Hillrom™

Welch Allyn Connex® Vital Signs Monitor 6000 Series™

Service manual

Software versions 2.0X – 2.4X

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Symbols

For information on the origin of these symbols, see the Welch Allyn symbols glossary: https://www.hillrom.com/content/dam/hillrom-aem/us/en/sap-documents/LIT/80022/80022945LITPDF.pdf.

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.
	WARNING Hot surface. Do not touch.
	Follow the operating instructions for use (IFU) — mandatory action. A copy of the IFU is available on this website. A printed copy of the IFU can be ordered from Hillrom for delivery within 7 days.

Power symbols

	Power on/Display power-saving [recent models]		Equipotential terminal
	Power on/Display power-saving [older models]		

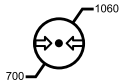
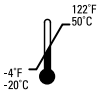
	(on the display) monitor is plugged into Alternating Current power		Battery absent or faulty
	(on the monitor, green indicator) Alternating Current power present, battery fully charged		Battery charge level
	(on the monitor, amber indicator) Alternating Current power present, battery is charging		Battery cover
	Alternating Current (AC)		Rechargeable battery
	Li-ion battery		AC input power

Connectivity symbols

	USB		Ethernet RJ-45
	Wireless signal strength • Best (4 bars) • Good (3 bars) • Fair (2 bars) • Weak (1 bar) • No signal (no bars) • No connection (blank)		Nurse call [recent models]
			Nurse call [older models]
	Connected to central station		Disconnected from central station

Miscellaneous symbols

	CO2 sampling input		CO2 sampling output/exhaust
	Manufacturer		Limited rotation/Turn completely to right

	Reorder number		Serial number
	Do not reuse		China RoHS markings for control of pollution caused by electronic information products. XX indicates Environmentally Friendly Use Period in years.
	Nonionizing electromagnetic radiation		Recycle the product separate from other disposables
	Restrictions for use of wireless device in Europe. European Community's Class 2 radio equipment.		Call for maintenance
	Defibrillation-proof Type BF applied parts		Defibrillation-proof Type CF applied parts
	Atmospheric pressure limitation		Not for injection
	Transport and storage temperature range	EC REP	Authorized Representative of the European Community
	Recycle	**IPX2** (Vital Signs Monitor)	IP = International Protection Marking X = No object ingress rating 2 = Protected against vertically falling water drops when enclosure tilted up to 15°
		IPX0 (Integrated Wall System)	Degree of protection provided by the enclosure with respect to harmful ingress of liquids
	Do not expose to open flame	#	Product Identifier
	Stacking limit by number		Keep dry

Mobile stand symbols

	Maximum safe working load limits (specific values presented with symbol)		Mass in kilograms (kg)

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.

Safety

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

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 Safety risk. Make frequent electrical and visual checks on cables, sensors, and electrode wires. All cables, sensors, and electrode wires must be inspected and properly maintained and in proper working order to allow the equipment to function properly and to protect patients.

WARNING Safety risk. Place the system and accessories in locations where they cannot harm the patient should they fall from a shelf or mount.

WARNING Fire and explosion hazard. Do not operate the system 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 Inaccurate measurement risk. Dust and particle ingress can affect the accuracy of blood pressure measurements. Use the system in clean environments to ensure measurement accuracy. If you notice dust or lint build-up on the system's vent openings, have the system inspected and cleaned by a qualified service technician.

WARNING Defective batteries can damage the device. If the battery shows any signs of damage or cracking, replace it immediately, and only with a battery approved by Welch Allyn.

CAUTION Before disassembling the device or installing options, disconnect the patient from the system, power down the device, and disconnect the AC power and any attached accessories (for example, SpO2 sensors, blood pressure hoses and cuffs, and temperature probes) from the device.

CAUTION To ensure that the system meets its performance specifications, store and use the system in an environment that maintains the specified temperature and humidity ranges.

CAUTION The system may not function properly if dropped or damaged. Protect it from severe impact and shock. Do not use the system if you notice any signs of damage.

CAUTION Do not connect more than one patient to a system or connect more than one system to a patient.

CAUTION Do not operate the system in the presence of magnetic resonance imaging (MRI) or hyperbaric chambers.

CAUTION Do not autoclave the system. Autoclave accessories only if the manufacturer's instructions clearly approve it.

CAUTION Do not exceed the maximum weight limits for your mobile stand with basket or bins. See the "Specifications" section of the device's *Instructions for use* for the basket/bin and mobile stand maximum weight limits.

General safety considerations

- If the monitor 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. (See the accessories list in the user documentation or https://parts.hillrom.com/hillromUS/en/.) Always use accessories according to your facility's standards and according to the manufacturer's recommendations and instructions. Always follow the manufacturer's instructions for use.
- Welch Allyn recommends that only Welch Allyn service personnel or an authorized repair center perform warranty service. Performing unauthorized service on a device that is within warranty may void the warranty.

Electrostatic discharge (ESD)

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

CAUTION Assume that all electrical and electronic components of the monitor 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 monitor 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

Purpose and scope

This manual is a reference for periodic preventive maintenance and corrective service procedures for the Welch Allyn Connex Vital Signs Monitor 6000 Series, firmware versions 2.0X–2.4X. It is intended for use only by trained and qualified service personnel.

This manual is a reference for periodic preventive maintenance and corrective service procedures for the Welch Allyn Connex Integrated Wall System, firmware version 2.3X-2.4X. 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 cause serious personal injury.

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

This manual applies only to this device. For servicing of any other device, see the service manual for the specific device.

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.

Related documents

When using this manual, refer to the following:

- *Welch Allyn Connex® Devices Instructions for use, Software version 2.4X*
- Welch Allyn Service Tool
  https://www.hillrom.com/en/services/welch-allyn-service-tool/
- *Welch Allyn Service Tool Installation and configuration guide*
  https://www.hillrom.com/en/services/welch-allyn-service-tool/
- *Welch Allyn Braun ThermoScan® PRO 6000 Ear Thermometer, Service manual*
  click here to download the PDF
- *Welch Allyn 9600 Plus Calibration Tester Directions for use* click here to download the PDF

- Hillrom website: hillrom.com

Technical support services

Welch Allyn offers the following technical support services:

- Telephone support
- Loaner equipment
- Service agreements
- Service training
- Replacement service parts
- Product service

For information on any of these services, contact Hillrom Technical Support: hillrom.com/en-us/about-us/locations/.

Service loaners

For warranty or non-warranty repairs not covered under a support agreement, loaners are available for a nominal charge, subject to availability. Payment is required prior to shipment for all loaners not covered under a support agreement.

Welch Allyn Service Centers that provide repair service for this product can, on request, loan a device for use while the device is being repaired. Loaned devices are provided free of charge for products repaired while under a support agreement that includes a free loaner provision.

Loaner equipment for the individual component modules is not available.

Service options

SmartCare™ services for maintenance and repair

While product warranties provide basic assurance of Welch Allyn hardware quality, they may not include the full range of services and support you need. Welch Allyn offers premium service and support through our SmartCare program. Whether you service your own devices and require a minimum of support or rely on us to service your device, Welch Allyn provides a program that will meet your needs. A list of available service and support agreements is presented in the "Field replaceable units" section of this manual.

For more information, call your sales representative or visit our website:

https://www.hillrom.com/en/services/.

SmartCare Remote Management

SmartCare Remote Management is a secure cloud-based portal that offers biomeds access to manage their Hillrom connected devices remotely in a centralized portal.

For more Information and a complete list of compatibility information, refer to the SmartCare Remote Management Instructions for use.

Warranty service

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

http://www.welchallyn.com/en/service-support/submit-a-repair.html.

CAUTION Unauthorized repairs will void the product warranty.

Non-warranty service

Welch Allyn product service and authorized service centers support non-warranty repairs. Contact any Welch Allyn regional service center 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 is available from Welch Allyn for biomedical/clinical engineers. Follow this link for more information.

Repairs

A Welch Allyn Service Center must perform all repairs on products under warranty, unless you have purchased a Welch Allyn Partners in Care Biomed 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, potentially avoiding an unnecessary return.

To expedite response to your issue, be prepared to provide details on how (steps executed) and when (time and date) the problem occurred. Also, log and configuration files captured on the device can assist with diagnosis and troubleshooting. You can easily save these files from the device to a flash drive using controls on the Service tab. See the "Service menu" section of this manual for details.

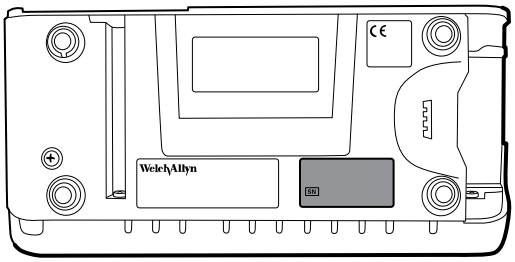
If your product requires warranty, extended warranty, or non-warranty repair service, a Welch Allyn Technical Support representative will record all necessary information to issue an RMA number. The support representative will provide you with the address of the Welch Allyn Service Center to send your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

Technical support is available during local business hours.

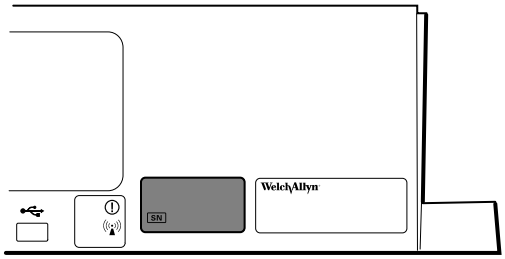
Returning products

When returning a product to Welch Allyn for service, ensure that you have the following information:

- Product name, model number, and serial number. This information may be found on the product and serial number labels 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.
- A SmartCare contract number if product is covered under a service agreement.
- A full description of the problem or service request.
- Product name, model number, and serial number. This information may be found on the product and serial number labels 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.
- A SmartCare contract number if product is covered under a service agreement.
- A full description of the problem or service request.

1. Obtain an RMA number:
   - Visit us on the web at https://www.welchallyn.com/en/service-support/submit-a-repair/, or
   - Contact Welch Allyn to make a request.

   NOTE Welch Allyn does not accept returned products without an RMA.

2. Ship the device to Welch Allyn, observing these rules:

a. Remove from the package the battery, all hoses, connectors, cables, sensors, power cords, and other ancillary products and equipment, except those items that might be associated with the problem.

b. Follow shipping and handling requirements regarding Lithium-ion batteries to comply with new IATA regulations.

Requirements for returning Lithium-ion batteries

- Remove the Lithium-ion battery from the device. You cannot ship these devices with batteries installed.
- Follow packaging requirements (presented next in this section).
- Do not ship any battery that has been physically damaged or shows signs of leakage.
- Do not ship any battery that has been recalled by the supplier or manufacturer.
- Do not ship any waste batteries that should be recycled or discarded.
- Do not ship multiple batteries together.
- Use ground transportation only to ship Lithium-ion batteries.

Packaging requirements for Lithium-ion batteries and associated devices

- Use packaging provided by Welch Allyn or the battery manufacturer to pack the battery. Seal the battery in the anti-static bag and place it in the shipping box. Return shipments without approved packing materials will not be accepted.

NOTE If the original shipping carton or replacement battery shipping box is unavailable, consult the manufacturer website for information regarding shipping Lithium-ion batteries:

http://www.iata.org/lithiumbatteries

- If returning both the battery and the device, pack the battery and the device separately.
- If returning multiple batteries, pack and ship each battery individually. Do not consolidate multiple batteries in a single package.

c. 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**. For decontamination and cleaning requirements, see the appendices.

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.

d. Pack the device. 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, and seal appropriately for shipping. Remember that batteries must be removed from devices before packing and shipping them for return.

e. Write the Welch Allyn RMA number with the Welch Allyn address on the outside of the shipping carton.

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.

WARNING Safety risk. Do not pack a defective battery in checked or carry-on baggage if traveling by air.

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.

Recommended service intervals

To confirm that the device is functioning within the design specifications, perform periodic service as indicated in the following table. Customers who have the Standard unlicensed edition of the Welch Allyn Service Tool can perform the basic functional verification and calibration procedures referenced in the table by following the instructions in this manual. If you have the Gold licensed edition of the service tool, use the tool to perform a complete functional verification and calibration of the device in lieu of performing the basic tests.

Component	Service interval	Service procedure
NIBP module	Annually	Basic functional verification
SpO2 module	Annually	Basic functional verification
SpHb parameter	Annually	Basic functional verification
SureTemp Plus	Annually	Basic functional verification
ECG	N/A	N/A
Braun ThermoScan PRO 6000	Annually	Basic functional verification
Battery	300 charge cycles	Replace the battery
Housing	Annually	Clean air vents to prevent dust buildup

Component	Service interval	Service procedure
NIBP module	Annually	Basic functional verification
SpO2 module	Annually	Basic functional verification
SpHb parameter	Annually	Basic functional verification

Component	Service interval	Service procedure
EarlySense module	N/A	N/A
RRa parameter	N/A	N/A
CO2 module [1]	Annually or 1200 hours (whichever comes first)	Calibration (first time only)
	Annually or 4000 hours (whichever comes first)	Calibration
	30,000 hours	Replace the module
SureTemp Plus	Annually	Basic functional verification
ECG	N/A	N/A
Braun ThermoScan PRO 6000	Annually	Basic functional verification
Battery	300 charge cycles	Replace the battery
Housing	Annually	Clean air vents to prevent dust buildup

[1]Initially calibrate the module after 1200 operating hours, then once a year or after 4000 operating hours, whichever comes first. The initial calibration should not occur before 720 hours of use. If the initial calibration is done before 720 hours of use, the module will reset to require its next calibration after 1200 hours, instead of after 4000 hours.

Use the service tool, Gold licensed edition, to perform a complete functional verification and calibration of the device whenever any of the following conditions exist:

- Based on the basic functional verification, the device does not meet specifications
- The device has been dropped or otherwise damaged
- The device is malfunctioning
- The case has been opened
- An internal part has been replaced (battery excluded)

NOTE For instructions on using the Gold licensed edition, see the service tool help files.

Maintenance

For device maintenance information, see “Maintenance and service” in the device’s directions for use. Covered topics include the following:

- Replacing the printer paper (Connex VSM only)
- Inspecting and cleaning the device and accessories
- Changing the battery

The Welch Allyn Service Tool

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

- **Standard unlicensed**: Accompanies your device. Download from https://www.hillrom.com/en/services/welch-allyn-service-tool/.
- **Gold**: Required to perform complete 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 device.

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.

  NOTE For the Welch Allyn Service Tool to support updates and upgrades, adjust your firewall settings to permit access for IP address 169.254.10.10 (the local feed server for the software upgrade process).

- **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 functional verification and calibration**. The service tool can check any device 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 service tool software accepts new plug-ins to support future Welch Allyn products.

Some of these features are enabled for any user (Standard unlicensed 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, please contact Welch Allyn technical support.

Battery performance

About the battery

NOTE The battery in the wall system provides backup power during a power outage, not power for normal use. Except during cleaning and maintenance activities, the wall system should remain connected to AC power at all times.

The device uses a rechargeable Lithium-ion smart battery. Internal circuitry enables the battery to report its condition to the device. The device displays the battery status via the LED power indicator, icons on the screen, and status messages appearing in the Device Status area of the display. Battery information may be collected using the service tool.

New batteries are shipped from the manufacturer with a 30 percent charge to extend shelf life. When installing a new battery in the device, you must plug the device into AC power to wake up the battery. If the AC power is not applied to the device, the new battery will appear discharged.

The Device Status area displays a low-battery status message when 30 minutes of power remain and again when 5 minutes remain.

Battery charging is provided by the device's internal power supply.

For a complete list of battery specifications, see the device's *Instructions for use*.

Follow best practices to extend the life of the battery

The following practices help to extend the life of the battery and the device.

WARNING Safety risk. When handling and storing Lithium batteries: Avoid mechanical or electrical abuse. Batteries may explode or cause burns, if disassembled, crushed, or exposed to fire or high temperatures. Do not short or install with incorrect polarity.

- Whenever possible, keep the monitor plugged in to charge the battery.
- Remove the battery when storing the device for an extended amount of time.
- Replace batteries that trigger a low battery status message when fully charged.
- Do not use damaged or leaking batteries.
- Store batteries with a 30 to 50 percent charge.
- Store batteries within the temperature range indicated for each period:
  - For storage less than 30 days: Maintain temperature between –4 °F and 122 °F (–20 °C and 50 °C).
  - For storage between 30 days and 90 days: Maintain temperature between –4 °F and 104 °F (–20 °C and 40 °C).
  - For storage more than 90 days up to 2 years: Maintain temperature between –4 °F and 95 °F (–20 °C and 35 °C).
- Recycle batteries where ever possible. In the United States call 1-877-723-1297 for information about recycling your Lithium-ion battery or go to the Call2Recycle website at http://www.call2recycle.org for additional information.
- When recycling is not an option dispose of batteries in an environmentally safe manner consistent with local regulations.

Factors affecting battery operating time

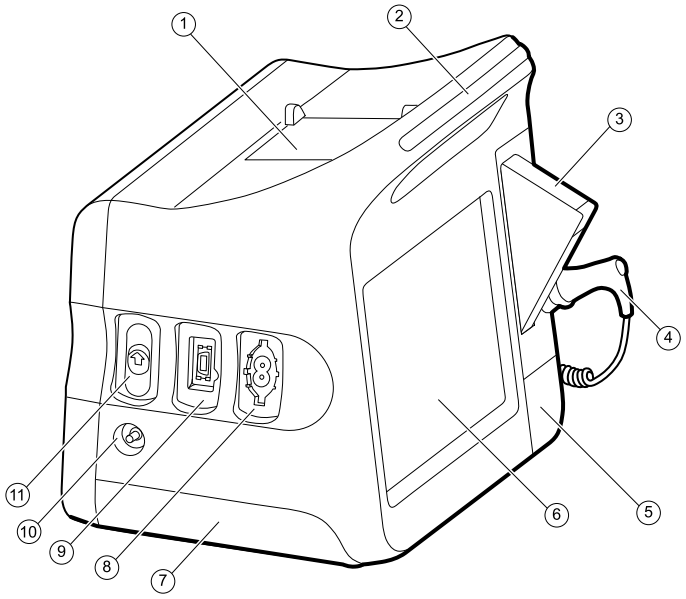
The following settings and conditions affect the battery operating time:

- The display brightness setting
- The display power-saver setting
- The device power-down setting
- Frequency and duration of alarms and alerts
- Amount of motion artifact during NIBP measurements
- Radio searching for an access point

Controls, indicators, and connectors

The following diagrams show a full-featured monitor. Your monitor, based on size or configuration, might not contain all of these features.

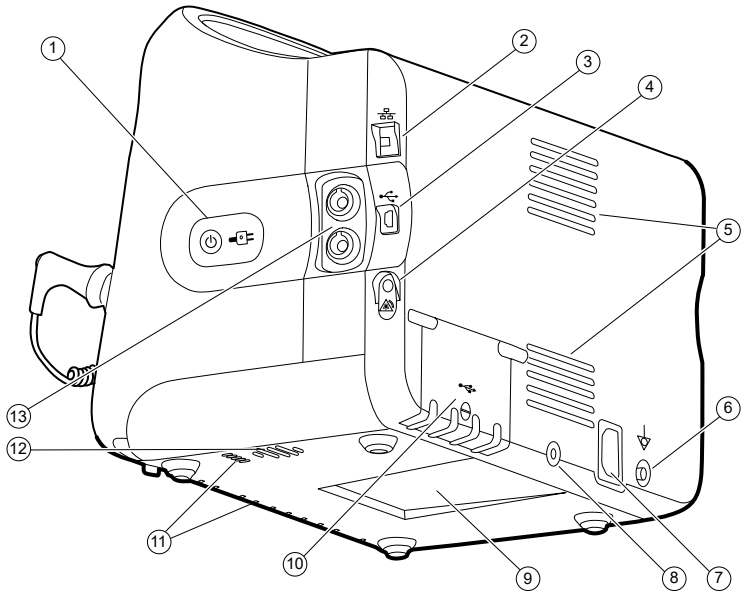
Top-Left-Front view



No.	Feature	Description
1	Printer	Printer provides a printout of patient and device information.
2	Light bar	Provides a visual alarm with red and amber LEDs.
3	Thermometry	Temperature probe cover box.
4	Thermometry	Temperature probe.
5	Thermometry (connector behind cover)	Secures the probe connection to the monitor.
6	LCD screen	1024 x 600 pixels color touchscreen provides a graphical user interface.

No.	Feature	Description
7	Battery compartment (behind cover)	Houses the lithium-ion battery.
8	Blood pressure	Supports dual-lumen or single-lumen hoses.
9	Pulse oximetry	Nellcor or Masimo rainbow SET module. The Nellcor module measures SpO2 and pulse rate. The Masimo module measures SpO2, pulse rate, SpHb, and RRa. **NOTE** SpHb and RRa are optional parameters but cannot be configured together. **NOTE** Monitors configured with RRa cannot be configured with CO2.
10	CO2	CO2 sampling exhaust port.
11	CO2	CO2 sampling input connector (behind cover).

Right-Back-Bottom view



No.	Feature	Description
1	Power switch and LED	Power-on/Display power-saving button. The LED indicates the charging status when the monitor is connected to AC power: • Green: The battery is charged.

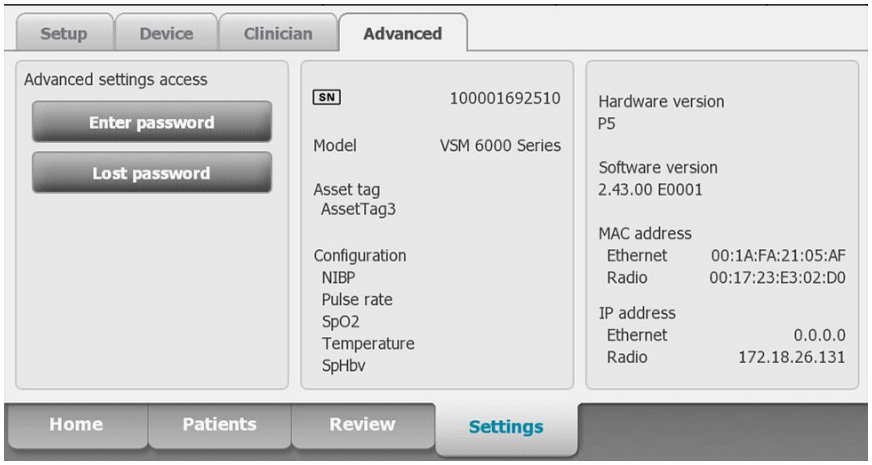
No.	Feature	Description
		• Amber: The battery is charging.
2	Ethernet RJ-45	Provides a hardwired connection to the computer network.
3	USB client	Provides a connection to an external computer for testing and software upgrades.
4	Nurse call	Provides a connection to the hospital nurse call system. (Not available on the 6300 model.)
5	Fan exhaust	
6	Ground lug (equipotential terminal)	Provided for electrical safety testing and as a means for connection of a potential-equalization conductor.
7	Power connection	Provides an external AC power connection.
8	Mobile stand mounting hardware	Secures the mounting plate to the monitor.
9	Recess for mounting plate	Secures the monitor when the monitor is mounted on the mobile stand or wall.
10	USB connector door	Provides access to host USB connections for optional accessories.
11	Fan intake	
12	Speaker	Provides tones.
13	Patient movement	The EarlySense module monitors patient movement, respiration (RR), and pulse rate. **NOTE** Monitors configured with RRa and CO2 cannot be configured with EarlySense.

Advanced settings

The Advanced tab provides password-protected access to the monitor's Advanced settings (or Admin mode), enabling nurse administrators, biomedical engineers, and/or service engineers to configure specific features. The Advanced tab also presents read-only information about the monitor.

NOTE You cannot enter Advanced settings if sensors or physiological alarms are active or if vital sign measurements are displayed.

NOTE If you lose your Advanced settings password, review the instructions to reset passwords.



General

Specify the language

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears, displaying the Language tab.
2. Select a language.
3. Do one of the following:

- To continue in the Advanced settings, touch another tab.
- To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify date and time settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. On the General tab, touch the **Date / Time** tab.
3. Specify settings.

Setting	Action/Description
Date format	Select a date format for display.
Time zone	Select your time zone offset from Coordinated Universal Time (UTC).
Automatically adjust clock for daylight saving time, reported by host	Select to adjust the displayed time by +/- one hour when the connected host reports daylight savings time.
Allow users to change date and time	Select to allow clinicians to set the date and time from the Settings tab.
Display date and time	Select to display the date and time on the Home tab in the Device Status area.
Enable NTP	Select to use the NTP server for time synchronization rather than the episodic host.
Host name or IP address	Enter the host name, IP address, or domain name of the NTP server.
Test	Touch **Test** to test the connection to the NTP server. Information messages indicate that a test is in progress and then the result of the test (pass or fail).

4. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced alarm settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Alarms** tab.
3. Specify settings.

Option	Description
General	(vertical tab)
Allow user to disable alarms	Select to allow clinicians to turn off or turn on all alarm limits for each vital sign. The control is on each parameter-specific tab on the Alarms tab.
Nurse call threshold	Select the minimum priority alarm that activates a nurse call relay. If you select **High**, only high-priority alarms activate a nurse call relay. If you select **Medium**, medium- or high- priority alarms activate a nurse call relay. If you select **Low**, high-, medium-, and low-priority alarms activate a nurse call relay.
Audio	(vertical tab)
Allow user to turn off general audio	Select to allow clinicians to turn off all audio notification for alarms. This control is on the Alarms tab (on the General tab).
Minimum alarm volume	Select the minimum alarm volume available. If you select **High**, then **Medium** and **Low** are not available to the clinician.
Audio pause time	Specify the amount of pause time that is added to the 60-second pause time. When a clinician pauses an audio alarm tone, the tone is paused for the combined amount of time.
Enable audio for low priority alarms	Select to enable the alarm to sound for low priority alarms. If this setting is disabled, the audio for very low priority alarms is automatically disabled.
Enable audio for very low priority alarms	Select to enable the alarm to sound for very low priority alarms. This setting is available only when "Enable audio for low priority alarms" is selected.
Allow user to turn on patient rest mode	Select to allow the user to turn off or turn on this option on the Alarms tab. This option is only available in the Continuous Monitoring profile and when the user has enabled night mode.
Allow host to turn on patient rest mode	Select to allow the host to turn off or turn on this option on the Alarms tab. This option is only available in the Continuous Monitoring profile and when the device is connected to the Central Station.
Enable cardiac high priority tone	Select to enable an alternate alarm tone for ECG LTA alarms.
Delays	(vertical tab)
	NOTE Alarm delays are available only for the parameters supported by your configuration.
SpO2 alarm condition delay	Specify the minimum amount of time that an SpO2 alarm condition must be active before audio and visual signals occur. SatSeconds is available with Nellcor SpO2 sensors. If you select Off, 10-, 15-, or 30-second delay, SatSeconds is disabled, and it is removed from the SpO2 tab in the Alarms tab.
SpO2 pulse rate alarm condition delay	Specify the minimum amount of time that a Pulse rate alarm condition measured by the SpO2 sensor

	must be active before audio and visual signals occur.
Motion pulse rate alarm condition delay	Specify the minimum amount of time that a Pulse rate alarm condition measured by the patient movement sensor must be active before audio and visual signals occur.
SpHb alarm condition delay	Specify the minimum amount of time that an SpHb alarm condition must be active before audio and visual signals occur.
Motion respiration alarm condition delay	Specify the minimum amount of time that a respiration alarm condition must be active before audio and visual signals occur (EarlySense configuration).
Motion pulse rate low confidence alarm delay	Specify the minimum amount of time that a pulse rate low confidence alarm condition must be active before audio and visual signals occur (EarlySense configuration).
Motion respiration low confidence alarm delay	Specify the minimum amount of time that a respiration low confidence alarm condition must be active before audio and visual signals occur (EarlySense configuration).
etCO2 alarm condition delay	Specify the minimum amount of time that an etCO2 alarm condition must be active before audio and visual signals occur.
Respiration alarm condition delay	Specify the minimum amount of time that an RR alarm condition must be active before audio and visual signals occur.
No breath detected alarm delay	If configured with a CO2 module, specify the amount of time for the device to wait after receiving a "valid breath" message before activating the "No breath detected" physiological alarm. If configured for RRa, specify the time that the Masimo module will wait before sending a respiration pause event, which will result in a "No breath detected" physiological alarm.
Adult no breath detected alarm delay	Specify the time that an adult no breath detected condition must be active in an Oridion CO2 configuration before audio and visual signals occur.
Pediatric no breath detected alarm delay	Specify the time that a pediatric no breath detected condition must be active in an Oridion CO2 configuration before audio and visual signals occur.
Neonate no breath detected alarm delay	Specify the time that a neonate no breath detected condition must be active in an Oridion CO2 configuration before audio and visual signals occur.
ECG HR alarm delay	Specifies the time that an ECG heart rate alarm condition must be active before audio and visual signals occur.

4. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced display settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.

b. Touch the **Advanced** tab.
c. Touch **Enter password**.
d. Enter your password and touch **OK**.

The General tab appears.

2. Touch the **Display** tab.
3. Specify settings.

Setting	Action/Description
Display power saver	Specify the required period of monitor inactivity before the display turns off. Clinician interactions, new vital sign measurements, or alarm conditions automatically turn on the display.
Device power down	Specify the required period of monitor inactivity before the monitor turns off.
Display lock	Specify the required period of monitor inactivity before the touchscreen locks. **NOTE** If the single sign-on (SSO) feature has been enabled on this device, the display lock idle period defaults to 2 minutes but remains configurable. In addition, all of the remaining controls described in this section (except forEnable continue without login) disappear from the display, but the Require clinician authentication control remains active as part of the SSO feature.
Require device access code	Enable to require entering a code to unlock the display.
Device access code	Enter the 4-digit code to unlock the display. **NOTE** You must enable Require device access code to enable this option.
Require clinician authentication	Enable to require clinician authentication (scanning badge or entering ID) to unlock the display. **NOTE** You must enable Search by clinician ID to enable this option.
Enable continue without login	Select to enable "Continue without login" button on the authentication dialog to unlock the display.

NOTE You must enable either Enable single sign-on or Search by clinician ID, and enable Require clinician ID match to view patient data to enable Patient Protection mode which is required with this option.

NOTE Additionally, If the Search by clinician ID feature has been enabled on this device, you must enable Require clinician authentication to enable the configuration of Enable continue without login.

4. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced device settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Device** tab.
3. Specify settings.

Option	Description
Location ID	Touch and enter up to 20 alphanumeric characters.
Enable Save as default	Select to enable display of the Save as default control.
Pause Mode timeout	Specify the default timeout used when entering Pause mode in the Continuous Monitoring profile.
Power line frequency	Specify power line frequency for AC power supplied to the device.
Available profiles	Specify the profiles to be available for selection.
Allow profile change	Select to enable manual selection of different profiles and the automatic shift to the Continuous Monitoring profile when a continuous sensor is connected to a patient. When disabled, the current profile selection in the Settings tab is locked in. No other profile selection buttons are available, and the device does not automatically shift to the Continuous Monitoring profile when a continuous sensor is connected to a patient.

Default profile	Specify the default profile to be used at startup.

4. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Set and start the demo mode

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **General** tab.
3. Touch the **Demo** tab.
4. Specify settings.

Setting	Action/Description
Type	Select a type of demonstration mode.
Start	Touch **Start** to put the monitor in demonstration mode. Navigate to the Home tab to begin Demo mode.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Parameters

Specify advanced IPI settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **IPI** tab.
4. Specify settings.

Setting	Action/Description
Display IPI	Select to display the IPI frame on the Home tab.
Default view	Select a numeric view or trend graph view as the primary IPI display on the Home tab.
Trend period default	Select a default time period for the trend graph display of IPI.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced RRa settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **RRa** tab.
4. Specify settings.

Setting	Action/Description
RRa averaging	Select the default averaging option that provides the desired visibility of subtle variations in RRa measurements.
Freshness timeout	Select the period of time the device should wait before alarming while it attempts to obtain a valid RRa reading.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced SpO2 settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **SpO2** tab.
4. Specify settings.

Setting	Action/Description
Default view	Select a numeric view or a waveform view as the default primary SpO2 display on the Home tab.
Default response	Select the default speed of response to changes in SpO2 measurements.
Sweep speed default	Select the default waveform sweep speed for the SpO2 display in the Home tab.
Allow low perfusion alarm	Select to enable Masimo low perfusion alarm.

5. Do one of the following:

- To continue in the Advanced settings, touch another tab.
- To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced HR/PR (pulse rate) settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **HR/PR** (Pulse rate) tab.
4. Specify settings.

Setting	Action/Description
Display source	Select this to show the source of pulse rate measurements (NIBP or SpO2) on the Home tab.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced etCO2 settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **etCO2** tab.
4. Specify settings.

Setting	Action/Description
Default view	Select a numeric view or a waveform view as the primary etCO2 display on the Home tab.
Display FiCO2	Select to display FiCO2 on the Home tab.
Waveform scale default	Select the default waveform scale in etCO2 measurements.
Unit of measure	Select primary units of measure for the etCO2 display on the Home tab.
Check calibration	Select to start CO2 calibration check.
Calibrate	Select to start CO2 calibration.
Sweep speed default	Select the default waveform sweep speed for the CO2 waveform view on the Home tab.

Enable sampling line dialog	Select to enable the sampling line dialog to be displayed when connecting a sampling line to the device.
BTPS compensation	Select to enable automatic adjustments for BTPS (body temperature pressure saturated) to improve the accuracy of CO2 measurements.
Calibration due hours	Displays time remaining until CO2 sensor calibration is required.
Maintenance due hours	Displays time remaining until CO2 periodic sensor maintenance is required.
Last calibration	Displays date (XX/XX/XXXX) and time (00:00:00) of last calibration.
Annual calibration	Displays anniversary date (XX/XX) of annual calibration.

- For more calibration information, see the Service manual.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced SpHb settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **SpHb** tab.
4. Specify settings.

Setting	Action/Description
Default view	Select a numeric view or a trend graph view as the primary SpHb display on the Home tab.
Unit of measure	Select the primary unit of measure for the SpHb display on the Home tab.
Default averaging	Select the default moving window of time used by the parameter to calculate the SpHb value and update the display: short (approximately 1 minute), medium (approximately 3 minutes), or long (approximately 6 minutes).
Reference	Select arterial or venous as the calibrated reference source.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced NIBP settings

1. Access the Advanced settings.

a. Touch the **Settings** tab.
b. Touch the **Advanced** tab.
c. Touch **Enter password**.
d. Enter your password and touch **OK**.

The General tab appears.

2. Touch the **Parameters** tab.
3. Touch the **NIBP** tab.
4. Specify settings.

Setting	Action/Description
Default view	Select primary and secondary views. Select **Display MAP** to display mean arterial pressure (MAP) in the NIBP frame on the Home tab. If **Display MAP** is selected, specify which numerics are primary in the NIBP frame. On the Home tab, clinicians can touch the NIBP frame to toggle between views.
Unit of measure	Select the NIBP unit of measure for display.
Tube type	Select the number of tubes that are connected to the NIBP cuff used with this monitor. If you select **1 tube**, the only algorithm available for selection is **Step**.
Algorithm default	Select the default algorithm used to determine NIBP measurements.
Cuff inflation target	If you select the **Step** algorithm, touch and enter a default cuff inflation target for each type of patient. Clinicians can change the CITs from the default CITs that you set here on the **Settings** > **Setup** > **NIBP** tab.
Allow interval program changes	Select to enable user to modify interval program selections in the **Settings** > **Setup** > **Intervals** tab.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Set up an NIBP averaging program

In Advanced settings, set up NIBP averaging programs to make them available for use.

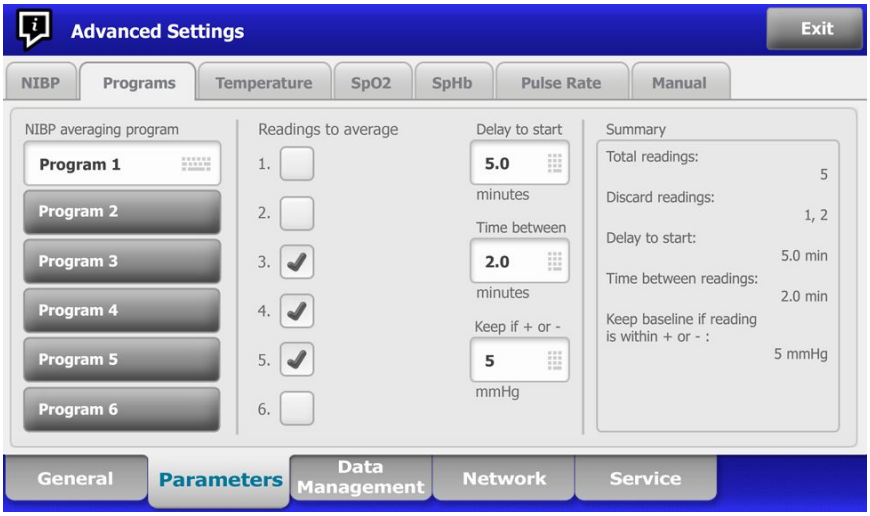
To set up a program:

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.

3. Touch the **Programs** tab.
4. Touch the button of the program you want to set up.

   The keyboard icon appears in the button.



5. (Optional) Change the name of the program:
   a. Touch the keyboard icon.
   b. Enter the name of the program and touch **OK**.
6. Specify the settings for this program.

Setting	Action/Description
Readings to average	Select readings to include in the average. You must select at least two readings. The last reading you select is the final reading of the program. For example, if you select Readings 3, 4, and 5, the program takes five readings. Unselected readings—in this example, Readings 1 and 2—are excluded ("discarded") from the average.
Delay to start	Enter the period between the start of the program (the moment that the "Start intervals" button is selected) and the start of the first reading.
Time between	Enter the period between the end of one reading and the start of the next reading.
Keep if + or –	Enter the range that the program uses to establish the baseline reading. For more information about how this setting affects the program, refer to "Excluded readings" in the "NIBP averaging programs" section of this manual.

   The settings you selected appear in the Summary area.
7. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

   The program is now available for use.

Specify advanced temperature settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **Temperature** tab.
4. Specify settings.

Setting	Action/Description
Unit of measure	Select primary units of measure for the temperature display on the Home tab
Display temperature conversion	Select to display primary units of measure and secondary units of measure for the temperature display on the Home tab.
Default SureTemp Plus site	Select the default site for SureTemp measurements. The default site applies when clinicians power up the monitor and each time clinicians remove the temperature probe from the well. Select **Last site** to set the default to the site selected for the last measurement.
Anti-theft return timeout	Select "Disabled" or a timeout value in hours for the Braun 6000 to lock after being removed from the dock.
Mode	Select **None**, **Technique Compensation**, or **Unadjusted** as the Braun 6000 compensation mode. Technique Compensation improves reading accuracy by detecting placement of the probe in the ear canal. Unadjusted places thermometer in mode to detect raw ear temperature only.
Enable pulse timer	Select to enable pulse timer on the Braun 6000 handle.
Enable Celsius only selection	Select to enable Celsius only mode, thus disabling the C/F button on the Braun 6000 handle as well as the hardware switch.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced ECG settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

The General tab appears.

2. Touch the **Parameters** tab.
3. Touch the **ECG** tab.
4. Specify settings.

Setting	Action/Description
Cable selection	Select either a 3-lead or 5-lead cable option. The current selection appears as a secondary label on the ECG vertical tab.
Electrode configuration	Select either **AHA** or **IEC**.
Allow impedance respiration	Select to enable the selection of impedance respiration as a source for respiration on the ECG settings tab. If not selected, this option is disabled, and impedance respiration is not displayed as an option on the ECG settings tab.
Enable V-Tach, V-Fib, Asystole detection	Select to enable detection of these LTA alarms.
Automatic print on ECG alarm	Select to enable automatic printing of an ECG waveform when an LTA alarm occurs.
Default lead	Select the lead to be displayed when the device is powered up.
V-Tach threshold	Use the keypad to enter the V-Tach threshold used by the ECG module (Range: 100-150 bpm).

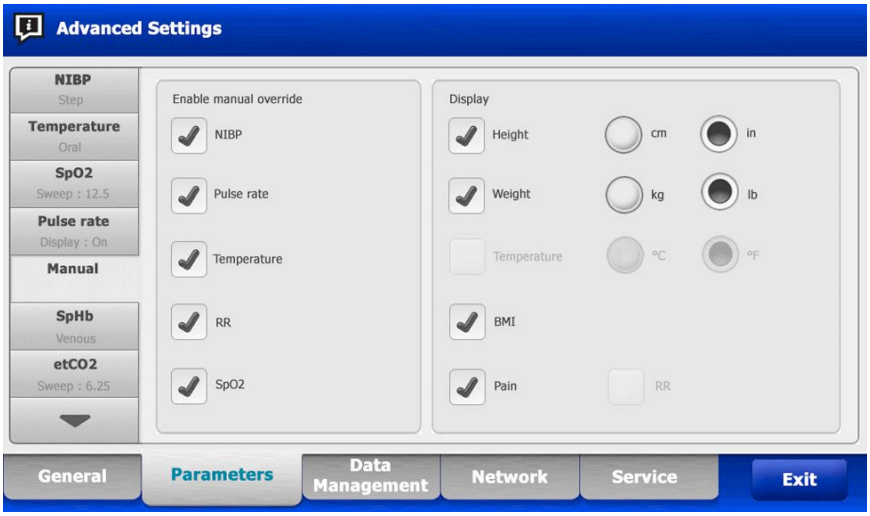
5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify the manual parameters

The Manual Parameters frame is in the lower right corner of the Home tab. You can manually enter values for parameters in the frame. In Advanced settings, you can specify which parameters appear in the frame and enable manual overrides of other parameter measurements displayed on the device.

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **Manual** tab.



4. Select up to four parameters and associated units of measure for display in the Manual Parameters frame.

   NOTE If the monitor has the SureTemp Plus temperature module, the Temperature parameter is not available in the Display frame or in the Manual Parameters frame on the Home tab.

   NOTE If the monitor is configured with CO2 or RRa, and you select the Continuous Monitoring profile before you enter Advanced settings, the respiration rate (RR) parameter is not available here or in the Manual Parameters frame. If any other profile is selected when you enter Advanced settings, the respiration rate (RR) parameter remains available for selection on this screen and is displayable in the Manual parameters frame.

5. Enable manual overrides of selected parameter measurements displayed on the device as desired.
6. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify advanced custom scores settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Parameters** tab.
3. Touch the **Custom scores** tab.
4. Specify settings.

Setting	Action/Description
Default score summary view	Select either a **Condensed** or **Expanded** view of custom scores information to display after saving a patient record.
Incomplete score save options	Select the desired response when a user presses Save before an aggregate score is complete: **Allow**: The device saves the record with incomplete scores. **Warn user**: The device displays a message that the score is incomplete and a prompt to save the incomplete record or cancel. **Block**: The device displays a message that the score is incomplete and that values for all required parameters must be entered before saving.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Data management

Specify patient settings

Patient identification appears on the Home tab in the Patient frame, and it is listed in various tabs, such as the Patient tab and the Review tab.

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Data Management** tab.
3. Touch the **Patient** tab.
4. Specify settings.

Setting	Action/Description
Default patient type	Select a default patient type for this monitor. The patient type shows in the Patient frame on the Home tab. In the Summary tab on the Patients tab, clinicians can change the displayed patient type from the default patient type that you set here.
Enable local patient creation	Select to enable adding new patients on the device. If enabled, you can add patients to the Patient List tab or to the Patient Summary tab. If disabled, the Add button does not appear on the List screen, and you can only edit the Patient ID field on the Summary tab. Disabling local patient creation also clears the active patient and the local patient list from the device.

Name format	Select a format for all displayed patient names: **Full name** or **Abbreviation**.
Primary label	Select the primary identification label for all displayed patients.
Secondary label	Select a secondary identification label for patients. A secondary label displays only on the Home tab, after the primary label.
Printout label	Select which patient identifier(s) appear on printouts: **Name and patient ID**, **Name**, **Patient ID**, **None**.
Require patient ID to save readings	Make entering a patient ID a prerequisite for saving measurements. If the clinician fails to enter an identifier, the monitor prompts the clinician when they try to save.
Search by patient ID	Enable clinicians to enter a patient ID to query for the patient's information. If clinicians scan the ID onto the Home tab or the Summary tab, the monitor queries the patient list and the network. Returned patient information populates the Patient frame on the Home tab and fields on the Summary tab. Select **Require patient ID match to save measurements** to require that the selected patient ID matches a patient ID in the Patient list of the device or an external host system before you can save measurements.
Clear patient information on manual save	Specify that the monitor clears the selected patient after a clinician manually saves measurements from the Home tab. Patient information clears from the Patient frame and the Summary tab. **NOTE** This setting does not take effect when intervals are in progress.
Retrieve list	Enable the monitor to retrieve the patient list from the network. When this option is selected, a **Retrieve list** button replaces the **Add** button on the List tab. Information from the network populates the List tab when clinicians touch the **Retrieve list** button. Since the **Add** button is not available, clinicians cannot add a patient to the patient list. Direct EMR connection is not compatible with the Retrieve list setting. Retrieve list is disabled and not selectable when you enable Direct EMR connection. Configuring the server back to Welch Allyn host restores the Retrieve list setting to its previous state and makes it selectable.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify clinician settings

Clinician identification appears next to the medicine symbol in the Device Status area on the Home tab.

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Data Management** tab.
3. Touch the **Clinician** tab.
4. Specify settings.

Setting	Action/Description
Label	Select a type of clinician identification label for display on the Home tab: **Full name**, **Abbreviation**, **Clinician ID**, **Masked Clinician ID**, or **Symbol only**.
Enable single sign-on	Select to enable the single sign-on (SSO) feature on the device. **NOTE** When SSO is enabled, many of the remaining controls described in this section are removed from the display. However, Clear clinician information on manual save and Require clinician ID match to view patient data remain configurable when Enable single sign-on is enabled. In addition, Display lock defaults to 2 minutes, three Display tab controls disappear from the display (see "Specify advanced display settings" for details), and the Office profile is disabled.
Require clinician ID to save readings	Make entering a clinician ID a prerequisite for saving measurements. If they fail to enter identification, the monitor prompts them when they try to save measurements. Clinicians can enter clinician identification on the Clinician tab.
Clear clinician information on manual save	Specify that the monitor clears the selected clinician after a clinician manually saves measurements from the Home tab. Clinician information clears from the Clinician tab and the Device Status area.
Require clinician ID match to view patient data	Select to enable Patient Protection mode, which prevents viewing the Patients List and Review tabs or changing profiles without an authenticated clinician being logged in.

Search by clinician ID	Enable the monitor to query the network for clinician information based on ID. The monitor initiates the search when the clinician enters or scans the ID from the Clinician tab. Returned clinician information populates the Device Status area and fields on the Clinician tab. Select **Require password** to require clinicians to enter their password, in addition to ID, on the Clinician tab. The monitor uses the ID and password combination to query the network for clinician information. Select **Require clinician ID match to save measurements** to require that the selected clinician ID matches a clinician ID in an external host system before you can save measurements.
Store clinician information for ___ hours	Select to enable a local cache of clinician login information to speed up and simplify future clinician logins. Use the keypad to enter the number of hours to store this clinician cache.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify clinical data settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Data Management** tab.
3. Touch the **Clinical Data** tab.
4. Specify settings.

Setting	Action/Description
Automatically send on manual save	Select this option to specify that measurements are sent to the network when a clinician saves measurements on the Home tab. **NOTE** When the device is in the Continuous Monitoring profile, this setting is grayed out. **NOTE** When the monitor is not connected to the network, measurements saved on the monitor are sent to the network with the first successful send after reconnecting to the network.
Delete readings after successful send	Select this option to specify that measurements are deleted from the monitor after they are successfully

	sent to the network. Sent measurements do not appear in the Review tab.
Emulate Spot Vital Signs LXi	Select this option to specify that clinical data sent to the network appears as Spot Vital Signs LXi data at the network.
Connect to CS	Select to enable connection to the Connex central station. Direct EMR connection is not compatible with the Connect to CS setting. Connect to CS is disabled and not selectable when you enable Direct EMR connection. Configuring the server back to Welch Allyn host restores the Connect to CS setting to its previous state and makes it selectable.
Enable clear button on Home tab	Select to enable the Clear button on the Home tab in Intervals Monitoring, Office, and Spot Check profiles. When not selected (disabled), the Clear button does not appear on the Home tab.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Network

View advanced monitor information

The Status tab shows the monitor's software version, MAC and IP addresses, network, server and access point information, session information, and more.

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Status** tab.
4. View the information.
5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify radio settings (Newmar)

This task applies only to devices with a Newmar radio card installed. Distinguishing features of devices with this radio card are the following:

- In Advanced settings, the Session frame on the **Network** > **Status** tab includes **Tx packets dropped**, **Rx packets dropped**, and **Rx multicast packets**.

- In Advanced settings, the left pane on the **Network** > **Radio** tab includes an *Enable dynamic frequency* option.

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Radio** tab.
4. Specify settings.

Setting	Action/Description
Enable radio	Enable the radio for device communications. When disabled, the radio is not available.
Enable radio network alarms	Activate radio network alarms when an alarm condition occurs. When disabled, radio network alarms are not available.
Enable dynamic frequency	Enable dynamic frequency selection when the radio is enabled. This might be required to prevent disrupting other technologies and services that share the same frequency.
SSID	Touch and enter the service set identifier (SSID). SSIDs that are longer than 16 characters may be truncated in the user view. Enter a maximum of 32 characters.
Radio band	Select the radio band.
Authentication type	Select an authentication scheme. Then specify any additional settings that appear.
Method	Select a method. Then touch and enter characters: Network key (64 characters), or Passphrase (8 to 63 characters). **NOTE** The characters you enter for Network key and Passphrase appear as asterisks on the keyboard and then on the Radio pane.
Security protocol	Select the security protocol.
EAP type	Select the EAP type.
Identity	Enter the EAP identity (maximum of 32 characters).
Password	Enter the EAP password (maximum of 32 characters).
Key number	Select the WEP key number.
Key	Enter the WEP key (10 characters for WEP 64, or 26 characters for WEP 128).
Roam Type	Select roam type.

Server validation	Select to enable server validation.
Inner EAP setting	Select inner EAP setting.
Allow anonymous identity	Select to enable the use of an anonymous identity.
PAC Provisioning	Select PAC provisioning option.
Configure radio	Touch **Configure radio** to activate all new radio settings not selected previously.

NOTE None of the changed radio settings take effect until you touch **Configure radio**.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify radio settings (Lamarr)

This task applies only to devices with a Lamarr radio card installed. Distinguishing features of devices with this radio card are the following:

- In Advanced settings, the Session frame on the **Network** > **Status** tab includes **Dir. Rx packets**, **Dir. Tx packets**, and **Signal-to-noise ratio**.
- In Advanced settings, the left pane on the **Network** > **Radio** tab includes only *Enable radio* and *Enable radio network alarms* options (no *Enable dynamic frequency* option).

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Radio** tab.
4. Specify settings.

Setting	Action/Description
Enable radio	Enable the radio for device communications. When disabled, the radio is not available.
Enable radio network alarms	Activate radio network alarms when an alarm condition occurs. When disabled, radio network alarms are not available.
SSID	Touch and enter the service set identifier (SSID). SSIDs that are longer than 16 characters may be truncated in the user view. Enter a maximum of 32 characters.
Radio band	Select the radio band.
Authentication type	Select an authentication scheme. Then specify any additional settings that appear.

Method	Select a method. Then touch and enter characters: Network key (64 characters), or Passphrase (8 to 63 characters). **NOTE** The characters you enter for Network key and Passphrase appear as asterisks on the keyboard and then on the Radio pane.
Security protocol	Select the security protocol.
EAP type	Select the EAP type.
Identity	Enter the EAP identity (maximum of 32 characters).
Password	Enter the EAP password (maximum of 32 characters).
Key number	Select the WEP key number.
Key	Enter the WEP key (10 characters for WEP 64, or 26 characters for WEP 128).
Configure radio	Touch **Configure radio** to activate all new radio settings not selected previously. Touch **OK** in the confirmation popup telling you to power down the monitor. Touch the **Settings** tab. Touch the **Device** tab. Touch **Power down**. The radio will reboot. **NOTE** None of the changed radio settings take effect until you touch **Configure radio**.

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify server settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Server** tab.
4. Select the method used to identify the IP address of the server with which the device will communicate.
5. Specify settings.

Connectivity Setting	Action/Description
Manual entry	Enable the device to connect to a Episodic, Continuous, or Service server at a fixed IP address or with a specified DNS name. Touch the desired server field and enter the IP address host name. Touch the Port entry field and enter the port number. The range of entry is 0 to 65535. This option supports server Authentication to either the Welch Allyn host (NCE and Connex CS) or a Direct EMR connection using HL-7. Touch the Server dropdown menu to select the server type. The Authentication option is disabled by default and only applies to the Episodic server. Authentication is not available when Data encryption is disabled. Direct EMR connection is not compatible with Connect to CS or Retrieve list settings. Both settings are disabled and not selectable when you enable Direct EMR connection. Configuring the server back to Welch Allyn host restores the Connect to CS and Retrieve list settings to their previous states and makes them selectable.
NRS IP	Enable the device to connect to a Network Rendezvous Service (NRS) at a fixed IP address. Touch the keypad in the Network rendezvous service IP address fields and enter the IP address. Touch the keypad in the Port entry field and enter the port number. The range of entry is 0 to 65535. The device will always use this IP address to contact the NRS server.
DNS Name	Enable the device to connect to a Network Rendezvous Service (NRS) by entering a host name to be sent to a Domain Name Server (DNS) to retrieve the NRS IP address. Touch the keypad in the Network rendezvous service DNS name field and enter the DNS name. Touch the keypad in the Port entry field and enter the port number. The range of entry is 0 to 65535. The device displays the NRS IP address as well as the Connex server address and port returned by the DNS. Enable data encryption for Episodic, Continuous, or Service server The DNS Name option is only available in the following conditions: – The radio is disabled – No radio is installed
DHCP	Enable the device to connect to a Network Rendezvous Service (NRS) by entering a port number and then connecting at an address provided by the DHCP43 response. Touch the keypad in the Port entry field and enter the port number. The range of entry is 0 to 65535. After you touch **Test** and successfully connect to the server, the device displays the NRS IP addresses.

Data encryption	Enable data encryption for Episodic, Continuous, or Service server and for the following Connectivity types: Manual entry, NRS IP, DNS Name, and DHCP
Authentication	Enable authentication with Episodic or Continuous server. This option is disabled by default and is only available when Data encryption is enabled and for manual entry Connectivity.
Restore defaults	Touch **Restore defaults** to restore settings for the selected option to the default values.
Test	Touch **Test** to test the connection to the configured server.

6. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

Specify Active Directory settings

1. Access the Advanced settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Active Directory** tab.
4. Specify settings.

Setting	Action/Description
Enable Active Directory	Select this option as the first step to connect to an Active Directory server (an alternative way to perform clinician queries). When you enable this control, you enable all other controls on this tab.
Host or IP address	Touch the keypad in the Host or IP address field and enter the Host name (Fully Qualified Domain Name) or IP address of the Active Directory server. This is an alpha-numeric string with a maximum length of 121 characters.
Group	Touch the keypad in the Group field and enter the Domain Group address. This is an alpha-numeric string with a maximum length of 121 characters.
Clinician ID type	Touch the Clinician ID type dropdown menu to select the Clinician identifier. This selection has no effect on the appearance of Clinician information on the display. It only affects communication of the request to the Active Directory server.
Authentication user name	Touch the keypad in the Authentication user name field and enter the User name. This is an alpha-numeric string with a maximum length of 100 characters.

Authentication password	Touch the keypad in the Authentication password field and enter the User password. This is an alpha-numeric string with a maximum length of 20 characters.
Search subtree	Touch the keypad in the Search subtree field and enter what you want to search in the Active Directory. This is an alpha-numeric string with a maximum length of 121 characters.
Test	Touch **Test** to test the connection to the Active Directory server. Information messages indicate that a test is in progress and then the result of the test (pass or fail).

5. Do one of the following:
   - To continue in the Advanced settings, touch another tab.
   - To exit the Advanced settings and return to the Home tab, touch **Exit**.

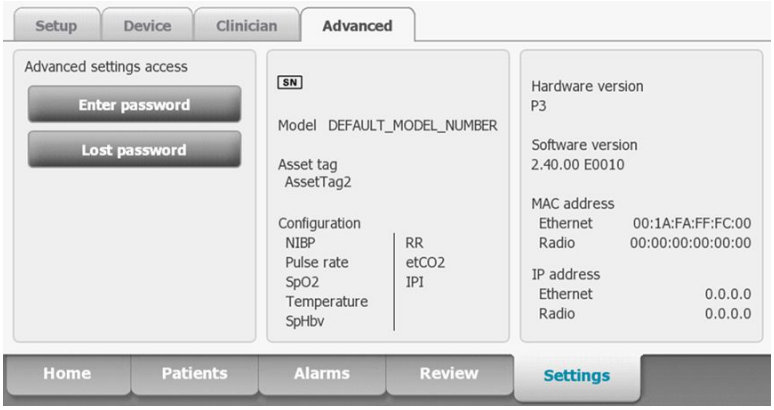
Service

Advanced settings and Service tabs

The Advanced tab provides password-protected access to the monitor's Advanced settings (or Admin mode), enabling nurse administrators, biomedical engineers, and/or service engineers to configure specific features. The Advanced tab also presents read-only information about the monitor.

The password to enter Advanced settings is configurable and can also be set to expire. See the "Password" topic at the end of this section for more details.

NOTE You cannot enter Advanced settings if sensors or physiological alarms are active or if vital sign measurements are displayed.



Access the Service tabs

NOTE You cannot access the Service tabs if sensors or physiological alarms are active or if vital sign measurements are displayed.

1. From the **Home** tab, touch the **Settings** tab.
2. Touch the **Advanced** tab.
3. Touch **Enter password**.

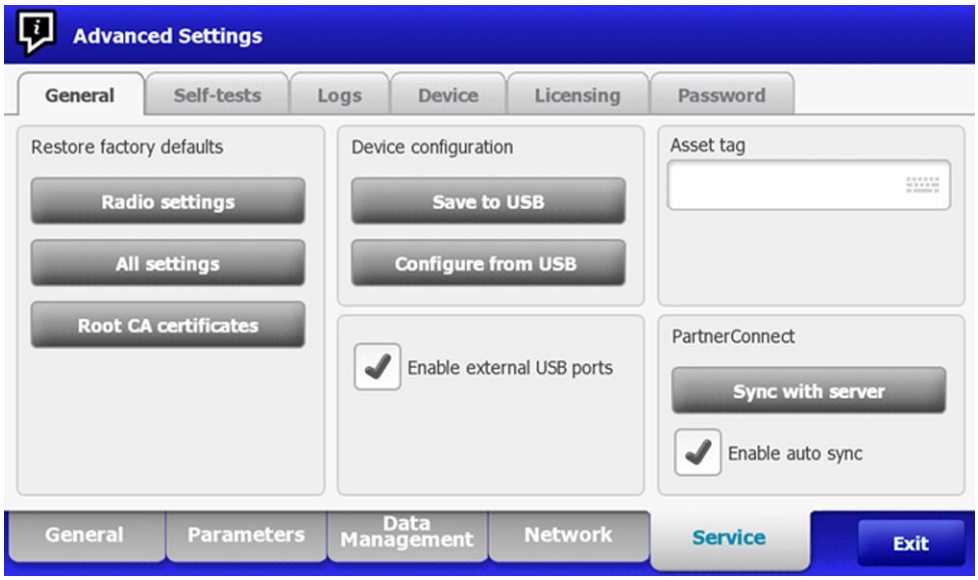
4. Enter **6345** , or the custom password for the device, as the access code and touch **OK**.
5. Touch the **Service** tab.

   The **General** screen appears.
6. Perform service tasks by making selections or touching other tabs.

   NOTE Service tasks and how to do them are detailed in this section.
7. When you are done, touch **Exit**.

   The **Home** tab appears.

General tab



Restore factory default settings

NOTE This process deletes the custom data file. All custom data will be lost.

NOTE Restoring the radio default settings on a device equipped with a Newmar radio will remove all installed wireless certificates.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **General** tab.
3. Restore factory default settings:
   - To restore radio settings to factory default values, touch **Radio settings**.
   - To restore all current settings to factory default values, touch **All settings**.
   - To delete all root certificates currently installed, touch **Root CA certificates**.

   A confirmation dialog appears.
4. Touch **OK**.

   The factory default settings are restored.

   If you selected **Radio settings**, the radio reboots, and the device remains powered on.

If you selected **All settings** or **Root CA certificates**, the device reboots.

Save the device configuration or custom data to a drive

You can save the device configuration or custom data (custom modifiers and custom scoring) to a USB flash drive. You can use the saved configuration to restore the device's configuration or to copy this configuration to use on other devices. You can use the saved custom data to restore custom modifiers or custom scores, or you can copy them to another device.

NOTE Not all flash drives are supported.

NOTE When saving the device configuration, the location ID and asset tag information are not included in the configuration file.

NOTE **Save to USB** does not support saving root CA and wireless certificates.

1. Connect a flash drive to the USB port.
2. Go to the Service tabs as described in "Access the Service tabs."
3. Touch the **General** tab.
4. Touch **Save to USB**.

   A confirmation dialog appears. You can save the device configuration or custom data if either custom scores or custom modifiers are present.
5. Touch **OK**.

   If the selected file or files already exist on the USB flash drive, a popup dialog appears with the message "Device configuration file already exists. Select OK to continue with save and overwrite existing file or cancel."
6. Touch **OK** to save the data to the USB drive or touch **Cancel** to exit without saving.

   A confirmation message appears.

NOTE If the USB drive is incompatible, the message "Unable to save configuration to USB" appears. Touch **OK** to continue.

NOTE The configuration file is saved as CONFIG.PMP. The custom data file is saved as CUSTOMDATA.XML.

Load a device configuration, custom data, and/or root CA certificates

You can load a configuration from a USB flash drive to the device.

NOTE Not all flash drives are supported.

NOTE If your configuration includes radio parameters, make sure the radio is enabled. The radio must be enabled before you can import radio parameters.

NOTE If a device setting is not available in the configuration file, the setting returns to the factory default. This might be the case when the configuration file was saved from a device with a different firmware version.

NOTE Configuration files cannot be cloned between devices with different host software, except where the version change is minor.

1. Connect a flash drive to the USB port.
2. Go to the Service tabs as described in "Access the Service tabs."

3. Touch the **General** tab.
4. Touch **Configure from USB**.

   A confirmation dialog appears.
5. Select **Device configuration**, **Custom data XML**, and/or **Root CA certificates**.

   A confirmation dialog appears to confirm overwriting the existing configuration.
6. Select **OK** to proceed, or **Cancel** to quit.

   The configuration from the USB flash drive overwrites the configuration on the device, and the device reboots.

NOTE If device configuration data is not present on the USB drive, that option will be disabled.

NOTE If custom modifiers are not present on the USB drive, that option will be disabled.

NOTE If root CA certificates are not present on the USB drive, that option will be disabled.

NOTE If the configuration file is incompatible, an "Unable to read configuration from USB" message appears. This might be the case if the configuration file was cloned from a device with different software version.

NOTE Configuration files can be edited or amended by loading the configuration file onto the device, making changes to the configuration through the user interface, and then saving the configuration file.

NOTE Lamarr radio configurations do not overwrite Newmar radio configurations, and vice versa. A single configuration file can store configurations for both Lamarr and Newmar radios. To create this file, first create the configuration file on a device with one type of radio and save it. Then load the configuration file on a second device with the other type of radio, configure the radio, and save the file. The newly saved configuration file includes both the Lamar and Newmar radio configurations, but the device activates only the configuration matching the device's radio type.

Delete custom data

To delete custom data, you must restore the monitor to factory defaults. Restoring the monitor to factory defaults also deletes all configuration settings.

To restore the custom configuration settings and/or custom data, save the configuration file and/or custom data to a USB drive and reload the file(s) after restoring factory defaults.

To determine if custom data is loaded on the device, complete these steps:

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Device** tab.

   A Custom file line displays the configuration name and the cyclical redundancy check (CRC) in the Firmware version column.

Enter an asset tag

You can enter an alpha-numeric identifier in the data field to serve as an asset tag for device identification.

1. Go to the Service tabs as described in “Access the Service tabs.”

2. Touch the **General** tab.
3. Touch and enter up to 20 characters.
4. Touch **OK**.

NOTE If the device language changes, the asset tag remains unchanged.

Enable/disable external USB ports

The external USB ports are enabled by default. Disabling (unchecking) this option cuts off power and data to the external USB ports, making them unavailable for connections and external storage.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **General** tab.
3. If the external USB ports were previously disabled, touch **Enable external USB ports** to provide power to those ports.

   A check now appears in the checkbox.
4. To disable the ports, touch **Enable external USB ports**.

   The checkbox now is empty.

Send device information to PartnerConnect

The device sends technical information, such as log files, to PartnerConnect periodically. You can also manually send this information at any time by following this procedure.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **General** tab.
3. Touch **Sync with server**.
4. If the Enable auto sync was previously disabled touch **Enable auto sync** to automatically synchronize with the server.

   A checkmark now appears in the checkbox.

Self-tests tab

Calibrate the touchscreen

This tab calibrates the touchscreen, if needed.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Self-tests** tab.
3. Touch **Start**.
   a. Touch the location indicated by the device. The device checks the current calibration. If the location coordinates and touched location match, a Calibration Confirmation dialog appears. Touch **OK** to finish.
   b. If the locations do not match, a calibration failure dialog appears. Touch **Calibrate**, and then touch the screen as indicated. When calibration is complete, a Calibration Confirmation dialog appears. Touch **OK** to finish.

Logs tab

View an error or event log

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Logs** tab.
3. View a log report.
   - To view an error log, select **Error.**
   - To view an event log, select **Event.**

Save error and event logs to a USB flash drive

This feature is available in software versions 1.71.03 and later.

You can save a copy of the error and event logs to a USB flash drive.

NOTE Not all flash drives are supported.

1. Connect a flash drive to the USB port.
2. Go to the Service tabs as described in "Access the Service tabs."
3. Touch the **Logs** tab.
4. Touch **Save to USB**.

   A confirmation dialog appears.
5. Touch **OK**.

   Copies of both log files are saved to the drive.

Device tab

View device and module information

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Device** tab.

   Device and module information appears for you to view.

Licensing tab

View device licenses

NOTE After activating a new license, restart the device to complete the activation process.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Licensing** tab.

   A list of available licenses appears. Checks indicate installed licenses.

Password tab

Advanced settings password and password reset

NOTE You cannot access the Service tabs if sensors or physiological alarms are active or if vital sign measurements are displayed.

1. From the **Home** tab, touch the **Settings** tab.
2. Touch the **Advanced** tab.
3. Touch **Enter password**.
4. Enter **6345**, or the custom password for the device, as the access code and touch **OK**.

Configure passwords

NOTE The keyboard for the Password tab is the English keyboard regardless of the language configured on the device.

NOTE New passwords must meet length requirements to be accepted as valid.

NOTE The keyboard for the Password tab does not set the first character to upper case.

NOTE If you forget or lose your password, you cannot access the Password tab. Touch **Lost password** and then contact Hillrom Technical Support: hillrom.com/en-us/about-us/locations/ and provide the code that appears on the screen. Enter your password using the keyboard and touch **OK**.

1. Go to the Service tabs as described in "Access the Service tabs."
2. Touch the **Password** tab.
3. To change the current password, touch **Change password**.
   a. Enter a new password.

      NOTE The password must have between 8 and 32 characters.

      A "Re-enter password" dialog appears.
   b. Touch **OK** and re-enter the new password to confirm the change.

      Either a "Successful password change" or "Failed password change" dialog appears.
   c. Touch **OK** and then proceed as needed. In the case of a failed password change, either try again or cancel the operation.
4. To lock out a user after 10 consecutive incorrect passwords, touch **Enable failed attempt lockout**.

   NOTE The lockout period is 5 minutes.

5. To set an expiration for the current password, touch **Enable password expiration**, and then enter the number of days after setting a password that it will expire.

   Once a valid password is entered the **Advanced** tab appears.

Power-up sequence

The system performs a power-on self test (POST) each time the device 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 system completes power up and the Home tab appears.

To perform the POST:

1. Disconnect any patient cables connected to the device.
2. Insert a fully charged battery into the device.
3. Upon each power up, confirm the following:
   a. The light bar flashes amber.
   b. The startup screen appears.
   c. A beep sounds, followed by one chime.

      NOTE If no chimes sound, replace the speaker as specified in "Remove the speaker."

      NOTE If no chimes sound, replace the speaker as specified in "Replace the speaker."

   d. The product line logo appears at the bottom of the screen.
   e. If a printer is installed, the paper advances slightly.
   f. The Home tab appears.

WARNING Equipment failure risk. The device includes a fan that circulates air through the device. If the fan does not run when you power up the device, remove it from use and inform qualified service personnel immediately. Do not use the device until the problem is corrected.

If the internal self-check is successful, the device shows its normal functions with all values blank and the device is ready for operation. If the self-check fails, an error message appears in the Device status area at the top of the screen. If a fault that could adversely affect the product is detected, the device enters a safe mode and stops monitoring patients. The device remains in safe mode until it is turned off or until it shuts down automatically after a period of inactivity.

If a system error is detected, the device becomes inactive until you press ⏻ 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.

While in safe mode, the red LED bar and the piezo buzzer cycle on and off.

Troubleshooting

This section provides the following tables to help troubleshoot the device.

- **Symptoms and solutions**: These tables list symptoms you might observe, list possible causes, and suggest actions that may eliminate the problem.
- **Technical alarm messages**: These tables list messages generated by the device software when a problem is detected. The tables explain possible causes and suggest actions that can resolve 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."

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.

Symptoms and solutions

Power

Symptom	Possible cause	Suggested action
The device does not power up	A new battery was installed	Connect AC power to wake up the battery.
	The AC power is disconnected	Connect AC power.
	The power cord is defective	Replace the power cord.
	The battery is discharged	Charge the battery.
	The power button is defective	Replace the power button.
	An internal connection is faulty	Check the power-flex cable connection at J6 on the main board.

