

**PHILIPS**

Efficia CM Series  
Patient Monitors

Release C.00

English



# Repair Guide

# Efficia CM Series Patient Monitors

## Repair Guide

C.00

English

**PHILIPS**

## Notice

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Document Number  
453564623601

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New editions of this document incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged by a revision date at the bottom of the page. Pages that are rearranged due to changes on a previous page are not considered revised.

The documentation printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The document part number changes when extensive technical changes are incorporated.

**First Edition . . . . . August 2018**

## Conventions

This section describes the conventions used in this guide.

### Text Formatting

The following typographical conventions are used in this guide.

Typeface	Usage	Example
<b>Bold</b>	System keys	Press the <b>Main Screen</b> key.
<b>Special bold</b>	User interface text	Open the <b>System Menu</b> .
<i>Italic</i>	Variables, document titles	<ul style="list-style-type: none"><li>• <i>&lt;product name&gt;-&lt;hardware configuration&gt;-&lt;software version&gt;.cfg</i></li><li>• <i>Efficia CM Series Instructions for Use</i></li></ul>

### Decimal Points

Because the Efficia CM monitors use a period (.) to indicate a decimal point in decimal numbers (for example, 10.0), all decimal numbers in this guide use a period as a decimal point. Commas are not use as decimal points.

### Notes, Cautions, and Warnings

This guide uses the following conventions for Notes, Cautions, and Warnings.

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**Note** — *A Note calls attention to an important point in the text.*

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**Caution**     **A Caution calls attention to a condition or possible situation that could damage or destroy the product or the user's work.**

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**Warning**     ***A Warning calls attention to a condition or possible situation that could cause injury to the user, patient, or both.***

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### Explanation of Symbols

The following symbols appear on the monitor and its packaging.






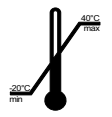


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**Note** — *The symbols that appear on your monitor depend on the monitor model and its configured options.*

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## Packaging Symbols

The following symbols appear on the monitor's packaging:

Symbol	Name	Standard/Reference
	Keep upright	International Air Transport Association, 405B
	Fragile, handle with care	ISO 15223-1* 5.3.1
	Stacking limit by number	ISO 7000** 2403
	Atmospheric pressure range for transport and storage	ISO 15223-1* 5.3.9
	Relative humidity range (non-condensing) for transport and storage	ISO 15223-1* 5.3.8
	Ambient temperature range (non-condensing) for transport and storage	ISO 15223-1* 5.3.5
	Keep dry	ISO 15223-1* 5.3.4
	CE mark: Product meets the requirements of 93/42/EEC for Medical Devices distributed in the European Economic Area (EEA).N	European Council Directive 93/42/EEC of 14 June concerning Medical devices, Annex XII
<p>* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements</p> <p>** ISO 7000 Graphical symbols for use on equipment - Registered symbols</p>		

## User-Control Symbols









The following symbols appear on and near the user-control buttons on the front of the monitor:

Symbol	Name	Standard/Reference
	On/Standby key	IEC 60417 <sup>†</sup> 5009
	AC power LED	IEC 60417 <sup>†</sup> 5032
	NBP key	NA
	Record key	NA
	Home key	NA
	Charging LED	IEC 60417 <sup>†</sup> 5546
	Alarm silence key	IEC 60417 <sup>†</sup> 5576 IEC 60417 <sup>†</sup> 5039
	Freeze Waveform key	NA
	Trend key	IEC 60417 <sup>†</sup> 5847
† IEC 60417 Graphical symbols for use on equipment		

**Note** — *Not all monitors have all keys.*

## Measurement Connector Symbols






The following symbols appear next to measurement connectors on the side of the monitor:

Symbol	Name	Standard/Reference
	Sidestream CO <sub>2</sub> input connector	NA
<b>CO<sub>2</sub></b>	Mainstream CO <sub>2</sub> connector	NA
	Defibrillator Proof Type CF applied part	IEC 60417 <sup>†</sup> 5336
<b>ECG</b>	ECG connector	NA
<b>SpO<sub>2</sub></b>	SpO <sub>2</sub> connector	NA
	NBP connector	NA
	Follow Instructions for Use (Blue safety symbol)	ISO 7010 <sup>¥</sup> M002
	Sidestream CO <sub>2</sub> output connector	NA
	Caution, consult accompanying documents	ISO 15223-1* 5.4.4
<b>IBP 1</b> <b>IBP 2</b>	IBP connectors	NA
	Temperature connectors	ISO 7000** 0034
	Masimo SET <sup>®</sup> and rainbow (red and black symbol)	NA

<sup>†</sup> IEC 60417 Graphical symbols for use on equipment  
 \* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements  
 \*\* ISO 7000 Graphical symbols for use on equipment - Registered symbols  
<sup>¥</sup> ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs





## Input/Output Connector Port Symbols

The following symbols appear next to the input/output ports on the rear panel of the monitor:












Symbol	Name	Standard/Reference
	Nurse call connector	IEC 60417 <sup>†</sup> 5336 IEC 60417 <sup>†</sup> 5035
	VGA Output	NA
	ECG Out port	NA
	USB port	NA
	Ethernet port	NA
† IEC 60417 Graphical symbols for use on equipment		


## Rear Panel Label Symbols

The following symbols appear on the rear panel label of the monitor:

Symbol	Name	Standard/Reference
	Catalog number	ISO 15223-1* 5.1.6
	Serial number	ISO 15223-1* 5.1.7
	Monitor key code	NA
	Manufacturer's name and address	ISO 15223-1* 5.1.1
ICES-001	Canadian ISM requirement	International Erosion Control Systems
† IEC 60417 Graphical symbols for use on equipment		
* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements		





Symbol	Name	Standard/Reference
	RF interference	IEC 60417 <sup>†</sup> 5140
	Compliance with WEEE standard	Waste Electrical and Electronic Equipment directive 2012/19/EU, Article 14.4
100V-240V  2xT 1.6 AL 250V	Input power and fuse rating	IEC 60417 <sup>†</sup> 5016
	Authorized EU Representative OK	ISO 15223-1* 5.1.2
	Date of manufacture	ISO 15223-1* 5.1.3
	Unique Device Identification (UDI) barcode	NA
	Option number	NA
<b>Rx Only</b>	Prescription Use Only (US Federal Law)	21 CFR 801.109(b)(1) Prescription Devices
<b>IPX1</b>	Ingress protection against vertically falling water drops	IEC 60529, Ed. 2.2 Degrees of protection provided by enclosures (IP Code), section 6
	Caution, consult accompanying documents	ISO 15223-1* 5.4.4
	CSA mark	Canadian Standards Association (CSA)
	CE mark: Product meets the requirements of 93/42/EEC for Medical Devices distributed in the European Economic Area (EEA).N	European Council Directive 93/42/EEC of 14 June concerning Medical devices, Annex XII
	Equipotential grounding post	IEC 60417 <sup>†</sup> 5021
<sup>†</sup> IEC 60417 Graphical symbols for use on equipment * ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements		

Symbol	Name	Standard/Reference
	Part number for label	NA
† IEC 60417 Graphical symbols for use on equipment * ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements		





## Internal Symbols


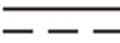






The following symbols are located inside the monitor:






Symbol	Name	Standard/Reference
	Protective earth (ground)	IEC 60417 <sup>†</sup> 5032
	Dangerous Voltage (Yellow safety symbol)	ISO 7010 <sup>‡</sup> , W012
† IEC 60417 Graphical symbols for use on equipment ‡ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs		

## Battery Symbols

The following symbols are located on the monitor batteries:

Symbol	Name	Standard/Reference
	CE mark: Product meets the requirements of 93/42/EEC for Medical Devices distributed in the European Economic Area (EEA).N	European Council Directive 93/42/EEC of 14 June concerning Medical devices, Annex XII
	Catalog number	ISO 15223-1* 5.1.6
	Serial number	ISO 15223-1* 5.1.7
	Date of manufacture	ISO 15223-1* 5.1.3
† IEC 60417 Graphical symbols for use on equipment * ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements ‡ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs		

Symbol	Name	Standard/Reference
	Lot number	ISO 15223-1* 5.1.5
	Direct current	IEC 60417 <sup>†</sup> 5031
	Ambient temperature range (non-condensing) for transport and storage	ISO 15223-1* 5.3.5
	Lithium-ion Charge Before Use	NA
	Lithium-ion Recycling mark	Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators
	Do not dispose of this product (or any parts of it) in industrial or domestic waste. The system may contain materials or hazardous substances that can cause serious environmental pollution. The system also contains privacy-sensitive information. It is advisable to contact your service personnel before disposing of this product.	Waste Electrical and Electronic Equipment directive 2012/19/EU, Article 14.4
	Follow Instructions for Use (Blue safety symbol)	ISO 7010 <sup>¥</sup> M002
	This product contains certain hazardous substances, and can be safely used during its environmental protection use period of 50 years, and should enter into the recycling system after its environmental protection use period.	Administrative Measure on the Control of Pollution Caused by Electronic Information Products, Chinese Ministry of Information Industry, 2006-02-28, Decree No. 39
<sup>†</sup> IEC 60417 Graphical symbols for use on equipment * ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements <sup>¥</sup> ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs		

Symbol	Name	Standard/Reference
	Product is certified to meet all applicable standards requirements	UL 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements, 5.1
	Meets safety requirements for portable sealed secondary cells for use in portable applications.	CNS 15364 Bureau of Standards, Metrology and Inspection of China
	Product complies with Japan's Electrical Appliance and Material Safety Law.	Ministry of Economy, Trade and Industry of Japan
	Complies with FCC standards for home or office use.	47 CFR 15.19 (a)(3)
	Product meets requirements for certification by the Bureau of Indian Standards.	IS 16046 Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes -- Safety Requirements for Portable Sealed Secondary Cells, and for Batteries made from them, for use in Portable Applications.
<p>† IEC 60417 Graphical symbols for use on equipment</p> <p>* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements</p> <p>‡ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs</p>		

## Regulatory and Safety Specifications

### Declaration



The Efficia CM10, CM12, CM100, CM120, and CM150 monitors are Class IIb medical devices and comply with the requirements of the Council Directive 93/42/EEC of 14 June 1993 concerning medical devices and carry CE-marking accordingly.

Philips Medical Systems hereby declares that the Efficia CM Series Patient Monitors are in compliance with Directive 2014/53/EU, The full text of the Declaration of Conformity is available on the Philips InCenter website (<https://incenter.medical.philips.com>).

## Authorized EU Representative



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## Rx Only

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**Caution**     **United States Federal Law restricts this device to sale by or on the order of a physician.**

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## Safety Standards

Applicable standards
IEC 60601-1, IEC 60601-1-2, IEC 60601-1-8, IEC 60601-2-27, IEC 80601-2-30, IEC 60601-2-34, IEC 60601-2-49, ISO 80601-2-55, ISO 80601-2-61, IEC 62366, IEC 62304, IEC 60601-1-6, ISO 80601-2-56, ISO 80601-2-61

Parameter	Specification
Protection Class	Class I, internally powered equipment, per EN/IEC 60601-1
Degree of Protection	Type CF defibrillator-proof: per EN/IEC 60601-1
Mode of Operation	Continuous
Protection Against Hazards of Ignition of Flammable Anaesthetic Mixtures	Equipment is not suitable for use in the presence of a flammable anaesthetic mixture with air or oxygen or nitrous oxide, per IEC 60601-1

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# Introduction

This guide provides repair procedures, performance verification procedures, troubleshooting steps, and replacement parts for the Efficia patient monitors shown below.



**Efficia CM10 and CM12**

**Efficia CM100, CM120 and CM150**

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## Intended Audience

This guide is intended for authorized biomedical engineers or technicians responsible for repairing Philips patient monitoring systems. Before you attempt to service the monitor, you must review the following information and familiarize yourself with the safety information contained within:

- For information about configuring the monitor, see the *Efficia CM Series Patient Monitors Installation and Configuration Guide*.
- For information about routine maintenance and the theory of operation, see the *Efficia CM Series Patient Monitors Service Guide*.
- For detailed information about the operation of the monitor, see the *Efficia CM Series Patient Monitors Instructions for Use*.

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## Navigation Controls

You can navigate by using the touch screen or the navigation wheel. The touchscreen is standard on the CM100, CM120, and CM150 monitors and is optional on the CM10 and CM12 monitors. All Efficia CM monitors include a navigation wheel.

The following table describes how to use the navigation controls on all Efficia CM monitors.

Action	Screen Type	Description
Select	Touch	Touch a button, menu, or list item on the touch screen to select it.
	Non-touch	Rotate the wheel to highlight an item and then press the wheel to select it.
Press	Touch	Press a front panel key or press the wheel.
	Non-touch	Press a front panel key or press the wheel.
Enter data using the keyboard	Touch	Touch the item to display the numeric keypad or the keyboard. Touch the values, and then touch <b>OK</b> to close the keypad or keyboard.
	Non-touch	Press the wheel to display a keyboard. Rotate the wheel to highlight the text or value, and then press the wheel to select the value. Select <b>OK</b> to close the keyboard.
Select or clear check boxes	Touch	Touch a check box to select or clear it.
	Non-touch	Rotate the wheel to highlight a check box and press the wheel to select or clear a check box.
Scroll	Touch	Touch a scroll bar arrow to scroll through the list one segment at a time. Touch and hold the arrow to quickly scroll through the list. (You can also use the wheel to scroll and select items in the list.) A scroll bar to the right of the list indicates the current location in the list. Touch an item to select it.
	Non-touch	Rotate the wheel to highlight a list and then press the wheel. To scroll through the list, rotate the wheel. To select items in the list, press the wheel. A scroll bar to the right of the list indicates the current location in the list.

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## Efficia CM Documentation

Efficia CM documentation includes:

- **Efficia CM Series Patient Monitors Instructions for Use:** Provides information for day to day operation of the Efficia monitors. Also includes safety information, monitor specifications, and compatible accessories.

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**Note** — For information about purchasing additional copies of the *Efficia CM Series Patient Monitors Instructions for Use*, contact the Philips Customer Care Center.

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- **Efficia CM Series Patient Monitors Quick Card:** Provides brief descriptions of commonly used functions.

The Philips Efficia documentation CD contains PDF versions of the following documents:

- **Efficia CM Series Patient Monitors Installation and Configuration Guide:** Provides instructions for unpacking, installing, and connecting all hardware. Includes initial testing and configuration procedures. Also includes instructions for returning the monitor.
- **Efficia CM Series Patient Monitors Service Guide:** Provides information about maintaining, troubleshooting, and performance verification testing of the monitor.

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**Note** — *Information about repair procedures are available on Philips InCenter.*

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- **Efficia CM Series Patient Monitors Data Export Guide:** Provides detailed information about the syntax and structure of the HL7 messages that are exported from the monitors.
- **Efficia CM Series Patient Monitors Network Configuration Guide:** Provides instructions for configuring your monitor to connect to a network using a wired LAN connection, a wireless LAN connection, or an RS-232 serial adapter.
- **Efficia CM Series Patient Monitors with Masimo<sup>®</sup> Instructions for Use:** Provides information for operation of the Masimo SET<sup>®</sup> and Masimo rainbow<sup>®</sup> SET options on the Efficia CM monitor. Includes safety information, alarm messages, specifications, and a list of compatible accessories.



# Performance Verification Testing

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## Overview

This chapter includes the performance tests that must be performed after repairs and before the monitor is put back into service.

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### Notes

- *The procedures in this chapter assume knowledge of basic monitor operation. For details about using the monitor, see the *Efficia CM Series Patient Monitors Instructions for Use*.*
  - *For more information about routine performance tests, see the *Efficia CM Series Patient Monitors Service Guide*.*
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## Testing and Inspection Guidelines

The following table lists the tests that Philips requires that you complete after performing monitor repairs or software upgrades.

For information about routine maintenance procedures, see the *Efficia CM Series Patient Monitors Service Guide*.

After	Complete These Tests
Upgrading the software	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Verify that your system settings are preserved</li> </ul>
Opening the monitor for any reason	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Alarms Test</li> <li>• Pneumatic leakage</li> <li>• Speaker</li> <li>• All safety tests</li> </ul>
Replacing any internal parts (except NBP parts, SpO <sub>2</sub> board, Sidestream CO <sub>2</sub> module)	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Pneumatic leakage</li> <li>• Speaker</li> <li>• All safety tests</li> </ul>

After	Complete These Tests
Replacing the main board or front end board	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Pneumatic leakage</li> <li>• Alarms test</li> <li>• All safety tests</li> </ul>
Replacing the NBP module or parts	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• NBP test</li> <li>• Pneumatic leakage</li> <li>• All safety tests</li> </ul>
Replacing the SpO <sub>2</sub> board <b>Note</b> — <i>Monitors with the Masimo SpO<sub>2</sub> board must be returned to Philips for Masimo SpO<sub>2</sub> board replacement. Contact the Philips Customer Care Center or your local Philips representative.</i>	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• SpO<sub>2</sub></li> <li>• Pneumatic leakage</li> <li>• All safety tests</li> </ul>
Replacing the temperature module	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Alarms Test</li> <li>• Temperature Test</li> <li>• Pneumatic leakage</li> <li>• All safety tests</li> </ul>
Replacing the Sidestream CO <sub>2</sub> module	<ul style="list-style-type: none"> <li>• Power-on</li> <li>• Sidestream CO<sub>2</sub> calibration</li> <li>• Pneumatic leakage</li> <li>• All safety tests</li> </ul>

## Recommended Frequency

Perform the test procedures at the recommended frequency outlined in the following table.

**Caution**      **The frequency recommendations in the following table do not supersede local requirements. Always perform locally required testing in addition to the testing outlined in the table.**

Suggested Testing	Frequency
<b>Preventive Maintenance</b>	
NBP calibration	Once every two years.
Battery reconditioning	When the <b>Max Error</b> is 8% or greater.

Suggested Testing	Frequency
Oridion Sidestream CO <sub>2</sub> calibration	<ul style="list-style-type: none"> <li>• First calibration at 1,200 hours of use or after one year, whichever comes sooner.</li> <li>• After the first calibration, once a year or after 4,000 hours, whichever comes sooner.</li> <li>• After any repairs or the replacement of any parts.</li> </ul> <p>Replace the entire CO<sub>2</sub> module after 20,000 hours of use.</p>
<b>Performance</b>	
<ul style="list-style-type: none"> <li>• Temperature accuracy</li> <li>• ECG/respiration</li> <li>• Invasive blood pressure</li> <li>• NBP accuracy test</li> <li>• SpO<sub>2</sub></li> <li>• Cardiac Output (C.O.)</li> </ul>	Once every two years or if you suspect the measurement is incorrect.
ECG Output	Before first use, and then once every two years.
Mainstream CO <sub>2</sub> accuracy	Once a year or if you suspect the measurement is incorrect.
LoFlo Sidestream CO <sub>2</sub> accuracy checks	Before first use, and then once yearly.
CapnoTrak Sidestream CO <sub>2</sub> accuracy checks	Before first use, and then once yearly.
Nurse call relay (if part of facility protocols)	Before first use, and then once every two years.
Network test	As needed or according to your institution's policy.
<b>Safety</b>	
In accordance with IEC 60601-1	
<ul style="list-style-type: none"> <li>• Enclosure leakage current</li> <li>• Ground integrity</li> <li>• Patient leakage current</li> </ul>	<ul style="list-style-type: none"> <li>• Once a year.</li> <li>• After repairs in which the monitor is opened (front panel and rear case separated) or if the monitor is damaged by impact.</li> <li>• When adding approved equipment.</li> </ul>



## Required Test Equipment

The following table lists the additional test equipment that you need to perform each of the tests in this chapter.

To Perform This Test	You Need This Test Equipment
"Visual Test" on page 2-10	None
"Power-On Self Test" on page 2-11	None
"Alarms Test" on page 2-11	NBP cuff and hose
"SpO <sub>2</sub> Test" on page 2-12	<ul style="list-style-type: none"> <li>• Adult SpO<sub>2</sub> sensor</li> <li>• SpO<sub>2</sub> simulator</li> </ul>
"Sidestream CO <sub>2</sub> Calibration Test" on page 2-13	<ul style="list-style-type: none"> <li>• Electronic flowmeter, M1026-60144</li> <li>• Gas calibration equipment:                             <ul style="list-style-type: none"> <li>– Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)</li> <li>– Cal gas flow regulator M2267A</li> <li>– Cal tube 13907A</li> </ul> </li> </ul>
"Respironics CapnoTrak Sidestream CO <sub>2</sub> Accuracy Test" on page 2-16	<ul style="list-style-type: none"> <li>• Water filter assembly.</li> <li>• Large airway adapter.</li> <li>• Gas calibration equipment:                             <ul style="list-style-type: none"> <li>– Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)</li> <li>– Cal gas flow regulator M2267A</li> <li>– Cal tube 13907A</li> </ul> </li> </ul>
"Respironics LoFlo Sidestream CO <sub>2</sub> Accuracy Test" on page 2-18	<ul style="list-style-type: none"> <li>• Respironics CO<sub>2</sub> LoFlo adult airway adapter kit.</li> <li>• Gas calibration equipment:                             <ul style="list-style-type: none"> <li>– Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)</li> <li>– Cal gas flow regulator M2267A</li> <li>– Cal tube 13907A</li> </ul> </li> </ul>
"Mainstream CO <sub>2</sub> Accuracy Test" on page 2-20	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> sensor</li> <li>• Gas calibration equipment:                             <ul style="list-style-type: none"> <li>– Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)</li> <li>– Cal gas flow regulator M2267A</li> <li>– Cal tube 13907A</li> <li>– M1990A airway adapters or similar (2)</li> </ul> </li> </ul>
"ECG/Respiration Performance Test" on page 2-21	<ul style="list-style-type: none"> <li>• Patient simulator</li> <li>• ECG patient cable</li> </ul>

To Perform This Test	You Need This Test Equipment
“ECG Output Performance Test” on page 2-22	<ul style="list-style-type: none"> <li>Defibrillator with Defib Sync cable</li> </ul> <p><b>Note</b> — <i>Your defibrillator must be capable of accepting digital output from the monitor.</i></p> <ul style="list-style-type: none"> <li>Patient simulator</li> </ul>
“NBP Test” on page 2-22	<ul style="list-style-type: none"> <li>A reference manometer (including hand pump and valve), with an accuracy of 0.2%</li> <li>An expansion chamber (volume 250 ml ± 10%)</li> <li>Tubing</li> </ul>
“IBP Test” on page 2-25	Patient simulator
“Temperature Test” on page 2-26	Patient simulator (with an accuracy of 0.1°C or 0.2°F)
“Cardiac Output Test (C.O.)” on page 2-27	<ul style="list-style-type: none"> <li>Patient simulator</li> <li>Fluke PS420 or similar M1012-61601 test tool</li> <li>Fluke cable CD 2462364 and M1642A or similar</li> </ul>
“Safety Tests” on page 2-28	A multimeter with a leakage network or a product safety analyzer
“Nurse Call Relay Test” on page 2-31	<ul style="list-style-type: none"> <li>A patient simulator</li> <li>An ohmmeter</li> <li>A phono connector</li> </ul>
“Network Test” on page 2-33	None

## Test Recording

Authorized Philips personnel report test results to Philips to add to the product development database. Hospital personnel, however, do not need to report results.

The following table describes what to record on the service record after you complete the tests in this chapter.

**Note** — *P = pass, F = fail, X = measured value as defined in tests in this chapter.*

Test	What to record
Visual	V:P or V:F
Power-On	PO:P or PO:F
Alarms	AL:P or AL:F
SpO <sub>2</sub>	SpO <sub>2</sub> :P or SpO <sub>2</sub> :F
ECG	ECG:P or ECG:F

Test	What to record
Respiration	R:P or R:F
ECG Output	EO:P or EO:F
NBP	NBP:P/X1/X2/X3 or NBP:F/X1/X2/X3
IBP	IBP(1):P or IBP(1):F IBP(2):P or IBP(2):F
Sidestream CO <sub>2</sub>	SCO <sub>2</sub> :P or SCO <sub>2</sub> :F
Mainstream CO <sub>2</sub>	MCO <sub>2</sub> cal:P or MCO <sub>2</sub> cal:F
C.O.	C.O.:P or C.O.:F
Temperature	T(1):P or T(1):F T(2):P or T(2):F
Safety	S(1):P/X1/X2 or S(1):F/X1/X2 S(2): P/X1 or S(2): F/X1 S(3): P/X1 or S(3): F/X1
Nurse Call	NC:P or NC:F
Network Test	NT:P or NT:F

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## Accessing the Admin Functions

You use the **System Menu** to access the password-protected **Admin** functions, which allow you to configure the monitor and perform diagnostic and maintenance tasks. For more information about configuring the monitor, see the *Efficia CM Series Patient Monitors Instructions for Use* or the *Efficia CM Series Patient Monitors Installation and Configuration Guide*.

