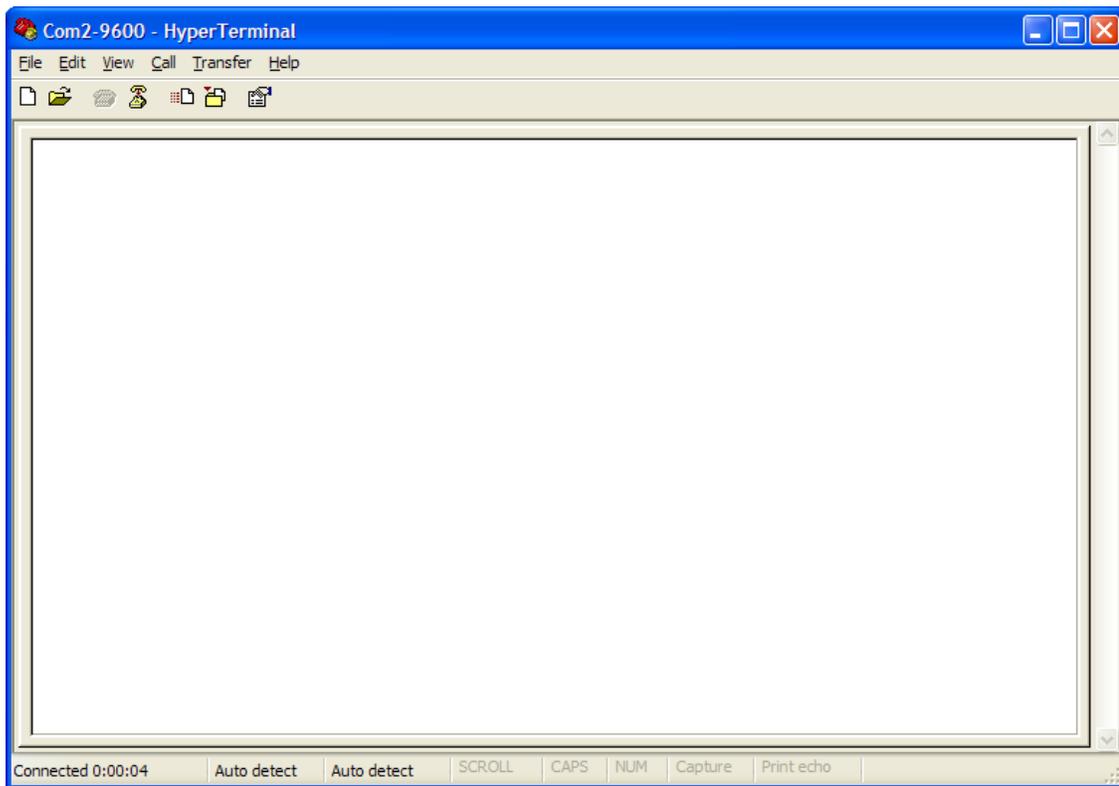


Figure M-4 HyperTerminal window



PuTTY

PuTTY is an open-source (i.e., free) terminal emulator for Windows. It is available here:

- <http://www.putty.org>

or here:

- <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>.

PuTTY software interface screen shots are shown in **Figure M-5** and **Figure M-6**.

The default color scheme uses a black terminal window. This can be changed to a white terminal window by going to the “**Colours**” setup, and then clicking the box titled “**Use system colours**”.

