

 BladderScan®



# BLADDERSCAN **BVI 9400**

## Verathon Service Partner Manual

0900-4472 REV-11

BLADDERSCAN

# BVI 9400

## Verathon Service Partner Manual

Effective: September 15, 2022

Caution: Federal (United States) law restricts this  
device to sale by or on the order of a physician.

## CONTACT INFORMATION

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The BladderScan technology described in this manual is protected by U.S. Patent Numbers 5,235,985, 6,676,605, and 6,884,217. The Scan Point technology described in this manual is protected by U.S. Patent Number 6,569,097. Other international patents pending.

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# INTRODUCTION

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## SERVICE PARTNER PROGRAM OVERVIEW & BENEFITS

The BladderScan BVI 9400 Service Partner Program gives you the tools and training necessary to perform factory-recommended certifications and repairs at your own facility. This annual certification service is one of the ways Verathon ensures that your BladderScan instruments perform to the highest standards.

This service partner manual provides detailed instructions on how to certify, troubleshoot, and repair BladderScan BVI 9400 devices.

### IMPORTANT

For detailed information about the system and how to operate it, see the latest BladderScan BVI 9400 Operations & Maintenance Manual, available at [verathon.com/service-and-support](http://verathon.com/service-and-support). Prior to operating the instrument, ensure that you are familiar with the content in the Operations & Maintenance manual(s) and you have watched the onboard tutorial video.

## HOW TO USE THIS MANUAL

*Note: To ensure that the figures and instructions are completely legible, this document must be printed in color. Do not use this document if it has been printed in black and white. Images of parts and labels are for representational purposes only and are subject to change without notice.*

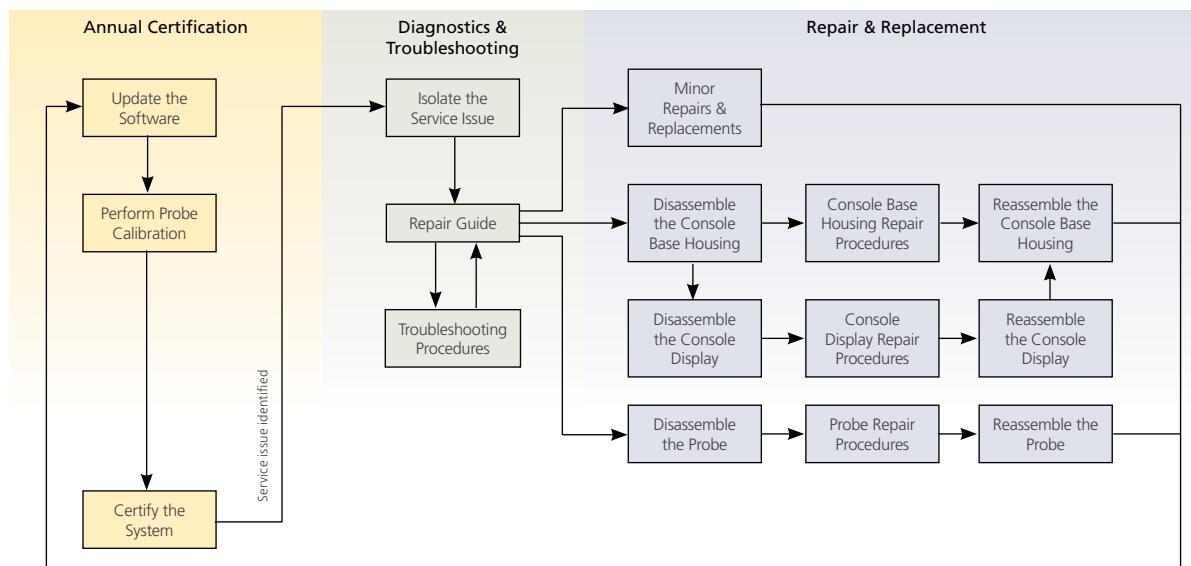
This manual is divided into the following chapters:

- **Introduction**—Includes an overview of how to use this manual and the required certifications, environment, and recommended tools needed in order to service a device. Also contains warnings and cautions. Ensure that you read and understand this chapter before performing repairs.
- **Annual Certification**—Contains procedures for performing annual maintenance and certification of the system. If the system requires service, you continue to the Diagnostics & Troubleshooting chapter.
- **Diagnostics & Troubleshooting**—Provides information about identifying the source or location of service issues, identifies the corrective procedures for service issues, and contains additional troubleshooting procedures for performance issues.
- **Repair & Replacement**—Provides targeted procedures for replacing and repairing components and parts within the console base housing, console display, or probe.
- **Reference Documentation**—Includes helpful information, such as product specifications, a complete list of available parts and part numbers, and a glossary.

## HOW TO SERVICE AN INSTRUMENT

The annual maintenance and certification procedures are contained in the Annual Certification chapter. As you complete these procedures, you may identify a service issue or required repair. If a service issue is identified, you will use the Diagnostics & Troubleshooting chapter and Repair & Replacement chapter in order to service the system. The following figure illustrates the general order in which you should complete these procedures and advance through the manual.

Figure 1. General Service Workflow



If a service issue is discovered while certifying the instrument, use the [Diagnostics & Troubleshooting](#) chapter in order to isolate the service issue to the console or the probe. The [Repair Guide](#) section identifies which repair procedures to complete and a recommended completion order. By completing the corrective procedures in the indicated order, you are troubleshooting and eliminating possible sources of the failure.

Once you have isolated the issue and identified the likely repair procedures, continue to the [Repair & Replacement](#) chapter, which is divided into three sections: minor service procedures, the console, and the probe. Use the disassembly procedure in each section in order to service that component, and then complete the repair or replacement procedures indicated during troubleshooting. Once the failure has been resolved, additional corrective procedures may not be required. Reassemble and complete service as detailed in each section. Use the [Annual Certification](#) chapter in order to certify the instrument and confirm that it is in good working condition after completing service.

# REQUIREMENTS FOR SERVICE

## CERTIFICATIONS

Only trained Verathon Service Partners, qualified to perform these activities, should perform the procedures contained within this manual. Verathon Service Partners agree to comply with the following:

- All maintenance and servicing will be conducted in accordance with the standards set forth in this manual.
- All repair parts, accessories, and product-specific calibration test equipment will be purchased directly from Verathon Inc.
- Only authorized Verathon Inc. parts will be used, and components will not be modified, changed, or substituted for any purpose.
- All soldering must comply with IPC/EIA J-STD-001C and IPC-A-610 standards.

Stop and seek assistance from Verathon Customer Care if, during the course of following a procedure, you notice something unsafe or beyond your training and experience.

## ENVIRONMENT

In order to protect electrical and electronic parts (such as PCBAs), ensure that you are working in an environment with an electrostatic discharge (ESD) control program. Any parts that are sensitive to ESD are marked with one of the following symbols.

*Figure 2. ESD Symbols*



## ROHS COMPLIANCE

Some BVI 9000 consoles and probes are compliant with the Restriction of Hazardous Substances (RoHS) Directive, which restricts the use of certain hazardous substances in electrical and electronic equipment. Consoles and probes that are compliant with RoHS can be identified by the number 3 as the third digit in the serial number. For example, the serial number *B4301234* for a 9400 console would be a RoHS-compliant instrument. When you are servicing one of these consoles or probes, ensure that you use RoHS-compliant materials and parts. For any questions about RoHS-compliant equipment, please contact Verathon Customer Care.

## UDI COMPLIANCE

Depending on its date of manufacture, a Verathon product may or may not conform to the Unique Device Identification (UDI) standard. For items manufactured before the standard went into effect, the identity of the product line and the individual device are shown on the product's labels and packaging as plain text. For items manufactured to comply with the standard, the identity and specifications of the product line are shown as a registered code on the product's labels and packaging. The identity of the individual device, frequently a serial number, appears within the code.

When replacing a product label, be sure to use the appropriate replacement part (either UDI-compliant or non-UDI). For any questions about UDI-compliant equipment, contact Verathon Customer Care.

## RECOMMENDED INSTRUMENTS & TOOLS

Be aware of the pressure that you are applying to the screw, as the screws and the housings are susceptible to breaking if too much force is used.

For information about the parts and components used when servicing a BVI 9400 instrument, see [Part Numbers](#) on page 124. The following tools are recommended in order to service the system:

- Power screwdriver
  - T10 star bit
  - T6 star bit
  - T5 star bit
  - 2 mm hex bit
- Small flat-head screwdriver
- Tweezers
- Bar clamp
- Spreader
- Wire cutters
- Pliers
- Scissors (small)
- X-ACTO knife
- Magnet
- Sandpaper, 600 grit or finer
- Loctite 422 Super Bonder (0135-0042)
- Eraser
- Ionized air gun
- Isopropyl alcohol, 70% or higher
- Kimtech wipes
- Foam swabs
- Cotton swabs (Q-tips)
- Soldering station with the following equipment:
  - Soldering iron
  - Solder
  - Flux
  - Desolder suction system, Metcal DSI
  - Desolder suction system tip cartridge, 1.8 mm round, Metcal STDC-804L
- PC station(s) running Scan Point with QuickPrint
- Phantoms:
  - Certified adult bladder phantom (0620-0068)
  - Certified pediatric bladder phantom (0620-0273)
- Calibration kit (0620-0340)
- BVI 9400 test console (0270-0676)
- BVI 9400 test probe (0570-0351 or E570-0351; 2 recommended)
- BVI 9400 battery charger/wireless hub kit (0270-0432)
- BVI 9400 USB cable (0600-0331)
- BVI 9400 battery (0400-0066)
- Kapton tape
  - Square (0280-0021)
  - 0.6 cm ( $\frac{1}{4}$ -in; 0136-0029)
  - 1.3 cm ( $\frac{1}{2}$ -in; 0136-0059)

## RECOMMENDED REPAIR STOCK

The spare parts listed in this section are likely to be needed as you repair the system. Verathon recommends keeping at least one of each part in stock.

PART	PART NUMBER
<b>Console Parts (Recommended)</b>	
Display housing lens assembly	0142-0854
Display housing lens	0122-0938
Display housing grip	0142-0269
Display housing bottom	0120-0373
Base housing top cover assembly	0142-0623
Base housing bottom cover	0142-0274
LCD flex cable	0141-0805
LCD flex cable (for old model LCDs)	0600-0508
Magnets (1 pair)	0130-0232
<b>Console Parts (Optional)</b>	
Base housing handle assembly	0142-0271
Backlight driver flex cable	0141-0804
Inverter flex cable (for old model LCDs)	0600-0509
<b>Probe Parts (Recommended)</b>	
Probe cable	0600-0534
Probe PCBA	0142-0706
Probe LCD flex cable	0140-0191
Probe bottom cover	0142-0689
Probe top cover housing	0142-0557
<b>Probe Parts (Optional)</b>	
DCM	0142-0685
Probe top cover assembly	0142-0254

# PRECAUTIONS & WARNINGS

Warnings indicate that injury, death, or other serious adverse reactions may result from use or misuse of the device. Please heed the following warnings.

*Note: For additional warnings and cautions related to using the instrument on a patient, see the operations and maintenance manual, available at [verathon.com/service-and-support](http://verathon.com/service-and-support).*

## WARNINGS



### WARNING

**WARNING! Risk of explosion, fire, or serious injury.**

The BladderScan 9000 Series devices are provided with two lithium-ion batteries. Never short circuit the battery by either accidentally or intentionally bringing the battery terminals into contact with any other conductive object. This could cause serious injury or fire and could also damage the battery and the device.



### WARNING

**WARNING! Risk of explosion, fire, or serious injury.**

Never expose the battery to abnormal shock, vibration, or pressure. The battery's internal protective covering could fail, causing it to overheat or ignite, resulting in caustic liquid leakage, explosion, or fire, possibly resulting in serious injury.

# ANNUAL CERTIFICATION

---

In this chapter, you complete required annual maintenance for your system and certify the instrument. When servicing an instrument, it is necessary to verify that the device is functioning properly. This chapter contains the required annual maintenance and certification procedures for your system:

- **Update the Software**—You must ensure that the console is operating the correct software as part of the certification. Unless you replace the DSP PCBA, probe PCBA, or DCM bottom cover assembly after completing this procedure, it is not necessary to repeat this procedure more than once when certifying an instrument.
- **Perform Probe Calibration**—You must ensure that the probe calibration is correct as part of the certification. Unless you disassemble and reassemble the probe after completing this procedure, it is not necessary to repeat this procedure more than once when servicing an instrument.
- **Certify the System**—This procedure ensures that the system is in good working order. Repeat this procedure and system repairs as needed in order to complete service.

If, during the course of completing the procedures in this chapter, you discover that the instrument requires repair, continue to the [Diagnostics & Troubleshooting](#) chapter on page 22.

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## PROCEDURE 1. UPDATE THE SOFTWARE

---

### IMPORTANT

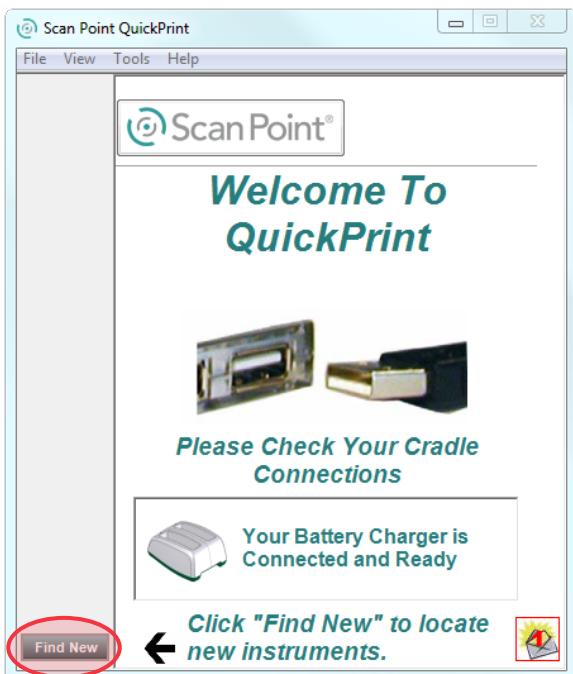
You must ensure that the console is operating the correct software as part of the certification. Unless you replace the DSP PCBA, probe PCBA, or DCM bottom cover assembly after completing this procedure, it is not necessary to repeat this procedure more than once when certifying an instrument.

QUANTITY	PART #	DESCRIPTION
Parts		
AR	—	PC with Scan Point installed

1. On the instrument, on the Home screen, press the **Scan Point** button .
2. On the computer, double-click the Scan Point with QuickPrint icon. Scan Point opens.



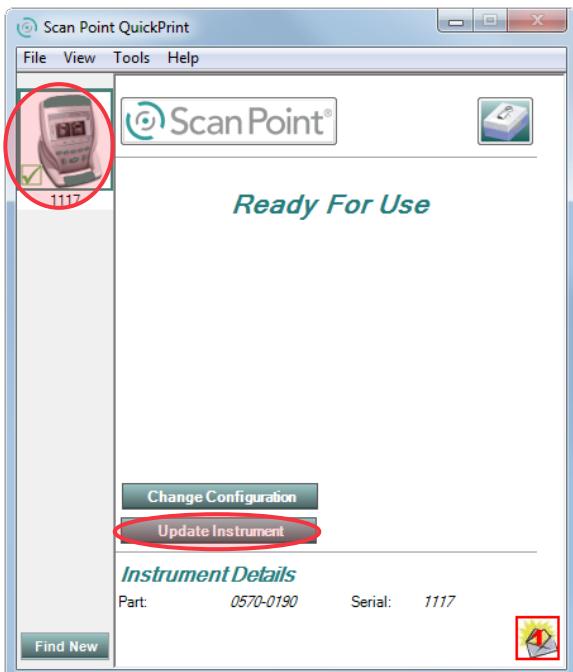
3. On the computer, in the Scan Point QuickPrint window, click **Find New**. QuickPrint establishes a connection with the instrument, and an icon for the device appears in the left pane.



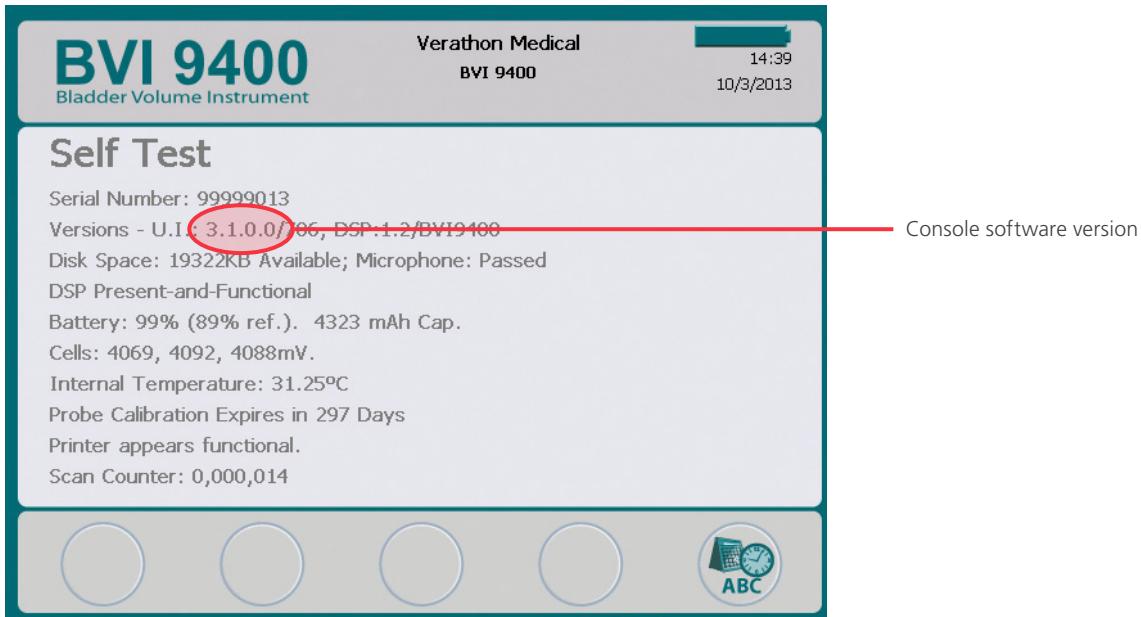
4. If a dialog box appears with the error message "0008: An error was encountered processing the exam file: Failed to upload RRD file to the DEM. Please reprocess exam," click **Close**.

*Note: If a browser window appears, close or minimize it.*

5. Select the device, verify that the serial number matches the device you are updating, and then click the **Update Instrument** button.



6. If any updates are available, the device downloads and installs them. The console displays a progress bar and automatically restarts when the installation is complete.  
If no updates are available, nothing happens.
7. If you would like to view the software version that the console is currently running, complete the procedure [Run a Self Test](#) on page 115.



## PROCEDURE 2. PERFORM PROBE CALIBRATION

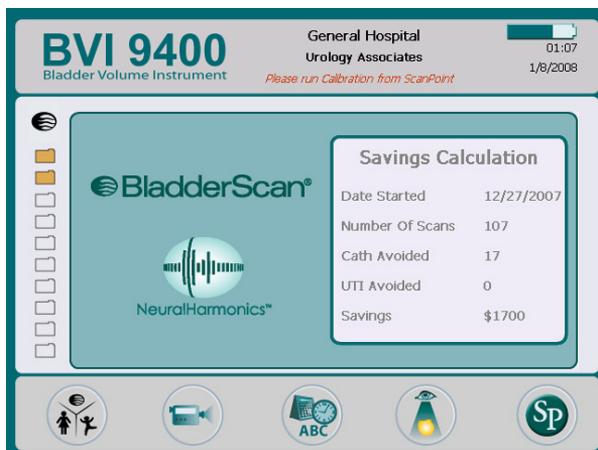
### IMPORTANT

You must ensure that the probe calibration is correct as part of the certification. Unless you disassemble and reassemble the probe after completing this procedure, it is not necessary to repeat this procedure more than once when servicing an instrument.

Calibrating ensures accurate and proper alignment of the instrument's internal coordinate system. If calibration is not performed by the prescribed date, the instrument can still be used to take scans, but the accuracy of the measurement may be compromised.

When calibration is required, a warning appears in the display header. If the warning has been disabled, the calibration warning will print on a self test. For more information about self tests, see [Run a Self Test](#) on page 115. This procedure takes approximately 15 minutes.

Figure 3. Calibration Warning



QUANTITY	PART #	DESCRIPTION
Tools		
1	0620-0340	Calibration kit (includes calibration tank and target)
—	—	PC station with Scan Point installed
1	—	Clean, soft cloth

1. Within 3 meters (10 feet) of the battery charger/wireless hub, place the calibration tank on a flat, nonreflective surface, and then remove the lid.
2. Pour clean, room-temperature water into the tank base, filling to the indicator mark. Ensure that the water is as free of bubbles as possible.

*Note: The tank may need to sit for 24 hours until the water has degassed.*

3. Using the notches to position the spiral-shaped target correctly, place the target in the tank base.



4. Replace the tank lid onto the base.
5. Place the probe into the recess in the lid. Ensure that the tip of the probe is submerged in the water.

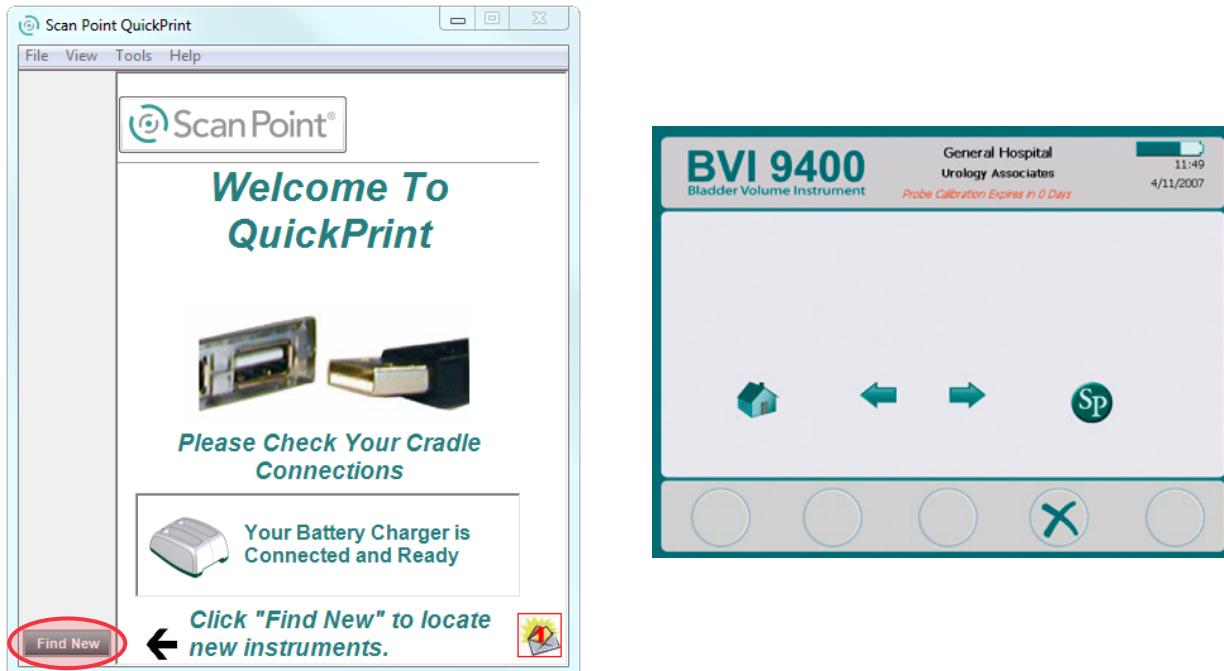


6. On the computer, double-click the Scan Point with QuickPrint icon. Scan Point opens.



7. Turn on the console.
8. On the console, on the Home screen, verify that the date in the upper right corner is current.  
If the date is not current, set the value to today's date according to the instructions in the instrument's Operations & Maintenance Manual.
9. On the Home screen, press the **Scan Point** button .

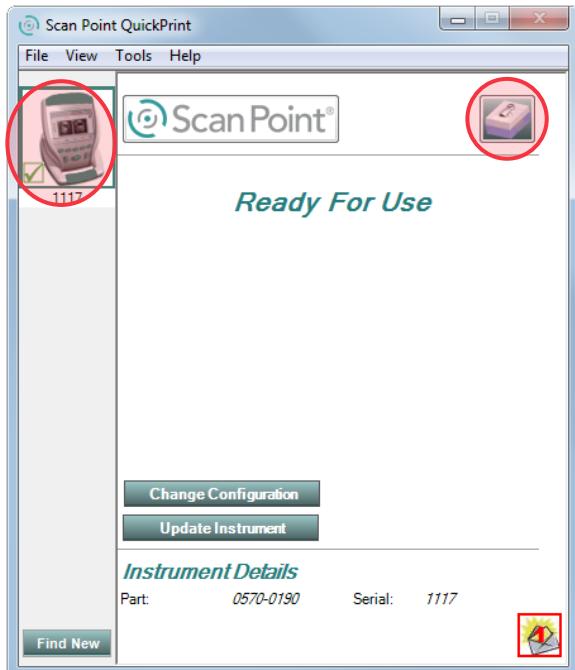
10. On the computer, in the Scan Point QuickPrint window, click **Find New**. QuickPrint establishes a connection with the instrument, and an icon for the device appears in the left pane. On the console, two arrows appear, confirming that the console is connected to Scan Point.



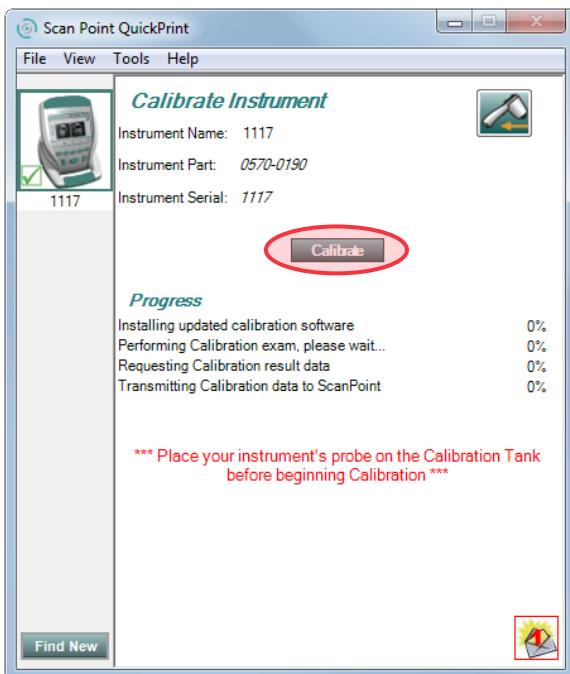
11. If a dialog box appears with the error message "0008: An error was encountered processing the exam file: Failed to upload RRD file to the DEM. Please reprocess exam," click **Close**.

*Note: If a browser window appears, close or minimize it.*

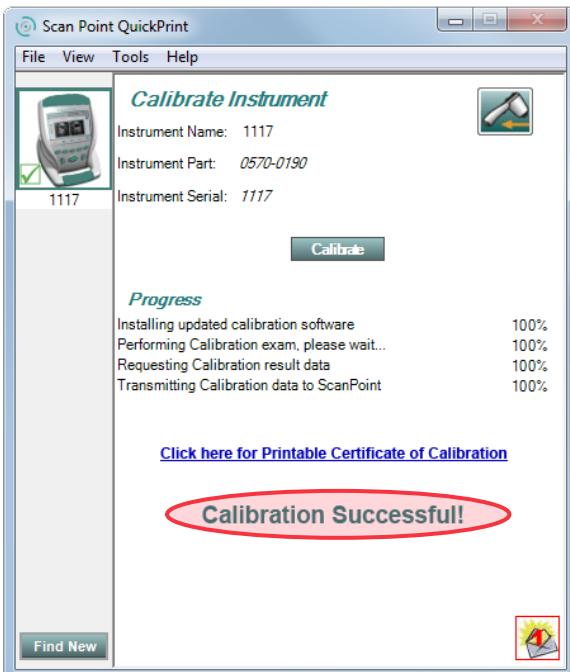
12. Select the device, and then click the calibration tank icon.



13. Click the **Calibrate** button. Scan Point begins to scan and analyze the data in order to ensure that it meets the calibration parameters. If necessary, the instrument automatically rescans the tank.



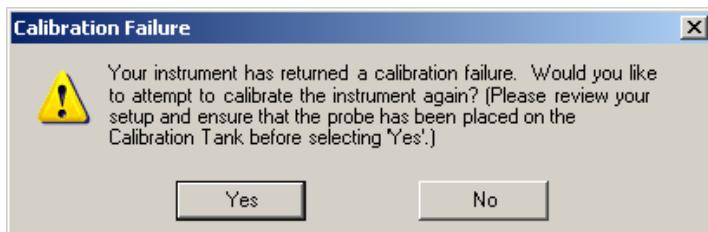
14. If calibration is successful, a "Calibration Successful" confirmation is displayed on the computer.  
If calibration fails, a "Calibration Failure" message appears.



15. If the calibration failed and you want to restart the calibration, ensure that the tank contains enough water and that the probe is seated properly in the tank lid. Then, on the "Calibration Failure" message, click **Yes**. Scan Point restarts the calibration.

If you need to review the failed scan image, click **No** to upload a record of the failed calibration to Scan Point.

If calibration continues to fail, continue to the following chapter, [Diagnostics & Troubleshooting](#) on page 22.



16. On the console, press the **Exit** button . This terminates the calibration procedure and ends communication with Scan Point.
17. Remove the probe from the tank lid, and then dry it with a clean, soft cloth.

---

## PROCEDURE 3. CERTIFY THE SYSTEM

---

After completing maintenance or repairs to the system, it is necessary to verify that the device is functioning properly. Complete this procedure in order to verify that the system is in good working order.

The Certification of Calibration and Compliance program is one of the ways that Verathon assures its customers that the BVI instruments are performing to the highest standards. Verathon strongly recommends that certification be performed once a year. This program ensures maximum productivity of the instrument and extended product life through regular inspections and maintenance. This is accomplished by physically inspecting the instrument; performing a number of tests on the probe, console, and printer; upgrading the software; and replacing the batteries if necessary. The goal is to ensure the instrument is functioning as well as a new unit. Often, the need for additional service may be discovered while performing certifications. This makes it imperative to complete the entire procedure and thoroughly check the instrument.

If you are certifying a BVI 9400 instrument and you have a pediatric bladder phantom available, ensure that you complete a scan in pediatric mode in order to certify that the instrument is functioning properly. If you do not have access to a pediatric bladder phantom, you cannot certify the pediatric mode on the instrument, although you may certify both adult modes by using the adult bladder phantom included in the Service Partner Program. For more information about how to purchase a pediatric bladder phantom, contact Verathon Customer Care or your local Verathon representative.

QUANTITY	PART #	DESCRIPTION
Parts		
AR	0125-2039	Battery caution label
Tools		
—	—	PC station with Scan Point with QuickPrint installed
AR	0620-0068	Certified adult bladder phantom
AR	0620-0273	Certified pediatric bladder phantom
1	0620-0340	Calibration kit
1	0600-0331	BVI 9400 USB cable
1	0270-0432	BVI 9400 battery charger/wireless hub kit
1	0400-0066	BVI 9400 lithium-ion battery
AR	0800-0319	Thermal paper roll for the printer



## BLADDERSCAN BVI 9400

# CERTIFICATE OF CALIBRATION & COMPLIANCE

Instrument SN: \_\_\_\_\_ Asset Number: \_\_\_\_\_

Probe SN: \_\_\_\_\_ Location: \_\_\_\_\_

The tests performed by the technician on the equipment listed above confirmed that it met all applicable product manufacturing and test specifications. Certification service is performed in compliance with Verathon Inc. manufacturing test specifications and equipment.

Verathon recommends that certification of calibration be performed once a year.

Today's Date: \_\_\_\_\_ Next Certification Date: \_\_\_\_\_

### COMPLIANCE WITH "CERTIFY THE SYSTEM" PROCEDURE

- |                                                                      |                                                                          |
|----------------------------------------------------------------------|--------------------------------------------------------------------------|
| <input type="checkbox"/> Update system software                      | <input type="checkbox"/> Self-test printout is accurate and legible      |
| <input type="checkbox"/> Calibrate the probe                         | <input type="checkbox"/> Scan results accurate (record in table below)   |
| <input type="checkbox"/> Cosmetic and physical inspection            | <input type="checkbox"/> Annotation is audible and clear                 |
| <input type="checkbox"/> Buttons, video, and audio function properly | <input type="checkbox"/> Battery charger/wireless hub functions properly |
| <input type="checkbox"/> System passes self-test                     | Replaced batteries? <input type="radio"/> Yes <input type="radio"/> No   |

### SCAN RESULTS ON TISSUE-EQUIVALENT PHANTOM

Ensure that you capture at least one scan result in each scan mode. If desired, collect three scan results in each mode in order to ensure consistency. Confirm the results are within the accuracy range of the system's certified value.

