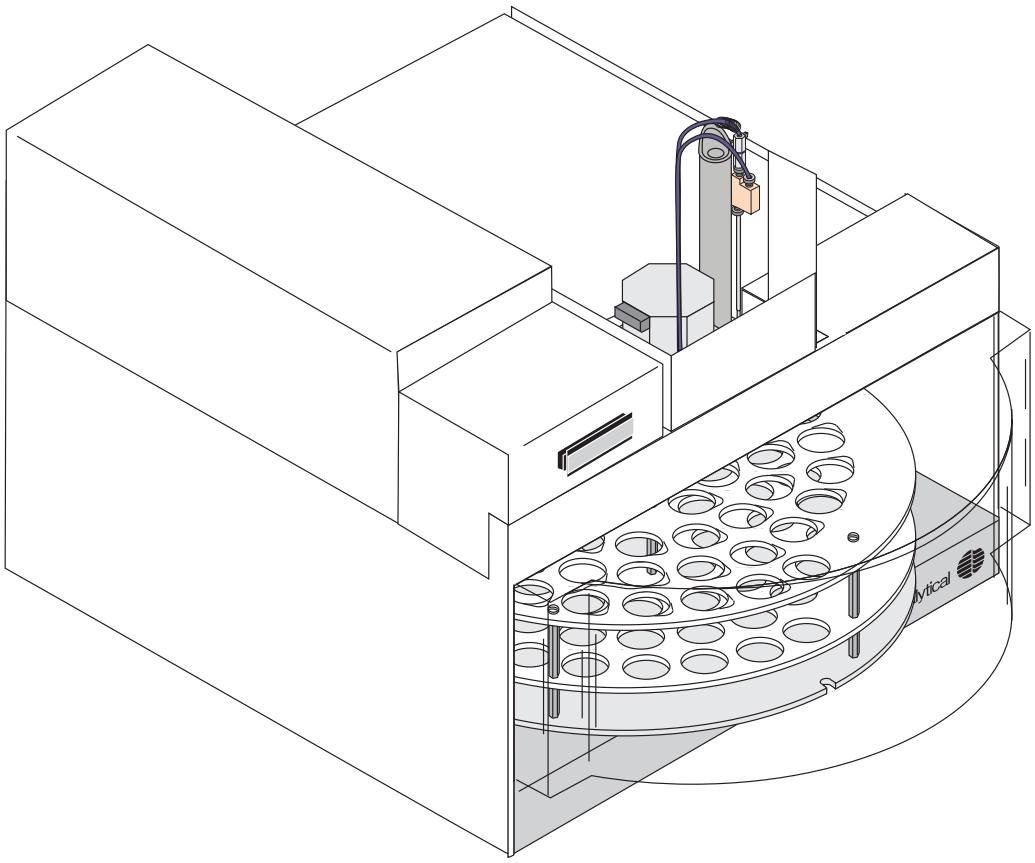
Model 4551A Purge-and-Trap Water Autosampler Operator's Manual



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OI Analytical warrants each OI Analytical-manufactured product against defects in materials and workmanship under normal use and service for a period of one year. Equipment installed by OI Analytical is warranted from the installation date; all other equipment is warranted from the ship date. If purchaser schedules or delays installation more than 90 days after delivery, then the warranty period starts on the 91st day from date of shipment. This warranty extends only to the original purchaser. OI Analytical will, at its option, repair or replace equipment that proves to be defective during the warranty period, provided the equipment is returned to OI Analytical at the expense of the purchaser.

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- Modification or misuse by the purchaser;
- Operation outside the product's environmental and electrical specifications;
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- A computer not meeting the minimum specifications recommended by OI Analytical;
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Chapter 1 Introduction

The Model 4551A Purge-and-Trap Water Autosampler transfers a specified liquid sample amount from standard USEPA-approved, 40-mL volatile organic analysis (VOA) vials to a common sparge vessel on the Model 4660 Eclipse or Model 4560 Purge-and-Trap (P&T) Sample Concentrator. When combined with the sample concentrator, the autosampler fully automates analysis of up to 51 samples. The Model 4551A Autosampler uses minimal benchspace, since the Eclipse or Model 4560 docks on the autosampler chassis.

NOTE: The Model 4551A also interfaces with an OI Analytical DPM-16. The required Model 4551A-to-DPM-16 interface kit (PN 314989) includes supplemental instructions. The DPM-16 does not interface with the Model 4551A without this kit.

Model 4551A applications include the following:

- USEPA Methods 502.1, 502.2, 503.1, 524.2
- USEPA Methods 601, 602, 603, 624

Operating Principles

The Model 4551A uses a unique spiral-design carousel containing 51 sample positions. Samples move sequentially into position under a needle-piercing assembly. The needle lowers to pierce the septum and the vial pressurizes with an inert gas. The sample transfers to a calibrated sample loop. A valve rotates and the same gas transfers the sample aliquot to the sample concentrator's sparge vessel. As the sample concentrator starts purging, the sample transfers and the analysis begins. When the sample completely desorbs to the GC, the sample automatically drains from the sparger, and the Model 4551A performs a programmed number of sample pathway and sparge vessel rinses. The water source used for rinsing the system's sample lines also provides water to run blanks at programed intervals during a sample sequence.

Features

- Automatically samples up to 51 USEPA-approved, 40-mL VOA vials.
- Docks directly with the Eclipse or Model 4560 to minimize benchspace requirements.
- Provides maximum flexibility using programmable rinses and blanks.
- Add the optional Standards Addition Module (SAM) for automated standard or surrogate addition.
- Interfaces with OI Analytical discrete multisamplers (DPM-16 or MPM-16) for discrete solid and liquid sampling capability.
- Transfers water or lightly particulated water samples with no system clogging.
- Optimizes septum-piercing accuracy using a spiral-design carousel.
- Eases sample loading and unloading with a removable, lightweight sample tray.

- Easily configures through the Eclipse or Model 4560, or through the optional Windows®-based WinTrap *Plus* software.
- Automatically transfers sample from closed vials to the sparge vessel via a 5-mL or 25-mL calibrated sample loop.
- Protects sample integrity through immediate replicate sampling from the vial.
- Maximizes accuracy with a calibrated loop sample injection.
- Easily changeable sample loops allow 5-mL or 25-mL sample volumes.

Specifications

The following sections provide the specifications for the instrument.

General Specifications

System Dimensions (Model 4551A with the Eclipse or Model 4560)

- 45.88 cm D x 39.68 cm W x 80.28 cm H
- 16.75" D x 15.5" W x 23.5" H
- Footprint: 260 in^2

Dimensions

- 45.88 cm D x 39.68 cm W x 37.47 cm H
- 16.75" D x 15.5" W x 14.75" H
- Footprint: 260 in^2

Weight

- 16.33 kg
- 36 lbs

Vial Specifications

- Capacity: 51 vials (with standard wash and waste stations)
- Size: 40-mL VOA vials, 95.25 mm x 27 mm

Sample Loop

- 5-mL glass loop
- 10-mL glass loop (optional)
- 25-mL glass loop (optional)

Sample Loop Valve

- Electrically actuated, 12 VDC
- Six-port, 60° rotation
- Valco® Cheminert®

Sample Transfer Pathway

- 7", two-holed, stainless steel needle
- 1/16" O.D. x 0.040" I.D. x 17" PEEK® tubing
- 1/16" O.D. x 0.040" I.D. x 26" nickel tubing

Processor

- 80C552 microcontroller
- 128 K ROM
- 32 K RAM

Communications with the Model 4560

- O•I•NET™ network interface for inter-instrument communication

Performance Specifications

The following sections provide the performance specifications for the instrument.

Sample Transfer Accuracy

- Greater than ±0.3%

Programmable Parameters

- Blank frequency
- Blank replicates
- Standard addition
- Surrogate intervals
- Loop fill time
- Loop transfer time
- Needle depth (85–100%)
- Replicate number
- Sample start position
- Sample end position
- Wash station fill time
- Wash station empty time
- Maximum needle depth into wash station

Requirements

The following sections provide the gas and power requirements for the instrument.

Gas Requirements

- 99.999% (UHP) helium (He) or nitrogen (N_2)
- 50–125 psi

Power Requirements

- 100–230 V_{AC} (autoselecting) ±10%; 50/60 Hz

Major Options

Major options for the instrument include:

- Standards Addition Module (SAM)
- Vial cooling option (supplemental instructions included with this option)
- 10-mL glass sample loop
- 25-mL glass sample loop

Safety Information

OI Analytical designed and tested the Model 4551A Autosampler in accord with recognized safety standards for use indoors. Using the instrument in a manner not specified by the manufacturer may impair the instrument's safety protection. Whenever the safety protection of the Model 4551A is compromised, disconnect the instrument from all power sources and secure the instrument against unintended operation.

EMC: **Directive 89/336/EEC: 1989**
EN50082-1:1992
CISPR 11:1990/EN55011 (1991) Group 1 Class A
IEC 801-2/EN61000-4-2
IEC 801-3/EN61000-4-3
IEC 801-4/EN61000-4-4

Operator Precautions

For operator safety, pay attention to ***WARNING*** and ***CAUTION*** statements throughout this manual.

- ***WARNING*** indicates a condition or possible situation that could result in physical injury to the operator.

- ***CAUTION*** indicates a condition or possible situation that could damage or destroy the product or the operator's work.

Warnings and precautions in this manual or on the instrument must be followed during operation, service, and repair of the instrument. Failure to follow these warnings and precautions violates the safety design standards and intended use of the instrument. OI Analytical is not be liable for the operator's failure to comply with these warnings and precautions.

Connect the Model 4551A to a dedicated AC power supply through a three-conductor power cord with the third wire firmly connected to an electrical ground at the power

outlet**. Any interruption of the grounding conductor or disconnection of the protective earth terminal could cause a shock that could result in personal injury.**

General Precautions

- Disconnect the AC power cord before removing covers.
- Replace or repair faulty or frayed insulation on power cords.
- Perform periodic leak checks on supply lines, fittings, and pneumatic plumbing.
- Arrange gas lines so they cannot become kinked, punctured, or otherwise damaged, and do not impede walkways.
- Turn off the main power switch and disconnect the main power cord before using a liquid solution to locate leaks.
- Wear safety glasses to prevent possible eye injury.
- Do not perform unauthorized modifications or substitute parts to the instrument that are not OI Analytical original parts. Any unauthorized modifications or substitutions void the warranty.
- Verify all heated areas have cooled before handling or wear adequate hand protection to prevent burns.
- Do not restrict airflow on the back or bottom of the unit. This can cause overheating within the unit.
- Maintain a static-safe area when handling all electronic parts and assemblies. Use a static-control wrist strap that is connected through a one megaohm resistor to an appropriate earth ground. Store all electrical parts and equipment in static-protective containers.
- Turn off all heated zones and allow time for cooling before working on the GC or the detector.
- Do not replace blown fuses inside the lamp power supply. Only trained service personnel should access the interior of the lamp power supply.

Compressed Gas Cylinder Precautions

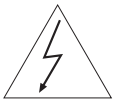
- Store and handle compressed gases in strict accordance with relevant safety codes.
- Fasten all cylinders securely to an immovable structure or permanent wall.
- Store or move cylinders only in a vertical position. Do not move or transport cylinders with the regulators attached.
- Use only approved regulators and tubing connections.
- Connect cylinders to instruments with pressure ratings that are significantly greater than the highest outlet pressure from the regulator.
- Nitrogen and helium are identified as asphyxiants. Handle and store these gases and the cylinders containing them in a manner consistent with OSHA regulations. Maintain adequate ventilation in areas where these materials are used and stored. Avoid prolonged exposure to high concentrations of these gases.
- Oxygen is identified as an oxidizer. Handle and store these gases and the cylinders containing them in a manner consistent with OSHA regulations. Maintain adequate ventilation in areas where these materials are used and stored. Avoid prolonged exposure to high concentrations of this gas.

Safety Symbols

The following symbols may be located on the instrument:

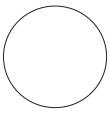
Warning/Caution, see accompanying instruction for more information.

Indicates a hot surface.



Indicates hazardous voltages.

Indicates earth (ground) terminal.



Indicates the OFF position on the power switch.

Indicates the ON position on the power switch.

Chapter 2 Instrument Components

This chapter lists the components of the Model 4551A Autosampler.

System Components

Figure 2.1 depicts the Model 4551A Autosampler with the Eclipse and SAM option.

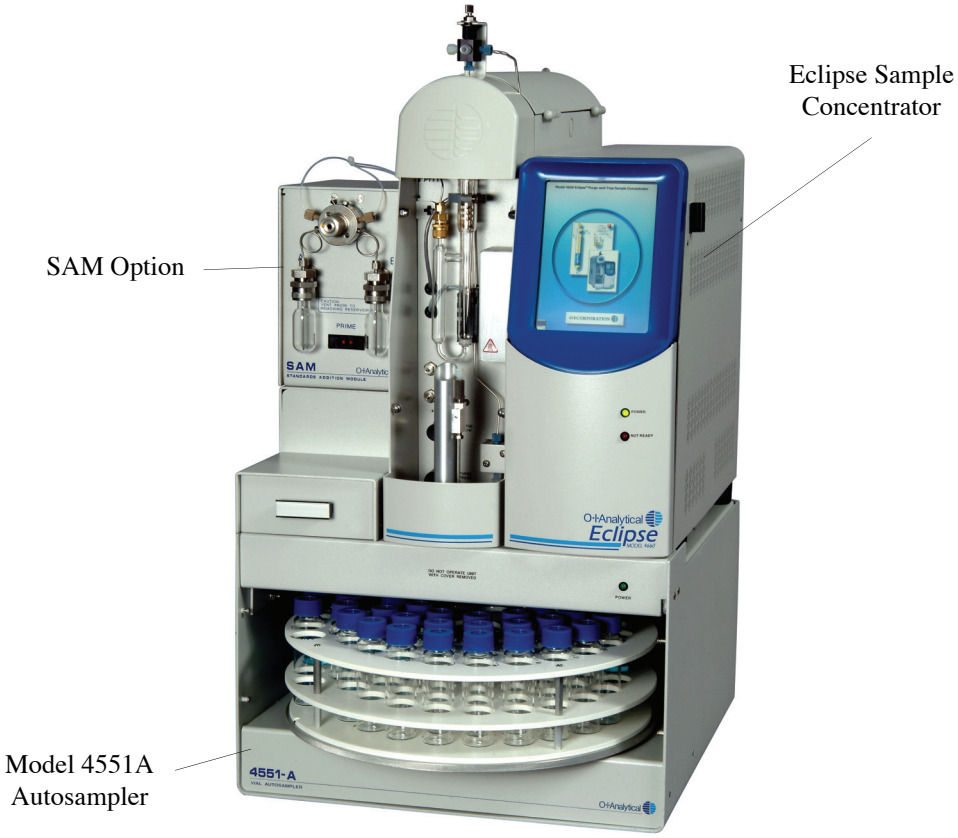


Figure 2.1. Model 4551A with Eclipse and SAM Option

Eclipse Sample Concentrator docks on the Model 4551A chassis.

Model 4551A Autosampler holds up to 51 samples.

Reagent water bottle (not shown) holds reagent water used for wash or blank sequences.

SAM option automatically adds standard or surrogate to the sample.

Waste bottle (not shown or supplied) receives drained wash water, blank water, and sample waste.

Exterior Components

Figure 2.2 depicts the exterior front view of the Model 4551A Autosampler.

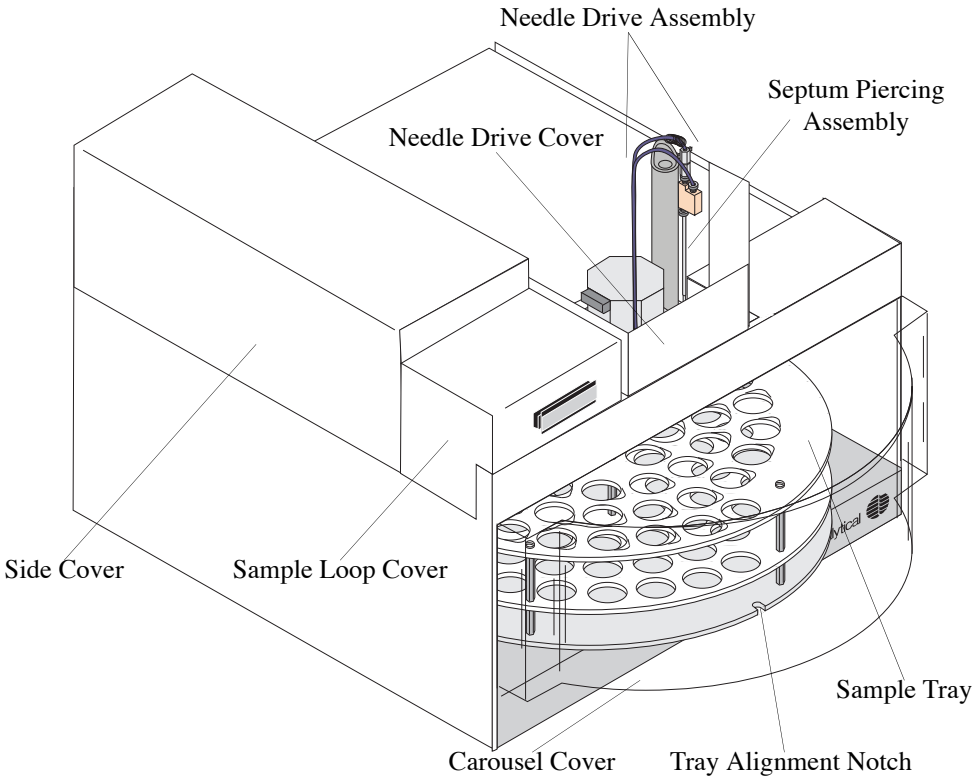


Figure 2.2. Model 4551A Front View

Carousel cover protects the samples and the operator during operation.

Needle drive assembly raises and lowers the needle piercing assembly, depicted in Figure 2.4.

Needle drive cover protects the needle drive assembly when used with the 4560 Purge & Trap. This cover is not present when the 4551A is used with the 4660 Purge & Trap.

Septum piercing assembly pierces the sample vial to extract the liquid sample. The stainless steel coaxial needle assembly includes a side-holed, septum-piercing needle and vial-pressurizing needle sleeve.

Sample tray holds up to 51 samples, a wash vial, and waste vial.

Sample loop cover allows easy access to the sample loop and valve.

Side cover provides access to the peristaltic sample pump, gas distribution valves, pressure regulator, and DC actuator.

Tray alignment notch aligns the sample tray into the correct position on the carousel.

Model 4551A Back Panel

Figure 2.3 depicts the back panel of the Model 4551A Autosampler.

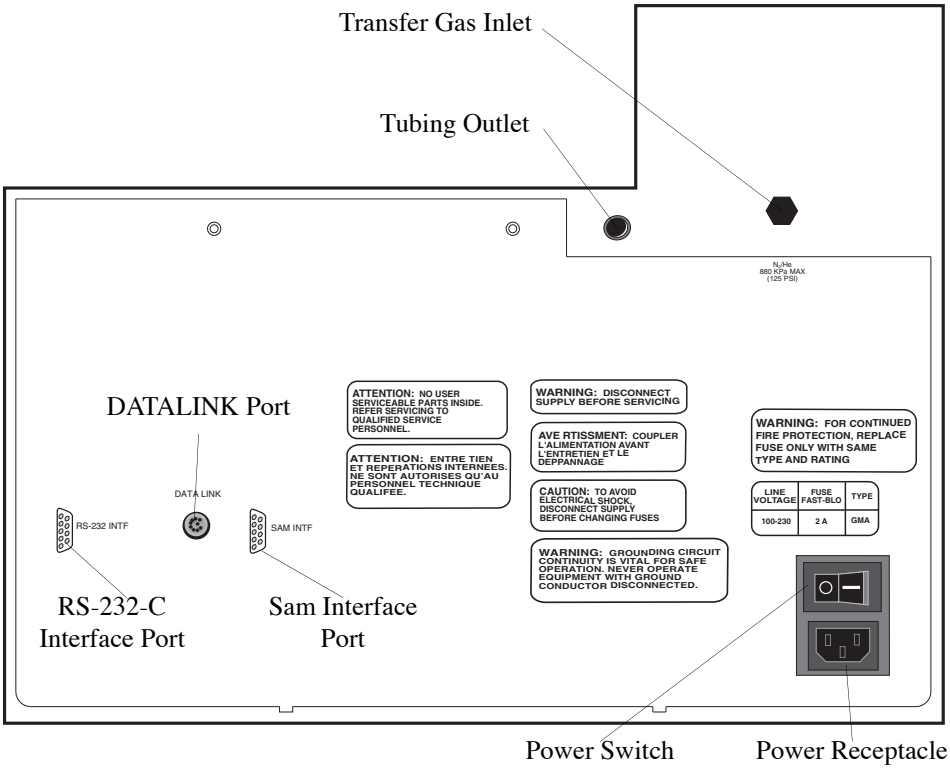


Figure 2.3. Model 4551A Back Panel

DATALINK port allows the Model 4551A and the Model 4560 to communicate through O•I•NET.

