Using High Dynamic Range (HDR) in Empower Environment

Technical Note

This is a technical guide for the configuration of the High Dynamic Range (HDR) option with two Agilent DADs in a Waters Empower 3 environment.

Contents

Agilent Technologies

Introduction

Waters Instrument Control Software (ICS) is Waters Corporation adoption of the Agilent Instrument Control Framework (ICF) for their data systems. This guide describes how to configure HDR using Agilent ICF in a Waters Empower environment.

Table 1 on page 2 lists the supported and unsupported configurations using HDR in Empower.

Table 1   Supported and not supported configurations

Waters Instrument Control Packages	Agilent ICF / LC Driver	HDR support in Waters Empower 3
ICF Support v2.2 #667005584	A.02.04 A.02.14	HDR support using
ICF Support v2.2 #667005449	A.02.03 DU2 A.02.13	• 2 x G4212A/B or
ICF Support v2.1 HF1 #667005397	A.02.03 DU1 HF2 A.02.11SP1 HF2	2 x G7117A/B • Firmware B.06.57 or higher
ICF Support v2.1 HF1 #667004920	A.01.05 SP1 A.01.05 SP1	
ICF Support v2.1 HF1 #667004900	A.01.04 A.01.04	No HDR Support
and any lower integration	and any lower integration	

Other Prerequisites:

• HDR requires HDR-DAD USB dongle (the USB dongle is part of the 1200 Infinity HDR-DAD Solution Kit, G2199AA), which contains a license to enable the HDR-DAD solution. Only one of the DADs requires a license.

• No other detectors are supported together with HDR.

NOTE   Ensure that all Agilent LC modules in the system *meet or exceed* the minimum firmware requirements specified by the 3rd-party CDS software vendor and Agilent's firmware set/firmware interoperability requirements. Agilent recommends using the latest available firmware set.

http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=79809

Set Up of HDR within the Agilent LC Instrument System

Software Requirements

The clustering option is directly provided by the Agilent LC driver. This driver is delivered along with the supporting ICS.

Ensure that all the components are installed correctly by checking in the operating systems Program and Features section. The Agilent components need to be listed among the Waters ICS component (Agilent LC).

Agilent Instrument Control Framework - LC Drivers A.02.14	Agilent Technologies	12.04.2017	111 MB	2.14.115
Agilent Instrument Control Framework A.02.04	Agilent Technologies	12.04.2017	47,0 MB	2.4.124
Agilent LC	Waters Corporation	12.04.2017	15,6 MB	2.2.0.0

Figure 1   Required components

HDR Cluster – Instrument Set Up

1 Close the Empower CDS.

2 Switch off the Agilent LC Tower and connect both DADs to the LC system.

3 Connect a LAN cable to each DAD.

4 The Agilent DADs are delivered with the communication switches (dip switches) set to LAN communication mode *using default*. The default IP address 192.168.254.11 is the same for all modules.

Both detectors used for HDR require a unique IP address, which is in the same subnet range. Ensure that the correct connection type on the detectors is set by the dip-switches on the back of each module.

Following listed initiation modes are selectable. Fixed IP addresses are strongly recommended for this set up, hence the proposed set ups are marked in bold font. The hardware manual for the DAD outlines:

- Bootp
- **Bootp and store**
- **Using stored** (assignment via Instant Pilot or Telnet commands)
- Using default
- DHCP (assignment by DHCP server during reboot)

Using Stored	SW4	SW5	SW6	SW7	SW8
G4212A/B			OFF	ON	OFF
G7117A/B	OFF	ON	OFF	OFF	OFF

Refer to the DAD manual available on the Agilent webpage (www.agilent.com). Type the product number of the detector in question and review chapter *LAN configuration* for the assignment of the IP address.

5 Reboot the instrument to ensure IP assignment of the module.

6 Use the ping command to verify online communication. Both DADs must be accessible from the LAC/E.

NOTE Note the IP address and the MAC Address for the DAD with the long and the short flow cell. Both parameters are required for the set up in Empower.

7 One detector used for HDR requires the HDR-USB dongle. Plug-in the USB dongle and turn the devices on. Wait until the HDR dongle stops blinking and power cycle the device. Afterwards the USB dongle can be removed from the device. The license remains on the device.

8 Connect both detectors to the Waters LAC/E box (HUB/switch required).

9 Connect the power plug and connect all modules using CAN cable.

10 Switch on all modules in the Agilent LC instrument system.

Configure HDR in Empower

Configure HDR in Empower

The configuration of HDR in Empower requires a PreConfiguration Utility.

Starting with ICF Support v. 2.1 HF1 with A.02.03 DU1 HF2 a PreConfiguration Utility is availabe. The PreConfiguration Utility is present at one of the following two locations:

• Using Empower installation on the LAC/E box, see "Using Empower installation on the LAC/E box" on page 5

• Via the Empower Configuration Manager (recommended for Client/Server configuration), see "Via the Empower Configuration Manager" on page 6

Using Empower installation on the LAC/E box

Software required   ICF Support v2.1 HF1 with A.02.03 DU1 HF2

1 Double-click on the PreConfiguration Utility in C:\Empower\Instruments\AgilentLC (the main Windows driver character may differ depending on the installation path, e.g. in Citrix environment).

