LIFEPAK® 20e

Defibrillator/Monitor

with CodeManagement Module™

SERVICE MANUAL

PN 3314177-008

Click a Topic

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:

(Continued on next page)

Preface *(continued)*

Trademarks

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The absence of a product, feature, or service name, or logo from this list does not constitute a waiver of Stryker's trademark or other intellectual property rights concerning that name or logo.

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PN 3314177-008

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Using Adobe Acrobat Reader

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

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 Physio-Control

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Responsibility for Information

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

!USA 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 Physio-Control, please notify the device-tracking coordinator at 1.800.426.4448. Refer to your operating instructions for more information concerning device tracking.

Service Information

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 Physio-Control Service representative.

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

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

Service Information *(continued)*

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

Warranty Information

To obtain a detailed warranty statement, contact your local Stryker representative or go to strykeremergencycare.com.

Battery Recycling Information

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 **strykeremergencycare.com/recycling**
- 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

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

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)*

- 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.
- EtCO2 — A capnograph device that uses non-dispersive infrared spectroscopy to continuously measure the amount of CO2 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)*

- 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**

Acronyms

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)*

Term	Description
DUART	Dual universal asynchronous receiver/transmitter
ECG	Electrocardiogram
EMS	Emergency medical service
ESD	Electrostatic discharge
ESU	Electrosurgical unit
EtCO2	End-tidal carbon dioxide
FiCO2	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)*

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

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

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 A13 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)*

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

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)*

	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)*

	Safety ground. Protective earth connection
	Indoor use only
	[signal] Input
	[signal] Output
	CO_2 Input
	CO_2 Exhaust
	Sync in/ECG out
	System connector/data in
	HOME SCREEN button
	Alarm off
	Alarm on

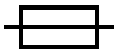
(Continued on next page)

Symbols *(continued)*

	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

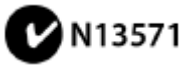
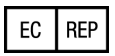
(Continued on next page)

Symbols *(continued)*

>	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)
CE	Mark of conformity to applicable European Directives

(Continued on next page)

Symbols *(continued)*

	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

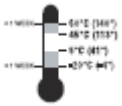
(Continued on next page)

Symbols *(continued)*

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 strykeremergencycare.com/recycling for instructions on the proper disposal of this product.

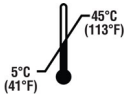
(Continued on next page)

Symbols *(continued)*

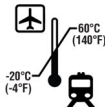
	Symbol for China RoHS indicating the Environmentally Friendly Use Period (EFUP) denoting the number of years before any substance is likely to leak out into the environment.
	Recycle this item
IPx1	Protected from vertically dripping water per IEC 60529
!USA	For USA audiences only
	Fragile. Handle with 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)*



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

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)*

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)*

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 (SpO2) readout
  - Displays a continuous End-tidal carbon dioxide (EtCO2) 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)*

Assemblies

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

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

and the following OEM and mechanical components:

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

See **LP20e Interconnect Diagram**

and the following attachments:

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

Introduction *(continued)*

Device Classifications per IEC 60601-1

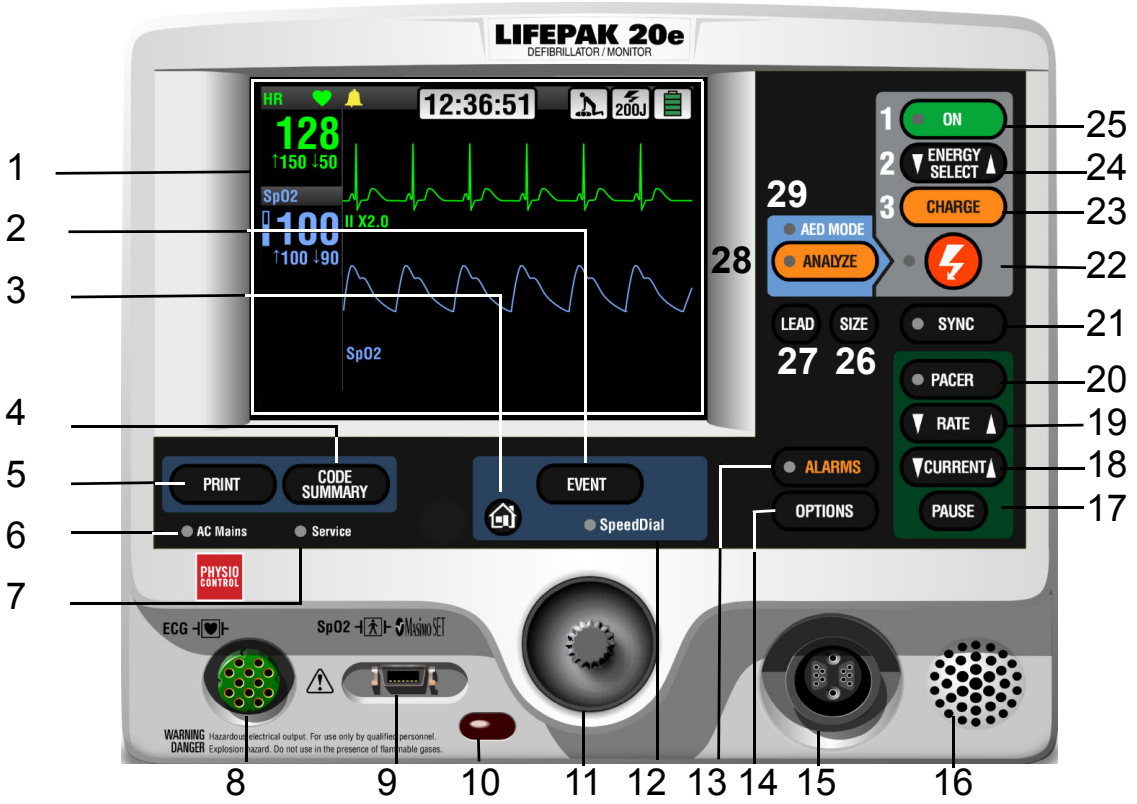
Defibrillator—Externally powered Class 1 device with battery backup.

Applied parts—ECG is a Type CF patient connection.
Therapy, SpO2, and CO2 are Type BF patient connections.
Internal electrodes are a Type CF patient connection.

Physical Description and Features

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)*

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)*

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 **Troubleshooting** 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)*

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: – QUIK-COMBO® electrodes (standard) – FAST-PATCH electrodes (with optional cable) – REDI-PAK electrodes (optional) – Standard adult and pediatric paddles (optional) – Internal paddles (optional) – Posterior paddle (optional)
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)

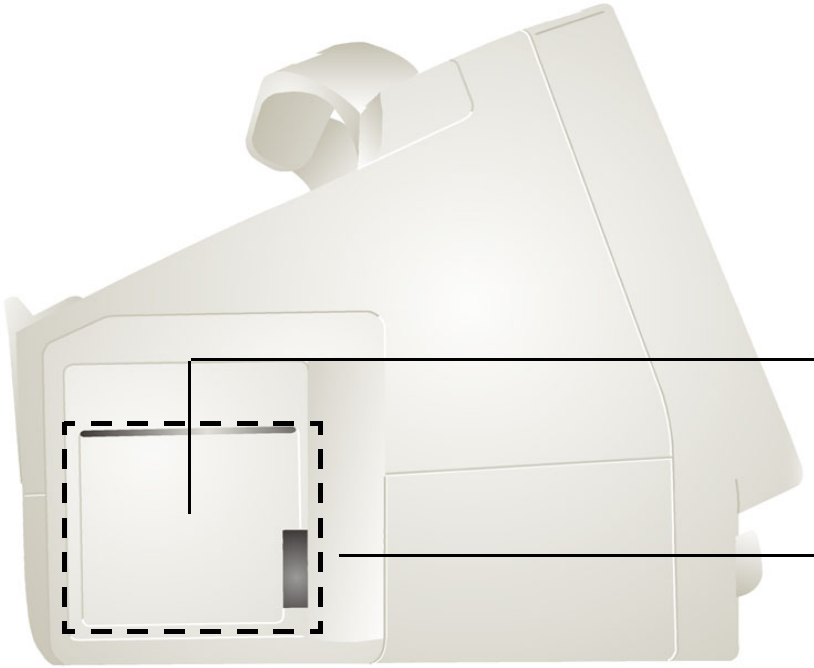
Physical Description and Features *(continued)*

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)*

LIFEPAK 20e Side Panel

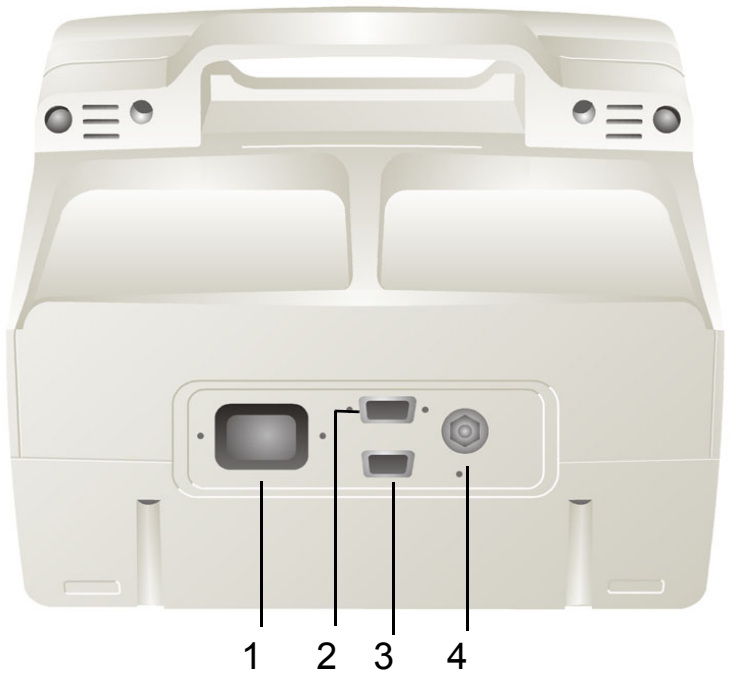


Printer — Prints ECG waveforms, CODE SUMMARY reports, and related information

Printer button — Opens printer door (for paper installation)

Physical Description and Features *(continued)*

LIFEPAK 20e Back Panel

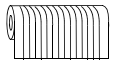


Number	Description
1	AC power connector — Connection port for ac (line) power. See Warning - Shock hazard on **Page 2-4**.
2	System connector — Connection port for RS-232 serial interface. See Warning - Shock hazard on **Page 2-4**.
3	ECG/Sync connector. See Warning - Shock hazard on **Page 2-4**.
4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

Physical Description and Features *(continued)*

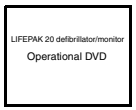
What Is Shipped with a Basic Device

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.

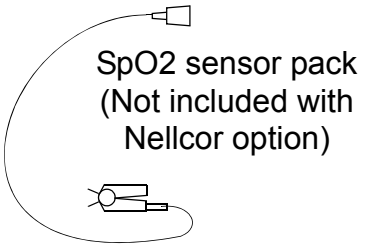


(3) rolls 50 mm printer paper

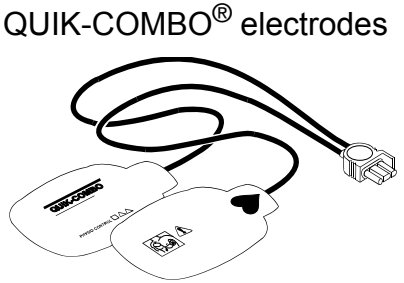
Operating instructions



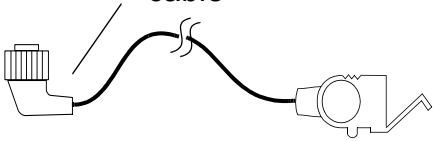
In-Service DVD



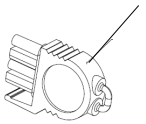
SpO2 sensor pack (Not included with Nellcor option)



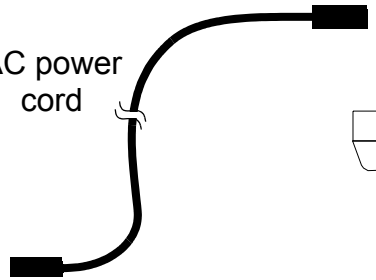
QUIK-COMBO® electrodes



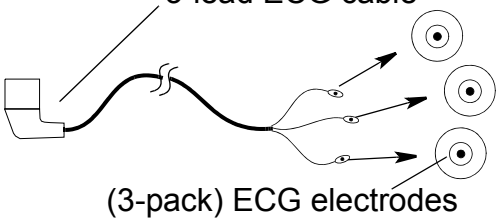
QUIK-COMBO® therapy cable



QUIK-COMBO® test plug



AC power cord



3-lead ECG cable

(3-pack) ECG electrodes

Ordering Devices, Supplies, and Accessories

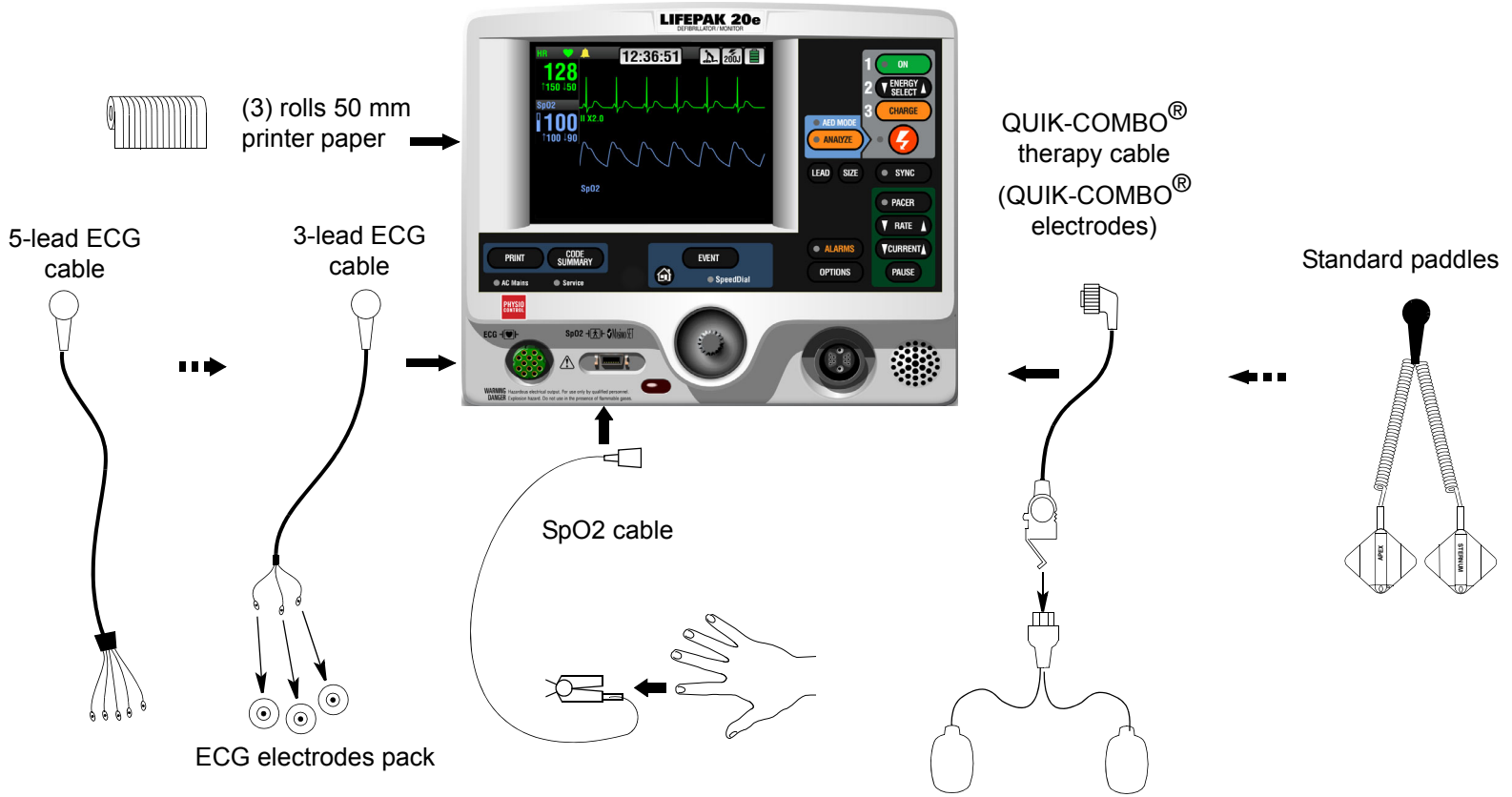
Refer to the LIFEPAK 20e Operating Instructions for accessories, supplies, and training tools that are available. For ordering instructions, refer to **Ordering Parts**.

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

System Context Diagrams

Front of Device

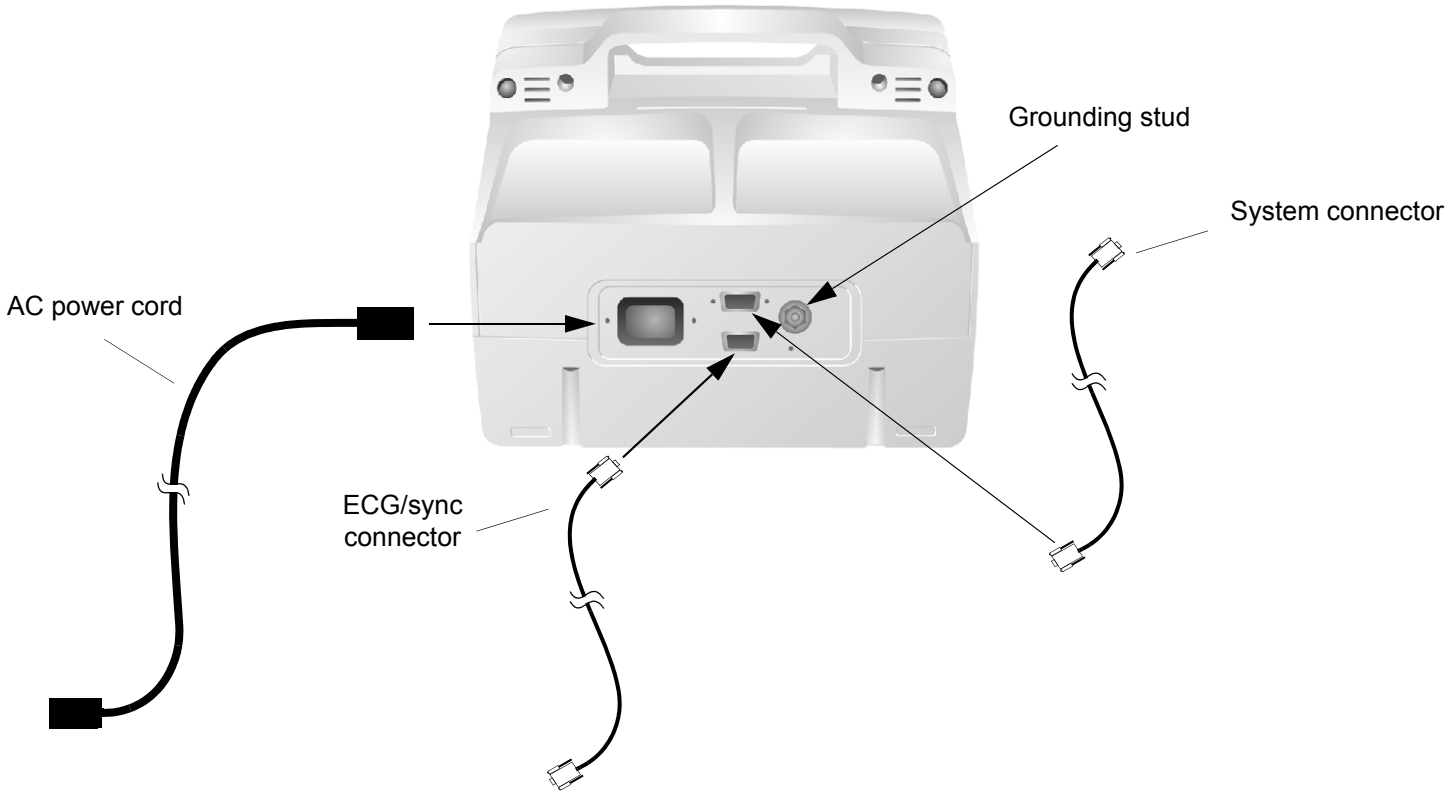
The system context diagrams illustrate how the device connects with external equipment, including accessories, batteries, and power devices.



(Continued on next page)

System Context Diagrams *(continued)*

Back of Device



Functional Description

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 SpO2 and ECG monitoring. With the CodeManagement Module installed, the device also offers EtCO2 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.

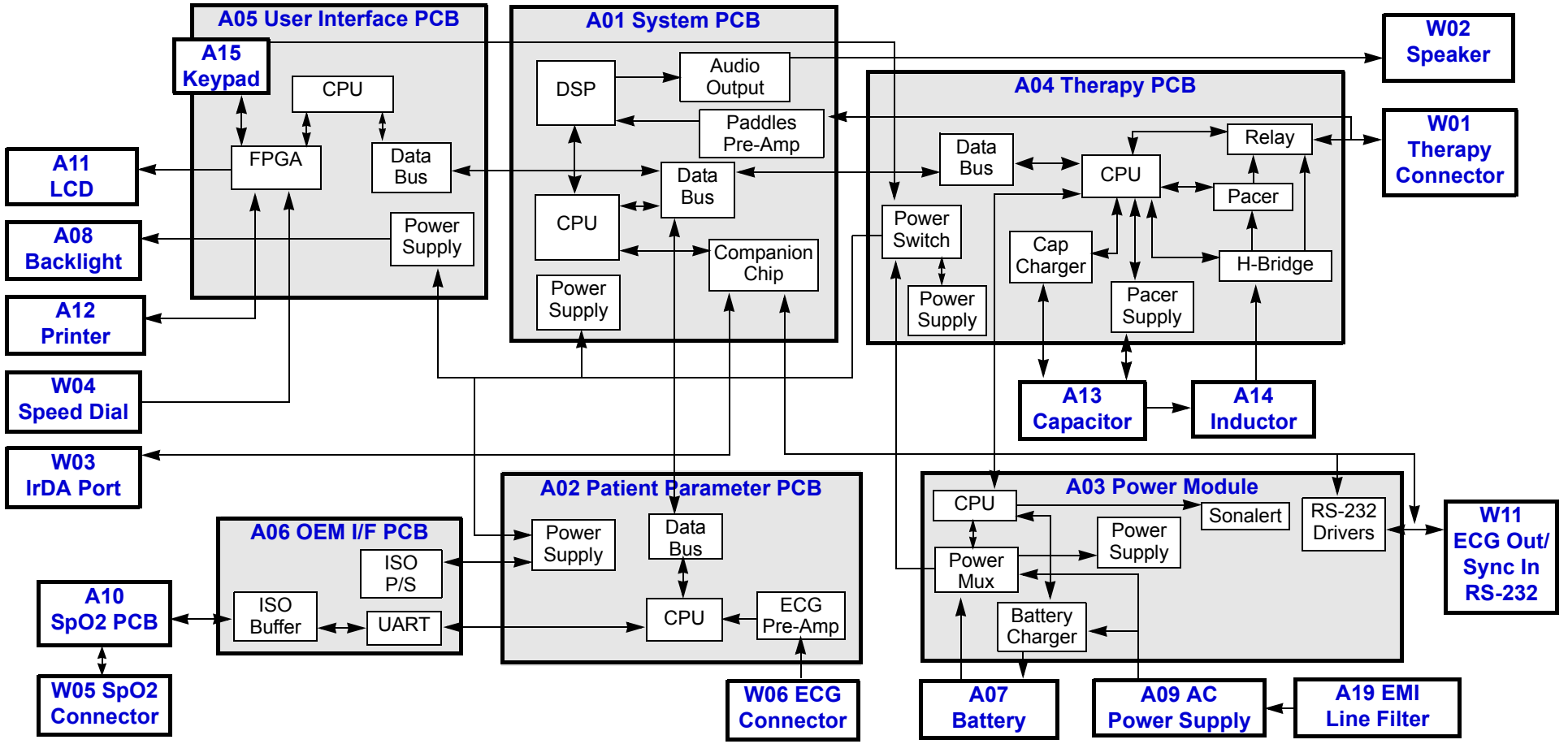
The following functional description is intended to provide service personnel with a basic understanding of the device design. Its purpose is to assist qualified service technicians in troubleshooting to the subassembly level. Troubleshooting below the subassembly level outside the factory is not recommended, 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)*

System Block Diagram

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



Functional Description *(continued)*

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 A04 Therapy PCB to originate five power supplies for use throughout the PCB as follows:
  - ±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 ±10 and ±5 V analog power for the paddles pre-amp

(Continued on next page)

Functional Description *(continued)*

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 A04 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)*

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 A04 Therapy PCB with dc power from the A07 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 A06 OEM Interface PCB
  - ±5 V patient-isolated supply to drive the ECG pre-amp

(Continued on next page)

Functional Description *(continued)*

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.

A03 Power Module

The **A03 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 A04 Therapy PCB through a serial interface.

The major subsystems on the A03 Power Module are as follows:

- **Power Supplies** — The A03 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)*

A03 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 A07 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)*

A03 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 A07 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 ±12 V prior to the system connector output.

Functional Description *(continued)*

A04 Therapy PCB

The **A04 Therapy PCB** controls the pacing and defibrillation therapy features. The primary communication between the A04 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 A04 Therapy PCB are as follows:

- **Power Supplies** — The A04 Therapy PCB uses SW_VBatt (switched battery voltage) from the A03 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
  - ±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)*

A04 Therapy PCB *(continued)*

- **Power Switch** — A power switch is a control circuit that detects the ON button selection from the A05 User Interface PCB or a timer event from the A01 System Control PCB to power up the device. This portion of the A04 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 A03 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 A13 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 A13 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)*

A04 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 A13 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)*

A05 User Interface PCB

The **A05 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 W18 UI Flex Cable provides physical connection between the A05 UI PCB and the A02 Patient Parameter PCB.

The major subsystems on the A05 UI PCB are as follows:

- **Power Supplies** — The A05 UI PCB uses SW_VBatt (switched battery voltage) from the A04 Therapy PCB to originate four power supplies for use throughout the PCB as follows:
  - +3.3 V logic power to drive the A11 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)*

A05 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 A11 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 W4 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 A05 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 A05 UI PCB does not recognize the ON switch. It passes the signal to the A04 Therapy PCB.

