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Empower 3 Feature Release 5

System Administrator's Guide

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Revision A

Empower 3 FR5 System Administrator's Guide

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Audience and purpose

This guide is intended as an aid to administrators of both the Waters Empower 3 Feature Release 5 (FR5) Enterprise client/server system and the Empower 3 FR5 Workgroup configuration.

References in this guide to an Enterprise server also pertain to a Workgroup server, and references to an Enterprise client also pertain to a Workgroup client.

Table of contents

1 Introduction

This guide describes the hardware and software requirements, system administrative tasks, and security settings and policies for the server.

For information on how to back up and restore the Empower 3 FR5 database on an Empower Personal system, refer to "Backing up the Empower Personal database" and "Restoring the Empower Personal database" topics in the *Empower online Information System*.

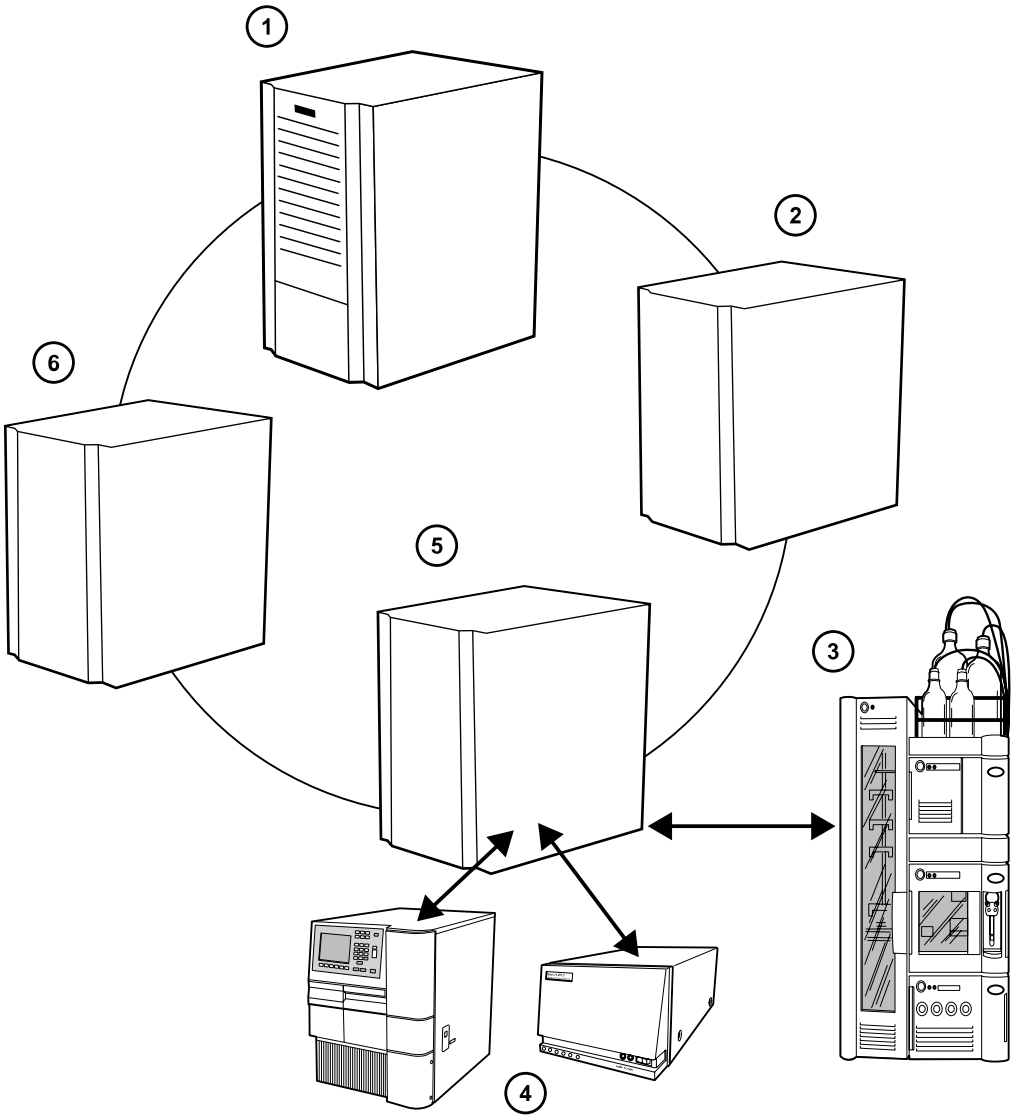
1.1 System overview

The Empower 3 Feature Release 5 Enterprise client/server system and Workgroup configuration are networked versions of the Empower 3 FR5 Personal stand-alone workstation. The architecture of these systems consists of these parts, as shown in the following figure:

- A central database on the server
- Distributed acquisition
- Distributed processing

You can use an Empower Personal workstation as a client in a workgroup or enterprise environment.

Figure 1–1: Example of Empower 3 FR5 Enterprise and Workgroup system architecture



1. Empower server that contains the Empower database and raw data files (Waters Service)
2. Alternate raw data storage that contains raw data files (Waters Service)
3. UPLC
4. Chromatographic system
5. LAC/E^{32} acquisition server that contains Waters Service and instrument server process
6. Empower client that contains Empower program files

1.2 Software description

This section describes the software components required to implement the Empower 3 FR5 Enterprise or Workgroup systems.

1.2.1 Server software

The server software comprises these components:

- Operating system
  - Microsoft Windows Server 2016 Standard
  - RedHat Enterprise Linux 7.6
- Oracle Enterprise Edition
  - Version 18.4.0.0.0 64 bit for Windows
  - Version 18.4.0.0.0 for RedHat
- Empower 3 FR5 Enterprise or Workgroup software

Windows Server operating systems

The Windows Server operating systems provide built-in networking utilities, protocol handlers, and services including basic file and print services and client/server application functionality.

Oracle Enterprise Edition 18c server

The Empower 3 relational database resides on the server in an Empower 3 Enterprise client/server system or an Empower 3 Workgroup configuration. Information from projects, such as processed results, sample identifiers, and methods, is stored in the Empower 3 database. The raw data files are not stored in the database. Raw data is stored where the project directory is configured.

See also: For details about how to set up the directory, see the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

Oracle client software provides the Empower 3 FR5 application running on the client computer with access to the Empower 3 database.

1.2.2 Client software

The client software runs on the PC and communicates with the corresponding software components on the server, as applicable. The client software includes these items:

- Empower 3 FR5 Enterprise or Empower 3 FR5 Workgroup client software
- Oracle Client Software version 18.3.0.0.0 32-bit

The client's Windows 10 operating system provides the connectivity software that communicates with the server through TCP/IP. The Windows operating system, combined with TCP/IP services, provides the Empower 3 FR5 software with access to these components:

- Raw data files on the server or other computer on the network
- Network printers
- Empower 3 FR5 clients and LAC/E^{32} acquisition servers

See also: Refer to the release notes for your LAC/E^{32} acquisition server to determine which operating system is supported.

Empower 3 FR5 software allows you to acquire data and control chromatographic instrumentation, process data interactively or in the background, customize management of project information, and customize report design and generation.

Oracle client software provides Empower 3 FR5 software with access to the Empower database through TCP/IP.

1.3 System administration

Managing the Empower 3 FR5 Enterprise or Workgroup system involves maintaining all the hardware components, operating system software, networking software, and application programs that make up the Empower 3 FR5 software. It also requires system administrators to know the system's workload so that they can anticipate changes, problems, and growth.

1.3.1 System administrator qualifications

System administrators are responsible for the smooth and efficient daily operation of the Empower system. They control and maintain the system by performing the system administration tasks listed in System administration tasks.

To effectively administer the Empower 3 FR5 system, administrators must be familiar with the operation of the hardware and software listed in the following tables.

Table 1–1: Hardware

Hardware	Reference
Server computer and peripherals	Server documentation
Waters LAC/E^{32} Acquisition Server	*Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184)
Empower 3 FR5 clients	*Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184)
PCs and printers	PC and printer manufacturer's documentation

Table 1–2: Software

Software	Reference
Windows Server 2016 Standard Edition	Microsoft Windows documentation
Oracle 18c	Oracle 18c Server online documentation
Microsoft TCP/IP	Microsoft Windows Help

1.3.2 System administration tasks

This section describes the routine and periodic system administration tasks that administrators need to perform to keep the Empower 3 FR5 system running efficiently. Several tools can assist with these tasks:

- *Empower online Information System*
- Empower 3 FR5 Configuration Manager
- Getting Stared with Windows Server 2016
- Waters Database Manager Help

See also: Waters Database Manager topic in this document.

1.3.2.1 Routine tasks

You should perform routine system administration tasks regularly: once daily, once each shift (every eight hours), or once a week. Routine system administration tasks apply to both the server and the client.

Periodic system administration tasks apply to both the server and the client.

1.3.2.2 Tasks performed from the Empower 3 FR5 server

The following table lists typical server tasks and chapter references.

Table 1–3: Tasks performed from the Empower 3 FR5 server

Task	Reference	Recommended frequency
Confirming disk space and status	*Empower online Information System*	Daily
Backing up the Empower database	*Empower online Information System*	Full, level 0 and Incremental, level 1 Daily or weekly, depending on system workload
Deleting or archiving unneeded files	*Empower online Information System*	As needed
Archive alert log	Section Archiving alert logs, in this document	Quarterly
Managing raw data files	*Empower online Information System*	As needed

1.3.2.3 Tasks performed from an Empower 3 FR5 client

You initiate periodic and routine client tasks from the Empower Configuration Manager on the client PC. The following table lists typical routine tasks that apply to clients.

Table 1–4: Tasks performed from an Empower 3 FR5 client

Task	Reference	Recommended frequency
Backing up, restoring, and deleting projects	*Empower online Information System*	As needed
Managing user types	*Empower online Information System*	As needed
Managing users	*Empower online Information System*	As needed
Managing user groups	*Empower online Information System*	As needed

1.3.3 System administrator's log

Set up and maintain a system administrator’s log to record all system administration tasks. Keep the log next to the system to record system administration information, such as the amount of free

disk space or the date of the last backup. Also, keep a record of any problems you encounter with the system, as well as the resolution. See Appendix A for sample log forms.

2 Managing the server

2.1 Network considerations

The Empower Enterprise/Workgroup system requires a domain-based network infrastructure. You must synchronize Empower-related computers (clients, LAC/E modules, and servers) with a time server.

The domain controller on the database server acts as a time server for the Oracle database.

Recommendation: Do not install Empower software on a domain controller.

To maximize service time and minimize issues related to the network environment, Waters recommends you follow these requirements:

- All Empower-related user accounts and computers should reside within the same domain.
- If you are using real-time virus scanning, after installation, exclude all Empower-related directories and their subdirectories, and all raw data directories or shares, from the scans. Some real-time virus scanners mistake normal Empower operations for virus activity and can therefore interfere with data buffering or cause a run to stop.
- After you install Empower software, do not change the name and IP (Internet Protocol) address on the server. The host name should not contain more than 15 characters, dashes, or symbols. A static IP address is recommended for Empower servers. If you are using DHCP (Dynamic Host Configuration Protocol) instead of a static IP, ensure that the host name remains the same.
- The server name must begin with an alphabetic character (A to Z) and cannot begin with a numeric character (0 to 9). Empower123 is acceptable for a server name, but not 123Empower.
- Configure Windows Updates to notify you before downloading and installing new updates.
- Configure preferences in Waters Database Manager (WDM) to notify you by email when tablespaces reach a user-defined size. Doing so helps you monitor database space usage. See the Waters Database Manager Online Help for more information.
- When you add a server, LAC/E module, or client to a domain, ensure that the Windows network discovery functionality is turned on for these computers.

