

# Welch Allyn Connex<sup>®</sup> ProBP<sup>™</sup> 3400 digital blood pressure device

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Service manual

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For information about any Welch Allyn product, contact Welch Allyn Technical Support ([www.welchallyn.com/support](http://www.welchallyn.com/support)) or call:

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**WelchAllyn**<sup>®</sup>  
Advancing Frontline Care™

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# Symbols

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## Documentation symbols



**Warning:** The warning statements in this manual identify conditions or practices that could lead to illness, injury, or death.



**Caution:** The caution statements in this manual identify conditions or practices that could result in damage to the equipment or other property, or loss of data.



Consult operating instructions.

## Power symbols



(green indicator) External power present, battery charged



Battery charging



(amber indicator) External power present, battery is charging



Rechargeable battery



No external power present



Battery charge level

## Button symbols



Power on/standby



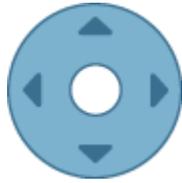
Return to previous screen



Blood Pressure Start/Stop



Select



Navigation (Up, Down, Left, Right)

## Shipping, storing, and environment symbols



Fragile; handle with care



Relative humidity limits



Temperature limits

**Li-ion**

Lithium-ion battery



Recovery/Recyclable



Recycle the product separate from other disposables



This end up



Keep dry

**IPX0**

Equipment is not protected against the ingress of liquid

## Connectivity symbols



*Bluetooth*® wireless technology enabled



USB connection



Devices are connected via *Bluetooth* wireless technology



*Bluetooth* radio is disabled or not paired

## Miscellaneous symbols



Wireless radio alert in Europe. European Communities Class 1 radio equipment.



EMC Framework of Australia



Intertek ETL listed



Type BF applied parts



Class II equipment

**R<sub>x</sub> ONLY**

Available for sale only upon order of a physician or licensed health care provider



Serial number



Reorder number



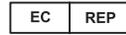
Non-ionizing electromagnetic radiation



Manufacturer



Call for maintenance



Regulatory Affairs Representative



# Safety

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All users of this device must read and understand all safety information presented in this manual before using or repairing the device.

United States federal law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.

## Warnings and cautions

-  **WARNING** Fire and explosion hazard. Do not operate the device in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide; in oxygen-enriched environments; or in any other potentially explosive environment.
-  **WARNING** The device might not function properly if dropped or damaged. Do not use the device if you notice any signs of damage. Qualified service personnel must check any device that is dropped or damaged for proper operation before putting the device back into use.
-  **WARNING** For proper patient electrical isolation and battery charging, use only the provided external power supply to charge the device.
-  **WARNING** Electric shock hazard. Use the USB connector only to connect to devices complying with IEC 60601-1 or other IEC standards as appropriate to the device. The user is responsible for verifying that the system complies with the requirements of the system standard IEC 60601-1-1 if additional devices are connected to the ProBP 3400.
-  **WARNING** Inaccurate measurement risk. Dust and particle ingress can affect the accuracy of blood pressure measurements. Use the device in clean environments to ensure measurement accuracy. If you notice dust or lint accumulation on the blood pressure port, have the device inspected and cleaned by a qualified service technician.
-  **WARNING** Electric shock hazard. Before cleaning the device, disconnect the power cord from the power source and the device.
-  **WARNING** Take care to prevent water or other fluid from entering any connectors on the device. Should this occur, dry the connectors with warm air. Check the accuracy of all operating functions.
-  **WARNING** Defective batteries can damage the device. If the battery shows any signs of damage, leakage, or cracking, it must be replaced immediately, and only with a battery recommended for or supplied with the device.



**WARNING** Improper disposal of batteries can create an explosion or contamination hazard. Never dispose of batteries in refuse containers. Do not dispose of the battery in fire. Always recycle batteries according to local regulations.



**WARNING** Improper handling of the battery can lead to heat generation, smoke, bursting, or fire.



**WARNING** Do not remove the label from the battery.



**WARNING** Do not disassemble, modify, or solder the battery.



**WARNING** Do not directly connect or short-circuit the positive (+) and negative (-) battery terminals.



**WARNING** To avoid short circuits, keep battery terminals away from metal objects.



**WARNING** Do not expose the battery to temperatures higher than 80 °C/176 °F.



**WARNING** Safety risk. When handling and storing lithium batteries, avoid mechanical or electrical abuse. Batteries might explode or cause burns if disassembled, crushed or exposed to fire or high temperatures. Do not short. Always install with correct polarity.



**Caution** The device is not heat-resistant. Do not autoclave.



**Caution** To ensure that the device meets performance specifications, store and use the device in an environment that maintains the specified temperature and humidity ranges.



**Caution** Do not operate the device in the presence of magnetic resonance imaging (MRI) or hyperbaric chambers.

## General safety considerations

- If the device detects an unrecoverable problem, it displays an error message. For more information, see “Troubleshooting.”
- To ensure patient safety, use only accessories recommended or supplied by Welch Allyn. Always use accessories according to your facility’s standards and according to the manufacturer’s recommendations and instructions. Always follow the manufacturer’s directions for use.
- Welch Allyn recommends that only Welch Allyn service personnel or an authorized repair center perform warranty service, unless otherwise specified in a service agreement. Performing unauthorized service on a device that is within warranty will void the warranty.

# Electrostatic discharge (ESD)



**Caution** Electrostatic discharge (ESD) can damage or destroy electronic components. Handle static-sensitive components only at a static-safe workstation.



**Caution** Assume that all electrical and electronic components of the device are static-sensitive.

Electrostatic discharge is a sudden current flowing from a charged object to another object or to ground. Electrostatic charges can accumulate on common items such as foam drinking cups, cellophane tape, synthetic clothing, untreated foam packaging material, and untreated plastic bags and work folders, to name only a few.

Electronic components and assemblies, if not properly protected against ESD, can be permanently damaged or destroyed when near or in contact with electrostatically charged objects. When you handle components or assemblies that are not in protective bags and you are not sure whether they are static-sensitive, assume that they are static-sensitive and handle them accordingly.

- Perform all service procedures in a static-protected environment. Always use techniques and equipment designed to protect personnel and equipment from electrostatic discharge.
- Remove static-sensitive components and assemblies from their static-shielding bags only at static-safe workstations—a properly grounded table and grounded floor mat—and only when you are wearing a grounded wrist strap (with a resistor of at least 1 megohm in series) or other grounding device.
- Use only grounded tools when inserting, adjusting, or removing static-sensitive components and assemblies.
- Remove or insert static-sensitive components and assemblies only with device power turned off.
- Insert and seal static-sensitive components and assemblies into their original static-shielding bags before removing them from static-protected areas.
- Always test your ground strap, bench mat, conductive work surface, and ground cord before removing components and assemblies from their protective bags and before beginning any disassembly or assembly procedures.



# Overview

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## Purpose and scope

This service manual is a reference for periodic preventive maintenance and corrective service procedures for the device. It is intended for use only by trained and qualified service personnel.

Corrective service is supported to the level of field-replaceable units. These include circuit-board assemblies and some subassemblies, case parts, and other parts.



**Caution** No component-level repair of circuit boards and subassemblies is supported. Use only the repair procedures described in this manual.



**WARNING** When performing a service procedure, follow the instructions exactly as presented in this manual. Failure to do so could damage the device, invalidate the product warranty, and lead to serious personal injury.

Find instructions for functional testing and performance verification in the Welch Allyn Service Tool help files.

Service work not described in this manual must be performed by qualified service personnel at the factory or at an authorized Welch Allyn service center.

For information about servicing any other product, see the service manual for that product.

## Related documents

When using this manual, refer to the following:

- *Welch Allyn Connex ProBP 3400 Digital Blood Pressure Device Directions for Use* (part number 103701)
- Welch Allyn Service Tool CD (part number 103521)
- *Welch Allyn Service Tool Installation and Configuration Guide* (part number 103820)
- Welch Allyn website: [www.welchallyn.com](http://www.welchallyn.com)

## Technical support services

Welch Allyn offers the following technical support services:

- Telephone support
- Advance replacement equipment
- Service agreements
- Service training

- Replacement service parts
- Product service

For information on any of these services, call the Welch Allyn Service Center nearest you.

## Advance replacement

When a device requires service by a Welch Allyn Service Center, Welch Allyn can provide an advance replacement device to minimize downtime. The replacement device will be shipped to you as soon as you request one and is yours to keep. After you receive it, you return your original device to Welch Allyn. Replacement devices are available at no cost for warranty repairs or as defined by a service agreement.

**Note** Welch Allyn reserves the right to charge for advance replacement if the repair is not covered under warranty or if the original device is not returned.

## Service options

### *Partners in Care* service agreements

While product warranties provide basic assurance of Welch Allyn hardware quality, they might not include the full range of services and support you need. Welch Allyn offers premium service and support through our *Partners in Care* program. Whether you service your own devices and require a minimum level of support or rely on us to service your device, Welch Allyn provides a program that will meet your needs. For more information, visit our website at [www.welchallyn.com](http://www.welchallyn.com) or call your sales representative.

### Warranty service

All repairs on products under warranty must be performed or approved by Welch Allyn. Refer all warranty service to an authorized Welch Allyn Service Center. Obtain a Return Material Authorization (RMA) number for all returns to Welch Allyn.



**Caution** Unauthorized repairs will void the product warranty.

### Non-warranty service

Welch Allyn Service Centers support non-warranty repairs. Contact Welch Allyn Technical Support for pricing and service options.

Welch Allyn offers modular repair parts for sale to support non-warranty service. This service must be performed only by qualified end-user biomedical/clinical engineers using this service manual.

Service training for this product is available from Welch Allyn for biomedical/clinical engineers. For information, go to [www.welchallyn.com/support/technical/monitoring\\_suppt\\_training.htm](http://www.welchallyn.com/support/technical/monitoring_suppt_training.htm).

