

URG 3000N

Sequential Particle Speciation System



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1

CAUTIONS and NOTICES

1.1 AC Power Warning

CAUTION 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

Instrument Specifications for the Semi-Volatile Organic Aerosol Sampler

Operating Temperature	-20° to 45° Celsius
Weight (Stand, Controller, Module C)	61.4 kg (135 lb)
Minimum Power Requirements	(1) Dedicated 15 amp, 115 VAC Outlets

May require additional heating equipment to operate at extremely low temperatures. See Pump Enclosure Heater on page 75 for more information.

1.3 Initial Assembly

The URG-3000N should be assembled where it will be operated.

1.4 Weight

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

2

INTRODUCTION

2.1 Purpose of this Manual

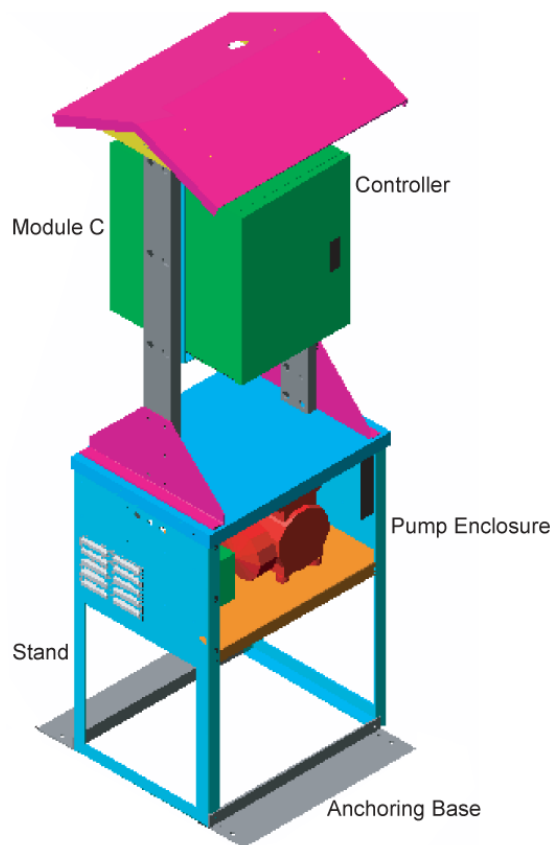
The purpose of this manual is to document the specifications for the URG-3000N, operating instructions and sampling protocols and limits for using the URG-3000N.

2.2 Introduction

A drawing of a URG-3000N Sequential Particulate Speciation System is shown. 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 Optics Analysis Method (TOA).

2.3 URG-3000N Overview

The standard URG-3000N Sequential Particulate Speciation System configuration is shown. 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.

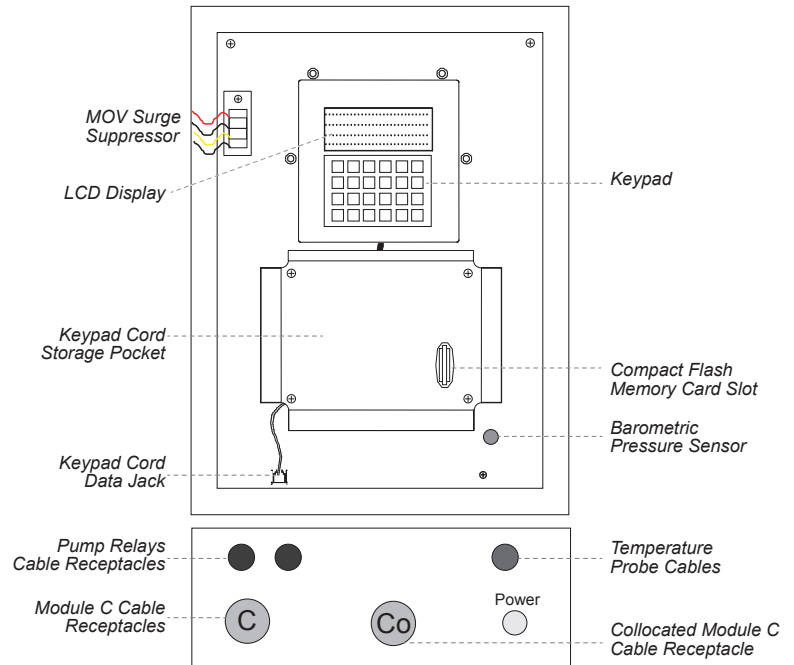


2.4 Controller Overview

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 electronics 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 a sampler module. When left in the Controller, the cord is contained in a 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 Compact Flash memory card.

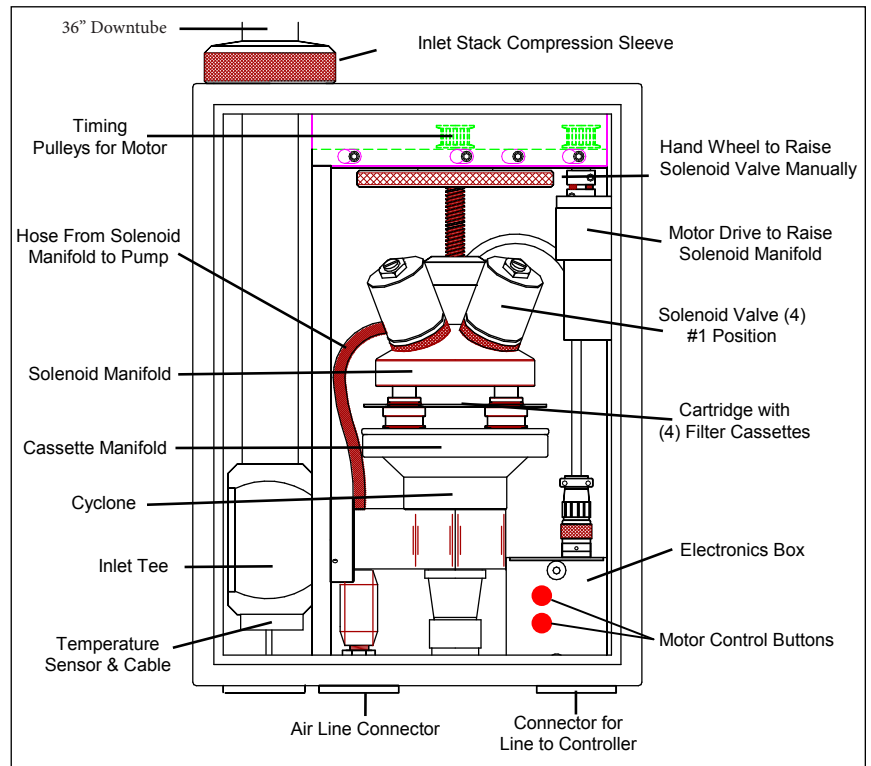


2.5 Module C Overview

The inside of a URG-3000N Sequential Particulate Sampler Module C and the flow diagram for the URG-3000N Module are shown below.

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 $15\ \mu\text{m}$. The air stream then passes through a cyclone that removes particles larger than $2.5\ \mu\text{m}$. 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 $2.5\ \mu\text{m}$ at the nominal flow rate of 22.0Lpm. 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.

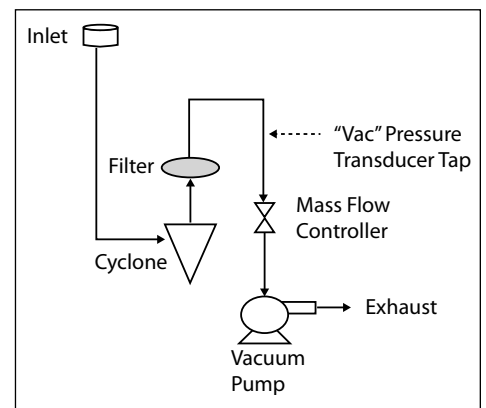


Mass Flow Controller

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 Mass Flow Controller (MFC) on page 73.

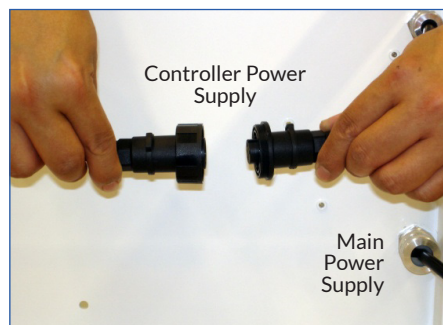
Filter Cassettes and Cartridges

The filter cassettes and cartridges are manufactured specifically for the URG-3000N sampler. They are made of acetyl homopolymner 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.



Pump Enclosure Bottom

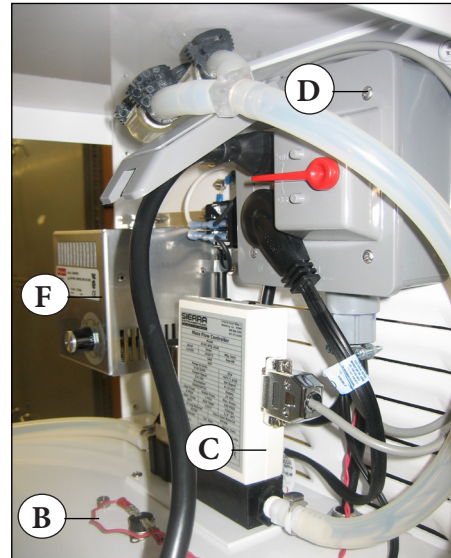
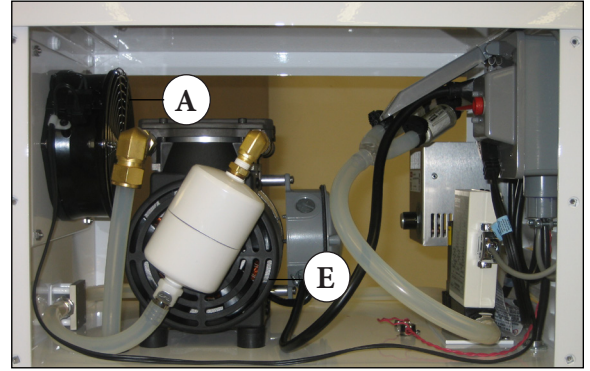
Pump Enclosure

Shown is a photo of the inside of the pump enclosure, part of the URG-3000N stand. The additional photos show a close-up of the sidewall. The components located inside the enclosure are labeled and listed below:

- A. **Fan:** The Pump Enclosure Fan is used to regulate the temperature within the enclosure.
- B. **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.
- C. **Mass Flow Controller:** The Mass Flow Controller is located on a bracket within the pump enclosure. For brief information see Mass Flow Controller (MFC) on page 12 and for service instructions see Mass Flow Controller on page 73.
- D. **Power Terminal:** Behind 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 The red lever is a dummy lever and does not perform any function.

