Chinook Engineering

STREAMLINE PRO™ MULTICAL™ SYSTEM

Operation Manual

NIST-Traceable Transfer Standard

•Flow Rate

•Temperature

•Barometric Pressure

- **CU Firmware Version 3.xx**
- **CU Models CU-LCD and CU-OLED**
- **RT Probe Model SLPRT203**
- **MU Model M, 0.9 to 19 L/min.**
- **MU Model S, 2 to 20 L/min.**
- **MU Model SX, 2 to 25 L/min.**
- **MU Model H, 4.5 to 55 L/min.**

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CONTACT INFORMATION

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It is recommended that all users read page 09 "PREPARING TO USE THE INSTRUMENT" before initially plugging in the data cables. Explore all of the menu options before using the instrument in the field.

Control Unit Model Identification:
Prior to June 2009, Control Unit Model CU-LCD
Display: Black Text on Blue-Green Background

After June 2009, Control Unit Model CU-OLED
Display: Yellow Text on Black Background

This instrument from Chinook Engineering, a division of Inter-Mountain Laboratories, Inc., is covered by United States Patent # 5792966.

TABLE OF CONTENTS

INTRODUCTION

DESCRIPTION

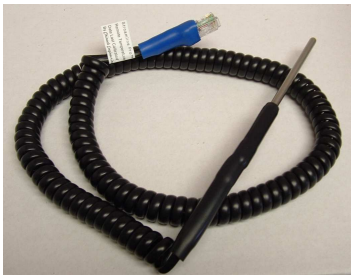
The Streamline Pro™ MultiCal™ System provides an integrated approach for assuring the quality of data generated by ambient air monitors and samplers. It is a battery-operated, handheld device with internal data storage that displays audit/calibration data directly on its screen. The unit provides a direct readout of NIST-traceable flow rate and barometric (ambient) pressure data. A remote (external) temperature probe allows for NIST-traceable temperature measurements, including ambient temperature.

For flow rate measurements, the Streamline Pro™ MultiCal™ System Measurement Unit contains an orifice made of a patented and durable zero-expansion material for consistent measurements under widely varying environmental conditions. Temperature and pressure sensors contained in the MU provide linear results over a wide range of temperatures and pressures.

The Streamline Pro™ MultiCal™ System is available in many flow ranges (see SPECIFICATIONS on page 14). The System is comprised of several components; Control Unit (CU), Measurement Unit (MU), Solar Radiation Shield, MU-CU Communication cable, Remote Temperature Probe (RT Probe), optional Universal Flow Adapter, optional AC-DC power adapter, and optional LogComm™ Software.

Control Unit (CU)


Measurement Unit (MU)



Remote Temperature Probe
(RT Probe)

Solar Radiation
Shield

FEATURES

- Simultaneous NIST-traceable measurements of flow rate, temperature and pressure with continuous readout
- User-selectable units
- Interchangeability—Control Units, Measurement Units, Remote Temperature Probes can be freely exchanged between kits while maintaining calibration and NIST traceability
- User-selectable option to use the RT Probe measurement in the calculation of flow rate can extend the equipment Operating Range and decrease the time spent at each sampler
- MU and RT Probe calibration data is automatically uploaded to CU, displayable, and recordable for QA tracking
- Internal data logging
- Battery powered or optional AC adapter for laboratory use
- Fits directly on 1.25 inch sample tubes or use the optional Universal Flow Adapter
- Optional LogComm™ Software
- Optional AC-DC Power Adapter
- Optional RoHS-Compliant version available

OPERATION

This instrument is designed for ease of use, but it is recommended that all users read page 09 “PREPARING TO USE THE INSTRUMENT” before initially plugging in the data cables. Explore all of the menu options before using the instrument in the field.

MENUS AND NAVIGATION

The system displays a start up screen for 5 seconds upon power-up. Information displayed includes the self test status, CU, MU and RT Probe serial numbers, CU firmware version and the MU calibrated flow rate range.

NAVIGATION

The bottom lines of all menus contain navigation options. These options are indicated by all capital letters. The ► symbol indicates the currently selected option. The symbol is moved between options using the arrow keys on the keypad. Once the indicator has been moved to the desired navigation option, it is selected by pressing the ENTER button on the keypad.

MAIN MENU

After the start up screen, the Main Menu is displayed. An example is shown here.

```
 ---Main--- 6/15/2009
             13:39:13
 Flow:   16.67 li/min
 Baro:   0.945 atm
 T Flow:   21.4 C
 T Remo:   21.4 C
►RECORD   SAVE  UNITS
 USE_RT   MISC  CALIB
```

The date and time are displayed in the upper right corner of the Main screen. The current measurements are displayed in the center of the screen; flow rate, barometric pressure, air flow temperature, and remote temperature probe. Units of measurement are indicated for each parameter and are user-selectable.

