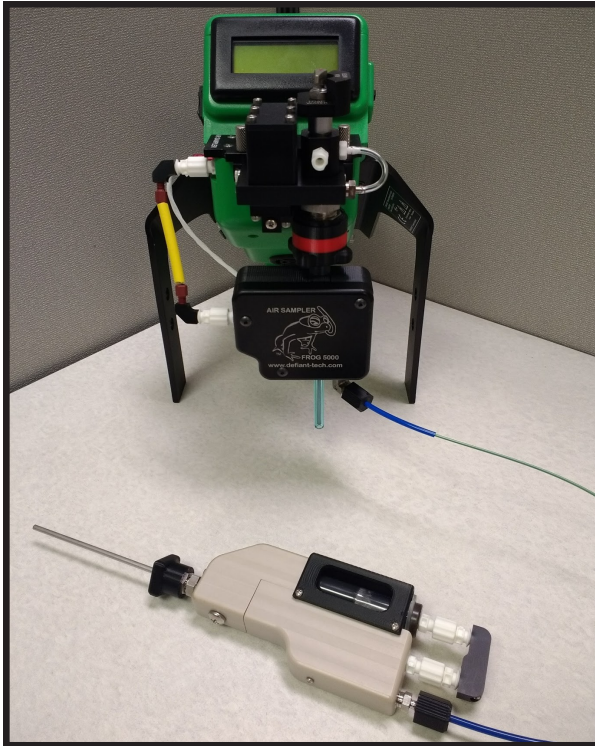


Inline Diluter



User's Manual

Defiant Technologies, Inc.

2017 Vol. 3

**Inline Diluter
Sample Dilution System
User's Manual**



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2017 Vol.3
www.defiant-tech.com

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SECTION 1: GETTING TO KNOW THE INLINE DILUTER

1.1 Operations Overview

The Inline Diluter provides a convenient way to dilute high concentration air samples on the spot in order to analyze the samples with the FROG—4000 and —5000 series. The basic steps for operating the inline diluter are:

1. Understanding operating principle
2. Setting up the Inline Diluter
3. Calibrating the Inline Diluter
4. Running samples with the Inline Diluter

