

Simplifying Method Translation to Intuvo

Introduction

The Agilent Intuvo 9000 GC System embodies transformational technology that greatly simplifies operation, and improves laboratory efficiency and productivity. It preserves proven, established technologies and designs related to inlets, fused silica columns, and detectors, ensuring that conventional analytical methods can be transferred to Intuvo readily, usually with minimal modification. Intuvo chromatograms look largely the same as those of conventional systems. Because the same separation column is used with Intuvo, elution order and resolution do not shift compared to conventional GCs.

Because of unavoidable slight variations between flowpaths from one GC system to another, retention times for any given method could vary slightly when transferred from one system to the other. No matter which GC systems a method is being transferred between, it is always good analytical practice to check retention times, and make slight adjustments accordingly. The Agilent Retention Time Locking Wizard is a convenient and powerful tool to help automate this process.

This Technical Overview summarizes what to consider when transferring methods between GC systems. While this study focuses on transferring conventional methods to Intuvo methods, the concepts are applicable and helpful when transferring methods between any two GC systems. Six conventional-to-Intuvo method transfer examples are detailed in an accompanying Application Note, for further information¹.

Method transfer basics

In general, conventional methods transfer seamlessly from air bath oven systems to Intuvo GC systems. Whenever transferring methods between systems, it is important to ensure that the two systems are configured in the same way. If the original system is configured with a split/splitless injector and an FID detector, for example, the Intuvo should be configured the same way.

For method transfer discussions, it is helpful to identify the various components of Intuvo. Figure 1 shows these components.

Retention time considerations

It is normal for column length to vary slightly from one column to another. If a conventional column had been clipped at all, it is likely that its length will vary from the Intuvo column. This could shift retention times slightly. It is good practice to always check retention times and adjust accordingly.

Intuvo has a built-in retention gap, therefore, when transferring from a conventional system using a similar retention gap (approximately 0.75 m path length), retention times should compare very well. If the original conventional system does not use a retention gap, there is likely a flowpath length difference from Intuvo. This difference could lead to a slight shift when transferring to Intuvo, especially for early eluting compounds. This is to be expected, and is due to the slight increase in path length of the retention gap.

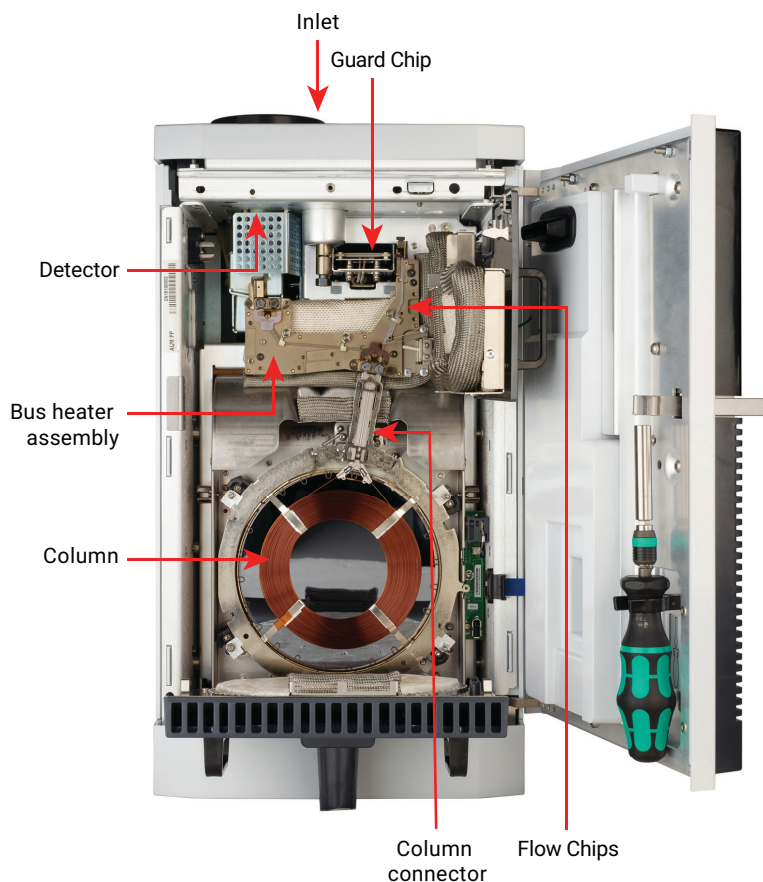


Figure 1. Basic Agilent Intuvo 9000 GC flowpath components.

Table 1. In most method transfers, temperature settings do not require user intervention; they are either the same as conventional, or set automatically by the Agilent Intuvo 9000 GC.

Component	Function	Temperature Setting
Inlet	Equivalent to conventional	Same as conventional
Guard Chip	Retention gap	Default = automatically set to track method oven temperature Optional = user variable
Bus heater block	Oven function	Default = automatically set by oven temperature Optional = user variable
Column connector		Automatically set based on oven temperature
Column	Equivalent to conventional	Same as conventional
Detector		

These concepts are not different from those when transferring methods between systems of different vendors, or vintage, and are not new to Intuvo.

