Notices

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Manual Part Number
G2199-90001 Rev. B

Edition
03/2017

Printed in Germany

Agilent Technologies
Hewlett-Packard-Strasse 8
76337 Waldbronn

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Safety Notices

CAUTION

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.
This guide covers the Agilent 1200 Infinity Series High Dynamic Range Diode Array Detector Solution (HDR-DAD)

Find detailed information on stack configurations and leak and waste handling in the manuals of the modules, that are necessary to run this solution.

1 What is the HDR-DAD Solution?
This chapter provides an overview of HDR-DAD and its intended use.

2 Specifications
This chapter provides information on performance specifications.

3 Installation of the HDR-DAD Solution
This chapter provides information on installation of the HDR-DAD Solution.

4 Using the HDR-DAD Solution
This chapter provides information on the main function of the user interface for the HDR-DAD solution. For more details refer to the software manual or the online help.

5 Frequently Asked Questions (FAQs)
This chapter answers frequently asked questions.

6 Application and Technical Notes for the HDR-DAD Solution
This chapter gives an overview on additional literature.
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This chapter provides an overview of HDR-DAD and its intended use.
What is the HDR-DAD Solution?

30x wider linear UV-range – Quantification of widely different concentrations in a single run

The typical linear range of around $1 \cdot 10^5$ for UV-detection is not sufficient for the analysis of samples or compound mixtures with widely different concentration levels. Usually, these samples require additional sample preparation steps (dilution/concentration), in combination with a second injection and sometimes recalibration.

The HDR-DAD solution eliminates these sample preparation steps. It increases the linear range by a factor of 30 and allows to acquire all sample information in one single assay. It significantly reduces the turnaround time and increases the productivity.

Figure 1  The HDR-DAD solution enables quantification of widely different concentrations in one run
What is the HDR-DAD Solution?

30x wider linear UV-range – Quantification of widely different concentrations in a single run

This is achieved by Agilent's Max-Light flow cells. Optofluidic waveguides in these flow cells facilitate total internal reflection for superior light transmission. This significantly reduces the detector noise regardless of the length of the flow path.

The HDR-DAD solution combines two Agilent Diode Array Detectors (possible combinations: G4212A/B x G4212A/B or G7117A/B x G7117A/B); one is fitted with a 3.7 mm path length flow cell, while the other has a longer 60 mm path length flow cell. The signal from the longer path length cell quantifies the low concentrations and the signal from the shorter path length cell is used for the high concentrations. Special algorithms correct the different retention times and compute these signals to one HDR signal. Compared with an earlier generation Agilent diode array detector, the HDR signal covers a 30 times higher linear dynamic range.

**Achieve up to 30-fold greater UV-sensitivity**

The Agilent HDR-DAD solution extends the upper linearity level nearly three-fold – from 2 to typically 6 absorbance units – which allows you to inject three-fold more sample and simultaneously benefit from 10-fold lower detector noise. This solution gives you up to 30-fold greater sensitivity for simultaneous analysis and quantification of main compounds and impurities. You gain more confidence in automated peak integration and achieve greater area precision for trace-level components.
The HDR-DAD solution combines two Agilent Diode Array Detectors (possible combinations: G4212A/B x G4212A/B or G7117A/B x G7117A/B). The two detectors transfer their signals to the software. The algorithm of the HDR-DAD solution combines and presents all signals to the user.

![Figure 2](https://example.com/signal_representation.png)

**Figure 2**  Signal representation in the HDR-DAD solution

It is important to know, which name corresponds to which signal, see **Table 1** on page 8.

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAD1 A</td>
<td>HDR (computed by the weighting function algorithm of the HDR-DAD solution)</td>
</tr>
<tr>
<td>LNG1 A</td>
<td>Long flow cell of DAD1</td>
</tr>
<tr>
<td>SHT1 A</td>
<td>Short flow cell of DAD2</td>
</tr>
</tbody>
</table>
The HDR-DAD solution is available in ChemStation and EZChrom. Both software solutions provide the same results.

Nevertheless, the two software solutions show different starting points of the HDR-DAD signal:

- **ChemStation:**
  The HDR signal is not starting from zero. The starting time of the HDR signal is calculated with the configuration settings of the delay volume between detectors and the linked pump.

- **EZChrom:**
  The signal is displayed starting from zero and the delay is present at the end of the chromatogram.