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### Notes

- The **Admin** tab in the **System Menu** is password-protected, and should only be accessed by qualified service personnel.
  - The procedures in this guide use the default Administrator password, **215**. To improve the security of the monitor settings, you can change the administrator password after you install the monitor. For more information about changing the password, see the *Efficia CM Series Patient Monitors Installation and Configuration Guide*.
-

**Caution** The System Menu fills the entire monitor display when it is open and obscures any active measurement data. When the Admin tab is open, it does not automatically close if left unattended, but remains open until it is closed manually.

To access the **System Menu** and the **Admin** tab:

Step	
1	Select <b>System</b> (⚙️). The <b>System Menu</b> appears.
1	Select the <b>Admin</b> tab.
2	In the window that appears, select the password field. A keyboard opens.
3	Enter the current Administrator password, and then select <b>OK</b> . <b>Note</b> — <i>The default Administrator password is 215. The password may have been changed for security purposes in your facility.</i>
4	In the <b>Enter Password</b> window, select <b>OK</b> . The <b>Admin</b> tab opens. <hr/> <p><b>Caution</b>  <b>The password-protected tabs remain unlocked for 1 minute after you close them. This allows you to re-open the tab without having to re-enter the password. Do not leave the monitor unattended during the unlock time.</b></p> <hr/> <p>The following options are described in this guide. All other options are described in the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i>.</p> <ul style="list-style-type: none"> <li>• <b>Demo Mode</b> — Demo Mode allows you to demonstrate the monitor without actually monitoring parameters.</li> <li>• <b>Upgrade Software</b> — Opens the <b>Upgrade Software</b> menu. For more information, refer to the <i>Efficia CM Series Service Guide</i>.</li> <li>• <b>Diagnostics</b> — Opens the <b>Diagnostics Menu</b>. Monitoring is suspended while this menu is open. For more information, see “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.</li> </ul> <p><b>Note</b> — <i>The <b>Diagnostics</b> button is unavailable when the monitor is in Demo mode.</i></p> <ul style="list-style-type: none"> <li>• <b>View Logs</b> — Opens the View Log menu, which allows viewing and management of system logs. For more information, see “Managing Logs” on page 3-42.</li> </ul>

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## Accessing the Diagnostics Menu and Maintenance Options

Some of the verification tests require you to use the **Diagnostics Menu** or the **Maintenance** options.

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**Note** — *The **Diagnostics Menu** and **Maintenance** options are password protected.*

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After you access the **Diagnostics Menu**, you must enter an additional password to access the **Maintenance** options. Only trained biomedical engineers or support personnel should access the **Maintenance** options and perform maintenance and repair procedures.

---

**Caution**      **When you open the Diagnostics Menu, monitoring is suspended and measurements stop.**

---

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### Notes

- *The Charging LED does not show battery status while the **Diagnostics Menu** is open.*
  - *The **Diagnostics Menu** is not available when the monitor is in Demo mode.*
- 

Use the **Diagnostics Menu** to perform the system diagnostic and verification tests and track component usage hours.

The **Diagnostics Menu** allows you to:

- Configure the hardware and software;
  - View monitor and rack status and errors;
  - Perform measurement and monitoring functions;
  - View connected plug-ins' status and errors;
  - Enter the system serial number if the monitor, rack, or plug-in module boards have been replaced.
- 

**Note** — *You cannot access the **Diagnostics Menu** when the monitor is in Demo mode.*

---

To access the **Diagnostics Menu**:

Step	
1	Access the <b>Admin</b> tab. See “Accessing the Admin Functions” on page 2-6.
2	Select the <b>Diagnostics</b> button. The <b>Diagnostics Menu</b> menu appears.
3	Select the <b>Maintenance &gt;&gt;</b> button to access additional options.

Step	
4	In the window that appears, select the password field. An onscreen keyboard opens.
5	Enter the password, <b>129</b> , and select <b>OK</b> .
6	Select <b>OK</b> . The <b>Diagnostics Menu</b> displays additional options.

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## Enabling Demo Mode

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**Warning**     ***Do not connect a patient to a monitor running in Demo mode. Values represented in Demo mode do not represent measurements from a patient connected to the monitor, and may lead to incorrect diagnoses.***

---

Demo mode is used to demonstrate the monitor without connecting the monitor to an actual person. Demo mode simulates all patient parameters and generates alarms when alarm settings are exceeded.

---

**Caution**     **Entering Demo mode clears the patient data.**

---

To put the monitor in Demo mode:

Step	
1	Access the <b>Admin</b> tab. See “Accessing the Admin Functions” on page 2-6.
2	Select <b>Demo Mode</b> . <b>Note</b> — <i>Checking Demo Rack allows you to demonstrate the rack measurements when Demo Mode is enabled.</i>
3	Close the menu. A confirmation window appears.
4	Select <b>OK</b> . The monitor enters Demo mode and clears all patient data. <b>DEMO</b> appears on the top of the monitor display.
5	To exit Demo mode, press the <b>On/Standby</b> key to turn the monitor off. The monitor clears all simulated patient data.

---

## Visual Test

To perform the visual test:

Step	
1	Inspect the system for obvious signs of damage; for example, cracks, cuts, or breakage.
2	Check all external cables and accessories for damage; for example, cuts, kinks, wrong connections.
3	Ensure that all markings and labeling are legible. If the labels on the rear case are not legible, replace the rear case. If the serial number label is not legible, contact the Philips Customer Care Center or your local Philips representative to return the monitor for label replacement.
4	Check for any obstructions to mechanical parts. The expected test result is that the system has no obvious signs of damage or obstruction. <b>Note</b> – <i>Philips employees record this value as <b>V:P</b> or <b>V:F</b>.</i>

---

## Power-On Self Test

To perform the power-on self test:

Step	
1	Connect the monitor to an AC power source.
2	Press the <b>On/Standby</b> key to power up the monitor.
3	<p>Make sure that the monitor powers up successfully as described in the following sequence:</p> <ul style="list-style-type: none"> <li>• The color bar is displayed and then the LCD turns off.</li> <li>• The Charging LED turns on (when the battery is available).</li> <li>• A tone sounds and the Philips splash screen appears.</li> <li>• The Alarm LED lights in blue, followed by yellow, and then by red.</li> <li>• The <b>Date/Time Menu</b> appears to allow the configuring of date and time.</li> </ul> <p>After you acknowledge the <b>Date/Time Menu</b>, the main screen appears. The expected result is that the monitor starts up and displays the main screen.</p> <p><b>Note</b> — If configured, the <b>Admit Patient Menu</b> appears. After you acknowledge the <b>Admit Patient Menu</b>, the main screen appears.</p> <p>The expected result is that the monitor starts up and displays the main screen. For detailed information about the start-up and power sequences, see “Start-up and Power Sequences” on page 3-2</p> <p>If the LEDs do not function as expected, see “Power Problems” on page 3-5.</p> <p>If the display does not function as expected, see “Power Problems” on page 3-5 or “Display Problems” on page 3-6.</p> <p>If you do not hear a startup tone, or the monitor displays the <b>Speaker Malfunc</b> error message, see “Error Codes” on page 3-18.</p> <p><b>Note</b> — Philips employees record this value as <b>PO:P</b> or <b>PO:F</b>.</p>

---

## Alarms Test

The following test allows you to verify that the visual and audio alarms are working.

To perform this test, you need an NBP cuff and hose.



To test the alarms:

Step	
1	With the monitor turned on, make sure that all alarms are enabled (the monitor is not in Audio Pause or Audio Off mode).
2	Make sure the NBP alarm is enabled (the crossed bell icon does not appear in the NBP numeric pane).
3	Connect the NBP hose to the NBP input connector, but do not place the cuff on your arm.
4	Press the <b>NBP</b> key on the front panel.
5	Wait for the NBP module to cycle and check that an NBP error message is displayed in the message area and an alarm tone sounds.
6	If you do not get the results in step 5, see “NBP Problems” on page 3-8. <b>Note</b> — Philips employees record this value as <b>AL:P</b> or <b>AL:F</b> .

## SpO<sub>2</sub> Test

The following procedure tests the performance of the SpO<sub>2</sub> measurement and alarm.

To perform this test, you need an adult SpO<sub>2</sub> sensor.

To perform the SpO<sub>2</sub> test:

Step	
1	Connect an adult SpO <sub>2</sub> sensor to the SpO <sub>2</sub> connector on the monitor. Ensure that the red LED in the sensor is lit.
2	Connect the other end of the sensor to your finger.
3	Verify that the SpO <sub>2</sub> value displayed on the monitor is between 95% and 100%. If it is not, try the test again with a patient simulator.
4	If you still do not get the results in step 3, see “SpO <sub>2</sub> Measurement Problems” on page 3-10. <b>Note</b> — Philips employees record this value as <b>SpO<sub>2</sub>:P</b> or <b>SpO<sub>2</sub>:F</b> .

### Caution

**A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor. However, if there is independent demonstration that a particular calibration curve is accurate for the combination of a pulse oximeter monitor and a pulse oximeter sensor, then a functional tester can measure the contribution of a monitor to the total error of a monitor/sensor system. The functional tester can then measure how accurately a particular pulse oximeter monitor is reproducing that calibration curve.**

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## Sidestream CO<sub>2</sub> Calibration Test

This test checks the calibration of the Microstream CO<sub>2</sub> gas measurement. The CO<sub>2</sub> calibration test is required after the first 1,200 hours of use or one year, whichever comes sooner. After the first calibration, calibrate after 4,000 hours of continuous use or every year, whichever comes sooner. In addition, perform the calibration tests when the instrument is repaired or when parts are replaced.

---

**Note** — *Replace the CO<sub>2</sub> module after 20,000 hours of use.*

---

The **CO<sub>2</sub> Test** menu also displays the following information about the Sidestream CO<sub>2</sub> module:

- Hardware version
- Firmware version
- Last calibration date
- CO<sub>2</sub> usage hours
- Hours to calibration
- Hours to service

---

**Caution**     **If the initial calibration is performed before 720 hours of use, the module resets to require the next calibration after 1,200 hours instead of after 4,000 hours.**

---

This test uses calibration equipment that you can order. Refer to the documentation accompanying the calibration equipment for more details.

---

**Warning**     ***A monitor that is not calibrated at the recommended intervals may provide inaccurate results.***

***Dispose of empty or partially empty calibration gas containers in accordance with the manufacturer's instructions and local regulations.***

---

### Recommended Test Equipment

- Electronic flowmeter, M1026-60144/Agilent HD(M)100 Tsi 4H0
- Gas calibration equipment:
  - Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)
  - Cal gas flow regulator M2267A
  - Cal tube 13907A

## Sidestream CO<sub>2</sub> Gas Measurement Calibration Check

To check the calibration of the CO<sub>2</sub> gas measurement:

Step	
1	<p>Ensure that the CO<sub>2</sub> module is not in Standby mode (when the monitor is in Display Waveform mode, <b>Standby</b> is displayed in the CO<sub>2</sub> waveform pane).</p> <p>If necessary, turn on the CO<sub>2</sub> module by opening the <b>CO<sub>2</sub> Menu</b> and setting <b>CO<sub>2</sub> On/Standby:</b> to <b>On</b>.</p>
2	<p>Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b>. See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.</p>
3	<p>Select the <b>CO<sub>2</sub> Test</b> button.</p> <p>The <b>CO<sub>2</sub> Test</b> menu appears.</p>
4	<p>Connect one end of the sampling line to the CO<sub>2</sub> inlet on the monitor and leave the other end unconnected.</p>
5	<p>In the <b>CO<sub>2</sub> Test</b> menu, select <b>Start Calibration Check</b>.</p> <p>A message to connect the gas to the CO<sub>2</sub> module appears.</p>
6	<p>Connect the other end of the sampling line to the gas controller equipment inlet with a 5% gas concentration.</p>
7	<p>Open the valve on the gas controller equipment to allow 5% CO<sub>2</sub> gas to flow into the monitor.</p>
8	<p>Select <b>OK</b> in the confirmation window to begin checking the calibration.</p> <p><b>Note</b> — <i>The calibration check can take up to one minute to complete. The monitor checks the calibration and when the calibration check completes, the <b>CO<sub>2</sub> Test</b> window displays a message. For example:</i></p> <p><b>CO<sub>2</sub> calibration check successful. CO<sub>2</sub> rate: 5.1.</b></p>
9	<p>If the module is not in calibration, an error message appears. Calibrate the module. See “Calibrating the Sidestream CO<sub>2</sub> Module” on page 2-15.</p>
10	<p>Turn off the flow of gas and close the menu.</p> <p><b>Note</b> — <i>Philips employees record this value as <b>SCO<sub>2</sub>:P</b> or <b>SCO<sub>2</sub>:F</b>.</i></p>

## Calibrating the Sidestream CO<sub>2</sub> Module

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**Caution** Because the monitor uses the current date and time as the calibration date and time, ensure that the system date and time is set correctly.

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**Note** – The monitor always displays the CO<sub>2</sub> module's operating (usage) time in the **CO2 Test** menu.

---

To calibrate the CO<sub>2</sub> module:

---

**Note** – Do not perform the initial calibration before 720 hours of use. If the initial calibration is performed before 720 hours of use, the module will reset, and then require its next calibration after 1,200 hours, instead of after 4,000 hours.

---

Step	
1	Connect one end of the sampling line (if not already connected) to the CO <sub>2</sub> inlet on the monitor and leave the other end unconnected.
2	In the <b>CO2 Test</b> menu, select <b>Start Calibration</b> . A confirmation window appears telling you to connect the gas to the CO <sub>2</sub> module.
3	Connect the other end of the sampling line to the gas controller equipment inlet with a 5% gas concentration.
4	Open the valve on the gas controller equipment to allow 5% CO <sub>2</sub> gas to flow into the monitor.
5	Select <b>OK</b> in the confirmation window to begin calibrating. The monitor begins calibrating the CO <sub>2</sub> module and displays the calibration value when complete. <b>Note</b> – The calibration process can take up to one minute to complete.
6	Turn off the flow of gas and close the menu.
7	If the calibration is successful, the <b>Last Calibration Date</b> and <b>Hours to Calibration</b> in the <b>CO2 Test</b> menu reset. To check this, re-open the <b>CO2 Test</b> menu.
8	If the module is not able to calibrate itself, an error message appears. Replace the CO <sub>2</sub> module.

## Respironics CapnoTrak Sidestream CO<sub>2</sub> Accuracy Test

The following procedure should be performed to check the CO<sub>2</sub> accuracy of the CapnoTrak module. It is recommended that this procedure be performed every 12 months. The accuracy of the CO<sub>2</sub> gas mixture must be greater than or equal to 5% ± 0.03%.

### Recommended Test Equipment

- Water filter assembly.
- Large airway adapter.
- Gas calibration equipment:
  - Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)
  - Cal gas flow regulator M2267A
  - Cal tube 13907A

To check the accuracy of the CapnoTrak sensor.

1	Ensure that CO <sub>2</sub> is not in Standby mode (when the monitor is in Display Waveform mode, <b>Standby</b> is displayed in the CO <sub>2</sub> waveform pane). If necessary, turn on the CO <sub>2</sub> module by opening the <b>CO2 Menu</b> and setting <b>CO2 On/Standby:</b> to <b>On</b> .
2	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
3	Select the <b>CO2 Test</b> button. The <b>CO2 Test</b> menu appears.
4	Attach a water filter assembly and large airway adapter to the sampling inlet of the module. <b>Sensor warming up.</b> is displayed. Wait for warm-up to complete.
5	Set the gas compensation settings of the CapnoTrak module to the verification gas mixture.
6	When the <b>Zero</b> button is enabled, select it and wait for the zero to complete. If the zero fails (“Zero Error” or “Zero Required” is present after the zero): <ul style="list-style-type: none"> <li>• Ensure the “Module Not Ready to Zero” status is not present.</li> <li>• Ensure that the sampling accessory is away from any sources of CO<sub>2</sub>.</li> <li>• Repeat the zero process. If the zero fails again, contact service</li> </ul>
7	Connect the gas mixture to the adapter and set the flow rate to 2.0 l/min.
8	Allow one minute for the gas mixture to stabilize and observe the CO <sub>2</sub> value. The expected value is 5% ± 0.3%.

9	<p>If the observed value is not within the expected value:</p> <ul style="list-style-type: none"> <li>• Turn off the gas mixture</li> <li>• Remove the gas connection from the airway adapter and wait one minute.</li> <li>• Repeat steps 7 through 10.</li> </ul> <p>If the observed value is not within the expected value, contact service.</p>
10	If a waveform is present, verify that it appears as a straight line at approximately 5%.
11	The accuracy check is now complete. Remember to set the CapnoTrak module settings for units and gas composition back to their previous settings.
12	<p>Select the <b>Stop Accuracy Check</b> button at any time to stop the test.</p> <p><b>Note</b> — Philips employees record this value as <b>SCO<sub>2</sub>:P</b> or <b>SCO<sub>2</sub>:F</b>.</p>

### Sample Flow Rate Accuracy Check

The CapnoTrak module's flow rate and cell pressure accuracy should be verified every 12 months by direct measurement using a calibrated flow meter.

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**Note** — *The test must be performed under load. Use the CapnoTrak Adult Airway Adapter for proper test verification.*

---

To verify flow rate accuracy:

1	Power on the CapnoTrak module.
2	Attach a water filter assembly and adult airway adapter to the sampling inlet of the CapnoTrak module.
3	Allow the CapnoTrak module to warm up.
4	After warm-up is complete, connect the calibrated flow meter to the exhaust port of the module.
5	Verify that the flow rate is 50 ml/min ± 10 ml/min. If the measured flow rate is outside the specified limits, remove the CapnoTrak module from use and contact service. A mass flow meter is typically used to verify the flow rate (1.5% full scale accuracy at 100 ml/min).

### Cell Pressure Accuracy Check

To verify cell pressure accuracy:

1	Power on the CapnoTrak module.
2	Verify there is no water filter assembly attached to the front panel connector.
3	Turn the pump off.
4	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
5	Select the <b>CO<sub>2</sub> Test</b> button. The <b>CO<sub>2</sub> Test</b> menu appears.
6	Read the cell pressure value from the screen. Verify that the pressure is between -20 to -30 mmHg.
7	If the pressures are not within range, refer the module for service.

## Respironics LoFlo Sidestream CO<sub>2</sub> Accuracy Test

The following procedure should be performed to check the CO<sub>2</sub> accuracy of the LoFlo module. It is recommended that this procedure be performed every 12 months. The accuracy of the CO<sub>2</sub> gas mixture must be greater than or equal to 5% ± 0.03%.

### Recommended Test Equipment

- Respironics LoFlo Adult On-Airway adapter kit.
- Gas calibration equipment:
  - Cal 1 gas 15210-64010 (5% CO<sub>2</sub>/95% N<sub>2</sub>)
  - Cal gas flow regulator M2267A
  - Cal tube 13907A

To check the accuracy of the LoFlo sensor.

1	Ensure that CO <sub>2</sub> is not in Standby mode (when the monitor is in Display Waveform mode, <b>Standby</b> is displayed in the CO <sub>2</sub> waveform pane). If necessary, turn on the CO <sub>2</sub> module by opening the <b>CO<sub>2</sub> Menu</b> and setting <b>CO<sub>2</sub> On/Standby</b> : to <b>On</b> .
2	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
3	Select the <b>CO<sub>2</sub> Test</b> button. The <b>CO<sub>2</sub> Test</b> menu appears.

4	Connect the CO <sub>2</sub> sensor to the monitor. <b>Sensor warming up.</b> is displayed. Allow warm-up to complete.
5	Verify that the <b>Amb. Pressure (mmHg)</b> and <b>Gas Temperature (°C)</b> values are accurate. If the values are incorrect, enter the correct values.
6	Set the gas compensation settings of the LoFlo CO <sub>2</sub> Module to the verification gas mixture.
7	Zero the LoFlo CO <sub>2</sub> Module on the airway adapter being used in this test.
8	Attach a regulated flowing gas mixture of 5% CO <sub>2</sub> , balance N <sub>2</sub> to the airway adapter. Set the flow rate of the gas to 2 l/m/.
9	Allow 10 seconds for the gas mixture to stabilize and observe the CO <sub>2</sub> value. The expected value is 5% ± 0.3%.
10	If a waveform is present, verify that it appears as a straight line at approximately 5%.
11	The accuracy check is now complete. Remember to set the LoFlo module settings for units and gas composition back to their previous settings.
12	Select the <b>Stop Accuracy Check</b> button at any time to stop the test. <b>Note</b> — Philips employees record this value as <b>SCO<sub>2</sub>:P</b> or <b>SCO<sub>2</sub>:F</b> .

### Sample Flow Rate Accuracy Check

The LoFlo module's flow rate accuracy should be verified every 12 months by direct measurement using a calibrated flow meter.

---

**Note** — *The test must be performed under load. Use the LoFlo Adult On-Airway Adapter Kit for proper test verification.*

---

To verify flow rate accuracy:

1	Connect the LoFlo module connector to the Efficia monitor.
2	Connect the RS232 output of the power supply to the Efficia monitor.
3	Attach the LoFlo Adult On-Airway adapter kit to the sample receptacle of the LoFlo module. A click will be heard when properly inserted.



4	Allow the LoFlo module to warm up.
5	After warm-up is complete, connect the calibrated flow meter to the exhaust port of the module.
6	Verify that the flow rate is 50 ml/min $\pm$ 10 ml/min. If the measured flow rate is outside the specified limits, remove the LoFlo module from use and contact service.

## Mainstream CO<sub>2</sub> Accuracy Test

The **CO<sub>2</sub> Test** menu displays the following information about the Mainstream CO<sub>2</sub> module:

- Part number
- Serial number
- Hardware version
- Firmware version
- Total usage time

This test checks the performance of the Mainstream CO<sub>2</sub> sensor.

1	Ensure that CO <sub>2</sub> is not in Standby mode (when the monitor is in Display Waveform mode, <b>Standby</b> is displayed in the CO <sub>2</sub> waveform pane). If necessary, turn on the CO <sub>2</sub> module by opening the <b>CO<sub>2</sub> Menu</b> and setting <b>CO<sub>2</sub> On/Standby</b> : to <b>On</b> .
2	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
3	Select the <b>CO<sub>2</sub> Test</b> button. The <b>CO<sub>2</sub> Test</b> menu appears.
4	Connect the CO <sub>2</sub> sensor to the monitor. <b>Sensor warming up.</b> is displayed.
5	Verify that the <b>Amb. Pressure (mmHg)</b> and <b>Gas Temperature (°C)</b> values are accurate. If the values are incorrect, enter the correct values.
6	When the <b>Zero</b> button is enabled, select it and wait for the zero to complete.
7	Connect the gas mixture to the adapter and set the flow rate to 2.0 – 5.0 l/min.

8	Select the <b>Start Accuracy Check</b> button.
9	Verify that the CO <sub>2</sub> value displayed is within 5% ± 0.26%. If the value is not within the range, replace the CO <sub>2</sub> sensor.
10	Select the <b>Stop Accuracy Check</b> button at any time to stop the test. <b>Note</b> — Philips employees record this value as <b>MCO<sub>2</sub>:P</b> or <b>MCO<sub>2</sub>:F</b> .

## ECG/Respiration Performance Test

This test checks the performance of the ECG and respiration measurements.

To perform this test, you need:

- Patient simulator (capable of respiration)
- ECG patient cable

To perform the ECG test:

Step	
1	Connect the ECG patient cable to the ECG connector on the side of the monitor.
2	Configure the patient simulator to: <ul style="list-style-type: none"> <li>• ECG sinus rhythm</li> <li>• HR = 80 bpm, or a rate of your choice</li> </ul>
3	Connect the other end of the ECG patient cable to the patient simulator.
4	Verify that the displayed ECG wave and HR value (± 2 bpm) correlate to the values you selected on the patient simulator. For an HR of 80 bpm, the displayed value on the patient monitor should be between 78 – 82 bpm.
5	Redo the test, selecting several heart rates on the patient simulator: 160, 80, 100.
6	If you do not get the expected results, see “ECG/Respiration Measurement Problems” on page 3-11. <b>Note</b> — Philips employees record this value as <b>ECG:P</b> or <b>ECG:F</b> .

To perform the Respiration performance test:

Step	
1	Change the patient simulator configuration to: Respiration rate 40 rpm.
2	Verify that the displayed respiration waveform and respiration rate ( $\pm 2$ rpm) are the same as the values you selected on the patient monitor: between 38 – 42 rpm.
3	If you do not get the expected results, see “ECG/Respiration Measurement Problems” on page 3-11. <b>Note</b> – Philips employees record this value as <b>R:P</b> or <b>R:F</b> .

---

## ECG Output Performance Test

The ECG Output performance test checks the performance of ECG synchronization between the monitor and a defibrillator. This test needs to be performed only if this feature is in use at your facility.