A06 OEM and Mechanical Components PCB

The **A06 OEM Interface PCB** provides power to and collects SpO2 data from the A10 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)*

A06 OEM and Mechanical Components PCB *(continued)*

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

- **Power supplies** — The A06 OEM Interface PCB uses power from the A02 Patient Parameter PCB to provide the 5 V power for the A10 SpO2 Module.
- **UART and ISO buffers** — The UART and ISO buffers provide patient isolation for the serial data signals received from the A10 SpO2 Module and routes them to the A02 Patient Parameter PCB.

A07 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 A03 Power Module when the device is connected to ac power.

(Continued on next page)

Functional Description *(continued)*

A08 Backlight Inverter PCB

The **A08 Backlight Inverter** provides power to the internal fluorescent backlight in the A11 Active Display. Filtered SW_VBatt is provided to the A08 Backlight Inverter through the A05 User Interface PCB. The output of the inverter is 1000 to 1500 RMS, open-circuit power to the internal A11 Active Display backlight. The backlight driver for the LED A11 Display (REF 21300-008166) 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 A03 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 A04 Therapy PCB. The A03 Power Module sits above the ac power supply and plugs directly into the ac power supply's power connector. Both the A03 Power Module and the ac power supply are held mechanically in place by the power assembly bracket.

Functional Description *(continued)*

A10 SpO2 Module

The **A10 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.

A11 Active Display/ Lens

The **A11 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 A11 Active Display also contains an internal backlight for visibility in low-light situations. The updated A11 LED display (REF 21300-008077) requires the use of A08 backlight driver module (REF 21300-008166).

A12 Printer Module

The **A12 Printer Module** is a 50 mm, stepper motor-driven recorder. The printer receives serial data and commands from the A05 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 A05 UI PCB.

Functional Description *(continued)*

A13 Energy Capacitor

The **A13 Energy Capacitor** is a metallized 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 μF. The energy on the capacitor is removed when the device is turned off. Energy is provided to the A04 Therapy PCB for pacing and defibrillation therapy through the A14 Inductor Resistor. The energy capacitor mounts above the A04 Power PCB by means of a capacitor support. Wires from the energy capacitor connect directly to the A04 Therapy PCB.

A14 Inductive Resistor

The **A14 Inductive Resistor** is used as an internal dump load to dissipate energy from the A13 Energy Capacitor. Energy is removed (dumped) from the A13 Energy Capacitor when the device is turned off and, during operation, when energy remains on the capacitor for an extended period of time. The A14 Inductive Resistor provides a nominal 5 ohm load in the energy delivery path. The inductor mounts to the board stack bracket. Wires from the A14 Inductive Resistor connect directly to connectors on the A04 Therapy PCB.

Functional Description *(continued)*

A15 Elastomer Keypad

The **A15 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 A04 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)*

W02 Speaker Assembly

The **W02 Speaker Assembly** is used to deliver device tones and voice prompts, including warnings and alarms. The OEM W02 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 W25 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)*

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 A05 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 A10 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 A05 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.

W07 Capacitor Discharge Cable

The W07 Capacitor Discharge Cable provides a capacitor discharge point by connecting to the A04 Therapy PCB at pin 5 of J02.

Functional Description *(continued)*

W08 Battery Cable	The W08 Battery Cable connects the A07 Battery at J85 to the A03 Power Module at J50.
W09/W10 Power to Therapy PCB Cables	The W09 and W10 Power to Therapy PCB Cables connect the A03 Power Module to the A04 Therapy PCB. W09 is a replaceable cable that connects to the A04 Therapy PCB at J16 and to the A03 Power Module at J41. The W10 connects to the A04 Therapy PCB at J17 and to the A03 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 A03 Power Module at J47.
W12 Grounding Cable	The W12 Grounding Cable provides a grounding path for the Speed Dial.

Functional Description *(continued)*

W13 AC Power Cable	The W13 AC Power Cable connects the A09 AC Power Supply Module at J49 with the A03 Power Module for the LIFEPAK 20e defibrillator/monitor.
W14 Printer Flex Cable	The W14 Printer Flex Cable connects the A05 UI PCB at J34 with the A03 Power Module at J45 and the A12 Printer.
W15 LCD to UI PCB Cable	The W15 LCD to UI PCB Cable connects the A11 LCD Display PCB at CN1 with the A05 UI PCB at J36.
W16 Display Jumper Cable Extender	The W16 Display Jumper Cable Extender connects the A11 LCD Display PCB at P77 to the A08 Backlight Inverter PCB at CN2.
W17 Backlight Inverter Cable	The W17 Backlight Inverter Cable connects the A08 Backlight Inverter PCB at P74 to the A05 UI PCB at J37.
W18 UI Flex Cable	The W18 UI Flex Cable connects the A02 Patient Parameters PCB at J21 and J22 to the A05 UI PCB at J31.

Functional Description *(continued)*

W19 – W24 Grounding Cables

The W19 through W24 Grounding Cables provide grounding paths for various device components.

W25 Speaker Harness Extension Cable

The W25 Speaker Harness Extension Cable connects the W02 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

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)*

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

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

Introduction

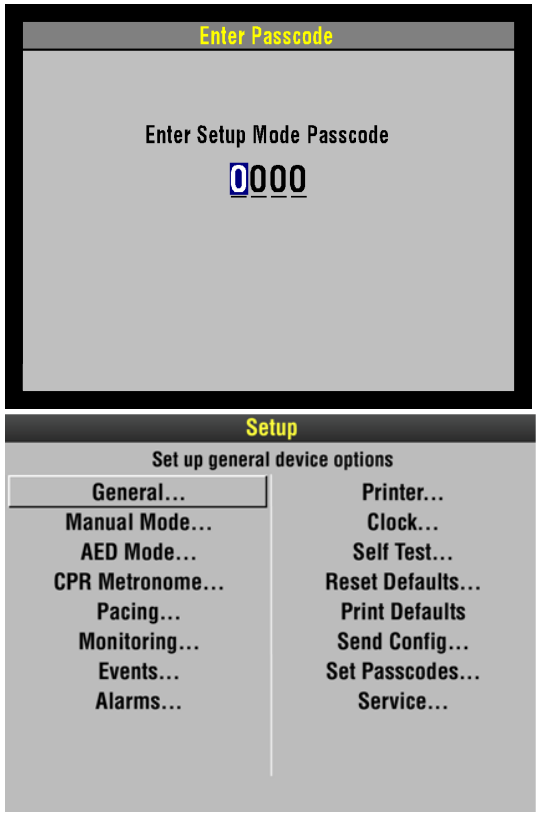
The operating defaults for the device are configured in the SETUP menu. Options include **manual mode** and **AED mode** operating characteristics, alarm setup, time-of-day clock, and others. There is also a factory-reset option that resets the device to the factory default settings, except the maintenance 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)*

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)*

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 during repair procedures.

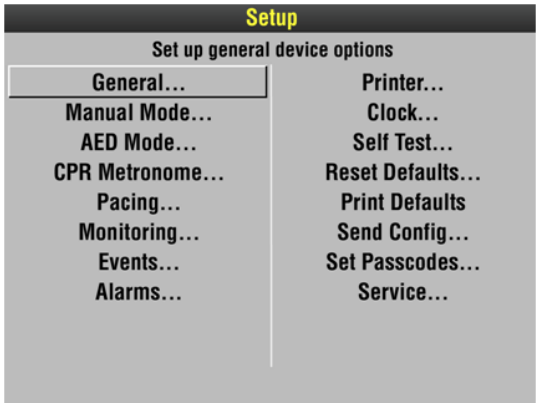
- To save the setup configuration, use SETUP menu to print the setup configuration. When service is complete, you can verify the setup and then manually reset the configuration.

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)*

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) 2. Archives Only 3. Delete 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)*

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)

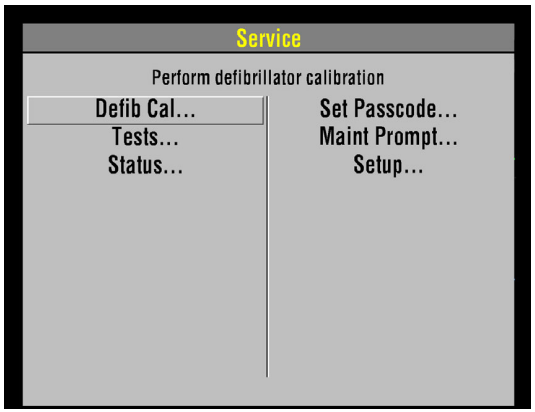
Service Mode *(continued)*

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
Defib Cal	Perform defibrillator calibration procedure.
Tests	Follow performance inspection procedure.
Status	Display device status.
Set Passcode	Set the service mode access passcode.
Maint Prompt	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)*

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)*

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)*

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

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

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)*

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 Physio-Control service or sales representative.

Troubleshooting Chart

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 **external cleaning**.
	Damaged keypad or labels	**Replace elastomer keypad**. 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 **AC Loss Alert alarm**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
Power On	Display on, no power-on LED	Check or **replace the W18 UI Flex Cable**. Check or **replace the A05 UI PCB**. **Replace the A04 Therapy PCB**.
	Continuous reset	**Replace the A01 System PCB**.
	Frozen at the power-on screen	Check or **replace the W18 UI Flex Cable**. **Replace the A01 System PCB**.
	Distorted display	**Replace the A05 UI PCB**.
	Service indicator remains on	Refer to **Processing Service Codes** for assistance.
	MAINTENANCE DUE message remains on screen	**Set the Maintenance Prompt interval**. **Reset the Maintenance Prompt interval**.
Keypad	Improper button response	Perform keypad test. Check or **replace the elastomer keypad**. **Replace the A05 UI PCB**.
	Standard paddle buttons	Perform keypad test. Check or replace standard paddles. Check or **replace the W01 Therapy Connector**. **Replace the A04 Therapy PCB**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
Printer	Not printing	Perform printer test. Check for proper paper. Check for 3.3 V on **pins 14 and 16 on the J38 test connector** on the A05 UI PCB. ■ If either is higher than 3.3 V, **replace the W14 Printer Flex Cable**. ■ If both are lower than 3.3 V: – Check or **replace the A12 Printer Assembly**. – **Replace the A05 UI PCB**.
	Light print	Verify use of proper paper. Check the W14 Printer Flex Cable connection. Check or **replace the A05 UI PCB**.
	Missing or broken characters	Verify use of proper paper. Clean the printhead. Check or **replace the A12 Printer Assembly**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
Audio	Inaudible or garbled audio	Perform the voice tone test. Check the speaker connection. Check or **replace the W02 Speaker Assembly**. Check or **replace the A01 System PCB**.
Power source management	No backup battery operation	**Replace the A07 Battery**. Check or **replace the A03 Power Module**.
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 **replace the W01 Therapy Connector**. **Replace the A04 Therapy PCB**.
	Delivered energy out of tolerance	Perform defibrillator calibration.
Patient impedance channel broken	Abnormal energy delivery	Check or **replace the A14 Inductive Resistor** (less than 5 ohms). Check or **replace the A04 Therapy PCB**. **Replace the A01 System PCB**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
Patient impedance channel broken *(continued)*	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, **replace the A01 System PCB**.
	Therapy cable leads off (QUIK-COMBO® only)	Check continuity of the QUIK-COMBO® cable; replace if necessary. Check continuity of the **W01 Therapy Connector**; replace if necessary. **Replace the A01 System PCB**.
Therapy - Synchronous cardioversion	No paddles channel sync mark	Check or replace the Therapy cable. Check or **replace the W01 Therapy Connector**. **Replace the A01 System PCB**.
	No lead channel sync mark	Check for noisy ECG signal. Check or replace the ECG cable. Check or **replace the W06 ECG connector**. Check or **replace the A02 Patient Parameter PCB**. **Replace the A01 System PCB**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
Therapy - Synchronous cardioversion *(continued)*	Failure to transfer coincident with sync mark	Check sync marker placement on R-wave. Perform the keypad test. ■ If test fails, **replace the A05 UI PCB**. ■ If test passes, run the user test and troubleshoot error code.
Pacer option characteristics	Pacer does not turn on	Verify manufacturer configuration bit setting. Perform keypad test: ■ If test fails, check key tactile feedback. – **Replace the elastomer keypad**. – **Replace the A05 UI PCB**. ■ If test passes, follow error code procedure.
	Pacing current/rate out of tolerance	Check or **replace the A04 Therapy PCB**.
ECG lead characteristics	No ECG	Check or replace the ECG cable. Check or **replace the W06 ECG Connector**. **Replace the A02 Patient Parameter PCB**.

(Continued on next page)

Troubleshooting Chart *(continued)*

Area	Observed Symptom	Suggested Corrective Action
ECG lead characteristics *(continued)*	No amplitude ECG	Check or replace the ECG cable. **Replace the A02 Patient Parameter PCB**.
	ECG gain out of tolerance	Check simulator output. Check or replace the ECG cable. Check or **replace the A02 Patient Parameter PCB**.
Therapy - Paddle ECG lead characteristics	ECG gain out of tolerance	Check simulator output. Check or replace the therapy cable. Check or **replace the A01 System PCB**.
	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, **replace the A03 Power module**. Check or replace the W09 Power Cable. Check or **replace the A01 System PCB**. Check or **replace the A03 Power module**.

(Continued on next page)

Troubleshooting Chart *(continued)*

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 **replace the W05 SpO2 Assembly**.
	Saturation reading missing or out of tolerance	Check or replace the SpO2 cable. Check or replace the SpO2 sensor. Check or **replace the W05 SpO2 Assembly**. Check or replace the A06 OEM PCB.
Speed Dial	Speed Dial not functioning	Check or **replace the W04 Speed Dial Assembly**. **Replace the A05 UI PCB**.
No ac power reminder tone	No alert	Check user configuration setting. **Replace the A03 Power module**.
Grounding resistance	Fails ground resistance test	Check or replace the power cord. **Replace the A03 Power module**.
Leakage current	Fails chassis leakage test	**Replace the A03 Power module**.

Service Code Categories

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

Initial Digit	Category	Description	Associated PCBs and Assemblies
0xxx	UT	Utilities	A01 System
1xxx	UI	User Interface	A01 System, A04 Therapy, A05 UI, A12 Printer, W14 Printer Flex Cable, W18 UI Flex Cable
2xxx	DC	Data Communications	A01 System
3xxx	DM	Data Management	A01 System
4xxx	SM	System Monitor	A01 System, A04 Therapy, A05 UI, W18 UI Flex Cable
50xx	PC	Processor Control	A01 System, A02 PP PCB, A04 Therapy, A05 UI, W18 UI Flex Cable
51xx	PM	Power Management	A03 Power Module, A04 Therapy, A07 Battery, W08 Battery Cable
6xxx	PP	Patient Parameter – SpO2	A02 PP PCB, A06 OEM PCB, A10 SpO2 Module
8xxx	DSP	Digital Signal Processor	A01 System, A02 PP PCB
9xxx	TH	Therapy	A01 System, A03 Power Module, A04 Therapy, A07 Battery
axxx	PR	Printer	A12 Printer
bxxx	BM	Behavior Manager	A01 System

Service Code Table

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	1. Replace the W18 UI Flex Cable 2. Replace the A05 UI PCB 3. Replace the A01 System PCB
100f	Display update timer error	1. Reload the device software* 2. Replace the A01 System PCB

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

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action Code
1010	Display update queue error	1. Reload the device software* 2. Replace the A01 System PCB
1013	System detected unexpected UI reset	1. Replace the W18 UI Flex Cable 2. Replace the A05 UI PCB
1014	Voice prompt/audio watchdog failure	1. Reload the device software* 2. Replace the A01 System PCB
1015	USB data time-out error	1. Clear error and perform PIP 2. Replace the W18 UI Flex Cable
1c01	UI FPGA programming error	Replace the A05 UI PCB
1c02	UI FPGA verification error	Replace the A05 UI PCB
1c03	UI FPGA program file error	1. Reload the device software* 2. Replace the A05 UI PCB
1c04	UI ADC not functioning	Replace the A05 UI PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
1c05	Printer ADC out of tolerance (temperature)	1. Check the W14 Printer Flex Cable 2. Replace the A12 Printer 3. Replace the A05 UI PCB
1c06	Printer ADC out of tolerance (voltage)	1. Check the W14 Printer Flex Cable 2. Replace the A12 Printer 3. Replace the A05 UI PCB
1c07	UI voltage out of tolerance (5 V)	Replace the A05 UI PCB
1c08	UI voltage out of tolerance (3.3 V)	Replace the A05 UI PCB
1c09	UI voltage out of tolerance (2.5 V)	Replace the A05 UI PCB
1c0a	UI voltage out of tolerance (35 V)	Replace the A05 UI PCB
1c0b	UI voltage out of tolerance (SW VBATT)	Replace the A05 UI PCB
1c0c	UI voltage out of tolerance (ground)	Replace the A05 UI PCB
1c0f	UI hardware I.D. corrupted	Replace the A05 UI PCB
1c10	UI boot program corrupted	Replace the A05 UI PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
1c11	UI application Flash memory corrupted	1. Reload the device software* 2. Replace the A05 UI PCB
1c12	UI font Flash memory corrupted	1. Reload the device software* 2. Replace the A05 UI PCB
1c13	UI FPGA Flash memory corrupted	1. Reload the device software* 2. Replace the A05 UI PCB
1c16	UI CPU RAM test failed on power-on	Replace the A05 UI PCB
1c17	UI CPU RAM test failed during normal operation	Replace the A05 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)	1. Reload the device software* 2. Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
3001	System cannot use data management (DM) Flash memory	1. Reload the device software* 2. Replace the A01 System PCB
3002	System data management Flash memory corrupted	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
3005	System cannot delete DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
3007	System cannot create new DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
3008	System could not store DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
3009	System could not erase oldest DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
300a	System cannot clear DM memory	1. Reload the device software* 2. Replace the A01 System PCB
300b	System error writing DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
300c	System cannot read archived DM record	1. Clear memory (service mode) 2. Reload the device software* 3. Replace the A01 System PCB
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)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
4005	System NVRAM error log	1. Replace the coin cell battery 2. Reload the device software* 3. Replace the A01 System PCB
4006	Error log queue not functioning	1. Reload the device software* 2. Replace the A01 System PCB
4008	Error log count corrupted	1. Reload the device software* 2. Replace the A01 System PCB
4009	System RAM test failed	1. Reload the device software* 2. Replace the A01 System PCB
400a	System program Flash memory corrupted	1. Reload the device software* 2. Replace the A01 System PCB
400b	Program contents failure	1. Check coin-cell battery 2. If error still occur, Replace A01 System PCB
400c	System ADC voltage low	Replace the A01 System PCB
400d	System ADC voltage high	Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
4010	Service LED failed	1. Replace the W18 UI Flex Cable 2. Replace the A05 UI PCB 3. Replace the A04 Therapy PCB
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	1. Reload the device software* 2. Replace the A01 System PCB
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	1. Reload the device software* 2. Replace the A01 System PCB
5008	System boot program failure	Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
5009	Real-time clock (RTC) access failed	1. Reload the device software* 2. Replace the A01 System PCB
500a	Coin cell battery not detected	1. Replace the coin cell battery 2. Replace the A01 System PCB
500b	Cannot use system NVRAM	1. Reload the device software* 2. Replace the A01 System PCB
500c	System application start error	1. Reload the device software* 2. Replace the A01 System PCB
500d	System software initialization time out	1. Reload the device software* 2. Replace the A01 System PCB
500e	System application start error	1. Reload the device software* 2. Replace the A01 System PCB
5010	Configuration mismatch	Replace the coin cell battery

(Continued on next page)

Service Code Table *(continued)*

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)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
501d	RTC out of sync	1. Replace the coin cell battery 2. Replace the A01 System PCB
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	1. Clear error and perform PIP 2. Replace the A01 System PCB
5028	PP USB did not initialize	1. Clear error and perform PIP 2. Replace the A02 PP PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
5029	Therapy USB did not initialize	1. Clear error and perform PIP 2. Replace the A04 Therapy PCB
502a	UI USB did not initialize	1. Clear error and perform PIP 2. Replace the W18 UI Flex Cable 3. Replace the A05 UI PCB
502b	USB system failed	1. Clear error and perform PIP 2. Replace the A01 System PCB
502f	Device type invalid	1. Check configuration code 2. Set device type (software loader program) 3. Replace the A01 System PCB
5030	PP USB disconnect	1. Clear error and perform PIP 2. Replace the A02 PP PCB
5031	UI USB disconnect	1. Clear error and perform PIP 2. Replace the W18 UI Flex Cable 3. Replace the A05 UI PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
5032	Therapy USB disconnect	1. Clear error and perform PIP 2. Replace the A04 Therapy PCB
5033	PP USB download time out	1. Clear error and perform PIP 2. Reload the device software*
5036	USB initialization failed	1. Clear error and perform PIP 2. Reload the device software* 3. Replace the A01 System PCB
5037	USB unitization error	1. Clear error and perform PIP 2. Reload the device software* 3. Replace the A01 System PCB
5038	Cannot clear interrupt source	Replace the A01 System PCB
5039	Bus error reported by USB PP channel	1. Clear error and perform PIP 2. Replace the A02 PP PCB 3. Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
503a	Bus error reported by USB UI channel	1. Clear error and perform PIP 2. Replace the A05 UI PCB 3. Replace the A01 System PCB
503b	Bus error reported by USB therapy channel	1. Clear error and perform PIP 2. Replace the A04 Therapy PCB 3. Replace the A01 System PCB
503c	USB host driver cannot create transfer descriptor	1. Clear error and perform PIP 2. Replace the A01 System PCB
503d	USB host driver received message larger than maximum allowed	1. Clear error and perform PIP 2. Replace the A01 System PCB
5040	Inconsistent RTC time	Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
5105	Battery failed to reach charge in 2.5 hours	1. Replace the A07 Battery 2. Replace the A03 Power module
5106	Power supply out of tolerance	1. If power supply voltage is >14 Vdc, replace A03 Power module 2. If ≤14 Vdc, clear error and perform PIP
5107	Power module RAM error	Replace the A03 Power module
5108	Power module self-test service code	Replace the A03 Power module
510a	Battery <10 V after 20 minutes of charging	1. Replace the A07 Battery 2. Replace the A03 Power module
510b	Does not switch to battery power	Replace the A03 Power module
510c	Does not detect ac disconnect	Replace the A03 Power module
510d	Battery powered when connected to ac power	Replace the A03 Power module
510e	Battery <10 V after charge cycle	Replace the A07 Battery

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
510f	Battery charge cycle stopped	1. Check battery connection 2. Replace the A07 Battery 3. Replace the A03 Power module
5110	AC isolation diode shorted	Replace the A03 Power module
5112	Battery not detected	1. Check the A07 Battery connection 2. Check W08 Battery Cable 3. Check for valid power hardware ID in SERVICE/STATUS/DEVICE DATA overlay 4. Replace the A07 Battery 5. Invalid power hardware ID; replace the A03 Power module 6. Valid power hardware ID; replace the A04 Therapy PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
5115	Battery thermistor <400 Ohms	Replace A07 Battery (LIFEPAK 20e) Ohm measurement of white wires of A07 Battery ■ Replace the A07 Battery if <400 Ohms ■ Replace the A03 Power module if >400 Ohms
5116	Charger reporting zero during battery charging	Replace the A03 Power module
5117	No 12C connection detected (LIFEPAK 20e only)	1. Replace the A07 Battery 2. Replace the A03 Power module
5118	Power module connected to NiMH battery (LIFEPAK 20 only)	Replace the A07 Battery
511a	Battery failure	Replace the A07 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)

Service Code Table *(continued)*

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 A06 OEM PCB
6019	Incorrect updated SpO2 image CRC	Replace the A06 OEM PCB

(Continued on next page)

Service Code Table *(continued)*

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 A10 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)

Service Code Table *(continued)*

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	1. Reload the device software* 2. Replace the A01 System PCB
801b	DSP did not receive USB SOF (start of frame) interrupt	1. Clear error and perform PIP 2. Replace the A01 System PCB
8105	Impedance channel out of calibration	Replace the A01 System PCB
8108	Paddles data out of sync	1. Reload the device software* 2. Replace the A01 System PCB
8109	Paddles pre-amp user test failed	1. Rerun the user test 2. Replace the A01 System PCB
810b	Real impedance <-30 ohms for one second	1. Perform TCP - defibrillator calibration 2. Replace the A01 System PCB

(Continued on next page)

Service Code Table *(continued)*

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 A07 Battery
900b	Pacing rate out of tolerance	Replace the A01 System PCB
900f	Unable to initialize therapy control	1. Check the stack connector 2. Replace the A04 Therapy PCB
9011	Pacer fault	1. Reload the device software* 2. Replace the A04 Therapy PCB
9017	Pacer disabled	Reload the device software*
901a	Pacer rate storage corrupted	Reload the device software*

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
901b	Therapy PCB communication lost	1. Check the stack connector 2. Replace the A04 Therapy PCB
901d	Testing purpose only	Replace the A01 System PCB
9021	Impedance value indicates regulator in System PCB pre-amp failed	1. Clear error and perform PIP 2. Replace the A01 System PCB
9c03	Therapy processor, unplanned reset	Replace the A04 Therapy PCB
9c04	Therapy/system controller communication watchdog	Replace the A01 System PCB
9c05	CRC error	1. Clear error and perform PIP 2. Replace the A04 Therapy PCB
9c06	Calibration constant A out of range	1. Perform TCP - defibrillator calibration 2. Clear Service Log
9c07	Calibration constant B out of range	1. Perform TCP - defibrillator calibration 2. Clear Service Log

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
9c08	Therapy ROM cyclic redundancy check (CRC) failed	1. Reload the device software* 2. Replace the A04 Therapy PCB
9c09	Therapy RAM pattern write test failed	Replace the A04 Therapy PCB
9c0a	Therapy relay idle coil voltage out of range	Replace the A04 Therapy PCB
9c0b	Therapy relay enabled coil voltage out of range (5 ms)	Replace the A04 Therapy PCB
9c0c	Therapy relay enabled coil voltage out of range (100 ms)	Replace the A04 Therapy PCB
9c0d	Therapy relay drive enabled coil voltage out of range	Replace the A04 Therapy PCB
9c0f	Therapy/power assembly communication error	1. Check power module 26-pin ribbon cable to J16 or A04 Therapy PCB 2. Replace the A03 Power module 3. Replace the A04 Therapy PCB
9c11	Capacitor Dump failed	Replace the A04 Therapy PCB
9c12	Therapy PCB 5 V out of range	Replace the A04 Therapy PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
9c13	Therapy PCB 15 V out of range	Replace the A04 Therapy PCB
9c14	Therapy PCB -15 V out of range	Replace the A04 Therapy PCB
9c15	Therapy ADC time out error	Replace the A04 Therapy PCB
9c18	3:00 AM H bridge test: NE leg shorted	Replace the A04 Therapy PCB
9c19	3:00 AM H bridge test: SE leg shorted	Replace the A04 Therapy PCB
9c1a	3:00 AM H bridge test: NW leg shorted	Replace the A04 Therapy PCB
9c1b	3:00 AM H bridge test: SW leg shorted	Replace the A04 Therapy PCB
9c1c	3:00 AM H bridge test: east side stuck open	Replace the A04 Therapy PCB
9c1d	3:00 AM H bridge test: west side stuck open	Replace the A04 Therapy PCB
9c1e	3:00 AM H bridge test: charge time out of range	1. Perform TCP - defibrillator calibration 2. Clear Service Log

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
9c1f	3:00 AM shorted paddles relay contact test: relay shorted	1. Inductive resister is not connected or is open 2. Replace the A04 Therapy PCB 3. Replace the A01 System PCB
9c20	3:00 AM shorted paddles relay contact test: relay shorted	Replace the A04 Therapy PCB
9c21	3:00 AM pace drive test: pace power supply stuck on	Replace the A04 Therapy PCB
9c22	3:00 AM pace drive test: pace power supply inoperable	Replace the A04 Therapy PCB
9c23	3:00 AM pace drive test: relay contacts shorted	Replace the A04 Therapy PCB
9c24	3:00 AM pace drive test: relay drive low side shorted	Replace the A04 Therapy PCB
9c25	3:00 AM pace drive test: relay drive high side shorted	Replace the A04 Therapy PCB
9c26	3:00 AM pace drive test: pace FET shorted	Replace the A04 Therapy PCB
9c27	3:00 AM pace drive test: pace current path open	Replace the A04 Therapy PCB
9c28	3:00 AM pace drive test: pace set point error	Replace the A04 Therapy PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
9c29	3:00 AM redundant controls test: redundant controls stuck on	Replace the A04 Therapy PCB
9c2a	3:00 AM redundant controls test: enable 2 stuck on	Replace the A04 Therapy PCB
9c2b	3:00 AM redundant controls test: enable 1 stuck on	Replace the A04 Therapy PCB
9c2c	Capacitor voltage per pacing pulse too high	Replace the A04 Therapy PCB
9c2d	Capacitor current per pacing pulse too high	Replace the A04 Therapy PCB
9c2e	Cap current per pacing pulse too high	Replace the A04 Therapy PCB
9c2f	Pacing current and selected current out of range	Replace the A04 Therapy PCB
9c30	Pacing pulse width too short	Replace the A04 Therapy PCB
9c31	Pacing pulse width too long	Replace the A04 Therapy PCB
9c32	Capacitor voltage and predicted capacitor voltage mismatch	1. Energy capacitor is not connected or is open 2. Replace the A04 Therapy PCB
9c35	Therapy CPU instruction test failed	Replace the A04 Therapy PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
9c36	Therapy software stack overflow	Reload the device software*
9c3a	Energy capacitor overvoltage error	Replace the A04 Therapy PCB
9c3b	3:00 AM redundant controls test: charge rate stuck on	Replace the A04 Therapy PCB
9c3e	Therapy software error	Replace the A04 Therapy PCB
9c3f	Therapy software error	Replace the A04 Therapy PCB

(Continued on next page)

Service Code Table *(continued)*

Code	Service Code Description	Corrective Action
a00b	Printer communication lost	1. Clear error and perform PIP 2. Reload the device software*
a00e	Printer initialization error	Reload the device software*
b001	Invalid state request	1. Clear error and perform PIP 2. Replace A01 System PCB
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	1. Clear error and perform PIP. 2. Replace A01 System PCB.