2.1.1 Synchronizing Empower and Windows clock time

Synchronize the Waters Empower software time and the clock time on the host Windows operating system to avoid any discrepancy, which typically can be one hour.

To synchronize Empower and Windows clock time:

1. Click **Start** > **Control Panel** > **Clock, Language, and Region** (with **Category** view selected) **> Date and Time**.

   Tip: To access the **Control Panel** in Windows Server 2016 Standard, right-click the **Windows** icon and click **Control Panel**.

2. In the **Date and Time** tab, click **Change the time zone**.

   Note: If you are prompted for an administrator password or confirmation, type the password or provide confirmation.

3. In Time Zone Settings, select the **Automatically adjust clock for Daylight Saving Time** check box, and then click **OK** in each open dialog box.

2.1.2 Configuring regional settings

If you are installing Empower software on an English-language computer, you must confirm that your Windows regional settings are configured for English (United States). The symbols for English (United States) use decimal formatting, not comma formatting, which is important when displaying numeric values ("12.56", not "12,56").

To confirm that the regional settings are correct:

1. Click the **Windows Start** menu, and then type `Regional Settings` in the search text box.
2. Click **Change date, time, or number formats**.
3. In the **Region and Language** dialog box, ensure that **English (United States)** is selected in the **Formats** tab.

2.1.3 Virus Scanning

Requirement: If you are using real-time virus scanning, after installing Empower software, exclude all Empower-related directories and their sub-directories, and all raw data directories or shares, from the scans. Some real-time virus scanners mistake normal Empower functionality for virus activity and can interfere with data buffering or cause the run to stop.

2.1.4 Group Policy Objects

System administrators use Group Policy Objects (GPOs) to define and enforce settings in an Active Directory network. Administrators can apply settings to users and computers based on locally defined group and site membership criteria. Before defining GPOs in an Empower network, keep in mind that Empower software is a distributed chromatography data acquisition system that relies on remote access and the Distributed Component Object Model (DCOM)

configuration to carry out its activities. Empower software makes use of information stored in the database and in individual flat files, such as `instsrv.dat` (instrument configuration information) and `channel_id.dat` (raw data files).

If GPOs are used in an Empower network, Waters recommends that you follow these guidelines:

- Place Empower nodes in their own Organization Unit (OU). For the OU, define GPOs that minimize allowable changes; for example, test Microsoft hot fixes and service packs before applying them to the environment.
- Grant administrators full access to the registry and file system so that they can properly install software.
- Limit changes to the file system protections expected by the Empower application.

GPOs can interfere with successful Empower operations. For example, data buffering can occur if the anonymous access to the raw data share is altered, or the editors for the COM instruments can sometimes operate improperly if the access control list for the HTML directories is altered.

2.2 Windows user accounts

Windows user accounts allow access to various system functions. These user accounts can be local or domain. You create local user accounts in the user management utility of the computer and cannot use them to log in to other computers. You create domain user accounts in the user management utility of the domain controller. By default, domain users can log in to any computer that is a member of the same, or a trusted, domain.

These accounts permit access to the Windows operating system:

- Administrator accounts (local or domain)
- User accounts (local or domain)

Use an administrator account to log in to the Empower 3 FR5 Enterprise/Workgroup server when you need to perform system administration tasks.

2.2.1 Windows administrator account privileges

The Windows Server 2016 Administrator account includes all privileges on the server. With administrator account privileges, you have full access to these files and directories:

- All public, personal, and system files and directories.
- Empower 3 FR5 database files.
- Empower 3 FR5 raw data files.
- All Windows Server 2016 user accounts and account information on the local machine.

For more information on Windows Server 2016 server privileges, see the Microsoft Windows Help and user documentation.

Important: Use caution when you access the Windows Server 2016 server using an administrator account. This account allows you unlimited access to the Empower 3 FR5 software and Windows files and directories on the server.

2.2.2 Windows domain user account privileges

Use domain user accounts to log in to the operating system of Empower 3 FR5 clients. By default, domain users have limited access to local resources. After you install Empower 3 FR5 software on the client, domain users have full control of Empower 3 FR5–related program files. If you modify these permissions, users may not be able to perform normal Empower 3 FR5 software functions, such as creating or modifying instrument methods or viewing data in Review.

2.3 Managing the server disk space

The operating system disk management Properties dialog box provides several tools to help manage disk space. This section covers the following topics:

- Confirming the amount of free disk space
- Increasing free disk space
- Defragmenting the hard disk

2.3.1 Checking free disk space

To avoid hard disk problems, and to maintain server performance, limit server hard drive use to no more than 80% of full capacity. The Windows operating systems provide utilities such as Windows Explorer, System Tools, Disk Management, and Windows Help to help you manage server disk space.

Use the following procedure to determine the amount of free disk space on the server. In a standard configuration, disk space on the server is used mainly by raw data acquired with Empower 3 FR5 software. The size of raw data files created in Empower 3 FR5 software is related to the sampling rate and the run time used to collect data. The database size also expands with usage. For instance, the archived redo logs generated by database activity grow over time, until they are cleaned up during database backups.

In Empower 3 FR5 software, you can define multiple raw data paths. Before doing so, inspect disk space on each drive where raw data files will be stored.

See also: Managing raw data files for more information.

Requirement: To avoid degradation in system performance, system administrators must inspect available disk space regularly. On systems with heavy daily usage, determine and record available disk space frequently. If your system is used less frequently, determine and record disk space accordingly.

To determine free disk space on the server:

1. On the desktop, right-click **Computer**, and then select **Manage**.
2. In the **Server Manager** window, click **Storage** > **Disk Management**.
3. Right-click a drive letter, and then select **Properties** to verify that there is available disk space.

   Tip: There are also utilities available to monitor and alarm or send an email when disk space reaches a user-defined size.

2.3.2 Increasing free disk space

Use the following methods to increase free disk space:

- Archiving projects
- Adding a hard disk
- Moving project raw data to another file share on a separate drive or server

2.3.2.1 Archiving projects

Archiving projects involves backing them up, and then deleting them from the database. For details, see the procedures on archiving projects in the *Empower online Information System*.

Waters offers several automated archive options for Empower 3 FR5 software. For more information, contact your local subsidiary or visit www.waters.com.

2.3.2.2 Adding a hard disk

Another way to increase free disk space is to add a hard disk to your Empower 3 FR5 system. For more information, see the hardware and Windows documentation that accompany your server.

2.3.2.3 Moving project raw data

Moving your raw data storage location to another computer or drive on your network adds additional storage capacity.

See also: Managing raw data files for more information.

2.3.3 Defragmenting the hard disk

Hard disk fragmentation occurs when you delete files from a disk, and then create or add new files on the same disk. If left unchecked, disk fragmentation can slow system performance. The Windows operating system contains a defragmenting utility.

Recommendation: Exclude the drives that host the database data files.

If you defragment the drives that host the Empower Program files, the defragmentation process does not affect database operations.

To access the Disk Defragmenter utility:

On Empower systems running on Windows Server 2016, from **Start**, click **Server Manager** > **Tools** > **Defragment and Optimize Drives**.

For information on using the Disk Defragmenter utility, see the operating system Help.

2.4 Stop and start services on the server

If you encounter communication problems involving LAC/E^{32} modules and clients, you may need to stop and start Waters services on the server. The server contains these Waters services:

Service	Definition
WatersService	Allows computers on which it is installed to act as a file server. The file server contains the raw data shares that are configured within the Empower 3 FR5 software. The service provides secure access to Empower raw data files via the Empower application.
Waters Database Manager Listener	Required service for the Waters Database Manager. RESTful listener facilitates communication with APEX for the Waters Database Manager application.
OracleServiceWAT*n*	Required service for the database instance.
OracleEmpowerTNSListenerWAT*n*	Required service for the database.
OracleJobSchedulerWAT*n*	Required service for the database.
OracleVssWriterWAT*n*	Required service for the database.

2.4.1 Stopping a service

To stop a service:

1. Click **Server Manager**.
2. In the **Server Manager** window, click **Local Server**.
3. In the list of services, scroll down to the service you want to stop.
4. Right-click the service name.
5. Click **Stop Services**.

2.4.2 Starting a service

To start a service:

1. Click **Server Manager**.
2. In the **Server Manager** window, click **Local Server**.
3. In the list of services, scroll to the service you want to start.
4. Right-click the service name.
5. Click **Restart Services**.

   Requirement: When you finish maintaining the database or server, you must reset the Startup Type of the Waters Service Host to Automatic (Delayed Start).

3 Managing the Empower 3 FR5 database

This chapter explains how to use the Waters Database Manager to manage the Empower 3 FR5 database.

These are the management tasks covered in this chapter:

- Waters Database Manager
- Starting and exiting Waters Database Manager
- Database file organization
- Configuring the Windows DBA account
- Manage Database User Accounts
- Record database information
- Adding tablespace datafiles to the database
- Archiving alert logs
- Shutting down and starting up the Empower 3 FR5 database

3.1 Waters Database Manager

Manage the Empower 3 FR5 database using the Waters Database Manager (WDM) Web application to monitor database backups and storage.

Important: To avoid compromising the functionality of Empower 3 FR5 software, requiring its re-validation, do not perform additional database tuning. Contact your Waters data specialist before implementing any database changes.

3.2 Starting and exiting Waters Database Manager

When starting Waters Database Manager for the first time, you must enter a valid username and password. The default user account has administrator (ADMIN) privileges, which allows you to create other user accounts with ADMIN or read-only privileges.

Tip: The default login username\password is `administrator\administrator`.

Recommendation: Log on to WDM using Google Chrome 73 or later.

3.2.1 Starting the Waters Database Manager

To start the Waters Database Manager application:

1. Use one of the following methods to start Waters Database Manager:
   - From an Empower server, click **Start** > **Waters Database Manager**, and then select **Waters Database Manager for (WAT18)**.
   - From a supported browser, type the Web url `http://<computer name>:8181/ords/<SID>/f?p=Waters` into the address bar, substituting the computer name for the database server.

   Note: The SID must be all uppercase or lowercase letters.
2. When the Waters Database Manager Login screen appears, type a valid user name and password, and then click **Login**.
   The dashboard appears, providing several options for managing the database.
   The maximum idle time for a session is 10 minutes. You can log on to the Waters Database Manager application as often as necessary. To view default settings, click **Server** > **Profiles**.

3.2.2 Exiting the Waters Database Manager

To exit the Waters Database Manager application:

1. While logged in to the dashboard, click the down arrow next to your user ID in the upper right-hand corner of the dashboard.
2. Click **Sign Out**.

3.3 View and configure alerts

Waters Database Manager can notify you by email when the database is in a critical state and these events occur:

- Tablespaces exceed the specified threshold.
- Alert and listener logs grow excessively large.
- Oracle errors are found in the log file.

Requirement: After software installation, you must configure alerts, and then click **Apply**. By default, customized alerts are not enabled. To receive notifications, you must configure the SMTP server and port settings.

You can customize alerts and thresholds. Alerts identify problematic situations that require your attention. Thresholds define the criteria that determine when an alert issues. For example, you

can specify that the software alerts you by sending an email when the listener log grows too large or if the tablespace is 95% full.

