

# Shimadzu LC Driver for Waters Empower Software

## Operation Guide

Read the instruction manual thoroughly before you use the product.  
Keep this instruction manual for future reference.



To ensure the safe use of this device, be sure to observe the points below.

- ◆ Follow the procedures in the instruction manuals.
- ◆ Observe all warnings and cautions.
- ◆ Do not disassemble or modify this product without permission.
- ◆ The repair of this product may be ordered at our offices and distributors.

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- Every effort has been made to ensure that the content of this manual was correct at the time of creation. However, in the event that any mistakes or omissions are discovered, it may not be possible to correct them immediately.
- Maintenance parts of this product are provided for seven years after production is stopped. Please note that we may not be able to provide maintenance parts after this period. However, for parts that are not genuine parts of our company, the period of provision is determined by the manufacturer.
- The contents of the hard disk in a PC can be lost due to an accident. To protect your important data from accidents, be sure to backup your data.
- If the user or usage location changes, be sure this Instruction Manual is always kept together with the product.
- To ensure safe operation, contact your Shimadzu representative for installation, adjustment, or re-installation after moving the instrument to a different site.

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# Introduction

Thank you for purchasing the Shimadzu LC Driver for Waters Empower Software (hereafter referred to as "Shimadzu LC Driver"). Read this instruction manual carefully before use.

This document assumes some level of familiarity with Waters' Empower, Empower 2, and Empower 3 Software (hereafter referred to as "Empower"), and explains the operating procedures required to control a Shimadzu high-performance liquid chromatograph (hereafter referred to as "Shimadzu HPLC".)

The explanation for each procedure is based on use of the Quick Start and an environment in which an Empower workgroup or enterprise has been created. Names and terms related to Empower™ appear in many places. Refer to the instruction manual provided with Empower as necessary for clarification.

## Structure of This Document

### **Chapter 1 Starting Empower**

This chapter explains the methods used to start and log in to Empower and the sequence of procedures leading up to the display of the Shimadzu HPLC instrument method editing window.

### **Chapter 2 Creating Instrument Methods**

This chapter explains the methods used to set the parameters displayed in the instrument method editing window, create method sets, and check the system configuration information.

### **Chapter 3 Checking the Instrument Status**

This chapter explains the operations of Shimadzu Control Panel.

### **Chapter 4 Acquiring Data**

This chapter explains procedures related to data acquisition, such as those used for single analysis and the creation of sample sets.

### **Chapter 5 Reviewing Data**

This chapter explains the operations used to review the acquired data and create processing methods.

### **Chapter 6 Creating Reports**

This chapter explains the operations used to create reports.

# Product Warranty

Our company provides a warranty on this product, as stated below.

## Details

1. **Warranty Period:** Please consult your Shimadzu representative for information about the extent of the warranty.
2. **Warranty Description:** If failure occurs for reasons attributable to our company during the warranty period, our company will provide repairs or the replacement of parts without charge (including USB dongles). However, we may not be able to provide identical products in the case of products such as PCs, and their peripherals and parts, which have a short lifespan in the market.
3. **Limitation of Liability:**
  - (1) In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
  - (2) In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount you paid for the product.
4. **Warranty Exceptions:** The failures caused by the following events are excluded from the warranty, even if they occur during the warranty period.
  - 1) The product is handled in an improper way.
  - 2) Repairs or modifications are performed by companies or people other than our company and our designated companies.
  - 3) When software other than the Shimadzu LC Driver is installed.
  - 4) This product was used in combination with hardware or software other than those designated by our company.
  - 5) Device failures and damage to data and software, including the basic software, that are caused by computer viruses.
  - 6) Device failures and damage to data and software, including the basic software, that are caused by power failures, including power outages and sudden drops of voltage.
  - 7) Device failures and damage to data and software, including the basic software, that are caused by powering off the device without the proper shutdown procedure.
  - 8) Failures are caused by reasons other than the device itself.
  - 9) Failures are caused by the use in harsh environments, such as in high temperature or humidity, corrosive gas, or vibration.
  - 10) Failures are caused by fires and earthquakes or any other act of providence, contamination by radio active substances and hazardous substances, or any other force majeure event including wars, riots, and crimes.
  - 11) Problems occur because the device is transferred or transported after installation.
  - 12) Expendable items and parts  
Note: Recording media such as floppy disks and CD-ROMs are considered expendables.

\* If there is a document such as a warranty attached to the product, or there is a separate contract agreed upon that includes warranty conditions, the rules stated in those documents shall be followed.  
Warranty periods for products with special specifications and systems are provided separately.

# Instruction Manuals

## List of Instruction Manuals

This product come with the following instruction manuals.

Name	Configuration	Content
Operation Guide (This Document)	Hard Copy / PDF File	Select the link in the [Shimadzu LC Driver] in the Start menu to display this file. Intended for operators, this document explains basic procedures in accordance with the flow of actual analytical procedures.
Installation Manual	Hard Copy / PDF File	Select the link in the [Shimadzu LC Driver] in the Start menu to display this file. Intended for laboratory administrators, this document details product specifications and software installation procedures, and explains the methods used to make Shimadzu HPLC settings to register to the Empower node.
Operatin Procedure	PDF File	Select the link in the [Shimadzu LC Driver] in the Start menu to display this file. This document uses flow procedure to explain the contents of the Operation Guide.
Installation Procedure	PDF File	Select the link in the [Shimadzu LC Driver] in the Start menu to display this file. This document uses flow procedure to explain the contents of the Installation Manual.
Help	Online Help	Click [Help] on the screen or press the F1 key to display explanations of the window parameters or an error list containing solutions to questions or problems. Refer to this Help utility before contacting your Shimadzu representative.
Release Notes	Hard Copy / PDF File	Select the link in the [Shimadzu LC Driver] in the Start menu to display this file. This document details restrictions and precautions that apply to the use of this product.

## Notations used in Instruction Manuals

The symbols and notations used in the instruction manuals have the following meanings.

Notation	Meaning
 NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.
 Reference	Indication of location for related information in the instruction manuals.
[ ]	Indicates the names of buttons, menu options, setting options, windows/sub-windows, and icons that are displayed in a window. Example: Click [OK].



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# 1

# Starting Empower

This chapter explains the methods used to start and log in to Empower.

1

## 1.1 Starting and Logging In to Empower

The operations used to start Empower and to log in to the main window (Quick Start) are explained below.

**1** Start the PC, and double-click the  (Empower) icon on the desktop.  
The [Empower Login] window is displayed.

**2** Enter your user name, password, select a database, then click [OK].

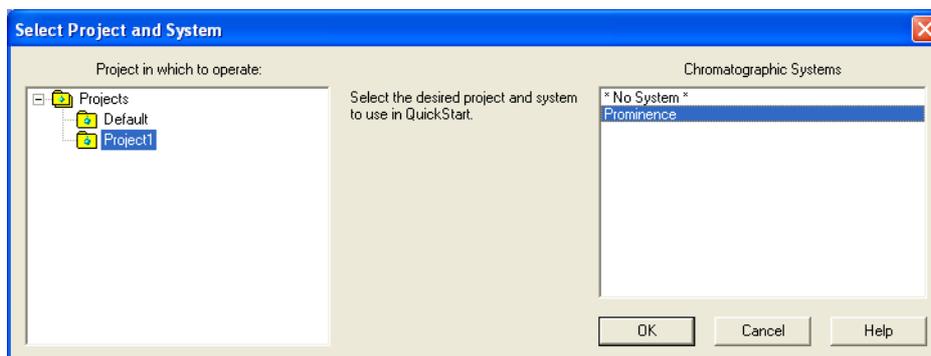


The [Select Project and System] window is displayed.

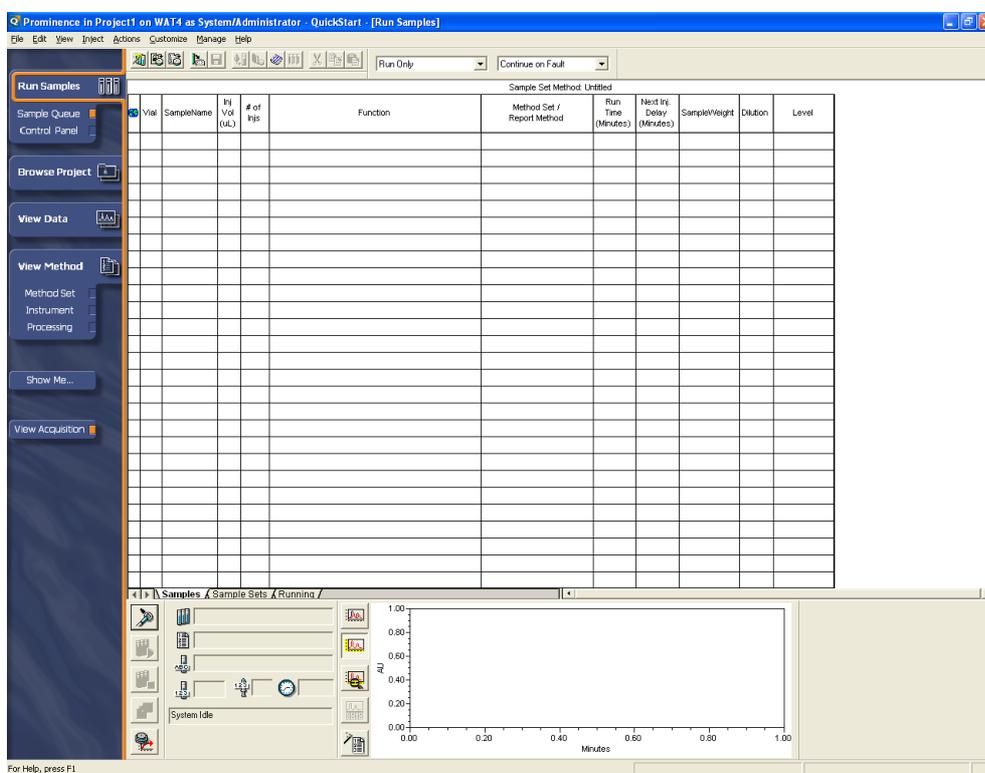
### NOTE

- The user name and password must be entered every time the system is logged in to.
- At the time of installation, the user name is set to "system" and the password is set to "manager".
- If Empower Personal (stand-alone type) is used, [Database] is not displayed in the [Empower Login] window. Enter your user name and password to log in to the system.

### 3 Select a project and chromatographic system, then click [OK].



The Quick Start [Run Samples] window is displayed.



#### NOTE

If the Quick Start is opened without selecting any chromatographic system such as when reviewing data and analyzing analysis reports, the [Find Data] window is displayed. Refer to ["5 Reviewing Data" P.35](#) for details.

## ■ Opening Quick Start from the [Professional] Window

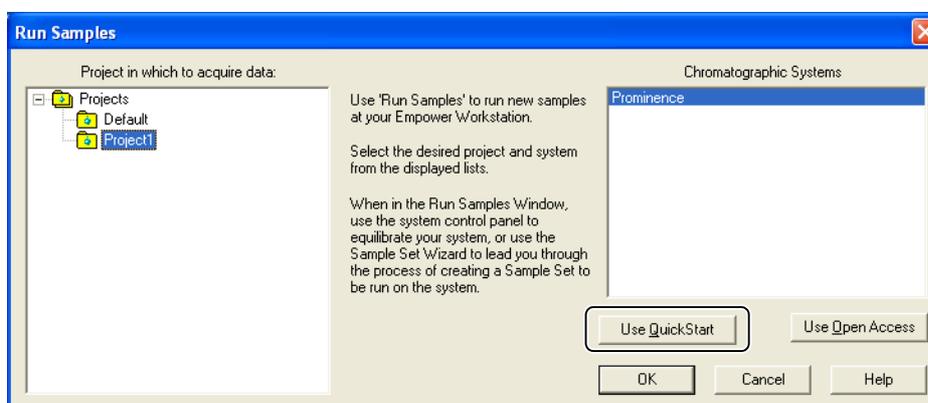
If the Empower system administrator has not set Quick Start as the user login startup window, the [Empower Pro] window is displayed. Use the following procedure to open Quick Start from the [Empower Pro] window.

### 1 Click [Run Samples] in the [Empower Pro] window.



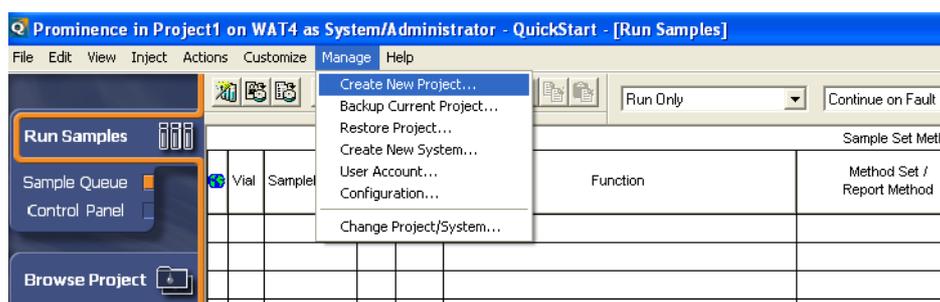
The [Run Samples] window is displayed.

### 2 Select a project to acquire data and chromatographic system, then click [Use Quick Start].



#### NOTE

In this explanation, the [Defaults] project is selected as the project to acquire data. When creating a new project, select [Create New Project] in the [Manage] menu. Create a project by following the wizard that will be displayed.

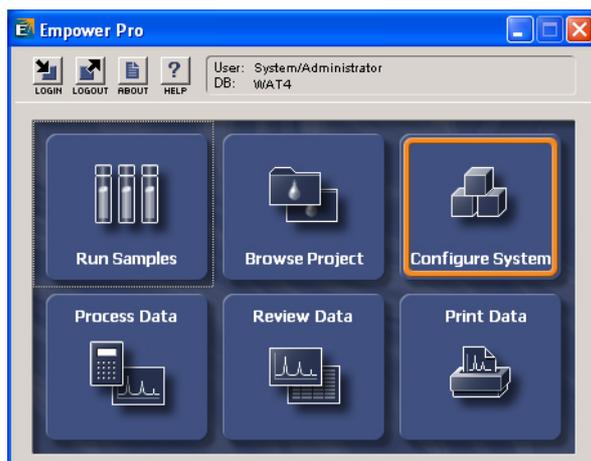


 **NOTE**

If the chromatographic system includes the PDA detector, [PDA Option] must be set when creating a new project.

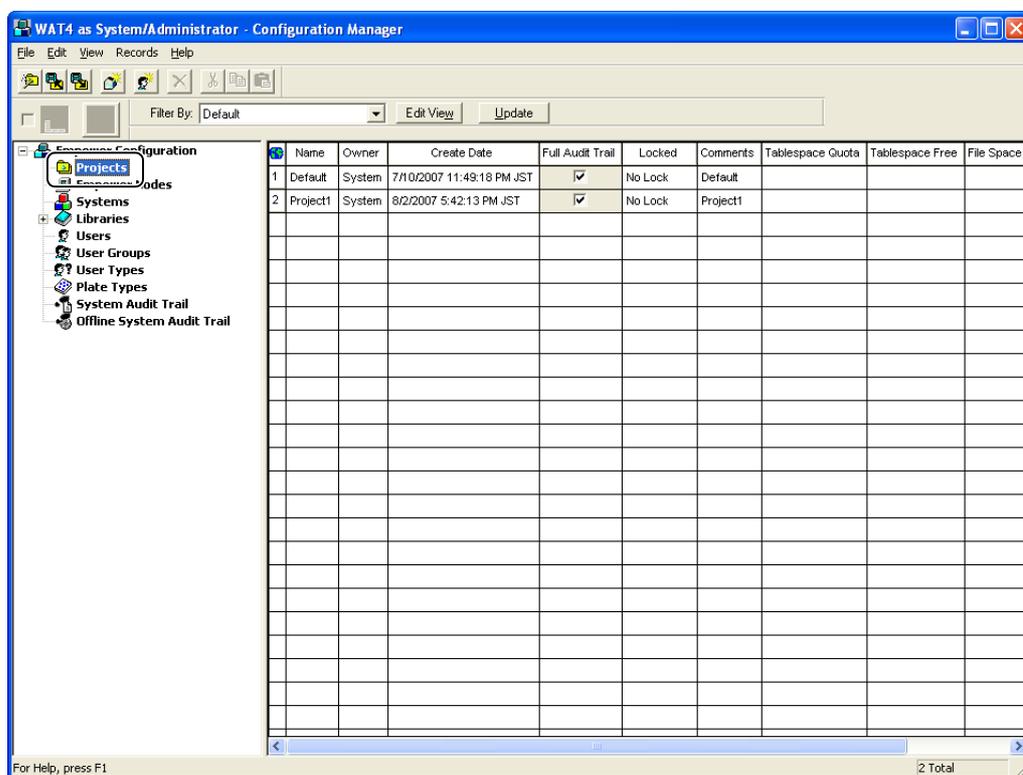
The method to set [PDA Option] is described below.

