# **Empower GPC Software**

**Getting Started Guide** 



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## Preface

The *Empower GPC Software Getting Started Guide* describes the basics of how to use Empower<sup>™</sup> software. Using a standard set of data, this guide takes you through the steps of logging in, acquiring data, developing methods and method sets, reviewing processed data, and printing reports.

This guide is intended for a wide variety of users whose familiarity with computers and software ranges from novice to expert.

## **Organization**

This guide contains the following:

<u>Chapter 1</u> describes GPC software features, procedures for logging in to Empower software, and loading the GPC\_Default project.

<u>Chapter 2</u> describes procedures that you can use to calibrate your system with GPC narrow standards.

<u>Chapter 3</u> describes procedures that you can use to process broad unknown GPC data.

Chapter 4 describes procedures that you can use to automate GPC processing.

<u>Chapter 5</u> describes procedures that you can use to generate reports of your results and back up your GPC data, methods, and results.

### **Related Documentation**

*Waters Licenses, Warranties, and Support*: Provides software license and warranty information, describes training and extended support, and tells how Waters handles shipments, damages, claims, and returns.

#### **Online Documentation**

**Empower Help:** Describes all Empower windows, menus, menu selections, and dialog boxes for the base software and software options. Also includes reference information and procedures for performing all tasks required to use Empower software. Included as part of the Empower software.

**Empower Read Me File:** Describes product features and enhancements, helpful tips, installation and/or configuration considerations, and changes since the previous version.

**Empower LIMS Help:** Describes how to use the Empower LIMS Interface to export results and import worklists.

**Empower Toolkit Professional Help:** Describes how to use the common-objectmodel, message-based protocol to communicate with the Empower software from a third-party application.

#### **Printed Documentation for Base Product**

**Empower Software Getting Started Guide:** Provides an introduction to the Empower software. Describes the basics of how to use Empower software to acquire data, develop a processing method, review results, and print a report. Also covers basic information for managing projects and configuring systems.

*Empower Software Data Acquisition and Processing Theory Guide:* Provides theories pertaining to data acquisition, peak detection and integration, and quantitation of sample components.

*Empower System Installation and Configuration Guide*: Describes Empower software installation, including the stand-alone Personal workstation, Workgroup configuration, and the Enterprise client/server system. Discusses how to configure the computer and chromatographic instruments as part of the Empower System. Also covers the installation, configuration, and use of acquisition servers such as the LAC/E<sup>32</sup> module, the busLAC/E<sup>TM</sup> card, and interface cards used to communicate with serial instruments.

*Empower System Upgrade and Configuration Guide*: Describes how to add hardware and upgrade the Empower software using an import-and-export upgrade method.

*Empower Software System Administrator's Guide*: Describes how to administer the Empower Enterprise client/server system and Workgroup configuration.

*Empower Software Release Notes*: Contains last-minute information about the product. Also provides supplementary information about specific Empower software releases.

#### **Printed Documentation for Software Options**

*Empower System Suitability Quick Reference Guide*: Describes the basics of the Empower System Suitability option and describes the equations used by the System Suitability software.

**Empower PDA Software Getting Started Guide:** Describes the basics of how to use the Empower PDA option to develop a PDA processing method and to review PDA results.

*Empower GC Software Getting Started Guide*: Describes how to use the Empower GC option to develop a GC processing method and to review GC results.

*Empower GPC Software Getting Started Guide*: Describes how to use the Empower GPC option to develop a GPC processing method and to review GPC results.

*Empower GPCV Software Getting Started Guide*: Describes how to use the Empower GPCV option to develop a GPCV processing method and to review GPCV results.

*Empower Light Scattering Software Getting Started Guide*: Describes how to use the Empower Light Scattering option to develop a light scattering processing method and to review light scattering results.

*Empower ZQ Mass Detector Software Getting Started Guide*: Describes installation, configuration, calibration, and tuning methods, as well as how to operate the ZQ Mass Detector with Empower software.

*Empower Chromatographic Pattern Matching Software Getting Started Guide:* Describes how to use the Chromatographic Pattern Matching option to develop a pattern matching processing method and to review pattern matching results.

*Empower Dissolution System Software Quick Start Guide*: Describes how to operate the Alliance<sup>®</sup> Dissolution System using Empower software.

*Empower Toolkit Programmer's Reference Guide:* Describes how to use the common-object-model, message-based protocol to communicate with Empower software from a third-party application.

*Waters Integrity System Getting Started Guide*: Describes features of the Waters Integrity<sup>®</sup> System and provides step-by-step tutorials that guide a user through the use of the Empower Mass Spectrometry (MS) option.

*Empower AutoArchive Software Installation and Configuration Guide:* Describes how to install and configure the Empower AutoArchive option.

#### **Documentation on the Web**

Related product information and documentation can be found on the World Wide Web. Our address is <u>http://www.waters.com</u>.

### **Related Adobe Acrobat Reader Documentation**

For detailed information about using Adobe<sup>®</sup> Acrobat<sup>®</sup> Reader, see the *Adobe Acrobat Reader Online Guide*. This guide covers procedures such as viewing, navigating, and printing electronic documentation from Adobe Acrobat Reader.

## **Printing This Electronic Document**

Adobe Acrobat Reader lets you easily print pages, page ranges, or the entire document by selecting **File > Print**. For optimum print quantity, Waters recommends that you specify a PostScript<sup>®</sup> printer driver for your printer. Ideally, use a printer that supports 600 dpi print resolution.

## **Documentation Conventions**

The following conventions can be used in this guide:

Convention	Usage
Purple	Purple text indicates user action such as keys to press, menu selec- tions, and commands. For example, "Click Next to go to the next page."
Italic	Italic indicates information that you supply such as variables. It also indicates emphasis and document titles. For example, "Replace <i>file_name</i> with the actual name of your file."
Courier	Courier indicates examples of source code and system output. For example, "The SVRMGR> prompt appears."
Courier Bold	Courier bold indicates characters that you type or keys you press in examples of source code. For example, "At the LSNRCTL> prompt, enter set password oracle to access Oracle."
<u>Underlined Blue</u>	Indicates hypertext cross-references to a specific chapter, section, subsection, or sidehead. Clicking this topic using the hand symbol brings you to this topic within the document. Right-clicking and selecting <b>Go Back</b> from the shortcut menu returns you to the originating topic. For example, "To check the calibration curve, follow the instructions in <u>Section 2.5, Checking the Calibration Curve.</u> "
Keys	The word <i>key</i> refers to a computer key on the keypad or keyboard. <i>Screen keys</i> refer to the keys on the instrument located immediately below the screen. For example, "The A/B screen key on the 2414 Detector displays the selected channel."
	Three periods indicate that more of the same type of item can optionally follow. For example, "You can store <i>filename1</i> , <i>filename2</i> , in each folder."
>	A right arrow between menu options indicates you should choose each option in sequence. For example, "Select File > Exit" means you should select File from the menu bar, then select Exit from the File menu.

#### Notes

Notes call out information that is helpful to the operator. For example:

Note: Record your result before you proceed to the next step.

#### Attentions

Attentions provide information about preventing damage to the system or equipment. For example:



**Attention:** To avoid damaging the detector flow cell, do not touch the flow cell window.

## Cautions

Cautions provide information essential to the safety of the operator. For example:



**Caution:** To avoid burns, turn off the lamp at least 30 minutes before removing it for replacement or adjustment.



**Caution:** To avoid electrical shock and injury, turn off the detector and unplug the power cord before performing maintenance procedures.



*Caution:* To avoid chemical or electrical hazards, observe safe laboratory practices when operating the system.

# Chapter 1 GPC Software Overview

This chapter defines GPC data, describes the basic features of the Empower<sup>™</sup> GPC software, lists the tutorials included in this book, and explains how to load sample GPC data on your workstation. Once you have loaded the sample data, you can view and manipulate the data in a variety of ways, as described in subsequent chapters.

## 1.1 What Is GPC Data?

Gel Permeation Chromatography (GPC) data is collected from a system that has a column set which separates samples by the size of the molecules in solution and a detector that measures the relative concentration of the molecules as they elute from the columns.

## 1.2 What Is GPC Software?

The Empower GPC software enables you to use the Empower software to acquire and process GPC data.

#### **GPC Software Features**

Empower is a chromatography and results management system you can adapt to your individual requirements. It consists of:

- Empower computer in one of the following configurations:
  - Personal stand-alone workstation
  - Workgroup configuration
  - Enterprise client/server system
- Empower software
- Empower database

Empower GPC software is an integrated part of the Empower software. GPC data acquisition, processing, and reporting with the GPC software requires use of the base Empower software and database.

## Features of the Base Empower Software

Empower software provides a graphical, icon-based user interface to acquire, process, and manage chromatographic data. All user actions are performed by pointing and clicking with the mouse (keyboard shortcuts are also supported).

Empower software supports operation in both Windows<sup>®</sup> 2000 Professional and Windows XP Professional environments, providing you with the ability to have multiple windows open at the same time.

You can view a real-time data acquisition run while simultaneously producing summary results of previously acquired data, or fine-tuning integration parameters for the last injection performed.