*Note: You may only certify small child mode if a pediatric bladder phantom is available.*

SCAN MODE	PHANTOM VOLUME	SCAN #1	SCAN #2	SCAN #3	WITHIN RANGE?
Male mode					<input type="radio"/> Yes <input type="radio"/> No
Female mode					<input type="radio"/> Yes <input type="radio"/> No
Small child mode					<input type="radio"/> Yes <input type="radio"/> No

Comments:

### CERTIFIED ON BEHALF OF VERATHON INC. BY:

---

Technician's Signature

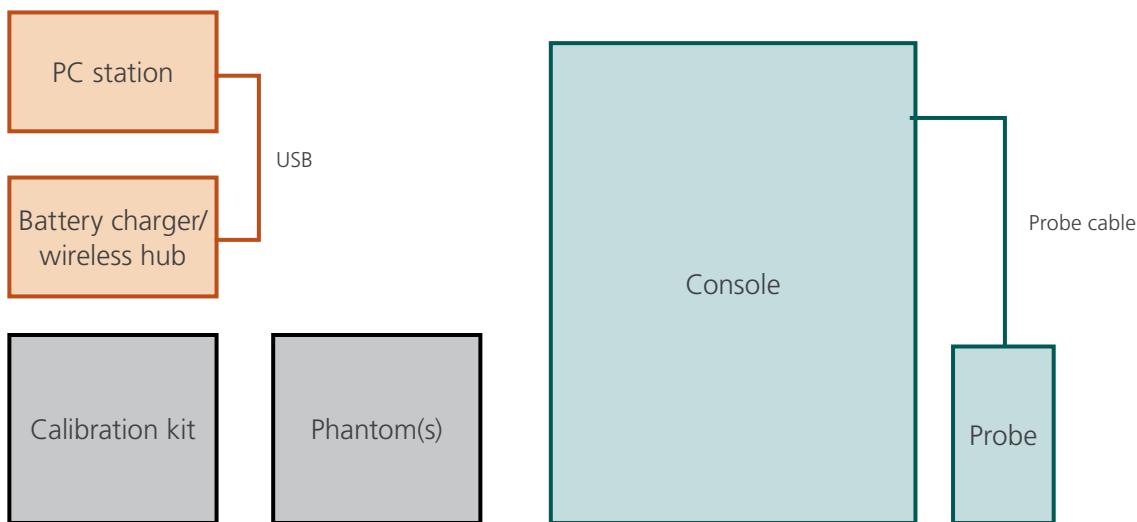
Date

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Figure 4. Station Setup



## STATION SETUP

1. Verify the following:
  - The station is set up with all equipment, as illustrated in [Figure 4](#).
  - Scan Point with QuickPrint has been installed on the PC station.
  - The PC station has an adequate Internet connection.
  - The battery charger/wireless hub is connected to the PC station via the USB cable provided.
  - The probe cable is plugged into the console.
  - Paper is correctly inserted into the console, according to the procedure [Load Thermal Paper](#) on page 118.
2. Make a copy of the "Certificate of Calibration & Compliance" on page 16. As you progress through this procedure, complete the certificate.
3. If you have not done so already, update the system software in accordance with the procedure [Update the Software](#) on page 7.
4. If you have not done so already, calibrate the probe in accordance with the procedure [Perform Probe Calibration](#) on page 10.

## COSMETIC AND PHYSICAL INSPECTION

If you encounter any damage to the system during the course of this procedure, replace the applicable part according to the instructions in the [Repair & Replacement](#) chapter on page 35.

5. Inspect the console for any cracks or damage that could cause harm to the patient or the user.
6. Inspect for stress caused by inaccurate assembly, such as protruding screws or covers that are distorted or warped.
7. Inspect the console and probe for cleanliness.
8. Verify that all screws, feet, and surfaces are well seated.

9. Verify fit and alignment of all surfaces, ensuring that there are no cracks or gaps that may permit water ingress.

Figure 5. Unacceptable Gap in Assembly

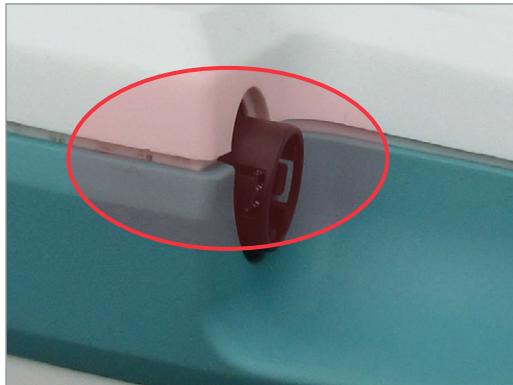


Figure 6. Proper Fit and Alignment



10. Secure the printer paper and print roller, and then gently shake the console to ensure there are no loose parts.

## TURN ON THE SYSTEM

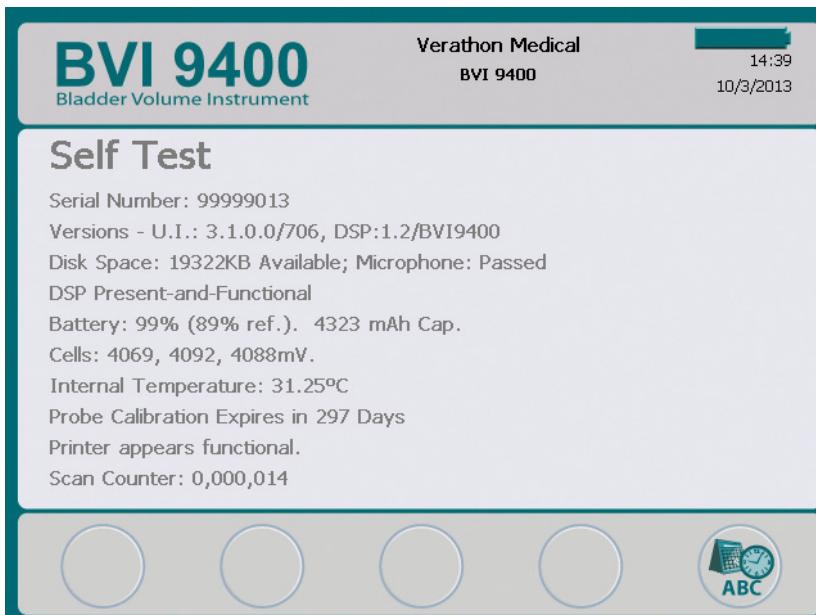
11. Place a battery into the console, and then allow the device approximately 30 seconds to power up.  
If the device does not start automatically, press the **Power** button.
12. If the Date & Time screen appears, press the **Home** button .
13. Check for irregularities or dead pixels on the LCD.

## TEST THE BUTTONS, VIDEO, AND AUDIO

14. On the Home screen, press the **Tutorial** button .
15. On the Tutorial screen, press the **Enter** button .
16. On the Video Viewing screen, press the **Play** button . The tutorial video begins to play.
17. While the video is playing, do the following:
  - Verify that the picture is clear.
  - Verify that the sound is audible and free of errors.
  - To the right of the Power button, press the **Volume Up** and **Volume Down** buttons and ensure that the audio level adjusts accordingly.
  - To the left of the Power button, press the **Brightness Up** and **Brightness Down** buttons and ensure that the screen brightness level adjusts accordingly.
18. Press the **Pause** button , and then press the **Home** button .
19. On the Home screen, press the **Scan Point** button . Ensure that the Scan Point Connection screen opens.
20. Press the **Exit** button .

## **PERFORM A SELF TEST**

21. Ensure there is a roll of thermal paper in the console.
22. On the Home screen, press the **Settings** button .
23. Press the **Down**  button until **Self Test** is highlighted, and then press the **Enter** button . The Self Test screen opens, and testing begins automatically. The display provides status and results, and when the test is complete, the printer prints the results.



24. Verify that all tests have been passed, the printout does not have any irregularities, and the serial number on the printout matches the serial number on the console.

If any errors are reported during the self-test, service may be required on the instrument. Skip to the [Diagnostics & Troubleshooting](#) chapter on page 22.

25. Press the **Settings** button , and then press the **Home** button .

## **SCAN THE PHANTOMS**

26. Select one of the following phantoms in order to test the measurements appropriate for the device:
  - If you are testing male or female bladder volume, use the certified adult bladder phantom.
  - If you are testing child bladder volume, use the certified pediatric phantom.
27. Place water on the scan membrane of the phantom, ensuring that the entire membrane is covered.
28. Press the **Mode** button  until the male figure is selected.
29. Place the dome section of the probe onto the phantom scan membrane, and then press it gently against the top surface of the phantom.
30. On the probe, press the **Scan** button. The probe scans the phantom.

31. When the scan is complete, verify that all 8 arrows on the probe LCD are flashing.

If some of the arrows on the probe LCD do not flash, or if the bladder image is not centered in the target crosshairs, repeat the scan.



32. On the console screen, verify that the measurement is within the accuracy range specified in the red box in the section [Accuracy Specifications](#) on page 119.

33. Press the **Record** button
- , and then speak clearly into the microphone port on the probe.

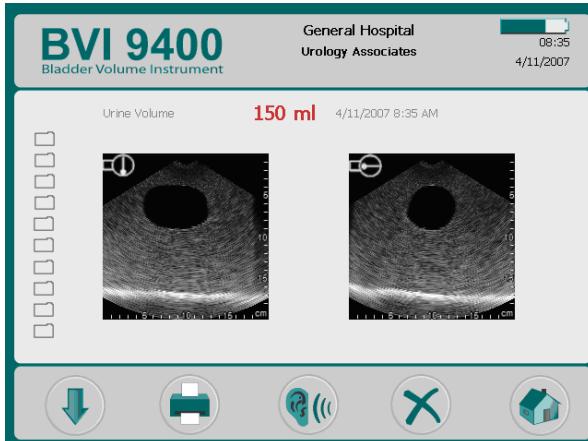
34. Press the **Stop** button
- , and then wait approximately 5 seconds for the console to save the voice annotation.

35. Press the **Listen** button
- . The voice annotation that you just recorded plays back.

36. Verify that the voice annotation is audible and clear.

37. Press the **Review** button
- , and then view the test exam results.

38. Verify that the ultrasound images are clear and resemble the following figure.



39. Press the **Home** button
- .

40. Repeat Step 26 through Step 39 as needed to collect male and female bladder volume measurements, and if a pediatric bladder phantom is available, collect small child bladder volume measurements. Refer to the section [Accuracy Specifications](#) on page 119 in order to verify that the measurements are within the accuracy range.

41. If desired, perform a scan in each mode up to three times each and ensure that the measurements are reasonably consistent.

42. From the home screen, press **Review** button
- , and then view a test exam result.

43. Press the **Delete** button
- until all exams performed during this procedure are deleted.

## **TEST THE BATTERY CHARGER/WIRELESS HUB**

44. Inspect the battery charger/wireless hub and batteries for damage.
45. Plug the battery charger/wireless hub into an outlet or power supply.
46. Insert known-good batteries into the battery charger.
47. Verify that the LED light turns orange or green, confirming that the batteries are charging or are already fully charged.

## **FINALIZE THE CERTIFICATION**

48. Make sure that you have completed the Certificate of Calibration & Compliance fully and accurately.

# DIAGNOSTICS & TROUBLESHOOTING

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## IDENTIFYING THE SOURCE OF THE ISSUE

Accuracy and performance issues may be the result of a service issue or caused by a deviation from the proper instructions for use. Prior to completing any repair or replacement procedures, it is recommended that you do the following:

- Ensure that the user is following the proper instructions for use, as provided in the latest version of the *Operations & Maintenance Manual*, available at [verathon.com/service-and-support](http://verathon.com/service-and-support).
- Compare the user's ultrasound results to the images in the procedure [Troubleshoot by Using Ultrasound Images](#) on page 30. This diagnostic procedure can help identify if the user is applying the appropriate amount of ultrasound gel, accurately aiming the probe, and/or applying the correct amount of pressure with the probe.
- When scanning patients, ensure that the user is familiar with the following situations, which may affect accuracy:
  - Use care when scanning patients who have had suprapubic or pelvic surgery. Scar tissue, surgical incisions, sutures, and staples can affect ultrasound transmission and accuracy.
  - Do not use the BladderScan instrument on a patient with open skin wounds in the suprapubic region. The device is not appropriate for use on such patients.
  - Do not use the BladderScan instrument on a patient with ascites.
  - Do not use the BladderScan instrument on a pregnant patient.
  - A catheter in the patient's bladder may affect the accuracy of the bladder volume measurement by introducing air into the bladder that blocks the ultrasound signal or by having the catheter-retaining balloon interfere with the volume measurement.
  - Obesity may affect ultrasound bladder volume measurements. Lift as much abdominal adipose tissue out of the way of the instrument as possible. Apply more pressure to the probe to reduce the amount of adipose tissue through which the ultrasound must pass.

If the issue is not resolved by reviewing the instructions for use or diagnostic images, then the issue is likely caused by a service issue within the console or probe. Complete the following procedure to identify the location of the service issue.

## PROCEDURE 4. ISOLATE THE SERVICE ISSUE

If the instrument is experiencing a performance or accuracy issue, it is necessary to determine if the source of the issue is located within the console or the probe. Complete this procedure in order to determine the location.

QUANTITY	PART #	DESCRIPTION
Tools		
1	0270-0676	BVI 9400 test console
1	0570-0351 or E570-0351	BVI 9400 test probe
1	0400-0066	9x00 battery
AR	0620-0068	Certified adult bladder phantom
AR	0620-0273	Certified pediatric bladder phantom (Optional)

1. On the system that may be experiencing a service issue, ensure that the probe and console are fully connected.
2. Place a fully charged battery into the console, and then allow the device approximately 30 seconds to turn on. If the device does not start automatically, press the **Power** button.
3. If the device does not turn on, refer to the entry "System does not turn on" in [Table 1](#) on page 25.
4. Ensure that the device software is current, according to the instructions in the procedure [Update the Software](#) on page 7.
5. Turn off the instrument, and then disconnect the probe from the console.

### TEST THE CONSOLE

6. Connect the test probe to the console that may be experiencing a service issue.
7. Place a fully charged battery into the console, and then allow the device approximately 30 seconds to turn on. If the device does not start automatically, press the **Power** button.
8. Observe the probe LCD. If any of the following occur, see "Missing transducer error appears when probe is connected" or "Probe power is irregular" in [Table 1](#) on page 25:
  - The probe LCD lights do not turn off after the system has booted
  - The probe LCD lights are dim or do not turn on at all while the system is booting or when a scan is taken
  - The console screen displays the missing transducer error
9. Scan the phantom appropriate for the scanning mode according to the instructions in [Scan a Tissue-Equivalent Phantom](#) on page 116. If the scan returns all zeros, see "Inaccurate scan result" in [Table 1](#) on page 25.
10. If the service issue occurs, then repair or maintenance is required on the console. Continue to the following section, [Repair Guide](#) on page 25.

If the scan is successful, continue with this procedure.

## TEST THE PROBE

11. Connect the probe that may be experiencing a service issue to the BVI 9400 test console.
12. Make a note of the probe's part number (0570-0351 or E570-0351).
13. Place a fully charged battery into the test console, and then allow the device approximately 30 seconds to turn on. If the device does not start automatically, press the **Power** button.
14. Scan the phantom appropriate for the device according to the instructions in [Scan a Tissue-Equivalent Phantom](#) on page 116.
15. If the service issue occurs, then repair or maintenance is required on the probe. Continue to the following section, [Repair Guide](#) on page 25.

# REPAIR GUIDE

This section provides an outline of service issues and their respective corrective procedures. Ensure that you have isolated the service issue to the console or probe according to the instructions in the procedure [Isolate the Service Issue](#) on page 23. Disassemble the component according to its respective procedure, and then complete the indicated corrective procedure(s) in the order that they are listed in the Order column in [Table 1](#). As you complete the corrective procedures in the indicated order, you are troubleshooting and eliminating possible sources of the issue. Once the issue has been resolved, additional corrective procedures may not be required.

Please note that probe and console failures are not limited to those detailed in the table below. If you encounter an issue that is not documented in this manual or if you complete all of the corrective procedures and the service issue is not resolved, contact Verathon Customer Care.

*Table 1. Issues and Corrective Procedures*

ISSUE	LOCATION	ORDER	CORRECTIVE PROCEDURE	PAGE
System does not turn on	Console	1	Ensure the battery is functional and charged	—
		2	<a href="#">Clean or Replace the Battery Contacts</a>	42
		3	Ensure that the power connector is connected to the DSP PCBA	55
		4	Ensure that there are no short/open wires in the power connector wire harness. If found, replace the base housing top cover assembly in <a href="#">Replace the Handle, Printer, or Top Cover Assembly</a> .	55
		5	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Console is performing slowly	Console	1	Delete saved exams	—
		2	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Unable to save exams to console	Console	1	Delete saved exams	—
		2	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Calibration required message	Probe	—	<a href="#">Perform Probe Calibration</a>	10
Can't connect to Scan Point	Console	1	<a href="#">Troubleshoot the Connection to Scan Point</a>	29
		2	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Failure during console self test	Console	—	Contact Verathon	—
In self test, missing version numbers or error message regarding software	Console	—	<a href="#">Update the Software</a>	7

ISSUE	LOCATION	ORDER	CORRECTIVE PROCEDURE	PAGE
Console button(s) non-responsive	Console	1	Replace the Keypad PCBA or Keypad Flex Cable*	64
		2	If only the power button is non-responsive, contact Verathon	—
		3	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Scan doesn't initiate <sup>†</sup>	Probe	1	Ensure the probe is fully connected to the console	—
		2	Visually inspect probe PCBA for damage. If damaged or faulty, replace the probe PCBA in the procedure <a href="#">Reassemble the Probe</a>	109
		3	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
		4	Optionally, repair the DCM bottom cover assembly in <a href="#">Install the DCM into a New Bottom Cover</a>	106
		5	Replace the DCM bottom cover assembly in the procedure <a href="#">Reassemble the Probe</a>	109
	Console	—	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Main display too bright or dark	Console	1	Ensure that the brightness setting is not responsible	—
		2	<a href="#">Replace the LCD and LCD Flex Cable*</a>	70
		3	<a href="#">Replace the Inverter Flex Cable*</a>	75
		4	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Image on main display is discolored or jumps	Console	1	Verify that the LCD flex cable is securely seated	—
		2	<a href="#">Replace the LCD and LCD Flex Cable*</a>	70
		3	<a href="#">Replace the Keypad PCBA or Keypad Flex Cable*</a>	64
		4	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Printout is irregular	Console	1	Verify paper is loaded correctly in <a href="#">Load Thermal Paper</a>	118
		2	<a href="#">Clean the Print Head</a>	44
		3	<a href="#">Replace the Printer Door</a>	45
		4	Replace the printer in <a href="#">Replace the Handle, Printer, or Top Cover Assembly</a>	55
Battery indicator always shows that the battery is fully discharged	Console	1	<a href="#">Clean or Replace the Battery Contacts</a>	42
		2	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90

ISSUE	LOCATION	ORDER	CORRECTIVE PROCEDURE	PAGE
Calibration fails <sup>†</sup>	Probe	1	Verify that the water level in the tank is correct and that the spiral is positioned correctly	10
		2	Optionally, repair the DCM bottom cover assembly in <a href="#">Install the DCM into a New Bottom Cover</a>	106
		3	Visually inspect probe PCBA for damage. If damaged or faulty, replace the probe PCBA in <a href="#">Reassemble the Probe</a>	109
		4	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
		5	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109
	Console	—	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Inaccurate scan result or irregular bladder shape on results screen) <sup>†</sup>	Probe	1	<a href="#">Troubleshoot by Using Ultrasound Images</a>	30
		2	Visually inspect probe PCBA for damage. If damaged or faulty, replace the probe PCBA in <a href="#">Reassemble the Probe</a>	109
		3	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
		4	Optionally, repair the DCM bottom cover assembly in <a href="#">Install the DCM into a New Bottom Cover</a>	106
		5	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109
	Console	—	Complete both procedures: • Replace the probe cable in <a href="#">Reassemble the Probe</a> • Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	109 90
System reports all bladder volumes as zero	Probe	1	Visually inspect probe PCBA for damage. If damaged or faulty, replace the probe PCBA in <a href="#">Reassemble the Probe</a>	109
		2	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109
Probe makes buzzing or knocking sound	Probe	—	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109
Probe LCD is blank	Probe	1	<a href="#">Replace the Probe LCD Flex Cable</a>	100
		2	Replace the probe top cover assembly in <a href="#">Replace the Probe Top Cover Assembly or Housing</a>	102
		3	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
Silent or distorted voice annotation	Probe	1	<a href="#">Replace the Probe LCD Flex Cable</a>	100
		2	Replace the probe top cover assembly in <a href="#">Replace the Probe Top Cover Assembly or Housing</a>	102
		3	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
Probe scan button feels loose	Probe	1	Optionally, repair the DCM bottom cover assembly in <a href="#">Install the DCM into a New Bottom Cover</a>	106
		2	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109

ISSUE	LOCATION	ORDER	CORRECTIVE PROCEDURE	PAGE
Probe is leaking oil	Probe	1	Optionally, repair the DCM bottom cover assembly in <a href="#">Install the DCM into a New Bottom Cover</a>	106
		2	Replace the DCM bottom cover assembly in <a href="#">Reassemble the Probe</a>	109
Missing transducer error appears when probe is connected <sup>†</sup>	Probe	—	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
	Console	—	Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	90
Probe power is irregular <sup>†</sup>	Probe	—	Replace the probe cable in <a href="#">Reassemble the Probe</a>	109
	Console	—	Complete both procedures: • Replace the probe cable in <a href="#">Reassemble the Probe</a> • Replace the DSP PCBA in <a href="#">Reassemble the Console Base Housing</a>	109 90

\* Replace the flex cable and verify the repair prior to replacing the PCBA.

† Observed failure typically occurs within the probe rather than the console.

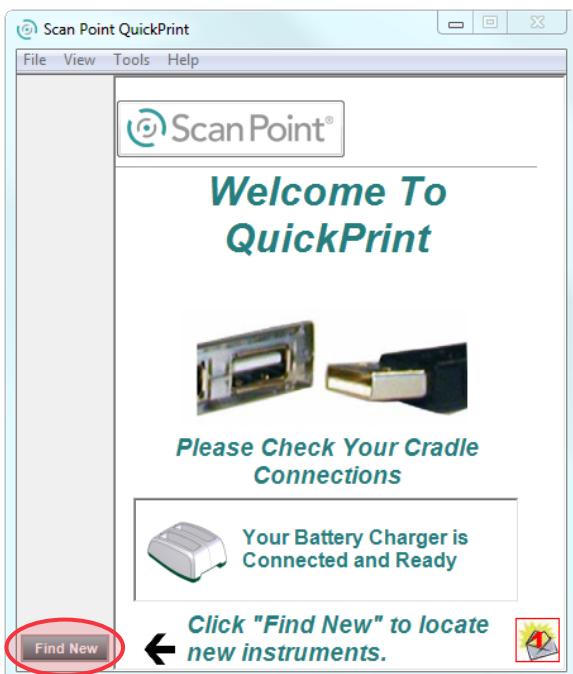
# TROUBLESHOOTING PROCEDURES

## PROCEDURE 5. TROUBLESHOOT THE CONNECTION TO SCAN POINT

QUANTITY	PART #	DESCRIPTION
Parts		
AR	—	PC with Scan Point installed

Complete this procedure if the console cannot connect to Scan Point.

1. In Scan Point, retry the connection by clicking the **Find New** button. Repeat this step up to 3 times.



If the console does not connect, continue to the next step.

2. Turn the console off, turn the console on, and then press the **Scan Point** button . On the PC, in Scan Point, click **Find New**.

If the console does not connect, repeat Step 1 (up to 3 times), and then continue to the next step.

3. On the console, press the **Scan Point** button . While the console is attempting to connect to Scan Point, remove the battery.
4. Reinsert the battery, allow the device to power on, and then press the **Scan Point** button .
5. On the PC, click **Find New**.

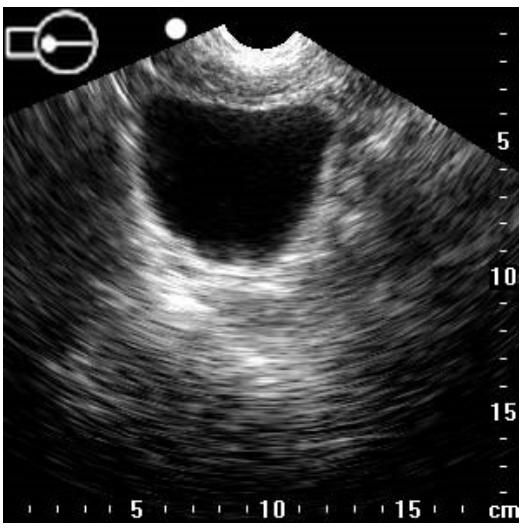
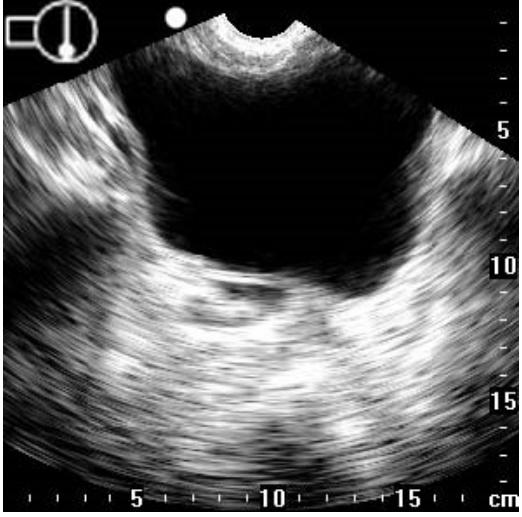
If the console does not connect, repeat Step 1 (up to 3 times), and then refer to **Table 1** on page 25.

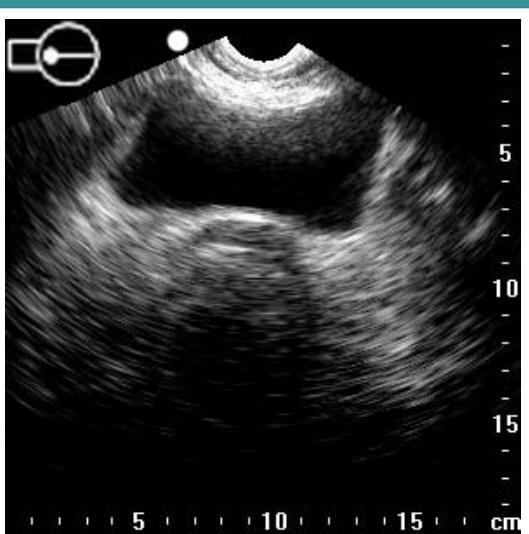
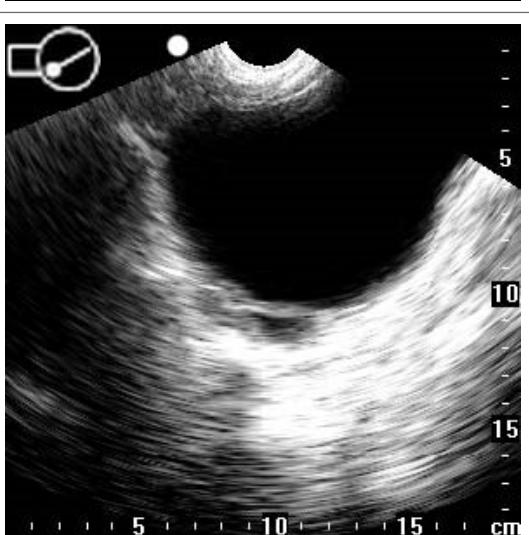
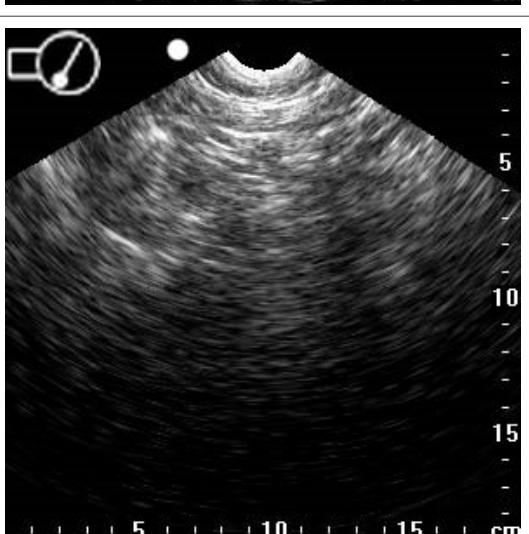
## PROCEDURE 6. TROUBLESHOOT BY USING ULTRASOUND IMAGES

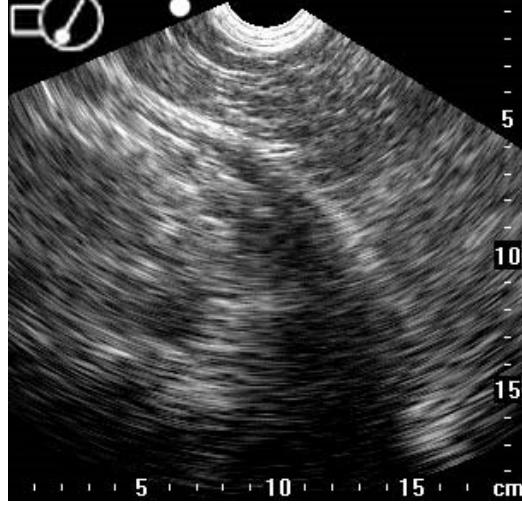
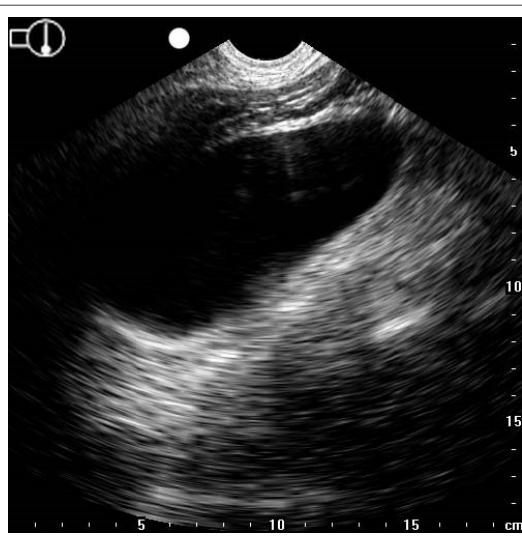
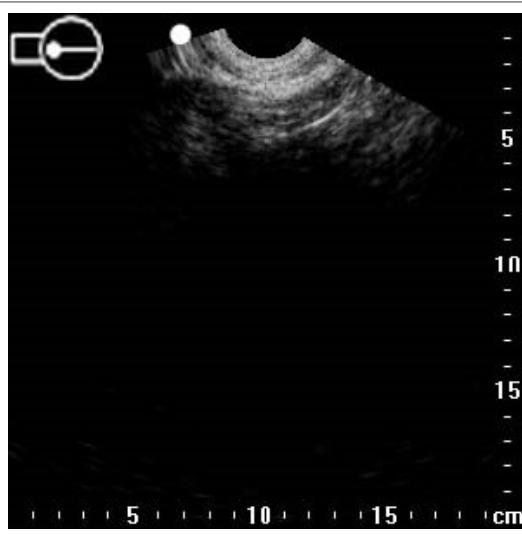
If you are experiencing inaccurate scans, it may be useful to troubleshoot for user error and instrument function by viewing the ultrasound images. On a BVI 9400, B-mode provides an ultrasound view of the bladder and the abdominal space below the probe.

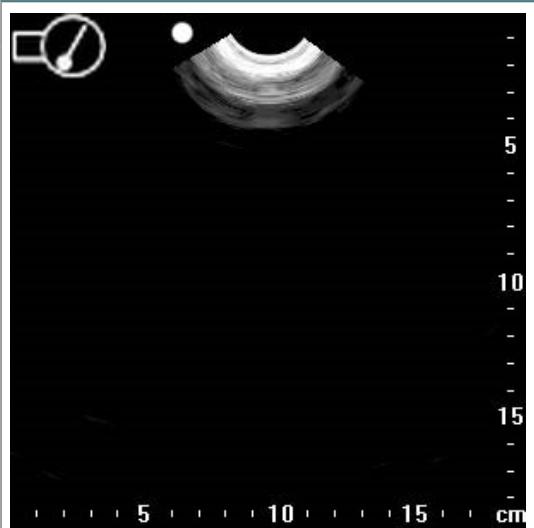
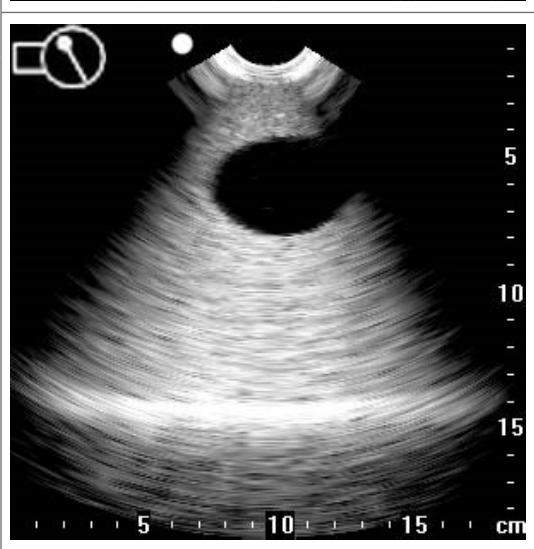
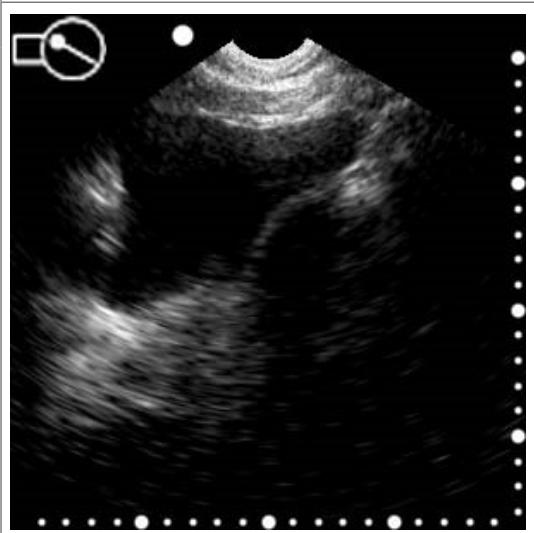
1. Using a B-mode scan result, compare it to the samples in [Table 2](#). If the sample resembles the issue that you are experiencing with the instrument, rescan per the instructions in the *Suggested adjustment* section.

