



# LIFEPAK® 20e

Defibrillator/Monitor

with CodeManagement Module™

## SERVICE MANUAL



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PN 3314176-009

## Section Navigator

**Preface**

**Safety**

**Device  
Description**

**Modes of  
Operation**

**Performance  
Inspection  
Procedures**

**Troubleshooting**

**Preventive  
Maintenance**

**Battery  
Maintenance**

**Replacement  
Procedures**

**CodeManagement  
Module**

**LIFEPAK 20e  
Specifications**

# Preface

This service manual describes how to maintain, test, troubleshoot, and repair the LIFEPAK 20e defibrillator/monitor (device).

**Note:** Except where specified, the information in this manual pertains to the LIFEPAK 20e defibrillator/monitor with CodeManagement Module. The CodeManagement Module may not be available in all countries.

Separate publications, the *LIFEPAK 20e Defibrillator/Monitor Operating Instructions*, are used by physicians, clinicians, and emergency care providers. The operating instructions provide step-by-step instructions, as well as operator-level testing and maintenance.

**Note:** Hyperlinks appear in blue text. Text that indicates the name of a button, menu, menu item, screen message, or screen overlay appears in all caps (for example, ANALYZE button and SETUP menu).

This section covers the following topics:

**Trademarks**

**Using Adobe Acrobat Reader**

**Navigating Through the Manual**

(Continued on next page)

Preface *(continued)*

**Contacting Stryker**

**Responsibility for Information**

**Device Tracking**

**Service Information**

**Warranty Information**

**Configuration Information**

**Glossary**

**Acronyms**



# Trademarks

1-4

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# Using Adobe Acrobat Reader

1-5

## Accessing Adobe Reader Help

This service manual opens in Adobe® Acrobat Reader. The Adobe Reader can be downloaded for free at the Adobe internet URL <http://www.adobe.com/products/reader.html>. For additional assistance using the Adobe Reader program, access ACROBAT READER HELP in the HELP menu.

## Using Bookmarks

Bookmarks appear in a column on the left side of the screen. They enable you to easily navigate to main sections of the manual, similar to a table of contents.

To view or hide the bookmarks column, click the BOOKMARKS tab located to the far left of the screen.

To jump to a bookmark topic, click the desired topic.



**Note:** A plus sign to the left of a bookmark topic indicates additional topics exist under that bookmark level. Click the plus sign to expand or collapse the bookmarks.

## Using Page View







Click the PAGES tab located to the far left of the screen to view miniature images of each page in the document. Scroll through the pages and click an image to jump quickly to that page.

# Navigating Through the Manual

1-6

Blue text indicates a hyperlink. Click a link to jump to that topic. Click  Back in the navigation bar at the bottom of each page to return to your previous location. The pointer changes to a pointing finger  when positioned over a link.

A navigation bar at the bottom of each page also provides helpful links. The navigation bar includes:

-  Table of Contents Click to jump to the main table of contents for the manual.
-  Section Contents Click to jump to the table of contents for the section you are currently viewing.
- Index  Click to jump to the index.
-  Back Click to retrace your steps in a document, returning to each page in the reverse order visited.
- Next Page  Click to jump to the next page of the manual.
-  Previous Page Click to jump to the previous page of the manual.

Some pages include an additional navigation bar above the main bar that provides access to closely related topics.

# Contacting Stryker

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1-7

**Stryker**

11811 Willows Road NE

P.O. Box 97006

Redmond, WA 98052 USA

Tel: 425 867 4000

Toll Free (USA only): 800 442 1142

Fax: 425 458 1404

[strykeremergencycare.com](http://strykeremergencycare.com)**Stryker European Operations Limited**

Anngrove, IDA Business &amp; Technology Park

Carrigtwohill, Co. Cork, T45 HX08 Ireland

**Stryker Australia Pty Ltd**

8 Herbert Street

St Leonards

NSW 2065

Australia

# Responsibility for Information

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1-8

This service manual describes the methods required to maintain, test, and repair the device. It does not address the operation of the device. Qualified service personnel must consult the appropriate operating instructions and this service manual to obtain a complete understanding of the use and maintenance of the device.

It is the responsibility of our customers to ensure that the appropriate person(s) within their organization has access to the information in this service manual, including any warnings and cautions used throughout the manual.

# Device Tracking

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1-9



## Device Tracking:

The U.S. Food and Drug Administration requires defibrillator manufacturers and distributors to track the location of their devices. If the device is located somewhere other than the shipping address or if your device has been sold, donated, lost, stolen, exported, or destroyed, or if it was not obtained directly from Stryker, please notify the device-tracking coordinator at 1.800.426.4448. Refer to your operating instructions for more information concerning device tracking.

# Service Information

1-10

Before attempting to clean or repair any assembly in the device, the service technician should be familiar with the information provided in the **Preventive Maintenance** section of this manual.

A qualified service technician should inspect any device that has been dropped, damaged, or abused to verify that the device is operating within performance standards listed in the Performance Inspection Procedure (PIP), and that the leakage current values are acceptable.

**Replacement procedures** for the device are limited to those items accessible at the subassembly level. Replacements and adjustments must be made by qualified service personnel. Replacements at the subassembly level simplify repair and servicing procedures and help ensure correct device operation and calibration. Printed circuit board assemblies that require software may require installation by a Stryker Service representative.

Also see **CodeManagement Module** section of this manual for additional replacement and test procedures.

To obtain Stryker service and maintenance for your device, contact your local service or sales representative. In the USA, call Stryker Technical Support at 1.800.442.1142. Outside the USA, contact your local Stryker representative. When you call Stryker to request service, provide the following information:

## Service Information *(continued)*

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1-11

- Model number and part number
- Serial number
- Observation of the problem that led to the call



# Warranty Information

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1-12

To obtain a detailed warranty statement, contact your local Stryker representative or go to [strykeremergencycare.com](http://strykeremergencycare.com).

# Battery Recycling Information

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1-13

Recycle the device at the end of its useful life.

- Recycling assistance – The device should be recycled according to national and local regulations. For instructions on disposing of this product or its accessories, see <https://www.stryker.com/us/en/emergency-care/recycling.html>.
- Preparation – The device should be clean and contaminant-free prior to being recycled.
- Recycling of disposable electrodes – After using disposable electrodes, follow your local clinical procedures for recycling.
- Recycling of batteries – The device uses rechargeable Lithium-ion batteries. Follow local guidelines and instructions provided in this service manual for discarding and recycling batteries as described.
- Packaging – packaging should be recycled according to national and local regulations.

# Configuration Information

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1-14

This service manual covers existing devices and options through the following revisions:

- LIFEPAK 20e defibrillator/monitor basic device with ECG
- Pacing option
- SpO2 option
- CodeManagement Module for wireless LIFENET System connection
- CodeManagement Module with EtCO2 option

# Glossary

1-15

The following are definitions of terms used throughout this service manual.

- Automated external defibrillator (AED) — The device uses an ECG analysis Shock Advisory System™ to advise the device operator if it detects a shockable or nonshockable rhythm. For more information, refer to the *Shock Advisory System* section in the operating instructions.
- Biphasic technology — The shock waveform generated by the device. The biphasic waveform is characterized by a positive current phase, followed by a reverse current phase of shorter duration and decreased magnitude. The waveform pulse characteristic is biphasic truncated exponential (BTE).
- CODE SUMMARY™ report — A summary report that consists of a preamble, an event/vital signs log, and waveforms associated with certain events. Refer to the *Data Management* section in the operating instructions for a sample CODE SUMMARY report.

(Continued on next page)

## Glossary *(continued)*

1-16

- Continuous patient surveillance system (CPSS) — A feature that monitors the patient ECG in LEADS or PADDLES for a potentially shockable rhythm. CPSS is active when the AED MODE indicator is on or the VF/VT ALARM is selected after pressing the ALARMS button (manual mode). The CPSS operates in conjunction with the Shock Advisory System. For more information, refer to the *Shock Advisory System* section in the operating instructions.
- EtCO<sub>2</sub> — A capnograph device that uses non-dispersive infrared spectroscopy to continuously measure the amount of CO<sub>2</sub> during each breath and report the amount present at the end of exhalation.
- FAST-PATCH® disposable defibrillation/ECG electrodes — An electrode system that allows delivery of defibrillation therapy to the patient.
- QUIK-COMBO® pacing/defibrillation/ECG electrodes — An electrode system that allows delivery of pacing and defibrillation therapy to the patient.
- QUIK-COMBO® patient simulator — A combination lead tester/patient cardiac rhythm simulator. The simulator is designed for use in training clinical personnel in the operation of the device.

*(Continued on next page)*

## Glossary (*continued*)

1-17

- REDI-PAK™ preconnect system — A variant of the QUIK-COMBO pacing/defibrillation/ECG electrodes system. The system allows QUIK-COMBO pacing/defibrillation/ECG electrode cable connection without removing the electrodes from their air-tight sealed pouch until needed.
- Shock Advisory System — A computerized ECG analysis system used to detect a shockable rhythm. For more information, refer to the *Shock Advisory System* section in the operating instructions.
- SpO2 — A noninvasive pulse oximeter that checks the saturation of oxygen in arterial blood.
- Test plug — An accessory used to connect the test load to the patient connector on the device.
- LIFENET Asset, LIFENET Device Agent — Software application that allows the user to change device user configuration and software updates. LIFENET Device Agent also provides a servicing tool to check and calibrate the CO2 module which is part of the CodeManagement Module. For more information about LIFENET System refer to internet:  
[strykeremergencycare.com](http://strykeremergencycare.com)

# Acronyms

1-18

The following is a list of acronyms and abbreviations used in this manual.

Term	Description
AAMI	Association for the Advancement of Medical Instrumentation
ADC	Analog-to-digital conversion
AED	Automated external defibrillator
Ah	Ampere hour
AHA	American Heart Association
ANSI	American National Standards Institute
BTE	Biphasic truncated exponential
BF	Electrically isolated, external body connection
BPM	Beats per minute
CF	Electrically isolated, direct cardiac connection
CPR	Cardiopulmonary resuscitation
CPU	Central processing unit
CPSS	Continuous patient surveillance system
DMM	Digital multimeter
DSP	Digital signal processor

*(Continued on next page)*

## Acronyms *(continued)*

1-19

Term	Description
DUART	Dual universal asynchronous receiver/transmitter
ECG	Electrocardiogram
EMS	Emergency medical service
ESD	Electrostatic discharge
ESU	Electrosurgical unit
EtCO <sub>2</sub>	End-tidal carbon dioxide
FiCO <sub>2</sub>	Inspired carbon dioxide
HR	Heart rate
IEC	International Electrical Commission
LCD	Liquid crystal display
LED	Light-emitting diode
mmHg	Millimeters of mercury
NHAAP	National Heart Attack Alert Program
NSR	Normal sinus rhythm
OEM	Original equipment manufacturer
PC	Personal computer
PCB	Printed circuit board

*(Continued on next page)*



## Acronyms *(continued)*

1-20

Term	Description
PIP	Performance inspection procedure
PPM	Pulses per minute
RISC	Reduced instruction set computer
RR	Respiration rate
RTC/NVRAM	Real-time clock/non-volatile random-access memory
SSD	Static-sensitive device
TCP	Test and calibration procedure
VAC	Volts, Alternating Current
VF	Ventricular fibrillation
VT	Ventricular tachycardia

# Safety

This section describes the general safety conventions, terms, and symbols used in this service manual or on the device. This information is intended to alert service personnel to recommended precautions in the care, use, and handling of this medical device.

## Terms

## General Warnings and Cautions

## Symbols

# Terms

2-2

The following terms are used in this service manual or on the various configurations of the device. Familiarize yourself with their definitions and significance.

**Danger:** Immediate hazards that will result in serious personal injury or death.

**Warning:** Hazards or unsafe practices that could result in serious personal injury or death.

**Caution:** Hazards or unsafe practices that may result in minor personal injury, product damage, or property damage.

**Note:** Points of particular interest for more efficient or convenient device operation; additional information or explanation concerning the subject under discussion.

# General Warnings and Cautions

2-3

The following are general warnings and cautions. Keep these warnings and cautions in mind when working with the device. More specific warnings and cautions appear throughout this service manual and the operating instructions.

## WARNING

**Shock hazard.** The defibrillator delivers up to 360 J of electrical energy. Unless properly used as described in the operating instructions, this electrical energy may cause serious injury or death. Do not attempt to operate or service this device unless thoroughly familiar with the function of all controls, indicators, connectors, and accessories.

Servicing of this device must be performed by properly trained individuals. This device may retain potentially lethal charges accessible inside the device at any time – even when off. Follow procedures carefully for discharging the E10 Energy Storage Capacitor.

**Shock or fire hazard.** Do not immerse any portion of this device in water or other fluids. Avoid spilling any fluids on the device or accessories. If the device is ever immersed in water or other fluids, remove the batteries and disconnect ac power until the device can be serviced.

Equipment or accessories improperly interconnected to each other can be a source of ignition or cause a shock. Make sure that all equipment is interconnected safely

*(Continued on next page)*

## General Warnings and Cautions *(continued)*

2-4

### WARNING

**Shock hazard.** To avoid the risk of electrical shock, this equipment must only be connected to a supply mains with protective earth.

All equipment connected to the system or ECG/sync connector must be battery powered or electrically isolated from AC power according to EN 60601-1.

**Possible fire or explosion hazard.** Do not service this device in the presence of flammable gases, anesthetics, or oxygen sources.

**Patient hazard.** Do not mount the device directly above the patient. Place the device in a location where it cannot harm the patient should it fall from its shelf or other mount

### CAUTION

**Possible equipment damage.** This device may be damaged by mechanical or physical abuse such as immersion in water or dropping. If the device has been abused, remove it from use and contact qualified service personnel.

# Symbols

2-5

The following list includes symbols that may be used in this service manual or on various configurations of the device and accessories. Some symbols may not be relevant to your device or used in every country.



Defibrillation-proof type CF applied part



Defibrillation proof, type BF applied part



Type BF applied part



Caution



Operating instructions



Follow instructions for use



General warning (symbol is black on yellow background)














Warning, high voltage

*(Continued on next page)*

## Symbols *(continued)*












2-6

	Equipotential connector
	Positive terminal
	Negative terminal
	Alternating current voltage
	Direct current voltage
	On (power: connection to the ac mains)
	Off (power: disconnection from the ac mains)
	Power on/off
	Switch on
	Switch off
	MR unsafe: keep away from magnetic resonance imaging (MRI) equipment

*(Continued on next page)*

## Symbols *(continued)*

2-7

	Safety ground. Protective earth connection
	Indoor use only
	[signal] Input
	[signal] Output
	CO <sub>2</sub> Input
	CO <sub>2</sub> Exhaust
	Sync in/ECG out
	System connector/data in
	HOME SCREEN button
	Alarm off
	Alarm on

*(Continued on next page)*



## Symbols *(continued)*

2-8



Biphasic defibrillator shock



Shock button



Shock count (x) on screen

J

Joules



Adult defibrillation paddle



Infant defibrillation paddle



Pace arrow, internal pacing



Pace arrow, noninvasive pacing



R-wave sense marker











Event marker

*(Continued on next page)*

## Symbols *(continued)*

2-9

>	Greater than
<	Less than
	VF/VT alarm on
	VF/VT alarm silenced
	Battery status indicator
	AC power indicator (CodeManagement Module only)
	Fuse
	Device includes RF transmitter
	Static-sensitive device (SSD)
	Mark of conformity to applicable European Directives

*(Continued on next page)*

## Symbols *(continued)*

2-10



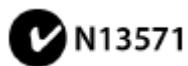
Canadian Standards Association certification for Canada and the United States



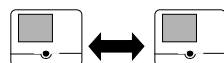
Intertek certification for Canada and the United States



Underwriters Laboratories recognized component mark for Canada and the United States



Mark of conformity to ACA standards



LIFEPAK 20e defibrillator/monitor to LIFEPAK 20e defibrillator/monitor cable



Turn counterclockwise to unlock



Manufacturer



Date of manufacture shown: YYYY-MM-DD



Serial number



Authorized EC representative

*(Continued on next page)*

## Symbols *(continued)*

2-11

REF

Reorder number

**PATENTS**

See website for patent information

PAT

See website for patent information

QTY

Quantity

PN

Part number

Assembled in the USA

Assembled in the USA

REFURBISHED DEVICE

Refurbished device

USED DEVICE

Used device



Use by date shown: yyyy-mm-dd



Do not reuse



Do not dispose of this product in the unsorted municipal waste stream. Dispose of this product according to local regulations. See <https://www.stryker.com/us/en/emergency-care/recycling.html> for instructions on the proper disposal of this product.

*(Continued on next page)*

## Symbols *(continued)*

2-12



Symbol for China RoHS indicating the Environmentally Friendly Use Period (EFUP) denoting the number of years before any substance is likely to leak out into the environment.



Recycle this item

IPx1

Protected from vertically dripping water per IEC 60529

!USA

For USA audiences only



Fragile. Handle with care.

Rx Only

Federal law restricts this device to sale by or on the order of a physician



Keep dry

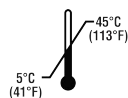


Recommended storage temperature 5° to 45°C (41° to 113°F). Storage at extreme temperatures of -20° or 60°C (-4° or 140°F) is limited to seven days. If storage at these temperatures exceeds one week, the electrode shelf-life is reduced.

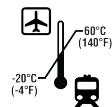
*(Continued on next page)*

## Symbols *(continued)*

2-13



Recommended storage temperature range 5° to 45°C (41° to 113°F).



Recommended shipping temperature range -20° to 60°C (-4° to 140°F).



Relative humidity range 5% to 95%.



This end up



# Device Description

This section describes the physical characteristics and functionality of the LIFEPAK 20e monitor/defibrillator (device). This section includes the following topics:

**Introduction**

**Defibrillator—Externally powered Class 1 device with battery backup.**

**Ordering Devices, Supplies, and Accessories**

**System Context Diagrams**

**Functional Description**



# Introduction

3-2

## About the Device

The LIFEPAK 20e defibrillator/monitor (device) is a complete, acute, cardiac-care response system with both manual and semiautomatic defibrillation operation. When clinically indicated, the device enables the operator to deliver a brief, high-energy pulse of electricity to the patient's heart. Operators can preconfigure the device to reduce complexity during normal operation.

## Energy Delivery

The device generates a biphasic truncated exponential (BTE) shock pulse for defibrillation. The standard method of energy delivery is through self-adhesive QUIK-COMBO® pacing/defibrillation/ECG electrodes. When using these disposable defibrillation electrodes (DDEs), internal circuitry continuously measures the impedance between the electrodes and allows defibrillation only when the defibrillation electrodes are attached to the patient. The user can select from a variety of optional accessories for energy delivery (for example, standard paddles or internal paddles).

## Introduction *(continued)*

3-3

### Manual Mode Operation

In **manual mode** (AED MODE indicator off), the device enables the operator to manually select an energy level, initiate a charge sequence, and apply energy in either direct or synchronized modes. When the operator selects the VF/VT ALARM from the ALARMS menu, the continuous patient surveillance system (CPSS) monitors the patient's ECG for a shockable rhythm. A suspect rhythm alerts the operator with a priority tone and screen message. The operator can then follow locally established guidelines for the administration of defibrillation therapy.

### AED Mode Operation

In **AED mode** (AED MODE indicator on), the device uses the CPSS to monitor the patient's ECG for a shockable rhythm. A suspect rhythm alerts the operator with a priority tone and screen message. The operator may continue by pressing the ANALYZE button, which allows the Shock Advisory System to analyze the ECG rhythm and make recommendations. The operator can then follow locally established guidelines for the administration of defibrillation therapy. For more information about CPSS and Shock Advisory System, refer to *Appendix E* in the operating instructions.

## Introduction *(continued)*

3-4

### Device Primary Functions

The device has four primary functions:

- Defibrillation
  - Manual or semi-automatic (AED) defibrillation
  - Synchronized cardioversion in manual mode
  - Leads-off detection for therapy and ECG electrodes
- Noninvasive pacing
  - Demand and nondemand modes of operation
- Capture patient information
  - Stores both patient and device data at each event
  - Real-time clock provides time stamps for events
  - Provides operator review of started events for printout
- Patient signal monitoring
  - Displays up to two waveforms at once
  - Displays a continuous pulse oximetry (SpO<sub>2</sub>) readout
  - Displays a continuous End-tidal carbon dioxide (EtCO<sub>2</sub>) readout
  - Displays a continuous heart rate readout
  - Displays waveform pace and sense markers
  - Monitors for ventricular fibrillation/ventricular tachycardia and sounds a warning alarm
  - Prints continuous ECG data

Service features include calibration and diagnostic functions.

# Introduction *(continued)*

3-5

## Assemblies

The device consists of a three-piece case assembly and optional extension module that enclose the following modules/PCBs:

- |                          |                       |
|--------------------------|-----------------------|
| 1. System Control PCB    | 4. Therapy PCB        |
| 2. Patient Parameter PCB | 5. User Interface PCB |
| 3. Power module          | 6. OEM modules        |

and the following OEM and mechanical components:

- |                                 |                                   |
|---------------------------------|-----------------------------------|
| 1. Display                      | 7. Patient connector panel        |
| 2. Speaker                      | 8. System connector panel module  |
| 3. User controls and indicators | 9. Internal ac to dc power supply |
| 4. Printer                      | 10. Internal battery              |
| 5. SpO2 acquisition             | 11. Internal cables               |
| 6. EtCO2 module                 | 12. Wireless interface to LIFENET |

See [LP20e Interconnect Diagram](#)

and the following attachments:

- |                            |                      |
|----------------------------|----------------------|
| 1. ECG 3- or 5-wire cables | 4. EtCO2 accessories |
| 2. QUIK-COMBO® cable       | 5. Internal paddles  |
| 3. SpO2 cable              | 6. Standard paddles  |

## Introduction *(continued)*

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3-6

### Device Classifications per IEC 60601-1

Defibrillator—Externally powered Class 1 device with battery backup.

Applied parts—ECG is a Type CF patient connection.

Therapy, SpO<sub>2</sub>, and CO<sub>2</sub> are Type BF patient connections.

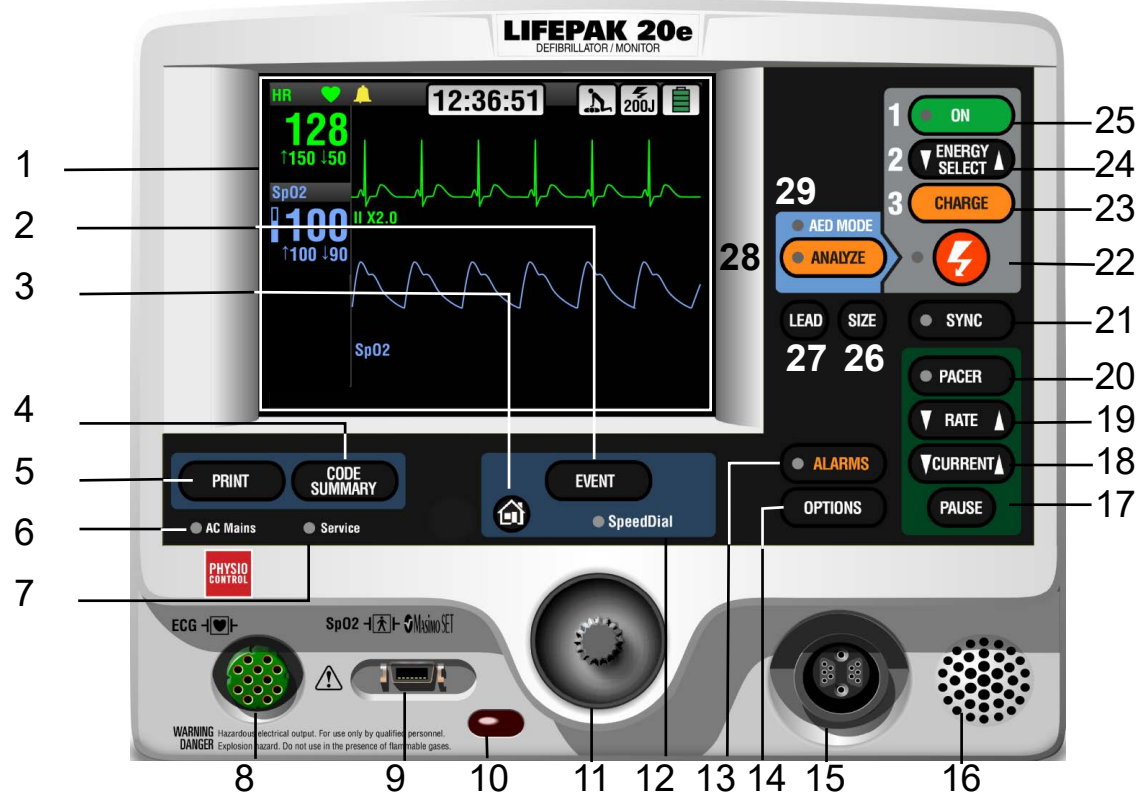
Internal electrodes are a Type CF patient connection.

# Physical Description and Features

3-7

## LIFEPAK 20e Front Panel

For information about the buttons, indicators and connectors shown below, click the appropriate right arrow on the items bar at the bottom of the page.



(Continued on next page)

Items 7–13 ►

Items 14–19 ►

Items 20–29 ►

Back to Illustration

## Physical Description and Features *(continued)*

3-8

### LIFEPAK 20e Front Panel *(continued)*

Number	Description
1	Display screen — Color liquid crystal display (LCD) screen displays operating messages, waveforms, status messages, setup menus, and so forth.
2	EVENT control — Press to activate user-defined events.
3	HOME SCREEN control — Press to return to the home screen of the particular option or feature you are configuring. Pressing this button does not take you to a specific screen; instead, it returns to the home screen for the mode or event you are configuring.
4	CODE SUMMARY control — Press to print the CODE SUMMARY critical event record.
5	PRINT control — Press to start and stop the printer.
6	AC Mains LED - When the ac power (line power) is connected, the AC mains light is steady.

*(Continued on next page)*

## Physical Description and Features *(continued)*

3-9

### LIFEPAK 20e Front Panel *(continued)*

Number	Description
7	Service indicator LED — Illuminates when the device enters service error codes into the Service Log (accessed through the SERVICE menu). Refer to <a href="#">Troubleshooting</a> for information about the error codes.
8	ECG cable connector — Connection port for the electrically isolated ECG patient cable.
9	SpO2 cable connector — Connection port for the pulse oximeter.
10	IrDA port connector — Infrared connection port provides wireless communications to data management devices (this feature is not available with this release).
11	SPEED DIAL selector — When active (SPEED DIAL LED is on), turn (either direction) to make a selection from the menu or overlay shown on the screen; press to confirm your selection.
12	SPEED DIAL LED — Illuminates when the SPEED DIAL is active.
13	ALARMS control — Press to activate and silence alarms.

*(Continued on next page)*



## Physical Description and Features *(continued)*

3-10

### LIFEPAK 20e Front Panel *(continued)*

Number	Description
14	OPTIONS control — Press to access the OPTIONS menu.
15	Therapy cable connector — Connection port for the following: <ul style="list-style-type: none"><li>– QUIK-COMBO® electrodes (standard)</li><li>– FAST-PATCH electrodes (with optional cable)</li><li>– REDI-PAK electrodes (optional)</li><li>– Standard adult and pediatric paddles (optional)</li><li>– Internal paddles (optional)</li><li>– Posterior paddle (optional)</li></ul>
16	Speaker — Provides audio voice prompts and alert tones.
17	PAUSE control — Press to temporarily slow the pacing rate.
18	CURRENT control — Press to adjust the pacing current.
19	RATE control — Press to select a pacing rate.

*(Continued on next page)*

## Physical Description and Features *(continued)*

3-11

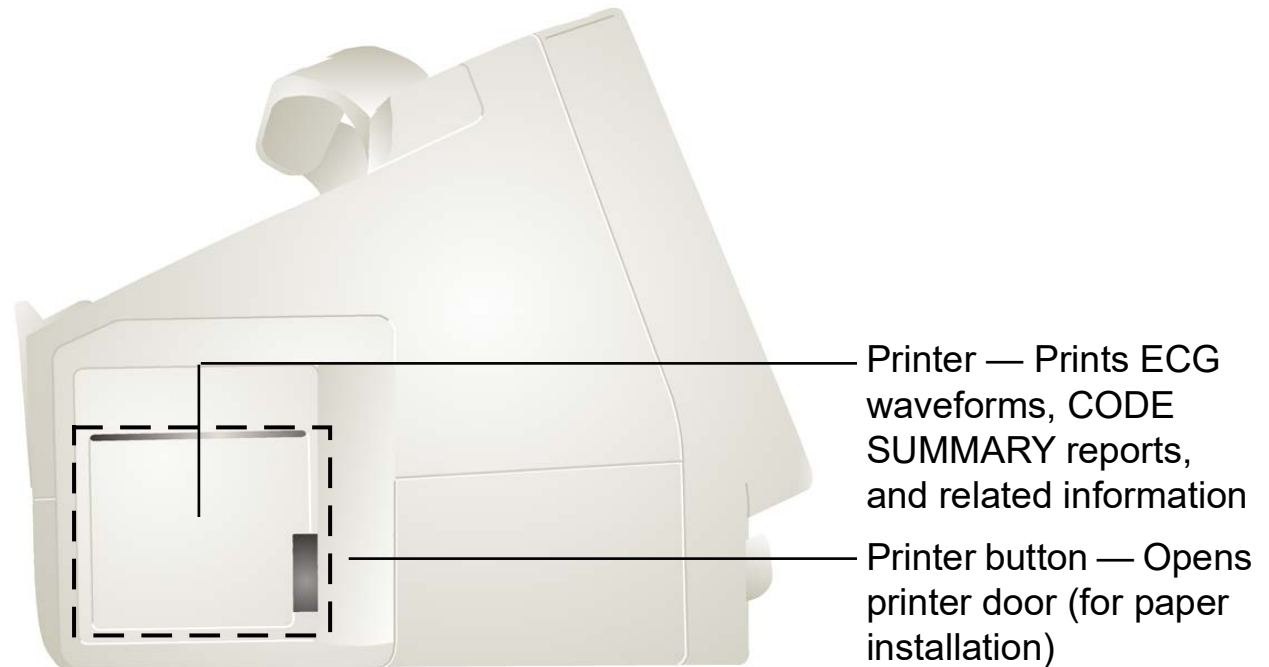
### LIFEPAK 20e Front Panel *(continued)*

Number	Description
20	PACER control — Press to activate the pacer function.
21	SYNC control — Press to activate the synchronized mode.
22	SHOCK control — Press to discharge the device.
23	CHARGE control — Press to charge the device.
24	ENERGY SELECT control — Press to select the energy levels in manual mode.
25	ON control — Press to turn the device on and off. Illuminates when the device is turned on.
26	SIZE control — Press to change the ECG size.
27	LEAD control — Press to change the ECG lead.
28	ANALYZE control — Press to activate the Shock Advisory System.
29	AED MODE indicator LED — Illuminates when device is in AED mode.

## Physical Description and Features *(continued)*

3-12

### LIFEPAK 20e Side Panel



# Physical Description and Features *(continued)*

3-13

## LIFEPAK 20e Back Panel



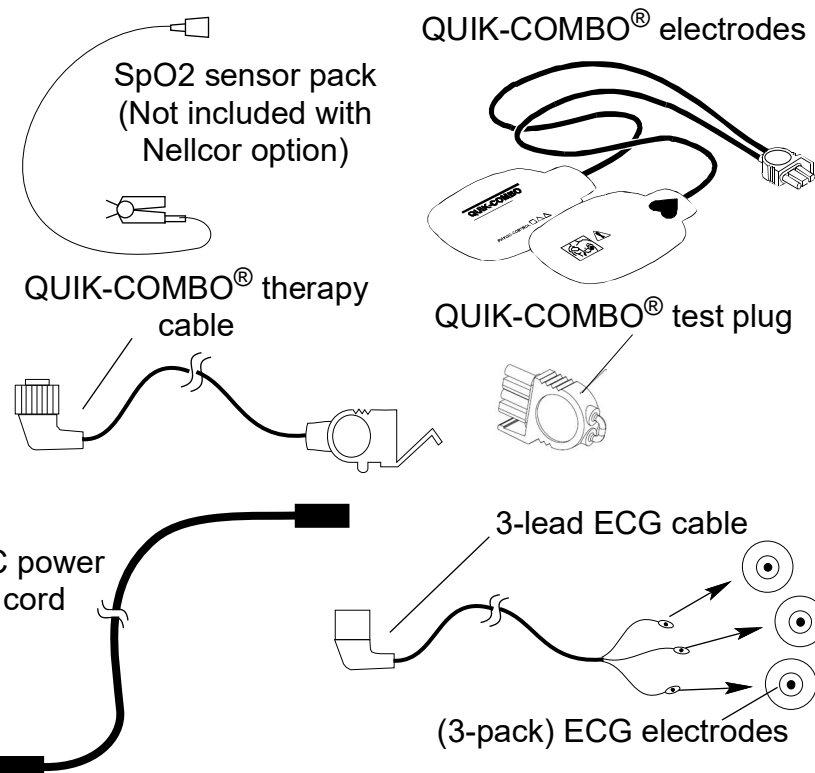
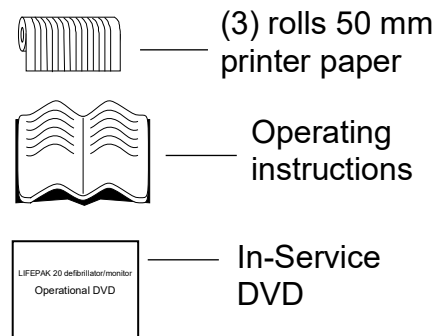
Number	Description
1	AC power connector — Connection port for ac (line) power. See Warning - Shock hazard on <a href="#">Page 2-4</a> .
2	System connector — Connection port for RS-232 serial interface. See Warning - Shock hazard on <a href="#">Page 2-4</a> .
3	ECG/Sync connector. See Warning - Shock hazard on <a href="#">Page 2-4</a> .
4	Grounding stud

# Physical Description and Features *(continued)*

3-14

## What Is Shipped with a Basic Device

A basic device includes the components shown below. For additional information about components, refer to *Accessories, Supplies, and Training Tools* in the *Maintaining the Equipment* section of the operating instructions.



# Ordering Devices, Supplies, and Accessories

Refer to the LIFEPAK 20e Operating Instructions for accessories, supplies, and training tools that are available. For ordering instructions, refer to [Ordering Parts](#).

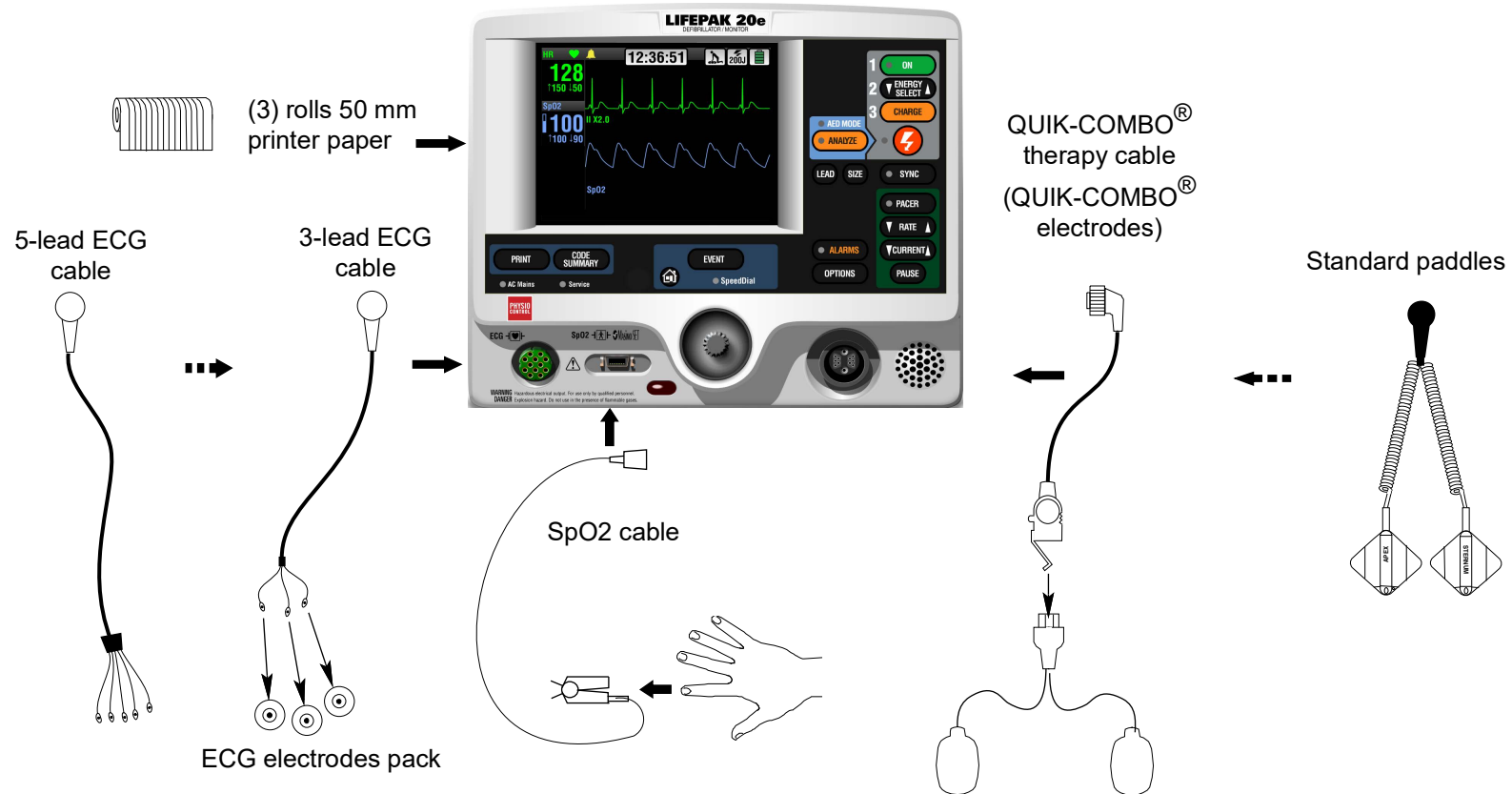
Description	REF
■ LIFEPAK 20e operating instructions, English	26500-004049

# System Context Diagrams

3-16

## Front of Device

The system context diagrams illustrate how the device connects with external equipment, including accessories, batteries, and power devices.

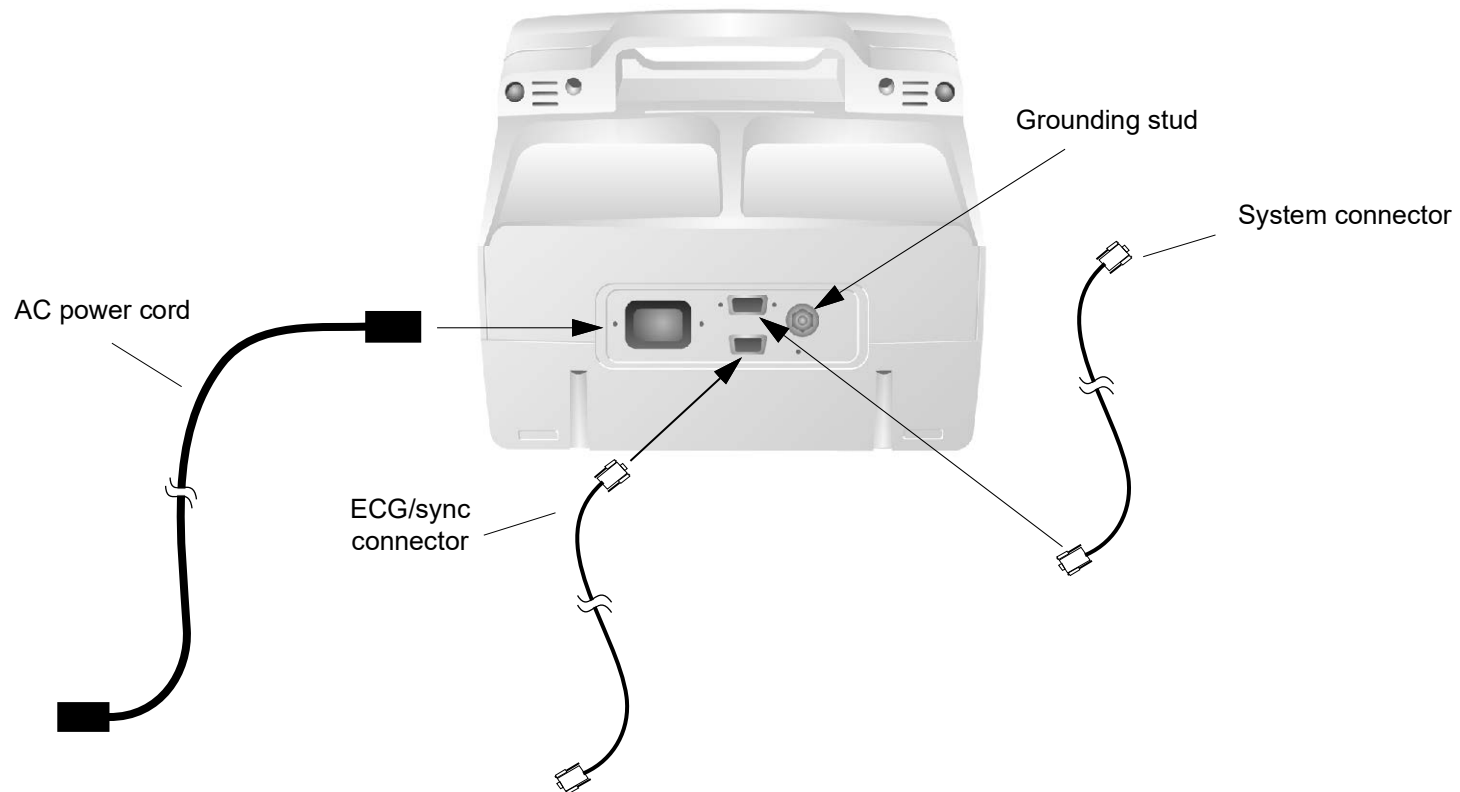


(Continued on next page)

# System Context Diagrams *(continued)*

3-17

## Back of Device





# Functional Description

3-18

## Introduction

The LIFEPAK 20e defibrillator/monitor is a medical device capable of combining a variety of therapeutic and monitoring features. In addition to automatic defibrillation, semiautomatic defibrillation, manual defibrillation, and noninvasive pacing, the device offers SpO<sub>2</sub> and ECG monitoring. With the CodeManagement Module installed, the device also offers EtCO<sub>2</sub> monitoring (see CodeManagement Module section for more information). This device should be used indoors only (for example, a hospital or therapy center) and is powered by ac (line) power. There is an additional internal battery for use as a backup to ac power.

The following functional description is intended to provide service personnel with a basic understanding of the device design. Its purpose is to assist qualified service technicians in troubleshooting to the subassembly level. Troubleshooting below the subassembly level outside the factory is not recommended, nor is it within the scope of this service manual to provide the detail necessary to support such repairs.

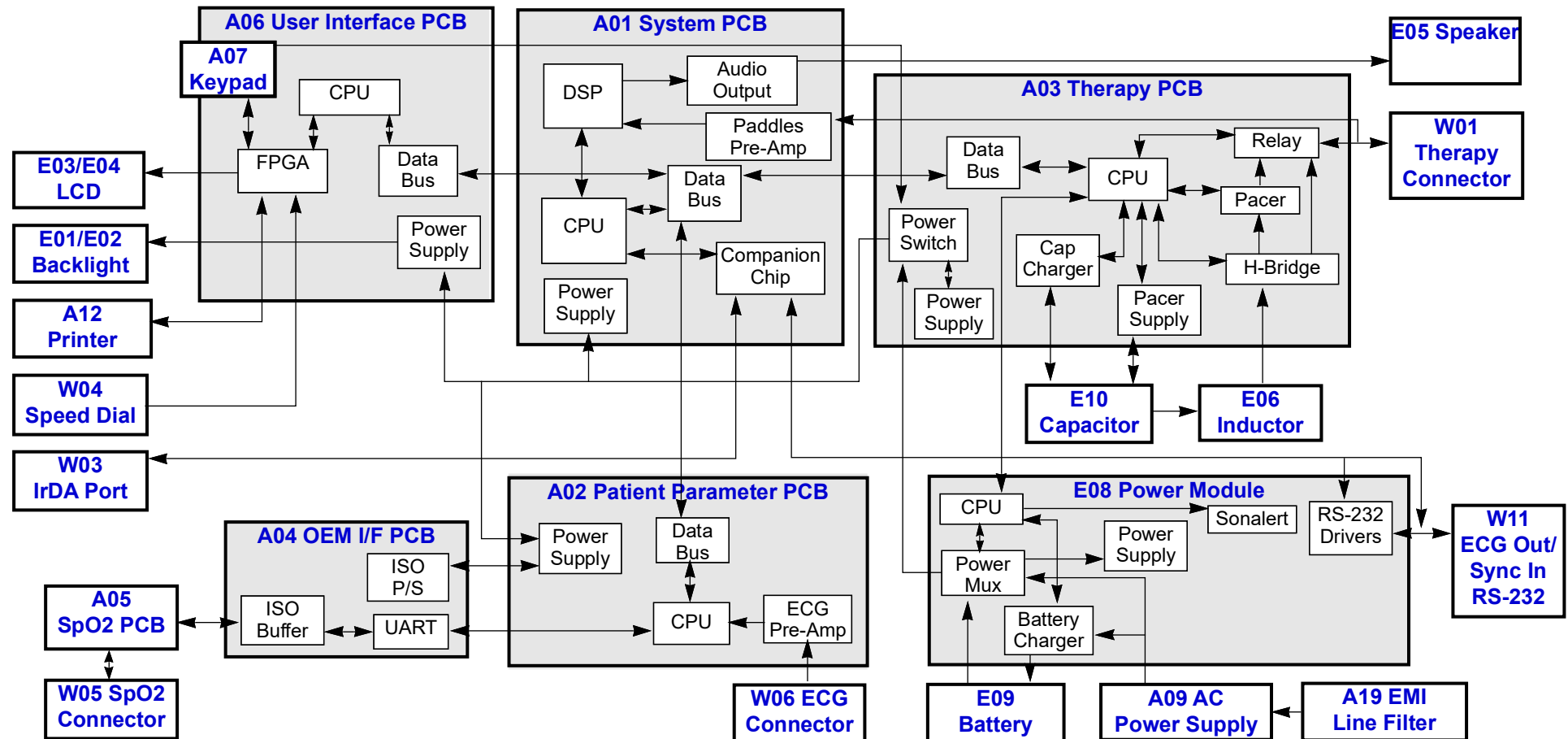
Refer to the diagrams on the next two pages as you review the descriptions that follow.

# Functional Description *(continued)*

3-19

## System Block Diagram

Click a link in the diagram below to view the descriptive text.



## Functional Description *(continued)*

3-20

### A01 System Control PCB

The **A01 System Control PCB** provides the central control for the device. A reduced instruction set computing (RISC) processor, along with a real-time clock and digital memory, serve as the central processing unit (CPU). A companion chip provides most of the discrete interfaces required within the device, including the RS-232 and IrDA external communication ports. The data bus provides high-speed communication between the A01 System Control PCB and other PCBs within the device.

The major subsystems on the A01 System Control PCB are as follows:

- **Power Supplies** — The A01 System Control PCB uses SW\_VBatt (switched battery voltage) from the A03 Therapy PCB to originate five power supplies for use throughout the PCB as follows:
  - $\pm 5$  V analog power for the analog ECG out, audio output circuitry, and bus control
  - +3.3 V logic power for the processor memory, companion chip and CPU I/O
  - +2.5 V logic power for the digital signal processor
  - +2.0 V logic power for the CPU processor chip
  - Patient-isolated  $\pm 10$  and  $\pm 5$  V analog power for the paddles pre-amp

*(Continued on next page)*

## Functional Description *(continued)*

3-21

### A01 System Control PCB *(continued)*

- **Paddles ECG Pre-Amplifier** — The paddles ECG pre-amplifier performs patient-isolation, low-pass bandwidth filtering, and ECG sampling by means of an analog-to-digital conversion (ADC) for the ECG signal received via the therapy paddles. Results from the ADC are fed into the digital signal processor (DSP) for additional filtering. Electrostatic discharge (ESD) and defibrillation protection are provided for these signals as they pass through the A03 Therapy PCB. Change in patient impedance is also measured using a 57.1 kHz carrier.
- **Digital Signal Processor (DSP)** — The DSP completes ECG digital signal processing to a diagnostic quality bandwidth, acceptable for Shock Advisory System, heart rate algorithm processing, and continuous ECG storage by the CPU. In addition, the DSP provides the necessary audio processing for voice prompts and tones, providing digital audio signals to the audio output circuitry.
- **Audio Output** — The audio output circuitry provides digital-to-analog conversion, filtering, and power analog drive circuitry for the audio tones and voice prompts. Up to 2 W of amplification are provided to drive the W02 Speaker located on the front case of the device.

## Functional Description *(continued)*

3-22

### A02 Patient Parameter PCB

The **A02 Patient Parameter PCB** collects ECG and SpO2 patient data, with the exception of the paddles ECG data, and provides preprocessed data to the system controller for AED and R-wave algorithms, alarm control, operator display and printout, and storage. Algorithms performed on the data before it is sent to the A01 System Control PCB include leads-off detection and internal pacer detection. A digital signal processor (DSP) with digital memory makes up the central processing unit (CPU) that performs these algorithms. Communication is provided to the A01 System Control PCB through the data bus.

The major subsystems on the A02 Patient Parameter PCB are as follows:

- **Power Supplies** — The A02 Patient Parameter PCB uses switched power from the A03 Therapy PCB with dc power from the E09 Battery to originate three power supply voltages for use throughout the PCB as follows:
  - +3.3 V logic power to drive the CPU digital signal processor and memory
  - +5 V analog power to drive the A04 OEM Interface PCB
  - $\pm 5$  V patient-isolated supply to drive the ECG pre-amp

*(Continued on next page)*

## Functional Description *(continued)*

3-23

### A02 Patient Parameter PCB *(continued)*

- **ECG Pre-Amplifier** — The ECG pre-amplifier performs the function of patient-isolation, low-pass bandwidth filtering, and ECG sampling through the analog-to-digital conversion (ADC) for the ECG signal received through the W06 ECG Connector. Digital signals are passed over the isolation barrier into the DSP for additional signal processing. The ECG pre-amplifier section supports either 3-wire or 5-wire ECG input.

### E08 Power Module

The **E08 Power module** is primarily responsible for selecting the best available source to power the rest of the modules/PCBs in the system from the available power sources. A microcontroller with built-in memory makes up the CPU. Communication is provided to the A03 Therapy PCB through a serial interface.

The major subsystems on the E08 Power Module are as follows:

- **Power Supplies** — The E08 Power Module uses ORed\_VBatt (battery voltage ORed with dc power from the A09 AC Power Supply Module) to originate two power supply voltages for use throughout the PCB as follows:
  - +5 V logic power to drive the CPU microcontroller and memory
  - + 3.3 V analog power to drive the power pump for the RS-232 driver circuits

*(Continued on next page)*

## Functional Description *(continued)*

3-24

### E08 Power Module *(continued)*

- **Power Mux** — The power mux switches battery power in and out of VBatt, depending on power availability and load draw within the device. This circuit is under supervisory control of the CPU and provides the current voltage from the E09 Battery and A09 AC Power Supply Module to the CPU. The circuit automatically switches from ac power to battery power if the voltage from the ac power supply falls rapidly. Low voltage is detected by the A09 AC Power Supply Module and broadcast to the other PCBs through the device internal communication buses.

*(Continued on next page)*

## Functional Description *(continued)*

3-25

### E08 Power Module *(continued)*

- **Battery Charger** (LIFEPAK 20e defibrillator/monitor) — The battery charger is a constant current-constant voltage charger designed specifically to support the A07 Lithium Ion Battery selected for the device. Li-ion batteries are not designed for trickle charging, so the A09 AC Power Supply Module keeps track of the Li-ion battery's state-of-charge and, when it drops below 85%, the battery charger initiates charging of the battery (provided the temperature is between 0° and 50° C). Charging can occur while the device is powered on or while the device is powered off, depending on need. The battery charger is designed to typically charge the internal battery in less than four hours when the device is powered off and AC power is applied.
- **Sonalert** — The sonalert is an audio tone generator located on the power module that warns the user if the device is turned off while not connected to ac power (which depletes the internal E09 Battery). This **ac loss alert alarm** can be turned off. A shipping mode setup is provided to temporarily disable this feature when packing the device for shipment.
- **RS-232 Drivers** — The RS-232 signal originates on the A01 System Control PCB. The RS-232 drivers shift the signal levels to  $\pm 12$  V prior to the system connector output.



## Functional Description *(continued)*

3-26

### A03 Therapy PCB

The **A03 Therapy PCB** controls the pacing and defibrillation therapy features. The primary communication between the A03 Therapy PCB and the remainder of the device is through the data bus. A microprocessor and digital memory make up the central processing unit (CPU) that manages communication with the A01 System Control PCB.

The major subsystems on the A03 Therapy PCB are as follows:

- **Power Supplies** — The A03 Therapy PCB uses SW\_VBatt (switched battery voltage) from the E08 Power Module to originate five power supply voltages for use throughout the PCB as follows:
  - +5 V logic power to drive the CPU microprocessor and memory
  - $\pm 15$  V analog power for the pacing and therapy drive circuit
  - Patient-isolated 5 V analog power for the pacing and therapy circuits
  - Patient-isolated 15 V analog power for the pacing and therapy circuits
  - Patient-isolated 30 V analog power for the pacing and therapy circuits

*(Continued on next page)*

## Functional Description *(continued)*

3-27

### A03 Therapy PCB *(continued)*

- **Power Switch** — A power switch is a control circuit that detects the ON button selection from the A06 User Interface PCB or a timer event from the A03 System Control PCB to power up the device. This portion of the A03 Therapy PCB is powered at all times, with very low quiescent current draw. When a power-on request is detected, this circuit switches VBatt (battery and/or ac converted dc power) provided by the E08 Power Module to the remaining PCBs in the device. Low Battery (Battery Fail) is detected and a discrete signal is broadcast to other PCBs if battery voltage falls rapidly or reaches the point where normal operation is no longer feasible.
- **Cap Charger** — The cap charger is a high-voltage, patient-isolated circuit that charges the E10 Energy Capacitor to the correct voltage for biphasic defibrillation (2 to 360 joules). Control is provided by the CPU, and capacitor voltage is provided back to the CPU for feedback. The cap charger is designed to nominally provide maximum charge rates and to automatically scale back to slower charge rates when low battery voltage is detected.
- **Pacer Power Supply** — The pacer power supply is a patient-isolated circuit that charges the E10 Energy Capacitor up to the correct voltage for pacing. Control is provided by the CPU, and voltage regulation is maintained locally within the pacer supply. Capacitor voltage is provided back to the CPU for control through the cap charger circuitry.

*(Continued on next page)*

## Functional Description *(continued)*

3-28

### A03 Therapy PCB *(continued)*

- **H-Bridge** — The H-Bridge is a patient-isolated circuit that creates the biphasic defibrillation waveform. A combination of silicon controlled rectifiers (SCR) and insulated gate bipolar transistors (IGBT) are used to place a positive-oriented defibrillation pulse across the patient load, followed immediately by a negative-oriented defibrillation pulse. The defibrillation pulse is delivered through the relay and W01 Therapy Connector assembly to the external therapy cable on the outside of the device.
- **Pacer** — The pacer is a patient-isolated circuit that creates the pacing waveform. A portion of the H-Bridge circuitry is used to support the pacer by providing energy from the E10 Defibrillation Capacitor. A current drive is used to control the amount of current provided to the patient during pacing.
- **Relay** — The relay provides patient isolation from the pacing and defibrillation circuitry when not in use. The relay is closed when the pacing current is set above zero and stays closed until the pacing current is set back to zero.

## Functional Description *(continued)*

3-29

### A06 User Interface PCB

The **A06 User Interface (UI) PCB** is responsible for the presentation of the acquired data to the screen display and to the printer, and for receiving all user input. The primary communication between the UI PCB and the remainder of the device is through the data bus. A RISC processor and digital memory make up the CPU that manages communication with the A01 System Control PCB. The W17 UI Flex Cable provides physical connection between the A06 UI PCB and the A02 Patient Parameter PCB.

The major subsystems on the A06 UI PCB are as follows:

- **Power Supplies** — The A06 UI PCB uses SW\_VBatt (switched battery voltage) from the A03 Therapy PCB to originate four power supplies for use throughout the PCB as follows:
  - +3.3 V logic power to drive the E03 Liquid Crystal Display (LCD) and the A12 Printer
  - +3.3 V logic power for the CPU processor and memory
  - +2.5 V logic power for the field-programmable gate array

*(Continued on next page)*

## Functional Description *(continued)*

3-30

### A06 User Interface PCB *(continued)*

- **Field-Programmable Gate Array (FPGA)** — The Field-Programmable Gate Array (FPGA) provides the interface between the CPU and all the user interface peripherals. The FPGA works in conjunction with the CPU to provide the 1/4 VGA signals to the E03/E04 Display, the data and strobe signals to the A12 Printer, and drive circuitry for the keypad LEDs. The FPGA converts the inputs from the keypad switch matrix and W04 Selector into digital words that can be read by the CPU.
- **Keypad** — The keypad is the primary user input control for the device. It consists of two parts, the keypad domes, which are located on the rear side of the A06 UI PCB, and the elastomer keypad cover that attaches to the front case. The keypad domes protrude through holes in the front case and enable the key covers to activate the domes when pressed by the user. The key presses are decoded by the FPGA and sent to the CPU for processing. The A06 UI PCB does not recognize the ON switch. It passes the signal to the A03 Therapy PCB.

