Troubleshooting FID Noise and High Background

This Information Applies To: All Agilent GC systems with flame ionization detector (FID)

Issue:

The FID uses a hydrogen flame to burn organic samples, resulting in increased ionization that is measured as a current from 5 to 10^6 pA. Normal FID background levels will be in the 5 to 20 pA range, with no sample present and the GC oven at low temperature. Agilent recommends a temperature ≥ 300 °C to prevent condensation damage. The detector temperature should be approximately 20 °C greater than highest oven ramp temperature in the method.

The gas delivery system must meet the following requirements:

- Stainless steel diaphragm tank regulators capable of sufficient supply pressure.
- All metal plumbing manifold comprised of clean 1/8” copper or stainless steel tubing and Swagelok nuts and ferrules.
- The gas delivery system must be leak free.
- Gas traps are recommended for carrier and make up gas supplies.

The following steps outline a logical procedure for troubleshooting FID baseline problems, including noise, high background, drift, or cycling.

Steps to follow:

⚠ **Caution**: The FID detector can be hot. Cool it to a minimum of 50 °C before exchanging parts or touching it.

FID noise can result from many contributing factors, including:

1. Contamination in the gas supplies to the GC (gas contamination usually yields a high background of >20 pA).
2. Poor flame stability due to a partially plugged or contaminated FID jet assembly.
3. Mechanical noise due to loose or vibrating FID components—interconnect/spring, collector etc.
4. Electrical current leakage in the FID interconnect or across the PTFE insulators that isolate the FID

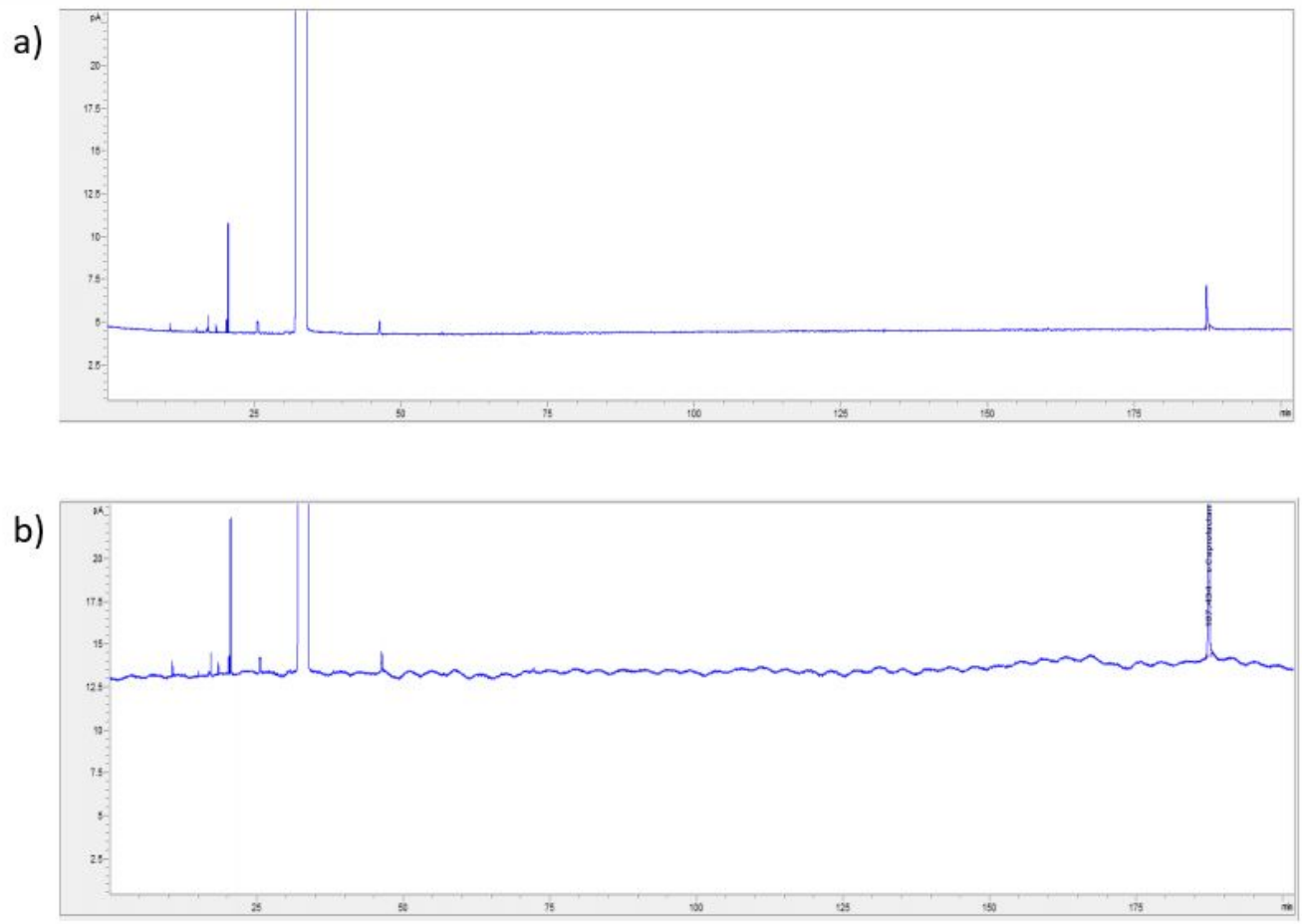

Figure 1 a) Regular baseline, b) Periodic cycling baseline caused by defective gas compressor.