- E. **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. Service details can be found in Pump Removal on page 74.
- F. **Enclosure Heater (Optional):** An optional Enclosure Heater is available for usage with the URG-3000N in colder environments. Installation instructions can be found in Pump Enclosure Heater on page 75.



3

INSTALLATION

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

3.1 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)
 - Audit cassette cartridge tray
- Inlet Cap
- Roof Flashing for Inlet
- Copy of inspection and status checklist

Collocated Module C Box (Optional)

- Collocated Module C
- 66" 12-pin Extended Control Cable for attaching Collocated 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 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

Collocated Stand Box (Optional)

- 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

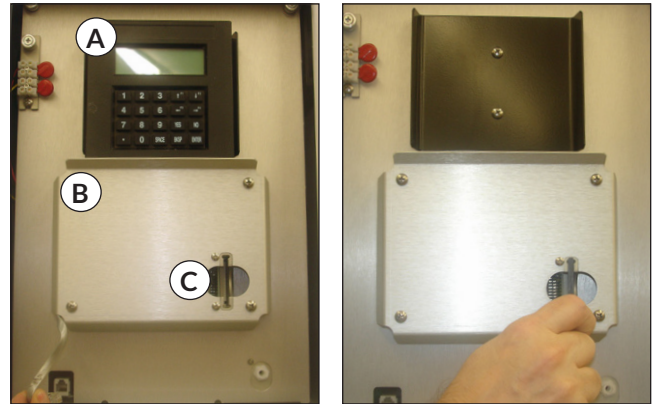
NOTE This packing list may not be all inclusive and additional components may or may not be included/shipped differently.

3.2 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.

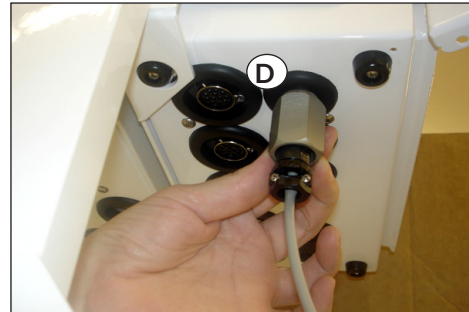
Keypad & Memory Card

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



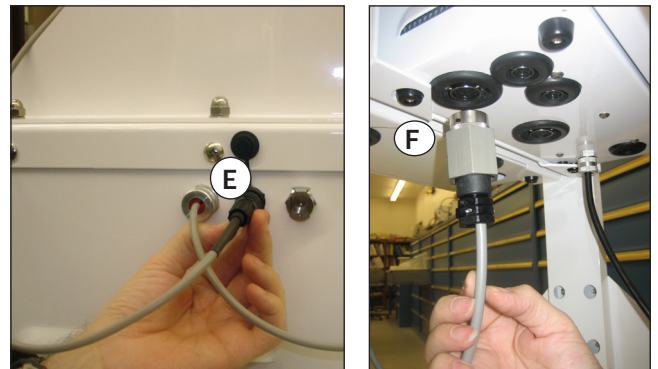
Pump Relay Cable

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 (see D).



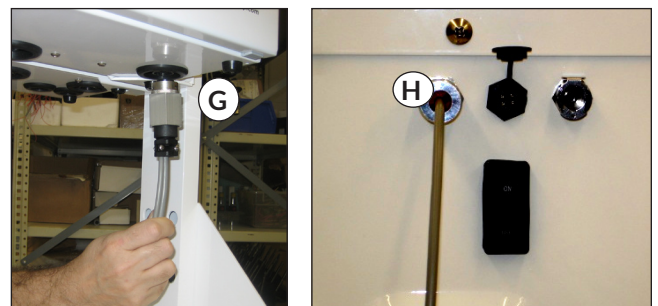
Controller Cable

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 (see E). 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 (see F). 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.



Air Line

The Air Line is a 30" black cable with Colder fittings at each end. It connects to the Module C (see G) and then to the pump enclosure (see H).



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 below for more details.

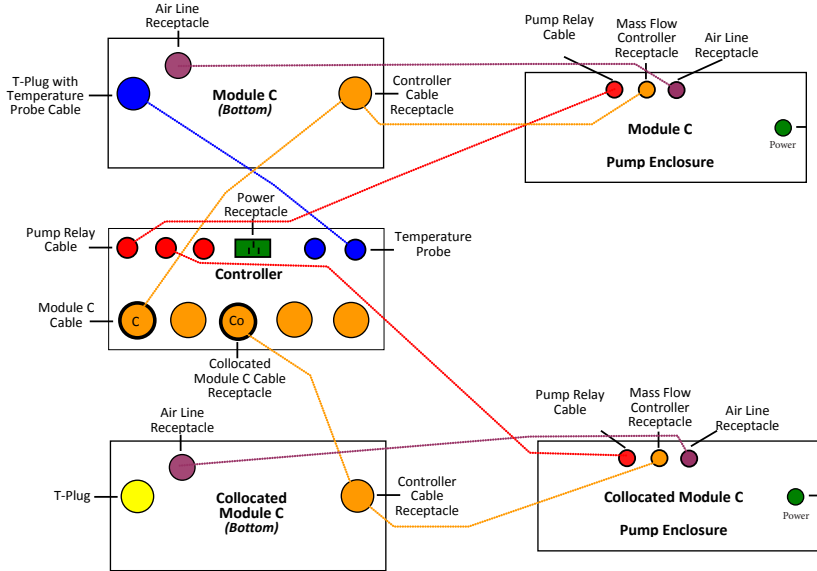
Collocated Module C (optional)

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.

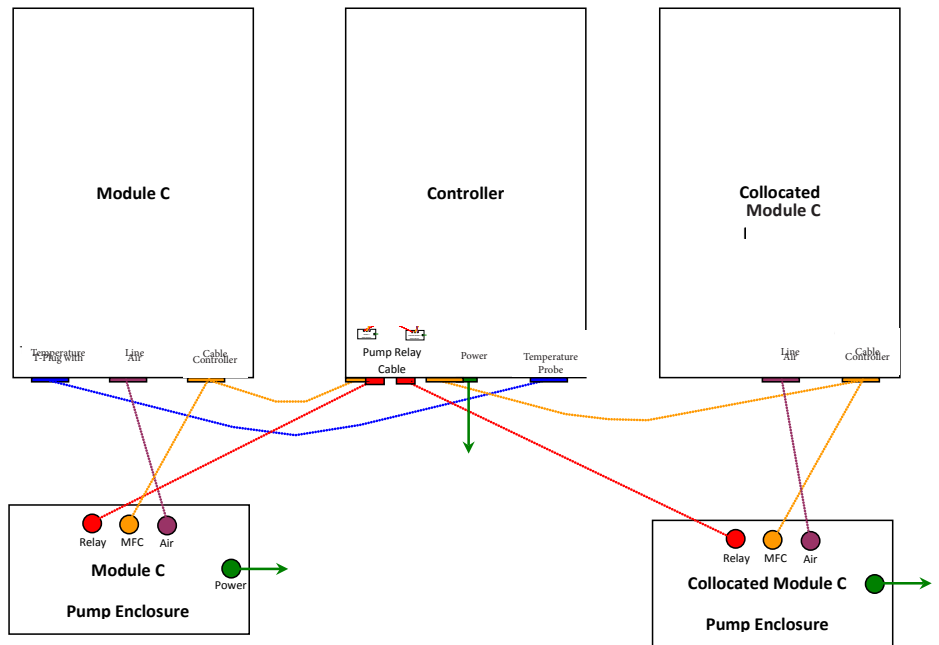
Bottom-View Wiring Diagram

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 fronts of the Controller, Module C, or Collocated Module C are facing up.

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



Front-View Wiring Diagram



3.3 Assembling the URG-3000N Stand

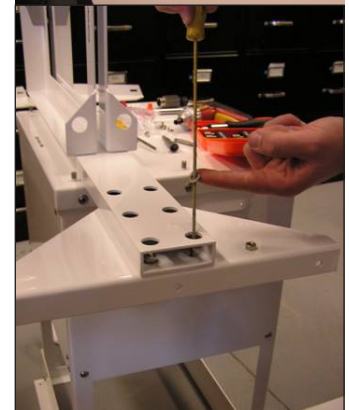
Upper Stand & Rain Shield Assembly

1. Install one roof support to the roof with (6) stainless steel nuts with integrated lock washers and tighten.

2. Install both H-body base supports with (12) stainless steel washers and nuts.
3. 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.

4. Turn the H-body over far enough that the washer does not slide off and the stainless steel 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.

5. Install the second roof support on the H-body. H-body should look like the image shown.



Roof Assembly Installation

1. Line up all the studs with the holes and press fit everything together. Assembly should look like the image shown.
2. Install and tighten all connectors. The roof connector nuts require an 11/32" open end wrench to access the studs at the peak.
3. 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.



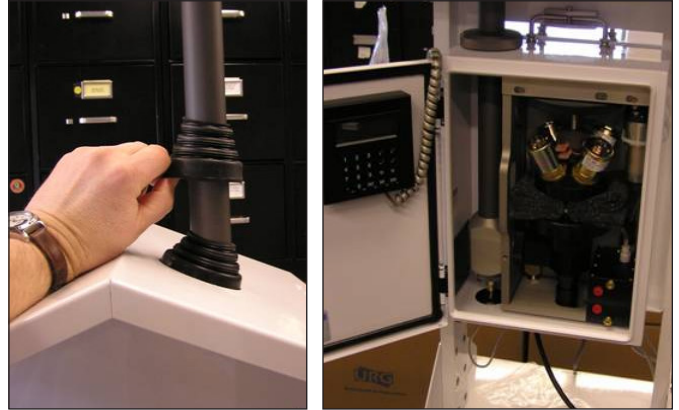
Controller & Module C Installation

1. Hang the Controller on the side labeled "Controller Side."
2. Install feet first into the precut holes.
3. Loosen the stainless steel cap screw to allow the Controller carrying handle to clear the cap screw and slide into the receiver.
4. Hand-tighten the cap screw so the Controller is captive.
5. Repeat the process for the Sampler Module.
6. Install the (6) stainless steel acorn nuts and washers on the H-body base studs.
7. Use the supplied Loctite on the studs at this time, then tighten all nuts.