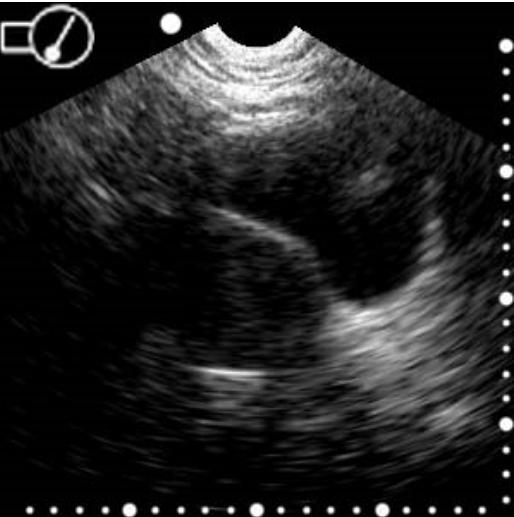
*Table 2. B-Mode Ultrasound Images of Bladder Measurements*

BLADDER IMAGE	DESCRIPTION
	<p><b>Good Scan Result and Coupling</b></p> <p><b>Description:</b> Bladder is anechoic with smooth, well-defined walls and has an oval shape. There is even contact across entire scan cone. This is an accurate reading, and no aiming arrows will be displayed.</p> <p><b>Suggested adjustment:</b> None. Good transmission through bladder and tissue. Using the proper amount of gel and pressure will facilitate a good scan result.</p>
	<p><b>Bladder Extends Outside Scan Cone</b></p> <p><b>Description:</b> The bladder is centered, and no aiming arrows are displayed; however, the bladder extends beyond the scan cone.</p> <p><b>Potential cause:</b> If this result is coupled with a large bladder volume or a scan result of the greater than symbol (&gt;), then this scan may be accurate, and the bladder volume may too large for measurement.</p> <p>If this result is coupled with a small bladder volume, then the user may be applying too much pressure with the probe and compressing the bladder.</p> <p><b>Suggested adjustment:</b> Rescan the patient and apply less pressure with the probe.</p>

BLADDER IMAGE	DESCRIPTION
	<p data-bbox="1041 185 1253 213"><b>Compressed Bladder</b></p> <p data-bbox="804 234 1481 340"><b>Description:</b> The center of the bladder appears compressed. The measurement may be accurate, and no aiming arrows appear.</p> <p data-bbox="804 361 1490 466"><b>Potential cause:</b> When too much pressure is applied while scanning, the bladder may be pushed out to one or both sides.</p> <p data-bbox="804 487 1465 551"><b>Suggested adjustment:</b> Rescan the patient and apply less pressure with the probe.</p>
	<p data-bbox="1028 734 1282 762"><b>Off-Center Bladder</b></p> <p data-bbox="804 783 1490 889"><b>Description:</b> The bladder is not centered in the scan cone. This is an inaccurate volume measurement, and the display provides an aiming arrow.</p> <p data-bbox="804 910 1473 973"><b>Potential cause:</b> The probe is not angled correctly or is misplaced on the abdomen.</p> <p data-bbox="804 994 1481 1022"><b>Suggested adjustment:</b> Re-aim and rescan the patient.</p>
	<p data-bbox="1024 1269 1286 1296"><b>Bladder Not Visible</b></p> <p data-bbox="804 1317 1432 1423"><b>Description:</b> The ultrasound image is good, but the bladder cannot be seen. The instrument provides a measurement of zero, and no aiming arrows appear.</p> <p data-bbox="804 1444 1498 1507"><b>Potential cause:</b> There may be no fluid in the bladder, or the bladder was not within the scan cone.</p> <p data-bbox="804 1529 1481 1556"><b>Suggested adjustment:</b> Re-aim and rescan the patient.</p>

BLADDER IMAGE	DESCRIPTION
 <p>This ultrasound image shows a faint, low-intensity signal representing the bladder. The probe is positioned at the top left, indicated by a circular icon with a probe tip. A vertical scale on the right indicates depth in centimeters, with markings at 5, 10, and 15. The image is characterized by significant internal noise and artifacts, likely due to surrounding adipose tissue.</p>	<p><b>Adipose Tissue</b></p> <p><b>Description:</b> The bladder appears low or faint in the scan cone. The volume measurement is inaccurate, and the instrument does not display aiming arrows.</p> <p><b>Potential cause:</b> The patient may be obese. Adipose tissue may be obscuring the scan.</p> <p><b>Suggested adjustment:</b> Rescan the patient, lift as much abdominal tissue out of the way of the probe as possible, and apply more pressure with the probe.</p>
 <p>This ultrasound image shows a dark, irregular shadow obscuring a portion of the scan cone. The probe is at the top left, and a vertical scale on the right shows depth from 5 to 15 cm. The shadow is most prominent on the left side, suggesting it is caused by the pubic bone or poor coupling.</p>	<p><b>Image Dark on One Side</b></p> <p><b>Description:</b> Shadow obscures a portion of the scan cone. Aiming arrows may not be present, and this may look like an accurate measurement in C-mode.</p> <p><b>Potential cause:</b> Shadows generally occur when the scanner is too close to the pubic bone; this results in a dark area as the ultrasound waves cannot penetrate bone. Poor coupling may also cause a scan image of this type.</p> <p><b>Suggested adjustment:</b> Adjust the probe to ensure proper location, angle, and pressure, and then rescan the patient.</p>
 <p>This ultrasound image is predominantly dark, with very little tissue visible. The probe is at the top left, and a vertical scale on the right shows depth from 5 to 15 cm. The instrument typically displays a lower or zero volume measurement in such cases.</p>	<p><b>Dark Scan</b></p> <p><b>Description:</b> Mostly dark, some tissue can be seen. Instrument typically displays a lower or zero volume measurement, and re-aiming arrows are not displayed.</p> <p><b>Potential cause:</b> This is generally caused by using an insufficient amount of gel or not applying enough pressure with the probe. A weak or failing transducer may also cause images of this type.</p> <p><b>Suggested adjustment:</b> Ensure that the user is familiar with proper scanning technique and amount of gel required. If this does not resolve the issue, calibrate the probe.</p>

BLADDER IMAGE	DESCRIPTION
 <p>A grayscale ultrasound image showing a transverse view of the bladder. The image is predominantly black, indicating no signal beyond the scan cone. A small portion of the probe is visible on the left. A scale bar at the bottom indicates 5, 10, and 15 cm.</p>	<p><b>All-Black Scan with Visible Cone</b></p> <p><b>Description:</b> Beyond the cone, the scan is entirely black. The instrument provides a measurement of zero, and no aiming arrows are displayed.</p> <p><b>Potential cause:</b> This is typically caused by an air scan, however may also be the result of not using any gel.</p> <p><b>Suggested adjustment:</b> Ensure that the user is familiar with proper scanning technique and amount of gel required, and then rescan the patient.</p>
 <p>A grayscale ultrasound image showing a transverse view of the bladder. The sides of the scan cone appear dark or incomplete. The bladder wall is visible as a bright, curved line. A scale bar at the bottom indicates 5, 10, and 15 cm.</p>	<p><b>Narrow Scan Cone</b></p> <p><b>Description:</b> The sides of the scan cone are black or missing. The volume measurement may not be accurate, and the instrument may or may not display aiming arrows.</p> <p><b>Potential cause:</b> This is generally caused by using an insufficient amount of gel.</p> <p><b>Suggested adjustment:</b> Ensure that the user is familiar with proper scanning technique and amount of gel required, and then rescan the patient.</p> <p><i>Note: This image is from a tissue-equivalent phantom. The exam registered 111 ml on an 80 ml phantom.</i></p>
 <p>A grayscale ultrasound image showing a transverse view of the bladder. The scan cone extends downwards, capturing the prostate gland, which appears as a distinct, darker, lobulated structure. A scale bar at the bottom indicates 5, 10, and 15 cm.</p>	<p><b>Male Patient: Additional Organ</b></p> <p><b>Description:</b> Prostate visible adjacent to bladder. The volume measurement may not be accurate. No aiming arrows are displayed.</p> <p><b>Potential cause:</b> The prostate, which is approximately the size of a chestnut, is situated below the neck of the bladder and is being captured within the scan cone.</p> <p><b>Suggested adjustment:</b> If the bladder volume is large, confirm measurement by using a method other than ultrasound.</p>

BLADDER IMAGE	DESCRIPTION
 A grayscale ultrasound image of a bladder. The image shows internal structures with varying shades of gray. In the upper portion, there is a bright, rounded area representing the bladder wall. To the right of the bladder, a darker, more complex structure is visible, which is identified as the uterus. The image is framed by a white border.	<p data-bbox="931 196 1375 228"><b>Female Patient: Additional Organ</b></p> <p data-bbox="801 242 1457 344"><b>Description:</b> Uterus visible adjacent to bladder. The volume measurement may not be accurate. No aiming arrows are displayed.</p> <p data-bbox="801 361 1490 424"><b>Potential cause:</b> The uterus may contain fluid that interferes with the accuracy of the volume measurement.</p> <p data-bbox="801 443 1506 544"><b>Suggested adjustment:</b> Ensure that the scan mode is set to female patient. If the bladder volume is large, confirm measurement by using a method other than ultrasound.</p>

# REPAIR & REPLACEMENT

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## MINOR REPAIRS & REPLACEMENTS

This section contains the minor, miscellaneous repairs that do not require disassembly of the console or probe. If you encounter a system performance issue, related procedures in this section should be the first attempt at resolving the issue.

This section consists of the following procedures:

- Replace the Display Housing Lens
- Clean or Replace the Battery Contacts
- Clean the Print Head
- Replace the Printer Door

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### PROCEDURE 7. REPLACE THE DISPLAY HOUSING LENS

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When you replace the display housing lens, it is not necessary to completely disassemble the console display or base housing. Use the steps in this procedure in order to replace the lens.

QUANTITY	PART #	DESCRIPTION
Parts		
AR	0122-0938	BVI 9400 display housing lens
AR	0120-0376	Keypad buttons
6	0261-0315	Display housing screw, M2, 10 mm
8	0261-0091	Base housing screw, M3, 12 mm
4	0120-0367	Base housing foot
Tools		
AR	—	Ionized air gun or a similar tool
1	—	T10 star screwdriver
AR	—	T6 star screwdriver
AR	—	T5 star screwdriver
1	—	X-ACTO knife

## DISASSEMBLE THE CONSOLE BASE HOUSING

1. If a battery is inserted in the console, remove it.
2. Remove the four rubber feet on the bottom of the console.

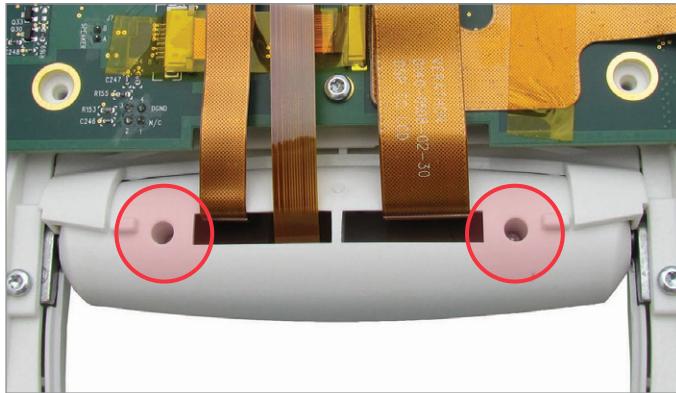


3. Using a T10 star screwdriver, remove the (8) base housing screws (0261-0091), and then remove the base housing bottom.



4. Using a T6 star screwdriver, remove the (2) display housing screws (0261-0315) from the lower edge of the display housing bottom.

*Note: A T5 star screwdriver may be needed for older consoles. If necessary, use a magnet to remove the screws from the recesses.*



## **REMOVE THE DISPLAY GRIP**

5. Flip the console onto the display, and then use a T6 star screwdriver to remove the (4) display housing screws (0261-0315) from the display grip.

*Note: A T5 star screwdriver may be needed for older consoles.*



6. Gently pry the grip loose from the console display, and then use an X-ACTO knife to detach the double-stick tape holding the grip in place.



7. Completely remove the grip from the console display.

## **REMOVE THE ORIGINAL DISPLAY HOUSING LENS**

8. Pull the lens away from the display. This detaches the lens from any double-sided adhesive tape that may be present.



9. Using an X-ACTO knife or a similar tool, remove any double-sided adhesive tape that remains on the display.
10. Flip the console display upside-down. Ensuring that you do not touch the LCD, grip the display housing lens by the exposed top and sides, and then lift the lens up and out.



11. Remove the rubber keypad buttons from the original display housing lens.

## **PREPARE FOR THE NEW DISPLAY HOUSING LENS**

12. On the new display housing lens, peel off the protective film on the interior-facing side. Do not remove the protective film from the exterior-facing side of the lens.
13. In the new display housing lens, insert the keypad buttons that were removed in Step 11 or new keypad buttons, as follows:
  - Push the power button through. This helps to center and anchor the remaining buttons.
  - Using a screwdriver, push the remaining button tabs through the lens.



14. Look at the front of the display housing lens and ensure that the buttons have been inserted fully and cleanly.

## **ATTACH THE NEW DISPLAY HOUSING LENS**

15. Ensure the console is upside-down, and then apply pressure to the display as if pushing it towards the base housing. This creates a gap between the front and back panels of the display.
16. Line up the new display housing lens against the display panel, and then snap the bottom lip of the lens into the gap created in Step 15.
17. Using an ionized air gun, blow any lint or dust off of the LCD.

18. Working from the base housing to the top of the display, press the display housing lens into place and apply pressure to ensure that the display housing lens is secured.



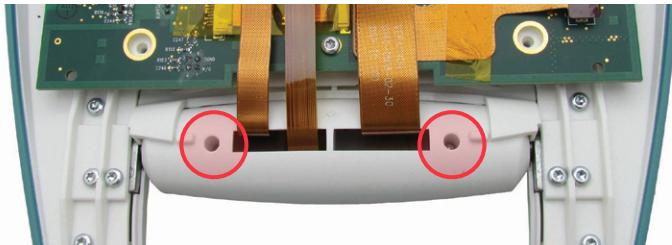
#### **ATTACH THE DISPLAY GRIP**

19. Align the grip on the front of the display.
20. Using a T6 star screwdriver, insert (4) display housing screws (0261-0315) through the display housing and into the grip.



## ATTACH THE BACK HOUSING BOTTOM

- Using a T6 star screwdriver, insert (2) display housing screws (0261-0315) into the lower edge of the display housing bottom.



- Place the base housing bottom over the assembly.
- Starting from the back and moving toward the handle, press around the unit in order to snap it together. Inspect for gaps.
- Using a T10 star screwdriver and (8) base housing screws (0261-0091), reattach the base housing bottom. Do not install the base housing rubber feet.



- Remove the protective film from the display housing lens.
- Apply the base housing rubber feet in the four recesses in the base housing bottom.

*Note: If you prefer, you may wait to install the base housing rubber feet until the console has passed the certification procedure.*



- If no additional repairs are required on the system, continue to the chapter [Annual Certification](#) on page 7.

## PROCEDURE 8. CLEAN OR REPLACE THE BATTERY CONTACTS

Use this procedure in order to clean the battery contacts on the console or the battery. If the battery contacts are dirty, it may prevent the console from drawing battery power.

Figure 7. Dirty Battery Contacts



Figure 8. Clean Battery Contacts



QUANTITY	PART #	DESCRIPTION
Parts		
AR	0200-0233	Battery contact, small
AR	0200-0231	Battery contact, large
Tools		
1	—	Eraser
1	—	Pliers
1	—	Flat-head screwdriver
AR	—	Isopropyl alcohol, 70% or higher
AR	—	Cotton swab

### CLEAN THE BATTERY CONTACTS

1. Remove the battery from the console.
2. On the battery, rub the contacts with an eraser until clean.

### CLEAN THE CONSOLE BATTERY CONTACTS

3. Lay the console on its side so that the battery contacts are facing up.
4. On the console, rub the contacts with an eraser until clean.



## REPLACE THE CONSOLE BATTERY CONTACTS

5. Grip the battery contact with pliers, and then pull straight up. The battery contact comes out of the battery contact receptacle in the battery well. Repeat this step until all of the damaged battery contacts are removed.

*Note: If the battery contact receptacle also pulls out from the battery well, use a flat instrument in order to push it back into place.*



6. Repeat Step 5 until all of the necessary battery contacts are removed.
7. Using isopropyl alcohol and a cotton swab, clean any white residue visible inside the battery contact receptacle.
8. Place a new battery contact into the battery contact receptacle, and then use the tip of a flat-headed screwdriver (or another flat instrument) in order to push the contact into place.



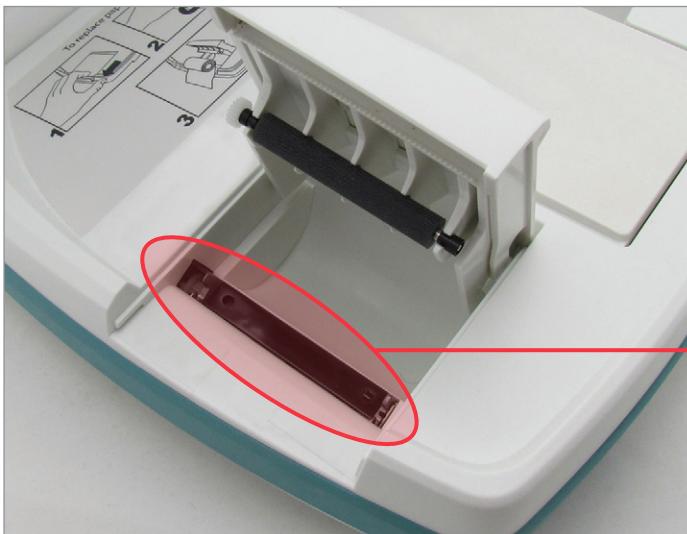
9. If no additional repairs are required on the system, continue to the chapter [Annual Certification](#) on page 7.

## PROCEDURE 9. CLEAN THE PRINT HEAD

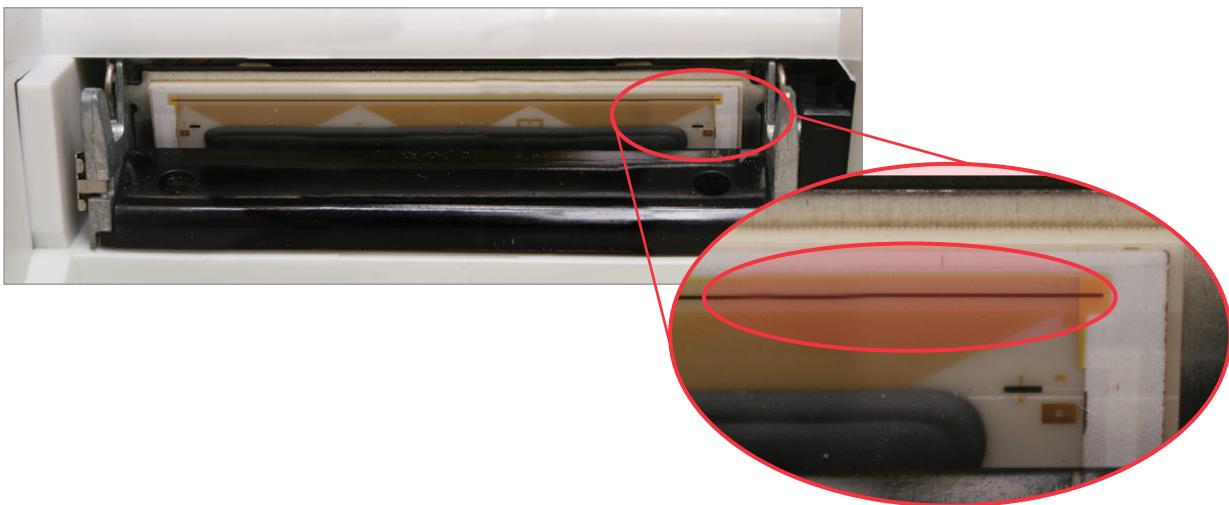
If the printer is producing irregular printouts, clean the print head prior to replacing any parts. If cleaning the print head does not solve the service issue, then replace the printer according to the procedure [Replace the Handle, Printer, or Top Cover Assembly](#) on page 55.

QUANTITY	PART #	DESCRIPTION
Tools		
AR	—	Cotton swab
AR	—	Isopropyl alcohol, 70% or higher

1. Open the printer door.



2. Using a cotton swab and isopropyl alcohol, wipe along the print head contact area.



3. If no additional repairs are required on the system, continue to the chapter [Annual Certification](#) on page 7.

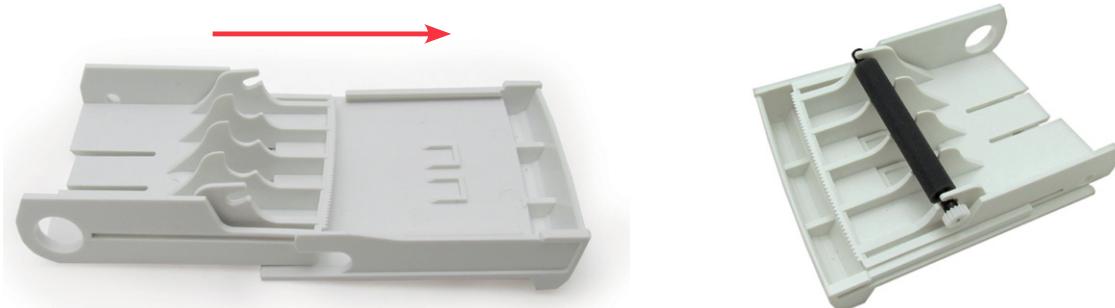
## PROCEDURE 10. REPLACE THE PRINTER DOOR

Complete this procedure if the printer door is damaged, if the printer is producing irregular printouts, or if you are moving the original printer door to a new base housing top cover assembly.

QUANTITY	PART #	DESCRIPTION
Parts		
AR	0120-0370	Base housing printer pivot door
AR	0120-0371	Base housing printer slider door

1. If you are using a new printer door, assemble the printer door as follows:

- Slide the printer pivot door and the printer slider door together, as shown in the following figure. You will hear a snap sound when the parts are securely joined.
- Install the print roller into the printer door assembly.



2. If you are relocating the original printer door to a new base housing top cover assembly, remove the printer door as follows:
  - Slide the printer door out, and then lift it open.
  - Grip the printer door near the pivot point, squeeze the door in order to release it from the pivot, and then remove the door.



3. Squeeze the pivot point of the printer door, and then snap it to the destination top cover assembly.
4. Close the printer door. Ensure that the door clicks into place.
5. Tear off any paper extending from the top cover assembly.
6. If no additional repairs are required on the system, continue to the chapter [Annual Certification](#) on page 7.

# CONSOLE REPAIR

This section contains instructions for repairing the console. It consists of the following procedures:

- Disassemble the Console Base Housing
- Replace the Hirose Connector
- Replace the Handle, Printer, or Top Cover Assembly
- Disassemble the Console Display
- Replace the Keypad PCBA or Keypad Flex Cable
- Replace the Console Hinges
- Replace the LCD and LCD Flex Cable
- Replace the Inverter Flex Cable
- Replace the Display Housing Bottom
- Reassemble the Console Display
- Reassemble the Console Base Housing
- Replace the Console Label

After replacing any damaged or non-functioning parts per the procedures in this section, you may skip additional replacement procedures and go directly to the reassembly procedure(s). The following figures provide a visual reference for the console components, parts, and assemblies.

The following images provide visual reference for the console's part names and numbers. For a complete list of part numbers, see [Part Numbers](#) on page 124.

Figure 9. Parts of the BVI 9400 Console Base Housing

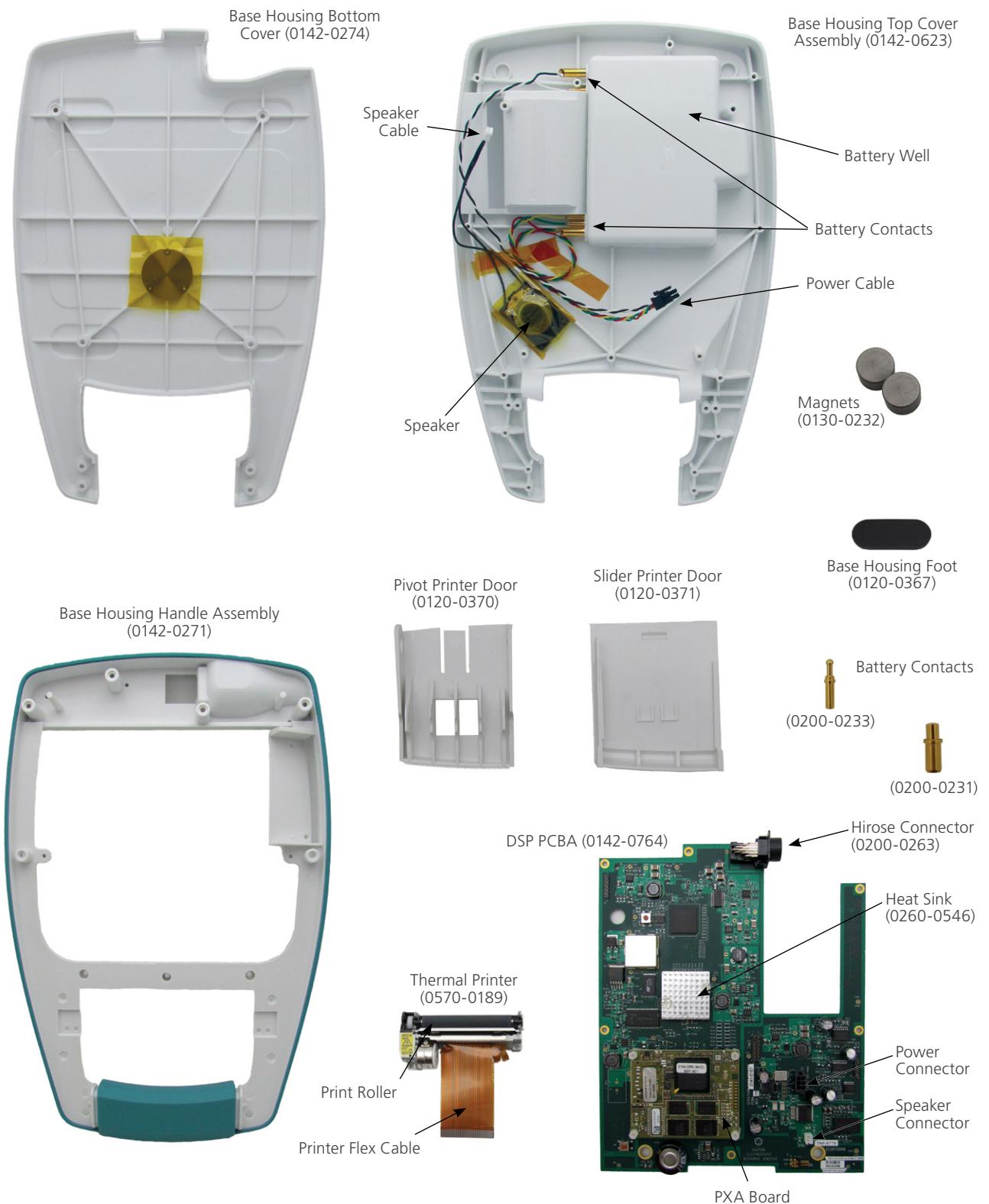
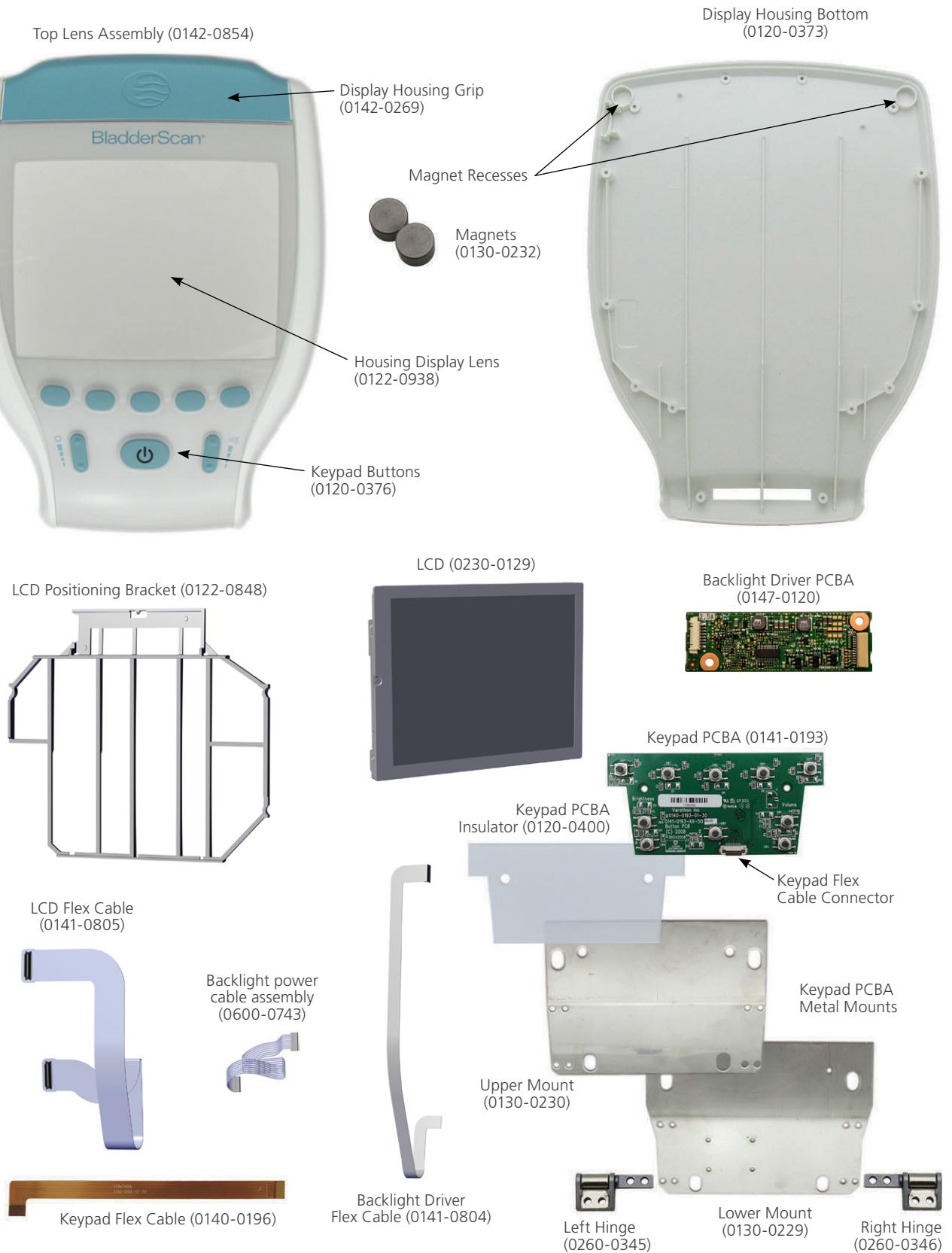
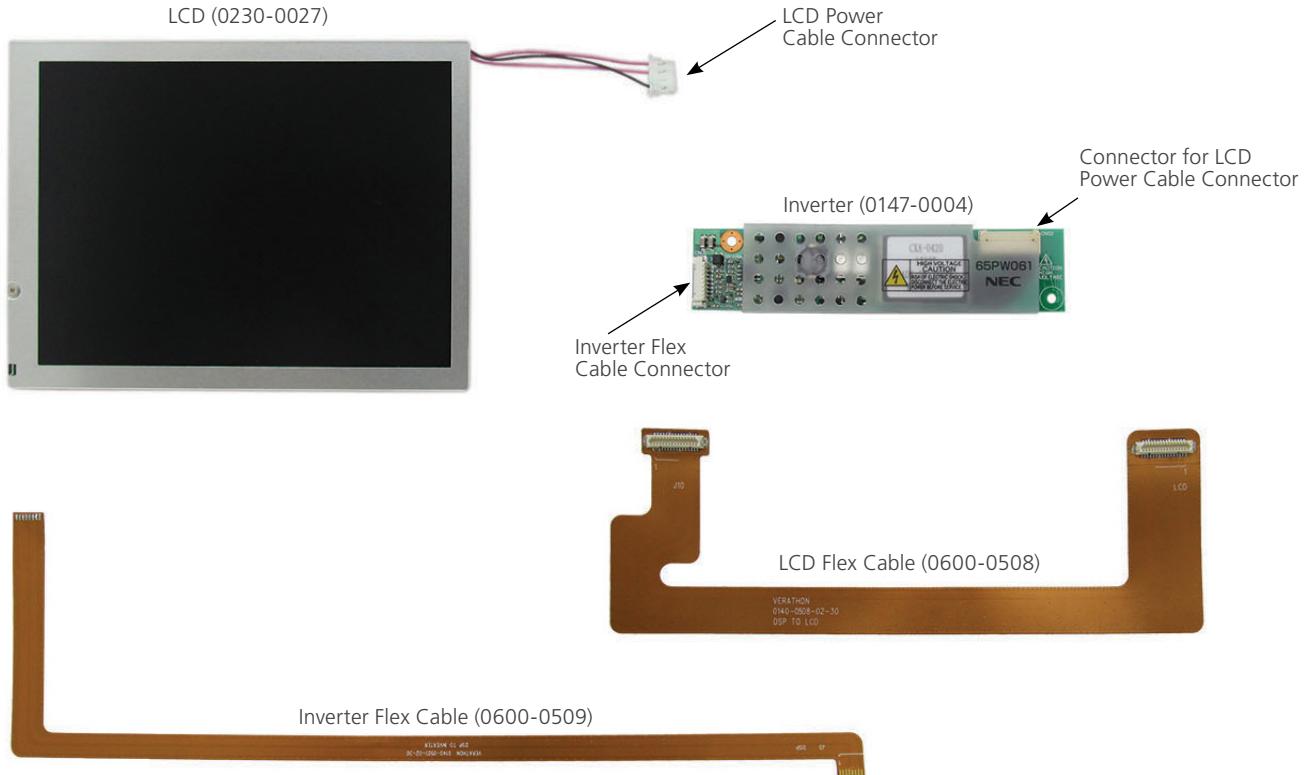


Figure 10. Parts of the BVI 9400 Console Display



A new model of LCD has been substituted for the model originally incorporated into BladderScan 9400 systems. As a result, if the LCD must be replaced, the inverter and supporting cables must be replaced as well. However, systems containing the original components will remain in the field for several years. The following figure identifies these components.