When the specified threshold is exceeded or a scheduled database backup fails, an email notification is sent to administrative users whose user accounts are configured to receive notifications. In the case of database backup failures, you do not need to configure a threshold because the software automatically sends a notification to users whose accounts are configured to receive notifications. You can log into Empower 3 FR5 and view the job log to determine the cause of the failure.

3.3.1 Customizing alerts and thresholds

To customize alerts and thresholds:

From the Configure Notifications page, perform these tasks, and then click **Apply** for each area.

Table 3–1: Notifications

Field	Definition
Tablespace Sizes	Specify the percent to which the tablespace is filled before a notification issues. Specify the frequency (in hours) to determine the tablespace size.
Alert and Listener Log Sizes	Specify the alert and listener size, in megabytes, before a notification issues. Specify the frequency (in hours) to determine the alert and listener log sizes.

You can also configure Empower 3 FR5 to ignore specific Oracle errors.

3.3.2 Configuring the software to ignore specific Oracle errors for alert purposes

To configure the software to ignore specific Oracle errors for alert purposes:

1. Log on to Waters Database Manager.
2. From the Dashboard, click **Server**, and then **Configure Notifications**.
3. In the Configure Notifications page, Oracle Alert Log Errors pane, specify the frequency (in hours) to inspect the log for Oracle errors, and then click **Apply**.
4. To add or remove Oracle errors, click **Manage List**.
5. In the **Manage ORA-Error Exclusion List**, perform the following tasks, and then click **Submit**:

- To add another error for exclusions, click **Add Row** and type the error number and a comment.
- To delete an error, select it from the list, and then click **Delete**. Click **OK**, in the confirmation dialog box.

6. When finished, click **Cancel**.
   After you configure the alerts, you must perform the following tasks:
   - Configure SMTP server and port settings
   - Enable notifications for the users to receive the alerts.

3.3.3 Configuring SMTP server and port settings

To receive notifications, you must specify SMTP server settings and a port number for the server that handles email sent from the Waters Database Manager.

To configure SMTP server and port settings:

1. Click **Dashboard** > **Server** > **Administration** > **Configure SMTP Server and Port**.
2. On the **Configure SMTP Server and Port** page, perform these tasks, and then click **Submit**:
   - In the **SMTP Server** field, type the IP address of the server.
   - In the **SMTP Port** field, type the port number for the server.

3.3.4 Enabling notifications in a user's account

To enable notifications in a user's account:

1. Click **Dashboard** > **Application Users**.
2. From the **Application Users** page, select a user account, and then click **Edit**.
3. From the **Application User** page, perform these tasks, and then click **Apply Changes**:
   - In the **E-Mail Address** field, type a valid email address for the user account.
   - In the **Notifications** field, select **Yes**.

3.4 Database file organization

This section describes the organization of the Empower 3 FR5 server and discusses server hard drives and database file organization.

3.4.1 Server configurations

The default configuration of the Empower 3 FR5 server uses four hard drives for storing these items:

- Empower 3 FR5 application program files
- Empower 3 FR5 projects, including raw data files
- Empower 3 FR5 Oracle database files

3.4.2 Database file organization

For detailed information on defining the basic database structure, see the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184). The spfile and other parameters used during instance creation define the Empower 3 FR5 database. For performance and reliability reasons, the Oracle archive logs, mirrored control files, and mirrored redo logs are usually located on different high performance physical disks. These locations are defined when Empower 3 FR5 software is installed, based on your selections.

Note: Place the redo logs on high performance disks such as solid state drives, if possible.

For detailed information on the Oracle database files, see the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

The Empower 3 FR5 database files are organized by default as shown in the following table. The specified locations assume a standard installation of Empower Enterprise to the recommended locations on a server with four physical drives. Replace all occurrences of WAT*n* in the table with your SID. The default SID is WAT18.

Tip: Recommended installation locations are listed in the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

Table 3–2: Empower 3 FR5 application program and mirrored files

Drives	Files
`[install-drive]:\Empower\Bin`	The Empower software executable files.
`[install-drive]:\Empower\Script`	The Empower 3 FR5 software scripts, including the hot and cold backup script files.
`[install-drive]:\WatersCDSArchive2DB`	Set of mirrored archive logs used for database recovery.
`[install-drive]:\WatersCDSMirrorDB\oradata\WAT`*n*	`Control0n.ctl` – Mirrored copies of the database control files (where *n* equals 2 or 3). `Redo2n.rdo` – Mirrored copies of the redo logs (where *n* equals 1 to 4).

Table 3–3: Empower 3 FR5 projects including raw data files

Drives	Files
`[rawdata-drive]:\Empower\Projects`	This directory is the default raw data location. It contains a subdirectory for each project in the database. **Tip:** The project folder names viewed in this directory do not always exactly match the project names displayed in Configuration Manager when projects are part of a project hierarchy or when projects were renamed.
`[rawdata-drive]:\WatersCDSArchive1DB`	Set of mirrored archive logs used for database recovery.

Table 3–4: Empower 3 FR5 Oracle files

Drives	Files
`[Oracle drive]:\Empower\Oracle\diag\rdbms\WAT`*n*` \WAT`*n*`\Trace`	The Oracle alert log, which contains information regarding database activity.
`[Oracle drive]:\Empower\Oracle\Oracle18c\Bin`	The Oracle software executable files.
`[Oracle drive]:\Empower\Oracle\Oracle18c\Database`	`pwdWAT18.ora` file – The Oracle (not Empower) password. `SPFILEWAT18.ora` – The server parameter file. **Restriction:** Do not edit the password or `SPFILEWAT18.ora` file.
`[Oracle drive]:\Empower\Oracle\Oracle18cClient\Network\Admin`	`tnsnames.ora` – The connect information for the Empower 3 FR5 database. `sqlnet.ora` – Oracle net configuration file. `listener.ora` – Oracle listener configuration file.
`[Oracle drive]:\Empower\Oracle\diag\tnslsnr\[server name]\listener\trace`	`Listener.log` – Information about database connections.
`[rawdata-drive]:\WatersCDSMirrorDB\oradata\WAT`*n*	`Control0n.ctl` – Mirrored copies of the database control files (where *n* equals 2 or 3). `Redo2n.rdo` – Mirrored copies of the redo logs (where *n* equals 1 to 4).

Table 3–5: Empower 3 FR5 Database files

Drives	Files
[database-drive]: \EmpowerDatabase \oradata\WAT*n*	INDEX0n.DBF – The index tablespace data files (where *n* is 1 to 9). TEMP01.DBF – The temporary tablespace data file. SYSTEM01.DBF – The system tablespace data file. UndoTBS01.DBF – The undo tablespace data file. SYSAUX01.DBF – The sys aux tablespace data file. USERS0n.DBF – The user tablespace data files (where *n* is 1 to 9). CONTROL01.CTL – One copy of the database control file. REDO0N.rdo – The redo logs (where *n* is 1 to 4).
[database-drive]: \Empower\tmp\scripts	Backup jobs, WDM data files scripts.
[database-drive]: \Empower\tmp\scripts \logs	Database backup and WDM data backup logs.

3.5 Configuring the Windows DBA account

Add the Windows user account as a member of the ORA_DBA group. When the user is already a member of a domain group, such as Server Operators, you can add the group as a member of the ORA_DBA group. For Windows Server 2016, the local and domain administrators are automatically added as members of the ORA_DBA group. To give a different user (or group) ORA_DBA privileges, refer to the following procedure:

3.5.1 Adding a user or group to the ORA_DBA group

To add a user group to the ORA_DBA group:

1. Right-click the **Windows** icon, and then click **Computer Management**.
2. In the Computer Management window, browse to **System Tools** > **Local Users and Groups** > **Groups**.
3. In the right-hand pane, double-click **ORA_DBA**.
4. Click **Add**.
5. Take one of the following actions if the administrator account you are using to manage the database is not already listed as a member, and then click **OK**:

- In the **Select Users, Computers, Service Accounts, or Groups** dialog box, click **Locations**. If you are adding a pre-configured local user to the group, select the Empower 3 FR5 database server name. If you are adding a domain user or group, select the appropriate domain.

  Requirement: To select a domain user or group, you must have administrator privileges on the local computer. If you want to select a user account on the local server, click **Cancel** when prompted for domain credentials, and then select the database server name from the **Locations** dialog box.

- In the **Select Users, Computers, Service Accounts, or Groups** dialog box, type the name for the user or group whose credentials will be used for database management functions, and then click **OK**.

3.6 Shutting down and starting up the database

The Empower 3 FR5 database is set to start when you power-on the database server. You can power-down the database by stopping the Oracle service (OracleServiceWAT*n*).

Before stopping the Oracle service, use System Monitor to confirm that no users are currently connected to the Empower 3 FR5 database. To start System Monitor, log in to Empower 3 FR5 software and select **View** > **System Monitor** from the Configuration Manager window.

3.6.1 Stopping the Oracle service

To stop the Oracle service:

1. Right-click the **Windows** icon, and then select **Computer Management**.
2. In the Computer Management window, expand **Services and Applications**, and then click **Services**.
3. In the list of services, right-click OracleServiceWAT*n*, where *n* varies with the database version (the default for Empower 3 FR5 is WAT18 where *n* equals 18), and then select **Properties**.
4. Click **Stop**. This stops the database immediately.
5. If the service does not stop, or if you want to ensure that the database does not attempt to start automatically when the server is restarted, change the *Startup Type* to **Disabled**, and then restart the server.

   Requirement: When you are finished maintaining the database or server, you must reset the *Startup Type* of the OracleServiceWAT*n* to **Automatic**.

3.6.2 Starting the Oracle service

To start the Oracle service:

1. Right-click the **Windows** icon, and then select **Computer Management**.
2. In the Computer Management window, expand **Services and Applications**, and then click **Services**.
3. In the list of services, right-click OracleServiceWAT*n*, and then select **Properties**.
4. Click **Start**.

3.7 Managing Database User Accounts

Empower 3 FR5 software uses Oracle database user accounts, such as Sys and System, to manage the database.

Recommendation: Reset user account passwords for the Oracle database after you install Waters software, and then periodically, according to your organization's security policies and standard operating procedures.

You can manage Oracle database user accounts by locking and unlocking them and resetting user passwords. When you install Empower software, an operating system (OS) user account, oraclejobs, is automatically created. This account provides operating system credentials to run scheduled jobs, such as backing up the database and running database scripts for the Waters Database Manager (WDM) application. The default password for this user account is `Edmund1!` (this password conforms to Oracle's requirement for password complexity).

Note: To run database scripts, the following account passwords must match:

- The Operating System account password for oraclejobs must match the WDM account password OS Job Password. If you change the password for this account in the OS, change the password for this account (OS Job Password) in WDM. If you change the password for this account in WDM, change the password for this account in the OS.
- The Oracle Sys password must match the WDM account password DBM Script User Password.

3.7.1 Changing Oracle account passwords

You can change or reset Oracle account passwords any time after software installation.

Recommendation: Change the Oracle user passwords after you install the software, and periodically, according to your organization's security policies and standard operating procedures.

Requirement: When you change the Oracle Sys account password, you must also change the password for DBM user account and assign it the same password as the Oracle Sys account in the Manage Application Configuration page in Waters Database Manager.

3.7.2 Changing the Sys account password

When you change the Oracle Sys account password, you must also change the password for the DBM user account and assign it the same password as the Oracle Sys user account password. The DBM user account allows you to run database scripts.

To change the DBM user account password:

1. From the **Waters Database Dashboard**, click **Application Admin**, and then click **Manage Application Configuration**.
2. From the Application Configuration page, locate DBM Script User Password in the **Parameter** column, and then click **Edit** .
3. From the Configuration Parameter page, type the new Sys password in the **Password** field, type it again in the **Confirm Password** field, and then click **Apply Changes**.

