# **Clarity Controls**

Shimadzu LC-10/20 System

LC + DET + AS + CO

ENG

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Phone: +420251013400 Fax: +420251013401 clarity@dataapex.com www.dataapex.com DataApex Ltd. Petrzilkova 2583/13 158 00 Prague 5 The Czech Republic

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Author: DM

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To facilitate the orientation in the Shimadzu LC-10/20 System 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, some sections are written in format other than normal text. These sections are formatted as follows:

Note:Notifies the reader of relevant information.Caution:Warns the user of possibly dangerous or very important information.

Marks the problem statement or trouble question. Description: Presents more detailed information on the problem, describes its causes, etc.

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

# 1 Shimadzu LC-10/20 System

This manual describes the setting of the **Shimadzu LC-10/20 System**. The control module enables direct control of the instrument over serial line or LAN (in case of **LC-20** series).

*Caution:* The **Shimadzu LC-10/20 System** control module can not be combined with **Shimadzu LC-10/20 Pump** control module on a single PC where Microsoft .NET Framework is installed.

*Caution:* A single **Clarity** station can only control one **Shimadzu LC-10/20 System**. This is the restriction of MIMIC libraries used to perform the instrument control.



Fig 1: Shimadzu Prominence system

As opposed to the **Shimadzu LC-10/20 Pump**, this control module operates the whole system (including detectors, autosampler, thermostat etc.), not just the pump, but requires any of the supported controllers for the operation of any other modules. 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:

Controllers: SCL-10Avp, CBM-20A, CBM-20ALite

**Pumps:** LC-6AD, LC-8A, LC-10AD, LC-10AS, LC-10AT, LC-10Ai, LC-10ADvp, LC-10ATvp, LC-20AT\*, LC-20AD\*, LC-20ADXR\*, LC-20AB\*, LC-20AS\*

**Detectors:** SPD-10A, SPD-10Ai, SPD-10AV, SPD-10Avi, SPD-10Avp, SPD-10AVvp, SPD-20A\*, SPD-20AV\*, RID-10A, RID-20A\*\*, RF-10A, RF-10AxI, RF-20A\*\*, RF-20Axs\*\*

Autosamplers: SIL-10ADvp, SIL-10AF, SIL-10AxI, SIL-HTA, SIL-HTC, SIL-20A\*, SIL-20AC\*, SIL-20AHT\*°, SIL-20ACHT\*°, SIL-20AXR\*, SIL-20ACXR\*

**PDA Detectors:** SPD-M10Avp\*\*\*, SPD-M20A\*

**Thermostats:** CTO-10A, CTO-10AC, CTO-10Avp, CTO-10ACvp, CTO-10ASvp, CTO-20A\*, CTO-20AC\*

The list continues to extend, for up to date list see the website www.dataapex.com. Some devices also require a firmware of particular minimal version for proper communication with **Clarity** (for more details see the chapter **Minimal version of device firmware required** on pg **4**). \* Devices marked with the asterisk will show in the System Configuration

dialog only after the **CBM-20A** (Lite) controller has been selected.

Caution: If any device from the LC-20 (Prominence) line is to be used with the LC-10 line Controller, it is necessary to set it to the LC-10 emulation mode. This is done (for example on the LC-20AD pump) on the devices display by pressing the VP key until the CALIBRATION screen appears. Then press func key, enter the password and keep pressing the func key until OP MODE screen shows. There, select the correct type of the controller installed. Later in the System Configuration dialog it is necessary to set the LC-20AD pump as LC-10AD when selecting the type of the pump in the Shimadzu LC-10/20 System setup.

<sup>°</sup> The autosamplers **SIL-20AHT** and **SIL-20ACHT** marked with the circle do not possess their specific option in the Shimadzu LC-10/20 System Autosampler dialog. In case of **SIL-20AHT** autosampler is present it should be configured through **SIL-20A** option. If the **SIL-20ACHT** autosampler is present it is necessary to configure it through **SIL-20AC** option.

\*\* **RID-20A**, **RF-20A** and **RF-20AXS** detectors must be always switched to the **LC-10 emulation mode** in order to be controlled (using MIMIC libraries) in **Clarity**.

\*\*\* **SPD-M10Avp** PDA detector is not supported on 64-bit Windows.

**RF-10AXL** and **RF-20AXS** (**RF-20AXS** with minimum firmware version 2.02) fluorescence detectors can be configured as a stand-alone control module developed through **Knauer** company. This control module for **RF-10AXL** and **RF-20AXS** fluorescence detectors supports serial communication via special RS232 cable (*p/n SK 11*). If the **RF-20A** detector was purchased through **Knauer** company (with special oem firmware version) it can be connected to **Clarity** with above mentioned special RS232 serial cable and controlled with above mentioned specific control module.

Clarity does not control following controllers: CBM-10A, SCL-10A.

# **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) and the PDA Detector will need the **PDA extension** (p/n A29) to operate.
- Supported Shimadzu system controller (see the full list of supported controllers in the chapter "Shimadzu LC-10/20 System" on pg 1.). The controller is needed even for the control of standalone PDA detector.
- Free serial port in the PC.

Note:	Modern computers usually have only 1 (if any) serial (COM) port installed. To use more devices requiring the RS232 port, the <b>MultiCOM</b> adapter (p/n MC01) is available.
<ul> <li>Stand cross</li> </ul>	dard RS232-compliant cross DB9F-DB9F serial cable (p/n SK01) or s LAN cable (p/n SK08) in case of <b>LC-20</b> system.
Note:	Cables are not part of <b>Clarity</b> Control Module. It is strongly recommended to order required cables together with the Control Module.
SCS     detee	I card for use of the SPD-M10Avp PDA detector. SPD-M20A PDA ctor uses LAN communication.
Caution:	It is recommended to use Adaptec SCSI cards. Drivers for Adaptec's cards are located on <b>Clarity</b> installation CD ROM in directory HW_DRIVERS\ASPI2. Read the README.TXT file before you install the drivers.
Caution:	SPD-M10Avp PDA detector is not supported on 64-bit Windows.

# 2.1 Minimal version of device firmware required

Tab 1: Controllers :

Name of Device:	Minimal version of firmware required:
SCL-10Avp	5.33
Subcontroller	5.20
OptionBox-L	3.2

#### Tab 2: Pumps :

Name of Device:	Minimal version of firmware required:
LC-10ADvp	5.26
LC-10ATvp	5.27
LC-10Ai	3.1
LC-10AD	3.1
LC-10AT	3.1
LC-10AS	3.1
LC-8A	1.5
LC-6AD	1.4

Tab 3: Autosamplers :

Name of Device:	Minimal version of firmware required:
SIL-10ADvp	5.32
SIL-HTA	6.02
SIL-HTC	6.02

Tab 4: Column Ovens :

Name of Device:	Minimal version of firmware required:
CTO-10Avp	5.24
CTO-10ACvp	5.24
CTO-10ASvp	5.24
CTO-10A[C]	3.0

Tab 5: Detectors :

Name of Device:	Minimal version of firmware required:			
SPD-10Avp	5.22			
SPD-10AVvp	5.22			
SPD-10Ai	3.0			
SPD-10Avi	3.0			
SPD-10A	3.0			
SPD-10AV	3.0			
RF-20A, Axs	1.10			

# **3 Installation Procedure**

# 3.1 Shimadzu LC-10/20 System communication

**Shimadzu LC-10/20 System** may be controlled either via standard serial cross DB9F-DB9F cable or via cross LAN cable, depending on the type of connector present on the controller. LAN communication is only present on **LC-20** line controllers.

#### **Serial Connection**

The **Shimadzu LC-10/20 System** is controlled by serial (RS232) communication. It uses standard serial cross DB9F-DB9F cable described in the picture.



Fig 2: Serial cross DB9F - DB9F cable

### LAN connection

For direct connection between chromatograph and computer, the cross LAN cable should be used. On the other hand, for the connection to the network, the straight LAN cable might be necessary (with older switches) instead.

### Shimadzu SCL-10Avp settings

In the controller it is necessary to set the *Classvp* parameter (accessible from the main menu via the system submenu (key **4**, it is located on the bottom of the list) to 5.x value. Other communication parameters set in the controller should be:

Interface: RS-232C Baud Rate: 19200

Level: Enhanced

*Caution:* Only COM ports up to COM9 are supported. Serial ports with higher numbers cannot be used. This also means that the **Shimadzu LC-10/20 System** cannot be connected to the serial port on Net-PAD (COM101 and COM102).

#### LC-20 components with SCL-10Avp controller

**Shimadzu LC-20** components have to be set to the **LC-10** emulation mode when they should be working under the **LC-10** controller. This is done from the device's keyboard according to this procedure (procedure presented on the **LC-20** series pump, may differ slightly for other devices):

- Press the **VP** button on the devices's front keyboard until the *CALIBRATION* inscription is shown on the display.
- Press the **func** button to enter the configuration. The password has to be filled in.

*Note:* The default password is *00000*.

- Press the **func** button repeatedly until the *OP MODE* inscription is shown on the display.
- Enter the desired number (1 for the pump) to switch the device to the SCL-10Avp emulation mode and press the enter button.
- Switch the device off and on again. The new communication parameters should be saved and used.

The procedure is in detail described in the **LC-20** hardware manual provided by the **Shimadzu** company.

#### CBM-20A(Lite) settings

It is necessary to set the communication parameters in the controller. From **Clarity** version 2.6.5, the parameters are:

#### Communication Mode: ClassVP

**Interface**: *RS232/Ethernet* (depending on the desired connection type) The exact procedure is described in the controllers hardware manual.

# 3.2 Software Installation

*Caution:* If the **PDA** detector is to be used, it is necessary to switch it on before the computer is turned on. This way, the SCSI controller will be detected automatically. When turned on later, the **PDA** has to be added manually using the **Add Hardware** function from the **Windows** Control Panel.

Install (or re-install) the **Clarity** software from the installation CD.

- Insert the installation CD into the CD-ROM of the computer and start the installation.
- Select the target directory and press the *Next* button.
- Select Custom installation. The control module for the Shimadzu LC-10/20 System is automatically included in it.
- If the PDA detector is to be used, select the Detector Control option (its icon is checked, but grayed) and either click the checkbox to change it to checked (not grayed) state or press the Details... button and check the Shimadzu PDA option there.
- Follow the instructions given by the installation procedure until the installation procedure ends.