ICF CFG Agilent.InstrumentControl.InstrumentPreConfigurator.exe

2 If an instrument is not present, click **New** to generate a new instrument.
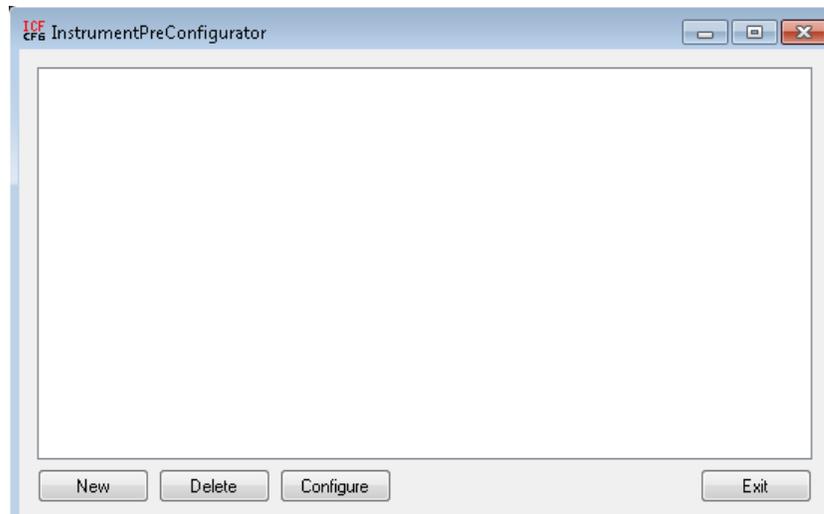
Figure 2   InstrumentPreConfigurator on LAC/E

Via the Empower Configuration Manager

Software required   ICF Support v2.2 (see "Waters" on page 20 for Waters support documentation TECN134936402)

1 In the Empower Configuration Manager select **Tools > Agilent PreConfiguration**.
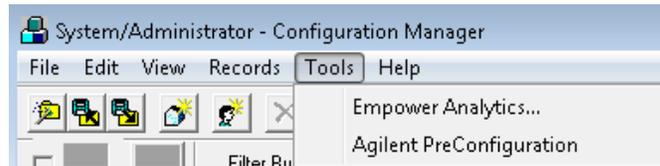

Figure 3   Configuration Manager

2 Enter IP address or host name of the LAC/E box which is connected to your instrument in the pop-up screen **Configuration Directory** and click **Connect**.

| NOTE | Do not enter the IP address of the instrument here. |

| NOTE | Enter IP address or host name of the LAC/E box where your instrument in the Configuration Directory. If you are connected, the status line above shows **Connected to...**. |

See Example: IP 169.254.135.144, where is the IP of Empower LACE Node.
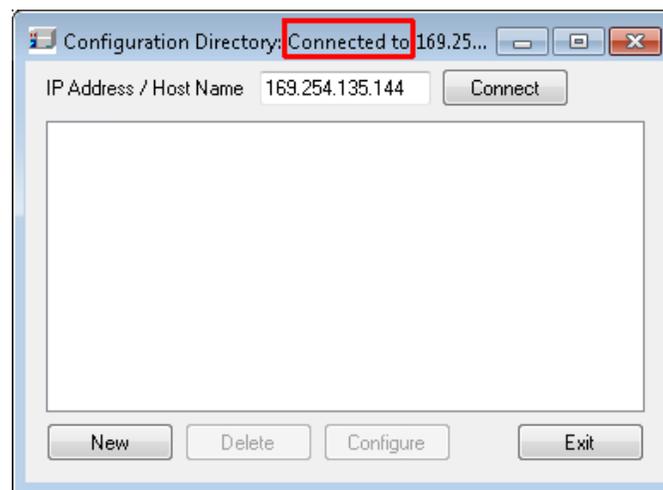
Figure 4   IP address to connect

3 Once the IP address is connected, click **New** to open the PreConfiguration Utility.

Pre-Configuration of HDR for Empower

Regardless of which PreConfiguration Utility was chosen, continue the configuration using the following steps when the dialog box opens:
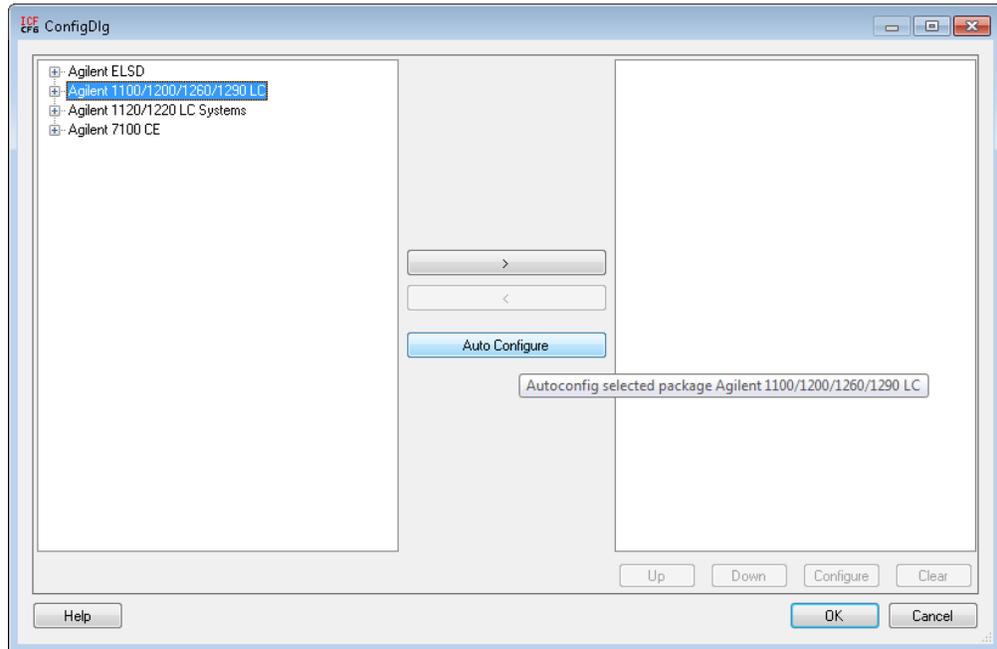
Figure 5   Configuration Dialog