Inlet Installation

1. Slide the inlet tube into the roof jack, then into the Sampler Module.
2. 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.
3. Slide the roof jack mate onto the tube into contact with the roof jack creating a weather proof seal.
4. 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.

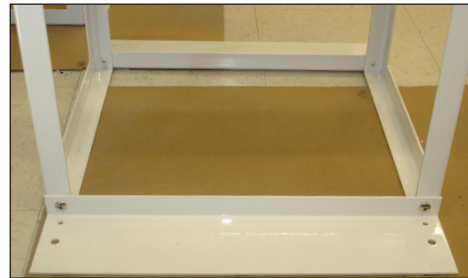


Support Feet Installation

The mounting feet are installed in the wrong direction to allow for easier shipping. The figure 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) 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 to the right. There are (4) holes 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.

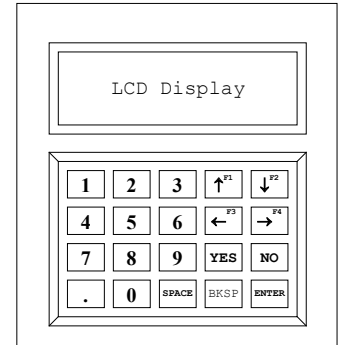


4

SOFTWARE

4.1 Introduction

The display terminal is shown in detail. The LCD has 4 lines that display 20 characters each. The keys/buttons consist of number **0** through **9**, **Decimal**, **SPACE**, **BKSP** (backspace), **↑F1**, **↓F2**, **←F3**, **→F4**, **YES**, **NO**, and **ENTER**. Keys will generally be shown in bold throughout the software section.



General Key Usage

The **ENTER** key is generally used to proceed to the next main step or to return to a previous menu. The **→F4** or **ENTER** keys are used to move to the next or previous screens. The **NO** key usually acts as an escape key when possible.

NOTE Number Key **1** and **2** will select either 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.

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). Current Status Screens on page 29 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.

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

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.

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.

```
12/20/06      04:00pm WED
Next samp: COMPLETED
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.

Authentication

The screen is still included in the menu tree, but there is no longer a password associated with it. You can simply press the **ENTER** key to proceed.

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

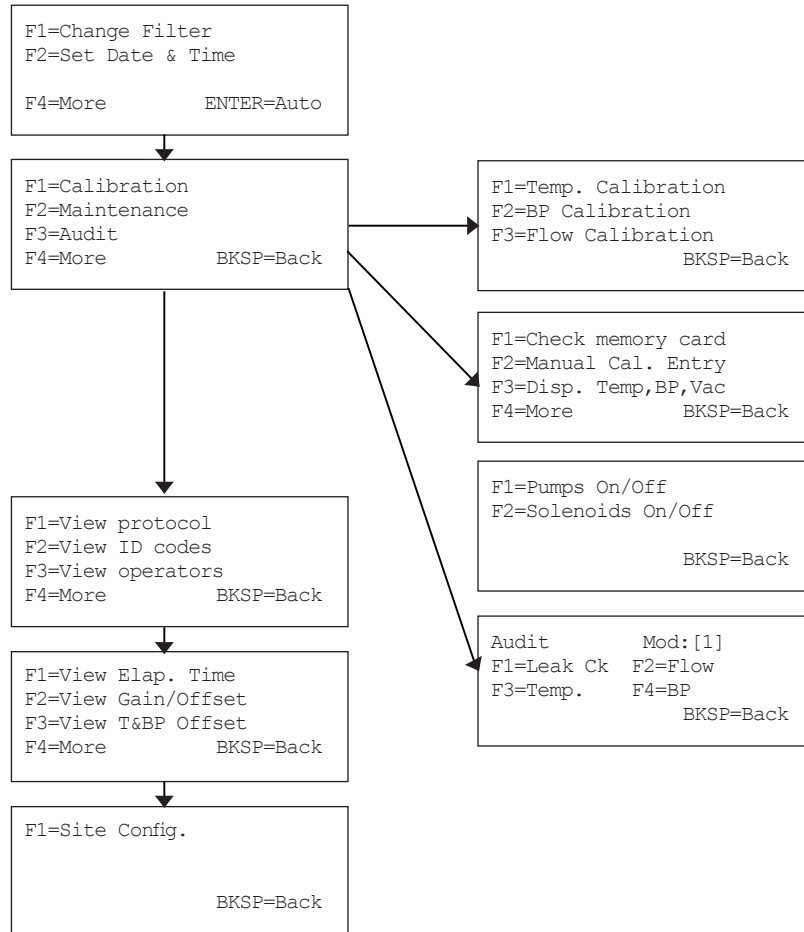
Select/Modify Operator

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 **ENTER** key corresponding to the initials. To change the operator initials, select the **→F4** key. 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 page 37 for a complete software menu map.



4.5 Main Menu

A. Main Menu (1 of 5)

Change Filter

The first Main Menu screen allows you to Change Filter, Set Date & Time, and progress to the next Main Menu screen by pressing →**F4** key for more options.

NOTE 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

F4=More          ENTER=Auto
```

Change Filter

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

Refer to the "Filter Change" section on page 56 for detailed instructions on how to perform a filter change.

Refer to page 37 for a complete filter change software menu map.

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

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. Pressin ↑**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
YES=Save changes
```

B. Main Menu (2 of 5)

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.

Calibration

Pressing the ↑**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=Calibration
F2=Maintenance
F3=Audit
F4=More          ENTER=Back
```

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

Maintenance

After pressing ↓**F2** to enter the Maintenance Menu, the options shown will appear. Maintenance allows you to Check Memory Card status, Manually Enter Calibration Information, and Display Temperature, Barometric Pressure and Vacuum, as well as control the pumps and solenoids.

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

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

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

Check Memory Card

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

If the Memory Card is properly inserted in the URG-3000N and properly formatted, a "Card is OK" message will appear for an instant. If not, a "Card not found" message 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
```

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

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.

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. Pressing **ENTER** will return you to the Maintenance Menu.

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

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

Display Temperature, Barometric Pressure, Vacuum

Pressing ←**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
```

Pumps On/Off

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

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

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 BKSP will return you to the Maintenance Menu.

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

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
```

Leak Check

Pressing ↑F1 key at the Audit Menu will bring you to the Leak Check procedure.

NOTE 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]
YES=Cont   NO=Cancel
```

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

Refer to Leak Check on Module C on page 64 for more details.

Flow Audit

Pressing ↓F2 key 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. Refer to page 66 for more details.

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

Temperature Audit

Pressing ←F3 key at the Audit Menu will bring you to the Temperature Audit screen. Refer to page 67 for more details.

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

Barometric Pressure Audit

Pressing →F4 key at the Audit Menu brings you to the Barometric Pressure Audit screen. Only one decimal place is allowed for input. Refer to page 67 for more details.

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

C. Main Menu (3 of 5)

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

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.

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

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

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 or 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
```

View Operators

Pressing **→F4** at the third Main Menu will allow you to view the Operator Initials currently stored. This screen only allows you to view operator, not change operators or edit operator information.

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

D. Main Menu (4 of 5)

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 **BKSP** key will return to the third Main Menu.

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. Pressing **BKSP** will return to the fourth Main Menu.

```
F1=View Elap. Time
F2=View Gain/Offset
F3=View T&BP Offset
F4=More          BKSP=Back
```

```
Elapsed Time
[1] 25 minutes
[2] 25 minutes
                    BKSP=Back
```

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 **BKSP** will return to the fourth Main Menu.

```
Gain  Offset
[1] 6.000 0.010
[2] 0.000 0.000
                    BKSP=Back
```

View Temperature and Barometric Pressure Offset

Pressing **←F3** at the fourth Main Menu brings you to the View T&BP (Temperature and Barometric Pressure) Offset screen. This shows the Temperature and Barometric Pressure values for any connected modules. Pressing **BKSP** will return to the fourth Main Menu.

```
Offset:   BP      Temp
          12      41
F3=View T&BP Offset
                    BKSP=Back
```

E. Main Menu (5 of 5)

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.
                                     BKSP=Back
```

Site Configuration

Pressing **↑F1** at the fifth Main Menu begins the Site Configuration process. The first screen of the Site Configuration prompts you for a Location Code. After entering the proper code with the digit keys, press **ENTER** to continue.

```
Location Code
000000000
                                     ENTER=Next
```

The next screen prompts you for the sampler Serial Number. Enter the serial number on the Controller module here.

```
Serial Number
0000
                                     ENTER=Next
```

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=Next
```

The next screen allows you to choose a sampling schedule. Here, the options shown are 1:1 in 3 [days], 2:1 in 6 [days], 3: IMPROVE, 4: Sequential, 5: Flex. By selecting 3: IMPROVE, the samples will be collected following the IMPROVE sequential sampling protocol. The currently selected schedule is also displayed. Press **ENTER** to advance to the next screen.

```
Select Schedule
1: 1 in 3  2: 1 in 6
3: IMPROVE 4:SEQ 5:Flex
Sched=1   ENTER=Next
```

Sampling Interval allows you to change the time in minutes at which data is logged to the flash card. 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=Next
```

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 intervals if necessary. Press **ENTER** to continue.