To perform this test, you need:

- Defibrillator with ECG sync cable
- Patient simulator

To test the ECG output:

Step	
1	Connect the patient simulator to the ECG connector on the monitor and the defibrillator to the ECG output on the monitor.
2	Set the patient simulator to the following configuration: <ul style="list-style-type: none"> <li>• HR = 100 bpm</li> <li>• ECG sinus rhythm</li> </ul>
3	Turn on the defibrillator in simulation mode.
4	Verify that the ECG signal is displayed.
5	If you do not get the expected results, see “ECG/Respiration Measurement Problems” on page 3-11. <b>Note</b> – Philips employees record this value as <b>EO:P</b> or <b>EO:F</b> .

---

## NBP Test

These tests check the performance of the non-invasive blood pressure measurement:

- NBP accuracy
- NBP calibration procedure (if required)

- NBP pneumatic leakage

To perform these tests, you need:

- A reference manometer (includes hand pump and valve), accuracy 0.2% of reading
- An expansion chamber (volume 250 ml  $\pm$  10%)
- Appropriate tubing

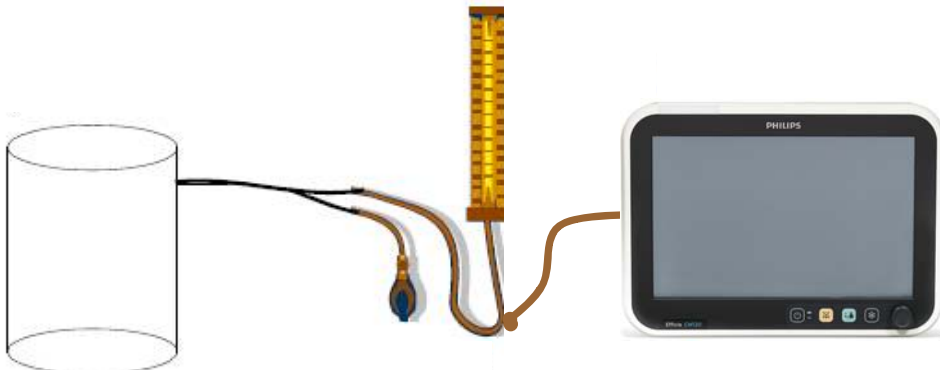
## NBP Accuracy

---

**Note** – Philips recommends that you do not test NBP accuracy with a simulator.

---

To test the NBP accuracy:

Step	
1	Connect the manometer and the pump with tubing to the NBP connector on the monitor.
2	<p>Connect the tubing to the expansion chamber (250 ml cylinder).</p>  <p style="text-align: center;"> <span data-bbox="527 1318 750 1348">Expansion chamber</span> <span data-bbox="943 1318 1071 1348">Manometer</span> <span data-bbox="1268 1318 1360 1348">Monitor</span> </p>
3	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
4	Select <b>NBP Test</b> . The <b>NBP Test</b> menu appears.
5	Select the <b>Start Static Pressure Test</b> button to start the test.
6	Squeeze the manometer pump and apply a pressure of 280 mmHg.
7	<p>Wait 10 seconds for the pressure to stabilize. Note the pressure displayed in the <b>NBP Test</b> menu. The value should be 280 mmHg <math>\pm</math> 3 mmHg.</p> <p><b>Note</b> – Philips employees record this value as <b>X1</b>.</p>
8	Squeeze the manometer pump to apply a pressure of 150 mmHg to the monitor.

Step	
9	<p>Wait 10 seconds for the pressure to stabilize. Note the pressure displayed in the <b>NBP Test</b> menu. The value should be 150 mmHg <math>\pm</math> 3 mmHg.</p> <p><b>Note</b> — <i>Philips employees record this value as X2.</i></p>
10	<p>Select the <b>Stop Static Pressure Test</b> button to stop the test.</p>
11	<p>If the difference between the manometer and displayed values is greater than 3 mmHg, calibrate the monitor (see “NBP Calibration Procedure” on page 2-24).</p> <p>If the results are as expected, proceed to the “Pneumatic Leakage Test” on page 2-25.</p>

## NBP Calibration Procedure

To calibrate the NBP module:

Step	
1	<p>In the <b>NBP Test</b> menu, Select <b>NBP Calibration</b>.</p> <p><b>Note</b> — <i>To stop the calibration process at any time, select <b>Stop</b>.</i></p> <p>The <b>NBP Calibration</b> menu appears.</p> <p><b>Note</b> — <i>If you are using a manual manometer, close the valve before continuing.</i></p>
2	<p>Select the <b>Start</b> button to begin calibration.</p> <p>The monitor inflates the expansion chamber and displays the message, <b>Starting NBP Calibration...</b></p>
3	<p>Wait until the message, <b>Ready for calibration at first pressure point...</b>, appears.</p>
4	<p>Select the <b>Set Pressure Value</b> field, and then select the value to match that displayed on the manometer.</p>
5	<p>Select <b>CAL Point</b> to save the calibration point.</p>
6	<p>Wait until the message, <b>NBP calibration successful</b>, appears.</p> <p>If the test fails for any reason, select the <b>Stop</b> button to stop the test.</p>
7	<p>Close the menu.</p>
8	<p>To verify the calibration, check the accuracy of the NBP. See “NBP Accuracy” on page 2-23.</p>
9	<p>If you do not get the expected results after several tries, see Chapter 3, “Troubleshooting.”</p>

## Pneumatic Leakage Test

To check the pneumatic system and valve:

Step	
1	In the <b>NBP Test</b> menu, select the <b>Start Static Pressure Test</b> button.
2	Squeeze the manometer pump to apply a pressure of 280 mmHg.
3	Wait 10 seconds for the pressure to stabilize. Note the pressure value in the <b>NBP Test</b> menu. <b>Note</b> – Philips employees record this value as <b>P1</b> .
4	Wait 60 seconds for the pressure to stabilize. Note the pressure value in the <b>NBP Test</b> menu. <b>Note</b> – Philips employees record this value as <b>P2</b> .
5	Calculate and document the leakage test value. The leakage test value should be less than or equal to 6 mmHg. <b>Note</b> – Philips employees record this value as <b>X3</b> (where <b>X3 = P1 - P2</b> ).
6	Select the <b>Stop Static Pressure Test</b> to stop the process.
7	If the leakage test value exceeds 6 mmHg, check the test setup cuff and tubing, and then test again. If the test still fails, check the pneumatic tubing inside the monitor (see Chapter 3, “Troubleshooting.”)
8	If you cannot eliminate the leak, see Chapter 3, “Troubleshooting.”

## IBP Test

This test checks the performance of the invasive blood pressure measurement.

To perform this test, you need a patient simulator such as the Foss Systems BP28.

To perform the IBP test:

Step	
1	Connect the patient simulator to the IBP connector.
2	Open the <b>Blood Pressure</b> menu and make sure that the <b>Display IBP</b> check box is selected Make sure that the IBP <b>Label</b> option selected is the same as the IBP measurement type selected on the patient simulator.
3	Ensure that the IBP waveform displays in one of the sectors on the monitor. <b>?</b> appears in the numeric IBP pane.
4	Set the patient simulator to <i>atmosphere</i> ( <b>atm</b> ). The monitor displays <b>IBP Zero Required</b> in the status pane.

5	Select the IBP waveform and then press the wheel to open the <b>&lt;Pressure&gt; Waveform Menu</b> .
6	Select the <b>IBP Zero</b> button and then press the wheel to begin zeroing the pressure. The <b>&lt;Pressure&gt; Waveform Menu</b> closes. The message, <b>IBP Zero - In Progress</b> , appears in the IBP Waveform pane.
7	Configure the patient simulator as P (static) = 200 mmHg. <b>Note</b> – To configure the patient simulator to 200 mmHg, use the blood pressure menu on the monitor to set 0 – 300 on the scale menu.
8	Ensure that the IBP waveform is at 200 mmHg.
9	Change the sweep speed to 25 mm/sec.
10	Wait for the displayed waveform and make sure that the IBP waveform corresponds to a steady pressure of 200 mmHg ± 5 mmHg.
11	If the value is outside these tolerances, check the sensor.
12	If you still do not get the expected results, see “IBP Problems” on page 3-12. <b>Note</b> – Philips employees record this value as <b>IBP(1 or 2):P</b> or <b>IBP(1 or 2):F</b> .

## Temperature Test

To perform this test, you need a patient simulator (with 0.1°C or 0.2°F). Perform the following test for each temperature connector in use.

To test the performance of the temperature measurement:

Step	
1	Connect the patient simulator to the temperature connector on the monitor or measurement server extension.
2	Configure the patient simulator to 40°C (100°F).
3	Wait for the monitor to display the static temperature value. The value should be 40°C ± 0.2°C (100°F ± 0.4°F).
4	If the value is not within tolerance, see “Temperature Measurement Problems” on page 3-9. <i>Philips employees record this value as <b>T(1 or 2):P</b> or <b>T(1 or 2):F</b></i>

## Cardiac Output Test (C.O.)

This test checks the performance of the C.O. module.

To perform this test, Philips recommends that you use the following equipment or its equivalent:

- Fluke PS420, M1012-61601, CD 2462364 or similar

To test the C.O. performance:

Step	
1	Connect the patient simulator to the C.O. connector on the side of the monitor.
2	Verify that the patient simulator is configured to the following settings: <ul style="list-style-type: none"> <li>• Injection temperature: 2°C</li> <li>• Computation constant: 0.542 (Edward's Catheter)</li> <li>• Flow: 5 l/min</li> </ul>
3	On the main screen, select the C.O. pane. The <b>C.O. Menu</b> appears.
4	Set the <b>Catheter Type</b> to <b>Other</b> .
5	Select <b>C.O. Measurement</b> . The <b>C.O. Procedure Menu</b> appears.
6	Verify that the <b>Computation Constant</b> is the same setting as the simulator.
7	Select the <b>Start Measurement</b> button.
8	Check the displayed value against the simulator configuration. <ul style="list-style-type: none"> <li>• C.O. = 5.0 l/min ± 1.0 l/min</li> </ul>
9	Connect the C.O. interface cable to the monitor.
10	Connect one side or the service tool to the injectate receptacle of the C.O. interface cable and the other side to the catheter cable receptacle.
11	Verify the result in the <b>C.O. Procedure Menu</b> . The expected result is T <sub>blood</sub> = 37.0°C ± 0.1°C. <b>Note</b> — Philips employees record this value as <b>C.O.:P</b> or <b>C.O.:F</b> .
12	Close the menu.



## Safety Tests

Use the following safety test procedures to verify safe installation or service of the monitor. The setups and the acceptable ranges of values used for these tests are derived from local and international standards, but may not be equivalent. These tests are not a substitute for local safety testing where it is required for an installation or a service event. If you use the Metron Safety tester, perform the tests in accordance with your local regulations. For example, in Europe, use IEC 60601-1 and in the United States, use ES 60601-1. The Metron Report should print results with the names listed below, together with other data.

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**Note** — Safety tests meet the standards of, and are performed in accordance with IEC 60601-1, Clause 8 (EN60601-1).

---

The monitor safety tests include:

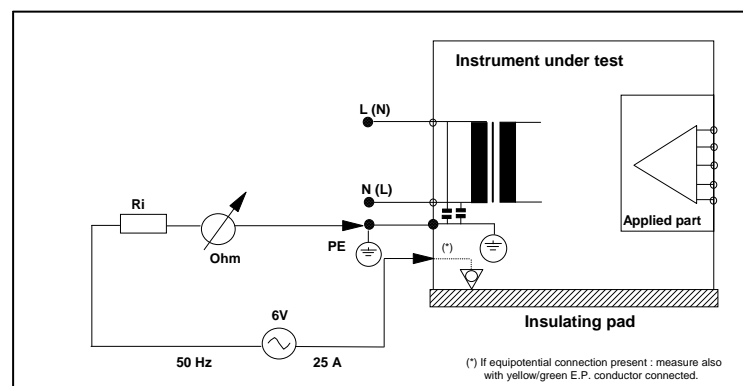
- Ground integrity
- Touch leakage — 4 parts
- Patient leakage current with mains voltage

To perform these tests, you need one of the following:

- Multimeter with a leakage network
- Product safety analyzer

## Ground Integrity Testing

**Figure 2-1 S(1) Protective Earth Continuity**



### Expected Test Results:

With mains cable, maximum impedance  $x \leq 200$  mOhms (IEC 60601-1 and ES 60601-1)

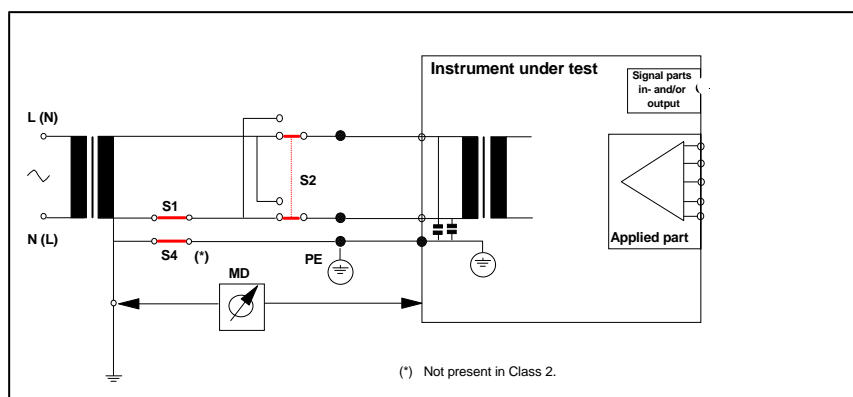
This measures impedance of Protective Earth (PE) terminal to all exposed metal parts of Instrument under Test (IUT), which are for safety reasons connected to the Protective Earth (PE). Test current 25 Amp applied for 5 to 10 seconds.

## Touch Leakage Testing

All monitors require the touch leakage tests part 1 and part 2. If the monitor under test is part of a medical electrical system, such as an EHR, you must also perform “Touch Leakage, Part 3” on page 2-30 and “Touch Leakage, Part 4” on page 2-30.

### Touch Leakage, Part 1

Figure 2-2 S(2) Part 1: Touch Leakage Current, NC (Normal Condition)



#### Expected Test Results:

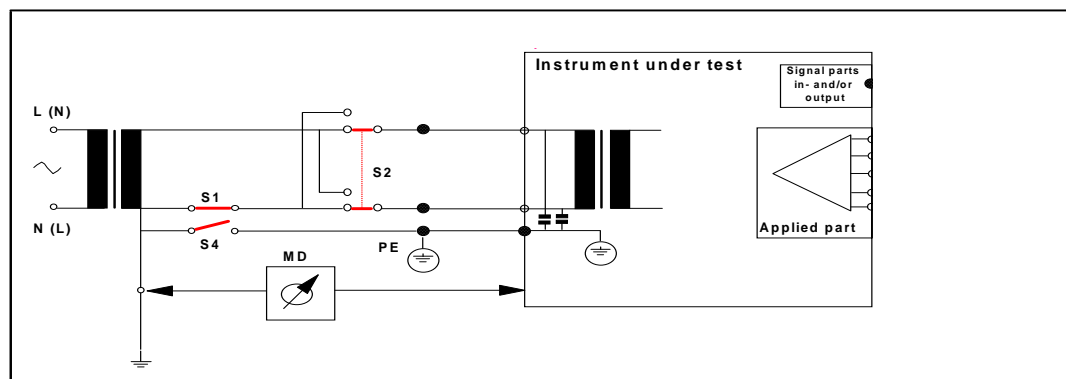
Normal condition maximum leakage current  $x1 \leq 100\mu\text{A}$

This measures leakage current of exposed metal parts of Instrument under Test (IUT) within the **patient environment**; normal and reversed polarity using S2.

Safety test according to IEC 60601-1 / ES 60601-1

### Touch Leakage, Part 2

Figure 2-3 S(2) Part 2: Touch Leakage Current, Single Fault (Open Earth)



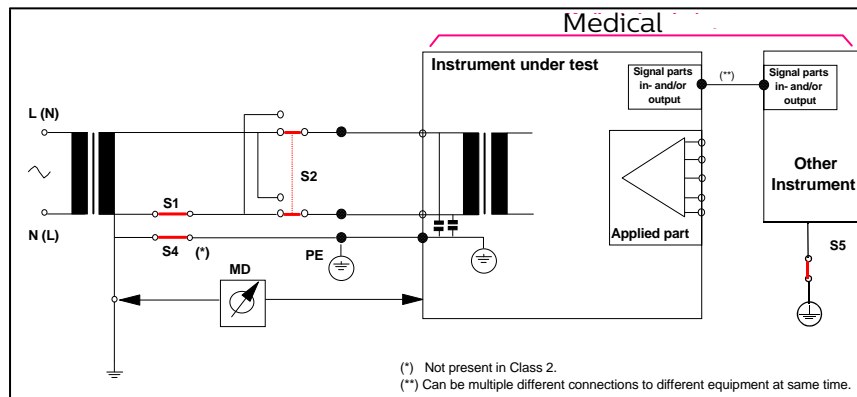
#### Expected Test Results:

Single Fault maximum leakage current  $x2 \leq 500\mu\text{A}$  (IEC 60601-1)

This measures leakage current of exposed metal parts of Instrument under Test (IUT) with Protective Earth (PE) open circuit (S4 = open); normal and reversed polarity using S2.

### Touch Leakage, Part 3

**Figure 2-4 S(2) Part 3: Touch Leakage Current - NC (normal condition) within a System**



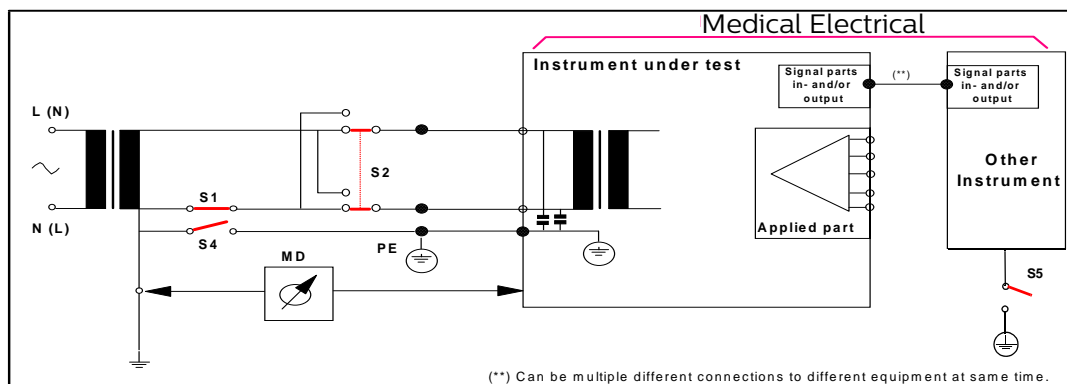
This measures leakage current of exposed metal parts of Instrument under Test (IUT) within a system with Protective Earth (PE) normal condition (S4 = closed) and between parts of the system within the **patient environment**; normal and reversed polarity using S2 with S5 closed/open for each in turn of “Other instrument” making up the medical electrical system.

#### Expected Test Results:

Normal condition maximum leakage current  $x1 \leq 100\mu A$

### Touch Leakage, Part 4

**Figure 2-5 S(2) Part 4: Touch Leakage current, Single Fault (open earth) within a System**



This measures leakage current of exposed metal parts of Instrument under Test (IUT) within a system with Protective Earth (PE) open circuit (S4 = open) and between parts of the system within the patient environment; normal and reversed polarity using S2 in turn for all other equipment that is connected to the medical instrument under test. S5

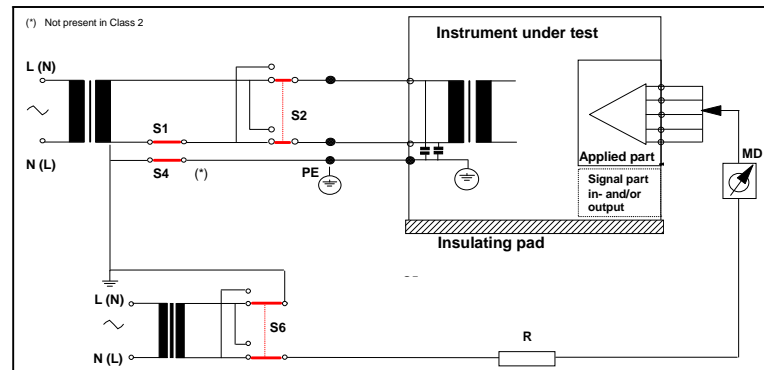
closed/open for each in-turn of "Other Instrument" making up the medical electrical system.

**Expected Test Results:**

Single Fault maximum leakage current  $x2 \leq 500\mu\text{A}$  (IEC 60601-1)

## Patient Leakage Current With Mains Voltage Testing

**Figure 2-6 S(3) Patient Leakage Current, Single Fault Condition (S.F.C.) Mains on an Applied Part**



**Expected Test Results:**

Maximum leakage current,  $x \leq 50\mu\text{A}$  @ 250V (IEC60601-1 and ES 60601-1)

Measures patient leakage current from applied part to earth caused by external main voltage on applied part. Each polarity combination possible is tested using S2 and S6. This test is applicable for each applied part in turn.

---

**Note** – To test the patient leakage current of the Mainstream CO<sub>2</sub> connector, if present, connect the cable to the monitor. Wrap the sensor with foil and connect it to the safety test equipment. Then test the Mainstream CO<sub>2</sub> as an applied part.

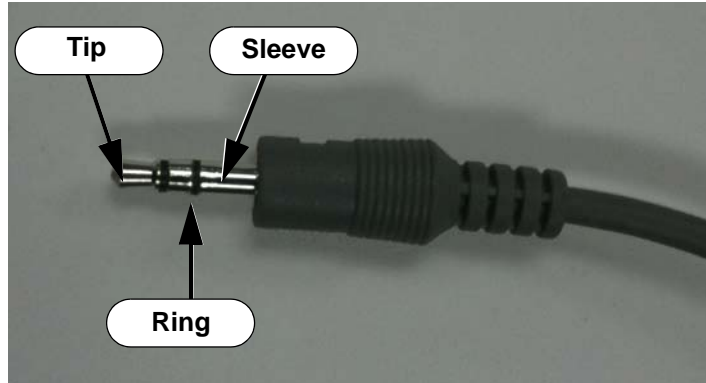
---

## Nurse Call Relay Test

If your facility uses the nurse call function on the monitor, perform the following procedure to test the nurse call alarm output relay.

The nurse call alarm output in the monitor uses a phone jack connector tip or ring and is capable of both normally closed and normally open relay operation.

The nurse call connector jack has three contacts that connect with those on a phono connector as shown in the following illustration.



- Tip — Relay normally open, closed for alarm
- Ring — Relay normally closed, open for alarm
- Sleeve — Common

To perform this test, you need:

- A patient simulator
- An ohmmeter
- A phono connector

To perform the nurse call relay test:

Step			
1	Plug the phono connector into the Nurse Call connector on the back of the monitor.		
2	Use the ohmmeter and simulator to verify relay operation as follows:		
	<b>Condition</b>	<b>Phone Jack Connector Tip (Relay Normally Open)</b>	<b>Phone Jack Connector Ring (Relay Normally Closed)</b>
	Alarm	Closed	Open
	No alarm	Open	Closed
3	If the nurse call function does not work as expected, see “Nurse Call Problems” on page 3-17		
	<b>Note</b> — Philips employees record this value as <b>NC:P</b> or <b>NC:F</b> .		

---

## Network Test

If your Efficia monitor is equipped with a wireless LAN module, perform the following procedure to test the module.

Step	
1	Open the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Select <b>Network Test</b> .
3	Select <b>Diagnostics</b> . The status of the wireless module will be checked, and information displayed.
4	If no information is displayed, verify that the module is installed correctly and repeat the test. If the second test is unsuccessful, replace the wireless module.  <b>Note</b> — <i>Philips employees record this value as <b>NT:P</b> or <b>NT:F</b>.</i>

Network Test

# Troubleshooting

Use the information in this chapter to diagnose and correct monitor problems. This chapter describes how to troubleshoot a monitor that is not operating correctly. To perform any recommended repairs, see Chapter 4, “Repairing the Monitor.”

---

## Overview

You can repair the monitor in either of two ways:

- Return the monitor to a Philips authorized service center for repair.
- Purchase spare parts from a Philips authorized service center.

---

### Caution

**Repairs should be made by qualified service personnel only.**

**Repairs should be made only with the recommended parts. Use of incorrect parts can cause damage to the monitor or incorrect measurements.**

---

The tools required to repair the monitor are listed in “Tools Required for Service” on page 4-3. If you open the case for a repair, you then must perform specific tests after reassembly. For detailed information about these tests, see Chapter 2, “Performance Verification Testing.”

