

Clarity Controls

Merck - Hitachi LaChrom Elite

LC + DET + AS + CO

ENG

Code/Rev.: M133/30B
Date: 1/3/2011

Phone: +420 251 013 400
Fax: +420 251 013 401
clarity@dataapex.com
www.dataapex.com

DataApex Ltd.
Podohradská 1
155 00 Prague 5
The Czech Republic

Clarity[®], DataApex[®] and [®] are trademarks of DataApex Ltd. Microsoft[®] and Windows[™] are trademarks of Microsoft Corporation.
DataApex reserves the right to make changes to manuals without prior notice. Updated manuals can be downloaded from www.dataapex.com.

Author: zte

Contents

1 Merck - Hitachi LaChrom Elite Control module	1
2 Requirements	2
3 Installation procedure	3
3.1 Merck - Hitachi LaChrom Elite communication.....	3
3.2 Clarity Configuration.....	3
4 Using the control module	5
4.1 Merck - Hitachi LaChrom Elite Setup - Common.....	5
4.2 Pump.....	7
4.2.1 Merck - Hitachi LaChrom Elite Setup - SMASH/HTA Pump.....	7
4.2.2 Method Setup - LC Gradient.....	8
4.2.2.1 Gradient Options.....	10
4.2.3 Device Monitor.....	11
4.2.4 Report Setup.....	12
4.3 Autosampler.....	13
4.3.1 Merck - Hitachi LaChrom Elite Setup - Autosampler.....	13
4.3.2 Method Setup - AS.....	14
4.3.3 Device Monitor.....	15
4.3.4 Report Setup.....	16
4.4 Column Oven.....	17
4.4.1 Merck - Hitachi LaChrom Elite Setup - Column Oven.....	17
4.4.2 Method Setup - Thermostat.....	18
4.4.3 Device Monitor.....	19
4.4.4 Report Setup.....	19
4.5 UV Detector.....	20
4.5.1 Merck - Hitachi LaChrom Elite Setup - Detector.....	20
4.5.2 Method Setup - Acquisition - Detector Settings.....	21
4.5.3 Method Setup - Acquisition - Time Program.....	22
4.5.4 Device Monitor.....	23
4.5.5 Report Setup.....	23

To facilitate the orientation in the **Merck - Hitachi LaChrom Elite** manual and **Clarity** chromatography station, different fonts are used throughout the manual. Meanings of these fonts are:

Instrument (blue text) marks the name of the window, to which the text refers.

Open File (italics) describes the commands and names of fields in **Clarity**, parameters that can be entered into them or a window or dialog name (when you already are in the topic describing the window).

WORK1 (capitals) indicates the name of the file and/or directory.

ACTIVE (capital italics) marks the state of the station or its part.

The bold text is sometimes also used for important parts of the text and the name of the **Clarity** station. Moreover, there are text sections written in format other than normal text. These sections are formatted as follows:

Note: Notifies the reader of possibly interesting information.

Caution: Warns the user of possibly dangerous or very important information.

█ Marks the problem statement or trouble question.

Description: Presents any closer information on the problem, describes its causes etc.

Solution: Marks the response to the question, presents a procedure how to remove it.

1 Merck - Hitachi LaChrom Elite Control module

This manual describes the setting of the **Merck - Hitachi LaChrom Elite** HPLC system. The control module enables direct control of the instrument over the USB port.



Fig 1: Merck - Hitachi LaChrom Elite

This control module operates the whole system (including detectors, autosampler, column ovens, etc.), not just the pump. Direct control means that the system can be completely controlled from the **Clarity** environment. Instrument method controlling the analysis conditions will be saved in the measured chromatograms.

Clarity can currently control following modules:

Pumps: L-2100 SMASH, L-2130 HTA

Detector: L-2400 UV

Autosampler: L-2200

Column Oven: L-2300

The number of controlled modules continues to extend, for up to date list see the web site www.dataapex.com.

2 Requirements

- **Clarity** installation CD ROM with **LC control** module (p/n A24) allowed. Other parts of the system may need other modules or extensions, namely the autosampler will need the **AS control** module (p/n A26).

Note: Cables are not part of the Clarity Control Module. If you don't have the USB cable for connecting the Interface Board with the PC, you can order it as p/n SK06.

Caution: **USB-IF Board** supplied by the system manufacturer (P/N 890-0703) must be installed in one of the modules. This board is connected to the computer over the USB port.

Caution: **Windows Vista** and **7** are not supported.

3 Installation procedure

3.1 Merck - Hitachi LaChrom Elite communication

It is possible to control up to 2 Merck - Hitachi LaChrom Elite systems configured on different Instruments in the Clarity Chromatography Station. Then it is necessary to set the switch on the first **USB-IF Board** to Sys1 and on the second one to the Sys2. Consult the **USB-IF Board** manual.