### A04 OEM and Mechanical Components PCB

The **A04 OEM Interface PCB** provides power to and collects SpO2 data from the A05 SpO2 Module. Its primary function is to provide patient isolation between the SpO2 module and the rest of the device design. In addition, it provides physical mounting provisions for the SpO2 module.

*(Continued on next page)*

## Functional Description *(continued)*

3-31

### A04 OEM and Mechanical Components PCB *(continued)*

The major subsystems on the A04 OEM PCB are as follows:

- **Power supplies** — The A04 OEM Interface PCB uses power from the A02 Patient Parameter PCB to provide the 5 V power for the A05 SpO2 Module.
- **UART and ISO buffers** — The UART and ISO buffers provide patient isolation for the serial data signals received from the A05 SpO2 Module and routes them to the A02 Patient Parameter PCB.

### E09 Battery

On the LIFEPAK 20e defibrillator/monitor, the Li-ion battery technology was selected for the same reasons as NiMH, but they are even lighter in weight. Li-ion batteries require a constant current-constant voltage charger that is provided by the E08 Power Module when the device is connected to ac power.

*(Continued on next page)*

## Functional Description *(continued)*

3-32

### E01 Backlight Inverter PCB

The **E01 Backlight Inverter** provides power to the internal fluorescent backlight in the E03/E04 Active Display. Filtered SW\_VBatt is provided to the E01 Backlight Inverter through the A06 User Interface PCB. The output of the inverter is 1000 to 1500 RMS, open-circuit power to the internal E03/E04 Active Display backlight. The backlight driver for the LED E03/E04 Display (REF E02) has an output average output voltage of 22Vdc and current of 24 mA dc

### A09 AC Power Supply Module

The **A09 AC Power Supply Module** is a 60-Watt OEM power supply, designed to meet IEC 60601-1 standards, converting 120/240 Vac (60/50 Hz) input signals to nominal 12 Vdc. The ac power supply provides power to the E08 Power Module for routing to the other PCBs in the device. The 12 Vdc output from the ac power supply is directly diode ORed into the SW\_VBatt (switched battery voltage) to power on the A03 Therapy PCB. The E08 Power Module sits above the ac power supply and plugs directly into the ac power supply's power connector. Both the E08 Power Module and the ac power supply are held mechanically in place by the power assembly bracket.

## Functional Description *(continued)*

3-33

### A05 SpO2 Module

The **A05 SpO2 Module** can be the Masimo MS-5, MS-11 or MS-2011 oximetry module. This patented OEM module performs all functions related to oxygen saturation measurement, including sensor drive. Measurement results are passed serially through the A06 OEM Interface PCB to the A02 Patient Parameter PCB where the SpO2 data is combined with the patient ECG data and sent to the A01 System Control PCB for display processing and storage. The SpO2 module mounts directly to the A06 OEM Interface PCB.

### E04 Active Display/ Lens

The **E04 Active Display** measures 14.5 cm (5.7-inch) (measured diagonally) and uses 1/4 VGA protocol with a 320 wide by 240 high pixel array. The display has a protective lens, held in place against the front case by a sheet metal bracket, and an elastomeric seal. This display features full-color, high-brightness, wide-viewing-angle capability, and is fully visible in bright-light situations (up to direct sunlight operations). The A04 Active Display also contains an internal backlight for visibility in low-light situations. The updated A04 LED display requires the use of A08 backlight driver module.

### A12 Printer Module

The **A12 Printer Module** is a 50 mm, stepper motor-driven recorder. The printer receives serial data and commands from the A06 User Interface PCB, converts the print data, and controls the motor-drive signals to perform the “muscle” part of printing. The printer returns status signals derived from the paper supply sensor and printer door to the A06 UI PCB.



## Functional Description *(continued)*

3-34

### E10 Energy Capacitor

The **E10 Energy Capacitor** is a metalized film capacitor used for energy storage. The energy capacitor stores energy for both pacing and defibrillation therapies. The actual capacitance of the energy capacitor is calculated during the defibrillation calibration procedure. The nominal value is 196 mF. The energy on the capacitor is removed when the device is turned off. Energy is provided to the A03 Therapy PCB for pacing and defibrillation therapy through the E06 Inductor Resistor. The energy capacitor mounts above the A03 Power PCB by means of a capacitor support. Wires from the energy capacitor connect directly to the A03 Therapy PCB.

### E06 Inductive Resistor

The **E06 Inductive Resistor** is used as an internal dump load to dissipate energy from the E10 Energy Capacitor. Energy is removed (dumped) from the E10 Energy Capacitor when the device is turned off and, during operation, when energy remains on the capacitor for an extended period of time. The E06 Inductive Resistor provides a nominal 5 ohm load in the energy delivery path. The inductor mounts to the board stack bracket. Wires from the E06 Inductive Resistor connect directly to connectors on the A03 Therapy PCB.

## Functional Description *(continued)*

3-35

### A07 Elastomer Keypad

The **A07 Elastomer Keypad** displays the common device controls (those not available using the SPEED DIAL). The number of keys on this keypad varies, depending on the features installed in a specific device.

### A19 AC Input Power Filter

The **A19 AC Input Power Filter** provides input current overload and electromagnetic interference (EMI) protection for the device. The filter is a potted module containing passive filter elements (inductors and capacitors), with in-line fuses in both the line and neutral leads. The A19 AC Input Power Filter is designed to meet the safety requirements in IEC 60601-1.

### W01 Therapy Connector Assembly

The **W01 Therapy Connector Assembly** provides a patient connection port used for delivery of either defibrillation or pacing therapeutic energies. The standard and premium models allow the attachment of all available electrode accessories, including QUIK-COMBO® pacing/defibrillation/ECG electrodes, external Standard paddles (with built-in pediatric paddles), and internal paddles with discharge control. The W01 Therapy Connector mounts directly to the bottom case and the wire harness plugs directly into the A03 Therapy PCB at J13 and J14. The therapy connector protrudes through a hole in the front case to provide user access for connecting the various external cable options.

**Note:** The device supports all existing LIFEPAK 12 defibrillator/monitor accessories (including external adult paddles with posterior attachments).

## Functional Description *(continued)*

3-36

### E05 Speaker Assembly

The **E05 Speaker Assembly** is used to deliver device tones and voice prompts, including warnings and alarms. The OEM E05 Speaker is a small, compact, low-profile speaker capable of producing a one-watt output with a frequency response from 300 to 7000 Hz. The input to the speaker is from the audio power amplifier in the A01 System Control PCB. The speaker is mounted directly on the front case and the speaker wire harness plugs into the W14 Speaker Harness Extension Cable.

### W03 Infrared Data (IrDA) Assembly

The **W03 IrDA Assembly** is used to provide high-speed wireless communications to data management devices. The OEM W03 IrDA port supports IrDA version 1.1 communications with asynchronous serial rates up to 4 Mbits/second. The IrDA port is mounted directly on the bottom case and the flex circuit connects directly to the A01 System Control PCB at J08. An infrared lens is molded into the device front case directly in front of the IrDA port. The IrDA port and front case lens are aligned so that direct communications can easily be made with a portable data receiver held by an operator or placed on a table.

## Functional Description *(continued)*

3-37

### W04 Speed Dial Assembly

The **W04 Speed Dial Assembly** is a rotary data entry device mounted on the LIFEPAK 20/20e defibrillator/monitor front case. It is used to control menu access and selection for user functions that are not supported directly by hard keys on the keypad. The selector detects rotation (in either a clockwise or counterclockwise direction) and presses (clicks), and then passes this information on to the A06 UI PCB at J32 for user-input decoding.

### W05 SpO2 Assembly

The **W05 SpO2 Assembly** provides a connecting point for the external SpO2 cable. The SpO2 connector is mounted on the bottom case of the device, and the flex circuit connects directly to the A05 SpO2 Module.

### W06 ECG Connector

The **W06 ECG Connector** provides a connection point for the standard 3-lead or 5-wire patient ECG cables. The ECG connector is mounted on the bottom case of the device, and the attached wire harness connects directly with the A06 Patient Parameters PCB at J23.

**Note:** The ECG connector is compatible with the 10-wire patient ECG cable, but the device will only operate as a 5-wire cable.

### W02 Capacitor Discharge Cable

The W02 Capacitor Discharge Cable provides a capacitor discharge point by connecting to the A03 Therapy PCB at pin 5 of J02.

## Functional Description *(continued)*

3-38

### W08 Battery Cable

The W08 Battery Cable connects the E09 Battery at J85 to the E08 Power Module at J50.

### W09/W10 Power to Therapy PCB Cables

The W09 and W10 Power to Therapy PCB Cables connect the E08 Power Module to the A04 Therapy PCB. W09 is a replaceable cable that connects to the A03 Therapy PCB at J16 and to the E08 Power Module at J41.

The W10 connects to the A03 Therapy PCB at J17 and to the E08 Power Module at J51.

### W11 ECG Sync/System Cables

The W11 ECG Sync/System Cables connect the ECG sync connector and the system connector to the E08 Power Module at J47.

### M12 Grounding Cable

The W12 Grounding Cable provides a grounding path for the Speed Dial.

## Functional Description *(continued)*

3-39

### W12 AC Power Cable

The W12 AC Power Cable connects the A09 AC Power Supply Module at J49 with the E08 Power Module for the LIFEPAK 20e defibrillator/monitor.

### W13 Printer Flex Cable

The W13 Printer Flex Cable connects the A06 UI PCB at J34 with the E08 Power Module at J45 and the A12 Printer.

### W15 LCD to UI PCB Cable

The W15 LCD to UI PCB Cable connects the E03/E04 LCD Display PCB at CN1 with the A06 UI PCB at J36.

### Display Jumper Cable Extender

The Display Jumper Cable Extender connects the E03/E04 LCD Display PCB at P77 to the E01 Backlight Inverter PCB at CN2.

### W16 Backlight Inverter Cable

The W16 Backlight Inverter Cable connects the E01 Backlight Inverter PCB at P74 to the A06 UI PCB at J37.

### W17 UI Flex Cable

The W17 UI Flex Cable connects the A02 Patient Parameters PCB at J21 and J22 to the A06 UI PCB at J31.

## Functional Description *(continued)*

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3-40

### M10 – M12 Grounding Cables

The M10 through M12 Grounding Cables provide grounding paths for various device components.

### W14 Speaker Harness Extension Cable

The W14 Speaker Harness Extension Cable connects the E05 Speaker Assembly to the A01 System PCB at J5.

# Modes of Operation

When the device is turned on, it operates in one of five modes. Choose from the following links to learn more about a particular operating mode.

**[Manual Mode](#)**

**[AED Mode](#)**

**[Setup Mode](#)**

**[Saving the Setup Configuration](#)**

**[Service Mode](#)**

**[Inservice Mode](#)**



# Manual Mode

4-2

## Turning On the Device in Manual Mode

Manual mode enables the user to determine when to deliver a shock.

To configure the device to turn on in manual mode (the default is AED mode):

1. Display the **SETUP** menu and select MANUAL MODE.
2. Select MANUAL ACCESS in the MANUAL MODE submenu.
3. Select the DIRECT option.

The following table shows all the available power-on options.

Mode/Response	Response Description
Manual/Direct	Turns on in manual mode; direct access between AED and manual modes.
AED/Direct	Turns on in AED mode; direct access between AED and manual modes.
AED/Confirmed	Turns on in AED mode; confirmation required to enter manual mode.
AED/Passcode	Turns on in AED mode; passcode required to enter manual mode.

If the device is placed in manual mode and then reset to AED mode by pressing the ANALYZE button, there are no additional manual mode reprompts or passcode requests until the device power has been cycled.

(Continued on next page)

## Manual Mode *(continued)*

4-3

### Starting Manual Mode from AED Mode

If the AED MODE LED is on when the device is turned on, the device is in **AED Mode**.

To enter manual mode:

- Open the door (if installed) by pressing the MANUAL button on the lower left corner of the door.
- OR-
- Press one of the following buttons:
  - ENERGY SELECT
  - CHARGE
  - PACER
  - LEAD

To restart AED mode, press the ANALYZE button or cycle the device power.

**Note:** Closing the door when in manual mode does not restart AED mode operation.

## AED Mode

4-4

In AED mode (the default setting), the device automatically evaluates the patient rhythm to determine if a shock is needed and prompts the user to press the SHOCK button to deliver a shock.

The device can be reconfigured to turn on in **manual mode**, if desired.

To set options for AED mode, display the **SETUP** menu and select AED MODE. AED mode options include energy protocol, voice prompts, ECG display, CPR time, and others. For a complete description of the options available, refer to the *Setup Options* section in the operating instructions.

**Note:** If configured to turn on in AED mode, opening the door on the device turns off AED mode and places the device in **manual mode**. Closing the door does not restart AED mode operation. To restart AED mode, press ANALYZE or cycle the device power.

# Setup Mode

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4-5

## Introduction

The operating defaults for the device are configured in the SETUP menu. Options include **manual mode** and **AED mode** operating characteristics, alarm setup, time-of-day clock, and others. There is also a factory-reset option that resets the device to the factory default settings, except the maintenance interval, which remains unchanged. After the setup is complete, turn off the device to save the configuration. The next time the device is turned on, the operating defaults last selected will be active.

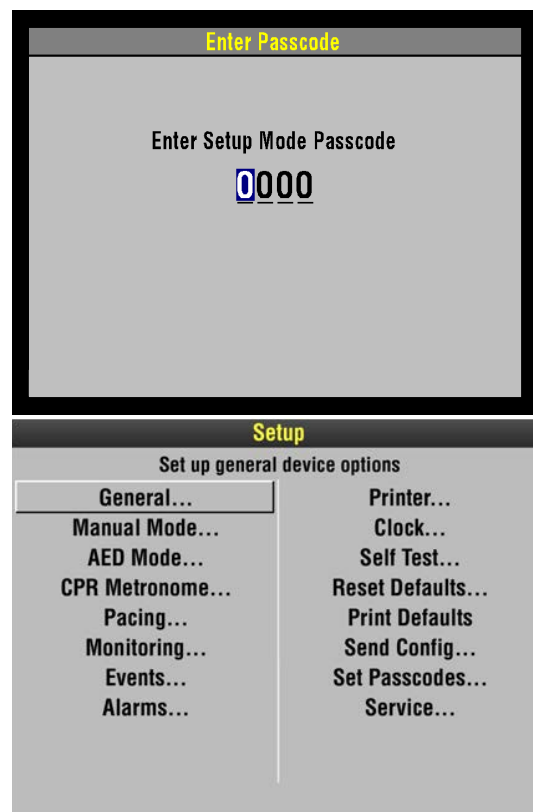
For a complete description of setup options, refer to the *Setup Options* section in the operating instructions.

(Continued on next page)

## Setup Mode *(continued)*

4-6

### Displaying the Setup Menu



To display the SETUP menu:

1. Press ON while holding down OPTIONS and EVENT. Continue to hold these controls down until the passcode screen appears.
2. Enter the passcode by scrolling through the digits in the highlighted fields.

**Note:** The factory default passcode (0000) or the reserved technician passcode (5433 or LIFE) can be used in place of other passcodes to gain access to the SETUP and SERVICE menus.

3. Select the digit. The digit changes to a dot to protect the passcode. If you enter the correct digit, the next number in line highlights automatically. When you have entered the correct passcode, the setup overlay appears. If you enter the passcode incorrectly, the message PASSCODE INCORRECT-TRY AGAIN appears again in the status message area. You have three chances to enter the passcode correctly. Turn the power off and on to start again.

To exit the SETUP menu, turn the device OFF.

*(Continued on next page)*

# Setup Mode *(continued)*

## Setup Menu Options

The following table defines the SETUP menu options.

**Note:** Refer to the *Setup Options* section in the operating instructions for complete descriptions of all options.

Option	Description
GENERAL	Set up general device options
MANUAL MODE	Set up manual mode defaults
AED MODE	Set up AED mode defaults
CPR METRONOME	Set up CPR metronome defaults
PACING	Set up pacing defaults
MONITORING	Set up monitoring defaults
EVENTS	Set up items to appear on the event overlay
ALARMS	Set up alarms defaults
PRINTER	Set up printer defaults
CLOCK	Set up date and time defaults
RESET DEFAULTS	Reset all defaults to factory configuration settings

*(Continued on next page)*

## Setup Mode *(continued)*

4-8

### Setup Menu Options *(continued)*

Option	Description
PRINT DEFAULTS	Print a report of current configuration settings.
SEND CONFIG	Send device configuration to another device.
SET PASSCODE	Set passcodes for setup mode and archives mode.
SERVICE	Display the SERVICE menu.

### Saving the Setup Configuration

If the device owner uses a setup configuration that cannot be disturbed, the setup can be preserved during repair procedures.

- To save the setup configuration, use SETUP menu to print the setup configuration. When service is complete, you can verify the setup and then manually reset the configuration.

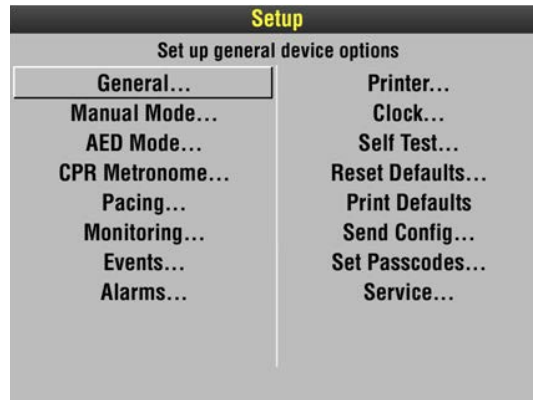
Saving the configuration by transferring it to another device requires that both devices have the same software version. Otherwise, unexpected results can occur when the configuration is restored to the repaired device.

*(Continued on next page)*

## Setup Mode *(continued)*

4-9

### Creating a Passcode



To create a passcode, select SET PASSCODES in the SETUP menu.

Select one of the following options in the SET PASSCODES submenu. .

Option	Description
SETUP MODE	Set passcode to enter setup mode.
ARCHIVES ACCESS	Select a passcode access protocol for archives mode: 1. No Passcode (default)      3. Delete Only 2. Archives Only                4. Archive/Delete
ARCHIVES MODE	Set passcode to enter archives mode.
DELETE RECORDS	Set passcode to delete records in archives mode.

*(Continued on next page)*



## Setup Mode *(continued)*

4-10

### Creating a Passcode

- ARCHIVES ACCESS – Set the device to any of the following protocols (refer to the table above):
  1. Allow unlimited access to archives mode and allow records to be deleted.
  2. Require a password to enter archives mode, but allow records to be deleted.
  3. Allow unlimited access to archives mode, but require a password to delete records.
  4. Require a password to enter archives mode and delete records setup
- MODE – Create a new passcode to access the SETUP menu. The ENTER PASSCODE overlay appears with the first digit highlighted. Rotate the SPEED DIAL to select digits.
- ARCHIVES MODE – Create a passcode to enter archives mode. The ENTER PASSCODE overlay appears with the first digit highlighted. Rotate the SPEED DIAL to select digits.
- DELETE RECORDS – Create a passcode to delete records in archives mode. The ENTER PASSCODE overlay appears with the first digit highlighted. Rotate the SPEED DIAL to select digits.

# Service Mode

## Introduction

The service mode functions enable qualified service technicians to:

Function	Description	
*Perform device calibration routines	■ Defibrillation Calibration	
*Perform device tests	■ Keypad Test	■ Printer Test
	■ Pixels Test	■ Audio Test
View the device status registers	■ Device Log Status	■ Counters Status
	■ Service Log Status	■ Clear Memory
	■ Device Data	
Set the service mode passcode		
Set the maintenance prompt interval		
Reset the maintenance prompt interval		

\* The **performance inspection procedure** must be performed from start to finish in the order presented.

(Continued on next page)

# Service Mode *(continued)*

## Displaying the Service Menu

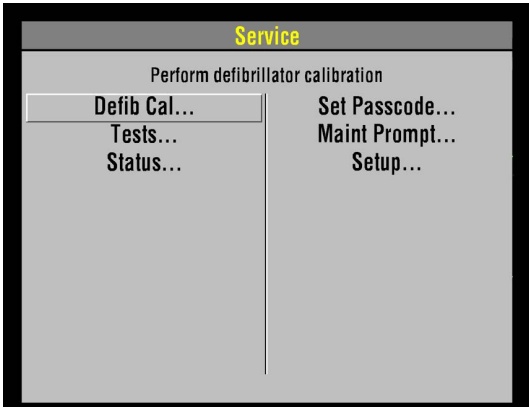
- To display the SERVICE menu:
1. Display the **SETUP** menu.
  2. Select SERVICE from the SETUP menu.
  3. Enter the service mode passcode (0000 or 5433).
  4. After you enter the passcode, press the SPEED DIAL. The SERVICE menu appears. (If an incorrect passcode is entered, the PASSCODE INCORRECT - TRY AGAIN message appears.)

## Service Menu Options

The SERVICE menu options include:

Option	Description
<b>Defib Cal</b>	Perform defibrillator calibration procedure.
<b>Tests</b>	Follow performance inspection procedure.
<b>Status</b>	Display device status.
<b>Set Passcode</b>	Set the service mode access passcode.
<b>Maint Prompt</b>	Prompt user to perform preventative maintenance.
Setup	Return to main SETUP menu.

To exit the SERVICE menu, turn the device OFF.



*(Continued on next page)*

## Service Mode *(continued)*

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4-13

### Setting the Service Mode Passcode

To set a service mode passcode:

1. Select SET PASSCODE in the SERVICE menu. The SERVICE/SET PASSCODE overlay appears.
2. Enter a passcode by rotating the SPEED DIAL to select a number and then pressing the SPEED DIAL.
3. When the last digit is entered, the SERVICE menu appears.

*(Continued on next page)*

## Service Mode *(continued)*

4-14

### Setting a Maintenance Prompt Interval

The LIFEPAK 20e defibrillator/monitor can be set to display a screen message that alerts the user when the maintenance prompt interval date has passed. The screen message MAINTENANCE DUE appears on the screen for the first 10 minutes after the device is powered on. The device maintenance interval can be turned off or set to 3 months, 6 months, or 12 months; the factory default is OFF, but it can be activated by a service technician.

To change the scheduled maintenance interval:

1. Display the SERVICE menu.
2. Select MAINT PROMPT. The SERVICE/MAINT PROMPT submenu appears showing the current prompt date for scheduled maintenance (if set).
3. Select INTERVAL. The interval choices are: OFF, 3 MONTHS, 6 MONTHS, and 12 MONTHS.
4. Select the desired interval.
5. Turn the device OFF.

*(Continued on next page)*

## Service Mode *(continued)*

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4-15

### Resetting the Maintenance Prompt

After completing scheduled maintenance, reset the maintenance prompt counter to clear the MAINTENANCE DUE message and begin the count for the next scheduled maintenance.

To turn off or reset the scheduled maintenance prompt:

1. Display the SERVICE menu.
2. Select MAINT PROMPT. The SERVICE/MAINT PROMPT menu appears, showing the current prompt date for scheduled maintenance.
3. Select RESET. The prompt date is revised to the next scheduled maintenance date.
4. Turn the device OFF.

# Inservice Mode

4-16

## Introduction

Inservice mode enables users to practice or demonstrate the monitoring functions of the device. The functions include:

- Selecting ECG lead selection, size, and volume, and moving ECG waveform with heart rate
- SpO2
- Alarms
- Events

**Note:** No therapy features are available in the Inservice mode.

## Entering Inservice Mode

To enter Inservice mode:

1. Remove all cables from the device. Inservice mode cannot be entered if cables are attached to the device.
2. While holding down the HOME and EVENT buttons, turn the device ON. Release these buttons when the INSERVICE overlay appears.

To exit Inservice mode, turn the device OFF.

# Performance Inspection Procedures

The Performance Inspection Procedures (PIP), document reference number 3201896, are a set of manual test procedures used for an operational closed-case evaluation of the LIFEPAK 20e defibrillator/monitor (device). The PIP describes the test procedures you will perform to determine if the device is operating within the required specifications. Investigate and correct any malfunctions or out-of-tolerance conditions detected during the PIP.

The PIP is comprised of safety and performance tests recommended by AHA/ ASHE (American Hospital Association/American Society for Hospital Engineering) Maintenance Management for Medical Equipment and International Electrotechnical Commission (IEC) Technical Report 1288-2, Maintenance of Cardiac Defibrillators-Monitors.

Perform the PIP as part of a regularly scheduled preventive maintenance routine. Perform the PIP after any repair, replacement, or calibration procedure. Use the PIP Checklist to record test results. Refer to the Operator Checklist for additional items.



# Troubleshooting

This section describes service event code usage, interpretation, and corrective action, and provides a separate troubleshooting chart for the performance inspection procedure (PIP) and individual troubleshooting tests that require operator interpretation. Choose from the following topics:

**Processing Service Codes**

**Troubleshooting Chart**

**Service Code Categories**

**Service Code Table**

**Service Indicator**

**Device User Test**

**Device Printed Circuit Board Replacement**

# Processing Service Codes

6-2

## Introduction

When an internal program or process fails to execute properly, a service code is logged and the service indicator LED turns ON. Service codes rarely occur and should be investigated thoroughly by qualified service personnel before the device is placed back into active use. Always complete the performance inspection procedure (PIP) after encountering and clearing any service code(s).

Service codes stored in the **Service Log** may not necessarily indicate a permanent error. Service codes can indicate transient electromagnetic interference (EMI) or **electrostatic discharge (ESD)**. If you suspect transient EMI or ESD as the source of an error, clear the service code(s), and cycle the power. If the service code does not reoccur, it may have been the result of EMI or ESD.

## Processing Service Codes

To process service code(s):

1. Note any problems with the device and consult the **Troubleshooting Chart**.
2. Review service codes in the **Service Log**. Record the service code(s), including the date, time, and service code extension.
3. Select CLEAR LOG in the service log, and then turn the device OFF.

*(Continued on next page)*

## Processing Service Codes *(continued)*

6-3

### Processing Service Codes *(continued)*

4. Complete the performance inspection procedure (PIP).
  - If completed successfully, the device may be returned to regular use. (The service code(s) may have been related to EMI or ESD.)
  - If the service LED turns ON at any time during the PIP, stop the PIP and continue to the next step in this procedure.
5. Consult the [Troubleshooting Chart](#) for the suggested corrective action for your PIP failure.  
-OR-  
Review the [Service Log](#) codes, and then locate the service code in the [Service Code Table](#).  
**Note:** Use the links in the [Service Code Categories](#) table to quickly jump to the correct code in the Service Code Table.
6. Read the corrective action(s). If the corrective action calls for the replacement of a part, click the link in the Troubleshooting Chart or click the appropriate part in the footer at the bottom of the Service Code Table pages to jump to the corrective action process.
7. Service the device based on these inputs, and then repeat the PIP.
8. For persistent error codes, contact your local Stryker service or sales representative.

# Troubleshooting Chart

6-4

Area	Observed Symptom	Suggested Corrective Action
Physical Inspection	Loose or broken hardware	Locate and tighten or replace loose items. Locate and replace broken components.
	Evidence of dirt, fluids, or foreign objects	Perform <b>external cleaning</b> .
	Damaged keypad or labels	<b>Replace elastomer keypad</b> . Replace product identification label. Replace explosion/hazard label. Replace operating instruction label.
Power Off	Device beeps when turned off	Connect device to ac power source. Disable <b>AC Loss Alert alarm</b> .

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-5

Area	Observed Symptom	Suggested Corrective Action
Power On	Display on, no power-on LED	Check or <b>replace the W17 UI Flex Cable</b> . Check or <b>replace the A06 UI PCB</b> . <b>Replace the A03 Therapy PCB</b> .
	Continuous reset	<b>Replace the A01 System PCB</b> .
	Frozen at the power-on screen	Check or <b>replace the W18 UI Flex Cable</b> . <b>Replace the A01 System PCB</b> .
	Distorted display	<b>Replace the A06 UI PCB</b> .
	Service indicator remains on	Refer to <b>Processing Service Codes</b> for assistance.
	MAINTENANCE DUE message remains on screen	<b>Set the Maintenance Prompt interval</b> . <b>Reset the Maintenance Prompt interval</b> .
Keypad	Improper button response	Perform keypad test. Check or <b>replace the elastomer keypad</b> . <b>Replace the A06 UI PCB</b> .
	Standard paddle buttons	Perform keypad test. Check or replace standard paddles. Check or <b>replace the W01 Therapy Connector</b> . <b>Replace the A03 Therapy PCB</b> .

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-6

Area	Observed Symptom	Suggested Corrective Action
Printer	Not printing	Perform printer test. Check for proper paper. Check for 3.3 V on <b>pins 14 and 16 on the J38 test connector</b> on the A06 UI PCB. ■ If either is higher than 3.3 V, <b>replace the W14 Printer Flex Cable</b> . ■ If both are lower than 3.3 V: – Check or <b>replace the A12 Printer Assembly</b> . – <b>Replace the A06 UI PCB</b> .
	Light print	Verify use of proper paper. Check the W14 Printer Flex Cable connection. Check or <b>replace the A06 UI PCB</b> .
	Missing or broken characters	Verify use of proper paper. Clean the printhead. Check or <b>replace the A12 Printer Assembly</b> .

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-7

Area	Observed Symptom	Suggested Corrective Action
Audio	Inaudible or garbled audio	Perform the voice tone test. Check the speaker connection. Check or <b>replace the W02 Speaker Assembly</b> . Check or <b>replace the A01 System PCB</b> .
Power source management	No backup battery operation	<b>Replace the E09 Battery</b> . Check or <b>replace the E08 Power Module</b> .
Therapy - delivered energy	Unable to complete auto test or user test	Rerun the test with proper test load shorting. Check continuity of the test plug or shorting bar. Check continuity of the QUIK-COMBO® cable. Check or <b>replace the W01 Therapy Connector</b> . <b>Replace the A03 Therapy PCB</b> .
	Delivered energy out of tolerance	Perform defibrillator calibration.
Patient impedance channel broken	Abnormal energy delivery	Check or <b>replace the E06 Inductive Resistor</b> (less than 5 ohms). Check or <b>replace the A03 Therapy PCB</b> . <b>Replace the A01 System PCB</b> .

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-8

Area	Observed Symptom	Suggested Corrective Action
Patient impedance channel broken <i>(continued)</i>	Low patient impedance	If tested into a 50 ohm load during 3:00 AM test, rerun test with correct test plug. If test passes, complete PIP. If test fails, <b>replace the A01 System PCB.</b>
	Therapy cable leads off (QUIK-COMBO® only)	Check continuity of the QUIK-COMBO® cable; replace if necessary. Check continuity of the <b>W01 Therapy Connector</b> ; replace if necessary. <b>Replace the A01 System PCB.</b>
Therapy - Synchronous cardioversion	No paddles channel sync mark	Check or replace the Therapy cable. Check or <b>replace the W01 Therapy Connector.</b> <b>Replace the A01 System PCB.</b>
	No lead channel sync mark	Check for noisy ECG signal. Check or replace the ECG cable. Check or <b>replace the W06 ECG connector.</b> Check or <b>replace the A02 Patient Parameter PCB.</b> <b>Replace the A01 System PCB.</b>

*(Continued on next page)*



# Troubleshooting Chart *(continued)*

6-9

Area	Observed Symptom	Suggested Corrective Action
Therapy - Synchronous cardioversion <i>(continued)</i>	Failure to transfer coincident with sync mark	<p>Check sync marker placement on R-wave. Perform the keypad test.</p> <ul style="list-style-type: none"> <li>■ If test fails, <b>replace the A06 UI PCB.</b></li> <li>■ If test passes, run the user test and troubleshoot error code.</li> </ul>
Pacer option characteristics	Pacer does not turn on	<p>Verify manufacturer configuration bit setting. Perform keypad test:</p> <ul style="list-style-type: none"> <li>■ If test fails, check key tactile feedback. <ul style="list-style-type: none"> <li>– <b>Replace the elastomer keypad.</b></li> <li>– <b>Replace the A06 UI PCB.</b></li> </ul> </li> <li>■ If test passes, follow error code procedure.</li> </ul>
	Pacing current/rate out of tolerance	Check or <b>replace the A03 Therapy PCB.</b>
ECG lead characteristics	No ECG	<p>Check or replace the ECG cable. Check or <b>replace the W06 ECG Connector.</b> <b>Replace the A02 Patient Parameter PCB.</b></p>

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-10

Area	Observed Symptom	Suggested Corrective Action
ECG lead characteristics <i>(continued)</i>	No amplitude ECG	Check or replace the ECG cable. <b>Replace the A02 Patient Parameter PCB.</b>
	ECG gain out of tolerance	Check simulator output. Check or replace the ECG cable. Check or <b>replace the A02 Patient Parameter PCB.</b>
Therapy - Paddle ECG lead characteristics	ECG gain out of tolerance	Check simulator output. Check or replace the therapy cable. Check or <b>replace the A01 System PCB.</b>
	ECG analog out (missing or out of tolerance)	Check simulator output. Check ECG on display. Check W11 ECG out connector.
Remote sync	No remote sync	Turn on remote sync function. Check ECG Out/Sync In connector. If bad, <b>replace the E08 Power module.</b> Check or replace the W09 Power Cable. Check or <b>replace the A01 System PCB.</b> Check or <b>replace the E08 Power module.</b>

*(Continued on next page)*

# Troubleshooting Chart *(continued)*

6-11

Area	Observed Symptom	Suggested Corrective Action
Oximeter	No SpO2 response (no cable detected)	Check or replace the SpO2 cable. Check or replace the SpO2 sensor. Check or <b>replace the W05 SpO2 Assembly</b> .
	Saturation reading missing or out of tolerance	Check or replace the SpO2 cable. Check or replace the SpO2 sensor. Check or <b>replace the W05 SpO2 Assembly</b> . Check or replace the A04 OEM PCB.
Speed Dial	Speed Dial not functioning	Check or <b>replace the W04 Speed Dial Assembly</b> . <b>Replace the A06 UI PCB</b> .
No ac power reminder tone	No alert	Check user configuration setting. <b>Replace the E08 Power module</b> .
Grounding resistance	Fails ground resistance test	Check or replace the power cord. <b>Replace the E08 Power module</b> .
Leakage current	Fails chassis leakage test	<b>Replace the E08 Power module</b> .

# Service Code Categories

6-12

Codes are organized into the following categories, in four-digit hexadecimal format:

Initial Digit	Category	Description	Associated PCBs and Assemblies
<b>0xxx</b>	UT	Utilities	A01 System
<b>1xxx</b>	UI	User Interface	A01 System, A03 Therapy, A06 UI, A12 Printer, W13 Printer Flex Cable, W17 UI Flex Cable
<b>2xxx</b>	DC	Data Communications	A01 System
<b>3xxx</b>	DM	Data Management	A01 System
<b>4xxx</b>	SM	System Monitor	A01 System, A03 Therapy, A06 UI, W17 UI Flex Cable
<b>50xx</b>	PC	Processor Control	A01 System, A02 PP PCB, A03 Therapy, A06 UI, W17 UI Flex Cable
<b>51xx</b>	PM	Power Management	E08 Power Module, A03 Therapy, E09 Battery, W08 Battery Cable
<b>6xxx</b>	PP	Patient Parameter – SpO2	A02 PP PCB, A04 OEM PCB, A05 SpO2 Module
<b>8xxx</b>	DSP	Digital Signal Processor	A01 System, A02 PP PCB
<b>9xxx</b>	TH	Therapy	A01 System, E08 Power Module, A03 Therapy, E09 Battery
<b>axxx</b>	PR	Printer	A12 Printer
<b>bxxx</b>	BM	Behavior Manager	A01 System

# Service Code Table

6-13

Code	Service Code Description	Corrective Action
0002	System Flash memory voltage error	Replace the A01 System PCB
0003	Cannot erase system Flash memory	Replace the A01 System PCB
0004	Cannot write to system Flash memory	Replace the A01 System PCB
0006	System ADC read error	Replace the A01 System PCB
0007	System DAC not responding	Replace the A01 System PCB
0008	ECG OUT DAC self-test failed	Replace the A01 System PCB
000a	System ADC background test failed	Replace the A01 System PCB
000b	System ADC failed self-calibration	Replace the A01 System PCB
000c	System Flash memory ID unknown	Replace the A01 System PCB
000d	System hardware/software configuration lost	Replace the A01 System PCB
100e	UI – system communication lost	<ol style="list-style-type: none"> <li>1. Replace the W17 UI Flex Cable</li> <li>2. Replace the A06 UI PCB</li> <li>3. Replace the A01 System PCB</li> </ol>
100f	Display update timer error	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>

\* Use software loader tool in forced update mode (Continued on next page)

A01 System PCB

A06 UI PCB

W17 UI Flex Cable

## Service Code Table *(continued)*

6-14

Code	Service Code Description	Corrective Action Code
1010	Display update queue error	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
1013	System detected unexpected UI reset	<ol style="list-style-type: none"> <li>1. Replace the W17 UI Flex Cable</li> <li>2. Replace the A06 UI PCB</li> </ol>
1014	Voice prompt/audio watchdog failure	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
1015	USB data time-out error	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the W17 UI Flex Cable</li> </ol>
1c01	UI FPGA programming error	Replace the A06 UI PCB
1c02	UI FPGA verification error	Replace the A06 UI PCB
1c03	UI FPGA program file error	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A06 UI PCB</li> </ol>
1c04	UI ADC not functioning	Replace the A06 UI PCB

*(Continued on next page)*

A01 System PCB

A06 UI PCB

W17 UI Flex Cable

## Service Code Table *(continued)*

6-15

Code	Service Code Description	Corrective Action
1c05	Printer ADC out of tolerance (temperature)	<ol style="list-style-type: none"> <li>1. Check the W13 Printer Flex Cable</li> <li>2. Replace the A12 Printer</li> <li>3. Replace the A06 UI PCB</li> </ol>
1c06	Printer ADC out of tolerance (voltage)	<ol style="list-style-type: none"> <li>1. Check the W13 Printer Flex Cable</li> <li>2. Replace the A12 Printer</li> <li>3. Replace the A06 UI PCB</li> </ol>
1c07	UI voltage out of tolerance (5 V)	Replace the A06 UI PCB
1c08	UI voltage out of tolerance (3.3 V)	Replace the A06 UI PCB
1c09	UI voltage out of tolerance (2.5 V)	Replace the A06 UI PCB
1c0a	UI voltage out of tolerance (35 V)	Replace the A06 UI PCB
1c0b	UI voltage out of tolerance (SW VBATT)	Replace the A06 UI PCB
1c0c	UI voltage out of tolerance (ground)	Replace the A06 UI PCB
1c0f	UI hardware I.D. corrupted	Replace the A06 UI PCB
1c10	UI boot program corrupted	Replace the A06 UI PCB

*(Continued on next page)*

W13 Printer Flex Cable

A12 Printer

A06 UI PCB

## Service Code Table *(continued)*

6-16

Code	Service Code Description	Corrective Action
1c11	UI application Flash memory corrupted	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A06 UI PCB</li> </ol>
1c12	UI font Flash memory corrupted	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A06 UI PCB</li> </ol>
1c13	UI FPGA Flash memory corrupted	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A06 UI PCB</li> </ol>
1c16	UI CPU RAM test failed on power-on	Replace the A06 UI PCB
1c17	UI CPU RAM test failed during normal operation	Replace the A06 UI PCB
1fff	Additional information related to error code that is logged before 1fff	No action required; refer to error code logged before 1fff.
2004	System cannot initialize serial port (system connector)	Replace the A01 System PCB
2005	System cannot initialize driver for serial port (system connector)	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>

*(Continued on next page)*

A01 System PCB

A06 UI PCB



## Service Code Table *(continued)*

6-17

Code	Service Code Description	Corrective Action
3001	System cannot use data management (DM) Flash memory	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
3002	System data management Flash memory corrupted	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
3005	System cannot delete DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
3007	System cannot create new DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
3008	System could not store DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>

*(Continued on next page)*

### A01 System PCB

## Service Code Table *(continued)*

6-18

Code	Service Code Description	Corrective Action
3009	System could not erase oldest DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
300a	System cannot clear DM memory	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
300b	System error writing DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
300c	System cannot read archived DM record	<ol style="list-style-type: none"> <li>1. Clear memory (service mode)</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
3010	System error DM memory corrupt	Replace the A01 System PCB
3fff	Additional information related to error code that is logged before 3fff	No action required; refer to error code logged before 3fff.

*(Continued on next page)*

### A01 System PCB

## Service Code Table *(continued)*

6-19

Code	Service Code Description	Corrective Action
4005	System NVRAM error log	<ol style="list-style-type: none"> <li>1. Replace the coin cell battery</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
4006	Error log queue not functioning	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
4008	Error log count corrupted	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
4009	System RAM test failed	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
400a	System program Flash memory corrupted	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
400b	Program contents failure	<ol style="list-style-type: none"> <li>1. Check coin-cell battery</li> <li>2. If error still occur, Replace A01 System PCB</li> </ol>
400c	System ADC voltage low	Replace the A01 System PCB
400d	System ADC voltage high	Replace the A01 System PCB

*(Continued on next page)*

A01 System PCB

Coin Battery

## Service Code Table *(continued)*

6-20

Code	Service Code Description	Corrective Action
4010	Service LED failed	<ol style="list-style-type: none"> <li>1. Replace the W17 UI Flex Cable</li> <li>2. Replace the A06 UI PCB</li> <li>3. Replace the A03 Therapy PCB</li> </ol>
4012	Voice Flash memory corrupted	Reload the device software*
4013	Voice/font Flash memory invalid	Reload the device software*
4fff	Additional information related to error code that is logged before 4fff	No action required for 4fff; refer to error code logged before 4fff.
5003	System watchdog failed	Replace the A01 System PCB
5004	System watchdog reset	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
5005	System CPU error during boot-up	Replace the A01 System PCB
5006	System RAM failed during boot-up	Replace the A01 System PCB
5007	System checksum failure during boot-up	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
5008	System boot program failure	Replace the A01 System PCB

*(Continued on next page)*

A01 System PCB

A03 Therapy PCB

A06 UI PCB

W17 UI Flex Cable

## Service Code Table *(continued)*

6-21

Code	Service Code Description	Corrective Action
5009	Real-time clock (RTC) access failed	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
500a	Coin cell battery not detected	<ol style="list-style-type: none"> <li>1. Replace the coin cell battery</li> <li>2. Replace the A01 System PCB</li> </ol>
500b	Cannot use system NVRAM	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
500c	System application start error	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
500d	System software initialization time out	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
500e	System application start error	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
5010	Configuration mismatch	Replace the coin cell battery

*(Continued on next page)*

A01 System PCB

Coin Battery

## Service Code Table *(continued)*

6-22

Code	Service Code Description	Corrective Action
5011	NVRAM configuration data error	1. Replace the coin cell battery 2. Reload the device software*
5012	Configuration data error	Replace the coin cell battery
5013	System meter initialization error	Reload the device software*
5014	System meter mismatch	Replace the coin cell battery
5015	NVRAM error	Replace the A01 System PCB
5016	MFG data mismatch	Replace the A01 System PCB
5017	NVRAM MFG data lost	Replace the A01 System PCB
5018	Watchdog reset failed	Replace the A01 System PCB
5019	NVRAM corrupted	Replace the coin cell battery
501a	NVRAM corrupted	Replace the coin cell battery
501c	RTC not running	1. Replace the coin cell battery 2. Replace the A01 System PCB

*(Continued on next page)*

A01 System PCB

Coin Battery

## Service Code Table *(continued)*

6-23

Code	Service Code Description	Corrective Action
501d	RTC out of sync	<ol style="list-style-type: none"> <li>1. Replace the coin cell battery</li> <li>2. Replace the A01 System PCB</li> </ol>
501e	System software execution error	Reload the device software*
501f	System software read error	Reload the device software*
5020	System software write error	Reload the device software*
5021	System software error	Reload the device software*
5022	System software exception code	Reload the device software*
5023	System software exception code	Reload the device software*
5024	System software exception code	Reload the device software*
5026	NVRAM low battery interrupt	Replace the coin cell battery
5027	System USB did not initialize	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
5028	PP USB did not initialize	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A02 PP PCB</li> </ol>

*(Continued on next page)*

A01 System PCB

A02 PP PCB

Coin Battery

## Service Code Table *(continued)*

6-24

Code	Service Code Description	Corrective Action
5029	Therapy USB did not initialize	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
502a	UI USB did not initialize	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the W17 UI Flex Cable</li> <li>3. Replace the A06 UI PCB</li> </ol>
502b	USB system failed	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
502f	Device type invalid	<ol style="list-style-type: none"> <li>1. Check configuration code</li> <li>2. Set device type (software loader program)</li> <li>3. Replace the A01 System PCB</li> </ol>
5030	PP USB disconnect	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A02 PP PCB</li> </ol>
5031	UI USB disconnect	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the W17 UI Flex Cable</li> <li>3. Replace the A06 UI PCB</li> </ol>

*(Continued on next page)*

A03 Therapy PCB

A01 System PCB

A06 UI PCB

A02 PP PCB

W17 UI Flex Cable



## Service Code Table *(continued)*

6-25

Code	Service Code Description	Corrective Action
5032	Therapy USB disconnect	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
5033	PP USB download time out	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Reload the device software*</li> </ol>
5036	USB initialization failed	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
5037	USB initialization error	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Reload the device software*</li> <li>3. Replace the A01 System PCB</li> </ol>
5038	Cannot clear interrupt source	Replace the A01 System PCB
5039	Bus error reported by USB PP channel	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A02 PP PCB</li> <li>3. Replace the A01 System PCB</li> </ol>

*(Continued on next page)*

A01 System PCB

A02 PP PCB

A03 Therapy PCB

A06 UI PCB

## Service Code Table *(continued)*

6-26

Code	Service Code Description	Corrective Action
503a	Bus error reported by USB UI channel	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A06 UI PCB</li> <li>3. Replace the A01 System PCB</li> </ol>
503b	Bus error reported by USB therapy channel	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A03 Therapy PCB</li> <li>3. Replace the A01 System PCB</li> </ol>
503c	USB host driver cannot create transfer descriptor	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
503d	USB host driver received message larger than maximum allowed	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
5040	Inconsistent RTC time	Replace the A01 System PCB

*(Continued on next page)*

A01 System PCB

E08 Power Module

E09 Battery

## Service Code Table *(continued)*

6-27

Code	Service Code Description	Corrective Action
5105	Battery failed to reach charge in 2.5 hours	<ol style="list-style-type: none"> <li>1. Replace the E09 Battery</li> <li>2. Replace the E08 Power module</li> </ol>
5106	Power supply out of tolerance	<ol style="list-style-type: none"> <li>1. If power supply voltage is &gt;14 Vdc, replace E08 Power module</li> <li>2. If <math>\leq 14</math> Vdc, clear error and perform PIP</li> </ol>
5107	Power module RAM error	Replace the E08 Power module
5108	Power module self-test service code	Replace the E08 Power module
510a	Battery <10 V after 20 minutes of charging	<ol style="list-style-type: none"> <li>1. Replace the E09 Battery</li> <li>2. Replace the E08 Power module</li> </ol>
510b	Does not switch to battery power	Replace the E08 Power module
510c	Does not detect ac disconnect	Replace the E08 Power module
510d	Battery powered when connected to ac power	Replace the E08 Power module
510e	Battery <10 V after charge cycle	Replace the E09 Battery

*(Continued on next page)*

E08 Power Module

A03 Therapy PCB

E09 Battery

## Service Code Table *(continued)*

6-28

Code	Service Code Description	Corrective Action
510f	Battery charge cycle stopped	<ol style="list-style-type: none"> <li>1. Check battery connection</li> <li>2. Replace the E09 Battery</li> <li>3. Replace the E08 Power module</li> </ol>
5110	AC isolation diode shorted	Replace the E08 Power module
5112	Battery not detected	<ol style="list-style-type: none"> <li>1. Check the E09 Battery connection</li> <li>2. Check W08 Battery Cable</li> <li>3. Check for valid power hardware ID in SERVICE/STATUS/DEVICE DATA overlay</li> <li>4. Replace the E09 Battery</li> <li>5. Invalid power hardware ID; replace the E08 Power module</li> <li>6. Valid power hardware ID; replace the A03 Therapy PCB</li> </ol>

*(Continued on next page)*

E08 Power Module

E09 Battery

## Service Code Table *(continued)*

6-29

Code	Service Code Description	Corrective Action
5115	Battery thermistor <400 Ohms	Replace E09 Battery (LIFEPAK 20e) Ohm measurement of white wires of A07 Battery <ul style="list-style-type: none"> <li>■ Replace the E09 Battery if &lt;400 Ohms</li> <li>■ Replace the E08 Power module if &gt;400 Ohms</li> </ul>
5116	Charger reporting zero during battery charging	Replace the E08 Power module
5117	No 12C connection detected (LIFEPAK 20e only)	1. Replace the E09 Battery 2. Replace the E08 Power module
5118	Power module connected to NiMH battery (LIFEPAK 20 only)	Replace the E09 Battery
511a	Battery failure	Replace the E09 Battery
5fff	Additional information related to error code that is logged before 5fff	No action required for 5fff; refer to error code logged before 5fff

*(Continued on next page)*

A04 OEM PCB

A02 PP PCB

## Service Code Table *(continued)*

6-30

Code	Service Code Description	Corrective Action
6002	PP program corrupted	Reload the device software*
6003	PP program not found	Reload the device software*
6004	PP boot-up error	Reload the device software*
6009	No PP data	Reload the device software*
600c	SpO2 misconfigured	1. Check configuration 2. Reload the device software*
600e	PP reset	1. Reload the device software* 2. Replace the A02 PP PCB
600f	OEM configuration error	1. Check configuration 2. Reload the device software*
6010	PP initialization error	Reload the device software*
6018	Incorrect updated SpO2 image	Replace the A04 OEM PCB
6019	Incorrect updated SpO2 image CRC	Replace the A04 OEM PCB

*(Continued on next page)*

A02 PP PCB

A05 SpO2 Module

## Service Code Table *(continued)*

6-31

Code	Service Code Description	Corrective Action
6801	PP power supply out of tolerance	Replace the A02 PP PCB
6802	PP pre-amp data invalid	1. Clear error and perform PIP 2. Replace the A02 PP PCB
6804	PP data RAM test error	1. Clear error and perform PIP 2. Replace the A02 PP PCB
6805	PP RAM test error	1. Clear error and perform PIP 2. Replace the A02 PP PCB
6806	PP CRC test error	1. Clear error and perform PIP 2. Replace the A02 PP PCB
6807	PP ECG test error	1. Clear error and perform PIP 2. Replace the A02 PP PCB
680b	SpO2 board error	Replace the A05 SpO2 Module
6fff	Additional information related to error code that is logged before 6fff	No action required for 6fff; refer to error logged before 6fff.

*(Continued on next page)*

### A01 System PCB

## Service Code Table *(continued)*

6-32

Code	Service Code Description	Corrective Action
800a	System DSP error	Reload the device software*
8013	Voice format error	Reload the device software*
8014	No paddles data	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
801b	DSP did not receive USB SOF (start of frame) interrupt	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
8105	Impedance channel out of calibration	Replace the A01 System PCB
8108	Paddles data out of sync	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A01 System PCB</li> </ol>
8109	Paddles pre-amp user test failed	<ol style="list-style-type: none"> <li>1. Rerun the user test</li> <li>2. Replace the A01 System PCB</li> </ol>
810b	Real impedance <-30 ohms for one second	<ol style="list-style-type: none"> <li>1. Perform TCP - defibrillator calibration</li> <li>2. Replace the A01 System PCB</li> </ol>

*(Continued on next page)*

A01 System PCB

E09 Battery

A03 Therapy PCB



## Service Code Table *(continued)*

6-33

Code	Service Code Description	Corrective Action
8fff	Additional information related to error code that is logged before 8fff	No action required for 8fff; refer to error logged before 8fff.
9004	Unable to initialize therapy control	Replace the A01 System PCB
9005	Defib disabled	Replace the A01 System PCB
9007	Shock not delivered	Reload the device software*
9009	Defib charge time expired	Replace the E09 Battery
900b	Pacing rate out of tolerance	Replace the A01 System PCB
900f	Unable to initialize therapy control	<ol style="list-style-type: none"> <li>1. Check the stack connector</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
9011	Pacer fault	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
9017	Pacer disabled	Reload the device software*
901a	Pacer rate storage corrupted	Reload the device software*

*(Continued on next page)*

A01 System PCB

A03 Therapy PCB

## Service Code Table *(continued)*

6-34

Code	Service Code Description	Corrective Action
901b	Therapy PCB communication lost	<ol style="list-style-type: none"> <li>1. Check the stack connector</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
901d	Testing purpose only	Replace the A01 System PCB
9021	Impedance value indicates regulator in System PCB pre-amp failed	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A01 System PCB</li> </ol>
9c03	Therapy processor, unplanned reset	Replace the A03 Therapy PCB
9c04	Therapy/system controller communication watchdog	Replace the A01 System PCB
9c05	CRC error	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
9c06	Calibration constant A out of range	<ol style="list-style-type: none"> <li>1. Perform TCP - defibrillator calibration</li> <li>2. Clear Service Log</li> </ol>
9c07	Calibration constant B out of range	<ol style="list-style-type: none"> <li>1. Perform TCP - defibrillator calibration</li> <li>2. Clear Service Log</li> </ol>

*(Continued on next page)*

E08 Power Module

A03 Therapy PCB

## Service Code Table *(continued)*

6-35

Code	Service Code Description	Corrective Action
9c08	Therapy ROM cyclic redundancy check (CRC) failed	<ol style="list-style-type: none"> <li>1. Reload the device software*</li> <li>2. Replace the A03 Therapy PCB</li> </ol>
9c09	Therapy RAM pattern write test failed	Replace the A03 Therapy PCB
9c0a	Therapy relay idle coil voltage out of range	Replace the A03 Therapy PCB
9c0b	Therapy relay enabled coil voltage out of range (5 ms)	Replace the A03 Therapy PCB
9c0c	Therapy relay enabled coil voltage out of range (100 ms)	Replace the A03 Therapy PCB
9c0d	Therapy relay drive enabled coil voltage out of range	Replace the A03 Therapy PCB
9c0f	Therapy/power assembly communication error	<ol style="list-style-type: none"> <li>1. Check power module 26-pin ribbon cable to J16 or A03 Therapy PCB</li> <li>2. Replace the E08 Power module</li> <li>3. Replace the A03 Therapy PCB</li> </ol>
9c11	Capacitor Dump failed	Replace the A03 Therapy PCB
9c12	Therapy PCB 5 V out of range	Replace the A03 Therapy PCB

*(Continued on next page)*

A01 System PCB

A03 Therapy PCB

## Service Code Table *(continued)*

6-36

Code	Service Code Description	Corrective Action
9c13	Therapy PCB 15 V out of range	Replace the A03 Therapy PCB
9c14	Therapy PCB -15 V out of range	Replace the A03 Therapy PCB
9c15	Therapy ADC time out error	Replace the A03 Therapy PCB
9c18	3:00 AM H bridge test: NE leg shorted	Replace the A03 Therapy PCB
9c19	3:00 AM H bridge test: SE leg shorted	Replace the A03 Therapy PCB
9c1a	3:00 AM H bridge test: NW leg shorted	Replace the A03 Therapy PCB
9c1b	3:00 AM H bridge test: SW leg shorted	Replace the A03 Therapy PCB
9c1c	3:00 AM H bridge test: east side stuck open	Replace the A03 Therapy PCB
9c1d	3:00 AM H bridge test: west side stuck open	Replace the A03 Therapy PCB
9c1e	3:00 AM H bridge test: charge time out of range	<ol style="list-style-type: none"> <li>1. Perform TCP - defibrillator calibration</li> <li>2. Clear Service Log</li> </ol>

*(Continued on next page)*

### A03 Therapy PCB

## Service Code Table *(continued)*

6-37

Code	Service Code Description	Corrective Action
9c1f	3:00 AM shorted paddles relay contact test: relay shorted	<ol style="list-style-type: none"> <li>1. Inductive resister is not connected or is open</li> <li>2. Replace the A03 Therapy PCB</li> <li>3. Replace the A01 System PCB</li> </ol>
9c20	3:00 AM shorted paddles relay contact test: relay shorted	Replace the A03 Therapy PCB
9c21	3:00 AM pace drive test: pace power supply stuck on	Replace the A03 Therapy PCB
9c22	3:00 AM pace drive test: pace power supply inoperable	Replace the A03 Therapy PCB
9c23	3:00 AM pace drive test: relay contacts shorted	Replace the A03 Therapy PCB
9c24	3:00 AM pace drive test: relay drive low side shorted	Replace the A03 Therapy PCB
9c25	3:00 AM pace drive test: relay drive high side shorted	Replace the A03 Therapy PCB
9c26	3:00 AM pace drive test: pace FET shorted	Replace the A03 Therapy PCB
9c27	3:00 AM pace drive test: pace current path open	Replace the A03 Therapy PCB
9c28	3:00 AM pace drive test: pace set point error	Replace the A03 Therapy PCB

*(Continued on next page)*

### A03 Therapy PCB

## Service Code Table *(continued)*

6-38

Code	Service Code Description	Corrective Action
9c29	3:00 AM redundant controls test: redundant controls stuck on	Replace the A03 Therapy PCB
9c2a	3:00 AM redundant controls test: enable 2 stuck on	Replace the A03 Therapy PCB
9c2b	3:00 AM redundant controls test: enable 1 stuck on	Replace the A03 Therapy PCB
9c2c	Capacitor voltage per pacing pulse too high	Replace the A03 Therapy PCB
9c2d	Capacitor current per pacing pulse too high	Replace the A03 Therapy PCB
9c2e	Cap current per pacing pulse too high	Replace the A03 Therapy PCB
9c2f	Pacing current and selected current out of range	Replace the A03 Therapy PCB
9c30	Pacing pulse width too short	Replace the A03 Therapy PCB
9c31	Pacing pulse width too long	Replace the A03 Therapy PCB
9c32	Capacitor voltage and predicted capacitor voltage mismatch	1. Energy capacitor is not connected or is open 2. Replace the A03 Therapy PCB
9c35	Therapy CPU instruction test failed	Replace the A03 Therapy PCB

*(Continued on next page)*

### A03 Therapy PCB

## Service Code Table *(continued)*

6-39

Code	Service Code Description	Corrective Action
9c36	Therapy software stack overflow	Reload the device software*
9c3a	Energy capacitor overvoltage error	Replace the A03 Therapy PCB
9c3b	3:00 AM redundant controls test: charge rate stuck on	Replace the A03 Therapy PCB
9c3e	Therapy software error	Replace the A03 Therapy PCB
9c3f	Therapy software error	Replace the A03 Therapy PCB

*(Continued on next page)*

### A03 Therapy PCB

## Service Code Table *(continued)*

6-40

Code	Service Code Description	Corrective Action
a00b	Printer communication lost	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Reload the device software*</li> </ol>
a00e	Printer initialization error	Reload the device software*
b001	Invalid state request	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP</li> <li>2. Replace A01 System PCB</li> </ol>
b011	System behavior manager error	Reload the device software*
b012	Energy cap charging time out	Reload the device software*
b013	Shock advisory system error	Reload the device software*
b014	Shock advisory system time out	Reload the device software*
b016	Motion detect timer error	Reload the device software*
b017	Shock result time out	Reload the device software*
b018	USB interrupt error	<ol style="list-style-type: none"> <li>1. Clear error and perform PIP.</li> <li>2. Replace A01 System PCB.</li> </ol>

*(Continued on next page)*

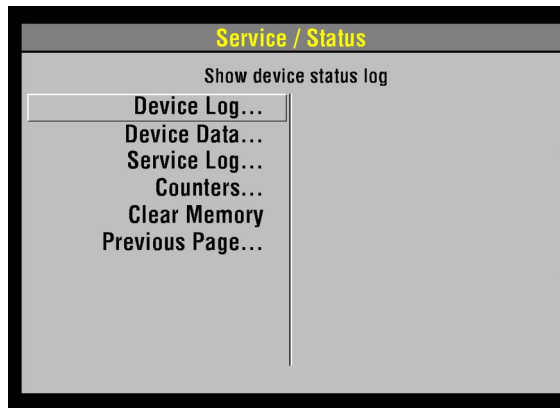
### A01 System PCB



# Using the Service/Status Features

6-41

## Accessing the Service/Status Features



The SERVICE/STATUS submenu includes options that provide information such as stored manufacturing data, recorded errors, and counters for shock and pacing operation.