Figure 11. Old Model BVI 9400 LCD Components (Deprecated)



## PROCEDURE 11. DISASSEMBLE THE CONSOLE BASE HOUSING

Use this procedure in order to disassemble the base housing to a stage from which you can complete any of the replacement procedures included in this section. If replacing a part or component requires additional disassembly, that information is detailed in the corresponding part-replacement procedure.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
8	0261-0091	Base housing screw, M3, 12 mm
6	0261-0091	DSP PCBA screw, M3, 12 mm
<b>Tools</b>		
1	—	T10 star screwdriver
1	—	Tweezers

### REMOVE THE BASE HOUSING BOTTOM

1. If a battery is inserted in the console, remove it.
2. Remove the four rubber feet on the bottom of the console.

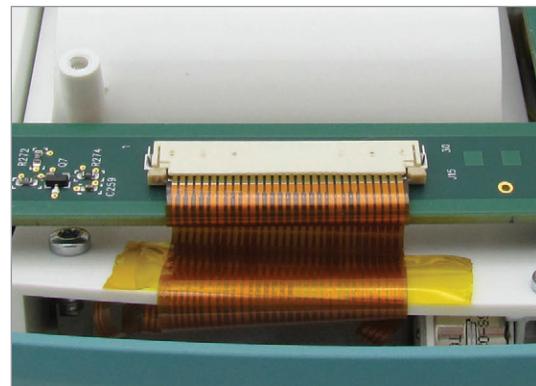
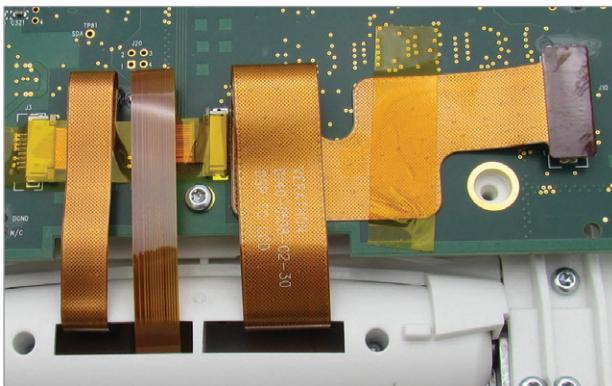


3. Using a T10 star screwdriver, remove the (8) base housing screws (0261-0091), and then remove the base housing bottom.



## REMOVE THE DSP PCBA

4. Remove the Kapton tape from the four flex cables.



5. Unplug the printer, inverter, and keypad flex cables.

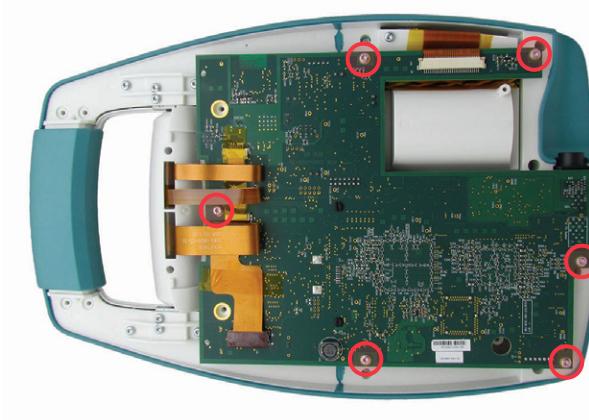
*Note: Handle the flex cables carefully in order to protect the connectors.*

6. On each side of the LCD flex cable connector, place tweezers against the metal tab, gently loosen the flex cable connector, and then remove the flex cable.

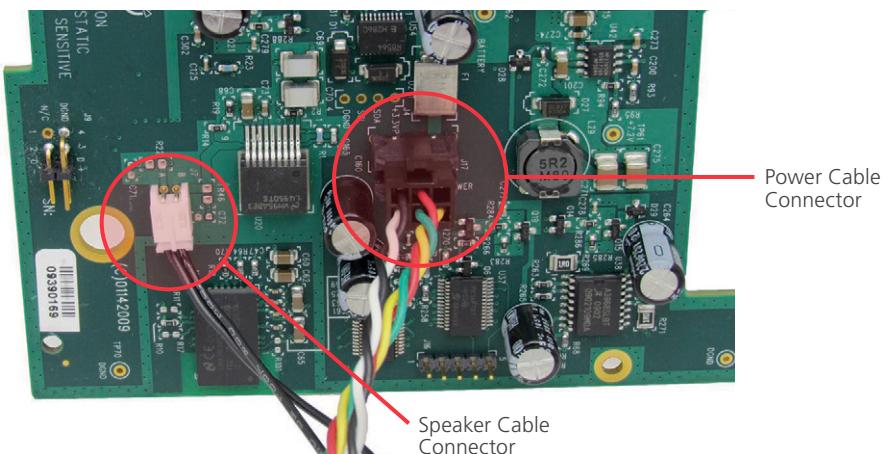
*Note: Ensure that you do not break the flex cable or peel it away from the connector.*



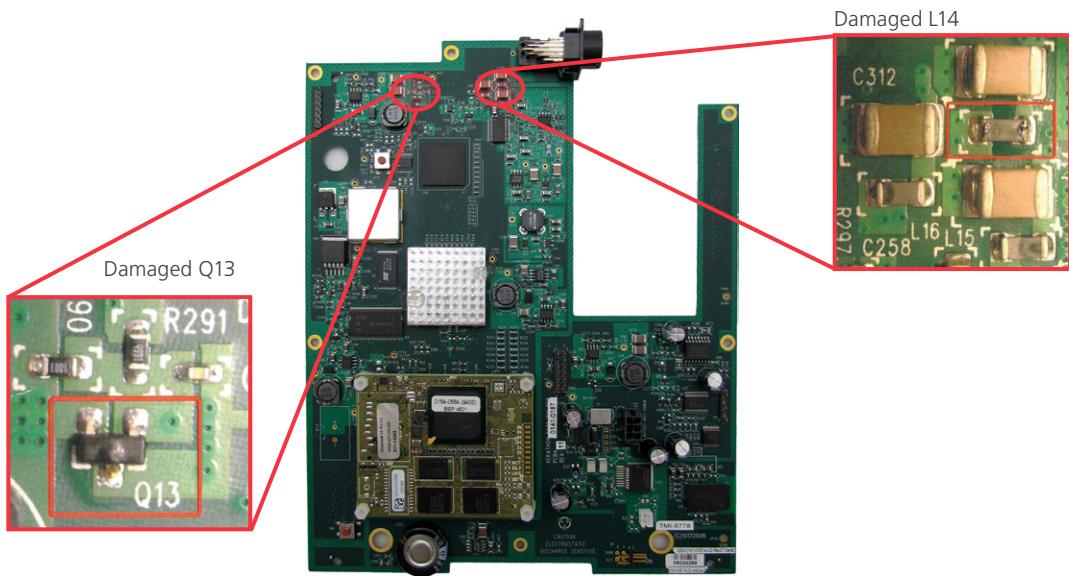
7. Using a T10 star screwdriver, remove the (6) DSP PCBA screws (0261-0091).



8. Tilt board up, hinging on the printer flex cable edge of the DSP PCBA.
9. Remove the power and speaker connectors, and then remove the DSP PCBA.



10. Inspect the DSP PCBA for damaged L14 and Q13 components. Damage to these components is caused by a shorted circuit in connector pins 1 and 2 in the probe cable. If you observe such damage, substitute a new DSP PCBA in the procedure [Reassemble the Console Base Housing](#) on page 90, and then replace the probe cable according to the instructions in the section [Probe Repair](#) on page 96.

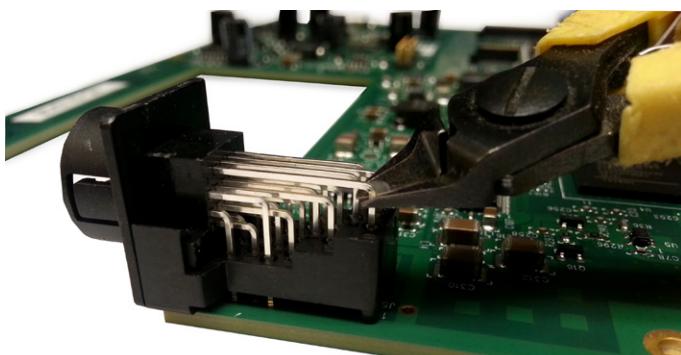


## PROCEDURE 12. REPLACE THE HIROSE CONNECTOR

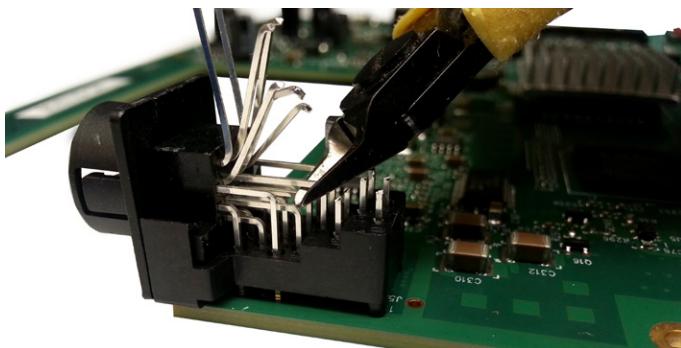
The Hirose connector is the probe connector receptacle on the console's base housing. Complete this procedure if any plastic is missing, or if the probe connector could disconnect unexpectedly.

QUANTITY	PART #	DESCRIPTION
Parts		
1	0200-0263	Hirose connector
Tools		
—	—	Wire cutters
—	—	Pliers
—	—	Desolder suction system, Metcal DSI
—	—	Desolder suction system tip cartridge, 1.8 mm round, Metcal STDC-804L

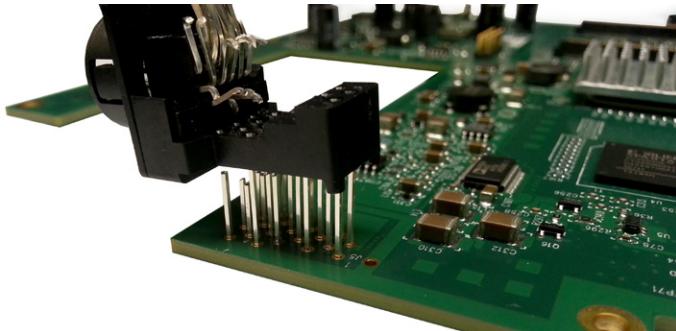
1. Complete the procedure [Disassemble the Console Base Housing](#) on page 50.
2. Cut the pins just below the bend. This releases the connector so that you can remove it later in this procedure.



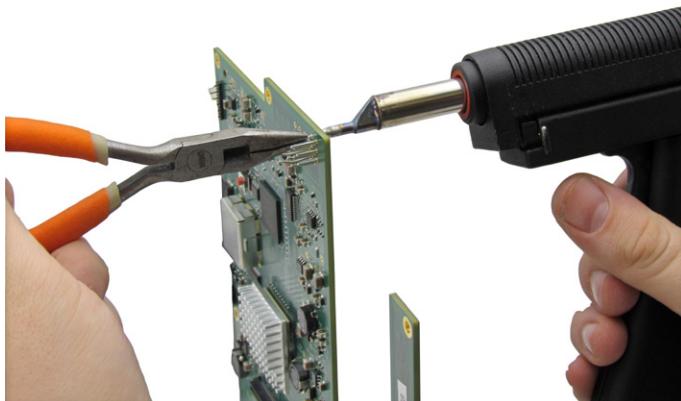
As you cut the pins, bend them up and out of the way to allow access to the rest of them.



3. Pull the plastic connector assembly directly up and off of the pin stubs.



4. Holding each pin stub with pliers, use the desolder suction system to remove the solder securing it to its solder pad on the DSP PCBA, taking care not to damage the pad. Pull the pin stub out of the PCBA.



5. Repeat Step 4 to remove the remaining pin stubs.
6. Insert the pins of a new Hirose connector into the solder pads you just cleared on the DSP PCBA. Slide the connector down until its plastic components are seated on the surface of the PCBA.



7. Solder all pins in place.
8. If there is any damage to the DSP PCBA or the components surrounding the Hirose connector during the course of completing this procedure, replace the DSP PCBA.
9. Complete any additional repairs to the console, and then reassemble the console according the procedure [Reassemble the Console Base Housing](#) on page 90.

## PROCEDURE 13. REPLACE THE HANDLE, PRINTER, OR TOP COVER ASSEMBLY

### IMPORTANT

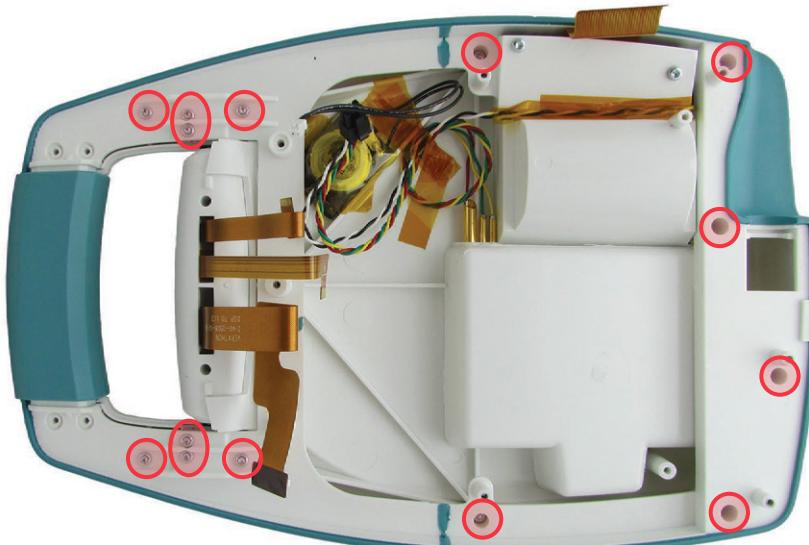
Prior to replacing the printer, ensure that you have completed the procedures [Clean the Print Head](#) on page 44 and [Replace the Printer Door](#) on page 45. If the printer is producing irregular printouts, these procedures may resolve the issue.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
AR	0142-0271	BVI 9400 base housing handle assembly
AR	0570-0189	Thermal printer
AR	0142-0623	BVI 9400 base housing top cover assembly
16	0261-0091	Base housing screw, M3, 12 mm
2	0130-0232	Neodymium disc magnet
<b>Tools</b>		
1	—	T10 star screwdriver
AR	0136-0059	Kapton tape, 1.3 cm (1/2-in)
1	—	Bar clamp
AR	—	Magnet
AR	0135-0042	Loctite 422 Super Bonder

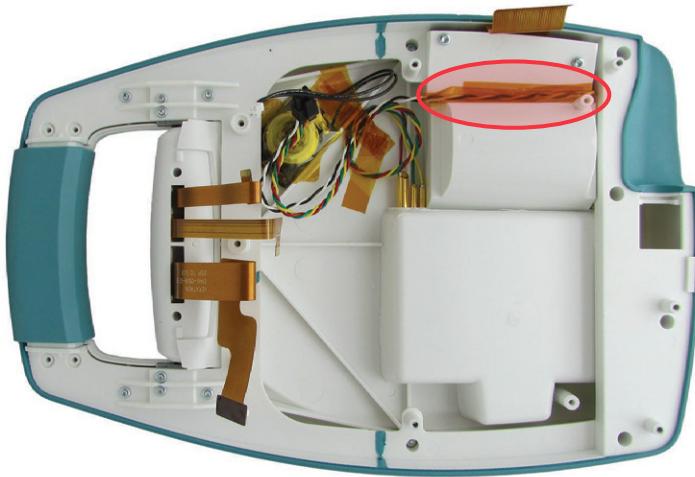
### REMOVE THE HANDLE ASSEMBLY

1. Complete the procedure [Disassemble the Console Base Housing](#) on page 50.
2. Using a T10 star screwdriver, remove the (14) base housing screws (0261-0091) securing the handle to the top assembly.

*Note: If necessary, use a magnet in order to remove the screws from the bosses.*



3. Remove the Kapton tape securing the negative-side power cable to the printer housing.

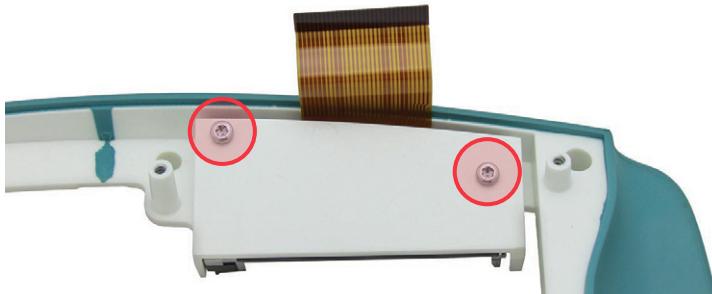


4. Gripping the end of the handle near the flex cables, pry the handle away from the base housing top cover assembly, and then remove the handle.



## REPLACE THE PRINTER OR HANDLE ASSEMBLY

5. If there is any Kapton tape securing the printer flex cable to the handle, remove it.
6. Using a T10 star screwdriver, remove the (2) base housing screws (0261-0091) securing the printer to the handle, and then remove the printer from the handle.



7. If you are replacing the printer, dispose of the original printer, and then use a new thermal printer for the rest of this procedure.

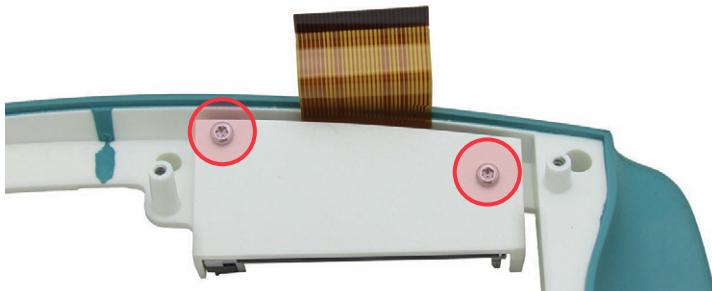
If you are replacing the base housing handle assembly, dispose of the original handle assembly, and then use a new handle assembly for the rest of this procedure.

8. Place the printer onto the printer housing in the handle assembly, slide the printer flex cable through the gap in the handle, and then flush align the printer and housing edge.



9. Turn the handle assembly and printer over.

10. Using the T10 star screwdriver, insert (2) base housing screws (0261-0091) into the base housing handle assembly. This secures the printer to the handle.

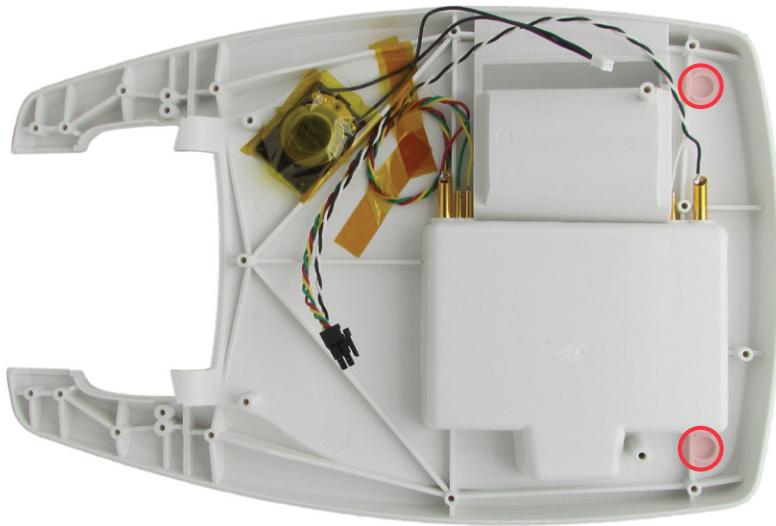


## REPLACE THE TOP COVER ASSEMBLY

11. If you are replacing the base housing top cover assembly, set the customer-owned top cover assembly aside and do not dispose of it. You will remove the printer door later in this procedure. Use a new top cover assembly for the remainder of this procedure.

If you are not replacing the top cover assembly, skip to Step 14.

12. If you are using a new top cover assembly, add a drop of Loctite 422 Super Bonder into the magnet recesses at the two corners.



13. Ensuring that you have the correct polarity so that the display housing magnets are attracted to the base housing magnets, insert the (2) neodymium disc magnets into the recesses.

## REASSEMBLE THE CONSOLE BASE HOUSING

14. Place the handle assembly on the base housing top cover assembly, ensuring that the negative-side power cable slides over the printer housing and that the flex cables are not pinched under the handle assembly.
15. Apply pressure to the back of the handle assembly, snapping the back of the handle assembly into place on the top cover assembly.
16. Ensure that there are no gaps in the console base housing assembly.

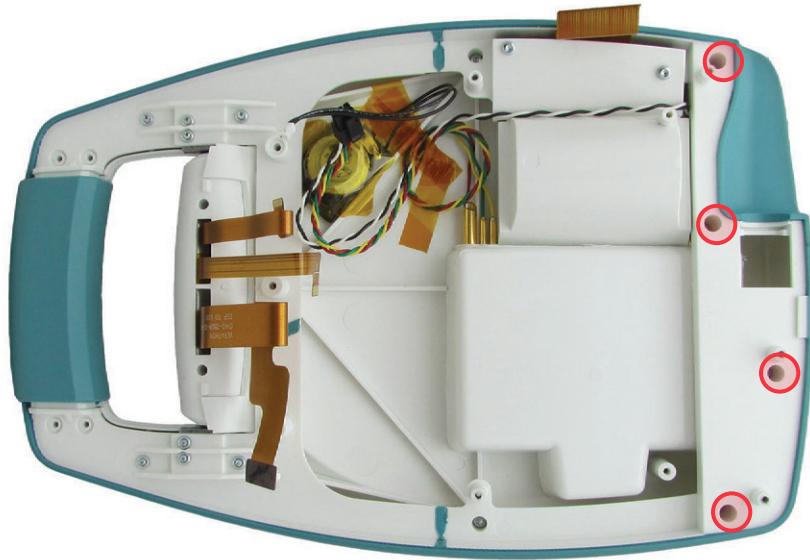
Figure 12. Unacceptable Gap in Assembly



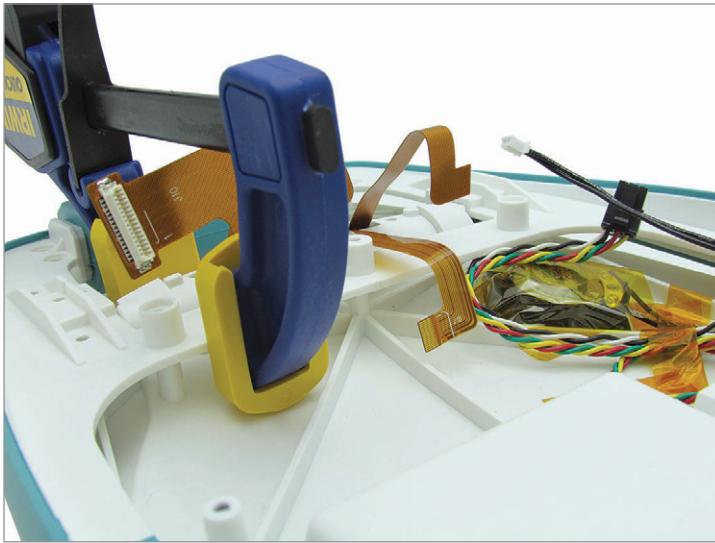
Figure 13. Proper Fit and Alignment



17. Using a T10 star screwdriver, insert (4) base housing screws (0261-0091) into the back of the handle assembly.



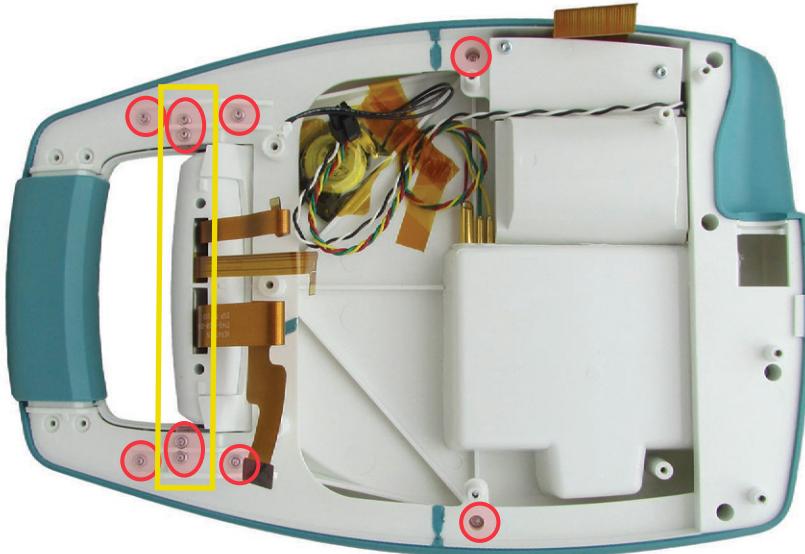
18. Use a clamp in order to force the three screw bosses in the middle of the top cover assembly into their housings on the handle assembly.



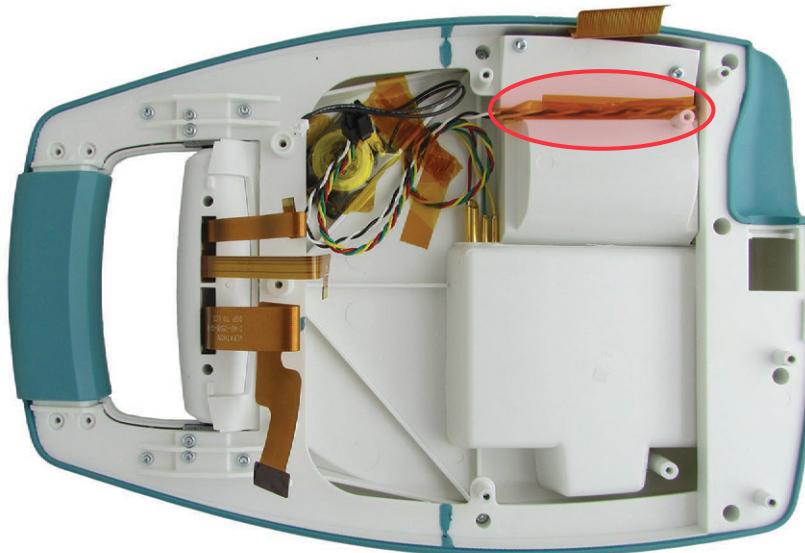
19. Apply pressure to the handle assembly, ensuring that the handle and top cover assemblies are completely snapped together.

20. Using a T10 star screwdriver, insert (10) base housing screws (0261-0091) as shown in the following figure.

*Note: When you insert the (4) hinge screws (highlighted in yellow in the following figure), ensure that you do not apply too much force to the screw. The low number of threads causes them to strip easily.*



21. Using a piece of 1.3 cm (1/2-inch) Kapton tape, secure the negative-side power cable to the top of the printer housing.



22. If you replaced the top cover assembly in this procedure, move the printer door from the original top cover assembly to the new top cover assembly according to the instructions in the procedure [Replace the Printer Door](#) on page 45.

## PROCEDURE 14. DISASSEMBLE THE CONSOLE DISPLAY

### IMPORTANT

Complete this procedure only if you are repairing or replacing parts or components within the console display. Otherwise, skip to the procedure [Reassemble the Console Base Housing](#) on page 90.

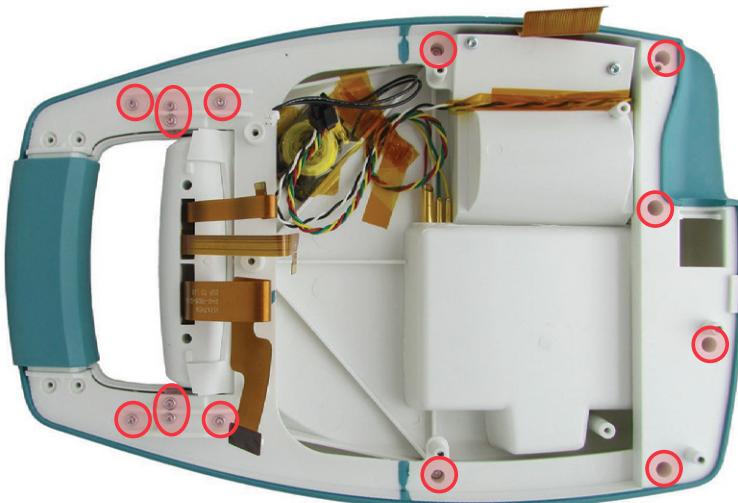
If you need to replace the display housing lens, it is not necessary to disassemble the console display. For more information, see the procedure [Replace the Display Housing Lens](#) on page 35.

Use this procedure in order to disassemble the console display to a stage from which you can complete any of the replacement procedures included in this section. If replacing a part or component requires additional disassembly, that information is detailed in the corresponding part replacement procedure.

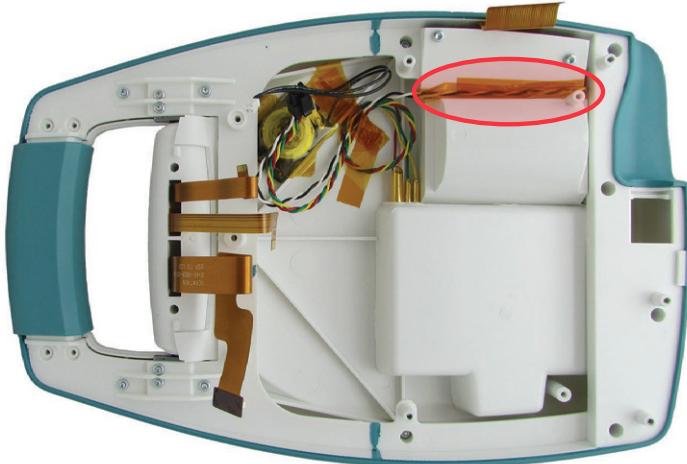
QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
12	0261-0315	Display housing screw, M2, 10 mm
2	0261-0314	Display housing screw, M2, 6 mm
14	0261-0091	Base housing screw, M3, 12 mm
<b>Tools</b>		
1	—	T10 star screwdriver
AR	—	T6 star screwdriver
AR	—	T5 star screwdriver
AR	—	Magnet

1. Complete the procedure [Disassemble the Console Base Housing](#) on page 50.
2. Using a T10 star screwdriver, remove the (14) base housing screws (0261-0091) holding the handle to the top assembly.

*Note: If necessary, use a magnet in order to remove the screws from the bosses.*



3. Remove the Kapton tape securing the negative-side power cable to the printer housing.



4. Gripping the end of the handle near the flex cables, pry the handle away from the base housing top cover assembly, and then remove the handle.

