

Bravo Automated Liquid-Handling Platform

Safety and Installation Guide

Original Instructions

Notices

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Safety Notices

 **A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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Contents



Preface

This preface contains the following topics:

- “About this guide” on page vi
- “Reporting problems” on page vii

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 Bravo Platform before it is used.
Integrator	Configures hardware and writes software.
Lab manager, administrator, or technician	<ul style="list-style-type: none">• Manages the automation system that contains the Bravo Platform• 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 Bravo Platform and solves routine problems.

What this guide covers

This guide describes the following:

- Potential safety hazards of the Bravo Platform and how to avoid them. For general safety information, see the *Automation Solutions Products General Safety Guide*.
- Installation instructions, including specifications and site requirements for the Bravo Platform.

What is new in this revision

Revision description	See...
Added a safety warning for the AssayMAP Bravo head	“Cut hazard” on page 9

Related user instructions

Go to the Automation Solutions knowledge base located at www.agilent.com/chem/askb for information on how to do the following:

- Set up and operate the Bravo Platform and accessories.
- Define labware and labware classes, liquid classes, and pipetting techniques, and how to track and manage labware in storage.
- Add devices, create protocols, and set task parameters for each device in the system.

- Use the automation control software.
- Set up and use the third-party devices.

For unpacking instructions, see the *Bravo Platform Unpacking Guide*.

Safety information for the devices appears in the corresponding device user guide. You can also search the knowledge base or the PDF files for safety information.

Reporting problems

Contacting Automation Solutions Technical Support

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

Reporting hardware problems

When contacting Agilent Technologies, make sure you have the serial number of the device ready. You can find the serial number on the Bravo Platform serial number label.

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.



1 Safety guidelines

This chapter contains the following topics:

- “General safety information” on page 2
- “Safety and regulatory compliance” on page 3
- “Emergency stops” on page 5
- “Mechanical hazards” on page 5
- “Ergonomics” on page 8
- “Cut hazard” on page 9

General safety information

Before installing and using the Bravo Platform

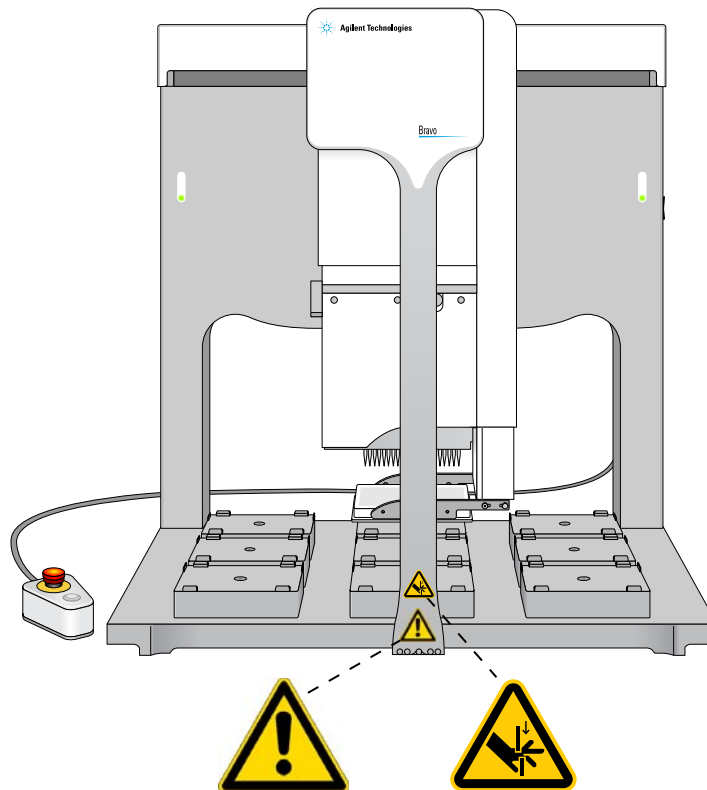
Before installing and using the Bravo Platform, make sure you are aware of the potential hazards and understand how to avoid being exposed to them. You must be properly trained in the correct and safe installation and operation of the device. For the intended product use statement and safety label descriptions, see the *Automation Solutions Products General Safety Guide*.



WARNING Changing or modifying the Bravo Platform safety equipment may prevent the safe operation of the Bravo Platform, invalidate its safety compliance, and lead to personal injury or property damage. Any customer who does not use the supplied safety equipment or who modifies the supplied safety equipment assumes full responsibility for providing an appropriate level of safety for its operators and for providing the applicable safety compliance marking and documentation.

The following figure shows the location of the warning labels on the Bravo Platform.

Figure Bravo Platform warning label location



Safety and regulatory compliance

The Bravo Platform 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 Bravo Platform 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 Bravo Platform 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: $L_p < 70$ dB according to EN ISO 779:2010.

Schalldruckpegel: $L_p < 70$ dB nach EN ISO 779:2010.

1 Safety guidelines

Safety and regulatory compliance

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 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Emergency stops

Procedure



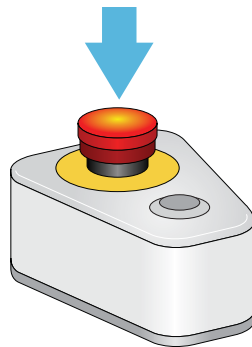
WARNING If the Bravo Platform is integrated with other devices in a system, Agilent Technologies recommends that you install a main emergency stop button that will stop all devices simultaneously. In addition, all operators must be instructed in the emergency stop procedure.

CAUTION You might not be able to resume a protocol after an emergency stop. Do not use an emergency stop to pause a run. To pause and continue a run, use the appropriate commands in the automation software.

To stop in an emergency:

Press the red button on the robot-disable (emergency-stop) pendant. The Bravo head stops immediately.

Figure Robot-disable pendant



To recover from an emergency stop

- 1 Remove any labware that was dropped and clean up any spills.
- 2 Release the red button on the robot-disable pendant by turning it clockwise.
- 3 In the automation software message box, select one of the options to abort, retry, or continue. This will re-enable the axes motors.

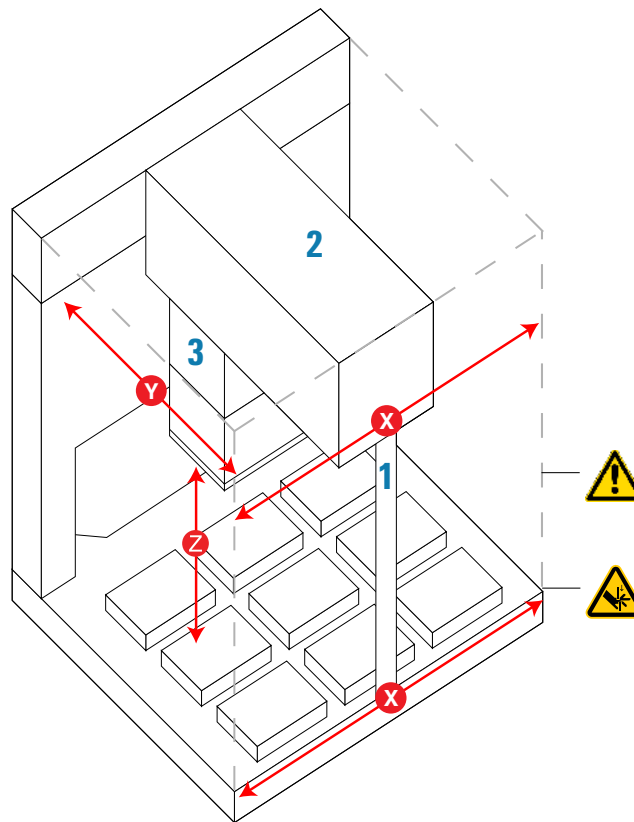
Mechanical hazards

Moving parts hazard

The Bravo Platform has moving parts that are accessible at the front, sides, and rear of the device, if not protected by shields and the Light Curtain.

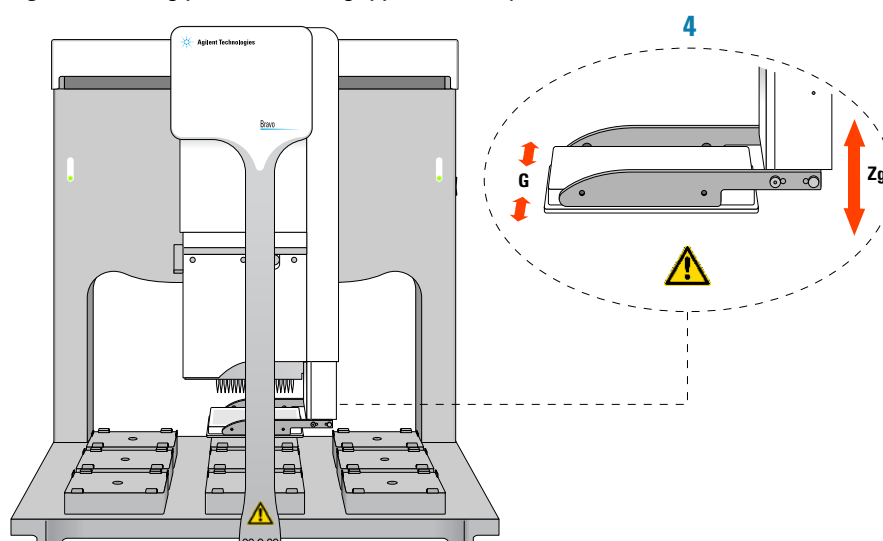
The following figures and tables show the potential moving-parts hazards. Note that the moving parts hazard area includes a piercing hazard.

Figure Bravo Platform (top front view) showing moving-parts hazards



Item	Part	Axis of motion	Description
1	Tie bar	<i>x</i> -axis	The tie bar is attached to the arm and moves side to side across the front of the deck.
2	Arm	<i>x</i> -axis	The arm carries the head mount side to side across the deck.
3	Head mount	<i>y</i> -axis	The pipette head attaches to the head mount, which moves back and forth on the arm between the back and front of the deck.
		<i>z</i> -axis	The head mount raises and lowers the pipette head.

Figure Moving parts on Bravo gripper assembly



Item	Part	Axis of motion	Description
4	Gripper assembly	<i>G</i> -axis	The gripper fingers close and open to grip and release labware.
		<i>Zg</i> -axis	The gripper moves up to provide clearance when the head is moving across the deck, and down to extend beyond the pipette head to pick and place labware.