To display the SERVICE/STATUS submenu, access the **SERVICE** menu and select STATUS.

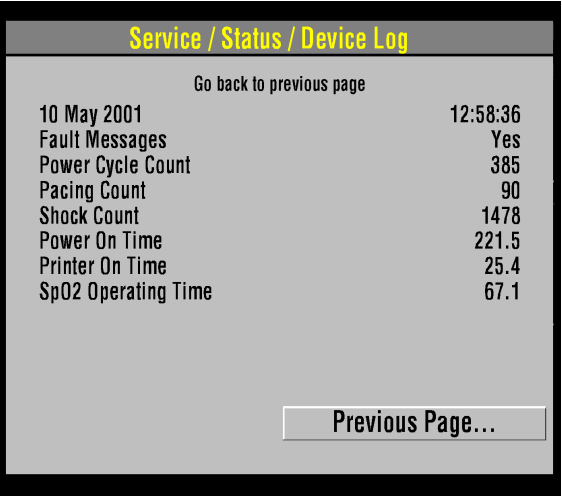
The SERVICE/STATUS options include:

Option	Description
<b>Device Log</b>	Show device status log
<b>Device Data</b>	Show device data
<b>Service Log</b>	Show service log
<b>Counters</b>	Display shock counters
<b>Clear Memory</b>	Clear data management memory

(Continued on next page)

# Using the Service/Status Features *(continued)*

## Device Log



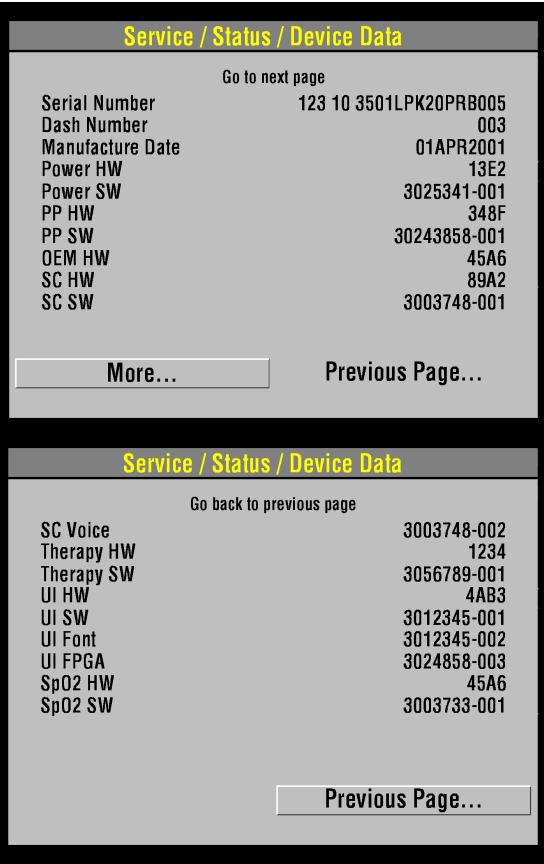
Select DEVICE LOG on the SERVICE/STATUS submenu to view essential device characteristics, such as when the operating software was installed, and accumulative device operations, such as the shock count. The device log data includes the following information:

Data	Description
Manufacturing date	The date when the device was manufactured, specifically, when the operating software was loaded.
Fault Messages	Indicates whether there are any error codes stored in the Service Log (refer to <b>Processing Service Codes</b> ).
Power Cycle Count	The number of times the device has been powered on.
Pacing Count	Total pacing pulses delivered by the device.
Shock Count	Total times the device defibrillation capacitor has been charged.
Power On Time	Total device power-on time.
Printer On Time	Total printer running time.
SpO2 Operating Time	Total SpO2 running time.

(Continued on next page)

# Using the Service/Status Features *(continued)*

## Device Data



Select DEVICE DATA on the SERVICE/STATUS submenu to view essential device characteristics, such as the serial number, and accumulative device operations, such as the shock count.

The device data includes:

Data	Description
Serial Number	Device serial number
Dash Number	Device dash number
Manufacture Date	Date device was built
Power HW	Power assembly hardware serial number
Power SW	Power assembly software version number
PP HW	Patient parameter PCB hardware serial number
PP SW	Patient parameter PCB software version number
OEM HW	OEM PCB hardware serial number
SC HW	System controller hardware serial number

*(Continued on next page)*

## Using the Service/Status Features *(continued)*

6-44

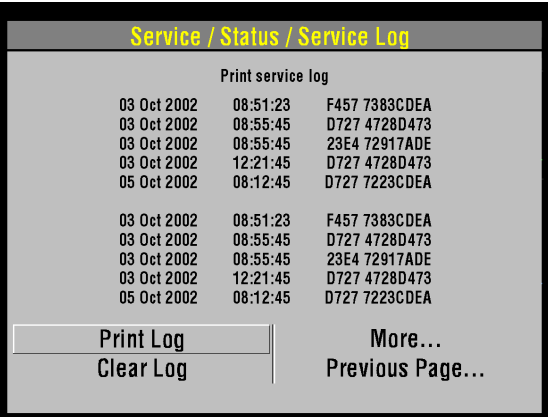
### Device Data *(continued)*

Data	Description
SC SW	System controller software version number
SC Voice	System controller voice prompt version
Therapy HW	Therapy PCB hardware serial number
Therapy SW	Therapy PCB software version number
UI HW	User interface hardware serial number
UI SW	User interface software version number
UI FPGA	User interface field programmable E program
SpO2 HW	SpO2 hardware serial number
SpO2 SW	SpO2 software version number

*(Continued on next page)*

# Using the Service/Status Features *(continued)*

## Service Log



Select SERVICE LOG on the SERVICE/STATUS submenu to view the device service record.

The service log includes the following information:

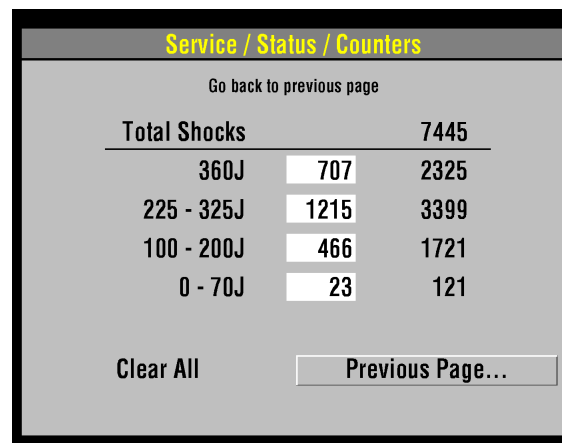
Data	Description
Service dates	Service log entries (service codes)
PRINT LOG button	Prints the service log
CLEAR LOG button	Clears the service log

(Continued on next page)

## Using the Service/Status Features *(continued)*

6-46

### Counters



Service / Status / Counters		
Go back to previous page		
Total Shocks		7445
360J	707	2325
225 - 325J	1215	3399
100 - 200J	466	1721
0 - 70J	23	121
Clear All	Previous Page...	

Select COUNTERS on the SERVICE/STATUS submenu to view the joule settings, the total number of shocks delivered since the last reset, and the total number of shocks delivered since the device went into operation.

To reset the counters, select CLEAR ALL. This resets the boxed subtotal counters but not the running-total counters. You can also reset the counters using the CLEAR MEMORY feature discussed on the next page.

*(Continued on next page)*

## Using the Service/Status Features *(continued)*

6-47

### Clear Memory

Select CLEAR MEMORY on the SERVICE/STATUS submenu to clear the flash data management memory on the A02 Memory PCB. A count-down timer appears to indicate the clearing process, which requires approximately 30 seconds.

Specifically, it clears the following:

- ECG data — All stored ECG data (up to 45 minutes of first-in-first-out continuous ECG waveforms) are permanently deleted.
- Patient reports — All stored patient reports are permanently deleted.

Clear the data management memory when the device is placed into new or different use and the old patient data is no longer required. The data management memory is also cleared as part of some service actions.

**Note:** Clearing the data management memory is permanent; there is no undo. To save important patient data before clearing the memory, print the individual patient data (refer to the *Data Management* section in the operating instructions).

## Service Indicator

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6-48

The service indicator LED does not indicate the presence of errors in the Service Log. The service indicator LED illuminates when a service code is written to the Service Log. Refer to [Processing Service Codes](#) to resolve the problem.

For example, if the service indicator illuminates when you turn on the device, a service code has been written to the Service Log. If you cycle the power, and the service indicator does not illuminate again, it does not mean that there are no codes in the Service Log. You must review the Service Log and resolve the service code that was written there in the first instance.



## Device User Test

6-49

When you turn on the device, a series of self-tests occur. If errors are detected, the service indicator LED illuminates and a printed report indicates that the test failed. Self-testing does not occur only at power-on; it is continuous while the device is turned on.

Pressing the OPTIONS button and selecting USER TEST does not initiate a self-test cycle; rather, it monitors self-test status and produces reports. The device waits until the next self-test cycle is complete and then reports USER TEST PASSES.

One operation is specific to the OPTIONS/USER TEST feature. This operation consists of one cycle of charging the defibrillator capacitor to 10 joules and then dumping the charge. If this operation does not pass, the service indicator LED illuminates and an error is written to the Service Log (refer to [Processing Service Codes](#)).

## Device Printed Circuit Board Replacement

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6-50

Anytime a printed circuit board (PCB) is replaced, then reloading of device system software to the current version is required.

The device system software are multiple software programs maintained on the circuit boards within the LIFEPAK 20 defibrillator/monitor, know as a device software set. This device software set is documented as a single software version and part number. Updating the software will maintain the device at a known released device system software set.

Device Software set can by install by using the LIFENET System Asset management tools or by contacting your local Stryker service or sales representative.

# Preventive Maintenance

Periodic maintenance, inspection, and testing of the device helps detect and prevent possible electrical and mechanical problems. When scheduled maintenance is due for the device, the MAINTENANCE DUE message displays for approximately 10 minutes each time the device is turned on (if a maintenance interval is set). To set and reset the maintenance interval, refer to [Setting a Maintenance Prompt Interval](#) and [Resetting the Maintenance Prompt](#).

For information about battery-related topics, refer to [Battery Maintenance](#). The information in this section includes the following:

## [Maintenance and Testing Guidelines](#)

### [Cleaning](#)

### [Device Useful Life](#)

### [Support Policy](#)

### [Storing the Device](#)

### [Recycling](#)

# Maintenance and Testing Guidelines

Periodic maintenance, inspection, and testing of the device will help prevent possible electrical and mechanical problems. Refer to the *Operator Checklist* in the operating instructions for additional items.

The following table shows the schedule for preventive maintenance activities. For items that should be replaced at regular intervals, refer to scheduled replacement Items shown below.

Activity	As Needed	Scheduled
Performance Inspection Procedure (PIP)	X	Annually
Test and Calibration Procedures (TCP)	X	
Exterior Physical Inspection	X	
Interior Physical Inspection	X	
External Cleaning Procedure	X	
Internal Cleaning Procedure	X	
Coin Battery Replacement		5 years
A07 Battery Replacement		2 years

# Cleaning

## Cleaning Tools and Materials

The tools and materials that you will need to perform an external and internal cleaning of the device are listed below.

Product	Description
Static-discharge-protected work area	Grounded conductive surface and wrist strap
Isopropyl alcohol	
Quaternary ammonium compounds	
Peracetic (peroxide) acid solutions	
Cotton swabs	
Vacuum cleaner	
Soft-bristle brush	Nonmetallic
Cloth	Clean and lint-free
Compressed air	Clean and dry (60 psi, maximum)

## Cleaning *(continued)*

7-4

### External Cleaning Procedure

#### **WARNING!**

**Shock or fire hazard.** Do not immerse or soak any portion of this device in water or any other fluid. Avoid spilling any fluid on the device or accessories.

#### **CAUTION!**

**Possible equipment damage.** Do not clean any part of this device or accessories with bleach, bleach dilution, or phenolic compounds. Do not use abrasive or flammable cleaning agents. Do not attempt to sterilize this device or any accessories unless otherwise specified in the accessory operating instructions.

Clean the LIFEPAK 20e defibrillator/monitor, cables, and accessories with a damp sponge or cloth. Use only the cleaning agents listed below:

- Quaternary ammonium compounds
- Isopropyl alcohol
- Peracetic (peroxide) acid solutions

## Cleaning *(continued)*

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7-5

### SpO2 Cleaning Procedure

To clean the SpO2 sensor, disconnect it from the patient cable and clean the LNOP DCI by wiping it with a 70% isopropyl alcohol pad. Allow the sensor to dry before placing back in use.

Clean the patient cable by wiping it with a 70% isopropyl alcohol pad and allowing it to dry. Do not soak or immerse the cable in any liquid solution. Do not attempt to sterilize.

## Cleaning *(continued)*

7-6

### Internal Cleaning Procedure

#### **WARNING!**

**Shock hazard.** The energy storage capacitor carries high voltage. Remove the battery and discharge the capacitor before handling.

#### **CAUTION!**

**Possible case damage.** Do not clean any part of this device or accessories with bleach, bleach dilution, or phenolic compounds. Do not use abrasive or flammable cleaning agents. Do not attempt to sterilize this device or any accessories unless otherwise specified in accessory operating instructions.

Clean the interior of the device as described below.

1. Brush interior surfaces and parts with a nonmetallic, soft-bristle brush.
2. Remove loosened dirt and dust using a dry, low-pressure compressed air (60 psi) or vacuum cleaner.
3. Wipe metal surfaces with a soft, nonabrasive cloth that has been dampened with isopropyl alcohol.



## Device Useful Life

7-7

During product development, the device and subassemblies are subjected to rigorous life testing. This testing and the routine testing and maintenance program recommended in this service manual will help provide reliable device operation for many years.

However, both rapid technological changes and the availability of replacement parts limit the useful life of all modern medical devices. The American Hospital Association suggests a five-year useful life expectancy for defibrillators (*Estimated Useful Lives of Depreciable Hospital Assets, Revised 1998 Edition*). Similarly, the U.S. Army lists an eight-year life expectancy for defibrillators (technical bulletin: *Maintenance Expenditure Limits for Medical Materiel, TB MED 7 Revision 8 October 1993*).

## Support Policy

Stryker provides full technical support and replacement parts for a period of eight years from the date of shipment from our manufacturing facility. After this eight-year period, Stryker provides technical support and replacement parts on an as-available basis.

# Storing the Device

7-8

When not in use, or during long periods of storage, connect the device to ac power. If this is not possible, fully charge the batteries at an ambient room temperature, not to exceed 25° C (77° F), prior to storage and before use.

**Note:** Do not store or ship the device without turning off the AC Loss Alert alarm.

## AC Loss Alert Alarm

The device is equipped with an alarm that beeps when the device is turned off and not connected to an ac power source. The alarm can be configured to beep at 5-, 15-, or 30-minute intervals, or it can be turned off. The default setting is 15 minutes.

To set or disable the alarm:

1. Display the **SETUP** menu.
2. Select GENERAL from the SETUP menu.
3. Select AC LOSS ALERT from the SETUP/GENERAL submenu.
4. Select 5 MINUTES, 15 MINUTES, 30 MINUTES, or NEVER ALERT to set or turn off the alarm.

# Recycling

7-9

Recycle the device at the end of its useful life.

- Recycling assistance — The defibrillator and its accessories should be recycled according to national and local regulations. Contact your local Stryker representative for assistance or refer to <https://www.stryker.com/us/en/emergency-care/recycling.html>.
- Preparation — The device should be clean and contaminant-free prior to being recycled.
- Recycling disposable electrodes — After using disposable electrodes, follow your local clinical procedures for recycling.
- Recycling batteries — Refer to [Discarding/Recycling Batteries](#).
- Packaging — Packaging should be recycled according to national and local regulations.

# Battery Maintenance

Follow the guidelines described in this section to help maximize battery life and performance.

## **Types of Batteries**

## **Charging the Backup Battery**

## **Discarding/Recycling Batteries**

## Types of Batteries

8-2

AC power is the main power source for the device.

There is one backup battery located in the bottom case.

- The LIFEPAK 20e defibrillator/monitor uses a 9-cell, lithium-ion (Li-ion) battery.
- The CodeManagement Module uses a 3-cell, lithium-ion (Li-ion) battery.

### **WARNING!**

**The LIFEPAK 20e defibrillator/monitor battery will not be charged or may be charged incorrectly if a battery other than a Stryker battery is used.**

This battery is not intended to be used as the primary power source. If the primary power source is removed, due to power outage or other reason, the backup battery will power the device for at least two hours.

The device also has a coin cell battery that delivers a continuous flow of power to the internal clock and other accessories. This battery has a greater than five-year life span. It is not rechargeable and should be replaced at the end of its life.

## Charging the Backup Battery

8-3

The LIFEPAK 20e defibrillator/monitor has a built-in, constant, current-constant voltage charger that recharges a completely discharged backup battery in approximately four hours when ac power is connected to the device. The charger does not recharge the battery until the Li-ion battery's state-of-charge drops below 85%.

**Note:** The LIFEPAK 20e defibrillator/monitor will only initiate battery charging if the battery pack is below 40° C. If extensive defibrillator shocks have been applied to a device in a high ambient temperature, the battery will not immediately start charging.

The CodeManagement Module has a built-in lithium-ion battery charger that recharges a completely discharged backup battery in 4 hours when ac power is connected to the device. The battery should be replaced every two years. Battery replacement must be performed by qualified service personnel.

## Discarding/Recycling Batteries

8-4

A battery should be considered to be at end of its useful life if one or more of the following circumstances occur:

- There is physical damage to the battery.
- The battery is leaking.
- The battery charges to 80% or less of full charge capacity.

Recycle batteries according to national and local regulations. Contact Stryker Technical Support for assistance at 1.800.442.1142, or refer to [strykeremergencycare.com/recycling/](http://strykeremergencycare.com/recycling/) for disposal instructions.

### **WARNING!**

**Risk of fire, explosion, and burns.** Do not recharge, disassemble, crush, heat above 100°C (212°F), incinerate, or mistreat batteries.

# Replacement Procedures

Replacement procedures are a set of detailed instructions for disassembly, handling, and reassembly of replaceable [LIFEPAK 20e defibrillator/monitor assemblies](#).

Replacement procedures for the CodeManagement Module are provided in the [CodeManagement Module](#) section of this service manual.

Perform an **interior inspection** whenever the device case is opened for service.

When disconnecting cables and wire harnesses, label the cables and connections so that they match easily during reassembly (for example, J1, J3, etc.). See the [LP20e Interconnect Diagram](#) for additional information.

**Note:** Within replacement procedures, item numbers in parentheses refer to parts that are in the section's Parts List.

## [Repair Procedures Index](#)

## [Warnings and Cautions](#)

## [Static-Sensitive Devices \(SSD\)](#)

## [Using the Capacitor Discharge Tool](#)

## [Saving the Setup Configuration](#)

## [Main Assemblies](#)

*(Continued on next page)*



# Replacement Procedures (continued)

## **LP20e Interconnect Diagram**

9-2

### **Top Case**

### **Front Case**

### **Boardstack**

### **Bottom Case**

### **Final Assembly**

### **Service Replacement Kits**

### **Device Part Number and Serial Number (continued)**

### **Ordering Parts**

# Repair Procedures Index

Choose from the following replacement procedures (procedures are listed in device disassembly order from left to right):

## Battery Replacement

### Top Case

<a href="#">Parts List</a>	<a href="#">Top Case Removal</a>	<a href="#">Top Case Installation</a>
----------------------------	----------------------------------	---------------------------------------

### Front Case

<a href="#">Assembly Diagram (Front View)</a>	<a href="#">Assembly Diagram (Rear View)</a>	<a href="#">Parts List</a>
<a href="#">Front Case Disassembly</a>	<a href="#">Front Case Reassembly</a>	<a href="#">Front Case Removal</a>
<a href="#">Front Case Installation</a>	<a href="#">Grounding Harness Orientation</a>	<a href="#">AED Door Replacement</a>
<a href="#">W17 UI Flex Cable Removal</a>	<a href="#">W17 UI Flex Cable Installation</a>	<a href="#">A07 Elastomer Keypad Removal</a>
<a href="#">A07 Elastomer Keypad Installation</a>	<a href="#">E03/E04 Active Display Removal</a>	<a href="#">E03/E04 Active Display Installation</a>
<a href="#">E01 Backlight Inverter PCB Diagram</a>	<a href="#">E03/E04 Active Display Diagram</a>	<a href="#">W16 Backlight Inverter Cable Diagrams</a>
<a href="#">A06 User Interface (UI) PCB Removal</a>	<a href="#">A06 User Interface (UI) PCB Installation</a>	<a href="#">A06 User Interface PCB Diagram</a>
<a href="#">W17 UI Flex Cable Diagrams</a>	<a href="#">W04 Speed Dial Assembly Removal</a>	<a href="#">W04 Speed Dial Assembly Installation</a>
<a href="#">E05 Speaker Assembly Removal</a>	<a href="#">E05 Speaker Assembly Installation</a>	<a href="#">W04 Speed Dial Assembly Diagrams</a>
<a href="#">E05 Speaker Assembly and W14 Speaker Harness Extension Cable Diagrams</a>		

(Continued on next page)

# Repair Procedures Index *(continued)*

9-4

## Boardstack

<a href="#">Assembly Diagram</a>	<a href="#">A03 Therapy PCB Assembly Diagram</a>	<a href="#">Parts List (continued)</a>
<a href="#">Boardstack Disassembly</a>	<a href="#">Boardstack Reassembly</a>	<a href="#">Boardstack Removal</a>
<a href="#">Boardstack Installation</a>	<a href="#">W02 Capacitor Discharge Cable Replacement</a>	<a href="#">W02 Capacitor Discharge Cable Diagram</a>
<a href="#">E06 Inductive Resistor Diagram</a>	<a href="#">A05 SpO2 Module Removal</a>	<a href="#">A05 SpO2 Module Installation</a>
<a href="#">A05 SpO2 Module Diagram</a>	<a href="#">A02 Patient Parameter and A04 OEM/ SpO2 Assembly Removal</a>	<a href="#">A02 Patient Parameter and A04 OEM/ SpO2 Assembly Installation</a>
<a href="#">A02 Patient Parameter PCB Diagram</a>	<a href="#">Coin Cell Battery Replacement</a>	<a href="#">A01 System PCB Removal</a>
<a href="#">A01 System PCB Installation</a>	<a href="#">A01 System PCB Diagram</a>	<a href="#">A03 Therapy PCB Removal</a>
<a href="#">A03 Therapy PCB Installation</a>	<a href="#">A03 Therapy PCB Diagram (With Pacing) REF A03 (RoHS)</a>	<a href="#">A03 Therapy PCB Diagram (Without Pacing) REF A03 (RoHS)</a>

*(Continued on next page)*

# Repair Procedures Index *(continued)*

9-5

## Bottom Case

<a href="#">Assembly Diagram (Modules)</a>	<a href="#">Assembly Diagram (Connectors)</a>	<a href="#">Parts List</a>
<a href="#">Bottom Case Disassembly</a>	<a href="#">Bottom Case Reassembly</a>	<a href="#">A12 Printer Module Removal</a>
<a href="#">A12 Printer Module Installation</a>	<a href="#">W13 Printer Flex Cable Diagrams</a>	<a href="#">E10 Energy Capacitor Removal</a>
<a href="#">E10 Energy Capacitor Installation</a>	<a href="#">E08 Power Module Removal</a>	<a href="#">A03 Power Module Installation</a>
<a href="#">E08 Power Module Diagram</a>	<a href="#">W11 ECG Sync/System Cables Diagrams</a>	<a href="#">W06 ECG Connector Removal</a>
<a href="#">W06 ECG Connector Installation</a>	<a href="#">W06 ECG Connector Assembly Diagrams</a>	<a href="#">W01 Therapy Connector Removal</a>
<a href="#">W01 Therapy Connector Installation</a>	<a href="#">W01 Therapy Connector Assembly Diagrams</a>	<a href="#">W01 Therapy Connector Assembly Wiring Diagram</a>
<a href="#">W05 SpO2 Connector Removal</a>	<a href="#">W05 SpO2 Connector Installation</a>	<a href="#">W05 SpO2 Assembly Diagrams</a>
<a href="#">W03 IrDA Assembly Removal</a>	<a href="#">W03 IrDA Assembly Installation</a>	<a href="#">W03 IrDA Assembly Diagrams</a>
<a href="#">W14 Speaker Harness Extension Cable Removal</a>	<a href="#">W14 Speaker Harness Extension Cable Installation</a>	

*(Continued on next page)*

# Repair Procedures Index *(continued)*

## Final Assembly

<a href="#">Device Labeling Including Label Set Multiple REF - LIFEPAK 20e</a>	<a href="#">LIFEPAK 20e Device Label Set Languages</a>	<a href="#">Manual Latch Label Languages</a>
<a href="#">AED Door/Latch Label Kits</a>	<a href="#">A07 Elastomer Keypad – All Options</a>	<a href="#">A07 Elastomer Keypad - Languages</a>
<a href="#">Installing Printer Paper</a>	<a href="#">Standard Paddles Labels and Buttons</a>	
<a href="#">Standard Paddles Parts List</a>	<a href="#">Standard Paddles Label Languages</a>	<a href="#">Charge Button Languages</a>

# Warnings and Cautions

9-7

The following general warnings and cautions apply to all actions you may perform during maintenance of the device.

## WARNING

**SHOCK HAZARD.** Servicing of this device must be performed by properly trained individuals. This device may retain potentially lethal charges accessible inside the device at any time, even when off. Follow the procedures carefully for discharging the E10 Energy Capacitor.

The E10 Energy Capacitor carries high voltage. Discharge the capacitor before handling.

It is possible to pinch and damage wires during reassembly. To avoid pinching wires, carefully follow reassembly instructions.

## CAUTION

**Possible component damage.** The PCB assemblies contain static-sensitive devices (SSDs). To avoid damage, observe the special handling practices described under [Static-Sensitive Devices \(SSD\)](#). PCBs contain high impedance circuitry; always handle the PCB by holding on to the edges.

# RoHS Standards

9-8

## About RoHS Parts

The European Union has initiated a new directive which applies to all medical devices sold in Europe. This directive is **2011/65/EU of the European Parliament and the Council**, commonly referred to as “RoHS 2” (Restriction of Hazardous Substances). The directive requires companies to restrict the use of certain substances in the design of their products (such as lead, mercury, etc.).

Some of the parts in the LIFEPAK 20e device have been updated to comply with this standard. For these parts, both RoHS-certified and non-RoHS parts may be listed.

RoHS-certified parts and non-RoHS parts are functionally equivalent. However, when ordering parts replacement, use the following RoHS vs Non-RoHS Parts Replacement Rules to decide what parts to order.

RoHS Device Identification—LIFEPAK 20e devices that are RoHS compliant can be identified by the product serial number label. The product part number for a RoHS version is 3202488 with a dash number of 300 or greater.

## RoHS Standards *(continued)*

9-9

### About RoHS Parts *(continued)*

Situation	Rules	
	RoHS Country (Europe)	Non-RoHS Country (ROW)
If replacing parts in a LIFEPAK 20e RoHS device	ALL parts must be RoHS	RoHS or non-RoHS equivalent parts can be used to service any device
If replacing parts in a LIFEPAK 20e non-RoHS device	RoHS or non-RoHS equivalent parts can be used until inventory is exhausted	RoHS or non-RoHS equivalent parts can be used to service any device
If replacing Code Management Module parts	All CMM parts are RoHS compliant already	All CMM parts are RoHS compliant already
Replacing accessories on a LIFEPAK 20e device	It is OK to put a non-RoHS accessory on a RoHS device. Existing inventory will be depleted and replaced by RoHS compliant accessories	It is OK to put a non-RoHS accessory on a RoHS device. Existing inventory will be depleted and replaced by RoHS compliant accessories



# Static-Sensitive Devices (SSD)

9-10

## About SSD Handling

Many electronic semiconductor devices (such as MOS ICs, FETs, optical isolators, or film resistors) can be damaged by the discharge of static electricity. Static-charge buildup is very common. Static discharges commonly occur when the operator wears synthetic clothes and transfers the charge to any object touched. These discharges can damage or destroy static-sensitive devices (SSDs). In most cases, the discharge is not even perceptible to the person who causes it.

To prevent static-discharge damage to SSDs, observe the following precautions during any open-case test, maintenance, or repair procedures:

## The SSD Symbol

SSDs are identified with the following warning symbol:



Always perform repair or maintenance on a static-dissipative mat that is connected to earth ground.

*(Continued on next page)*

# Assembly Tools List

9-11

## Tools List

The suggested list of tools for the LIFEPAK 20e defibrillator/monitor replacement procedures is as follows:

- Static-dissipative mat and wrist strap
- Anti-static rack and/or conductive bags
- Capacitor discharge tool
- Torque screwdriver(s) - required torque settings are 0.4 in-lb, 4.0 in-lb, 6.8 in-lb, and 10.0 in-lb.

Torque Measurements	Values			
Torque in-lb	0.4	4.0	6.8	10.0
Torque in-oz	6.5	64.0	108.8	160
Torque cNm	4.6	45.2	77.0	113.0

- Point 1 power drive bit (P1)- Phillips tip for 4-40 screws (shaft length of 2")
- Point 2 power drive bit (P2)- Phillips tip for 6-32 screws (shaft length of 2")
- 3/32" Allen Driver
- 1/4" Nut Driver
- Pin Extractor Tool 11-03-0044

# Using the Capacitor Discharge Tool

9-12

## WARNING

**SHOCK HAZARD.** Discharge tools that are not designed and labeled for biphasic use are inadequate for use on biphasic defibrillators. They will take several minutes to discharge the energy capacitor.

The capacitor discharge tool is used to discharge the energy storage capacitor before beginning any maintenance on the inner parts of the device.

To use the capacitor discharge tool:

1. **Remove the battery.**
2. **Remove the top case.**
3. Place one probe on the solder joint on the inductive resistor and hold it steady (see the illustration on the next page).
4. Place the other probe in the connection point of the capacitor wire. Hold both probes steady.
5. Observe the neon lamp inside the capacitor discharge tool. If a charge of approximately 90 volts is present, the neon lamp will light.

*(Continued on next page)*

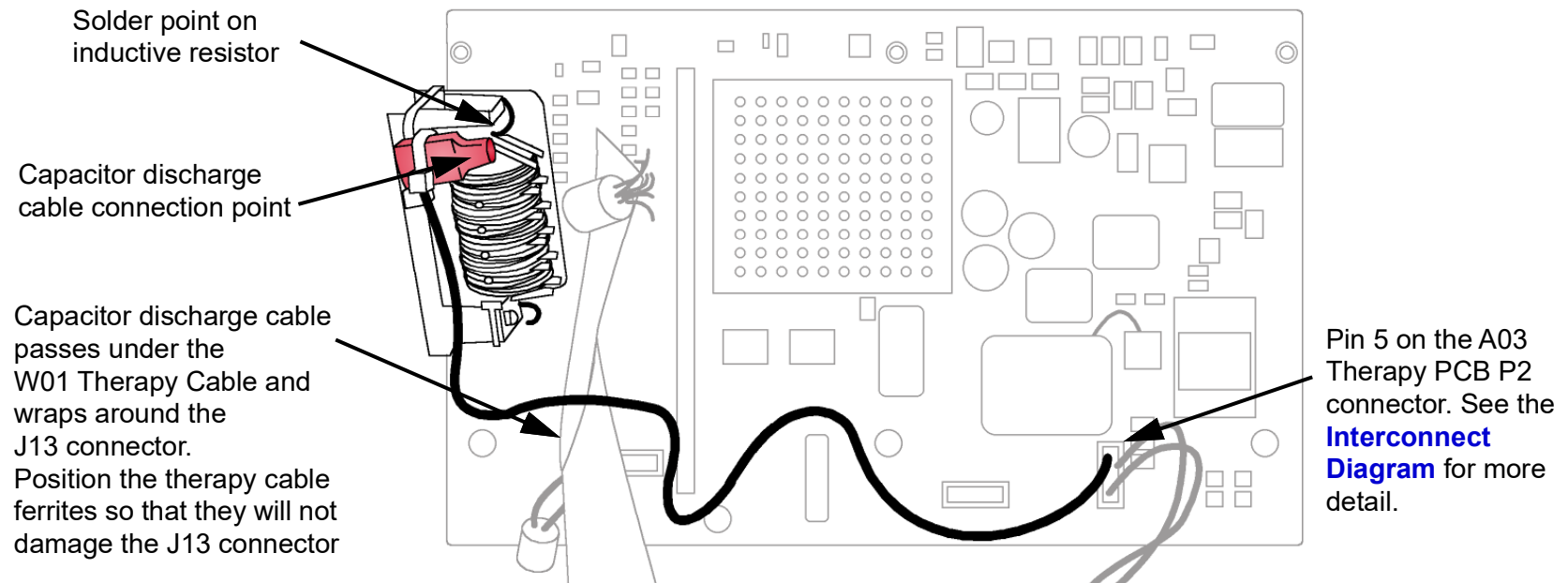
# Using the Capacitor Discharge Tool (continued)

9-13

## WARNING

**SHOCK HAZARD.** Do not assume the capacitor is discharged if the neon lamp does not light! There may still be a charge on the capacitor. Do not touch capacitor terminals until completing the discharge operation.

6. Continue holding the probes on the points indicated for at least 30 seconds after the neon lamp is no longer lit.



# Saving the Setup Configuration

9-14

The following procedures describe how to save the device setup configuration before beginning any repair action.

**Note:** If the CodeManagement Module is attached, the LIFEPAK 20e configuration transfer cable can not be used to transferred setup configuration.

- If the CodeManagement Module is attached to the LIFEPAK 20e defibrillator/monitor, either remove the device and use the configuration transfer cable (see next option) or if the device owner has a LIFENET System account, then use the LIFENET Device Agent application to manage setup configurations.
- Another method is to transfer the setup configuration to a spare device, complete repairs, and then transfer the setup configuration back again.
- The final method is to print the setup configuration, complete repairs, and then manually reconfigure the device.

**Note:** Saving the configuration by transferring it to a spare device requires that both devices have the same software version. Otherwise, potentially unexpected results may occur when the configuration is restored to the repaired device. Verify that copyright dates are the same on the introduction page of both devices.

## Saving the Setup Configuration *(continued)*

9-15

### Transferring the Setup Configuration

To transfer the setup configuration to a spare device:

1. With the power OFF on both devices, connect the two devices using a configuration transfer cable (REF 11230-000019) between the device system connectors.
2. Display the **SETUP** menu on both devices.
3. Select SEND CONFIG in the SETUP menu on the device to be repaired. The SEND CONFIG overlay appears.
4. Select SEND and press the SPEED DIAL. The setup configuration transfers to the spare device.
5. Select PRINT DEFAULTS in the SETUP menu on the device to be repaired. The printer prints the device setup configuration. Save this backup printout for possible future reference.
6. Turn both devices OFF.

### Restoring the Setup Configuration

To restore the setup configuration by transferring it back to the repaired device:

1. Connect the spare device (with the saved setup configuration) to the repaired device using a configuration transfer cable (REF 11230-000019) between the device system connectors.
2. Display the **SETUP** menu on both devices.

*(Continued on next page)*

## Saving the Setup Configuration *(continued)*

9-16

3. Click SEND CONFIG in the SETUP menu on the spare device. The SEND CONFIG overlay appears.
4. Select SEND and press the SPEED DIAL. The setup configuration transfers back to the repaired device.
5. Turn both devices OFF.

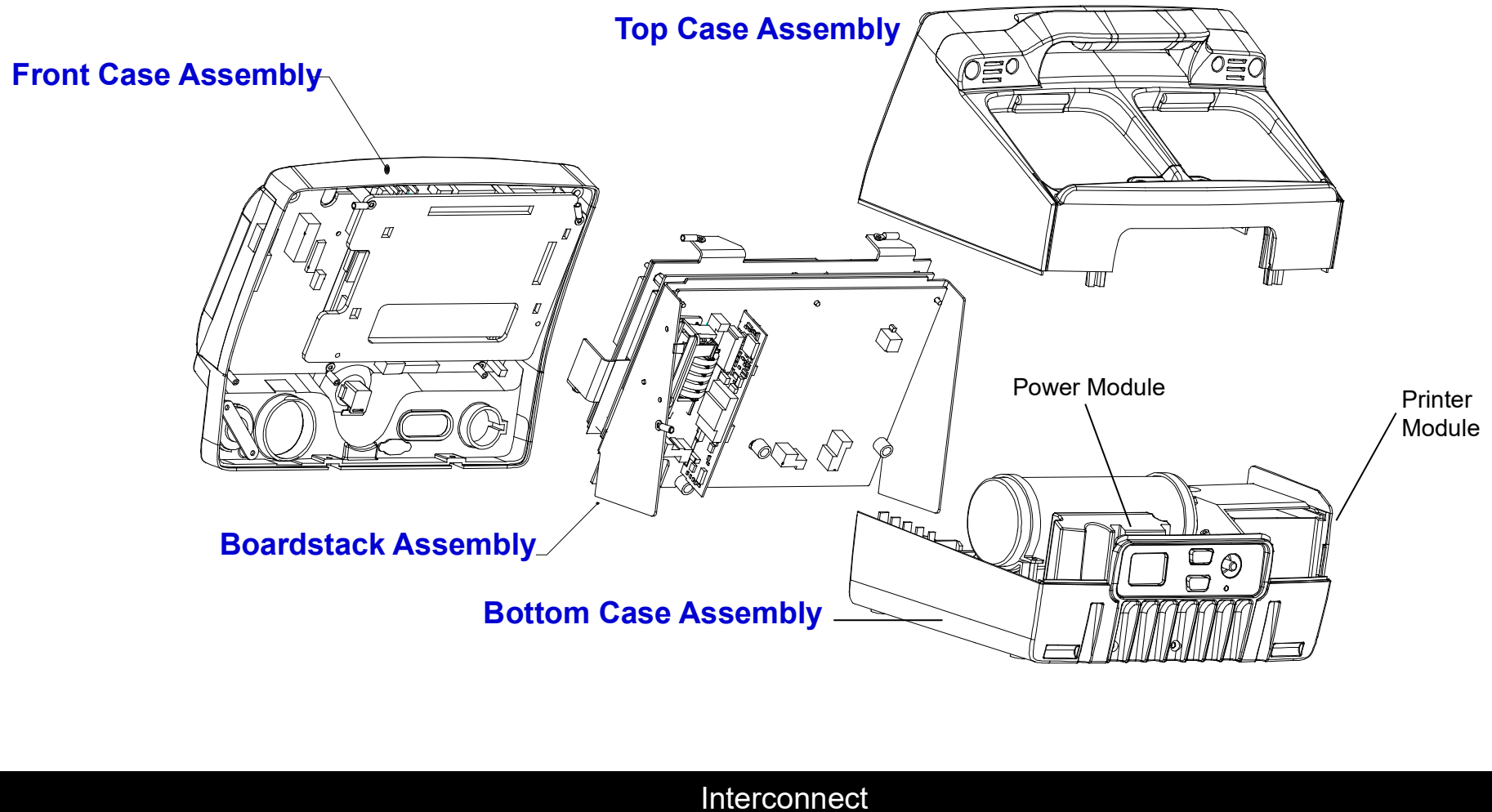
### Printing the Setup Configuration

To print the setup configuration:

1. Display the **SETUP** menu.
2. Select PRINT DEFAULTS. The printer prints the device setup configuration. Save this printout for future reference.
3. Turn the device OFF.
4. Make the necessary repairs.
5. Turn the device ON and display the SETUP menu.
6. Using the printout, check the settings in each menu and revise as necessary to match the printout.
7. Turn the device OFF.

# Main Assemblies

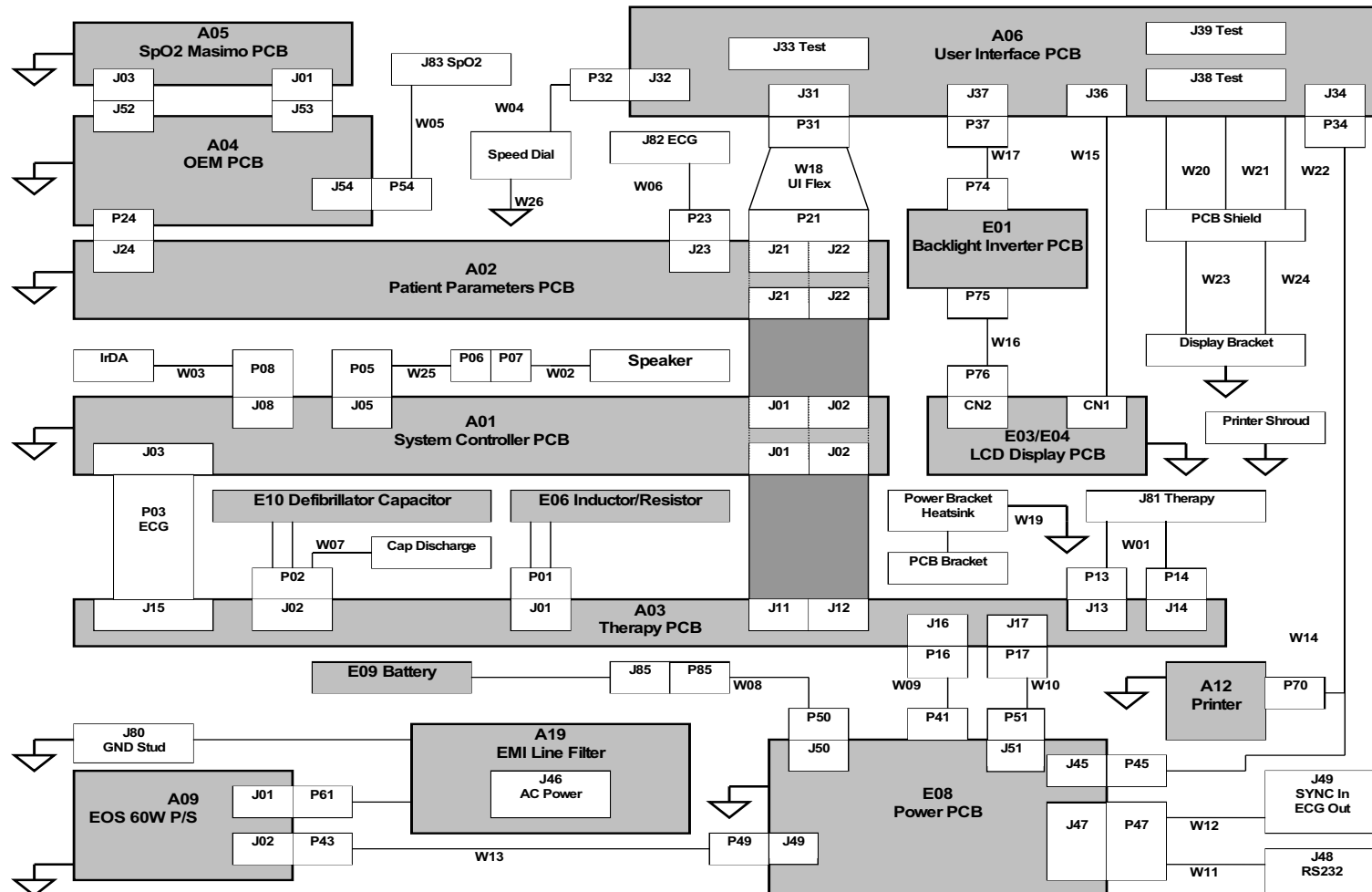
9-17





## LP20e Interconnect Diagram

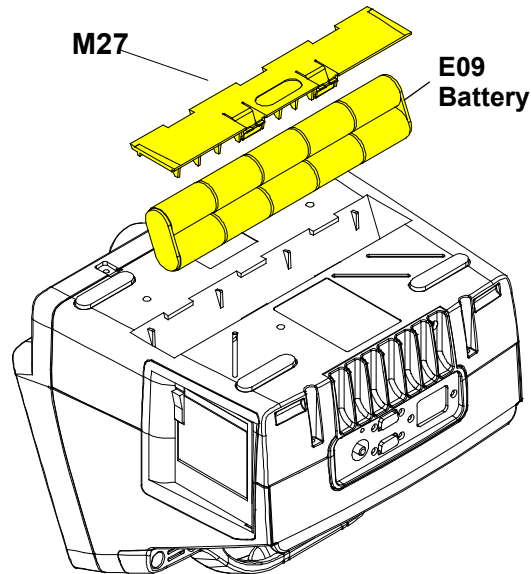
9-18



# Battery Replacement

9-19

## E09 Battery Replacement



**Note:** The LIFEPAK 20e defibrillator/monitor uses the E09 Battery with the 6-pin connector. To remove the E09 Battery from the device:

1. Disconnect the device from ac power.
2. Place the device top down.
3. Insert two, small, flat-bladed screwdrivers into the door taps and pinch the tabs to remove the battery door (M27).
4. Remove and disconnect the E09 Battery.

To install the E09 Battery:

1. Place the device top down.
2. Connect the W08 Battery Cable to the E09 Battery.
3. Insert the E09 Battery into the battery compartment.

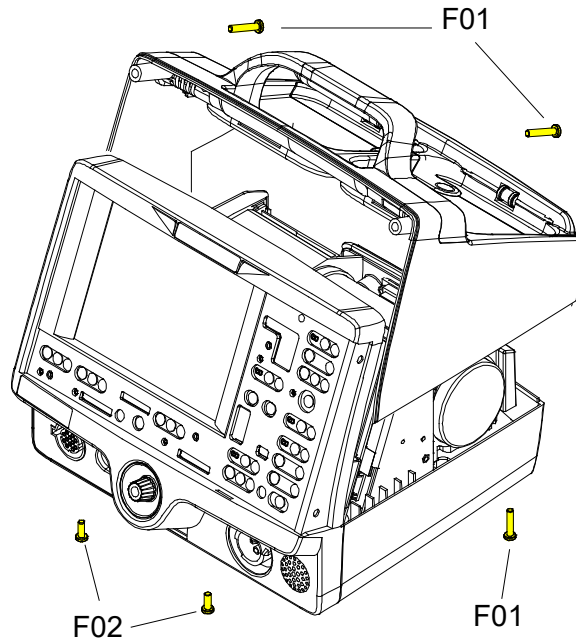
**Note:** Install the E09 Battery in the compartment with the wire harness facing toward the front of the device.

4. Close the battery door (M27).
5. Complete the LIFEPAK 20e Device PIP.

# Top Case

9-20

## Top Case Removal



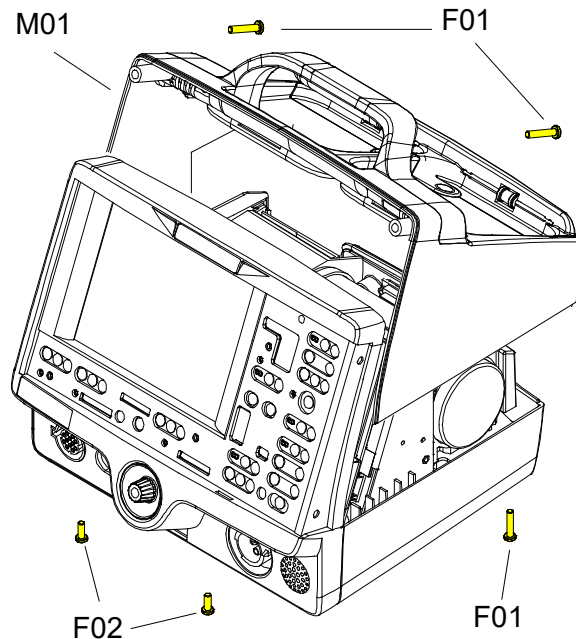
To remove the top case:

1. Disconnect the device from ac power.
2. **Remove the E09 Battery** from the device.
3. Place the device face down.
4. Remove and discard the two 6-32 × 0.375 screws (F02) securing the bottom case to the front case.
5. Remove and discard the two 6-32 × 1.75 screws (F01) securing the bottom case to the top case.
6. Place the device on its bottom.
7. Remove and discard the two 6-32 × 1.75 screws (F01) securing the top case to the front case (outboard screws).
8. Pull the front case slightly away from the top case, and slide the top case up and away from the rest of the device.
9. **Discharge the E10 Capacitor.**

## Top Case *(continued)*

9-21

### Top Case Installation



To install the top case:

1. Align the front case to the bottom case.
2. Align the top case (M01) to the bottom case.
3. Align the front case to the top case.
4. Secure the top case to the front case with two new 6-32 × 1.75 screws (F01); torque to 10 in-lb.
5. Turn the device face down and secure the front case to the bottom case with two new 6-32 × 0.375 screws (F02); torque to 10 in-lb.
6. Secure the top case onto the bottom case with two new 6-32 × 1.75 screws (F01); torque to 10 in-lb.
7. **Install the E09 Battery** into the device.
8. Review the **labels parts list** and install new labels.
9. Complete the LIFEPAK 20e Device PIP.

[Parts List](#)[Main Assemblies](#)

# Top Case *(continued)*

## Parts List

Reference Designator	Quantity	Part Description	Note
F01	4	SCREW,MACHINE,PANHEAD,NY LOK,6-32 X 1.750	
F02	2	SCREW-PH,SS,P,NYLOK,6-32 X .375	
M01	1	CASE-TOP,SUB ASSEMBLY,LP20	

# Front Case

9-23

## Assembly Diagram (Front View)

**Front Case Removal** (M02)

**Front Case Installation**  
(M02)

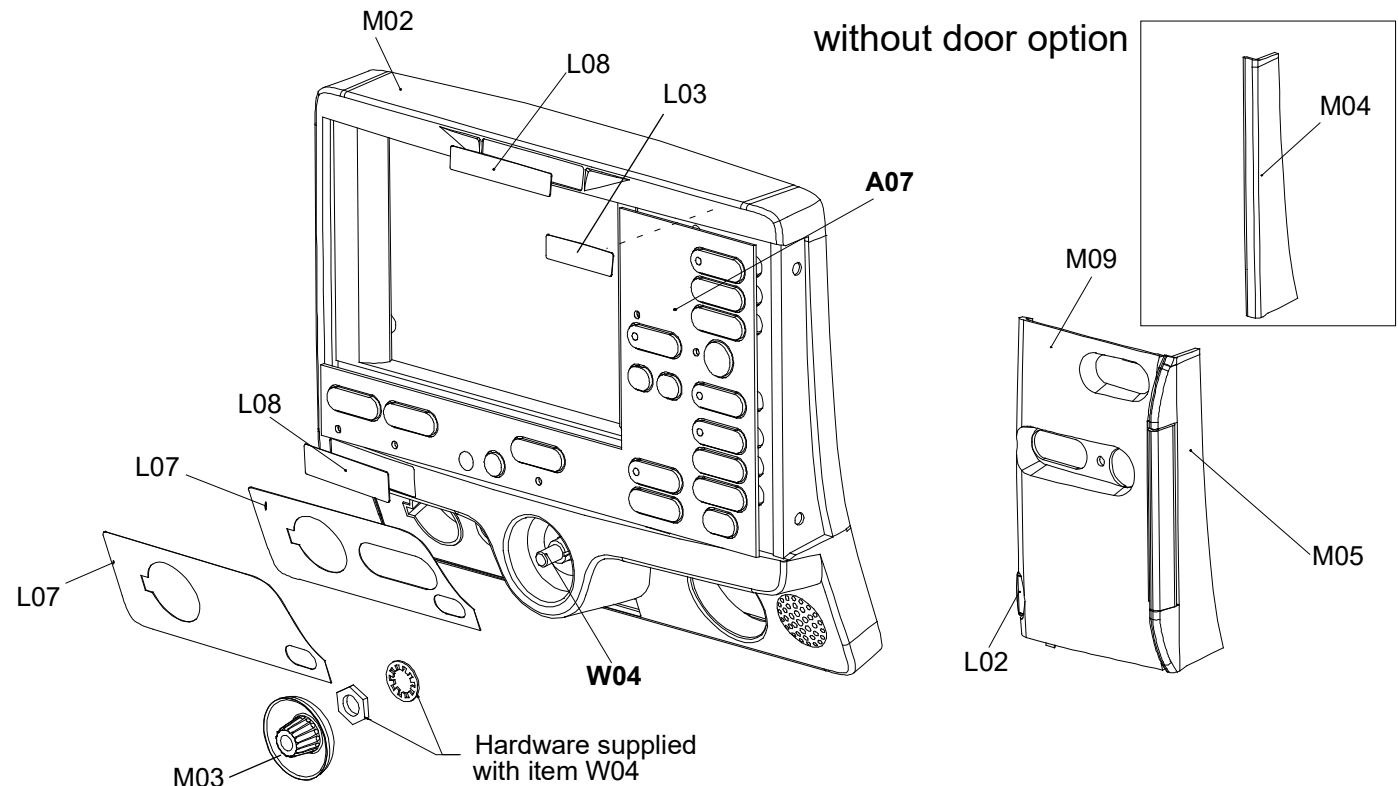
**AED Door Replacement**  
(M09)

**W04 Speed Dial Assembly**  
**Removal**

**W04 Speed Dial Assembly**  
**Installation**

**A07 Elastomer Keypad**  
**Removal**

**A07 Elastomer Keypad**  
**Installation**



Parts A05–W18

Parts 9–47

Parts 161–284

Rear View

Main Assemblies

# Front Case (continued)

9-24

## Assembly Diagram (Rear View)

**E03/E04 Active Display Removal**

**E03/E04 Active Display  
Installation**

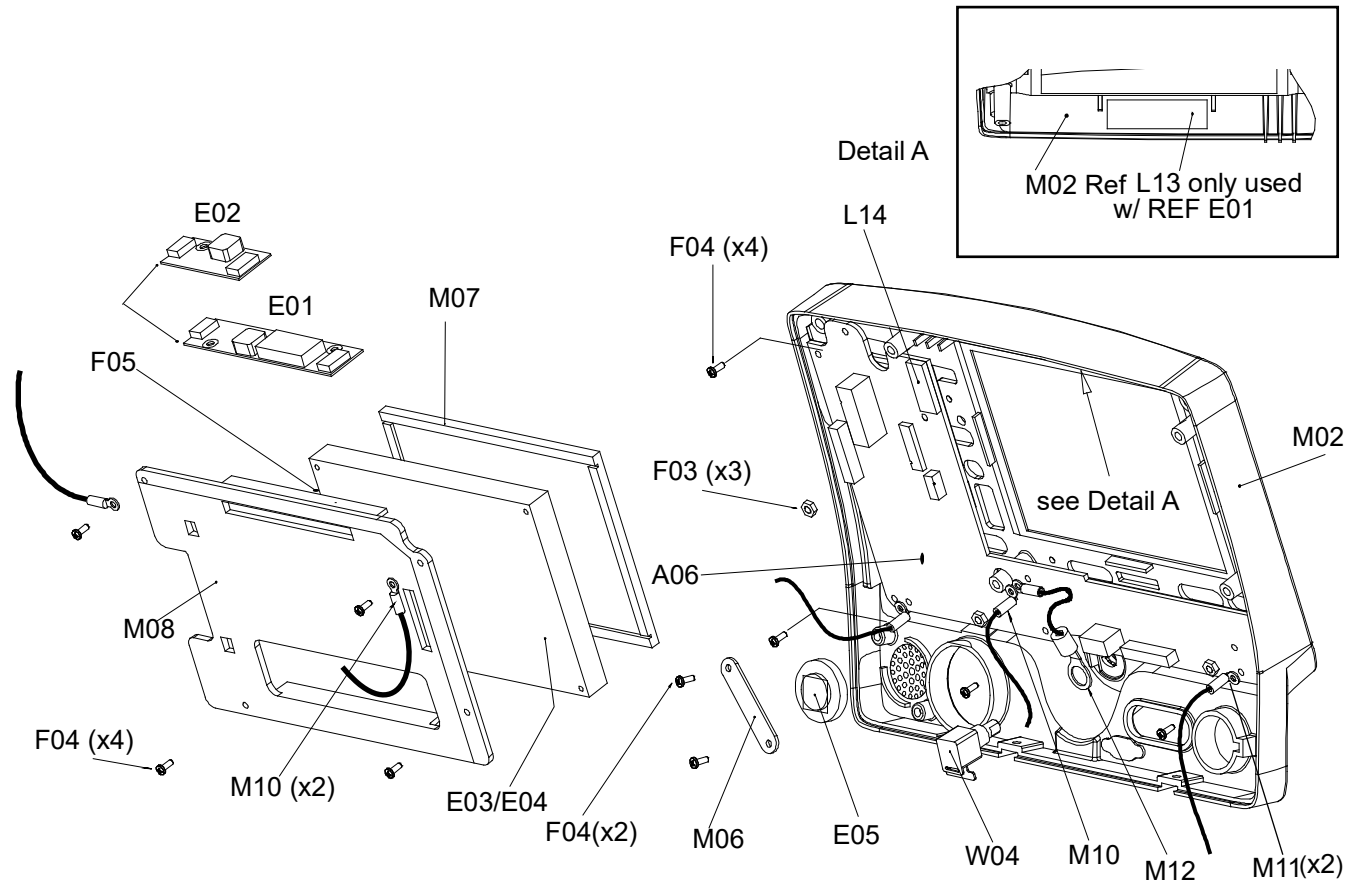
**A06 User Interface (UI) PCB  
Removal**

**A06 User Interface (UI) PCB  
Installation**

**E05 Speaker Assembly Removal**

**E05 Speaker Assembly  
Installation**

**Grounding Harness Orientation**



Parts A06–W17

Parts 9–47

Parts 161–284

Front Case View

Main Assemblies

# Front Case *(continued)*

9-25

## Parts List

Reference Designator	Quantity	Part Description	Note
A06	1	User Interface PCB	<b>Part of kit REF K30, K31, K32</b>
E01	1	Backlight Inverter, CCFT, LCD, 1.5KV Out, 8to20V in	Part used with E03 <b>Part of kit REF K04</b>
A08	1	Module-OEM, LED Driver (Backlight Inverter)	Part used with E04 <b>Part of kit REF K09</b>
E03	1	Active Display, Color LCD	<b>Part of kit REF K03</b>
E04	1	Active Display, Color LED	Requires REF A06 (RoHS) or greater and Redux Device S/W <b>Part of kit REF K09</b>
A07	1	Elastomer Keypad	<b>Select other languages and catalog numbers</b>

*(Continued on next page)*

Parts W17–47

Parts 161–284

Front Case View

Rear View

Main Assemblies



## Front Case *(continued)*

9-26

### Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
E05	1	Speaker Assembly	RoHS
W04	1	Speed Dial Assembly	
W15	1	Active Color Display Cable	
W16	1	Active Backlight Inverter Cable	
W17	1	UI to Stack Flex Assembly	
M02	1	Front case, Pad printed	<b>Part of kit REF K02</b>
L01	1	Label set (6 labels)	<b>Refer to Labels Assembly</b>
M03	1	Speed Dial knob	
M04	1	Cover plate, door	<b>Part of kit REF K02</b>
L02	1	Manual latch label	<b>Select other language</b>

*(Continued on next page)*

Parts A05–W15

Parts 161–284

Front Case View

Rear View

Main Assemblies

# Front Case *(continued)*

9-27

## Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
M05	1	Door hinge plate	<b>Part of kit REF K02</b>
M06	1	Bracket, speaker mounting	
M07	1	Display lens	<b>Part of various kits</b>
M08	1	Active display bracket	<b>Part of various kits</b>
F03	3	Locking hex nut, 4-40	
F04	10	Machine screw, 4-40 x 0.312L	
M09	1	AED door assembly	<b>Part of kit K23</b> See AED Door/Latch Label Kits
L13	1	Thermally conductive backlight inverter pad	
M10	3	Grounding strap harness	Active Display
M11	2	Grounding strap harness	User Interface PCB

Parts List

Interconnect

Front Case View

Rear View

Main Assemblies

## Front Case *(continued)*

9-28

### Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
L14	1	Spacer Foam, UI PCB	<b>Part of various kits</b>
M12	1	Grounding strap harness, Speed Dial	
F05	1	Nylon snap rivet	<b>Part of various display kits</b>
E15	1	Cable-Extender, Active Display	
L03	1	Label - Adult VF Dose	<b>Refer to labels assembly</b> See <b>LIFEPAK 20e Device Label Set Languages Table</b>

## Front Case *(continued)*

9-29

### Front Case Disassembly

To disassemble the front case:

1. **Remove the front case** from the device.
2. **Remove the AED door** (if the device is equipped with a door).
3. **Remove the E03/E04 Active Display.**
4. **Remove the A06 User Interface PCB.**
5. **Remove the W04 Speed Dial Assembly.**
6. **Remove the E05 Speaker Assembly.**
7. **Replace the front case** and continue to **Front Case Reassembly.**

## Front Case *(continued)*

9-30

### Front Case Reassembly

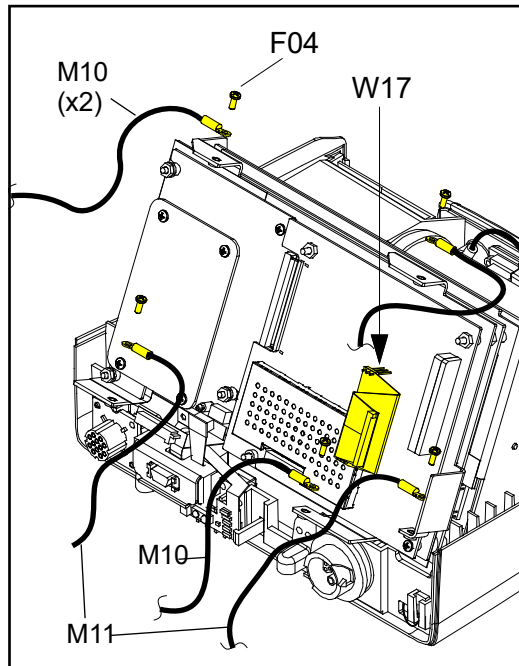
To reassemble the front case:

1. **Install the E05 Speaker Assembly.**
2. **Install the W04 Speed Dial Assembly.**
3. **Install the A06 User Interface PCB.**
4. **Install the E03/E04 Active Display.**
5. **Install the A07 Elastomer Keypad**, if replacing the Front Case.
6. **Install the AED door**, if the device is equipped with a door.
7. **Install the front case.**
8. **Install the top case.**
9. **Install the E09 Battery.**
10. Review the **labels parts list** and install new labels.
11. Complete the LIFEPAK 20e Device PIP.

