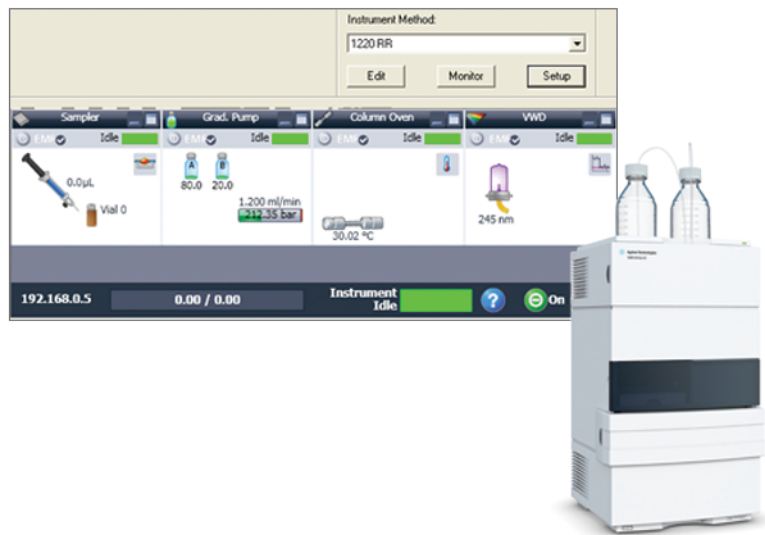# Using the Agilent Instrument Control Framework to control the Agilent 1220 Infinity LC system through Waters Empower software

Instrument set up and performance

Technical Overview

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Abstract

The Agilent Instrument Control Framework (ICF) enables other providers of LC data acquisition and processing software to simplify the development of the control of Agilent LC instrumentation. In this Technical Overview, we demonstrate how Agilent ICF facilitates enhanced control of the Agilent 1220 Infinity LC system through Waters Empower chromatography data software versions 2 and 3. The combination of Agilent ICF and Waters Empower software provides easy access to advanced features of the 1220 Infinity LC system such as overlapped injections.

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Introduction

The Agilent Instrument Control Framework (ICF) is a software component that makes it easier and faster for software providers to implement control of Agilent LC equipment in their chromatographic data systems or workstations[1,2]. Based on new standard instrument drivers from Agilent, ICF eliminates much of the delay and effort of using low-level instrument control codes and the need of software developers to write their own native drivers.

In this Technical Overview, we demonstrate:

- What prerequisites have to be fulfilled to ensure seamless interaction between Agilent 1220 Infinity LC systems, Waters Empower software, and Agilent ICF

- How instruments are configured and methods are created for the Agilent 1220 Infinity LC system using Waters Empower software in combination with Agilent ICF

- That the performance of the Agilent 1220 Infinity LC system fulfills expectations in combination with Waters Empower data acquisition and processing tools

Experimental

An Agilent 1220 Infinity LC system with the following configuration was used for the precision measurement:

- Gradient pump

- Autosampler

- Column oven

- Variable wavelength detector

- Agilent ZORBAX RRHT Eclipse Plus C-18 column packed with 1.8-µm particles

Chromatographic conditions for precision measurement

Compounds:	RRLC Checkout sample (p/n 5188-6529), acetanilide, acetophenone, propiophenone, butyrophenone, benzophenone, valerophenone, hexanophenone, heptanophenone, octanophenone
Column:	Agilent ZORBAX RRHT Eclipse Plus C-18, 4.6 × 100 mm, 1.8 µm
Mobile phases:	A = Water, B = Acetonitrile
Gradient:	20% to 80% B in 8 min, at 9 min 80% B, at 9.01 min 20% B
Flow rate:	1.2 mL/min
Stop time:	12 min
Column temperature:	30 °C
Injection volume:	1 µL
VWD:	245, 10 Hz
Software:	Empower 2 Build 2154, Installed Service Packs: A-D
Installed feature releases:	1-4, with ICF version A.01.02 SP1

Prerequisites for the combination of Empower and ICF

- Only Agilent 1220 Infinity LC systems containing an autosampler are supported. Instruments with a manual injector are not supported by Empower 2 or 3.

- All Agilent LC modules must have firmware version A.06.32 or B.06.32 or B.06.41 or higher.

- All Agilent LC modules must have RC.Net drivers.

- Agilent Infinity LC ICS 1.0.0

- Empower 2, feature release 3 or higher or Empower 3 software[3]

- Windows XP with service pack 3 or higher[3]

Results and discussion

Agilent ICF facilitates access to advanced features of Agilent LC instruments that were previously not supported by earlier revisions of Empower with drivers provided by Waters. Now, all features are supported and available though the new *On line* screen, which has been added to the familiar Empower screen, see Figure 1. A right-click on one of the module fields gives access to all control, method and other advanced features of the module.

For supported modules and functions, refer to the Appendix.

Configuring the Agilent 1220 Infinity LC system

1. Set up the DHCP of the Empower node.

2. Set all DIP switches of the Agilent module to 0. This module is connected to the Empower node through LAN.

3. The LC receives an IP address from the DHCP server.

4. To connect the Agilent instrument, configure the DHCP server through *Properties* of the *Empower Nodes*.

5. Use *Edit* to set the instrument type and a unique name.

6. Click *File* and *New chromatographic system* to make the new LC system accessible for data acquisition.

After this last configuration step, the Agilent 1220 Infinity LC system is *On Line* and ready for use.