1 Highlight Agilent 1100/1200/1260/1290 LC, select **Auto Configure** and enter the IP address of the DAD with the long flow cell.

NOTE Note the IP address of the DAD with the long flow cell. The same IP address is used later in the Empower Configuration Manager.

2 Click **OK**.

If the system offers cluster possibilities, the Cluster option screen appears.

Otherwise the currently connected online modules appear on the right-hand side and no cluster options are displayed.

3 In the following **Edit automatic configuration** screen all available cluster options are shown in a highlighted blue box. As HDR is the clustering of two DADs (example shown for G7117A/B), select the option **Configure HDR-DAD Cluster**.

If all prerequisites are met, the Cluster Configuration screen opens.
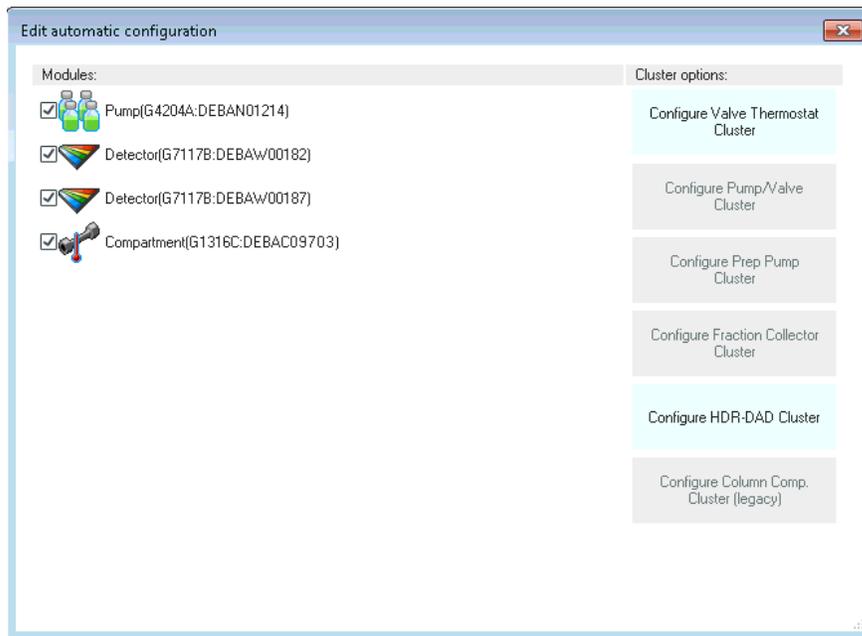
Figure 6   Automatic configuration offering cluster options

> **NOTE**   Ensure that all hardware requirements (firmware, long flow cell 1st detector and short flow cell 2nd detector) are fullfilled. Please refer to the HDR manual.

4 The HDR-Cluster Configuration screen shows the automatically clustered detectors.

5 Highlight the 2nd DAD (short flow cell) and select **Configure**.
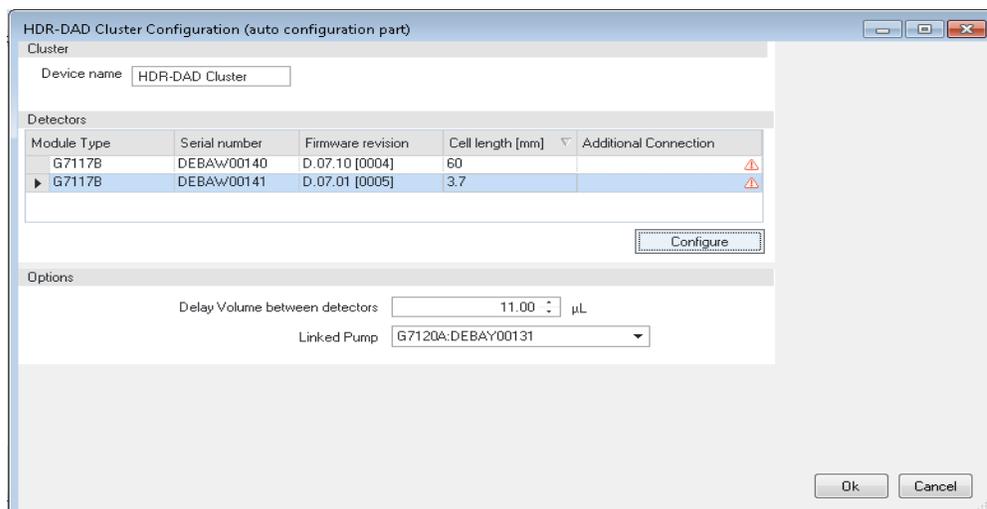
Figure 7   HDR - Cluster configuration screen

Empower requires only one IP address to connect to the LC System. The IP address of the detector with the long flow cell is to be used as connection point. In addition the second DAD requires a LAN card connection to ensure sufficient bandwidth to transmit the delivered data (especially spectra data) in the required time.