## Front Case *(continued)*

9-31

### Front Case Removal



### WARNING

**SHOCK HAZARD.** Carefully follow disassembly instructions to avoid a shock or damage to wires during disassembly.

To disassemble the front case:

1. **Remove the E09 Battery.**
  2. **Remove the top case.**
  3. **Discharge the E10 Energy Capacitor.**
  4. Disconnect the two grounding harnesses (M10) that connect the E03/E04 Active Display to the top of the PCB support bracket by removing and discarding the two screws (F04).
- Note:** Replace any broken or frayed grounding straps.
5. Pull the front case away from the boardstack assembly and disconnect the W17 UI Flex Cable from the A02 Patient Parameter (PP) PCB at J21 and J22.

*(Continued on next page)*

[Parts List](#)[Interconnect](#)[Front Case View](#)[Rear View](#)[Main Assemblies](#)

## Front Case *(continued)*

9-32

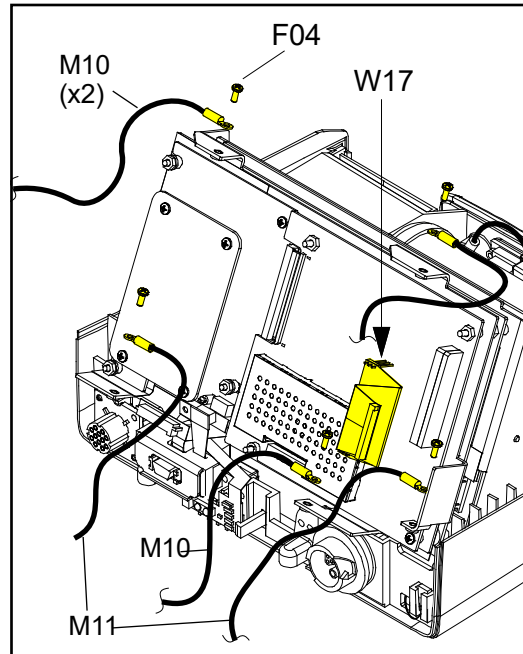
### Front Case Removal *(continued)*

6. Disconnect the two grounding harnesses (M11) that connect the bottom left and right corners of the A06 User Interface (UI) PCB to the PCB support bracket by removing and discarding the two screws (F04).
7. Disconnect the grounding harness (M10) that connects the bottom center of the A06 UI PCB to the PCB support bracket by removing and discarding the screw (F04).
8. Disconnect the W14 Speaker Harness Extension Cable from the E05 Speaker Assembly.
9. Disconnect the W13 Printer Flex Cable from the A06 UI PCB at J34.  
**Note:** Disconnect the Speed Dial connector to access the printer connector.
10. Pull the front case away from the device.

## Front Case *(continued)*

9-33

### Front Case Installation



To install the front case assembly:

1. Connect the W13 Printer Flex Cable to the A06 UI PCB at J34.
2. Connect the W14 Speaker Harness Extension Cable to the E05 Speaker Assembly.

**Note:** Reconnect the SPEED DIAL cable if it was disconnected during the disassembly process.

### CAUTION

**Possible component damage.** The grounding harnesses must be installed at precise angles to avoid damaging device components.

3. Install the two grounding harnesses (M11) by connecting the bottom left and right corners of the A06 UI PCB to the PCB support bracket, using two new screws (F04); torque to 6.8 in-lb. Refer to [Grounding Harness Orientation](#) for grounding harness placement.
4. Install the grounding harness (M10) by connecting the bottom center of the A06 UI PCB to the PCB support bracket, using a new screw (F04); torque to 6.8 in-lb.

*(Continued on next page)*



## Front Case *(continued)*

9-34

### Front Case Installation *(continued)*

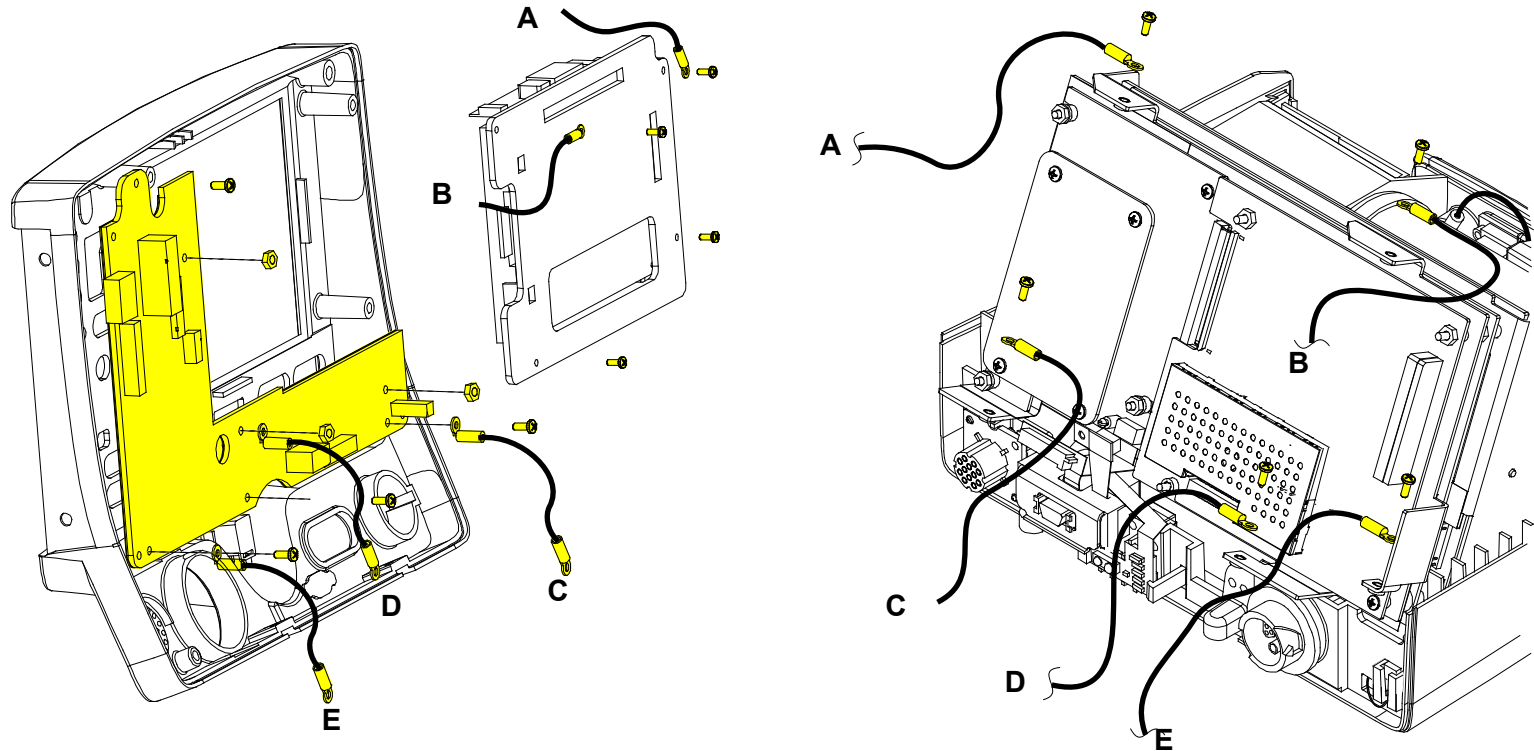
5. Connect the W17 UI Flex Cable to the A06 UI PCB at J31.
6. Carefully connect the W17 UI Flex Cable to the A02 PP PCB at J21 and J22, ensuring that the pins connect with the connectors evenly to avoid possible pin damage.
7. Connect the two grounding harnesses (M10) by connecting the top of the front case to the system shield, using two new screws (F04); torque to 6.8 in-lbs. Refer to **Grounding Harness Orientation** for grounding harness placement.
8. Return to **Front Case Reassembly**.

## Front Case *(continued)*

9-35

### Grounding Harness Orientation

To ensure that the top case, front case, and bottom case join correctly, align the grounding harnesses as shown below and on the next page.



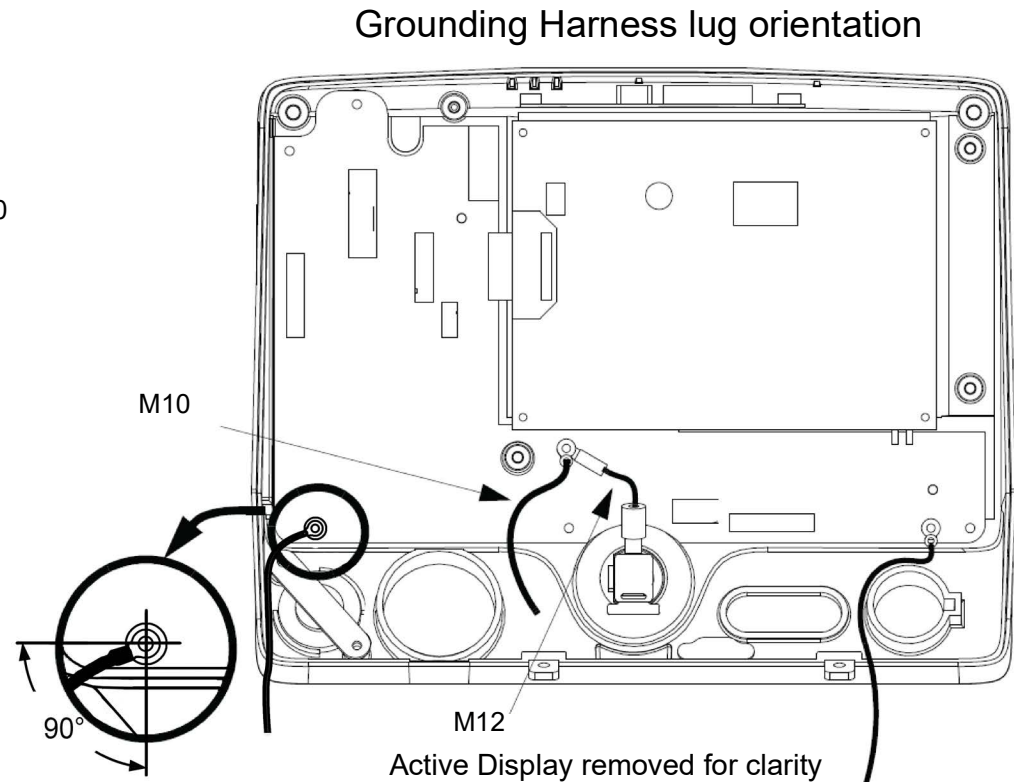
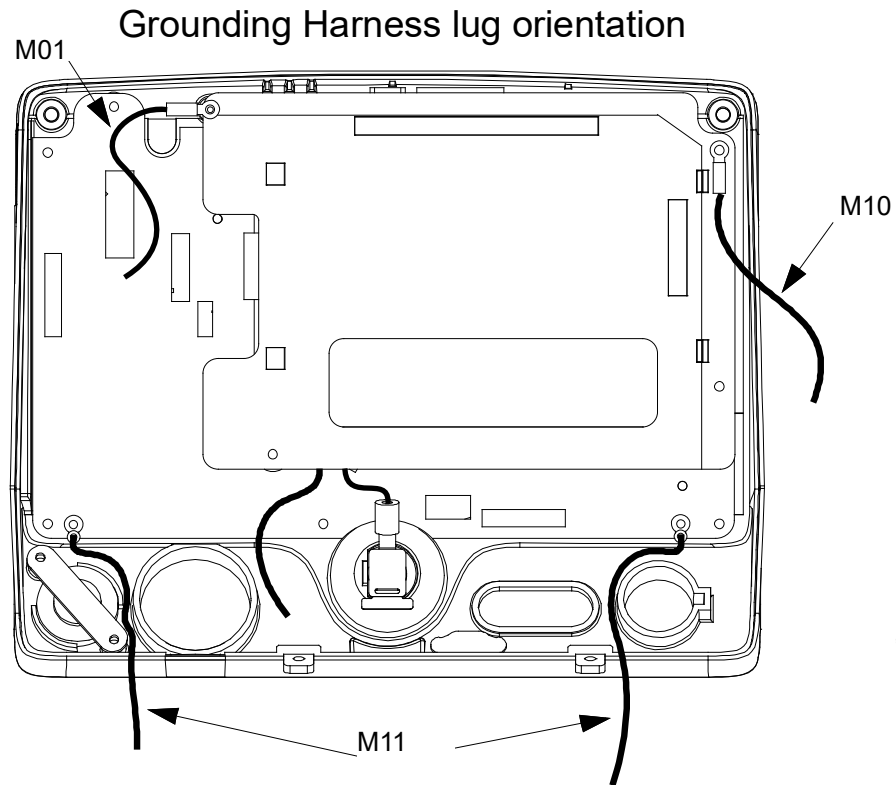
*(Continued on next page)*

[Parts List](#)[Interconnect](#)[Front Case View](#)[Rear View](#)[Main Assemblies](#)

## Front Case (continued)

9-36

### Grounding Harness Orientation (continued)

[Parts List](#)[Interconnect](#)[Front Case View](#)[Rear View](#)[Main Assemblies](#)

## Front Case *(continued)*

9-37

### AED Door Replacement

The AED door assembly is designed to be an easily replaceable, breakaway assembly. If the door assembly accidentally comes off during use, follow step 3 of the AED door installation procedure below.

To remove the entire AED door assembly:

1. Open the AED door.
2. Use a small screwdriver to pry the hinge pin center slightly away from the door assembly until the door slides free of the hinge.
3. Peel the hinge off the front case.
4. Clean the front case to remove old adhesive.

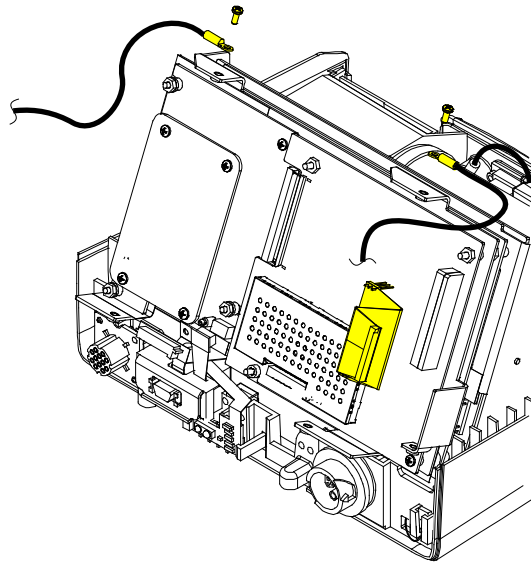
To install a new AED door assembly:

1. Clean the hinge area.
2. Expose the adhesive and secure the door hinge plate (M05) to the front case.
3. Use a small screwdriver to pry the hinge pin center slightly away from the door assembly until the door slides into the hinge. Ensure that the hinge pins snap into the securing holes.

## Front Case *(continued)*

9-38

### W17 UI Flex Cable Removal



**Note:** The **top case** must be removed before beginning this disassembly.

To remove the W17 UI Flex Cable:

1. From the boardstack assembly, disconnect the two grounding straps (M10) that connect the top of the front case to the system shield, by removing the two screws.

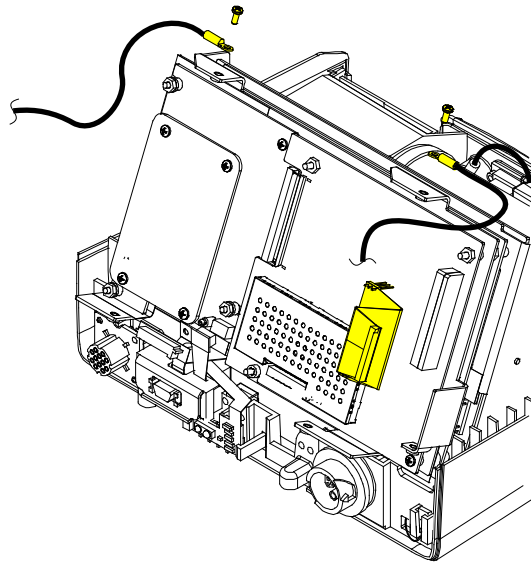
**Note:** Observe the **positioning on the grounding harnesses**. If they are not reinstalled at the correct angles, the front case will not join with the rest of the device correctly.

2. Pull the front case slightly forward, away from the boardstack assembly, and disconnect the W17 UI Flex Cable from the A02 PP PCB at J21 and J22.
3. Disconnect the W17 UI Flex Cable from the A06 UI PCB at J31, and remove the cable from the device.

## Front Case *(continued)*

9-39

### W17 UI Flex Cable Installation



To install the W17 UI Flex Cable:

1. With the front case pulled slightly forward and away from the boardstack assembly, connect the W17 UI Flex Cable to the A06 UI PCB at J31.  
**Note:** Avoid bending the W17 UI Flex Cable during installation. Excessive bending can damage wires and connectors.
2. Carefully connect the W17 UI Flex Cable to the A02 PP PCB at J21 and J22, ensuring that the pins connect with the connectors evenly to avoid possible pin damage.
3. Connect the two grounding straps (M10) by connecting the top of the front case to the system shield, using the two screws (F04); torque to 6.8 in-lb.  
**Note:** Observe the **positioning of the grounding harnesses**. If they are not reinstalled at the correct angles, the front case will not join with the rest of the device correctly.
4. **Reassemble the top case.**

## Front Case *(continued)*

9-40

### A07 Elastomer Keypad Removal

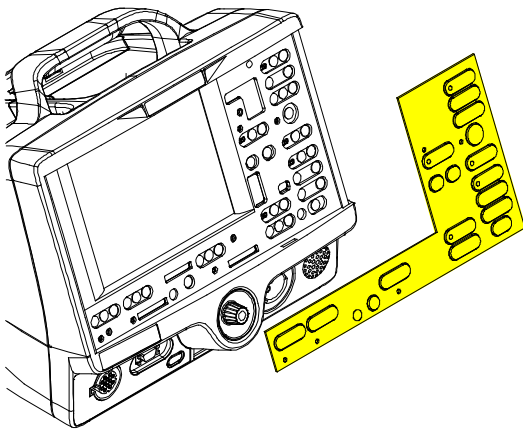
To remove the A07 Elastomer Keypad:

1. Peel the old keypad away from the front case.
2. Thoroughly clean the front case.

### A07 Elastomer Keypad Installation

To install the A07 Elastomer Keypad:

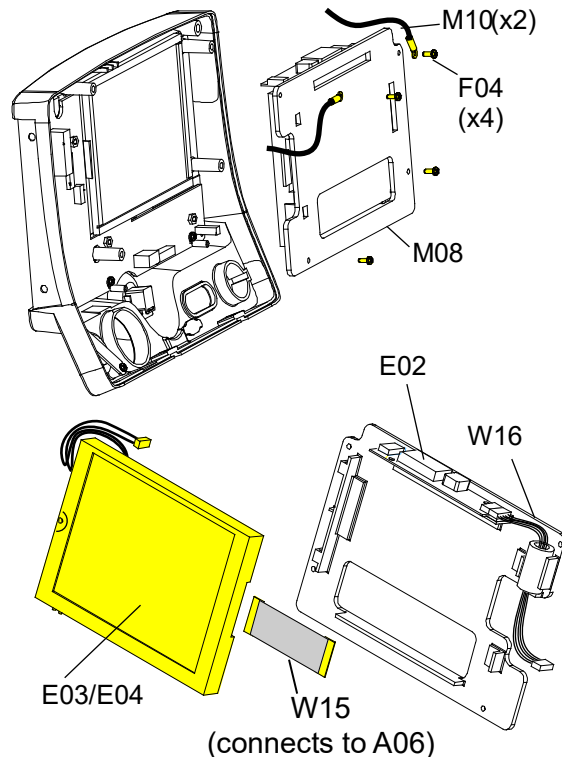
1. Select one of the following device configurations to find the MIN (part number) for the correct keypad for your device:
  - [Keypad View](#)
  - [Keypad Parts List](#)
2. After thoroughly cleaning the front case, remove backing and position the left and right bottom edges of the A07 Elastomer Keypad flush against the bottom corners of the front case.
3. Press the A07 Elastomer Keypad onto the front case ensuring that it is flush against the case with no air pockets or gaps.



## Front Case *(continued)*

9-41

### E03/E04 Active Display Removal



**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**

To remove the E03/E04 Active Display:

1. Disconnect the W15 Active Display Cable (see illustration) from the E03/E04 Active Display, as follows:
  - Gently pull both sides of the locking tab away from the connector.
  - Pull the cable out of the socket (leave the cable connected to the UI PCB).
2. Disconnect the W16 Backlight Inverter Cable from the A06 UI PCB at J37.
3. Remove and discard the four 4-40 x 0.312 screws (F04) from the display assembly cover.

**Note:** **Remove the two grounding harnesses** (M10) attached to the top two screws of the display assembly. Replace any broken or frayed grounding harnesses.

4. Remove the display bracket assembly from the front case.

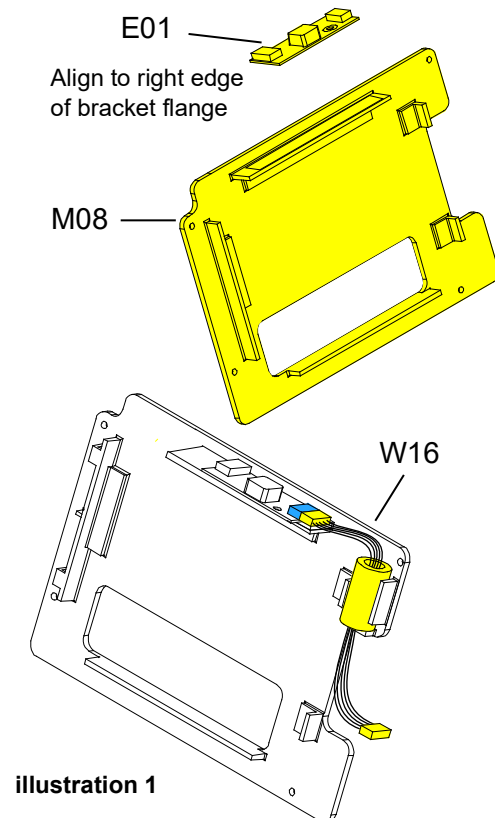
*(Continued on next page)*



## Front Case (continued)

9-42

### E03/E04 Active Display Removal (continued)



5. Check the condition of the following parts. Remove and replace any part that has cracks, broken wires, or damaged connectors.

**E01 Backlight Inverter** — To remove, disconnect the Active Display wires at J2. Disconnect the W16 Backlight Inverter Cable at J1. Pull the backlight inverter away from the display bracket. A new display bracket is required because the adhesive and foam are pre-attached.

**W15 Active Display Cable** — To remove, disconnect it from the A06 UI PCB at J36 (cable was previously disconnected from the Active Display in step 1)

**W16 Backlight Inverter Cable** — To remove, disconnect it from the A06 UI PCB at J37. Disconnect it from the E01 Backlight Inverter (if not previously removed) at J1. Pull the ferrite bead out of the molded notches on the display bracket.

**Display bracket (M08)** — After removing above parts, replace if necessary. The display bracket has the Backlight Inverter PCB adhesive and the Active Display foam pre-attached.

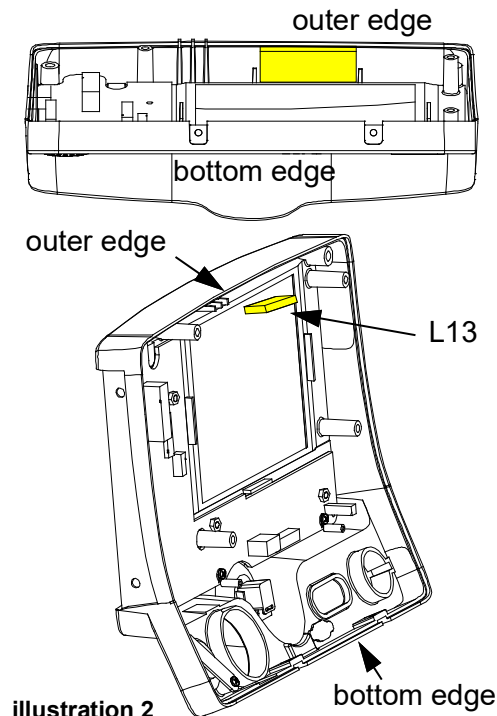
**Thermal conductive pad (L13)** — (used only with REF E01 Backlight Inverter) To remove, peel away the old pad located on the top inside edge of the top case ([see illustration 2](#)).

## Front Case *(continued)*

9-43

### E03/E04 Active Display Installation

Only required with Backlight Inverter - REF E01



To install the E03/E04 Active Display:

1. Verify the condition of the following parts and replace if necessary:
  - E01 Backlight Inverter ([see illustration 1](#))
  - W15 Active Display Cable ([see illustration 3](#))
  - W16 Backlight Inverter Cable ([see illustration 1](#))
  - Display bracket (M08) ([see illustration 1](#))
  - Thermal conductive pad (L13), located on the top inside edge of the top case.
- Note:** The thermal conductive pad is only required when using E01 Backlight Inverter . The thermal conductive pad must be positioned flush against the outer edge of the front case (past the ends of the locator notches in the front case)
2. Replace the thermal conductive pad (L13), if necessary, by peeling away the old pad, removing any remaining adhesive, and applying the new pad to the upper inside edge of the top case, centered between the locator notches.

*(Continued on next page)*

## Front Case *(continued)*

9-44

### E03/E04 Active Display Installation *(continued)*

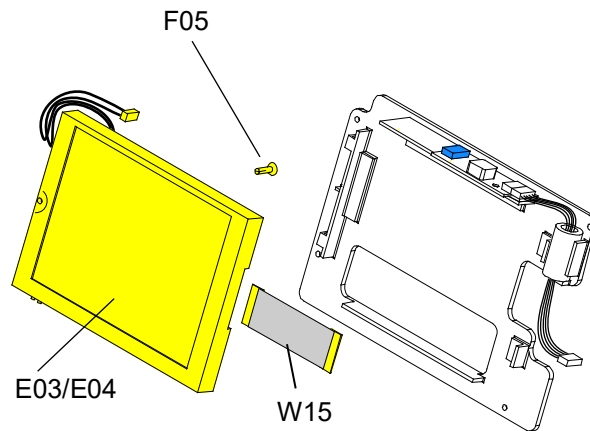


illustration 3

3. If replacing the E01 Backlight Inverter, a new display bracket (M08) is required. The display bracket has the adhesive and display foam piece pre-installed. Remove backing from display bracket. Place the E01 Backlight Inverter on display bracket so that J1 connector edge is aligned to the top side and right edge of the bracket flange.
4. Connect the W16 Backlight Inverter Cable “P74” connector to location J1 on E01 Backlight Inverter.
5. Place W16 Backlight Inverter cable’s ferrite bead into the molded saddle location such that the cable tie does not interfere with the saddle flange. ([see illustration 1](#)).
6. Insert the snap rivet (F05) through the hole from the back of the display and ensure the rivet expands on the front side.
7. E03/E04 Active Display - (REF E04), route display backlight wires together around black strain relief features. Extend excess wires to the right, straight across the top of the display.

*(Continued on next page)*

## Front Case *(continued)*

9-45

### E03/E04 Active Display Installation *(continued)*

8. Position the E03/E04 Active Display inside the display bracket.
9. E03/E04 Active Display - (REF E03), route the backlight wires from display along the corner and under the hook and then back to the E01 Backlight Inverter.
10. Connect the E03 Active Display wires to the E01 Backlight Inverter at J2.
11. Connect the W15 Active Display Cable to the A06 UI PCB at J36 (if removed previously), as follows.
  - Open the J36 connector lock.
  - Insert the W15 Display Cable (metal contacts down) into the connector lock.
  - Close the connector lock to secure the cable.

**Note:** The cable connector must be square with the connector lock.

12. Place the active display bracket assembly in position in the front case. (If replacing the Active Display, remove the clear protective cover prior to installing it into the front case.)

**Note:** E01 Backlight Inverter must make contact with the thermal conductive pad (L13) on the front case.

## Front Case *(continued)*

9-46

### E03/E04 Active Display Installation *(continued)*

13. Place the two grounding harnesses (M10) onto the top two screws (F04); torque to 6.8 in-lb. Refer to [Grounding Harnesses Orientation](#) for grounding harness placement.

#### CAUTION

**Possible component damage.** The grounding harnesses must be installed at precise angles to avoid damaging device components.

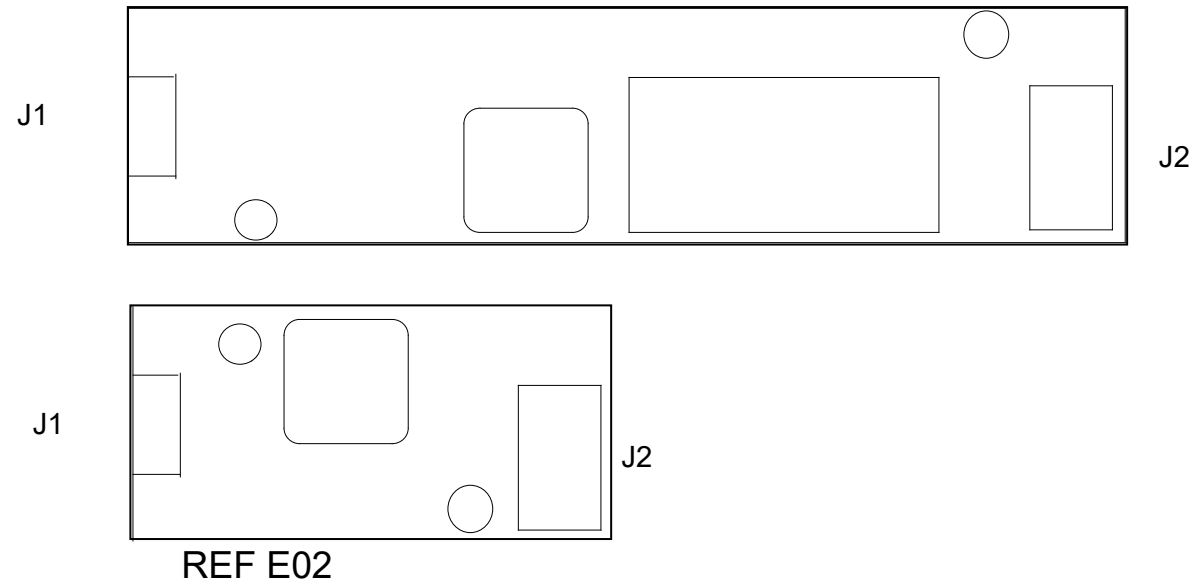
14. Install two new 4-40 x 0.312 screws (F04) to secure the display assembly to the front case; torque to 6.8 in-lb.
15. To install the W15 Active Display cable, unlatch “CN101” connector lock on E03 Active Display. Insert W15 Active Display cable under latch with metal contact band facing toward the circuit board until the cable is fully seated and square in the holding latches on the connector lock to secure the cable.
16. Complete the process by [Installing the front case](#).

*(Continued on next page)*

## Front Case *(continued)*

9-47

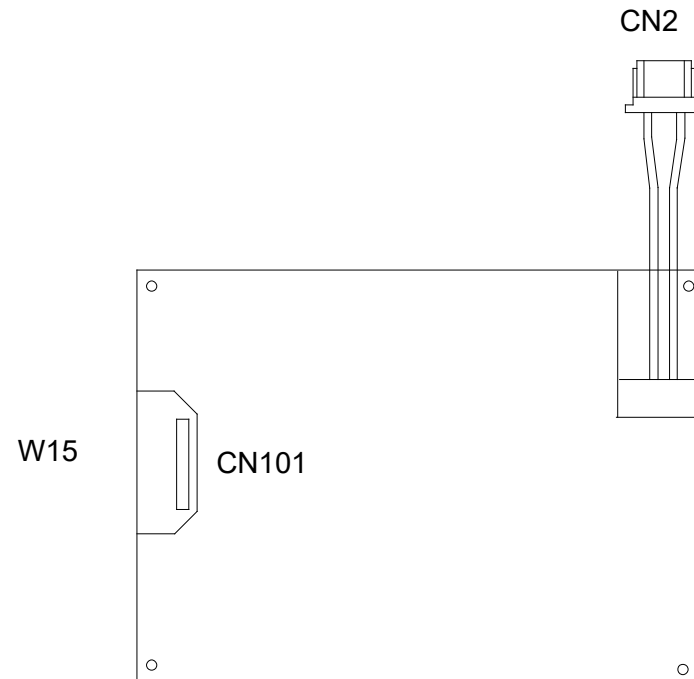
### E01 Backlight Inverter PCB Diagram

REF **E01**REF **E02**[Parts List](#)[Interconnect](#)[Front Case View](#)[Rear View](#)[Main Assemblies](#)[Interconnect](#)

## Front Case *(continued)*

9-48

### E03/E04 Active Display Diagram

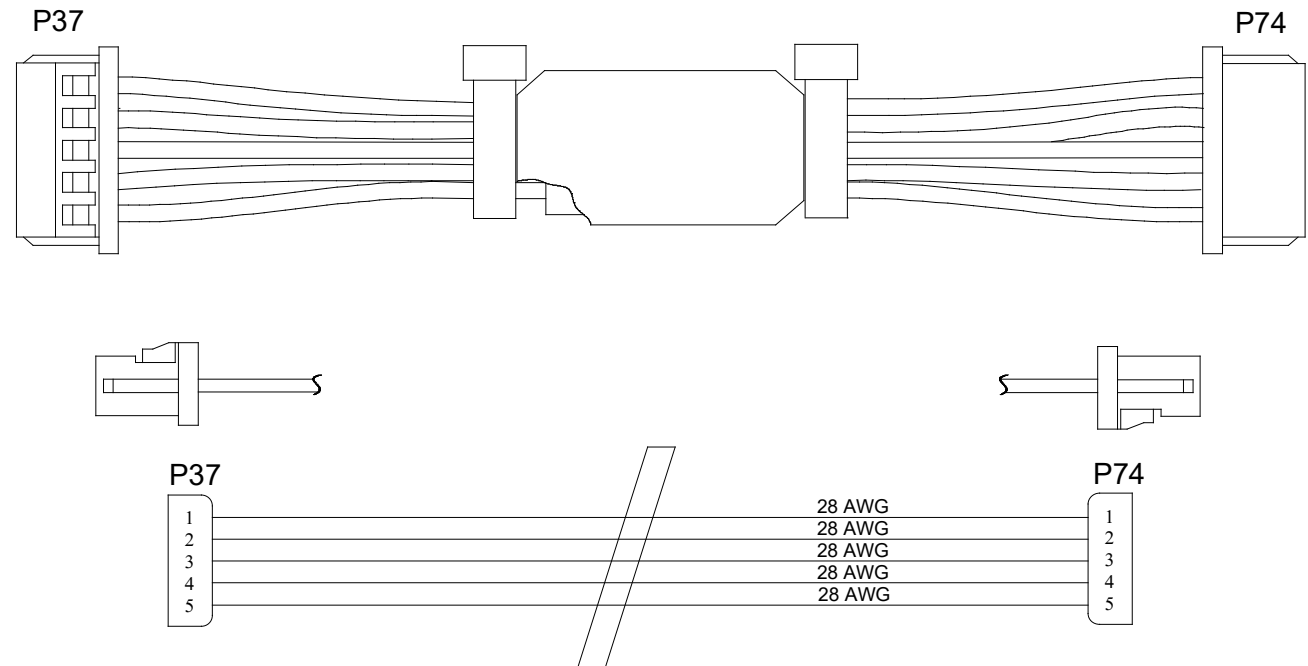
REF **E03**

Interconnect

## Front Case *(continued)*

9-49

### W16 Backlight Inverter Cable Diagrams

REF **W16**

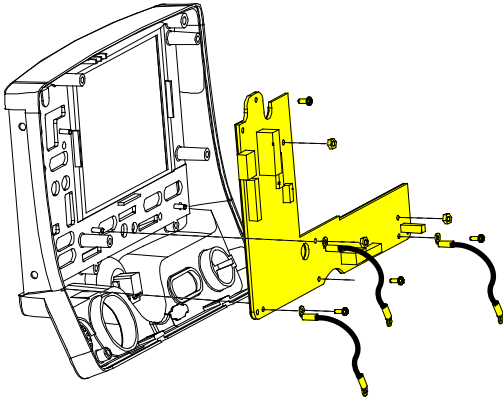
Interconnect



## Front Case *(continued)*

9-50

### A06 User Interface (UI) PCB Removal



**Note:** The following assemblies must be removed before beginning this disassembly:

- **Top case**
- **Front case**
- **Active display assembly**

To remove the A06 UI PCB:

1. Disconnect the W17 UI Flex Cable from the A06 UI PCB at J31.
2. Remove the Speed Dial connector from the A06 UI PCB at J32.
3. Remove and discard the three 4-40 x 0.312 screws (F04) from the bottom edge of the A06 UI PCB. **Remove the two grounding harnesses** (M11) attached to the left and right corner screws.

**Note:** Replace any broken or frayed grounding harnesses.

**Note:** If replacing the A06 UI PCB, transfer the grounding harnesses to the new PCB.

*(Continued on next page)*

## Front Case *(continued)*

9-51

### A06 User Interface (UI) PCB Removal *(continued)*

4. Remove and discard the 4-40 x 0.312 screw (F04) from the top left corner of the A06 UI PCB.
5. Remove the three 4-40 nuts (F03) from the A06 UI PCB. Remove the two grounding harnesses attached to the center nut.
6. Remove the A06 UI PCB from the front case.

### A06 User Interface (UI) PCB Installation

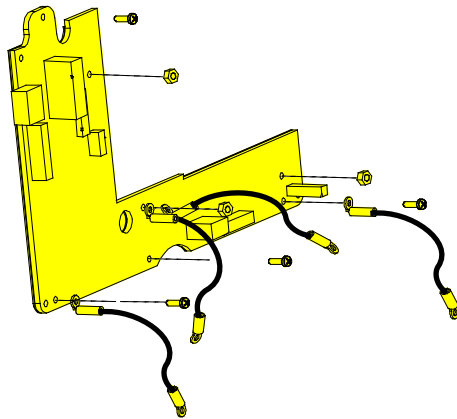
To install the A06 UI PCB:

1. Position the A06 UI PCB onto the front case.

#### CAUTION

**Possible component damage.** The grounding harnesses must be installed at precise angles to avoid damaging device components.

2. Insert the grounding harness (M12) from the W04 Speed Dial Assembly, and a second grounding harness (M10) to the lower center stud, and install the three 4-40 nuts (F03) onto the A06 UI PCB; torque nuts to 6.8 in-lb. Refer to **Grounding Harness Orientation** for grounding harness placement.



*(Continued on next page)*

## Front Case *(continued)*

9-52

### A06 User Interface (UI) PCB Installation *(continued)*

3. Place the two grounding harnesses (M11) onto the new lower left and right 4-40 x 0.312 screws (F04); torque to 6.8 in-lb.
4. Install two new 4-40 x 0.312 screws (F04) onto the A06 UI PCB; torque to 6.8 in-lb. Refer to [Grounding Harness Orientation](#) for grounding harness placement.

**Note:** Replace any broken or frayed grounding straps.

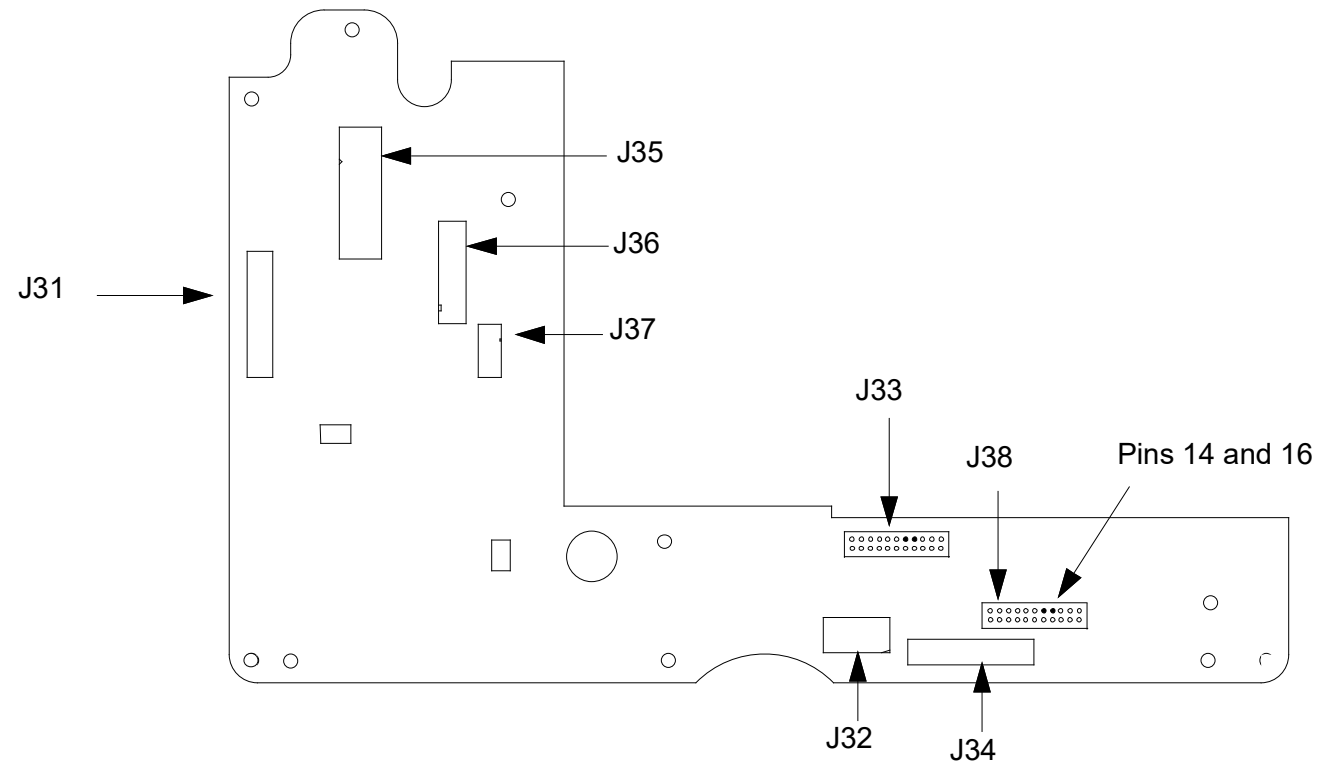
5. Install the Speed Dial connector to the A06 UI PCB at J32.
6. Connect the W17 UI Flex Cable to the A06 UI PCB at J31.
7. Complete the process by [Installing the active display](#) assembly.

## Front Case (continued)

9-53

### A06 User Interface PCB Diagram

REF **A06**  
(RoHS)

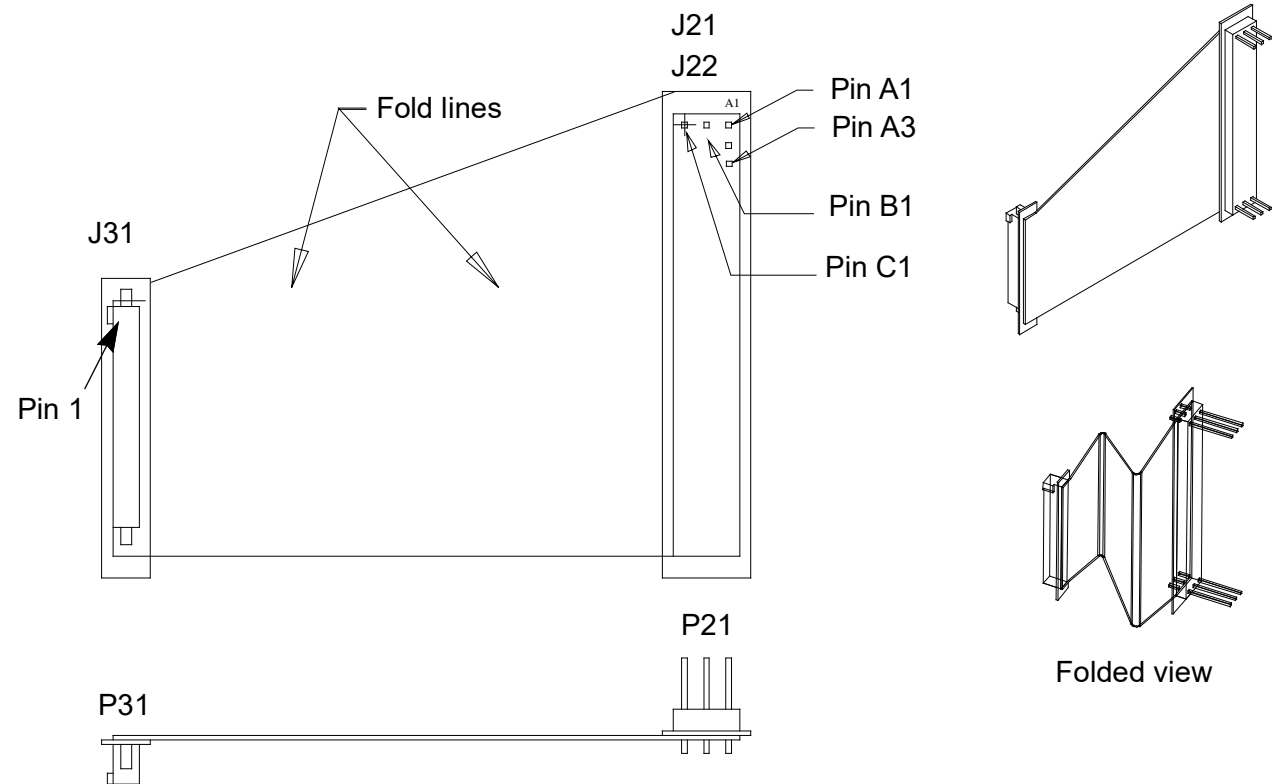


Interconnect

# Front Case (continued)

9-54

## W17 UI Flex Cable Diagrams

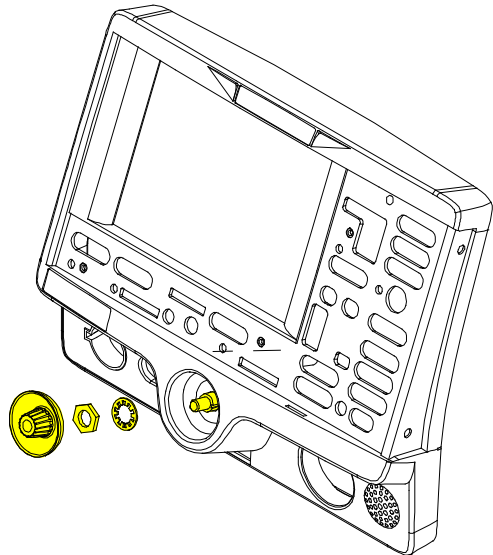
REF **W17**

Interconnect

## Front Case *(continued)*

9-55

### W04 Speed Dial Assembly Removal



**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**

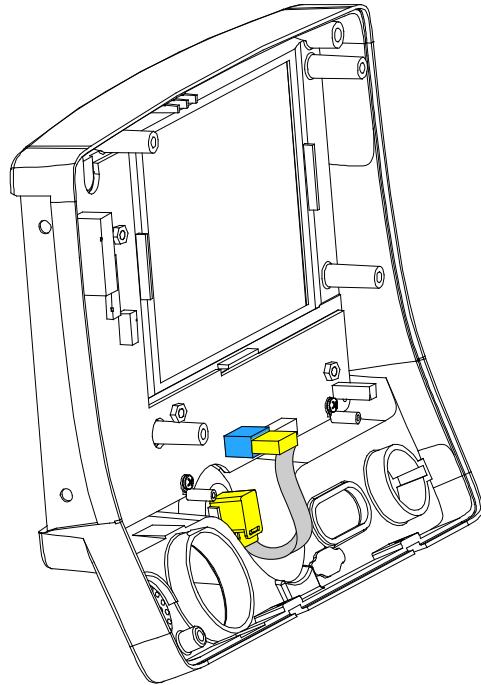
To remove the W04 Speed Dial Assembly:

1. Disconnect the W04 Speed Dial connector from the A06 UI PCB at J32.
2. Turn the front case over and remove the Speed Dial knob (M03).
3. Loosen and remove the nut from the Speed Dial axle.
4. Remove the washer from the Speed Dial axle.
5. From inside the case, pull the W04 Speed Dial Assembly out of the front case.
6. Remove the grounding harness (M12) from the Speed Dial axle.

## Front Case *(continued)*

9-56

### W04 Speed Dial Assembly Installation



To install the W04 Speed Dial Assembly:

1. Insert the grounding harness (M12) onto the Speed Dial axle.
2. From inside the case, install the W04 Speed Dial Assembly into the front case by aligning the key on the assembly to the notch in the front case.
3. Install the washer onto the Speed Dial axle.
4. Install the nut onto the Speed Dial axle and torque to 10 in-lb.
5. Press the Speed Dial knob (M03) onto the axle.
6. Connect the W04 Speed Dial Assembly connector to the A06 UI PCB at J32.
7. Complete the process by **Installing the front case**.

## Front Case *(continued)*

9-57

### E05 Speaker Assembly Removal

**Note:** The following assemblies must be removed before beginning this disassembly:

- **Top case**
- **Front case**

To remove the E05 Speaker Assembly:

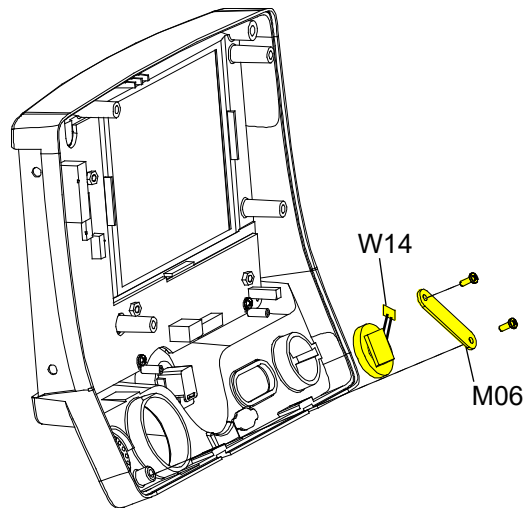
1. Disconnect the speaker cable from the W14 Speaker Harness Extension Cable connector. Refer to the **W14 Speaker Harness Extension Cable** removal and installation instructions for more information.
2. Remove and discard the two 4-40 x 0.312 screws (F04) from the speaker mounting bracket (M06), and remove the speaker mounting bracket from the front case.
3. Remove the E05 Speaker Assembly from the front case.



## Front Case *(continued)*

9-58

### E05 Speaker Assembly Installation



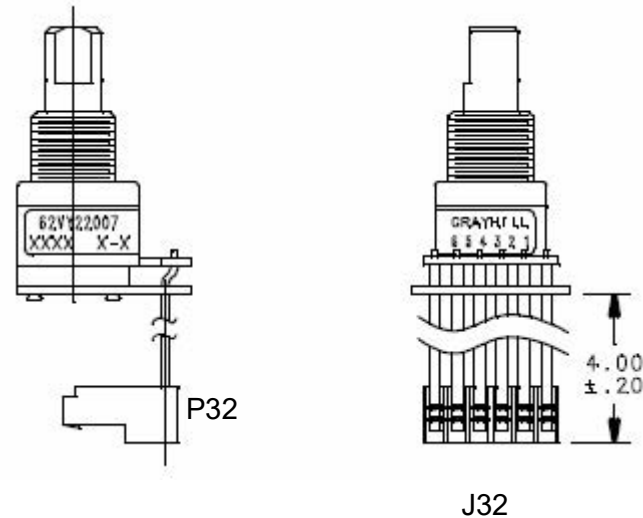
To install the E05 Speaker Assembly:

1. Fit the E05 Speaker Assembly into the front case and position the cable at the 2:00 position.
2. Place the speaker mounting bracket (M06) over the foam spacer and install two new 4-40 x 0.312 screws (F04); torque to 6.8 in-lb.
3. Connect the speaker cable to the W14 Speaker Harness Extension Cable connector.
4. Complete the process by [Installing the front case](#).