# 3.3 Clarity Configuration

*Caution:* If the **PDA** detector will be used, it must be switched on prior to starting the computer.



Fig 3: System Configuration

- Start the **Clarity** station by clicking on the **M** icon on the desktop.
- Invoke the System Configuration dialog accessible from the Clarity window using the System Configuration... command.

- Press the *Add* button ① (see **Fig 3** on pg **8**.) to invoke the Available Control Modules dialog.
- You can specify the searching filter (2) to simplify the finding of the driver.
- Select the LC-10/20 System item and press the Add 3 button.

The Shimadzu LC-10/20 System Setup dialog will appear.

Shimadzu LC-10/20 System Setup		
System Controller Model: CBM-20A Serial Port: COM1 C IP Address: 0 . 0 . 0 . 0	Ритря Ритр <u>А</u> : LC-20AU Ритр <u>B</u> : LC-20AU Ритр <u>C</u> : None Ритр D: None	
Port: 5001	Detectors Detector A: SPD-10/ Detector B: None	
Seturn Controller Pump A Pump B Detector	Autosampler:  SIL-20A PDA Detector: SPD-M2 Ihermostat: CTO-20	DA
<u>, seed ( )</u>	Digital Input Name:	; Change
OK Cancel		Help

Fig 4: Shimadzu LC-10/20 System Setup

• Select the type of the controller in the *Model* field and the *Serial Port* or *IP Address* to which the controller is connected.

Note:	Only	CBM- 20A	and	CBM-20ALite	controllers	may	be	connected
	throu	gh LAN.						

- Select other parts of the system that are connected to the controller (such as pumps, detectors, autosampler etc.). Each module selected will add its own tab to the Shimadzu LC 10/20 System Setup dialog.
- *Note:* Other fields and parameters of the Shimadzu LC-10/20 System Setup dialog are described later in the manual(for more details see the chapter Shimadzu LC-10/20 System Setup Setup on pg 12).
  - Set the *Instrument Type* on the desired Instrument tab ④ to LC (or LC-PDA when you want to use the PDA detector).
  - Drag and drop the LC-10/20 System icon in from the Setup Control Modules (4) list on the left side of the System Configuration dialog to the desired Instrument (5) tab on the right side (6) (or use the is button (7) to do so).

- *Note:* When you only change some of the already configured parts of the **Shimadzu LC-10/20 System**, it is recommended to remove the system from the given Instrument tab and add it there once more.
  - Set the *Ext. Start Dig. Input* and *Ready Dig. Output* numbers (8) for your acquisition card according to the wires being used for synchronization.

*Caution:* The **Shimadzu LC-10/20 System** must have all subdevices configured on the same Instrument (cannot have parts of it on different Instruments) and no sub- device may be left unconfigured (if any subdevice is configured on the Instrument, all subdevices must be).

# 3.4 Shimadzu LC-10/20 System Setup

Shimadzu LC-10/20 Pump Setup dialog (accessible through the System Configuration dialog) is used to set the connection to the Shimadzu LC-10/20 System, select it's configuration and set some other basic parameters. The Setup tab is always opened by default.

#### **Digital Input Names**

Pressing the *Change* button opens the Digital Input Names dialog which allows to set the custom name for the virtual Shimadzu LC-10/20 System digital input. This input allows to start Clarity run by the signal of the Shimadzu LC-10/20 System controller.

Digital Input N	ames 🛛 🚺	3
Input no. 1	Descriptions: Digital Input 1	
ОК	Cancel Help	

Fig 5: Digital Input Names

## 3.4.1 Shimadzu LC-10/20 System Setup - Setup

Shimadzu LC-10/20 System Setup		×		
System Controller Model: CBM-20A Serial Port: COM1 IP Address: 0.0.0 Port: 5001 Connect	Pump <u>A</u> : Pump <u>A</u> : Pump <u>C</u> : Pump D: Detectors <u>Detector A</u> : <u>Detector B</u> : Autogampler: <u>PDA Detector</u> : <u>Ihermostat</u> :	LC-20AD LC-20AD None None SPD-10Avp SPD-10Avp SPD-10Avp SPD-10Avp SPD-10Avp CTO-20A V		
Setup Controller Pump A Pump B Detector A Autosampler PDA Detector Thermostat Digital Input Names Change				
OK Cancel		Help		

Fig 6: Shimadzu LC-10/20 System Setup - Setup

#### **System Controller**

Section defining the type of the **Shimadzu LC-10/20 System** controller and the connection to it.

#### Model

Sets the type of the controller unit. Only *SCL-10Avp*, *CBM-20A* and *CBM-20ALite* controllers are supported at the moment.

Note:

The selection of the controller influences the number of options that will be displayed when configuring other system devices. If any **LC-20** modules should be used with the **SCL-10Avp** controller, these devices have to be switched to the **LC-10 emulation mode** (for more details see the chapter **Installation Procedure** on pg **5**).

#### **Serial Port**

Selects the serial port to which the Shimadzu LC-10/20 System is connected.

#### IP Address

Sets the *IP Address* if using the LAN connection. LAN can only be used for the Shimadzu **LC-20** controllers.

#### Connect

Tests the connection to the controller. If it is correctly set, the Hardware Configuration dialog with all controller information and other information on added modules will appear.

H	ard	ware Configu	ration		×
	-Co	ntroller			
		Model:	SCL-10Avp		
		ROM Version:	5.33		
		Serial Number:	C21013750663		
		Connection :	COM9		
		Model	ROM Version	Serial Number	٦
	1	SIL-10ADvp	5.34	C21053501737	-
	2	SPD-10Avp	5.24	C20994333672	
	3	LC-10ADvp	1.06	L20104200259	
	4	CTO-10ACvp	5.27	C21034330180	
				Close	

Fig 7: Hardware Configuration

#### Pumps

Sets the model of the pump connected. Up to three pumps may be configured in a **Shimadzu LC-10** and four pumps on **Shimadzu LC-20** System.

The first pump may have valves configured, other pumps are not allowed to have any valves. Any pump may be set as gradient or auxiliary, but maximum of four solvents can be used in a gradient, so any further pumps are automatically configured as auxiliary.

#### Detectors

Sets the model of the detector connected. Up to two detectors may be configured in a **Shimadzu LC-10/20 System**.

#### Autosampler

Sets the model of the autosampler.

#### **PDA Detector**

Set the model of the **PDA** detector.

#### Thermostat

Sets the model of the thermostat.

*Note:* It is recommended to add the modules one by one and to check the communication with the *Connect* button in between.

## 3.4.2 Shimadzu LC-10/20 System Setup - Controller

Shimadzu LC-10/20 System Set	up		×					
Switches System Protect Sound Alarm on Error Turn Off Relays on Error Autozero Detector A Autozero Detector B	Relays Relay <u>1</u> : Relay <u>2</u> : Relay <u>3</u> : Relay <u>4</u> : E <u>x</u> ternal Start:	Start  Start Start Start Start All Runs						
Setup Controller Pump A Pump E	Setua Costroller Pump A Pump B Detector A Autosampler Thermostat							
Digital Input Names Change								
			neip					

Fig 8: Shimadzu LC-10/20 System Setup - Controller

#### Switches

#### System Protect

While checked, in case of exceeding the maximal pressure the flow rate will be decreased to one half of the set value. If unchecked, the exceeding will shut-off the pump.

#### Sound Alarm on Error

Check to signalize error messages by sound.

#### **Turn Off Relays on Error**

If checked, in case of the controller error the AC power for devices plugged in the multiple terminal box will be turned off.

#### Autozero Detector A (B)

If checked, the particular detector response will be set to zero at the start of acquisition.

#### Autozero PDA

If checked, the PDA detector response will be set to zero at the start of acquisition.

#### Relays

#### Relay 1 (..4)

These controls define the trigger criterion for each controller relay outputs. Possible criteria are:

Start - Relay closed at the beginning of the analysis.

Stop - Relay closed at the end of the analysis or time program.

*Error* - Relay closed in the event of the system controller error.

*Event* - Relay closed on the time basis as the event of the HPLC time program.

#### External Start

This control sets the conditions for closing the controllers start relays at the beginning of the analysis. Possible options are:

Disable - External start is disabled.

*All Runs* - Closes start relays at each analysis start including starts with no injection.

*Inject Only* - Closes start relays only after starting the analysis with the injection performed.

# **4** Using the control module

Several new tabs appear in the Method Setup dialog, based on the settings performed in the Shimadzu LC-10/20 System Setup dialog. These new tabs enable the setting of the **Shimadzu** system operation program.

*Note:* The instrument method is always sent to the **Shimadzu LC-10/20 System** as a whole.

# 4.1 Pump

## 4.1.1 Shimadzu LC-10/20 System Setup - Pump

This tab of the Shimadzu LC-10/20 System Setup dialog allows to set the parameters of the given pump.

Shimadzu LC-10/2	0 System Setup			×
Auxiliary Pump		Solvent <u>1</u> Name:	PumpA 1	
Valve Model :	FCV-10AL	Solvent <u>2</u> Name:	PumpA 2	
Solvents :	4 💌	Solvent <u>3</u> Name:	PumpA 3	_
Low Pressure Limit:	0 MPa	Solvent <u>4</u> Name:	PumpA 4	
High Pressure Limit:	43,2 MPa			
Setup Controller	Pump A Pump B Dete	ctor A Autosampler	Thermostat	
		Digital I	input Names	Change
ок	Cancel			Help

Fig 9: Shimadzu LC-10/20 System Setup - Pump

#### Auxiliary Pump

Check for the pump to become auxiliary pump (not part of the **Gradient Table**). If there are more pumps added in the configuration and the first one is set either as low-pressure gradient or binary pump, the other pumps are automatically set as *Auxiliary* pumps.

#### Valve Model

Select the valve model installed in your pump. This selection influences the number of solvents available.

#### Solvents

Select the number of solvents to be used.

*Note:* Only the first pump configured as a gradient pump allows to set the number of solvents in the Low-pressure gradient. Available options depend on the *Valve Model* configured.

#### Solvent 1 (..4) Name

Change names for the particular solvent.

#### 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.

*Note:* Exceeding of *High Pressure Limit* or *Low Pressure Limit* defined here will cause a system error, requiring the closure and reopening of the given Instrument.

