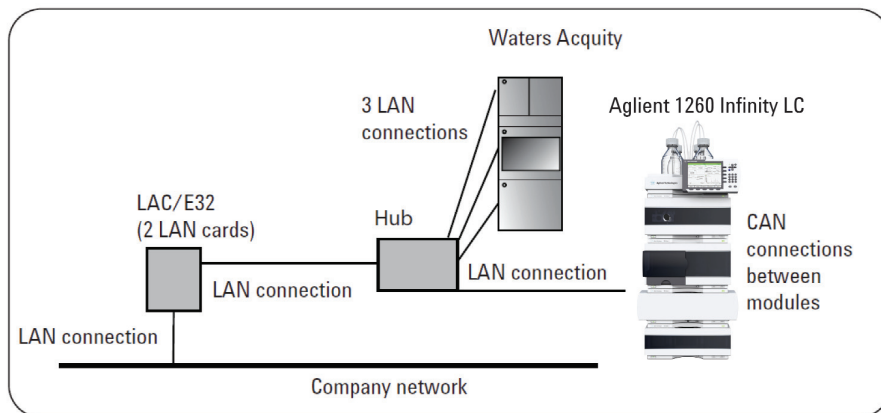# Using emulation mode to control Agilent 1260 Infinity LC Systems through Waters Empower software

Application Note

Pharmaceutical Analysis and Chemical Analysis

Author

A. Gratzfeld-Huesgen

Agilent Technologies

Waldbronn, Germany

Abstract

Agilent 1260 Infinity LC Systems can be operated using the Waters Empower 2 chromatography data software with ICS 1.05.

An Empower client/server system provides:
- Easy installation and configuration of the Agilent 1260 Infinity LC System; modules with new product number need emulation mode via a special firmware (possible limitations of some features)

- Evaluation of two-dimensional, three dimensional and spectral raw data acquired by Agilent 1260 Infinity UV detectors, except the Agilent 1260 Infinity DAD

- Support of maintenance and diagnostics through Agilent Lab Monitor and Diagnostic software

- Fast access to the Agilent 1260 Infinity LC System through the instant pilot controller

Agilent Technologies

Introduction

Today, a key requirement of HPLC users is the control of new equipment through the software already deployed in their laboratory. This helps to reduce the cost of user training and costs related to software licenses, IT effort and comparability of results. As a consequence, suppliers of software and instrumentation are working to make their systems more compatible. This publication describes how and to what extent the Waters Empower chromatography data software can control the Agilent 1260 Infinity LC Systems. Configuration and operation of an Agilent 1260 Infinity LC Systems through Empower is demonstrated.

Supported Agilent 1200 Infinity Series LC modules

For details on supported 1200 Infinity Series LC modules please follow this link:
http://www.chem.agilent.com/en-US/Support/Downloads/firmware/Pages/LC.aspx

The content of this website is constantly updated and contains information on compatibility issues as well as instructions for emulating instruments for use with new modules with Empower. In addition, downloads of firmware are possible using this link. The Agilent firmware revisions for the 1260 Infinity modules must be A.06.32, B.06.32. The Agilent 1260 Infinity DAD (G4212B) is not supported as of this publication date.

The following Agilent 1260 Infinity LC modules allow emulation of Agilent 1200 Series modules:

- G1310B   Isocratic Pump (replaces G1310A)
- G1311B   Quaternary Pump (replaces G1311A)
- G1311C   Quaternary Pump VL (replaces G1311A)
- G1312C   Binary Pump VL (replaces G1312A)
- G1314F   Variable Wavelength Detector (replaces G1314D)
- G1321B   Fluorescence Detector (replaces G1321A)
- G1367E   Autosampler (replaces G1367A/B/C/D; for D hardware upgrade is required)

The following already existing Agilent 1260 Infinity LC or Agilent 1290 Infinity LC modules allow emulation of Agilent 1200 Series modules:

- G1316C   Thermostatted Column Compartment (G1316A/B)
- G1314B   Variable Wavelength Detector (G1314A)
- G1314C   Variable Wavelength Detector (G1314A/B)
- G1329B   Autosampler (G1329A)
- G1312B   Binary Pump (G1312A)

The following Agilent 1260 Infinity LC modules require special firmware for downgrade due to hardware changes:

- G1312B   Binary Pump
- G1376A   Capillary Pump
- G2226A   Nanoflow Pump

Currently not controllable modules

The new Agilent 1260 Infinity DAD (G4212B), all Agilent 1220 Infinity LC Systems and all Agilent 1290 Infinity LC modules besides the Agilent 1290 Infinity Thermostatted Column Compartment are not yet controllable. Regular updates are available at

http://www.chem.agilent.com/en-US/Support/Downloads/firmware/Pages/LC.aspx

Configuration used for testing

Module	Emulation mode required	Comment	Limitation
Pump G1311B	✘	was directly recognized as G1311A	Max pressure 400 bar
DAD G1315D	✘	already supported	Max data rate <0.01 min (0.1 s)
Oven G1316C	✓	was emulated as G1316B	door-open sensor not supported
Autosampler G1367E	✘	was directly recognized as G1367C	No needle wash option

This system as well as additional Waters Acquity HPLC systems were controlled by Waters Empower 2 chromatography data software with Instrument Control Software (ICS) version 1.05.2154, Service Pack A-D installed.