## Front Case (continued)

9-59

### W04 Speed Dial Assembly Diagrams

REF **W04**

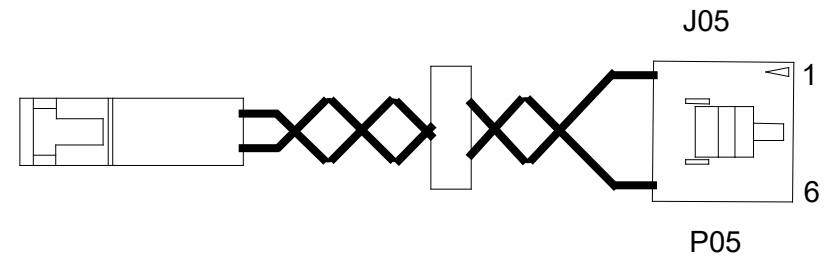
Interconnect

## Front Case *(continued)*

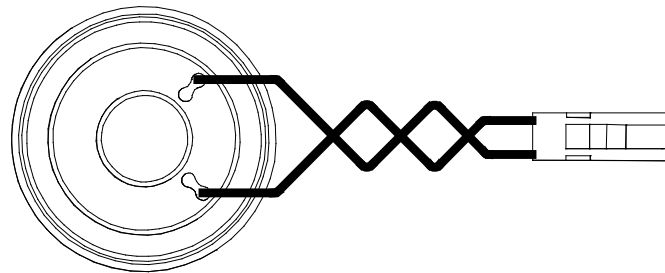
9-60

### E05 Speaker Assembly and W14 Speaker Harness Extension Cable Diagrams

W14 Speaker Harness Extension Cable (bottom case)  
REF W14 (RoHS)



E05 Speaker Assembly (front case)  
REF E05 (RoHS)

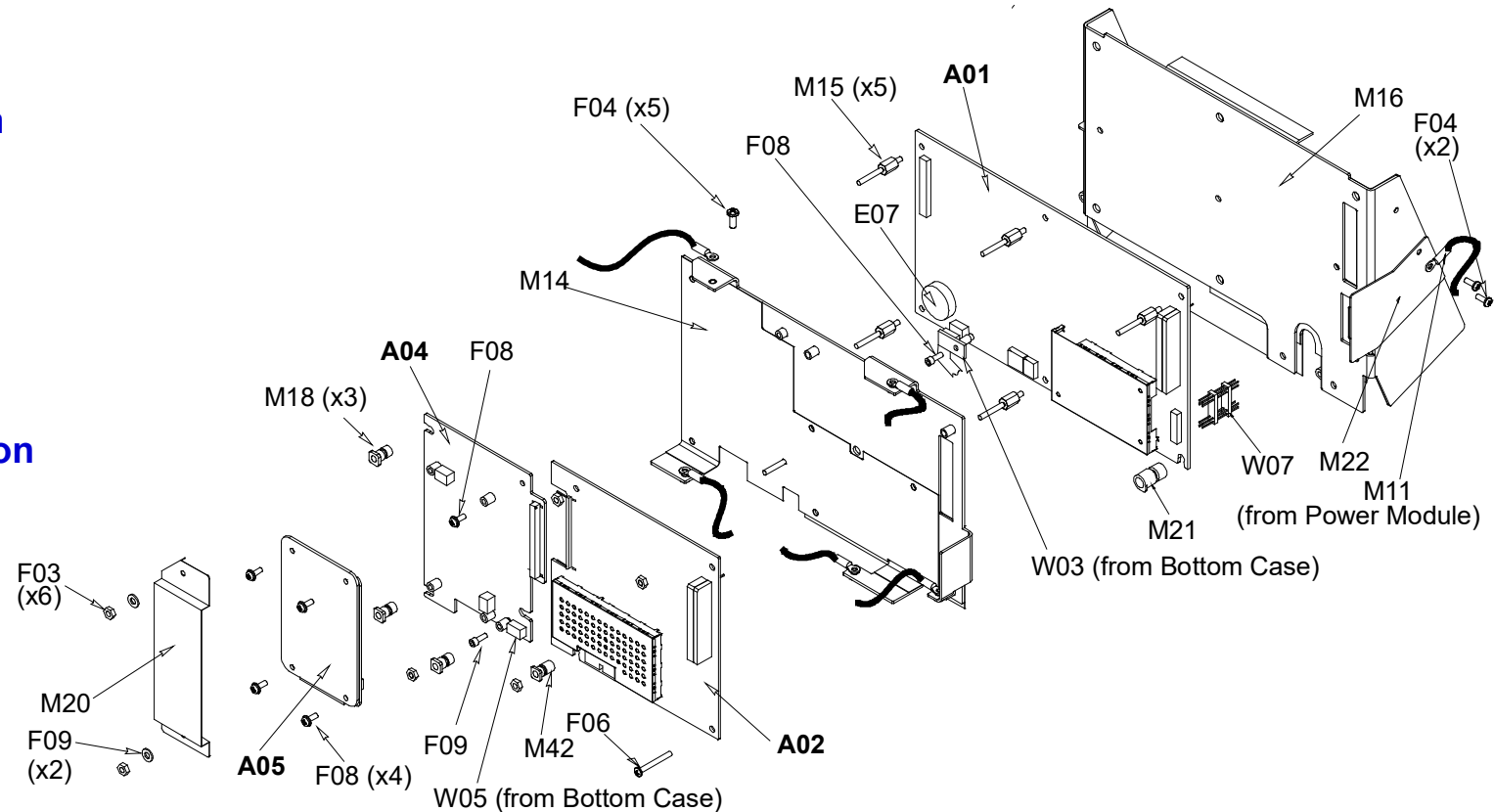


Interconnect

# Boardstack

9-61

## Assembly Diagram

[Boardstack Removal](#)[Boardstack Installation](#)[A05 SpO2 Module  
Removal](#)[A05 SpO2 Module  
Installation](#)[OEM/PP PCB Removal](#)[OEM/PP PCB Installation](#)[A01 System PCB  
Removal](#)[A01 System PCB  
Installation](#)

Interconnect

## Boardstack *(continued)*

9-62

### A03 Therapy PCB Assembly Diagram

With Pacing:

REF **A03** (RoHS)

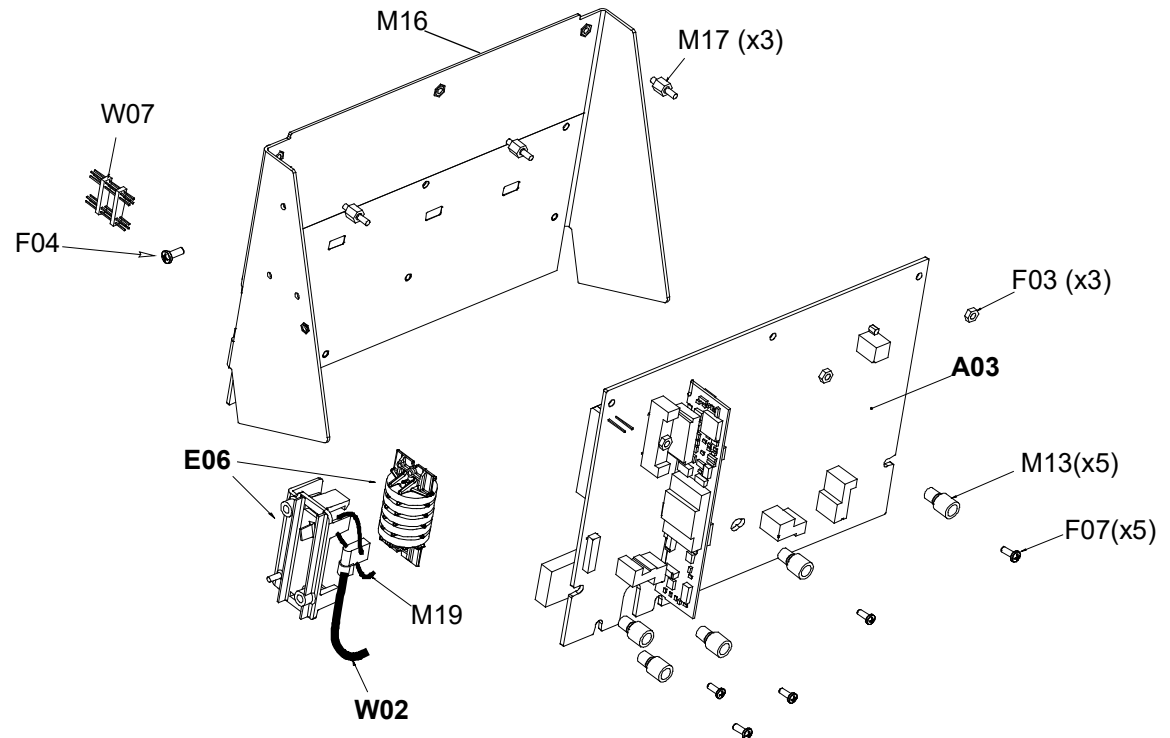
Without Pacing:

REF **A03** (RoHS)

#### **A03 Therapy PCB Removal**

- Inductive Resistor

#### **A03 Therapy PCB Installation**



Interconnect

# Boardstack *(continued)*

9-63

## Parts List

Reference Designator	Quantity	Part Description	Note
A01	1	System Controller PCB	Part of kit REF K30 and REF K33
A02	1	Patient Parameter PCB	Part of kit REF K16 (4th Edition)
A03	1	Therapy PCB (with pacing)	Part of kit REF K24 (RoHS)
A03	1	Therapy PCB (without pacing)	Part of kit REF K25 (RoHS)
A04	1	PCB ASSY- OEM Interface, Masimo	Part of kit REF K15 (4th Edition)
A05	1	SpO2 Module	Part of kit REF K10 (RoHS)
A05	1	SpO2 Module, with MNC Flash	For devices with Masimo-Nellcor compatibility, Order kit REF K11 (RoHS)

*(Continued on next page)*

# Boardstack *(continued)*

9-64

## Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
E06	1	Inductive Resistor Assembly	
W02	1	Capacitor Discharge Cable	
M13	5	ISO mount, Therapy	
F06	1	Screw 4-40 x 1.000L	
M14	1	Boardstack shield	<b>Part of kit REF K06</b>
M15	5	Standoff-M/M 0.250 hex, 0.375	<b>Part of kit REF K06</b>
W07	1	Boardstack connector	<b>Part of kit REF K29 (RoHS)</b>
M16	1	PCB support bracket	
M17	3	Standoff-M/M 0.250 hex, 0.250L	
L15	0	Thermally conductive pad	No longer used in assembly
M18	3	ISO mount, OEM	<b>Part of kit REF K06</b>

*(Continued on next page)*

Parts 123–173

Parts 185–344

System View

Therapy View

Main Assemblies

◀ Previous Page

◀◀ Table of Contents

◀◀ Section Contents

◀ Back

Index ▶▶

Next Page ▶

## Boardstack *(continued)*

9-65

### Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
F03	9	Locking hex nut, 4-40	
F04	3	Machine screw, 4-40 x 0.312L	
F07	5	Machine screw, 4-40 x 0.500L	
M19	2	Cable tie retainer	
F08	5	Machine screw, SEMS, 4-40 x 5/16 L, Split	
F09	2	Screw-Cap, Hex, 4-40 x 0.312 Nylon	3/32 hex drive
M42	1	ISO mount, Parameter	<b>Part of kit REF K06</b>
M20	1	Nomex shield	<b>Part of kit REF K06</b>
F10	2	Washer, 0.125ID, 0.312D	
M21	1	ISO mount, System Controller (standoff)	<b>Part of kit REF K29 (RoHS)</b>

*(Continued on next page)*



## Boardstack *(continued)*

9-66

### Parts List *(continued)*

Reference Designator	Quantity	Part Description	Note
M22	1	Shield - EMI, PCB Stack	<b>Part of kit REF K06</b>
E07	1	Coin cell battery, 3 V	
M43	1	Bracket-Inductive Resistor, LP20	
A10	1	PCB Assy-Programmed System Controller, LP20	
A06	1	PCB Assy - Programmed User Interface, LP20	

## Boardstack *(continued)*

9-67

### Boardstack Disassembly

To disassemble the boardstack:

1. **Remove the E09 Battery.**
2. **Remove the top case.**
3. **Remove the front case.**
4. **Remove the boardstack assembly.**
5. **Remove the A05 SpO2 Module** (only if it is being replaced).
6. **Remove the A04 OEM/A02 PP PCB.**
7. **Remove the A03 System PCB.**
8. **Remove the A04 Therapy PCB.**

## Boardstack *(continued)*

9-68

### Boardstack Reassembly

**Note:** If there are indications that the plastic isolation mounts are cracking, then use the boardstack repair kit [REF K06](#) as part of the reassembly process.

To reassemble the boardstack:

1. [Install the A03 Therapy PCB.](#)
2. [Install the A01 System PCB.](#)
3. [Install the A04 OEM/A02 PP PCB.](#)
4. [Install the A05 SpO2 Module](#), if removed.
5. [Install the boardstack assembly.](#)
6. [Install the front case.](#)
7. [Install the top case.](#)
8. [Install the E09 Battery.](#)
9. Review the [labels parts list](#) and install new labels.
10. Complete the LIFEPAK 20e Device PIP.

## Boardstack *(continued)*

9-69

### Boardstack Removal

#### WARNING

**SHOCK HAZARD.** Carefully follow disassembly instructions to avoid a shock or damage to wires during disassembly.

**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**

To remove the boardstack assembly:

1. Turn the device so the ECG and therapy connectors are in view, and then set the device on its left side.
2. Disconnect the grounding harness (M10) that connects the power module to the PCB support bracket (M16) by removing the screw.

**Note:** Replace the grounding harness if broken or frayed.

3. Turn the device so that the ECG and therapy connectors are in view.
4. Disconnect the W03 IrDA flex cable from the A01 System PCB at J8 by removing the screw (F09) using a 3/32 hex driver.

*(Continued on next page)*

## Boardstack *(continued)*

9-70

### Boardstack Removal *(continued)*

5. Disconnect the W05 SpO2 Flex Cable from the A04 OEM/SpO2 Assembly at J54 by first removing the screw (F09) using a 3/32 hex driver.
6. Disconnect the W06 ECG wire harness from the A02 PP PCB at J23.
7. Disconnect the W14 Speaker Harness Extension Cable from the A01 System PCB at J5.
8. Turn the device so the AC power connector is in view.
9. Disconnect the 4-pin W10 Power/Therapy Cable connector from the A03 Therapy PCB at J17
10. Lift the boardstack assembly out of its track and tilt it forward to make the lower connections accessible.
11. Disconnect the W09 26-pin cable from the A03 Therapy PCB at J16 by releasing the outer tabs.
12. Disconnect the W01 Therapy Connector Assembly from the A03 Therapy PCB at J14.
13. Disconnect the W07 Capacitor Discharge Cable from the A03 Therapy PCB at J2.

*(Continued on next page)*

## Boardstack *(continued)*

9-71

### Boardstack Removal *(continued)*

14. Disconnect the therapy connector cable at J13 and cut the cable tie attaching the cable to the Pacer SIMM PCBA if the device has the pacing option.

#### CAUTION

**Possible component damage.** The OEM/SpO2 flex cable is secured to locking posts. Remove the plug and the locking post simultaneously to avoid damage to the connector.

15. Lift the boardstack assembly away from the bottom case
16. Disconnect the E06 Inductive Resistor's cable from the A03 Therapy PCB at J1.
17. Remove and discard the two 4-40 x 0.312 screws (F04) that connect the E06 Inductive Resistor to the EMI shield (M22) and PCB support bracket (M16).
18. Remove the boardstack assembly from the bottom case.

## Boardstack *(continued)*

9-72

### Boardstack Installation

To install the boardstack assembly:

1. Turn the device so that the power connector is visible, and lower the boardstack assembly into its track. The boardstack assembly will not seat in the tracks correctly if the therapy wires do not slide into the notch cut for them in the boardstack assembly.
2. Install the inductive resistor bracket (M43) onto the PCB support bracket (M16) using two new 4-40 x 0.312 screws (F04); torque to 6.8 in-lb. The bottom bracket screw goes through the top hole of the EMI shield (M22).
3. Connect the E06 Inductive Resistor's cable to the A03 Therapy PCB at J1. Route the cable under the W01 Therapy Cable as shown on the following pages.
4. Connect the E10 Energy Capacitor's cable to the A03 Therapy PCB at J2.
5. Route the W02 Capacitor Discharge Cable with the E06 Inductive Resistor's cable as shown on the following pages.

*(Continued on next page)*

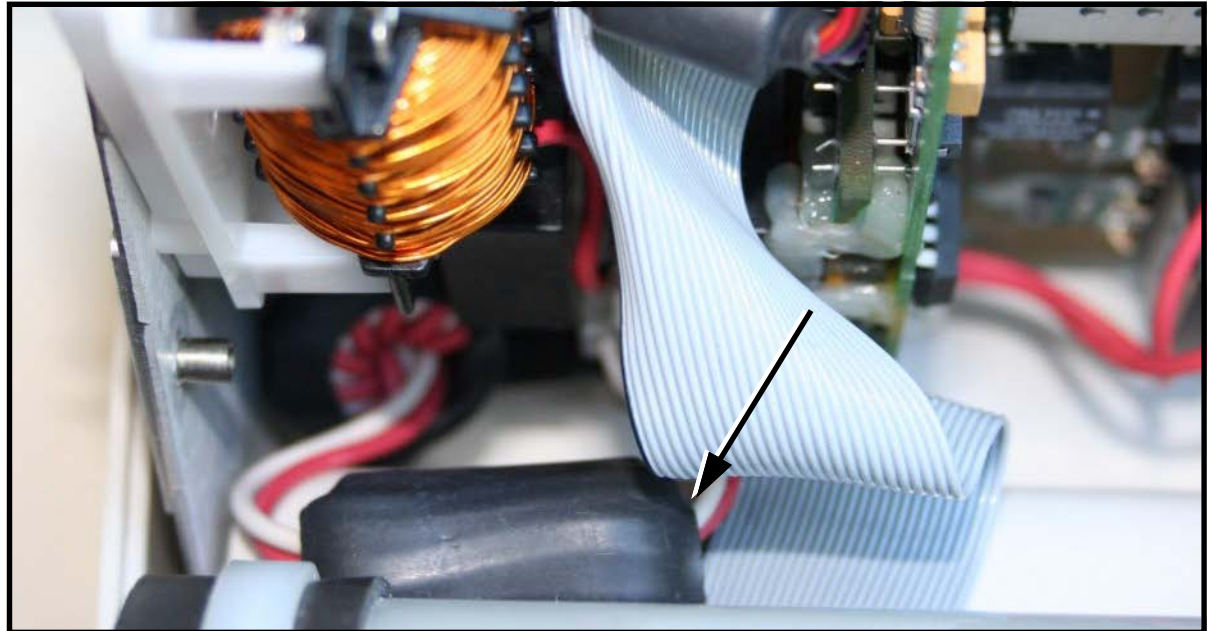
## Boardstack *(continued)*

9-73

### Boardstack Installation *(continued)*

6. Connect the 5-pin therapy connector to the A03 Therapy PCB at J13. Route three ferrite beads of the 5-pin therapy connector cable into the lower left corner of the A03 therapy PCB.

**Note:** If the 5-pin therapy connector cable has a fourth ferrite bead, (REF W01 (RoHS)), route this bead above the battery well, prior to connecting to J13



*(Continued on next page)*



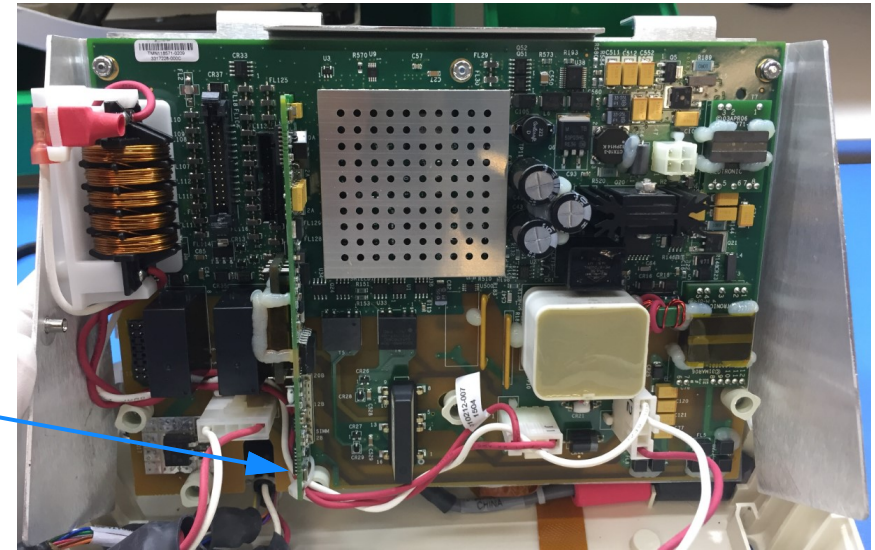
## Boardstack *(continued)*

9-74

### Boardstack Installation *(continued)*

Capacitor discharge cable passes under the W01 Therapy Cable and wraps around the J13 connector. Position the therapy cable ferrites so that they will not damage the J13 connector

Secure the cables to the Pacer SIMM PCBA with a cable tie for devices that have the pacing option.



7. Connect the 10-pin therapy connector to the A03 Therapy PCB at J14.
8. Connect the W09 26-Pin Power Cable to the A03 Therapy PCB at J16.
9. Seat the boardstack assembly into the bottom case.

**Note:** Ensure that the W01 Therapy Connector Assembly slides into the slot in the A03 Therapy PCB.

*(Continued on next page)*

## Boardstack *(continued)*

9-75

### Boardstack Installation *(continued)*

10. Connect the 4-pin W10 Power/Therapy Cable connector to the A03 Therapy PCB at J17.
11. Turn the device so that the ECG and therapy connectors are in view.
12. Connect the W14 Speaker Harness Extension Cable to the A01 System PCB at J5.
13. Connect the ECG cable to the A02 PP PCB at J23.
14. Connect the W05 SpO2 Cable (if included) to the OEM PCB at J54 and fasten with a screw (F09) using a 3/32 hex driver. Torque to 0.4 in-lb.  
**Note:** Carefully align the SpO2 and IrDA connectors to the sockets, and gently press the connectors into the sockets using steady pressure to avoid damage to the connector pins.
15. Connect the W03 IrDA Flex Cable to the A01 System PCB at J08 and fasten with a screw (F09) using a 3/32 hex driver. Torque to 0.4 in-lb.
16. Install the grounding harness (M10) from the power module to the EMI shield (M22) and support bracket (M16) using new 4-40 x 0.312 screws (F04); torque to 6.8 in-lb.
17. Complete the process by [Installing the front case](#).

*(Continued on next page)*

## Boardstack *(continued)*

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9-76

### W02 Capacitor Discharge Cable Replacement

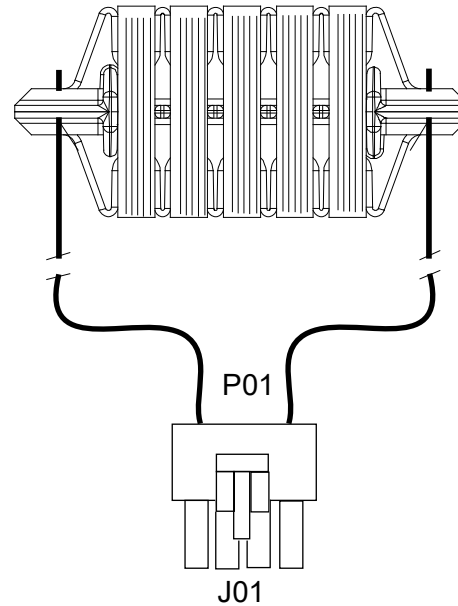
The W02 Capacitor Discharge Cable is part of the capacitor replacement kit. Complete the [E10 Energy Capacitor Removal procedure](#) to remove the cable. Complete the [E10 Energy Capacitor Installation procedure](#) to install the cable.

## Boardstack *(continued)*

9-77

E06 Inductive Resistor  
Diagram

REF **E06**



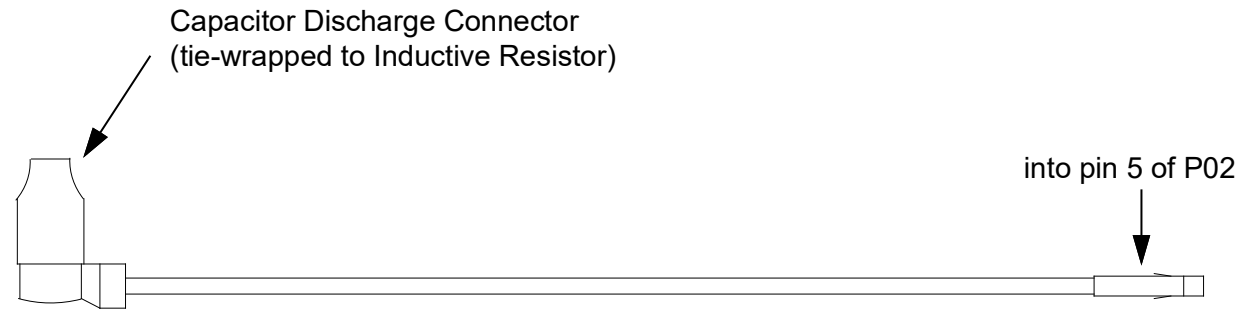
Interconnect

## Boardstack *(continued)*

9-78

W02 Capacitor  
Discharge Cable  
Diagram

REF **W02**

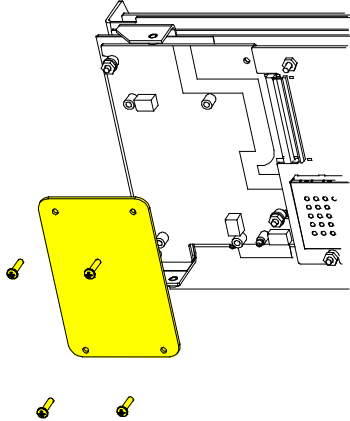


Interconnect

## Boardstack *(continued)*

9-79

### A05 SpO2 Module Removal



### A05 SpO2 Module Installation

**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**
- **Boardstack assembly** (optional removal)

To remove the SpO2 Module:

1. Remove the Nomex shield (M20) by removing the two nuts (F03) and washers (F10).
2. Remove and discard the four 4-40 x 0.312 screws (F08) from the A05 SpO2 Module.
3. Lift the A05 SpO2 Module away from the boardstack assembly.

To Install the A05 SpO2 Module:

**Note:** Order correct SpO2 module replacement kit for the LIFEPAK 20 device.

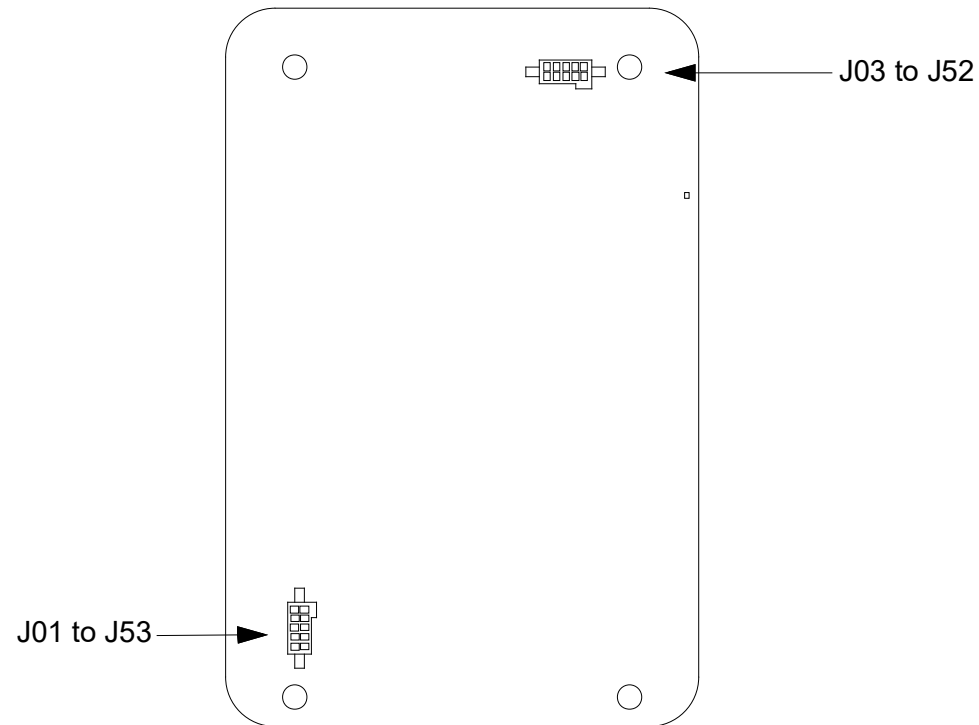
1. Position the A05 SpO2 Module into position over the A04 OEM PCB.
2. Install four new 4-40 x 0.312 screws (F08) into the A05 SpO2 Module; torque to 4 in-lb.
3. Install the Nomex shield (M20) by securing it to the A04 OEM PCB with the two washers (F10) and nuts (F03); torque to 6.8 in-lb.
4. Complete the process by **installing the front case**.

## Boardstack *(continued)*

9-80

### A05 SpO2 Module Diagram

REF A05

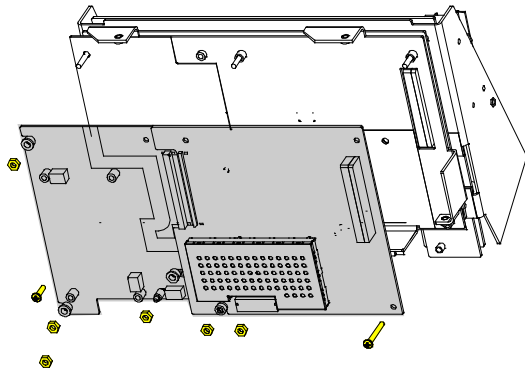


Interconnect

## Boardstack *(continued)*

9-81

### A02 Patient Parameter and A04 OEM/SpO2 Assembly Removal



**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**
- **Boardstack** assembly (optional removal)

To remove the A02 Patient Parameter and optional A04 OEM/SpO2 assemblies:

1. Disconnect the W05 SpO2 Flex Cable from the A04 OEM/SpO2 Assembly at J54 by removing the screw (F09).
2. Disconnect the W06 ECG wire harness from the A02 PP PCB at J23.
3. Remove and discard the 4-40 x 0.937 screw (F06). Remove the three 4-40 nuts (F03) from the A02 Patient Parameter PCB.
4. If the device is equipped with the A04 OEM/SpO2 option, remove the Nomex shield (M20) by removing the two washers (F10) and nuts (F03).

**Note:** **Remove the A05 SpO2 module** if replacing the A04 OEM PCB.

5. Lift the A02 Patient Parameter PCB (OEM/SpO2) assembly away from the boardstack assembly. Ensure that the PCB clears the lip on the frame in the lower right corner.

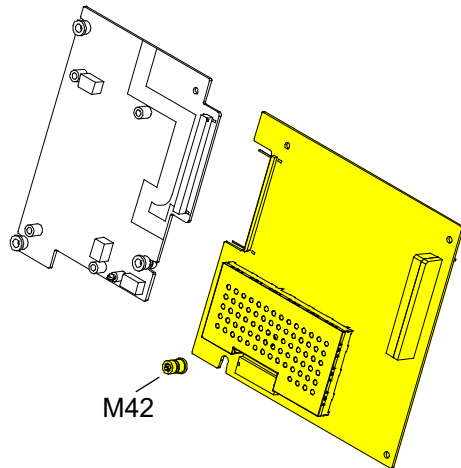
*(Continued on next page)*



## Boardstack *(continued)*

9-82

### A02 Patient Parameter and A04 OEM/SpO2 Assembly Removal *(continued)*



6. Inspect the orange parameter ISO mount (M42) installed in the A02 Patient Parameter PCB. Verify the mount is in good condition.
7. If the device is equipped with the A04 OEM/SpO2 option:
  - a. Inspect the three, white, OEM ISO mounts (M18) installed in the A06 OEM PCB. Verify the mounts are in good condition.
  - b. Separate the A02 Patient Parameter PCB from the A04 OEM/SpO2 assembly at J24.

**Note:** If replacing the A02 Patient Parameter PCB or A04 OEM PCB, remove the isolated mounts from the old PCBs, note the condition, and install them on the new PCBs. Replace the isolated mounts if broken or cracked.

## Boardstack *(continued)*

9-83

### A02 Patient Parameter and A04 OEM/SpO2 Assembly Installation

To install the A02 Patient Parameter and optional A04 OEM/SpO2 assembly:

1. Make sure the orange parameter ISO mount (M42) is installed on the A02 Patient Parameter PCB with the square end facing out.
2. If the device is equipped with the A04 OEM/SpO2 option:
  - a. Make sure the three, white, OEM ISO mounts (M18) are installed on the A04 OEM PCB with the square ends facing out.
  - b. Connect the A02 Patient Parameter to the A04 OEM/SpO2 assembly at J24.
3. Install the A02 Patient Parameter (OEM/SpO2) PCB onto the five standoffs (M15) on the boardstack shield (ensure the standoffs are tight and in good condition). Make sure the PCB clears the lip in the lower right corner and the 60-pin connector seats correctly.
4. If the device is equipped with the A04 OEM/SpO2 option:
  - a. **Install the A05 SpO2 module**, if previously removed.

*(Continued on next page)*

## Boardstack *(continued)*

9-84

### A02 Patient Parameter and A04 OEM/SpO2 Assembly Installation *(continued)*

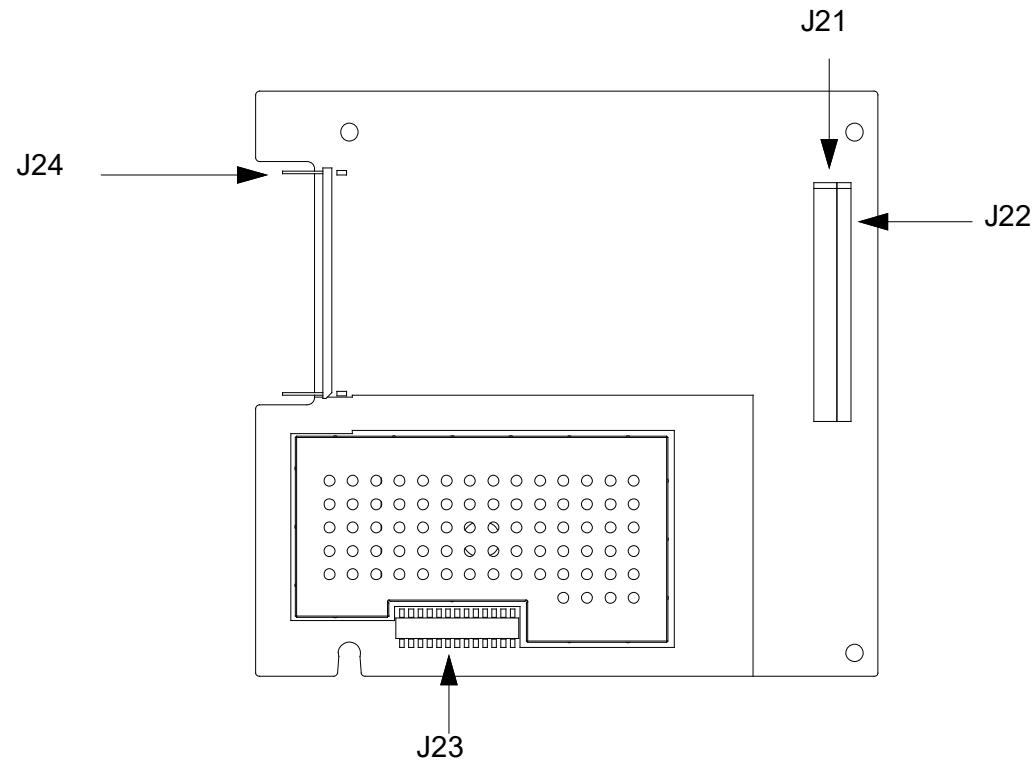
- b. Install the Nomex shield (M20) onto the OEM PCB by securing it with two washers (F10) and nuts (F03); torque to 6.8 in-lb. Make sure the fold on the Nomex shield is in the upper left corner of the OEM PCB.
  - c. Install the one remaining nut (F03) and new 4-40 x 0.312 screw (F08) onto the OEM PCB; torque to 4 in-lb.
5. If the device is NOT equipped with the A05 OEM/SpO2 option, make sure the boardstack shield is secured with two nuts (F03) along the left side only; torque to 6.8 in-lb.
6. Install the three remaining 4-40 nuts (F03) and new 4-40 x 1.00 screw (F06) onto the A02 Patient Parameter PCB; torque to 6.8 in-lb.
7. Connect the W05 SpO2 Cable (if included) to the OEM PCB at J54 and fasten with a screw (F09); torque to 6.8 in-lb.  
  
**Note:** Carefully align the SpO2 connector to the sockets, and gently press the connectors into the sockets using steady pressure to avoid damage to connector pins.
8. Connect the ECG cable to the A02 PP PCB at J23.
9. Complete the process by [Installing the front case](#).

## Boardstack *(continued)*

9-85

A02 Patient Parameter  
PCB Diagram

REF **A02** (RoHS)



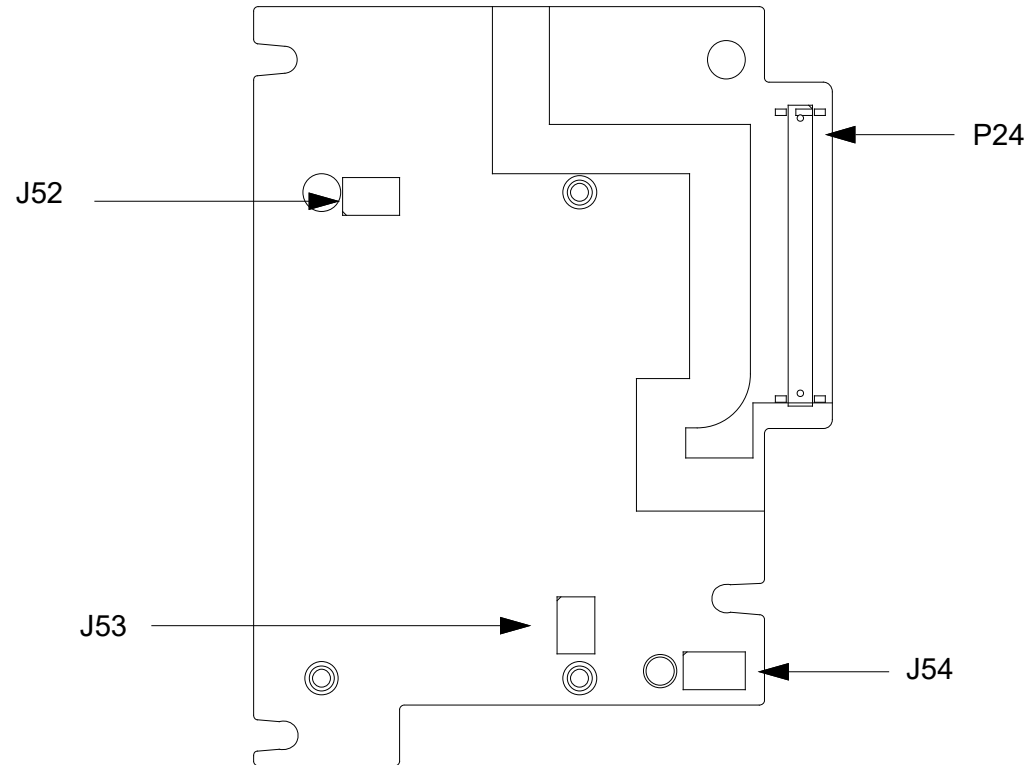
Interconnect

## Boardstack *(continued)*

9-86

A04 OEM Interface  
PCB Diagram

REF **A04** (RoHS)



Interconnect

## Boardstack *(continued)*

9-87

### Coin Cell Battery Replacement

**Note:** Remove the following assemblies before beginning this disassembly:

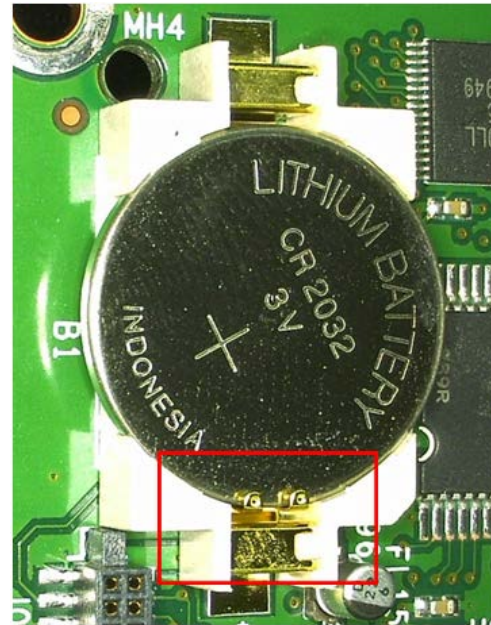
- **Top case**
- **Front case**
- **Boardstack assembly** (optional removal)
- **A02 Patient Parameter PCB** (OEM/SpO2 assembly, if applicable)

To replace the coin battery:

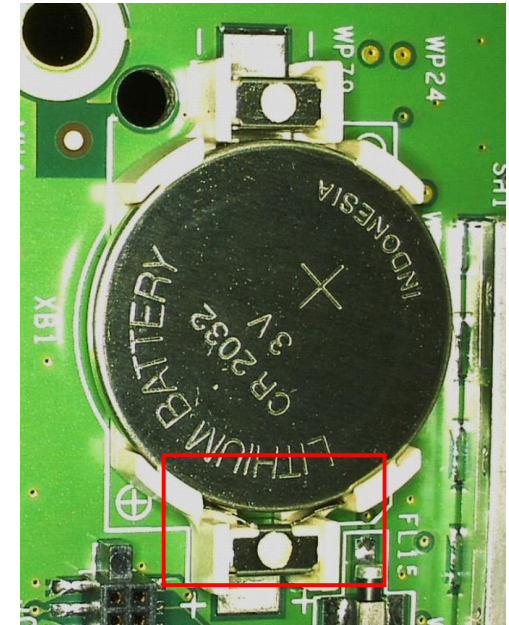
1. Remove the patient parameter shield (M14).
2. Identify which type of coin cell holder is installed on the A01 System Controller PCB: **A)** Keystone (positive contacts visible on top of the battery) or **B)** Renata (positive contacts to the side of the battery)

## Boardstack *(continued)*

9-88



A) Keystone holder (positive contacts visible on top of the coin cell battery)



B) Renata holder (positive contacts are to the side of the coin cell battery)

3. Replace the coin cell battery in accordance with **Replacement Procedure A** for Keystone holder, or **Replacement Procedure B** for Renata holder.

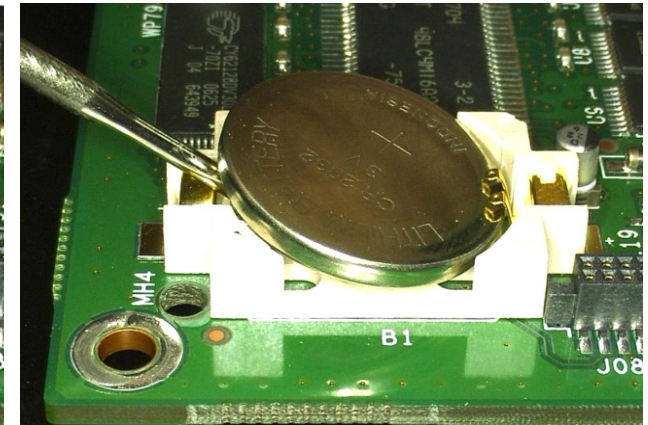
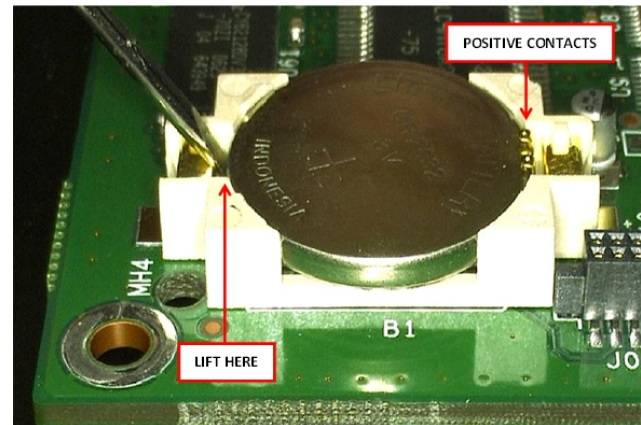
## Boardstack *(continued)*

9-89

### Replacement Procedure A - Keystone:

*Caution: The positive contacts of the Keystone coin cell battery holder are easily damaged. Do not bend or deform the positive contacts during removal or insertion. If the battery holder is damaged, replacement of the A01 System Controller PCB is required.*

1. Push battery gently toward the positive side of battery holder while using a flat screwdriver to lift up the battery closest to the negative side of the holder, until the battery releases from the holder.

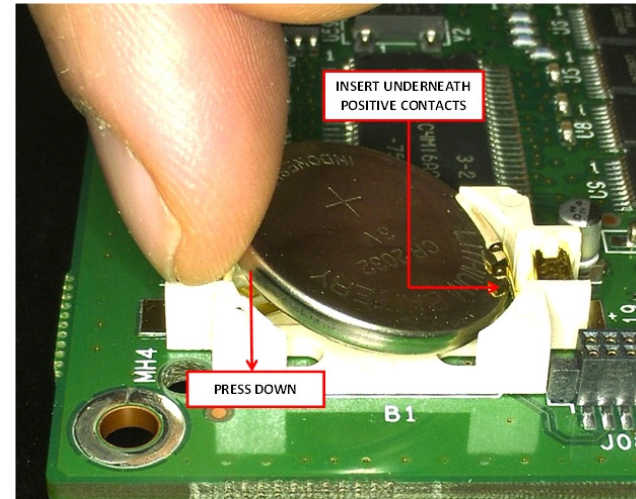




## Boardstack *(continued)*

9-90

2. Install the new coin battery (E07) by inserting battery (positive up) **underneath** the positive contacts and then pressing it into the negative side of battery holder. Ensure that the battery is fully seated in the holder.



3. After the battery has been replaced, check the voltage on the coin cell battery holder circuit with a multi-meter to confirm that the battery is installed correctly and is making contact with the battery holder.
4. Replace the PCB shield (M14).
5. **Install the A02 Patient Parameter PCB and A04 OEM PCB.**
6. **Install the A05 SpO2 Module** (if previously removed).

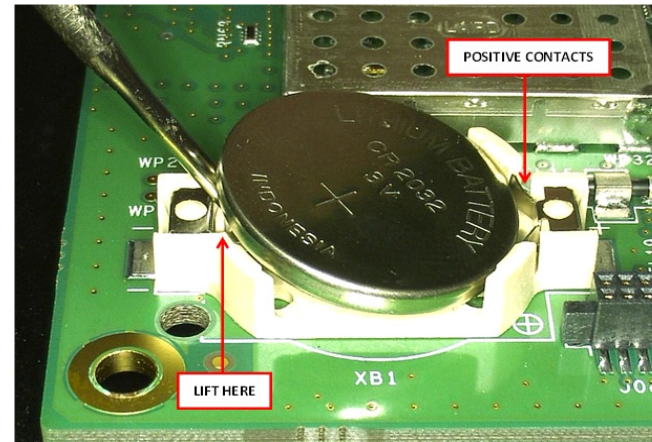
## Boardstack (continued)

9-91

7. Complete the process by **installing the front case.**

## Replacement Procedure B - Renata

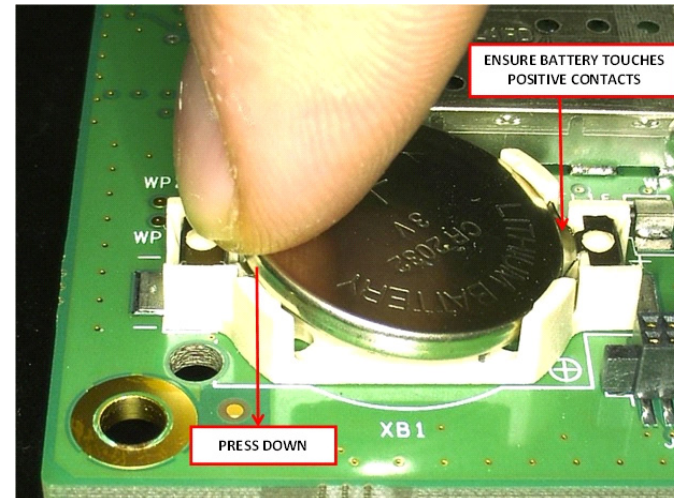
1. Push battery gently toward the positive side of battery holder while using a flat screwdriver to lift up the edge of the battery closest to the negative side of the holder until the battery releases.



## Boardstack *(continued)*

9-92

2. Install the new coin cell battery (E07) by inserting the side of the battery (positive up) against the positive contacts and then pressing it into the negative side of battery holder. Ensure that the battery is fully seated in the holder and that the side of the battery touches the positive contacts.



3. After the battery has been replaced, check the voltage on the coin cell battery holder circuit with a multi-meter to confirm that the battery is installed correctly and is making contact with the battery holder.
4. Replace the PCB shield (M14).
5. **Install the A02 Patient Parameter PCB and A04 OEM PCB.**

## Boardstack *(continued)*

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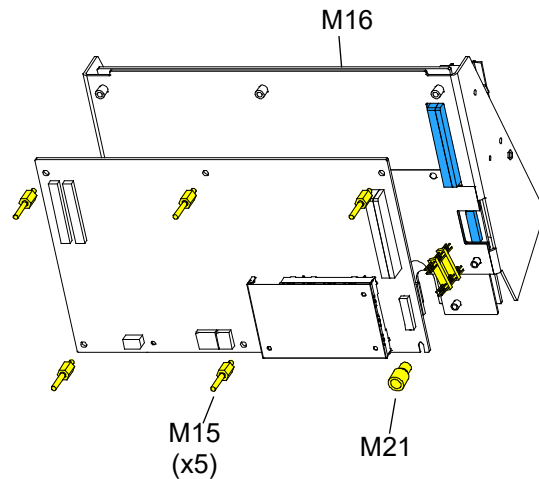
9-93

6. **Install the A05 SpO2 Module** (if previously removed).
7. Complete the process by **Installing the front case**.

## Boardstack *(continued)*

9-94

### A01 System PCB Removal



**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**
- **Boardstack** assembly
- **A02 Patient Parameter PCB** (and A04 OEM/SpO2 assembly, if applicable)

To remove the A01 System PCB:

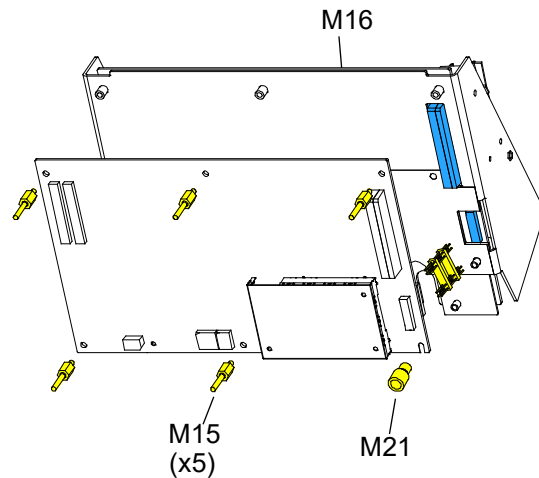
1. Remove the PCB shield (M14).
2. Remove and discard the five threaded standoffs (M15) from the A01 System PCB.
3. Remove the round, snap-in standoff (M21) from the A01 System PCB.
4. Remove the A01 System PCB from the PCB support bracket (M16).
5. Locate the 8-pin stack connector (W07) (connects the A01 System PCB J03 with the A03 Therapy PCB at J15), and safeguard it for reuse.

**Note:** The 8-pin stack connector may remain connected to the A03 Therapy PCB or the A01 System PCB, or it may fall out completely when the A01 System PCB is removed. Be sure to account for it immediately.

## Boardstack *(continued)*

9-95

### A01 System PCB Installation



To install the A01 System PCB:

1. Ensure that the plastic standoff (M21) is correctly positioned, large end up, on the A01 System PCB.
  2. Insert the short end of the 8-pin stack connector (W07) into the A03 Therapy PCB at J15.
  3. Carefully position the A01 System PCB over the PCB support bracket (M16), and slide it down the support bracket standoffs. As the A01 System PCB slides down, ensure that the support bracket standoffs and the pins on the 8-pin and 60-pin stack connectors seat with their connectors evenly.
  4. Install five new threaded standoffs (M15), long end up, into the support bracket; torque to 6.8 in-lb.
- Note:** Do not install a screw in the insulated standoff in the lower right corner at this time.
5. **Replace the coin battery** if needed.
  6. Install the PCB shield (M14) by sliding it down the five threaded standoffs on the A01 System PCB.

*(Continued on next page)*

## Boardstack *(continued)*

9-96

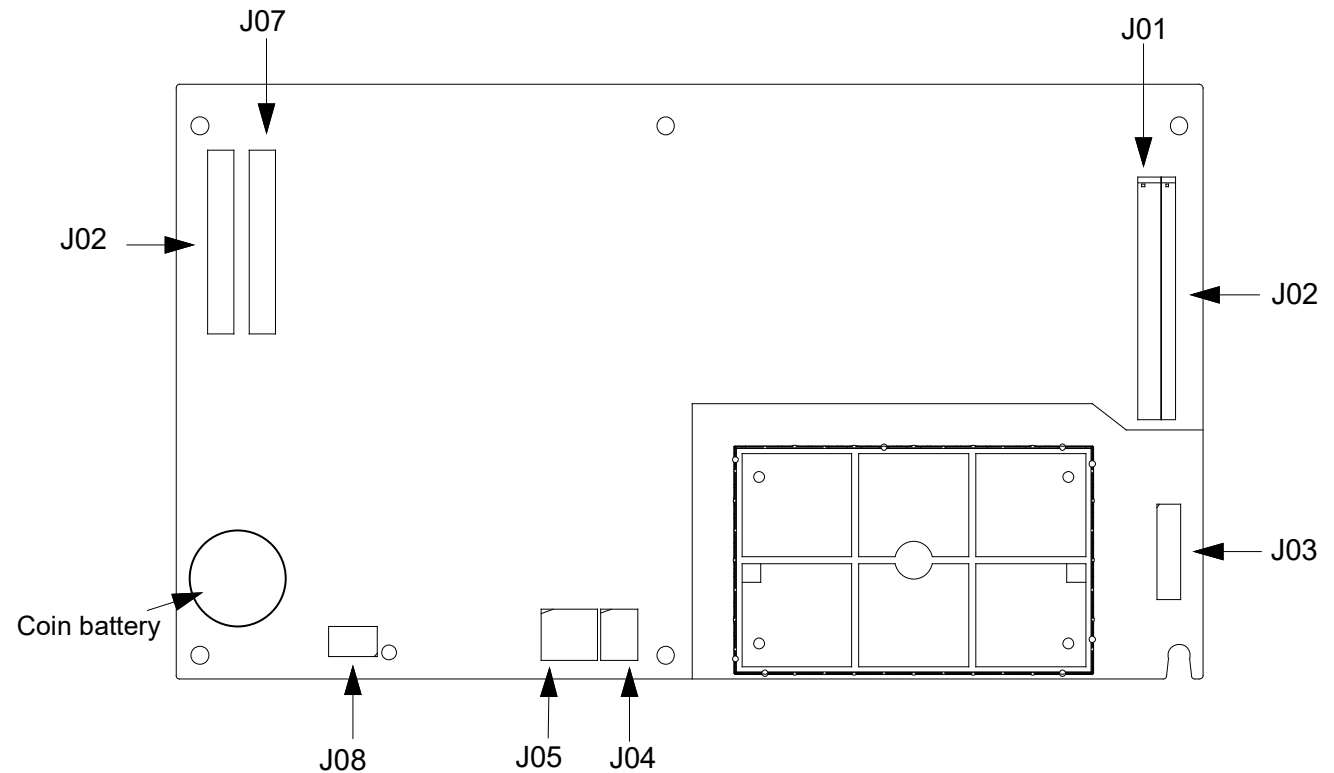
### A01 System PCB Installation *(continued)*

7. **Install the A02 Patient Parameter PCB** and A04 OEM PCB assembly.
8. **Install the A05 SpO2 Module** (if previously removed).
9. **Install the Boardstack Assembly.**
10. Complete the process by **Installing the front case.**

## Boardstack *(continued)*

9-97

### A01 System PCB Diagram

REF **A01** (RoHS)

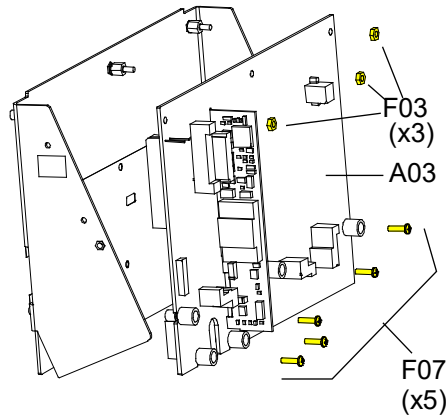
Interconnect



## Boardstack *(continued)*

9-98

### A03 Therapy PCB Removal



**Note:** Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**
- **Boardstack assembly**

To remove the A03 Therapy PCB:

1. Remove and discard the five 4-40 x 0.500 screws (F07) located inside the five insulated standoffs.  
**Note:** The standoffs should remain with the A03 Therapy PCB.
2. Remove the three 4-40 nuts (F03) from the metal standoffs along the top edge of the A03 Therapy PCB (see illustration B at left).
3. Remove the A03 Therapy PCB from the PCB support bracket (M16).
4. Locate the 8-pin stack connector (W07) (connecting the A01 System PCB at J3 with the A03 Therapy PCB at J15) and safeguard it for reuse.