RECORD Menu

The RECORD feature produces average and min/max records for each measurement over a user-specified time period. To record data, scroll up to the Period field and specify the desired length of run, then scroll down to BEGIN RECORDING and press ENTER on the keypad. The unit will begin recording. When the run is finished, measurement statistics will be displayed on two screens. To abort a run, press STOP. Only the most recent data are stored in VIEW EXISTING DATA. Data collected with the RECORD feature are cleared when the CU is powered down. Expanded data logging features, including PC file transfers, and graphical displays and recording are available using optional LogComm™ Software(see page 13). For purchase information, contact Chinook Engineering.

SAVE Menu

Measurement information is displayed and recorded in the SAVE menu. This allows the user to collect up to 45 instantaneous records of all parameters. The data is recorded when the SAVE option is selected from the MAIN menu. Saved data can be viewed with the DATADISP function in the MISC menu or can be downloaded to a PC using the optional LogComm™ Software. This feature can be very useful for reduction of field paperwork.

UNITS Menu

UNITS allows selection of desired measurement units through a series of screens; first Flow, then Pressure, then Temperature. Volumetric flow rates are actual flow rates, not standardized flow rates. To change a measurement unit, scroll to the appropriate screen. Current units are indicated with the * symbol. Scroll the cursor to your choice and press ENTER. Then proceed to the next menu. To store your choices, proceed through all menus, then select MAIN to accept your choices. Returning directly to the Main menu prior to this screen will not store your new choices.

USE_RT

The USE_RT option is a new firmware version 3.xx feature requested by users who wish to use the output of the Remote Temperature Probe in the flow calculation. The default calculation method uses the flow temperature measured in the MU air flow path. USE_RT is a convenience in cases of severely inclement weather when it can be uncomfortable waiting for the MU to equilibrate to ambient conditions. Use of this feature can extend the Operating Temperature to beyond the specified range of –30℃ to 55℃ (see Inclement Weather, page 11). The RT Probe tip must be in a spot representative of the ambient air temperature. Upon activation of this feature, OK…. is momentarily displayed, then the prompt for USE_MU option is displayed. Also on the Main screen, T MU replaces T Flow on the 5th line and T Flow is shown in the place of USE_RT on the 6th line.

MISC Menu (Miscellaneous)

MISC gives the user access to several functions:

1) The MU and CU serial numbers and calibration dates are shown at the top of the screen;

2) DISPLAY displays data saved using the SAVE function (move between records with left and right arrow keys);

3) ERASE clears all data collected using the SAVE function;

4) ZERO allows the user to zero the flow rate pressure drop (see Zeroing the Instrument, page 11);

5) POWER gives access to the display's Contrast adjustment and Standby options. The contrast of the display is adjusted using the arrow keys. The standby mode can be used to conserve battery power. The unit continues to function in standby mode; only the display is dimmed. This can be useful during field data logging or when the CU is left turned on for long periods of time. To return from standby mode, press any key. Standby is disabled when the CU is connected to a PC.

6) SETCLOCK allows the user to set the instrument's clock.

CALIB Menu (Calibration Constants)

CALIB displays the NIST-traceable MU and RT Probe calibration constants for user information and Quality Assurance tracking. The MU and RT Probe constants can be viewed by the user but they can only be changed at the factory. The constants shown are those of the currently connected MU and/or RT Probe. The displayed constants will change when components are changed.

PREPARING TO USE THE INSTRUMENT

It is best to plug in cords before powering up. The cord between the MU and CU has a larger, RJ45 plug-connector. Note: The smaller RJ12 6-pin plug-connectors used for the external temperature Probe and connection to a computer will fit into the larger RJ45 8-pin jack-connector. However, inserting the RJ12 plug into the RJ45 jack can damage the RJ45 connector.

The system is turned on using the switch on the right side of the CU. The system zeroes the flow pressure sensors at power up, so **always turn the power on with no air flow through the MU.**

If the system will be used during changing thermal conditions or in a location with exposure to significant solar radiation, install the solar radiation shield by sliding it over the MU. Additionally, consider the option of using the RT Probe measurement in the flow calculation (see USE_RT on page 08).

For best results, avoid unnecessary exposure to solar radiation.