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

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
```

4.6 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 file names include c0000105.299, a0000105.299, or r0000106.008.

NOTE Files beginning with a "c" are calibration logs, "a" are audit logs, "f" are filter change, and "r" is sample data. An example of the headers from each type of data log file (with text wrap) is shown below. Values would be listed below.

r file:

```
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 NUM ET ETT ETA FIL BF VERSION
```

f file:

```
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 NUM ET ETT ETA
BF FIL VERSION
```

a file:

```
SN LOCATION_NUM Q_NUMBER COMP_ID_NUMBER CalDate CalTime TEMP ATEMP
Pres APres Flow AFlow MaxVac MinVac Diff Sec Leak OPI BF Version
```

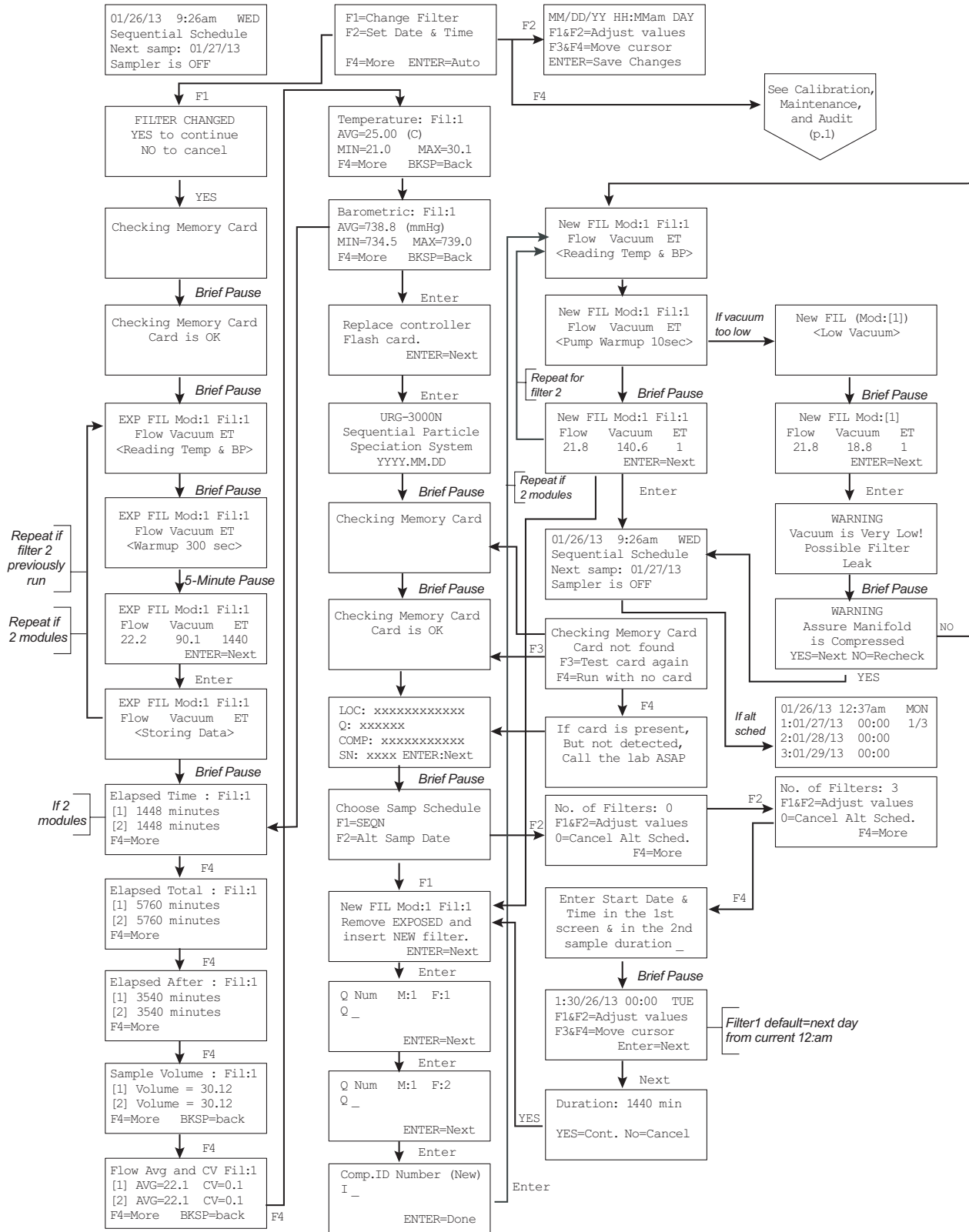
c file:

```
SN LOCATION_NUM Q_NUMBER COMP_ID_NUMBER CalDate CalTime TEMP Baro
VsetP1 MFout2 VserP2 MFout1 VsetP3 MFout3 Gain Offset OPI BF VERSION
```

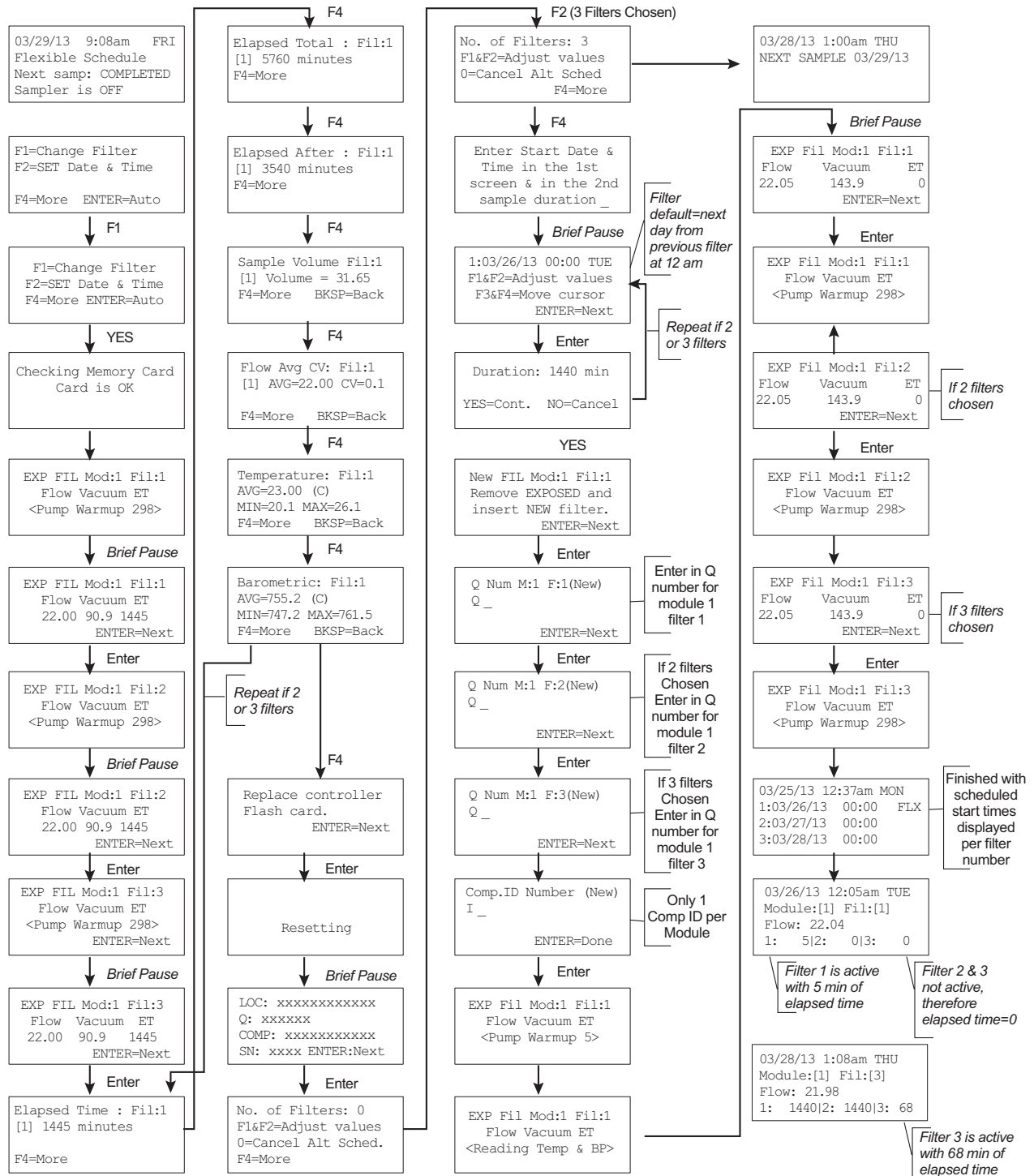
4.7 Cheat Codes

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

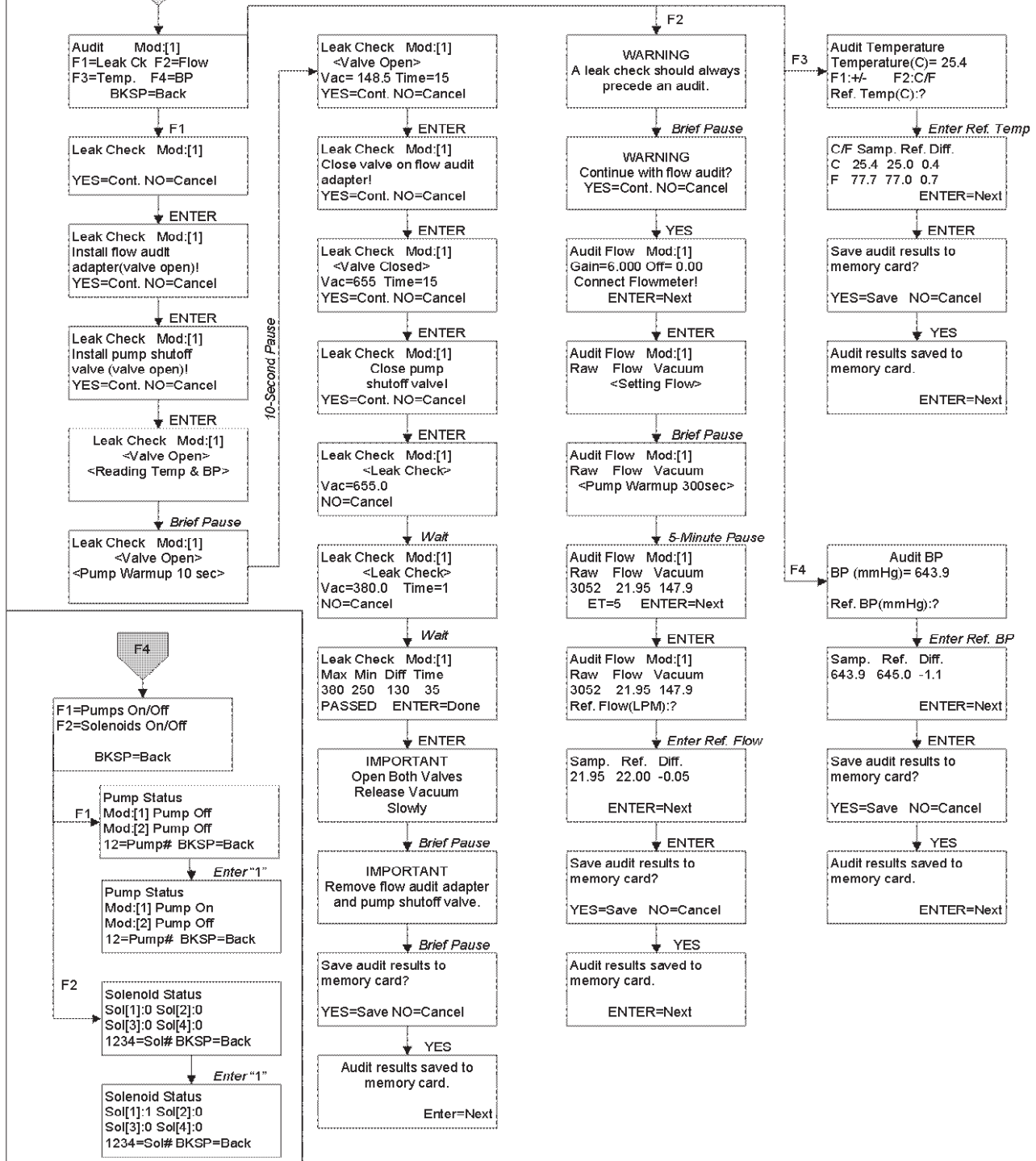
Filter Change and Scheduling for 1/3, 1/6 and Alt



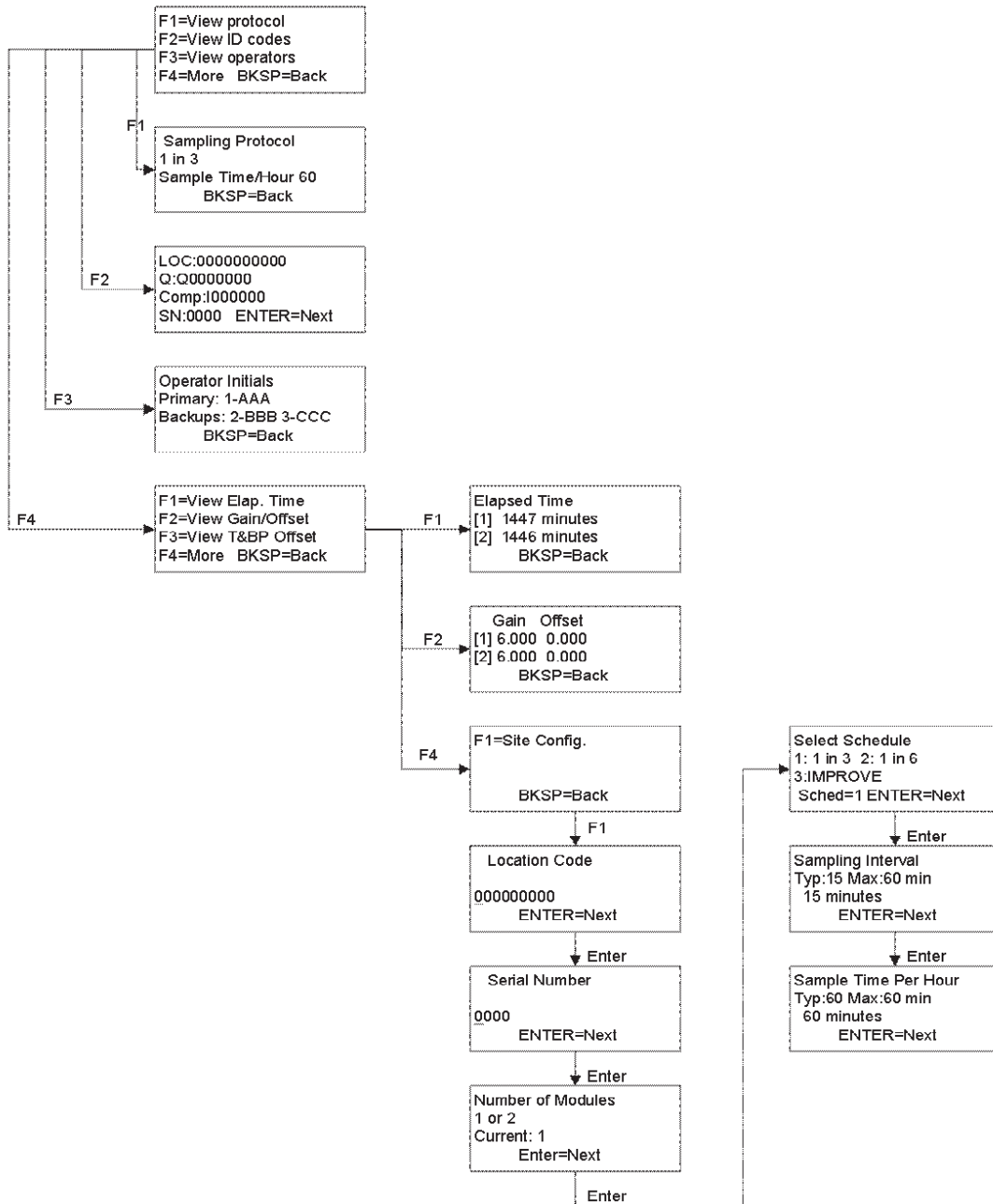
Filter Change and Scheduling for Flexible Schedule



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



View Settings, Site Configuration



5

STARTUP

5.1 Startup

The procedures below will show how to start up the URG-3000N:

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. The date will display in YYYY.MM.DD.

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

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.