3.7.3 Changing a user's password

To change a user's password:

1. Log on to the Waters Database Manager application.
2. From the dashboard, click **Manage Oracle Database Users**.
3. From the Users page, select a user account and click **Edit** .
4. From the Manage User page, perform these actions:
   - In the **Password field**, type a new password for the account.
   - In the **Re-enter Password** field, retype the password, and then click **Reset**. Passwords are case sensitive.
5. Click **Reset Password**.

3.7.4 Locking and unlocking Oracle accounts

You may need to lock an Oracle account to prevent its unauthorized use. You may also need to unlock an Oracle account that was locked when an Oracle user exceeded the specified number of attempts when typing a password.

3.7.4.1 Locking an Oracle database user account

To lock an Oracle database user account:

1. Log on to the Waters Database Manager application and then, from the dashboard, click **Manage Oracle Database Users**.
2. From the Users page, select a user account and click **Edit** .
3. From the Manage User page, click **Lock User**.

   Result: The database user cannot use this account until it is unlocked.

3.7.4.2 Unlocking the Oracle database user account

To unlock the Oracle database user account:

1. Log on to the Waters Database Manager application.
2. From the dashboard, click **Manage Oracle Database Users**.
3. From the Users page, select a user account and click **Edit** .
4. From the Manage User page, click **Unlock User**.

   Result: The database user can use this account.

3.8 Record database information

The database name and identification number is on the Waters Database Manager application dashboard in the Database Information group box. When you contact Waters Technical Support, you must provide that information.

As soon as your database is built, record the following information:

- Unique database name
- Database ID

3.9 Add tablespace datafiles to the database

You can add tablespace datafiles to the database to increase storage for a datafile. Typically, you would need to add storage to the `User_Data` or the `Index_Data` files. You add tablespace datafiles by using Waters Database Manager.

3.9.1 Adding a tablespace datafile to the database

To add a tablespace datafile to the database:

1. Log on to Waters Database Manager.
2. From the **Dashboard**, click **Server**.
3. From the Server page, click **Tablespaces** (beneath **Storage**).
4. From the Tablespaces page, select the manage datafiles icon to identify the tablespace into which to add the datafile.
5. From the Manage Datafiles page, enter the following information:
   - In the **Initial Size** field, enter a value in megabytes to specify the initial size of the datafile.
   - In the **Maximum Size** field, enter a value in megabytes to specify the maximum size of the datafile.
   - In the **Increment By** field, enter a value to specify by how much the datafile can be incremented.
   - In the **Filename** field, specify the path and the file name of the datafile.

   Note: If you do not specify the path, the data file will be created in this directory: `Empower \oracle\oracle18c\Database` folder.
6. Click **Add**.

   Recommendation: Contact Waters Technical Support for assistance before adjusting datafile storage.

3.9.2 Adjusting the datafile size limit

To adjust the datafile size limit:

1. Log on to Waters Database Manager.
2. From the Storage pane on the Server page, click **Datafiles**.
3. Locate the datafile you want to modify in the **File Name** column, and then click the **Adjust Storage Settings** icon in the first column.
4. In the Adjust datafile storage settings page, change the storage settings as follows:
   - In the **Increment By** field, type the number of megabytes the storage space is increased when the datafile reaches its initial limit.
   - In the **Maximum Size** field, type a number in gigabytes to specify the maximum size of the datafile.
5. Click **Apply**.

3.10 Archiving alert logs

The Oracle alert log (Alert_WAT*n*.log) is a file that Oracle uses to log important database information. The file continually grows larger, and if it becomes too large, it can adversely affect system performance. Archive the alert log on a regular basis so that it does not become so large as to cause problems.

To archive the alert log, move it from `[Oracle drive]:\Empower\Oracle\diag\rdbms\WAT*n*\WAT*n*\Trace` and `[Oracle drive]:\Empower\Oracle\diag\rdbms\WATn\WATn\alert` to your storage location.

Tip: Once you move the alert log, a new one is recreated automatically.

4 Managing Empower 3 FR5 software

4.1 Configuring a database net service name

You must configure a database net service name (previously called a database alias) on each client and LAC/E module to connect to the Empower database, unless you are using the *TNS_ADMIN* environment variable. A database net service name is a name for an individual Empower database. This name appears in the **Database** field of the Empower Login page.

Tip: The *TNS_ADMIN* variable points to the `tnsnames.ora` file. A `tnsnames.ora` file contains the list of Empower databases that can be accessed by the client or LAC/E32 module.

Use the following procedure to create a new database net service name, or modify an existing net service name. If you are using an Empower Personal as a client, perform this procedure to force the use of the `TNSNames.ora` file. You must define the same database net service name on each client or LAC/E32 module.

To configure a database net service name:

1. Select **Start** > **Empower** > **Waters Net Configuration Assistant**.

   Alternative: Click **Start** and type `Waters Net Configuration Assistant`.

2. On the Waters Net Configuration Assistant utility, click the first row to edit the column details.

3. In the **Alias** column, type the alternative name for the database service.

   Example: `WATWIN2016R2`

   Rule: The database service identifier must begin with a character, not a number.

4. In the **Server Name** column, type the computer name or IP address of the database server.

5. In the **Service Name** column, type the database service name in this format: `<SID.ServerName.domain>`, where the *SID* is the Oracle Service Identifier, the *ServerName* is the value you typed in the **Server Name** column, and if the server is in a **domain**, specify the name of the domain.

   Recommendation: For Windows systems, you can name the *SID* with the prefix `WAT` followed by alphanumeric characters (up to eight characters in length).

   Tips:

- If you do not know the Service name, you can find it using the Listener Configuration on the database server. The Listener Configuration is disabled on the client. Perform the inspection on the database server as follows: Click **Configuration** > **Listener Configuration**. The Waters Net Configuration Assistant displays the service name (Service = "<*servicename*>").
- The global database name is the combination of the Oracle Service Identifier (SID) and the database domain name, as supplied during installation. For example, if the *SID* is `WAT18` and the database *domain name* is `Empower1.Waters.com`, the global database name is `WAT18.Empower1.Waters.com`.

6. In the **Port Number** column, ensure that the default port selection is `1521`.
7. Click **Save**.

   Result: The `tnsnames.ora` file is created.
8. Select the row, right-click, and then select **Test**.
9. In the Change Login dialog box, verify that the *username* `System` and *password* are pre-populated, and then click **OK**.

   Note: The default Oracle System password is *Waters2!*.
10. When the connection test is successful, click **OK**.

    Result: When you log on to Empower 3 FR5 from a client, the database alias name is automatically populated in the Login dialog box if the SID prefix begins with *WAT*. Otherwise you must type the name of the database in the **Database** field in the Empower Login dialog box.

4.1.1 Configuring a shared tnsnames.ora file

Once the tnsnames.ora file is created, you can create a Windows share, copy the tnsnames.ora file to the Windows share, and then set the tns_admin variable to the Windows share on each client and LAC/E that is connected to the database.

To configure a shared `tnsnames.ora` file:

1. Locate the drive installed with the Oracle program files and browse to the `Empower\Oracle\Oracle18cClient\Network\Admin` directory.
2. Locate the `tnsnames.ora` file, right-click the file, and then click **Copy**.

   Requirement: If you have multiple Empower 3 FR5 Database servers, add them to the `tnsnames.ora` file using the Waters Net Configuration Assistant prior to copying the `tnsnames.ora` file. For information about using the Waters Net Configuration Assistant,

see the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

3. Browse to the `raw data drive:\Empower\Projects` directory and paste the `tnsnames.ora` file into the folder or you can copy this file to the share you configured.

   Recommendation: Place the share in the same directory that holds Empower 3 raw data. If you use custom directories, set the share permissions exactly as described in the "Configuring projects directory" section of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

4.2 Logging in to Empower as the default administrator

Empower 3 FR5 software comes with a default system user account that does not require a named user license. You can disable, but not delete, this administrator account from Empower 3 FR5 software.

To log in as the default system administrator:

1. Select **Start** > **Empower** > **Empower**.
2. In the Empower Login dialog box, do the following, and then click **OK**:
   a. Specify `System` as your user name and `Manager` as your password.

      Tip: The username and password are not case sensitive.

   b. Select the net service name (database alias) for your Empower 3 server.

   c. Click **Advanced** and verify that the **Requested Interface** field is set to **Pro**

      Requirement: If you do not have access to the Pro interface, you must log in with a different user account or modify the user properties of the current user account to allow access you access to the Pro interface.

Result: The Empower Pro window appears with the name of the database and the logged-in user displayed. The first time you log in to Empower, you will be prompted to select the time zone for the node, and prompted to set up system policies and projects.

Notice: If you are logged in to Empower 3 FR5 software, and then you log out and leave some of its applications running (such as Configuration Manager), a Running Empower Applications message box appears. This message box reminds you that the applications remain open, and offers the option of leaving them in a locked or unlocked state. If you leave them in an unlocked state, a user without the required access privileges can log in and use the open applications as if he or she were you, assuming your access privileges, regardless of whether his or her user type grants those privileges.

4.2.1 Changing the Empower 3 FR5 system user account password

Change the Empower 3 FR5 system user account password the first time you log in, and then periodically, to maintain system security.

Requirement: You must be logged in as an Administrator to perform this procedure.

To change the System account password:

1. In Configuration Manager, select the **Users** view.
2. In the right-hand pane, select **System**.
3. Right-click **System**, and then select **Properties**.
4. In the **General** tab, type the new password in the **New Password** and **Confirm New Password** boxes.
5. Click **OK**.

4.2.2 Changing the database password

The Empower 3 FR5 software uses the database password to access the database. Waters recommends that you do not change this password unless the security protocol of your organization requires this.

Recommendations:

- If your organization's policy requires you to change this password, be certain to change it properly from the Configuration Manager window.
- If you change the database password, restart all Empower nodes.

Restriction: Do not change this password directly in Oracle. Follow the procedure below exactly as it is written.

To change the database password:

1. Save any unsaved results.
2. Close all open applications except Configuration Manager and the Empower Pro window.
3. In Configuration Manager, select **View** > **Database Properties**.
4. In the Database Properties dialog box, click **Change Database Password**.
5. In the Change Password dialog box, type the old password and the new password.
6. Confirm the new password by retyping it, and then click **OK** twice.
7. Restart all Empower nodes.

4.3 Managing raw data files

Use the Manage Raw Data Files capability to configure additional paths on your system in which to store raw data on a per-project basis. By default, project raw data files are stored in the `rawdata-drive:\Empower\Projects` directory; however, you can specify any valid share on your network. The specified directory does not have to reside on an Empower 3 FR5 server, although the WatersService service must be running on the computer where the path is located. For information on installing the WatersService service, see “Installing a File Server” in the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

4.3.1 Adding a raw data share

To add a raw data share:

1. In Configuration Manager, select **View** > **Manage Raw Data Files**.
2. In the Manage Raw Data Files dialog box, select the name of the file service running on the computer on which you want to store your data from the **File Service** list.

   Tip: To add a file service, click **Add File Service**, type the node name for the new file service, and then click **OK**.
3. Click **Add Raw Data Share**.
4. In the Add Raw Data Share dialog box, type the share name and click **OK**.

   Result: If the share does not already exist, a dialog box appears, allowing you to specify the directory path for the share.