1. Click [Configure System] in the [Empower Pro] window.

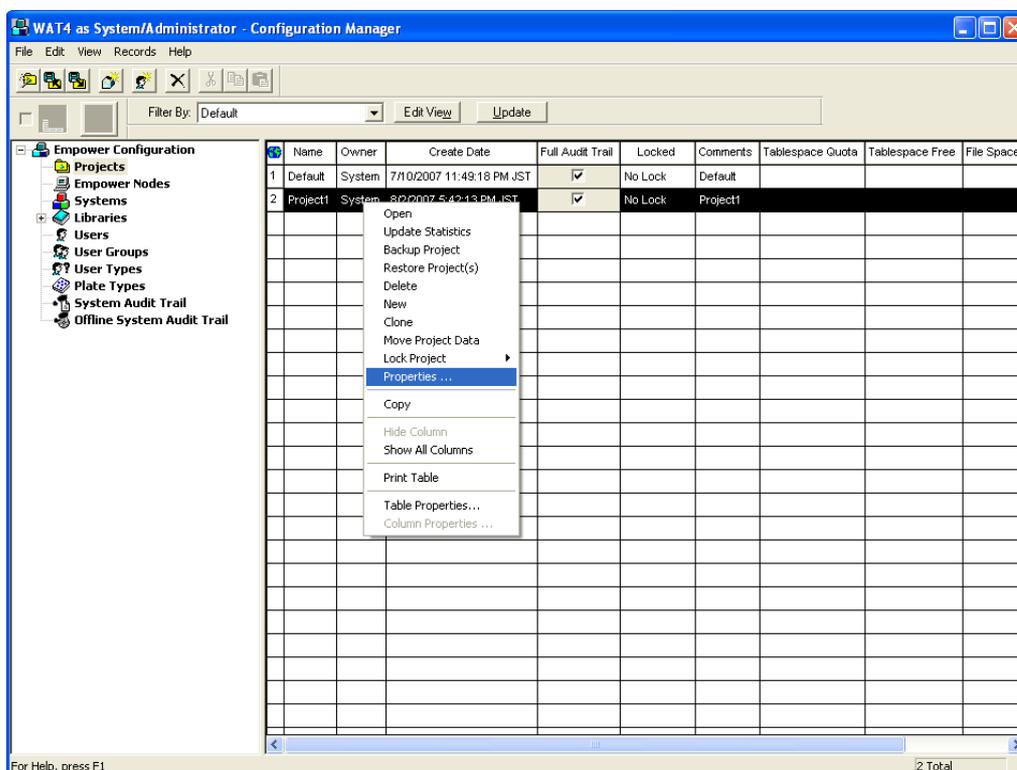


The [Configuration Manager] window is displayed.

2. Select [Project] in the tree pane.

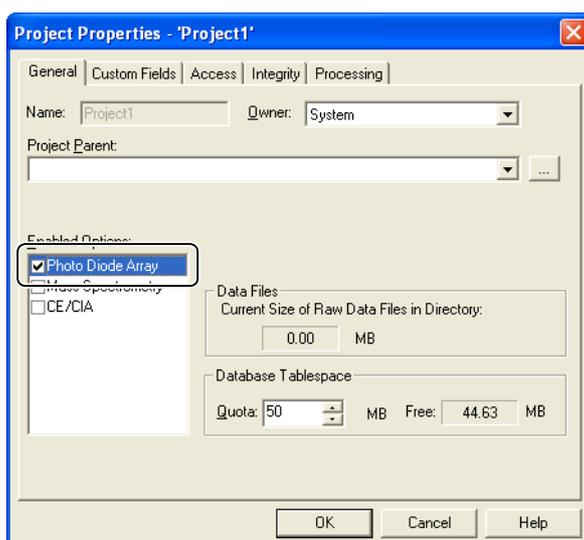


3. Select the project in the view table, and then select [Properties] in the menu.



The [Project Properties] window is displayed.

4. Click the [General] tab. Select the [Photo Diode Array] checkbox in the [Enabled Options].



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# 2

# Creating Instrument Methods

This chapter explains the methods used to create instrument methods and to check system configuration information.

## 2.1 Displaying the Instrument Method Editing Window

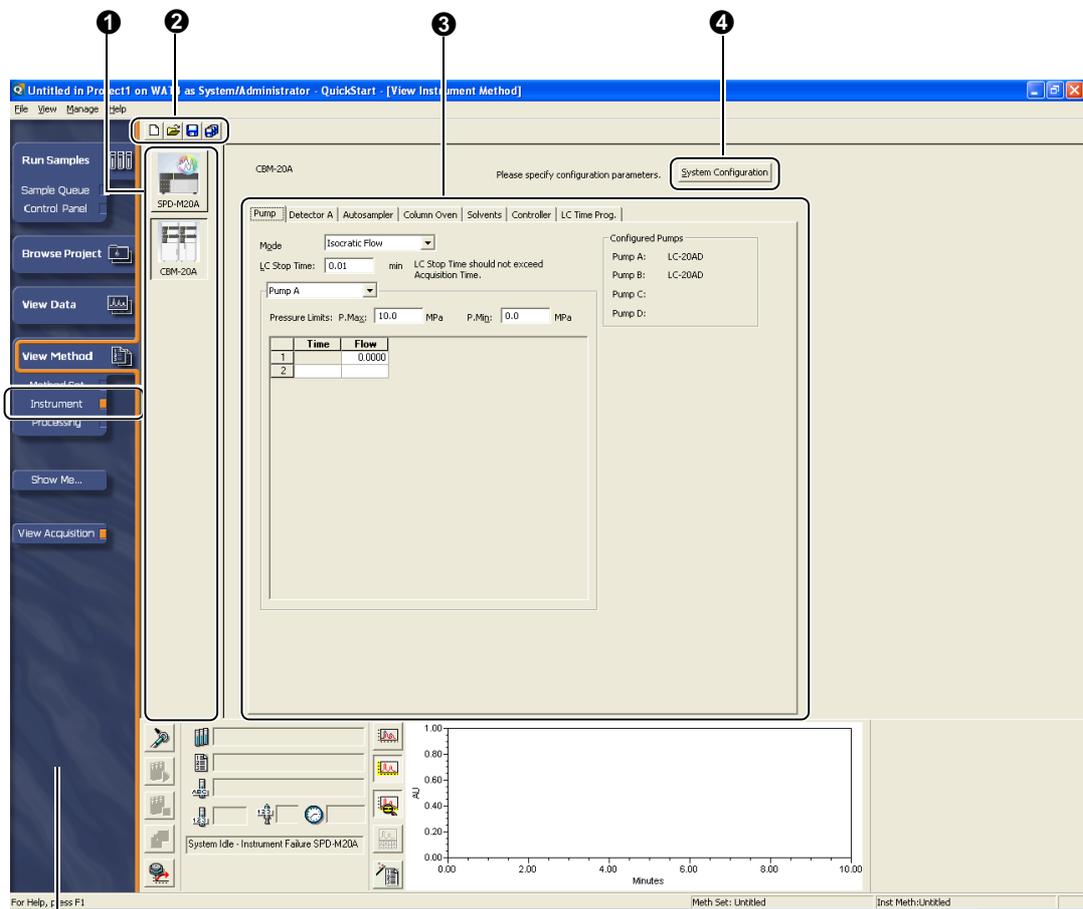
2

The instrument method editing window in the Quick Start is explained below.

1

Click [Instrument] under [View Method] in the navigation bar.

The [View Instrument Method] window is displayed.



Navigation Bar

No.	Explanation
①	The icon of the system controller set for the chromatographic system is displayed. If the PDA detector is configured in the system configuration, the icon of the PDA detector is also displayed.
②	Options such as [New Method] and [Save Method] are displayed on the toolbar.
③	Tab pages for the units included in the system are displayed. In each tab page, the instrument parameters can be set.
④	Settings information can be checked and detailed parameters can be set for the units that comprise the system.

## 2.2 Setting Parameters for Instruments

The operations used to set the instrument parameters for a system containing two pumps, an autosampler, a column oven, and a UV detector are explained below.

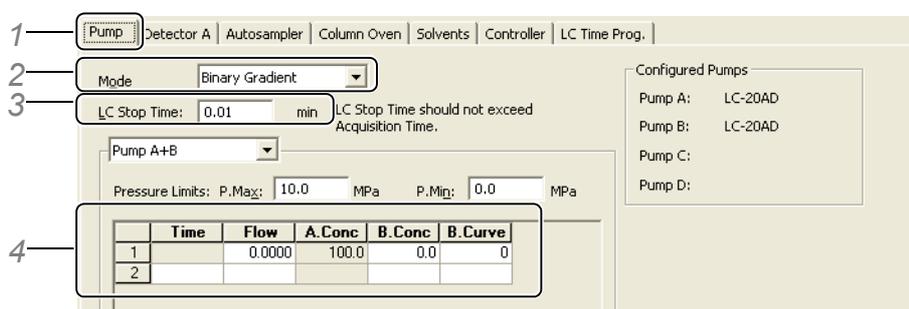
### 1 Click [Instrument] under [View Method] in the navigation bar.

The [View Instrument Method] window is displayed.

#### Reference

["2.1 Displaying the Instrument Method Editing Window" P.7](#)

### 2 Set the pump parameters.



1 Click the [Pump] tab.

2 Select [Mode].

3 Set the [LC Stop Time].

Set the time required for one analytical cycle (from sample injection to the completion of analysis).

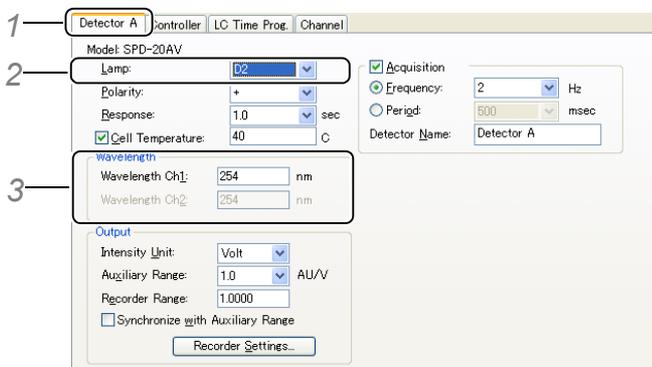
4 Set the [Gradient Program].

In the first row, enter initial flow rate and initial concentration values. In the following rows, enter time, flow and concentration values.

#### NOTE

- In ultra high pressure analysis, set a value larger than that of default to the [P.Max].
- Set parameters other than the above as necessary. Normally, the default values can be used as they are.

### 3 Set the detector parameters.



1 Click the [Detector A] tab.

2 Select [D2].

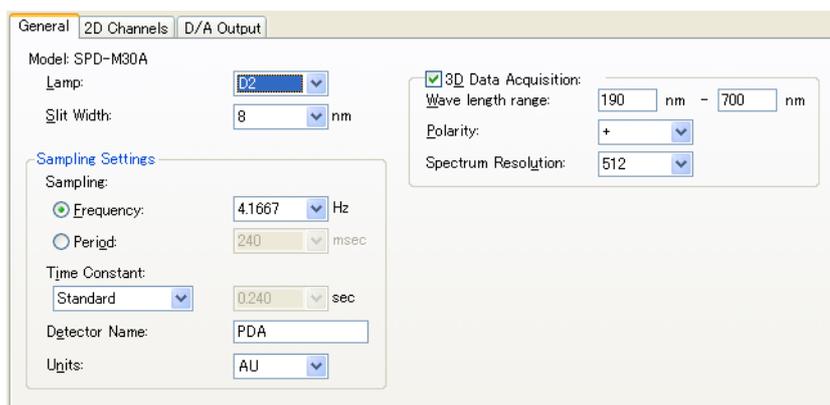
3 Enter a wavelength.

 **NOTE**

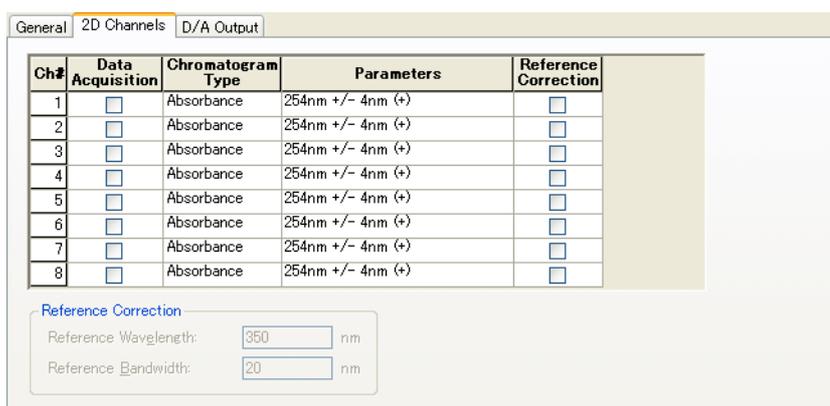
- Set parameters other than the above as necessary. Normally, the default values can be used as they are.
- If dual mode is selected, enter a wavelength for [Wavelength Ch2]. Refer to ["2.4 Checking System Configuration Information" P.13](#) for details on the setting method for dual mode.
- When including the Fluorescence detector in the system configuration, set the lamp mode and enter wavelengths (excitation wavelength and emission wavelength).
- When including the Differential refractive index detector in the system configuration, select the mode.
- When including the PDA detector in the system configuration, set the wavelength range and lamp mode in the [General] tab page. In the [2D Channels] tab page, the parameters such as the chromatogram type, wavelength, and reference correction can be set. In the [D/A Output] tab page, set the wavelength at which D/A signals are output from the PDA detector (all four channels).

Set the wide slit width for high sensitive analysis. Set the narrow slit width when high resolution spectrum is required.

## [General] Tab



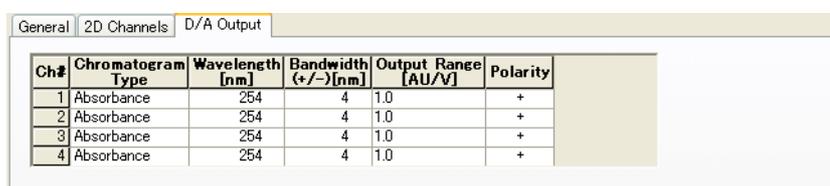
## [2D Channels] Tab



Ch#	Data Acquisition	Chromatogram Type	Parameters	Reference Correction
1	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
2	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
3	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
4	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
5	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
6	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
7	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>
8	<input type="checkbox"/>	Absorbance	254nm +/- 4nm (+)	<input type="checkbox"/>

Reference Correction  
 Reference Wavelength: 350 nm  
 Reference Bandwidth: 20 nm

## [D/A Output] Tab



Ch#	Chromatogram Type	Wavelength [nm]	Bandwidth (+/-)[nm]	Output Range [AU/V]	Polarity
1	Absorbance	254	4	1.0	+
2	Absorbance	254	4	1.0	+
3	Absorbance	254	4	1.0	+
4	Absorbance	254	4	1.0	+

- In fast analysis, such as Prominence UFLC, the peaks have a relatively sharp shape (narrow peak width). Therefore, it is necessary to set a fast response time. When analysis is conducted with a long response time, peak widening occurs, and peaks that are successfully separated in the column may not be shown separated on the detector signal. However, if a short response time is set, the noise increases in inverse proportion to the square root of the response time. As a result it is necessary to set an appropriate response considering both peak separation and sensitivity.

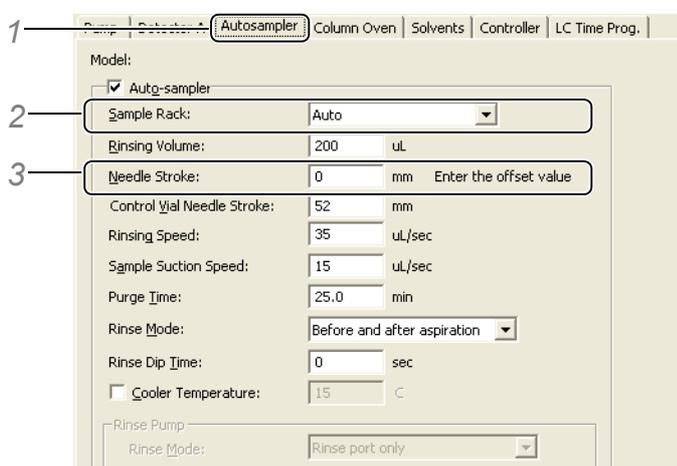
So when creating a method, after confirming that the peaks are separated when a short response time is set, set a longer response time in the range which does not affect the separated peaks.

Set the appropriate response time in reference to the following table.