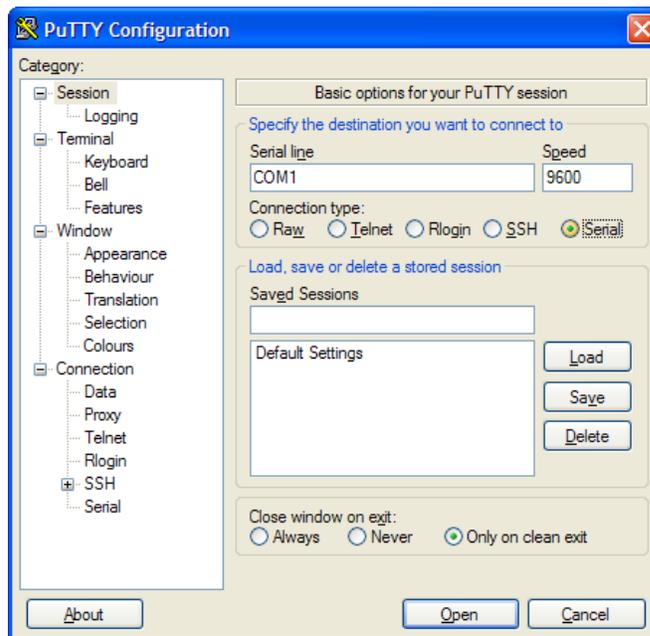


Figure M-5 PuTTY Configuration window

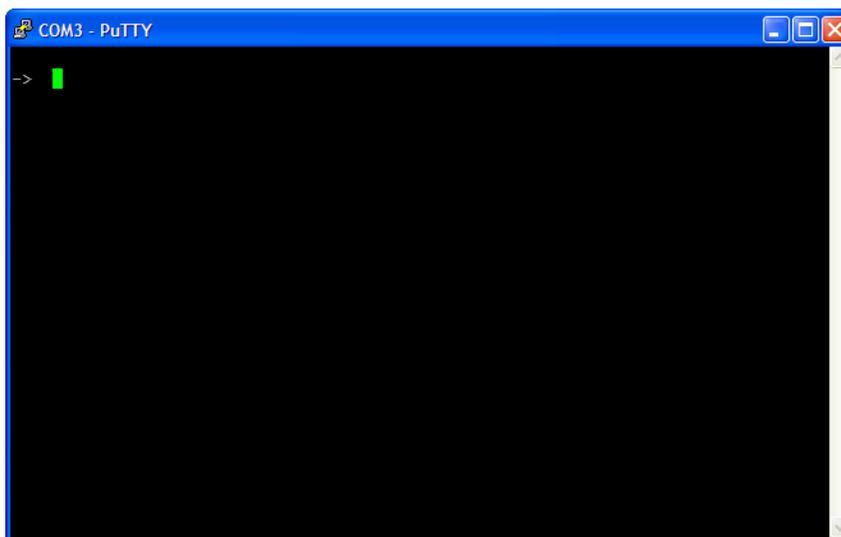


Figure M-6 PuTTY Main window



Tera Term

Tera Term is another free terminal emulator. It is a somewhat larger download than PuTTY described above. It is available at:

- <http://en.sourceforge.jp/projects/tssh2/releases/>.

Tera Term also uses a black main window. It can be reversed under the **Setup**→**Window** option.

Tera Term software interface screen shots are shown in **Figure M-7** and **Figure M-8**.

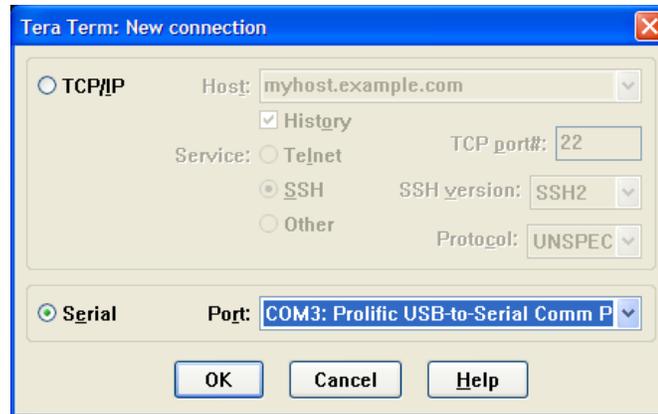


Figure M-7 Tera Term **Setup** window

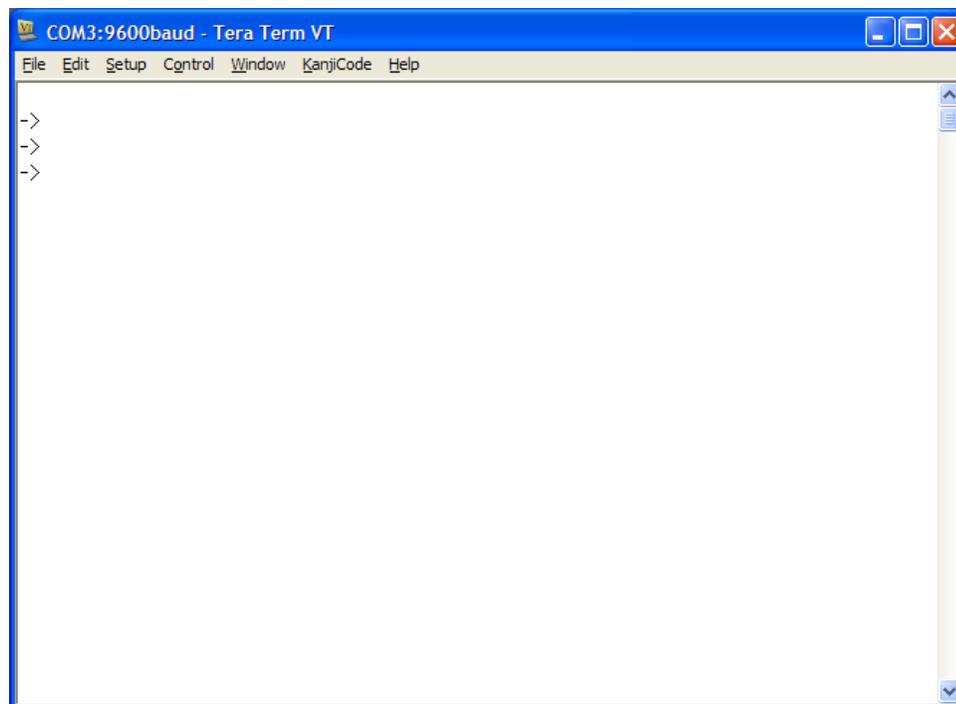


Figure M-8 Tera Term **Main** window (colors reversed)



Communications Configuration

The default communication parameters for all Particle Measuring Systems instruments are as listed in **Table M-4**:

Table M-4 Communication parameters

Baud	9600 (This can be changed on the Lasair II and Lasair III front panels.)
Parity	None
Data Bits	8
Stop Bits	1
Control Flow	Xon/Xoff (none is also OK)

ENODE Specific Settings

The ENODE requires additional settings for communications. These are not covered in this appendix. In addition, not all the settings are supported by PuTTY or Tera Term.