Symptom	Possible cause	Suggested action
		Check the AC power harness connections from the IEC connector to the power supply.
		Check the power harness from the power supply J2 to J30 on the main board.
		Check the battery power harness from J2 on the battery connector board to J29 on the main board.
	The power supply is defective	Check the output voltage on the power supply. The voltage should be 15 V ± 0.45V DC. If it is not, replace the power supply.
	The battery is defective	Charge the battery for 5 hours. If the battery icon on the display still shows an empty battery symbol, replace the battery.
	The main board is defective	Replace the main board.
The battery doesn't charge or run time is low	The battery is defective	Charge the battery for 5 hours. If the battery icon on the display still shows an empty battery symbol, replace the battery.
	The battery connector board is defective	Check the battery connector board for an open short or broken connector and replace if necessary.
	The battery has reached the end of its useful life	Use the service tool to check cycle count. If the cycle count exceeds 300, replace the battery.

Hardware

Mechanical Symptom	Possible cause	Suggested action
Noisy fan	Dust build up	Use canned air to blow dust out of fan.
	Fan is out of balance	Replace fan.

Mechanical Symptom	Possible cause	Suggested action
Cracks in housing	Non-approved cleaning agents	Replace plastic housing as necessary.
		Use only approved cleaning agents.

Display

Symptom	Possible cause	Suggested action
The touchscreen does not respond	Software error	Reboot the device. Press and hold the power button until the device shuts down. **Note** Any configuration settings not saved as default will be lost. Press the power button to restart.
	The touchscreen is out of calibration	In Advanced Settings, touch the **Service > Self-tests** tabs, then recalibrate the screen.
	The touchscreen lock is activated	To unlock the touchscreen, touch at the bottom of the screen. To disable the touchscreen lock, touch the **Settings > Device** tabs, then uncheck **Allow display lock timeout**.
	An internal connection is faulty	Check the connection at J48 on the main board with display flex cable.
	A display flex cable is broken	Replace the touchscreen and display assembly.
	The main board has a faulty touchscreen controller	Replace the main board.
	Excessive force or prolonged rubbing in an area of the touchscreen	Replace the touchscreen.
The display is blank when the power is on	The device is in Power-Saver mode	Wake the display by touching the screen or the power button.
	The device powered down after a period of inactivity	Turn on the device by pressing the power button. In Advanced Settings, touch the **General > Display** tabs, then set **Device power down** to the desired interval.

Symptom	Possible cause	Suggested action
	An internal connection is faulty	Check the display harness connections at the display and J19 on the main board. Replace the cable if damaged.
	A cable is damaged	Replace the cable.
The display is dim	The brightness setting is too low	Increase the brightness setting. Touch the **Settings > Device** tabs, touch **Defaults**, then set **Display brightness** to the desired level.
	The display has reached the end of its useful life	Replace the display.

User interface

Symptom	Possible cause	Suggested action
Unable to access advanced settings or enter the advanced settings code	Patient monitoring is active or being simulated	Discontinue patient monitoring or stop the simulation.
	The parameter alarm is on	Dismiss the alarm.
	Intervals are turned on	Stop intervals.
Desired profile does not appear in the Profiles tab	The profile license is not installed	In Advanced settings, touch the **Service > Licensing** tabs. Verify that the profile license box is checked. If not, purchase the license and install it using the service tool.
	The profile is not enabled	In Advanced settings, touch the **Device** tab, then check the profile(s) you want to enable.

Communication

Symptom	Possible cause	Suggested action
Cannot communicate through the USB client connection	The battery charge is low	Connect the device to AC power and allow the battery to fully charge.
	The communications board does not receive power	Check the voltage from J49 on the main board for +5.0, ±0.5V DC. Replace the main board if necessary.
	The USB client is defective	Test the connection by connecting a PC running the service tool. Verify that the service tool is configured properly on the PC to communicate with the device. See the service tool help files.
		Replace the power cable to the communications board.
USB accessories do not communicate with the monitor	The accessory is defective	Replace with a known good accessory.
	The communications board is not receiving power	Check the voltage from J49 on the main board for +5.0, ±0.5V DC. Replace the main board if necessary.
	One or more USB host connections are defective	Test the connection with a USB thumb drive. If no power or enumeration is present, such as an LED on a thumb drive, replace the communications board.
	A USB connection from the communications board to the main board is faulty	Verify that the USB cables are connected correctly.
		Replace the USB cables.
The device does not communicate via Ethernet with the computer network	The device is not configured properly	Check the settings with your network administrator.
	The communications board is not receiving power	Check the voltage from J49 on the main board for +5.0, ±0.5V DC. Replace the main board if necessary.
	The Ethernet connection from the main board is faulty	Test the internal Ethernet cable. Replace if necessary.
		Verify that the shim is installed, if required, on the Ethernet cable connector at J11. See the reassembly notes for the main board.

Symptom	Possible cause	Suggested action
	The network Ethernet switches are not set to the correct speed to work with the device	Set the switches to 10 Mbps full duplex.
	The cable run to the switch is too long	Use a shorter patch cable.
The radio does not connect to the network	The device is out of range of the access point	Check the network status screen's RSSI value.
	The device is not configured properly	Check the settings with your network administrator.
	The antenna is defective	Check the antenna cable and antenna connection. Replace the cable and antenna if necessary.
	The communications board is not receiving power	Check the voltage from J49 on the main board for +5.0, ±0.5V DC. Replace the main board if necessary.

Alarms

Symptom	Possible cause	Suggested action
The light bar does not turn on	No alarm was triggered	Verify that the light bar flashes when the system starts.
		Verify that the alarm is triggered by a visual indicator in the message status area and an audio alarm occurs.
	There is a faulty connection	Check the light-bar harness and connections at the light bar and J46 on the main board. Replace the defective cable if necessary.
	The light-bar board is defective	Apply +3.3V to pin 1 of the harness and ground to pin 2. Verify that the amber LEDs illuminate. Connect the ground to pin 3. Verify that the red LEDs illuminate. If one or both do not illuminate, replace the LED light bar.
	The main board is defective	Verify that there are +3.3V at pin 1 of J46 on the main board.
No audible alarm occurs	No alarm was triggered	Verify that the alarm is triggered by a visual indicator in the message status area

Symptom	Possible cause	Suggested action
		and light bar. Listen for audible sounds on start up.
	The alarm audio is set to Off	Touch the **Alarms > General** tabs, then select **Alarm audio on**.
		In Advanced settings, touch the **General > Alarms** tabs, then disable **Allow user to turn off general audio**.
	The alarm audio is set too low	Touch the **Alarms > General** tabs, then set **Volume** to the desired level.
		In Advanced settings, touch the **General > Alarms** tabs, then set **Minimum alarm volume** to the desired level.
	There is a faulty connection	Check the speaker harness and connections at the speaker and J12 on the main board. Replace the defective cable if needed.
	The speaker is defective	Replace the speaker.
	The main board is defective	Test speaker output using an oscilloscope on J12.

NIBP

Symptom	Possible cause	Suggested action
The NIBP frame on the display is blank	The USB cable is defective	Replace the USB cable.
	The NIBP module is not connected	Check the internal USB connection.
	The NIBP module is not functional	Check the error logs for NIBP errors. See the service tool help files for details on specific errors and suggested actions.
		Check with Welch Allyn for software updates.
	If no NIBP error is logged, the main board might be defective	Replace the main board if necessary.

SpO2

Symptom	Possible cause	Suggested action
The SpO2 frame on the display is blank	The USB cable is defective	Replace the USB cable.
	The SpO2 module is not connected	Check the internal USB connection.
	The SpO2 module is not functional	Check the error logs for SpO2 errors. See the service tool help files for details on specific errors and suggested actions.
		Check with Welch Allyn for software updates.
	If no SpO2 error is logged, the main board might be defective	Replace the main board if necessary.

SpHb

Symptom	Possible cause	Suggested action
The SpHb frame on the display is blank	The UI license is not installed.	Purchase a license and install the license using the service tool.
	The wrong sensor is connected.	Use a sensor that supports the SpHb parameter.
	The sensor or cable expired.	Replace the sensor or cable.
	The sensor or cable is defective.	Replace the sensor or cable.
	The Masimo SpO2 module does not have the SpHb parameter enabled.	Purchase the parameter and install using the service tool.
The SpHb frame is unavailable	The selected profile does not support SpHb.	Change the profile to Intervals Monitoring or Continuous Monitoring.

ECG

Symptom	Possible cause	Suggested action
No LTA alarm associated with patient injury or death	LTA license not installed	Remove device from service, contact Welch Allyn Technical Support, and return to Welch Allyn for service.
	V-Tach, V- Fib, Asystole detection disabled	
	invalid data	

Symptom	Possible cause	Suggested action
No LTA or ECG tile shows Arrhythmia detection off	Alarms off in advanced settings	Turn on alarms.
	No license	Install license.
	ECG module unable to detect arrhythmias	Contact Welch Allyn Technical Support.
		Replace the module if necessary.
No ECG pane	Module not connected	Check ECG module LED.
	Faulty patient cable	Check cable.
	Faulty module cable	
	CVSM software does not support ECG	Update software.
	Profile not set to Continuous Monitoring	Set profile to Continuous Monitoring.
ECG tile disabled	Patient type set to Neonate	Change patient type to Adult or Pediatric.
No waveform	Start button not activated	Touch **Start** on ECG tile to begin waveform streaming.
	ECG gain too high	Reduce ECG gain.
	Patient type set to Neonate	Change patient type to Adult or Pediatric.
Noisy waveform	50 or 60 Hz filter disabled	Enable filter.
	Wrong mains filter value selected (50 Hz versus 60 Hz)	Set the filter to the correct mains frequency for your location.
	Poor lead placement	See DFU for proper placement.
No pacer or ECG tile shows pacer detection off	Pacer detection Off	Touch the **Settings** > **Setup** tabs, then touch the **ECG** vertical tab. Enable **Patient has a pacemaker**.
	ECG module unable to detect pacer	Contact Welch Allyn Technical Support.
		Replace the module if necessary.
No alarming snapshot was auto-printed	Device does not have a printer	None. Connex IWS does not have a printer.

Symptom	Possible cause	Suggested action
Printed waveform is too small	ECG gain and/or sweep speed is set too low	Increase gain and/or sweep speed and reprint.
Snapshot button is disabled	An alarming snapshot is in progress	Wait for up to one minute for the button to enable.
	Less than one minute has elapsed between snapshots	
Module LED off	Module is not receiving power	Replace cable.
Module LED yellow	Internal error	Power cycle device or disconnect and then reconnect cable.
Module LED steady green	Module powered on	Working as designed.
Module LED flashing green	Sending data	Working as designed.

Weight scale

Symptom	Possible cause	Suggested action
Weight does not appear in manual parameter frame	The weight was not selected in Advanced settings	In Advanced settings, touch the **Parameters** tab, then select **Weight**. **Note** You can select only four manual parameters.
	The weight scale is not licensed	Purchase a license and install the license using the service tool.
	The weight scale is not connected	Check cables and connections. Use the service tool to test connectivity. Replace cables.
	The weight scale is not configured	Consult the scale directions for use.

Temperature

Symptom	Possible cause	Suggested action
The temperature frame on the display is blank	The USB cable is defective	Replace the USB cable.
	The temperature module is not connected	Check the internal USB connection.
	The temperature module is not functional	Check the error logs for temperature errors. See the service tool help files for

Symptom	Possible cause	Suggested action
		details on specific errors and suggested actions.
	If no temperature error is logged, the main board might be defective	Replace the main board if necessary.

Braun ThermoScan PRO 4000 thermometer

Symptom	Possible cause	Suggested action
The thermometer batteries don't charge	The rechargeable battery pack no longer takes a charge	Replace the rechargeable battery pack.
	Primary AA batteries are installed in the thermometer	Replace the batteries with a rechargeable battery pack.
The dock LED is green, but the battery is low or depleted	Primary AA batteries are installed in the thermometer	Replace the batteries with a rechargeable battery pack.
	The dock is defective	Replace the dock.
Thermometer readings do not transfer to the device	The external USB cable is unplugged	Check the external USB connection.
	The USB bus has stopped communicating with the Braun dock. (The device displays wrench error #00000014.)	Reboot the host device.

NOTE For additional troubleshooting tips for the thermometer, see the manufacturer's product documentation.

Braun ThermoScan PRO 6000 thermometer

Symptom	Possible cause	Suggested action
Braun measurements are inaccurate	Probe lens is displaced	Examine lens for displacement. If you observe a gap in the seam between the bezel and the lens, replace the thermometer.
	Use inconsistent with DFU	See DFU for proper operation. Perform the Braun functional verification test using the service tool or the manual test described in this manual. Replace as necessary.
	Ingress of cleaning solutions has corroded the electronics	Replace the thermometer. Review cleaning procedures in the DFU.

Symptom	Possible cause	Suggested action
Temperature tile displays ++ Braun displays HI 	Temperature taken is not within typical human temperature range. HI will be displayed when temperature is higher than 108°F (42.2°C).	Change probe cover to reset. Then, make sure thermometer is properly inserted and take a new temperature.
Temperature tile displays - - Braun displays LO 	Temperature taken is not within typical human temperature range. LO will be displayed when temperature is lower than 68°F (20°C).	
Braun displays "POS" error 	The infrared monitor cannot find a temperature equilibrium and allows no measurement.	Change the probe cover to reset. Restrict patient movement and ensure that the positioning of the probe is correct and remains stable while taking new temperature.
Braun displays "Err" error 	Ambient temperature is not within the allowed operating range (50 – 104 °F or 10 – 40 °C) or changing too rapidly.	Wait 20 seconds until thermometer turns off automatically, then turn on again. Ensure thermometer and patient are in an environment for 30 minutes where the temperature is between 50 °F and 104 °F or 10 °C and 40 °C.
Braun display is blank or displays all icons 	System error	Wait 20 seconds until the thermometer turns off automatically, then turn on again. If error persists, reset the thermometer by removing the batteries and putting them back in. If error still persists, batteries are dead. Insert new batteries. If error still persists, contact local Welch Allyn Service Center or representative.
Braun displays Alert icon with "1" in lower right corner 	Technique Compensation (PerfecTemp) technology is not functioning or disabled	Open the temperature tab in Advanced settings to configure PerfecTemp*.

Symptom	Possible cause	Suggested action
Braun displays Alert icon with "U" in lower right corner	Unadjusted Operating Mode is enabled	Open the temperature tab in Advanced settings to configure Unadjusted Operating Mode*.
C/F button is not functional	Celsius only enabled	Open the temperature tab in Advanced settings to disable Celsius only selection*.
Pulse timer button is not functional	Pulse timer disabled	Open the temperature tab in Advanced settings to enable pulse timer*.
Braun displays lock icon and is unresponsive	Security mode enabled and anti-theft timer has expired	Return Braun thermometer to dock to unlock. Security mode is set on temperature tab in Advanced settings.
Braun display is blank after performing upgrade	Software upgrade was interrupted	Remove and replace the battery while holding the C/F button or return to the dock while holding the C/F button. Retry upgrade.

*Host device Braun 6000 settings override configuration settings from Welch Allyn Service Tool.

NOTE For additional troubleshooting tips for the thermometer, see the manufacturer's product documentation.

Manual parameters

Symptom	Possible cause	Suggested action
The manual parameter frame does not appear on the Home tab	No manual parameters are selected in Advanced settings	In Advanced settings, touch the **Parameters** tab, then select the desired manual parameters. **Note** You can select only four manual parameters.
BMI is not displayed	The BMI parameter is not selected	Select the BMI parameter in the advanced settings.
	Height or weight was changed	Adjusting the height or weight clears BMI.
	Weight scale not connected	BMI is available only from a weight scale with height.

Printer

Symptom	Possible cause	Suggested action
The printer does not print	The reactive side of the thermal paper does not face the print head	Reverse the printer paper.
	The thermal paper is wet	Clean and dry the inside of the printer housing and replace the printer paper.
	The USB cable is defective	Replace the USB cable.
	The printer module is not connected	Check the internal USB and power harness connection.
	The printer does not have power	Check J17 on the main board. For more information, see "Interconnect diagram."
	The printer module does not function	Replace the printer module.
	The power harness is defective	Test the power harness. Replace if necessary.
	If no printer error is logged, the main board may be defective	Check the error logs for printer errors. Replace the main board if necessary.
	The printer fuse has blown; check MCE printer fuse F5	Replace the MCE PCBA.

Barcode reader

Symptom	Possible cause	Suggested action
The barcode reader powers on but does not transfer data	No license is installed	Purchase a license and install the license using the service tool.
	The barcode reader is not programmed to use USB Com Port Emulation mode	Refer to the manufacturer's documentation to program the barcode reader to USB COM Port Emulation mode.
	The barcode reader is not supported	For Honeywell model 4600g barcode readers, verify that the PID is set to 020A.
	The barcode scanner did not enumerate properly	Power cycle the Connex device.

Symptom	Possible cause	Suggested action
The patient ID or clinician ID do not match	The barcode scanner is not programmed to properly interpret the barcode	Program the barcode scanner to turn on required symbology and to also add or delete characters to form correct ID.

Errors

Symptom	Possible cause	Suggested action
#000000001	An internal software error	Power down and restart. If the error persists, call Welch Allyn Technical Support for service.
#000000002	An unclassified hardware error	
#000000003	Graphics RAM POST	
#000000004	System RAM POST	
#000000005	Watchdog POST	
#000000006	FLASH initiation failed	
#000000007	A display system error	
#000000008	A real-time clock error	
#000000009	An audio system error	
#000000010	An Ethernet system error	
#000000011	The touchscreen controller failed	
#000000012	Five or more SMBUS errors over a 1-minute period occurred	
#000000013	The communications module or main board failed	
#000000014	Main board USB hub failure	
#000000015	Software watchdog timer reset	

Technical alarm messages

This section presents tables of technical alarm and information messages to help you troubleshoot issues on the device. For information about physiological, dialog, or informational messages, see the device's directions for use.

When the device detects certain events, a message appears in the Device Status area at the top of the screen. Message types include the following:

- **Information messages** appear on a blue background.

- **Very low-priority alarms** appear on a cyan background.
- **Low- or medium-priority alarms** appear on an amber background.
- **High-priority alarms** appear on a red background.

Technical alarm messages are low priority or very low priority unless noted in the Message column.

You can dismiss a message by touching the message on the screen, or, for some messages, you can wait for the message to time out.

To use these tables, locate the message that appears on the device in the left column of the table. The remainder of the row explains possible causes and suggests actions that can resolve the issue.

If you cannot resolve the issue, use the service tool to read the error log files or use the service tool to perform a functional test[1] on the module reporting the message.

NIBP messages

Message	Possible cause	Suggested action
Alarm		
NIBP air leak; check cuff and tubing connections.	The NIBP module has an air leak	Check the cuff, tubing, and connections for leaks. If no leaks are found, retake the measurement. If the message reappears, replace the NIBP module.
NIBP not functional. Call for service.	Internal errors or messaging errors occurred	Check the error logs for NIBP errors. See the service tool help files for details on specific errors and suggested actions.
		Check with Welch Allyn for software updates.
	The ambient temperature is out of range	Use the monitor in the specified temperature range.
Unable to determine NIBP; check connections; limit patient movement.	Pressure exceeded the maximum limit for this patient mode	Check connections; limit patient movement. Clear the alarm and retry NIBP.
Unable to determine NIBP; check connections and tubing for kinks.	NIBP tubing on the outside of the device is kinked	Check the connections and tubing for kinks. Clear the alarm and retry NIBP.
	The NIBP module needs to be calibrated	Perform NIBP calibration.
	Tubing inside the NIBP module is kinked	Replace the NIBP module.
Incorrect NIBP cuff size; check patient type.	A neonate cuff is in use with the monitor in adult or pediatric mode	Check the patient type and cuff size. Clear the alarm and retry NIBP.

[1] Requires the service tool, Gold licensed edition.

Message	Possible cause	Suggested action
Inflation too quick; check NIBP cuff and tubing connections.	NIBP inflation was too quick	Check the connections and tubing for kinks. Clear the alarm and retry NIBP.
Unable to determine NIBP; check inflation settings.	Target pressure was too low	Check inflation settings and change as necessary. Clear the alarm and retry NIBP.
		Change the inflation setting.
	Too many attempts	Change the inflation setting.
Information		
User cancelled NIBP reading.	Blood pressure reading cancelled by user	Touch **OK** to dismiss. Touch NIBP Start button to dismiss and restart the NIBP reading.
Tube type does not match device configuration. (NIBP measurement is available)	The tube type connected to the monitor does not match the NIBP configuration.	Touch **OK** to dismiss. Configure the NIBP advanced settings to match the tube type, patient type, and algorithm.
	The single lumen switch on the NIBP connection is stuck	Use a small screw driver to press the switch in and release until the spring returns the switch to the dual-lumen position.
Excessive patient movement.	The NIBP reading was deemed not precise	Touch **OK** to dismiss. Limit patient movement and restart the NIBP measurement.

SpO2 and SpHb messages

Message	Possible cause	Suggested action
Alarm		
SpO2 not functional. Call for service.	The sensor is defective	Replace the SpO2 sensor with a known good sensor.
	An internal error occurred	Update the host software to the current version.
		Check the error logs for SpO2 errors. See the service tool help files for details on specific errors and suggested actions.

Message	Possible cause	Suggested action
		Check with Welch Allyn for software updates.
Attach SpO2 sensor to monitor.	The sensor was not detected	Check the sensor connection.
		Replace the sensor.
Replace the SpO2 sensor.	The sensor is faulty	Replace the sensor.
	The sensor expired (applies only to SpO2 / SpHb sensors)	Replace the sensor.
	No sensor is connected	Connect the sensor.
	The patient cable is faulty	Replace the cable.
	The SpO2 module is faulty	Verify module functionality by replacing the sensor with the applicable SpO2 tester. If the message persists after you have installed the SpO2 tester, replace the module.
Searching for SpO2. (High-priority alarm)	The SpO2 sensor is not attached to the patient's finger	Touch the alarm icon or the SpO2 frame to dismiss the alarm.
		Set the SpO2 Alarm limits to **Off**.
		Reattach the SpO2 sensor to the patient's finger.
Low SpO2 signal quality. Check sensor. Low SpHb signal quality. Check sensor. Low perfusion. Check sensor.	Poor sensor placement on the patient.	Remove the sensor from the patient and reapply.
	The patient cable or sensor is defective	Replace the patient cable or sensor.
	The SpO2 module is faulty	Verify module functionality by replacing the sensor with the applicable SpO2 tester. If the message persists after you have installed the SpO2 tester, replace the module.
SpO2 mode only. Check sensor or cable.	The sensor is operating as an SpO2-only sensor because it failed to calibrate properly	Reattach the cable to the monitor.
		Remove the sensor from the patient and reapply.
SpO2 sensor expires in... **Note** This message appears only on devices configured with SpHb.	The sensor will expire soon	Replace the sensor.

Message	Possible cause	Suggested action
Replace the SpO2 cable.	The cable is not functioning properly	Replace the cable.
	The SpO2 module is faulty	Verify module functionality by replacing the sensor with the applicable SpO2 tester. If the message persists after you have installed the SpO2 tester, replace the module.

Temperature messages (SureTemp)

Message	Possible cause	Suggested action
Alarm		
Connect temperature probe.	No probe is connected	Connect a temperature probe and retry.
	The probe is faulty	Replace the temperature probe.
	The temperature module returned a connect probe message	Connect a temperature probe and try again. If a probe is already connected, replace the probe.
	The SureTemp temperature module is faulty	Verify module functionality by replacing the temperature probe with the CAL-KEY assembly. If the message persists after you have installed the CAL-KEY assembly, replace the module.
Insert correct color-coded probe well.	The probe well is missing	Insert a temperature probe well.
	The SureTemp temperature module is faulty	Verify that the lever arm on the back of the probe well housing is engaging switch SW1 on the temperature PCBA. If the problem persists, replace the module.
Replace temperature probe.	The probe is faulty	Replace the temperature probe.
	The SureTemp temperature module is faulty	Verify module functionality by replacing the temperature probe with the CAL-KEY assembly. If the message persists after you have installed the CAL-KEY assembly, replace the module.

Message	Possible cause	Suggested action
Retry temperature measurement. **Note** This message often accompanies other temperature messages.	A probe heater or data error occurred	Retry the temperature measurement. If the problem persists, replace the probe.
	User settings require adjustment	Adjust the user settings and retry.
	The ambient temperature is out of range	Operate the monitor within the specified temperature range. Retry patient temperature measurement.
	The SureTemp temperature module is faulty	Verify module functionality by replacing the temperature probe with the CAL-KEY assembly. If the message persists after you have installed the CAL-KEY assembly, replace the module.
Temperature time limit exceeded. Retry temperature measurement.	The direct mode timed out	Return the temperature probe to the probe well and retry measurement.
Information		
Tissue contact lost.	Lost tissue contact while attempting to acquire temperature reading or acquired reading was performed with limited tissue contact	Touch **OK** to dismiss the message. Start a new temperature reading.

Temperature messages (Braun ThermoScan PRO)

Message	Possible cause	Suggested action
Alarm		
Unable to detect temperature. Retry measurement.	Measurement was not taken Measurement recalled from memory	Retry measurement.
	Loose or broken USB cable	Check USB connection and cable. Replace as necessary.
	Dead battery Braun display is blank or battery icon shows one bar	Recharge or replace battery.
	Braun displays "POS" error	Change the probe cover to reset. Restrict patient movement and ensure that the positioning of the probe is correct and remains stable while taking new temperature.
	Braun displays "Err" error Ambient temperature is outside the allowed operating range (50–104 °F or 10–40 °C) or changes too rapidly	Wait 20 seconds until thermometer turns off automatically, then turn on again. Ensure thermometer and patient are in an environment for 30 minutes where the temperature is between 50 °F and 104 °F or 10 °C and 40 °C.
Thermometer might be docked improperly.	Thermometer is not properly docked	Re-dock thermometer.
	Thermometer has dirty contacts	Clean dock and thermometer contacts with 70 percent isopropyl alcohol. See Cleaning Instructions for Braun ThermoScan PRO 6000.
Braun temperature not functional. Call for service.	Communication timeout BDD transfer took longer than expected POST did not complete or failed within the expected time period	Remove and replace battery to reset, then return thermometer to dock. If error persists, return for service.

Message	Possible cause	Suggested action
	POST failure Braun display is all icons or blank	
	Unsupported parameter Sensor data definition error (occurs when the proxy is unable to set parameters to the sensor using local DDS)	
	WACP serialization failure	
	Braun maximum battery voltage exceeded Battery voltage is too high	
	Braun BDD compatibility	
	Braun BDD unexpected compatibility	
	Braun send message failure	
	Braun bridge failure	
Temperature is not functional. Call for service.	An internal error occurred	Check the error logs for temperature errors. See the service tool help files for details on specific errors and suggested actions.
		Check with Welch Allyn for software updates.
	The USB cable is disconnected	Check the USB cable.
	The battery is depleted or missing	Replace the batteries.

ECG messages

Message	Possible cause	Suggested action
Alarm		
Electrodes off:	Device is configured for 5 leads, but you are using 3 leads	Ensure that the device is configured for the appropriate number of leads in Advanced settings.
IEC electrodes (N, F, R, L, C)	(N, F, R, L, C) disconnected	Connect (N, F, R, L, C) lead.

Message	Possible cause	Suggested action
AHA electrodes (RA, LA, LL, V)	(RA, LA, LL, V) disconnected	Connect (RA, LA, LL, V) lead.
Electrode x off.	One lead is disconnected	Check the connections of all leads.
ECG not functional.	ECG module error, WACP error, Data failure	Check the USB cable and connections.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
	ECG module has not transmitted ECG data for the past 30 seconds	Check the USB cable and connections.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
	ECG module disconnected	Check the ECG module connection to Connex device.
	Unexpected alarm compatibility bits	Restart the Connex device and the ECG module; if the error persists, contact Customer Care.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
Cannot analyze ECG.	Module unable to analyze the ECG signal for V-Tach, V-Fib, and/or asystole	Check electrodes and leads, and replace as needed.
		Check the patient cable connection to the ECG module.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
Cannot measure ECG.	ECG module has been unable to detect and ECG waveform for the past 30 seconds	Check electrodes and leads, and replace as needed.

Message	Possible cause	Suggested action
		Check the patient cable connection to the ECG module.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
Searching for respiration.	ECG unable to measure patient respirations	Check electrodes and leads, and replace as needed.
		Check the patient cable connection to the ECG module.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
	You are not using Lead II to view respiration	Ensure that you are viewing Lead II for respiration.
	Attempting to acquire ECG/ Impedance respiration	Check electrodes and leads, and replace as needed.
		Check the patient cable connection to the ECG module.
		Perform functional test. If the test fails, contact Customer Care and replace the ECG module if necessary.
Respiration alarm limits changed.	Respiration physiological alarm limits were modified because the respiration source changed	Reset alarm limits.

Weight scale messages

Message	Possible cause	Suggested action
Weight scale not functional. Call for service.	The weight scale is not operating properly	Check the scale.
		Use the service tool to check connectivity with adapter.
		Replace cables.

Message	Possible cause	Suggested action
		Replace adapter.

Communications module messages

Message	Possible cause	Suggested action
Communications module did not power on properly. Power down the device. (High-priority alarm)	The communications board is not connected properly to the main board	Check the USB connection at J4. Check the Power connection at J50. Check the voltage from J49 on the main board for +5.0V ±0.5V DC. Replace the main board if necessary.
	The communications board malfunctioned	Replace the communications board.

Radio messages (Lamarr)

Message	Possible cause	Suggested action
Alarm		
Radio not functional. Call for service.	A hardware failure occurred	Replace the radio.
	The radio has the wrong software	Update the radio software.
Radio error. Power down and restart.	The monitor and the radio failed to establish communication with each other	Power down and restart the monitor. If the problem persists, check the following: • The USB and power connections from the main board to the communications board. • The connection from the radio board to the communications board. • Monitor and radio software compatibility. Replace the radio if necessary.
Unable to establish network communications. Radio out of network range.	The radio is no longer communicating with the access point	Verify that the monitor is within the radio coverage area. Verify that the radio is correctly configured to the network. If this message appears intermittently, check the RSSI value.

Message	Possible cause	Suggested action
Unable to establish network communications. Call for service.	Unable to get an IP address from the DHCP server	Verify that a DHCP sever is available on the network. The monitor requires an IP address from a DHCP server.
Radio Software upgrade failed.	The connection with the host was broken	Re-establish the connection and try again.
	The radio was not provisioned correctly	Reset radio to factory defaults and try again.
	Hardware error	Replace the radio.
Information		
Radio software upgrade in progress. Do not shut down.	Radio software is being written to the radio	Do not interrupt the upgrade until complete.
Radio card rebooting; please wait.	The radio is restarting as part of the software upgrade	Do not interrupt the upgrade until complete.

Radio messages (Newmar)

Message	Possible cause	Suggested action
Alarm		
Radio not functional. Call for service.	Internal radio/communication error	Reboot radio. If error persists, reinstall software.
		If error persists after reinstalling software, check for a software update and apply it.
		If error persists after updating software, replace the radio.
Unable to establish network communications.	Unable to associate with access point after 30 seconds	Check radio configuration.
		Consult IT and check network.
	Unable to authenticate after 30 seconds	Check radio configuration.
		Consult IT and check network.
		If using FIPS, verify that authentication types are compatible with FIPS.
Radio card DHCP timeout.	Unable to establish communications between radio and DHCP server (network)	Check DHCP server.
		Check radio configuration settings.

Message	Possible cause	Suggested action
	DHCP request timed out before obtaining DHCP address	
Invalid radio configuration. Reconfigure and try again.	Radio configuration error	Consult IT to verify that wireless radio settings match network settings.
		If using FIPS, verify that authentication types are compatible with FIPS.
		If problem persists, reset to factory defaults.
		If problem persists after factory reset, check for a software update and apply it.
		If problem persists after updating software, replace the radio.
Lost network communications. Radio out of network range.	Radio was communicating but is out of range, lost power, or for some other reason is no longer able to continue communications with the access point	Move device into network coverage area.
		Check access point and ensure it is powered on.
		Verify that RSSI value is greater than -65 dbi.
		Verify wireless radio settings.
		Check network configuration.
Configuration invalid without certificates. Install certificates and try again.	Radio configuration certificate error	Verify that certificate settings are correct and not expired.
		Load certificates.
		Verify radio configuration settings and authentication types.
		If problem persists, reset to factory defaults and reload certificates.
		If problem persists after factory reset, check for a software update and apply it.
		If problem persists after updating software, replace the radio.

Message	Possible cause	Suggested action
Information		
Certificate load failed.	Radio customer certificate did not load	Check that certificate includes all required items.
		Check certificate server log.
Certificate load successful.	Radio customer certificates loaded successfully from the host	No action required.

Ethernet messages

Message	Possible cause	Suggested action
Alarm		
Network not found; check network cable connection.	A network cable is unplugged	Check the network cable connection.
	A network connection is broken elsewhere	Check network wiring.

USB messages

Message	Possible cause	Suggested action
Alarm		
External device not recognized.	An unrecognized external device is connected	Reconfigure the external device.
		Replace the external device.
		Disconnect the unsupported device.
USB Communication failure. Call for service	An internal or external device is connected but failed enumeration	Power down and restart.
		Check the external device.
		Check external and internal USB connections.
Information		
External device not licensed for use.	A device requiring a license has been connected to the USB connection	Obtain an authorization code from Welch Allyn to activate the license.
Unable to save configuration to USB.	There was a problem writing the configuration file to the USB flash drive	Use a Welch Allyn approved flash drive.

Message	Possible cause	Suggested action
		Verify that the flash drive is not locked.
		Verify that there is space available on the flash drive.
Unable to read configuration from USB.	There was a problem reading the configuration file to the USB flash drive	Restart and try again.
USB accessory disconnected.	The USB cable between an external device and the monitor is disconnected	Confirm that the USB cable is connected to the device and the monitor.

System messages

Message	Possible cause	Suggested action
Alarm		
Set date and time.	The date or time is not set	Set the date and time.
	The date or time is not set properly	Reset the date or time.
Incompatible Welch Allyn device.	A known USB device enumerates, but fails	The device may be faulty. Test a known good device.
Unexpected restart occurred. Call for service.	A system error caused the monitor to restart	Check Event and Error logs. Run the service tool verification test.
Information		
Device shutdown is not available at this time.	The device cannot perform an immediate shutdown	Touch **OK** to dismiss message. If any process is active, wait for it to complete before attempting shutdown.
		If the device is unresponsive, hold down the power button until device shuts down. **Note** Any configuration changes not saved as default are lost.

Battery power manager messages

Message	Possible cause	Suggested action
Alarm		

Message	Possible cause	Suggested action
Low battery 5 minutes or less remaining. (High-priority alarm)	Battery power is extremely low	Plug the monitor into AC power. If not plugged in, the monitor automatically powers off.
Battery is absent or faulty.	There is no battery in the monitor	Insert a battery.
Battery is absent or faulty. Call for service.	The battery is faulty	Replace the battery.
Low battery 30 minutes or less remaining.	The battery power is low	Touch the alarm icon to dismiss or plug the monitor to AC power.
Information		
Device is operating in battery mode.	The AC power cord has been disconnected	Touch the alarm icon to dismiss or plug the monitor to AC power.

Configuration Manager messages

Message	Possible cause	Suggested action
Alarm		
Unable to load configuration; using factory defaults.	A configuration load error occurred	Restore factory defaults. If the error persists, replace the main board.
Functional error. Call for service.	A critical configuration load error occurred	Replace the main board.
Information		
No connection for send.	The monitor is not configured to the network	In Advanced settings, touch the **Data Management > Clinical Data** tabs, then disable **Automatically send on manual save** if you only want to store readings on the device.
		If your want to send readings, then configure the device to the network.

Patient data management messages

Message	Possible cause	Suggested action
Alarm		
Maximum number of patient records saved. Oldest record overwritten.	The maximum number of patient records has been saved on the device	Go to the Review tab and delete old records to prevent the alarm from appearing when new records are saved.
Information		
No data saved.	No patient data is available	Take or enter vital signs before saving.
Patient ID required to save data.	The configuration requires a patient ID to save data	In Advanced settings, touch the **Data management** > **Patient** tabs, then disable **Require patient ID to save readings**.
Clinician ID required to save data.	The configuration requires a clinician ID to save data	In Advanced settings, touch the **Data management** > **Clinician** tabs, then disable **Require clinician ID to save readings**.
Patient ID required to send data.	The configuration requires a patient ID to send data	Add a patient ID.
Patient list is full. Delete some patients to add more.	The maximum number of patients was exceeded	Delete a patient from the list to add a new patient.
Stop intervals to select new patient.	The device is set to take interval readings	Stop intervals before changing the patient.
No connection for send.	No connectivity is available to support sending data manually or automatically sending data on manual save	Check the network connection.
		Check the Radio Configuration settings.
Unable to identify clinician.	The clinician ID or password is incorrect	Confirm the clinician ID and password (if applicable), and retry.
Unable to retrieve list.	The device is unable to retrieve a patient list from the network	Check the network connection.
		Check the Radio Configuration settings.
		Verify that the server is available.

Network messages

Message	Possible cause	Suggested action
Lost connectivity with host.	The central station or other host application has stopped running or is not operating properly	Confirm that the host application is running properly.
Failed to authenticate to server.	Device is configured for server authentication, but server authentication failed for one of the following reasons: • the domain name of the server does not match the one reported in the server certificate • the certificate is expired (no longer within the validity period) • the certificate has not been verified • the certificate has been revoked	Make sure server certificates are valid. Make sure the correct CA certificate file exists on the device to authenticate the server certificate. Check the server configuration. Make sure authentication is configured correctly.
	The server is not configured for authentication	Disable the server authentication option on the device.

Disassembly and repair

This chapter is divided into two major subsections, defined in the table below.

Section A	Section B (IEC 60601 3rd- and 4th-edition compliant)
Devices meeting these criteria: • Manufactured before 11/2017* • MCE hardware version P3 or earlier (see the right pane on the Advanced Settings tab) • Built before serial number* 100043244817	3rd-edition devices meeting these criteria: • Manufactured after 11/2017* • MCE hardware version P5 or later (see the right pane on the Advanced Settings tab) • Built after serial number* 100043244817 4th-edition devices meeting these criteria: • Manufactured after 12/2018**

* See "Monitor serial number and model label" in the Appendix for serial number format and meaning.

**See Customer Service Bulletin 80022414 CSB – CVSM/CIWS IEC 60601 4th Edition for the exact manufacturing cutoff and start dates as well as the serial number for the first 4th-edition device.

Section A	Section B (IEC 60601 3rd- and 4th-edition compliant)
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* See "Device serial number and model label" in the Appendix for serial number format and meaning.

**See Customer Service Bulletin 80022414 CSB – CVSM/CIWS IEC 60601 4th Edition for the exact manufacturing cutoff and start dates as well as the serial number for the first 4th-edition device.

Examine your device to determine which subsection you should follow to complete disassembly and repair procedures.

This overview includes exploded views of the rear housing and main chassis that include callouts referencing the parts. These exploded views apply to both Section A and Section B, though certain parts are labeled as specific to one section or set of devices and not the other. In the instructions, numbers in parentheses refer to callouts in the exploded drawings. Except where otherwise noted, the reassembly procedure is the reverse of the disassembly procedure.

This overview includes exploded views of the front externior and rear interior that include callouts referencing the parts. These exploded views apply to both Section A and Section B, though certain parts are labeled as specific to one section or set of devices and not the other. In the instructions, numbers in parentheses refer to callouts in the exploded drawings. Except where otherwise noted, the reassembly procedure is the reverse of the disassembly procedure.

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

- **Reassembly notes**: This contains information specific to reassembly not addressed in the disassembly instructions, especially when reassembly is not a simple reverse of disassembly.
- **When replacing the *component***: This contains information specific to installing a new option or replacement part.

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 Electrical shock hazard. Disconnect AC power before opening the device. Disconnect and remove the battery before opening the main chassis. 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 pack.

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

CAUTION Before disassembling the device or installing options, disconnect the patient from the monitor, power down the device, disconnect the AC power cord and any attached accessories (SpO2 sensors, blood pressure hoses and cuffs, temperature probes, ECG modules, Braun docks, and barcode scanners) from the device.

CAUTION Before disassembling the device or installing options, disconnect the patient from the monitor, power down the device, disconnect the AC power cord and any attached accessories (SpO2 sensors, blood pressure hoses and cuffs, temperature probes, Braun docks, and barcode scanners) from the device.

CAUTION Remove the probe well in the temperature module prior to disassembly.

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 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. It is possible to mistakenly install machine screws in locations intended for plastite screws. Plastite screws in this device have a Torx-pan head.

CAUTION After performing any of these procedures and prior to returning the device to service, you must use the service tool, Gold licensed 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.

NOTE EarlySense and CO2 can be installed only on the extended chassis.

For information about screws or connectors used in the device, see the Appendix.

Required tools and equipment

- #1 Phillips bit
- #2 Phillips bit
- #10 Torx bit
- Torque driver calibrated for 2.5 in-lb ±0.25 in-lb
- Torque driver calibrated for 6.0 in-lb ±1.0 in-lb
- Torque driver calibrated for 7.5 in-lb ±0.5 in-lb
- Slotted screwdriver
- Tweezers
- Needle-nose pliers
- Spudger
- Tie-wrap tool
- Tie-wrap cutter
- Soft lens wipes
- Scissors or other cutting device
- Canned air
- Adhesive tape
- Pro Gaff tape

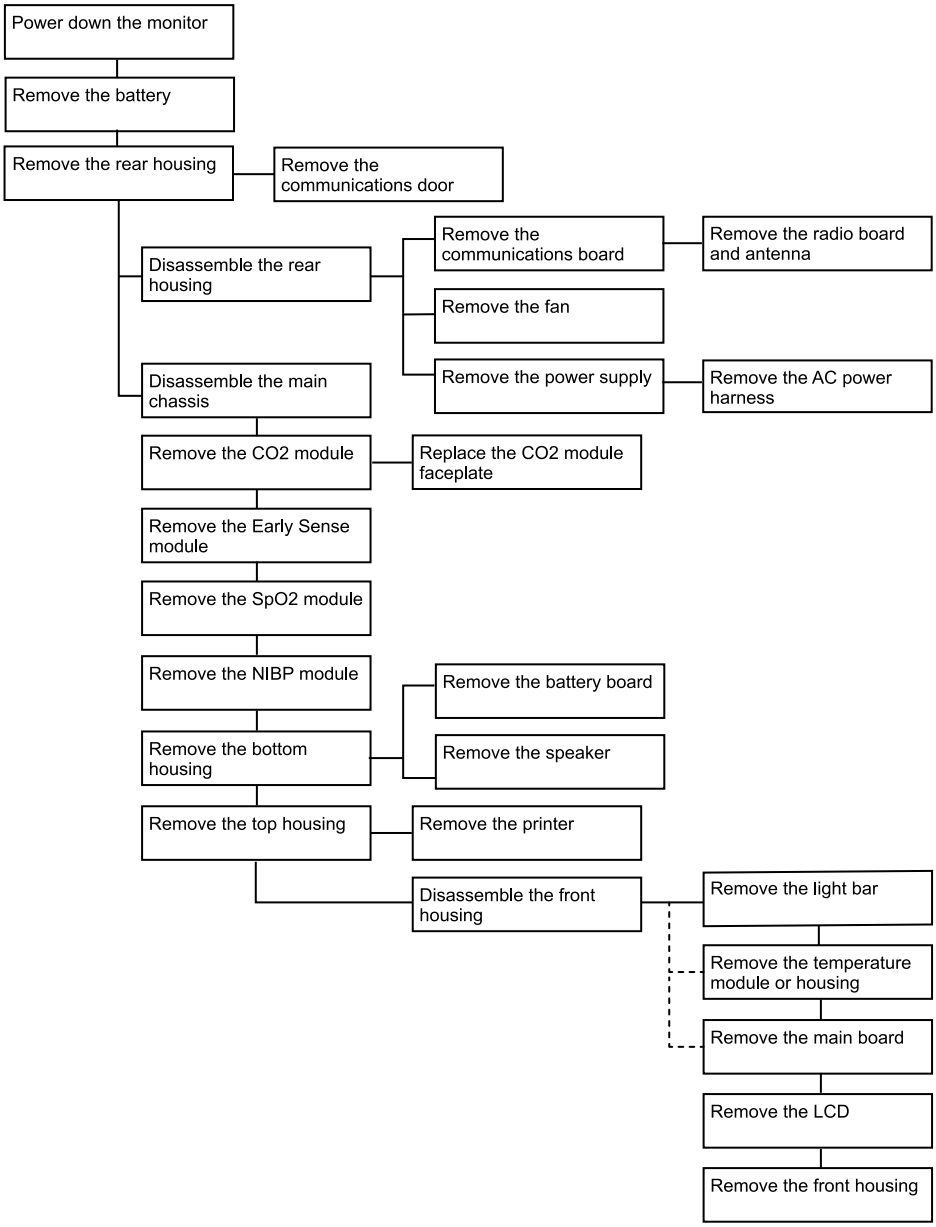
For information about screws and connectors used in the device, see the Appendix.

- #1 Phillips bit
- #2 Phillips bit
- #10 Torx bit
- 8mm socket
- Torque driver calibrated for 2.5 in-lb ±0.25 in-lb
- Torque driver calibrated for 6.0 in-lb ±1.0 in-lb
- Torque driver calibrated for 7.5 in-lb ±0.5 in-lb
- Torque driver calibrated for 12.0 in-lb ±1.0 in-lb
- Slotted screwdriver
- Tweezers
- Needle-nose pliers
- Spudger
- Tie-wrap tool
- Tie-wrap cutter
- Soft lens wipes
- Scissors or other cutting device
- Canned air
- A coin to open the battery door. Select a size that comfortably fits the slot.
- Pro Gaff tape

For information about screws and connectors used in the device, see the Appendix.

Disassembly overview

The following chart provides an overview of the complete disassembly of the device. Most disassembly activities require that you complete a subset of the steps detailed here. The flow chart indicates the steps that must be completed in sequence to remove a particular component. Because a different sequence of preliminary steps might be required to remove certain components, you should use this flow chart as a reference at the start of every disassembly and component replacement procedure. A list of preliminary steps presented at the start of each disassembly topic provides the prerequisites for that disassembly task. (Some tasks in the flowchart are optional, depending on the scope of disassembly.)



Section A

This section applies to devices manufactured before 11/2017, serial numbers before 100043244817, and MCE hardware version P3 or earlier.

NOTE If your device does not meet these criteria, see Section B for the correct disassembly and repair instructions.

NOTE See "Monitor serial number and model label" in the Appendix to learn how to determine the manufacture date from the serial number.

If the MCE hardware version is P2 or P3, DO NOT replace any components with service kits with the "3rd Ed" suffix. IEC 3rd Edition service kits are not compatible with hardware versions P2 and P3.

Service kits with the "4th Ed" suffix may be used on all devices running host software version 1.71.03 or 2.20.00 and later *with the exception of* 107124 (SERV KIT, CVSM, SpO2 MOD, NELLCOR 4th Ed). Use 107124 only on devices running host software version 2.41.xx or later.

This section applies to devices manufactured before 11/2017, serial numbers before 100023374817, and MCE hardware version P3 or earlier.

NOTE If your device does not meet these criteria, see Section B for the correct disassembly and repair instructions.

NOTE See "Monitor serial number and model label" in the Appendix to learn how to determine the manufacture date from the serial number.

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Power down the device

You can power down the device as follows: 1) on devices with 2.X software, briefly press the power button on the housing and then following the onscreen prompts, or 2) on all devices, use onscreen controls alone.

Option 1. After the device is powered up, briefly press of the power button to open an onscreen dialog with the following options:

- **Power down**. Device behavior varies based on the active profile, whether or not patient trend data is stored, and whether or not patient context is established. While servicing the device, you need not be concerned about these details. They only matter to clinicians who are monitoring patients and storing patient data.

- **Sleep**. The Sleep button clears the display and puts the device into Display power-saving mode.
- **Cancel**. The Cancel button dismisses the dialog.

Touch **Power down** and complete the power-down procedure.

Option 2. To use onscreen controls alone to power down the device, follow these steps:

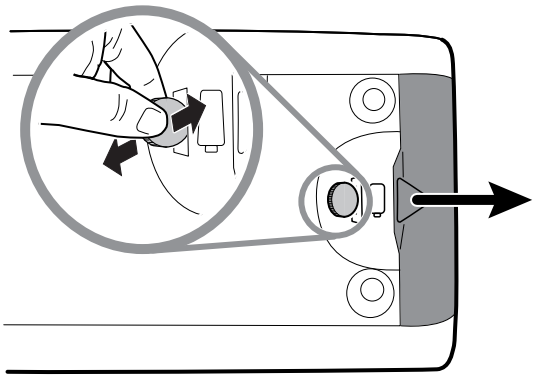
1. Touch the **Settings** tab.
2. Touch the **Device** tab.
3. Touch **Power down**.

NOTE The next three sections address disassembly and repair steps you can complete without removing the device from the wall or removing the battery. All steps presented after "Remove the system from the wall and remove the battery" require powering down as well as removing the device from the wall and removing the battery.

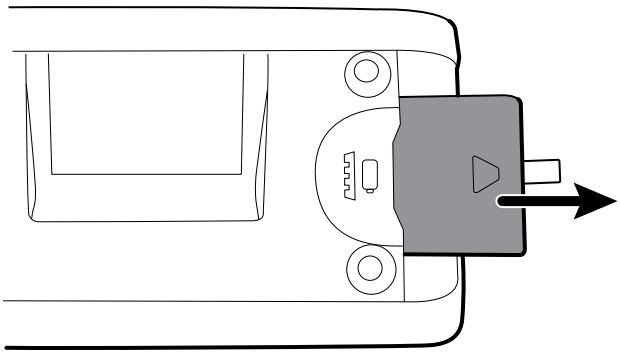
Remove the battery

Before removing the battery, power down the monitor as described in this manual and disconnect the AC power cord.

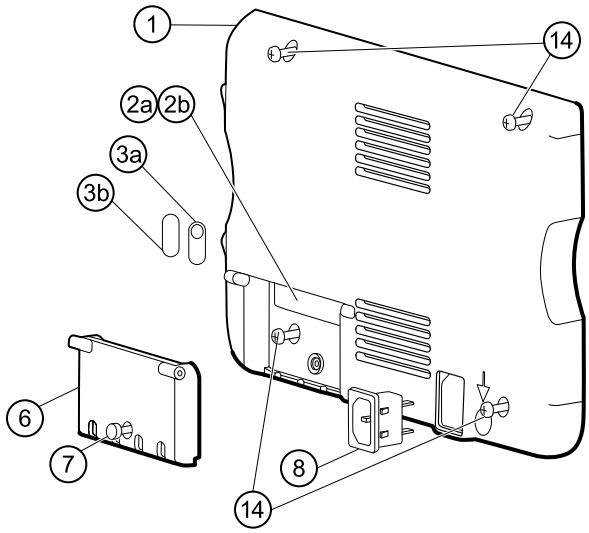
1. Turn the monitor upside down to access the battery cover.
2. Locate the battery cover, indicated by .
3. Insert a coin into the slot and push to open. Choose a coin that fits comfortably into the slot.



4. Pull the battery out by pulling the battery label, which is visible when you open the battery cover.



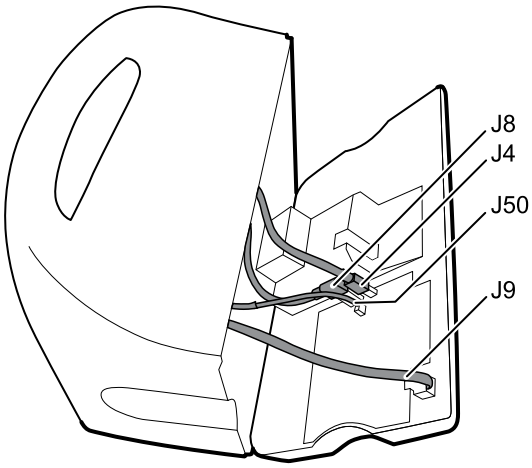
Remove the rear housing



No.	Item	No.	Item
1	Rear housing	6	Communications door
2a	USB label 4 USB host	7	Communications door captive screw
2b	USB label 1 USB host (model 6300 only)	8	IEC connector
3a	Nurse call label	14	Screw, M4 X 10 pan head with NYLOC
3b	No nurse call label (model 6300 only)		

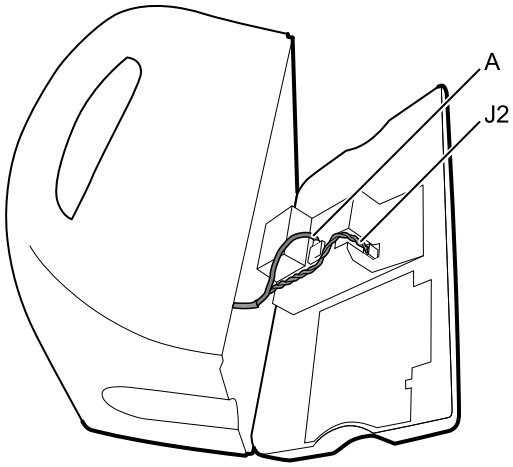
Before you begin, power down the device, disconnect the AC power cord, and remove the battery as described in this manual.

1. Lay the monitor face down on the antistatic mat.
2. Loosen the screw (7) to open the communications door (6).
3. Open the communications door (6) to access the rear housing screw.
4. Remove the four rear housing screws (14).
5. Stand the monitor on its feet with the display facing away from you.
6. Pull the top of the rear housing away from the monitor to access the rear housing cable connections.
7. While supporting the rear housing, disconnect the following from the communications module:



a. The Ethernet cable from J9.
b. The small USB connector from J4.
c. The large USB connector from J8.
d. The communications power cable from J50.

8. Continuing to support the rear housing, do the following at the power-supply cover:
   a. Free the power supply and fan cable from the wire guide on the side of the power-supply cover.
   b. Disconnect the power supply cable from the power supply board at J2.



   c. Disconnect the fan cable (A) from the main harness.
   d. Separate the rear housing (1) from the monitor.

Once the rear housing is removed, choose which part of the monitor to work on:

- Rear housing components. For details, see "Disassemble the rear housing."
- Main chassis. For details, see "Disassemble the main chassis."

Reassembly notes

- Route the power cable and fan harness cables in the channel on the side of the power-supply cover.

- Some communications boards have two large USB connectors. The large USB connector J8 is the one closest to the mini USB connector J4. For reference, see the communications board diagram in the appendices.
- When closing the case, verify that no wires are crushed or pinched before securing with screws. After tightening the screws, examine the seam between the rear housing and the main chassis to verify that there is no bulging. Bulging indicates that something is preventing the mating surfaces from seating properly.

When replacing the rear housing

NOTE The rear housing replacement service kit is assembled with the comms door, ground stud, ground lug plate, IEC connector, and AC power harness. It is unnecessary to transfer these components from the old rear housing.

1. Follow the procedures to disassemble the rear housing and remove any components that you intend to transfer to the replacement housing.
2. Connect the AC power harness to the IEC connector (8). See the reassembly notes for the power supply.
3. Install the rear housing gasket (15), included in the rear housing service kit, into the slot in the outer edge of the rear housing. To ease installation, use a small flat-blade screwdriver to assist in pushing the seal into the channel.
4. Install any components removed from the old rear housing in the reverse order of the disassembly instructions.
5. After reassembling the rear housing, install the USB client cover (40) as follows:
   a. Place the USB client cover on a USB mini B cable with the tape facing out.
   b. Peel off the tape to expose the adhesive.
   c. Insert the USB cable into the client USB connection, press and remove the cable to adhere the cover to the rear housing.
6. Install these labels:
   - USB label (2a for models 6400, 6500, 6700, and 6800; 2b for model 6300) in the communications door opening.
   - Nurse call label (3a for models 6400, 6500, 6700, and 6800; 3b for model 6300) over the nurse call connection.

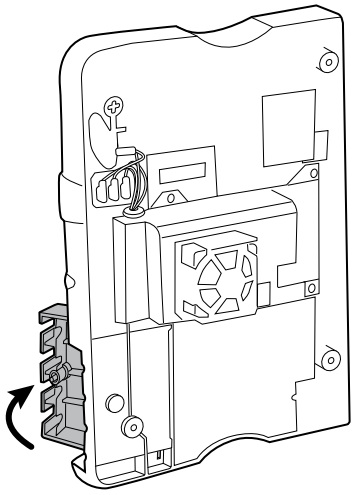
Remove the communications door

NOTE If the communications door is missing or already removed from the device, proceed to "When replacing the communications door."

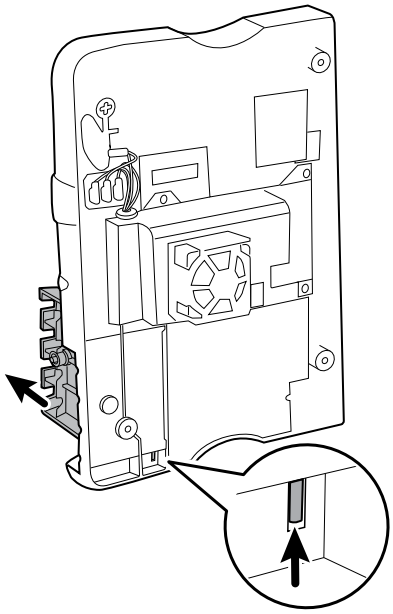
WARNING Personal injury risk. Because removing the door might propel the pin and spring into the air, wear safety glasses to complete these steps.

Before removing the communications door, power down the monitor, remove the battery, and remove the rear housing as described.

1. Position the rear housing with the Ethernet connection side down on an antistatic mat.
2. Open the communications door perpendicular to the rear housing.



3. Use a spudger to push the pin upward until the pin clears the hinge.

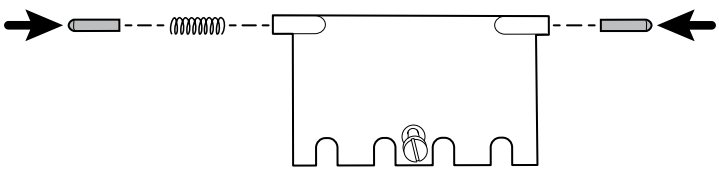


4. Carefully remove the door from the rear housing.

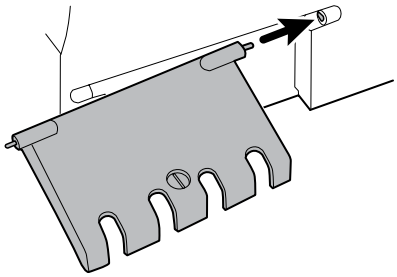
When replacing the communications door

WARNING Personal injury risk. Because attaching the door might propel the pin and spring into the air, wear safety glasses to complete these steps.

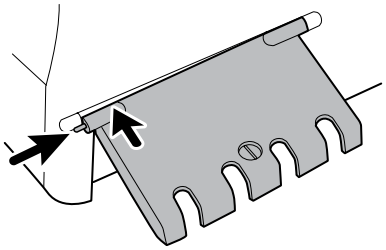
1. Insert a spring and two pins into the communications door as shown.



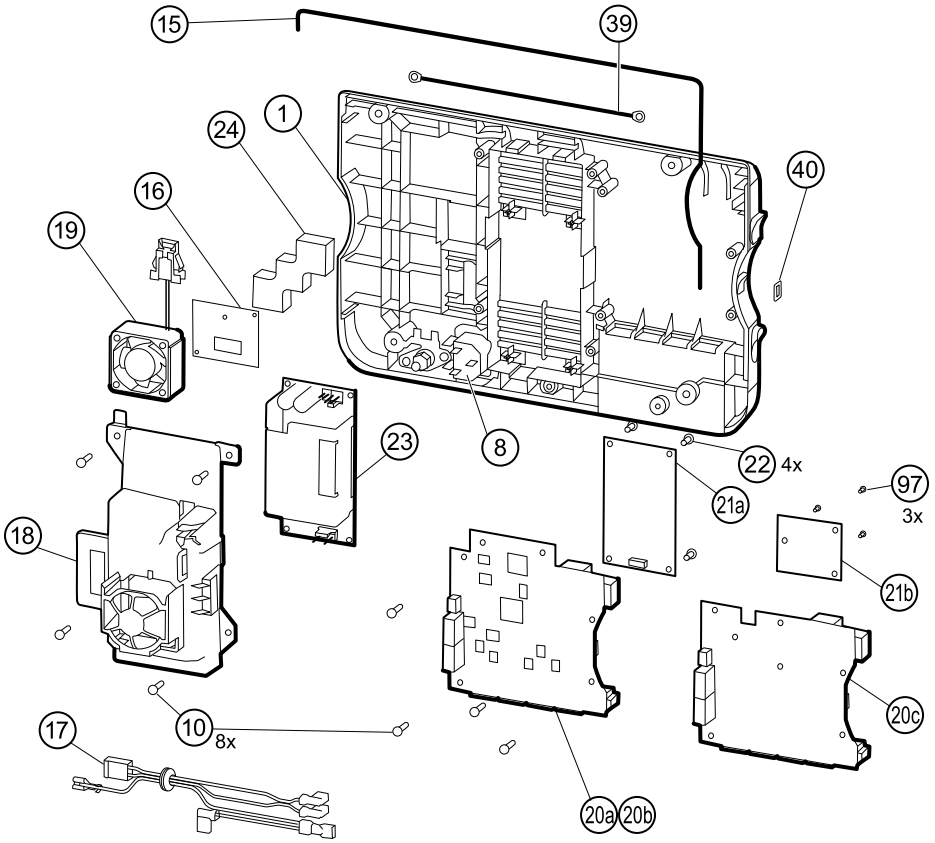
2. With the bottom of the door on the antistatic mat, insert the pin on the right side of the door into the hinge of the rear housing.



3. Press the pin into the left side of the door and slide the door into the hinge of the rear housing until it snaps into place.



Disassemble the rear housing



No.	Item	No.	Item
1	Rear housing	20c	Communications board for Newmar radio (Models 6400, 6500, 6700, and 6800)
8	IEC connector	21a	Radio board, Lamarr, 802.11a/b/g
10	Screw, plastite #4-20 X 0.500 Torx-pan head	21b	Radio board, Newmar, 802.11a/b/g/n
15	Rear housing gasket (Norprene tubing)	22	Screw, M3 X 0.5, Phillips pan head
16	Antenna board	23	Power supply board
17	AC power harness	24	Antenna mounting foam block
18	Power supply cover	39	Antenna cable
19	Fan	40	USB client cover
20a	Communications board (Model 6300)	97	Screw, M3x0.5x8, Pan Phillips (Small Phillips screw)
20b	Communications board (Models 6400, 6500, 6700, and 6800)		

Remove the communications board

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

- Battery
- Rear housing

1. Lay the rear housing on its back on the antistatic mat.
2. Remove the four Torx screws (10) that secure the communications board (20a or 20b) to the rear housing.
3. Remove the communications board by doing the following:
    a. Lift the inside edge of the board until the USB connector clears the wire channel on the power-supply cover.
    b. Slide the board slightly toward the power supply and lift until the board contacts the wire channel on the power-supply cover.
    c. Lift the outside edge of the board until the side connectors clear the rear housing.
    d. For monitors with a radio: rotate the board (without pulling on the antenna cable) slightly counter-clockwise, pivoting on the upper left-hand corner. Turn the board over and set it down outside the top of the case.
4. If replacing the communications board, remove the radio board (21) as described in "Remove the radio board and antenna."

Reassembly notes

- If the radio board was removed, reinstall it before reinstalling the communications board.
- To install the communications board, do the following:
    1. Position the board over the standoffs with the inside edge of the board under the wire channel on the power-supply cover until the outer edge drops into the rear housing.
    2. Align the mini-USB external connector with the opening in the side of the rear housing.
    3. Slide the mini-USB connector into the opening until the board rests on the standoffs.

When replacing the communications board

Install the radio board on the new communications board before installing the communications board on the rear housing.

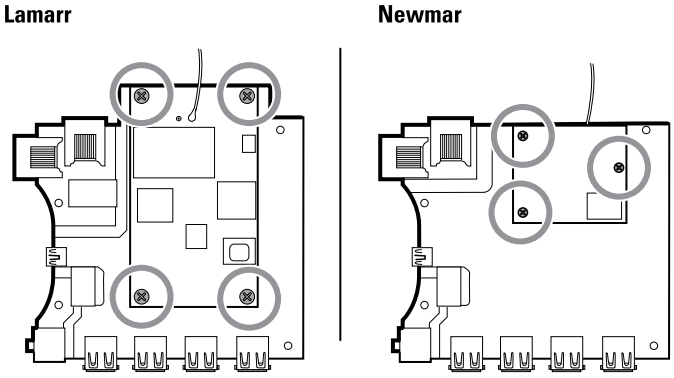
Remove the radio board and antenna

CAUTION Do not remove the radio antenna from the rear housing unless replacing the radio and antenna or the rear housing.

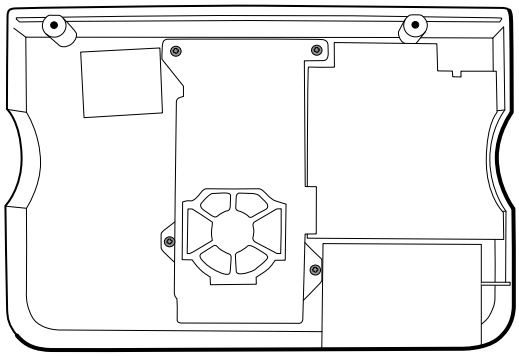
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- Communications board

1. If the monitor has a radio:
   a. Turn the communications board over to access the radio board, taking care to avoid straining the antenna cable.
   b. If the original Lamarr radio (a/b/g band) is installed, remove the four small Phillips (machine) screws securing the radio board to the communications board, as shown on the left. If the Newmar radio (a/b/g/n band) is installed, remove the three small Phillips (machine) screws securing the radio board to the communications board, as shown on the right.



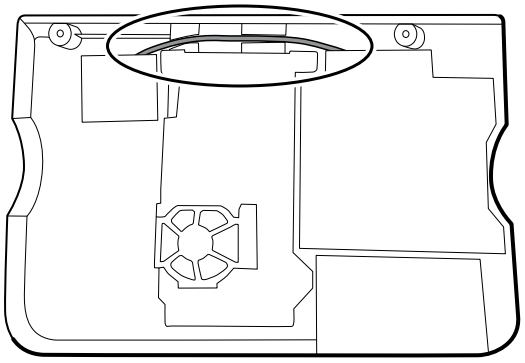
   c. Hold the communications board with one hand while grasping the radio board at the opposite end from the antenna connection and pull the radio board away from the communications board.
2. (Perform this step only if you are replacing the radio or antenna.) Disconnect the radio antenna cable from the radio board.
3. Remove the four Torx screws (10) securing the power-supply cover.



4. Remove the power-supply cover (18).
5. Use a soft tool such as a spudger to separate the foam block (24) from the inside of the rear housing.

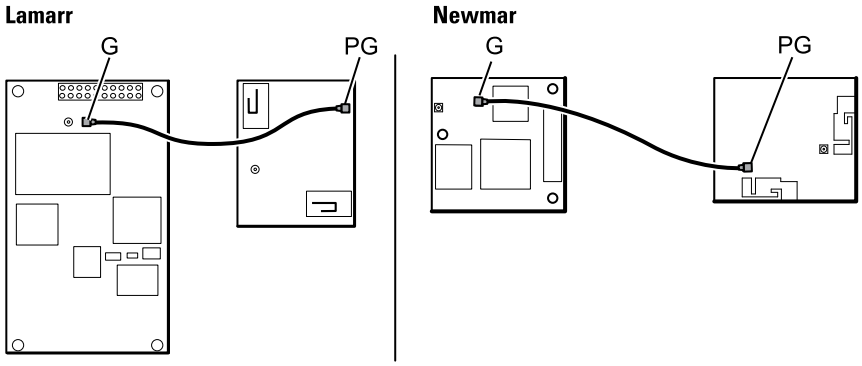
Reassembly notes

Route the antenna cable in the channel located at the top of the rear housing.

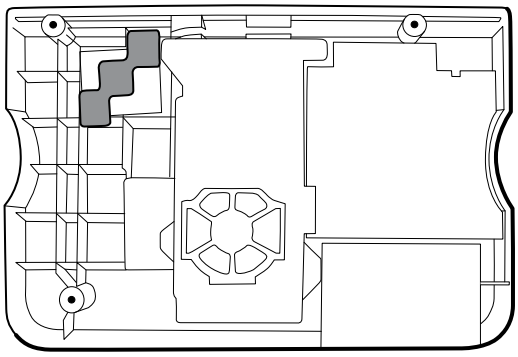


When replacing the radio board and antenna

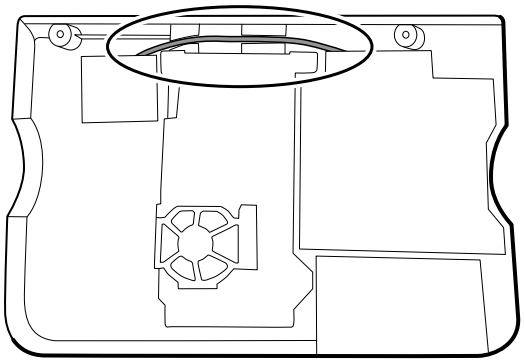
1. If the antenna is removed, clean the rear housing and mounting surface with isopropyl alcohol.
2. The following illustration shows both Lamarr and Newmar radio and antenna boards. Attach the antenna cable to terminal G on the radio board. Attach the other end of the cable to the antenna on terminal PG.



3. Peel the backing off the foam block (24) and affix the foam block to the rear housing.



4. Expose the adhesive on the foam block. Mount the antenna (16) on the foam block with the antenna cable (39) oriented under the board and in the wire channel above the power supply.
5. Route the antenna cable in the channel located at the top of the rear housing.

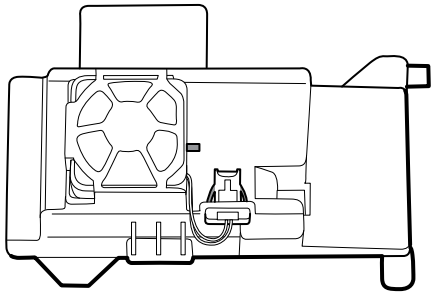


Remove the fan

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

- Battery
- Rear housing

1. Press the flanges on the sides of the fan harness connector and separate the fan connector from the power-supply cover (18).