```
Check Memory Card
Card is OK
```

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: 000000000
Q:Q000000Q
Comp:|000000|
SN:0000      Enter:Skip
```




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 left. Refer to page 37 for a complete temperature calibration software menu map. It displays the current DAC Raw values, Offset, and Temperature in Celsius and Fahrenheit. Pressing **SPACE** allows you to proceed with temperature calibration.

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

You are now able to enter the positive or negative (toggled by **↑F1**) temperature value from your NIST traceable reference method device by reusing the digit keys Celsius or Fahrenheit (toggled by **↓F2**). Use the **BSKP** 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. 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 Barometric Pressure calibration. Refer to page 37 for a complete barometric pressure calibration software menu map. Initially, the screen shown to the right will display Raw, Offset, and Barometric Pressure 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 Barometric Pressure value from your NIST traceable reference method device in mmHg by using the digit keys. **↑F1** / **↓F2** will change between positive and negative values. Use the **BSKP** 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.

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 page 37 for a complete flow calibration software menu map.

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.

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

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

The mass flow controller will warm up for a few seconds.

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

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

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.

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

```
Calibration  Mod:[1]
NO=Back      ENTER=Next
```

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

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

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

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

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

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

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

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

```
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 points.

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:2
Gain=0.000 Off=0
Correlation= 0.00
          SAVED
```

```
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 the instructions on page X 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
```

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 on page 78.

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

```
F1=Change Filter
F2=Set Date & Time

F4=More          ENTER=Auto
```

Exposed Filter Values

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

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

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

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

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

The data is stored to the CompactFlash card.

```
Elapsed Time Fil:1
[1] 1448 minutes
[2] 1448 minutes
F4=More
```

Elapsed Time Total indicates time elapsed between install and pickup.

```
Elapsed Time Total Fil:1
[1] 5760 minutes
[2] 5760 minutes
F4=More
```

Elapsed Time Total indicates time elapsed between install and pickup.

Elapsed Time After indicates time elapsed between end of sample collection and pickup.

```
Elapsed Time After
[1] 3540 minutes
[2] 3540 minutes
F4=More
```

NOTE *[2] indicates Collocated Modules

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

```

Sample Volume
[1] Volume=30.12
[2] Volume=30.12
F4=More          BKSP=back
    
```

```

Flow Average and CV
[1]AV=22.1   CV=0.1
[2]AV=22.1   CV=0.1
F4=More          BKSP=back
    
```

```

Temperature
AV=25.0 (C)
MIN=24.3 MAX=26.1
F4=More
    
```

```

Barometric Pressure
AV=738.8 (mmHg)
MIN=734.5 MAX=739.0
ENTER=Done
    
```

Replace Memory Card

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

```

Replace controller's flash
card.

ENTER=Done
    
```

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

```

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

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

```

Checking Memory Card
    
```

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

```

Checking Memory Card
Card is OK
    
```

Choose Sample Schedule

The 1 in 3, 1 in 6, and Sequential options follow a predetermined sampling schedule. If you run on a different day see the Alternate Sample Day section.

```

Choose Samp Schedule
F1=1 in 3
F2=Alt Samp Date
    
```

Alternate Sample Date

If you are running in Sequential mode, you will be give the option to choose how many filters to run. Press **↑F1** or **↓F2** to adjust the number of filters. If you are running in 1 in 3 or 1 in 6 mode, you will not see this screen. Press **→F4** to continue.

```
No. of Filters: 2
F1&F2=Adjust values
0=Cancel Alt Sched.
F4=More
```

To set a single alternate sample day press **↓F2** 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.

```
Enter Start Date &
Time in the 1st
Screen & in the 2nd
Sample duration_
```

To change the duration press **BSKP** and enter values using number keys.

```
1:03/26/13 00:00 TUE
F1&F2=Adjust values
F3&F4=Move cursor
ENTER=Next
```

Flexible Schedule

If the Flexible Schedule has been chosen, choose how many filters you want to run. You can choose up to three. Press **↑F1** or **↓F2** to adjust the number of filters. Press **→F4** to continue.

```
Duration: 1440 min
Yes=Cont. No=Cancel
```

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.

```
No. of Filters: 3
F1&F2=Adjust values
0=Cancel Alt Sched.
F4=More
```

To change the duration press **BSKP** and enter values using number keys.

```
Enter Start Date &
Time in the 1st
Screen & in the 2nd
Sample duration_
```

Remove Exposed Filter Cassette Cartridge

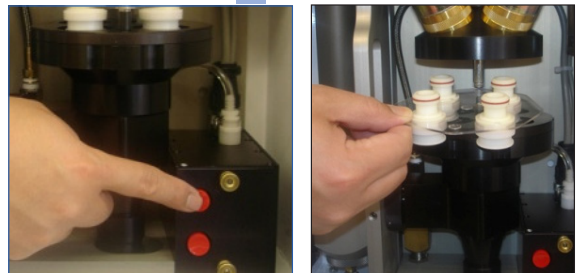
The software will now advance to the next step of the Filter Change procedure. You will be prompted to replaced the exposed filter cassette cartridge.