The Philips Parts Center stocks board level assemblies and mechanical parts. Chapter 5, “Replacement Parts and Assembly Drawings” lists these parts and assemblies. Service notes announce the availability of additional spare parts.

## When You Cannot Correct a Problem

The information in this chapter is intended to help you resolve most problems that may occur with your monitor. If you still cannot isolate a problem after using the information in this chapter, call the Philips Customer Care Center or your local representative.

---

**Note** — *If you have created a custom password for your institution, you must change the password to the Philips default (215) before you return the monitor for any reason.*

---



## Viewing System Information

Before you troubleshoot the monitor, identify important information about the monitor, such as the hardware version and the software version, which are displayed on the **General** tab of the **System Menu**.

To view the **System Menu**:

- Select **System** (). The **General** tab of the **System Menu** appears.

---

## Diagnosing a Problem

Before you begin to troubleshoot a problem or open the monitor for repair, check the following basics:

1. Is the power switch turned on?
2. Is the battery adequately charged?
3. Is the AC power cord connected to the monitor and plugged into a functional AC outlet?
4. Is the monitor's display functioning?
5. Are the LEDs on the front of the monitor lit as you expect?

---

### Notes

- *It may take several seconds for the AC Power LED to light or turn off after the AC power cord has been connected or disconnected.*
- *It may take several seconds for the battery status icon to update and appear.*

---

If the monitor is not receiving power:

1. Check “Start-up and Power Sequences” on page 3-2, and then follow the troubleshooting steps in “Power Problems” on page 3-5.
2. If the monitor has no — or an incorrect — display, follow the troubleshooting steps in “Display Problems” on page 3-6.

When the monitor has power and a functioning display, use the information in this chapter to diagnose other monitor problems.

---

## Start-up and Power Sequences

The following table describes the start-up and power on phases of the monitor and its components. If the monitor does not behave as described in the following table, see “Display Problems” on page 3-6.

For the monitor to start correctly, it must be powered correctly as indicated by the lit LEDs on the front panel.

User Action	Expected Result
<p>Connect the AC power cord or insert a battery or batteries (or both) into an unpowered monitor.</p> <p>Press the <b>On/Standby</b> key.</p>	<p>The color bar is displayed and then the LCD turns off.</p> <p>The Charging LED turns on (when a battery is present).</p> <p>A tone sounds and the Philips splash screen appears.</p> <p>The Alarm LED lights in blue, followed by yellow, and then by red.</p> <p>The <b>Date/Time Menu</b> appears to allow the configuring of date and time.</p> <p>After you acknowledge the <b>Date/Time Menu</b>, the main screen appears.</p>
<p>Press the <b>On/Standby</b> key when the monitor (with AC power and/or battery power) is off.</p>	<p>The color bar is displayed and then the LCD turns off.</p> <p>The Charging LED turns on (when a battery is installed).</p> <p>A tone sounds and the Philips splash screen appears.</p> <p>The Alarm LED lights in blue, followed by yellow, and then by red.</p> <p>If configured, the <b>Admit Patient Menu</b> appears.</p> <p>After you acknowledge the <b>Admit Patient Menu</b>, the main screen appears.</p>
<p>Software reset (system or user).</p>	<p>The color bar is displayed and then the LCD turns off.</p> <p>The Charging LED turns on (when a battery is installed).</p> <p>A tone sounds and the Philips splash screen appears.</p> <p>The Alarm LED lights in blue, followed by yellow, and then by red.</p> <p>The main screen appears.</p>
<p>Plug AC power cord into a monitor that is off (battery only).</p> <p>Press the <b>On/Standby</b> key.</p>	<p>The color bar is displayed and then the LCD turns off.</p> <p>The Charging LED turns on (when a battery is installed).</p> <p>A tone sounds and the Philips splash screen appears.</p> <p>The Alarm LED lights in blue, followed by yellow, and then by red.</p> <p>If configured, the <b>Admit Patient Menu</b> appears.</p> <p>After you acknowledge the <b>Admit Patient Menu</b>, the main screen appears.</p>

User Action	Expected Result
Press the <b>On/Standby</b> key when the monitor is in Standby mode (with AC power and/or battery power).	A tone sounds and the Philips splash screen appears. If configured, the <b>Admit Patient Menu</b> appears. After you acknowledge the <b>Admit Patient Menu</b> , the main screen appears.
Press the <b>On/Standby</b> key when the monitor is on (with AC power and/or battery power).	The Philips splash screen appears and the LCD turns off.
Select <b>Shut Down</b> on the <b>General</b> tab in the <b>System Menu</b> .	After you select <b>OK</b> , the Philips splash screen appears while data is being saved. The LCD turns off.

## Troubleshooting Tables

Use the following tables to diagnose and fix monitor problems. The tables describe a monitor problem by symptom, list a possible cause, and suggest actions. Check the first possible cause listed, and then perform the associated action to repair the problem. Perform all actions in the order that they appear in a table.

Monitor problems are categorized as follows:

- Power
- Display
- Alarms
- Measurements, including:
  - NBP
  - Temperature
  - SpO<sub>2</sub>
  - CO<sub>2</sub>
  - ECG/Respiration
  - IBP
  - C.O.
- Navigation wheel, touch screen, and keys
- Recorder
- Nurse Call
- Security
- SD Card

If using the following troubleshooting tables does not solve the problem, see “Running System Diagnostics” on page 3-34.

## Power Problems

Symptom	Possible Cause	Action
The monitor turns on with battery power, but does not with AC power.	The power cord is unplugged.	Ensure that the AC power cord is plugged into an outlet.
	The power cord is broken.	Replace the AC power cord.
	The fuse is blown.	Replace the fuse. See "Replacing a Fuse" on page 4-8.
	The power supply cable malfunctioned.	Replace the power supply module. See "Removing the Power Supply Module" on page 4-17.
	The power supply malfunctioned.	Check output voltage on power supply. If you do not measure 15 V, replace the power supply. See "Removing the Power Supply Module" on page 4-17.
	The AC power connector malfunctioned.	Replace the AC connector. See "Replacing the Power Entry Module" on page 4-12.
	The main board malfunctioned.	Replace the main board. See "Replacing the Main Board" on page 4-27.
The monitor turns on with AC power, but does not with battery power.	A battery is not present.	Ensure that a battery or batteries are installed.
	The battery is not charged.	Charge the battery. For more information, see the <i>Efficia CM Series Service Guide</i> .
	The battery or connector is loose.	Reseat the battery and the battery cable.
	The main board malfunctioned.	Replace the main board. See "Replacing the Main Board" on page 4-27.
The monitor does not turn on with either AC or battery power.	The LCD, cables, battery, power supply, or main board malfunctioned.	Follow the steps shown in the previous two symptoms. If the problem is not resolved, replace the LCD. See "Removing the LCD Assembly" on page 4-29.
	The monitor keypad is worn.	Replace the front panel. See "Removing the LCD Assembly" on page 4-29.
Only one of the Charging LED colors is displayed.	The membrane switch assembly malfunctioned.	Replace the front panel assembly. See "Removing the Rear Case" on page 4-10

## Display Problems

Symptom	Possible Cause	Action
The power is on, but the monitor screen is blank.	The monitor is in Standby mode.	Press the <b>On/Standby</b> key to end Standby mode.
	The connection with the backlight LCD is faulty.	Ensure that there is a proper connection between the cable, LCD, and main board.
	The LCD is faulty.	Replace the LCD. See “Removing the LCD Assembly” on page 4-29
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
The monitor displays random or distorted graphics with a white background.	The LCD signal cable is not attached correctly.	Open the monitor and reseal the LCD signal cable. See “Removing the LCD Assembly” on page 4-29.
	The LCD malfunctioned.	Replace the LCD. See “Removing the LCD Assembly” on page 4-29.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
The monitor turns on and the opening screen and/or color bar starts, but then freezes.	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.

## Alarm Problems

Symptom	Possible Cause	Action
Audible alarms do not sound.	The monitor is in Audio Pause mode or Audio Off mode.	Confirm audio alarms are enabled.
	If the monitor has one speaker, it malfunctioned. If your monitor has two speakers, both speakers have malfunctioned.	Ensure that the connection to the speaker is correct. Clear the error message by performing the speaker test. See “Testing the Speaker” on page 3-39. Clear the error log. See “Managing Logs” on page 3-42.
	The speaker or speakers malfunctioned.	Replace the speaker. See “Replacing a Speaker” on page 4-13.
	The connection to the speaker is faulty.	Ensure that the connection to the speaker is correct.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
The <b>Auto Set Alarm Limits</b> button is unavailable.	Auto Set Alarm Limits function is only available when the monitor is in the <b>Interval Setting Menu</b> for NBP, CO <sub>2</sub> , and SpO <sub>2</sub> .	Ensure that the monitor is in the <b>Interval Setting Menu</b> for NBP, CO <sub>2</sub> , and SpO <sub>2</sub> . See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
Alarm LED on the front panel does not light up.	Alarm LED assembly malfunctioned.	Replace the front panel. See “Replacing the Front Panel Assembly” on page 4-30.
The <b>Speaker Malfunc</b> alarm appears in the message pane.	A speaker malfunctioned.	Clear the message by performing the speaker test. See “Testing the Speaker” on page 3-39. Replace the speaker. See “Replacing a Speaker” on page 4-13.

## NBP Problems

Symptom	Possible Cause	Action
The NBP cuff does not inflate.	The air tube or cuff is bent or twisted.	Straighten the tube or cuff.
	Air leak in the air tube or cuff.	Replace the cuff and ensure that there is no air leakage in the tube.
	The NBP module malfunctioned.	Replace the NBP pump module. See “Removing the NBP Module” on page 4-18.
NBP measurements are not displayed.	Wrong cuff size, or incorrect cuff placement.	Use proper cuff size, ensure proper cuff placement.
	Initial pressure setting is incorrect.	Specify the correct initial pressure. For more information, see the Installation and Configuration Guide provided with your monitor.
	The air tube is bent or twisted or there is air leakage in the air tube or cuff.	Ensure that the tube is straight and not kinked. Replace the cuff and ensure that there is no air leakage in tube.
	External problem. For example, the patient is moving excessively, shivering, or has arrhythmias.	Ensure that all external blood pressure reading requirements are met. For more information about measuring NBP, see the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	NBP module error.	Replace the NBP module.
NBP measurements are unreliable.	Wrong cuff size, or incorrect cuff placement.	Use proper cuff size and ensure proper cuff placement. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	Initial pressure setting is incorrect.	Specify the correct initial pressure. For more information, see the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i> .
	External problem. For example, the patient is moving excessively, shivering, or has arrhythmias	Ensure that all external blood pressure reading requirements are met. For more information about measuring NBP, see the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The NBP module needs to be calibrated.	Recalibrate the NBP module see “NBP Calibration Procedure” on page 2-24.

Symptom	Possible Cause	Action
The NBP initial pressure too high.	The initial inflation pressure setting is incorrect.	Specify the correct initial inflation pressure. See the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i> .

### Temperature Measurement Problems

Symptom	Possible Cause	Action
Temperature measurements are not displayed.	The probe is disconnected from the monitor.	Ensure that the temperature probe is connected and seated in the probe well.
	The probe is misplaced.	Ensure that the probe is properly placed in the measurement site.
	The temperature is over range.	Ensure that the temperature measurements are in the range of 15° – 45°C (59°F – 113°F). See “Temperature Test” on page 2-26.
	The probe malfunctioned.	Replace the probe. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	Front end malfunction.	Replace the front end board. See “Removing the Front End Assembly” on page 4-20.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
Temperature measurements are unreliable.	The probe malfunctioned.	Replace the temperature probe. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The module is not calibrated.	Replace the main board. See “Replacing the Main Board” on page 4-27.
	The front end malfunctioned.	Replace the front end board. See “Removing the Front End Assembly” on page 4-20.



## SpO<sub>2</sub> Measurement Problems

Symptom	Possible Cause	Action
SpO <sub>2</sub> measurements are not displayed.	The SpO <sub>2</sub> module is in the learning phase.	Wait until the module finishes the learning phase.
	The SpO <sub>2</sub> sensor malfunctioned.	Replace the SpO <sub>2</sub> sensor.
	The SpO <sub>2</sub> board has a faulty connection to the front end board.	Ensure that all connectors to the front end board are seated correctly.
	The SpO <sub>2</sub> board malfunctioned.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO <sub>2</sub> Board” on page 4-22.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
SpO <sub>2</sub> measurements are unreliable.	External problem. For example, excessive patient movement, excessive ambient light, incorrect sensor placement, sensor is too loose or too tight.	Ensure that all external SpO <sub>2</sub> reading requirements are met. For more information about taking SpO <sub>2</sub> readings, see the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	Perfusion is low.	Reset the SpO <sub>2</sub> function. See “SpO <sub>2</sub> Test” on page 2-12.

## Sidestream etCO<sub>2</sub> Measurement Problems

Symptom	Possible Cause	Action
CO <sub>2</sub> measurements are not displayed.	The CO <sub>2</sub> module is initializing.	Wait until initialization is complete.
	The CO <sub>2</sub> sampling line is bent or twisted.	Ensure that the sampling line is straight.
	The CO <sub>2</sub> module malfunctioned.	Replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.

Symptom	Possible Cause	Action
CO <sub>2</sub> measurements are unreliable.	The CO <sub>2</sub> sampling line is bent or twisted.	Ensure that the sampling line is straight.
	The module is not zeroed.	Perform a zero. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	A problem external to the monitor occurred.	Ensure that all external CO <sub>2</sub> reading requirements are met. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The CO <sub>2</sub> board is not calibrated.	Calibrate the CO <sub>2</sub> board. See “Sidestream CO <sub>2</sub> Calibration Test” on page 2-13.

### Mainstream etCO<sub>2</sub> Measurement Problems

Symptom	Possible Cause	Action
CO <sub>2</sub> measurements are not displayed.	The CO <sub>2</sub> module is initializing.	Wait until initialization is complete.
	The CO <sub>2</sub> sensor malfunctioned.	Replace the CO <sub>2</sub> sensor.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
CO <sub>2</sub> measurements are unreliable.	The module is not zeroed.	Perform a zero. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	A problem external to the monitor occurred.	Ensure that all external CO <sub>2</sub> reading requirements are met. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The CO <sub>2</sub> sensor is not accurate.	Calibrate the CO <sub>2</sub> sensor. See “Mainstream CO <sub>2</sub> Accuracy Test” on page 2-20.

### ECG/Respiration Measurement Problems

Symptom	Possible Cause	Action
ECG measurements are not displayed.	The ECG leads are off.	Ensure that the leads are connected.
	The ECG cable is broken.	Ensure that the cable is in good working order.
	The ECG 3/5/10 wire is not configured correctly.	Correct the ECG configuration.

Symptom	Possible Cause	Action
ECG measurements are unreliable.	The ECG leads are off.	Ensure that the ECG leads are connected.
	A problem external to the monitor occurred.	Ensure that all external ECG reading requirements are met. Check lead placement. Ensure that the skin has been prepared properly. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	An external interference occurred.	Set the default AC power frequency. For more information, see the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i> .
Respiration measurements are not displayed.	The respiration leads are off.	Ensure that the respiration leads are connected.
Respiration measurements are unreliable.	External interference.	Ensure that all respiration reading requirements are met. Ensure that the correct ECG lead set is being used. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .

## IBP Problems

Symptom	Possible Cause	Action
IBP measurements are not displayed.	The transducer malfunctioned.	Replace the front end board. See “Removing the Front End Assembly” on page 4-20.
	The front end board malfunctioned.	Replace the front end board. See “Removing the Front End Assembly” on page 4-20.
	The main board malfunctioned.	Replace the main board. See “Removing the Front End Assembly” on page 4-20.

Symptom	Possible Cause	Action
IBP measurements are unreliable.	The transducer is not zeroed.	Refer to your facility's protocol regarding pressure monitoring setup and transducer placement. Perform a zero. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The transducer cannot be zeroed.	Ensure the correct steps for performing a zero (especially the position of the stopcocks) are followed. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> . Replace the transducer cable. Replace the transducer tubing setup. Replace the front end board. See "Removing the Front End Assembly" on page 4-20.
	The module is not calibrated.	Replace the front end board. See "Removing the Front End Assembly" on page 4-20.
	The front end board malfunctioned.	Replace the front end board. See "Removing the Front End Assembly" on page 4-20.
	The main board malfunctioned.	Replace the main board. See "Replacing the Main Board" on page 4-27.

### Cardiac Output Problems

Symptom	Possible Cause	Action
The C.O. measurements are not reliable.	The blood temperature is incorrect.	Verify the C.O. module is calibrated. See "Cardiac Output Test (C.O.)" on page 2-27. Verify the cable connections. Replace the cable. Consider whether the catheter should be replaced. Replace the front end assembly. See "Removing the Front End Assembly" on page 4-20.

Symptom	Possible Cause	Action
	The injectate temperature is incorrect.	Verify the correct injectate temperature is entered. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> . Replace the injectate temperature probe.
	The difference between the blood temperature and the injectate temperature is not wide enough.	Consider using iced injectate. See the <i>Efficia CM Series Patient Monitors Instructions for Use</i> .
	The wrong computation constant is being used.	Verify that you are using the correct computation constant for the catheter that you are using and the corresponding injectate volume and temperature. See the instructions for use supplied with the catheter.
The C.O. measurements cannot be performed.	The patient cable is not detected.	Replace C.O. cable. Replace the front end board. See "Removing the Front End Assembly" on page 4-20.

## Navigation Wheel, Touch Screen, and Key Problems

Symptom	Possible Cause	Action
The monitor does not respond to the navigation wheel or front panel keys.	The main board has a faulty connection.	Ensure that all connectors to the main board are seated correctly.
	The front panel keypad or navigation wheel is broken.	Replace the front panel assembly or navigation wheel.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.
	The membrane switch assembly malfunctioned.	Replace the front panel assembly. See “Replacing the Front Panel Assembly” on page 4-30.
Pressing a key does not access the expected function.	The membrane switch assembly malfunctioned.	Replace the front panel assembly. See “Replacing the Front Panel Assembly” on page 4-30.
A key is collapsed, or doesn't click when pressed.	The membrane switch assembly malfunctioned.	Replace the front panel assembly. See “Replacing the Front Panel Assembly” on page 4-30.
The monitor does not respond to the touch screen.	The touch screen is locked.	On the <b>System Menu</b> , select the <b>Unlock Touch Screen</b> button. See “Accessing the Admin Functions” on page 2-6.
	The touch screen is not calibrated.	Calibrate the touch screen. See “Calibrating the Touchscreen” on page 3-38.
	The touch screen malfunctioned.	Replace the touchscreen, which is part of the front panel assembly. See “Replacing the Front Panel Assembly” on page 4-30.

## Recorder Problems

Symptom	Possible Cause	Action
The recorder paper is jamming.	The paper is not installed correctly.	Remove paper and reinstall correctly.
	The wrong type of paper is installed.	Use only the recommend recorder paper.
	The recorder has a mechanical problem.	Replace the recorder module. See “Replacing the Recorder” on page 4-8.
The recorder does not print.	The recorder is out of paper.	Install a new roll of paper.
	The recorder door is open.	Open the recorder door, and then close it again.
	Incorrect battery installed.	Verify that the correct battery is installed.
	The following message is displayed: <b>Unsupported Battery Config</b> The optional recorder is disabled when one or two 3-cell batteries are installed in the Efficia CM monitor.  <hr/> <b>Note</b> — <i>The Unsupported Battery Config message will not be triggered if a 9-cell battery is installed.</i> <hr/>	Install an additional battery, if only a single battery is installed. Recondition or replace depleted batteries. See “Reconditioning the Battery” on page 2-5. See “Battery Replacement” on page 2-6.
	The system does not recognize the recorder.	Check the recorder’s physical connections. See “Replacing the Recorder” on page 4-8.
	The recorder module malfunctioned.	Replace the recorder module. See “Replacing the Recorder” on page 4-8.
	The main board malfunctioned.	Replace the main board. See “Replacing the Main Board” on page 4-27.

## Nurse Call Problems

Symptom	Possible Cause	Action
The nurse call function does not signal alarm conditions.	<b>Minimum Nurse Call Alarm Priority</b> is set too high.	Specify an appropriate <b>Minimum Nurse Call Alarm Priority</b> for your facility. For more information, see the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i> .
	The configuration setting is incorrect for what is expected.	Configure the setting per your facility's protocols. See the <i>Efficia CM Series Patient Monitors Installation and Configuration Guide</i> .
	The phono connector is loose or broken.	Check the physical connection to the nurse call connector.
	The communications board malfunctioned.	Replace the Communications (I/O) Board. See "Removing the Communications (I/O) Board" on page 4-15.
	The main board malfunctioned.	Replace the main board. See "Replacing the Main Board" on page 4-27.

## Security Problems

Symptom	Possible Cause	Action
The default System Administrator password, <b>215</b> , does not open the password-protected menus and the following message is displayed: <b>Incorrect password. Please try again.</b>	The default password was changed.	Contact your system administrator to obtain the specific password for your institution.  If the password is unknown, contact the Philips Customer Care Center or your service provider.

## Full Disclosure SD Card Problems

Symptom	Possible Cause	Action
<b>SD Card Corrupt</b> message is displayed.	Data in SD card has been corrupted.	Format the SD card. See "Formatting the SD Card" on page 3-45.
	Defective SD card.	Replace SD card.
No full disclosure data is displayed.	If full disclosure option is present, it is not configured.	Ensure that the Full Disclosure option has been purchased and configured.
	The SD card is not installed.	Install SD card.



## Error Codes

When the monitor detects an error condition (depending on the type of error), an error message appears on the screen or an error code is written to the Error Log. An error code is an indication that the monitor detected an error in operation and service may be required. An error code is a hexadecimal number that indicates the nature of the error.

If an error occurs during monitoring, an audible alarm also sounds. Press the **Alarm Silence** key to end the audible alarm.

