

# Preventive Maintenance for the CombiFlash® Torrent

## Instructions



Instruction Sheet #60-5243-184  
Revision E, January 2019

### Overview

The CombiFlash Torrent preventive maintenance kit (Isco part #60-5247-018) contains the following items:

Item	Part #
O Ring 0.176 ID 0.070 (Qty. 4)	202-9070-08
O Ring 0.364 ID 0.070 (Qty. 1)	202-9070-12
Timing Belt (Qty. 2)	209-0030-34
In-Line Cup Filter, 40µm, 1.463 (Qty. 1)	209-0165-53
Lamp Assembly (Qty. 1)	60-5238-123
This Instruction Sheet (Qty. 1)	60-5243-184
RediSep Column 330g (Qty. 1 box of 4)	69-2203-330
Loctite Viperlube Synthetic Grease, 1.0cc (Qty. 2)	800-1010-20
Torrent Verification Kit	60-5244-128

The table below lists scheduled maintenance tasks required by the Torrent. Following the table are instructions and additional information for performing each of the tasks.

**Table 1: Annual Scheduled Maintenance**

Component	Isco Part#	Task
Lamp	60-5238-159	Replace
Flow cell	60-5244-057	Cleaning
Fraction collector racks	N/A	Ensure proper grounding of all racks used with the Torrent.
Fraction collector rack alignment	N/A	Align fraction collector drop former.
Cartridge and column connection O-rings	202-9070-08	Replace (Four O-rings)
Pump collar	209-0019-01	Lubricate piston linkage bearing.
Belt tensioner/ Belt	299-3000-01/ 209-0030-34	Service check of belt tensioner/ Replace belt
B Prime Filter element/ O-ring	209-0165-53 202-9070-012	Replace

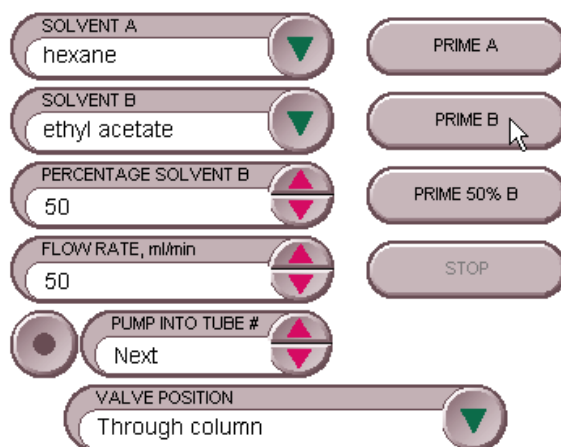
The Firmware tab on the Service menu offers a reminder for keeping periodic maintenance on schedule. Simply select the desired monthly interval on the Preventative Maintenance feature. Reset this feature every time maintenance tasks are performed.

**Note**

For additional assistance, contact Teledyne Isco's service department. Contact information can be found at the bottom of the last page of this document.

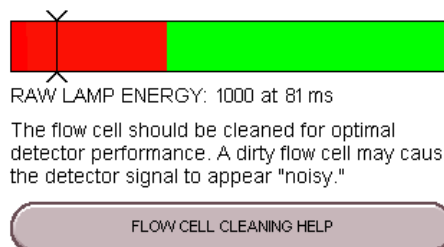
### Flow Cell Cleaning

1. Remove the column and insert a bypass tube (provided with the unit) between the upper and lower column mounts.
2. From the menu, select Tools > Manual Control. This opens the Manual Control window.
3. Set the Flow Rate to 50 mL/min (Figure 1).
4. Select Through column for the Valve Position.
5. Select Next for the Pump into Tube # option. Place the B1 solvent inlet line into a reservoir of methanol, acetone, or a strong solvent that readily dissolves residual sample material.
6. Click the Prime B button to pump 100% Solvent B through the bypass tube and into the collection tubes.



**Figure 1: Manual control settings: Quick Cleaning**

7. After three minutes click the Stop button. Allow the system to stand during the rest of the scheduled maintenance.
8. Return the B1 solvent line to the original solvent container. If the lamp energy is in the green range (see Figure 2 below), return the system to operation. If the lamp energy indicator is red, contact Teledyne Isco's service department for assistance.



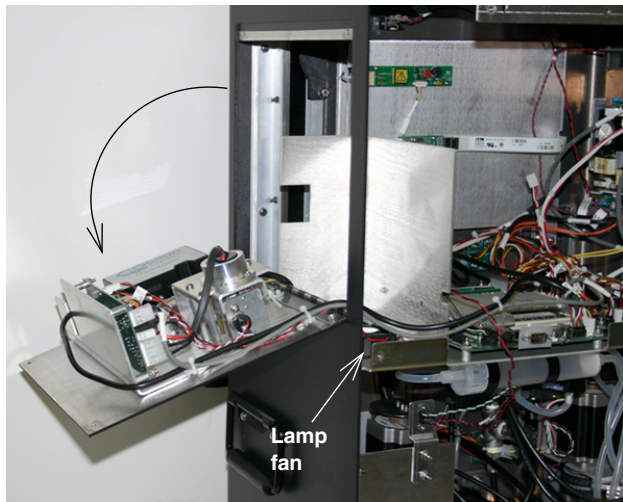
**Figure 2: Raw lamp energy gauge**

## Lamp Replacement

To open the lamp compartment, remove the two screws holding it in place.

**✓ Note**

If the lamp compartment is left open while the lamp is on, the thermal breaker will open, causing a lamp failure message.



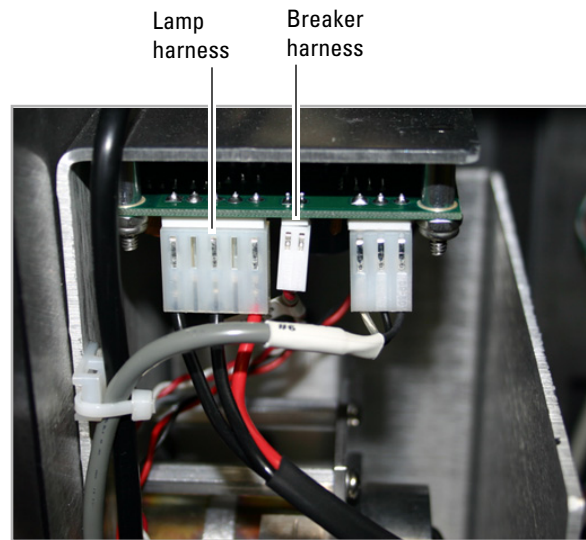
**Figure 3: Opening the lamp compartment**

**✓ Note**

If the lamp compartment is left open while the lamp is on, the thermal breaker will open, causing a lamp failure message.