6 Click **Additional Connection.**...
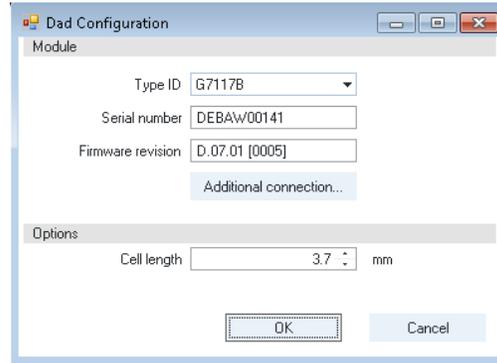
Figure 8   Second DAD LAN configuration

7 In the pop-up screen **Auxiliary connection settings** select **Use auxiliary connection** to enable the communication settings and enter the IP of the 2nd DAD (short flow cell).
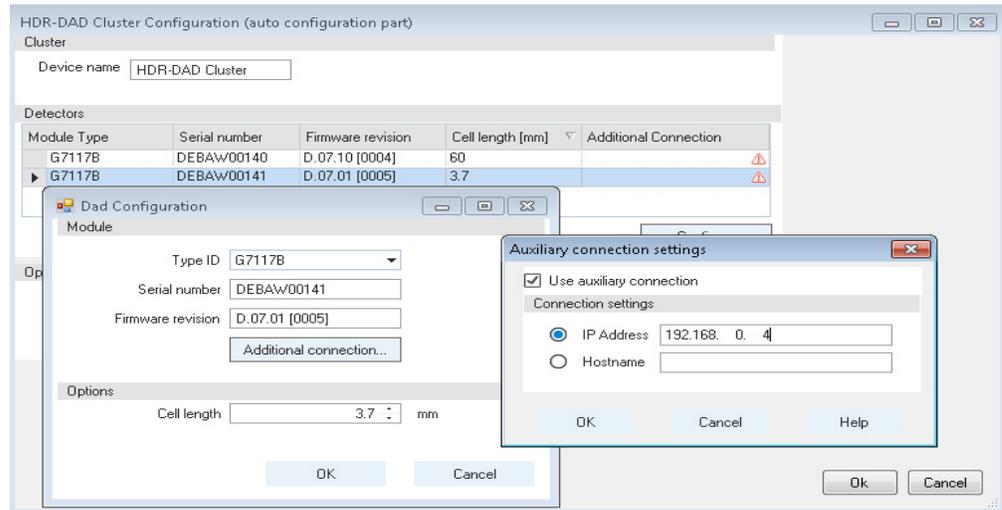
Figure 9   Communication of 2nd DAD – flow cell

8 Click **OK** to close the **Auxiliary connection settings** window.

9 Click **OK** to close the **Dad Configuration** window.

In the configuration screen, the 2 clustered DADs are listed.
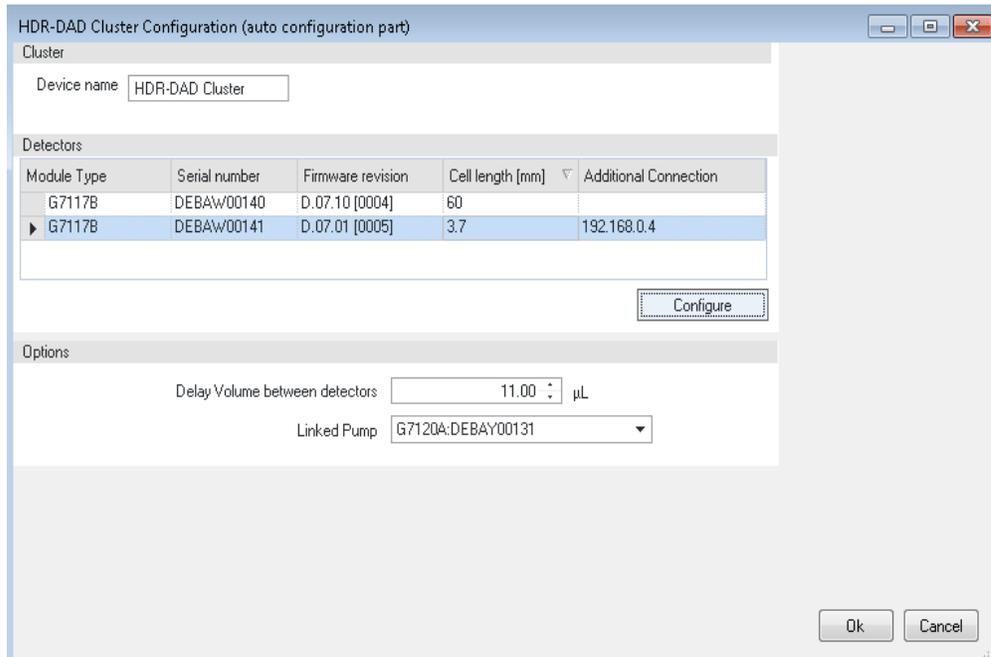
Figure 10   HDR - DAD Cluster Configuration

NOTE   If the LC system connection would be hosted by another module, two IP addresses need to show up in this screen – one for each DAD module.