For details, see Table 3 on page 46
1 What is the HDR-DAD Solution?
HDR-DAD Solution Data-Representation
This chapter provides information on performance specifications.
## Specifications of the 1200 Infinity Series High Dynamic Range Diode Array Detector Solution

### Table 2  Performance Specifications of the HDR-DAD solution

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection type</td>
<td>1024-element photodiode array</td>
<td></td>
</tr>
<tr>
<td>Light source</td>
<td>Deuterium lamp</td>
<td>equipped with RFID tag that holds lamp typical information.</td>
</tr>
<tr>
<td>Number of signals</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>HDR-DAD Maximum</td>
<td>80 Hz</td>
<td></td>
</tr>
<tr>
<td>sampling rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short term noise</td>
<td>$&lt; \pm 0.85 \cdot 10^{-6}$ AU/cm</td>
<td>at 230/4 nm, slit width 4 nm, TC 2 s, ASTM</td>
</tr>
<tr>
<td></td>
<td>Typically $&lt; \pm 0.60 \cdot 10^{-6}$ AU/cm</td>
<td></td>
</tr>
<tr>
<td>Drift</td>
<td>$&lt; 0.5 \cdot 10^{-3}$ AU/h</td>
<td>at 230 nm</td>
</tr>
<tr>
<td>Linearity</td>
<td>$&gt; 5.4$ AU (5 %)</td>
<td>at 265 nm</td>
</tr>
<tr>
<td></td>
<td>Typically 6.7 AU (5 %)</td>
<td></td>
</tr>
<tr>
<td>Wavelength range</td>
<td>190 – 640 nm</td>
<td></td>
</tr>
<tr>
<td>Wavelength accuracy</td>
<td>$\pm 1$ nm</td>
<td>self-calibration with deuterium lines</td>
</tr>
<tr>
<td>Slit width</td>
<td>Programmable: 1, 2, 4, 8 nm</td>
<td>(with G7117B, G4212A)</td>
</tr>
<tr>
<td></td>
<td>Fixed slit: 4 nm</td>
<td>(with G7117A, G4212B)</td>
</tr>
<tr>
<td>Diode width</td>
<td>$\sim 0.5$ nm</td>
<td></td>
</tr>
<tr>
<td>Wavelength bunching</td>
<td>2 – 400 nm</td>
<td>programmable in steps of 1 nm</td>
</tr>
<tr>
<td>Flow cells</td>
<td>Max-Light Cartridge Cell (60 mm, V(s) 4.0 µL) (G4212-60007)</td>
<td>70 bar (1015 psi) Maximum Operating Pressure (MOP)$^1$</td>
</tr>
<tr>
<td></td>
<td>HDR Max-Light Cartridge Cell (3.7 mm, V(s) 0.4 µL) (G4212-60032)</td>
<td>150 bar (2175 psi) Maximum Incidental Pressure (MIP)$^2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cartridge type, equipped with RFID tags that holds cell typical information.</td>
</tr>
<tr>
<td>Spectral tools</td>
<td>Data analysis software for spectra evaluation, including spectral libraries and peak purity functions</td>
<td></td>
</tr>
</tbody>
</table>
### Specifications of the 1200 Infinity Series High Dynamic Range Diode Array Detector Solution

**Table 2**  Performance Specifications of the HDR-DAD solution

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog outputs</td>
<td>Recorder/integrator: 100 mV or 1 V, output range 0.001 – 2 AU, one output</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>G4212A/B: LAN, controller-area network (CAN), RS-232C, APG Remote: ready start, stop and shut-down signals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G7117A/B: LAN, controller-area network (CAN), USB, ERI/APG Remote: ready start, stop and shut-down signals</td>
<td></td>
</tr>
<tr>
<td>GLP features</td>
<td>RFID for electronics records of flow cell and UV lamp conditions (path length, volume, product number, serial number, test passed, usage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user settable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with deuterium lines.</td>
<td></td>
</tr>
<tr>
<td>Safety and maintenance</td>
<td>Extensive diagnostics, error detection and display through Agilent Instant Pilot and Agilent Lab Advisor software. Leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Electronic temperature control (ETC) for the complete optical unit</td>
<td></td>
</tr>
</tbody>
</table>

1. **Maximum Operating Pressure (MOP):** The maximum pressure at which the system can operate continuously under normal conditions.