Fuses (not shown) protect the Model 4551A from a short circuit condition. The power entry module holds these fuses.

Power receptacle connects the Model 4551A to an appropriate power source via a power cable.

Power switch turns the Model 4551A power on and off.

RS-232-C interface port connects the Model 4551A to the Eclipse or a PC.

SAM interface port connects the Model 4551A to the SAM option with a cable included with the SAM option.

Transfer gas inlet (1/8" Swagelok® fitting) connects the He or N_2 gas supply (50–125 psi) to the Model 4551A.

Tubing outlet provides a path for the water and waste lines.

NOTE: OI Analytical does not guarantee proper operation of the Model 4551A with non-OI Analytical sample concentrators. The operator must identify communication pathways between the Model 4551A and instruments not manufactured by OI Analytical.

Needle Drive Assembly

Figure 2.4 depicts the needle drive assembly of the Model 4551A Autosampler.

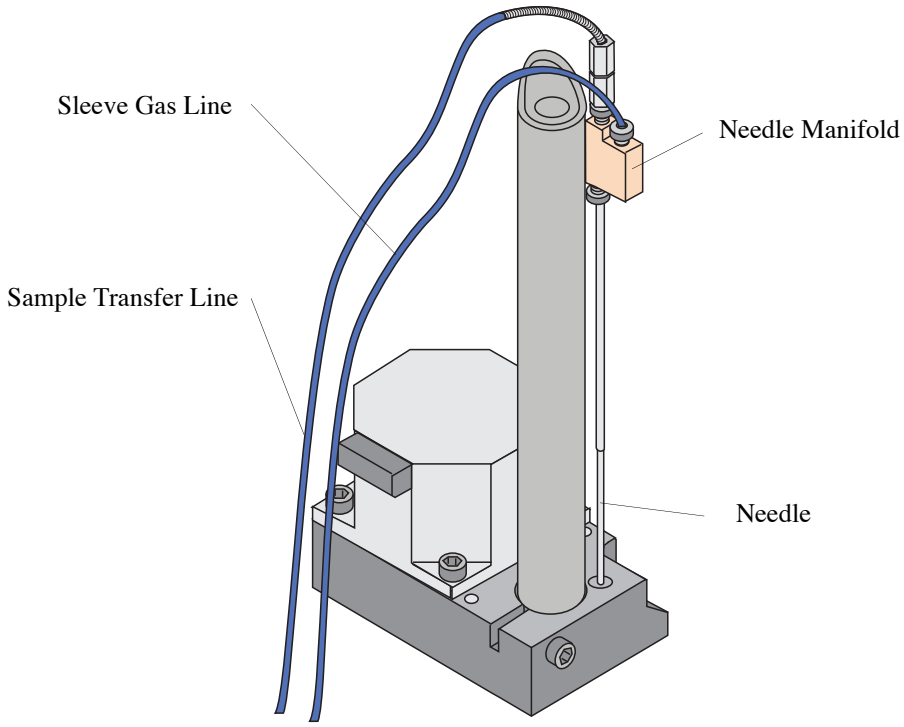


Figure 2.4. Needle Drive Assembly

Needle pierces the septum and provides a path for the sample and wash water to reach the sample concentrator.

Needle manifold connects the sample and vial pressurization lines to the needle drive assembly.

Sample transfer line provides a path for liquid sample, wash water, and blank water from the needle drive assembly to the sample loop.

Sleeve gas line provides a path for gas supplied to the sample vial during loop fill, preventing a vacuum from forming in the vial.

Interior Components

Figure 2.5 depicts some of the interior components, described below.

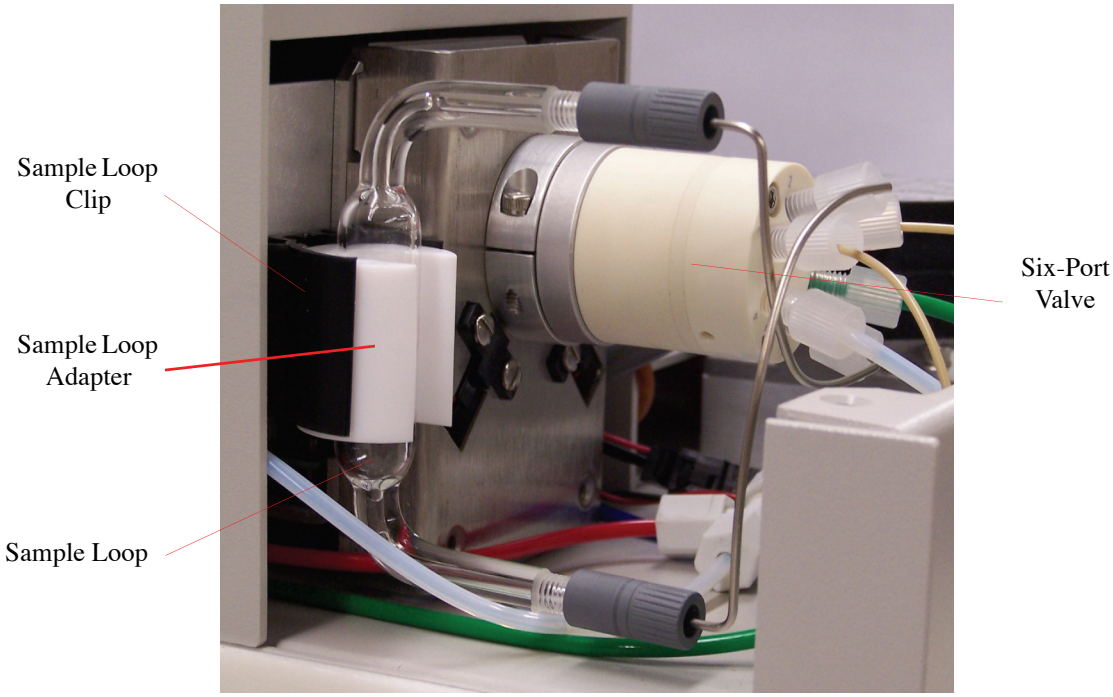


Figure 2.5. Model 4551A Interior Components

Valve actuator (not shown) rotates the six-port valve 60° from its home position and back, connecting the sample loop to either the loop fill path or the sample transfer path.

Sample loop holds 5, 10, or 25 mL of sample, wash water, or blank water for transfer from the Model 4551A to the sample concentrator.

Sample loop clip holds the sample loop in place.

Six-port valve rotates to direct the sample flow path. It is a six-port Valco Cheminert loop injection valve.

SAM Option Front View

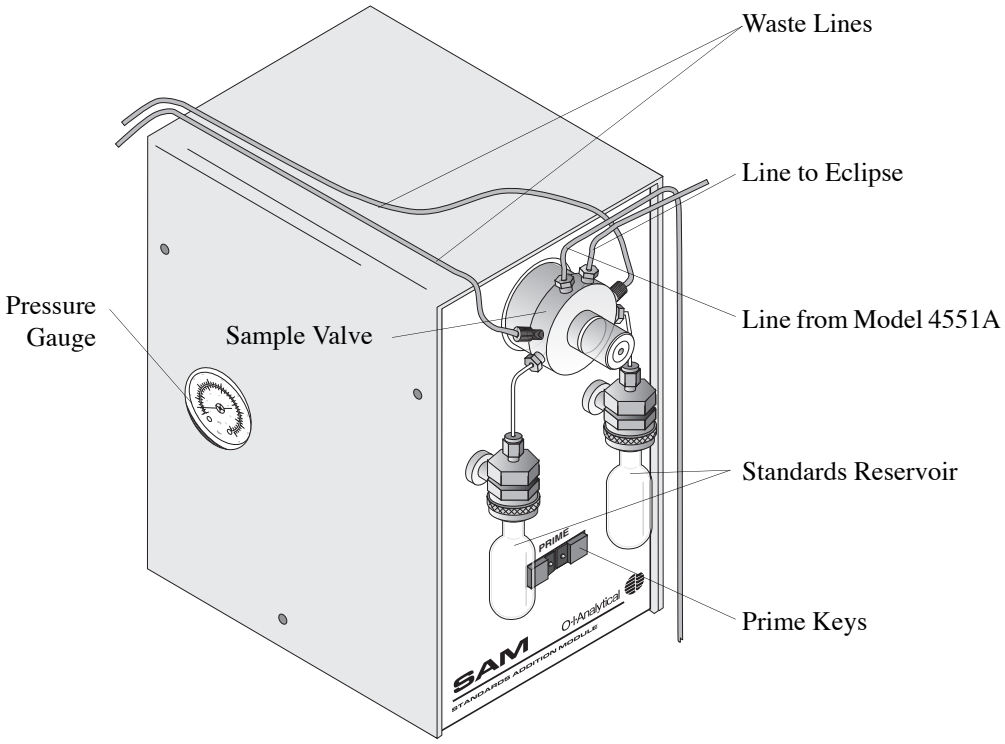


Figure 2.6. SAM Option Front View

Line from Model 4551A connects the SAM to the Model 4551's six-port loop valve. Sample from the Model 4551A sweeps the SAM's 1-μL internal loop, adding standards as the sample transfers to the sample concentrator's sparge vessel.

Line to Eclipse connects the SAM to the sample concentrator's injection valve.

Pressure gauge shows the gas pressure within the SAM.

Prime keys prime the lines and the sample valve.

Sample valve rotates to add standards into the sample.

Standards reservoir holds standard solution. Program standards addition from two independent standards reservoirs.

Waste lines connect to the waste bottle.

SAM Option Back View

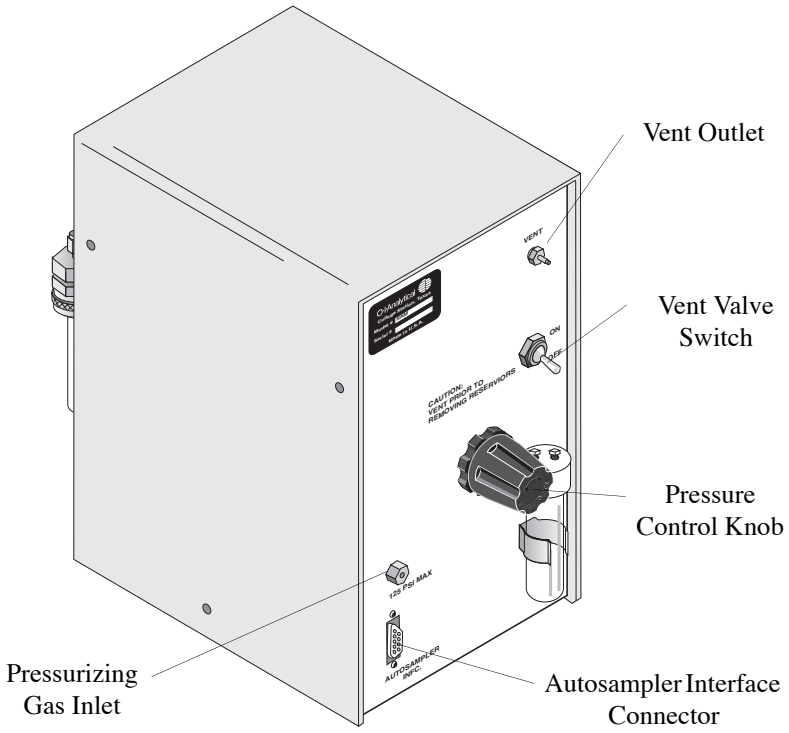


Figure 2.7. SAM Option Back View

Autosampler interface connector attaches the cable from the Model 4551A's SAM interface port.

Pressure control knob sets the gas pressure within the SAM.

Pressurizing gas inlet connects the SAM to a He or N_2 gas supply.

Vent outlet provides pressure outflow, relieving pressure in the standards reservoirs when the vent valve switch turns off.

Vent valve switch turns the vent valve on or off.

Chapter 3 Installation

This chapter describes basic installation procedures for connecting the Model 4551A Autosampler to the Eclipse or Model 4560 Sample Concentrator.

NOTE: Install firmware version 3.21 or later on the Model 4560 Sample Concentrator as necessary to interface with the Model 4551A. Verify the Model 4560 operates properly before installing the autosampler.

Required Materials

The Model 4551A startup kit **does not** contain the following items required for installation:

- Waste bottle (>4 L capacity)
- 7/16" open-ended wrench
- Ultra-high purity (UHP, 99.999%) He or N_2 (125 psi maximum, 50 psi minimum)
- Appropriate gas scrubbers
- 3/16" flat-bladed screwdriver

Unpacking and Positioning the Model 4551A

Unpack the instrument(s) and check the items against the component list. If any damage appears, notify the carrier immediately. Save all packing materials until verifying proper component operation.

NOTE: Ship all instruments returned to OI Analytical for service or warranty repair in the instrument's original OI Analytical box with its packing materials. ***If instruments are damaged due to improper shipping, OI Analytical is not responsible for the cost of repairs.*** If no access exists to proper shipping materials, contact the OI Analytical Order Entry Department at (800) 336-1911 or (979) 690-1711.

Prepare the Model 4551A for installation using the following steps:

1. Position the Model 4551A on the side of the GC nearest the injection port.

2. Remove any additional packing materials, as necessary, from the autosampler.

   Save all packing materials until verifying proper autosampler operation.

3. Turn off the sample concentrator power, if applicable.

4. If installing on the Model 4560, remove the sparge vessel door if it is installed on the Model 4560 (see "Installing the Sparge Vessel Door" on page 20 in this chapter).

If necessary, upgrade the Model 4560 firmware. Refer to the instructions provide with the firmware or the *Model 4560 Sample Concentrator Operator's Manual* for firmware upgrade instructions.

5. Move the sample transfer line off the Model 4551A platform (packed to the left of the sample loop valve for shipping purposes).

NOTE: OI Analytical does not support docking any non-OI Analytical sample concentrator on the Model 4551A Autosampler. If a non-OI Analytical sample concentrator is present, position it immediately adjacent to the autosampler to allow efficient routing of sample transfer plumbing.

6. Once the area is clear, align the sample concentrator's rubber feet with the white nylon screws on the autosampler platform to mount the sample concentrator on the Model 4551A.

7. Position the provided reagent water bottle behind the autosampler to allow routing the water and waste lines from the autosampler back panel.

NOTE: Position the waste bottle level with or lower than the Model 4551A to allow proper drainage.

8. Position a waste bottle (not provided) in a suitable location behind the Model 4551A to allow routing the waste line from the autosampler and sample concentrator back panels.

Electrical Connections

The following procedure outlines how to install the electrical connections. The unit can be installed on either the Eclipse or the Model 4560.

To install the Model 4551A to the Eclipse:

1. Connect the nine-pin D-sub cable (PN 321133) into the port labeled "RS-232 INTF" on the Model 4551A.

2. Connect the other end of the cable to the port labeled "COM 2". as depicted in Figure 3.1.

3. Plug the appropriate end of the autosampler power cord into the power receptacle on the autosampler back panel.

4. Plug the other end into an appropriate 100–230 V_{AC} ±10% grounded outlet.

When installing the Model 4551A to the Model 4560:

1. Connect one end of the three-foot BNC cable (PN 235515) to the DATALINK port on the back of the autosampler, as depicted in Figure 3.2.

2. Connect the other end of the cable to the DATALINK port on the Model 4560's CPU card (see Chapter 2, "Description of Components," in the *Model 4560 Sample Concentrator Operator's Manual*).

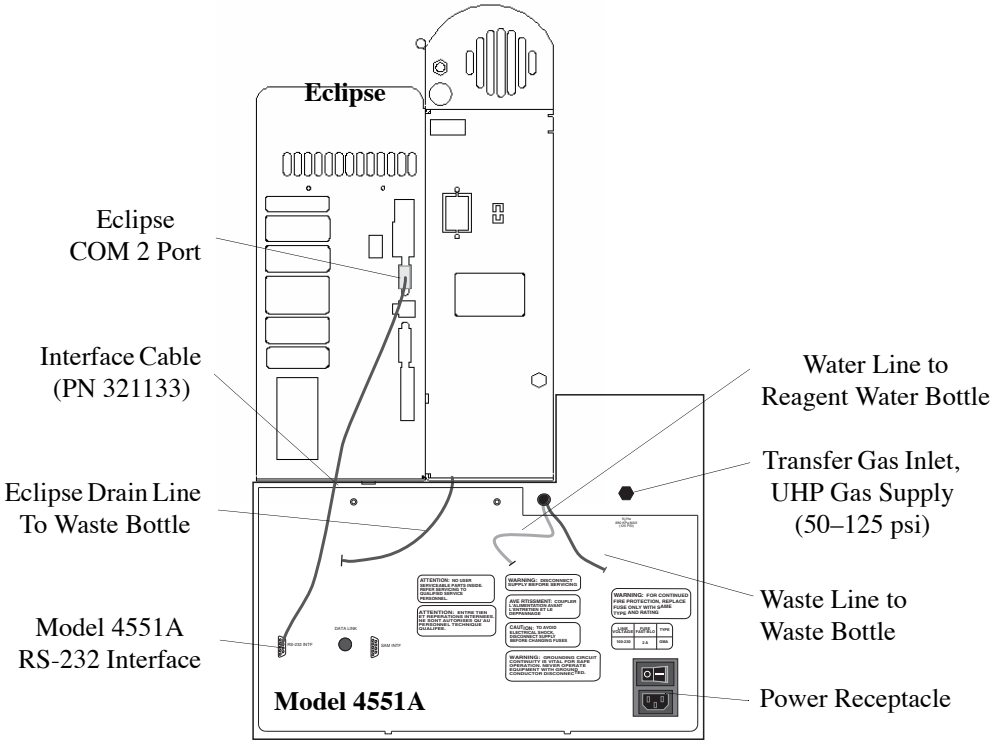


Figure 3.1. Model 4551A Electrical and Plumbing Connections to the Eclipse

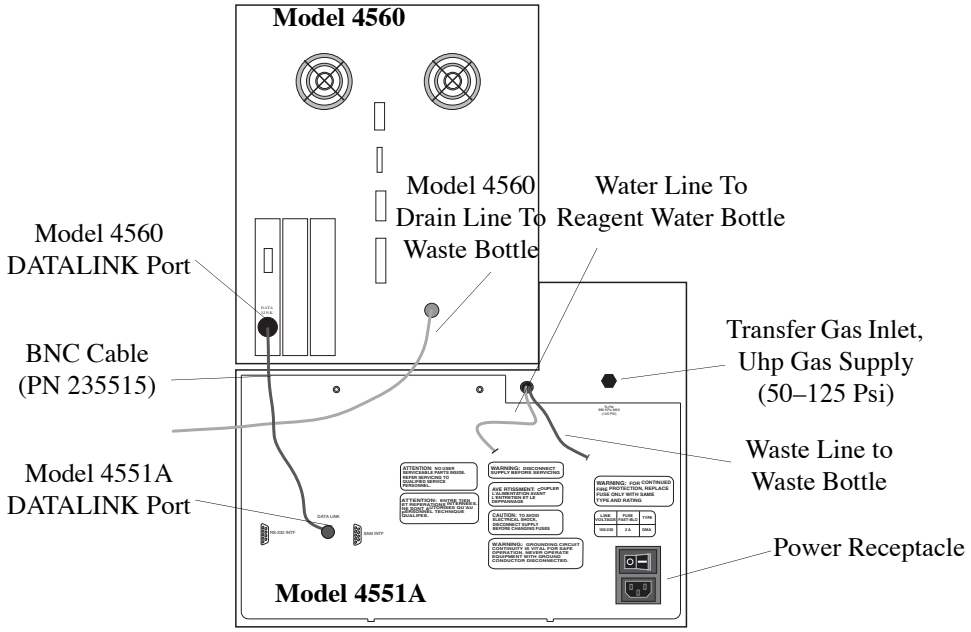


Figure 3.2. Model 4551A Electrical and Plumbing Connections to the Model 4560

3. Plug the appropriate end of the autosampler power cord into the power receptacle on the autosampler back panel.

4. Plug the other end into an appropriate 100–230 V_{AC} ±10% grounded outlet.

Plumbing Connections

The following procedure outlines how to complete the plumbing connections.