## Repairs

A Welch Allyn Service Center must perform all repairs on products under warranty, unless you have purchased a Welch Allyn support agreement allowing you to service the device while under warranty.



**Caution** Unauthorized repairs will void the product warranty.

Qualified service personnel or a Welch Allyn Service Center should repair products out of warranty.

If you are advised to return a product to Welch Allyn for repair or routine maintenance, schedule the repair with the service center nearest you.

### Welch Allyn Technical Support

If you have a problem with the device that you cannot resolve, call the Welch Allyn Technical Support Center nearest you for assistance. A representative will assist you in troubleshooting the problem and will make every effort to solve the problem over the phone, avoiding a potential unnecessary return.

If your product requires warranty, extended warranty, or non-warranty repair service, a Welch Allyn Technical Support representative will record all necessary information to issue an RMA number. The support representative will provide you with the address of the Welch Allyn Service Center to send your device to.

Technical support is available during local business hours.

## Returning products

When returning a product to Welch Allyn for service, provide the following information:

- Product reference number and serial number. This information can be found on the product and serial number label on the bottom of the device.
- A complete return shipping address.
- A contact name and phone number.
- Any special shipping instructions.
- A purchase-order number or credit-card number if the product is not covered by a warranty or service agreement.
- A full description of the problem or service request.

1. Contact Welch Allyn and request an RMA number.

**Note** Welch Allyn does not accept returned products without an RMA.

2. Ship the device to Welch Allyn, observing these packing guidelines:
  - a. Remove from the package the battery, all hoses, connectors, cables, power cords, and other ancillary products and equipment, except those items that might be associated with the problem.

### Recommendations for returning the lithium-ion battery

- Use ground transportation to return batteries.
- If returning multiple batteries, package each battery individually.
- Do not consolidate multiple batteries in a single package.

- Use packaging provided by Welch Allyn or the battery manufacturer.
- If traveling by air, do not pack a defective battery in checked or carry-on baggage.

### Packaging

- If you return the battery with the device, remove the battery, seal the battery in an antistatic plastic bag, and place the battery in the position reserved for the battery in the original shipping carton near the device.
- If you return the battery separately, package the battery in the replacement battery's plastic bag and shipping box.



**WARNING** Safety risk. Do not ship any battery that has been physically damaged or shows signs of leakage unless you receive specific instructions which meet the requirements for the shipment of lithium batteries. Dispose of damaged or leaking batteries in an environmentally safe manner consistent with local regulations.

**Note** In the United States, the applicable regulations can be found in the Code of Federal Regulations (CFR). Refer to 49 CFR 173.185 for shipping lithium batteries by air or ground. Use 49 CFR 172.102 sections 29, 188, 189, A54, A55, A100, A101, A103, and A104 to find the special provisions for shipping lithium batteries.

- b. Clean the device.

**Note** To ensure safe receipt of your device by the service center and to expedite processing and return of the device to you, **thoroughly clean all residues from the device before you ship it to Welch Allyn.**

If a returned device is found to be contaminated with bodily fluids, it will be returned at the owner's expense. United States federal regulations prohibit the processing of any device contaminated with blood-borne pathogens. Welch Allyn thoroughly cleans all returned devices on receipt, but any device that cannot be adequately cleaned cannot be repaired.

- c. Put the device, enclosed in a plastic bag **with a packing list**, into the original shipping carton with the original packing materials or into another appropriate shipping carton.
- d. Put a copy of the Welch Allyn RMA in the shipping carton.
- e. Write the Welch Allyn RMA number with the Welch Allyn address on the outside of the shipping carton.

## Recommended service intervals

To confirm that the device is functioning within the design specifications, perform periodic service using the Welch Allyn Service Tool as indicated in the following table.

Component	Service interval	Service procedure
Device	Annually	Calibration check using the Silver-level Welch Allyn Service Tool

Use the Gold-level Welch Allyn Service Tool to perform a complete functional verification and calibration of the device whenever any of the following conditions exist:

- Based on the calibration check, the device does not meet specifications
- The device has been dropped or otherwise damaged
- The device is malfunctioning
- The case has been opened
- A part has been replaced

For details on performing the functional verification, see the section on functional verification.

## Maintenance

For device maintenance information, see the directions for use. Covered topics include the following:

- Changing the battery
- Inspecting and cleaning the device and accessories

## Configuration options

The device is available in the configurations shown in the table below. The model-number suffix, denoted by an asterisk (\*), indicates the power cord packaged with the device. Available suffixes are listed after the configuration table.

**Note** For more configuration options, including approved accessories, see the directions for use.

Model	Standard BP	SureBP	Bluetooth	Mounting configuration
34BFHT-*		✓	✓	Handheld
34BFWT-*		✓	✓	Wall mounted
34BFST-*		✓	✓	Mobile stand
34XFHT-*		✓		Handheld
34XFWT-*		✓		Wall mounted
34XFST-*		✓		Mobile stand
34BXHT-*	✓		✓	Handheld
34BXWT-*	✓		✓	Wall mounted
34BXST-*	✓		✓	Mobile stand
34XXHT-*	✓			Handheld

Model	Standard BP	SureBP	Bluetooth	Mounting configuration
34XXWT-*	✓			Wall mounted
34XXST-*	✓			Mobile stand

Region codes, as indicated by the asterisk (\*), include the following:

Code	Region
6	Australia/New Zealand
C	China
2	Europe
J	Japan (mobile stand version only)
B	North America
7	South Africa
4	United Kingdom

## The Welch Allyn Service Tool

The Welch Allyn Service Tool is available in the following editions:

- **Silver:** Accompanies your device.
- **Gold:** Required to perform functional verification and calibration. This edition requires an additional license. For more information about acquiring this license, contact Welch Allyn.

**Note** To qualify for the Gold license, you must attend the Welch Allyn technical training course or complete online training for the product.

Clinicians and technical service personnel can use the service tool to manage and maintain supported Welch Allyn products. You can use the service tool to do the following:

- **Review device information.** When connected to the device, the service tool lists installed modules, installed firmware and hardware versions, warranty and repair information, status, and usage history.
- **Receive notifications when periodic maintenance is needed.** The service tool can help you manage and maintain your entire inventory of supported Welch Allyn products. Through the remote service function, the service tool can connect to Welch Allyn Customer Service. With this functionality you can automatically receive firmware updates and feature upgrades for your supported products, including software upgrades for the service tool.
- **Install updates and upgrades.** The service tool can read the firmware version for each module and check for available updates or upgrades.
- **Create a work list.** The work list provides information about service actions—referred to as work orders—that are waiting for you to perform on your maintained devices. Work orders may include periodic calibrations, upgrades, or license installations.

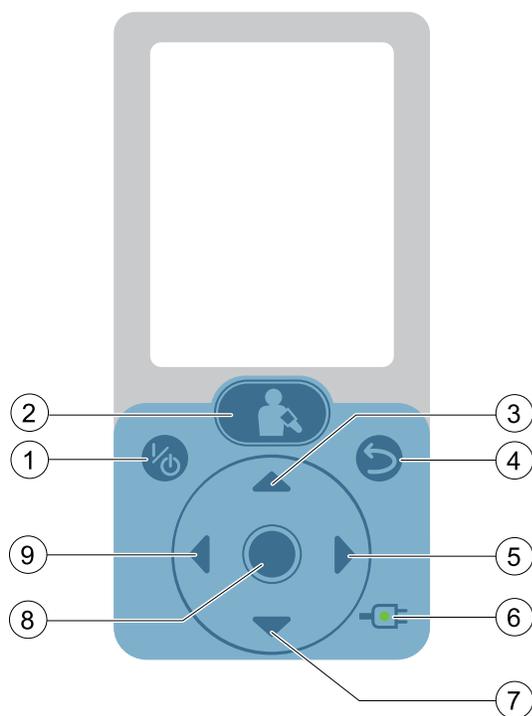
- **Schedule periodic maintenance.** You can use the service tool to set the service interval for each maintained device.
- **View and save logs.** You can download and save log files from the device for analysis to help diagnose and identify reported issues.
- **Create user accounts.** Administrators can create user accounts and set permission levels to control access to the features, allowing one group to perform administrative tasks and another to perform service tasks. Restricting access prevents the service tool from being used to make unauthorized changes on a connected device.
- **Perform calibration check.** You can use the service tool to test the system to ensure that its performance meets calibration specifications. A calibration check is required to meet the periodic maintenance requirements.
- **Perform functional verification and calibration.** The service tool can check any system requiring calibration and, if necessary, calibrate the device to match the design specifications. This feature is not supported for all products and requires the service tool, Gold edition, for each supported product.
- **Recover devices.** In the rare case where a device can no longer boot because of corrupted firmware, the service tool can connect the device to Welch Allyn Technical Support to reinstall the firmware.
- **Extensible.** The device accepts new plug-ins to support future Welch Allyn products.

Some of these features are enabled for any user (Silver edition). Others require special user account privileges or a Welch Allyn service contract (Gold edition). If you require Gold-level support for a Welch Allyn product, contact Welch Allyn Technical Support.