Mitigating the risk to users



WARNING To reduce the risk of injury from moving parts, ensure that the Bravo safety interlock circuit is connected to a light curtain or an enclosure with an interlock switch.

The Bravo Platform has a safety interlock circuit that must be closed for the device to operate. Interrupting the safety interlock circuit will stop the motion of the robot head. Agilent Technologies highly recommends, and workplace safety laws in many countries require, that you connect the Bravo Platform safety interlock circuit to a light curtain or an enclosure with an interlock switch to mitigate the risk from moving parts.

If the Bravo Platform is operated outside an enclosure, you should install safety shields, as appropriate, in addition to a light curtain at the front of the device. For more information, contact Automation Solutions Technical Support. See “[Installing the Light Curtain and front and side shields](#)” on page 25 and “[Installing the rear shield](#)” on page 36.

It is the responsibility of every operator to follow the warnings and safety labels and to keep away from the Bravo Platform whenever the device is likely to move.



WARNING If you touch any of the moving parts or attempt to move labware while the Bravo Platform is in operation, the device could pinch, pierce, or bruise you. Keep your fingers, hair, clothing, and jewelry away from the device while it is in motion.



WARNING The pipette head z-axis motor is particularly powerful. It might not stop immediately in a collision and a pipette tip could pierce your hand. Keep away from the Bravo Platform when the pipette head is moving or about to move, especially in the z-axis direction.



WARNING When you initialize the Bravo Platform, the head and tie bar can move. To prevent injury, keep clear of the device while it is in motion.



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

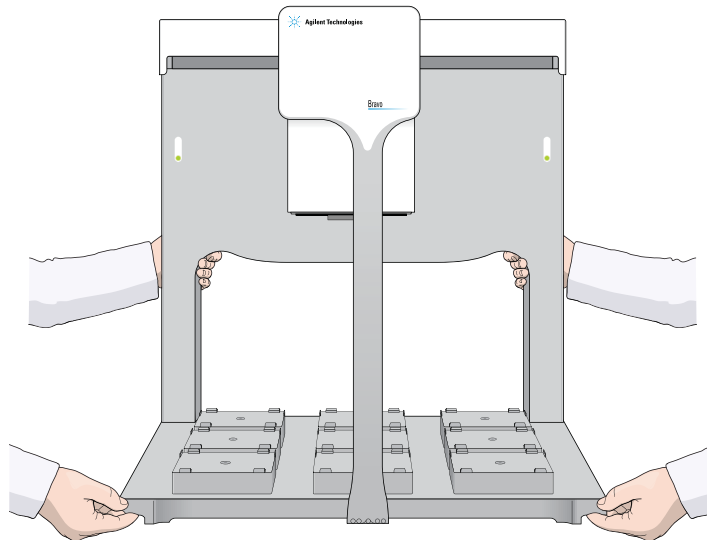
Ergonomics

About lifting the Bravo Platform



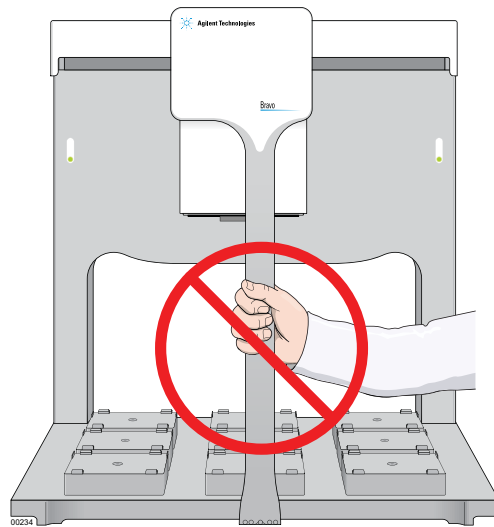
WARNING The Bravo device weighs approximately 52.1 kg (114.9 lb). Attempting to move the Bravo device without assistance could cause personal injury. Request assistance and use proper lifting techniques when moving the Bravo device.

Figure Correct lifting technique



CAUTION Tugging on the tie bar or using it to lift the device can damage the device.

Figure Incorrect lifting or handling technique



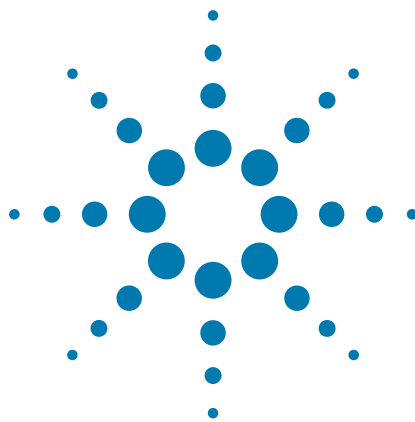
Cut hazard



WARNING The probes of the AssayMAP head (Bravo 96AM Head) are sharp and can scratch you if they brush across your hand. A probe scratch can expose you to any contaminants remaining on the probes. Wear gloves and use extreme caution to avoid brushing against the probes.

1 Safety guidelines

Cut hazard



2 Installing the Bravo Platform

This chapter contains the following topics:

- “Workflow for installing the Bravo Platform” on page 12
- “Laboratory setup requirements” on page 13
- “Connecting the Bravo Platform” on page 15
- “Installing the liquid-handling head” on page 19
- “Installing the Light Curtain and front and side shields” on page 25
- “Installing the rear shield” on page 36
- “Starting up and shutting down” on page 39

Workflow for installing the Bravo Platform

Before you begin

The Bravo Platform can be installed in the following configurations:

- A single device controlled by a computer
- Integrated with other devices in a lab automation system

For either configuration, ensure that you connect the Bravo safety interlock circuit to a light curtain or an enclosure with an interlock switch to mitigate the risk to users from moving parts.

If the Bravo Platform will be operated outside of an enclosure, install the Light Curtain and shields, as described in the following workflow.



WARNING To reduce the risk of injury from moving parts, ensure that the Bravo safety interlock circuit is connected to a light curtain or an enclosure with an interlock switch.

Workflow

To install the Bravo Platform, perform the following procedures in the order listed.

Step	For this task...	See...
1	Verify that the installation location meets the site requirements.	“Laboratory setup requirements” on page 13 For unpacking instructions, see the <i>Bravo Platform Unpacking Guide</i> .
2	Connect the Bravo Platform.	“Connecting the Bravo Platform” on page 15
3	Install the liquid-handling head.	“Installing the liquid-handling head” on page 19
4	Install the Light Curtain and the front and side shields, if applicable.	“Installing the Light Curtain and front and side shields” on page 25
5	Install the rear shield, if applicable.	“Installing the rear shield” on page 36
6	Install the automation control software, if not already installed.	<i>VWorks Automation Control Setup Guide</i>

Laboratory setup requirements

About this topic

This topic describes the lab requirements for the Bravo Platform. Read this topic before you unpack and install the Bravo Platform.

Space and bench requirements

Place the Bravo Platform in a location that has the following:

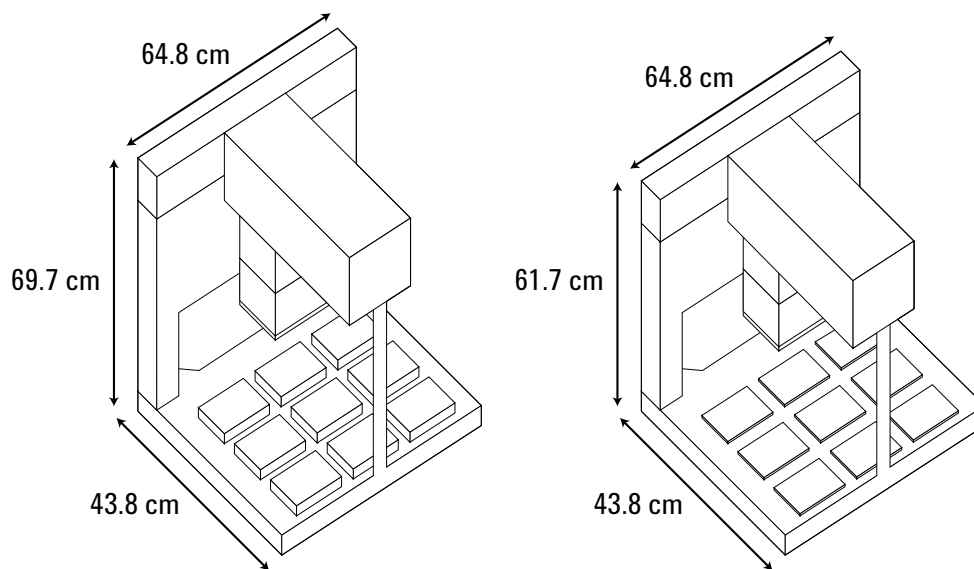
- Proximity to power outlet
- Enough space to accommodate the Bravo Platform, computer, monitor, pendant, and accessories
- A fixed laboratory bench or table that can support the weight of the Bravo Platform without excessive shaking or movement
- Access so that you can quickly disconnect the power to the Bravo Platform if the need arises

If the Bravo Platform is outside an enclosure, you can install a rear shield to prevent rear access to the device's moving parts while still allowing easy access to the rear power connections.

The Bravo Platform has the following physical specifications:

Dimension	Standard Bravo Platform	SRT Bravo Platform
Height	69.7 cm (27.4 in)	61.7 cm (24.3 in)
Width	64.8 cm (25.5 in)	64.8 cm (25.5 in)
Depth	43.8 cm (17.2 in)	43.8 cm (17.2 in)
Weight	52.1 kg (114.9 lb)	51.5 kg (113.5 lb)

Figure Dimensions of a standard Bravo Platform (left) and the SRT Bravo Platform (right)



Electrical requirements

The Bravo Platform has the following electrical requirements:

Requirement	Value
Voltage	100–240 V~
Frequency	50/60 Hz
Current	10 A at 115 V~ 5 A at 230 V~
Fuse	250 V, 10 A, 5 mm x 20 mm, fast acting

Environmental operating requirements

Ambient environment

The Bravo Platform is for indoor use only. The following table lists the operating and storage specifications.

If you have integrated devices, your system might require additional cooling depending on the number and types of integrated devices.