2. **Maximum Incidental Pressure (MIP):** The maximum pressure which the system can experience during a short time.
2 Specifications
Specifications of the 1200 Infinity Series High Dynamic Range Diode Array Detector Solution
3 Installation of the HDR-DAD Solution

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Enabling the HDR-DAD solution 21
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Calculation of the Delay Volume 30

This chapter provides information on installation of the HDR-DAD Solution.
Unpacking the Solution Kit

Ensure all parts and materials have been delivered. The delivery checklist for the 1200 Infinity HDR-DAD Solution Kit (G2199AA) is shown below.

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5067-4660</td>
<td>Capillary, SST 0.11 mm ID 220 mm long</td>
</tr>
<tr>
<td>1</td>
<td>5063-6524</td>
<td>Caffeine in Water, 10 mg/L, 50 mL</td>
</tr>
<tr>
<td>1</td>
<td>5022-2159</td>
<td>Restriction capillary, SST 0.12 mm ID, 2 m long</td>
</tr>
<tr>
<td>1</td>
<td>G1680-63721</td>
<td>Network LAN Switch</td>
</tr>
<tr>
<td>3</td>
<td>8121-0008</td>
<td>LAN Cable, shielded</td>
</tr>
<tr>
<td>1</td>
<td>N/A</td>
<td>HDR-DAD USB dongle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contains licence to enable HDR-DAD solution</td>
</tr>
<tr>
<td>1</td>
<td>Power Cord</td>
<td>Part number as ordered (country specific)</td>
</tr>
<tr>
<td>1</td>
<td>G2199-90000</td>
<td>Printed manual</td>
</tr>
<tr>
<td>1</td>
<td>5188-8049</td>
<td>USB A F-USB Mini B M OTG (Module to Flash Drive)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For the installation of the HDR-DAD USB dongle into a G7117A/B</td>
</tr>
</tbody>
</table>
Flow connections and network setup

For details on the installation of the entire stack, the detector and the flow cell, see the manual *Agilent 1200 Infinity Series Diode Array Detectors* or *Agilent 1290 Infinity II Diode Array Detector*.

<table>
<thead>
<tr>
<th>Parts required</th>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>G7117A/B_HDR</td>
<td>Agilent 1290 Infinity II Diode Array Detector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The HDR-DAD solution supports all combinations of the two mandatory DADs (G7117A/G7117A, G7117A/G7117B or G7117B/G7117B).</td>
</tr>
<tr>
<td>OR</td>
<td>2</td>
<td>G4212A/B_HDR</td>
<td>Agilent 1290 Infinity Diode Array Detector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The HDR-DAD solution supports all combinations of the two mandatory DADs (G4212A/G4212A, G4212A/G4212B or G4212B/G4212B).</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>G4212-60007</td>
<td>Max-Light Cartridge Cell (60 mm, V(σ) 4.0 µL)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>G4212-60032</td>
<td>HDR Max-Light Cartridge Cell (3.7 mm, V(σ) 0.4 µL)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>G2199AA</td>
<td>Agilent 1200 Infinity HDR-DAD Solution Kit</td>
</tr>
</tbody>
</table>

**NOTE**

The detector with the long path cell needs to be the first one and the detector with the short cell needs to be the second one.

- **DAD₁**: 60 mm Cell - for low concentrations (high sensitivity)
- **DAD₂**: 3.7 mm Cell - for high concentrations (lower sensitivity)
3 Installation of the HDR-DAD Solution
Flow connections and network setup

1 Install the DAD₂ on top of DAD₁

2 Connect the capillaries from the TCC to DAD₁ and the outlet of DAD₁ to inlet the of DAD₂ using Capillary, SST 0.11 mm ID 220 mm long (5067-4660).
Setup the network, for an example see “Local LAN connection to a PC (not via corporate LAN)” on page 20.

**NOTE**

- Connect both detectors to the LAN and in addition connect all the devices via CAN bus.
- Configure both LAN connections, otherwise HDR-DAD will remain offline.
- Use the included network switch, in case the LC instrument is directly connected to a PC (not via corporate LAN).
3  Installation of the HDR-DAD Solution

Local LAN connection to a PC (not via corporate LAN)

Local LAN connection to a PC (not via corporate LAN)
Enabling the HDR-DAD solution

The steps below are valid for the DAD which shall get the license.

1. Turn off the module.
2. Plug-in the HDR-DAD USB dongle into the back of the detector (G7117A/B or G4212A/B).

**NOTE**

Only one of the DADs needs a license (DAD₁ or DAD₂).