## Controls and indicators

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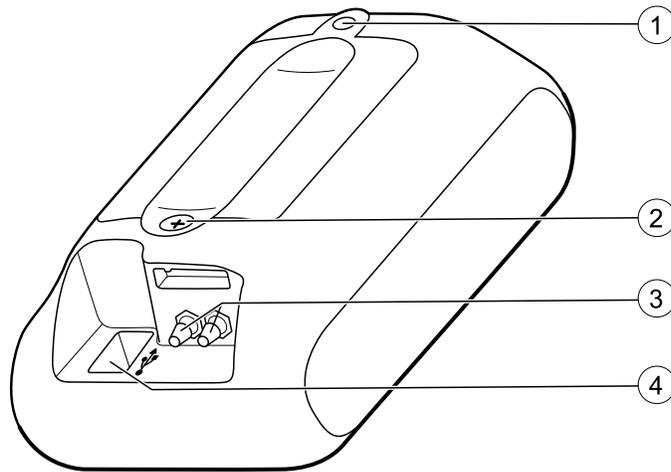


1. **Power on/standby** button: controls power to the device.
2. **Blood Pressure Start/Stop** button: initiates a new blood pressure cycle from the Home screen. Pressing again aborts an active blood pressure measurement. This button returns user to the Home screen from any other screen on the device.
3. **Up navigation** button: highlights the previous option in the Display window or increases numeric values.
4. **Return** button: returns the user to the previous screen.
5. **Right navigation** button: highlights the Settings tab in the Display window or highlights options to the right.
6. **Charging LED**: indicates when device is connected to external power and battery charging state.
7. **Down navigation** button: highlights the next option in the Display window or decreases numeric values.
8. **Select** button: selects list item that has been highlighted.
9. **Left navigation** button: highlights the Review tab in the Display window or highlights options to the left.



# Connections

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1. Mounting connection
2. Battery door screw
3. Blood pressure hose connection port
4. USB/external power cord connection port



# Power-up sequence

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The device performs a power-on self-test (POST) each time it is powered on. During power-up, the device performs a comprehensive self-test of the software. If software testing is successful, the device then tests internal hardware. If all tests are successful, the device completes power-up and the Home screen appears.

To perform the POST:

1. Insert a fully charged battery into the device.
2. Power on the device.
3. Confirm the following:
  - a. The backlight turns on.
  - b. The Welch Allyn startup screen appears, and the product line logo appears at the bottom of the screen.
  - c. The Home screen appears.

If the internal self-test is successful, the device shows its normal functions with all values blank, and the device is ready for operation. If a system error is detected, the device becomes inactive until you press the power button or until the device shuts down automatically. The device displays a system fault message that contains a wrench icon and a system fault code to aid service personnel and engineers in diagnosing the problem.



# Troubleshooting

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This section lists symptoms that you might observe, possible causes, and suggested actions that might eliminate the problem. These tables can help you diagnose and fix a problem. They do not replace basic troubleshooting skills. You must still trace the source of the problem to the board or module level to decide the best course of action. Welch Allyn does not support component-level repair to the board or module. For available replacement parts, see “Field-replaceable units.”

The Welch Allyn Service Tool enables you to access the error log for this device. The error log contains diagnostic information in the form of text string errors. You can find descriptions of the text string errors in the service tool Help files, along with potential corrective actions that do not require device disassembly. If these corrective actions do not solve the problem, reference the observed behavior in the tables below.

**Note** Numeric error codes displayed alongside the text string errors are for engineering evaluation purposes. These codes are not intended for diagnostic use.



**WARNING** Do not perform troubleshooting on a device that is emitting smoke or exhibits other signs of excessive overheating. Disconnect the device from AC power and call Welch Allyn Technical Support immediately.



**Caution** Replace parts, components, or accessories only with parts supplied or approved by Welch Allyn. The use of any other parts can lead to inferior device performance and will void the product warranty.

## Power

Symptom	Possible cause	Suggested action
The device does not power on	The battery is depleted	Plug in the device and allow the battery to fully charge.
	The battery is defective	Replace the battery with a fully charged battery.
	An internal connection is faulty	Verify that the battery contact harness is not damaged, is installed with the correct polarity, and is securely connected to J2 on the main board.
		Verify that the flex cable is securely installed in J5 on the main board.

Symptom	Possible cause	Suggested action
	The key panel is defective	Replace the front housing.
	The main board is defective	Replace the main board.
The battery does not charge or run time is low	The battery is defective	Verify all external connections and allow the battery to charge for 6 hours. If the problem persists, replace the battery.
	An internal connection is faulty	Verify that the battery contact harness is not damaged, is installed with the correct polarity, and is securely connected to J2 on the main board.
	The main board is defective	Replace the main board.

## Display

Symptom	Possible cause	Suggested action
The display is blank or cracked, or the backlight is not on	The display is faulty	Replace the main board.

## Communication

Symptom	Possible cause	Suggested action
A button does not respond correctly	An internal connection is faulty	Verify that the flex cable is securely installed in J5 on the main board.
	The key panel is defective	Replace the front housing.
	The main board is defective	Replace the main board.
Cannot communicate via the USB connection	The device is off	Verify that the device is powered on.
	The USB cable is faulty	Replace the USB cable.
	Incorrect PC configuration	Test the connection by connecting the device to a PC running the service tool. Verify that the service tool is configured properly to communicate with the device. See the service tool help files for more information.
	The main board is defective	Replace the main board.

Symptom	Possible cause	Suggested action
Cannot communicate via the <i>Bluetooth</i> connection	Various causes	See the device directions for use for <i>Bluetooth</i> troubleshooting information before replacing modules within the device.
	The main board is defective	Replace the main board.

## NIBP

Symptom	Possible cause	Suggested action
The cuff does not inflate, the device displays inaccurate or no blood pressure readings, or the device displays persistent NIBP errors	An external connection or accessory is faulty	Verify all external connections.  Replace NIBP tubing and cuff.
	An internal connection is faulty	Verify that the manifold assembly is properly connected to the pump, valves, and transducer.  Verify that the dump valve cable is securely connected to J10 on the main board.  Verify that the pump cable is securely connected to J80 on the blood pressure board.
	There is an air leak in the system, or the air filter is occluded	Replace the manifold assembly.
	The pump is defective	Replace the pump.
	The blood pressure board is defective	Replace the blood pressure board.
	The main board is defective	Replace the main board.
	The cuff deflates too slowly	An occlusion in the system is blocking the valves
The blood pressure board is defective		Replace the blood pressure board.
The main board is defective		Replace the main board.

## System errors

Symptom	Possible cause	Suggested action
#00000001	A system EEPROM error occurred	Cycle the device power.

Symptom	Possible cause	Suggested action
		Replace the main board.
#00000002	A ModF error occurred	Cycle the device power. Verify that J22 on the blood pressure board and J1 on the main board are properly connected. Replace the blood pressure board. Replace the main board.

# Disassembly and repair

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These procedures provide instructions for device disassembly and board removal. Except where otherwise noted, the assembly procedure is the reverse of the disassembly procedure.

An exploded view of the assembly precedes disassembly instructions, with callouts referencing the parts.

Each part's disassembly instructions might include one or both of the following:

- **Reassembly notes:** This contains information specific to reassembly not addressed in the disassembly instructions.
- **When replacing the *component*:** This contains information specific to installing a replacement part.

For information about screws or connectors used in the device, see "Screws" and "Connectors" in the appendices.

**Note** After performing any of these procedures and before returning the device to service, you must use the service tool, Gold edition, to complete the full suite of functional tests to ensure that all systems are operating within the design specifications. For more information about these tests and the service tool, see "Functional verification and calibration."

If you do not have the service tool, contact Welch Allyn Technical Support.



**WARNING** Electrical shock hazard. Disconnect AC power before opening the device. Disconnect and remove the battery before proceeding with disassembly. Failure to do this can cause serious personal injury and damage to the device.



**WARNING** Risk of fire, explosion and burns. Do not short-circuit, crush, incinerate, or disassemble the battery.



**WARNING** Safety risk. Do not attempt to service the device when the device is connected to a patient.



**Caution** Before disassembling the device, disconnect the AC power cord and any attached accessories.



**Caution** Perform all repair procedures at a static-protected station.



**Caution** When the device case is opened, regard all parts as extremely fragile. Execute all procedure steps with care and precision.



**Caution** Always protect the LCD. When the main board is outside of the device case, never rest the board on the LCD.



**Caution** Observe screw torque specifications, especially with screws that secure directly into plastic standoffs.

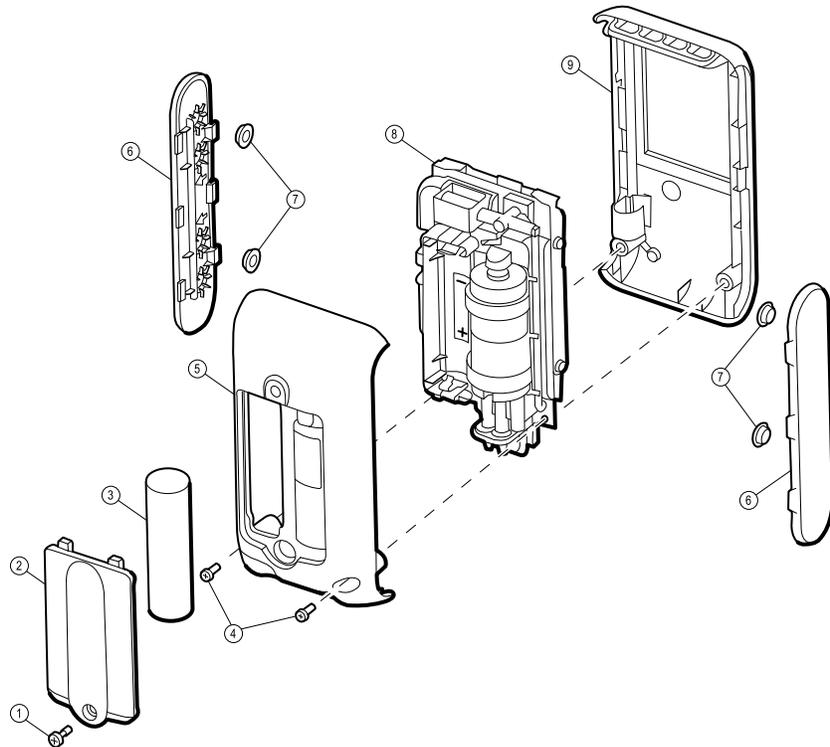


**Caution** To avoid mismatching screws and holes, keep the screws for each piece with that piece as you remove modules and circuit assemblies.