1. Verify the Model 4551A power is off.

2. Route the 1/8" copper tubing from the UHP He or N_2 tank to the transfer gas inlet port on the autosampler back panel and connect using a 7/16" open-ended wrench, as depicted in Figure 3.1 and Figure 3.2.

3. Verify the gas is regulated to 125 psi maximum and 50 psi minimum.

4. Rinse the reagent water bottle with volatiles-free reagent water to ensure cleanliness.

5. Fill the reagent water bottle with volatiles-free reagent water.

6. Route the Teflon® water line from the tubing outlet on the Model 4551A back panel to the bottom of the reagent water bottle.

7. Route the brown waste line from the tubing outlet on the Model 4551A back panel to the waste bottle.

8. Route the drain line from the sample concentrator back panel to the waste bottle.

NOTE: Verify the reagent water bottle is level with or lower than the Model 4551A to allow proper drainage.

Installing on the Eclipse

The following sections outline how to install the Model 4551A on to the Eclipse.

CAUTION: Use gas scrubbers for all gas supplies.

NOTE: OI Analytical recommends the Model 4551A connects to a separate gas supply than the GC carrier gas or retention times may shift.

Installing the Four-Way Injection Valve on the Eclipse

If the Eclipse is not equipped with a four-way injection valve, replace the three-way injection valve with the four-way injection valve (PN 321100).

NOTE: The four-way valve became standard equipment on the Eclipse in June 2005.

1. Verify the Eclipse power is off and unplug the unit.
2. Remove the front and sparge mount covers.
3. Disconnect the drain line from the three-way injection valve by loosening the Cheminert® 1/4–28 drain line fitting, depicted in Figure 3.3.

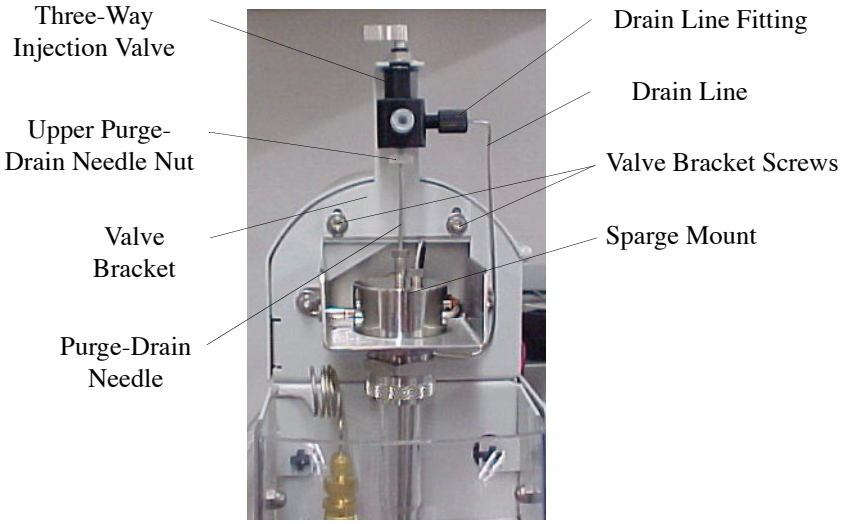


Figure 3.3. Removing the Three-Way Injection Valve

4. Remove the purge-drain needle from the bottom of the three-way injection valve by loosening the upper purge-drain needle nut.
5. Loosen the two valve bracket screws holding the valve bracket to the Eclipse.
6. Remove the valve bracket by sliding it up, leaving the screws attached to the Eclipse.
7. Loosen and slide the three-way injection valve forward to remove it from the bracket.
8. Place the four-way injection valve on the valve bracket with the ports oriented at 3, 6, and 9 o'clock as viewed from the top of the valve.
9. Slide the valve bracket back onto the two screws.
10. Reinstall the purge-drain needle into the bottom of the four-way injection valve.
11. Retighten the two valve bracket screws to secure the bracket to the Eclipse.
12. Reconnect the drain line to the four-way injection valve and finger-tighten the connecting nut.

13. Remove the Luer-Lok® fitting from the three-way injection valve and place it on the four-way injection valve at the 6 o'clock (forward) position.

    If using a SAM option, see "Installing the Optional Standards Addition Module" on page 22 in this chapter, and disregard the following steps.

    If there is no SAM option, continue with the following steps.

14. Remove the sample loop cover from the Model 4551A.

15. Connect the sample transfer line.

    a. Connect one end to the 2 o'clock position (port 1) of the Model 4551A six-port loop valve.

    b. Connect the other end to the 9 o'clock position on the Eclipse four-way valve.

16. Replace the Model 4551A sample loop cover.

Installing on the Model 4560

The following sections provide information on installing on the Model 4560.

CAUTION: Use gas scrubbers for all gas supplies.

NOTE: OI Analytical recommends the Model 4551A connects to a separate gas supply than the GC carrier gas or retention times may shift.

Installing the Four-way Sample Valve on the Model 4560

Replace the three-way sample valve on the Model 4560 with the four-way sample valve (PN 237180) provided using the following steps:

1. Verify the Model 4560 power is off.

2. Disconnect the drain line from the three-way sample valve by loosening the knurled nut, depicted in Figure 3.4.

3. Loosen the sample valve bracket by loosening the two screws holding it to the Model 4560.

4. Remove the purge-drain needle from the bottom of the three-way sample valve by loosening the knurled fitting.

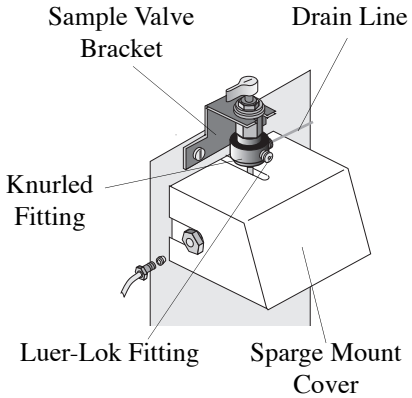


Figure 3.4. Model 4560 Three-Way Valve

5. Remove the sample valve bracket by sliding it up, leaving the screws attached to the Model 4560.

6. Loosen and slide the three-way sample valve forward to remove it from the bracket.

7. Place the four-way sample valve (included in the startup kit) on the sample valve bracket with the ports oriented at 3, 6, and 9 o'clock as viewed from the top of the valve, as depicted in Figure 3.5.

8. Slide the bracket on to the two screws.

9. Reinstall the purge-drain needle into the bottom of the four-way sample valve.

10. Retighten the screws to secure the bracket to the Model 4560.

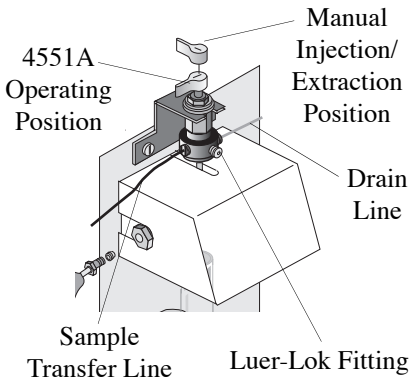


Figure 3.5. Model 4560 Four-Way Valve

11. Reconnect the drain line to the four-way valve and finger-tighten the connecting nut.

12. Remove the Luer-Lok fitting from the three-way valve and place it on the four-way valve at the 6 o'clock position.

    If using the SAM option, see Chapter 5, "Standards Addition Module (SAM) Option" on page 44 for line plumbing and SAM installation. Disregard the following steps and continue with "Installing the Sparge Vessel Door" on page 20 in this chapter.

    If not using the SAM option, continue with the following steps.

13. Remove the sample loop cover from the Model 4551A.

14. Connect the sample transfer line to the 2 o'clock position (port 1) of the Model 4551A six-port loop valve. Connect the other end to the 9 o'clock position on the Model 4560 four-way valve.

15. Replace the Model 4551A sample loop cover.

Installing the Sparge Vessel Door

Some Model 4560 units have a sparge vessel door installed, while others need to have this door in place. The following procedures outline how to install the correct sparge vessel door for proper operation with the Model 4551A.

If a Sparge Vessel Door is Installed on the Model 4560

If the Infra-Sparge Sample Heateroption is installed on the Model 4560, the Model 4560 contains a sparge vessel door. Remove this door and replace it with the new door (PN 257428) included in the Model 4551A startup kit to accommodate the Model 4551A needle drive assembly, as depicted in Figure 3.6.

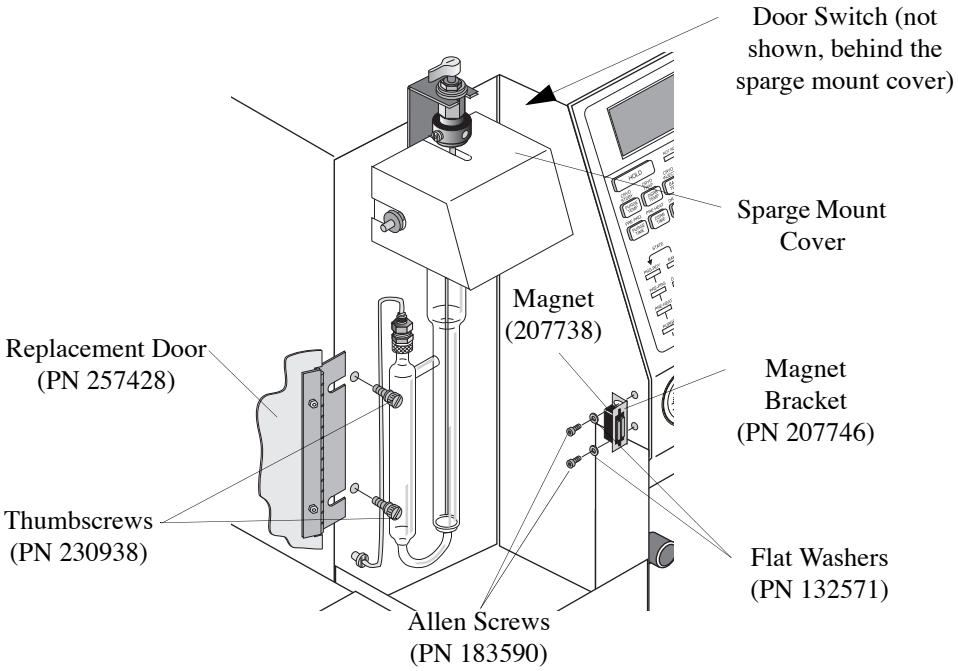


Figure 3.6. Installing the Sparge Vessel Door

1. Loosen, but do not remove, the two thumbscrews (PN 230938) holding the sparge vessel door hinge to the Model 4560.

2. Slide off the door.

3. Line up the replacement door hinge slots with the thumbscrews and slide on the new door.

4. Tighten the thumbscrews with a flat-bladed screwdriver.

5. Line up the slot on the door frame with the door switch on the Model 4560.

   Leave the installed magnetic latch to use with the new door.

If No Sparge Vessel Door is Installed on the Model 4560

Install the door (PN 257428) on the Model 4560, as depicted in Figure 3.6, using the following steps:

1. Insert the two thumbscrews (PN 230938) included in the Model 4551A startup kit into the corresponding holes on the left side of the Model 4560 front panel.

2. Screw the thumbscrews in about halfway.

3. Line up the door hinge slots with the thumbscrews and slide the door hinge into place.

4. Tighten the thumbscrews with a flat-bladed screwdriver to secure the hinge.

5. Install the magnetic latch included in the Model 4551A startup kit by snapping the magnet (PN 207738) into the magnet bracket (PN 207746.

   Align the bracket holes with the holes on the Model 4560.

6. Place the flat washers (PN 132571) over the two stainless steel Allen screws (PN 183590) and screw the magnetic latch into place using the 3/32" Allen wrench provided.

7. Adjust the slot positions as necessary so the door opens and closes smoothly.

Installing the Optional Standards Addition Module

The following procedure outlines how to install the Standards Addition Module (SAM) to the Model 4551A.

CAUTION: When installing the SAM option, unplug both the Eclipse (or Model 4560) and Model 4551A to prevent electrical malfunction or damage.

1. Verify power to the sample concentrator and Model 4551A are off and that both instruments are unplugged.

   If the SAM was purchased with the Model 4551A, go to step 4.

2. Carefully remove the Model 4551A side cover by sliding it forward and upward.

3. From the cover's underside, carefully cut the three plastic plugs using wire cutters, and gently push out the plugs.

   If any plug does not come out, use a screwdriver or other pointed object to gently remove the plug.

4. Screw the three ball studs (PN 313676) into the PEM® nuts.

5. Replace the side cover.

6. Line up the three holes on the SAM's bottom panel with the three ball studs protruding from the top of the side cover.

7. Snap the SAM housing into position.

8. If present, remove the existing sample transfer line from the Model 4551A.

a. Unscrew the connecting nut from the 2 o'clock position (port 1) of the Model 4551A six-port loop valve.

b. Disconnect the other end of the line attached to the sample concentrator's sample valve, depicted in Figure 3.5.

NOTE: Order PN 286427 separately to connect the SAM to the Model 4560. The SAM startup kit contains PN 321955 to connect the SAM to the Eclipse.

9. Connect the 1/16" nickel-tubing transfer line (PN 321955 for Eclipse, PN 286427 for Model 4560) to the SAM sample valve assembly's top right connector, depicted in Figure 3.7.

10. Connect the line's other end to the sample concentrator's injection valve.

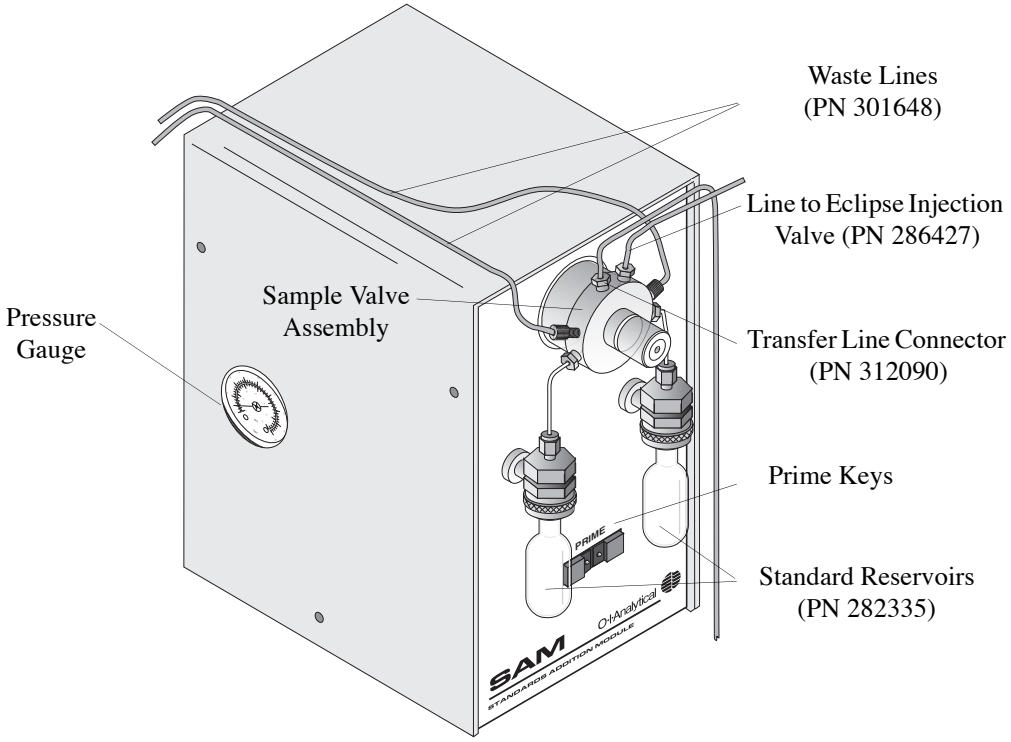


Figure 3.7. SAM Option, Front View

11. Connect the 1/16" nickel-tubing transfer line (PN 312090) to the SAM valve assembly's top left connector, depicted in Figure 3.7.

12. Connect the line's other end to the 2 o'clock position of the Model 4551A six-port loop valve.

13. Turn on the vent valve switch on the SAM back panel, depicted in Figure 3.8.

14. Connect one end of the 1/16" stainless steel gas transfer tubing (PN 188466) to the pressurizing gas inlet on the SAM back panel, depicted in Figure 3.8.

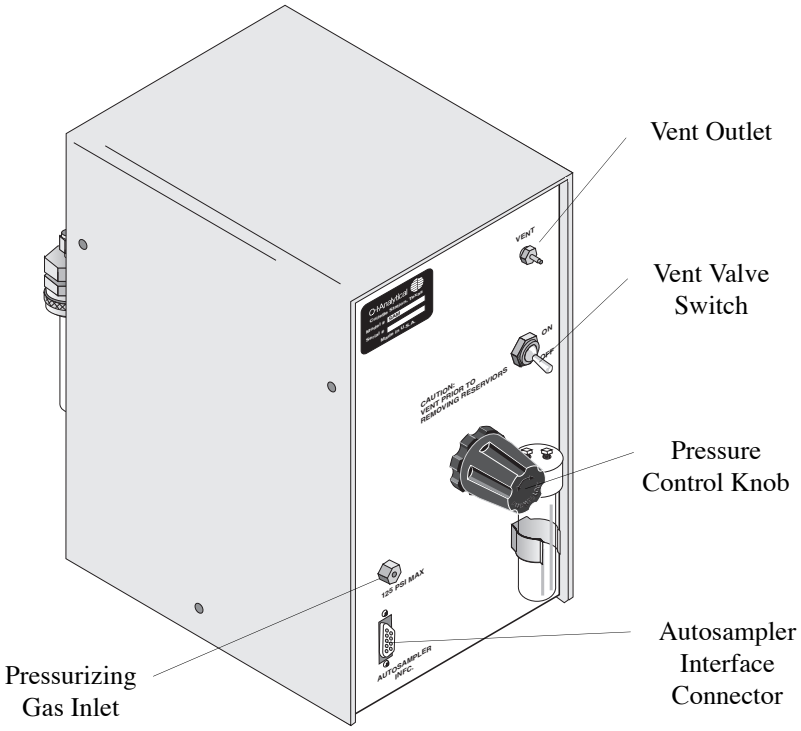


Figure 3.8. SAM Option, Back View

15. Connect the other end to a He or N_2 gas supply (25–125 psi).

16. Connect the SAM option to the Model 4551A.

    a. Plug one end of the provided cable (PN 294660) into the SAM interface port on the Model 4551A back panel.

    b. Plug the cable's other end into the autosampler interface connector on the SAM back panel, depicted in Figure 3.8.

17. Turn on the Model 4551A power.

18. Grasp the standard reservoir and loosen its retaining nut about one turn.

19. Slide the reservoir down, carefully clearing the bottom of the 1/16" pickup tube.

    Tilt the SAM to remove the reservoir, if necessary.

20. Fill the reservoir with approximately 10 mL of standard or surrogate solution.

21. Slide the reservoir back into the mounting manifold.

22. Tighten the retaining nut.

Do not overtighten the retaining nut to prevent damaging the reservoir.