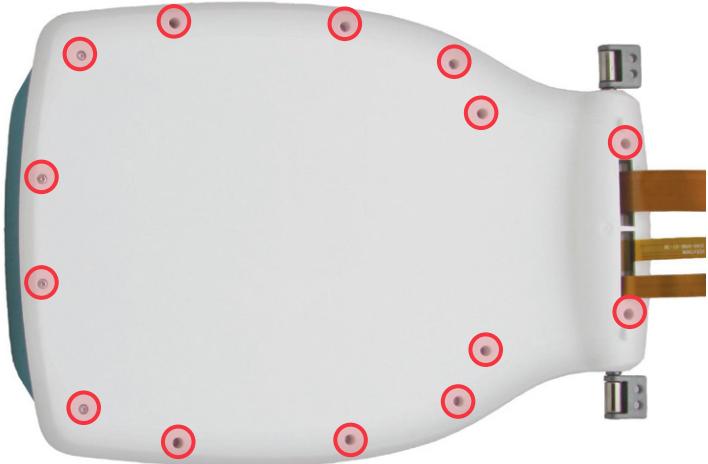


5. Tilt the console display up, pop one corner of the console display out of its base housing socket, and then remove the console display from the base housing.



6. Set the base housing top cover assembly aside.
7. Using a T6 star screwdriver, remove the display housing screws (12 × 0261-0315, 2 × 0261-0314) from the display housing bottom (the rear side of the display).

*Note: A T5 star screwdriver may be needed for older consoles. If necessary, use a magnet to remove the screws from the bosses.*



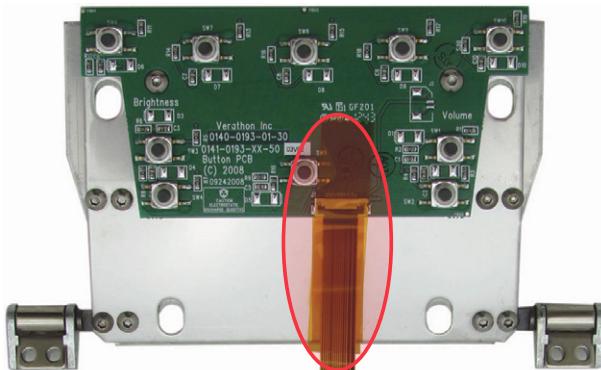
8. Flip the console display over, and then remove the display housing lens assembly.



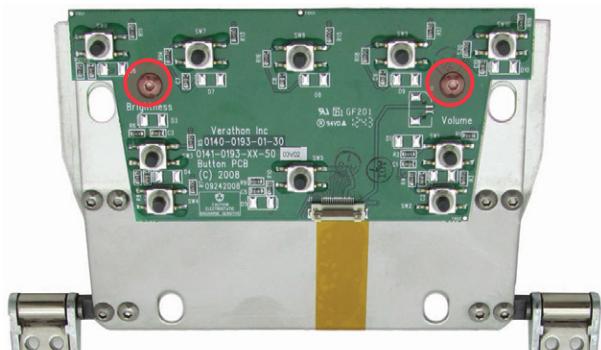
## PROCEDURE 15. REPLACE THE KEYPAD PCBA OR KEYPAD FLEX CABLE

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
2	0261-0090	Keypad PCBA screw, M3, 5 mm
1	0141-0193	Keypad PCBA
1	0140-0196	Keypad flex cable
1	0120-0400	Keypad PCBA insulator
<b>Tools</b>		
AR	—	2 mm hex screwdriver
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

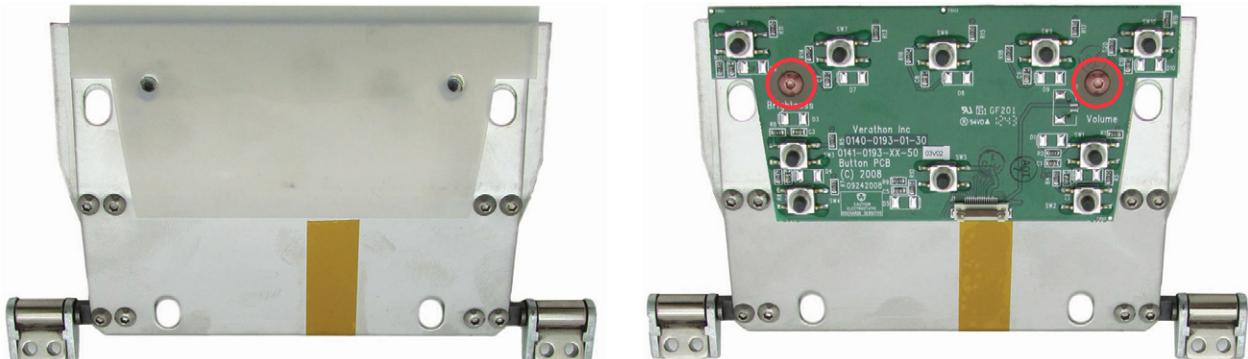
1. Complete the procedure [Disassemble the Console Display](#) on page 61.
2. Lift the metal keypad mount off of the display housing bottom.
3. On the keypad PCBA and mount, remove the Kapton tape securing the keypad flex cable. Do not remove the Kapton tape attached to the keypad mount.



4. Gently loosen the connector and remove the flex cable.
5. If you are replacing the keypad flex cable only, skip to Step 8.  
If you are replacing the keypad PCBA, continue to the next step.
6. Use a 2 mm hex screwdriver in order to remove the 2 keypad PCBA screws (0261-0090), and then remove the keypad PCBA.

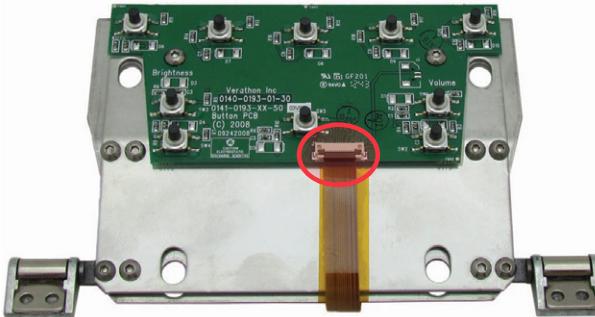


7. Align the keypad PCBA insulator against the metal mount, place the new keypad PCBA on top of the insulator, and then use a 2 mm hex screwdriver and (2) keypad PCBA screws (0261-0090) in order to secure the keypad PCBA to the metal mount.

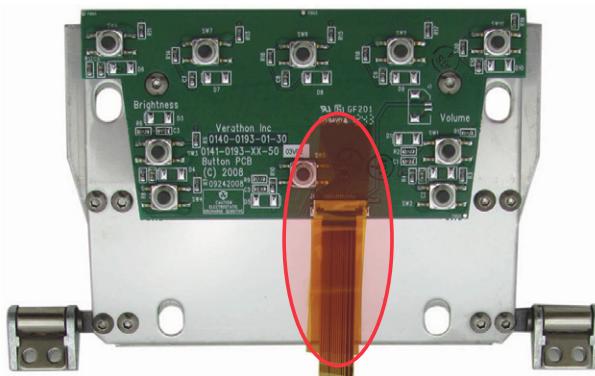


8. If you are replacing the keypad flex cable, attach a new flex cable to the keypad flex cable connector.

If you are not replacing the keypad flex cable, attach the original flex cable to the keypad flex cable connector.



9. Secure the flex cable to the PCBA connector and the keypad mount with a piece of 1.3 cm (1/2-inch) Kapton tape.



10. Place the metal keypad mount below the LCD, and then thread the keypad flex cable through the right gap in the base of the console display.

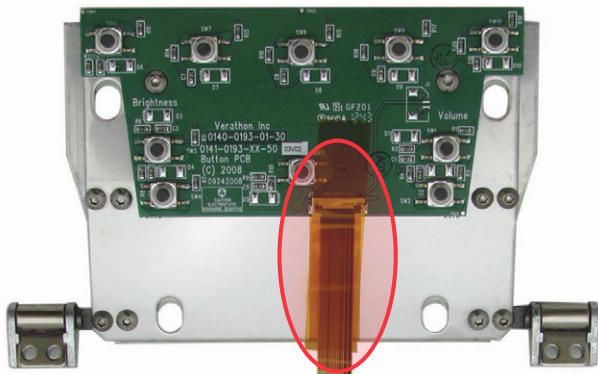


11. Complete any additional repairs to the console display, and then reassemble the console according to the procedure [Reassemble the Console Display](#) on page 82.

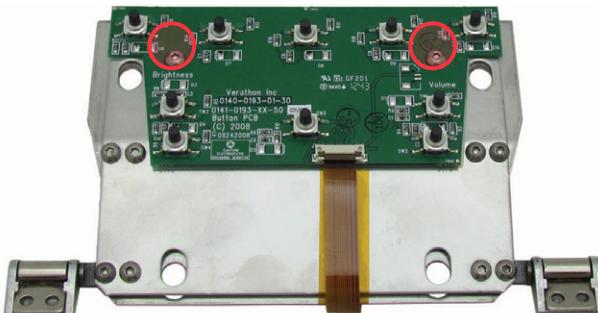
## PROCEDURE 16. REPLACE THE CONSOLE HINGES

QUANTITY	PART #	DESCRIPTION
Parts		
8	0261-0090	Console hinge screw, M3, 5 mm
2	0261-0080	Keypad PCBA screw, M3, 5 mm
1	0260-0345	Left hinge
1	0260-0346	Right hinge
Tools		
AR	—	2 mm hex screwdriver
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

1. Complete the procedure [Disassemble the Console Display](#) on page 61.
2. Lift the metal keypad mount off of the display housing bottom.
3. On the keypad PCBA and mount, remove the Kapton tape securing the keypad flex cable.

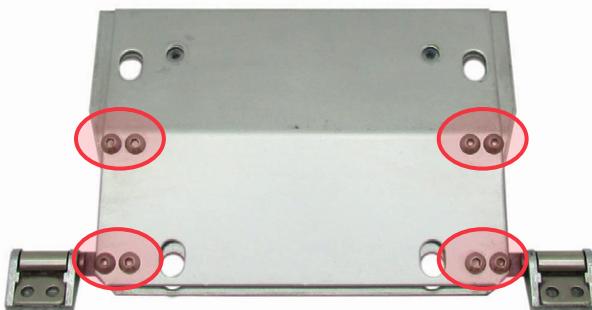


4. Use a 2 mm hex screwdriver in order to remove the (2) keypad PCBA screws (0261-0080), and then remove the keypad PCBA, keypad flex cable, and keypad PCBA insulator.



5. Remove the Kapton tape from the mount.

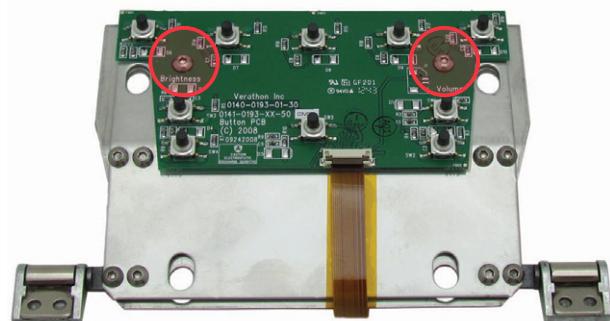
- Using a 2 mm hex screwdriver, remove the (8) console hinge screws (0261-0090) securing the hinges to the metal keypad mount.



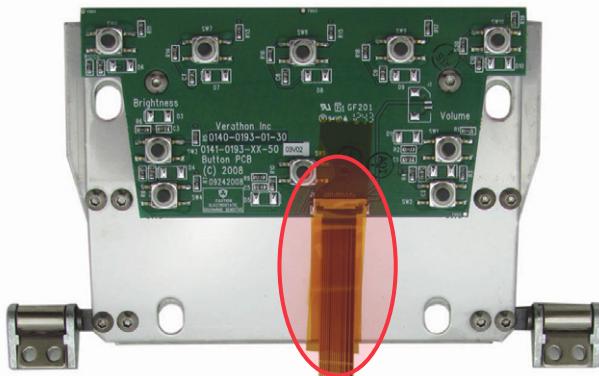
- Remove the original hinges, and then insert a new left hinge and right hinge between the upper and lower metal mount plates.
- Using the 2 mm hex screwdriver and (8) console hinge screws (0261-0090), attach the new hinges to the metal keypad mount, and then wrap a piece of 1.3 cm ( $\frac{1}{2}$ -inch) Kapton tape over the front and onto the back of the mount. This protects the keypad flex cable from the metal mount.



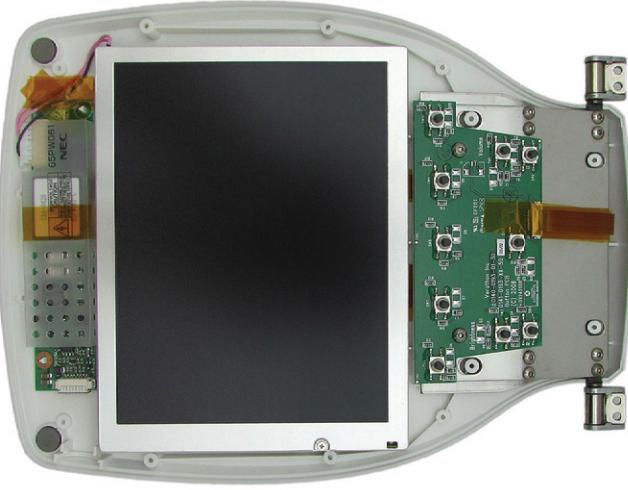
- Align the keypad PCBA insulator against the metal mount, place the new keypad PCBA on top of the insulator, and then use a 2 mm hex screwdriver and (2) keypad PCBA screws (0261-0090) in order to secure the keypad PCBA to the metal mount.



10. Secure the flex cable to the PCBA connector and the keypad mount with a piece of 1.3 cm (1/2-inch) Kapton tape.



11. Place the metal keypad mount below the LCD, and then thread the keypad flex cable through the right gap in the base of the console display.



12. Complete any additional repairs to the console display, and then reassemble the console according to the procedure [Reassemble the Console Display](#) on page 82.

## PROCEDURE 17. REPLACE THE LCD AND LCD FLEX CABLE

As of January 2016, a new LCD replaces the original part (0230-0027). Because the original power inverter (0147-0004) is not compatible with the new LCD, you must update both parts together. A positioning bracket compensates for dimensional differences between the two LCDs, while allowing the new LCD and its backlight driver PCBA to be positioned as a single unit.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
1	0141-0805	LCD flex cable
1	0141-0804	Backlight driver flex cable
1	0600-0743	Backlight power cable assembly
1	0147-0120	Backlight driver PCBA
1	0230-0129	LCD
1	0122-0848	LCD positioning bracket
<b>Tools</b>		
—	—	Tweezers
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

1. Complete the procedure [Disassemble the Console Display](#) on page 61.
2. Lift the metal keypad mount off of the display housing bottom, and then set the keypad mount aside.
3. Remove the Kapton tape securing the LCD flex cable to the display housing bottom.



4. Remove the Kapton tape securing the LCD power cables to the inverter.



5. Lift the power inverter off of the display housing bottom. Do not attempt to remove the power inverter until it is disconnected from the LCD.

*Note: If necessary, separate the inverter from the display housing bottom using tweezers.*

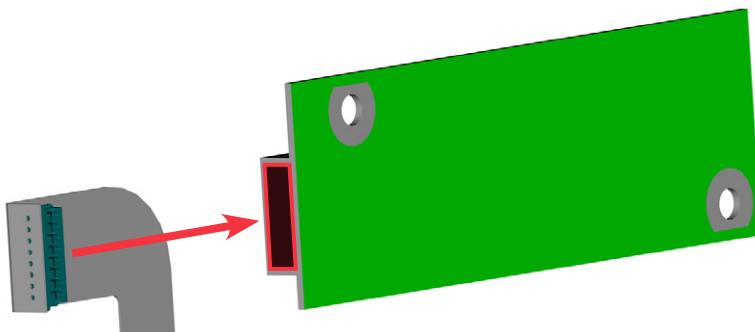
6. Using tweezers, remove the LCD power cable connector from the inverter.



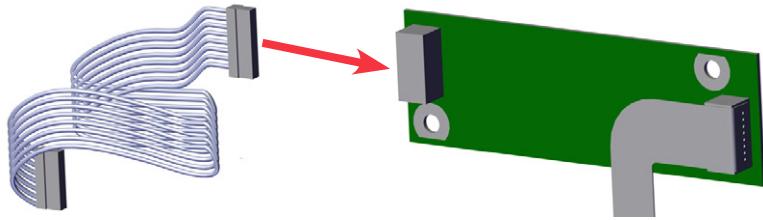
7. Lift the LCD and the LCD flex cable off the display housing bottom and remove them.

8. Lift out the inverter and remove it.

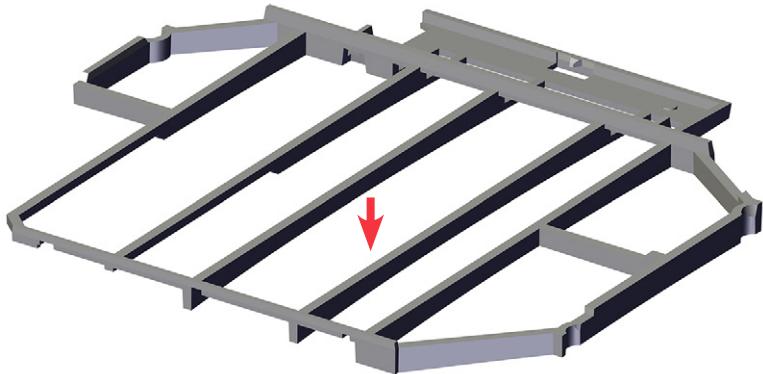
9. Locate the 8-pin connector on the new backlight driver PCBA (0147-0120). Attach the backlight driver flex cable (0141-0804), and then fold the cable over the connector. The connector is keyed, so the cable should fit only in the correct position. The following figure shows the correct orientation of the cable.



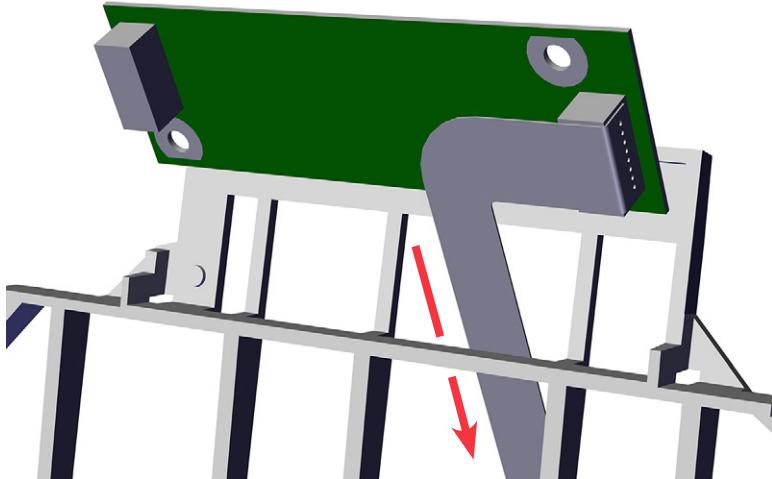
10. Attach the backlight power cable assembly (0600-0743) to the 12-pin connector on the new backlight driver PCBA. This connector is keyed, so the cable should fit only in the correct position.



11. Secure the ends of both cables to the backlight driver PCBA using 1.3 cm ( $\frac{1}{2}$ -inch) Kapton tape. Use enough tape to wrap around the edges of the PCBA.
12. Orient the LCD positioning bracket (0122-0848) with the curved edges of the ribs down. These curved edges will align with the interior curvature of the back of the display housing.

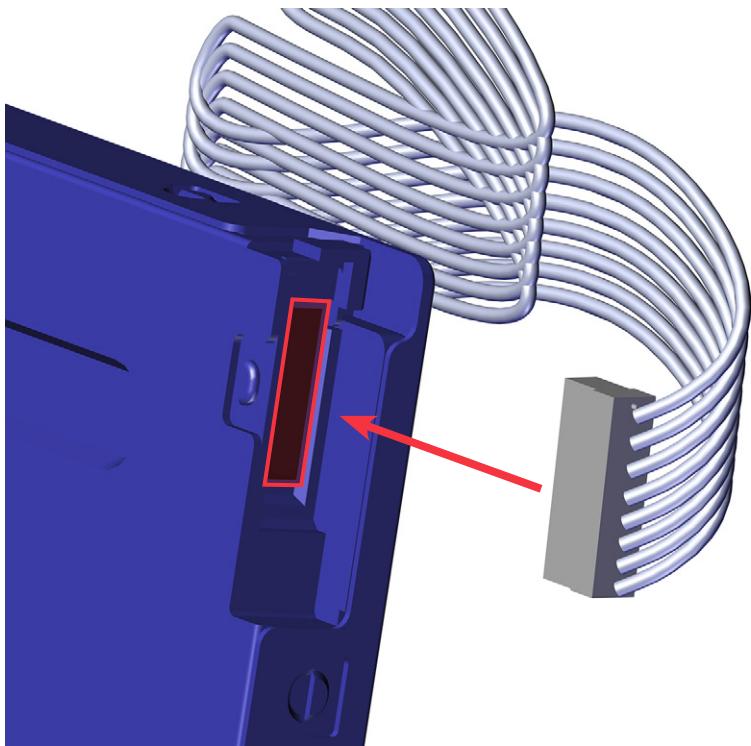


13. Pass the loose end of the backlight driver flex cable through the backlight driver frame of the bracket, as shown in the following figure.

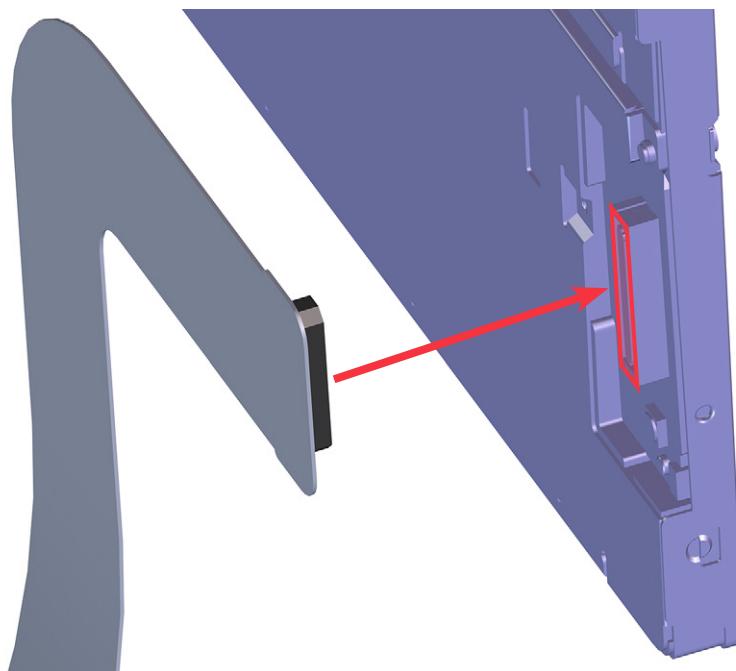


14. Insert the upper edge of the backlight driver PCBA under the tab on the edge of the frame. Pull any excess flex cable through the frame, and then press the remaining edges of the PCBA into place. Secure the PCBA using 1.3 cm ( $\frac{1}{2}$ -inch) Kapton tape.

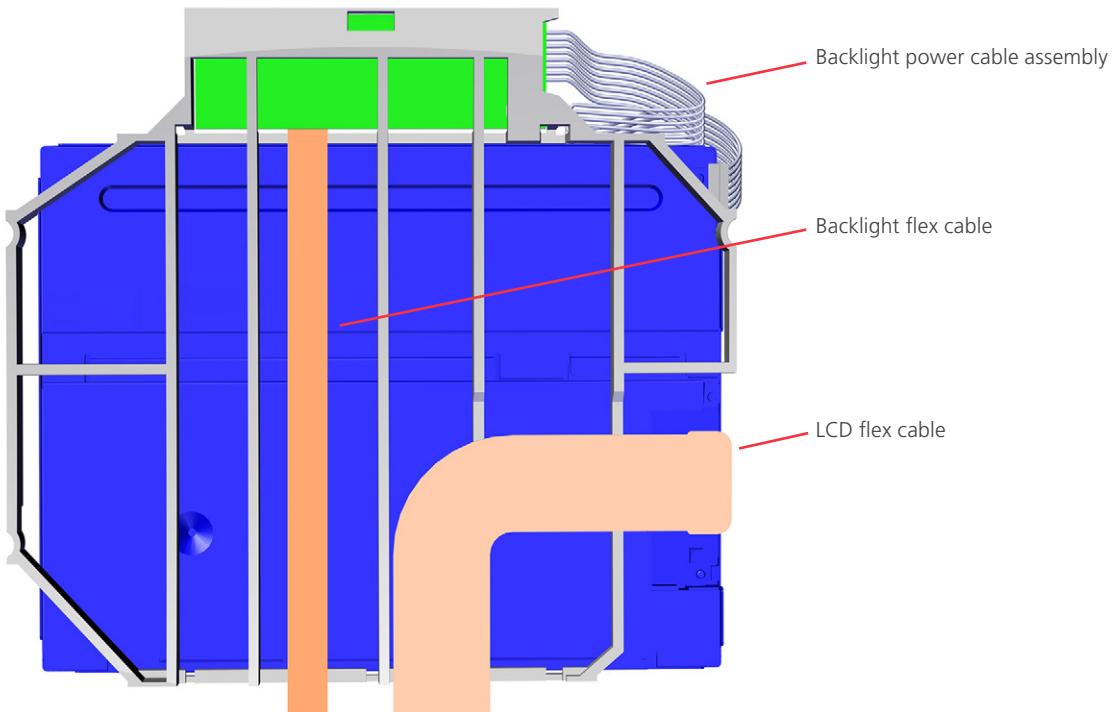
15. Insert the opposite end of the backlight power cable assembly into the recessed connector at the corner of the LCD assembly (0230-0129). Because the connector is keyed, the cable should fit only in the correct position.



16. Position the LCD flex cable (0141-0805) next to the back of the LCD assembly so that the end of the cable extends from the edge to the center of the assembly. Insert the multi-pin connector on the flex cable into the socket on the back of the LCD assembly and press it into place.



17. Place the LCD assembly onto the positioning bracket while guiding the LCD flex cable behind the bracket. Position the LCD assembly so that its edges fit snugly inside the retaining edges and tabs on the bracket. Make sure that the two flex cables pass out of the bottom of the bracket and are not pinched by the bracket's ribs. The following figure shows the correct orientation of these parts and cables.



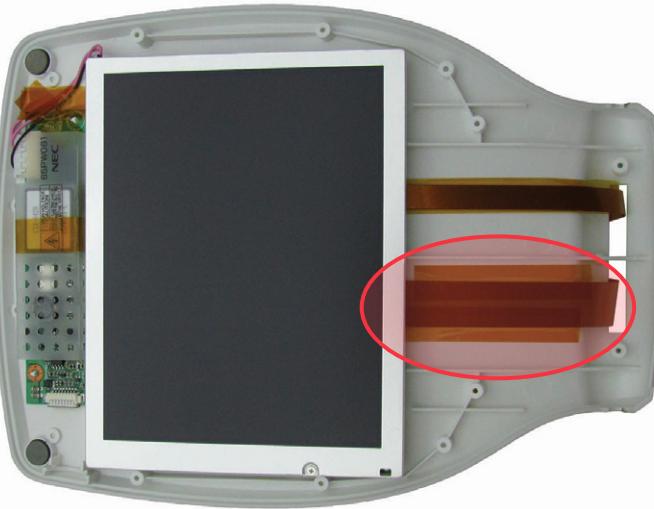
18. Complete any additional repairs to the console display, and then reassemble the console according to the procedure [Reassemble the Console Display](#) on page 82.

## PROCEDURE 18. REPLACE THE INVERTER FLEX CABLE

Note: Follow this procedure only if you are replacing an older model inverter without updating the LCD. If you are updating the LCD as well, refer to [Replace the LCD and LCD Flex Cable](#) on page 70.

QUANTITY	PART #	DESCRIPTION
Parts		
1	0600-0509	Inverter flex cable
Tools		
—	—	Tweezers
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

1. Complete the procedure [Disassemble the Console Display](#) on page 61.
2. Lift the metal keypad mount off of the display housing bottom, and then set the keypad mount aside.
3. Remove the Kapton tape securing the LCD flex cable to the display housing bottom.



4. Remove the Kapton tape that is securing the LCD power cables to the inverter.



5. Lift the power inverter off of the display housing bottom. This provides space for you to access the LCD power cable connector.

*Note: If necessary, use tweezers in order to leverage the inverter away from the display housing bottom.*

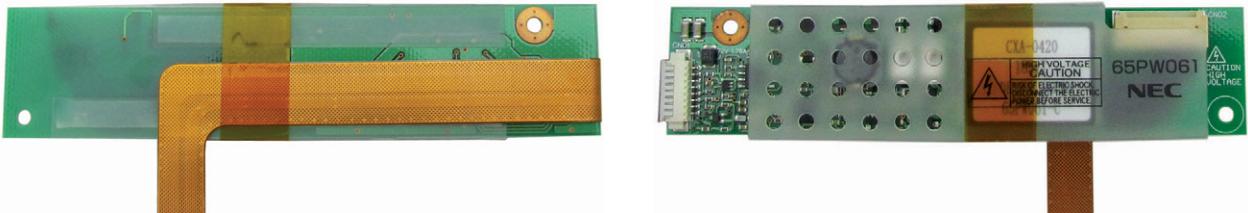
- Using tweezers, remove the LCD power cable connector from the inverter.



- Lift the LCD and the LCD flex cable off the display housing bottom. Set the LCD and LCD flex cable aside.
- Remove the Kapton tape that secures the inverter flex cable to the display housing bottom.



- Lift the inverter and the inverter flex cable off of the display housing bottom.
- On each side of the inverter flex cable connector, place tweezers against the tab, gently loosen the flex cable connector, and then remove the flex cable.  
*Note: Ensure that you do not break the flex cable or peel it away from the flex cable connector.*
- Attach a new flex cable to the original inverter.
- Wrap 1.3 cm (½-inch) Kapton tape around the inverter in order to secure the inverter flex cable.



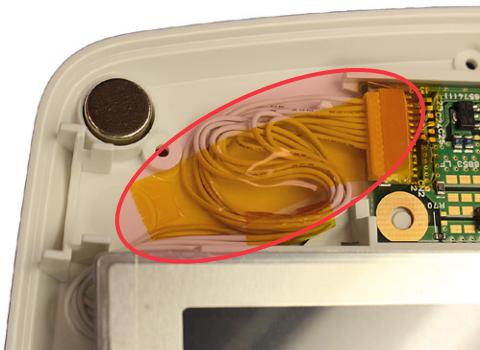
- Complete any additional repairs to the console display, and then reassemble the display according to the procedure [Reassemble the Console Display](#) on page 82.

## PROCEDURE 19. REPLACE THE DISPLAY HOUSING BOTTOM

QUANTITY	PART #	DESCRIPTION
Parts		
1	0120-0373	Display housing bottom
2	0130-0232	Neodymium disc magnet
Tools		
AR	—	Tweezers
AR	—	Scissors (small)
AR	—	X-ACTO knife
AR	0135-0042	Loctite 422 Super Bonder

### REMOVE THE LCD ASSEMBLY (NEWER MODEL LCD)

1. If the system still contains an older model LCD, but you are not currently replacing it, skip to Step 8. Otherwise, continue to Step 2.
2. Complete the procedure [Disassemble the Console Display](#) on page 61.
3. Lift the metal keypad mount off of the display housing bottom, and then set the keypad mount aside.
4. Remove the Kapton tape securing the backlight power cable assembly to the display housing bottom.



5. Remove the Kapton tape securing the LCD flex cables to the display housing bottom.



6. Lift the LCD assembly (LCD, backlight driver PCBA, positioning bracket, and cables) off of the display housing bottom.
7. Skip to Step 17.

#### **REMOVE THE KEYPAD, LCD, AND INVERTER (OLDER MODEL LCD)**

8. Complete the procedure [Disassemble the Console Display](#) on page 61.
9. Lift the metal keypad mount off of the display housing bottom, and then set the keypad mount aside.
10. Remove the Kapton tape securing the LCD flex cable to the display housing bottom.



11. Remove the Kapton tape that is securing the LCD power cables to the inverter.



12. Lift the power inverter off of the display housing bottom. This provides space for you to access the LCD power cable connector.