## Required tools and equipment

- #1 Phillips bit
- Torx T10 bit
- Torque driver calibrated for 3.0 in-lb  $\pm$ 0.5 in-lb
- Torque driver calibrated for 4.0 in-lb  $\pm$ 0.5 in-lb
- Torque driver calibrated for 6.0 in-lb  $\pm$ 0.5 in-lb
- Needlenose pliers
- Tweezers
- Spudger/nylon probe

## Disassemble the external housing



No.	Item	No.	Item
1	Screw, M3 x 0.5 shoulder	6	Side panel
2	Battery compartment door	7	Isolation bumper
3	Battery	8	Chassis and circuit board assemblies

No.	Item	No.	Item
4	Screw, M3 x 0.5 pan head	9	Front housing with key panel
5	Rear housing		

## Remove the battery

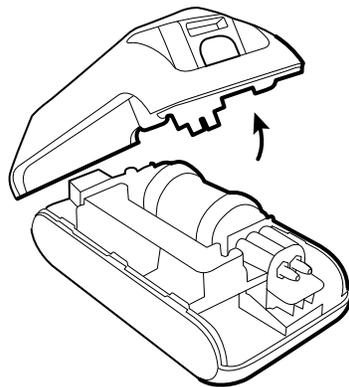
Before you begin, ensure that the device is powered off.

1. Loosen the screw to remove the battery compartment door.
2. Remove the battery.

## Remove the rear housing

Before you begin, remove the battery as described in this manual.

1. Remove the two rear-housing screws.
2. Lift the rear housing on the side closest to the bottom of the device and pivot it toward the top of the device until it comes free of the front housing.



## Reassembly notes

- Start by orienting the rear housing at an angle of approximately 45 degrees from the front housing and then mate the tabs on the rear housing with the slots on the front housing.
- Verify that no wires or hoses are crushed or pinched before securing the rear housing with screws.
- After tightening the screws, examine the seams between the rear housing, side panels, and front housing to verify that there is no bowing. Bowing indicates that something is preventing the mating surfaces from seating properly.

## Remove the front housing and side panels

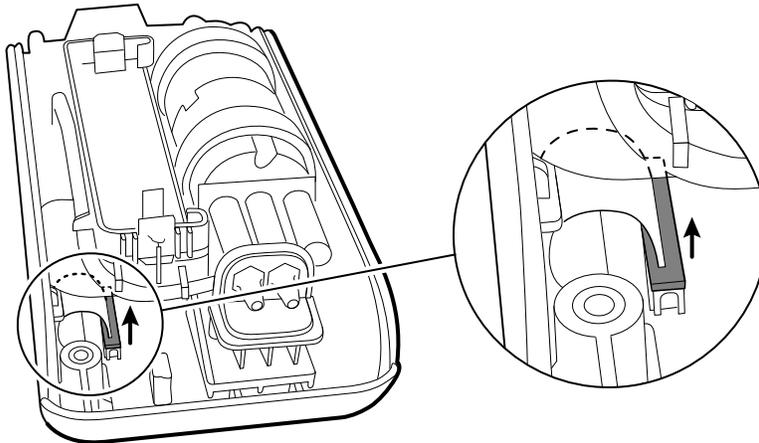
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing

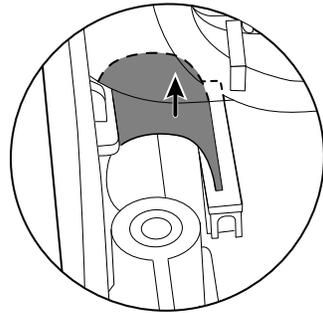
1. Unlock the ZIF connector (J5) on the main board by sliding the latching piece of the connector away from the connector body.



**Caution** Do not use excessive force when releasing pressure on the connector. Excessive force may result in breaking the sliding outer piece.



2. Remove the flex cable from the ZIF connector.



3. Grasp both side panels and lift them and the chassis and circuit board assemblies away from the front housing.
4. While holding the chassis and circuit board assemblies, remove the side panels.



**Caution** Always protect the LCD. When the main board is outside of the device case, never rest the board on the LCD.

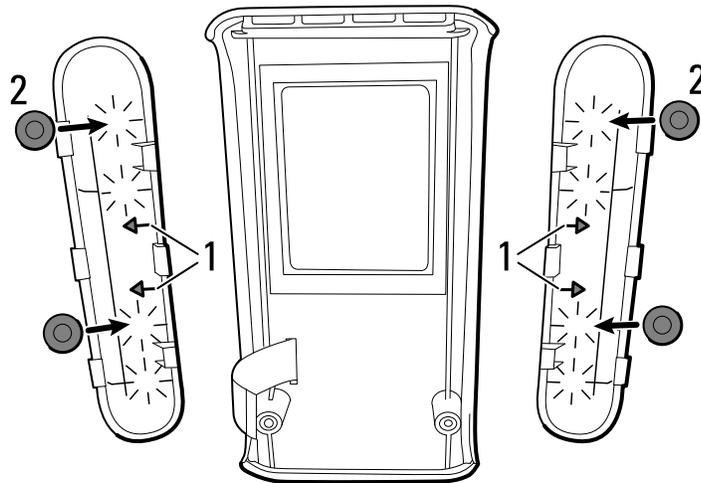
## When replacing the front housing

Remove the liner from the inside of the housing window if present. Wipe any dust or fingerprints off of the window with a clean cloth.

## Reassembly notes

Before reassembly, do the following to ensure proper installation of the side panels and isolation bumpers:

1. Place the front housing and side panels on the antistatic mat as shown in the diagram below, making sure that the arrows on the side panels point away from the front housing.
2. Confirm that the isolation bumpers on the side panels are in the first and third holes from the top, as shown in the diagram below.

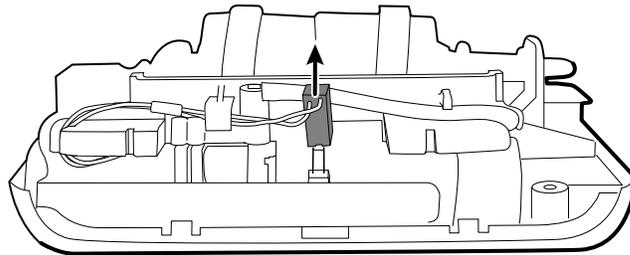


## Separate the chassis assembly from the circuit board assembly

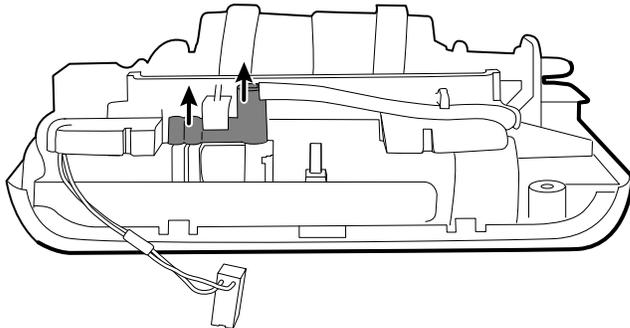
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- Front housing and side panels

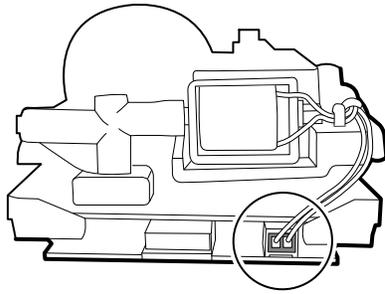
1. Disconnect the pump power connector from J80 on the blood pressure board.



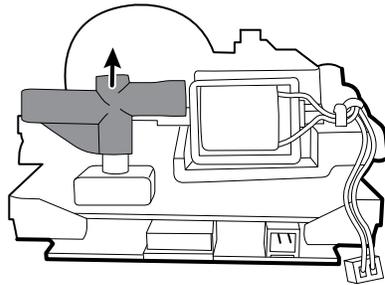
2. Disconnect the step valve manifold from the step valve on the blood pressure board.



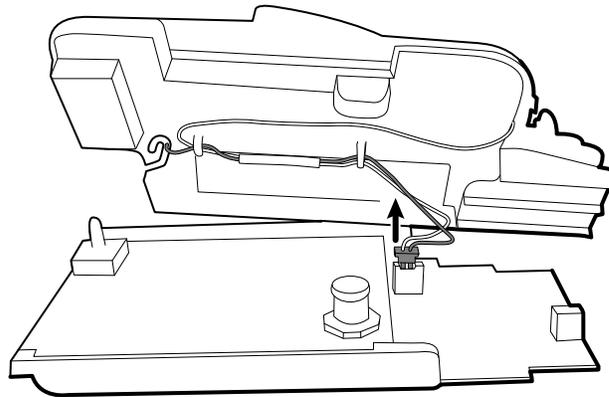
3. Disconnect the dump valve cable from J10 on the main board.