Support of maintenance and diagnostic features

In contrast to Agilent ChemStation software, third-party software typically does not control all diagnostic and maintenance features of the Agilent LC systems. To help users bridge this gap, Agilent offers the LabAdvisor software, which runs on a separate PC and can control maintenance functions such as Early Maintenance Feedback (EMF) as well as all diagnostic features. Agilent LabAdvisor software runs completely independent of instrument control software such as Waters Empower software. The use of Agilent LabAdvisor software and Waters Empower software in parallel requires a special setup that involves multiple network interface cards in the LC instruments and dedicated PCs for the LabAdvisor software. In a Waters Empower software environment, it is recommended to use the LabAdvisor software for instrument maintenance and diagnostics, but not for continuous instrument monitoring. To access the LC instruments through the LabAdvisor software for maintenance and diagnostics, it is recommended to disconnect the LC instruments from Waters EmPower software. In this way no additional hardware or IT infrastructure are required.

Agilent 1200 Infinity Series Instant Pilot controller

The Agilent 1200 Infinity Series Instant Pilot controller (G4208A) provides fast access to any 1260 Infinity LC System. Chromatographic parameters and MAC addresses can be verified as well as the instrument status and error messages. The Agilent 1200 Infinity Series Instant Pilot is also a powerful tool whenever the user needs to react quickly to a certain situation. For example, it can turn off the pump immediately if the control software goes down.

When connecting the instant pilot to an Agilent 1260 Infinity LC System that is controlled by third-party software, the software may generate an error indicating detection of an unknown module in the system configuration. This error can be prevented by making the instant pilot invisible to other controllers. To change the setting, open the **Configure–Controller** menu, scroll to the item "3rd party software" and change to ON.

Backward compatible:
OFF visible to other controllers (default)
ON invisible to other controllers

System requirements

An Empower client-server system is required to control an Agilent LC System (Figure 1). For details on how to install the instrument control software, refer to release note 716002507, Rev A or newer, available from Waters. When connected to the Empower chromatographic data system, the Agilent 1260 Infinity LC (all dip switches to off) receives an IP address from the LAC/E bus automatically through DHCP or BOOTP. In this example, the Agilent 1260 Infinity LC System was connected to the Empower chromatographic data system using a LAN cable. The modules of the Agilent 1260 Infinity LC were interconnected using CAN cables.
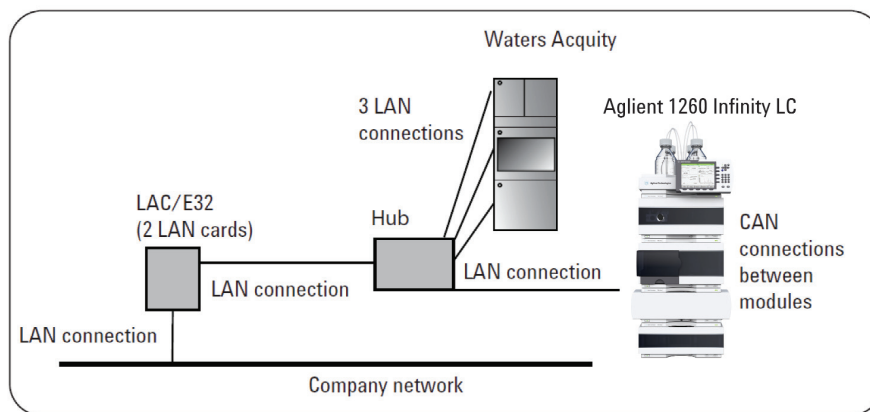
Figure 1
Installation of the Agilent 1260 Infinity LC Systems within the Empower client-server environment .

Agilent equipment

The Empower software incorrectly labels the Agilent 1260 Infinity LC as *"A1100"*. This is a software defect that has not yet been corrected. The functionality and performance is not influenced by this incorrect label.

The full functionality of the Agilent 1260 Infinity LC System is available, including operation up to 400 bar and a data rate up to 20 Hz for the Agilent 1260 Infinity Diode Array Detector VL. During this test the Agilent 1260 Infinity LC System was running in the emulation mode.

Setting the communication protocol

The Agilent 1260 Infinity LC System is configured by clicking *Configure System* in the Empower main menu (Figure 2).

To check whether the Agilent 1260 Infinity LC System has received an IP address after connection through a LAN cable to the LAC/E bus, click *Configure System > LAC/E 32 controller > Properties > Configure DHCP.*