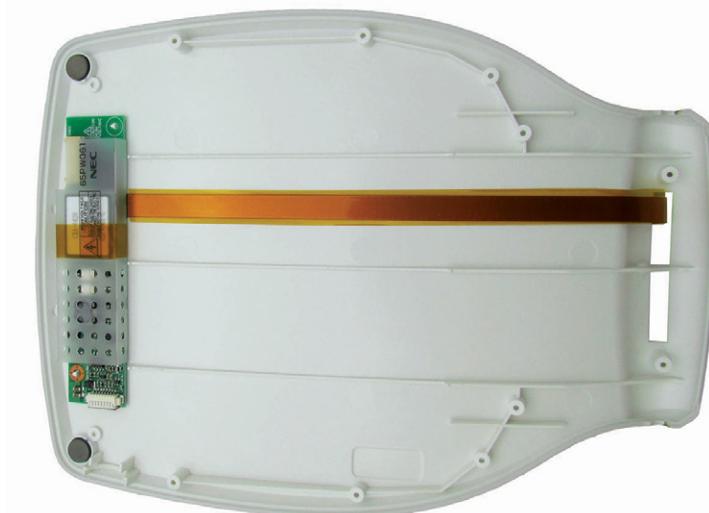
*Note: If necessary, use tweezers in order to leverage the inverter away from the display housing bottom.*

13. Using tweezers, remove the LCD power cable connector from the inverter.



14. Lift the LCD and the LCD flex cable off the display housing bottom. Set the LCD and flex cable aside.

15. Remove the Kapton tape that secures the inverter flex cable to the display housing bottom.



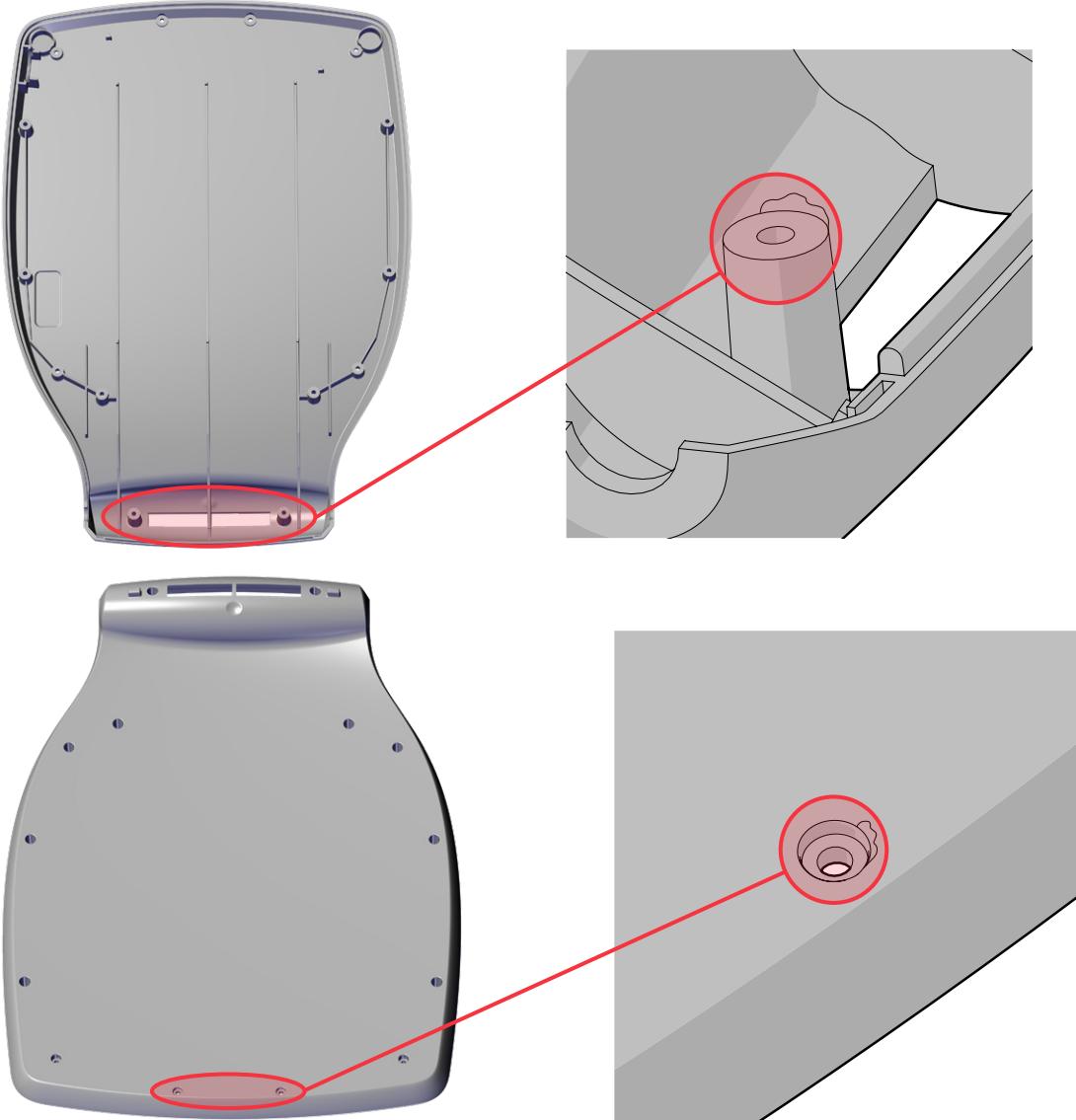
16. Lift the inverter and the inverter flex cable off of the display housing bottom.

### REPLACE THE DISPLAY HOUSING BOTTOM

17. On the new display housing bottom (0120-0373), examine the screw bosses and openings for *flash* (extra plastic that flows out through the seams of the mold during the molding process). On the display housing bottom, flash may occur in two places:

- Around the end of the two large screw bosses next to the console hinge
- Around the edges of the screw openings on the end farthest from the hinge

The following diagrams show how flash may appear in these places.



18. Using an X-ACTO knife or a small pair of scissors, cut away and dispose of all flash.

19. Place the new display housing bottom, interior facing up, onto the base housing top cover assembly. You will use the original top cover assembly in order to determine the correct polarity for the magnets in the display housing bottom.



20. Add a drop of Loctite 422 Super Bonder into the magnet recesses at the two corners.



21. Ensuring that you have the correct polarity so that the display housing magnets are attracted to the base housing magnets, insert the new magnets into the recesses.



22. Complete any additional repairs to the console display, and then reassemble the display according to the procedure [Reassemble the Console Display](#) on page 82.

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## PROCEDURE 20. REASSEMBLE THE CONSOLE DISPLAY

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If you did not disassemble the console display, skip to the next procedure, [Reassemble the Console Base Housing](#) on page 90.

If any of the console display housing components require replacement, replace those components during this reassembly procedure.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
12	0261-0315	Display housing screw, M2, 10 mm
2	0261-0314	Display housing screw, M2, 6 mm
14	0261-0091	Base housing screw, M3, 12 mm
AR	0142-0854	BVI 9400 display housing lens assembly
AR	0125-0540	Housing vent membrane
<b>Tools</b>		
—	—	T10 star screwdriver
AR	—	Isopropyl alcohol, 70% or higher
AR	—	Kimtech wipe
AR	—	Cotton swab
—	—	Ionized air gun or a similar tool
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

### REINSTALL THE LCD ASSEMBLY (NEWER MODEL LCD)

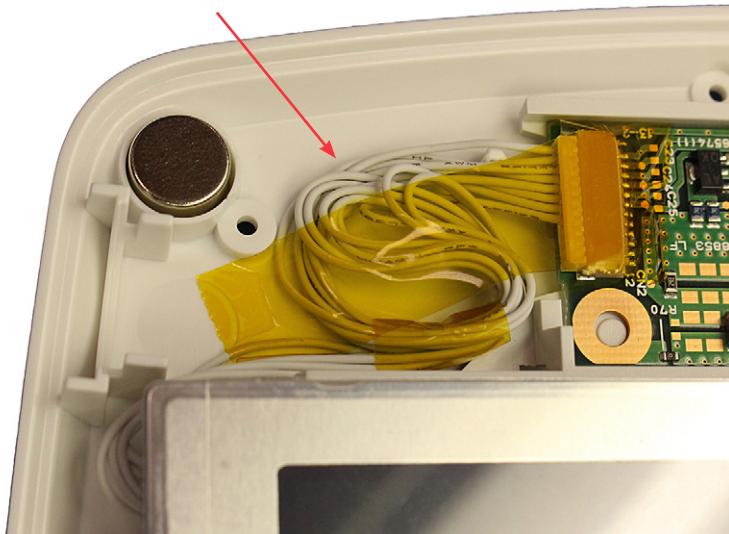
Complete this section if you are installing or reinstalling the newer model of LCD assembly (consisting of the LCD, the backlight driver PCBA, the mounting bracket holding them both in place, and associated cables). If you are reinstalling the older model of LCD, skip to Step 8. If you also need to reinstall the inverter for the older model of LCD, skip to Step 6.

1. Carefully lower the LCD assembly (LCD, backlight driver PCBA, mounting bracket, and cables) into place on the display housing bottom so that it fits securely into the recess in the ribs on the housing. As you position the bracket, verify that the two flex cables are not pinched.
2. Feed the two flex cables through the two large slots at the base of the display housing bottom.

3. Secure the two flex cables to the display housing bottom using 1.3 cm (½-inch) Kapton tape.



4. Loop the excess length of the backlight power cable assembly around itself until it can fit into the small recess between the LCD assembly and the corner of the display housing bottom. Tuck the looped cable into the recess, and then secure it using a length of 1.3 cm (½-inch) Kapton tape.



5. Skip to Step 14.

## **REINSTALL THE INVERTER AND INVERTER FLEX CABLE (OLDER MODEL LCD)**

Complete this section if you removed the inverter or inverter flex cable for the older model of LCD. If you did not remove these items, skip to Step 8.

6. Place the inverter and inverter flex cable onto the display housing bottom, ensuring that the inverter fits correctly onto the posts of the bottom housing.



7. Feed the inverter flex cable through the right gap in the base of the console display, and then use 1.3 cm (½-inch) Kapton tape in order to secure the flex cable to the display housing bottom.



## **REINSTALL THE LCD AND LCD FLEX CABLE (OLDER MODEL LCD)**

Complete this section if you removed the older model of LCD or LCD flex cable and are now replacing them. If you do not need to reinstall these items, skip to Step 14.

8. Set the LCD below the inverter, and then feed the flex cable through the left gap in the base of the console display.



9. Plug the LCD power connector into the inverter.
10. Place the LCD power wires so that they are not in the way of the screw bosses or housing seams, and then secure them in place with 1.3 cm (½-inch) Kapton tape.



11. Place the display housing lens assembly over the LCD, ensuring that the LCD is aligned properly.
12. Remove the display housing lens assembly, and then secure the LCD flex cable to the display housing bottom with 1.3 cm (½-inch) Kapton tape.



13. Place the metal keypad mount below the LCD, and then feed the keypad flex cable through the right gap in the base of the console display.



## ATTACH THE LENS ASSEMBLY

14. If you are using a new top cover assembly, peel the protective backing off of the housing vent membrane, and then install the membrane into the top cover assembly as shown in the following figure.



15. If you are using a new top cover assembly, remove the protective masking tape cover from the interior-facing side of the lens.
16. Using an ionized air gun or a similar tool, blow off the interior surface of the display housing lens assembly and the LCD.  
If necessary, use cotton swabs, isopropyl alcohol, or Kimtech wipes in order to clean the surface of the lens and LCD.
17. If you have installed a new LCD, remove the plastic protective sheet on the screen.
18. Place the display housing lens assembly over the LCD, ensuring that no debris is trapped between the lens and the screen.
19. Hold the lens assembly and the housing bottom together, and then turn the console display over.
20. Using a T6 star screwdriver, insert (12) display housing screws (0261-0315) as indicated in the following figure.



21. Using a T6 star screwdriver, insert (2) display housing screws (0261-0314) as indicated in the following figure.



#### **ATTACH THE DISPLAY TO THE BASE HOUSING TOP COVER**

22. Insert the hinges into the base housing top cover assembly at an angle, as shown in the following figure.

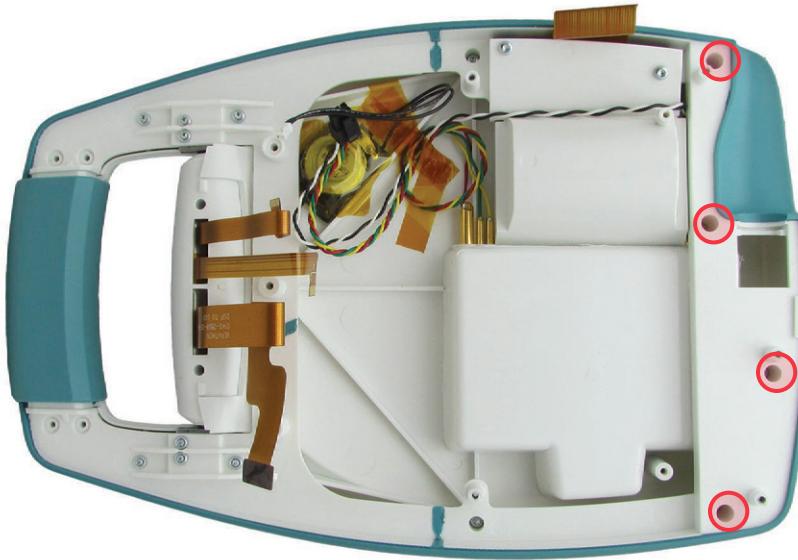


23. Ensuring that the flex cables do not become pinched between the top cover assembly and the console display, push the console display base into place.

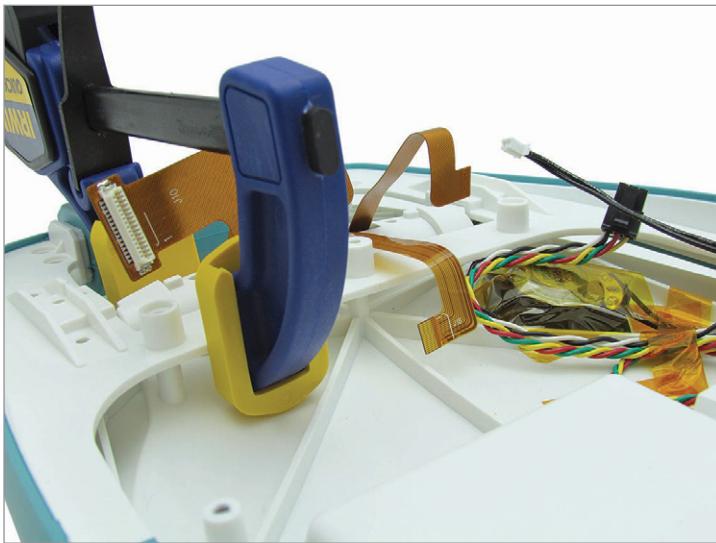
#### **ATTACH THE HANDLE ASSEMBLY**

24. Place the handle assembly on the base housing top cover assembly, ensuring that the negative-side power cable slides over the printer housing and that the flex cables are not pinched under the handle assembly.
25. Apply pressure to the back of the handle assembly, snapping the back of the handle assembly into place on the top cover assembly.

26. Using a T10 star screwdriver, insert (4) base housing screws into the back of the handle assembly.



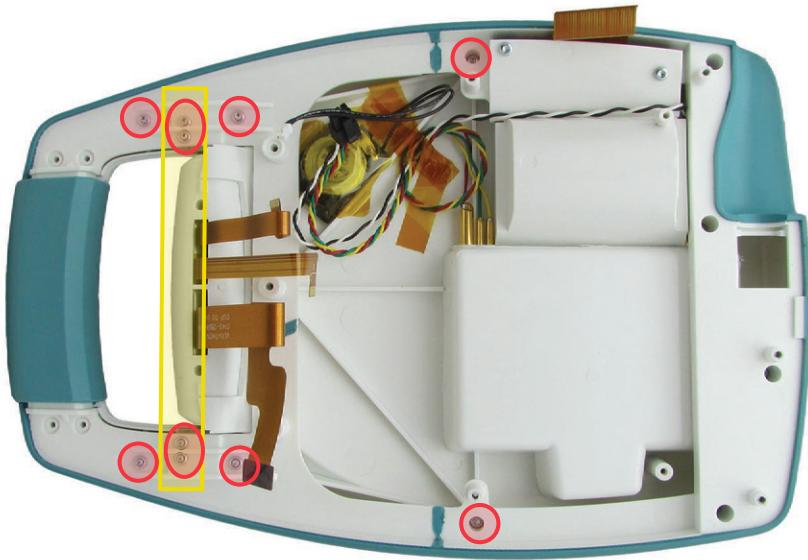
27. As shown in the following figure, use a clamp in order to force the three screw bosses in the middle of the top cover assembly into their housings on the handle assembly.



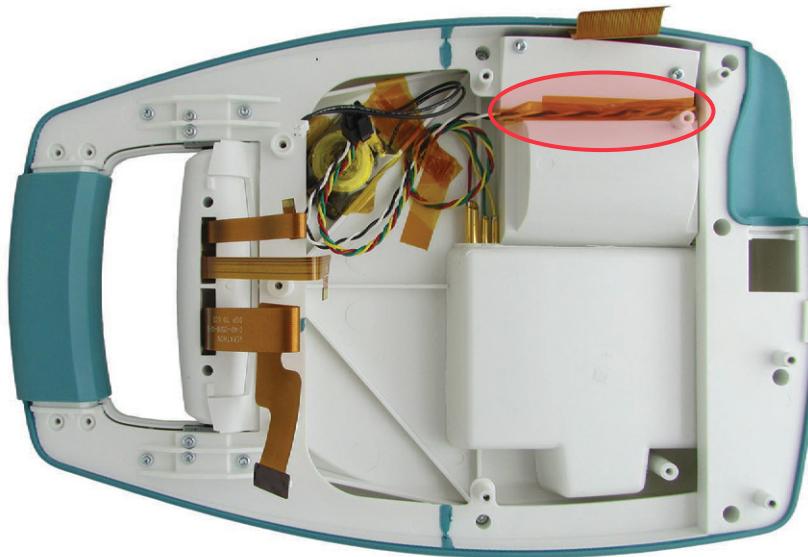
28. Apply pressure to the top of the base housing, ensuring that the handle and top cover assemblies are completely snapped together.

29. Using a T10 star screwdriver, insert (10) base housing screws as shown in the following figure.

*Note: When you insert the (4) hinge screws (highlighted in yellow in the following figure), ensure that you do not apply too much force to the screw. The low number of threads causes them to strip easily.*



30. Using a piece of 1.3 cm (1/2-inch) Kapton tape, secure the negative-side power cable to the top of the printer housing.



31. Continue to the next procedure.

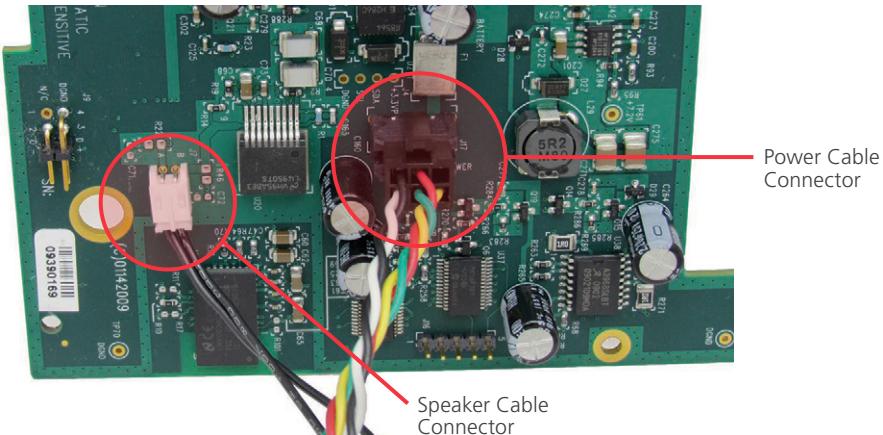
## PROCEDURE 21. REASSEMBLE THE CONSOLE BASE HOUSING

If any of the console housing components require replacement, replace those components during this reassembly procedure.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
AR	0142-0764	BVI 9400 DSP PCBA
8	0261-0091	Base housing screw, M3, 12 mm
6	0261-0091	DSP PCBA screw, M3, 12 mm
AR	0120-0369	IR lens
4	0120-0367	Base housing foot
<b>Tools</b>		
1	—	T10 star screwdriver
AR	0136-0059	Kapton tape, 1.3 cm (½-in)

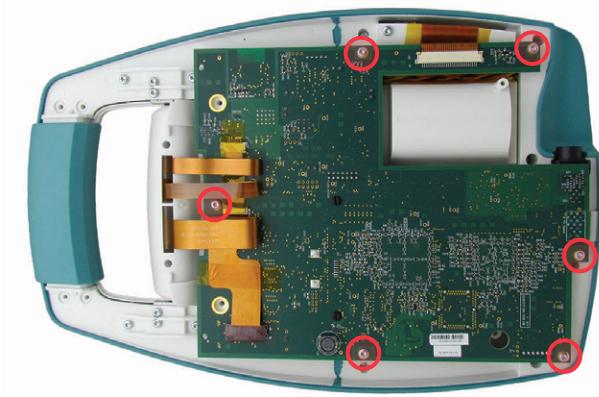
### REATTACH THE DSP PCBA

1. Connect the speaker and power connectors to the DSP PCBA.

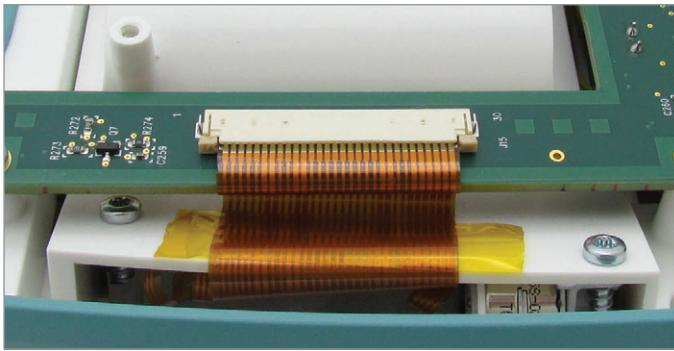


2. Carefully tilt the DSP PCBA down over the base housing handle.
3. Position the battery and speaker wires so they won't interfere with the handle bosses, and then align the DSP PCBA with the handle posts.

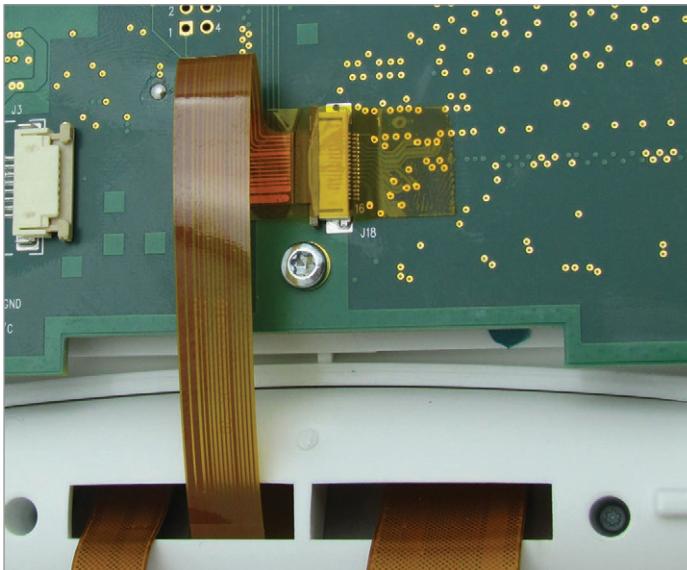
- Secure the DSP PCBA board with (6) DSP PCBA screws.



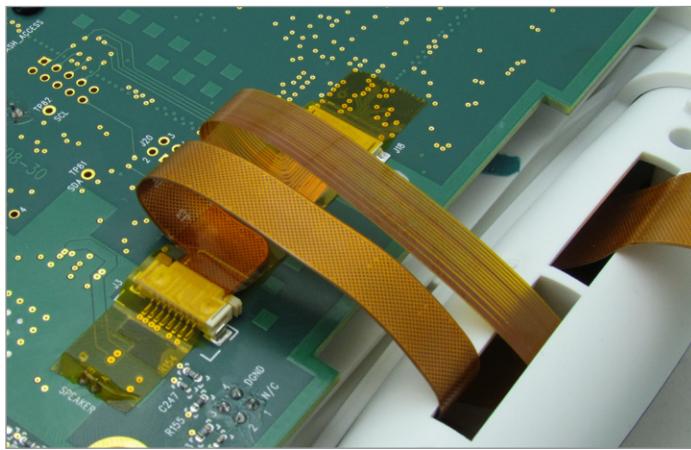
- Insert the printer flex cable into the DSP PCBA connector, and then secure it with 1.3 cm (1/2-inch) Kapton tape.



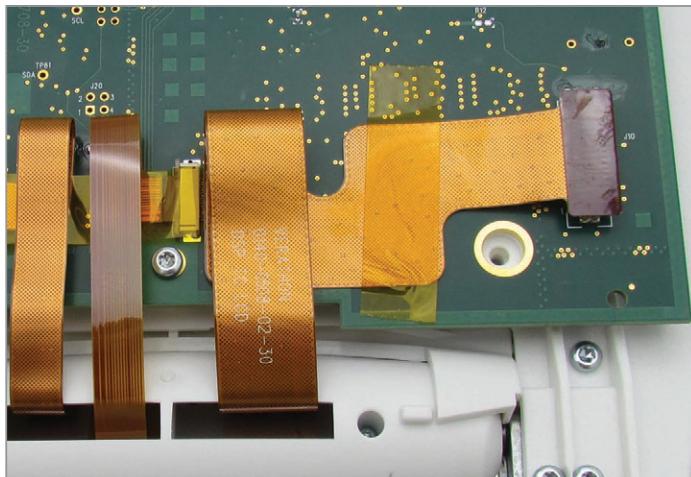
- Loop the keypad flex cable so the gold pads are facing down, insert the keypad flex cable into the DSP PCBA connector, and then secure it with 1.3 cm (1/2-inch) Kapton tape.



7. Loop the inverter flex cable so the gold pads are facing upward, insert the flex cable into the DSP PCBA connector, and then secure it with 1.3 cm (½-inch) Kapton tape.



8. Loop the LCD flex cable so the flex cable connector faces the DSP PCBA, press the LCD flex cable connector onto the DSP PCBA connector, and then secure the flex cable with 1.3 cm (½-inch) Kapton tape.



9. Power up the console to ensure that it turns on.

10. Turn the console off.

#### **REATTACH THE BASE HOUSING BOTTOM COVER ASSEMBLY**

11. Inspect the IR lens in the base housing bottom cover assembly. If the IR lens is missing or damaged, replace it.
12. Place the base housing bottom over the assembly.
13. Starting from the back and moving toward the handle, press around the unit in order to snap it together. Check for gaps.

- Using a T10 star screwdriver and (8) base housing screws, reattach the base housing bottom.



- Apply the base housing rubber feet in the four recesses in the base housing bottom.

*Note: If you prefer, you may wait to install the base housing rubber feet until the console has passed the certification procedure.*



- If you need to replace the label on the bottom of the console, continue to the next procedure.

- If you have completed all necessary repair and replacement procedures, continue to the [Annual Certification](#) chapter on page 7.

If you replaced the DSP PCBA while servicing the console, ensure that you complete the procedure [Update the Software](#) on page 7 as part of the certification process.

## **PROCEDURE 22. REPLACE THE CONSOLE LABEL**

## **IMPORTANT**

When reprinting the serial number, ensure that you reuse the original console serial number.

Complete this procedure if the console label is damaged or if you have replaced the base housing bottom.

When replacing a label, examine the existing console label and compare it to the following two figures in order to determine whether or not the instrument is UDI-compliant.

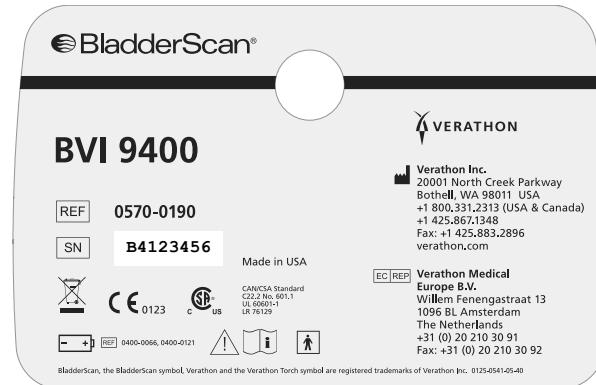
In order to confirm that a unit is UDI-compliant, look for the following items of information on the label:

- The unit's date of manufacture
  - A DataMatrix code  containing the unit's ID and date of manufacture in machine-readable form

*Figure 14. UDI-compliant console label*



*Figure 15. Non-UDI console label*



QUANTITY	PART #	DESCRIPTION
Parts		
AR	0125-0541	BVI 9400 console label, non-UDI
AR	0800-0549	BVI 9400 console label kit with serial number, UDI-compliant
Tools		
1	—	X-ACTO knife
—	—	Plastic scraper
—	—	Isopropyl alcohol, 70% or higher

1. If the instrument is UDI-compliant, order a UDI console serial number label kit (0800-0549).  
If the instrument is not UDI-compliant, use a non-UDI console label (0125-0541).
  2. If the base housing bottom has an existing label, using an X-ACTO knife, carefully peel off the original label.
  3. Using a plastic scraper and Isopropyl alcohol, remove any residue from the previous label.
  4. If you are using a UDI console serial number label kit, skip to Step 9.  
If you are using a non-UDI console label, continue to the next step.

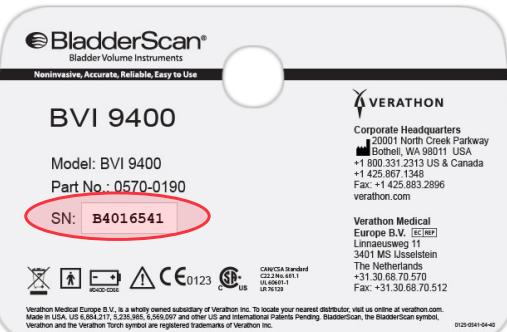
- On a white piece of paper, print the replacement serial number, ensuring it matches the original and uses the following specifications:
  - Font Family—Courier New
  - Font Size—14
  - Font Style—Bold

**B4016542**

- Trim the serial number label on it to the size of the window in the console label.
- Peel back the protective backing on the console label in order to reveal the serial number window.



- Line up the serial number label in the window of the console label, and then carefully apply it.



- Remove the protective backing from the console label, and then carefully apply the console label to the bottom of the console base housing, ensuring that the orientation is correct, as shown in the following figure.



- If you have completed all necessary repair and replacement procedures, continue to the [Annual Certification](#) chapter on page 7.

# PROBE REPAIR

## IMPORTANT

You may only perform service on the probe if the probe has a serial number that starts with PX and has a gray dome. If the probe has a serial number that starts with a 00 or PA and the probe has a black dome, then it must be replaced.

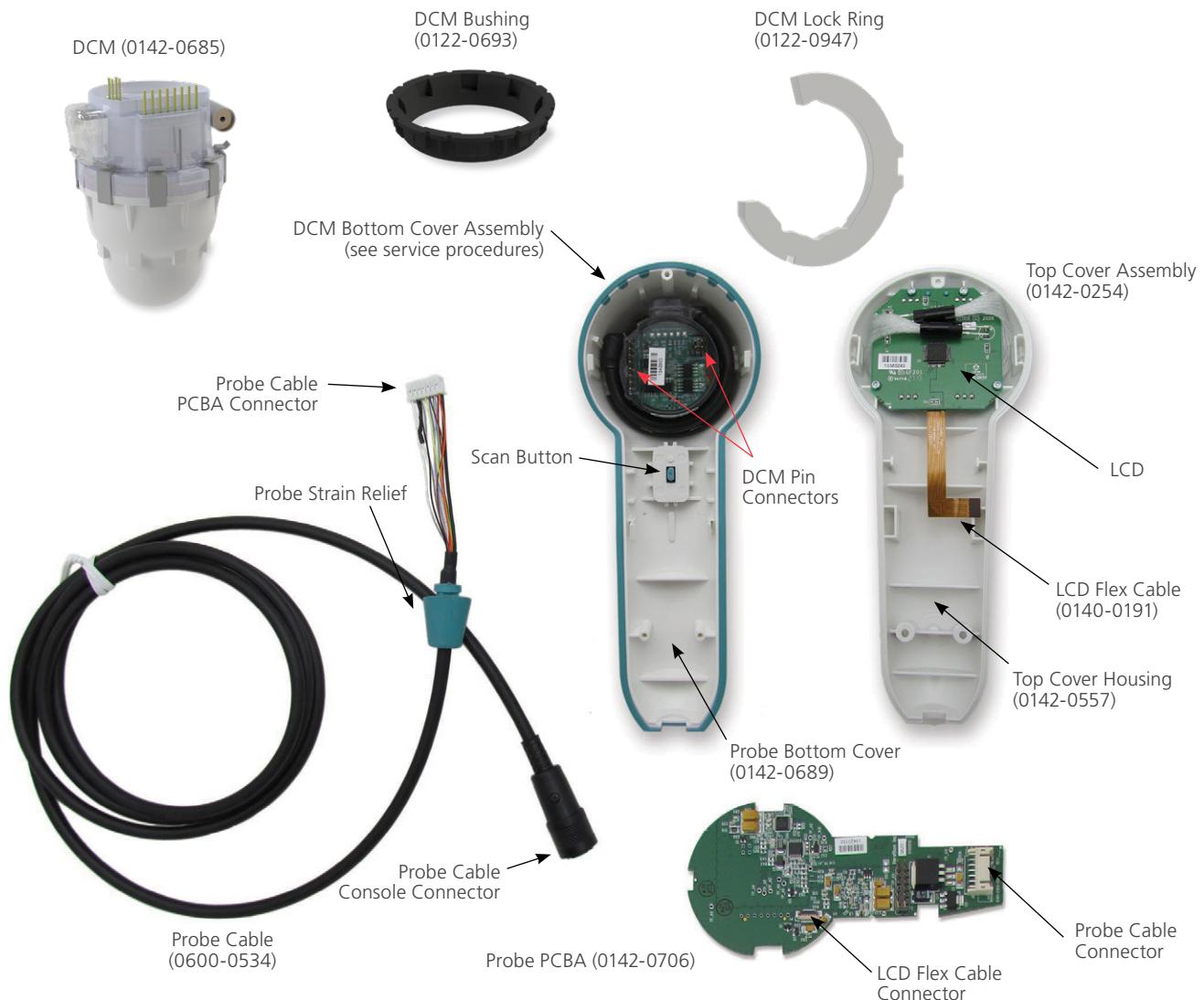
This section contains instructions for completing service on the probe. It consists of the following procedures:

- [Disassemble the Probe](#)
- [Replace the Probe LCD Flex Cable](#)
- [Replace the Probe Top Cover Assembly or Housing](#)
- [Remove the Probe Bottom Cover](#)
- [Install the DCM into a New Bottom Cover](#)
- [Reassemble the Probe](#)
- [Replace the Probe Serial Number Label](#)

After replacing any damaged or non-functioning parts per the procedures in this section, you may skip additional replacement procedures and continue directly to the reassembly procedure.