3.2 Clarity Configuration

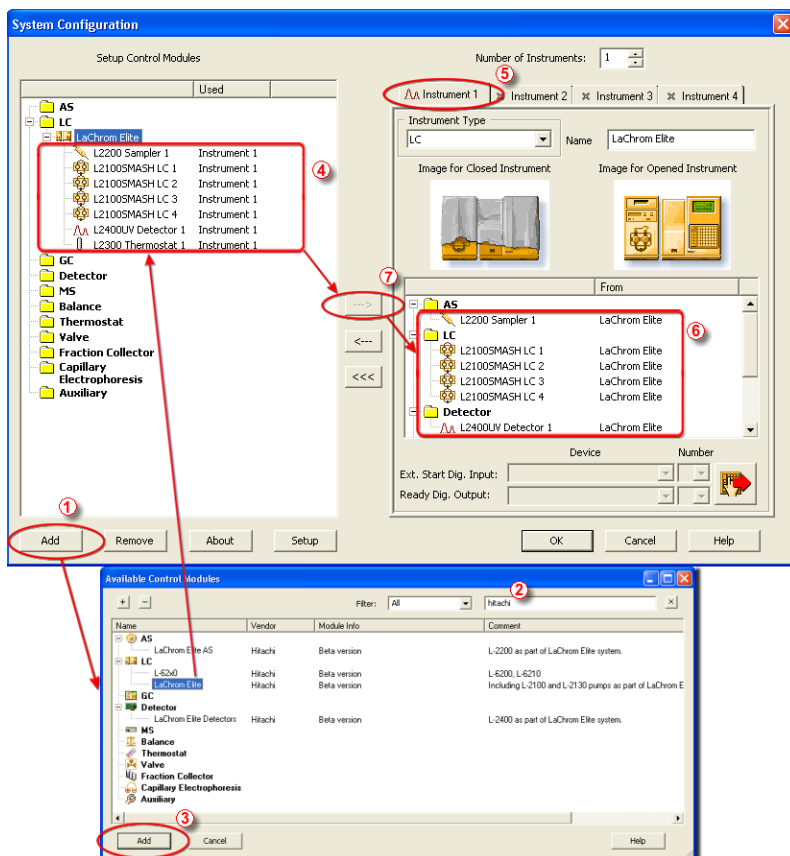


Fig 2: Adding Merck - Hitachi LaChrom Elite module

- Press the *Add* button ① in the **System Configuration** dialog to invoke the **Available Control Modules** dialog.
- You can use the filter ② to simplify the searching of the control module.
- Select the *LaChrom Elite* and click the *Add* ③ button. The **Merck - Hitachi LaChrom Elite Setup** dialog will appear.

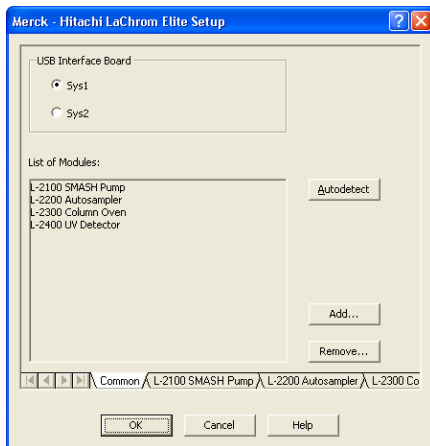


Fig 3: Merck - Hitachi LaChrom Elite Setup

- Select proper *USB Interface Board* and by clicking the *Autodetect* button all modules are detected including the *Serial* and *Program Numbers* of the modules. Alternatively you can click the *Add...* button and add the available modules manually. Each module will add its own tab to the **Merck - Hitachi LaChrom Elite Setup** dialog. It will be described in the manual later.
- After clicking the *OK* button, the **Merck - Hitachi LaChrom Elite** item ④ will appear in the *Setup Control Modules* list of the **System Configuration** dialog.
- Set the *Instrument Type* on the desired *Instrument* tab ⑤ to **LC**.
- Drag the LC chromatograph icon from the *Setup Control Modules* list on the left side to the desired *Instrument* tab ⑤ on the right side ⑥, or use the *--->* button ⑦ to do so.

4 Using the control module

Several new tabs appear in the **Method Setup** dialog, based on the settings performed in the **Merck - Hitachi LaChrom Elite Setup** dialog. These new tabs enable the setting of the **Merck - Hitachi** system operation program.

Note: The instrument method is always sent to the **Merck - Hitachi LaChrom Elite** as a whole.

4.1 Merck - Hitachi LaChrom Elite Setup - Common

The *Common* tab serves for configuration of the communication with the **Merck - Hitachi LaChrom Elite** system and for adding its modules you want to control.



Fig 4: Merck - Hitachi LaChrom Elite Setup - Common tab

USB Interface Board

Depending on the switch configured on the **USB-IF Board** in the **Merck - Hitachi LaChrom Elite** system, this options allow to select the matching **Sys1** or **Sys2** setting.