The base Empower software provides tools for:

- Creating projects
- Configuring chromatographic systems
- · Developing instrument methods to control chromatographic systems
- · Acquiring data from samples and standards
- Developing a processing method to perform integration, calibration, and quantitation
- · Processing data and obtaining results
- Creating report methods to generate custom reports
- Viewing and printing reports
- Backing up, deleting, restoring, and copying the contents of an individual project

### **Empower Software Reference Information**

You can perform additional procedures for data acquisition, processing, and report generation depending on the complexity of your application. Refer to the *Empower Help* for more information. For information on using the *Empower Help*, refer to the *Empower Software Getting Started Guide*.

### **GPC Software Functions**

The Empower GPC software supports the following functions in Empower software:

- **Sample loading** Defines narrow and broad standards and narrow and broad unknowns.
- **Component loading** Defines the following parameters:
  - Molecular weights of narrow standards
  - Component names for System Suitability
  - Molecular weight averages of broad standards

- Mark-Houwink (K and alpha) values for standards and unknowns
- Cumulative percent molecular weight pairs and named distributions for broad standards
- Named distributions for broad standards
- Calibration standard options Include the following options:
  - Narrow
  - Broad
  - Combined narrow and broad
- Calibration techniques Include the following types:
  - Relative
  - Universal (Modified Universal)
- Calibration curve fit types Includes the following fit types:
  - First-order
  - Second-order
  - Third-order
  - Fourth-order
  - Fifth-order
  - Bounded
  - Cubic-spline
  - Point to point
- Review Displays GPC calibration curves and molecular weight distributions.
- Compare Overlays distributions to compare molecular weight distributions from multiple analyses of the same or different polymers. Overlays GPC calibration curves to compare curves generated on different dates or under different conditions.
- Reporting Includes custom report groups as well as the following plots and tables:
  - GPC Distribution plot
  - GPC General Distribution plot
  - GPC Distribution table
  - GPC Calibration plot
  - GPC Calibration table
- Axial dispersion correction Corrects the spreading of broad standard and broad unknown peaks caused by large-particle size (20 micron) columns in the chromatographic system. Empower provides two types of axial dispersion correction:
  - Iterative Deconvolution
  - Peak Compression

## 1.3 Tutorial Overview

The tutorials in this book show you how to:

- Restore the GPC\_Default project from the Empower CD-ROM. This project is used in all the examples in this guide.
- Determine the exclusion volume (V<sub>0</sub>) and total volume (V<sub>t</sub>) of the column set used in your GPC system.
- Develop a GPC processing method using the Processing Method Wizard.
- Process narrow standards.
- Check the calibration curves.
- Process broad unknowns.
- Save results.
- Automate processing procedures using background processing.
- Report GPC results.
- Back up your project data.

This guide does not explain how to acquire GPC data. The data acquisition tutorial is included in the *Empower Software Getting Started Guide* along with the other basic Empower tutorials.

#### **Before You Begin**

**Note:** This guide uses the Empower Pro interface. If you do not have access to this interface, see your system administrator.

Before you proceed with the tutorial, ensure that:

- You have installed Empower software as described in the *Empower System* Installation and Configuration Guide.
- You have installed the GPC software option as described in the *Empower System Installation and Configuration Guide*.
- You have reviewed and followed the basic operating procedures in the *Empower* Software Getting Started Guide.
- Your printer is properly configured in the Windows 2000 or Windows XP software as described in the appropriate Microsoft<sup>®</sup> documentation.

## 1.4 Restoring the GPC\_Default Project

The GPC\_Default project contains GPC example data used in all the tutorials in this guide. Before you can run the tutorials, you must restore the GPC\_Default project to your workstation. Restoring the GPC\_Default project will also copy the example GPC data to your workstation. The GPC\_Default project is located on the Empower CD-ROM.

To restore the GPC\_Default project:

 To start Empower software, select Start > Programs (for Windows XP, All Programs) > Empower > Empower Login. The Empower Login dialog box appears (Figure 1-1).

Empower Login 🤗 🔀	Empower Login
User Name: System Password: Enter Empower User Name and Password to gain access to Empower on this database.	User Name: System Password: Database: Local
OK Cancel Advanced >> Help	OK Cancel Advanced >> Help

Personal System

Workgroup or Enterprise System

Figure 1-1 Empower Login Dialog Box

- 2. Enter your user name and password. If you do not know your user name or password, see your system administrator.
- 3. If you are using an Empower Enterprise system, select the correct database from the Database list. This list appears only when connected to a client/server system.
- 4. Click Advanced and verify that the Requested Interface field is set to Pro. If you cannot select the Empower Pro interface, see your system administrator.
- 5. Click **OK**. The Empower Pro window appears.

6. Click Configure System. Configuration Manager appears (Figure 1-2).

	🖶 System/Administrator - Configurat	ion	Manage	er										
_	File Edit View Records Tools Help													
Restore ——														
	Filter By:     Default     Edit View     Update													
	Empower Configuration	5	Name	Owner	Create Date	Full Audit Trail	Locked	Comments	Tablespace Quota	Tablesp				
	Projects     Acquisition Servers	1	Defaults	system	6/10/2002 1:56:23 PM	Γ	Γ	Default project						
	Systems	Ц												
	🕀 🐼 Libraries	Ц												
	🖸 Users	Ц												
	Ser Groups	Ш												
	Plate Types	Ц												
	📲 System Audit Trail	Ш												
	offline System Audit Trail													
	Project Archives	Ш												
	Offline Project Archives													
	🛯 🖗 Offline Sample Archives													
		П												
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	For Help, press F1								NUM					

Figure 1-2 Configuration Manager

7. Click **Restore** to start the Restore Project(s) Wizard. Follow the instructions on each page of the wizard. Refer to the "Restoring a Project Using the Wizard" topic in the *Empower Help* Find tab for details.

# Chapter 2 Calibrating Your System

This chapter provides step-by-step tutorials of the procedures required to calibrate your system for operation using narrow standards.

## 2.1 Tutorial Overview

The goal of this tutorial is to familiarize you with the Empower software tools and procedures used to calibrate your system from narrow standard data. The tutorial shows you how to:

- Determine the void (exclusion) volume (V<sub>0</sub>) and total retention volume (V<sub>t</sub>) of the column set for your GPC system
- · Developing a processing method using the Processing Method Wizard
- · Process narrow standards to produce a calibration curve
- · Check the calibration curve
- Save the calibration curve
- · Add your processing method to a method set

Figure 2-1 illustrates the steps used to calibrate your system using GPC narrow standards.



Figure 2-1 Steps in Calibrating Your System Using Narrow Standards

## 2.2 Determining $V_0$ and $V_t$

Empower GPC software uses values for void (exclusion) volume (V<sub>0</sub>) and total retention volume (V<sub>t</sub>) to extend the valid range of a calibration curve. For the GPC\_Default project, use the following information to calculate V<sub>0</sub> and V<sub>t</sub>:

- For a typical 300 mm x 7.8 mm column and flow rate of 1 mL/min, the value for  $V_0$  is 5.5 to 6.0 mL per column. The GPC\_Default data was collected using three columns, thus the range for  $V_0$  should be 16.5 to 18.0 mL.
- The value of V<sub>t</sub> is approximately double that of V<sub>0</sub>. You can enter V<sub>t</sub> based on the retention time of the last impurity peak that is detected in the chromatogram.

Ensure that the retention times of all points in your broad unknown sample peak are between the values set for  $V_0$  and  $V_t$ . If the retention time of any point in the peak is outside the range of  $V_0$  and  $V_t$ , slice molecular weight values are not calculated.

You can specify values for  $V_0$  and  $V_t$  when you create a GPC processing method using the Processing Method Wizard (see the following section).

## 2.3 Developing a Processing Method Using the Wizard

The first step in analyzing GPC data is to develop a method to process your GPC data. The processing method is a stored data analysis routine that you:

- · Create from calculated and fixed parameters
- Apply to each of your standards to create a calibration curve
- · Apply to each of your broad unknowns to create molecular weight distribution curves
- · Apply to each of your narrow unknowns to calculate component molecular weights

You can develop a new processing method in one of two ways:

- Interactively in the Processing Method window
- Using the Processing Method Wizard

In this tutorial, you develop a processing method by using the Processing Method Wizard. The Processing Method Wizard steps you through:

- Setting up integration parameters
- Setting up calibration parameters
- Defining slicing table parameters
- · Saving your new or modified processing method

To create a new processing method using the Processing Method Wizard:

- 1. From the Empower Pro window, click **Review Data**. The Review Data dialog box appears.
- 2. Ensure that the **GPC\_Default** project is selected.
- 3. Select Review and Channels to open the Project window in Review Data Selection mode.
- 4. Click OK.
- 5. From the Channels tab in the Project window, select the narrow standard channels in the GPC\_Default Project (Figure 2-2).

