

Sequential Particulate Speciation System URG-3000N

Operations Manual for URG-3000N



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Section 1

Cautions and Notices

1.1 AC Power Warning

WARNING: AC voltage can be dangerous. Special care should be taken to avoid personal injury. The URG-3000N should be in the **OFF** position when the AC power is applied to the system.

1.2 Equipment Rating

Specifications for the URG-3000N

Operating Temperature	-20° to 45° Celsius*
Weight (Stand, Controller, Module C)	61.4 kg (135 lbs)
Minimum Power Requirements	(2) Dedicated 15 amp, 115VAC Outlets

*May require additional heating equipment to operate at extremely low temperatures. See Section 9.7 for more information.

1.3 Initial Assembly

CAUTION: The URG-3000N must be assembled where it will be operated. The URG-3000N should not be moved once it has been assembled.

1.4 Weight

The URG-3000N sampler can weigh as much as 135 lbs. when completely assembled. Special care should be taken to prevent injury when lifting or moving a sampler.

Section 2

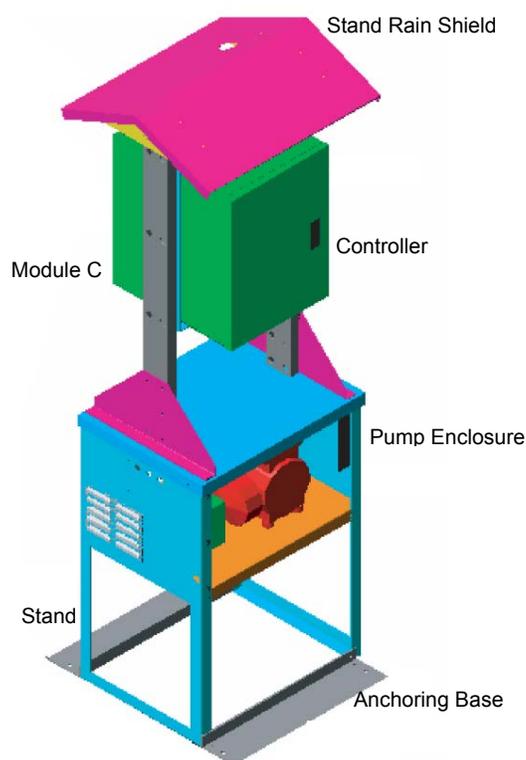
Introduction

2.1 Purpose of This Manual

The purpose of this manual is to document the operating instructions for the URG-3000N.

2.2 Introduction

A drawing of a URG-3000N Sequential Particulate Speciation System is shown here. The sampler consists of one Module C, one Controller, one Stand, one Stand Rain Shield and one 36" Inlet Tube (the inlet tube is not shown in this illustration). There may also be an optional collocated Module C and Stand. The controller contains the timer, the keypad, and other electronic equipment required to operate the sampler. The stand contains the pump and flow controller. The Module C collects $PM_{2.5}$ particles on quartz filters. These filters are analyzed for organic and elemental carbon using Thermal Optical Analysis Method (TOA).

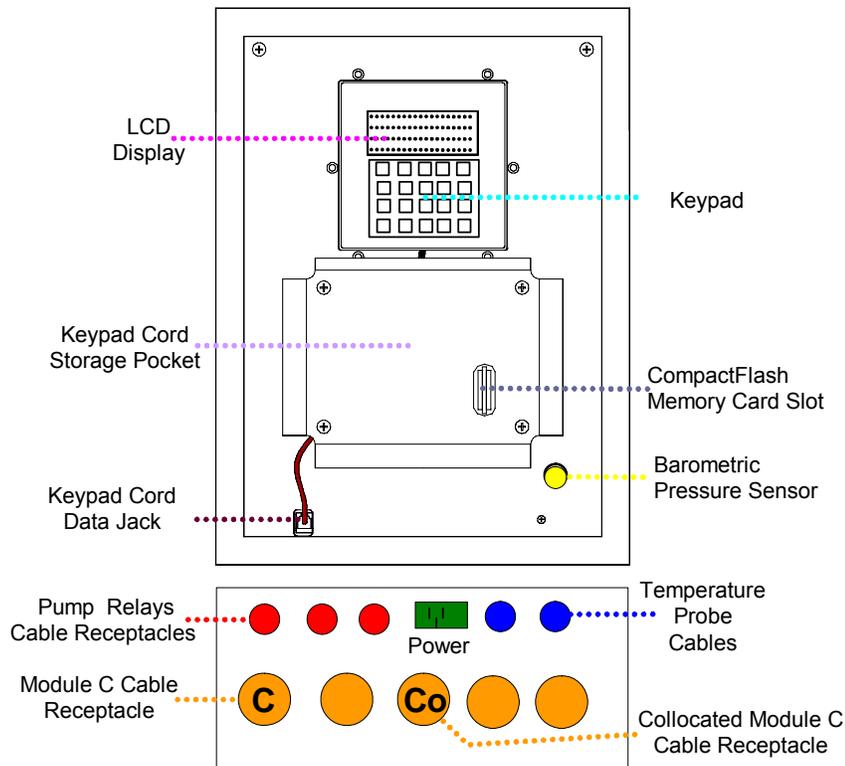


2.3 URG-3000N Overview

The standard URG-3000N Sequential Particulate Speciation System configuration is shown above. Each site will have a Module C that collects $PM_{2.5}$ samples and a Controller and a Stand. The lower portion of the stand contains the vacuum pump as well as the mass flow controller to provide active volumetric flow control. An additional Collocated Module C can be included in the configuration which would require a Stand containing a vacuum pump and mass flow controller.

2.4 Controller Overview

The sampler controller is used to control the sample collection and acquire data during sampling. This consists of a controller, a terminal with LCD screen, a twenty-button keypad and the appropriate electronic components. The controller is shown below. The lower portion of the figure shows the connectors on the bottom of the controller. The keypad and display terminal can be removed from the controller to be closer to the sampler modules. When left in the controller, the cord is contained in the storage pocket.

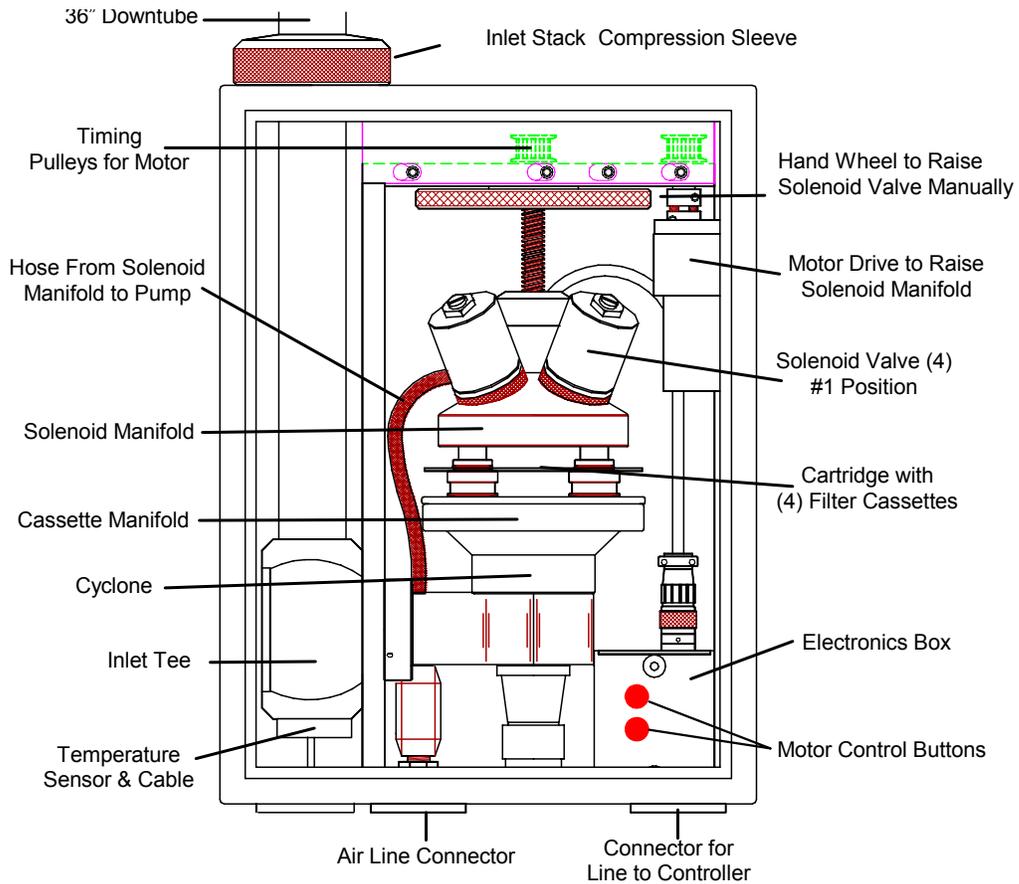


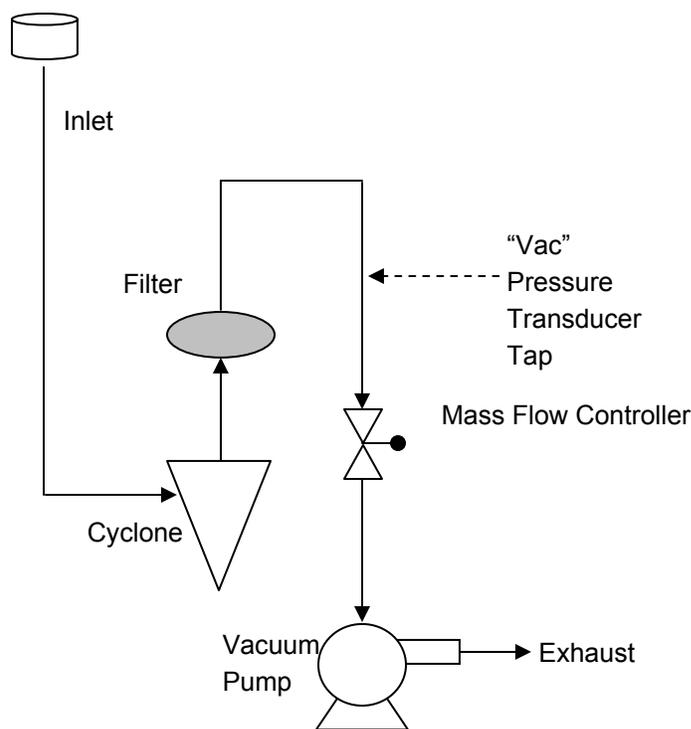
The controller:

- Provides a status of current sampler operations to the site operator.
- Provides an interface for recording initial and final measurements of the filters during sample changes to the site operator.
- Provides options for selecting sampling protocols.
- Keeps the current date and time.
- Switches the filter solenoids and pump relays on and off.
- Records pressure transducers measurements. A standard configuration has 3 transducers: Barometric Pressure, One Vacuum per module, and temperature. Measurement is done once a minute and averages are recorded on the CompactFlash memory card every 15 minutes. The averages are also recorded whenever there is a power outage or the operator starts the sample change.
- Records the solenoid valve number that is open.
- Downloads all the measurements to the removable CompactFlash memory card.

2.5 Module C Overview

The inside of a URG-3000N Sequential Particulate Sampler Module C is shown below. The flow diagram for the URG-3000N module is shown on the following page.





2.5.1 Cyclone and Inlet

The ambient air enters through a screened inlet on top of the stack. The screened inlet removes bugs, rain, and particles larger than approximately 15 μm . The air stream then passes through a cyclone that removes particles larger than 2.5 μm . The cyclone is located inside the module, as shown on the previous page. The cyclone is 50% efficient at removing particles with aerodynamic diameters larger than 2.5 μm at the nominal flow rate of 22.0 Lpm. It is volumetric flow controlled using a mass flow controller and corrections are made for temperature and barometric pressure variations. A temperature probe is inserted in the inlet tee of the Module C. The temperature probe is situated in the air stream just prior to the cyclone. The temperature is measured and the average temperature is recorded on the CompactFlash memory card.

2.5.2 Mass Flow Controller

The Mass Flow Controller is used to maintain a constant flow rate during a sampling period. It is located within the Pump Enclosure, near the base of the stand. For service/removal instructions, see Section 9.5.

2.5.3 Filter Cassettes and Cartridges

The filter cassettes and cartridges are manufactured specifically for the URG-3000N sampler. They are made of acetyl homopolymer with stainless steel screens. The two halves of the cassette snap together and are sealed with an o-ring. A special tool is required to separate and assemble the two halves. The individual cassettes are always installed in cartridges, with four cassettes per cartridge. Most cassettes are secured in the cartridges by a snap ring and cannot be removed easily. Each cartridge has a center hole and a small alignment hole. When the cartridge is placed on the cyclone manifold, alignment pins on the manifold prevent the cartridge from being installed incorrectly.