23. Turn on the vent valve switch.

    Allow 10–15 seconds for the pressure to build in the reservoirs. The pressure gauge should reach 10 ±1 psi (preset at the factory).

24. Press each side of the prime key on the front of the SAM to verify standard flow through the valve and out of waste lines.

    If not observing flow, check for leaks in the valve connections and ensure the standard reservoirs properly connect. The system needs more than 12 psi to obtain flow through the valve.

For older versions of the Model 4560, upgrade the EPROM program chips in the Model 4560. Contact the OI Analytical Customer Support Center for more information.

Powering Up the Unit

1. Install the carousel cover.

2. Turn on both the sample concentrator and the Model 4551A.

   If installed on the Model 4560, verify the Model 4560 passes the automatic self test.

Confirming Proper Installation

Confirm the Model 4551A is properly installed by running a water sample and rinsing the system. See Chapter 4, “Operation” on page 24 for instructions on running a sample and rinsing the system. Watch the process and verify the following:

- All sample loop connections are leak-free.
- The wash station does not overfill, confirming an accurate wash fill time.
- The wash station pumps dry prior to filling, confirming an accurate wash station empty time.
- The system achieves full sample and rinse transfer, 5 mL or 25 mL.

The Model 4551A is ready for programming and running samples. Follow the steps in Chapter 4, “Operation” on page 24 to program a sequence.

Chapter 4 Operation

This chapter provides basic information on operating the Model 4551A Autosampler with the Eclipse or Model 4560 Sample Concentrator.

CAUTION: The Model 4560 Sample Concentrator must have firmware 3.21 or later to operate with the Model 4551A. The Model 4551A does not function without the correct firmware version.

NOTE: Included in the Model 4551A startup kit is a Model 4560 firmware upgrade. If interfacing the Model 4551A to an existing Model 4560, a firmware upgrade may be necessary. Refer to the installation instructions included with the upgrade. A new Model 4560 already contains the current firmware.

Added States

When the Eclipse or Model 4560 Sample Concentrator operates in a run state, the microprocessor advances through a sequence of primary states (see the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* or the *Model 4560 Sample Concentrator Operator's Manual*).

The Model 4551A adds the following states to the sample concentrator's cycle:

Filling sample loop — This state indicates the sample vial is being pierced and pressurized. Transfer gas (N_2 or He) plumbed to the Model 4551A back pushes the sample from the bottom of the vial and through the sample loop, against the restriction of the running peristaltic pump.

SAM inject — This state occurs quickly and does not display on the sample concentrator. In this state, the SAM 1-μL loop valve momentarily rotates in line with the standard vessel and then rotates back in line with the sample transfer path.

Sample transfer — The transfer gas pushes the loop volume to the sample concentrator's sparge vessel. Adjust the transfer time so transfer gas flow continues for a few seconds after the sample transfers to ensure a complete transfer. The sample passes through the SAM valve, if present, to the sample concentrator's sparge vessel. As it does, it sweeps the valve contents along with the sample for effective ISTD/surrogate addition. Sample purging begins at the start of sample transfer.

Wash

After desorb begins and the sample concentrator drains the purged sample, the Model 4551A begins cleanup for the next sample. The carousel rotates to the waste vial, the needle lowers, and gas flow through the needle evacuates any particulates or sample remaining in the Model 4551A needle or plumbing. The needle then rises and the carousel moves to the adjacent wash position. The needle lowers and pumps for the programmed wash empty time to remove any remaining water.

The wash station liquid level replenishes, and the sample loop fills with a wash water aliquot approximately equal to the sample volume. This aliquot transfers, like a sample, to the sparge vessel and then automatically drains. This wash process repeats (including the wash evacuation) for the programmed number of washes. The wash state occurs during desorb and bake and, therefore, does not display on the sample concentrator.

Wash complete

This state occurs after bake only if the programmed sum of desorb and bake time is less than the time required to complete the total number of programmed washes. The sample concentrator automatically estimates the remaining time required to complete the wash state. Once the programmed sample loop washes end and the time allotted for wash complete expires, the sample concentrator advances to standby for the next sample.

Preparing the Carousel

Once the preceding actions are completed, the sample carousel must be prepared for use. The following procedure outlines this process.

1. Place the sample concentrator in the hold position (see the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* or the *Model 4560 Sample Concentrator Operator's Manual*).

2. Remove the carousel cover.

3. Lift and remove the sample tray.

4. Remove the sample vials or insert new sample vials into position.

5. Remove the wash/waste vials from the Model 4551A startup kit and rinse with reagent water.

6. Place the vials in the wash and waste station positions.

7. Replace the sample tray by rotating the sample tray until it drops on the locating pin.

8. Replace the carousel cover.

Operating with the Eclipse

The following sections outline how to operate the Model 4551A with the Eclipse.

Configuring the Eclipse

The following procedure outlines how to configure the Eclipse to operate with the Model 4551A. See the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* for complete information.

1. Press **Config** to access the General configuration screen, depicted in Figure 4.1.

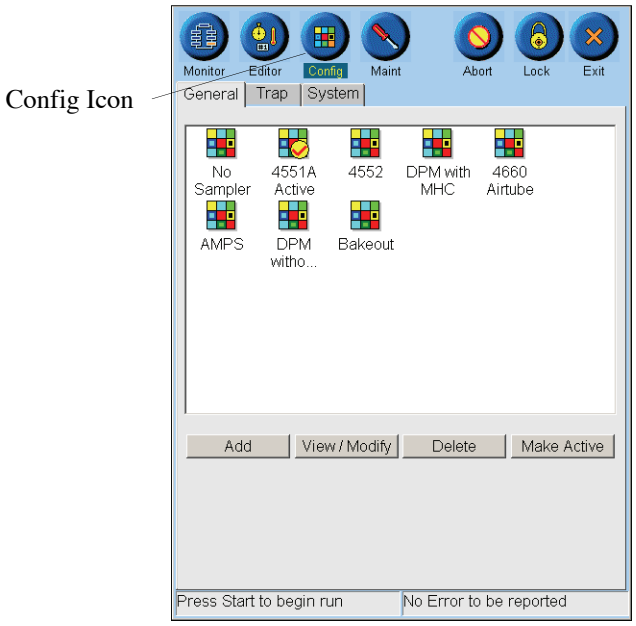


Figure 4.1. General Configuration Screen

2. Select the 4551A configuration by pressing and highlighting its named icon and pressing **View/Modify**, or create a new configuration by pressing **Add**.

NOTE: Verify the configuration's sample introduction mode is set to **4551A**.

3. From the Configure screen, select or enter parameters for specific instrument configuration.

Table 4.1 lists the default configuration settings. See Chapter 4 of the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* for complete information these settings.

Table 4.1. Eclipse Default Configuration Settings

Parameter		Setting
Flow	Drain on startup	User specified
	Drain at desorb	On
	Purge at bake	On
	Flow at purge ready	User specified
Inputs	Wait for start at purge ready	Off
	Wait for ready at desorb	On
Outputs	Output at start of purge	On
	Output at end of purge	Off
	Output at start of desorb	On
	Output at start of bake	Off
4551A Configuration	5-mL Fill time	0.15
	5-mL Transfer time	0.40
	25-mL Fill time	0.40
	25-mL Transfer time	0.75
	Wash fill time	0.23
	Wash empty time	0.50
	Sample needle depth	95%
	Wash needle depth	98%
	Calibration depth	3950

4. Press **Save** to save the changes or **Cancel** to exit the screen without saving the changes.

5. To designate the active configuration, press and highlight the named icon and press **Make Active**.

   A check mark appears above the active configuration's named icon.

Autosampler Configure Screen

Set the Model 4551A Autosampler configuration parameters with the Autosampler Configure screen, depicted in Figure 4.2.

Access the Autosampler Configure screen from the General configuration screen by selecting the 4551A configuration icon and pressing **View/Modify**. Press the Autosampler tab.

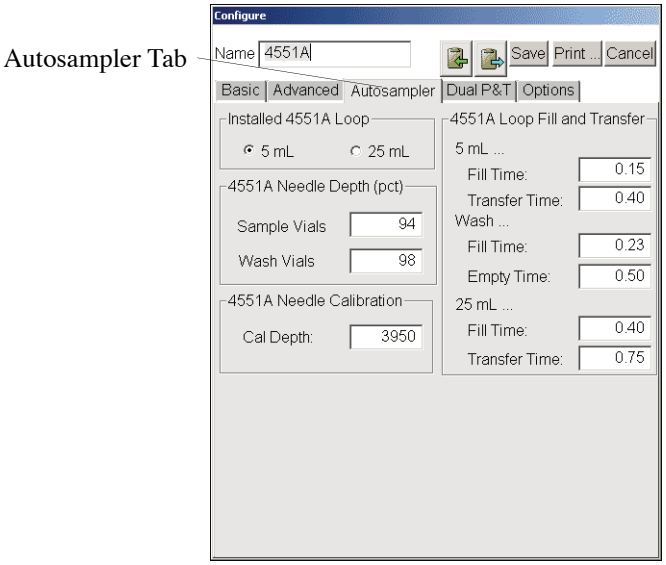


Figure 4.2. Autosampler Configure Screen

NOTE: The configuration parameters become available only when operator accesses the 4551A configuration.

Installed 4551A Loop — Selects the loop size installed on the autosampler: **5 mL** or **25 mL**.

4551A Needle Depth (pct) — Sets the depth (percent) that the needle penetrates the **Sample Vials** and **Wash Vials**, as depicted in Figure 4.3. For example, setting the depth to 90% lowers the needle 90% into the vial. Set the depth to 90% for particulated samples to prevent large, settled particles from clogging the needle. The available needle depth ranges from 75 to 100%.

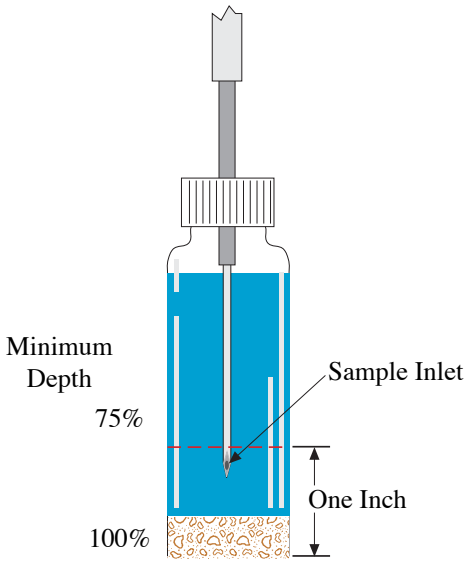


Figure 4.3. Needle Depth

NOTE: The Model 4551A sample filter contains a 200-mesh screen that filters particles that are 74 microns or larger.

4551A Needle Calibration	Sets the physical depth that the needle travels when set to 100%. It ranges from 0 to 4,000. The typical setting is 3,950.
4551A Loop Fill and Transfer	Sets the fill time (minutes) of the **5 mL** and **25 mL** sample loops and the **Wash** vial. It ranges from 0.00 to N.A.

Using Sequences

The Eclipse uses sequences to automate sample runs when working with the Model 4551A. Create, view, and edit sequences from the Sequence Editor screen. Make a sequence active from the Active Sequence screen. See the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* for complete information.

CAUTION: As a safety feature, the needle does not lower without the carousel cover in place. Do not attempt to perform any analyses without the carousel cover installed.

Using the Sequence Editor

Generate new or edit existing sequences from the Sequence Editor screen, depicted in Figure 4.4.

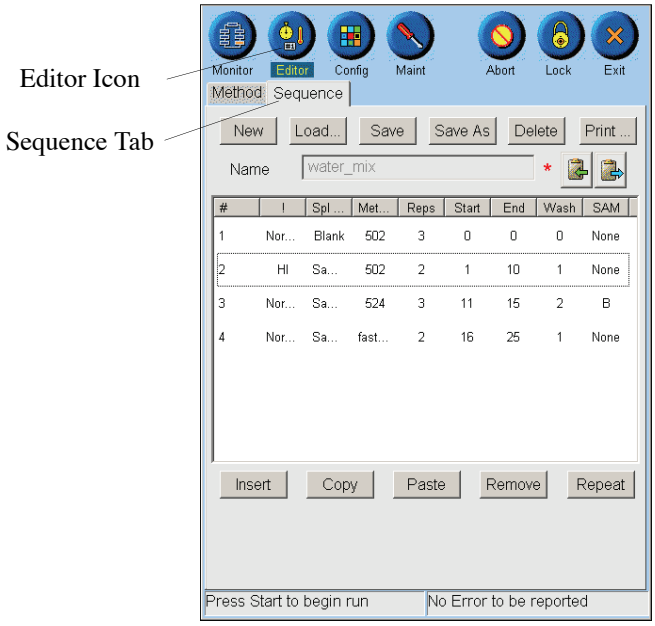


Figure 4.4. Sequence Editor Screen

NOTE: An active sequence cannot be loaded from this screen. View an active sequence from the Active Sequence screen. See "Working with Active Sequences" on page 33 in this chapter for more information.

NOTE: The autosampler vials cannot be run in a nonsequential manner. The ending autosampler vial position cannot be set for a location before the starting vial position. To skip vials, insert a new line and set the starting vial position for the next desired sample.

NOTE: Use Insert, Copy, Paste, Remove, and Repeat to simplify sequence creation and editing. Paste inserts below a highlighted line.

1. Press **Editor** → **Sequence**.

   The Sequence Editor screen is displayed.

2. Press **New** to create a new sequence or press **Load** to access an existing sequence.

   - If **New** is pressed, the Sequence Name dialog box appears. Enter the new sequence name using the onscreen keyboard. Press **OK** to save the changes or **Cancel** to exit the screen without saving the changes.

- If **Load** is pressed, the Load Sequence dialog box appears. Select an existing sequence from the dropbox. Press ✓ to save the changes or ✕ to exit the screen without saving the changes.

3. To insert a line above an existing line:

   a. Press to highlight that line.

   b. Press **Insert**.

   c. Press to highlight the new line to begin editing.

4. To add a line at the end of the sequence:

   a. Press the blank area of the sequence table (no line is highlighted).

   b. Press **Insert**.

   c. Press to highlight the new line to begin editing.

5. Select or enter specific parameters for the sequence.

6. Press **Save** to save the changes, **Save As** to save the sequence with a new name, or **Cancel** to exit the screen without saving the changes.

Working with Active Sequences

An active sequence is the currently loaded sequence. When the run commences, the samples run in the order and using the method specified in the active sequence. Once the run starts, only lines that have not been run can be edited. Make a sequence active from the Active Sequence screen. The following procedure outlines how to work with sequences.

1. Press **Monitor** → **Active Sequence**.

The Active Sequence screen is displayed, as depicted in Figure 4.5.

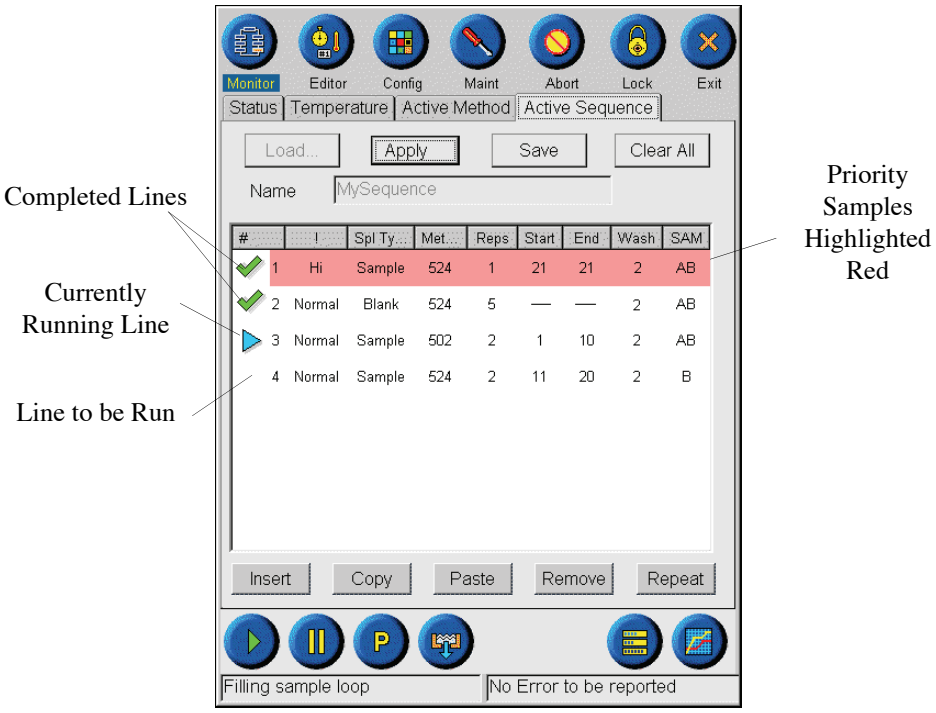


Figure 4.5. Active Sequence Screen

2. Press **Load** to make a sequence active.

   The Load Sequence dialog box appears.

3. Select a sequence from the list.

4. Press ✓ to save the changes or ✕ to exit the screen without saving the changes.

5. To edit the active sequence, press to highlight the line.

6. Select and enter any parameter changes.

NOTE: The autosampler vials cannot be run in a nonsequential manner. The ending autosampler vial position cannot be set for a location before the starting vial position. To skip vials, Insert a new line and set the starting vial position for the next desired sample.

NOTE: Use Insert, Copy, Paste, Remove, and Repeat to simplify sequence creation and editing. See “Using the Sequence Editor” on page 32 in this chapter.

7. Press **Apply** to apply the changes to the active sequence only.

   The changes are *not* saved to the sequence file.

8. Press **Save** to save the changes to the sequence file, **Save As** to save the sequence with a new name, or **Cancel** to exit the screen without saving the changes.

9. To remove the active sequence, press **Clear All**.

   This action also clears the active method.

Inserting Priority Samples

Priority Samples can be inserted into an active sequence, even while the sequence is running. The following procedure outlines how to insert a priority sample. See the *Eclipse Purge-and-Trap Sample Concentrator Operator's Manual* for complete information.

NOTE: Be sure to match sequence order or priority status changes to alternations in the GC data system sequence.

1. Press **Priority Sample**  .

   The Enter Priority Sample dialog box appears, depicted in Figure 4.6.

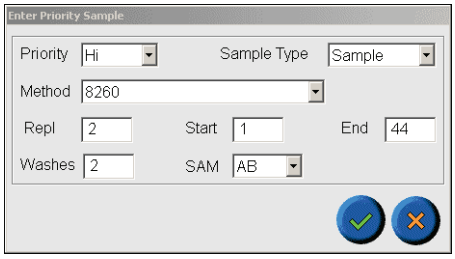


Figure 4.6. Enter Priority Sample Dialog Box

2. Select and enter the sequence parameters.

3. Press ✓ to enter the priority sample line into the active sequence or ✕ to exit the screen without adding the line.

   The Enter Priority Sample dialog box is closed and the focus is returned to the Active Sequence screen.

4. Press **Apply** to apply the changes to the active sequence only.

The priority sample line moves to the top of the sequence list or inserts into the sequence after the current sample run finishes. The priority sample line highlights red. After the priority sample line finishes, the Eclipse returns to the previously programmed sequence order.

For example, the operator programs the Eclipse with the following active sequence:

Active Sequence

Start	End	Reps
1	10	3

When the operator inserts a priority sample line as vial 11, 2 replicates while the Eclipse runs vial 2, replicate 1, the new active sequence appears:

Active Sequence

Start	End	Reps
1	2	3
11	11	2
3	10	3

Operating with the Model 4560

The following sections describe how to operate the Model 4551A with the Model 4560.

Method Sequencing

Program the Model 4560's vial sequencing parameters for each run. Refer to "Method Sequencing" in Chapter 4, "Operation," of the *Model 4560 Sample Concentrator Operator's Manual* for a detailed explanation.