Operating	Specification
Pollution degree	2
Installation category	II
Temperature	0–40 °C
Humidity	10–90% RH, non-condensing

Operating	Specification
Altitude	1–2000 m

Computer requirements

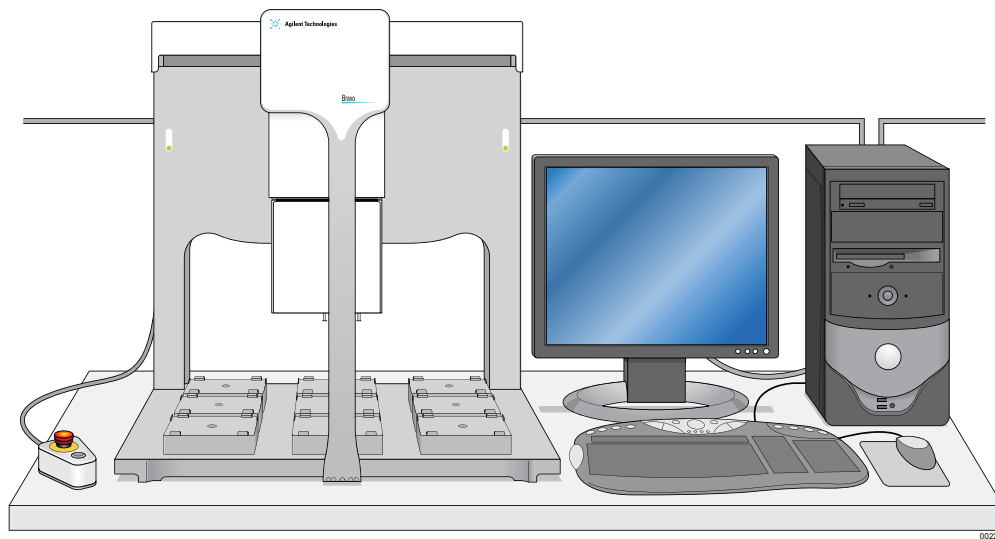
The requirements of the controlling computer depend on the lab automation software you are using. See the software release notes or the Automation Solutions knowledge base at www.agilent.com/chem/askb. For third-party automation software, see the user documentation supplied with the product.

Connecting the Bravo Platform

About this topic

This topic provides basic connection instructions for the Bravo Platform.

Figure Bravo Platform basic connections



Before you start

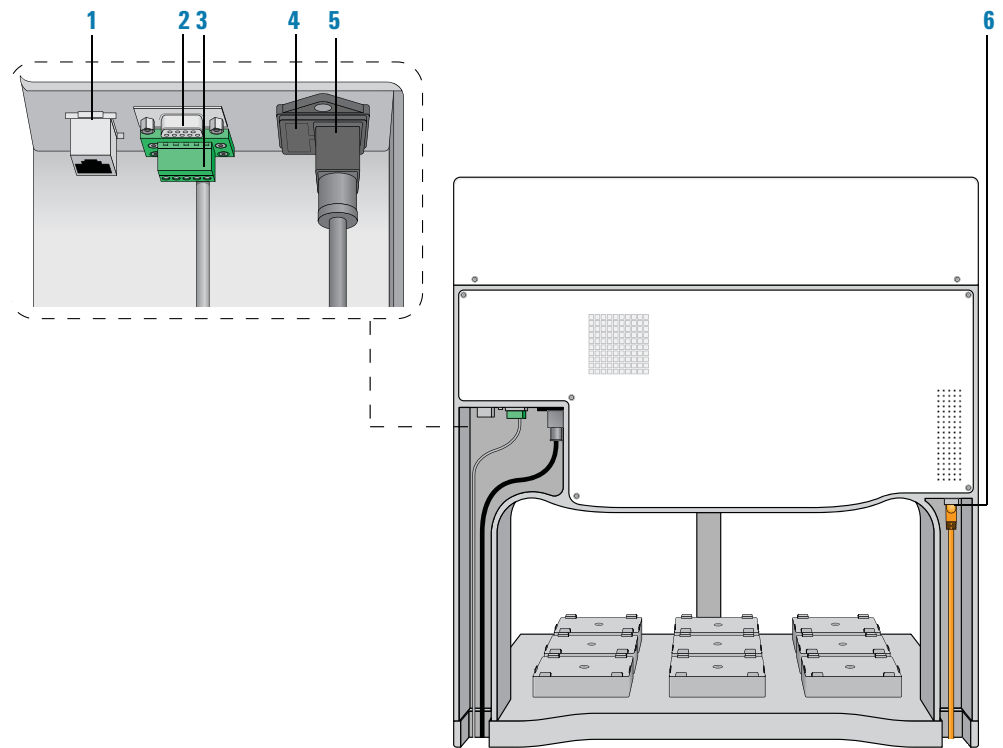
- Make sure the laboratory setup requirements have been met.
- Follow the instructions included with the computer for setting up the computer. Ensure that the computer and Bravo Platform are turned off.
- Make sure you have the supplied Ethernet cables or RS-232 DB9 serial cable.

See the following figure and table for the connection locations on the device.

2 Installing the Bravo Platform

Connecting the Bravo Platform

Figure Power and communication connections on the Bravo Platform (back view)



Item	Feature	Description
1	Ethernet port	Provides an Ethernet connection to the Bravo Platform. If you connect the Bravo Platform using the Ethernet port, you do not need to connect using the serial port.
2	Serial port (RS-232)	Provides serial connection to the Bravo Platform. If you connect the Bravo Platform using the serial port, you do not need to connect using the Ethernet port.
3	Pendant port	Connects the pendant to the safety interlock circuit. The safety interlock circuit must be closed for the Bravo Platform to operate. The pendant's robot-disable button interrupts this circuit. The safety interlock circuit can also be connected to the Light Curtain to stop the Bravo Platform if the light boundary is breached.
4	Fuse holder	Contains the main fuse and a place for a spare fuse.
5	AC power entry	Connects the Bravo Platform power cord to an AC outlet with a grounded circuit.

Item	Feature	Description
6	Pump I/O port (RJ-45)	Enables you to connect a peristaltic pump to the Bravo Platform. The connection is made with a straight-through shielded Cat-5 or Cat-6 (Ethernet) cable.

IMPORTANT This is not an Ethernet port and should be used to connect only the Agilent Pump Module to the Bravo Platform.

About connecting the power and pendant



WARNING To reduce the risk of injury from moving parts, ensure that the Bravo safety interlock circuit is connected to a light curtain or an enclosure with an interlock switch.

If you are installing the Light Curtain, do not connect the power cord and pendant at this step. You will connect the power cord and pendant during the Light Curtain installation procedure.

To connect the power cord and pendant without a Light Curtain:

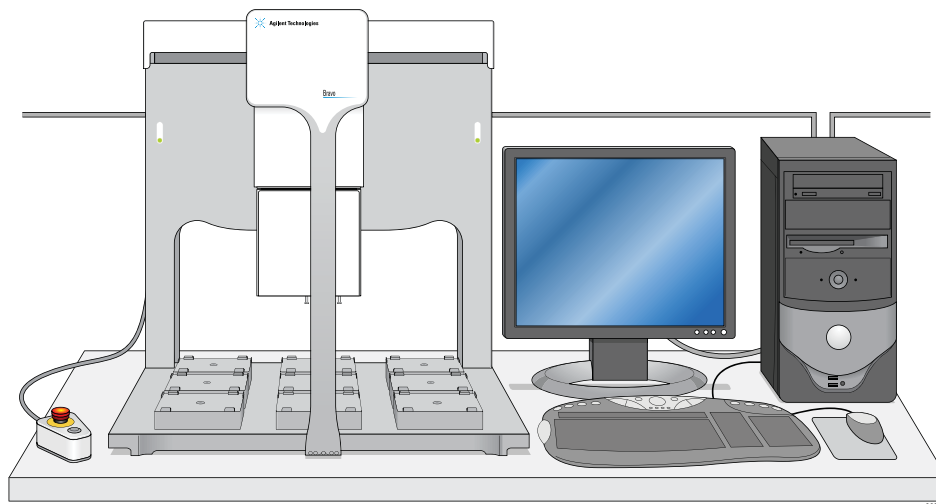
- 1 Connect one end of the power cord to the AC power entry on the back of the Bravo Platform. Connect the other end of the cord into an AC outlet with a grounded circuit.
- 2 Connect the pendant into the pendant port on the back of the Bravo Platform.

Connecting the Bravo Platform to the controlling computer

You can connect the computer to the Bravo Platform using either of the following:

- *Ethernet connection.* If using an Ethernet connection, see [“Using an Ethernet connection” on page 18.](#)
- *Serial connection.* If using a serial connection:

Connect one end of the supplied RS-232 DB9 serial cable to a COM port on the computer, and connect the other end of the cable to the serial port on the back of the Bravo Platform.



Using an Ethernet connection

You can use Ethernet to connect a Bravo Platform to the computer:

- Directly
- Through an Ethernet switch

If you are setting up a standalone Bravo Platform, you can use either method. If you are setting up a local area network (LAN) that has other devices on it, use an Ethernet switch.

The Agilent configured computer has two Ethernet ports. You can use one port to connect to the Bravo Platform and the other port to connect to your LAN.

Connecting directly to the computer

A red crossover Ethernet cable is provided for connecting the computer directly to the Bravo Platform.

To connect directly to the computer using Ethernet:

- 1 Connect one end of the red crossover Ethernet cable to the Ethernet port on the Bravo Platform.
- 2 Connect the other end of the cable to the Ethernet port of the computer.

Connecting through an Ethernet switch

An Ethernet switch connects the single cable from the computer to one or more cables that lead to one or more devices.

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

If you are adding the Bravo Platform to an existing LAN, [step 1](#) of the following procedure should already be done.

To connect through an Ethernet switch:

- 1 Connect the switch to the computer as follows:
 - a Connect the power cord to the switch.

2 Installing the Bravo Platform

Installing the liquid-handling head

Before mounting a liquid-handling head, familiarize yourself with the features of the dovetail interface on the liquid-handling head top and the connector underneath the head mount. See the following figures.