*(Continued on next page)*

## Boardstack *(continued)*

9-99

### A03 Therapy PCB Removal *(continued)*

**Note:** The 8-pin stack connector may remain connected to the A03 Therapy PCB or the A01 System PCB, or it may fall out completely when the A01 System PCB is removed. Be sure to account for it immediately.

### A03 Therapy PCB Installation

To install the A03 Therapy PCB:

1. If you are replacing the PCB support bracket (M16), install three new standoffs (M17), short side down, onto the bracket; torque to 6.8 in-lb.
2. If you are replacing the Therapy PCB, ensure that the five plastic standoffs (M18) are correctly positioned, large end up, on the PCB.

**Note:** If the A01 System PCB is installed on the boardstack assembly, ensure that the 8-pin stack connector (W07) and the 60-pin stack connector are securely positioned on the A01 System PCB with the long pin side of the 8-pin stack connector installed in the System PCB.

*(Continued on next page)*

## Boardstack *(continued)*

9-100

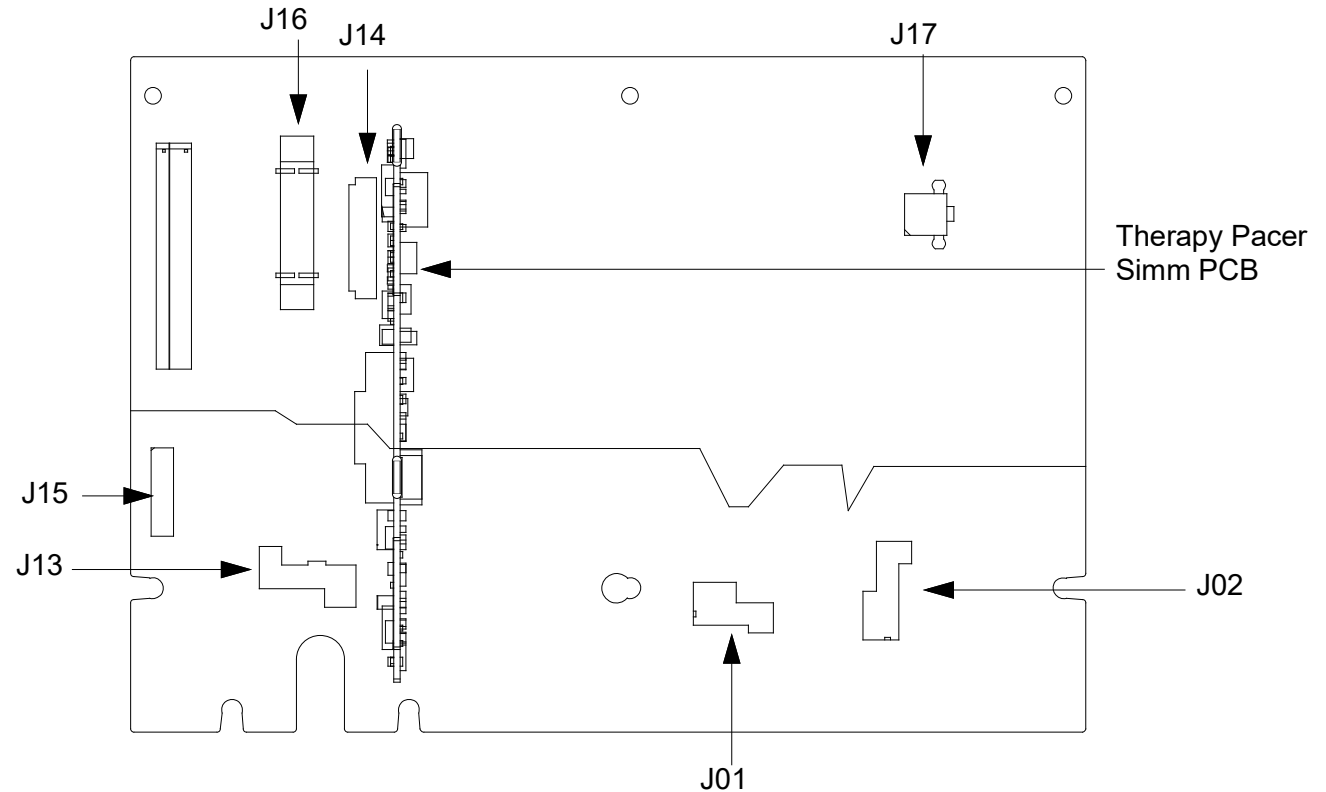
### A03 Therapy PCB Installation *(continued)*

3. Carefully align the A03 Therapy PCB with the PCB support bracket (M16) and press it into position. As the A03 Therapy PCB slides down the support bracket standoffs, ensure that the pins on the 8-pin and 60-pin stack connectors seat with their connectors evenly.
4. Install five new 4-40 x 0.500 screws (F07) in the five insulated standoffs (M18); torque to 6.8 in-lb.
5. Install the three 4-40 nuts (F03) onto the metal standoffs along the top edge of the A03 Therapy PCB; torque to 6.8 in-lb.
6. **Install the Boardstack Assembly.**
7. Complete the process by **Installing the front case.**

## Boardstack *(continued)*

9-101

A03 Therapy PCB  
Diagram (With Pacing)  
REF **A03** (RoHS)



Interconnect

# Bottom Case

9-102

## Assembly Diagram (Modules)

### Bottom Case Disassembly

### Bottom Case Reassembly

### A12 Printer Module Removal

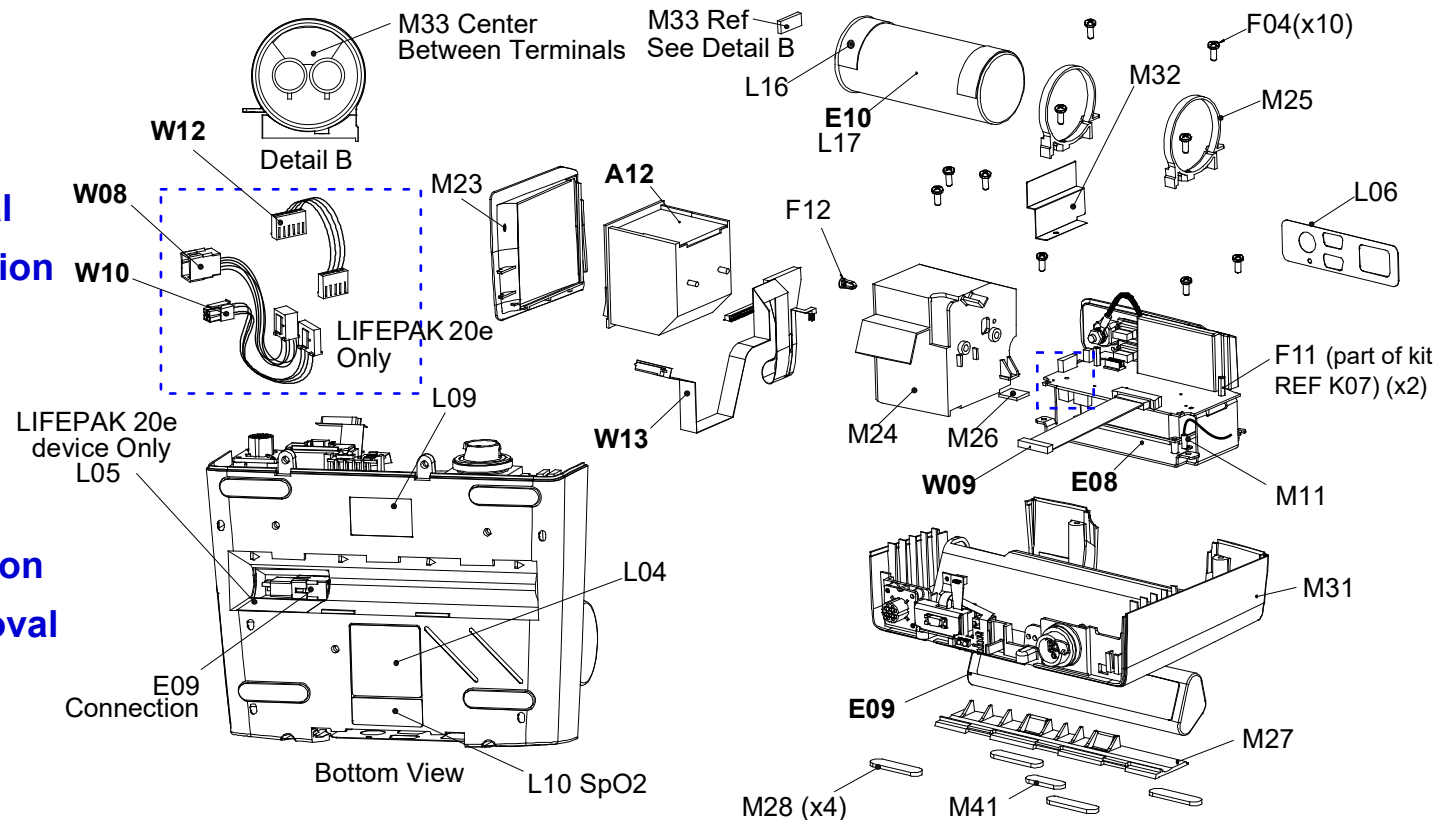
### A12 Printer Module Installation

- Printer
- Printer flex cable
- Printer bezel
- Printer shroud

### E08 Power Module Removal

### E08 Power Module Installation

### E10 Energy Capacitor Removal



Parts E08–W09

Parts W10–M26

Parts 99–183

Parts 221–270

Connectors View

Main Assemblies

## Bottom Case (continued)

9-103

### Assembly Diagram (Connectors)

**E09 Battery Replacement**

**W01 Therapy Connector Removal**

**W01 Therapy Connector  
Installation**

**W06 ECG Connector Removal**

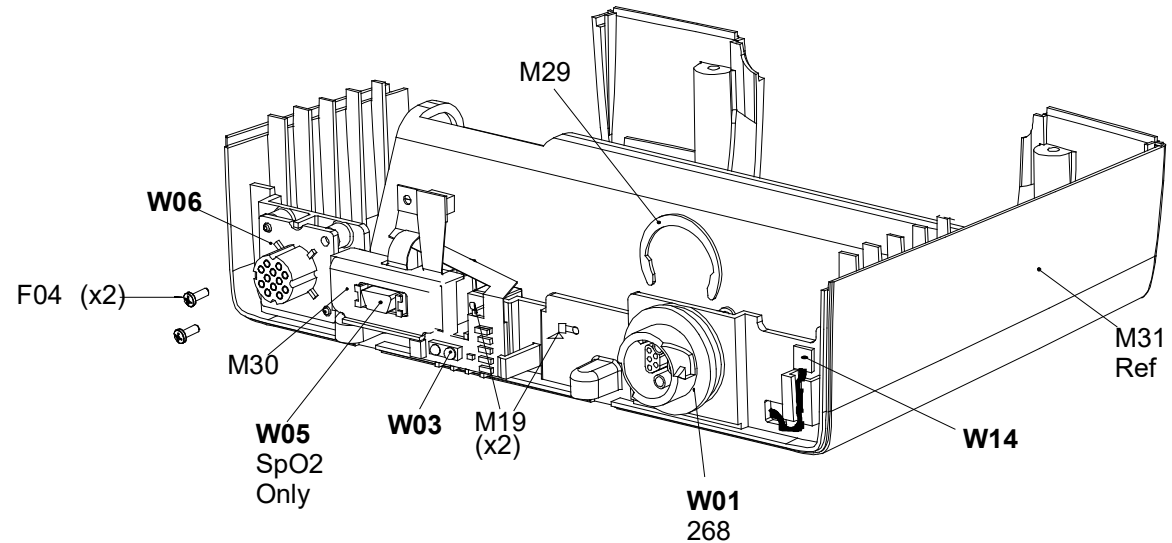
**W06 ECG Connector Installation**

**W05 SpO2 Connector Removal**

**W05 SpO2 Connector Installation**

**W03 IrDA Assembly Removal**

**W03 IrDA Assembly Installation**



## Bottom Case *(continued)*

9-104

### Parts List

Reference Designator	Quantity	Part Description	Note
E08	1	Power Module Assy, LIFEPAK 20e	<b>Part of kit REF K19 (RoHS)</b>
E09	1	Battery Pack – Li-ion, LIFEPAK 20e	
A12	1	Printer - 50MM, Thermal Printhead	
E10	1	Energy Storage Capacitor	<b>Part of kit REF K08</b>
W01	1	Therapy Connector Assembly	<b>Part of kit REF K12(RoHS)</b>
W03	1	IrDA Flex Assembly	(RoHS)
W05	1	SpO2 Flex Assembly	<b>Part of Masimo SpO2 Connector Repair kit REF K05</b>
W06	1	ECG 7-Contact Receptacle	(RoHS)
W08	1	Battery Cable, LIFEPAK 20e	<b>Part of kit REF K28 (RoHS)</b>
W09	1	Power to Therapy 26-pin Cable	

*(Continued on next page)*

Bottom Case *(continued)*

Parts List

Reference Designator	Quantity	Part Description	Note
W10	1	Power/Therapy Cable, LIFEPAK 20e	<a href="#">Part of kit REF K28 (RoHS)</a>
W11	1	ECG Sync/System Cables	<a href="#">Part of kit REF K28 (RoHS)</a>
W12	1	AC Power Cable, LIFEPAK 20e	<a href="#">Part of kit REF K28 (RoHS)</a>
W13	1	Printer Flex Cable Assembly	
W14	1	Speaker Assembly Harness Ext.	(RoHS)
L01	sheet	Label Set (6 labels), LIFEPAK 20e	<a href="#">Refer to Labels Assembly</a>
F11	2	Standoff-Hex, M/F,4-40,0.188	<a href="#">Part of kit REF K07</a>
M23	1	Printer Bezel	
M24	1	Printer Shroud	
L16	2	Foam Spacer (part of A13 assy)	
M25	2	Capacitor Support Bracket	<a href="#">Part of kit REF K07</a>
M26	1	EMI Foam Core Gasket	

*(Continued on next page)*



## Bottom Case *(continued)*

9-106

### Parts List

Reference Designator	Quantity	Part Description	Note
M27	1	Battery Door, LIFEPAK 20e	
M28	4	Mounting Foot	Part of bottom case assembly
M29	1	Therapy Retaining Ring	<b>Part of kit REF K12 (RoHS)</b>
M30	1	SpO2 Connector Mounting Clip	<b>Part of kit REF K05</b>
M31	1	Bottom case assembly	
L17	1	Capacitor shield (part of A13 assembly)	<b>Part of kit REF K06</b>
F04	12	Machine screw 4-40 X 0.312L	
L04	1	Serial number label, LIFEPAK 20e	<b>Refer to Labels Assembly</b>
M11	1	Grounding strap harness	
F12	1	Plastic Fastener	

*(Continued on next page)*

Bottom Case *(continued)*

Parts List

Reference Designator	Quantity	Part Description	Note
M41	1	Mounting foot	Attached to battery door (M27)
M19	2	Cable tie retainer	Part of kit REF K08
M32	1	Dielectric shield	Part of kit REF K07
M33	1	Poron Foam, Capacitor	Part of kit REF K08
M34	1	Seal, Therapy Connector Mount	Part of kit REF K12 (RoHS)
L05	1	Label, NIMH Battery Warning	

(Continued on next page)

## Bottom Case *(continued)*

9-108

### Bottom Case Disassembly

To disassemble the bottom case:

1. **Remove the E09 Battery.**
2. **Remove the top case.**
3. **Remove the front case.**
4. **Remove the boardstack assembly.**
5. **Remove the A12 Printer Module.**
6. **Remove the E10 Energy Capacitor.**
7. **Remove the E08 Power Module.**
8. **Remove the W01 Therapy Connector.**
9. **Remove the W06 ECG Connector.**
10. **Remove the W05 SpO2 Connector.**
11. **Remove the W03 IrDA Connector.**
12. **Remove the W14 Speaker Harness Extension Cable.**

## Bottom Case *(continued)*

9-109

### Bottom Case Reassembly

To reassemble the bottom case:

1. Obtain a new bottom case. If bottom case needs replaced, provide current Device Part Number and Serial Number to your local Stryker representative.
2. Inspect and install the bottom case friction foot pads (M28), as needed.
3. Inspect and install the mounting foot (M41) to the battery door (M27), as needed.
4. **Install the E08 Power Module.**
5. **Install the E10 Energy Capacitor.**
6. **Install the A12 Printer Module.**
7. **Install the W01 Therapy Connector.**
8. **Install the W14 Speaker Harness Extension Cable.**
9. **Install the W06 ECG Connector.**
10. **Install the W05 SpO2 Connector.**
11. **Install the W03 IrDA Connector.**
12. **Install the boardstack assembly.**

*(Continued on next page)*

## Bottom Case *(continued)*

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9-110

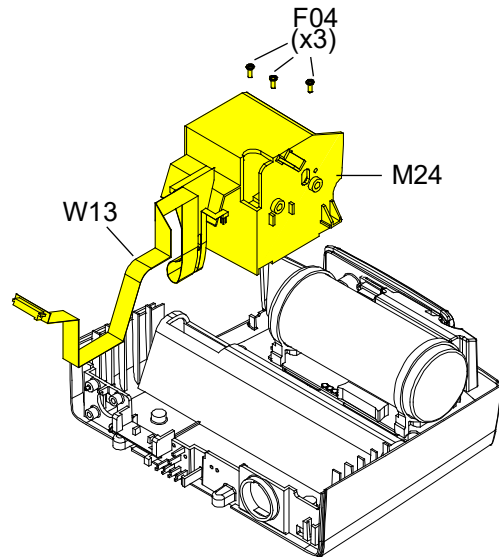
### Bottom Case Reassembly *(continued)*

13. [Install the front case.](#)
14. [Install the top case.](#)
15. [Install the E09 Battery.](#)
16. Review the [labels parts list](#) and install new labels.
17. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-111

### A12 Printer Module Removal



#### WARNING

**SHOCK HAZARD.** Carefully follow disassembly instructions to avoid a shock or causing damage to wires during disassembly.

To remove the A12 Printer Module assembly and shroud:

**Note:** If Printer shroud or W13 Printer Flex cable is remove, the following assemblies will require disassembly:

- E09 Battery
- Top case
- Front case
- Boardstack

1. Open the printer door and remove the printer paper roll.
2. Loosen the two captured screws located inside the printer on the rear wall.
3. Carefully pull the A12 Printer out of the printer shroud (M24).
4. Disconnect the W13 Printer Flex Cable from the printer at printer connection J1.

*(Continued on next page)*

## Bottom Case *(continued)*

9-112

### A12 Printer Module Removal *(continued)*

**Note:** If removing the A12 Printer, the removal process is complete. If removing the printer shroud or the W13 Printer Flex Cable, continue with the removal process until the desired part is removed.

5. Slide the printer bezel (M23) up and away from the bottom case.
6. Remove and discard the three 4-40 x 0.312 screws (F04) from the bottom of the printer shroud (M24).
7. Carefully lift the shroud to access the 4-pin power cable.
8. Disconnect the 4-pin power cable from the E08 Power Module at J45, and feed it through the small shroud cutout.
9. Lift the W06 ECG Cable out of the way and carefully remove the W13 Printer Flex Cable from the bottom case. The cable is held in place by adhesive, so it should be removed evenly to avoid damaging the connectors or the cable.
10. Remove the printer shroud (M24) and W13 Printer Flex Cable from the bottom case.
11. Carefully remove the W13 Printer Flex Cable from the printer shroud pulling the J34 connector end through the large shroud cutout.

## Bottom Case *(continued)*

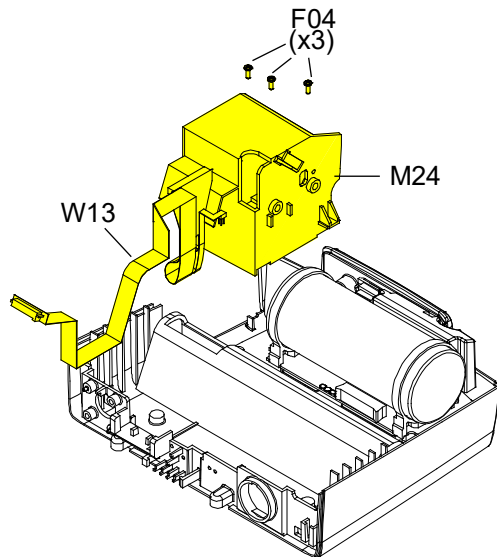
9-113

### A12 Printer Module Installation

**Note:** If installing the A12 Printer only, start at [step 9](#).

To install the printer module:

1. Insert the J34 connector end of the Printer Flex Cable through the large slot in the printer shroud.
2. Slide the W13 Printer Flex Cable under the W06 ECG Cable and position the printer cable along the right side of the guide on the bottom case.
3. Insert the 4-pin power connector through the small slot in the shroud.
4. Connect the 4-pin power connector to the E08 Power Module at J45, ensuring that the connector is positioned correctly.
5. Position the printer shroud (M24) in the bottom case.
6. Install three new 4-40 x 0.312 screws (F04) into the bottom of the printer shroud; torque to 6.8 in-lb.



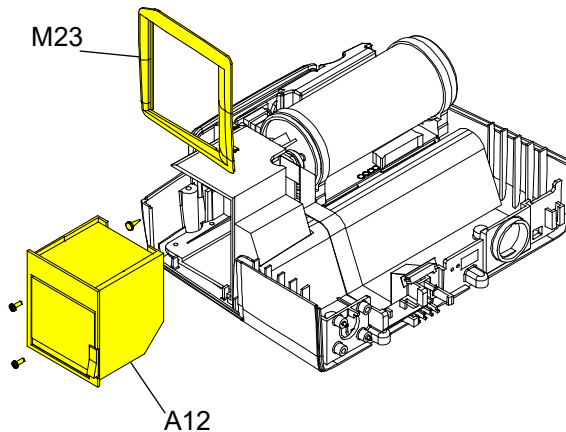
*(Continued on next page)*



## Bottom Case *(continued)*

9-114

### A12 Printer Module Installation *(continued)*

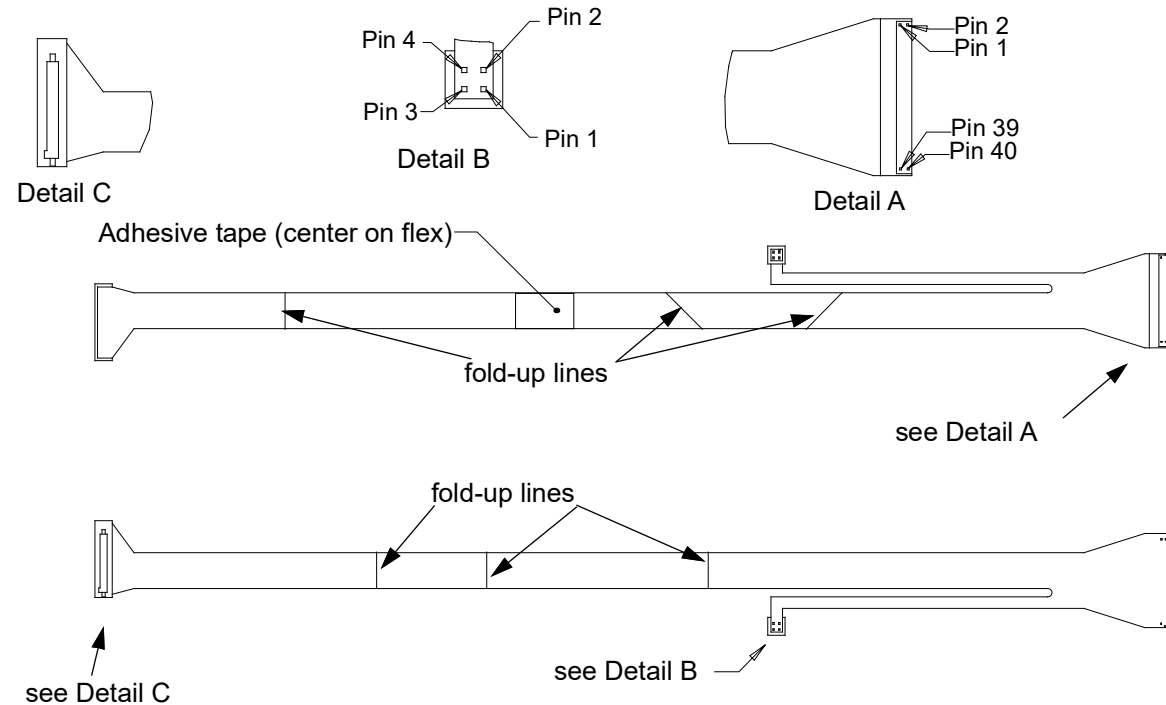


7. If removed, press the fastener (F12) into the printer shroud to secure the J45 flex connector.
8. Insert the printer bezel (M23) ensuring that it is flush with the bottom case.
9. Connect the W13 Printer Flex Cable to the J1 connector on the printer. The cable should lay flat against the rear of the printer.
10. Ensure that the W13 Printer Flex Cable lays between the two captured screws.
11. Slide the A12 Printer into the printer shroud.
12. Tighten the two captured screws located in the A12 Printer. Torque to 10 in-lb.
13. Install the paper roll in the A12 Printer and close the printer door.
14. **Install the boardstack.**
15. **Install the front case.**
16. **Install the top case.**
17. **Install the E09 Battery.**
18. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-115

### W13 Printer Flex Cable Diagrams

REF **W13**

Interconnect

## Bottom Case *(continued)*

9-116

### E10 Energy Capacitor Removal

#### WARNING

**SHOCK HAZARD.** Carefully follow disassembly instructions to avoid a shock or causing damage to wires during disassembly.

**Note:** Remove the following assemblies before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**

To remove the E10 Energy Capacitor:

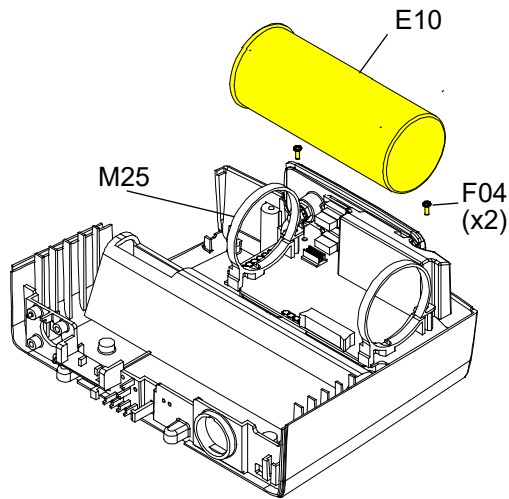
1. If the boardstack assembly was not removed, remove and discard the screw from the ground cable (M11).
2. Disconnect the W10 Power/Therapy Cable from the A03 Therapy PCB at J17.
3. Pull the boardstack assembly away from the printer shroud (M24) and the power module.
4. Disconnect the W02/E10 Capacitor Discharge Cable from the A03 Therapy PCB at J2.

*(Continued on next page)*

## Bottom Case *(continued)*

9-117

### E10 Energy Capacitor Removal *(continued)*



5. Uninstall the white connector pin of the inductive resistor assembly (using Pin Extractor Tool, 11-03-0044) from pin 5 of J2 connector.
6. Remove and discard the two 4-40 × 0.312 screws (F04) from the rear of the capacitor brackets (95).
7. Lift the capacitor (E10) out of the capacitor brackets.
8. Remove the capacitor sleeve with foam tape (L17 and L16) from the capacitor.
9. If removing the capacitor brackets (M25), remove and discard the two 4-40 × 0.312 screws (F04) from the front of the capacitor brackets (M25) and remove the capacitor brackets (M25) and the capacitor shield (M32) (see illustration on next page).

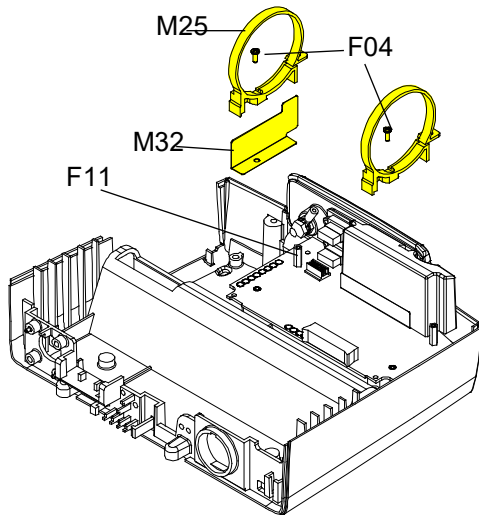
## Bottom Case *(continued)*

9-118

### E10 Energy Capacitor Installation

To install the E10 Energy Capacitor:

1. Ensure that two capacitor bracket standoffs (F11) are on the power module.
2. Install the capacitor shield (M32) and the two capacitor brackets (M25) onto the standoffs using two new 4-40 × 0.312 screws (F04); torque to 6.8 in-lb (if the brackets were removed).
3. Install the capacitor sleeve with foam tape.
4. Install the capacitor into the capacitor brackets (M25) with the capacitor cable end toward the printer shroud and the warning label visible at the top of the capacitor.
5. Ensure that the capacitor brackets are centered on the foam tape and install two new 4-40 × 0.312 screws (F04) into the capacitor brackets; torque to 6.8 in-lb.



*(Continued on next page)*

## Bottom Case *(continued)*

9-119

### E10 Energy Capacitor Installation *(continued)*

6. Install the white connector pin from Inductive Resistor Assembly into Pin 5 of Capacitor J2 connector.
7. Connect the capacitor cable to the A03 Therapy PCB at J2
8. **Install the power module**, if not installed.
9. **Install the boardstack**, if not installed.
10. Reconnect the 4-pin W10 Power/Therapy Cable connector to the A03 Therapy PCB at J17. Reseat the boardstack assembly.
11. Install a new 4-40 × 0.312 screw (F04) and fasten the ground cable (M11) to the boardstack; torque to 6.8 in-lb.
12. **Install the front case**.
13. **Install the top case**.
14. **Install the E09 Battery**.
15. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-120

### E08 Power Module Removal

#### WARNING

**SHOCK HAZARD.** Carefully follow disassembly instructions to avoid a shock or causing damage to wires during disassembly.

**Note:** Remove the following assemblies before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Printer module**
- **Capacitor (optional removal)**
- **Boardstack (optional removal)**

To remove the power module assembly:

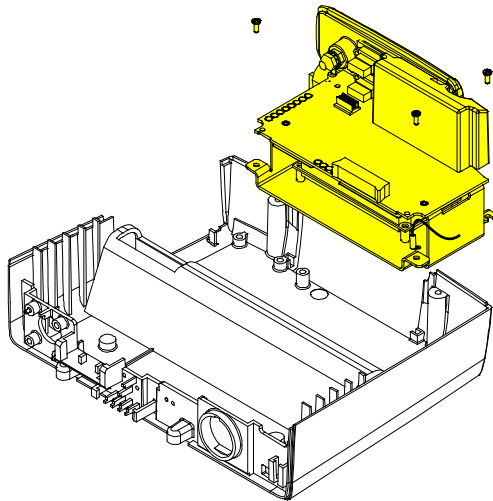
1. If the boardstack assembly is installed in the bottom case, continue with step 2. If the boardstack assembly has been removed, proceed to step 5.
2. Disconnect the W10 Power/Therapy Cable from the A03 Therapy PCB at J17.
3. Disconnect the W09 26-Pin Cable from the A03 Therapy PCB at J16.

*(Continued on next page)*

## Bottom Case (continued)

9-121

### E08 Power Module Removal (continued)



4. Pull the boardstack assembly away from the printer shroud and power module.
5. If replacing the power module, **remove the E10 Energy Capacitor** (complete steps 6 through 9).
6. Remove and discard the forward right 4-40 × 0.312 screw (F04) that secures the right side of the power module and grounding harness (M11).  
**Note:** Remove the grounding harness (M11) as you remove the right forward screw. Replace the grounding harness if broken or frayed.
7. Remove and discard the forward left 4-40 × 0.312 screw (F04) that secures the left side of the power module.
8. Loosen the rear 4-40 × 0.312 screw (F04) that secures the right rear corner of the power bracket three turns.
9. Tilt the left side of the power module up, clearing the loosened screw, and remove it from the bottom case.



## Bottom Case *(continued)*

9-122

### E08 Power Module Installation

To install the power module assembly:

1. Ensure that the right rear corner 4-40 × 0.312 screw (F04) is loosely installed (back off 3 to 5 turns) in the bottom case.
2. Position the power module in the bottom case ensuring that the notch in the rear right lip slips into place under the loosened screw.
3. Install a new 4-40 × 0.312 screw (F04) in the power bracket's left forward corner; torque to 6.8 in-lb.
4. Insert a 4-40 × 0.312 screw (F04) through the grounding strap (M11) ring, and install the screw in the power bracket's right forward corner; torque to 6.8 in-lb.

**Note:** If broken or frayed, replace the grounding strap.

5. Tighten the 4-40 × 0.312 screw (F04) in the rear right corner; torque to 6.8 in-lb.
6. [Install the E10 Energy Capacitor](#), if it was removed.
7. [Install the boardstack](#), if it was removed.

## Bottom Case *(continued)*

9-123

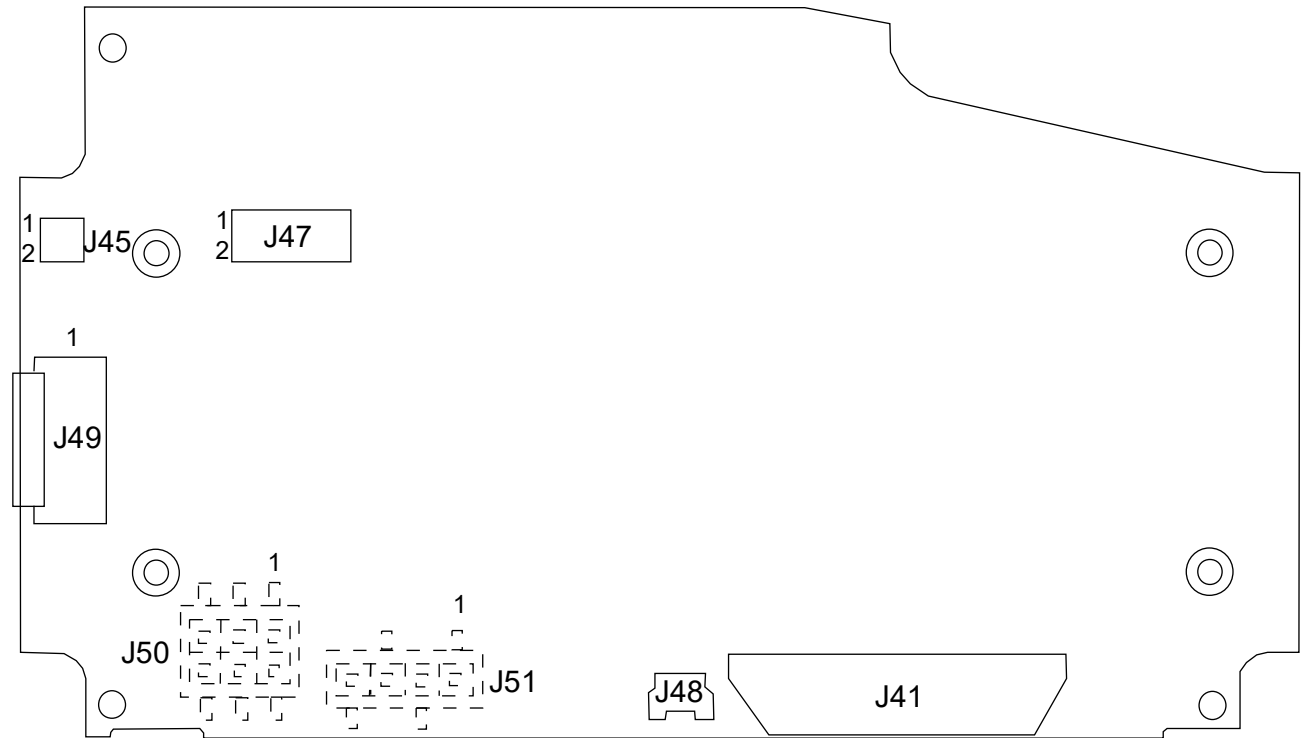
### E08 Power Module Installation *(continued)*

8. Connect the 4-pin W10 Power/Therapy Cable connector to the A03 Therapy PCB at J17.
9. **Install the A12 Printer Module.**
10. **Install the front case.**
11. **Install the top case.**
12. **Install the E09 Battery.**
13. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-124

### E08 Power Module Diagram

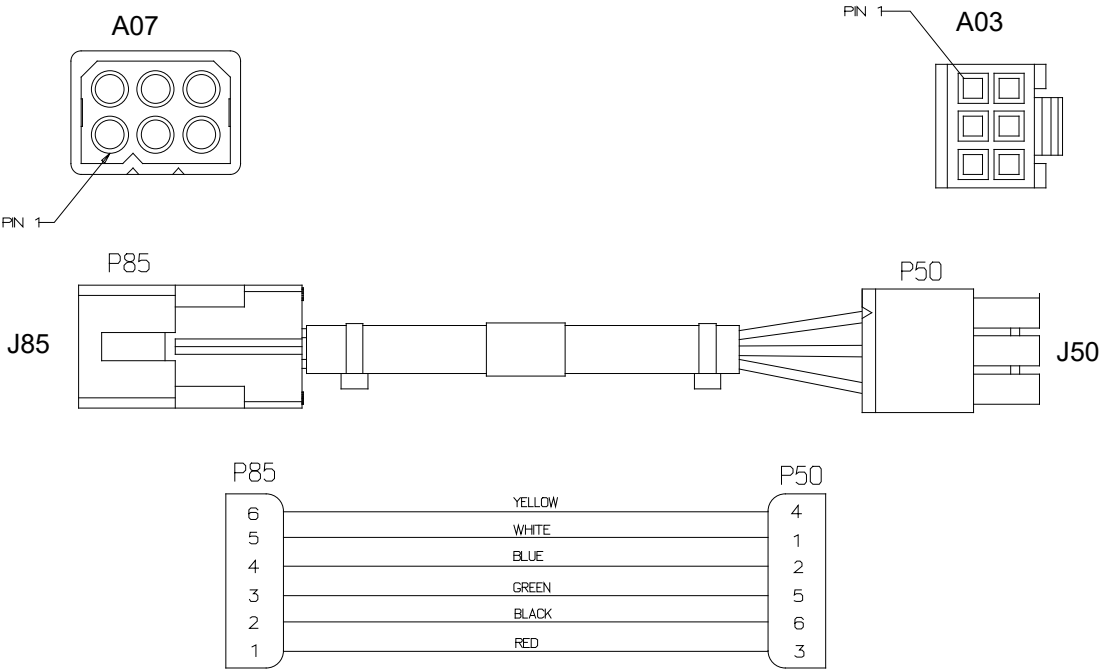
REF **E08** (RoHS)

Interconnect

Bottom Case *(continued)*

W08 Battery Cable  
Diagrams

REF**W08**

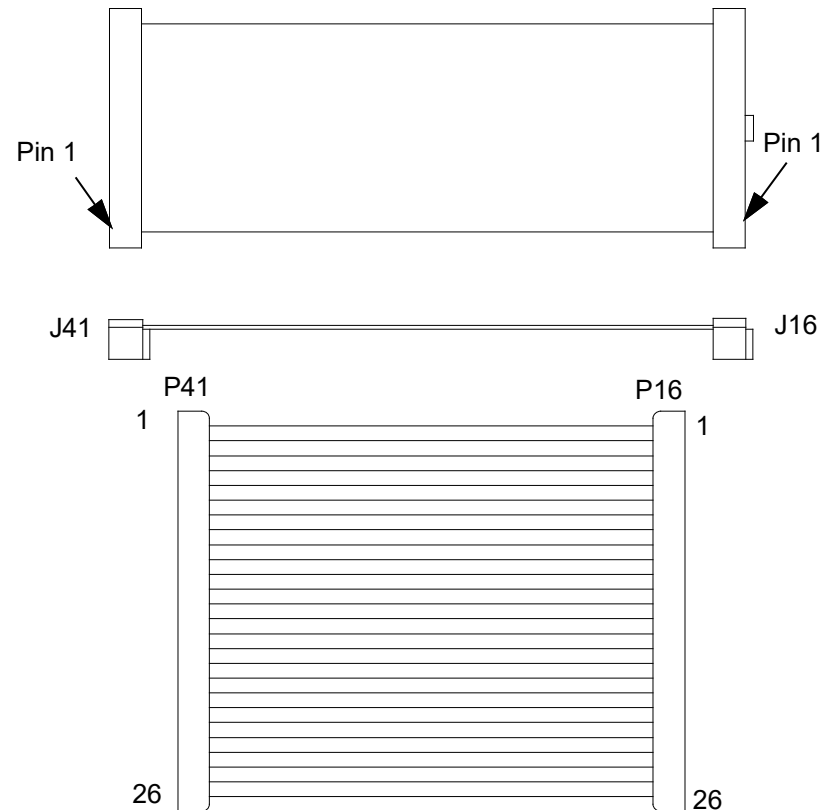


WIRING DIAGRAM

## Bottom Case *(continued)*

9-126

### W09 26-Pin Cable Diagrams

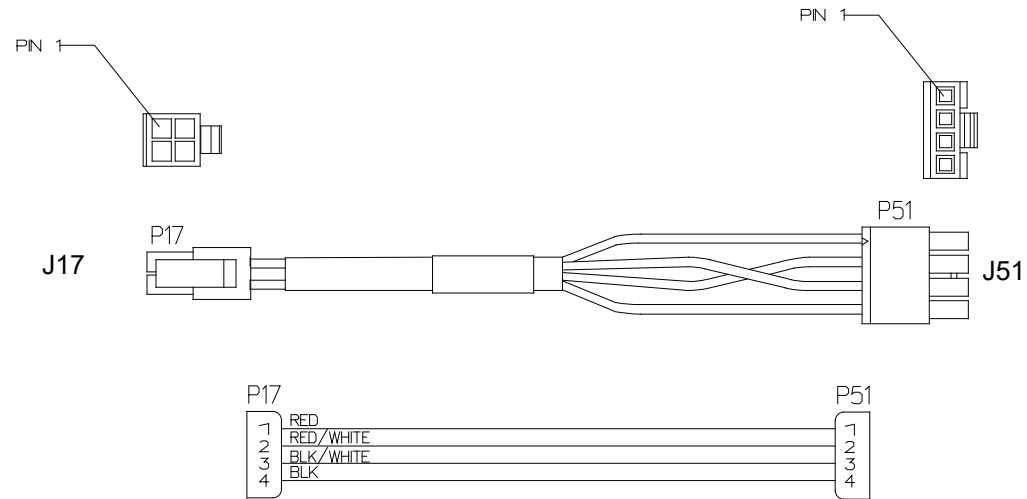
REF **W09**

Interconnect

## Bottom Case *(continued)*

9-127

### W10 Power/Therapy Cable Diagrams

REF **W10**

WIRING DIAGRAM

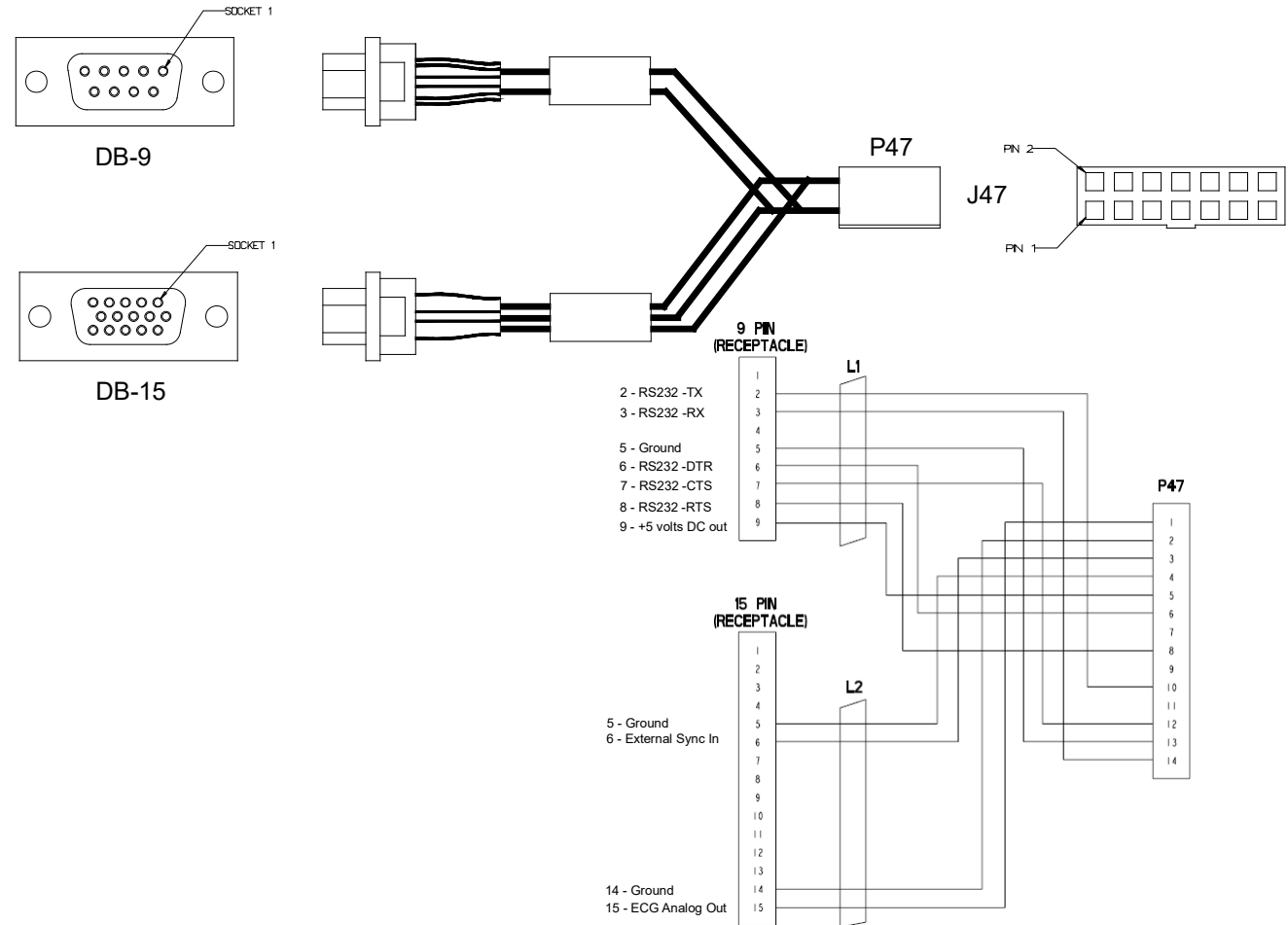
Interconnect

## Bottom Case *(continued)*

9-128

## W11 ECG Sync/System Cables Diagrams

REF **W11**



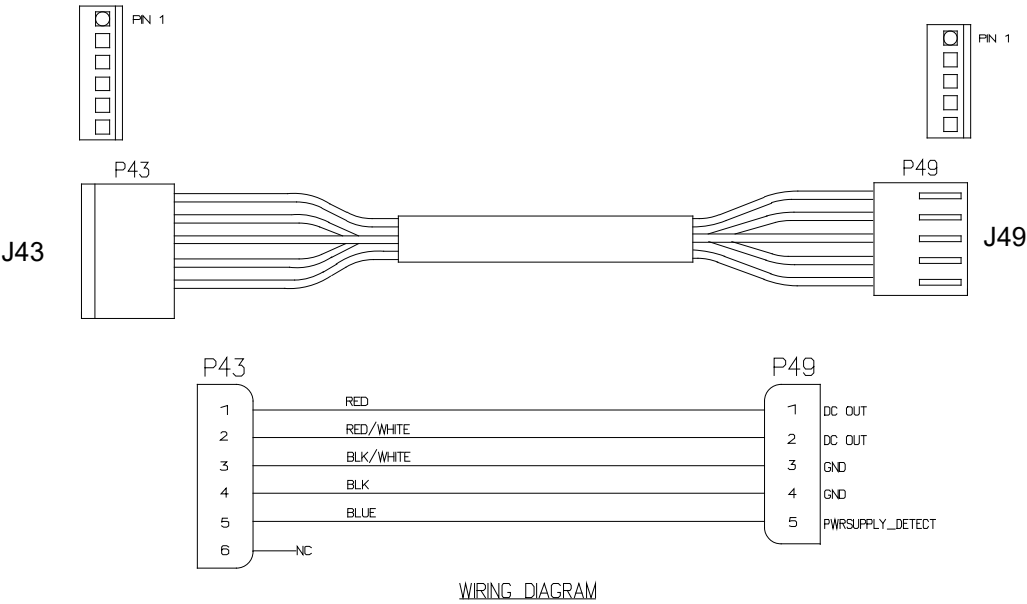
## Interconnect

Bottom Case *(continued)*

9-129

W12 AC Power Cable  
Diagrams

REF **W12**

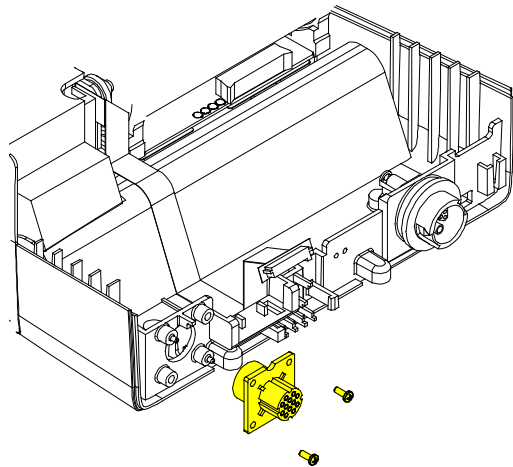




## Bottom Case *(continued)*

9-130

### W06 ECG Connector Removal



**Note:** The following assemblies must be removed before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**
- **Boardstack**

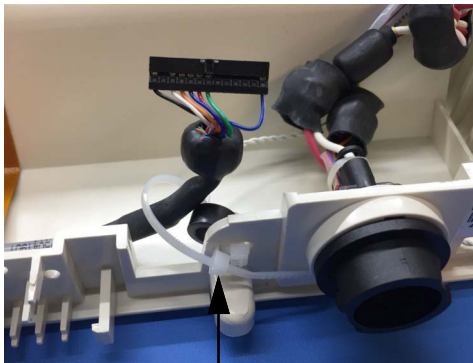
To remove the W06 ECG Connector:

1. Cut the cable tie, then remove and discard the two 4-40 x 0.312 screws (F04) from the W06 ECG Connector located on the bottom case assembly.
2. From outside the case, remove the W06 ECG Connector from the bottom case and feed the ECG cable through the connector hole.

## Bottom Case *(continued)*

9-131

### W06 ECG Connector Installation



REF M19  
Cable Tie Retainer

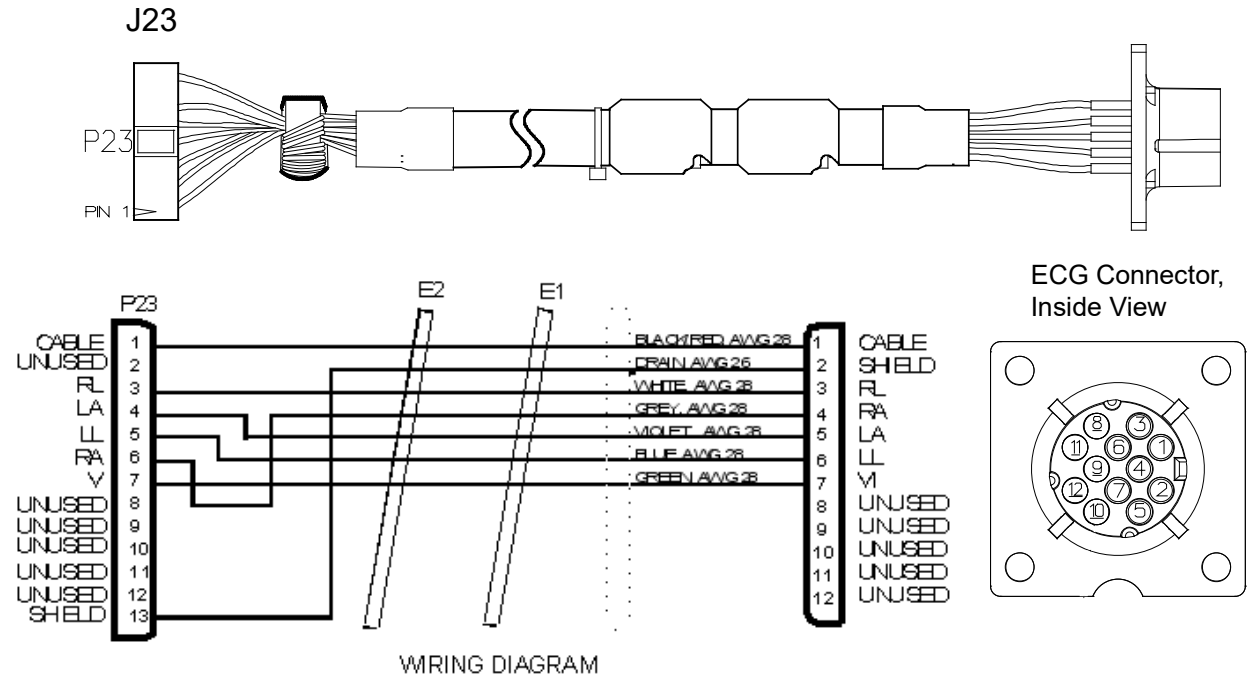
To install the W06 ECG Connector:

1. On the outside of the case, align the W06 ECG Connector with the connector standoffs and align the key in the connector with the notch in the bottom case and slide the ECG connector into position.
2. Install two new 4-40 x 0.312 screws (F04) into the W06 ECG Connector; torque to 6.8 in-lb.
3. Position the cable in the slot between the first rib and the forward left corner of the bottom case.
4. Place the first ferrite bead in its slot in the bottom case.
5. Route a new cable tie through the small hole in the bottom case and connect around ECG receptacle cable.
6. **Install the boardstack.**
7. **Install the front case.**
8. **Install the top case.**
9. **Install the E09 Battery.**
10. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-132

### W06 ECG Connector Assembly Diagrams

REF **W06** (RoHS)

Interconnect

## Bottom Case *(continued)*

9-133

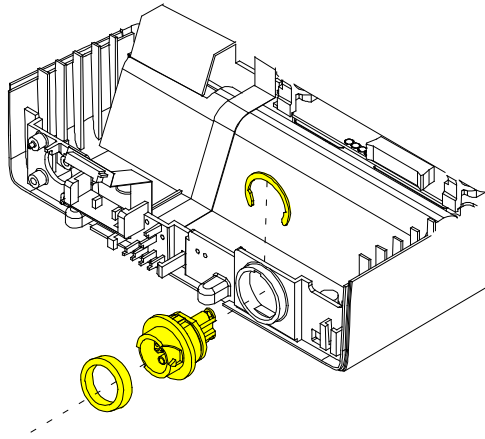
### W01 Therapy Connector Removal

**Note:** The following assemblies must be removed before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**
- **Boardstack**

To remove the W01 Therapy Connector Assembly:

1. Remove the Therapy Connector Seal (M34) from the W01 Therapy Connector.
2. Remove the retaining ring (M29) from the back of the W01 Therapy Connector.
3. From outside the case, remove the therapy connector from the bottom case and feed the therapy cable through the connector hole.