<u>(</u>	🖸 GPC_Default as System/Administrator - Project (Data Selection Mode)												
File	File Edit View Tools Database Help												
Г													
Filb	er By: Default					- E	dit Vie <u>w</u>	<u>U</u> pdat	e				
	Review												
┛	Sample Set:	s   Ir	njections	Channels Met	hods	Result Sets	Results	Peaks	Sign Offs	Curves V	view Filters	Custom Fields	1
60	SampleName	Vial	Injection	Sample Typ	е	Date Acc	quired	Channel	Channel D	escription	]		
1	Broad PS	4	5	Broad Unknown	1	9/24/1997 12	:09:40 AM	SATIN	410 dRI		1		
2	Broad PS	4	4	Broad Unknown		9/23/1997 11	:23:03 PM	SATIN	410 dRI		]		
3	Broad PS	4	3	Broad Unknown		9/23/1997 10	:36:27 PM	SATIN	410 dRI				
4	Broad PS	4	2	Broad Unknown		9/23/1997 9:4	49:51 PM	SATIN	410 dRI				
5	Broad PS	4	1	Broad Unknown		9/23/1997 9:0	03:14 PM	SATIN	410 dRI		]		
6	Green PS Std	3	2	Narrow Standar	d	9/23/1997 8:1	16:30 PM	SATIN	410 dRI				
7	Green PS Std	3		Narrow Standar	d	9/23/1997 7:2	29:51 PM	SATIN	410 dRI				
8	vVhite PS Std	2	2	Narrow Standar	d	9/23/1997 6:4	43:07 PM	SATIN	410 dRI				
9	vVhite PS Std	2		Narrow Standar	d	9/23/1997 5:5	56:29 PM	SATIN	410 dRI				
10	Red PS Std		2	Narrow Standar	d	9/23/1997 5:0	09:44 PM	SATIN	410 dRI				
11	Red PS Std			Narrow Standar	d	9/23/1997 4:2	23:08 PM	SATIN	410 dRI				
For	Help, press F1											11 Sel	ected //

Figure 2-2 Selecting the Narrow Standard Channels

- 6. Click Review to bring the selected channels into the Review Main window.
- 7. Click the 2D Channels tab (Figure 2-3).





Figure 2-3 First Injection Displayed in the Review Main Window

8. Select the narrow standard with the highest molecular weight to start creating a processing method.

**Note:** To determine the narrow standard with the highest molecular weight, click **Overlay** (Figure 2-3) to overlay the standard chromatograms. Click the chromatogram with the earliest eluting standard peak, then click **Overlay** again to turn off the overlay function. The standard with the highest molecular weight (one of the Green PS standards for this data set) is selected in the 2D Channels table.

 Click Processing Method Wizard (Figure 2-3). The Processing Method Wizard dialog box appears (Figure 2-4).



Figure 2-4 Processing Method Wizard Dialog Box

 Click the Create a New Processing Method option button, then click OK. The New Processing Method dialog box appears (<u>Figure 2-5</u>).

New Processing Method	K
Processing Type: GPC	
Use Processing Method Wizard	

Figure 2-5 New Processing Method Dialog Box

 Select GPC from the Processing Type list . Make sure the Use Processing Method Wizard check box is selected, then click OK. The Integration– Peak Detection 1 page of the GPC Processing Method Wizard appears (<u>Figure 2-6</u>). This page allows you to set the peak width value.



Figure 2-6 Setting the Peak Width

12. Click-drag the cursor to draw a box around the narrowest peak of interest to set the peak width (Figure 2-6). You can also type the peak width value instead of graphically selecting the peak width.

The view zooms into the selected region. The software automatically determines appropriate peak width setting using the data contained within the region in which you have zoomed. The value is displayed in the text box. Check your integration region. If the desired peak is not selected, right-click in the chromatogram, select **Full View**, then redraw the box.

 When you are satisfied with the integration region, click Next to go to the Integration–Peak Detection 2 page (Figure 2-7). This page allows you to set the threshold for peak detection.



Figure 2-7 Setting the Peak Threshold

14. Click-drag the cursor to draw a box around a section of baseline that contains noise that you would like to reject.

The view zooms into the selected region. The software automatically determines appropriate peak threshold setting using the data contained within the region in which you have zoomed. The value is displayed in the text box; for this example a value of approximately 4 is appropriate. If you want to change the selected region, right-click in the chromatogram, select Full View, then reselect or reenter the value.

15. Click **Next** to go to the Integration–Integration Region page (<u>Figure 2-8</u>). This page allows you to define the area where you would like to perform the integration.



Figure 2-8 Setting the Integration Region

- 16. Click-drag the cursor to draw a box around the region where you want to perform integration (from 15 to 33 minutes is a good integration region for these narrow standards). You can also type the start and end times instead of graphically selecting the integration region.
- When you are satisfied with the integration region, click Next to go to the Integration–Peak Rejection page (Figure 2-9). This page allows you to reject peaks based on area or height.



Figure 2-9 Setting Minimum Area and Height

- If you want to enter values to set integration limits for Minimum Area and/or Minimum Height, enter them on this page. Enter 219000 for the Minimum Area and 7007 for Minimum Height to correctly integrate the narrow standards in the GPC\_Default project.
- 19. Click **Next** to go to the GPC–Calibration page (Figure 2-10). This page allows you to select the parameters for calibration.



Figure 2-10 Setting GPC Calibration Parameters

- 20. Select the following values for the GPC Calibration parameters on this page:
  - Type of calibration Relative
  - Calibration fit type 3rd Order (based on the column set used to collect the data in this project)
  - Calibrate against time or volume Time

You do not need to enter a flow rate because you are calibrating against time so the last line on the screen is grayed out.

21. Click Next to go to the GPC–Column Set page (Figure 2-11). This page allows you to enter values for  $V_0$  and  $V_t$ .

GPC - Column Set - SATIN		? 🗙
	What is the total void volume time (V0) of your column set in minutes (assuming a 1.0 ml/ml flow rate)? What is the total retention volume time (Vt) of your column set in minutes (assuming a 1.0 ml/ml flow rate)?	
	< Back Next > Cancel I	Help

Figure 2-11 Setting V<sub>0</sub> and V<sub>t</sub> Values

- 22. Enter the values that you calculated for void (exclusion) volume (V<sub>0</sub>) and total retention volume (V<sub>t</sub>). See <u>Section 2.2</u>, <u>Determining V<sub>0</sub> and V<sub>t</sub></u>. To process the data in the GPC\_Default project, enter 16.500 for V<sub>0</sub> and 33.000 for V<sub>t</sub> (values for the system used to collect this GPC data). If you do not enter values for V<sub>0</sub> and V<sub>t</sub>, the retention time of the highest and lowest molecular weight standards will be used as V<sub>0</sub> and V<sub>t</sub>.
- Click Next to go to the Processing Method Name page (Figure 2-12). This page allows you to define a name to save your method.

Processing Method Name	- SATIN		? 🗙
2 1 2 3 2 3 1	Method Name:	GPC_Default	
	Default Comments:	<u></u>	-
	Comments:		
	< Back	Finish Cancel H	Help

Figure 2-12 Naming the Processing Method

24. Enter GPC\_Default in the Method Name text box to name the new processing method (Figure 2-12). Enter comments if you want to provide additional information about the processing method. Click Finish to complete the wizard, save your new processing method, and process the current narrow standard channel with the new processing method.

The integrated and calibrated narrow standard appears in the chromatogram plot in the Review Main window (Figure 2-13).



Figure 2-13 Integrated and Calibrated Narrow Standard

25. Select Window > Processing Method to view the new method's processing method parameters in the Processing Method window (Figure 2-14). Check the Integration, Calibration, and Slicing pages by clicking the corresponding tabs.

**Note:** Although it is not shown in this tutorial, you can view the Review Main window and the Processing Method window side by side by selecting View > Processing Method Layout.

🛗 Green PS Std in GPC_Default as System	m/A	dministrator - Rev	iew - [GP	C_Default in GPC_Default as System	/Administrator - Review - [Ma	in Window] 🔳 🖻 🔀		
🕒 File Edit View Plot Process Navigate (	Optio	ins Window Help				_ 8 ×		
ee 🕺 🖉 🖉 🕍 🖉 🧏	9 L	2 <b>2 3 3</b> 2 4 2 5	8 9 9 9	<u>\$</u> <u>*</u>   <u>\$</u>     <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>     <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u>\$</u>   <u></u>   <u></u>   <u></u>   <u></u>   <u></u>   <u></u>   <u></u>   <u></u>   <u></u>	<u>R</u>			
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		Minimum Area	219000	Minimum Height 7007				
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	2		33.000	Inhibit Integration				
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Figure 2-14 Processing Method Window (Integration Page)

- 26. On the Integration page, note the peak width and threshold values and the two inhibit integration events that have been added to both the narrow and broad integration parameters. You can switch between the narrow and broad integration parameters by clicking the corresponding option buttons on the Integration page.
- 27. Switch to the Calibration page by clicking the Calibration tab. Notice that the calibration parameters you entered in the wizard are visible (Figure 2-15).

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🔄 File Edit View Plot Process Navigate Options Window Help		_ 8	ĸ
D 出版 2 (1997) (1997	9 E Z B 🥌 🛛 🗾 🧧	2	
Integration Colibration Slicing Axial Dispersion Noise and Drift			
GPC Technique Relative			
Fit Type 3rd Order 💌 V0 16.500 Vt 33.000			
XAxis Time Flow Rate 1.000			
Reference Peak			
🗌 Standard 📄 Unknown			
Retention Time RT Window (%) 1.000			
☐ Ignore Reference Peak when Identifying Standards			
Calibration Order of Molecular Weights High to Low			
For Help, press F1	Meth Set: Untitled	Proc Meth: GPC Default GPC	

Figure 2-15 Processing Method Window (Calibration Page)

28. Switch to the Slicing table by clicking the Slicing tab. Notice that the table (on the Slicing page) contains a component named Broad with a peak match type set to greatest width to help you process a broad unknown peak (Figure 2-16).