The following image provides visual reference for the part names and numbers of the probe. For a complete list of part numbers, see [Part Numbers](#) on page 124.

Figure 16. Parts of the BVI 9400 Probe



## PROCEDURE 23. DISASSEMBLE THE PROBE

Use this procedure in order to disassemble the probe to a stage from which you can complete any of the replacement procedures included in this section. If replacing a part or component requires additional disassembly, that information is detailed in the corresponding part replacement procedure.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
1	0261-0353	Small probe housing screw, M2, 8 mm
2	0261-0315	Large probe housing screw, M2, 10 mm
<b>Tools</b>		
AR	—	T6 star screwdriver
AR	—	T5 star screwdriver
—	—	Spreader
—	—	Tweezers

1. Remove the serial number label and the screw cover plug from the probe, making note of the serial number so that you can order a replacement label.

If the serial number is unreadable or missing, see [Replace the Probe Serial Number Label](#) on page 113.



2. Using a T6 star screwdriver, remove the (3) probe housing screws.

*Note: A T5 star screwdriver may be needed for older probes.*



3. Gently separate the handle of the probe top housing assembly from the DCM base housing assembly. You may either very gently twist the probe handle or use a flat instrument in order to create a gap.

*Note: If you use a flat instrument, be very careful not to damage the probe PCBA or probe cable. If you gently twist the handle in order to create a gap, ensure that you do not twist the head of the probe. If the probe bottom cover has clips, twisting may damage them.*

4. Align the spreader near the center of the handle, and then gently spread the probe top and bottom cover assemblies apart, repositioning spreaders as needed.

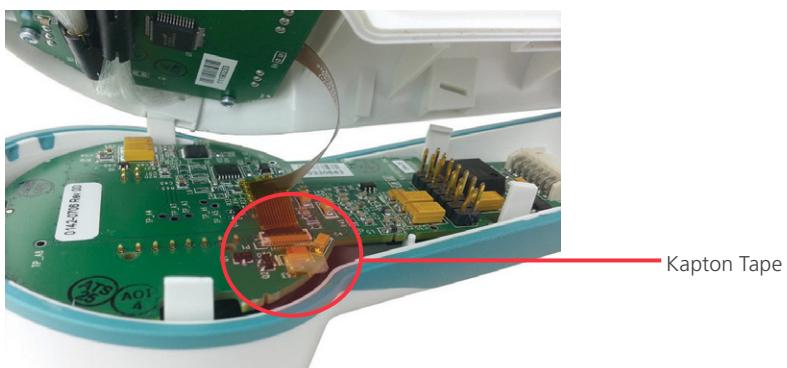


5. When the probe top cover assembly is loose, lift the top cover assembly straight up. If the probe bottom cover has clips, do not twist, bend, or tilt any of them.

*Note: Do not completely remove the top cover. You must first detach the flex cable.*

6. Tilt the probe so that the flex cable is accessible, remove the Kapton tape, and then detach the flex cable.

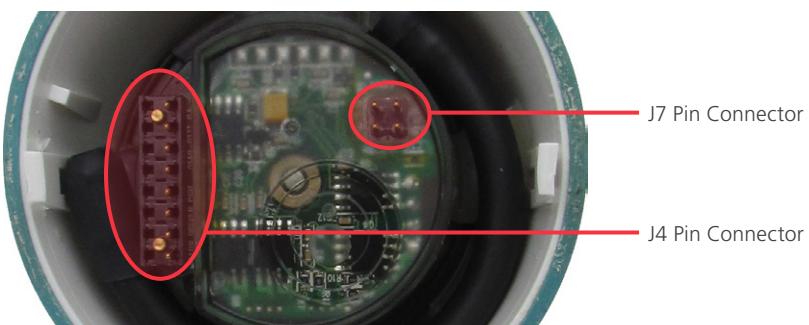
*Note: If needed, use tweezers to help remove the flex cable.*



7. Remove the probe PCBA from the DCM pin connector.

8. If the J7 or J4 black plastic connectors remain on the DCM pins, as shown in the following figure, or if they fall off, reattach the connectors to the probe PCBA.

If any of the J7 or J4 probe PCBA pins remain attached to the DCM, remove them from the DCM, and replace the probe PCBA during the procedure [Reassemble the Probe](#) on page 109.



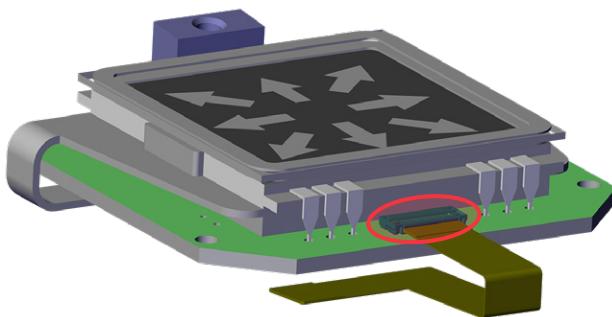
## PROCEDURE 24. REPLACE THE PROBE LCD FLEX CABLE

If voice annotations are silent or distorted or the probe LCD does not function correctly, but there is no evidence of oil contamination around the probe LCD assembly or the microphone filter, replace the probe LCD flex cable before replacing any larger components.

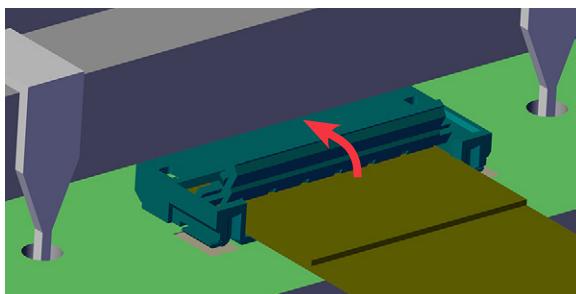
*Note: This procedure does not apply to the AortaScan AMI 9700. If you are servicing an AMI 9700 unit, proceed to [Replace the Probe Top Cover Assembly or Housing](#) on page 102.*

QUANTITY	PART #	DESCRIPTION
Parts		
1	0140-0191	Probe LCD flex cable
4	0261-0082	Probe LCD screw, M2, 5 mm
Tools		
AR	—	T6 star screwdriver
AR	—	T5 star screwdriver
AR	0136-0029	Kapton tape, 0.6 cm (1/4-in)

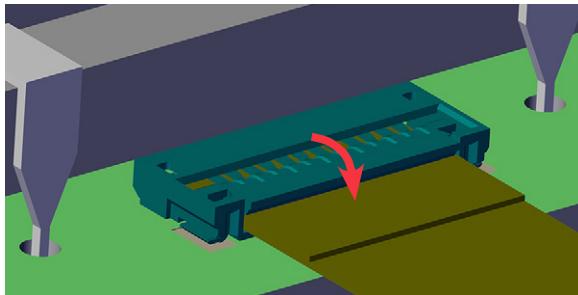
1. Complete the procedure [Disassemble the Probe](#) on page 98.
2. Using a T6 star screwdriver, remove the (4) probe LCD screws (0261-0082). Retain screws for later use.  
*Note: A T5 star screwdriver may be needed for older probes.*
3. Lift the probe LCD assembly out of the top cover housing.
4. On the probe LCD assembly, locate the flex cable connector.



5. Remove any Kapton tape covering the flex cable connector, and then move the latch on the connector up and back.



6. Remove the existing flex cable from the connector.
7. Insert the straight end of the replacement flex cable (0140-0191) into the connector with its exposed conductor stripes down.
8. Press the latch forward and down in order to secure the cable.



9. Place a length of 0.6 cm (1/4-inch) Kapton tape (0136-0029) over the latch in order to secure it in place.
10. Insert the probe LCD assembly into its seat on the probe top cover housing.
11. Reattach the (4) probe LCD screws (0261-0082).
12. Complete any additional repairs to the probe, and then reassemble the probe according to the procedure [Reassemble the Probe](#) on page 109.

## PROCEDURE 25. REPLACE THE PROBE TOP COVER ASSEMBLY OR HOUSING

QUANTITY	PART #	DESCRIPTION
Parts		
AR	0142-0557	BVI 9400 probe top cover housing
AR	0142-0254	BVI 9400 probe top cover assembly
4	0261-0082	Probe LCD screw, M2, 5 mm
Tools		
AR	—	T6 star screwdriver
AR	—	T5 star screwdriver

1. Complete the procedure [Disassemble the Probe](#) on page 98.
2. If voice annotations are silent or distorted, visually inspect the microphone filter for oil. If present, replace the probe top cover housing assembly in the following step.
3. If the probe LCD or microphone does not function correctly, dispose of the LCD and top cover, and then use a new probe top cover assembly.

If the probe LCD functions, do the following:

- Using a T6 star screwdriver, remove the (4) probe LCD screws (0261-0082). Retain screws for later use.  
*Note: A T5 star screwdriver may be needed for older probes.*
- Transfer the LCD to a new probe top cover housing.
- Reattach the (4) probe LCD screws (0261-0082).



4. Complete any additional repairs to the probe, and then reassemble the probe according to the procedure [Reassemble the Probe](#) on page 109.

## PROCEDURE 26. REMOVE THE PROBE BOTTOM COVER

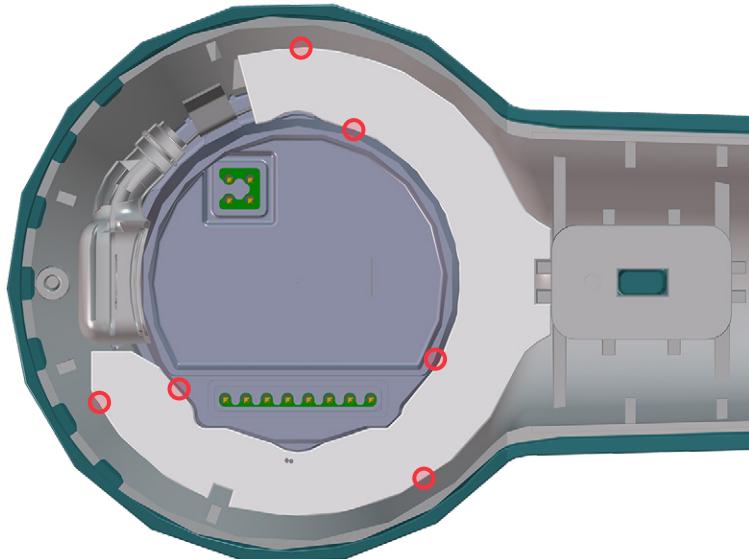
Complete the following two procedures to reuse the original DCM if the probe bottom cover is damaged, but the DCM is still functional.

### IMPORTANT

You can replace the probe bottom cover only if the DCM is held in place with a plastic lock ring. If the DCM is simply glued into place, you must either return the DCM bottom cover assembly to Verathon for replacement or rebuild it using new parts. For the part list and instructions to rebuild the DCM bottom cover assembly, refer to the procedure [Install the DCM into a New Bottom Cover](#) on page 106.

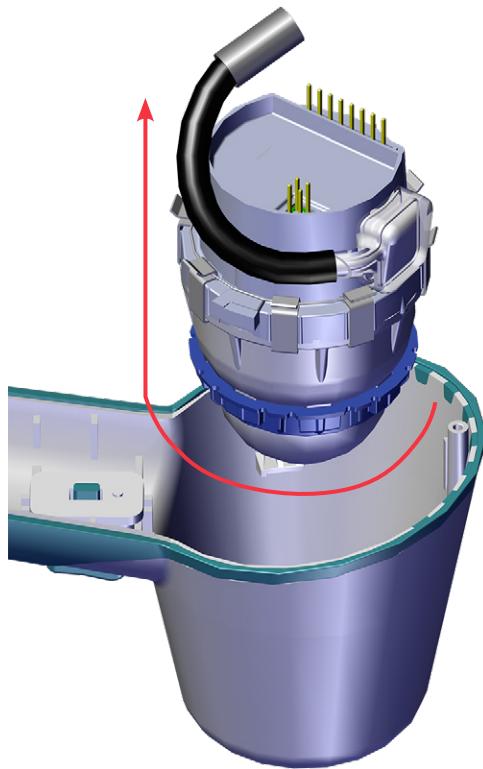
QUANTITY	PART #	DESCRIPTION
Tools		
1	—	X-ACTO knife

1. Complete the procedure [Disassemble the Probe](#) on page 98.
2. Using an X-ACTO knife, cut through the six drops of silicone RTV adhesive securing the lock ring inside the bottom cover.

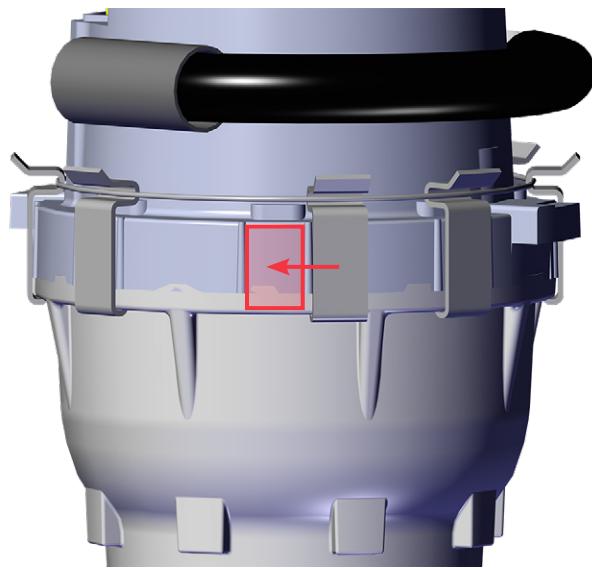


3. Remove the lock ring from the bottom cover.

4. Turn the DCM clockwise until its tabs are fully disengaged from the locking tabs on the bottom cover, and then lift the DCM out.

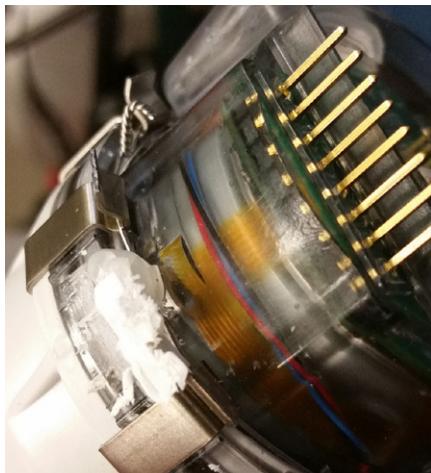


5. Using the X-ACTO knife, cut away any remaining RTV adhesive from the lock ring and the bottom cover.
6. Examine the spring clips securing the DCM dome to ensure it is still in position. If a clip has moved from its correct location between two ridges, slide it back between them.



7. Visually inspect the DCM ensuring that there is no damage to either the plastic or the DCM pins.

If the plastic or pins are damaged, complete the procedure [Reassemble the Probe](#) on page 109 using a new DCM.



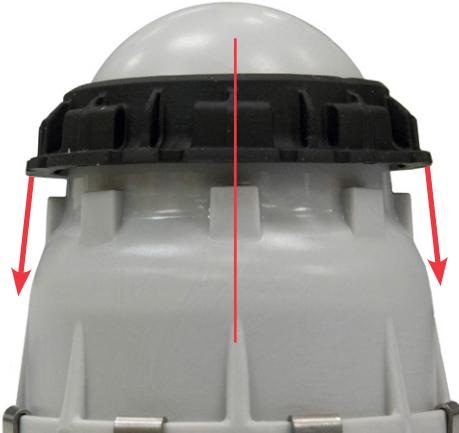
8. If the plastic and pins are intact, continue to the procedure [Install the DCM into a New Bottom Cover](#).

## PROCEDURE 27. INSTALL THE DCM INTO A NEW BOTTOM COVER

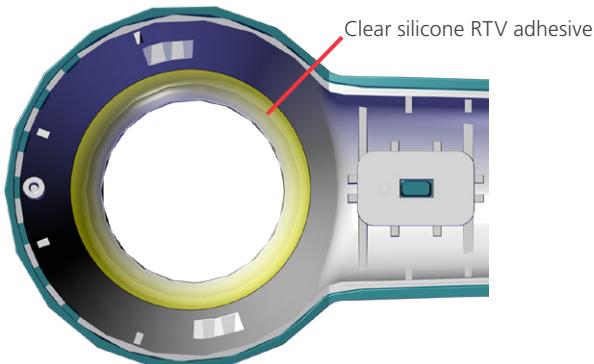
Follow this procedure to assemble a new DCM bottom cover assembly using a new or existing DCM.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
1	0142-0689	Probe bottom cover
AR	0142-0685	DCM
1	0122-0693	DCM bushing
1	0122-0947	DCM lock ring
AR	0136-0149	Clear silicone RTV adhesive

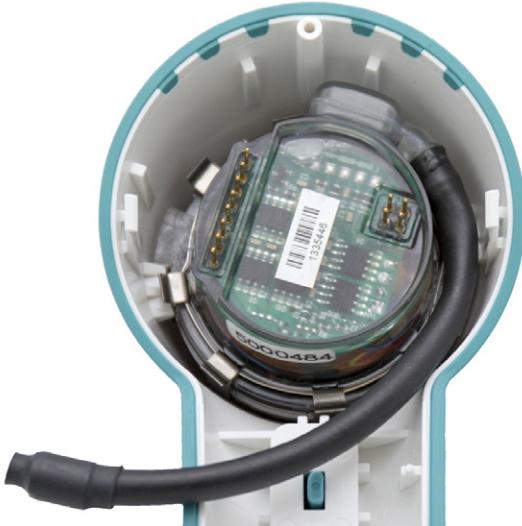
1. Ensure the old bushing has been removed and that the DCM is clean.
2. Seat the new bushing onto the DCM. Ensure the bushing grooves are aligned with the DCM guide ledges.



3. Apply a thin layer of clear silicone RTV adhesive to the inside surface of a new probe bottom cover, just inside the DCM opening, as shown in the following figure.



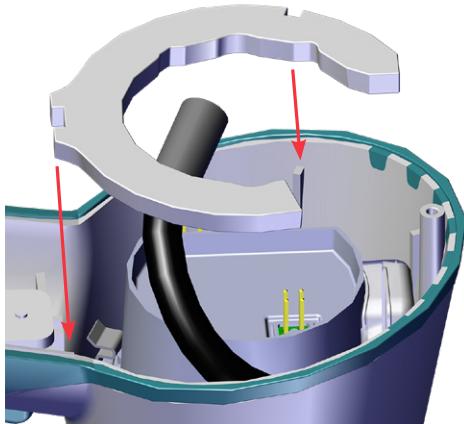
4. Place the DCM into the bottom cover, aligned as shown in the following figure.



5. While pressing down on the top of the DCM, turn the DCM counterclockwise until its tabs slide under the bottom cover's plastic locking tabs.

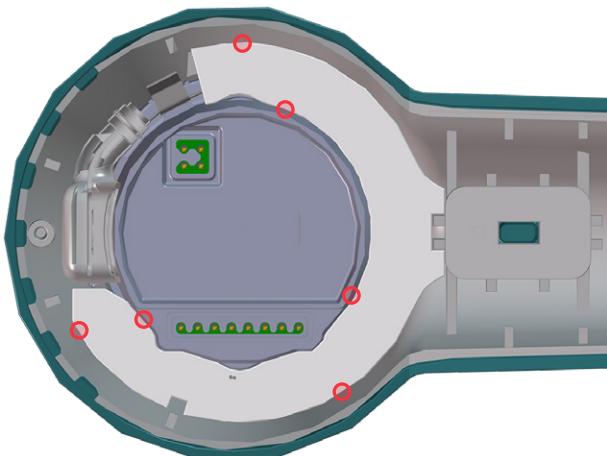


6. Insert the lock ring into the bottom cover, pressing it into place so that it lines up with the DCM and the cover as shown in the following figure.

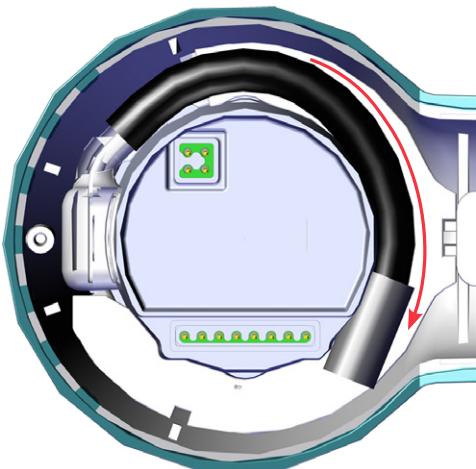


7. Place six drops of silicone RTV adhesive around the lock ring at the locations shown in the following figure.

*Note: Do not apply RTV adhesive at any notch or alignment feature. In the following figure, the oil filler tube is omitted for clarity.*



8. After the RTV adhesive has set, tuck the oil filler tube into place around the DCM.

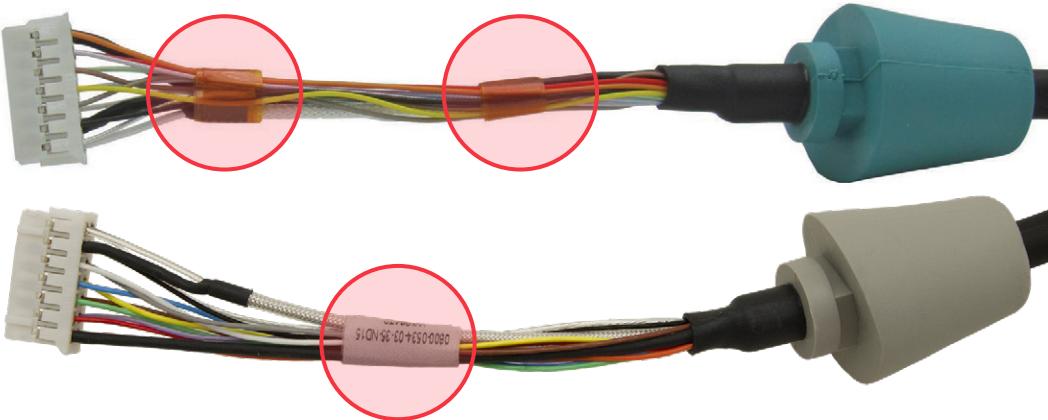


## PROCEDURE 28. REASSEMBLE THE PROBE

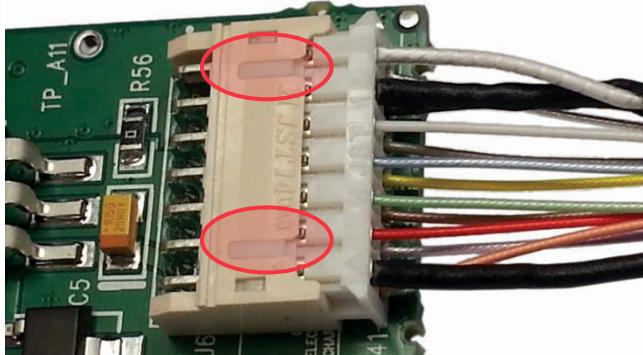
If any of the probe housing components require replacement, then replace those components during this reassembly procedure.

QUANTITY	PART #	DESCRIPTION
<b>Parts</b>		
AR	—	DCM bottom cover assembly
AR	0142-0706	Probe PCBA
AR	0600-0534	Probe cable
AR	0142-0254	Probe top cover assembly
1	0261-0353	Small probe housing screw, M2, 8 mm
2	0261-0315	Large probe housing screw, M2, 10 mm
1	0122-0559	Screw cover plug
AR	0136-0111	Room-temperature-vulcanization (RTV) silicone adhesive sealant, white
<b>Tools</b>		
—	—	Tweezers
AR	—	T6 star screwdriver
AR	0136-0029	Kapton tape, 0.6 cm ( $\frac{1}{4}$ -in)
AR	—	Sandpaper, 600 grit or finer
AR	—	Foam swab or Kimtech wipe

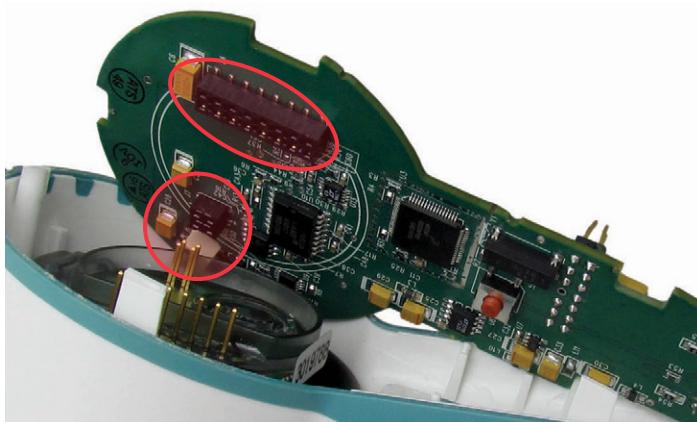
1. If the cable wires on the probe cable are not secured with tape or a label, wrap the wires with two pieces of 0.6 cm ( $\frac{1}{4}$ -inch) Kapton tape.



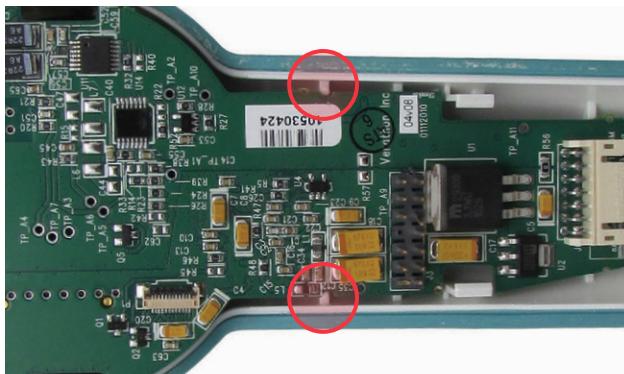
2. Connect the probe cable to the probe PCBA, ensuring that the probe cable PCBA connector is seated properly.



3. Inspect the original DCM bottom cover assembly. If the DCM is malfunctioning or if the clips or bosses are damaged, replace the DCM bottom cover assembly:
4. Align the pin holes on the J4 and J7 connectors, and then connect the probe PCBA to the DCM bottom cover assembly.

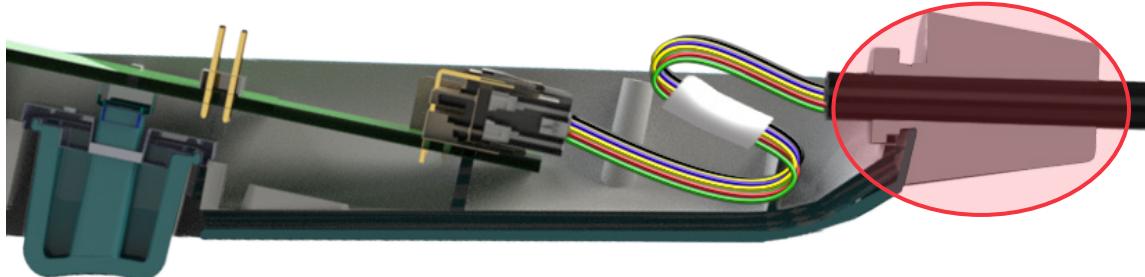


5. If the bottom cover has alignment pins, ensure the probe PCBA is seated securely with them, as shown in the following figure.



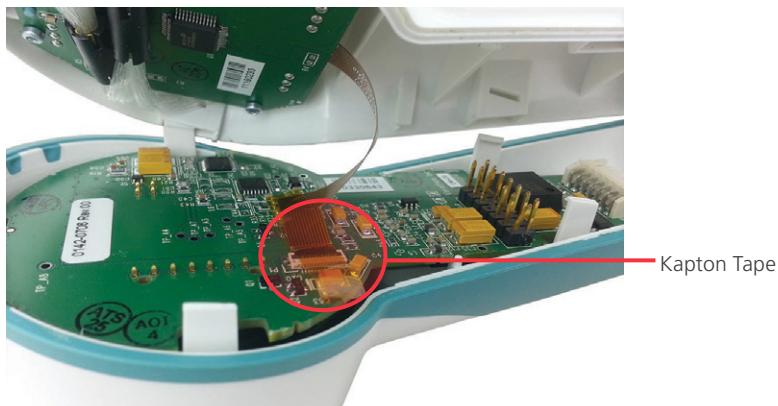
6. Seat the cable strain relief into the bottom cover assembly, and then ensure that the probe cable wires curve in an S shape as shown in the following image.

*Note: The curve in the probe cable wires helps ensure that the probe PCBA will not shift within the probe. Reversing the curve of the wires may cause the probe PCBA to unseat within the probe.*

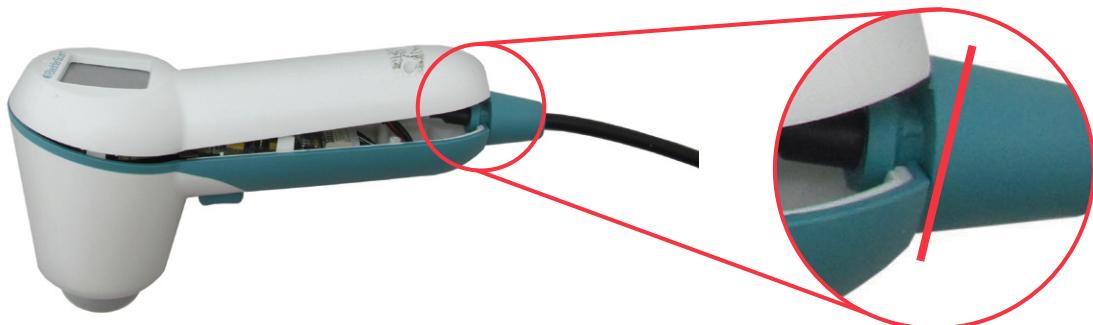


7. Connect the flex cable to the probe PCBA, and then secure the latch and flex cable with 0.6 cm (1/4-inch) Kapton tape.

*Note: If needed, use tweezers to help adjust the flex cable.*



8. Fit the cable to the bottom cover, ensuring the cable strain relief is seated at the correct angle.

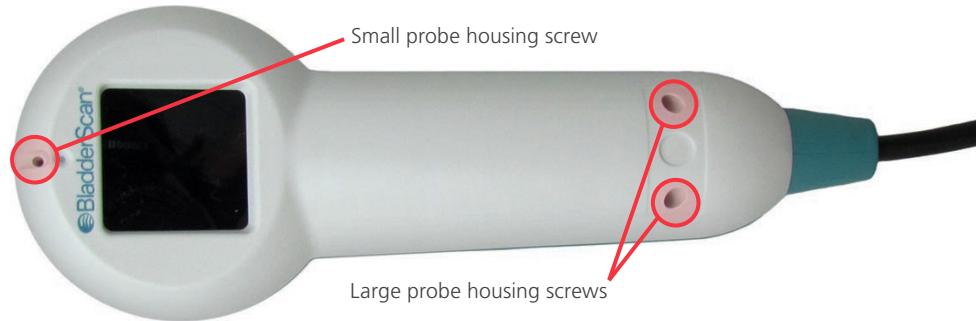


9. If the probe bottom cover has clips, connect them all around the top and bottom cover assemblies, and then squeeze until the tabs click.

If needed, press the probe against a hard surface.

- Using a T6 star screwdriver, secure the top and bottom housings together using (2) large probe housing screws (0261-0315) at the bottom of the probe, and (1) small probe housing screw (0261-0353) at the top.

*Note: These screws are delicate. Do not over-tighten. It is recommended that you replace these screws instead of reusing them.*



### INSERT THE SCREW COVER PLUG

- On the top housing, fit the screw cover plug over the screw.
- If the plug extends over the edges of the slot, remove it and then sand the surface with sandpaper, as shown in red in the following figure. Replace the plug, check for fit, and then repeat sanding as necessary.



- Remove the screw cover plug.
- Apply RTV sealant into the opening for the screw cover plug.