## Bottom Case *(continued)*

9-134

### W01 Therapy Connector Installation

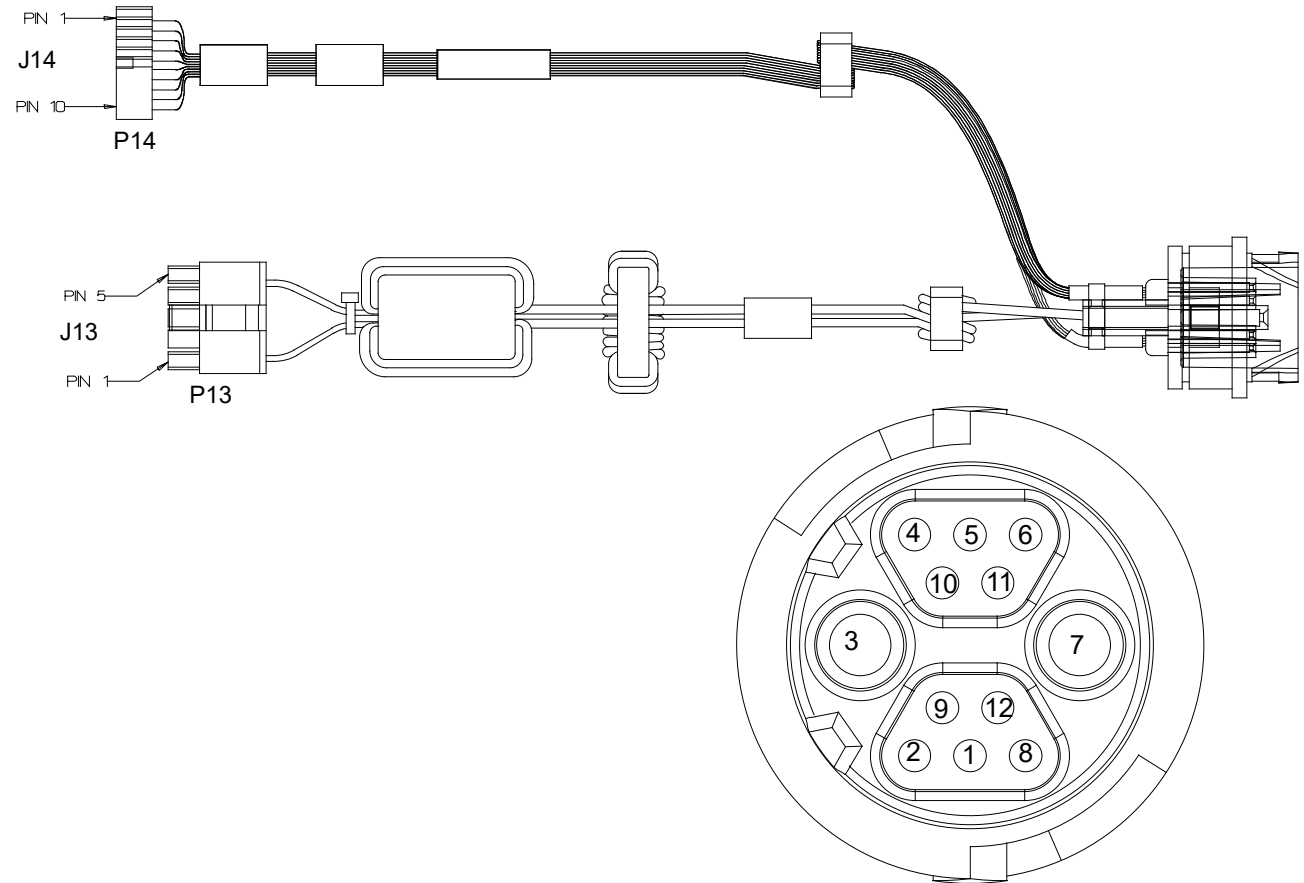
To install the W01 Therapy Connector Assembly:

1. From outside the case, align the key on the connector with the notch in the bottom case and slide the W01 Therapy Connector Assembly into the bottom case.
2. Install the retaining ring (M29) onto the back of the W01 Therapy Connector Assembly.
3. Install the Therapy Connector Seal (M34) onto the W01 Therapy Connector.
4. **[Install the boardstack.](#)**
5. **[Install the front case.](#)**
6. **[Install the top case.](#)**
7. **[Install the E09 Battery.](#)**
8. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-135

### W01 Therapy Connector Assembly Diagrams

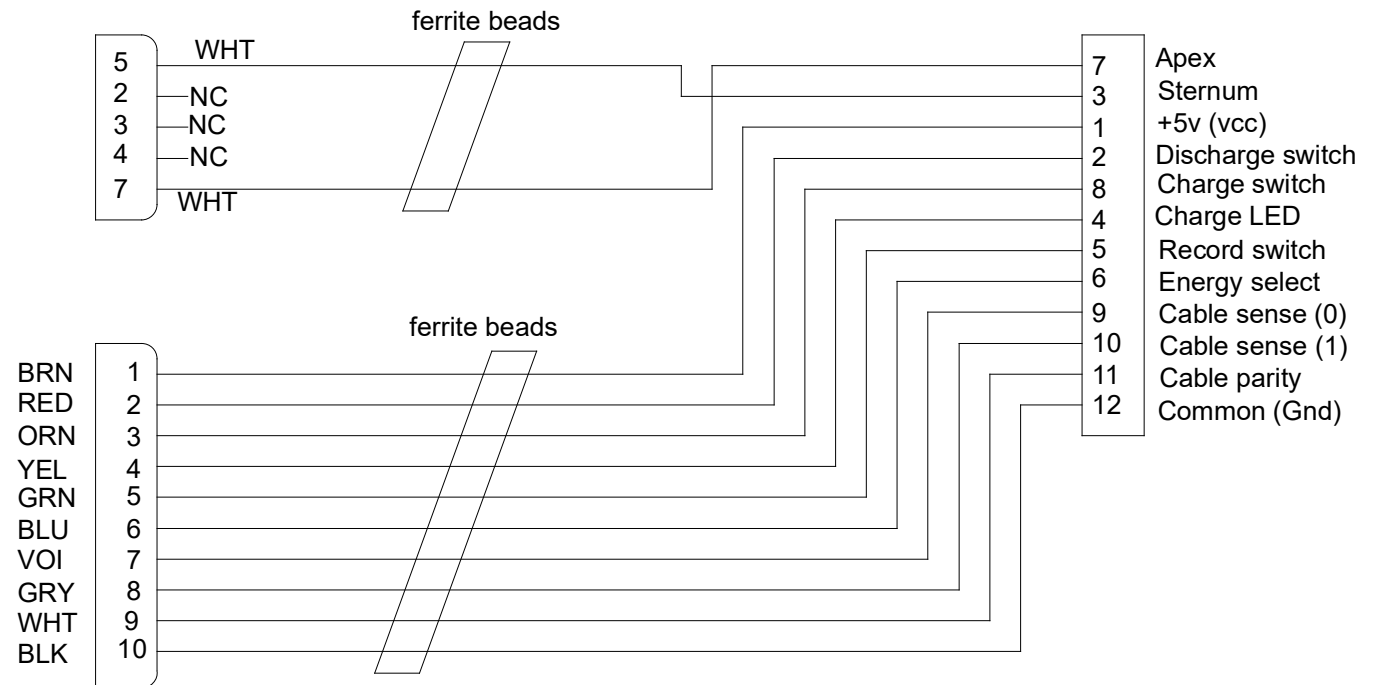
REF **W01** (RoHS)

Interconnect

## Bottom Case *(continued)*

9-136

### W01 Therapy Connector Assembly Wiring Diagram



Interconnect

## Bottom Case *(continued)*

9-137

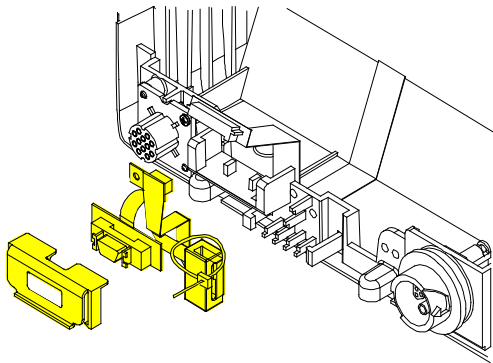
### W05 SpO2 Connector Removal

**Note:** The following assemblies must be removed before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**
- **Boardstack**
- **W03 IrDA Port**

To remove the W05 SpO2 Connector Assembly:

1. Remove the cable tie retainer (M19) securing the SpO2 cable to the bottom case. The W03 IrDA Port must be removed to expose this tie wrap.
2. Gently pull apart the plastic snap arms on the SpO2 connector mounting clip (M30), away from the bottom case.
3. Lift the mounting clip away from the bottom case.
4. Lift the W05 SpO2 connector assembly away from the bottom case.





## Bottom Case *(continued)*

9-138

### W05 SpO2 Connector Installation



To install the W05 SpO2 Connector Assembly:

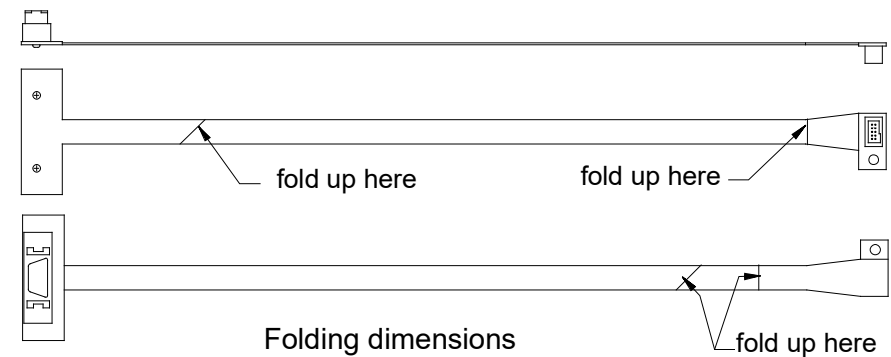
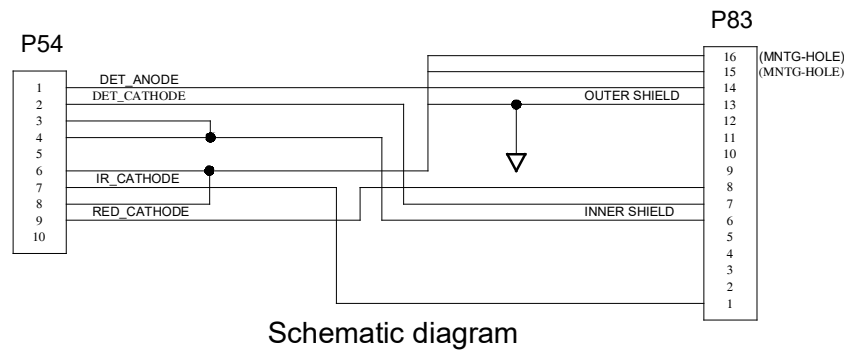
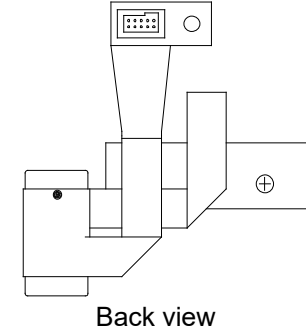
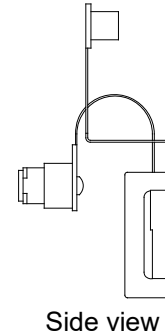
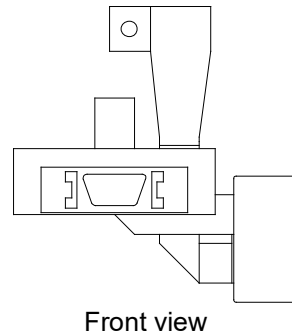
1. Place the W05 SpO2 input connector into the locating detail in the bottom case.
2. Position the SpO2 connector mounting clip (M30) in front of the mounting block detail on the bottom case.
3. Press the SpO2 connector mounting clip in and down onto the bottom case mounting block detail until the snap arms click into position.
4. Install a cable tie retainer (M19) to secure the ferrite bead to the bottom case.
5. **Install the W03 IrDA Assembly.**
6. **Install the boardstack.**
7. **Install the front case.**
8. **Install the top case.**
9. **Install the E09 Battery.**
10. Complete the LIFEPAK 20e Device PIP.

*(Continued on next page)*

## Bottom Case (continued)

9-139

### W05 SpO2 Assembly Diagrams REF **W05**

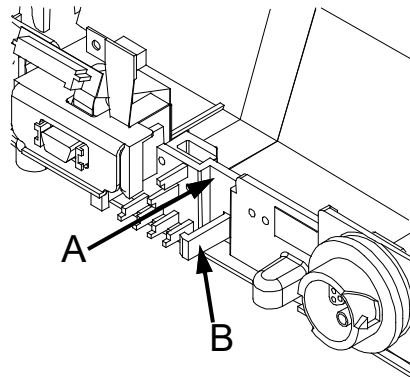
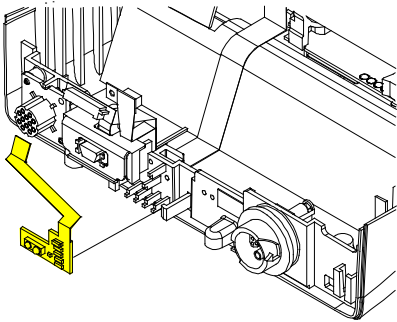


Interconnect

## Bottom Case *(continued)*

9-140

### W03 IrDA Assembly Removal



**Note:** The following assemblies must be removed before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**
- **Boardstack (optional removal)**

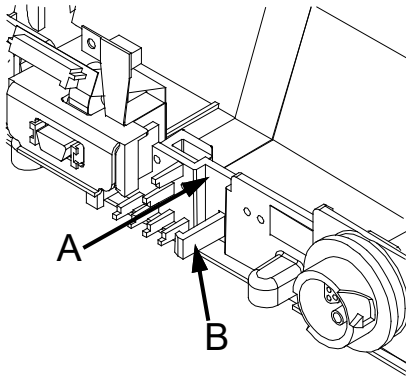
To remove the W03 IrDA Assembly:

1. If the boardstack is not removed, disconnect the W03 IrDA flex cable from the A01 System PCB at J8 by first removing the screw (F09) using a 3/32 hex driver.
2. Insert a slotted screwdriver into the slot between the bottom case cutout (A) and the right snap tab (B).
3. Gently apply pressure to the screwdriver. Bend the right IrDA snap tab (B) outward slightly, freeing the right edge of the W03 IrDA Assembly.
4. Remove the W03 IrDA Assembly from the bottom case.
5. If the boardstack is still installed in the bottom case, disconnect the IrDA connector from the A01 System PCB at J8.

## Bottom Case *(continued)*

9-141

### W03 IrDA Assembly Installation



To install the W03 IrDA Assembly:

1. Position the W03 IrDA Assembly on the bottom case. (The IrDA is located near the center of the front panel on the bottom case.)
2. Insert a large slotted screwdriver into the slot between the bottom case cutout (A) and the right snap tab (B).
3. Gently apply pressure to the screwdriver. Bend the right IrDA snap tab (B) slightly outward,
4. Press the W03 IrDA Assembly down into the snap tabs and release the pressure on the screwdriver. The snap tabs will close around the W03 IrDA Assembly.
5. Ensure that the W03 IrDA Assembly is resting centered on the support brackets and snap tabs.
6. Connect the W03 IrDA Assembly to the A01 System PCB at J08 and fasten with a screw (F09) using a 3/32 hex driver and torque to 0.4 in-lb if the boardstack is still installed in the bottom case. Otherwise, **install the boardstack**. The IrDA flex cable is connected during the boardstack installation.

*(Continued on next page)*

## Bottom Case *(continued)*

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9-142

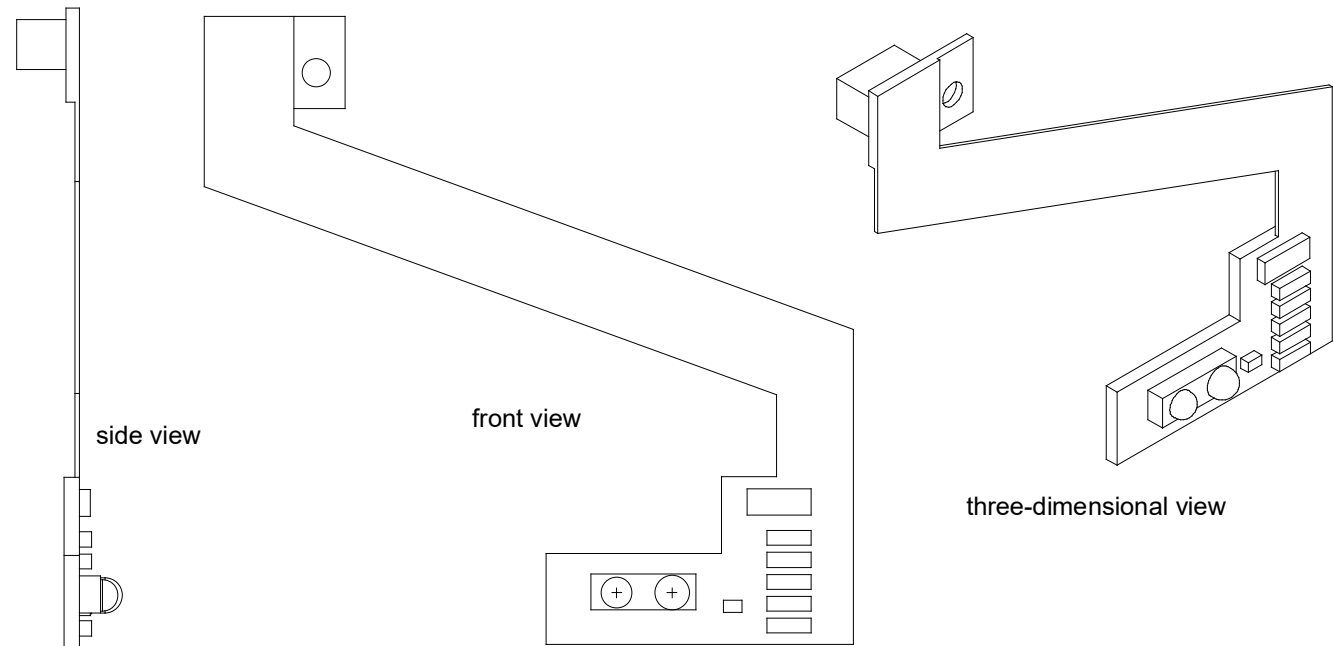
### W03 IrDA Assembly Installation *(continued)*

7. **Install the front case.**
8. **Install the top case.**
9. **Install the E09 Battery.**
10. Complete the LIFEPAK 20e Device PIP.

## Bottom Case *(continued)*

9-143

### W03 IrDA Assembly Diagrams

REF **W03**

Interconnect

## Bottom Case *(continued)*

9-144

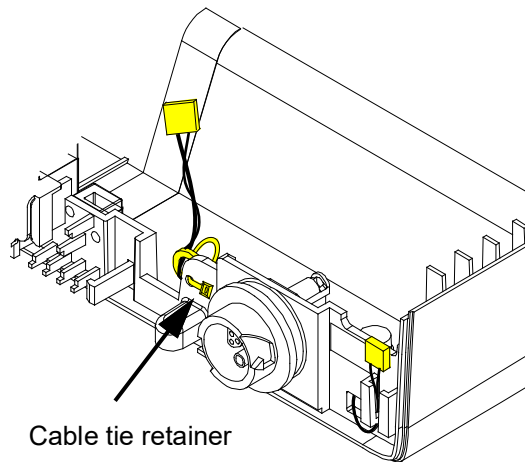
### W14 Speaker Harness Extension Cable Removal

**Note:** The following assemblies must be removed before beginning this disassembly:

- **E09 Battery**
- **Top case**
- **Front case**
- **Boardstack**

**Note:** To remove the W14 Speaker Harness Extension Cable:

1. Disconnect the W14 Speaker Harness Extension Cable from the W02 Speaker Assembly (part of front case removal).
2. Disconnect the other end of the W14 Speaker Harness Extension Cable from the A01 System PCB at J5 (part of boardstack removal).
3. Cut the cable tie retainer (M19) securing the ferrite ring to the bottom case.
4. Remove the connector from the holder and feed the W14 Speaker Harness Extension Cable under the W01 Therapy Connector Assembly. Remove the cable from the bottom case.



## Bottom Case *(continued)*

9-145

### W14 Speaker Harness Extension Cable Installation



To Install the W14 Speaker Harness Extension Cable:

1. Feed the W14 Speaker Harness Extension Cable under the W01 Therapy Connector Assembly.
2. Insert the W14 Speaker Harness Extension Cable into the holder in the bottom case.
3. Install the cable tie retainer (M19) in the set of holes 0.5 inches to the left of the W01 Therapy Connector Assembly, and secure the extension cable's ferrite ring to the bottom case.
4. **Install the boardstack.**
5. **Install the front case.**
6. **Install the top case.**
7. **Install the E09 Battery.**
8. Complete the LIFEPAK 20e Device PIP.



# Final Assembly

9-146

## Device Labeling Including Label Set **Multiple REF** - LIFEPAK 20e

To apply the labels to the device:

1. Remove the old labels and clean the device with isopropyl alcohol.
2. Select the correct label set (**language**).
3. Apply the labels (refer to the next page for placement):

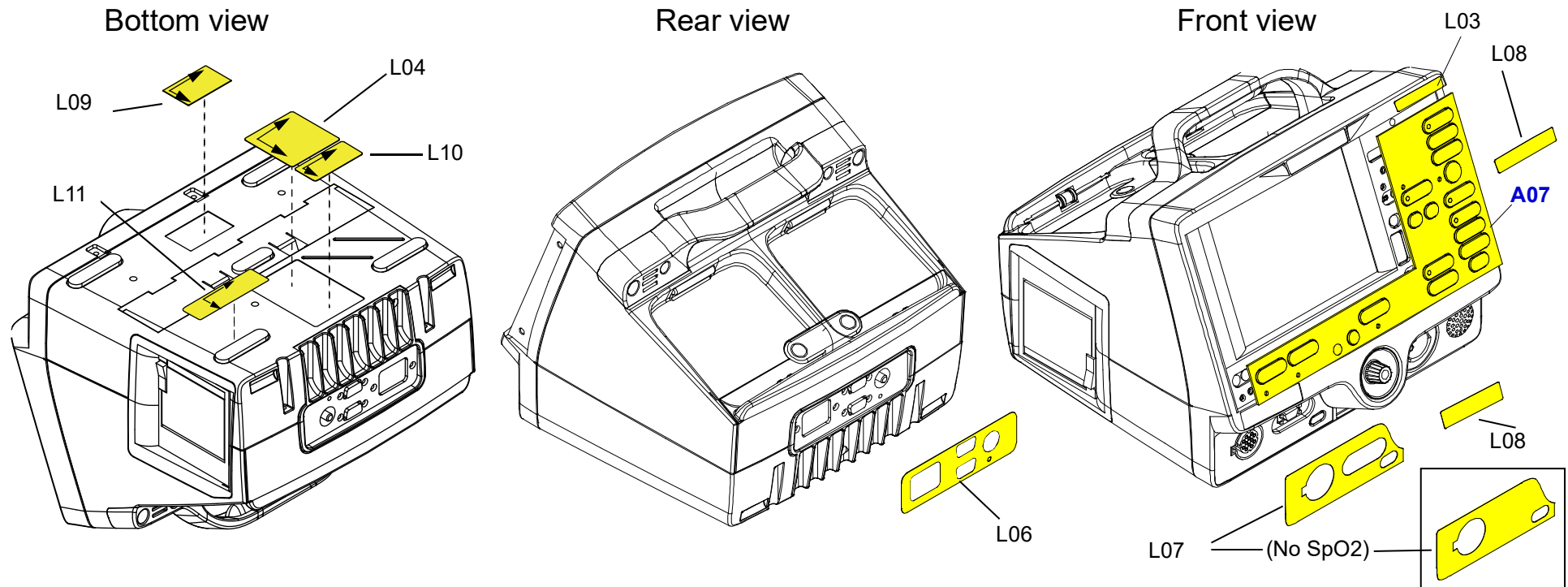
Designator Reference		Part Description	Note
L06 - Label set		Rear connector label	L06 in <a href="#">Labels Assembly diagram</a>
L07 - Label set		Front connector label, ENG (SpO2)	L07 in <a href="#">Labels Assembly diagram</a>
L07 - Label set		Front connector label, ENG (no SpO2)	L07 in <a href="#">Labels Assembly diagram</a>
L08 - Label set		Physio-Control logo label	L08 in <a href="#">Labels Assembly diagram</a>
L08 - Label set		Product ID label	L08 in <a href="#">Labels Assembly diagram</a>
L09 - Label set		FDA label	L09 in <a href="#">Labels Assembly diagram</a>
L10 - Label set		Masimo patent label	L10 in <a href="#">Labels Assembly diagram</a>
W18		Manual latch label	<a href="#">Select language</a>
L04		Serial Number, LP20E	<a href="#">SN label illustration</a>
L03		Label - Adult VF Dose, ENG	<a href="#">Select language</a>
L11		Label-UDI	See <a href="#">Labels Assembly diagram</a>

# Final Assembly *(continued)*

9-147

## Label Placement Diagrams

Refer to the [parts list](#) for label description.



## Final Assembly *(continued)*

9-148

### LIFEPAK 20e Device Label Set Languages

Language	Reference Designator	Part Description
English	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
English	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
French	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
French	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
German	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
German	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Spanish	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Spanish	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition

*(Continued on next page)*

## Final Assembly *(continued)*

9-149

### LIFEPAK 20e Device Label Set Languages *(continued)*

Language	Reference Designator	Part Description
Italian	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Italian	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Swedish	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Swedish	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Danish	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Danish	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Dutch	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Dutch	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition

*(Continued on next page)*

## Final Assembly *(continued)*

9-150

### LIFEPAK 20e Device Label Set Languages *(continued)*

Language	Reference Designator	Part Description
Finnish	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Finnish	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Norwegian	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Norwegian	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Polish	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Polish	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Portuguese	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Portuguese	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition

*(Continued on next page)*

## Final Assembly *(continued)*

9-151

### LIFEPAK 20e Device Label Set Languages *(continued)*

Language	Reference Designator	Part Description
Brazilian	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Brazilian	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Japanese	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Japanese	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Chinese	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Chinese	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Hungarian	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Hungarian	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition

*(Continued on next page)*

## Final Assembly *(continued)*

9-152

### LIFEPAK 20e Device Label Set Languages *(continued)*

Language	Reference Designator	Part Description
Czech	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Czech	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Russian	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Russian	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition
Korean	L01	LIFEPAK 20e label set (no SpO2) 3rd Edition
Korean	L01	LIFEPAK 20e label set (with SpO2) 3rd Edition

*(Continued on next page)*

## Final Assembly *(continued)*

9-153

### Manual Latch Label Languages



**Note:** To order the MANUAL latch label and the AED door together as a kit refer to **AED Door/Latch Label Kits**.

Language	Reference Designator
English	L02
French	L02
German	L02
Spanish	L02
Italian	L02
Swedish	L02
Danish	L02
Dutch	L02
Finnish	L02
Norwegian	L02
Polish	L02

*(Continued on next page)*



## Final Assembly *(continued)*

9-154

### Manual Latch Label Languages *(continued)*



**Note:** To order the MANUAL latch label and the AED door together as a kit refer to **Manual Latch Label Kits**.

Language	REF
Portuguese	L02
Brazilian	L02
Japanese	L02
Chinese	L02
Hungarian	L02
Czech	L02
Russian	L02
Korean	L02

# Final Assembly (continued)

## Adult VF Dose Label Languages (L03)

Recommended  
Adult VF Dose: 200-300-360J

See [Labels Assembly diagram](#)

Language	Reference Designator
English	L03
French	L03
German	L03
Spanish	L03
Italian	L03
Swedish	L03
Danish	L03
Dutch	L03
Finnish	L03
Norwegian	L03
Polish	L03
Portuguese	L03
Hungarian	L03
Czech	L03
Russian	L03
Chinese	L03
Korean	L03
Japanese	L03

## Final Assembly *(continued)*

9-156

### AED Door/Latch Label Kits

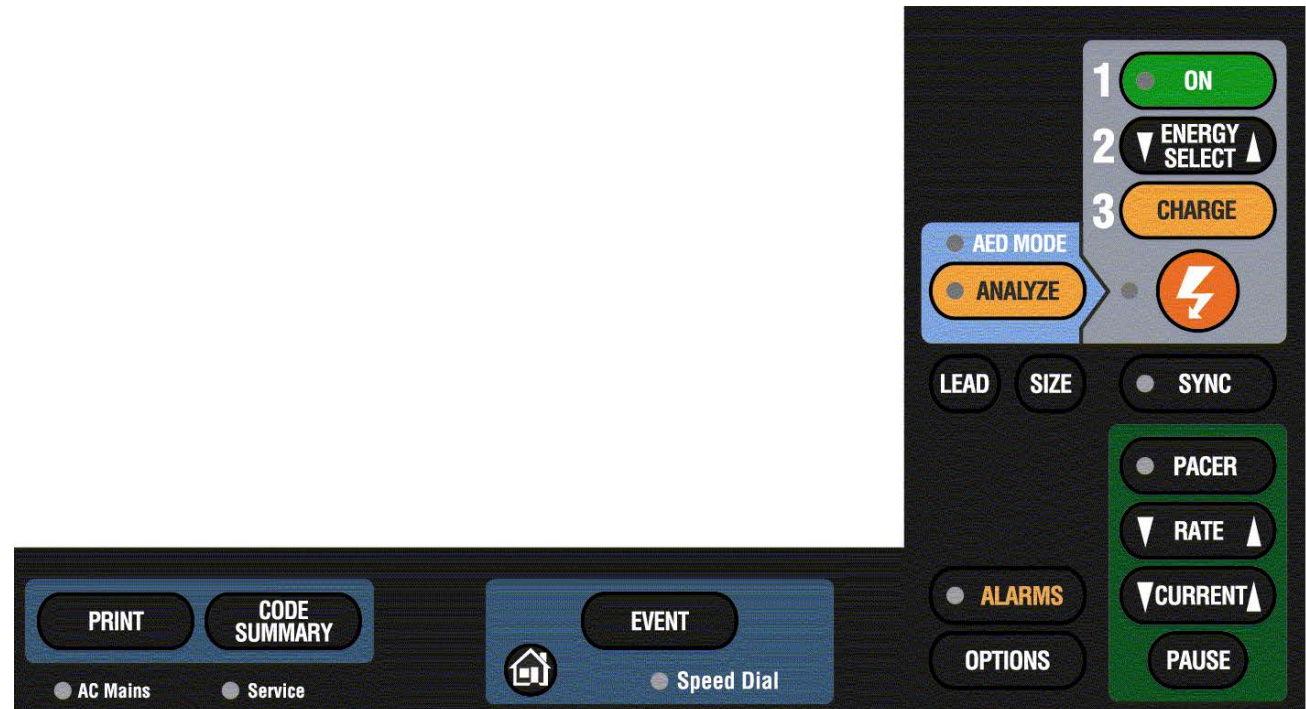
Reference Designator	Languages	Part Description
K23	English, Spanish, Portuguese, Brazilian	AED door (REF M09) and Latch label (REF L02)
K23	German, Swedish, Norwegian	AED door (REF M09) and Latch label (REF L02)
K23	Italian	AED door (REF M09) and Latch label (REF L02)
K23	French, Danish	AED door (REF M09) and Latch label (REF L02)
K23	Dutch	AED door (REF M09) and Latch label (REF L02)
K23	Finnish	AED door (REF M09) and Latch label (REF L02)
K23	Polish	AED door (REF M09) and Latch label (REF L02)
K23	Chinese	AED door (REF M09) and Latch label (REF L02)
K23	Japanese	AED door (REF M09) and Latch label (REF L02)

## Final Assembly *(continued)*

9-157

### A07 Elastomer Keypad – All Options

(Refer to the [parts list](#) on the next page for language MINs.)



*(Continued on next page)*

## Final Assembly *(continued)*

9-158

### A07 Elastomer Keypad - Languages

Language	Reference Designator	Part Description
English	A07	Keypad (no Pacing)
English	A07	Keypad (with Pacing)
French	A07	Keypad (no Pacing)
French	A07	Keypad (with Pacing)
German	A07	Keypad (no Pacing)
German	A07	Keypad (with Pacing)
Spanish	A07	Keypad (no Pacing)
Spanish	A07	Keypad (with Pacing)
Italian	A07	Keypad (no Pacing)
Italian	A07	Keypad (with Pacing)
Swedish	A07	Keypad (no Pacing)
Swedish	A07	Keypad (with Pacing)

*(Continued on next page)*

## Final Assembly *(continued)*

9-159

### A07 Elastomer Keypad - Languages *(continued)*

Language	Reference Designator	Part Description
Danish	A07	Keypad (no Pacing)
Danish	A07	Keypad (with Pacing)
Dutch	A07	Keypad (no Pacing)
Dutch	A07	Keypad (with Pacing)
Finnish	A07	Keypad (no Pacing)
Finnish	A07	Keypad (with Pacing)
Norwegian	A07	Keypad (no Pacing)
Norwegian	A07	Keypad (with Pacing)
Polish	A07	Keypad (no Pacing)
Polish	A07	Keypad (with Pacing)
Portuguese	A07	Keypad (no Pacing)
Portuguese	A07	Keypad (with Pacing)

*(Continued on next page)*

## Final Assembly *(continued)*

9-160

### A07 Elastomer Keypad - Languages *(continued)*

Language	Reference Designator	Part Description
Brazilian	A07	Keypad (no Pacing)
Brazilian	A07	Keypad (with Pacing)
Japanese	A07	Keypad (no Pacing)
Japanese	A07	Keypad (with Pacing)
Chinese	A07	Keypad (no Pacing)
Chinese	A07	Keypad (with Pacing)
Hungarian	A07	Keypad (no Pacing)
Hungarian	A07	Keypad (with Pacing)
Czech	A07	Keypad (no Pacing)
Czech	A07	Keypad (with Pacing)
Russian	A07	Keypad (no Pacing)
Russian	A07	Keypad (with Pacing)
Korean	A07	Keypad (no Pacing)
Korean	A07	Keypad (with Pacing)

## Final Assembly *(continued)*

9-161

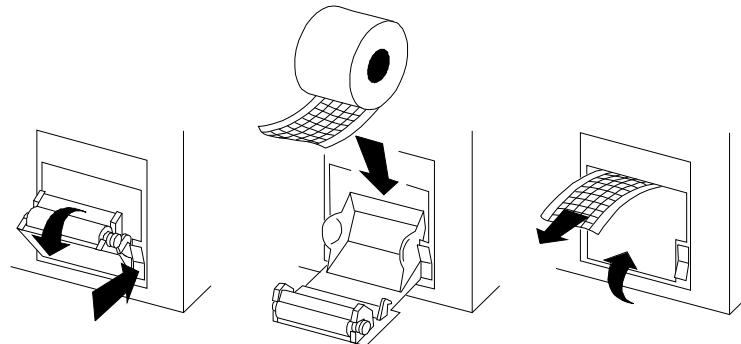
### Installing Printer Paper

To install a new roll of printer paper into the printer:

1. Press the printer button located on the left side of the device to open the printer door.
2. Remove the old roll of paper.
3. Insert the new paper roll into the paper chamber, with the end coming from under the roll.

**Note:** The printer will not print properly if the paper roll is inserted with the end coming over the top of the roll. The paper roll must be inserted with the end coming from under the roll.

4. Close the printer door. Ensure that the paper end extends out of the side of the printer.

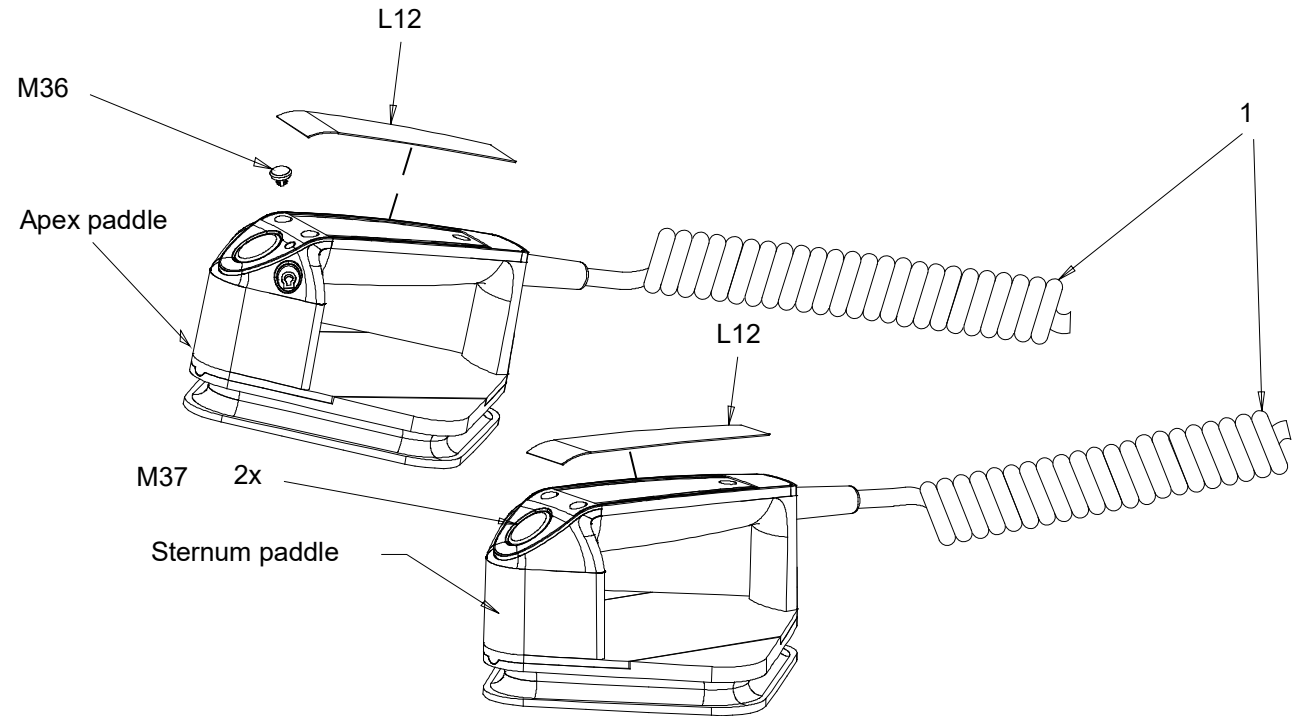




## Final Assembly *(continued)*

9-162

### Standard Paddles Labels and Buttons



## Final Assembly *(continued)*

9-163

### Standard Paddles Parts List

Reference Designator	Quantity	Part Description	Note
M35	2	Standard paddle adapter assembly	
M36	1	Charge button	Refer to <b>Charge Button Languages</b>
M37	2	Shock button	
L12	2	Paddle label	Refer to <b>Standard Paddles Label Languages</b>

## Final Assembly *(continued)*

9-164

### Standard Paddles Label Languages

Language	Designator Reference
English	L12
French	L12
German	L12
Spanish	L12
Italian	L12
Swedish	L12
Danish	L12
Dutch	L12
Finnish	L12
Norwegian	L12
Polish	L12

*(Continued on next page)*

## Final Assembly *(continued)*

9-165

### Standard Paddles Label Languages *(continued)*

Language	Designator Reference
Portuguese	L12
Brazilian	L12
Japanese	L12
Chinese	L12
Hungarian	L12
Czech	L12
Russian	L12
Korean	L12

## Final Assembly *(continued)*

9-166

### Charge Button Languages

Language	Designator Reference
English	M36
French	M36
German	M36
Spanish	M36
Italian	M36
Swedish	M36
Danish	M36
Dutch	M36
Finnish	M36
Norwegian	M36
Polish	M36

*(Continued on next page)*

## Final Assembly *(continued)*

9-167

### Charge Button Languages *(continued)*

Language	Designator Reference
Portuguese	M36
Brazilian	M36
Japanese	M36
Chinese	M36
Hungarian	M36
Czech	M36
Russian	M36
Korean	M36

# Service Replacement Kits

9-168

The service replacement kits include components that support a particular replacement activity.

Reference Designator	Part Description
<b>K01</b>	KIT-REPAIR, TOP CASE HANDLE
<b>K02</b>	KIT-REPAIR, FRONT CASE
<b>K03</b>	KIT REPAIR, DISPLAY FOR UI (REF 21330-001034)
<b>K04</b>	KIT REPAIR, BACKLIGHT FOR UI (REF 21330-001034)
<b>K05</b>	KIT-REPAIR, MASIMO SPO2 CONNECTOR
<b>K24</b>	KIT-REPAIR, THERAPY PCBA, PACING, ROHS
<b>K25</b>	KIT-REPAIR, THERAPY PCBA, NON-PACING, ROHS
<b>K26</b>	KIT-REPAIR, OEM PCBA, ROHS
<b>K27</b>	KIT-REPAIR, PP PCBA, ROHS
<b>K06</b>	KIT-REPAIR, PCB STACK

*(Continued on next page)*

# Service Replacement Kits *(continued)*

9-169

Reference Designator	Part Description
<b>K28</b>	KIT-REPAIR, POWER MODULE, <b>LIFEPAK 20e</b> , ROHS
<b>K07</b>	KIT-REPAIR, CAPACITOR BRACKET
<b>K08</b>	KIT-REPAIR, CAPACITOR
<b>K12</b>	KIT-REPAIR, THERAPY CONNECTOR, ROHS
<b>K29</b>	KIT-REPAIR, REDUX SC PCBA AND UI PCBA, ROHS
<b>K10</b>	KIT-REPAIR, SPO2 MODULE, ROHS
<b>K11</b>	KIT-REPAIR, MNC FLASH SPO2, ROHS
<b>K09</b>	KIT-REPAIR, LED DISPLAY FOR Redux or Post-Redux UI (REF 21330-001345) and LED Display and Backlight for Redux or Post-Redux UI PCB (REF 21330-001345) or greater requires Redux level PCB software set
<b>K30</b>	KIT-REPAIR, POST REDUX UI, SC, PRINTER, ROHS
<b>K31</b>	KIT-REPAIR, POST REDUX UI, PRINTER, ROHS
<b>K32</b>	KIT-REPAIR, POST REDUX UI, ROHS
<b>K33</b>	KIT-REPAIR, POST REDUX SC, ROHS

*(Continued on next page)*



## Service Replacement Kits *(continued)*

9-170

Reference Designator	Part Description
<b>K34</b>	KIT-REPAIR, POST REDUX, PRINTER, ROHS
<b>K13</b>	KIT REPAIR, THERAPY PCBA, PACING, LP20, 4TH ED
<b>K14</b>	KIT REPAIR, THERAPY PCBA, NON-PACING, LP20, 4TH ED
<b>K15</b>	KIT REPAIR, OEM PCBA, LP20, 4TH ED
<b>K16</b>	KIT REPAIR, PP PCBA, LP20, 4TH ED
<b>K35</b>	KIT REPAIR, POST REDUX UI, SC, PRINTER, 4TH ED
<b>K36</b>	KIT REPAIR, POST REDUX UI, PRINTER, 4TH ED
<b>K37</b>	KIT REPAIR, POST REDUX UI, 4TH ED
<b>K17</b>	KIT REPAIR, POST REDUX SC, 4TH ED
<b>K18</b>	KIT REPAIR, POST REDUX, PRINTER, 4TH ED
<b>K19</b>	KIT REPAIR, POWER MODULE,LP20E,4TH ED V2

## Service Replacement Kits *(continued)*

9-171

KIT-REPAIR, TOP CASE  
HANDLE  
REF K01

Reference Designator	Quantity	Part Description
M28	1	Top case handle
F01	2	Machine screw 6-32 x 1.75L
F02	2	Machine screw 6-32x0.375L

KIT-REPAIR, FRONT CASE  
REF K02

Reference Designator	Quantity	Part Description
M02	1	Front case, pad printed
M04	1	Cover plate, door
M05	1	Door hinge plate
M07	1	Display lens
F01	4	Machine screw 6-32 x 1.75L
F02	2	Machine screw 6-32x0.375L

## Service Replacement Kits *(continued)*

9-172

KIT-REPAIR, DISPLAY FOR  
UI  
REF K03

Reference Designator	Quantity	Part Description
E04	1	Active Color LCD Display
W15	1	Active Display Cable
M07	1	Display lens
F04	4	Screws 4-40 x 0.312
F05	1	Nylon snap rivet

KIT-REPAIR, BACKLIGHT  
FOR UI  
REF K04

Reference Designator	Quantity	Part Description
E01	1	Backlight Inverter
W16	1	Active Backlight Inverter Cable
M08	1	Active Display Bracket
E15	1	Extender cable (for Sanyo display devices)

## Service Replacement Kits *(continued)*

9-173

KIT-REPAIR, MASIMO SPO2  
CONNECTOR  
REF **K05**

Reference Designator	Quantity	Part Description
W05	1	SpO2 Flex Assembly
M30	1	SpO2 connector mounting clip

KIT-REPAIR THERAPY PCB,  
PACING  
REF **K24** (RoHS)

Reference Designator	Quantity	Part Description
A03	1	Therapy PCB with pacing (RoHS)
M13	5	ISO mount, Therapy
F03	3	Nut-Hex, SS, Lock 4-40 x 0.250W
F07	5	Machine Screw, 4-40 x 0.500L
W07	1	Connector - Board Stacker, Modified

## Service Replacement Kits *(continued)*

9-174

KIT-REPAIR THERAPY PCB,  
NON-PACING  
REF **K25** (RoHS)

Reference Designator	Quantity	Part Description
A03	1	Therapy PCB without pacing (ROHS)
M13	5	ISO mount, Therapy
F03	3	Nut-Hex, SS, Lock 4-40 x 0.250W
F07	5	Machine Screw, 4-40 x 0.500L
W07	1	Connector - Board Stacker, Modified

KIT-REPAIR, OEM PCBA  
REF **K26** (RoHS)

Reference Designator	Quantity	Part Description
A04	1	OEM Interface PCB (ROHS)
F08	1	Machine screw, SEMS 4-40 x 5/16 L, split washer
F09	1	Screw-Cap, Hex, 4-40 x 0.312 Nylon

## Service Replacement Kits *(continued)*

9-175

KIT-REPAIR, PATIENT  
PARAMETER PCBA  
REF **K27** (RoHS)

Reference Designator	Quantity	Part Description
A04	1	Patient Parameter PCB (ROHS)
F06	1	Screw 4-40 × 1.000L

## Service Replacement Kits *(continued)*

9-176

KIT-REPAIR, PCB STACK  
REF K06

Designator Reference	Quantity	Part Description
F06	1	Screw 4-40 x 1.000L
M14	1	Boardstack shield
M15	5	Standoff-M/M 0.250 hex, 0.375
M18	3	ISO mount, OEM
F04	2	Screw, 4-40 x 0.312L
F08	5	Machine screw SEMS 4-40 x 5/16 L, split washer
M42	1	ISO mount, Parameter
M20	1	Nomex shield
F10	2	Washer, 0.125ID, 0.312D
M22	1	Shield - EMI, PCB Stack

# Service Replacement Kits *(continued)*

KIT-REPAIR, POWER  
MODULE, **LIFEPAK 20e**  
REF **K28** (RoHS)

Reference Designator	Quantity	Part Description
E08	1	Power Supply module (ROHS)



# Service Replacement Kits *(continued)*

KIT-REPAIR, CAPACITOR  
BRACKET  
REF **K07**

Reference Designator	Quantity	Part Description
M25	2	Capacitor Support Bracket
F04	4	Screw, 4-40 x 0.312L
M32	1	Dielectric shield
F11	2	Standoff, 0.188 hex, 0.562L

## Service Replacement Kits *(continued)*

9-179

KIT-REPAIR, CAPACITOR  
REF K08

Reference Designator	Quantity	Part Description
E10	1	Energy Storage Capacitor
L16	2	Foam spacer
L17	1	Capacitor dielectric shield
M19	1	Cable tie retainer
E06	1	Inductive Resistor Assy.
M25	2	Capacitor bracket support
F04	4	Screw, 4-40 x 0.312L
F11	2	Standoff, 0.188 hex,0.562L
M32	1	Dielectric shield
M33	1	Poron Foam, Capacitor

# Service Replacement Kits *(continued)*

KIT-REPAIR, THERAPY  
CONNECTOR  
REF **K12** (RoHS)

Reference Designator	Quantity	Part Description
W01	1	Therapy Connector Assembly (ROHS)
M29	1	Therapy retaining ring
M34	1	Seal, therapy connector

## Service Replacement Kits *(continued)*

9-181

KIT-REPAIR, REDUX SC  
PCBA AND UI PCBA  
REF **K29** (RoHS)

Designator Reference	Quantity	Part Description
A01	1	System Controller PCB (ROHS)
A06	1	User Interface PCB (ROHS)
W15	1	Active Display Cable
F06	2	Screw 4-40 x 1.000L
M14	1	Boardstack shield
M15	5	Standoff-M/M 0.250 hex, 0.375
W07	1	Boardstack connector
M18	3	ISO mount, OEM
F04	2	Screws 4-40 x 0.312
L14	1	Spacer Foam, UI PCB
F08	5	Machine screw, SEMS 4-40 x 5/16 L, split washer

# Service Replacement Kits *(continued)*

KIT-REPAIR, REDUX SC  
PCBA AND UI PCBA  
REF **K29** (RoHS)  
*(continued)*

Reference Designator	Quantity	Part Description
M42	1	ISO mount, Parameter
M20	1	Nomex shield
F10	2	Washer, 0.125ID, 0.312D
M21	1	ISO mount, System Controller (standoff)
M22	1	Shield - EMI, PCB Stack

*(Continued on next page)*

## Service Replacement Kits *(continued)*

9-183

KIT-REPAIR, SPO2 MODULE  
REF **K10** (RoHS)

Reference Designator	Quantity	Part Description
A05	1	MODULE-OEM, PULSE OXIMETER, 3780, ROHS
W05	1	SpO2 Flex Assembly
F08	4	Machine screw, SEMS 4-40 x 5/16 L, split washer

# Service Replacement Kits *(continued)*

KIT-REPAIR, MNC FLASH  
SPO2, **LIFEPAK 20e (Nellcor)**  
REF **K11** (RoHS)

Reference Designator	Quantity	Part Description
A05	1	MODULE-OEM, PULSE OXIMETER WITH MNC, 3783, ROHS
W05	1	SpO2 Flex Assembly (RoHS)
F08	4	Machine screw, SEMS 4-40 x 5/16 L, split washer

## Service Replacement Kits *(continued)*

9-185

KIT-REPAIR, LED DISPLAY  
FOR UI (REF A10) - LED  
Display and Backlight for  
Redux UI PCB (REF A10) or  
greater requires Redux level  
PCB software set  
REF **K09**

Reference Designator	Quantity	Part Description
E02	1	Module-OEM, LED Driver (Backlight Inverter)
E04	1	Active Display, Color LED
W15	1	Active Display Cable
M07	1	Display lens
M08	1	Active Display Bracket
F04	4	Screws 4-40 x 0.312
F05	1	Nylon snap rivet



## Service Replacement Kits *(continued)*

9-186

KIT - REPAIR, POST REDUX  
 UI, SC, PRINTER, ROHS  
 REF **K30**

Reference Designator	Quantity	Part Description
F10	2	Washer, Flat, Round, S, Zinc, 0.312D, 0.125ID
F08	1	Screw-M, PH, CP, P, Sems, #4-40, 5-16 L, Split Washer
F04	16	Screw-M, CS, Z, PH, Nylock, 4-40 X .312L
F06	1	Screw, Machine, Panhead, Nylok, 4-40 X 1.000
M14	1	Shield - PCB Stack
W07	1	Connector-Board Stacker, Modified
M21	1	Mount-Isolation, PCB, System Controller
M18	3	Mount-Isolation, PCB, OEM

# Service Replacement Kits *(continued)*

9-187

KIT - REPAIR, POST REDUX  
UI, SC, PRINTER, ROHS

*(continued)*

REF **K30**

Reference Designator	Quantity	Part Description
M42	1	Mount - Isolation, PCB, Parameter
M15	5	Standoff - Male/Male, 0.250 HEX, 0.375L
M20	1	Shield - Nomex
M22	1	Shield - EMI, PCB Stack
W15	1	Cable - Assembly, Active Color, RoHS
F01	4	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
F02	2	Screw, PH, SS, P, Nylok, 6-32 X 0.375
W18	1	Flex Assembly - UI to Stack
F09	2	Screw, Cap, SKT HD, Hex Rec, 4-40, 0.312L, NYL

## Service Replacement Kits *(continued)*

9-188

KIT - REPAIR, POST REDUX  
UI, SC, PRINTER, ROHS  
*(continued)*  
REF **K30**

Reference Designator	Quantity	Part Description
F03	9	Nut-Hex, SS, Lock 4-40 X 0.250W
L14	1	Spacer - Foam, LP20 UI PCB
A01	1	PCB Assy - Programmed System Controller, LP20
A06	1	PCB Assy - Programmed User Interface, LP20
A12	1	Printer - 50mm, Thermal Printhead, RoHS

## Service Replacement Kits *(continued)*

9-189

KIT - REPAIR, POST REDUX  
UI, PRINTER, ROHS  
REF **K31**

Reference Designator	Quantity	Part Description
F04	13	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
W15	1	Cable - Assembly, Active Color, RoHS
F03	3	Nut - Hex, SS, Lock 4-40 X 0.250W
F01	4	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
F02	2	Screw - PH, SS, P, Nylok, 6-32 X 0.375
A06	1	PCB Assy - Programmed User Interface, LP20
A12	1	Printer - 50mm, Thermal Printhead, RoHS
L14	1	Spacer Foam, UI PCB

## Service Replacement Kits *(continued)*

9-190

KIT - REPAIR, POST REDUX  
UI, ROHS  
REF **K32**

Reference Designator	Quantity	Part Description
F04	13	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
W15	1	Cable - Assembly, Active Color, RoHS
F03	3	Nut - Hex, SS, Lock 4-40 X 0.250W
F01	4	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
F02	2	Screw - PH, SS, P, Nylok, 6-32 X 0.375
A06	1	PCB Assy - Programmed User Interface, LP20
L14	1	Spacer Foam, UI PCB

## Service Replacement Kits *(continued)*

9-191

KIT - REPAIR, POST REDUX  
SC, ROHS  
REF **K33**

Reference Designator	Quantity	Part Description
F10	2	Washer, Flat, Round, S, Zinc, 0.312D, 0.125ID
F08	1	Screw - M, PH, SP, P, Sems, # 4-40, 5-16 L, Split Washer
F04	5	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
F06	1	Screw, Machine, Panhead, Nylok, 4-40 X 1.000
W07	1	Connector - Board Stacker, Modified
M15	5	Standoff - Male/Male, 0.250 Hex, 0.375L
M20	1	Shield - Nomex
F01	4	Screw, Machine, Panhead, Nylok, 6-32 X 1.750

## Service Replacement Kits *(continued)*

9-192

KIT - REPAIR, POST REDUX

SC, ROHS *(continued)*REF **K33**

Reference Designator	Quantity	Part Description
F02	2	Screw - PH, SS, P, Nylok, 6-32 X 0.375
F03	6	Nut - Hex, SS, Lock 4-40 X 0.250W
F09	2	Screw - Cap, SKT HD, HEX REC, 4-40, 0.312L, NYL
A10	1	PCB Assy - Programmed System Controller, LP20
M21	1	ISO Mount, System Controller (Standoff)

## Service Replacement Kits *(continued)*

9-193

KIT - REPAIR, POST REDUX,  
PRINTER, ROHS  
REF **K34**

Reference Designator	Quantity	Part Description
A12	1	Printer - 50mm, Thermal Printhead, RoHS



# Service Replacement Kits *(continued)*

9-194

KIT REPAIR, THERAPY  
PCBA, PACING, LP20, 4TH  
ED  
REF **K13**

Reference Designator	Quantity	Part Description
F03	3.0	NUT-HEX, SS, LOCK 4-40X.250W
F07	5.0	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X .500
W07	1.0	CONNECTOR-BOARD STACKER, MODIFIED
A03	1.0	PCB ASSY-THERAPY MODULE, PACING, LP20
M13	5.0	MOUNT-ISOLATION, PCB, THERAPY

# Service Replacement Kits *(continued)*

9-195

KIT REPAIR, THERAPY  
PCBA, NON-PACING, LP20,  
4TH  
REF **K14**

Reference Designator	Quantity	Part Description
W07	1.0	CONNECTOR-BOARD STACKER, MODIFIED
F07	5.0	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X .500
F03	3.0	NUT-HEX, SS, LOCK 4-40X.250W
A03	1.0	PCB ASSY-THERAPY MODULE, ROHS, LP20
M13	5.0	MOUNT-ISOLATION, PCB, THERAPY

## Service Replacement Kits *(continued)*

9-196

KIT REPAIR, OEM PCBA,  
LP20, 4TH ED  
REF **K15**

Reference Designator	Quantity	Part Description
F08	1.0	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
F09	1.0	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
A04	1.0	PCB ASSY - OEM INTERFACE, MASIMO

# Service Replacement Kits *(continued)*

9-197

KIT REPAIR, PP PCBA, LP20,  
4TH ED  
REF **K16**

Reference Designator	Quantity	Part Description
A04	1.0	PCB ASSY-PP, 3 CH WITH SIR, LP20-LP20E
F06	1.0	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000

## Service Replacement Kits *(continued)*

9-198

KIT REPAIR, POST REDUX  
UI, SC, PRINTER, 4TH ED  
REF **K35**

Reference Designator	Quantity	Part Description
A01	1.0	PCB ASSY-PROGRAMMED SYSTEM CONTROLLER, LP20
M42	1.0	MOUNT-ISLOATION, PCB, PARAMETER
F02	2.0	SCREW-PH, SS, P, NYLOK, 6-32 X .375
F01	4.0	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
M14	1.0	SHIELD - PCB STACK
M20	1.0	SHIELD - NOMEX
F04	16.0	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L
F10	2.0	WASHER, FLAT, ROUND, S, ZINC, .312D, .125ID
L14	1.0	SPACER-FOAM, LP20 UI PCB
F03	9.0	NUT-HEX, SS, LOCK 4-40X.250W

*(Continued on next page)*

## Service Replacement Kits *(continued)*

9-199

KIT REPAIR, POST REDUX  
UI, SC, PRINTER, 4TH ED  
REF **K35** *(continued)*

Reference Designator	Quantity	Part Description
F09	2.0	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
W17	1.0	FLEX ASSEMBLY - UI TO STACK
F06	1.0	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000
M18	3.0	MOUNT-ISOLATION, PCB, OEM
F08	1.0	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
M21	1.0	MOUNT-ISOLATION, PCB, SYSTEM CONTROLLER
W07	1.0	CONNECTOR-BOARD STACKER, MODIFIED
A06	1.0	PCB ASSY - PROGRAMMED USER INTERFACE, LP20

*(Continued on next page)*

# Service Replacement Kits *(continued)*

9-200

KIT REPAIR, POST REDUX  
UI, SC, PRINTER, 4TH ED  
REF **K35** *(continued)*

Reference Designator	Quantity	Part Description
M22	1.0	SHIELD - EMI, PCB STACK
A12	1.0	PRINTER-50MM, THERMAL PRINthead, ROHS
W15	1.0	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
M15	5.0	STANDOFF - MALE/MALE, .250 HEX, .375L

## Service Replacement Kits *(continued)*

9-201

KIT REPAIR, POST REDUX  
UI, PRINTER, 4TH ED  
REF **K36**

Reference Designator	Quantity	Part Description
A06	1.0	PCB ASSY - PROGRAMMED USER INTERFACE, LP20
A12	1.0	PRINTER-50MM, THERMAL PRINthead, ROHS
F02	2.0	SCREW-PH, SS, P, NYLOK, 6-32 X .375
F03	3.0	NUT-HEX, SS, LOCK 4-40X.250W
L14	1.0	SPACER-FOAM, LP20 UI PCB
W15	1.0	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
F01	4.0	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
F04	13.0	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L



## Service Replacement Kits *(continued)*

9-202

KIT REPAIR, POST REDUX  
UI, 4TH ED  
REF **K37**

Reference Designator	Quantity	Part Description
A06	1.0	PCB ASSY - PROGRAMMED USER INTERFACE, LP20
L14	1.0	SPACER-FOAM, LP20 UI PCB
F01	4.0	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
F02	2.0	SCREW-PH, SS, P, NYLOK, 6-32 X .375
F01	3.0	NUT-HEX, SS, LOCK 4-40X.250W
W15	1.0	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
F04	13.0	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L

# Service Replacement Kits *(continued)*

9-203

KIT REPAIR, POST REDUX

SC, 4TH ED

REF **K17**

Reference Designator	Quantity	Part Description
A01	1.0	PCB ASSY-PROGRAMMED SYSTEM CONTROLLER, LP20
M15	5.0	STANDOFF - MALE/MALE, .250 HEX, .375L
M21	1.0	MOUNT-ISOLATION, PCB, SYSTEM CONTROLLER
F06	1.0	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000
F04	5.0	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L
F03	6.0	NUT-HEX, SS, LOCK 4-40X.250W
F04	4.0	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750

*(Continued on next page)*

## Service Replacement Kits *(continued)*

9-204

KIT REPAIR, POST REDUX  
SC, 4TH ED  
REF **K17** *(continued)*

Reference Designator	Quantity	Part Description
F09	2.0	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
F08	1.0	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
W07	1.0	CONNECTOR-BOARD STACKER, MODIFIED
F02	2.0	SCREW-PH, SS, P, NYLOK, 6-32 X .375
F10	2.0	WASHER, FLAT, ROUND, S, ZINC, .312D, .125ID
M20	1.0	SHIELD - NOMEX

## Service Replacement Kits *(continued)*

9-205

KIT REPAIR, POST REDUX,  
PRINTER, 4TH ED  
REF **K18**

Reference Designator	Quantity	Part Description
A04	1	OEM Interface PCB (ROHS)
F08	1	Machine screw, SEMS 4-40 x 5/16 L, split washer
F09	1	Screw-Cap, Hex,4-40 x 0.312 Nylon

KIT-REPAIR, POWER  
Module,LP20E, 4th ED V2  
REF **K19**

Reference Designator	Quantity	Part Description
E08	1.0	POWER SUPPLY ASSEMBLY - LIFEPAK 20E,4TH ED,NEW MCU

# Device Software Replacement

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9-206

Device configuration settings and system software replacement require tools and procedures that are proprietary to Stryker. These procedures and tools may be available for use by customers using LIFENET System Asset Management products. Device configuration and software can also be installed by authorized Stryker service personnel.