**NOTE**

You must use the same HDR-DAD USB dongle for reinstallation as was originally used for installation. This, for example, is necessary after exchanging the mainboard of the detector. Thus it’s advisable to keep the serial number information of the detector together with the HDR-DAD USB dongle.

---

### Parts required

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>HDR-DAD USB dongle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contains licence to enable HDR-DAD solution</td>
</tr>
<tr>
<td>1</td>
<td>5188-8049</td>
<td>USB A F-USB Mini B M OTG (Module to Flash Drive)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For the installation of the HDR-DAD USB dongle into a G7117A/B</td>
</tr>
</tbody>
</table>
3 Installation of the HDR-DAD Solution

Enabling the HDR-DAD solution

3 Turn the module on.

4 Wait until the USB dongle stops blinking.

   The HDR-DAD-License is installed on the module.

5 Remove the USB dongle from the module.

   The license remains on the module.

NOTE For the installation of the HDR-DAD USB dongle into a G7117A/B the USB A F-USB
Mini B M OTG (Module to Flash Drive) (5188-8049) (part of the HDR-DAD Solution Kit) is
required.
Configuring the HDR-DAD Solution

The instrument can be configured via the OpenLAB Control Panel, when setting up the device there.

Software required
- OpenLAB CDS A.01.05 (or higher)
  - ChemStation Edition C.01.05 (or higher), or
  - EZChrom Edition A.04.05 (or higher)
- LC & CE Drivers A.02.09 installed on top
- Firmware (DAD1 and DAD2): B.06.57 or higher

Preparations
If the previously available HDR solution was used, uninstall it first.

Auto configuration of the HDR-DAD solution
1. Configure your instrument in the Agilent OpenLAB Control Panel.
2. Click on Configure Instrument.

Figure 6  Control Panel of OpenLAB CDS
3 **Installation of the HDR-DAD Solution**

**Configuring the HDR-DAD Solution**

3 **Click Yes.**

4 Enter the **IP address** or **Hostname** of the DAD with the long cell and click **OK**.

After Auto-Configuration the Post Auto Configuration dialog is shown.
5 To configure the instrument click **Configure HDR-DAD Cluster**.

**NOTE**
In case the prerequisites are not fulfilled, the button is not active. A tooltip informs about the reason.

The detector with the longest cell is always the first detector in the **Detectors** list.
6 Define the **Delay Volume between detectors** (calculate the delay volume upfront, see “Calculation of the Delay Volume” on page 30).

![Delay volume configuration screen]

**NOTE**

The default value as specified in the software is 11.0 µL.

Recheck for correct delay compensation in additional runs.
7 Specify the linked pump.

The **Linked Pump** is used to recalculate the delay for different flow values.

8 Configure the second LAN connection.
   a Select the detector with the shorter cell and click **Configure**.
b Click **Additional connection**...

c Check **Use auxiliary connection**, enter **IP Address** or **Hostname** of the detector with the *shorter cell* and click **OK**.
In **HDR-DAD Cluster Configuration (auto configuration part)** click **OK**.

![HDR-DAD Cluster Configuration](image)

The HDR-DAD solution now is configured.

**Figure 7** Configured system

**NOTE** No other detectors are supported together with HDR.
Calculation of the Delay Volume

### Parts required

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5022-2159</td>
<td>Restriction capillary, SST 0.12 mm ID, 2 m long</td>
</tr>
<tr>
<td>1</td>
<td>5063-6524</td>
<td>Caffeine in Water, 10 mg/L, 50 mL IQ test sample, for UV/VIS spectrophotometer</td>
</tr>
</tbody>
</table>

No shipment of caffeine standard to China.

**NOTE**

**Suggestion:**

For statistical calculations use 6 sample injections.

1. Install Restriction capillary, SST 0.12 mm ID, 2 m long (5022-2159) in place of the column.

2. Inject 1 μL of Caffeine in Water, 10 mg/L, 50 mL (5063-6524) at a moderate flow rate (for example 0.5 μL/min).

**NOTE**

The amount of sample is selected to run both detectors in linear range (for example 50 μg/mL, \( V_{\text{inj}} = 1 \mu L \Rightarrow 50 \ldots 100 \text{ mAU/cm} \)).
3 Calculate the **Delay Volume**.