## 4.1.2 Method Setup - LC Gradient

The Method Setup - LC Gradient dialog serves for setting up the LC instrument method.

			idient I al	ble				
	Time [min]	A [%]	В [%]	C [%]	D [%]	Flow [ml/min]	^	Standby Flow
1	Initial	10,0	20,0	65,0	5,0	1,000		
2	3,00	10,0	20,0	65,0	5,0	1,000		Time to Standby 0 [min]
3	6,00	50,0	20,0	25,0	5,0	1,000		
4	10,00	50,0	20,0	25,0	5,0	1,000		Standby Time 0 [min]
5	15,00	95,0	0,0	5,0	0,0	1,000		
Mo Mo Ho	1,5- 1,0- 0,5- 0,0 0	5	Ti	10 me	15	-80 -60 -40 -20 0 [min.]	Flow	Initial     Standby     Initial - Standby     Options

Fig 10: 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.

*Note:* The values of the *Flow* for the **Shimadzu LC-10/20** pumps vary in certain range according to the type of the pump. Check the device manual for valid *Flow* ranges for your pump.

#### 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.

#### **Initial - Standby**

The flow is defined by the first row of the gradient table (the *Initial* row) after the method is sent, or by the value entered in the *Standby Flow* field after the method finishes.

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*.

#### 4.1.2.1 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 Shimadzu LC-10/20 System 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.

Gradient Optic	ons			
Min. Pressure :	0	[MPa]	Solvent 1	Water
Max. Pressure	40	[MPa]	Solvent 2	Methanol
			Solvent 3	Acetonitrile
			Solvent 4	D
		OK	Cancel	Help

Fig 11: 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 **Shimadzu LC-10/20** 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.

## 4.1.3 Method Setup - LC

If the only pump was set to *Auxiliary* mode in the Shimadzu LC-10/20 System Setup - Pump dialog, the LC tab will appear instead of the LC Gradient tab. The LC tab will also appear if the second pump is set to *Auxiliary* mode (showing only the Auxiliary Pump sub-tab) or when primary pump is configured with valve and only one solvent in the Shimadzu LC-10/20 System Setup - Pump dialog (showing only the LC Valve sub-tab).

In case that several pumps with the LC tab available are configured on the same **Clarity** Instrument, it is possible to switch between them using the *Select LC* menu on the top of the LC tab.

#### From LC

Acquires the status of the auxiliary pump from the controller.

#### LC Status

Invokes the hardware configuration dialog listing the settings of the **Shimadzu LC-10/20 System**. The upper part shows the settings of the controller, the lower part the settings of other modules.

Hardware Configuration										
Controller										
	Model: SCL-10Avp									
		ROM Version:	5.33							
		Serial Number:	C21013750663							
		Connection :	COM9							
	_				_					
		Model	ROM Version	Serial Number						
	1	SIL-10ADvp	5.34	C21053501737						
	2	SPD-10Avp	5.24	C20994333672						
	3	LC-10ADvp	1.06	L20104200259						
	4	CTO-10ACvp	5.27	C21034330180						
				Close						

Fig 12: Method Setup - LC - Hardware Configuration

#### **Auxiliary Pump tab**

Me	thod	Setu	p Test							
S	elect L(	с	P	umpB	•	🔽 Enable	d			
	LC-10/20 System LC Method LC Status									
	Auxiliary Pump									
	Initial Flow: 0 ml/min									
		Solve	nt B Conc	entration:	0	%				
		Low F	Pressure L	imit:	0	MPa				
		High I	Pressure L	.imit:	40	MPa				
		Time	Program							
			Time		-					
			[min.]	Event		Parameter				
		1	1,00	Flow	2,0	0000				
		2	6,00	Flow	1,4	1000 3000				
		4	20,00	1101	0,0	,000				
	Charles		1	D					Exem LC	
	Status Ready From LC									
	Event	t Tabl	e LC	Measurement Integr	ation	Calculation 4	dvanced			
				ОК	Can	cel Se	nd method	Report	Audit Trail	Help

Fig 13: Method Setup - LC - Auxiliary Pump

#### **Initial Flow**

Sets the initial flow of the auxiliary pump.

#### **Solvent B Concentration**

Allows to set the percentage of the second solvent in the mixture created by auxiliary binary pump. This field is only present for the **LC-20AB** pump (which is binary) in the auxiliary pump mode.

#### Low Pressure Limit

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

#### **High Pressure Limit**

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

#### Time Program

This table sets the flow changes for the auxiliary pump based on the analysis time. Insert the desired time in minutes into the *Time* column, set the *Flow* event in the *Event* column and the desired flow value into the *Parameter* column.

#### LC Valve tab

Tab listing the Valve Position table. Each row defines the change of the valve position in given time. These settings can be later printed as a part of the report.

Note:

The valves set on particular pumps may not be governed from the Method Setup - Event Table dialog, only from the Time Table on the Method Setup - LC - LC Valve tab.

Method	Setu	id Test							X
Select L(	c	P	JmpA	<b>_</b>	🔽 Enabled				
Aux	LC-10/20 System LC Method Auxiliary Pump LC Valve								
		Time [min.]	Valve Position	_					
	2	0,01	B						
	4	2,00	B						
	5								
		r							
Statu	IS	ļ	Ready					From LC	
Even	t Tab	le LC	Measurement Inte	egration C	alculation Advance	1			
			ОК	Cance	Send meth	od Report		Audit Trail	Help

Fig 14: Method Setup - LC - LC Valve

### 4.1.4 Method Setup - Advanced

Method Setup Demo1			×
Common for all detectors			
Subtraction			
Chromatogram	[None]		
Matching	No Change	<b></b>	
	<u>S</u> et	None	
Column Calculations			
Unretaine	d Time 0 [m	in.]	
Column Le	ngth 3000000 [m	im]	
	Statistical Moments		
	From Width at 50%		
	Auxiliary Signal	Store	
1 LC Flow PumpA 2 LC Pressure PumpA			
3 LC Flow PumpB			
,			
Event Table LC Gradient Measurement	Integration Calculation Adv	anced	
ОК Саг	icel S <u>e</u> nd Method	Report Audi	t Trail Help

Fig 15: Method Setup - Advanced

Shimadzu LC-10/20 System provides the pump flow and pressure auxiliary signals for use in **Clarity**. To save the auxiliary signals into each chromatogram measured according to the given method, check the particular checkbox in the lower section of the Method Setup - Advanced dialog.

## 4.1.5 Device Monitor

The pump status dialog can be invoked by the *Monitor - Device Monitor* command from the Instrument window or using the LC Monitor 32 icon.

### **Device Monitor - LC Monitor**

It displays the actual flows of particular solvents, as well as the total flow, the total pressure and the analysis time.



Fig 16: 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.

Set Flow		
Total Flow	1,5	[ml/min]
Water	80	[%]
Methanol	15	[%]
Acetonitrile	5	[%]
ОК	l	Cancel

Fig 17: 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.

### **Device Monitor - Auxiliary Pump**

Each Auxiliary pump has its own device monitor displaying the actual flow and pressure on the device.

🚥 Instrument 1 - Device Monitor										
Eile Control View Window Help 🔼 👔 🖆 🍯 🗊 🖆 🛇 🎯 🌮 😭 🤣 🧿										
🗹 LC-10/20 System PumpA 🛛 💦 Ready 🌑										
Flow 0,000 ml/min Pressure 0,000 MPa										
For Help, press F1										

Fig 18: Device Monitor - Auxiliary pump

## 4.1.6 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.

🙆 Pr	int Preview									
[Prin	Next Page	Pre <u>v</u> Page	<u>T</u> wo Page Zoon	n In Zoom	n <u>O</u> ut <u>C</u> la	ose Print	to PD <u>E</u> Ser	nd PDF		
	Standby How Time to Standby Min. Pressure	: 1,00 ml/min : 0,00 min. : 0,00 MPa			Idle Sta Standb Max. Pr	ite : Initia y Time : 0,00 ressure : 40,00	l min. ) MPa			
			Time [min]	Water [%]	Methanol [%]	Acetonitrile [%]	How [ml/min]	]		
			Initial	10	20	70	1,000	1		
			3,00	10	20	70	1,000			
			6,00	50	20	30	1,000			
			10,00	50	20	30	1,000			
			15,00	95	0	5	1,000			
			18,00	95	0	5	1,000	]		×
Page 1										10

Fig 19: Report - pump part of the gradient

If the pump is set as an Auxiliary pump, thus excluded of the **Gradient Table**, the values set on the of the Method Setup - LC tab are reported, including the **Time Table**. To do so, the *Instrument Control* parameter on the Method tab of the Report Setup dialog must be checked.

🗟 Print Preview									
Print Next Page Prey	<u>Page Two Page</u>	Zoom In Zoom C	out <u>⊂</u> lose	Print to PDE	DF				
Shimadzu LC-10/20 System LC-20AB Method - PumpB									
Initial How : 0 ml/min		Low Pressure Limit : 0 MPa Time Program		High Pressure Lir	nit : 40 MPa				
	Time [min]	Event		Parameter					
	6,00	How		1,200					
	8,00	How		1,500					
	12,00		How						
Valve Time Program									
		Time [min]	Valve Position						
		6,00	ABA						
		8,00	AAB						
		12,00	ABB						
Page 1									

Fig 20: Report - Auxiliary pump

# 4.2 Detector

### 4.2.1 Shimadzu LC-10/20 System Setup - Detector

The Shimadzu LC-10/20 System Setup - Detector tab for SPD detectors and **RF** detectors looks the same, although some items may be missing depending on the type of the detector.

Shimadzu LC-1	10/20 System Setu	ıp			×
Base Period:	100 💌	ms Si Si	ignal <u>1</u> Name: ignal <u>2</u> Name:	DetectorA 1 DetectorA 2	-
Setup Control	er Pump A Pump B	Detector A	Autosampler	Thermostat	
			Digital Ir	nput Names	Change
ОК	Cancel				Help

Fig 21: Shimadzu LC-10/20 Detector setup

#### **Base Period**

Specifies the base rate of the detector signal acquisition. The value set here is also limiting the available range of values for the *Sampling Rate* as set in the <u>Method Setup - Acquisition</u> dialog - the lower *Base Period* is, the higher can the *Sampling Rate* be. The possible values are influenced by the checking/unchecking of the *Dual Mode* item.