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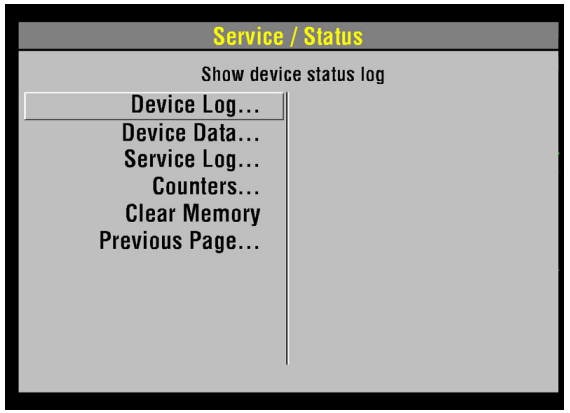
Using the Service/Status Features

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
Device Log	Show device status log
Device Data	Show device data
Service Log	Show service log
Counters	Display shock counters
Clear Memory	Clear data management memory

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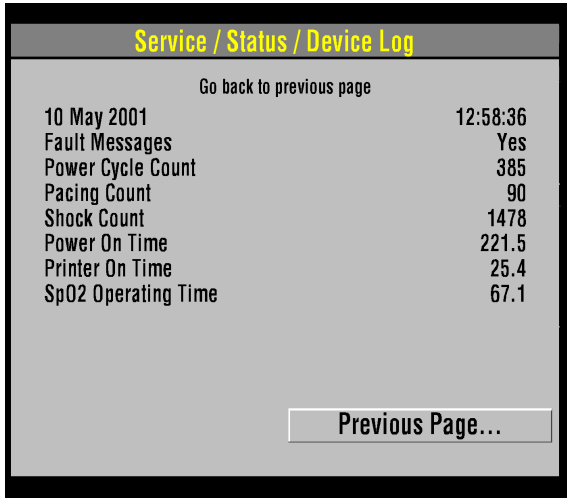
Using the Service/Status Features *(continued)*

Device Log



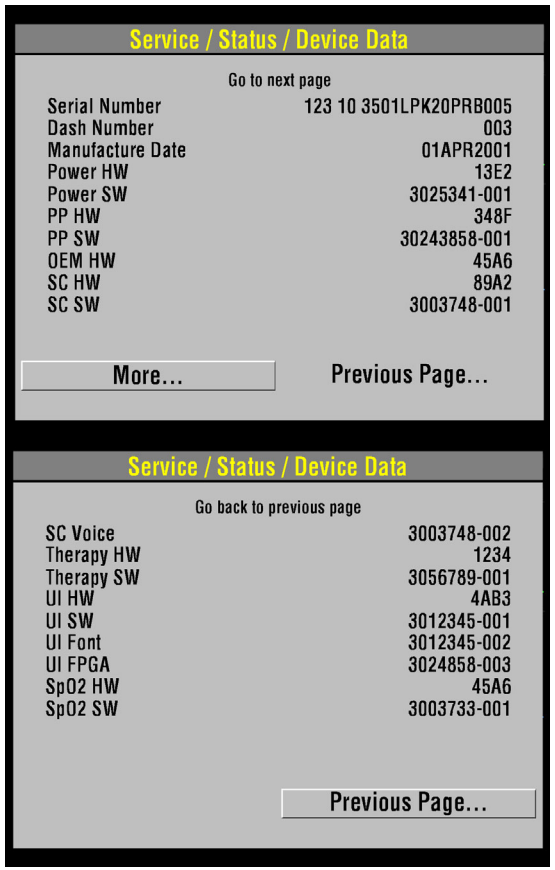
Select DEVICE LOG on the SERVICE/STATUS submenu to view essential device characteristics, such as when the operating software was installed, and accumulative device operations, such as the shock count.
The device log data includes the following information:

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 **Processing Service Codes**).
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)*

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

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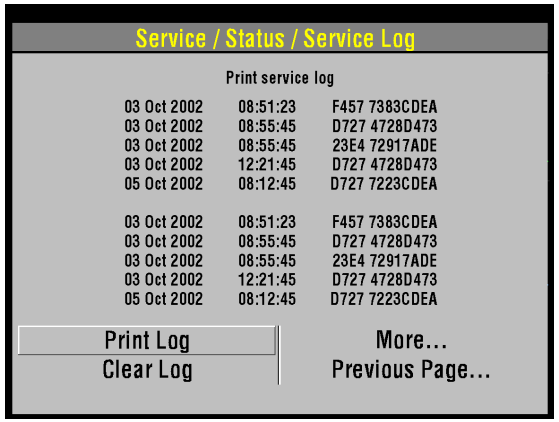
Using the Service/Status Features *(continued)*

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

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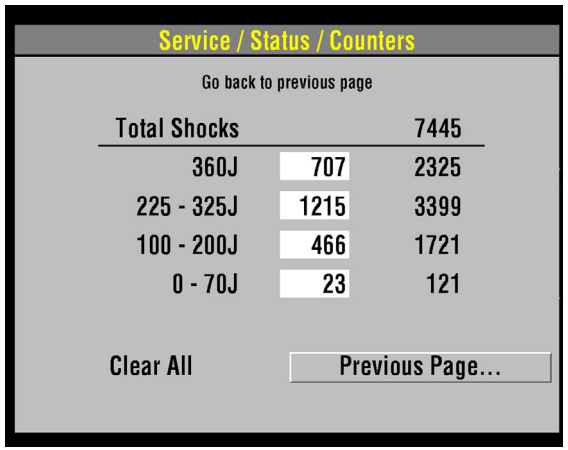
Using the Service/Status Features *(continued)*

Counters



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)*

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

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

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

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 Physio-Control 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

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)*

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)*

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)*

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

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

Physio-Control 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, Physio-Control provides technical support and replacement parts on an as-available basis.

Storing the Device

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

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 Physio-Control representative for assistance or refer to **strykeremergencycare.com/recycling**.
- 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

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 Physio-Control 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

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

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 Physio-Control Technical Support for assistance at 1.800.442.1142, or refer to **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.

(Continued on next page)

Replacement Procedures *(continued)*

Repair Procedures Index

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

Battery Replacement

Top Case

Parts List	Top Case Removal	Top Case Installation

Front Case

Assembly Diagram (Front View)	Assembly Diagram (Rear View)	Parts List
Front Case Disassembly	Front Case Reassembly	Front Case Removal
Front Case Installation	Grounding Harness Orientation	AED Door Replacement
W18 UI Flex Cable Removal	W18 UI Flex Cable Installation	A15 Elastomer Keypad Removal
A15 Elastomer Keypad Installation	A11 Active Display Removal	A11 Active Display Installation
A08 Backlight Inverter PCB Diagram	A11 Active Display Diagram	W17 Backlight Inverter Cable Diagrams
A05 User Interface (UI) PCB Removal	A05 User Interface (UI) PCB Installation	A05 User Interface PCB Diagram
W18 UI Flex Cable Diagrams	W04 Speed Dial Assembly Removal	W04 Speed Dial Assembly Installation
W02 Speaker Assembly Removal	W02 Speaker Assembly Installation	W04 Speed Dial Assembly Diagrams
W02 Speaker Assembly and W25 Speaker Harness Extension Cable Diagrams		

(Continued on next page)

Repair Procedures Index *(continued)*

Boardstack

(Continued on next page)

Repair Procedures Index *(continued)*

Bottom Case

(Continued on next page)

Repair Procedures Index *(continued)*

Final Assembly

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 may retain potentially lethal charges accessible inside the device at any time, even when off. Follow the procedures carefully for discharging the A13 Energy Capacitor.

The A13 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

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)*

About RoHS Parts *(continued)*

	Rules	
Situation	**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)

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

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

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.

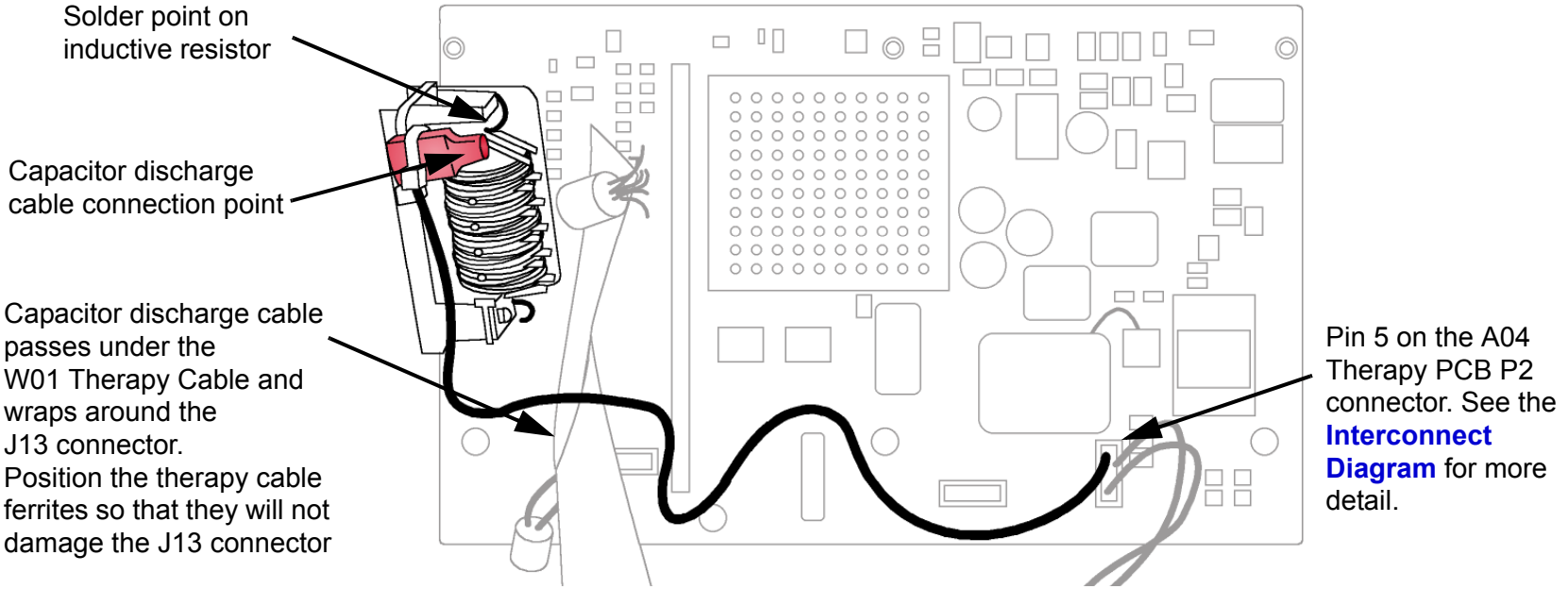
(Continued on next page)

Using the Capacitor Discharge Tool *(continued)*

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

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)*

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)*

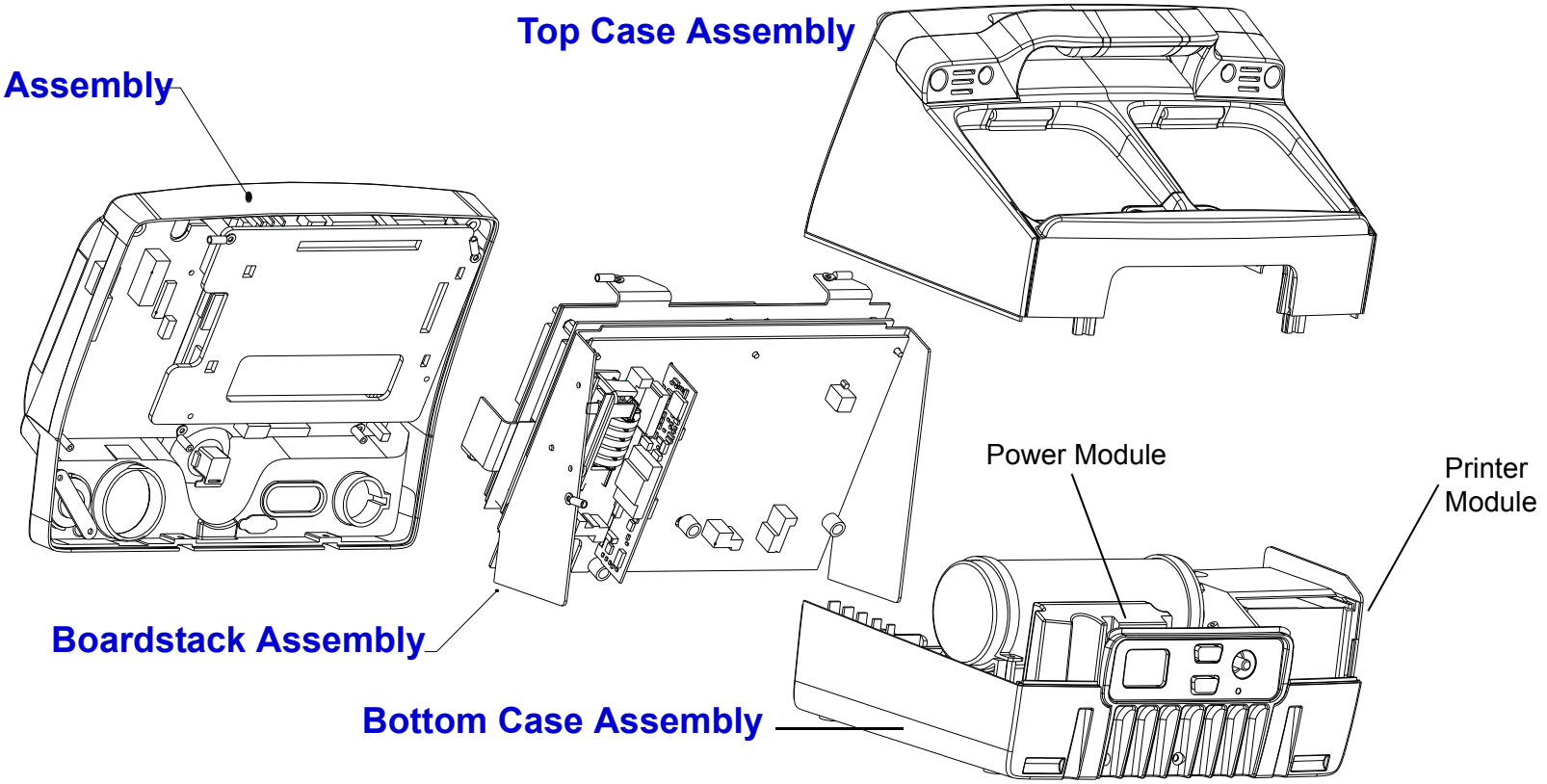
3. Click SEND CONFIG in the SETUP menu on the spare device. The SEND CONFIG overlay appears.
4. Select SEND and press the SPEED DIAL. The setup configuration transfers back to the repaired device.
5. Turn both devices OFF.

Printing the Setup Configuration

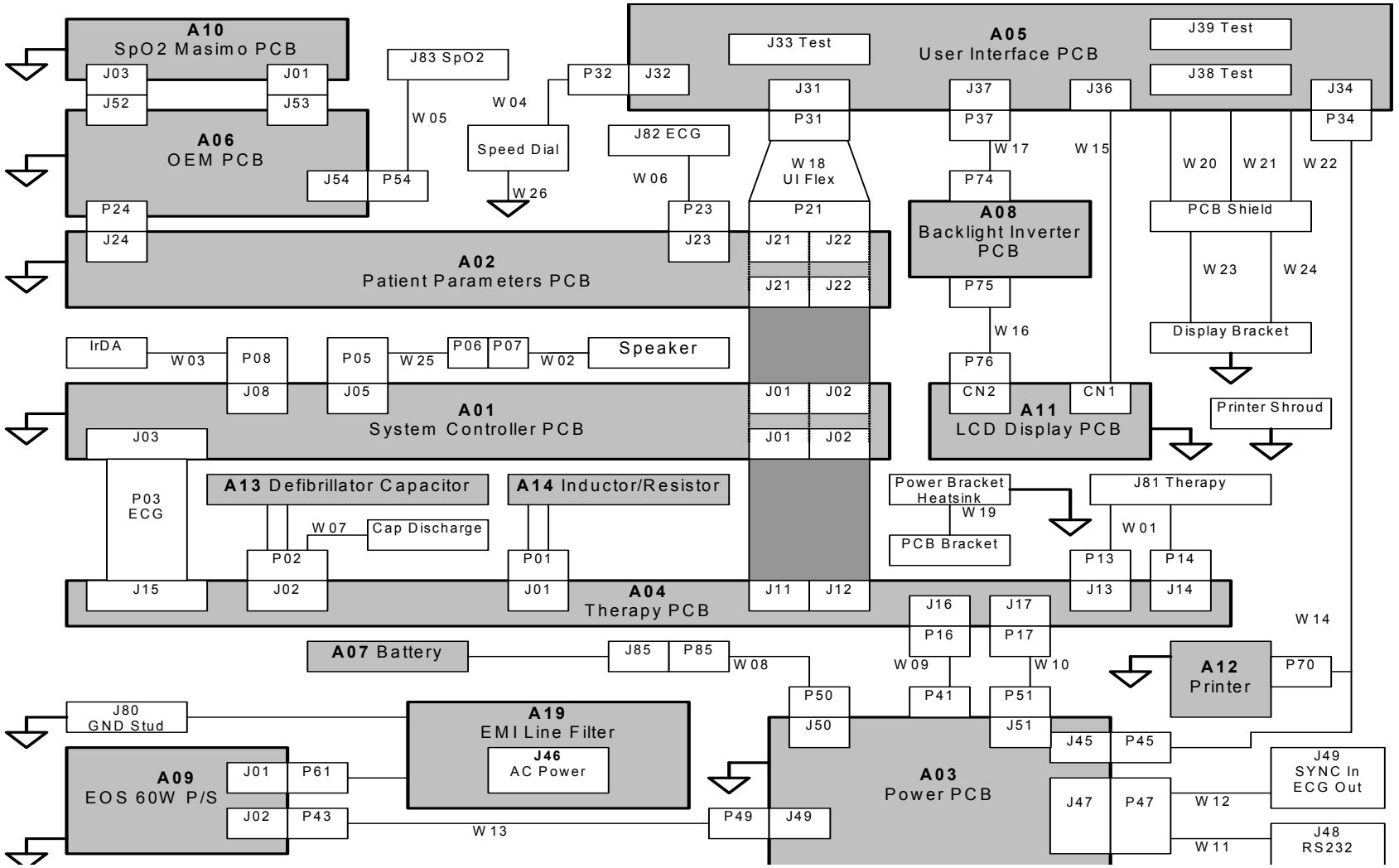
To print the setup configuration:

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

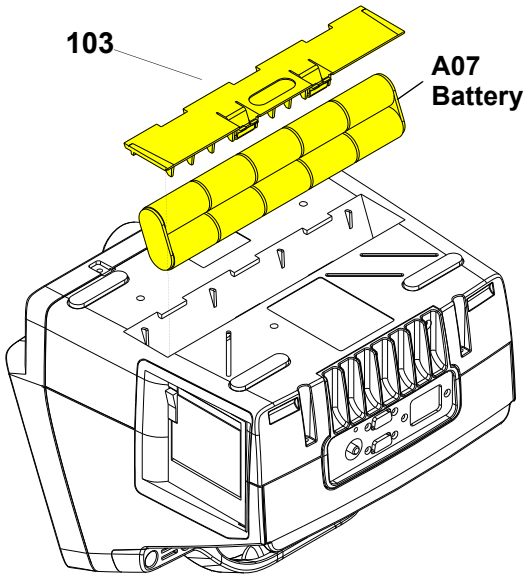


LP20e Interconnect Diagram



Battery Replacement

A07 Battery Replacement



Note: The LIFEPAK 20e defibrillator/monitor uses the A07 Battery with the 6-pin connector. To remove the A07 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 (103).
4. Remove and disconnect the A07 Battery.

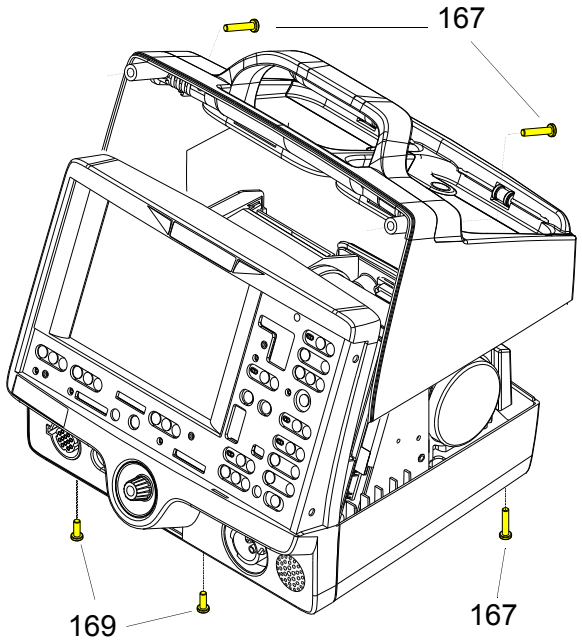
To install the A07 Battery:

1. Place the device top down.
2. Connect the W08 Battery Cable to the A07 Battery.
3. Insert the A07 Battery into the battery compartment.

   Note: Install the A07 Battery in the compartment with the wire harness facing toward the front of the device.
4. Close the battery door (103).
5. Complete the LIFEPAK 20e Device PIP.

Top Case

Top Case Removal

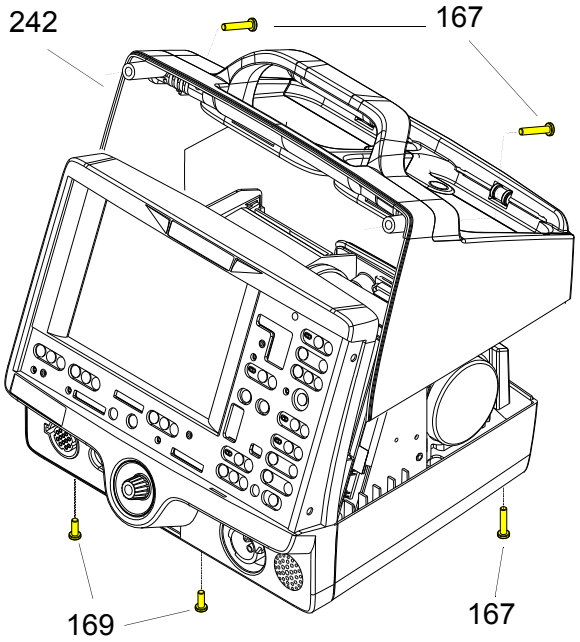


To remove the top case:

1. Disconnect the device from ac power.
2. **Remove the A07 Battery** from the device.
3. Place the device face down.
4. Remove and discard the two 6-32 × 0.375 screws (169) securing the bottom case to the front case.
5. Remove and discard the two 6-32 × 1.75 screws (167) 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 (167) 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 A13 Capacitor**.