List of Modules

Shows the list of modules autodetected or manually added to the setup.

Autodetect

When used, this button automatically detects modules and their serial and program numbers installed in your **Merck - Hitachi LaChrom Elite** system and lists them in the *List of Modules* section.

Add...

Opens the **Add Module** dialog, which is used to select the added *Module Type* together with the *Serial Number* and *Program Number*. The added module is then listed in the *List of Modules* and has its own tab in the lower part of the **Merck - Hitachi LaChrom Elite Setup** dialog.

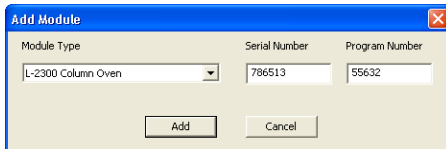


Fig 5: Add Module dialog

Remove...

Opens the **Remove Module** dialog, which is used to select the removed *Module Type*.

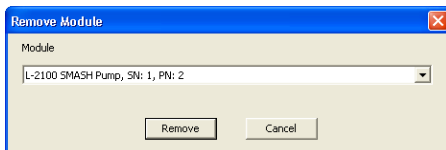


Fig 6: Remove Module dialog

4.2 Pump

The **Method Setup - LC Gradient** tab serves for setting the gradients of the pumps configured in the **Merck - Hitachi LaChrom Elite Setup - SMASH/HTA Pump** dialog.

4.2.1 Merck - Hitachi LaChrom Elite Setup - SMASH/HTA Pump

This tab of the **Merck - Hitachi LaChrom Elite Setup** dialog allows to set the parameters of the SMASH or HTA pump. Both of the pumps have the same options in their tabs. The only one difference between these pumps is in the maximum flow rate. Please, see the manual of the pump.

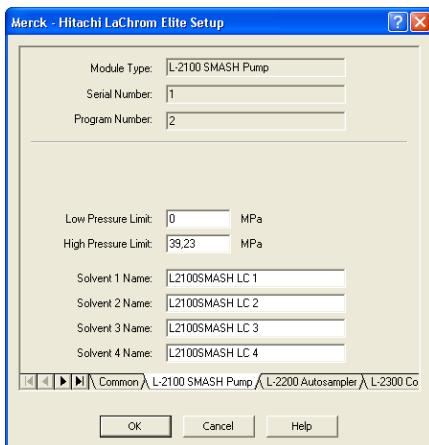


Fig 7: Merck - Hitachi LaChrom Elite Setup - SMASH/HTA Pump

Module Type

Displays the *Module Type* you have added. The *L-2100 SMASH Pump* or the *L-2130 HTA Pump* is possible.

Serial Number

Displays the Serial Number you have entered for the module.

Program Number

Displays the Program Number you have entered for the module.

Low Pressure Limit

Lower pressure limit. Number entered will be sent to the pump and checked by the pump firmware.

High Pressure Limit

Upper pressure limit. Number entered will be sent to the pump and checked by the pump firmware.

Solvent 1 (...4) Name

Change names for the particular solvent.

4.2.2 Method Setup - LC Gradient

The [Method Setup - LC Gradient](#) dialog serves for setting up the LC instrument method.

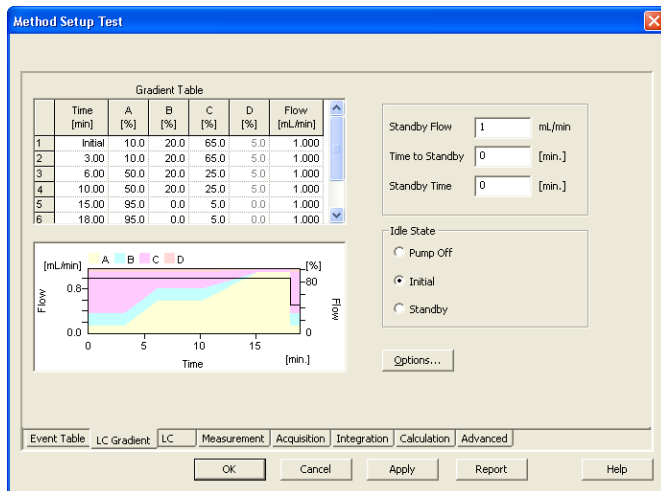


Fig 8: Method Setup - LC Gradient

Gradient Table

A table for setting the composition of the mobile phase and the overall flow rate as a function of time. Operation is analogous to that of spreadsheets (Excel, Quatro Pro, etc.). To prepare the cell to receive values, click it by the left mouse button; the cell will highlight by dots. A cell that fails to highlight is not available for editing.

Time [min.]

Sets the time at which the ratio of flow rates and the overall flow rate correspond to the values entered in the corresponding row. (These values vary continuously from one time to the next in a manner ensuring that the conditions specified in the next row are satisfied).