#### **Dual Mode**

Check to perform the data acquisition on two wavelengths.

#### **Use Recycle Valve**

Defines whether the solvent recycling valve is used during the acquisition.

#### Signal 1 (2) Name

Sets the name of the given detector.
# **RID-10A Detector Setup**

The Shimadzu LC-10/20 System Setup - Detector tab for the **RID-10A** detector differs somewhat from the classical one. All options are the same except for the *Large Scale Preparative Option Installed*.

Shimadzu LC-10/20 System Setup
Base Period: 100 💌 ms Signal <u>1</u> Name: DetectorA
Large Scale Preparative Option Installed
Setup Controller Pump A Pump B Detector A Autosampler PDA Detector Thermostat
Digital Input Names Change
OK Cancel Help

Fig 22: Shimadzu LC-10/20 Detector setup - RID-10A

# Large Scale Preparative Option Installed

Defines whether the optional Large Scale Preparative Option is installed in the **RID-10A** detector.

# 4.2.2 Method Setup - Acquisition - Detector

In case of greater number of detectors configured on one Instrument, it is possible to switch to the desired detector by selecting it in the *Select Detector* menu on the upper part of the Method Setup - Acquisition window.

The chapter describes the SPD detectors, other detector types are described later in the manual.

Method Setup Test	×
Select Detector A 1	
LC-10/20 System Detector Method	Det Status
Detector Time Program Analog Output	
Wavelength Ch.1:       254       nm         Wavelength Ch.2:       254       nm         Lamp:       D2       ▼         Polarity:       Positive       ▼         Response:       1,0       ▼         Sampling Rate:       10,00       Hz         ✓       Cell Temperature:       40       °C         ✓       Check Cell Temperature	
Status Pondu	Erom Det
Juius jneauy	THOMPSE
Event Table Measurement Acquisition Integration Calculation Advanced	
OK Cancel Send method Report	Audit Trail Help

Fig 23: Method Setup - Acquisition - Detector

# Wavelength Ch.1

Defines the initial wavelength of the first channel.

### Wavelength Ch.2

Defines the initial wavelength of the second channel, available only in the *Dual Mode*. Any changes made on the tab of one channel will be also changed on the other channel of the *Dual Mode* detector.

### Lamp

Sets the lamp used at the beginning of the analysis. Available options are (based on the type of the detector): *Off*, *D2*, *W*, *D2*+*W* 

### Polarity

Selects the initial polarity of the detector.

### Response

Defines the level of the digital noise filter. The higher the number set, the lower the noise level is. On the other hand, some peaks may not be detected.

# Sampling Rate

Sets the sampling rate of the detector. The available detector sample rates are dependent on the *Base Period* settings on the <u>Shimadzu LC-10/20</u> <u>System Setup - Detector</u> tab - by using the shortest *Base Period* of 20 ms, the *Sampling Rate* can be set up to 50 Hz. Please note that in dual mode the *Base Period* is limited to 100 ms and maximum *Sampling Rate* to 10 Hz.

# **Cell Temperature**

Sets the cell temperature of the given detector. The Value range is between 9 and 50  $^{\circ}$ C.

# **Check Cell Temperature**

If checked, doesn't allow the Instrument to become *READY* until the temperature is not close to the temperature set in the *Cell Temperature* field (with the tolerance of 1,5 °C).

# 4.2.2.1 Method Setup - Acquisition - RF Detector

This sub-tab replaces the **Detector** sub-tab when one of the configured **RF-10A** and **RF-10AxI** detectors is selected in the *Select Detector* field.

Method Setup Test	X
Select Detector DetectorA 💽 🔽 Enabled	
LC-10/20 System Detector Method	Det Status
RF Detector Time Program Analog Output	
Excitation Wavelength: 350 nm Emission Wavelength: 450 nm Lamp: On Gain: x4 Sensitivity: Low Response: 3,0 Sampling Rate: 10,00 Hz	
Status Ready	From Det
Event Table Measurement Acquisition Integration Calculation Advanced	
OK Cancel Send method Report	Audit Trail Help

Fig 24: Method Setup - Acquisition - RF Detector

### **Excitation Wavelength**

Sets the excitation wavelength. The possible values are in the range 200 to 900 nm.

### **Emission Wavelength**

Sets the emission wavelength. The possible values are in the range 200 to 900 nm.

### Lamp

Sets whether the lamp should be activated prior to the analysis.

### Gain

Selects the detector gain amplification value. Possible options are x1, x4 and x16.

### Sensitivity

Sets the detector sensitivity by adjusting the voltage on the photomultiplier.

# Response

Defines the detector signal response. Possible values vary for the **RF-10A** and **RF-10AxI** detector.

### Sampling Rate

Sets the sampling rate of the detector. The available detector sample rates are dependent on the *Base Period* settings on the <u>Shimadzu LC-10/20</u>

System Setup - Detector tab - by using the shortest *Base Period* of 20 ms, the Sampling Rate can be set up to 50 Hz. Please note that in dual mode the *Base Period* is limited to 100 ms and maximum Sampling Rate to 10 Hz.

# 4.2.2.2 Method Setup - Acquisition - RID Detector

This sub-tab replaces the **Detector** sub-tab when the configured **RID-10A** detector is selected in the *Select Detector* field.

Method Setup Test	
Select Detector Detector V Enabled	
LC-10/20 System Detector Method	Det Status
RID Detector Time Program Analog Output	
Mode:       Analytical         Polarity:       Positive         Response:       1,0         Jampling Rate:       10,00         V       Cell Temperature:         40       °C         Image: Check Cell Temperature	
Status Ready	From Det
Event Table Measurement Acquisition Integration Calculation Advanced	
OK Cancel Send method Report	Audit Trail Help

Fig 25: Method Setup - Acquisition - RID Detector

#### Mode

This field specifies the operating mode of the detector. The contents of the field depend on the state of the *Large Scale Preparative Option Installed* checkbox in the Shimadzu LC-10/20 System Setup - Detector dialog for **RID** detector. If the checkbox is checked, the *Large Scale Preparative* text is the only option to be selected in the field. If the checkbox is left unchecked, the *Analytical* and *Semi-preparative* options are available.

### Polarity

Sets whether the increasing refraction value will be counted as more *Positive* or more *Negative* voltage signal.

### Response

Defines the level of the digital noise filter. The higher the number set, the lower the noise level is. On the other hand, some peaks may not be detected.

### Sampling Rate

Sets the sampling rate of the detector. The available detector sample rates are dependent on the *Base Period* settings on the <u>Shimadzu LC-10/20</u> <u>System Setup - Detector</u> tab - by using the shortest *Base Period* of 20 ms, the *Sampling Rate* can be set up to 50 Hz. Please note that in dual mode the *Base Period* is limited to 100 ms and maximum *Sampling Rate* to 10 Hz.

# **Cell Temperature**

Sets the temperature of the detector cell.

## **Check Cell Temperature**

When checked, the Instrument will not be ready until the actual temperature will reach the set value (with the 1.5 °C tolerance). While the checkbox is unchecked, no temperature verification will be performed.

# 4.2.3 Method Setup - Acquisition - Time Program

This sub-tab allows to reset the detector parameters defined on other tabs based on the analysis time. Note that the options listed in the *Event* column depend on the type of the detector (not all events listed under the picture are accessible).

Metho	d Se	tup Tes	t					X
Selec	t Dete	ector	DetectorA 1	💌 🔽 Ena	bled			
			LC	-10/20 System Det	ector Method		Det Status	
1	)etect	or Time	Program Analog Output					1
		Time	Event	Parameter				
		[min.]	Lyon	Parameter				
	1	1,00	Lamp	D2 Negative	-			
	3	6,50	Polarity	Positive	-			
	4	9,00	Wavelength Ch. 1	380	-			
	5	,						
-								
St	atus		Ready				From Det	
Ev	Event Table Measurement Acquisition Integration Calculation Advanced							
			ОК	Cancel	Send method	Report	Audit Trail	Help

Fig 26: Method Setup - Acquisition - Time Program

### Time Table

The initial analysis settings defined on the **Detector** sub-tab can be changed during the analysis by events programmed in the **Time Table**. Possible events are:

Zero - Set the current absorbance value to zero.

Mark - Marks recorder output.

*Polarity* - Change the polarity of the signal.

*Recorder Range* - Change the range of the output signal.

*Response* - Change the settings of the digital noise filter.

*Sensitivity* - Changes the sensitivity parameter. Only available for **RF** detectors.

Lamp - Select the lamp type to be used.

Wavelength - Set the wavelength of the chosen detector.

*Cell Temperature* - Set the desired cell temperature. Allowed values are in range 9 - 50 °C, 0 means that the cell temperature control is off.

*Flow* - Switches the flow in the detector reference cell *On* and *Off*. Only available for **RID** detectors. The function of the command is the same as the function of the *Flow Off/On* button in the **Device Monitor** window.

*Balance* - Sends the *Balance* command to the detector. Only available for **RID** detectors. The function of the command is the same as the function of the *Balance* button in the Device Monitor window.

*Gain* - Change the current *Gain* parameter. Only available for **RF** detectors.

*Excitation Wavelength* - Change the current *Excitation Wavelength* parameter. Only available for **RF** detectors.

*Emission Wavelength* - Change the current *Emission Wavelength* parameter. Only available for **RF** detectors.

# 4.2.4 Method Setup - Acquisition - Analog Output

Method Setup Test		<
Select Detector A 1		
LC-10/20 System Detector Method Detector Time Program Analog Output	Det Status	
Auxiliary Range: 1,0 ▼ AU/V Recorder Range: 1 AUFS Synchronize with Auxiliary Range Recorder Mode: Ch. 1 Signal ▼ Raţio Range: 10 nm Raţio Threshold: 0,0001 AU		
Status Ready	From Det	
Event Table Measurement Acquisition Integration Calculation Advanced		
OK Cancel Send method Report	Audit Trail Help	

Fig 27: Method Setup - Acquisition - Analog Output

#### **Auxiliary Range**

Sets output range of integrator terminals.

*Caution:* Auxiliary range will affect the acquired signal. For **RID-10A** and **RID-20A** detectors use 0.25 mRIU/V to get correct signal values

#### **Recorder Range**

Sets the range of the recorder.

#### Synchronize with Auxiliary Range

Synchronizes the *Recorder Range* with the *Auxiliary Range* value.