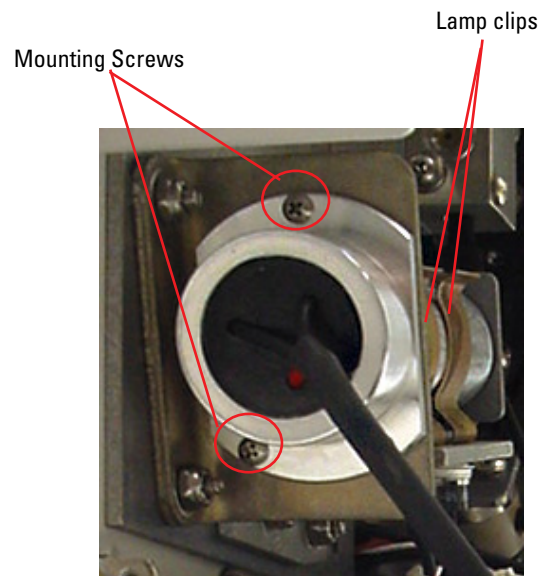
To remove the lamp:

1. Locate the lamp power board in the Lamp Compartment of the unit. Disconnect the lamp and breaker wiring harnesses from the lamp power board.



**Figure 4: Disconnecting lamp and breaker wiring harnesses**

2. Remove the three large mounting screws holding the bracket in place and pull the lamp mounting bracket away from the Torrent.
3. Gently pull apart the lamp clips and remove. Then, remove the lamp (Figure 5).



**Figure 5: Mounting screws and lamp clips**

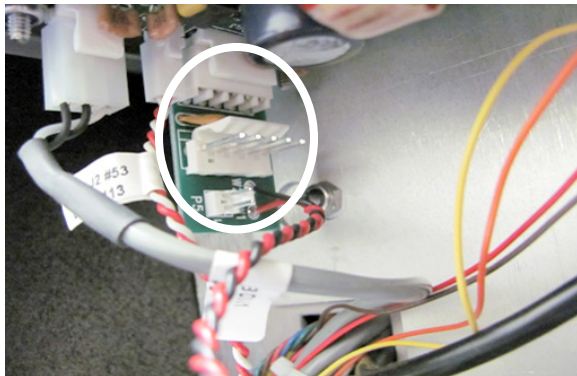
4. Remove the three smaller screws holding the lamp in the bracket and pull the lamp out of the bracket.



**Figure 6: Removing lamp from bracket**

**✓ Note**

If a lamp driver board patch board is already installed (see Figure 7), install the new lamp the same way as the old lamp. Contact Teledyne Isco Technical Service for additional assistance.



**Figure 7: Location of lamp driver board patch board**

**Fraction Collector Racks (Foxy R1/R2): Grounding Inspection**

Inspect the test tube racks at least annually to ensure that the Foxy R1/R2 does not present a risk of ignition.

**⚠ DANGER**

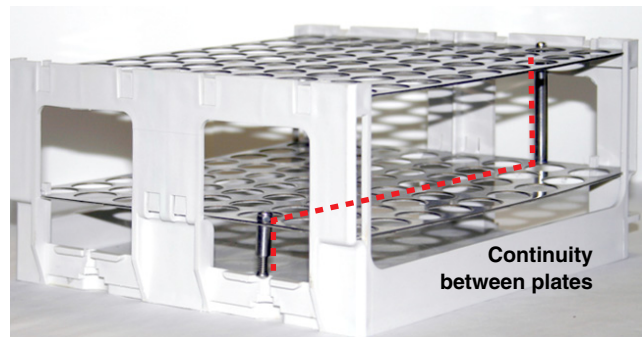
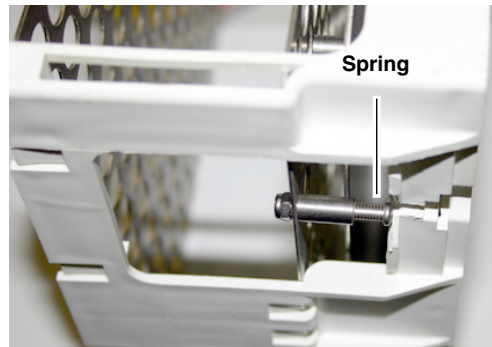
**There is a danger of fire hazard if the test tube racks are not properly grounded.**

**Grounding Pins**

The spring-loaded lower rack grounding screw presses down against the chassis grounding pin. The upper and lower plates are connected by a long metal standoff, creating continuity from one plate to the next.

Inspect the grounding screw, ensuring that the screw and nut are properly tightened, and that the spring expands and compresses with pressure.

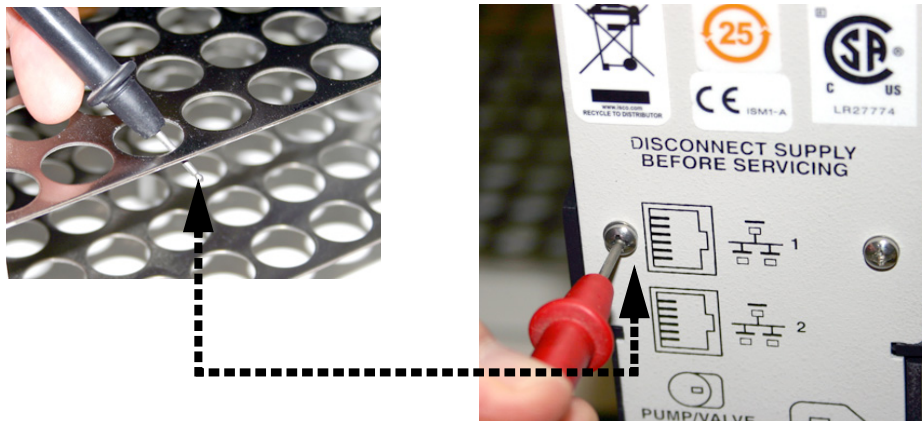
Install the rack assembly on the tray. The spring should compress, its tension holding the screw down on the top of the pin.



**Figure 8: Rack grounding pin function**

## Continuity Check

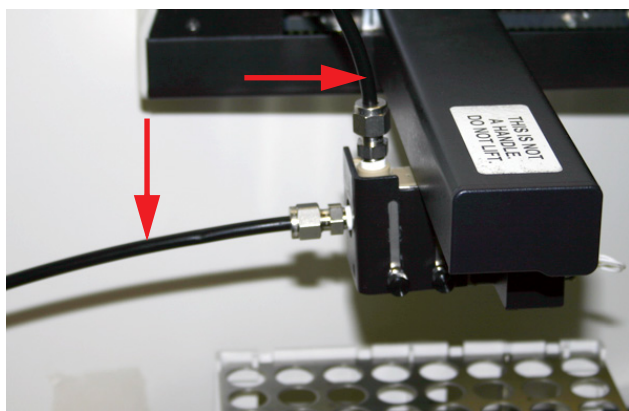
Using an ohmmeter, perform a continuity check for proper grounding.



**Figure 9: Voltmeter continuity check**

## Fraction Valve Tubing

The black tubing attached to the fraction valve is Teledyne Isco's static dissipative PFA tubing. No other tubing can be substituted for these connections, as grounding is accomplished through its conductivity.









**Figure 10: Fraction valve black tubing**

Touch one probe to the *underside or inner surface* of the top rack (the top of the rack is plastic-coated and non-conductive). Touch the other probe to the *unpainted* screw on the rear panel of the Foxy R1/R2.