Troubleshooting Serial Communications

Here are some basic troubleshooting guidelines.

No Communications

- Is all the cabling correct? Add a null-modem adapter and see if that resolves the issue.
- Is the right COM port selected in the communication settings?
 - If using a USB to serial adapter, use the Windows Device Manager to find the correct COM port.
- Are the communication settings correct? Is the software set for 9600,N,8,1?
 - If the problem is with a Lasair II or Lasair III check the instrument's communications setup screen.
- Is hardware flow control enabled? If so, disable it.

Dropped Characters or Strange Characters

- Is the baud rate correct?
- Verify that hardware flow control is not enabled.
- Is there a problem with the serial port on the PC? Bad USB to Serial adapter drivers can cause issues.

Unexpected Characters

- If there are extra blank lines, check the <CR> and <LF> input translation.
- If characters are duplicated, half duplex mode may be enabled. Use full duplex mode.



Appendix N 有毒或有害的物质和元素

Part Name 部件名称	有毒或有害的物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴联苯醚 (PBDE)
电源供应	X	O	X	O	X	X
印刷电路装配	X	O	X	O	X	X
光学元件	X	O	X	O	X	X
激光	X	O	X	O	O	O
机械部件	X	O	X	X	X	X
电缆	X	O	X	O	X	X
机电	X	O	X	X	X	X
显示器	X	X	X	O	O	O
电池	X	O	X	O	X	X

O: 表示用于部件的所有同族物质中所含的有毒或有害物质低于SJ/T11363-2006规定的限度要求。

X: 表示用于部件的至少一种同族物质中所含的有毒或有害物质高于SJ/T11363-2006规定的限度要求。



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Numerics

- 1/0 button 6-10, 6-12
- 4-20 mA input J-1
 - connecting sensors 2-5
 - connectors J-1
 - setup values J-2

A

- AC to DC power supply
 - external, connecting 2-7
- accessories
 - mounting and positioning 2-3
 - positioning 1-5
 - TouchRAM 1-6
 - TRH accessory J-2
 - USB storage drive 1-6
 - wall/hand/tripod adaptors 1-6
 - Wi-Fi Wireless Ethernet Bridge 1-6
 - zero count filters 1-6
- adapters M-2
 - RJ-12 M-3
 - serial M-2
 - USB serial port M-2
- Add Location button 6-7
- address
 - gateway L-3
 - MAC L-3
 - multicast L-3
- Advanced tab, Sampling Setup screen 6-3
 - buttons 6-3, 6-4, 6-5
- Advanced tab, Security Setup screen 7-14
 - buttons 7-14
- Advertencia A-1
- Alarm Setup screen 6-8
 - Environment tab 6-10
 - buttons 6-10
 - Particles tab 6-8, 6-9
 - buttons 6-9
 - Trend tab 6-11
 - buttons 6-12

alarms

- parameters 6-1
 - setting parameters 6-1
 - Statistics mode 10-9
- Alarms button 7-12
- Assign tab, Recipe Setup screen 9-7
 - buttons 9-7
- ATTENZIONE A-1
- Auto Logout button 7-14
- Auto Print button 6-2
- Auto Print USB button 6-2, 10-11
- Auto Scaling button 5-12
- auto-increment mode 10-1
- auto-location-increment mode 10-1
- AVERTISSEMENT A-1

B

- battery
 - optional 1-6
 - specifications 1-8
 - reconditioning 11-3
 - requirements 1-6
 - battery charger 1-6, 2-6
 - Battery Disposal 11-3
 - battery pack, installing 2-6
- Baud rate M-8
- Beep button 6-5
- Brightness buttons 7-5
- browser
 - Firefox 4-3
 - interface advantages G-1
 - interface functions G-1
 - software, controlling LASAIR III with G-1
 - Windows Explorer 4-3
- buttons
 - 1/0 6-10, 6-12
 - Add Location 6-7
 - Alarms 7-12
 - Auto Logout button 7-14
 - Auto Print 6-2