XXX1 (...4) [%]

Represents the percentage of a component. The designation **XXX1-4** is in fact replaced by the name of the component (items *Solvent 1 - 4* in the [Gradient Options](#) dialog). Should you enter a component value such that the sum of all values exceeds 100 %, the percentage in the last column is automatically adjusted; if the percentage of the last compound is already zero, the value of the currently entered component is adjusted instead. The flow rate of a compound is

calculated by multiplying the overall flow rate (indicated in the *Flow* column) by the corresponding percentage divided by 100.

Flow [ml/min]

Indicates the overall flow rate through the column. The entered value applies to the time specified in the corresponding row.

Caution: The maximum flow may vary according to the pump type you have installed. Check the pump's manual.

Graph

The graph depicts the percentage of components as a function of time together with the overall flow rate. Data are taken over from the **Gradient Table**. Changes effected in this table are immediately reflected in the graph. Legend in the header of the graph indicates the assignment of colors to individual components. The assignment is fixed and individual components are displayed in the graph from bottom to top. The flow rate is displayed as a black line.

The graph has two vertical axes: the axis on the left refers to the mixing ratio, the one on the right to the overall flow rate.

Parameters

Standby Flow

Sets the overall flow rate through the column in the *STANDBY* state reached after the last row of the table has been performed and the time period defined in the *Time to Standby* field has passed. The duration of this state is defined by the *Standby Time* item. The ratio of individual components in the respective *STANDBY* and *IDLE* states is given by the first row of the **Gradient Table** (the *Initial* row).

Time to Standby [min]

Indicates the time during which the flow rate and mobile phase composition changes continuously between the last values entered in the table and the values defined by *Standby Flow* field and the *Initial* row mobile phase composition.

This time is included in the analysis time (the Instrument is in the *CONTROL* state). In case when the *Time to Standby* is zero, there is step change from flow and components percentage specified on the last row of gradient table to that specified for *STANDBY* state.

Standby Time [min]

The time during which the flow rate is maintained at *Standby Flow*. This time is included in the analysis time (the Instrument is in the *CONTROL* state).

Idle State

An item specifying the overall flow rate through the column outside the instrument method. The following options are possible:

Pump Off

The flow rates of all components are zero.

Caution: Be careful as this setting may damage the column in some cases.

Initial

The flow rate is defined by the first row of the **Gradient Table** (the *Initial* row).

Standby

The flow rate is the same as in the *STANDBY* mode and, accordingly, corresponds to the value entered in *Standby Flow* field.

The *IDLE* state comes into effect each time an Instrument is opened, at the end or after abortion of an analysis by the *Abort* command, and is also maintained after the **Clarity** program is shut down.

The mixing ratio of individual components in both the *IDLE* and *STANDBY* states is given by the first row of the **Gradient Table** (the *Initial* row).

Note: There is a step change in the flow and components percentage from the values specified for the *STANDBY* state to those specified for the *IDLE* state if the *Idle State* field is not set to *Standby*.

4.2.2.1 Gradient Options

Invoke the *Options...* button in the **Method Setup - LC Gradient** dialog to open the **Gradient Options** dialog. This dialog allows to set the custom name for particular solvents, to switch whether they are used or not in the gradient and to set the warning levels for pressure to prevent the damage to hardware.

The abovementioned pressure limits are checked in the software. Pressure check for low pressure limit doesn't start immediately after pump is started, but with few minutes delay. During this delay the pressure in chromatographic system can stabilize.

In addition to those limits, a pressure limits are set in the **Merck - Hitachi LaChrom Elite Setup - Pump** dialog. Those limits are checked in the pump firmware. As they will cause a system error, they should be set outside the limits defined here in the **Gradient Options** dialog.

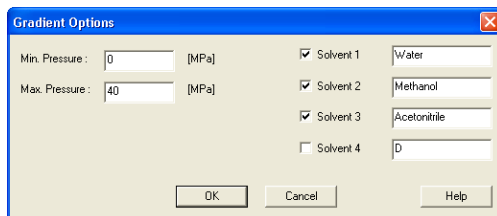


Fig 9: Gradient Options

Min. Pressure

Sets the minimum pressure for the given pump. When pressure drops to the set value, the pump will shut down. This prevents the solvent leakage.

Max. Pressure

Sets the maximum pressure for the given pump. When pressure reaches the set value, all pumps on the Instrument will shut down. This serves to prevent the damage to the pump when the column is blocked.

Note: *Min. Pressure* and *Max. Pressure* for the **Merck - Hitachi LaChrom Elite** pumps vary in certain range according to the type of the pump and valves used. Check the device manual for valid values for your pump.

Solvent 1 (.4)

It is possible to enable/disable particular solvent, as well as to set custom name to it.