Response	Applicable Half Height Width
No Filter	0.08 sec or more
0.05 sec	0.2 sec or more
0.1 sec	0.4 sec or more
0.5 sec	2.2 sec or more
1.0 sec	4.8 sec or more
1.5 sec	7.2 sec or more

For example, in fast analysis, if the first eluting peak has a half height width of 1 second, set the response time to 0.1 second. Although the data capacity increases when a fast sampling period is set, it is recommended to set the same value as the response time to the sampling period.

## 4 Set the autosampler parameters.



- 1 Click the [Autosampler] tab.
- 2 Select [Auto].
- 3 Enter a needle stroke value.

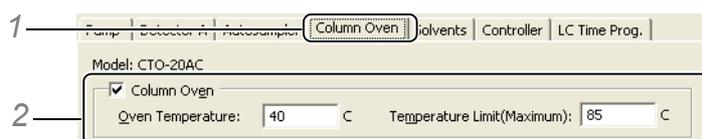
### NOTE

- Set parameters other than the above as necessary. Normally, the default values can be used as they are.
- When using SIL-30AC, rinsing of needles using a maximum of four rinse solutions (multi-rinse function) can be set. Refer to the Empower driver Help for details on the setting method for this function.

- If a rinse pump or a rack changer is selected in the [Instrument Configuration Wizard], the respective parameters can be set. Refer to "4.1 Registering Shimadzu Instruments in the System" in the Installation Manual for details on the setting method for rinse pumps and rack changers.
- When using the rack changer, Set [Changer Rack] to [Sample Rack], then set the [Rack Type] and [Needle Stroke] for stack A - D.
- When using LC-2010, select a rack as follows.
  - When using model A
    - Select [Auto] or a rack other than [Cooling rack].
  - When using model C
    - Select [Auto] or a rack other than [Standard Rack].
- If [Auto] is selected for [Sample Rack], [Enter the offset value] is displayed next to the [Needle Stroke] box. This means that the needle stroke for the sample rack set in the autosampler is specified as an offset value corresponding to the setting range and the initial value. For example, when a sample rack whose setting range of the needle stroke is 17 - 54 and initial value is [52], if [2] is set for the offset value, [54] will be set to the autosampler.

Needle Stroke:  mm Enter the offset value

## 5 Set the oven parameters.



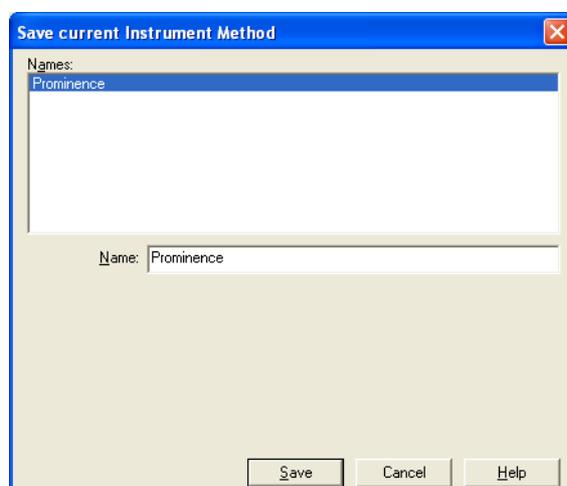
- 1 Click the [Column Oven] tab.
- 2 Enter the oven temperature.

### NOTE

When using CTO-20A/20AC/30A, if a built-in valve is set in the [Instrument Configuration Wizard], the valve position for the initial state can be set.

## 6 Click the (Save) button.

## 7 Enter an instrument method name, and click [Save].



This completes the procedure for creating an instrument method. The next step is to create a method set.

**NOTE**

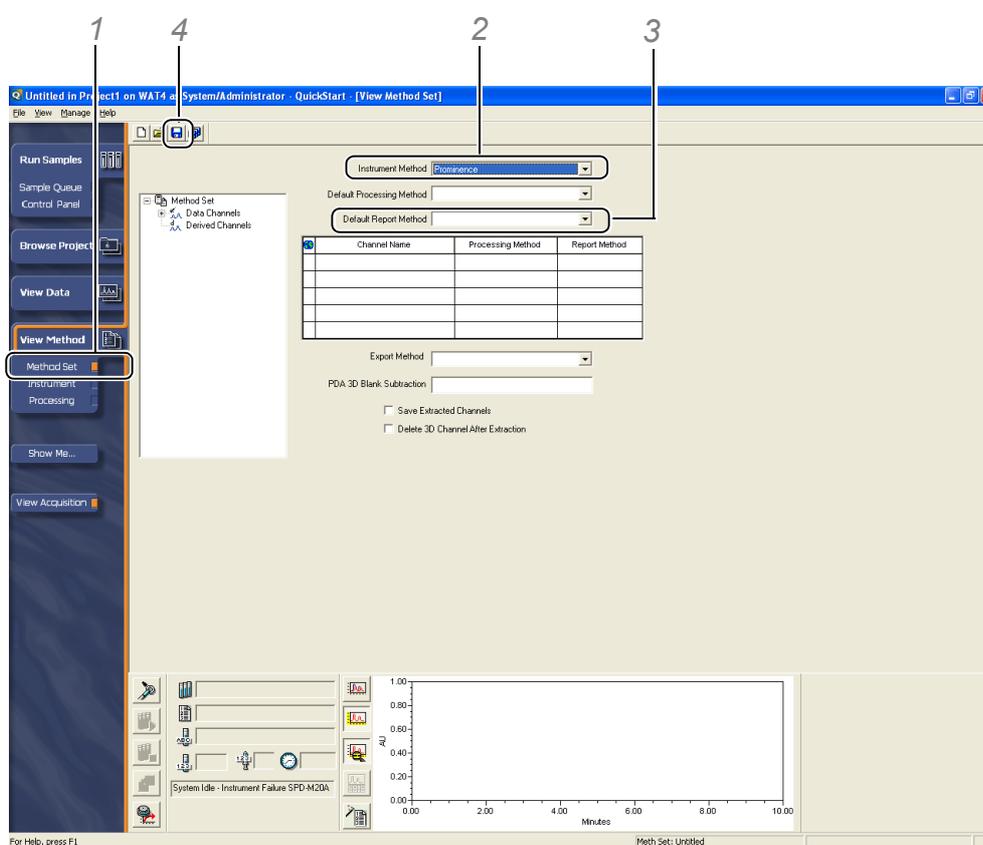
Other Shimadzu HPLC instrument parameters that can be set on Empower include solvent names, time programs, and valve settings (with a subcontroller). Refer to Online Help for details on each parameter.

## 2.3 Creating Method Sets

On Empower, instrument parameters, data processing parameters, and output formats for reports are set as part of a method set that is used in the execution of analysis.

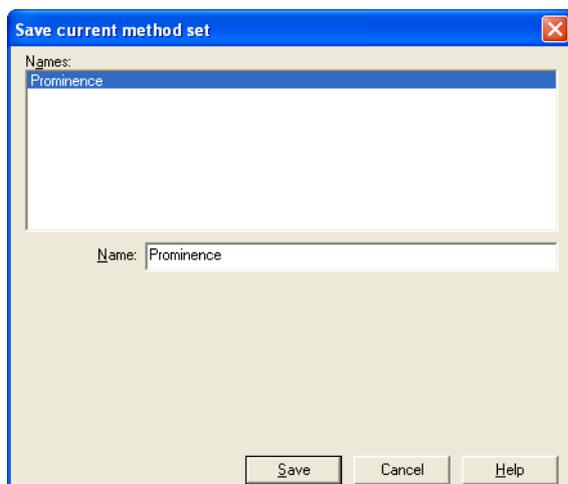
The operations used to create a method set are explained below.

### 1 Select an instrument method and report method.



- 1 Click [Method Set] under [View Method] in the navigation bar.
- 2 Select the instrument method created in 2.2.
- 3 Select [Default Individual Report] in the [Default Report Method] box.
- 4 Click the  (Save) button.

## 2 Enter a method set name, and click [Save].



This completes the procedure for creating a method set. Refer to ["3.1 Operating the Control Panel" P.19](#) and ["4 Acquiring Data" P.27](#) for details on the methods used to check the instrument status and to start analysis.

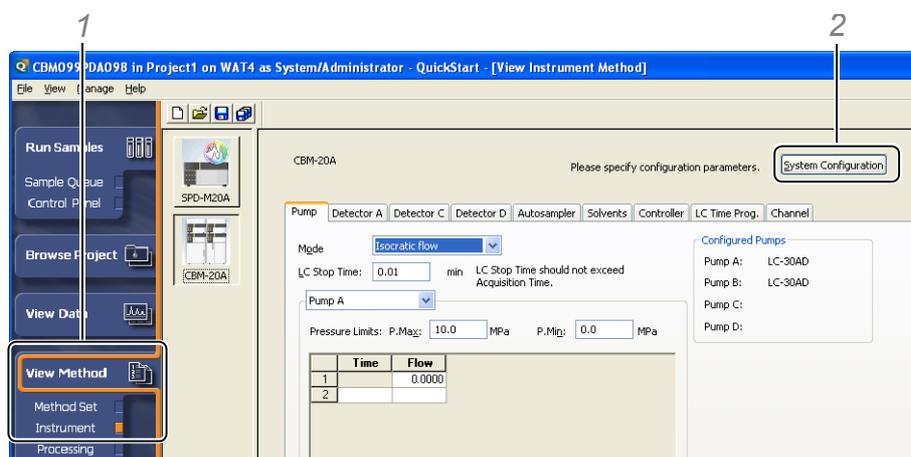
### NOTE

- Analysis can still be executed if a method set is created without setting a processing method or report method. Refer to ["5.2 Creating Processing Methods" P.37](#) for details on the method used to create processing methods.
- In the [Default Individual Report] report method, sample information, chromatograms, and peak information for the acquired data are output. Refer to ["6.2 Creating Report Methods" P.46](#) for details on the method used to create a report method.

## 2.4 Checking System Configuration Information

This section explains how to check system configuration information and to set detailed parameters for each instrument.

### 1 Open the [Shimadzu HPLC System Configuration] window.



- 1 Click [Instrument] under [View Method] in the navigation bar.
- 2 Click [System Configuration].

The [Shimadzu HPLC System Configuration] window is displayed.

## 2 Click [Configure] for each instrument.

<CBM-20A/20Alite>

**Shimadzu HPLC System Configuration**

System Controller: CBM-20A

**Pumps**

Pump A: LC-30AD

Pump B: LC-30AD

Pump C: None

Pump D: None

**Detectors**

Detector A: SPD-20A

Detector B: None

Detector C: Analog

Detector D: Analog

Autosampler: SIL-30AC

Oven: None

Subcontroller: None

<LC-2010>

**Shimadzu HPLC System Configuration**

System Controller: LC-2010 Controller

Pump: LC-2010 Pump

Detector: LC-2010 Detector

Autosampler: LC-2010 Autosampler

Oven: LC-2010 Oven

### NOTE

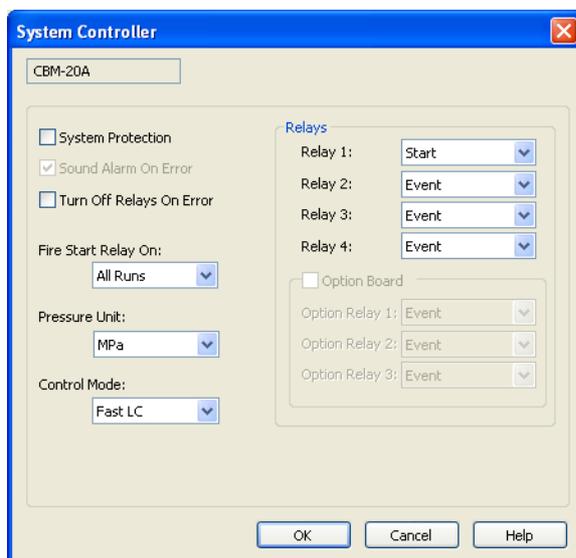
It is not possible to add to, delete, or change the instruments that are configured in the [Shimadzu HPLC System Configuration] window. Refer to "4.1 Registering the Shimadzu HPLC system information in the System" in the Installation Manual for details on the method used to configure instruments.

### 3 Check the system configuration information for each instrument.

Set the instruments' detailed parameters as necessary. Refer to Online Help or the Installation Manual for details on each parameter.

#### Detailed Settings for the System Controller

Parameters such as the pressure unit and event signals can be set.



2

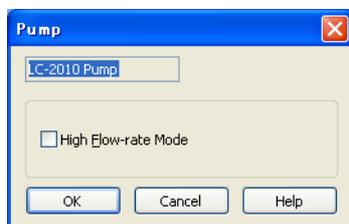
#### Detailed Settings for Pumps

Information about the solenoid valve connected to the pump can be checked.

<LC-20AD/20AT/20AB/20ADXR/30AD>

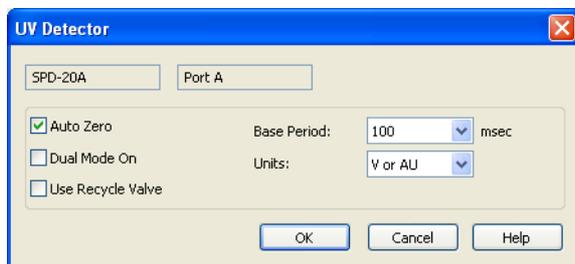


<LC-2010>



### Detailed Settings for the Detector

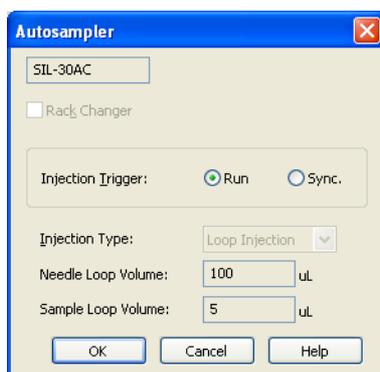
Dual wavelength measurement mode (dual mode) and the base period for the digital data acquisition can be set.



### Detailed Settings for the Autosampler

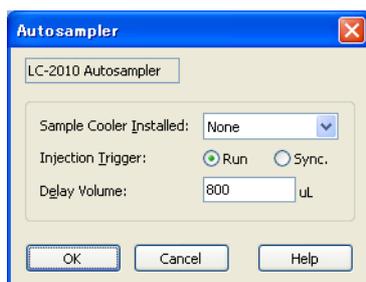
Information about rinse pumps or rack changers connected to the autosampler can be checked.

<SIL-30AC>



is intentionally left blank.

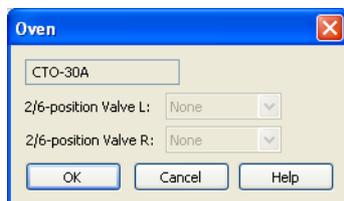
<LC-2010>



### Detailed Settings for the Oven

Information about the valve units incorporated in the oven can be checked.

<CTO-20A/20AC/30A>

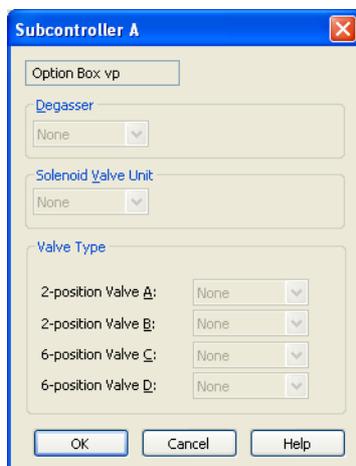


<LC-2010>



### Detailed Settings for the Sub-controller

Information about the solenoid valve units and other valve units connected to the sub-controller can be checked.



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# 3

## Shimadzu Control Panel

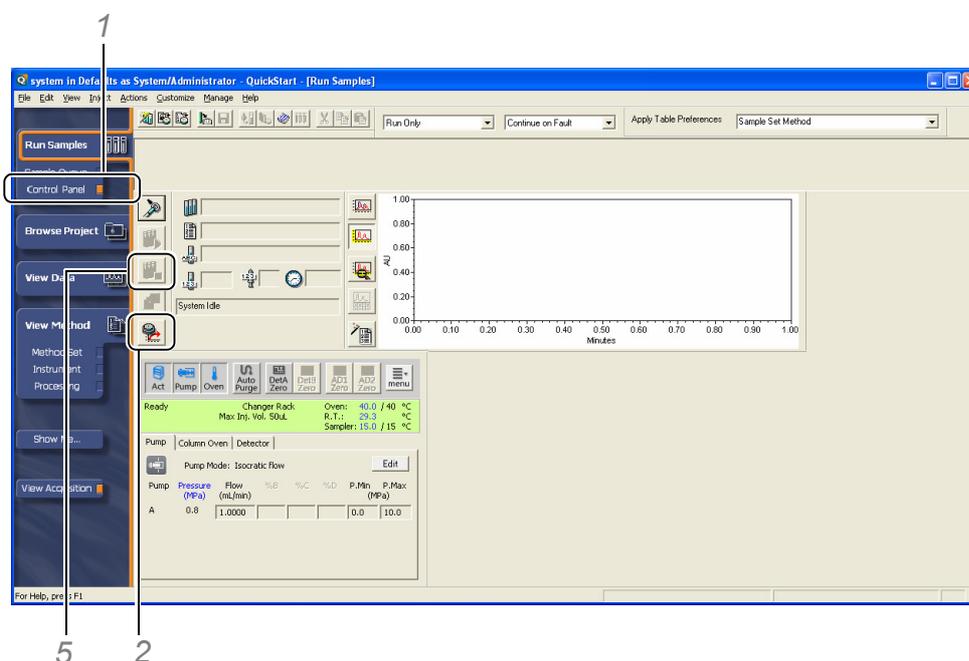
Shimadzu Control Panel is used to monitor and control the Shimadzu HPLC system. This chapter explains the operations of Shimadzu Control Panel.