![Diagram showing RT1 and RT2 with equation: \( T_{\text{delay}} = R_{\text{TDA2}} - R_{\text{TDA1}} \) and \( V_{\text{delay}} = \text{Flow rate} \times T_{\text{delay}} \)](image)

**Figure 8** Calculation of the Delay Volume

- Delay Time: \( T_{\text{delay}} = R_{\text{TDA2}} - R_{\text{TDA1}} \)
- Delay Volume: \( V_{\text{delay}} = \text{Flow rate} \times T_{\text{delay}} \)

4 Open the **High Dynamic Range DAD Configuration**, enter the calculated delay volume and click **OK**.

![Image of DAD configuration with highlighted delay volume](image)

5 Eventually fine tune the parameter delay volume in further runs.
3 Installation of the HDR-DAD Solution
Calculation of the Delay Volume
Using the HDR-DAD Solution

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This chapter provides information on the main function of the user interface for the HDR-DAD solution. For more details refer to the software manual or the online help.
4 Using the HDR-DAD Solution

Status Information and Module Information Dialog of the HDR-DAD Cluster

Status Information and Module Information Dialog of the HDR-DAD Cluster

NOTE For details on how to use the controller software, see the manual Agilent 1200 Infinity Series Diode Array Detectors, Agilent 1290 Infinity II Diode Array Detector or the online help.

There are some specialties of the HDR-DAD cluster control panel, compared to the use with a single DAD:

• The DAD₁ (long cell) is always shown on the top line, DAD₂ (short cell) on the 2nd line.

Figure 9 Status of the HDR-DAD Cluster

• The signals shown in the status table of the HDR-DAD Cluster are the calculated HDR signals.

Figure 10 HDR-DAD Signals
Tooltips show lamp (see Figure 11 on page 35) and cell (see Figure 12 on page 35) tag information for DAD₁ and DAD₂.
Using the HDR-DAD Solution
Status Information and Module Information Dialog of the HDR-DAD Cluster

- The module information dialog shows information about the access point and the additional 2\textsuperscript{nd} LAN connection of the HDR-DAD cluster.

Figure 13  Information on Additional Connection and Access Point
The following section describes only settings which are only relevant for the HDR-DAD solution.

For details on method settings as they are important for general use of the DAD, see the manual *Agilent 1200 Infinity Series Diode Array Detectors, Agilent 1290 Infinity II Diode Array Detector* or the online help.

The following method setting are relevant for the HDR-DAD solution:

- The **Signals** section provides 8 HDR signals (Signal A-H) with a bandwidth from 190 – 640 nm and its corresponding signals of the single DADs as LNG and SHT (for each detector 8 signals (LNG A-H and SHT A-H))

![Figure 14 HDR-DAD Bandwidth](image)
• In the Advanced Spectrum section, the user may choose the storage of All spectra or None from a dropdown list. The HDR-DAD solution supports full HDR spectra data (190 – 640 nm)

NOTE

There is no support for other spectra modes.

Only the Analog Output channel of DAD₂ with the short cell delivers the HDR-DAD signal. (The Analog Output channel of DAD₁ with the long cell will show 0 V signal.)
• **Peakwidth**
  
The data rate is settable from 0.31 – 80 Hz

![Figure 16 HDR-DAD Peakwidth settings](image)

• **Slit**
  
The slit width is settable to 1, 2, 4, or 8 nm

**NOTE**

If one or both detectors are G7117A or G4212B (module has a fixed slit), the slit automatically is set to 4 nm and cannot be adjusted.

![Figure 17 HDR-DAD Slit width settings](image)
Status Display During a run with the HDR-DAD

![Figure 18 ](image)

For details on the general functions of the status display, see the manual *Agilent 1200 Infinity Series Diode Array Detectors, Agilent 1290 Infinity II Diode Array Detector* or the online help.
Click on the menu items in the context menu of the status dashboard offers the following HDR-DAD solution specific functions:

- **Identify Device** lets both detectors blink
- **Balance** triggers balance on both detectors
- **Switch On/Switch Off** switches lamps of both detectors on/off

![Context menu of the status dashboard](image)

**Figure 19** Context menu of the status dashboard
Control User Interface of the HDR-DAD Solution

NOTE

For details on the general functions of the control user interface, see the manual Agilent 1200 Infinity Series Diode Array Detectors, Agilent 1290 Infinity II Diode Array Detector or the online help.