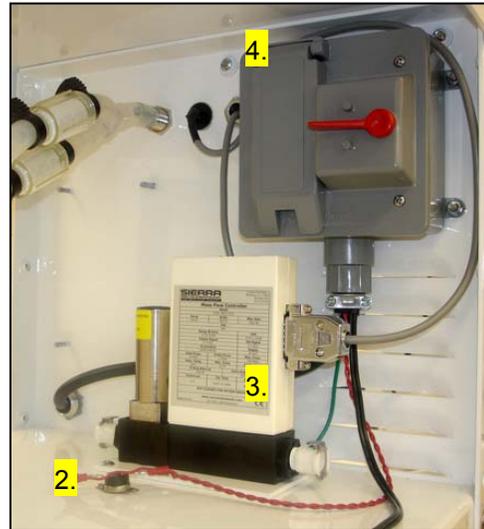
2.6 Stand Overview

The URG-3000N is shown below. Important components of the stand are labeled. The Pump Enclosure is described in detail within this section.



2.6.1 Pump Enclosure

Shown below is a photo of the inside of the pump enclosure, part of the URG-3000N stand. The additional photo shows a close-up of the side wall. The components located inside of the enclosure are labeled and listed following the photos. Note the following connections in the photos:



1. Fan: The Pump Enclosure Fan is used to regulate the temperature within the enclosure. It is regulated by the Snap Thermostat.

2. Snap Thermostat: The Snap Thermostat regulates the Pump Enclosure Fan. When the enclosure temperature rises above 85 degrees Fahrenheit, the fan is turned on. When the enclosure temperature drops below 65 degrees Fahrenheit, the enclosure fan is disabled.

3. Mass Flow Controller: The Mass Flow Controller is located on a bracket within the pump enclosure. For brief information see Section 2.5.2 and for service instructions see Section 9.5

4. Power Terminal: Underneath the door shown in the photo are two power outlets. The top outlet is the correct outlet for usage with the Pump. This outlet is controlled to power on and off the pump. The bottom outlet is to be used for the optional Enclosure Heater. Note that the red lever is a dummy lever and does not perform any function.

5. Pump: The URG-3000N utilizes a 120V pump that is seated in the pump enclosure as shown. It mounts with four nuts from the bottom, and service details can be found in Section 9.6

6. (Optional) Enclosure Heater: The area with four small mounts on the wall of the pump enclosure is shown to indicate where the optional Enclosure Heater would be located. This heater is available for usage with the URG-3000N in colder environments. Installation instructions can be found in Section 9.7.

Section 3

Installation

3.1 Introduction

The installation consists of:

- Assembling the URG-3000N Stand and attaching the Module C and Controller Module.
- Installing the module inlet.
- Connecting the cables between the controller, Module C, and Pump.
- Connecting the vacuum hoses between the Module C and Pump.
- Selecting the sampling parameters.
- Calibrating the flow rates of the Modules

3.2 Packing List

The following list details all of the individual boxes that the URG-3000N ships in, and the contents of each box. Note that the box labels are in bold, and all quantities are one (1) unless noted otherwise.

- **Module C Box**
 - Module C
 - 20" 12-pin Standard Control Cable for attaching Module C to Controller and Mass Flow Controller
 - Temperature Probe (Partially Installed in Inlet Tee)
 - Leak Check (Flow Audit) Assembly:
 - Downtube Reducer (1.5"ID to 1.25"OD),
 - Leak Check (Flow Audit) Adapter (1.25" to brass hose barb with shutoff valve)
 - Pump shutoff valve
 - Audit cassette cartridge tray.
 - Inlet Cap
 - Roof Flashing for Inlet
 - Copy of inspection and status checklist.
- **(Optional) Collocated Module C Box**
 - Collocated Module C
 - 66" 12-pin Extended Control Cable for attaching Collocated Module C to Controller and Mass Flow Controller
 - T-plug (Installed in Inlet Tee)
 - Leak Check (Flow Audit) Assembly: Downtube Reducer (1.5"ID to 1.25"OD), Leak Check (Flow Audit) Adapter (1.25" to brass hose barb with shutoff valve), 1 pump shutoff valve assembly, audit cassette cartridge tray.
 - Inlet Cap

- Roof Flashing for Inlet
- Copy of inspection and status checklist.
- **Stand Box**
 - Lower Stand Components
 - Pump Enclosure: Mass Flow Controller, Snap Thermostat, Fan, Power Terminal
 - 30" Standard Pump Relay Cable
- **(Optional) Collocated Stand Box**
 - Lower Stand Components
 - Pump Enclosure: Mass Flow Controller, Snap Thermostat, Fan, Power Terminal
 - 120" Extended Pump Relay Cable
- **Controller Module Box**
 - Controller Module
 - 72" 115VAC Power Cable
 - CompactFlash Memory Card
 - Operations Manual for URG-3000N
 - Copy of inspection and status checklist
- **Inlet Box**
 - 36" Inlet Stack
- **Stand Rain-shield Box**
 - Stand Rain-shield Roof
 - Rain-shield Left Side Support
 - Rain-shield Right Side Support
 - Assorted Assembly Hardware
- **Pump Box**
 - 120V Pump
 - Assorted Mounting Hardware
 - Exhaust Tube
 - Rubber Feet

Note that this packing list may not be all inclusive and additional components may or may not be included/shipped differently.

3.3 Assembling the URG-3000N

The following steps show how to properly attach all cables for the URG-3000N prior to operation. At the end of the instructions, a wiring diagram is shown for reference. Additional steps must be taken if a collocated Module C is being used.

3.3.1 Keypad & Memory Card

The Keypad has magnetic strips on the back, which allow it to sit in a holder as shown below. Directly below the Keypad holder is a cord storage area and memory card slot. To attach the Keypad, drop the cable through the cord storage area and pull the data jack through the slot in the bottom left as shown. Plug this data jack into the designated jack on the controller, also shown below. Afterwards, insert a compatible CompactFlash memory card into the slot.



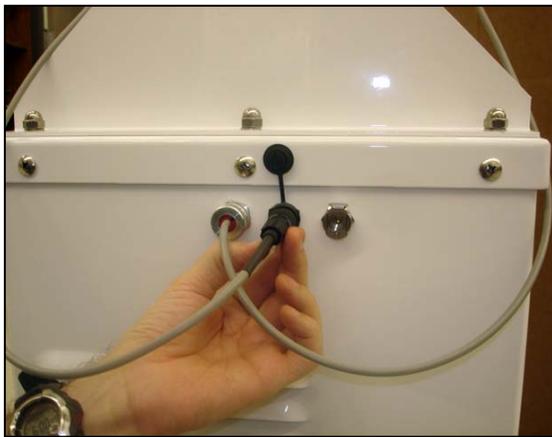
3.3.2 Pump Relay Cable

On the side of the pump enclosure, the cable furthest to the left is the relay control, which is fixed at the pump end. The relay cable leaving the pump should be connected to the controller, as shown below. A close-up of where the pump relay connects is also shown.



3.3.3 Controller Cable

The second cable to be attached is the 20" 12-pin to 12-pin data cable that connects the Controller to the Module C and Mass Flow Controller. Begin by inserting the *single end* of the data cable (without the mass flow controller connector) to the Controller as shown. Then, plug the other 12-pin connector into the Module C. The breakout cable on that end is connected to the Mass Flow Controller, which is the central port on the side of the pump enclosure, as shown.



3.3.4 Air Line

The Air line is a 30" black cable with Colder fittings at each end. It connects to the Module C and then to the pump enclosure as shown, on the far right.



3.3.5 Temperature Probe

The temperature probe is mounted in the bottom left of the Module C, in the inlet tee. To install, make certain that the plug is inserted in the inlet tee. Drop the cable out of the bottom of the Module C, and affix the plastic disc in the hole. Plug the connector into the rear right of the Controller. See the Wiring Diagram for more details.



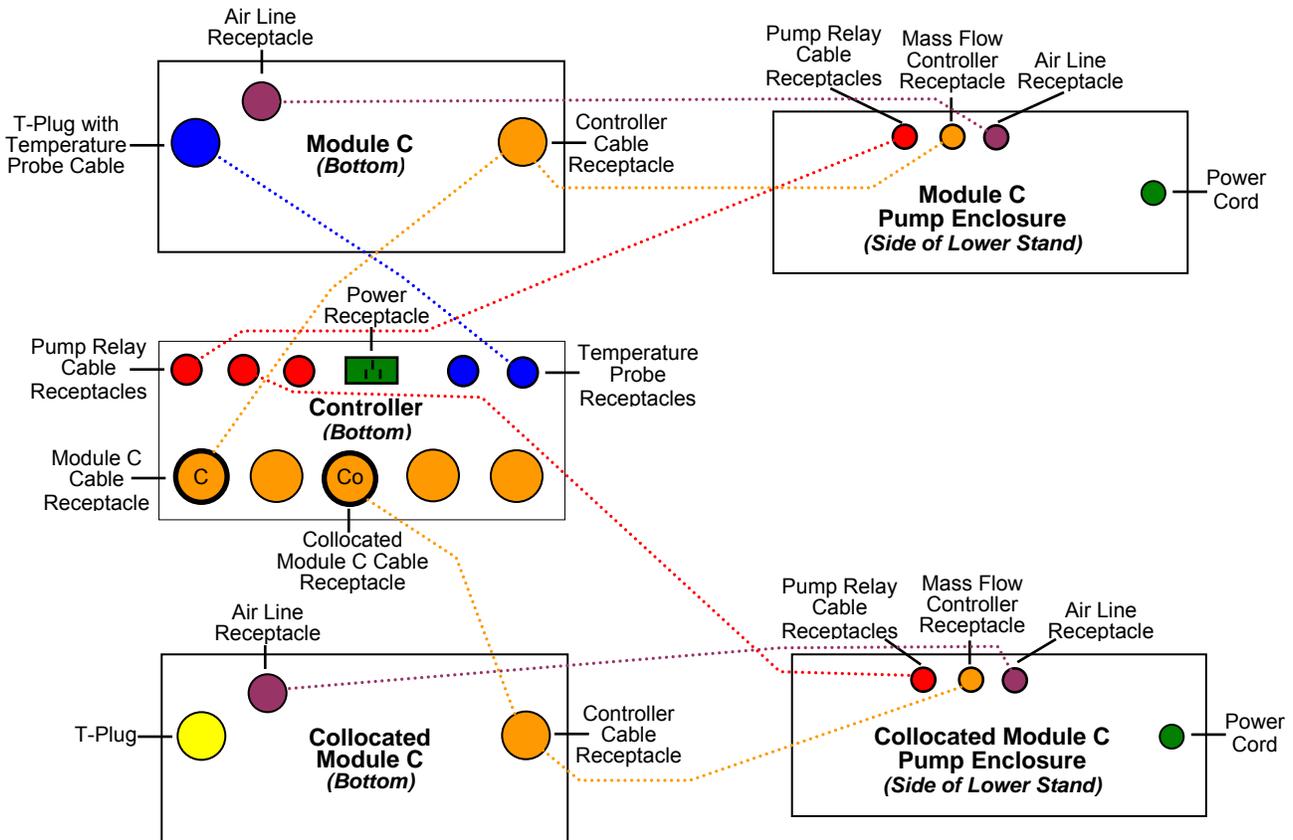
3.3.6 (Optional) Collocated Module C

The optional Collocated Module C is installed exactly the same as the standard Module C. The only difference is that (2) of the cables are much longer so that the Collocated Module C can be installed 1 meter (inlet to inlet) away from the Module C. See the wiring diagram below for details.