   When the share is created, the default permissions are applied. The permissions vary depending on operating systems. To ensure proper functionality and security, the permissions on the raw data folder must be set exactly as described in the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).
   When creating a new project, specify the raw data path in the Name Entry page of the New Project Wizard. You can also move existing project data to a different raw data share. The three Empower 3 FR5 software privileges associated with this capability are **Create Project Path**, **Specify Project Path**, and **Change Project Path**. Users must have the appropriate privilege to use the different aspects of this feature.

   Exception: If a raw data path that is being used by a project is removed, the path no longer appears on the list in the Manage Raw Data Files dialog box; however, the project’s existing and newly acquired data continue to use the removed raw data path.

   Recommendation: Do not remove a share that is in use.

4.3.2 Moving project raw data files

To move project raw data to a new data directory, in Configuration Manager, right-click the project and select **Move Project Data**. For more information, see the *Empower online Information System*.

Recommendation: When moving large amounts of data, do not use the Move Project Data utility. Instead, modify the project's raw path using Move Project Data, and then manually move the files using operating system commands.

4.3.3 Viewing the current raw data paths

By default, the column listing the directories containing project raw data does not appear in the Configuration Manager Projects table. You can add this information to the table by creating a view filter.

To display the current raw data paths for projects:

1. Log in to Empower as an administrator.
2. In Configuration Manager window, click **Projects**.
3. In Configuration Manager window, click **Edit View**.
4. In the View Editor dialog box, double-click **Directory** to add it to the view filter.
5. In the View Editor dialog box, click **Save As**.
6. In the Save current View Filer dialog box, enter a name for the view filter, and then click **Save**.

4.4 Using the System Monitor

The System Monitor application allows you to monitor system database usage. Information such as which users are accessing which projects, systems, and processing servers appears in table form. The following four views are available:

- Users
- Systems
- Projects
- Processing

System Monitor also displays the total number of licenses used compared to the total number of licenses available, by license type. The different license types are User Licenses, System Licenses, Agilent LC Licenses, Agilent GC Licenses, Shimadzu LC Licenses, Shimadzu GC Licenses, and Hitachi LC Licenses.

Tip: For each license type, the total number of available licenses is the total number of licenses that are activated minus the total number of licenses used.

To access System Monitor, select **View** > **System Monitor** from the Configuration Manager window.

For more information on System Monitor, see the *Empower online Information System*.

4.5 Checking for Empower service or feature releases

Waters issues service or feature releases to address existing issues or to provide enhanced functionality. These service releases are available for download from the Waters Elite website. Install them according to the instructions contained in the release notes. For those customers who require physical media, note the part number from the website and contact your local subsidiary to place an order.

Tip: You can find the Empower software build number and determine which service and feature releases are installed by clicking **Help** > **About** in any Empower software window.

5 Database backup and recovery

Recommendation: Periodically test your Empower backups to ensure that the backups are working correctly and according to your organization's standard operating procedures for failure recovery.

5.1 Backing up the database

Database backups play an important role in disaster recovery. You can restore a database to its previous backup version. For example, you can enable Empower software to perform daily online backups, and then copy the backups to a network or storage array. Alternatively, you can take these actions to ensure that data are protected:

- Configure corporate backup solutions, to access the contents of the database backup location.
- Create a task using Windows Scheduler to copy the contents of the database backup folders.
- Move the database and raw data files off the server and onto other media quickly. Follow your company's standard operating procedures for data archival.
- Do not store database backups in the same location as the database files. If the physical drive becomes corrupted, you could lose both sets of files. If you store backup files in a location other than the one used for the original files, the backup files are unaffected.

When you install Empower 3 FR5 software on a server, daily online RMAN database backups are automatically enabled and set to run as a scheduled task. After you install the software, a full RMAN database backup runs once immediately. By default, a full online backup runs every Monday morning at 2:59 A.M. Incremental backups run Tuesday through Sunday at 3:00 A.M. You can modify the time, disable the scheduled backup, and modify other backup settings in the Waters Database Manager application. If the database backups ran successfully and are available, you can recover your database to the point in time of the last database backup.

See also: Waters Database Manager Help. WDM Help describes all the features and functions that you can perform in Waters Database Manager. Click **?** to open WDM Help.

See also: Scheduling database backups

When a scheduled database backup runs, you can configure the backups to include your project raw data files. To do so, on the Manage Backup Settings page in Waters Database Manager application, select the **Backup Empower Raw Data Shares** check box, and then specify the location where the raw data files will be backed up.

Note: The raw data file backup location can be a local path or network share; however, the OracleJobs Windows account must have write access to this location, the location cannot be a mapped network drive, and the path name cannot contain spaces.

Important: If you do not configure the scheduled database backups to include backing up your project raw data files, you could lose your data in the event of a disaster.

See also: Manage backup settings

Level 1 incremental backups are daily incremental backups with the Archive log mode active. During database backups, the database is online and available for use (users can log on to the software and acquire data).

Size of the Database Backup Area

The default location for database backups is called the Fast Recovery Area (FRA). You can change the default location; however, it must accommodate two database backups simultaneously. The software does not delete an obsolete backup until it confirms that the current one is complete. Online, incremental backups also include archive logs.

A database backup generates a time-stamped log file that includes details about individual steps of the backup process.

See also: Viewing database backup

By default, the backup retention policy is set to **Redundancy 1**, which means one full backup set (full backup and incremental backups) is kept in the FRA. Archive logs are removed when a new backup is made. When a new, full database backup (level-0) runs, previous backups older than one week are removed from the database backup location.

The database is backed up using backup jobs that are automatically created when you install Empower software on a server and run in Waters Database Manager. Restore the database by using scripts stored in this folder: `[Oracle drive]:\Empower\Oracle\BackupRecoveryScripts`. When you restore the database, you must be able to access the backed up Oracle database files and the backed up project raw data files.

The database backup process typically compresses a database, reducing its size by 50 percent.

5.1.1 Copying database backups

Copy the database backup folders daily, including the raw data files, to a network share or storage array. If you schedule a task to copy the database backup folders, ensure that the task runs at a time other than the scheduled backup (2:59 or 3:00 A.M.).

Run the scheduled task after the estimated completion of the backup. Consult the database backup log to determine the amount of time it takes to complete a database backup.

5.1.2 Testing backups

Recommendations:

- Periodically test your database backups media sets to ensure that the backups are working correctly and according to your organization's standard protocols for failure recovery.
- Create a test server with the same configuration as your actual server. Verify your backups by restoring them on the test server.

5.2 Scheduling database backups

When you install Empower software, scheduled database backups are automatically configured. You can use these default-scheduled backups or create your own. The Manage Scheduled Backups page in the Waters Database Manager application displays the default-scheduled backups.

Empower software configures three backup schedules by default on a server.

Backup Schedule	Description
First full, level 0	Full database backup that runs once immediately after software installation.
Full, level 0	Full database backup that runs once a week.
Increment, level 1	Incremental backup that runs once daily.

To create a new scheduled backup, see Waters Database Manager Help.

Recommendation: Before you schedule a new backup, consult with a Waters data specialist.

You can modify, disable, enable, or delete a scheduled backup. When you no longer need a scheduled database backup, you can delete it. If you delete a scheduled database backup and later need to use it again, you must recreate it.

Recommendation: Waters recommends that you do not delete or disable the scheduled backups during software installation. If you do so, ensure that you have an alternate backup strategy in place.

5.2.1 Disabling a scheduled backup job

To disable a scheduled backup job:

1. From the dashboard, click **Manage Scheduled Backups**.
2. From the Manage Scheduled Backups page, select the **Scheduled Backups** you want to disable, and then click **Edit** .
3. Click **Disable**.

5.2.2 Enabling a scheduled backup job

To enable a scheduled backup job:

1. From the dashboard, click **Manage Scheduled Backups**.
2. From the Manage Scheduled Backups page, select the **Scheduled Backups** you want to enable, and then click **Edit Definition**.
3. Click **Enable,** and then click **Apply Changes**.

5.3 Manage backup settings

This section concerns settings you can adjust in **Dashboard** > **Manage Backups** > **Manage Backup Settings**.

You can manage the backup settings by configuring disk settings and the backup policy. You can change the location of the database backup by changing both the Disk Backup Location and the Control File location. When you do so, these settings affect all future backup jobs.

Requirement: If you want to back up your project raw data files, you must select the **Backup Empower Raw Data Shares** check box, and then specify the location where the raw data files are backed up. If you do not select this method to backup your raw data files, use an alternative backup method.

5.3.1 Modifying disk settings

You can modify these disk settings:

- **Parallelism**
- **Disk Backup Location**
- **Backup Empower Raw Data Shares**
- **Raw Data Backup Location**

To modify the disk settings:

1. From the Manage Backup Settings page, click **Disk**.
2. From the Disk Settings page, change these settings as needed:

- In the **Parallelism** field, type a value to increase CPU threads for the backup processes.
- In the **Disk Backup Location** field, type a new path for the database backup location to change the location of the database backup. The disk backup location is the Fast Recovery Area by default, or you can specify a different directory.
- To back up your project raw data files, select the **Backup Empower Raw Data Shares** check box.

Requirement: If you selected the **Backup Empower Raw Data Shares** check box, type the location where the raw data files are backed up automatically when scheduled backups are run. The OracleJobs Windows account must have write access to the raw data file backup location. The location cannot be a mapped network drive, and the path name cannot contain spaces.

5.3.2 Changing the backup policy

You can change the backup policy settings, such as the location of the control file.

To change the backup policy:

1. From the Manage Backup Settings page, click **Policy**.
2. From the Policy page, change these settings as needed:

Backup Policy	Description
Autobackup	Automatically backs up the control files.
Control file location	The location to which you want to back up the control file. You must be able to access the control file to restore the database in the event of disaster recovery.
Optimize	Optimizes database backup by copying only those files that changed.
Tablespaces Excluded from Whole Database Backup	When the database is backed up, you can specify the tablespaces you want to exclude from the backup.
Retention Policy	Specify how many database backups you want to retain: • **Retain all backups**. • **To Redundancy** (keep a particular number of backups based on the number specified in the **Backups Redundancy** field). • **To Window** (keep a particular set of backups based on the number of days specified in the **Days Recovery Window** field).

Backup Policy	Description
Archive Redo Log Deletion Policy	Define how often you want to delete archived redo logs: • **None** (Archived redo logs are deleted if they were transferred to a destination specified in `LOG_ARCHIVE_DEST` and backed up to disk or labeled **obsolete** by the backup retention policy.) • **Delete archived redo log files**. Delete archived redo logs only after they are backed up based on a particular number of times that you specify. **Recommendation:** Delete archived redo logs after they are backed up at least once. Type `1` in the **after been backed up specified number of times** field. Automatically deleting archived logs increases available disk space. Automatically deleting archived logs increases available space in the FRA.

5.4 Viewing database backup

You can view the results of a database backup by reviewing log files. If the database backup failed, review the log files to determine the cause of the problem.

If you are also backing up the raw data files, review the `PostBackupCmd-<date/time>` log file located in the `<database drive>:\Empower\tmp\scripts\logs` directory and ensure that there are no errors.

Review the results of a database backup and log files regularly.

To view the results of a database backup job:

1. From the Waters Database Manager **Dashboard**, click **Manage Backups** > **Scheduled Backups**.
2. From the Backup Schedules page, click **View Run details**  (in the **Log** column) next to the backup job you want to view.
3. To open the log file associated with a specific backup job, click **View backup log file**  .

   Result: The Backup Run Details page lists the results of the scheduled database backups that ran.