### 3.1 Operating the Control Panel

The operations used to check the instrument status with Shimadzu control panel are explained below.

3

#### 1 Start Shimadzu control panel.



- 1 Click [Control Panel] under [Run Samples] in the navigation bar.
- 2 Click the  (Equilibrate) button in the [Control Panel] window. The [Setup Equilibrate/System Monitor] window is displayed.

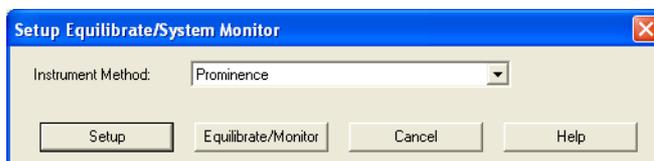


#### NOTE

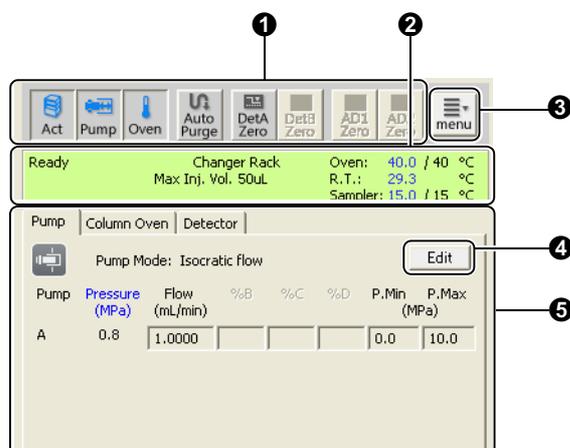
Check that [View Acquisition] in the navigation bar is selected. The indicator is orange when this item is selected.



- 3 Select the instrument method to be used for analysis, and click [Equilibrate/Monitor]. Data plots start in accordance with the instrument parameters.



4 Check that the status of each component is displayed in Shimadzu control panel.



No.	Explanation
①	The direct command buttons for each component are displayed. Click a button to send the corresponding command to the instrument.
②	The status of the HPLC system, the information about injection, the oven temperature and so on are displayed.
③	Menus such as those for starting the instrument's utility programs and clearing error are displayed.
④	Instrument parameters can be changed by clicking [Edit].
⑤	The current values for each component are displayed.

5 When the baseline equilibrates, click the  (Stop) button.

If the status of the Shimadzu HPLC is [Ready], analysis can be started.

Refer to "[4 Acquiring Data](#)" P.27 for details on the method used to start analysis.

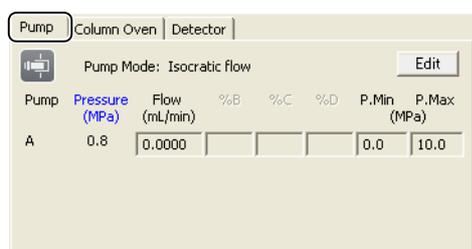
#### NOTE

- In the Empower real-time plotting window, an automatic scale is used for the Y axis. When checking the stability of the baseline, also check the Y-axis scale.
- When an autosampler is connected, [Vial#] and [Inj. Vol] are displayed during analysis, in other cases the rack name and the upper injection volume limit [Max Inj. Vol] are displayed.
- If analysis is performed that exceeds the upper injection volume limit, an error occurs at each injection and injection is not performed.
- When using CBM-20A/20Alite version 1.20 or earlier, or SIL-20A/20AC version 1.20 or earlier, the upper injection volume limit is 2000 uL. If the injection exceeds the volume of the actual sample loop, sample will adhere to the measuring line and can lead to operation problems. Please upgrade ROM version, and perform the instrument configuration wizard.

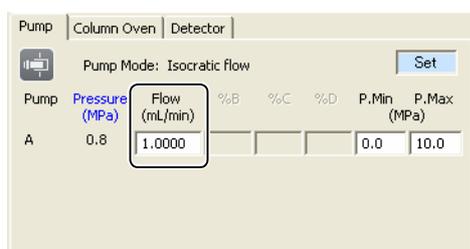
### 3.1.1 Changing Instrument Parameters

The operations used to change instrument parameters directly from Shimadzu control panel are explained below. The operations used to change the pump flow rate are explained below.

#### 1 Click the [Pump] tab in the control panel.

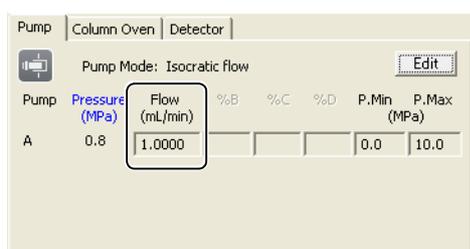


#### 2 Click [Edit] and change the flow rate.



#### 3 Click [Set].

The flow rate will be set to the instrument.



Other instrument parameters can be changed in the same way.

#### NOTE

- To perform analysis with the instrument parameters returned to their original settings, select the instrument method again from the [Setup Equilibrate/System Monitor] window, and click [Setup].
- While editing parameters, the parameters are not be updated.
- With Shimadzu LC Driver version 2.00 or later and CBM-20A/20Alite version 1.20 or later, if [Control Mode] is set to [Fast LC], [Pump Mode] is displayed as following.

Pump Configuration	Actual Setting Value	Displayed Value
Pump A+B: LC-20AD/LC-20ADXR	Binary Gradient	Binary Gradient (Fast)
Pump A+B: LC-20AD/LC-20ADXR	Binary Gradient x 2	Binary Gradient x 2 (Fast)
Pump A: LC-20AB	Binary Pump	Binary Pump (Fast)

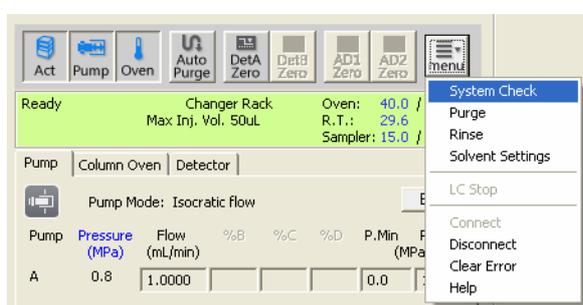
- When using Shimadzu LC Driver version 2.00 or later and CBM-20A/20Alite version 1.20 or later, while Fast LC mode analysis is being performed, the value of [Flow] and [%B] for [Pump A] through [Pump D] cannot be changed from the control panel.

- When using CBM-20A/20Alite version 1.20 or earlier, or when performing the normal mode analysis, if the values of [Flow], [%B] to [%D] for [Pump A] to [Pump D] are changed from the control panel, gradient delivery for pumps A through D is stopped.

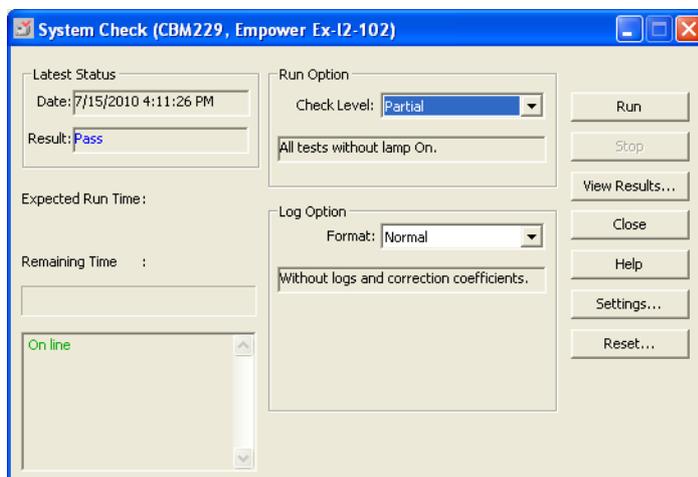
## 3.2 Executing System Check

The operations used to check the usage frequency of the instrument's consumable items (system check) before performing analysis are explained below.

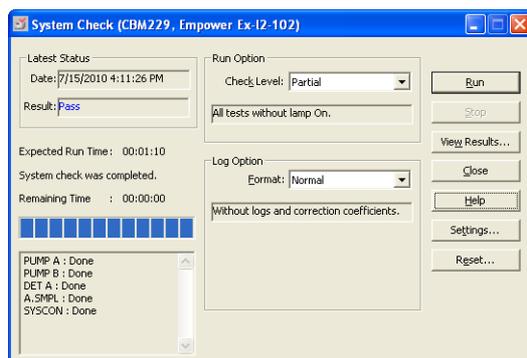
- 1 Click the  (Menu) button and select [System Check] on the menu that is displayed. The [System Check] window is displayed.



- 2 Execute a System Check.



- 1 Confirm that both the [Run Option] and [Log Option] are set to [Normal].
- 2 Click [Run].  
The system check starts.  
During the system check, the state of progress is displayed on the screen.



3 After completion of the system check, the [System Check Results] window is displayed.



#### NOTE

- If [Complete] is set for [Run Option], a wavelength check is performed for the lamp together with the system check.
- If [Detail] is set for [Format] of [Log Option], an instrument log is also displayed in the system check results.
- To cancel the system check, click [Stop].
- If [View Results...] is clicked without executing a system check, the results of the latest system check are displayed.
- When using LC-2010, [Log Option] cannot be set. Depending on the system configuration, the following report is output for each [Run Option].

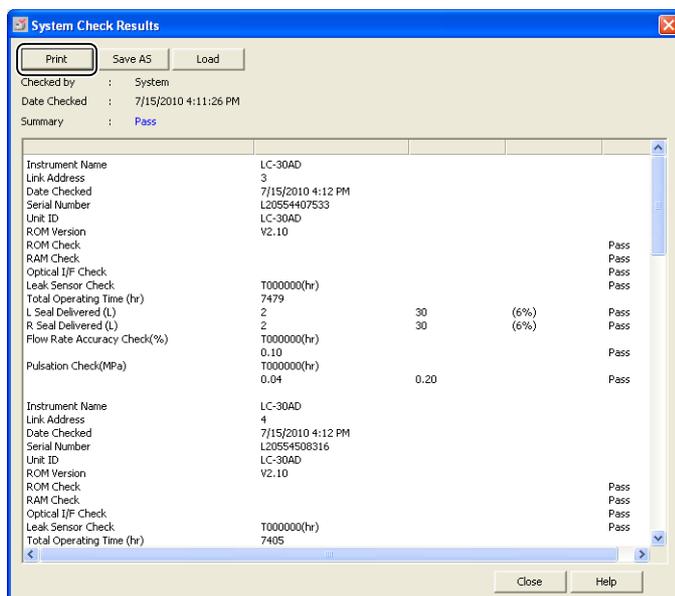
System Configuration	Run Option	Report Option (LC-2010)	Report Option (PDA)
LC-2010	Partial	(Output in [Detail])	-
LC-2010	Log	Log	-
LC-2010 + PDA	Partial	(Output in [Detail])	(Output in [Detail])
LC-2010 + PDA	Complete (*1)	(Output in [Detail])	(Output in [Detail])
LC-2010 + PDA	Log	Log	- (*2)

(\*1)When [Complete] is selected for the [Run Option], wavelength check is executed only for the PDA.

For LC-2010, the wavelength check is executed in the self-diagnosis when the instrument is turned on. In the system check report, this check result is displayed.

(\*2)Even though [Log] is selected for the [Run Option], the PDA's instrument log is not output.

### 3 Click [Print] and print the system check results.



#### NOTE

- The system check results can be saved in a file. To save the results, click [Save As].
- To display past system check results, click [Load], and select the desired file from the open file dialog box.
- In the [System Check] window, the criteria for replacement of consumable items settings and the usage frequency can be reset. If [Fail] is displayed in the system check results, replace the consumable item in question. At the same time, click the [Setting] button in the [System Check] window to open the [Consumable Reset] window, and click the [Reset] button to the side of the replaced part to reset the usage frequency.

## 3.3 Executing AutoPurge

The operations (autopurge) used to remove air from inside the pumps and the autosampler and to replace the mobile phase immediately after starting the instrument or when switching to another mobile phase are explained below.

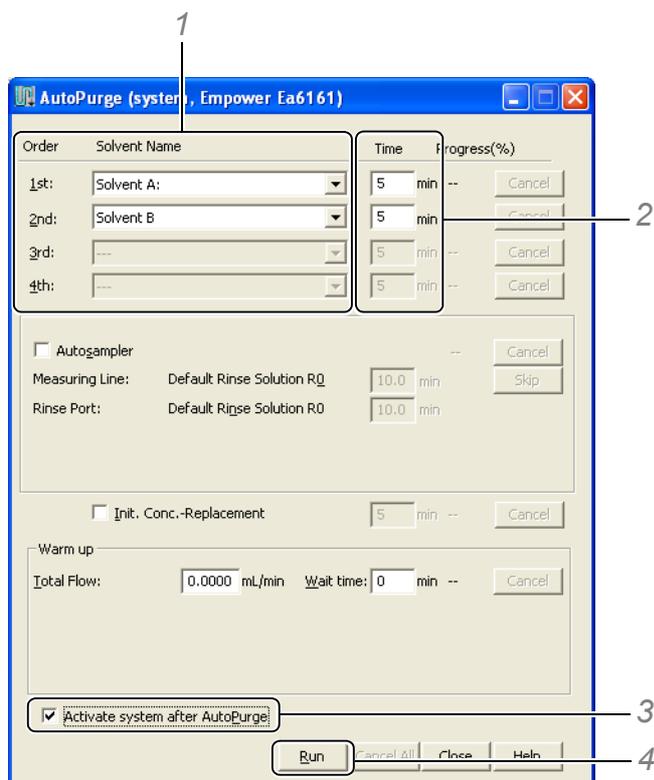
### 1 (AutoPurge) button.

The [AutoPurge] window is displayed.

#### NOTE

When using instruments which don't support autopurge, you cannot click the  (AutoPurge) button.

## 2 Execute AutoPurge.



- 1 Select the mobile phase to be subjected to autopurge from the list.  
Multiple lines can be selected in accordance with the number of pumps and the pump mode.
- 2 Enter the purge times.
- 3 Select the option to continue solvent delivery after the completion of autopurge.
- 4 Click [Run].  
Autopurge is executed under the set conditions.  
During the execution of autopurge, the state of progress is displayed on the screen.



### NOTE

The following settings are also possible with the autopurge setting window.

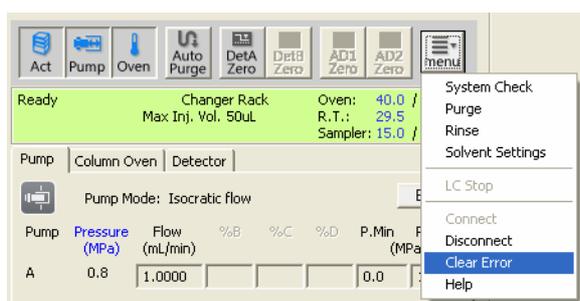
- The setting to execute autopurge of the autosampler after completing autopurge of the pumps.
- The setting to execute autopurge at the initial concentration after completing autopurge of the pumps and autosampler (when the pump mode is not [Isocratic] mode).
- The setting to start solvent delivery (warm-up) at the specified flow rate after completion of all autopurge operations.

To execute these operations, select the mobile phase and checkboxes and set the [Purge Time] as appropriate. To cancel the autopurge operation, click [Cancel] for the applicable line.

## 3.4 Clearing Instrument Error

The operations used to clear instrument errors are explained below.

- 1 Click the  (Menu) button and select [Clear Error] on the menu that is displayed. The indicator of the system controller (CBM-20A) changes from red to green.



- 2 Check the error that occurred in the message center.