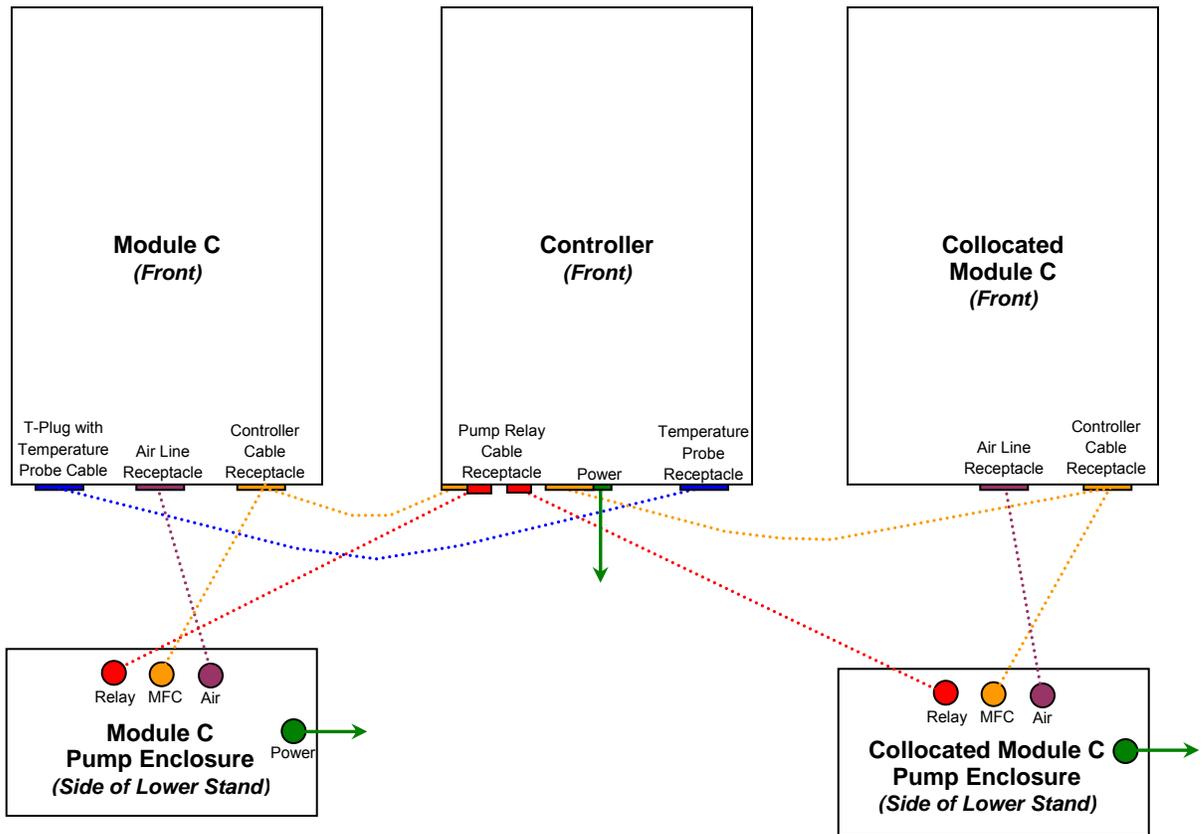
3.3.7 Bottom-View Wiring Diagram

The following diagram shows a bottom view of the modules for wiring. Cable lengths are not to scale. These bottom views are as if the front of the Controller, Module C, or Collocated Module C are facing up.

Example: Take a Controller with the front facing you and you lie it on its back. The bottom view that you would see is what is detailed below.



3.3.8 Front-View Wiring Diagram



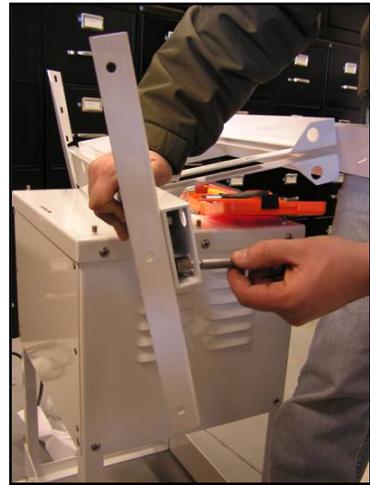
3.4 Assembling the URG-3000N Stand

3.4.1 Upper Stand & Rain Shield Assembly

Install one roof support to the roof with six (6) S.S. nuts with integrated lock washers and tighten.

Install both H-body base supports with twelve (12) S.S. washers and nuts. Turn the H-body on its side, using a thin screwdriver, slide one washer on the screwdriver. Align the screwdriver with the stud and let the washer slide down onto the stud.

Turn the H-body over far enough that the washer does not slide off and the S.S. nut in a nut-driver will stay in the driver. Tighten the nut. Repeat the washer/nut installation until all 12 studs have been secured.



Install the second roof support on the H-body. H-Body should look like the figure below on the left.

Install the roof assembly as shown in the center figure below. Line up all the studs with the holes and press fit everything together.

Assembly should look like the below on the right.



Install and tighten all connectors. The roof connector nuts require an 11/32" open end wrench to access the studs at the peak.



Install the completed H-Body on the pump house studs. Align the "Controller Side" labels on the pump box and H-body on the same side.

3.4.2 Controller & Module C Installation

Hang the Controller on the side labeled "Controller Side". Install feet first into the precut holes. Loosen the S.S. cap screw to allow the Controller carrying handle to clear the cap screw and slide into the receiver. Hand tighten the cap screw so the Controller is captive.

Repeat the process for the Sampler Module as shown at right.

Install the six (6) S.S. acorn nuts and washers on the H-body base studs. Use the supplied Loctite on the studs at this time, then tighten all nuts.



3.4.3 Inlet Installation

Slide the inlet tube into the roof jack, then into the Sampler Module. Open the door to the Module and guide the inlet tube into the Tee until it is past the O-ring and seated on the stop inside the Tee. Slide the roof jack mate onto the tube into contact with the roof jack creating a weather proof seal.

The roof jack assembly should look like the right figure below.

Tighten the lock ring at the top of the Sampler Module by hand until it is secure around the inlet tube. This keeps melting snow and wind blown precipitation out of the Sampler Module.



3.4.4 Support Feet Installation

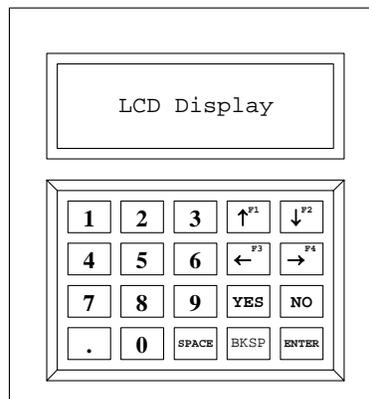
The mounting feet are installed in the wrong direction to allow for easier shipping. The figure below on the left shows how the feet are installed when you receive the stand. You will have to remove the support feet and install them correctly before operating the URG-3000N

Remove the (2) S.S. screws that hold the feet onto the base and re-install them with the larger flat surface facing down onto the ground like shown in the figure below on the right. There are (4) hole in the part of the feet that face the ground. The (2) larger holes are to allow the stand to be bolted to a sampling platform.



4.1 Introduction

The display terminal is shown in detail below. The LCD has 4 lines that display 20 characters each. The keys/buttons consist of numbers 0 through 9, Decimal, Space, Backspace, \uparrow F1, \downarrow F2, \leftarrow F3, \rightarrow F4, YES, NO, and ENTER. Keys will generally be shown in bold throughout the software section. See software details see Section 4.



4.1.1 General Key Usage

The **ENTER** key is generally used to proceed to the next main step or to return to a previous menu. The \rightarrow F4 or **ENTER** keys are used to move to the next or previous screens. The **NO** key will usually act as an escape key when possible. Note that Number Key **1** and **2** will select either a Module C and Collocated Module C when you are shown **Mod:[#]** onscreen. In most cases, the LCD will list the available options for navigation. From the Main Menu, pressing **ENTER** will return to the previous Main Menus (if possible), and then to AUTO MODE.

4.1.2 Software Modes

The Controller program has two modes: AUTO MODE and MENU MODE. The program is normally in the AUTO MODE, whether the sampler is running or not. In the AUTO MODE, the LCD will display the Current Status of the sampler module(s). Section 4.2.1 details the current status screens. All sampler functions are performed using menus and submenus in the MENU MODE, as discussed in this section.

To move from the AUTO MODE to the MENU MODE, press the **ENTER** key. This will prompt you for authentication and site Operator Initials, followed by the Main Menu.

4.1.3 Cautions and Notices

- Pressing **ENTER** to skip a process is optional but *not recommended*, as the software is tailored to allow components time to warm up based on manufacturer specifications.
- After using MENU MODE, make certain that the controller has returned to the AUTO MODE.
- After completing the standard Filter Change, the software will reset and automatically return to AUTO MODE.
- Actual values obtained may differ from those shown in the Software “screenshots”.

4.2 Auto Mode

4.2.1 Current Status Screens

When the sampler is in AUTO MODE, the current status of the sampler is displayed. The display shows whether the sampler is collecting, idling, or waiting for samples. An example of auto mode is shown.

```
12/20/06 04:00pm WED
Next samp: COMPLETED
Sampler is OFF
```

The first line displays the current date and time. For this example, the date is December 20th, 2006. The time is 4:00 pm. After the time, the day of the week is listed, in this case Wednesday. The third line indicates the sample status. The fourth line shows that the sampler is off.

This screen is the same as previously shown, except that it is displaying that the sampler is currently on. At this time, the sampler is recording the flow rate, temperature, and other parameters. Pressing **ENTER** will allow you to authenticate and proceed to Menu Mode.

```
12/20/06 04:05pm WED
Module:[1]
Flow: 22.00
ET: 15
```

4.3 Menu Mode

The MENU MODE has a five screen main menu and several sub-menus. The Main Menu can be accessed by pushing the **ENTER** key while the sampler is displaying the status in Auto Mode.

4.3.1 Authentication

When prompted with the Authorized Use screen the four digit code “1123” should be entered.

```
Authorized use only
Please enter code:
-
```

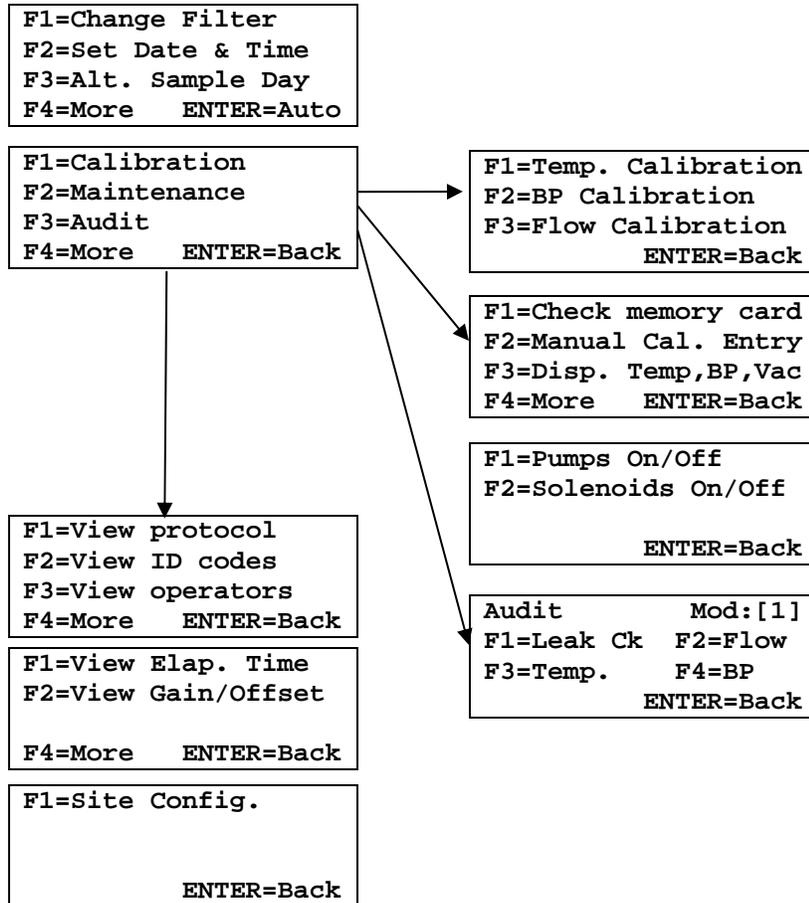
4.3.2 Select/Modify Operator

Now you are prompted to select the current operator. There is space for one primary and two backup operators initials to be stored. To select an operator, press the # key corresponding to the initials. To change the operator initials, select the →**F4**. These values all begin as blank until edited for the first time. After selecting an operator, you will be presented with the initial Main Menu.

```
Choose Operator
Primary: 1-ABC
Backups: 2-XXX 3-YYY
F4=Edit
```

4.4 Main Menu Map

Below is a map of the Main Menus and first Sub-Menus of the URG-3000N. Refer to Section 4.12 for a complete software menu map.



4.5 Main Menu (1 of 5)

4.5.1 Change Filter

The first Main Menu screen allows you to Change Filter, Set Date & Time, select an Alternate Sample Day, and progress to the next Main Menu screen by pressing →F4 key for more options. Note that pressing the ENTER key on this screen will return to Auto Mode, requiring you to re-authenticate before accessing the menu again.

```
F1=Change Filter
F2=Set Date & Time
F3=Alt. Sample Day
F4=More    ENTER=Auto
```

4.5.2 Change Filter

This section of the software allows you to remove the exposed filter and replace it with a new filter.