As an example, Figures 2 and 3 show chromatograms and relative retention times for over 60 compounds measured by identical methods for US EPA 8270D run on an Agilent 7890B GC and an Intuvo 9000 GC system. The original 7890B method was used on Intuvo,

using identically specified columns. This demonstrates how retention times are largely the same. However, a slight shift in retention times is evident in a few early eluting compounds, because the 7890B was not outfitted with a retention gap.

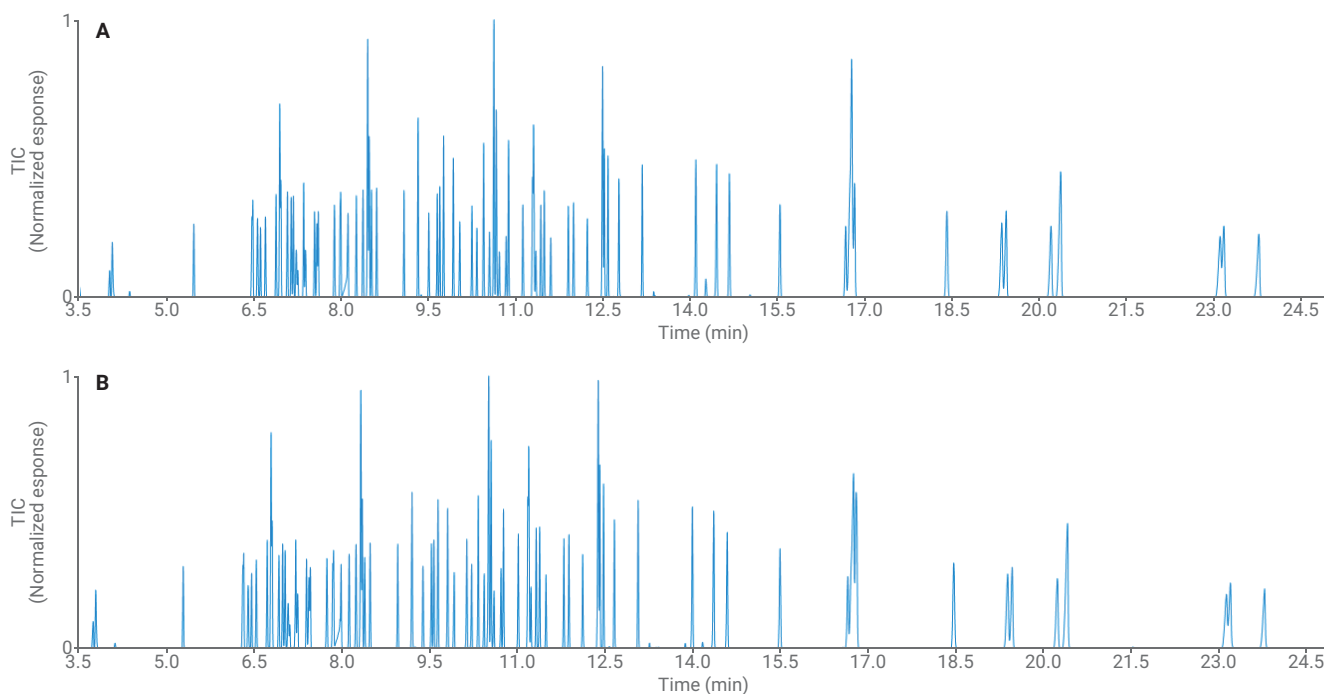


Figure 2. The Agilent Intuvo 9000 GC system (A) yields nearly identical performance as the Agilent 7890 GC system (B) with the same method parameters.

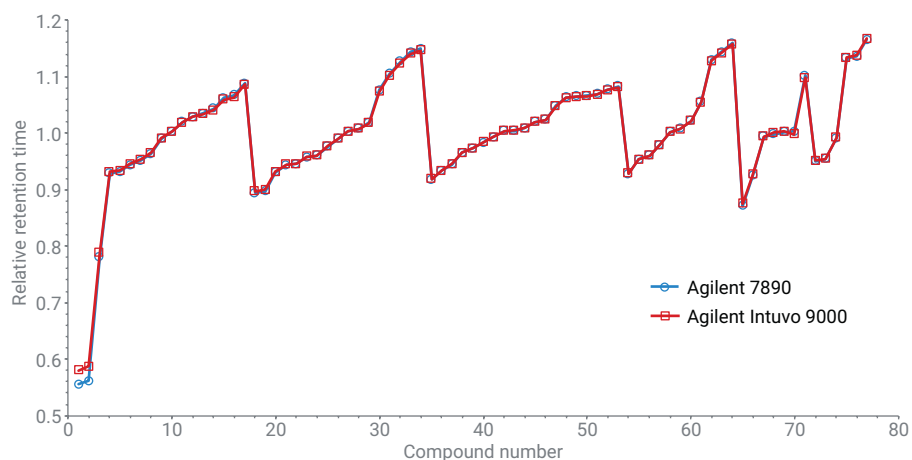


Figure 3. Relative retention times for the Agilent 7890 GC system and Agilent Intuvo 9000 GC system are virtually identical.

