Microplate Centrifuge with Loader

User Guide

Original Instructions

Agilent Technologies

Notices

User Guide Part Number

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Preface

This preface contains the following topics:

- "About this guide" on page iv
- "Accessing Agilent Automation Solutions user information" on page vii

Agilent Technologies

About this guide

Who should read this guide

This user guide is for people with the following job roles:

Job role	Responsibilities
Installer	Unpacks, installs, and tests the Agilent Microplate Centrifuge with Loader before it is used.
Integrator	Configures hardware and writes software.
Lab manager, administrator, or technician	• Manages the automation system that contains the Centrifuge with Loader • Develops the applications that are run on the system • Develops training materials and standard operating procedures for operators
Operator	Performs the daily production work on the Centrifuge with Loader and solves routine problems.

What this guide covers

This guide contains the safety guidelines and the installation, setup, operation, and maintenance procedures for the Centrifuge with Loader.

This guide does not provide instructions for the VWorks software, third-party software, or ActiveX controls. For more information about these topics, see the relevant user guides for these products.

What is new in this revision

Revision C

Revision C specifies a change in the operating temperature for the Centrifuge Loader. For details, see "Environmental requirements" on page 21.

Revision B

Revision B contains the following changes.

Feature and description	See...
Updated the safety guidelines to include the South Korean Class A EMC declaration.	"Safety and regulatory compliance" on page 3
Updated the hardware overview to include the connection panel description for both the Loader and the Centrifuge.	"Hardware overview" on page 9

Feature and description	See...
Updated the laboratory requirements to include the environmental requirements, performance specifications, and labware specifications.	"Laboratory requirements" on page 19 "Labware and performance specifications" on page 22
Moved the unpacking procedures to a separate guide that is attached to the shipping container.	*Microplate Centrifuge with Loader Unpacking Guide*
Included a description of how to add devices to a VWorks device file.	"Creating and editing device files" on page 39
Updated the teachpoint descriptions and procedures.	• "Setting the Centrifuge bucket home positions" on page 59 • "About the Loader teachpoints" on page 70 • "Determining if the Loader teachpoints require adjustment" on page 74 • "Setting the gripper-head teachpoints" on page 115
Updated all diagnostics procedures based on Centrifuge Diagnostics version 8.0 and Centrifuge Loader Diagnostics version 9.0.	• "Initializing the device profile and checking status" on page 53 • "Performing a spin" on page 77 • "Using diagnostics software" on page 87
Combined maintenance procedures and troubleshooting for the Centrifuge and the Loader devices, and added how to change a fuse.	"Maintaining the device" on page 107
Added quick reference for Centrifuge Diagnostics version 8.0 and Centrifuge Loader Diagnostics version 9.0.	"Quick reference" on page 135

Software version

This guide documents the following:
- Centrifuge Loader Diagnostics version 9.0
- Centrifuge Diagnostics version 8.0.

Related guides

Use this guide in conjunction with the following:
- *Automation Solutions Products General Safety Guide*. Provides general safety information and describes potential safety hazards that you might encounter when using Automation Solutions products. A copy of this safety guide is included with your shipment.

- *Microplate Centrifuge with Loader Unpacking Guide*. Provides unpacking instructions for the Centrifuge with Loader.
- *Centrifuge with Loader Quick Guide*. Provides a brief hardware overview and instructions on how to start up, shut down, set spin parameters, load and unload microplates, and spin the labware.
- *Automated Centrifuge Loader ActiveX v9 User Guide*. Describes the ActiveX controls for the Centrifuge Loader.
- *Microplate Centrifuge ActiveX v8 User Guide*. Describes the ActiveX controls for the Microplate Centrifuge.
- *VWorks Automation Control Setup Guide*. Explains how to define labware and labware classes, liquid classes, and pipetting techniques, and how to track and manage labware in storage.
- *VWorks Automation Control User Guide*. Explains how to create protocols, and set task parameters for each device in the system.

If the Centrifuge with Loader is a device in a third-party system, see the relevant third-party system guides.

Related information

For more information about…	See…
How to access the VWorks Knowledge Base	"Accessing Agilent Automation Solutions user information" on page vii
Reporting problems	"Reporting problems" on page 134
Unpacking instructions	*Microplate Centrifuge with Loader Unpacking Guide*

Accessing Agilent Automation Solutions user information

About this topic

This topic describes the different formats of user information and explains how to access it for the Agilent Automation Solutions products.

Where to find user information

The Automation Solutions user information is available in the following locations:

- *Knowledge base*. The help system that contains information about all the Automation Solutions products is available from the Help menu within the VWorks software.

- *PDF files*. The PDF files of the user guides are installed with the VWorks software and are on the software CD that is supplied with the product. A PDF viewer is required to open a user guide in PDF format. You can download a free PDF viewer from the internet. For information about using PDF documents, see the user documentation for the PDF viewer.

- *Agilent website*. You can search the online knowledge base or download the latest version of any PDF file from the Agilent website at www.agilent.com/chem/askb.

Accessing safety information

Safety information for the Automation Solutions devices appears in the corresponding device safety guide or user guide.

You can also search the knowledge base or the PDF files for safety information.

Using the knowledge base

Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

Note: If you want to use Internet Explorer to display the topics, you might have to allow local files to run active content (scripts and ActiveX controls). To do this, in Internet Explorer, open the **Internet Options** dialog box. Click the **Advanced** tab, locate the **Security** section, and select **Allow active content to run in files on my computer.**

To open the knowledge base, do one of the following:

- From within VWorks software, select **Help** > **Knowledge Base** or press F1.

- From the Windows desktop, select **Start** > **All Programs > Agilent Technologies > VWorks** > **User Guides** > **Knowledge Base.**

Opening the help topic for an area in the VWorks window
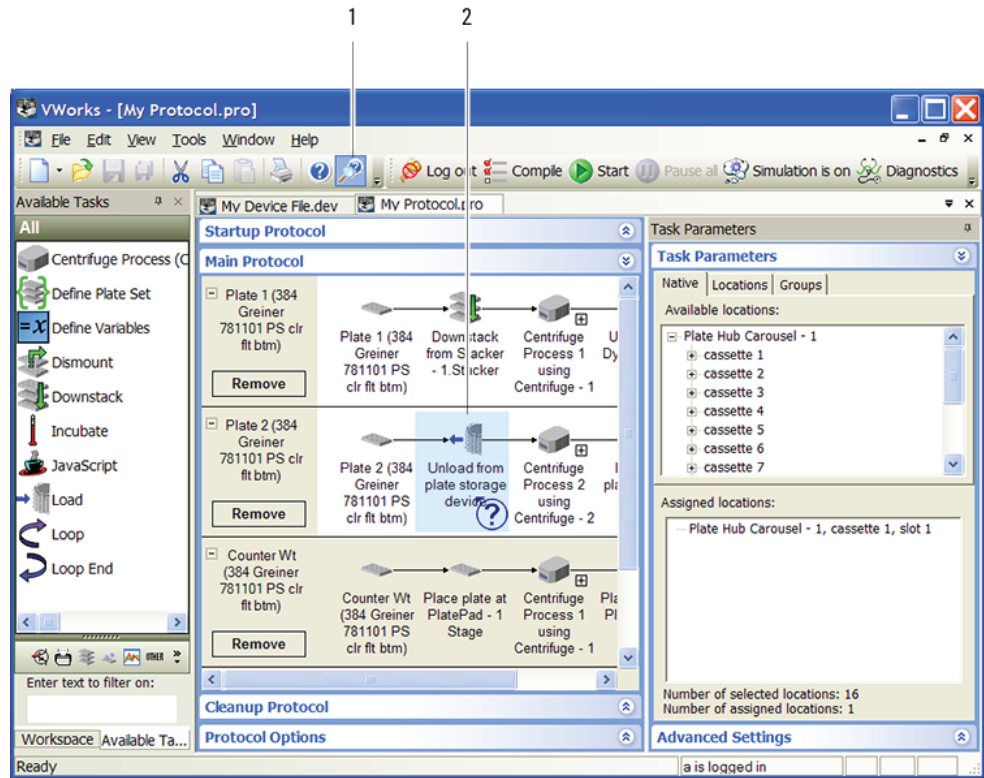
To access the context-sensitive help feature:

1   In the main window of the VWorks software, click the help button [icon].

The pointer changes to [icon]. Notice that the different icons or areas are highlighted as you move the pointer over them.

2   Click an icon or area of interest. The relevant topic or document opens.

Features in the Knowledge Base window
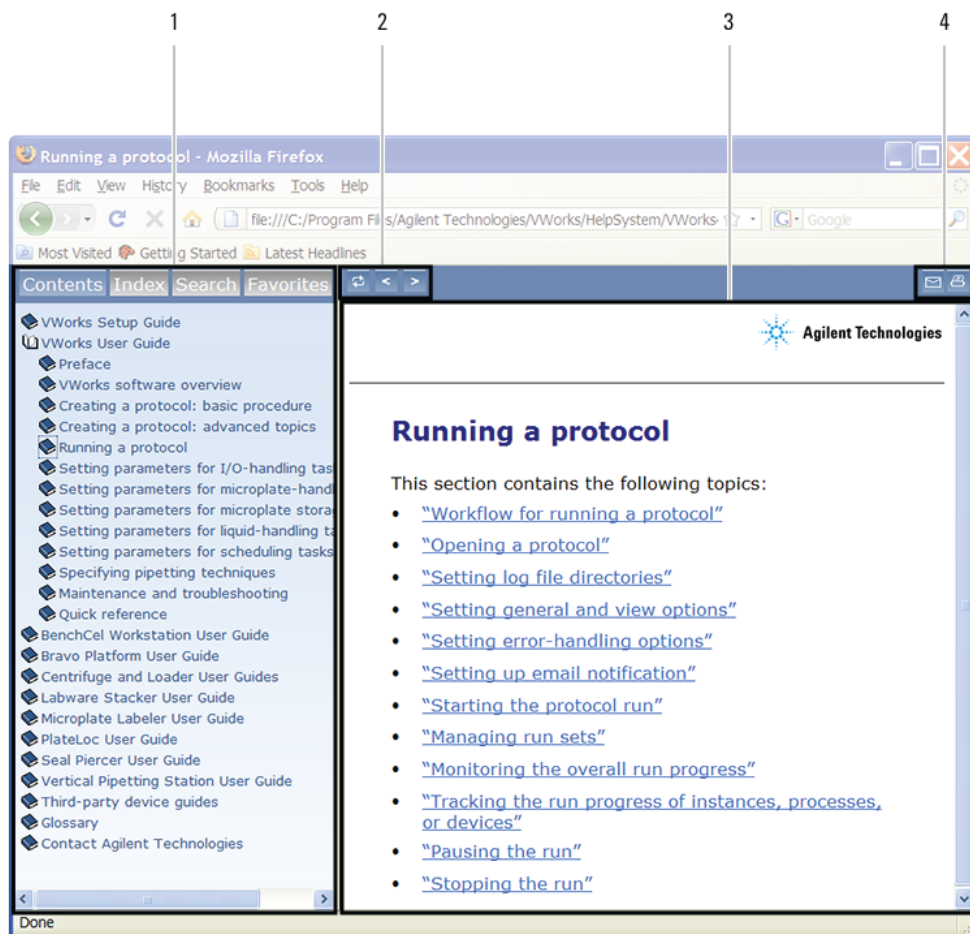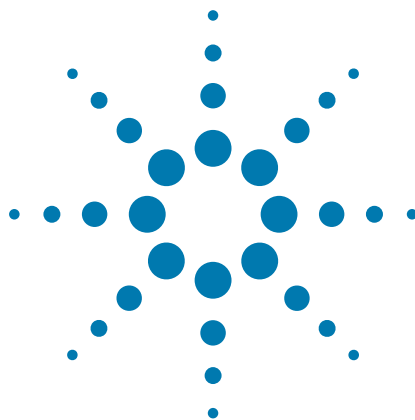
Item	Feature
1	*Navigation area*. Consists of four tabs: • *Contents*. Lists all the books and the table of contents of the books. • *Index*. Displays the index entries of all of the books. • *Search*. Allows you to search the Knowledge Base (all products) using keywords. You can narrow the search by product. • *Favorites*. Contains bookmarks you have created.
2	*Navigation buttons*. Enable you to navigate through the next or previous topics listed in the Contents tab.
3	*Content area*. Displays the selected online help topic.
4	*Toolbar buttons*. Enable you to print the topic or send documentation feedback by email.

Related information

For more information about...	See...
What this guide cover and who should read it	"About this guide" on page iv
Reporting problems	"Reporting problems" on page 134

1
Safety guidelines

This chapter contains the following topics:

Agilent Technologies

General safety information

Before installing and using the Centrifuge with Loader

Before using the Centrifuge with Loader, make sure that you are properly trained in:

- General laboratory safety
- The correct and safe operation of the Centrifuge with Loader
- The correct and safe operation of lab automation systems or components used in combination with the Centrifuge with Loader

The Centrifuge Loader has a safety interlock circuit that must be closed for it to operate. The Machinery Directive requires that you connect the safety interlock to a safety guard, light curtain, or enclosure.

⚠️ **WARNING** **Operating the Centrifuge with Loader without safety guards or an enclosure connected to the safety interlock circuit increases the risk of injury.**

General safety precautions

For general safety precautions, intended product use statement, and the list of safety labels, see the *Automation Solutions Products General Safety Guide*.

Note: If the Centrifuge with Loader is installed in a BioCel System, see the *BioCel System Safety Guide.*

Related information

For information about…	See…
General precautions, intended product use statement, and list of safety labels	*Automation Solutions Products General Safety Guide*
Mechanical hazards	"Mechanical hazards" on page 5
Regulatory compliance	"Safety and regulatory compliance" on page 3

Safety and regulatory compliance

The Centrifuge with Loader complies with the applicable EU Directives and bears the CE mark. See the Declaration of Conformity or Declaration of Incorporation, as applicable, for details. The Centrifuge with Loader is designed to comply with the regulations and standards listed in the following table.

Regulatory Compliance	Standard
EMC	
European Union	EMC Directive 2004/108/EC
	IEC 61326-1:2005 / EN 61326-1:2006
Canada	ICES/NMB-001:2004
Australia/New Zealand	AS/NZS CISPR 11:2004
Safety	
European Union	Machinery Directive 2006/42/EC
	Low Voltage Directive 2006/95/EC
	IEC 61010-1:2001 / EN61010-1:2001 IEC 61010-2-081:2001+A1:2003 / EN 61010-2-081:2002+A1:2003
Canada	CAN/CSA-C22.2 No. 61010-1-04 CAN/CSA-C22.2 No. 61010-2-081-04
USA	ANSI/UL 61010-1:2004

Electromagnetic compatibility

If the Centrifuge with Loader causes interference with radio or television reception, which can be determined by turning the device off and on, try one or more of the following measures:

- Relocate the radio or television antenna.
- Move the device away from the radio or television.
- Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
- Make sure that all peripheral devices are also certified.
- Make sure that appropriate cables are used to connect the device to peripheral equipment.
- Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.

Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

Sound emission declaration

Sound pressure: Lp < 70 dB according to EN ISO 779:2010.

Schalldruckpegel: Lp < 70 dB nach EN ISO 779:2010.

South Korean Class A EMC declaration

A 급 기기 (업무용 방송통신기자재)

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주 의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으 로 합니다 .

Related information

For information about...	See...
General precautions, intended product use statement, and list of safety labels	*Automation Solutions Products General Safety Guide*
Mechanical hazards	"Mechanical hazards" on page 5
Cautions about potential equipment damage	"Potential equipment damage" on page 6

Mechanical hazards

> **WARNING** The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.

> **WARNING** The Centrifuge door can cause possible pinching, piercing, or bruising if your hand is in the opening when it closes. Keep away from the Centrifuge door while it is opening or closing.

Figure Centrifuge with Loader moving parts
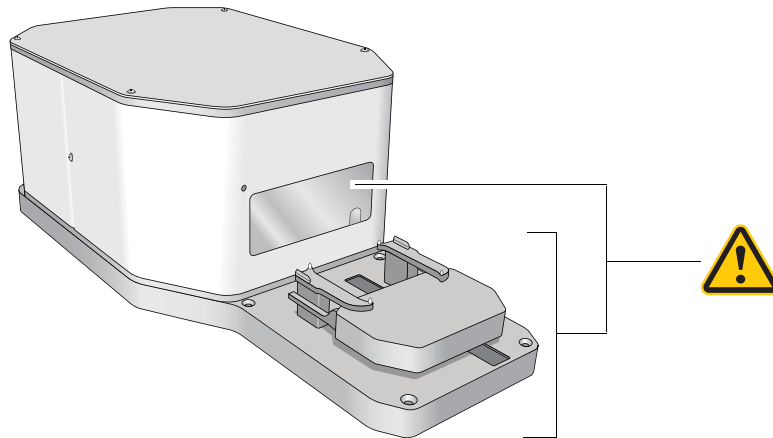
The Centrifuge will not spin unless:

- The door is closed and locked.
- The buckets are unlocked.
- The bucket payloads are balanced.
- The appropriate software command is sent.

The Centrifuge automatically closes and locks the door whenever you start a spin or spin cycle. The Centrifuge door will not unlock or open if the rotor is moving.

> **WARNING** Do not attempt to manually unlock the Centrifuge door while the rotor is moving. Although no longer powered, the buckets might still be rotating at a dangerous speed.

> **WARNING** Do not operate the Centrifuge if any of its components or accessories are damaged or have been modified in any manner not authorized by Agilent Technologies. Do not operate the Centrifuge if objects or liquids are trapped within the chamber. Discontinue use if the Centrifuge vibrates or emits noise above normal levels.

> **WARNING** Each Centrifuge bucket can hold a microplate or counterweight that weighs up to 250 g (8.82 oz). Placing heavier microplates or counterweights in the Centrifuge can cause the device to malfunction during operation, damaging the device and causing severe injury.

> **WARNING** Do not operate the Centrifuge above speeds of 1500 RPM unless it is securely mounted to a structure approved by Agilent Technologies.

Related information

For information about...	See...
General precautions, intended product use statement, and list of safety labels	*Automation Solutions Products General Safety Guide*
Safety and regulatory compliance	"Safety and regulatory compliance" on page 3

Potential equipment damage

CAUTION   Dirt in unfiltered air can build up in the Centrifuge air valves and can eventually cause a malfunction. Ensure that the air supply is properly filtered for moisture and aerosol impurities.

CAUTION   Trapped liquids in the Centrifuge may cause corrosion inside the device.

CAUTION   Use only the recommended cleaning materials. Using other cleaning solutions and materials can cause damage to the device. Do not use abrasive, corrosive cleaning agents. Do not use metal brushes.

CAUTION   If labware breaks apart inside the Centrifuge, ensure that all the fragments are removed. Labware fragments can interfere with moving parts and potentially damage the Centrifuge.

CAUTION   The Centrifuge has a permanently attached rotor. Tampering with or adjusting the rotor mounting screw, which fastens the rotor to the central motor axle, can result in equipment damage. If you think the rotor mounting screw requires maintenance, contact Automation Solutions Technical Support.

Related information

For information about...	See...
General precautions, intended product use statement, and list of safety labels	*Automation Solutions Products General Safety Guide*
Mechanical hazards	"Mechanical hazards" on page 5

2
Introduction

This chapter provides an overview of the Centrifuge with Loader and contains the following topics:

Agilent Technologies

About the Centrifuge with Loader

Introduction

The Agilent Microplate Centrifuge with Loader consists of an automated centrifuge and a robotic microplate handler:

- The Centrifuge has two buckets, each capable of carrying a single microplate, filter plate, or lidded microplate.

- The Loader has a plate stage and a gripper that enables microplate placement by a robotic arm in your automation system. After the robot places a microplate onto the Loader plate stage, the gripper picks up the microplate and moves it into the Centrifuge.

Figure   Centrifuge with Loader (shown with a microplate in the gripper)
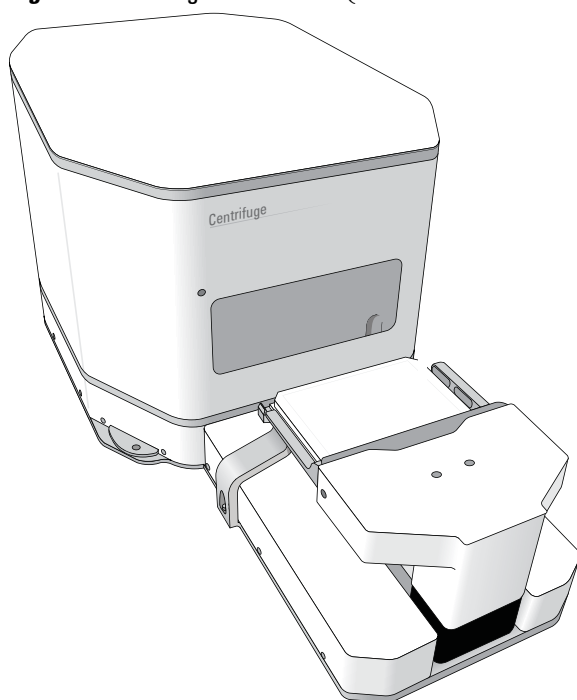
The Centrifuge with Loader is intended to be integrated with a robotic lab automation system, such as the BioCel Automation System.

Related information

For information about…	See…
Safety guidelines	"Safety guidelines" on page 1
Centrifuge with Loader hardware components	"Hardware overview" on page 9
Spinning microplates	"Workflows for performing spins" on page 78

Hardware overview

Front features

The following figure and table describe the primary hardware components.

Figure Centrifuge with Loader components
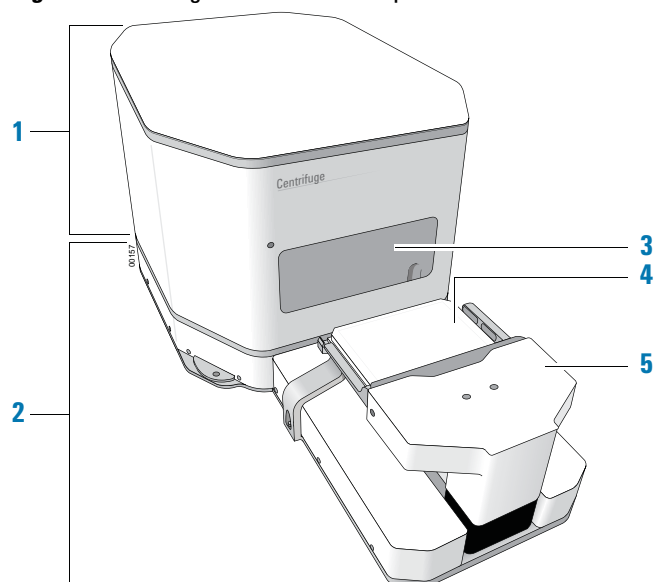
Item	Feature	Description
1	Centrifuge	The device that spins microplates.
2	Loader	The device that loads and unloads microplates in the Centrifuge.
3	Centrifuge door	The structure that: • Opens to permit the loading and unloading of microplates. • Closes to block access while the Centrifuge is spinning microplates.
4	Loader plate stage (shown with a microplate)	The two parallel rails on which a microplate sits before it is loaded into the Centrifuge and after it is unloaded from the Centrifuge.
5	Gripper	The assembly that moves a microplate between the plate stage and the Centrifuge. The gripper fingers close and open to hold and release the microplate, respectively. For gripper details, see "Centrifuge Loader overview" on page 13.

Centrifuge buckets

Inside the Centrifuge are two buckets that host microplates and counterweights. The following figure shows a close-up view of the buckets.

Note: Only one bucket is visible from the doorway.

Figure Buckets inside the Centrifuge
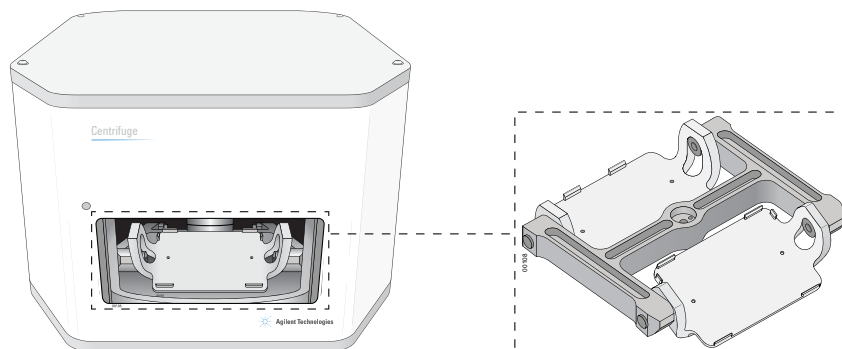
The microplates in the two buckets must be balanced to within 10 grams of each other. You can pair one sample microplate with another of equal weight, or you can pair a sample microplate with a balance microplate that has been equally weighted with water.

Related information

For information about...	See...
Connection panels on device rear	"Connection panels" on page 11
Safety guidelines	"Safety guidelines" on page 1
Labware gripper	"Centrifuge Loader overview" on page 13
Labware considerations	"Labware and performance specifications" on page 22
Performance specifications	"Performance specifications" on page 22
Spinning microplates	"Workflows for performing spins" on page 78

Connection panels

Description

The Microplate Centrifuge has two connection panels:

- Centrifuge control panel
- Loader control panel

The following figure shows the connection panels on the device rear. The tables provide descriptions of the connectors.

Figure   Connection panels: (**A**) Centrifuge and (**B**) Loader
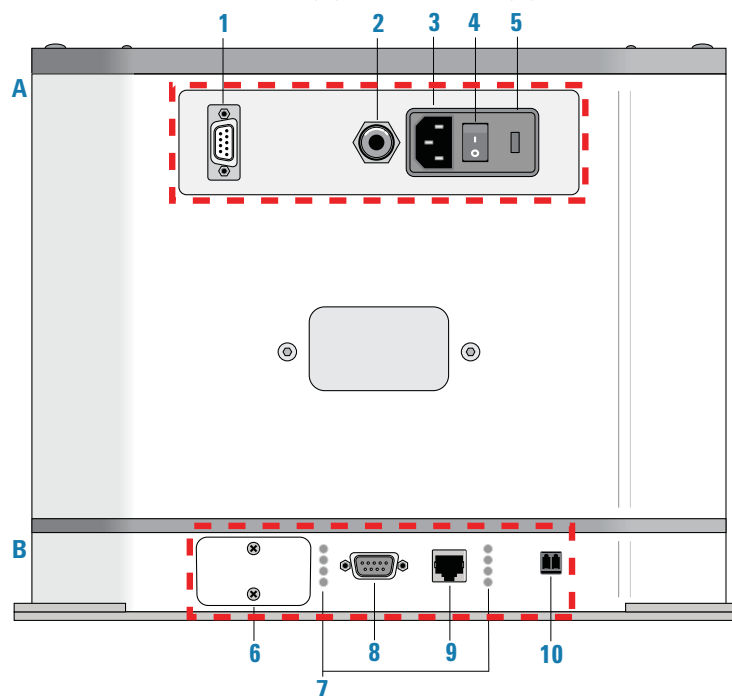
Table   Centrifuge (**A**) connection panel

Item	Part	Comment
1	Serial port (DB-9 RS-232 9-pin)	Connects a serial cable from the controlling computer to the Centrifuge for communication.
2	Air supply port	Connects to a compressed-air source. The Centrifuge uses compressed air to open and close the door, lock the door, and lock and unlock the bucket at the door.
3	AC power entry	Connects the power cord.
4	Power switch	Turns on (**I**) and off (**0**) the device power.

Item	Part	Comment
5	Fuse panel	Houses the AC inlet fuse.

Table   Loader (B) connection panel

Item	Part	Comment
6	Testing access panel	For use by Agilent personnel only.
7	Status lights	Indicate device status, which is useful for troubleshooting problems. • Serial status lights: PRG, NMC, TX, RX • Power and Ethernet status lights: PWR, LNK, ACT, STAT.
8	Serial port (DB-9 RS-232 9-pin)	Connects a serial cable from the controlling computer to the Loader for communication. **IMPORTANT** You can connect to the Loader using either the Ethernet port or the serial port.
9	Ethernet port	Connects an Ethernet cable from the controlling computer for network communication.
10	E-stop port (emergency-stop interface)	Connects the safety interlock circuit to an emergency-stop device, such as a pendant, or connects to an e-stop jumper. **IMPORTANT** The safety interlock circuit must be closed for the Loader to operate.

Related information

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Hardware components	"Hardware overview" on page 9
Connecting the device	• "Connecting the air, power, and e-stop" on page 29 • "Connecting the device to the computer" on page 32
Disconnecting the air	"Disconnecting the air supply" on page 110

Centrifuge Loader overview

Description

The Centrifuge Loader is a robotic microplate handler that moves plates into and out of the Centrifuge. The process of moving a plate into the Centrifuge is called loading, and the process of moving a plate out of the Centrifuge is called unloading.

Figure   Loader components
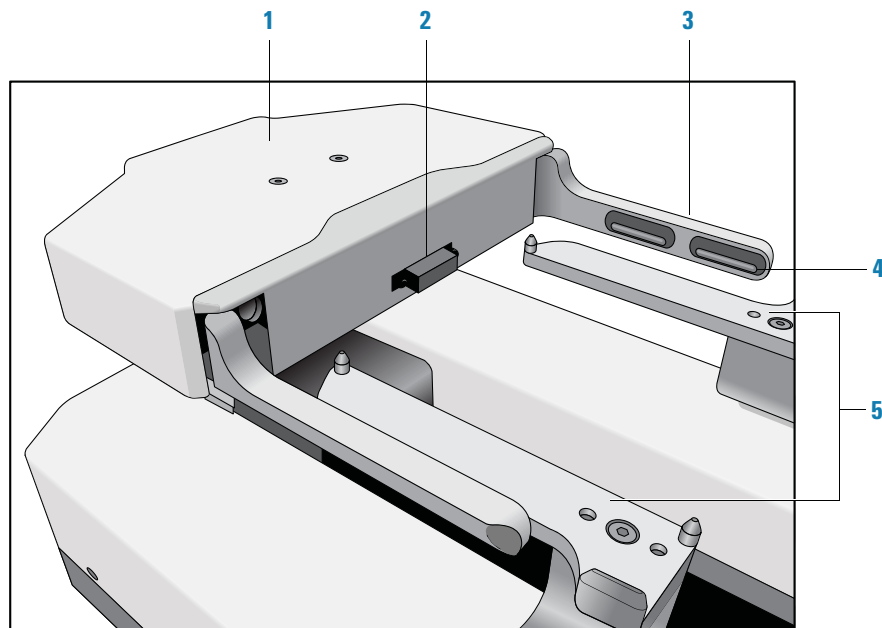
Item	Part	Description
1	Gripper head	Houses the electronics for the gripper assembly.
2	Optical plate sensor	Detects the presence of labware on the plate stage.
		For details, see "Understanding how plate detection works" on page 57.
3	Gripper fingers	The components that close to grip and open to release labware on the plate stage or in the bucket at the door.
4	Gripper pads	The two pads on the inward-facing surface of each gripper finger. Each gripper pad has a protrusion that grips microplates. The grip point is defined as the center of the gripper pad protrusion.

Figure   Gripper pads on gripper finger
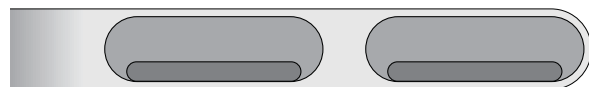
Item	Part	Description
5	Plate stage	The platform upon which a robot places labware to be picked up by the Loader gripper.

Axes of movement

The Loader gripper has three axes of movement.

Axis	Directions of Motion	Positive direction is towards the...
y	Forward/Back	Centrifuge door
z	Up/Down	Top of the range of movement
Gripper	Open/Close	Closed position
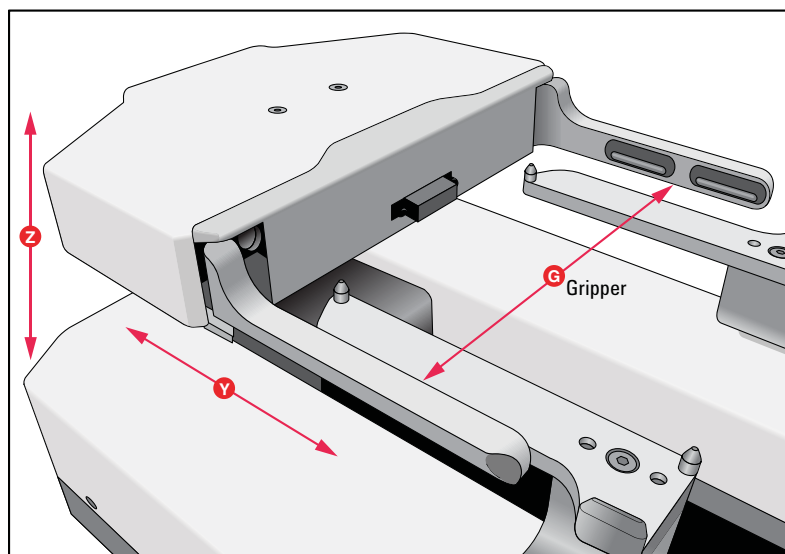
Related information

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Initializing the device	"Initializing the device profile and checking status" on page 53
Spinning microplates	"Workflows for performing spins" on page 78
Labware considerations	"Labware and performance specifications" on page 22

Software overview

About this topic

This topic describes the software that you use to operate the Centrifuge with Loader.

Diagnostics software

You use the following diagnostics software for the Centrifuge with Loader:

Centrifuge Diagnostics

Centrifuge Diagnostics enables you to:

- Set up the Centrifuge device for automated operation. The setup requires a device profile. A Centrifuge device profile specifies the:
  - Serial communication connection (COM port) with the controlling computer.
  - The bucket home positions. The home position is the location to which the rotor turns to line up a bucket with the door.
- Spin individual microplates without running a protocol.
- Diagnose problems. You can view status information and move Centrifuge components to diagnose and troubleshoot problems.

Centrifuge Loader Diagnostics

Centrifuge Loader Diagnostics enables you to:

- Set up the Loader device for automated operation. The setup requires a device profile. A Loader profile specifies the:
  - Communication connection with the controlling computer, either an Ethernet connection (IP address) or serial connection (COM port).
  - Centrifuge profile to use.
- Load, unload, and spin individual microplates without running a protocol.
- Diagnose problems. You can view status information and move Centrifuge with Loader components to diagnose and troubleshoot problems.

About labware automation software

You can use either the VWorks software or third-party automation software to operate the Centrifuge with Loader in protocol runs. If you plan to use third-party automation software, you use the ActiveX controls to permit the software to interface with the device.

VWorks software

The VWorks software allows you to:

- Set up the Centrifuge with Loader. During setup, you create a device file for the Centrifuge with Loader, and then open Centrifuge Loader Diagnostics to complete the setup.
- Set up user accounts and privileges. You can set up different user accounts to enforce access policies.

- Define labware. Labware definitions describe the labware you will use during protocol runs.
- Create protocols. Protocols determine the sequence of tasks you want to automate in a run.
- Run, pause, monitor, and stop protocols. You can start, pause, monitor, and stop a protocol run from the controlling computer.

ActiveX control

The Centrifuge Loader and Centrifuge ActiveX controls enable third-party automation software to control the Centrifuge with Loader.

Related information

For information about...	See...
Setting up the VWorks software, including defining labware	*VWorks Automation Control Setup Guide*
Setting up the Centrifuge with Loader	"Setup workflow" on page 36
Performing a spin	"Workflows for performing spins" on page 78
Centrifuge Loader ActiveX controls	*Automated Centrifuge Loader ActiveX User Guide*
	Microplate Centrifuge ActiveX v8 User Guide

3
Installing the device

This chapter describes how to install the Centrifuge with Loader.

IMPORTANT   The procedures in this section are intended for personnel properly trained in the installation of such hardware.

Agilent Technologies

Installation workflow

To install the Centrifuge with Loader, perform the following procedures in the order listed.

Step	Procedure	See...
1	Verify that the installation site meets the requirements.	"Laboratory requirements" on page 19
2	Unpack the Centrifuge with Loader.	*Microplate Centrifuge with Loader Unpacking Guide*
3	Install the buckets.	"Installing the buckets" on page 27
4	Mount the Centrifuge with Loader on the laboratory table.	"Mounting the device on a stable surface" on page 24
5	Connect the air and power sources to the Centrifuge.	"Connecting to the air source" on page 29
6	Connect the computer to the Centrifuge with Loader.	"Connecting the device to the computer" on page 32
7	Install the automation control software.	*VWorks Automation Control Setup Guide* or the software release notes

Laboratory requirements

About this topic

This topic describes the requirements for the site where you plan to install the Centrifuge with Loader.