Refer to Section Section 7 for detailed instructions on how to perform a filter change.

Refer to Section 4.12 for a complete filter change software menu map.

```
FILTER CHANGE
YES to continue
NO to cancel
```

4.5.3 Set Date & Time

To set the current date and/or time, press the ↓F2 key in the Main Menu. The figure to the right shows the menu for changing the date and time. By pressing the ←F3 and →F4 keys, the operator can move the cursor to select the month, day, year, hour or minute. Pressing ↑F1 or ↓F2 will alter values. The day of the week changes based on the month, day, and year. If you enter an invalid date, the screen will prompt you to re-enter the proper date.

```
12/20/06 09:00am Wed
F1&F2=Adjust values
F3&F4=Move cursor
ENTER=Save changes
```

4.5.4 Alternate Sample Day

To set a single alternate sample day press ←F3 at the initial Main Menu. Similar to the Set Date & Time screen, pressing the ←F3 and →F4 buttons to move the cursor to the value and ↑F1 or ↓F2 will alter values. Press ENTER to save changes.

```
12/20/06 10:00am Wed
F1&F2=Adjust values
F3&F4=Move cursor
ENTER=Save changes
```

4.6 Main Menu (2 of 5)

4.6.1 Overview

The second main menu screen allows you to perform Calibration, Maintenance, and Audit procedures. Pressing the →F4 key will again allow you to access the next Main Menu, pressing ENTER will return to the first Main Menu.

```
F1=Calibration
F2=Maintenance
F3=Audit
F4=More    ENTER=Back
```

4.6.2 Calibration

Pressing ↑F1 at the second Main Menu brings you to the Calibration Menu. This menu allows you to select from Temperature, Barometric Pressure, and Flow Calibration. The Temperature and Barometric Pressure calibrations are only done on the Module C. The Flow Calibration should be performed on the Module C, and the Collocated Module C if it is present.

```
F1=Temp. Calibration
F2=BP Calibration
F3=Flow Calibration
          ENTER=Back
```

4.6.3 Maintenance

After pressing ↓F2 to enter the Maintenance Menu, the options shown to the right will appear. Maintenance allows you to check memory card status, manually enter calibration info, and display temperature, BP, and Vacuum, as well as control the pumps and solenoids.

```
F1=Check memory card
F2=Manual Cal. Entry
F3=Disp. Temp,BP,Vac
F4=More    ENTER=Back
```

Pressing →F4 proceeds to the second Maintenance screen to select these options, as shown. Pressing ENTER returns to the previous Maintenance menu.

```
F1=Pumps On/Off
F2=Solenoids On/Off
          ENTER=Back
```

4.6.3.1 Check Memory Card

Selecting the Check Memory Card menu option allows you to manually re-initiate the memory procedure performed at startup.

```
Checking Memory Card
```

If the Memory Card is properly inserted in the URG3000-N and properly formatted, a Card is OK message will appear. If not, a card not found screen will show. Pressing ←F3 will repeat the check, whereas pressing →F4 will proceed, but sample data will not be able to be saved. User will be returned to the Maintenance screen when complete.

```
Checking Memory Card
Card not found
F3= Test card again
F4= Run with no card
```

4.6.3.2 Manual Calibration Entry

Pressing ↓F2 at the Maintenance screen enables you to manually change Gain and Offset values. At this screen, press ↑F1 to modify Gain and ↓F2 to modify Offset.

```
Manual Cal. Mod:[1]
F1=Gain    F2=Offset
Gain=6.000 Off= 0.00
          ENTER=Done
```

In the example on the right, Gain is being modified. Pressing **↑F1** would toggle between + and – values, and the digit keys would be used to enter a number, using **BKSP** key to make any corrections.

```
Manual Cal.  Mod:[1]
F1: +/-
Gain: 0.000
NO=Cancel  ENTER=Done
```

4.6.3.3 Display Temp, BP, Vacuum

Pressing the **←F3** key at the Maintenance Menu brings you to the Display Temperature, Barometric Pressure, and Vacuum screen. After a series of warm-ups, this screen displays the current Vacuum data for any available Modules, and shows the Barometric Pressure and Temperature reading from the Module C. Pressing **ENTER** will return you to the Maintenance Menu.

```
Display Temp,BP,Vac
Vac: 1= 22.0 2= 22.0
Temp: 25.7 BP: 761.3
ENTER=Done
```

4.6.3.4 Pumps On/Off

Pressing **↑F1** at the second Maintenance Menu will allow you to access the Pump Status screen. Pressing **1** or **2** will toggle On/Off for the corresponding pump. Pressing **ENTER** will returns to the Maintenance Menu.

```
Pump Status
Mod:[1] Pump Off
Mod:[2] Pump Off
12=Pump#  ENTER=Back
```

4.6.3.5 Solenoids On/Off

Pressing **↓F2** at the second Maintenance Menu will bring you to the Solenoid Status screen. Pressing **1**, **2**, **3**, or **4** will turn the corresponding solenoid valves On/Off. Pressing **ENTER** will return you to the Maintenance Menu.

```
Solenoid Status
Sol[1]:0 Sol[2]:0
Sol[3]:0 Sol[4]:0
1234=Sol#  ENTER=Back
```

4.6.4 Audit

Pressing **←F3** on the second Main Menu screen brings you to the Audit menu. The Audit menu allows you to choose between a Leak Check procedure, a Flow Rate Audit, a Temperature Audit, and a Barometric Pressure Audit. Pressing **ENTER** will return to the second Main Menu.

```
Audit          Mod:[1]
F1=Leak Ck    F2=Flow
F3=Temp.      F4=BP
ENTER=Back
```

4.6.4.1 Leak Check

Pressing the **↑F1** key at the Audit Menu will bring you to the Leak Check procedure. Note that the selected module is located in the top right. Press Key **1** or **2** to select between a Module C or Collocated Module C.

```
Leak Check    Mod:[1]
NO=Cancel  ENTER=Next
```

Press **ENTER** to continue the Leak Check, or press **NO** to cancel.

4.6.4.2 Flow Audit

Pressing ↓F2 at the Audit Menu will bring you to the Flow Check procedure. Initially, a warning will be shown reminding you that a leak check should be performed before an audit.

```
WARNING
A leak check should
always precede an
audit.
```

4.6.4.3 Temperature Audit

Pressing ←F3 on the Audit Menu brings you to the Temperature Audit screen

```
Audit Temperature
Temperature(C)= 25.4
F1:+/-      F2:C/F
Ref. Temp(C):?
```

4.6.4.4 BP Audit

Pressing →F4 on the Audit Menu brings you to the BP Audit screen.

```
Audit BP
BP (mmHg)= 643.9
Ref. BP(mmHg):?
```

4.7 Main Menu (3 of 5)

4.7.1 Overview

The third Main Menu allows for you to view sampling protocol, sampler ID codes, or view the initials of the site operator.

```
F1=View protocol
F2=View ID codes
F3=View operators
F4=More      ENTER=Back
```

4.7.2 View Protocol

Pressing ↑F1 allows you to view the sampling protocol, as shown. In this example, the Sample Days are shown as 1 in 3, and the Sample Time/Hour is shown as 60.

```
Sampling Protocol
1 in 3
Sample Time/Hour 60
ENTER=Back
```

4.7.3 View ID codes

Pressing ↓F2 at the third Main Menu enables you to once again view the ID codes that were shown on startup. Here, the display shows the Location Code (LOC), the 15-character Chain of Custody (Q), the 15-character Module ID (Comp), and the Serial Number (SN). The ENTER key will return you to the Main Menu.

```
LOC:0000000000
Q:Q0000000
Comp:I000000I
SN:0000      ENTER=Back
```

4.7.4 View operators

Pressing ←F3 at the third Main Menu will allow you to view the Operator Initials currently stored. This screen only allows you to view operators, not change operators or edit operator information.

Operator Initials Primary: 1-ABC Backups: 2-AAA 3- ENTER=Back
--

4.8 Main Menu (4 of 5)

4.8.1 Overview

The fourth Main Menu allows you to View Elapsed Time and View Gain/Offset by pressing the appropriate keys. Pressing the →F4 key proceeds to the fifth and final Main Menu, whereas pressing the ENTER key will return to the third Main Menu.

F1=View Elap. Time F2=View Gain/Offset F4=More ENTER=Back
--

4.8.2 View Elapsed Time

Pressing ↑F1 at the fourth Main Menu brings you to the View Elapsed Time screen. On the right, the screen shows that both Module C [1] and collocated Module C [2] have had samples with 25 minutes elapsed time.

Elapsed Time [1] 25 minutes [2] 25 minutes ENTER=Back
--

4.8.3 View Gain/Offset

Pressing ↓F2 at the fourth Main Menu brings you to the View Gain/Offset screen. This shows the Gain and Offset values for any connected modules. Pressing ENTER will return to the fourth Main Menu.

	Gain	Offset
[1]	0.000	0.010
[2]	0.000	0.000
		ENTER=Back

4.9 Main Menu (5 of 5)

4.9.1 Overview

The fifth Main Menu allows you to run the Site Configuration procedure. Press ↑F1 to step through Site Configuration, or press ENTER to return to the previous Main Menu.

F1=Site Config. ENTER=Back

4.9.1.1 Site Configuration

Pressing **↑F1** at the fifth Main Menu begins the Site Configuration process.

The first screen of the Site Configurations prompts you for a Location Code. After entering the proper code with the digit keys, press **ENTER** to continue.

```

Location Code
000000000
ENTER=Done
    
```

The next screen prompts you for the sampler Serial Number.

NOTE: The serial number on the **Controller Module** is the correct number to use when entering the serial number.

```

Serial Number
0000
ENTER=Done
    
```

The Number of Modules screen appears next, which allows you to select 1 or 2 modules (if the configuration contains a collocated Module C).

```

Number of Modules
1 or 2
Current: 1
Enter=Done
    
```

The next screen allows you to choose a sampling schedule. Here, the options shown are 1 in 3 days, and 1 in 6. Currently selected schedule is also displayed. Press **ENTER** continues to the next screen.

```

Select Schedule
1: 1 in 3  2: 1 in 6
Current: 1
ENTER=Done
    
```

Sampling Interval is the screen that follows schedule. It allows you to change the time in minutes between samples. As shown, this is typically 15 minutes, whereas the maximum is set at 60 minutes. Press **ENTER** to continue

```

Sampling Interval
Typ:15 Max:60 min
15 minutes
ENTER=Done
    
```

Sample Time Per Hour allows the choice of how long a sample will run during each hour. This is typically set at 60 minutes, with a maximum of 60 minutes, to allow for shorter sampling hours if necessary. Press **ENTER** to continue.

```

Sample Time Per Hour
Typ:60 Max:60 min
60 minutes
ENTER=Done
    
```

The final site configuration screen allow for you to select from Normal or Stacked Filter Configuration, as shown. When completed, press **ENTER** to complete the Site configuration process, and return to the fifth Main Menu.

```

Filter Configuration
1=Normal 2=Stacked
Current: 1
ENTER=Done
    
```