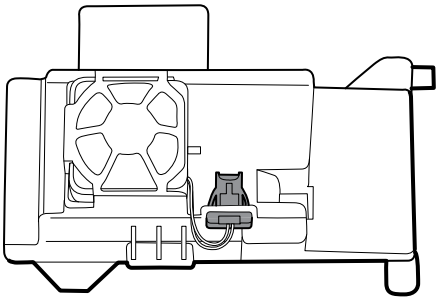
2. Depress the tab on the power-supply cover and slide the fan (19) over the tab and out of the housing.

Reassembly notes

CAUTION Ensure that the fan is properly oriented. Air must flow toward the power supply.

NOTE If the fan is dirty, use canned air to remove dust. Do not bend the fan blades or otherwise damage the fan. If the fan is noisy and cleaning does not reduce the noise, replace the fan.

- With the label facing down, slide the fan into the housing on top of the power-supply cover until the tab on the cover holds it in place.
- Clip the fan harness into the power-supply cover so that the connector is oriented toward the fan, as shown in the following figure.

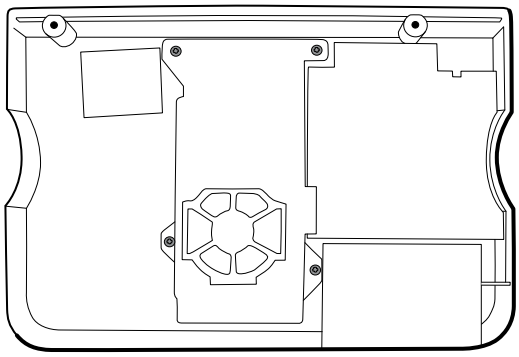


Remove the power supply

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

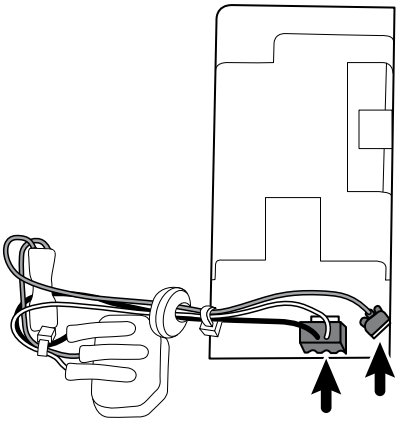
- Battery
- Rear housing

1. Remove the four Torx screws (10) securing the power-supply cover.



2. Remove the power-supply cover (18).
3. Disconnect the following from the power supply:
   - The (green) ground cable
   - The AC power harness (17)

NOTE See "Remove the AC power harness" for instructions.



4. Remove the power supply.

Remove the AC power harness

NOTE Do not disconnect the AC power harness from the IEC connector unless you are replacing it. Once you disconnect the AC power harness, you cannot reuse it.

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

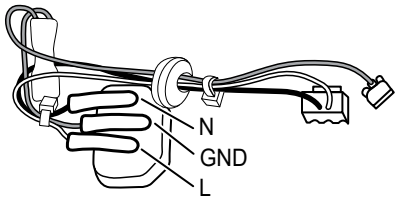
- Battery
- Rear housing
- Power supply

Disconnect the AC power harness from the IEC connector and grounding plate.

Reassembly notes

When replacing the rear case or AC power harness, route the wiring as follows:

- Connect blue to neutral (N), green to ground (GND), and brown to line (L).

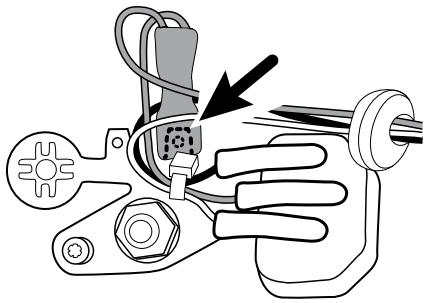


NOTE The power supply harness to IEC connector is rated for a single connection. Replace the power supply harness if it has been disconnected from the IEC connector.

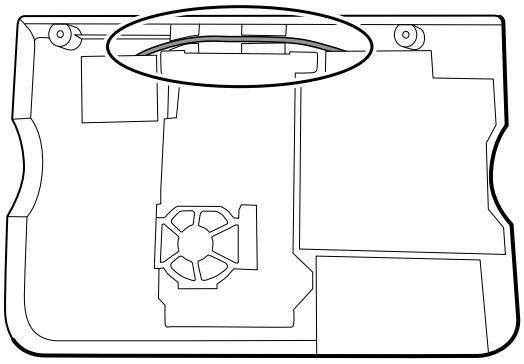
NOTE In older devices, color coding of the line and neutral wires was reversed. The color of the wiring has no impact on the functionality of the device and does not require reversing the connection to the IEC connector. Reversing the connection to the IEC harness would also require replacement of the power harness.

The risk of not replacing the harness is considered minimal as the manual contains a warning to disconnect the device from AC power before opening the case.

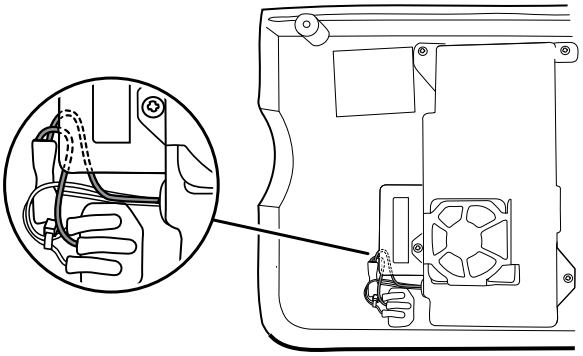
- Plug the ground cable from the IEC connector onto the ground plate in the position closest to the IEC connector.



- Ensure that the green ground wires are routed over the blue and brown wires.
- Ensure that the grommet on the AC power harness is in the slot in the power supply cover.
- When replacing the power supply cover, ensure that the antenna cable is routed in the channel located at the top of the rear housing.

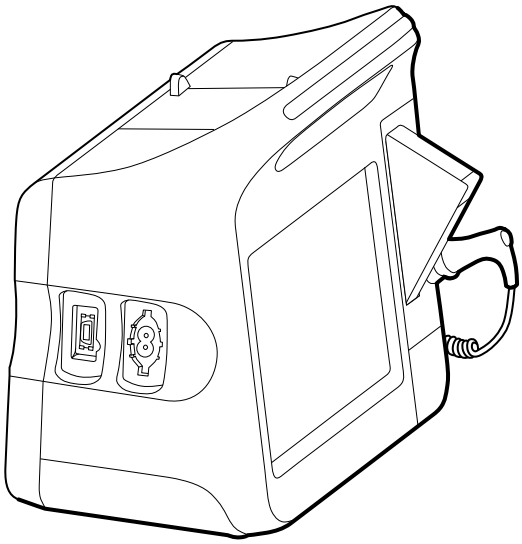
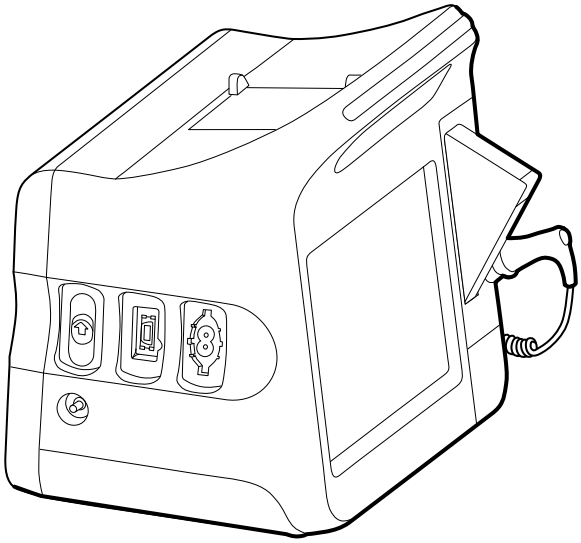


- Ensure that the green ground wires are underneath the power-supply cover, as shown in the next figure.



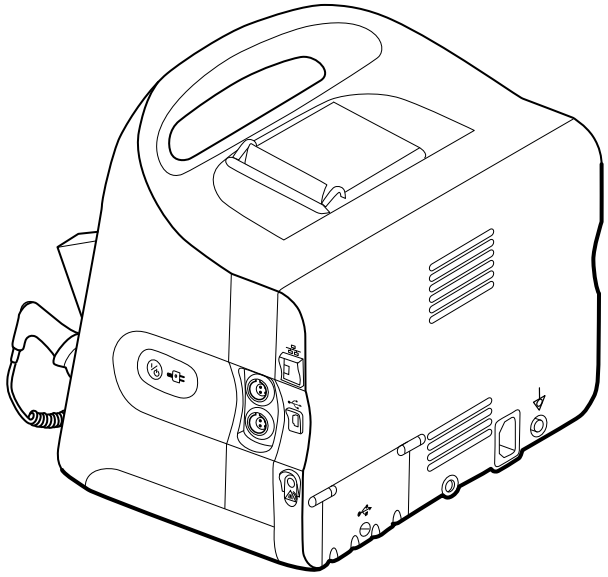
Disassemble the main chassis

Disassembly and reassembly procedures are the same for the standard chassis and extended chassis, unless otherwise noted.

Configuration options	
Standard chassis (left side)	**Extended chassis (left side)**
Supports a maximum of two modules	Supports a maximum of three modules
	
Components (back to front): SpO2, NIBP Blank, NIBP (6300, 6400, and 6500 only)	Components (back to front): CO2, SpO2, NIBP Blank, SpO2, NIBP

Extended chassis (right side) Supports a maximum of one module

NOTE The standard chassis is the same as extended chassis minus space for an EarlySense module, so it is not presented here.



Components (front to back):

Power button, EarlySense, Ethernet RJ-45, USB client, Nurse call

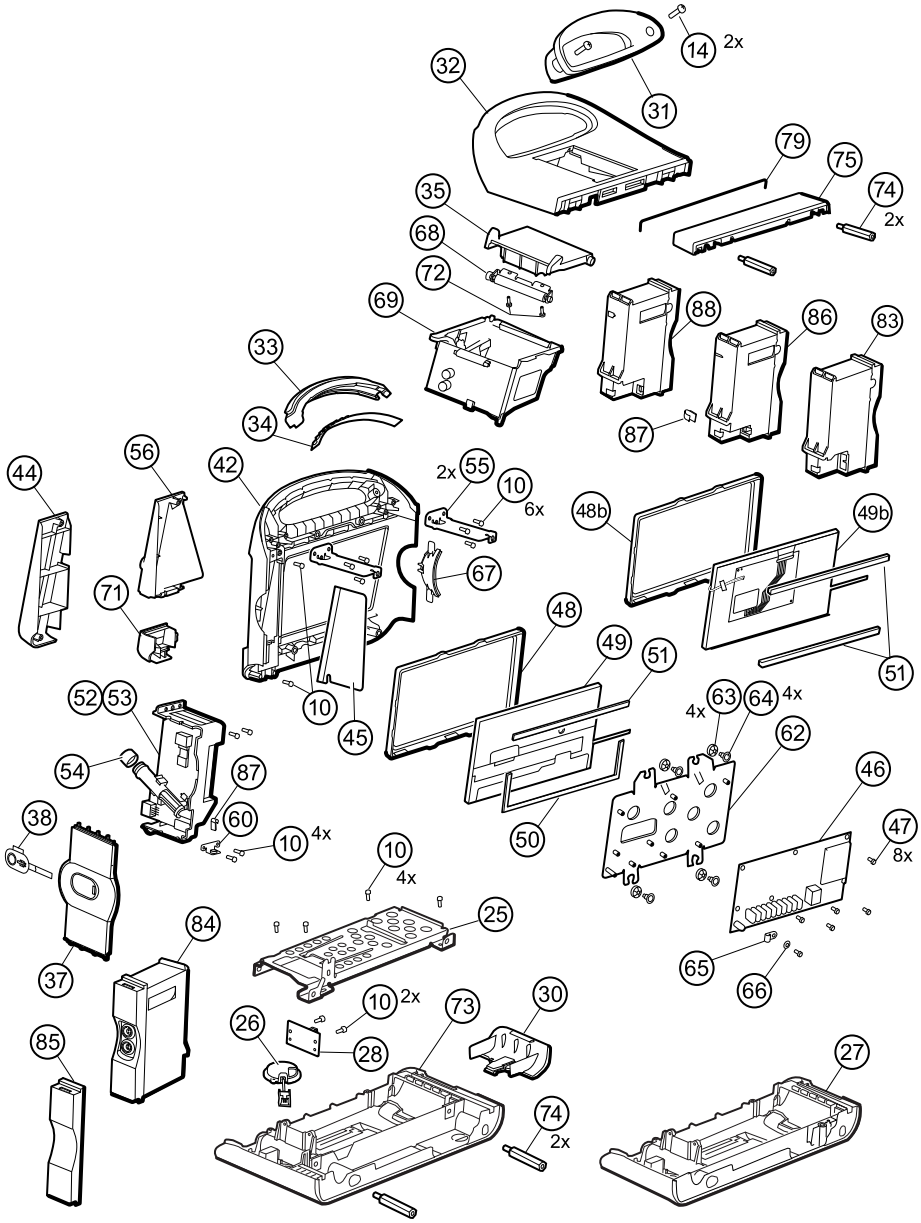
Power button, Blank, Ethernet RJ-45, USB client, Nurse call

NOTE Monitors configured with RRa, SpHb, or CO2 cannot be configured with EarlySense.

NOTE Ethernet RJ-45 provides a hardwired connection to the computer network. USB client provides a connection to an external computer for testing and software upgrades. Nurse call provides a connection to the hospital nurse call system. (Not available on the 6300 model.)

Main chassis exploded view

More detailed views of main chassis components and tables identifying specific parts appear later in this section preceding the associated disassembly and repair instructions.



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	53	Temperature housing
14	Screw, M4 X 10 pan head with NYLOC	54	Probe well seal
25	Bottom housing metal chassis	55	Horizontal struts

No.	Item	No.	Item
26	Speaker	56	Temperature mounting cover
27	Bottom housing	60	HSG clamp
28	Battery connector board	62	LCD frame
30	Battery door	63	Grommet, ear - G411-1
31	Handle insert	64	Shoulder screw, ear G-411-1 metric
32	Top housing	65	Clamp, cable 3/16 X 3/8 wide X 3/4 long
33	Light bar	66	Washer, M3
34	Light-bar board	67	Left insert
35	Printer door	68	Paper-feed roller
37	Right side panel	69	Printer
38	Power button and flex cable	71	Temperature connection access cover
42	Front housing	72	Screw, M2.2X8, THRDFORM, PNH, TRX
44	Temperature blanking panel	73	Extended bottom housing
45	Thermal shield	74	M4 standoff
46	Main board	75	Housing top extension
47	Screw, M3 x 5 pan head	79	Top housing gasket
48	LCD bezel (1st generation displays)	83	CO2 module assembly
48b	LCD bezel (2nd generation displays)	84	EarlySense module assembly
49	LCD with touchscreen (1st generation dispalys)	85	Blank faceplate
49b	LCD with touchscreen (2nd generation displays)	86	SpO2 module assembly

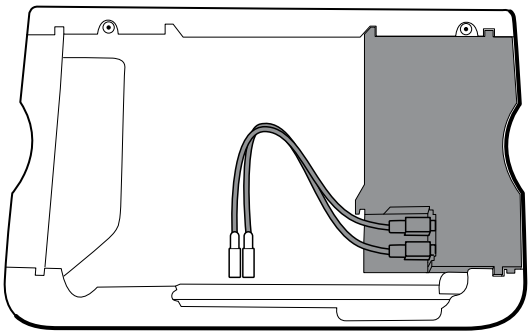
No.	Item	No.	Item
50	Foam pad	87	USB cable retaining clip
51	Foam pad	88	NIBP module assembly
52	Temperature module		

Remove the CO2 module

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

- Battery
- Rear housing

1. Disconnect the two USB cables from the CO2 module.

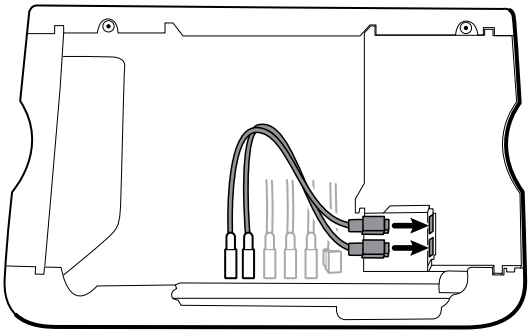


2. Slide the CO2 module out of the case.

Reassembly notes

- Do the following before installing the CO2 module:
  - Install the NIBP module (the module closest to the display).
  - Install the SpO2 module.
- Insert the CO2 module into the housing with the serial number label facing up.
- Connect the two USB cables to the CO2 module.

NOTE You may connect the CO2 USB cables in any order in either CO2 FSS USB socket.

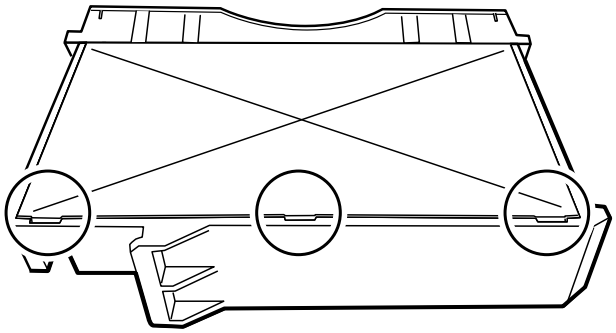


Replace the CO2 module faceplate

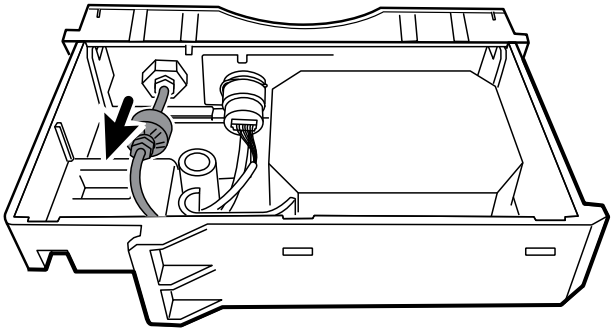
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module

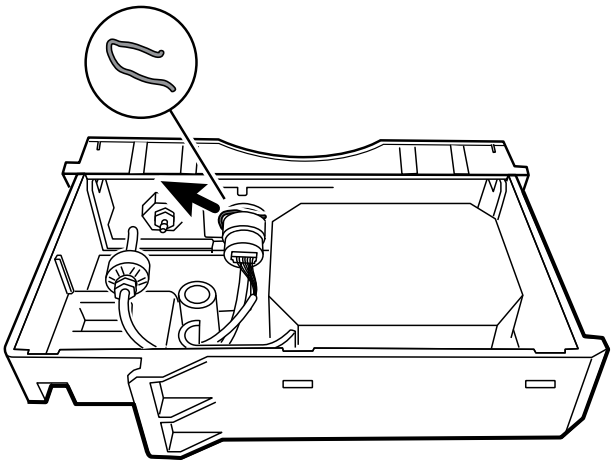
1. Remove the two blank labels securing the clear housing cover to the module housing.
2. Using a slotted screwdriver, release the three plastic clips from the module rear housing, and remove the clear housing cover.



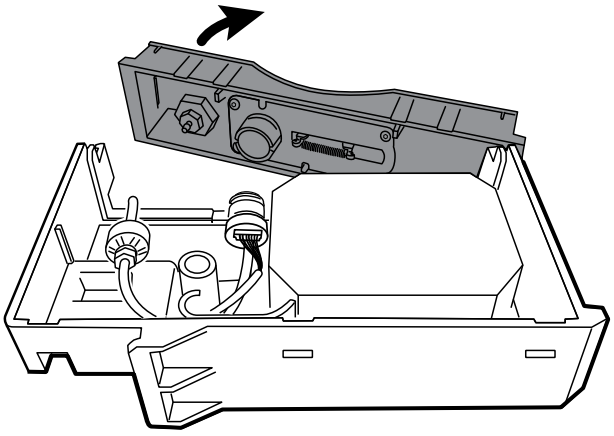
3. Disconnect the exhaust tube from the exhaust port on the faceplate.



4. Remove the spring clip from the input port, and slide the input port away from the faceplate.

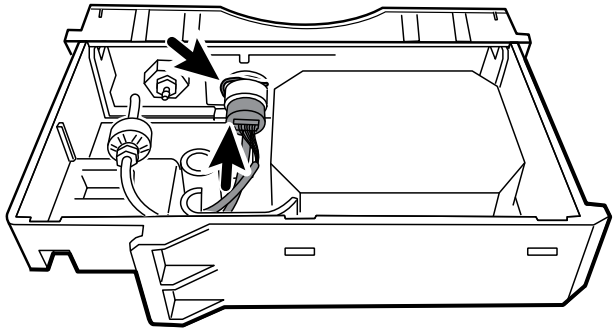


5. Remove the faceplate:
   a. Disengage one plastic clip on the module rear housing from the faceplate.
   b. Remove the faceplate by pivoting it away from the rear housing.

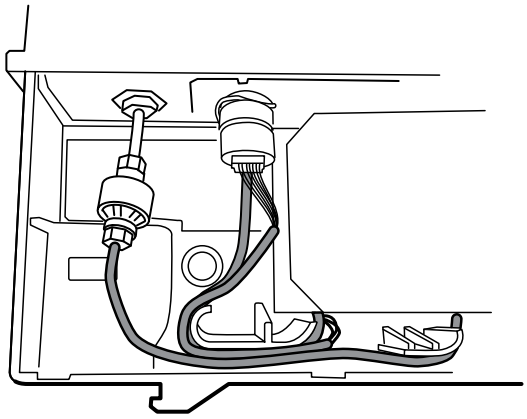


6. Inspect the new faceplate before installing it:
   a. Verify that the spring is attached to the door latch.
   b. Verify that the door opens and closes freely.
7. Slide the new faceplate onto the module rear housing until both plastic clips lock in place.
8. Install the input port and spring clip:
   a. Slide the input port into the faceplate receptacle until the port is flush with the faceplate.
   b. While holding the port in place, install the spring clip over the port and receptacle as shown in the figure below. The spring clip is secured by pushing on the clip from the direction of the exhaust fitting towards the faceplate door. Make sure the spring clip is fully seated.

NOTE Do not reuse the spring clip. Replace the spring clip with the new one provided in the kit.

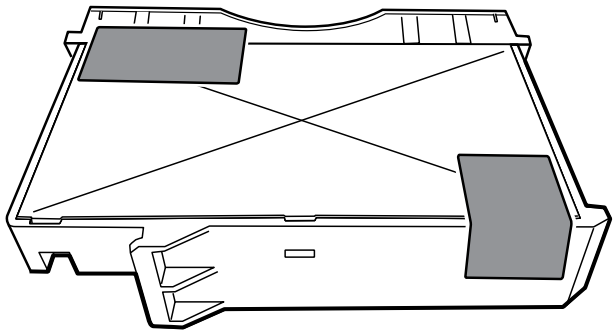


9. Connect the exhaust tube to the exhaust port.
10. Verify that all hoses and wires are routed as shown in the figure below. Also verify that the tubing is free of kinks.



NOTE The exhaust tube runs along the back of the module and gradually bends to the exhaust fitting. The inlet tube and wire run around the molded feature and boss to the large connector.

11. Install the clear housing cover onto the module rear housing, and press the cover into place until the three plastic clips lock.
12. Apply the two new blank labels to the locations shown in the figure below.

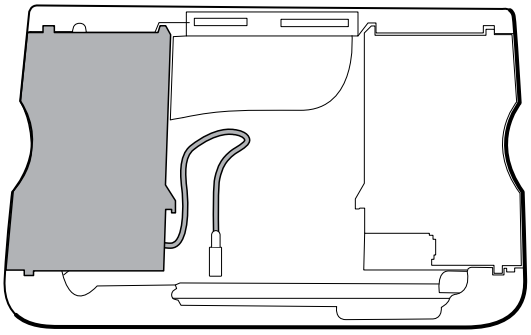


Remove the EarlySense module

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

- Battery
- Rear housing

1. Disconnect the USB cable from the EarlySense module.



2. Slide the EarlySense module out of the case.

Reassembly notes

Insert the EarlySense module into the housing with the serial number label facing down.

When replacing the EarlySense module or adding an EarlySense module

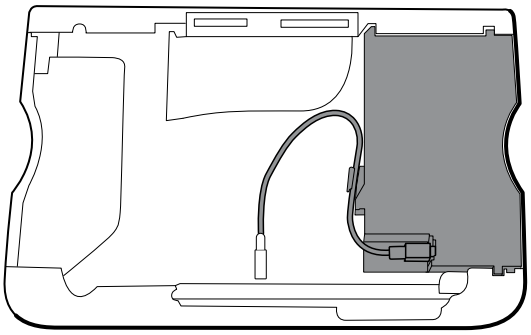
- Insert the EarlySense module into the housing with the serial number label facing down.
- Connect the USB cable to the EarlySense module.
- When adding an EarlySense module, the bottom housing and SureTemp cover must have ventilation holes. Use the bottom housing from service kit 105504 and the SureTemp cover from service kit 103542.

Remove the SpO2 module

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module (optional)

1. Disconnect the USB cable from the SpO2 module.
2. Remove the USB cable from the retaining clip on the SpO2 module.



3. Slide the SpO2 module out of the case.

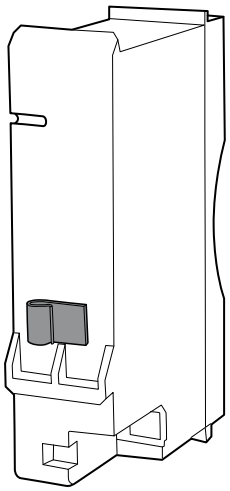
Reassembly notes

- Install the NIBP module (the module closest to the display) *before* installing the SpO2 module.
- Insert the SpO2 module into the housing with the serial number label facing up.

When replacing the SpO2 module or adding an SpO2 module

CAUTION Ensure that your module has the correct option (Masimo or Nellcor).

- On the back of the SpO2 module, clean the surface to which the retaining clip will be applied (see figure below) and apply the clip.



- Insert the SpO2 module into the housing with the serial number label facing up.
- Connect the USB cable to the SpO2 module.
- Secure the USB cable to the retaining clip on the SpO2 module.

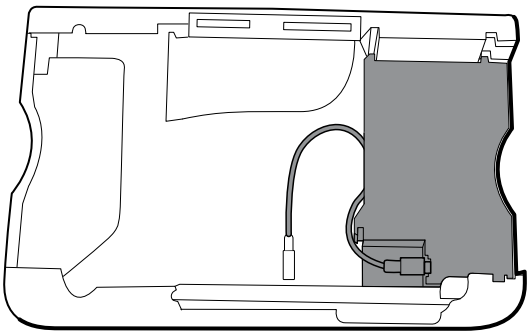
Remove the NIBP module

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module (optional)

- SpO2 module or blank faceplate

1. Disconnect the USB cable from the NIBP module.



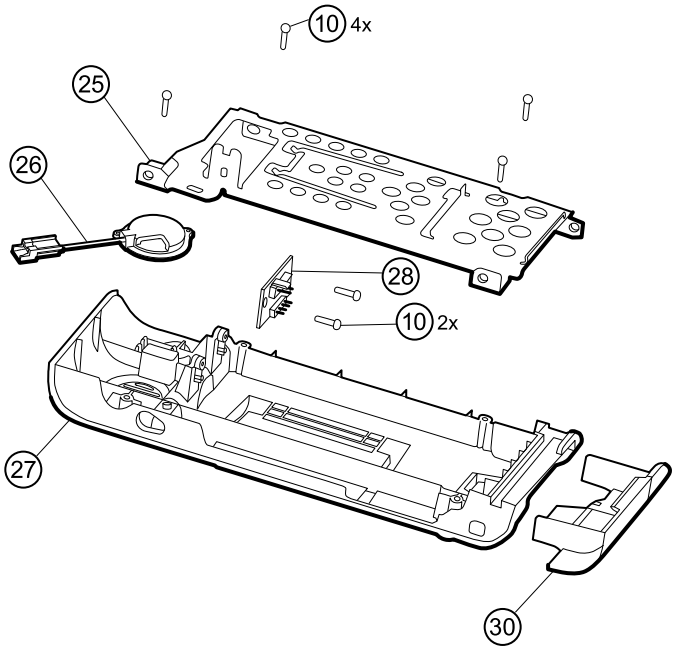
2. Slide the NIBP module out of the case.

Reassembly notes

- Install the NIBP module (the module closest to the display) *before* installing the SpO2 and CO2 modules.
- Insert the NIBP module into the housing with the serial number label facing up.
- Connect the USB cable to the NIBP module.
- If originally installed, install the blanking panel by sliding it into the housing.

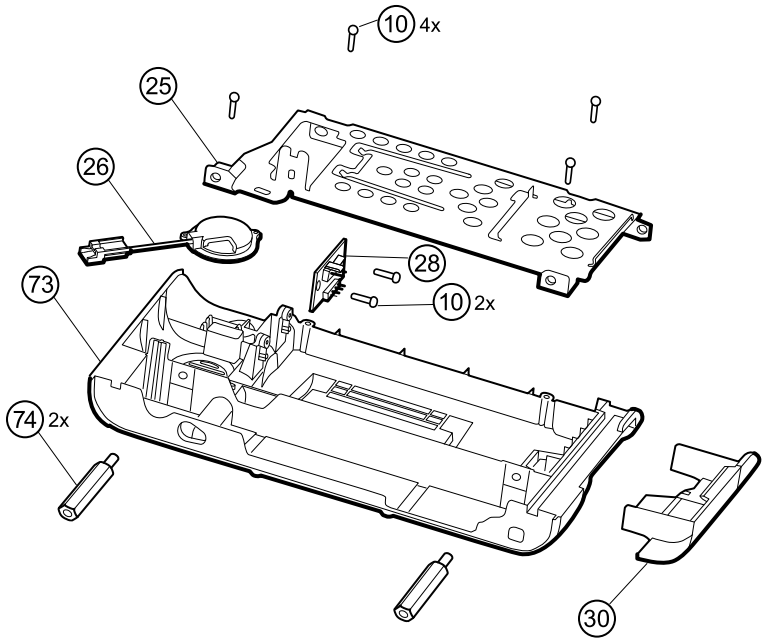
Remove the bottom housing

Bottom housing for the standard chassis



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	27	Bottom housing
25	Bottom housing metal chassis	28	Battery connector board
26	Speaker	30	Battery door

Extended bottom housing for the extended chassis

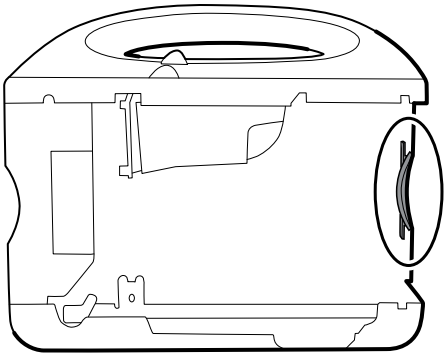


No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	30	Battery door
25	Bottom housing metal chassis	73	Extended bottom housing
26	Speaker	74	M4 standoff
28	Battery connector board		

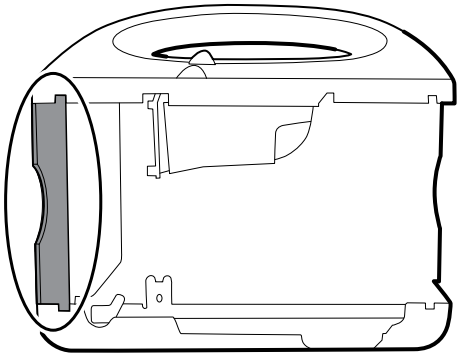
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module

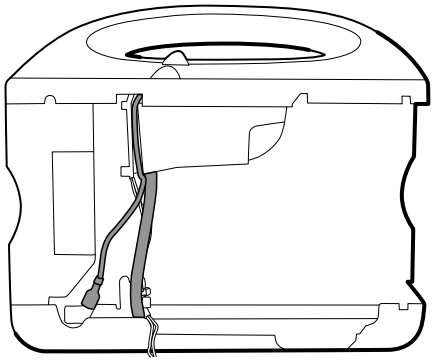
1. Remove the insert circled in the figure below.



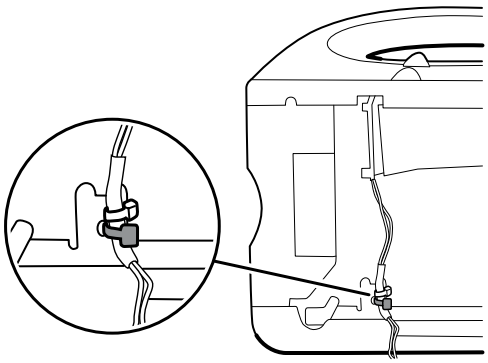
2. If your model has an extended chassis, remove the insert shown below.



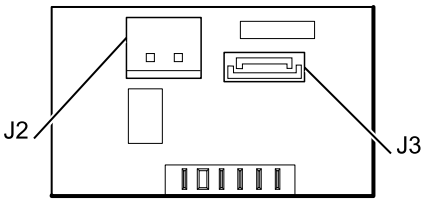
3. If your model has a printer, do the following:
   a. Remove the drain tube located between the printer and the bottom plate.



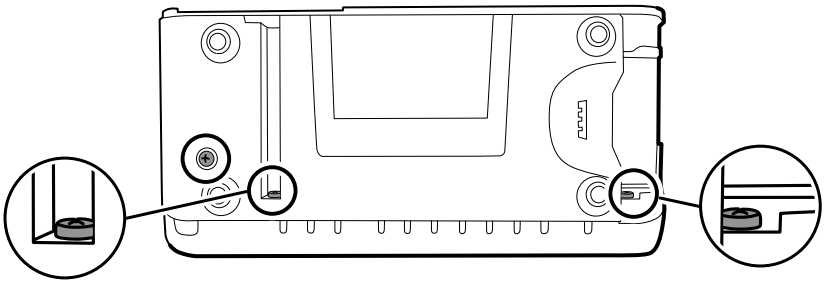
   b. Disconnect the printer ground wire from the ground lug on the bottom plate.
4. Cut the tie wrap that secures the main harness to the bottom bracket. This tie wrap is located below the tie wrap on the main harness.



5. Pull the speaker wire out from behind the bottom bracket and disconnect the speaker cable (26) from the main harness.
6. Disconnect the following on the battery connector board:
   a. The battery power harness from J2.
   b. The smart-battery harness from J3.



7. Remove the following screws:



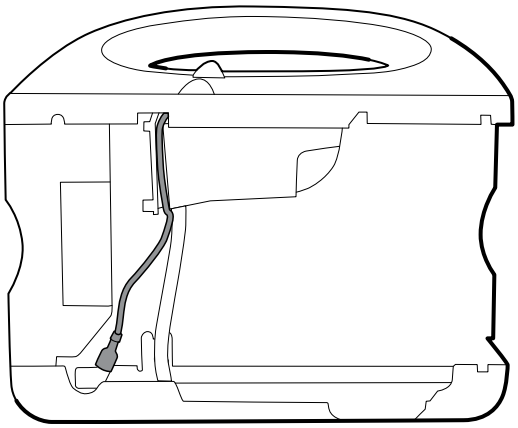
   - The bottom housing screw.
   - The two screws that secure the bottom housing assembly to the front housing.
8. Remove the bottom housing.
9. Disassemble the bottom housing.

NOTE Disassemble the bottom housing only if you plan to replace the battery connector board or the speaker. See the instructions for removing these components later in this section.

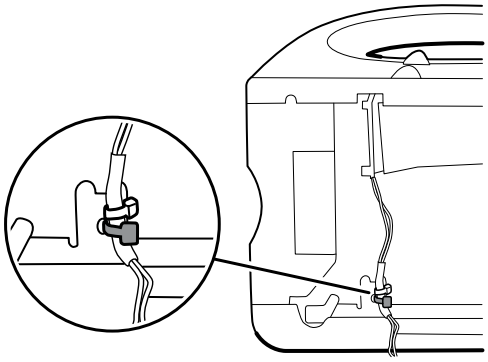
Reassembly notes

- When reassembling the bottom housing of an extended chassis, use an 8mm socket and a Torque driver calibrated for 12.0 inch-pound ±1.0 inch-pound to secure the standoffs (74).
- Plug the speaker cable into the shortest cable of the main harness (the cable closest to the wire tie). Tuck the cable behind the ground-wire stud. Ensure that the speaker cable is positioned in the channel.

- If a printer is installed, route the printer ground wire through the channel on the printer housing.



- Secure the main harness to the bracket on the bottom housing using a tie wrap. Position the tie wrap just below the tie wrap on the main harness. Use the tie-wrap tool to secure the tie wrap.



- If your model has an extended chassis, orient the insert so that, when installed, it is flush with the panel that contains the power button.

When replacing the bottom housing

NOTE The bottom housing, or extended bottom housing, must be replaced by a Welch Allyn service center to ensure proper labeling.

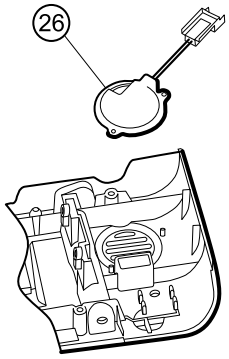
Remove the speaker

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

1. Remove the metal chassis to more easily access the speaker.

2. Remove the speaker (26) from the bottom housing.



3. Remove any remaining gasket material and clean the surface with 70 percent isopropyl alcohol.

When replacing the speaker

1. Remove the paper to expose the adhesive on the gasket.
2. Align the holes in the speaker with the pins on the bottom housing and press the speaker into place.
3. Apply pressure to the outer radius of the speaker to ensure good adhesion with the bottom housing.

Remove the battery connector board

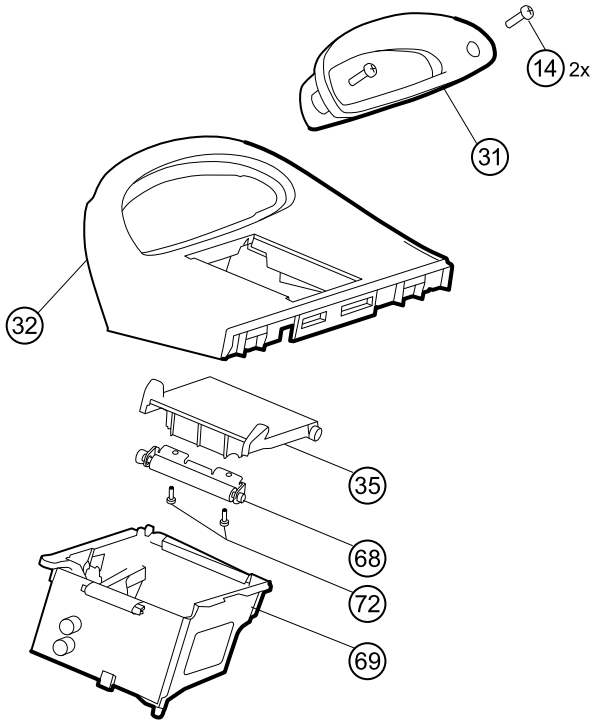
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

Remove the two Torx screws (10) that secure the battery connector board (28) to the bottom housing using a no. 10 Torx driver.

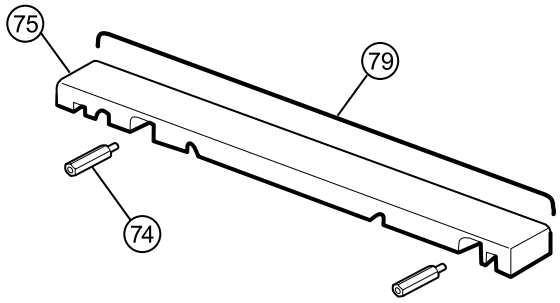
Remove the top housing

Top housing



No.	Item	No.	Item
14	Screw, M4 X 10 pan head with NYLOC	68	Paper feed roller
31	Handle insert	69	Printer housing
32	Top housing	72	Screw, M2.2X8, Thrdform, PNH, TRX
35	Printer door	Not shown	Printer door blank

Housing top extension (extended chassis only)



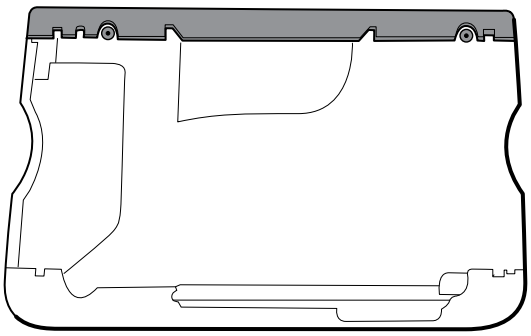
No.	Item	No.	Item
74	M4 standoff	79	Top housing gasket
75	Housing top extension		

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

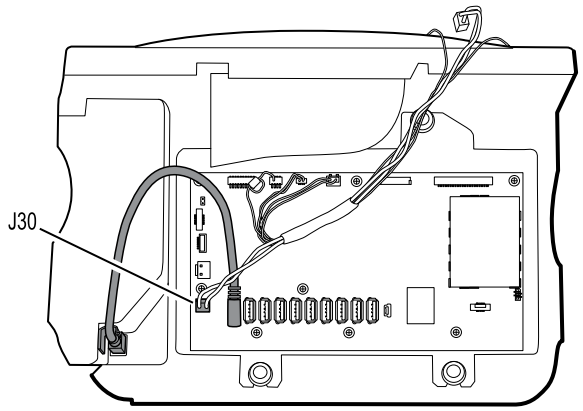
- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

NOTE Do not remove the side panel that contains the power button.

1. If your model has an extended chassis, remove the housing top extension.
   a. Use an 8mm socket and driver to remove the two standoffs (74) that secure the housing top extension (75).
   b. Remove the housing top extension.



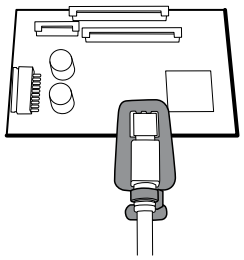
2. Lay the main harness over the top of the unit to clear the USB cables.
3. Disconnect the power connector on the main harness from J30 on the main board.



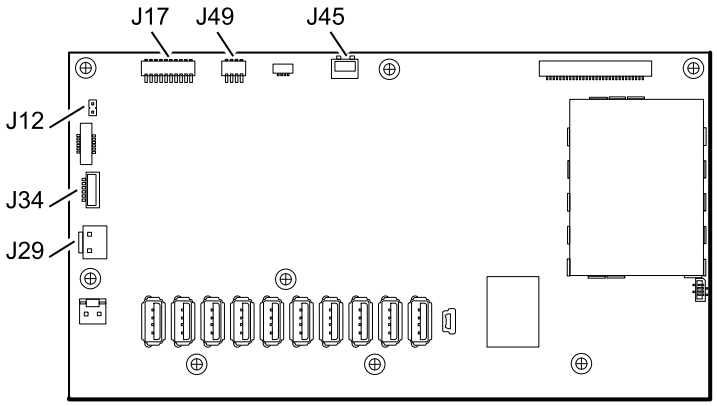
4. For models that include the temperature option, disconnect the USB cable connected to the temperature module from J1 on the main board and free the USB cable from the cable separator.

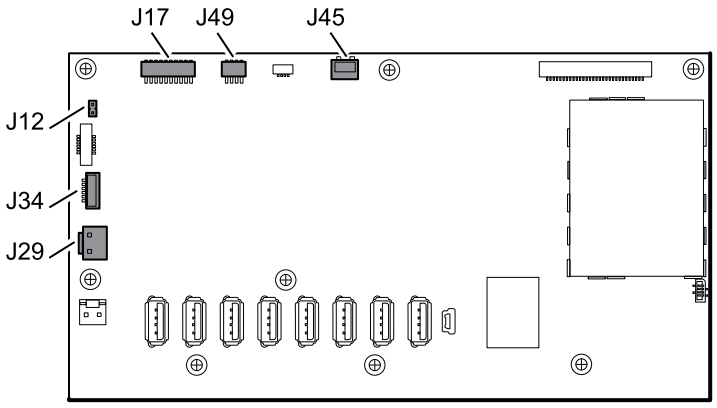
NOTE Do not remove the USB cable from the temperature module unless you plan to replace the module. If you disconnect the USB cable, the retaining clip must be replaced upon reassembly.

5. For models that include a printer, unhook the plastic latch to disconnect the USB cable from the printer.



6. Disconnect the USB cables from the main board.
7. Remove the USB cables and the cable separator.
8. Disconnect and then remove the following:

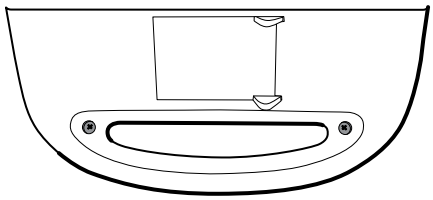




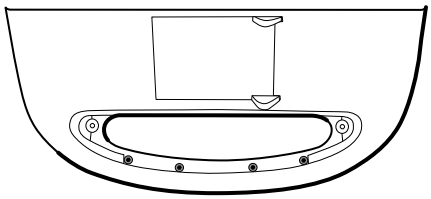
a. The fan cable on the main harness from J45 on the main board.
b. The communications power cable on the main harness from J49 on the main board.
c. The battery power harness from J29 on the main board.
d. The smart-battery harness from J34 on the main board.
e. The printer harness from J17 on the main board.
f. The speaker cable on the main harness from J12 on the main board.

NOTE Use extra care when disconnecting J12 to avoid pulling the connector off the board.

9. Remove the two screws (14) that secure the handle insert and remove the insert.



10. Remove the four Torx screws that secure the handle.



11. Remove the top housing.

Reassembly notes

- Ensure that the printer is installed in the top housing. See the reassembly notes for the printer.
- Before installing the USB cables, install the following:
  - The fan cable on the main harness to J45 on the main board.
  - The communications power cable on the main harness to J49 on the main board, with the ferrite bead closest to the main board.
  - The battery power harness to J29 on the main board.
  - The smart-battery harness to J34 on the main board.
  - The printer harness to J17 on the main board.

- The speaker cable on the main harness to J12 on the main board.

  NOTE First inspect J12 for bent pins before installing the speaker cable.

- Install the USB cables based on the type of cable separator you have—6-hole or 11-hole—and the instructions below.

  NOTE The 6-hole separator has been discontinued, but it might be found in older devices.

USB cable locations—6-hole cable separator

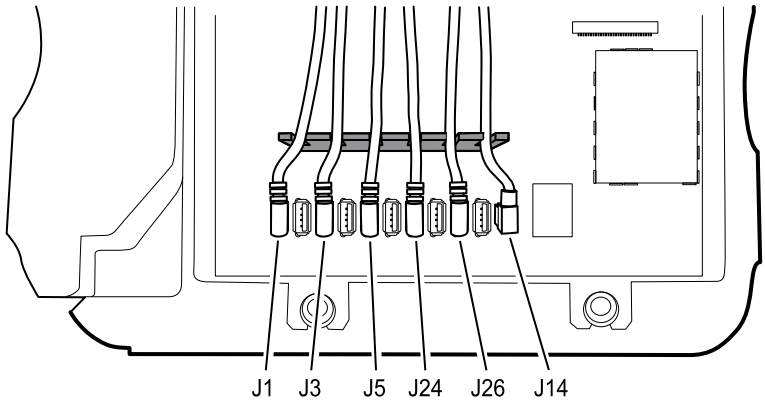
- Place the USB cables in the cable separator.

  NOTE If the USB cable was not removed from the temperature module, leave the J1 position in the figure below vacant until the cable separator is placed in the case and the other USB cables have been connected to the main board. When the cable separator is in the case, connect the USB cable from the temperature module to J1 on the main board and snap the cable into the J1 position in the cable separator.

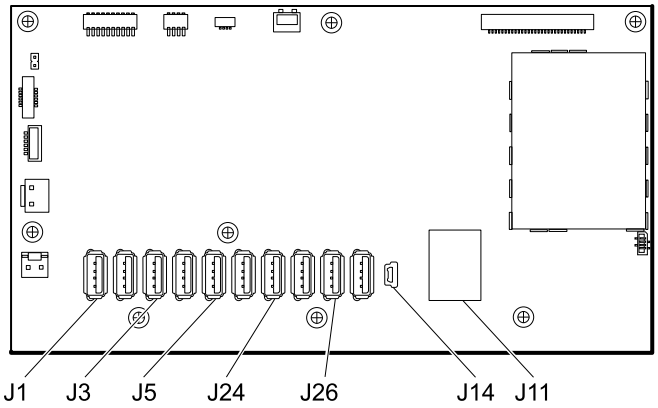
  NOTE The cable with right-angle connectors at both ends is in the J14 position in the figure below.

  NOTE If the option is not included, leave the separator position empty.

- Position each cable to extend approximately 1.5 inches past the separator.
- Place the separator in the unit as shown below.



- Plug the USB cables into the main board as follows:



No.	Item	No.	Item
J1	Temperature	J24	NIBP
J3	Printer	J26	COMMS J4
J5	SpO2	J14	COMMS J8

USB cable locations—11-hole cable separator

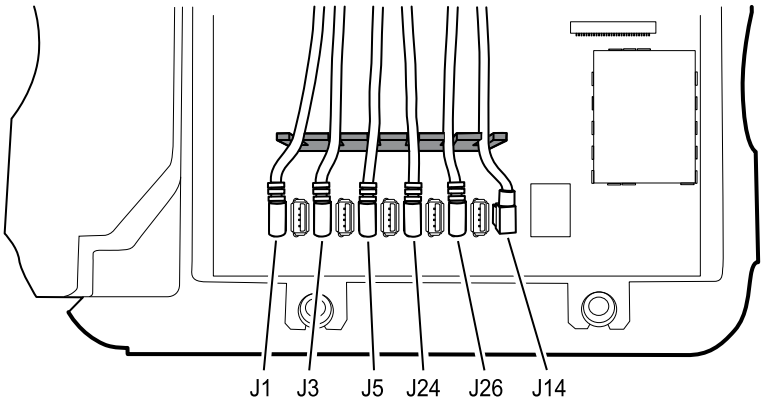
- Place the USB cables in the cable separator.

NOTE If the USB cable was not removed from the temperature module, leave the J1 position in the figure below vacant until the cable separator is placed in the case and the other USB cables have been connected to the main board. When the cable separator is in the case, connect the USB cable from the temperature module to J1 on the main board and snap the cable into the J1 position in the cable separator.

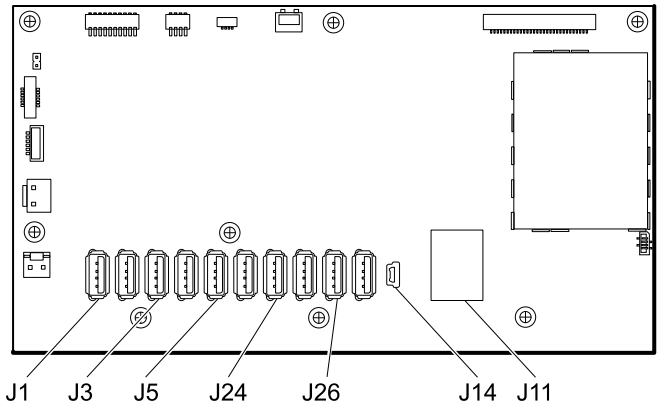
NOTE The cable with right-angle connectors at both ends is in the J14 position in the figure below.

NOTE If the option is not included, leave the separator position empty.

- Position each cable to extend approximately 1.5 inches past the separator.
- Place the separator in the unit as shown below.



- Plug the USB cables into the main board as follows:



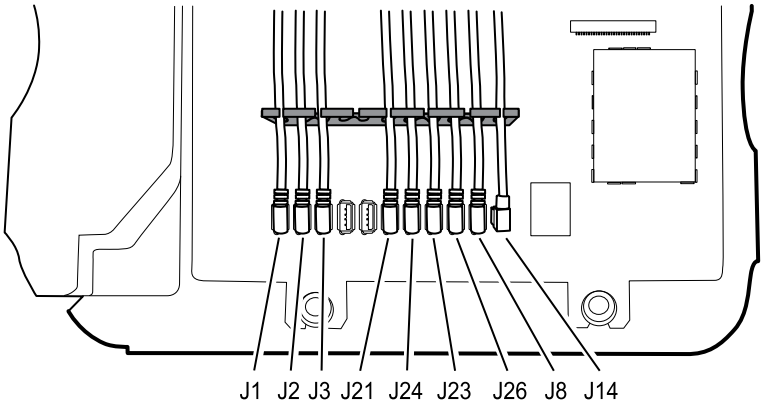
- Place the USB cables in the cable separator.

NOTE If the USB cable was not removed from the temperature module, leave the J1 position in the figure below vacant until the cable separator is placed in the case and the other USB cables have been connected to the main board. When the cable separator is in the case, connect the USB cable from the temperature module to J1 on the main board and snap the cable into the J1 position in the cable separator.

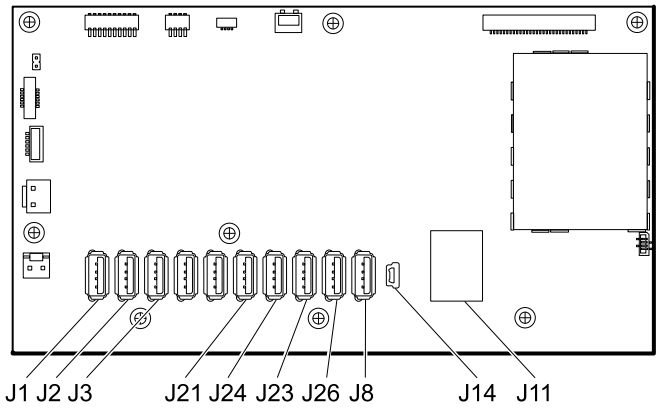
NOTE The cable with right-angle connectors at both ends is in the J14 position in the figure below.

NOTE If the option is not included, leave the separator position empty.

- Position each cable to extend approximately 1.5 inches past the separator.
- Place the separator in the unit as shown below.

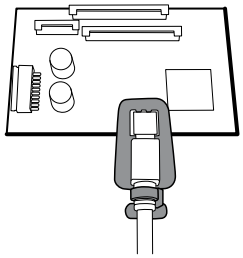


- Plug the USB cables into the main board as follows:

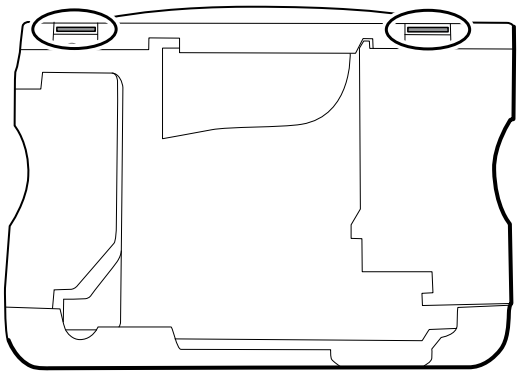


No.	Item	No.	Item
J1	Temperature	J23	SpO2
J2	Printer	J26	NIBP
J3	EarlySense	J8	COMMS J4
J21	CO2	J14	COMMS J8
J24	CO2		

- For models with a temperature module, if you disconnected the USB cable from the temperature module during disassembly, you must replace the retaining clip. (See the topic "When replacing the temperature module" for specific instructions.)
- For models with a printer, plug the other end of the USB cable into the printer while pulling the plastic latch away from the connector. Once the connector is seated, push the plastic latch over the connector to secure it.



- Verify that the Ethernet cable passes freely through the space between the temperature housing and the printer board, exiting the case in the space between the top of the temperature housing and beneath the top housing.
- If the Ethernet cable was removed, re-install it when re-installing the bottom housing.
- When installing the top housing on the chassis, line up the slots on the top housing with the ends of the horizontal struts on the chassis to ensure proper seating.



- When installing the housing top extension (75), verify that the top housing gasket is in place. Use an 8mm socket and Torque driver calibrated for 12.0 inch-pound ±1.0 inch-pound to secure the standoffs (74).

When replacing the top housing

For models without a printer, install the printer door blank as follows:

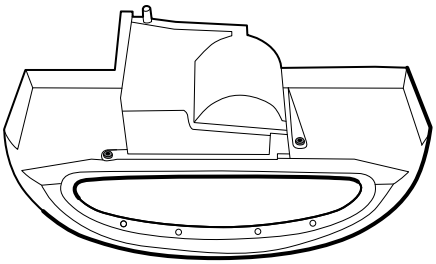
1. Remove the paper backing from the gasket on the door blank.
2. Install the door blank into the top housing, pressing to secure the door blank to the top housing.

Remove the printer

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing

1. Remove the two Torx screws that secure the printer housing to the top housing.



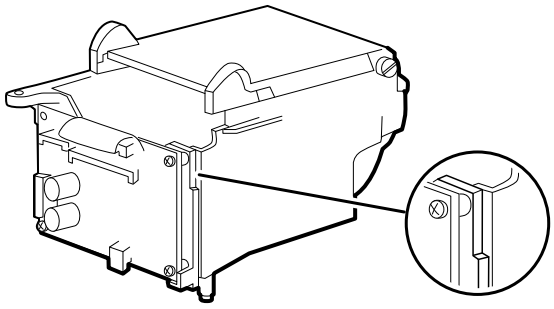
2. Remove the printer from the top housing:
   a. Hold the printer housing while opening the printer door.
   b. Separate the printer and printer door from the top housing.

Reassembly notes

1. Verify that the ground wire exits from the side opposite the printer board in the notched area.
2. Place the printer door into the top housing assembly and hold it in place while performing the next step.
3. Install the printer in the top housing by sliding the tabs into the slots.
4. Snap the printer door shut to hold the printer in place while securing it into the housing with two screws.

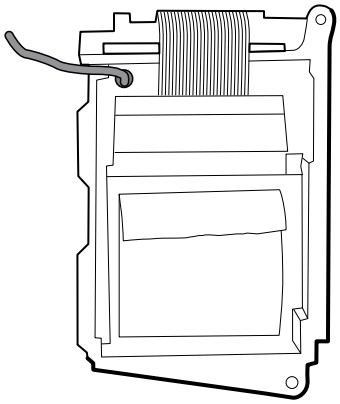
When replacing the printer or adding a printer

- Verify whether the printer housing has a notch, as shown below. If the printer has a notch, you can use the printer in a standard chassis or an extended chassis. If the printer does not have a notch, you can use the printer only in a standard chassis.

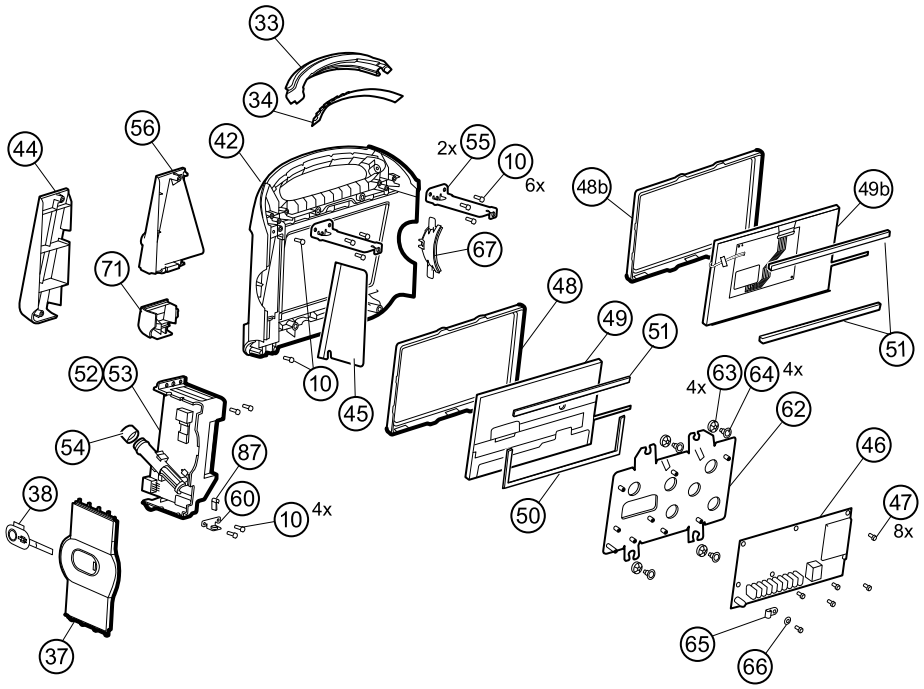


- If adding a printer, remove the printer door blank. Remove any remaining gasket material and clean the surface with 70 percent isopropyl alcohol.

1. Separate the door from the printer assembly.
2. Attach the printer ground harness to the printer ground lug.



Disassemble the front housing



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	51	Foam pad
33	Light bar	52	Temperature module
34	Light-bar board	53	Temperature housing
37	Right side panel	54	Probe well seal
38	Power button	55	Horizontal struts
42	Front housing	56	Temperature mounting cover
44	Temperature blanking panel	60	HSG clamp
45	Thermal shield	62	LCD frame
46	Main board	63	Grommet, ear - G411-1
47	Screw, M3 x 5 pan head	64	Shoulder screw, ear G-411-1 metric

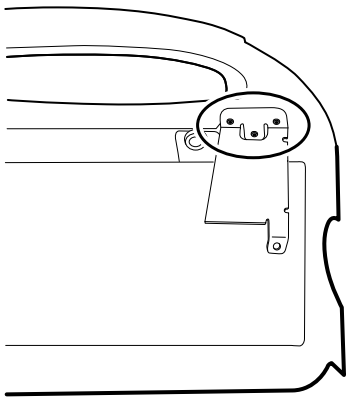
No.	Item	No.	Item
48	LCD bezel (1st generation displays)	65	Clamp, cable 3/16 X 3/8 wide X 3/4 long
48b	LCD bezel (2nd generation displays)	66	Washer, M3
49	LCD with touchscreen (1st generation displays)	67	Left insert
49b	LCD with touchscreen (2nd generation displays)	71	Temperature connection access cover
50	Foam pad		

Remove the light bar

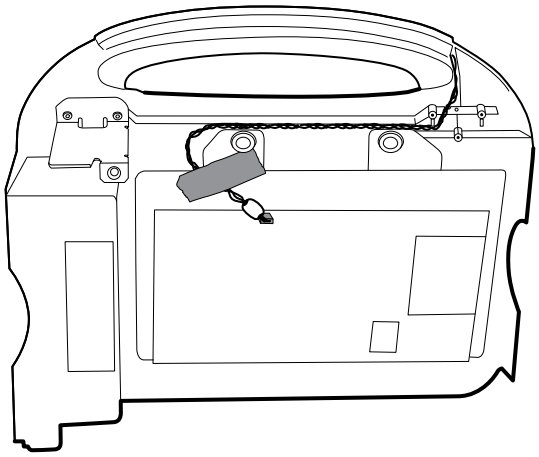
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing

1. Remove the three screws (10) that secure the horizontal strut (located on the right side when facing the device from the back) to the front housing.



2. Remove the strut.
3. Remove the tape that secures the light-bar harness to the LCD frame.



4. Disconnect the light-bar harness from J46 on the main board.
5. Remove the light-bar board (34) and light bar (33) from the front housing.
6. Remove the light-bar board from the light bar.
7. Disconnect the light-bar harness from the light-bar board.

Reassembly notes

- Insert the light-bar board into the light bar as follows:
  1. Place the end without the connector into the closed end of the light bar, with the LEDs facing into the light bar.
  2. Ensure that you slide the non-connector end of the light-bar board to the end of the slot in the light bar.
- Using the end furthest from the ferrite bead, plug the light-bar harness into the light-bar board.
- Route the light-bar harness as follows:
  - Through the slot in the front housing, underneath the horizontal strut.
  - In the channel and between the top of the housing and the LCD frame standoffs.
- Secure the light-bar harness with tape, making sure that the ferrite bead is between the main board and the tape.

Remove the temperature module or housing

NOTE These instructions also apply to removing the temperature housing for models without the temperature option.

NOTE Do not disconnect the USB cable from the temperature module unless you plan to replace the module and/or the USB cable. Disconnect the USB cable at the main board when removing the module.

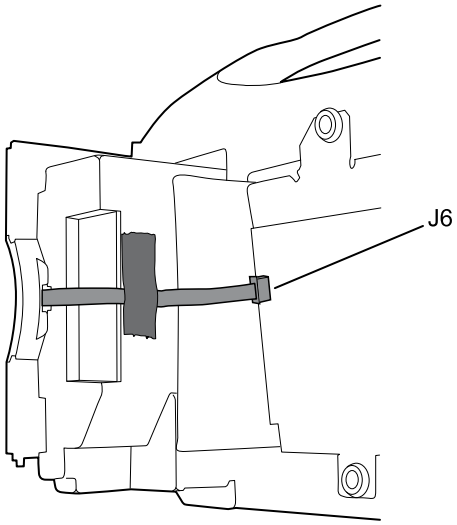
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate

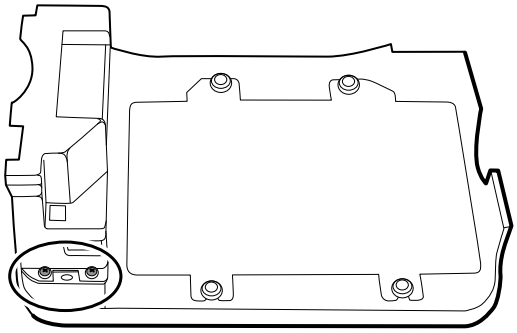
- NIBP module
- Bottom housing
- Top housing

NOTE You can remove and replace the temperature module without disconnecting the main harness, battery harnesses, USB cables, or light-bar harness from the main board.

1. Remove the probe well from the temperature module.
2. Disconnect the power button flex cable from the J6 ZIF locking connector on the main board and remove the securing tape.



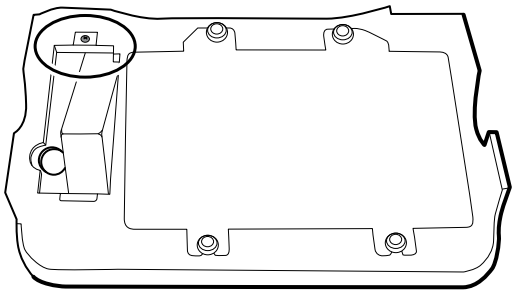
3. Remove the right side panel (37).
4. Remove the two Torx screws (10) from the HSG clamp (60).



5. Remove the two Torx screws (10) that secure the top of the temperature module or empty housing.
6. Remove the temperature module or empty housing.

NOTE If you are replacing only the temperature module without replacing the temperature mounting cover, stop here. Install the replacement module in the reverse order of disassembly procedure.

7. Complete the following steps that apply to your monitor:
   - If your monitor has a temperature module, remove the temperature mounting cover:
     a. Remove the screw that secures the temperature mounting cover to the front housing.

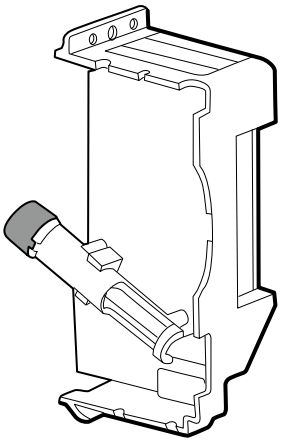


b. Remove the temperature mounting cover (56) from the front housing.

- If your monitor does not have a temperature module, remove the temperature blanking panel:
  a. Remove the two screws that secure the blanking panel to the front housing.
  b. Remove the blanking panel (44).

Reassembly notes

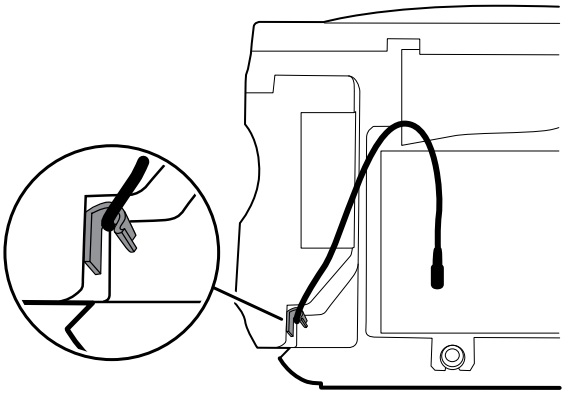
- Before installing the temperature module into the front housing, ensure that the probe well seal is installed with the tab aligned with the slot or notch in the probe well housing.



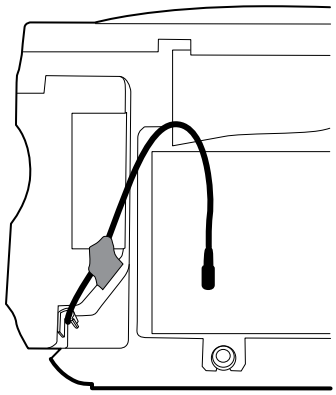
- Route the power button flex cable up and over the temperature module and plug the cable into the J6 ZIF locking connector on the main board.

When replacing the temperature module

1. Connect the USB cable to the temperature module.
2. Position the retaining clip on the USB cable against the shoulder of the mini-B connector with the adhesive pad facing away from the temperature module and toward the bottom.
3. Remove the backing on the retaining clip to expose the adhesive.
4. Rotate the clip on the USB cable to fasten the clip to the temperature module housing.

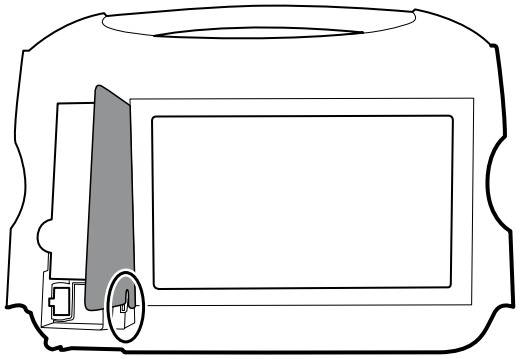


5. Secure the USB cable with a piece of tape as shown.



When adding a temperature module

1. Follow the instructions to remove the temperature housing, main board, and LCD.
2. Replace the temperature blanking panel (44) with the temperature mounting cover (56).
3. Install the thermal shield (45) on the front housing, aligning the notch on the shield with the housing.