- Auto Print USB 6-2, 10-11
 - Auto Scaling 5-12
 - Beep 6-5
 - Brightness 7-5
 - Clear All 8-6
 - Comm/Port 7-12
 - Continuous Pump 6-5
 - Continuous Sampling 6-2
 - control 5-6
 - Statistics mode 5-6
 - Create Numbered Locations 6-7
 - Cubic Foot 6-4, 8-2
 - Cubic Meter 6-4, 8-2
 - Cumulative Count 8-2
 - Cumulative Only Table 5-8
 - Cycle 6-5
 - Data 7-12
 - Delete All Associations 9-7
 - Delete All Locations 6-7
 - Delete All Recipes 9-4
 - Delete Location 6-7
 - Delete Recipe 9-4
 - Differential Count 8-2
 - Display 7-12
 - Displaying Order A-Z 8-2
 - Displaying Order Z-A 8-2
 - Edit Location 6-7
 - Enable Location Filtering 8-6
 - Enable Screen Saver 7-5
 - Enable Security 7-14
 - End Time Filtering 8-8
 - Erase Data 8-3
 - Feet 10-13
 - Histogram Chart 5-11
 - LASAIR III TouchRAM data format F-3
 - Liter 6-4, 8-2
 - Load Recipe 9-4
 - Load USB 6-7
 - Loaded Recipe Names 9-6
 - Location 8-6
 - Location Filtering 8-5
 - Location List 6-2
 - Main 7-12
 - Maximum Value 5-11, 5-12
 - Meters 10-13
 - Minimum Value 5-12
 - Multidirectional Airflow 10-12
 - navigation panel 3-3
 - Normalized Data 6-4, 8-2
 - Number of Samples 6-2
 - on instrument
 - Standby/On 3-2
 - on navigation panel 5-3
 - Print 5-13, 8-3, 9-4
 - Print Averages 6-5
 - Print to Default Printer 9-6, 10-11
 - Print to USB Key 9-4, 9-6
 - RAM button 6-2
 - Raw Data 6-4, 8-2
 - Read 7-8
 - Read Names from USB 9-4
 - Recipe Name 6-2
 - Recipes 7-12
 - Recover Data 8-3
 - Report 7-12
 - Restore Factory Settings 7-8
 - Return to Main Display 9-4
 - Sample Size 6-3
 - Sample Size by Time 6-2
 - Sample Size by Volume 6-2
 - Sample Time 6-3
 - Sampling 6-2, 7-12
 - Save Data File to CSV USB 8-3
 - Save Recipe 6-5, 9-5
 - Save Secure Data File to USB 8-3
 - Save Selection to CSV 8-3
 - Save Selection to Secure USB 8-3
 - Save Statistics Recipe 9-5, 10-11
 - Save to USB 6-7, 9-5
 - Security 7-12
 - Select All 8-6
 - Sort 9-7
 - Square Feet 10-10
 - Square Meters 10-10
 - Start Time Filtering 8-7
 - Statistics 7-12
 - Statistics Mode Disable 10-10
 - Statistics Mode Enable 10-10
 - Statistics Off 10-3
 - Status 7-12
 - Summary Statistics 10-3
 - System 7-12
 - TouchRAM 6-2
 - data written on F-3
 - Trend Graph 5-12
 - Undo 6-7
 - Unidirectional Airflow 10-11
 - USB 5-16
 - Volume, Alarm 7-5
 - Volume, Click 7-5
 - Write 7-8
- buttons on instrument
- Standby/On 3-2
- C**
- C commands supported I-3



- table format I-5
- unsupported I-4
- cable pin-outs B-2
- cables M-2
 - RJ-12 M-3
 - serial M-3
- Calibration Warning tab, System Setup screen
 - buttons 7-10
- calibration 11-3
 - reminder 7-10
 - specifications 1-8
- Calibration Warning tab, System Setup screen
 - 7-10
- Channels tab, System Setup screen 7-9
- channels, specifications 1-8
- characters, unexpected M-8
- China-GMP standard 10-7
- cleaning Lasair III particle counter enclosure
 - 11-1
- cleanliness standards 10-6
- Clear All button 8-6
- codes, command, formatting H-2
- Comm/Port button 7-12
- Comm/Port Setup screen C-1, C-2, F-2
 - Environmental tab J-1
 - TouchRAM tab F-2
- comma separated value (CSV) format E-1
- command codes, multi-drop H-2
- commands
 - multi-drop H-3
 - protocol (MiniLaz Emulation) coding H-2
 - native serial RS-232 I-5
 - unsupported C I-4
- communication modes, specifications 1-8
- communications
 - configuring on Lasair III C-1
 - control software 4-1
 - default communication parameters M-8
 - ENODE specific M-8
 - RS-232 4-2
 - RS-485 4-2
 - software options M-5
 - software protocol C-1
 - TCP/IP protocol 4-2
 - disabled in Statistics mode 10-9
 - third-party serial interfaces C-1
 - through a web browser G-1
 - troubleshooting
 - dropped or strange characters M-8
 - no communications M-8
 - serial M-8
 - unexpected characters M-8
 - with computer 4-1
- computer
 - connections, attaching 2-8
 - using LASAIR III 4-1
- configure
 - communication for data download D-1
 - communication protocol C-1
 - control software for data download D-2
 - software protocol C-1
 - third-party serial communication interfaces C-1
- connecting
 - external AC to DC power supply 2-7
 - sample probe, 310 and 510 2-3
 - temperature/relative humidity (T/RH) sensor 2-5
- connections
 - electrical B-1
 - to a computer 2-8
- connector signals M-4
- Continuous Pump button 6-5
- Continuous Sampling button 6-2
- control buttons 5-6
 - Change Display 5-6
 - Histogram 5-6
 - Print 5-6
 - Save to USB 5-6
 - Start 5-6
 - Statistics mode 5-6
 - Statistics Summary mode 5-6
 - Stop 5-6
 - Trend Graph 5-6
- control flow setting M-8
- control software 4-1
- control/data management software 4-2
- counting efficiency, specifications 1-8
- Create Numbered Locations button 6-7
- create recipes 9-1
- CSV format E-1
- CTD command
 - data format H-5
- CTD2 command
 - data format H-6
- Cubic Foot button 6-4, 8-2
- Cubic Meter button 6-4, 8-2
- Cumulative Count button 8-2
- Cumulative Count option 6-9
- Cumulative Data option 7-4
- Cumulative Only Table button 5-8
- cumulative only table data display 5-8
- Customer Service Center, PMS 2-1