4.10 Collected Data

The URG-3000N saves text files to the root directory of a CompactFlash memory card when sampling or other procedures have occurred. Example filenames include c0000105.299, a0000105.299 or r0000106.008. Note that files beginning with c are calibration logs, a are audit logs and r is sample data. An example of the headers from a sampling data logfile (with text wrap) is shown below. These headers are different for calibration/audit/sample runs. Values would be listed below.

```

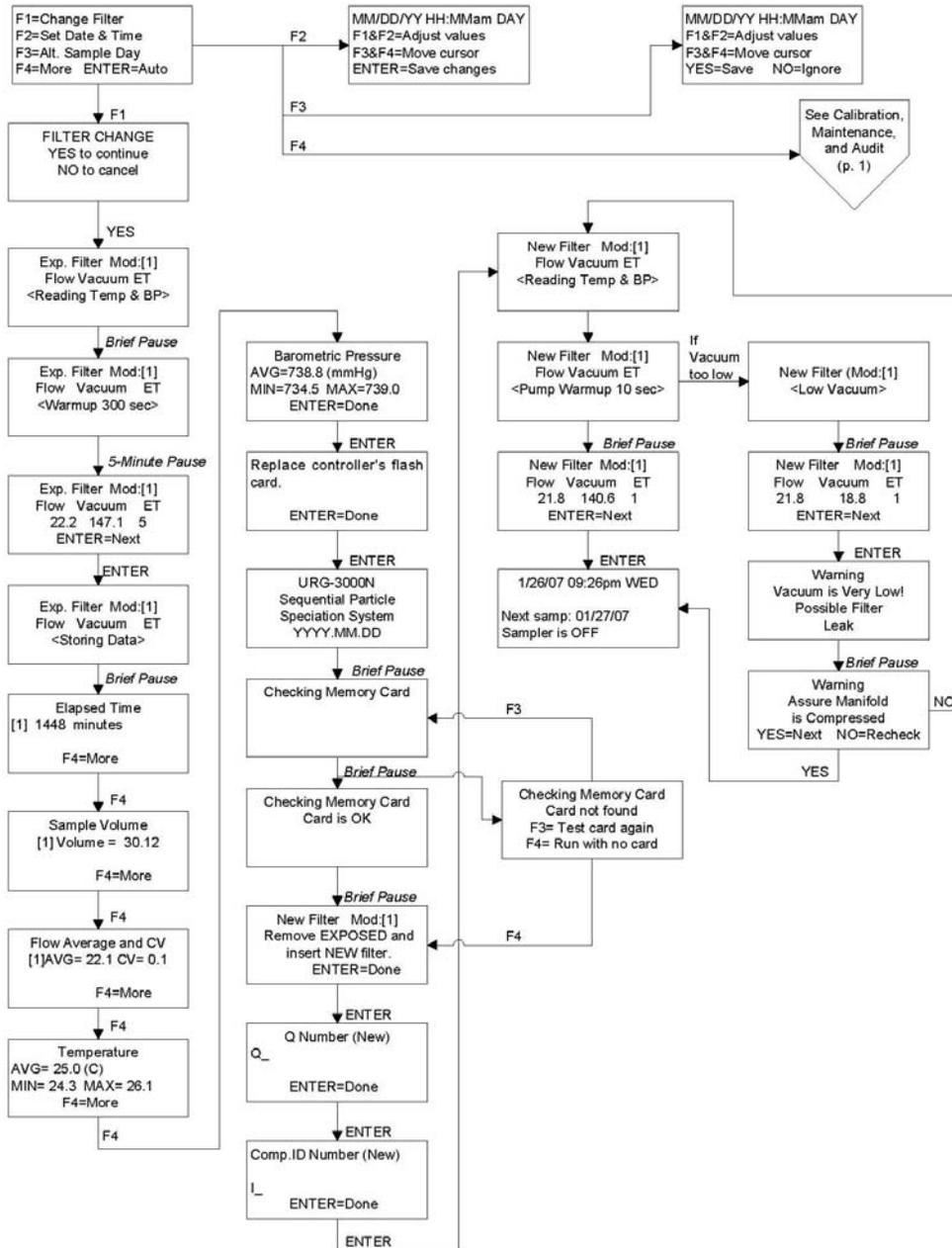
SN  LOCATION_NUM  Q_NUMBER  COMP_ID_NUM  SDATE  STIME  EDATE  ETIME  TempAV
TempMN TempMX BaroAV BaroMN BaroMX  VacAV  VacMN  VacMX FlowAV FlowMN FlowMX RTmpAV RTmpMN RTmpMX
RBarAV RBarMN RBarMX RVacAV RVacMN RVacMX RFloAV RFloCV RFloVL  GAIN OFFSET OPI  ADC BF
VERSION
    
```

4.11 Cheat Codes

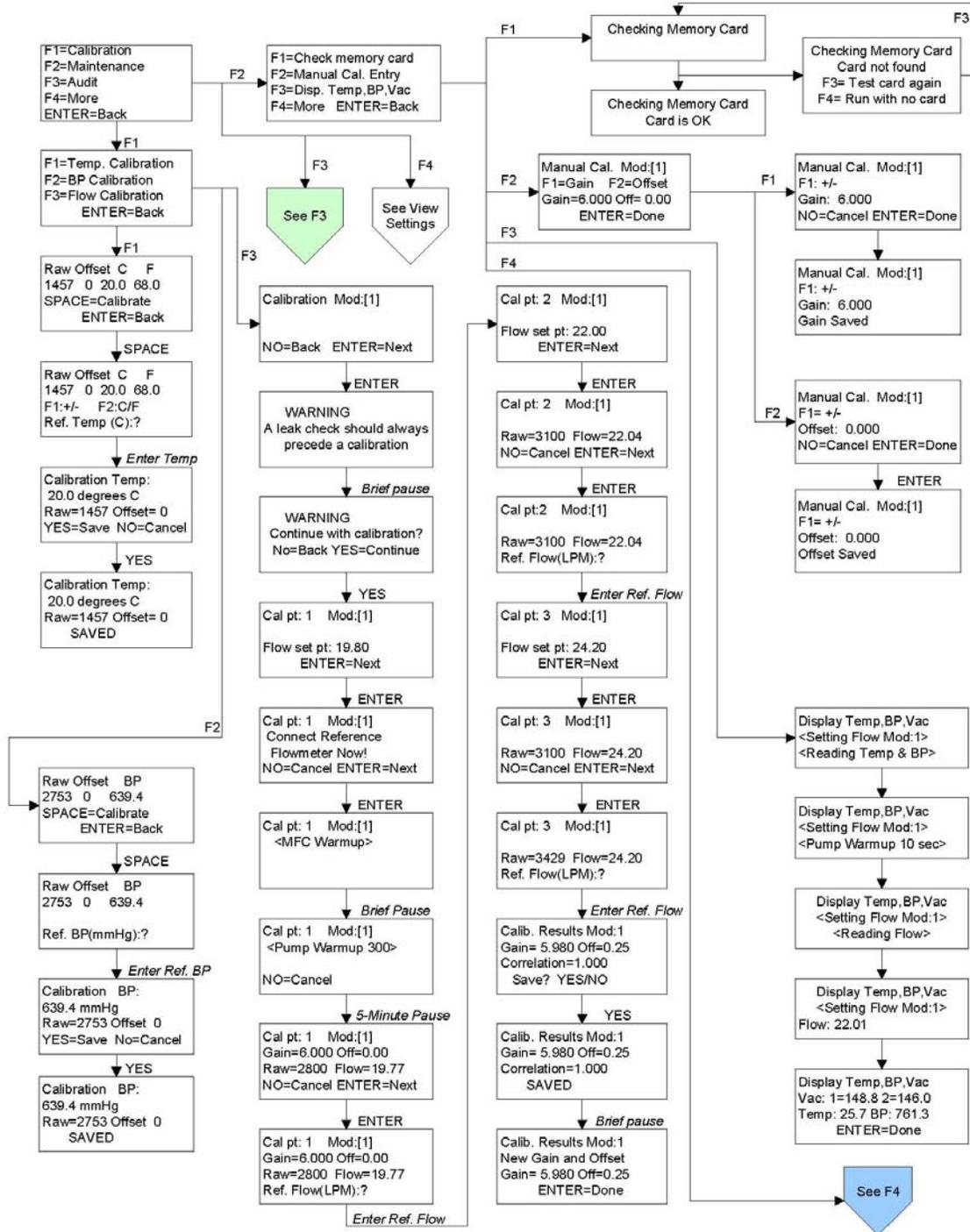
To enable changing of the Flow Rate for different calibration, enter Authorization Code 7004 at Authorization Prompt to enable changing this value.