Section 1: Getting to Know the Inline Diluter

1.2 Operations Concept

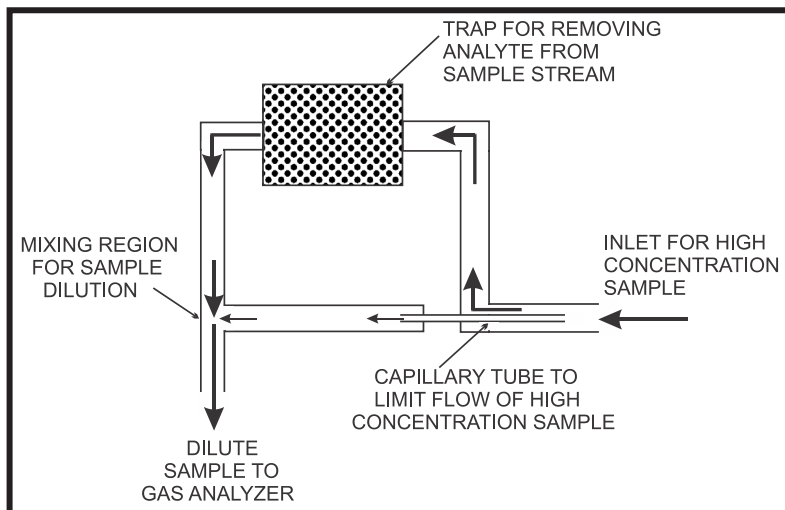


Figure 1.2-1: Inline Diluter Operating Concept Diagram

Basic Operating Concept

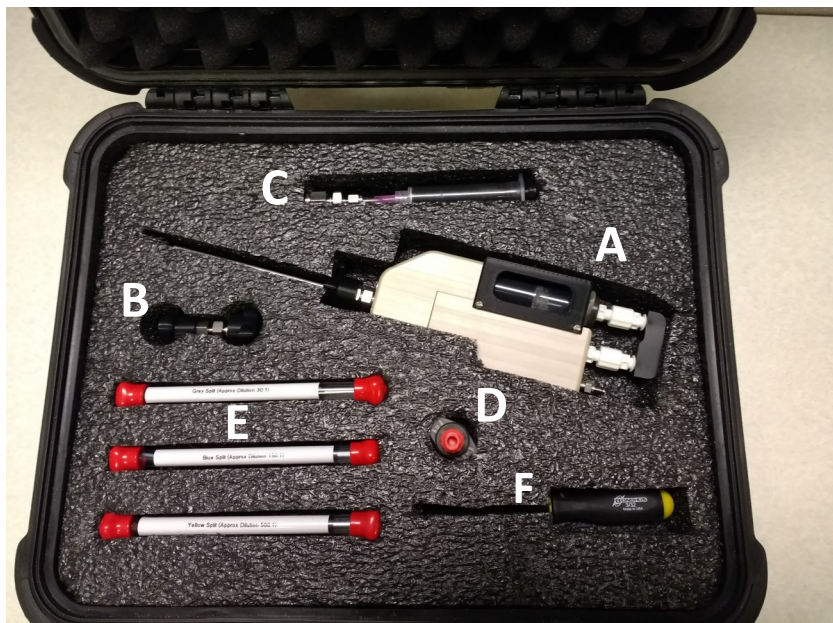
- Contaminated air sample enters the inlet
- The bulk of flow is diverted through a trap where VOCs are removed
- A small portion of sample carrying VOCs passes through a capillary
- Scrubbed and contaminated flows are remixed and sent to detector for analysis

Basic limitations

- Some VOCs will pass through the trap
- At high concentrations more VOCs will pass through the trap
- As a result of these two conditions, the Inline Diluter and the Frog must be calibrated together as a system

SECTION 2: COMPONENTS

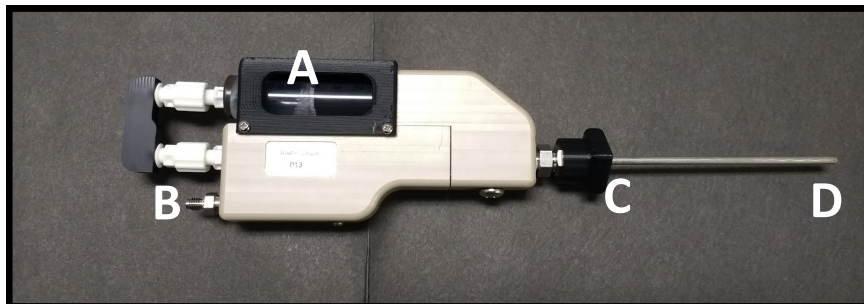
2.1. Instrument Components



Item Reference for Inline Diluter

- A. Inline Diluter
- B. Fitting to Connect Inline Diluter to Tedlar Bag
- C. Sample Inlet Filter with Fittings
- D. Replacement Sample Scrubber
- E. Extra Splits (for different levels of Dilution)
- F. 3/32 Allen Driver (for changing splits)

2.1: Instrument Components



Components Reference for Inline Diluter

- A. Sample Scrubber
- B. Port to Chemical Analyzer
- C. Sample Inlet Probe
- D. Sample Inlet Port

SECTION 3: INSTRUMENT SETUP AND OPERATION

There are several procedures necessary to setup the Gas Diluter for proper use. The following procedures prepare the instrument for use:

1. 3.1: Removing Protective Cap
2. 3.2: Connecting to a FROG-5000™
3. 3.3: Sample Introduction

Section 3: Instrument Setup

3.1: Removing Protective Cap

- If present, pull protective cap off sample inlet port (it will pull straight off)