- Insert the screw cover plug into the slot, ensuring that it is flush with the exterior surfaces of the top housing.
- If any RTV sealant is visible on exterior surfaces of the plug or top housing, use a foam swab or Kimtech wipe in order to clean off the residue.
- If you need to replace the probe serial number label, continue to the next procedure.
- If you have completed the necessary repair and replacement procedures, continue to the [Annual Certification](#) chapter on page 7. Note the following:
  - If you replaced the probe PCBA or the DCM bottom cover assembly during this procedure, complete the procedure [Update the Software](#) on page 7.
  - Complete the procedure [Perform Probe Calibration](#) on page 10. This procedure is required each time the probe is disassembled and reassembled.

## PROCEDURE 29. REPLACE THE PROBE SERIAL NUMBER LABEL

Replace the serial number label on the probe if it was removed during a probe service procedure. The probe serial number label kit includes a preprinted label, spacer dots, and a clear protective film.

When replacing a probe serial number label, examine the existing probe label and compare it to the following two figures in order to determine whether or not the probe is UDI-compliant. Once you have that information, order the appropriate probe serial number label kit.

*Note: UDI-compliant labels cannot be created for a non-UDI probe.*

If the label is damaged or missing, contact Verathon Customer Care for assistance. If they can retrieve the probe's serial number, you can then order the appropriate kit. If not, you will need to return the probe to Verathon so that it can be renumbered.

In order to confirm that a unit is UDI-compliant, look for the following items of information on the label:

- The unit's date of manufacture
- A DataMatrix code containing the unit's ID and date of manufacture in machine-readable form

Figure 17. UDI-compliant probe label



Figure 18. Non-UDI probe label



QUANTITY	PART #	DESCRIPTION
Parts		
AR	0800-0538	BVI 9400 probe serial number label kit, non-UDI
AR	0800-0553	BVI 9400 probe serial number label kit, UDI-compliant
AR	0800-0616	BVI 9400 probe serial number label kit, Service Probe Exchange Program (UDI-compliant)

1. Install the spacer dot in the label recess between the two screws. Do not allow the spacer dot to protrude above the edge of the recess.



2. Remove the printed label from its backing, and then apply it to the recess in the probe top cover, ensuring that there are no wrinkles.



3. Place the clear protective film on top of the serialized label.

If you have completed all necessary repair and replacement procedures, continue to the [Annual Certification](#) chapter on page 7.

# REFERENCE DOCUMENTATION

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## REFERENCE PROCEDURES

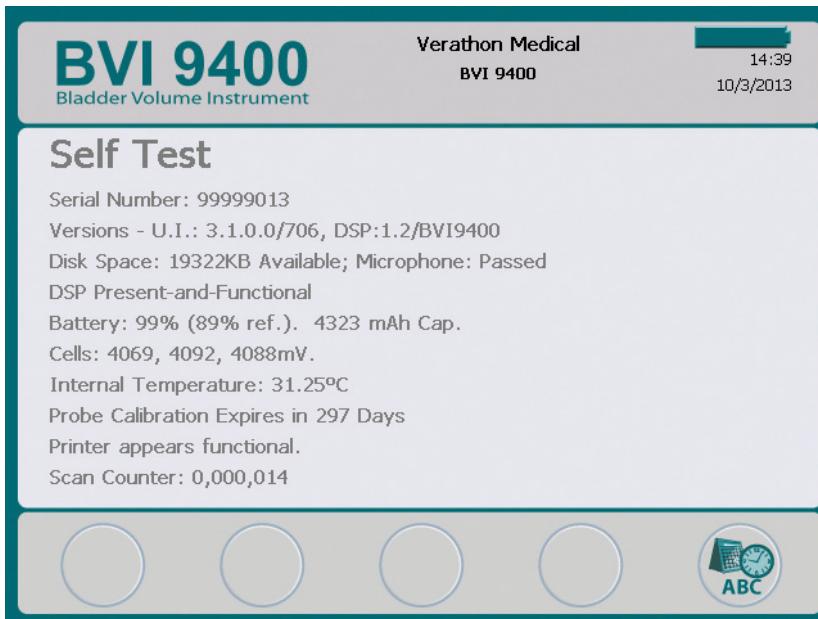
### PROCEDURE 30. RUN A SELF TEST

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No parts are required in order to run this test. Use the self test and this procedure in order to receive basic diagnostics about the instrument, including the software version, available storage capacity, DSP version, and other helpful information.

1. From the Home screen, press the **Settings** button .
2. When the Settings screen opens, press the  or  buttons until **Self Test** is highlighted, and then press .

The Self Test screen opens, and testing begins automatically. The display provides status and results, and when the test is complete, the printer prints the results.



3. Press the **Settings** button , and then press the **Home** button .
4. If any errors are reported during the self-test, service may be required on the instrument. Skip to the **Diagnostics & Troubleshooting** chapter on page 22.

## PROCEDURE 31. SCAN A TISSUE-EQUIVALENT PHANTOM

A tissue-equivalent phantom is an instrument that is designed to simulate a human bladder filled with urine. It is manufactured to specific values so that you may use it to verify the instrument's performance and accuracy. It is a delicate instrument that requires annual certification. Note the following:

- Keep the phantom in a set location as much as possible.
- When being used regularly, clean and refill the top of the phantom weekly.
- When not being used regularly, store the phantom in its case.
- It is recommended that the tissue-equivalent phantom be certified every year.

It is important to note when troubleshooting with the tissue-equivalent phantom that the scan image must be within all four quadrants of the target area. Scans taken in three or less quadrants can receive differing measurements and are not considered accurate.

QUANTITY	PART #	DESCRIPTION
<b>Tools</b>		
AR	0620-0068	Certified adult bladder phantom
AR	0620-0273	Certified pediatric bladder phantom (Optional)
1	—	Clean, soft cloth

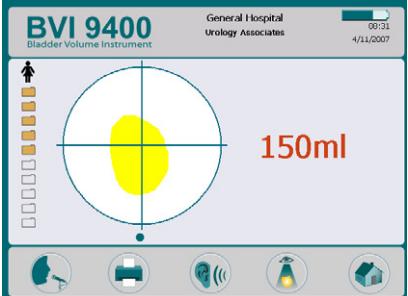
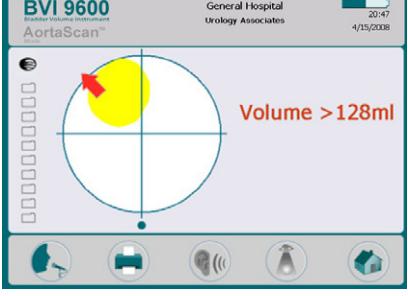
### SCAN A PHANTOM

1. Place the phantom on a level surface.
2. Fill the top of the phantom with just enough water to ensure that the entire surface is covered.
3. Press the **Power** button . The instrument turns on.
4. Select one of the following exam modes:
  -  Select to scan bladder volume for a female patient who has not had a hysterectomy.
  -  Select to scan bladder volume for a small child who is shorter than 122 cm (48 inches) tall and weighs less than 27 kg (60 lbs). (Select this option only if a pediatric bladder phantom is available.)
  -  Select to scan bladder volume for all other patients.
5. Place the probe dome on the center of the phantom.
6. Press the scan button on the probe. The instrument begins scanning.
7. Hold the probe still while the instrument is scanning. Movement reduces the accuracy of the measurement.  
The scan is complete when the end-scan tone chimes.
8. If desired, repeat Step 5 through Step 7 two more times in order to ensure measurement consistency.
9. Using a clean, soft cloth, dry the probe dome.

## VERIFY AIM AND SCAN RESULTS

10. Using the information in the following table, determine if your scan was accurate and on-target. For additional information about reading ultrasound results, see [Troubleshoot by Using Ultrasound Images](#) on page 30.

*Table 3. Verifying Accuracy of Scan Results*

BLADDER RESULT	SAMPLE DISPLAY	DESCRIPTION
Successful (on target)		If the scan is successful and "on target," the probe will show eight arrows on the aiming display. On the console display, the bladder will appear in the center of the crosshairs.
Unsuccessful (off target)		If the scan is unsuccessful or "off-target," the probe will show an arrow (solid or flashing) indicating the direction to move the probe to be on target. If the arrow is solid, it means you are slightly off target and it is strongly recommended you aim and scan again. If the probe shows a single flashing arrow, you must aim and scan again. In either case, on the console display, the bladder will not appear in all four quadrants of the crosshairs.

11. If necessary, re-aim the probe and rescan.

## CONFIRM MEASUREMENT ACCURACY

12. Confirm that the measurement results are within the accuracy range for your phantom as defined in [Accuracy Specifications](#) on page 119.

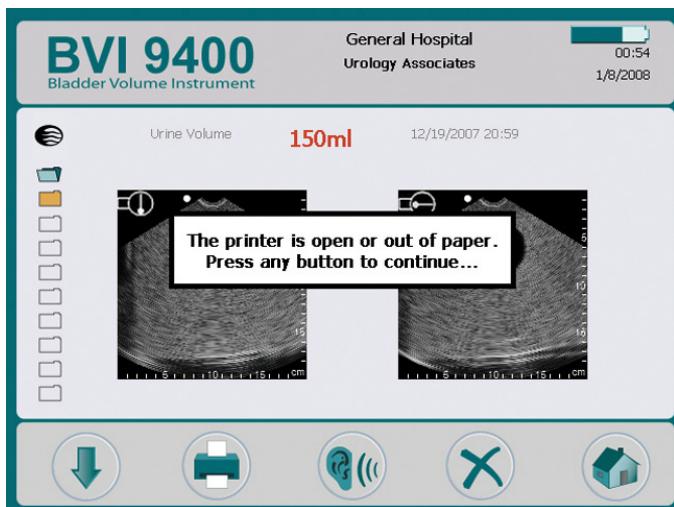
13. If the measurement(s) are consistent and accurate, then the instrument is performing as intended. Continue to the following section in order to complete the annual maintenance procedures.

If the instrument is unable to produce consistent, accurate measurements, service is required on the instrument. Continue to the [Diagnostics & Troubleshooting](#) chapter on page 22.

## PROCEDURE 32. LOAD THERMAL PAPER

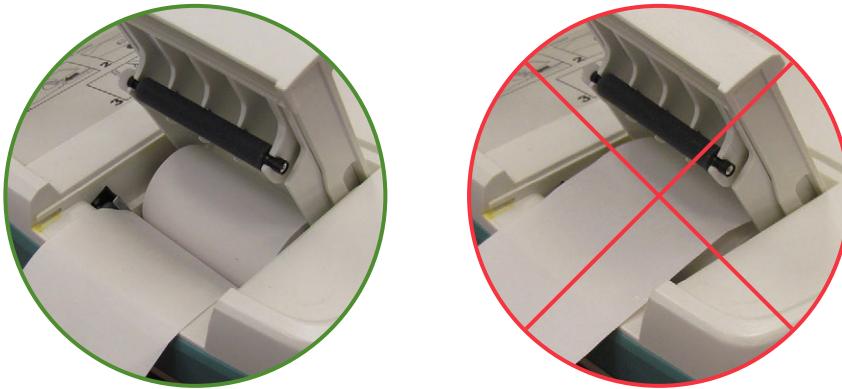
BladderScan BVI 9400 device senses the presence of paper and automatically displays a message when the printer is out of paper.

Figure 19. Printer Out of Paper Message



QUANTITY	PART #	DESCRIPTION
Parts		
1	0800-0319	Thermal paper roll for the printer

1. On the console base housing top cover, under the display, locate the printer door.
2. Slide the printer door to the right, and then lift the door up.
3. If there is an empty paper roll, remove it.
4. In the paper well, insert the end of a new paper roll with the thermal side down.



5. Extend the end of the paper past the edge of the console.
6. Close the printer door, and then slide it to the left. Ensure that the door clicks into place.
7. Tear off any excess paper protruding from the printer.

# ACCURACY SPECIFICATIONS

The following accuracy specifications assume usage per instructions, compliance with operating and storage conditions, and scanning a tissue-equivalent phantom.

## BLADDER VOLUME

In order to ensure that the highest standards of quality are being met, the range of accuracy used by all service technicians when scanning a tissue-equivalent bladder phantom is  $\pm (10\% + 10 \text{ mL})$ . For example, if a tissue-equivalent phantom is 132 mL, an accurate test result would be within 109 and 155 mL, as follows:

FORMULA	EXAMPLE
$\pm (10\% + 10 \text{ mL})$	$10\% (13 \text{ mL}) + 10 \text{ mL} = 23 \text{ mL}$
	$132 - 23 \text{ mL} = 109 \text{ mL}$
	$132 + 23 \text{ mL} = 155 \text{ mL}$

When performing a scan on a patient, the recommended accuracy specification is  $\pm (15\% + 15 \text{ mL})$ , in order to account for the physical variations in human anatomy.

## PHANTOM SPECIFICATIONS

Record the accuracy range of your tissue-equivalent phantom(s) below. Accuracy is compromised if the user does not obtain an optimal, repeatable image within the accuracy range.

Our **adult bladder** tissue-equivalent phantom is \_\_\_\_\_ mL, and the range is \_\_\_\_\_ to \_\_\_\_\_ mL.

Our **pediatric bladder** tissue-equivalent phantom is \_\_\_\_\_ mL, and the range is \_\_\_\_\_ to \_\_\_\_\_ mL.

# PRODUCT & SCAN POINT SPECIFICATIONS

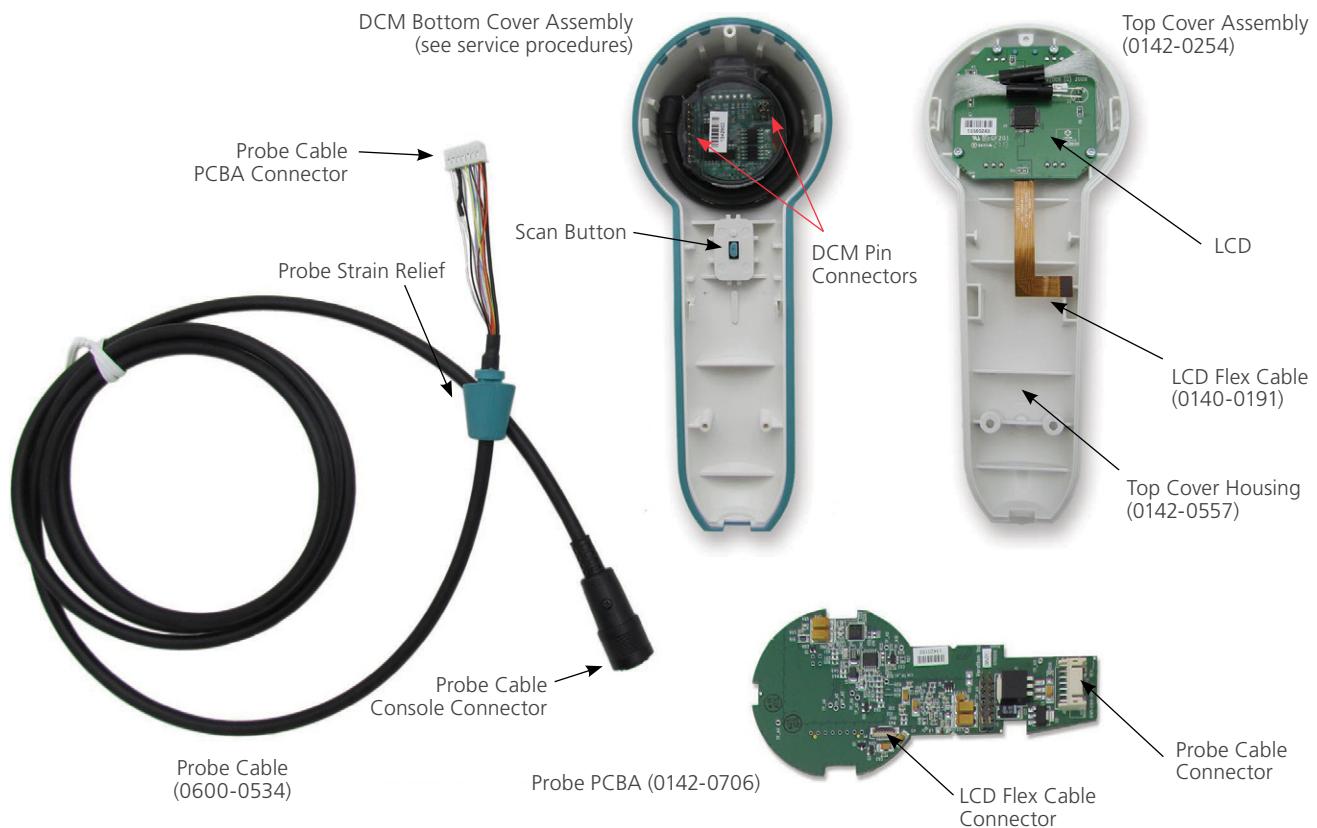
For information about instrument compliance with standards and regulations, electromagnetic compatibility, and product specifications, see the latest *Operations & Maintenance Manual*, available at [verathon.com/service-and-support](http://verathon.com/service-and-support).

For information about the minimum software and hardware requirements in order to run Scan Point with QuickPrint, refer to the specifications on the sleeve for the Installation CD.

## SYSTEM PARTS & ASSEMBLIES

### PROBE PARTS & ASSEMBLIES

Figure 20. Parts of the BVI 9400 Probe



## CONSOLE PARTS & ASSEMBLIES

Figure 21. Parts of the BVI 9400 Console Base Housing

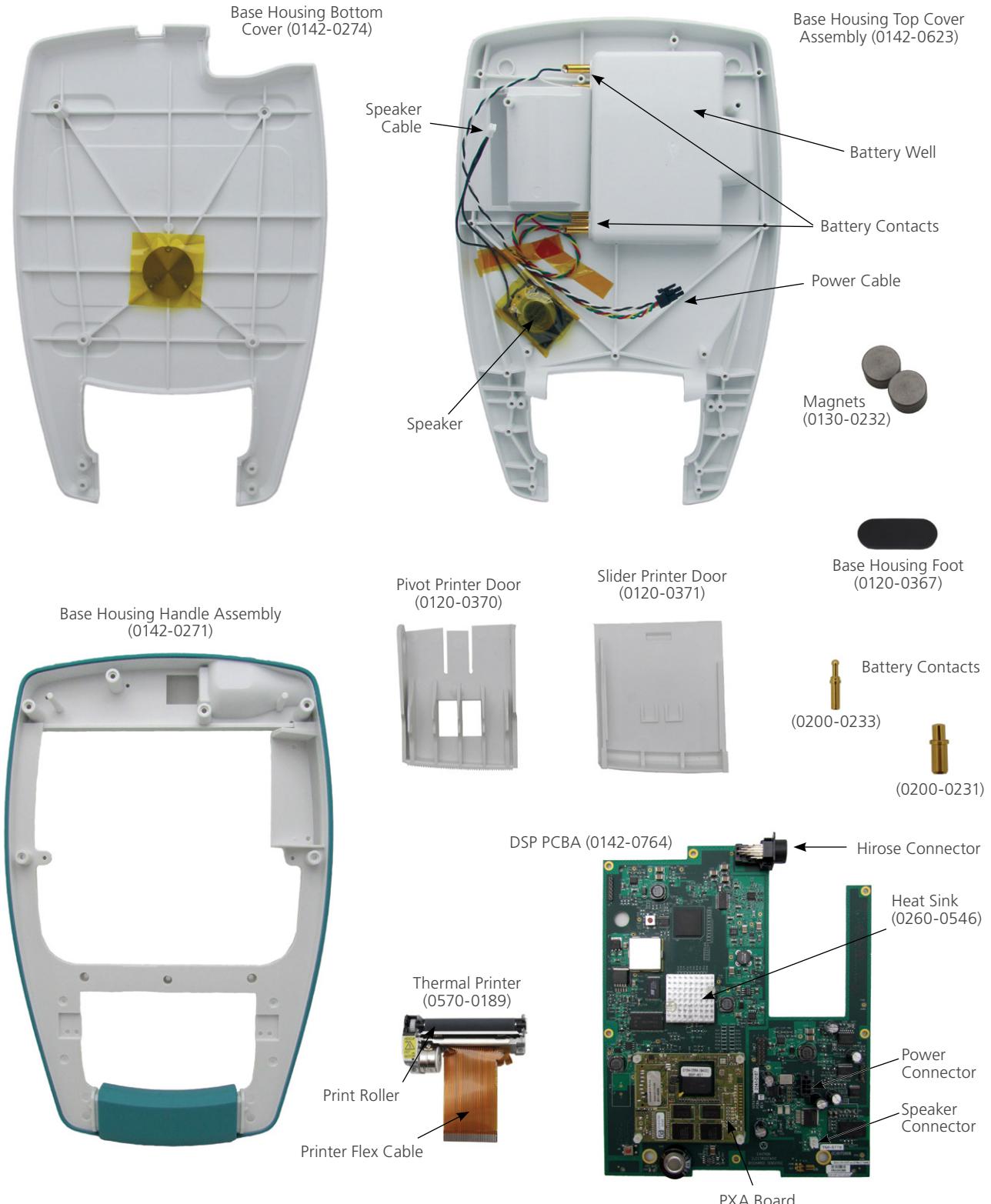


Figure 22. Parts of the BVI 9400 Console Display

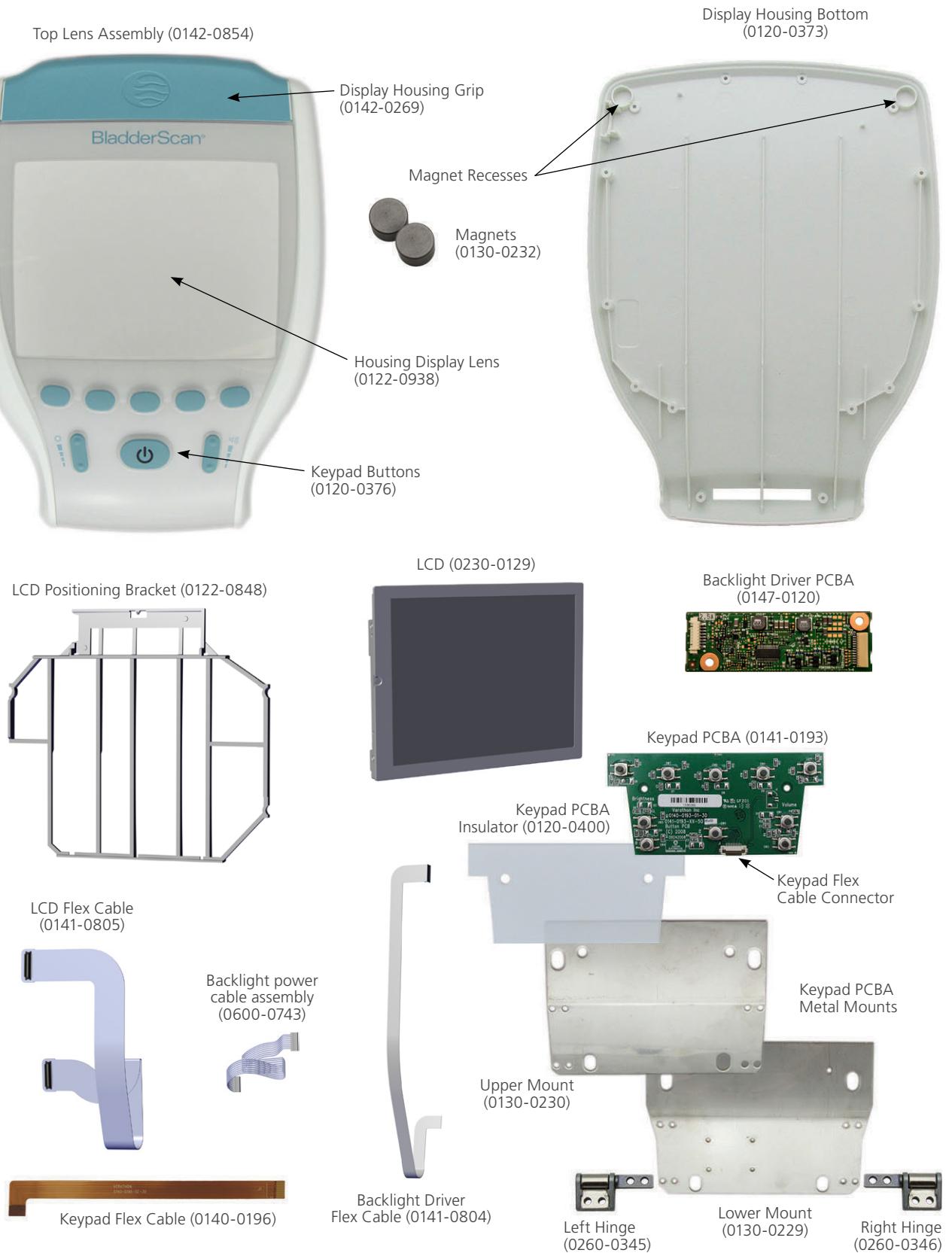
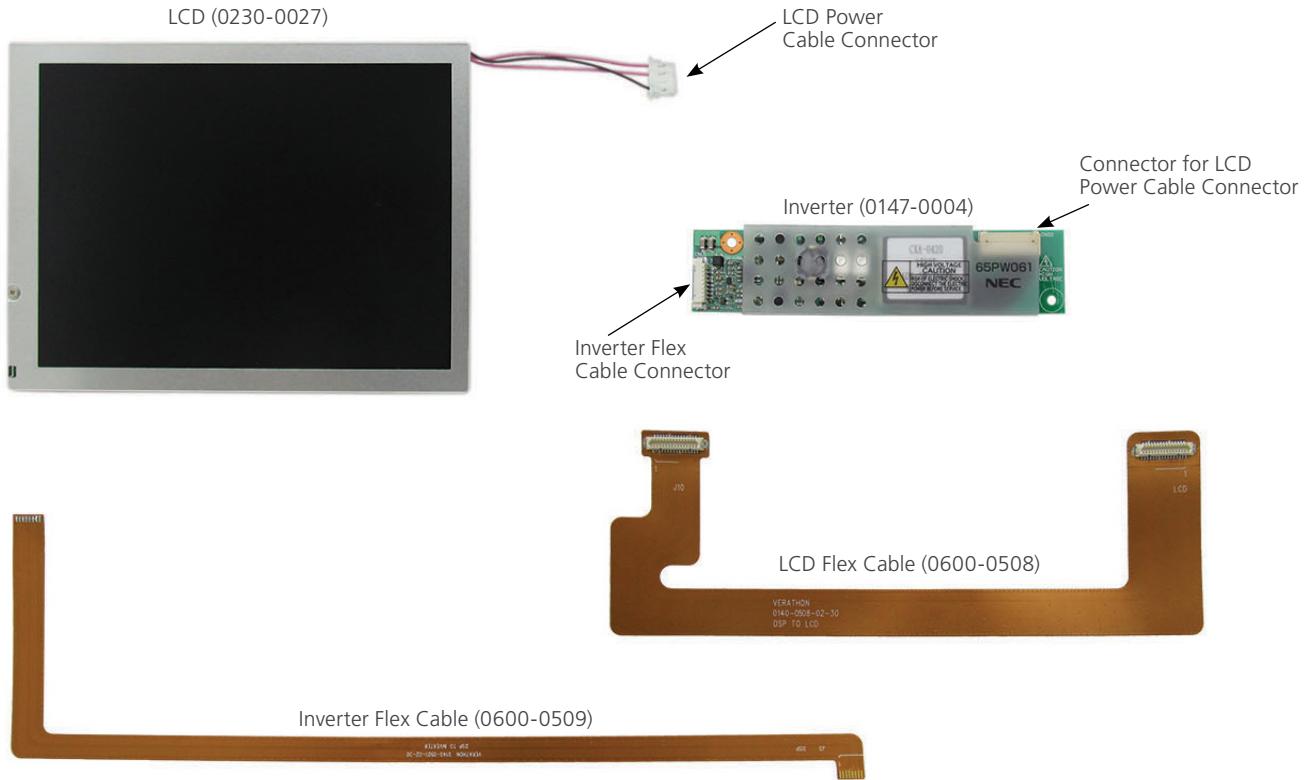


Figure 23. Old Model BVI 9400 LCD Components (Deprecated)



## PART NUMBERS

Note: The part numbers shown in this document are used to order replacement parts or assemblies. In cases where a different subassembly part number appears on a part, use the numbers shown in this table when ordering replacements.

PART	PART NUMBER
<b>Console Base Housing</b>	
Base housing top cover assembly	0142-0623
Base housing bottom cover	0142-0274
Base housing screw, M3, 12 mm	0261-0091
Base housing handle assembly	0142-0271
Pivot printer door	0120-0370
Slider printer door	0120-0371
Thermal printer	0570-0189
Paper roll for thermal printer	0800-0319
Lithium-ion battery	0400-0066
BVI 9400 DSP PCBA	0142-0764
DSP PCBA screw, M3, 12 mm	0261-0091
Hirose connector (probe cable port receptacle)	0200-0263
Battery contacts	Small
	Large
Base housing foot	0120-0367
Labels	BVI 9400 console label, non-UDI
	0125-0541
	BVI 9400 console label kit with serial number, UDI-compliant
	0800-0549
IR lens	0120-0369
Neodymium disc magnet	0130-0232
<b>Console Display</b>	
Console hinge screw, M3, 5 mm	0261-0090
Neodymium disc magnet	0130-0232
Housing vent membrane	0125-0540
Inverter (for old model LCDs)	0147-0004
Display housing lens assembly	0142-0854
Display housing lens	0122-0938
Display housing grip	0142-0269
Display housing bottom	0120-0373
Display housing screw, M2, 6 mm	0261-0314
Display housing screw, M2, 10 mm	0261-0315
Keypad buttons	0120-0376
Keypad PCBA	0141-0193
Keypad PCBA insulator	0120-0400

PART		PART NUMBER
Keypad PCBA screw, M3, 5 mm		0261-0090
Backlight driver PCBA		0147-0120
LCD		0230-0129
LCD positioning bracket		0122-0848
Cables	LCD flex cable	0141-0805
	Keypad flex cable	0140-0196
	Backlight driver flex cable	0141-0804
	Backlight power cable assembly	0600-0743
	Inverter flex cable (for old model LCDs)	0600-0509
Keypad metal mount	Left hinge	0260-0345
	Right hinge	0260-0346
	Upper mount	0130-0230
	Lower mount	0130-0229
Probe		
Probe top cover assembly		0142-0254
Probe top cover housing		0142-0557
Small probe housing screw, M2, 8 mm		0261-0353
Large probe housing screw, M2, 10 mm		0261-0315
Probe LCD flex cable		0140-0191
Probe cable		0600-0534
Probe bottom cover		0142-0689
DCM		0142-0685
DCM lock ring		0122-0947
DCM bushing		0122-0693
Probe LCD screw, M2, 5 mm		0261-0082
Probe PCBA		0142-0706
Labels	BVI 9400 probe serial number label kit, non-UDI	0800-0538
	BVI 9400 probe serial number label kit, UDI-compliant	0800-0553
	BVI 9400 probe serial number label kit, Service Probe Exchange Program (UDI-compliant)	0800-0616
9x00 probe label spacer dot (included in label kits)		0125-2214
Screw cover plug		0122-0559
General Assembly		
Kapton tape	Square	0280-0021
	0.6 cm (1/4-in)	0136-0029
	1.3 cm (1/2-in)	0136-0059
Loctite 422 Super Bonder		0135-0042
Room-temperature-vulcanization (RTV) silicone adhesive sealant, white		0136-0111

PART		PART NUMBER
Tools & Test Fixtures		
Tissue-equivalent phantoms	Bladder	0620-0068
	Pediatric	0620-0273
BVI 9400 Test Console		0270-0676
Test probe		0570-0351 or E570-0351 (order part number 0270-0803)
Calibration kit		0620-0340
Battery charger/wireless hub kit		0270-0432
Rechargeable battery		0400-0066
Scan Point with QuickPrint Installation CD		0900-1238
Service Partner Scan Point Access		0003-0642

## GLOSSARY

TERM	DEFINITION
A	Ampere (also known as amp)
AR	As required
Boss	A channel or void in an extrusion that accepts a certain diameter screw
BSP	Binary source package
CFR	Code of Federal Regulations
DCM	Data collection module
DSP	Digital signal processor
ESD	Electrostatic discharge
Flash	Extra material, such as plastic, that flows out through the seams of a mold during the molding process.
g	Gram
Hirose	Probe cable receptacle on the base housing of the console
IR	Infrared
LCD	Liquid-crystal display
MMC	Multimedia card
mV	Millivolt
Ohm	The SI unit of electrical resistance, expressing the resistance in a circuit transmitting a current of one ampere when subjected to a potential difference of one volt
PCBA	Printed circuit board assembly
POUR	Post-operative urinary retention
PVR	Post-void residual
Resistor	A passive two-terminal electrical component that implements electrical resistance as a circuit element
RoHS	Restriction of Hazardous Substances
RTV	Room-temperature-vulcanization, an adjective describing certain types of self-curing silicone adhesive sealant
SI	International System of Units
UDI	Unique Device Identification, a service of the U.S. Food and Drug Administration (FDA) that tracks individual medical devices using standardized identification codes
V	Volt