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#F & ## & ## 2.4.2 & ## 2 = ## A& I												
4	🕨 inte	egration Calibr	ation Slicing	Axial Dispersion	Noise and Drift							
6	Name	Retention Time (min)	RT Window (min)	Peak Match	Туре	High MVV (Daltons)	Low MVV (Dattons)	Accumulate Area	Mol Wt Marker 1 (Daitons)	Mol Wit Marker 2 (Daitons)	Mol Wt Marker 3 (Dattons)	Mol Wt Marke (Daltons)
1	Broad	24.000	4.000	Greatest Width	Unk and Std			High to Low				
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Previous Component Meth Set: Untitled Proc Meth: GPC_Default GPC //												

Figure 2-16 Processing Method Window (Slicing Page)

## 2.4 Processing the Narrow Standards

After you have developed your GPC processing method using the wizard, you can integrate the narrow standards, adjust the processing method to optimize the integration as needed, and then calibrate the narrow standards.

To process the narrow standards, you need to:

- Prepare to process the narrow standards
- Process the narrow standards

## 2.4.1 Preparing to Process the Narrow Standards

Preparing to process the narrow standards involves the following tasks:

- Bringing the narrow standards into Review
- Opening your processing method

If you just completed <u>Section 2.3, Developing a Processing Method Using the Wizard</u>, and have not closed the resulting windows, you can skip this section and go directly to <u>Section 2.4.2, Processing the Narrow Standards</u>.

To prepare to process the narrow standards:

- 1. Click Review Data, then select Review > Channels to display the Project window.
- 2. From the Channels tab of the Project window, select the six narrow standard channels in the Channels table (see <u>Figure 2-2</u>).
- Click Review to bring the selected standards into Review. The first channel from the Green PS standard appears in the chromatogram plot and 2D Channels table of the Review Main window (see Figure 2-3). Notice that this channel contains data from the second injection of the narrow standard Green PS Std.
- Select File > Open > Processing Method. The Open an Existing Processing Method dialog box appears. Select GPC\_Default, then click Open. The processing method name and type appear at the bottom of the Review window (Figure 2-17).





## 2.4.2 Processing the Narrow Standards

Processing the narrow standards involves the following tasks:

· Integrating the narrow standard

- Checking the integration
- Calibrating the narrow standard
- · Repeating for each narrow standard
- · Checking the calibration curve
- Saving the calibration

#### **Integrating the Narrow Standard**

To integrate the narrow standard:

 From Review, click Integrate. The processing parameters stored with your processing method are applied to the first narrow standard channel. The integrated peaks appear on the chromatogram (Figure 2-18).



Integrate

Figure 2-18 Processing Method Applied to First Narrow Standard

 Check that only the standard peaks are integrated and that the peaks are properly integrated (Figure 2-18).

If the peaks are not properly integrated, access the Processing Method window (select Window > Processing Method) and adjust the narrow integration parameters on the Integration page. Make sure that the Narrow option button is
selected because you are adjusting parameters for a narrow standard (see <u>Figure 2-14</u>). For details, refer to the "Optimizing Peak Integration" topic in the *Empower Help* Find tab.

- Click the Peaks tab (at the bottom of the Review Main window) to display the Peaks table (Figure 2-19).
- Click Calibrate. The chromatogram is calibrated with the existing peaks and the result appears in the Peaks table (<u>Figure 2-19</u>).



Figure 2-19 Checking Assigned Molecular Weight

The first molecular weight is assigned to the first integrated peak in the chromatogram, the second molecular weight is assigned to the second integrated peak, and so on.

5. If the molecular weight (MP) is assigned to the wrong peak, adjust your integration parameters so that only the standard peaks are integrated (see <u>Figure 2-14</u>). Try setting a minimum height or a minimum area or adjust the inhibit integration event times. For details, refer to the "Defining Integration Parameters and Events" topic in the *Empower Help* Find tab.

#### **Repeating for Each Narrow Standard**

- Click Next 2D Channel (Figure 2-19). The next chromatogram appears in the Chromatogram plot.
- 7. Repeat steps 1 through 6 until each narrow standard channel is processed. If you adjusted the processing method, you need to reintegrate and recalibrate any standards that were processed before you modified the processing method.

*Note:* You must process all standards using the same processing method parameters.

# 2.5 Checking the Calibration Curve

When you finish calibrating all the narrow standards, you need to check the calibration curve, which involves:

- Displaying the calibration curve
- Adjusting the calibration curve, if necessary
- · Saving your calibration curve

### 2.5.1 Displaying the Calibration Curve

**Note:** The steps in this procedure continue from the point at which the previous procedure concluded.

To display the calibration curve for your standards:

- Select Window > Calibration in Review to display the Calibration Curve window (Figure 2-20).
- 2. Maximize the window to display more of the Individual Points table.



Figure 2-20 Calculated Calibration Curve

### 2.5.2 Checking the Calibration Curve

Checking the calibration curve involves:

- Verifying the calibration curve
- · Making corrections to the calibration curve or its points

### Verifying the Calibration Curve

You use the calibration curve window to perform the following verifications on the calibration curve:

- 1. Check the shape of the calibration curve and note whether an invalid curve message appears in the calibration status area (see Figure 2-20).
- 2. Examine the calibration points in the calibration curve to verify that each point falls along the curve.
- 3. Check the correlation coefficient (R) and standard error of the calibration curve in the calibration status area.

4. Check the Codes field in the calibration status area for any processing problems that occurred while the software was calculating the calibration curve.

### **Making Corrections**

There are three ways to correct a calibration curve:

- Check the integration and molecular weight of the narrow standard that corresponds to the outlying calibration point, and reprocess the standard if necessary.
- Recalculate the calibration curve with a different fit type.
- Ignore a calibration point.

Use the following procedures to make corrections to the calibration curve.

#### **Correcting the Outlying Points**

Note the narrow standard result that corresponds to an outlying calibration point and check the following parameters to be sure that they are set correctly to process the narrow standard:

- Sample Loading parameters Check the molecular weights of your standards, and ensure you entered correct *K* and *alpha* values in the Component Editor if you are performing universal calibration. For details, refer to the "Loading Components for GPC/V Standards and Unknowns" topic in the *Empower Help* Find tab.
- **Narrow Integration parameters** For details, refer to the "Optimizing Peak Integration" topic in the *Empower Help* Find tab.

If you need to make corrections to sample parameters, restart Review with the corrected standards and reintegrate and recalibrate them.

If you change the integration parameters, you must reintegrate and recalibrate all the narrow standards.

#### Recalculating the Calibration Curve with a Different Fit Type

To change the fit type of the calibration curve:

- Select Window > Processing Method. The Processing Method window appears (see <u>Figure 2-14</u>).
- 2. Click the **Calibration** tab to locate and choose another fit type from the Fit Type drop-down list.
- 3. Select Window > Calibration. The Calibration Curve window appears.
- 4. Select Process > Calculate Curve to recalculate the curve with the new fit type.

#### Ignoring a Calibration Point

If you cannot correct the outlying point, you can ignore the calibration point so it is not used when the calibration curve is calculated.

To ignore a point in the calibration curve:

- In the Calibration Curve window, click the point on the plot that you want to ignore. The row corresponding to that point is highlighted in the Individual Points table (Figure 2-21).
- 2. Scroll the table horizontally until the Ignore field appears.
- 3. Select the **Ignore** check box. The point appears with an "X" through it. The curve does not change until you recalculate the curve.
- 4. Select Process > Calculate Curve. The calibration curve reappears with the coefficients and the other statistics recalculated.



Figure 2-21 Selecting a Calibration Point to Ignore

### 2.5.3 Saving Your Calibration Curve

To save the adjustments to the calibration curve and the standard results associated with it:

1. From the Review - Calibration Curve window, select File > Save > Calibration.

**Note:** If you modified the processing method, a message indicating that all the standards were not processed with the same version of the processing method may appear. If this happens, you either:

 Click Save to save the calibration curve with some or all of the calibration points marked as manual points indicating the standards were processed with an earlier version of the processing method.

- or-

- Click Cancel, reintegrate and recalibrate all your standards, then save the standards and the calibration curve.
- 2. Select File > Exit to return to the Empower Pro window.

# 2.6 Adding Your Processing Method to a Method Set

Add the processing method you created in <u>Section 2.3, Developing a Processing Method</u> <u>Using the Wizard</u>, to a method set. Adding your processing method to a method set involves:

- · Accessing the Method Set Editor
- Adding your processing method
- · Saving the method set

#### Accessing the Method Set Editor

To access the Method Set Editor:

- 1. From the Project window, select File > New Method > Method Set.
- You are prompted to use the wizard to create a new method set. Click No. The Method Set Editor appears (Figure 2-22).