10 Ensure that the HDR modules are in the correct order:

- First: the long cell (60 mm)
- Second: the small cell (3.7 mm)

11 Fill in the **Delay volume between detectors** in μL.

NOTE   Agilent provides the G2199AA 1200 Infinity HDR-DAD Solution Kit, which includes capillaries ensuring to have a delay volume of 11.00 μL. The package includes the HDR user manual G2199-90001 documenting the calculation of the delay volume.

NOTE   Please contact Agilent Support if you need to measure the delay volume in case there are changes in kit used, or if the retention time is not the same as expected.

12 Click **OK** to close the **HDR - DAD Cluster Configuration** window.

13 If you need to perform additional cluster configuration, proceed with the cluster configuration. Otherwise close the window by clicking the red X in the upper right corner or click **Close**.
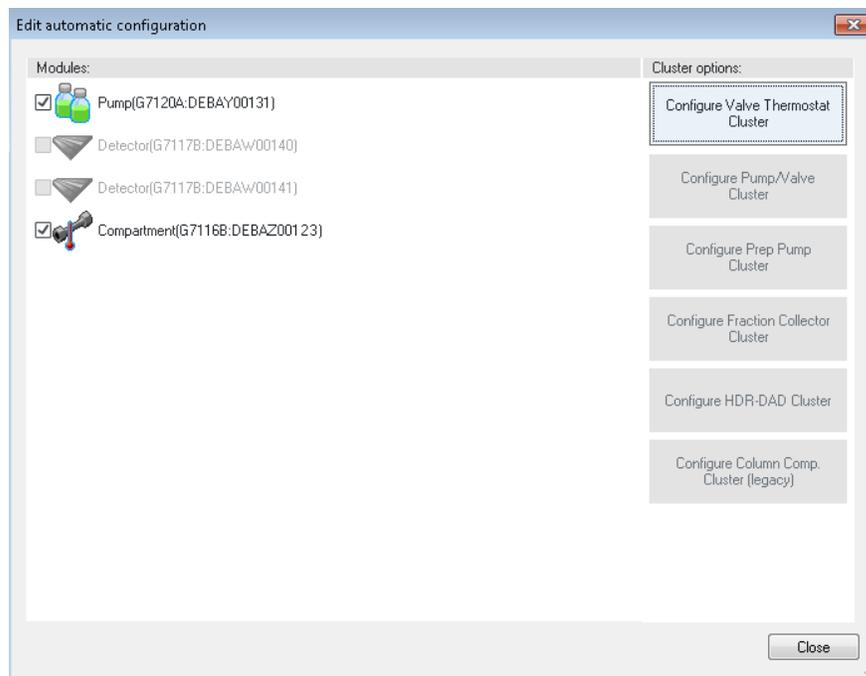
Figure 11 Cluster option window

The just configured Cluster (HDR-DAD Cluster) is present in the right-hand side of the configuration editor.
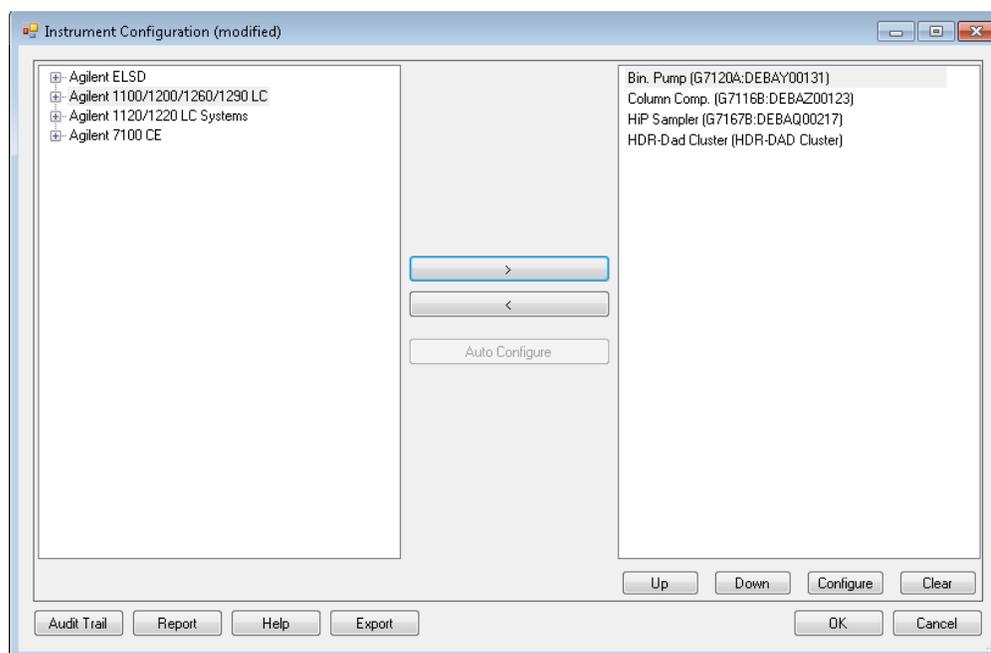