Figure 3 shows that the Agilent 1260 Infinity LC System, labeled as *A1100,* has received the IP address 192.168.0.7 (last line of the list). This confirms that the Empower software has recognized the new LC system. To give the system a correct name, highlight *A1100,* click *Edit* and then type, for example, *A1260new*.
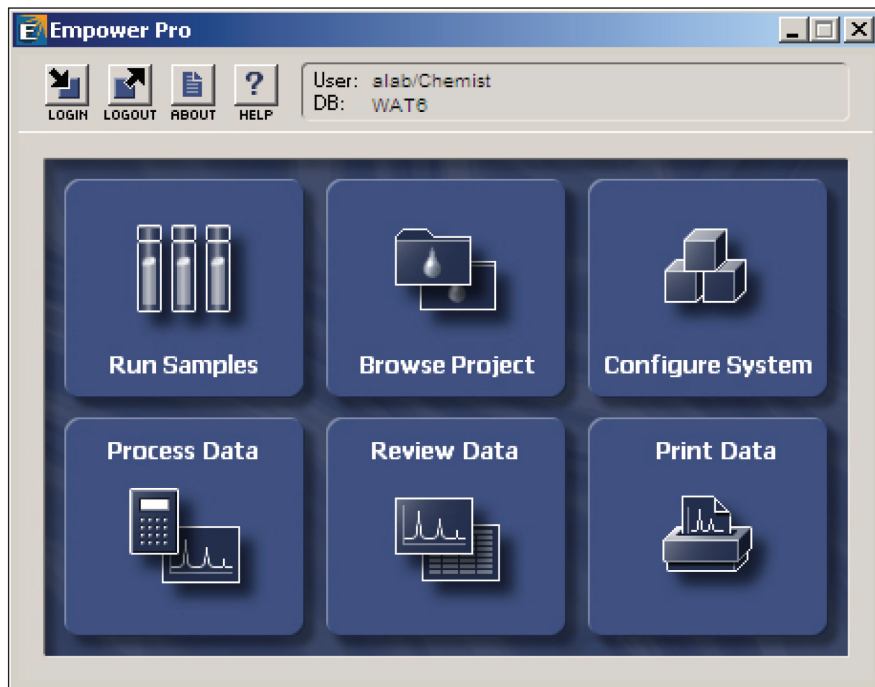
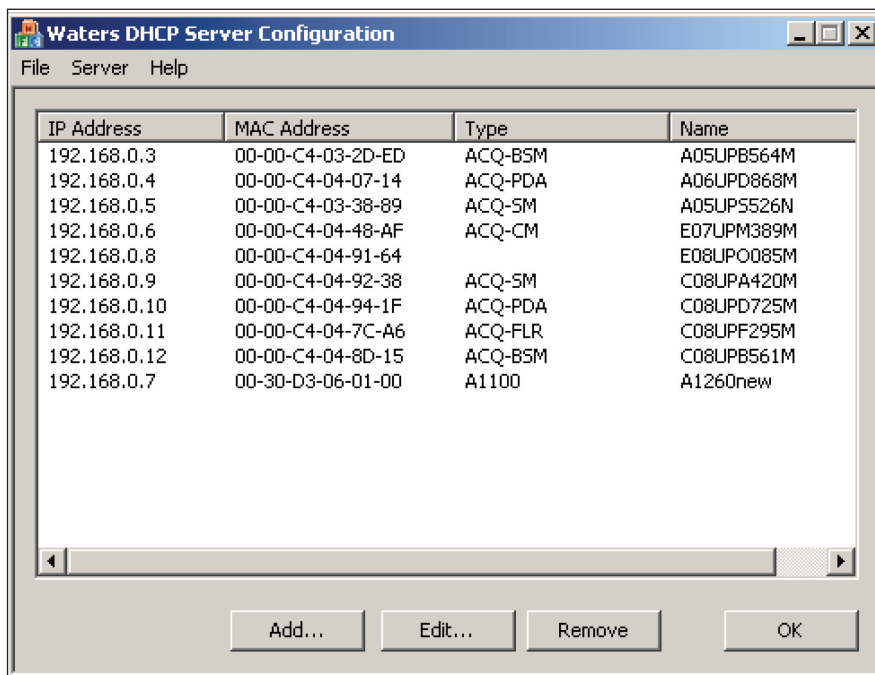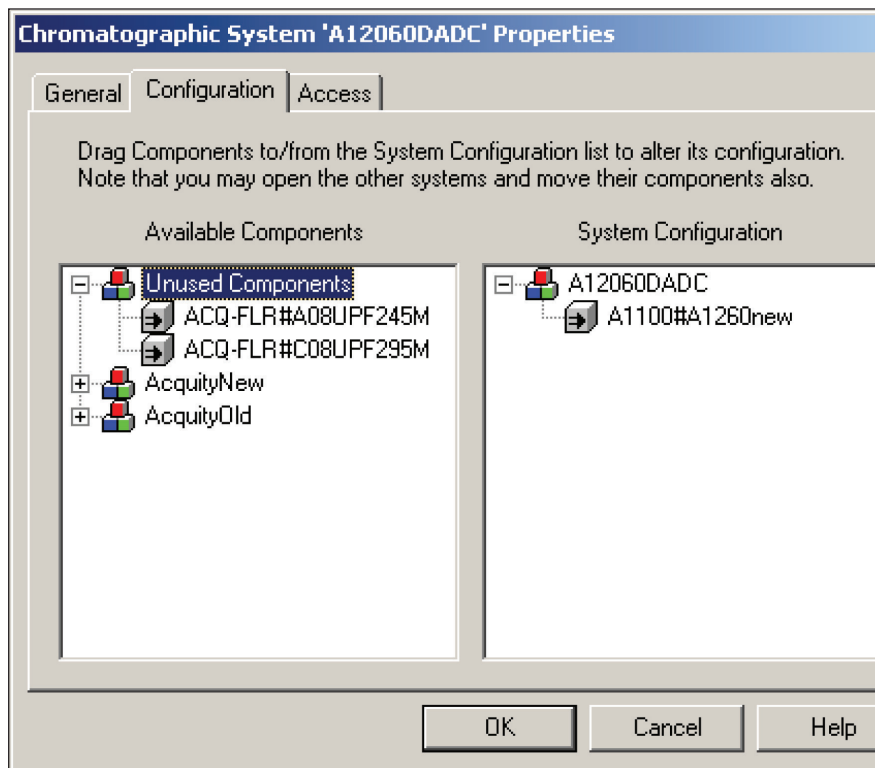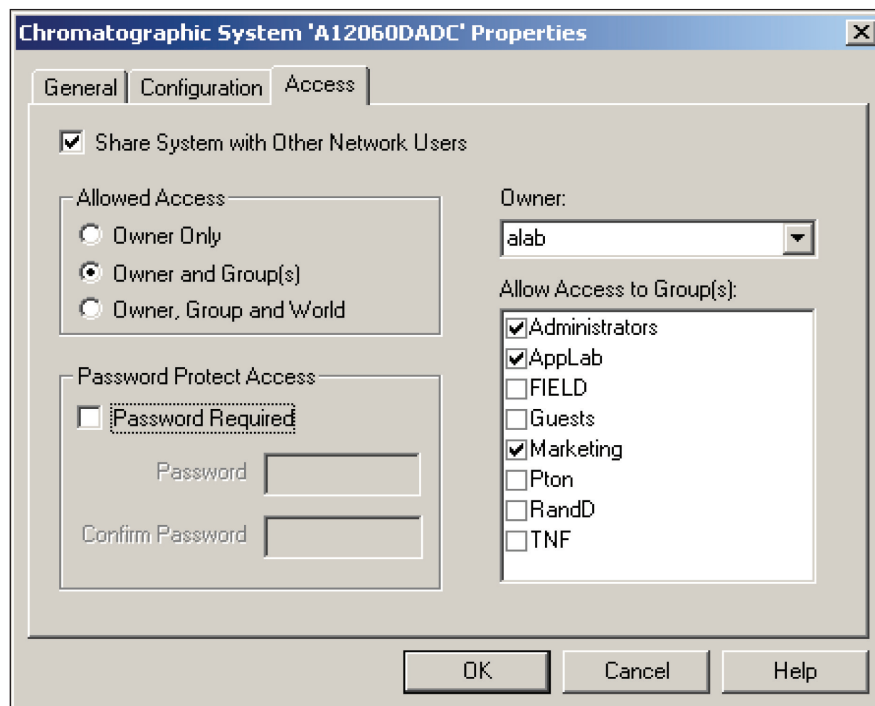