💕 Untitled in GPC_Default as System/Administrator - Method Set Editor 📃 💷 🗙										
<u>F</u> ile <u>E</u> dit <u>V</u> iew <u>H</u> elp										
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Method Set     Method Set     More Channels     More Channels     More Channel Sets	Instrument Method GPC Default Default Processing Method GPC Default Default Report Method	<ul> <li>✓ Edit</li> <li>✓ Edit</li> <li>✓ Edit</li> </ul>								
	Channel Name Processing Method	Report Method								
	Export Method	×								



### **Adding Your Processing Method**

- 3. Select GPC Default from the Instrument Method list.
- 4. Select GPC\_Default or the name of the processing method you created (if different), from the Default Processing Method list.
- 5. Leave the Default Report Method and Export Method fields blank.

#### Saving the Method Set

- 6. Select File > Save. The Save Current Method Set dialog box appears.
- Type GPC\_Default Method Set in the Name field. Click Save to save the current method set.

**Note:** You can also edit a method set in Review using the Method Set Editor. To open the Method Set Editor, select **File > New or Open > Method Set**. (If you selected **Open**, the Open an Existing Method Set dialog box appears. Select the desired method set and click **Open**.) Select **Window > Method Set** to access the Method Set Editor.

# 2.7 Tutorial Summary

In this chapter, you have learned how to:

- Determine V<sub>0</sub> and V<sub>t</sub> for your GPC system
- Develop a processing method using the Processing Method Wizard
- Process narrow standards
- Check the calibration curve and adjust, if necessary
- Save the calibration curve
- · Add your processing method to the method set

# Chapter 3 Processing Broad Unknowns

This chapter provides a step-by-step tutorial of the procedures required to process broad unknown samples with the processing method used to calibrate your narrow standard.

# 3.1 Tutorial Overview

The goal of this tutorial is to familiarize you with the Empower software tools and procedures used to process unknown samples. The tutorial shows you how to:

- Prepare to process unknown data samples
- Process broad unknown data samples using the GPC processing method and calibration curve created in the previous tutorials
- · Check the molecular weight distribution plot for a processed broad unknown
- Make adjustments to a broad unknown result
- Save your unknown results

Figure 3-1 outlines the steps used to process unknowns.



Figure 3-1 Steps in Processing Broad Unknowns

# 3.2 Preparing to Process Unknowns

Processing unknown data samples involves:

- Bringing the broad unknown channels into Review
- Opening the GPC processing method which you used to calibrate your standards

### 3.2.1 Bringing the Unknowns into Review

To bring broad unknown channels into Review for processing:

- 1. In the Empower Login dialog box, enter your user name and password, then click OK.
- From the Empower Pro window, click Review Data. The Review Data dialog box appears.
- 3. Select Review and Channels.
- 4. Click OK. The Project window appears.
- Select the five broad unknown channels from the Channels tab in the Project window (Figure 3-2).

	۵	GPC_Default as System/Administrator - Project											
	File	Edit View	Tool	s Databa	ise Help								
Review —	E		8	<b>#</b>	<mark>9      </mark>	<b>!</b>	Filter By: D	)efault			•	Edit Vi	
	◀	Sample Set	s Ir	njections	Channels Methods	Result Sets Results	Peaks	Sign Offs Curves	View Filters	Custom Fields	1		
	6	SampleName	Vial	Injection	Sample Type	Date Acquired	Channel	Channel Description	۱				
	1	Broad PS	4	5	Broad Unknown	9/24/1997 12:09:40 AM	SATIN	410 dRI					
	2	Broad PS	4	4	Broad Unknown	9/23/1997 11:23:03 PM	SATIN	410 dRI					
	3	Broad PS	4	3	Broad Unknown	9/23/1997 10:36:27 PM	SATIN	410 dRI					
	4	Broad PS	4	2	Broad Unknown	9/23/1997 9:49:51 PM	SATIN	410 dRI					
	5	Broad PS	4	1	Broad Unknown	9/23/1997 9:03:14 PM	SATIN	410 dRI					
	6	Green PS Std	3	2	Narrow Standard	9/23/1997 8:16:30 PM	SATIN	410 dRI					
	7	Green PS Std	3	1	Narrow Standard	9/23/1997 7:29:51 PM	SATIN	410 dRI					
	8	vVhite PS Std	2	2	Narrow Standard	9/23/1997 6:43:07 PM	SATIN	410 dRI					
	9	White PS Std	2	1	Narrow Standard	9/23/1997 5:56:29 PM	SATIN	410 dRI					
	10	Red PS Std	1	2	Narrow Standard	9/23/1997 5:09:44 PM	SATIN	410 dRI					
	11	Red PS Std	1	1	Narrow Standard	9/23/1997 4:23:08 PM	SATIN	410 dRI					
	For	Help, press F1								11 Sel	ected	11.	

Figure 3-2 Selecting Broad Unknown Channels

 Click Review. Review appears with the first broad unknown channel displayed (<u>Figure 3-3</u>).



Processing Method Name



### 3.2.2 Opening the GPC Processing Method

To open the GPC Processing Method to process unknown samples:

- Select File > Open > Processing Method. The Open an Existing Processing Method dialog box appears.
- Select your processing method, GPC\_Default (or the name of the processing method you are using), then click Open. The processing method name and type appear at the bottom of the window.
- 3. Click the Peaks tab to display the Peaks table (Figure 3-4).

#### Processing Method Wizard



Figure 3-4 Review with GPC Processing Method Open

# 3.3 Setting Broad Unknown Integration Parameters

You use the Processing Method Wizard to set the integration parameters for the broad unknowns. This modifies the processing method you created in <u>Section 2.3</u>, <u>Developing a</u> <u>Processing Method Using the Wizard</u>, to include processing parameters for the broad unknowns.

To run the Processing Method Wizard to modify the method for the broad unknowns:

 Click Processing Method Wizard in the Review Main window (Figure 3-4). The GPC Processing Method Wizard dialog box appears (Figure 3-5).

GPC Processing Method Wizard									
You can use the Processing Method wizard to edit the current GPC processing method or to create a new processing method.									
Creating a new processing method using the wizard always starts a new calibration for the new processing method.									
If you are editing the current GPC processing method with the Processing Method wizard, you can choose to either keep the existing calibration or clear the calibration and start a new calibration for the modified GPC processing method.									
C Create a New Processing Method									
Edit Existing GPC Processing Method and Keep the Calibration									
C Edit Existing GPC Processing Method and Clear the Calibration									
OK Cancel Help									

Figure 3-5 GPC Processing Method Wizard Dialog Box

- Click the Edit Existing GPC Processing Method and Keep the Calibration option button, then click OK. The Integration–Integration Region page of the wizard appears since the integration region was set when you created the processing method.
- 3. Click **Back** twice to access the Integration–Peak Detection 1 page.



Figure 3-6 Setting Peak Width

Click-drag the cursor to draw a box around the narrowest peak of interest to set the peak width (Figure 3-6). You can also type the peak width value instead of graphically selecting the peak width. The view zooms into the selected region. The software automatically determines the appropriate peak width setting using the data contained within the region in which you have zoomed. The value is displayed in the text box. For this broad unknown a value of approximately 360 is appropriate. Check your integration region. If the desired peak is not selected, right-click in the chromatogram, select Full View, then redraw the box.

 When you are satisfied with the integration region, click Next to go to the Integration–Peak Detection 2 page (<u>Figure 3-7</u>). This page allows you to set the threshold for peak detection.



Figure 3-7 Setting Peak Threshold

5. Click-drag the cursor to draw a box around a section of baseline that contains noise that you would like to reject.

The view zooms into the selected region. The software automatically determines the appropriate peak threshold setting using the data contained within the region in which you have zoomed. The value is displayed in the text box; for this example a value of approximately 25 is appropriate. If you want to change the selected region, right-click in the chromatogram, select Full View, then reselect or reenter the value.

6. Click **Next** to go to the Integration–Integration Region page (<u>Figure 3-8</u>). This page allows you to define the area where you want to perform the integration.



Figure 3-8 Setting the Integration Region

- Enter the start and end times for the region where you want to perform integration. From 12.955 minutes to 28 minutes is a good integration region for these broad unknowns.
- 8. Click Next to go to the Integration–Peak Rejection page (Figure 3-9). Check your integration. If the integration is incorrect, click Back, then reenter start and end time values. If you want to enter values to set integration limits for Minimum Area and/or Minimum Height, enter them on this page. You can leave these values at 0, as they are not needed to correctly integrate the broad unknowns in the GPC\_Default project.

Integration - Peak Rejectio	n - SATIN
2 3 2 3 2 3 2 3 2 3 2 3 2 3 1 2 3 2 3 1 2 3 1 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 2 3	If the integration is not correct, press the Back button to readjust the chromatogram zoom level to a different region and try again. To reject peaks based on area or height, select the smallest peak of interest and click the Minimum Area or Minimum Height box.
	Minimum Area 0 Minimum Height 0 Test
	< Back Next > Cancel Help

Figure 3-9 Setting Minimum Area and Height

9. Click Next to go to the GPC–Calibration page (Figure 3-10).



Figure 3-10 Setting GPC Calibration Parameters

- 10. Leave the GPC calibration parameters at their current settings (Figure 3-10).
- 11. Click Next to go to the GPC–Column Set page (Figure 3-11). This page allows you to enter values for  $V_0$  and  $V_t$ .