4.2.3 Device Monitor

The pump status dialog can be invoked by the *Monitor - Device Monitor* command from the **Instrument** window or using the LC Monitor 🗨️ icon. It displays the actual flows of particular solvents, as well as the total flow, the total pressure and the analysis time.

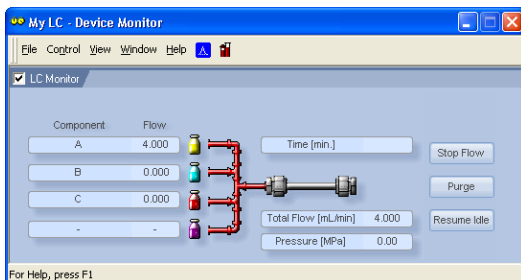


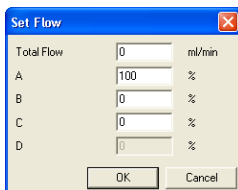
Fig 10: LC Monitor

Stop Flow

The pumps can be stopped from this window using the *Stop Flow* button. This action will stop the pump only, the analysis run will continue and must be stopped or aborted from the **Data Acquisition** window or **Single Analysis** dialog.

Purge

The pumps may be purged by pressing this button. Set the desired total flow and solvent ratios in the opened **Set Flow** dialog.



The **Set Flow** dialog box contains the following fields:

- Total Flow: 0 ml/min
- A: 100 %
- B: 0 %
- C: 0 %
- D: 0 %

Buttons: OK, Cancel

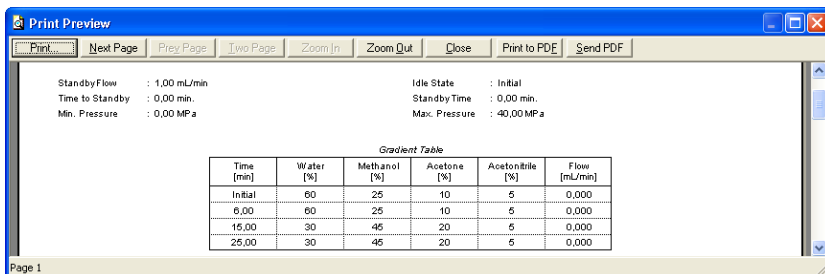
Fig 11: Set Flow

Resume Idle

Returns the pumps to *IDLE* state as defined in the appropriate field on the **LC Gradient** tab of the **Method Setup** dialog.

4.2.4 Report Setup

All of the pump settings accessible on the **Method Setup - LC Gradient** tab and in the **Gradient Options** dialog are reported, if the pump is configured as the part of the gradient. To do so, the *Instrument Control* parameter on the **Method** tab of the **Report Setup** dialog must be checked.



Print Preview dialog showing report details:

- Standby Flow : 1,00 mL/min
- Time to Standby : 0,00 min.
- Min. Pressure : 0,00 MPa
- Idle State : Initial
- Standby Time : 0,00 min.
- Max. Pressure : 40,00 MPa

Gradient Table

Time [min]	Water [%]	Methanol [%]	Acetone [%]	Acetonitrile [%]	Flow [mL/min]
Initial	60	25	10	5	0,000
6,00	60	25	10	5	0,000
15,00	30	45	20	5	0,000
25,00	30	45	20	5	0,000

Page 1

Fig 12: Report - pump part of the gradient

4.3 Autosampler

The autosampler used with the **Merck - Hitachi LaChrom Elite** allows for automated injection of samples. This can only be performed from the **Sequence** window, not from the **Single Analysis** dialog (where it is impossible to specify from which position the injection will be performed).

4.3.1 Merck - Hitachi LaChrom Elite Setup - Autosampler

Merck - Hitachi LaChrom Elite Setup

Module Type: L-2200 Autosampler

Serial Number: 3

Program Number: 4

Sampler Name: L2200 Sampler 1

Rack Properties:

Code: 1

Type: Standard, 200 vials

Syringe Type: 100 µl

Common > L-2100 SMASH Pump > L-2200 Autosampler > L-2300 Co

OK Cancel Help

Fig 13: Merck - Hitachi LaChrom Elite Setup - Autosampler

Module Type

Displays the *Module Type* you have added. The *L-2100 SMASH Pump* or the *L-2130 HTA Pump* is possible.

Serial Number

Displays the Serial number you have entered for the module.

Program Number

Displays the Program Number you have entered for the module.

Sampler Name

Sets the name of the autosampler.

Rack Properties

Code

Sets the proper code of the rack.

Type

Sets the proper type of the rack.

Syringe Type

Sets the proper type of the syringe depending on its volume.