## Fraction Collector (Foxy R1/R2) Alignment

If the solvent is not hitting the center of the test tubes, the fraction collector must be calibrated for alignment.

1. Ensure that the fraction collector is level. With the Torrent Off, turn the fraction collector On.
2. Press Tools (  ), then Rack (  ).
3. Load the rack with the collection vessels and place the rack on the system.
4. Press Calibrate (  ) to access the calibration options.
5. Press First Tube (  ) to move the drop former over the front and left-most tube in the rack.
6. Press the Arrows to incrementally position the drop former over the center of the collection vessel opening.
7. When the first tube position is calibrated, press Last Tube (  ) to move the drop former over the back and right-most tube.
8. Press the Arrows to position the drop former over the center of the collection vessel opening.
9. Press Enter (  ) to save the calibration settings.

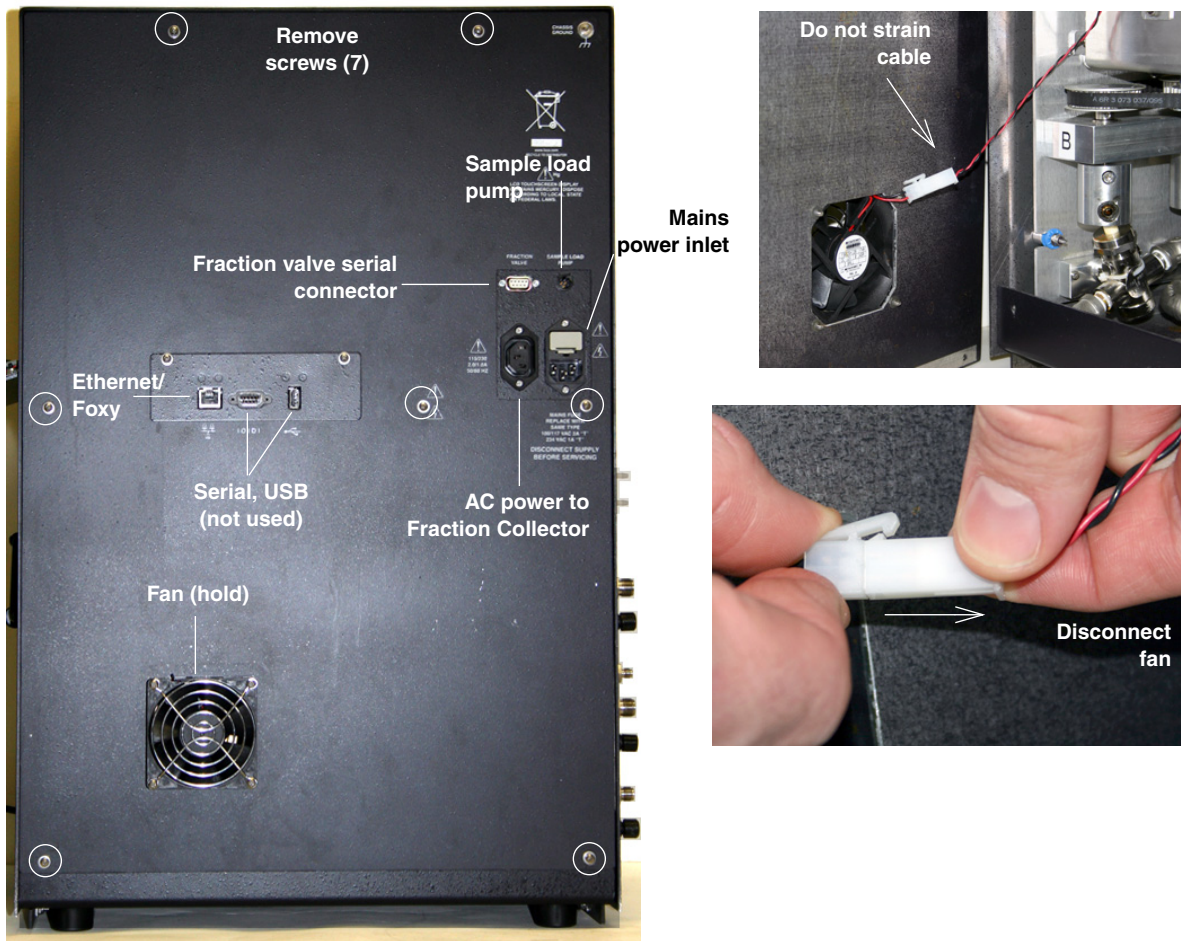
By calibrating the drop former position over the first and last tubes, the fraction collector calculates the position of all other tubes in the rack.

## Pump Maintenance

To service the pump belts and piston linkage, the pump sled must be removed from the unit. To gain access to the bottom compartment, first remove the rear panel.

**Hold the fan** to support the rear panel while removing the seven (7) screws holding it in place. This is to avoid damaging the fan's connection cable.

Keeping the rear panel close to the Torrent, carefully set it down and disconnect the fan's cable by pressing the lever to separate the connectors.



**Figure 11: Rear panel removal**

## Pump Sled Removal

1. Prior to removal of either pump, tubing must first be disconnected to clear the way. To disconnect the tubing, refer to Figure 12 for Pump A, and Figure 13 for Pump B.
2. Next, disconnect the pump motor cable from the extension cable going to the control board. Do this by pressing the plastic lever to separate the connectors (Figure 14).
3. Cut the cable ties binding the harnesses together and disconnect the pump sensor cable from the control board (A Pump sensor from **P17**, B Pump sensor from **P18**).

**Note**

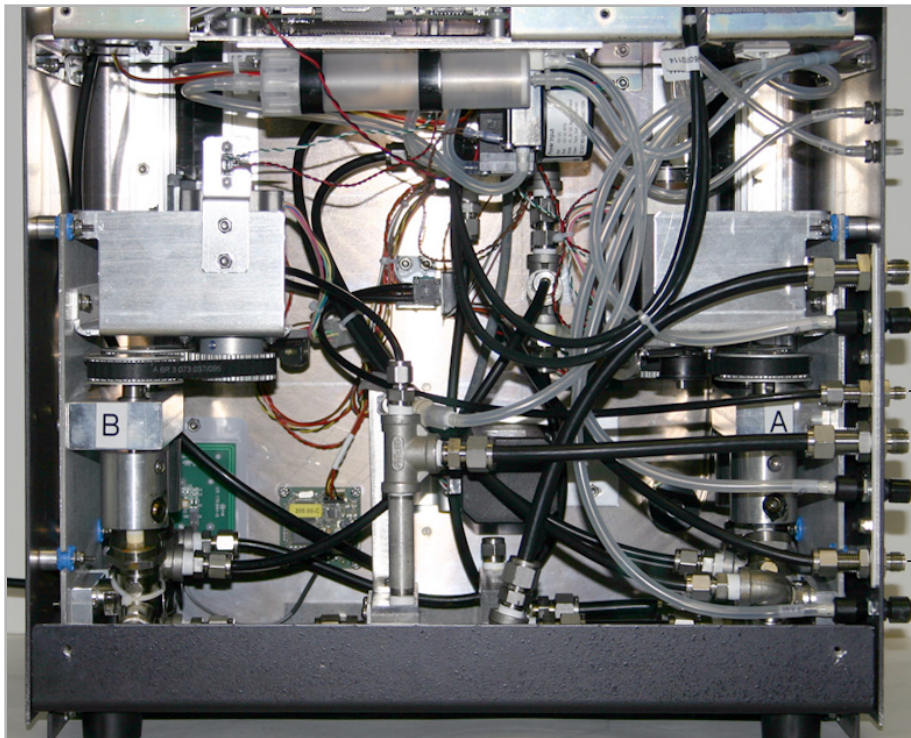
Do not disconnect the extension cable from the control board.