4. Reinstall the LCD in the reverse order of disassembly.
5. Reinstall the main board in the reverse order of disassembly.
6. Install the probe well seal onto the probe well as described in the reassembly notes for the temperature module.
7. Insert the temperature module into the front housing aligning the probe well with the access hole in the front housing.
8. Secure the top of the temperature module to the front housing with two screws included with the kit.

9. Place the HSG clamp on the bottom of the temperature module and secure with two screws.
10. Connect the USB cable to the module as described in the instructions for replacing the temperature module.

Remove the main board

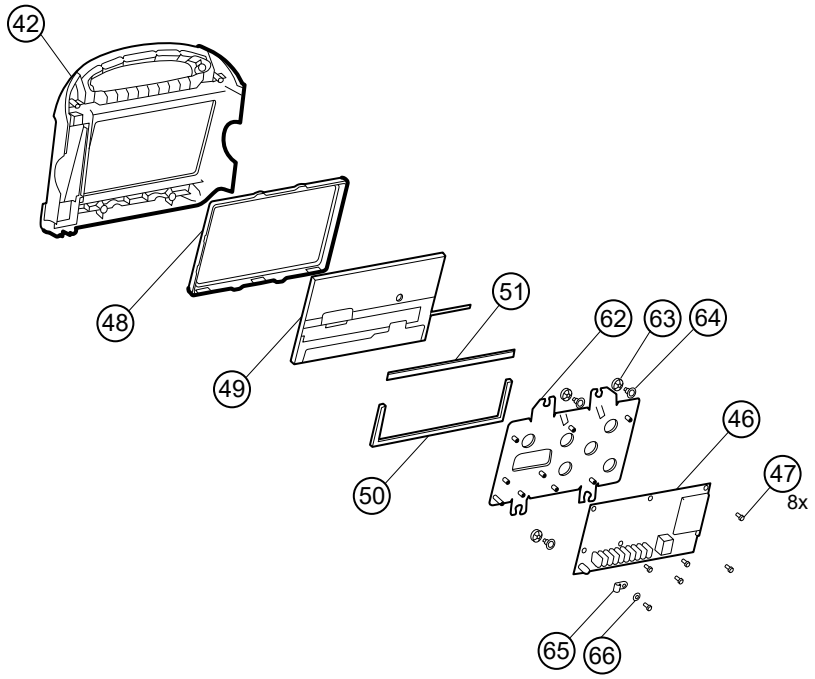
This section includes instructions for 1st generation and 2nd generation displays. Follow the instructions that apply to your configuration.

NOTE If you are replacing this board, you must have the service tool, Gold licensed edition, to re-enter the serial number of the monitor and the main board.

NOTE If you are replacing the display, you must replace the bezel, LCD with touchscreen, and foam pads with the replacement parts in Service kit 106546. The bezel and foam pads are designed to match the display.

NOTE Different configurations of parts appear in Connex VSM monitors, depending on the age of the display. Use Configuration A or Configuration B to identify the components in your device.

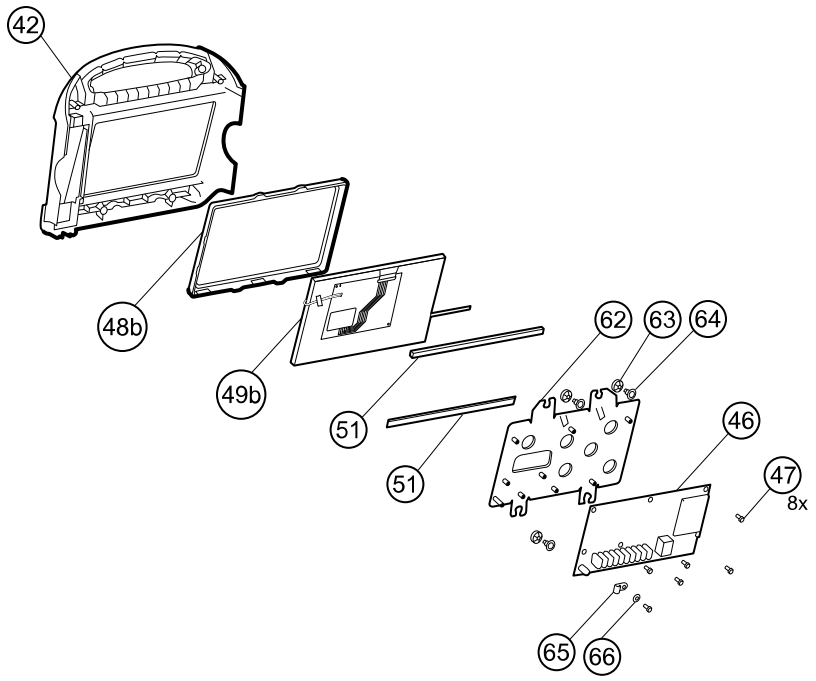
Configuration A - 1st generation displays



No.	Item	No.	Item
42	Front housing	51	Foam pad, bottom (and bottom in 2nd generation models)
46	Main board	62	LCD frame
47	Screw, M3 x 5 pan head	63	Grommet, ear - G411-1
48	LCD bezel	64	Shoulder screw, ear G-411-1 metric

No.	Item	No.	Item
49	LCD with touchscreen	65	Clamp, cable 3/16 X 3/8 wide X 3/4 long
50	Foam pad, bottom (1st generation displays)	66	Washer, M3

Configuration B - 2nd generation displays



No.	Item	No.	Item
42	Front housing	62	LCD frame
46	Main board	63	Grommet, ear - G411-1
47	Screw, M3 x 5 pan head	64	Shoulder screw, ear G-411-1 metric
48b	LCD bezel	65	Clamp, cable 3/16 X 3/8 wide X 3/4 long
49b	LCD with touchscreen	66	Washer, M3
51	Foam pads, top and bottom		

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

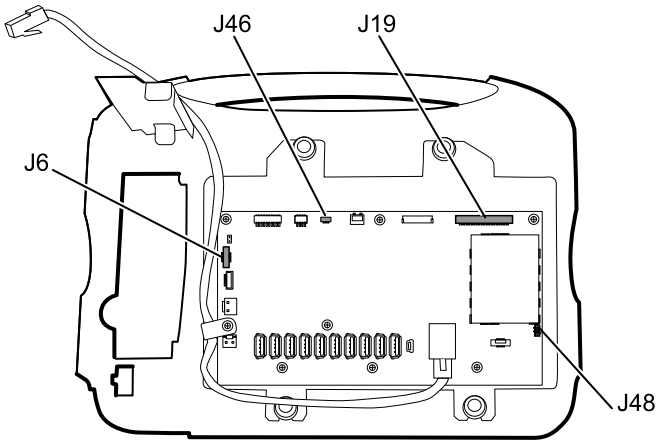
- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate

- NIBP module
- Bottom housing
- Top housing

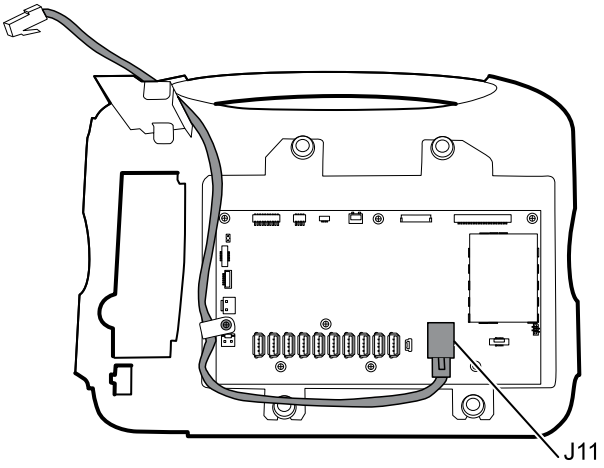
NOTE It is not necessary to remove the temperature module or light bar to remove the main board or LCD.

1. Disconnect the following on the main board:
   a. The power button flex cable from the J6 ZIF locking connector.
   b. The light-bar harness from J46.
   c. The LCD harness from J19.
   d. The LCD flex cable from J48.

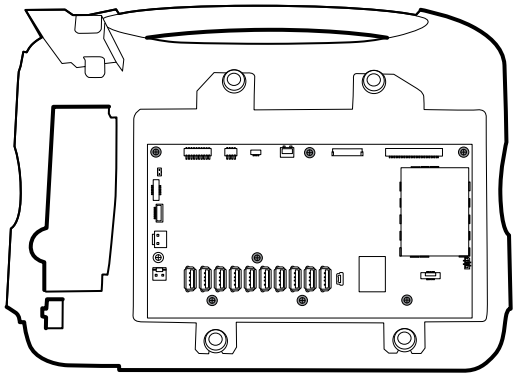
CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.



2. Remove the Ethernet cable:
   a. Disconnect the Ethernet cable from the Ethernet connector (J11) on the main board.



   b. Remove the screw that secures the Ethernet cable P-clamp to the main board.
3. Remove the seven screws that secure the main board to the LCD frame.



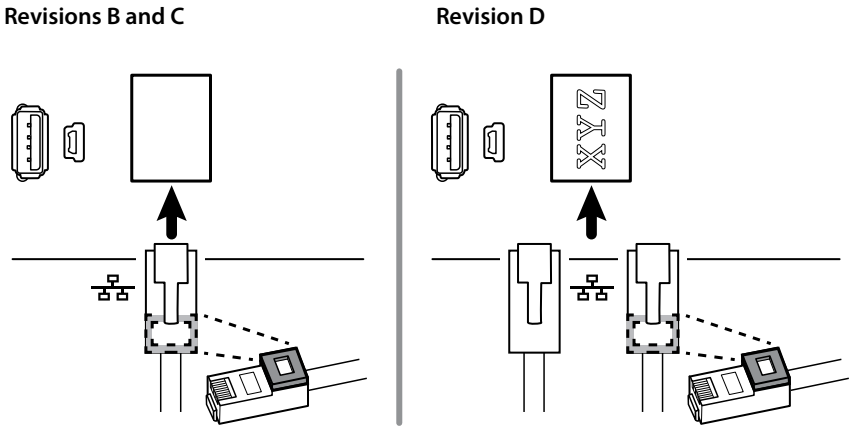
4. Remove the main board.

Reassembly notes

- Ensure that the LCD flex cable is not under the main board.

  CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.

- Before replacing the MCE board, remove the LCD frame as described in "Remove the LCD." Once the LCD frame has been removed, install approximately 3 inches of Pro Gaff tape (M11580) to cover the bottom of the two standoffs as indicated (see "When replacing the LCD frame"). Do not cover any portion of the large openings. Replace any Pro Gaff tape on the LCD frame that shows signs of wear or that was removed during reassembly.
- Route the Ethernet cable outside the PEM stud and not underneath the main board.
- Connect the Ethernet cable to the main board:
  - Verify whether your model contains PCBA 407574 revision B, C, or D. Revisions B and C have no logo on the top surface of the Ethernet port. Revision D has a logo on the top surface of the Ethernet port. See the figure below.
  - For PCBA 407574 revisions B and C, confirm that the Ethernet cable has a shim on one connector. Insert the connector with the shim into the Ethernet port.
  - For PCBA 407574 revision D, you can use either an Ethernet cable with a shim or an Ethernet cable without a shim. Insert the connector into the Ethernet port.



- When securing the main board, install the screw near J30 *after* you install the Ethernet cable.
- If the light bar is not installed, install the light-bar harness into the housing, positioning the ferrite bead near the main board.

When replacing the main board

- When ordering the replacement main board, order the standard license for the model being serviced. You will receive an authorization code to enter in the service tool to reactivate the licenses included with the original configuration.
- After reassembling the monitor, use the service tool to provision the monitor as follows:
  - Enter the monitor's serial number. This can be found on the bottom of the monitor.
  - Restore any previously licensed features by entering the authorization code in the service tool. Use the authorization codes that accompanied the replacement board, along with any additional license authorization codes previously installed. Record the device serial number on the license Authorization Code cards received with the replacement board and retain for future use. If the license is lost, you can reuse the authorization code on the same device.
  - Update the host controller software to the current version. If the current version of the host software is not available after connecting the device to the service tool, contact Welch Allyn Technical Support.

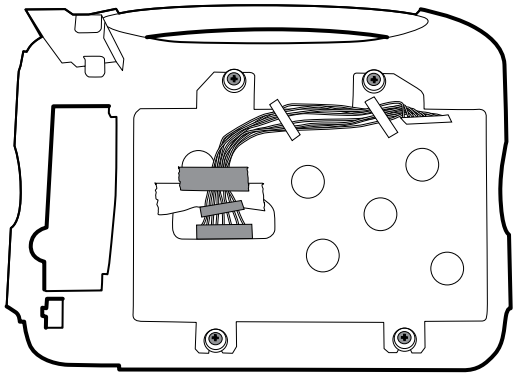
Remove the LCD

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing
- Main board

NOTE It is not necessary to remove the temperature module or light bar to remove the main board or LCD.

1. Disconnect the LCD harness from the LCD. For easier access to the connector, you can slide the ferrite bead closest to the connector up the harness.



2. Remove the four shoulder screws that secure the LCD frame.
3. Remove the LCD frame.

NOTE Be sure to support the LCD if you are removing it with the frame. The foam strips on the LCD might cause the LCD to stick to the frame.

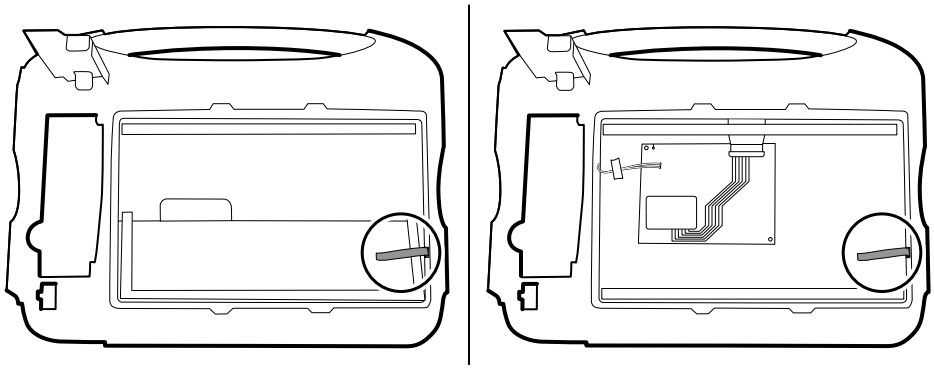
4. Remove the LCD.

Reassembly notes

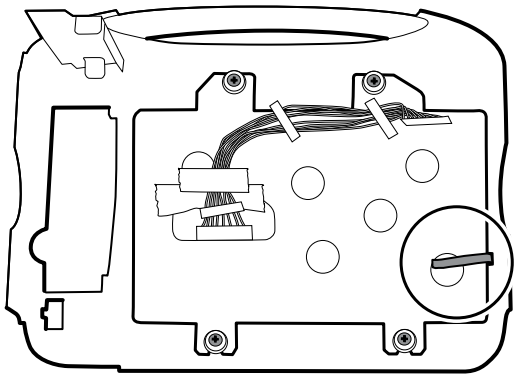
CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.

- Verify that the LCD flex cable feeds through the bezel's clearance feature. Insert the LCD into the bezel in the front housing with the LCD flex cable on the lower right as shown. (The image on the left applies to 1st generation displays while the one on the right applies to 2nd generation displays.)

1st generation displays **2nd generation displays**

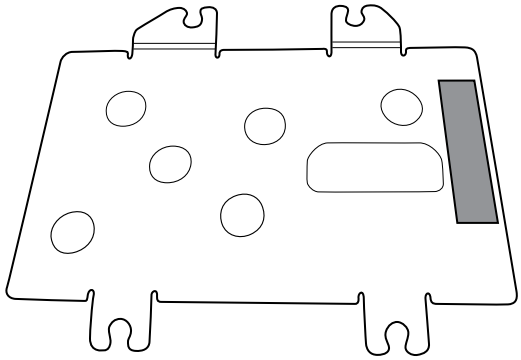


- Place the LCD frame over the LCD. Verify that the LCD frame does not cover the LCD flex cable.



When replacing the LCD frame

- Install a 3-inch strip of Pro Gaff tape on the back of the LCD frame to cover the bottom of the standoffs. This tape will prevent any small pieces of metal left over from the threading process from falling into the display where it might cause a short.



- Install the LCD frame with shoulder screws and washers.
- Install a 3-inch strip of Pro Gaff tape over the top part of the LCD harness cutout to protect the LCD harness from abrasion.
- Install the LCD harness. If it was removed from the frame, use isopropyl alcohol to clean the area in the scribed boxes where you will mount the harness's ferrite beads. Expose the sticky backing on the ferrite beads and mount them in the scribed rectangles.

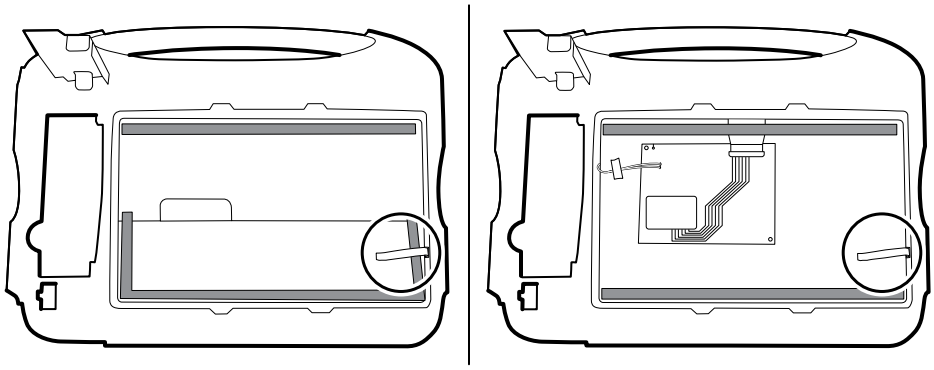
NOTE If you don't place the ferrites correctly in marked areas, they will obstruct the placement of other components like the MCE board.

- Attach a piece of tape to the top of the LCD harness to secure it to the frame.
- Attach the LCD frame ground wire to the frame.
-

When replacing the LCD

- Peel the protective sheet from the LCD.
- Verify that the foam strips are installed on the back of the LCD near the top and bottom edges. On 1st generation displays (see image on the left), the foam strip extends halfway up from the bottom on both sides of the LCD. On 2nd generation displays, the foam strips are only on the top and bottom of the LCD (see image on the right).

1st generation displays **2nd generation displays**



- Verify that the LCD flex cable feeds through the bezel's clearance feature.
- Add a 1.25-inch strip of tape to the edge of the LCD frame where the LCD flex cable and ground come around it.
- Insert the LCD into the bezel in the front housing with the LCD flex cable on the lower right as shown.
- Add a 1.25-inch strip of tape to the edge of the LCD frame, where the harness passes through to connect to the LCD, to prevent abrasion of the LCD harness.
- When adding the ferrite beads, align the beads with the marks on the LCD frame.
- Add tape to secure the harness to the LCD frame where the harness passes through.

Remove the front housing

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing
- Light bar
- Temperature module and mounting cover
- Main board
- LCD

To complete disassembly, remove the remaining strut from the front housing.

When replacing the front housing

For models with the temperature option, replace the thermal shield (45).

Section B

This section applies to devices that meet all of the following criteria:

- manufactured after 11/2017
- MCE hardware version P5 or later
- serial number after 100043244817.

NOTE See "Monitor serial number and model label" in the Appendix to learn how to determine the manufacture date from the serial number.

This section applies to devices that meet all of the following criteria:

- manufactured after 11/2017
- MCE hardware version P5 or later
- serial number after 100023374817.

NOTE See "Monitor serial number and model label" in the Appendix to learn how to determine the manufacture date from the serial number.

These devices comply with IEC 60601 3rd edition. Devices built after 12/2018 are 4th-edition compliant.

NOTE See Customer Service Bulletin 80022414 CSB – CVSM/CIWS IEC 60601 4th Edition for the exact manufacturing cutoff and start dates as well as the serial number for the first 4th-edition device.

NOTE If your device does not meet these criteria, see Section A for the correct disassembly and repair instructions.

If your device is IEC 3rd- or 4th-edition compliant, use only service kits with the "3rd Ed" or "4th Ed" suffix when replacing the following components:

- MCE (main board)
- LCD
- AC power supply
- AC power supply harness
- printer
- Ethernet cable
- rear housing
- product labels
- power button
- SureTemp module

- Masimo SpO2 module
- NIBP module
- EarlySense module
- CO2 module

If your device is IEC 3rd- or 4th-edition compliant, use only service kits with the "3rd Ed" or "4th Ed" suffix when replacing the following components:

- MCE (main board)
- LCD
- AC power supply
- AC power supply harness
- Ethernet cable
- main housing
- product labels
- SureTemp module
- Masimo SpO2 module
- NIBP module

NOTE For 4th-edition devices, use only 107124* when replacing Nellcor SpO2. Host software must be 2.40.01 or later.

NOTE Devices that are 4th-edition compliant cannot be downgraded below host software version 2.41.XX.

Power down the device

You can power down the device as follows: 1) on devices with 2.X software, briefly press the power button on the housing and then following the onscreen prompts, or 2) on all devices, use onscreen controls alone.

Option 1. After the device is powered up, briefly press of the power button to open an onscreen dialog with the following options:

- **Power down**. Device behavior varies based on the active profile, whether or not patient trend data is stored, and whether or not patient context is established. While servicing the device, you need not be concerned about these details. They only matter to clinicians who are monitoring patients and storing patient data.
- **Sleep**. The Sleep button clears the display and puts the device into Display power-saving mode.
- **Cancel**. The Cancel button dismisses the dialog.

Touch **Power down** and complete the power-down procedure.

Option 2. To use onscreen controls alone to power down the device, follow these steps:

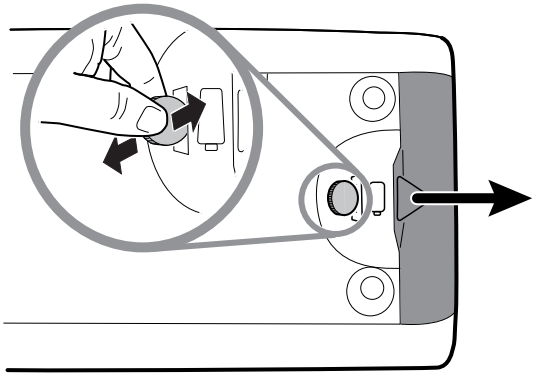
1. Touch the **Settings** tab.
2. Touch the **Device** tab.
3. Touch **Power down**.

NOTE The next three sections address disassembly and repair steps you can complete without removing the device from the wall or removing the battery. All steps presented after "Remove the system from the wall and remove the battery" require powering down as well as removing the device from the wall and removing the battery.

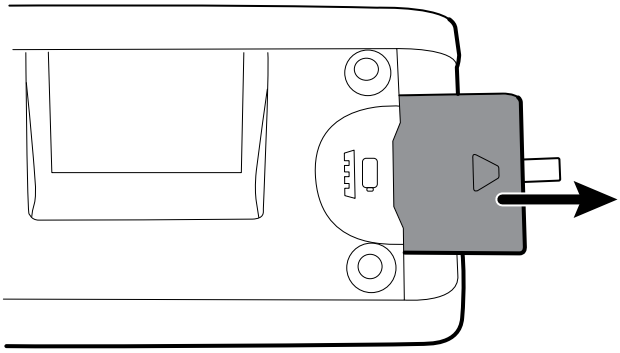
Remove the battery

Before removing the battery, power down the monitor as described in this manual and disconnect the AC power cord.

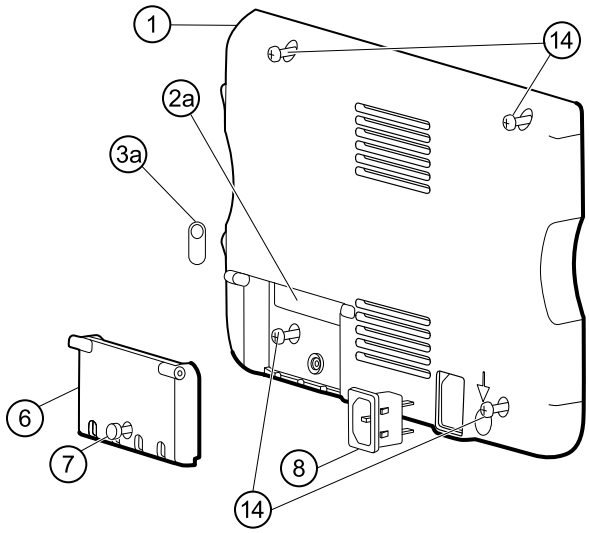
1. Turn the monitor upside down to access the battery cover.
2. Locate the battery cover, indicated by .
3. Insert a coin into the slot and push to open. Choose a coin that fits comfortably into the slot.



4. Pull the battery out by pulling the battery label, which is visible when you open the battery cover.



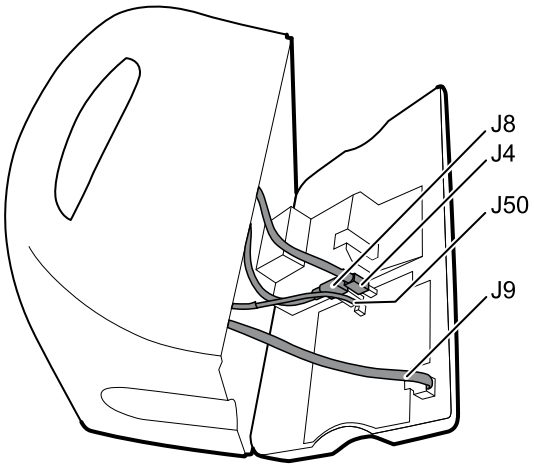
Remove the rear housing



No.	Item	No.	Item
1	Rear housing	7	Communications door captive screw
2a	USB label 4 USB host	8	IEC connector
3a	Nurse call label	14	Screw, M4 X 10 pan head with NYLOC
6	Communications door		

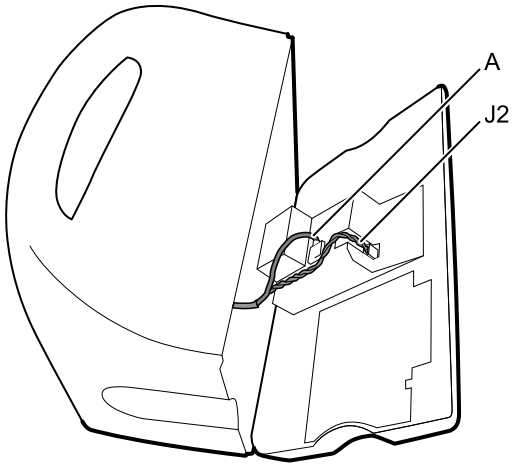
Before you begin, power down the device, disconnect the AC power cord, and remove the battery as described in this manual.

1. Lay the monitor face down on the antistatic mat.
2. Loosen the screw (7) to open the communications door (6).
3. Open the communications door (6) to access the rear housing screw.
4. Remove the four rear housing screws (14).
5. Stand the monitor on its feet with the display facing away from you.
6. Pull the top of the rear housing away from the monitor to access the rear housing cable connections.
7. While supporting the rear housing, disconnect the following from the communications module:

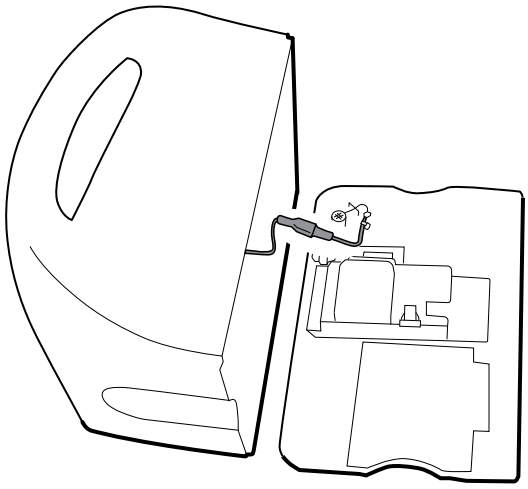


a. The Ethernet cable from J9.
b. The small USB connector from J4.
c. The large USB connector from J8.
d. The communications power cable from J50.

8. Continuing to support the rear housing, do the following at the power-supply cover:
   a. Free the power supply and fan cable from the wire guide on the side of the power-supply cover.
   b. Disconnect the power supply cable from the power supply board at J2.



   c. Disconnect the fan cable (A) from the main harness.
   d. Disconnect the LCD ground wire from the IEC power harness.



e. Separate the rear housing (1) from the monitor.

Once the rear housing is removed, choose which part of the monitor to work on:

- Rear housing components. For details, see "Disassemble the rear housing."
- Main chassis. For details, see "Disassemble the main chassis."

Reassembly notes

- Route the power cable and fan harness cables in the channel on the side of the power-supply cover.
- Some communications boards have two large USB connectors. The large USB connector J8 is the one closest to the mini USB connector J4. For reference, see the communications board diagram in the appendices.
- When closing the case, verify that no wires are crushed or pinched before securing with screws. After tightening the screws, examine the seam between the rear housing and the main chassis to verify that there is no bulging. Bulging indicates that something is preventing the mating surfaces from seating properly.

When replacing the rear housing

NOTE Use 3rd edition service kit 106840. The rear housing replacement service kit is assembled with the comms door, ground stud, ground lug plate, IEC connector, and 3rd edition AC power harness. It is unnecessary to transfer these components from the old rear housing.

1. Follow the procedures to disassemble the rear housing and remove any components that you intend to transfer to the replacement housing.
2. Connect the AC power harness to the IEC connector (8). See the reassembly notes for the power supply.
3. Install the rear housing gasket (15), included in the rear housing service kit, into the slot in the outer edge of the rear housing. To ease installation, use a small flat-blade screwdriver to assist in pushing the seal into the channel.
4. Install any components removed from the old rear housing in the reverse order of the disassembly instructions.
5. After reassembling the rear housing, install the USB client cover (40) as follows:
   a. Place the USB client cover on a USB mini B cable with the tape facing out.
   b. Peel off the tape to expose the adhesive.

c. Insert the USB cable into the client USB connection, press and remove the cable to adhere the cover to the rear housing.

6. Install these labels:
   - USB label (2a) in the communications door opening.
   - Nurse call label (3a) (Serv Kit 106837 CVSM Nurse call label 3rd Ed) over the nurse call connection.

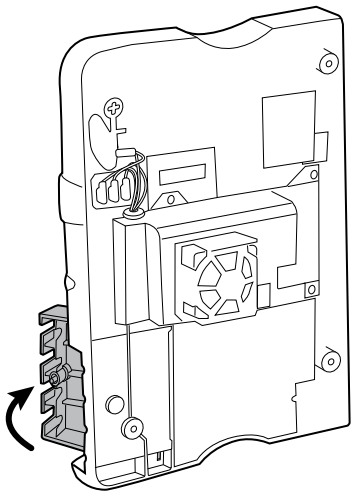
Remove the communications door

NOTE If the communications door is missing or already removed from the device, proceed to "When replacing the communications door."

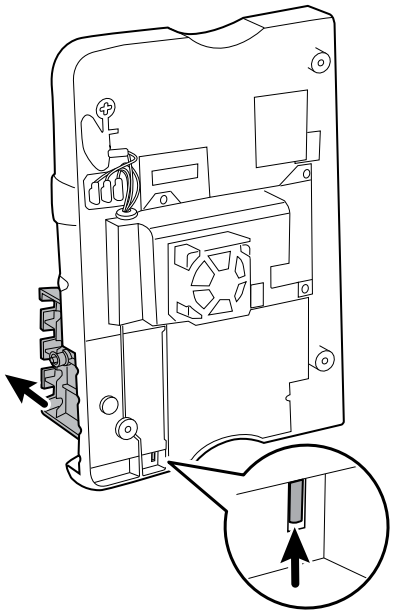
WARNING Personal injury risk. Because removing the door might propel the pin and spring into the air, wear safety glasses to complete these steps.

Before removing the communications door, power down the monitor, remove the battery, and remove the rear housing as described.

1. Position the rear housing with the Ethernet connection side down on an antistatic mat.
2. Open the communications door perpendicular to the rear housing.



3. Use a spudger to push the pin upward until the pin clears the hinge.

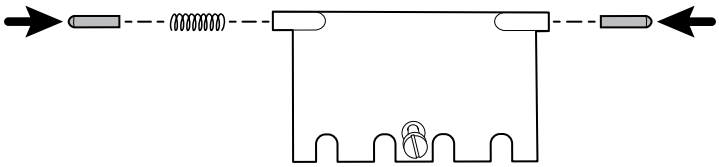


4. Carefully remove the door from the rear housing.

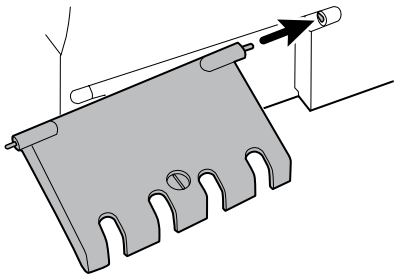
When replacing the communications door

WARNING Personal injury risk. Because attaching the door might propel the pin and spring into the air, wear safety glasses to complete these steps.

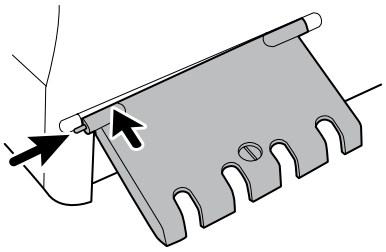
1. Insert a spring and two pins into the communications door as shown.



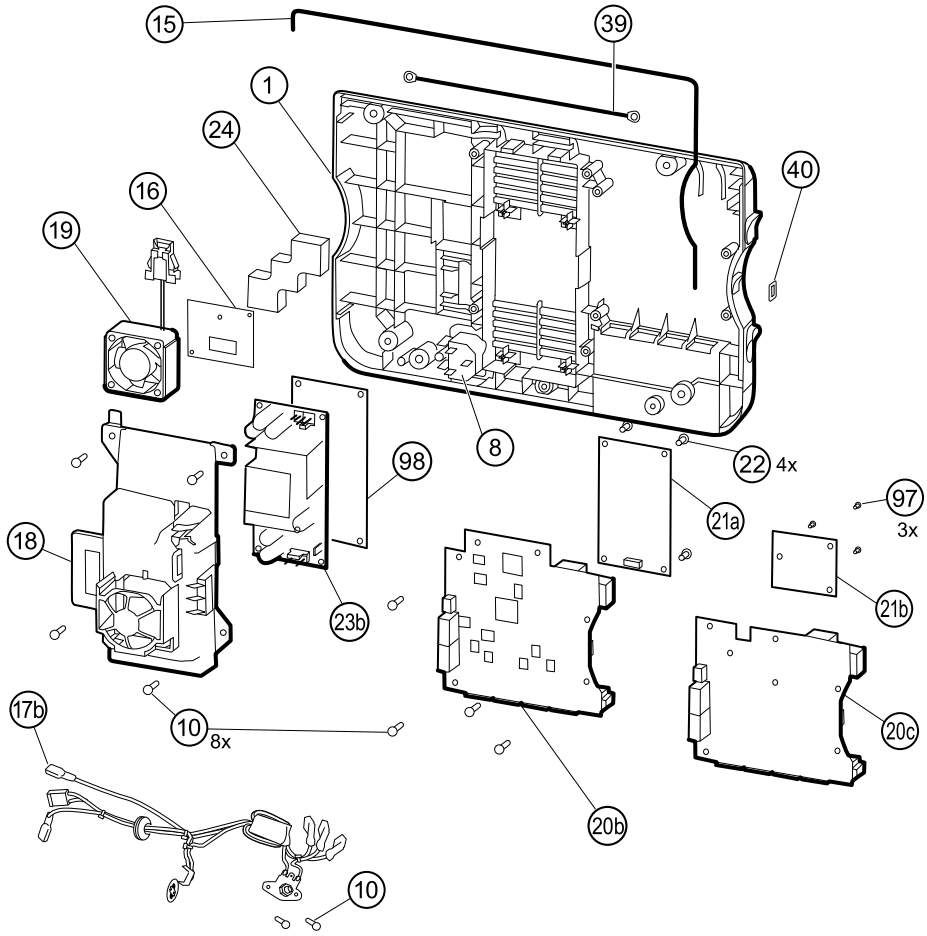
2. With the bottom of the door on the antistatic mat, insert the pin on the right side of the door into the hinge of the rear housing.



3. Press the pin into the left side of the door and slide the door into the hinge of the rear housing until it snaps into place.



Disassemble the rear housing



No.	Item	No.	Item
1	Rear housing	20c	Communications board for Newmar radio (Models 6400, 6500, 6700, and 6800)
8	IEC connector	21a	Radio board, Lamarr, 802.11a/b/g
10	Screw, plastite #4-20 X 0.500 Torx-pan head	21b	Radio board, Newmar, 802.11a/b/g/n
15	Rear housing gasket (Norprene tubing)	22	Screw, M3 X 0.5, Phillips pan head
16	Antenna board	23	Power supply board
17b	AC power harness	24	Antenna mounting foam block
18	Power supply cover	39	Antenna cable
19	Fan	40	USB client cover
20b	Communications board (Models 6400, 6500, 6700, and 6800)	97	Screw, M3x0.5x8, Pan Phillips (Small Phillips screw)

No.	Item	No.	Item
20c	Communications board for Newmar radio (Models 6400, 6500, 6700, and 6800)	98	Nomex ESD shield, CVSM power supply (4th edition only)

Remove the communications board

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

- Battery
- Rear housing

1. Lay the rear housing on its back on the antistatic mat.
2. Remove the four Torx screws (10) that secure the communications board (20a or 20b) to the rear housing.
3. Remove the communications board by doing the following:
    a. Lift the inside edge of the board until the USB connector clears the wire channel on the power-supply cover.
    b. Slide the board slightly toward the power supply and lift until the board contacts the wire channel on the power-supply cover.
    c. Lift the outside edge of the board until the side connectors clear the rear housing.
    d. For monitors with a radio: rotate the board (without pulling on the antenna cable) slightly counter-clockwise, pivoting on the upper left-hand corner. Turn the board over and set it down outside the top of the case.
4. If replacing the communications board, remove the radio board (21) as described in "Remove the radio board and antenna."

Reassembly notes

- If the radio board was removed, reinstall it before reinstalling the communications board.
- To install the communications board, do the following:
    1. Position the board over the standoffs with the inside edge of the board under the wire channel on the power-supply cover until the outer edge drops into the rear housing.
    2. Align the mini-USB external connector with the opening in the side of the rear housing.
    3. Slide the mini-USB connector into the opening until the board rests on the standoffs.

When replacing the communications board

Install the radio board on the new communications board before installing the communications board on the rear housing.

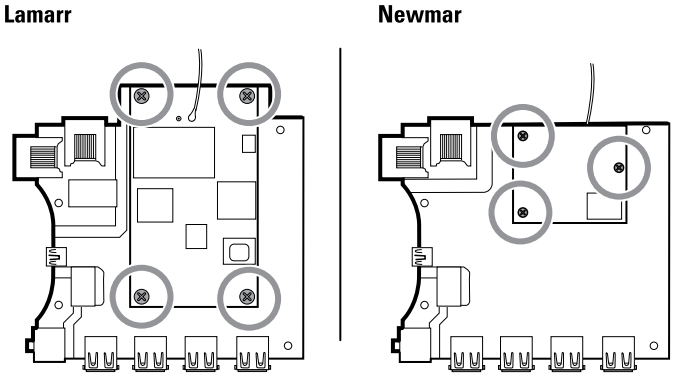
Remove the radio board and antenna

CAUTION Do not remove the radio antenna from the rear housing unless replacing the radio and antenna or the rear housing.

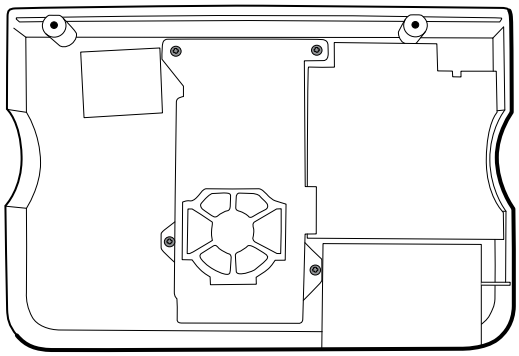
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- Communications board

1. If the monitor has a radio:
   a. Turn the communications board over to access the radio board, taking care to avoid straining the antenna cable.
   b. If the original Lamarr radio (a/b/g band) is installed, remove the four small Phillips (machine) screws securing the radio board to the communications board, as shown on the left. If the Newmar radio (a/b/g/n band) is installed, remove the three small Phillips (machine) screws securing the radio board to the communications board, as shown on the right.



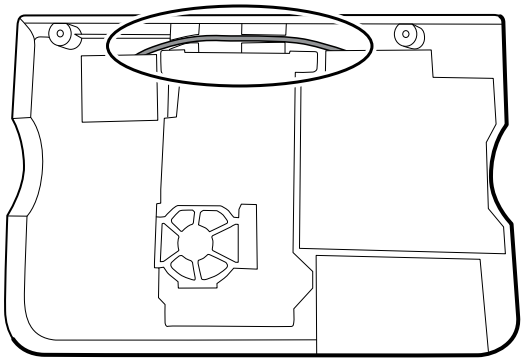
   c. Hold the communications board with one hand while grasping the radio board at the opposite end from the antenna connection and pull the radio board away from the communications board.
2. (Perform this step only if you are replacing the radio or antenna.) Disconnect the radio antenna cable from the radio board.
3. Remove the four Torx screws (10) securing the power-supply cover.



4. Remove the power-supply cover (18).
5. Use a soft tool such as a spudger to separate the foam block (24) from the inside of the rear housing.

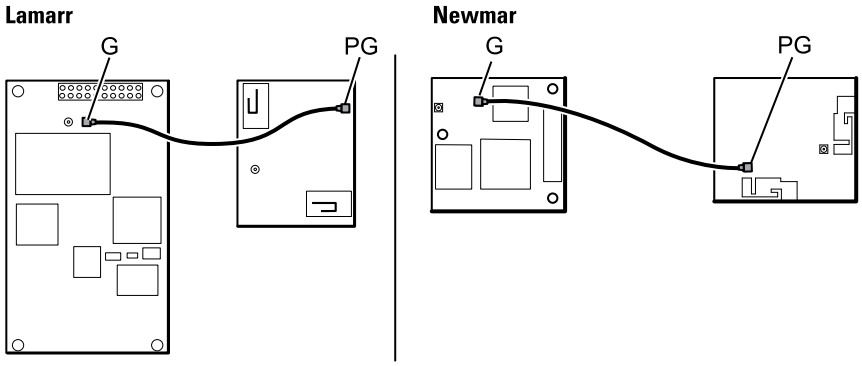
Reassembly notes

Route the antenna cable in the channel located at the top of the rear housing.

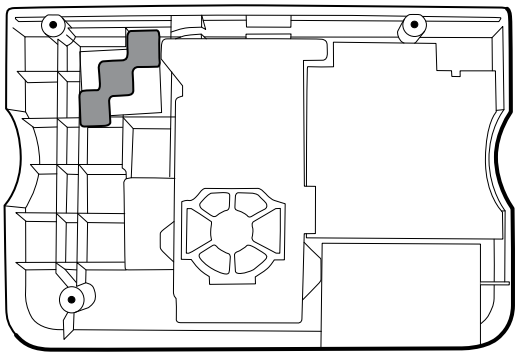


When replacing the radio board and antenna

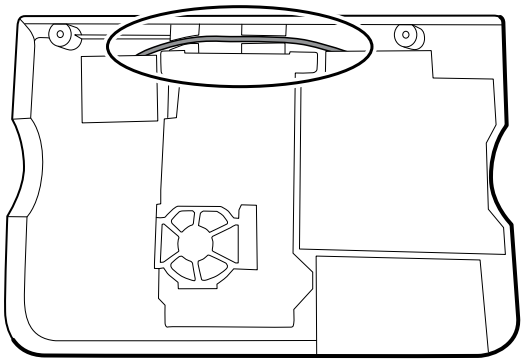
1. If the antenna is removed, clean the rear housing and mounting surface with isopropyl alcohol.
2. The following illustration shows both Lamarr and Newmar radio and antenna boards. Attach the antenna cable to terminal G on the radio board. Attach the other end of the cable to the antenna on terminal PG.



3. Peel the backing off the foam block (24) and affix the foam block to the rear housing.



4. Expose the adhesive on the foam block. Mount the antenna (16) on the foam block with the antenna cable (39) oriented under the board and in the wire channel above the power supply.
5. Route the antenna cable in the channel located at the top of the rear housing.

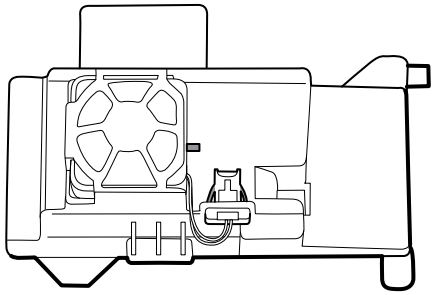


Remove the fan

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

- Battery
- Rear housing

1. Press the flanges on the sides of the fan harness connector and separate the fan connector from the power-supply cover (18).



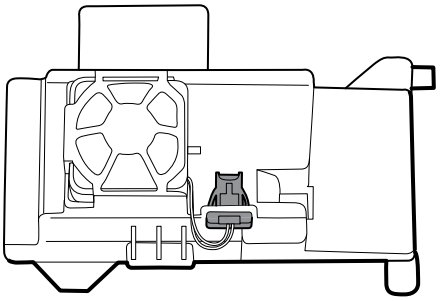
2. Depress the tab on the power-supply cover and slide the fan (19) over the tab and out of the housing.

Reassembly notes

CAUTION Ensure that the fan is properly oriented. Air must flow toward the power supply.

NOTE If the fan is dirty, use canned air to remove dust. Do not bend the fan blades or otherwise damage the fan. If the fan is noisy and cleaning does not reduce the noise, replace the fan.

- With the label facing down, slide the fan into the housing on top of the power-supply cover until the tab on the cover holds it in place.
- Clip the fan harness into the power-supply cover so that the connector is oriented toward the fan, as shown in the following figure.

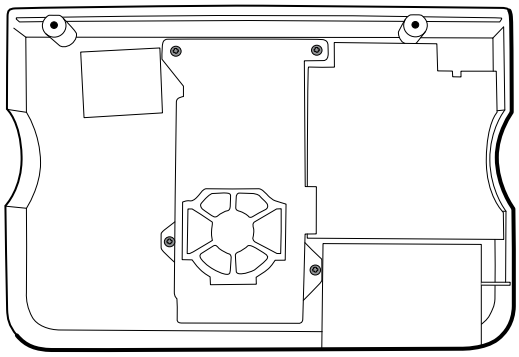


Remove the power supply

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

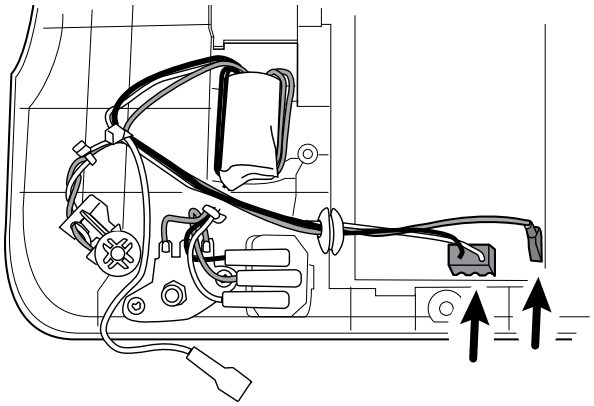
- Battery
- Rear housing

1. Remove the four Torx screws (10) securing the power-supply cover.



2. Remove the power-supply cover (18).
3. Disconnect the following from the power supply:
   - The (green) ground cable
   - The AC power harness (17b)

NOTE See "Remove the AC power harness" for instructions.



4. Remove the power supply and Nomex shield if present.

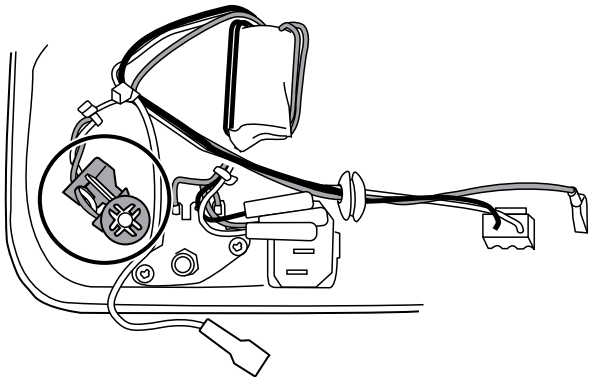
Remove the AC power harness

NOTE Do not disconnect the AC power harness from the IEC connector unless you are replacing it. Once you disconnect the AC power harness, you cannot reuse it.

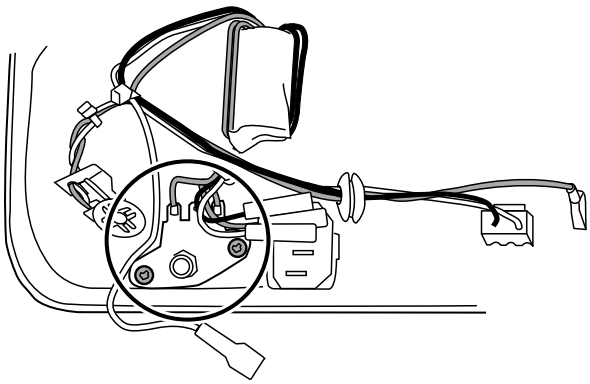
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- Power supply

1. Disconnect the AC power harness from the IEC connector.
2. Remove the metal grounding plate from the housing rib.



3. Remove the two screws securing the ground stud assembly to the rear housing.

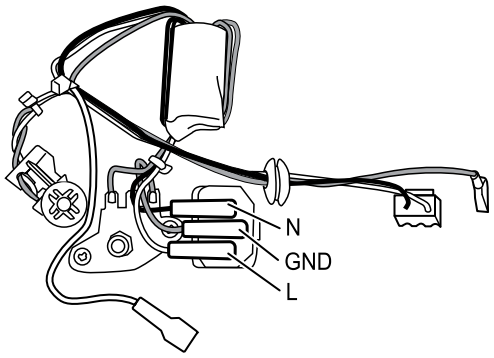


4. Remove the ground stud AC power harness assembly.

Reassembly notes

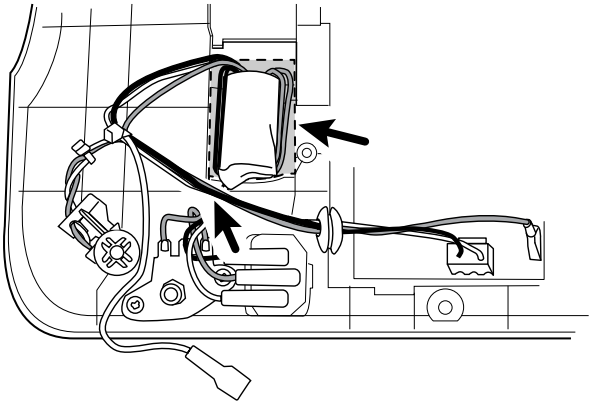
When replacing the rear case or AC power harness, route the wiring as follows:

- Connect blue to neutral (N), green to ground (GND), and brown to line (L).

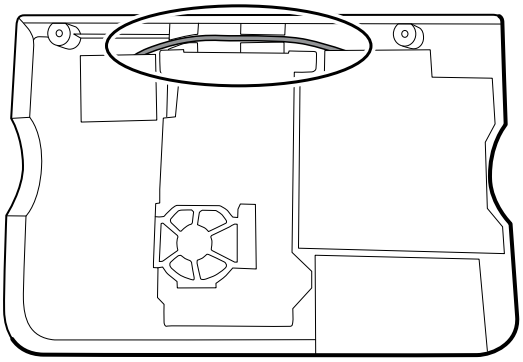


NOTE The power supply harness to IEC connector is rated for a single connection. Replace the power supply harness if it has been disconnected from the IEC connector.

- Ensure that the grommet on the AC power harness is in the slot in the power supply cover.
- Place ferrite on the AC power harness assembly into the molded feature on the back housing and then check the following details:



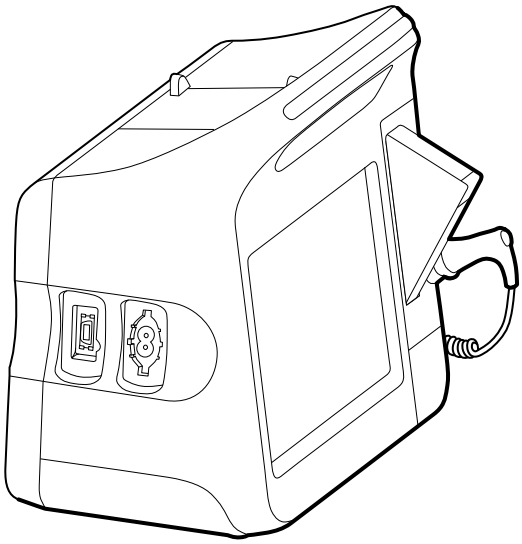
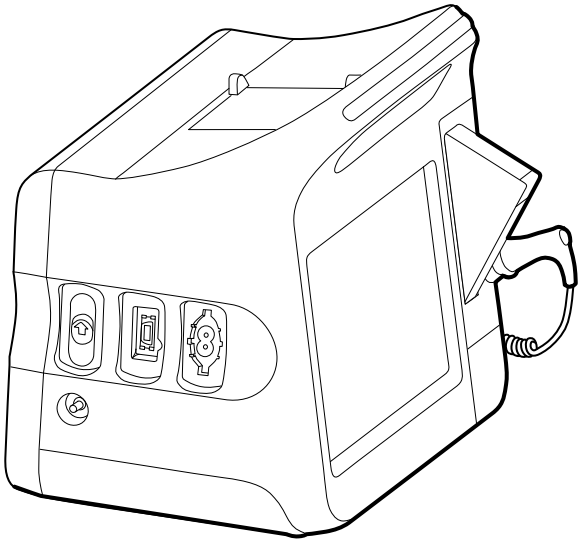
  - Ensure that the edge of the ferrite is inside the edge of the molded feature.
  - Ensure that the wires on the power supply wire harness ferrite are on the sides of the ferrite.
  - Confirm that the wires to the power supply and the LCD ground wire pass over the top of the wires to the ferrite.
  - Confirm that the power cables are not pinched by the power supply cover.
- When replacing the power supply cover, ensure that the antenna cable is routed in the channel located at the top of the rear housing.



- When replacing the power supply, if the a Nomex ESD shield was installed, inspect the ESD shield and replace as needed. Replace the shield if you see any degradation of the material.

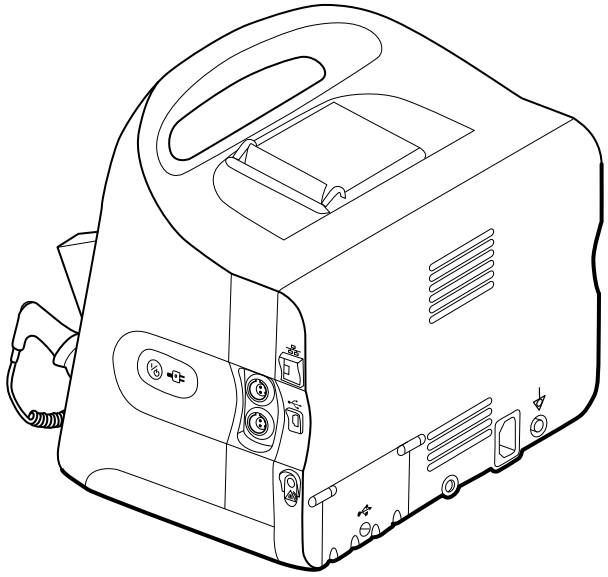
Disassemble the main chassis

Disassembly and reassembly procedures are the same for the standard chassis and extended chassis, unless otherwise noted.

Configuration options	
Standard chassis (left side)	**Extended chassis (left side)**
Supports a maximum of two modules	Supports a maximum of three modules
	
Components (back to front): SpO2, NIBP Blank, NIBP (6300, 6400, and 6500 only)	Components (back to front): CO2, SpO2, NIBP Blank, SpO2, NIBP

Extended chassis (right side) Supports a maximum of one module

NOTE The standard chassis is the same as extended chassis minus space for an EarlySense module, so it is not presented here.



Components (front to back):

Power button, EarlySense, Ethernet RJ-45, USB client, Nurse call

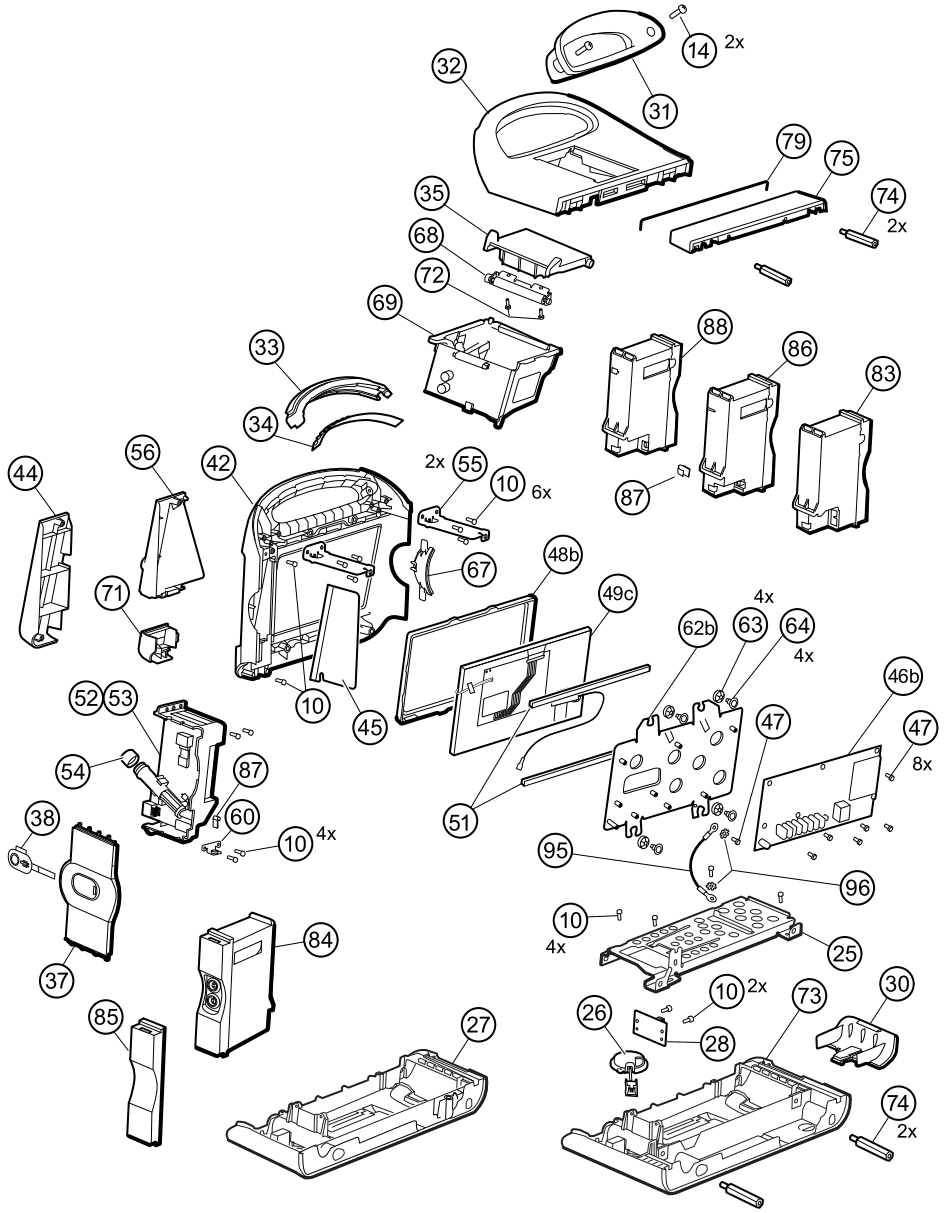
Power button, Blank, Ethernet RJ-45, USB client, Nurse call

NOTE Monitors configured with RRa, SpHb, or CO2 cannot be configured with EarlySense.

NOTE Ethernet RJ-45 provides a hardwired connection to the computer network. USB client provides a connection to an external computer for testing and software upgrades. Nurse call provides a connection to the hospital nurse call system.

Main chassis exploded view

More detailed views of main chassis components and tables identifying specific parts appear later in this section preceding the associated disassembly and repair instructions.



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	54	Probe well seal
14	Screw, M4 X 10 pan head with NYLOC	55	Horizontal struts
25	Bottom housing metal chassis	56	Temperature mounting cover

No.	Item	No.	Item
26	Speaker	60	HSG clamp
27	Bottom housing	62b	LCD frame
28	Battery connector board	63	Grommet, ear - G411-1
30	Battery door	64	Shoulder screw, ear G-411-1 metric
31	Handle insert	67	Left insert
32	Top housing	68	Paper-feed roller
33	Light bar	69	Printer
34	Light-bar board	71	Temperature connection access cover
35	Printer door	72	Screw, M2.2X8, THRDFORM, PNH, TRX
37	Right side panel	73	Extended bottom housing
38	Power button and flex cable	74	M4 standoff
42	Front housing	75	Housing top extension
44	Temperature blanking panel	79	Top housing gasket
45	Thermal shield	83	CO2 module assembly
46b	Main board	84	EarlySense module assembly
47	Screw, M3 x 5 pan head	85	Blank faceplate
48b	LCD bezel	86	SpO2 module assembly
49c	LCD with touchscreen	87	USB cable retaining clip
51	Foam pad	88	NIBP module assembly
52	Temperature module	95	LCD frame ground wire

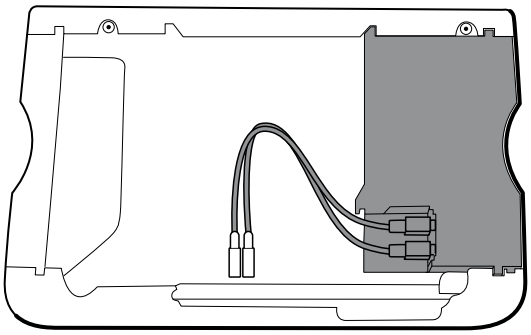
No.	Item	No.	Item
53	Temperature housing	96	Lock washer

Remove the CO2 module

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

- Battery
- Rear housing

1. Disconnect the two USB cables from the CO2 module.

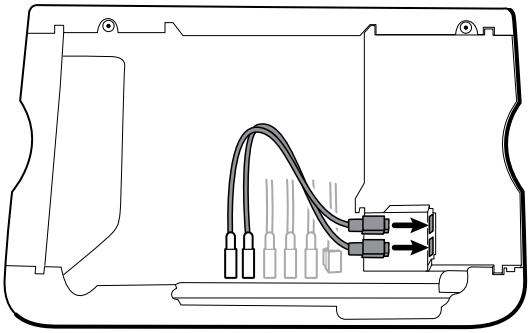


2. Slide the CO2 module out of the case.

Reassembly notes

- Do the following before installing the CO2 module:
  - Install the NIBP module (the module closest to the display).
  - Install the SpO2 module.
- Insert the CO2 module into the housing with the serial number label facing up.
- Connect the two USB cables to the CO2 module.

NOTE You may connect the CO2 USB cables in any order in either CO2 FSS USB socket.

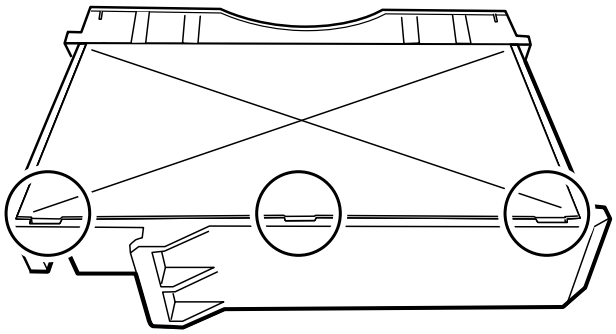


Replace the CO2 module faceplate

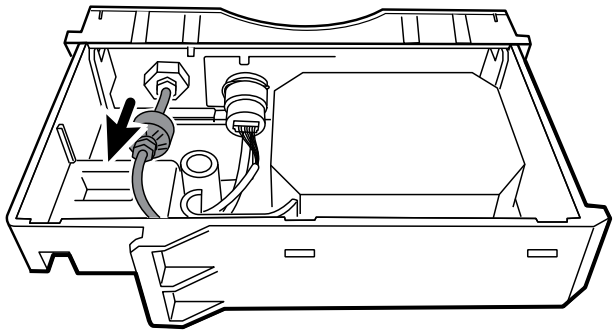
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module

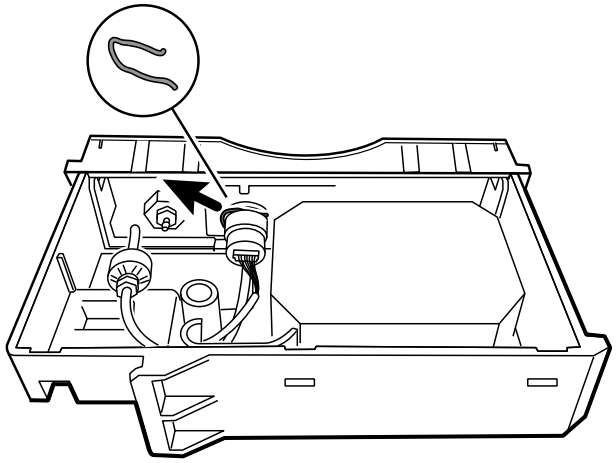
1. Remove the two blank labels securing the clear housing cover to the module housing.
2. Using a slotted screwdriver, release the three plastic clips from the module rear housing, and remove the clear housing cover.



3. Disconnect the exhaust tube from the exhaust port on the faceplate.

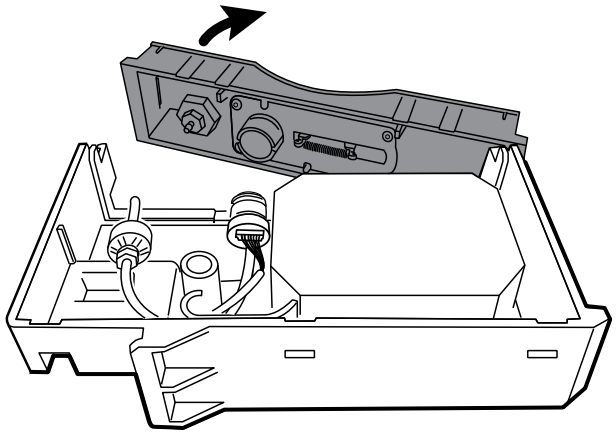


4. Remove the spring clip from the input port, and slide the input port away from the faceplate.



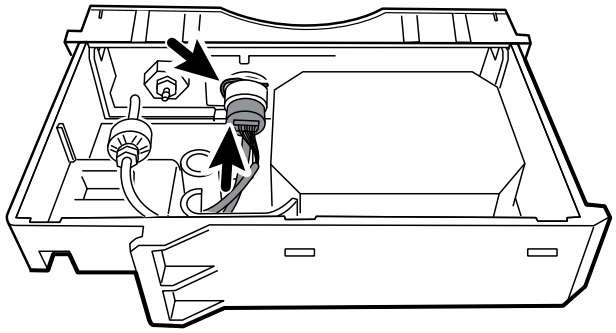
5. Remove the faceplate:
   a. Disengage one plastic clip on the module rear housing from the faceplate.

b. Remove the faceplate by pivoting it away from the rear housing.

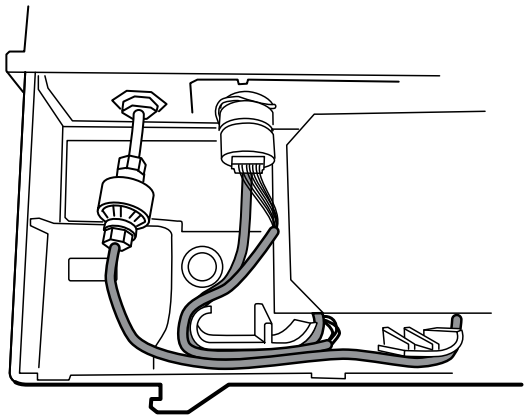


6. Inspect the new faceplate before installing it:
   a. Verify that the spring is attached to the door latch.
   b. Verify that the door opens and closes freely.
7. Slide the new faceplate onto the module rear housing until both plastic clips lock in place.
8. Install the input port and spring clip:
   a. Slide the input port into the faceplate receptacle until the port is flush with the faceplate.
   b. While holding the port in place, install the spring clip over the port and receptacle as shown in the figure below. The spring clip is secured by pushing on the clip from the direction of the exhaust fitting towards the faceplate door. Make sure the spring clip is fully seated.

NOTE Do not reuse the spring clip. Replace the spring clip with the new one provided in the kit.

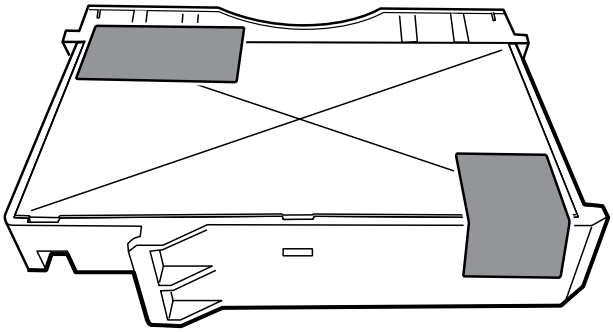


9. Connect the exhaust tube to the exhaust port.
10. Verify that all hoses and wires are routed as shown in the figure below. Also verify that the tubing is free of kinks.



NOTE The exhaust tube runs along the back of the module and gradually bends to the exhaust fitting. The inlet tube and wire run around the molded feature and boss to the large connector.

11. Install the clear housing cover onto the module rear housing, and press the cover into place until the three plastic clips lock.
12. Apply the two new blank labels to the locations shown in the figure below.