4. Disconnect the dump valve manifold from the pressure transducer on the blood pressure board.



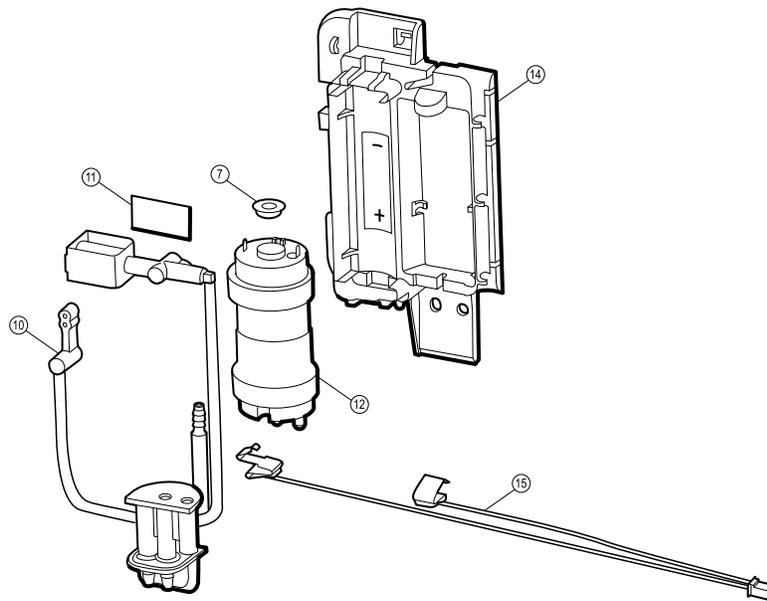
5. Lift the chassis assembly away from the circuit board assembly, and disconnect the battery contact harness from J2 on the main board.



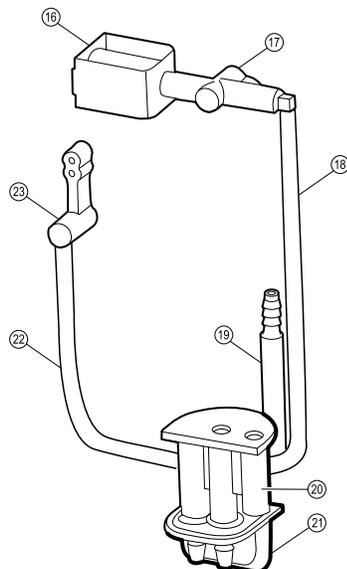
## Reassembly notes

See the "Reassembly" section for the recommended procedure to reassemble the device after the chassis and circuit board assemblies have been separated.

# Disassemble the chassis assembly



No.	Item	No.	Item
10	Manifold assembly	7	Isolation bumper
11	Adhesive pad, dump valve	14	Inner chassis
12	Pump	15	Battery contact harness



No.	Item	No.	Item
16	Dump valve	20	Pump manifold

No.	Item	No.	Item
17	Dump valve manifold	21	Blood pressure port
18	Dump valve hose	22	Step valve hose
19	Air filter	23	Step valve manifold

## Remove the blood pressure port

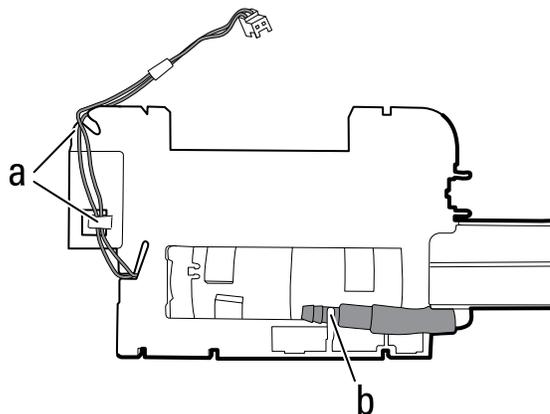
Before you begin, remove the following as described in this manual:

- Battery
  - Rear housing
1. Lift the blood pressure port to disconnect it from the inner chassis.
  2. Disconnect the blood pressure port from the pump manifold.

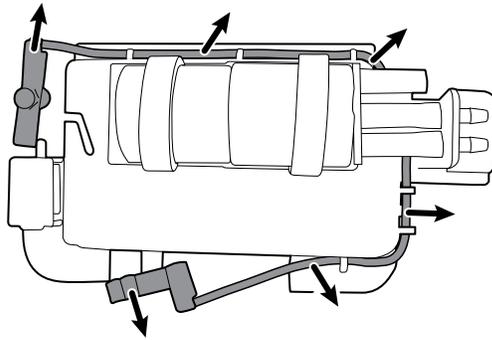
## Remove the pump and manifold assembly

Before you begin, remove the following as described in this manual:

- Battery
  - Rear housing
  - Front housing and side panels
  - Circuit board assembly
1. On the underside of the inner chassis, do the following:
    - a. Remove the pump cable from the routing slot and wire clip.
    - b. Remove the air filter from the retaining clip.



2. Disconnect the dump valve manifold from the dump valve.
3. Remove the step valve and dump valve hoses from the hose clips on the inner chassis.



4. Lift the pump and manifold assembly free of the inner chassis.
5. If you are replacing the pump or manifold assembly, disconnect the pump from the manifold assembly.
6. If you are replacing the manifold assembly or inner chassis, remove the dump valve cable from the wire clip on the inner chassis and detach the dump valve from the inner chassis.

**Note** Removal of the dump valve from the inner chassis is not recommended unless one of these parts is being replaced.

### When replacing the manifold assembly or inner chassis

- After removing the dump valve from the inner chassis, ensure that the adhesive pad is fully removed and that no adhesive residue remains on any items that will be installed in the device.
- Use a new adhesive pad to install the dump valve onto the inner chassis.

### Remove the battery contact harness

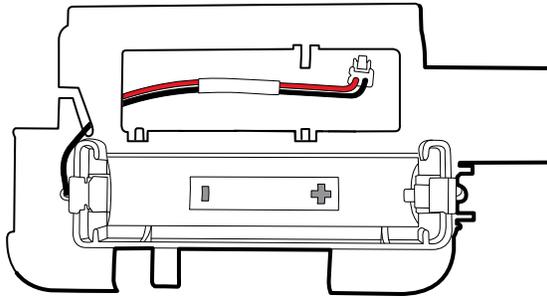
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- Front housing and side panels
- Circuit board assembly
- Pump and manifold assembly

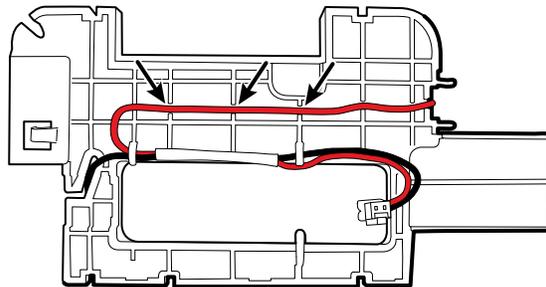
1. Remove the battery contact harness from the wire clips on the underside of the inner chassis.
2. Flex each battery contact away from the inner chassis wall, and slide the battery contact off of the inner chassis.

### Reassembly notes

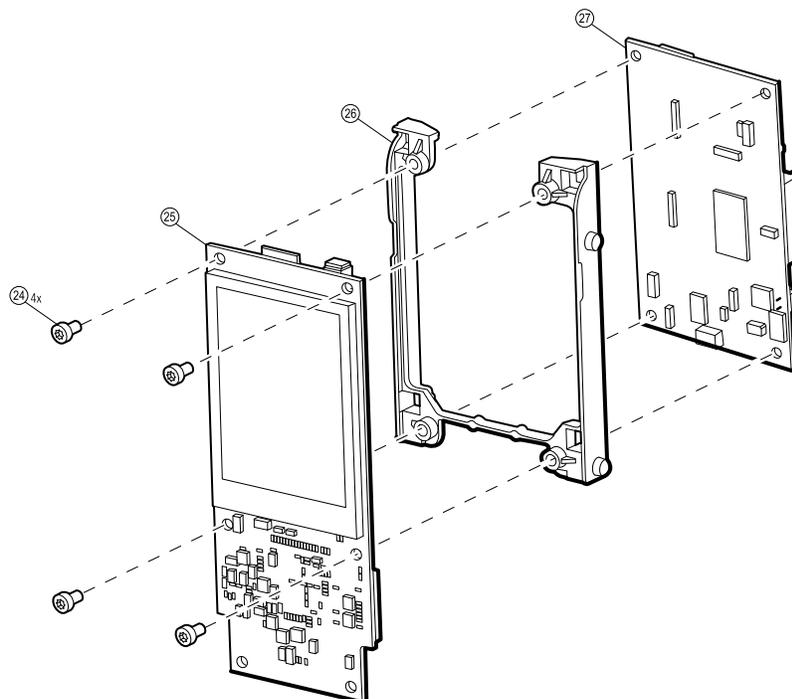
- Ensure that the polarity of the battery contact matches the symbol on the inner chassis. (The contact on the black wire is negative; the other contact is positive.)
- Slide the black wire into the routing slot.



- On the underside of the inner chassis, route the wires as shown in the diagram below.
  - Insert the black wire into the wire clips.
  - Place the red wire in the notches.



## Disassemble the circuit board assembly



**No. Item**

24 Screw, #4 x 0.25 Plastite

**No. Item**

26 PCBA mount

No.	Item	No.	Item
25	Main board	27	Blood pressure board

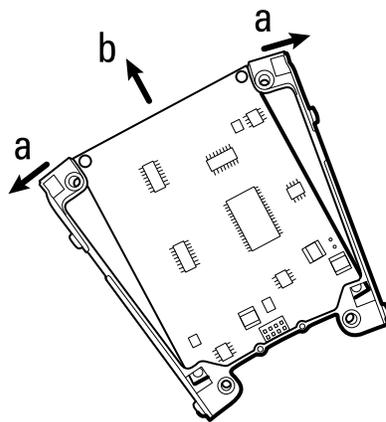
Before you begin, remove the following as described in this manual:

- Battery
  - Rear housing
  - Front housing and side panels
  - Chassis assembly
1. Using the Torx T10 bit, remove the four screws from the main board.
  2. Keeping the main board and the blood pressure board parallel to each other, carefully pull them apart.



**Caution** The boards are connected by an 8-pin connector. Twisting the boards or pulling them apart at an angle might damage these pins.