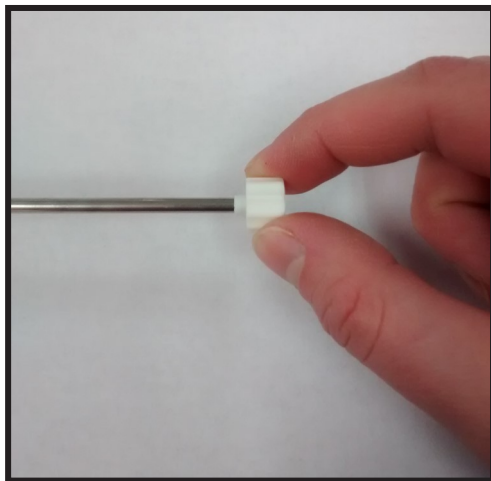


Figure 3.1-1: Removing Protective Cap

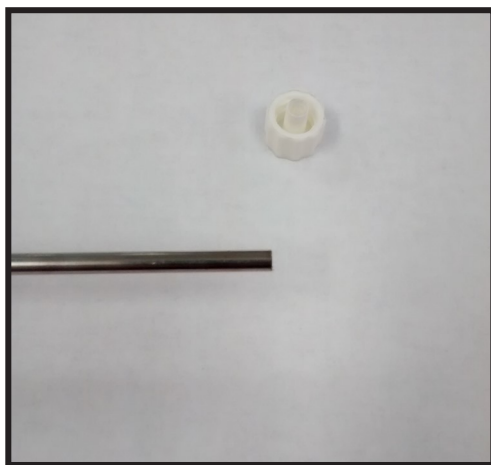


Figure 3.1-2: Protective Cap Removed,
Exposing Sample Inlet Port

Section 3: Instrument Setup

3.2: Connecting to a FROG-5000™

- Connect transfer line from the FROG's air sampler kit to the Port to Chemical Analyzer found at the bottom of the Inline Diluter



Figure 3.2-1: Attaching transfer line to Inline Diluter



Figure 3.2-2: Transfer line attached to Inline Diluter

3.2 Connecting to a FROG-4000™

- Refer to the Frog-5000 User's Manual for proper installation of it's air sampler. Make sure transfer line goes between the Frog's air sampler and the Inline Diluter (Figure 3.2-3).

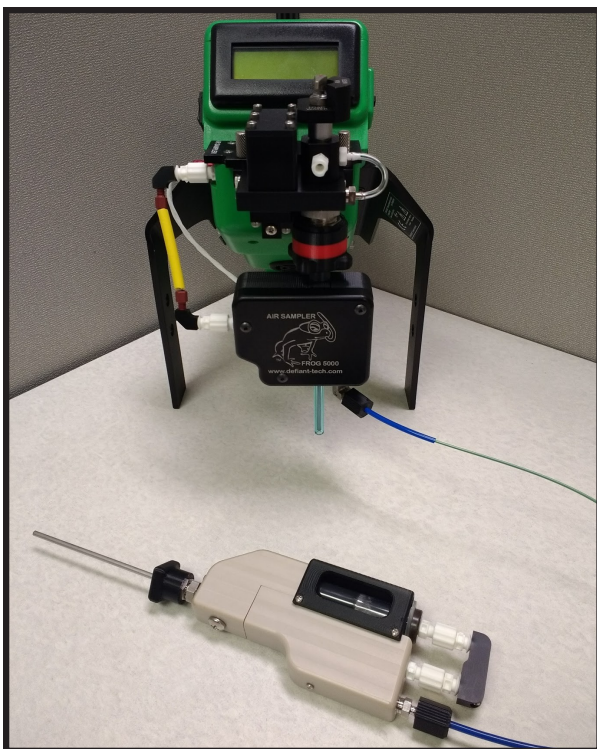


Figure 3.2-3: FROG with air sampler attached to the Inline Diluter via the transfer line

Section 3: Instrument Setup

3.3: Sample Introduction

The Inline Diluter can be used in combination with the FROG-4000 to sample air in a variety of ways. The simplest of these ways is to take a sample directly with the Inline Diluter. However, the Inline Diluter can be also be used in conjunction with a filter (to provide blank samples for the FROG-5000) or with a Tedlar bag.

- To sample directly with the Inline Diluter, make sure that the sample inlet port is clear (Figure 3.3-1).