4.3.2 Method Setup - AS

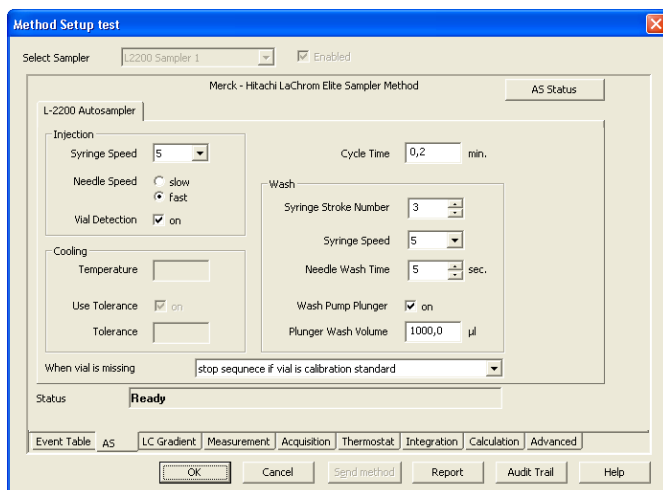


Fig 14: Method Setup - AS

Injection

Syringe Speed

Sets the speed of the syringe.

Needle Speed

Sets the speed of the needle.

Vial Detection

Checks whether the vial is in the position or not.

Cooling

This section is enabled, if the autosampler have installed the Thermo Unit.

Temperature

Sets the target temperature of the cooling.

Use Tolerance

Sets whether to use the tolerance.

Tolerance

If the *Use Tolerance* is checked, sets the tolerance.

Cycle Time

Sets the cycle time for analysis of one vial. After the Cycle Time is finished, the autosampler is ready for next vial analysis.

Wash

Parameters used during the washing.

Syringe Stroke Number

Sets the stroke number of the syringe.

Syringe Speed

Sets the speed of the syringe.

Needle Wash Time

Set the period of washing time of the needle.

Wash Pump Plunger

Sets whether to wash the plunger.

Plunger Wash Volume

Volume for plunger washing.

When vial is missing

Sets the behavior when the vial is missing.

4.3.3 Device Monitor

The **Device Monitor** window can be invoked by the *Monitor - Device Monitor* command from the **Instrument** window or using the Device Monitor 🙄🙄 icon. It displays the actual cooler temperature (if configured) and allows to perform the *Purge* and *Rinse* actions.

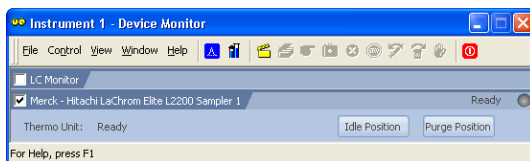


Fig 15: Device Monitor - Autosampler

Idle Position

Move the autosampler to the initial position.

Purge Position

Move the autosampler to the purge position.

4.3.4 Report Setup

The autosampler settings accessible from the [Method Setup - AS](#) tab and [Merck - Hitachi LaChrom Elite Setup - Autosampler](#) dialog may also be included in the report. To do so, the *Injection Control* parameter on the [Method](#) tab of the [Report Setup](#) dialog must be checked.

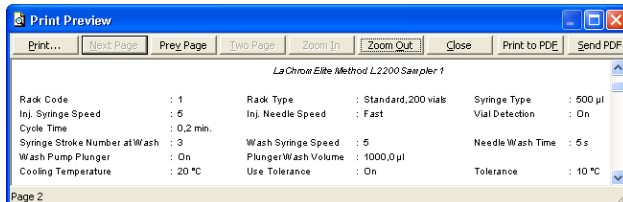


Fig 16: Report - Autosampler

The first part of the parameters is taken from the [Merck - Hitachi LaChrom Elite Setup - Autosampler](#) dialog settings, the second part contains parameters set on the [Method Setup - AS](#) tab.

4.4 Column Oven

The [Method Setup - Thermostat](#) tab serves for setting the temperature program of the analysis using the thermostat (column oven) configured in the [Merck - Hitachi LaChrom Elite Setup - Column Oven](#) dialog.

4.4.1 Merck - Hitachi LaChrom Elite Setup - Column Oven

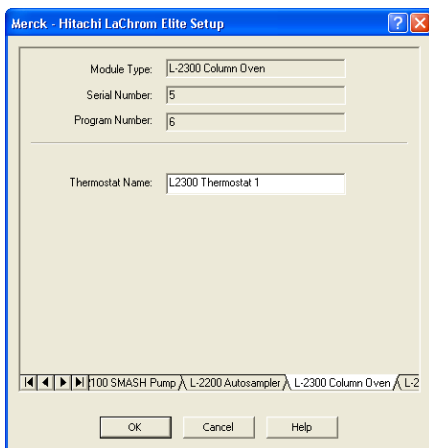


Fig 17: Merck - Hitachi LaChrom Elite Setup - Thermostat

Thermostat Name

Defines the name of the thermostat to be shown in the Method Setup dialog and on other places.