Cycle button 6-5

D

data

CSV format E-1

displays

cumulative only table 5-8

differential and cumulative table 5-9

environment table 5-10

histogram chart 5-11

options 5-8

trend graph 5-12

downloading to PMS control software D-1

configuring D-2

configuring communication D-1

format, CTD command H-5

format, CTD2 command H-6

data analysis 1-3

data bits C-5

data bits setting M-8

Data button 7-12

data file, saving 5-16

data records, deleting in browser interface G-3

Data screen 8-1

Data Table tab 8-4

buttons 8-5

Options tab 8-1, 8-2

buttons 8-2, 8-3

Select Locations tab 8-6

buttons 8-6

Select Time tab 8-7

buttons 8-7, 8-8

data storage 1-3

specifications 1-8

Data tab, Statistics Summary screen 10-5

Data Table tab, Data screen 8-4

buttons 8-5

DataAnalyst 4-2

database, recipes 9-1

date, set current 7-7

DE-9 M-2

delete

associations 9-7

locations 6-7

recipes 9-4

sample data records G-3

Delete All Associations button 9-7

Delete All Locations button 6-7

Delete All Recipes button 9-4

Delete Location button 6-7

Delete Recipe button 9-4

differential and cumulative table

data display 5-9

Differential Count button 8-2

Differential Count option 6-9

Differential Data option 7-4

dimensions, specifications 1-8

disconnecting temperature/relative humidity (T/RH) sensor 2-5

disinfecting Lasair III particle counter enclosure 11-1

Display button 7-12

Display Setup screen 7-1

Graphs tab 7-2

buttons 7-2, 7-3

Histogram tab 7-4

buttons 7-4

Options tab 7-1, 7-5

buttons 7-5

display specifications 1-8

Displaying Order A-Z button 8-2

Displaying Order Z-A button 8-2

downloading data D-1

E

EC-GMP and ISO standards, simultaneous 10-7

Edit Location button 6-7

electrical connections 1-4, B-1

Enable Location Filtering button 8-6

Enable Screen Saver button 7-5

Enable Security button 7-14

enclosure cleaning materials, specifications 1-8

End Time Filtering button 8-8

ENODE

communications settings M-8

Enter Network Password dialog box G-2

Environment tab, Alarm Setup screen 6-10

buttons 6-10

environment table, data display 5-10

environmental conditions 1-9

environmental sensors, specifications 1-8

Environmental tab, Comm/Port Setup screen C-5, J-1

Erase Data button 8-3

error messages, native serial protocol I-2

Ethernet

addressing basics L-1

gateway address L-3

IP address L-1

IP settings on instrument L-8

IP settings on PC L-6

MAC address L-3



- multicast address L-3
- network mask L-2
- overview L-1
- setup of instrument to laptop computer L-6
- troubleshooting L-4
- EU GMP Annex 1 10-1
- EU GMP Annex 1 standard 10-7
- examples
 - final sample report 5-13
 - output 5-13
 - print output 5-13
 - USB final sample report 5-16
 - USB output 5-16
- Explorer 4-3
- external power supply, specifications 1-8
- external surface, specifications 1-8
- F**
- Facility Net 4-2
- Feet button 10-13
- file, sample data
 - saving in browser interface G-3
- filtering, specifications 1-8
- Firefox 4-3
- fixed communication parameters C-5
- floor tripod 1-5
- flow control C-5
- flow rate 1-7
 - specifications 1-8
- formatting command codes H-2
- FS-209E standard 10-1, 10-8
- G**
- gateway address L-3
- getting started 2-1
- Graphs tab, Display Setup screen 7-2
 - buttons 7-2, 7-3
- H**
- handheld HHIPA attachment K-1
- Hand-Held Isokinetic Probe Attachment (HHIPA) K-1
- HEPA filter 1-3
- HHIPA accessory K-1
- Histogram Chart 5-11
- histogram chart
 - data display 5-11
- Histogram Chart button 5-11
- Histogram tab, Display Setup screen 7-4
 - buttons 7-4
- how the Lasair III works 1-3
- humidity conditions 1-9
- HyperTerminal M-5
 - communications software M-5
- I**
- installation requirements 1-9
- installing
 - battery pack 2-6
 - Lasair III particle counter 2-3
- Institute of Environmental Sciences and Technology 10-8
- International Precautions A-1
- International Standards Organization 10-6
- introduction to Lasair III 1-1
- IP address
 - Ethernet L-1
 - static versus DHCP address L-4
- IP settings
 - on instrument L-8
 - on PC L-6
- IPv4 network ranges L-2
- ISO 14644-1 standard 10-6
- L**
- languages 7-7
 - specifications 1-8
- Lasair III particle counter
 - assembling 2-3
 - cable pin-outs B-2
 - calibration 11-3
 - cleaning enclosure 11-1
 - components 1-4
 - configure communications C-1
 - control software for 4-1
 - controlling with browser software G-1
 - data storage 1-3
 - description 1-2
 - disinfecting enclosure 11-1
 - downloading data from D-1
 - electrical connections 1-4
 - environmental conditions 1-9
 - flow rate 1-7
 - getting started 2-1
 - how it works 1-3
 - installation 2-3
 - introduction 1-1
 - maintenance 11-1
 - memory capacity 1-3
 - native serial communications I-1
 - paper roll, replacing 11-2
 - powering 2-5