Type	Category	Time	Application	User	Project	Message
Error	Instrument	5/10/2007 11:14:26 AM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure CBM-20A#1
Error	Instrument	5/10/2007 11:16:37 AM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure CBM-20A#1
Error	Instrument	5/10/2007 11:16:38 AM JST	CBM20A229	System/Administrator	Defaults	LC instrument error. Q - 2007/05/10 02:16:19 [WTSExeServer]-5#2;
Error	Instrument	5/10/2007 4:22:29 PM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure CBM-20A#1
Error	Instrument	5/10/2007 4:22:39 PM JST	CBM20A229	System/Administrator	Defaults	LC instrument error. Q - 2007/05/10 07:22:22 [WTSExeServer]-5#2;
Error	Instrument	5/11/2007 2:39:49 PM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure CBM-20A#1
Error	Instrument	5/11/2007 2:47:26 PM JST	CBM20A229	System/Administrator	Defaults	CBM-20A#1 Setup Failed
Error	Instrument	5/11/2007 2:47:26 PM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure
Error	Instrument	5/11/2007 2:58:49 PM JST	CBM20A229	System/Administrator	Defaults	CBM-20A#1 instrument currently in use.
Error	Instrument	5/11/2007 2:58:49 PM JST	CBM20A229	System/Administrator	Defaults	Run aborted - instrument already in use.
Error	Instrument	5/11/2007 3:12:45 PM JST	CBM20A229	System/Administrator	Defaults	CBM-20A#1 instrument currently in use.
Error	Instrument	5/11/2007 3:12:45 PM JST	CBM20A229	System/Administrator	Defaults	Run aborted - instrument already in use.
Error	Security	5/14/2007 18:33:52 AM JST	Login Window	System/Administrator	Defaults	Unsuccessful login attempt to user account 'system'. See System Audit Trail for details.
Error	Instrument	5/14/2007 18:45:39 AM JST	CBM20A229	System/Administrator	Defaults	Instrument Failure CBM-20A#1
Inform	Instrument	5/14/2007 10:52:05 AM JST	CBM20A229	System/Administrator	Defaults	System Check has been completed. (Summary/Pass There are some consumables over the referen
Warning	Instrument	5/14/2007 10:54:01 AM JST	CBM20A229	System/Administrator	Defaults	Failure - SCODE(0x00000000) ( 0.000 5/14/2007 10:54:00 AM ) - 2007/05/14 01:54:00 [WTSExeSe
Inform	Instrument	5/14/2007 10:54:32 AM JST	CBM20A229	System/Administrator	Defaults	Autopurge has been stopped. ((Autosampler)) - 2007/05/14 01:54:30 [WTSAutoPurge]-646c;
Inform	Instrument	5/14/2007 10:54:34 AM JST	CBM20A229	System/Administrator	Defaults	Autopurge has been completed. ( ) - 2007/05/14 01:54:32 [WTSAutoPurge]-646d;

### NOTE

Take the appropriate action for the errors displayed in the message center. Refer to Online Help for details on the countermeasures for errors.

# 4

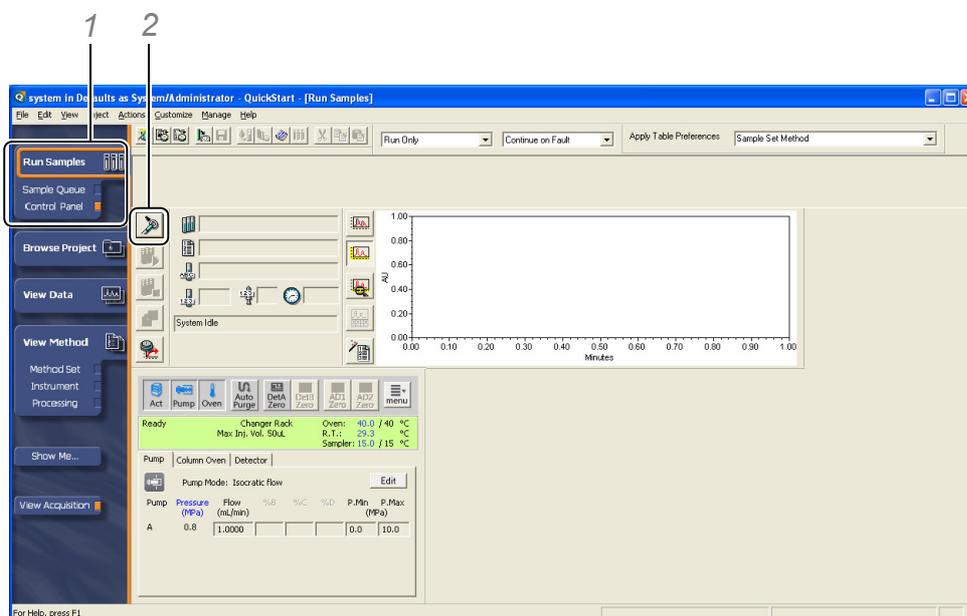
## Acquiring Data

This chapter explains the analytical operations and the method used to create sample sets.

### 4.1 Performing a Single Run

The operations used to perform a single run of a standard sample (i.e., to inject a sample once) are explained below.

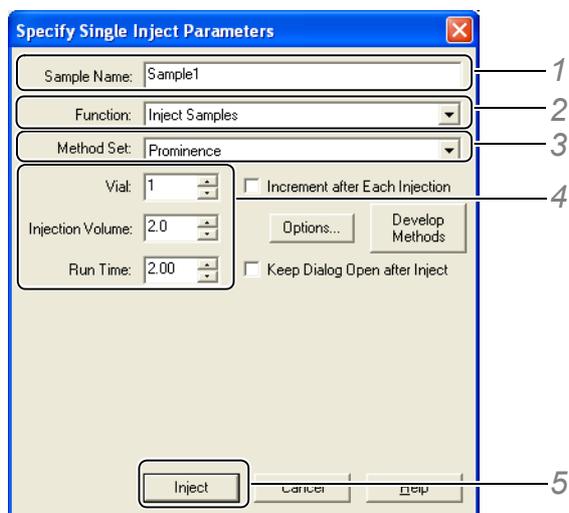
#### 1 Open the [Specify Single Inject Parameters] window.



1 Click [Control Panel] under [Run Samples] in the navigation bar.

2 Click the  (Inject) button in the window.  
The [Specify Single Inject Parameters] window is displayed.

## 2 Set the parameters.



- 1 Enter a [Sample Name].
- 2 Select [Inject Standards].
- 3 Select the method set to be used for analysis.
- 4 Enter a [Vial], an [Injection Volume], and a [Run Time].
- 5 Click [Inject].



### NOTE

[Injection Volume] range

<SIL-20A Series, LC-2010>

0.1 -0.9 with step 0.1 and 1 - [Max Inj. Vol] with step 1

<SIL-30A : Direct Injection, Loop Injection/Partial Loop>

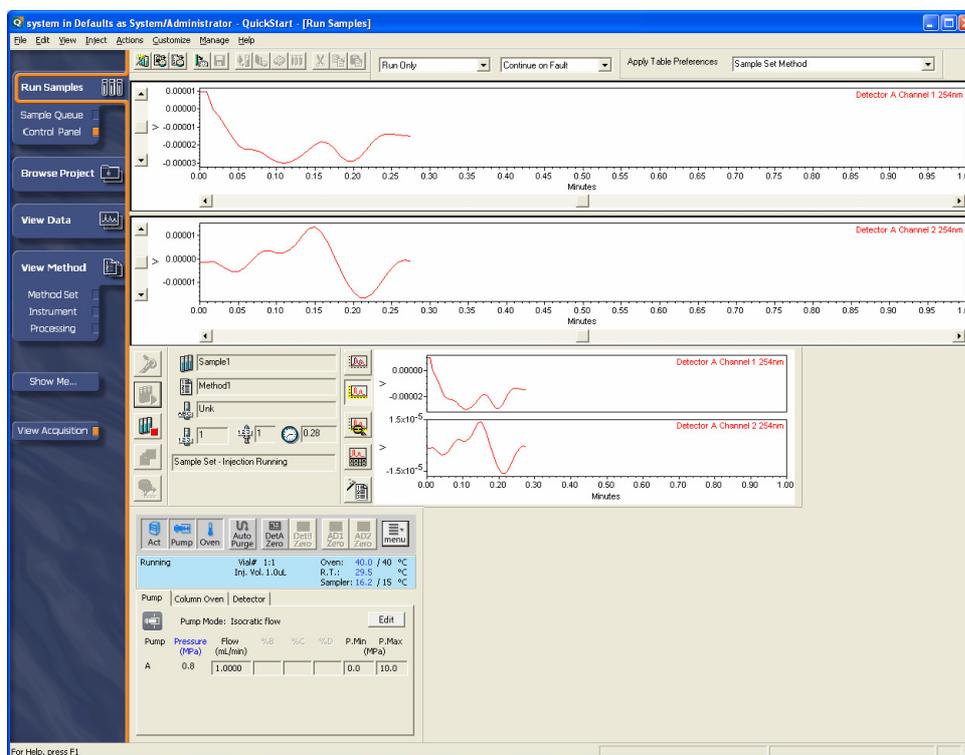
0.1 -9.9 with step 0.1 and 10 - [Max Inj. Vol] with step 1

<SIL-30A : Loop Injection/Full Loop>

[Max Inj. Vol]

Single analysis starts.

During analysis, the analysis status and the chromatogram are displayed on the screen.



#### NOTE

To cancel analysis, click the  (Abort) button in the main window.

4

## 4.2 Creating Sample Sets

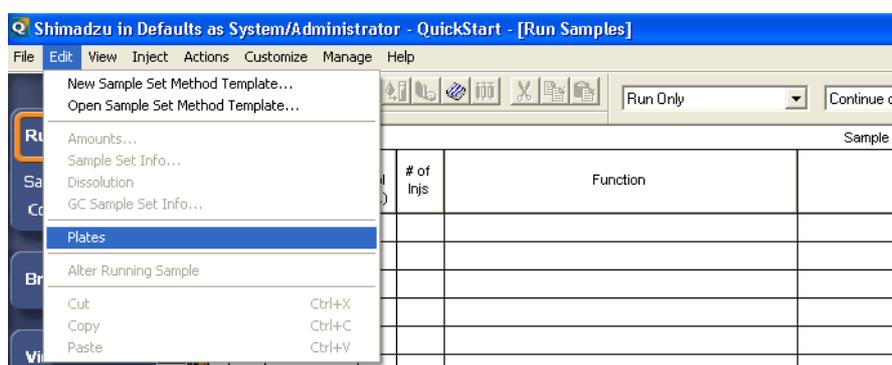
To perform the continuous analysis of multiple samples, it is necessary to create a sample set. The operations used to create a sample set and start analysis are explained below.

- 1 Click **[Sample Queue]** under **[Run Samples]** in the navigation bar.

The [Sample Queue] window is displayed.

- 2 Select **[Plates]** on the **[Edit]** menu.

The [Set Plate for Sample Set Method] window is displayed.

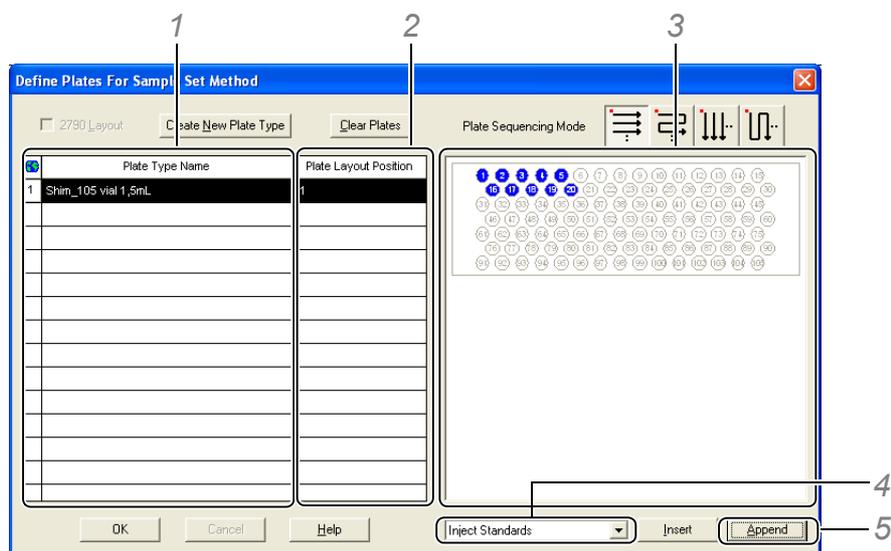


- 3 Select the Shimadzu HPLC plate to be used and the vial positions.



### NOTE

If the [2790 Layout] checkbox is selected, clear the checkbox to display the following windows.



- 1 Select the Shimadzu HPLC plate (sample rack) set to the autosampler.
- 2 Enter "1".
- 3 Click the vial positions at which the samples are set.  
The selected vial positions turn blue.
- 4 Select the type of the samples to be injected.  
Types such as standard samples, unknown samples, and control samples can be selected.
- 5 Click [Append].

 **NOTE**

- The Shimadzu HPLC plate must be registered to Empower beforehand. Refer to "5 Registering Sample Racks" in the Installation Manual for details on the methods used to create and set new plates.
- The values that can be set for "Plate Layout Position" vary with the plate.  
<SIL-20A/20AC/20AXR/20AXR/30AC>

Sample Rack Name	Plate Layout Position
1.5-mL, 105-vial rack	1
1.5-mL, 70-vial rack	1
1-mL cooling rack	1
4-mL cooling rack	1
MTP 96-well plate	1, 2 (1 to 12 when using a rack changer)
MTP 384-well plate	1, 2
DWP 96-well plate	1, 2 (1 to 12 when using a rack changer)
DWP 384-well plate	1, 2
Control rack	0

&lt;LC-2010&gt;

Sample Rack Name	Plate Layout Position
1.5-mL, 105-vial rack	1, 2
1.5-mL, 70-vial rack	1, 2
1-mL cooling rack/standar rack	1, 2
4-mL cooling rack/standar rack	1, 2
MTP 96-well plate	1 to 4
MTP 384-well plate	1 to 4
DWP 96-well plate	1 to 4

- The order in which the vials are injected can be changed using [Plate Sequencing Mode].

# 4 Set each item in the schedule table.

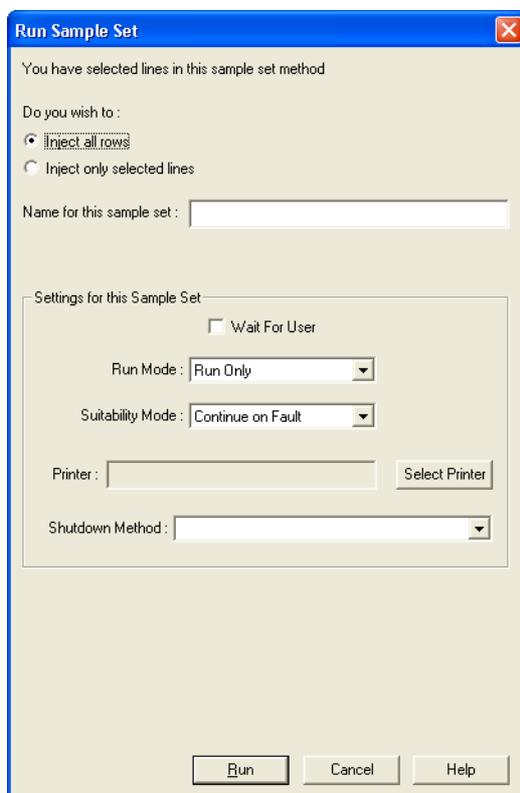
Rack/View	SampleName	Inj Vol (µL)	# of Injs	Function	Method Set / Report Method	Run Time (Minutes)	Next Inj Delay (Minutes)	SampleHeight	Dilution	Level
1 1:1	Sample1	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
2 1:2	Sample2	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
3 1:3	Sample3	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
4 1:4	Sample4	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
5 1:5	Sample5	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
6 1:16	Sample6	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
7 1:17	Sample7	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
8 1:18	Sample8	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
9 1:19	Sample9	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	
10 1:20	Sample10	10.0	1	Inject Standards	Prominence	10.00	0.00	1.0000	1.0000	

- 1 Enter a [SampleName].
- 2 Select the method set to be used for analysis.
- 3 Enter a [Run Time].
- 4 Click the  (Run Sample Set) button.  
The [Run Sample Set] window is displayed.

## NOTE

- In a sample set, items such as [SampleWeight] and [Dilution] can be set in addition to the above.
- Sample sets can also be created with a wizard. Click the  (Wizard) button in the window to display the wizard.
- The initial value for [Injection Volume] is 10 µ L. Change this setting as necessary.

- 5** Enter a sample set name, and click [Run].  
Analysis starts.