**CAUTION**

Black PTFE tubing does NOT bend. Do not attempt to bend this tubing, or it will break.

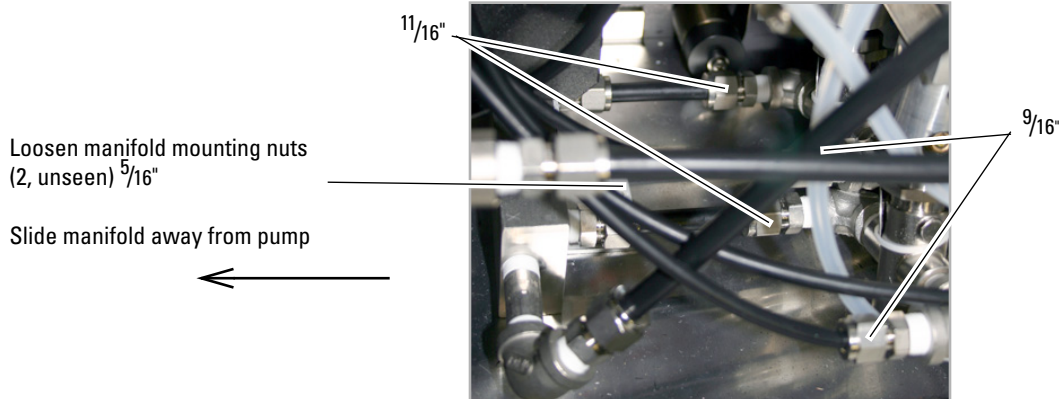
**Note**

Although pumps/pump head assemblies A and B are similar in appearance, be sure they are never switched, as this will cause irreparable damage.

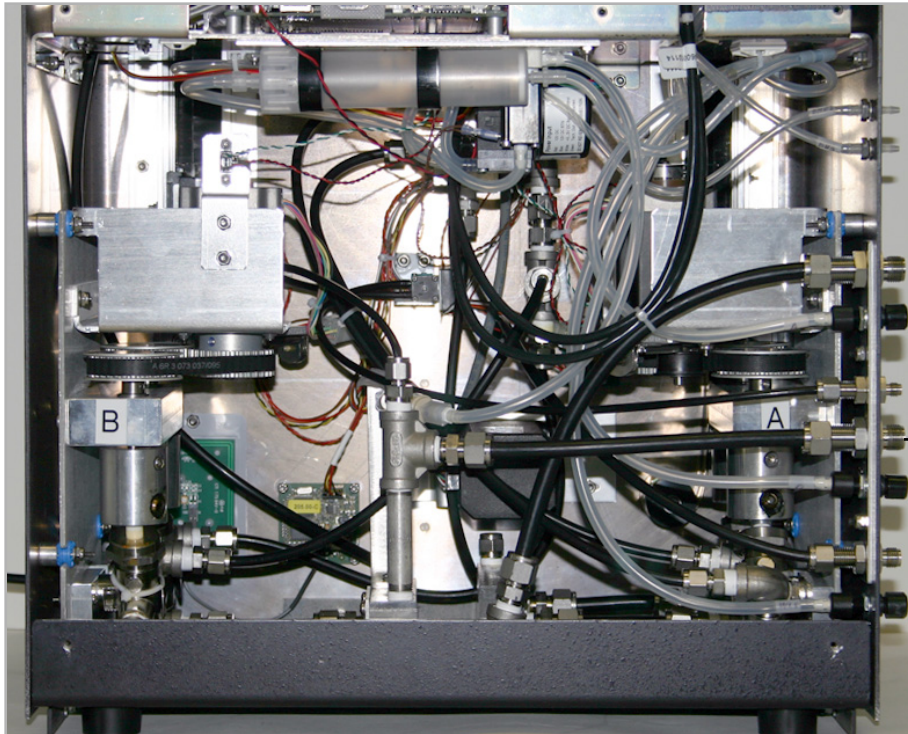


To remove Pump A, first disconnect the following:

- 'A' Inlet  $1\frac{1}{16}$ " - Disconnect both ends & remove tubing.
- 'A' Level
- 'B' Prime  $\frac{1}{2}$ "
- 'B' Inlet  $1\frac{1}{16}$ " - Disconnect both ends & remove tubing.
- 'B' Level
- Waste  $\frac{9}{16}$ "
- Waste Level