Figure 2
Empower software main menu.

Figure 3
Checking the IP address of the Agilent 1260 Infinity LC System.

The next step activates the Agilent 1260 Infinity LC System for use (Figure 4a). In the configuration menu, click *System* and then *New Instrument*. When the configuration screen appears, drag-and-drop the *A1260new* system from the left to the right. Click the *Access* tab to share the instrument and define users (Figure 4b).

Figure 4a
Activating the Agilent 1260 Infinity LC through drag-and-drop in the configuration screen.

Figure 4b
Defining share and user parameters.

5

Figure 5 shows how to test if communication is ready to use by clicking *Empower Nodes > Czc7424s3r > Properties > Instrument.* The column labeled *OK?* indicates the readiness: *Yes* or *No*. If new modules are attached to the existing *A1260new*-system with *SCAN Instruments* the system indicates whether the new modules are recognized and accepted. If it turns to *NO* the new module is not recognized. In this case use the emulation mode.

Empower support of Agilent equipment

The Empower software supports all functionality of the Agilent 1260 Infinity LC Systems with the exception of:

- Injector programming
- EMF and other diagnostic tasks
- RFID tags on lamps and detector cells
- RFID tags on columns
- DAD recovery card
- Creation of additional compressibility curves by the user

Support of the Agilent 1260 Infinity quaternary pump

Figures 6 and 7 show the main setup screens for the Agilent 1260 Infinity Quaternary Pump. The gradient, flow and stroke settings are entered. In this test, water and acetonitrile were selected as solvents. All other modules are supported through a similar menu design (Appendix A).
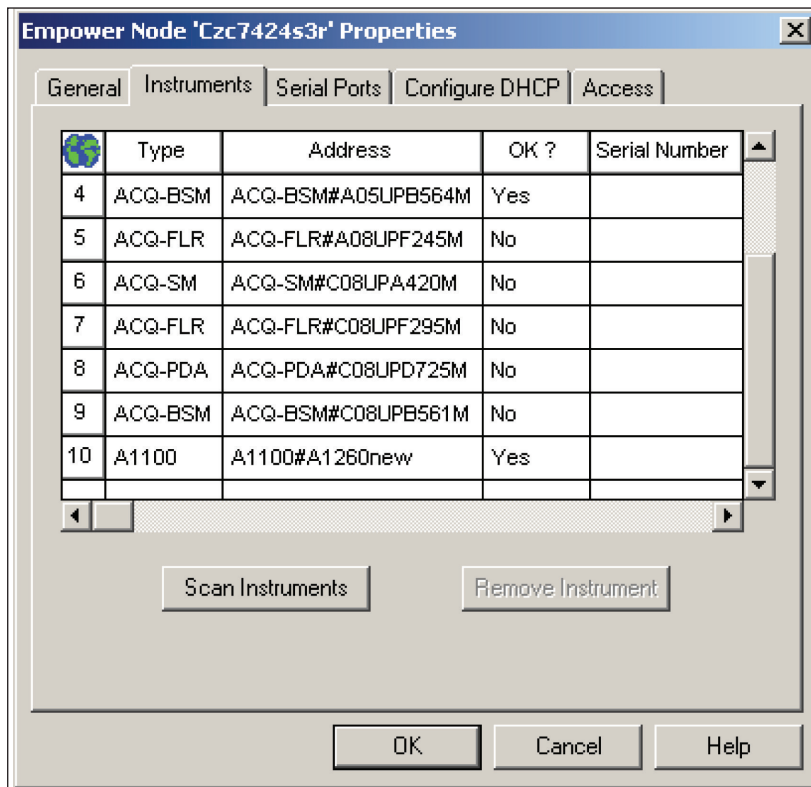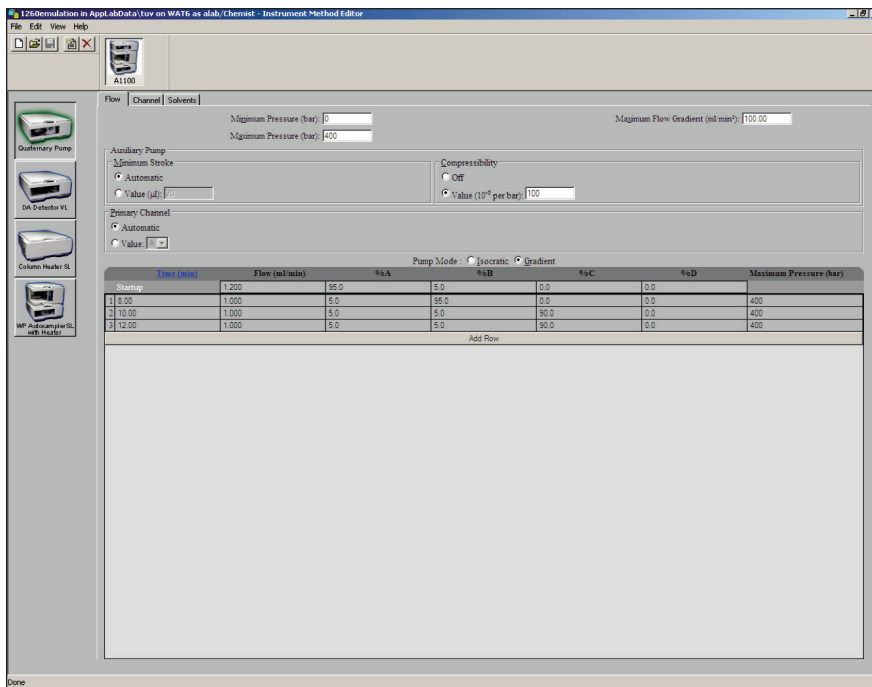