UNITS SELECTION

Use the UNITS menu to select the preferred measurement units for your application. Volumetric flow rates are actual flow rates, not standardized flow rates. The following table summarizes the available selections.

PARAMETER	UNIT OPTIONS
Flow rate	Liters/min, ft^3/min, grams/sec, cc/min
Pressure	mmHg, atm, kPa
Temperature	℃, ℉, K

USING THE INSTRUMENT

The flow rate, barometric (ambient) pressure, flow temperature and remote temperature will read out in real time on the MAIN menu screen. Volumetric flow rates are actual flow rates, not standardized flow rates. Record the measurements on a field data sheet or use the RECORD or SAVE functions of the instrument. Also see Zeroing The Instrument on page 11 of this manual.

FLOW RATE MEASUREMENT

After turning the instrument on, place the MU firmly on the inlet tube of the air sampler to be tested. The MU has a double o-ring seal to assure leak-free connection. If the device to be measured has an inlet that does not use a 1.25 inch outside diameter tube, use the optional universal adapter. The MU's calibrated flow range is displayed on the start up screen. When the measured flow rate exceeds 10% outside that range, XXXXX is displayed. Do not obstruct the free flow of air at the MU inlet.

BAROMETRIC (AMBIENT) PRESSURE MEASUREMENT

The barometric pressure sensor is located in the MU. The MU does not have to be installed on an air sampler to make this measurement.

TEMPERATURE MEASUREMENTS

The MU internal temperature (T Flow) is the default measurement used in the determination of flow rate or the Remote Temperature Probe measurement can be used as described on page 08 of this manual. To measure temperatures such as ambient temperature or filter temperature, use the RT Probe. To measure ambient temperature, place the tip of the RT Probe into the radiation shield or aspirator of the air sampler. Place the probe tip as close to the sampler's temperature sensor as possible.

INCLEMENT WEATHER

The USE_RT feature can extend the Operating Temperature beyond the range stated in the Specifications and can be used to decrease the time spent at each sampler. The only temperature-sensitive components are contained in the CU and the sensor box on the MU. Keep the CU protected from extreme conditions while taking the flow measurements. The MU sensors can be temporarily protected with the solar radiation shield or with heat packs or cold packs, as appropriate. Do not obstruct the free flow of air at the MU inlet. Initiate the USE_RT feature and use the RT Probe to measure the ambient air temperature.

ZEROING THE INSTRUMENT

The performance of the pressure sensors used to determine flow rate is temperature sensitive. To account for this, the instrument zeros the sensors at power up. When the internal temperature (T Flow) sensor measures a change of conditions of 5℃ or more since the last zero, a warning message is displayed on the screen and the operator is given the opportunity to re-zero the instrument or ignore the warning.

The user can zero the instrument at any time by navigating to the MISC screen and selecting the ZERO option. It is recommended that the user zero the instrument after a warm-up period and especially prior to making sensitive measurements in the low end of the instrument's flow rate range.

There must be <u>no air flow</u> through the MU when the instrument is zeroed.

CALIBRATION

All components are completely self-contained, and have their unique calibration information and serial numbers stored internally, in non-volatile memory. This feature makes all Streamline Pro™ MultiCal™ System components fully interchangeable, while maintaining all NIST-traceabilities. On power-up, the CU uploads the unique serial numbers and calibration constants of the attached components, and calculates measurements accordingly. This calibration data is specific to the sensors and flow orifice and is generated and stored at the factory.

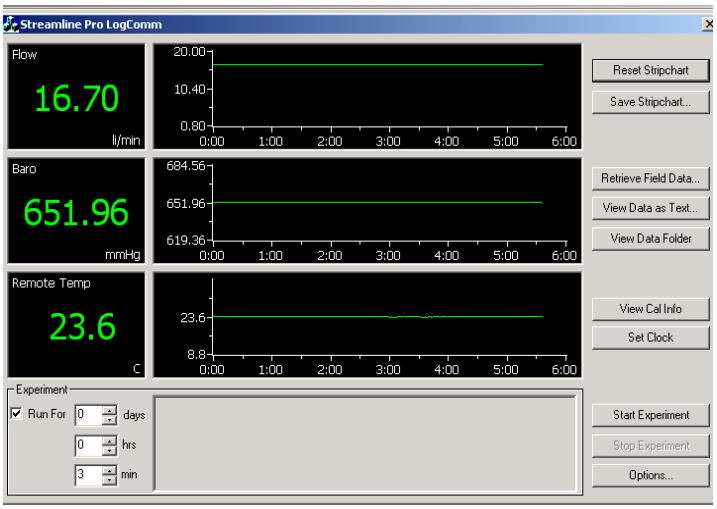
The Streamline Pro™ MultiCal™ System's highly accurate results are ensured by multi-point calibration procedures carried out at the manufacturing facility. All sensors and the flow orifice are individually calibrated. Batch-calibration short-cuts are not used and the resultant losses of accuracy and repeatability are thus avoided. Calibration of the system's flow rate measurement is performed on a NIST-traceable critical flow venturi calibration bench that Chinook Engineering developed in close consultation with NIST. Chinook's state-of-the-art flow metrology facility ensures that each Streamline device provides flow measurements traceable to primary mass and time standards. Other parameters measured by the unit are also certified using high precision, NIST-traceable reference standards. The service includes calibration of two differential pressure sensors, the barometric pressure sensor, the internal flow temperature sensor, the flow orifice and the remote temperature probe.