To Troubleshoot high noise or high baseline:

1. Confirm the integrity of the gas supply, check gas purities, and leak check the plumbing manifolds.

   Tips: For recommended gas pressure settings, check the respective site preparation guide of your GC.

2. Evaluate the level of leakage current in the FID. It is the amount of current flowing in the FID electrometer with the flame extinguished. The FID should be at operating temperature (at least 20 °C hotter than the highest oven temperature in your method). To perform the test, turn off the FID from the GC front panel, hand-held controller or use an integrated diagnostic tool. Allow the FID background to stabilize. It should quickly drop to a signal between 2 and 3 pA and slowly be moving towards 0 pA. The output on the display should also be stable at this point—not jumping more than +/- 0.1 pA at a time. If the background stays above 5 pA or is unstable, suspect the following:

c. One of the electronic components is faulty.

3. Perform FID maintenance per the GC operator's manual or follow the instructions under the article How to Clean an FID.

   a. Clean or replace the FID jet. Clean or replace the FID collector and PTFE insulators.

   b. Inspect the underside of the brass castle assembly for rust or corrosion. Replace if dirty.

   c. When reassembling the FID, make sure that all mechanical assemblies are tight and that the interconnect spring does not get deformed. It should be oriented into the channel on the outer perimeter of the FID collector (Figure 2).

   Tips: Pay attention to the FID signal when the collector assembly is built out. Should the signal be still high during this situation, it might be an indicator of a faulty board. Contact Agilent for more support.

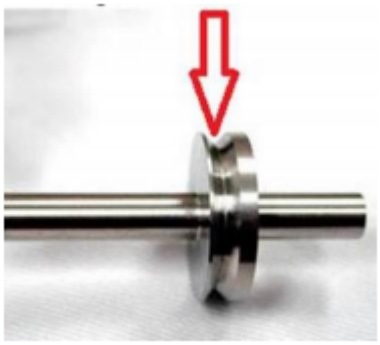

Figure 2 FID collector.

4. Eliminate the column/carrier as the source of noise/background.

   a. Remove the column from the FID and cap the fitting. Use a blank no hole ferrule or blanking plug with any ferrule.

   b. Relight the flame, allow it to stabilize and re-evaluate the noise and background. If the FID background and noise become acceptable, the problem could be due to contaminated carrier gas or excessive column bleed.

   c. If the problem persists, continue the procedure, otherwise re-evaluate with a known and well-conditioned, thin film column.

   Tips: An uncoated retention gap is a good troubleshooting tool to isolate column bleed problems.

5. Measure the FID flows with an independent measurement device (bubble meter or electronic flow meter).

   Tips: Remember that ambient pressure affects flow measurement from a soap film bubble meter. Flow modules are calibrated at Standard Temperature and Pressure. For accurate readings, use a true

b. H_2: Equal or > Column or Column + Make up if using capillary column

c. Air: 400 ml/min

Tips: Optimum FID signal-to-noise performance is achieved at about a 1:1 ratio of H_2 to inert gas.

There will no carrier flow, because the column is disconnected, and the detector fitting plugged. Measure the H_2, Air, and make up gas flows independently by turning them on one at a time. They should be within +/- 10% of the setpoint.

If the flows are significantly off, the jet could be partially plugged, there could be a leak anywhere in the FID pneumatic system, or tone of the electronic modules could be defective. Resolve any flow control problems and retest the FID noise.

6. Relight the flame and bake out the detector at 350 °C for an hour.
7. Re-evaluate the FID noise and background at normal FID and GC oven operating temperature.

If the noise and or background is still too high, the Air, H_2, and make up gas purity is suspected. The FID can be operated with just Air and H_2. Turn off the make up gas and re-evaluate the FID noise and background. If there is a significant drop in noise or baseline (>5 pA drop in background), then the make up gas purity is suspect. It is recommended at this point to replace traps in the make up gas supply line. If the problem persists, replace the moisture traps in the H_2 and Air supply lines.

If the problem persists after gas purity issues are addressed, there could be a possible problem with the electronics. Please contact Agilent's local customer support service.

Learn how to effectively troubleshoot your Flame Ionization Detector: GC-MULTI-2250s - FID Maintenance and Troubleshooting and Agilent 7890 Series GC: Flame Ionization Detector (FID) Maintenance and Troubleshooting **e-learning available from Agilent education.**

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