- quick reference 3-1, 3-2
- reminder 7-10
- Remote mode 4-1
- sizing sensitivity 1-7
- specifications 1-8
- standalone or portable use 1-2
- touch screen 1-4, 5-1
- TRH accessory J-2
- upgrade information I-2
- using 5-1
 - with web browser 4-1, G-1
- laser classification 1-9
- legend
 - sample report printout 5-14
 - statistics report 10-14, 10-15
 - USB output 5-17
- Liter button 6-4, 8-2
- Load Recipe button 9-4
- Load USB 6-7
- Loaded Recipe Names button 9-6
- Location buttons 8-6
- Location Filtering button 8-5
- Location List button 6-2
- Location Name Setup screen 6-6
- location names or numbers, Statistics mode 10-13
- location numbers, about in statistical mode 10-13
- Locations tab, Sampling Setup screen 6-6, 6-7
 - buttons 6-7
- login, set 7-13
- logout
 - automatic 7-14
- Logout tab, Security Setup screen 7-11
 - buttons 7-13

M

- MAC address L-3
- Main button 7-12
- Main Display screen 5-2, 5-4
- maintenance 11-1
- maximum altitude 1-9
- maximum concentration, specifications 1-8
- Maximum Value button 5-11, 5-12
- Meters button 10-13
- Minimum Value button 5-12
- modes
 - Particle Counting 10-10
 - Remote 4-1
 - Statistics 10-1
 - alarms 10-9

- mounting and positioning accessories 2-3
- multicast address L-3
- Multidirectional Airflow button 10-12
- multi-drop commands H-3
- multi-drop protocol (MiniLaz Emulation)
 - coding commands H-2
- multi-drop protocol (MiniLaz emulation) H-1

N

- native serial communications I-1
- native serial protocol
 - command list I-5
 - error messages I-2
 - fundamentals I-1
- native serial RS-232 command list I-5
- Navigation panel, using 5-1
- network mask L-2
- network ranges L-2
- Network tab, Comm/Port Setup screen C-2, C-3
- Normal option 6-5
- Normalized Data button 6-4, 8-2
- Number of Samples button 6-2

O

- operating temperatures 1-9
- optional
 - accessories 1-6
 - batteries 1-6
 - battery 1-8
 - connecting analog environmental sensors 2-5
 - connection to a computer 2-8
 - control software 4-2
 - enabling the Auto Print button 3-1
 - probes 1-5
 - sensors 1-5, J-1
 - supplies 1-6
 - Touch RAM wand F-1
 - wireless Ethernet 1-8
- Options tab, Data screen 8-1, 8-2
 - buttons 8-2, 8-3
- Options tab, Display Setup screen 7-1, 7-5
 - buttons 7-5
- Options tab, System Setup screen 7-6
 - buttons 7-7, 7-8
- output
 - examples 5-13
 - final sample report 5-13
 - print 5-13
 - USB 5-16