Laboratory space requirements

Ensure that the installation location meets the following requirements:

- Provides proximity to the power outlet and air source.
- Allows sufficient space to accommodate the device and provide clearance at the back of the device to access power, communication, and air tubing connections.

Laboratory table requirements

Ensure that the laboratory table meets the following specifications at a minimum:

- Fixed table (locking casters) that can support the weight of the device without excessive shaking or movement.

  Ensure that the Centrifuge with Loader is mounted on a stable base that does not move in relation to your microplate-handling robot. For your robot to move microplates to and from the Centrifuge Loader plate stage, the three-dimensional position of the plate stage must be fixed and known to the controlling software of the lab automation system.

- Level, non-skid surface: 36 x 49 cm (14 x 19 in) surface. The frame should have a leveling mechanism in the feet or costars.

- Table surface thickness: 1.3 cm (0.5 in)

- Correct bolt-hole pattern for mounting the device to the surface

  For details, see "Mounting the device on a stable surface" on page 24.

- Table weight: 45.5 kg (100 lb)

- Proper height for any operator to comfortably operate the device.

Physical dimensions

The dimensions of the Centrifuge with Loader are as follows.

Dimension	Value
Height	25.1 cm (9.88 in)
Width	32.7 cm (12.9 in)
Depth	71.1 cm (28.0 in)
Weight	34.7 kg (76.5 lb)

Figure   Centrifuge with Loader width and depth (top view)
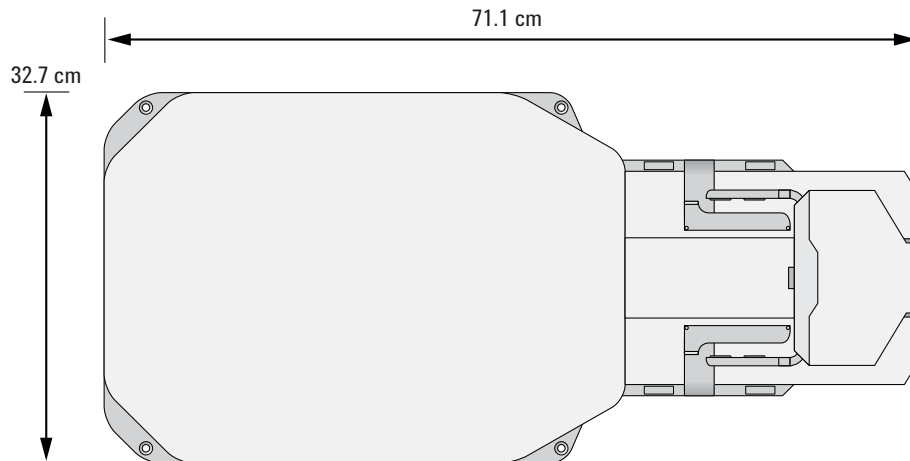
Electrical requirements

The Centrifuge with Loader has the following power requirements:

Requirement	Value
Electrical	100–240~, 50/60 Hz
Fuse	7 A, 250 V, 3AG

The power supply in the Centrifuge supplies power to both the Centrifuge and the Loader.

Compressed air requirements

The Centrifuge with Loader requires the use of clean, dry, compressed air to move the pneumatic components. The compressed air can be from the following sources:

• Centralized source (laboratory)

• Compressed-air cylinders

• Portable pumps

CAUTION   Ensure that the air coming into the device is properly filtered from moisture or aerosolized impurities. Significant moisture or impurities in the air line can adversely affect the performance and life of the device. Using oil compressors can cause oil to leak into the device and void your warranty.

The minimum compressed-air requirements are:

Requirement	Value
Quality	Clean, dry, compressed
Flow rate and pressure	0.5 Lps at 550 kPa (1 cfm at 80 psi)

Environmental requirements

Ambient environment

The Centrifuge with Loader is for indoor use only. The following table lists the operating specifications.

Requirement	Value
Pollution degree	2
Installation category	II
Ambient temperature	
Centrifuge	5 to 40 °C
Centrifuge Loader	15 to 40 °C
Humidity condition	10-90% RH, non-condensing
Elevation	1–2000 m

Computer requirements

The Centrifuge with Loader requires two computer connections:

- The Centrifuge has a DB-9 RS-232 9-pin serial port for serial communication with the controlling computer.

- The Loader can use either of the following:

  - *Serial connection*. A DB-9 RS-232 9-pin serial port for serial communication. If the computer does not have a second serial port, you may use a serial-to-USB connection.

  - *Ethernet network connection*. An Ethernet port for a local area network (LAN) connection to the controlling computer. The computer configuration should include one of the following:

    - One network card if the controlling computer will not be connected to your organization's LAN.

    - Two network cards if the controlling computer will be connected to your organization's LAN in addition to the Loader LAN.

WARNING   **Connecting the Loader to a company or general network can potentially cause injury. Remote computer operators might accidentally initiate an operation that causes the gripper head to move unexpectedly, possibly injuring nearby lab personnel. Avoid connecting the Loader to a company or general network. Ensure that anyone with access to the device is trained in the potential hazards and how to avoid them.**

An Ethernet switch is required if you want to connect the Loader to a network that has other devices on it.

Additional computer requirements depend on the lab automation software you are using.

- For VWorks software computer requirements, see the VWorks software release notes or the Automation Solutions Knowledge Base at www.agilent.com/chem/askb.

- For third-party automation software requirements, see the user documentation supplied with the product.

Related information

For more information about...	See...
Installation workflow	"Installation workflow" on page 18
Labware specifications, performance specifications	"Labware and performance specifications" on page 22
Safety guidelines	"Safety guidelines" on page 1

Labware and performance specifications

Performance specifications

Property	Value
Spindle speed	0–3000 RPM
Maximum centrifugal force on plate	1000 x*g*
Maximum imbalance	10 grams If you require a higher balance tolerance, contact Technical Support.
Maximum mass of each microplate	250 grams
Acceleration	0–2000 RPM in 5.0 seconds 0–3000 RPM in 7.5 seconds
Deceleration	2000–0 RPM in 5.0 seconds 3000–0 RPM in 7.5 seconds
Loader maximum speed	
y-axis	760 mm/s
z-axis	380 mm/s
Gripper open/close	80 mm/s

Labware specifications

For microplate weight limitations, see "Performance specifications" on page 22.

The Centrifuge is designed for labware that comply with the standards ANSI/SLAS 1‑2004 (R2012) through ANSI/SLAS 4‑2004 (R2012). Carefully evaluate any labware before use. If you have questions, contact your Agilent representative for evaluation.

The overall labware dimensions, including a lid, must fit within the following values.

- Width: 12.8 cm (5.03 in)
- Depth at base: 8.6 cm (3.38 in)
- Depth above base and height:
  - 8.6 cm (3.38 in) up to 4.0 cm (1.57 in)
  - 7.8 cm (3.07 in) up to 4.8 cm (1.89 in)

The maximum height specification varies based on the depth measurement above a height of 4.0 cm, as the following figure shows.

Figure   Labware maximum height based on depth
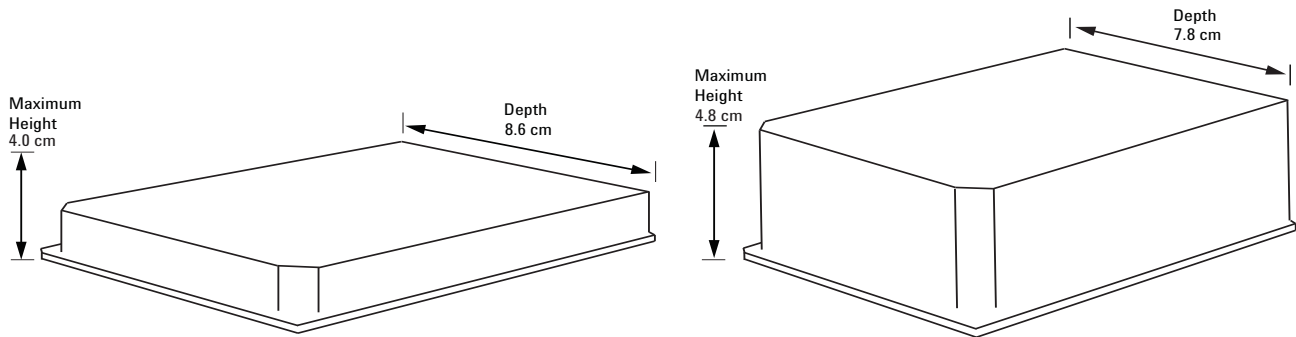
CAUTION   Even if a microplate will fit through the Centrifuge door, an oversized microplate can cause a collision during a spin cycle when the buckets are tilted. Ensure that the microplate and lid, if applicable, fit within the specified depth profile.

Figure   Depth profile (**A**) labware that fits within the profile and (**B**) labware that does not fit the profile
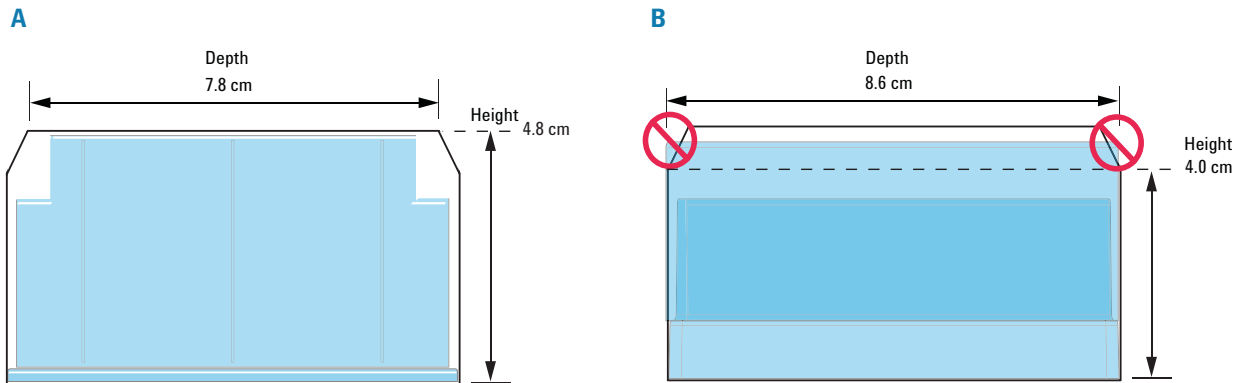
In example **A**, the microplate is 4.8‑cm tall and has a 8.6‑cm skirt depth, but the upper portion of the microplate fits within the 7.8‑cm specification.

In example **B**, the microplate has a lid. The depth of the top of the lid (8.6 cm) exceeds the 4.0 cm maximum height. This microplate with lid might fit through the Centrifuge door and into the bucket. However, during a spin cycle when the buckets are tilted, the top corners of the lid would collide with the Centrifuge rotor, potentially resulting in equipment damage.

Related information

For more information about...	See...
Installation workflow	"Installation workflow" on page 18
Safety guidelines	"Safety guidelines" on page 1

Mounting the device on a stable surface

Before you start

Follow the instructions in the *Microplate Centrifuge with Loader Unpacking Guide* to unpack the device and remove the shipping brace.

WARNING   The Centrifuge with Loader weighs 34.7 kg (76.5 lb). Attempting to move the device without assistance could cause personal injury. Request assistance and use proper lifting techniques when lifting the device.

CAUTION   Using the Loader as a lift point can damage the baseplate, which is easily bent. A damaged baseplate can result in improper teachpoint alignment and decreased gripper-head accuracy. To avoid potential damage, do not use the front end of the Loader as a lift point. To lift the device, position a person on each side and grasp the device at the Centrifuge door and at the rear control panel recess.
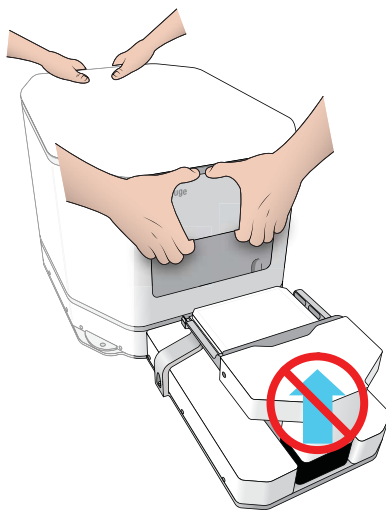
> **CAUTION**   Dropping or bumping the Centrifuge or the buckets can damage the device and result in further damage during a Centrifuge spin cycle. If the Centrifuge is subjected to a forceful impact, do not use the device until it is safe to operate. If you have questions about potential equipment damage, contact Agilent Automation Solutions Technical Support.

Perform the following steps to mount the device.

Step	For this task…	See…
1	Ensure the installation site meets the requirements.	"Laboratory requirements" on page 19
2	Prepare the table surface for installation of the device.	"Preparing the table surface for installation" on page 25
3	Mount the device on the table surface.	"Mounting the Centrifuge with Loader to a stable surface" on page 26

Preparing the table surface for installation

Before mounting the Centrifuge with Loader you must prepare the mounting surface. You can mount the device directly on a tabletop or on a mounting plate that also holds other components of your system. You should have the tabletop or mounting plate accurately drilled and tapped to create screw holes, according to the dimensions given in this section.

To prepare your table surface for installation:

1   Refer to the following figure for the mounting hole locations.

2   Using a #9 drill bit with an M6 tap, drill and tap the mounting holes into the tabletop or mounting plate.

Figure   Centrifuge with Loader mounting holes (top view)

Mounting the Centrifuge with Loader to a stable surface

Note: The Centrifuge with Loader includes four M6 X 30 flathead screws for mounting the device. You may need to obtain screws that are a more suitable length for your particular laboratory setup.

To mount the Centrifuge with Loader to a stable surface:

1 Using the proper lift points, position the Centrifuge with Loader on the table so that the screw holes in the its base align with the screw holes in the tabletop.

All holes accommodate M6 flathead cap screws.

2 Screw one M6 flathead screw into a front screw hole, and another into the diagonally opposed screw hole on the rear, making sure that both screw completely into the base.

Gently nudge the Centrifuge with Loader back and forth as you install the screws to ensure that the device screw holes are seated squarely over the screw holes in the mounting surface.

Tighten the front screw before tightening the rear screw.

3 Install the other two screws into the screw holes, making sure they screw completely into the base.

4 Verify that the Centrifuge with Loader is firmly mounted to the surface by gently trying to move it.

If the Centrifuge with Loader moves, loosen the screws and repeat step 2 and step 3 to re-tighten the screws.

Related information

For more information about...	See...
Site requirements	"Laboratory requirements" on page 19
Installation workflow	"Installation workflow" on page 18
Safety guidelines	"Safety guidelines" on page 1

Installing the buckets

About this topic

The buckets are packaged in their own box to minimize damage to the Centrifuge during shipment. This topic describes how to install the buckets in the Centrifuge.

Before you start

Manually open the Centrifuge door. For instructions, see "Unlocking and opening the door manually" on page 111.

Procedure

To install or replace a bucket:

1 Ensure that the rotor is positioned so that the bucket pins are centered in the open doorway.

   If necessary, manually rotate the rotor to align it as the following figure shows.

2 Pass the bucket through the open door as the following figure shows.

Figure Open door showing (**1**) rotor pin, (**2**) bucket hanger, and (**3**) rear tab
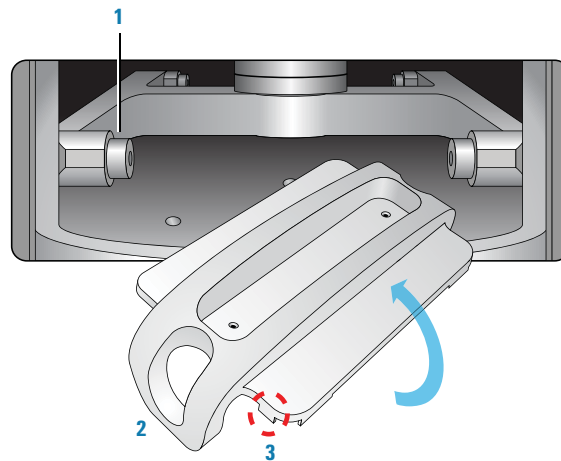
3 Roll the bucket right-side-up so that the bucket hangers are seated onto the rotor pins.

   You may need to align one hanger on a rotor pin, and then adjust the position before you can align the second hanger onto the other rotor pin.

4 Ensure that the bucket tabs are facing up, and that the rear tabs are towards the rotor, as the following figure shows.
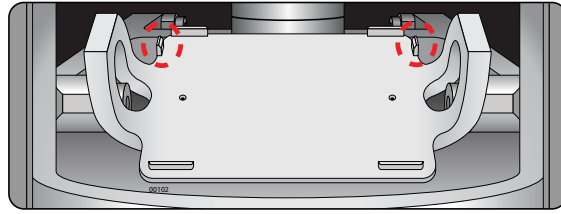
5 Push the bucket onto the pins until the bucket seats snugly and can pivot freely.

Figure   Detail of buckets seated on rotor pins
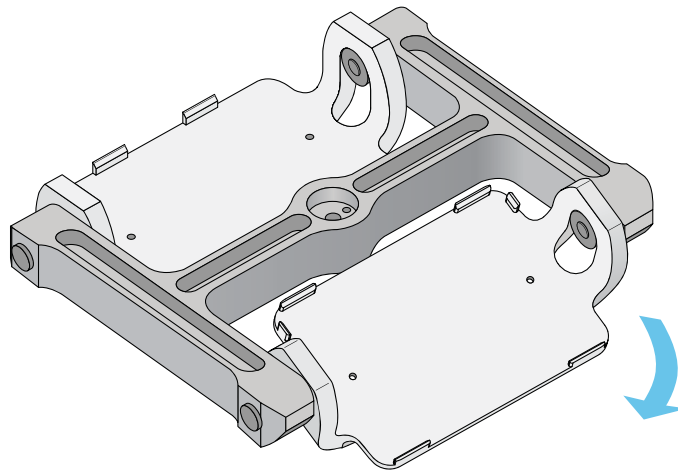
Related information

For more information about...	See...
Site requirements	"Laboratory requirements" on page 19
Installation workflow	"Installation workflow" on page 18
Safety guidelines	"Safety guidelines" on page 1

Connecting the air, power, and e-stop

Before you start

- Make sure the laboratory setup requirements have been met. See "Laboratory requirements" on page 19.
- Make sure you have the supplied power cord, air connection kit, including tubing and fittings.

Connecting to the air source

This section includes procedures for both:

- Non-metric-based installations, such as those in the US
- Metric-based installations

⚠️ **WARNING Working with open, charged air lines can result in injury. Turn off the compressed air line when disconnecting or reconnecting devices that use compressed air. Contact your facilities department or Agilent Automation Solutions Technical Support with questions about setting up the air line.**

CAUTION Dirt in unfiltered air can build up in the Centrifuge air valves and can eventually cause a malfunction. Ensure that the air supply is properly filtered for moisture and aerosol impurities.

The following procedure is for a direct connection. If you have another instrument connected to the house air supply, you can use the supplied T-connector to connect into the existing air tubing.

To install the compressed air line (non-metric):

1 Turn off the air supply before connecting the air tubing to the Centrifuge.

2 Cut the supplied tubing to the required length.

3 Connect one end of the tubing to the air source.

4 If your air line uses a threaded port, attach the 0.25-in NPT fitting to the port. Attach the 0.25-in one-touch hose fitting into the 0.25-in tubing.

5 Plug the other end of the 0.25-in tubing into the one-touch air-supply port on the back of the Centrifuge.

6 Test the installation by gently tugging the air tubing.

   If you feel resistance, the line has been properly installed. If the tubing comes free, it needs to be inserted with more force.

Figure Air line connection
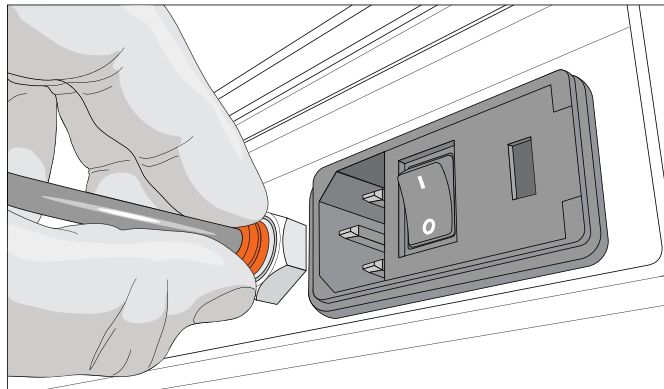
To install the compressed air line (metric)

1 Push one end of the nipple (white plastic tube) into the 0.25-in side (red side) of the adapter.

2 Push the other end of the nipple into the air input port on the Centrifuge.

3 Push the 6-mm tubing into the blue side of the adapter.

> **CAUTION** Attempting to use tubing that has a different diameter can damage the adapter.

4 Gently pull on the air tubing to ensure that the assembly is connected properly.

Connecting the power cord

To connect the power cord to the Centrifuge:

1 On the back of the Centrifuge, ensure that the power switch is set to **off** (**0**).

2 Connect one end of the power cord to the AC power entry on the back of the Centrifuge.

3 Connect the other end of the power cord to an AC outlet with a grounded circuit.

Connecting the E-stop port

The Centrifuge Loader is equipped with a safety interlock circuit, which is designed to protect operators from moving-parts hazards. The safety interlock circuit must be closed for the Loader to operate.

To close the safety interlock circuit, you connect the E port (emergency-stop interface) to one of the following:

• A system-wide emergency-stop mechanism

  If the Centrifuge with Loader is integrated in an automation system, Agilent Technologies recommends that you install a system-wide emergency-stop button to stop all the integrated devices simultaneously.

• An e-stop jumper (provided)

Figure   Emergency-stop port on Loader (rear view)
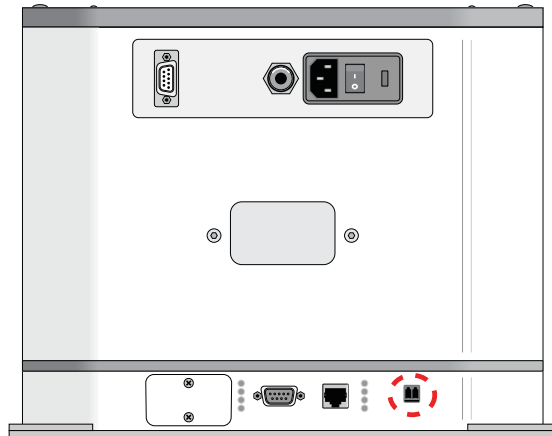
Related information

For more information about...	See...
Connecting the Centrifuge with Loader to the computer	"Connecting the device to the computer" on page 32
Site requirements	"Laboratory requirements" on page 19
Installation workflow	"Installation workflow" on page 18
Safety guidelines	"Safety guidelines" on page 1

Connecting the device to the computer

Before you start

The Centrifuge with Loader requires two computer connections:

- The Centrifuge uses a serial connection to the controlling computer.
- The Loader can use a serial or an Ethernet connection.

Figure Control panel: **A** Centrifuge serial port, **B** Loader serial and Ethernet ports
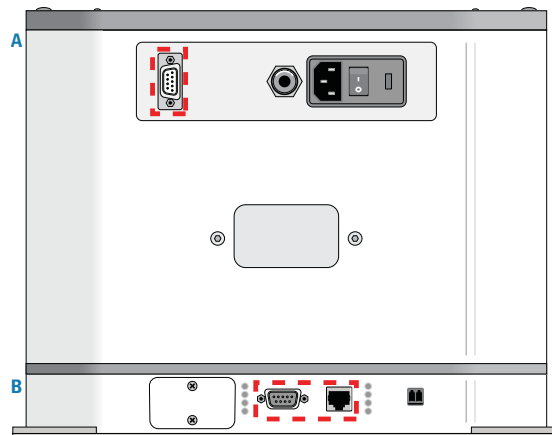
Ethernet connection

If you want to use an Ethernet connection for the Loader, you can connect it to the same computer that is connected to the Centrifuge, or to any computer that is connected to the same network.

WARNING **Connecting the Loader to a company or general network can potentially cause injury. Remote computer operators might accidentally initiate an operation that causes the gripper head to move unexpectedly, possibly injuring nearby lab personnel. Avoid connecting the Loader to a company or general network. Ensure that anyone with access to the device is trained in the potential hazards and how to avoid them.**

Connecting the Centrifuge to the computer

To connect the Centrifuge to the computer:

1 Connect one end of the supplied serial communications cable to the serial port on the back of the Centrifuge.

2 Connect the other end of the serial communications cable to a serial port on the controlling computer.

Make a note of the COM port number. You will provide the number when creating a Centrifuge profile in Centrifuge Diagnostics.

Connecting the Loader using a serial connection

If you want to use a serial connection for both the Centrifuge and the Loader, your computer must have a second DB-9 serial port available. Alternatively, you may use a USB-to-serial connection to connect a serial cable to the Loader.

To connect the Loader using a serial connection:

1 Connect one end of the serial communications cable to the serial port on the back of the Loader.

2 Connect the other end of the serial communications cable to a serial port on same computer that is connected to the Centrifuge.

Make a note of the COM port number. You will provide the number when creating a Loader profile in Centrifuge Loader Diagnostics.

Note: For a USB-to-serial connection, you can use the Device Manager in the Windows Control Panel to identify the port number. If you have trouble identifying the port number, verify that the USB-to-serial device driver is installed and up to date.

Connecting the Loader using an Ethernet connection

You can connect the Loader to the computer using one of the following methods:

- *Connect directly to the computer.* If you are using one Loader and the controlling computer will not be connected to your organization's network, you can use the computer's existing network card.

- *Connect through an Ethernet switch.* If you are connecting the Loader to a local area network (LAN) that has other devices on it, use an Ethernet switch.

To connect the Loader directly to the computer:

1 Connect one end of the Ethernet cable to the Ethernet port on the Loader.

2 Connect the other end of the cable to the Ethernet port of the computer.

To connect through an Ethernet switch:

Note: If you are adding the Loader to an existing LAN, step 1 should already be done.

1 Connect the switch to the computer as follows:

   a Connect the power cord to the switch.

   b Connect one end of the Ethernet cable into any Ethernet port on the switch, and connect the other end of the cable to an Ethernet port on the computer.

2 Connect the Loader to the switch as follows:

   a Connect one end of a second Ethernet cable to a port on the Ethernet switch.

   b Connect the other end of the cable to the Ethernet port on the Loader.

IMPORTANT   Do not use a crossover cable with an Ethernet switch. The switch performs the crossover function.

Note: You can connect as many devices to the network as there are Ethernet ports available.

About configuring the computer's network card (Ethernet only)

If you are adding the Loader to an existing LAN, the network card should already be configured.

Make sure the value of the network card IP address and subnet mask are as follows:

- IP address: 192.168.0.1
- Subnet mask: 255.255.255.0

If your computer will be connected to your LAN, make sure the computer has a second network card. The second network card can have a dynamic IP address.

Related information

For more information about...	See...
Site requirements	"Laboratory requirements" on page 19
Installation workflow	"Installation workflow" on page 18
Safety guidelines	"Safety guidelines" on page 1
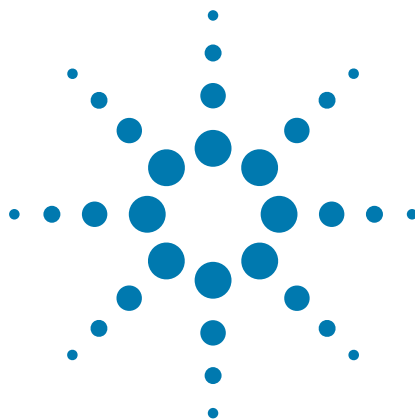
4

Setting up the devices

This chapter contains the following topics:

Agilent Technologies

Setup workflow

Perform the following procedures in the order listed to set up the Centrifuge with Loader.

Step	Procedure	See…
1	Turn on the Centrifuge with Loader.	"Starting up and shutting down" on page 37
2	In the VWorks software, create a device file and add the following: • Centrifuge device • Loader device	"Creating and editing device files" on page 39
3	Open Centrifuge Diagnostics and create a Centrifuge profile.	"Opening diagnostics software" on page 43 "Creating and editing profiles" on page 47
4	Open Centrifuge Loader Diagnostics and create a Loader profile.	"Opening diagnostics software" on page 43 "Creating and editing profiles" on page 47
5	Initialize the Centrifuge Loader profile.	"Initializing the device profile and checking status" on page 53
6	Set the Centrifuge bucket 1 and bucket 2 home positions.	"Setting the Centrifuge bucket home positions" on page 59
7	*Optional*. Understand the Loader teachpoint requirements.	"About the Loader teachpoints" on page 70
8	Verify the Loader teachpoints by loading and unloading plates in slow motion.	"Determining if the Loader teachpoints require adjustment" on page 74
9	Verify that you can perform a spin using Centrifuge Loader Diagnostics.	"Performing a spin" on page 77
10	Edit the VWorks labware definitions to include the Centrifuge Loader parameters.	*VWorks Automation Control Setup Guide*
11	Set the external robot teachpoint for picking and placing labware on the plate stage.	User documentation for the external robot

Starting up and shutting down

Starting up the Centrifuge with Loader

To start up the Centrifuge with Loader:

1 Verify that the air supply is turned on.

2 Turn on the computer and the monitor. Wait for the Microsoft Windows operating system to finish starting up.

3 On the back of the Centrifuge with Loader, press the power switch to the on (**I**) position.

Figure Power switch on Centrifuge with Loader (rear view)
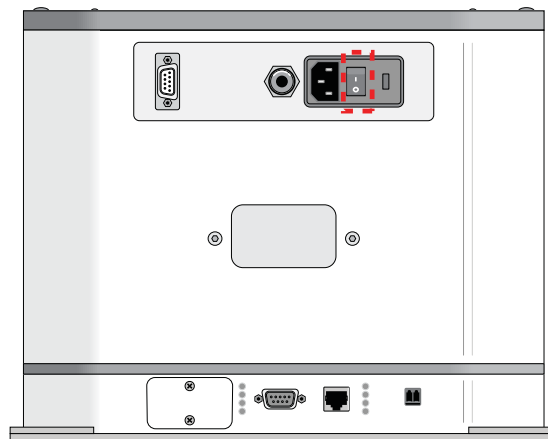
4 Start the VWorks software.

5 To establish communication with the Centrifuge with Loader, ensure that VWorks simulation is off, and then initialize the Centrifuge and the Loader devices.

For details, see "Initializing the device profile and checking status" on page 53.

If you have not yet created a device file or configured the device profile for your setup, see "Creating and editing profiles" on page 47.

Shutting down the Centrifuge with Loader

To shut down the Centrifuge with Loader:

1 Remove any labware or counterweight that is in the Centrifuge.

For unloading instructions, see "Loading and unloading microplates and counterweights" on page 80.

2 Close the Centrifuge Loader Diagnostics dialog box, if applicable.

3 In the VWorks window, select the Centrifuge Loader device in the device tab, and then click **Close selected device**.

4 Exit the VWorks software.

5 Shutdown the computer.

6 On the back of the Centrifuge, press the power switch to the off position (**O**).

7 Turn off the air supply to the Centrifuge.

Related information

For more information about…	See…
Initializing the Centrifuge with Loader	"Initializing the device profile and checking status" on page 53
Creating profiles	"Creating and editing profiles" on page 47
Loading and unloading microplates	"Loading and unloading microplates and counterweights" on page 80
Using Centrifuge Loader Diagnostics to perform a spin	"Spinning the microplates" on page 83
How to use the VWorks software to run a protocol	"Workflow for running a protocol" on page 78

Creating and editing device files

About this topic

This topic explains how to create a device file in the VWorks software and how to edit the device properties.

If you already have a device file you want to use, proceed to the following:

- "Adding a Centrifuge with Loader to the device file" on page 40
- "Setting the Centrifuge Loader device properties" on page 41

Devices and device file defined

What is a device?

A device is an item in your lab automation system that has an entry in the VWorks software device file. A device can be a robot, an instrument, or a location in the system that can hold a piece of labware.

What is a device file?

To communicate with and to control the robot and integrated devices, the VWorks software uses a device file that contains the following information:

- List of devices the software will communicate with and control
- Profile of each device (communication method, unique device configuration information)
- System-related configuration information of each device (for example, approach height, barcode access, and so on)

You provide the device information in the VWorks software. The device information is stored in a device (.dev) file that is located in a folder you specify when saving the file.

For detailed information about device files and associations with profiles, teachpoint files, and other VWorks components, see the *VWorks Automation Control User Guide*.

Creating a device file

Before you create a device file, start the VWorks software and log in. See the *VWorks Automation Control User Guide* for instructions.

To create a new device file:

1   In the **VWorks** window, select **File > New > Device**. A Device File tab appears.
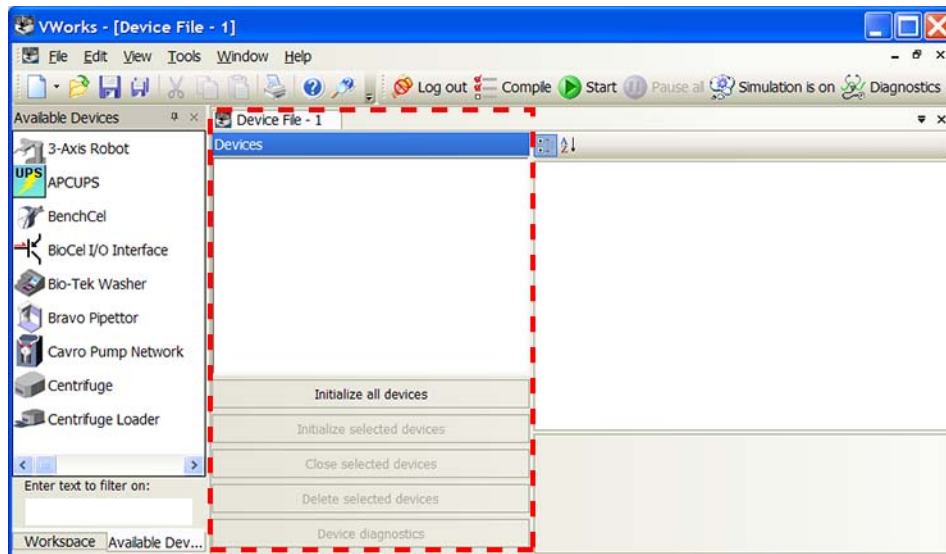
2 Select **File > Save** to save the device file. The file name appears in the Device File tab.

Adding a Centrifuge with Loader to the device file

To add the Centrifuge with Loader to the device file:

1 In the **Available Devices** area, double-click the **Centrifuge Loader** device icon, or drag the icon into the **Device File** area.
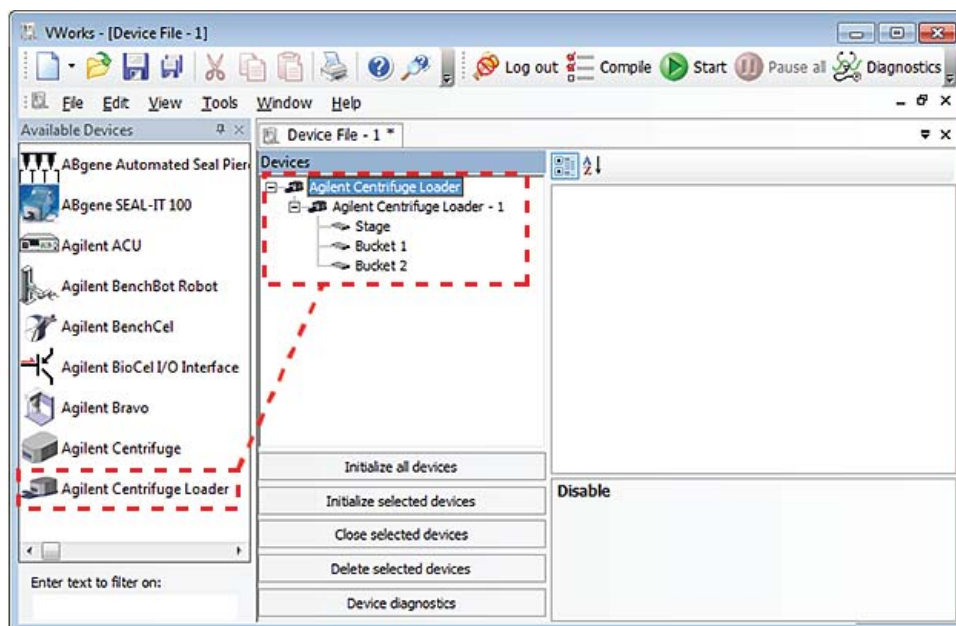
Notice that in the **Devices** area, the first Centrifuge Loader device is labeled Centrifuge Loader-1. If you add another Centrifuge Loader device, it will appear as Centrifuge Loader-2, and so forth.