4.4.2 Method Setup - Thermostat

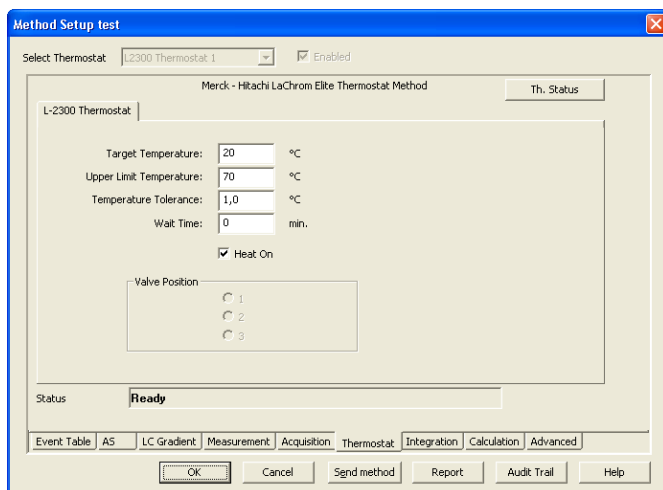


Fig 18: Method Setup - Thermostat

Target Temperature

Sets the target temperature.

Upper Limit Temperature

Sets the maximal allowed temperature. When the temperature in the thermostat exceeds the value entered here, the controller will report error and the analysis will stop.

Temperature Tolerance

The control module will not switch to the *READY* state until the actual temperature is not in the temperature tolerance and the *Wait Time* has elapsed.

Wait Time

Sets the time in min. until the Thermostat will report *READY* status.

Heat On

Switch the thermostat on/off.

Valve Position

Sets the initial position of the valves (if there are any installed).

4.4.3 Device Monitor

The **Device Monitor** window can be invoked by the *Monitor - Device Monitor* command from the **Instrument** window or using the Device Monitor ☹️ icon. Thermostat **Device Monitor** serves for monitoring the actual thermostat temperature and allows to switch the thermostat on and off.

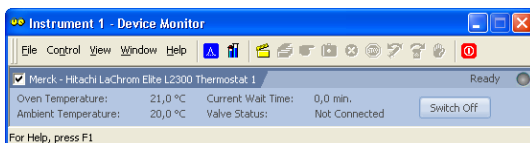


Fig 19: Device Monitor - Thermostat

Oven Temperature

Information about the oven temperature.

Ambient Temperature

Field displaying the actual thermostat temperature.

Current Wait Time

Information about the actual wait time duration.

Valve Status

Information about the valve status.

Switch On (Off)

Toggles the thermostat program (as set on the **Method Setup - Thermostat** tab) on and off.

4.4.4 Report Setup

Both parameters set on the **Merck - Hitachi LaChrom Elite Setup - Thermostat** tab (valve types used) and parameters set on the **Method Setup - Thermostat** tab can be printed. To do so, it is necessary to check the *Instrument Control* option on the **Method** tab of the **Report Setup** dialog.

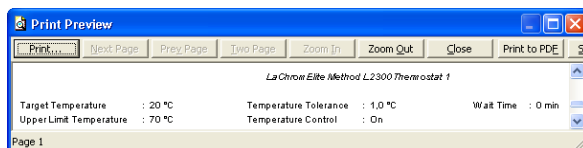


Fig 20: Report - Thermostat

4.5 UV Detector

The [Method Setup - Column Oven](#) tab and its sub-tabs serves for setting the UV Detector parameters configured in the [Merck - Hitachi LaChrom Elite Setup - Column Oven](#) dialog.

4.5.1 Merck - Hitachi LaChrom Elite Setup - Detector

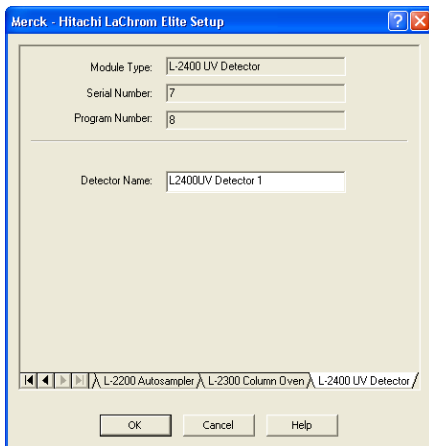


Fig 21: Merck - Hitachi LaChrom Elite Setup - UV Detector

Module Type

Displays the *Module Type* you have added.

Serial Number

Displays the Serial number you have entered for the module.

Program Number

Displays the Program Number you have entered for the module.

Detector Name

Sets the Name of the Detector.