```
1:03/26/13 00:00 TUE
F1&F2=Adjust values
F3&F4=Move cursor
ENTER=Next
```

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.

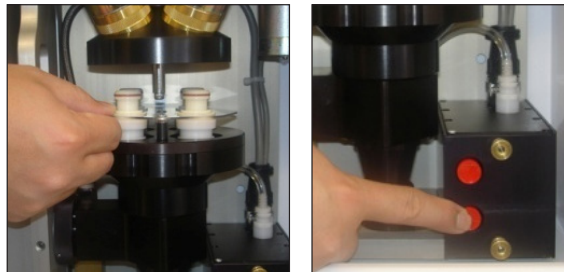
```
Duration: 1440 min
Yes=Cont. No=Cancel
```

```
New Filter Mod:1 Fil:1
Remove EXPOSED and
Insert NEW filter.
ENTER=Next
```



Insert New Filter Cassette Cartridge

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.



New Filter Identification

You will be prompted to enter the Q Number for each filter and one 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: 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 number 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**.

- 1/3 and 1/6 Schedule (Protocol) - Only one Q number.
- Sequential Schedule - Two Q numbers are required for entry except in the case of setting up for a Wednesday Sample. Wednesday samples require one entry.
- Flex Schedule - Q number based on number of filters chosen by operator.

COMP ID: Most sampling networks prepare Standard Operating Procedures (SOP) that will include instructions for what should be referenced as the COMP ID number. IF two modules (collocated) are used they each get separate Q number and Comp ID numbers.

```
Q Number M:1 Fil:1 (New)
Q_                               ENTER=Next
```

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

Vacuum Check/Manifold Check

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

The pump will warm up for 10 seconds.

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

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

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

```
New Filter Mod:1 Fil: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
1/3 Schedule
Next Samp: 01/27/07
Sampler is OFF
```

If there is not sufficient vacuum during the pump warm-up, 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 Completion section below. 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.

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.

Vacuum Check/Manifold Check

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

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.

```
1/26/07 09:26PM WED
1/3 Schedule
Next Samp: 01/27/07
Sampler is OFF
```

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 on page X to perform a filter change on a Collocated Module C.

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.

```
1/26/07 09:26PM WED
1/3 Schedule
Next Samp: 01/27/07
Sampler is OFF
```

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 page 66.

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 cannot exceed approximately .55 Lpm. This is derived using the followin equation: $Leak\ Rate = V * \Delta P / t * PATM$

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.

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 left.

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

```
Leak Check  Mod:[1]

NO=Cancel      ENTER=Next
```

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

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>
Vac=148  Time=15
NO=Cancel      ENTER=Next
```

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.

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]
Close valve on flow audit
adapter!
NO=Cancel      ENTER=Next
```

```
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
```

Performing Leak Check

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

The Vacuum cannot lose more than 225mm Hg pressure in 35 seconds or the test will fail, as shown on the left. The timer will stop counting when the test has failed. If the leak check fails, refer to page 78 for troubleshooting.

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

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

The second screen to the left 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
```

NOTE If the pressure does not reach 380mm Hg within 70 seconds, the leak check passes.

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 the top of the Inlet Tube.

```
IMPORTANT
Remove flow audit adapter.
```

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 the same as the 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.

Select Mod: 2 for doing the leak check on the Collocated Module C, and **ENTER**. Then follow the instructions on page X to perform a leak check on the Collocated Module C.

```
Leak Check   Mod:[2]

NO=Cancel    ENTER=Next
```

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.

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

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

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

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.

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.

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

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

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

```
WARNING
Continue with flow audit?

NO=Back    YES=Continue
```

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

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

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

```
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) :?
```

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

ENTER=Next
```

```
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** at 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 Celsius and Fahrenheit results for the sampler's temperature, reference temperature and the difference. 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 **BSKP** key can be used to make any corrections.

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

The following screen displays the sampler's Barometric Pressure, the reference barometric pressure, 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.