Note: If you do not see the Centrifuge Loader in the Available Devices list, check that the plugin file (.dll) is stored in the following folder:

\Velocity11\VWorks\Plugins

If you have added the plugin file in the Plugins folder and started the VWorks software, and still do not see the device in the Available Devices list, close any open device files and protocol files, and then select Tools > Reload Plugins.

Setting the Centrifuge Loader device properties

To set the Centrifuge Loader properties:

1 In the **Centrifuge Loader Properties** area of the device file, type or select the following:

Property	Description
Name	The name of the Centrifuge with Loader.
Profile	The profile associated with the Centrifuge Loader device.
	Select the desired profile from the list. If the profile you want does not appear in the list, or if no profile appears in the list, see "Creating and editing profiles" on page 47, and then return to this step to select the profile.
	IMPORTANT Without the profile, you will not be able to establish communication with the device.
Disable	The option to disable this device. Ensure that the check box is clear if you want to enable this device.

2 In the **Devices** area, expand **Centrifuge Loader**, and then select **Stage.**

3 In the **Centrifuge Loader Location Properties** area, set the following parameters:

Parameter	Description
Allow/prohibited labware	Permitted labware class for the selected location.
	Use this field only if you want to limit the labware types. For details on labware classes, see the *VWorks Automation Control Setup Guide*.
BCR on south/ west/north/east side	The location of the barcode reader and the desired barcode reader device.
	Use this field only if a barcode reader is installed on the device.
Teachpoint for robot *<name of Agilent Centrifuge Loader>*	The name of the selected component.
	If you selected Stage in the previous step, Stage should be selected here.
Use for deadlock avoidance	The option to permit the location to be used for deadlock avoidance.
	Select **Yes** to permit labware to be moved to this location to avoid a deadlock in the system.
	Select **No** if you do not want to move random labware to this location to avoid deadlock.
	IMPORTANT For typical operation, select **Yes** for the Stage.
Door	Not applicable

4 In the **Devices** area, under **Centrifuge Loader**, select **Bucket 1.**

5 Repeat step 2 to set the properties for the **Bucket 1**, except ensure the following:

   a **Teachpoint for robot** *<name of Agilent Centrifuge Loader>* is set to **Bucket 1**.

   b **Use for deadlock avoidance** is set to **No**.

6 In the **Devices** area, under **Centrifuge Loader**, select **Bucket 2.**

7 Repeat step 2 to set the properties for the **Bucket 2**, except ensure the following:

   a **Teachpoint for robot** *<name of Agilent Centrifuge Loader>* is set to **Bucket 2**.

   b **Use for deadlock avoidance** is set to **No**.

8 Select **File > Save** to save the device file.

Related information

For more information about…	See…
Initializing the Centrifuge with Loader	"Initializing the device profile and checking status" on page 53
Creating profiles	"Creating and editing profiles" on page 47

For more information about...	See...
Loading and unloading microplates	"Loading and unloading microplates and counterweights" on page 80
Using Centrifuge Loader Diagnostics to perform a spin	"Spinning the microplates" on page 83
How to use the VWorks software to run a protocol	"Workflow for running a protocol" on page 78

Opening diagnostics software

About this topic

This topic describes how to open the diagnostics software:

- "Opening Centrifuge Loader Diagnostics" on page 43
- "Opening Centrifuge Diagnostics" on page 45

Opening Centrifuge Loader Diagnostics

To open Centrifuge Loader Diagnostics:

1   In the **VWorks** window, ensure that the device file for your device is open.

To open the device file, choose **File > Open**. In the **Open** dialog box, select the ***.dev** file type, navigate to the device file, and then click **Open**.

A list of the devices appears in the Device File tab.

2   Select the Centrifuge Loader device, and then click **Device diagnostics**.
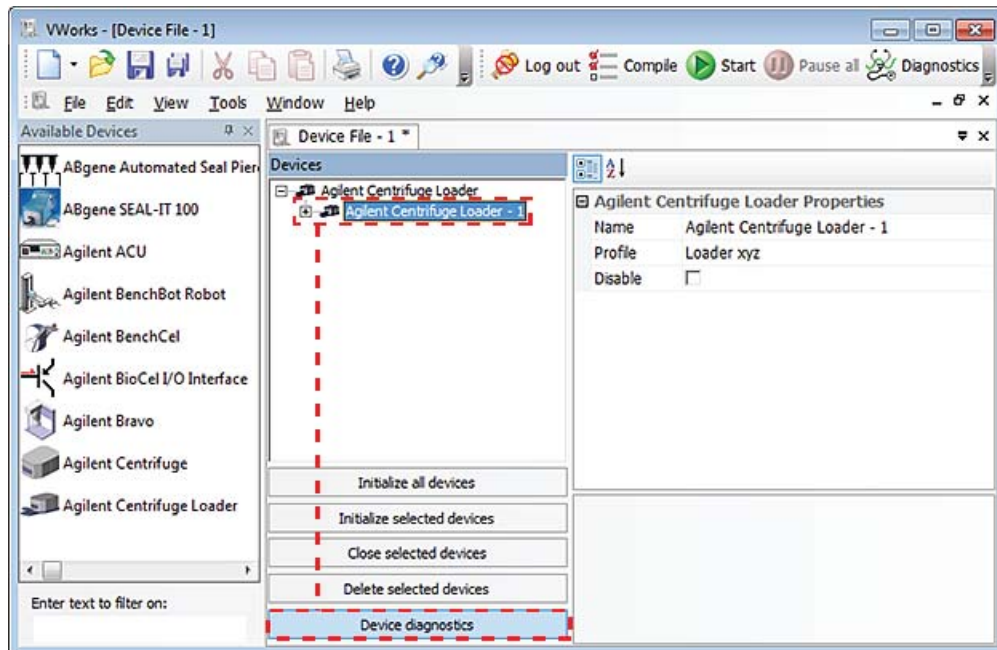
The Centrifuge Loader Diagnostics dialog box opens.
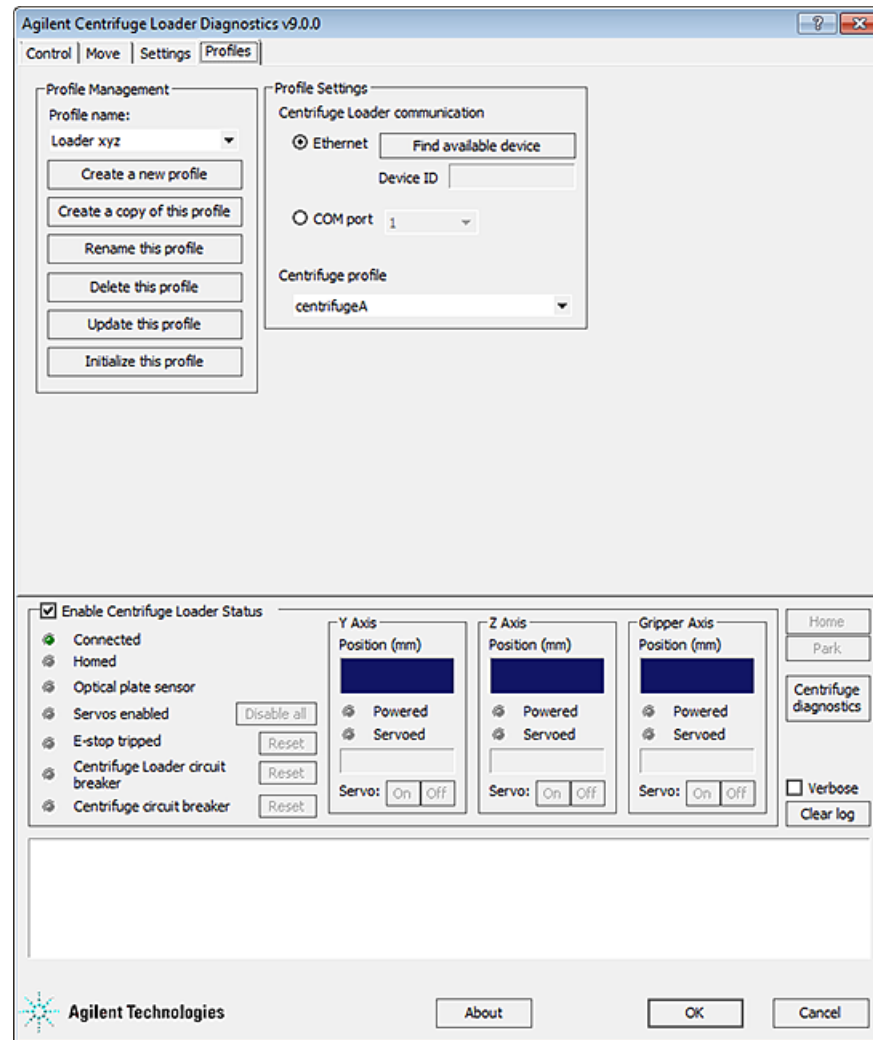
Opening Centrifuge Diagnostics

To open Centrifuge Diagnostics from Centrifuge Loader Diagnostics:

In the **Centrifuge Loader Diagnostics** dialog box, click **Centrifuge diagnostics**.

The Centrifuge Diagnostics dialog box opens.

Figure   Centrifuge Loader Diagnostics dialog box and Centrifuge Diagnostics dialog box

Related information

For more information about...	See...
Initializing the Centrifuge with Loader	"Initializing the device profile and checking status" on page 53
Creating profiles	"Creating and editing profiles" on page 47
Loading and unloading plates	"Loading and unloading microplates and counterweights" on page 80
Using Centrifuge Loader Diagnostics to perform a spin	"Spinning the microplates" on page 83
How to use the VWorks software to run a protocol	"Workflow for running a protocol" on page 78

Creating and editing profiles

About this topic

This topic includes the following:

- "About Centrifuge with Loader profiles" on page 47
- "Creating and verifying a Centrifuge profile" on page 48
- "Creating a Centrifuge Loader profile" on page 50
- "Editing and managing profiles" on page 51

About Centrifuge with Loader profiles

A VWorks device profile is a collection of settings that manages how you connect to a device. The Centrifuge with Loader requires two device profiles.

1 Centrifuge profile to specify the following:

- COM port used to establish communication between the Centrifuge and the controlling computer.
- The Centrifuge bucket 1 and bucket 2 home positions.

2 Centrifuge Loader profile to specify the following:

- Serial or Ethernet connection used to establish communication between the Loader and the controlling computer.
- The Centrifuge profile for the Centrifuge with Loader device.

Note: For a detailed description of the relationships between the device file and profile, see the *VWorks Automation Control User Guide*.

Before you start

In the **VWorks** window, ensure that **Simulation is off**.
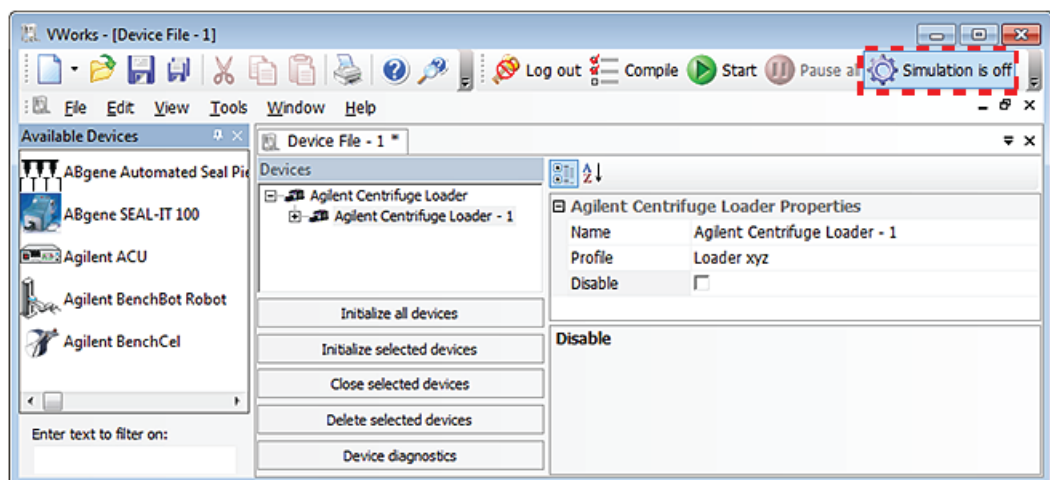
You create the profiles in the diagnostics software. Use the following workflow for the Centrifuge with Loader:

Step	Task	See...
1	Create and verify the Centrifuge profile.	"Creating and verifying a Centrifuge profile" on page 48
2	Create a Centrifuge Loader profile that is linked to the Centrifuge profile.	"Creating a Centrifuge Loader profile" on page 50
3	Ensure that both the Loader and the Centrifuge initialize when you initialize the Centrifuge Loader profile.	"Initializing the profile in Centrifuge Loader Diagnostics" on page 54

For instructions on how to open diagnostics, see "Opening diagnostics software" on page 43.

Creating and verifying a Centrifuge profile

To create a Centrifuge profile:

1   Open the **Centrifuge Loader Diagnostics** dialog box, and then click **Centrifuge diagnostics** to open the **Centrifuge Diagnostics** dialog box.

Figure   Centrifuge Loader Diagnostics dialog box and Centrifuge Diagnostics dialog box
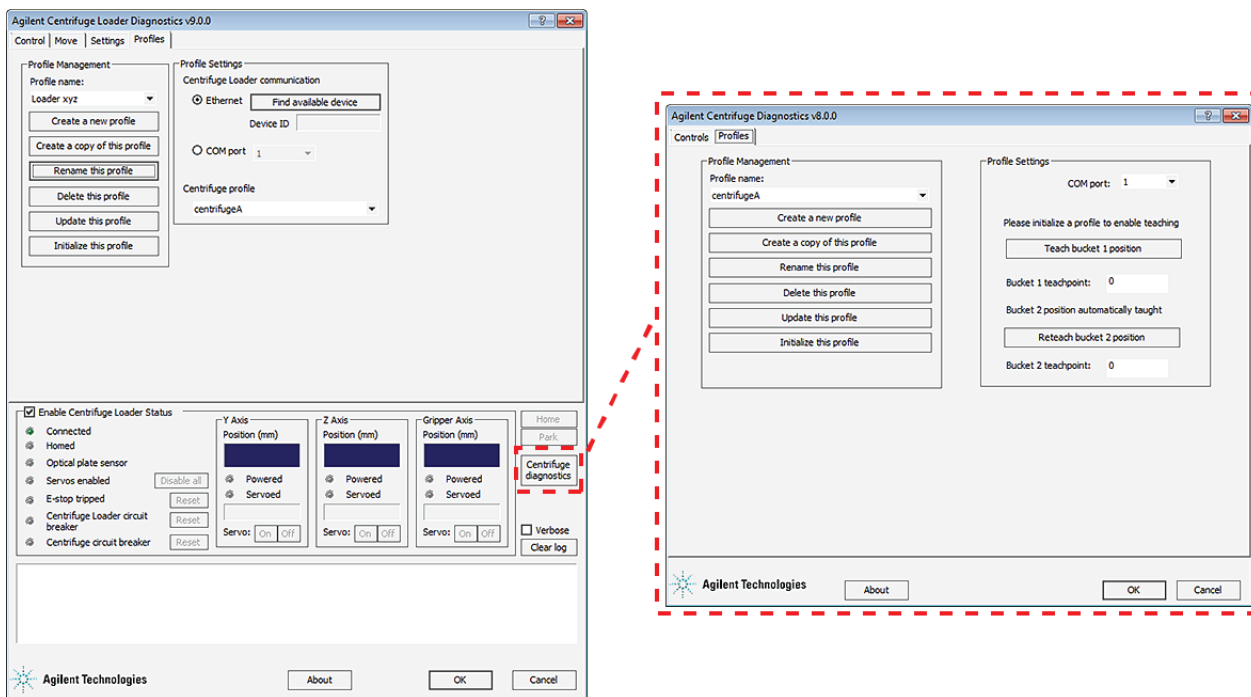
2   In the **Profiles** tab, click **Create a new profile**.

Figure   Centrifuge Diagnostics Profiles tab
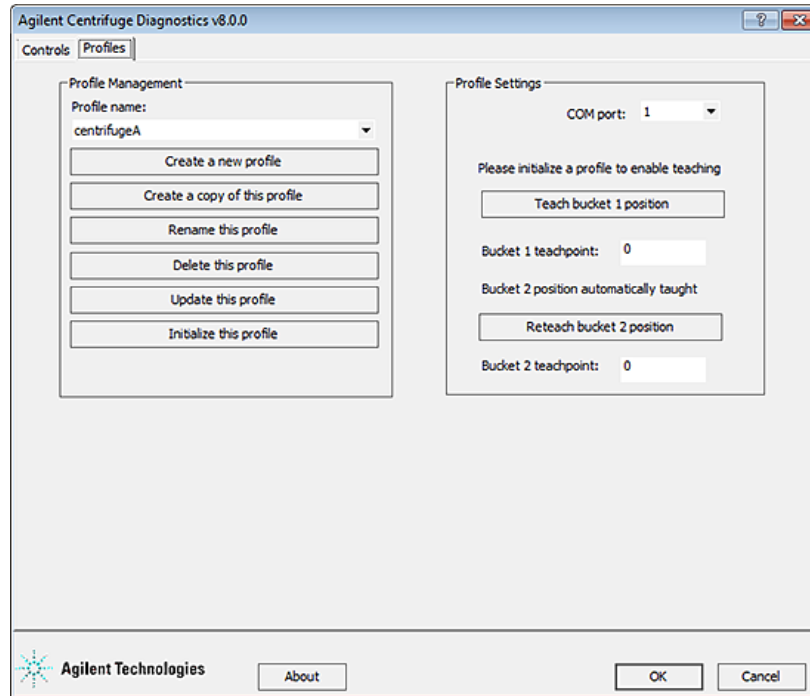
3   In the **Create Profile** dialog box that opens, type a profile name, and then click **OK**.

4   In the COM port list, select the COM port on the controlling computer that is connected to the Centrifuge.

5   Notice the **Bucket 1 teachpoint** and **Bucket 2 teachpoint** settings. You will set these bucket home positions after you establish communication with the device. Use the default value for now.

6   To save the profile settings, click **Update this profile.**

7   Verify that you can establish communication as follows:

a   Click **Initialize this profile**.

b   Ensure that the Centrifuge initializes. During initialization, the door closes, the rotor spins to the bucket 1 position, and then the door opens.

Note: If the device fails to initialize, verify the COM port number in the profile. If the problem persists, restart the VWorks software, and if necessary, power cycle the device.

Creating a Centrifuge Loader profile

To create a Centrifuge Loader profile:

1   In the **Centrifuge Loader Diagnostics** dialog box, click the **Profiles** tab.

Figure   Centrifuge Loader Diagnostics Profiles tab
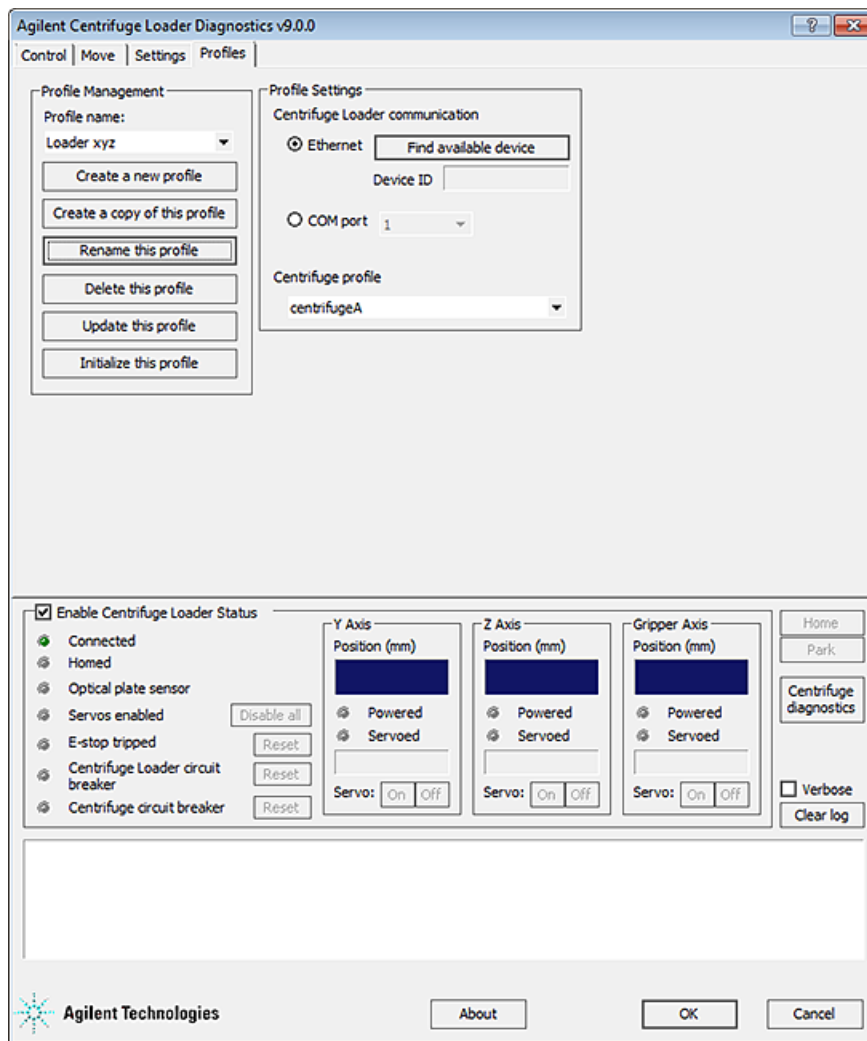
2   Click **Create a new profile**. The **Create Profile** dialog box opens.

3   Type a profile name, and then click **OK**.

4 Under **Profile Settings**, select the communication type to match the type of cable you connected to the Loader connection panel:

- *Ethernet*. Select **Ethernet**, and then continue with step 5.

- *Serial*. Select **COM port**, and then select the number of the COM port on the computer. Go to step 6.

  Note: For a USB-to-serial connection, you can use the Device Manager in the Windows Control Panel to identify which port number you should use in the profile.

5 *Ethernet connection only*. Click **Find available device** to select the device to associate with the profile.

In the **Discovered BioNet Devices** dialog box that appears:

a Click the **Select the Ethernet adapter to use from the list below**, and select the correct adapter for the device connection.

b In the list of devices that appear, select the Loader device. To successfully communicate with the Loader device, the **Status** column must display **New** or **Matched**.

c Click **OK**.
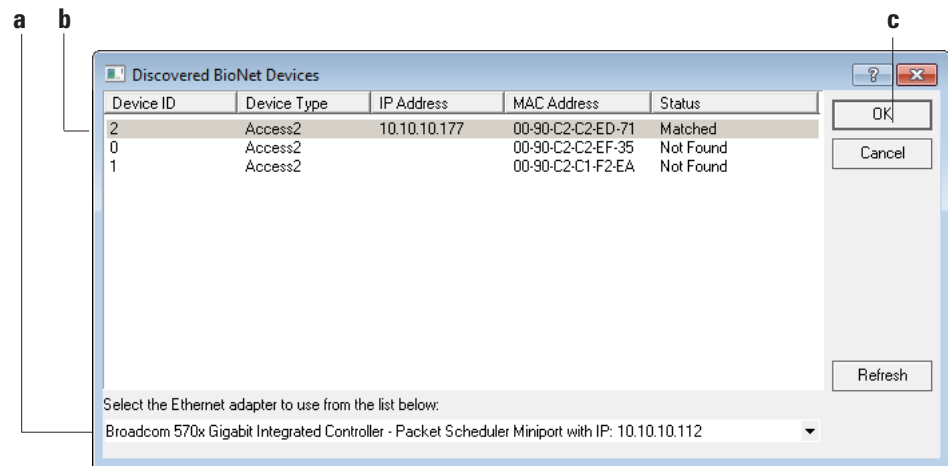
6 In the **Centrifuge profile** list, select the profile of the associated Centrifuge device.

7 To save the profile settings, click **Update this profile.**

Editing and managing profiles

Editing profiles

To edit a profile:

1 In the **Profiles** tab, select the profile you want to edit in the **Profile Management** area.

2 Modify the profile information.

3 When you are finished, click **Update this profile** to save the changes.

Managing profiles

In the **Profiles** tab, you can select an existing profile, and then rename, copy, or delete the profile.

IMPORTANT   The Centrifuge bucket home positions (teachpoints) are associated with a specific Centrifuge profile. A copy of a Centrifuge profile references the same bucket teachpoints as the original profile.

Note: The Loader teachpoints are stored in the firmware.

Related information

For more information about...	See...
Initializing the Centrifuge with Loader	"Initializing the device profile and checking status" on page 53
Using Centrifuge Loader Diagnostics to perform a spin	"Spinning the microplates" on page 83
How to use the VWorks software to run a protocol	"Workflow for running a protocol" on page 78

Initializing the device profile and checking status

About this topic

To establish communication between the computer and the Centrifuge with Loader, you initialize the device in the following ways:

- *Centrifuge Loader Diagnostics.* To control the Centrifuge Loader using Diagnostics, initialize the profile in Centrifuge Loader Diagnostics.

  When you initialize the Centrifuge Loader profile, the associated Centrifuge profile is automatically initialized.

- *VWorks window.* To control the Centrifuge with Loader from the VWorks window, for example, to run a protocol, initialize the Centrifuge Loader device in the VWorks window.

Before you start

In the **VWorks** window, ensure that **Simulation is off**.
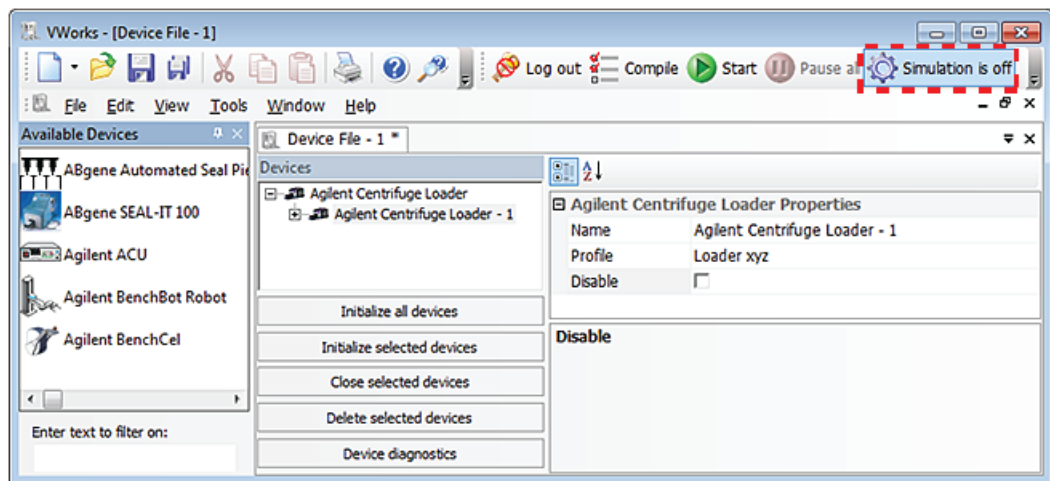
> ⚠️ **WARNING** **The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.**

During initialization, the device does the following:

1 The Loader goes through a homing routine that moves the gripper to different teachpoint locations. The gripper moves to the Park location at the end of Loader initialization.

2 The Centrifuge door closes and locks, the bucket unlocks, and the rotor spins to the bucket 1 position. The bucket locks, the door unlocks and opens.

Note: If you have not yet taught the bucket home positions, the bucket might not be aligned with the door.

Initializing the profile in Centrifuge Loader Diagnostics

To initialize a profile in Centrifuge Loader Diagnostics:

1   Open the **Centrifuge Loader Diagnostics** dialog box.

2   In the **Profiles** tab, ensure that the correct profile is selected in the **Profile name** list.
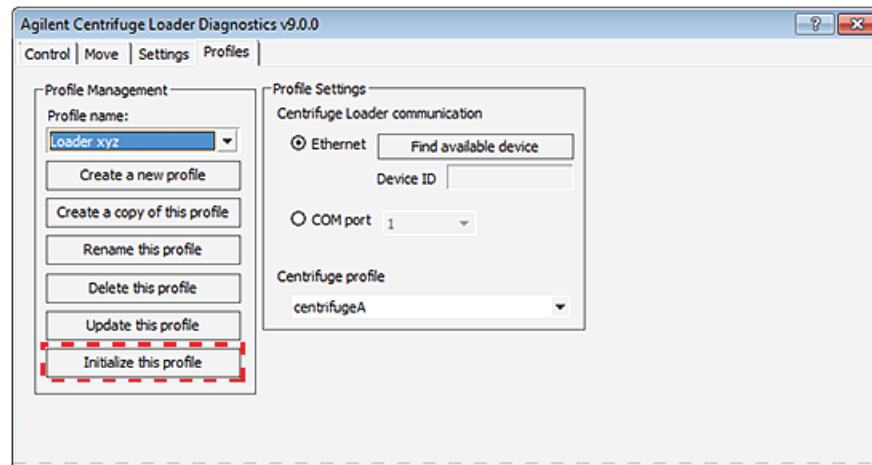
3   Click **Initialize this profile** to start initializing the Centrifuge Loader and the Centrifuge.

If either device fails to initialize, verify the communication settings in the profile and reinitialize the profile. If the problem persists, restart the VWorks software, and if necessary, power cycle the device.

Initializing the Centrifuge with Loader in the VWorks software

To initialize the Centrifuge with Loader from the VWorks software window:

1   In the **VWorks** window, choose **File > Open**. In the **Open** dialog box, select the ***.dev** file type, navigate to the device file, and then click **Open**.

A list of the devices appears in the Device File tab.

2   In the **Devices** area, select the **Centrifuge Loader** device.

3   In the **Centrifuge Loader Properties** area, make sure the correct profile is selected.

4   Click **Initialize selected devices**.
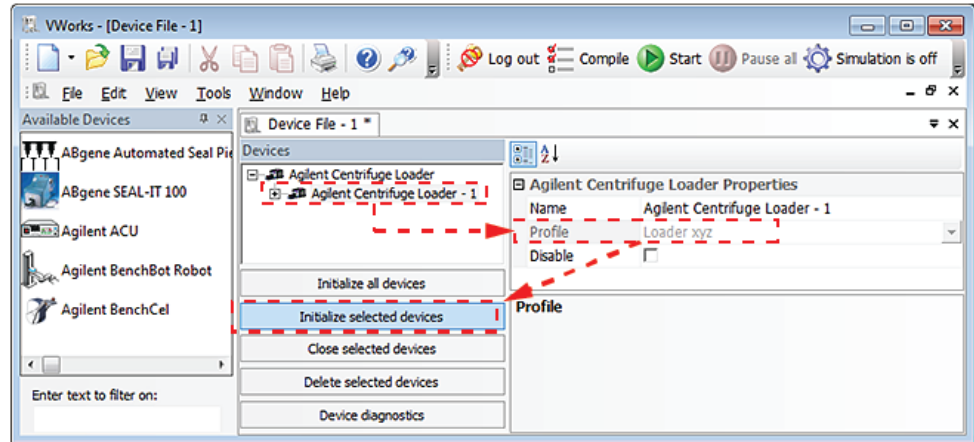
Checking the Centrifuge Loader status

To check the Centrifuge Loader status:

1 In the **Centrifuge Loader Diagnostics** dialog box, make sure that the **Enable Centrifuge Loader Status** check box is selected.

2 Ensure that the green **Connected** and **Homed** indicators are lit.
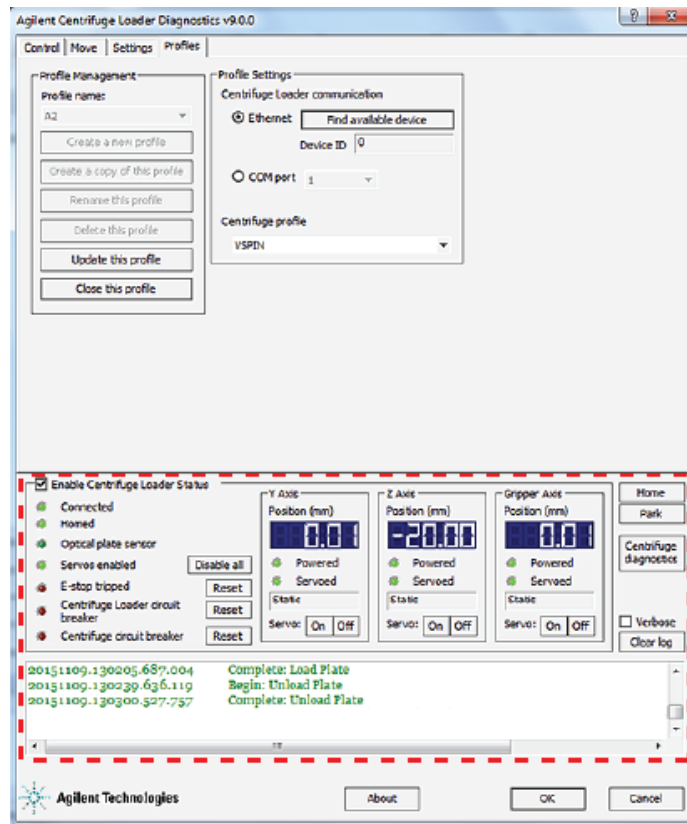
Checking the Centrifuge status

To check the Centrifuge status:

1   Open **Centrifuge Diagnostics**.

2   Click the **Controls** tab. In the **Status** area, make sure that the appropriate indicator lights are illuminated.
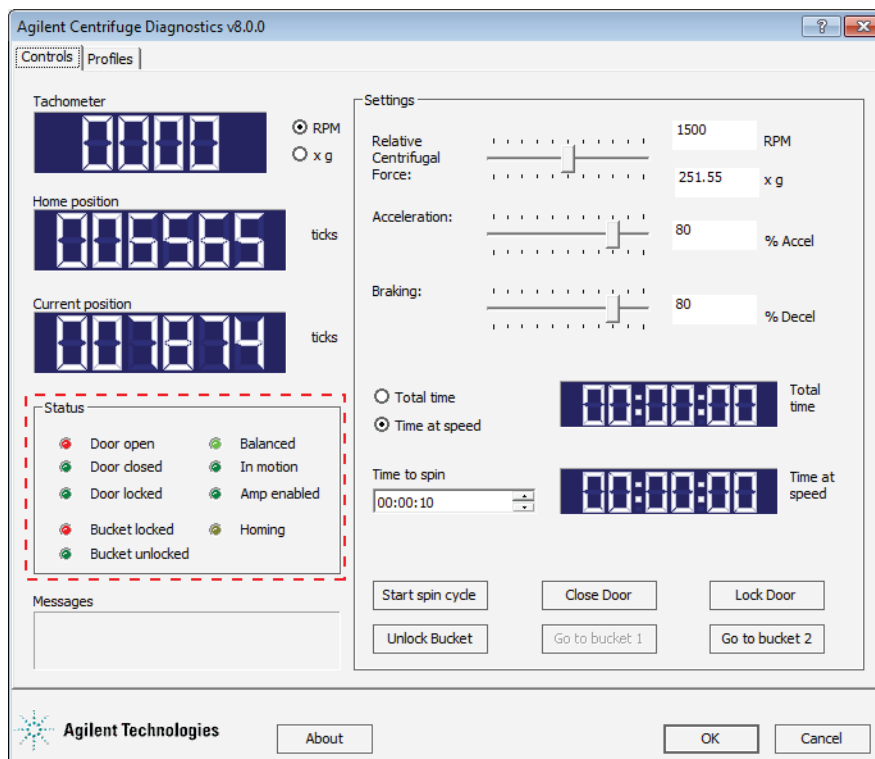
Related information

For more information about...	See...
Status indicators	• "Centrifuge Loader Diagnostics– Status and log areas" on page 136 • "Centrifuge Diagnostics–Controls tab" on page 157
Creating profiles	"Creating and editing profiles" on page 47
Loading and unloading microplates	"Loading and unloading microplates and counterweights" on page 80
Using Centrifuge Loader Diagnostics to perform a spin	"Spinning the microplates" on page 83
How to use the VWorks software to run a protocol	"Workflow for running a protocol" on page 78

Understanding how plate detection works

Determining plate presence

The gripper head can determine the presence of a microplate using either:

- The optical plate sensor on gripper head
- The gripper finger positions

Optical sensor plate detection

The sensor emits light, and then reads the amount of light reflected by the surface of a microplate. For optimum results, the sensor light should bounce off of the microplate at halfway between the top of the microplate and the top of the microplate skirt.

The optical plate sensor may have difficulty detecting the following types of microplates:

- Short microplates, because the height is below the line of sight of the sensor.