#### **Recorder Mode**

Sets the output mode of the recorder terminals.

#### **Ratio Range**

Sets the range of the signal ratio calculation.

#### **Ratio Threshold**

Sets the threshold of the signal ration calculation.

# 4.2.5 Device Monitor

The Device Monitor window can be invoked by the *Monitor - Device Monitor* command from the Instrument window or using the Device Monitor 22 icon. It displays the actual wavelength and the lamp used, the cell temperature (if configured) and allows to perform the *Autozero* action and switch the signal on outside of the analysis.



Fig 28: Device Monitor - Detector

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

# Auto Zero

Sets the response of the detector to 0.

# Wavelength

Displays the wavelength set in the method.

# Lamp

Displays the type of lamp set in the detector.

# Cell Temp.

Shows the actual temperature on the detector cell.

# **Check Signal On**

Turns the detector signal monitoring on and off. Active only when analysis is not running.

- *Note:* This type of detectors is giving data only during analysis. Pressing this button starts a "dummy" analysis run (all data discarded) that allows to check the detector signal before the actual analysis. It should be turned *OFF* before starting the analysis by external contact.
- *Caution:* The *Check Signal On* function can not be activated when a *Purge* was used to set the flow and composition manually from the Device Monitor. You need to use the *Resume Idle* function from the LC Device Monitor first.

# **Device Monitor - RID Detector**

The **RID** detectors has slightly different **Device Monitor** window with other options on the monitor pane. Only new items are described:



Fig 29: Device Monitor - RID Detector

# Balance

When invoked, sends the *Balance* command to the detector. For the description of the command see **Shimadzu RID-10A** detector documentation.

# Flow Off/On

When invoked, the flow in the reference detector cell is switched off and the button changes to the *Flow On*. If invoked again, the flow will be renewed and the button returns to the *Flow Off* state.

# **Device Monitor - RF Detector**

The **RF** detectors has slightly different **Device Monitor** window with other options on the monitor pane. Only new items are described:



Fig 30: Device Monitor - RF Detector

# Ex. Wavelength

Displays the currently set *Excitation Wavelength*. This value may be changed in the Time Table on the Method Setup - Acquisition - Time Program tab of the **RF** detectors.

# Em. Wavelength

Displays the currently set *Emission Wavelength*. This value may be changed in the Time Table on the Method Setup - Acquisition - Time Program tab of the **RF** detectors.

# 4.2.6 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. For each detector set in the Shimadyu LC-10/20 System Setup dialog, a specific section of the report will be printed.

🙆 Print Preview				
Print <u>N</u> ext Page	Prey Page <u>T</u> wo Page	Zoom In Zoom Out Close	Print to PDE Send PDF	
	Shi	imadzu LC-10/20 System SPD-20AV Method	- Common Part	
Base Period Lamp Gell Temperature	: 100 ms : D2 : 40 °C Time [min] 2,00 8,00 12,00	Dual Mode : Yes Polarity : Positive Check Cell Temperature : Yes <i>Time Program</i> Event Event Zero Wavelength Ch. 1 Wavelength Ch. 2	Use Recycle Valve : Response : Parameter 350 254	No 1,0 s
Wavelength : 2 Wavelength : 3		imadzu LC-10/20 System SPD-20AV Method Sampling Rate : 10,0000 Hz Simadzu LC-10/20 System SPD-20AV Method Sampling Rate : 10,0000 Hz	- DetectorA 1 (- DetectorA 2	
Page 1				//

Fig 31: Report Setup

Two groups of parametres 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 parametres. When the Dual Mode is off, only one set of parametres will be printed in this section, while in the Dual Mode, two sets will be present, one for each channel.

**Report Setup - RID Detector** 

d	Print	Preview						
	Print	Next Page	Prey Page Ywo Page	Zoom In Zoom Out	<u>C</u> lose Pri⊓	nt to PDE Send PDF		
				Shimadzu LC-10/20 System RID-	10A Melhod - Delei	ctorB		-
		Base Period	: 100 ms	Large Scale Prep. Option Installe	ed : Yes			
		Mode	: Large Scale Preparative	Polarity	: Positive	Response	: 1,5 s	
		Sampling Rate	: 10,0000 Hz	Cell Temperature	:40 °⊂	Check Cell Temperature	: Yes	
				Time Program				
			Time [min]	Event		Parameter	]	
			2,00	Zero				
			8,00	Recorder Ra	nge	100	]	
			12,00	Cell Tempera	ture	50	1	
			-				-	×
Pag	je 2							

Fig 32: Report Setup - RID Detector

The report setup of the **RID-10A** detector differs only in the items displayed, it is the same in all other respects.

# **Report Setup - RF Detector**

d Print Preview				
Print Next Page Pr	e <u>v</u> Page <u>T</u> wo Page	Zoom In Zoom Out Close	Print to PDE Send PDF	₹
	و	himadzu LC-10/20 System RF-10Ax/ Method	- DelectorA	
Base Period : Excitation Wavelength : Sensitivity :	100 ms 350 nm Low	Emission Wavelength : 450 nm Response : 3,0 s	Gain : x4 Sampling Rate : 10,	.0000 Hz
Lamp :	0n	Time Program		
	Time [min]	Event	Parameter	
	1,00	Lamp	On	
	8,00	Sensitivity	Medium	
	12,00	Gain	x16	
Page 1				<b>—</b> ///

Fig 33: Report Setup - RF Detector

The report setup of the **RF** detectors differ only in the items displayed, it is the same in all other respects.

# 4.3 Autosampler

The autosamplers used with the **Shimadzu LC-10/20 System** allow 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 Shimadzu LC-10/20 System Setup - Autosampler

Some options may be missing or shaded depending on the type of the autosampler installed.

Shimadzu LC-10/20 System Setup	×
Name:     Sampler 1       Sample Loop Size:     50     µl       Injection Triggered By External Device     Skip Missing Yial       Sample Cooler Installed       MTP Sample Order       Horizontal       I yetrical	T
Digital Input Names Change	1
OK Cancel Help	

Fig 34: Shimadzu LC-10/20 System Setup - Autosampler

# Name

Sets the name of the autosampler.

# Sample Loop Size

Defines the volume of the injector loop. Some parameters are predefined, but any whole number in certain range can be entered. The range depends on the type of the autosampler.

# **Injection Triggered By External Device**

Sets whether the injection will be performed only after the external start contact on the controller is closed.

# **Skip Missing Vial**

Defines whether the missing vial in the sequence measurement should be skipped. Otherwise, the sequence would be stopped when encountering the missing vial.

# Sample Cooler Installed

Defines whether the tray cooler is installed.

# **MTP Sample Order**

Defines the numbering of wells in the plate when the MTP Tray is used. If other trays are used, this option is ignored. Possible parameters are *Horizontal* or *Vertical*.

## Rack Changer Installed

Enables the rack changer control in case a rack changer is installed.

## **Rinse Pump Installed**

Enables the control of the rinse pump (if it is installed).

## **Supports Pretreatment**

Enables the display of the Pretreatment sub-tab of the Method Setup - AS dialog. For this option to function, it is necessary to have the **Pretreatment** option installed in the hardware.

# 4.3.2 Method Setup - AS - Sampler

Method Setup Test						
Select Sampler	ampler 1	Ţ	🔽 Enabled			
		LC-10/20 S	system Sampler Method		AS Status	
Sampler Time Proc	gram Pretreatm	nent				
Rack Type: Ra	ck Changer	▼ Detect	Control Vial Needle Stroke:	: 45 mm		
		1.	Rinse Pump		1 1	
Rinsing Volume:	200	- µI	Rinse Method: Port Only			
Needle Stroke:	52	mm	Rinse Time: 1	s		
Rinsing Speed:	35	µl/s	- Rack Changer			
Sampling Speed:	5	µl/s	Rack Type	Needle Stroke		
Purge Time:	1	min	D MTP 96 🔻	45 mm		
Rinse Dip Time:	0	s	C MTP 96	45 mm		
Rinse Mode:	Before Aspirati	ion 💌	B MTD 06	45 000		
Cooler Temper/	ature: 4	∘⊂	• MIP 96			
🔽 Check Cool	er Temperature		A  MTP 96 💌	45 mm		
Statuc	Boodu				From AS	
julia da la	ready				TION HD	
Event Table AS		Measurement	Acquisition   Thermostat   1	ntegration Calculati		
	ОК	Canc	el S <u>e</u> nd method	Report	Audit Trail	telp

Fig 35: Method Setup - AS - Sampler

# **Rack Type**

Defines the sample rack type. For some trays, it is also necessary to choose the correct *Tray Type* (*Single* or *Dual*).

### Detect

Auto detects the *Rack Type* and sets the *Needle Stroke* parameter.

Note:

Vial number mapping on various types of trays can be found in the chapter **"Vial Plate Numbers"** on pg **71**.

### **Rinsing Volume**

Sets the volume of the solvent used for rinsing the flow lines.

### **Needle Stroke**

Sets the depth of the needle penetration into the vial. The *Needle Stroke* is defined by the *Rack Type* installed.

### **Rinsing Speed**

Sets the solvent discharge speed when rinsing.

### **Sampling Speed**

Sets the speed of the sample aspiration into the syringe.

### **Purge Time**

Sets the duration of the Purge operation.

### **Rinse Dip Time**

Sets the time for which the needle tip will remain immersed in the rinsing solvent.

## Rinse Mode

Sets the time when the rinsing will be performed. Available options are *No Rinsing*, *Before Aspiration*, *After Aspiration* and *Before and After Aspiration*.

# **Cooler Temperature**

Enables the cooling of the autosampler. This option is available only after the *Sample Cooler Installed* option was checked in the Shimadzu LC-10/20 System Setup - Autosampler dialog. The field than allows to set the desired temperature.

# **Check Cooler Temperature**

If checked, doesn't allow the Instrument to become *READY* until the temperature is not close to the temperature set in the *Cooler Temperature* field (with the tolerance of 1,5 °C).

# **Control Vial Needle Stroke**

Sets the needle depth used when aspirating from the **Control Rack** (used with the **SIL-20** samplers).

### **Rinse Pump**

Section enabled by checking the *Rinse Pump Installed* option in the Shimadzu LC-10/20 System Setup - Autosampler dialog.