Figure Bravo head mount with (1) head lock and (2) dovetail connector

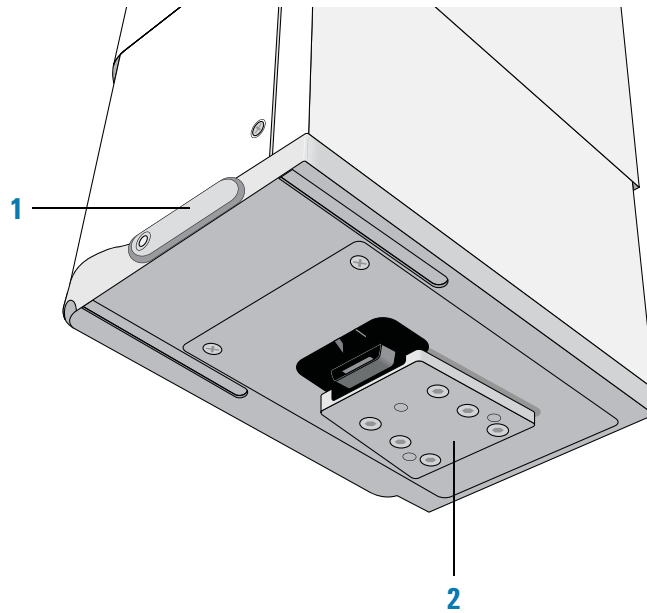
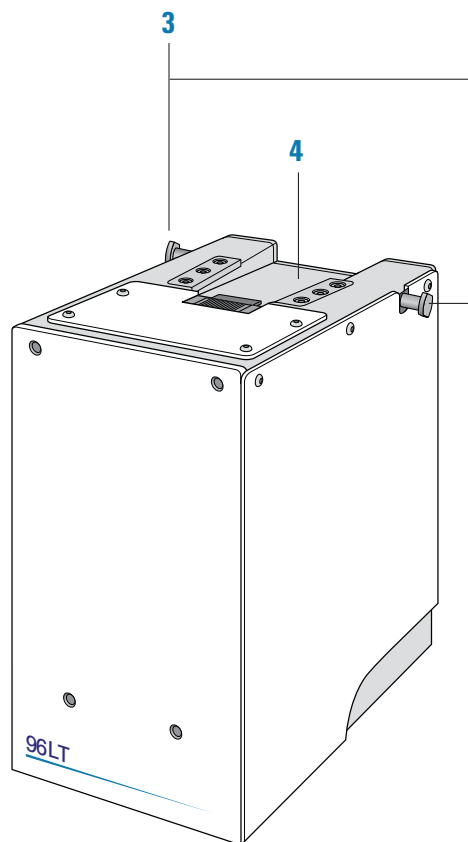


Figure Series III disposable-tip head with (3) retainer pins and (4) dovetail interface



Procedure

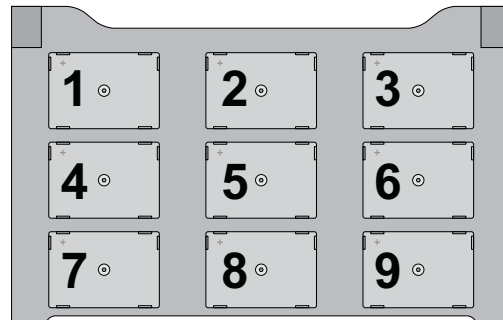
CAUTION Always turn off the Bravo Platform before installing or uninstalling a liquid-handling head. Failure to do so can damage the pipette head electronics.

To mount a Bravo liquid-handling head:

- 1 Make sure that the Bravo head mount is in its home position, which is centered above deck location 5. You can use your hands to move the head mount gently into position.

Note: If the Bravo Platform is already initialized, you can use Bravo Diagnostics to move the head mount to the home position.

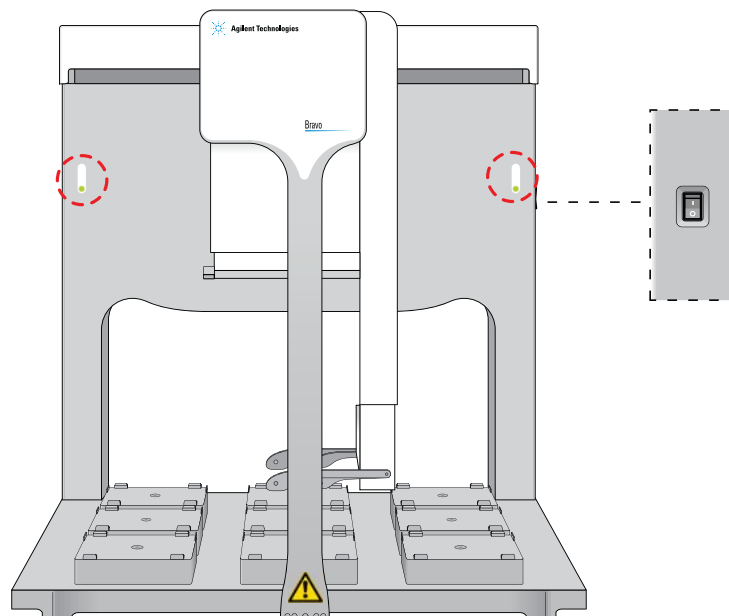
Figure Bravo deck locations (top view)



Front

- 2 Ensure that the Bravo Platform is turned off. Check that the power switch located on the right side is set to **off (o)** and the status lights on the device front are not lit.

Figure Bravo Platform status lights (front) and power switch (right side)



2 Installing the Bravo Platform

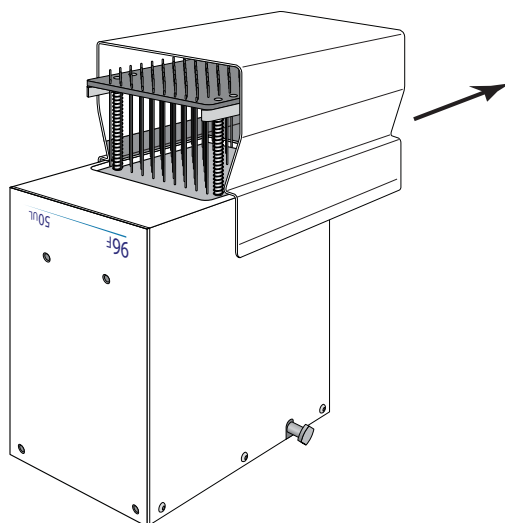
Installing the liquid-handling head

- Carefully remove the liquid-handling head and protective stand from the packaging. While the head is seated in the stand, pull out and twist the two head-retainer pins one-quarter turn so that they remain retracted.

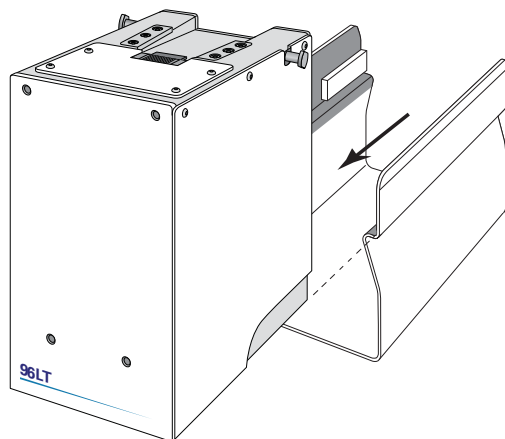
CAUTION Do not rest the bottom of a liquid-handling head on any surface. Doing so can damage the barrels, tips, pins, or probes.

CAUTION To prevent potential contamination, do not touch the liquid-handling head barrels, tips, pins, or probes with your hands.

- Remove the head from the stand as follows:
 - Fixed-tip heads and pin tools.* Rest the top of the head on a clean, dry surface with the tips or pins facing up. Slide the stand off the head as the following figure shows.



- Disposable-tip heads.* Rest the bottom of the stand on a clean, dry surface. Slide the head out of the stand as the following figure shows, so that the barrels are facing down.



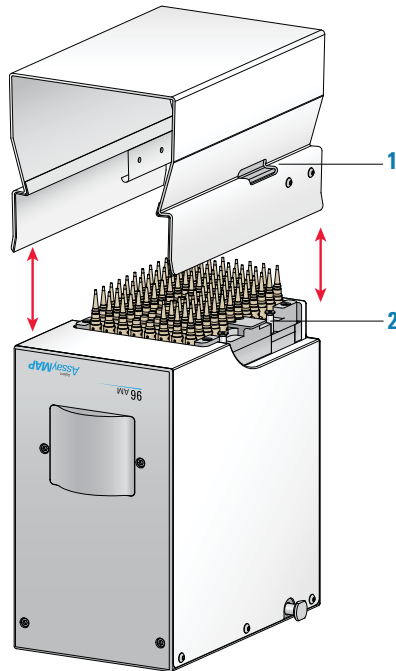
- Bravo 96AM Head.* Ensure that the top of the head is resting on a clean, stable surface so that the probes are facing up.



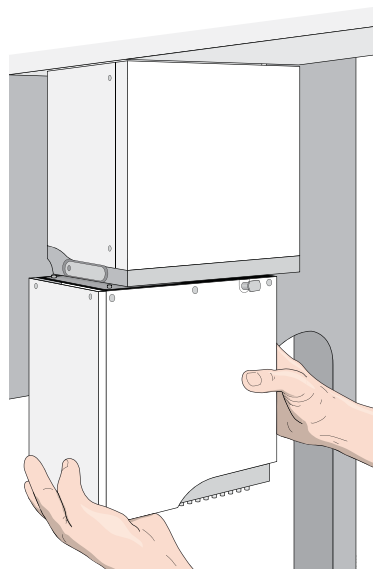
WARNING The probes of the AssayMAP head (Bravo 96AM Head) are sharp and can scratch you if they brush across your hand. A probe scratch can expose you to any contaminants remaining on the probes. Wear gloves and use extreme caution to avoid brushing against the probes.

Using both hands, carefully lift the stand off of the head while guiding the stand's side cutouts (1) off the head side tabs (2). Use care to avoid touching the probes.

Figure Removing or inserting the stand on the head



- 5 Slide the liquid-handling head onto the Bravo head mount as the following figure shows.