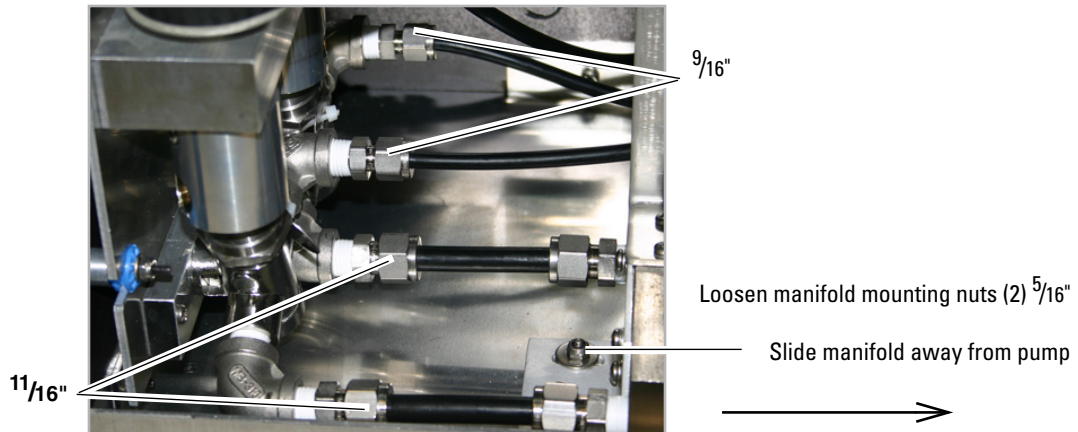


**Figure 12: Pump A removal:  
Tubing disconnections**

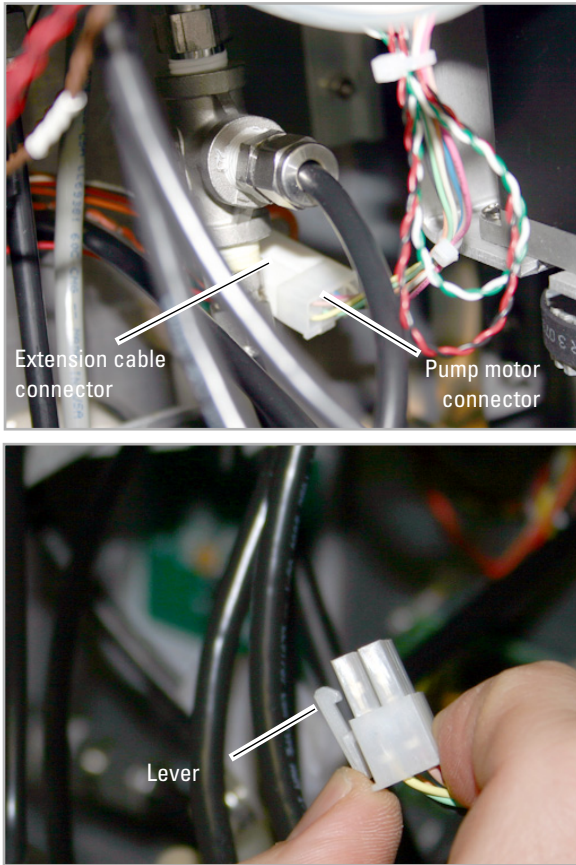


To remove Pump B, first disconnect the following:

'B' Inlet  $1\frac{1}{16}$ " - Disconnect both ends & remove tubing.

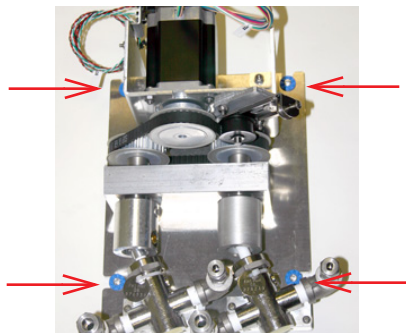


**Figure 13: Pump B removal:  
Tubing disconnections**



**Figure 14: Disconnecting pump motor cable from extension cable**

4. With one hand, hold the pump sled in place while using the nut driver to remove the four mounting nuts (located at each of the four blue bushings). Gently tilt the pump sled away from the wall of the unit and remove.

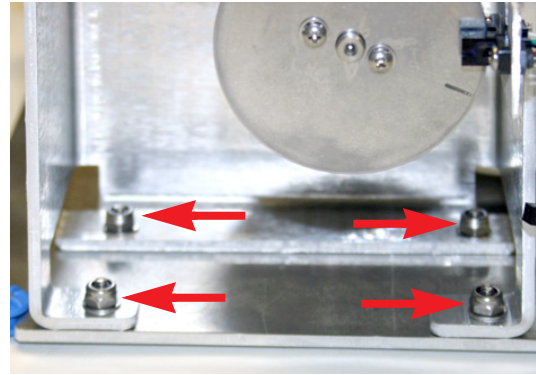


**Figure 15: Pump sled mounting hardware**

## Pump Belt(s)

To remove the belt:

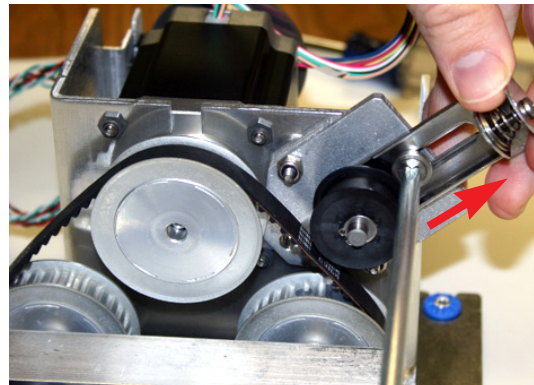
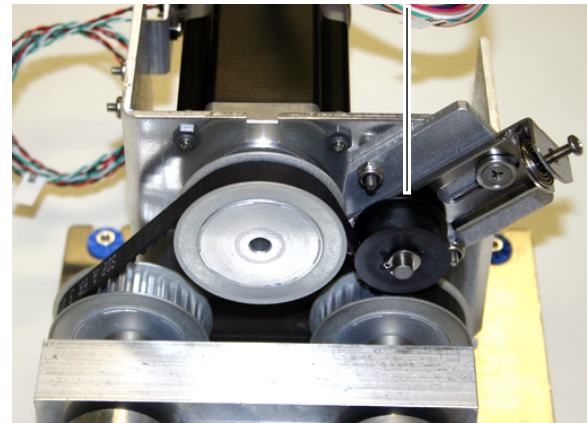
1. Using the nut driver and open wrench, remove the four nuts holding the motor mounting bracket on the sled.



**Figure 16: Remove motor mount bracket nuts**

2. Eliminate belt tension by loosening the large screw on the belt tensioner, sliding it away from the belt, and tightening the screw again to hold the tensioner out of the way.

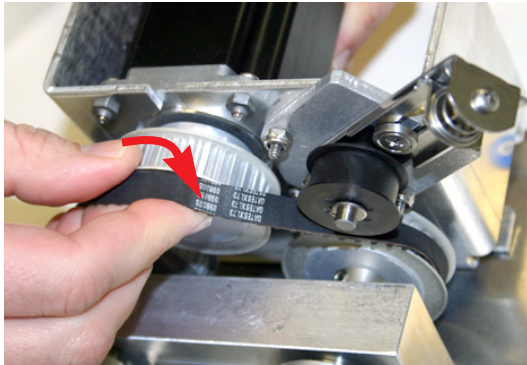
Belt tensioner



**Figure 17: Loosening belt tensioner**

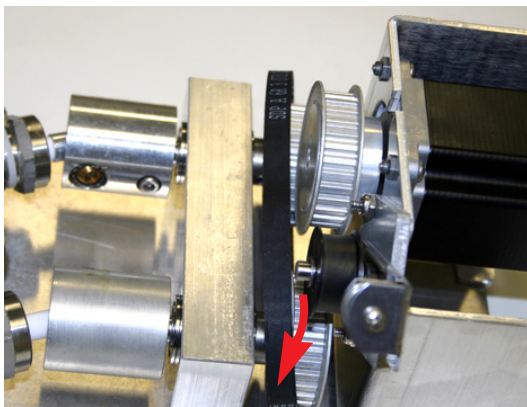


3. Slide the motor assembly backward. Tilt the motor and pulley forward to further reduce tension on the belt. Rotate the motor pulley and work the belt forward off the motor pulley.



**Figure 18: Roll belt off motor pulley**

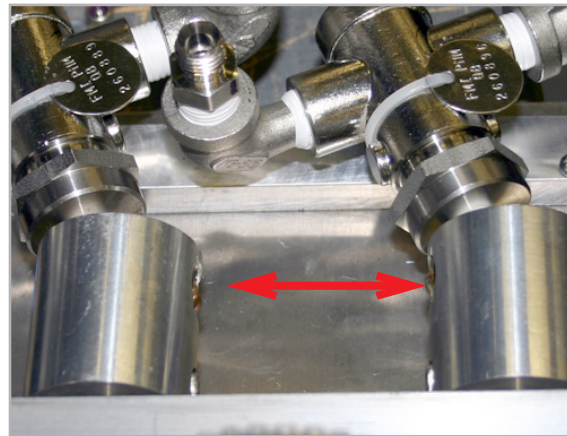
4. Rotate the collar pulleys, working the belt forward and off.