4.12 Complete Software Menu Map

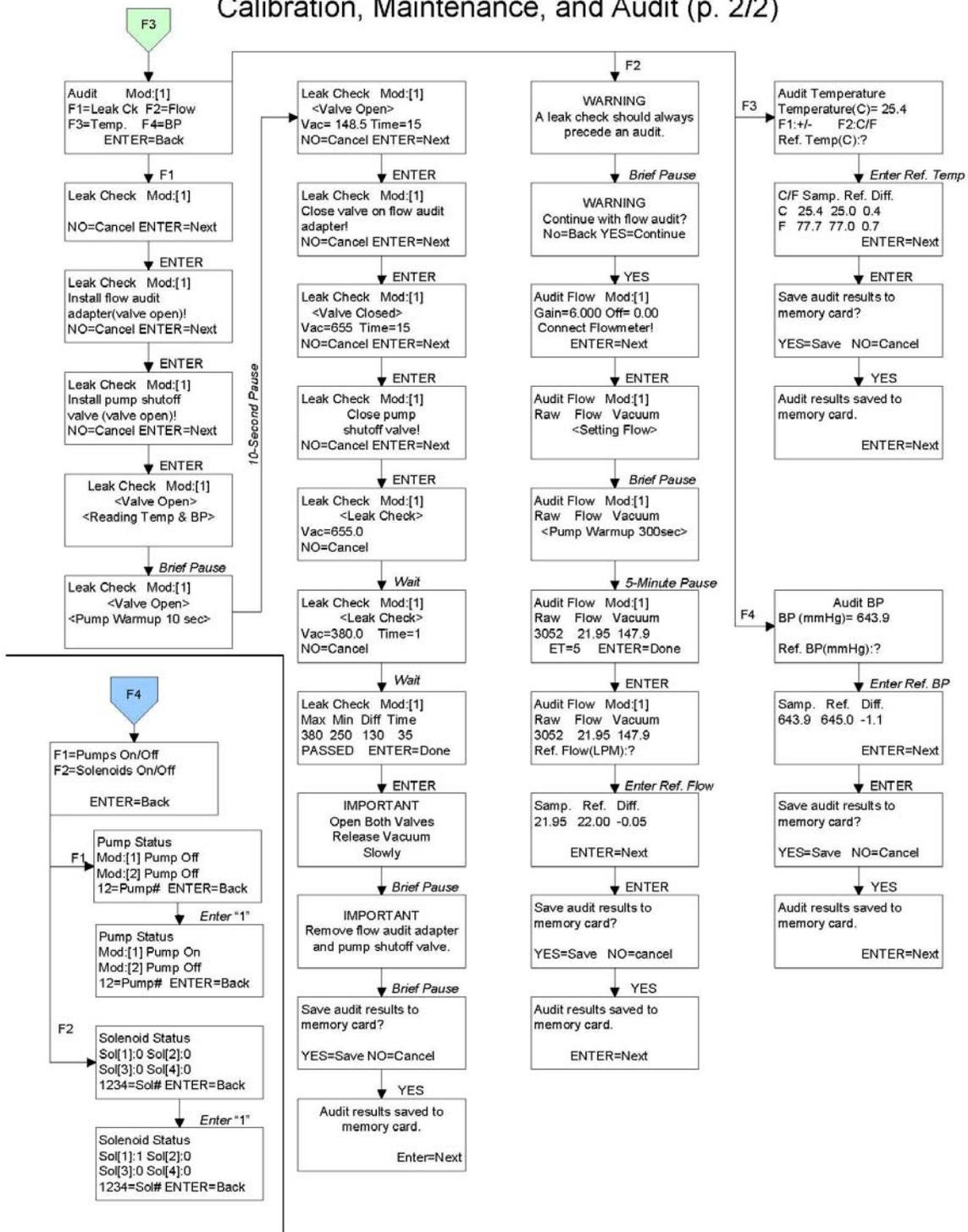
Filter Change and Scheduling



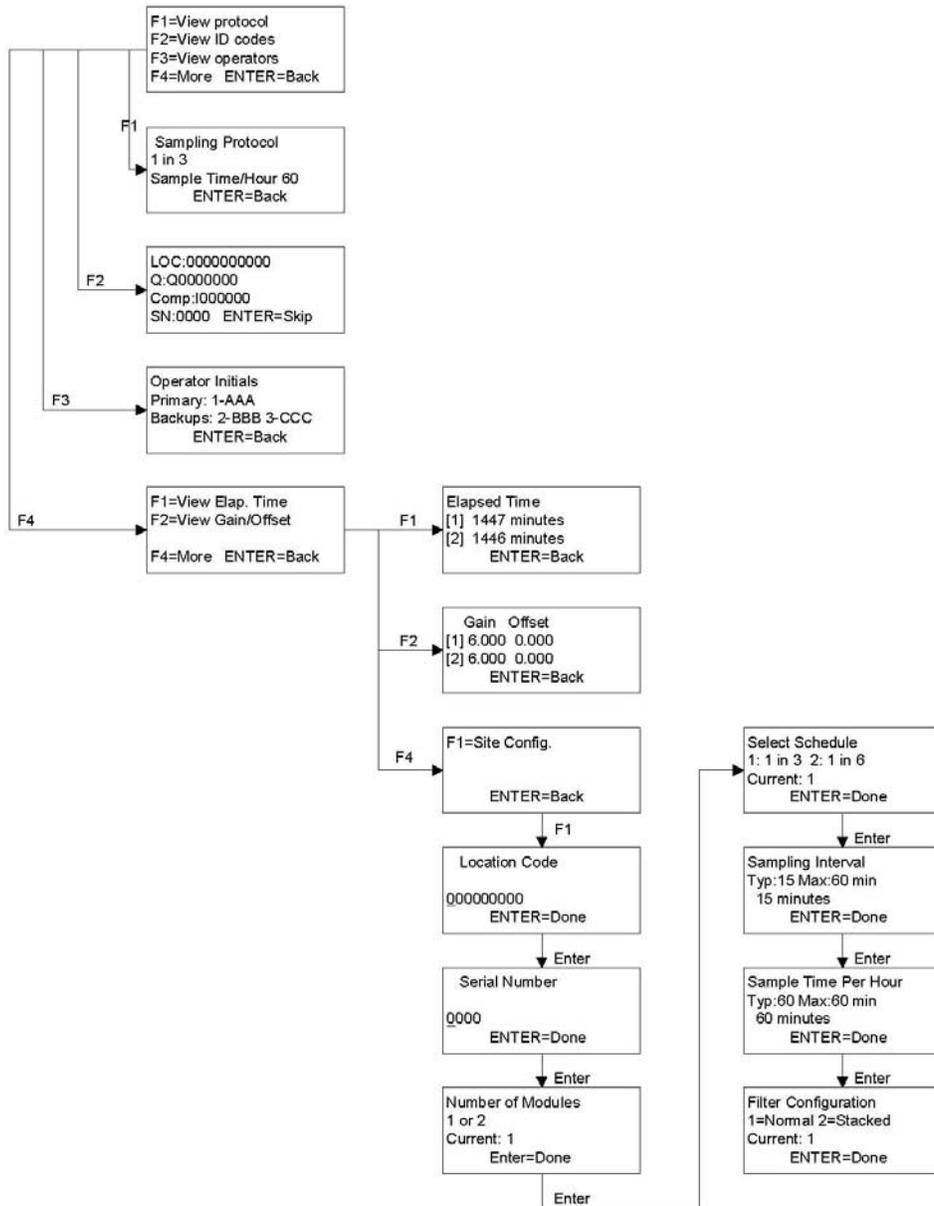
Calibration, Maintenance, and Audit (p. 1/2)



Calibration, Maintenance, and Audit (p. 2/2)



View Settings, Site Configuration



5.1 Startup

The procedures below will show how to start up the URG-3000N. This section also includes instructions on how to perform a leak check on both a Module C and a Collocated Module C.

5.1.1 Power Up

Put a CompactFlash memory card into the controller and then plug in the controller and the stand. Upon powering the URG-3000N, the LCD screen will display the welcome message shown. The date will be displayed in YYYY.MM.DD.

```
URG-3000N
Sequential Particle
Speciation System
YYYY.MM.DD
```

5.1.2 Memory Check

After initializing, the URG-3000N will check the presence and status of the CompactFlash card located in the slot. If the card is present and working properly "Card is OK" will be displayed. Otherwise, an error will be shown.

```
Checking Memory Card
Card is OK
```

5.1.3 ID Codes

After checking memory, the display will briefly show the ID codes before entering Auto Mode. Here, the display shows the Location Code (LOC), the 15 Character Chain of Custody (Q), the 15 Character Module ID (Comp), and the Serial Number (SN). This screen will proceed to AUTO MODE after a short pause, or the **ENTER** key can be pressed at any time to skip this screen.

```
LOC:00000000
Q:Q000000Q
Comp:I000000I
SN:0000 ENTER=Skip
```


Section 6 Calibration

This menu allows you to perform the temperature, barometric pressure, and flow calibrations. The temperature and barometric pressure calibrations are only done on the Module C. The flow calibration should be performed on the Module C, and the Collocated Module C if one is present.

6.1 Temperature Calibration

Pressing **↑F1** at the calibration menu will bring you to the Temperature Calibration screen shown on the right. Refer to Section 4.12 for a complete temperature calibration software menu map. It displays the current DAC Raw

```
Raw Offset C F
1457 0 20.0 68.0
SPACE=Calibrate
ENTER=Back
```

values, Offset, Temperature in Celsius, and Fahrenheit. Pressing **SPACE** allows you to proceed with temperature calibration.

You are now able to enter a positive or negative (toggled by **↑F1**) temperature value using the digit keys Celsius or Fahrenheit (toggled by **↓F2**). Use the **BKSP** key to clear the currently entered values.

```
Raw Offset C F
1457 0 20.0 68.0
F1:+/- F2:C/F
Ref. Temp):?
```

After pressing **ENTER**, you are shown the final calibration temperature, as shown to the right. Pressing **YES** will save the data, pressing **NO** will cancel the calibration. You will be returned to the Calibration Menu.

```
Calibration Temp:
20.0 degrees C
Raw=1457 Offset= 0
YES=Save NO=Cancel
```

The next screen will confirm that the temperature calibration results have been saved to the memory card. Press **ENTER** to return to the Calibration Menu.

```
Calibration Temp:
20.0 degrees C
Raw=1457 Offset= 0
SAVED
```

6.2 Barometric Pressure Calibration

Pressing the **↓F2** at the Calibration Menu will allow you to proceed with BP calibration. Refer to Section 4.12 for a complete barometric pressure calibration software menu map. Initially, the screen shown to the right will display Raw, Offset, and BP values. Pressing **SPACE** will allow you to proceed to the following screen.

```
Raw Offset BP
2753 0 639.4
SPACE=Calibrate
ENTER=Back
```

The next screen allows you to enter a reference BP value in mmHg using the digit keys. **↑F1** / **↓F2** will change between positive and negative values. Use the **BKSP** key to clear incorrect data.

```
Raw Offset BP
2753 0 639.4
Ref. BP(mmHg):?
```

Pressing **YES** will allow you to save results, pressing **NO** will discard the results.

```
Calibration BP:
639.4 mmHg
Raw=2753 Offset=0
YES=Save NO=Cancel
```

The next screen will confirm that the barometric calibration results have been saved to the memory card. Press **ENTER** to return to the Calibration Menu.

```
Calibration BP:
639.4 mmHg
Raw=2753 Offset=0
YES=Save NO=Cancel
```

6.3 Flow Calibration for Module C

Pressing **←F3** at the Calibration Menu will allow you to step-through a three-point flow calibration. Refer to Section 4.12 for a complete flow calibration software menu map.

```
Calibration Mod:[1]

NO=Back ENTER=Next
```

Select **Mod: 1** for doing a flow calibration on the Module C, and **ENTER** to begin.

A warning will be shown reminding you that a leak check should be performed before an audit

```
WARNING
A leak check should
always precede a
calibration
```

The next screen warns you not to proceed with calibration unless a leak check has been performed. Pressing **YES** will continue.

```
WARNING
Continue with
calibration?
NO=Back YES=Continue
```

The next screen will show the Calibration Point (1 of 3), the Module (1), and the Flow set point of 19.80. Press **ENTER** to continue the process.

```
Cal pt: 1 Mod:[1]
Flow set pt: 19.80
ENTER=Next
```

The next screen will prompt you to install the reference flow meter.

```
Cal pt: 1 Mod:[1]
Connect Reference
Flowmeter Now!
NO=Cancel ENTER=Next
```

The mass flow controller will warm up for a few seconds

```
Cal pt: 1 Mod:[1]
<MFC Warmup>
```

The pump will warm up for 300 seconds (5 minutes). Pressing **ENTER** at any time during the pump warmup will stop the pump warmup and advance to the next screen.

```
Cal pt: 1 Mod:[1]
<Pump Warmup 300>
```

Next, the Gain, Offset, Raw, and Flow values are shown for the selected module. Again, pressing **ENTER** will advance to the next screen.

```
Cal pt: 1 Mod:[1]
Gain=6.00 Off= 0.00
Raw=2800 Flow= 19.77
NO=Cancel ENTER=Next
```

Again, pressing **ENTER** will advance to the next screen.

You are now prompted to enter a Reference Flowrate in LPM. This completes the first calibration point.

```
Cal pt: 1    Mod:[1]
Gain=6.00 Off= 0.00
Raw=2800 Flow= 19.77
Enter Ref(LPM):?
```

The Calibration Results screen will be and will allow you to save the flow calibration.

```
Calib. Results Mod:1
Gain=0.000 Off=0
Correlation= 0.00
Save? YES/NO
```

The software will advance through the 2nd and 3rd calibration points exactly the same way it did for the 1st calibration point.

```
Calib. Results Mod:2
Gain=0.000 Off=0
Correlation= 0.00
SAVED
```

After entering the 2nd and 3rd calibration point, the Calibration Results screen will be shown for each calibration point and will allow you to save the flow calibration results for each point.

After choosing one of these options, the Calibration results will be displayed again and selecting **ENTER** will return to the Calibration Menu.

```
Calib. Results Mod:1
Gain=5.98 Off=.25
Correlation= 1.00
ENTER=Done
```

6.4 Flow Calibration for Collocated Module C

The flow calibration procedure for the Collocated Module C is done exactly the same way as the Module C. Follow instruction in Section 6.3 to do a flow calibration on the Collocated Module C.

Select **Mod: 2** for doing a flow calibration on the Collocated Module C, and **ENTER** to begin.

```
Calibration Mod:[2]

NO=Back    ENTER=Next
```


Section 7

Filter Change

7.1 Filter Change for Module C

These instructions will walk through the filter change procedure. You will also need to refer to your Standard Operating Procedures when completing a filter change.

NOTE: There may be some instances that require the exposed filter cassette cartridge and the memory card to be removed **WITHOUT** installing the new ones because they are not available yet. Detailed instructions for doing this are located in the Troubleshooting Section 10.4.

To begin the Filter Change procedure, press **↑F1** on the Main Menu to begin the Change Filter procedure. The screen on the right will be shown. Press the **YES** key to continue.

```
FILTER CHANGE
YES to continue
NO to cancel
```

7.1.1 Exposed Filter Values

The first screen in the filter change procedure allows you to select which module you are going to perform the filter change procedure on.

```
Exp. Filter Mod:[1]
Flow Vacuum ET
<Reading Temp & BP>
```

Select **Mod: 1** to change the filter in the Module C, and **ENTER** to begin.

The pump will warm up for 300 seconds (5 minutes). Pressing **ENTER** at any time during the pump warmup will stop the pump warmup and advance to the next screen.

```
Exp. Filter Mod:[1]
Flow Vacuum ET
<Warmup 300 sec>
```

NOTE: The vacuum pump will occasionally contain some residual vacuum from the previous sample run. Even a small amount of residual vacuum can prevent the pump from starting. If this occurs, disconnect the black air line from the side of the sampler lower stand and then plug it back in. This will release the residual vacuum and allow the pump to start again.

```
Exp. Filter Mod:[1]
Flow Vacuum ET
22.2 147.1 5
ENTER=Next
```

The next several screens display the flow, vacuum and elapsed time values.

```
Exp. Filter Mod:[1]
Flow Vacuum ET
<Storing Data>
```

The next several screens show the sample volume, flow average, coefficient of variation, temperature and barometric pressure values.

<p>Elapsed Time [1] 1448 minutes</p> <p>F4=More</p>
<p>Sample Volume [1] Volume=30.12</p> <p>F4=More</p>
<p>Flow Average and CV [1]AV=22.1 CV=0.1</p> <p>F4=More</p>
<p>Temperature AV=25.0 (C) MIN=24.3 MAX=26.1</p> <p>F4=More</p>
<p>Barometric Pressure AV=738.8 (mmHg) MIN=734.5 MAX=739.0</p> <p>ENTER=Done</p>

7.1.2 Replace Memory Card

Next, you will be prompted to replace the CompactFlash memory card. Press **ENTER** to continue.

<p>Replace controller's flash card.</p> <p>ENTER=Done</p>

The system will reset after the CompactFlash memory card has been replaced. The initial startup screen will be displayed for a few seconds.

<p>Checking Memory Card</p>

The software will check for the presence and status of the new CompactFlash memory card that has been installed.

<p>URG-3000N Sequential Particle Speciation System YYYY.MM.DD</p>

If the card is present and working properly "Card is OK" will be displayed.

<p>Checking Memory Card Card is OK</p>
--

7.1.3 Remove Exposed Filter Cassette Cartridge

The software will now advance to the next step of the Filter Change procedure.

You will be prompted to replace the expose filter cassette cartridge.

Press the top red motor control button to raise the solenoid manifold until the exposed filter cassette cartridge is accessible. Remove the exposed filter cassette cartridge as shown. Press **ENTER** to continue the filter change procedure.

<p>New Filter Mod:[1] Remove EXPOSED and Insert NEW filter.</p> <p>ENTER=Done</p>



Filter



Cassette Cartridge

7.1.4 Insert New

Locate the alignment hole on the new filter cassette cartridge. There is an alignment pin on the cyclone filter manifold to ensure that the filter cassette cartridge is installed properly. Press the bottom red motor control button to lower the solenoid manifold back into place until it stops. Press **ENTER** to continue the filter change procedure.