Figure 12 Final **Instrument Configuration** window

14 Click **OK** to close the configuration editor.

In the **InstrumentPreConfigurator** the newly created instrument appears with the assigned IP number.
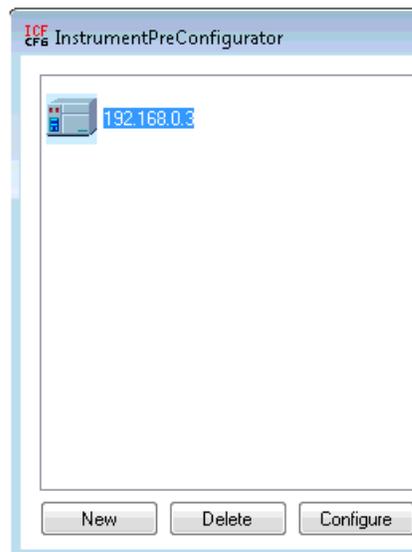
Figure 13   Final Screen of PreConfiguration

15 Click **Exit** to close the PreConfiguration Utility.

Set Up of LC System with HDR in Empower

Refer to the Waters Empower documentation for installation and configuration of an LC system in Empower.

1 Open **Waters DHCP Server Configuration** window by entering to C:\Empower\ Instruments\Waters DHCP Server Configuration.exe.

OR

Access Empower Configuration manager window, select **Node** on the right-hand side, right-click and select **Properties**.

2 Select the **Configure DHCP** tab and click on **Configure DHCP**.

The set up can be performed in two different ways:

• manually (see "Manual Set Up Using Fixed Addresses" on page 13)

• using the *scan instrument* functionality (see "Set Up Using the Scan Functionality" on page 15)

Manual Set Up Using Fixed Addresses

Preparations   IP assignment: Using stored or Bootp and Store

1 Add the IP/MAC manually just for the DAD with the *long* flow cell.
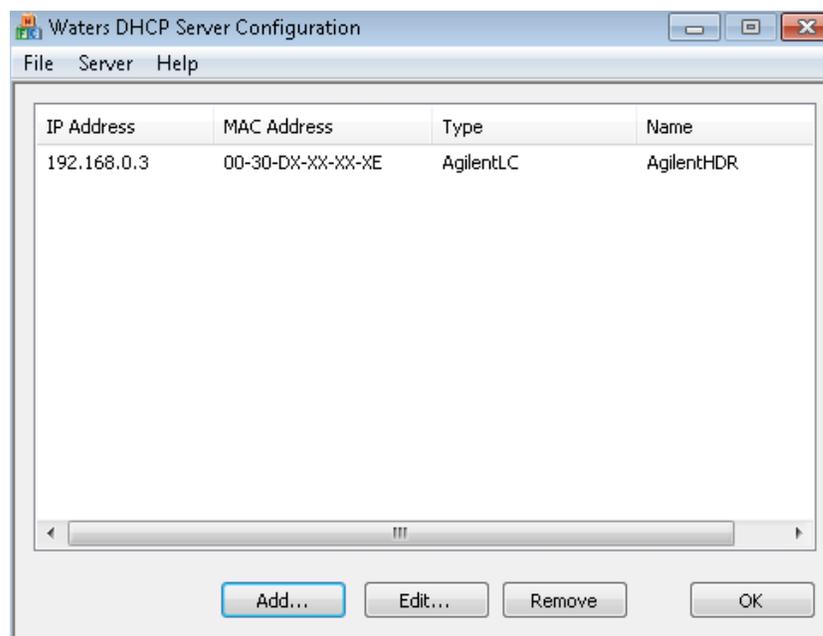
Figure 14   Set up of detector with long flow cell

2 Select **Instrument Type**: **AgilentLC** and click **OK** to leave the screen.

3 Access the **Nodes Properties** in the Empower Configuration Manager and check if the Instrument is **OK?**.
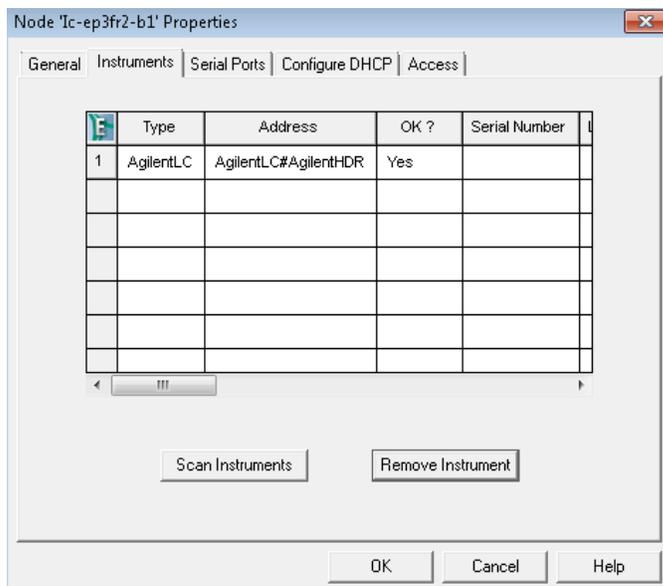
Figure 15   Node Properties