  The following figure shows an inward-facing view of a gripper finger with the opposing arm hidden for clarity.

  Figure   Detail of gripper (**1**) optical sensor, (**2**) gripper finger, (**3**) sensor detection level, and (**4**) thin microplate
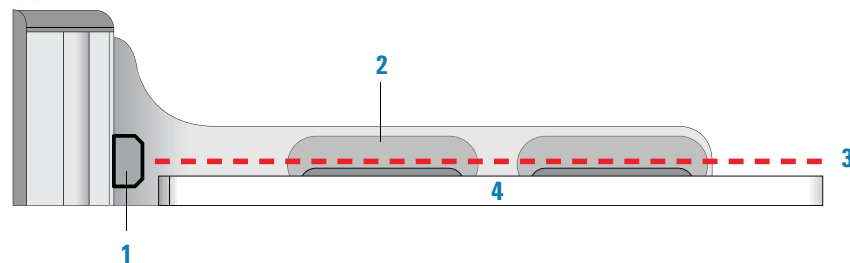
- Microplates where the line of sight of the sensor is on the joint at the top of the skirt.
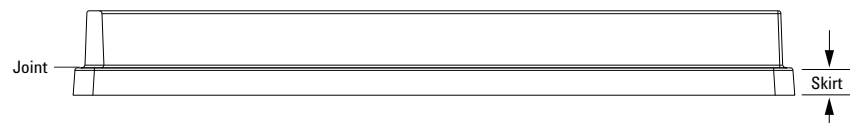
- Dark, matte-finish microplates because the color and material require higher intensity light for detection than lighter colors.

The optical plate sensor has difficultly detecting a type of microplate, you can select the option to ignore the optical plate sensor.

Option to ignore the plate sensor

The software provides the option to ignore the plate sensor. In this case, the device uses only the grip resistance method to determine the presence of microplates during the loading or unloading process.

The option to ignore the plate sensor is available in the following software locations:

- *VWorks Labware Editor.* The VWorks software uses the labware definition when you run a protocol.
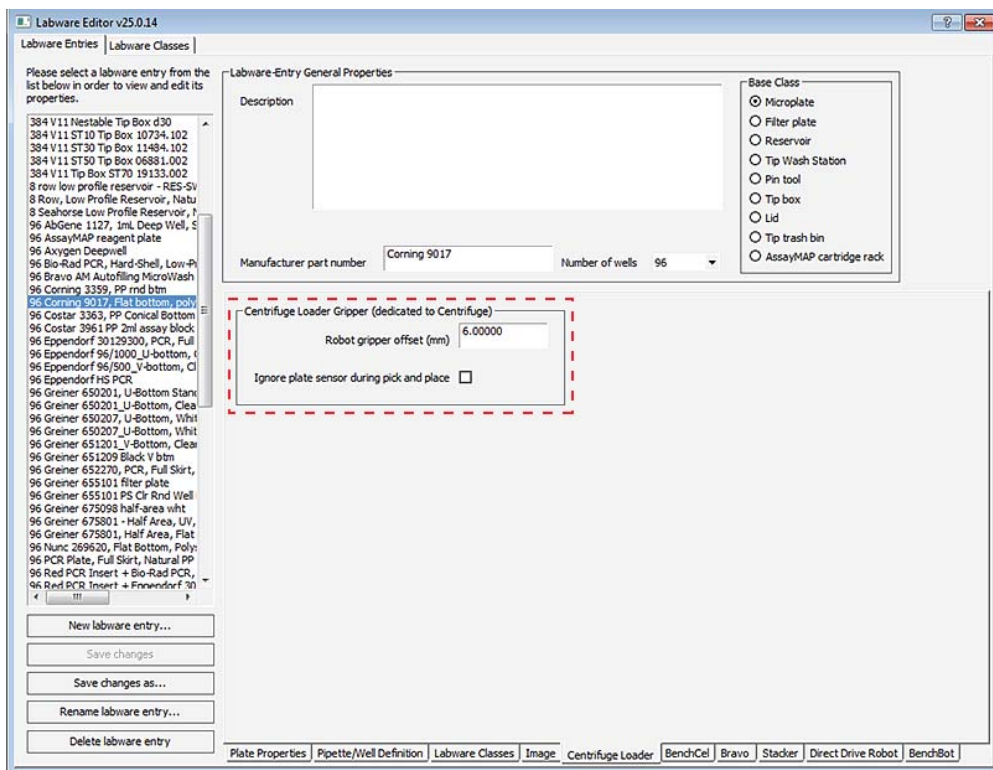
- *Centrifuge Loader Diagnostics.* When you use the Control tab to load and unload microplates, you can select the Ignore optical plate sensor option. This setting relates only to the Control tab in the Centrifuge Loader Diagnostics dialog box.

About the grip-resistance method

The Loader can detect the presence of a microplate when the gripper fingers encounter resistance that keeps them from traveling over their full range of movement when they close. This method is useful for detecting plates that are not easily detected by the optical sensor.

Related information

For more information about…	See…
VWorks software and Centrifuge Loader Diagnostics	"Software overview" on page 15
Gripper components	"Centrifuge Loader overview" on page 13

Setting the Centrifuge bucket home positions

About this topic

You set the Centrifuge bucket home positions to align with the door so that the Loader can place labware onto the buckets.

Before you start

⚠️ **WARNING** **The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.**

CAUTION If the bucket lock is extended when a bucket is misaligned, turning the rotor manually could cause the rotor or the bucket to collide with the bucket lock resulting in equipment damage. Ensure that the air supply is turned off before manually rotating the rotor.

CAUTION Attempting to move the gripper head manually in any of its axes without first disabling the servos could damage the motors. Ensure that you disable the corresponding motor before attempting to move the gripper manually.

Perform the following workflow in the order given.

Step	For this task…	See…
1	In Centrifuge Loader Diagnostics, initialize the Centrifuge Loader profile that you want to use.	"Initializing the device profile and checking status" on page 53
2	Prepare to set the bucket home positions.	"Preparing to set the bucket home position" on page 59
3	Set the bucket 1 home position.	"Setting the bucket 1 home position" on page 61
4	Verify the bucket 2 home position.	"Setting the bucket 2 home position" on page 65

Preparing to set the bucket home position

After initialization, the gripper is at the Park teachpoint, the Centrifuge door is open, and bucket 1 should be visible at the door.

If the bucket is not centered at the door, perform the following steps to visually align the bucket before proceeding.

To visually align the bucket position:

1 Turn off the air supply to the Centrifuge, and disconnect the air supply.

Note: If the door closes after you turn off the air, see "Unlocking and opening the door manually" on page 111.

For instructions on how to disconnect the air supply, see "Disconnecting the air supply" on page 110.

2 Manually rotate the rotor, until the bucket is visually aligned with the top edge of the door, as the following figure **B** shows.

Figure Centrifuge bucket: (**A**) Misaligned and (**B**) Properly aligned with top edge of door
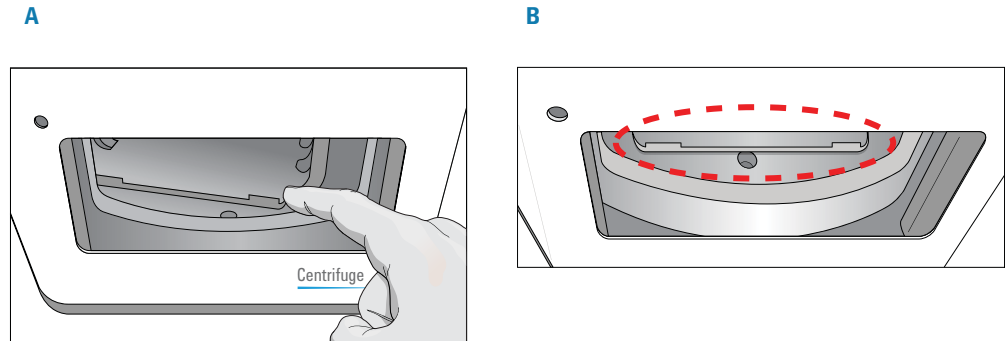
To move the gripper to the bucket:

1 Send the gripper to the stage as follows:

  a In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

  b Under **Gripper-Head Teachpoints**, verify the following:

  – Gripper Z offset: 8.0

  – Plate height: 15.0

  – Speed: Slow

  – Operation mode: Holding plate

  c Click **Stage Go**. The gripper moves to the plate stage. The gripper fingers are in the open position.
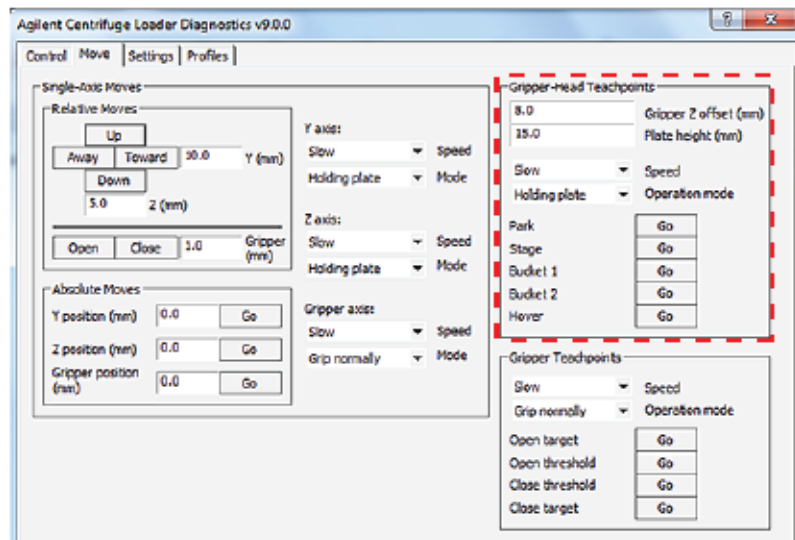
2   Move the gripper to the bucket manually, as follows:

a   In the **Y Axis** area, click **Servo Off** to disable the y-axis motor.
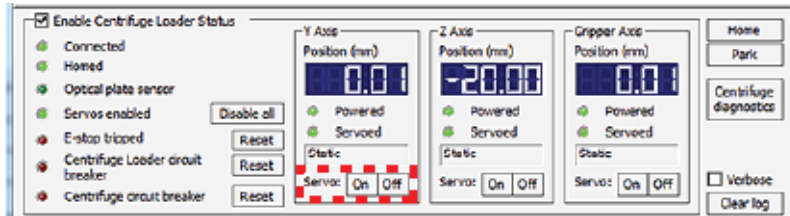
b   Grasp the gripper head and gently move the gripper head forward from the (**A**) stage until the gripper fingers are in position at the (**B**) bucket.

Figure   Gripper at (**A**) stage and at (**B**) bucket
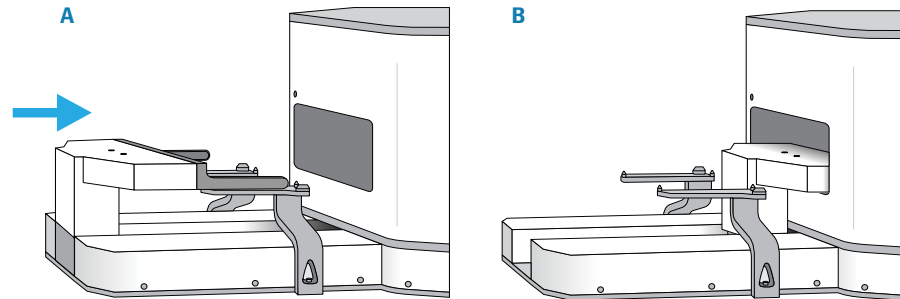
Setting the bucket 1 home position

The following procedure takes measurements of the farthest points a bucket can rotate counterclockwise and clockwise while the gripper is positioned over the bucket, as the following figure shows. The measurements are called Capture 1 and Capture 2, respectively. The software averages Capture 1 and Capture 2 to center the bucket around the gripper and calculate the bucket teachpoint.

Figure   Gripper at bucket in Centrifuge (top view): Capture 1 and Capture 2 locations
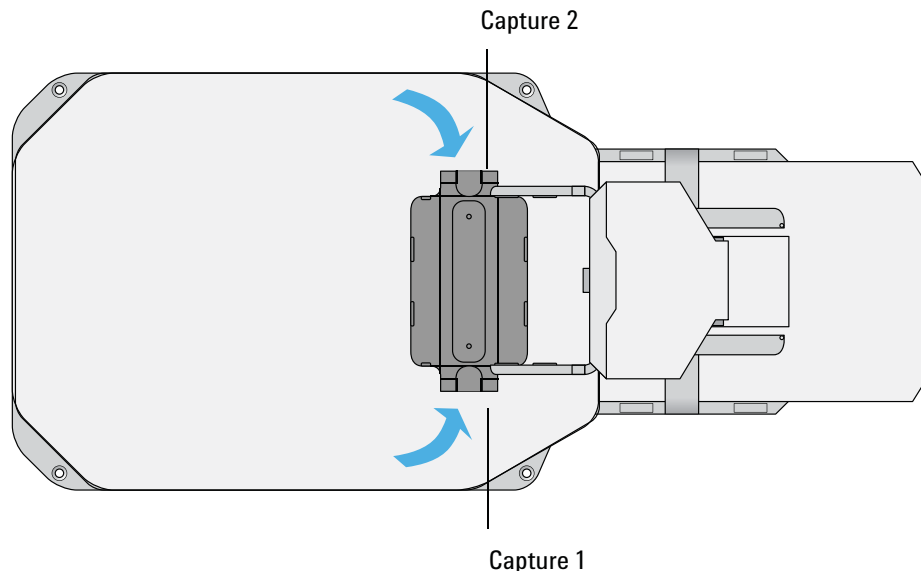
Before you begin:

- Ensure the bucket is visually aligned with the top edge of the door and the gripper is in position at the bucket per "Preparing to set the bucket home position" on page 59.

- Ensure the Centrifuge air is turned off.

To teach the bucket 1 home position:

1 In the **Centrifuge Loader Diagnostics** dialog box, click **Centrifuge diagnostics** to open the Centrifuge Diagnostics dialog box.
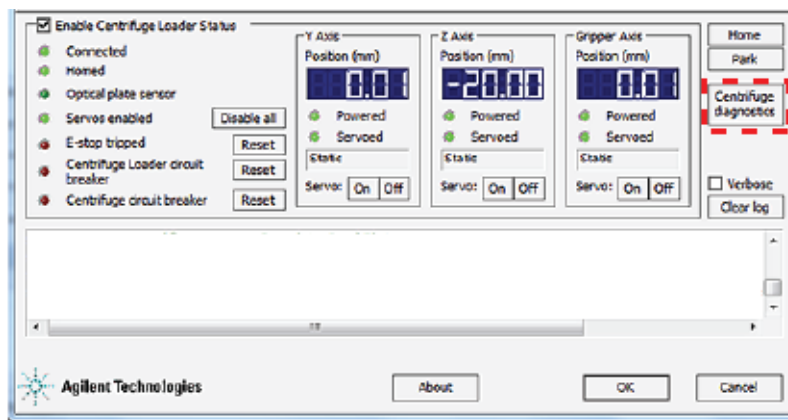
2 In the **Profiles** tab of the **Centrifuge Diagnostics** dialog box:

a Click **Teach bucket 1 position**.
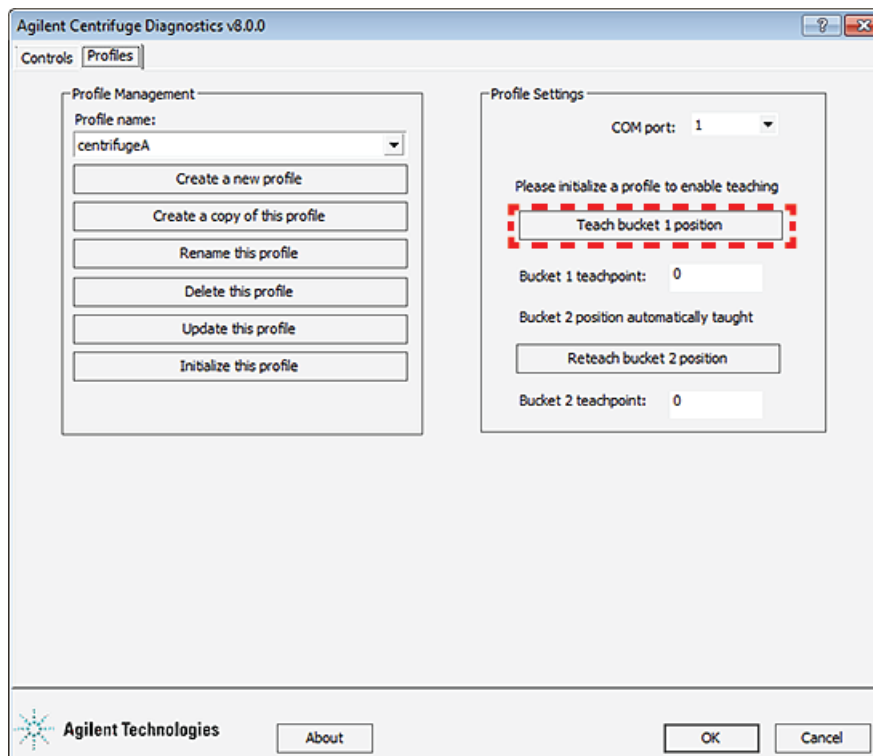
b When the message **Time out waiting for bucket to unlock** appears, click **OK**.

Note: The timeout message for the bucket lock occurs, as expected, because the air was turned off in a preceding step.

The Teach Bucket1 Position dialog box opens.
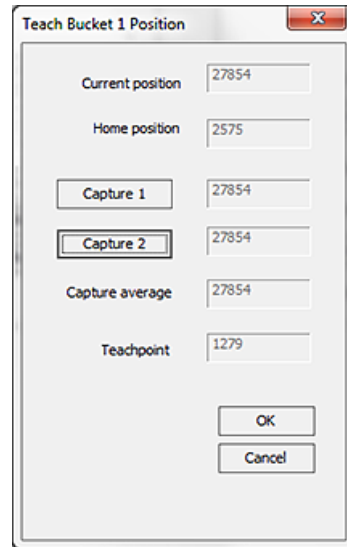
3 Set the Capture 1 coordinates for bucket 1 as follows:

a Manually, turn the Centrifuge rotor slightly counterclockwise so that the left side of the bucket lightly touches the gripper.

b In the **Teach Bucket 1 Position** dialog box, click **Capture 1**.
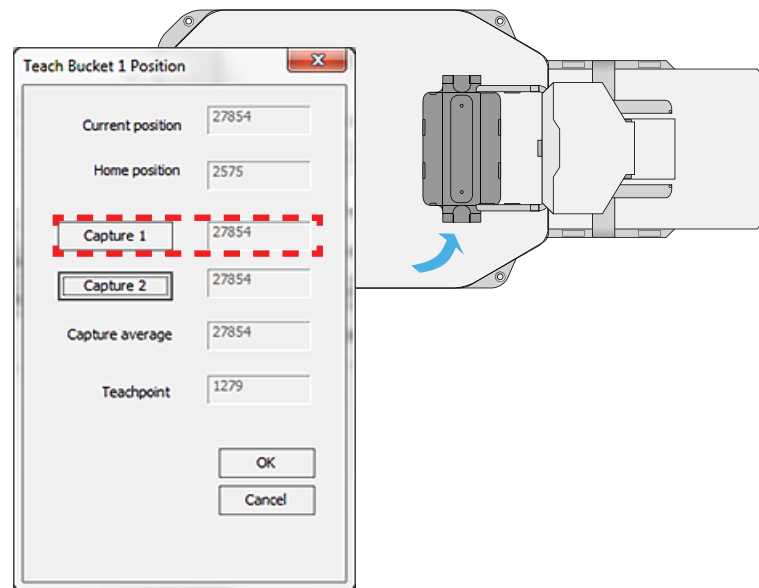
4 Set the Capture 2 coordinates for bucket 1 as follows:

   a Turn the rotor slightly clockwise so that the right side of the bucket lightly touches the gripper.

   b In the **Teach Bucket 1 Position** dialog box, click **Capture 2**.

5 Manually move the gripper head back towards the stage to provide clearance for the door to close.

Figure   Gripper at (**C**) bucket and at (**D**) stage

6 Reconnect and turn on the Centrifuge air.

7 In the **Teach Bucket 1 Position** dialog box, click **OK**.

8 When the message appears and asks if you want to update the bucket 2 teachpoint based on this change, click **Yes**.

Note: You set the home positions for both buckets when you create a Centrifuge profile.
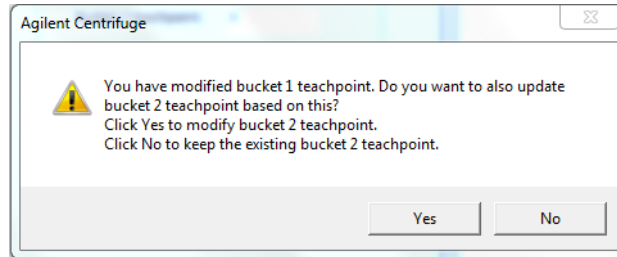
9 In the **Profiles** tab, click **Update this profile** to save the setting, and then close **Centrifuge Diagnostics**.
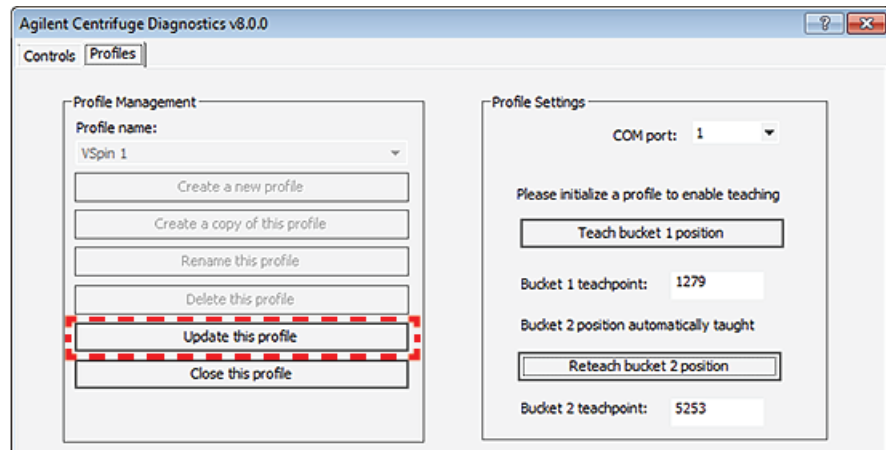
To set the bucket 2 teachpoint, use the following procedure.

Note: If you are finished setting the bucket home positions, re-enable the Loader *y*-axis motor by clicking Servo Off in the Y Axis area of the Centrifuge Loader Diagnostics dialog box.

Setting the bucket 2 home position

To set the bucket 2 home position teachpoint:

1 Open **Centrifuge Diagnostics**, and in the **Profiles** tab, initialize the profile.

The Centrifuge rotates bucket 1 to the door, and then unlocks and opens the door.

2 Label bucket 1 as follows:

a Turn off the Centrifuge air.

b Attach a piece of colored tape to bucket 1 so that you can keep track of bucket 1 versus bucket 2.

Note: Alternatively, you can place a microplate in bucket 1.

c Turn on the Centrifuge air.

3 In the **Controls** tab, click **Go to bucket 2**. The Centrifuge door closes and locks, bucket 2 rotates to the door, and the door unlocks and opens. Bucket 2, which is the empty bucket without a label, should be visible from the doorway.

Figure   Centrifuge Diagnostics Controls tab
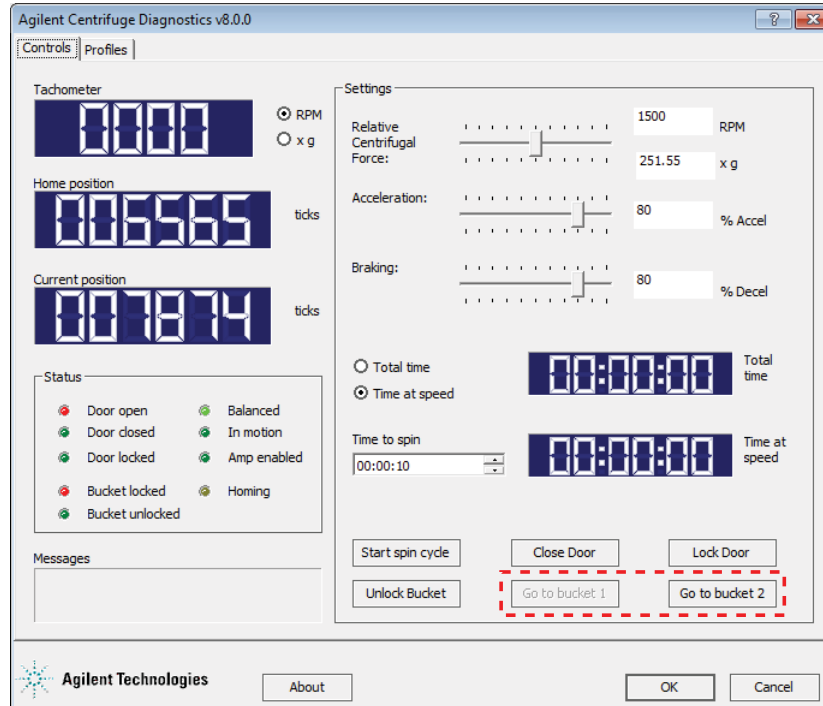
4 Ensure that bucket 2 is visually aligned with the top edge of the door.

5 Turn off the Centrifuge air.

6   Manually move the gripper to bucket 2 as follows:

a   In **Centrifuge Loader Diagnostics**, click **Servo Off** in the **Y Axis** area to disable the y-axis motor.
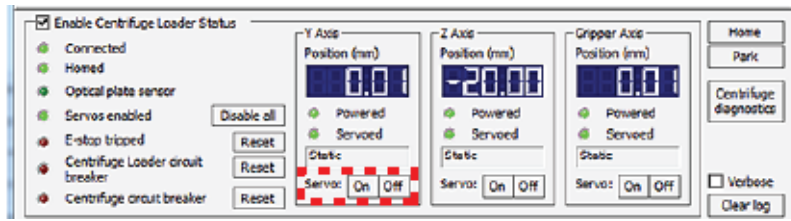
b   Grasp the gripper head and gently move the gripper head forward from the (**A**) stage until the gripper fingers are in position at the (**B**) bucket.

Figure   Gripper at (**A**) stage and gripper at (**B**) bucket
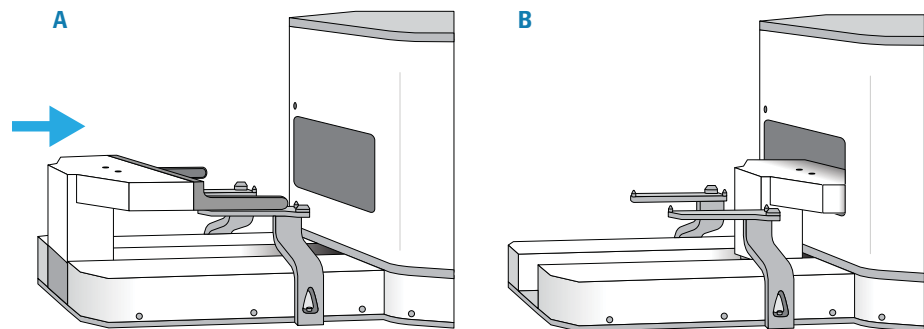
7   In the **Profiles** tab of **Centrifuge Diagnostics**, do the following:
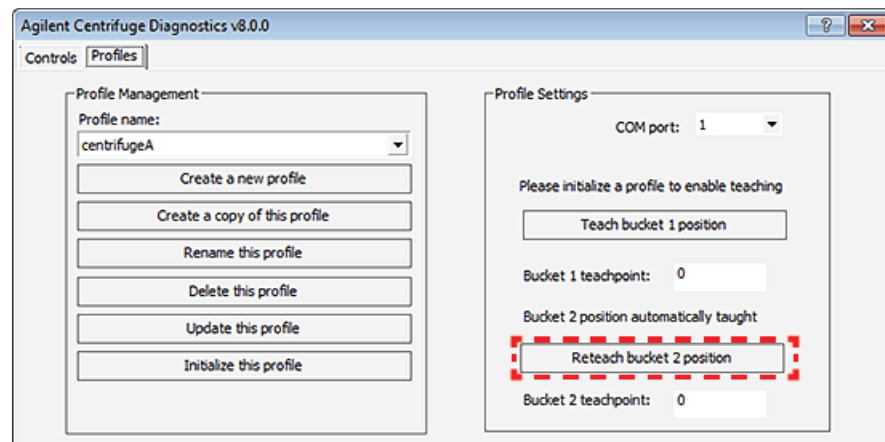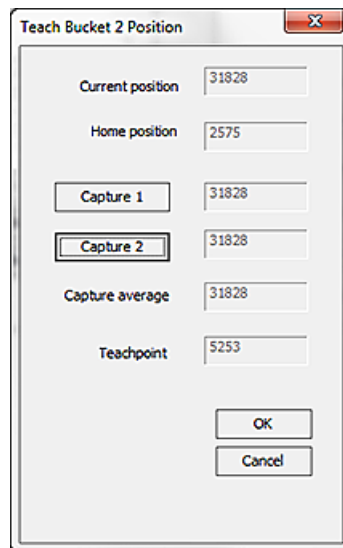
a   Click **Reteach bucket 2 position**.

b   When the message **Time out waiting for bucket to unlock** appears, click **OK**.

The **Teach Bucket 2 Position** dialog box opens.

Figure   Teach Bucket 2 Position dialog box

8 Set the Capture 1 coordinates for bucket 2 as follows:

   a Manually turn the rotor counterclockwise slightly so that the left side of the bucket lightly touches the gripper.

   b In the **Teach Bucket 2 Position** dialog box, click **Capture 1**.

9 Set the Capture 2 coordinates for bucket 2 as follows:

   a Turn the rotor slightly clockwise so that the right side of the bucket lightly touches the gripper.

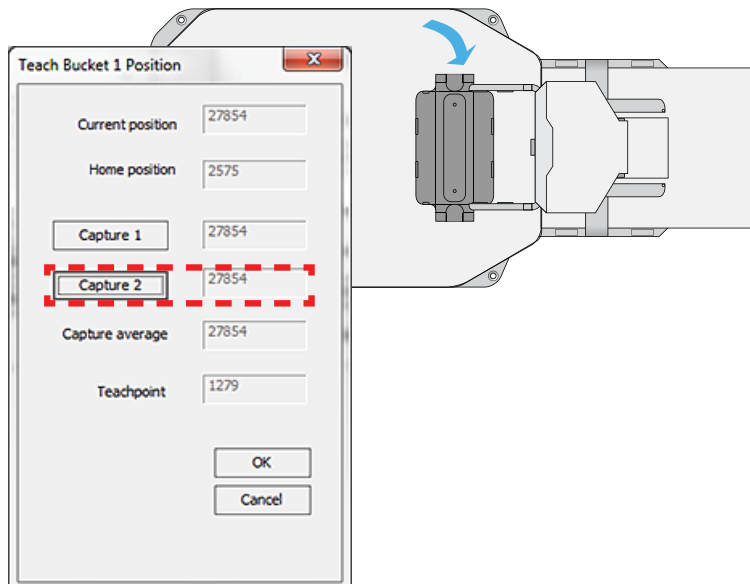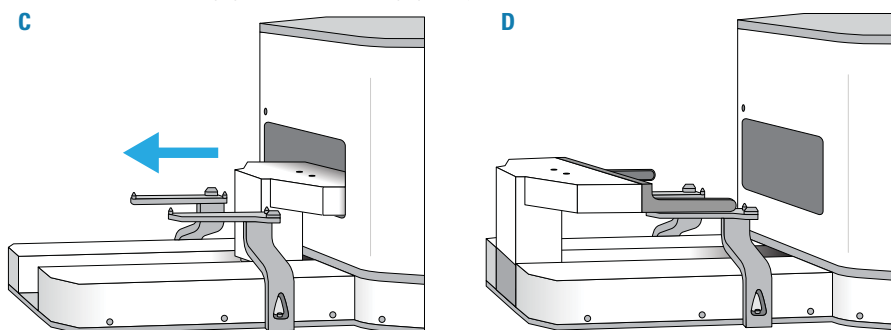   **b** In the **Teach Bucket 2 Position** dialog box, click **Capture 2**.

10 Manually move the gripper head from (**C**) the bucket back towards (**D**) the stage to provide clearance for the door to close.

Figure   Gripper at (**C**) bucket and at (**D**) stage
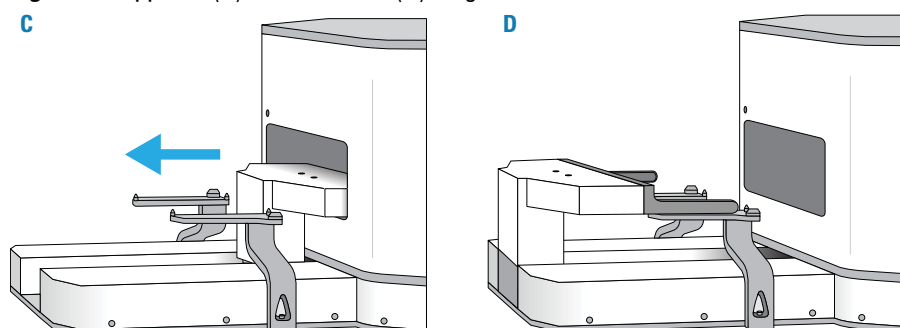
11 Reconnect and turn on the Centrifuge air.

12 In the **Teach Bucket 2 Position** dialog box, click **OK.**

13 In the **Profiles** tab, click **Update this profile** to save the setting, and then the close the Centrifuge Diagnostics dialog box.
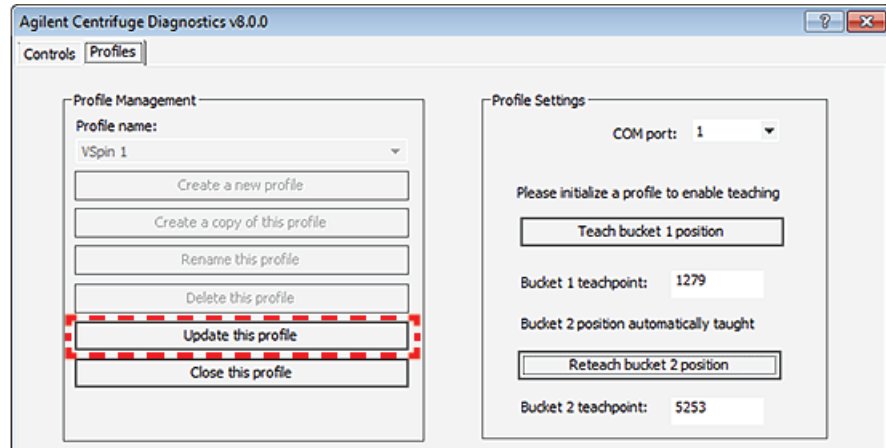
Note: The new teachpoints do not take effect until the next time you initialize the profile.

Related information

For more information about...	See...
Centrifuge Loader teachpoints	"About the Loader teachpoints" on page 70
Loading and unloading microplate	"Loading and unloading microplates and counterweights" on page 80

About the Loader teachpoints

About this topic

Read this topic to become familiar with the Loader teachpoints, the relationships they have to each other and to the origin, and how the Gripper Z offsets are used to adjust the gripper height for different types of microplates.

Teachpoint defined

A Loader teachpoint is a point in space where the gripper head moves to perform a function, such as picking up a microplate. The Loader has five gripper teachpoints that are preset at the factory. However, the teachpoints might require adjustment if you are customizing your installation.

Axis origin defined

The origin, also commonly referred to as the zero position, is defined at the center of the Loader stage teachpoint in the y-axis and z-axis.

The origin is defined by the following positions.

Axis	Origin Position
y	Where the gripper head would be on the y-axis when picking up a microplate from the plate stage.
z	Where the center of the gripper pad is level with the top of the plate stage.
$gripper$	The open-gripper finger position.

Setting a Loader teachpoint defines a distance along each axis from the origin to the teachpoint location. The gripper head must travel these distances to reach the teachpoint location.

About the gripper finger teachpoints

The Loader can determine that it is gripping or releasing a microplate by where the gripper fingers stop in relation to thresholds and targets shown in the following figure.

Note: The distances between the thresholds, targets and gripper arms are exaggerated in the following figure for clarity.