7.1.5 New Filter Identification

You will be prompted to enter the Q Number and the Comp ID number to identify the new filter cassette cartridge and store this data on the new memory card. Press **ENTER** to continue.

```

Q Number (New)
Q_
ENTER=Done
  
```

Q NUMBER: Some of the Q numbers include both alpha & numeric characters. You can enter letters via the Controller Keypad by pressing the F1 key several times. F1 will step forward through numbers 0-9 and then continue to step through letters A-Z. You can use the F2 key to go back to previous numbers and/or letters already passed when using F1.

```

Comp.ID Number (New)
I_
ENTER=Done
  
```

COMP ID: Most sampling networks prepare Standard Operating Procedures (SOP) that will include instructions for what should be referenced as the COMP ID number.

7.1.6 Vacuum Check/Manifold Check

Now, a manifold vacuum check will be performed and begin by reading the temperature and barometric pressure.

```

New Filter Mod:[1]
Flow Vacuum ET
<Reading Temp & BP>
  
```

The pump will warm up for 10 seconds.

```
New Filter Mod:[1]
Flow Vacuum ET
<Pump Warmup 10 sec>
```

The flow, vacuum and elapsed time values will be displayed. Sufficient vacuum indicates that the filter manifold is sealed.

```
New Filter Mod:[1]
Flow Vacuum ET
21.8 140.6 1
ENTER=Next
```

Selecting **ENTER** will return you to the Main Menu screen.

```
1/26/07 09:26PM WED
Next Samp: 01/27/07
Sampler is OFF
```

If there is not sufficient vacuum during the pump warmup, it will display <Low Vacuum>.

```
New Filter Mod:[1]
<Low Vacuum>
```

The flow, vacuum and elapsed time values will be displayed and the vacuum value will be significantly lower than what is considered acceptable.

```
New Filter Mod:[1]
Flow Vacuum ET
21.8 18.8 1
ENTER=Next
```

The next screen will display a WARNING that the vacuum is very low.

```
WARNING
Vacuum is very low!
Possible Filter Leak
```

Check the filter manifold to ensure that it is closed properly. Once it is determined that the filter manifold is closed correctly and completely, select **NO** to recheck the manifold vacuum.

```
WARNING
Assure Manifold
is Compressed
YES=Next NO=Recheck
```

You will now return to the first screen in Section 7.1.6. Follow the instructions exactly like you did the first time and at the end of this sequence you will return to the Main Menu screen.

```
1/26/07 09:26PM WED
Next Samp: 01/27/07
Sampler is OFF
```

If you want to ignore/bypass the warning about low flow, press **YES** on the WARNING page. This will also return you to the Main Menu screen

7.1.7 Completion

The filter change procedure is now completed. The software will return to AUTO MODE and will wait for the next scheduled sampling.

Refer to Appendix for a complete Filter Change Menu Map.

NOTE: After the sample has been collected, the sampler display will read “*Sample Completed*”. The software contains a “lock out” feature that prevents the collection of another sample until the site operator performs and completes the *Filter Change Procedure*. This prevents the sampler from collecting an additional sample onto the exposed filter from the previous sample run.

7.2 Filter Change for Collocated Module C

The filter change procedure for the Collocated Module C is done exactly the same way as the Module C. Follow instructions in Section 7.1 to perform a filter change on a Collocated Module C.

Select **Mod: 2** to perform the filter change procedure on the Collocated Module C. Press **ENTER** to continue.

```
Exp. Filter Mod:[2]
Flow Vacuum ET
21.8 140.6 5
ENTER=Next
```

7.3 Sampling with Stacked Filters

Refer to Section 4.9.1.1 of the Software section to navigate to the appropriate place in the software. This site configuration screen will allow you to select from Normal or Stacked Filter Configuration, as shown. When completed, press **ENTER** to complete the Site configuration process, and return to the fifth Main Menu.

```
Filter Configuration
1=Normal 2=Stacked
Current: 1
ENTER=Done
```


Section 8

Audit

Pressing ←F3 on the second Main Menu screen brings you to the Audit menu. The Audit menu allows you to choose between a Leak Check procedure, a Flow Rate Audit, a Temperature Audit, and a Barometric Pressure Audit. Pressing ENTER will return to the second Main Menu.

```
Audit          Mod:[1]
F1=Leak Ck    F2=Flow
F3=Temp.      F4=BP
                ENTER=Back
```

8.1 Leak Check on Module C

This section provides instructions for performing a leak check on the Module C. For instructions on how to perform a leak check on a Collocated Module C, refer to section 8.2.

8.1.1 Maximum Allowable Leak Rate

The maximum allowable Leak Rate for the URG-3000N is 2.5% of the nominal flow rate of 22Lpm. The internal volume of the Module C components is approximately 1.2 Liters. Therefore, the Leak Rate can not exceed approximately .55 Lpm. This is derived using the following equation.

$$\text{Leak Rate} = V * \Delta P / t * P_{\text{ATM}}$$

8.1.2 Audit Cassette Cartridge/Tray Installation

Each URG-3000N ships with a cassette cartridge/tray labeled "AUDIT", to be used during Leak Check and Audit procedures. Locate and install an Audit Cassette at this time. To do so, press the red "up" button on the Electronics box to release the current filter cassette. Insert this cassette properly, and press and hold the red "down" button on the Electronics box to install the Audit Cassette.

NOTE: If you have a Collocated Module C, you will still only have (1) AUDIT cassette cartridge that can be used on both the Module C and the Collocated Module C.

8.1.3 Beginning Leak Check

From the Main Menu, press the →F4 key to proceed to the second Main Menu, and press the ←F3 key to enter the Audit Menu. Press ↑F1 to begin the Leak Check procedure, displaying the screen on the right.

```
Leak Check    Mod:[1]
               NO=Cancel ENTER=Next
```

Select **Mod: 1** for doing the leak check on the Module C, and **ENTER** to begin.

```
Leak Check    Mod:[1]
Install flow audit
adapter(valve open)!
NO=Cancel ENTER=Next
```

8.1.4 Installing Flow Audit Adapter

You will then be prompted to install the flow audit adapter with the valve open. To do so, remove the Inlet Cap, as shown. Install the Flow Audit Adapter on top of the inlet with the Valve Open. Depending on the Flow Audit Adapter and Inlet Size, a reducer may be required (as shown below). A reducer is in use in the photo showing the Flow Audit Adapter installed.



8.1.5 Installing Pump Shutoff Valve

Next, the software will prompt for the Pump Shutoff Valve to also be installed inline with the pump enclosure. The photo below shows the appropriate steps to install the Pump Shutoff Valve (with Valve Open). Press **ENTER** to proceed.

```
Leak Check  Mod:[1]
Install pump shutoff
valve(valve open)!
NO=Cancel  ENTER=Next
```



8.1.6 Valves Open

Software screen will indicate that both valves should be open. The pump will now power on and the following screen will show a Vacuum value and a Time value. The timer will countdown for 15 seconds to reach maximum vacuum.

```
Leak Check  Mod:[1]
<Valve Open>
<Reading Temp & BP>
```

```
Leak Check  Mod:[1]
<Valve Open>
<Pump Warmup 10 sec>
```

```
Leak Check  Mod:[1]
<Valve Open>
Vac=148  Time=15
NO=Cancel  ENTER=Next
```

8.1.7 Closing Valves

The software will now prompt you to CLOSE the Flow Audit Adapter, which MUST be closed to achieve a vacuum. Press **ENTER** to continue. The software will then prompt to close the Pump Shutoff Valve. Press **ENTER** again to continue once both valves have been closed.

```
Leak Check  Mod:[1]
Close valve on flow
audit adapter!
NO=Cancel  ENTER=Next
```

The software will display values and countdown for 15 seconds to achieve maximum vacuum with the valves closed, as shown. At the end of this countdown, the Leak Check will be performed.

```
Leak Check  Mod:[1]
<Valve Closed>
Vac=655    Time=15
NO=Cancel  ENTER=Next
```

```
Leak Check  Mod:[1]
Close pump
shutoff valve!
NO=Cancel  ENTER=Next
```

8.1.8 Performing Leak Check

The Leak Check is now being performed. The pressure will begin to drop, and when it reaches 380 mmHg, a timer will count for 35 seconds, while vacuum statistics are shown.

```
Leak Check  Mod:[1]
<Leak Check>
Vac=655    Time=1
NO=Cancel
```

The Vacuum can not lose more than 225 mmHg pressure in 35 seconds or the test will fail, as shown on the right. The timer will stop counting when the test has failed. If the leak check fails, refer to section 10.3 for troubleshooting.

```
Leak Check  Mod:[1]
Max  Min  Diff  Time
380   81   299   4
FAILED      ENTER=Done
```

The second screen to the right shows that the Leak Check passed. Press **ENTER** to finish.

```
Leak Check  Mod:[1]
Max  Min  Diff  Time
380   301  79    35
PASSED      ENTER=Done
```

8.1.9 Completing Leak Check

The Leak Check is now complete, and the screen to the right will be shown. (This will also be shown if the leak check is cancelled at any time.)

```
IMPORTANT
Open Both Valves
Release Vacuum
Slowly
```

At this time, OPEN the valve on the Flow Audit Adapter FIRST, and then remove the Pump Shutoff Valve the same way it was installed. Replace the Inlet Cap on top of the Inlet Tube.

```
IMPORTANT
Remove flow audit
adapter and pump
shutoff valve.
```

After the IMPORTANT messages, the option will be given to save the audit results. Press **YES** to save

```
Save audit results
to memory card?
YES=Save  NO=Cancel
```

The next screen will confirm that the audit results have been saved to the memory card. Press **ENTER** to return to the Audit Menu.

```
Audit results saved
to memory card

ENTER=Next
```

8.2 Leak Check on Collocated Module C

The leak check of the Collocated Module C is done exactly like the same as the Module C. Follow the instruction in section 8.1 to perform a leak check on the Collocated Module C.

From the Main Menu, press the **→F4** key to proceed to the second Main Menu, and press the **←F3** key to enter the Audit Menu. Press **↑F1** to begin the Leak Check procedure, displaying the screen on the right.

```
Leak Check   Mod:[2]

NO=Cancel  ENTER=Next
```

Select **Mod: 2** for doing the leak check on the Collocated Module C, and **ENTER** to begin.

8.3 Flow Audit

Pressing **↓F2** at the Audit Menu will bring you to the Flow Check procedure. A warning will be shown reminding you that a leak check should be performed before an audit.

```
WARNING
A leak check should
always precede an
audit.
```

At the following screen, press **YES** to continue.

```
WARNING
Continue with flow
audit?
NO=Back YES=Continue
```

Initially, gain and offset will be shown, and you will be prompted to connect a flowmeter. Press the **ENTER** key to continue.

```
Audit Flow   Mod:[1]
Gain=6.000 Off= 0.00
Connect Flowmeter!
ENTER=Next
```

The pump will warm up for 300 seconds (5 minutes). Pressing **ENTER** at any time during the pump warmup will stop the pump warmup and advance to the next screen.

```
Audit Flow   Mod:[1]
Raw   Flow   Vacuum
<setting flow>
```

Following warm-up procedures, the next screen will show the DAC raw values, the flow rate, and the vacuum stats. Press **ENTER** to proceed to the next step.

```
Audit Flow   Mod:[1]
Raw   Flow   Vacuum
<Pump Warmup 300sec>
```

At this point, you will be prompted for reference flow in LPM. The digit keys can be used to enter the value, and press **ENTER** to continue.

```
Audit Flow   Mod:[1]
Raw   Flow   Vacuum
3052  21.95  147.9
ET=5      ENTER=Done
```

```
Audit Flow   Mod:[1]
Raw   Flow   Vacuum
3052  21.95  147.9
Ref. Flow(LPM):?
```

Next, a results screen will show the sampler's flow rate, the reference flowmeter's flow rate and the difference. Press **ENTER** to continue.

```
Samp.   Ref.   Diff.
21.95  22.00  -0.05

ENTER=Next
```

The next screen prompts you to save audit results to memory card. Press **YES** to save these results, press **NO** to cancel.

```
Save audit results
to memory card?

YES=Save NO=Cancel
```

When audit results have been saved, press **ENTER** to return to the Audit Menu.

```
Audit results saved
to memory card.

ENTER=Next
```

8.4 Temperature Audit

Pressing **←F3** on the Audit Menu brings you to the Temperature

Audit screen. You are prompted to enter the Reference Temperature. Pressing the **↑F1** key will toggle between positive and negative values whereas pressing **↓F2** will toggle Celsius/Fahrenheit. Press **ENTER** to accept the entered value.

```
Audit Temperature
Temperature(C)= 25.4
F1: +/-      F2:C/F
Ref. Temp(C):?
```

The following screen will display the results for the sampler's temperature, reference temperature and the difference, in Celsius and Fahrenheit. Press **ENTER** to proceed.

```
C/F Samp. Ref. Diff.
C   25.4 25.0 0.4
F   77.7 77.0 0.7

ENTER=Next
```

The next screen prompts you to save the audit results. Press **YES** to save the results or **NO** to cancel them.

```
Save audit results
to memory card?

YES=Save NO=Cancel
```

The next screen will confirm that the results have been saved to the memory card. Press **ENTER** to return to the Audit Menu.

```
Audit results saved
to memory card.

ENTER=Next
```

8.5 Barometric Pressure Audit

You are prompted to enter reference Barometric pressure in mmHg. Pressing **↑F1** will toggle positive/negative values, and the **BKSP** key can be used to make any corrections.

```
Audit BP
BP (mmHg)= 643.9
Ref. BP(mmHg):?
```

The following screen displays the sampler's BP, the reference BP, and the difference. Press **ENTER** to continue.