Top Case *(continued)*

Top Case Installation



To install the top case:

1. Align the front case to the bottom case.
2. Align the top case (242) 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 (167); 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 (169); torque to 10 in-lb.
6. Secure the top case onto the bottom case with two new 6-32 × 1.75 screws (167); torque to 10 in-lb.
7. **Install the A07 Battery** into the device.
8. Review the **labels parts list** and install new labels.
9. Complete the LIFEPAK 20e Device PIP.

Top Case *(continued)*

Parts List

Item	Quantity	REF	Part Description	Note
167	4	21300-005334	Machine screws 6-32 × 1.75L	
169	2	21300-001032	Machine screw, 6-32 × 0.375L	
242	1	21330-001036	Top case assembly	

Front Case

Assembly Diagram (Front View)

Front Case Removal (9)

Front Case Installation (9)

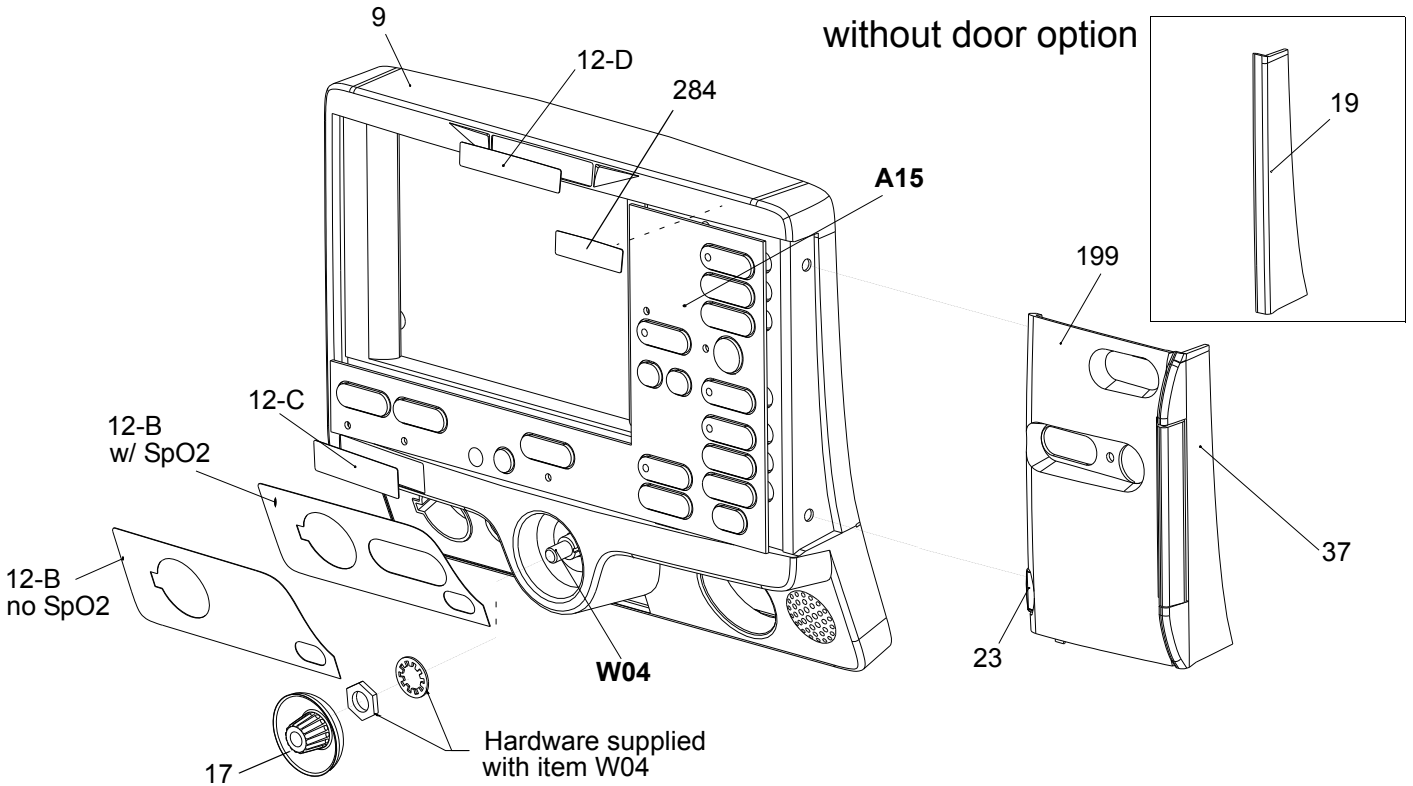
AED Door Replacement (199)

W04 Speed Dial Assembly Removal

W04 Speed Dial Assembly Installation

A15 Elastomer Keypad Removal

A15 Elastomer Keypad Installation



Front Case *(continued)*

Assembly Diagram (Rear View)

A11 Active Display Removal

A11 Active Display Installation

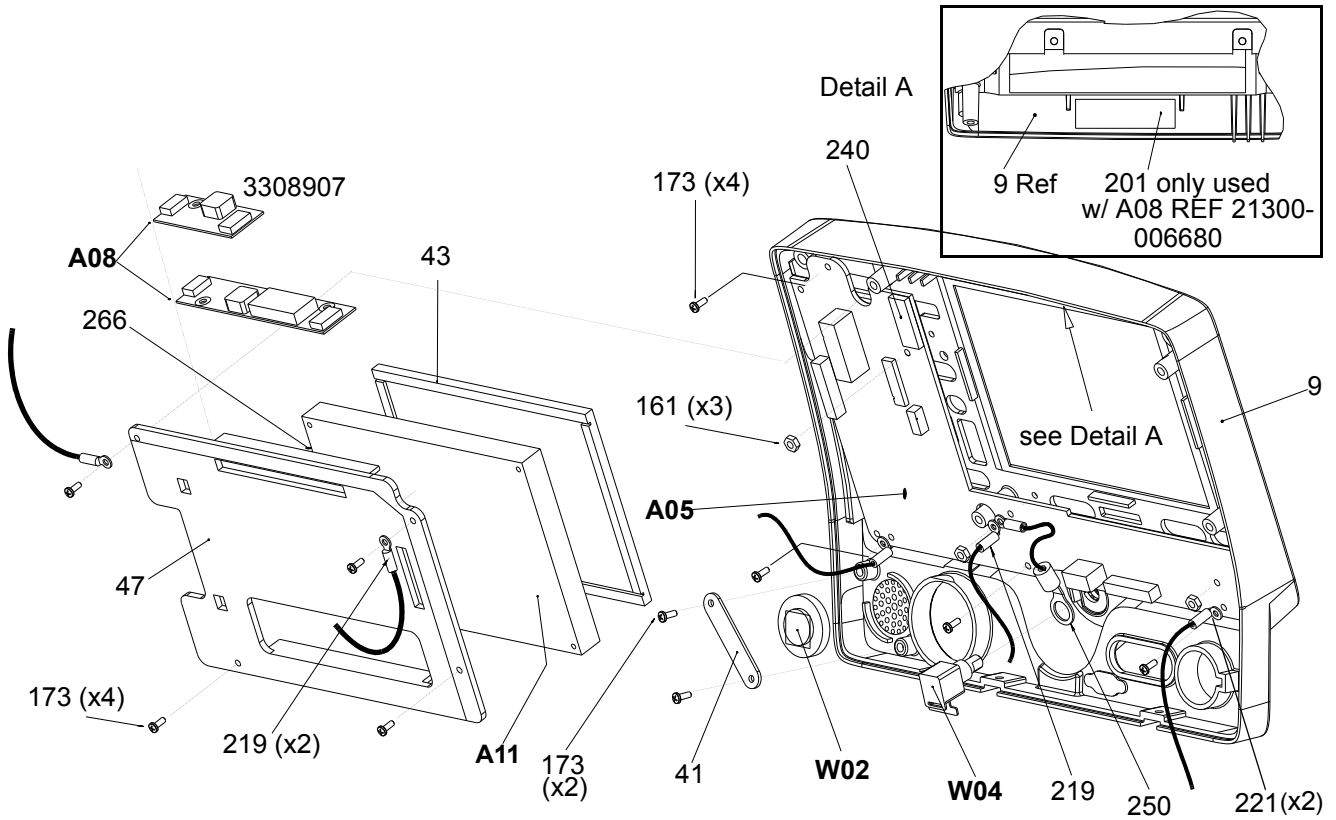
A05 User Interface (UI) PCB Removal

A05 User Interface (UI) PCB Installation

W02 Speaker Assembly Removal

W02 Speaker Assembly Installation

Grounding Harness Orientation



Front Case *(continued)*

Parts List

Item	Quantity	REF	Part Description	Note
A05	1	21330-001562	User Interface PCB	**Part of kit REF 40402-000037, 40402-000038, 40402-000039**
A08	1	21300-006680	Backlight Inverter, CCFT, LCD, 1.5KV Out, 8to20V in	Part used with A11 - REF 21300-007363 **Part of kit REF 40402-000010**
A08	1	21300-008166	Module-OEM, LED Driver (Backlight Inverter)	Part used with A11 - REF 21300-008077 **Part of kit REF 40402-000027**
A11	1	21300-007363	Active Display, Color LCD	**Part of kit REF 40402-000009**
A11	1	21300-008077	Active Display, Color LED	Requires REF 21330-001345 (RoHS) or greater and Redux Device S/W **Part of kit REF 40402-000027**
A15	1	Multiple REF	Elastomer Keypad	**Select other languages and catalog numbers**

(Continued on next page)

Front Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
W02	1	21300-008133	Speaker Assembly	RoHS
W04	1	21300-004264	Speed Dial Assembly	
W15	1	21300-007774	Active Color Display Cable	
W17	1	21300-004237	Active Backlight Inverter Cable	
W18	1	21300-008056	UI to Stack Flex Assembly	
9	1	21300-007086	Front case, Pad printed	**Part of kit REF 40402-000002**
12	1	Multiple REF	Label set (6 labels)	**Refer to Labels Assembly**
17	1	21300-004620	Speed Dial knob	
19	1	21300-004837	Cover plate, door	**Part of kit REF 40402-000002**
23	1	21501-000767	Manual latch label	**Select other language**

(Continued on next page)

Front Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
37	1	21300-004836	Door hinge plate	**Part of kit REF 40402-000002**
41	1	21300-004649	Bracket, speaker mounting	
43	1	21300-004233	Display lens	**Part of various kits**
47	1	21300-004838	Active display bracket	**Part of various kits**
161	3	21300-000584	Locking hex nut, 4-40	
173	10	21300-001038	Machine screw, 4-40 x 0.312L	
199	1	21300-004252	AED door assembly	**Part of kit MIN 3202360** See AED Door/Latch Label Kits
201	1	21300-004241	Thermally conductive backlight inverter pad	
219	3	21300-004254	Grounding strap harness	Active Display
221	2	21300-004255	Grounding strap harness	User Interface PCB

Front Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
240	1	21300-004807	Spacer Foam, UI PCB	**Part of various kits**
250	1	21300-004884	Grounding strap harness, Speed Dial	
266	1	21300-006141	Nylon snap rivet	**Part of various display kits**
284	1	Multiple REF	Label - Adult VF Dose	**Refer to labels assembly** See **LIFEPAK 20e Device Label Set Languages Table**

Front Case *(continued)*

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 A11 Active Display**.
4. **Remove the A05 User Interface PCB**.
5. **Remove the W04 Speed Dial Assembly**.
6. **Remove the W02 Speaker Assembly**.
7. **Replace the front case** and continue to **Front Case Reassembly**.

Front Case *(continued)*

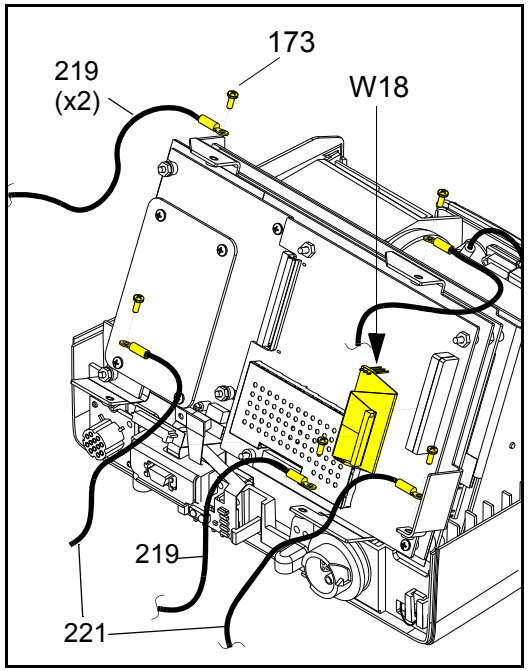
Front Case Reassembly

To reassemble the front case:

1. **Install the W02 Speaker Assembly**.
2. **Install the W04 Speed Dial Assembly**.
3. **Install the A05 User Interface PCB**.
4. **Install the A11 Active Display**.
5. **Install the A15 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 A07 Battery**.
10. Review the **labels parts list** and install new labels.
11. Complete the LIFEPAK 20e Device PIP.

Front Case *(continued)*

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 A07 Battery**.
2. **Remove the top case**.
3. **Discharge the A13 Energy Capacitor**.
4. Disconnect the two grounding harnesses (219) that connect the A11 Active Display to the top of the PCB support bracket by removing and discarding the two screws (173).

   Note: Replace any broken or frayed grounding straps.
5. Pull the front case away from the boardstack assembly and disconnect the W18 UI Flex Cable from the A02 Patient Parameter (PP) PCB at J21 and J22.

(Continued on next page)

Front Case *(continued)*

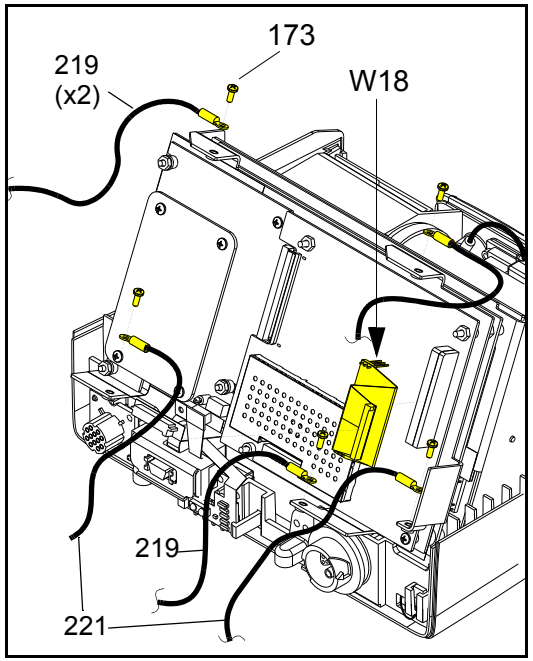
Front Case Removal *(continued)*

6. Disconnect the two grounding harnesses (221) that connect the bottom left and right corners of the A05 User Interface (UI) PCB to the PCB support bracket by removing and discarding the two screws (173).
7. Disconnect the grounding harness (219) that connects the bottom center of the A05 UI PCB to the PCB support bracket by removing and discarding the screw (173).
8. Disconnect the W25 Speaker Harness Extension Cable from the W02 Speaker Assembly.
9. Disconnect the W14 Printer Flex Cable from the A05 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)*

Front Case Installation



To install the front case assembly:

1. Connect the W14 Printer Flex Cable to the A05 UI PCB at J34.
2. Connect the W25 Speaker Harness Extension Cable to the W02 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 (221) by connecting the bottom left and right corners of the A05 UI PCB to the PCB support bracket, using two new screws (173); torque to 6.8 in-lb. Refer to **Grounding Harness Orientation** for grounding harness placement.
4. Install the grounding harness (219) by connecting the bottom center of the A05 UI PCB to the PCB support bracket, using a new screw (173); torque to 6.8 in-lb.

(Continued on next page)

Front Case *(continued)*

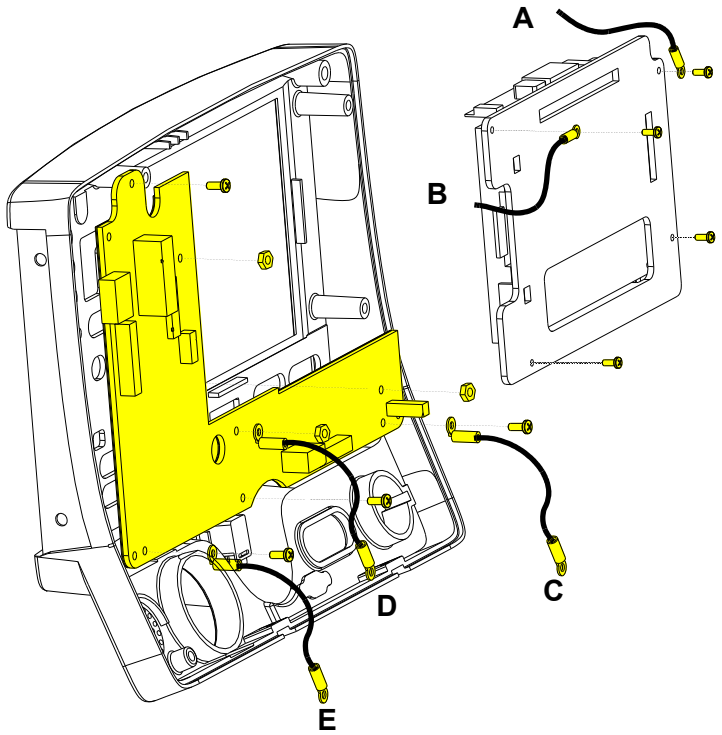
Front Case Installation *(continued)*

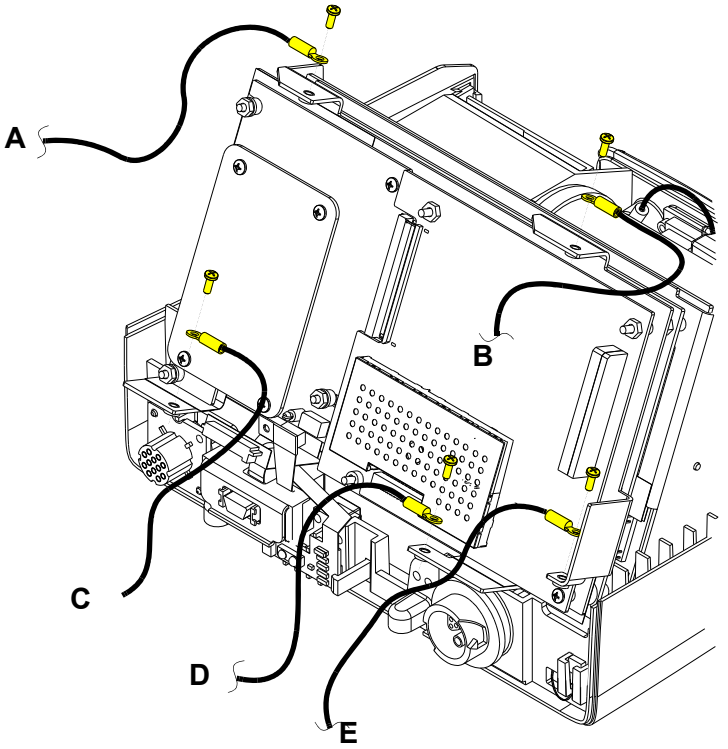
5. Connect the W18 UI Flex Cable to the A05 UI PCB at J31.
6. Carefully connect the W18 UI Flex Cable to the A02 PP PCB at J21 and J22, ensuring that the pins connect with the connectors evenly to avoid possible pin damage.
7. Connect the two grounding harnesses (219) by connecting the top of the front case to the system shield, using two new screws (173); torque to 6.8 in-lbs. Refer to **Grounding Harness Orientation** for grounding harness placement.
8. Return to **Front Case Reassembly.**

Front Case *(continued)*

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.





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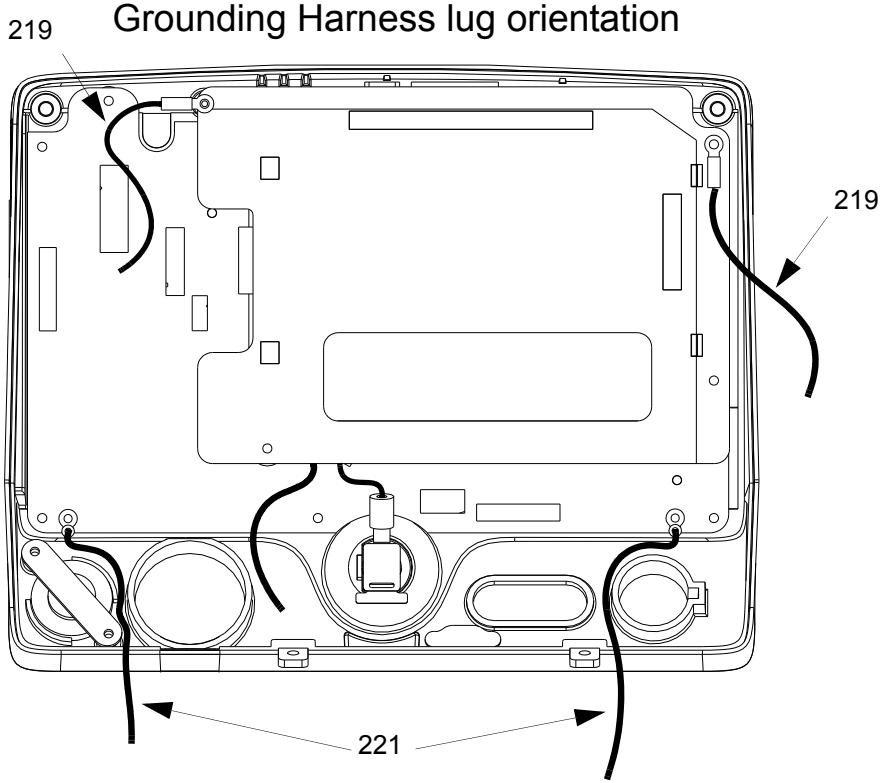
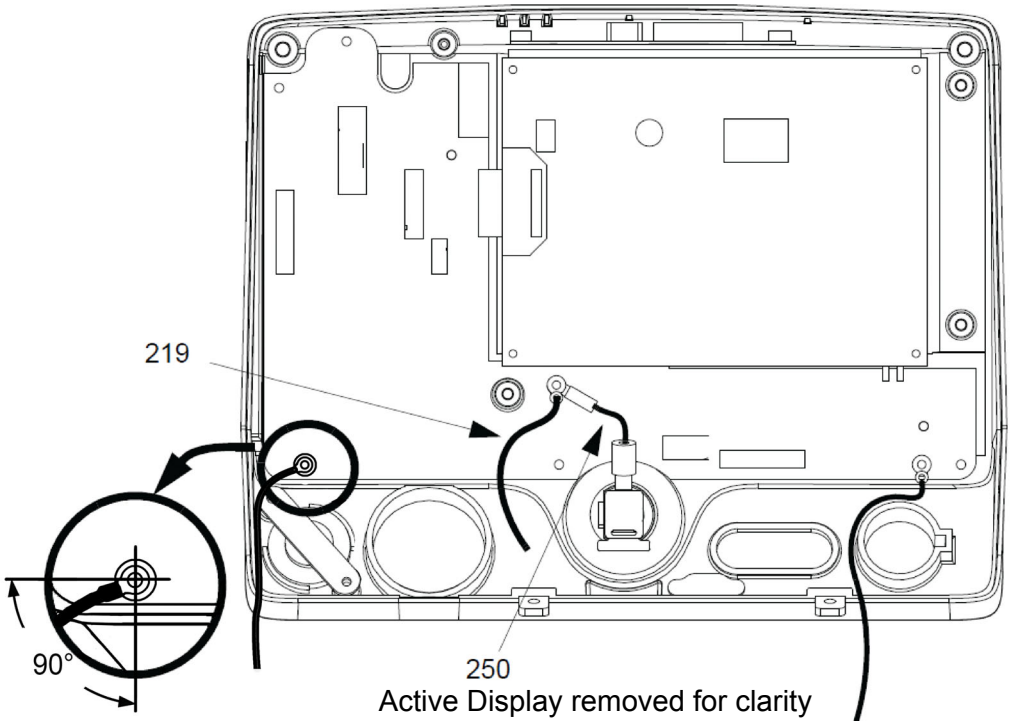
Front Case *(continued)*

Grounding Harness Orientation *(continued)*

Grounding Harness lug orientation



Grounding Harness lug orientation



Front Case *(continued)*

AED Door Replacement

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

To remove the entire AED door assembly:

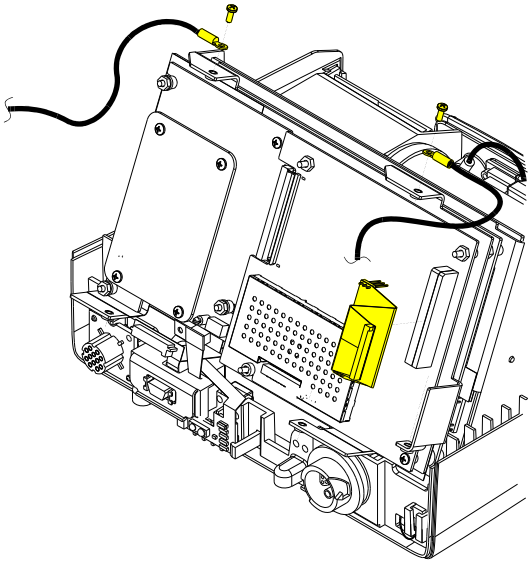
1. Open the AED door.
2. Use a small screwdriver to pry the hinge pin center slightly away from the door assembly until the door slides free of the hinge.
3. Peel the hinge off the front case.
4. Clean the front case to remove old adhesive.

To install a new AED door assembly:

1. Clean the hinge area.
2. Expose the adhesive and secure the door hinge plate (37) 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)*

W18 UI Flex Cable Removal



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

To remove the W18 UI Flex Cable:

1. From the boardstack assembly, disconnect the two grounding straps (219) that connect the top of the front case to the system shield, by removing the two screws.