**Figure 19: Slide belt off collar pulleys**

To install a new belt:

1. Insert the new belt around the collar pulleys.
2. Align the collars while installing the belt around the motor pulley.
  - a. Turn the collars inward so that the bearings are directly facing each other ( $180^\circ$  out-of-sync), with the belt teeth fully engaged with the two collar pulleys.

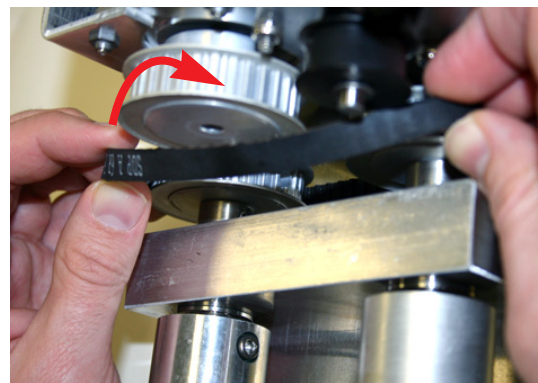


**Figure 20: Collar bearings must be  $180^\circ$  out-of-sync**

**⚠ CAUTION**

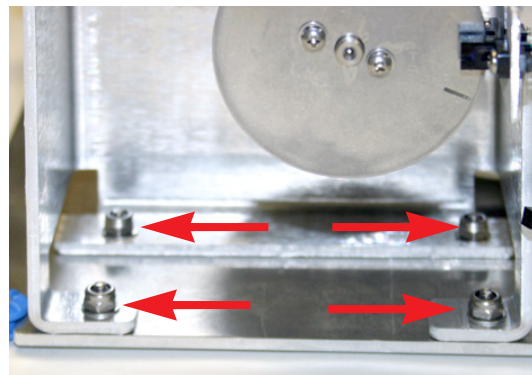
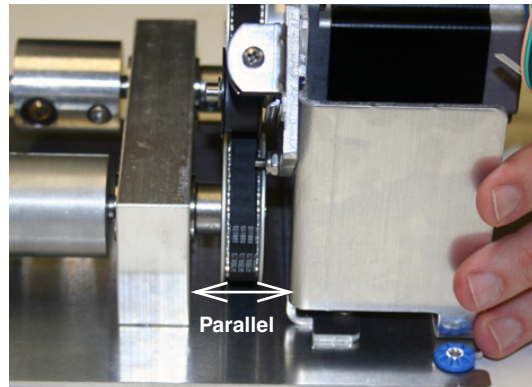
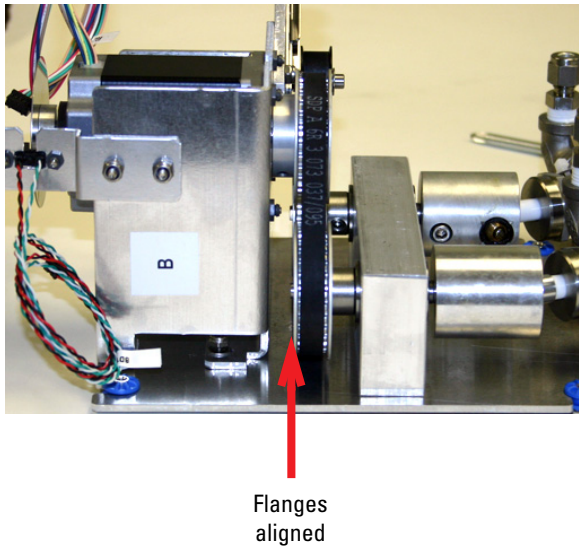
The collars must remain oriented in this way in order for the pump to operate properly. If the collar adjustment gets off by one or more teeth, malfunctioning will be immediately identifiable by the pump emitting a loud, ratcheting noise during operation.

- b. Keeping tight tension on the belt, begin to engage the teeth with the motor pulley. Carefully turn the motor pulley while rolling the belt onto it.  
**Ensure that the collars are still properly oriented.**



**Figure 21: Installing belt on motor pulley**

3. Position the motor assembly so that the flanges on the three pulleys are aligned, and so that the pump motor mounting plate is parallel with the bearing block.  
Tighten the four motor bracket mounting nuts.



**Figure 22: Align flanges, plate, and bearing block**

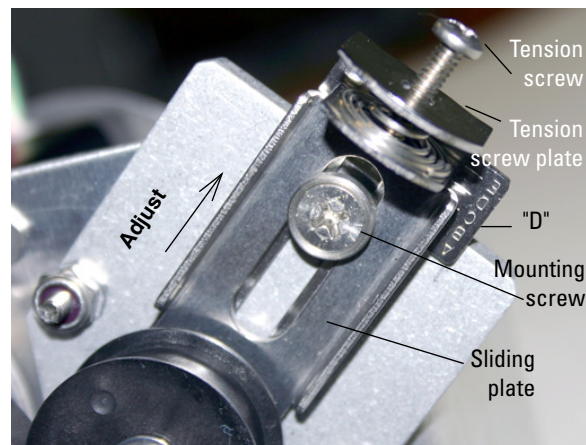
4. Readjust the belt tensioner (see next section).
5. Inspect the belt position while turning the pulleys to ensure that the belt remains straight down the center of all three pulleys. If it does not, loosen the four mounting nuts and readjust. This may require several attempts.

### Belt Tensioner

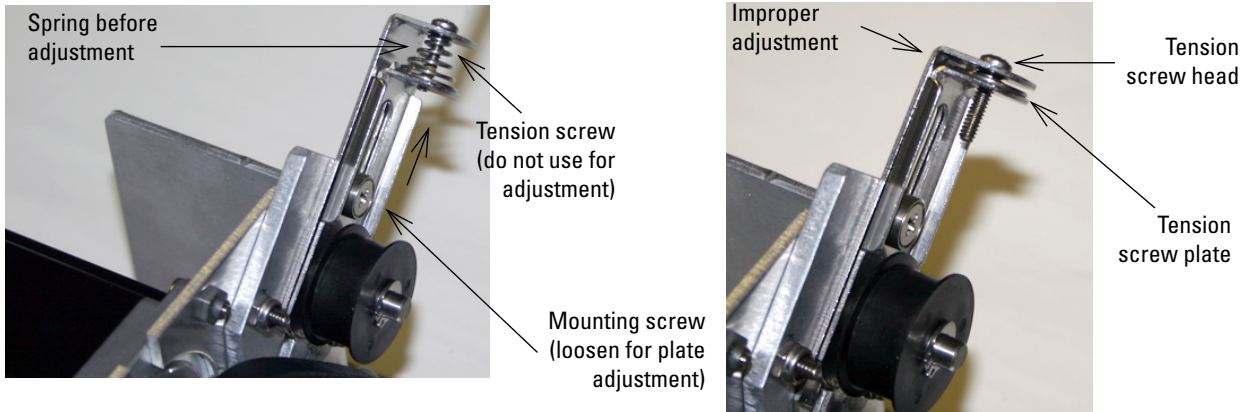
The spring component of the belt tensioner provides the tension to the belt. The tension screw head must not be against the tension screw plate. If it is, the tensioner must be readjusted. Do not adjust the tension using the tension screw.