Samp.	Ref.	Diff.
643.9	645.0	-1.1

ENTER=Next

The following screen will prompt you to save audit results to the memory card. Press **YES** to save the results or **NO** to cancel.

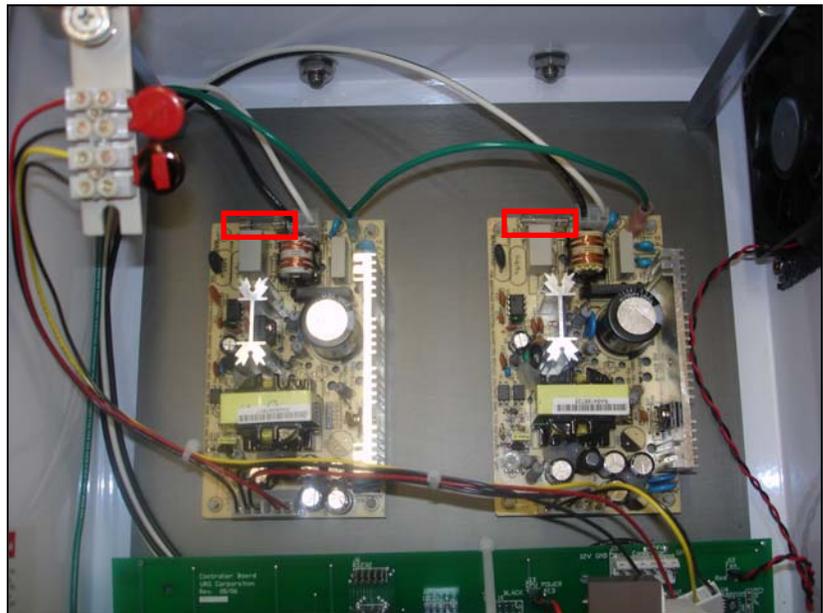
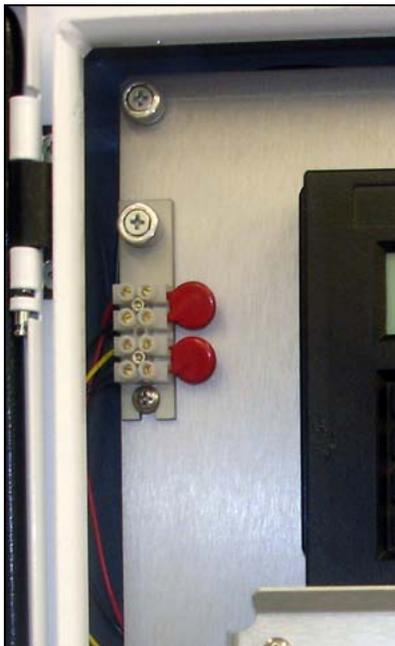
Save audit results to memory card?
YES=Save NO=Cancel

The next screen will confirm that the results have been saved to the memory card. Press **ENTER** to return to the Audit Menu.

Audit results saved to memory card.
ENTER=Next

9.1 Replacing Fuses/MOVs

On the front of the controller, to the top-left of the Keypad/Display, there are two Metal Oxide Varistors (MOVs). The top MOV is a P18Z3 for the 12-volt power supply, as noted by the red and black wires that lead to it. The bottom MOV is a P33Z5 for the 24-volt power supply, as noted by the yellow and black wires that lead to it. If these become damaged, it may be necessary to replace them. Additionally, inside the controller, behind the protective plate, each board shown below has a 4A 250vAC fuse on the top left that may need to be replaced.



If these fuses have been damaged for any reason, one of the following may occur:

- Display Not Shown
- Pump Not Operating
- Electronics Box buttons not operating

If fuses/MOVs have been damaged and replaced and URG-3000N is still not operational, contact URG for further assistance.

9.2 Manually Move Solenoid Manifold

To manually move the solenoid manifold, follow the steps below. Note that you can remove the solenoid manifold completely for servicing by lowering it fully using the wheel.

- Grasp the motor to the right of the solenoid manifold firmly and pull downwards.
- Next, grasp the motor and swing it to the left, as shown in the second photo.
- You can now use the large wheel located above the solenoid manifold to manually raise and lower the Solenoid Manifold.



9.3 Electronics Box

The black box located at the bottom-right of the Module C is known as the Electronics Box. This box contains the electronics that control the Solenoid Manifold. To remove it for servicing, follow the steps below.

- First, remove the vacuum sensor tube by pressing in the quick-release adapter and lifting at the same time. Next, reach behind it to remove the motor control cable by twisting the metal nut counter-clockwise.
- Then, remove the 12-pin controller cable from the bottom of the Module C (which is connects through to the electronics box).
- Then, unscrew the two gold-colored bolts in the front of the electronics box, as shown to the left.
- The electronics box can now be removed, as shown.



9.4 Cyclone Removal

In order to remove the Cyclone, you must first release the filter cassette by pressing the red “up” button on the electronics box. Refer to Section 7.1.3 to remove the filter cassette cartridge. After removing the filter cassette remove the black electronics box. Note that the box does not have to be completely removed, but it is recommended for ease of Cyclone Removal.

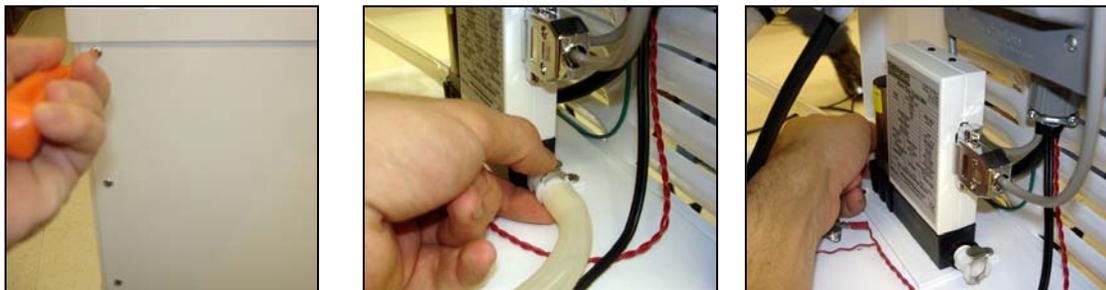
Proceed by unscrewing the ring that connects the cyclone to the inlet tee, as shown below. Then, lift up and carefully remove the cyclone and cassette manifold body.



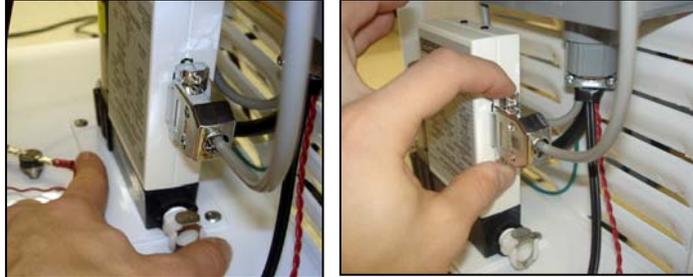
9.5 Mass Flow Controller (MFC)

The Mass Flow Controller can be removed from the Pump Enclosure by following the directions below.

- Remove the six (6) small screws from the front panel. The door will slide down and off.
- Remove the hose that connects to the front of the MFC (and runs to the Airline port on the enclosure wall), as shown.



- Remove the hose that connects to the rear of the MFC (and runs to the pump inlet), as shown.
- Unscrew the two (2) flathead screws to loosen, and then remove, the MFC data cable.
- Unscrew the two Philips screws on the MFC base plate. This plate will then lift out with the MFC attached. If MFC needs to be replaced/repared, save mounting plate separately to avoid accidental discard.



9.6 Pump Removal

The 120V Pump inside of the Pump Enclosure may need to be serviced or replaced. To remove the Pump, follow the steps below.

- Remove the four nuts on the bottom of the Pump Enclosure, shown below (side view).
- Disconnect the hose that runs from the Mass Flow Controller to the pump, on the MFC end.
- Disconnect the Outlet Hose that runs from the pump through the bottom of the pump enclosure. To do this, pull the hose out from the hole, bend slightly, and gently twist the connector and hose until removed.
- Unplug the power from the top outlet of the power terminal inside the pump enclosure.
- Carefully lift the pump out of the base of the pump enclosure. Be aware that the pump is quite heavy and may take two hands to hold firmly.



9.7 Optional Pump Enclosure Heater

The installation of a Pump Enclosure Heater is recommended for cold-weather environments.

Shown on the right are the four mounting brackets on the wall of the enclosure that the heater mounts on. The other photo is an example of the available heaters that can be installed in the URG-3000N. Contact URG for more information about purchasing a heater.



Section 10

Troubleshooting

10.1 Display Not Shown

If the URG-3000N display is blank, first check the power (Section 10.1), then check Fuses (Section 9.1).

10.2 No Power

Follow these steps to attempt to resolve the lack of power to the URG-3000N. If this does not help, contact URG for further assistance.

- Check that the Power Cable running to the Stand Pump Enclosure is properly plugged in an outlet.
- Attempt to use in another device in the outlet the URG-3000N is using to determine if AC power is available.
- Check inside the Pump Enclosure to ensure that the Pump is plugged into the top outlet of the power terminal, and that the Optional Enclosure Heater is plugged into the bottom outlet.
- If Power

10.3 Leak Check Failed

If a Leak Check (Section 8.1) has failed, the following steps may help to determine where the leak is occurring.

- Reseat the Audit Cassette Tray and re-attempt Leak Check.
- Replace the Audit Cassette Tray with an alternate and re-attempt Leak Check
- Inspect O-rings on cyclone manifold for tears or other damage. If found, contact URG.
- Inspect Temperature Probe plug O-rings for tears or other damage.
- Inspect O-rings in Inlet Tee for tears or other damage.

If damaged O-rings have been found, or none of these steps have resolved the Failed Leak Check, please contact URG for further assistance.

10.4 Removing Exposed Filter Cartridge Without Installing a New One

There may be some instances that require the exposed filter cassette cartridge and the memory card to be removed **WITHOUT** installing the new ones because they are not available yet.,

Follow the portion of the *“Filter Change Procedure”* detailed in section 7.1.1

After completing **ONLY** the instructions in section 7.1.1, you can remove the memory card and the exposed filter cassette cartridge. Do **NOT** proceed any further through the “*Filter Change Procedure*” until you return to the sampler with the **NEW** filter cartridge and memory card.

Upon arriving with the new filter cartridge and memory card, immediately insert the new memory card.

The software should pick up exactly where it left off. If it does not, turn the Controller Module power off and then back on (by unplugging the cord). This should allow you to continue through the rest of the “*Filter Change Procedure*”.

10.5 Prevent Sampler from Collecting Sample on Previous Exposed Filter

There may be instances when the sampler is scheduled to collect a new sample before the site operator has removed the previous filter cassette cartridge and memory card.

After a sample has been collected, the sampler display will read “*Sample Completed*”. The software contains a “lock out” feature that prevents the collection of another sample until the site operator performs & completes the *Filter Change Procedure*. This prevents the sampler from collecting an additional sample onto the exposed filter from the previous sample run.

10.6 Pump Will NOT Start During Filter Change Procedure

The vacuum pump will occasionally contain some residual vacuum from the previous sample run. Even a small amount of residual vacuum can prevent the pump from starting. If this occurs, disconnect the black air line from the side of the sampler lower stand and then plug it back in. This will release the residual vacuum and allow the pump to start again.

Section 11

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