4 Generate a new Chromatographic System with the newly configured instrument.

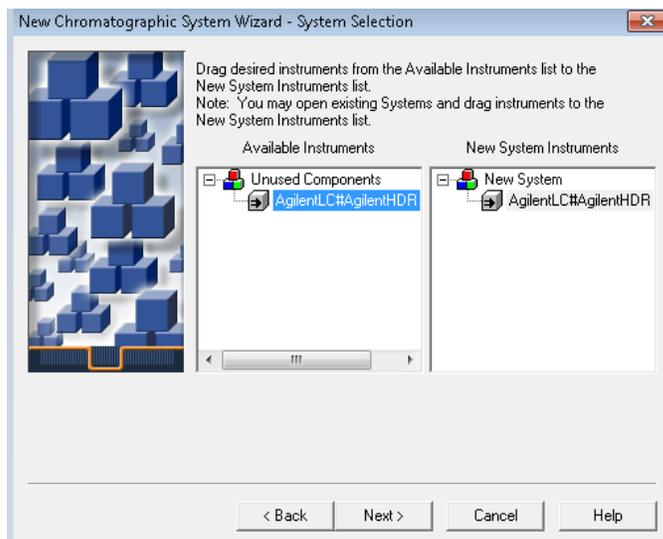Due to the manual set up, only the instrument with the long flow cell should be listed.

Figure 16   Create new chromatographic system after manual set up

Set Up Using the Scan Functionality

Preparations

IP assignment: DCHP.

Note that the recommended set up is working with fixed IP addresses.

1 Select the **Instrument** tab and click on **Scan Instruments**

2 The online instruments, including both detectors are listed. Ensure that the type for the 1st DAD with the long flow cell is **AgilentLC**. Ignore the other DAD entry for the 2nd DAD with the short flow cell.
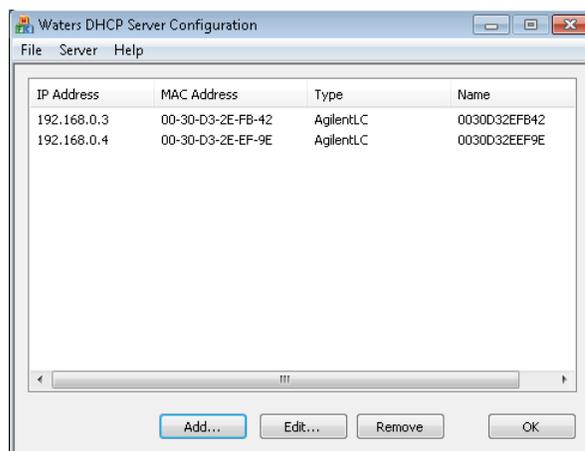
Figure 17   DHCP detects all online instruments

3 Access the **Nodes Properties** in the Empower Configuration Manager and check if the Instrument is **OK?**.

4 Generate a new Chromatographic System with the newly configured instrument. Use the instrument with the long flow cell.
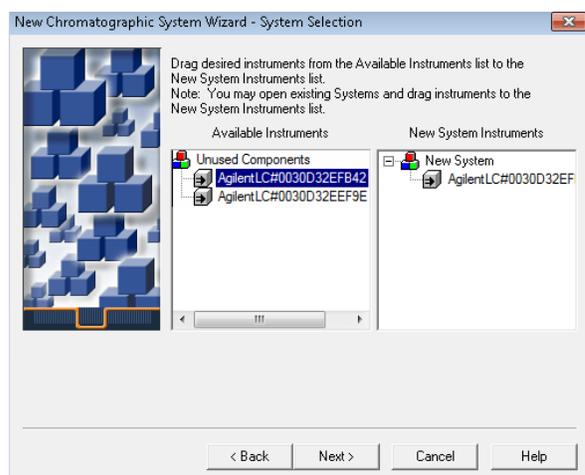
Figure 18   Generate HDR Chromatographic system – ensure to select instrument with long flow cell

| NOTE | Ignore the other DAD entry for the 2nd DAD with the short flow cell. |

Method Set Up of HDR in Empower

1 Start Empower and open the **Run Sample** screen.

2 The LC Status window automatically displays all available online modules – including the HDR-DAD Cluster.
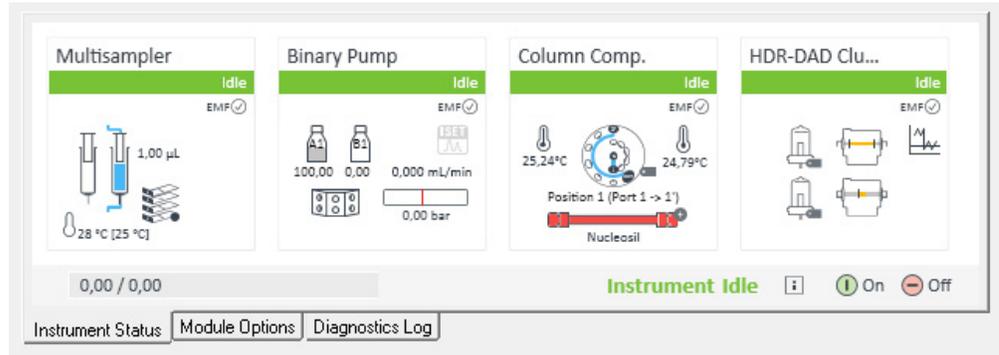