If the sliding plate is moving freely, the spring is bad.

1. Loosen the mounting screw and align the top edge of the sliding plate with the letter "D" on the scale (see below).
2. Tighten the mounting screw to hold the tensioner in place.



**Figure 23: Adjustment of belt tensioner**

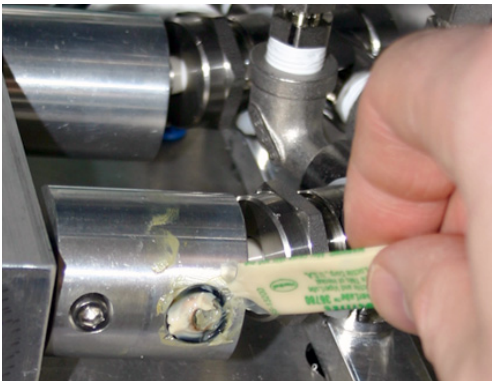
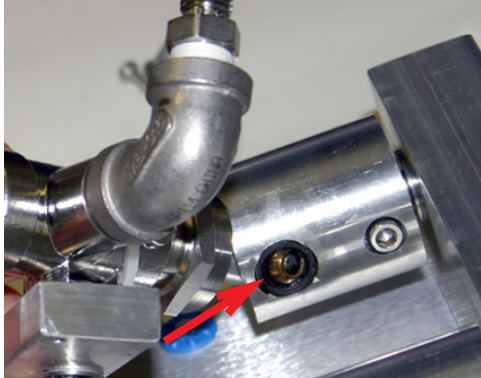


**Figure 24: Belt tensioner service check**

The belt tensioner is replaced along with its mounting plate. Remove the two mounting nuts to separate the tensioner from the pump sled.

### Piston Linkage Bearings

The piston linkage bearings are located on the sides of the pump collars. Lubricate both bearings with the synthetic grease provided in the kit.



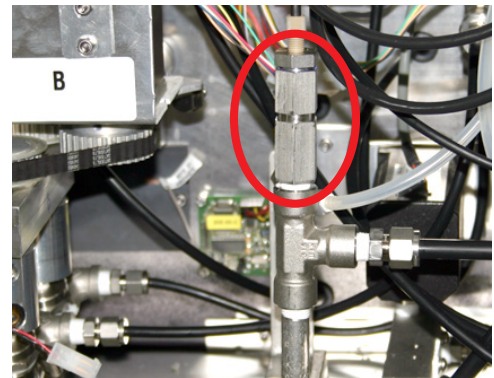
**Figure 25: Bearing lubrication**

### Replacing the B Prime Filter and O-Ring

The B Prime pump filter assembly prevents lint and particulates from damaging the B Prime pump.

Tools required:

Latex gloves,  $\frac{3}{4}$ " open wrench, PTFE thread tape



**Figure 26: B Prime pump filter assembly**

To remove the filter assembly, first disconnect the tubing from the top of the assembly.

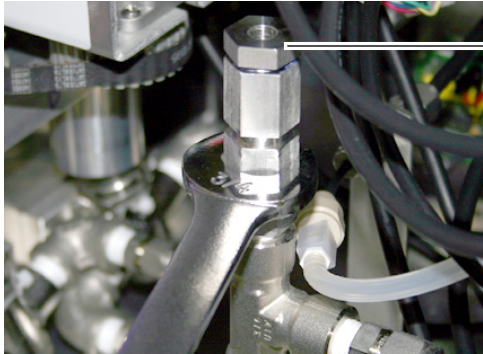


**Figure 27: Disconnect tubing from filter assembly**

With the open wrench, remove the assembly from the Torrent.

**Note**

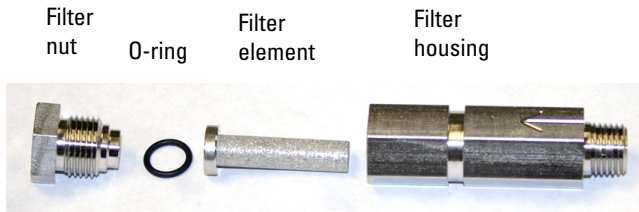
Do not loosen or remove the filter nut until the entire assembly has been removed from the Torrent.



Do not remove filter nut yet.

**Figure 28: Removing filter assembly from Torrent**

Separate the filter nut from the assembly to replace the O-ring and filter element.



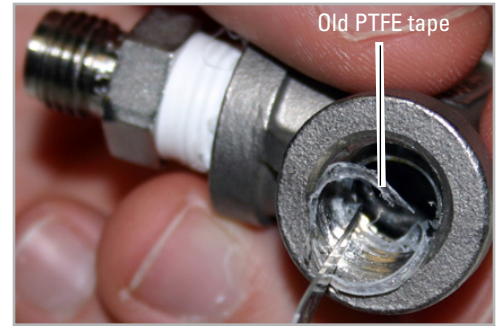
**Figure 29: Filter assembly, disassembled**

Before reinstalling the filter assembly, clean and re-tape the filter housing threads, as described in the following section.

**Pipe Thread Taping**

Taper-threaded pipe ends **not using ferrules** must be sealed and protected with PTFE thread tape.

If you have loosened or disconnected a fitting, before applying new tape, clean away all traces of old tape from both mating parts with a pick. Failure to clean the threads can result in system clogs and leaks.

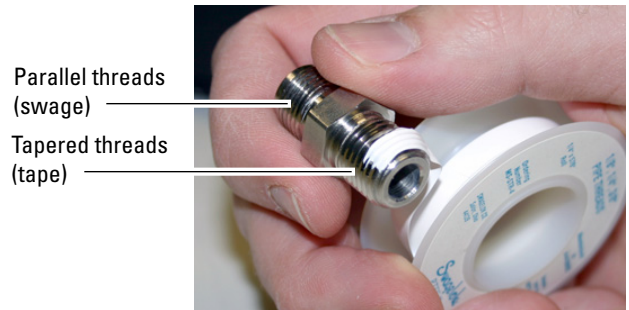


**Figure 30: Removing old PTFE tape from pipe threads**

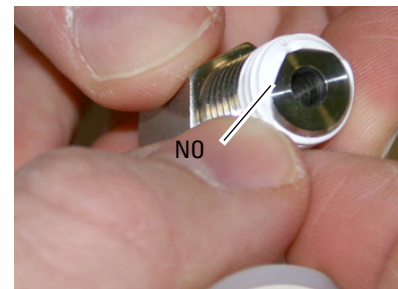
At the end of the pipe, begin wrapping the male threads clockwise, keeping slight tension on the tape so it will mold to the threads. Wrap two to three times.

**CAUTION**

Do not overlap the end of the pipe. This can result in bits of tape clogging the system or causing leaks.