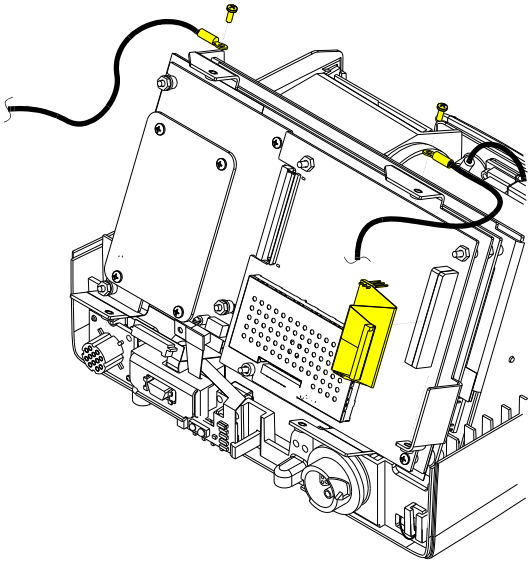
   Note: Observe the **positioning on the grounding harnesses**. If they are not reinstalled at the correct angles, the front case will not join with the rest of the device correctly.

2. Pull the front case slightly forward, away from the boardstack assembly, and disconnect the W18 UI Flex Cable from the A02 PP PCB at J21 and J22.

3. Disconnect the W18 UI Flex Cable from the A05 UI PCB at J31, and remove the cable from the device.

Front Case *(continued)*

W18 UI Flex Cable Installation



To install the W18 UI Flex Cable:

1. With the front case pulled slightly forward and away from the boardstack assembly, connect the W18 UI Flex Cable to the A05 UI PCB at J31.

   Note: Avoid bending the W18 UI Flex Cable during installation. Excessive bending can damage wires and connectors.

2. Carefully connect the W18 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 (219) by connecting the top of the front case to the system shield, using the two screws (173); 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**.

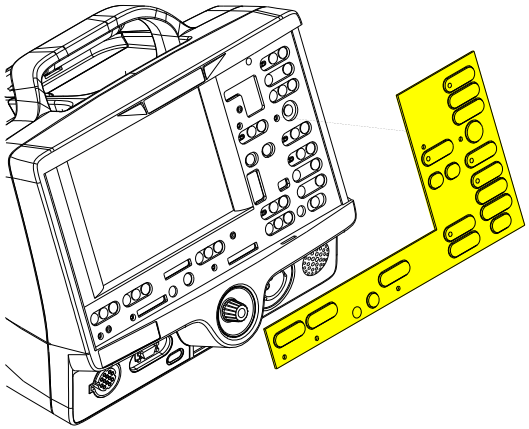
Front Case *(continued)*

A15 Elastomer Keypad Removal

To remove the A15 Elastomer Keypad:

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

A15 Elastomer Keypad Installation

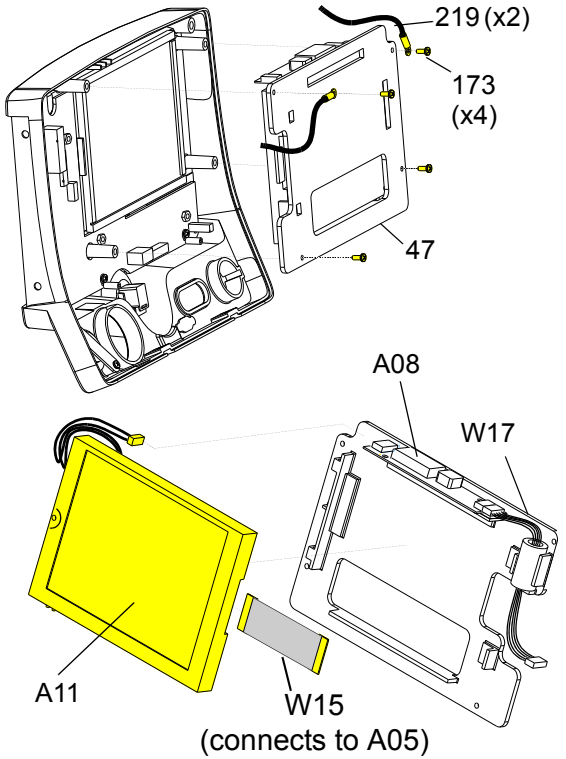


To install the A15 Elastomer Keypad:

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 A15 Elastomer Keypad flush against the bottom corners of the front case.
3. Press the A15 Elastomer Keypad onto the front case ensuring that it is flush against the case with no air pockets or gaps.

Front Case *(continued)*

A11 Active Display Removal



Note: Remove the following assemblies before beginning this disassembly:

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

To remove the A11 Active Display:

1. Disconnect the W15 Active Display Cable (see illustration) from the A11 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 W17 Backlight Inverter Cable from the A05 UI PCB at J37.
3. Remove and discard the four 4-40 x 0.312 screws (173) from the display assembly cover.

   Note: **Remove the two grounding harnesses** (219) 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)*

A11 Active Display Removal *(continued)*

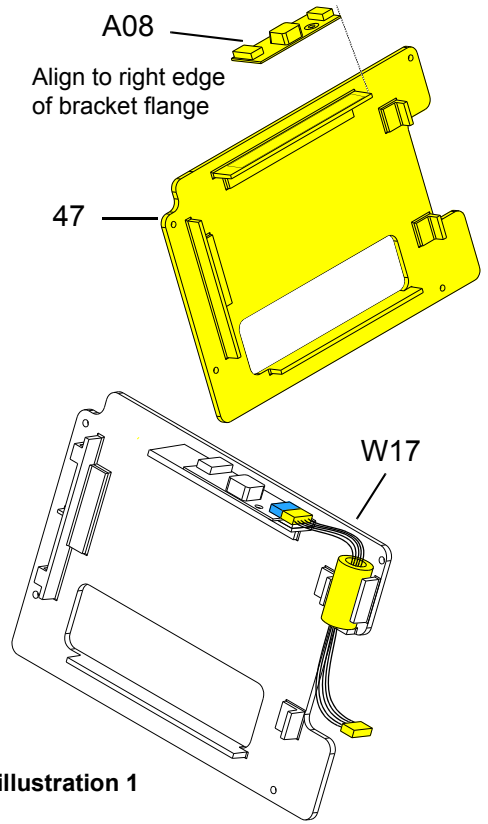


illustration 1

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

   A08 Backlight Inverter — To remove, disconnect the Active Display wires at J2. Disconnect the W17 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 A05 UI PCB at J36 (cable was previously disconnected from the Active Display in step 1).

   W17 Backlight Inverter Cable — To remove, disconnect it from the A05 UI PCB at J37. Disconnect it from the A08 Backlight Inverter (if not previously removed) at J1. Pull the ferrite bead out of the molded notches on the display bracket.

   Display bracket (47) — 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 (201) — (used only with REF 21300-006680 - A08 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)*

A11 Active Display Installation

Only required with Backlight Inverter - REF 21300-006680

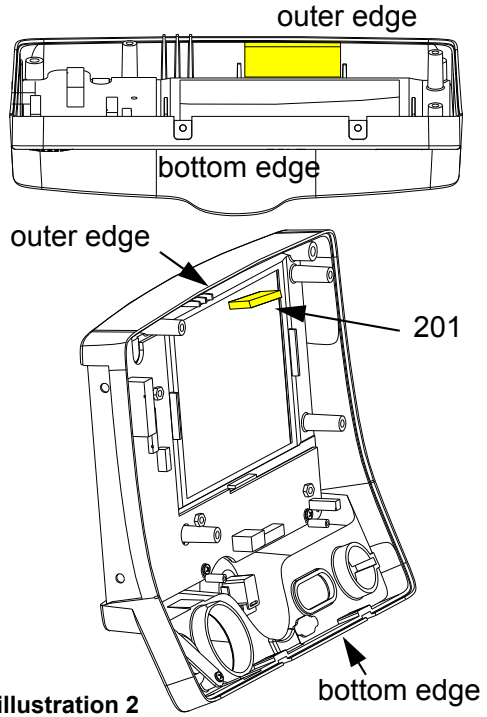


illustration 2

To install the A11 Active Display:

1. Verify the condition of the following parts and replace if necessary:
   - A08 Backlight Inverter (**see illustration 1**)
   - W15 Active Display Cable (**see illustration 3**)
   - W17 Backlight Inverter Cable (**see illustration 1**)
   - Display bracket (47) (**see illustration 1**)
   - Thermal conductive pad (201), located on the top inside edge of the top case.

Note: **The thermal conductive pad is only required when using A08 Backlight Inverter - REF 21300-006680.** 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 (201), 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)*

A11 Active Display Installation *(continued)*

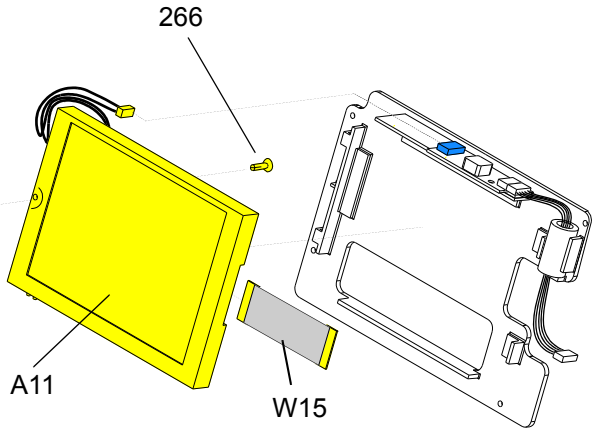


illustration 3

3. If replacing the A08 Backlight Inverter, a new display bracket (47) is required. The display bracket has the adhesive and display foam piece pre-installed. Remove backing from display bracket. Place the A08 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 W17 Backlight Inverter Cable “P74” connector to location J1 on A08 Backlight Inverter.
5. Place W17 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 (266) through the hole from the back of the display and ensure the rivet expands on the front side.
7. A11 Active Display - (REF 21300-008077), 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)*

A11 Active Display Installation *(continued)*

8. Position the A11 Active Display inside the display bracket.
9. A11 Active Display - (REF 21300-007363), route the backlight wires from display along the corner and under the hook and then back to the A08 Backlight Inverter.
10. Connect the A11 Active Display wires to the A08 Backlight Inverter at J2.
11. Connect the W15 Active Display Cable to the A05 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: A08 Backlight Inverter - (21300-006680) must make contact with the thermal conductive pad (201) on the front case.

Front Case *(continued)*

A11 Active Display Installation *(continued)*

13. Place the two grounding harnesses (219) onto the top two screws (173); 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 (173) 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 A11 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**.

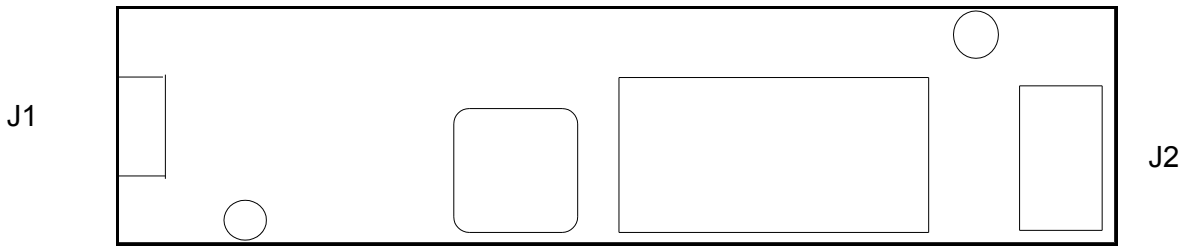
(Continued on next page)

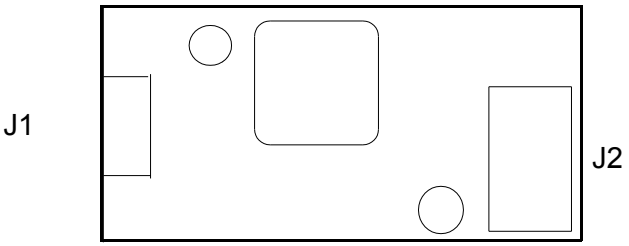
Front Case *(continued)*

A08 Backlight Inverter PCB Diagram

REF **21300-006680**

REF **21300-008166**



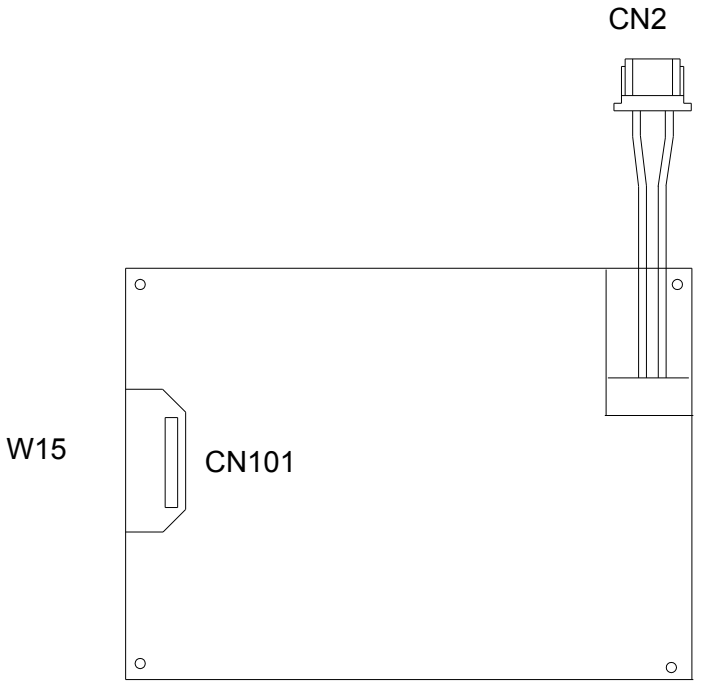


REF 21300-008166

Front Case *(continued)*

A11 Active Display Diagram

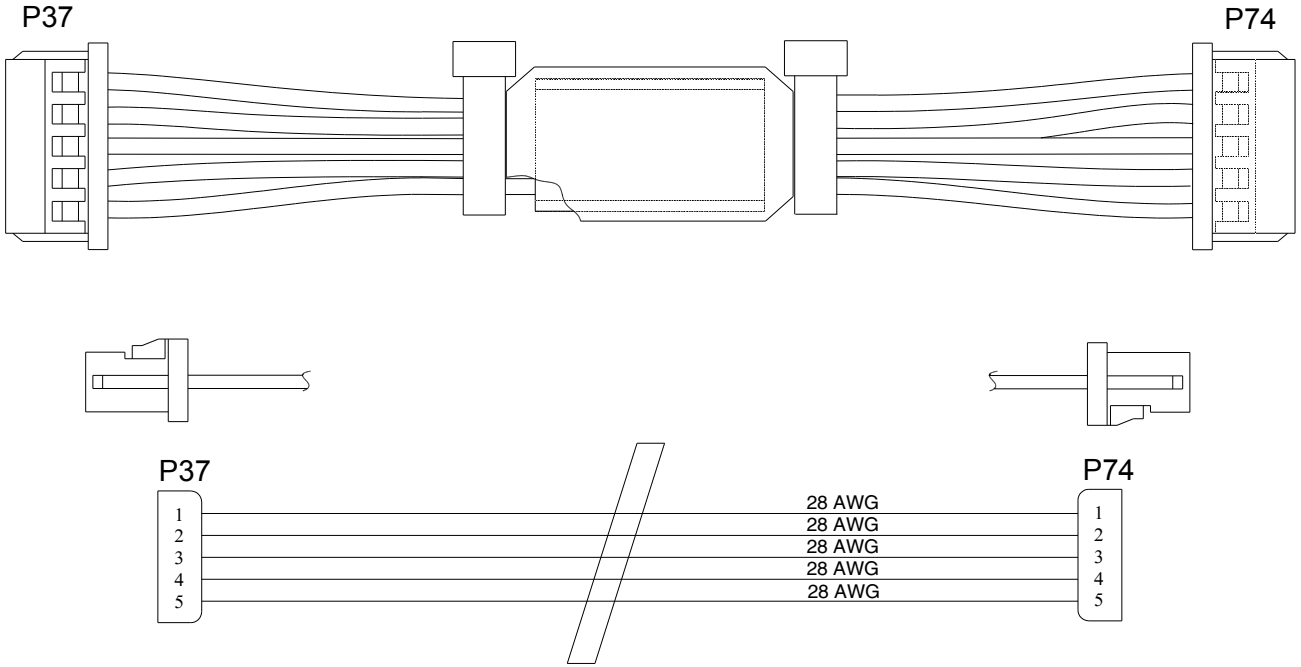
REF **21300-007363**



Front Case *(continued)*

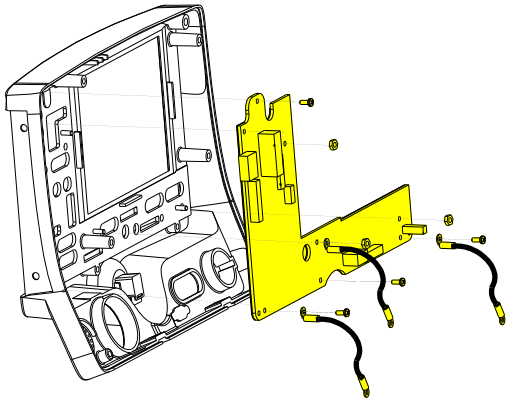
W17 Backlight Inverter Cable Diagrams

REF **21300-004237**



Front Case *(continued)*

A05 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 A05 UI PCB:

1. Disconnect the W18 UI Flex Cable from the A05 UI PCB at J31.
2. Remove the Speed Dial connector from the A05 UI PCB at J32.
3. Remove and discard the three 4-40 x 0.312 screws (173) from the bottom edge of the A05 UI PCB. **Remove the two grounding harnesses** (221) attached to the left and right corner screws.

   Note: Replace any broken or frayed grounding harnesses.

   Note: If replacing the A05 UI PCB, transfer the grounding harnesses to the new PCB.

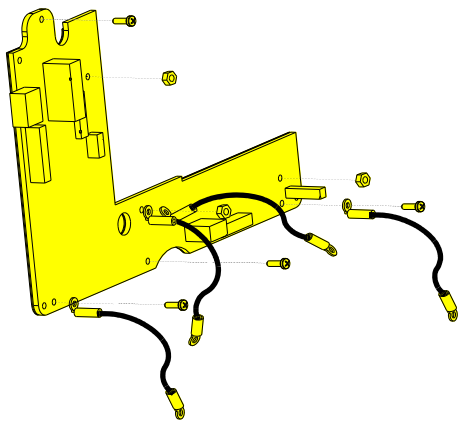
(Continued on next page)

Front Case *(continued)*

A05 User Interface (UI) PCB Removal *(continued)*

4. Remove and discard the 4-40 x 0.312 screw (173) from the top left corner of the A05 UI PCB.
5. Remove the three 4-40 nuts (161) from the A05 UI PCB. Remove the two grounding harnesses attached to the center nut.
6. Remove the A05 UI PCB from the front case.

A05 User Interface (UI) PCB Installation



To install the A05 UI PCB:

1. Position the A05 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 (250) from the W04 Speed Dial Assembly, and a second grounding harness (219) to the lower center stud, and install the three 4-40 nuts (161) onto the A05 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)*

A05 User Interface (UI) PCB Installation *(continued)*

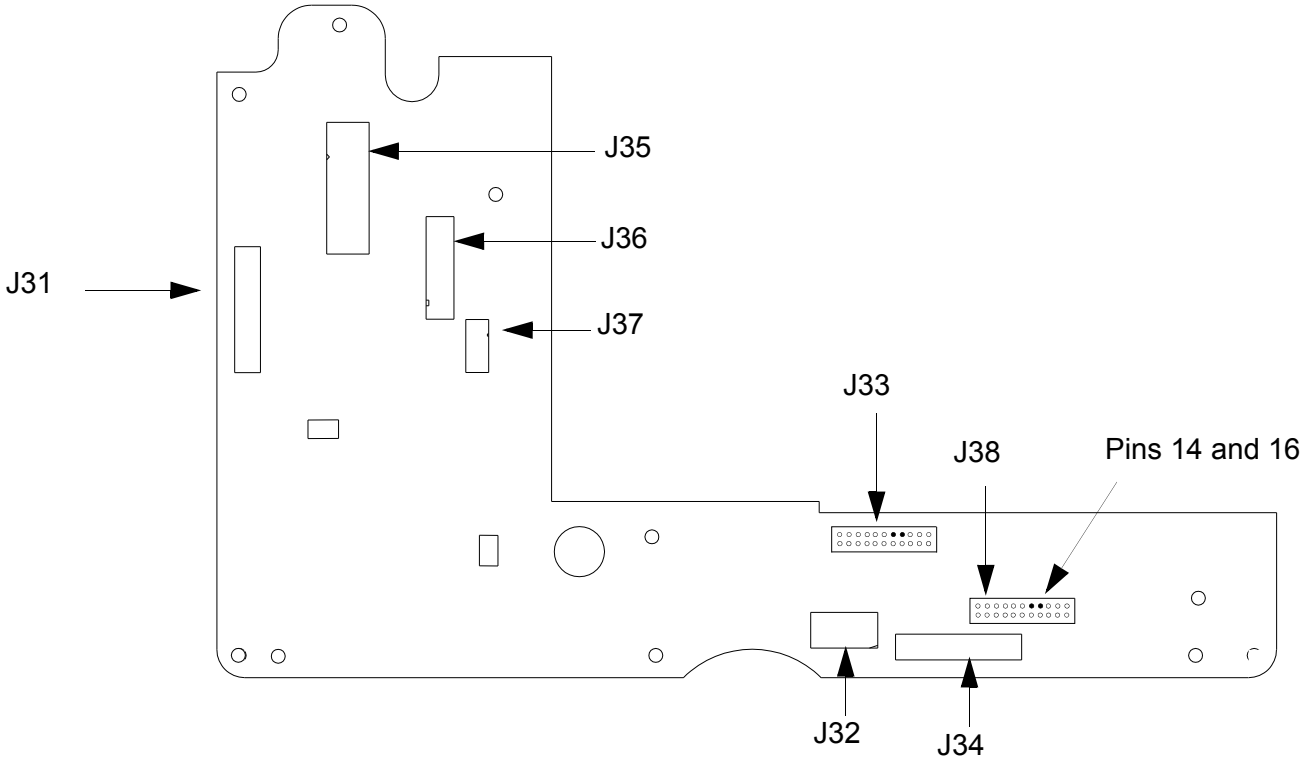
3. Place the two grounding harnesses (221) onto the new lower left and right 4-40 x 0.312 screws (173); torque to 6.8 in-lb.
4. Install two new 4-40 x 0.312 screws (173) onto the A05 UI PCB; torque to 6.8 in-lb. Refer to **Grounding Harness Orientation** for grounding harness placement.

   Note: Replace any broken or frayed grounding straps.
5. Install the Speed Dial connector to the A05 UI PCB at J32.
6. Connect the W18 UI Flex Cable to the A05 UI PCB at J31.
7. Complete the process by **Installing the active display** assembly.

Front Case *(continued)*

A05 User Interface PCB Diagram

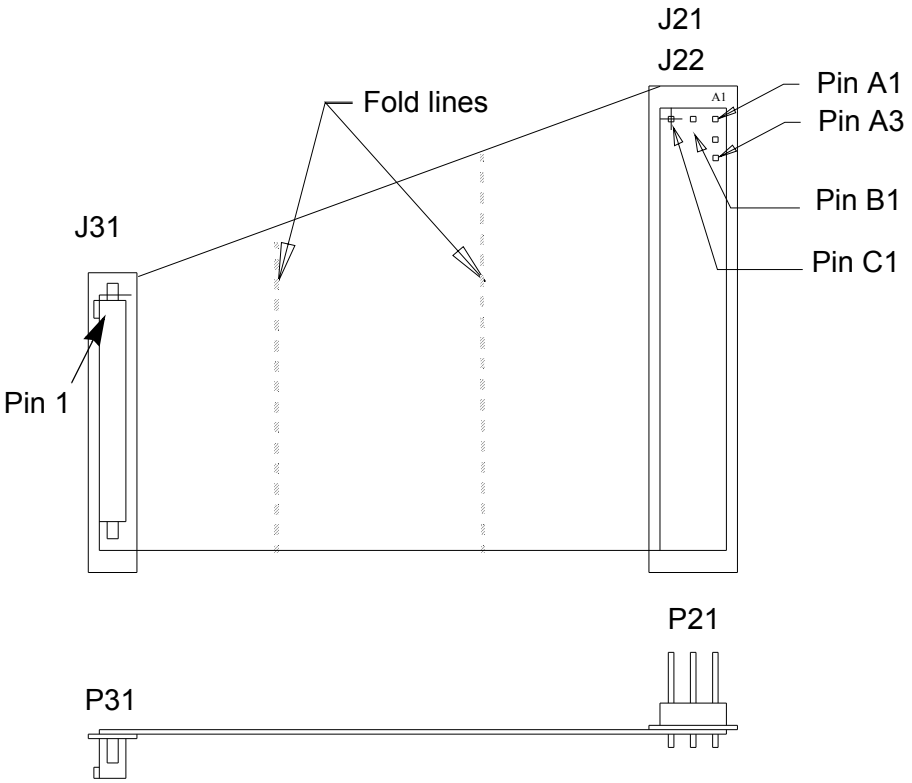
REF **21330-001562** (RoHS)

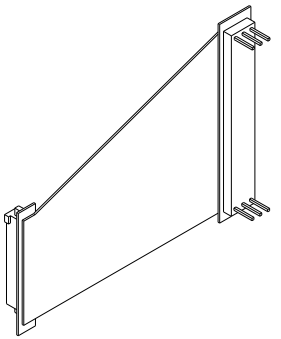


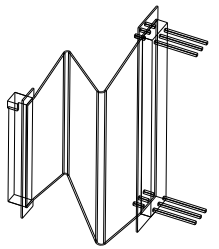
Front Case *(continued)*

W18 UI Flex Cable Diagrams

REF **21300-008056**



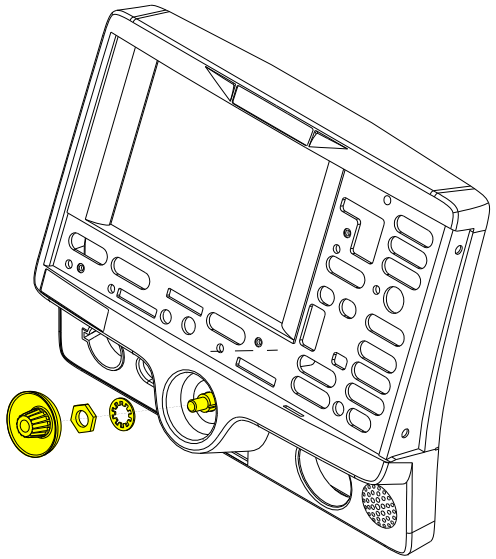




Folded view

Front Case *(continued)*

W04 Speed Dial Assembly Removal



Note: Remove the following assemblies before beginning this disassembly:

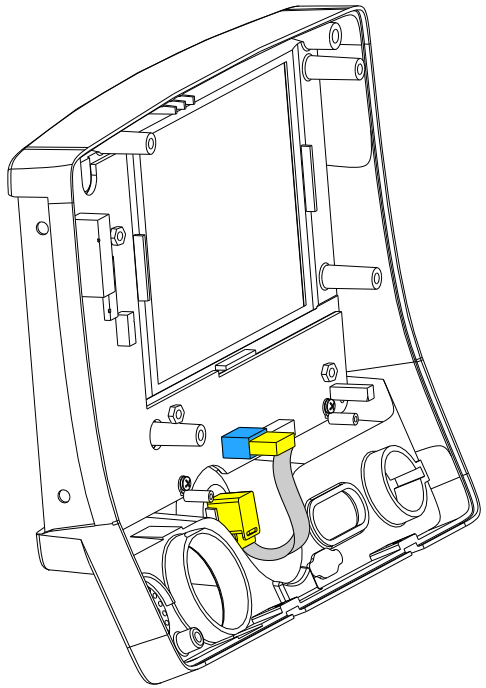
- **Top case**
- **Front case**

To remove the W04 Speed Dial Assembly:

1. Disconnect the W04 Speed Dial connector from the A05 UI PCB at J32.
2. Turn the front case over and remove the Speed Dial knob (17).
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 (250) from the Speed Dial axle.