4

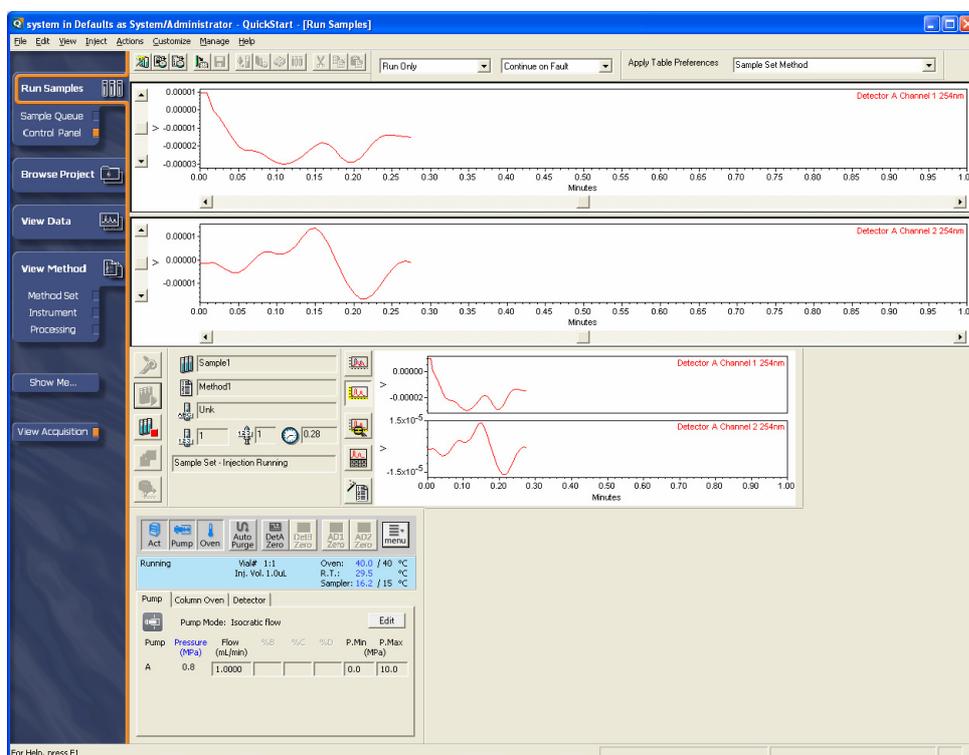
 **NOTE**

- The process after analysis can be set in [Run Mode]. (Three settings are available: [Run Only], [Run and Process], and [Run and Report].) In this case, no processing method has been created, so [Run Only] is selected.
- After creating a sample set, click the  (Run Sample Set) button to register the sample set in the queue. To display the sample sets in the sample queue, click the [Sample Sets] tab in the [Sample Queue] window.
- To view the data during analysis, click [View Data] in the navigation bar.
- When an instrument method in which such as the following are set is set as [Shutdown Method], the instruments will stop in accordance with the set parameters after analysis is completed.
  - Stopping pump solvent delivery
  - Turning off the oven temperature
  - Turning off the detector lamp

 **Reference**

*"2 Creating Instrument Methods" P.7*

During analysis, the analysis status and the chromatogram are displayed on the screen.



## NOTE

Notice for using the manual injector

Configuration	Procedure on the Empower
Manual Injector only (No start input)	<ol style="list-style-type: none"> <li>1. Click the [Prepare] button on the Single Injection window.</li> <li>2. Click the [Inject] button on the Single injection window.</li> </ol> <p> <b>NOTE</b> The data acquisition will be started just after clicking the [Inject] button.</p>
Manual Injector only (With start input)	<ol style="list-style-type: none"> <li>1. Click the [Inject] button.</li> <li>2. Turn a handle of manual injector to the INJECT position.</li> </ol> <p> <b>NOTE</b> If the manual injector signal is output to MAN.INJ.IN port of the controller before clicking the [Inject] button, only the LC instrument will become [RUN] status. In this case, please select [LC Stop] from the  (Menu) button on the Control Panel to stop the LC instrument.</p>
Manual Injector (No start input) + Autosampler	<p>Same as "Manual Injector only (No start input)".</p> <p> <b>NOTE</b> When injecting sample by the autosampler, press the [Inject] button. (Do not press the [Prepare] button.)</p>
Manual Injector (With start input) + Autosampler	<p>Please use the instrument method, where unchecks the "Autosampler" check box in the [Autosampler] tab on the Instrument Method Editor. Follow the same procedure as "Manual Injector only (With start input)".</p>

# 5

## Reviewing Data

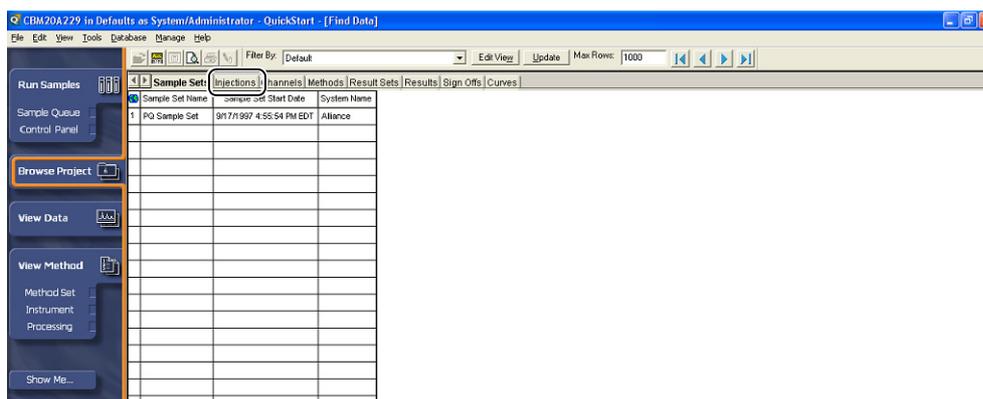
This chapter explains the operations used to review the acquired data and create processing methods.

### 5.1 Displaying Chromatograms

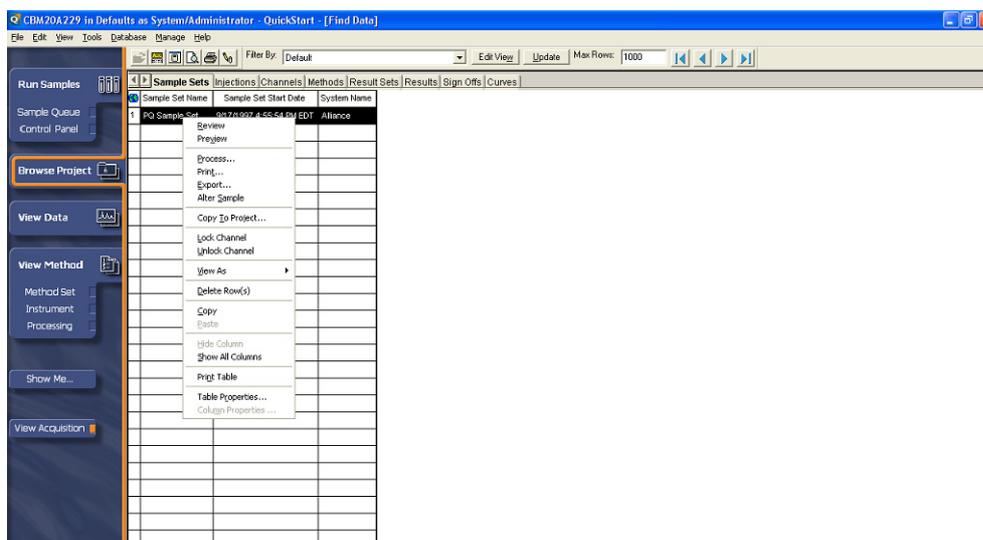
The operations used to display the acquired data are explained below.

**1** Click **[Browse Project]** in the navigation bar.  
The **[Find Data]** window is displayed.

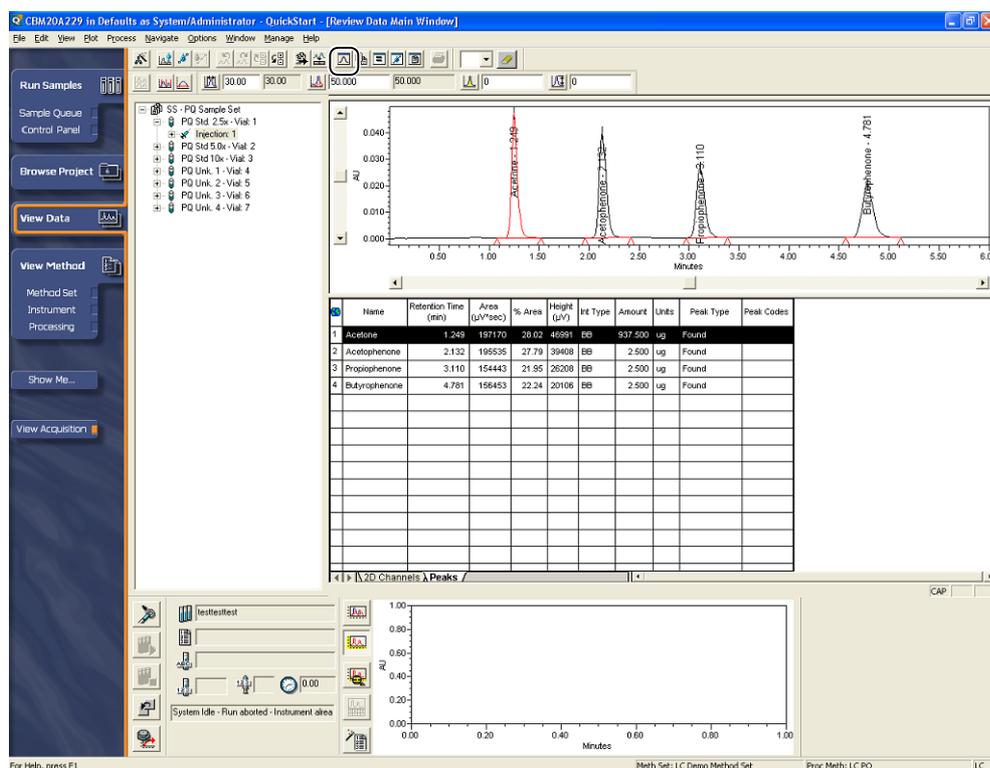
**2** Click the **[Injections]** tab.



**3** After selecting data, right-click, and select **[Review]** on the menu that is displayed.

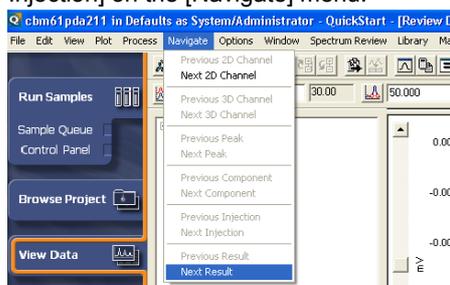


The chromatogram, sample information, and peak information table are displayed in [Review Data Main Window].

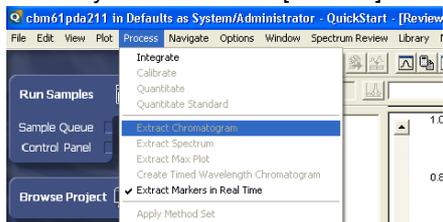


## NOTE

- Select [Review] in the [Result Set] tab page in the [Find Data] window to display data in the [Review Data Main Window] in sample-set units. At this time, to view the next data, select [Next Injection] on the [Navigate] menu.



- If data is not displayed on the screen, click the  (Review Main Window) button.
- The display size of the chromatogram and the sample information can be changed with the split bar.
- Clear the [View Acquisition] checkbox in the navigation bar to increase the display size of the chromatogram and peak information table.
- To display data loaded from the PDA detector, 2D chromatograms must be extracted from 3D data. Select [Extract Chromatogram] on the [Process] menu, and extract 2D chromatograms manually from 3D data in [Contour].

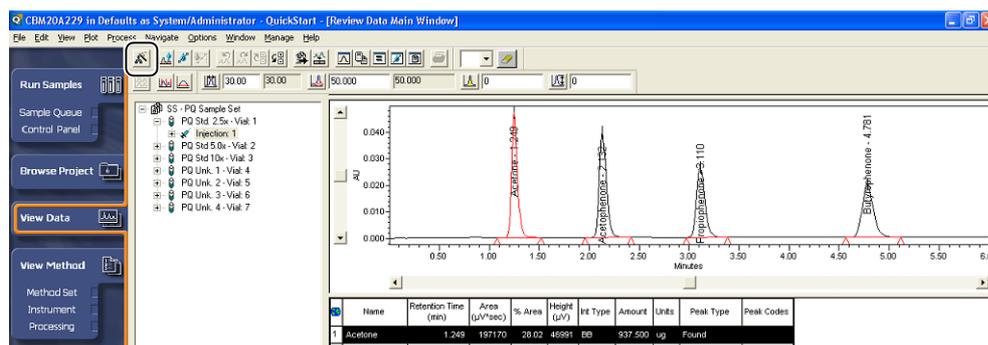


## 5.2 Creating Processing Methods

To execute peak integration and quantitative calculations on the acquired data, it is necessary to create a processing method.

The operations used to create a processing method using the wizard are explained below.

### 1 Click the (Processing Method Wizard) button.



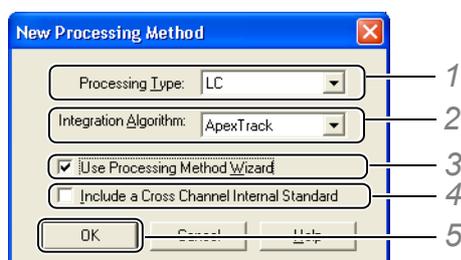
The [Processing Method Wizard] window is displayed.

### 2 Select [Create a New Processing Method], and click [OK].



The [New Processing Method] window is displayed.

### 3 Set the parameters.

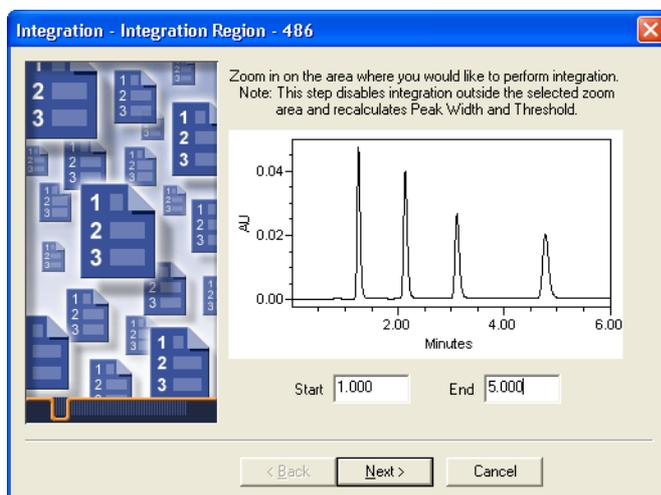


- 1 Select [LC].
- 2 Select [Apex Track] or [Traditional].
- 3 Select the checkbox.
- 4 To perform quantitation using the area ratio (or height ratio) obtained by comparison with an internal standard sample set with a different channel, select the checkbox.
- 5 Click [OK].

 **NOTE**

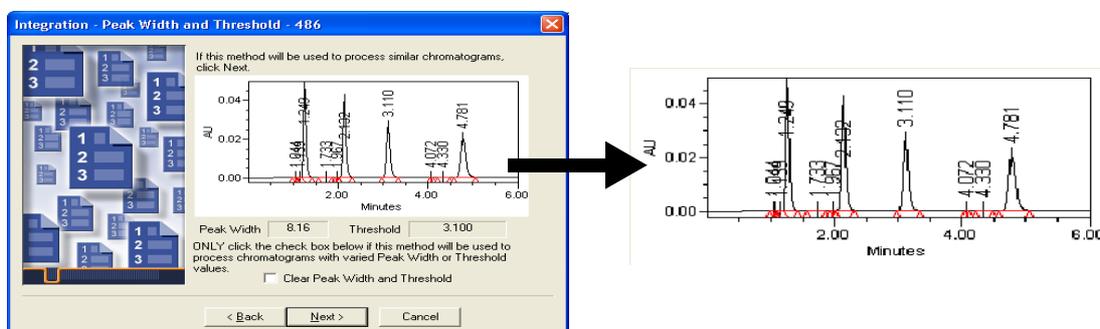
The parameters displayed in the [New Processing Method] window vary with system policy settings. Refer to the Empower Online Help for details on the system policy.

**4** Enter the time range during which peak analysis is performed, and click [Next].



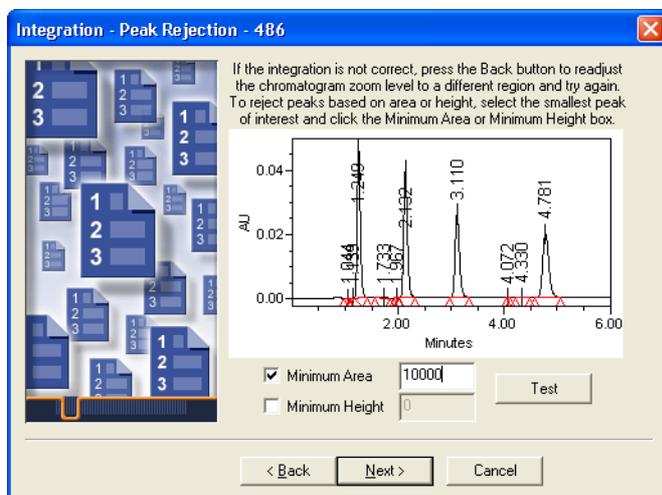
**5** Check the chromatogram that is created as a result of peak analysis and click [Next].