Beginning with Model 4560 rev. 3.21 firmware, the Model 4560 stores all the Model 4551A parameters (including all configuration parameters listed in Table 4.2) when a method file saves in the Model 4560. Sequence method files by choosing the file number in the sequence ([1]–[5]) and selecting the method file using the on and off arrows. Since the autosampler start and end positions also save, **avoid overlapping start and end positions when sequencing files**.

CAUTION: As a safety feature, the needle does not lower without the carousel cover in place. Do not attempt to perform any analyses without the carousel cover installed.

Table 4.2. Model 4551A/4560 Default Settings

Options	ON/OFF	5 mL	25 mL
Wash quantity	ON	2	2
Blank quantity, interval	—	0,0	0,0

Table 4.2. Model 4551A/4560 Default Settings

Options	ON/OFF	5 mL	25 mL
SAM A interval	OFF	0	0
SAM B interval	OFF	0	0
Loop fill time (minutes)	—	0.15	0.45
Loop transfer time (minutes)	—	0.20	0.75
Needle depth	—	95%	95%
Replicate number	—	1	1
Sample start position	—	1	1
Sample end position	—	1	1
Wash empty (minutes)	—	0.40	0.40
Wash fill (minutes)	—	0.30	0.30

Programming the Model 4551A for Daily Analyses with the Model 4560

Begin an analysis sequence by placing the sample vials in the appropriate sample tray positions, following the carousel loading procedure described in “Preparing the Carousel” on page 27. Table 4.2 on page 36 lists default values that appear on the Model 4560 display when configuring 5-mL and 25-mL sample loop options.

Perform the following steps using the Model 4560 keypad, depicted in Figure 4.7. See Figure 4.8 for the Model 4560's configuration menus.

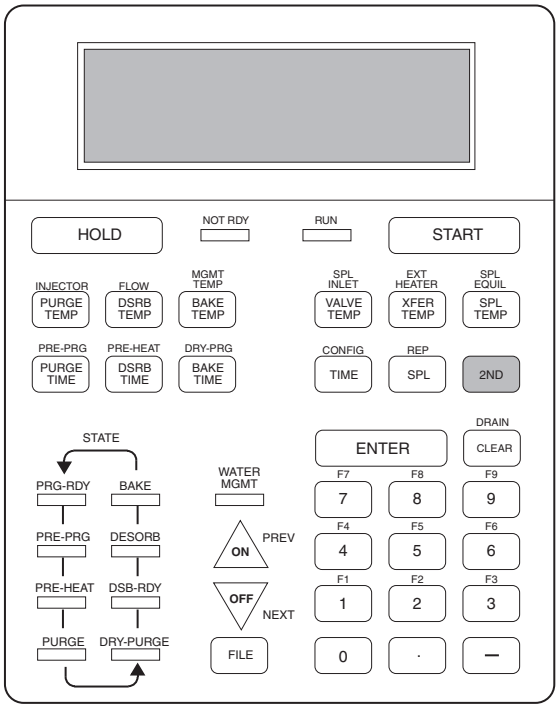


Figure 4.7. Model 4560 Keypad

1. Press **2nd** (the red 2nd function key) and **CONFIG** to access the Configure menu.

2. Select **OPTIONS** from the display menu by pressing either arrow key, then press **ENTER**.

3. Select **4551** from the display menu by pressing **ENTER** to scroll through the menu.

4. Select **ON** from the display menu by pressing the up arrow key labeled **ON**.

   The Model 4551A establishes communication with the Model 4560.

5. Press **1** to configure the parameters listed in Table 4.2 on page 36.

Configuration Menu

Figure 4.8 shows the Model 4560's configuration menus, each of which are discussed in the following sections.

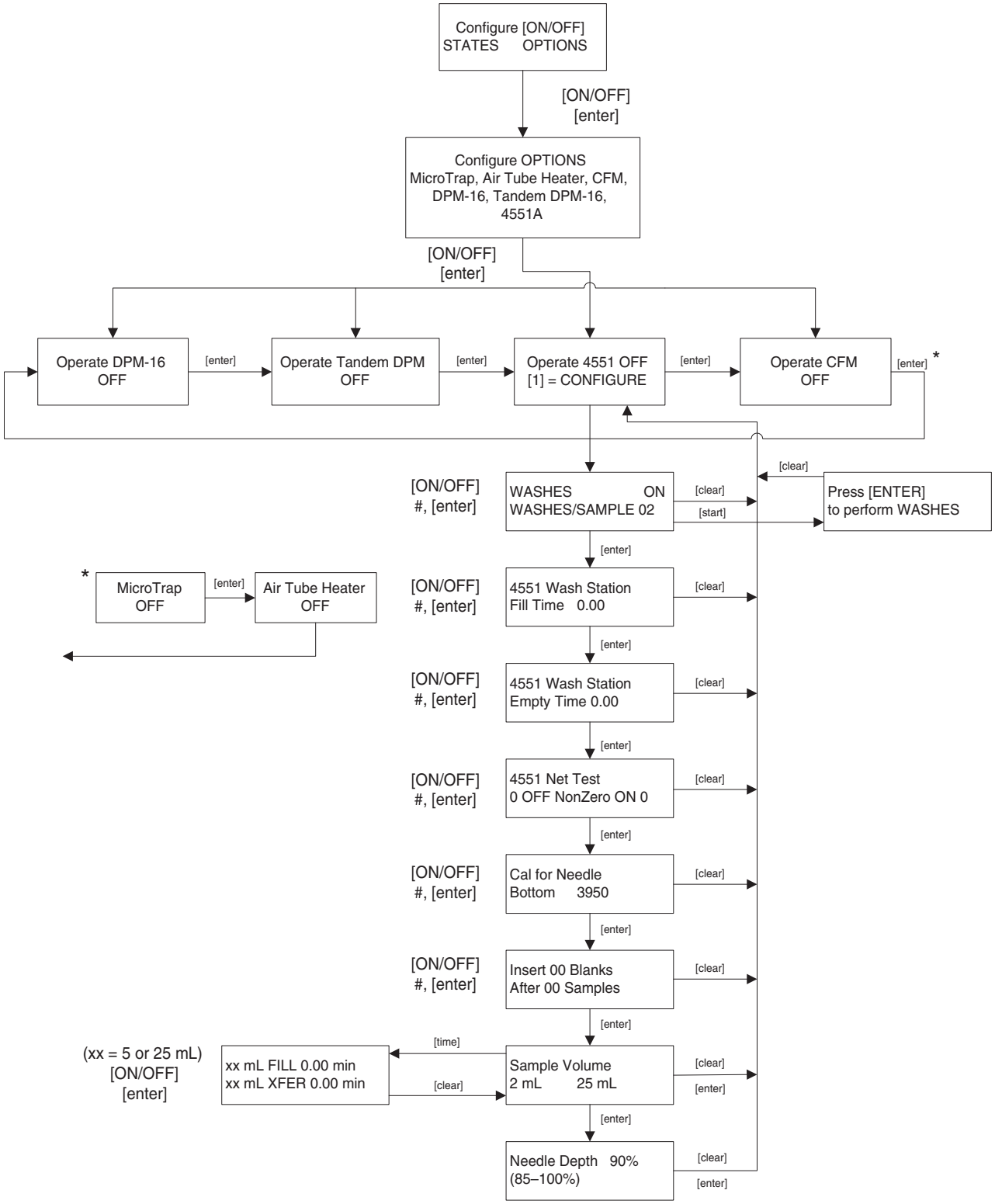


Figure 4.8. Model 4560 Configuration Menu

Programming Washes

The Model 4551A wash feature helps ensure accurate and uncontaminated results by automatically rinsing the Model 4551A transfer lines and Model 4560 sparge vessel after each sample analysis. The following steps set the automatic wash sequence. The number programmed sets the number of washes run between each sample.

Follow all the previous programming steps to reach the WASH menu, then continue with the following instructions:

NOTE: Only change Wash Fill and Wash Empty if the times entered give inadequate performance.

NOTE: An asterisk shown on the Model 4560 display indicates a changed value. Press **ENTER** within five seconds or the previous value remains in effect.

1. While in the Wash menu, press **ON** to enable washes.

2. If changing the default quantity, enter the desired quantity using the number keys, then press **ENTER**.

3. Press **ENTER** again to advance to the Wash Fill menu.

   If not changing the default intervals, press **ENTER** only once to advance.

   Change the value, if necessary.

4. Press **ENTER** to advance to the Wash Empty menu.

   Change the value, if necessary.

5. Press **ENTER** to advance to the Cal for Needle Bottom menu.

   This menu sets the distance that the needle goes into the wash vial.

6. Set the distance so the needle goes to the bottom of the vial.

7. Press **ENTER** to advance to the next menu.

Programming Blanks

Blanks are entered into a sequence from the Blanks menu and are set to run at intervals between sample analyses. To program a blank into a sequence, follow all previous steps to reach the Blank menu and then use the following procedure.

NOTE: For best performance, reset the Model 4560 after running blanks. Press **HOLD**, **2nd**, **ON**, and then **ENTER** to reset the Model 4560.

1. Enter the desired **blank quantity** and **interval**.

Use the arrow keys to move the cursor between selections and press the number keys. The following example illustrates how blanks can be programmed between sequence intervals.

Insert 0 Blanks After 0 Samples	Eliminates blanks from the sample sequence.
Insert 50 Blanks After 0 Samples	Programs 50 blanks before advancing to the first sample in the sequence. This is useful for cleanup when the Model 4551A is not in use.
Insert 2 Blanks After 5 Samples	Programs two blanks after every five samples in the sample sequence. If the SAM interval corresponds with the blank, an internal-surrogate standard spikes the blank.

2. Press **ENTER**.

   If the values changed, press ENTER again to advance to the next menu. If the default values did not change, press ENTER only once to advance.

Programming SAM A and SAM B

If using the SAM option, the SAM A and SAM B menus display next. If not using the SAM, these menus do not display. Refer to Chapter 5, “Standards Addition Module Option” on page 48” for information on programming the SAM and then continue with “Programming Sample Volume” on page 41 in this chapter.

Programming Sample Volume

The Sample Volume menu displays next. Follow all the previous programming steps to reach this menu, then continue:

1. Press **ON** to choose the appropriate **sample volume**.

   The sample volume corresponds to the sample loop size, either 5 mL or 25 mL.

2. Press **ENTER** to move to the next menu, or press **TIME** to set custom loop fill and sample transfer times.

Customizing Loop Fill / Loop Transfer Times

Loop fill time sets the time that the sample pump runs to fill the sample loop. Loop transfer time sets the time to transfer the sample from the loop to the sparger.

Selecting between 5-mL and 25-mL loop size enters the appropriate loop fill (pump) and loop transfer (sample transfer) times for the selected loop size. When using N_2 and

the fill or transfer does not complete, increase the fill or transfer time. The following procedure outlines how to change the loop fill and loop transfer times.

1. Perform all previous programming steps to reach the Sample Volume menu.
2. Press **TIME**.
3. Press the arrow keys to move the cursor and the number keys to set new times.
4. Press **CLEAR**, then **ENTER** to return to the Sample Volume menu.

Programming Needle Depth

The Needle Depth menu displays next. Program needle depth by entering the percentage the needle lowers into the sample vial. For example, setting the depth to 90% lowers the needle 90% into the vial. Set the depth to 90% for particulated samples to prevent large, settled particles from clogging the needle. The available needle depth ranges from 75 to 100%, as depicted in Figure 4.3 on page 31.

NOTE: The Model 4551A sample filter contains a 200-mesh screen that filters particles that are 74 microns or larger.

1. Enter the value and press **ENTER**.

   To demonstrate needle depth from this menu, before pressing any other keys, use the arrow keys to lower the needle into the priority vial position in intervals of 5%.

2. Press **CLEAR** repeatedly to return to the Main menu.

Sample Menu

The following section describes the Sample Menu for the Model 4560.

Programming Start and End Positions

Enter a start position and end position for each sample sequence corresponding to the actual sample positions marked on the sample tray. See Figure 4.9 for the Model 4560's Sample menu for more information. The following procedure outlines how to program the start and end positions.

NOTE: In some instances the current value displayed may not match the actual sample tray position, or the carousel may not rotate immediately to the entered start position. This may occur when a task is in progress or when the carousel has been manually rotated several positions. The display updates when the Model 4551A returns to its home position or when the command in progress completes.

NOTE: The sample menu does not display unless the Model 4551A is turned on.

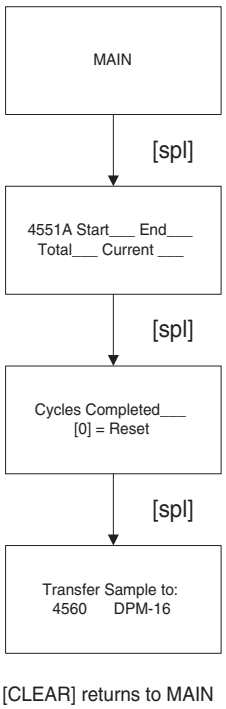


Figure 4.9. Model 4560 Sample Menu

1. From the main menu, press **SPL** (the sample key).

   The Model 4551A Sample menu displays.

2. Enter the **START** position and **END** position of the samples to be analyzed using the number keys.

   Use the ON and OFF keys to toggle between START and END.

3. Press **ENTER**.

   The carousel moves automatically to the new start position. The display shows the total samples to be analyzed (as a verification) and the current carousel position.

4. Press **CLEAR** to return to the Main menu.

Replicate Menu

For each 5-mL sample, select a replicate quantity, up to three. The following procedure outlines how to program replicates for a sample sequence.

NOTE: The Sample menu does not display unless the Model 4551A is turned on.

NOTE: A 40-mL vial contains insufficient sample for more than three replicates, since the sample loop fills with more than 5 mL of sample. Only one 25-mL sample may be extracted from a 40-mL vial.

1. From the main menu, press **2nd** and **REP** to access the Replicate menu, depicted in Figure 4.10.

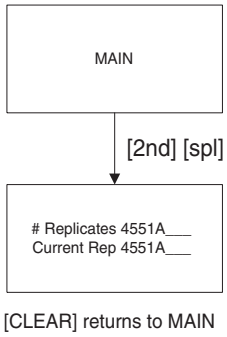


Figure 4.10. Model 4560 Replicate Menu

2. Using the number keys, enter the desired replicate number, up to three (depending on loop fill time optimization).

3. Press **ENTER**.

4. Press **CLEAR** to return to the main menu.

Saving the Method File

Once programming the method file is completed, the file can be saved for later use. The following procedure outlines how to save the file.

1. Save this programmed file if desired (refer to "File Management Key" in Chapter 4, "Operation," of the *Model 4560 Sample Concentrator Operator's Manual*).

2. Press CLEAR to return to the Main menu.

Running the Model 4551A

After the Model 4560 or Eclipse is programmed to operate with the Model 4551A, the unit is ready for operation. The following sections outline how to operate the Model 4551A.

Prerun Checks

Prior to operating the Model 4551A, there are several items that require checking to ensure proper operation of the unit. The following list includes those items that require checking.

Item	Description
Reagent Water Bottle	Verify it contains sufficient water to run the programmed sequence. Refill if necessary.
Wash/Waste Vials	Verify the vials are loaded in the sample tray.
Waste Bottle	Verify the waste bottle will not overflow during the programmed sequence.
SAM Option	If installed, verify the option is properly programmed and loaded. (See Chapter 5, “Standards Addition Module (SAM) Option” on page 44 for more information on the SAM option.)

Starting a Run

The following procedure outlines how to start a run.

1. After choosing all configuration, sequence, and method parameters, load the samples.

2. Press **Start**  on the Eclipse to begin the run.

   If using the Model 4560, press **START** on the Model 4560 to begin the run.

The Model 4551A automatically runs the sample pump to evacuate the transfer lines until free of residue. The Model 4551A then begins the programmed analyses.

Pausing or Stopping (Abort) a Run

Once a run is started, it can be paused or stopped.

NOTE: When pausing a run, the Model 4551A will continue with the operation that it is currently in and then pause operation.

NOTE: When stopping a run, the Model 4551A will stop performing the operation it is currently in when the Abort command is received.

Pausing or Stopping a Run on an Eclipse

Suspend the run on the Eclipse by pressing the **Pause** icon  . Press **Pause** again to resume the run.

Stop the run on the Eclipse by pressing the **Abort** icon  .

Pausing or Stopping a Run on a Model 4560

Pause a run on the Model 4560 by pressing **HOLD**. Resume the run by pressing **START**.

Stop the run on the Model 4560 by pressing **HOLD**, **2nd**, and **ON**, then pressing **ENTER**.

Sample Checks

Watch the first sample transfer to verify the Model 4551A is operating correctly.

NOTE: To prevent sample backup when the Model 4551A is on, the Model 4560 *always* drains, even if the drain is disabled.

NOTE: The Eclipse 4551 configuration defaults to “desorb with drain.” The operator can override this setting.

Verify the sample loop ports do not leak during the analysis. If detecting a leak, stop the run and tighten the port connections.

NOTE: Visually check for leaks on the Model 4551A.

Performing a Manual Wash

OI Analytical recommends performing a manual wash before starting a new sample sequence and after priming the SAM option to ensure cleanliness. Perform a manual wash as a cleanup procedure if contamination is suspected.

The following sections outline how to perform a manual wash with an Eclipse and a Model 4560.

Performing a Manual Wash with the Eclipse

1. Press **Maint** to access the Maintenance screen.

2. Press **4551 Sampler** to access the Maintenance: 4551 Sampler dialog box, depicted in Figure 4.11.

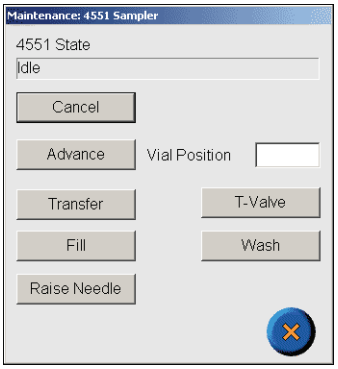


Figure 4.11. Maintenance: 4551 Sampler Dialog Box

3. Press **Wash** to rinse the needle and fill the sample loop with rinse water.
4. Press **Transfer** to send the water to the Eclipse.
5. Press ✕ to exit the dialog box.
6. Perform a manual drain by pressing **Monitor** and **Manual Drain** .

Performing a Manual Wash with the Model 4560

1. Press **2nd** and **TIME** to configure the manual wash.
2. Select **OPTIONS** from the display menu by pressing either arrow key.
3. Press **ENTER**.
4. Select **4551** from the display menu by pressing **ENTER** to scroll through the menu.
5. Press **1** to configure the option.

   The Wash menu displays.
6. Using the number keys, enter the desired number of consecutive washes.
7. Press **ENTER**.
8. While in the Wash menu, press **START**.
9. Verify the manual wash by pressing **ENTER**.

Chapter 5 Standards Addition Module Option

The Standards Addition Module (SAM) option adds 1-µL standard or surrogate to the sample during sample transfer to the sparge vessel. The SAM option contains two separate standard reservoirs that add internal standard (ISTD) or surrogate-matrix spikes at programed sampling intervals.

SAM Option Features

- Automates ISTD or surrogate-matrix spike injections at defined intervals.
- Uses the sample to sweep ISTD or surrogate into the sparge vessel.
- Easily docks onto the Model 4551A chassis.

Programming the SAM Option on the Eclipse

Enable the SAM option from the Sequence Editor screen, depicted in Figure 5.1. For more information, see Chapter 4, “Using Sequences” on page 31.