# **Rinse Method**

Sets the method for the *Rinse Pump*. *Port Only*, *Pump Only*, *Pump Then Port*, *Port Then Pump*, *Pump And Port Between Analyses* and *Auxiliary 1* (2) methods are available.

### Rinse Time

Sets the length of the rinse. Possible values are integers in the range 1 - 9.

### **Rack Changer**

Section enabled by checking the *Rack Changer Installed* option in the Shimadzu LC-10/20 System Setup - Autosampler dialog.

### Rack Type D..A

Sets the type of the rack for each position in the rack changer.

### Needle Stroke D..A

Sets the needle stroke depth (in mm) for each particular rack in the rack changer.

.

*Note:* When the *Rack Changer* tray type has been selected, the common *Needle Stroke* parameter is not used and thus is disabled. Moreover, do not use values less than *20* for rack types 4, 5, 14 or 15.

# 4.3.2.1 Method Setup - AS - Sampler (SIL-10AxI)

This sub-tab replaces the Sampler sub-tab when the SIL-10AxI sampler is configured on the Instrument. The majority of items in the dialog is the same, the differing items are described below:

Method Setup Test	×
Select Sampler Sampler 1	
LC-10/20 System Sampler Method	AS Status
Sampler Time Program Pretreatment	
Rack Type:       5       ▼         Rinsing Volume:       200       µl         Needle Stroke:       51       mm         Rinsing Speed:       35       µl/s         Sampling Speed:       5       µl/s         Cooler Temperature:       4       °C         ✓ Check Cooler Temperature       Injection Compensation Factor:       1	
Status Ready	From AS
Event Table AS LC Gradient Measurement Acquisition Thermostat Integration Calculati	ion Advanced
OK Cancel Send method Report	Audit Trail Help

Fig 36: Method Setup - AS - Sampler (SIL-10Axl)

*Caution:* Due to the error in the MIMIC Libraries, SIL-10AXL sampler does not support the non-default rack types. Only *S* rack type should be used while operating this sampler from **Clarity**.

### **Check Cooler Temperature**

While checked, the temperature set in the *Cooler Temperature* field is validated against the real cooler temperature. When both values don't match, the Instrument will not become ready.

### **Injection Compensation Factor**

The value that is used to compensate the actual volume of different injectors. The specified *Injection volume* is multiplied by the *Injection Compensation Factor* value to produce the real injection volume. Possible values are 1.00 - 1.30, although usually the value 1.00 is used.

# 4.3.2.2 Method Setup - AS - Sampler (SIL-10AF)

This sub-tab replaces the Sampler sub-tab when the SIL-10AF sampler is configured on the Instrument. The majority of items in the dialog is the same, the differing items are described below:

Method Setup Test		×
Select Sampler	ipler 1 💌 🔽 Enabled	
	LC-10/20 System Sampler Method AS Status	_
Sampler Time Progr	am Pretreatment	
Rack Type:		
Rinsing Volume:	200 µl	
Needle Stroke:	51 mm	
Rinsing Speed:	35 µl/s	
Sampling Speed:	5 µl/s	
Excess Volume:	20 µl	
Injection Compensat	ion Factor: 1	
Shahur D	andu Erom AS	
Event Table AS	LC Gradient   Measurement   Acquisition   Thermostat   Integration   Calculation   Advanced	-
,	OK Cancel Send method Report Audit Trail Help	

Fig 37: Method Setup - AS - Sampler (SIL-10AF)

### **Excess Volume**

Allows to set the excess volume of the sample drawn into the syringe during each injection. This portion of the sample is not injected, but serves for better precision of the injection. Allowed values in the *Excess Volume* field are between 10 and 100  $\mu$ l.

### **Injection Compensation Factor**

The value that is used to compensate the actual volume of different injectors. The specified *Injection volume* is multiplied by the *Injection Compensation Factor* value to produce the real injection volume. Possible values are 1.00 - 1.30, although usually the value 1.00 is used.

# 4.3.3 Method Setup - AS - Time Program

Method	d Se	tup Tes	t					×		
Select	Sam	pler	Sampler 1	💌 🔽 Ena	bled					
LC-10/20 System Sampler Method AS Status										
Sa	ample	er Time F	Program Pretreatment					1		
		Time [min.]	Event	Parameter	]					
	1	0,01	Inject							
	2	1,00	Rinse		_					
	<u> </u>	1								
Stal	tus		Beady				From AS			
-					-					
Eve	int I	able_AS		Acquisition	[ Thermostat ]		advanced			
			ОК	Cancel	Send method	Report	Audit Trail	Help		

Fig 38: Method Setup - AS - Time Program

### **Time Table**

It is possible to set events to be performed during the analysis run based on the analysis time, namely the *Inject*, *Rinse* and *Start Pretreatment* actions.

*Note:* The time needed to perform the *Rinse* operation is longer than 1 minute, for exact duration it is necessary to test it in the given configuration.

# 4.3.4 Method Setup - AS - Pretreatment

The logic for all calculations of pretreatment vials goes as follows: The vial specified in the Sequence window for the injection (called the *Sample vial*, *SV*) needs to be empty when performing pretreatment. The actual sample is in the *Source Vial* (specified on the Method Setup - AS - Pretreatment tab), while the diluent is placed in the *Diluent Vial* and reagents are placed in *Reagent Vials 1..3*.

When using the *Auto* calculation of the *Source Vial*, the source vials are found on the second half of the vial tray; the first half of the tray is reserved for the empty vials used for mixing (diluting). These vials are specified in the **Sequence** window and from these vials the injection is performed.

Note:

In case of racks with odd number of vials, the middle vial cannot be used as *Sample Vial* with pretreatment operation as it would have no corresponding *Source Vial*.

Method Setup	lest lest	
Select Sampler	Sampler 1	
	LC-10/20 System Sampler Method	AS Status
Sampler T	ne Program Pretreatment	1
Mode:	Dilution	
Course 18-1		
Source via	AUC0 (5V+50)	
Diluent Vial	<u> </u>	
<u>T</u> otal Volun	e: 50 µl	
Dilution Ea	tor: 2	
Mixing <u>⊂</u> ou	t: 3	
Mixing <u>V</u> olu	ne: 49 µl	
🔲 <u>B</u> ubblin	·	
<u>W</u> ait Time:	1 min	
Status	Ready	From AS
Event Table	AS LC Gradient Measurement Acquisition Thermostat Integration C	Calculation Advanced
	OK Cancel Send method Report	Audit Trail Help

Fig 39: Method Setup - AS - Pretreatment (Dilution)

#### Mode

Selects the pretreatment mode. There are 3 types of pretreatment available:

Standard - Standard type of autosampler operation with no special pretreatment. No other parameter fields are available on the Pretreatment tab. This mode is also used when the Pretreatment tab is unavailable. *Dilution* - Sample will be diluted before the injection.

*Reagent* - Sample will be mixed with the reagent and then injected.

*Inner Needle Wash* - Sampler inner needle will be washed prior and/or after the injection.

*Note:* The *Advanced* pretreatment mode is not currently supported by **Clarity**.

The set of other parameters available differ according to the *Mode* selected.

# Dilution

#### Source Vial

Specifies the source vial for the original sample (before dilution).

*Note:* The vial used for dilution and injection is specified in the Sequence window.

### **Diluent Vial**

Specifies the vial from which the diluent (solvent) will be taken.

# **Total Volume**

Specifies the final volume of the diluted sample without the respect to the volume contraction.

### **Dilution Factor**

Specifies the factor for the dilution. For example, the factor 5 means that the resulting diluted sample will consist of 1/5 of pure sample and 4/5 of diluent.

### Mixing Count

Specifies the number of mixing cycles the dilution will consist of (range 1 - 10 cycles).

### **Mixing Volume**

Specifies the volume to be aspirated and flushed back in every mixing step. This volume must be lower than the *Total Volume*.

# Bubbling

When checked, a bubble is aspirated during the mixing cycle in addition to the specified volume. The bubble is dispensed into the vial during mixing.

# Wait Time

Sets the time interval from the last mixing cycle to the injection. Possible values are 0.1 - 120 minutes.

# Reagent

Method Setup Test 🛛 🛛 🔀								
Select Sampler Sampler 1								
LC-10/20 System Sampler Method AS Status								
Sampler Time Program Pretreatment								
Mode: Reagent								
Vial Volume (µl)								
Source Vial: Auto (SV+50) 💽 50								
Reagent Vial <u>1</u> : Not Used <b>v</b> 50								
Reagent Vial 2: Not Used 💽 50								
Reagent Vial 3: Not Used 50								
Mixing <u>C</u> ount: 3								
Mixing Volume: 49 µl								
Eubbling								
Wait Time: 1 min								
Status Ready	From AS							
Event Table AS LC Gradient Measurement Acquisition Thermostat Integration Calculation	Advanced							
OK Cancel Send method Report Au	dit Trail Help							

Fig 40: Method Setup - AS - Pretreatment (Reagent)

Part of the fields (namely *Mixing Count*, *Mixing Volume*, *Bubbling* and *Wait Time*) in the *Reagent* mode has the same meaning as in the *Dilution* mode. Different fields are described lower:

### Source Vial

Specifies the source vial for the original sample (before reaction). The automatic calculation uses the same rules as in the *Dilution* mode.

### Reagent Vial 1..3

Specifies vials used for particular reagents. It is possible to select the *Not Used* option.

### Volume

Specifies the volume of the sample and each reagent used.

# **Inner Needle Wash**

Method Setup Test		×							
Select Sampler	ampler 1 💌 K Enabled								
	LC-10/20 System Sampler Method A5 Status								
Sampler Time Pro	gram Pretreatment								
Mode:	Inner Needle Wash								
	Source Volume (µl)								
Pre-Rinse:	Not Used 🗾 50								
Rinse 1:	Rinse 1 🗾 50								
Rinse 2:	Rinse 2 50								
Replenish:	Mobile Phase 50								
<u>W</u> ait Time:	1 min								
Note: Wait Time sh	ould be sufficient to flush sample from sample loop based upon flow rate and								
sample amount.									
Status	Ready From AS								
,									
Event Table AS	LC Gradient Measurement Acquisition Thermostat Integration Calculation Advanced	-							
	OK Cancel Send method Report Audit Trail Help								

Fig 41: Method Setup - AS - Pretreatment (Inner Needle Wash)

#### **Pre-Rinse**

Sets the rinsing prior to the injection (which is not recommended). The same options as for the *Rinse* operation (see below) apply.