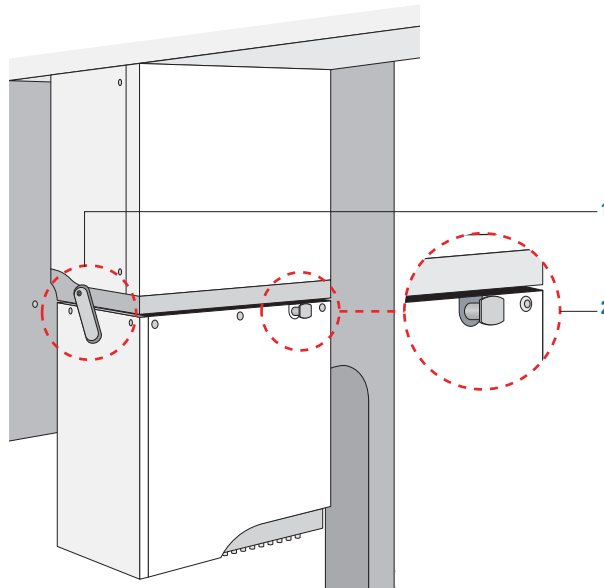


2 Installing the Bravo Platform

Installing the liquid-handling head

- 6** Rotate the head lock clockwise until it reaches its hard stop.
This ensures that the head is fully seated and will not shift position during operation.
- 7** Twist the two head-retainer pins so they snap in, securing the head on the mount.

Figure Mounted head with (1) head lock and (2) retainer pin



Installing the Light Curtain and front and side shields

About this topic

The Light Curtain and shields protect operators from moving-parts hazards while the Bravo Platform is in operation. If the Bravo Platform is integrated within an enclosure that connects to the device's safety interlock circuit and you determine that the enclosure provides adequate protection to the operator, the enclosure can replace the Light Curtain and shields.



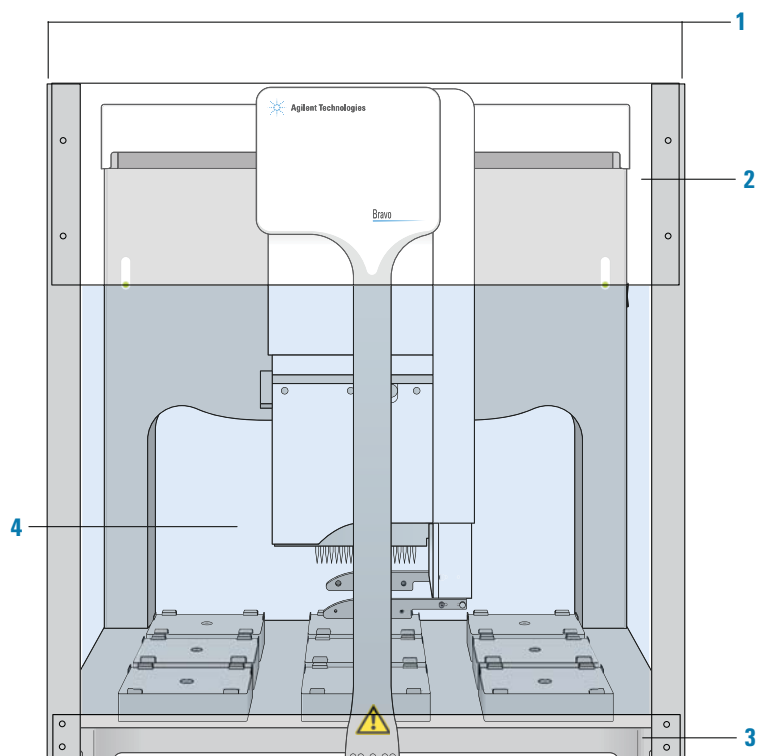
WARNING Ensure that the Bravo safety interlock circuit is connected to a light curtain or an enclosure with an interlock switch to reduce the risk of injury from moving parts.

Light Curtain and shield description

The Light Curtain contains two lightposts mounted at the front of the Bravo Platform that project light beams across the front of the device. If an object disrupts the light beams, the safety interlock circuit stops the motion of the Bravo head.

The following figure and table provide details on the Light Curtain and the front and side shields.

Figure Bravo Platform with Light Curtain and shields (front view)



2 Installing the Bravo Platform

Installing the Light Curtain and front and side shields

Item	Name	Description
1	Lightposts	The two lightposts, which mount on each end of the Bravo base, contain the transmitter and receiver that project the light beams, detect disruptions in the beam, and transmit signals to the safety interlock circuit.
2	Upper front shield	A clear plastic shield, which attaches to the two lightposts, prevents access at the front between the top of the light shield and the Bravo top.
3	Lower front shield	A clear plastic shield, which attaches to the two lightposts, prevents access at the front between the bottom of the light shield and top of the Bravo deck.
4	Light shield (invisible)	After the light beams are aligned, the Light Curtain generates an invisible light shield that spans the area between the two lightposts across the front of the Bravo Platform.
5	Side and rear shields (not shown)	Clear plastic shields prevent access through the sides and rear opening of the Bravo platform. Each clear plastic side shield attaches to a lightpost and the Bravo backplate. A side shield might not be required if the Bravo Platform is integrated with another device on a given side.
6	Junction box or Accessories Hub (not shown)	You can use either the junction box or Accessories Hub to provide the electrical and communication connection point for the lightposts and to connect the robot-disable pendant and integrate the Light Curtain into the safety interlock circuit of a standalone Bravo Platform. If the Bravo Platform is integrated with other devices, you use the Automation Control Unit to provide the central connection point for the safety interlock circuit.
7	Cable, extension (not shown)	The extension cable connects the Bravo pendant port to the junction box or the Accessories Hub.

Before you start

Safety warnings and caution



WARNING To prevent potential injury, shut down the Bravo Platform and unplug the power cord before installing the Light Curtain.



WARNING Do not replace the pendant with the Light Curtain. The Light Curtain is an additional safety feature to be used with the pendant.



WARNING The Light Curtain light beams extend across the front of the Bravo Platform only. Access to moving parts from the sides or back of the device may be possible and cannot be detected by the Light Curtain. If access from the sides or back is possible, install the side and rear shields, as applicable.

CAUTION Handle the lightposts with care to prevent any damage to the glass panels. Avoid touching the glass panels with your fingers. Fingerprints or dirt on the glass can interfere with the Light Curtain operation.

Required components and tools

Make sure that you have the following:

- Light Curtain components (lightposts and extension cable)
- Shields
- Junction box (provided with the Light Curtain) or Accessories Hub
- 2.5-mm and 3-mm hex wrenches
- Cross-tip screwdriver

Workflow overview

Make sure that you perform the procedures in the following order:

Step	Procedure	See...
1	Install the lightposts on the Bravo Platform.	“Installing the lightposts” on page 27
2	Connect the Light Curtain to the Bravo Platform.	“Connecting the Light Curtain” on page 28
3	Align the light beams.	“Aligning the light beams” on page 31
4	Install the front and side shields.	<ul style="list-style-type: none">• “Installing the front shields” on page 34• “Installing the side shields” on page 34

Installing the lightposts

To install the lightposts:

- 1 Position the foot of the left lightpost onto the Bravo front left base handle. To ensure a snug fit, press the lightpost foot firmly from the front and the side.

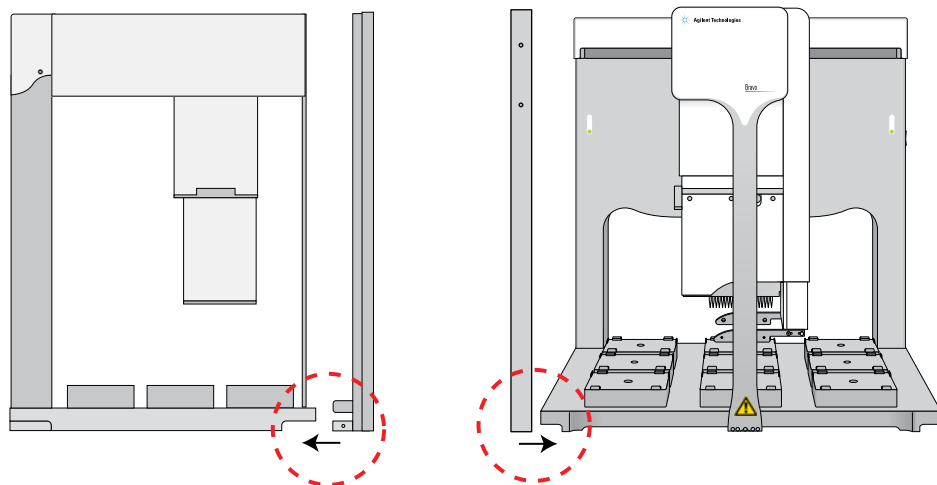
Note: The glass panel of the lightpost should face toward the Bravo center front.

IMPORTANT Ensure that the lightpost foot fits completely onto the Bravo base handle without any gaps in space. Otherwise, you will not be able to align the light beams correctly.

2 Installing the Bravo Platform

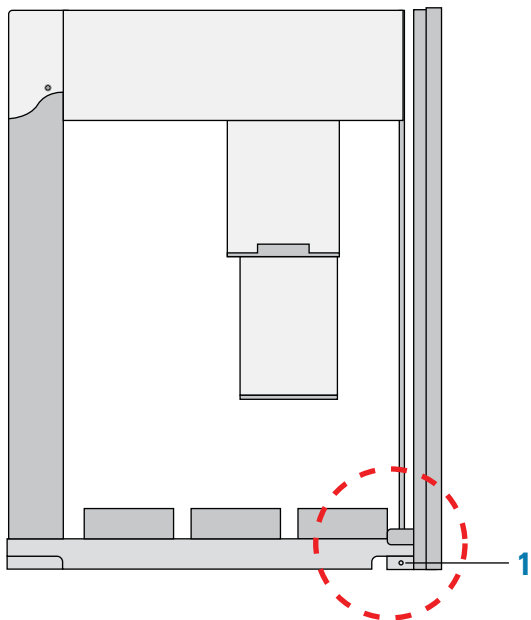
Installing the Light Curtain and front and side shields

Figure Positioning a lightpost (side view and front view)



- 2 On the outer side of the lightpost foot, install the setscrew to lock the lightpost into position, as the following figure shows (1).

Figure Lightpost setscrew (Bravo Platform side view)



- 3 Repeat [step 1](#) to [step 2](#) to mount the front right lightpost.