When checking the chromatogram, the chromatogram displayed in the window can be zoomed using the mouse.



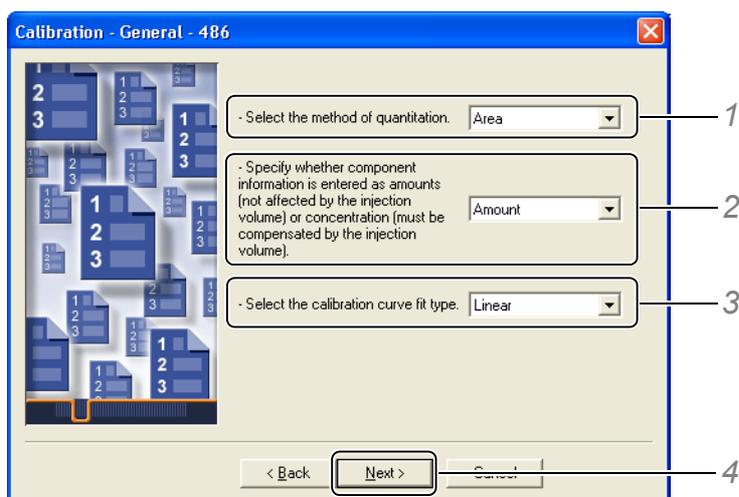
## 6 Enter a value for either [Minimum Area] or [Minimum Height] to determine the peaks that are rejected from postrun analysis.

It is possible to check that the entered value is accurate by clicking [Test] in the window.



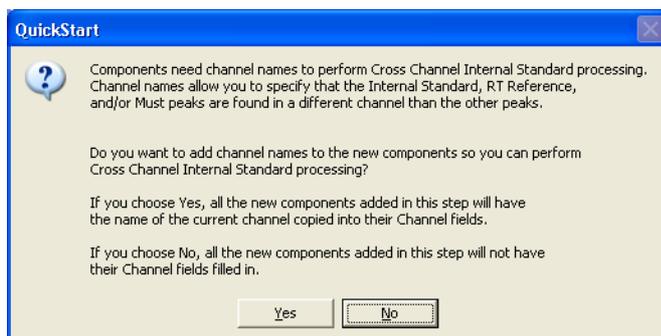
## 7 Set the quantitation method and the type of calibration curve.

5

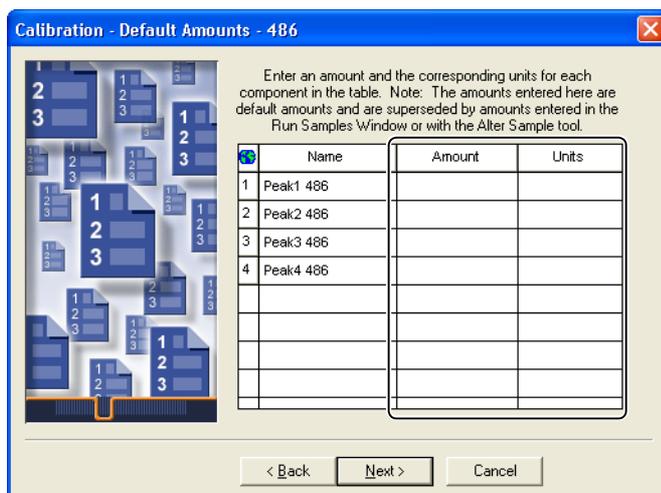
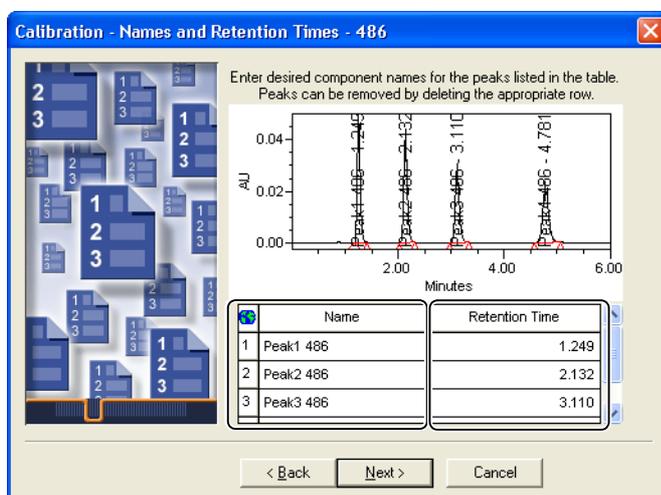


- 1 Select [Area] or [Height] as the quantitation method.
- 2 Select either [Amount (concentration of the total amount of the constituents in the chromatogram)] or [Concentration (concentration of each constituent calculated from the injection volume)] as the X axis of the calibration curve.
- 3 Select the type of calibration curve to be used for analysis.
- 4 Click [Next].

## 8 Click [Yes].

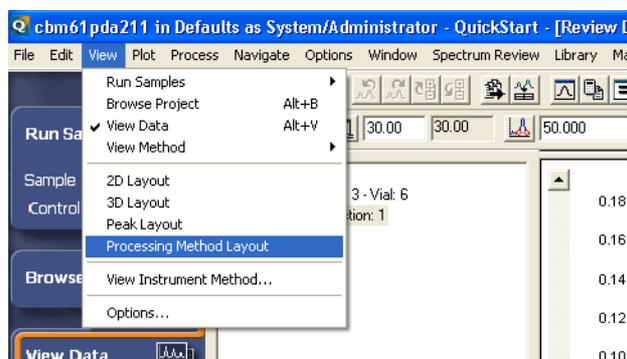


## 9 Enter the component names, and click [Next].

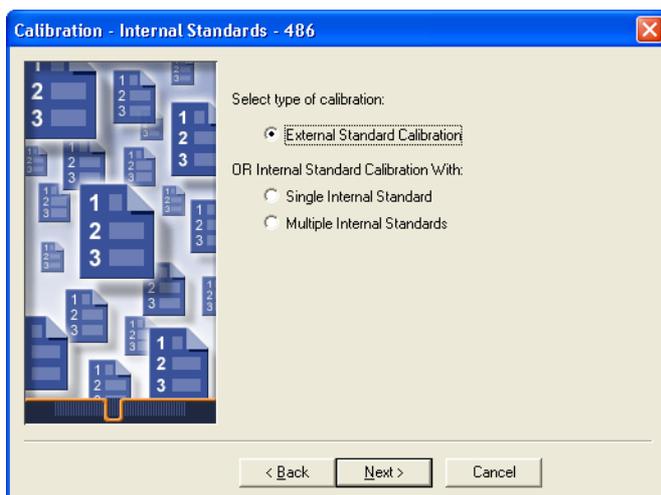


The calibration curve for the processing method is created with just one concentration level. To create a calibration curve with multiple concentration levels, each level and concentration value must

be entered on the [Default Amounts] tab page of the processing method. To display the processing method, select [Processing Method Layout] on the [View] menu.

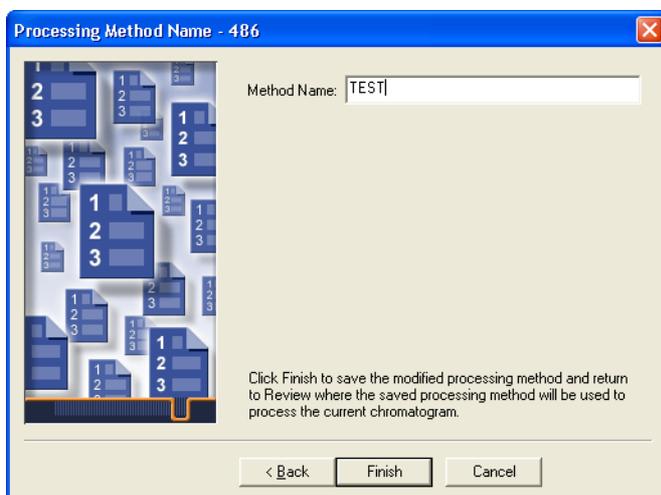


- 11** Select a quantitative calculation method (external standard method or internal standard method), and click [Next].



5

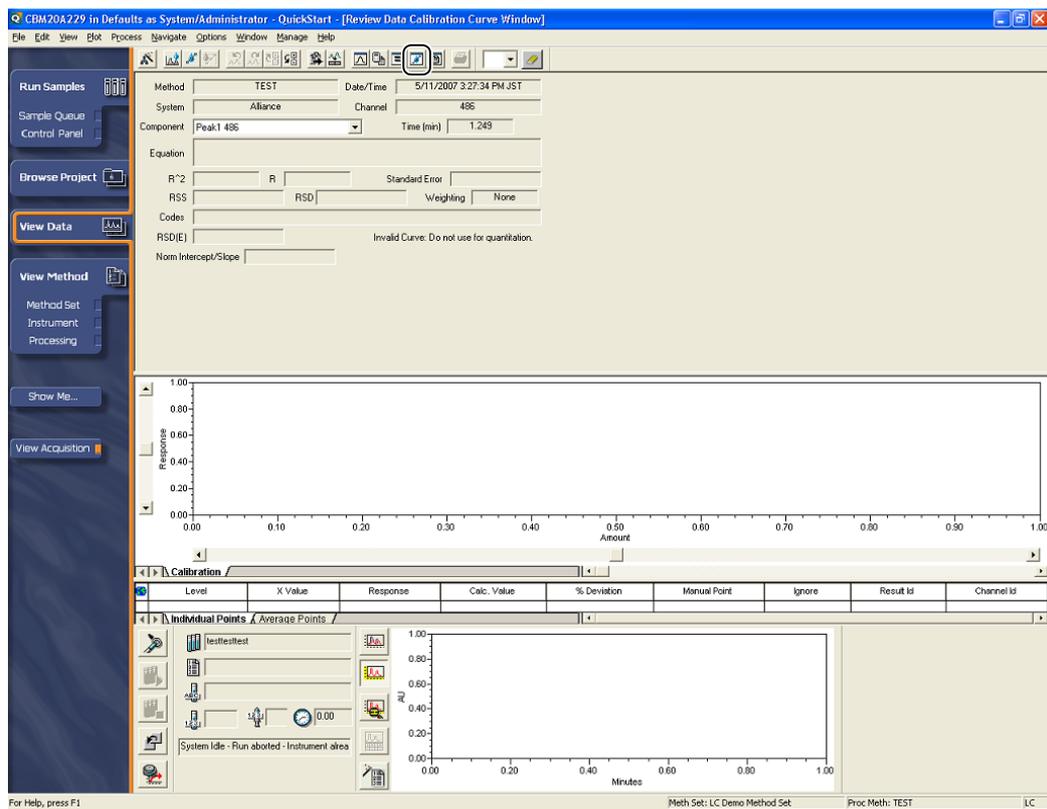
- 12** Enter a processing method name, and click [Finish].



The peak integration starts according to the saved processing method. Check the chromatogram and the postrun analysis results table in the window.

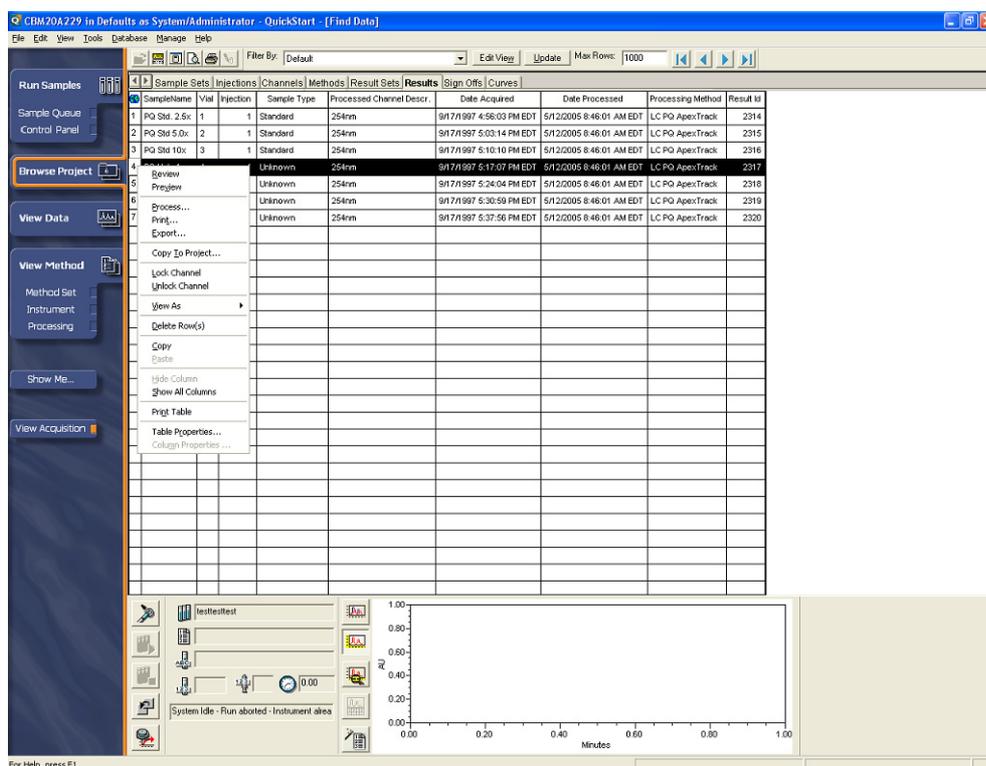
 **NOTE**

- To use the created processing method for analysis, the processing method must be specified in the method set. Click the  (Method Set) button in the [Review Data Main Window] to display the method set. Refer to "2.3 Creating Method Sets" P.12 for details on the operations used to create method sets.
- To view the calibration curves created for the components, click the  (Calibration Curve) button to open the [Review Data Calibration Curve Window].



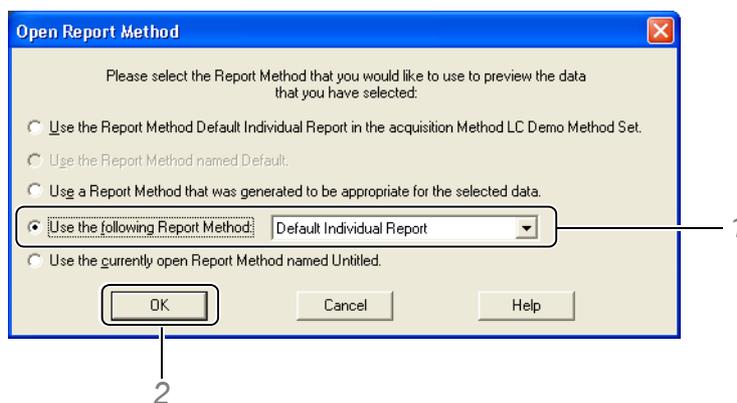


### 3 After selecting data, right-click, and select [Preview] on the menu that is displayed.



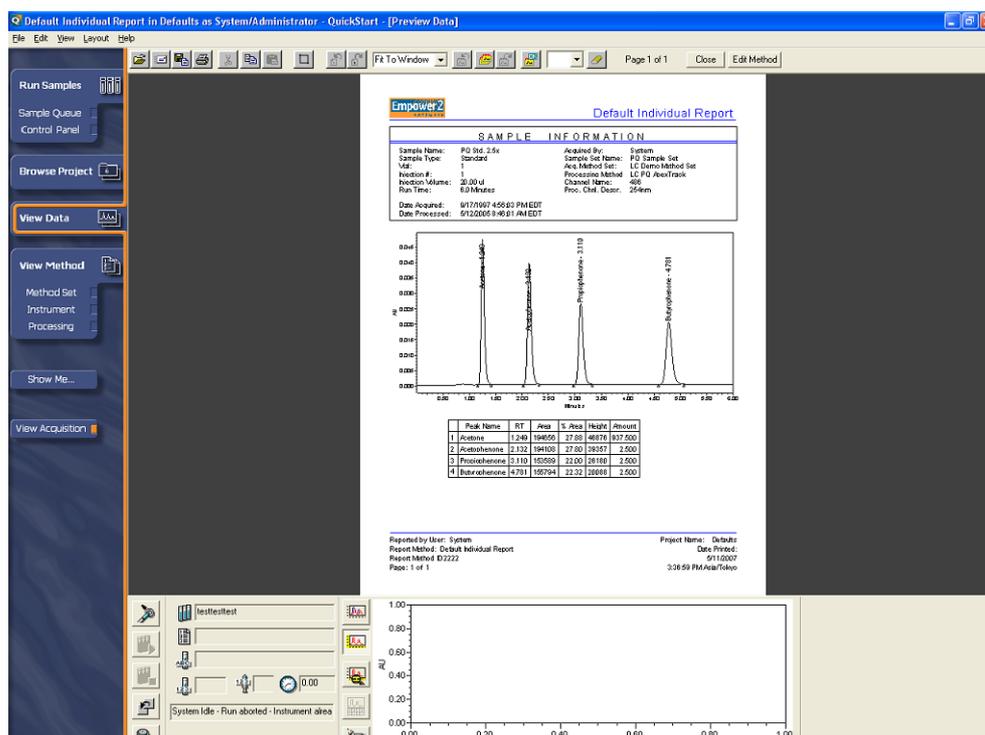
The [Open Report Method] window is displayed.