These configuration steps have to be followed whenever a new module is added or removed. Previously, the old configuration has to be deleted from the DHCP server configuration. Then the Empower software has to be shut down and the LAN connection to the module has to be switched off and on again. When the LAN connection has been restored, the new configuration procedure can be started.

Creating an instrument method and a method set

Having configured the instrument, the instrument method and the method set can be created in the *Empower Run* sample screen. The Instrument method is set up through the *Edit* method. All parameters that are available in the Agilent ChemStation are now typically accessible in Empower.

The created instrument method is saved and used to set up a method set. The method set can then be used to create sequences.
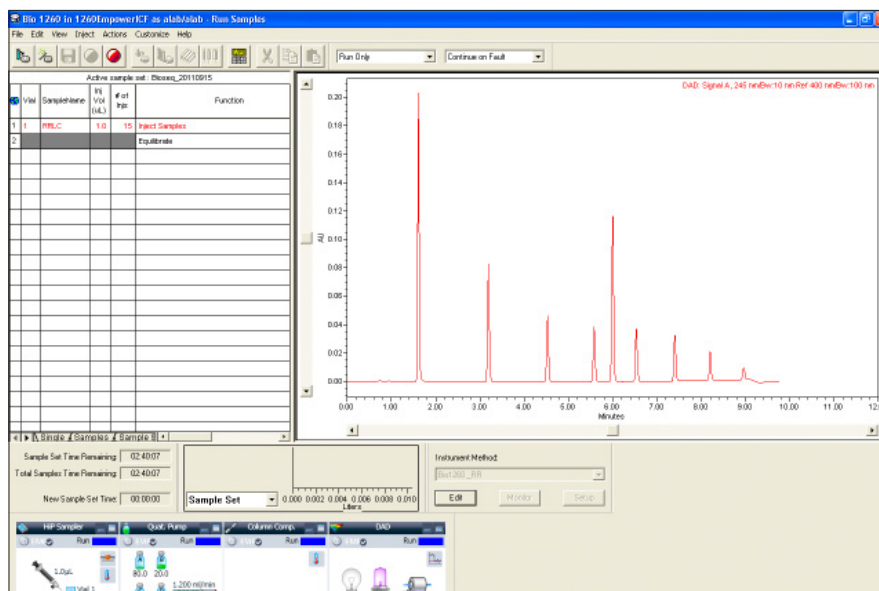

Figure 1
Agilent Instrument Status screen under Empower software and ICF, captured while a sequence was running.

Creating a sequence

A sequence is created by filling the sample set table with name of sample, position of vials, number of injection per vial, method set to be used, and so forth.

Performance of the Agilent LC systems using Waters Empower data processing tools

To demonstrate that the Agilent 1220 Infinity LC system fulfills the expected performance the following tests were done using the RRLC Checkout sample:

• Precision of retention time

• Precision of areas

Precision of retention time and areas

Precision of retention times and areas for a 1 µL injection are combined in Table 1. Data were evaluated using the Empower Component summary report. The precision for the retention times for six consecutive runs is less than 0.24% RSD, for the area the precision is less than 0.9% RSD.

Peak name	RSD RT (%)	RSD Area (%) (1 µL injection volume)
acetanilide	0.236	0.229
acetophenone	0.149	0.308
propiophenone	0.066	0.392
butyrophenone	0.034	0.518
benzophenone	0.041	0.334
valerophenone,	0.051	0.459
hexanophenone	0.050	0.510
heptanophenone	0.039	0.605
octanophenone	0.038	0.838

Table 1
Precision of retention times and areas for six consecutive runs.

Conclusion

The Agilent Instrument Control Framework (ICF) is a software component that makes it easier and faster for software providers to implement control of Agilent liquid chromatography systems in their chromatographic data systems or workstations. In our application example, ICF was used to control the Agilent 1220 Infinity LC system in combination with Waters Empower software. The instrument was configured in Empower and data were acquired and processed. The combination of ICF and Empower software facilitates access to all available Agilent instrument features such as overlapped injection. The Agilent Instrument Status screen is used to set up On Line methods, to switch the system on or off, to equilibrate columns, to view the status of single module, and to access special features using the Control function available for each Agilent LC module. As expected, the Agilent 1220 Infinity LC system shows the same excellent performance for data acquired and processed using Empower and ICF.

References

1.
"The Agilent Technologies Instrument Control Framework", Technical Overview, Publication number 5990-6504EN, November 2010

2.
"The Agilent Technologies Instrument Control Framework", Short overview, Publication number 5990-5756EN, June 2010

3.
"Agilent Infinity LC Instrument Component software Version 1.0 for Empower software", Waters Installation note, Publication number 716003453 Rev.A, August 2011

4.
"Using the Agilent Instrument Control Framework to control the Agilent 1260 Infinity LC through Waters Empower software- Instrument set up and performance", Agilent Publication, Publication number 5990-9092EN, November 2011

5.
"Using the Agilent Instrument Control Framework to control the Agilent 1290 Infinity LC through Waters Empower software - Instrument set up and performance", Agilent Publication, Publication number 5990-9093EN, November 2011

Appendix

	Supported	Not supported
G4286B Isocratic, Manual Injector		X
G4288B/C Gradient, Manual Injector		X
G4290B/C Gradient, Autosampler	X	

Table 2
Supported and not supported instruments.

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