Connecting the Light Curtain

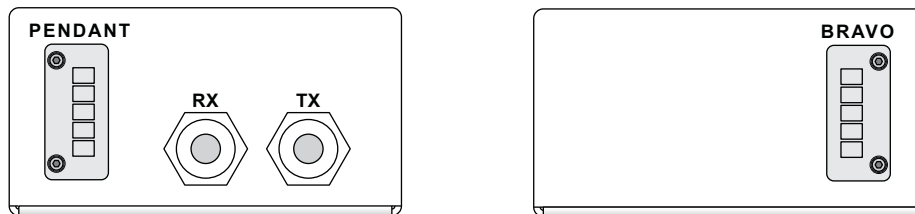
You can connect the Light Curtain to a standalone Bravo Platform in either of the following ways. If the Bravo Platform is integrated with an Automation Control Unit, see the [Automation Control Unit User Guide](#) for connection instructions.

- “Using a junction box” on [page 29](#).
- “Using the Accessories Hub” on [page 30](#)

Using a junction box

The ports for the pendant cable and the two lightpost cables are on the front of the junction box. The Bravo port for the extension cable is on the back of the junction box. The following figure shows the junction box connections.

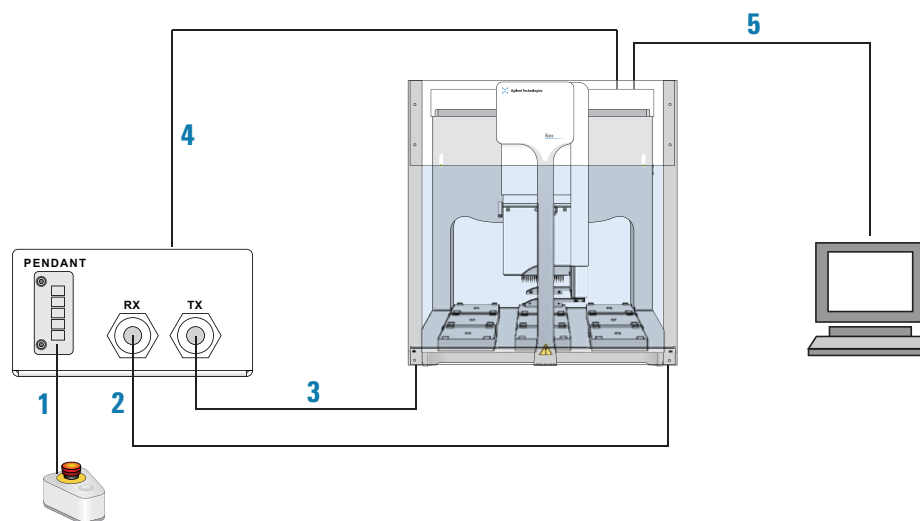
Figure Junction box connections (front view and back view)



To use a junction box to connect the Light Curtain:

Use the following figure and table to connect the junction box and Light Curtain.

Figure Light Curtain connections using a junction box



Item	Description	From	To
1	Pendant cable	Pendant	Junction box: PENDANT port (front)
2	Lightpost cable, black	Lightpost receiver	Junction box: RX port (back)
3	Lightpost cable, gray	Lightpost transceiver	Junction box: TX port (front)
4	Extension cable	Pendant port on the Bravo connection panel	Junction box: BRAVO port (back)
5	Ethernet cable	Bravo connection panel	Controlling computer panel

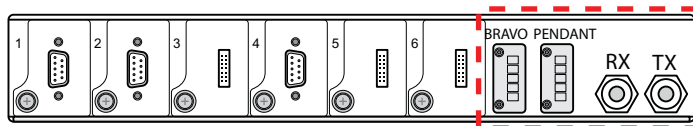
2 Installing the Bravo Platform

Installing the Light Curtain and front and side shields

Using the Accessories Hub

The following figure shows the Light Curtain ports on the Accessories Hub.

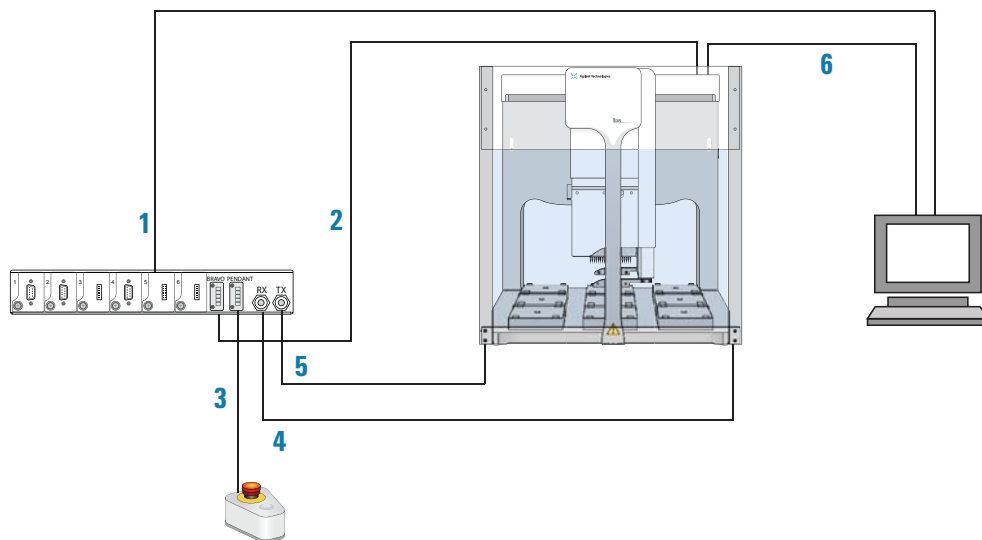
Figure Light Curtain ports on the Accessories Hub (front view)



To use the Accessories Hub to connect the Light Curtain:

Use the following figure and table to connect the Accessories Hub and Light Curtain.

Figure Light Curtain connections using the Accessories Hub



Item	Description	From	To
1	USB cable	Controlling computer	Accessories Hub: USB port (back)
2	Extension cable	Pendant port on the Bravo connection	Accessories Hub: BRAVO port (front)
3	Pendant cable	Pendant	Accessories Hub: PENDANT port (front)
4	Lightpost cable, black	Lightpost receiver	Accessories Hub: RX port (front)
5	Lightpost cable, gray	Lightpost transceiver	Accessories Hub: TX port (front)
6	Ethernet cable	Bravo connection panel	Controlling computer

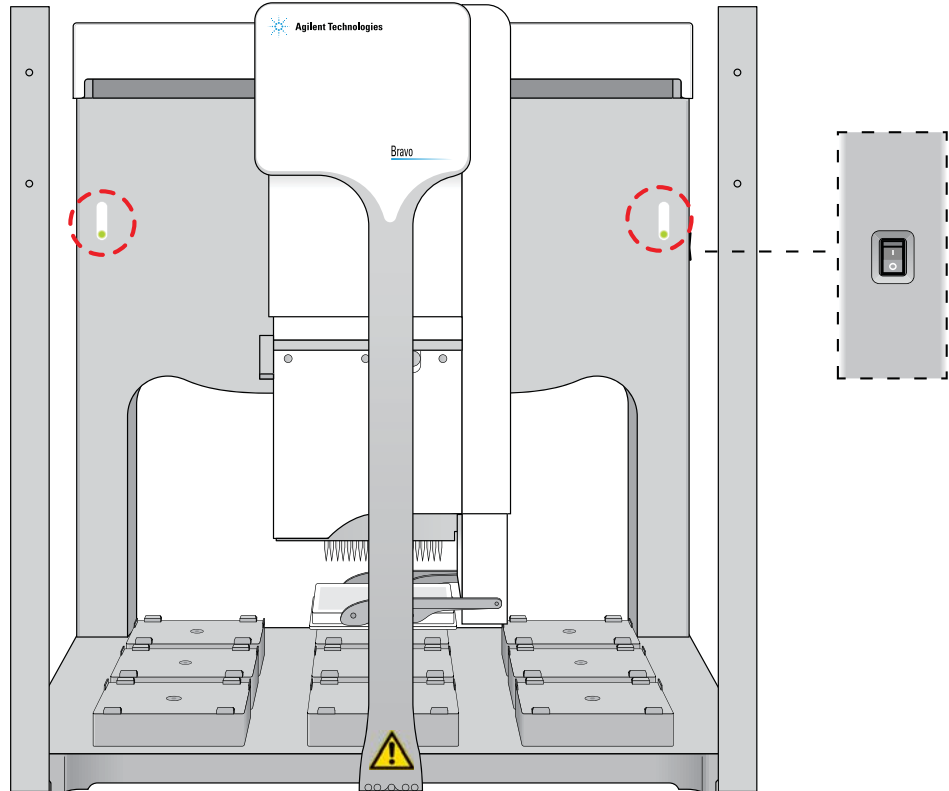
Aligning the light beams

To align the light beams:

- 1 On the side of the Bravo Platform, press the power switch to the **on** (I) position.

The two indicator lights on the front of the Bravo backplate illuminate, indicating that the Bravo Platform is on, and the Light Curtain activates.

Figure Bravo Platform status lights (front) and power switch (right side)

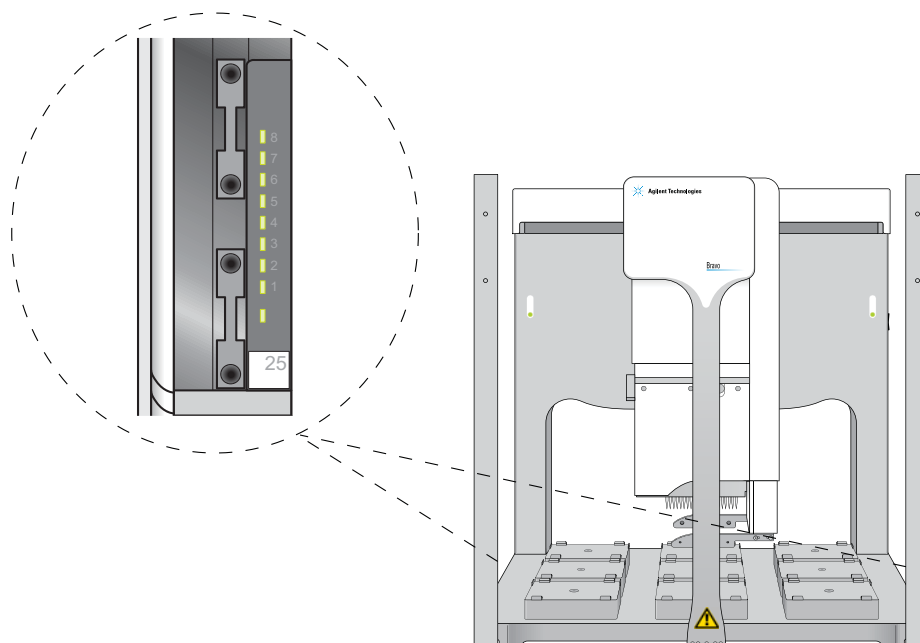


- 2 On the lower inside panel of each lightpost, verify that the column of LEDs turn on.