### 4 Select a report method.



- 1 Select [Use the following Report Method] and select [Default Individual Report].
- 2 Click [OK].

The results for the selected data are displayed in the [Default Individual Report] report method.



5

Click the  (Print) button to output the results.

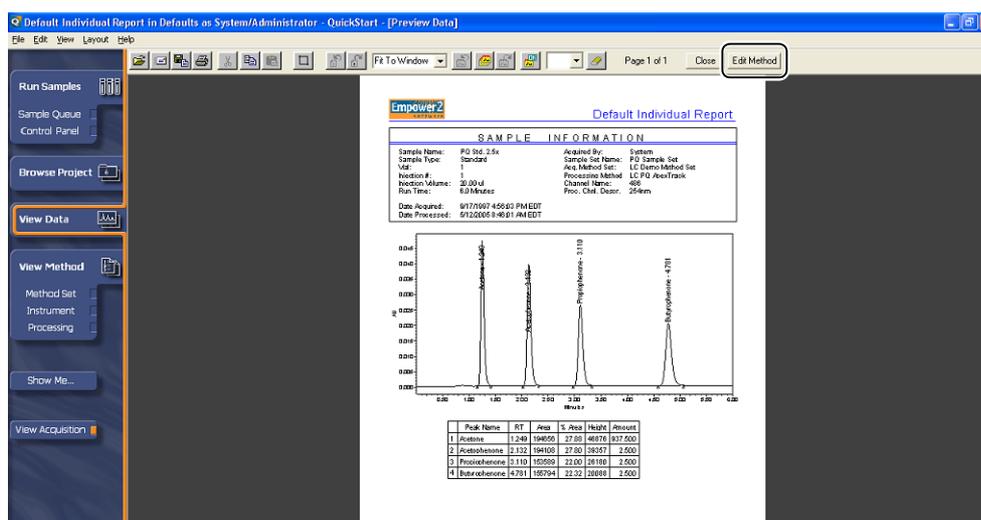
The results are output from the set printer.

6

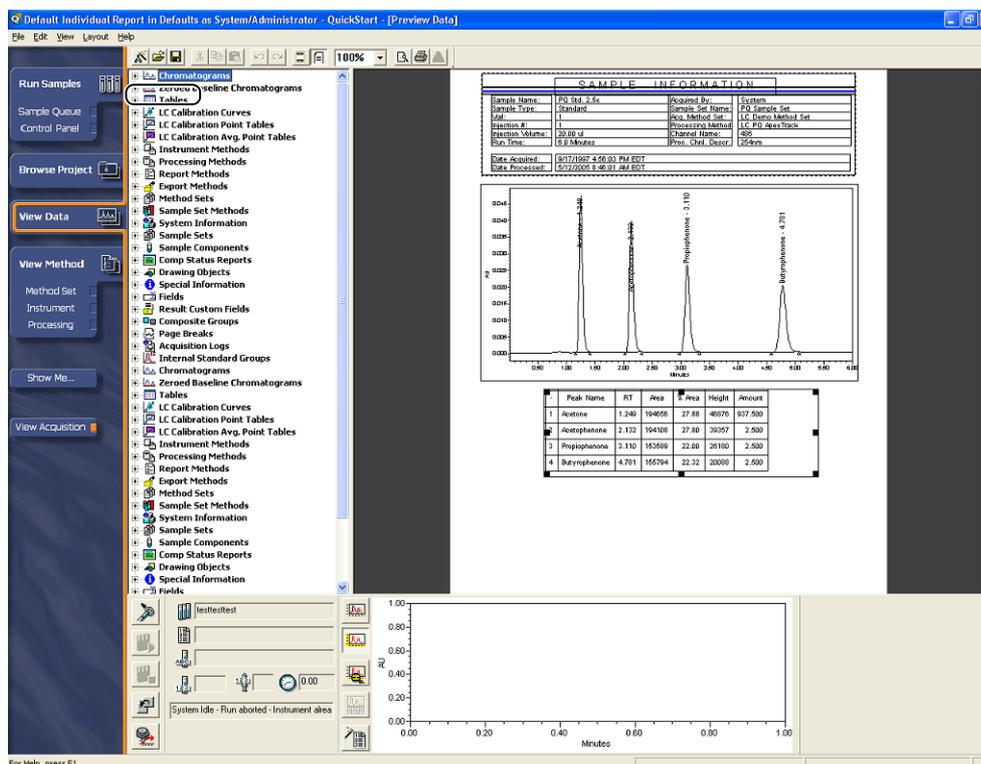
## 6.2 Creating Report Methods

The operations used to edit the table information of the report method (Individual Report Default) used in 6.1 and create a new report method are explained below.

- 1 Display the [Default Individual Report] report method.
- 2 Click [Edit Method].

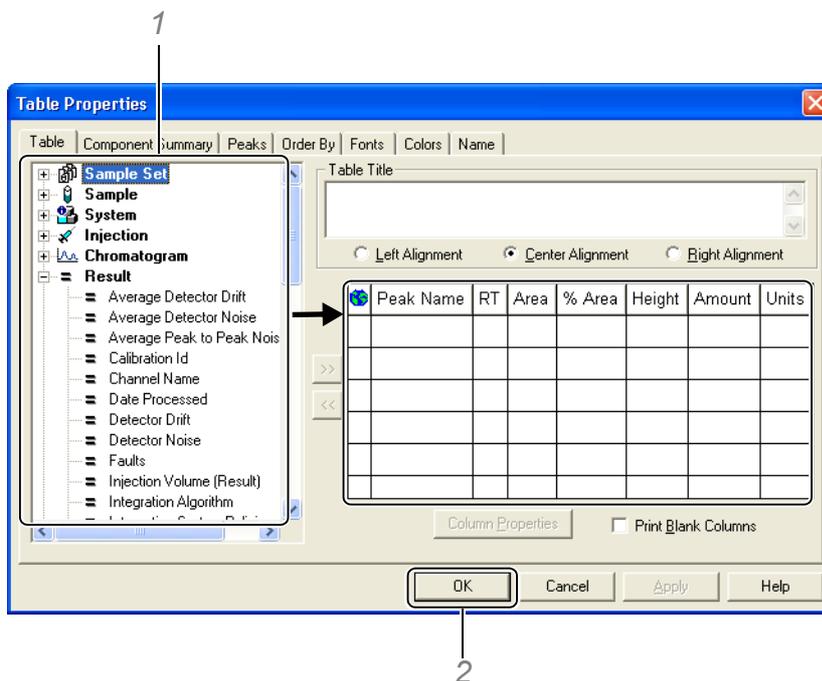


- 3 Double-click the [Tables] item in the report method.



The [Table Properties] window is displayed.

## 4 Add (or delete) items displayed in the table as appropriate.

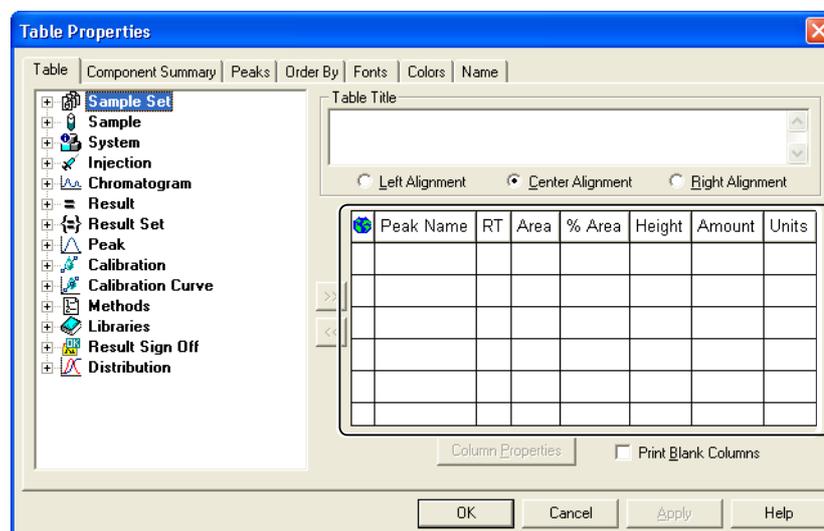


- 1 Double-click the items to be added to the table in the Available Fields tree. The items to be added are displayed on the right-hand side of the window.

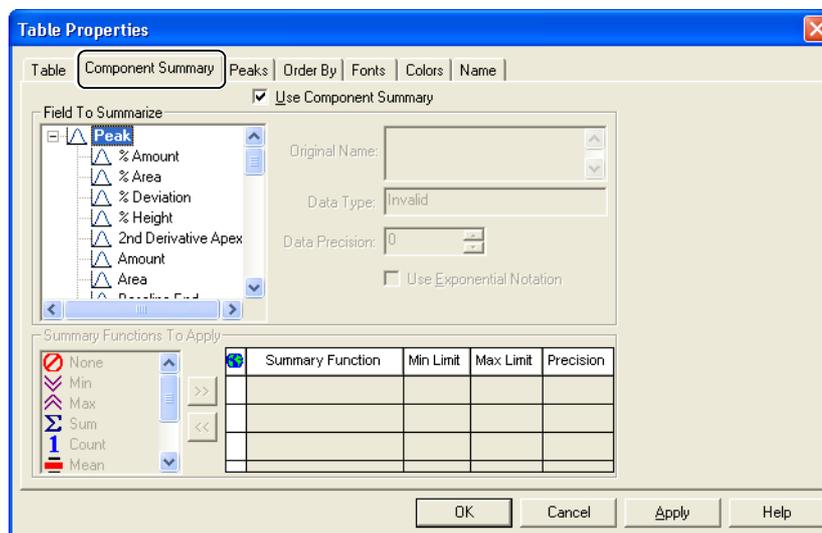


### NOTE

- The display order can be changed by dragging the corresponding items.

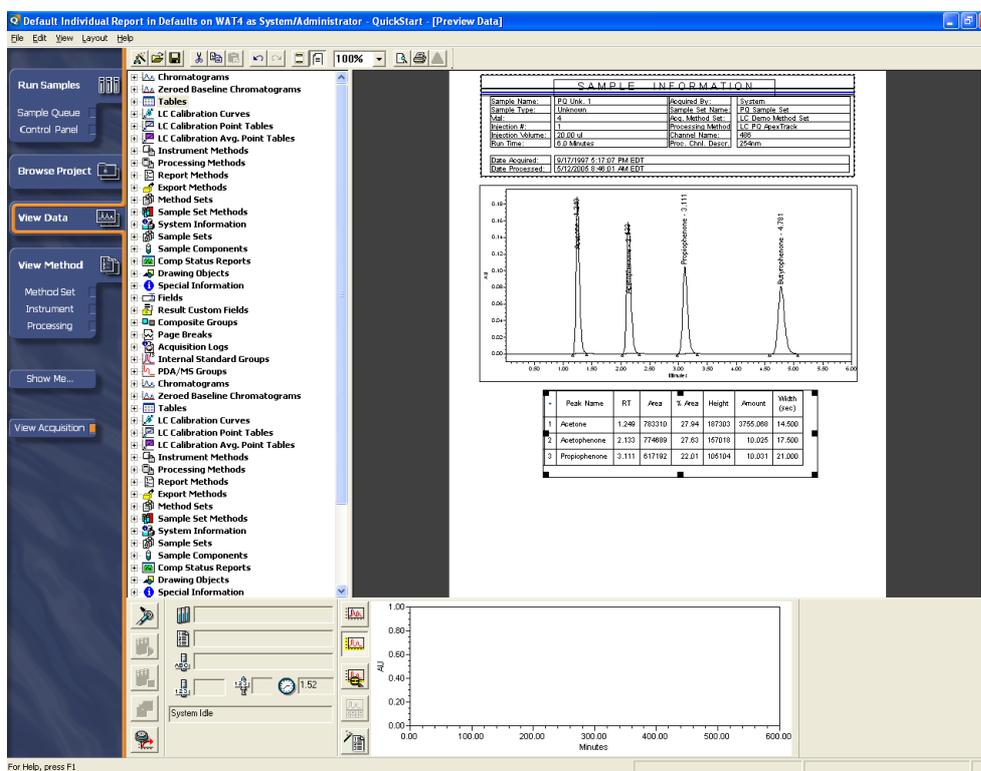


- Summary information for each component can be output in the [Table Properties] window. To display summaries, click the [Component Summary] tab, and make the output settings for the item names and statistical calculations (Mean, Std.Dev, and %RSD).



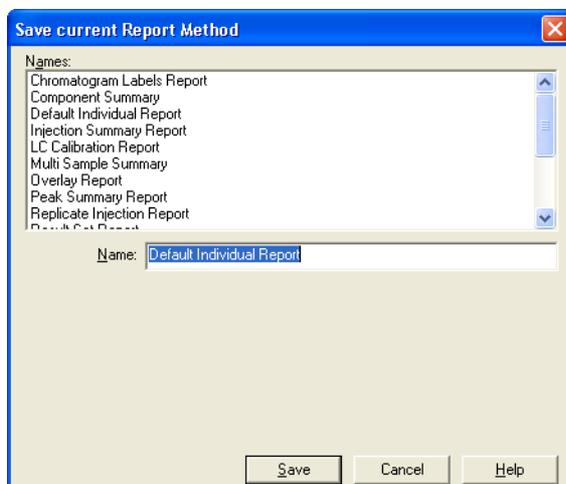
2 Click [OK].

The changed table is displayed.



**5** Select [Save As] on the [File] menu.

**6** Enter a report method name, and click [Save].

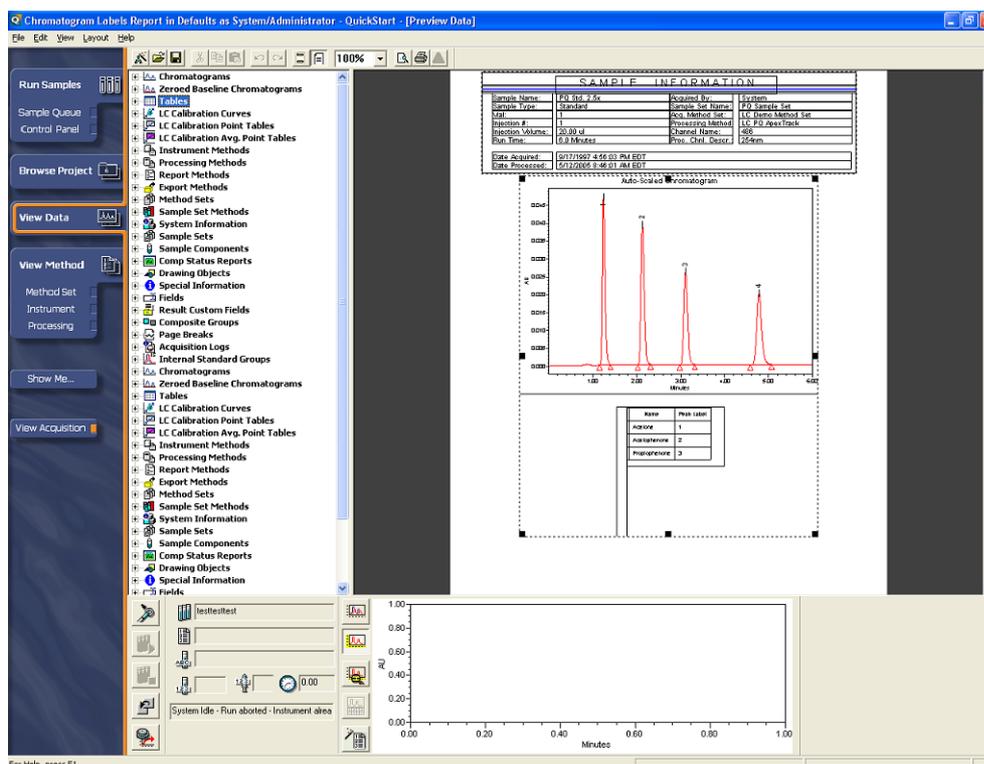


**NOTE**

- To use the created report method for analysis, the report method must be specified in the method set. Refer to "2.3 Creating Method Sets" P.12 for details on the method used to create method sets.
- Option sample projects are included in the Empower DVD. It is recommended to use report methods copied from a sample project to create new report methods. To copy methods, see "6.1 Printing a Report" P.43.

**6**

The measurement results are displayed in the selected report method.



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