### Rinse 1[2]

Sets the first (second) rinse solvent. It is possible to select from the *Not Used*, *Rinse 1*, *Rinse 2* and *Mobile Phase* options.

#### Replenish

Select whether or not to replenish the Inner Needle by the mobile phase after rinsing. If any *Pre-Rinse* or *Rinse* step is used, the only option is *Mobile Phase*, otherwise *Not Used* option is also available.

#### Wait Time

Sets the time for which the injection loop will be switched into the flow path to wash away the sample from there. After elapsing of this time period the *Rinse 1* and *Rinse 2* operations will be performed. Available time span for this field is 0.1 - 120 minutes.

# 4.3.5 Device Monitor - Shimadzu LC-10/20 System

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



Fig 42: Device Monitor - Autosampler

# Purge

Runs the **Purge** operation according to the settings in the Method Setup - AS - Sampler dialog.

# Rinse

Rinses the syringe according to the settings in the Method Setup - AS - Sampler dialog.

# Cooler Temp.

Displays the temperature of the cooler. Only available when the autosampler is equipped with the sample cooling unit and the *Sample Cooler Installed* checkbox is checked in the Shimadzu LC-10/20 System Setup - Autosampler dialog.

# 4.3.6 Report Setup

The autosampler settings accessible from the Method Setup - AS tab and Shimadzu LC-10/20 System 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.

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				Shimadzu .	LC-10/20 5ys	tem SIL-Zi	IACKR Me	thod - Samj	oler 1			<u> </u>
	Sample Loop Size	: 50	Ы									
	Skip Missing Vial	: No										
	MTP Sample Order	: Ver	tical									
	Rack Changer Installed	: Yes										
	Rinse Pump Installed	: Yes										
	Supports Pretreatment	: Yes										
	Rack Tupe	: Rac	:k Changer	Rinsina	Volume	: 200 ul						
	Rinsing Speed	: 35	ul/s	Samplin	a Speed	: 5.0 ul/s						
	Purge Time	: 1,0	min	Rinse D	ip Time	: 0 s			Rinse M	1ode	: Before Aspiration	
	Enable Cooler Unit	: Yes		Cooler 1	Femperature	:4 ℃			Check	Cooler Temperatu	ure : Yes	
					•	Pump A	And Port B	etween				
	Control Vial Needle Stroke	: 45	mm	Rinse P	ump Method	: Analysis	z		Rinse P	'ump Time	: 1 s	
	Rack Changer Rack Type A	: MT	P 96	Needle	Stroke	: 45 mm						
	Rack Changer Rack Type B	: MT	P 96	Needle	Stroke	: 45 mm						
	Rack Changer Rack Type C	: MT	P 96	Needle	Stroke	: 45 mm						
	Rack Changer Rack Type D	: MT	P 96	Needle	Stroke	: 45 mm						
	Pretreatment Mode	: Rea	agent									
	Source Vial	: Aut	o (SV+48)	Volume		: 50 ul						
	Reagent Vial 1	: Not	Used	Volume		: 50 µl						
	Reagent Vial 2	: Not	: Used	Volume		: 50 µl						
	Reagent Vial 3	: Not	Used	Volume		: 50 µl						
	Mixing Count	: 3		Mixing	Volume	:49 µl			Wait Ti	me	: 1,0 min	
						Time Pr	ogram				_	
			Time [mi	n]			Event			Parameter		
			1,00				Rinse					
			2,00				Inject					<b>~</b>
Page 1												

Fig 43: Report Setup - Autosampler

The first part of the parametres is taken from the Shimadzu LC-10/20 System Setup - Autosampler dialog settings, the second part contains parametres set on the Method Setup - AS tab (including the **Time Table**).

# **4.4 PDA**

# 4.4.1 Shimadzu LC-10/20 System Setup - PDA Detector

It is necessary to switch the **PDA** detector on before switching on the PC. Caution:

Shimadzu LC-1	10/20 System Setup			×
Name:	PDADetector 1	Signal <u>1</u> Name:	PDASignal 1	
Host ID:	0	Signal <u>2</u> Name:	PDASignal 2	_
Device ID:	4	Signal <u>3</u> Name:	PDASignal 3	_
D/A Board I	installed	Signal <u>4</u> Name:	PDASignal 4	-
🔲 🔲 Iriggered b	y External Device			
Setup Control	ler Pump A Pump B Det	ector A Autosampler	PDA Detector Therm	ostat
ĺ.		Digital :	Input Names	Change
ОК	Cancel			Help

Fig 44: Shimadzu LC-10/20 System Setup - PDA Detector

### Name

Sets the name of the PDA Detector.

### Host ID

Uniquely identifies the SCSI adapter board. This number is assigned by the operation system and can be found in the Device Manager. The default value is 0. See Shimadzu SPD-M10Avp manual for more details.

### **Device ID**

Number of the **PDA** Detector unit (set on the back of the unit). The default value is 4. See Shimadzu **SPD-M10Avp** manual for more details.

Note: When using the **SPD-M20A** device, the *IP Address* and *Port* commands are displayed instead of Host ID and Device ID. These two specify the parameters of the connection through LAN.

### D/A Board Installed

Sets whether the optional D/A output converter (not autodetected) is installed in the PDA unit.

# Triggered by External Device

Check if the **PDA** should start acquisition based on the external signal (by wire from the back of the device).

Note:

In the standard operation mode, the PDA detector is started by the controller (this checkbox should be unchecked).

# Signal 1 (..4) Name

Defines the names of the particular detector signals.

# 4.4.2 Method Setup - PDA

Method Setup Test		×
Select PDA	or 1 💌 💌 Enabled	
	LC-10/20 System PDADetector Method	PDA Status
PDA		
Start Wavelength:	190 nm	
End Wavelength:	800 nm	
Wave Step:	1 m	
Lamp:	D2+W	
Sampling Rate:	12,5 💌 Hz	
Time Constant:	0,64 💌 s	
Slit Wi <u>d</u> th:	1,2 • nm	
✓ <u>C</u> ell Temperature:	40 ℃	
Check Cell Tempe	rature	
Status Ready		From PDA
Event Table Measurement	Acquisition PDA Integration PDA Method Calculation Advance	ed
	OK Cancel Send method Report	Audit Trail Help

Fig 45: Method Setup - PDA

# Start Wavelength

Defines the lowest value of the wavelength to be used for the acquisition of spectra. This value also influences the lowest possible value of the *Wavelength* parameter on the Method Setup - Acquisition tab for the single-wavelength **PDA** detector signals. The value must be in range <190, 799> and lower than the *End Wavelength* value.

# End Wavelength

Defines the highest value of the wavelength to be used for the acquisition of spectra. This value also influences the highest possible value of the *Wavelength* parameter on the Method Setup - Acquisition tab for the single-wavelength **PDA** detector signals. The value must be in range <191, 800> and greater than the *Start Wavelength* value.

### Wave Step

Sets the wavelength step for the **PDA** spectra gathering. The lowest possible value is *1* nm.

### Lamp

Defines the lamp type that will be used in the measurement. Possible options are Off, D2, W and D2+W.

### Sampling Rate

Defines the sampling rate of the **PDA** detector, set in the Hz.

### Time Constant

Sets the amount of time from which will the raw spectra be averaged to get one reported spectrum. The value should be set so that it is longer than it takes to gather one spectrum (based on the Sampling Rate parameter).

#### Slit Width

Defines the wavelength accuracy provided by the hardware.

#### **Cell Temperature**

Sets the temperature of the detector cell.

### **Check Cell Temperature**

When checked, the Instrument will not be ready until the actual temperature will reach the set value (with the 1.5 °C tolerance). While the checkbox is unchecked, no temperature verification will be performed.

# 4.4.3 Method Setup - Acquisition

Method Setup Test	X
Select Detector PDASignal 1	
LC-10/20 System Detector Method	Det Status
	1
Wavelength: 190 nm	
Bandwidth: 1 nm	
Polarity: Positive	
Output Range: 0,50 V AU/V	
Status Ready	From Det
Event Table Measurement Acquisition PDA Integration PDA Method Calculation Advan	nced
OK Cancel Send method Report	Audit Trail Help

Fig 46: Method Setup - Acquisition - PDA Signal

# Wavelength

Sets the wavelength of the desired analog signal. This value must lie in the range set by the *Start Wavelength* and *End Wavelength* parameters defined on the Method Setup - PDA tab.

### Bandwidth

Sets how "wide" will the wavelength window be for the purpose of the analog signal creation. This signal is created by calculation from several wavelengths, not by hardware settings.

# Polarity

Sets whether the increasing absorbance value will be counted as more *Positive* or more *Negative* voltage signal.

### **Output Range**

Defines the maximal output value of the analog signal.

# 4.4.4 Device Monitor

The Device Monitor window can be invoked by the *Monitor - Device Monitor* command from the Instrument window or using the Device Monitor  $\bigotimes$  icon. It allows to Autozero the detector, turn its lamp(s) on or off and start the data monitoring outside of the analysis run. The Device Monitor window also displays the actual lamp state and the detector cell temperature.

🗪 Instrument 1 - Device Monitor	
📗 Eile Co <u>n</u> trol <u>V</u> iew <u>W</u> indow <u>H</u> elp 🔼 👬	4 <b>5 T 13</b> 8 © 7 7 9 <mark>0</mark>
LC-10/20 System PDADetector 1	Ready 🔘
Auto Zero Lamp On Lamp : Off	Cell Temp. : 25 °C Check Signal On
For Help, press F1	

Fig 47: Device Monitor - PDA Detector

# Auto Zero

Sets the response of the detector to 0.

# Lamp Off (On)

Turns the lamp Off and On again. The actual state of the lamp(s) can be seen in the *Lamp* field.

# Lamp

Shows the actual state of the detector lamp(s).

# Cell Temp.

Shows the actual temperature on the detector cell.

# Check Signal On (Off)

Turns the detector signal monitoring on and off. Active only when analysis is not running.

- *Note:* This type of detectors is giving data only during analysis. Pressing this button starts a "dummy" analysis run (all data discarded) that allows to check the detector signal before the actual analysis. It should be turned *OFF* before starting the analysis by external contact.
- *Caution:* The *Check Signal On* function can not be activated when a *Purge* was used to set the flow and composition manually from the Device Monitor. You need to use the *Resume Idle* function from the LC Device Monitor first.