Figure   Gripper teachpoints: (**1**) open target, (**2**) open threshold, (**3**) close threshold, and (**4**) close target (top view)
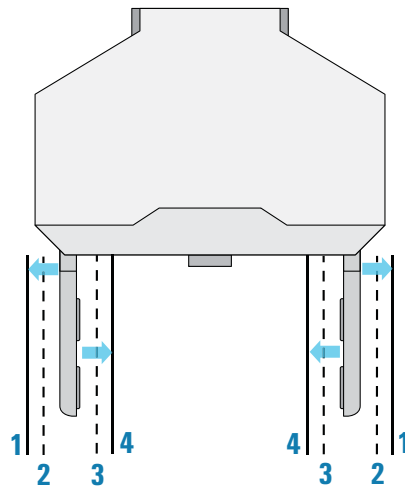
When the gripper fingers are commanded to close, they move towards the closed-gripper target (**4**).

A microplate is determined to be present if both gripper fingers:

- Pass the close-gripper threshold (**3**)
- Do not meet the close-gripper target (**4**)

If the grippers are closed, and you command them to open, they will move toward the open-gripper target (**1**).

A microplate is said to be released if the grippers pass the open gripper threshold (**2**).

Parameters that define gripper movements at a teachpoint

The following parameters are specific to the type of microplate you use.

- **Gripper Z offset**. The height above a teachpoint where the gripper fingers grip a microplate.

  IMPORTANT   You use the Gripper Z offsets to adjust grip height. Do not re-teach a teachpoint to adjust where the gripper head grips a microplate.

  You measure the distance from the bottom of the microplate to where the bottom of the gripper pad can grip the microplate, as the following figure shows.
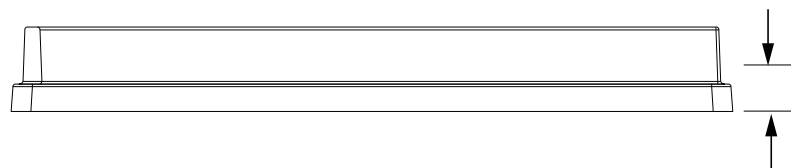
- **Plate height**. The distance from the bottom to the top of a microplate.

Together, these parameters define the gripper movement at the Loader teachpoints. These parameters specify how high the top of the microplate rises above the grip point.

You set these parameters in the following places:

- *VWorks Labware Editor.* The VWorks software uses the labware definition when you run a protocol.
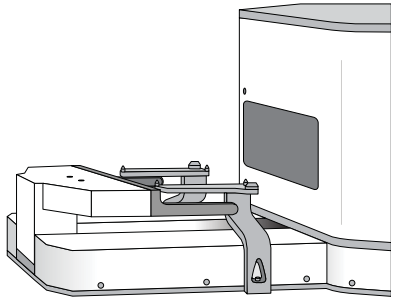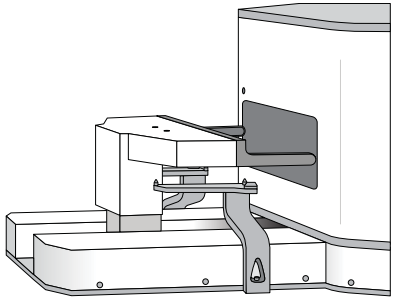
  Note: In the Labware Editor, you set the Plate height in the Plate Properties tab and the gripper offset in the Centrifuge Loader tab.
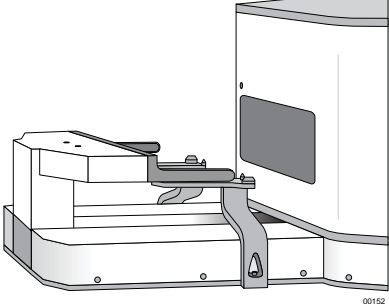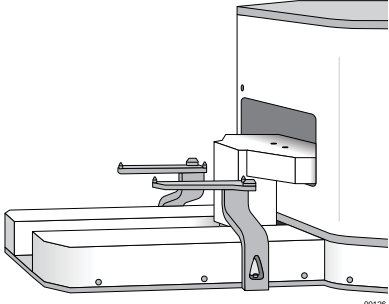
- *Centrifuge Loader Diagnostics.* The parameter values you set in the Centrifuge Loader Diagnostics dialog box relate only to the tab in which they appear.

Loader teachpoints

The following table illustrates the position of the gripper head at each of the Loader teachpoints.

You can send the gripper head to any teachpoint by clicking the appropriate Go button in the Centrifuge Loader Diagnostics dialog box.

Teachpoint Name	Description	Figure
Park	The gripper head is underneath and slightly behind the Loader stage. The Park teachpoint is where the gripper head moves to get out of the way when a plate-handling robot places a plate onto the Loader stage.	 00152
Hover	The gripper head is in front of the Centrifuge door, this is the closest that the gripper head can be to the Centrifuge when the Centrifuge is in operation. This position reduces the time needed to unload a plate.	 00127

Teachpoint Name	Description	Figure
Stage	The gripper head is in front of the stage on which a microplate sits before it is loaded into the Centrifuge. The gripper fingers are aligned above the top of the two parallel rails of the stage, and have clearance to open and close, gripping and releasing a microplate on the stage. The Loader stage is about the same height as the buckets. *Note:* The Gripper Z offset is used to adjust the height where the gripper grabs a microplate. The Loader stage teachpoint is the origin.	
Bucket 1, Bucket 2	The gripper head position above a bucket in the Centrifuge, when the gripper places a microplate onto a bucket. Each bucket has its own teachpoint because each bucket may be at a slightly different height. *Note:* The Gripper Z offset is used to adjust the height where the gripper grabs a microplate.	

Related information

For more information about…	See…
Verifying the Loader teachpoints	"Determining if the Loader teachpoints require adjustment" on page 74
Setting parameters in the VWorks Labware Editor	*VWorks Automation Control Setup Guide*
Centrifuge Loader Control tab	"Centrifuge Loader Diagnostics—Control tab" on page 141

Determining if the Loader teachpoints require adjustment

About this topic

The Loader teachpoints are preset at the factory. However, before you use the Centrifuge with Loader the first time, you should verify that the Loader teachpoints are set properly.

For a description of the teachpoints, see "About the Loader teachpoints" on page 70.

Before you start

⚠️ **WARNING   The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.**

CAUTION   Collision avoidance is not fully functional when using the Diagnostics controls. To prevent potential equipment damage, ensure that the gripper path is clear of objects, such as extra labware, that could cause a potential collision.

IMPORTANT   If the microplate is not fully seated within the plate stage alignment tabs, the gripper can fail to pick up the microplate correctly, resulting in skewed placement or a dropped microplate. Ensure that the microplate is fully seated in the plate stage.

Procedure

To determine if the teachpoints require adjustment:

1 In the **Centrifuge Loader Diagnostics** dialog box, initialize the profile. For instructions, see "Initializing the device profile and checking status" on page 53.

During initialization, the Centrifuge Loader goes through a homing process and the gripper head moves. After initialization, the gripper should be in the Park position and the Centrifuge door should be open with bucket 1 in the loading position.

2 Ensure that the bucket is empty, and then place a microplate on the Loader stage.

3 In the **Centrifuge Loader Diagnostics** dialog box, click the **Control** tab.
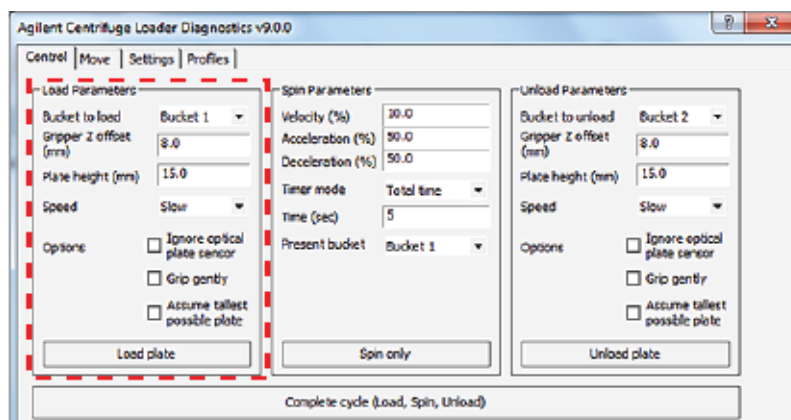
4 Follow the instructions in "Loading and unloading microplates and counterweights" on page 80 to load and unload a microplate in bucket 1. Make sure that you set the **Speed** to **Slow**.

As the gripper lifts the microplate and moves it to the bucket, listen carefully for any rubbing, bumping, or dropping noises. Visually inspect the alignment the gripper at each teachpoint.

Gripper move	What to observe
Lifts the microplate from the stage	The gripper fingers grip the microplate at the specified Gripper Z offset.
Places the microplate in the bucket	If you can hear or see the microplate drop into the bucket, the gripper z-axis teachpoint for the bucket may be too high. You should not hear any noise when the gripper releases the microplate into the bucket.
	Verify that the microplate is properly seated in the bucket. If the gripper places the microplate askew in the bucket (either not fully in the bucket or too far inward), the Loader Bucket teachpoint might require a y-axis adjustment.
Lifts the microplate from the bucket	The gripper fingers grip the microplate at the specified Gripper Z offset.
Returns the microplate to the stage	If the gripper drops the microplate on the stage, the gripper z-axis teachpoint at the stage may be too high.
	If the gripper seems to be pressing the microplate down instead of placing it on the stage or if the gripper fingers slide down the microplate while placing it, the gripper z-axis teachpoint at the stage may be too low.

5 Repeat step 4 for bucket 2 to determine if the Loader Bucket 2 teachpoint requires adjustment.

IMPORTANT If you determine that the Loader teachpoints require adjustment, contact Agilent Automation Solutions Technical Support before you make the adjustments.

Related information

For more information about...	See...
Setting Centrifuge Loader teachpoints	"Setting the gripper-head teachpoints" on page 115
Setting parameters in the VWorks Labware Editor	*VWorks Automation Control Setup Guide*
Control tab in Centrifuge Loader Diagnostics	"Centrifuge Loader Diagnostics—Control tab" on page 141
Move tab in Centrifuge Loader Diagnostics	"Centrifuge Loader Diagnostics—Move tab" on page 144
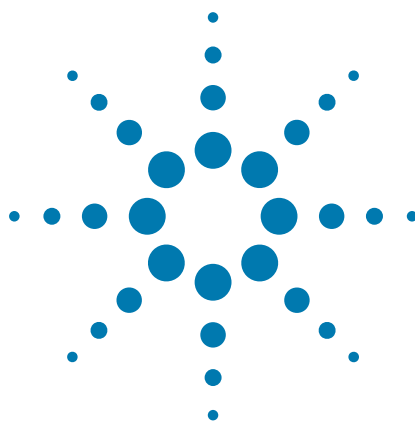
5
Performing a spin

This chapter contains the following topics:

Agilent Technologies

Workflows for performing spins

You can use the Centrifuge with Loader to spin microplates in the following ways:

- In a lab automation system, where you run a protocol containing Centrifuge tasks to spin multiple microplates in one or more spin cycles. See Workflow for running a protocol.

- Using diagnostics commands to spin an individual microplate. See Workflow for using Centrifuge Loader Diagnostics.

Workflow for running a protocol

You can start one or more spin cycles when you run a protocol containing Centrifuge tasks. During the run, the lab automation system robot will load and unload sample microplates at the Loader, the Loader will load and unload the microplate in the Centrifuge, and the Centrifuge will spin the microplates based on the parameters specified in the Centrifuge tasks.

The workflow for starting a run is as follows:

Step	For this task…	See…
1	Start up the lab automation system.	Lab automation system user guide, such as the *BioCel System User Guide*
2	Edit the Centrifuge Loader parameters in the labware definitions.	*VWorks Automation Control Setup Guide*
3	Open the form or protocol that contains the Centrifuge tasks.	*VWorks Automation Control User Guide*
4	Make sure the spin parameters are set correctly.	*VWorks Automation Control User Guide*
5	Determine whether to load the counterweight in bucket 2 before the run.	*VWorks Automation Control User Guide*
6	Load the microplate and the counterweight, if required.	"Loading and unloading microplates and counterweights" on page 80
7	Start the protocol run.	*VWorks Automation Control User Guide*

Workflow for using Centrifuge Loader Diagnostics

You can use Centrifuge Loader Diagnostics to spin individual microplates without running protocols. The workflow is as follows.

Step	For this task...	See...
1	Start up the Centrifuge with Loader.	"Starting up and shutting down" on page 37
2	Open Centrifuge Loader Diagnostics and initialize the profile.	"Initializing the profile in Centrifuge Loader Diagnostics" on page 54
3	Load the microplate and counterweight.	"Loading and unloading microplates and counterweights" on page 80
4	Setting the spin parameters and starting the spin cycle.	"Spinning the microplates" on page 83

Loading and unloading microplates and counterweights

About this topic

This topic describes how to use Centrifuge Loader Diagnostics for loading and unloading microplates.

If you want to run a protocol containing Centrifuge tasks to load and spin multiple microplates in one or more spin cycles, see "Workflow for running a protocol" on page 78.

Before you start

⚠ **WARNING**   **The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.**

CAUTION   A collision can occur if an object is placed in the path of the moving gripper. To prevent potential equipment damage, ensure that the path is clear of objects, such as extra labware, that could cause a potential collision.

IMPORTANT   If the microplate is not fully seated within the plate stage alignment tabs, the gripper can fail to pick up the microplate correctly, resulting in skewed placement or a dropped microplate. Ensure that the microplate is fully seated in the plate stage.

Use the following workflow.

Step	For this task...	See...
1	Open Centrifuge Loader Diagnostics and initialize the profile.	"Initializing the profile in Centrifuge Loader Diagnostics" on page 54
2	Ensure that you understand the Centrifuge balance requirements.	"Balancing the Centrifuge buckets" on page 80
3	On the Controls tab, set the load and unload parameters.	"Setting the load and unload parameters" on page 81
4	Loading or unloading the microplate or counterweight.	"Loading or unloading a microplate or counterweight" on page 82

Balancing the Centrifuge buckets

⚠ **WARNING**   **Each Centrifuge bucket can hold a microplate or counterweight that weighs up to 250 g (8.82 oz). Placing heavier microplates or counterweights in the Centrifuge can cause the device to malfunction during operation, damaging the device and causing severe injury.**

The Centrifuge buckets must be the same weight or within the balance tolerance to remain balanced during the spin. Unbalanced buckets can cause a spin error.

IMPORTANT   Each Centrifuge is shipped with a pair of buckets that have been balanced to within 1 g of each other. To stay within the balance tolerance of the Centrifuge, use only the buckets that shipped with your Centrifuge. Do not use buckets from another Centrifuge.

IMPORTANT   Before placing microplates and counterweights in the Centrifuge, make sure that the weight of the two items are within 10 g of each other to avoid a spin error.

If you want to spin one sample microplate, be sure to use a counterweight that is within 10 g of the sample microplate. The counterweight can be a microplate containing water. If you want to spin two sample microplates together, make sure they weigh within 10 g of each other.

Note: The software does not provide indications that the buckets are unbalanced when you load the microplates and counterweights. If the buckets are unbalanced, the rotor will stop during the spin, and the red Balanced light in Centrifuge Diagnostics will turn on.

IMPORTANT   If you are using a microplate counterweight, replace it regularly (weekly with heavy use), especially if the microplate is made from polystyrene.

Setting the load and unload parameters

To set the load or unload parameters:
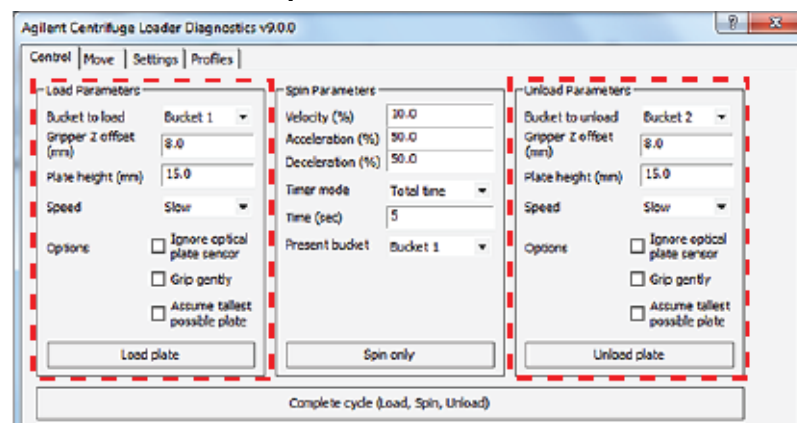
1   In the **Bucket to load** or **Bucket to unload** list, select the bucket you want to use for loading or unloading.

If you are preloading a counterweight for a protocol run, be sure to load the counterweight in bucket 2.

2   Specify the labware properties for the microplate you are using:

   a   In the **Gripper Z offset (mm)** box, type the distance (mm) from the bottom of the microplate to where the bottom of the gripper pad can grip the microplate.

   b   In the **Plate height (mm)** box, type the distance (mm) from the bottom of the microplate to the top of the microplate.

IMPORTANT The Plate height value and the Gripper Z offset value are used together to determine whether the microplate or counterweight can successfully enter and exit the Centrifuge.

3 Select the **Speed** at which the Loader will load or unload the microplate or counterweight. The options are Slow, Medium, and Fast.

Note: If the system is in the BYPASS safety interlock mode, the Loader will move at a reduced speed. For more information about the BYPASS mode, see the *BioCel System Safety Guide*.

4 Select any applicable options:

Option	Description
Ignore optical plate sensor	Uses only the grip-resistance method to determine the presence of microplates during the loading or unloading process.
	Select this option if you are loading and unloading dark matte-finish microplates or microplates that are too short for the optical sensor to detect.
Grip gently	Uses only the optical plate sensor to determine the presence of microplates during the loading or unloading process. The grip resistance method is not used.
	Select this option if you are loading and unloading soft or highly flexible microplates, such as PCR microplates.
Assume tallest possible plate	Ignores the Plate height value in step 3 and assumes the microplate or counterweight is 48.3 mm tall.

Loading or unloading a microplate or counterweight

To load a microplate or counterweight:

1 Place the microplate or counterweight on the Loader stage.

2 Click **Load plate**. The gripper picks up the microplate or counterweight from the Loader stage and places it in the specified bucket.
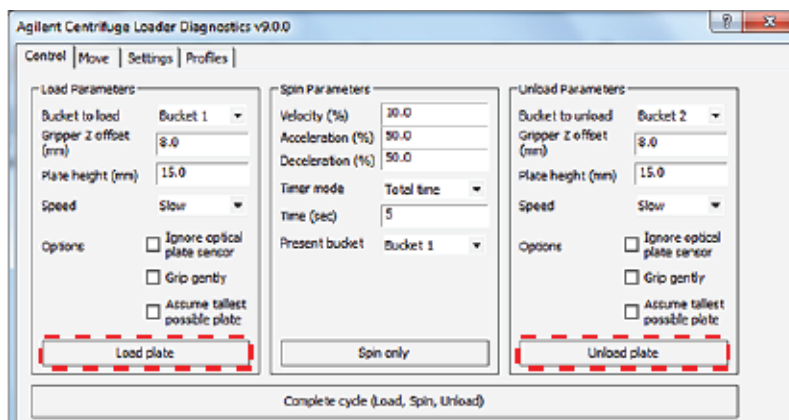
To unload a microplate or counterweight:

Click **Unload plate**. The gripper picks up the microplate or counterweight from the specified bucket and place it on the Loader stage.

Related information

For more information about…	See…
Setting spin parameters and starting the spin	"Spinning the microplates" on page 83
Status area in Centrifuge Loader Diagnostics	"Centrifuge Loader Diagnostics—Status and log areas" on page 136
Centrifuge Loader teachpoints	"About the Loader teachpoints" on page 70
Centrifuge Loader Control tab	"Centrifuge Loader Diagnostics—Control tab" on page 141
Running a protocol containing Centrifuge tasks	"Workflow for running a protocol" on page 78

Spinning the microplates

About this topic

This topic explains how to use Centrifuge Loader Diagnostics to spin an individual microplate.

If you want to run a protocol containing Centrifuge tasks to spin multiple microplates in one or more spin cycles, see "Workflow for running a protocol" on page 78.

Before you start

Ensure the following:

*   You understand the Centrifuge balance requirements.
*   You have loaded the microplate and counterweight for the spin.

Setting spin parameters in Centrifuge Loader Diagnostics

To set the spin parameters:
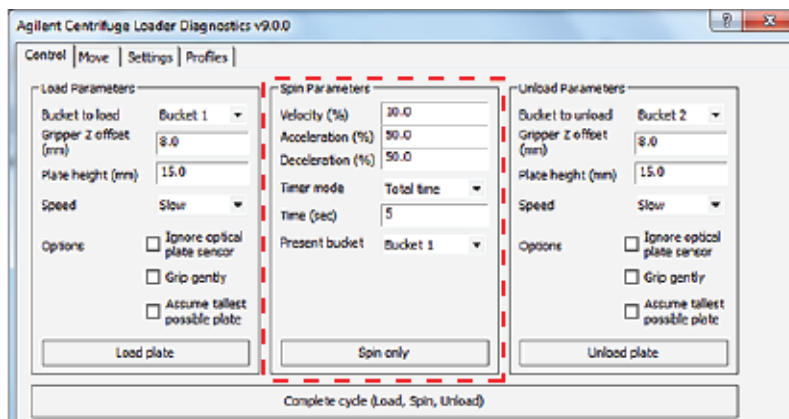
1   In the **Velocity** box, type the rotor speed, as a percent of factory-set maximum speed.

2   In the **Acceleration** box, type the rate of centrifugation, as a percent of the factory-set maximum acceleration.

3   In the **Deceleration** box, type the deceleration of the centrifuge, as a percent of the factory-set maximum deceleration.

4   In the **Timer mode** list, select one of the following to specify how the software should count the spin time:

Timer mode selection	Description
Total time	The total spin time, including acceleration and deceleration.
Time at speed	The length of time during which the Centrifuge is spinning at the target speed. The time does not include acceleration and deceleration.

5   In the **Time** box, type the length of total time or time at speed in seconds.

6   *Spin only*. In the **Present bucket** list, select the bucket that should be moved to the door when the Centrifuge stops spinning.

This parameter is applicable only if you use the Spin only command. It is ignored if you use the Complete cycle command.

Starting the spin

Two spin commands are available in the Centrifuge Loader Diagnostics Control tab.
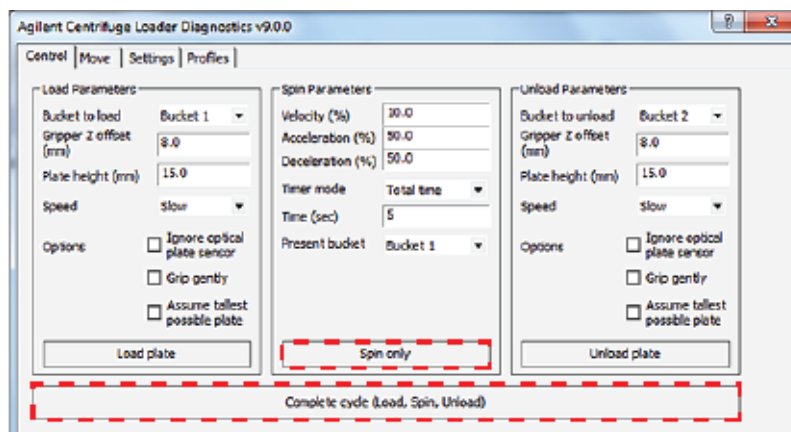
Spin command	Description
Spin only	Performs the spin using the spin parameters you specified and assumes that the microplate and counterweight are already loaded.
Complete cycle	Performs the spin cycle using the specified load, unload, and spin parameters. The spin cycle consists of loading, spinning, and unloading the microplate.

To spin the preloaded microplate and counterweight:

1   Click **Spin only**. The Centrifuge closes and locks the door, and then starts to spin. When it is finished, the Centrifuge unlocks and opens the door. The bucket selected in the **Spin Parameters Present bucket** list is visible in the doorway.

2   Unload the microplate and counterweight.

To start a spin cycle where the counterweight is already loaded:

1   Click **Complete cycle**. The Loader picks up the microplate from the stage and places it the specified bucket. The Centrifuge spins the microplate. When it is finished, the Loader moves the microplate from the Centrifuge to the Loader stage.

2   To spin another microplate, place it on the Loader stage and repeat step 1.

3   After you are finished, unload the microplate or counterweight.

Related information

For more information about...	See...
Unloading a microplate or counterweight	"Loading and unloading microplates and counterweights" on page 80
Status area in Centrifuge Loader Diagnostics	"Centrifuge Loader Diagnostics—Status and log areas" on page 136
Centrifuge Loader teachpoints	"About the Loader teachpoints" on page 70
Control tab in Centrifuge Loader Diagnostics	"Centrifuge Loader Diagnostics—Control tab" on page 141
Running a protocol containing Centrifuge tasks	"Workflow for running a protocol" on page 78

6
Using diagnostics software

This chapter contains the following topics:

Agilent Technologies

Homing the gripper head

About this topic

This topic describes how to use Centrifuge Loader Diagnostics to home the gripper head.

When to use the Home command

Home the gripper head to ensure all of its axes are calibrated correctly. For example, if you notice that the gripper head is not accurately picking up or placing microplates, home the gripper head.

Procedure

When you command the gripper head to home, it executes a sequence that rediscovers the home position in the y-axis, z-axis and $gripper$-axis. At the end of the homing routine, the gripper head should be in the Park position.

Figure Gripper Park position
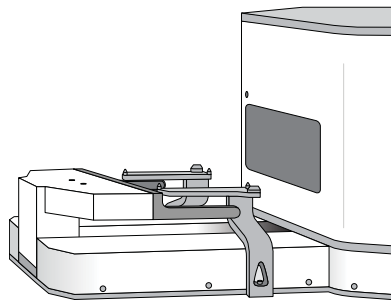
To home the gripper head:

1 Initialize the profile in **Centrifuge Loader Diagnostics.**

2 At the bottom of any tab, click **Home.**

The homing process appears as slow movement in all three axes, one axis at a time.
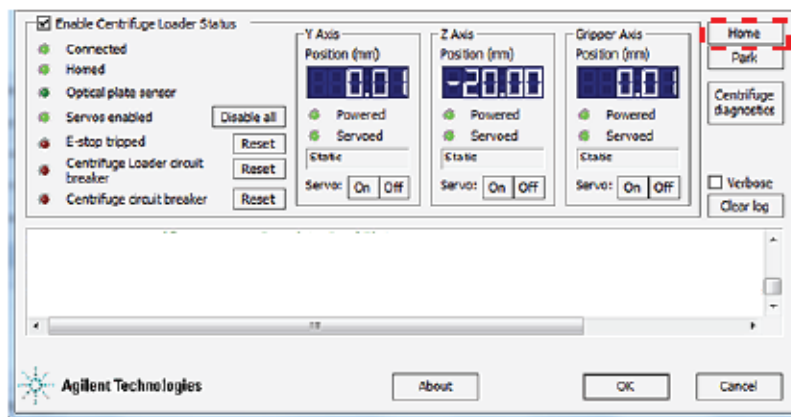
Related information

For more information about...	See...
Moving the gripper	"Options for moving the gripper" on page 89
Centrifuge actuators	"Testing the Centrifuge actuators" on page 103
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Options for moving the gripper

About this topic

This topic describes ways that you can use Centrifuge Loader Diagnostics to move the gripper head. Typically, you move the gripper head when you:

- Install the device
- Set teachpoints
- Troubleshoot problems

Alternatively, you can move the gripper by hand. For details, see "Moving the gripper manually" on page 101.

⚠️ **WARNING   Moving the gripper head can create pinch points along the path of movement. The gripper is designed to stop if it contacts an object, but movement along any axis could still result in injury. Keep away from the Centrifuge with Loader when the gripper moves.**

CAUTION   A collision can occur if an object is placed in the path of the moving gripper. To prevent potential equipment damage, ensure that the path is clear of objects, such as extra labware, that could cause a potential collision.

IMPORTANT   The controls in the Move tab are available to VWorks Technicians and Administrators only.

Types of moves using Centrifuge Loader Diagnostics

You use the controls in the Move tab to move the gripper in the following axes:

- Forward or backward in the y-axis
- Up or down in the z-axis
- Open or closed in the $gripper$-axis

For more details about the axes, see "Axes of movement" on page 14.

The following figure shows the types of controls in the Move tab.

Figure Move tab controls for (**A**) Single-Axis Moves and (**B**) Teachpoints
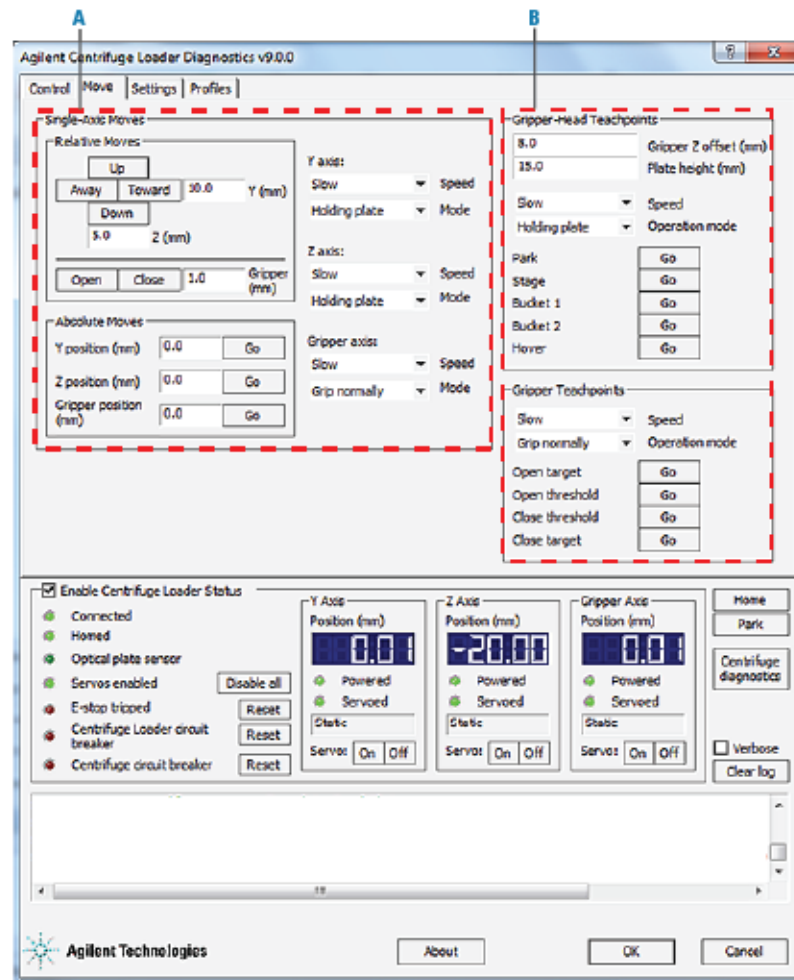
You can use the controls in the Move tab for the following types of moves:

- *Single-axis moves* (**A**). The controls that enable you to move the gripper in a given direction along the *y-*, *z-*, or *gripper-*axis.

- *Moves to teachpoints* (**B**). The controls that enable you to send the gripper a specified teachpoint.

For a description of each control and indicator in the Move tab, see "Centrifuge Loader Diagnostics—Move tab" on page 144.

Single-axis moves

You use the Single-Axis Moves area of the Move tab for the following types of moves:

- **Relative Moves** (jogging). The controls that move the gripper in one of the three axes by a fixed increment relative to the current location.

    Use jogging to:

    - Set the gripper head teachpoints. For example, you could move the gripper head manually to a position you want to set as a teachpoint. After you have re-enabled the gripper head servos, you can fine-tune the position of the gripper head by jogging it.

    - Recover from errors.

    - Perform troubleshooting.

- **Absolute Moves**. The controls move the gripper head in one of the three axes by a distance measured from the origin (zero position).

    Use absolute moves to position the gripper head a discrete distance from the axis origin.

    For details about the origin, see "Axis origin defined" on page 70.

Moves to teachpoints

You use the following areas of the Move tab to move the gripper to a teachpoint:

- **Gripper-Head Teachpoints**. The controls that move the gripper head to the Park, Stage, Bucket, or Hover teachpoint location.

- **Gripper Teachpoints**. The controls that move the gripper fingers to the Open or Close teachpoint location.

Related information

For more information about…	See…
Moving the gripper head to a teachpoint	"Sending the gripper head to a teachpoint" on page 92
Jogging the gripper head	"Jogging the gripper head" on page 95
Opening and closing the gripper	"Opening and closing the gripper" on page 97
Manually moving the gripper	"Moving the gripper manually" on page 101
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Sending the gripper head to a teachpoint

About this topic

This topic describes how to use Centrifuge Loader Diagnostics to move the gripper head to a teachpoint.

Before you start

⚠️ **WARNING** **Moving the gripper head can create pinch points along the path of movement. The gripper is designed to stop if it contacts an object, but movement along any axis could still result in injury. Keep away from the Centrifuge with Loader when the gripper moves.**

CAUTION A collision can occur if an object is placed in the path of the moving gripper. To prevent potential equipment damage, ensure that the path is clear of objects, such as extra labware, that could cause a potential collision.

Procedure

To send the gripper head to a teachpoint:

1 In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

2 Under **Gripper-Head Teachpoints**, set the following parameters.

3 Click **Go** to move the gripper to the corresponding teachpoint: Park, Stage, Bucket 1, Bucket 2, or Hover.

Note: In the Status area at the bottom of the tab, the Axis Position (mm) readout displays the distance from the axis origin.

Parameter	Description
Gripper Z offset (mm)	The height (mm) above a teachpoint where the gripper fingers can grip a type of microplate securely. The height is measured from the bottom of the microplate to where the gripper pad can grip the microplate.

Figure   Example of a Gripper Z offset

This value defines gripper movements only for the commands in the Gripper-Head Teachpoints area of the Move tab. The parameter is used when the Loader is sent to the Stage, Bucket 1, and Bucket 2 teachpoints.

Together, the Gripper Z offset and Plate height values determine how high the top of the microplate rises above the grip point, at the center of the grip pads in the z-axis. For example, if the Gripper Z offset is set to 8 mm and the Plate height is set to 15 mm, then the top of the microplate is 7 mm above the grip point.

IMPORTANT   You use the Gripper Z offsets to adjust grip height for a specific type of microplate. Do not re-teach a teachpoint to adjust where the gripper head grips a microplate.

Plate height (mm)	The distance from the bottom of the microplate to the top of the microplate, as the following figure shows.

Speed	The speed at which the Loader gripper head will move to a teachpoint. The speed is defined as a percent of the factory-set maximum speed: Slow, Medium, and High.
Operation mode	The y-axis and z-axis mode for a gripper-head move to a teachpoint. The options are:

- **Holding plate** (Default). Prevents the gripper head from moving to certain places where it is restricted by the microplate it is gripping.
- **Not holding plate**. Lets the gripper head move to places that would otherwise be restricted if it is holding a microplate.
- **Homing**. Moves very slowly, assuming that potential obstacles might be in the path with which the gripper head might collide.
- **Static**. Restricts all movement. The servo motors attempt to keep the gripper head perfectly still.

Related information

For more information about...	See...
Loader teachpoints	"About the Loader teachpoints" on page 70
Homing the gripper	"Homing the gripper head" on page 88
Jogging the gripper head	"Jogging the gripper head" on page 95
Opening and closing the gripper	"Opening and closing the gripper" on page 97
Manually moving the gripper	"Moving the gripper manually" on page 101
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Jogging the gripper head

About this topic

This topic describes how to use Centrifuge Loader Diagnostics to move the gripper head.

Before you start

⚠️ **WARNING**   **Jogging the gripper head can create pinch points along the path of movement. The gripper is designed to stop if it contacts an object, but movement along any axis could still result in injury. Keep away from the Centrifuge with Loader when the gripper moves.**
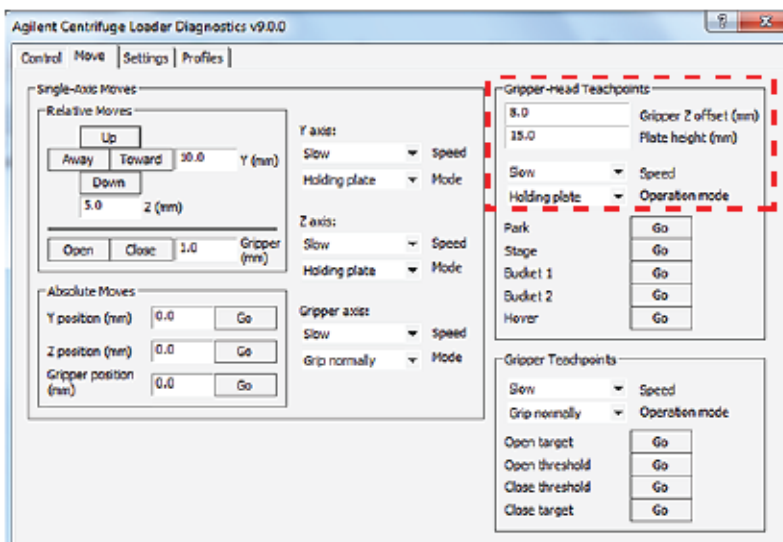
CAUTION   A collision can occur if an object is placed in the path of the moving gripper. To prevent potential equipment damage, ensure that the path is clear of objects that could cause a potential collision.