Figure 3.3-1: Inline Diluter ready to sample directly

- To Sample a Tedlar bag:
 - Assemble fittings: take apart the Tedlar bag adapter that is included with the Frog's air sampling kit and attach it to the fittings included with the Inline Diluter as shown in Figure 3.3-2. Note that it may be helpful to use a piece of tubing as shown in the figure to help get the ferrules into the correct positions, just be sure to remove the tubing before completely assembling fittings.
 - Attach Tedlar bag to Inline Diluter using assembled fittings (Figure 3.3-3), be sure to open Tedlar bag prior to analysis.

3.3: Sample Introduction

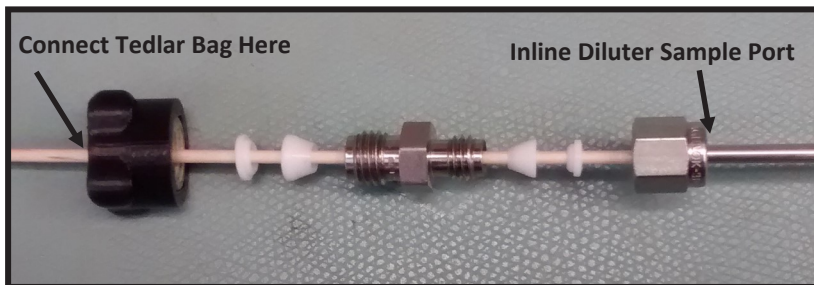


Figure 3.3-2: Fittings assembly to attach the Inline Diluter to a Tedlar Bag



Figure 3.3-3: Inline Diluter Ready to sample a Tedlar Bag

3.3: Sample Introduction

- To clean the Inline Diluter (to provide a blank air sample for the FROG-5000 prior to use, or to clean up after running a high concentration) an inlet filter can be attached to the end of the Inline Diluter.
 - Assemble fittings as shown in figure 3.3-4. It may be helpful to use tubing, or in this case the sample inlet probe of the inline diluter to guide the ferrules into correct position.
 - Activated carbon in the filter will scrub VOCs from the sample stream. The filter can be used in a contaminated environment to clean the Frog and Inline Diluter between runs. However, the filter will last longer if used in a clean environment.

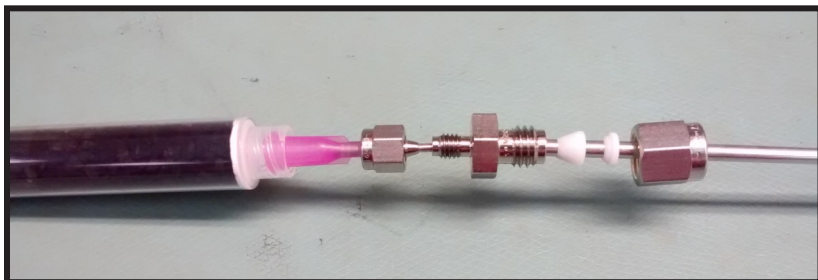


Figure 3.3-4: Assembly of fittings for attaching inlet filter to Inline Diluter

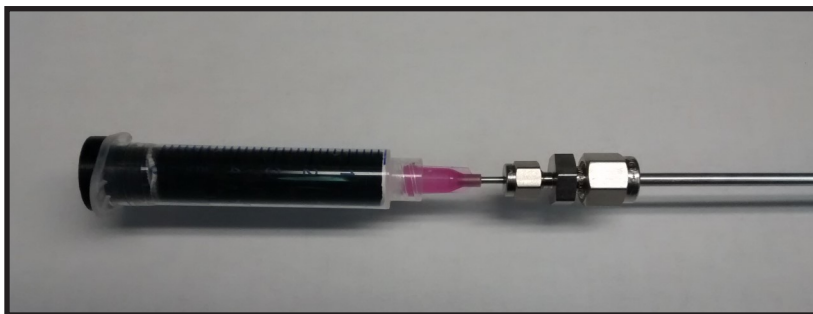


Figure 3.3-5: Inline Diluter with an Inlet Filter attached to provide a clean air sample

SECTION 4: CALIBRATION AND SAMPLING

4.1: Calibrating the Inline Diluter

The Inline Diluter will not provide a fixed dilution factor across all compounds at all concentrations. For this reason, the Inline Diluter and the FROG must be calibrated as a combined set. This can be done using Defiant's Portable Gas Diluter or any other gas dilution system capable of providing known concentrations of analyte gas to the Inline Diluter and FROG.