The following table lists the error codes that correspond to monitor malfunctions and actions to take when the error occurs. These errors are written to the Error Log. To view or export the Error Log, see “Managing Logs” on page 3-42.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
257 (1 or 2)	<b>System Error</b>	Battery charger power failure.	Replace the battery. See “Replacing the Battery” on page 4-5. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27. If the problem persists, replace the AC power module. See “Removing the Power Supply Module” on page 4-17.
261 (1 or 2)	<b>System Error</b>	Battery is overcharged.	Run the monitor without AC power. If the problem persists, replace the battery. See “Replacing the Battery” on page 4-5. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
264 (1 or 2) <i>temp value</i>	<b>System Error</b>	Battery is over temperature.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
401	<b>System Error</b>	Main board EEPROM not read.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
402	<b>System Error</b>	Write to Main board EEPROM failed.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
403	<b>System Error</b>	Main board EEPROM checksum error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
404	<b>System Error</b>	Front end board EEPROM not read.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the front end board. See “Removing the Front End Assembly” on page 4-20.
405	<b>System Error</b>	Write to Front end board EEPROM failed.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the front end board. See “Removing the Front End Assembly” on page 4-20.
406	<b>System Error</b>	Front end board EEPROM checksum error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the front end board. See “Removing the Front End Assembly” on page 4-20.
769 (1)	<b>ECG Equip Malfunc (1)</b>	ECG hardware internal calibration – gain error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
769 (2)	<b>ECG Equip Malfunc (2)</b>	ECG hardware did not initialize.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
769 (3)	<b>ECG Equip Malfunc (3)</b>	ECG hardware initialization timed out.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
769 (4)	<b>ECG Equip Malfunc (4)</b>	ECG is not functioning because of no data feedback.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board.
770	<b>FPGA FIFO Overrun</b>	ECG software error.	Informational message. No action required.
771	<b>ECG Error. The front end will now reset itself.</b>	No data from ECG.	Allow the monitor to reset. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
785 (1)	<b>IBPx Equip Malfunc (1)</b>	IBP A/D did not configure correctly during power-up.	Replace the front end board. See “Removing the Front End Assembly” on page 4-20.
785 (3)	<b>(IBP label) Equip Malfunc - (3)</b>	No data from IBP.	Replace the front end assembly. See “Removing the Front End Assembly” on page 4-20. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
786	<b>FPGA FIFO Overrun</b>	IBP software error.	Informational message. No action required.
787	<b>IBP Error. The front end will now reset itself.</b>	No data from IBP.	Allow the monitor to reset. If the problem persists, replace the front end board. See “Removing the Front End Assembly” on page 4-20. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
801	<b>Tx FIFO Overrun</b>	Temperature software error.	Informational message. No action required.
802	<b>Tx Error. The front end will now reset itself.</b>	No data from the continuous temperature components.	Allow the monitor to reset. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
803 (1)	<b>Tx Equip Malfunc (1)</b>	Temperature component malfunction.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
817	<b>FPGA FIFO Overrun</b>	NBP software error.	Informational message. No action required.
818 (101)	<b>NBP Equip Malfunc (101)</b>	Task overrun.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
818 (102)	<b>NBP Equip Malfunc (102)</b>	Interrupt stack overwritten.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (103)	<b>NBP Equip Malfunc (103)</b>	User stack overwritten.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (104)	<b>NBP Equip Malfunc (104)</b>	Data validity check failed.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (106)	<b>NBP Equip Malfunc (106)</b>	Unable to write init flag data to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (107)	<b>NBP Equip Malfunc (107)</b>	Unable to verify init flag data written to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
818 (109)	<b>NBP Equip Malfunc (109)</b>	Unable to write NBP configuration data to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (110)	<b>NBP Equip Malfunc (110)</b>	Unable to write NBP configuration data to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (111)	<b>NBP Equip Malfunc (111)</b>	Calibration data checksum error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (112)	<b>NBP Equip Malfunc (112)</b>	Unable to write calibration data to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (113)	<b>NBP Equip Malfunc (113)</b>	Unable to verify calibration data written to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (114)	<b>NBP Equip Malfunc (114)+</b>	Error log checksum error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (115)	<b>NBP Equip Malfunc (115)</b>	Unable to write error log to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
818 (116)	<b>NBP Equip Malfunc (116)</b>	Unable to verify error log data written to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (117)	<b>NBP Equip Malfunc (117)</b>	Inflation cycle count and runtime data checksum error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (118)	<b>NBP Equip Malfunc (118)</b>	Unable to write inflation cycle count and runtime data to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (119)	<b>NBP Equip Malfunc (119)</b>	Unable to verify inflation cycle count and runtime data written to non-volatile memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (120)	<b>NBP Equip Malfunc (120)</b>	A new message will be sent to the host although the previous message is not finished.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (121)	<b>NBP Equip Malfunc (121)</b>	Pressure value from second pressure sensor not available.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (122)	<b>NBP Equip Malfunc (122)</b>	The 5-volt supply voltage value is too high or low.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
818 (123)	<b>NBP Equip Malfunc (123)</b>	Error from the 5-volt regulator.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (124)	<b>NBP Equip Malfunc (124)</b>	The 12-volt supply voltage value is too high or low.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (128)	<b>NBP Equip Malfunc (128)</b>	Offset of pressure sensor 1 is out of range.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (129)	<b>NBP Equip Malfunc (129)</b>	Offset of pressure sensor 2 is out of range.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (130)	<b>NBP Equip Malfunc (130)</b>	Response of pressure sensor 2 to test signal is out of range.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (131)	<b>NBP Equip Malfunc (131)</b>	The difference between the two pressure channels is too large.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (132)	<b>NBP Equip Malfunc (132)</b>	One of the two valves was activated for too long.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
818 (133)	<b>NBP Equip Malfunc (133)</b>	CRC mismatch in calibration data.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (134)	<b>NBP Equip Malfunc (134)</b>	CRC mismatch in error log data.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (135)	<b>NBP Equip Malfunc (135)</b>	CRC mismatch in inflation cycle count and runtime data.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (136)	<b>NBP Equip Malfunc (136)</b>	The pneumatic safety switch malfunctioned.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (137)	<b>NBP Equip Malfunc (137)</b>	Valve 2 is defective or blocked.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
818 (141)	<b>NBP Equip Malfunc (141)</b>	Inflation time for selected patient type exceeded.	Verify that the appropriate cuff size is being used for the selected patient type.  If the problem persists, shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.
818 (199)	<b>NBP Equip Malfunc (199)</b>	No data from NBP module.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18.
819 (127)	<b>NBP Equip Malfunc (127)</b>	NBP module is not calibrated.	Contact the Customer Care Center.



<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
820 (138)	<b>NBP Hose Blocked (138)</b>	Problem in pneumatic system.	Verify that all internal NBP hoses are connected.  If the problem persists, shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the NBP Module” on page 4-18
821 (139)	<b>NBP Air Leak (139)</b>	Air leak or valve defect.	Verify that all internal NBP hoses are connected.  If the problem persists, shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the NBP module. See “Removing the Philips SpO2 Board” on page 4-22.
833 (1)	<b>SpO2 Equip Malfunc (1)</b>	Philips SpO <sub>2</sub> ROM checksum error.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (2)	<b>SpO2 Equip Malfunc (2)</b>	Philips SpO <sub>2</sub> RAM test error.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (4)	<b>SpO2 Equip Malfunc (4)</b>	Philips SpO <sub>2</sub> analog signal path self test failed.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (6)	<b>SpO2 Equip Malfunc (6)</b>	Philips SpO <sub>2</sub> self test timeout.	Reseat the SpO <sub>2</sub> board.  If the problem persists, replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (8)	<b>SpO2 Equip Malfunc (8)</b>	Philips SpO <sub>2</sub> internal DSP communication error.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (10)	<b>SpO2 Equip Malfunc (10)</b>	Philips SpO <sub>2</sub> host communication error.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
833 (20)	<b>SpO2 Equip Malfunc (20)</b>	Philips SpO <sub>2</sub> hardware defect.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
833 (40)	<b>SpO2 Equip Malfunc (40)</b>	Philips SpO <sub>2</sub> non-volatile memory corrupted.	Replace the SpO <sub>2</sub> board. See “Removing the Philips SpO2 Board” on page 4-22.
833 (100)	<b>SpO2 Equip Malfunc (100)</b>	Masimo SpO <sub>2</sub> board is not enabled.	Contact the Philips Customer Care Center.
833 (101)	<b>SpO2 Equip Malfunc (101)</b>	Masimo SpO <sub>2</sub> DSP Raw Queue Overrun	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (102)	<b>SpO2 Equip Malfunc (102)</b>	Masimo SpO <sub>2</sub> DSP hardware failure.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (103)	<b>SpO2 Equip Malfunc (103)</b>	Masimo SpO <sub>2</sub> MCU failure.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (104)	<b>SpO2 Equip Malfunc (104)</b>	Masimo SpO <sub>2</sub> watchdog failure.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (105)	<b>SpO2 Equip Malfunc (105)</b>	Masimo SpO <sub>2</sub> invalid board type.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (106)	<b>SpO2 Equip Malfunc (106)</b>	Masimo SpO <sub>2</sub> invalid master control state.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (107)	<b>SpO2 Equip Malfunc (107)</b>	Masimo SpO <sub>2</sub> SRAM transfer failure.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (108)	<b>SpO2 Equip Malfunc (108)</b>	Masimo SpO <sub>2</sub> SRAM task queue overrun.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (109)	<b>SpO2 Equip Malfunc (109)</b>	Masimo SpO <sub>2</sub> database failure.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (110)	<b>SpO2 Equip Malfunc (110)</b>	Masimo SpO <sub>2</sub> invalid flash memory device.	Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.
833 (111)	<b>SpO2 Equip Malfunc (111)</b>	Cannot configure Masimo SpO <sub>2</sub> .	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  Replace the SpO <sub>2</sub> board. Contact the Philips Customer Care Center.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
834	<b>SpO2 Sensor Malfunc</b>	Malfunction of the SpO <sub>2</sub> sensor or sensor cable.	<p>Check the SpO<sub>2</sub> sensor and extension cable.</p> <p>If the problem persists, check the cable between the front end board and SpO<sub>2</sub> board. Reseat it if necessary.</p> <p>If the problem persists, replace the SpO<sub>2</sub> board. For Philips SpO<sub>2</sub> boards, see “Removing the Philips SpO2 Board” on page 4-22. For Masimo SpO<sub>2</sub> boards, contact the Philips Customer Care Center.</p> <p>If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.</p>
835	<b>FPGA FIFO Overrun</b>	SpO <sub>2</sub> software error.	Informational message. No action required.
836	<b>SpO2 Communication Error</b>	SpO <sub>2</sub> communication error.	<p>Informational message. No action required.</p> <p>If the message continues, replace the SpO<sub>2</sub> board. For Philips SpO<sub>2</sub> boards, see “Removing the Philips SpO2 Board” on page 4-22. For Masimo SpO<sub>2</sub> boards, contact the Philips Customer Care Center.</p>
837	<b>SpO2 Error. The front end will now reset itself.</b>	No data from SpO <sub>2</sub> .	<p>Allow the monitor to reset. Replace the SpO<sub>2</sub> board. For Philips SpO<sub>2</sub> boards, see “Removing the Philips SpO2 Board” on page 4-22. For Masimo SpO<sub>2</sub> boards, contact the Philips Customer Care Center.</p> <p>If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.</p>
838 (100)	<b>SpHb Equip Malfunc</b>	SpHb not enabled.	Return the monitor to Philips. Contact the Philips Customer Care Center.
839 (100)	<b>RRa Equip Malfunc</b>	RRa not enabled.	Return the monitor to Philips. Contact the Philips Customer Care Center.
849	<b>FPGA FIFO Overrun</b>	CO <sub>2</sub> software error.	Informational message. No action required.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
850	<b>CO2 Error. The front end will now reset itself.</b>	No data from Sidestream CO <sub>2</sub> .	Allow the monitor to reset. If the problem persists, replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18. If the problem persists, replace the front end assembly. See “Removing the Front End Assembly” on page 4-20. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
851 (1)	<b>CO2 Equip Malfunc (1)</b>	Sidestream CO <sub>2</sub> calibration error.	Recalibrate the CO <sub>2</sub> module. See “Sidestream CO <sub>2</sub> Gas Measurement Calibration Check” on page 2-14.
851 (2)	<b>CO2 Equip Malfunc (2)</b>	Sidestream CO <sub>2</sub> sampling line malfunction.	Check flow in sampling line.
851 (3)	<b>CO2 Equip Malfunc (3)</b>	Occlusion in Sidestream CO <sub>2</sub> input line.	Check flow in input line.
851 (16)	<b>CO2 Equip Malfunc (16)</b>	Sidestream CO <sub>2</sub> main board error.	Replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18.
851 (17)	<b>CO2 Equip Malfunc (17)</b>	Sidestream CO <sub>2</sub> module malfunction.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18.
851 (18)	<b>CO2 Equip Malfunc (18)</b>	Sidestream CO <sub>2</sub> scrubber, pump error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18.
851 (19)	<b>CO2 Equip Malfunc (19)</b>	Sidestream CO <sub>2</sub> sensor malfunction.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
851 (20)	<b>CO2 Equip Malfunc (20)</b>	Sidestream CO <sub>2</sub> 15V voltage out of range.	Replace the CO <sub>2</sub> module. See “Replacing the Sidestream CO <sub>2</sub> Module” on page 4-18. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
852	<b>CO2 Sensor Malfunc</b>	MainstreamCO <sub>2</sub> : Source current failure, EEPROM checksum failure, or hardware error	Verify that the sensor is connected properly. Reseat or reinsert the sensor if necessary. If the problem persists, contact the Philips Customer Care Center.
853	<b>CO2 Sensor Over Temp</b>	The MainstreamCO <sub>2</sub> sensor temperature is greater than 40°C.	Verify that the sensor is not exposed to extreme heat. If the problem persists, contact the Philips Customer Care Center.
865	<b>Temp FIFO Overrun</b>	Temperature software error.	Informational message. No action required.
881	<b>Speaker Malfunc (881)</b>	The speaker failed.	To clear the message, perform the speaker test or clear the error log. See “Testing the Speaker” on page 3-39 or “Clearing Patient Data” on page 3-44. If the problem persists, replace the speaker. See “Replacing a Speaker” on page 4-13.
882	<b>Wireless Malfunc</b>	The wireless module malfunctioned.	Replace the wireless module.
883	<b>System Error</b>	Internal power management error state.	Allow the monitor to reset. If the problem persists, upgrade the software. See the <i>Efficia CM Series Service Guide</i> .
884	<b>SD Card Corrupted</b>	SD card is corrupted.	Informational message. No action required.
885	<b>Data on SD Card Erased</b>	The SD card was taken from a different monitor and was not formatted.	Informational message. No action required.
886	<b>Data on SD Card Erased</b>	The data on the SD card was corrupted and the data is lost.	Informational message. No action required.
887	<b>Running Backup Image System Error (887)</b>	The backup image was use to start up the monitor because the latest software image could not be used.	Upgrade the software. See the <i>Efficia CM Series Service Guide</i> .

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
888	<b>System could not load font files. Please upgrade software.</b> <b>System Error (888)</b>	The monitor could not load the font files.	Upgrade the software. See the <i>Efficia CM Series Service Guide</i> .
889	<b>System Error (889)</b>	The file system on the flash memory is corrupted.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, upgrade the software. See the <i>Efficia CM Series Service Guide</i> .
900	<b>C.O. FIFO Overrun</b>	Cardiac output FIFO overrun	Informational message. No action required.
920	<b>FGPA FIFO Overrun</b>	Recorder received FIFO overrun.	Informational message. No action required.
921	<b>FGPA FIFO Overrun</b>	Recorder transmitted FIFO overrun.	Informational message. No action required.
1025	<b>System Error (1025)</b>	Could not load ResourceDLL.dll.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1026	<b>System Error (1026)</b>	Could not load data from flash.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1027	<b>System Error (1027)</b>	Could not start the front end.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1028	<b>System Error (1028)</b>	Could not stop the front end.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor.  If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
1029	<b>System Error (1029)</b>	Could not allocate enough memory.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “If the problem persists, replace the front end assembly. See “Removing the Front End Assembly” on page 4-20.
1030	<b>System Error (1030)</b>	An error occurred when the system shut down front end devices.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27. If the problem persists, replace the front end assembly. See “Removing the Front End Assembly” on page 4-20.
1031	<b>System Error (1031)</b>	The monitoring and watchdog thread could not initialize.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “If the problem persists, replace the front end assembly. See “Removing the Front End Assembly” on page 4-20.
1032	<b>System Error (1032)</b>	Could not open audio files.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1033	<b>System Error (1033)</b>	Unspecified error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1035	<b>System Error (1035)</b>	Cannot initialize the front-end manager.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.

<b>Code</b>	<b>Description</b>	<b>Possible Cause</b>	<b>Action</b>
1036	<b>System Error (1036)</b>	Failed to start work thread.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1037	<b>System Error (1037)</b>	Cannot start polling thread.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1043	<b>System Error</b>	Work thread timed out.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1044	<b>System Error</b>	Front end software error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1045	<b>System Error</b>	Printing software error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1047	<b>System Error</b>	Monitoring software error.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1048	<b>System Error</b>	An exception was detected in the alarming software.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.



Code	Description	Possible Cause	Action
1050	<b>System Error</b>	Failed to stop work thread.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1051	<b>System Error (1051)</b>	Cannot initialize NBP.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, replace the main board. See “Replacing the Main Board” on page 4-27.
1053	<b>System Error</b>	Loss of monitoring.	Informational message. No action required.
1054	<b>System Error</b>	An internal error occurred during system state transition.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, upgrade the software. See the <i>Efficia CM Series Service Guide</i> .
1055	<b>System Error</b>	System did not initialize the LCD display.	Shut down (see “Shutting Down the Monitor” on page 4-1) and restart the monitor. If the problem persists, upgrade the software. See the <i>Efficia CM Series Service Guide</i> .

---

## Running System Diagnostics

If you cannot identify a problem by using the troubleshooting tables beginning on page 3-4 or the Error Codes table on page 3-18, run the diagnostic tests available in the **Diagnostics Menu**.

---

**Note** — Accessing the **Maintenance** options requires a password that is different from the Admin Password. Only trained biomedical engineers or support persons should access the **Maintenance** options and perform maintenance and repair.

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## Running the Self Test

Running the **Self Test** performs the resident self test, which includes a complete memory test and a front end test on all available modules, such as SpO<sub>2</sub> or NBP. If the test cannot detect a specific module or if an error occurs, then that test fails.

---

**Note** — *When the monitor is powered up from Standby mode, the monitor performs the front end tests in addition to the start-up sequence. When the monitor is powered up from Deep Sleep mode, the monitor performs the complete memory test and front end tests.*

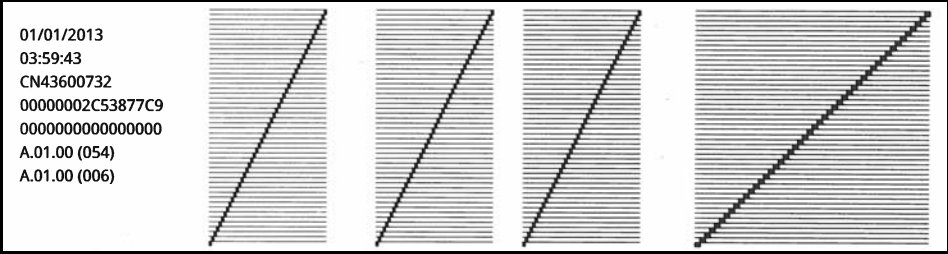
---

To run the self test:

Step	
1	In the <b>Diagnostics Menu</b> , select the <b>Self Test</b> button. The following messages are displayed as the <b>Result</b> for each <b>Test Item</b> : <ul style="list-style-type: none"> <li>• <b>Passed</b> — the module is installed, passed the self test, and is operating correctly.</li> <li>• <b>In Progress</b> — the test is running.</li> <li>• <b>Not Supported</b> — the module is not installed or configured.</li> <li>• <b>Failed</b> (in red text) — the test was not successful.</li> </ul>
2	When all tests are complete, close the menu. Detected errors are written to the error log with detailed error information and error codes.

## Testing the Recorder

To test the optional recorder:

Step	
1	In the <b>Diagnostics Menu</b> , select the <b>Recorder Test</b> button.
2	<p>Select <b>Print Test Strip</b>.</p> <p>The recorder prints a test pattern as shown below.</p> 
3	Compare the pattern to verify that the recorder is functioning properly.

## Testing the Navigation Wheel and Keys

The **Keys/Rotary Wheel Test** tests the functions of the navigation (rotary) wheel and the keys on the front panel. If you do not get the expected results, see “Display Problems” on page 3-6.

To run the keys/rotary wheel test:

Step	
1	<p>In the <b>Diagnostics Menu</b>, select the <b>Keys Test</b> button.</p> <p>The <b>Keys/Rotary Wheel Test Menu</b> appears. The wheel and each fixed key on the monitor (except <b>On/Standby</b>) is represented by an icon in the menu.</p>
2	<p>Press a fixed key on the front of the monitor to test it.</p> <p>If the key is working properly, the corresponding icon in the test window is surrounded by a white frame for five seconds.</p> <p>Repeat for each key on the front of the monitor.</p>
3	<p>To test the navigation wheel, turn the wheel clockwise or counterclockwise.</p> <p>If the wheel is working properly, the wheel icon on the screen draws red dots in the direction that you turn the wheel.</p>
4	To end the test, press the wheel.

## Testing the Display

To test the display:


Step		
1	<p>In the <b>Diagnostics Menu</b>, select the <b>Display Test</b> button to start the test. The display test draws a sequence of patterns on the monitor screen. Each pattern displays for five seconds. When the last pattern is drawn, the sequence starts again from the first pattern. The following describes the test patterns displayed:</p>	
	Pattern	Description of Screen
	Vertical bars	Alternating black and white vertical bars, starting with white. This description is displayed in red text across the top of the screen.
	Vertical bars (inverse)	Alternating black and white vertical bars, starting with black. This description is displayed in red text across the top of the screen.
	Solid white	The screen background is white. <b>White</b> is displayed in black text that moves across the screen.
	Solid red	The screen background is red. <b>Red</b> is displayed in black text that moves across the screen.
	Solid Green	The screen background is green. <b>Green</b> is displayed in black text that moves across the screen.
	Solid blue	The screen background is blue. <b>Blue</b> is displayed in black text that moves across the screen.
	Buttons	A dialog box with blank buttons is displayed.
	Test pattern	A centered square containing a test pattern is displayed.
2	To exit the test, touch the wheel.	

## Calibrating the Touchscreen

When you replace the LCD or the touchscreen is unresponsive, you must calibrate the touch screen after reassembly.

To calibrate the touch screen:

**Caution** Use your finger to perform the test. Do not use a sharp object that could scratch the screen.

Step	
1	Open the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Select the <b>Touch Calibration</b> button. <b>Note</b> — <i>You cannot exit the test until it is completed.</i> The calibration screen appears.
3	<hr/> <p><b>Caution</b>  <b>Touch and release each target and wait for the target to move to the next position before touching it. Be careful not to touch any target more than once, because it may adversely effect the calibration.</b></p> <hr/> <p>Touch and release the center of the target cross hair  that appears.                      The target moves to the next position, which is the top right corner.</p>
4	Repeat step 3 for the remaining target cross hairs. The target moves clockwise to each corner and then to the center. After the center target is touched and released, a confirmation window appears.
5	Select <b>OK</b> . <hr/> <p><b>Caution</b>  <b>If the confirmation screen does not appear within a few seconds after the center calibration target disappears, you must restart the monitor and recalibrate the touchscreen.</b></p> <hr/> <p>The monitors restarts.</p>

---

## Testing the Speaker

The audio test plays a sample sound three times. If the monitor has two speakers, the right speaker is tested first, followed by the left speaker.

---

**Note** — *The CM10 and CM12 models have one speaker. The CM100, CM120, and CM150 have two speakers.*

---

To test the speaker or speakers:

Step	
1	In the <b>Diagnostics</b> menu, select the <b>Audio Test</b> button to start the test. A window appears confirming that the monitor is entering the audio test and displays the text: <b>Listen for three short tones. If your monitor has two speakers, the three tones will repeat.</b>
2	Verify that three short tones sound for each speaker. When the test completes, the window closes.

## Testing the LEDs

To test the battery and alarm LEDs:

Step	
1	In the <b>Diagnostics</b> menu, select the <b>LED Test</b> button to start the test.
2	<p>Verify the following LED behavior during the test.</p> <p>If the Charging LED is functioning correctly, the following sequence occurs:</p> <ul style="list-style-type: none"> <li>– Lights in yellow for five seconds</li> <li>– Flashes in yellow for five seconds</li> <li>– Lights in green for five seconds</li> <li>– Flashes in green for five seconds</li> </ul> <p>If the Alarm LED is functioning correctly, the following sequence occurs:</p> <ul style="list-style-type: none"> <li>– Lights in blue for five seconds</li> <li>– Flashes in blue for five seconds</li> <li>– Lights in yellow for five seconds</li> <li>– Flashes in yellow for five seconds</li> <li>– Lights in red for five seconds</li> <li>– Flashes in red for five seconds</li> </ul> <p>The AC Power LED remains green during the test.</p> <p>When the test completes, the window closes.</p>
3	If you do not get the expected results, see “Power Problems” on page 3-5.

## Managing Component Usage Parameters

The monitor tracks the usage of some components and displays them on the **Diagnostics Menu**. This information can help to diagnose monitor problems.

The monitor tracks the following parameters:

Parameter	Description
<b>NBP Cycle Count</b>	The number of NBP measurements taken by the monitor.
<b>LCD Usage Hours</b>	The number of hours that the LCD screen has been on.

---

**Note** — CO<sub>2</sub> usage information is displayed in the **CO2 Test** menu, accessed through the **Diagnostics Menu**. See Chapter 2, “Performance Verification Testing.”

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## Resetting Component Usage Parameters

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**Caution**      **Always reset a component usage parameter after replacing the associated part.**

---

To reset the parameter:

Step	
1	Open the <b>Maintenance</b> options of the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8. When <b>Maintenance</b> options are available, a <b>Reset</b> button appears next to each parameter.
2	Select the <b>Reset</b> button to the right of the parameter to reset. A confirmation window appears before the parameter is cleared.
3	In the confirmation window, select <b>OK</b> to reset the parameter to <b>0</b> .
4	Repeat step 2 and step 3 to reset another parameter.
5	Close the menu.



## Managing Logs

The monitor collects data in the logs described in the following table.