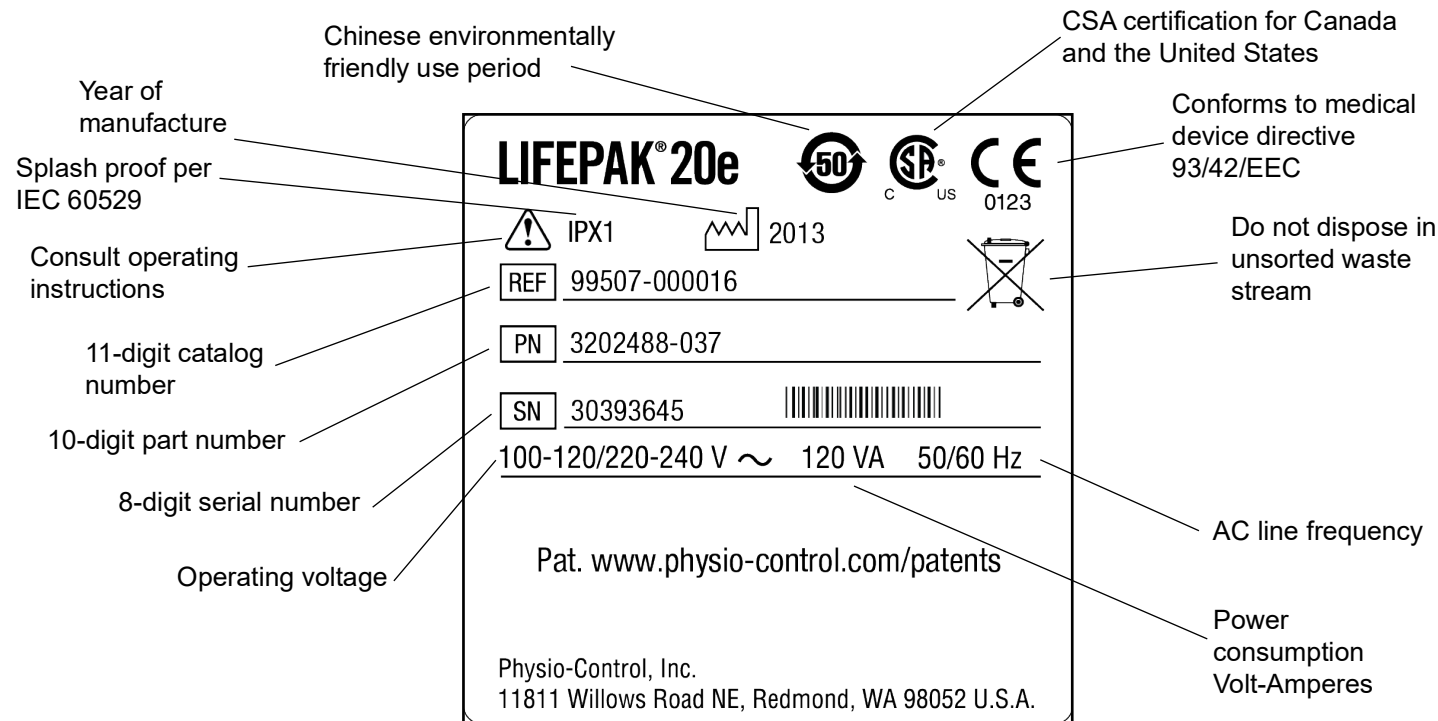
Contact a Stryker customer services representative for assistance.

# Device Part Number and Serial Number

9-207

## PN and SN Label

The device serial number (SN) and part number (PN) are noted on a label on the bottom of the device.

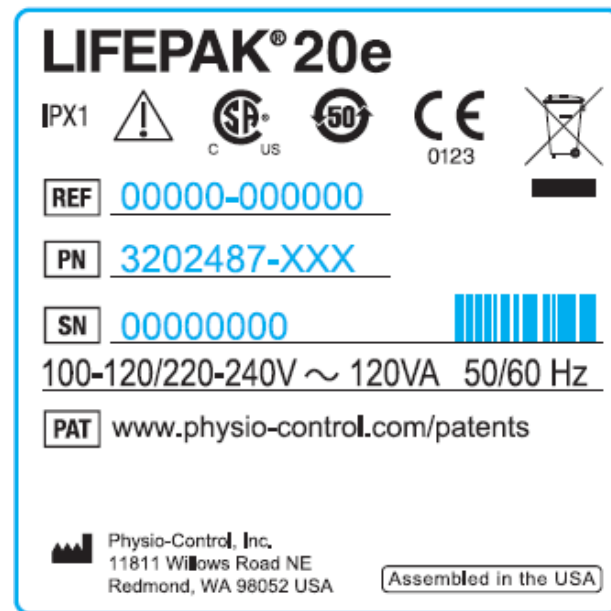
**REF L04****LIFEPAK 20e 2nd Edition**

## Device Part Number and Serial Number *(continued)*

9-208

### PN and SN Label *(continued)*

The device serial number (SN) and part number (PN) are noted on a label on the bottom of the device.

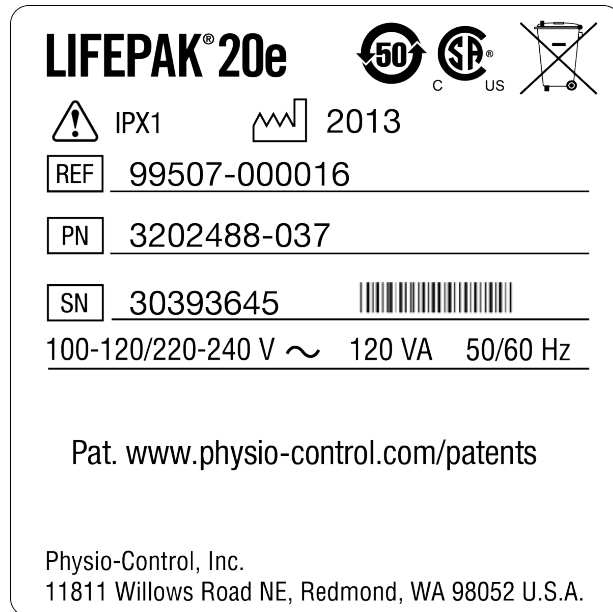
**REF L04****LIFEPAK 20e 3rd Edition**

# Device Part Number and Serial Number *(continued)*

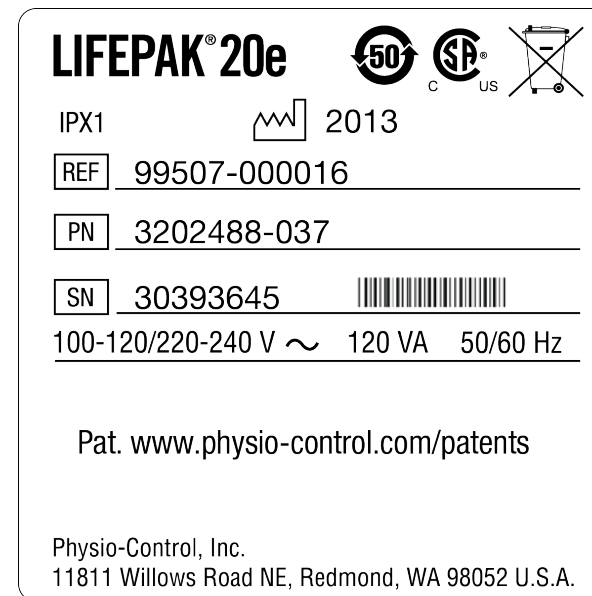
9-209

## PN and SN Label

The device serial number (SN) and part number (PN) are noted on a label on the bottom of the device.



**REF L04 LIFEPAK 20e No  
CE Mark**



**REF L04 LIFEPAK 20e 3rd  
Edition, No CE Mark**



## Device Part Number and Serial Number *(continued)*

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9-210

### Understanding the Part Number

The device part number, for example, 3202487-072, reflects the device options, features, language, operating power, and so forth.

### Understanding the Serial Number

The serial number for the device is related to the sales order created during device manufacturing and appears on the serial number label on the bottom of the device. Use this number when calling to order parts.

# Ordering Parts

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9-211

To order parts, contact your local Stryker representative or order online at [shop.stryker.com/medicalredmond](http://shop.stryker.com/medicalredmond). In the USA, call 1.800.442.1142. Provide the part number and serial number located on the bottom of the device. Specify all assembly numbers, MINs (part numbers), reference designations, and descriptions. Parts may be substituted to reflect device modifications and improvements.

## Manufacturing Date

In some cases when ordering parts, you may also need the device manufacturing date. This manufacturing date is available for viewing by accessing the [Device Log](#).

## Serial Number

The serial number of the device identifies the manufacturing conditions and elements used in producing your device. When ordering parts, use the serial number (SN) listed on the label on the bottom of the device.

## CodeManagement Module

This section includes the following topics:

**Introduction**

**Physical Description and Features**

**Ordering Devices, Supplies, and Accessories**

**Functional Description**

**Troubleshooting - Service Events**

**Specifications - CodeManagement Module Battery**

**Replacement Procedures**

# Introduction

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10-2

## About the Device

The CodeManagement Module attaches to the LIFEPAK 20e device. The base model provides wireless connectivity with the LIFENET System. An additional configuration provides the ability to provide EtCO2 monitoring.

When the CodeManagement Module is added to a LIFEPAK 20e device, the software in the device must be updated. Your Stryker Smart Services representative can assist with this process.

## Introduction *(continued)*

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10-3

### Device Primary Functions

The CodeManagement Module has two primary functions:

- Wireless connectivity, including:
  - Transmission to/from LIFENET System
  - Data download and transmission from TrueCPR™ device
- EtCO2 monitoring, including:
  - EtCO2
  - Respiration Rate
  - Alarms for EtCO2, FiCO2, and Respiration Rate

## Introduction *(continued)*

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10-4

### Assemblies

The device consists of a three-piece case assembly that encloses the following modules/PCBs:

1. Interface PCB
2. AC to DC power converter module
3. Antenna PCB

and the following OEM and mechanical components:

1. CO2 Module (optional)
2. Internal Battery Pack
3. Wireless module

and the following attachments:

1. CO2 FilterLine (optional)

# Physical Description and Features

10-5

## Front Panel



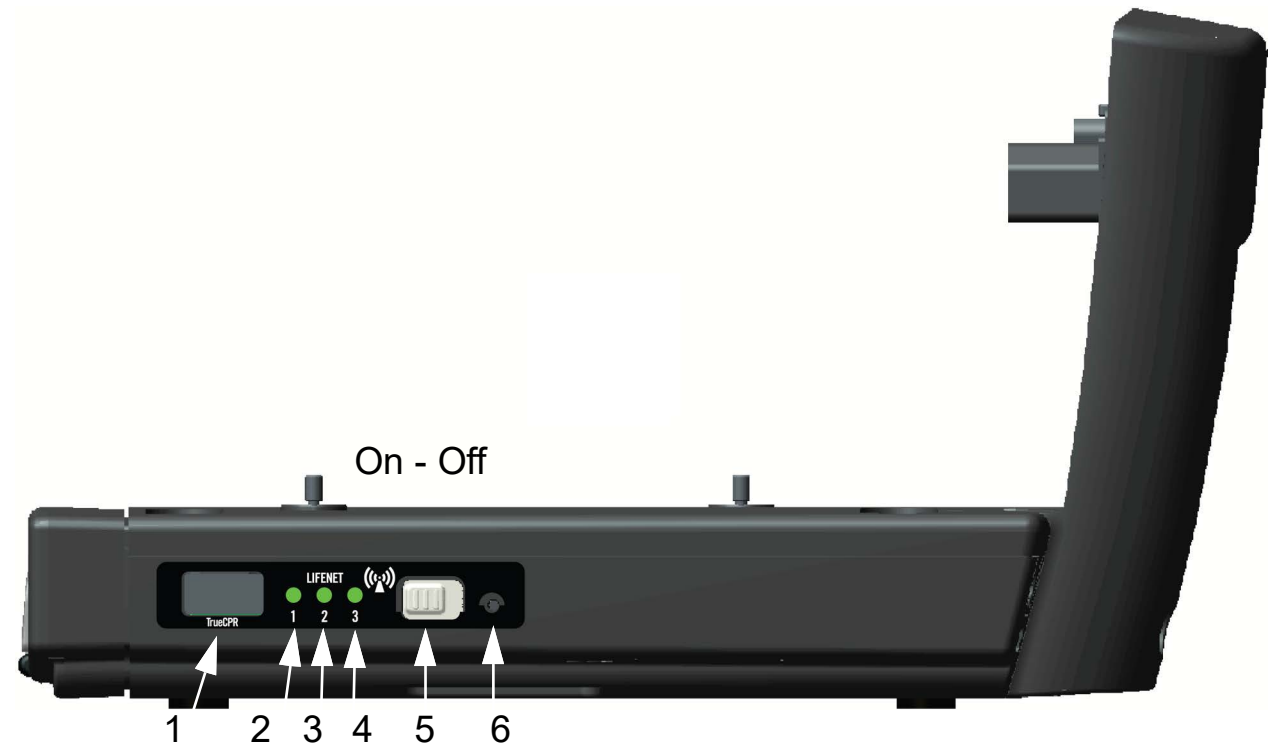
Number	Description
1	Power indicator — LED illuminates when AC power (line power) is connected and providing power.
2	CO2 port — Connection port for FilterLine tubing. Refer to operation instructions for EtCO2 operations. Includes CO2 connector cover (9)

*(Continued on next page)*

# Physical Description and Features *(continued)*

10-6

## Side Panel

*(Continued on next page)*



## Physical Description and Features *(continued)*

10-7

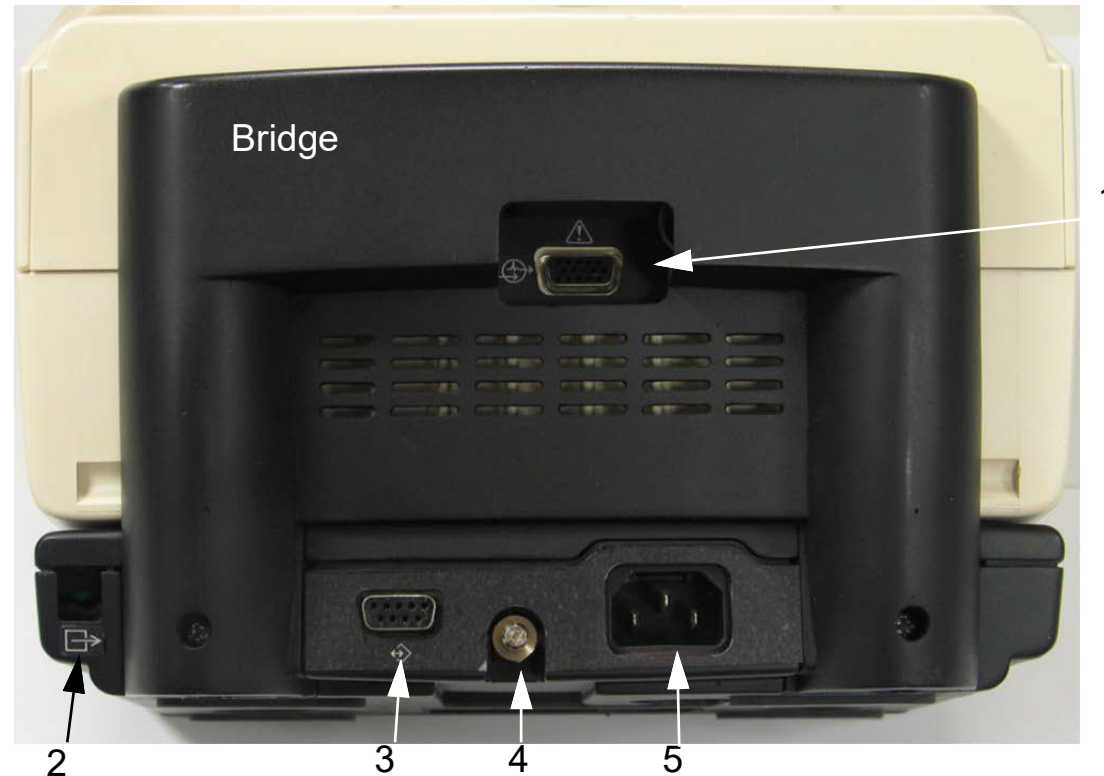
### Side Panel *(continued)*

Number	Description
1	TrueCPR device port — Used to transfer data from the TrueCPR device to the LIFENET System. Only the TrueCPR device should be connected to this port.
2	Wireless indicator 1 — LED illuminates when wireless is active.
3	Wireless indicator 2 — LED illuminates when CodeManagement Module is connected to the local network.
4	Wireless indicator 3 — LED illuminates when CodeManagement Module is connected to the LIFENET server.
5	Wireless On/Off switch — Used to turn wireless on or off.
6	Reset button — Recessed button that can be accessed using the straightened end of a large paper clip or similar tool. Used to reboot the CodeManagement Module.

# Physical Description and Features *(continued)*

10-8

## Back Panel

*(Continued on next page)*

# Physical Description and Features (*continued*)

10-9

## Back Panel (*continued*)

Number	Description
1	ECG/Sync connector — The ECG/Sync connector provides remote synchronization and real-time ECG output to a third party monitor. See Warning - Shock hazard on <a href="#">Page 2-4</a> .
2	CO2 exhaust port — The CO2 exhaust port connects to a scavenger system when monitoring EtCO2 during use of anesthetics.
3	System connector — The system connector provides access to another LIFEPAK 20e defibrillator/monitor so that setup information can be transferred between defibrillators Provides access to a computer so software can be updated or CO2 calibration can be performed using LIFENET Systems. See Warning - Shock hazard on <a href="#">Page 2-4</a> .
4	Ground (equipotential) connector
5	AC power connector. See Warning - Shock hazard on <a href="#">Page 2-4</a> .

# Ordering Devices, Supplies, and Accessories

A CodeManagement Module includes the components shown below. The table (provided for reference) summarizes optional configurations, supplies, and accessories that are available. For ordering instructions, refer to [Ordering Parts](#).

Item	REF
Package - CodeManagement Module, Wireless	E11
Package - CodeManagement Module, Wireless, CO2 options	E12

CO2 Supplies are ordered from the Stryker Accessories Price List 3302108

# Functional Description

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10-11

## Introduction

When properly attached to the LIFEPAK 20e device, the CodeManagement Module offers EtCO<sub>2</sub> monitoring and Wireless connectivity. This device should be used indoors only (for example, a hospital or therapy center) and is powered by AC (line) power. There is an additional internal battery for use as a backup to AC power.

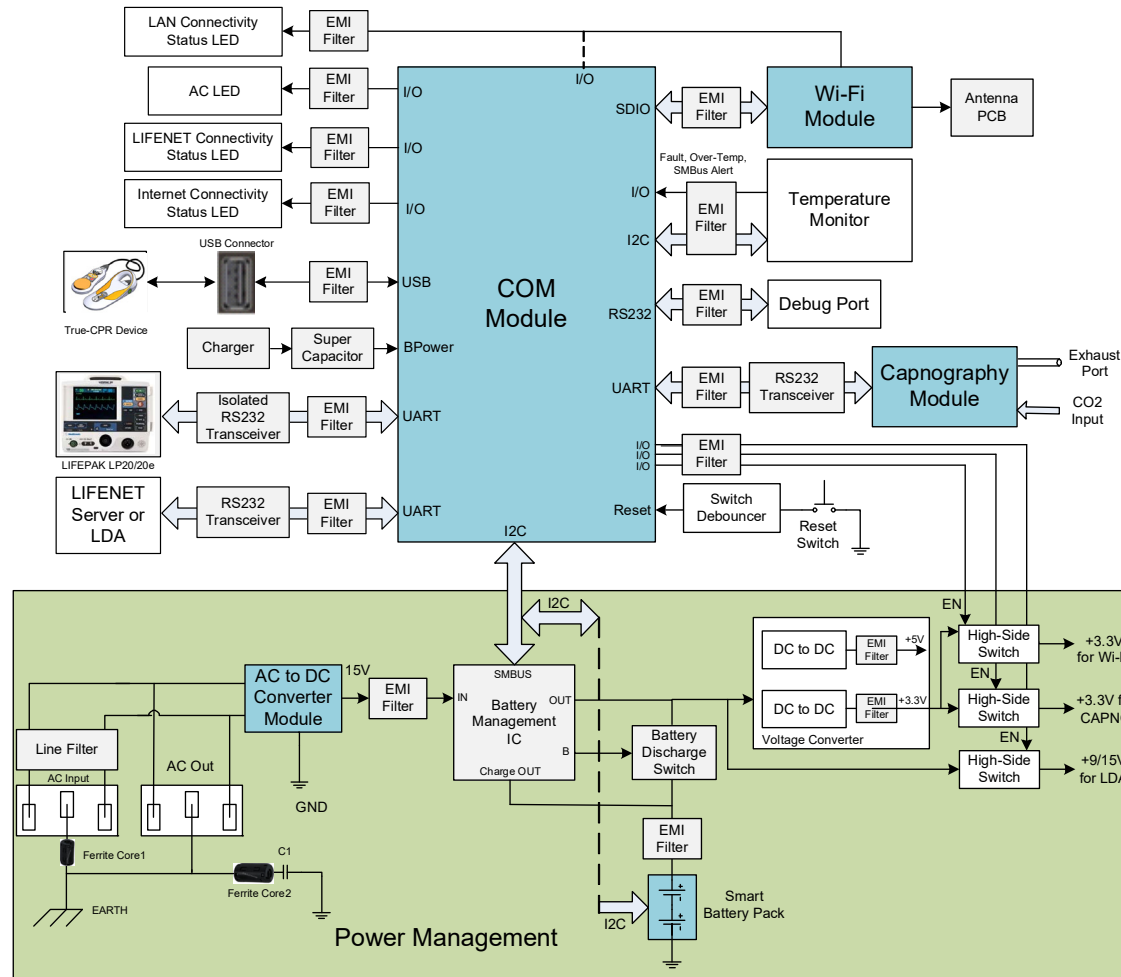
The following functional description is intended to provide service personnel with a basic understanding of the device design. Its purpose is to assist qualified service technicians in troubleshooting to the subassembly level. Troubleshooting below the subassembly level outside the factory is not recommended, nor is it within the scope of this service manual to provide the detail necessary to support such repairs.

Refer to the diagrams on the next pages as you review the descriptions that follow.

# Functional Description *(continued)*

10-12

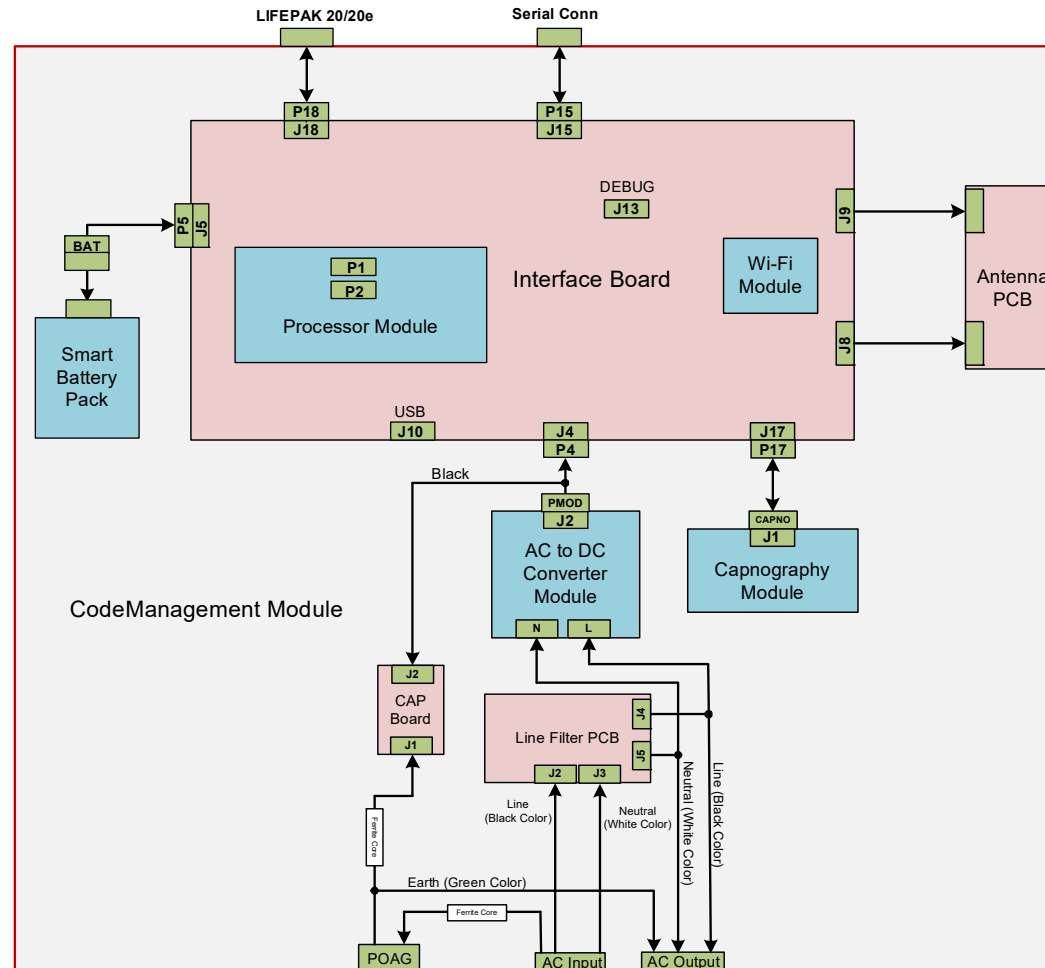
## System Block Diagram



# Functional Description *(continued)*

10-13

## Interconnect Diagram



## Troubleshooting - Service Events

10-14

### CodeManagement Service Codes

CodeManagement Module service codes can only be transmitted and viewed through a connection to LIFENET Asset.

The LIFEPAK 20e and CodeManagement Module will send test log data every 24 hours and device self-test status to LIFENET Asset every 8 hours.

CodeManagement Module service codes and descriptions:

Service Code	Description	Possible corrections
01	Real Time Clock Failure	<ul style="list-style-type: none"><li>• Press reset button on CodeManagement Module</li><li>• Reconnection to WI-FI network</li><li>• Replace CodeManagement Module</li></ul>
02	Non-volatile Ram Integrity Test Failure	
03	LIFEPAK 20 Device Data Checksum Error	
04	LIFEPAK 20 Device Serial Port Comm. Failure	



## Troubleshooting - Service Events (continued)

10-15

### Additional Troubleshooting

Issue	Possible correction
No CO2 Operation displayed on monitor	Check serial cable connection between the CodeManagement Module and LIFEPAK 20e device. Also refer to the Troubleshooting section in the LIFEPAK 20e operating instructions.
AC power LED on LIFEPAK 20 device not illuminated	Check ac power cable connection between the CodeManagement Module and LIFEPAK 20e device.
No wireless connection to LIFENET System	Verify wireless switch is set to ON. Press the CodeManagement Module reset button. If no wireless connection after a repair, then verify that RF antenna wires are not damaged and are connected correctly to Interface PCB.

# Specifications - CodeManagement Module Battery

10-16

## CodeManagement Module Internal Battery

Specification	Description
Type	Lithium-ion, rechargeable
Voltage	Typical: 11.1 V Operating range: 9.0 V – 12.6 V
Capacity	2.4 Ah
Weight	0.15 kg (0.33 lb)
Service Life	2 years
Operating Temperature	0° to 45°C (32° to 113°F)
Storage Temperature	-20° to 60°C (-4° to 140°F) for up to 1 month
Relative Humidity	5 to 95% non-condensing

# Replacement Procedures

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10-17

## Section Contents

Replacement procedures are a set of detailed instructions for disassembly, handling, and reassembly of replaceable **CodeManagement Module** (referred to as “device”) assemblies.

Perform an interior inspection whenever the device case is opened for service.

When disconnecting cables and wire harnesses, identify labeling on cables and connections so they can be matched easily during reassembly (for example, J1, J3, etc.). See the [Interconnect Diagram](#) for additional information.

## Repair Procedure Index

[CodeManagement Module Door and Battery Replacement](#)

[CO2 Micro-Module Removal](#)

[CO2 Micro-Module Installation](#)

# Replacement Procedures (continued)

10-18

## Warnings and Cautions

The following general warnings and cautions apply to all actions you may perform during maintenance of the device.

### WARNING

**SHOCK HAZARD.** Servicing of this device must be performed by properly trained individuals. This device has exposed line voltage when connected to AC power. Do not handle the power supply when connected to AC power.

**POSSIBLE SHOCK AND DEVICE DAMAGE.** It is possible to pinch and damage wires during reassembly. To avoid pinching wires, carefully follow reassembly instructions

### CAUTION

**POSSIBLE COMPONENT DAMAGE.** The PCB assemblies contain static-sensitive devices (SSDs). To avoid damage, observe the special handling practices described under [Static-Sensitive Devices \(SSD\) Handling](#).

# Replacement Procedures (continued)

10-19

## Static-Sensitive Devices (SSD) Handling

Many electronic semiconductor devices (such as MOS ICs, FETs, optical isolators, or film resistors) can be damaged by the discharge of static electricity. Static-charge buildup is very common. Static discharges commonly occur when the operator wears synthetic clothes and transfers the charge to any object touched. These discharges can damage or destroy static-sensitive devices (SSDs). In most cases, the discharge is not even perceptible to the person who causes it.

To prevent static-discharge damage to SSDs, observe the following precautions during any open-case test, maintenance, or repair procedures:

## The SSD Symbol

SSDs are identified with the following warning symbol:



Always perform repair or maintenance on a static-dissipative mat that is connected to earth ground.

*(Continued on next page)*

# Replacement Procedures (continued)

10-20

## Assembly Tools List

The suggested list of tools for the CodeManagement Module replacement procedures is as follows:

- Static-dissipative mat and wrist strap
- Anti-static rack and/or conductive bags
- Torque screwdriver(s) - required torque settings are 6.8 and 10.0 in-lb.

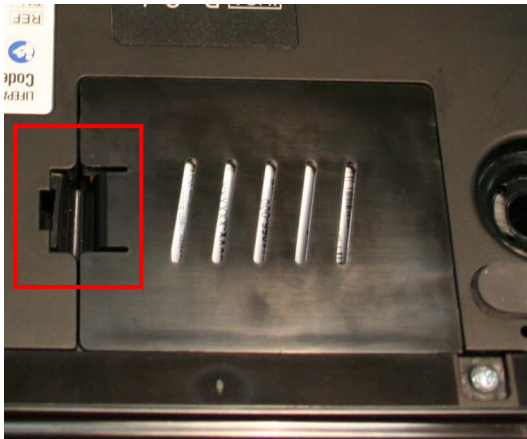
Torque Measurements	Values	
Torque in-lb	6.8	10.0
Torque in-oz	108.8	160
Torque cNm	77	113

- Point 1 power drive bit (P1)- Phillips tip for 4-40 screws (shaft length of 2")
- Point 2 power drive bit (P2)- Phillips tip for 6-32 screws (shaft length of 2")
- Small flat blade regular screwdriver
- Antenna wire extraction tool - Mouser p/n 798-U.FL-LP-N-2

# Replacement Procedures (continued)

10-21

## CodeManagement Module Door and Battery Replacement



To remove the Battery Door and Battery from the CodeManagement Module:

1. Disconnect the device from ac power.
2. Place the device top down.
3. Insert a small, flat-bladed screwdriver into the door tap and pinch the tab to remove the battery door. Set battery door aside.
4. Lift Battery from lower enclosure and then disconnect wire harness from the Battery.

**Note:** Numbers in parentheses refer to parts in [Replacement Parts List](#).

To install the Battery and Battery Door onto the CodeManagement Module:

1. Place the device top down. The battery door was previously removed.
2. Connect the device's battery cable to the CodeManagement Module Battery (12).
3. Insert the CodeManagement Module Battery into the lower enclosure battery compartment.

**Note:** Install the battery in the compartment with the battery label facing out of the device.

4. Close and lock the battery door (13).
5. Complete the CodeManagement Module PIP.

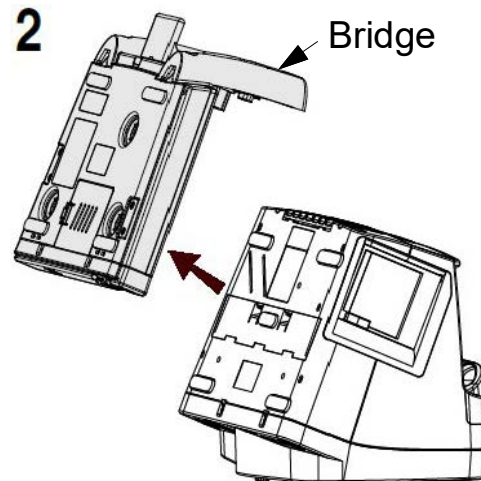
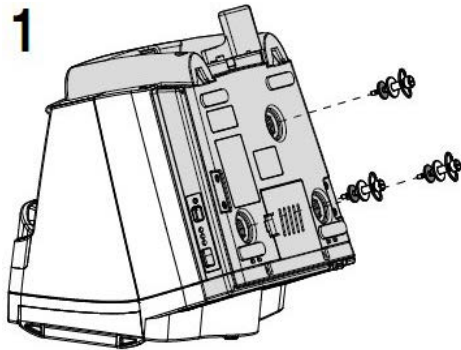
# Replacement Procedures (continued)

10-22

## CO2 Micro-Module Removal

To remove the CO2 Micro-Module:

1. Disconnect the device from ac power.
2. **Remove the Battery** from the CodeManagement Module.
3. Remove the CodeManagement Module from the LIFEPAK 20e defibrillator/monitor: 1- Loosen the three thumb screws on the bottom of the device. Carefully turn the device back over and then slide the LIFEPAK 20e defibrillator/monitor forward to gain access to disconnect the ac power cord and serial interface cable. 2- Remove the LIFEPAK 20e defibrillator/monitor from the CodeManagement Module and set aside.

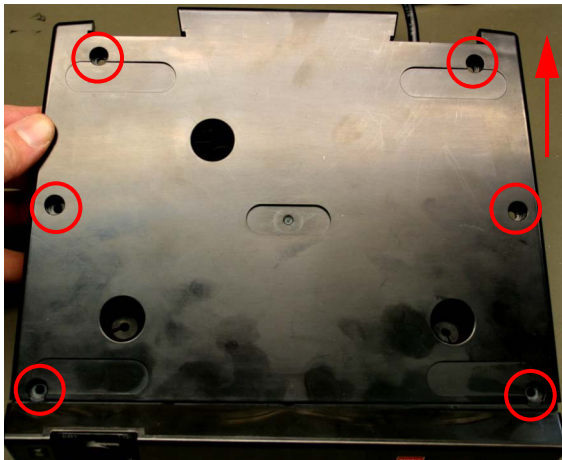




# Replacement Procedures (continued)

10-23

## CO2 Micro-Module Removal (continued)

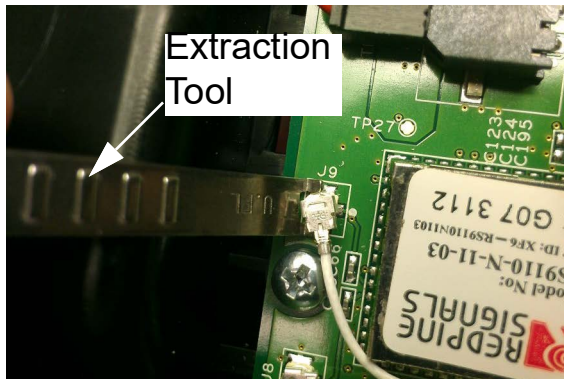
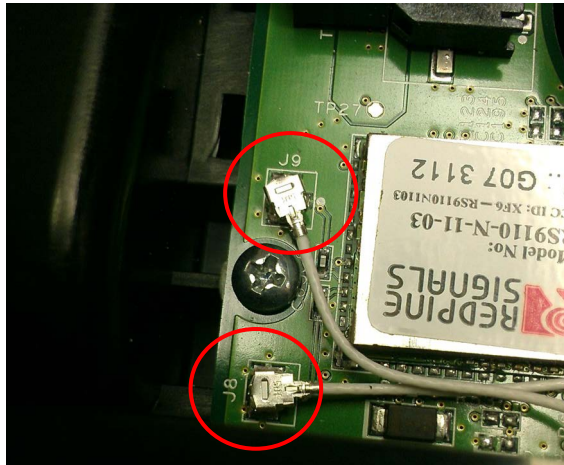


4. Turn the CodeManagement Module over and face the rear of the device. Remove and discard the two 6-32 x 0.375 screws from the back of the device. Lift the Bridge up and away from the rest of the device.
5. Remove and discard the six 6-32 x 0.375 screws that secure the top enclosure to the bottom enclosure.
6. Tilt the rear portion of top enclosure up and slide backwards to remove.

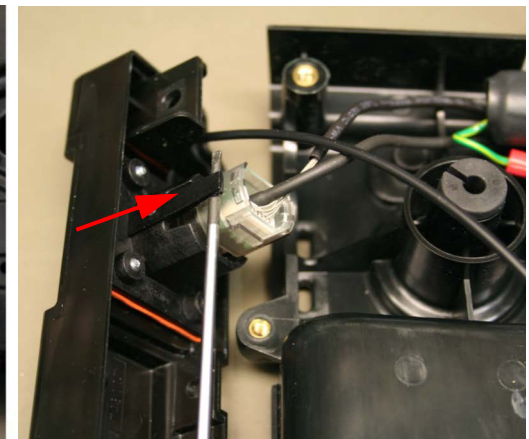
# Replacement Procedures (continued)

10-24

## CO2 Micro-Module Removal (continued)



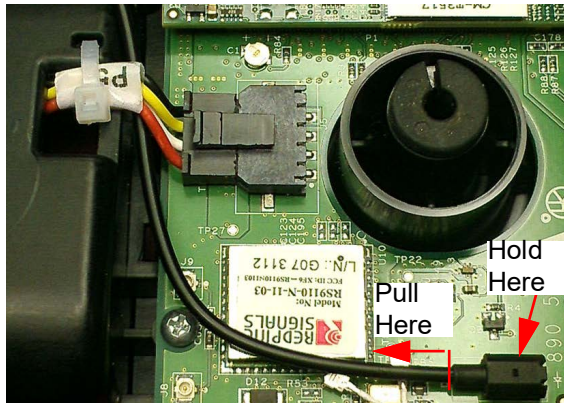
7. Disconnect the two wireless RF antenna wires from the Interface PCB at J8 and J9 connectors using the Antenna Extraction Tool.
8. Turn device over and remove and discard two 6-32 x 0.375 screws from front enclosure. Lift the front enclosure away from the rear enclosure far enough to gain access to the CO2 input (FRS) connector.
9. Using a small flat blade screwdriver open the arms of the CO2 connector retainer. Slide CO2 input (FRS) connector from CO2 connector retainer.



# Replacement Procedures (continued)

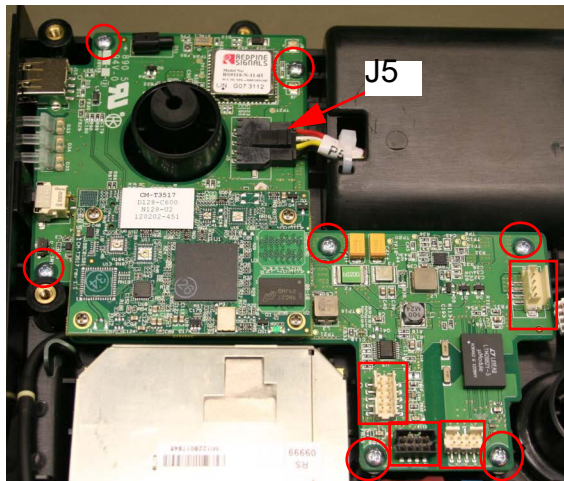
10-25

## CO2 Micro-Module Removal (continued)



10. Disconnect the LED Fiber Optic cable from the D51 connector on the Interface PCB. Carefully pull fiber optic cable straight out from D51 connector.
11. Set the front enclosure aside.
12. Disconnect Cables at J4, J15, J17 and J18 on Interface PCB.
13. Remove and discard seven 4-40 x 0.25 screws from the Interface PCB.
14. Disconnect Battery Cable from J5 on Interface PCB. The Interface PCB can be rotated slightly while disconnecting connector.
15. Carefully lift the Interface PCB from the lower enclosure.

**Note:** The wireless switch cover will come off the switch when the interface PCB is removed. Note the orientation of switch cover for re-installation.

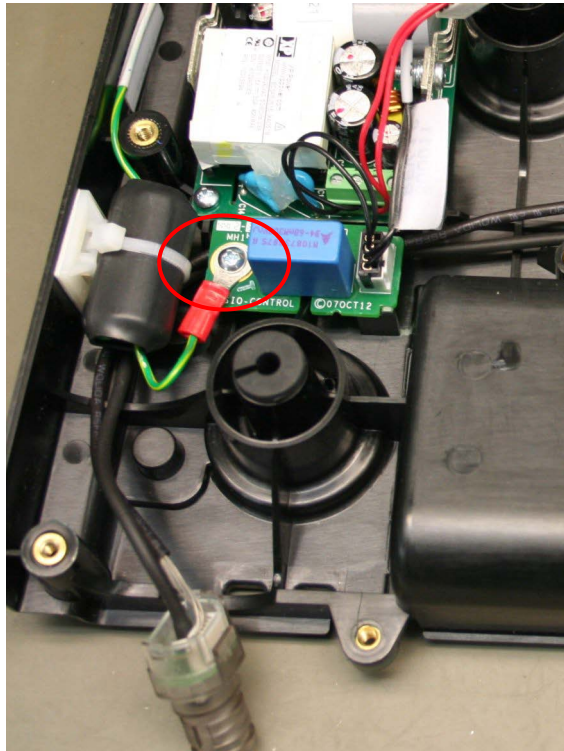




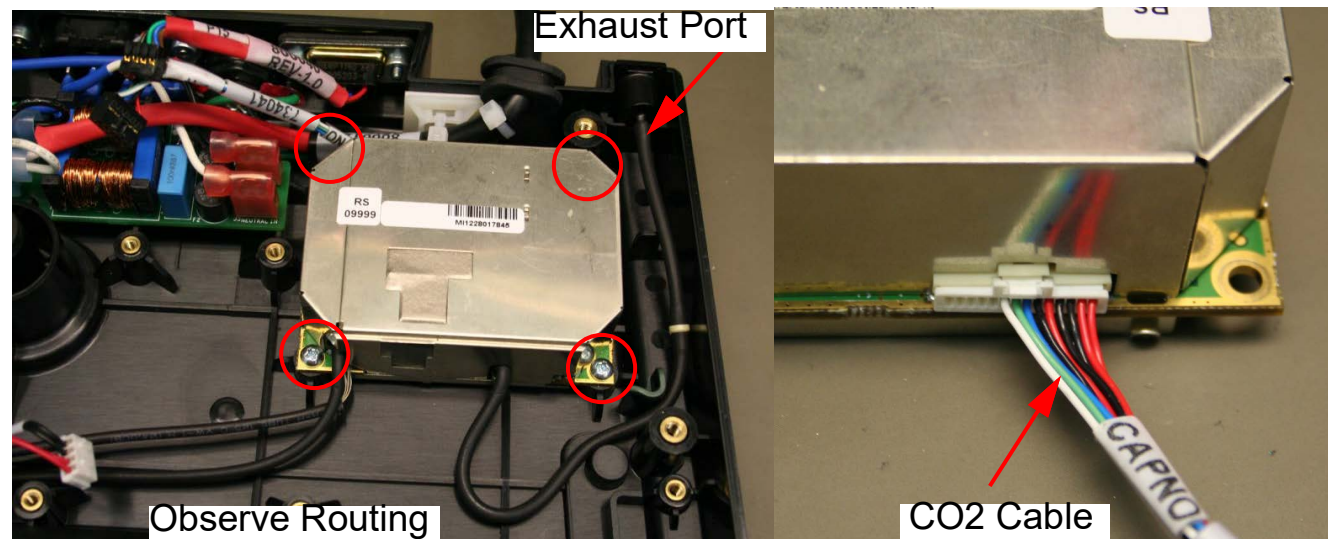
# Replacement Procedures (continued)

10-26

## CO2 Micro-Module Removal (continued)



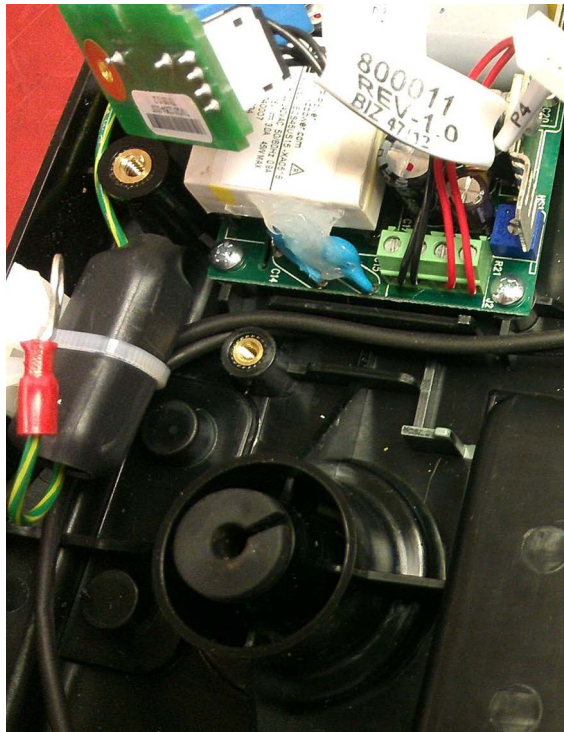
16. Remove and discard one 4-40 x 0.375 screw from Cap PCB. Lift the Cap PCB up and out of the way to gain access to CO2 tubing and cable that are routed under the PCB.
  17. Disconnect the exhaust port connector from the CO2 module. Set the exhaust port aside for reuse.
  18. Remove and discard four 4-40 x 0.375 screws from CO2 module. Remove the CO2 module from the lower enclosure.
- Note:** Observe the CO2 tubing/wire routing to front and exhaust to rear of case.
19. Disconnect the CO2 cable from CO2 module for reuse.



# Replacement Procedures (continued)

10-27

## CO2 Micro-Module Installation



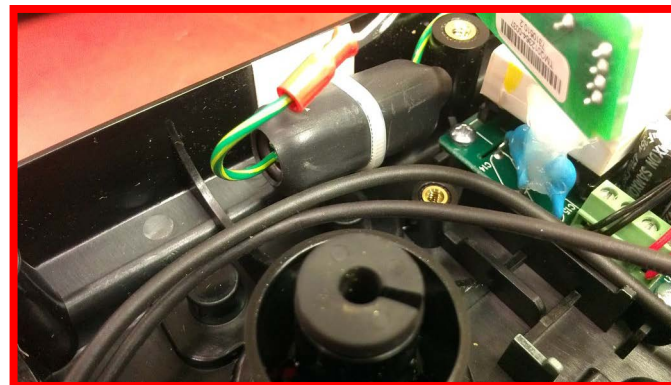
Correct CO2 Input Hose Routing

**Note:** Numbers in parentheses refer to parts in [Replacement Parts List](#).

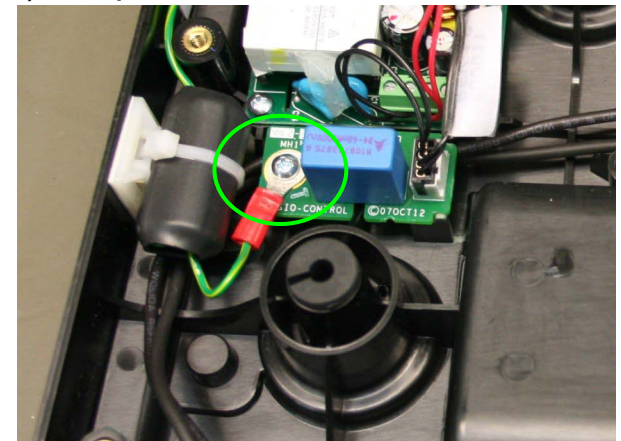
1. Remove replacement CO2 module (18) from static bag.
2. Connect the CO2 cable end marked "Capno" to the CO2 module.
3. Connect Exhaust port fitting to exhaust tubing of CO2 module.

**Note:** Verify that four white CO2 mounting spacers (30) are in place under CO2 module. Review the observed CO2 tubing routing from previous section.

4. Mount the CO2 module to lower enclosure with four 4-40 x 0.375 screws (10); torque to 6.8 in-lb.
5. Route the input tubing and cable from the CO2 module.
6. Install the Cap PCB, being careful not to pinch tubing or wire harness. Secure with one 4-40 x 0.375 screw (10); torque to 6.8 in-lb.



Incorrect Hose Routing

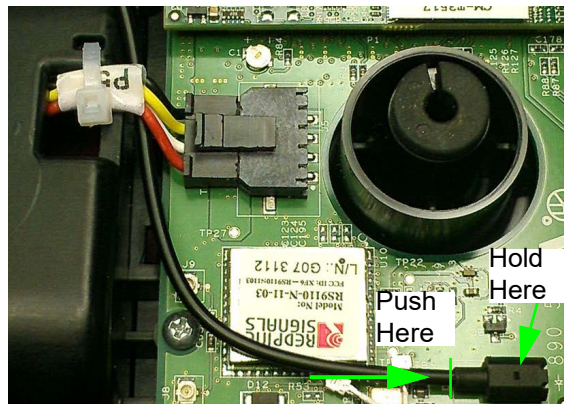
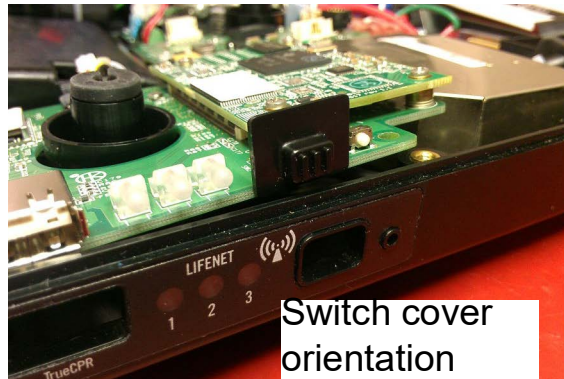




# Replacement Procedures (continued)

10-28

## CO2 Micro-Module Installation (continued)



7. Place the Interface PCB into lower enclosure.
  8. Connect battery cable to J5 on Interface PCB.
- Note:** For switch cover orientation, the switch cover part number goes along the top side of switch.
9. Facing the front of the device, shift the interface PCB to the left with right side of PCB tilted up. Place wireless switch cover onto the switch and install into enclosure.
  10. Secure the Interface PCB with seven 4-40 x 0.25 screws (17); torque to 6.8 in-lb.
  11. Connect Cables at J4, J15, J17 and J18 on Interface PCB.
  12. Slide CO2 input (FRS) connector into CO2 connector retainer.
  13. Route the LED Fiber Optic cable under P5 battery cable connector.
  14. Reconnect the LED Fiber Optic cable into connector D51 by holding the connector and gently pushing the fiber optic into place.
- Note:** The fluting on the end of the LED Fiber Optic cable should not be visible when the cable is fully installed into connector.
15. Install front enclosure to the bottom enclosure. Turn the device over and secure with two 6-32 x 0.375 screws (3); torque to 10 in-lb.

# Replacement Procedures (continued)

10-29

## CO2 Micro-Module Installation (continued)

**Note:** RF antenna wires connection location on the Interface PCB is important. Incorrect connections will limit the wireless signal range of the device.

16. Carefully reinstall the RF Antenna wires (23) onto the Interface PCB connectors J8 and J9. The wires from Antenna PCB J1 go to J9, and J2 go to J8.
17. To install the top enclosure, tilt the rear side of the top enclosure up slightly and slide toward the front of the bottom enclosure to install.
18. Secure the top enclosure with six 6-32 x 0.375 screws (3); torque to 10 in-lb.
19. Facing the rear of the device, place the rear Bridge back onto the device. Install two 6-32 x 0.375 screws (3) to the back of the device; torque to 10 in-lb.
20. Install the CodeManagement Module to the LIFEPAK 20e defibrillator/monitor. Connect the ac power and serial cables to the LIFEPAK 20e defibrillator/monitor. Route the cables into bridge guides. Place the LIFEPAK 20e defibrillator/monitor onto the CodeManagement Module and tighten the three thumb screws (10) from the bottom of the device. See illustration [CO2 Micro-Module Removal](#).
21. Perform Procedure [CodeManagement Module Door and Battery Replacement](#) that includes performing the CodeManagement Module PIP.

# Replacement Procedures (continued)

10-30

## Replacement Parts List

Reference Designator	Quantity	Part Description
M38	1	Battery Door
E13	1	Battery
E14	1	CO2 Micro-Module
F13	10	6-32 x 0.375 screw
F14	7	4-40 x 0.25 screw
F15	5	4-40 x 0.375 screw
W18	2	RF Antenna Wire
L18	4	CO2 Mounting Spacer
M39	3	Rubber Mounting Spacer
M40	1	CO2 Input Connector Cover
M28	4	Foot-Mounting
F16	1	Mounting Hardware Kit (thumb screws)



# LIFEPAK 20e Specifications

Detailed specifications are provided in the Operating Instructions for the device. Additional specifications are included in this section.

# General

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11-2

## Operation Modes

**Note:** All specifications are at 20°C (68°F) unless otherwise stated.

The LIFEPAK 20e defibrillator/monitor has seven main operating modes:

- |                |   |
|----------------|---|
| Manual Mode    | - Provides normal operating capability for ALS users                  |
| AED Mode       | - Provides normal operating capability for BLS users                  |
| Archive Mode   | - Allows operator to print, edit or delete previous patient records   |
| Setup Mode     | - Allows operator to configure the instrument                         |
| Service Mode   | - Allows operator to execute device diagnostic tests and calibrations |
| Inservice Mode | - Provides simulated waveforms for demonstration purposes             |
| Auto Test Mode | - Provides daily automatic tests of critical circuits                 |

# Monitor

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11-3

CO2	Waveform Sample Rate	20/sec or one sample every 50ms
	Calibration Interval	Initial calibration after 1200 operating hours, then once a year or after 4000 operating hours, whichever comes first.
CO2 - 80601-2-55	<p>Method for End-tidal CO2 calculation:</p> <p>EtCO2 is a Maximum rather than average value.</p> <p>Manufacture's test method to determine rated respiration rate and corresponding effects of End-tidal CO2 gas reading accuracy as a function of respiratory rate:</p> <p>The accuracy of the CO2 reading at various respiration rates is tested with a CO2 square wave simulator.</p>	



# LIFEPAK<sup>®</sup> 20e MONITOR/DEFIBRILLATOR

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## Service Manual

For further information, call Stryker at 1 800 STRYKER or visit [stryker.com](https://www.stryker.com)

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