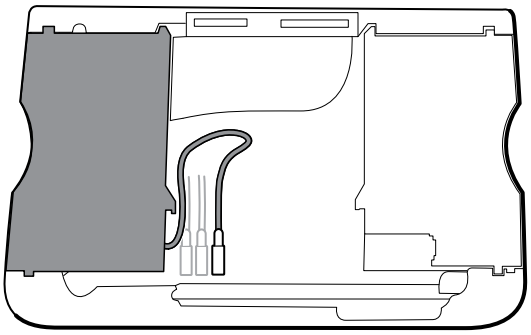


Remove the EarlySense module

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

- Battery
- Rear housing

1. Disconnect the USB cable from the EarlySense module.



2. Slide the EarlySense module out of the case.

Reassembly notes

Insert the EarlySense module into the housing with the serial number label facing down.

When replacing the EarlySense module or adding an EarlySense module

Use 106838 SK CVSM Early Sense Module 3rd Ed.

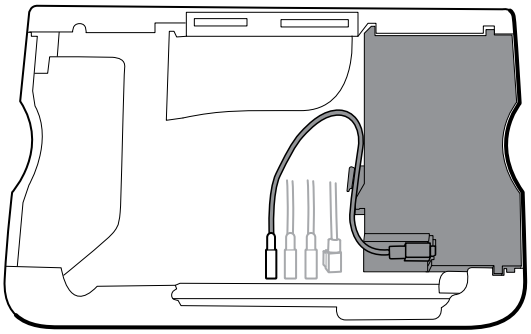
- Insert the EarlySense module into the housing with the serial number label facing down.
- Connect the USB cable to the EarlySense module.
- When adding an EarlySense module, the bottom housing and SureTemp cover must have ventilation holes. Use the bottom housing from service kit 105504 and the SureTemp cover from service kit 103542.

Remove the SpO2 module

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module (optional)

1. Disconnect the USB cable from the SpO2 module.
2. Remove the USB cable from the retaining clip on the SpO2 module.



3. Slide the SpO2 module out of the case.

Reassembly notes

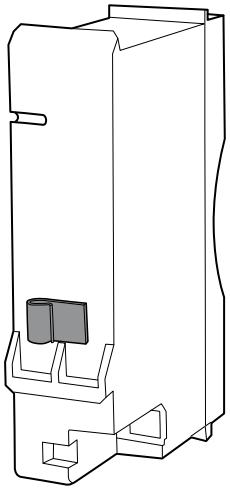
- Install the NIBP module (the module closest to the display) *before* installing the SpO2 module.

- Insert the SpO2 module into the housing with the serial number label facing up.

When replacing the SpO2 module or adding an SpO2 module

CAUTION Ensure that your module has the correct option (Masimo or Nellcor).

- On the back of the SpO2 module, clean the surface to which the retaining clip will be applied (see figure below) and apply the clip.



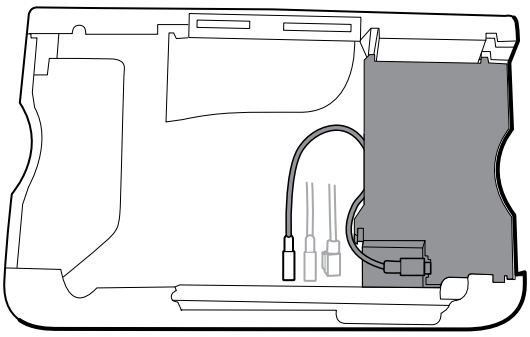
- Insert the SpO2 module into the housing with the serial number label facing up.
- Connect the USB cable to the SpO2 module.
- Secure the USB cable to the retaining clip on the SpO2 module.

Remove the NIBP module

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module (optional)
- SpO2 module or blank faceplate

1. Disconnect the USB cable from the NIBP module.



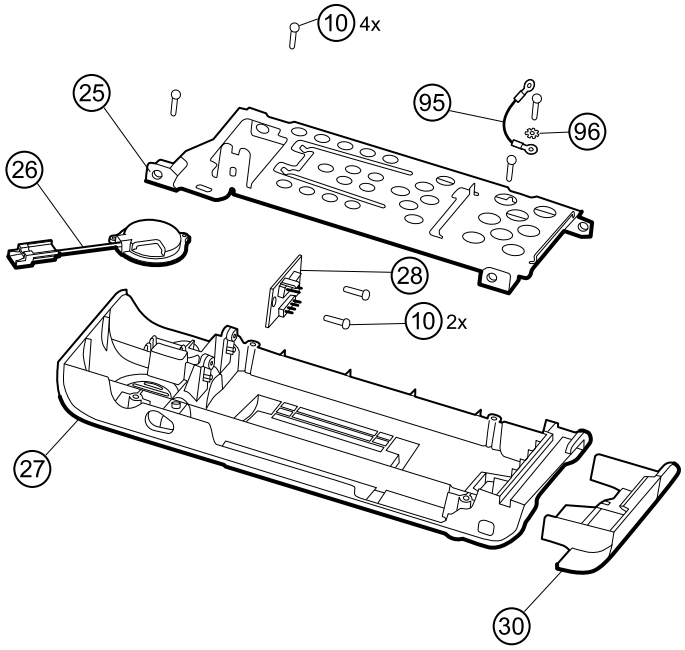
2. Slide the NIBP module out of the case.

Reassembly notes

- Install the NIBP module (the module closest to the display) *before* installing the SpO2 and CO2 modules.
- Insert the NIBP module into the housing with the serial number label facing up.
- Connect the USB cable to the NIBP module.
- If originally installed, install the blanking panel by sliding it into the housing.

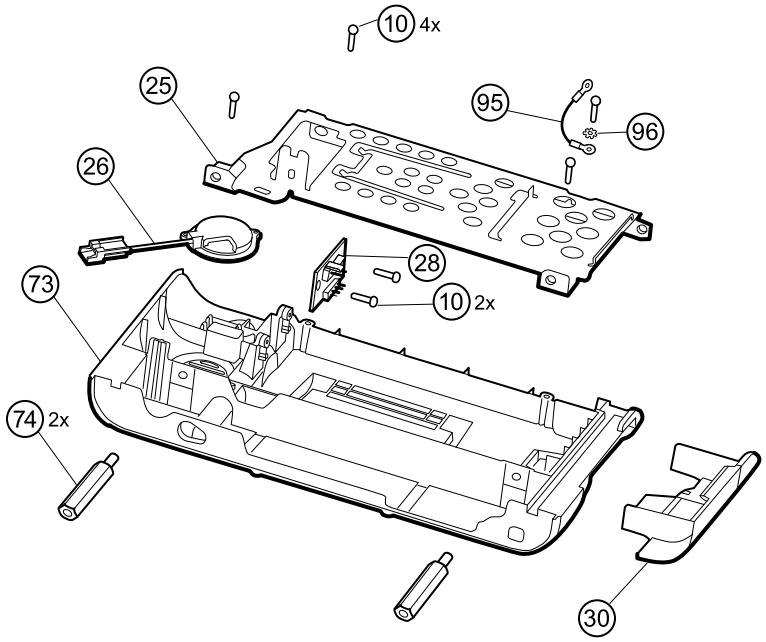
Remove the bottom housing

Bottom housing for the standard chassis



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	30	Battery door
25	Bottom housing metal chassis	95	LCD frame ground wire
27	Bottom housing	96	Lock washer
28	Battery connector board		

Extended bottom housing for the extended chassis

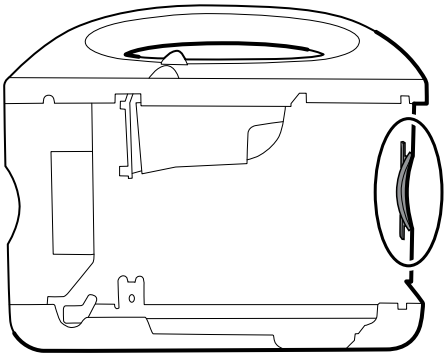


No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	73	Extended bottom housing
25	Bottom housing metal chassis	74	M4 standoff
26	Speaker	95	LCD frame ground wire
28	Battery connector board	96	Lock washer
30	Battery door		

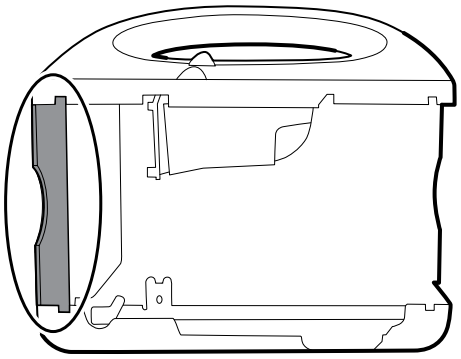
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module

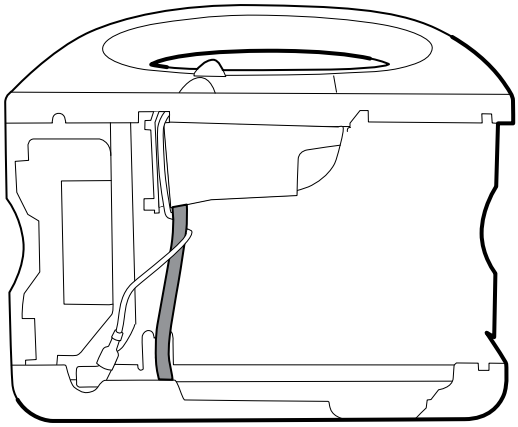
1. Remove the insert circled in the figure below.



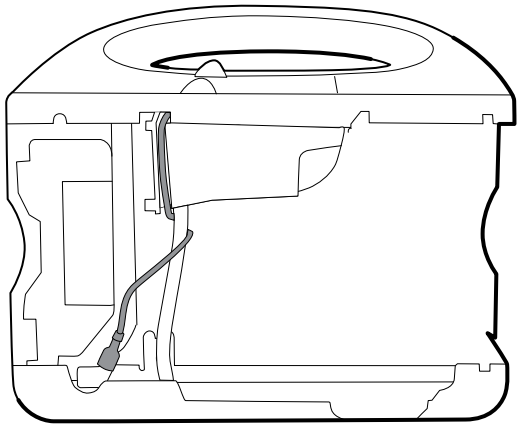
2. If your model has an extended chassis, remove the insert shown below.



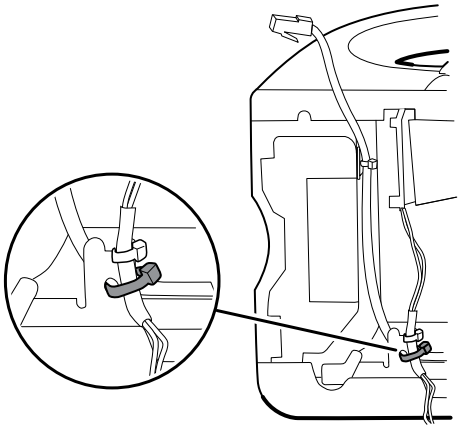
3. If your model has a printer, do the following:
   a. Remove the drain tube located between the printer and the bottom plate.



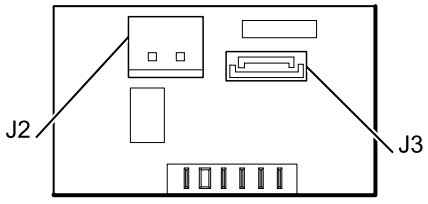
   b. Disconnect the printer ground wire from the ground lug on the bottom plate.



4. Cut the tie wrap that secures the main harness to the bottom bracket. This tie wrap is located below the tie wrap on the main harness.

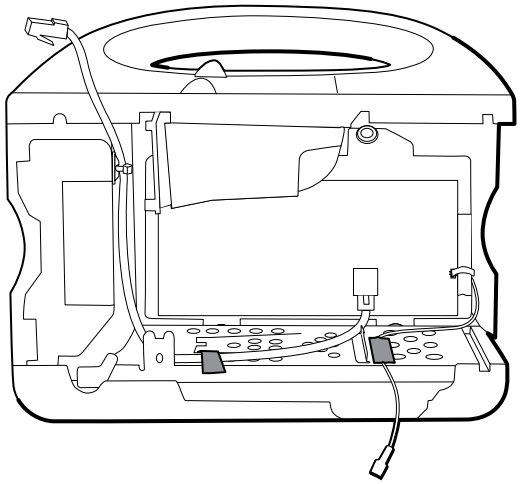


5. Pull the speaker wire out from behind the bottom bracket and disconnect the speaker cable (26) from the main harness.
6. Disconnect the following on the battery connector board:
   a. The battery power harness from J2.
   b. The smart-battery harness from J3.

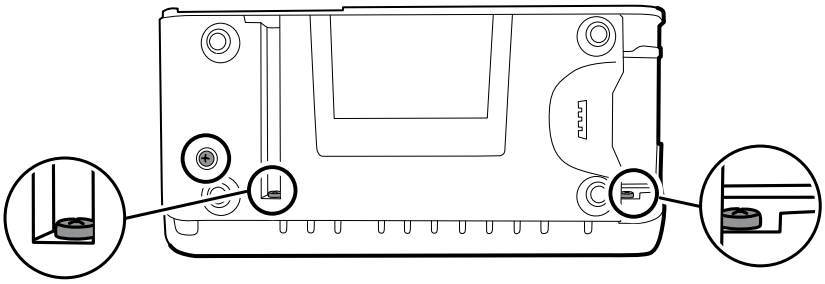


7. Remove the Pro Gaff tape securing the Ethernet cable and the LCD ground wire to the metal chassis.

NOTE Observe the locations of the Pro Gaff tape so that you can replace it properly during reassembly.

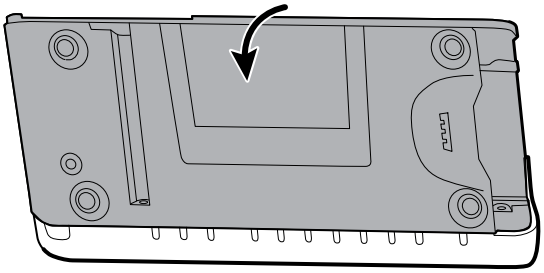


8. Remove the following screws:

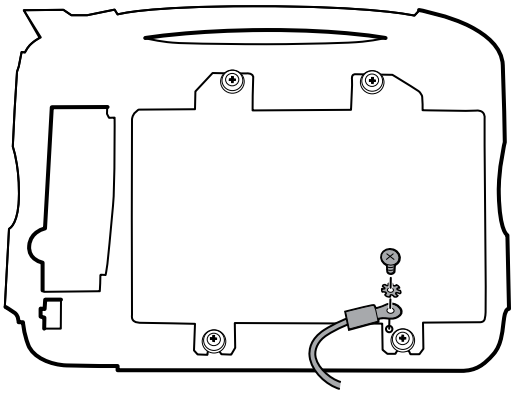


   - The bottom housing screw.
   - The two screws that secure the bottom housing assembly to the front housing.

9. Remove the bottom housing.
   a. Pivot the bottom housing along the edge shared with the front housing and lay it on the work bench.



   b. Remove the screw securing the LCD frame ground wire to the LCD frame.

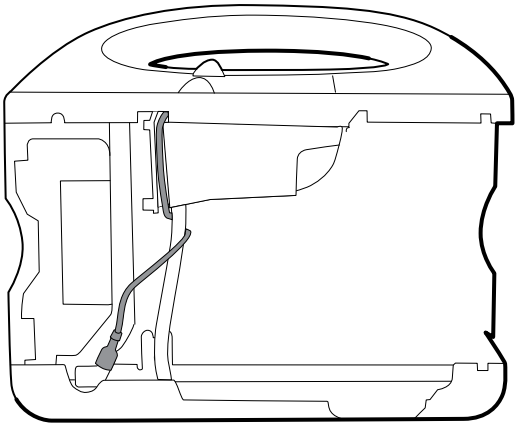


10. Disassemble the bottom housing:

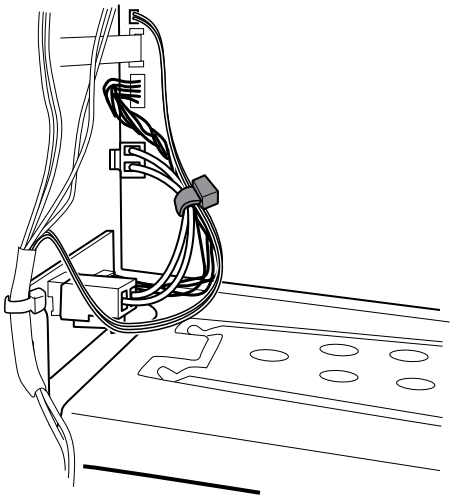
NOTE Disassemble the bottom housing only if you plan to replace the battery connector board or the speaker. See the instructions for removing these components later in this section.

Reassembly notes

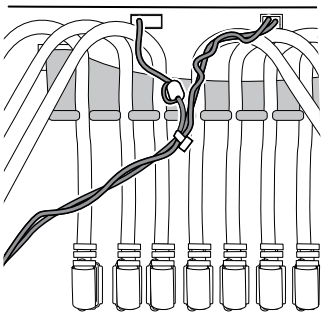
- When reassembling the bottom housing of an extended chassis, use an 8mm socket and a Torque driver calibrated for 12.0 inch-pound ±1.0 inch-pound to secure the standoffs (74).
- Plug the speaker cable into the shortest cable of the main harness (the cable closest to the wire tie). Tuck the cable behind the ground-wire stud. Ensure that the speaker cable is positioned in the channel.
- If a printer is installed, route the printer ground wire through the channel on the printer housing and wrap the printer ground cable once around the printer drain tube.



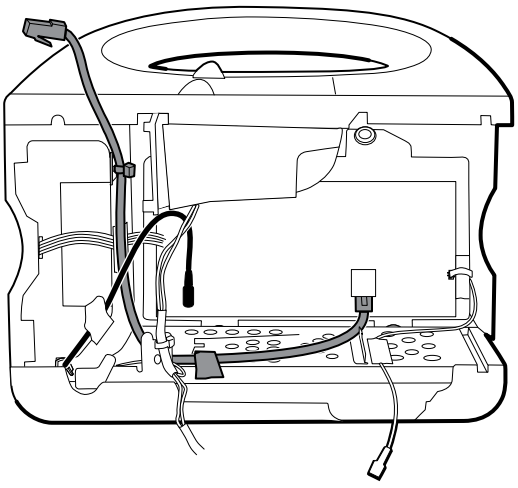
- Tie wrap the smart harness, battery, and speaker wires together.



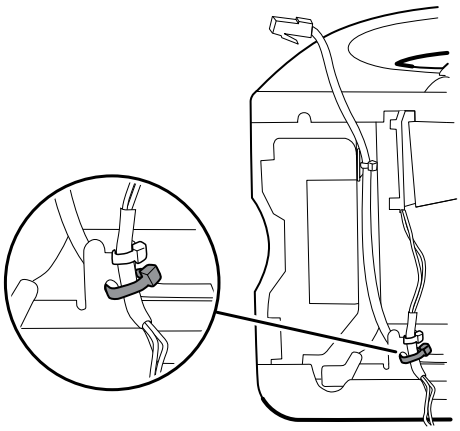
- Route the main harness wires over the USB cables and cable separator.



- Replace the Pro Gaff tape securing the LCD ground wire to the battery frame. Tape the ground wire to the battery frame between the center rib and the holes on the right end.
- If the Ethernet cable was removed, connect it to the MCE board. Route the Ethernet cable from the MCE diagonally across the bottom housing metal chassis to the metal bracket above the battery board and use a 2" piece of Pro Gaff tape to tape it to the edge of the metal chassis. Bend the Ethernet cable to parallel the right side of the SureTemp housing, passing over the power button flex cable and under the SureTemp USB cable to the tie wrap anchor on the SureTemp housing's upper right side.



- Secure the main harness to the bracket on the bottom housing. Position the Ethernet cable behind the bracket and secure both with a tie wrap. Use the tie-wrap tool to secure the tie wrap.



- If the tie wrap securing the Ethernet cable to the tie wrap anchor on the SureTemp housing was removed, use a tie wrap to secure the Ethernet cable to the tie wrap anchor. As noted previously, route the Ethernet cable over the power button flex cable and under the SureTemp USB cable to the tie wrap anchor.

When replacing the bottom housing

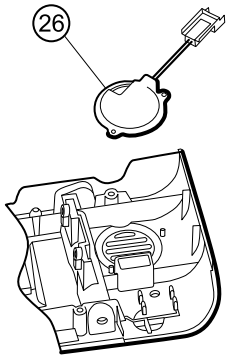
NOTE The bottom housing, or extended bottom housing, must be replaced by a Welch Allyn service center to ensure proper labeling.

Remove the speaker

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

1. Remove the metal chassis to more easily access the speaker.
2. Remove the speaker (26) from the bottom housing.



3. Remove any remaining gasket material and clean the surface with 70 percent isopropyl alcohol.

When replacing the speaker

1. Remove the paper to expose the adhesive on the gasket.
2. Align the holes in the speaker with the pins on the bottom housing and press the speaker into place.
3. Apply pressure to the outer radius of the speaker to ensure good adhesion with the bottom housing.

Remove the battery connector board

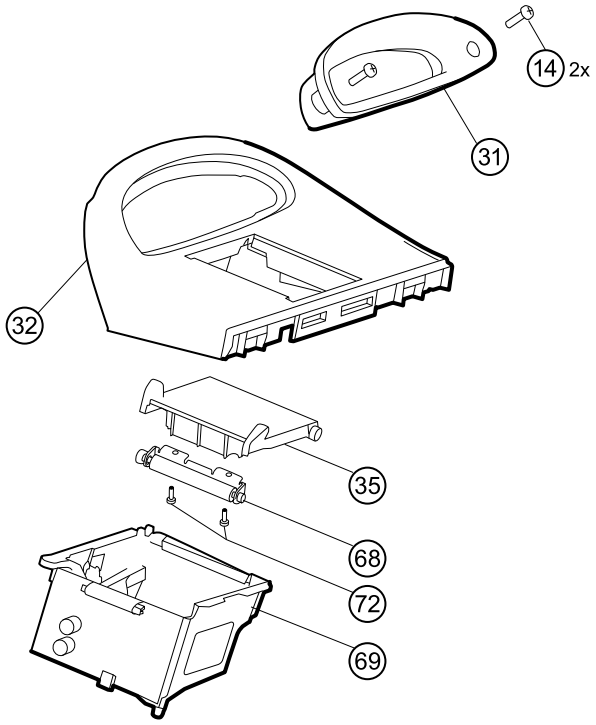
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

Remove the two Torx screws (10) that secure the battery connector board (28) to the bottom housing using a no. 10 Torx driver.

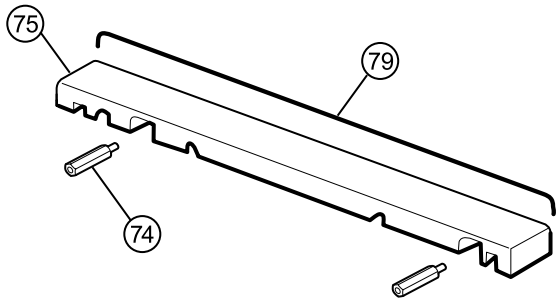
Remove the top housing

Top housing



No.	Item	No.	Item
14	Screw, M4 X 10 pan head with NYLOC	68	Paper feed roller
31	Handle insert	69	Printer housing
32	Top housing	72	Screw, M2.2X8, Thrdform, PNH, TRX
35	Printer door	Not shown	Printer door blank

Housing top extension (extended chassis only)



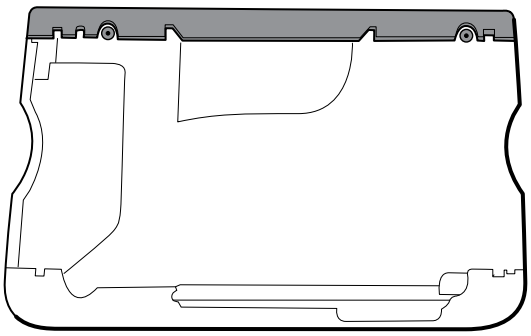
No.	Item	No.	Item
74	M4 standoff	79	Top housing gasket
75	Housing top extension		

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

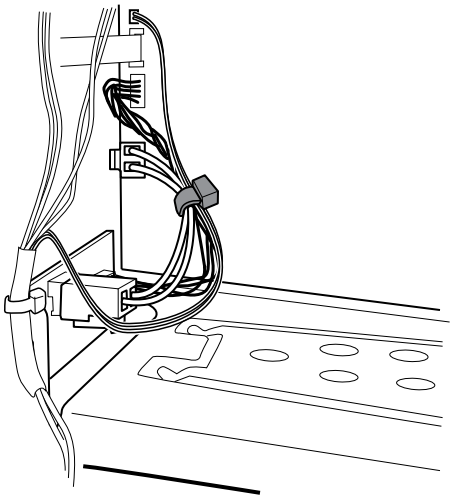
- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing

NOTE Do not remove the side panel that contains the power button.

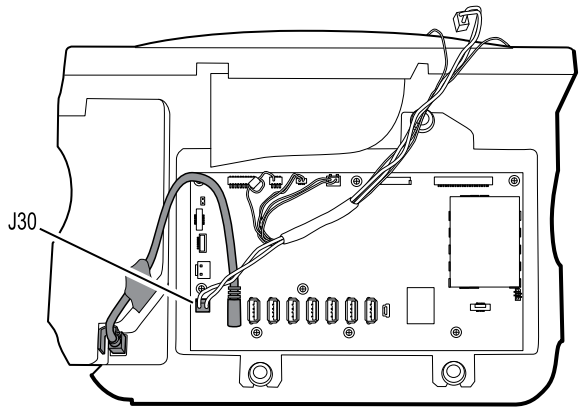
1. If your model has an extended chassis, remove the housing top extension.
   a. Use an 8mm socket and driver to remove the two standoffs (74) that secure the housing top extension (75).
   b. Remove the housing top extension.



2. Cut the tie wrap securing the smart battery harness to the main harness.



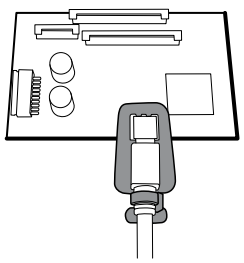
3. Lay the main harness over the top of the unit to clear the USB cables.
4. Disconnect the power connector on the main harness from J30 on the main board.



5. For models that include the temperature option, disconnect the USB cable connected to the temperature module from J1 on the main board and free the USB cable from the cable separator.

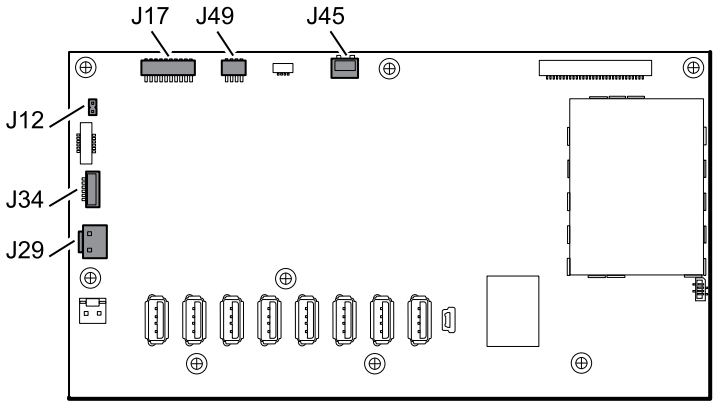
NOTE Do not remove the USB cable from the temperature module unless you plan to replace the module. If you disconnect the USB cable, the retaining clip must be replaced upon reassembly.

6. For models that include a printer, unhook the plastic latch to disconnect the USB cable from the printer.



7. Disconnect the USB cables from the main board.
8. Remove the USB cables and the cable separator.

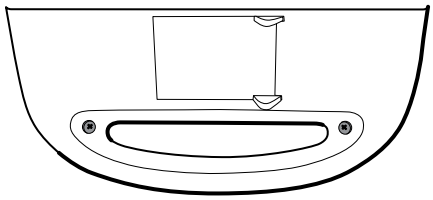
9. Disconnect and then remove the following:



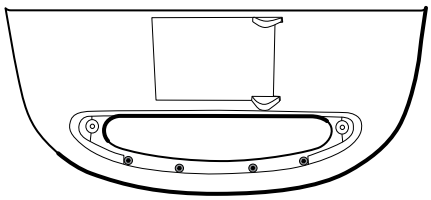
   a. The fan cable on the main harness from J45 on the main board.
   b. The communications power cable on the main harness from J49 on the main board.
   c. The battery power harness from J29 on the main board.
   d. The smart-battery harness from J34 on the main board.
   e. The printer harness from J17 on the main board.
   f. The speaker cable on the main harness from J12 on the main board.

NOTE Use extra care when disconnecting J12 to avoid pulling the connector off the board.

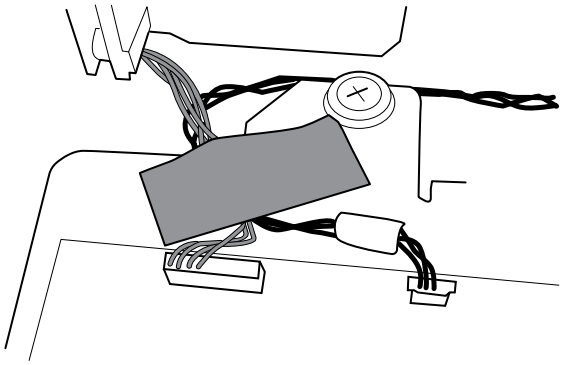
10. Remove the two screws (14) that secure the handle insert and remove the insert.



11. Remove the four Torx screws that secure the handle.



12. Remove the Pro Gaff tape securing the printer harness (if present) and light bar harness to the LCD frame. Note the location of the Pro Gaff tape for placement during reassembly.



13. Remove the top housing.

Reassembly notes

- Ensure that the printer is installed in the top housing. See the reassembly notes for the printer.
- For devices equipped with a printer, position the top housing close to the main chassis, connect the printer harness, and secure both the light bar harness and the printer harness to the LCD frame with approximately 2 inches of Pro Gaff tape.
- Before installing the USB cables, install the following:
  - The fan cable on the main harness to J45 on the main board.
  - The communications power cable on the main harness to J49 on the main board, with the ferrite bead closest to the main board.
  - The battery power harness to J29 on the main board.
  - The smart-battery harness to J34 on the main board.
  - The printer harness to J17 on the main board.
  - The speaker cable on the main harness to J12 on the main board.

    NOTE First inspect J12 for bent pins before installing the speaker cable.

- Install the USB cables based on the instructions below.

USB cable locations—9-hole cable separator

- Place the USB cables in the cable separator.

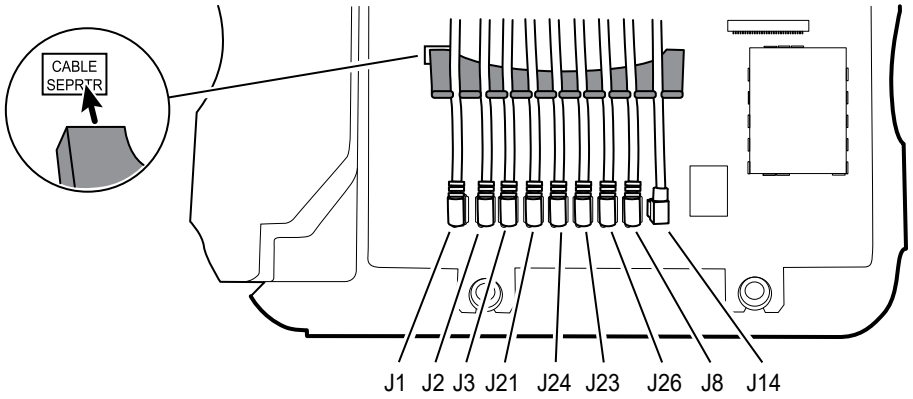
  NOTE If the USB cable was not removed from the temperature module, leave the J1 position in the figure below vacant until the cable separator is placed in the case and the other USB cables have been connected to the main board. When the cable separator is in the case, connect the USB cable from the temperature module to J1 on the main board and snap the cable into the J1 position in the cable separator.

  NOTE The cable with right-angle connectors at both ends is in the J14 position in the figure below.

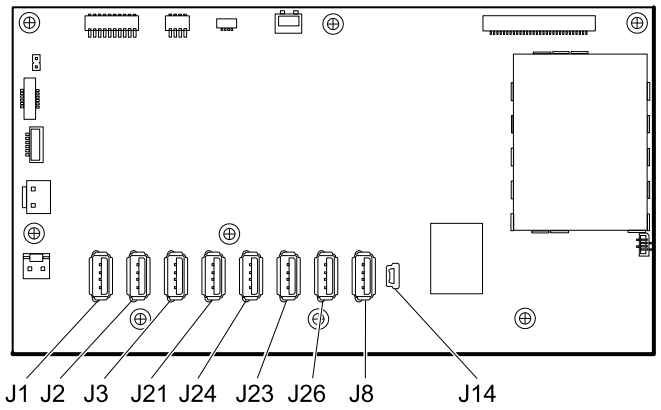
  NOTE If the option is not included, leave the separator position empty.

- Position each cable to extend approximately 2 inches past the separator.

- When positioning the separator in the device, place the feet in the marked areas of the MCE board as shown.

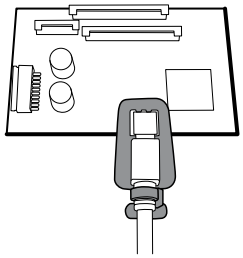


- Plug the USB cables into the main board as follows:

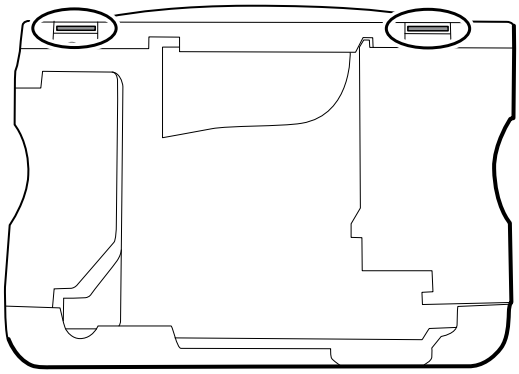


No.	Item	No.	Item
J1	Temperature	J23	SpO2
J2	Printer	J26	NIBP
J3	EarlySense	J8	COMMS J4
J21	CO2	J14	COMMS J8
J24	CO2		

- For models with a temperature module, if you disconnected the USB cable from the temperature module during disassembly, you must replace the retaining clip. (See the topic "When replacing the temperature module" for specific instructions.)
- For models with a printer, plug the other end of the USB cable into the printer while pulling the plastic latch away from the connector. Once the connector is seated, push the plastic latch over the connector to secure it.



- Verify that the Ethernet cable passes freely through the space between the temperature housing and the printer board, exiting the case in the space between the top of the temperature housing and beneath the top housing.
- If the Ethernet cable was removed, re-install it when re-installing the bottom housing.
- When installing the top housing on the chassis, line up the slots on the top housing with the ends of the horizontal struts on the chassis to ensure proper seating.



- When installing the housing top extension (75), verify that the top housing gasket is in place. Use an 8mm socket and Torque driver calibrated for 12.0 inch-pound ±1.0 inch-pound to secure the standoffs (74).

When replacing the top housing

For models without a printer, install the printer door blank as follows:

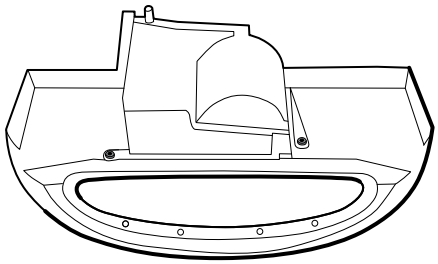
1. Remove the paper backing from the gasket on the door blank.
2. Install the door blank into the top housing, pressing to secure the door blank to the top housing.

Remove the printer

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing

1. Remove the two Torx screws that secure the printer housing to the top housing.



2. Remove the printer from the top housing:
   a. Hold the printer housing while opening the printer door.
   b. Separate the printer and printer door from the top housing.

Reassembly notes

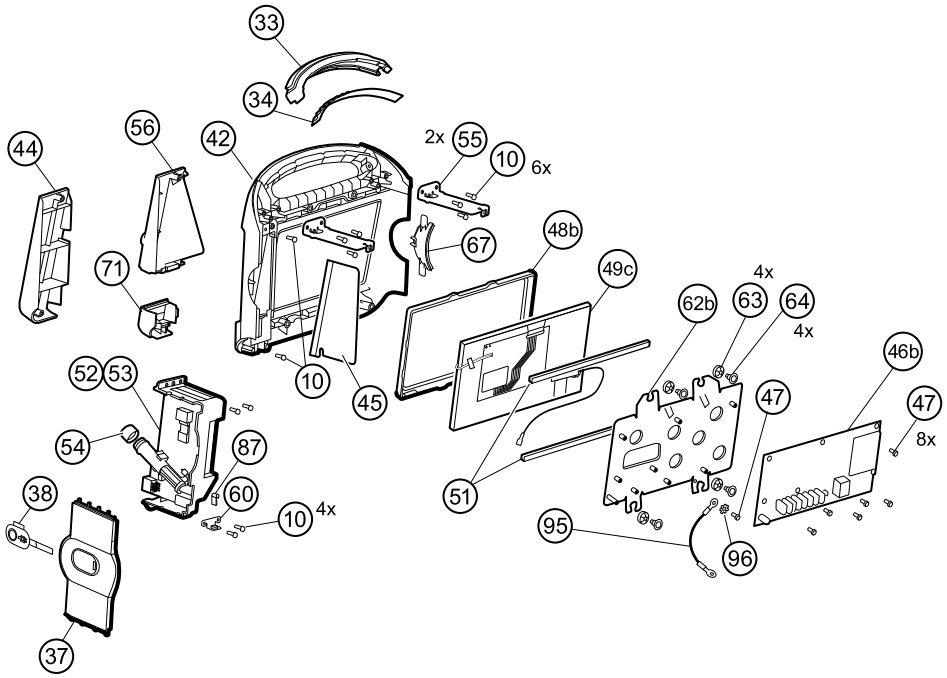
1. Verify that the ground wire exits from the side opposite the printer board in the notched area.
2. Place the printer door into the top housing assembly and hold it in place while performing the next step.
3. Install the printer in the top housing by sliding the tabs into the slots.
4. Snap the printer door shut to hold the printer in place while securing it into the housing with two screws.
5. Connect the printer ground wire to the bottom housing. (See the bottom housing reassembly notes.)

When replacing the printer or adding a printer

- If adding a printer, remove the printer door blank. Remove any remaining gasket material and clean the surface with 70 percent isopropyl alcohol.

1. Separate the door from the printer assembly.
2. Follow the reassembly notes above to install the printer.
3. Connect the printer ground wire to the bottom housing. (See the bottom housing reassembly notes.)

Disassemble the front housing



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	52	Temperature module
33	Light bar	53	Temperature housing
34	Light-bar board	54	Probe well seal
37	Right side panel	55	Horizontal struts
38	Power button	56	Temperature mounting cover
42	Front housing	60	HSG clamp
44	Temperature blanking panel	62b	LCD frame
45	Thermal shield	63	Grommet, ear - G411-1
46b	Main board	64	Shoulder screw, ear G-411-1 metric
47	Screw, M3 x 5 pan head	67	Left insert

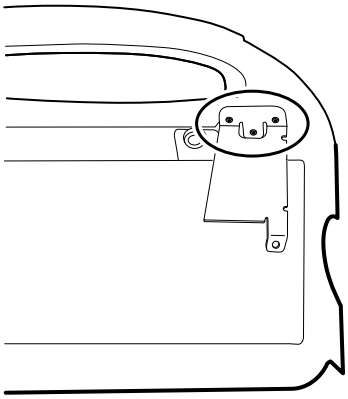
No.	Item	No.	Item
48b	LCD bezel	71	Temperature connection access cover
49c	LCD with touchscreen	95	LCD frame ground wire
51	Foam pad, top and bottom	96	Lock washer

Remove the light bar

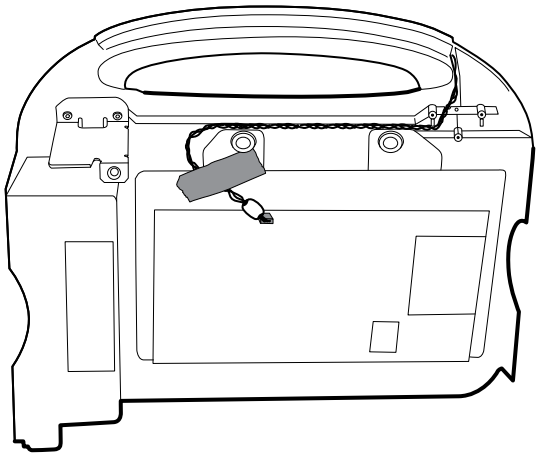
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing

1. Remove the three screws (10) that secure the horizontal strut (located on the right side when facing the device from the back) to the front housing.



2. Remove the strut.
3. Remove the tape that secures the light-bar harness to the LCD frame.



4. Disconnect the light-bar harness from J46 on the main board.
5. Remove the light-bar board (34) and light bar (33) from the front housing.
6. Remove the light-bar board from the light bar.
7. Disconnect the light-bar harness from the light-bar board.

Reassembly notes

- Insert the light-bar board into the light bar as follows:
  1. Place the end without the connector into the closed end of the light bar, with the LEDs facing into the light bar.
  2. Ensure that you slide the non-connector end of the light-bar board to the end of the slot in the light bar.
- Using the end furthest from the ferrite bead, plug the light-bar harness into the light-bar board.
- Route the light-bar harness as follows:
  - Through the slot in the front housing, underneath the horizontal strut.
  - In the channel and between the top of the housing and the LCD frame standoffs.
- Secure the light-bar harness with tape, making sure that the ferrite bead is between the main board and the tape.

Remove the temperature module or housing

NOTE These instructions also apply to removing the temperature housing for models without the temperature option.

NOTE Do not disconnect the USB cable from the temperature module unless you plan to replace the module and/or the USB cable. Disconnect the USB cable at the main board when removing the module.

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

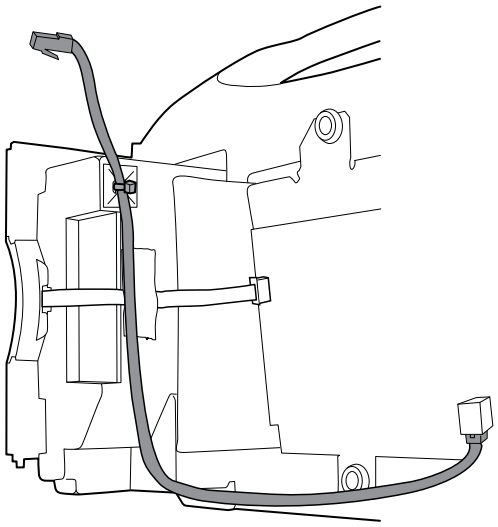
- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate

- NIBP module
- Bottom housing
- Top housing

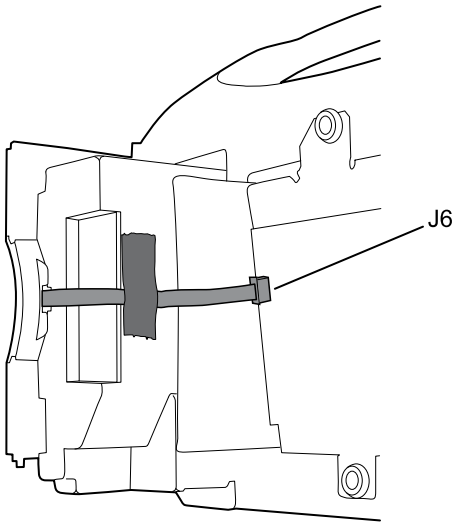
NOTE You can remove and replace the temperature module without disconnecting the main harness, battery harnesses, USB cables, or light-bar harness from the main board.

1. Remove the probe well from the temperature module.

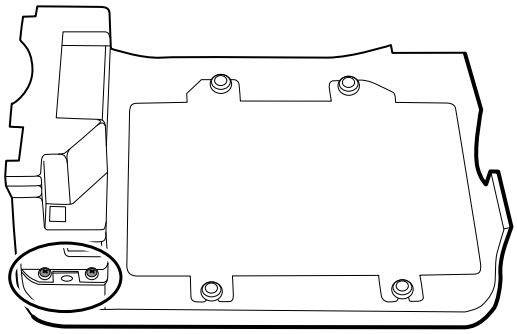
NOTE Disconnect the Ethernet cable from the MCE board or cut the wire tie securing the Ethernet cable to the SureTemp housing.



2. Disconnect the power button flex cable from the J6 ZIF locking connector on the main board and remove the securing tape.



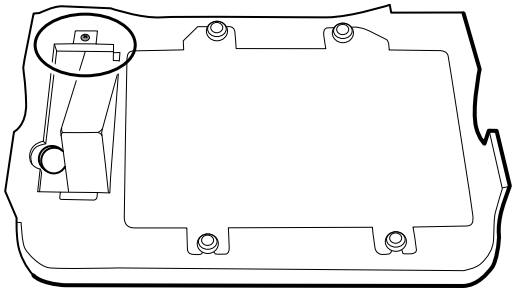
3. Remove the right side panel (37).
4. Remove the two Torx screws (10) from the HSG clamp (60).



5. Remove the two Torx screws (10) that secure the top of the temperature module or empty housing.
6. Remove the temperature module or empty housing.

NOTE If you are replacing only the temperature module without replacing the temperature mounting cover, stop here. Install the replacement module in the reverse order of disassembly procedure.

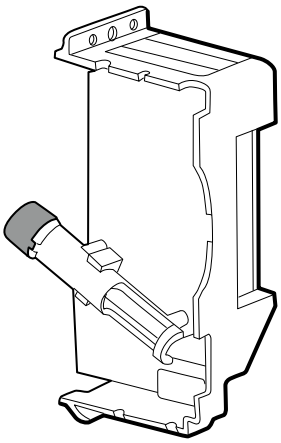
7. Complete the following steps that apply to your monitor:
   - If your monitor has a temperature module, remove the temperature mounting cover:
     a. Remove the screw that secures the temperature mounting cover to the front housing.



     b. Remove the temperature mounting cover (56) from the front housing.
   - If your monitor does not have a temperature module, remove the temperature blanking panel:
     a. Remove the two screws that secure the blanking panel to the front housing.
     b. Remove the blanking panel (44).

Reassembly notes

- Before installing the temperature module into the front housing, ensure that the probe well seal is installed with the tab aligned with the slot or notch in the probe well housing.

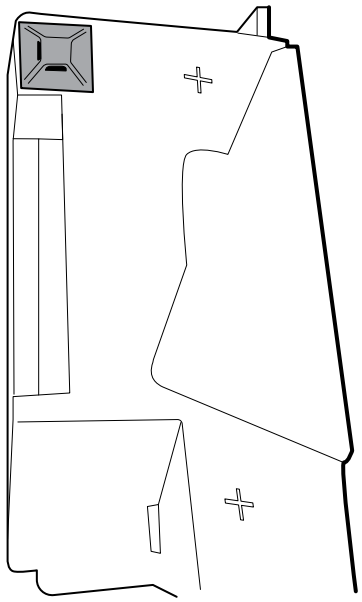


- Route the power button flex cable up and over the temperature module and plug the cable into the J6 ZIF locking connector on the main board.

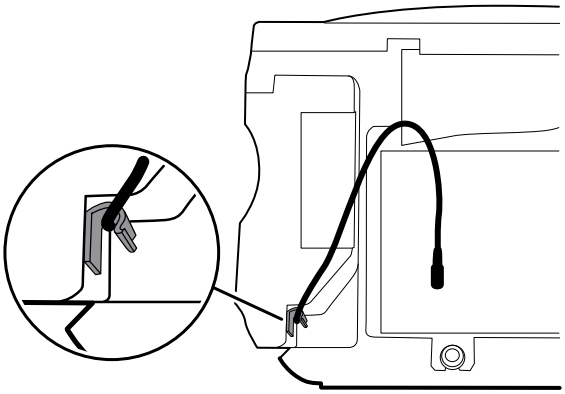
When replacing or adding a temperature module

Follow these instructions when replacing temperature modules and when installing them in the device for the first time.

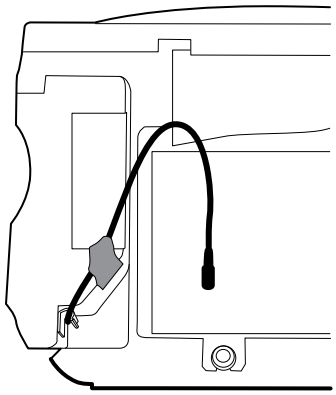
1. Prepare the temperature module housing: Attach the cable tie mount (113P463) with a .75-inch square foam strip (78P567) to the SureTemp housing near the top corner of the housing as shown.



2. Connect the USB cable to the temperature module.
3. Position the retaining clip on the USB cable against the shoulder of the mini-B connector with the adhesive pad facing away from the temperature module and toward the bottom.
4. Remove the backing on the retaining clip to expose the adhesive.
5. Rotate the clip on the USB cable to fasten the clip to the temperature module housing.



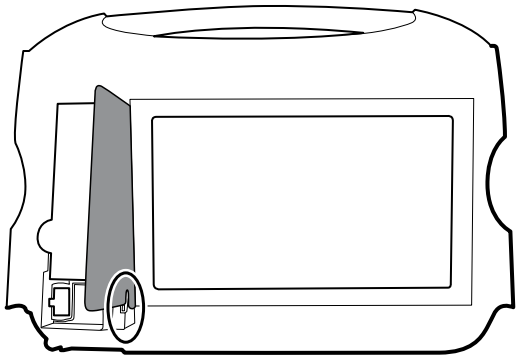
6. Secure the USB cable with a piece of tape as shown.



When adding a temperature module

In addition to completing the steps in the previous section, follow these instructions when installing a temperature module in the device for the first time.

1. Follow the instructions to remove the temperature housing, main board, and LCD.
2. Replace the temperature blanking panel (44) with the temperature mounting cover (56).
3. Install the thermal shield (45) on the front housing, aligning the notch on the shield with the housing.



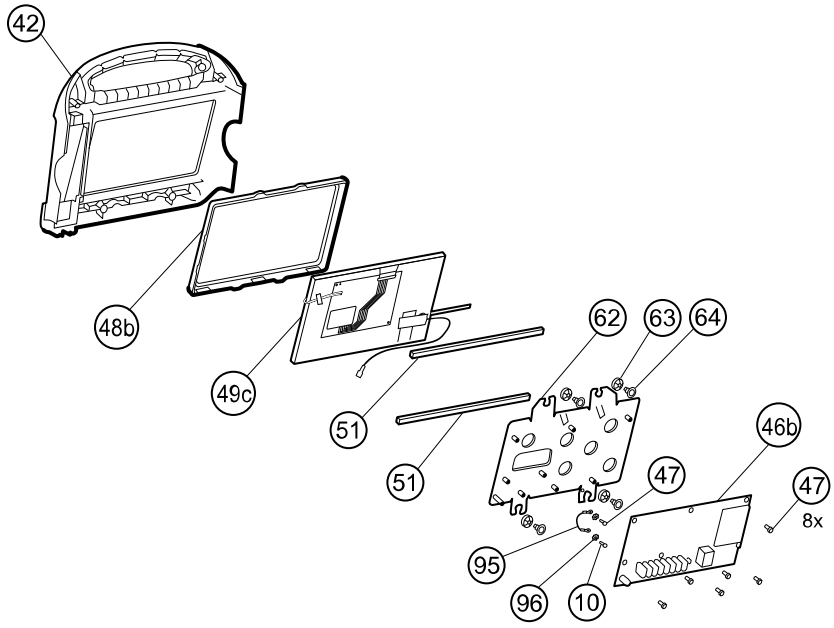
4. Reinstall the LCD in the reverse order of disassembly.
5. Reinstall the main board in the reverse order of disassembly.
6. Install the probe well seal onto the probe well as described in the reassembly notes for the temperature module.
7. Insert the temperature module into the front housing aligning the probe well with the access hole in the front housing.

8. Secure the top of the temperature module to the front housing with two screws included with the kit.
9. Place the HSG clamp on the bottom of the temperature module and secure with two screws.
10. Connect the USB cable to the module as described in the instructions for replacing the temperature module.

Remove the main board

NOTE If you are replacing this board, you must have the service tool, Gold licensed edition, to re-enter the serial number of the monitor and the main board.

NOTE If you are replacing the display, you must replace the bezel, LCD with touchscreen, and foam pads with the replacement parts in Service kit 106825. The bezel and foam pads are designed to match the display.



No.	Item	No.	Item
10	Screw, plastite #4-20 X 0.500 Torx-pan head	51	Foam pads, top and bottom
42	Front housing	62b	LCD frame
46b	Main board	63	Grommet, ear - G411-1
47	Screw, M3 x 5 pan head	64	Shoulder screw, ear G-411-1 metric
48b	LCD bezel	95	Ground wire
49c	LCD with touchscreen	96	Lock washer

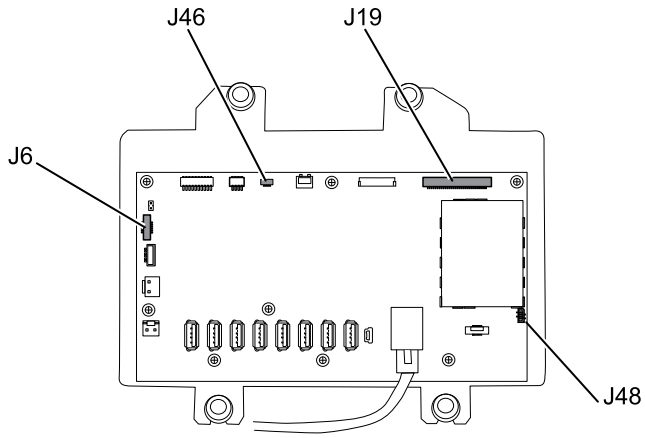
Before you begin, remove the following as described in this manual:

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing

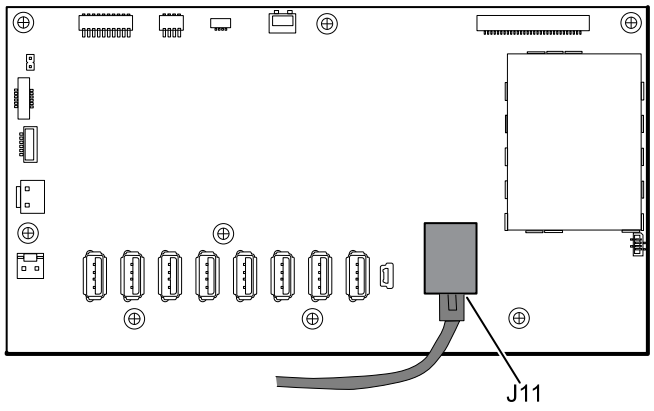
NOTE It is not necessary to remove the temperature module or light bar to remove the main board or LCD.

1. Disconnect the following on the main board:
   a. The power button flex cable from the J6 ZIF locking connector.
   b. The light-bar harness from J46.
   c. The LCD harness from J19.
   d. The LCD flex cable from J48.

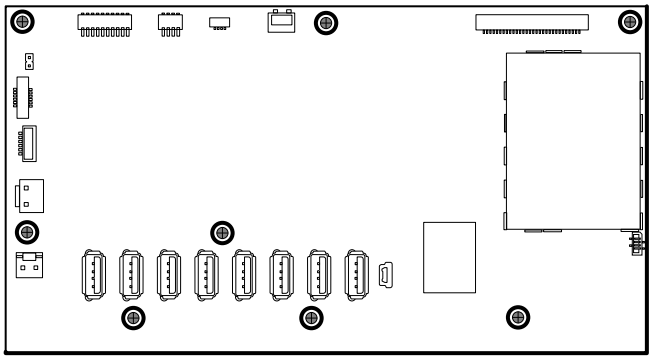
CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.



2. Disconnect the Ethernet cable from the Ethernet connector (J11) on the main board and remove it.



3. Remove the eight screws that secure the main board to the LCD frame.



4. Remove the main board.

Reassembly notes

- Ensure that the LCD flex cable is not under the main board.

  CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.

- Remove the LCD frame as described in "Remove the LCD." Once the LCD frame has been removed, install approximately 3 inches of Pro Gaff tape (M11580) to cover the bottom of the two standoffs as indicated (see “When replacing the LCD frame”). Do not cover any portion of the large openings. Replace any Pro Gaff tape on the LCD frame that shows signs of wear or that was removed during reassembly.
- Re-install the Ethernet cable (see Reassembly notes for the bottom housing).
- If the light bar is not installed, install the light-bar harness into the housing, positioning the ferrite bead near the main board.

When replacing the main board

- Use service kit 1068939 on IEC 60601 3rd edition-compliant devices.
- When ordering the replacement main board, order the standard license for the model being serviced. You will receive an authorization code to enter in the service tool to reactivate the licenses included with the original configuration.
- After reassembling the monitor, use the service tool to provision the monitor as follows:
  - Enter the monitor’s serial number. This can be found on the bottom of the monitor.
  - Restore any previously licensed features by entering the authorization code in the service tool. Use the authorization codes that accompanied the replacement board, along with any additional license authorization codes previously installed. Record the device serial number on the license Authorization Code cards received with the replacement board and retain for future use. If the license is lost, you can reuse the authorization code on the same device.
  - Update the host controller software to the current version. If the current version of the host software is not available after connecting the device to the service tool, contact Welch Allyn Technical Support.

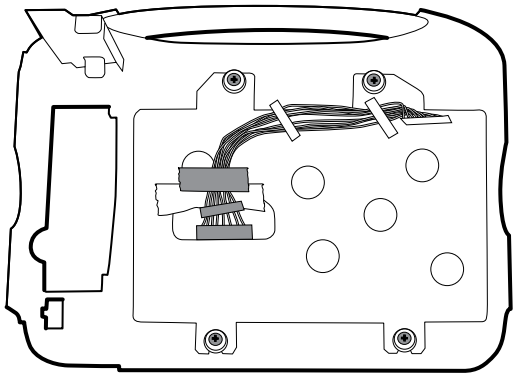
Remove the LCD

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing
- Main board

NOTE It is not necessary to remove the temperature module or light bar to remove the main board or LCD.

1. Disconnect the LCD harness from the LCD. For easier access to the connector, you can slide the ferrite bead closest to the connector up the harness.



2. Remove the four shoulder screws that secure the LCD frame.
3. Remove the LCD frame.

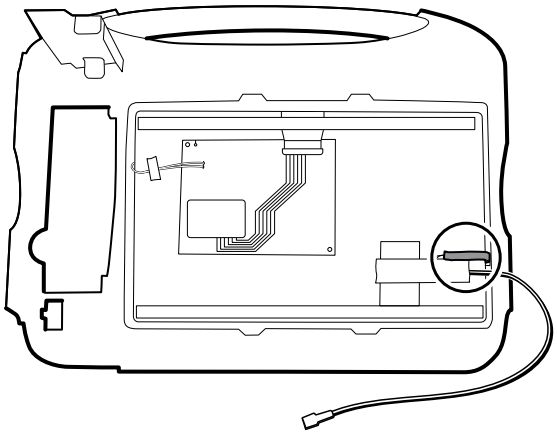
NOTE Be sure to support the LCD if you are removing it with the frame. The foam strips on the LCD might cause the LCD to stick to the frame.

4. Remove the LCD.

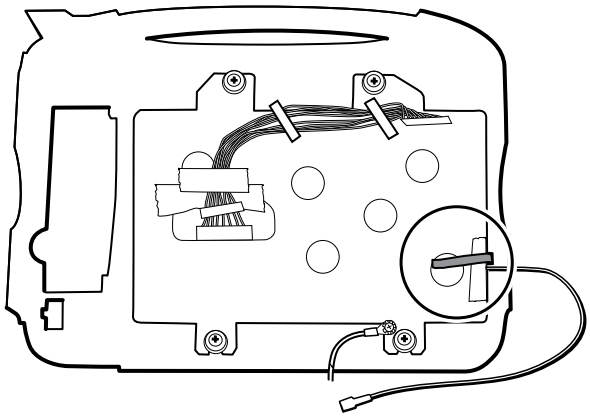
Reassembly notes

CAUTION The solder joint of the LCD connector (J48) is fragile. When inserting or removing the flex cable, do not stress the solder joint.

- Verify that the LCD flex cable feeds through the bezel's clearance feature. Insert the LCD into the bezel in the front housing with the LCD flex cable on the lower right.



- Position the display ground wire just below the LCD flex cable.
- Place the LCD frame over the LCD. Verify that the LCD frame does not cover the LCD flex cable.

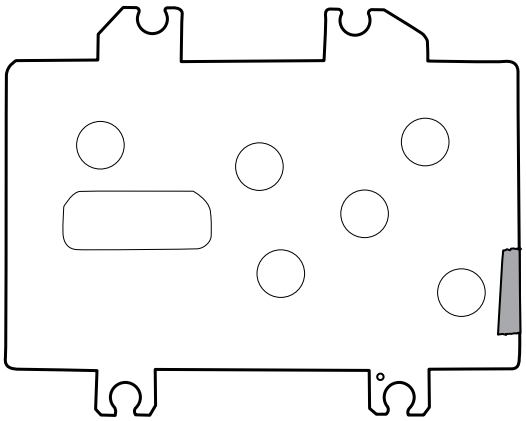


When replacing the LCD frame

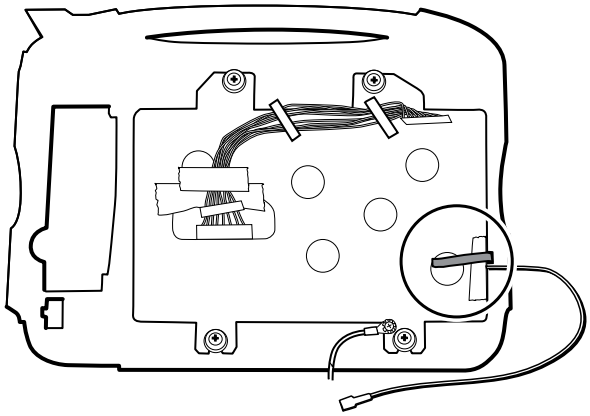
- Install the LCD frame with shoulder screws and washers.
- Install a 3-inch strip of Pro Gaff tape over the top part of the LCD harness cutout to protect the LCD harness from abrasion.
- Install the LCD harness. If it was removed from the frame, use isopropyl alcohol to clean the area in the scribed boxes where you will mount the harness's ferrite beads. Expose the sticky backing on the ferrite beads and mount them in the scribed rectangles.

NOTE If you don't place the ferrites correctly in marked areas, they will obstruct the placement of other components like the MCE board.

- Attach a piece of tape to the top of the LCD harness to secure it to the frame.
- Install approximately 1.25 inches of Pro gaff tape (M11580) on the front of the LCD frame near the LCD flex cable.

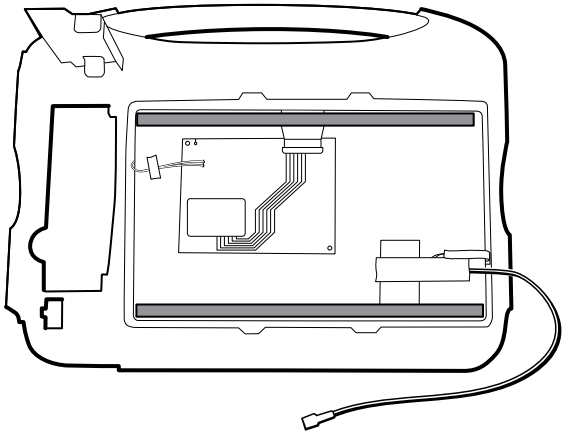


- Attach the LCD frame ground wire to the frame.
- Remove the ground wire from the old frame and install it on the new frame.

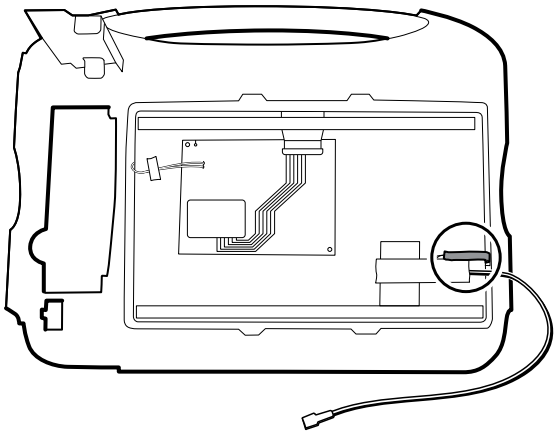


When replacing the LCD

- Peel the protective sheet from the LCD.
- Verify that the foam strips are installed on the back of the LCD near the top and bottom edges.



- Verify that the LCD ground wire is positioned just below the LCD flex cable.



- Verify that the LCD flex cable feeds through the bezel's clearance feature.
- Add a 1.25-inch strip of tape to the edge of the LCD frame where the LCD flex cable and ground come around it.
- Insert the LCD into the bezel in the front housing with the LCD flex cable on the lower right as shown.
- Add a 1.25-inch strip of tape to the edge of the LCD frame, where the harness passes through to connect to the LCD, to prevent abrasion of the LCD harness.
- When adding the ferrite beads, align the beads with the marks on the LCD frame.
- Add tape to secure the harness to the LCD frame where the harness passes through.

Remove the front housing

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

- Battery
- Rear housing
- CO2 module or blank faceplate
- EarlySense module
- SpO2 module or blank faceplate
- NIBP module
- Bottom housing
- Top housing
- Light bar
- Temperature module and mounting cover
- Main board
- LCD

To complete disassembly, remove the remaining strut from the front housing.

When replacing the front housing

For models with the temperature option, replace the thermal shield (45).

Functional verification and calibration

Functional verification tests

The functional verification tests help to confirm the proper operation of the device and its options. The tests may also be useful as a diagnostic tool to help isolate a malfunction. It is not necessary to disassemble the device to perform these tests.

For periodic service, you can—at a minimum—perform the basic functional verification tests described in this manual. These tests are for customers who have the Standard unlicensed edition of the Welch Allyn Service Tool. If you have the Gold licensed edition of the service tool, use the tool to perform a complete functional verification and calibration of the device in lieu of performing the basic tests.

NOTE To document basic functional verification tests, print out the "Service record" sheets at the end of this manual and record the test results.

Any time you open the case, you must use the service tool, Gold licensed edition, to perform a complete functional verification and calibration of the device before returning the device to service.

NOTE For instructions on using the Gold licensed edition, see the service tool help files.

About the Welch Allyn Service Tool

The service tool is required to complete functional verification and calibration tests. The service tool is available in the following editions:

- **Standard unlicensed edition**: Enables NIBP functional verification tests to satisfy the recommended annual service. If any Standard unlicensed edition testing shows an out-of-specification result, use the Gold licensed edition to perform a full calibration.
- **Gold licensed edition**: Checks the functionality and calibration of the device. As it checks the device, the Gold licensed edition 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 licensed edition 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 the *Welch Allyn Service Tool Installation and Configuration Guide*.
- To use the Standard unlicensed edition to test the NIBP module, follow the instructions in this service manual.

- For instructions on using the Gold licensed edition, see the service tool help files.

Standard unlicensed edition service tool tests performed

The service tool performs the following functions on the host device and installed options.

Test	Description	NIBP	Temp	SpO2	SpHb	RRa	CO2	Host	EarlySense
Reads firmware	Displays the firmware version	✓	✓	✓	✓	✓	✓	✓	✓
Firmware upgrade	Loads the latest firmware into the module	✓	✓	✓	✓	✓	✓	✓	✓
Leak test	Verifies leaks using 100 cc volume	✓							
Accuracy test (NIBP)	Checks the accuracy of transducers across the pressure range	✓							
Overpressure test	Verifies the maximum cuff pressure for adults and neonates	✓							

Test	Description	NIBP	Temp	SpO2	SpHb	Host
Reads firmware	Displays the firmware version	✓	✓	✓	✓	✓
Firmware upgrade	Loads the latest firmware into the module	✓	✓	✓	✓	✓
Leak test	Verifies leaks using 100 cc volume	✓				
Accuracy test (NIBP)	Checks the accuracy of transducers across the pressure range	✓				
Overpressure test	Verifies the maximum cuff pressure for adults and neonates	✓				

Gold licensed edition service tool tests performed

The service tool tests the host device and installed options as listed in the following table.

Test	Description	NIBP	Temp	SpO2	SpHb	RRa	CO2	Host	EarlySense
POST	Performs the power-on self test (POST)[1]	✓	✓	✓			✓	✓	✓
Firmware version	Checks the firmware version	✓	✓	✓			✓	✓	✓
Firmware upgrade	Loads the latest firmware into the module	✓	✓	✓			✓	✓	✓
Leak	Verifies leaks using 100 cc volume	✓							
AD noise	Checks noise on the pressure channel	✓							
Calibration	Calibrates pressure transducers	✓							
Accuracy (NIBP)	Checks the accuracy of transducers across the pressure range	✓							
Dump	Checks dump valves	✓							
Inflation	Verifies the pneumatic pump	✓							
Valve control	Verifies control of the system valve	✓							
Overpressure	Verifies pump limits	✓							
Probe detect	Verifies the operation of the probe detect switch[2]		✓						
Accuracy (Temp)	Verifies the accuracy of the thermometer across range		✓						
Functional check	Verifies module operation with cal-key[2]		✓						
Masimo SpO2 and SpHb functional check	Verifies module operation with rainbow SET tester			✓	✓				
Calibration	Calibrates CO2 sensor						✓		
Printer	Prints the sample patient record and test pattern							✓	
Display	Verifies video output							✓	

Test	Description	NIBP	Temp	SpO2	SpHb	RRa	CO2	Host	EarlySense
Back light interface	Verifies display LED back light							✓	
Touchscreen interface	Verifies touchscreen calibration							✓	
LED	Verifies the light bar amber and red LED strings							✓	
Fan interface	Verifies fan operation							✓	
Beeper	Verifies the buzzer							✓	
Nurse call relay	Verifies the nurse call relay							✓	
Battery operation	Verifies the internal battery							✓	
Speaker	Verifies the speaker							✓	
USB host port communication	Verifies the USB ports							✓	
Ethernet communication	Verifies the Ethernet port							✓	

[1] POST testing checks the following:

- **NIBP**: ROM, RAM, A/D channels, calibration, and user configuration.
- **Temperature**: ROM, RAM, calibration, and heater.
- **EarlySense**: ROM and RAM, and connection to the EarlySense board.
- **SpO2**: ROM and RAM, and connection to the SpO2 board.
- **CO2**: RAM, Flash, ADC, Bias Validation, EEPROM, Flow, Optics.
- **Printer**: ROM and RAM, and connection to the printer.