Figure 5
Checking if communication is active.

Figure 6
Setting up the main functions of the Agilent 1260 Infinity Quaternary Pump through the Empower software.

6

Application example

This application example used the following workflow:

- Setting up the instrument
- Running a sample
- Finding the data
- Reviewing the results

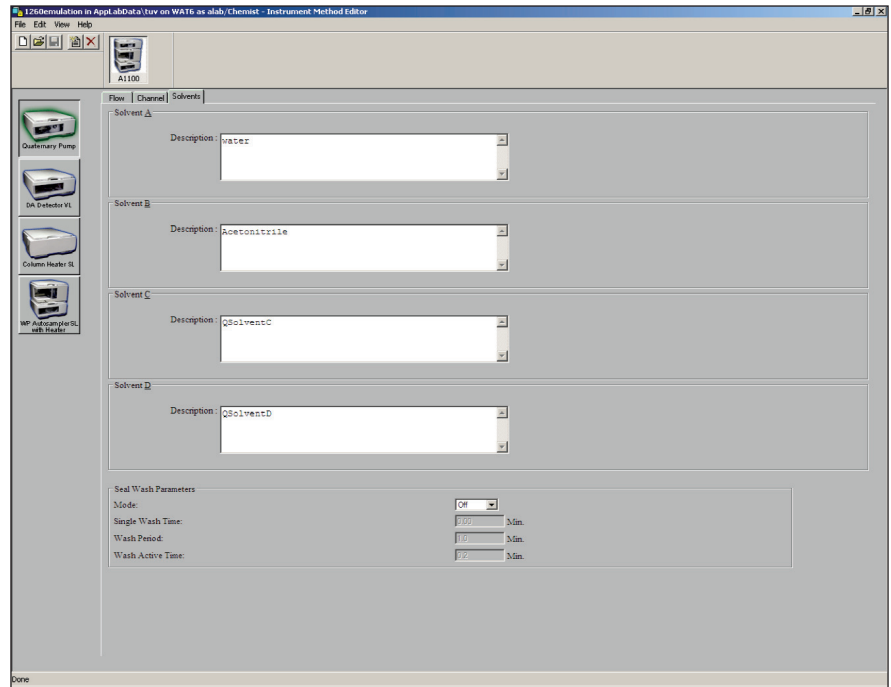The chromatographic parameters for the individual modules are set up through *Instrument Method > Edit* (Figure 8).