Figure 5–1: Database backup log file example

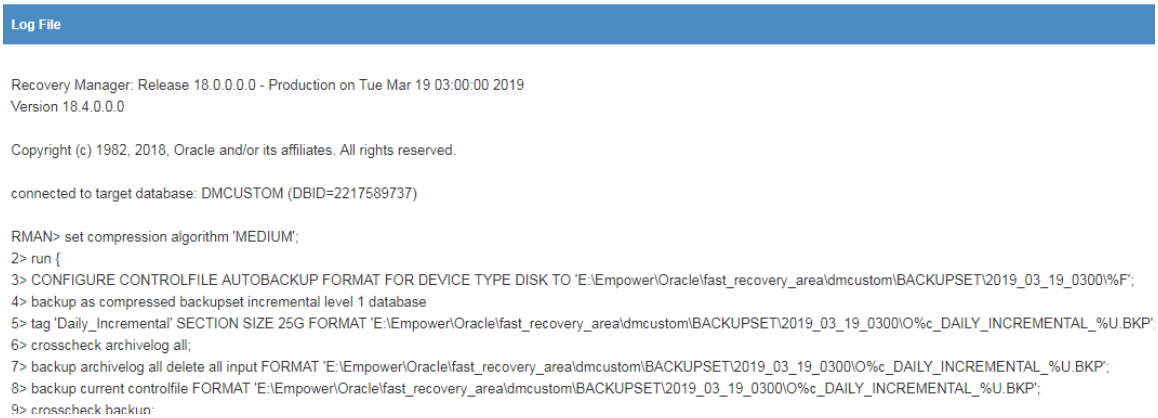


Table 5–1: Backup Run Details

Backup Details	Definition
Log file	Contains detailed information about the backup job.
Log date	Date the log was generated.
Status	Status of the database backup: succeeded or failed.
Error number	If database backup failed, the error code associated with the failure.
Reg start date	Date and time the database backup was scheduled to occur.
Actual start date	Date and time the database backup ran.
Run duration	Amount of time, in seconds, that it took the backup to run.
CPU used second	CPU usage, in seconds, for the database backup.
Errors	Number of errors in the log file.

5.5 Changing the database backup location

When you install Empower software on a server, the default location of database backups is `[Oracle drive]:\Empower\Oracle\Fast_Recovery_Area`. After installing Empower software, change the location of your database backups to a different local drive with adequate available storage.

To change the location of your database backups:

- The new location to store your database backups must exist. Ensure that this location can accommodate the number of copies of the database backups you want to retain.
- Ensure that there are no active database backups running.
- Change the location of both the database backup files (datafiles) and the control file.

5.5.1 Changing the locations of the database backup and control file

When you change the location of the database backups, the datafiles are backed up to the new location. The database backup files that were stored in the previous location remain in that location.

To change the locations of the database backup and control file:

1. Log on to the Waters Database Manager application.
2. From the **Dashboard**, click **Manage Backups**, and then **Manage Backup Settings**.
3. In the **Disk Settings** tab of the Manage Backup Settings page, type the new location of the database backup files in the **Disk Backup Location** field, and then click **Submit**.
4. From the Manage Backup Settings page, click **Policy**.
5. In the **Policy** tab, type the new location of the control file in the **Control File location** field.
6. In the **Archived Redo Log Deletion Policy** field of the **Policy** tab, specify how often you want to delete archived redo logs from the flash recovery area (FRA), and then click **Submit**.

   Recommendation: After changing the locations of the database backups and control files, verify that the location of the database backup files and control files were changed to the new location.

   If you changed the location of the database backups and the control file and want to recover the database, you must specify the location of the backup files and control files that must be restored in the recovery script. However, if you are recovering the database and following disaster recovery procedures, the database backup location can be the offline storage location where you keep copies of the database backup files.

   See also: Restoring the database

5.5.2 Verifying that the location of the database backup and control files was changed

To verify that the location of the database backup files and control files was changed:

1. Log on to the Waters Database Manager application.
2. From the **Dashboard**, click **Manage Backups**, and then **View Backup Settings**.

   Recommendation: Run a full backup by enabling the **First Full Level 0 backup** job. When you do so, all previous full and incremental backups are deleted and a new, full database backup is created in the new location. This creates a new backup set. The full backup and the incremental backups run subsequently can be used as a set to restore your database back to the point of the last incremental backup.

   See also: Scheduling database backups

   When the full backup job ends, verify that the backup files (.bkp) and the control files (files that begin with the letter "c") reside in the new location. View the backup log for error messages.

   See also: Viewing database backups

5.6 Restoring the database

Recommendation: Contact Waters Support before restoring your database.

If you lose your server, you can restore the database by running the `Restore_Full_DatabaseEmp.bat` script located in the `[Oracle drive]:\Empower\Oracle\BackupRecoveryScripts` folder. The restoration process replaces all data files, control files, and tablespaces from the most recent backup. Any changes made since the last backup are lost.

After you restore the database, you must restore your project raw data files. If you specified that you wanted to back up your project raw data files in Waters Database Manager (**Backup and Recovery** > **Backup Settings** > **Disk Settings**), you can restore them using a batch file. You must also specify where the project's raw data files are stored in the WDM application.

Important: The computer name and IP address must remain the same for the database restoration process to work correctly. If you are replacing a server with a new computer, you cannot restore the database on a server with a different computer name and IP address.

5.6.1 Disaster recovery

If your server is inoperable, you must install Empower 3 software on new hardware following the procedures outlined in the *Empower 3 Feature Release 5 Installation, Configuration, and*

Upgrade Guide (715006184), and then restore the database. As stated in the guide, Waters recommends that you copy the database backup folders and raw data backup folders daily to a network share or storage array.

Requirement: The path indicating the location of the folder to which you copy database backups must not contain spaces in the path name.

When you run this script, you must provide the information listed in the `Restore_Full_DatabaseEmp.bat` parameters table. Upon completion, this script restores the latest full database backup and the incremental backups.

Table 5–2: Restore_Full_DatabaseEmp.bat parameters

Parameter	Description
Location where all backups are copied	Location where full and incremental backups are copied. **Example:** `F:\All_backups`
Latest control file name with full name	Location of the latest control file. **Example:** `F:\All_backups\C-2839594718-20160906-0B` **Tip:** Control files are copied to the **Control file location** (as specified in the Backup policy) along with backup files under a date-and-time-stamped folder. The FRA backup location is the default control file location, but you can change it.
Database ID	The database ID. **Tip:** The control file also contains the database ID number. **Example:** `C-2839594718-20160906-0B`. The database ID is the first digits after `C- (2839594718)`.
Disaster recovery: true or false	**True** means that your server is inoperable. You must install Empower 3 software on a server, and then restore the database. When you restore the database for all other situations, disaster recovery is **false**. **False** restores the database to the point of failure.
Sys user password	The password for the Oracle Sys user account.

Before you restore the database, perform these tasks:

- Copy the control file to the `FULL_backup folder`.
- Identify the database ID.
- Identify Sys user account password.
- Ensure that the database starts.
- Identify the location of the RAW data backups (for disaster recovery situations only).

- Identify the `recover_DF.BAT` script within the `Raw data backups\Backupscript` folder.
- In the case of disaster recovery, recreate the file shares.

5.6.2 Copying incremental database backup files

Six incremental backup folders remain after a full database backup. Copy the files from the latest incremental backup to the latest FULL_backup folder.

Tip: You can copy both the full and incremental backup files to the same folder, or you can copy the backup files in their original folders, keeping the original folder structure intact.

To copy the latest incremental backup:

1. Browse to the network location where the database backups are stored.
2. Copy all the incremental backups that follow a full backup into the FULL_backup folder.
3. Sort the files by name and identify the control file with the most recent timestamp and suffix.

5.6.3 Restoring the database

When you run the `Restore_Full_DatabaseEmp.bat` file, the database is restored to the location where all backups are copied.

To restore the database:

1. Open an Administrator's **Command prompt**, type `Restore_Full_DatabaseEmp.bat`, and provide this information:
   - Location where all backups are copied (include the folder name)
   - Location of the latest control file (include the folder name)
   - Database ID (identified in the control file)
   - In the event of a disaster recovery, type `true`; otherwise, type `false`
   - Sys user account password

   Example: `Restore_Full_DatabaseEmp.bat F:\All_backups F:\All_backups \C-2839594718-20160906-0B 2839594718 true <syspassword>`.
2. When the restoration process ends, restart **Waters services** on the server.

   Tip: When the database is recovered, Waters services are started on the server.
3. Review the restore log for any Oracle or RMAN errors, which is located in the `<Database drive>:\Empower\tmp\scripts\logs` folder.

Tip: Some of the ORA- and RMAN errors are expected; expected error numbers are noted at the end of the log file.

4. After disaster recovery, you must perform these tasks:
   a. Create a folder with the same name as the raw data backup folder.
   b. Copy the Raw data files mimicking the `<your backup location>\projects\<share name>` folder structure.
   c. Open an Administrator's Command prompt, and from the `<your backup location>\projects\backupscript` folder, run the `recover_DF.bat` script.

   Requirement: Before running the script, open the recover_DF.bat script and ensure that the source location is correct.

   Result: The database and the project's raw data files are restored to their original location.
5. When recovery is complete and before you run any new backup jobs, delete all files from the `\<Rawdata backup>\Backupscript` folder.

   Requirement: Delete these files prior to running any new backup jobs. If you fail to do so, the next time you run a run backup job, it will not back up any new Raw data files.
6. Log in to Empower and ensure that all projects are present.
7. Verify that all Raw data files are present in the Raw data share location.
8. Log in to Waters Database Manager and ensure that the first full level 0 database backup job is enabled.

6 Troubleshooting

This chapter provides guidelines for isolating and correcting system-level problems that can occur with the Empower 3 FR5 Enterprise or Workgroup system. It describes possible symptoms and corrective actions for both hardware and software problems.

For complete information on reporting shipping damages and submitting claims, see Waters Licenses, Warranties, and Support Services on the www.waters.com.

6.1 Isolating problems

Isolating the problem is the first step in troubleshooting. Because the necessary procedure depends on system type, this chapter provides general instructions for isolating a problem.

Keep in mind the following recommendations when attempting to isolate a problem:

- Develop a systematic troubleshooting strategy.
- Confirm simple things first, such as cable connections and privileges.
- Try to reproduce a symptom and note all steps leading up to the problem.
- Make only one change at a time to identify the cause of the problem.
- Software problems in the Empower 3 software application can generate an Empower error message. If no message appears, or if you cannot log in, it could be a setup problem.
- For an instrument control problem, disconnect the device in question from the acquisition server, and if possible, control the device from its front panel. If the device does not respond as expected when programmed from its front panel, the problem might be within the instrument, not the Empower 3 system.
- Inspect the Empower 3 **Message Center** for errors.
- Inspect the operating system's **Event Viewer** for errors.

Record all system problems and troubleshooting activities in the **System Problem Log**.

6.2 Reporting problems

Before you contact Waters technical assistance, ensure that you have adequately investigated the problem. If the corrective actions listed in this chapter do not solve the problem, collect all your troubleshooting information, the **System Problem Log**, and relevant technical manuals, and then contact Waters.