The following HDR-DAD specific functions exist:

- Selection of radio button On/Off in section Lamps-UV turns on/off lamps of DAD1 and DAD2

![Figure 20] HDR-DAD Control User Interface
Method and Run Control User Interface in ChemStation

The **Method and Run Control** user interface provides information on the status of the system.

![Figure 21](image.png) HDR-DAD solution control screen in ChemStation

**NOTE**

With EZChrom, the functionality of the HDR-DAD solution is equal and the status dashboard looks akin to ChemStation - but the online plots and spectra look different.
Code for the signals observed:

- The HDR-DAD signals are available as **DAD1A - H signal**
- The original signals of DAD₁ are available as **LNG1A - H signal (= long cell)**
- The original signals of DAD₂ are available as **SHT1A - H signal (= short cell)**

**Figure 22  HDR-DAD Online Plot section**

The HDR-DAD solution also offers the possibility to review the spectra online while acquiring data. The **HDR-DAD Cluster: Spectrum (mAU)** section shows the HDR spectra.

**Figure 23  HDR-DAD spectrum**
The HDR-DAD solution offers the following sections for **Data Analysis**:

- Three separate signal groups for HDR, DAD₁ (LNG = long cell), DAD₂ (SHT = short cell)
  
  The user can observe 24 signals (3 × 8 signals: HDR, DAD₁, DAD₂) x 8 signals (A-H)

- Spectra information

**NOTE**

**Display of Delay Time in the data analysis software**

The flow from DAD₁-capillary-DAD₂ causes a **Delay Time**. The HDR-DAD solution calculates the chromatogram from DAD₁ and DAD₂ signals. Therefore a HDR-chromatogram always starts at earliest with the signal of DAD₂.

In spite of this, ChemStation and EZChrom display the delay time differential.

- **ChemStation:**
  
  The HDR-DAD chromatogram shows a short gap at the beginning of the signal. This reflects the fact that the combined HDR signal can only start as it is delayed by the delay time between the detectors. Whereas the signals of the single detectors start immediately at t = 0 min.

  See Figure 24 on page 46.

- **EZChrom:**
  
  The HDR-DAD chromatograms always start at t = 0 min and shows a short gap at the end of the signal.

  See Figure 25 on page 46.
### Using the HDR-DAD Solution
#### HDR-DAD Solution - Data Analysis

#### Table 3  Differential display of delay time in ChemStation and EZChrom

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<th>EZChrom</th>
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**Figure 24**  ChemStation displays a short gap at the beginning of the HDR signal (red rectangle)

**Figure 25**  EZChrom displays a short gap at the end of the HDR signal (red rectangle)
This chapter answers frequently asked questions.
Frequently Asked Questions

1 What can I do if I observe a leap in the HDR signal?
Wrong delay calibrations cause leaps in the data signal (see Figure 26 on page 48).
Double check the delay calibration between the 2 detectors.

![Figure 26](image-url) Leaps in the HDR signal

2 How are the signals named?
- **DAD1** = combined HDR-DAD signal
- **LNG1** = signal of the single DAD with the long Max-Light Cartridge Cell installed
- **SHT1** = signal of the other single DAD with the short Max-Light Cartridge Cell installed

3 Can I use additional detectors if I include a UIB II to the HDR-DAD solution?
It is not recommended to use additional detectors with the HDR-DAD solution.

4 Which firmware is required to run the HDR-DAD solution?
You need firmware revision B.06.57 or later to run the HDR-DAD solution.
5 How can I print spectra information in OpenLAB CDS ChemStation edition?

To print the correct spectra information, adhere to the following procedure:

a Open Signal Details... dialog (in ChemStation via Calibration > Signal Details...).

b Make sure that only the DAD 1A signal is loaded (and not any of the LNG1 or SHT1).

c Open the View > Preferences... dialog, select Signal > Review Options and check Load using signal details.

d Save the method and reload the data.

e Now the Full Report will contain the correct information whenever printed.
Frequently Asked Questions (FAQs)

Frequently Asked Questions
This chapter gives an overview on additional literature.
Application and Technical Notes

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More information and documents are available on the worldwide web site on the internet at www.agilent.com/chem/hdr
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User information about the Agilent 1200 Infinity Series High Dynamic Range Diode Array Detector Solution (HDR-DAD)

The manual describes the following:

• Introduction
• Specifications
• Installation
• Using
• Frequently Asked Questions
• Additional Information