Front Case *(continued)*

W04 Speed Dial Assembly Installation



To install the W04 Speed Dial Assembly:

1. Insert the grounding harness (250) 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 (17) onto the axle.
6. Connect the W04 Speed Dial Assembly connector to the A05 UI PCB at J32.
7. Complete the process by **Installing the front case**.

Front Case *(continued)*

W02 Speaker Assembly Removal

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

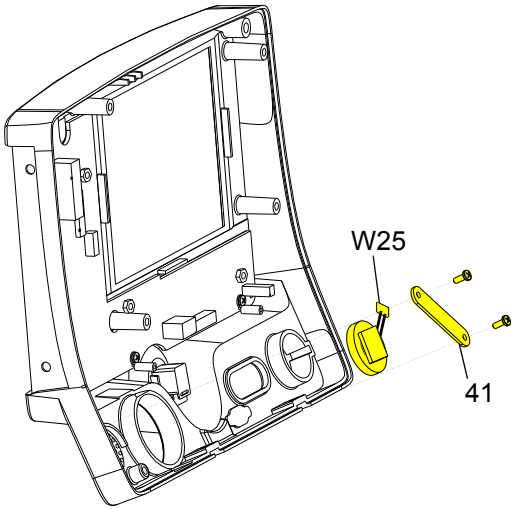
- **Top case**
- **Front case**

To remove the W02 Speaker Assembly:

1. Disconnect the speaker cable from the W25 Speaker Harness Extension Cable connector. Refer to the **W25 Speaker Harness Extension Cable** removal and installation instructions for more information.
2. Remove and discard the two 4-40 x 0.312 screws (173) from the speaker mounting bracket (41), and remove the speaker mounting bracket from the front case.
3. Remove the W02 Speaker Assembly from the front case.

Front Case *(continued)*

W02 Speaker Assembly Installation



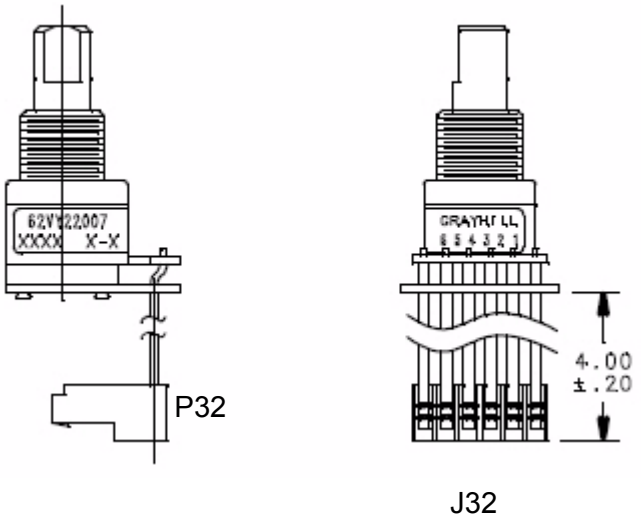
To install the W02 Speaker Assembly:

1. Fit the W02 Speaker Assembly into the front case and position the cable at the 2:00 position.
2. Place the speaker mounting bracket (41) over the foam spacer and install two new 4-40 x 0.312 screws (173); torque to 6.8 in-lb.
3. Connect the speaker cable to the W25 Speaker Harness Extension Cable connector.
4. Complete the process by **Installing the front case**.

Front Case *(continued)*

W04 Speed Dial Assembly Diagrams

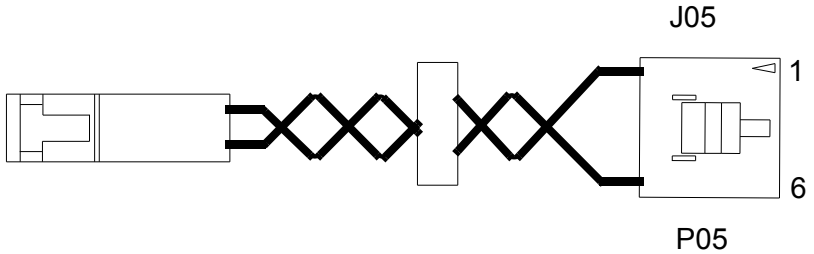
REF **21300-004264**



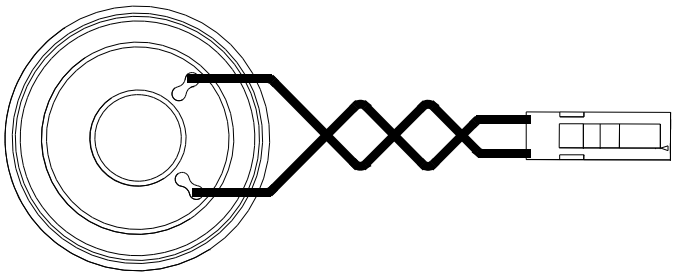
Front Case *(continued)*

W02 Speaker Assembly and W25 Speaker Harness Extension Cable Diagrams

W25 Speaker Harness Extension Cable (bottom case)
REF 21300-008132 (RoHS)

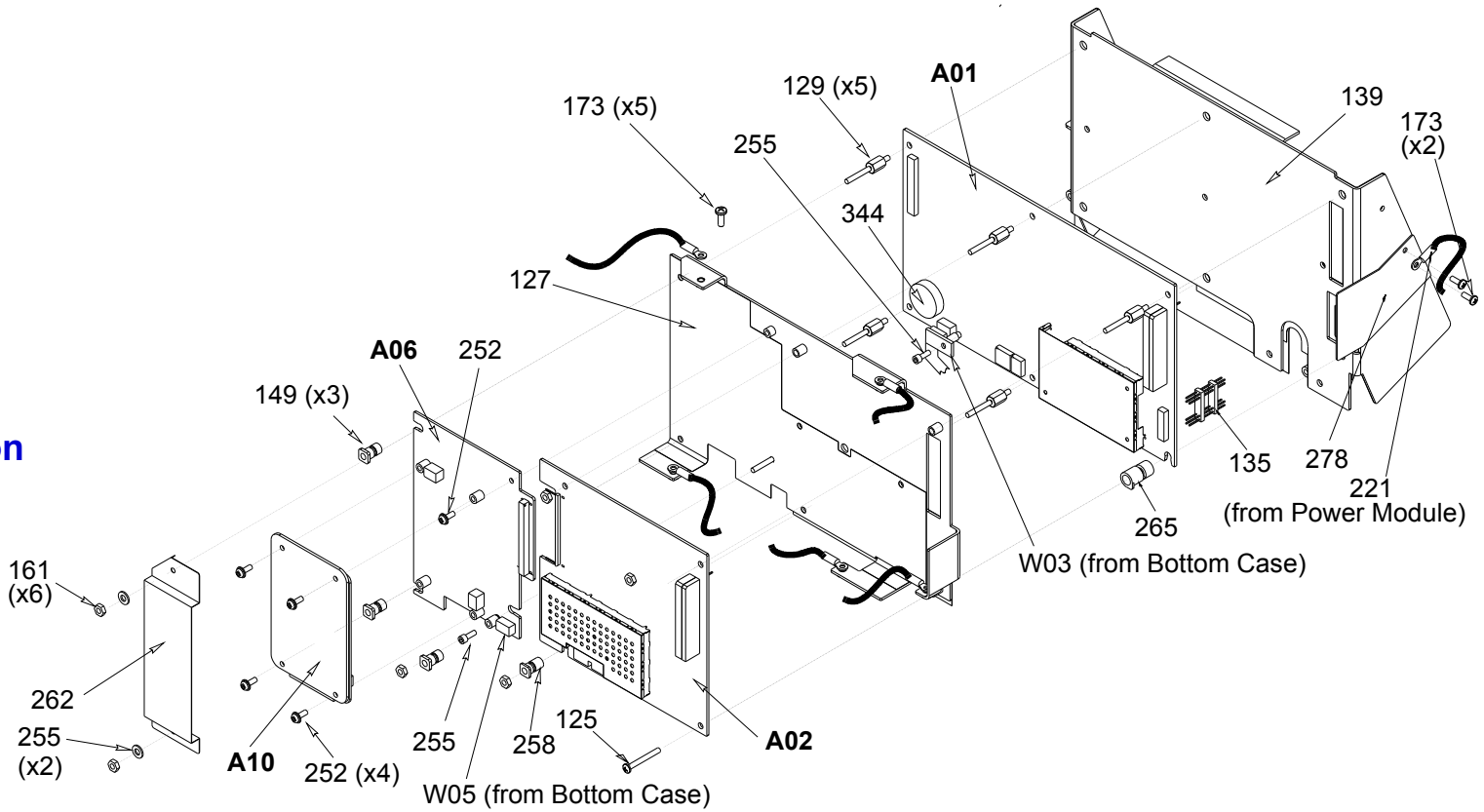


W02 Speaker Assembly (front case)
REF 21300-008133 (RoHS)



Boardstack

Assembly Diagram



Boardstack *(continued)*

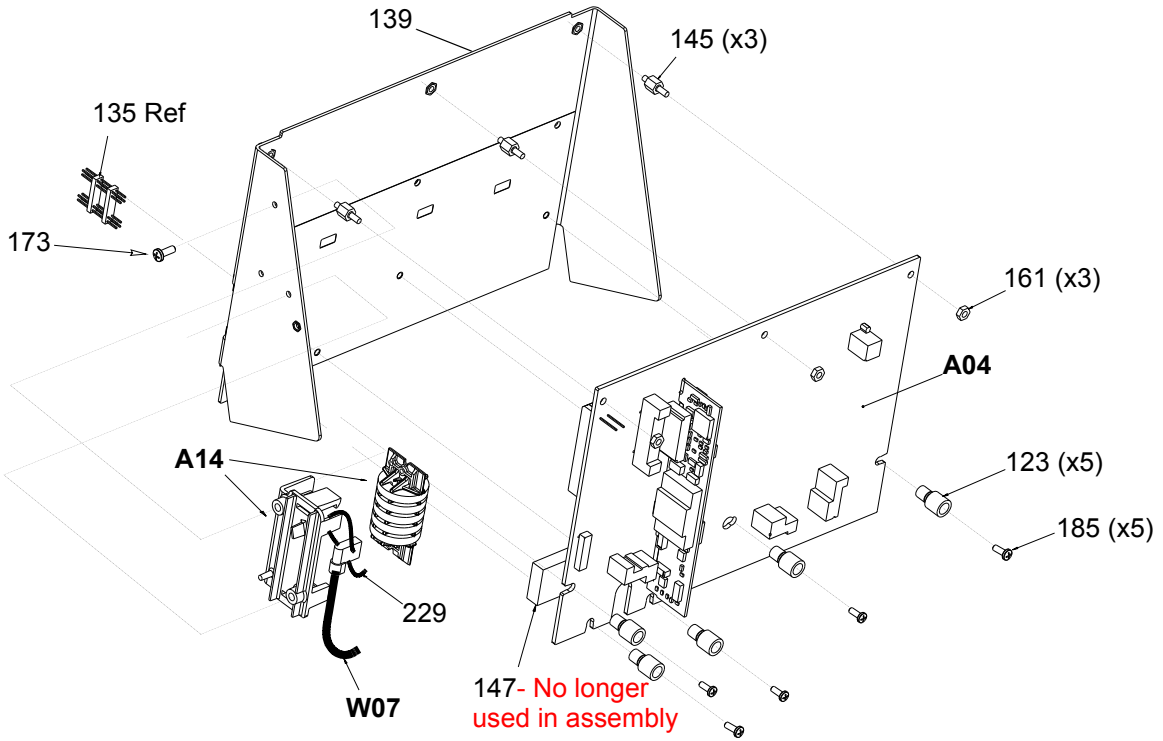
A04 Therapy PCB Assembly Diagram

With Pacing:
REF **21330-001560** (RoHS)
Without Pacing:
REF **21330-001563** (RoHS)

A04 Therapy PCB Removal

- Inductive Resistor

A04 Therapy PCB Installation



Boardstack *(continued)*

Parts List

Item	Quantity	REF	Part Description	Note
A01	1	21330-001561	System Controller PCB	**Part of kit REF 40402-000037** and **REF 40402-000040**
A02	1	21330-001558	Patient Parameter PCB	**Part of kit REF 40402-000045 (4th Edition)**
A04	1	21330-001560	Therapy PCB (with pacing)	**Part of kit REF 40402-000028 (RoHS)**
A04	1	21330-001563	Therapy PCB (without pacing)	**Part of kit REF 40402-000029 (RoHS)**
A06	1	21330-001557	PCB ASSY- OEM Interface, Masimo	**Part of kit REF 40402-000044 (4th Edition)**
A10	1	21996-000074	SpO2 Module	**Part of kit REF 40402-000034 (RoHS)**
A10	1	21996-000117	SpO2 Module, with MNC Flash	For devices with Masimo-Nellcor compatibility, **Order kit REF 40402-000035 (RoHS)**

(Continued on next page)

Boardstack *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
A14	1	21300-005068	Inductive Resistor Assembly	
W07	1	21300-004307	Capacitor Discharge Cable	
123	5	21300-004242	ISO mount, Therapy	
125	1	21300-006430	Screw 4-40 x 1.000L	
127	1	21300-004236	Boardstack shield	**Part of kit REF 40402-000017**
129	5	21300-004815	Standoff-M/M 0.250 hex, 0.375	**Part of kit REF 40402-000017**
135	1	21300-004704	Boardstack connector	**Part of kit REF 40402-000033 (RoHS)**
139	1	21300-004228	PCB support bracket	
145	3	21300-004816	Standoff-M/M 0.250 hex, 0.250L	
147	0	21300-007457	Thermally conductive pad	No longer used in assembly
149	3	21300-004243	ISO mount, OEM	**Part of kit REF 40402-000017**

(Continued on next page)

Boardstack *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
161	9	21300-000584	Locking hex nut, 4-40	
173	3	21300-001038	Machine screw, 4-40 x 0.312L	
185	5	21300-004599	Machine screw, 4-40 x 0.500L	
229	2	21300-000499	Cable tie retainer	
252	5	21300-008019	Machine screw, SEMS, 4-40 x 5/16 L, Split	
255	2	21300-005120	Screw-Cap, Hex,4-40 x 0.312 Nylon	3/32 hex drive
258	1	21300-005187	ISO mount, Parameter	**Part of kit REF 40402-000017**
262	1	21300-006038	Nomex shield	**Part of kit REF 40402-000017**
264	2	21300-000580	Washer, 0.125ID, 0.312D	
265	1	21300-005578	ISO mount, System Controller (standoff)	**Part of kit REF 40402-000033 (RoHS)**

(Continued on next page)

Boardstack *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
265	1	21300-005578	ISO mount, System Controller (standoff)	**Part of kit REF 40402-000033**
278	1	21300-006593	Shield - EMI, PCB Stack	**Part of kit REF 40402-000017**
344	1	21300-001052	Coin cell battery, 3 V	

Boardstack *(continued)*

Boardstack Disassembly

To disassemble the boardstack:

1. **Remove the A07 Battery**.
2. **Remove the top case**.
3. **Remove the front case**.
4. **Remove the boardstack assembly**.
5. **Remove the A10 SpO2 Module** (only if it is being replaced).
6. **Remove the A06 OEM/A02 PP PCB**.
7. **Remove the A01 System PCB**.
8. **Remove the A04 Therapy PCB**.

Boardstack *(continued)*

Boardstack Reassembly

Note: If there are indications that the plastic isolation mounts are cracking, then use the boardstack repair kit **REF 40402-000017** as part of the reassembly process.

To reassemble the boardstack:

1. **Install the A04 Therapy PCB**.
2. **Install the A01 System PCB**.
3. **Install the A06 OEM/A02 PP PCB**.
4. **Install the A10 SpO2 Module**, if removed.
5. **Install the boardstack assembly**.
6. **Install the front case**.
7. **Install the top case**.
8. **Install the A07 Battery**.
9. Review the **labels parts list** and install new labels.
10. Complete the LIFEPAK 20e Device PIP.

Boardstack *(continued)*

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 (219) that connects the power module to the PCB support bracket (139) 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 (255) using a 3/32 allen driver.

(Continued on next page)

Boardstack *(continued)*

Boardstack Removal *(continued)*

5. Disconnect the W05 SpO2 Flex Cable from the A06 OEM/SpO2 Assembly at J54 by first removing the screw (255) using a 3/32 allen driver.
6. Disconnect the W06 ECG wire harness from the A02 PP PCB at J23.
7. Disconnect the W25 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 A04 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 A04 Therapy PCB at J16 by releasing the outer tabs.
12. Disconnect the W01 Therapy Connector Assembly from the A04 Therapy PCB at J14.
13. Disconnect the W07 Capacitor Discharge Cable from the A04 Therapy PCB at J2.

(Continued on next page)

Boardstack *(continued)*

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 A14 Inductive Resistor's cable from the A04 Therapy PCB at J1.
17. Remove and discard the two 4-40 x 0.312 screws (173) that connect the A14 Inductive Resistor to the EMI shield (278) and PCB support bracket (139).
18. Remove the boardstack assembly from the bottom case.

Boardstack *(continued)*

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 (141) onto the PCB support bracket (139) using two new 4-40 x 0.312 screws (173); torque to 6.8 in-lb. The bottom bracket screw goes through the top hole of the EMI shield (278).
3. Connect the A14 Inductive Resistor's cable to the A04 Therapy PCB at J1. Route the cable under the W01 Therapy Cable as shown on the following pages.
4. Connect the A13 Energy Capacitor's cable to the A04 Therapy PCB at J2.
5. Route the W07 Capacitor Discharge Cable with the A14 Inductive Resistor's cable as shown on the following pages.

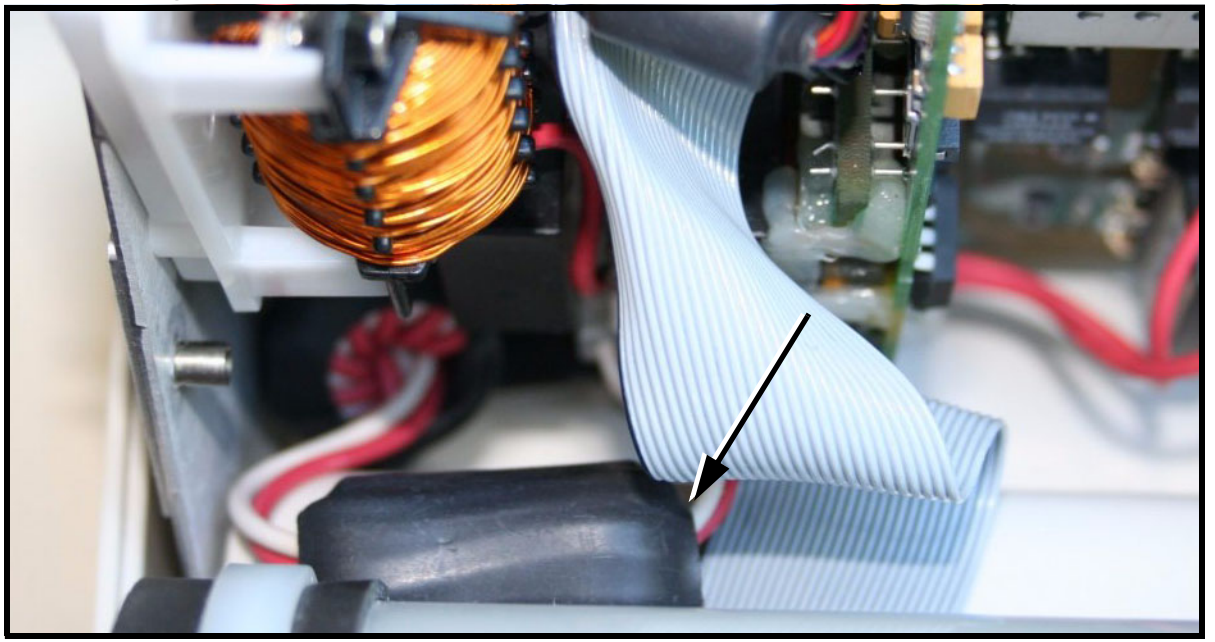
(Continued on next page)

Boardstack *(continued)*

Boardstack Installation *(continued)*

6. Connect the 5-pin therapy connector to the A04 Therapy PCB at J13. Route three ferrite beads of the 5-pin therapy connector cable into the lower left corner of the A04 therapy PCB.

   Note: If the 5-pin therapy connector cable has a fourth ferrite bead, (REF 21300-007366 (RoHS)), route this bead above the battery well, prior to connecting to J13



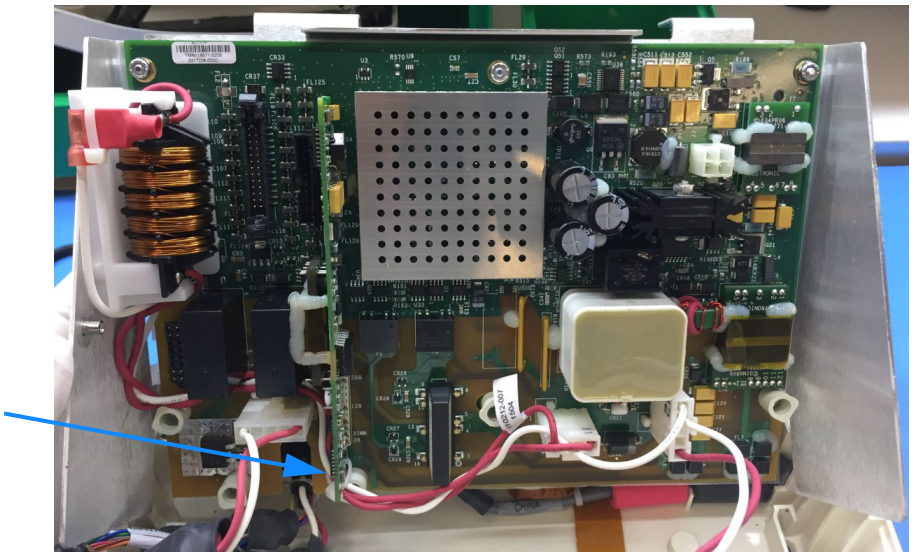
(Continued on next page)

Boardstack *(continued)*

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 A04 Therapy PCB at J14.
8. Connect the W09 26-Pin Power Cable to the A04 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 A04 Therapy PCB.

(Continued on next page)

Boardstack *(continued)*

Boardstack Installation *(continued)*

10. Connect the 4-pin W10 Power/Therapy Cable connector to the A04 Therapy PCB at J17.
11. Turn the device so that the ECG and therapy connectors are in view.
12. Connect the W25 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 (255) using a 3/32 allen 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 (255) using a 3/32 allen driver. Torque to 0.4 in-lb.
16. Install the grounding harness (219) from the power module to the EMI shield (278) and support bracket (139) using new 4-40 x 0.312 screws (173); torque to 6.8 in-lb.
17. Complete the process by **Installing the front case**.

(Continued on next page)

Boardstack *(continued)*

W07 Capacitor Discharge Cable Replacement

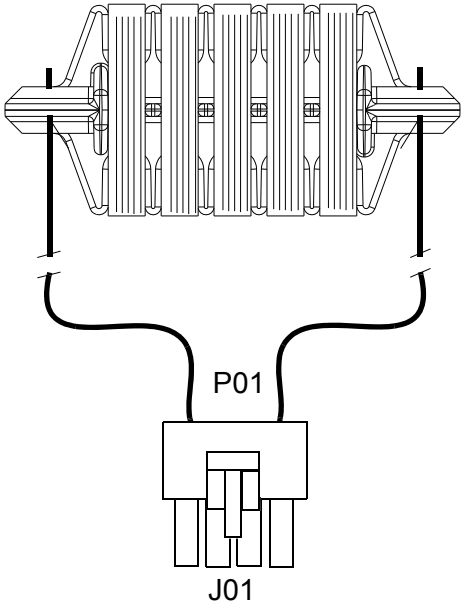
The W07 Capacitor Discharge Cable is part of the capacitor replacement kit. Complete the **A13 Energy Capacitor Removal procedure** to remove the cable.

Complete the **A13 Energy Capacitor Installation procedure** to install the cable.