For the best calibration, run 5 different concentrations of analyte gas through the Inline Diluter (attached to a FROG-5000) and run each concentration 3 times, this allows time for the system to reach equilibrium, resulting in a more accurate calibration. Work from the lowest concentration to the highest. If you just want an estimate at higher concentrations, a one point calibration may be suitable.

[Section 4: Calibrating and Sampling](#)

4.2: Sampling with the Inline Diluter

Once the Inline Diluter is properly attached to the FROG-5000, air samples can be taken. To take an air sample, simply start a run on the FROG-5000. The FROG's air sampler will pull the sample in through the Inline Diluter. If a high signal is seen on the FROG, it is recommended that blanks be run in between samples to clear excess analyte from the system before moving onto the next sample.

SECTION 5: MAINTENANCE AND TROUBLESHOOTING

5.1: Changing the Sample Scrubber

Defiant Technologies recommends changing the sample scrubber on the Inline Diluter when it is difficult to achieve a clean baseline (while running clean air through the Inline Diluter). The Inline Diluter will require recalibration after the sample scrubber is changed.

To change the sample scrubber:

- Twist off and remove both ends of the Luer Couple line from the Inline Diluter (Figure 5.1-1).
- Twist sample scrubber counterclockwise and remove from the Inline Diluter (Figure 5.1-2).
- Replace sample scrubber with new sample scrubber (provided with the Inline Diluter) and twist clockwise into place, make sure the sample scrubber is secure. (Figure 5.1-3)
- Attach Luer Couple line to the sample scrubber and Inline Diluter (Figure 5.1-4).

5.1: Changing the Sample Scrubber

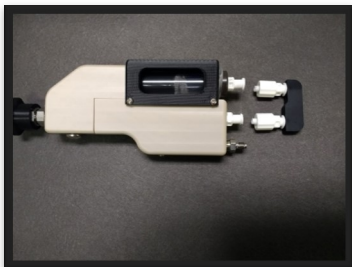


Figure 5.1-1: Luer Couple line removed from the Inline Diluter

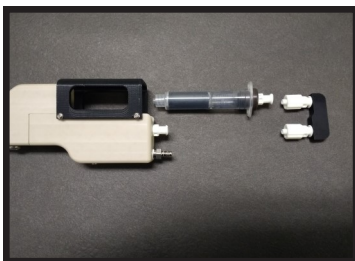


Figure 5.1-2: Sample Scrubber removed from Inline Diluter



Figure 5.1-3: New sample scrubber Installed



Figure 5.1-4: Luer Couple line installed, completing the installation of the new sample scrubber



5.2: Changing the Split on the Inline Diluter

Preparation: Make sure the inline diluter is not connected to any instruments. Also note that after changing the split, recalibration of the inline diluter system with a Frog is necessary.

Step 1: Unscrew black nut and remove the nut and sample

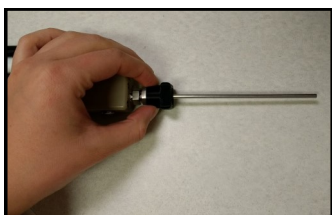


Figure 1: Unscrewing black nut and sample probe assembly.



Figure 2: Black nut and sample probe assembly removed from Inline Diluter.

Step 2: Using 3/32 Allen Driver, loosen 4 screws surrounding split, the screws do not need to be removed; only loosened.

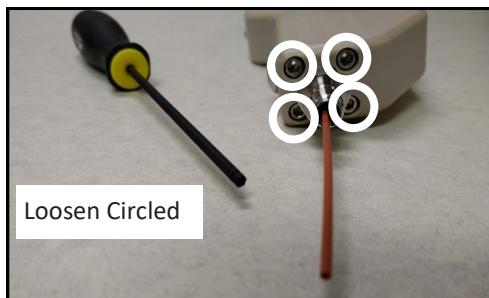


Figure 3: Four screws that should be loosened.

