

Model LTC & 10050 FRM Leak Test Tool Instructions

About Airflow System Leaks

PM_{2.5} Federal Reference Method (FRM) and similar air particulate samplers must be regularly tested for flow system leaks. The standard EPA-recommended leak test procedure involves installing a standard filter cassette into the sampler, blocking the air inlet, pumping down the flow system to a partial vacuum, and then measuring any vacuum loss over a period of several minutes. If the leak test fails, the leak could be located anywhere in the entire sampler airflow path.

The most common cause of leaks in FRM particulate samplers is the 47mm filter cassette itself. The two halves of the cassette are interference-fit together, and if the plastic is worn or the fit is not tight enough, air can leak in through the cassette. In addition, the thin plastic rings around the perimeter of PM_{2.5} PTFE filter discs are often not perfectly flat, which can prevent the cassette from fully sealing against the face of the filter. Leaks can also occur at number of other flow system components above or below the filter cassette, and can be difficult to quickly identify and remedy.

Model LTC 2-Piece Leak Test Cassette Kit



The Alaric LTC 2-Piece Leak Test Cassette kit is designed to allow the site operator to quickly isolate and repair flow system leaks above, below, or at the sample filter. These tools fit any PM_{2.5} FRM or similar PM sampler that use standard EPA-pattern 47mm filter cassettes, and are also designed to fit R&P/Thermo Partisol® series samplers, which use slightly different cassettes.

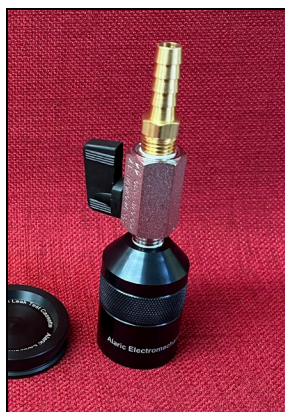
The LTC kit all contain one “open” and one “closed” cassette surrogate tool. These are machined from a single solid piece of black Delrin® polymer with the same outside profile and thickness as a standard loaded 47mm filter cassette assembly. The hole in the “open” cassette allows the whole sampler flow system to equilibrate to the same vacuum level. The “closed” cassette does not have a hole, and isolates the upper and lower flow system at the filter cassette holder.

LTM Membrane Cassette



Our older model LTM Membrane Cassette is one of our standard 47mm filter cassettes, with a rubber membrane disc in place of a standard filter disc. This tool was designed for the recommended method for leak tests from 40 CFR Part 50L. As a practical matter, this tool serves the same function as the more effective solid closed cassette tool in the LTC kit, and is rarely used. LTM is still available for some agencies who specify this older tool as a matter of local SOPs.

Model 10050 Leak Test Valve



The Model 10050 Inlet Leak Test Valve & Flow Meter Adapter is used to close the

main sampler air inlet tube during leak checks. This also has a hose barb which can be used to adapt some types of flow audit meters to the sampler inlet. The standard hose barb is for 3/8 inch ID hose, but can be replaced with many other sizes of barbs with 1/4 NPT threads. This tool meets the leak test specifications from 40 CFR Part 50L.

Model 10052 PM₁₀ Leak Test Tool



The 10052 PM₁₀ Inlet Leak Test Tool can be used to test the EPA-pattern PM₁₀ inlet for leaks which would otherwise be missed during normal leak testing that only tests the downstream components.

Using the Leak Test Tools

Remove the PM₁₀ inlet from the sampler, and block the main inlet flow at the top of the sampler inlet tube or the cyclone with the 10050 leak test valve. Perform a normal leak check procedure using the specific instructions from your air sampler instrument.

If the test indicates that an excessive leak is present, install the open tool from the LTC kit into the sampler and repeat the leak test. The open tool eliminates any possibility of leakage through the cassette itself, but allows the rest of the complete flow path to be tested. If the leak is no longer present with the open tool in place, then the original filter cassette was almost certainly the source of the original leak. This is the most likely outcome.

If the leak is still present with the open tool installed, install the closed tool and repeat the leak test again. The closed tool eliminates everything upstream of the cassette holder from the leak test volume. The pressure sensor used to measure flow system vacuum is located downstream of the cassette holder in

most samplers, so if the leak is no longer present with the closed tool in place, then the leak is located somewhere *upstream* of the cassette holder. This would often indicate the o-rings in the cyclone or WINS Impactor (if used) as the source. If the leak is still present with the closed tool in place, then it is caused by some component or fitting located *downstream* of the cassette holder.

Important Note: The leak rate measurement calculation used in most air samplers is based on vacuum loss over a fixed amount of time, in the known volume of the whole flow path. By blocking the flow system with the closed cassette tool or the membrane cassette, you effectively isolate a significant amount of the flow system volume (inlet tube, etc.) from the pressure sensor during the test. Most samplers don't compensate for this, so the corresponding leak rate measurement with a closed cassette in place may read higher than the actual leak rate, due to the reduction in the tested volume.

Using The PM₁₀ Inlet Leak Tool



The model 10052 PM₁₀ Inlet Leak Test Tool is designed to block the flow inside the funnel of the EPA-pattern PM₁₀ inlet as an optional addendum to standard leak check procedures. This includes the PM₁₀ particle trap and water collector in the leak test:

1. First, perform a standard leak check procedure on the air sampler without the PM₁₀ inlet, and resolve any leak issues.
2. Remove the four screws from the bottom of the PM₁₀ inlet upper section and remove the louvered plate stack from the main funnel. Insert the 10052 plug firmly into the top of the nozzle jet in the bottom of the funnel as shown in the photo.
3. Install the PM₁₀ inlet onto the sampler inlet tube and repeat the standard leak check procedure. Resolve any leaks. Be sure to remove the plug tool before reassembling the PM₁₀ inlet!

If a leak is indicated with the red plug in place, the problem is most likely located at the main particle trap o-ring or the water collection jar seal. It could also be located at the bottom of the PM₁₀ inlet at the socket o-rings. These leaks are important, because an unknown amount of sample air could bypass the impactor and particle trap during normal operation.

Maintenance & Cleaning

The two solid cassette surrogate tools must be kept clean and protected from scratches or damage. They may be cleaned with warm soapy water. The membrane cassette should also be kept clean and protected, and should not be disassembled unless necessary.

The soft red silicone part of the 10052 PM₁₀ Inlet Leak Test Tool should be rinsed to remove any dust or debris.

Delrin parts should not be autoclaved or steam cleaned, because this exceeds the temperature specification of the plastic.

Warranty

Alaric Electromechanics Inc. leak test tools are warranted against defects in materials and workmanship for a period of 1 year from shipment from the factory, when used per the instructions. This warranty does not apply to products that have been subjected to misuse, negligence, acts of nature, or to products that have been modified or used for an application other than intended. Any product found to be defective will be repaired or replaced at our option. The liability of Alaric Electromechanics Inc. shall not exceed the purchase price of the product.

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