**Caution**      **To avoid loss of data, export the log contents before the log becomes full.**

Log	Description
User Activity Log	<p>The following events are logged:</p> <ul style="list-style-type: none"> <li>• Setting changes (except diagnostics)</li> <li>• User actions in menus (except diagnostics)</li> <li>• Night Mode entry or exit</li> <li>• Waveform Freeze</li> <li>• Recording events</li> <li>• C.O. measurement</li> <li>• IBP and CO<sub>2</sub> Zero</li> </ul> <p>The log contains up to 3000 entries. The oldest entry is deleted when full capacity is reached.</p> <p>The exported log is named: <i>UserActivity.csv</i>.</p>
Alarm Log	<p>The following events are logged:</p> <ul style="list-style-type: none"> <li>• All high, medium, low priority patient physiological alarms, occurred and released</li> <li>• All high, medium, low priority technical alarms, occurred and released</li> <li>• Alarm Silence/Audio Pause/Audio Off</li> <li>• Alarm Silence from Central</li> </ul> <p><b>Note</b> — <i>When the monitor is in Demo mode, events are indicated by [Demo] at the end of the entry.</i></p> <p>The log contains up to 3000 entries. The oldest entry is deleted when full capacity is reached.</p> <p>The exported log is named <i>AlarmActivity.csv</i>.</p> <hr/> <p><b>Warning</b></p> <p><b><i>The alarm logs are retrievable after a controlled shutdown. Manually performing the shutdown procedure or allowing the battery to completely discharge are considered controlled shutdowns. However, the loss of AC power without battery backup will result in the loss of the alarm logs.</i></b></p> <hr/>

Log	Description
Network Log	<p>The following events are logged:</p> <ul style="list-style-type: none"> <li>• LAN cable connect and disconnect</li> <li>• WLAN connect and disconnect</li> <li>• Central connect and disconnect</li> <li>• Dashboard connect and disconnect</li> <li>• EMR server connect and disconnect</li> <li>• SNTP server connect and disconnect</li> </ul> <p>The log contains up to 500 entries. The oldest entry is deleted when full capacity is reached.</p> <p>The exported log is named <i>NetworkActivity.csv</i>.</p> <p>For detailed information about errors and error codes, see “Error Codes” on page 3-18.</p>
Error Log	<p>The following events are logged:</p> <ul style="list-style-type: none"> <li>• All hardware malfunctions</li> <li>• Watch dog resetting</li> <li>• Loss of monitoring</li> </ul> <p>The log contains up to 500 entries. The oldest entry is deleted when full capacity is reached.</p> <p>The exported log is named <i>Error.csv</i>.</p>

The log entries include a timestamp that indicates when the error occurred. You can view, export, or delete the logs.

Monitor, rack and plug-in module HW Error Logs are automatically stored in internal memory. A summary report can be downloaded to a USB flash drive.

To view the logs:

Step	
1	Access the <b>Admin tab</b> . See “Accessing the Admin Functions” on page 3-5.
2	Select the <b>View Logs</b> button. The <b>View Log Menu</b> appears.
3	Select the tab for the log you want to view.
4	To view the entire list of errors, select and drag the scrollbar.
5	Close the menu.

To export the logs to a USB flash drive:

1	Insert a compatible USB flash drive into any USB port on the monitor.
2	Access the <b>Admin tab</b> . See “Accessing the Admin Functions” on page 3-5.

3	Select the <b>View Logs</b> button. The <b>View Log Menu</b> appears.
4	Select the <b>Manage Logs</b> tab.
5	Select the <b>Save All</b> button. All logs are saved to the USB flash drive as a tar file named: <i>SN_logs.tar</i> , where <i>SN</i> is the serial number of the monitor.
6	Close the menu.

To delete the logs:Clearing Patient Data

1	Access the <b>Admin tab</b> . See “Accessing the Admin Functions” on page 3-5.
2	Select the <b>View Logs</b> button. The <b>View Log Menu</b> appears.
3	Select the <b>Manage Logs</b> tab.
4	Select the <b>Clear All</b> button. All logs are deleted from the monitor.
5	Close the menu.

---

## Clearing Patient Data

If you return a monitor for service, you must first clear the patient data.

Patient data and a summary are automatically stored in internal memory. A summary report can be downloaded to a USB flash drive.

The **Clear Data** function resets the user settings to the factory defaults and clears the following:

- All patient data
- All profiles and profile settings
- All logs
- All cloneable settings, except the AC line frequency
- Monitor name

The following settings are not cleared:

- Monitor serial number
- Key code
- LAN/WLAN MAC Address
- Touchscreen, temperature, IBP, and C.O. calibration data
- Language
- NBP cycle count

- LCD usage time
- Time zone
- AC line frequency
- RTC calibration data
- Country code
- Main board version, ID, and serial number
- Front end board version, ID, and serial number
- Usage and calibration data saved in the internal memory of each measurement module

To clear all patient data:

Step	
1	Open the <b>Maintenance</b> options of the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Select the <b>Clear Data</b> button. A confirmation window appears.
3	Select the <b>OK</b> button. The monitor clears the data and then restarts.

---

## Formatting the SD Card

If the Full Disclosure option is configured on the monitor, all Full Disclosure waveforms are saved to an SD card. If a new or replacement SD card is used it must be formatted. If the SD card becomes corrupted, it can be corrected by formatting it. Formatting the SD card clears all of the Full Disclosure data stored on the card.

To format the SD card:

Step	
1	Open the <b>Maintenance</b> options of the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Select the <b>SD Card</b> button. The <b>SD Card</b> menu appears and displays the <b>SD Card Information</b> , including the card capacity and the used and available memory values.
3	Select the <b>Format SD Card</b> button. The monitor restarts and the SD card is reformatted. After the SD card is reformatted, the monitors restarts and opens to the Main screen.



# Repairing the Monitor

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## Shutting Down the Monitor

Perform a hard shutdown whenever you need to power down the monitor for maintenance or repair. A hard shutdown ensures that all patient and system data is saved in memory.

To initiate a hard shutdown on the monitor:

Step	
1	Do one of the following: <ul style="list-style-type: none"> <li>• Press and hold the <b>On/Standby</b> key for at least 7 seconds.</li> <li>• Select the <b>System</b> button, and in the <b>System Menu</b>, on the <b>General</b> tab, select the <b>Shut Down</b> button.</li> </ul>
2	In the window that appears, select <b>OK</b> . The monitor shuts down after saving the data.

---

## Disassembling the Monitor

This chapter contains the procedures for disassembling the monitor to replace defective assemblies or components.

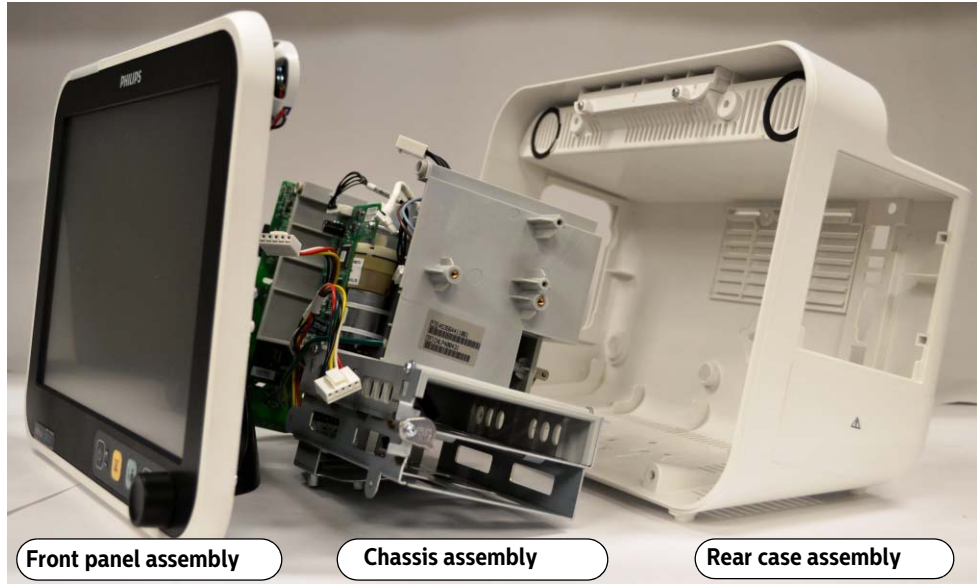
The monitor has three main assemblies:

- Rear case
- Chassis
- Front panel

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**Note** — *The Efficia CM120 monitor is shown below. Your monitor may be slightly different.*

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For more information about replaceable parts, see Chapter 5, “Replacement Parts and Assembly Drawings.”

---

**Warning**

***Before you open or disassemble the monitor, disconnect the AC power from the monitor and remove the battery.***

***After any monitor repair, you must perform the recommended Performance and Safety tests before you put the monitor into operation. Failure to perform these tests can result in erroneous monitor readings. For more information about performing safety and performance tests, see Chapter 2, “Performance Verification Testing.”***

***If a repair or upgrade changes the functionality of the monitor, Philips recommends that your facility establishes a protocol to train users about any changes before the upgraded monitor is put back into service.***

---

**Caution**

**Repairs should be made by qualified service personnel only.**

**Repairs should be made only with the recommended parts. Use of incorrect parts can cause damage to the monitor or incorrect measurements.**

**Observe ESD (electrostatic discharge) precautions when disassembling the monitor, working inside the monitor, and reassembling the monitor.**

**If the Gases module is installed, use caution when turning the water trap to prevent injury by crushing or pressing fingers against the exhaust connector of the module.**

**Do not dispose of this product (or any parts of it) in industrial or domestic waste. The system may contain hazardous substances that can cause serious environmental pollution. The system also contains privacy sensitive information. Philips recommends that you contact your Philips Service Organization before disposing of this product.**

**To avoid contaminating or infecting personnel, the environment or other equipment, disinfect and decontaminate the monitor before disposing of it in accordance with your country's laws. For more information, see the resources listed below.**

**Philips Healthcare gives support for:**

- **Recovery of reusable parts.**

- **The recycling of useful materials by competent disposal companies.**
- **Safe and effective disposal of equipment**

**For advice and information, contact your Philips Service Organization and see <http://www.healthcare.philips.com/main/about/sustainability/recycling/index.wpd> for more information.**

**Before disposing of a monitor, delete all patient information. For instructions on deleting patient data, see “Clearing Patient Data” on page 3-44.**

**If the device label on your monitor indicates that it may contain mercury, recycle or dispose of the monitor in accordance with local, state, or federal laws for mercury.**

**If this product is to be passed on to another user who is to use it for its intended purpose, then it should be passed on in its complete state. In particular, the existing user should make sure that all the product support documentation — including all Instructions for Use — are passed on to the new user. A new user should be made aware of the support services that Philips Healthcare provides for installing, commissioning, and maintaining the equipment or system, and for the comprehensive training of operators. Existing users must bear in mind that passing on medical electrical equipment to new users may present serious technical, medical, privacy, and legal risks. The original user may remain liable even if the equipment is given away.**

**Existing users are strongly advised to seek advice from their local Philips Healthcare representative before agreeing to pass on any equipment.**

**After the equipment has been passed on to a new user, the previous user may still receive important safety-related information, such as bulletins and field change orders. In many jurisdictions there is a clear duty on the previous user to communicate such safety-related information to new users.**

**Previous users who are not able or prepared to do this should inform Philips Healthcare about the new user, so that Philips Healthcare can provide the new user with safety-related information.**

**To protect confidential patient information, do not leave the monitor unattended.**

**Passwords restrict access to the system administration and service functions. Only qualified service personnel can access these functions. The password does not protect electronic health information (ePHI).**

## Tools Required for Service

The following tools and additional test equipment are required to disassemble, repair, and re-assemble the monitor.

- #1, #2 Phillips screwdrivers
- Torx T6, T10, T20 screwdrivers
- Small and medium flathead screwdrivers
- 10 mm, 12 mm wrenches
- Needle nose pliers
- Plastic cable zip ties
- Wire-cutters
- ESD mat and wrist strap
- Torque meter



## Viewing Battery Information

As a battery ages, its capacity decreases and the battery status indicator becomes increasingly less accurate, relative to the total number of charges and discharges.

To view information about the battery:

Step	
1	Open the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	<p>Select the <b>Battery Info</b> button.</p> <p>The <b>Battery Info</b> window appears.</p> <p>If the monitor has two batteries, the information is displayed in two columns. The information for the battery in the top position is displayed as <b>Battery 1 Value</b> and the bottom battery information is displayed as <b>Battery 2 Value</b>.</p> <p>To view the entire list of results, select the scroll bar or select the up and down arrows.</p> <p><b>Note</b> — <i>If the message, <b>No data from battery. Please see Service Guide.</b> appears, you must reset the battery. For detailed information, see “Replacing the Battery” on page 4-5.</i></p>

### Battery Info Window

The Battery Info window displays the following information:

Parameter	Description
Manufacturer	Name of the battery manufacturer
Chemistry	Battery’s chemistry type (e.g., LiON)
Serial Number	Battery serial number
Manufact. Date	Date of battery manufacture
Cycle Count	The number of cycle counts the battery has accrued
Max Error	The expected margin of error (%) in the state of charge calculation
Relative Charge	The predicted remaining battery capacity, expressed as a percentage of full charge capacity
Absolute Charge	The predicted remaining battery capacity, expressed as a percentage of design capacity
Battery name	Device name of the battery
Voltage	Terminal voltage of the battery (sum of all cells)
Current	Current being supplied (or accepted) by the battery

Parameter	Description
Temperature	Battery temperature
Full Capacity	The predicted capacity of the battery when it is fully charged
Design Capacity	The theoretical or nominal capacity of a new battery
Design Voltage	The theoretical voltage of a new battery
State Register	The value of the battery state register
Mode Register	The value of the battery mode register
Charging Voltage	The desired charging voltage
Charging Current	The desired charging current

---

## Replacing the Battery

- 
- Caution**
- **Before you remove the battery, perform a monitor hard shutdown to ensure that all patient and system data is saved in memory.**
  - **Dispose of used batteries in an environmentally responsible manner. Do not dispose of the battery in normal waste containers. Consult your hospital administrator to find out about local arrangements.**
- 

Replace the battery if the following conditions occur:

- After reconditioning, if the **Max Error** exceeds 2%.
- If the battery does not recharge to full capacity after four reconditioning cycles.
- If the battery cycle count exceeds the recommended limit of **300 cycles**.
- If the battery is older than **three (3) years**.

---

**Warning** *The risk of battery failure increases with age, when a battery remains in use past 300 charge-discharge cycles or 3 years. Such failures can result in overheating that in rare cases can cause the battery to ignite.*

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### Battery Part Numbers

The following table contains Efficia lithium ion battery part numbers.

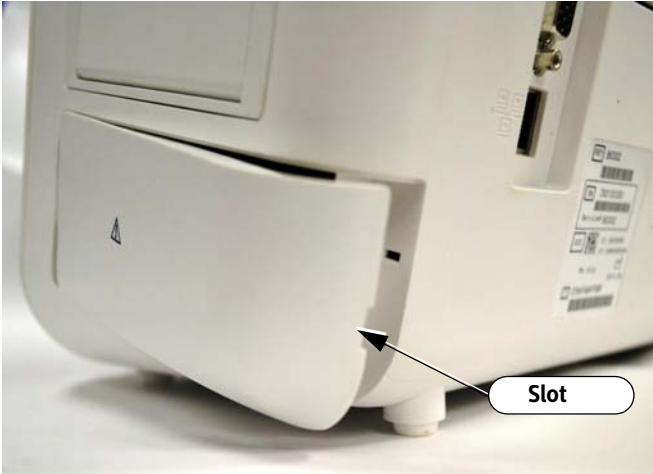
Description	Part Number
3-cell	989803189981
9-cell	989803199221

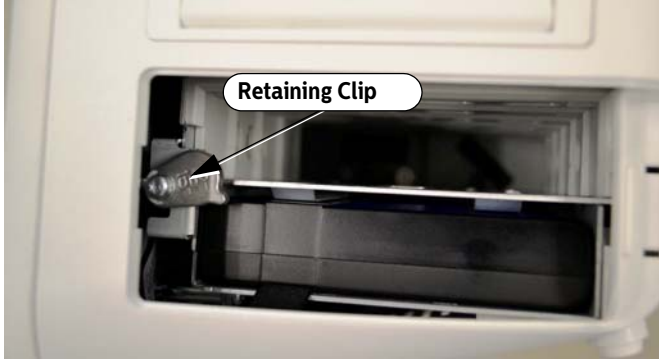
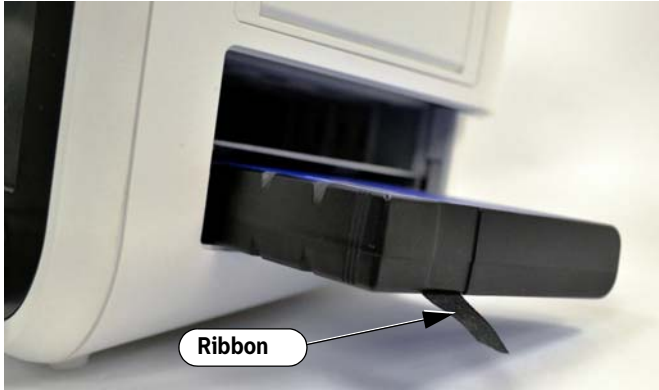
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**Caution**     **Store batteries at a room temperature of 25° C (77° F) or lower. Exposure to higher temperatures may reduce battery life, damage the batteries, and degrade overall monitor performance.**

---

To replace the battery:

Step	
1	Shut down the monitor. See “Shutting Down the Monitor” on page 4-1.
2	Remove the AC power cord from the back of the monitor.
3	Insert a slotted screwdriver into the slot in the battery cover. 
4	Hold one hand over the battery cover while you twist the screwdriver slightly to release the battery cover from the case. <hr/> <b>Warning</b> <b><i>Twist the screwdriver slowly and gently to avoid expelling the battery cover with enough force to cause personal injury.</i></b> <hr/>

<p>5</p>	<p>Rotate the battery retaining clip until it clears the battery.</p> <hr/> <p><b>Note</b> — <i>The Efficia CM120 monitor is shown below. Your monitor may appear differently.</i></p> <hr/> 
<p>6</p>	<p>Remove the battery from the monitor by pulling the attached black ribbon.</p> 
<p>7</p>	<p>Insert the new battery and replace the cover.</p> <p><b>Note</b> — <i>The battery retaining clip must be in place to allow the cover to be replaced.</i></p>

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**Note** — *Lithium-ion batteries are shipped with only a 30% charge. Charge battery completely before first use of the patient monitor.*

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## Replacing a Fuse


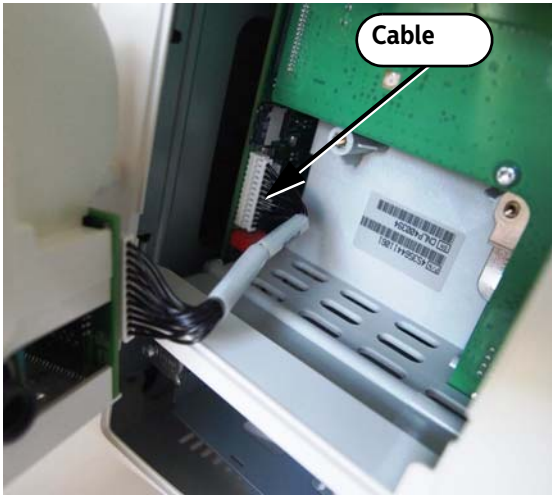
To replace a fuse in the AC power connector:

Step	
1	Shut down the monitor. See “Shutting Down the Monitor” on page 4-1.
2	Remove the AC power cord from the rear of the monitor.
3	Remove the battery from the monitor (see “Replacing the Battery” on page 4-5).
4	Use needle-nose pliers to pull the fuse holder out of the AC power connector. <div data-bbox="565 730 1219 1199" data-label="Image"> </div>
5	Replace the fuse or fuses, and then push the fuse holder back into the power connector until it snaps into place.

## Replacing the Recorder

To replace the recorder:

Step	
1	Shut down the monitor. See “Shutting Down the Monitor” on page 4-1.
2	Remove the AC power cord from the rear of the monitor.
3	Remove the battery from the monitor (see “Replacing the Battery” on page 4-5).
4	Open the recorder door on the rear case assembly and remove the paper roll.

<p>5</p>	<p>Loosen (do not try to remove) the two Torx T10 screws (torque: 0.6 Nm) holding the recorder to the monitor case.</p> 
<p>6</p>	<p>Place your thumbs on either side of the recorder case and pull it straight out of the assembly.</p>
<p>7</p>	<p>Disconnect the recorder cable from the main board, and remove the recorder.</p> 

## Upgrading the Recorder Firmware

To upgrade the recorder firmware:

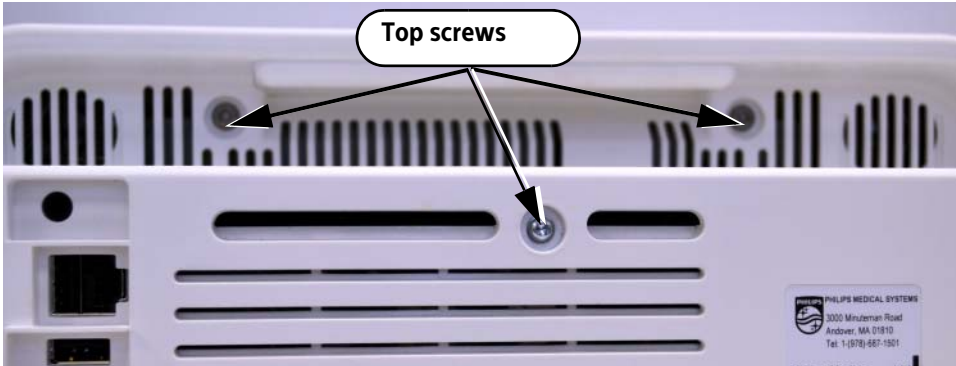
Step	
1	Access the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Insert the firmware upgrade USB flash drive into a USB port.

3	Select the <b>Recorder Test</b> button. The <b>Recorder Test</b> menu appears.
4	Select the <b>Upgrade Firmware</b> button. The upgrade starts and displays the status as the upgrade proceeds.
5	The monitor restarts.

## Removing the Rear Case

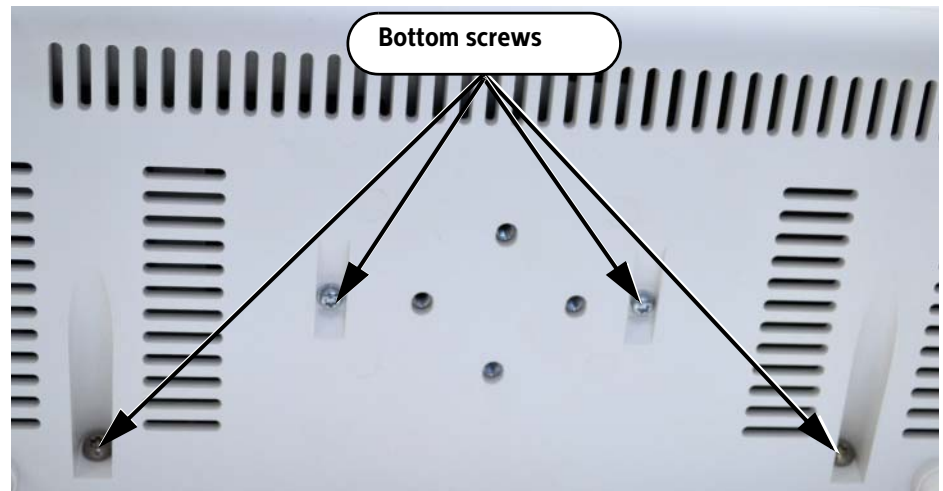
To open the monitor to install internal replacement parts, you must first remove the rear case.

To remove the rear case:

Step	
1	Shut down the monitor. See “Shutting Down the Monitor” on page 4-1.
1	Disconnect the AC power cable from the back of the monitor.
2	Remove the battery from the monitor (see “Replacing the Battery” on page 4-5).
3	Disconnect all external cables from the monitor.
4	If the monitor has an optional recorder, remove it. See “Replacing the Recorder” on page 4-8.
5	Remove the three Torx T20 screws (torque: 1.2 Nm) from the top of the monitor. 

6

Tip the monitor and remove the two Torx T20 screws (torque: 1.2 Nm) and two Torx T10 (torque; 0.8 Nm) screws.



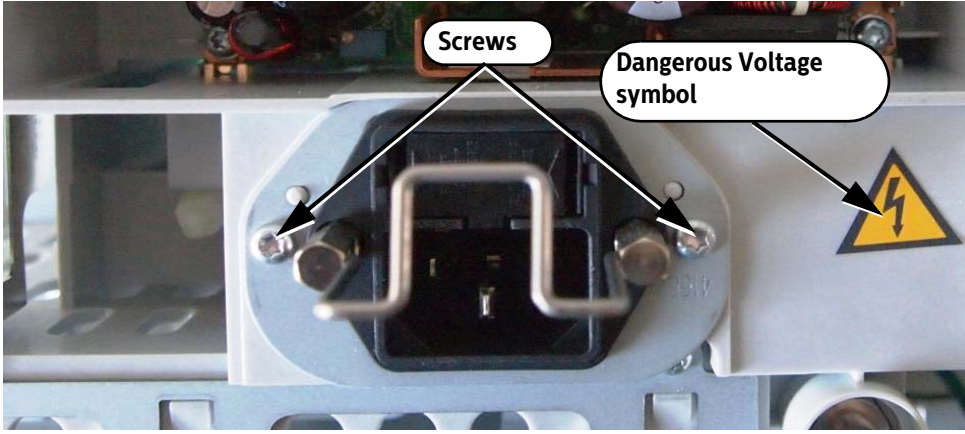
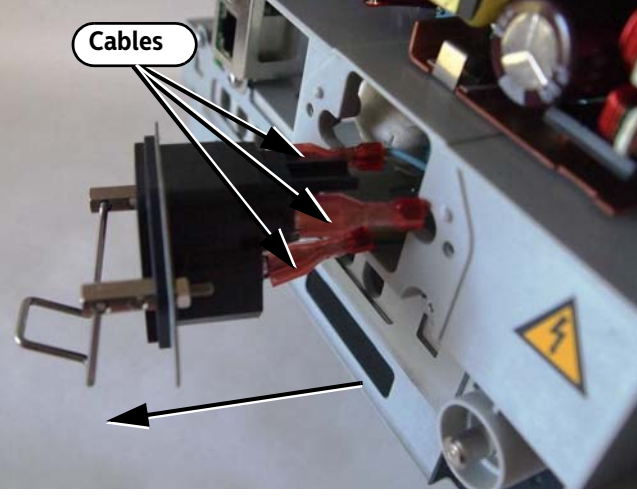
7

Pull the rear case away.