- USB final sample report 5-16
 - filtering, specifications 1-8
 - printer 5-13
 - USB .MHT format 5-16
- P**
- packing list 2-1
 - sample 2-2
 - paper roll, replacing 11-2
 - parameters
 - alarm 6-1
 - communication, fixed C-5
 - recipes for 9-1
 - sampling 6-1
 - parity C-5
 - parity setting M-8
 - Particle Counting mode 10-10
 - Particles tab, Alarm Setup screen 6-8, 6-9
 - buttons 6-9
 - password, set 7-13
 - PC serial port connection M-4
 - PC, using LASAIR III with 4-1
 - pin-outs, cable B-2
 - PMS multi-drop protocol (MiniLaz emulation)
 - H-1
 - PMS TCP/IP protocol 4-2
 - portable use 1-2
 - positioning accessories 1-5
 - and mounting 2-3
 - power 2-5
 - auxiliary output 2-6
 - power supply, specifications 1-8
 - Power Up option 6-5
 - powering the unit 2-5
 - Print Averages button 6-5
 - Print button 5-13, 8-3, 9-4, 10-14
 - Print Data dialog box 8-3
 - Print to Default Printer button 9-6, 10-11
 - Print to USB Key button 9-4, 9-6
 - printer, specifications 1-8
 - printing
 - sample report 5-13
 - statistics report 10-14
 - printouts
 - sample report 5-13
 - legend 5-14
 - statistics report 10-14, 10-15
 - private IPv4 network ranges L-2
 - probes
 - available 1-5
 - connecting 2-3
 - problems 11-3
 - protocols
 - communication protocols C-1
 - software configuration C-1
 - PuTTY
 - communications software M-5
 - terminal emulator M-6
- Q**
- quick reference 3-1, 3-2
 - Quick tab, Sampling Setup screen 6-1, 6-2
 - buttons 6-2
- R**
- RAM button 6-2
 - Raw Data button 6-4, 8-2
 - Read button 7-8
 - Read Names from USB button 9-4
 - reading TouchRAM buttons F-3
 - Recipe Name button 6-2
 - Recipe Setup screen 9-3
 - Assign tab 9-7
 - buttons 9-7
 - Setup tab 9-3, 9-4
 - buttons 9-4
 - View tab 9-6
 - buttons 9-6
 - recipes
 - accessing via TouchRAM button F-1
 - creating for sampling 9-1
 - creating for statistics 9-1
 - database 9-1
 - sampling info 9-1
 - statistics info 9-2
 - sampling 9-1
 - statistics 9-2
 - information not saved 9-3
 - Recipes button 7-12
 - Reconditioning the Battery 11-3
 - Recover Data button 8-3
 - reminder for calibration 7-10
 - Remote mode 4-1
 - remote operation, specifications 1-8
 - Replacing the Paper Roll 11-2
 - Report button 7-12
 - Report Setup screen 8-9
 - buttons 8-9
 - reports
 - sample 5-13
 - specifications 1-8
 - statistics



- legend 10-14, 10-15
- printing 10-14
- Restore Factory Settings button 7-8
- Results tab, Statistics Summary screen 10-4
- Return button 5-2, 9-4
- RJ-12 cable and adapter M-3
- RJ-12 connector pinout M-4
- RS-232
 - output format I-1
 - serial protocol 4-2
- RS-232/RS-485 converters H-1
- RS-485 system 4-2
- S**
- sample
 - data
 - deleting records G-3
 - saving in browser interface G-3
 - viewing 5-8
 - output filtering, specifications 1-8
 - probes 1-5
 - connecting 2-3
 - quick reference for taking 3-2
 - size
 - Advanced tab, Sampling Setup screen 6-3
- Sample Acknowledge mode 10-1
- Sample Size button 6-3
- Sample Size by Time button 6-2
- Sample Size by Volume button 6-2
- Sample Time button 6-3
- sample tubing inside diameter, specifications 1-8
- sampling
 - parameters 6-1
 - parameters recipes 9-1
 - setting parameters 6-1
 - status indicators 5-5
- Sampling button 6-2, 7-12
- Sampling Setup screen 3-3, 6-1
 - Advanced tab 6-3
 - buttons 6-3, 6-4, 6-5
 - sample size 6-3
 - Locations tab 6-6, 6-7
 - buttons 6-7
 - quick reference 3-1
 - Quick tab 6-1, 6-2
 - buttons 6-2
- Save Data File to CSV USB button 8-3
- Save Recipe button 6-5, 9-5
- Save Secure Data File to USB button 8-3
- Save Selection to CSV button 8-3
- Save Selection to Secure USB button 8-3
- Save Statistics Recipe button 9-5, 10-11
- Save to USB button 6-7, 9-5
- saving data to a USB key 5-16
- screens
 - Alarm Setup 6-8
 - Comm/Port Setup C-1, C-2, F-2, J-1
 - Comm/Port Setup, Environmental tab C-5
 - Comm/Port Setup, Network tab C-2, C-3
 - Comm/Port Setup, Serial tab C-4
 - Data 8-1
 - Display Setup 7-1
 - Location Name Setup 6-6
 - Main Display 5-2, 5-4
 - Main Display, Statistics mode 10-3
 - Recipe Setup 9-3
 - Report Setup 8-9
 - Sampling Setup 3-3, 6-1
 - Security Setup 7-11
 - Statistics mode 10-2
 - Statistics Setup 10-9
 - Statistics Summary 10-4, 10-5
 - System Setup 7-6
- Security button 7-12
- Security Setup screen 7-11
 - Advanced tab 7-14
 - buttons 7-14
 - Logout tab 7-11
 - buttons 7-13
- Select All button 8-6
- Select Locations tab, Data screen 8-6
 - buttons 8-6
- Select Time tab, Data screen 8-7
 - buttons 8-7, 8-8
- sensors
 - connecting through 4-20 mA input connector 2-5
 - optional 1-5, J-1
 - temperature/relative humidity (T/RH) 2-5
- serial (RS-232) output format I-1
- serial adapters M-2
- serial cable M-3
- serial communications
 - overview M-1
 - troubleshooting M-8
- serial number output to Pharmaceutical Net 7-9
- serial port connection M-4
- serial protocol, RS-232 4-2
- Serial tab, Comm/Port Setup screen C-4
- Setup tab, Recipe Setup screen 9-3, 9-4
 - buttons 9-4
- shipping container 2-1



