Checking the Basics
A surprising number of problems involve fairly simple and often overlooked components of the GC system or analysis. Many of these items are transparent in the daily operation of the GC and are often taken for granted (“set it and forget it”). The areas and items to check include:

- Gas pressures, carrier gas average linear velocity, and flow rates (detector, split vent, septum purge)
- Temperature: column, injector, detector, and transfer lines
- System parameters: purge activation times, detector attenuation and range, mass ranges, etc.
- Gas lines and traps: cleanliness, leaks, and expiration
- Injector consumables: septa, liners, O-rings, and ferrules
- Sample integrity: concentration, degradation, solvent, and storage
- Syringes: handling techniques, leaks, needle sharpness, and cleanliness
- Data system: settings and connections

Condensation Test
Use this test whenever injector or carrier gas contamination problems are suspected (e.g., ghost peaks or erratic baseline).

1. Leave the GC at 48–50 °C for 8 or more hours.
2. Run a blank analysis (i.e., start the GC, but with no injection) using the normal temperature conditions and instrument settings.
3. Collect the chromatogram for this blank run.
4. Immediately repeat the blank run as soon as the first one is completed. Do not allow more than 5 minutes to elapse before starting the second blank run.
5. Collect the chromatogram for the second blank run and compare it to the first chromatogram.

If the first chromatogram contains a substantially larger amount of peaks and baseline instability, the incoming carrier gas line or the carrier gas is contaminated.

7. If both chromatograms contain few peaks or very little baseline drift, the carrier gas and incoming carrier gas lines are relatively clean.

Excessive Baseline Noise

Possible Cause

- Injector contamination: Check the injector, replace the column, recondition the column. Check the GC for contamination or replacement
- Column contamination: Check the column for contamination or replacement
- System parameters: Check the GC for contamination or replacement
- Detector contamination: Check the detector for contamination or replacement
- Gases: Check for contamination or replacement

Solution

- Change the column sensitivity
- Change the GC sensitivity
- Change the detector sensitivity
- Change the system parameters
- Change the gases

Comments

- All peaks will shift in the same direction by approximately the same amount
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always readily visible

Baseline Instability or Disturbances

Possible Cause

- Column overlength: Reduce carrier gas flow rate
- Improper column installation: Reduce carrier gas flow rate
- Injector technique: Change technique
- Compound sample overload in injection solvent: Change technique
- Mixed sample overload: Change technique

Solution

- Use a retention gap
- Use a retention gap
- Change the technique
- Change the technique
- Change the technique

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always readily visible
- The needle; leaks are not always readily visible
- The needle; leaks are not always readily visible

Fronting Peaks

Possible Cause

- Column overlength: Reduce carrier gas flow rate
- Improper column installation: Reduce carrier gas flow rate
- Injector technique: Change technique
- Compound sample overload in injection solvent: Change technique

Solution

- Use a retention gap
- Use a retention gap
- Change the technique
- Change the technique

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always readily visible
- The needle; leaks are not always visible

Loss of Resolution

Possible Cause

- Different column temperatures: Check the column temperature
- Different column dimensions or phase: Check the column temperature
- Inadequate separation: Check the column temperature

Solution

- Use a different sample concentration
- Use a different sample concentration
- Use a different sample concentration

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always visible

Split Peaks

Possible Cause

- Sample injection: Check the sample injection
- Change the gas injection velocity
- Change the purge activation time

Solution

- Use a different sample concentration
- Use a different sample concentration
- Use a different sample concentration

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always visible

Retention Time Shift

Possible Cause

- Sample injection: Change the sample injection
- Change the gas injection velocity
- Change the purge activation time

Solution

- Use a different sample concentration
- Use a different sample concentration
- Use a different sample concentration

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always visible

Change in Peak Size

Possible Cause

- Sample injection: Change the sample injection
- Change the gas injection velocity
- Change the purge activation time

Solution

- Use a different sample concentration
- Use a different sample concentration
- Use a different sample concentration

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always visible

Symmetrical Fronting Overload

Possible Cause

- Compound very soluble in injection solvent: Change solvent. Using a retention gap may help
- Improper column installation: Reinstall the column

Solution

- Use a retention gap
- Reinstall the column

Comments

- All peaks may not be equally affected
- The baseline must be smooth and not suddenly depressed or having sample in the syringe
- The needle; leaks are not always visible

Agilent GC solutions deliver the highest level of analytical performance and day-after-day productivity, with the assurance of legendary Agilent reliability and technical support. Learn why Agilent is the genuine global GC leader at agilent.com/chem/resolve.