Jogging the gripper head

To jog the gripper head incrementally:

1   In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

2   Under **Relative Moves**, type the jog increment (mm) for the direction that you want the gripper to move:

- Y (mm) to move the gripper away from or toward the Centrifuge.
- Z (mm) to move the gripper head up or down.
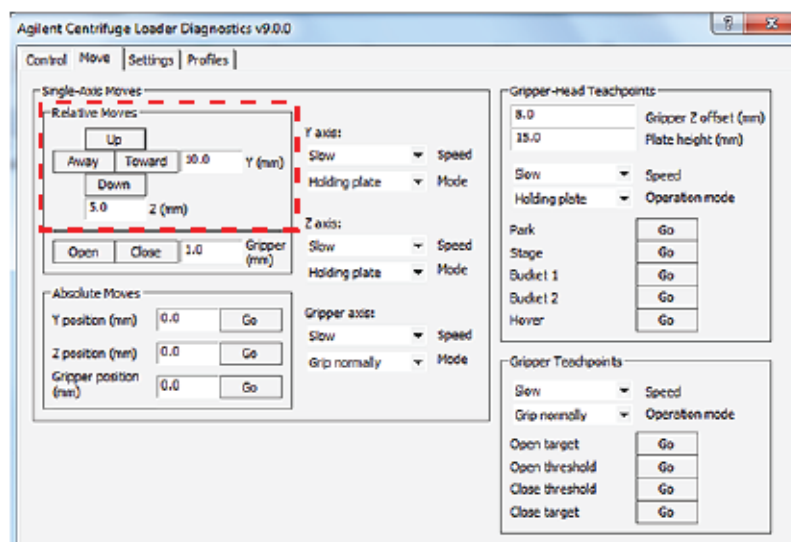
Note: If you enter a distance that is out of range, the number appears red.

3 For the axis to be moved, verify the settings for the following:

Parameter	Description
Speed	The speed of the move, defined as a percent of the factory-set maximum speed: Slow, Medium, or High.
Mode	The mode of the move. The options are:
	• **Holding plate** (Default). Prevents the gripper head from moving to certain places where it is restricted by the microplate it is gripping.
	• **Not holding plate**. Lets the gripper head move to places that would otherwise be restricted if it is holding a microplate.
	• **Homing**. Moves very slowly, assuming that potential obstacles might be in the path with which the gripper head might collide.
	• **Static**. Restricts all movement. The servo motors attempt to keep the gripper head perfectly still.

4 Click the corresponding axis button to move the head by the selected jog increment.

5 Repeat steps 2 and 4, as required, to move the gripper head to the target destination. Ensure that you reduce the jog increment as the head gets closer to the destination.

Note: In the Status area at the bottom of the tab, the Position (mm) readout display the distance from the axis origin.

Related information

For more information about...	See...
Moving the gripper head to a teachpoint	"Sending the gripper head to a teachpoint" on page 92
Opening and closing the gripper	"Opening and closing the gripper" on page 97
Manually moving the gripper	"Moving the gripper manually" on page 101
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Opening and closing the gripper

About this topic

This topic describes how to use Centrifuge Loader Diagnostics to move the gripper fingers, including:

- Opening or closing to a teachpoint
- Jogging the gripper fingers open or closed
- Performing an absolute move

To manually move the gripper, see "Moving the gripper manually" on page 101.

Opening or closing to a teachpoint

To open or close the gripper fingers:

1 In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

2 Under **Gripper Teachpoints**, verify the settings for the following parameters:

    a **Speed**. The options are Slow, Medium, and Fast.

    b **Operation mode**. For most situations, select **Grip normally** (Default) if you want the grippers to close using normal force, or **Grip gently** if you want the grippers to use less than normal force.

    For details on each option, see "Centrifuge Loader Diagnostics—Move tab" on page 144.
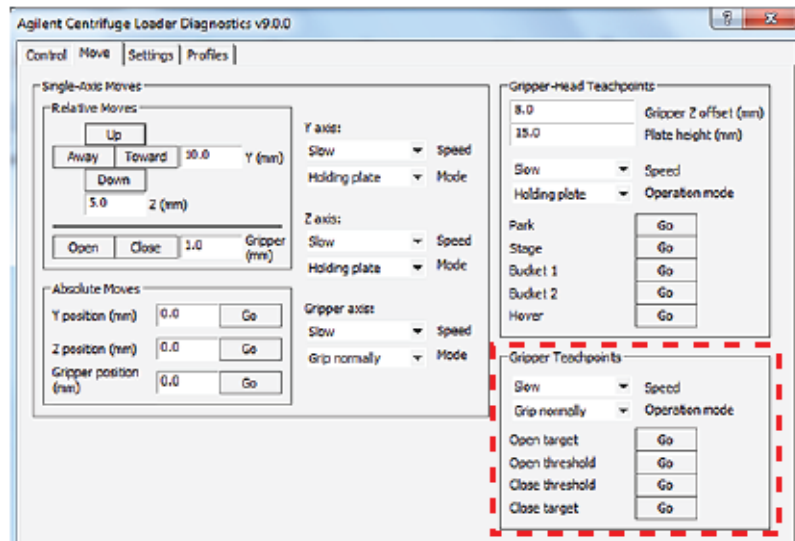
3 Click **Go** to move to the corresponding teachpoint:

- Open target (**1**), as the following figure shows.
- Open threshold (**2**).
- Close threshold (**3**).
- Close target (**4**).

Figure Gripper finger open and close targets and thresholds (top view)
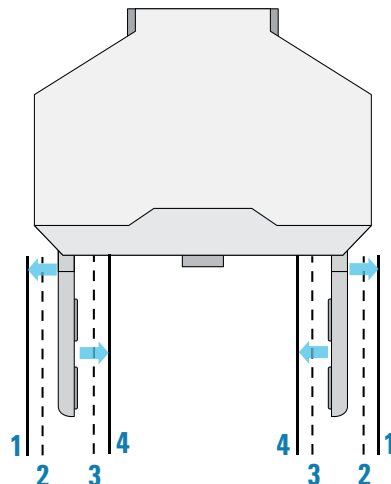
Note: In the figure, the distances between the thresholds, targets and gripper fingers are exaggerated to illustrate the concept.

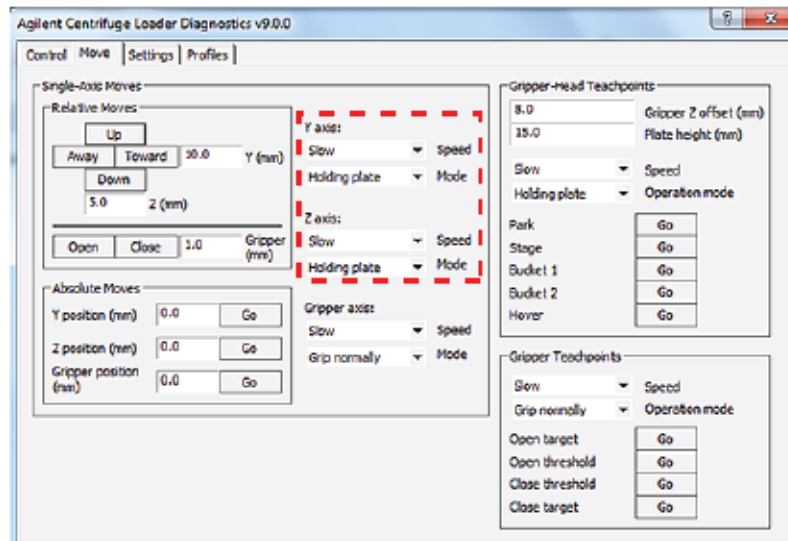## Jogging the gripper fingers open or closed

To jog the gripper fingers incrementally:

1   In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

2   Under **Relative Moves**, type the **Gripper (mm)** jog increment.
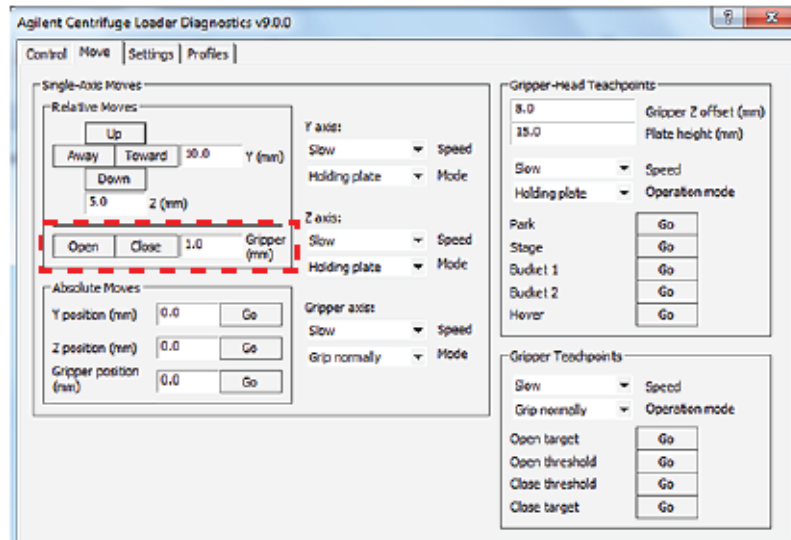
Note: If you enter a distance that is out of range, the number appears red.

3   Verify the **Gripper axis** settings:
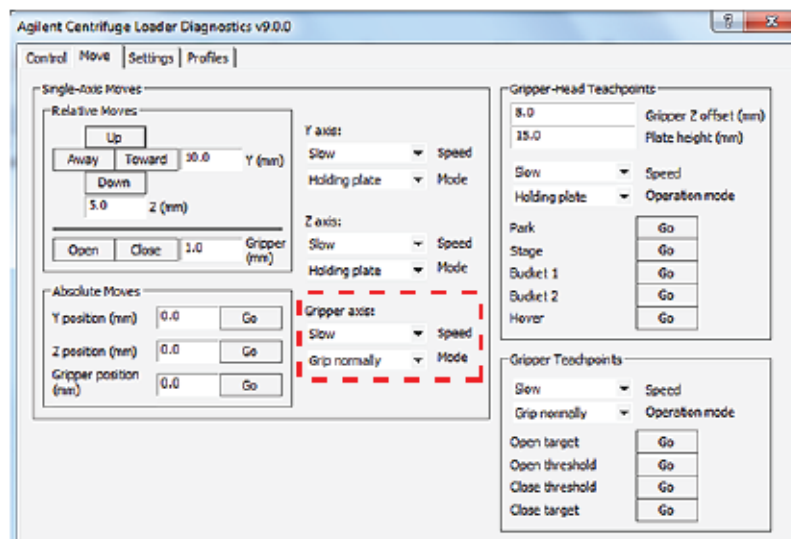
a   **Speed**. The options are Slow, Medium, and Fast.

b   **Mode**. For most situations, select **Grip normally** (Default) if you want the grippers to close using normal force, or **Grip gently** if you want the grippers to use less than normal force.

For details on each option, see "Centrifuge Loader Diagnostics—Move tab" on page 144.

4 Click **Open** or **Close** to move the gripper fingers by the selected jog increment.

5 Repeat steps 2 and 4, as required, to move the gripper fingers to the target destination.

Note: In the Status area at the bottom of the tab, the Position (mm) readout displays the distance from the axis origin.

Performing an absolute move

To open or close the gripper fingers:

1 In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

2 Under **Absolute Moves**, type the value for the **Gripper position (mm)**. The range is –5 to 10 mm.

Note: If you enter a distance that is out of range, the number appears red.

3 Verify the **Gripper axis** settings:
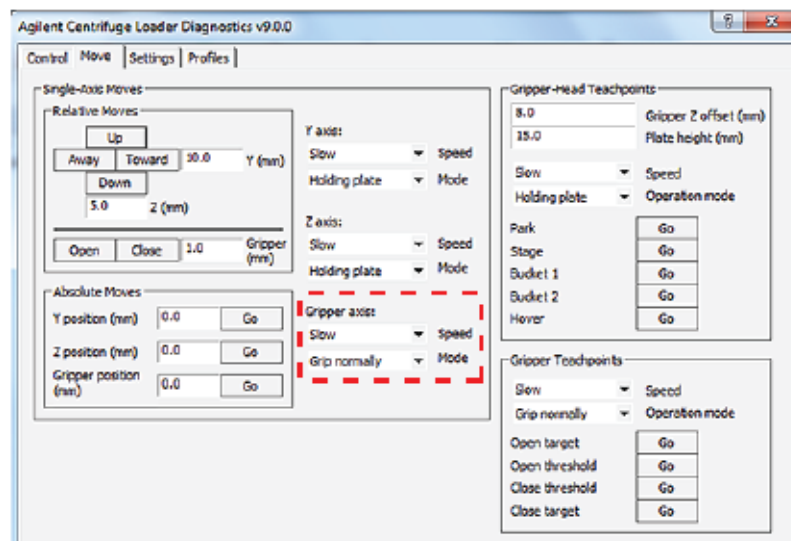
a **Speed**. The options are Slow, Medium, and Fast.

b **Mode**. For most situations, select **Grip normally** (Default) if you want the grippers to close using normal force, or **Grip gently** if you want the grippers to use less than normal force.

For details on each option, see "Centrifuge Loader Diagnostics—Move tab" on page 144.

4 Click **Go** to open or close the gripper to the specified location.

Note: In the Status area at the bottom of the tab, the Position (mm) readout displays the distance from the axis origin.

Related information

For more information about…	See…
Moving the gripper head to a teachpoint	"Sending the gripper head to a teachpoint" on page 92
Jogging the gripper head	"Jogging the gripper head" on page 95
Homing the gripper	"Homing the gripper head" on page 88
Manually moving the gripper	"Moving the gripper manually" on page 101
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Moving the gripper manually

About this topic

Disabling the axis motors allows you to move the gripper by hand. Manually moving the gripper can be useful so that you can position the robot in a convenient location during setup or maintenance. You can also isolate the movements of one axis by disabling the motors of the other axes.

Before you start

CAUTION   Attempting to move the gripper head manually in any of its axes without first disabling the servos could damage the motors.

CAUTION   Applying too much force on the gripper fingers can damage the gripper head. To move the gripper fingers manually, you must turn the gripper lead screw.

Ensure that you have a flathead screwdriver if you want to manually open or close the gripper fingers.

Procedure

To move the gripper manually:

1 In the **Centrifuge Loader Diagnostics** dialog box, locate the **Enable Centrifuge Loader Status** area.
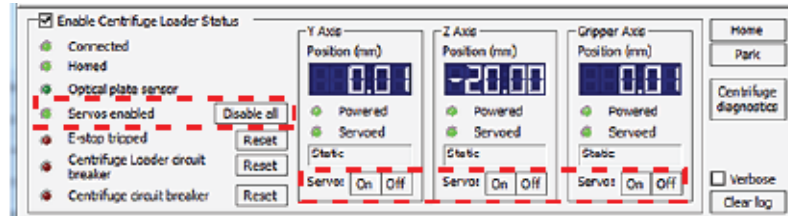
2 Do one of the following to disable the axis motors:

- To disable the servos by axis, click the **Servo Off** buttons in the **Y Axis**, **Z Axis**, and **Gripper Axis** areas, as applicable.

- To disable all the motors, click **Disable all** next to the **Servos enabled** indicator.

3 Carefully, move the gripper head in the y- and z-axes to the desired position.

4 To open and close the gripper fingers manually, using a flathead screwdriver turn the lead screw to move the gripper fingers.

Note: Moving the gripper arms is not necessary for finding a teachpoint.

Figure Gripper lead screw location
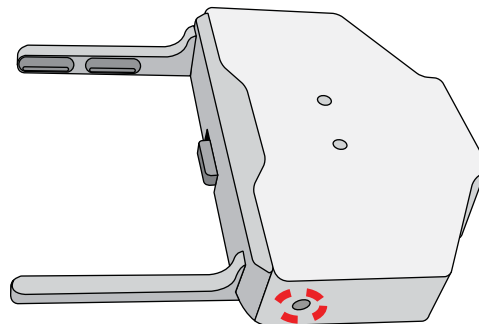
5 After you have finished moving the gripper manually, click **Servos On** in the **Y Axis**, **Z Axis**, and **Gripper Axis** areas, as applicable, to turn the servos back on.
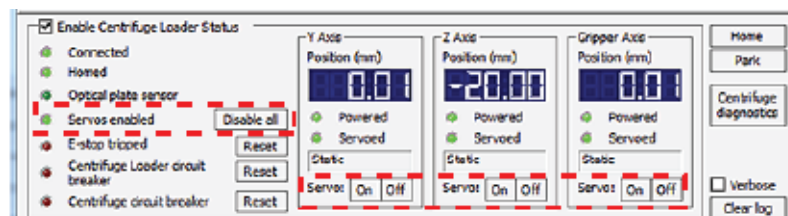
Alternatively, the servos turn on automatically when you command the gripper head to move using controls in the Centrifuge Loader Diagnostics dialog box, or if ActiveX motion commands are invoked.

Related information

For more information about...	See...
Moving the gripper head to a teachpoint	"Sending the gripper head to a teachpoint" on page 92
Jogging the gripper head	"Jogging the gripper head" on page 95
Opening and closing the gripper	"Opening and closing the gripper" on page 97
Manually moving the gripper	"Moving the gripper manually" on page 101
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

Testing the Centrifuge actuators

About this topic

This topic describes controls and indicators in Centrifuge Diagnostics that you can use to diagnose problems with Centrifuge actuators. You can test the following actuators in Centrifuge Diagnostics:

• Lock Bucket and Unlock Bucket

• Lock Door and Unlock Door

• Open Door

Note: The door cannot be opened until it is unlocked.

Before you start

Open Centrifuge Diagnostics. For instructions, see "Opening diagnostics software" on page 43.

The following figure shows the actuator controls in the Controls tab of the Centrifuge Diagnostics dialog box.

Figure   Actuator controls in the Controls tab
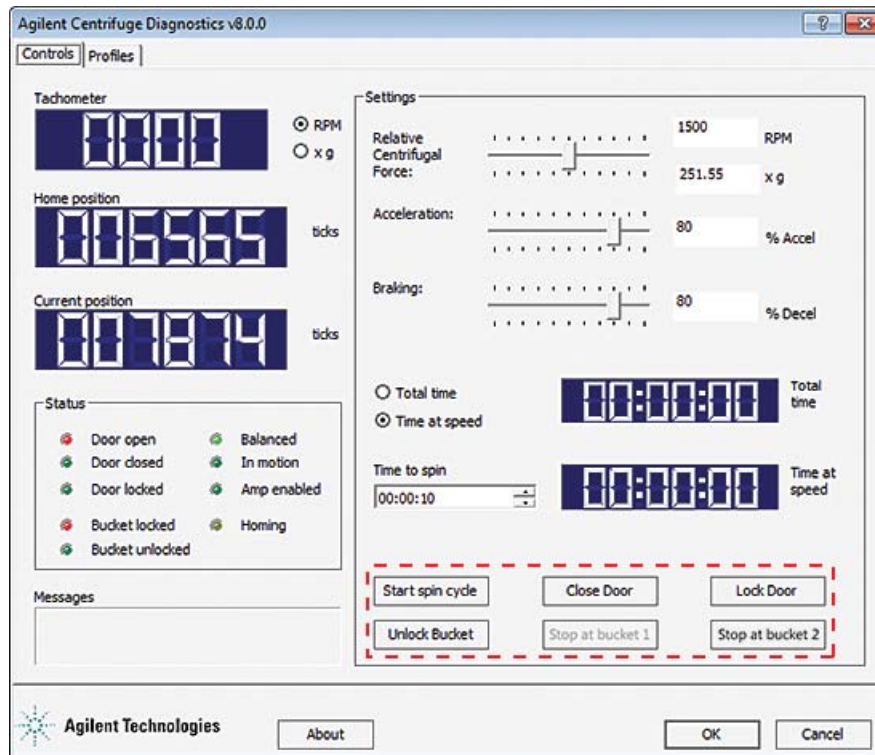
If there are problems with the actuators, check the indicators in the Status area and check the Messages area of the Controls tab.

Locking and unlocking the bucket assembly

The bucket assembly (buckets and rotor) locks automatically before a microplate is picked from or placed on a bucket. When locked, the buckets do not swing and the rotor does not turn. You can also manually lock the bucket assembly.

To unlock the bucket assembly:

On the **Controls** tab, click **Unlock Bucket**.

The bucket assembly is now free to spin, and can be moved manually.

To lock the bucket assembly:

On the **Controls** tab, click **Lock Bucket**.

The bucket assembly locks, restricting bucket swinging and rotor spinning.

Locking and unlocking the door

Between spin cycles, you can command the door to lock or unlock.

The door must be locked before you can start a spin, and remains locked throughout the spin. If the rotor starts spinning, the hardware interlocks close and lock the door automatically.

To lock the door:

In the **Controls** tab, click **Lock Door**.

The door locks, and cannot be opened without sending an unlock command or unlocking it manually.

To unlock the door:

In the **Controls** tab, click **Unlock Door**.

The door unlocks.

Opening and closing the door

> ⚠ **WARNING**   **The Centrifuge door can cause possible pinching, piercing, or bruising if your hand is in the opening when it closes. Keep away from the Centrifuge door while it is opening or closing.**

Figure   Centrifuge door
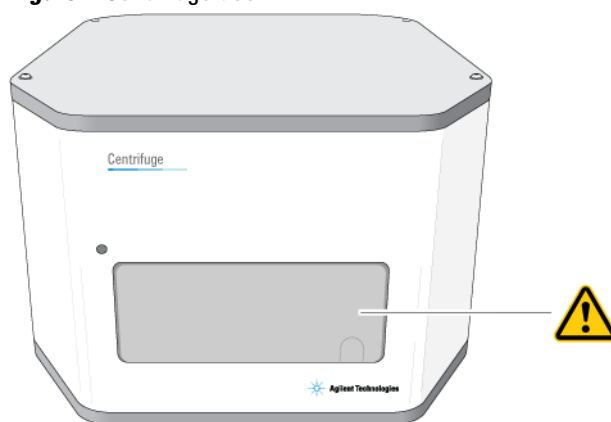
Between spin cycles, you can command the door to open.

The door must be closed before you can start a spin.

The door will not open until it is unlocked.

To open the door:

1   In the **Controls** tab, verify that the door is unlocked by checking the **Door locked** status light in the **Status** area.

2   Click **Open Door**.

The door opens.

To close the door:

Click **Close door**.

The door closes.

Checking error messages

The following types of error and status messages appear in the Messages area of the Control tab:

- Bucket lock failed
- Door lock failed
- Door open failed

Door closed status anomaly

The Door closed sensor is not triggered when the door is fully closed, but rather when it is just starting to close.

As a result, it is occasionally possible for the door to be open slightly, but for the Door closed status light to still be lit.

Related information

For more information about...	See...
Error messages	"Troubleshooting error messages" on page 128
Controls and indicators in Centrifuge Diagnostics	• "Centrifuge Diagnostics–Profiles tab" on page 155 • "Centrifuge Diagnostics–Controls tab" on page 157
Troubleshooting problems	"Troubleshooting error messages" on page 128
Reporting problems	"Reporting problems" on page 134

7
Maintaining the device

This chapter contains the following topics:

Agilent Technologies

Routine maintenance and cleaning

Before you start

This topic provides guidelines for periodic routine maintenance and cleaning.

⚠️ **WARNING** **To prevent potential injury or equipment damage, always disconnect the Centrifuge power, air, and serial cable before performing any cleaning or maintenance.**

⚠️ **WARNING** **Sample microplates may contain toxic, caustic, or radioactive substances. If a sample microplate containing anything other than innocuous materials breaks apart in the Centrifuge, contact Agilent Automation Solutions Technical Support.**

CAUTION If labware breaks apart inside the Centrifuge, ensure that all the fragments are removed. Labware fragments can interfere with moving parts and potentially damage the Centrifuge.

CAUTION Use only the recommended cleaning materials. Using other cleaning solutions and materials can cause damage to the device. Do not use abrasive, corrosive cleaning agents. Do not use metal brushes.

CAUTION Trapped liquids in the Centrifuge may cause corrosion inside the device.

Preventive maintenance

To keep the Centrifuge working properly, Agilent Technologies recommends that you schedule at least two maintenance visits every year. To schedule the maintenance service, contact Agilent Automation Solutions Technical Support.

Spindle lubrication

The Centrifuge requires no lubrication except for the spindle, which has been designed to remain lubricated for two years of operation.

Do not attempt to lubricate the spindle yourself. If you hear squeaking noises, or notice that it takes longer for the Centrifuge to reach the set spin velocity, contact Agilent Automation Solutions Technical Support.

Bucket pin lubrication

The Centrifuge bucket pins use bushings and do not require lubrication.

If the buckets do not swing freely, do not attempt to lubricate the bucket pins yourself. Contact Agilent Automation Solutions Technical Support.

Centrifuge rotor

CAUTION The Centrifuge has a permanently attached rotor. Tampering with or adjusting the rotor mounting screw, which fastens the rotor to the central motor axle, can result in equipment damage. If the rotor mounting screw requires maintenance, contact Agilent Automation Solutions Technical Support.

Routine cleaning procedure

Clean the Centrifuge weekly or as needed. Do not let liquids contact:

- The electronic components
- Mechanical components inside the motor assembly
- The spindle support assembly

To clean the Centrifuge:

1 Use standard laboratory wipes and a mild detergent or isopropyl alcohol to clean the exterior painted white surfaces and the metal surfaces of dust, grime, chemical deposits, and other debris.

2 Remove the buckets. Inspect and clean the interior.

3 Clean the buckets using standard laboratory wipes and a mild detergent or isopropyl alcohol.

4 Install the buckets.

Cleaning up broken plates

Counterweight plates are particularly susceptible to falling apart because of repeated wear. However, the fluid spilled from a counterweight plate is usually water, which is easy to clean up.

Whenever a plate breaks apart in the Centrifuge, follow these guidelines:

- Depending on the amount of spillage, you may need to remove the buckets, or disassemble the Centrifuge.

  To remove the buckets, see "Removing the buckets" on page 113.

  If the Centrifuge might require disassembly, contact Agilent Automation Solutions Technical Support.

- Use a long pair of tweezers to remove broken plate fragments.
- If not much liquid spilled, you can vacuum up smaller plate fragments.
- Make sure that excess liquid is removed. Avoid using the Centrifuge until it has dried completely.

Related information

For more information about...	See...
Disconnecting the air supply	"Disconnecting the air supply" on page 110
Unlocking the door	"Unlocking and opening the door manually" on page 111
Removing the buckets	"Removing the buckets" on page 113
Installing the buckets	"Installing the buckets" on page 27
Reporting problems	"Reporting problems" on page 134

Disconnecting the air supply

When to disconnect the air supply

Disconnect the air supply before:

- Performing maintenance on the Centrifuge
- Cleaning the Centrifuge
- Cleaning up broken plates

Procedure

⚠️ **WARNING**   **Working with open, charged air lines can result in injury. To prevent potential injury or equipment damage, turn off the air supply before disconnecting the air line from the Centrifuge.**

To disconnect the air line:

1 At the back of the Centrifuge, push in the orange locking collar to release the air line.
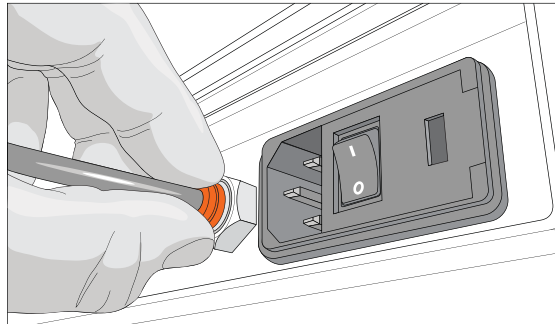
2 Gently, pull on the air line with your free hand until the tubing comes out.

Related information

For more information about...	See...
Connecting the air supply	"Connecting the air, power, and e-stop" on page 29
Specifications for air supply	"Laboratory requirements" on page 19
Reporting problems	"Reporting problems" on page 134

Unlocking and opening the door manually

About this topic

Before cleaning or performing maintenance on your Centrifuge, you will need to unlock and open the door.

Before you start

⚠️ **WARNING**   **To prevent potential injury or equipment damage, always disconnect the Centrifuge power, air, and serial cable before performing any cleaning or maintenance.**

⚠️ **WARNING**   **To prevent potential injury or equipment damage, do not attempt to manually unlock the door while the rotor is moving. Although no longer powered, the buckets may still be rotating at a dangerous speed.**

To disconnect the air hose, see "Disconnecting the air supply" on page 110.

Procedure

To manually unlock and open the door:

1 Put a small, thin tool, such as a large unfolded paperclip, through the hole at the upper left of the door to push against and fully retract the lock pin.

Ensure that the tool is inserted at an angle so that it goes between the door column and the cover, as the following figure (**A**) shows

At the same time, push upward in the indentation (**B**) in the door with your other hand.

Figure   Centrifuge (**A**) door-lock access hole and (**B**) door indentation
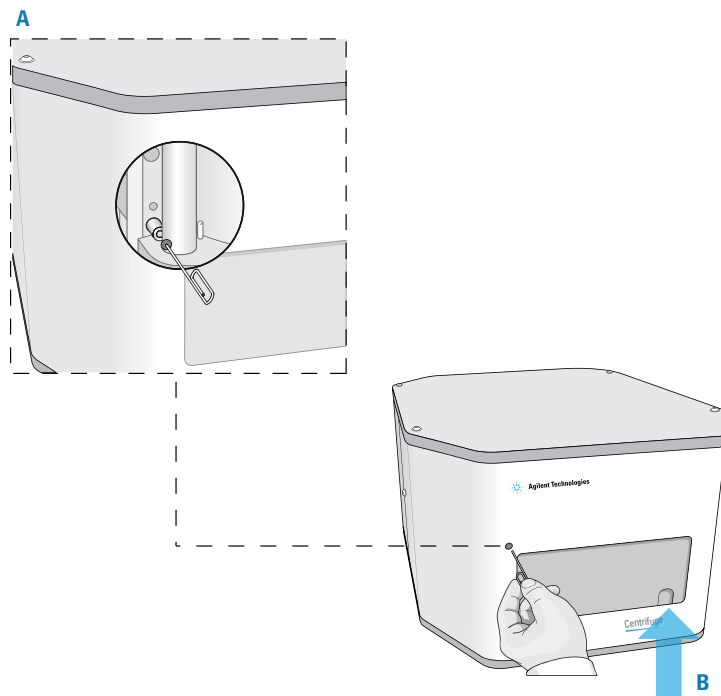
2   Remove the tool after the door begins to open, to continue opening the door. Otherwise, the tool will obstruct the door's movement.

Related information

For more information about...	See...
VWorks software	*VWorks Automation Control Setup Guide*
	VWorks Automation Control User Guide
Controls and indicators in Centrifuge Diagnostics	*Centrifuge Diagnostics Version 8 Quick Reference*
Reporting problems	*"Reporting problems" on page 134*

Removing the buckets

When to remove the buckets

Remove the buckets before cleaning or moving the Centrifuge.

To access the buckets, you must open the door manually.

Before you start

⚠️ **WARNING**   **To prevent potential injury or equipment damage, always disconnect the Centrifuge power, air, and serial cable before performing any cleaning.**

Ensure that the power and air are turned off. To disconnect the air hose, see "Disconnecting the air supply" on page 110.

Open the Centrifuge door manually. See "Unlocking and opening the door manually" on page 111.

Procedure

To remove a bucket:

1   Roll the bucket as the following figure shows, and then pull the bucket towards you until it comes free of the pins.
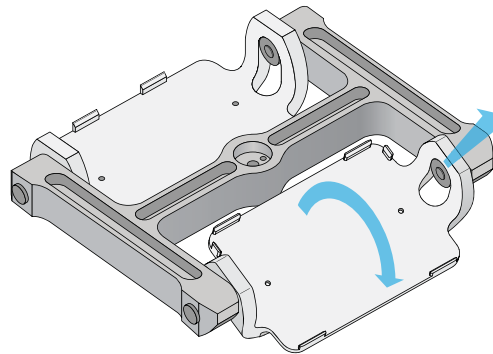
2   Rotate one end of the bucket towards you, and turn it upside down.
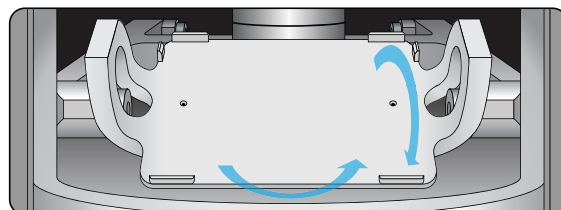
3   Remove the bucket from the door opening.
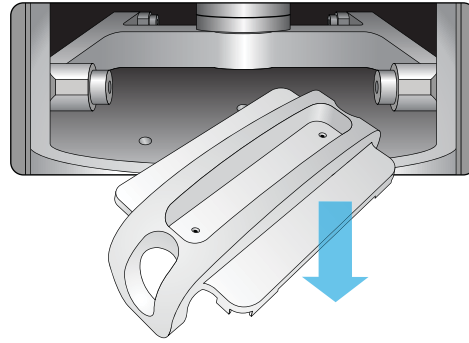
Related information

For more information about...	See...
Unlocking the door manually	"Unlocking and opening the door manually" on page 111
Installing the buckets	"Installing the buckets" on page 27
Reporting problems	"Reporting problems" on page 134

Setting the gripper-head teachpoints

About this topic

⚠️ **WARNING** **To avoid potential injury and damage to the device, only personnel trained in how to teach a robot should perform the procedures in this topic.**

IMPORTANT Before performing the procedures in this section, ensure that you have an understanding of the Loader teachpoint requirements and know how to move the gripper head. For details, see the following:

- "About the Loader teachpoints" on page 70
- "Options for moving the gripper" on page 89

Before you start

⚠️ **WARNING** **The Centrifuge with Loader has many moving parts that can cause possible pinching, piercing, or bruising. Keep away from the Centrifuge with Loader while it is in motion.**

CAUTION A collision between the gripper and another object, such as extra labware, can cause equipment damage. Before moving the gripper, ensure that the path is clear of objects that could cause a potential collision.

IMPORTANT The teachpoints are preset at the factory. The teachpoint values are stored on the Loader firmware. Before you change the teachpoints, contact Agilent Automation Solutions Technical Support to make sure the teachpoints require adjustment.

IMPORTANT The teachpoints should be valid for a range of labware types. To make gripper adjustments for different labware, you adjust the value of the Gripper Z offset for the given labware type. For details, see "Parameters that define gripper movements at a teachpoint" on page 71.

Use the following workflow.

Step	For this task...	See...
1	Determine if the teachpoints require adjustment.	"Determining if the Loader teachpoints require adjustment" on page 74
2	Ensure that you have the Gripper Z offset and Plate height measurements for the microplate that you are using for teaching.	"Parameters that define gripper movements at a teachpoint" on page 71
3	Set the teachpoint for the Stage position.	"Adjusting the Stage teachpoint" on page 116

Step	For this task...	See...
4	Set the teachpoint for the Bucket 1 and Bucket 2 positions.	"Adjusting the Loader bucket teachpoints" on page 118

Adjusting the Stage teachpoint

You can adjust the Stage teachpoint in the y-axis (toward and away from the Centrifuge) and the z-axis (up and down).

Figure Gripper at the Stage teachpoint
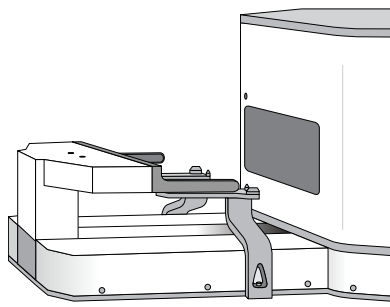
To adjust the Stage teachpoint:

1 Make a note of the current Stage teachpoint coordinates as follows:

    a In the **Centrifuge Loader Diagnostics** dialog box, click the **Settings** tab.

    b Under **Gripper-Head Teachpoints**, select the **Stage** teachpoint, and then make a note of the **Y position** and **Z position** values.