Boardstack *(continued)*

A14 Inductive Resistor Diagram

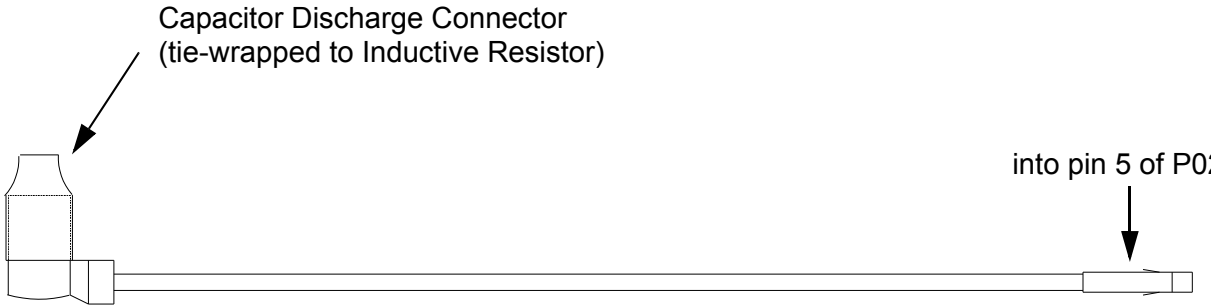
REF **21300-005068**



Boardstack *(continued)*

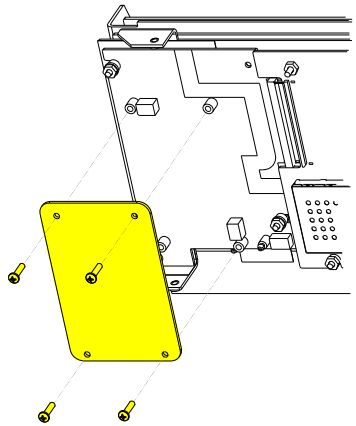
W07 Capacitor Discharge Cable Diagram

REF **21300-004307**



Boardstack *(continued)*

A10 SpO2 Module Removal



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 (262) by removing the two nuts (161) and washers (264).
2. Remove and discard the four 4-40 x 0.312 screws (252) from the A10 SpO2 Module.
3. Lift the A10 SpO2 Module away from the boardstack assembly.

A10 SpO2 Module Installation

To Install the A10 SpO2 Module:

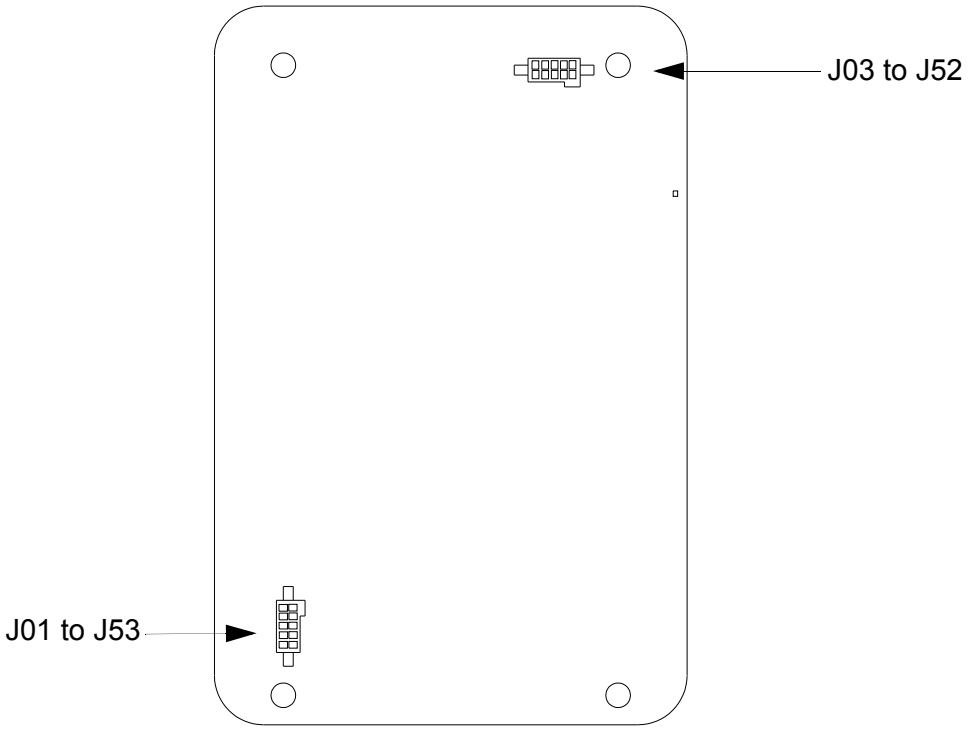
Note: Order correct SpO2 module replacement kit for the LIFEPAK 20 device.

1. Position the A10 SpO2 Module into position over the A06 OEM PCB.
2. Install four new 4-40 x 0.312 screws (252) into the A10 SpO2 Module; torque to 4 in-lb.
3. Install the Nomex shield (262) by securing it to the A06 OEM PCB with the two washers (264) and nuts (161); torque to 6.8 in-lb.
4. Complete the process by **Installing the front case**.

Boardstack *(continued)*

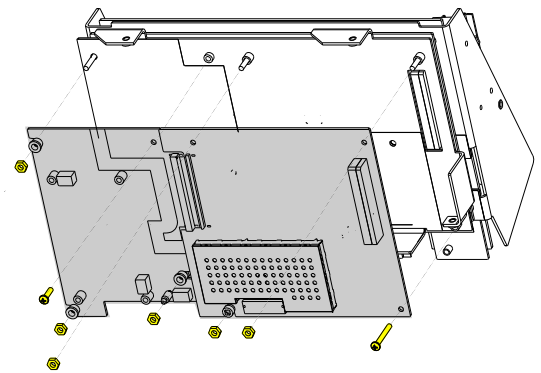
A10 SpO2 Module Diagram

REF 21300-007444



Boardstack *(continued)*

A02 Patient Parameter and A06 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 A06 OEM/SpO2 assemblies:

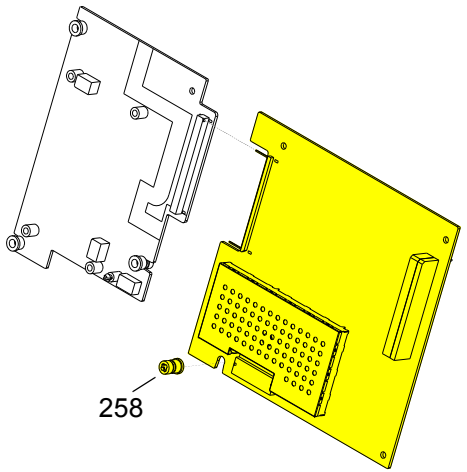
1. Disconnect the W05 SpO2 Flex Cable from the A06 OEM/SpO2 Assembly at J54 by removing the screw (255).
2. Disconnect the W06 ECG wire harness from the A02 PP PCB at J23.
3. Remove and discard the 4-40 x 0.937 screw (125). Remove the three 4-40 nuts (161) from the A02 Patient Parameter PCB.
4. If the device is equipped with the A06 OEM/SpO2 option, remove the Nomex shield (262) by removing the two washers (264) and nuts (161).

   Note: **Remove the A10 SpO2 module** if replacing the A06 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)*

A02 Patient Parameter and A06 OEM/SpO2 Assembly Removal *(continued)*



6. Inspect the orange parameter ISO mount (258) installed in the A02 Patient Parameter PCB. Verify the mount is in good condition.
7. If the device is equipped with the A06 OEM/SpO2 option:
   a. Inspect the three, white, OEM ISO mounts (149) installed in the A06 OEM PCB. Verify the mounts are in good condition.
   b. Separate the A02 Patient Parameter PCB from the A06 OEM/SpO2 assembly at J24.

Note: If replacing the A02 Patient Parameter PCB or A06 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)*

A02 Patient Parameter and A06 OEM/SpO2 Assembly Installation

To install the A02 Patient Parameter and optional A06 OEM/SpO2 assembly:

1. Make sure the orange parameter ISO mount (258) is installed on the A02 Patient Parameter PCB with the square end facing out.
2. If the device is equipped with the A06 OEM/SpO2 option:
   a. Make sure the three, white, OEM ISO mounts (149) are installed on the A06 OEM PCB with the square ends facing out.
   b. Connect the A02 Patient Parameter to the A06 OEM/SpO2 assembly at J24.
3. Install the A02 Patient Parameter (OEM/SpO2) PCB onto the five standoffs (129) 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 A06 OEM/SpO2 option:
   a. **Install the A10 SpO2 module**, if previously removed.

(Continued on next page)

Boardstack *(continued)*

A02 Patient Parameter and A06 OEM/SpO2 Assembly Installation *(continued)*

b. Install the Nomex shield (262) onto the OEM PCB by securing it with two washers (264) and nuts (161); 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 (161) and new 4-40 x 0.312 screw (252) onto the OEM PCB; torque to 4 in-lb.

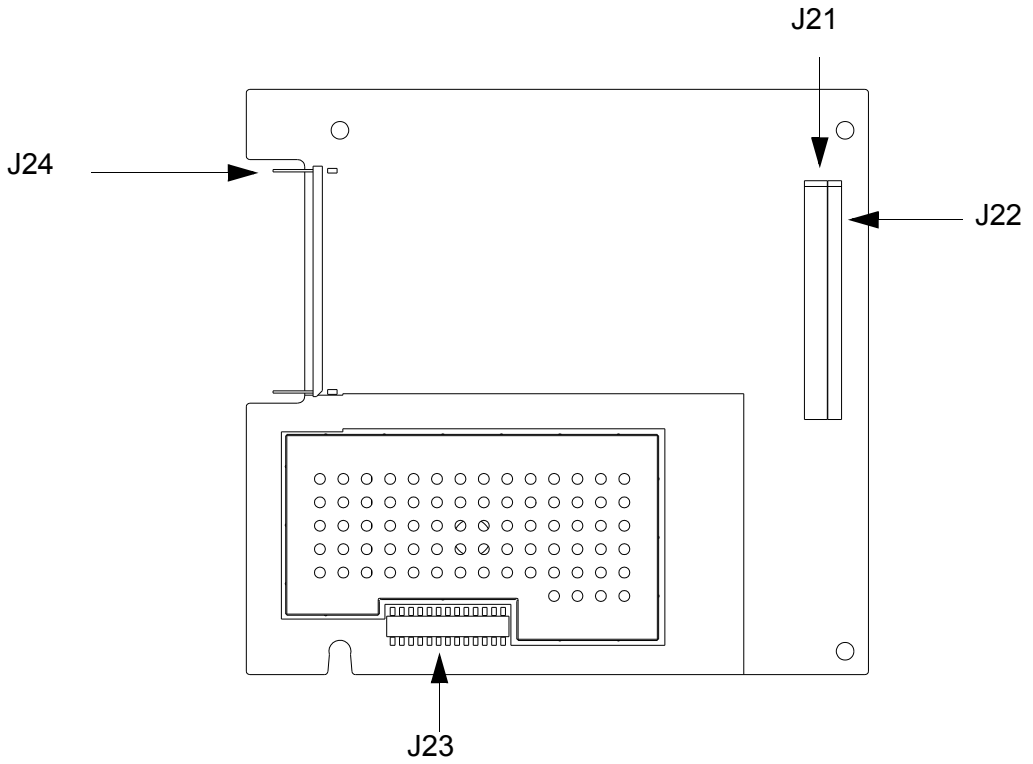
5. If the device is NOT equipped with the A06 OEM/SpO2 option, make sure the boardstack shield is secured with two nuts (161) along the left side only; torque to 6.8 in-lb.
6. Install the three remaining 4-40 nuts (161) and new 4-40 x 1.00 screw (125) onto the A02 Patient Parameter PCB; torque to 6.8 in-lb.
7. Connect the W05 SpO2 Cable (if included) to the OEM PCB at J54 and fasten with a screw (255); torque to 6.5 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)*

A02 Patient Parameter PCB Diagram

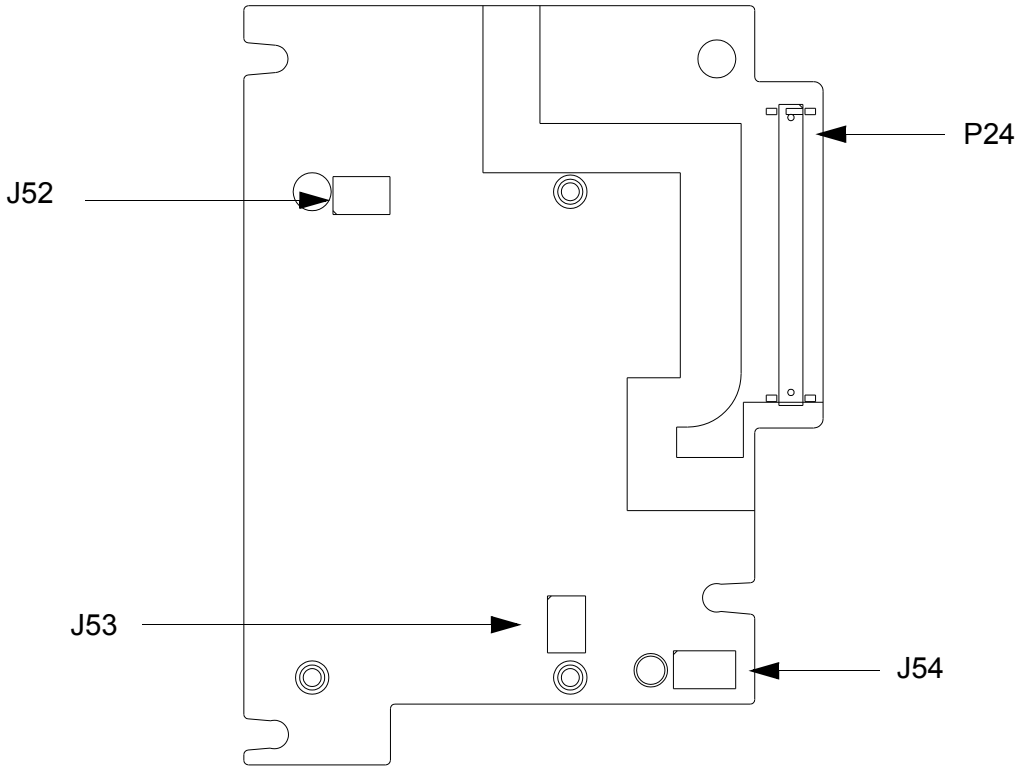
REF **21330-001558**
(RoHS)



Boardstack *(continued)*

A06 OEM Interface
PCB Diagram

REF **21330-001557**
(RoHS)



Boardstack *(continued)*

Coin Cell Battery Replacement

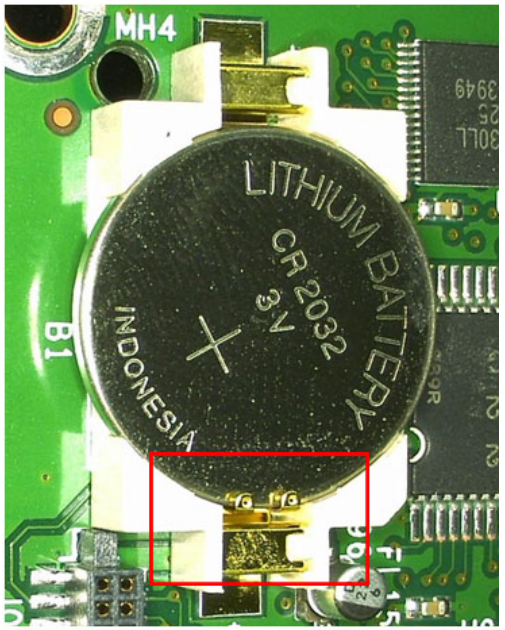
Note: Remove the following assemblies before beginning this disassembly:

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

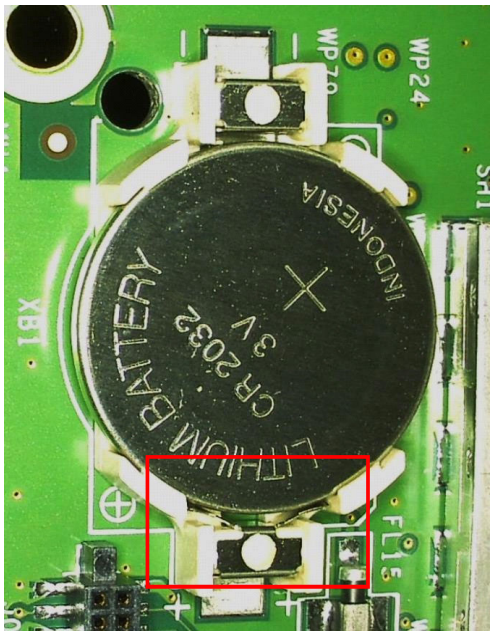
To replace the coin battery:

1. Remove the patient parameter shield (127).
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)*



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)

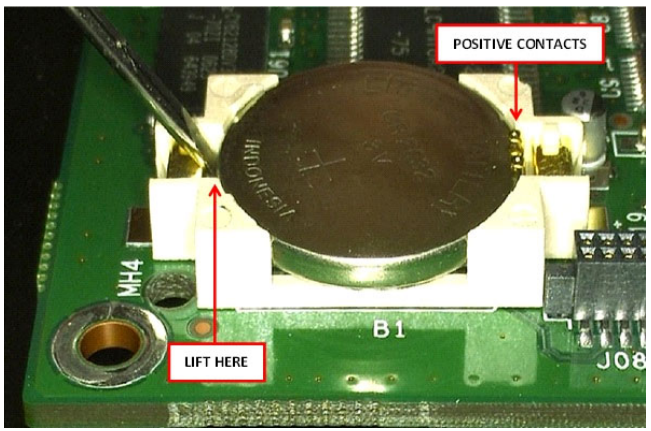
3. Replace the coin cell battery in accordance with **Replacement Procedure A** for Keystone holder, or **Replacement Procedure B** for Renata holder.

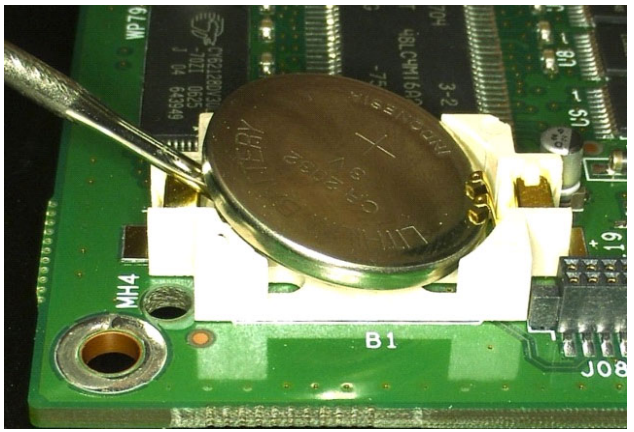
Boardstack *(continued)*

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.

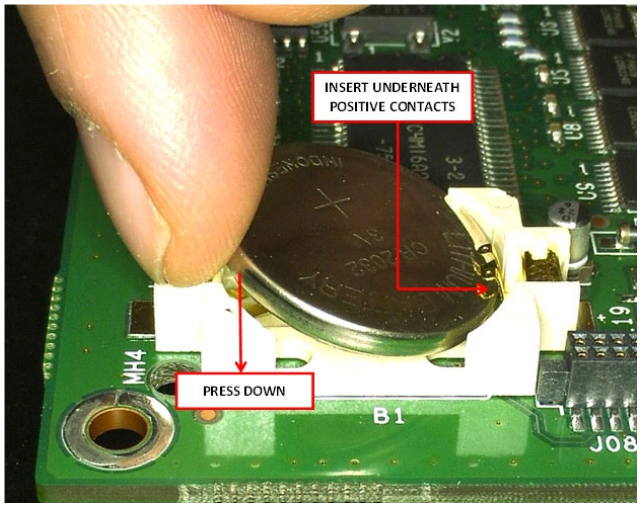
1. Push battery gently toward the positive side of battery holder while using a flat screwdriver to lift up the battery closest to the negative side of the holder, until the battery releases from the holder.





Boardstack *(continued)*

2. Install the new coin battery (344) 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.



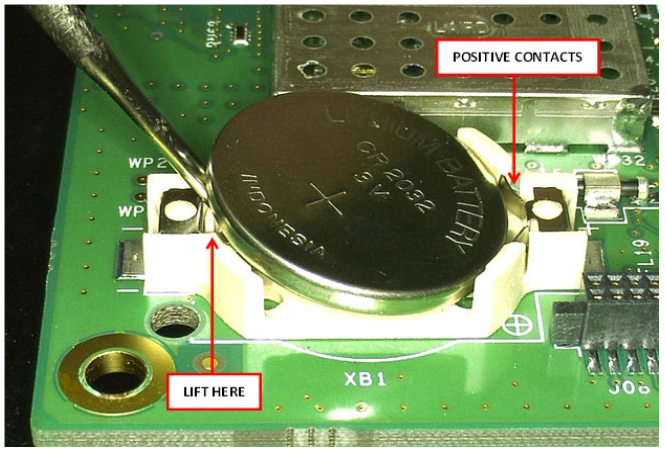
3. After the battery has been replaced, check the voltage on the coin cell battery holder circuit with a multi-meter to confirm that the battery is installed correctly and is making contact with the battery holder.
4. Replace the PCB shield (127).
5. **Install the A02 Patient Parameter PCB and A06 OEM PCB**.
6. **Install the A10 SpO2 Module** (if previously removed).

Boardstack *(continued)*

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

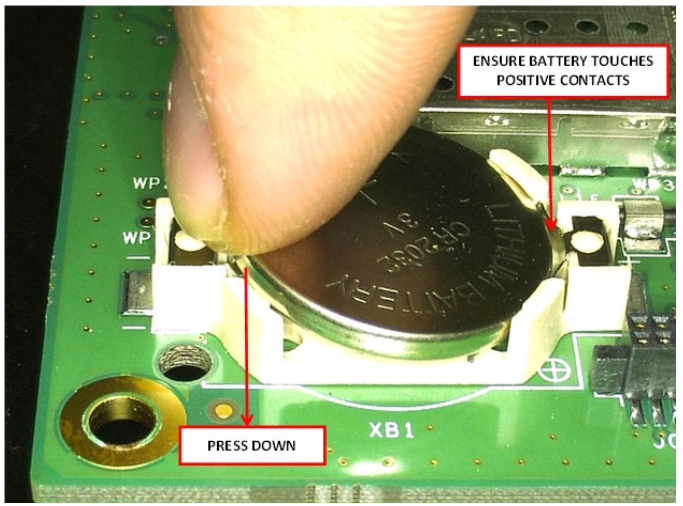
Replacement Procedure B - Renata

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)*

2. Install the new coin cell battery (344) 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.



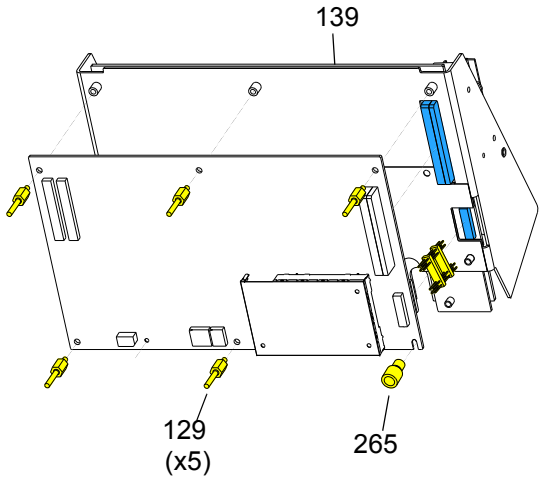
3. After the battery has been replaced, check the voltage on the coin cell battery holder circuit with a multi-meter to confirm that the battery is installed correctly and is making contact with the battery holder.
4. Replace the PCB shield (127).
5. **Install the A02 Patient Parameter PCB and A06 OEM PCB**.

Boardstack *(continued)*

6. **Install the A10 SpO2 Module** (if previously removed).
7. Complete the process by **Installing the front case**.

Boardstack *(continued)*

A01 System PCB Removal



Note: Remove the following assemblies before beginning this disassembly:

- **Top case**
- **Front case**
- **Boardstack** assembly
- **A02 Patient Parameter PCB** (and A06 OEM/SpO2 assembly, if applicable)

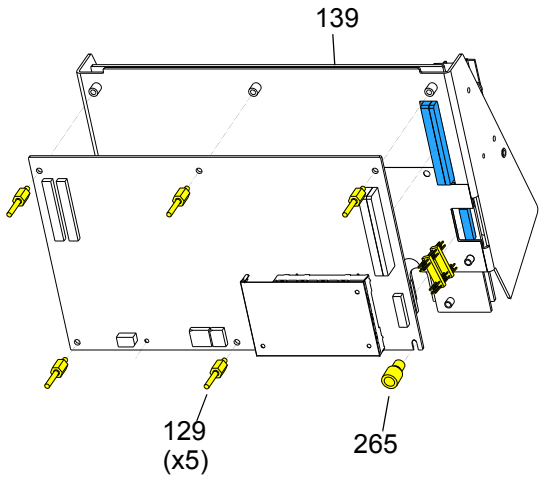
To remove the A01 System PCB:

1. Remove the PCB shield (127).
2. Remove and discard the five threaded standoffs (129) from the A01 System PCB.
3. Remove the round, snap-in standoff (265) from the A01 System PCB.
4. Remove the A01 System PCB from the PCB support bracket (139).
5. Locate the 8-pin stack connector (135) (connects the A01 System PCB J03 with the A04 Therapy PCB at J15), and safeguard it for reuse.

   Note: The 8-pin stack connector may remain connected to the A04 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)*

A01 System PCB Installation



To install the A01 System PCB:

1. Ensure that the plastic standoff (265) is correctly positioned, large end up, on the A01 System PCB.
2. Insert the short end of the 8-pin stack connector (135) into the A04 Therapy PCB at J15.
3. Carefully position the A01 System PCB over the PCB support bracket (139), 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 (129), 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 (127) by sliding it down the five threaded standoffs on the A01 System PCB.