3. Flex the PCBA mount to free two corners of the blood pressure board and slide the board clear of the PCBA mount.



## Reassembly notes

- Ensure that the blood pressure board is oriented correctly in the PCBA mount.
- Ensure that all pins of the 8-pin connector on the main board, J1, are aligned with J22 on the blood pressure board before connecting the boards.

## When replacing the main board

- After reassembling the device, enter the device serial number in the service tool. The serial number can be found on the bottom of the device.
- Any licensed features must be restored. Call Welch Allyn Technical Support to replace the license files.



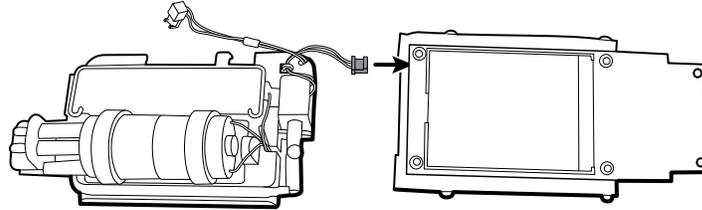
# Reassembly

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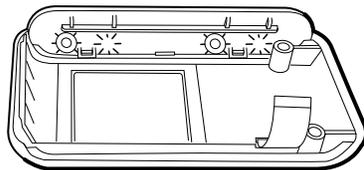
Device reassembly can be performed by reversing the disassembly instructions. However, the following alternate procedure simplifies device reassembly after the chassis assembly and circuit board assembly have been separated.

Before you begin this procedure:

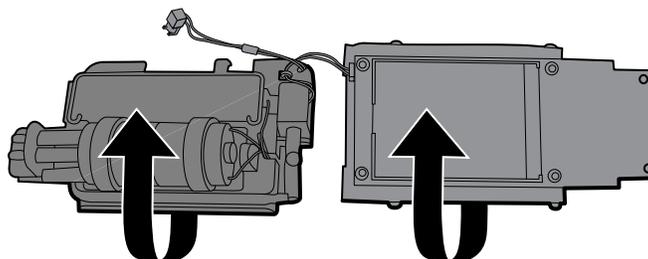
- Reassemble the chassis assembly and reassemble the circuit board assembly by reversing the disassembly instructions. Keep the assemblies separated.
  - Ensure that the isolation bumpers are installed on the side panels as described in “When replacing the side panels or isolation bumpers.”
1. Orient the chassis and circuit board assemblies as shown below, and connect the dump valve cable to J10 on the main board.



2. Place the front housing face down on the antistatic mat, and insert one side panel.

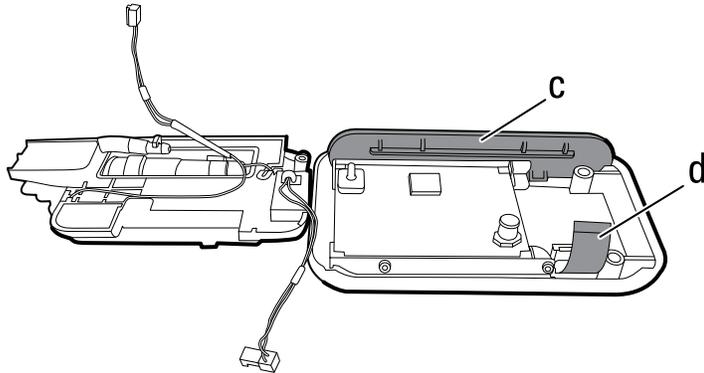


3. Place the circuit board assembly into the front housing.
  - a. Turn over the chassis and circuit board assemblies.

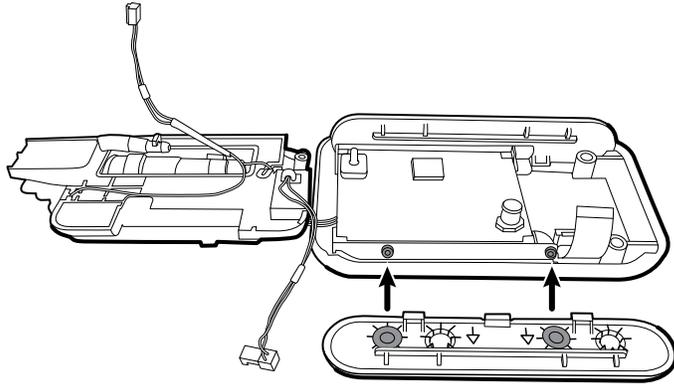


- b. Lower the circuit board assembly into the front housing.

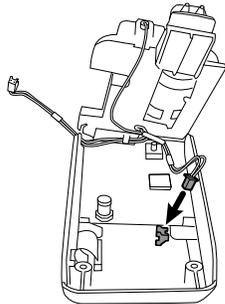
- c. Align the pegs on the PCBA mount with the isolation bumpers on the side panel.
- d. Ensure that the flex cable is not under the circuit board assembly.



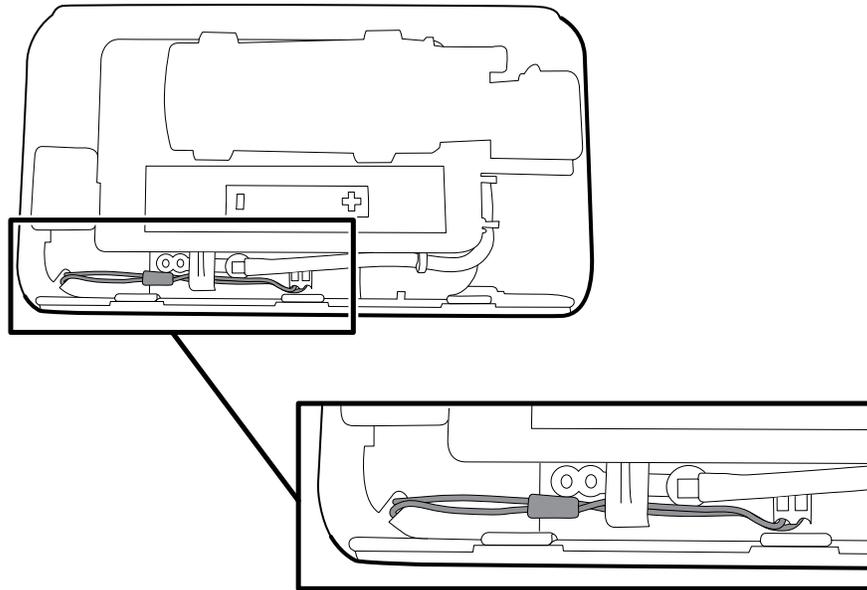
4. Insert the second side panel into the front housing, aligning the isolation bumpers with the PCBA mount pegs.



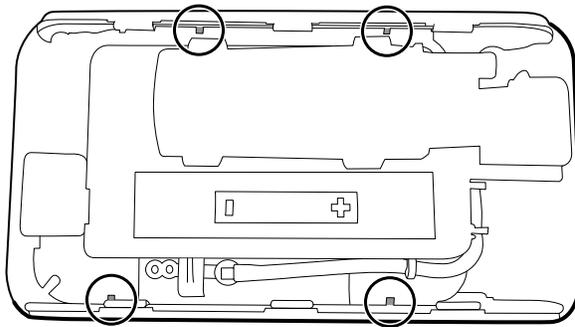
5. Insert the flex cable into the ZIF connector (J5) on the main board and lock the connector.
6. Pivot the chassis assembly over the circuit board assembly, and connect the battery contact harness to J2 on the main board.



7. Connect the step valve manifold to the step valve on the blood pressure board.
8. Connect the pump cable to J80 on the blood pressure board. Ensure that the cable is routed as shown below.



9. Align the inner chassis notches with the side panel guides, and align the dump valve manifold with the pressure transducer on the blood pressure board.



10. Push the dump valve manifold onto the pressure transducer until fully seated.
11. Install the rear housing, battery, and battery compartment door by reversing the applicable disassembly instructions.



## Functional verification tests

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The functional verification tests help to confirm the proper operation of the device and its options. You do not need to disassemble the device to perform these tests.

The tests can also be used as a diagnostic tool to help isolate a malfunction.

### About the Welch Allyn Service Tool

The service tool is required to complete functional verification and calibration tests.

The Silver-level service tool enables a calibration check to satisfy the recommended annual service. To perform the calibration check, execute each of the Silver-level tests indicated in the table below. A Service Record form is provided at the end of this chapter for documentation of the calibration check results. If any of the Silver-level testing shows an out-of-specification result, use the Gold-level service tool to perform a full calibration.

The Gold-level service tool checks the functionality and calibration of the device. As it checks the device, the Gold tool also performs any needed calibration to bring the device within specifications. This full suite of tests is required to complete a repair. Each time you open the case, you must use the Gold tool to test the device before returning the device to normal use.

For information about the service tool, see the following:

- For instructions on installing and using the service tool, see *Welch Allyn Service Tool Installation and Configuration Guide*.
- For instructions on performing these tests, see the service tool's help files installed with the Welch Allyn Service Tool CD.

### Tests performed by the service tool

The service tool tests the following device functionality:

Test	Silver	Gold
POST		✓
LCD		✓
Backlight		✓
LED		✓

Test	Silver	Gold
Voltage		✓
Leak test	✓	✓
Calibration		✓
Accuracy	✓	✓
A/D noise		✓
Pump inflation		✓
Dump		✓
Valve control		✓
Inflation linearity		✓
Overpressure	✓	✓
Valve/pump current		✓
Residual pressure		✓
<i>Bluetooth</i>		

## Required equipment

Material no.	Description	Silver	Gold	Qty
407691	Service test box		✓	1
407672	BP test volume repair fixture 113670	✓	✓	1
407841	Adapter, Y tube, PTSS	✓	✓	1
4500-30	Blood pressure hose, 5 ft		✓	1
3400-925	USB cable, 2.4 m (8 ft)	✓	✓	1
200-2000IN	Pressure meter, NETECH	✓	✓	1
103521	Welch Allyn Service Tool CD	✓	✓	1

# Test *Bluetooth* radio functionality

Use this procedure to verify *Bluetooth* radio functionality on devices with the *Bluetooth* feature enabled. The procedure tests whether the device can be detected by a *Bluetooth* technology-enabled computer.