Figure 3-11 Setting  $V_0$  and  $V_t$  Values

- 12. Leave the GPC column set parameters  $V_0$  and  $V_t$  at their current settings.
- 13. Click Next to go to the GPC-Broad Unknowns and Standards page (Figure 3-12).



Figure 3-12 Setting GPC Broad Unknowns and Standards Parameters

 Enter the component name, Broad PS, in the Name field (Figure 3-12). The component name is copied to the Slicing table in the Processing Method window (Figure 3-16). **Note:** If you entered a name for the component in the Component Editor, the name must match the name in the Slicing table in the Processing Method window in order for the distribution to be calculated. For details, refer to the "Component Editor" and "Slicing Tab" topics in the Empower Help Find tab.

15. Click Next to go to the Processing Method Name page (Figure 3-13).



Figure 3-13 Finishing the Processing Method Wizard

- Click Finish to finish the Processing Method Wizard, save the modified processing method and apply it to the current broad unknown, and return to the Review Main window.
- 17. The Saving Processing Method with Calibration Curves dialog box appears. Click Copy Curves.

 View the integrated and quantitated broad unknown in the chromatogram plot of the Review Main window (<u>Figure 3-14</u>).



Figure 3-14 Integrated and Quantitated Broad Unknown

 Select Window > Processing Method to view your new broad processing method parameters in the Processing Method window (Figure 3-15). Check the Integration and Slicing pages by clicking the corresponding tabs.

Note the peak width and threshold values and inhibit integration events in the Broad Integration table corresponding to the start and end times you set in the Processing Method Wizard.

**Note:** Although it is not shown in this tutorial, you can view the Review Main window and the Processing Method window side by side by selecting View > Processing Method Layout.

Broad PS in GPC_Default as System/A	Administrator - Review - [GPC_Default in GPC_Defa	ault as System/Administrator - Review	- [Main Window] - GPC 🔳 🖻 🔀
🕞 File Edit View Plot Process Navigate	Options Window Help		_ 8 ×
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Time (min)	Туре	Value	Stop (min)
1 0.000	Inhibit Integration		12.955
2 28.000	Inhibit Integration		
	-		
	-		
For Help, press F1	1	Meth Set: Untitled P	roc Meth: GPC_Default GPC

Figure 3-15 Processing Method Window (Broad Integration Page)

20. Click the Slicing tab to switch to the Slicing table (Figure 3-16). Note that the table contains the component name, Broad PS, that you entered using the Processing Method Wizard (Figure 3-12), and that the peak match is closest and the retention time is the same as the peak displayed in the Review Main window (Figure 3-14).

A.A. 2011	📓 Broad PS in GPC_Default as System/Administrator - Review - [GPC_Default in GPC_Default as System/Administrator - Review - [Main Window] - GPC 🔳 🗃 🔀												
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•	Integration Calibration Science Asial Dispersion Noise and Drift												
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1	Broad PS	20.678	5.000	Closest		0.0000	1st Order	Structural	1st Order	100.000		None	
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Figure 3-16 Processing Method Window (Slicing Page)

# 3.4 Processing a Broad Unknown Sample

Process each broad unknown sample using the calibrated processing method. Processing a broad unknown involves:

- Integrating the broad unknown
- Checking the peak integration
- Quantitating the broad unknown

#### Integrating the Broad Unknown

When you finished the Processing Method Wizard in the previous tutorial, the broad unknown was integrated and quantitated with the modified processing method. For the sake of the tutorial we are reintegrating and requantitating the broad unknown to show you the effects of clicking the Integrate and Quantitate buttons. To integrate the broad unknown sample, click **Integrate**. The first broad unknown channel's integration results are displayed in the Chromatogram plot (Figure 3-17).



Figure 3-17 Integrating the Broad Unknown

### **Checking the Peak Integration**

If the integration was not performed correctly, you need to modify the broad integration parameters and events in the Processing Method window (<u>Figure 3-15</u>).

Access the Processing Method window (select Window > Processing Method) and adjust the Broad Integration parameters on the Integration page. Make sure that the Broad option button is selected because you are adjusting parameters for a broad sample (Figure 3-15). For details, refer to the "Optimizing Peak Integration" topic in the Empower Help Find tab.

### **Quantitating the Broad Unknown**

When you are satisfied with integration, click **Quantitate**. The Peak table displays the molecular weight averages for the integrated peak (Figure 3-18).



Quantitate

Figure 3-18 Quantitating the Broad Unknown

# 3.5 Reviewing the Molecular Weight Distribution

You can review and adjust the molecular weight distribution and molecular weight averages for each processed broad unknown sample peak. Adjusting the molecular weight distribution involves:

- Setting up the Result window to display the Molecular Weight Distribution plot
- · Checking the molecular weight distribution and molecular weight averages
- · Making integration adjustments, if necessary

### 3.5.1 Viewing the Molecular Weight Distribution

To view the molecular weight distribution curve and the molecular weight averages:

- Select Window > Results from Review. The Results window appears (Figure 3-19).
- 2. Click the **Distribution Plot** tab at the bottom of the Results window, if it does not appear as the default tab.
- 3. Click the **Peaks** tab at the top of the Results window, if it does not appear as the default tab and make sure the peak with the distribution you want to view is selected in the Peaks table.



Figure 3-19 Molecular Weight Distribution Plot

### **Customizing the Molecular Weight Distribution Plot View**

To customize your viewing preferences in the Molecular Weight Distribution plot:

1. Right-click the Molecular Weight Distribution plot, then select **Properties**. The Plot Properties dialog box appears (<u>Figure 3-20</u>).

- 2. Check the Axis Data section on the Distribution Plots tab. Verify that the following parameters have been selected:
  - MW Averages
  - MW Markers

**Note:** You can select additional parameters to customize the Molecular Weight Distribution plot. For details, refer to the "GPC Distribution Plots Tab" topic in the Empower Help Find tab.

Plot Properties		? ×
Axis Data	rerlay Scaling Legend Fonts Colors Name	
A-Axis Data. Slice Lugivi w	Right-Axis Data: Cumulative %	
Additional Plots		
Plot3 Data:	▼ Plot6 Data:	
Plot4 Data:	Plot7 Data:	
Plot5 Data:	Plot8 Data:	
Plot Data		
High To Low	MW Averages	
C Low To High	MW Markers	
		1

Figure 3-20 Customizing the Molecular Weight Distribution Plot

### 3.5.2 Checking the Molecular Weight Distribution

To check the molecular weight distribution:

- 1. Check the molecular weight averages in the Peaks table (Figure 3-19).
- 2. Check the shape of the Molecular Weight Distribution plot (Figure 3-19).
- Check the values in the Molecular Weight Distribution table. Click the Distribution tab at the top of the Results window (<u>Figure 3-19</u>) to see the table.
- 4. Decide if you are satisfied with the molecular weight averages, distribution curve, and distribution table.
  - If you are satisfied with the molecular weight distribution, proceed to <u>Section 3.6,</u> <u>Saving Your Unknown Results</u>.
  - If you are not satisfied with the molecular weight distribution, proceed to Section 3.5.3, Making Adjustments.

### 3.5.3 Making Adjustments

You can make adjustments to the processed data if you are not satisfied with the molecular weight distribution results.

Adjusting your Molecular Weight Distribution plots involves all of the following:

- Adjusting the integration of the broad unknown chromatogram
- · Checking and possibly adjusting the calibration curve
- Adjusting the slicing table parameters for the broad unknown peak

#### Adjusting the Integration of the Broad Unknown

To check, and, if necessary, adjust the integration of the broad unknown:

- 1. Select Window > Main Window to return to the Review Main window.
- 2. Check that the processing method is set correctly to integrate a broad unknown:
  - **Broad Integration parameters** Refer to the "Optimizing Peak Integration" topic in the *Empower Help* Find tab.
  - Integration Table events Refer to the "Integration Events" topic in the *Empower Help* Find tab.
- 3. If you make any changes to the processing method, click Integrate and then click Quantitate. The processed result for the broad unknown is updated.

#### **Checking the Calibration Curve**

To check the calibration curve, follow the instructions in <u>Section 2.5, Checking the</u> <u>Calibration Curve</u>.

#### **Checking the Slicing Table Parameters**

To check the Slicing table parameters:

- Select Window > Processing Method from Review, then click the Slicing tab to access the Slicing table (Figure 3-16).
- Check the peak name in the Name field. The name must match the name that you
  entered in the Component Editor (if you entered a component name) in order for the
  result to be generated. For details, refer to the "Component Editor" and "Slicing Tab"
  topics in the Empower Help Find tab.
- 3. Check other fields in the Slicing table, such as:
  - Retention Time
  - RT Window
  - Peak Match
  - Type

- High and Low MW
- Minimum Area

For details, refer to the "Slicing Tab" topic in the Empower Help Find tab.

4. If you make any changes to the slicing table parameters, click **Quantitate** to update the processed result for the broad unknown.

# 3.6 Saving Your Unknown Results

To save the GPC results for a broad unknown, select File > Save > Result.