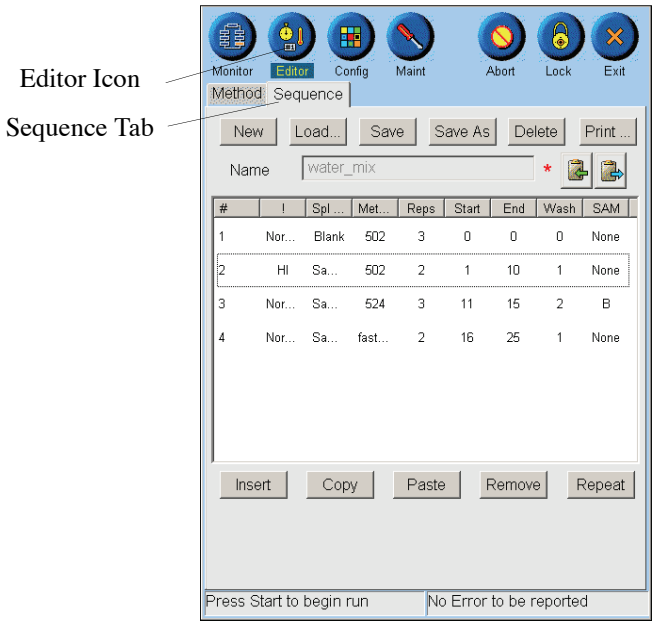


Figure 5.1. Sequence Editor Screen

1. Press **Editor** → **Sequence**.

   The Sequence Editor screen is displayed, as depicted in Figure 5.1.

2. Press **New** to create a new sequence or press **Load** to access an existing sequence.

3. To insert a line above an existing line:

   a. Press to highlight that line.

   b. Press **Insert**.

   c. Press to highlight the new line to begin editing.

4. To add a line at the end of the sequence:

   a. Press the blank area of the sequence table (no line is highlighted).

   b. Press **Insert**.

   c. Press to highlight the new line to begin editing.

5. Select or enter specific parameters for the sequence.

   - Pressing **SAM** enables the Standard Addition Module.
     - **A** indicates SAM A is active.
     - **B** indicates SAM B is active.
     - **A/B** indicates both SAM A and SAM B are active.
     - **None** indicates the SAM is not active.

6. Press **Save** to save the changes, **Save As** to save the sequence with a new name, or **Cancel** to exit the screen without saving the changes.

Programming the SAM Option on the Model 4560

The SAM option is programmed from the keyboard on the Model 4560. The following procedure outlines how to program the SAM.

1. Press **2nd** and **TIME** to configure.

2. Choose **OPTIONS** from the display menu by pressing either arrow key.

3. Press **ENTER**.

4. Select **4551** from the display menu by pressing **ENTER** to scroll through the menu.

5. Press **1** to configure.

6. Press **ENTER** six times to reach the SAM A menu.

7. Press **ON** to enable the SAM.

8. Use the number keys on the keypad to program the injection interval (e.g., an interval of two adds a spike to every other sample).

9. Press **ENTER** to program SAM B, if installed, or **CLEAR** repeatedly to reach the Main menu.

The SAM automatically adds standard or surrogate to the Model 4551A analysis as programmed through the Model 4560.

Refilling the Standards Reservoir

During the process of operating the Model 4551A, the standards reservoir empties and must be refilled. The following procedure outlines how to refill the standards reservoir.

1. Turn on the **vent valve**.

   a. Flip the vent valve switch located on the back of the SAM to the ON position, depicted in Figure 5.2.

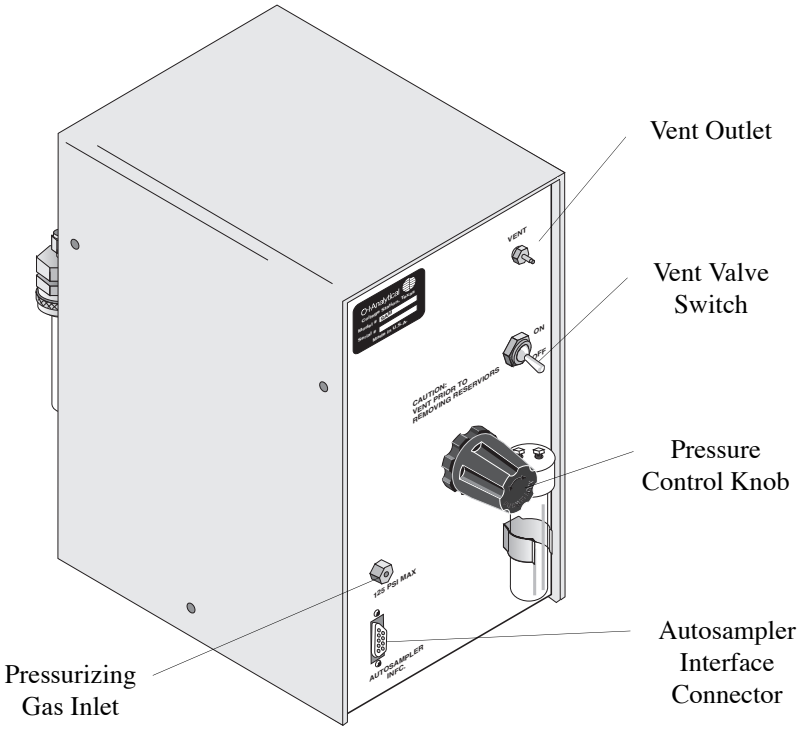


Figure 5.2. SAM Option, Back View

NOTE: The pressure gauge does not indicate the reservoir pressure.

   b. Wait 10–15 seconds for the reservoir pressure to drop.

2. Grasp the **reservoir** and loosen the **retaining nut** about **one turn**.

3. Slide the **reservoir down**, carefully clearing the bottom of the 1⁄16" pickup tube.

   Tilt the SAM to remove the reservoir, if necessary.

4. **Clean** the reservoirs and **dry** them thoroughly.

5. Fill the **reservoirs** with approximately **10 mL** of new standard or surrogate solution.

6. Slide the reservoir back into the **mounting manifold** and tighten the nut.

   Do not overtighten to avoid damaging the reservoirs.

7. Turn off the **vent valve** by flipping the vent valve switch to **OFF**.

8. Allow **10–15 seconds** for reservoir pressure to build.

9. Prime using the **prime keys** on the SAM front panel.

10. Before running any samples, perform a **wash** to clear any standard from the **transfer line**.

    See Chapter 4, “Performing a Manual Wash” on page 46 for information on performing a manual wash on the system.

Chapter 6 Maintenance

The Model 4551A Autosampler requires very little maintenance other than cleaning and routine part replacements. This chapter describes cleaning, replacing parts, and other general maintenance procedures for the Model 4551A's sample loop, needle drive assembly, and glassware.

Eclipse Maintenance Screen's 4551 Sampler Dialog Box

Directly control Model 4551A key functions for testing and diagnostic purposes. Press **Maint → 4551 Sampler** to access the Maintenance: 4551 Sampler dialog box, depicted in Figure 6.1.

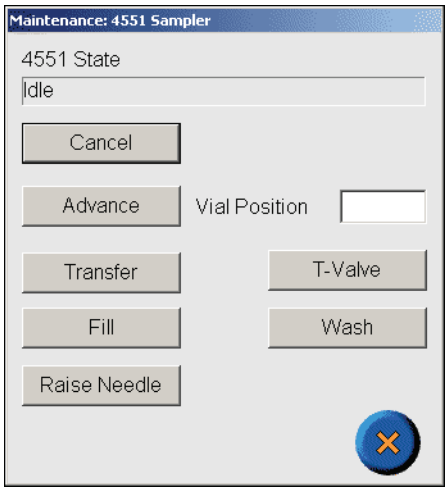


Figure 6.1. Maintenance: 4551 Sampler Dialog Box

This dialog box allows for controlling the following autosampler functions:

Advance	Moves the carousel to the designated vial position.
Transfer	Sends the sample loop contents to the sparge vessel.
Fill	Sends sample from the current autosampler position to the sample loop.
Raise Needle	Lifts up the needle.
T-Valve	Actuates the transfer valve.
Wash	Rinses the needle and fills the sample loop with rinse water.
×	Exits the dialog box.

Cleaning Procedures

Cleaning procedures for the Model 4551A involve cleaning the sample loop assembly and the reagent water bottles. The following sections describe the procedures for cleaning these items.

Cleaning the Sample Loop

Each programmed wash sequence cleans the sample loop. Remove and manually clean the sample loop when contamination is suspected. Manually clean the sample loop using the following steps:

NOTE: After replacing the sample loop, observe one full sample transfer to verify the connection does not leak.

1. Loosen the loop fittings on each side of the six-port valve (ports 2 and 5).
2. Remove the sample loop, depicted in Figure 6.2, together with the upper and lower tube assemblies (not shown).
3. Flush the sample loop and tube assemblies thoroughly with methanol followed by reagent water.
4. Remove the plastic nuts on each end of the loop and the upper and lower tube assemblies.
5. Bake the sample loop at 180–200 °C for 1–2 hours.
6. Loosely reattach the upper and lower tube assemblies to the sample loop ends.

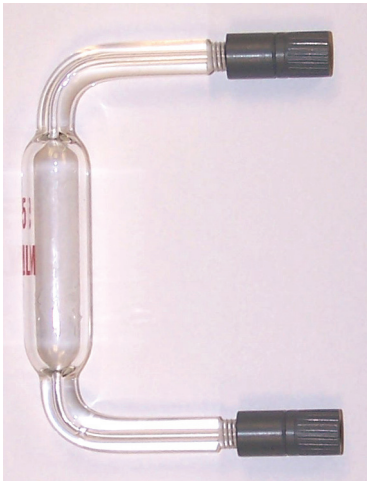


Figure 6.2. 5-mL Sample Loop

7. Reattach the other end of the tube assemblies to the 6-port valve (ports 2 and 5).

   Be careful not to crossthread the loop fitting nut.

8. Slide and snap the sample loop into the sample loop clip, depicted in Figure 6.3.

   For the smaller 5-mL and 10-mL sample loops, a sample loop clip adapter is required to properly secure the sample loop inside the sample loop clip. The 25-mL sample loop does not require the use of a sample loop clip adapter.

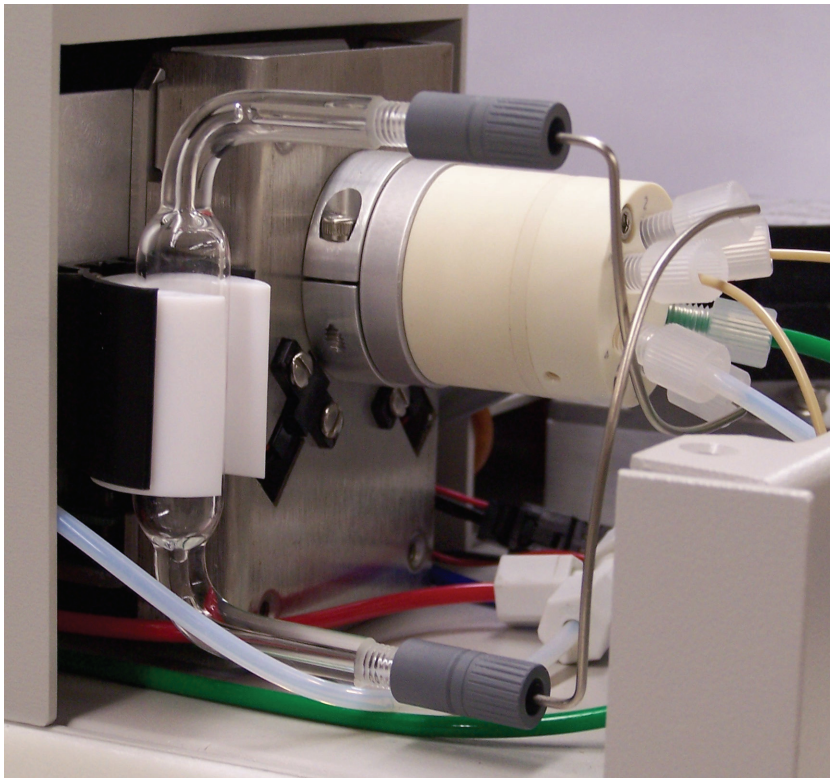


Figure 6.3. Sample Loop in Sample Loop Clip

9. Finger-tighten all fittings until snug.

Cleaning the Reagent Water Bottle

Remove and clean the reagent water bottle when contamination is suspected. The following procedure outlines how to clean the reagent water bottle.

1. Rinse the bottle thoroughly with reagent water.

2. Bake the bottle at 180–200 °C for 1–2 hours.

Replacement Procedures

The following sections describe the replacement procedures for the sample loop, the needle transfer line, the sample filter, septum-piercing needle, and the needle sleeve.

Replacing the Sample Loop

Replace the sample loop any time it appears damaged or contaminated, or to switch to another loop size (e.g., 5 mL to 25 mL). The following procedure outlines how to replace the sample loop.

CAUTION: Overtightening the loop fittings irreparably damages the valve body. Finger-tighten sufficiently to form a leak-free seal.

NOTE: After replacing the sample loop, observe one full sample transfer to verify the connection does not leak.

1. Loosen the plastic nuts on both ends of the sample loop, depicted in Figure 6.2.
2. Remove the sample loop from the upper and lower tube assemblies.
3. Remove the old ferrules.
4. Place new ferrules on the upper and lower tube assemblies.
5. Attach the sample loop to the upper and lower tube assemblies.
6. Tighten the female threaded tube nuts until snug.

   Do not overtighten the tube nuts.

Replacing the Needle Transfer Line

Replace the needle transfer line tubing, depicted in Figure 6.4, if it becomes damaged or contaminated.

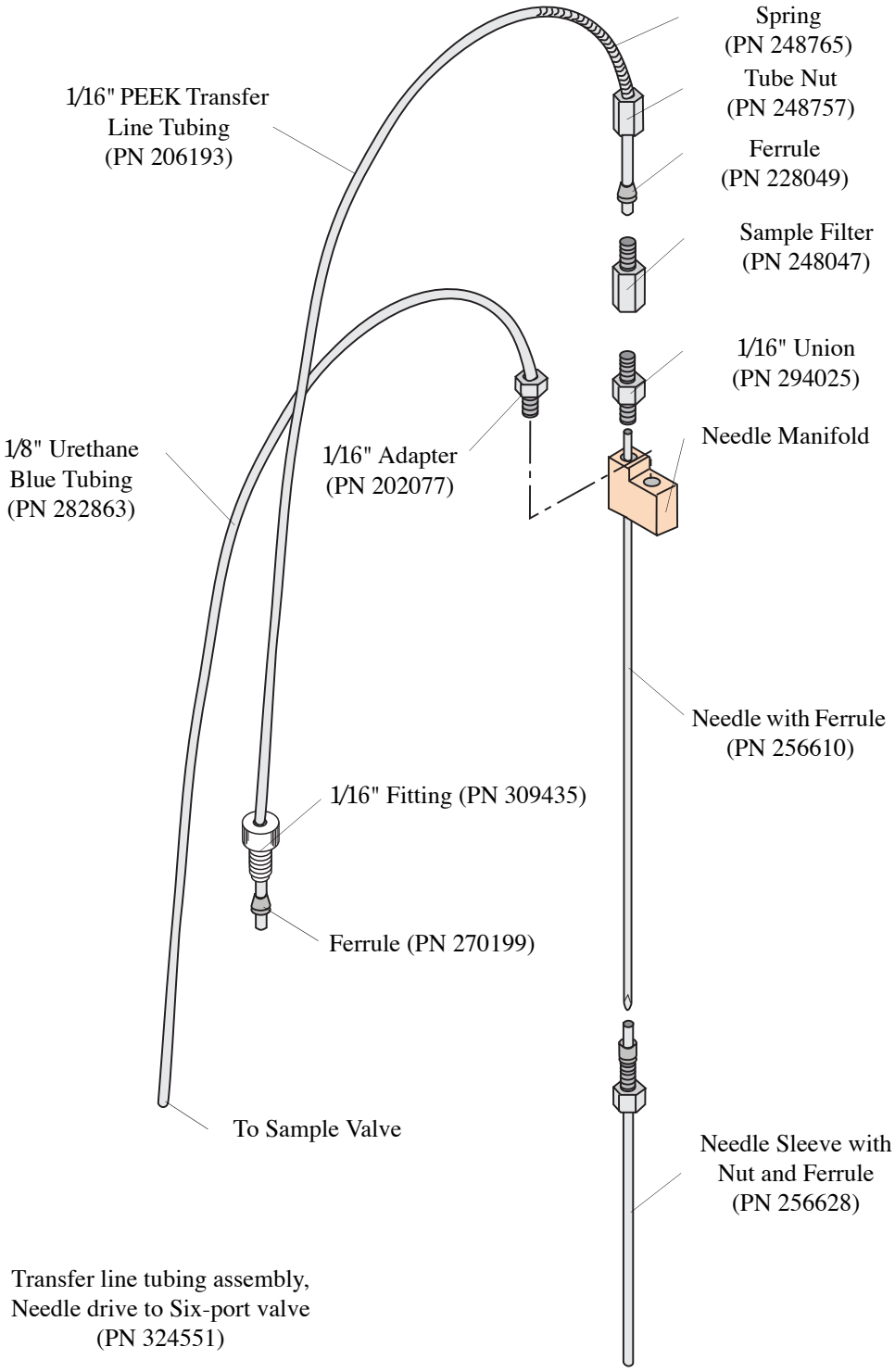


Figure 6.4. Needle Assembly

1. Remove the needle drive cover.

2. Loosen and remove the tube nut (PN 248757) located above the sample filter using a 1/4" wrench.

   Use a backup wrench on the sample filter to avoid loosening the sample filter.

3. Loosen and remove the PEEK transfer line tubing (PN 206193) from the six-port loop valve.

4. Install the new needle transfer line tubing (PN 206193) onto the six-port loop valve.

5. Replace the tube nut.

Replacing or Cleaning the Sample Filter

Replace or clean the sample filter in the needle drive assembly, depicted in Figure 6.4, if it becomes clogged.

1. Remove the needle drive cover.

2. Loosen and remove the tube nut (PN 248757) located above the sample filter (PN 248047) using a 1/4" wrench.

   Use a backup wrench on the sample filter to avoid loosening the sample filter.

3. Remove the sample filter (PN 248047) using a 1/4" wrench.

   Use a backup wrench on the union to avoid loosening the union.

4. Clean the filter using either of the following methods:

   - Blow compressed air through both ends of the filter. The screen should be clear enough to see through.
   - Sonicate for 15 minutes in methanol and blow dry.

5. Install the clean sample filter.

6. Replace and tighten the tube nut.

Replacing the Septum-Piercing Needle

Replace the septum-piercing needle (PN 256610), depicted in Figure 6.4, if it becomes clogged, damaged, or too dull to pierce the septum.

1. Remove the needle drive cover.

2. Loosen and remove the tube nut (PN 248757) located above the sample filter (PN 248047) using a 1/4" wrench.

Use a backup wrench on the sample filter to avoid loosening the sample filter.

3. Remove the sample filter (PN 248047) using a 1/4" wrench.

4. Loosen the 1/16" union (PN 294025) using the 1/4" nut driver (PN 223917) included in the Model 4551A startup kit.

5. Slide the needle out through the top of the needle manifold.

6. Slide the replacement needle with preattached ferrule into the needle manifold.

7. Tighten the 1/16" union (PN 294025) with the 1/4" nut driver and reattach the sample filter and needle transfer line assembly (PN 309443).

Replacing the Needle Sleeve

Replace the needle sleeve (PN 256628), depicted in Figure 6.4, if it becomes clogged or damaged.

1. Remove the needle drive cover.

2. Loosen the fittings above the septum-piercing needle and partially slide the needle out of the needle manifold.

   See “Replacing the Septum-Piercing Needle” on page 57 for information on replacing the septum-piercing needle.

3. Loosen and remove the 1/16" stainless steel nut located below the needle manifold.

4. Slide the needle sleeve out of the manifold and off the needle.

5. Remove the Teflon ferrule.

6. Slide the new needle sleeve and ferrule over the needle until the top of the sleeve fits into the needle manifold.

7. Tighten the existing 1/16" stainless steel nut to seal the needle sleeve, ensuring the septum-piercing needle slides freely through the sleeve.

NOTE: Do not overtighten the stainless steel nut. The needle sleeve can collapse around the needle, restricting flow.

8. Replace the septum-piercing needle and retighten all needle fittings.

Chapter 7 Troubleshooting

CAUTION: To reduce the risk of electrical shock, do not remove the Model 4551A cover or back panel. No operator-serviceable parts are located inside. Refer servicing to qualified OI Analytical Customer Support personnel.