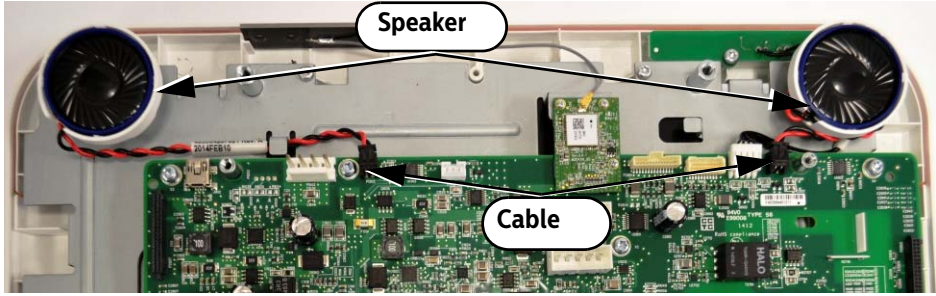
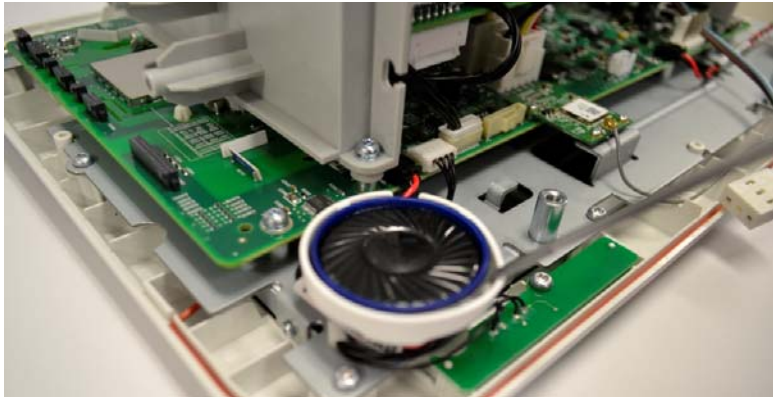
## Replacing the Power Entry Module

To replace the power entry module:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p data-bbox="418 495 1377 558">Remove the two Torx T10 screws (torque: 0.8 Nm) from the power input module.</p>  <p>The image shows a close-up of the power input module. Two screws are visible, one on each side of the module. A yellow warning symbol with a lightning bolt is located to the right of the module. Arrows point from the labels 'Screws' and 'Dangerous Voltage symbol' to their respective locations.</p>
3	<p data-bbox="418 1056 1377 1119">Pull the module out of the chassis and disconnect the three cables from the module.</p>  <p>The image shows the power input module being pulled out of the chassis. Three cables are visible, one red and two black. Arrows point from the label 'Cables' to each of the three cables.</p>

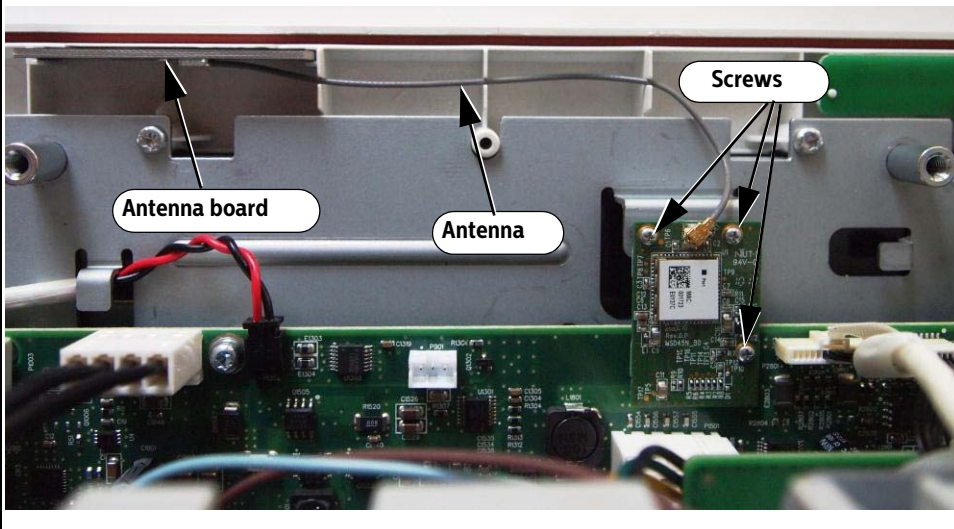
## Replacing a Speaker

To replace the speaker or speakers:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p>Disconnect the speaker cables from the main board.</p> <p><b>Note</b> — A monitor with two speakers is shown. Your monitor may appear differently.</p> 
3	<p>Insert a small flathead screwdriver under the speaker and remove it by prying it out of the rear case.</p> 

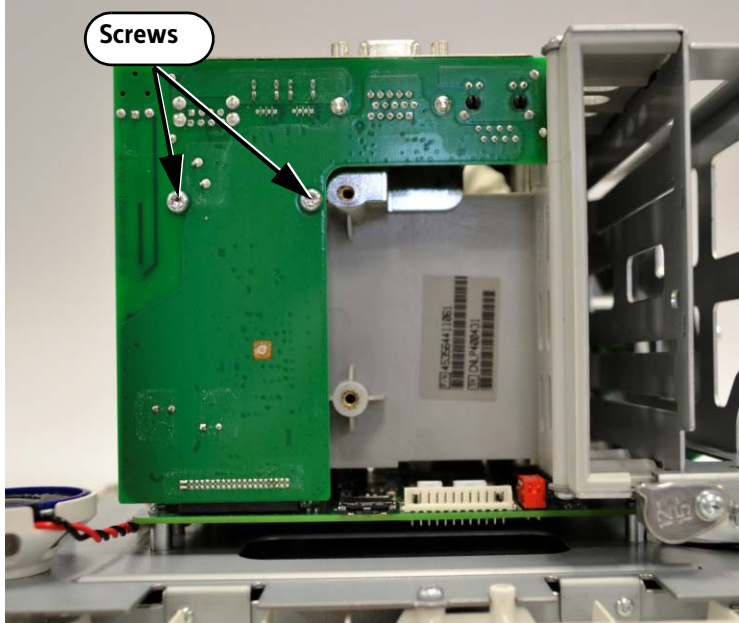
## Replacing the Wireless Assembly

To replace the wireless assembly:

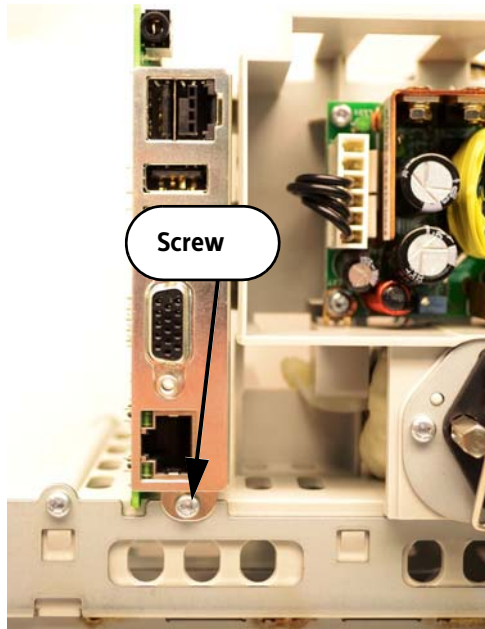
Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p data-bbox="418 493 1274 556">Remove the three Phillips screws (torque: 0.1 Nm) from the wireless board and remove it.</p> <hr/> <p data-bbox="418 619 1331 735"><b>Caution</b> Use caution when removing the assembly. The antenna connection to the wireless board is fragile. Do not attempt to disconnect the antenna and remove the assembly in one piece.</p> <hr/> 
3	Lift the antenna board out of the front panel.

## Removing the Communications (I/O) Board

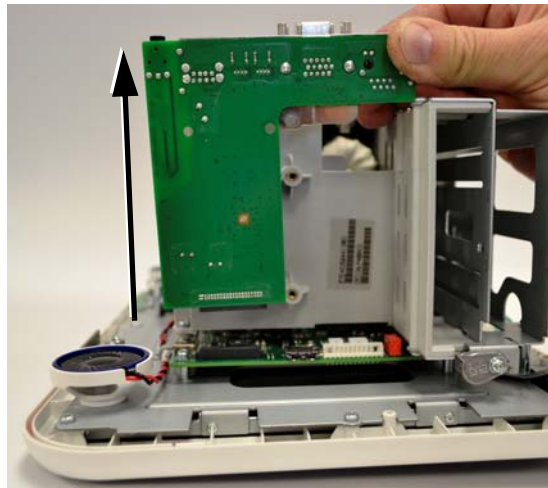
To remove the communications board:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p data-bbox="516 493 1458 556">Remove the two Torx T10 screws (torque: 0.8 Nm) from the communications board.</p> 

- 3 Rotate the chassis and remove the Torx T10 screw (torque: 0.8 Nm) from the rear of the chassis.

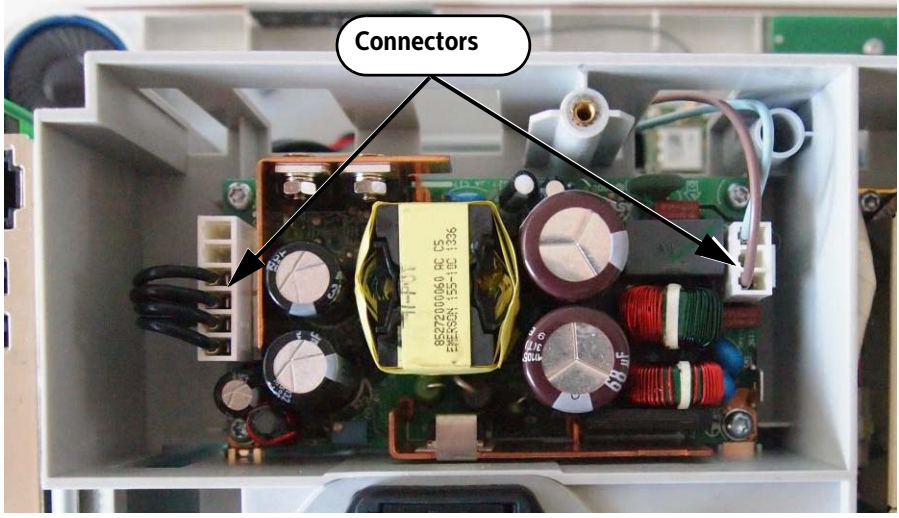
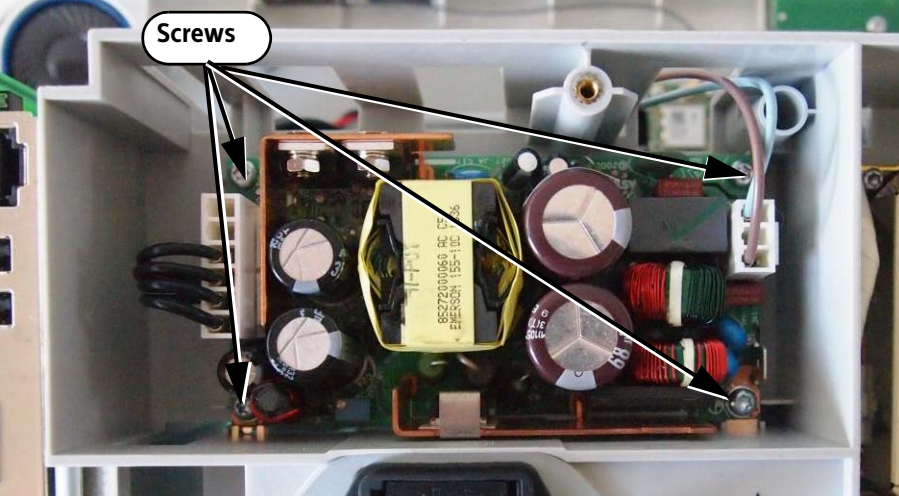


- 4 Pull the communications board away from the connector on the main board and remove it.



## Removing the Power Supply Module

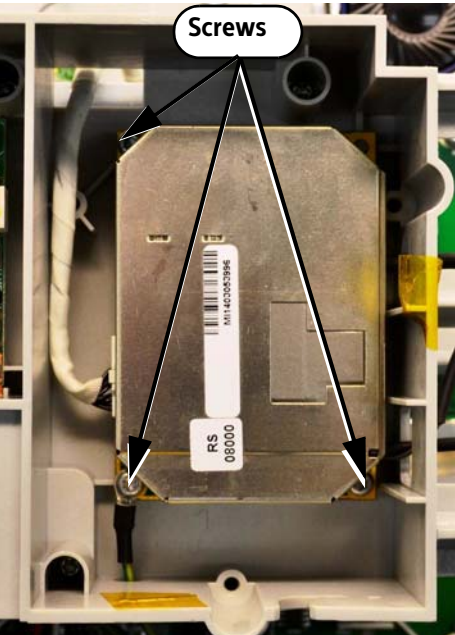
To remove the power supply:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p>Remove the power supply connectors.</p>  <p>A photograph showing the internal components of a power supply module. A callout box labeled 'Connectors' has two arrows pointing to the multi-pin connectors on the left and right sides of the module. The module is populated with various components including capacitors, a transformer, and a yellow heat sink.</p>
3	<p>Remove the four Torx T10 screws (torque: 0.8 Nm) and lift the module out of the chassis.</p>  <p>A photograph showing the same power supply module as in the previous step. A callout box labeled 'Screws' has four arrows pointing to the screws that hold the module to the chassis. The module is mounted on a white plastic chassis.</p>

## Replacing the Sidestream CO<sub>2</sub> Module

**Note** — *This procedure may vary slightly due to different monitor configurations.*

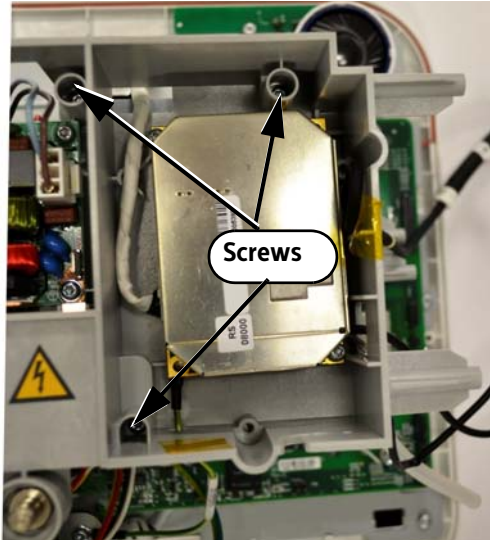

To remove the Sidestream CO<sub>2</sub> module:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the front end assembly. See “Removing the Front End Assembly” on page 4-20.
3	Remove the Torx T10 screws (torque: 0.8 Nm) from the module. <div data-bbox="662 772 1114 1402" style="text-align: center;">  </div>
4	Pull the module out of the chassis.

## Removing the NBP Module

**Caution**     **After you replace the NBP module, you must reset the NBP cycle count and run the NBP test. For information on resetting the NBP cycle count, see “Managing Component Usage Parameters” on page 3-40. For information on running the NBP test, see “NBP Test” on page 2-22.**

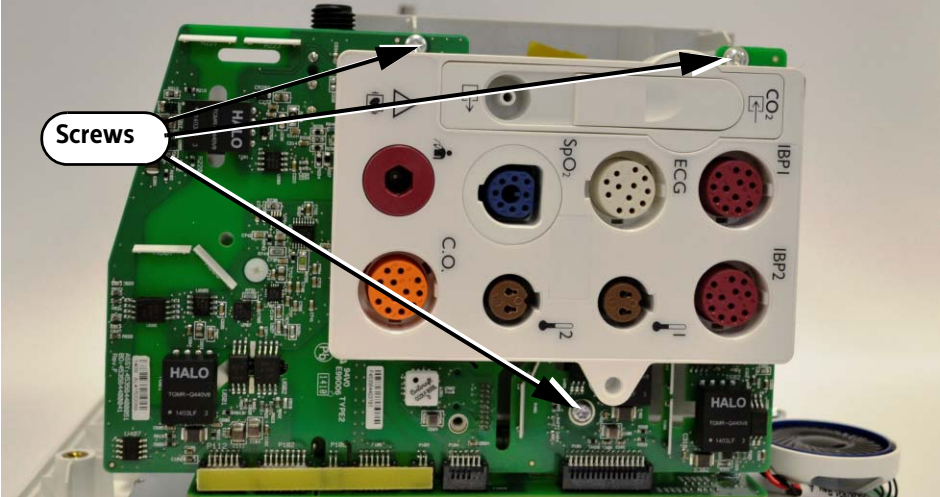
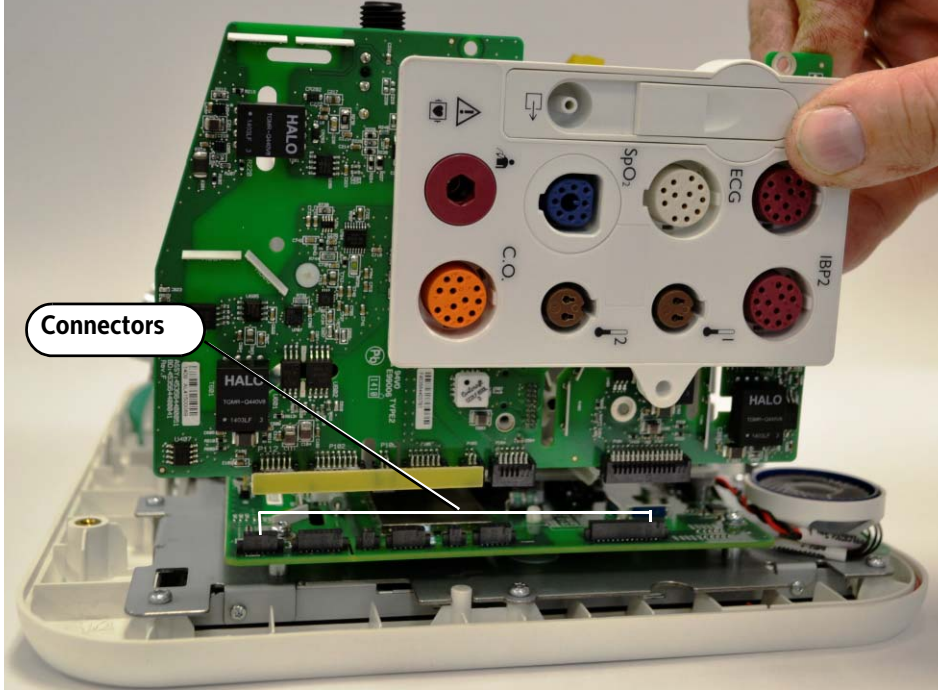
To remove the NBP module:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the chassis. See “Removing the Chassis” on page 4-23.
3	<p>Remove the Torx T10 screws (torque: 0.8 Nm) from the rear of the NBP module.</p> <p><b>Note</b> — <i>The screws are in the CO<sub>2</sub> assembly compartment on the opposite side of the chassis.</i></p> 
4	<p>Turn the chassis over and lift the NBP module out of the chassis.</p> 

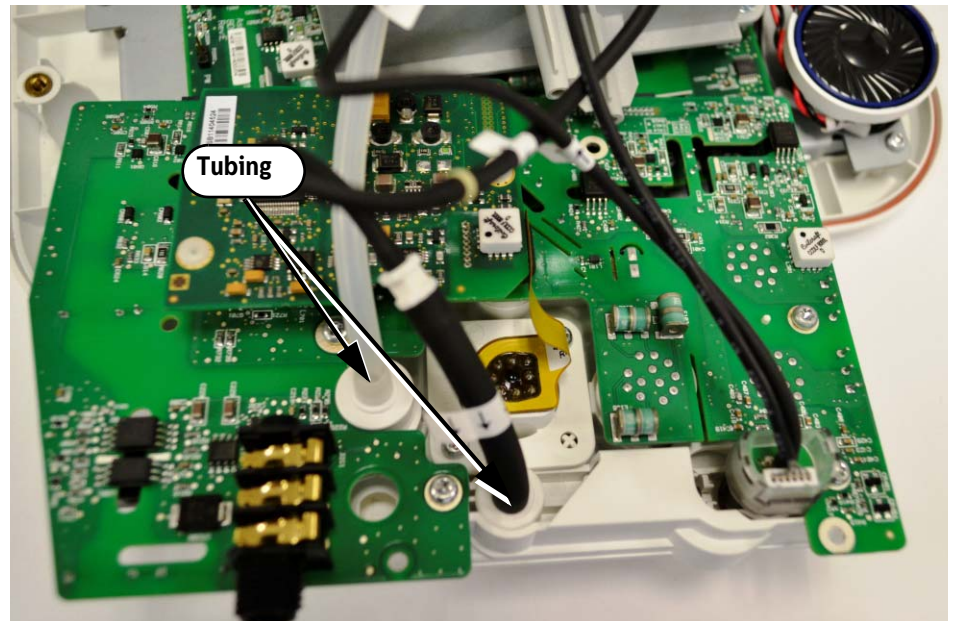


## Removing the Front End Assembly

To remove the plastic patient connector panel from the front end assembly or SpO<sub>2</sub> board, you must remove the front end assembly from the main board assembly.

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	<p>Remove the three Torx T10 screws (torque: 0.8 Nm) from the front end board.</p> 
3	<p>Lift the front end board straight up and away from the connectors on the main board.</p> 

- 4 Disconnect the tubing from the front end board.



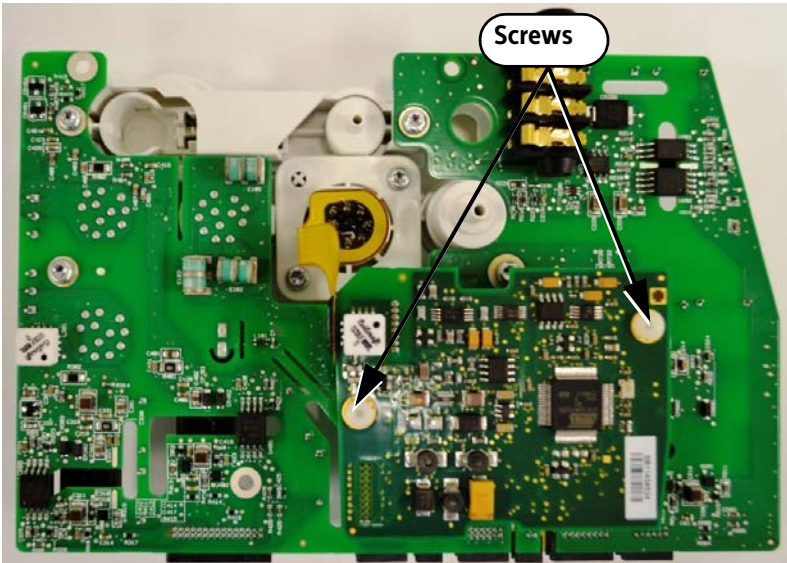
- 5 Grasp the CO<sub>2</sub> connector on the front end board and twist it clockwise while pulling up to remove it.