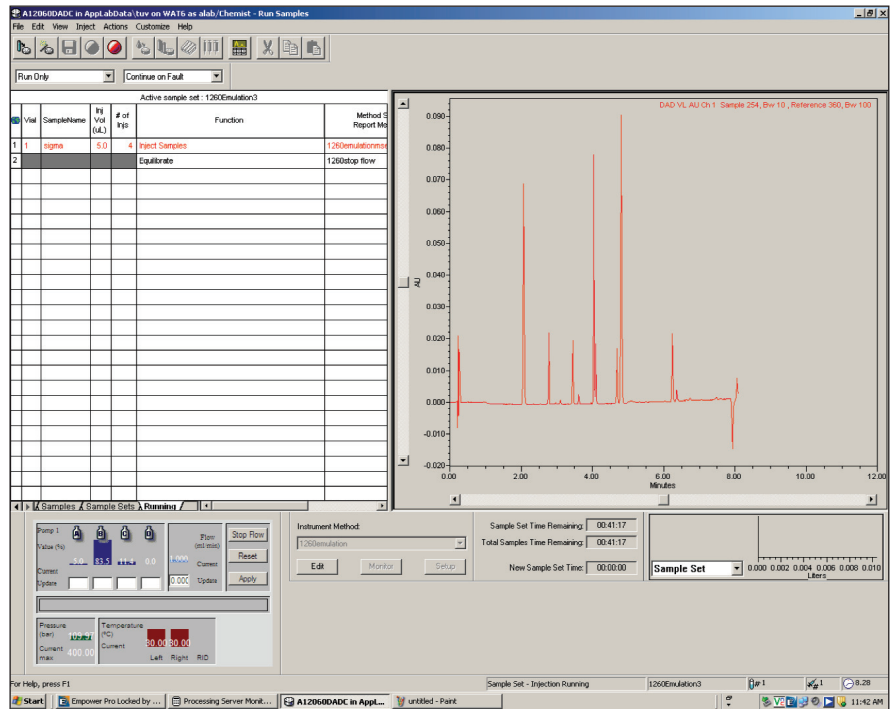

Figure 7
Selecting and defining solvent channels.

Figure 8
Editing instrument method parameters and sequences.

The setup screens for the modules appear and the parameters can be set. The parameters are saved as an instrument method. After saving an appropriate *Method Set*, a sequence can be created. Using the *Method Set,* the sequence lines are filled out as in the upper left section of Figure 9. The sequence is then saved as a *Sample Set*. After equilibration of the system the sequence can be started and all data files are stored under the selected *Sample Set* name. When the sequence has been completed the two-dimensional and three dimensional data can be reviewed and evaluated (Figure 9).

In the *Review* screen, the parameters for integration, calibration and other data evaluation are set and saved as a Process Method. The report editor creates a report and Figure 10 shows an example based on the data created using the sequence and process method described in this example.
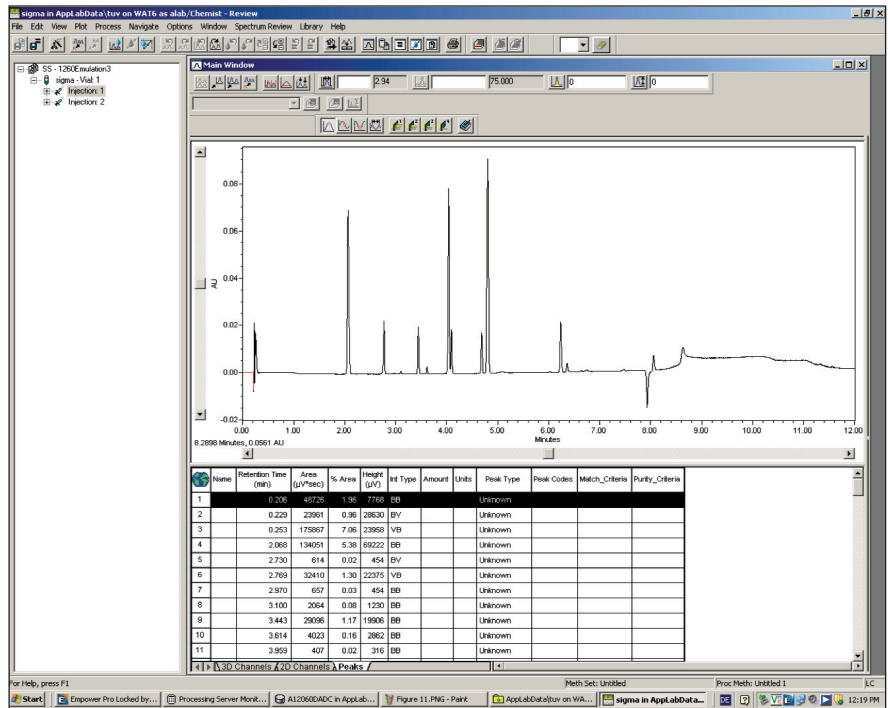
Figure 9
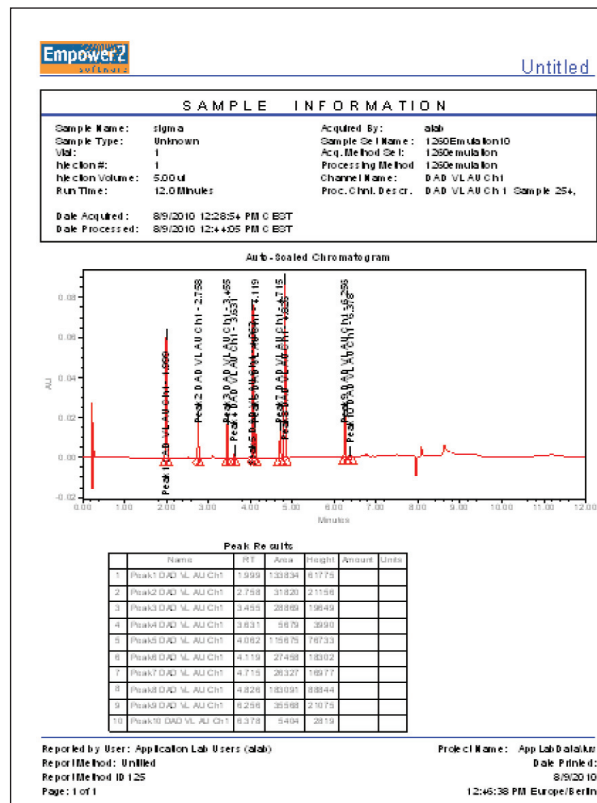**Review screen for data evaluation and creating a process method.**

Figure 10
Example report created using the report editor.