This chapter lists problems that might occur during normal operation of the Model 4551A Autosampler along with possible solutions. Any maintenance that involves the interior components of the Model 4551A should be performed by OI Analytical-trained technical support personnel only. If a problem still exists after reviewing the following chart or if it is not addressed, contact the OI Analytical Customer Support Center for assistance at (800) 336-1911 or (979) 690-1711.

Table 7.1. Model 4551A Troubleshooting

Symptom	Probable Cause	Corrective Action
The Model 4551A does not turn on.	Power cord not plugged in	Plug in the power cord.
	Blown fuse	If back panel fuse, replace the fuse. If any other fuse, contact the OI Analytical Customer Support Center.
	Faulty power supply	Contact the OI Analytical Customer Support Center.
The Model 4551A and sample concentrator lose communication (locked-up or not executing commands).		Turn both units off and then back on.
	O•I•NET BNC cable not connected	Connect the BNC cable. Press **HOLD**, **2nd**, and **ON** and then press **ENTER**.
	Units not synchronized	Clear the sample concentrator by returning to Standby.

Table 7.1. Model 4551A Troubleshooting (Continued)

Symptom	Probable Cause	Corrective Action
The Model 4551A does not extract sample from a VOA vial or wash station.	If the sample pump is not running: loop fill time is "0"	Extend the loop fill time.
	Leak (sucking air)	Check associated fittings for leaks.
	Clogged needle	Clean the needle.
	Clogged filter	Clean, remove, or replace the filter.
	Needle sleeve over tightened	Loosen the nut slightly.
	No transfer gas	Turn on the transfer gas.
	Needle transfer and sleeve transfer lines reversed	Switch the lines.
The Model 4551A extracts wash water or blanks, but not from a VOA vial.	Model 4551A has been programmed to perform blanks only	Check the programming.
Sample pumps from vial or wash station, but does not transfer to the sparger.	Transfer time is "0"	Extend the transfer time.
	Transfer gas tubing is disconnected	Connect the transfer gas tubing.
	Transfer valve is unplugged	Contact the OI Analytical Technical Support Department.
Sample transfer to the sparger slows.	Model 4560 needle opening obstructed	Raise the needle slightly off the Model 4560 frit.
	Leak	Check all connections for leaks.
	Insufficient gas flow	Verify at least 50 psi external gas.
The Model 4551A does not perform washes.	Washes turned off	Check the programming.

Table 7.1. Model 4551A Troubleshooting (Continued)

Symptom	Probable Cause	Corrective Action
The needle assembly does not lower to pierce the vial.	Carousel cover removed, interlock switch interrupted	Replace the carousel cover.
	Wrong vial type	Use only standard 40-mL VOA vials.
	Low gas pressure	Verify at least 50 psi external gas.
The tray advances to an unwanted position.	Wrong sample start position programmed	Check the programming.
The needle does not pierce the septum center.	Bent needle	Replace the needle.
	Carousel or needle tower needs alignment	Contact the OI Analytical Customer Support Center.
The wash vessel completely overflows.	Wash fill time excessive	Reduce the wash fill time.
The needle remains in the wash or waste station without raising.	Carousel cover is off	Replace the carousel cover.
	Low gas pressure	Verify the gas supply.
Reagent (blank) water drips from the spout.	Siphoning effect, bottle positioned higher than the Model 4551A	Position the bottle lower than the Model 4551A.
One of the following zones shows no sign of power (movement): • Carousel • Needle drive • Sample valve • Actuator • Sample pump	Associated cable may be unplugged	Contact the OI Analytical Customer Support Center.
The wash station completely empties when filling the sample loop.	Wash fill time too short	Increase the wash fill time.
	Loop fill time too long	Decrease the loop fill time.

Table 7.2. SAM Option Troubleshooting

Symptom	Probable Cause	Corrective Action
The SAM (A or B) does not inject at selected intervals.	SAM A and B programming reversed	Check the programming.
No spiking occurs.	Vent switch on	Turn off the vent switch.
	Reservoir fitting loose	Tighten the reservoir fitting.
	Leak	Check the system for leaks.
	Pressure is too low	Verify the SAM is primed.

Chapter 8 Replacement Parts

This chapter provides a list of replacement parts and support items for the Model 4551A. An asterisk indicates replacement parts that are considered expendable (XPN). Replace expendable parts regularly, since they may become deformed or broken. Keep a supply of expendable parts in stock.

Model 4551A Autosampler Parts

Table 8.1. Boards

Product	Unit	PN	XPN
Main board to interface with Model 4560	each	278101	
Main board to interface with Eclipse	each	321738	

Table 8.2. Cables

Product	Unit	PN	XPN
Cable, BNC-to-BNC, Model 4551A to Model 4560, 3 feet	each	235515	
Cable, nine-pin D-sub, Model 4551A to Eclipse	each	321133	
Power cord	each	116038	

Table 8.3. Fittings and Ferrules

Product	Size	Unit	PN	XPN
Adapter fitting	1/8" hose x 1/16"	each	178434	
Adapter fitting, brass	1/8"	each	166208	
Adapter fitting, brass/nickel	10-32 x 1/16 hose	each	202077	
Bulkhead fitting	—	each	285189	
Bushing, PEEK, Cheminert	1/8"	each	284828	
Coupling fitting	1/4-28	each	166274	
Cross fitting, swivel, brass/nickel	10/32	each	179499	

Table 8.3. Fittings and Ferrules (Continued)

Product	Size	Unit	PN	XPN
Ferrule, Tefzel®	1/8" tube	each	263756	
Ferrule, brass	1/16" reverse tube	each	228049	
Ferrule, CTFE, Cheminert	1/16"	each	321495	
Ferrule, PFA, Cheminert	1/8"	each	284844	
Ferrule, stainless steel	1/16" tube	each	227207	
Ferrule, Tefzel	1/16" tube	each	270199	
Filter, 20 μm	10-32 fitting	each	238865	
Fitting union, stainless steel	1/16"	each	294025	
Nut	1/4-28 1/8" tube	each	263764	
Nut, black, Cheminert	1/16" x 1/4-28	each	321494	
Nut, female, stainless steel	1/4"	each	169682	
Nut, male, stainless steel, DSF	1/16"	each	223057	
Nut, natural, Cheminert	1/8"	each	284729	
Nut, polypropylene	1/4-28 x 1/16"	each	309435	
Nut, stainless steel, spring	1/16"	each	248757	
Plug, brass/nickel, O-ring	10-32	each	177502	
Restrictor element, blue	0.0025 to 10-32	each	280172	
Restrictor, barbed fitting	10-32 x 1/16"	each	309344	
Sample filter assembly	—	each	248047	
Spring, stainless steel	0.125 O.D. x 1.25"	each	248765	
Tee fitting	1/8"	each	279125	

Table 8.4. Glassware and Accessories

Product	Size	Unit	PN	XPN
Reagent water bottle assembly	—	each	248915	
Bottle, amber	1 gallon	each	257360	
Cap for 40-mL VOA vial	—	72/pk	296079	*
Septum for 40-mL VOA vial	—	72/pk	296061	*

Table 8.4. Glassware and Accessories (Continued)

Product	Size	Unit	PN	XPN
Vial, VOA	40 mL	72/box	296087	*
Vial, wash/waste station	—	each	232801	*

Table 8.5. Tubing and Tubing Assemblies

Product	Size	Unit	PN	XPN
Transfer line tubing assembly, Eclipse to Model 4551A	—	each	321655	
Transfer line tubing assembly, Model 4560 to Model 4551A	—	each	309443	
Transfer line tubing assembly, Needle Drive to Six-Port Valve	—	each	324551	
Tube, lower, threaded loop	—	each	325329	
Tub, upper, threaded loop	—	each	325330	
Tube insert, stainless steel	1/16 x 0.030	each	295543	
Tubing, urethane, red	1/8 O.D.	ft	282848	
Tubing, brown	1/8 x 1/16 I.D.	in	257550	
Tubing, PEEK	1/16 x 0.040	in	206193	
Tubing, Teflon	1/8 x 0.03	ft	147901	
Tubing, Tygon®	1/4 x 1/8 I.D.	in	257469	
Tubing, urethane, blue	1/8 O.D.	ft	282863	
Tubing, urethane, green	1/8 O.D.	ft	282855	

Table 8.6. Valve and Valve Assemblies

Product	Unit	PN	XPN
Check valve, polypropylene	each	182238	
Four-way injection valve for Eclipse, 1/4-28	each	321100	
Four-way sample valve for Model 4560, 10-32	each	237180	
Three-way solenoid valve	each	282756	

Table 8.7. Miscellaneous Model 4551A Parts

Product	Unit	PN	XPN
Carousel cover	each	257436	
Firmware for Model 4551A (latest revision)	each	315945	
Fuse, 2 A, 250 V	each	177453	*
Loop cover	each	257451	
Model 4551A Operator's manual	each	310565	
Model 4560 door for 4551A	each	257428	
Peristaltic pump tube kit	each	277319	
Pressure switch	each	270173	
Reagent water pump, 24V	each	296160	
Sample loop adapter, 5 mL (included with unit)	each	261347	
Sample loop adapter, 10 mL (included with 325336)	each	324043	
Sample loop, glass, 25 mL, threaded	each	325334	
Sample loop, glass, 10 mL, threaded	each	325333	
Sample loop, glass, 5 mL, threaded	each	325332	
Sample tray assembly for Model 4551A	each	234815	
Septum-piercing needle	each	256610	*
Startup kit for Model 4551A	each	282731	
Threaded loop upgrade kit, 5 mL	each	325335	
Threaded loop upgrade kit, 10 mL	each	325336	
Threaded loop upgrade kit, 25 mL	each	325337	
Transfer gas sleeve needle	each	256628	*

SAM Option Parts

Table 8.8. SAM Option Parts

Product	Unit	PN	XPN
Carrier gas tube assembly	each	188466-002	
Ferrule, Teflon, 12 mm	10/pk	223164	*
Interface cable, Model 4551A to SAM	each	294660	
Regulator, 0–60 psi	each	282251	
SAM waste tube assembly	each	301648	
Six-port valve	each	295998	
Standard reservoir	each	282335	
Tube assembly, Eclipse to SAM	each	321955	
Tube assembly, Model 4551A to SAM	each	312090	
Tube assembly, SAM to Model 4560	each	286427	

Chapter 9 Plumbing Schematics

Figure 9.1 depicts the plumbing schematic for the Model 4551A.

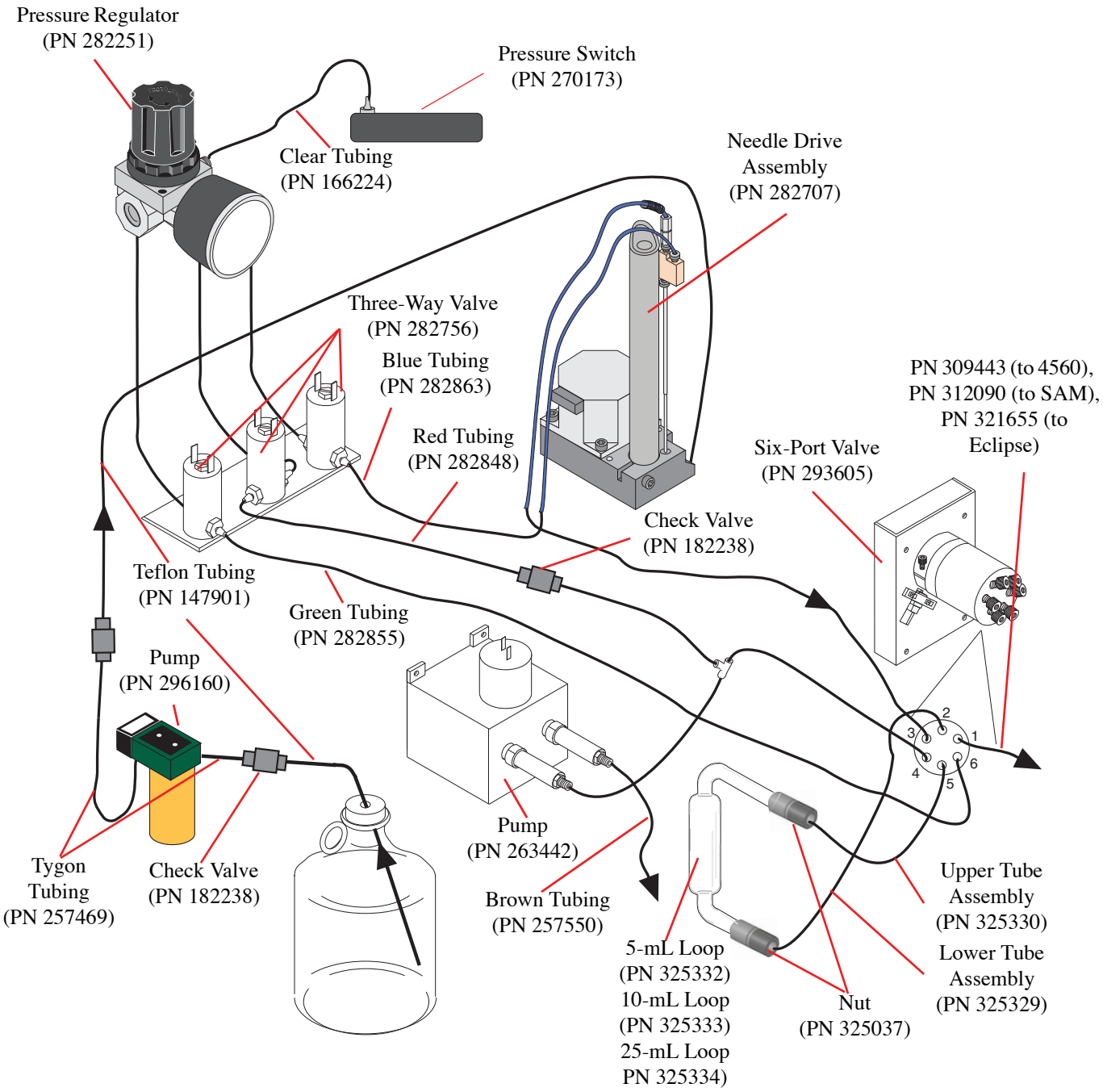


Figure 9.1. Plumbing Schematic

Figure 9.2 depicts a parts breakout of the Model 4551A.

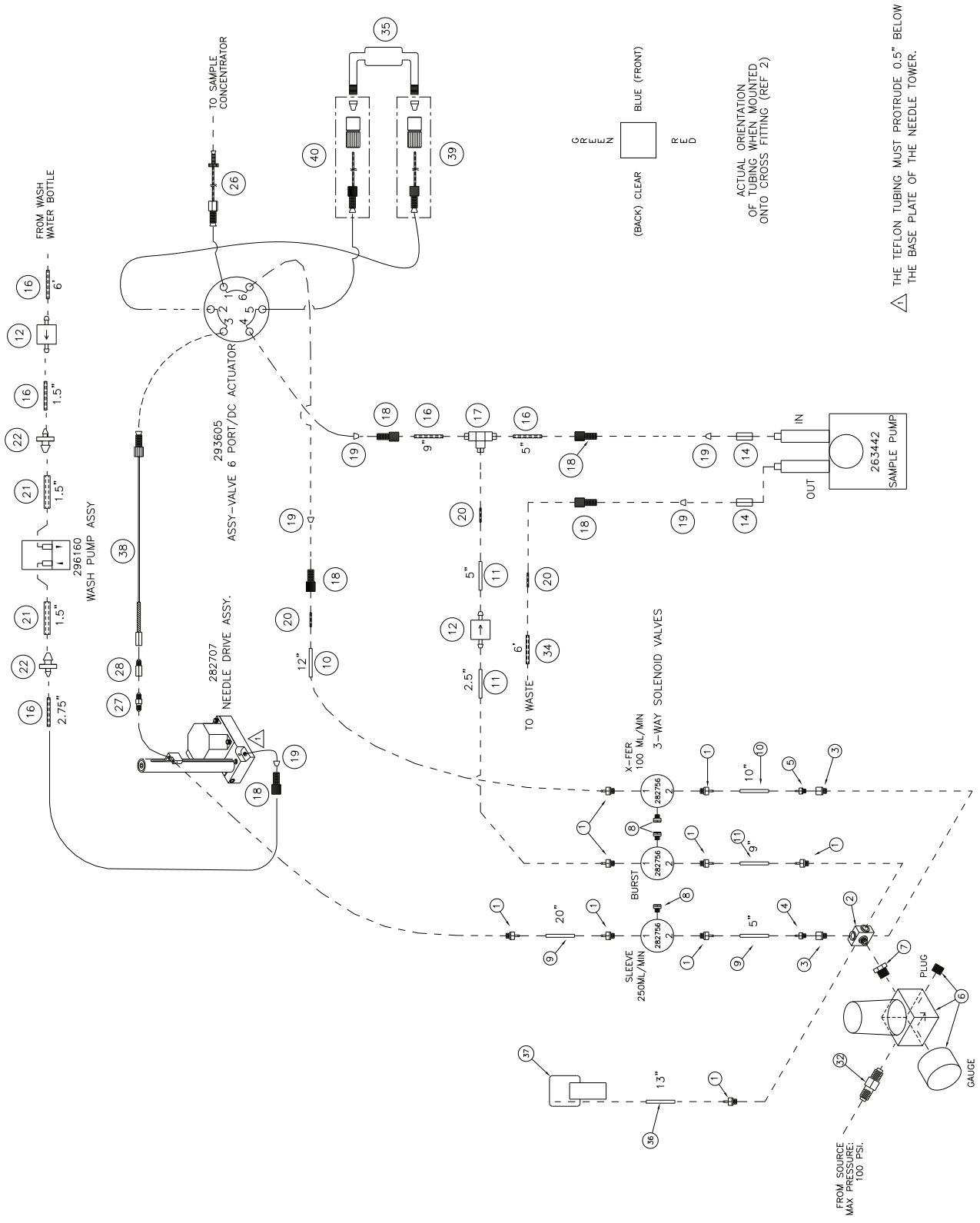


Figure 9.2. Parts Breakout

Number	Part Number	Amount Required	Description
1	202077	8	Fitting-Adapt Tbr/Ni 10-32 x 1/16 Hose
2	179499	1	Fitting-Cross Br/Ni Swivel 10/32
3	238865	2	Filter-20 10/32 Fitting
4	280172	1	Restr Elem 0.0025 to 10/32 (blue)
5	309344	1	Restr-100 mL 30 psi Brb Fitting #10-32 x 1/16"
6	282251	1	Regulator-Pressure
7	166208	1	Fitting-Adapt Br 1/8 Mpt-F10-32
8	177502	3	Fitting-Plug Br/Ni 10-32 O-ring
9	282863	25”	Tubing-Urethane 1/8 OD (blue)
10	282853	22”	Tubing-Urethane 1/8 OD (green)
11	282855	21.5”	Tubing-Urethane 1/8 OD (red)
12	182238	2	Valve-Check 1/16 Tube
13	284828	1	Bushing-PEEK 1/8 Cheminert
14	166274	2	Fitting-Coupling PP 1/4-28
15	284844	1	Ferrule-PFA 1/8 Cheminert
16	147901	88.5”	Tubing-Tef 1/8 x 0.063
17	279125	1	Fitting-Tee PP 1/8
18	263764	4	Fitting-Nut PP 4-28 1/8 Tube
19	263756	4	Ferrule-Tefzel 1/8 Tube
20	295543	3	Insert Tube-Stainless Steel 1/16 x 0.030
21	257469	3”	Tube-Tygon 1/4 x 1/8
22	178434	2	Fitting-Adapt Pls 1/8" Hose x 1/16" Hose
23	206193	17”	Tubing-PEEK 1/16 x 0.040
24	309435	1	Fitting-Nut PP 1/4-28 x 1/16
25	270199	1	Ferrule-Tefzel 1/16 Tube
26	309443	1	Tubing Assembly-Transfer Line 4551A
27	294025	1	Fitting-Union Stainless Steel 1/16 M-M DSF
28	248047	1	Assembly-Sample Filter 4551A
29	228049	1	Ferrule-BR 1/16 Tube RV
30	248757	1	Fitting-Nut Stainless Steel 1/16 XXTD Spring