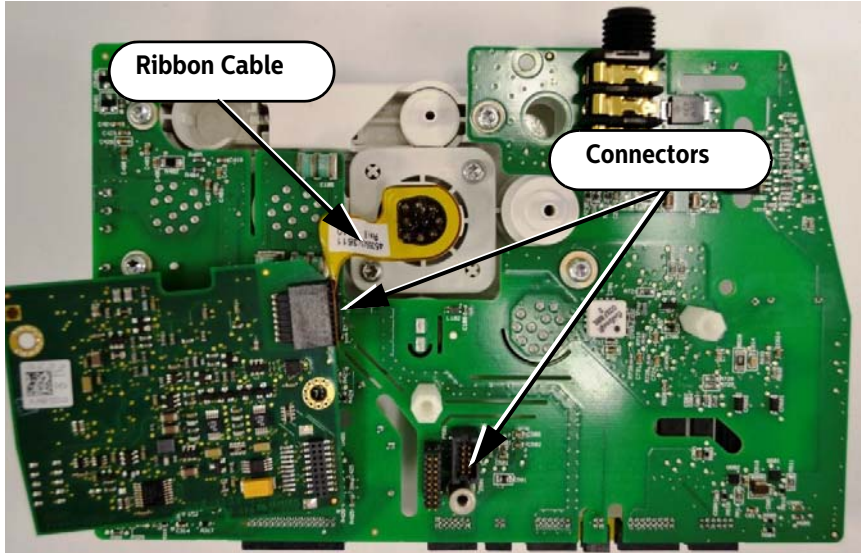


## Removing the Philips SpO<sub>2</sub> Board

**Note** — *This procedure may vary slightly due to different monitor configurations.*

To remove the SpO<sub>2</sub> board:

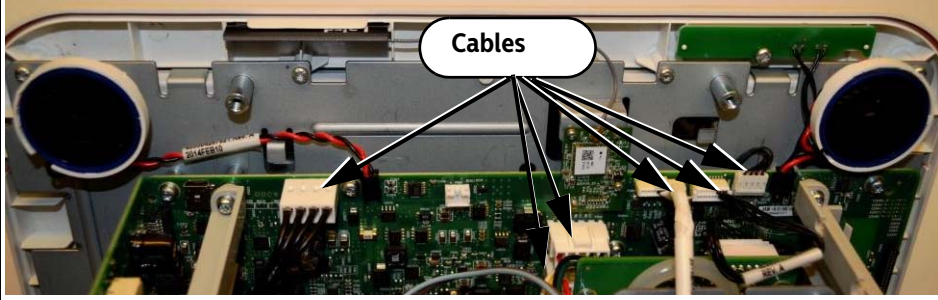
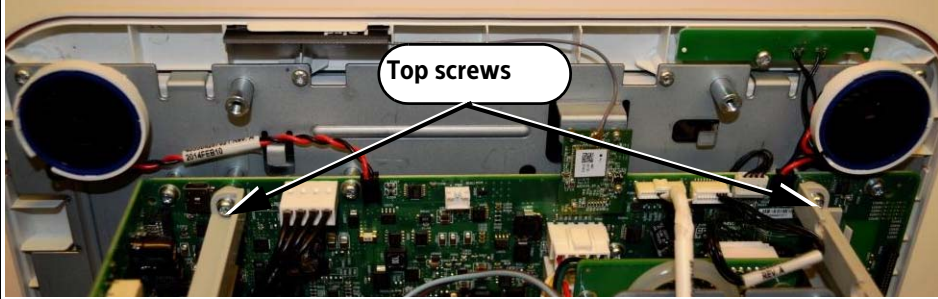
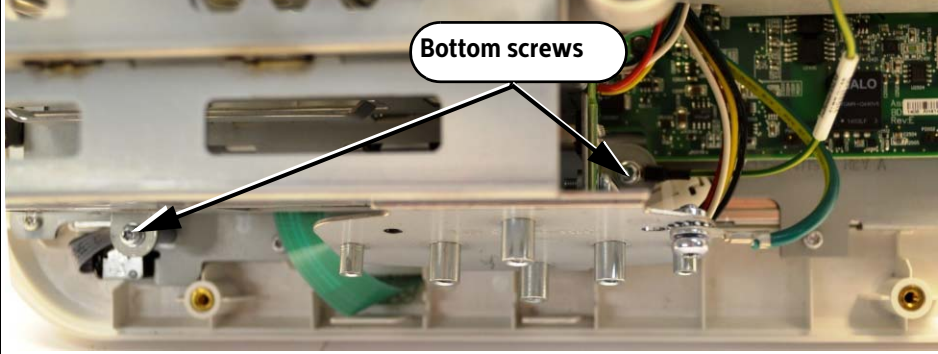
Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the front end assembly. See “Removing the Front End Assembly” on page 4-20.
3	Remove the two white plastic #1 Phillips screws (torque: 0.1 Nm). 

<p>4</p>	<p>Pull the SpO<sub>2</sub> board upward to separate it from the connector on the front end board.</p> 
<p>5</p>	<p>Disconnect the ribbon cable.</p>

## Removing the Chassis


To remove the chassis:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the front end assembly. See “Removing the Front End Assembly” on page 4-20.
3	Remove the communications board. See “Removing the Communications (I/O) Board” on page 4-15.

<p>4</p>	<p>Disconnect the cables from the main board.</p> 
<p>5</p>	<p>Remove the Torx T10 screws (torque: 0.8 Nm) from the top of the chassis.</p> 
<p>6</p>	<p>Remove the Torx T10 screws (torque: 0.8 Nm) from the bottom of the chassis.</p> 

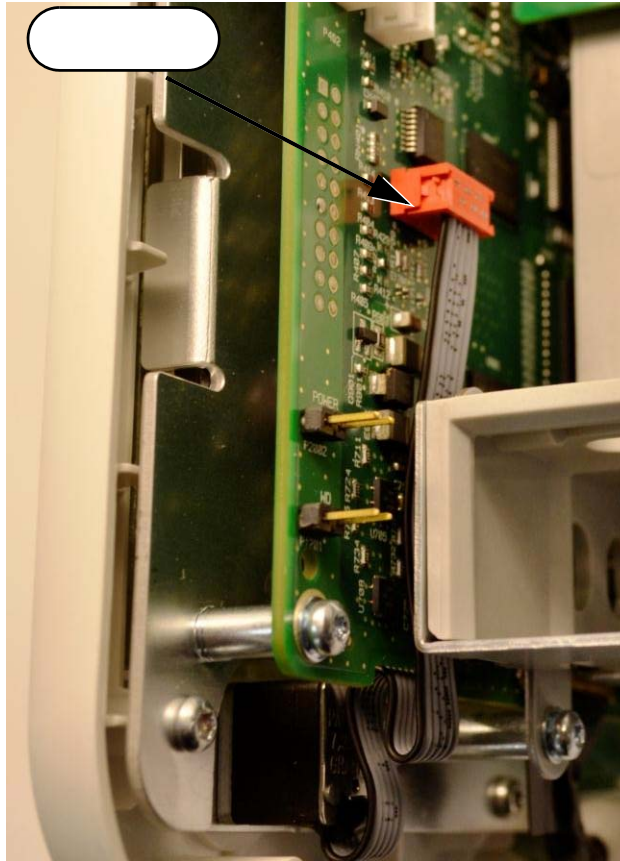
## Replacing the Navigation Wheel Assembly

To remove the navigation wheel assembly board:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Pull the wheel off of the stem. 

3

Disconnect the navigation wheel cable from connector on the main board.



4

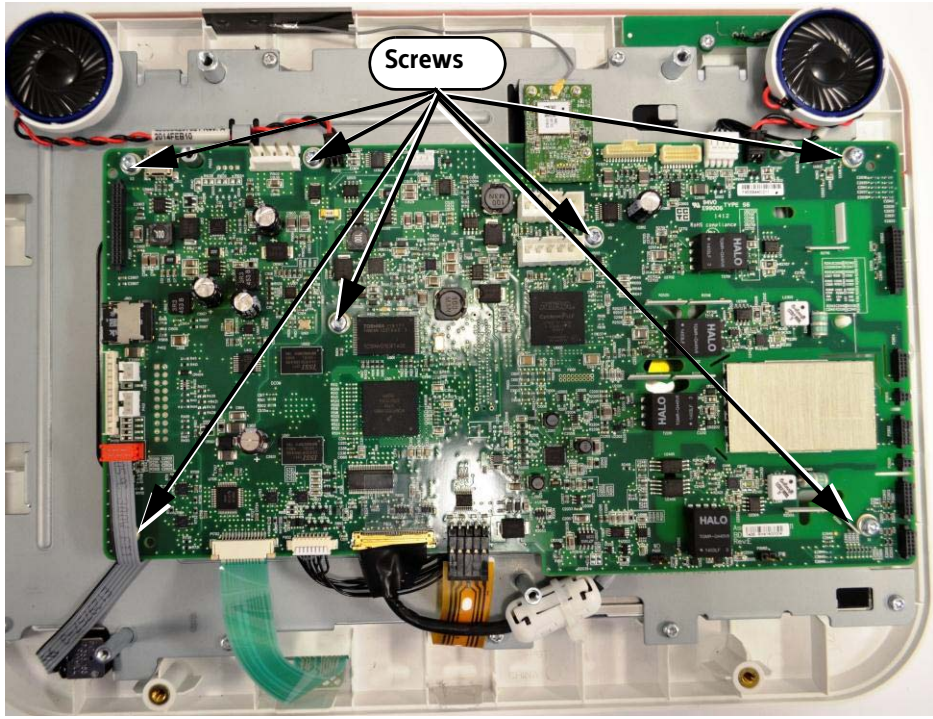
Remove the locking nut (torque: 0.8 Nm) and washer with a 10 mm wrench.



5	<p>Remove the navigation wheel assembly from the front panel.</p> <p><b>Note</b> — <i>The navigation wheel stem is keyed to fit both the opening in the front panel and the wheel.</i></p>
---	--

## Replacing the Main Board

To replace the main board assembly:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
1	Remove the chassis. See “Removing the Chassis” on page 4-23.
1	Remove the wireless assembly. See “Replacing the Wireless Assembly” on page 4-14.
2	<p>Disconnect the speaker or speakers from the main board.</p> <p>Disconnect the trim knob, membrane switch, alarm light, LCD signal, LCD backlight, and touch cables from the main board.</p>
3	<p>Remove the Torx T10 screws (torque: 0.8 Nm) from the main board.</p> 
4	Lift the main board away from the front panel assembly.

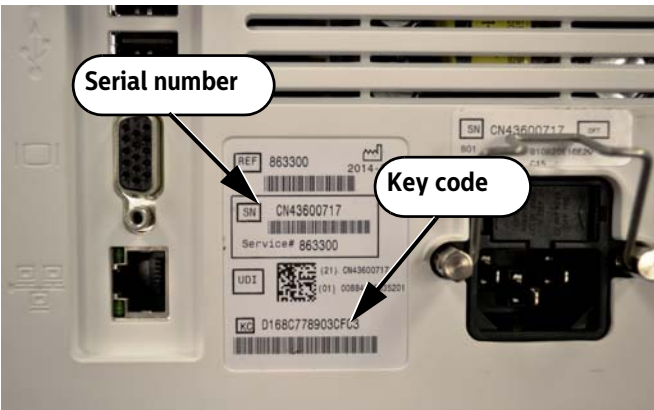


5	After you replace the main board, you must enter the serial number and key code. See “Updating the Serial Number and Key Code” on page 4-28.
---	--

## Updating the Serial Number and Key Code

When you replace the main board or upgrade the options of a monitor, you must program the key code and serial number into the main board.

To enter the serial number and key code:

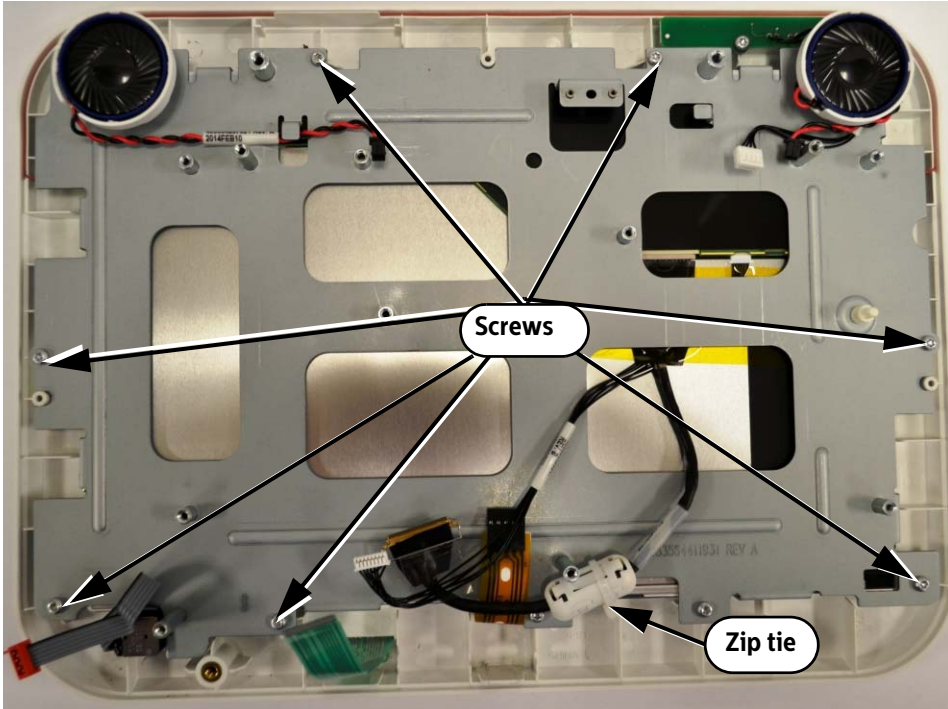
Step	
1	Access the <b>Maintenance</b> options in the <b>Diagnostics Menu</b> . See “Accessing the Diagnostics Menu and Maintenance Options” on page 2-8.
2	Select the <b>SN/Key Code</b> button. The <b>Serial Number/Key Code</b> menu appears.
3	<p>Do one of the following:</p> <ul style="list-style-type: none"> <li>• If you have replaced the main board, enter the serial number (SN) and key code (KC) located on the label on the back of the monitor and click <b>Apply</b>.</li> <li>• If you are upgrading options, enter the key code (KC) from the label provided with the upgrade and click <b>Apply</b>.</li> </ul> <p>The monitor restarts.</p> <div style="text-align: center;">  </div>
4	Close the menu.

## Removing the LCD Assembly

**Caution** After you replace the LCD, you must reset the LCD Usage Hours. For more information on resetting the LCD Usage Hours, see “Managing Component Usage Parameters” on page 3-40.

Perform this procedure in a dust-free environment to avoid damage to the LCD display.

To remove the LCD assembly:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the chassis. See “Removing the Chassis” on page 4-23.
3	Remove the main board. See “Replacing the Main Board” on page 4-27.
4	<p>Use wire cutters to cut the plastic zip tie and remove it.</p>  <p>The diagram shows the internal components of the LCD assembly. A central callout labeled 'Screws' has arrows pointing to several screws on the metal frame. A callout labeled 'Zip tie' has an arrow pointing to a white plastic zip tie that is securing a cable to the frame.</p>
5	Remove the Torx T10 screws (torque: 0.8 Nm) that attach the LCD assembly to the front panel.
6	If you are repairing a CM12, CM120, or CM150, remove the Torx T6 screws (torque: 0.6 Nm) from the side of the LCD assembly.
7	Pull the LCD assembly away from the front panel.

## Replacing the Front Panel Assembly

To replace the front panel assembly:

Step	
1	Remove the rear case. See “Removing the Rear Case” on page 4-10.
2	Remove the chassis. See “Removing the Chassis” on page 4-23.
3	Remove the wireless assembly. See “Replacing the Wireless Assembly” on page 4-14.
4	Remove the main board. See “Replacing the Main Board” on page 4-27.
5	Remove the LCD assembly. See “Removing the LCD Assembly” on page 4-29.

---

## Upgrading the Software

For information on upgrading the Efficia CM patient monitor software, refer to the *Efficia CM Series Patient Monitors Service Guide*.

For information on upgrading the Efficia rack and module firmware, refer to the *Efficia Rack Service Guide*.





# Replacement Parts and Assembly Drawings

## Replacement Parts Lists

The following table lists the Efficia CM replacement parts and their Philips part numbers. Figure 5-1 and Figure 5-2 show the item numbers that correspond to each part in the list.

Circuit diagrams will be made available upon request. Please contact your local representative.

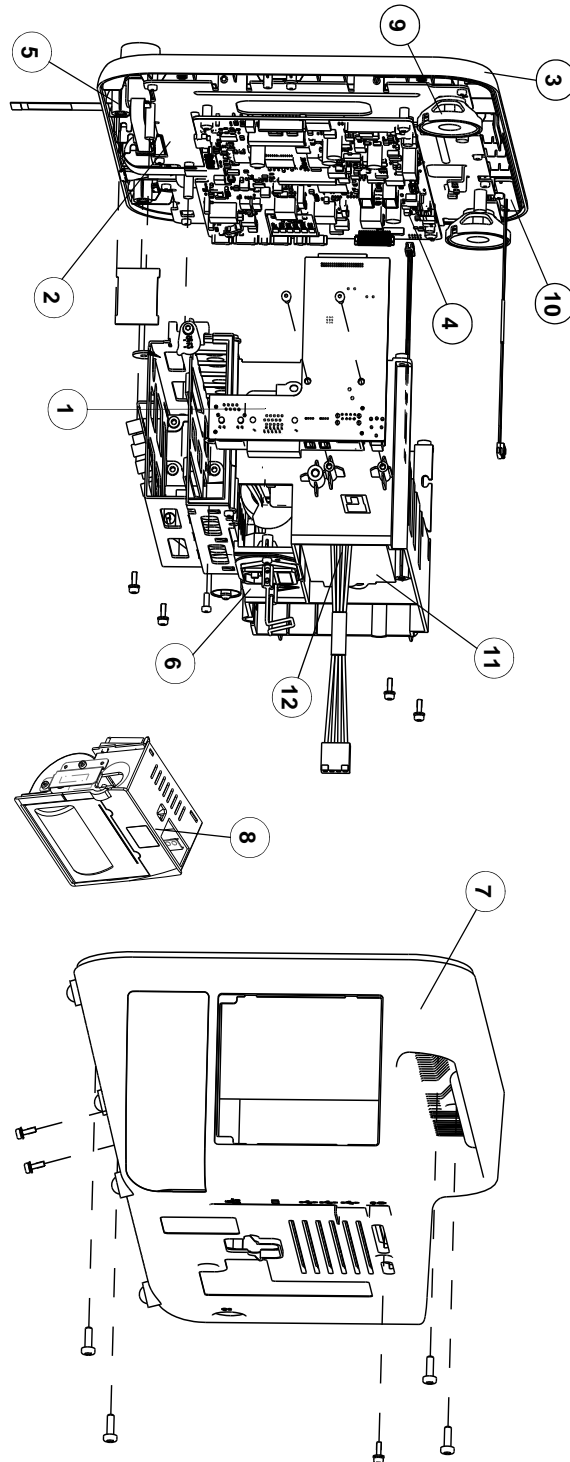
Description	Part Number	Figure	Item
Battery, 3-cell	9898 031 89981	Not shown	
Battery, 9-cell	9898 031 94541	Not shown	
CO <sub>2</sub> assembly, Respiration CapnoTrak sidestream	4535 646 24051	Not shown	
CO <sub>2</sub> connector assembly, Oridion sidestream	4535 644 67961	Not shown	
CO <sub>2</sub> module, Oridion sidestream	4535 643 70151	5-1	11
Communications (I/O) board, CM10, CM12, CM100	4535 646 52811	5-1	1
Communications (I/O) board, CM120, CM150	4535 646 36421	5-1	1
Front end assembly: NBP, ECG, Temperature	4535 646 51091	Not shown	
Front end assembly: NBP, ECG, Temperature, ECG Output	4535 646 51061	Not shown	
Front end assembly: NBP, ECG, Temperature, ECG Output, IBP	4535 646 51071	Not shown	
Front end assembly: NBP, ECG, Temperature, IBP, C.O.	4535 646 51081	Not shown	
Front panel assembly, CM10	4535 647 89011	5-1, 5-2	2, 14
Front panel assembly, CM10, non-touchscreen	4535 647 89021	5-1, 5-2	2, 14
Front panel assembly, CM100	4535 647 89031	5-1, 5-2	2, 14
Front panel assembly, CM12	4535 647 89041	5-1, 5-2	2, 14
Front panel assembly, CM12, non-touchscreen	4535 647 89051	5-1, 5-2	2, 14
Front panel assembly, CM120	4535 647 89061	5-1, 5-2	2, 14
Front panel assembly, CM150	4535 647 89071	5-1, 5-2	2, 14
LCD assembly, CM10, CM100	4535 645 14201	5-1, 5-2	3, 13
LCD assembly, CM12, CM120	4535 645 14211	5-1, 5-2	3, 13
LCD assembly, CM150	4535 645 14221	5-1, 5-2	3, 13

Description	Part Number	Figure	Item
Main board, CM10, CM100	4535 646 85081	5-1, 5-2	4, 14
Main board, CM10, non-touchscreen	4535 646 85091	5-1, 5-2	4, 14
Main board, CM12, non-touchscreen	4535 646 85111	5-1, 5-2	4, 14
Main board, CM120, CM150	4535 646 85101	5-1, 5-2	4, 14
Navigation wheel assembly	4535 643 70631	5-1	5
NBP assembly	4535 643 68861	Not shown	
Power entry module	4535 646 59291	5-1	6
Power Module	4535 640 15931	5-1	12
Rear case, CM10, CM100	4535 645 17131	5-1	7
Rear case, CM12, CM120	4535 645 17141	5-1	7
Rear case, CM150	4535 645 17151	5-1	7
Recorder assembly	4535 643 70001	5-1	8
Small parts kit: <ul style="list-style-type: none"> <li>• Battery cover (1)</li> <li>• Fuse, 1600mA/250V (2)</li> <li>• Hex nut, M6 x1mm (1)</li> <li>• Navigation wheel, (1) CM10/CM12, (1) CM100/CM120/CM150</li> <li>• Power cord retainer kit</li> <li>• Rubber feet (4)</li> <li>• Screw, self-forming, M3 x 8 mm (8)</li> <li>• Screw, T10 (6)</li> <li>• Screw, machine, M1.6 x 0.35 x 4 mm (3)</li> <li>• Screw, standoff, plastic (1)</li> </ul>	4535 645 17161	Not shown	
Speaker assembly	4535 642 87821	5-1	9
SpO <sub>2</sub> board, Masimo	4535 643 70421	Not shown	
SpO <sub>2</sub> board, NellCor	4535 646 24041	Not shown	
SpO <sub>2</sub> module, Philips	4535 644 29711	Not shown	
SpO <sub>2</sub> connector block, Masimo	4535 643 70411	Not shown	
SpO <sub>2</sub> connector block, Philips	4535 643 43611	Not shown	
Wireless assembly	4535 645 17121	5-1	10
Master board AMZ-CM PCA GR 12S/A 15 touch MB	4535 646 85101	5-2	15
Master board AMZ-CM PCA GR 12A non-touch MB	4535 646 85111	5-2	15
Master board AMZ-CM PCA GR 10S/A touch MB	4535 646 85081	5-2	15
Master board AMZ-CM PCA GR 10A non-touch MB	4535 646 85091	5-2	15

## Assembly Drawings

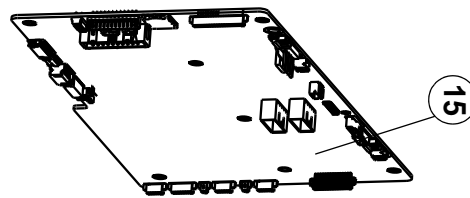
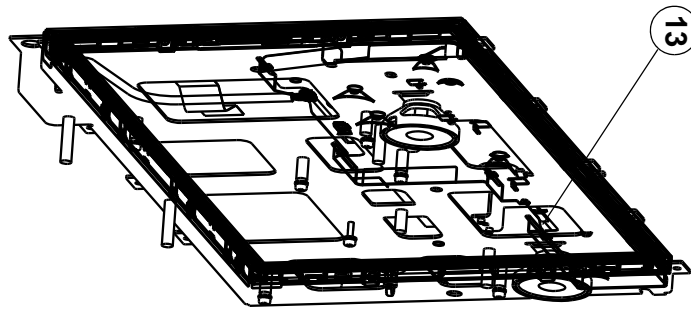
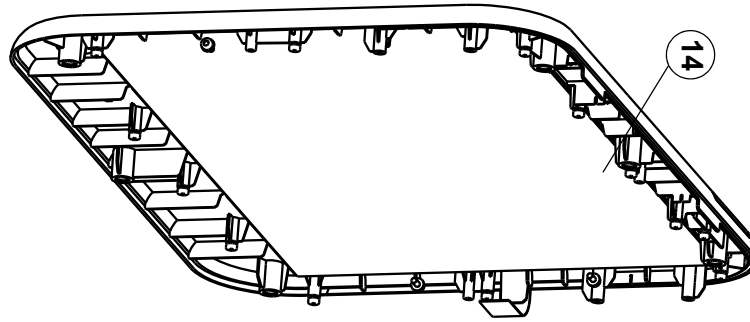
The drawings show the parts of an Efficia CM 120 monitor. Your monitor may be slightly different.

**Figure 5-1 Rear View**





**Figure 5-2 Front Panel Components**







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Printed in USA

453564623601, Revision A