Figure 19   LC Status Window

3 Loading the **instrument method**, the system requests the user to update the given method configuration with the new instrument configuration.
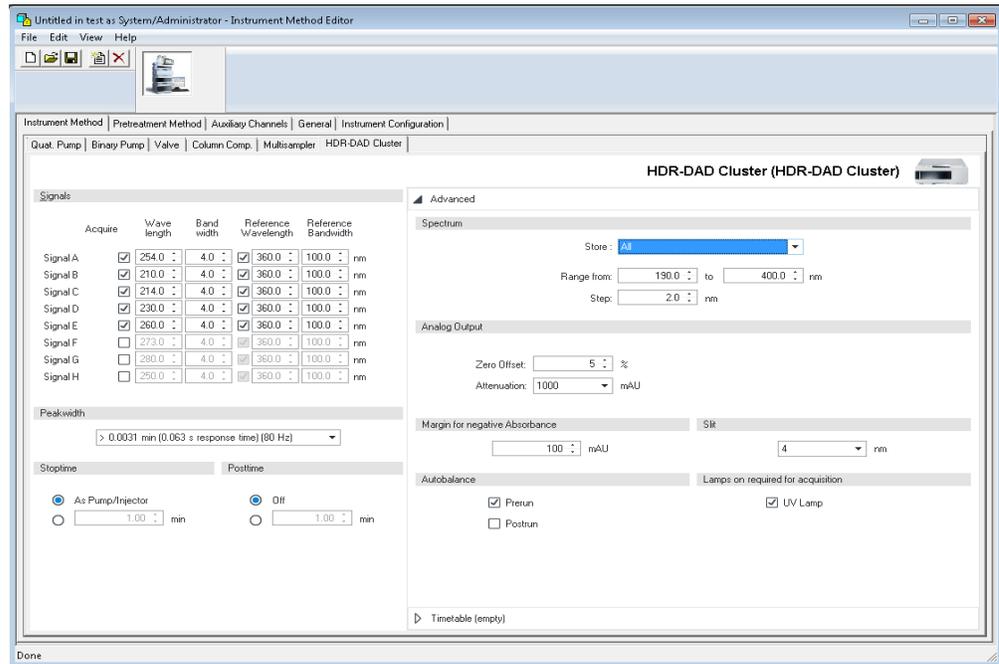

Figure 20   HDR Method Screen

Instrument Configuration Tab

In the **instrument configuration** tab the LC system configuration is present. All settings in this dialog are already defined using the PreConfiguration Utility. Changes in this section of the method are not applied to the system. Any changes like e.g. modifying the cell length need to be handled in the PreConfiguration Utility.

Instrument Method Tab

The **instrument method** tab provides access to all method parameters of the LC system, again one tab per module. Select the HDR –DAD Cluster tab to enter the method parameters. For details on the parameters refer to the online help and the HDR user manual.

Using HDR in Empower

Executing HDR- DAD Cluster the data systems treats the signal like any other detector signal. The combined signal can be seen in the online plot or viewed as part of sample sets in the projects. It is also possible to view the separated signals building the HDR signal.
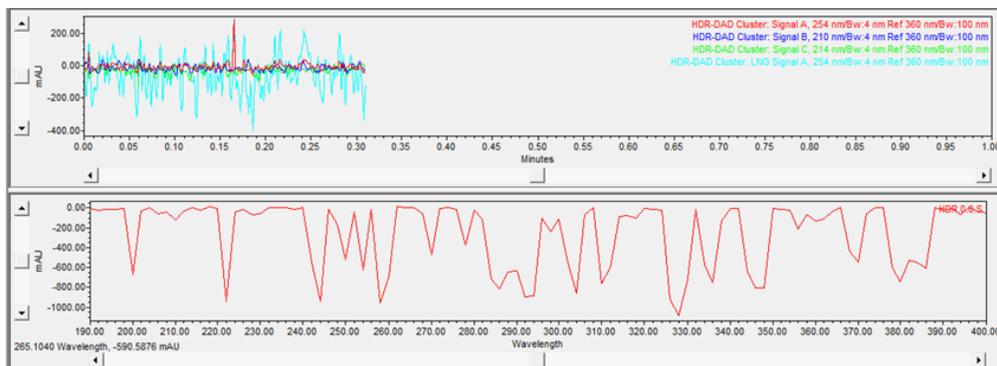
Figure 21   Online channel plots HDR

Figure 22   HDR signals in Data Analysis

De-clustering HDR

In case the HDR set up is no longer required and the DADs are planned to be used as single modules a new autoconfiguration is required. Perform a new auto-configuration without selection of the HDR Cluster option. The DADs will appear as single modules as the de-clustering is performed by the driver in the background.

Additional Information

Agilent Technologies

Additional information on prerequisites, cabling, configuration and use of HDR can be found in the HDR user manual (Part Number G2190-90001) delivered along with the HDR-DAD USB dongle or on the Agilent Webpage http://www.agilent.com/cs/library/usermanuals/public/HDR_USR_EN.pdf.

Waters

Additional information on the PreConfiguration Utility is provided on the Waters Support Webpage http://www.waters.com/waters/support.htm?lid=134936402&cid=511442&type=TECN.

Document reference: TECN134936402

Title: Using the Agilent PreConfiguration Utility with Agilent ICF Support Version 2.2