When you contact Waters, be ready to offer the following information:

- Software support plan number
- A description of the symptoms
- An accurate assessment of the problem's severity; for example, system down, server down, PC down, PC client not connecting to server, printer printing unusual characters, or occasional malfunction
- When the problem started; whether it is intermittent, reproducible, or constant; and whether it is data-related or account-related
- The specific sequence of events leading to the problem
- Whether the system was recently modified, new hardware or software was installed, or maintenance was performed
- Actions you took to correct the problem
- Version information for:
  - Empower 3 FR5 software (obtain the build number and any service or feature releases from any **Help** > **About** dialog box)
  - Windows operating system software (use the **System** applet in **Control Panel** for the software version)
  - Waters HPLC devices and instruments (see the Empower 3 FR5 installation log — `C:\Windows\Empower.log` — or use the Verify Files utility to obtain ICS/ICF Software Driver versions; see Node Export to text for firmware versions)
- Basic configurations and serial numbers of the hardware components involved
- Examples of printouts
- User manuals for the components

Be prepared to perform these tasks:

- Swap cables, if you have not already tested cables
- Email or fax hard-copy documentation of the problem

Recommendation: Ensure that you call from a location close to the system in question. Your Waters Technical Support representative can help you more effectively if you have access to the system while you are on the telephone.

6.3 Buffering and data recovery problems

Empower 3 FR5 software provides data buffering and recovery to safeguard your acquired data in the event of a server or network failure. If the LAC/E^{32} acquisition server or the acquisition client loses its connection to the Empower 3 FR5 database or to the file server storing the project's raw data, Empower 3 FR5 stores the acquired data temporarily on the LAC/E^{32}

acquisition server or acquisition client's hard drive, on the drive where the Empower 3 FR5 program files are installed. Once the network connection is restored, the LAC/E^{32} acquisition server or acquisition client resumes sending the data to the appropriate server or servers.

Tip: Database information (sample identifiers, method information, results, etc.) is stored in the Empower 3 FR5 database on the Empower 3 FR5 server. By default, chromatographic raw data are stored in the `<rawdata-drive>:\Empower\Projects` directory on the Empower 3 FR5 server.

You can change the location of raw data using the Manage Raw Data Files capability to another computer as long as the Waters Service is present. Data are buffered when the Empower 3 FR5 database or the computer storing the project raw data (`\\servername\Waters_Projects$`, by default) is not available on the network for any reason.

See also: Managing raw data files

6.3.1 Reconnecting while buffering

During normal data acquisition, chromatographic data currently being acquired are stored in the `\Empower\InstrumentServer` directory on the LAC/E^{32} acquisition server. Empower software then moves the data acquired to the file share. Buffering occurs when communication between the LAC/E^{32} acquisition server and the file share or database server is interrupted. During data buffering, the LAC/E^{32} acquisition server stores the raw data files and the database files locally. Empower software attempts to reconnect to the server after each injection in a sample set in one of the following ways:

- If the acquisition server reconnects, then the buffered injection data is copied over the network to the appropriate location or locations. The software then deletes the raw data files on the acquisition server's hard drive, buffering stops, and normal acquisition continues.
- If data are still buffering after acquisition of a sample set or a single injection is complete, the acquisition server confirms the appropriate network connection every 10 minutes (approximately) until the connection is restored, at which time the data are copied to the appropriate location, and then deleted from the acquisition server.

The appropriate network connections must be intact before you can acquire a sample set. Immediately after acquisition of a sample set begins, the Empower 3 FR5 software downloads all methods required to complete data acquisition to the acquisition server. This downloading sequence must end before acquisition can begin, and is necessary if subsequent buffering is required.

Tip: The Empower 3 FR5 software also buffers data from all queued sample sets, if necessary.

6.3.2 Continuing acquisition while buffering

While buffering, acquisition continues for the remainder of the queued sample sets. During buffering:

- Acquisition continues in **Run Only**, **Continue on Fault** mode.
- The real-time plot does not always appear in Run Samples.
- You cannot see the buffered data in the Review window.
- An “x” appears on the disk icon in the Run Samples window. (This icon appears in the status bar in the lower right-hand corner, next to the clock.)

When the network connection is restored and normal acquisition resumes, these conditions no longer apply; however, acquisition continues in Run Only mode.

6.4 Disconnecting dead connections

Sometimes you receive the `server busy` message when you try to move project data or manually archive projects, because the LAC/E^{32} acquisition server is running with no active connections. This happens when the LAC/E^{32} acquisition server is turned off unexpectedly, as with a power failure.

Look at the **Projects** tab in System Monitor to determine whether you need to disconnect processes. You can also automatically inspect for dead connections by editing the `sqlnet.ora` file.

To automatically disconnect dead connections:

1. Log in to the database server.
2. In Notepad, from **Oracle Home**, open the `sqlnet.ora` file.
3. Type the following commands:
   ```
   sqlnet.authentication_services = (NTS)
   sqlnet.expire_time=X
   ```
   where X equals the number of minutes, such as 10, after which you want the database to inspect for dead connections.

   Important: If you set this parameter too small, such as two minutes, it can affect database performance.
4. Restart the database server.
5. Inspect the System Monitor to ensure that all processes are clear.

6.5 Software problems

The following topics list symptoms, possible causes, and suggested corrective actions for general software problems.

6.5.1 System performance degraded

Possible cause	Corrective action
Not enough free disk space.	In Windows Explorer, view the properties of the drives used to confirm free disk space. Archive or delete files if disk space is low (see Managing the server disk space).
Not enough contiguous free disk space (disk fragmentation).	Defragment the drive: Perform a backup and restore all hard disks or use the OS disk defragmenter: Windows 10 systems: Select **Start**, click the down arrow to display the Apps page, point to **Accessories**, and select **System Tools** > **Disk Fragmenter**

6.5.2 Errors when confirming disk status

Possible cause	Corrective action
Network is down. Services are not running. Firewall settings were modified.	See Windows documentation.

6.5.3 Client cannot connect to the database

Possible cause	Corrective action
Server is down.	Restart the server.
Listener is not running.	Restart Listener. **To restart the Listener:** 1. Select **Start**, click the down arrow to display the Apps page, point to **Empower**, and select **Waters Net Configuration Assistant**. 2. From Waters Net Configuration Assistant, click **Configuration** > **Listener Configuration**. 3. To start the Listener, click **Start**. **Tip:** You can also **Stop** the Listener and obtain the Listener status.
Client configuration problem.	Verify that the entries in the client's `tnsnames.ora` file are correct and that the *TNS_ADMIN* variable is pointing to the correct share.

Possible cause	Corrective action
Network problem.	Ensure that the network cabling is properly connected. Use the Windows TCP/IP utility on the client to ping the server. When routing, ensure that the default gateway is set properly.

6.5.4 Client cannot connect to Run Samples on the LAC/E^{32} acquisition server

Possible cause	Corrective action
User does not have appropriate privileges.	From the client, ensure that user is logged in to the correct domain relationship.

6.5.5 No results are created during Run and Report or background processing

Possible cause	Corrective action
The Empower path cannot be located.	Ensure that the Empower path is listed before other paths in the operating system's path environment variable.
The *TNS_ADMIN* variable references a Win2016 Enterprise database server that has not had its security settings properly configured.	Refer to Chapter 4 in the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

6.5.6 The "No COM connection" error occurs when attempting to connect to an acquisition server

Possible cause	Corrective action
The Waters Service is not running or the acquisition server is not in a domain relationship.	Start the Waters Service (if the Waters Service is not on the list of services in the operating system, call Waters Technical Support) or enable two one-way trusts between the domains.

6.5.7 Client in another domain cannot access Empower resources

Possible cause	Corrective action
Domain trusts are not set up.	Ensure that there is a two-way trust between domains, or create an account in the Empower domain specifically for that user.

6.5.8 Run not starting, database fetch error, or connect error

Possible cause	Corrective action
Incorrect database alias for LAC/E^{32} acquisition server.	Confirm the database alias on the LAC/E^{32} or acquisition client for the database you are trying to connect to.

6.5.9 LAC/E^{32} began acquisition in buffering mode

Possible cause	Corrective action
Mismatch of database service names between clients and LAC/E^{32} acquisition server.	Standardize `tnsnames.ora` file.

6.5.10 Client cannot see chromatograms or create or delete projects

Possible cause	Corrective action
User is not logged in to the domain or permissions are not correct in the raw data share.	See the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184). **Tip:** To view or test the share, in Configuration Manager, select **View** > **Manage Raw Data Files**.
Firewall exceptions not set properly.	See the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

6.6 Acquisition node problems

The troubleshooting tables in this section include symptoms, possible causes, and suggested corrective actions for problems with the following components:

- Acquisition node
- Printer
- Citrix

If the troubleshooting procedures in this section do not correct the problem with your system, see the manual shipped with the hardware and perform the recommended test and diagnostic procedures. If you discover a problem that requires repair of a component, refer to your maintenance agreement for the appropriate support organization to contact.

See the *Empower online Information System* for additional troubleshooting information, maintenance procedures, and status messages.

6.6.1 Troubleshooting the LAC/E^{32}

The following topics list symptoms, possible causes, and suggested corrective actions for troubleshooting the LAC/E^{32}.

6.6.1.1 LAC/E^{32} module power LEDs do not glow

Possible cause	Corrective action
LAC/E^{32} module not plugged in to power outlet or no power at outlet.	Connect the LAC/E^{32} module to the power outlet, ensure that there is power, and then power-on the LAC/E^{32} module.
Hardware failure.	Call Waters Technical Service.

6.6.1.2 Failure to connect to LAC/E^{32} acquisition server over the network or through Empower software

Possible cause	Corrective action
Incorrect LAC/E^{32} acquisition server configuration.	Confirm that the LAC/E^{32} acquisition server is in the correct network domain. Confirm configuration of all network parameters.
Network card not functioning.	Call Waters Technical Service.
busLAC/E hardware error.	Call Waters Technical Service.
Firewall exceptions not set properly.	See the latest version of the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).

6.6.1.3 Data files not available for review because data files were not copied to database server

Possible cause	Corrective action
Waters Service not running on LAC/E[32] acquisition server or acquisition client.	Set Waters Service Startup to **Automatic (Delayed Start)**, and then reboot the LAC/E[32] acquisition server or acquisition client.
Waters Service not running on database server.	Set Waters Service Startup to **Automatic (Delayed Start)**, and then start the service. Wait up to 10 minutes for data file upload.
General networking failure.	Call Waters Technical Service.

6.6.1.4 Cannot see print resources from Run Samples

Possible cause	Corrective action
Print queues not registered.	Register print queues on the LAC/E[32] acquisition server or acquisition client. • Windows 7 systems: Select **Start** > **All Programs** > **Empower** > **Register Empower Node Printers**. • Windows 10 systems: Select **Start**, click the down arrow to display the Apps page, point to **Empower**, and select **Register Empower Node Printers**. You can perform this procedure remotely using Windows Remote Desktop Connection.

6.6.1.5 Could not recover all sample set data when performing a run on LAC/E[32] acquisition server

Possible cause	Corrective action
Network cable was removed, causing data buffering.	The *TNS_ADMIN* variable inhibits recovery after removal of a network cable. Use a local `tnsnames` file, and then upload sample set data.

6.6.2 Troubleshooting Citrix problems

Table 6–1: Troubleshooting Citrix problems

Symptom	Possible cause	Corrective action
When using Citrix Web interface to access Empower 3 FR5 software, local drives and directories are not accessible as options when you perform tasks that enumerate the local drives, such as backing up and restoring a project.	This behavior is related to the response given to the File Security - Citrix online plug-in dialog box that appears the first time a user performs a task that requires enumeration of the local drives; for example, when projects are backed up or restored or when methods or reports are exported. If at any time **No Access** was selected in this dialog box, Citrix Web interface users cannot access the client local drives on that workstation.	Follow the instructions in "Citrix Online Plug-in 12.0 Ignores `Webica.ini` Settings" (Document ID CTX124921) in the Citrix Knowledge Center (http://support.citrix.com).
When restoring a project from a Citrix client, one or more of these behaviors is observed: • Restore wizard response is delayed and the window status is sometimes `Not Responding` • Project hierarchy is not restored • Project restoration fails	Projects to be restored are local on the Citrix client.	When restoring from a Citrix client drive, ensure that the client is part of a domain that has some trust relationship with the Citrix server and is logged into that domain. The restore operation can fail if the client and the server reside in separate domains with no trust relationship.