- shipping materials, storing 2-2
 - simultaneous EC-GMP and ISO standards 10-7
 - sizing sensitivity 1-7
 - software
 - DataAnalyst 4-2
 - Facility Net 4-2
 - for controlling Lasair III 4-1
 - optional 4-1
 - specifications 1-8
 - Sort button 9-7
 - specifications 1-8
 - Square Feet button 10-10
 - Square Meters button 10-10
 - standalone use 1-2
 - standards
 - cleanliness 10-6
 - EU GMP Annex 1 10-1, 10-7
 - FS-209E 10-8
 - ISO 14644-1 10-1, 10-6
 - simultaneous EC-GMP and ISO 10-7
 - simultaneous EU-GMP Annex 1 and ISO 14644-1 10-1
 - Standby/On button 3-2
 - Start Time Filtering button 8-7
 - statistics
 - parameters recipes 9-1
 - recipes 9-1
 - report 10-14
 - legend 10-14, 10-15
 - Statistics button 7-12
 - Statistics mode 10-1, 10-10
 - communications in 10-9
 - features 10-1
 - locations, selecting 10-13
 - Main Display screen 10-3
 - Sample Setup screen 10-2
 - screens 10-2
 - TCP/IP protocol disabled in 10-9
 - Statistics Mode Disable button 10-10
 - Statistics Off button 10-3
 - Statistics Setup screen 10-9
 - Statistics Summary screen
 - Data tab 10-5
 - Results tab 10-4
 - Status button 7-12
 - status indicators
 - Administrator Enabled 5-7
 - Communications Status Indicator 5-7
 - Faulty Laser Operation Indicator 5-7
 - Flow Status with Faulty Pump Operation 5-7
 - Flow Status with Normal Pump Operation 5-7
 - instrument 5-7
 - Normal Laser Operation Indicator 5-7
 - Password Protection – Disabled 5-7
 - Password Protection – Enabled 5-7
 - Power Indicator – AC Power 5-7
 - Power Indicator – Battery 5-7
 - Power Indicator – Battery Charging 5-7
 - Print Queue Indicator 5-7
 - sampling 5-5
 - stop bits C-5, M-8
 - storage temperatures 1-9
 - Summary Statistics button 10-3
 - System button 7-12
 - System Setup screen 7-6
 - Calibration Warning tab
 - buttons 7-10
 - Calibration Warning tab 7-10
 - Channels tab 7-9
 - Options tab 7-6
 - buttons 7-7, 7-8
- ## T
- table tripod 1-5
 - TCP/IP protocol 4-2
 - disabled in Statistics mode 10-9
 - temperatures
 - operating 1-9
 - storage 1-9
 - transportation 1-9
 - Tera Term
 - communications software M-5
 - terminal emulator M-7
 - terminal emulator
 - PuTTY M-6
 - Tera Term M-7
 - third-party serial communication interfaces C-1
 - Time of Day option 6-5
 - time, set current 7-7
 - touch screen 1-4
 - buttons on navigation panel 5-3
 - Navigation panel 5-1
 - using 5-1
 - TouchRAM
 - accessories 1-6
 - programmed button for accessing sampling recipes F-1
 - wand operation F-3
 - write to TouchRAM 6-2
 - TouchRAM button 6-2
 - TouchRAM tab, Comm/Port Setup screen F-2
 - transportation temperatures 1-9



- trend graph 5-12
 - data display 5-12
- Trend Graph button 5-12
- Trend tab, Alarm Setup screen 6-11
 - buttons 6-12
- TRH accessory J-2
- tripod
 - floor 1-5
 - table 1-5
- troubleshooting
 - Ethernet connectivity L-4
 - serial communications M-8
 - unexpected characters M-8
- tubing inside diameter, specifications 1-8

U

- Undo button 6-7
- unexpected characters M-8
- Unidirectional Airflow button 10-11
- unpacking instructions 2-1
- unsupported C commands I-4
- upgrade information I-2
- USB
 - driver for Windows XP M-3
 - serial port adapter M-2
- USB button 5-16
- USB output 5-16
 - legend 5-17

V

- View tab, Recipe Setup screen 9-6
 - buttons 9-6
- viewing sample data 5-8
- Volume, Alarm buttons 7-5
- Volume, Click buttons 7-5

W

- wall/hand/tripod adaptors 1-6
- wand, TouchRAM F-3
- WARNING A-1
- WARNUNG A-1
- web browser 4-1, G-1
 - interface advantages G-1
 - interface functions G-1
 - operating from G-3
- weight, specifications 1-8
- Windows Explorer 4-3
- Write button 7-8
- writing to TouchRAM buttons F-3

X

- Xon/Xoff M-8

Z

- zero count, specifications 1-8