## Required equipment

- Computer with *Bluetooth* technology enabled and the Welch Allyn Service Tool installed
- Device to be tested
- USB 2.0/5-pin Mini-B cable

## Before you begin

If the device and the computer are already paired, unpair them using the *Bluetooth* software on the computer. Consult the instructions provided by the software manufacturer.

## To verify *Bluetooth* radio functionality

1. Use the service tool to acquire the serial number of the device.
  - a. Start the service tool on the computer.
  - b. If the Welch Allyn screen appears, click **Service**.
  - c. If prompted, log on.

The Device list page appears.
  - d. If any device tabs are open, close them.
  - e. Use the USB cable to connect the device to the computer.
  - f. If the device is not already on, power it up.

The device name and serial number appear on the Device list page.
  - g. Keep the service tool open so that you can access the serial number later in this procedure.
2. Place the device into Pairing mode.
  - a. On the device, navigate to **Settings > Bluetooth radio**.
  - b. Confirm that **Enable** is selected.
  - c. Select **Pair**.

The device indicates that it is in Pairing mode by displaying the message, "Pairing."
3. Verify that the computer detects the device.
  - a. Use the *Bluetooth* software on the computer to search for discoverable *Bluetooth* devices. Consult the instructions provided by the software manufacturer.

The software detects the device and displays the device serial number.
  - b. Verify that the serial number displayed by the *Bluetooth* software matches the serial number displayed on the Device list page of the service tool.

If the *Bluetooth* software detects the device, the radio is functioning properly. Completion of the pairing process is not required for this test.

## Service record

<b>Date:</b>	<b>Time:</b>
<b>Device name:</b>	<b>Serial number:</b>
<b>Technician:</b>	<b>MODF firmware version:</b>
<b>Host Controller version:</b>	

## Leak test

	<b>Specification</b>	<b>Actual reading</b>
LeakTest:	Max: 5	

## Overpressure test

	<b>Specification</b>	<b>Actual reading</b>
OverPressureTest:	280 . . . 329	

## Accuracy test

<b>Target pressure ±5 mmHg</b>	<b>Pressure meter</b>	<b>Service tool</b>	<b>Specification</b>	<b>Pass/fail</b>
0 mmHg	mmHg	mmHg	±3 mmHg	
50 mmHg	mmHg	mmHg	±3 mmHg	
150 mmHg	mmHg	mmHg	±3 mmHg	
250 mmHg	mmHg	mmHg	±3 mmHg	

## Upgrades and licenses

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Welch Allyn supports software and license upgrades for this device.

Software upgrades, when available, may be purchased or provided at no charge to customers covered by a Welch Allyn Service Agreement. The upgrades can be installed by either a Welch Allyn service center or by the customer using the service tool, Silver or Gold edition. Customers choosing to install software upgrades on their own will receive the software via the internet. When ordering software, provide the serial number of the device you wish to install the software on.

Licenses are available for purchase to enable additional software features. Customers who want to install licenses themselves must have the service tool, Silver or Gold edition, installed on a PC with internet access. Customers who have purchased a license receive an authorization code to enter in the service tool. The code authorizes the service tool to download the license file from the Welch Allyn server. The service tool then installs the license on the connected device, enabling the new feature. A more detailed description of the license process can be found in the service tool help files.

**Note** When a license authorization code is used to activate the license, the authorization code is married to the device serial number. Save the license authorization code with the serial number for future use. If the main board is replaced, you will need the authorization code to reactivate the license.

## Available upgrades and licenses

The following upgrades and licenses can be added to each model's base configuration.

### Supported software upgrades

Software updates and upgrades are supported for the Host Controller and ModF (Blood Pressure) module. New software upgrades are announced on the product page of the Welch Allyn website as they become available.

### Licensed features

<b>Model</b>	<b><i>Bluetooth</i></b>	<b>SureBP</b>
34XX		
34BX		

<b>Model</b>	<b><i>Bluetooth</i></b>	<b>SureBP</b>
34XF	<input type="checkbox"/>	<input checked="" type="checkbox"/>
34BF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

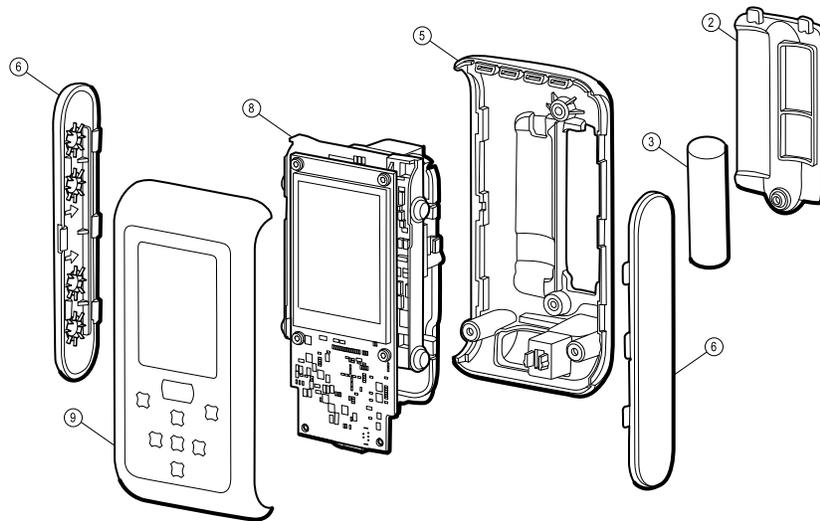
Not available for this model.     Available for this model.     Included with this model.

## Field-replaceable units

This listing includes only field-replaceable service parts. Product accessories are listed separately in the directions for use.

Service kits are shown with the contents listed underneath each kit.

### External housing



#### Service kit, front housing (material number 104097)

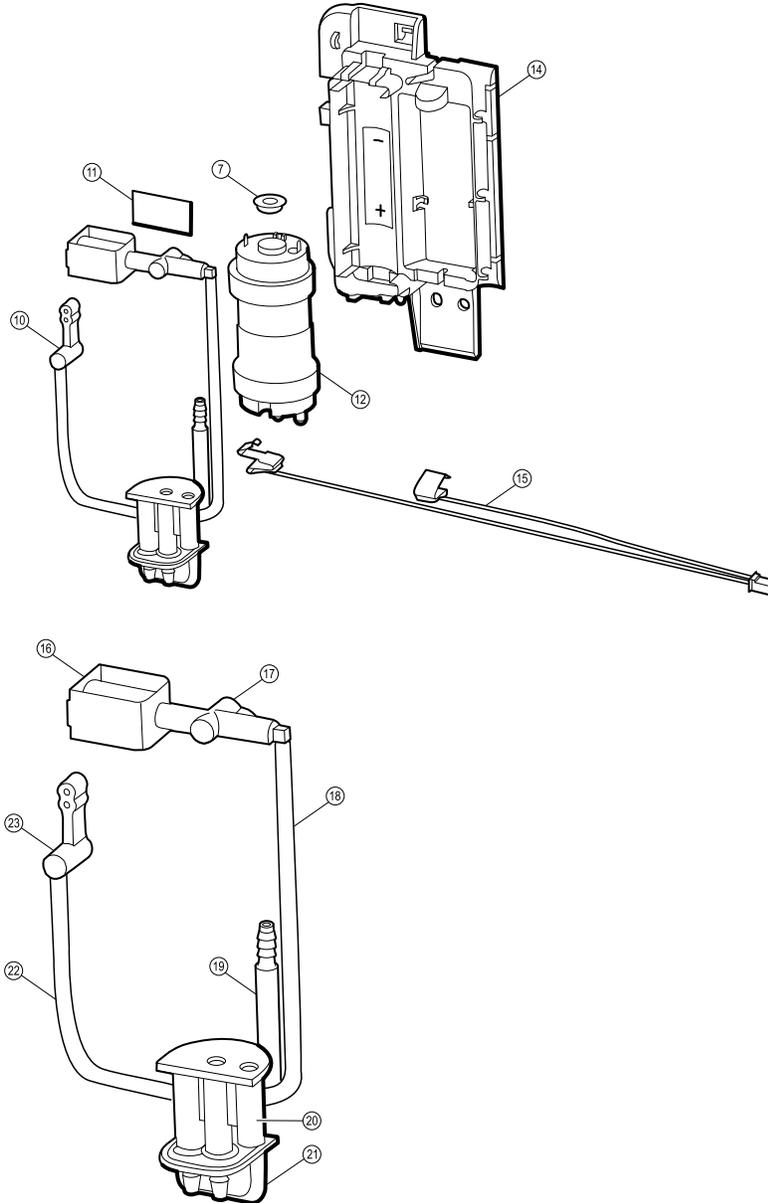
No.	Item	Qty
9	Front housing	1
9	Key panel	1

#### Individual parts

No.	Material no.	Item	Qty
6	104098	Service kit, side panels	2

No.	Material no.	Item	Qty
3	BATT11	Lithium-ion battery, 1 cell	1
2	3400-100	Battery door with screw	1