      You can use the current teachpoint values as a reference to help you determine how much to move the teachpoint.
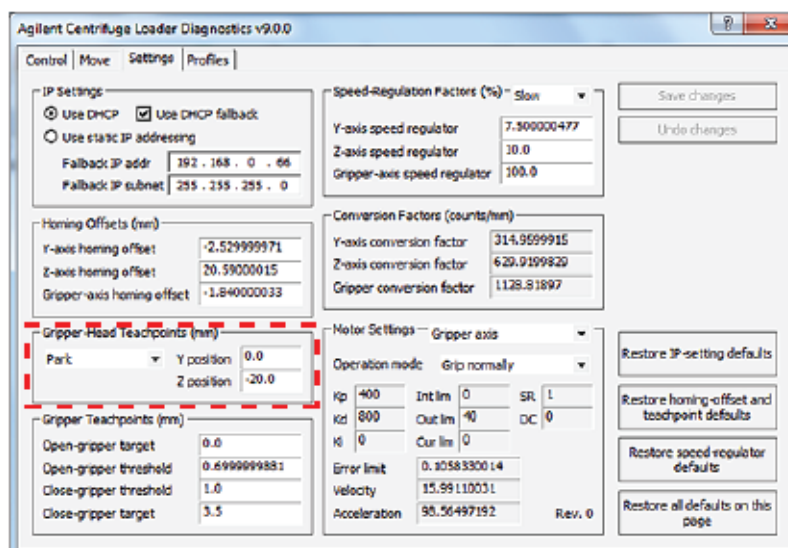
2 If you know the values that you want to use for the teachpoint, type the new values in the **Y position** and **Z position** boxes, and then skip to step 5.

- *y*- axis. Positive direction is towards the Centrifuge. Negative direction is away from the Centrifuge.
- *z*- axis. Positive direction is towards the top of the range of movement. Negative direction is towards the bottom of the range of movement.

Note: The teachpoint *z*- axis value for the Stage may be the same as for the Bucket 1 or Bucket 2 teachpoint.

3 To determine the teachpoint values by moving the gripper to the position:

a Use the controls in the **Move** tab to position the gripper at the desired teachpoint location. For instructions, see "Options for moving the gripper" on page 89.

b Visually inspect the alignment of the gripper fingers relative to the top surface of the stage.

Note: The *z*- axis origin (0 position) is where the center of the gripper pad protrusion is level with the top of the plate stage.

c Under **Enable Centrifuge Loader Status**, notice that the new values are displayed in the **Y Axis Position** and **Z Axis Position** displays.

IMPORTANT If the gripper is at the stage, the value in the Z Axis Position display is the sum of the teachpoint location and the Gripper Z offset value. Subtract the Gripper Z offset value from the displayed value to determine the teachpoint value.
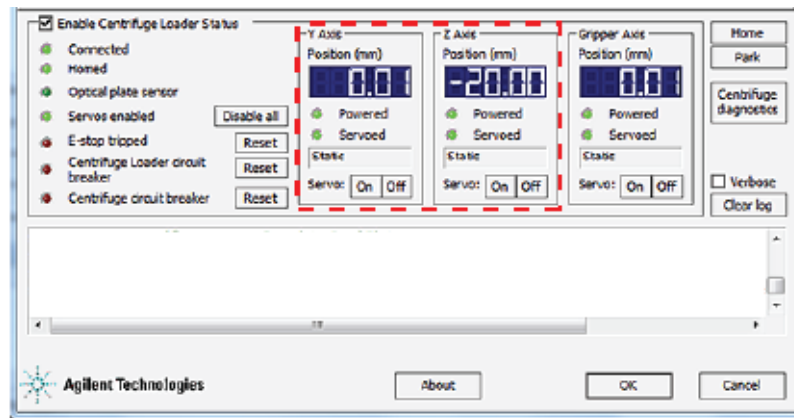
4 In the **Settings** tab, under **Gripper-Head Teachpoints**:

a Select the **Stage** teachpoint.

b Type the new **Y position** and **Z position** teachpoint values.

5 To save the new teachpoint value for the gripper position at the stage, click **Save changes** in the **Settings** tab.

The new teachpoint values are stored on the Loader firmware.

Adjusting the Loader bucket teachpoints

You can adjust the Stage teachpoint in the y-axis (toward and away) and the z-axis (up and down).

Note: The z-axis value for the bucket teachpoints is typically the same as for the stage.

Figure Gripper at the Bucket teachpoint
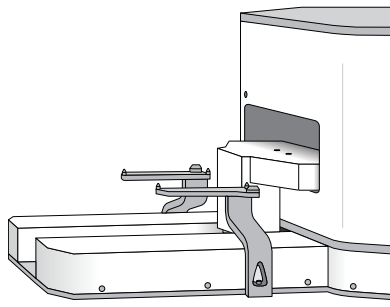
To adjust the bucket teachpoint:

1 Make a note of the current bucket teachpoint coordinates as follows:

    a In **Centrifuge Loader Diagnostics** dialog box, click the **Settings** tab.

    b Under **Gripper-Head Teachpoints**, select the **Bucket 1** or **Bucket 2**, as applicable, and then make a note of the **Y position** and **Z position** values.

       You can use the current teachpoint values as a reference to help you determine how much to move the teachpoint.
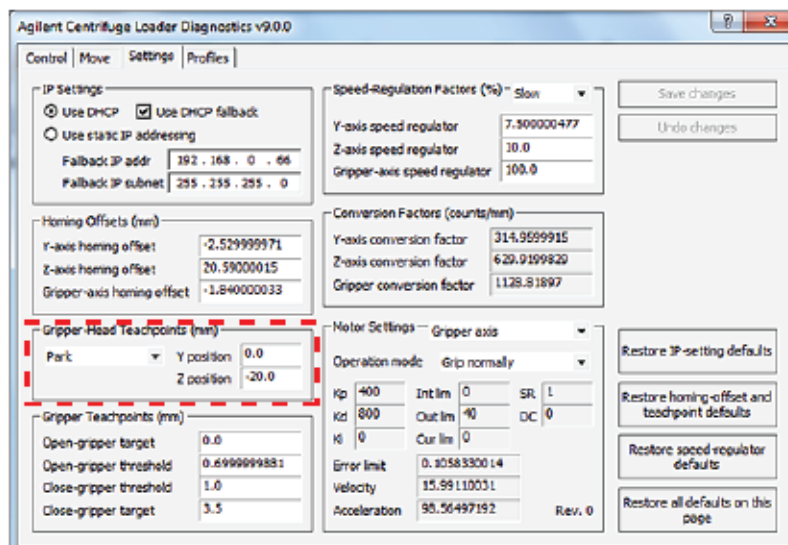
2 If you know the new values that you want to use for the teachpoint, type the values in the **Y position** and **Z position** boxes, and then skip to step 5.

- y-axis. Positive direction is towards the Centrifuge. Negative direction is away from the Centrifuge.

- z-axis. Positive direction is towards the top of the range of movement. Negative direction is towards the bottom of the range of movement.

For example, if the current teachpoint z-axis is 0 mm, but the gripper drops the microplate in the bucket, try setting the teachpoint z-axis at -2 mm.

3 To determine the teachpoint values by moving the gripper to the position:

a Place a microplate on the Loader stage.

b Use the controls in the **Move** tab to grip the microplate and move the gripper head into position at the bucket. For instructions, see "Options for moving the gripper" on page 89.

Alternatively, you can position the gripper manually. For instructions, see "Moving the gripper manually" on page 101.

c Under **Enable Centrifuge Loader Status**, notice that the new values are displayed in the **Y Axis Position** and **Z Axis Position** displays.

IMPORTANT If the gripper is at the bucket, the value in the Z Axis Position display is the sum of the teachpoint location and the Gripper Z offset value. Subtract the Gripper Z offset value from the displayed value to determine the teachpoint value.
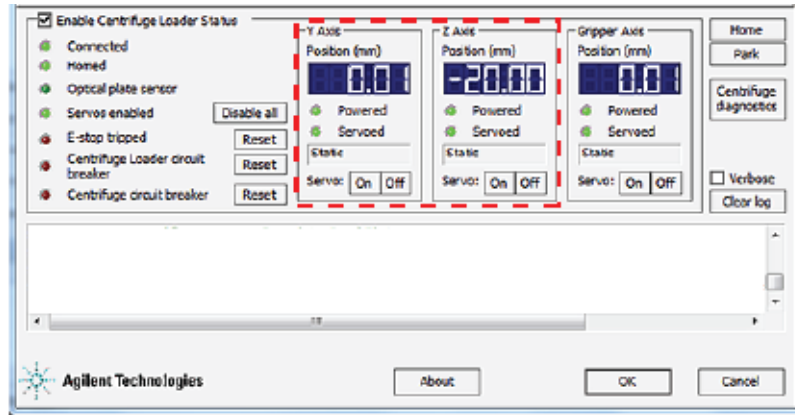
4 In the **Settings** tab, under **Gripper-Head Teachpoints**:

a Select the corresponding **Bucket 1** or **Bucket 2** teachpoint.

b Type the new **Y position** and **Z position** teachpoint values.

5 To save the new teachpoint value for the gripper position at the bucket, click **Save changes**.

The new teachpoint values are stored in the Loader firmware.

Teaching the Hover teachpoint

Figure Gripper at the Hover teachpoint
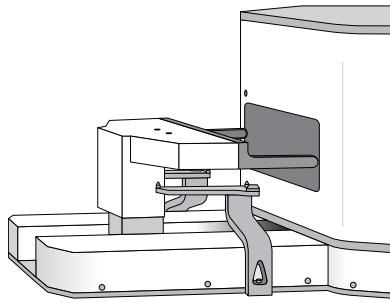
To teach the Hover teachpoint:

1 If the gripper is holding a microplate, release the microplate as follows:

  a In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

  b In the **Gripper Teachpoints** area, click **Open target**.
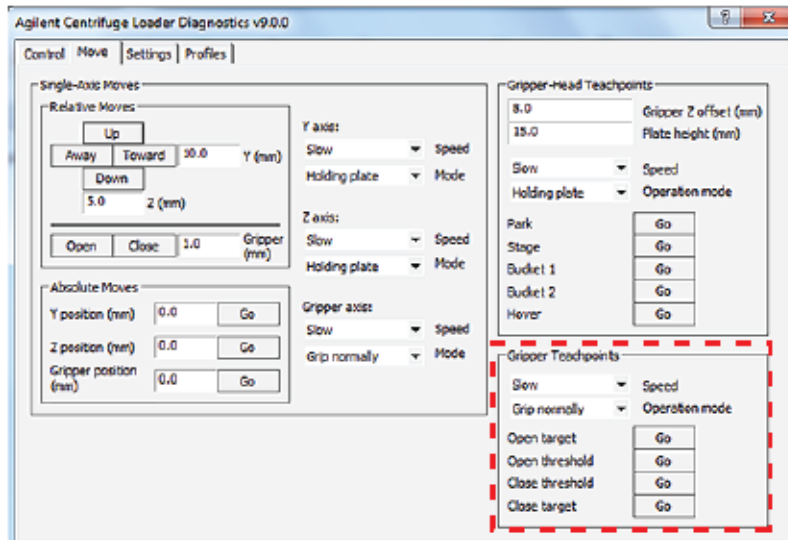
2 Use the controls in the **Move** tab to move the gripper head so that it is just outside the Centrifuge door. For instructions, see "Options for moving the gripper" on page 89.

3 Make a note of the **Y Axis Position** and **Z Axis Position** values that appear in the displays of the **Status** area.
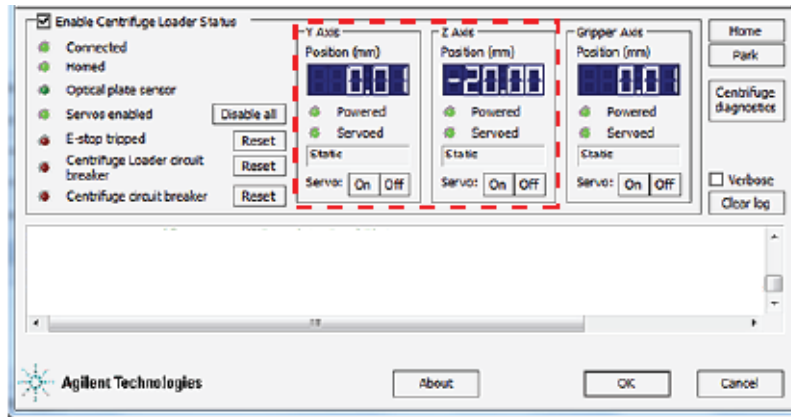
4 In the **Settings** tab, under **Gripper-Head Teachpoints**:

a Select **Hover** in the teachpoint list.

b Type the new **Y position** and **Z position** teachpoint values.
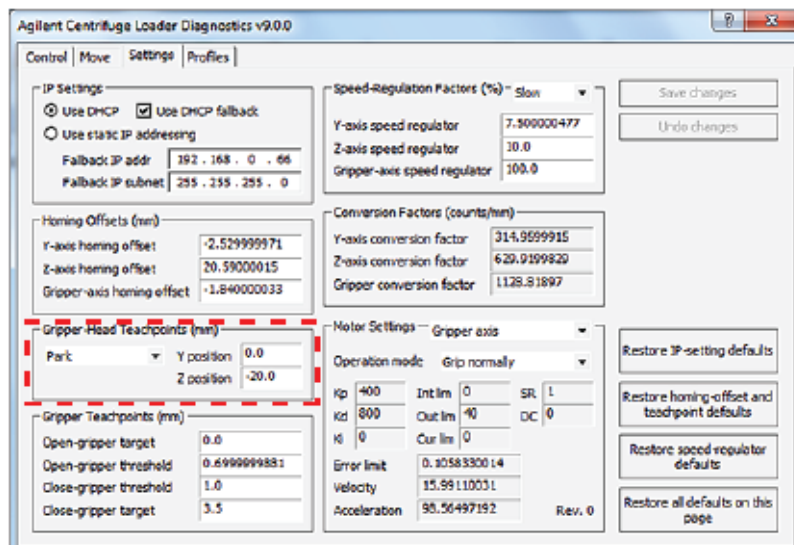
5 Click **Save changes**. The new teachpoint values are stored in the Loader firmware.

Teaching the Park teachpoint

Figure Gripper at the Park teachpoint
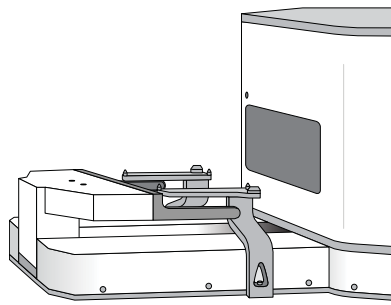
To teach the Park teachpoint:

1 Open the gripper as follows:

    a In the **Centrifuge Loader Diagnostics** dialog box, click the **Move** tab.

    b In the **Gripper Teachpoints** area, click **Open target**.
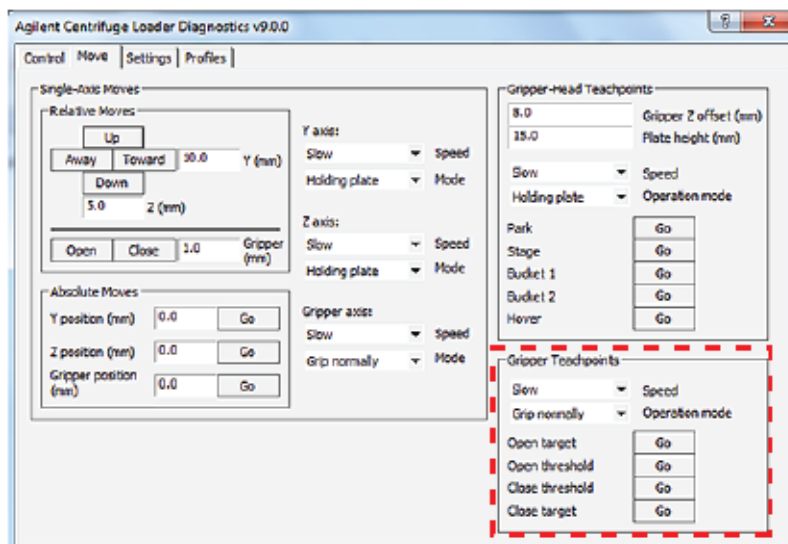
2 Use the controls in the **Move** tab to move the gripper head so that it is at its lowest point behind the stage. For instructions, see "Options for moving the gripper" on page 89.

3 Make a note of the **Y Axis Position** and **Z Axis Position** values that appear in the displays of the **Status** area.
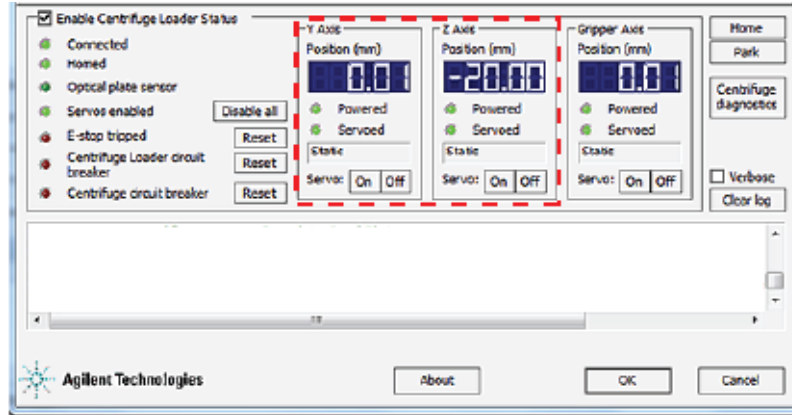
4   In the **Settings** tab, under **Gripper-Head Teachpoints**:

a   Select **Park** in the teachpoints list.

b   Type the new values in the **Y position** and **Z position** boxes.
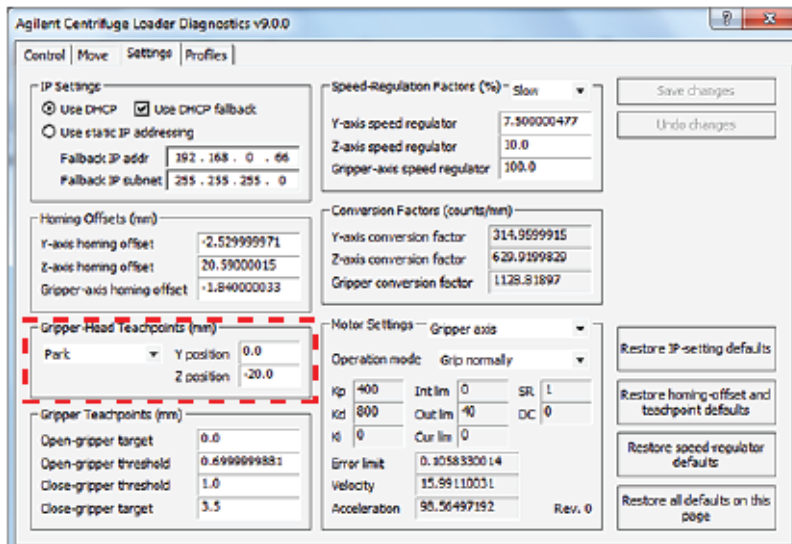
5   Click **Save changes**. The new teachpoint values are stored on the Loader.

Related information

For more information about…	See…
Gripper-head teachpoints	"About the Loader teachpoints" on page 70
Moving the gripper	"Options for moving the gripper" on page 89
Reporting problems	"Reporting problems" on page 134

Replacing the fuse

Before you start

⚠️ **WARNING** **To prevent potential injury or equipment damage, disconnect the instrument power, air, and communication cables before performing the following procedure.**

CAUTION A blown fuse can indicate an over-current condition caused by a ground fault or faulty electronics. If the fuse blows again after replacement, troubleshoot the problem by disconnecting the power supply and inspecting the AC wiring through the power entry module.

CAUTION Use only the specified fuse type for replacement. Using an incorrect fuse can damage the Centrifuge.

Ensure that you have the following:

- Fuse of the specified type: 7 A, 250 V, 3AG
- Flathead screwdriver

Procedure

To replace the fuse in the power switch:

1 Shut down the Centrifuge with Loader, and unplug the power cable from the rear panel connector.

2 At the rear panel power switch enclosure, use a small flat-head screwdriver (2.5 mm) to pry open the tab at the top of the enclosure and open the enclosure cover.

Figure Fuse enclosure location
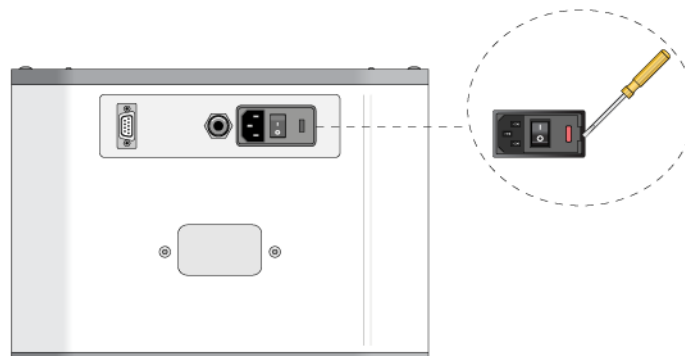
3 Insert the screwdriver head in the enclosure notch to dislodge the fuse cartridge. Slide the fuse cartridge all the way out of the enclosure.

Figure   Fuse enclosure location
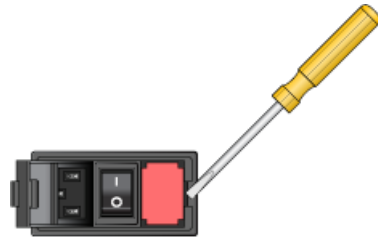
4   Replace the fuse in the cartridge.

5   Slide the fuse cartridge back into the fuse enclosure.

6   Press the enclosure cover securely into the closed position.

7   Plug in the power cord at the rear panel connector.

Related information

For more information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Troubleshooting problems	"Troubleshooting hardware problems" on page 126
Reporting problems	"Reporting problems" on page 134

Troubleshooting hardware problems

Refer to the following table to resolve common errors. If your particular issue is not in the table, or if the recommended steps do not solve your problem, see "Reporting problems" on page 134.

Problem	Possible cause	Solution
The Centrifuge does not turn on.	The site does not meet the electrical requirements.	See "Laboratory requirements" on page 19.
	The device is not connected to the power source, or the power cord is damaged.	Ensure that you are using the correct country-specific power cord and plug. Inspect the power cord and connections, and ensure that the device is connected to the power source.
	The AC inlet fuse is bad.	See "Replacing the fuse" on page 124. If the fuse blows immediately after replacement, stop using the device and see "Reporting problems" on page 134.
The bucket is not centered in the doorway.	The bucket home position is incorrect.	Set the bucket home positions. See "Setting the Centrifuge bucket home positions" on page 59.
	The profile was not re-initialized after teaching the bucket home positions.	After teaching the bucket home positions, you must re-initialize for the changes to take effect.
The buckets were level before a spin cycle. But after the spin cycle the buckets are not level.	The upper corner of a deepwell microplate with lid is hitting the rotor during the spin cycle.	Ensure that your labware fits within the Centrifuge specifications for labware height. For details, see "Laboratory requirements" on page 19. *Note:* If the microplate meets the size specifications without adding the lid, you can seal the microplate instead of using a lid.
The Loader unloads a microplate from one bucket, but not from the other bucket.	If the Loader is gripping the microplate correctly at both buckets, the microplate drops or is dislodged when the gripper moves the microplate from a bucket, the bucket may not be installed correctly.	Remove and reinstall the bucket following the procedure, "Installing the buckets" on page 27.
	If the Loader is not gripping the microplate correctly at one of the buckets, try adjusting the teachpoint for the bucket.	See "Setting the gripper-head teachpoints" on page 115

Problem	Possible cause	Solution
The Loader grips the microplate loosely, drops it, or does not keep it level while moving between locations.	The microplate was not properly seated on the Loader plate stage before it was gripped.	Ensure that the microplate is fully seated within the stage alignment tabs, and then retry the operation.
	The gripper pads are dirty or worn.	Inspect and clean the gripper pads. For details, see "Routine maintenance and cleaning" on page 108.
	If the problem occurs while using Centrifuge Loader Diagnostics, the Gripper Z offset value is incorrect. If the problem occurs while running a VWorks protocol, the Robot gripper offset value in the labware definition is incorrect.	Verify the labware properties in the software interface. For details, see "Parameters that define gripper movements at a teachpoint" on page 71. • *Centrifuge Loader Diagnostics*. Adjust the Gripper Z offset value. • *VWorks software*. Adjust the Robot gripper offset value in the labware definition. See the *VWorks Automation Control Setup Guide*.

Troubleshooting error messages

This topic provides a reference to the following types of errors:

- "General errors" on page 128
- "Loader controller errors" on page 130
- "Loader firmware errors" on page 130
- "Errors that occur before a method is launched" on page 131

If your particular issue is not in the tables, or if the recommended steps do not solve your problem, see "Reporting problems" on page 134.

General errors

Errors	What this means	What to do
Could not connect to the Centrifuge.	Power or communications are not functioning properly.	Ensure that the: • Power cord is properly connected. • Power switch is turned on. • Fuse is not burned out. • Centrifuge serial cable is properly connected to the computer, and the Centrifuge profile specifies the correct COM port. • Loader Ethernet or serial cable is properly connected to the computer, and the Loader profile specifies the correct COM port or Ethernet device ID, as applicable. Try re-initializing the device. If initialization fails, set the power switch to off, wait a few minutes, and then turn on the power again.
The Loader profile initializes, but the linked Centrifuge profile failed to initialize.	The communication settings in the profile are incorrect, or an internal software error occurred.	Verify the communication settings in the profile and reinitialize the profile. If the problem persists, restart the VWorks software, and if necessary, power cycle the device.
A position-error condition was encountered.	The Centrifuge failed to go to the specified position.	Check to see if something is blocking the rotor, such as a piece of plastic from a microplate.
Aborting current process.	The Centrifuge is currently performing another process, and cannot perform the requested action. For example, the door cannot be opened while the rotor is spinning.	Wait for the current action to finish before you perform the next action.

Errors	What this means	What to do
An imbalance condition was encountered.	During a spin, the buckets were imbalanced.	Ensure that the weight in the buckets is balanced before you start a spin. See "Balancing the Centrifuge buckets" on page 80.
\<process\> may not be called at present time.	The Centrifuge is currently performing another process, and cannot perform the requested action. For example, the door cannot be opened while the rotor is spinning.	Wait for the current action to finish before you perform the next action.
NmcNoOp() failed: Communication likely failed.	The Centrifuge may have become disconnected during operation.	Check to make sure that the: • Power cord is properly connected. • Power switch is turned on. • Centrifuge serial cable is properly connected to the computer. • Loader Ethernet or serial cable is properly connected to the computer.
Timed out error	The action did not complete within the allotted time. The power or communications to the Centrifuge has been interrupted. A hardware problem has occurred that needs to be addressed.	Check to make sure that the: • Power cord is properly connected. • Fuse is not burned out. • Power switch is turned on. • Centrifuge serial cable is properly connected to the computer. • Loader Ethernet or serial cable is properly connected to the computer. Perform the action again.
Tried to actuate bucket lock but failed.	The system may have insufficient air pressure or another hardware problem may have occurred.	Check to make sure that the: • Air line is properly connected to the Centrifuge and to the air source. • Air is turned on at the source. • Air pressure is at the proper level as listed in "Laboratory Requirements" on page 23.

Loader controller errors

Controller errors	What this means	What to do
Loader failed to connect or is disconnected	Could not establish connection with the Loader.	Ensure that the:
Loader did not respond (timeout)	The action did not complete within the allotted time.	• Centrifuge power cord is properly connected.
Loader sent empty or unrecognized response (unexpected error)	The response from the Loader was an unexpected value.	• Centrifuge fuse is not burned out. • Centrifuge power switch is turned on. • Centrifuge serial cable is properly connected to the computer, and the Centrifuge profile specifies the correct COM port. • Loader Ethernet or serial cable is properly connected to the computer, and the Loader profile specifies the correct COM port or Ethernet device ID, as applicable. Try re-initializing the device. If initialization fails, set the power switch to off, wait a few minutes, and then turn on the power again.
Loader failed to disconnect	The Loader is not physically connected to the host computer.	Physically connect to the host computer with an Ethernet or serial connection.
Loader could not open grippers before closing grippers	The gripper is unable to open.	Verify that the gripper can open. For instructions, see "Opening and closing the gripper" on page 97.
Loader grippers fail to sense plate	There was no microplate for the gripper to grip.	Ensure that a microplate is present for the gripper to grip.

Loader firmware errors

Firmware errors	What this means	What to do
E-stop active	The emergency-stop is triggered, preventing movement.	Reset the emergency-stop button on the pendant, and on the Automation Control Unit, if applicable.
Motor-power fault	A motor-power fault condition occurred. The motor-power circuit must be re-enabled before the Loader can accept more commands.	**_To reset the circuit:_** **1** Open the Centrifuge Loader Diagnostics dialog box. **2** Under Enable Centrifuge Loader Status, click Reset next to the corresponding circuit breaker indicator.

Firmware errors	What this means	What to do
E-stop reset required	The emergency-stop was activated and deactivated, but the E-stop circuit has not been reset. The E-stop must be reset before the Loader can accept further commands.	**To reset the circuit:** **1** Open the Centrifuge Loader Diagnostics dialog box. **2** Under Enable Centrifuge Loader Status, click Reset next to the E-stop tripped indicator.
Not initialized	The Loader is not initialized.	Initialize the Loader. For instructions, see "Initializing the device profile and checking status" on page 53. If initialization fails, set the power switch to off, wait a few minutes, and then turn on the power again. Try initializing again.
Not homed	The Loader cannot perform the requested action because it is not homed.	Home the Loader. For instructions, see "Homing the gripper head" on page 88.
Insufficient modules	The connected device is not being detected as a Loader.	Verify that the device is a Loader.
Excess modules		
Invalid gripper offset	The specified gripper offset is outside of the acceptable range.	Specify a valid Gripper Z offset.
Position error	One or more of the axes were prevented from moving to an expected position.	Make sure there are no objects in the path of movement of any of the axes.

Errors that occur before a method is launched

The following errors can occur before a method is launched, for example, if you are calling ActiveX methods from your code.

Note: For a reference of ActiveX methods, see the *Automated Centrifuge Loader ActiveX v9 User Guide*.

These errors occur when ActiveX methods are called either:

• With bad parameters.

• When a required connection to the Centrifuge or Loader has not been established.

Errors that occur before a method is launched	What this means	What to do
Invalid profile name	The profile you entered does not exist.	Enter a valid profile name, or if there are none available, create one.
Invalid bucket number	The bucket number entered is not 1 or 2.	Enter bucket number 1 or 2.
Invalid gripper z-offset	The gripper z-offset is outside the allowable limits.	Enter a gripper z-offset value within the allowable limits of 2.6 – 21.1.

Errors that occur before a method is launched	What this means	What to do
Invalid options	These options are used with the following methods: LoadPlate UnloadPlate SpinCycle You have selected a bitmask value that is out of the allowed range (0 – 7), and therefore does not invoke any combination of the options: Grip gently Ignore plate sensor Assume maximum plate height	Pick only from the following bitmasks in the form shown: 0x00000000 – No options set 0x00000001 – Ignore plate sensor 0x00000002 – Grip plates gently 0x00000003 – Ignore plate sensor and grip plates gently 0x00000004 – Assume maximum plate height 0x00000005 – Assume maximum plate height and Ignore plate sensor 0x00000006 – Assume maximum plate height and Grip plates gently 0x00000007 – Use all options
Invalid security code	These security codes are used with the method ShowDiagsDialog. You have selected a security code value that is out of the allowed range (0 – 3), and therefore does not correspond to any of the four security levels: Administrator Technician Operator Guest	Select a security code in the range of 0 – 3: 0 = administrator 1 = technician 2 = operator 3 = guest
Invalid speed	The speed is outside the allowable limits.	Select a speed in the range of 0 – 2: 0 = slow 1 = medium 2 = fast
Invalid Centrifuge acceleration	The Centrifuge acceleration is outside the allowable limits.	Select an acceleration in the range of 1.0 – 100.0.
Invalid Centrifuge deceleration	The Centrifuge deceleration is outside the allowable limits.	Select a deceleration in the range of 1.0 – 100.0.
Invalid Centrifuge spin time	The Centrifuge spin time is outside the allowable limits.	Select a spin time in the range of 0 – 2147483647. Time is measured in seconds.

Errors that occur before a method is launched	What this means	What to do
Invalid Centrifuge timer mode	These options are used with the method SpinCycle. You have selected a timer mode that is out of the allowed range (0 – 1), and therefore does not invoke either of the timer modes: Total time Time at speed	Select a timer mode in the range of 0 – 1: 0 = total time 1 = time at speed
Invalid Centrifuge velocity	The Centrifuge velocity is outside the allowable limits.	Select a velocity in the range of 1.0 – 100.0.
Loader not initialized	The Loader cannot perform the requested action because it is not initialized.	Make sure the Loader is initialized.
Centrifuge not initialized	The Centrifuge cannot perform the requested action because it is not initialized.	Make sure the Centrifuge is initialized.

Reporting problems

Contacting Automation Solutions Technical Support

If you find a problem with the Centrifuge with Loader, contact Automation Solutions Technical Support. For contact information, see Notices on the back of the title page.

Reporting hardware problems

When contacting Velocity11, make sure you have the serial number of the device ready.

Reporting software problems

When you contact Automation Solutions Technical Support, make sure you provide the following:

- Short description of the problem
- Relevant software version number (for example, automation control software, diagnostics software, and firmware)
- Error message text (or screen capture of the error message dialog box)
- Relevant files, such as log files

Reporting user guide problems

If you find a problem with this user guide or have suggestions for improvement, send your comments in an email to documentation.automation@agilent.com.

Related information

For more information about...	See...
Error messages	"Troubleshooting error messages" on page 128
Safety guidelines	"Safety guidelines" on page 1
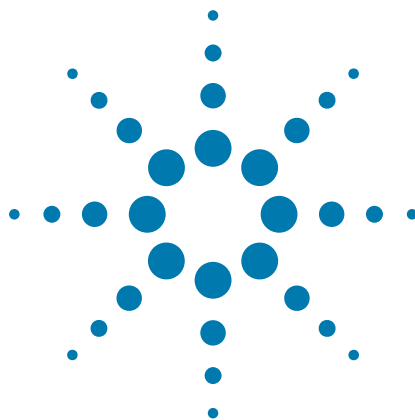
A
Quick reference

This appendix provides a quick reference of the commands, selections, and parameters in the Diagnostics dialog boxes. The topics are:

Agilent Technologies

Centrifuge Loader Diagnostics—Status and log areas

The following Status and log areas appear at the bottom on each tab in Centrifuge Loader diagnostics.

Figure   Status and log area
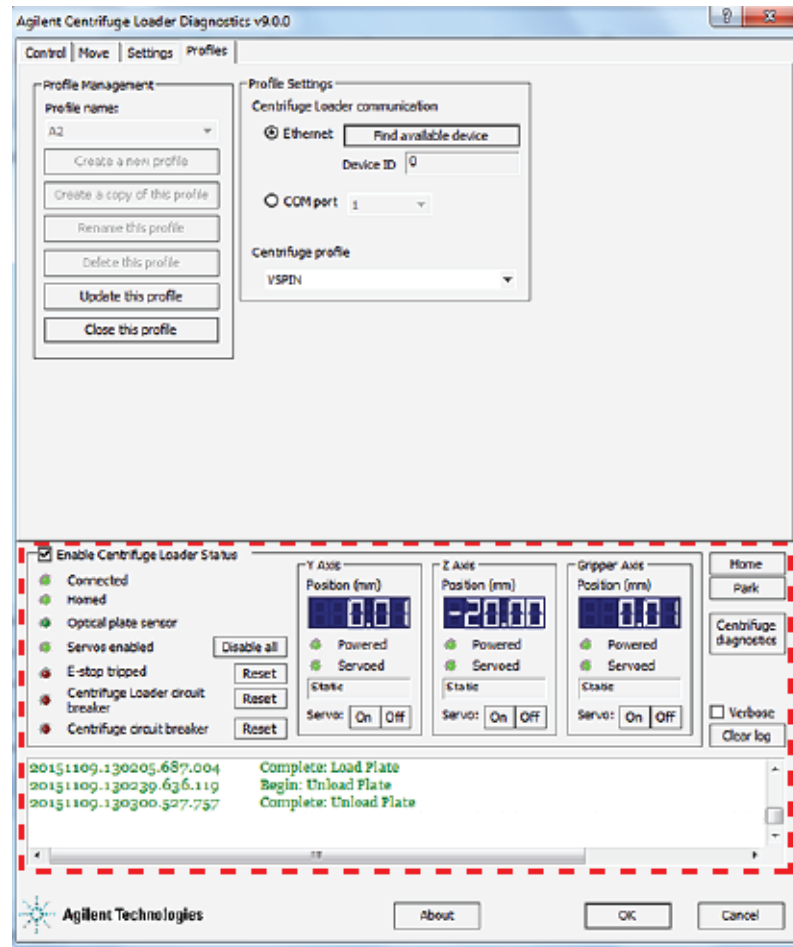
Enable Centrifuge Loader Status area

Status or command	Description
Enable Centrifuge Loader Status	Activates the Enable Centrifuge Loader Status area. If you clear the check box, the status area grays out, and no status is presented.
Connected	Indicates whether the Loader is connected to its power source.
Homed	Indicates whether the Loader components are in their home positions.
Optical plate sensor	Indicates whether the optical sensor is in use.