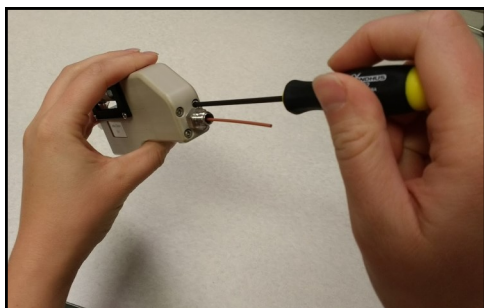


Figure 4: Loosening screws.

Step 3: Slide out the split (the colored tubing).

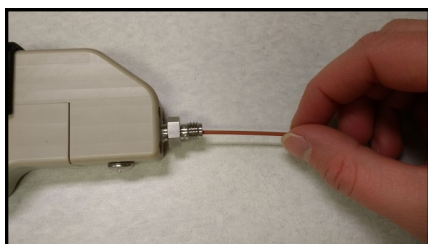


Figure 5: Removing original split.

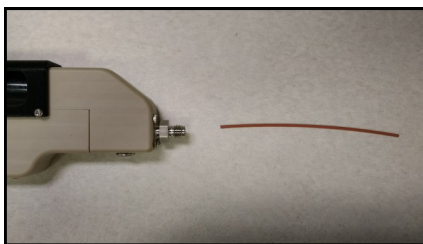


Figure 6: Original split removed.

Step 4: Insert the new split. Slide the new split into place, make sure it is fully seated.

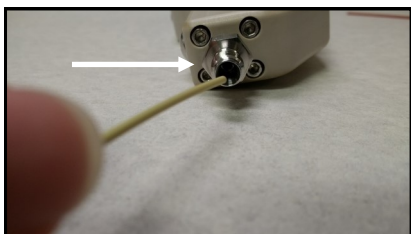


Figure 7: Inserting new split.

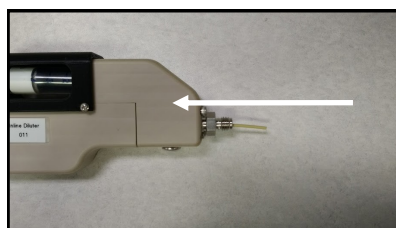


Figure 8: New split in place.

Step 5: Tighten 4 screws around split assembly. Make sure they are snug

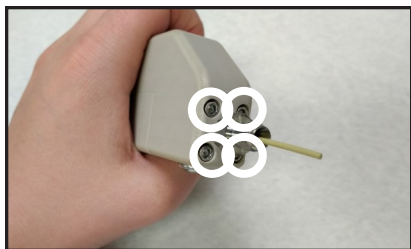


Figure 9: Tightening four screws.



Figure 10: Screws tightened, new split is secured in place. If you can pull the tube out at this point, it was not fully seated. Loosen the screws and push the tube in further.

Step 6: Reattach black nut and sample probe assembly. Make sure Ferrules are still in place (see Figure 11). Tighten black nut

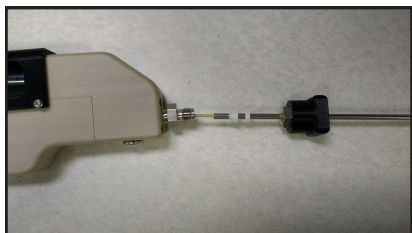


Figure 11: Reassembling inline diluter by attaching the black nut and sample probe assembly.

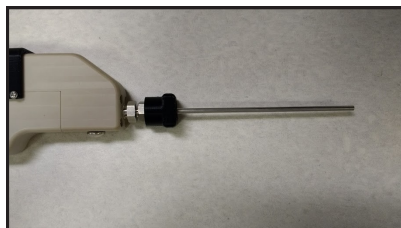


Figure 12: Black nut and sample probe assembly tightened. Inline Diluter is reassembled.

Congratulations! You have now successfully installed a new split in the inline diluter. Be sure to calibrate your inline diluter with a Frog prior to performing any sampling.

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