Most quality assurance programs require periodic recertification of transfer standards. Chinook Engineering anticipates the annual return of the Streamline Pro™ MultiCal™ System to its manufacturing and calibration laboratory for inspection and recalibration. For recertification, return the instrument to the Chinook Engineering factory in Sheridan, Wyoming USA.

Re-certifications can be customized to meet the user’s flow rate, ambient temperature and barometric pressure ranges. Additionally, the MU can be modified at the factory to accommodate measurements at other flow rates. Contact Chinook Engineering for more information.

LOGCOMM™ SOFTWARE

The Streamline Pro™ MultiCal™ System has an optional LogComm™ software package available to expand the usefulness of the instrument. LogComm™ software runs on a PC and allows the user enhanced data download, viewing, and acquisition features.



LogComm™ software allows the user to:

- View constantly updated graphs of flow rate, barometric pressure, and Remote Temperature Probe measurements
- Save graphs on a PC for later viewing
- Log data for a set time period or until user stops experiment
- Create and view Microsoft® Excel compatible data files
- Download data saved and recorded on the CU
- View system calibration information
- Set the system clock

Contact Chinook Engineering for purchase information.

SPECIFICATIONS

	Models M, S, SX, H	Model X . (Not described in this manual)
Flow Rate Ranges:		180 - 220 L/min
Model M	0.9 - 19.0 L/min	
Model S	2.0 - 20.0 L/min	Model X: The RT Probe is optional and the Solar Radiation Shield is not available.
Model SX	2.0 - 25.0 L/min	
Model H	4.5 - 55.0 L/min	
*Add the suffix –R after the Model letter to specify RoHS-Compliant build		
Other Custom Models And Flow Rates Are Available Upon Request		
Flow Rate Measurement Uncertainty (%full scale)	±0.6% @ 22℃ ±1.2% over operating range	±1.1% @ 22℃
Operating Range*	-30℃ to 55℃ 0.5 to 1.1 atm	-30℃ to 55℃ 0.5 to 1.1 atm
Temperature Range*	-30℃ to 55℃	-30℃ to 55℃
Temperature Measure-ment Uncertainty	<±0.2% full scale	<±0.2% full scale
Barometric Pressure Range	0.25 to 1.1 atm	0.25 to 1.1 atm
Barometric Pressure Measurement Uncertainty	<±0.4% full scale	<±0.4% full scale

* See page 11 INCLEMENT WEATHER for procedures to extend the Tempera-ture Range

DEVELOPMENT HISTORY

Component	Description	Release Date
Streamline Pro™ MultiCal™ System	First Release	October 2002
CU-LCD	LCD Display	
MU Model M	0.9—19.0 L/min Delrin Body	
LogComm™	Logging Software	October 2003
SLPRT203	RT Probe Standard Component in Kits	April 2004
MU Upgrade	Aluminum Body, Dual Pressure Sensors, Enhanced Accuracy	April 2004
MU Model H	4.5—55.0 L/min	December 2004
MU Model X	180—220 L/min	December 2004
MU Model S	2.0—20.0 L/min	March 2006
MU Model SX	2.0—25.0 L/min	March 2006
CU-OLED	OLED Display, RoHS Available	June 2009
Firmware v3.xx	USE_RT Feature	June 2009

WARRANTY

The Streamline Pro™ MultiCal™ System is warranted against material defects and workmanship for a period of 1 year from Chinook Engineering's initial shipment. The warranty does not cover misuse, accidents or use outside of its normal operating conditions. Contact Chinook Engineering if any problems are encountered.

Return the Warranty Card or email chinook@imlinc.com with owner's contact information to register the equipment and to receive additional and updated information on equipment use and features.

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