**Note:** If you are saving an unknown, File > Save > Result will not be enabled unless you have already saved the processing method and calibration. If the Save > Result selection is not available, select File > Save > Calibration to save the changes to the processing method and calibration. Then select File > Save > Result to save your result. Because you modified the processing method after processing the standards, you should reprocess the standards and unknowns with the final processing method using the Background Processing and Reporting function described in Chapter 4, Automating Your Processing Procedures.

# 3.7 Processing Additional Broad Unknowns

To process additional broad unknowns, repeat the procedures in the following sections for each broad unknown sample:

- Section 3.4, Processing a Broad Unknown Sample
- <u>Section 3.5, Reviewing the Molecular Weight Distribution</u>
- Section 3.6, Saving Your Unknown Results

# 3.8 Tutorial Summary

In this chapter, you have learned how to:

- Prepare to process unknown data samples
- Process broad unknown samples
- · Check the molecular weight distribution for a broad unknown peak
- · Make adjustments to a broad unknown result
- Save your unknown results

# Chapter 4 Automating Your Processing Procedures

The step-by-step procedures in this chapter lead you through procedures for automating the processing of your GPC data.

# 4.1 Tutorial Overview

The goal of this tutorial is to familiarize you with Empower software tools and procedures that you can use to streamline calibrating your system and processing your unknowns once you have optimized your processing method to process both standards and unknowns. The tutorial shows you how to:

- Use the Background Processing and Reporting function to automatically process a GPC sample set in the background
- Use the Preview function to examine and print the GPC results

# 4.2 Using Background Processing

To use the Background Processing and Reporting function:

- 1. From the Empower Pro window (see <u>Figure 1-1</u>), click **Process Data**. The Process Data dialog box appears.
- 2. Select Sample Sets, then click OK. The Project window appears (Figure 4-1).

🖻 GPC_Default as System/Administrator - Project (Data Selection Mode)
File Edit View Tools Database Help
Process
Filter By: Default
Sample Sets Injections Channels Methods Result Sets Results Peaks Sign Offs Curves View Fith
Sample Set Name Sample Set Start Date System Name
1 GPC_Demo 9/23/1997 3:34:50 PM 2690_410
For Help, press F1 1 Selected

Figure 4-1 Sample Set View in the Project Window

- 3. Select the GPC\_Demo sample set associated with the GPC\_Default project.
- Click Process. The Background Processing and Reporting dialog box appears (Figure 4-2).

GPC_Default - Background Proces	sing and Reporting	? 🔀
Processing ✓ Process <sup>C</sup> Use acquisition method set (i.e. fr <sup>C</sup> Use specified method set <sup>C</sup> Use specified processing method ✓ Clear Calibration	om the sample set used to acquire data) GPC Default How: Calibrate and Quantitat	
Reporting Print Waters PDF Generato GUse acquisition method set (i.e. fr Use specified method set Use specified report method	r rom the sample set used to acquire data)	•
Exporting Export Use acquisition method set (i.e. fr Use specified method set Use specified export method	rom the sample set used to acquire data)	¥ ¥

Figure 4-2 Background Processing and Reporting Dialog Box

 Click Use specified processing method in the Processing section of the dialog box. Select GPC\_Default from the list (<u>Figure 4-2</u>).

**Note:** You can also process the sample set using the method set you created in <u>Section 2.6, Adding Your Processing Method to a Method Set</u>, by clicking **Use specified method set** and selecting the method set from the drop-down list box.

- Select Clear Calibration (Figure 4-2). Ensure that Calibrate and Quantitate is selected in the How list.
- 7. Click OK. The following actions occur:
  - a. A new calibration curve is created for the processing method.
  - b. Each channel in the GPC\_Default sample set is processed in the background with the parameters specified in the GPC\_Default processing method. The channels are processed in the order in which they were collected (standards first, then unknowns).
  - c. The processed results are stored as part of a result set with the current date.

8. When the processing is complete, maximize the Project window and click the **Result Sets** tab. The Result Sets View table appears (<u>Figure 4-3</u>).

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Review –		<u>a # 5 8 1</u>		№ □ ■ ■	Filter By: Default			Edit View
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	For Help, press F1			-				1 Selected

Figure 4-3 Results Sets View of the Project Window

- 9. Highlight the result set for the current (Result Set) date.
- 10. Click **Review**. The Results window appears (Figure 4-4).

Å	GPC Default in GPC_Default as System/Administrator - Review - [Results Window]																				
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### Review Main Window

Figure 4-4 Results Window in Review

11. Click **Review Main Window**, if it is not already displayed. The first processed injection appears in the Review Main window (<u>Figure 4-5</u>).

Use Review to check the:

- Integration of standard and unknown peaks in the Main window
- Calibration curve in the Calibration Curve window
- Molecular weight distributions in the Results window
- 12. Use the tree view to sequence through the results in the result set, injection by injection.



Figure 4-5 First Processed Injection in Review

### **Checking the Calibration Curve**

13. Examine and, if necessary, adjust the calibration curve for the processed narrow standards (refer to <u>Section 2.5, Checking the Calibration Curve</u>).

#### **Checking the Broad Unknown Molecular Weight Distributions**

 Examine and, if necessary, adjust the molecular weight distributions for the broad unknown injections (refer to <u>Section 3.5, Reviewing the Molecular Weight</u> <u>Distribution</u>).

# 4.3 Examining and Printing Reports Using Preview

1. In the Project window, click the **Results** tab. A table of processed results appears (Figure 4-6).

#### Preview/Publisher

٦	🖻 GPC_Default as System/Administrator - Project 📃 🗖 🔀											
File	Edit View	Tools	; Databa	ase Help								
E	Edit Vi											
Sample Sets Injections Channels Methods Result Sets Results Peaks Sign Offs Curves View Filters Custom Fields												
89	SampleName	Vial	Injection	Sample Type	Processed Channel Descr.	Date Acquired	Date Processed	Processing Method				
1	Red PS Std	1	1	Narrow Standard	410 dRI	9/23/1997 4:23:08 PM	6/27/2002 9:01:03 AM	GPC_Default				
2	Red PS Std	1	2	Narrow Standard	410 dRI	9/23/1997 5:09:44 PM	6/27/2002 9:00:56 AM	GPC_Default				
3	White PS Std	2	1	Narrow Standard	410 dRI	9/23/1997 5:56:29 PM	6/27/2002 9:00:50 AM	GPC_Default				
4	White PS Std	2	2	Narrow Standard	410 dRI	9/23/1997 6:43:07 PM	6/27/2002 9:00:46 AM	GPC_Default				
5	Green PS Std	3	1	Narrow Standard	410 dRI	9/23/1997 7:29:51 PM	6/27/2002 9:00:41 AM	GPC_Default				
6	Green PS Std	3	2	Narrow Standard	410 dRI	9/23/1997 8:16:30 PM	6/27/2002 9:00:33 AM	GPC_Default				
7	Broad PS	4	5	Broad Unknown	410 dRI	9/24/1997 12:09:40 AM	4/25/2002 3:13:20 PM	GPC Default				
8	Broad PS	4	3	Broad Unknown	410 dRI	9/23/1997 10:36:27 PM	4/25/2002 3:13:19 PM	GPC Default				
9	Broad PS	4	4	Broad Unknown	410 dRI	9/23/1997 11:23:03 PM	4/25/2002 3:13:19 PM	GPC Default				
10	Broad PS	4	1	Broad Unknown	410 dRI	9/23/1997 9:03:14 PM	4/25/2002 3:13:18 PM	GPC Default				
11	Broad PS	4	2	Broad Unknown	410 dRI	9/23/1997 9:49:51 PM	4/25/2002 3:13:18 PM	GPC Default				
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13	Green PS Std	3	1	Narrow Standard	410 dRI	9/23/1997 7:29:51 PM	4/25/2002 3:13:17 PM	GPC Default				
14	Green PS Std	3	2	Narrow Standard	410 dRI	9/23/1997 8:16:30 PM	4/25/2002 3:13:17 PM	GPC Default				
15	Red PS Std	1	1	Narrow Standard	410 dRI	9/23/1997 4:23:08 PM	4/25/2002 3:13:16 PM	GPC Default				
16	Red PS Std	1	2	Narrow Standard	410 dRI	9/23/1997 5:09:44 PM	4/25/2002 3:13:16 PM	GPC Default				
17	White PS Std	2	1	Narrow Standard	410 dRI	9/23/1997 5:56:29 PM	4/25/2002 3:13:16 PM	GPC Default				
For	Help, press F1							17 Selected				

Figure 4-6 Results View of the Project Window

 Select a Broad PS result, then click Preview/Publisher. The Open Report Method dialog box appears (Figure 4-7) and prompts you to specify a report type method to use when displaying a report.

Open Report Method	? 🗙		
Please select the Report Method that you would like to use to preview the data that you have selected:			
C Use the Report Method in the acquisition Method Set GPC_Demo.			
C Use the Report Method named Default.			
C Use a Report Method that was generated to be appropriate for the selected data.			
C Use the following Report Method: GPC Default Individual Report			
C Use the currently open Report Method named Untitled.			
OK Cancel Help			

Figure 4-7 Specifying a Report Method

- 3. Click the Use the following Report Method option button.
- 4. Select GPC Default Individual Report from the drop-down list.
- Click OK. Report Publisher appears with a report for the Broad PS result based on the GPC Default report method (<u>Figure 4-8</u>).