## Chassis and manifold assemblies



## Service kit, inner chassis (material number 104099)

No.	Item	Qty
14	Inner chassis	1
11	Adhesive pad, dump valve	1

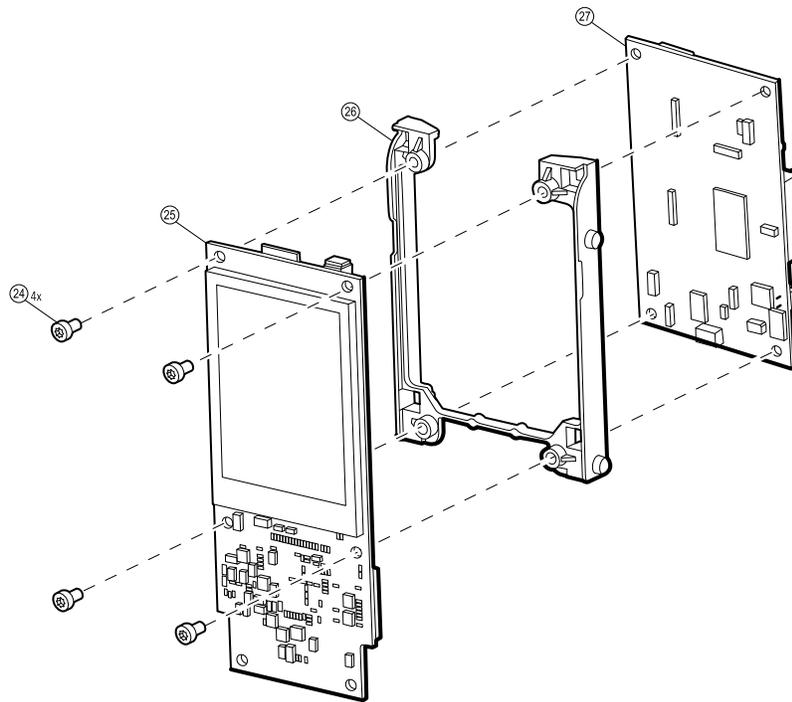
## Service kit, manifold assembly (material number 104120)

No.	Item	Qty
20	Pump manifold	1
16	Dump valve	1
17	Dump valve manifold	1
23	Step valve manifold	1
21	Blood pressure port	1
19	Air filter	1
Not shown	1/8" elbow fitting	1
Not shown	L fitting	4
22	1/8" tubing	1
Not shown	1/16" tubing, short	1
18	1/16" tubing, long	1
11	Adhesive pad, dump valve	1

## Individual parts

No.	Material no.	Item	Qty
12	104121	Service kit, pump	1
15	104122	Service kit, battery contact assembly	1
21	104123	Service kit, blood pressure port	1

## Circuit board assembly



### Service kit, NCE PCBA (material number 104124)

**Note** Requires the service tool, Gold edition, to program.

No.	Item	Qty
25	Main board	1

### Service kit, ModF PCBA (material number 104125)

No.	Item	Qty
27	Blood pressure board	1

### Individual parts

No.	Material no.	Item	Qty
26	104126	PCBA mount	1

## Miscellaneous parts

### Service kit, fasteners (material number 104127)

No.	Item	Qty
4	Screw, M3 x 0.5 pan head	20
24	Screw, #4 x 0.25 Plastite	20
13	Isolation bumper	20

## Service tool

Material no.	Item	Qty
103521	Welch Allyn Service Tool CD	1
103820	Welch Allyn Service Tool Installation guide	1
103991	Welch Allyn Service Tool Gold license key (ProBP)	1

## Licenses

Material no.	Item
3400-BT	<i>Bluetooth</i> activation code
3400-SUREBP	SureBP activation code

## Partners in Care service and support agreements

Material no.	Item	Material no.	Item
S1-3400	Comprehensive Partnership Program, 1 year	S1-3400-2	Comprehensive Partnership Program, 2 years
S2-3400	Biomed Partnership Program, 1 year	S2-3400-2	Biomed Partnership Program, 2 years
S3-3400	Investment Protection Partnership Program, 1 year	S3-3400-2	Investment Protection Partnership Program, 2 years
S4-3400	Warranty Extension, 1 year	S4-3400-2	Warranty Extension, 2 years

## Service and repair training

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Material no.	Item
PROBP3400REPW-TRN	Repair web training

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# Appendices

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## Clean the device



**WARNING** Electric shock hazard. Before cleaning the device, disconnect the power cord from the power source and the device.



**WARNING** Take care to prevent water or other fluid from entering any connectors on the device. Should this occur, dry the connectors with warm air. Check the accuracy of all operating functions.



**Caution** The device is not heat-resistant. Do not autoclave.

The following agents are compatible with the device:

- CaviWipes™
- Sani-Cloth®Plus
- 70 percent isopropyl alcohol
- 10 percent chlorine bleach/90 percent water solution

**Note** Clean the device on a routine basis, according to your facility's protocols and standards or local regulations.

## CaviWipes or Sani-Cloth Plus

Follow the cleaning agent manufacturer's guidelines.

1. Using CaviWipes or Sani-Cloth Plus, wipe the surface of the device to remove all debris.
2. Allow the device surface to dry for a minimum of 10 minutes before using the device.

## 70 percent isopropyl alcohol

Wipe the device with a clean cloth slightly dampened with 70 percent isopropyl alcohol.

## 10 percent chlorine bleach/90 percent water solution

1. Wipe the device with a clean cloth slightly dampened with a 10 percent bleach and 90 percent water solution.
2. Rinse with a clean cloth slightly dampened with clean water.
3. Allow the device surface to dry for a minimum of 10 minutes before using the device.

## Clean the accessories

Wipe the NIBP hose and any reusable cuffs with a damp cloth moistened in a mild detergent solution.

The same cleaning agents used to clean the device can be used on the stand and mounting accessories.

**Note** Clean the device on a routine basis, according to your facility's protocols and standards or local regulations.

## Factory defaults

Setting	Default value
<i>Bluetooth</i>	Enable
Unit of measure	mmHg
Pressure presets	160 mmHg
Data management	Auto overwrite
MAP	On
Language	English

## Disassembly and repair reference

### Screws

The following table lists torque specifications for all screws.

Qty	Location	Type	Size/length	Torque	Bit type
1	Battery door	Shoulder screw	M3 x 0.5	3.0 in-lb ±0.5 in-lb	#1 Phillips
2	Rear housing	Pan head machine screw	M3 x 0.5	6.0 in-lb ±0.5 in-lb	#1 Phillips
4	PCBA mount	Plastite	#4 x 0.25	4.0 in-lb ±0.5 in-lb	Torx T10

# Connectors

## Connector types

Disassembly and repair procedures require that you disconnect and reconnect the following connector types:

- **Locking (squeeze-release):** Locking connectors use a latching mechanism to prevent accidental disconnection during assembly and use. The latch is located on one end of a tab so it may flex and lock into place when coupled with its matching connector. The tab provides a lever to release the latch. When disconnecting, squeeze to provide pressure on the tab to unlatch. Some connectors have multiple latches that require you to press multiple tabs to release.

To remove a locking connector, squeeze the release lever and remove the cable.

To connect a locking connector, push the mating pieces together until the latch locks in place.

- **Pressure:** Pressure connectors use friction to prevent accidental disconnects. To remove a pressure connector, grasp each connector mating half and pull the halves apart.



**Caution** Do not use excessive force to disconnect the connector. Excessive force may result in pulling the mounted connector off the circuit board.

To connect a pressure connector, grasp each connector mating half and insert one half into the other.

- **ZIF (zero insertion force):** ZIF connectors use a sliding outer piece that latches and unlatches to secure and release the flex cable. ZIF cables cannot be successfully connected or disconnected without properly unlatching and latching the sliding outer piece.



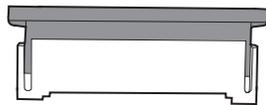
**Caution** Do not use excessive force when releasing pressure on the connector. Excessive force may result in breaking the sliding outer piece.

### To remove a ZIF connector



**Caution** Remove a flex cable only *after* the ZIF latch is open.

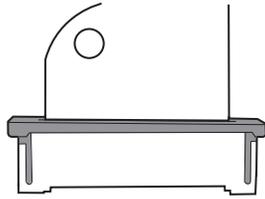
1. Using a suitable tool (for example, a spudger or needle-nose pliers), slide the latching piece of the connector away from the connector body.



2. Remove the cable.

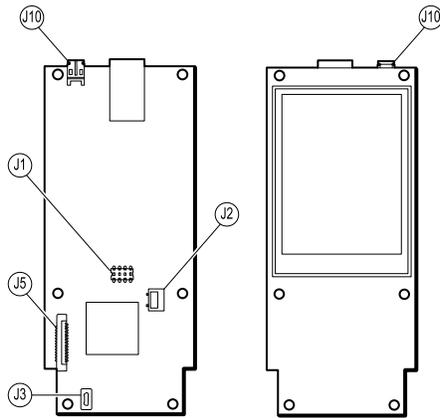
### To connect a ZIF connector

1. Slide the latching piece of the connector away from the connector body.
2. Insert the flex cable into the connector. This may require using a suitable tool to keep the latching piece elevated.
3. Slide the latching piece toward the connector body until it locks into place.



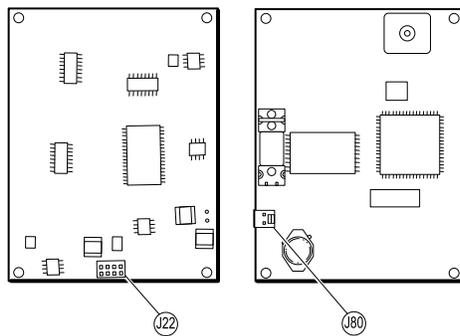
## Connector diagrams

### Main board connectors



ID	Connects with	Type
J1	J22 on the blood pressure (ModF) board	Pressure
J2	Battery	Locking
J3	External USB	USB
J5	Keypad	ZIF
J10	Dump valve	Pressure

### Blood pressure board connectors



<b>ID</b>	<b>Connects with</b>	<b>Type</b>
J22	J1 on the main (NCE) board	Pressure
J80	Pump	Pressure