4.5.2 Method Setup - Acquisition - Detector Settings

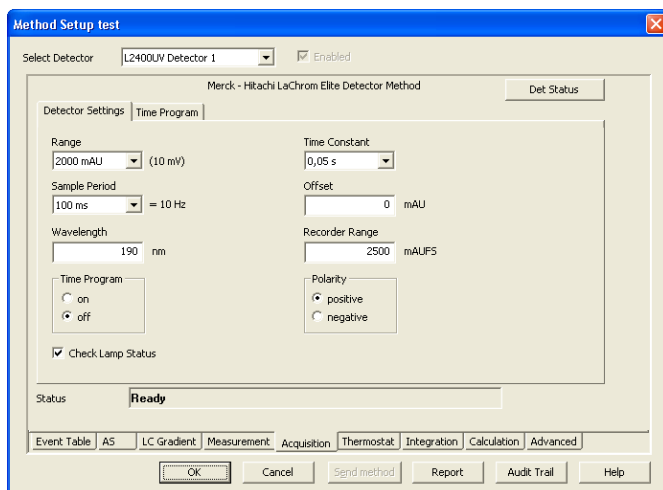


Fig 22: Method Setup - Acquisition - Detector Settings

Range

Sets the range of the detector.

Sample Period

Sets the period time in ms.

Wavelength

Sets the wavelength the detector is measuring on.

Time Program

Sets whether the Time Program is turned on/off.

Check Lamp Status

If Checked, the status of the lamp will be detected.

Time Constant

Defines the Time Constant of the detector's filter.

Offset

Sets the offset of the signal output.

Recorder Range

Sets the Recorder Range of the signal output.

Polarity

Sets whether the Polarity is positive/negative.

4.5.3 Method Setup - Acquisition - Time Program

This sub-tab allows to set the detector wavelength parameter defined on other tabs based on the analysis time.

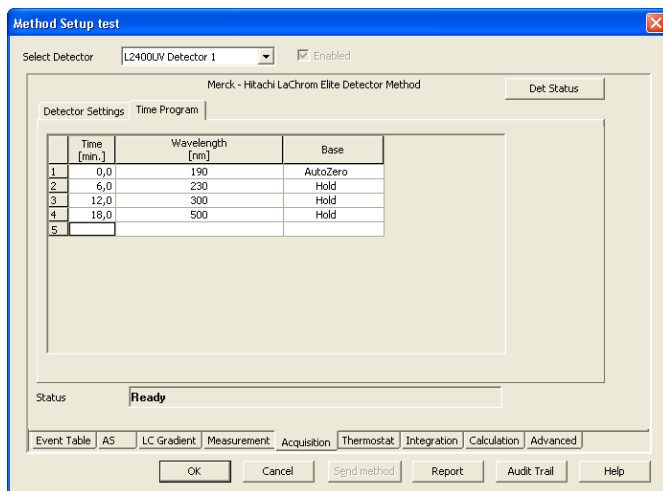


Fig 23: Method Setup - Acquisition - Time Program

Time Table

The wavelength settings defined on the [Detector Settings](#) sub-tab can be changed during the analysis by events programmed in the [Time Table](#).

Time [min.]

Sets the time of the wavelength change in min.

Wavelength

Sets the wavelength which will be set in the defined time.

Base

Choose the *AutoZero* if you want to reset the Detector to zero or *Hold* if you want to keep the current value.

4.5.4 Device Monitor

The **Device Monitor** window can be invoked by the *Monitor - Device Monitor* command from the **Instrument** window or using the Device Monitor 🤖 icon. It displays the actual wavelength and also allows to perform the *Zero Detector* action and switch the lamp off.

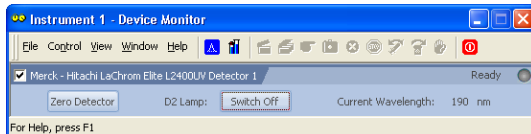


Fig 24: Device Monitor - UV Detector

It is possible to control the detector operation during the analysis in the **Device Monitor** window.

Zero Detector

Sets the response of the detector to 0.

Switch On (Off)

Turns the D2 Lamp on/off.

Current Wavelength

Current wavelength retrieved from the UV Detector.

4.5.5 Report Setup

All detector settings accessible on the **Method Setup - Acquisition** tab (including sub-tabs) are reported if the *Instrument Control* parameter on the **Method** tab of the **Report Setup** dialog is checked.

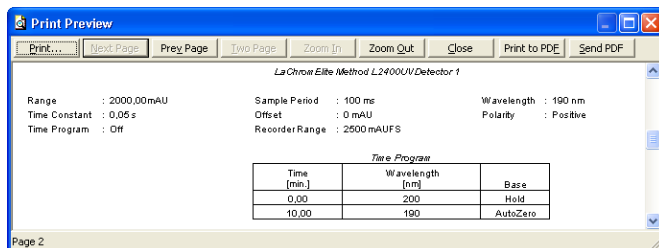


Fig 25: Report - UV Detector

Two groups of parameters are then printed, one common to all channels of a given detector, the other specific to particular channels. The first section also includes the **Time Table** from the **Method Setup - Acquisition - Time Program** tab. The other part of the report is the detector specific parameters.