Print		
I.		
🖾 GPC Default Individual Report in GPC_De	efault as System/Administrator - Report Publisher (Preview)	
<b>F I I I I I I I I I I I I I I I I I I I</b>	🔟 📽 🔊 🖾 🔛 🔽 🔽 🖸 🖸 🖸	
	GPC Default Individual Report	
	Reported by USer: System Project Name: GRC_Deranit	
	Sample Name: Broad PS Accured By: DBID	
	Samole Troe: Broad Unition 1 Earls Aco Ne d: 9/23/1997 11/25/03 PM VBI: 4 Acq. Net of Set GPC Demo Net by 4 Dep Processor 67/2012 21/53 PM	
	No The Volume: 100,000 v1 Processing Method: OFC, Da that Ru The: v5,0 Markes Clause Name: SATM Sector Volume: OFC Dama	
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	Peport lietiod: GPC Defail Linduidra/Report Printe d/25603 PN 6/27/2002 Page: 1 of 1	
Page 1 of 1	Project: GPC_Default Individual	

Figure 4-8 Result Shown in GPC Default
- 6. You can print the report displayed in Report Publisher by clicking **Print**.
- 7. Use Preview to examine and print reports for one or more results in the result set. For details about previewing a report method, refer to the "Previewing a Report from the Report Publisher" topic in the *Empower Help* Find tab. For information about changing a report method, refer to the "Modifying a Report Method" topic in the *Empower Help* Find tab.
- 8. When you complete previewing your report, click the **Close** button to close Preview, then select **File > Exit** to close Report Publisher and return to the Project window.

#### 4.4 Tutorial Summary

In this chapter, you have learned how to:

- Use background processing
- Examine and print reports using Preview

## Chapter 5 Reporting and Backing Up Project Data

This chapter provides procedures for reporting and backing up your project.

#### 5.1 Tutorial Overview

The goal of this tutorial is to familiarize you with Empower software tools and procedures used to generate reports and back up your GPC data, methods, and results. The tutorial shows you how to:

- · Generate printed reports of GPC results
- · Back up your project to protect your data, methods, and results

#### 5.2 Generating Reports

To generate printed reports of your GPC results for one or more samples:

- 1. From the Empower Pro window (Figure 1-1), double-click Print Data. The Print Data dialog box appears.
- 2. Select Results, then click OK. The Project window appears (Figure 5-1).

4	💼 GPC_Default as System/Administrator - Project (Data Selection Mode)											
Eile Edit ⊻iew Iools Database Help												
Print Filter By: Default Edit View Update												
Sample Sets   Injections   Channels   Methods   Result Sets Descrite. Peaks   Curves   View Filters   Custom Fields												
66	SampleName	Vial	Injection	Sample Type	Processed Channel Descr.	Date Acquired	Date Processed	Processing Method	-			
1	Broad PS	4	5	Broad Unknown	410 dRI	9/24/97 12:09:40 AM	9/14/01 1:30:47 PM	GPC Default				
2	Broad PS	4	4	Broad Unknown	410 dRI	9/23/97 11:23:03 PM	9/14/01 1:30:45 PM	GPC Default				
з	Broad PS	4	3	Broad Unknown	410 dRI	9/23/97 10:36:27 PM	9/14/01 1:30:44 PM	GPC Default				
4	Broad PS	4	2	Broad Unknown	410 dRI	9/23/97 9:49:51 PM	9/14/01 1:30:42 PM	GPC Default				
5	Broad PS	4	1	Broad Unknown	410 dRI	9/23/97 9:03:14 PM	9/14/01 1:30:40 PM	GPC Default				
6	Green PS Std	з	1	Narrow Standard	410 dRI	9/23/97 7:29:51 PM	9/14/01 1:30:38 PM	GPC Default				
7	Green PS Std	з	2	Narrow Standard	410 dRI	9/23/97 8:16:30 PM	9/14/01 1:30:38 PM	GPC Default				
8	White PS Std	2	1	Narrow Standard	410 dRI	9/23/97 5:56:29 PM	9/14/01 1:30:37 PM	GPC Default				
9	White PS Std	2	2	Narrow Standard	410 dRI	9/23/97 6:43:07 PM	9/14/01 1:30:37 PM	GPC Default				
10	Red PS Std	1	1	Narrow Standard	410 dRI	9/23/97 4:23:08 PM	9/14/01 1:30:36 PM	GPC Default				
11	Red PS Std	1	2	Narrow Standard	410 dRI	9/23/97 5:09:44 PM	9/14/01 1:30:36 PM	GPC Default				
12	Broad PS	4	5	Broad Unknown	410 dRI	9/24/97 12:09:40 AM	9/14/01 1:21:02 PM	GPC Default				
13	Broad PS	4	4	Broad Unknown	410 dRI	9/23/97 11:23:03 PM	9/14/01 1:21:01 PM	GPC Default				
14	Broad PS	4	3	Broad Unknown	410 dRI	9/23/97 10:36:27 PM	9/14/01 1:20:59 PM	GPC Default				
15	Broad PS	4	2	Broad Unknown	410 dRI	9/23/97 9:49:51 PM	9/14/01 1:20:57 PM	GPC Default				
16	Broad PS	4	1	Broad Unknown	410 dRI	9/23/97 9:03:14 PM	9/14/01 1:20:56 PM	GPC Default				
17	Green PS Std	3	2	Narrow Standard	410 dRI	9/23/97 8:16:30 PM	9/14/01 1:20:54 PM	GPC Default				
18	White PS Std	2	2	Narrow Standard	410 dRI	9/23/97 6:43:07 PM	9/14/01 1:20:53 PM	GPC Default				
19	Green PS Std	з	1	Narrow Standard	410 dRI	9/23/97 7:29:51 PM	9/14/01 1:20:53 PM	GPC Default				
20	Red PS Std	1	2	Narrow Standard	410 dRI	9/23/97 5:09:44 PM	9/14/01 1:20:52 PM	GPC Default				
21	White PS Std	2	1	Narrow Standard	410 dRI	9/23/97 5:56:29 PM	9/14/01 1:20:52 PM	GPC Default	-			
For Help, press F1 44 Selected												

Figure 5-1 Results View of the Project Window

- 3. Select the results for which you want to generate reports.
- 4. Click Print (Figure 5-1). The Background Processing and Reporting dialog box appears (Figure 5-2).

GPC_Default - Background Processing and Reporting	? ×									
Processing										
• Use acquisition method set (i.e. from the sample set used to acquire data)										
C Use specified method set										
C Use specified processing method										
Clear Calibration 🔲 Use Existing Integration How: Calibrate and Quantit	at 🔻									
Reporting										
Print VVPRINTSHARE/techpub4si	-									
C Use acquisition method set (i.e. from the sample set used to acquire data)										
O Use specified method set	~									
Use specified report method GPC Default Individual Report										
Exporting										
If the equivition method set. (i.e. from the sample set used to equive date)										
C Use apoptified method set	-									
Use specified export method	<u> </u>									
OK Cancel He	lp									



- 5. Ensure that the **Print** check box in the Reporting section is selected and the desired printer is selected in the drop-down list.
- 6. Click Use specified report method, then select GPC Default Individual Report from the drop-down list of report methods.
- 7. Click **OK**. The software generates a report for each selected result based on the selected report method.

#### 5.3 Backing Up Data

To protect your data, method, and results, always back up your GPC project whenever you change it.

To back up a project:

- 1. From the Empower Pro window, click Configure System.
- Select Projects from the Configure System dialog box and click OK. Configuration Manager appears (<u>Figure 5-3</u>).
- 3. Select the project that you want to back up in the table of projects.

#### Backup Project

🖶 System/Administrator - Configurati	ior	Manager							
File Edit View Records Tools Help									
🔊 🛃 💕 💉 🗡 🖿 🖬 🖬		Filter By: Default					Edit Vie	w <u>U</u> pdate	1
🖃 🚭 Empower Configuration	5	Name	Owner	Create Date	Full Audit Trail	Locked	Comments	Tablespace Quota	Tables
Projects	1	Defaults	system	6/10/2002 1:56:23 PM	Γ	Г	Default project		
Systems	2	GPC_Default	System	6/10/2002 3:47:44 PM	Γ	Г			
Elibraries	Г								
😨 Users	F								
😨 User Groups	Г								
Plate Types	Г								
System Audit Trail	Γ								
Gffline System Audit Trail									
Sample Archives M Offline Project Archives	F								
P Offline Sample Archives	F								
-	Γ								
	Γ								
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	Γ								
	Γ								
	Γ								
	<		1	I					>
For Help, press F1									

Figure 5-3 Configuration Manager

 Click Backup Project to start the Backup Project Wizard. Follow the instructions on each page of the wizard. For details, refer to the *Empower Software Getting Started Guide*, Section 8.4.1, Project Backup.

#### 5.4 Tutorial Summary

In this chapter, you have learned how to:

- · Generate a report of GPC results
- Back up your project

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