[2] SureTemp Plus only.

[3] Normal mode.

Test	Description	NIBP	Temp	SpO2	SpHb	Host
POST	Performs the power-on self test (POST)[1]	✓	✓	✓		✓
Firmware version	Checks the firmware version	✓	✓	✓		✓
Firmware upgrade	Loads the latest firmware into the module	✓	✓	✓		✓

Test	Description	NIBP	Temp	SpO2	SpHb	Host
Leak	Verifies leaks using 100 cc volume	✓				
AD noise	Checks noise on the pressure channel	✓				
Calibration	Calibrates pressure transducers	✓				
Accuracy (NIBP)	Checks the accuracy of transducers across the pressure range	✓				
Dump	Checks dump valves	✓				
Inflation	Verifies the pneumatic pump	✓				
Valve control	Verifies control of the system valve	✓				
Overpressure	Verifies pump limits	✓				
Probe detect	Verifies the operation of the probe detect switch[2]		✓			
Accuracy (Temp)	Verifies the accuracy of the thermometer across range		✓			
Functional check	Verifies module operation with cal-key[2]		✓			
Masimo SpO2 and SpHb functional check	Verifies module operation with rainbow SET tester			✓	✓	
Display	Verifies video output					✓
Back light interface	Verifies display LED back light					✓
Touchscreen interface	Verifies touchscreen calibration					✓
LED	Verifies the light bar amber and red LED strings					✓
Fan interface	Verifies fan operation					✓
Beeper	Verifies the buzzer					✓
Nurse call relay	Verifies the nurse call relay					✓
Battery operation	Verifies the internal battery					✓

Test	Description	NIBP	Temp	SpO2	SpHb	Host
Speaker	Verifies the speaker					✓
USB host port communication	Verifies the USB ports					✓
Ethernet communication	Verifies the Ethernet port					✓

[1] POST testing checks the following:

- **NIBP**: ROM, RAM, A/D channels, calibration, and user configuration.
- **Temperature**: ROM, RAM, calibration, and heater.
- **SpO2**: ROM and RAM, and connection to the SpO2 board.

[2] SureTemp Plus only.

[3] Normal mode.

Basic functional verification checks

NOTE Calibration is available only with the service tool, Gold licensed edition.

The basic functional verification test using the Welch Allyn Service Tool Standard edition meets the minimum requirements for routine preventive maintenance. These tests verify basic functionality of the NIBP, SpO2, SpHb, RRa, CO2, and thermometry parameters. Welch Allyn recommends using the service tool, Gold licensed edition, to perform verification of the device when completing a repair.

The basic functional verification test using the Welch Allyn Service Tool Standard edition meets the minimum requirements for routine preventive maintenance. These tests verify basic functionality of the NIBP, SpO2, SpHb, and thermometry parameters. Welch Allyn recommends using the service tool, Gold licensed edition, to perform verification of the device when completing a repair.

Basic functional verification check tools

Listed below are the all the tools required to perform the basic functional test.

Material no.	Description	Qty	Component
407672	BP test volume repair fixture 113670	1	NIBP
N/A	SpO2 simulator	1	Masimo and Nellcor SpO2
DOC-10	Cable, SpO2 extension, Nellcor	1	Nellcor SpO2
06138-000	Cal-key, assembly, M690/692	1	SureTemp Plus Thermometry Module

Material no.	Description	Qty	Component
01802-110	Tester, calibration, 9600 Plus	3	Braun ear and SureTemp Thermometry Probe
411690	PRO 6000 calibration fixture* *Use with older models have a dust cover screw that rises above the O-ring washer. Newer models have a dust cover screw that is recessed into the washer.	3	Braun ear
N/A	Pressure meter (must include at least two decimal points and be accurate to within ±0.5 mmHg)	1	NIBP
4500-925	USB 2.0/5-pin Mini-B cable, gold, 6 ft.	1	NIBP, Software updates
6000-30	Single tube blood pressure hose, 5 ft.	1	NIBP
N/A	PC running the Welch Allyn Service Tool on Windows 10	1	ALL
web download	Welch Allyn Service Tool https://www.hillrom.com/en/services/welch-allyn-service-tool/	1	NIBP, Software updates and calibration
N/A	Blood pressure Y-tube	1	NIBP
4500-30	Blood pressure hose, 5 ft.	1	NIBP
620216	Fitting "Y" 1/8 X 1/8 X 1/8	1	NIBP
N/A	ECG patient simulator calibrated to ISO/IEC standards with defined amplitudes for Lead I, Lead II, Lead III, and Lead IV when using a 5-lead patient cable -OR- an ECG patient simulator with defined amplitudes for Lead I, Lead II, and Lead III when using a 3-lead patient cable.	1	ECG

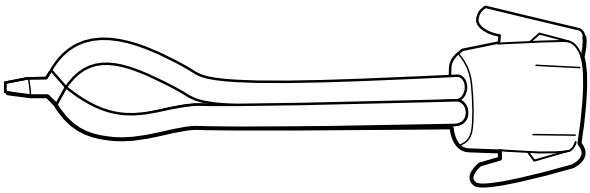
Full functional verification check and calibration tools

The list of tools below is what is required to perform a full device functionality check and calibration. The tools are used in conjunction with the Welch Allyn service tool, Gold licensed edition, to perform a device calibration.

Material no.	Description	Qty	Component
01802-110	Tester, calibration, 9600 Plus	3	Braun ear and SureTemp Thermometry Probe
407672	BP test volume repair fixture 113670	1	NIBP
411690	PRO 6000 calibration fixture*	3	Braun ear

Material no.	Description	Qty	Component
	*Use with older models have a dust cover screw that rises above the O-ring washer. Newer models have a dust cover screw that is recessed into the washer.		
N/A	SpO2 simulator	1	Masimo and Nellcor SpO2
LNCS-DC1	SpO2 cable and finger sensor	1	Masimo SpO2
DS-100A	SpO2 finger sensor	1	Nellcor SpO2
DOC-10	Cable, SpO2 cable extension, Nellcor	1	Nellcor SpO2
06138-000	Cal-key, assembly, M690/692	1	SureTemp Thermometry Module
N/A	Pressure meter (must include at least two decimal points and be accurate to within ±0.5 mmHg)	1	NIBP
4500-925	USB 2.0/5-pin Mini-B cable, gold, 6 ft.	1	NIBP
106270	Service test box	1	Nurse Call, USB ports
660-0138-00	Cable, patch 5 feet RJ45, T568B	1	Ethernet Test
407022	Assy, MMF Nurse call cable - service	1	Nurse Call (Service Test Box Required)
N/A	USB cable Type A to Type B (3 ft.)	1	USB Ports (Service Test Box Required)
6000-30	Single tube blood pressure hose, 5 ft.	1	NIBP
N/A	Wireless router, a/b/g or equivalent	1	Wired & Wireless Test
N/A	PC running Windows 10	1	All
web download	Welch Allyn Service Tool (version 1.8 or later) Click this link	1	NIBP, Software updates
N/A	Blood pressure Y-tube	1	NIBP
4500-30	Blood pressure hose, 5 ft.	1	NIBP
620216	Fitting "Y" 1/8 X 1/8 X 1/8	1	NIBP

Create a blood pressure Y-tube

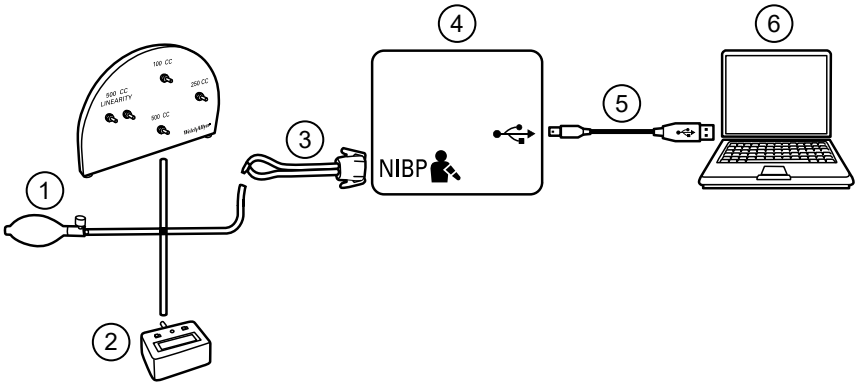


The blood pressure Y-tube is a piece of custom test equipment that connects the device to the test setup. The Y-tube is composed of a modified blood pressure hose and a Y-type fitting. Follow these instructions to create a Y-tube.

1. Cut a 4500-30 blood pressure hose approximately 6 inches from the connector that connects to the device.
2. Split the end of the dual-lumen hose to create two separate hoses. Make sure not to puncture either hose.
3. Insert one end of the Y-type fitting into each end of the hose.

NIBP test setup

For the NIBP leak test, overpressure test, or accuracy check, connect the test equipment shown below. Connect the manifold to the volume repair fixture as indicated by the service tool or the test procedure.



No.	Item	No.	Item
1	Test volume repair fixture with test manifold, bulb, and valve	4	Device
2	Pressure meter	5	USB 2.0/5-pin type A to mini-B cable
3	Blood pressure Y-tube	6	PC

NIBP leak test (Standard unlicensed edition)

The NIBP leak test is performed automatically using the service tool. The leak test pressurizes the system with a start pressure (P_s) of 250 mmHg ± 10 mmHg. After 15 seconds (T_t) the end pressure (P_e) is measured. The leak rate is calculated using the formula $L = (P_s - P_e)/ T_t$. The test fails if the leak rate exceeds 5 mmHg in 15 seconds.

Perform an NIBP leak test

1. Set up the test equipment.
2. Launch the service tool on the PC.
3. If the simplified interface is active, choose the Service option.
4. Log on with your user ID and password or with ADMIN as the user ID and leave the password field blank.
5. Power on the device.
6. Select the device you want to test from the device list.
7. Click **NIBP Sensor** under the Device Information tab.
8. Click **Leak Test** in the NIBP Sensor pane on the right side of the window.
9. Follow the prompts until the test completes.
10. Click **Close**.
11. To view the results, open the active log file by selecting **File** > **View Log File** > **Active log file** > **Ok**.
12. To record the results of your test, go to "Service record."

NIBP overpressure test (Standard unlicensed edition)

The NIBP overpressure test is performed automatically using the service tool. The overpressure test verifies that the NIBP system will prevent the pressure from exceeding 329 mmHg in adult mode and 164 mmHg in neonate mode. To pass this test, the device must shut down the pump and open the valves when the pressure is between 280 mmHg and 329 mmHg in adult mode, or 130 mmHg to 164 mmHg in Neonate mode.

Perform an NIBP overpressure test

NOTE If you are performing this test after performing the NIBP leak test, skip to step 7.

1. Set up the test equipment.
2. Launch the service tool on the PC.
3. If the simplified interface is active, choose the Service option.
4. Log on with your user ID and password or with ADMIN as the user ID and leave the password field blank.
5. Power on the device.
6. Select the device you want to test from the device list.
7. Click **NIBP Sensor** under the **Device Information** tab.
8. In the NIBP Sensor pane on the right side of the window, click **Over Pressure Test**.
9. Follow the prompts until the test completes.
10. Click **Close**.

11. To view the results, open the active log file by selecting **File** > **View Log File** > **Active log file** > **Ok**.
12. To record the results of your test, go to "Service record."

NIBP accuracy check (Standard unlicensed edition)

The NIBP accuracy check is performed manually using the service tool to control the valves. The accuracy check compares the reading from the primary transducer pressure shown in the service tool window with the reading from an external calibrated digital pressure meter. The results of this check are not recorded in the service tool log file. To record the results for your records, copy the table in the service record section of the service manual. If a calibration is required, run the NIBP calibration included with the Gold licensed edition of the service tool.

WARNING Patient safety risk. If the primary transducer fails, the system might not identify an overpressure condition at the right limit, causing injury when the device is re-connected to a patient. To ensure patient safety, Welch Allyn recommends that a qualified service technician perform a full functional verification and calibration on an annual basis.

CAUTION Equipment calibration error can occur. This accuracy check verifies only the accuracy of the primary transducer. If the safety transducer is out of calibration, a calibration error can occur due to the pressure difference between the primary transducer and the safety transducer. To avoid equipment calibration errors, Welch Allyn recommends that a qualified service technician perform a full functional verification and calibration on an annual basis.

Perform an NIBP accuracy check

NOTE If you are performing this test after performing a previous NIBP check, skip to step 7.

1. Set up the test equipment.
2. Launch the service tool on the PC.
3. If the simplified interface is active, choose the Service option.
4. Log on with your user ID and password or with ADMIN as the user ID and leave the password field blank.
5. Power on the device.
6. Select the device you want to test from the device list.
7. Click **NIBP Sensor** under the **Device Information** tab.
8. Click **Accuracy Check** in the NIBP Sensor pane on the right side of the window.
9. Connect the 500cc volume.
10. Turn on the pressure meter and zero if necessary.
11. Check the accuracy at 0 mmHg.
12. Record the reading on the pressure meter and the service tool and compare the results.
13. Using the hand bulb, pressurize the NIBP system to 50 mmHg ± 5 mmHg and allow 10 seconds for the pressure to stabilize.
14. Record the reading on the pressure meter and the service tool and compare the results.
15. Using the hand bulb, pressurize the NIBP system to 150 mmHg ± 5 mmHg and allow 10 seconds for the pressure to stabilize.
16. Record the reading on the pressure meter and the service tool and compare the results.

17. Using the hand bulb, pressurize the NIBP system to 250 mmHg ± 5 mmHg and allow 10 seconds for the pressure to stabilize.
18. Compare the reading on the pressure meter to the service tool reading and record the results.
19. Click **Open valve** to open the NIBP valves. Verify that the pressure on the meter and service tool change to zero.
20. Click **Done** to complete the check.
21. To record the results of your test, go to "Service record."

SpO2, SpHb, and RRa tests

Use this procedure to test the device's SpO2, SpHb, RRa functions, if included.

Perform a Masimo SpO2 and SpHb test

1. Power on the device.
2. Touch the **Settings** tab.
3. Touch the **Device** tab.
4. Touch **Intervals Monitoring**.
5. Touch the **Home** tab.
6. Connect the SpO2 simulator to the device.
7. Verify the following on the simulator:
   - The default pulse rate is 61 bpm and the default SpO2 is 81%.
8. Give the device up to 30 seconds to stabilize and then verify a displayed pulse rate of 61 bpm ± 1 bpm and a displayed SpO2 of 81% ± 3%.
9. If the SpHb option is active, verify that the parameter is displayed with a reading of 14 g/dL ± 1 g/dL.

Perform a Masimo RRa test

1. Power on the device.
2. Touch the **Settings** tab.
3. Touch the **Device** tab.
4. Touch **Continuous Monitoring**.
5. Touch the **Home** tab.
6. Connect the Masimo RRa simulation tool to the device.
7. Verify that measurements appear in the RRa frame. The tool provides 30 minutes of trending data, so the values will change.
8. Touch the averaging selector in the RRa frame to verify that you can cycle through the options: off, slow, medium, fast, and trending.

Perform a Nellcor SpO2 test

Use this procedure to test only the device SpO2 function.

1. Power on the device.
2. Connect the SpO2 simulator to the SpO2 input connector through a Nellcor DOC-10 extension cable.

NOTE In the following tests, if the defaults are outside the device alarm limits, readjust the limits or silence the alarms.

3. Verify the following on the simulator:
   - The default pulse rate is 60 bpm and the default SpO2 is 90%.
4. Give the device up to 30 seconds to stabilize, and verify a displayed pulse rate of 60 ±1 bpm and a displayed SpO2 of 90% ±1 sat point.
5. Disconnect the SpO2 simulator.

Perform an EarlySense test

NOTE The following test confirms that data can pass to the device from the sensor. The device performs a self-test upon power up. If the tiles show on the device, then the module is functional.

1. Power on the device.
2. Touch the **Settings** tab.
3. Touch the **Device** tab.
4. Touch **Continuous Monitoring**.
5. Touch the **Home** tab.
6. Connect the EarlySense sensor to the device, and then wait approximately 40 seconds for the Movement frame to appear.
7. Verify that the bed exit sensitivity graphic is lighted and active.

SureTemp temperature system test

The SureTemp temperature system test is performed using a calibration key (cal-key). The calibration key tests the system using a fixed resistance to display a temperature of 97.3 ± 0.2 °F (36.3 ± 0.1 °C).

Perform a SureTemp temperature system test

1. With the system power on and the temperature probe in the well, disconnect the probe cable from the temperature input connector on the front of the device.
2. Connect the calibration key to the temperature input connector.
3. Remove the probe from the well.
4. Verify that the displayed temperature is 97.3 ± 0.2 °F (36.3 ±0.1 °C).

SureTemp temperature probe and system test

Use this procedure to test the temperature function while verifying the temperature probe. To achieve accurate results, you must perform this test with the device in Direct mode.

Test each probe at the low, medium, and high set points on the tester. Repeat the procedure for each thermometer and temperature to test.

Set up the 9600 Plus calibration tester

Place the tester on a level surface away from sunlight, drafts, and other sources of heat or cold.

The tester takes approximately 20 minutes to heat to the lowest set point.

To expedite testing, Welch Allyn recommends the following practices:

- To eliminate waiting for the tester to heat to the next set point, use three testers, each set to one of three different set points.
- When using only one tester to test several thermometers at all three temperatures, test all thermometers at one set point before proceeding to the next set point.
- To eliminate waiting for the tester to cool down, start at the lowest set point. Because the tester does not have an internal fan, it requires more time to cool down than to heat up.

Change the 9600 Plus set point

To scroll from one set point to the next, press and hold the Temperature Selection button until a beep sounds.

The new set point appears in the upper left corner of the display. The device's current temperature appears, flashes, and continues flashing until the cavity reaches equilibrium at the new set point. The 9600 Plus beeps when the set point is reached.

Perform a SureTemp temperature probe and system test

1. Set the 9600 Plus to the desired set point and wait for the display to stop flashing.
2. Insert the temperature probe, without a probe cover, into the thermistor device port on the tester.
3. When appears on the display, touch it to switch to Direct mode.
4. Wait for up to two minutes for the temperature reading to stabilize.
5. Record the results in the temperature service record.
6. Return the temperature probe to the probe well on the device.
7. Repeat the procedure as necessary until all thermometers are tested at each temperature.

To record the results of your test, go to "Service record."

Braun ThermoScan PRO thermometer tests

This explains how to perform a functional verification on the Braun ThermoScan PRO 6000 thermometer using the 9600 Plus Calibration Tester.

NOTE Use this procedure in place of the verification and calibration test for the Braun PRO 6000 in the Welch Allyn Service Tool version 1.0.2.0 and earlier.

CAUTION Before the test, place thermometers and tester in the same room for approximately 30 minutes so that they adjust to the ambient temperature.

CAUTION Set the temperature scales on the 9600 Plus to match the Braun Thermoscan PRO's default temperature scale.

CAUTION Set up the 9600 Plus away from sunlight, drafts, and other sources of heat or cold. Fluctuations will impact the calibration check.

CAUTION The ambient temperature must be stable and within the range of 18.3°C (65.0°F) to 26.7°C (80.0°F).

For more information, see the *Welch Allyn 9600 Plus Calibration Tester Directions for use*.

Perform a Braun ThermoScan PRO 6000 functional verification test

1. Complete the following pre-check steps:
   a. Check the probe tip lens window with a magnifying glass for signs of displacement. Any gaps in the seam between bezel and the lens window indicate a displaced lens window. If you see a gap, the unit is damaged and must be replaced.
   b. Gently wipe the probe tip with a cotton swab slightly moistened with 70 percent isopropyl or ethyl alcohol taking care not to displace the lens window. Remove excess alcohol with a clean cotton swab, and let air dry for 5 minutes. Do not use any chemical other than alcohol to clean the probe window.
   c. Verify that the thermometer is fully charged.
2. Place the thermometer in calibration mode:
   a. With the thermometer in sleep mode, press and release the **C/F** button.
   b. Immediately (while all segments of the LCD are illuminated during self-test), press and hold the **C/F** button and the **Mem** button.

      After 5 seconds the thermometer begins a long beep.
   c. During the beep, release the **Mem** button and the **C/F** button.

   The thermometer is now in Calibration check mode. ("CAL" flashes on the screen for 0.25 seconds every second.)
3. Return the thermometer to the dock or a flat surface and wait for 1 minute before taking the first temperature.

   NOTE Holding the thermometer could raise the temperature of the thermometer. Put the thermometer down while waiting so that the thermometer remains at ambient room temperature.
4. Apply a new probe cover.

   When the probe cover is applied properly, the flashing probe cover icon disappears from the display and a short beep sounds.
5. Wait for the screen to flash three dashes (---) alternating with "CAL."
6. Place the probe firmly into the ear device port or Braun 6000 test fixture. Firmly push the device down into the well to ensure perpendicularity and that the probe is fully seated in the device port. Visually check the thermometer and fixture to ensure proper alignment.

   NOTE When using the Braun 6000 test fixture, follow the instructions provided with the fixture to position the PRO 6000 in the test fixture.

   NOTE If you are not using the Braun 6000 test fixture, ensure that the device is perpendicular in the port, directly aligned with the calibration tester sensor, and not at an angle or tilted.

   NOTE Once the device is firmly seated, do not apply additional pressure. Doing so may cause your hand to waver and tilt or move the device during testing.
7. Wait 5 seconds, press the thermometer measure button, and watch for the green ExacTemp light to flash.
8. Leave the thermometer in the 9600 Plus Calibration Tester until the ExacTemp light stops flashing and you hear a beep.
9. Remove the Braun PRO 6000 thermometer from the 9600 Plus Calibration Tester and compare the temperature displayed on the tester with the temperature on the thermometer's display.

If the temperatures are within ±0.2 ºC (±0.4 ºF), the thermometer is within calibration.

10. Replace the probe cover to reset, and wait for the thermometer screen to flash three dashes (---) alternating with "CAL."

    NOTE Replace the probe cover before each reading to remove any residual heat absorbed from the 9600 Plus Calibration Tester.

11. Return the thermometer to the dock or a flat surface and wait 1 full minute before taking another reading with the same thermometer.

    NOTE Repeated measurements in short sequence might cause higher readings.

    NOTE Holding the thermometer could raise the temperature of the thermometer. Put the thermometer down while waiting so that the thermometer remains at ambient room temperature.

12. Test all available thermometers for calibration verification at the current calibration set point temperature before proceeding to the next calibration set point temperature.
13. See the 9600 Plus Calibration Tester DFU to change the set point temperature.

    NOTE The device will exit CAL mode after 10 minutes of inactivity or can be forced to exit by holding both **C/F** and **Mem** for 5 seconds. After exiting Calibration Check Mode, the thermometer returns to Sleep Mode.

To record the results of your test, go to "Service record."

Perform a CO2 calibration or calibration check

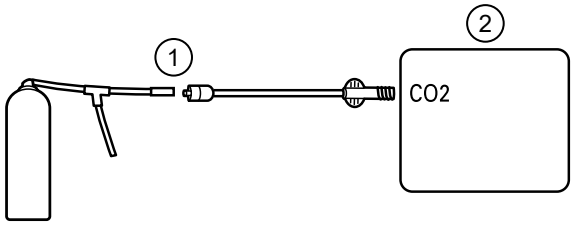
You can use the etCO2 parameter advanced settings to check the CO2 sensor for proper calibration and to calibrate the sensor when calibration is due. **Check calibration** helps you verify whether the module is calibrated at the time of the calibration check. **Calibrate** launches the calibration process.

Passing a calibration check could be misleading, especially if calibration is due in the near future. A sensor that is calibrated today might not remain calibrated over the next 4000 operating hours. Check calibration at the intervals recommended here to ensure proper calibration. Initially calibrate the CO2 sensor after 1,200 operating hours, then once a year or after 4,000 operating hours, whichever comes first. The initial calibration should not occur before 720 hours of use unless a calibration check shows the sensor to be out of calibration.

NOTE If you perform the initial calibration before 720 hours of use, the module will reset to require its next calibration after only 1200 hours rather than 4000 hours.

The calibration kit provides the appropriate gas mix (5% CO2, 21% O2, Balance N2) with an accuracy of 0.03% volume percent. The gas canister has a calibrated orifice to allow the gas to flow at approximately 1 liter per minute, the flow rate necessary to perform the calibration.

Before you begin, verify the time and date setting on the device is correct to correctly calculate when the next calibration is due. Then connect the CO2 calibration kit to the device as shown in the diagram:



No.	Item	No.	Item
1	CO2 calibration kit	2	Device

1. Power on the device.
2. Touch the **Settings** tab.
3. Touch the **Advanced** tab.
4. Enter the configured Advanced settings code and touch **OK**.
5. Touch the **Parameters** tab.
6. Touch the **etCO2** tab.
7. Scroll to the bottom of the screen and touch **Check calibration** or **Calibrate**.
8. Enter the calibrated CO2 concentration to the nearest tenth of a percent.
9. Open the gas supply and touch **Start**.
10. When prompted, close the gas supply.

If the calibration or calibration check is successful,

- Touch **OK** to complete the calibration process.
- Disconnect the calibration line from the device.
- Dispose of or store the pressurized calibration gas container in accordance with your local regulations.

If the calibration or calibration check is unsuccessful,

- Verify that the test CO2 concentration is correct according to the certificate of analysis provided by the vendor.
- Check the sample line for occlusions or leaks.
- Verify that the sample line is firmly attached to the input connector.
- Check that the filter is not blocked.
- Rerun the calibration check or calibrate procedure.

To record the results of your test, go to "Service record."

ECG functional test

The ECG module does not require any calibration or routine maintenance other than cleaning. This functional test should be performed to verify the ECG module is functioning properly after the Connex device case has been opened or you suspect a problem.

Required equipment

- Connex device with software version 2.30.01 or later
- Welch Allyn Connex Devices ECG module
- 5-lead AHA or IEC cables
- Stopwatch
- Clinical Dynamics AccuSim patient simulator or equivalent

ECG simulator requirements:

- Supports outputs for Lead RA, Lead LA, Lead LL, Lead RL, and Lead V when using a 5-lead patient cable
- Generates heart rate between 20 and 300, inclusive
- Generates ECG amplitude between 0.5 mV and 5.0 mV, inclusive
- Generates ECG width between 40 ms and 120 ms, inclusive
- Generates irregular rhythms (Asystole, V-Tachycardia, V-Fib)

General acceptance criteria

- Heart Rate: within +/- 3 beats per minute or +/- 3%, whichever is greater
- Respiration Rate: within +/- 2 breaths per minute or +/- 2%, whichever is greater
- Asystole alarm triggers in 4 seconds or longer

Test setup

Configure the ECG simulator

1. Normal Sinus Rhythm (NSR)
   a. Heart rate 80 beats per minute
   b. Amplitude 1.00 mV
   c. Mode Continuous (AccuSim simulators)
2. Respiration
   a. Rate 15 breaths per minute
   b. ΔR: 1.5 ohms
   c. Base impedance 250 ohms
   d. Apnea: Off

Connex device and ECG module

1. Disconnect all parameter sensors from the device, if connected.
2. Connect the Connex device to AC power and power on.
3. Restore settings on the Connex device to factory default and restart the device.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Enter **6345** or the custom password for the device.

      NOTE Restoring factory defaults will not reset the password.

   d. Touch the **Service** tab.
   e. In the Restore factory defaults pane, touch **All settings**.
   f. Touch **OK** to confirm the change and restart the device.
4. If the device does not open to Advanced settings after restart, repeat substeps 3a. through 3c.

5. Touch the **Device** tab and adjust settings as follows:
   a. Set the power line frequency to match your AC power frequency (50Hz or 60Hz).
   b. Set the default profile to Continuous monitoring.
6. Touch the **Parameters** tab and then the **ECG** vertical tab.
7. Configure ECG settings as follows:
   a. Set Cable selection to **5 Lead**.
   b. Set electrode configuration to match the patient cable used with this test.
   c. Enable **Allow impedance respiration**.
   d. Enable **V-Tach, V-Fib, Asystole detection**.
   e. Enable **Automatic print on ECG alarm**.
   f. Set Default lead to **II.**
   g. Set the V-Tach threshold to **120**.
8. Touch **Exit** to leave Advanced settings.
9. Connect the ECG module to one of the USB host ports on the Connex device.
10. Touch the **Settings** tab, then the **Device** tab, then the **Profiles** vertical tab.
11. Set the profile to continuous monitoring.
12. Touch the **Settings** tab, then the **Setup** tab, then the **ECG** vertical tab.
13. Configure ECG settings as follows:
    a. Set ECG gain to 20 mm/mv.
    b. Set sweep speed to 25 mm/s.
    c. Enable Filter.
14. Touch the **Device** tab, then the **Defaults** vertical tab.
15. Touch **Save as default** in the Current settings pane.
16. Power off the Connex device.
17. Use either a 5-lead AHA or IEC ECG cable to connect the ECG module to the corresponding AHA or IEC connections on the simulator.

ECG test procedure

Inspect the ECG module and cables. Capture the results in the ECG Test Record worksheet and compare results to the acceptance criteria to determine if the step passes or fails. If you determine that the cable is faulty, replace it with a known good cable and repeat the test.

Inspect the ECG module and cables

Before performing a functional test, inspect the module and cables.

1. Inspect the ECG patient cables for the following:
   a. Cuts to insulation or connectors
   b. Cracks or discoloration of the plastic
   c. Missing or loose rubber or plastic
   d. Missing or damaged labels
2. Inspect the ECG USB cable for the following:
   a. Cuts to insulation or connectors
   b. Cracks or discoloration of the plastic
   c. Missing or loose rubber or plastic
   d. Missing or damaged labels
3. Inspect the ECG module for the following:
   a. Broken plastic
   b. Cracks

c. Discoloration
d. Missing or damaged fasteners
e. Missing or damaged labels
f. Broken internal parts as evidenced by rattles
g. Broken, bent, burnt, contaminated, or corroded connector pins
h. Discoloration around connector pins

ECG module and LED test

1. Verify that the LED on the ECG module is off. Record result.
2. Power on the Connex device and observe the LED on the ECG module.
3. Verify that the LED on the ECG module initially lights up amber then changes to steady green. Record result.
4. On the Connex device Home tab, touch **Start** in the ECG frame.
5. Verify that the LED on the ECG module is flashing green. Record result.

Waveform and heart rate test

1. Touch the ECG frame on the Connex device display until the selected lead is Lead I.
2. Touch **Start** in the ECG frame.
3. Verify that a waveform appears and that heart rate is 80 beats per minute +/- 3 beats per minute. Record result.

   The ECG NSR waveform for Lead I and HR/PR should appear as shown.

ECG Lead I

4. Touch the ECG frame to change the ECG lead.
5. Repeat steps 3 and 4 for Leads II, III, and V.

NOTE The waveform will vary for each lead, as shown.

ECG Lead II

ECG Lead III

ECG Lead V

Lead-off alarm test

1. Remove one lead from the simulator and verify that the monitor displays an equipment alert identifying the failed lead. Record result.
2. Replace the lead and wait for the waveform to stabilize again.
3. Repeat steps 1 and 2 for each lead (AHA or IEC leads RA/R, LA/L, RL/N, LL/F, V/C).

Respiration test

1. Touch the **Settings** tab, then the **Setup** tab, then the **ECG** vertical tab.
2. Configure ECG settings as follows:
   a. Set ECG gain to **20 mm/mv**.
   b. Set sweep speed to **25 mm/s**.
   c. Enable **Filter**.
   d. Disable **Patient has a pacemaker**.
   e. Enable **Use ECG as an RR source when available**.
3. Touch the **Home** tab.
4. Touch the ECG frame on the Connex device display until the lead switches to Lead II.
5. Allow 3 minutes for the ECG signal to stabilize before observing heart rate and respiration rate.
6. Verify that the respiration rate is 15 breaths per minute +/- 2 breaths per minute. Record result.

Arrhythmia alarm test

1. On the Connex device display, touch **Stop** in the ECG frame.
2. Set the ECG simulator to trigger an Arrhythmia.
3. Touch **Start** in the ECG frame.
4. Trigger the Asystole on the ECG simulator and start the stop watch to capture the time elapsed between triggering the Asystole and the Asystole alarm appearing on the Connex device.
5. Verify that the Asystole alarm triggers after ≥ 4 seconds. Record result.
6. Touch **Stop** in the ECG frame.
7. Turn off Asystole on the ECG simulator and resume a normal sinus rhythm.

Pacemaker detection test

1. Touch the **Settings** tab, then the **Setup** tab, then the **ECG** vertical tab.
2. Enable **Patient has a pacemaker**.
3. Touch the **Home** tab.
4. Observe the PACER DETECTION ON label in the ECG frame.
5. Turn on the Pacemaker signal on the ECG simulator.
6. Set the following Atrial Pacer settings:
   a. Polarity ve+
   b. Width 1 ms

c. Amp 5.0 mv

d. Pacer and ECG synced

7. Set the ECG channel to Lead I.
8. Touch **Start** in the ECG frame.
9. Wait a few seconds and observe the waveform in the ECG frame.
10. Verify that the Pacer spike marker appears before the QRS complex in the ECG frame. Record result.
11. Repeat steps 7 through 10 for Lead II, Lead III, and Lead V.

End of test.

Electrical safety testing

Welch Allyn recommends performing only ground continuity and leakage current tests after all open-case repairs. Dielectric strength testing is not recommended.

NOTE Perform dielectric strength testing only if there is a reason to doubt the integrity of the electrical insulation (e.g. multiple trips of a residual-current device or liquid ingress of a saline solution). If you determine this test should be performed, return the device to Welch Allyn for service.

These recommendations trace to EN/IEC 60601-1 – Medical Electrical Equipment – Part 1: General Requirements for Basic Safety and Essential Performance or EN/IEC 62353 – Medical Electrical Equipment – Recurrent Test and Test After Repair of Medical Electrical Equipment.

Because of the variability of test equipment in the field, Welch Allyn does not include specific instructions to perform electrical safety tests. When performing electrical safety tests, refer to your test equipment manuals for detailed instructions to ensure proper test equipment setup that aligns with the appropriate standard. The following table provides connections and test limits to assist you in performing these tests.

Test	Limits
Ground continuity (see Note above)	Ground continuity from EP stud (equipotential terminal)* to the Gnd pin of the IEC power connector shall be no greater than 0.1 ohms.
Leakage current (see Note above)	Leakage current shall be less than 500 µA from EP stud* to mains (Line and Neutral pins of the IEC power connector).
Insulation resistance	Dielectric strength shall be 500 V (DC) EP stud* to IEC mains (Line and Neutral pins of the IEC power connector), and insulation resistance is measured.

* To locate the equipotential terminal, see “Controls, indicators, and connectors."

Devices with an external power supply

The power bricks are CB Certified and UL Listed; they meet ALL of the requirements that the Medical Device standard requires for power supplies. The manufacturer is required to perform 100% electrical safety testing on all of their power bricks prior to shipment. Welch Allyn does not perform nor recommend testing on these external power bricks because additional testing would put undue stress on the insulation system and possibly cause premature failures in the field. Open case repairs of devices with external power supplies are only dealing with DC circuitry and robust isolation circuits built into the printed circuit boards. No additional after-servicing testing is

required in that instance. The patient isolation systems within the device (Temperature Probe, SpO2 sensor, CO2 sensor, ECG sensor, etc.) all have visible isolation gaps built into the printed circuit board. The quality control on the PCB and the thorough type-testing performed by the testing agency (ETL) eliminates the need for further testing on the devices that are downstream from the mains isolation device.

Devices with an internal power supply

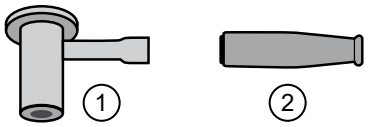
The internal power supplies are CB Certified and UL Registered. These power supplies are an open frame style (no protective enclosure). Therefore, the products that contain an internal power supply require electrical safety testing. Open case repairs of devices with an internal power supply require the recommended testing because those devices contain the open frame power supply, and the testing involves the manipulation of wiring that carries 120 or 240 volts AC. Welch Allyn does not recommend HiPot / Dielectric Withstand testing because of a potential stress on the insulation system, which could cause premature failures.

Ground stud connector

This device is equipped with a ground stud (equipotential terminal) for electrical safety testing, and to connect a potential equalization conductor. To ensure use of the proper connector for safety testing, the ground stud is recessed into the system's housing. Do not use "alligator" style clamps or connectors. The mating electrical connector requires self assembly by crimping it to appropriate connecting leads.

The mating connector (Type POAG-KBT6DIN, order number 15.0010) consists of the right-angled socket and insulator, as shown in the next figure. You can purchase the mating connector and the crimping pliers from the manufacturer, Multi-Contact:

http://www.multi-contact.com.



Item	Description	Type	Order no.
①	The mating electrical connector, a right-angled socket made of nickel-plated brass with Multilam™ made of gold-plated, hard-drawn copper alloy.	POAG-WB6DIN	01.0404
②	Insulator	T-POAG6	15.5004-24
	Crimping pliers with mandrel crimp for 4 mm^2 and 6mm^2 flexible conductors.	POAG-PZ-N	14.5009

Options, upgrades, and licenses

Welch Allyn supports option, software, and license upgrades for all models.

Option upgrades for devices still under warranty that require any installation inside the device must be performed by a Welch Allyn service center unless you participate in the Partners in Care Biomed Partnership Program. If you want to install internal options, we recommend you attend either the classroom or online technical training course for the device. The training is required to be eligible to receive the Welch Allyn Service Tool Gold licensed edition. The Gold licensed edition is required to verify that the device is functioning correctly after it has been serviced. Although all of the option upgrades are calibrated and tested before leaving the factory, Welch Allyn recommends performing a complete functional test whenever the device is serviced.

Software upgrades, when available, can be purchased or provided at no charge if your device is covered by a Welch Allyn Service Agreement. The upgrades can be installed by either a Welch Allyn service center or by using the service tool, Standard unlicensed edition or Gold licensed edition.

If you choose to install software upgrades on your own, you will receive the software through the internet. When ordering software, provide the serial number of the device you want to install the software on.

Licenses are available for purchase to turn on additional software features or communication options. If you want to install licenses, you will need the service tool, Standard unlicensed edition or Gold licensed edition, and an internet connection. If you purchase a license, you will receive a code to enter in the service tool running on a PC connected to the internet that will contact a server and download the license file. The service tool connects with the device to install the license to turn on the advanced 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 tied to the device's 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 files.

Available options, upgrades, and licenses

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

CAUTION Before installing any option, disconnect the patient from the monitor and power down the device.

Options

Model	6400	6500	6700	6800
Masimo	○	○	○	○
Nellcor	○	○	○	○
SureTemp Plus	○	○	○	○
Braun ThermoScan PRO 6000 [1]	○	○	○	○
Masimo with SpHb enabled [2, 3]	○	○	○	○
Masimo with RRa enabled [4, 4, 5, 10]	○	○	○	○
Oridion CO2 [5, 6,6, 10]	○	○	○	○
EarlySense [6, 7, 7, 8, 9]	○	○	○	○
EarlySense safety [10]	○	○	○	○
ECG [6, 11, 12]	○	○	○	○
Printer	○	○	○	○
Radio	○	●	○	●

[1] Requires host software version 2.30.00 or higher.

[2] Requires host software version 1.70.03 or higher.

[3] Requires applicable UI license.

[4] Requires host software version 2.00.00 or higher.

[5] Requires the Continuous Monitoring profile license.

[6] Requires the extended chassis.

[7] Requires host software version 2.10.00 or higher.

[8] Requires Motion pulse/respiration license to display pulse and respiration.

[9] Not compatible with other respiration options.

[10] Requires host software version 2.20.00 or higher.

[11] Requires LTA license for arrhythmia analysis.

Model	6400	6500	6700	6800
[12] Requires host software version 2.30.01 or higher.				

Model	6400	6500	6700	6800
Masimo	○	○	○	○
Nellcor	○	○	○	○
SureTemp Plus	○	○	○	○
Braun ThermoScan PRO 6000 [1]	○	○	○	○
Masimo with SpHb enabled [2, 3]	○	○	○	○
Masimo with RRa enabled [4, 4, 5, 10]	○	○	○	○
Oridion CO2 [5, 6, 6, 10]	○	○	○	○
EarlySense [6, 7, 7, 8, 9]	○	○	○	○
EarlySense safety [10]	○	○	○	○
Printer	○	○	○	○
Radio	○	●	○	●

[1] Requires host software version 2.30.00 or higher.

[2] Requires host software version 1.70.03 or higher.

[3] Requires applicable UI license.

[4] Requires host software version 2.00.00 or higher.

[5] Requires the Continuous Monitoring profile license.

[6] Requires the extended chassis.

[7] Requires host software version 2.10.00 or higher.

[8] Requires Motion pulse/respiration license to display pulse and respiration.

[9] Not compatible with other respiration options.

[10]Requires host software version 2.20.00 or higher.

● Standard with this model. ○ Available hardware/software upgrade for this model. **X** Not an available hardware/software upgrade for this model.

Licensed features

Model	6400	6500	6700	6800
Vitals communication	●	●	●	●
Barcode scanner	●	●	●	●
Weight scale [1]	○	○	○	○
Total hemoglobin (Masimo SpHb) [2]	○	○	○	○
Acoustic respiration rate (Masimo RRa) [3]	○	○	○	○
Motion pulse/respiration[4, 5]	○	○	○	○
ECG LTA [6]	○	○	○	○
Profiles				
Spot Check	●	●	●	●
Office [7]	●	●	●	●
Triage [8]	X	X	X	X
Intervals Monitoring [9]	●	●	●	●
Continuous Monitoring [3]	●	●	●	●

[1] Requires host software version 1.70.00 or higher.

[2] Requires host software version 1.70.03 or higher.

[3] Requires host software version 2.00.00 or higher.

[4] Requires EarlySense; not compatible with RRa or etCO2.

[5] Requires host software version 2.20.00 or higher.

[6] Requires host software version 2.30.01 or higher.

[7] Requires host software version 1.71.00 or higher.

[8] Triage is not available in host software 2.30.00 and higher

[9] In host software versions 1.X, this profile was called Monitor.

Model	6400	6500	6700	6800
Vitals communication	●	●	●	●
Barcode scanner	●	●	●	●

Model	6400	6500	6700	6800
Weight scale [1]	○	○	○	○
Total hemoglobin (Masimo SpHb) [2]	○	○	○	○
Acoustic respiration rate (Masimo RRa) [3]	○	○	○	○
Motion pulse/respiration [4, 5]	○	○	○	○
Profiles				
Spot Check	●	●	●	●
Office [6]	●	●	●	●
Triage [7]	X	X	X	X
Intervals Monitoring [8]	●	●	●	●
Continuous Monitoring [3]	○	○	●	●

[1] Requires host software version 1.70.00 or higher.

[2] Requires host software version 1.70.03 or higher.

[3] Requires host software version 2.00.00 or higher.

[4] Requires EarlySense; not compatible with RRa or etCO2.

[5] Requires host software version 2.20.00 or higher.

[6] Requires host software version 1.71.00 or higher.

[7] Triage is not available in host software 2.30.00 and higher.

[8] In host software versions 1.X, this profile was called Monitor.

● Standard with this model. ○ Available hardware/software upgrade for this model. **X** Not an available hardware/software upgrade for this model.

Check the Connex device software version

Verify that the firmware version supports an option using one of the two methods described in this section.

Check the firmware version on the device

1. If the device is not running, power it on.
2. Touch the **Settings** tab.
3. Touch the **Advanced** tab.
4. In the right pane, check the number under Software version to identify the version currently running on your device.

Check the firmware version using the Service Tool

1. Connect the Connex device to a PC running the Service Tool with a type A to type B mini USB cable.
2. Launch the Welch Allyn Service Tool.
3. In the startup screen, click **Service**.
4. Either log in as ADMIN with no password or use any account you previously created.
5. Select the model of your device from the Device list tab.

   The Device Information tab opens.
6. Locate the host controller in the Device Name column and follow the row across to the Available firmware column to identify the version currently running on your device.

Install options

Install internal options

All internal option installations entail opening the device case and performing some disassembly. Whenever you repair, replace, or install internal components, Welch Allyn requires that the device undergo a full functional test and electrical safety test before placing the device back in service.

Before installing an internal option, read the information about removing the option in "Disassembly and repair." After familiarizing yourself with the process, follow the instructions in the disassembly section to remove currently installed components or empty housings as needed, and then proceed to install new options.

Install external options

External options include ECG, Braun thermometers, barcode readers, and scales. Perform any required software upgrades and install any required licenses before connecting the option to the Connex device. Follow any instructions included with the option to set up or mount the option before connecting it to the Connex device.

External options include Braun thermometers, barcode readers, and scales. Perform any required software upgrades and install any required licenses before connecting the option to the Connex device. Follow any instructions included with the option to set up or mount the option before connecting it to the Connex device.

1. Power down the Connex device and remove the A/C power cord.
2. Access the back panel of the Connex device
3. Locate the USB connector door.
4. Loosen the captive screw in the access door until you can open the door.
5. Plug the USB connector of the module external option (e.g., barcode reader) into any available USB port. Check that the connector is fully inserted.
6. Align the external option's USB cable with the corresponding slot in the USB access door and close the door.
7. Tighten the captive screw to secure the access door.
8. Connect the A/C power cord to the device.
9. Power on the device.

10. After the device boots up, follow the instructions in the device and/or option's *Instructions for use* to configure the option as necessary.

Upgrade software

If the current software version does not meet the minimum required version, update the Connex device firmware to the latest version that supports the option. To update the software, you will need the latest version of the Welch Allyn Service Tool, available from https://www.hillrom.com/en/services/welch-allyn-service-tool/l. If necessary, follow the instructions in the Welch Allyn Service Tool Installation and Configuration Guide, available from https://www.hillrom.com/en/services/welch-allyn-service-tool/. Contact Hillrom Technical Support: hillrom.com/en-us/about-us/locations/ to obtain the latest version of Connex device software. Follow these steps to update the Connex device firmware using the Welch Allyn Service Tool:

1. Connect the Connex device to a PC running the Service Tool with a type A to type B mini USB cable.
2. Connect the AC power plug to an AC power outlet and power on the Connex device.
3. Launch the Welch Allyn Service Tool.
4. If the startup screen with the "Add new features" and "Service" button appears, click **Service**.
5. Either log in as ADMIN with no password or use any account previously created.
6. Select your Connex device from the Device list tab.

   The Device Information tab opens.
7. Click the **Upgrade** tab.
8. Locate the host controller in the device column and follow the row across to the Available firmware column.
   - If a version number is present, click to select it.
   - If no upgrade available is shown, click **Check for upgrades**.
   - If no upgrade appears, contact Hillrom Technical Support: hillrom.com/en-us/about-us/locations/.
9. Click **View release notes** for information about this version.
10. Click **Upgrade all**.
11. In the dialog that appears asking if you want to continue, click **Yes** to continue or **No** to return to the Upgrade tab.

    NOTE Once the upgrade starts, do not shut down or disconnect the device until the process is complete. The device will reboot and begin the upgrade process. The host controller software and any subsystem firmware will be upgraded with available firmware versions. The device will reboot multiple times depending on the number of subsystems requiring an update. For each subsystem, the progress spinner will progress from 0 to 100 percent.

    When the upgrade is complete, the device returns to the Upgrade tab, and the Available firmware column will show NA for the host controller.

If the Chinese fonts and IME tables appear in the list of items to add to the device, you must install them to print charts as follows:

1. Complete steps 1 through 6 at the beginning of this topic.
2. Select Chinese fonts and IME tables from the list of items to add to the device.
3. Click **Add selected**.

4. In the dialog that asks if you want to continue, click **Yes** to continue or **No** to return to the Upgrade tab.

When the installation in complete, the device returns to the Upgrade tab.

Activate licenses

Licensed features are enabled using the licensing application in the Welch Allyn Service Tool. When you purchase a licensed upgrade for the Connex device, you receive an authorization code from Welch Allyn Customer Service. This code enables you to activate the new features through Service Tool's Install License feature.

1. Connect the Connex device to a PC running the Service Tool with a type A to type B mini USB cable.
2. Launch the Welch Allyn Service Tool.
3. If the startup screen with the "Add new features" and "Service" buttons appears, click **Add new features**.
4. Either log in as ADMIN with no password or use any account previously created.
5. Click on the **Administration** menu and select **Install license**.
6. Select **Medical device license** for the type of license you want to activate.
7. Enter your authorization code.
8. Select the device from the Device list.

NOTE The device must either be connected or on the maintained device list to appear.

9. Click **Activate**.

NOTE If the license you are activating is for a connected device, the license is installed immediately. If the license is for an offline (maintained) device, the license will be installed the next time the device is connected to the Service Tool. A new license activation action will be added to your work list.

10. After installing the license, power down and restart the Connex device to load the license and activate the new licensed features.

NOTE If a forced shutdown occurred immediately after installing the license, you might need to reinstall the license.

11. If you observe any issues or errors in the activation process, confirm that you entered the correct authorization code, check your Internet connection, and repeat the installation process. Confirm with your systems administrator that ports 5093 and 5094 on your firewall are open for TCP/IP communications. If you cannot resolve the issue, contact Hillrom Technical Support: hillrom.com/en-us/about-us/locations/.

NOTE Masimo SpHb requires an additional license that is installed as a software upgrade using the Service Tool. Additional instructions for installing the Masimo licenses are included with the Masimo parameter upgrade kits.

Host firmware requirements

This section lists the host firmware requirements for each parameter. If your device does not meet the minimum requirements, you can upgrade the host firmware with the Welch Allyn Service Tool.

- SpHb requirement: host firmware version 1.70.03 or later
- RRa requirement: host firmware version 2.00.00 or later
- CO2 requirement: host firmware version 2.00.00 or later
- EarlySense requirement: host firmware version 2.10.00 or later
- Braun ThermoScan PRO 6000 requirement: host firmware version 2.30.00 or later
- ECG requirement: host firmware version 2.30.01 or later

NOTE The EarlySense module software does not support downgrading. The following error message appears in the device log file NAK: "FmFLASH/GnSTATUS/1."

This section lists the host firmware requirements for each parameter. If your device does not meet the minimum requirements, you can upgrade the host firmware with the Welch Allyn Service Tool.

- SpHb requirement: host firmware version 1.70.03 or later
- Braun ThermoScan PRO 6000 requirement: host firmware version 2.30.00 or later
- ECG requirement: host firmware version 2.30.01 or later

Masimo parameter upgrades

Masimo parameter upgrades are available for device models 6400, 6500, 6700, and 6800. Available upgrades are as follows:

- Hemoglobin (SpHb)
- Acoustic respiration (RRa)

NOTE SpHb and RRa are not compatible with EarlySense. RRa is not compatible with CO2.

A Hemoglobin parameter upgrade is available for models 8400 and 8500 with Masimo SpO2.

Upgrading devices configured without Masimo SpO2

You can upgrade devices configured without Masimo SpO2 by adding Masimo SpO2 or by replacing the Nellcor SpO2 module with a Masimo SpO2 module.

If you participate in a SmartCare™ Biomed program, you can purchase an upgrade kit and complete the installation on your own. Upgrade kits contain a Masimo module with the desired parameters, a user interface license authorization code, and instructions for installing and licensing the upgrade. To complete the installation, you also need the tools listed in the “Disassembly and repair” section of this manual.

If you do not participate in a SmartCare™ Biomed program, contact Welch Allyn to order a Masimo hardware upgrade and arrange for Welch Allyn to perform the upgrade. Customers performing hardware upgrades without participating in a SmartCare™ Biomed program void the device warranty.

Upgrading devices configured with Masimo SpO2

If your device has a Masimo SpO2 module, you can enable new parameters by upgrading the module firmware. All customers can perform firmware upgrades on their own by using the service tool. To upgrade your module, purchase a firmware upgrade kit and follow the instructions provided with the kit.

Each parameter firmware upgrade is custom-built for a specific device and cannot be transferred to another device.

Configure options

When connected and powered on, the monitor recognizes all options. When the option successfully passes the POST, all software controls in the monitor's user interface are activated, enabling you to configure option settings.

Option parameters are initially set at factory default values. To change these settings go to Advanced Settings. The configuration screens for IPI, SpO2, SpHb, Pulse rate, etCO2, NIBP, RRa, Temperature, and Manual parameters are on the Parameters tab. The configuration screens for the radio are on the Network tab. For more information about the Advanced Settings menu, see the device's directions for use.

Option parameters are initially set at factory default values. To change these settings go to Advanced Settings. The configuration screens for SpO2, SpHb, Pulse rate, NIBP, Temperature, and Manual parameters are on the Parameters tab. The configuration screens for the radio are on the Network tab. For more information about the Advanced Settings menu, see the device's *Instructions for use*.

Chinese fonts and input method editor (IME) tables

Chinese fonts

Chinese fonts require a lot of memory because each font size includes thousands of Chinese characters. The fonts are loaded separately to the Connex device to reduce the size of the binary image (the *.pim file). The fonts are stored to non-volatile memory to preserve them through power cycles and software upgrades.

Chinese IME

IME is a component of the device software that allows users to input text in Chinese using a standard keyboard. The software translates multiple keystrokes to characters that otherwise could not be represented individually on keyboards.

IME technology relieves end users of the need to remember all possible ideographic character values. Instead, the IME monitors user keystrokes as they type Chinese character sounds in phonetic English and anticipates the Chinese characters the user might want. When several similar choices are available, the IME presents a list of candidate characters, giving the user an opportunity to choose the appropriate one.

Load Chinese font and IME tables

1. Open the WAST on your PC.

2. Connect a mini-USB cable to the PC and the Connex device.
3. On the Device list tab, click on the device name to select it and then click **Select**.

   A new detailed device tab appears with the Device Information subtab selected.
4. Click on the **Upgrade** subtab.

   The Upgrade subtab appears with two panes of upgrade options.
5. In the pane on the right, click **Chinese Fonts and IME Tables**, and then click **Add selected**.

   A dialog appears asking if you want to continue the upgrade process.
6. Click **Yes** and wait for firmware update to complete.

   A dialog presenting an instruction to wait appears and remains onscreen until the installation is complete. Then the dialog closes and the pane on the right of the Upgrade subtab disappears (assuming no other items populated that pane initially).

Field replaceable units

This section of the manual addresses only field-replaceable service parts. Product accessories—including patient sensors, probes, cables, batteries, probe covers, printer paper and other consumable items—are listed separately in the accessories list in the user documentation or repair parts/kits can be purchased through Hillrom sales channels. You can also visit the Hillrom Parts Store online to purchase replacement parts and accessories for your Welch Allyn device.

Table for service kits

The following table provides an at-a-glance view of service kits.

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] Serial numbers prior to 100043244817	**3rd edition [2] Serial numbers 100043244817 to 100072205218**	**4th edition [3] Serial numbers 100072205218 and above**
103573	VSM 6000 LCD frame	X	X	X
104269	Serv Kit, Chassis	X	X	X
105362	Serv Kit, VSM 6000, Labels, Models 6700, 6800	X	X	X
105480	Serv Kit, EarlySense module	X	X	X
105504	Serv Kit, Extended chassis upgrade	X	X	X
105611	Serv Kit, VSM 6000, ES Module w/ Bed Sensor	X	X	X
105792 (SERVICE ONLY)	Oridion CO2 Extended chassis upgrade kit	X	X	X
105793	Oridion CO2 Extended chassis Nellcor SpO2 upgrade kit	X	X	X

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] **Serial numbers prior to 100043244817**	**3rd edition [2]** **Serial numbers 100043244817 to 100072205218**	**4th edition [3]** **Serial numbers 100072205218 and above**
106821	Serv Kit, CVSM power supply 3rd Ed		X	X
106822	Serv Kit, CVSM printer module 3rd Ed		X	X
106823	Serv Kit, CVSM AC power harness 3rd Ed		X	X
106824	Serv Kit, CVSM LCD frame to chassis harness 3rd Ed		X	X
106825	Serv Kit, CVSM LCD display 3rd Ed		X	X
106831	Serv Kit, CVSM/CIWS USB cable separator 3rd Ed		X	X
106832	Serv Kit, CVSM/CIWS Ethernet cable 20" 3rd Ed		X	X
106835	Serv Kit, CVSM Extended bottom housing 3rd Ed		X	X
106838	Serv Kit, CVSM EarlySense module 3rd Ed	X	X	X
106839 [4]	Serv Kit, CVSM/CIWS Mainboard MCE 3rd Ed		X	X
106840	Serv Kit, CVSM Rear housing 3rd Ed		X	X
107123	Serv Kit, power supply ESD shield			X
107124 [5]	Serv Kit, CVSM SpO2 module, Nellcor 4th Ed	X	X	X
107166	Serv Kit, PLFM Comms PCBA, Newmar		X	X
107167	Serv Kit, CVSM Newmar antenna		X	X
107169	Serv Kit, CVSM Newmar radio		X	X

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] Serial numbers prior to 100043244817	3rd edition [2] Serial numbers 100043244817 to 100072205218	4th edition [3] Serial numbers 100072205218 and above
107171	Serv Kit, CVSM Newmar radio upgrade (radio and comms board)		X	X
107231 [6]	Serv Kit, CVSM main board MCE with inbound		X	X
107256	Serv Kit, CVSM R side panel with power button 4th Ed	X	X	X
107258	Serv Kit, CVSM SureTemp module 4th Ed	X	X	X
107281	Serv Kit, CVSM MODPG module assembly 4th Ed	X	X	X
107282	Serv Kit, CVSM SpO2 module, Masimo 4th Ed	X	X	X
107283	Serv Kit, CVSM Masimo SpHb module 4th Ed	X	X	X
107285	Serv Kit, CVSM Masimo SpHb module repair 4th Ed	X	X	X
107288	Upgrade Kit, Masimo module SpO2 and RRa 4th Ed	X	X	X
107289	Serv Kit, Masimo module SpO2 and RRa repair 4th Ed	X	X	X
107290 [7]	Serv Kit, Oridion CO2 module 4th Ed	X	X	X
103388 (SERVICE ONLY)	Serv Kit, SpO2 module, Nellcor	X	X	
108610	Serv Kit, NIBP pump assembly ROHS3	X	X	X
103995	Serv Kit, VSM 6000, screws and fasteners	X	X	X
106193 (SERVICE ONLY)	Serv Kit, CVSM housing templess	X	X	X

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] **Serial numbers prior to 100043244817**	**3rd edition [2]** **Serial numbers 100043244817 to 100072205218**	**4th edition [3]** **Serial numbers 100072205218 and above**
106194 (SERVICE ONLY)	Serv Kit, CVSM housing SureTemp	X	X	X
103550	PLFM Light bar board	X	X	X
103551	Serv Kit, PLFM display	X	X	X
103569	VSM 6000 Light bar harness	X	X	X
104027	Braun dock cradle ring	X	X	X
103557	VSM 6000 Temp acess cover	X	X	X
104028	Braun dock base	X	X	X
104912	Serv Kit, Oridion CO2 module faceplate	X	X	X
103545	VSM 6000 Temp housing (Templess)	X	X	X
105637	Serv Kit, EarlySense cable	X	X	X
105948	Serv Kit, Braun PRO 6000 thermometer	X	X	X
106320	Serv Kit, VSM 6000 comms door	X	X	X
106462	VSM 6000 LCD bezel for 9" display	X	X	X
106512	Serv Kit, ECG module USB cable	X	X	X
106743	Braun PRO 6000 dock	X	X	X
106834	Serv Kit, VSM 6000, Bottom housing 3rd Ed		X	X
103353	Serv Kit, VSM 6000 LED Light bar	X	X	X
6000-CBL3A	Serv Kit, Patient cable 3L AHA	X	X	X

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] Serial numbers prior to 100043244817	**3rd edition [2] Serial numbers 100043244817 to 100072205218**	**4th edition [3] Serial numbers 100072205218 and above**
6000-CBL3I	Serv Kit, Patient cable 3L IEC	X	X	X
6000-CBL5A	Serv Kit, Patient cable 5L AHA	X	X	X
6000-CBL5I	Serv Kit, Patient cable 5L IEC	X	X	X
6000-ECG3A	Serv Kit, ECG module, USB, Patient cable 3L AHA	X	X	X
6000-ECG3I	Serv Kit, ECG module, USB, Patient cable 3L IEC	X	X	X
6000-ECG5A	Serv Kit, ECG module, USB, Patient cable 5L AHA	X	X	X
6000-ECG5I	Serv Kit, ECG module, USB, Patient cable 5L IEC	X	X	X
105294 (Required software version 2.42 auto enabled)	Office Profile license	X	X	X
105363 (Required software version 2.42 auto enabled)	Continuous Profile license	X	X	X
105364 (Required software version 2.42 auto enabled)	CVSM 6700/6800 Standard license	X	X	X
105870 (Required software version 2.42 auto enabled)	Motion, Pulse, and Respiration license	X	X	X

Material	Material Description	IEC 60601 compatibility		
		2nd edition [1] Serial numbers prior to 100043244817	**3rd edition [2] Serial numbers 100043244817 to 100072205218**	**4th edition [3] Serial numbers 100072205218 and above**
103910 (Required software version 2.42 auto enabled)	CVSM 6300 Standard license	X	X	X
103371 (Required software version 2.42 auto enabled)	Bar code reader license	X	X	X
103372 (Required software version 2.42 auto enabled)	Spot profile Standard license	X	X	X
103373 (Required software version 2.42 auto enabled)	Triage profile Standard license	X	X	X
103911 (Required software version 2.42 auto enabled)	CVSM 6400/6500 Standard license	X	X	X
104560	Serv Kit, PLFM, Radio	X	X	

[1] CVSM and CIWS hardware and software has been modified to comply with IEC 60601 3rd Edition. All CVSM and CIWS software will be harmonized starting with host software version 2.30.01.

[2] CVSM and CIWS hardware and software has been modified to comply with IEC 60601 3rd Edition. All CVSM and CIWS software will be harmonized starting with host software version 2.30.01.

[3] All IEC 60601-1-1-2 4th edition compliant devices must be maintained with 4th edition compliant materials. All CVSMs manufactured from serial number 100072205218 and later and all CIWS manufactured from serial number 100025445218 and later will be serviced as 4th edition complaint devices.

[4] Requires 2.41.01 firmware or higher comms module to be replaced to 410389-04, Housing to 106835, LCD screen kit 106825, Printer kit (new cabling) {If the device had a printer} 411695-01 and Nellcor module 412896 when replacing mainboard from second edition device.

[5] Needs Host Firmware 2.41.01 to work with newer mainboards.

[6] Requires 2.41.01 firmware or higher comms module to be replaced to 410389-04, Housing to 106835, LCD screen kit 106825, Printer kit (new cabling) {If the device had a printer} 411695-01 and Nellcor module 412896 when replacing mainboard from second edition device.

[7] 407574/407574-02 2nd edition MCE boards only

Licenses

Material no.	Item	Notes
103371	Bar code reader	
103372	Spot profile	6300 only
103373	Triage profile	6300 only
105294	Office profile	Requires software version 1.71.03 or 2.20.XX and later
105363	Continuous Monitoring profile	6400, 6500, 6700, and 6800 only
103910	CVSM 6300 standard license	6300 only
103911	CVSM 6400/6500 standard license	6400 and 6500 only
105364	CVSM 6700/6800 standard license	6700 and 6800 only
104197	Weight scale	
105870	Motion pulse and respiration	6400, 6500, 6700, and 6800 with EarlySense only; not compatible with RRA or etCO2
106553	VTach, VFib, Asystole license	ECG module only

Material no.	Item	Notes
103371	Bar code reader	
103372	Spot profile	6300 only
103373	Triage profile	6300 only
105294	Office profile	Requires software version 1.71.03 or 2.20.XX and later

Material no.	Item	Notes
105363	Continuous Monitoring profile	6400, 6500, 6700, and 6800 only
103910	CVSM 6300 standard license	6300 only
103911	CVSM 6400/6500 standard license	6400 and 6500 only
105364	CVSM 6700/6800 standard license	6700 and 6800 only
104197	Weight scale	
105870	Motion pulse and respiration	6400, 6500, 6700, and 6800 with EarlySense only; not compatible with RRA or etCO2

SmartCare services for maintenance and repair

SmartCare protection plans

Material no.	Item
S1-CVSM-PRO-1	CVSM SmartCare Protection 1YR
S1-CVSM-PRO-3	CVSM SmartCare Protection 3YR
S1-CVSM-PRO-PS	CVSM SmartCare Protection 3YR POS

SmartCare protection plus plans

Material no.	Item
S9-CVSM-PROPLUS-1	CVSM SmartCare Protection Plus 1YR
S9-CVSM-PROPLUS-3	CVSM SmartCare Protection Plus 3YR
S9-CVSM-PROPLUS-PS	CVSM SmartCare Protection Plus 3YR POS

SmartCare biomed plans

Material no.	Item
S2-6000	CVSM, Bio-Med Partner Pgm 1yr
S2-6000-2	CVSM, Bio-Med Partner Pgm 2yr
S2-6000-5	CVSM, Bio-Med Partner Pgm 5yr
S2-6000-ES	CVSM ES, Bio-Med Partner Pgm 1YR
S2-6000-ES-2	CVSM ES, Bio-Med Partner Pgm 2YR
S2-6000-ES-5	CVSM ES, Bio-Med Partner Pgm 5YR
S2-6000-O2	CVSM, Bio-Med Partner Pgm with CO2
S2-6000-O2-2	CVSM, Bio-Med Partner Pgm 2yr with CO2
S2-6000-O2-5	CVSM, Bio-Med Partner Pgm 5yr with CO2

Other service plans

Material no.	Item
PRV–001	Preventive SVC WA Bench per unit
PRV–002	Preventive SVC Planed on site per unit
PRV-ESS	Preventive Annual Sensor Replacement Agreement
S4–6000	CVSM, Warranty Extension 1 year
S4-6000- 5	CVSM, Warranty Extension 5 yr
S4-6000-2	CVSM, Warranty Extension 2 yr
S4-6000ES	CVSM ES, Warranty Extension 1 yr
S4-6000ES-2	CVSM ES, Warranty Extension 2 yr
S4-6000ES-5	CVSM ES, Warranty Extension 5 yr
S4-6000-O2	CVSM, Warranty Extension 1 yr with CO2
S4-6000-O2-2	CVSM, Warranty Extension 2 yr with CO2
S4-6000-O2-5	CVSM, Warranty Extension 5 yr with CO2

Service and repair training

NOTE Required to be eligible to receive the service tool, Gold licensed edition.

Material no.	Item
VSM6000SERREP-TRN	VSM 6000 series repair training
VSM6000SERREPW-TRN	VSM 6000 series repair web training
VSM6000REPRCW-TRN	VSM 6000 series repair recertification web training

Service tools

Material no.	Item	Qty
103396	Welch Allyn Service Tool Gold license key (VSM6000)	1
web download	Welch Allyn Service Tool	1

Appendix

Decontamination and cleaning requirements for returns

As a general safety precaution, the Connex device must undergo decontamination before being returned to Welch Allyn for service, repair, inspection, or disposal.

NOTE Contaminated items must not be returned without prior, written agreement.

NOTE Decontaminate the device according to your facility's procedures and local regulations.

Cleaning is an essential prerequisite for effective disinfection or decontamination.

Clean the monitor

WARNING Electric shock hazard. Before cleaning the device, disconnect the AC power cord from the power outlet and the device.

WARNING Electric shock hazard. DO NOT autoclave the device or accessories. The device and the accessories are not heat-resistant.

WARNING Electric shock hazard. Do not open the monitor or attempt repairs. Only perform routine cleaning and maintenance procedures specifically described in this manual. Inspection and servicing of internal parts shall only be performed by qualified service personnel.

WARNING Liquids can damage electronics inside the device. Prevent liquids from spilling on the device.

If liquids are spilled on the device:

1. Power down the device.
2. Disconnect the power plug.
3. Remove battery pack from the device.
4. Dry off excess liquid from the device.

   NOTE If liquids possibly entered the device, remove the device from use until it has been properly dried, inspected, and tested by qualified service personnel.

5. Reinstall battery pack.
6. Power on the device and verify device functions normally before using it.

If liquids enter the printer housing (Connex VSM only):

1. Power down the device.
2. Disconnect the power plug.
3. Remove battery pack from the device.
4. Remove and discard the paper roll.
5. Clean and dry the inside of the printer housing.

   NOTE The printer housing has a drain tube that directs liquids down and out the bottom of the device. If liquids possibly entered other openings in the device, remove the device from service until it has been properly dried, inspected, and tested by qualified service personnel.

6. Install a new roll of paper.
7. Power on the device and verify that the device functions normally before using it.

CAUTION Sterilizing the monitor could damage the device.

NOTE Disinfect according to your facility's protocols and standards or local regulations.

NOTE See separate instructions for cleaning accessories.

Prepare to clean the equipment

CAUTION Some cleaning agents are not compatible with all components of the device. Use only approved cleaning agents. Using unapproved cleaning agents may cause damage to components.

CAUTION Do not use bleach solutions of any kind when cleaning metal electrical contacts. They will damage the device.

CAUTION When cleaning the device, do not use incompatible cloths or solutions that include quaternary ammonium compounds (ammonium chlorides) or glutaraldehyde-based disinfectants.

Select an approved cleaning agent from the following table.

Approved for the Connex Vital Signs Monitor and Connex Integrated Wall System main housings *except as noted in Additional information*

Cleaning agent	Additional information
Clorox HP Wipes	
Dispatch Hospital Cleaner Disinfectant Towels with Bleach (Clorox Healthcare®)	Not compatible with Braun dock
CleanCide Wipes (Wexford Labs)	
70 percent isopropyl alcohol solution	Applied to a clean cloth
10 percent bleach solution	(.5% - 1% sodium hypochlorite) applied to a clean cloth

NOTE To see the current list of cleaning agents that have been tested and identified as non-compatible and unapproved, see Customer Service Bulletin "CSM/CVSM Cleaning and Disinfection Compatibility," DIR 80023964.