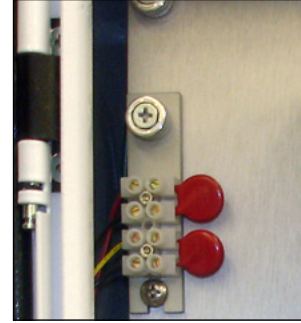
ENTER=Next
```


9

SERVICE

9.1 Replacing Fuses/MOVs

On the front of the Controller, to the top-left of the Keypad/Display, there are (2) 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 P33 Z5 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.

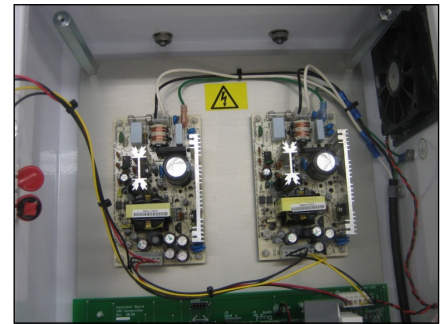


CAUTION RISK OF SHOCK! Before removing panel, disconnect all power sources!

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 the URG-3000N is still not operational, contact URG for further assistance.

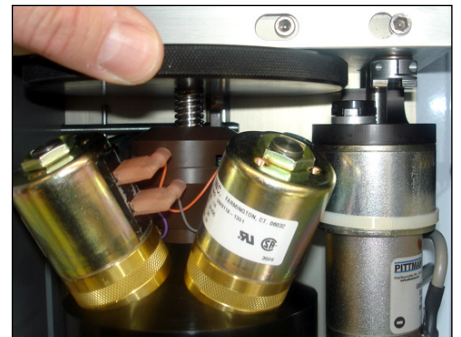
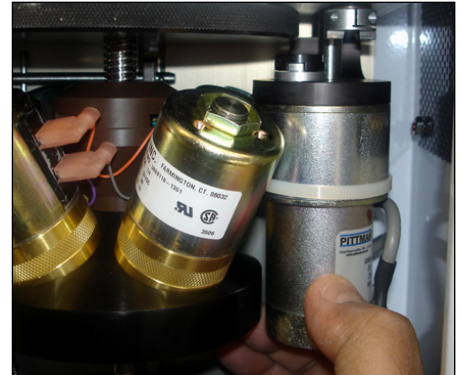


9.2 Manually Move Solenoid Manifold

To manually move the solenoid manifold, follow the steps below.

NOTE You can remove the solenoid manifold completely for servicing by lowering it fully using the wheel.

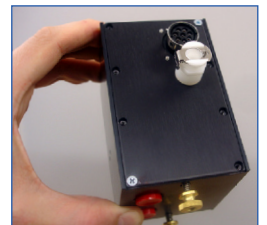
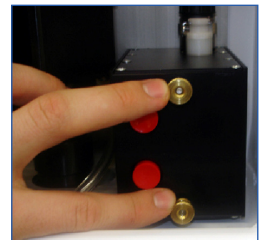
1. Grasp the motor to the right of the solenoid manifold firmly and pull downwards.
2. Grasp the motor and swing it to the left.
3. You can now use the large wheel located above the solenoid manifold to manually raise and lower the Solenoid Manifold.



9.3 Electronics Box

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

1. Remove the vacuum sensor tube by pressing in the quick-release adapter and lifting at the same time.
2. Reach behind it to remove the motor control cable by twisting the metal nut counter-clockwise.
3. Grasp the motor to the right of the solenoid manifold firmly and pull downwards.
4. Unscrew the (2) gold-colored bolts in the front of the electronics box.
5. The electronics box can now be removed.



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 page 58 to remove the filter cassette cartridge. After removing the filter cassette, remove the black electronics box.

NOTE 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. Then, lift up and carefully remove the cyclone and cassette manifold body.



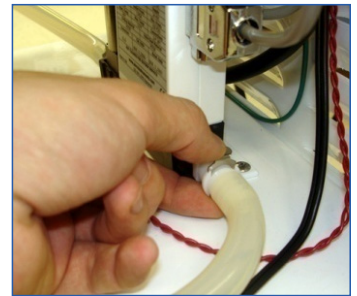
9.5 Mass Flow Controller (MFC)

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

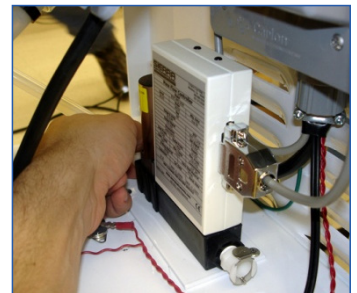
1. Remove the (6) small screws from the front panel. The door will slide down and off.



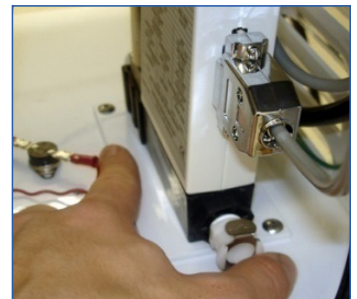
2. Remove the hose that connects to the front of the MFC (and runs to the Air Line port on the enclosure wall), as shown.



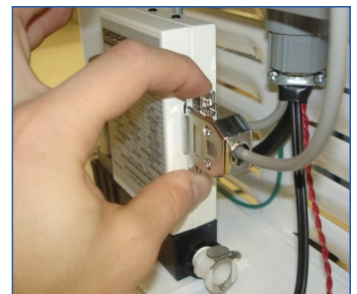
3. Remove the hose that connects to the rear of the MFC (and runs to the pump inlet).



4. Unscrew the (2) flathead screws to loosen and remove the MFC data cable.



5. Unscrew the (2) Phillips screws on the MFC base plate. This plate will then lift out with the MFC attached. If MFC needs to be replaced/repaired, save the 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:

1. Remove the (4) nuts on the bottom of the Pump Enclosure, shown (side view).
2. Disconnect the hose that runs from the Mass Flow Controller to the Pump, on the MFC end.
3. 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.
4. Unplug the power from the top outlet of the power terminal inside the Pump Enclosure.
5. 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 Pump Enclosure Heater

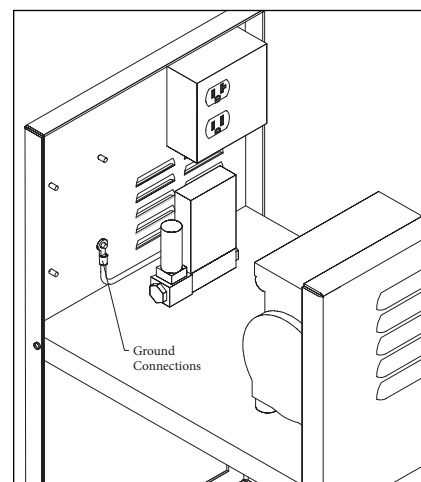
The optional heater assembly is designed to run continuously and provide heat inside the enclosure when the temperature drops below the thermostat setting. Once the heater is installed, it can be left running continuously in the lower stand and does not have to be removed after the cold weather conditions are over.



1. Unplug the ENTIRE sampler from the AC power source.
2. Remove both of the side access panels on the lower stand (pump housing).
3. Install the foam vent cover over the vent that is behind the MFC.

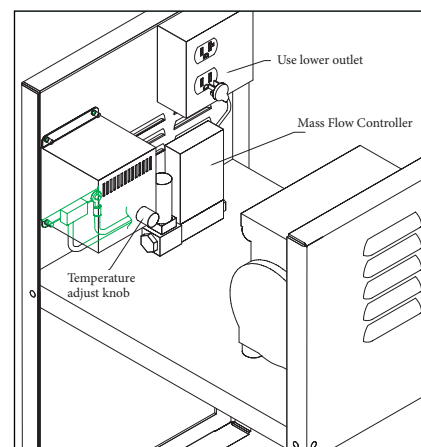
NOTE The foam vent cover must **ONLY** be used during extremely cold weather. It **MUST** be removed as soon as the extreme weather condition is over.

4. Remove the ground connection from the bottom right stud that is attached to using an 11/32 nut driver.



5. Install the heater assembly over the four studs to the left of the MFC and then replace the ground connection.
6. Secure the heater assembly and ground connection with the hex nuts provided.
7. Route the heater power cable behind the MFC and plug it into the lower power outlet.

NOTE You must **ONLY** use the lower power outlet for the optional heater.



10

TROUBLESHOOTING

10.1 Display Not Shown

If the URG-3000N display is blank, first check the power, then check fuses.

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 another device in the outlet the URG-3000N is using to determine if AC power is available.
- Disconnect the vacuum line from the pump and plug the pump into the lower outlet. If the pump activates, the power is available.
- Use a volt meter to check the voltage between the red and black wires in the MOV Surge Suppressor. The voltage should be 12 VDC. Then check that the voltage between the yellow and black wires in the MOV Surge Suppressor is 24 VDC. If no power is detected in either location, please contact URG for further assistance.

10.3 Leak Check Failed

If a Leak Check (page 64) has failed, the following steps may help to determine where the leak is occurring.

- Reset the Audit Cassette Tray and re-attempt Leak Check.
- Replace the Audit Cassette Tray with an alternate and re-attempt Leak Check.
- Inspect the O-rings on cyclone manifold for tears or other damage.
- 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 new ones because they are not available yet.

Follow the portion of the "Filter Change Procedure" detailed on page 57.

After completing ONLY the instructions on page X, 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.

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 Preventing Sampler from Collecting on Previous Exposed Filter

There may be some 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 and completes the "Filter Change Procedure." This prevents the sampler from collecting an additional sample onto the exposed filter from the previous sample run.

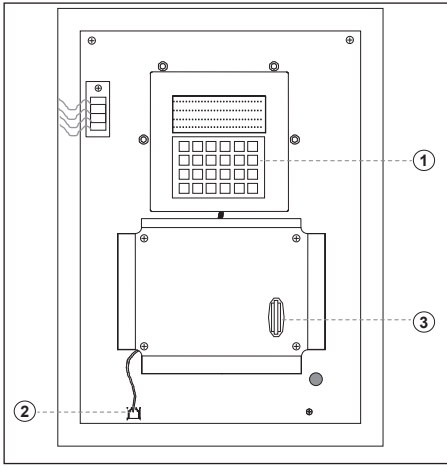
10.6 Pump Will Not Start During Filter Change Procedure

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.

1 1

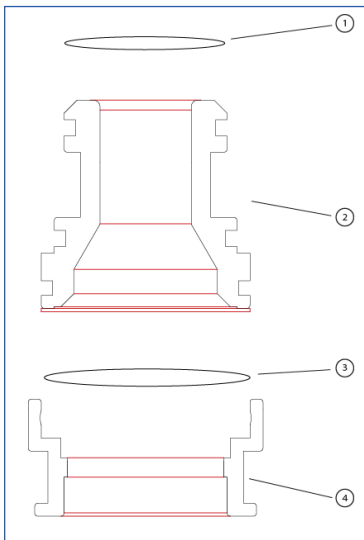
SCHEMATICS and
MAINTENANCE

11.1 Schematics



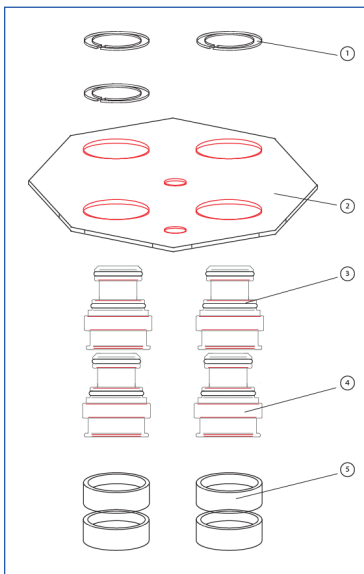
Controller Module C - Drawing Number: EPA-3280

Item #	Part Number	Description	Size
1	URG-3N-DKP	Display Keypad	
2	URG-3N-DKPC	Keypad Cord	
3	URG-3N-CFMC	Memory Card	



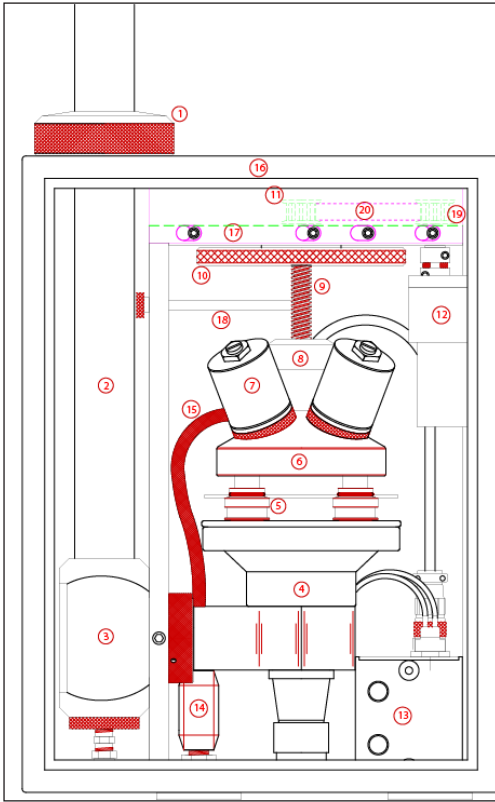