Status or command	Description
Servos enabled Enable/ Disable all	Indicates whether the gripper head motors are enabled. You can disable the motors by clicking **Disable all**. Click the button again to re-enable the motors.
E-stop tripped Reset	Indicates whether the emergency-stop button has been pressed. To recover the Centrifuge with Loader from the emergency stop, click **Reset**.
Centrifuge Loader circuit breaker Reset	Indicates whether the Loader circuit breaker has been tripped. To reset the circuit breaker, click **Reset**.
Centrifuge circuit breaker Reset	Indicates whether the Centrifuge circuit breaker has been tripped. To reset the circuit breaker, click **Reset**.

Y, Z, and Gripper Axis areas

Status or command	Description
Position (mm)	The readout of the current position of the given axis. The value is the distance (mm) from the axis origin (0 position): • *y-axis origin.* Where the gripper head would be on the *y*-axis when picking up a microplate from the plate stage. • *z-axis origin.* Where the center of the gripper pad protrusion is level with the top of the plate stage. *Note:* When you move to a teachpoint, such as Park, Bucket 1, or Bucket 2, the *z*-axis gripper position is based on the teachpoint and the Gripper Z offset value. • *Gripper axis origin.* The open-gripper position.
Powered	The indicator that shows whether the motor power is on.
Servoed	The indicator that shows whether the motor is in error state.
Servo	The power switch to the axis motor. To turn on or turn off a motor, click **On** or **Off**.

Commands

Command	Description
Home	Sends the Loader components to their home positions.

Command	Description
Park	Sends the Loader to the park position.
Centrifuge Diagnostics	Opens the Centrifuge Diagnostics dialog box. For details, see: "Centrifuge Diagnostics–Profiles tab" on page 155 "Centrifuge Diagnostics–Controls tab" on page 157.

Log area

Displays the events and errors that occurred.

Option or command	Description
Verbose	Displays detailed log information.
Clear log	Removes existing log information from the log area.

Related information

For more information about...	See...
Profiles tab	"Centrifuge Loader Diagnostics–Profiles tab" on page 139
Controls tab	"Centrifuge Loader Diagnostics–Control tab" on page 141
Move tab	"Centrifuge Loader Diagnostics–Move tab" on page 144
Settings tab	"Centrifuge Loader Diagnostics–Settings tab" on page 150

Centrifuge Loader Diagnostics—Profiles tab

Profile Management area

Command	Description
Profile name	Displays the selected profile. Also allows you to select from the list of available profiles.
Create a new profile	Creates a new profile.
Create a copy of this profile	Creates a duplicate copy of the selected profile.
Rename this profile	Renames the selected profile.
Delete this profile	Deletes the selected profile.
Update this profile	Saves changes to the selected profile.

Command	Description
Initialize this profile	Initiates communication with the Centrifuge Loader using the selected profile.

Profile Settings area

Selection or command	Description
Ethernet	Specifies an Ethernet communication connection between the device and the computer.
Find available device	Opens the Discovered BioNet Devices dialog box, which lists the connected devices that the software found.
Device ID	Displays the device number of the Centrifuge Loader that is communicating with the computer.
COM port	Specifies the serial communication port on the computer that is connected to the Loader.
Centrifuge profile	Specifies the Centrifuge profile to which the Centrifuge Loader profile is linked. For information on the Centrifuge profile, see "Centrifuge Diagnostics–Profiles tab" on page 155.

Related information

For more information about...	See...
Creating a profile	"Creating and editing profiles" on page 47
Establishing communication with the device	"Initializing the device profile and checking status" on page 53
Centrifuge Diagnostics Profiles tab	"Centrifuge Diagnostics–Profiles tab" on page 155

Centrifuge Loader Diagnostics—Control tab
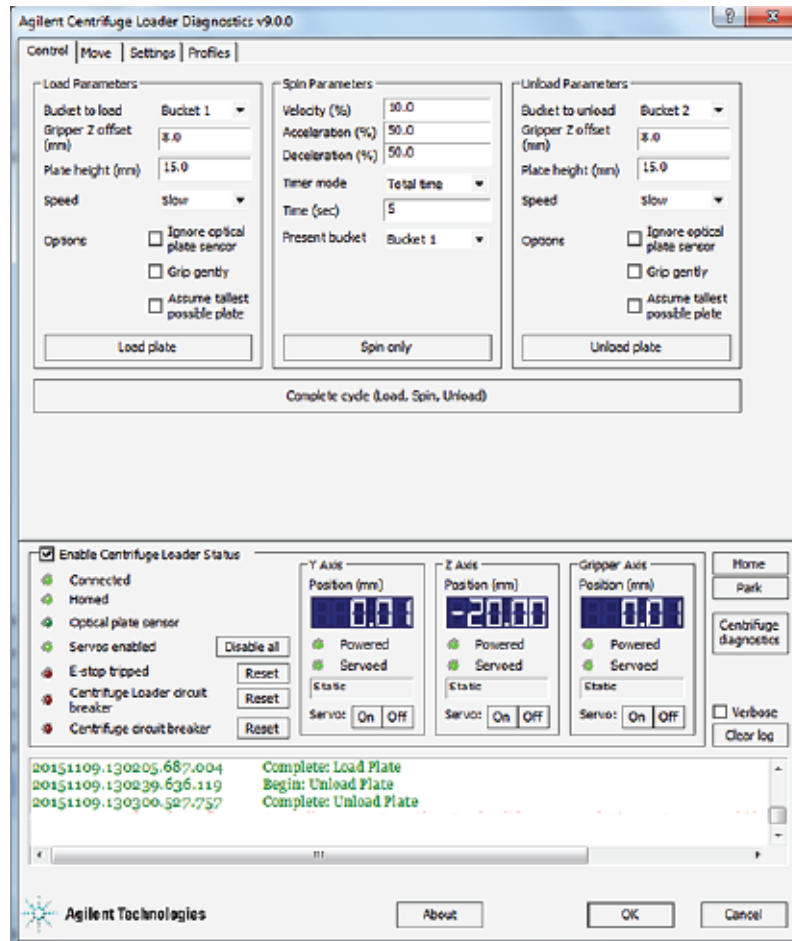
Load Parameters and Unload Parameters areas

Parameter or command	Description
Bucket to load/unload	The bucket to use to load or unload a microplate or counterweight.

Parameter or command	Description
Gripper Z offset (mm)	The distance from the bottom of the microplate to where the gripper pad can grip the microplate securely at the stage and in the bucket. ***Figure*** Example of a Gripper Z offset For details, see "Parameters that define gripper movements at a teachpoint" on page 71. *Note:* The Gripper Z offset parameter is the same as the Centrifuge Loader Gripper Offset parameter in the VWorks Labware Editor. For details on labware definitions, see the *VWorks Automation Control Setup Guide*.
Plate height (mm)	The distance from the bottom of the microplate to the top of the microplate, as the following figure shows. ***Figure*** Plate height *Note:* The Plate height parameter is the same as the Thickness parameter in the VWorks Labware Editor. For details on labware definitions, see the *VWorks Automation Control Setup Guide*.
Speed	The speed at which the Loader will load or unload the microplate or counterweight. The speed is defined as a percent of the factory-set maximum speed, where: • Slow is 20% • Medium is 50% • Fast is 90%
Ignore optical plate sensor	The option to use only the grip resistance method to determine the presence of microplates during the loading or unloading process. The plate sensor on the gripper head is not used. Select this option if you are loading and unloading dark matte-finish microplates or very short microplates that are difficult for the sensor to detect. For more details, see "Understanding how plate detection works" on page 57.
Grip gently	The option to use only the optical plate sensor to determine the presence of microplates during the loading or unloading process. The grip resistance method is not used.

Parameter or command	Description
Assume tallest possible plate	The option to ignore the Plate height value and assume the microplate or counterweight is 48.3 mm tall.
Load/Unload plate	The command to load or unload a microplate or counterweight in the Centrifuge.

Spin Parameters area

Parameter or command	Description
Velocity (%)	The rotor speed, as a percent of maximum factory-set maximum speed.
Acceleration (%)	The rate of centrifugation, as a percent of the factory-set maximum acceleration.
Deceleration (%)	The deceleration of the centrifuge, as a percent of the factory-set maximum deceleration.
Timer mode	How the software should count the spin time: • **Total time**. The total spin time, including acceleration and braking. • **Time at speed**. The length of time during which the Centrifuge is spinning at the target speed. The time does not include acceleration and braking.
Time (sec)	The length of total time or time at speed, in seconds.
Present bucket	The bucket that should be moved to the door when the Centrifuge stops spinning. This selection is applicable only if you use the Spin only command.
Spin only	The command that starts the spin.

Complete cycle command

Performs a complete spin cycle, which consists of the load, spin, and unload steps.

Related information

For more information about…	See…
Status area and logs	"Centrifuge Loader Diagnostics–Status and log areas" on page 136
Loading and unloading plates in the Centrifuge	"Loading and unloading microplates and counterweights" on page 80

For more information about...	See...
Performing a spin	"Spinning the microplates" on page 83

Centrifuge Loader Diagnostics—Move tab
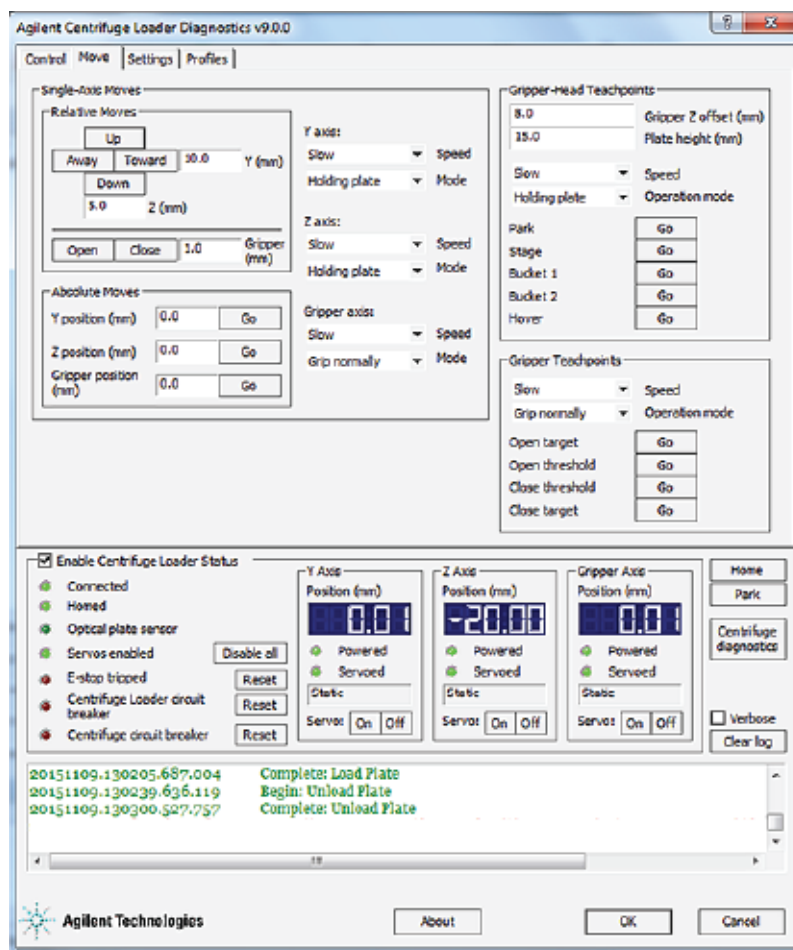
Single-Axis Moves area

Parameter or command	Description
Relative Moves	The controls that enable you to move using the specified Speed and Mode, in a given direction relative to the current location of the gripper.
Away/Toward	The buttons that enable you to move the gripper head along the y-axis by the incremental value specified in the Y (mm) box.
Up/Down	The buttons that enable you to move the gripper head along the z-axis by the incremental value specified in the Z (mm) box.
Open/Close	The buttons that enable you to move the gripper fingers by the incremental value specified in the Gripper (mm) box. The move is relative to the current location of the gripper fingers.
Absolute Moves	The controls that move the gripper head in one of the three axes by a distance measured from the origin.
Y position (mm) Go	The control that enables you to send the gripper to a location specified in the Y position (mm) box. *Note:* Positive direction is towards the Centrifuge.
Z position (mm) Go	The control that enables you to send the gripper to a location specified in the Z position (mm) box. *Note:* Positive direction is towards the top of the range of movement.
Gripper position (mm) Go	The control that enables you to send the grippers to an open or close location specified in the Gripper position (mm) box. *Note:* Positive direction is towards the closed direction.
Speed Y axis/Z axis	The speed for a y-axis or z-axis move. The speed is defined as a percent of the factory-set maximum speed: Slow, Medium, and High.
Mode Y axis/Z axis	The y-axis or z-axis mode for a single-axis move. The options are: • **Holding plate** (Default). Prevents the gripper head from moving to certain places where it is restricted by the microplate it is gripping. • **Not holding plate**. Lets the gripper head move to places that would otherwise be restricted if it is holding a microplate. • **Homing**. Moves very slowly, assuming that potential obstacles might be in the path with which the gripper head might collide. • **Static**. Restricts all movement. The servo motors attempt to keep the gripper head perfectly still.

Parameter or command	Description
Speed Gripper axis	The speed for a *gripper*-axis move. The speed is defined as a percent of the factory-set maximum speed: Slow, Medium, and High.
Mode Gripper axis	The gripper finger mode for a single-axis move. The options are: • **Grip normally** (Default). The gripper fingers close using normal force. • **Grip gently**. The gripper fingers close using less than normal force. • **Homing**. Moves very slowly, assuming that potential obstacles might be in the path of the gripper fingers. • **Static**. Restricts all movement. The servos attempt to keep the gripper fingers perfectly still.

Gripper-Head Teachpoints area

Parameter	Description
Gripper Z offset (mm)	The height (mm) above a teachpoint where the gripper fingers can grip a type of microplate securely. The height is measured from the bottom of the microplate to where the gripper pad can grip the microplate.

Figure   Example of a Gripper Z offset

This value defines gripper movements only for the commands in the Gripper-Head Teachpoints area of the Move tab. The parameter is used when the Loader is sent to the Stage, Bucket 1, and Bucket 2 teachpoints.

Together, the Gripper Z offset and Plate height values determine how high the top of the microplate rises above the grip point, at the center of the grip pads in the z-axis. For example, if the Gripper Z offset is set to 8 mm and the Plate height is set to 15 mm, then the top of the microplate is 7 mm above the grip point.

IMPORTANT   You use the Gripper Z offsets to adjust grip height for a specific type of microplate. Do not re-teach a teachpoint to adjust where the gripper head grips a microplate.

Plate height (mm)	The distance from the bottom of the microplate to the top of the microplate, as the following figure shows.

Speed	The speed at which the Loader gripper head will move to a teachpoint. The speed is defined as a percent of the factory-set maximum speed: Slow, Medium, and High.
Operation mode	The y-axis and z-axis mode for a gripper-head move to a teachpoint. The options are:

- **Holding plate** (Default). Prevents the gripper head from moving to certain places where it is restricted by the microplate it is gripping.
- **Not holding plate**. Lets the gripper head move to places that would otherwise be restricted if it is holding a microplate.
- **Homing**. Moves very slowly, assuming that potential obstacles might be in the path with which the gripper head might collide.
- **Static**. Restricts all movement. The servo motors attempt to keep the gripper head perfectly still.

Command	Description
Park Go	The command that sends the gripper to the Park teachpoint.
Stage Go	The command that sends the gripper to the Stage teachpoint.
Bucket 1 Go	The command that sends the gripper to the Bucket 1 teachpoint.
Bucket 2 Go	The command that sends the gripper to the Bucket 2 teachpoint.
Hover Go	The command that sends the gripper to the Hover teachpoint.

Gripper Teachpoints area

Figure   Gripper teachpoints: (**1**) Open-gripper target, (**2**) Open-gripper threshold, (**3**) Close-gripper threshold, and (**4**) Close-gripper target

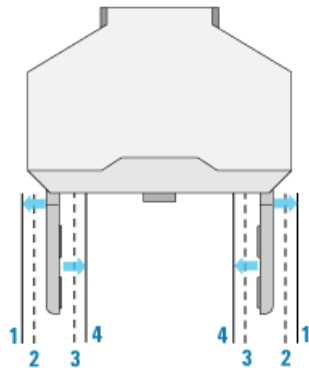| Parameter or command	Description
Speed	The speed for the gripper fingers to move to a target or threshold teachpoint. The speed is defined as a percent of the factory-set maximum speed: Slow, Medium, and High.
Operation mode	The gripper mode for a move to a target or threshold teachpoint. The mode options are: • **Grip normally** (Default). The gripper fingers close using normal force. • **Grip gently**. The gripper fingers close using less than normal force. • **Homing**. Moves very slowly, assuming that potential obstacles might be in the path of the gripper fingers. • **Static**. Restricts all movement. The servos attempt to keep the gripper fingers perfectly still.

Parameter or command	Description
Open target Go	The command that opens the gripper fingers to the Open-gripper target teachpoint (**1**), as the preceding figure shows.
	If the grippers are closed, and you command them to open, they will move toward the Open-gripper target.
	A microplate is said to be released if the grippers pass the Open-gripper threshold (**2**).
Open threshold Go	The command that opens the gripper fingers to the Open-gripper threshold teachpoint (**2**).
Close threshold Go	The command that closes the gripper fingers to the Close-gripper threshold teachpoint (**3**).
Close target Go	The command that closes the gripper fingers to the Close-gripper target teachpoint (**4**).
	When the grippers are commanded to close, they move towards the closed gripper target.
	A microplate is determined to be present in the gripper if the gripper fingers:
	• Pass the Close-gripper threshold
	• Do not meet the Close-gripper target

Related information

For more information about...	See...
Status area and logs	"Centrifuge Loader Diagnostics—Status and log areas" on page 136
Moving the gripper	"Options for moving the gripper" on page 89
Loader teachpoints	• "About the Loader teachpoints" on page 70
	• "Determining if the Loader teachpoints require adjustment" on page 74
	• "Setting the gripper-head teachpoints" on page 115

Centrifuge Loader Diagnostics—Settings tab

IP Settings area

Display title	Description
Use DHCP	The option to use DHCP to automatically assign the IP address to a Loader on a network. Default: Use DHCP is selected.
Use DHCP fallback	The option to use DHCP fallback, which is defined in the Fallback IP addr and Fallback IP subnet fields. If you plan to always use DHCP, clear the User DHCP fallback check box. Default: Use DHCP fallback is selected.
Use static IP addressing	The option to assign an IP address manually to a Loader on a network. Default: Not selected.

Display title	Description
Fallback IP addr	192.168.0.66 (default)
Fallback IP subnet	255.255.255.0 (default)
	If you select a different IP address or subnet, set the same IP address range and subnet on the controlling computer. For example, if you change the Loader IP address to 10.0.0.2 and subnet to 255.0.0.0, select a controlling computer IP address in the range of 10.0.0.3–100 and a subnet of 255.0.0.0.

Homing Offsets area

CAUTION   Changing these settings could degrade the performance or damage the Centrifuge with Loader. Contact the Automation Solutions Technical Support for assistance.

Gripper-Head Teachpoints (mm) area

CAUTION   Changing these settings could degrade the performance or damage the Centrifuge with Loader. Contact the Automation Solutions Technical Support for assistance.

Item	Description
<teachpoint selection>	The gripper-head teachpoint options: Park, Stage, Bucket 1, Bucket 2, and Hover.
	When you make changes to the gripper-head teachpoints and click **Save changes**, the revised teachpoint values are stored on the Centrifuge.
Y position	Displays the y-axis value of the currently selected teachpoint.
	To change the value you can use the controls on the Move tab to position the gripper at the teachpoint, or you can type a new value in the box.
Z position	Displays the z-axis value of the currently selected teachpoint.
	To change the value you can use the controls on the Move tab to position the gripper at the teachpoint, or you can type a new value in the box.

Gripper Teachpoints (mm) area

Figure   Gripper teachpoints: (**1**) Open-gripper target, (**2**) Open-gripper threshold, (**3**) Close-gripper threshold, and (**4**) Close-gripper target
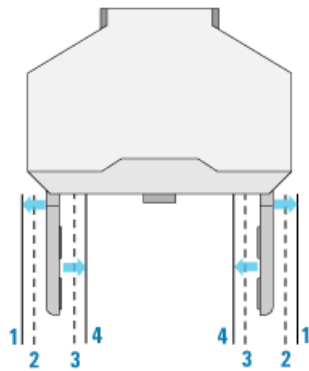
Item	Description
Open-gripper target	Displays the current value of the Open-gripper target (**1**) teachpoint. To change the value you can use the controls on the Move tab to position the gripper fingers at the teachpoint, or you can type a new value in the box.
Open-gripper threshold	Displays the current value of the Open-gripper threshold (**2**) teachpoint. To change the value you can use the controls on the Move tab to position the gripper fingers at the teachpoint, or you can type a new value in the box.
Close-gripper threshold	Displays the current value of the Close-gripper threshold (**3**) teachpoint. To change the value you can use the controls on the Move tab to position the gripper fingers at the teachpoint, or you can type a new value in the box.
Close-gripper target	Displays the current value of the Close-gripper target (**4**) teachpoint. To change the value you can use the controls on the Move tab to position the gripper fingers at the teachpoint, or you can type a new value in the box.

Speed-Regulation Factors (%) area

WARNING   Changes to the factory-set maximum speed settings can affect the device regulatory compliance. To prevent potential injury and damage to the equipment, do not change the speed definitions. Contact Agilent Automation Solutions Technical Support for assistance.

Displays the percentage settings that define the Slow, Medium, and Fast speed options for the axes of motion:

- Y-axis

- Z-axis
- Gripper-axis

Conversion Factors (counts/mm) area

Displays the conversion factor settings for the *y*-axis, *z*-axis, and *Gripper*-axis. These settings define the number of counts that each axis motor must turn to produce a movement of one millimeter.

Motor Settings area

Displays the motor settings, such as velocity and acceleration, for the selected axis of motion and operation mode.

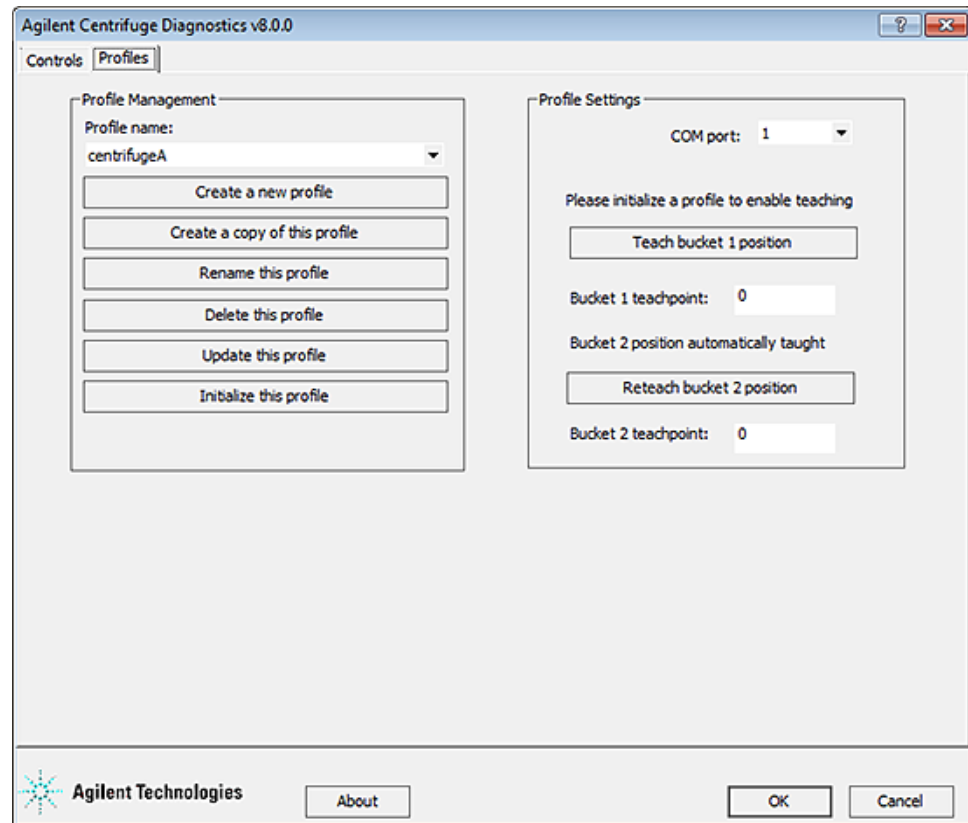| Item	Description
<axis selection>	The axis of motion for which you want to display the motor settings. The options are: • Y axis (gripper head) • Z axis (gripper head) • Gripper axis (open/close gripper fingers)
Operation mode (Y and Z axes)	The operation mode for the selected axis motor. The options are: • **Holding plate** (Default). Prevents the gripper head from moving to certain places where it is restricted by the microplate it is gripping. • **Not holding plate**. Lets the gripper head move to places that would otherwise be restricted if it is holding a microplate. • **Homing**. Moves very slowly, assuming that potential obstacles might be in the path with which the gripper head might collide. • **Static**. Restricts all movement. The servo motors attempt to keep the gripper head perfectly still.
Operation mode (Gripper axis)	The operation mode for the selected axis motor. The options are: • **Grip normally** (Default). The gripper fingers close using normal force. • **Grip gently**. The gripper fingers close using less than normal force. • **Homing**. Moves very slowly, assuming that potential obstacles might be in the path of the gripper fingers. • **Static**. Restricts all movement. The servos attempt to keep the gripper fingers perfectly still.

Save and Restore buttons

Display title	Description
Save changes	Saves any changes to the values in the Settings tab. For example, if you change a teachpoint value, click Save changes to set the new teachpoint value.
Restore IP setting defaults	Resets the settings in the IP Settings are to the factory-set defaults. For details, see "IP Settings area" on page 150.
Restore homing-offset and teachpoint defaults	**IMPORTANT** If you restore these settings, verify the default teachpoints to determine if any adjustments are required. See "Determining if the Loader teachpoints require adjustment" on page 74.
Restore speed-regulator defaults	Resets the speed-regulation factors to the factory-set maximum speeds.
Restore all defaults on this page	**IMPORTANT** If you restore these settings, verify the default teachpoints to determine if any adjustments are required. See "Determining if the Loader teachpoints require adjustment" on page 74.

Related information

For more information about...	See...
Status area and logs	"Centrifuge Loader Diagnostics—Status and log areas" on page 136
Connecting the Loader to a computer	"Connecting the device to the computer" on page 32
Moving the gripper	"Options for moving the gripper" on page 89
Loader teachpoints	"About the Loader teachpoints" on page 70
	"Determining if the Loader teachpoints require adjustment" on page 74
	"Setting the gripper-head teachpoints" on page 115

Centrifuge Diagnostics—Profiles tab

Profile Management area

| Command	Description
Profile name	Displays the selected profile. Also allows you to select from the list of available profiles.
Create a new profile	Creates a new profile.
Create a copy of this profile	Creates a duplicate copy of the selected profile.
Rename this profile	Renames the selected profile.
Delete this profile	Deletes the selected profile.
Update this profile	Saves changes to the selected profile.
Initialize this profile	Initiates communication with the Centrifuge using the selected profile.

Profile Settings area

Selection or command	Description
COM port	The controlling computer COM port that is connected to the Centrifuge.
Teach bucket 1 position	The command that opens the Teach Bucket 1 dialog box to allow you to set the bucket-1 teachpoint. See "Centrifuge Diagnostics–Teach Bucket Position dialog boxes" on page 160. **IMPORTANT** Make sure you initialize the desired profile before setting the teachpoint. **IMPORTANT** Make sure you unlock the bucket before you set the teachpoint. When the bucket is unlocked, you can move the bucket to the desired position before setting the teachpoint. *Note:* When you set the bucket-1 teachpoint, the software automatically sets the bucket-2 teachpoint. If a bucket-2 teachpoint already exists, you have the option of keeping the existing teachpoint or use the new auto-set bucket-2 teachpoint.
Bucket 1 teachpoint	The bucket-1 teachpoint position. When you set the bucket 1 teachpoint, a value displays to indicate the teachpoint position.
Reteach bucket 2 position	The command that opens the Teach Bucket 2 dialog box to allow you to set the bucket-2 teachpoint. See "Centrifuge Diagnostics–Teach Bucket Position dialog boxes" on page 160. **IMPORTANT** Make sure you initialize the desired profile before setting the teachpoint. **IMPORTANT** Make sure you unlock the bucket before you set the teachpoint. When the bucket is unlocked, you can move the bucket to the desired position before setting the teachpoint. You typically do not have to set the bucket-2 teachpoint, because it is set automatically when you set the bucket-1 teachpoint. Use this command only if you want to fine-tune the bucket-2 teachpoint.
Bucket 2 teachpoint	The bucket-2 teachpoint position. When you set the bucket-2 teachpoint (or when it is set automatically), a value displays to indicate the teachpoint position.

Related information

For more information about...	See...
Creating a profile	"Creating and editing profiles" on page 47
Initializing the device	"Initializing the device profile and checking status" on page 53
Setting the bucket home positions	"Setting the Centrifuge bucket home positions" on page 59

Centrifuge Diagnostics—Controls tab
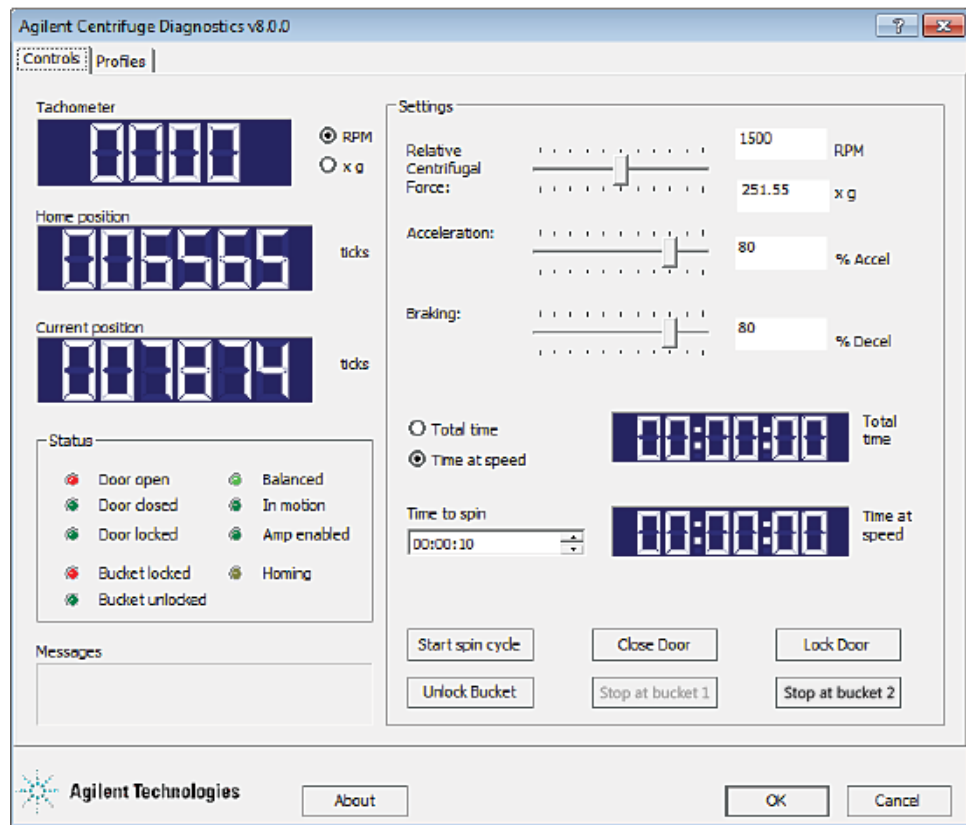
Display area

Item	Description
Tachometer	The current spin speed. You can select the desired spin speed unit to display: **RPM** (revolutions per minute), or **x g** (a multiple of gravity).
Home position	The home position value. The home position is also the bucket-1 teachpoint.
Current position	The current position of bucket 1.

Status area

Item	Description
Door open	Indicates that the Centrifuge door is open.
Door closed	Indicates that the Centrifuge door is closed.
Door locked	Indicates that the door is locked.
Bucket locked	Indicates that the bucket at the door is locked in position to prevent the rotor from moving.
Bucket unlocked	Indicates that the front bucket is unlocked and the rotor can move.
Balanced	Indicates that the buckets are out of balance during spinning, because one of the buckets has more mass than the other bucket.
In motion	Indicates that the buckets are spinning.
Homing	Indicates that the Centrifuge is in the homing process.

Messages area

Displays error or status messages.

Settings area

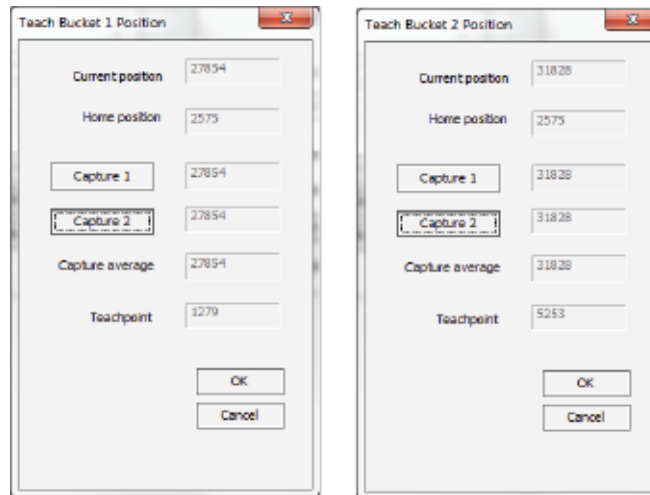| Setting or command	Description
Relative Centrifugal Force	The rotor speed, in RPM (revolutions per minute) and as a multiple of gravity.
Acceleration	The rate of centrifugation, as a percent of maximum acceleration.

Setting or command	Description
Braking	The deceleration of the centrifuge, as a percent of maximum deceleration.
Total time	The specified spin time, including acceleration and braking.
Time at speed	The specified spin time, not including acceleration and braking.
Time to spin	The length of time to spin the microplates in the desired mode.
Start Spin Cycle	The command to start the spin.
Open Door	The command to open the Centrifuge door.
Lock Door	The command to lock the Centrifuge door.
Lock/Unlock Bucket	The command to lock or unlock the front bucket. Locking the front bucket prevents the rotor from moving. Unlocking the front bucket allows the rotor to move. Unlock the bucket when you want to set a teachpoint. Lock the bucket after you finish setting the teachpoints.
Go to Bucket 1	The command to move bucket 1 to the door.
Go to Bucket 2	The command to move bucket 2 to the door.

Related information

For more information about...	See...
Spinning microplates	"Workflows for performing spins" on page 78
Testing the actuators	"Testing the Centrifuge actuators" on page 103
Unlocking and opening the door manually	"Unlocking and opening the door manually" on page 111

Centrifuge Diagnostics—Teach Bucket Position dialog boxes

Display or command	Description
Current position	The current position value of the bucket.
Home position	The home position value.
Capture 1	The command that records the current position of the bucket. **IMPORTANT** Move bucket 1 to the door before capturing its position. Move bucket 2 to the door before capturing its position.
Capture 2	The command that records the current position of the bucket a second time. If you do not move the buckets, the second capture value should be the same as or close to the first capture value. *Note:* The final bucket teachpoint is the average of the two captured position values. The software will not allow you to exit this dialog box until you click **Capture 2**.
Capture average	The average of the two captured position values.
Teachpoint	The position value of the bucket teachpoint, based on the calculated Capture average.

Related information

For more information about...	See...
Setting the bucket home positions	"Setting the Centrifuge bucket home positions" on page 59

Agilent Technologies

User Guide

G5405-90002

Revision C, April 2016