Number	Part Number	Amount Required	Description
31	248765	1	Sprint-Ext SS 0.125 O.D. x 1.25 L
32	285189	1	Fitting-SS Bulkhead 1⁄8 MNP to 1⁄8" TB
33	284729	1	Fitting-Nut PP 1⁄8 Ntl Cheminert
34	257550	6 feet	Tubing-Urth 1⁄8 x 1⁄16 I.D. Brown
35	325332	1	Loop, 5 mL Glass
35	325333	1	Loop, 10 mL Glass (not shown)
35	325334	1	Loop, 25 mL Glass (not shown)
36	166224	1.083 feet	Tubing-Urth 1⁄8 x 1⁄16 I.D. Clear
37	270173	1	SW-Pressure Spdt 18 psi
38	324551	1	Assy-tube PEEK xfer 4551A
39	325329	1	Tube assy - lower threaded loop 4551A
40	325330	1	Tube assy - upper threaded loop 4551A

Chapter 10 Flow Diagrams

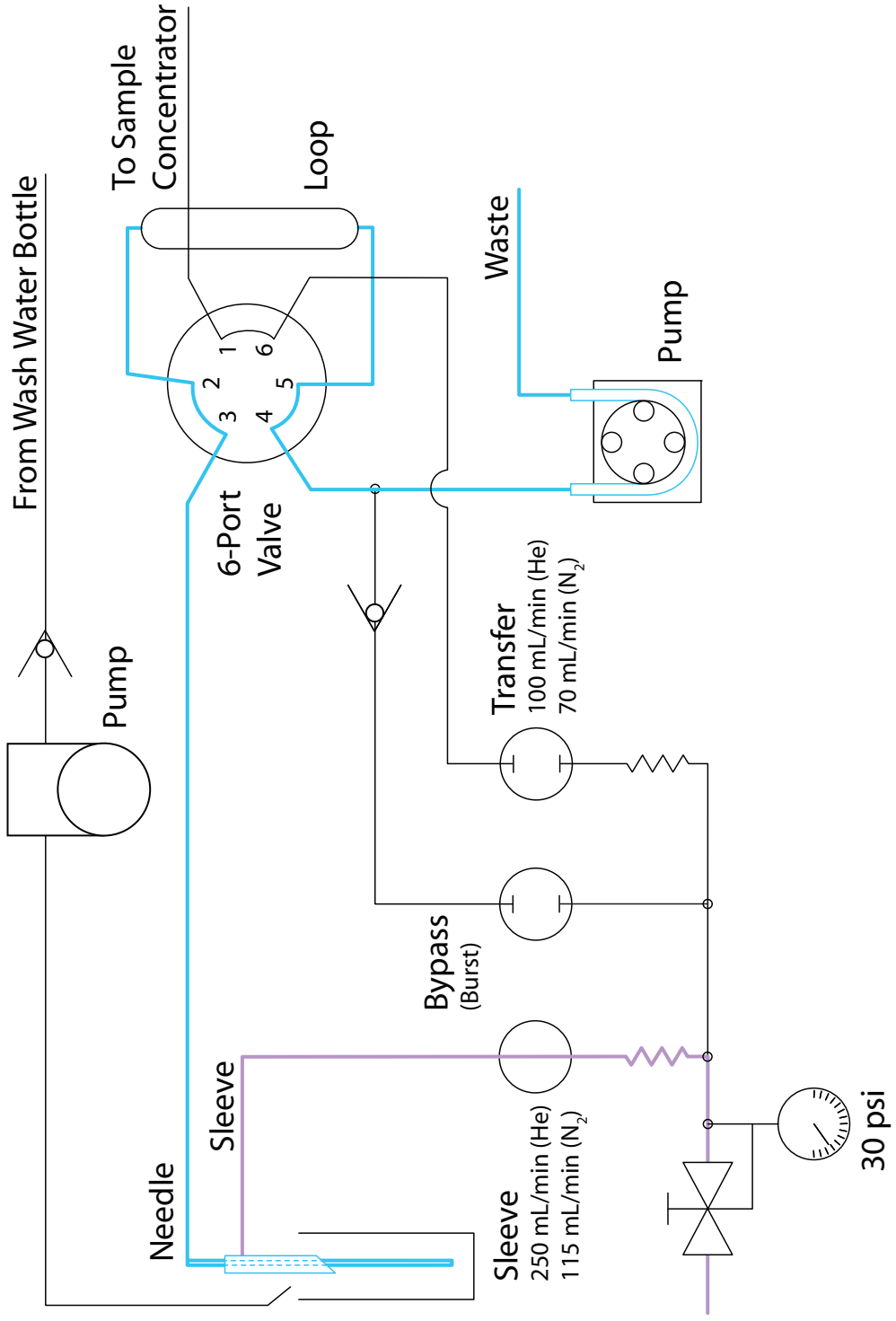


Figure 10.1. Loop Fill

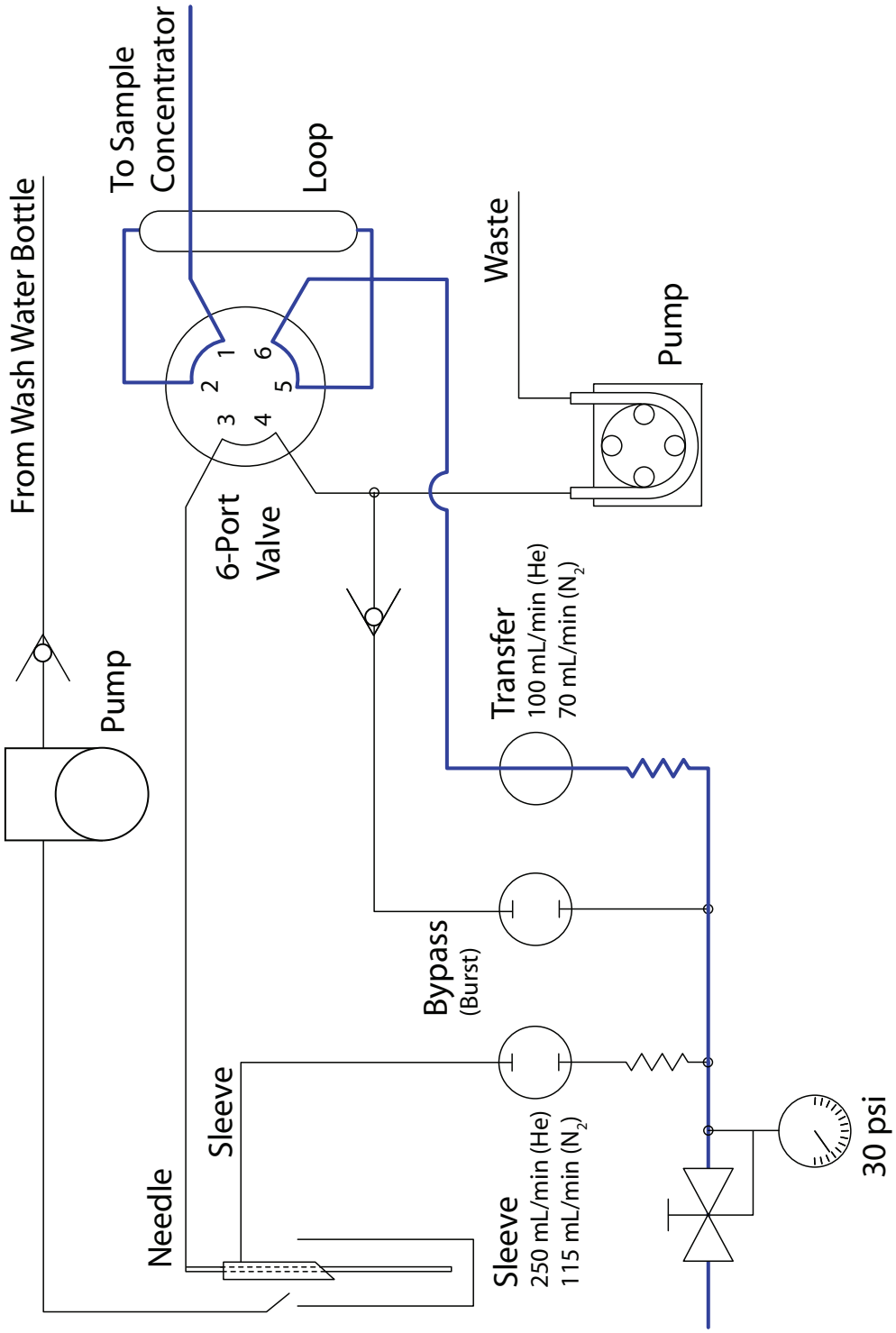


Figure 10.2. Loop Transfer

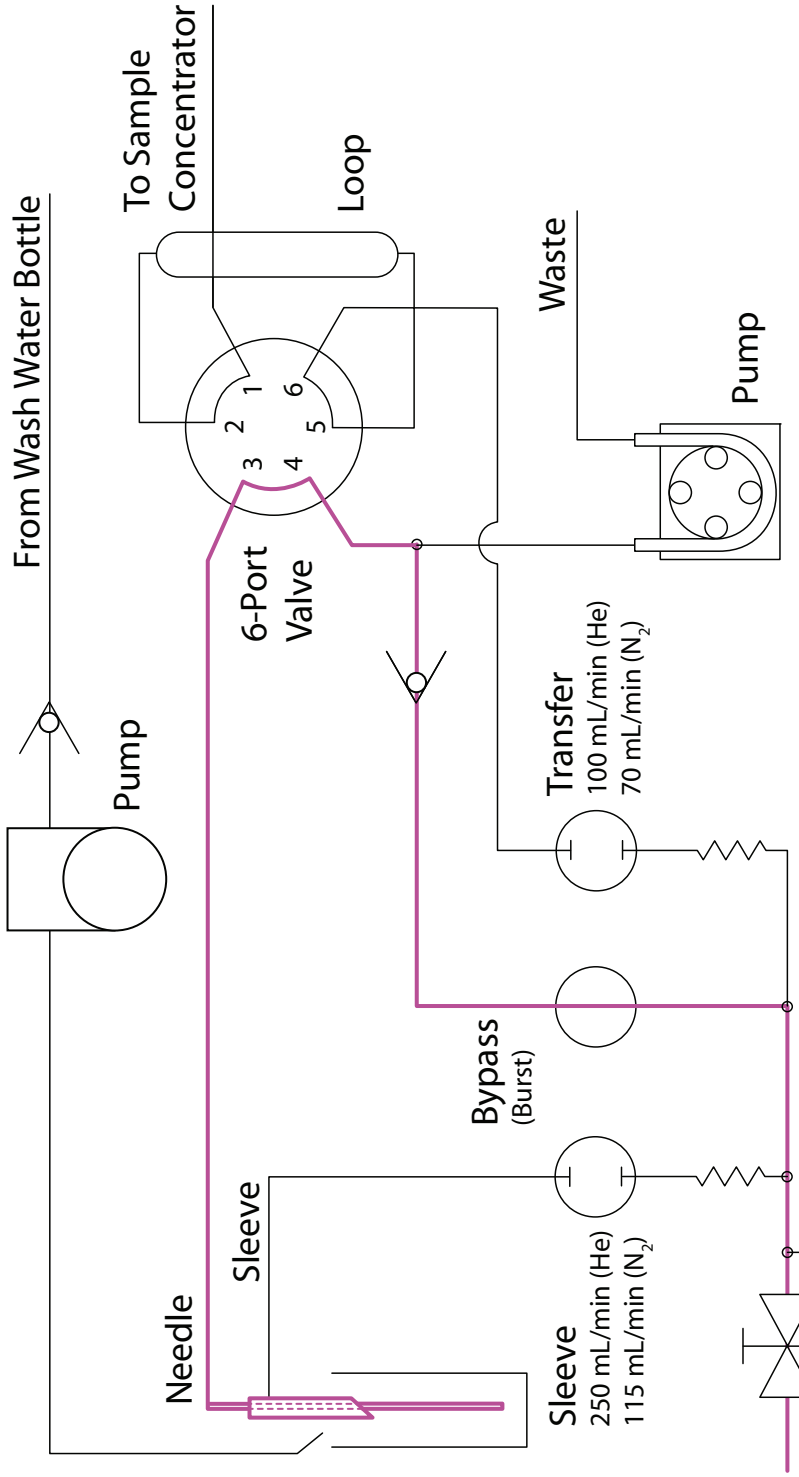


Figure 10.3. Needle Burst

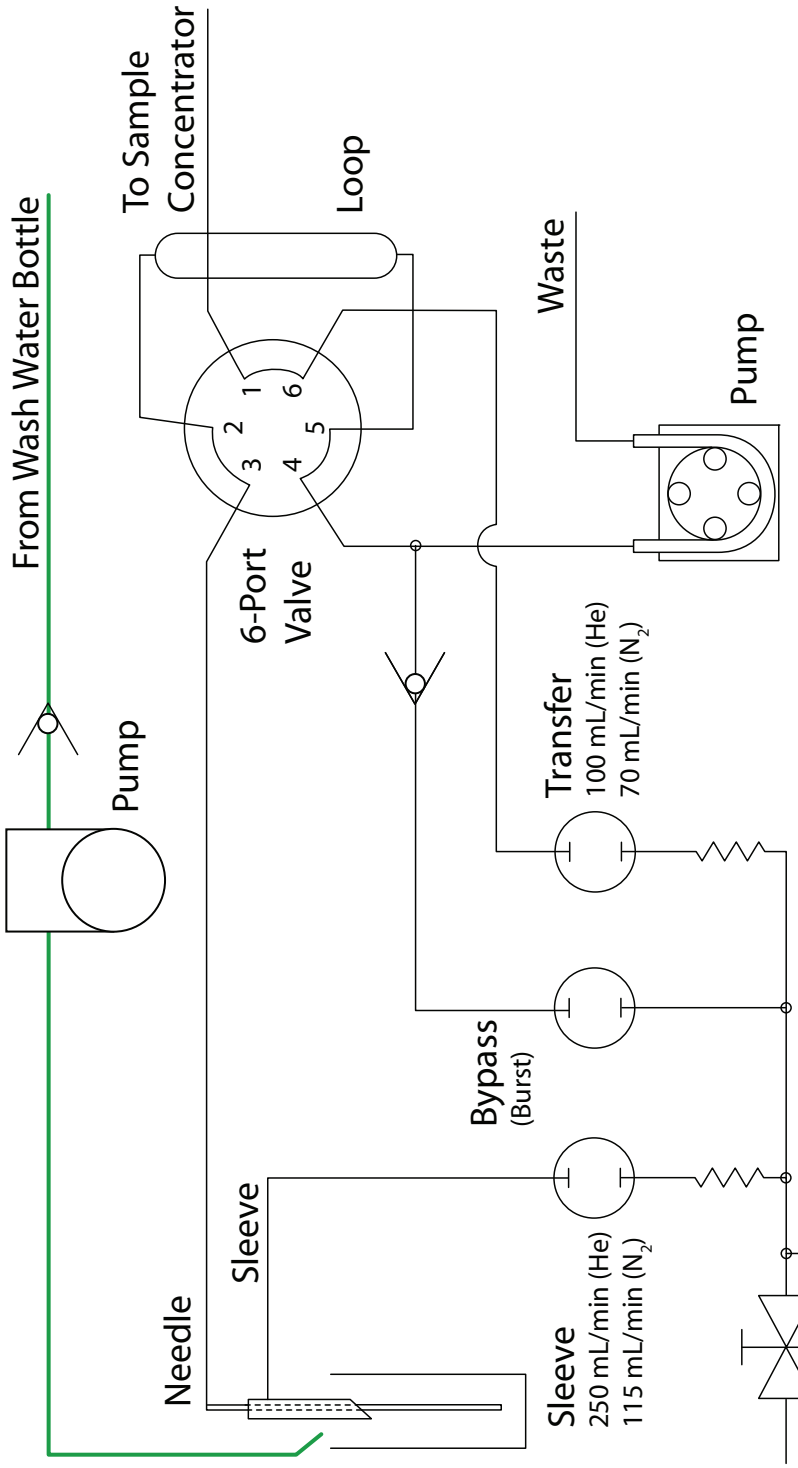


Figure 10.4. Wash Station Fill

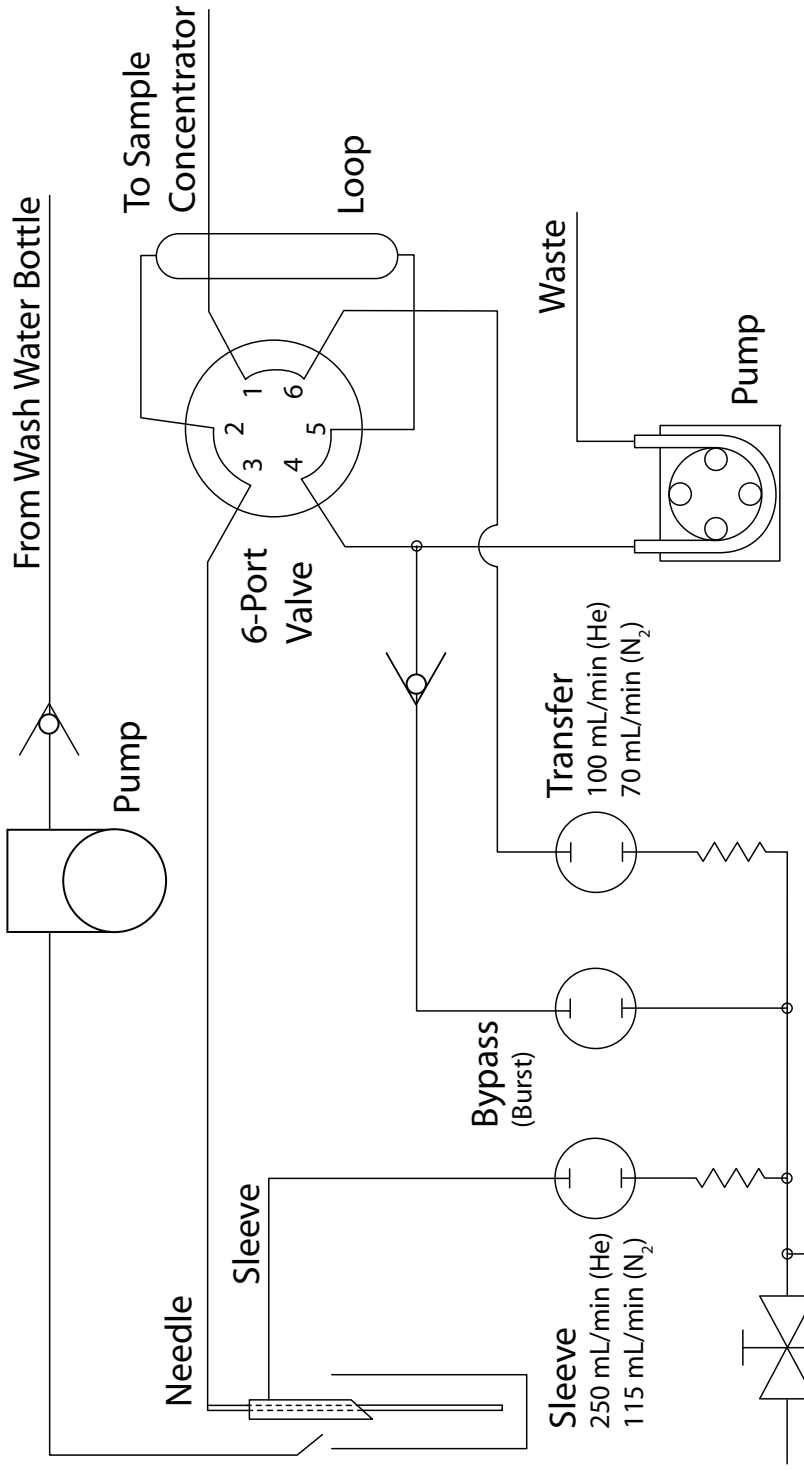


Figure 10.5. Standby/Bake

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