25mm Cassette Assembly - Drawing Number: NPS-3256D

Item #	Part Number	Description	Size
1	<i>Included with Item #2</i>	O-Ring	-016
2	URG-3N-25-CBT	Cassette Body	
3	<i>Included with Item #2</i>	O-Ring	-020
4	URG-3N-25-CSC	Cam-snap Cover	



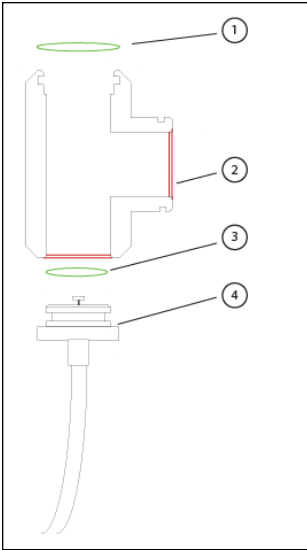
25mm Cassette Cartridge Assembly - Drawing Number: NPS-4340

Item #	Part Number	Description	Size
1	URG-3N-FC-SW	Split Washer	
2	URG-3N-CCP	Cassette Cartridge Plate	
3	<i>Included with Item #4</i>	O-Ring	-017
4	URG-3N-25-SCA	25mm Cassette Cartridge Assembly	
5	URG-3N-SCA	Cap for shipping	



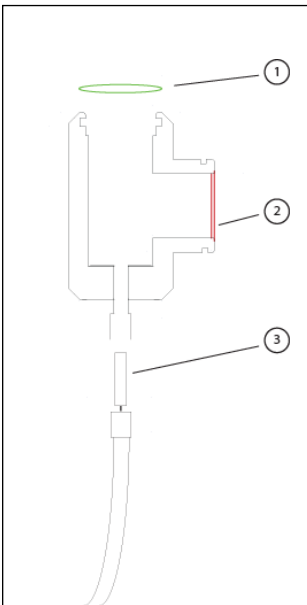
Module C - Drawing Number: EPA-3215

Item #	Part Number	Description	Size
1	URG-3N-MC-SCS	Stack compression sleeve	
2	URG-3N-MC-DT-36	Inlet stack	
3	URG-3N-MC-ITV2	Inlet tee	
4	URG-3N-MC-CA	Cyclone Assembly	
5	URG-3N-25-SCC	25mm Sample Cassette Cartridge	
6	URG-3N-MC-SVM	Solenoid Valve Manifold	
7	URG-3N-MC-SV	Solenoid Valve	
8	URG-3N-MC-DNA	Drive Nut/Wire Spool Assembly	
9	<i>Included with Item #10</i>	Leadscrew, 1/2-5 ACME	
10	URG-3N-MC-HML	Handwheel	
11	URG-3N-MC-10-TP	10 Tooth Timing Pulley	
12	URG-3N-MC-24V-DCM	24VDC Motor	
13	URG-3N-MC-EBA	Electronics Enclosure	
14	URG-3N-MC-PPA	Pressure Port Adapter	
15	URG-3N-MC-VH	Vacuum Hose	
16	URG-3N-MC-E	Enclosure, 16x12x6	
17	URG-3N-MC-BG	Belt Guard	
18	URG-3N-MC-RP	Sampler Retaining pin	
19	URG-3N-MC-14-TP	14 Tooth Timing Pulley	
20	URG-3N-MC-TB	Timing Belt	



Tee Plug (For Phase I Samplers) - Drawing Number: EPA-3251A

Item #	Part Number	Description	Size
1	<i>Included with Item #2</i>	O-Ring	-222
2	URG-3N-MC-ITV1	Tee	
3	<i>Included with Item #2</i>	O-Ring	-216
4	URG-3N-MC-ITP	Tee Plug w/ Temperature Probe	

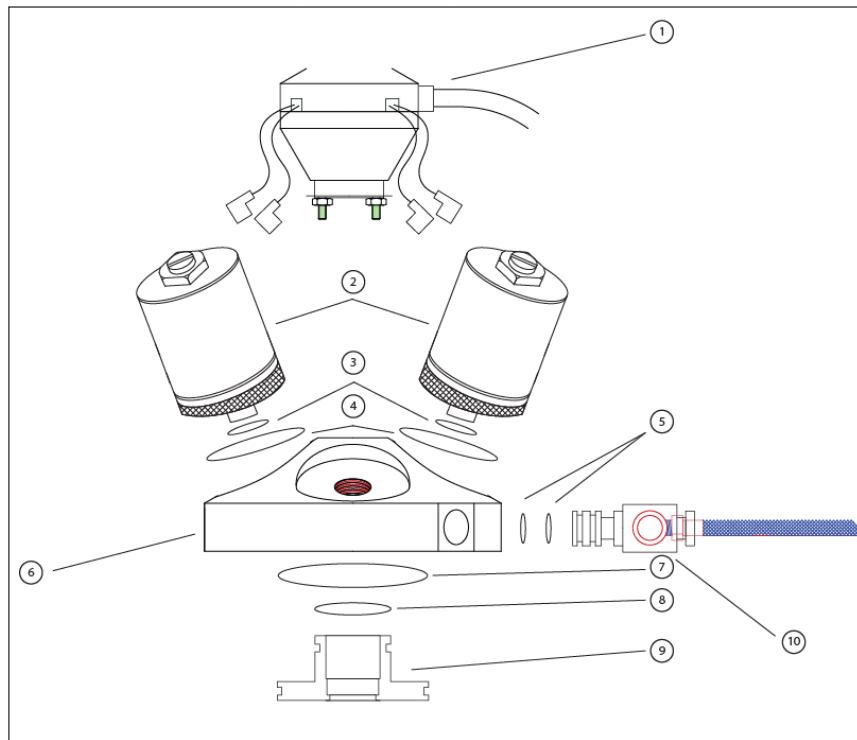


Tee Plug (For Phase II Samplers) - Drawing Number: EPA-3251B

Item #	Part Number	Description	Size
1	<i>Included with Item #2</i>	O-Ring	-222
2	URG-3N-MC-ITV2	Tee	

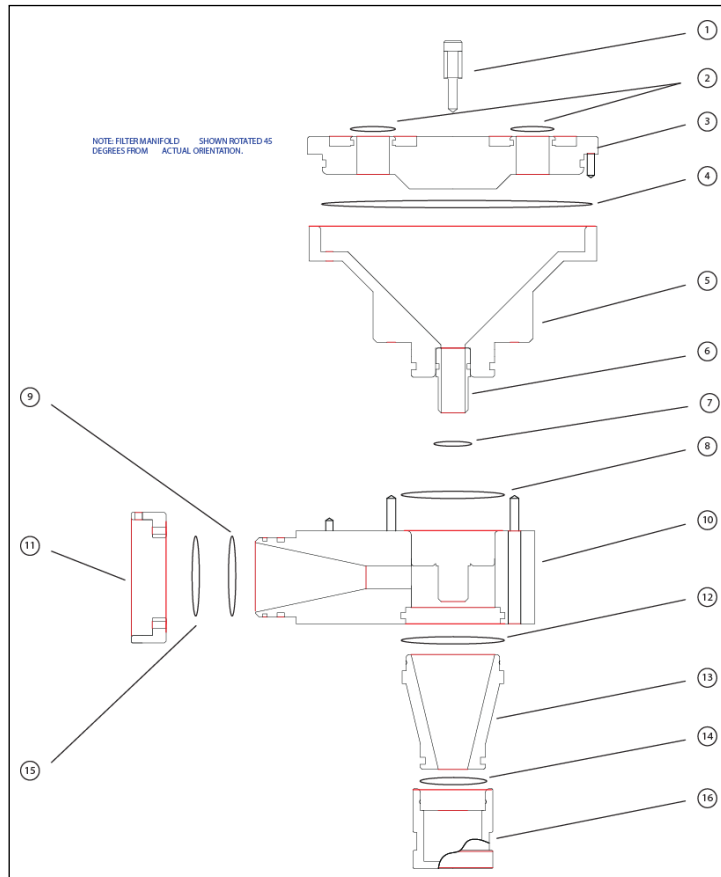
Solenoid Valve Manifold - Drawing Number: EPA-3213

Item #	Part Number	Description	Size
1	URG-3N-MC-DNA	Drive Nut/Wire Spool Assembly	
2	URG-3N-MC-SV	Solenoid Valves	
3	<i>Included with Item #2</i>	O-Ring	-015
4	<i>Included with Item #4</i>	O-Ring	-028
5	<i>Included with Item #10</i>	O-Ring	
6	URG-3N-MC-SVM	Solenoid Valve Manifold	
7	<i>Included with Item #6</i>	O-Ring	-018
8	<i>Included with Item #9</i>	O-Ring	-030
9	URG-3N-MC-SMP	Solenoid Manifold Plug	
10	URG-3N-MC-VH	Vacuum Hose	



Cyclone Assembly - Drawing Number: EPA-3246

Item #	Part Number	Description	Size
1	URG-3N-FM-IB	Filter Manifold Index Bar	
2	<i>Included with Item #3</i>	O-Ring	-016
3	URG-3N-CFM	Filter Manifold	
4	<i>Included with Item #3</i>	O-Ring	-156
5	URG-3N-CEF	Exit Funnel	
6	URG-3N-CT	Cyclone Throat	
7	<i>Included with Item #6</i>	O-Ring	-014
8	<i>Included with Item #10</i>	O-Ring	-124
9	<i>Included with Item #10</i>	O-Ring	-123
10	URG-3N-CIB	Inlet Body	
11	URG-3N-CCN	Cam Nut for Tee	
12	<i>Included with Item #10</i>	O-Ring	-130
13	URG-3N-CC	Cyclone Cone	
14	<i>Included with Item #13</i>	O-Ring	-119
15	<i>Included with Item #10</i>	O-Ring	-026
16	URG-3N-CBCC	Catch Cup	



11.2 Maintenance Parts List

Maintenance/Replacement Parts	
Part Number	Description
URG-3N-VP-71R	71R Series Vacuum Pump, 115VAC
URG-3N-VP-72R	72R Series Vacuum Pump, 115VAC
URG-3N-PRK-71R	71R Series Pump Rebuilt Kit, Includes (2) Head O-Rings, (2) Valve Retainers, (2) Leaf Valves, (4) Tube O-Rings, (1) Cylinder O-Ring, (2) Cylinders and (2) Piston Cups
URG-3N-PRK-72R	72R Series Pump Rebuilt Kit, Includes (2) Head O-Rings, (2) Valve Retainers, (2) Leaf Valves, (4) Tube O-Rings, (1) Cylinder O-Ring, (2) Cylinders and (2) Piston Cups
URG-3N-MFC	Mass Flow Controller
URG-3N-PEH	Lower Stand Pump Heater
URG-3N-MFC-RE	Replacement Mass Flow Controller for URG-3000N Sampler with One Year Warranty, Exchange Program
URG-3N-MC-SV	Individual Solenoid Valve
URG-3N-MC-SVM	Solenoid Valve Manifold Assembly
URG-3N-MC-SVM-DNR	Drive Nut and Bushing Replacement on Solenoid Valve Manifold, Exchange Program
URG-3N-MC-24V-DCM	24VDC Motor
URG-3N-MC-EBA	Complete Black Box Assembly with Motor Drive/Vacuum Sensor
URG-3N-MC-EBEX	Complete Black Box Assembly with Motor Drive/Vacuum Sensor, Exchange Program
URG-3N-DKP	Controller Display Keypad
URG-3N-IFA	Replacement Inline Filter Assembly for Pump
URG-3N-CFMC	Compact Flash Memory Card, 32MB Minimum Capacity
URG-3N-CF-MCR	Memory Card Reader
URG-3N-MC-CA	Complete Cyclone Assembly
URG-3N-MC-CA-ORR	Complete O-Ring Replacement and Cleaning of Cyclone Assembly, Exchange Program
URG-3N-MC-CA-POR	O-Ring Replacement on Filter Manifold and Catch Cup of Cyclone Assembly, Exchange Program
URG-3N-LCB	Leak Check/Flow Audit Assembly for Phase II & Phase III URG-3000N Samplers, Includes: (1) Downtube Reducer, 1.5"ID to 1.246"OD, (1) Leak Check (Flow Audit) Adapter, 1.25"ID to Brass Barb with Shut-Off Valve
URG-3N-MC-ITV2	Inlet Tee for Phase II & Phase III URG-3000N Samplers
URG-3N-MC-TP	Temperature Probe for Phase II & Phase III URG-3000N Samplers
URG-3N-MC-DT-36	1.5"OD x 36" Length Downtube Inlet
URG-3N-MC-ICA	Inlet Cap Assembly
URG-3N-25-ACC	25mm Audit Cassette, Includes (4) 25mm Filter Cassette with Stainless Steel Screen and Quartz Filters, Cassette Cartridge Plate, O-Rings and (4) Shipping Caps

URG-3N-25-ACC-ORR	Complete O-Ring Replacement and Filter Media on Audit Cassette Cartridge, Exchange Program
URG-3N-25-SCC	25mm Sampler Cassette Cartridge, Includes (4) 25mm Filter Cassette with Stainless Steel Screens, Cassette Cartridge Plate, O-Rings and (4) Shipping Caps
URG-3N-25-SCC-ORR	Complete O-Ring Replacement on Sample Cassette Cartridge, Exchange Program
URG-3N-CAP	Assembly/Disassembly Press for 25mm Filter Cartridges
URG-3N-RCB	Replacement Connector Board for Controller
URG-3N-TB	Motor Timing Belt
URG-3N-CC-12	Controller Cable for URG-3000N, 12 Position
URG-3N-LCB-DR	Downtube Reducer, 1.5"ID to 1.246"OD
URG-B300A	Filter/Muffler for 71R Series Vacuum Pump on URG-3000N
URG-3N-QCS-ORR	Set of Replacement O-Rings for Quick Connect Stem on Vacuum Tubing, 2 Per Set
URG-3N-RMC	Replace Microcontroller on URG-3000N
URG-3N-VT-QC	Vacuum Tubing Line for URG-3000N with Quick Connect Fittings on Both Ends

11.3 Suggested Service & Maintenance

Once Annually:

- Cyclone O-Ring Replacement, Exchange Program: **URG-3N-MC-CA-ORR**
- Audit Cassette O-Ring & Filter Media Replacement, Exchange Program: **URG-3N-25-ACC-ORR**
- Vacuum Tube Quick : **URG-3N-QCS-ORR**

Once Every 2 Years:

- Vacuum Pump Rebuild: **URG-3N-PRK-71R** or **URG-3N-PRK-72R**
- Vacuum Pump Inline Filter Replacement: **URG-3N-IFA**
- Motor Timing Belt Replacement : **URG-3N-TB**



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