Intuvo Guard Chip settings

There are two choices of Guard Chips for Intuvo: the standard Guard Chip (approximately 0.75 m long) and the Jumper Chip (approximately 0.6 m long). Choose the Guard Chip for maximum protection of the column from sample matrix contamination, and the Jumper Chip where samples injected are of higher purity and the concern for flowpath contamination is low (see Technical Overview 5991-8447EN *Choosing the Right Guard Chip for Your Application* for more information).

The Guard Chip integrated into Intuvo acts as a retention gap. In conventional air bath ovens, the retention gap is immersed in the same oven as the column, and its temperature naturally tracks the column. This is the preferred operation in Intuvo. When transferring a conventional retention gap method to Intuvo, set the Guard Chip to the track oven mode. In this mode, the Guard Chip temperature tracks the oven temperature to best replicate retention times between the two systems (Figure 2).

The Intuvo automatic default temperature setting best replicates the outcome of conventional methodology. To help protect the column when analyzing samples with especially dirty matrices, tracking the oven ramp helps optimize the Guard Chip matrix-trapping potential. Because Intuvo is composed of discrete independently-heated flowpath elements, many flowpath temperatures can be set independently. For example, a different temperature program for the Guard Chip versus the column can be set in the *ramped temperature* mode. This allows the option of ramping at a different rate than the oven.

Advanced users may find, in some cases, that a slightly altered ramp for the Guard Chip might improve chromatography. Usually, the ramped temperature mode can be used to set the Guard Chip (or Jumper Chip) to an isothermal temperature (for example, in between the inlet and the oven maximum), which is most likely the simplest and best way to run volatiles using headspace or purge-and-trap sampling. When developing methods for highest throughput of high purity samples, setting an isothermal temperature for the Jumper Chip (zero ramp in the *ramped temperature* mode) can be a good strategy for maximizing throughput.

If equivalent chromatographic (and productivity) output is the aim in transferring an established conventional method, the simplest automatic default settings are always best to achieve equivalency.

Intuvo Flow Chip settings

The flowpath between the Guard Chip and the column is composed of one or more Intuvo Flow Chips mounted on an independent heater assembly called the bus (Figure 1). By default, the bus heater temperature is automatically set to an isothermal setpoint based on the method oven temperature. All Intuvo Flow Chips mounted to the bus heater assembly (for example, inlet flow chip, detector flow chip, or backflush flow chip) are heated to the same temperature by the bus.

As with the Guard Chip setting, the default setting for the bus heater assembly can be manually over-ridden. There might be some cases where a slightly lower bus temperature (perhaps 20 °C less) might provide some benefit, for example, in the case of analyzing thermally labile compounds.

Detector settings

Detectors are connected to the bus heater assembly and integrated flow chips as detector tails. These connectors are heated at the same temperature as the detector temperature set by the method, and do not require any additional settings in transferring the method to Intuvo.

Method flow settings

In general, Intuvo flow settings are equivalent to method flow settings in conventional air bath oven systems, and can be ported over directly.

However, Intuvo greatly simplifies backflush and reduces the number of required decisions. A separate Technical Overview provides guidelines for moving retention time based databases that may be impacted by subtle flow rate changes.

Conclusions

In general, method transfer from a conventional GC to Intuvo is straightforward. Intuvo is operated in the same manner as a conventional gas chromatograph. Split/splitless and multimode inlet parameters, capillary column stationary phases, oven temperature programs, and detector setpoints remain the same when moving methods between the two platforms. However, Intuvo offers a few additional, optional capabilities. Automatic default settings make these options transparent to the user. In specific cases, the advanced user can access a greater amount of control to help optimize applications further.

Here is a high-level summary of things to consider when transferring conventional methods to Intuvo:

- A conventional method is a great way to start a method for Intuvo. You are probably more than 90 % done.
- Choose the Guard Chip for dirtier samples and the Jumper Chip for samples of higher purity.
- Allow default Guard and Jumper Chip settings to be set automatically to achieve the most equivalent outcomes with an existing method.
- Consider manually setting slightly lower temperatures than default (for example, 20 °C lower) for the bus heater assembly for highly thermally labile analytes.
- Consider a Jumper Chip set isothermally for measuring volatiles by headspace or purge-and-trap.

References

1. R. Veeneman, Transferring Methods to Intuvo: Six Practical Examples, Agilent Technologies Technical Overview, publication number 5991-9150EN, March **2018**.
2. R. Veeneman, Choosing the Right Guard Chip for Your Application, *Agilent Technologies Application Note*, publication number 5991-8447EN, November **2017**.
3. R. Veeneman, Updating Pesticide Retention Time Libraries for the Agilent Intuvo 9000 GC, publication number 5991-8446EN, November **2017**.

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