2 Installing the Bravo Platform

Installing the Light Curtain and front and side shields

Figure Lightpost LED lights



- 3 While facing the front of the Bravo Platform, slowly rotate the LED panels forward as far as possible, so that the LED panels are angled to face toward you.

The LED lights at the bottom of the glass panels turn red, indicating that the light beams are not aligned.

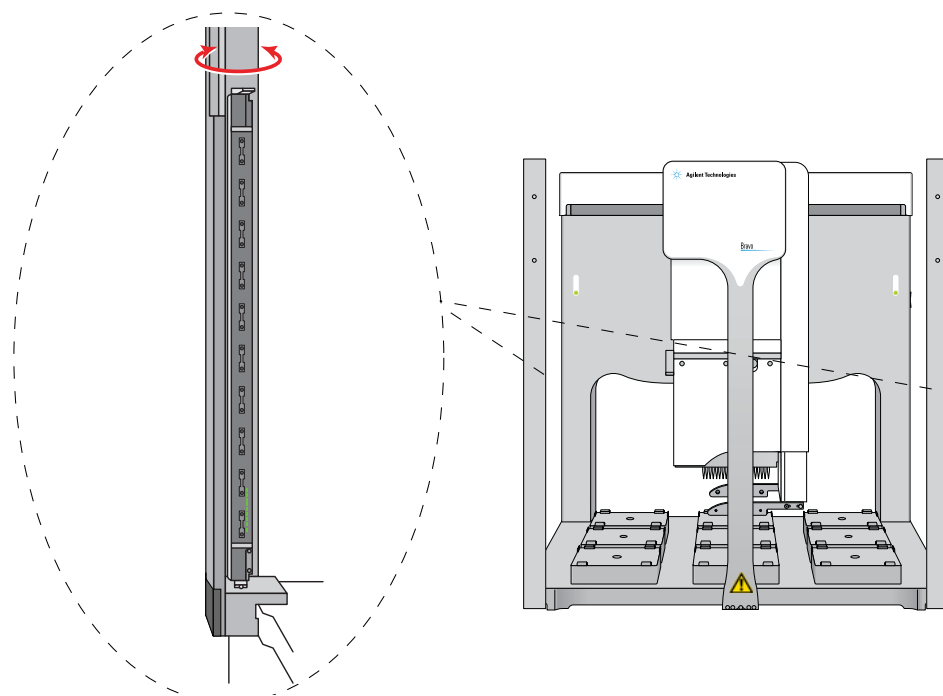
CAUTION Avoid touching the glass panels with your fingers. Fingerprints or dirt on the glass can interfere with the Light Curtain operation.

- 4 Slowly rotate the LED panels backwards again until the entire column of LEDs on each panel turns solid green, indicating that the light beams are aligned.

The two indicator lights on the front of the Bravo backplate turn blue.

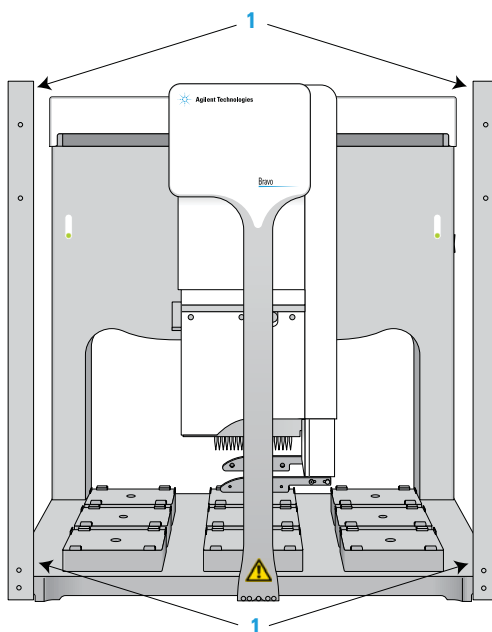
IMPORTANT If any of the LEDs on the lightpost panel are partial green or blinking, the light beams are not completely aligned. On the front of the Bravo backplate, the two indicator lights are red if the light beams are not aligned.

Figure Rotating the LED panels to align the light beams



- 5 Use a 2.5-mm hex wrench to tighten the two adjustment screws located near the top and bottom of each lightpost's interior-facing side, as the following figure shows (1).

Figure Adjustment screws (1) on the lightpost interior top and bottom



- 6 To verify the adjustment:
- a Press the Bravo power switch to the **off (o)** position, wait a minute, and then press the power switch to the **on (|)** position.

2 Installing the Bravo Platform

Installing the Light Curtain and front and side shields

- b Verify that the entire column of LEDs on each lightpost are solid green and not blinking.

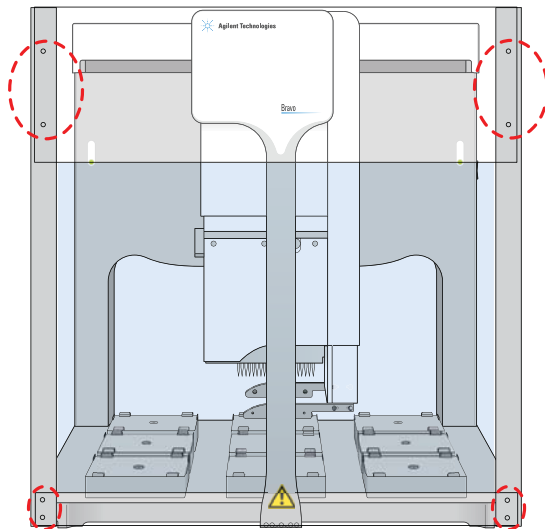
Installing the front shields

To install the front shields:

- 1 At the front of Bravo Platform, position the upper front shield so that the side with the countersink screw holes is facing away from the device.
- 2 Secure the upper front shield to the top of the two lightposts using the four screws provided.
- 3 Position the lower front shield so that the side with the countersink screw holes is facing away from the device.
- 4 Secure the lower front shield to the two lightposts using the four screws provided.

After installation, the flat screw heads should be flush with the shield surface.

Figure Bravo Platform front shield attachment screws



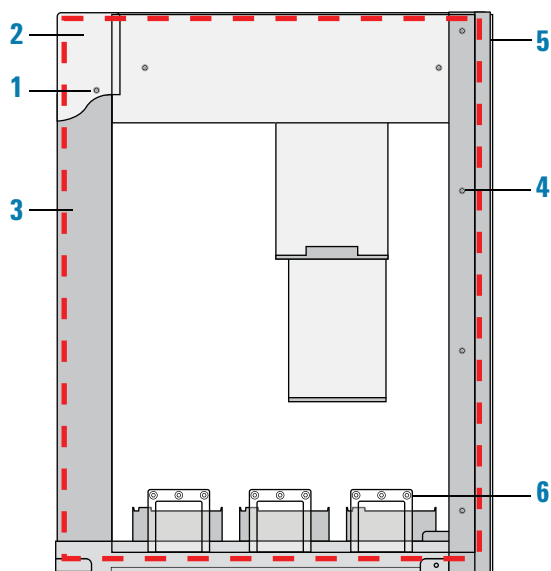
Installing the side shields

The Bravo side shield configurations can vary depending on whether the Bravo Platform is integrated with another device at a given side. The options include:

- *Full-size side shield.* Prevents access to the Bravo moving parts from the side. The full-size shield is used on a side where no device is integrated.
- *Upper side shield.* Prevents access to the Bravo moving parts at the upper side only. For example, the upper shield could prevent an operator from reaching over a device with a low profile that is integrated at the side of the Bravo Platform.
- *Partial-width shield.* Prevents access from the side to certain deck locations only. For example, if a device is integrated at the side aligned with the back row of platepads, a partial side shield can prevent access to the other rows of platepads that are not blocked by an integrated device.

The procedure in this section describes how to install the full-size side shield. Refer to the following figure and table for this procedure.

Figure Full-size side shield installed on the Bravo Platform (side view)



Item	Description
1	Top cover attachment screw
2	Top cover
3	Backplate
4	Shield attachment screws (four)
5	Lightpost (Light Curtain)
6	Shield platepad-access window (three)

To install the side shield:

- 1 At the side of the Bravo Platform, remove the crosshead screw (1) that attaches the Bravo top cover (2) to the Bravo backplate (3).
- 2 Use the crosshead screw from [step 1](#) to secure the side shield to the Bravo top cover.
- 3 Using the four attachment screws (4) provided, secure the side shield to the lightpost (5).
- 4 If tubing access is required at the side, use a 2.5-mm hex wrench to remove the appropriate platepad-access window (6) from the shield.

Installing the rear shield

About this topic

Read this topic if you have a Bravo Platform that will be operated in an area where access to the moving parts is possible through the rear opening in the backplate. This topic describes how to install the rear shield to protect operators from moving-parts hazards while the device is in operation.

The rear shield is not necessary if the back of the Bravo Platform is next to a wall or if the device is operated inside an enclosure.

Before you start



WARNING To prevent potential injury, turn off the Bravo Platform and disconnect the power cord before you install or remove any accessory.