Clean the accessories

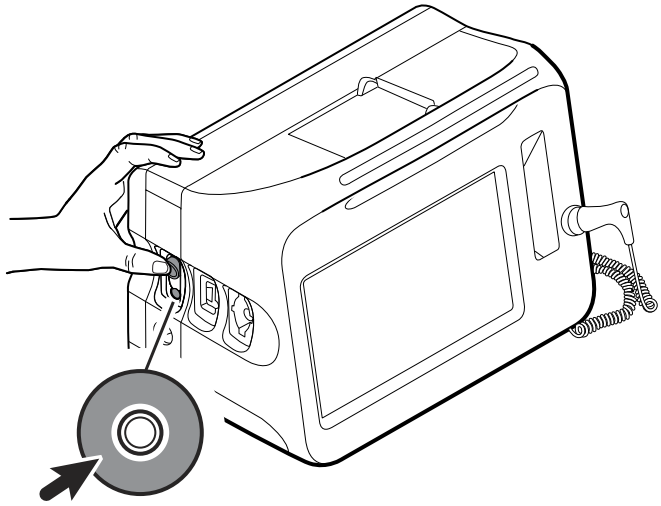
1. Wipe the NIBP hose and any reusable cuffs with a damp cloth moistened in a mild detergent solution.
2. Wipe the temperature probe with a cloth dampened with alcohol, warm water, or an appropriately diluted, nonstaining disinfectant solution.
3. Clean the pulse oximetry sensors with a cloth dampened with 70 percent isopropyl alcohol or 10 percent chlorine bleach solution.
4. Clean the RRa cable and the SpO2/RRa dual cable with a cloth dampened with 70 percent isopropyl alcohol.
5. Clean the EarlySense sensor by gently wiping with a soft, slightly damp cloth or wipes containing antiseptic substances (alcohols, Chlorohexidine, and bleach material up to 5% concentration). Ensure that the sensor is dry before re-use. Avoid excessive liquids.
6. To clean the ECG module, follow the instructions provided in the ECG module instructions for use.
7. (Connex IWS only) To clean Welch Allyn 3.5V instrument heads attached to the physical assessment handles, follow the instructions provided in their instructions for use.

CAUTION Never immerse any monitor accessories.

Clean the CO2 input connector

If a new sampling line is securely connected to the device, but the pump does not activate, clean the CO2 input connector on the device as part of your troubleshooting.

1. Remove the sampling line from the device.
2. Using compressed air supplied in a can with a nozzle, clean the threads on the inside surface of the CO2 input connector (the gray area in the figure below). Do not clean the inner ring and interior of the inner ring.



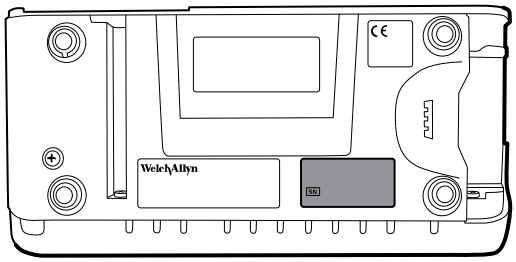
Identifying the monitor and subsystems

This explanation of the monitor labeling is provided to assist you in identifying these particular parts by serial number. The part numbers appearing on the labels are internal part numbers and will not be found in the list of field replaceable units (FRUs) included in this manual.

Future revisions of a part may not always be backward compatible with a legacy part. To determine the correct replacement part for your unit always provide the serial number and model when ordering.

Monitor serial number and model label

The model number and serial number can be found on the label on the bottom of the monitor and to the right.



Serial number and format code	
Serial number	MMMMXXXXWWYY
MMMM	Manufacturing plant
XXXX	Sequential number
WW	Week of manufacture
YY	Year of manufacture

Model number format and code

Model configurations

NOTE For more configuration options, including approved accessories, see the accessories list in the *Instructions for use* or visit the Hillrom Parts Store.

NOTE If options have been added to the device, the actual configuration will not match the model description.

NOTE A monitor with an **R** (RRa) is always configured with **M** for Pulse Oximetry.

NOTE RRa is a licensed feature sold in new configurations or as an upgrade. Upgrades include new UI (User Interface) license and addition of the CM (Continuous Monitoring) profile.

NOTE Model 6300 has been discontinued.

The device is available in multiple configurations. Use the following table to determine available 6400, 6500, 6700, and 6800 model configurations:

Model	Parameter				
	One item from each column, based on Model Number **Examples**: 64MTPE-B (North America); 67NSTP-4 (United Kingdom)				
64 = 6400 Standard **65** = 6500 Wireless	**N** = Nellcor **M** = Masimo **H** = Hemoglobin / Masimo **X** = None	**T** = SureTemp **X** = None	**P** = Printer **X** = None	**E** = Braun **X** = None	**A** = Denmark **B** = North America **C** = China **G** = Argentina **K** = South Korea **N** = India / UAE **P** = Thailand **T** = Taiwan **Y** = Italy **Z** = Brazil **2** = Europe **3** = Israel **4** = United Kingdom **5** = Switzerland **6** = Australia / New Zealand **66** = Australia / New Zealand (orange) **7** = South Africa **B2** = Canada
67 = 6700 Standard **68** = 6800 Wireless	**N** = Nellcor **M** = Masimo **H** = Hemoglobin / Masimo	**C** = CO2 **R** = RRa **X** = None **S** = ES **F** = ES Safety	**T** = SureTemp **E** = Braun **X** = None **D** = Both	**P** = Printer **X** = None	

Model	Parameter
	2R = Russia **2T** = Turkey **4S** = Singapore

Monitor circuit board and internal options label

Circuit board and internal option labels	
PCBA identifier	**XXXXXX BOM Y DWG Z**
XXXXXX	Welch Allyn material number
Y	Bill of material (BOM) revision
Z	Assembly drawing version from current version of drawing

Circuit board and internal option labels	
Serial number	**XXXXWWYYID**
XXXX	Sequential number
WW	Week of manufacture
YY	Year of manufacture
ID	Unique vendor identifier

NIBP, EarlySense, and SpO2 module labels

Circuit board and internal option labels	
Module identifier	**XXXXXX**
XXXXXX	Welch Allyn material number
Module serial number	**XXXXWWYYID**
XXXX	Sequential number
WW	Week of manufacture
YY	Year of manufacture
ID	Unique vendor identifier

Factory defaults

General alarm

Settings		Default value
General		
	Display alarm limits	Enabled
	Alarm audio on	Enabled
	Alarm audio off	Disabled
	Volume	Medium
	Patient rest mode on	Off
Advanced		
	General	
	Allow user to disable alarms	Enabled
	Nurse call threshold	Medium
	Audio	
	Allow user to turn off general audio	Enabled
	Minimum alarm volume	Low
	Audio pause time	2 minutes
	Allow user to enable patient rest mode	Enabled
	Allow host to enable patient rest mode	Enabled
	Delays	
	SpO2 alarm condition delay	10 seconds
	SpO2 pulse rate alarm condition delay	3 seconds
	Motion pulse rate alarm condition delay	3 seconds
	Motion respiration alarm condition delay	180 seconds
	Motion low confidence RR/PR alarm condition delay	3 minutes
	etCO2 alarm condition delay	15 seconds
	Respiration alarm condition delay	10 seconds

Settings		Default value
	No breath detected alarm delay	Adult: 30 seconds Pediatric: 20 seconds Neonate: 15 seconds
	SpHb alarm condition delay	10 seconds

Settings		Default value
General		
	Display alarm limits	Enabled
	Alarm audio on	Enabled
	Alarm audio off	Disabled
	Volume	Medium
	Patient rest mode on	Off
Advanced		
General		
	Allow user to disable alarms	Enabled
	Nurse call threshold	Medium
Audio		
	Allow user to turn off general audio	Enabled
	Minimum alarm volume	Low
	Audio pause time	2 minutes
	Allow user to enable patient rest mode	Enabled
	Allow host to enable patient rest mode	Enabled
Delays		
	SpO2 alarm condition delay	10 seconds
	SpO2 pulse rate alarm condition delay	3 seconds
	Respiration alarm condition delay	10 seconds
	No breath detected alarm delay	Adult: 30 seconds Pediatric: 20 seconds

Settings	Default value
	Neonate: 15 seconds
SpHb alarm condition delay	10 seconds

NIBP

Settings	Default value
Alarms	
Systolic and diastolic alarm limits on/off control	On
Systolic: Upper limit	Adult: 220 mmHg (29.3 kPa) Pediatric: 145 mmHg (19.3 kPa) Neonate: 100 mmHg (13.3 kPa)
Systolic: Lower limit	Adult: 75 mmHg (10.0 kPa) Pediatric: 75 mmHg (10.0 kPa) Neonate: 50 mmHg (6.7 kPa)
Diastolic: Upper limit	Adult: 110 mmHg (14.7 kPa) Pediatric: 100 mmHg (13.3 kPa) Neonate: 70 mmHg (9.3 kPa)
Diastolic: Lower limit	Adult: 35 mmHg (4.7 kPa) Pediatric: 35 mmHg (4.7 kPa) Neonate: 30 mmHg (4.0 kPa)
MAP alarm limits on/off control	Off
MAP: Upper limit	Adult: 120 mmHg (16 kPa) Pediatric: 110 mmHg (14.7 kPa) Neonate: 80 mmHg (10.7 kPa)
MAP: Lower limit	Adult: 50 mmHg (6. 7 kPa) Pediatric: 50 mmHg (6.7 kPa) Neonate: 35 mmHg (4.7 kPa)
Intervals	
Interval	Automatic

Settings	Default value
Minutes	15 minutes
Automatic print on interval	Disabled
Advanced	
Display MAP	Enabled
SYS/DIA as primary	Enabled
MAP as primary	Disabled
Tube type	2 tubes
Unit of measure	mmHg
Algorithm default	SureBP
Cuff inflation target (step algorithm)	
Adult	160 mmHg (21.3 kPa)
Pediatric	140 mmHg (18.7 kPa)
Neonate	90 mmHg (12.0 kPa)
Allow interval program changes	Enabled
Programs (NIBP Averaging)	Programs 1 to 6 (default settings are empty)

SpO2

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit	Adult: 100% Pediatric: 100% Neonate: 100%
Lower limit	Adult: 90% Pediatric: 90% Neonate: 90%
SatSeconds™ (Nellcor only)	0

Settings	Default value
Advanced	
Default view	% SpO2
Default response	Normal
Sweep speed default	25 mm/s
Allow low perfusion alarm	Enabled

SpHb

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit	17.0 g/dL (11.0 mmol/L)
Lower limit	7.0 g/dL (4.0 mmol/L)
Setup	
Trend period	1 hr
Advanced	
Default view	Numeric
Reference	Venous
Unit of measure	g/dL
Default averaging	Medium

Temperature

Settings	Default value
Alarms	
Alarm limits on/off control	Off
Upper limit	101 °F (38.3 °C)
Lower limit	94 °F (34.4 °C)

Settings	Default value
Advanced	
Unit of measure	°F (Fahrenheit)
Display temperature conversion	Enabled
Default SureTemp Plus site	Oral
Braun 6000	
Anti-theft return time out	Disabled
Mode	Technique compensation
Enable pulse timer	Enabled
Enable Celsius only selection	Disabled

Pulse rate

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit	Adult: 120 bpm Pediatric: 150 bpm Neonate: 200 bpm
Lower limit	Adult: 50 bpm Pediatric: 50 bpm Neonate: 100 bpm
Setup	
Tone volume	Off
Advanced	
Display source	Enabled

EarlySense

Settings	Default value
Patient Motion General	
Patient not admitted delay	15 minutes
Patient not measured delay	12 hours
Low motion alert time	23400 seconds
EarlySense sensor selection	Bed
Patient turn interval	Off
Patient Motion Alarms	
Exit sensitivity enabled	On
Exit sensitivity	3
Motion alarm enabled	On

etCO2

Settings	Default value
Alarms	
etCO2 alarm limits on/off control	On
etCO2: Upper limit	Adult: 60 mmHg (8.0 kPa) Pediatric: 60 mmHg (8.0 kPa) Neonate: 50 mmHg (6.7 kPa)
etCO2: Lower limit	Adult: 15 mmHg (2.0 kPa) Pediatric: 15 mmHg (2.0 kPa) Neonate: 20 mmHg (2.7 kPa)
FiCO2 alarm limits on/off control	On
FiCO2: Upper limit	Adult: 8 mmHg (1.1 kPa) Pediatric: 8 mmHg (1.1 kPa) Neonate: 5 mmHg (0.7 kPa)
High alarm delay	15 seconds
Setup	

Settings	Default value
Pump standby time	15 minutes
Advanced	
etCO2 view default	Numeric
Display FiCO2	Enabled
Waveform scale default	50 mmHg
Unit of measure	mmHg
Enable sampling line dialog	Enabled
Sweep speed default	6.25 mm/s
BTPS compensation	Enabled

RR

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit (etCO2)	Adult: 30 breaths per minute Pediatric: 40 breaths per minute Neonate: 65 breaths per minute
Upper limit (ECG)	Adult: 30 breaths per minute Pediatric: 40 breaths per minute
Lower limit (etCO2)	Adult: 5 breaths per minute Pediatric: 10 breaths per minute Neonate: 25 breaths per minute
Lower limit (ECG)	Adult: 5 breaths per minute Pediatric: 10 breaths per minute
High alarm delay for CO2	10 seconds
Patient motion respiration alarm delay	180 seconds
No breath alarm	Adult: 30 seconds Pediatric: 20 seconds Neo: 15 seconds

RR

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit (ECG)	Adult: 30 breaths per minute Pediatric: 40 breaths per minute
Lower limit (ECG)	Adult: 5 breaths per minute Pediatric: 10 breaths per minute
No breath alarm	Adult: 30 seconds Pediatric: 20 seconds Neo: 15 seconds

IPI

Settings	Default value
Alarms	
Alarm limits on/off control	On
Lower limit	Adult: 4 Pediatric: 4 Neonate: Not applicable
Advanced	
Display IPI	On
IPI view default	Numeric
Trend period default	30 minutes

RRa

Settings	Default value
Alarms	
Alarm limits on/off control	On

Settings	Default value
Upper limit	30 breaths per minute
Lower limit	6 breaths per minute
Alarm delay	10 seconds
No breath alarm	30 seconds
Advanced	
RRa averaging default	Slow
Freshness timeout	5 minutes

ECG

Settings	Default value
Alarms	
Alarm limits on/off control	On
Upper limit	120
Lower limit	50
Setup	
ECG gain	10mm/mV
Sweep speed	25 mm/s
Filter	Enabled
Pacemaker detection	Disabled
Use ECG as an RR source when available	Disabled
Advanced	
Enable cardiac high priority tone	Enabled
Cable selection	3 lead
Electrode configuration	AHA
Allow impedance respiration	Enabled
V-Tach, V-Fib, Asystole detection enable	Enabled
Automatic print on ECG alarm	Enabled

Settings	Default value
Default lead	II
V-Tach threshold	120

Custom scores

Settings	Default value
Advanced	
Default score summary view	Condensed
Incomplete score save options	Allow

Patient manual parameters

NOTE Defaults appear in software versions lower than 2.30.00 when you open the keypad or use the up/down arrow keys for entry. In software versions 2.30.00 and higher, the manual parameter fields are blank (no defaults set).

Settings	Default value
Height	70 in (177.8 cm)
Weight	150 lb (68.0 kg)
Pain	0
Respiration	12
Temperature	98.6 °F (37 °C)
Advanced[1]	
Display height	Enabled
Display weight	Enabled
Display pain	Enabled
Display respiration	Enabled
Display temperature[2]	Disabled
Display BMI	Disabled
Height units	in

Settings	Default value
Weight units	lb
Enable manual override NIBP Default value	Enabled
Enable manual override Pulse rate	Enabled
Enable manual override Temperature Default	Enabled
Enable manual override RR Default	Enabled
Enable manual override SpO2 Default	Enabled

[1] You can enable only four manual parameters.

[2] If a temperature module is available, manual temperature selection is not available.

Patient manual parameters

NOTE In software versions 2.30.00 and higher, the manual parameter fields are blank (no defaults set).

Settings	Default value
Height	
Weight	
Pain	
Respiration	
Temperature	
Advanced[1]	
Display height	Enabled
Display weight	Enabled
Display pain	Enabled
Display respiration	Enabled
Display temperature[2]	Disabled
Display BMI	Disabled
Height units	in
Weight units	lb

Settings	Default value
Enable manual override NIBP Default value	Enabled
Enable manual override Pulse rate	Enabled
Enable manual override Temperature Default	Enabled
Enable manual override RR Default	Enabled
Enable manual override SpO2 Default	Enabled

[1] You can enable only four manual parameters.

[2] If a temperature module is available, manual temperature selection is not available.

Device

Settings	Default value
Temporarily pause patient monitoring[1]	10 minutes
Display brightness	6
Allow display lock timeout	Enabled
Profiles	Spot Check
Advanced	
Language	English
Date/time	
Date format	mm/dd/yyyy
Time zone	UTC
Automatically adjust clock for daylight saving time, reported by host	Disabled
Allow users to change date and time	Enabled
Display date and time	Enabled
Display	
Display lock	Never
Display power saver	2 minutes
Device power down	20 minutes
Device	

Settings	Default value
Enable save as default	Enabled
Standby Mode timeout	10 minutes
Allow profile change	Enabled
Power line frequency	60 Hz
Demo	
Type	Normal values

[1]Continuous mode only

Data management

Settings	Default value
Advanced	
Patient	
Default patient type	Adult
Name format	Full name
Primary label	Name
Secondary label	Patient ID
Printout label	Name and patient ID
Require patient ID to save readings	Disabled
Search by patient ID	Disabled
Clear patient information on manual save	Enabled
Retrieve list	Disabled
Clinician	
Label	Clinician ID
Require clinician ID to save readings	Disabled
Search by clinician ID	Disabled
Require password	Disabled
Clear clinician information on manual save	Disabled

Settings	Default value
Clinical data	
Automatically send on manual save	Disabled
Delete readings after successful send	Disabled
Emulate Spot Vital Signs LXi	Enabled
Connect to Connex CS	Enabled

Network

NOTE Unless otherwise noted, the numbers in parentheses presented in the Options column indicate the maximum number of alphanumeric characters you can enter in the field for that setting.

Radio (Newmar)

Settings	Comments	Options / Data type / Length	Default value
Radio	n/a	Enabled, Disabled	Enabled
Radio alarms	n/a	Enabled, Disabled	Disabled
Radio ESSID selection	n/a	(32)	com.welchallyn
Radio band	n/a	a, a/n, a/b/g, a/b/g/n, b/g/n	a/b/g/n
Dynamic frequency selection	n/a	Enabled, Disabled	Enabled
Authentication/ Encryption	n/a	Open, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WEP 64, WEP 128	WPA2-Personal
Pre-shared key method type	Only available when WPA-Personal or WPA2-Personal is selected.	Network Key, Passphrase	Network Key
Method	Only available when WPA-Personal or WPA2-Personal is selected. If Pre-Shared Key Method Type is Passphrase, UI must only allow 8-63 ASCII characters.	(64)	1234567890ABCDEF 1234567890ABCDEF 1234567890ABCDEF 1234567890ABCDEF

Radio (Newmar)

Settings	Comments	Options / Data type / Length	Default value
	If Pre-Shared Key Method Type is Network Key, UI must require exactly 64 hexadecimal characters.		
EAP type	Only available when WPA-Enterprise or WPA2-Enterprise is selected.	TLS, TTLS, PEAP-MSCHAPv2, PEAP-GTC, PEAP-TLS, EAP-FAST	PEAP-MSCHAPv2
EAP identity	Only available when WPA-Enterprise or WPA2-Enterprise is selected.	(32)	vitalsigns
EAP password	Only available when WPA-Enterprise or WPA2-Enterprise is selected and EAP type is NOT TLS or PEAP-TLS.	Up to 32 printable ASCII characters, U +0020 to U+007E	password
Roam type	Only available when WPA-Enterprise or WPA2-Enterprise is selected.	PMK Caching, OKC, CCKM	OKC
Server validation	Only available when WPA-Enterprise or WPA2-Enterprise is selected and EAP type is NOT EAP-FAST.	Enabled, Disabled	Disabled
Allow anonymous identity	Only available when WPA-Enterprise or WPA2-Enterprise is selected and EAP type is NOT TLS or TTLS.	Enabled, Disabled	Disabled
PAC provisioning field	Only available when WPA-Enterprise or WPA2-Enterprise is selected and EAP type is EAP-FAST.	Auto, Manual	Auto
Inner EAP setting	Only available when WPA-Enterprise or WPA2-Enterprise is selected and EAP type is EAP-FAST.	Auto, PAP	Auto
WEP 64 Key number	Only available when WEP 64 is selected. 0-3 range within object presented as 1-4 on UI.	1, 2, 3, 4	1
WEP 64 Key 1	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 64 Key 2	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 64 Key 3	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789

Radio (Newmar)

Settings	Comments	Options / Data type / Length	Default value
WEP 64 Key 4	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 128 Key number	Only available when WEP 128 is selected. 0-3 range within object presented as 1-4 on UI.	1, 2, 3, 4	1
WEP 128 Key 1	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 2	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 3	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 4	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
FIPS mode	Only available when (WPA2-Personal) or (WPA2-Enterprise and TLS EAP type and Roam Type != CCKM) is selected.	Enabled, Disabled	Enabled

Radio (Lamarr)

Settings	Comments	Options / Data type / Length	Default value
Radio	n/a	Enabled, Disabled	Enabled
Radio alarms	n/a	Enabled, Disabled	Disabled
Radio ESSID selection	This setting can be controlled through the UI only when the value is part of the list and will take effect on a reboot.	(32)	com.welchallyn
Radio band	n/a	a, b/g	b/g

Radio (Lamarr)

Settings	Comments	Options / Data type / Length	Default value
Authentication/ Encryption	n/a	Open, WPA2-PSK, WPA2-AES, WEP 64, WEP 128	WPA2-PSK
Pre-shared key method type	Only available when WPA2-PSK is selected.	Network Key, Passphrase	Network Key
Method	Only available when WPA2-PSK is selected. If Pre-Shared Key Method Type is Passphrase, UI must only allow 8-63 ASCII characters. If Pre-Shared Key Method Type is Network Key, UI must require exactly 64 hexadecimal characters.	(64)	1234567890ABCDEF 1234567890ABCDEF 1234567890ABCDEF 1234567890ABCDEF
Security protocol	Only available when WPA2-PSK or WPA2-AES is selected.	CCMP, CCMP, and TKIP	CCMP
EAP type	Only available when WPA2-AES is selected.	TLS, TTLS, PEAP, Auto (TLS, TTLS, or PEAP)	TLS
EAP identity	Only available when WPA2-AES is selected.	(32)	vitalsigns
EAP password	Only available when WPA2-AES is selected.	Up to 32 printable ASCII characters, U +0020 to U+007E	password
WEP 64 Key number	Only available when WEP 64 is selected. 0-3 range within object presented as 1-4 on UI.	1, 2, 3, 4	1
WEP 64 Key 1	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 64 Key 2	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 64 Key 3	Only available when WEP 64 is selected. WEP 64 requires 10 hexadecimal chars (0-9, A-F).	(10)	0123456789
WEP 64 Key 4	Only available when WEP 64 is selected.	(10)	0123456789

Radio (Lamarr)

Settings	Comments	Options / Data type / Length	Default value
	WEP 64 requires 10 hexadecimal chars (0-9, A-F).		
WEP 128 Key number	Only available when WEP 128 is selected. 0-3 range within object presented as 1-4 on UI.	1, 2, 3, 4	1
WEP 128 Key 1	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 2	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 3	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789
WEP 128 Key 4	Only available when WEP 128 is selected. WEP 128 requires 26 hexadecimal chars (0-9, A-F).	(26)	0123456789ABCDEF 0123456789

Server

Settings	Comments	Options / Data type / Length	Default value
Server determination type	n/a	Manual Entry, NRS IP, DNS, DHCP43	Lamarr: Manual Entry Newmar: DNS
Network Rendezvous Server IP	Only used if Server Determination Type is NRS IP.	IP Address Array of 4 numbers, each byte's range is 0-255	0.0.0.0
Network Rendezvous Server port	Only used if Server Determination Type is Broadcast, NRS IP, DNS, or DHCP43.	Integer (0-65535)	7711

Server			
Settings	**Comments**	**Options / Data type / Length**	**Default value**
DNS hostname	Only used if Server Determination Type is DNS. Only enabled on the UI if radio version supports DNS.	(128)	WANRS
DHCP option 60 vendor string	Only used if Server Determination Type is DHCP43. Only enabled on the UI if radio version supports DHCP option 43. Currently visible but not configurable from the UI; only the default value is used.	(128)	welchallyn-nrs
Call home enable	Has no effect if call home is disabled by upgrade. Does not affect ability to manually initiate a call home session.	Enabled, Disabled	Enabled
Data encryption enable	n/a	Enabled, Disabled	Disabled
Server authentication enable	n/a	Enabled, Disabled	Disabled
Episodic WACP server address	Used when server determination type is Manual entry	(128)	hostname
Episodic WACP server port	Used when server determination type is Manual entry	Integer (0-65535)	281
Continuous WACP server address	Used when server determination type is Manual entry	(128)	hostname
Continuous WACP server port	Used when server determination type is Manual entry	Integer (0-65535)	291
Service WACP server address	Used when server determination type is Manual entry	(128)	hostname
Service WACP server port	Used when server determination type is Manual entry	Integer (0-65535)	283

Service

Settings	Default value
Advanced	
General	
PartnerConnect enable auto sync	Enabled
Enable external USB ports	Enabled

Password

Settings	Default value
Advanced	
Change password	6345
Enable failed attempt lockout	Disabled
Enable password expiration	Disabled
Password expiration	730 days

Disassembly and repair reference

Screws

Quantity	Location	Type	Size/length	Torque	Bit type
2	Comms connection cover	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
1	Module cover	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
2	Braun housing or end cap	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
4	Module retaining plate	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
10	Handle module assembly housing	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
3	767 controller PCBA	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
2	Top housing extension	8mm hex standoff	M4x0.7	12 in-lb ± 1.0 in-lb	8mm socket
6	Main housing	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
4	Power supply	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
4	Comms PCBA	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
4	Radio board (Lamarr)	Pan head machine	M3x0.5x8	6.0 in-lb ± 0.5 in-lb	#1 Phillips
3	Radio board (Newmar)	Pan head machine	M2x6	2.5 in-lb ± 0.25 in-lb	Small Phillips
2	Light bar cover	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
2	Power panel	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
2	Battery board	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
1	P-clamp, Ethernet cable	Pan head machine	M3x0.5x8	6.0 in-lb ± 0.5 in-lb	#1 Phillips
7	Main board	Pan head machine	M3x0.5x8	6.0 in-lb ± 0.5 in-lb	#1 Phillips
4	LCD frame	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
2	Module well	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
2	P-clamp, USB cable bundle	Pan head machine	M4x10	7.5 in-lb ± 0.5 in-lb	#2 Phillips
4	Module tracks	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10
2	Blue insert	Plastite	#4-20 x 0.500	7.5 in-lb ± 0.5 in-lb	Torx T10

Quantity	Location	Type	Size/length	Torque	Bit type
2	USB client cable	Plastite	#4-20 x 0.500	7.5 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.
- **USB**: USB connectors provide communications and power connectivity between the main board and any sub-systems and external devices. USB connectors use friction to maintain the connection, but rarely require much force to connect or disconnect. The USB cable can safely be removed from the mounted connector by simply pulling it out of the connector. Two types of USB connectors are used: USB A-type and USB mini-B.

  To remove a USB connector, grasp the connector and pull.

  To connect a USB connector, grasp the connector and insert.
- **ZIF (zero insertion force)**: The device uses flex cables and ZIF flex cable connectors. Flex cables and ZIF connectors require special care when handling.

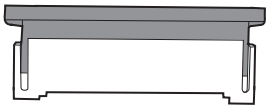
  ZIF connectors use a sliding outer piece that latches and unlatches to secure and release the flex cable. ZIF cables cannot be successfully connected or disconnected without properly unlatching and latching the sliding outer piece.

  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.

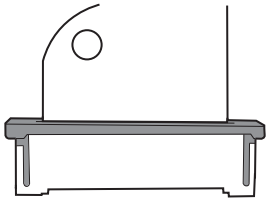
  1. Using a suitable tool (for example, a paper clip, small flat-head screwdriver, or needle-nose pliers), slide the latching piece of the connector away from the connector body.



2. Remove the cable.

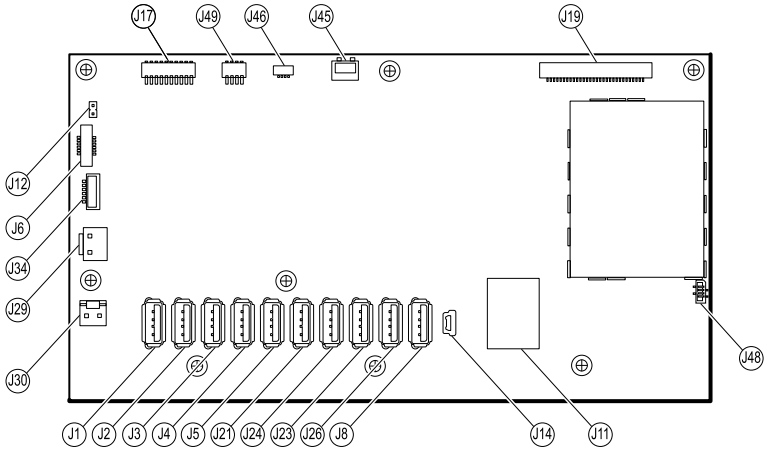
To connect a ZIF connector

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.



Connectors

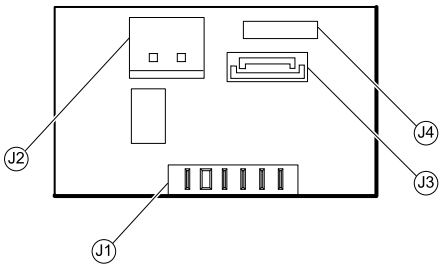
Main board connectors



Connector	Wiring harness	Connects with	Connector
J1	USB	MCE to modules—Braun if required	USB
J2	USB	MCE to modules	USB
J3	USB	MCE to modules	USB
J4	USB	MCE to modules	USB
J5	USB	MCE to modules	USB

Connector	Wiring harness	Connects with	Connector
J6	Power button	Power button and LED status	ZIF
J8	USB	MCE to handle module PCBA	USB
J11	Ethernet	Communications board	Locking
J12	Main harness	Speaker	Pressure
J14	Client USB	Communications board J8	Mini USB
J17	Not used	Not used	Pressure
J19	LCD	LCD board	Pressure
J21	USB	MCE to SpO2	USB
J23	USB	Communications board J4	USB
J24	USB	MCE to NIBP	USB
J26	USB	Reserved for future use	USB
J29	Battery power	Battery connector board J2	Locking
J30	Main harness	Power supply board J2	Pressure
J34	Battery	Battery connector board J3	Locking
J45	Main harness	Fan connector on the power-supply cover	Locking
J46	Light bar	Light bar board J1	Pressure
J48	LCD flex cable	LCD	Pressure
J49	Main harness	Communications board power	Pressure

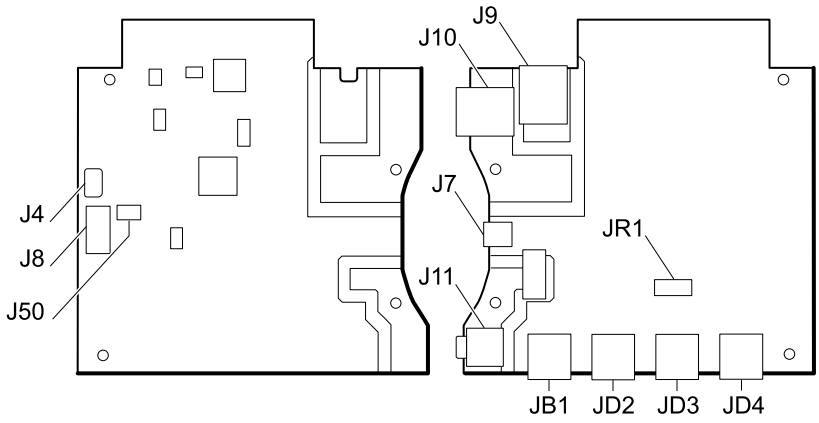
Battery connector board connectors



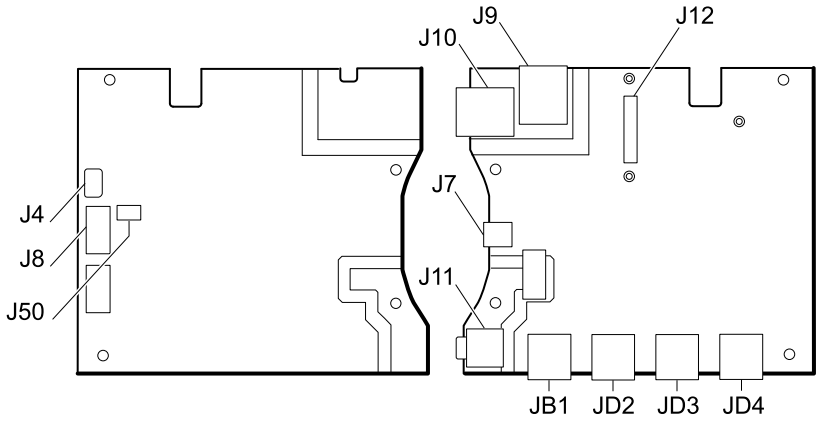
Connector	Wiring harness	Connects with	Connector
J1	N/A	Battery	Pressure
J2	Battery power	Main board J29	Locking
J3	Battery	Main board J34	Locking
J4	N/A	Internal use only	N/A

Communications board connectors

Lamarr



Newmar

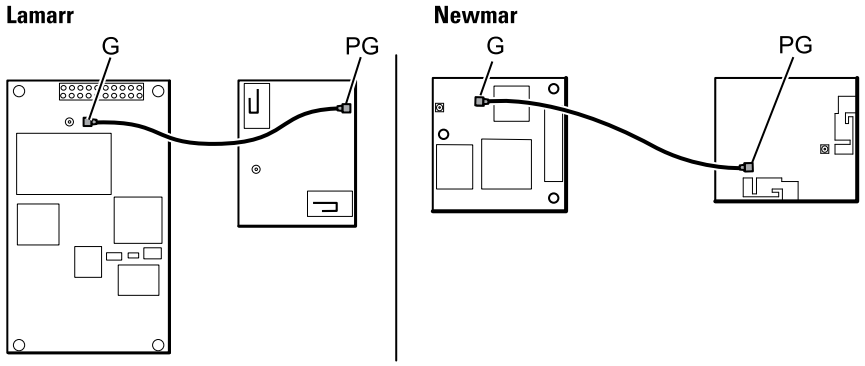


Connector	Wiring harness	Connects with	Connector
J4	USB	Main board J23	Mini USB
J7	USB	External (client)	Mini USB
J8	USB	Main board J14	USB
J9	Ethernet	Main board J11	Locking (RJ45)
J10	Ethernet	External	Locking (RJ45)
J11 *	Nurse call	External	Mini stereo
J12	N/A	Radio (Newmar)	Pressure

Connector	Wiring harness	Connects with	Connector
J50	Main	Main board J49	Pressure
JB1	USB	External	USB
JD2 *	USB	External	USB
JD3 *	USB	External	USB
JD4 *	USB	External	USB
JR1 *	N/A	Radio (Lamarr)	Pressure

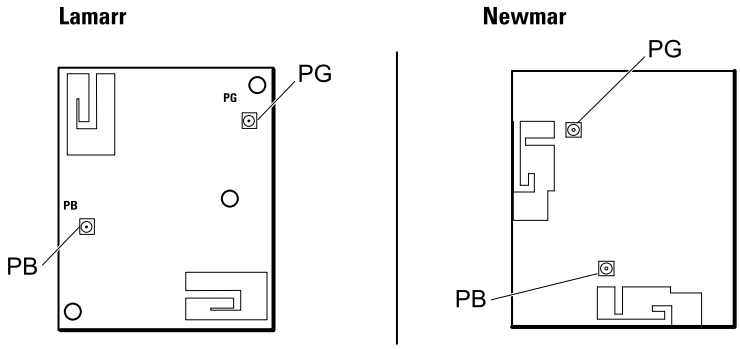
* Not available on the Basic communications board.

Radio board connectors



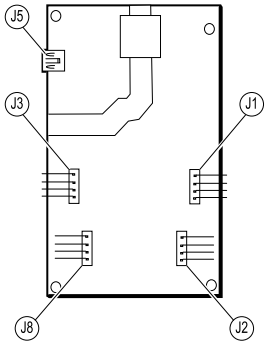
Connector	Wiring harness	Connects with	Connector
B	Not used	Not used	Pressure
G	Antenna cable	Antenna board PG	Pressure
A (not labeled)	N/A	Standard communications board JR1 (Lamarr) Standard communications board J12 (Newmar)	Pressure

Antenna board connectors



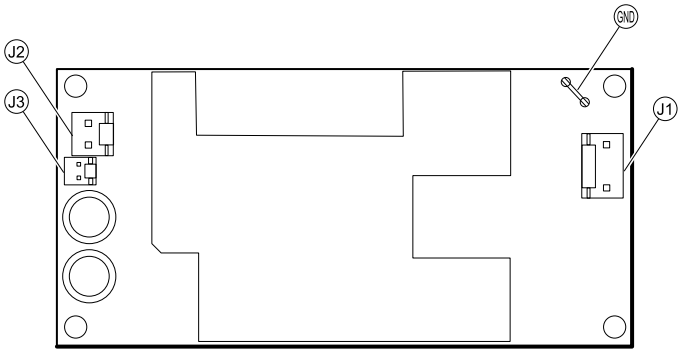
Connector	Wiring harness	Connects with	Connector
PG	Antenna cable	Radio board G	Pressure
PB	Not used	Not used	Pressure

767 controller board connectors



Connector	Wiring harness	Connects with	Connector
J1	Optical assembly	Handle cradle	Pressure
J2	Handle assembly	Handle	Pressure
J3	Optical assembly	Handle cradle	Pressure
J5	USB	Main board J8	USB (mini)
J8	Handle assembly	Handle	Pressure

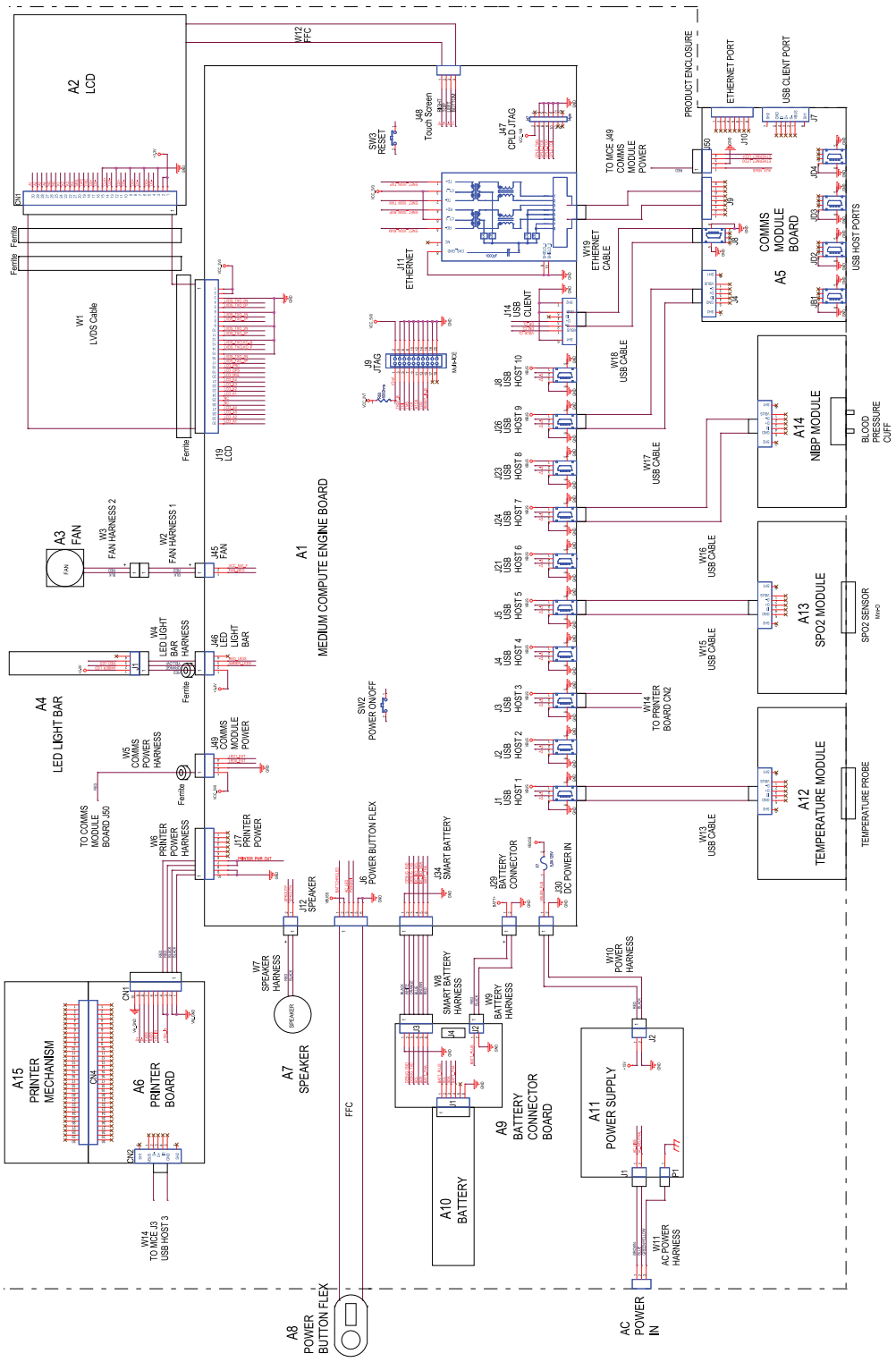
Power supply board connectors



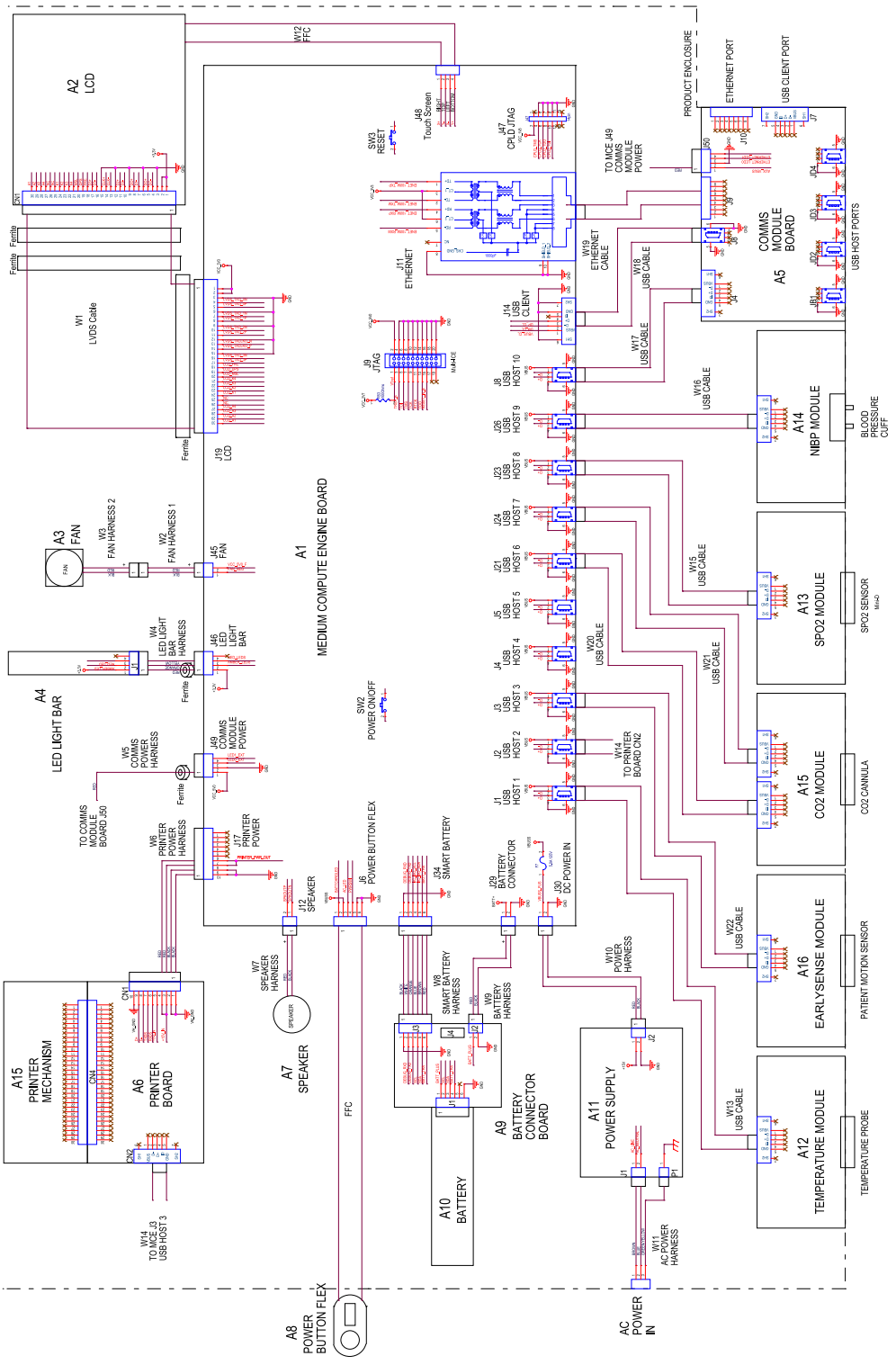
Connector	Wiring harness	Connects with	Connector
J1	AC to power supply	IEC connector (blue: neutral, brown: line in)	Pressure
J2	Main harness	Main board J30	Pressure
J3	N/A	Internal use only	N/A
GND	AC to power supply	IEC connector (green: ground) via ground stud	Pressure

Interconnect diagram

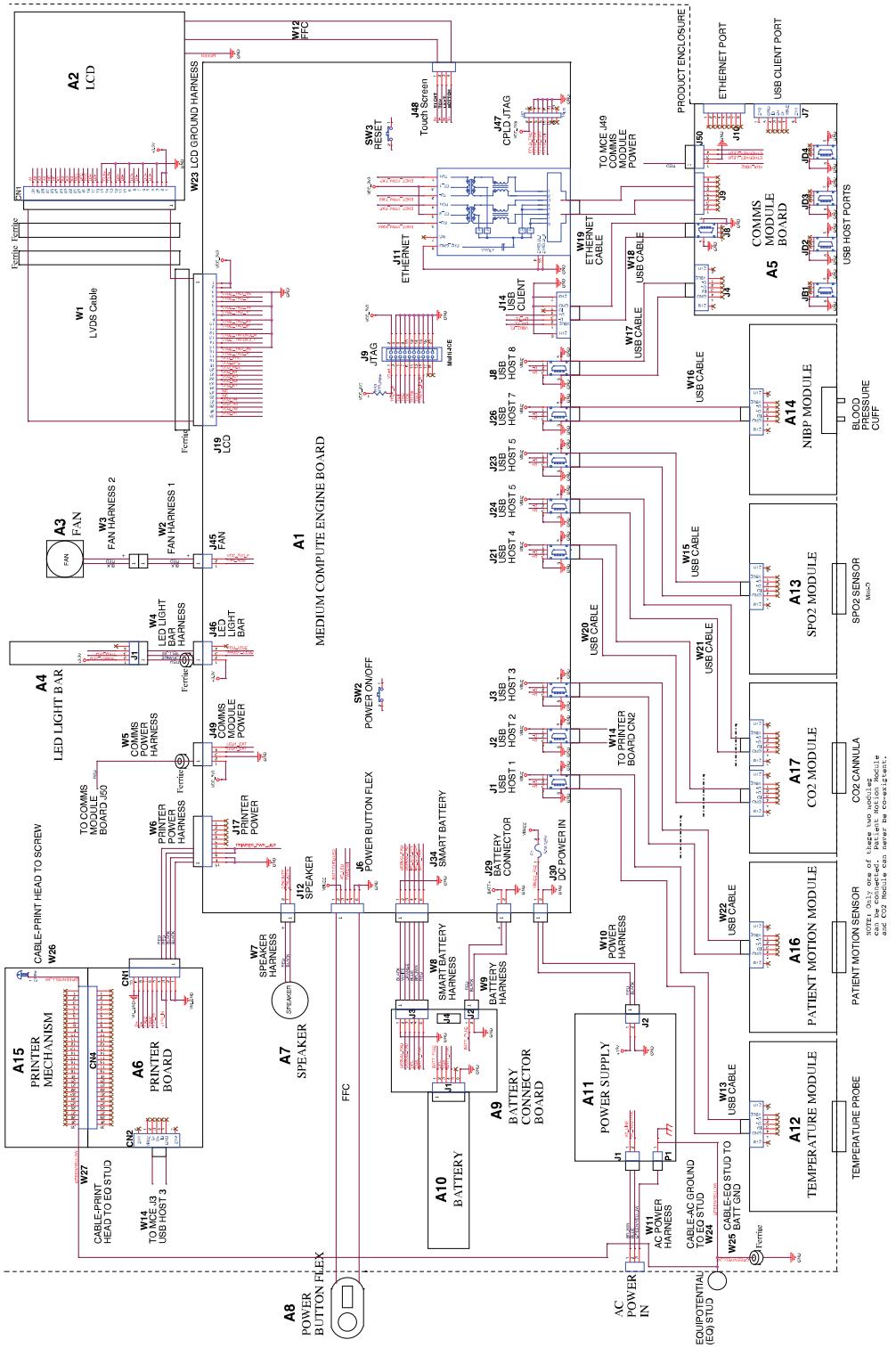
This diagram applies to devices with the 6-hole USB cable separator.



This diagram applies to devices with the 11-hole USB cable separator.



This diagram applies to IEC 60601 3rd edition-compliant devices with the 9-hole USB cable separator.



Service and maintenance toolset

Connex devices

The following is the listing of tools and test equipment required to perform basic functional verification checks, full functional verification checks and calibration, and service and maintenance on the Welch Allyn Connex devcices (CVSM and CIWS).

NOTE Tools and test equipment must also be readily available to complete Welch Allyn Technical Service Training for this device.

			Usage	
Material no.	**Description**	**Qty**	**Full**	**Basic**
General test equipment				
106270	Service test box	1	X	
N/A	Wireless router, a/b/g or equivalent	1	X	
N/A	Ethernet cable	1	X	
660-0138-00	Cable, patch 5 feet RJ45, T568B	1	X	
407022	Assy, MMF Nurse call cable - service	1	X	
4500-925	USB 2.0/5-pin Mini-B cable, gold, 6 ft.	1	X	X
N/A	PC running Windows 10	1	X	X
web download	Welch Allyn Service Tool (version 1.8 or later)	1	X	X
103396	Welch Allyn Service Tool, Gold license	1	X	
NIBP testing				
407672	BP test volume repair fixture 113670	1	X	X
N/A	Pressure meter (must include at least one decimal point and be accurate to within ±0.5 mmHg)	1	X	X
N/A	Blood pressure Y-tube	1	X	X
6000-30	Single tube blood pressure hose, 5 ft.	1	X	X
4500-30	Blood pressure hose, 5 ft.	1	X	
620216	Fitting "Y" 1/8 X 1/8 X 1/8	1	X	X
Nellcor SpO2 configuration testing				
N/A	SpO2 simulator	1	X	X

Material no.	Description	Qty	Usage	
			Full	Basic
DOC-10	Nellcor SpO2 extension cable	1	X	X
Masimo SpO2 configuration testing				
N/A	SpO2 simulator	1	X	X
SureTemp Plus configuration testing				
06138-000	Cal-key, assembly, M690/692	1	X	X
01802-110	Tester, calibration, 9600 Plus	3	X	
Braun ThermoScan PRO 4000 / PRO 6000 configuration testing				
01802-110	Tester, calibration, 9600 Plus	3	X	
Braun ThermoScan PRO 6000 configuration testing				
411690	Braun PRO 6000 calibration fixture	3	X	X
Masimo RRa configuration testing				
105460	Masimo RRa tester	1	X	
CO2 configuration testing				
N/A	CO2 Calibration Kit (T46530RF-2BD)	1	X	X

Notes:

- All items marked "N/A" in the Material no. column are OEM or off-the-shelf tools and equipment not available from Welch Allyn. The remaining items are available through Welch Allyn or a Welch Allyn distributor.
- All items marked in the Full column are required for full functional verification checks and calibration. The Welch Allyn Service Tool software and an active Gold license is also required to perform these checks. The Gold license is obtained upon successful completion of Welch Allyn Technical Service Training.
- All items marked in the Basic column are required for basic functional verification checks. The Welch Allyn Service Tool software Standard unlicensed edition can be used to perform the NIBP checks and software upgrades/updates.

Material no.	Description	Qty	Usage	
			Full	Basic
General test equipment				
106270	Service test box	1	X	
N/A	Wireless router, a/b/g or equivalent	1	X	

Material no.	Description	Qty	Usage	
			Full	Basic
N/A	Ethernet cable	1	X	
660-0138-00	Cable, patch 5 feet RJ45, T568B	1	X	
407022	Assy, MMF Nurse call cable - service	1	X	
4500-925	USB 2.0/5-pin Mini-B cable, gold, 6 ft.	1	X	X
N/A	PC running Windows 10	1	X	X
web download	Welch Allyn Service Tool (version 1.8 or later)	1	X	X
103396	Welch Allyn Service Tool, Gold license	1	X	
NIBP testing				
407672	BP test volume repair fixture 113670	1	X	X
N/A	Pressure meter (must include at least one decimal point and be accurate to within ±0.5 mmHg)	1	X	X
N/A	Blood pressure Y-tube	1	X	X
6000-30	Single tube blood pressure hose, 5 ft.	1	X	X
4500-30	Blood pressure hose, 5 ft.	1	X	
620216	Fitting "Y" 1/8 X 1/8 X 1/8	1	X	X
Nellcor SpO2 configuration testing				
N/A	SpO2 simulator	1	X	X
DOC-10	Nellcor SpO2 extension cable	1	X	X
Masimo SpO2 configuration testing				
N/A	SpO2 simulator	1	X	X
SureTemp Plus configuration testing				
06138-000	Cal-key, assembly, M690/692	1	X	X
01802-110	Tester, calibration, 9600 Plus	3	X	
Braun ThermoScan PRO 4000 / PRO 6000 configuration testing				
01802-110	Tester, calibration, 9600 Plus	3	X	
Braun ThermoScan PRO 6000 configuration testing				
411690	Braun PRO 6000 calibration fixture	3	X	X

Material no.	Description	Qty	Usage	
			Full	Basic

Notes:

- All items marked "N/A" in the Material no. column are OEM or off-the-shelf tools and equipment not available from Welch Allyn. The remaining items are available through Welch Allyn or a Welch Allyn distributor.
- All items marked in the Full column are required for full functional verification checks and calibration. The Welch Allyn Service Tool software and an active Gold license is also required to perform these checks. The Gold license is obtained upon successful completion of Welch Allyn Technical Service Training.
- All items marked in the Basic column are required for basic functional verification checks. The Welch Allyn Service Tool software Standard unlicensed edition can be used to perform the NIBP checks and software upgrades/updates.

Miscellaneous Tools

- #1 Phillips bit
- #2 Phillips bit
- #10 Torx bit
- 8mm socket
- Torque driver calibrated for 2.5 in-lb ±0.25 inch-pound
- Torque driver calibrated for 6.0 in-lb ±1.0 inch-pound
- Torque driver calibrated for 7.5 in-lb ±0.5 inch-pound
- Torque driver calibrated for 12.0 inch-pound ±1.0 inch-pound
- Slotted screwdriver
- Tweezers
- Needle-nose pliers
- Spudger
- Tie-wrap tool
- Tie-wrap cutter
- Soft lens wipes
- Scissors or other cutting device
- Canned air to remove dust and debris
- A coin to open the battery door; select a size that comfortably fits the slot
- Pro Gaff tape

Connex Direct

Introduction

Follow these steps to:

- set up an Active Directory connection for clinician authentication
- set up an NTP connection for date/time synchronization
- install wireless network radio certificates
- set up an HL7® Direct Connection to enable a Welch Allyn device to directly send patient queries and vitals to an EMR

Active Directory and HL7 (Direct EMR Connection) features are used to identify, authenticate, and authorize users/clinicians via clinician query from the device.

These instructions apply to the following device(s):

- Connex® Spot Monitor (CSM), Version 1.32.01 or higher
- Connex® Vital Spot Monitor (CVSM), 2.43.00 or higher
- Connex® Integrated Wall System, 2.43.00 or higher

Related documents

When using this manual, refer to the following:

- *Welch Allyn Network Installation Best Practices 80018745*
- *Welch Allyn Vitals Device HL7 Interface 60080809 IDS*
- *Welch Allyn® Configuration Tool Reference guide 80027311*
- Welch Allyn Service Tool: https://www.hillrom.com/en/services/welch-allyn-service-tool/
- *Welch Allyn Service Tool Installation and configuration guide*: https://www.hillrom.com/en/services/welch-allyn-service-tool/
- Hillrom website: hillrom.com

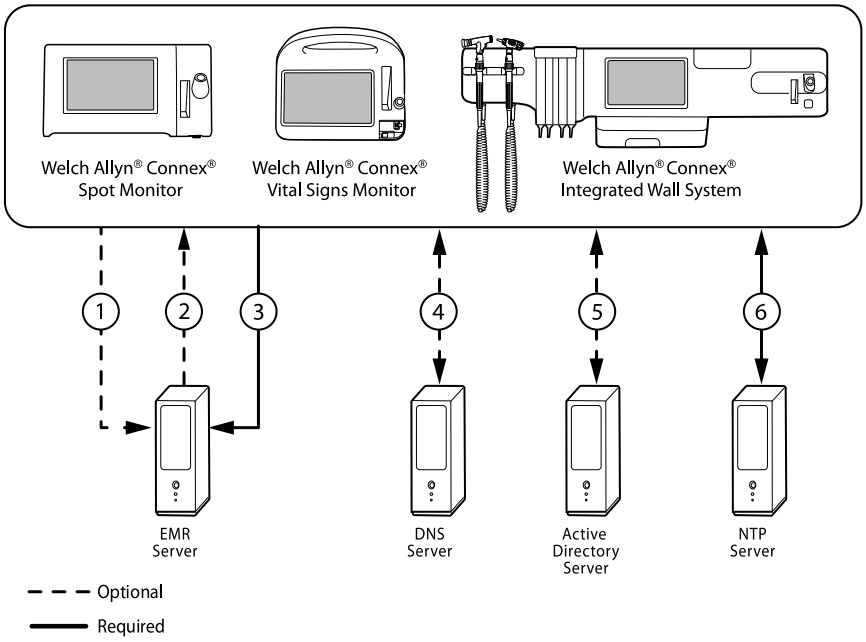
Definitions

Acronym/Term	Description
AD	A directory service developed by Microsoft for providing tree-structured information. Used for authenticating and authorizing users of the device.
Clinician Authentication	Workflow feature where a clinician is required to log in to the device. The device will assure a clinician's credentials are valid by providing an interface where the clinician logs in to the device using their ID and password, and the ID and password are validated by an authority system on the network (e.g. Active Directory).
Clinician Identification	Workflow feature where the clinician enters their ID into the device so the Clinician ID can be logged with the vitals.
Clinician Identifier	Configurable to be the clinician's User name, Account name, or Employee ID.
CSM	Connex Spot Monitor: A Welch Allyn device that supports NIBP; Temperature (SureTemp Plus and Braun); SpO2 (Nellcor; Masimo, and Nonin); Weight, Height, and BMI; Pain; and other configured parameters.
CVSM and CIWS	Connex Vital Signs Monitor and Connex Integrated Wall System: Welch Allyn devices that supports NIBP; Temperature (SureTemp Plus and Braun); SpO2 (Nellcor; Masimo, and Nonin); Respiration Rate, Weight, Height, and BMI; Pain; CO2; and other configured parameters.
DC	Domain Component – In LDAP servers and Active Directory, a dotted domain name is split into domain components that form "dc=component" pairs separated by commas. Example: ad.welchallyn.com in an AD server will be "dc=ad,dc=welchallyn,dc=com"
FQDN	Fully Qualified Domain Name. The complete domain name of a computer on the Internet. Contains the host name and the full domain.
Gateway Software	A software application that can receive data from a device and convert the data to HL7 messages and then transmit that data via a TCP/IP socket.
HL7	Health Level 7 – A framework for the exchange, integration, sharing, and retrieval of electronic health information.
Host HL7 System or Host Application	Software System that receives the HL7 data from the device.
IDS	Interface Design Specification
LDAP	Lightweight Directory Access Protocol – An industry standard protocol for maintaining distributed directory information. Often used for user names and password information.

Acronym/Term	Description
NTP	Network Time Protocol is a networking protocol for clock synchronization between computer systems. It is used by the devices to maintain accurate date/time in the devices.
Patient Confirmation	The act of the device configuration/behavior ensuring that the vitals record contains the patient context.
Patient Identification	The act of the device configuration/behavior that displays the patient context on the device and that allows the clinician to ensure the right vitals go to the right patient.
SSL	Secure Sockets Layer– A set of cryptographic protocols to provide security of communications over a network. SSL is a predecessor to TLS.
Vitals Device	Generic names for CSM, CVSM, and CIWS.
X.509 Certificate	An X.509 certificate is a digital certificate that uses the widely accepted international X.509 public key infrastructure (PKI) standard to verify that a public key belongs to the user, computer or service identity contained within the certificate.

Architecture

*Optional setting within the device.



Server	
EMR Server	
1	Patient Query HL7 (QRY^A19) AES-128*
2	Patient Demographics HL7 (RSP^K22) AES-128*
3	Vitals HL7 (ORU^R01) AES-128*
DNS Server	
4	DNS Lookup
Active Directory Server	
5	Clinician Authentication
NTP Server	
6	Date/Time Synchronization

Technical Specifications

Ports	
Listening Port(s)	A single TCP/IP listening port on the EMR (or external server) needs to be available to receive connections from multiple devices.
Computer Requirements	
NTP Message Frequency	The NTP host solution(s) must be capable of processing time synchronization requests every 36 seconds (see IDS for calculation details).
Active Directory Message Frequency	The host solution(s) must be capable of processing clinician authentication requests every 36 seconds (see IDS for calculation details).
Patient Lookup and/or Vitals Send	The host solution(s) must be capable of processing patient lookup requests every 1.2 seconds (see IDS for calculation details).
Network	
Internet Connection	An Internet connection may be required depending on how NTP is configured. If NTP is configured to use an external time server (e.g., time.nist.gov), then the device must be able to connect to the Internet.
Device Support	
Quantity	Some systems may scale up to and potentially beyond 400 devices, depending on the clinical environment.
Device(s)	Connex Spot Monitor (CSM) with software version 1.30 or higher Connex Vital Spot Monitor (CVSM), 2.43.00 or higher Connex Integrated Wall System

Active Directory setup

Prerequisites:

- Confirm that the Date and Time are set correctly on the device.

  NOTE This ensures that the device Date and Time fall between the Certificate Authority (CA) Root Certificate validity period for successful connection.

- Load the CA Root Certificate on the device and the Server Certificate on the Active Directory Server.

NOTE The connection to the Active Directory Server might fail due to a missing CA Root Certificate on the device and a missing Server Certificate on the AD Server. (See: "Import/Install an Active Directory server certificate on the Active Directory server" and "Import/Install a Certificate Authority (CA Root certificate on the Active Directory server"). A CA can be either: Third-Party (GoDaddy, Symantec, Comodo) or Self-Signed - Internal CA (AD CS)

- Check the DNS Server IP assignment on the device via DHCP or Static configuration.
  - Make sure that the assigned DNS Server(s) on the device can successfully query for the Domain Name entered on the Active Directory User Interface.

CA Root Certificate format

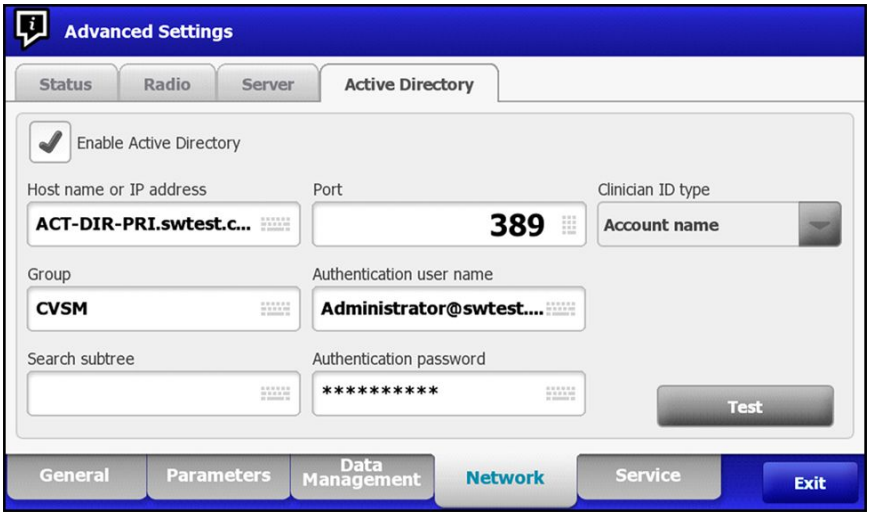
• The CA Root Certificate can be either in PEM or DER format and can have extensions: ".pem", ".der", ".crt", or ".cer".

• These certificate files are converted into PEM format during the load process on the device.

Specify Active Directory settings

1. Access the Advanced Settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter Password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Active Directory** tab.



Active Directory settings

- Enable Active Directory (Turn the feature On or Off).

NOTE The device always uses TLS to encrypt communications between the Active Directory Server and the device. If an encrypted connection cannot be established, the device will not communicate with the server.

NOTE As part of establishing the TLS connection, the device software requests an X.509 certificate from the Active Directory Server and validates it against a stored CA Root certificate. If the AD Server cannot be validated, the device will not continue communications with the Active Directory Server.

Host name or IP address

Use the FQDN or the IP Address of the Active Directory.

1. Touch the keyboard in the *Host name* or *IP address* text field.
2. Enter a Host name (FQDN) or an IP address of the Active Directory Server in the text field.

NOTE FQDN consists of the Host name and Domain name.

Example: <Hostname>.<DomainName>

Example: SomeActiveDirectoryhost.someDomain.com

Port

The Standard LDAP Port "389" is used to Authenticate and Authorize Clinicians

1. Touch the keypad in the *Port* text field.
2. Enter the Port Number that is listening for the LDAP connection on the Active Directory Server.

NOTE Keep the default Port entry "389".

Domain Name

The Domain Name is the domain namespace of the server.

1. Touch the keyboard in the *Domain name* text field.

FQDN consists of the Host name and Domain name.

Examples: <DomainName>

someDomain.com

hillrom.com

service.hillrom.com

Group

Select the Group to which the clinician must belong to be Authenticated.

1. Touch the keyboard in the *Group* text field.

- If the Group field is blank, a group will not be checked.
- If there is a value, the query will check for a Group match. This is an alpha-numeric string.

Examples: ServiceGroup

Service Group 1

Clinician ID type

Clinician ID type is selected from a dropdown menu of the 3 listed options. (User name, Account name, or Employee ID). These options correspond to the common fields in the Active Directory.

1. Touch the dropdown menu in the *Clinician ID type* field.

- The device performs a match by using the selected option when the Clinician logs into the device.
- The setting for the Clinician ID type is based on the facility policy. The facility policy determines how employees are expected to log into a device and what is encoded in a barcode if using barcodes.

Examples: "userPrincipalName" (**User name**)

"SAMAccountName" (**Account name**)

"employeeid" (**Employee ID**)

User name — A string attribute that contains the user account name and DNS Domain name combined.

Account name — Examples:

<UserAccountName>@<DomainName>

serviceUser@hillrom.com

A SINGLE-VALUE attribute that is the user account name only.

Examples:

<UserAccountName>

serviceUser

Employee ID — Is the user's employee ID stated on the Active Directory Server.

Examples:

<employeeID>

1234567890

Authentication user name

Authentication username Is the name of a user with authority to perform clinician searches on the Active Directory Server. This is an Alpha-numeric string.

1. Touch the keyboard in the *Authentication user name* text field.

Examples: UserName@DomainName.com

Administrator@hillrom.com

Authentication password

Authentication password is the password of the Authentication Username. This is an Alpha-numeric string and case sensitive.

1. Touch the keyboard in the *Authentication password* text field.

Example: P@ssW@rd!23

Search subtree

The Search subtree searches for a Clinician in an "Organizational Unit" (OU). An Organizational Unit (OU) is a subdivision within an Active Directory into which you can place Users, Groups, Computers, and other Organizational Units.

The Search subtree field should be empty if you are just querying for a Clinician in the Domain/ SubDomain Users or Group.

1. Touch the keyboard in the *Search subtree* text field.

Examples: OU=OUname, DC=DomainPrefix, DC=DomainSuffix

OU=someOU, DC=someDomain, DC=com

OU=serviceOU, DC=hillrom, DC=com

OU=serviceOU, DC=eastcoast, DC=hillrom, DC=com

Test network connection

Perform a lookup of the Default Naming Context to test the network connection to the Active Directory Server and to test the use of the Administrator user name and password, and domain lookup.

1. Touch **Test network connection** to test the connection from the device to the Active Directory Server.

Test

Perform a lookup of the Default Naming Context to test the network connection to the Active Directory Server and to test the use of the Administrator user name and password, and domain lookup.

1. Touch **Test** to test the connection from the device to the Active Directory Server.

CVSM

See the section "*Load a waclientcert.pim file to CVSM with a Newmar Radio to a USB flash drive*" for specific details about the CA Root Certificate loading process.

Active Directory- setup details (Best Practices)

Prerequisites

Set up the Active Directory and the DNS Servers and ensure that your version supports this feature.

The following sections describe how to configure and use the device's Active Directory feature for clinician authentication.

Configuration support for the Active Directory

Install required certificates

For the device to connect to Active Directory, you need to include the Active Directory CA (Certificate Authority) Root Certificate in the device configuration.

NOTE The connection to Active Directory Server might fail because of: A missing **CA Root Certificate** on the device, an incorrect format certificate on the device (cacert.cer certificates are not recognized by the CSM wireless radio), or by a missing **server certificate** on the Active Directory Server. To authenticate with the Active Directory Server, CSM should have a CA root certificate from the same Certificate Authority (CA) that issued a server certificate to the Active Directory Server.