Wrap clockwise



Do NOT overlap end of pipe

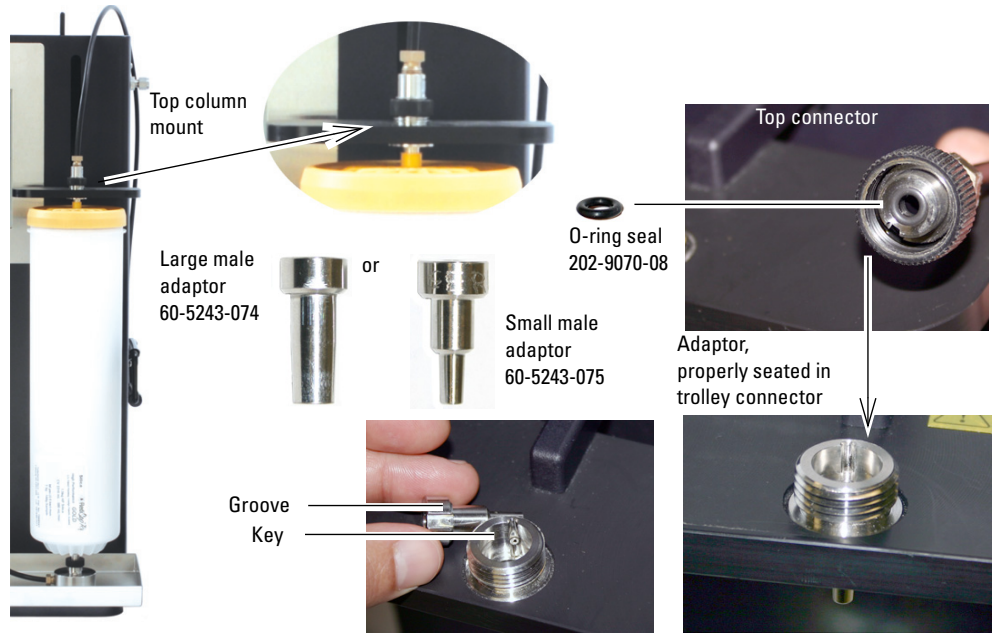
**Figure 31: Wrapping pipe threads with PTFE tape**

## O-Ring Replacement

The o-ring is used in two locations: the bottom (female) Luer fitting, and the connector at the top of the column or cartridge. Both o-rings should be replaced at minimum yearly as part of periodic maintenance. Old o-rings can be removed with a non-scratching tool, such as a toothpick.

Both adaptors are keyed to prevent them from turning when installing a column or cartridge. Ensure that the groove in the side of the adaptor is aligned with the key on the inside wall of the connector.

### Column Adaptor O-Rings

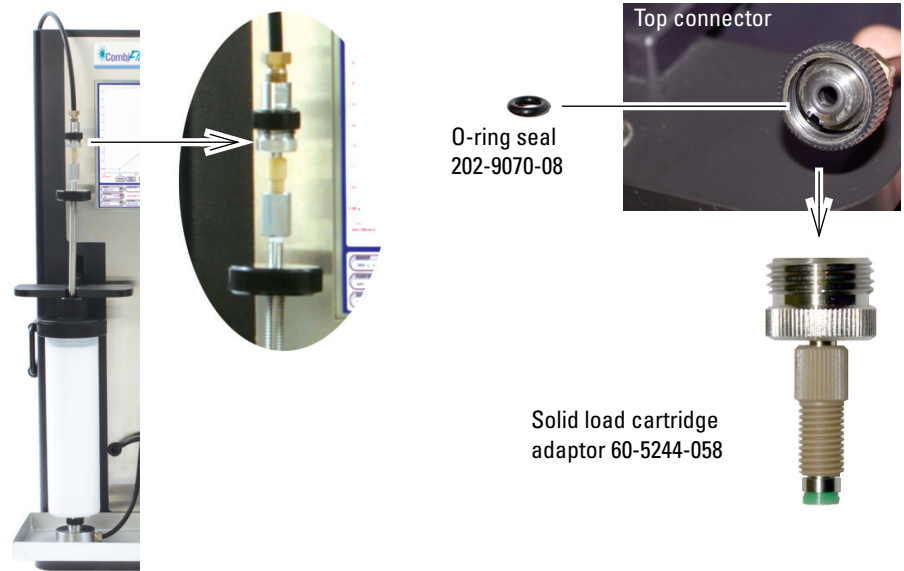


**Figure 32: Installation of top column adaptor and o-ring**

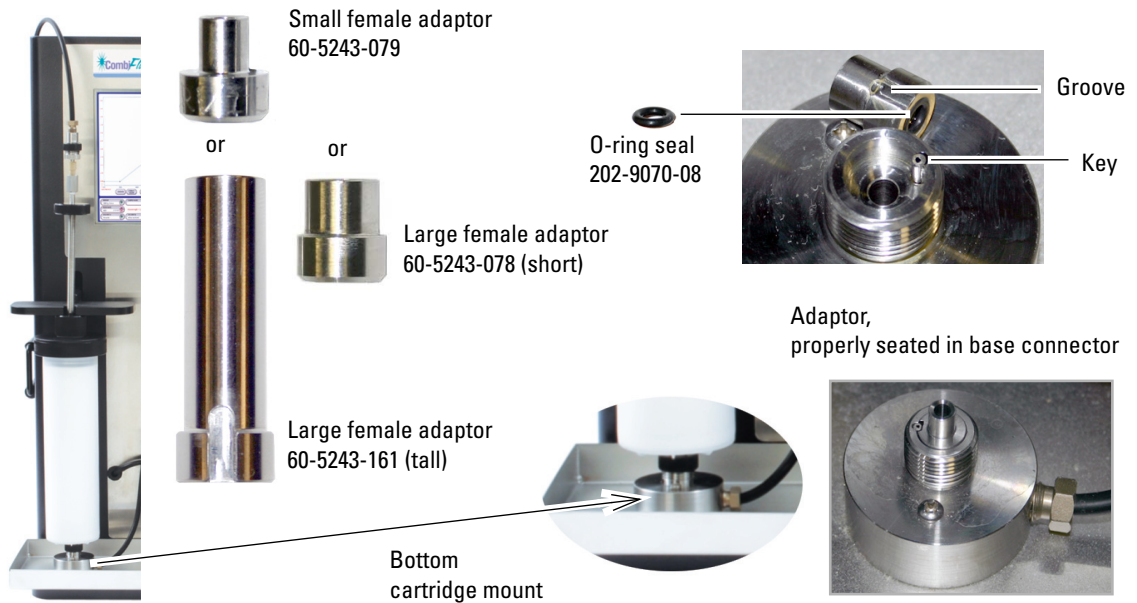


**Figure 33: Installation of bottom column adaptor and o-ring**

## Cartridge Adaptor O-Rings



**Figure 34: Installation of top cartridge adaptor and o-ring**



**Figure 35: Installation of bottom cartridge adaptor and o-ring**

*Last modified January 23, 2019*

**EAR-Controlled Technology** Subject to Restrictions Contained on the Cover Page

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