# 4.4.5 Report Setup

All **PDA** detector settings accessible on the Shimadzu LC-10/20 System Setup - PDA tab, in the Method Setup - Acquisition tab for the **PDA** signals and settings from the Method Setup - PDA tab are reported if the *Instrument Control* parameter on the Method tab of the Report Setup dialog is checked. For each detector set in the Shimadzu LC-10/20 System Setup dialog, a specific section of the report will be printed, as well as dedicated section for common **PDA** parameters.

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			Shimadzu LC-10/20	System SPD-	MZ0A Method	- PDASignal 1			
	Wavelength : 190 nm Output Range : 0,50 AU/V		Bandwidth : 1	nm		Polarity	: Positive		
			Shimadzu LC-10/20	System SPD-	MZ0A Method	- PDASignal Z			
	Wavelength : 190 nm Output Range : 0,50 ALJ/V		Bandwidth : 1	nm		Polarity	: Positive		
			Shimadzu LC-10/20	System SPD-	MZ0A Method	- PDASignal 3			
	Wavelength : 190 nm Output Range : 0,50 AU/V		Bandwidth : 1	nm		Polarity	: Positive		≣
			Shimadzu LC-10/20	System SPD-	MZ0A Method	- PDASignal 4			
	Wavelength : 190 nm Output Range : 0,50 AU/V		Bandwidth : 1	nm		Polarity	: Positive		_
			Shimadzu LC-10/20-5	ystem SPD-M	420A Method -	PDADetector 1			
	D/A Board Installed Triggered by External Device Start Wavelength End Wavelength Slit Width	: Yes : No : 190 nm : 800 nm : 1,2 nm	Wave Step Lamp Cell Temperature	:1⊓m :D2+₩ ≥ :40 °⊂		Samplin Time Co Check C	g Rate Instant iell Temperature	: 12,5000 Hz : 0,64 s : No	
Page 2									1

Fig 48: Report Setup

# 4.5 Thermostat

The Method Setup - Thermostat tab serves for setting the temperature program of the analysis using the thermostat (column oven) configured in the Shimadzu LC-10/20 System Setup - Thermostat dialog.

*Note:* The *Ready Range* (temperature range, in which the actual temperature is considered as matching the set value) and *Wait Time* (time to stabilize the system between the temperature is reached and the device is ready) could be set only from the thermostat keyboard, those parameters are not supported in the software control.

# 4.5.1 Shimadzu LC-10/20 System Setup - Thermostat

Shimadzu LC-1	0/20 System Setup	×
Name:	Thermostat 1	1
Valves		
Left:	FCV-14AH	
<u>R</u> ight:	None	
Setup Control	er Pump A Pump B Detector A Autosampler Thermostat	
	Digital Input Names Change	
ОК	Cancel Help	

Fig 49: Shimadzu LC-10/20 System Setup - Thermostat

Some options may be missing or shaded depending on the type of the thermostat installed.

### Name

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

# Valves

When using the **CTA-20A** or **CTA-20AC** thermostat, fill in the type of valves installed (if any).

# 4.5.2 Method Setup - Thermostat - Thermostat

Method Setup Test		X
Select Thermostat Thermostat 1		
LC-10/20 System Thermostat Method	Th. Status	
Thermostat Time Program	1	
✓ Enable Thermostat       Iarget Temperature:       40       °C       Maximum Temperature:     85       °C		
Initial Valve Position Left: FCV-12AH 1 Right: FCV-14AH 3		
Status Ready	From Th.	
Event Table Measurement Thermostat Integration Calculation Advanced		
OK Cancel Sgnd method Report	Audit Trail Help	

Fig 50: Method Setup - Thermostat - Thermostat

### **Enable Thermostat**

Enables the temperature control of the thermostat. When unchecked, all other fields on the tab will be grayed and no thermostat control will be performed.

#### **Target Temperature**

Sets the target temperature. The control module will not switch to the *READY* state until this temperature is reached.

#### **Maximum 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.

#### **Initial Valve Position**

Sets the initial position of the valves (if there are any installed).
### 4.5.3 Method Setup - Thermostat - Time Program

Method Setup Test									
Select Thermostat 1									
	LC-10/20 System Thermostat Method Th. Status								
Thermostat Time Program									
		Time [min.]	Event	Parameter					
	1	4,20	Temperature	40					
	2	8,00	Linear Temperature	60					
	3	10,00	Left Valve	0					
	4	10,00	Right Valve	1					
	5	15,00	Thermostat Off		_				
	6								
			<b>—</b>						
Sta	atus		Ready			From Th.			
Event Table Measurement Thermostat Integration Calculation Advanced									
			ОК	Cancel	Send method Report	Audit Trail Help			

Fig 51: Method Setup - Thermostat - Time Program

#### **Time Table**

The initial analysis settings defined on the Thermostat sub-tab can be changed during the analysis by events programmed in the Time Table. Possible events are:

Thermostat Off - At specified time, switches of the thermostat.

*Temperature* - Changes the temperature to the specified value in one step.

*Linear Temperature* - Changes the temperature using the temperature ramp.

Left Valve - Changes the position of the left valve.

*Right Valve* - Changes the position of the right valve.

## 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 20 icon. Thermostat Device Monitor serves for monitoring the actual thermostat temperature and allows to switch the thermostat on and off. The room temperature is also displayed.



Fig 52: Device Monitor - Thermostat

#### Switch Therm. On (Off)

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

#### **Actual Temperature**

Field displaying the actual thermostat temperature.

#### **Room Temperature**

Field displaying the actual room temperature.

## 4.5.5 Report Setup

Both parameters set on the Shimadzu LC-10/20 System Setup -Thermostat tab (valve types used) and parameters set on the Method Setup - Thermostat tab (including the **Time Table**) can be printed. To do so, it is necessary to check the *Instrument Control* option on the Method tab of the Report Setup dialog.

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Shimadzu LO-10/20 System CTO-20AC Method - Thermostat 1								
Left Valve : Right Valve : Enable Thermostat : Initial Left Valve Position :	FCV-12AH FCV-14AH Yes 1	Target Temperature : 40 °⊂ Initial Right Valve Position : 3 <i>Time Program</i>	Maximum Temperature	: 85 °⊂				
	Time [min]	Event	Parameter					
	4,20	Temperature	40					
	8,00	Linear Temperature	60					
	12,00	Temperature	70					
	15,00	Right Valve	1					
Page 1				••••				

Fig 53: Report Setup

## **5 Troubleshooting**

The Shimadzu LC-MIMIC libraries are not correctly registered in the registration database error message shows when adding the Shimadzu LC-10/20 System to the configuration.



Fig 54: Missing MIMIC error message

Description: MIMIC libraries (needed by the control module) were probably not installed. Solution: To be able to use the **Shimadzu LC-10/20 System** control module it is necessary to reinstall the **Clarity** station. During the installation, the *Custom* installation must be chosen.

The Shimadzu PDA detector is not present while trying to configure it.Solution:The PDA detector was probably switched on after the computer. It will be<br/>necessary to add the hardware manually to the Windows configuration. Use the<br/>Control Panel section (available through the Start menu) in the MS Windows and<br/>invoke the Add Hardware icon. You will be guided through the rest of the process.

The SPD-M10Avp PDA detector does not work on 64-bit Windows.Solution:Reset the SCSI card and run Clarity in Win XP Ser3 emulation mode.

The switching of *Ref. Flow Off/On* function of the RID-10Avp detector from the Time Table is not functioning.

Solution: This is known problem of the MIMIC libraries. The *Ref. Flow Off/On* functions can still be invoked from the **Device Monitor** window by pressing the appropriate button on the **RID-10Avp** detector section.

# **6 Vial Plate Numbers**

The following tables show the Vial Number mapping on the various trays used with **Shimadzu LC-10/20 System** autosamplers:

Tab 6: Vial numbers on vial trays:

Rack type	Subtype or model	Vial numbers	
1, 11		0 - 149	
2, 12, 12A		0 - 69	
3, 13		0 - 59	
	Single	1 - 96	
4,40,14,14A,14DDVV	Dual	1 - 192	
5 5U 15	Single	1 - 384	
5, 50, 15	Dual	1 - 768	
6, 16		0 - 99	
7		0 - 69	
S		0 - 99	
S Peltier		0 - 59	
L		0 - 79	
L Peltier		0 - 49	
LL		0 - 24	
MTP Dual		1 - 192	
1 Eml Standard	SIL-HTA, SIL-HTC	1001 - 1105, 2001 - 2105	
	Other	1 - 105	
1 Eml Cooled	SIL-HTA, SIL-HTC	1001 - 1070, 2001 - 2070	
	Other	1 - 70	
1ml Standard 1ml Caalad	SIL-HTA, SIL-HTC	1007 - 1175, 2001 - 2175	
	Other	1 - 175	
Am Standard Am Caalad	SIL-HTA, SIL-HTC	1001 - 1050, 2001 - 2050	
	Other	1 - 50	
MTP96 Standard, MTP96		1001 - 1096, 2001 - 2096,	
Cooled, DW96 Standard,	SIL-ITTA, SIL-ITTC	3001 - 3096, 4001 - 4096	
DW96 Cooled	Other	1001 - 1096, 2001 - 2096	
MTP384 Standard	SIL-HTA SIL-HTC	1001 - 1384, 2001 - 2384,	
MTP384 Cooled		3001 - 3384, 4001 - 4384	
	Other	1001 - 1384, 2001 - 2384	

With a **Rackchanger** (device usable with the SIL-20 autosamplers) the vial number mapping changes a bit: A **Rackchanger** has four holders, each with three trays. All vial trays in a single holder must be the same, but can differ between different holders. The vial's numbering is performed

so that each tray has its own number (1-12) and vials on that tray are numbered according to the tray number multiplied by 1000 and the vial position on that tray (based on the tray type):

Tab 7: Vial numbers in the Rackchanger:

Tray type	Vial numbers
MTP96, DWP96	1001 - 1096, 2001 - 2096,, 12001 - 12096
MTP384, DWP384	1001 - 1384, 2001 - 2384,, 12001 - 12384
1.5ml Standard, 1.5ml Cooled	1001 - 1054, 2001 - 2054,, 12001 - 12054

The **Control Rack** used on SIL-20 autosamplers has vials numbered 20001 - 20010.