8

Conclusion

The Agilent 1260 Infinity LC System can be controlled through the Waters Empower chromatographic data system software, and all chromatographic parameters required for optimum performance can be set. The emulation mode is required for control of modules with new product numbers. The new Agilent 1260 Infinity DAD (G4212A) is not yet supported. Several specific features such as injector programming are still not supported. An immediate support of all Agilent hardware modules and all of their features will be provided as soon as the Agilent Instrument Control Framework (ICF)[1] is supported by the Waters Empower software. The maintenance and diagnostic features of the Agilent 1260 Infinity LC System are supported by the Agilent LabAdvisor software, which runs on a separate PC and is completely independent from the LC control software. Overall the combination of the Agilent 1260 Infinity LC System and Empower software is an equivalent alternative for laboratories where this software is deployed for instrument control and data evaluation.
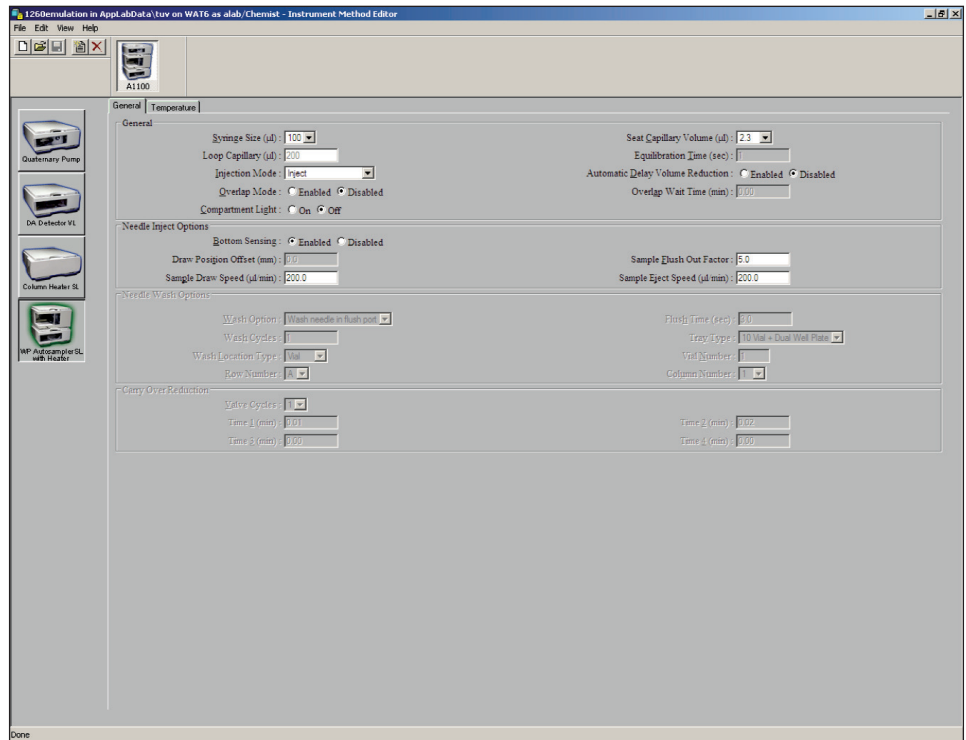
References

1
"The Agilent Instrument Control Framework (ICF) - A short introduction for end users of Agilent HPLC instrumentation as well as third party instrument control providers", Agilent 2010, pub. no. 5990-5756EN
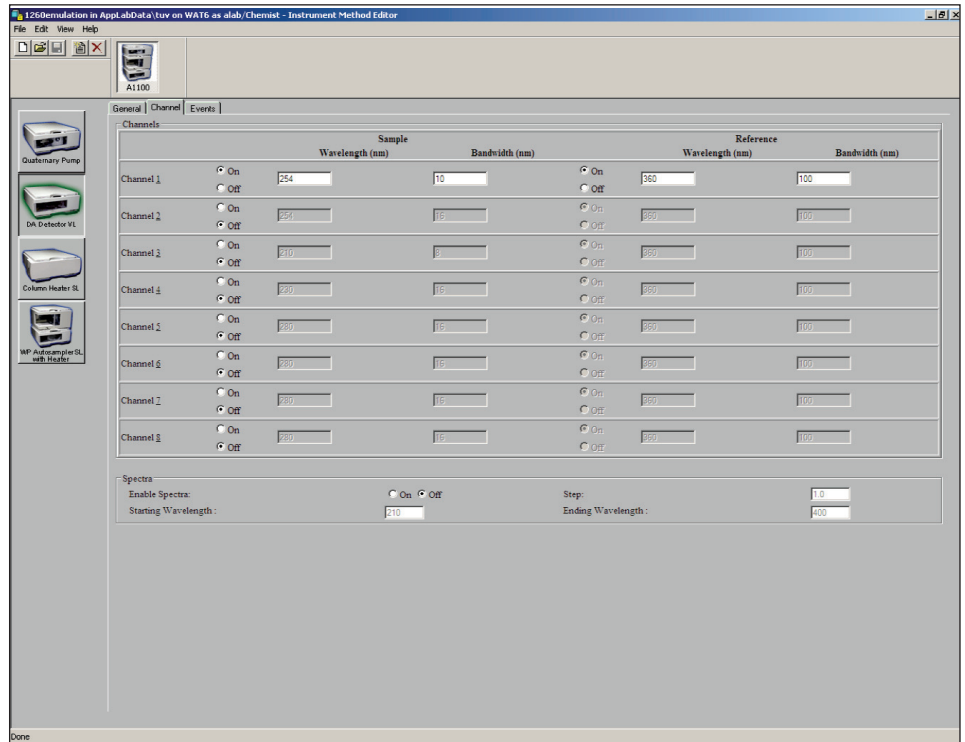
Appendix A