NOTE The CA Root Certificate must be in PEM or DER formats. Failure to abide by these restrictions will cause the device to ignore the certificate.

Examples of CA (Certificate Authority) include:

- Third party (GoDaddy, Symantec, Comodo, etc.)

or

- Internal CA (AD CS) - self-signed certificates

Import or install third-party or AD CS Certificate Authority certificates

Request and import/install the following AD CS Certificate Authority certificates:

- Server certificate on Active Directory Server via **Windows Certificate Store**
- CA Root Certificate on Active Directory Server via **Windows Certificate Store**
- CA Root Certificate on the CSM device via **Config File** generated by the Configuration Tool
- CA Root Certificate on the CVSM/CIWS devices via **USB Drive in CA_CERTIFICATES** folder

Install wireless network radio certificates

Wireless network authentication – radio certificates

Hillrom supports uploading your wireless certificates onto vital sign devices. Uploading certificates can be done using different methods based on the product design, however the certificates must be in a specific format and be named correctly for deployment on a device. This document does not specify instructions for a specific server, however, it does provide information on support of wireless client certificates and wireless client certificates supporting server authentication. This support pertains to Hillrom products using the Newmar 802.11 a/b/g/n radio card and the Lamarr 802.11 a/b/g radio card.

NOTE Customer certificates that are uploaded to Hillrom devices must adhere to the x.509 standard.

Supported radio certificate formats

The 802.11 a/b/g/n radio supports a **DER** or **PEM** file format containing the **CA Root certificate** chain - cacert.der or cacert.pem.

The 802.11 a/b/g/n radio also supports the **P12**, **PFX**, or **PEM** file formats containing the device's **Client certificate** and private key - client.p12, or client.pfx, or client.pem.

NOTE If a P12 or PFX file is supplied, the Newmar Radio will automatically convert it to PEM format during installation.

No server validation – no certificates

Devices do not need to load the corresponding CA Root Certificate to authenticate.

A certificate does not need to be created for Server Validation (such as EAP-PEAP with Enable Server Validation - Unchecked).

No Certificates need to be loaded onto the devices for successful PEAP authentication. Only the following inputs are required:

- Username
- Password

The 'waclientcert.pim' file

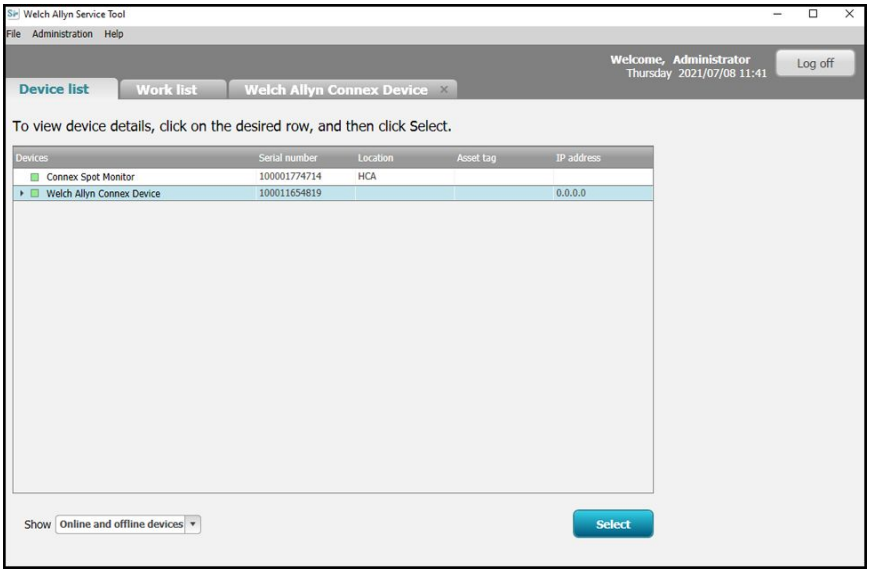
For a certificate to be loaded to the 802.11 a/b/g/n radio using the Welch Allyn Service Tool (WAST), the certificate must be formatted into the 'waclientcert.pim' file format. This '.pim' file is a Hillrom specific container that includes the customer certificates, commands, information about how the certs are to be loaded, and information about which folders the certificate(s) will be written to on the radio file system.

You cannot re-name an existing customer client certificate or ca certificate to 'waclientcert.pim' and upload it because the certificate lacks information on where the certificates need to be deployed on the radio and how the product should handle the file. The 'waclientcert.pim' file must be created using a Welch Allyn process.

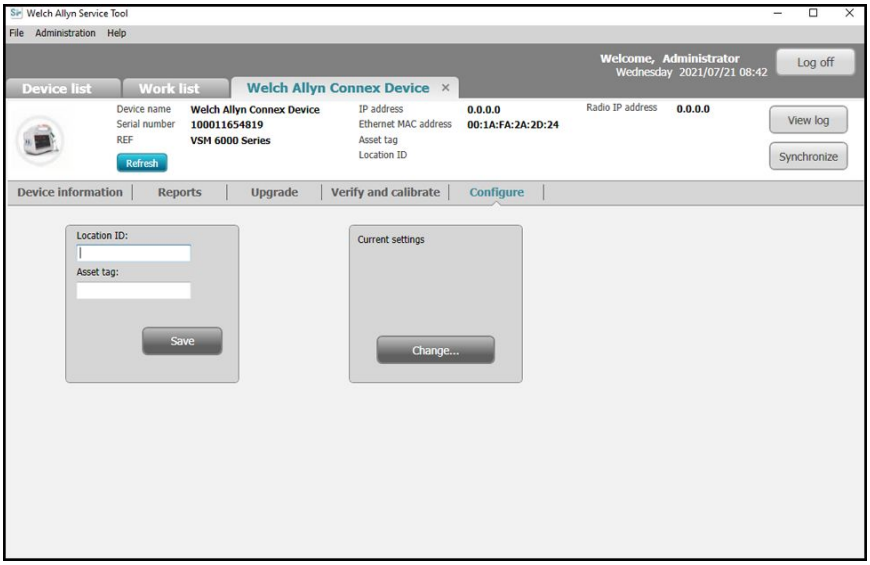
Create a waclientcert.pim file using the Welch Allyn Service Tool (WAST)

The Welch Allyn Service Tool (WAST) can create the **'waclientcert.pim'** file using only a 'ca cert' (server verification), or a 'ca cert' and 'client cert' (for client authentication).

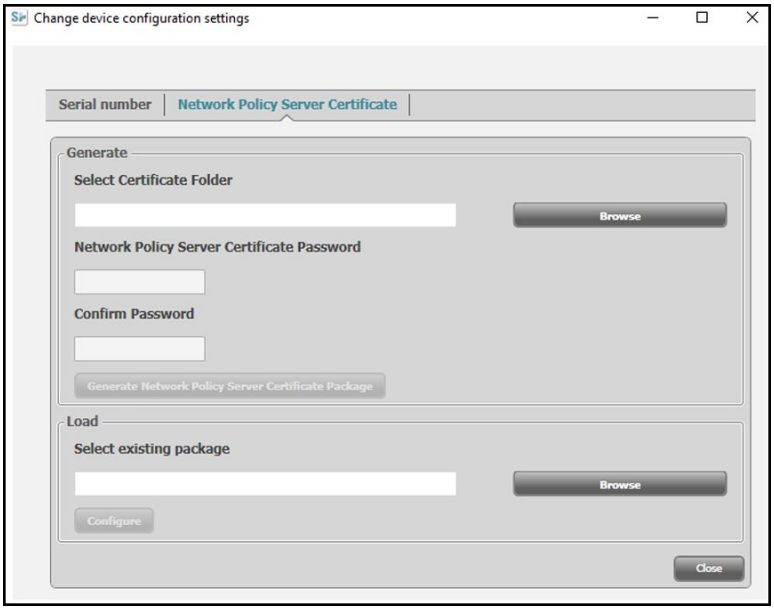
1. Create a folder on the PC or thumb drive and place the ca cert, and if needed, the client cert in the same folder.
2. Connect a device to the PC running the WAST and allow the device to come up to a usable state.
3. Click **Select** to choose the desired device from the WAST 'Device list' .



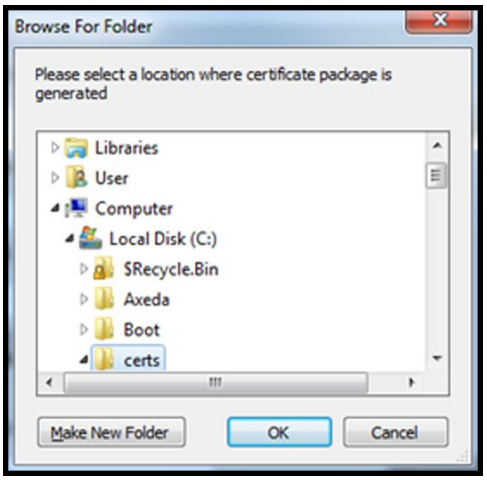
4. Click the *Configure* tab and then click **Change…** in the Current settings pane.



5. Select the *Network Policy Server Certificate* tab.



6. Use the **Browse** button to select the folder where the customer certs are kept – this will fill in the *Select Certificate Folder* field with a path to the customer certificates.



Server validation only certificate

If the certificate created for Server Validation (such as EAP-PEAP with **Enable Server Validation** checked), the folder created should only contain a 'ca cert'. A client certificate is not required.

The Network Policy Server Certificate Password and Confirm Password fields are inactive for editing, however, the device needs to load the corresponding CA Root Certificate to authenticate.

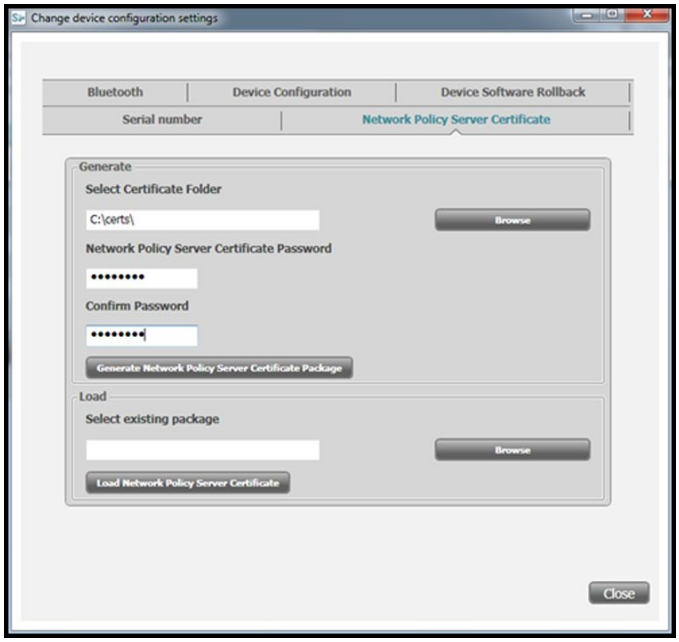
The CA Root Certificate needs to be loaded onto both the device for successful PEAP authentication.

- Username
- Password
- CA Root Certificate (Installed - via WAST)(Installed via USB flash drive)

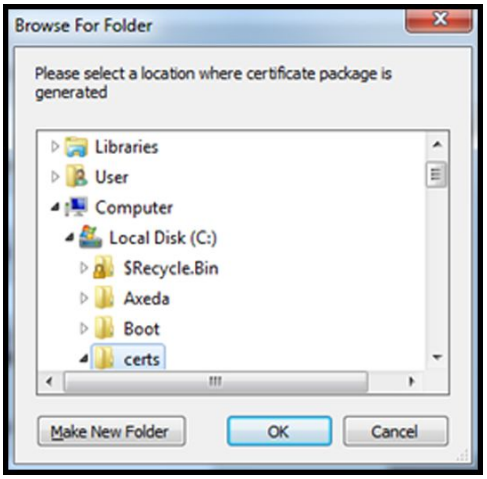
Client authentication certificate

If the certificate to be created is for Client Authentication (such as EAP-TLS) the folder created should have a 'ca cert' and a 'client certificate'. The *Network Policy Server Certificate Password* field and *Confirm Password* field will need to be filled in with the password created for the client cert at creation time.

NOTE The WAST does not verify the client password is correct, it only loads to the CSM radio for authentication. This password must be known for the client to authenticate to the network.



1. Once the folder path of the certificates is entered, (and the Server Verification Only or Client Authentication is chosen), click **Generate Network Policy Server Certificate Package** and a browse to the destination folder where the written 'waclientcert.pim' file will appear.



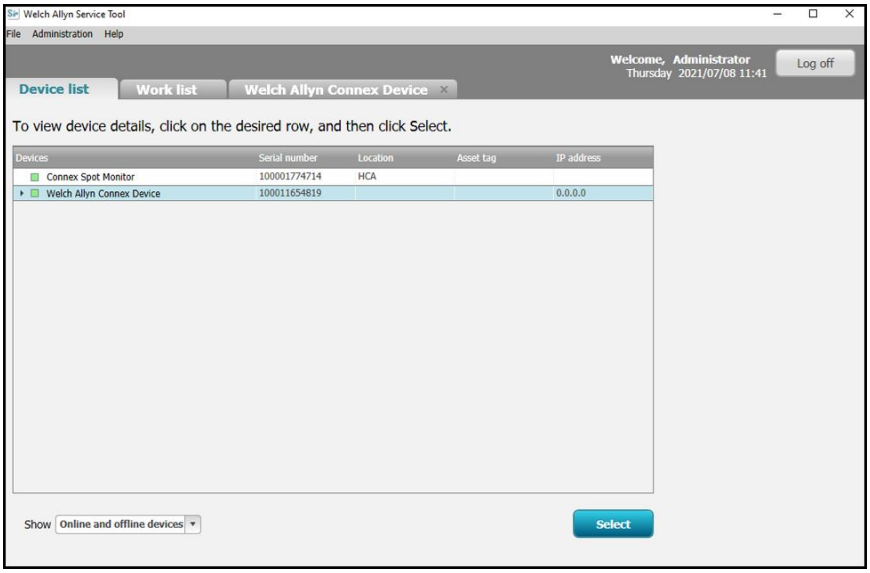
   For convenience, we suggest writing the 'waclientcert.pim' file into the same directory as the certificate files.

2. After selecting the destination location and clicking OK, the 'Compressing', 'Generating', and 'Success' status windows appear.

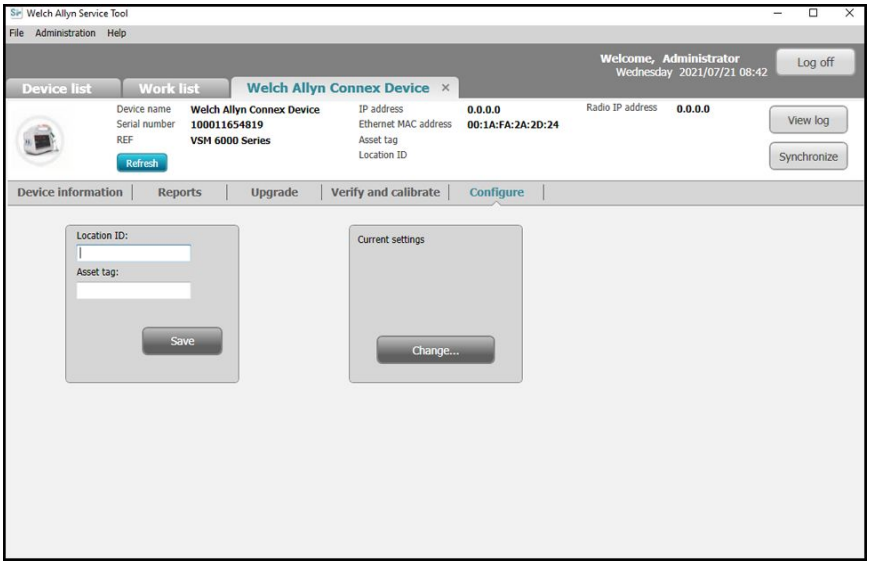
   The destination folder now contains the 'waclientcert.pim' file along with the certificate files.

Load a waclientcert.pim file onto the device with a Newmar Radio via the Welch Allyn Service Tool (WAST)

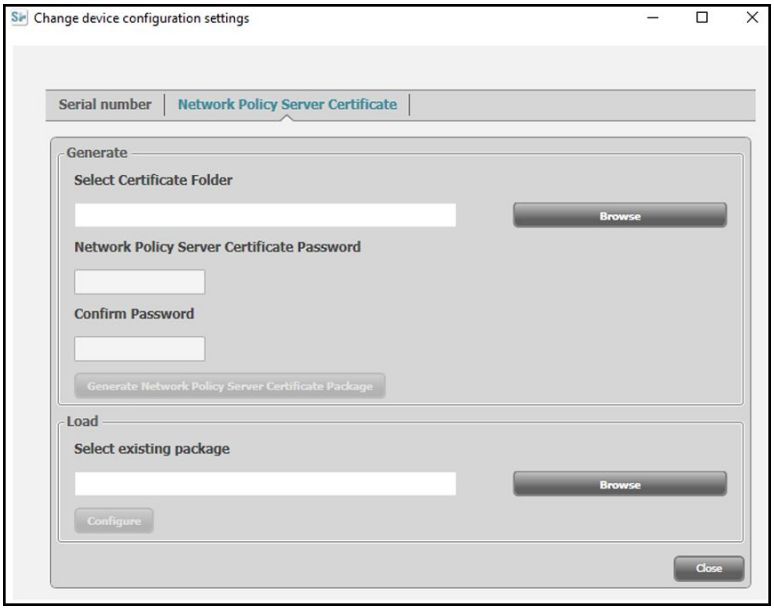
1. Disconnect the USB link between the PC and the device.
2. Launch the Welch Allyn Service Tool (WAST) on the PC.
3. Reboot the device and allow it to come up to a usable state.
4. Connect the USB link from the PC to the device.
5. Click **Select** to choose the desired device from the WAST 'Device list'.



6. Click the *Configure* tab and then click **Change…** in the Current settings pane.

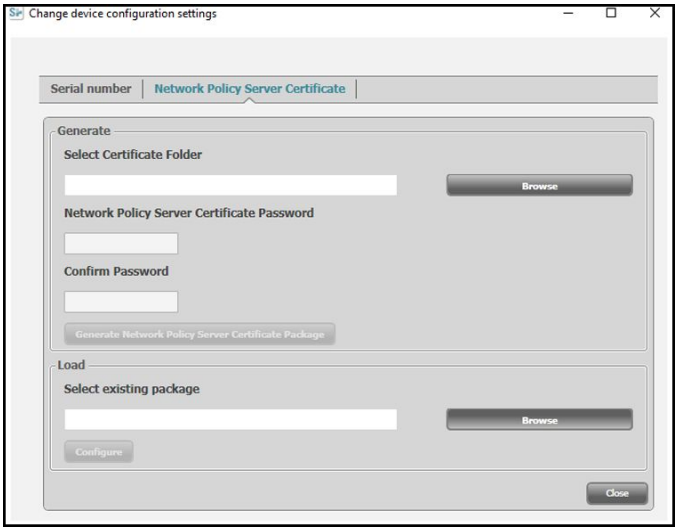


7. Select the *Network Policy Server Certificate* tab.

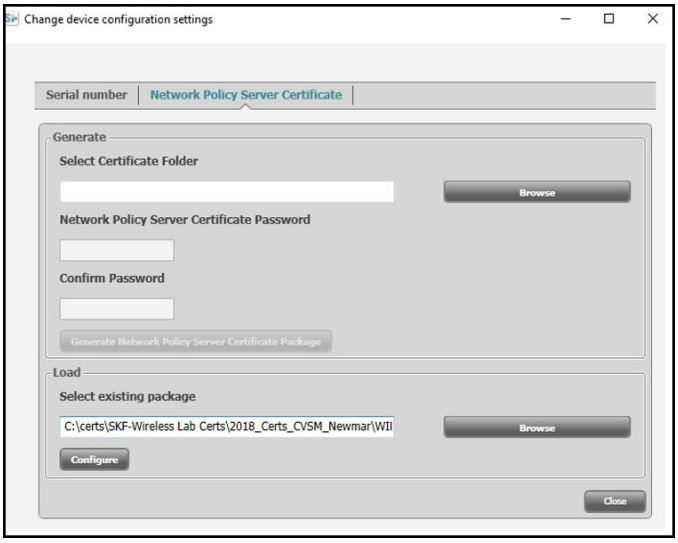


8. Click **Browse** from the *Load* pane and navigate to where the 'waclientcert.pim' file is located.

   The *Select existing package* field displays the path to the waclientcert.pim file.



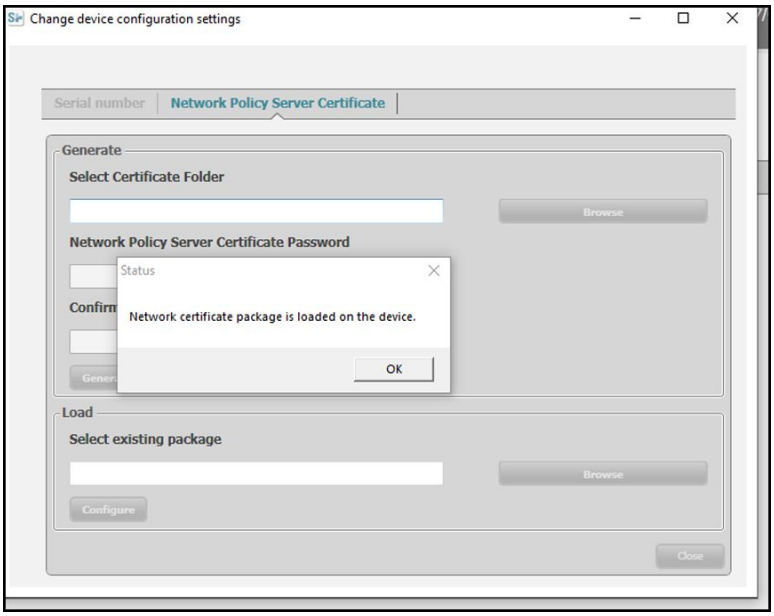
9. Click **Configure** to load the certificate to the device radio.



A message box displays the installation progress. The process should take a maximum of three minutes.

NOTE If the process moves past the 6-minute mark, disconnect the device from USB, reboot it and begin again.

10. If the message box displays the message: *Network certificate package is loaded on device*, click **OK**.

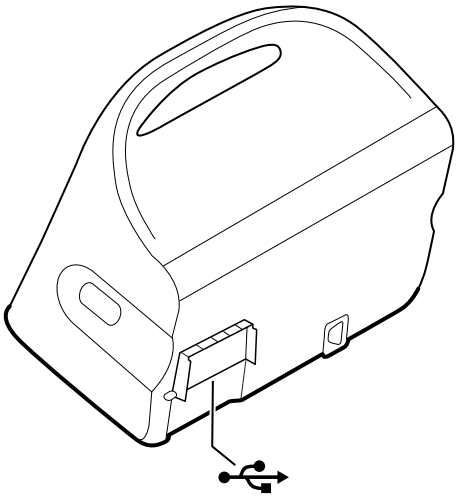


11. Close the Welch Allyn Service Tool application.
12. Disconnect the USB connection.
13. Restart the device.

    You can now configure the device to use certificates on the wireless network.

Load a waclientcert.pim file to CVSM (with a Newmar Radio) via a USB flash drive

Loading certificates to the CVSM is currently done by using the USB ports located within the communication panel.

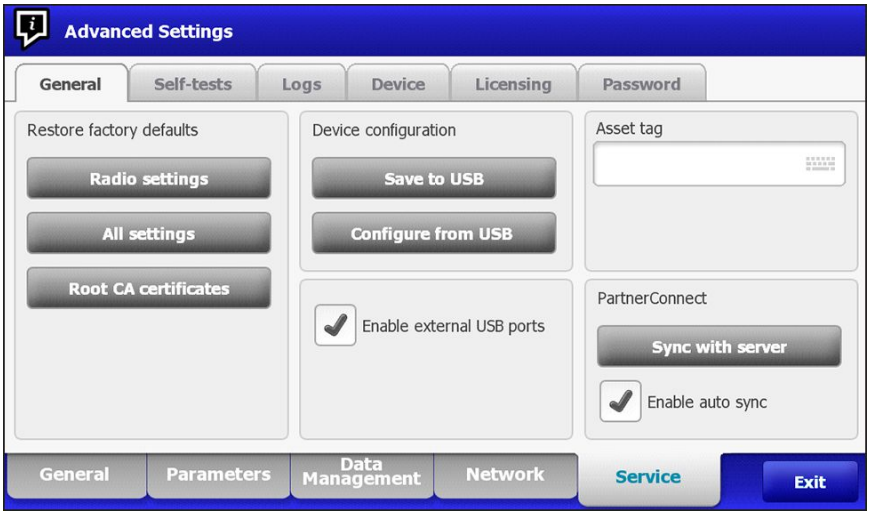


- The USB must be formatted in FAT or FAT32.
- The certificates must be in the 'waclientcert.pim' format – but renamed to 'WIRELESS_CERT.pim' in the root directory of the flash drive.

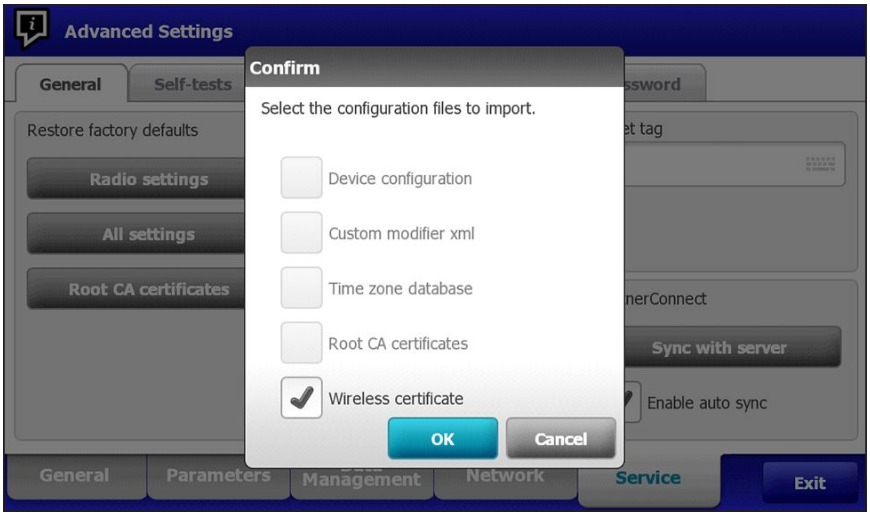
NOTE Do not place WIRELESS_CERT.pim in the CA_CERTIFICATES folder. CA_CERTIFICATES is not used for wireless radio certificates.

The same requirements for client authentication and server validation also apply. For more information, see "Load a waclientcert.pim file onto the device with a Newmar Radio via the Welch Allyn Service Tool (WAST)."

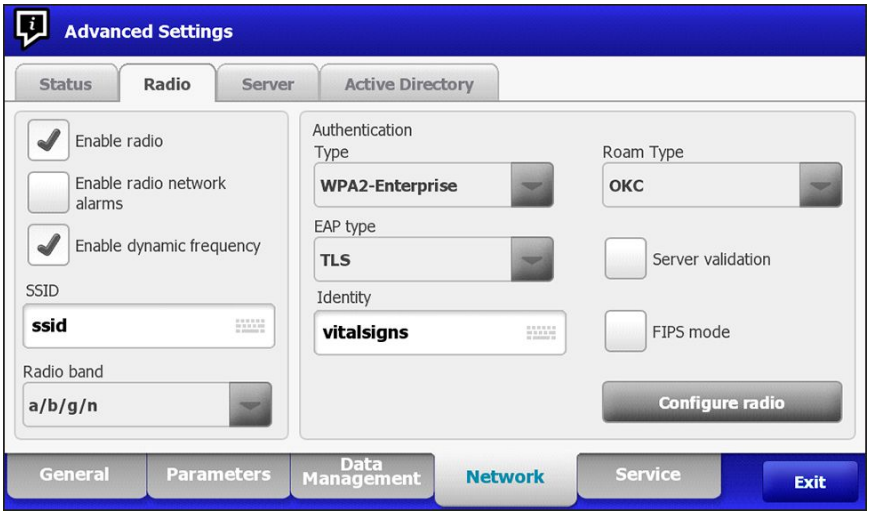
1. Insert the USB drive with the certificates.
2. Navigate to the **Settings** > **Advanced** > **Enter Password> General** > **Service** screen.
3. Touch **Configure from USB**.



4. If the certificates are in the proper format and the USB drive is formatted properly, check the **Wireless certificate** box and touch **OK**.



5. Touch **OK** at the prompt: "Select OK to confirm overwrite of existing device configuration or cancel."
6. The CVSM displays the "Device will be restarted" message and the system reboots.
7. After the CVSM reboots, navigate to the **Settings**> **Advanced** > **Network** > **Radio** screen.
8. Set the network parameters as needed.
9. If the network requires server authentication, check the **Server validation** box.



10. Touch **Configure radio**. If the network settings are correct, the device authenticates to the network.

The CVSM (Newmar) can now be configured to use certificates on the wireless network.

NOTE For CVSM (Newmar), the Restore Factory Defaults (Radio Settings or All Settings) deletes the wireless radio certificates on the device.

Load wireless certificates to CVSM/CIWS (with a Lamarr Radio) via the web interface

- To load wireless radio certificates onto a CVSM/CIWS (Lamarr), the CVSM/CIWS (Lamarr) first needs to be connected to a WPA2-PSK WLAN.
- Make sure that certificates are in the valid format and that the certificates are named appropriately:

- CA root certificate: cacert.pem
- Client certificate: client.p12

Using Mozilla Firefox web browser, enter the IP address of the connected CVSM/CIWS (Lamarr) device with WPA2-PSK WLAN as the URL:

Example: **http://xxx.xxx.xxx.xxx**

User Name: superadm

Password: Generated via the Password Generator with Lamarr Radio MAC address as input.

NOTE To check the status of the wireless radio certificates:

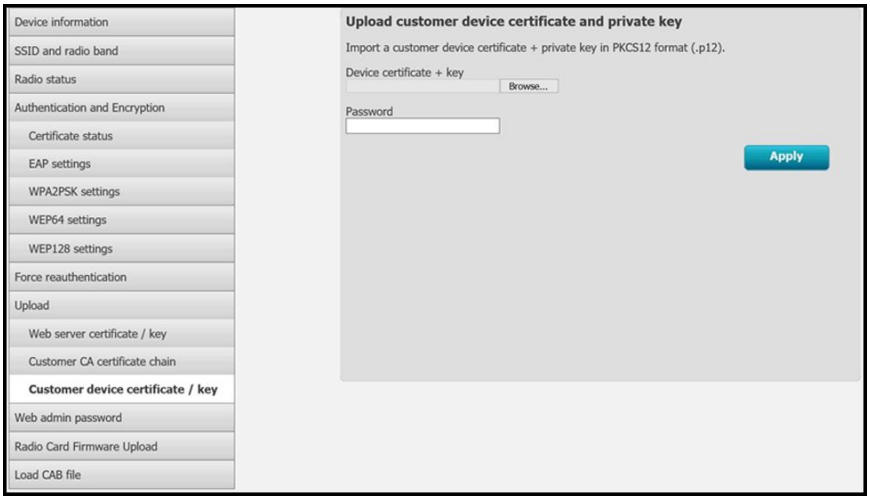
Under the Authentication and Encryption section:

a. Select the **Certificate status tab**.
b. Verify that **Customer CA Certificate Chain**> **Not Present**.
c. Verify that **Customer Device Certificate and Private Key**> **Not Present**.

Loading CA Root Certificate on Lamarr Radio

1. Load the CA root certificate by selecting the **Customer CA certificate chain** tab.

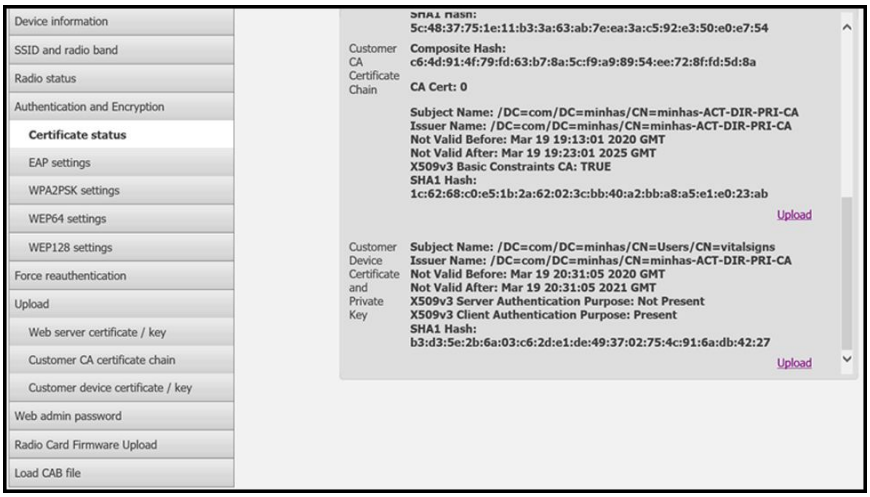
2. Click **Browse** to navigate to the CA Root Certificate file location on the PC.
3. Click **Apply** to load the CA root certificate onto the device.
4. Load the client certificate onto the Lamarr radio.
5. Under the *Upload* tab, click the **Customer device certificate / key** tab to load the client certificate.



6. Click **Browse** to navigate to the Client Certificate file location on the PC.
7. Enter the **Password** for the client certificate.
8. Click **Apply** to load the Client Certificate onto the device.

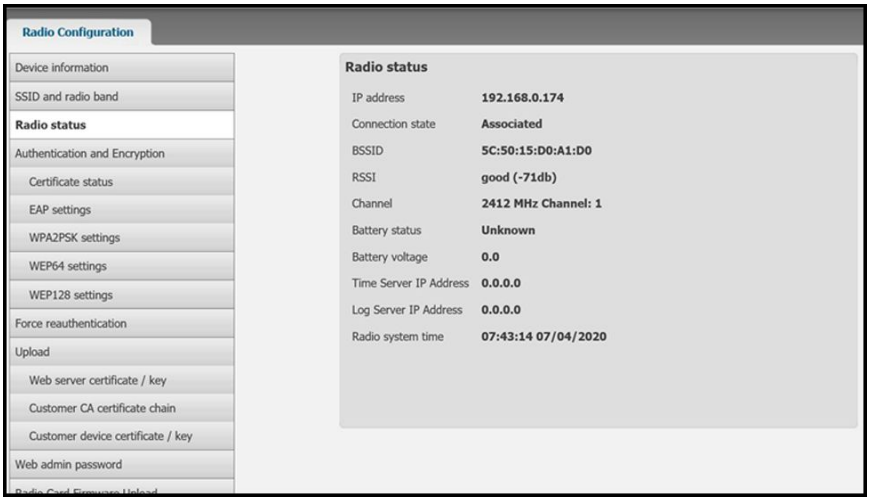
To check the status of the wireless radio certificates:

1. Under the Authentication and Encryption section, click the **Certificate status** tab to view the Customer CA Certificate Chain >CA Root Certificate and the Customer Device Certificate and Private Key >Client Certificate details.



2. To confirm the presence of valid certificates on the CVSM/CIWS (Lamarr) device, configure the Radio to an SSID with the authentication type: EAP-TLS.

   A successful wireless connection with the SSID confirms the validity of wireless certificates.



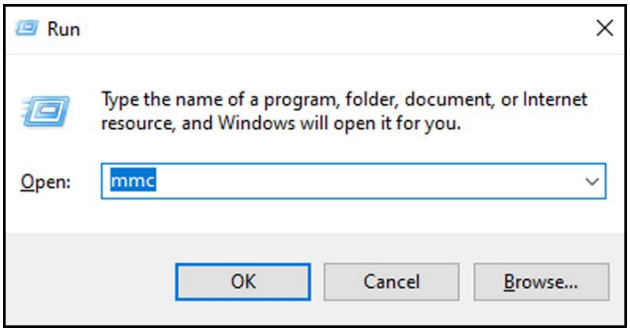
The CVSM/CIWS (Lamarr) can now be configured to use certificates on the wireless network.

NOTE For CVSM/CIWS (Lamarr), the Restore Factory Defaults (Radio Settings or All Settings) *does not delete* the Wireless Radio Certificates on the device.

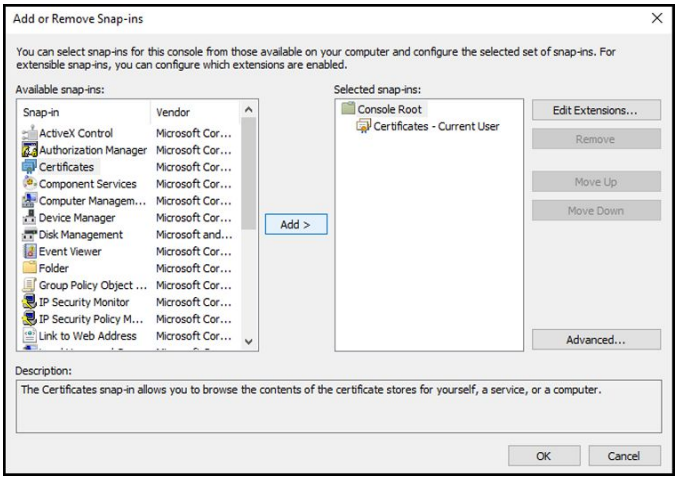
Import/Install an Active Directory server certificate on the Active Directory server

These instructions apply to Active Directory servers with Windows Server 2012 OS and above:

1. Press the **Windows key + R** to bring up the Run command.
2. Type mmc and press **Enter** to open the Microsoft Management Console.

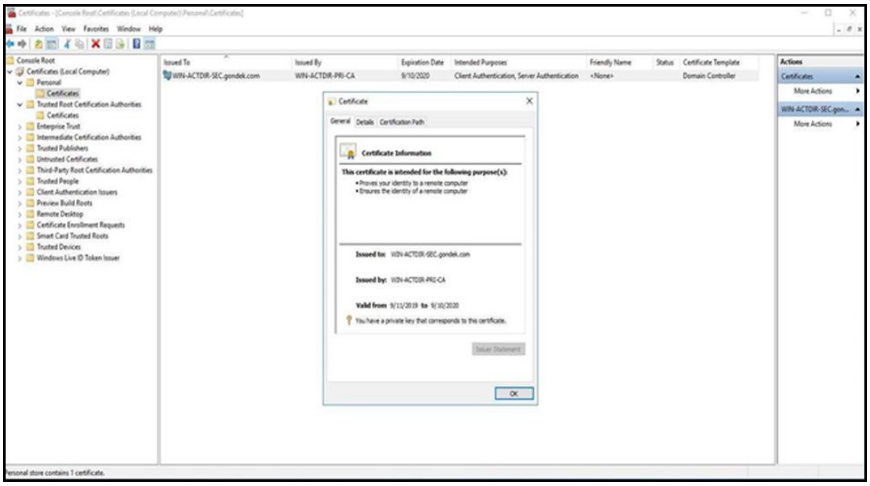


3. Click the **File** menu and then select **Add/Remove Snap-in...**.
4. Select **Certificates** from the list of Snap-ins, and click **Add**.

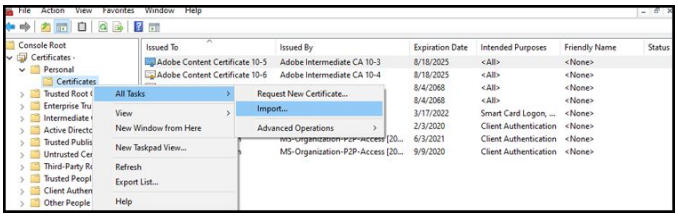


5. In the next dialog box, select **Computer account** and click **Next**.
6. Select Local computer and click **Finish**.
7. From the "Add or Remove Snap-ins" window, click **OK**.

   Click **>** to view the certificates folder. When you open any certificates folder, you will see certificates displayed in the right pane.
8. Import/Install the AD Server Certificate into the following folder: Certificates (Local Computer) > Personal > Certificates.

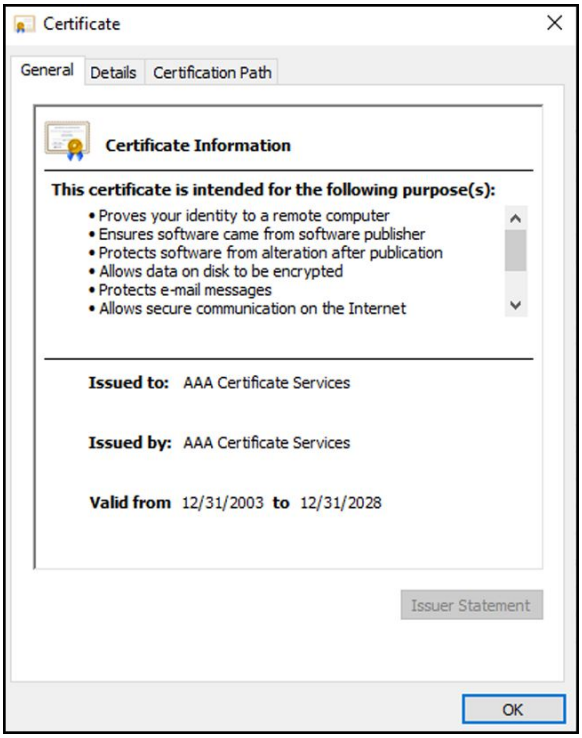


9. Right-click the Certificates folder under Personal and choose **All Tasks > Import**.



10. Follow the Certificate Import Wizard and provide the Active Directory Server Certificate file path.

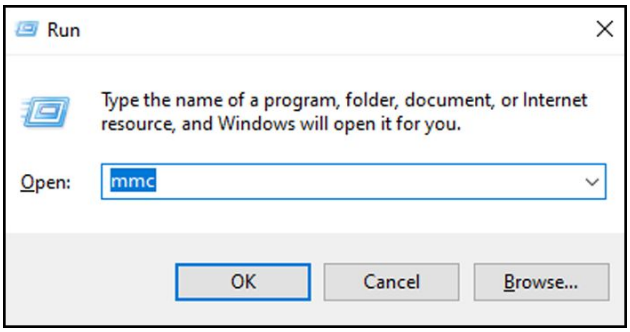
NOTE An example Active Directory server certificate is shown below.



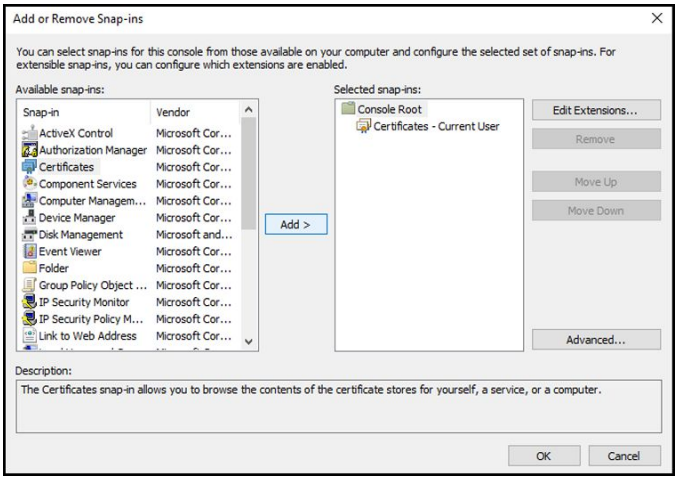
Import/Install a Certificate Authority (CA) Root certificate on the Active Directory server

These instructions apply to Active Directory servers with Windows Server 2012 OS and above:

1. Press the **Windows key + R** to bring up the Run command.
2. Type mmc and press **Enter** to open the Microsoft Management Console.

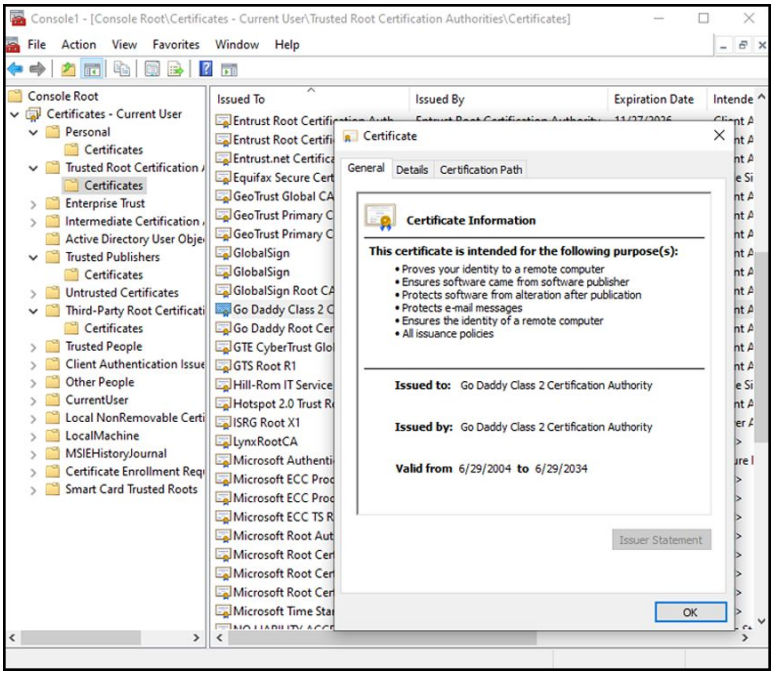


3. Click the **File** menu and then select **Add/Remove Snap-in...**.
4. Select **Certificates** from the list of Snap-ins, and click **Add**.

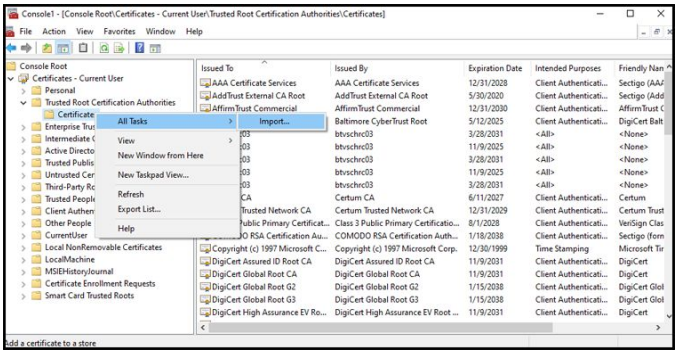


5. In the next dialog box, select **Computer account** and click **Next**.
6. Select Local computer and click **Finish**.
7. From the "Add or Remove Snap-ins" window, click **OK**.

   Click **>** to view the certificates folder. When you open any certificates folder, you will see certificates displayed in the right pane.
8. Import/Install the CA Root Certificate into the following folder: Certificates (Local Computer) > Trusted Root Certification Authorities > Certificates.

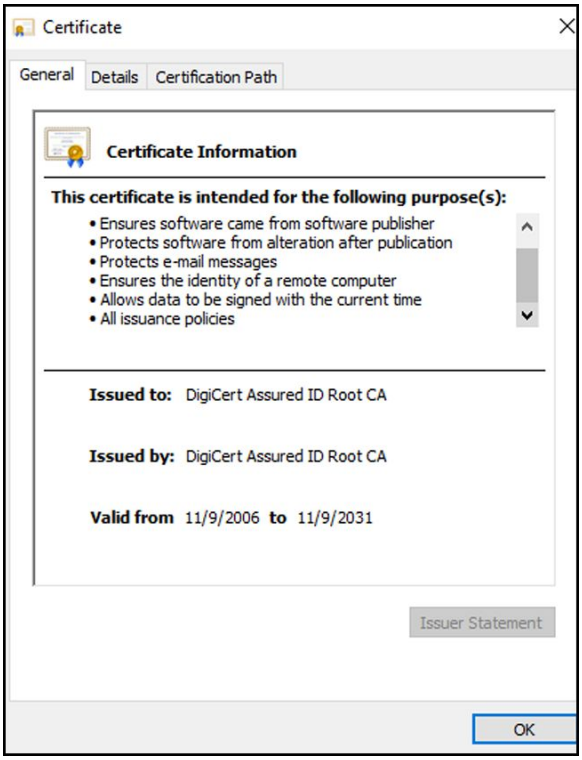


9. Right-click the Certificates folder under Trusted Root Certification Authorities and choose **All Tasks > Import**.



10. Follow the Certificate Import Wizard and provide the CA Root Certificate file path.

NOTE An example CA Root Certificate is shown below.



Import/Install a CA Root Certificate onto the device (includes CSM, CVSM, and CIWS)

Use the WA CSM Configuration Tool web application to install or import a CA Root Certificate onto the device. The Config file (*-signed.waconfig) is generated by the Configuration Tool. See "*Log into the Configuration Tool*" and "*Configure a CA Root certificate using the Configuration Tool*".

Create third party AD CS Certificate Authority Certificates

Third Party Certificates (AD Server & CA Root) need to be requested from the Third Party Certificate Authority with the required Active Directory Server information.

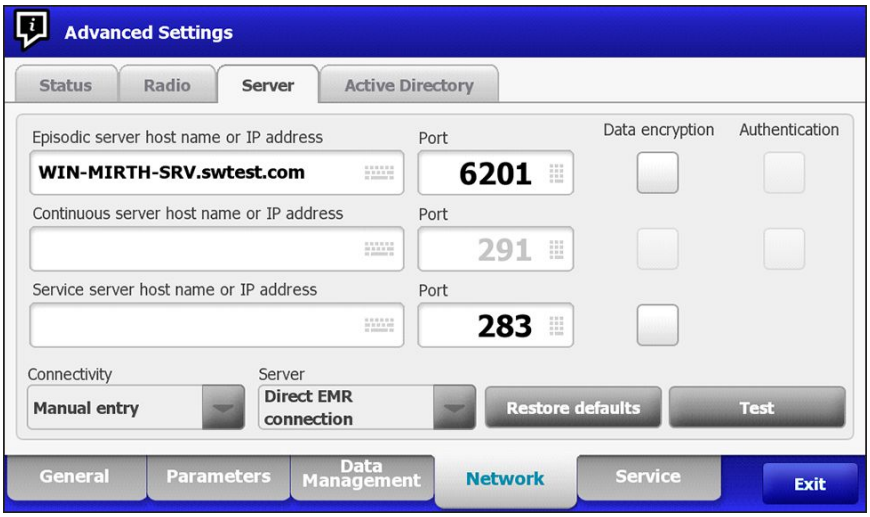
AD CS Certificates (AD Server & CA Root) are auto-generated during the AC CS Role Installation and Configuration on the AD Server. No specific process is required after the installation and configuration of the AD CS Role on the AD Server to generate these certificates.

HL7 out-of-box - setup details

HL7 (Direct EMR connection) setup

1. Access the Advanced Settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter Password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Network** tab.
3. Touch the **Server** tab.
4. Select **Manual Entry** from the drop-down list of the Connectivity method.
5. Select **Direct EMR Connection** from the Server drop-down list .



6. Select **Data encryption** to turn the Security on or off.

   If Data encryption is enabled , then Server Authentication can be turned on or off. Data encryption is intended to keep data secure while the data is transferred over a network.

   NOTE Check or Uncheck Data encryption per the intended Secure (TLS) or unsecure connection.

7. Select **Authentication** to turn the server authentication on or off.

   NOTE Server Authentication is the process of confirming the identity of the EMR Server by receiving a server certificate from the server and checking it against the installed CA Root certificates on the device.
   - If checked, confirm that CA Root Certificate is loaded on the device and that the Server Certificate is loaded on the EMR Server for the successful connection.
   - If unchecked, the CA Root Certificate on the device and Server Certificate on the EMR Server are not required for the successful connection.

8. Touch the keyboard to enter an **IP Address**, **Episodic server host name**, or **FQDN** of the EMR Server in the *Episodic server host name or IP address* field.

9. Touch the keyboard to enter an **IP Address**, **Continuous server host name**, or **FQDN** in the *Continuous server host name or IP Address* field for the Continuous server that is listening for a connection.
10. Touch the keyboard to enter an **IP Address**, **Service server host name**, or **FQDN** of the Service server in the *Service server host name or IP address* field.
11. If needed, touch the keypad to enter a **Port** number in the *Port* field for the Episodic, Continuous, or Service server that is listening for a connection.
12. Touch **Test** to test the connection of the device to the EMR Server.

NTP server- setup details

Set up the NTP server

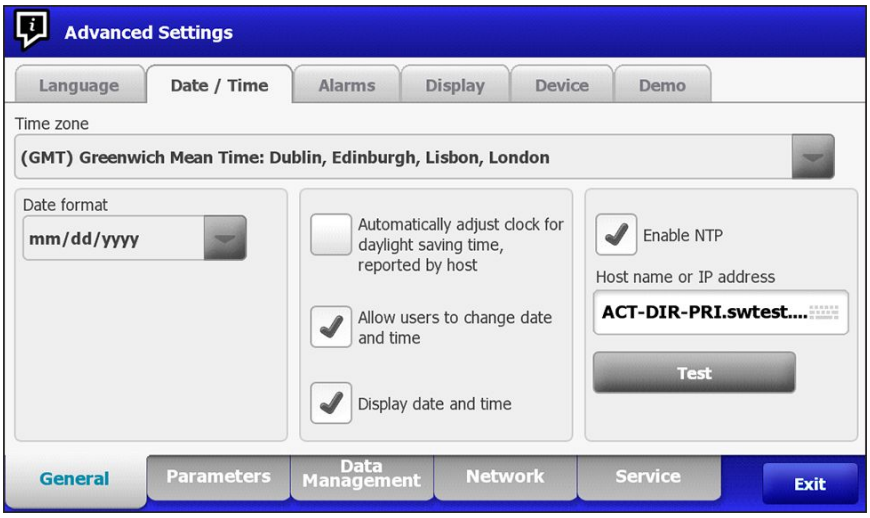
1. Access the Advanced Settings.
   a. Touch the **Settings** tab.
   b. Touch the **Advanced** tab.
   c. Touch **Enter password**.
   d. Enter your password and touch **OK**.

   The General tab appears.
2. Touch the **Date/Time** tab.
3. Touch the **Enable NTP** checkbox to enable NTP.

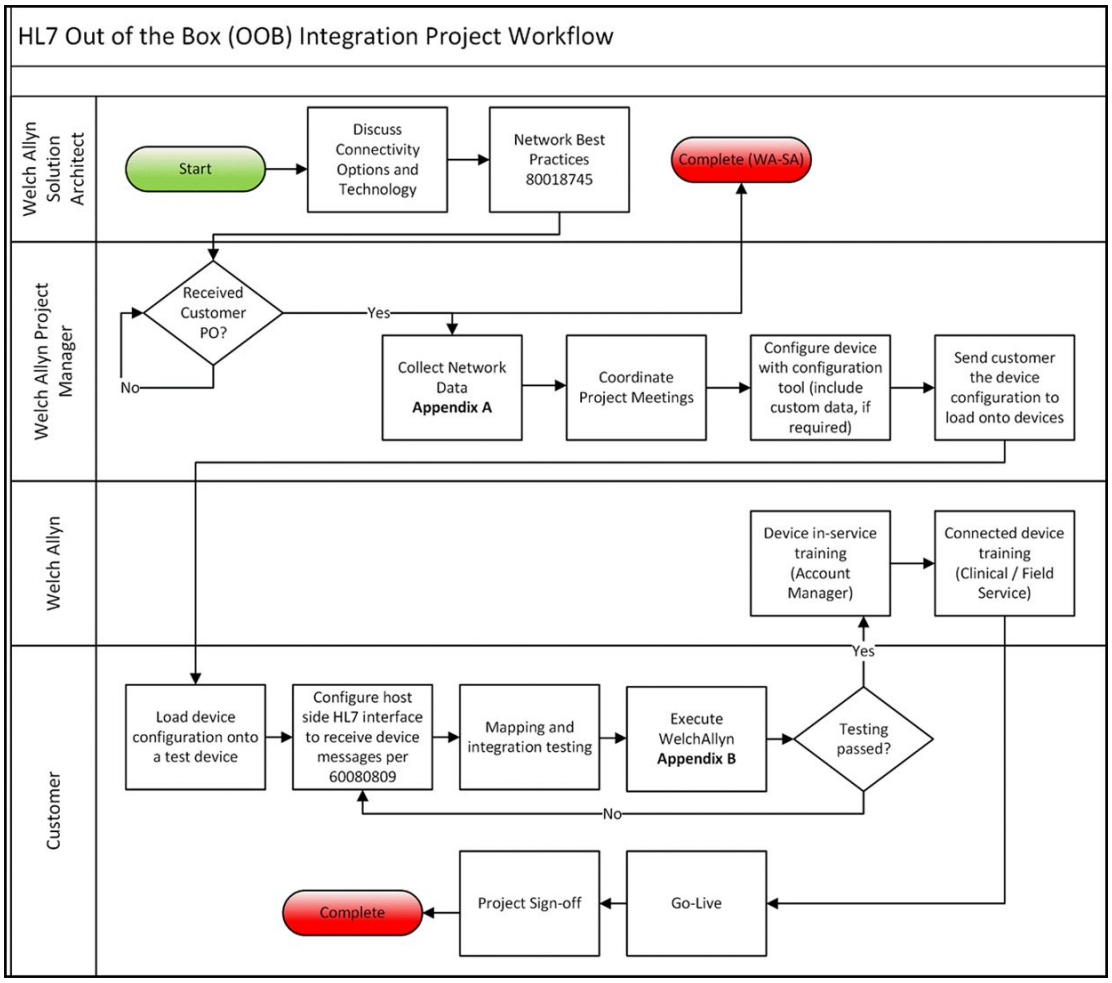
   NOTE Check the *Enable NTP* option as the first step of connecting with the NTP server to synchronize the device Date/Time clock over the internal or external (Internet) network.

4. Enter the Host name or IP address of the NTP server.

   To enter this information, touch the keypad in the Host name or IP address text field and enter either the Host name or IP address of the NTP server.
5. Touch **Test** to test the connection of the device to the NTP Server and to synchronize the device Date/Time.



Project workflow



Troubleshooting

Problem	Possible cause	Suggested action
Date/Time "Test network connection" failed	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > "IP address".
	The device does not have a properly configured NTP server	Review the NTP server configuration and make sure NTP is properly configured.
	The device does not have a properly configured NTP connection	Verify the Date/Time configuration on the device: Settings > Advanced > General > Date/Time: a. "Enable NTP" is checked. b. The proper NTP server address appears in the "Domain" field (Domain, FQDN, or IP Address).
	The device does not have Internet connectivity	Connect the device to the Internet. (An Internet connection is required when the NTP server is outside the local network.
	Your network firewall is blocking UDP port 123	Verify that the network's NTP port is open: typically, UDP 123.
	The path to NTP server cannot be reached	The path to NTP server cannot be reached
Server "Test network connection" failed	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > IP address.
	The device does not have a properly configured HL7 server connection	Verify the server configuration on the device: Settings > Advanced > Network > Server: a. Server connectivity = Direct EMR Connection. b. Host IP is selected. c. The proper address appears in the Host Address field (FQDN or IP Address). d. The proper port appears in the Host Port field.
	Server authentication failed	Load the proper Root Certificate on the server and the proper CA Root Certificate in the device using the device configuration tools.

Problem	Possible cause	Suggested action
	Your network firewall is blocking the TCP port used for the HL7 host connection	Verify that the network's TCP host port is open.
	The path to EMR server cannot be reached	Check network topology to ensure there's a valid path from the device to the EMR server.
Active Directory "Test network connection" failed	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > IP address.
	The device does not have a properly configured Active Directory server connection	Verify the server configuration on the device: Settings > Advanced > Network > Active Directory: a. "Enable Active Directory" is selected. b. The proper domain name appears in the "Domain name" field. c. The proper group name appears in the "Group" field. d. You are using the proper Clinician ID type, it matches what you are scanning, and the clinician is in the Active Directory. e. You are using the proper Authentication User name. f. You are using the proper Authentication password.
	Server authentication failed	Load the proper Root Certificate on the server and the proper CA Root Certificate in the device using the device configuration tools.
	Path to Active Directory server cannot be reached	Check network topology to ensure there's a valid path from the device to the Active Directory server.
Date/Time is incorrect on the device	Time zone is configured incorrectly	Confirm the device's time zone configuration is set to the correct time zone.
	DST adjustment is not configured correctly	Configure the DST setting appropriately (enable or disable DST adjustment depending on location).

Problem	Possible cause	Suggested action
	The device is syncing time to a different source than the rest of the network	Configure the device to configure its date and time to the same source as the rest of the network.
Failed to identify a patient	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > IP address.
	The device does not have a properly configured HL7 server connection	Verify the server configuration on the device: Settings > Advanced >Network > Server: a. "Server connectivity" = Direct EMR Connection. b. "Host IP" is selected. c. The proper address appears in the "Host Address" field (FQDN or IP Address). d. The proper port appears in the "Host Port" field.
	Scanned patient ID is not the proper barcode	Verify the patient ID scanned is a valid patient ID barcode.
	Scanned patient ID could not be found in the host database containing the patient census	Verify the patient ID scanned is in the host database.
	The HL7 host is not properly configured to receive census query requests	Verify that the host is configured to receive census query requests on the configured port.
	Your network firewall is blocking the TCP port used for the HL7 host connection	Verify that the network's TCP host port is open.
	Server authentication failed	Load the proper Root Certificate on the server and the proper CA Root Certificate in the device using the device configuration tools.
Failed to authenticate a user	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > IP address.
	Scanned Clinician ID is not the proper barcode	Verify the Clinician ID scanned is a valid Clinician ID barcode.
	Scanned Clinician ID is not contained in the user authentication database	Verify the Clinician ID scanned is in the user authentication database.

Problem	Possible cause	Suggested action
	The device does not have a properly configured Active Directory server connection	Verify the server configuration on the device: Settings > Advanced > Network > Active Directory: a. "Enable Active Directory" is selected. b. The proper domain name appears in the "Domain name" field. c. The proper group name appears in the "Group" field. d. You are using the proper Clinician ID type, it matches what you are scanning, and the clinician is in the Active Directory. e. You are using the proper Authentication User name.
	User ID entered is not valid	Verify that the user ID entered is accurate and a valid ID in the Active Directory.
	Server authentication failed	Load the proper Root Certificate on the server and the proper CA Root Certificate in the device using the device configuration tools.
Failed to send vitals	The device is not connected to a network and therefore does not have an IP address	Verify that the device has an IP address: Settings > Advanced > IP address.
	The device does not have a properly configured HL7 server connection	Verify the server configuration on the device: Settings > Advanced > Network > Server: a. Server connectivity = Direct EMR Connection. b. Host IP is selected. c. The proper address appears in the Host Address field (FQDN or IP Address). d. The proper port appears in the Host Port field.
	Your network firewall is blocking the TCP port being used for the HL7 host connection	Verify that the network's TCP host port is open.
	Server authentication failed	Load the proper Root Certificate on the server and the proper CA Root Certificate in the device using the device configuration tools.

Problem	Possible cause	Suggested action
	The configured custom data cannot be imported into the EMR	Verify the custom data configuration and make sure the fields going to the EMR match what the EMR is expecting.
	EMR response does not match device interface	Verify EMR response to the device's HL7 interface specification.
	The EMR rejected the Clinician ID	Verify Clinician ID sent from the device is a valid Clinician ID for the EMR.
	EMR or interface engine is down	Call your EMR or system administrator.
	Data was rejected for one of the following reasons: • Patient ID not found • Clinician ID not found • vitals date/time in the future • device received a message timeout notification	Check the EMR or interface engine message logs to determine root cause.

Troubleshooting the CVSM/CIWS (Newmar & Lamarr)

The CVSM/CIWS do not have a direct connection to the radio through a debug connection, so all troubleshooting will be done on the device.

Verify if a CA Root certificate is loaded on the radio

To check if the CA Root certificate is loaded, navigate to: Advanced > Network > Radio

- Enable radio selected
- ESSID = Enter an WPA2-Enterprise SSID
- Set the Authentication type to WPA2-Enterprise (Newmar) or WPA2-AES (Lamarr)
- Set the EAP Type to PEAP-MSCHAPv2 (Newmar) or PEAP (Lamarr)
- Check the Server validation box

  (Newmar Only - Lamarr doesn't have Server validation option)
- Enter valid Identity & Password
- Touch **Configure radio**

Newmar

If the "*Configuration invalid without certificates. Install certificates and try again.*" message appears in the banner, the CA Root Certificate is not loaded.

Lamarr

If the CVSM/CIWS does not connect to the WLAN, the CA Root Certificate is not loaded.

Verify if a Client certificate is loaded

To check if the Client certificate is loaded, navigate to: Advanced > Network > Radio

- Enable radio selected
- ESSID = Enter an WPA2-Enterprise SSID
- Set the Authentication type to WPA2-Enterprise (Newmar) or WPA2-AES (Lamarr)
- Set the EAP Type to TLS
- Check the Server validation box

  (Newmar Only - Lamarr doesn't have Server validation option)
- Enter valid Identity
- Touch **Configure radio**

Newmar

If the "*Configuration invalid without certificates. Install certificates and try again.*" message appears in the banner, the Client Certificate is not loaded.

Lamarr

If the CVSM/CIWS does not connect to the WLAN, the CA Root Certificate is not loaded.

NOTE Newmar Radio version 2.00.02 will encrypt the password file which is stored at: /etc/welchallyn/clientpassword or /pacpasword.

Service record

Print the*Service record* pages to enter and save the results of your tests.

Date:	**Time**:
Device name:	**Serial number**:
Technician:	**Service tool version**:

Leak test

Leak test	Specification	Actual reading	Pass	Fail
Leak test:	Max: 5			

Overpressure test

Overpressure test		Specification	Actual reading
Over Pressure Test:	Adult mode:	280 329	
	Neonate mode:	130 164	

NIBP accuracy check

Target pressure ± 5 mmHg	Pressure meter	Service tool	Specification	Pass	Fail
0 mmHg	mmHg	mmHg	± 1 mmHg		
50 mmHg	mmHg	mmHg	± 3 mmHg		
150 mmHg	mmHg	mmHg	± 3 mmHg		

250 mmHg		mmHg	mmHg	± 3 mmHg	

Masimo SpO2, SpHb, heart rate, and RRa tests

Test	Specification	Actual reading		Pass	Fail
SpO2 heart rate 61 bpm	Pulse rate 61 ±1 bpm 59 to 61 bpm		bpm		
SpO2 saturation 81%	Saturation 81% ±3% 78 to 84%		%		
SpHb g/dL 14 g/dL	SpHb 14 g/dL ±1 g/dL 13 g/dL to 15 g/dL		g/dL		
RRa	A measurement between 5 and 16 breaths per minute		breaths per minute		

Nellcor SpO2 and heart rate test

Test	Specification	Actual reading		Pass	Fail
SpO2 heart rate 60 bpm	Pulse rate 60 ±1 bpm 59 to 61 bpm		bpm		
SpO2 saturation 90%	Saturation 90% ±1 sat point 89 to 91%		%		

Calibration key temperature test for SureTemp Plus

Temperature test	Specification ± 0.2°F (± 0.1°C)		Actual reading	Pass	Fail
97.3 °F (36.3°C)	97.1 to 97.5°F	36.2 to 36.4°C	°F or °C		

SureTemp Plus test

9600 Plus Calibration Tester ID number	Calibration Date	Next Calibration Due Date

Temperature tested	Specification	Range		Actual reading	Pass	Fail
96.8 °F (36.0 °C)	± 0.3 °F (± 0.2 °C)	96.5 °F to 97.1 °F	35.8 °C to 36.2 °C	°F or °C		
101.3 °F (38.5 °C)	± 0.2 °F (± 0.1 °C)	101.1 °F to 101.5 °F	38.4 °C to 38.6 °C	°F or °C		
105.8 °F (41.0 °C)	± 0.3 °F (± 0.2 °C)	105.5 °F to 106.1 °F	40.8 °C to 41.2 °C	°F or °C		

Braun ThermoScan PRO 4000 or PRO 6000 test

9600 Plus Calibration Tester ID number	Calibration Date	Next Calibration Due Date

Temperature tested	Specification ± 0.4 °F (± 0.2 °C)		Actual reading	Pass	Fail
96.8 °F (36.0 °C)	96.4 °F to 97.2 °F	35.8 °C to 36.2 °C	°F or °C		
101.3 °F (38.5 °C)	100.9 °F to 101.7 °F	38.3 °C to 38.7 °C	°F or °C		
105.8 °F (41.0 °C)	105.4 °F to 106.2 °F	40.8 °C to 41.2 °C	°F or °C		

ECG functional test record

Inspection of module and cables

Step	Acceptance criteria	Pass	Fail
1	No missing parts, cuts, cracks, or discoloration to ECG patient cables		
2	No missing parts, cuts, cracks, or discoloration to USB cable		
3	No broken plastic, cracks, discoloration, missing parts, or rattle to module		

ECG module LED test

Step	Acceptance criteria	Pass	Fail
1	ECG module LED is off		
3	ECG module LED is amber then steady green		
5	ECG module LED is flashing green		

Waveform and heart rate test

Step	Acceptance criteria	Displayed heart rate		Pass	Fail
3	Waveform present (normal sinus rhythm) Heart rate 80 ♥/min +/- 3 ♥/min	Lead I HR	♥/min		
5		Lead II HR	♥/min		
5		Lead III HR	♥/min		
5		Lead V HR	♥/min		

Lead-off alarm test

Step	Acceptance criteria	Lead	Pass	Fail
1	Connex device displays the following messages: Alert: Cannot analyze ECG. Technical alarm: Lead off	RA or R		
3		LA or L		
3		RL or N		
3		LL or F		

3	V1 or C1

Respiration test

Step	Acceptance criteria	RR		Pass	Fail
6	Respiration rate is 15 BPM +/- 2 BPM		BPM		

Arrhythmia alarm test

Step	Acceptance criteria	Delay		Pass	Fail
5	Asystole alarm triggered ≥ 4 seconds		seconds		

Pacemaker detection test

Step	Acceptance criteria	Lead	Pass	Fail
10	Pacer spike marker appears before each QRS complex	Lead I		
11		Lead II		
11		Lead III		
11		Lead V		

CO2 calibration or calibration check

	Measured CO2	Pass	Fail
CO2 _____%			
CO2 successfully calibrated on:			

EarlySense check

	Present	Not present
Movement frame		
Exit sensitivity		