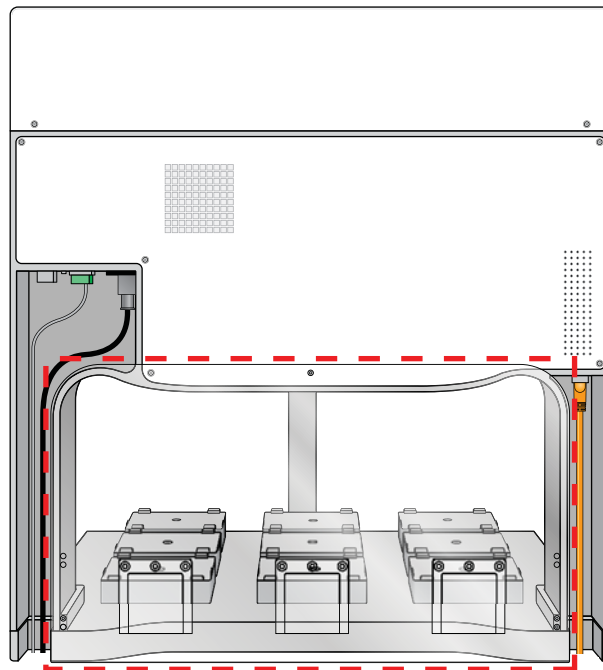
Make sure that you have the following:

- Rear shield kit, including two clamps, one M3 screw and four M4 screws
- Cross-tip screwdriver
- 2.5-mm and 3-mm hex wrenches

Installing the rear shield

The following figure shows the installed rear shield, which is a clear panel that blocks rear access to the deck through the opening in the backplate.

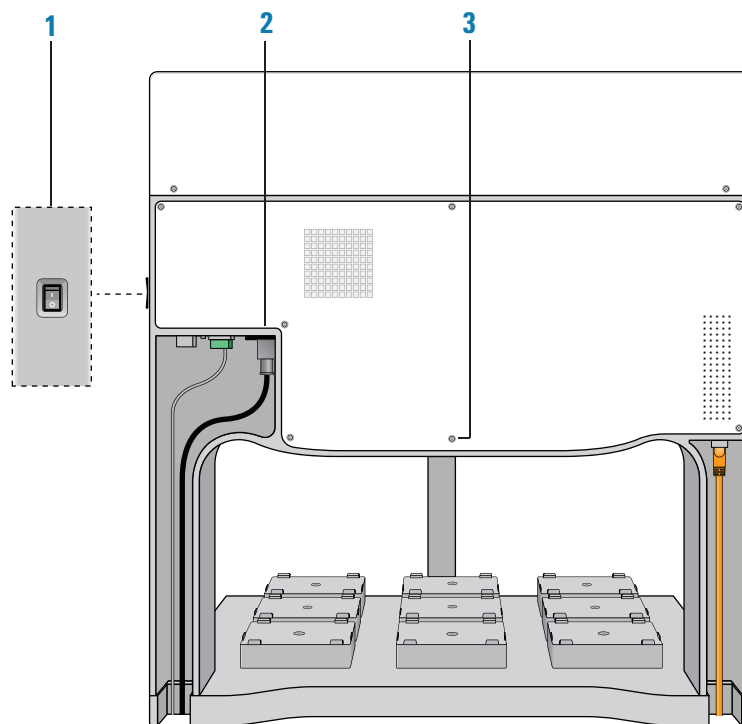
Figure Bravo Platform with rear shield installed



To install the rear shield:

- 1 On the side of the Bravo Platform, press the power switch to the **off (o)** position (1), and unplug the power cord (2). See the following figure.

Figure Bravo Platform rear view

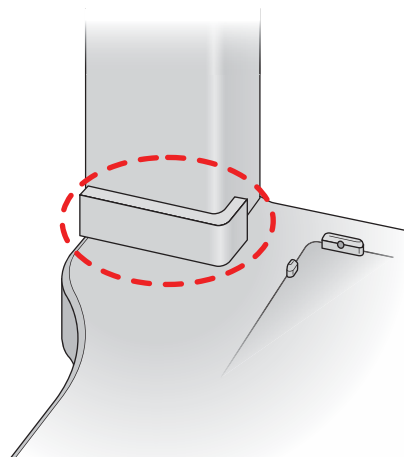


- 2 At the back of the Bravo Platform, remove the flathead screw from the center lower edge of the rear cover (3), as the preceding figure shows. Save the screw for future use in case the shield is removed.
- 3 While holding the shield in place to cover the rear deck access, install the screw (M3) at the top center of the shield into the empty screw hole in the Bravo backplate.
- 4 At the bottom of each backplate post, position a shield clamp on the interior. See the following figure.

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Installing the rear shield

Figure Shield clamp in position on Bravo backplate post (view from interior)

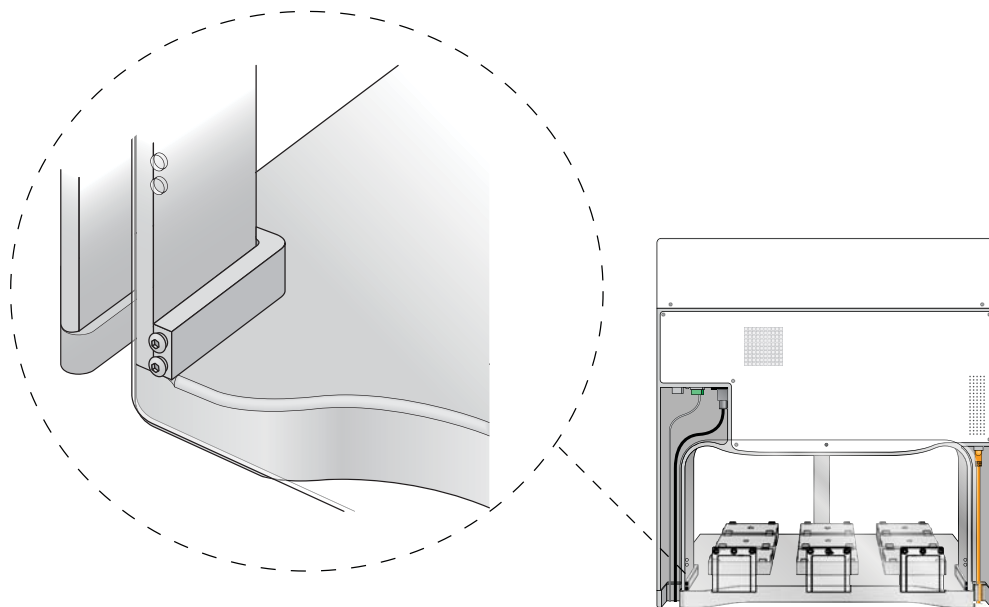


Note: The clamps are secured in place after the shield screws are installed in the next step.

- 5 Install the two screws (M4) in the rear-facing end of each clamp to secure the shield to the clamps, as the following figure shows.

The preferred location for the clamps is at deck level. If something interferes with the deck-level position of a clamp, you can use the optional attachment holes on the shield to position the clamp higher on the post. In this case, you should keep the second clamp at deck level if possible.

Figure Screws installed in a shield clamp



- 6 If tubing or cabling access is required at the deck's rear, use a 2.5-mm hex wrench to remove the appropriate platepad-access window from the shield. Three screws secure each of the three platepad-access windows in the rear shield.

Starting up and shutting down

About this topic

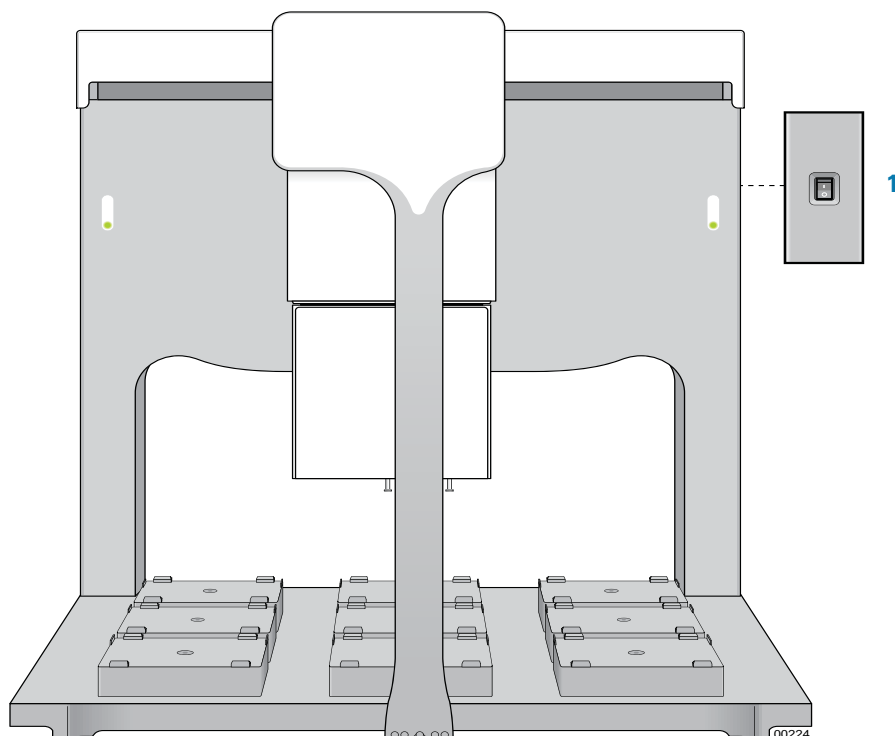
This topic describes how to start up and shut down the Bravo Platform when you are operating it as a standalone device. For instructions on how to turn on and turn off the Bravo Platform when it is integrated into a workstation or system, see the workstation or system user documentation.

Starting up the Bravo Platform

To start up the Bravo Platform:

- 1 Ensure that the main power cable and Ethernet or serial cables are plugged into the connection panel.
- 2 Turn on any accessories, for example, Pump Modules.
- 3 Turn on the computer and the monitor, and start the Microsoft Windows operating system.
- 4 On the side of the Bravo Platform, press the power switch (1) to the **on** (I) position.

The green light on the switch is illuminated when the Bravo Platform is on.



- 5 Start the automation software, for example, the VWorks software.

Shutting down the Bravo Platform

Shut down the Bravo Platform before you:

- Clean the Bravo Platform
- Change the pipette head
- Install accessories
- Move the Bravo Platform

To shut down the Bravo Platform:

- 1** If removing the pipette head, ensure that the disposable tips are removed or that fixed tips are clean.
- 2** Optionally, home the pipette head.
- 3** Shut down the computer.
- 4** Turn off any accessories, for example, Pump Modules.
- 5** If using an Auto Filling Reservoir, disconnect the bottles to prevent siphoning.
- 6** On the side of the Bravo Platform, press the power switch to the **off (o)** position.

Related information

For information about...	See...
Setting up and using the Bravo Platform	<ul style="list-style-type: none">• The Help menu from within the automation software controlling the Bravo Platform• The online knowledge base at www.agilent.com/chem/askb



Safety and Installation Guide

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