This appendix contains additional setup screens (Figures 11-14) for additional modules of the Agilent 1260 Infinity LC System.
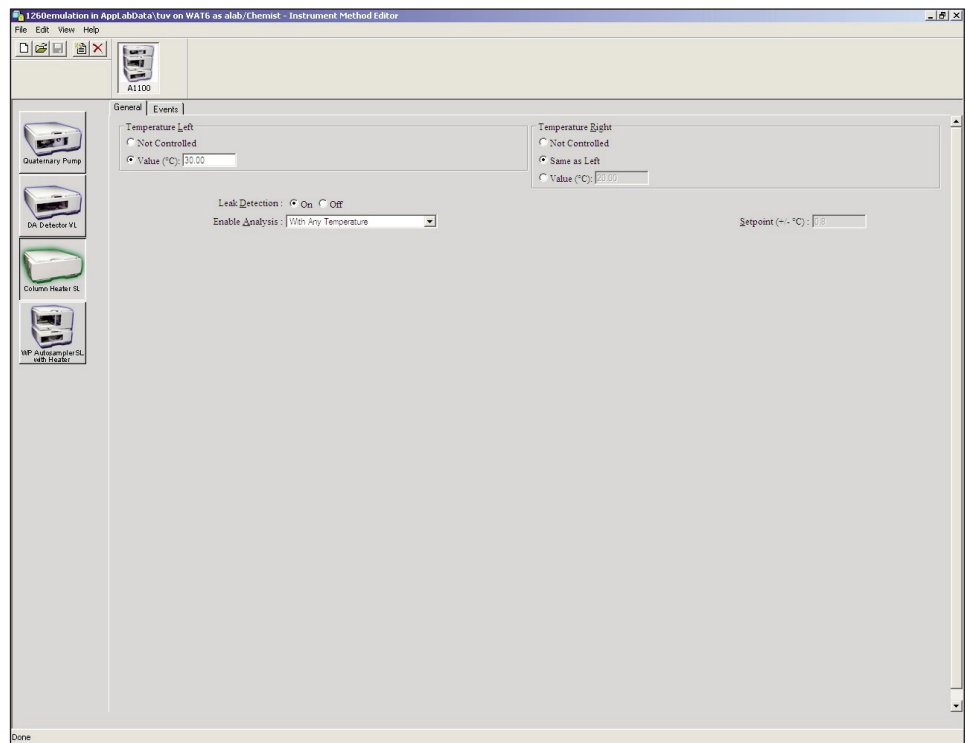

Figure 11
Setup screen for Agilent 1260 Infinity High Performance Autosampler.
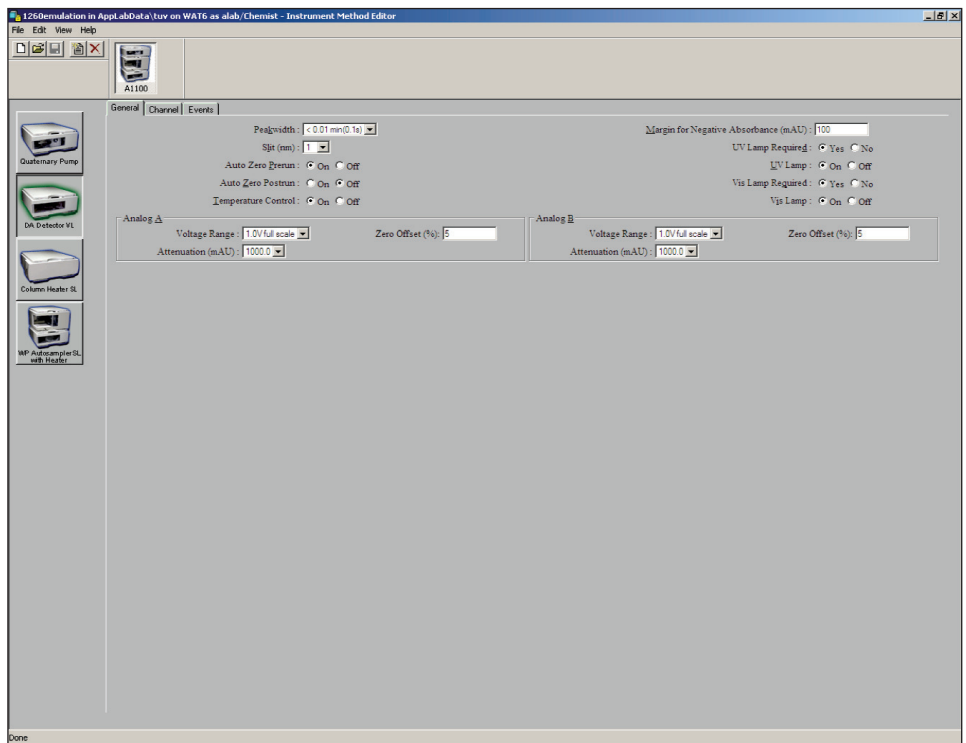
Figure 12
Setup screen for Agilent 1260 Infinity Diode Array Detector VL Plus.

Figure 13
Additional setup screen for Agilent 1260 Infinity Diode Array Detector VL Plus.

Figure 14
Setup screen for Agilent 1260 Infinity Thermostatted Column Compartment.

11

Agilent Technologies