6.7 Troubleshooting procedures

6.7.1 Evaluating Windows error messages

System messages from the Windows operating system and its various utilities share a similar format. Take note of the information in the message.

Tip: Capture an image of the error message using the Windows Print Screen function or a screen capture utility.

For additional information, click **?**, **Help**, or press the `F1` key.

For more information about Windows operating system and utility error messages, see the Microsoft Windows Operating System Help, or the Microsoft website.

6.7.2 Evaluating Empower 3 software error messages

Empower 3 software application status and error messages appear in the Message Center on the client. For details on the Message Center error messages, see the *Empower online Information System*.

If you need to call Technical Support about an error message, note the particular error and document the steps required to re-create the error before contacting Waters.

6.7.2.1 Evaluating Oracle errors

For information about Oracle system and utility error messages, see the Oracle Database 18c Documentation media.

Notice: If you create or modify database objects in response to Oracle error messages, it can negatively affect Empower 3 software performance and you might need to re-validate the software. Contact your Waters Data Specialist before implementing any database changes.

If you need to call Technical Support about an error message, note the particular error and document the steps required to re-create the error before contacting Waters.

6.8 Additional help

For additional Empower 3 FR5 system troubleshooting help, consult the following documentation:

- *Empower online Information System*
- Windows Help
- Hardware documentation shipped with your system hardware
- Operator's guides for detectors, pumps, autosamplers, and other components of the chromatography system
- *Empower 3 Feature Release 5 Release Notes* (716006111)
- *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184)
- www.waters.com
- Waters Technical Service

If the corrective actions suggested here fail to correct a problem, consult Reporting problems, and then contact Waters for assistance.

Customers in the USA and Canada can report the problems to Waters Technical Service (800 252-4752). Others can phone their local Waters subsidiary or Waters corporate headquarters in Milford, Massachusetts (USA), or visit www.waters.com.

A Log forms

This appendix provides sample forms for logging important system information.

Tip: When sending log files to the Waters Technical Support department, save them as a compressed (zip) file and include `WATZIP` in the subject line.

A.1 Database initialization parameters

Table A–1: Database initialization parameters

Parameter	Database instance	Comment
Oracle SID		
Oracle Database Domain		
Oracle Application Drive		There is only one copy of Oracle program files.
Empower Oracle Database		Called `DB_DIRECTORY` in Oracle Database Configuration Assistant (DBCA).
Empower Projects		You must create unique Share Names for each instance.
Empower Program Files		There is only one copy of the Empower 3 Program files.
Mirrored Directory		Called `DB_MIRROR` in DBCA.
First Archive Directory		Called `DB_ARCHIVE` in DBCA.
Second Archive Directory		Called `DB_ ARCHIVE2` in DBCA.
Memory Allocation		Step 8 of 9 in DBCA. Confirm that the memory allocation is divided sufficiently for each instance. Ensure that you reserve enough memory for the operating system.

Table A–1: Database initialization parameters (continued)

Parameter	Database instance	Comment
Character Set		Must be `WE8ISO8559P1`. **Tip:** To confirm that the database uses the correct character set, open the alert log file and search for the line `Database Characterset is WE8ISO8559P1`.

A.2 Database storage information (Control files)

Tip: If you need additional space, attach suitable documentation.

Table A–2: Control files

Parameter	Database instance	Comment
Control File 1		
Control File 2		
Control File 3		

A.3 Database storage information (Tablespace)

Tip: If you need additional space, attach suitable documentation.

Table A–3: Database storage information

Parameter	Database instance	Comment
Index_Data Tablespace		
SYSAUX Tablespace		
SYSTEM Tablespace		
TEMPORARY _DATA Tablespace		
UNDOTBS1 Tablespace		
USER_DATA Tablespace		

A.4 Data file information

Record the tablespace name, and then record the path and size for each file.

Table A–4: Data file log

Tablespace name	Database instance	Comment

A.5 Data file information (Redo_logs)

Table A–5: Redo logs

Parameter	Database instance	Comment
Redo Log Group 1		
Redo Log Group 2		
Redo Log Group 3		
Redo Log Group 4		

A.6 Disk space usage log

Table A–6: Disk space usage log

Date/initials	Drive	Free disk space	Date/initials	Drive	Free disk space

Table A–6: Disk space usage log (continued)

Date/initials	Drive	Free disk space	Date/initials	Drive	Free disk space

A.7 Database backup log

Table A–7: Database backup log

Date/initials	Database disk	Storage media description

Table A–7: Database backup log (continued)

Date/initials	Database disk	Storage media description

A.8 Full disk backup log

Table A–8: Full disk backup log

Date/initials	Drive volume name	Media label	Backup set name

A.9 System service log

Table A–9: System service log

Date/initials	Service performed	Service provider

A.10 System problem log

Table A–10: System problem log

Date/initials	Problem description	Corrective action

Table A–10: System problem log (continued)

Date/initials	Problem description	Corrective action

A.11 Hardware service information sheet

Hardware technical support/repair terms:

Name of service company:

Address:

Telephone number:

Contact person:

Service access number:

Service contract expiration date:

A.12 Software service information sheet

Software technical support/repair terms:

Name of service company:

Address:

Telephone number:

Contact person:

Service access number:

Service contract expiration date:

B Deprecated recovery procedures

B.1 Recovering from a program drive or raw data share failure

Hard disk failure is a common cause of data loss. You will need to either restore particular drives or the entire database, depending on the type of failure.

Specifically, this section describes how to recover from these scenarios:

- Empower raw data drive failure
- Empower program files disk failure

Tip: The recovery procedures described in this section assume that the Empower server is configured exactly as described (the application configured on four separate physical drives) in the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184). If your server is configured differently, you will need the raw data file backup and the backup of the program drive, or the Empower application media. If you performed a custom installation, you must modify the recovery procedures as needed. For example, the default *SID* name is `WAT18`. If you selected a *SID* name other than `WAT18`, supply your *SID* in the space designated by `WAT`*`n`* in this procedure.

B.1.1 Recovering from an Empower software raw data drive failure

The Empower 3 FR5 software raw data disk contains the raw chromatographic files, the `EmpowerArchive1DB` directories, and often, the `EmpowerMirrorDB` directory (however, you may have configured your database differently). If the disk fails, you do not lose Empower 3 FR5 database information, because the Empower 3 FR5 database disk remains intact.

Because chromatographic files produced between the last backup and the time of a disk failure are not recoverable, you cannot review or otherwise use chromatograms acquired or their results during that time period; however, all methods created or edited, sample loading information, and results generated since the last backup are available.

B.1.1.1 Recovering from raw data drive failure

Before you start the recovery process, perform these actions:

- Log in to the operating system as the administrator.
- If the database is running, shut it down as described in Shutting down and starting up the database.

Tip: In this procedure, substitute your *SID* in the space designated by `WAT`*n*. Keep in mind that the installed software may reside on different drives than those listed in the recovery procedure outlined below.

To recover from a raw data drive failure:

1. Create the `Projects` directory on `<rawdata-drive>:\Empower\Projects.`
2. From the backup projects directory, copy all projects' folders to the `<rawdata-drive>:\Empower\Projects` directory.

   Tip: Your configuration may consist of multiple shares with raw data.
3. Share the `Projects` directory with the share name `Waters_Projects$` and set the appropriate level of security as described in the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184).
4. From the `<database-drive>:\EmpowerDatabase\oradata\WAT`*n* directory, copy `Control01` to the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n*.
5. In the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n* directory, rename `Control01.CTL` to `Control02.CTL`.
6. From the `<database-drive>:\EmpowerDatabase\oradata\WAT`*n* directory, copy `Control01` to the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n*.
7. In the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n* directory, rename `Control01.CTL` to `Control03.CTL`.
8. From the `<database-drive>:\EmpowerDatabase\oradata\WAT`*n* directory, copy `REDO0`*n* log files (where *n* is `1` to `4`) to the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n*.
9. In the `<rawdata-drive>:\WatersCDSMirrorDB\oradata\WAT`*n* directory, rename `REDO0`*n*`.RDO` log files to `REDO2`*n*`.RDO` (where *n* is `1` to `4`).
10. Create the archive log directory `<rawdata-drive>:\WatersCDSArchive1DB`.
11. From the `<program-drive>:\WatersCDSArchive2DB` directory, copy all contents of the directory to `<rawdata-drive>:\WatersCDSArchive1DB`.
12. Restart your database by stopping and then starting `OracleServiceWAT`*n*`,` or restart the server.
13. You may also need to restore the database. If so, follow the procedures outlined in the Restoring the database section of this guide.

    Tip: This procedure assumes a single raw data drive or share. Empower software supports multiple raw data shares.

B.1.2 Recovering from an Empower program files disk failure

The Empower 3 FR5 program files disk contains the `Empower program` file and the `Empower \Script` directory. The Oracle program files disk contains the Oracle directory `oracle_home`, including the Oracle password file (`pwdWAT`*`n`*`.ora`) and the `WatersCDSArchive2DB` directory containing one set of archive log files. Recovering these disks involves reinstalling Empower and Oracle.

Tip: Empower software and Oracle can both occupy the same program disk, but can also exist on separate program disks.

In the case of partial disk failure (such as bad data sectors), where all archive (`*.arc`) files can be saved from the disk, back up the database drive immediately. You can then copy the archive files to a tape or network drive before the disk is repaired. This allows restoration of the database to the state at the time of failure.

Recommendation: Back up all other drives, in case any files are inadvertently deleted or overwritten. Ensure that the target directories have sufficient disk space to copy the files.

B.1.2.1 Recovering from a program drive failure

The best option is to restore a disk image backup of the entire drive, if available. If a disk image backup of the program files disk is not available, or your backup does not include the latest changes, reinstall Empower 3 FR5 and Oracle as follows.

To recover from an Empower program drive failure:

1. Manually back up the contents of the `<database-drive>:\EmpowerDatabase \oradata\WAT`*`n`* directory to a safe location, such as a network drive, and then delete the `<database-drive>:\EmpowerDatabase` directory.
2. Manually back up the contents of the `<rawdata-drive>:\Empower\Projects` directory to a safe location, such as a network drive, and then delete the `<rawdata-drive>:\Empower\Projects` directory.
3. Manually back up the `<rawdata-drive>:\WatersCDSArchive1DB` and `<rawdata-drive>:\WatersCDSMirrorDB` directories to a safe location, and then delete the directories.
4. Re-image the operating system drive to the last restore point before Empower was installed.
5. Re-install Empower from the Empower 3 FR5 DVD as described in the *Empower 3 Feature Release 5 Installation, Configuration, and Upgrade Guide* (715006184) to the same location where it was originally installed and use the same *SID* and global database name.
6. Access **Services** and set the **Startup Type** for the following services to **Disabled**:

- **OracleServiceWAT*n***
- **OracleEmpower18cTNSListener**
- **WatersService**

7. Restart the server, and then restore the database.

See also: Restoring the database