(Continued on next page)

Boardstack *(continued)*

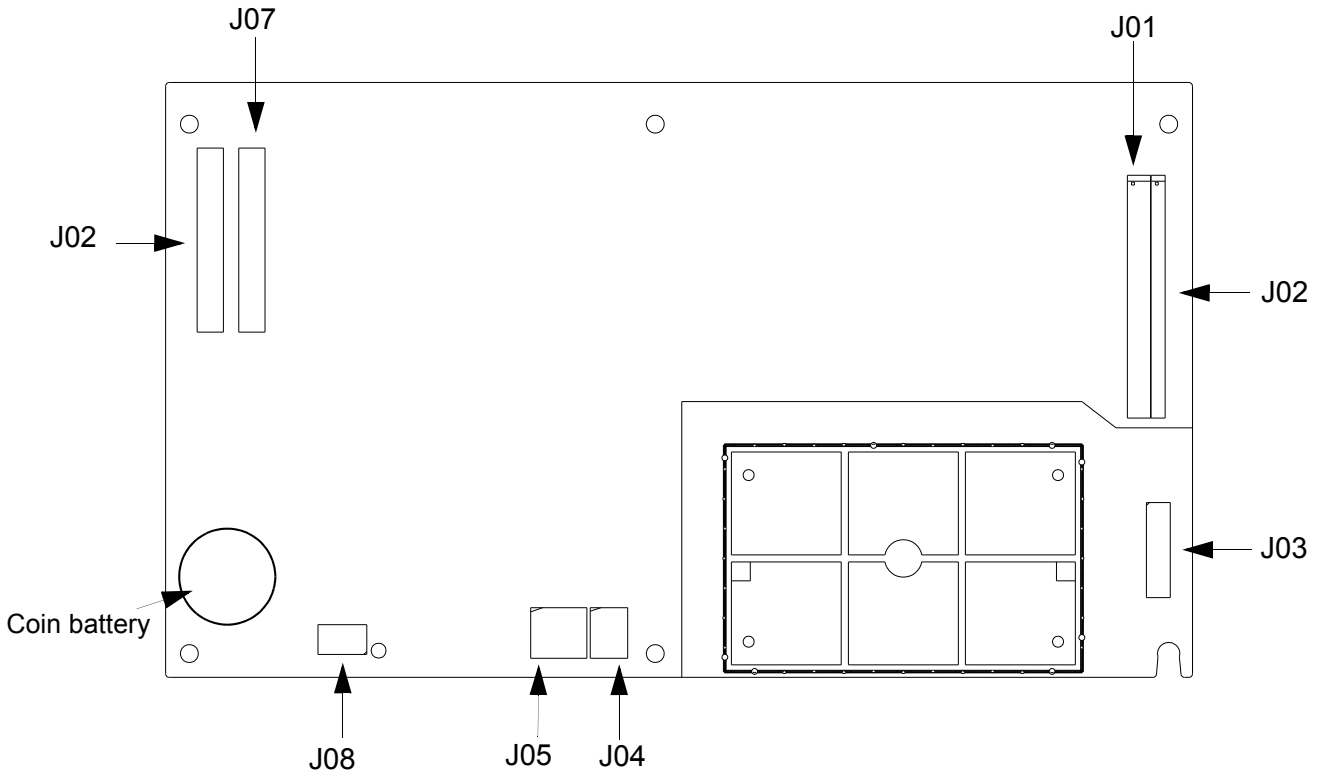
A01 System PCB Installation *(continued)*

7. **Install the A02 Patient Parameter PCB** and A06 OEM PCB assembly.
8. **Install the A10 SpO2 Module** (if previously removed).
9. **Install the Boardstack Assembly**.
10. Complete the process by **Installing the front case**.

Boardstack *(continued)*

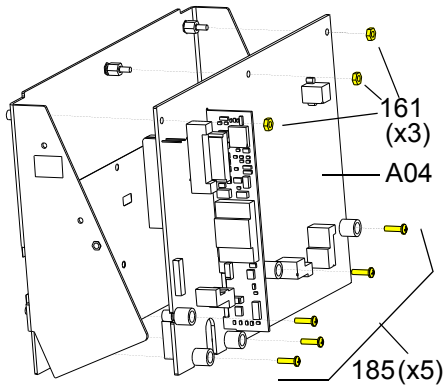
A01 System PCB Diagram

REF **21330-001561** (RoHS)



Boardstack *(continued)*

A04 Therapy PCB Removal



Note: Remove the following assemblies before beginning this disassembly:

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

To remove the A04 Therapy PCB:

1. Remove and discard the five 4-40 x 0.500 screws (185) located inside the five insulated standoffs.

   Note: The standoffs should remain with the A04 Therapy PCB.

2. Remove the three 4-40 nuts (161) from the metal standoffs along the top edge of the A04 Therapy PCB (see illustration B at left).
3. Remove the A04 Therapy PCB from the PCB support bracket (139).
4. Locate the 8-pin stack connector (135) (connecting the A01 System PCB at J3 with the A04 Therapy PCB at J15) and safeguard it for reuse.

(Continued on next page)

Boardstack *(continued)*

A04 Therapy PCB Removal *(continued)*

Note: The 8-pin stack connector may remain connected to the A04 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.

A04 Therapy PCB Installation

To install the A04 Therapy PCB:

1. If you are replacing the PCB support bracket (139), install three new standoffs (145), 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 (149) 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 (135) 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)

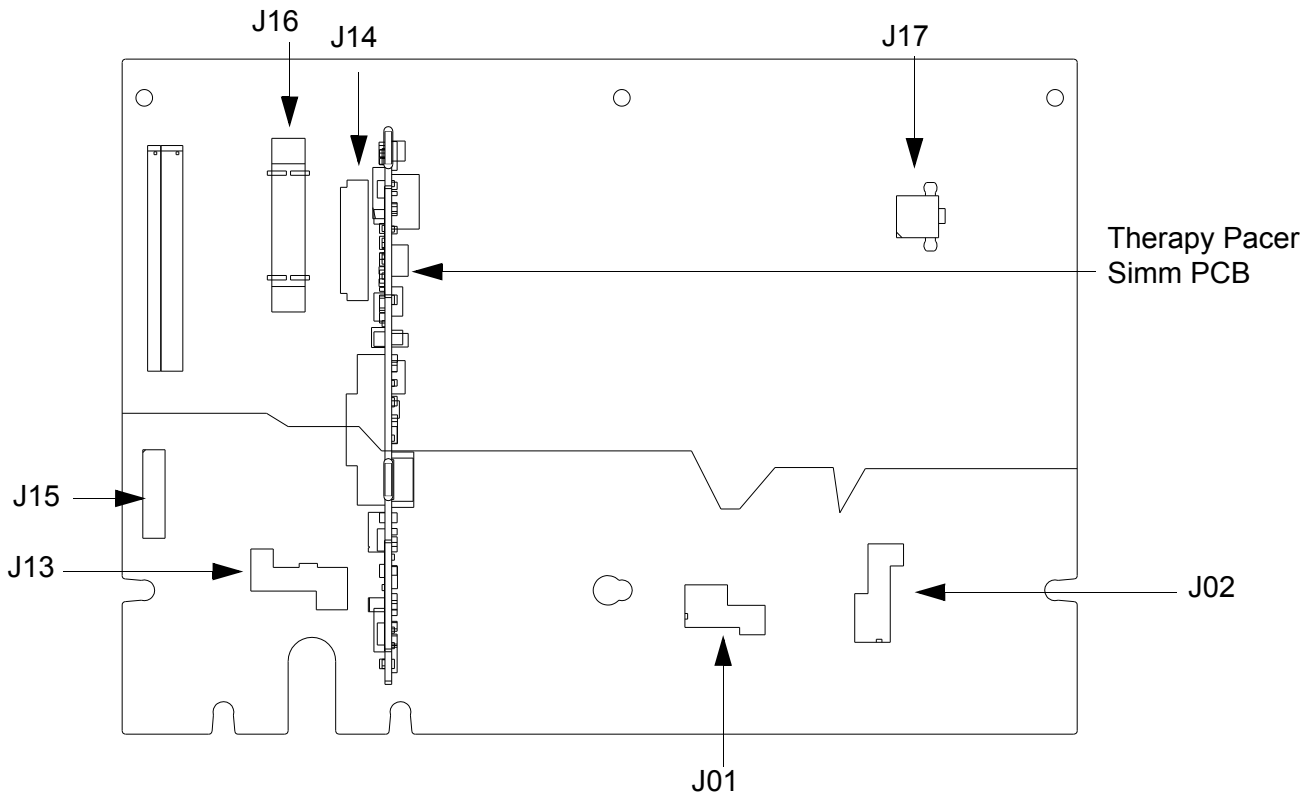
Boardstack *(continued)*

A04 Therapy PCB Installation *(continued)*

3. Carefully align the A04 Therapy PCB with the PCB support bracket (139) and press it into position. As the A04 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 (185) in the five insulated standoffs (149); torque to 6.8 in-lb.
5. Install the three 4-40 nuts (161) onto the metal standoffs along the top edge of the A04 Therapy PCB; torque to 6.8 in-lb.
6. **Install the Boardstack Assembly**.
7. Complete the process by **Installing the front case**.

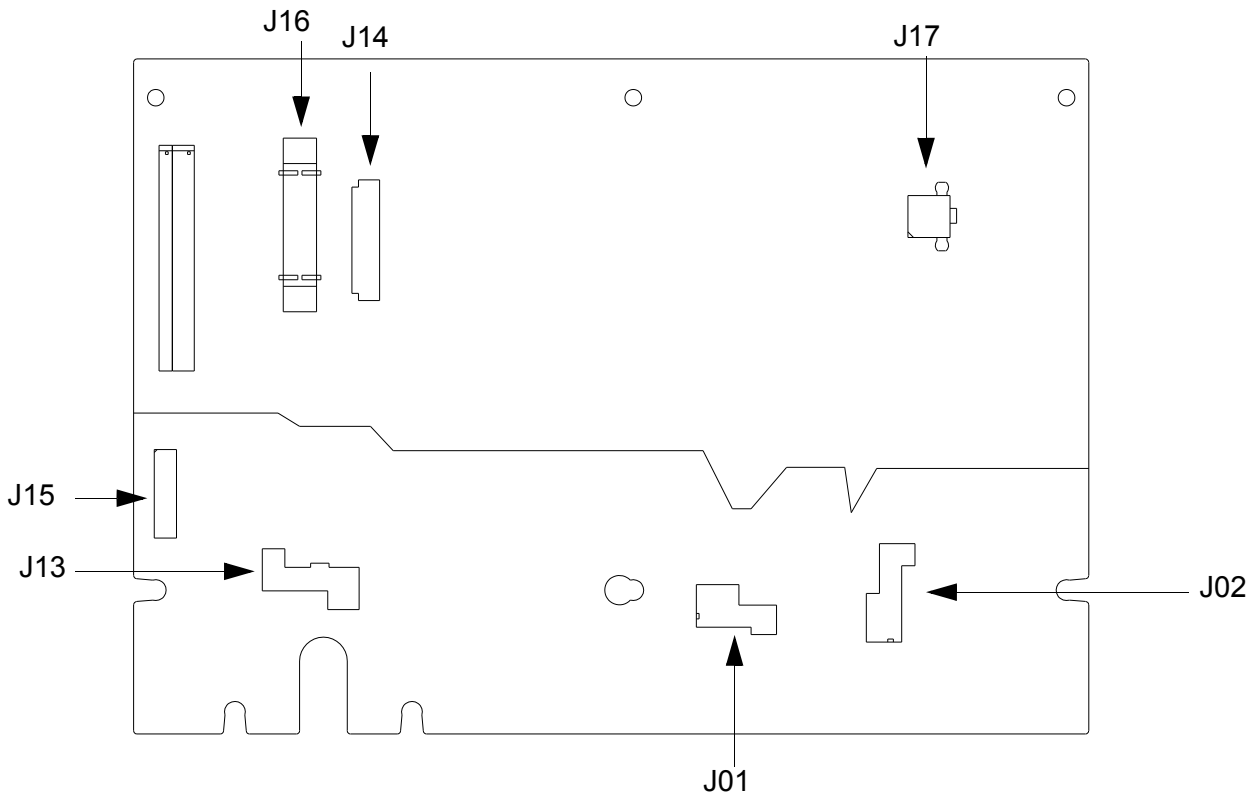
Boardstack *(continued)*

A04 Therapy PCB
Diagram (With Pacing)
REF **21330-001560**
(RoHS)



Boardstack *(continued)*

A04 Therapy PCB Diagram (Without Pacing)
REF **21330-001563** (RoHS)



Bottom Case

Assembly Diagram (Modules)

Bottom Case Disassembly

Bottom Case Reassembly

A12 Printer Module Removal

A12 Printer Module Installation

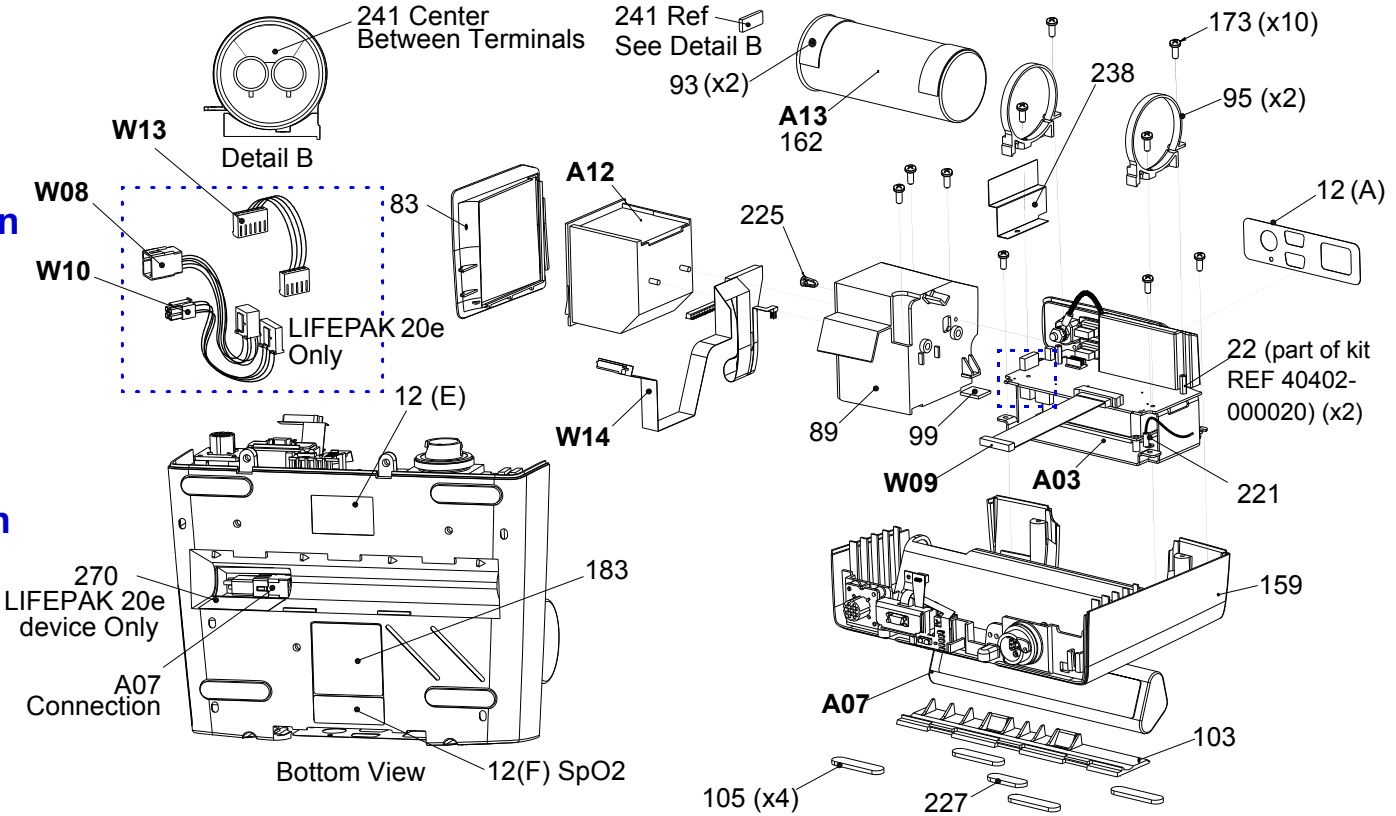
- Printer
- Printer flex cable
- Printer bezel
- Printer shroud

A03 Power Module Removal

A03 Power Module Installation

A13 Energy Capacitor Removal

A13 Energy Capacitor Installation



Bottom Case *(continued)*

Assembly Diagram (Connectors)

A07 Battery Replacement

W01 Therapy Connector Removal

W01 Therapy Connector Installation

W06 ECG Connector Removal

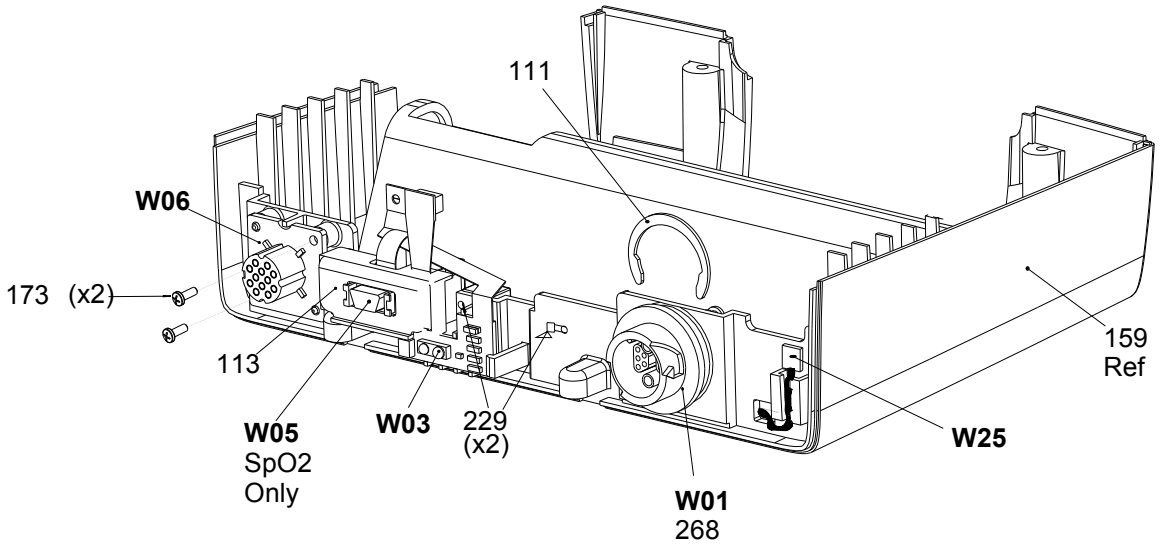
W06 ECG Connector Installation

W05 SpO2 Connector Removal

W05 SpO2 Connector Installation

W03 IrDA Assembly Removal

W03 IrDA Assembly Installation



Bottom Case *(continued)*

Parts List

Item	Quantity	REF	Part Description	Note
A03	1	21330-001569	Power Module Assy, LIFEPAK 20e	**Part of kit REF 40402-000052 (RoHS)**
A07	1	11141-000112	Battery Pack – Li-ion, LIFEPAK 20e	
A12	1	21240-000001	Printer - 50MM, Thermal Printhead	
A13	1	21300-004232	Energy Storage Capacitor	**Part of kit REF 40402-000021**
W01	1	21300-007366	Therapy Connector Assembly	**Part of kit REF 40402-000036 (RoHS)**
W03	1	21300-004235	IrDA Flex Assembly	(RoHS)
W05	1	21300-004234	SpO2 Flex Assembly	**Part of Masimo SpO2 Connector Repair kit REF 40402-000014**
W06	1	21330-001521	ECG 7-Contact Receptacle	(RoHS)
W08	1	21330-001166	Battery Cable, LIFEPAK 20e	**Part of kit REF 40402-000032 (RoHS)**
W09	1	21300-004669	Power to Therapy 26-pin Cable	

(Continued on next page)

Bottom Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
W10	1	21330-001165	Power/Therapy Cable, LIFEPAK 20e	**Part of kit REF 40402-000032 (RoHS)**
W11	1	21300-007072	ECG Sync/System Cables	**Part of kit REF 40402-000032 (RoHS)**
W13	1	21330-001164	AC Power Cable, LIFEPAK 20e	**Part of kit REF 40402-000032 (RoHS)**
W14	1	21300-008058	Printer Flex Cable Assembly	
W25	1	21300-008132	Speaker Assembly Harness Ext.	(RoHS)
12	sheet	see note	Label Set (6 labels), LIFEPAK 20e	**Refer to Labels Assembly**
22	2	21300-003883	Standoff-Hex, M/F,4-40,0.188	**Part of kit REF 40402-000020**
83	1	21300-004621	Printer Bezel	
89	1	21300-004306	Printer Shroud	
93	2	21300-007458	Foam Spacer (part of A13 assy)	
95	2	21300-004619	Capacitor Support Bracket	**Part of kit REF 40402-000020**
99	1	21300-004653	EMI Foam Core Gasket	

(Continued on next page)

Bottom Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
103	1	21300-006412	Battery Door, LIFEPAK 20e	
105	4	21300-002137	Mounting Foot	Part of bottom case assembly
111	1	21300-000149	Therapy Retaining Ring	**Part of kit REF 40402-000036 (RoHS)**
113	1	21300-004602	SpO2 Connector Mounting Clip	**Part of kit REF 40402-000014**
159	1	21300-004889	Bottom case assembly	
162	1	21300-004110	Capacitor shield (part of A13 assembly)	**Part of kit REF 40402-000021**
173	12	21300-001038	Machine screw 4-40 x 0.312L	
183	1	21501-002888	Serial number label, LIFEPAK 20e	**Refer to Labels Assembly**
221	1	21300-004255	Grounding strap harness	
225	1	21300-004400	Plastic Fastener	

(Continued on next page)

Bottom Case *(continued)*

Parts List *(continued)*

Item	Quantity	REF	Part Description	Note
227	1	21300-002138	Mounting foot	Attached to battery door (103)
229	2	21300-000499	Cable tie retainer	**Part of kit REF 40402-000021**
238	1	21300-006962	Dielectric shield	**Part of kit REF 40402-000020**
241	1	21300-007794	Poron Foam, Capacitor	**Part of kit REF 40402-000021**
268	1	21300-005784	Seal, Therapy Connector Mount	**Part of kit REF 40402-000036 (RoHS)**
270	1	21501-001625	Label, NIMH Battery Warning	

(Continued on next page)

Bottom Case *(continued)*

Bottom Case Disassembly

To disassemble the bottom case:

1. **Remove the A07 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 A13 Energy Capacitor**.
7. **Remove the A03 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 W25 Speaker Harness Extension Cable**.

Bottom Case *(continued)*

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 Physio-Control representative.
2. Inspect and install the bottom case friction foot pads (105), as needed.
3. Inspect and install the mounting foot (227) to the battery door (103), as needed.
4. **Install the A03 Power Module**.
5. **Install the A13 Energy Capacitor**.
6. **Install the A12 Printer Module**.
7. **Install the W01 Therapy Connector**.
8. **Install the W25 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)

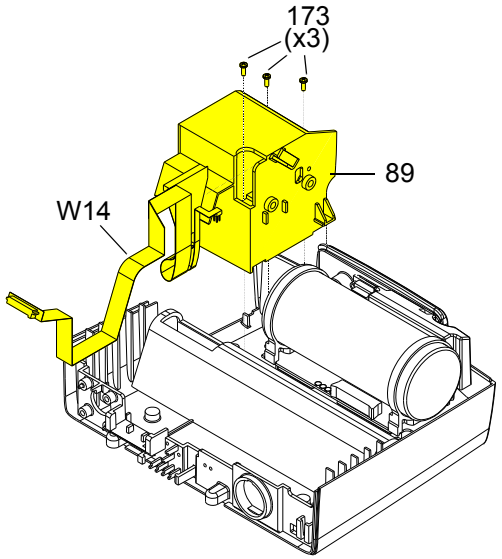
Bottom Case *(continued)*

Bottom Case Reassembly *(continued)*

13. **Install the front case**.
14. **Install the top case**.
15. **Install the A07 Battery**.
16. Review the **labels parts list** and install new labels.
17. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

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 W14 Printer Flex cable is remove, the following assemblies will require disassembly:

- **A07 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 (89).
4. Disconnect the W14 Printer Flex Cable from the printer at printer connection J1.

(Continued on next page)

Bottom Case *(continued)*

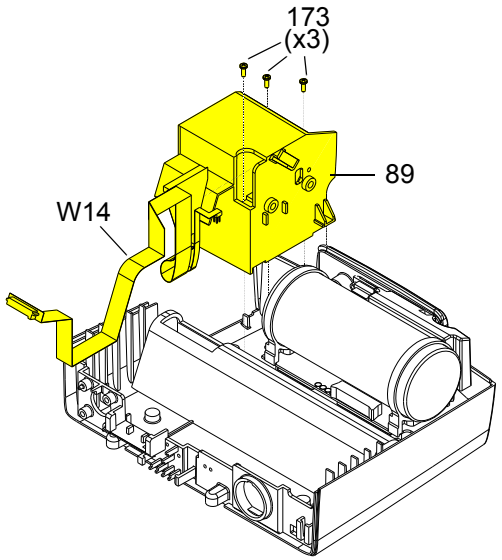
A12 Printer Module Removal *(continued)*

Note: If removing the A12 Printer, the removal process is complete. If removing the printer shroud or the W14 Printer Flex Cable, continue with the removal process until the desired part is removed.

5. Slide the printer bezel (83) up and away from the bottom case.
6. Remove and discard the three 4-40 x 0.312 screws (173) from the bottom of the printer shroud (89).
7. Carefully lift the shroud to access the 4-pin power cable.
8. Disconnect the 4-pin power cable from the A03 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 W14 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 (89) and W14 Printer Flex Cable from the bottom case.
11. Carefully remove the W14 Printer Flex Cable from the printer shroud pulling the J34 connector end through the large shroud cutout.

Bottom Case *(continued)*

A12 Printer Module Installation



Note: If installing the A12 Printer only, start at **step 9**.

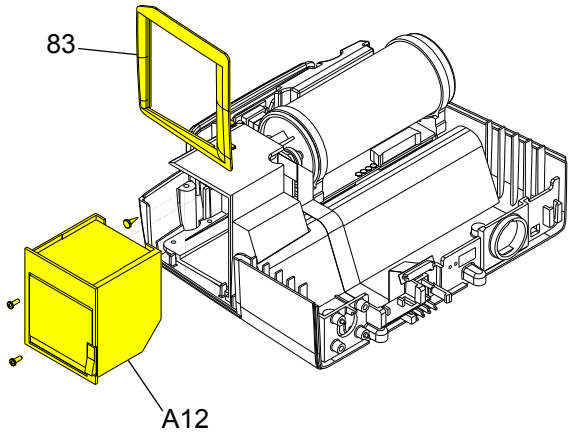
To install the printer module:

1. Insert the J34 connector end of the Printer Flex Cable through the large slot in the printer shroud.
2. Slide the W14 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 A03 Power Module at J45, ensuring that the connector is positioned correctly.
5. Position the printer shroud (89) in the bottom case.
6. Install three new 4-40 x 0.312 screws (173) into the bottom of the printer shroud; torque to 6.8 in-lb.

(Continued on next page)

Bottom Case *(continued)*

A12 Printer Module Installation *(continued)*

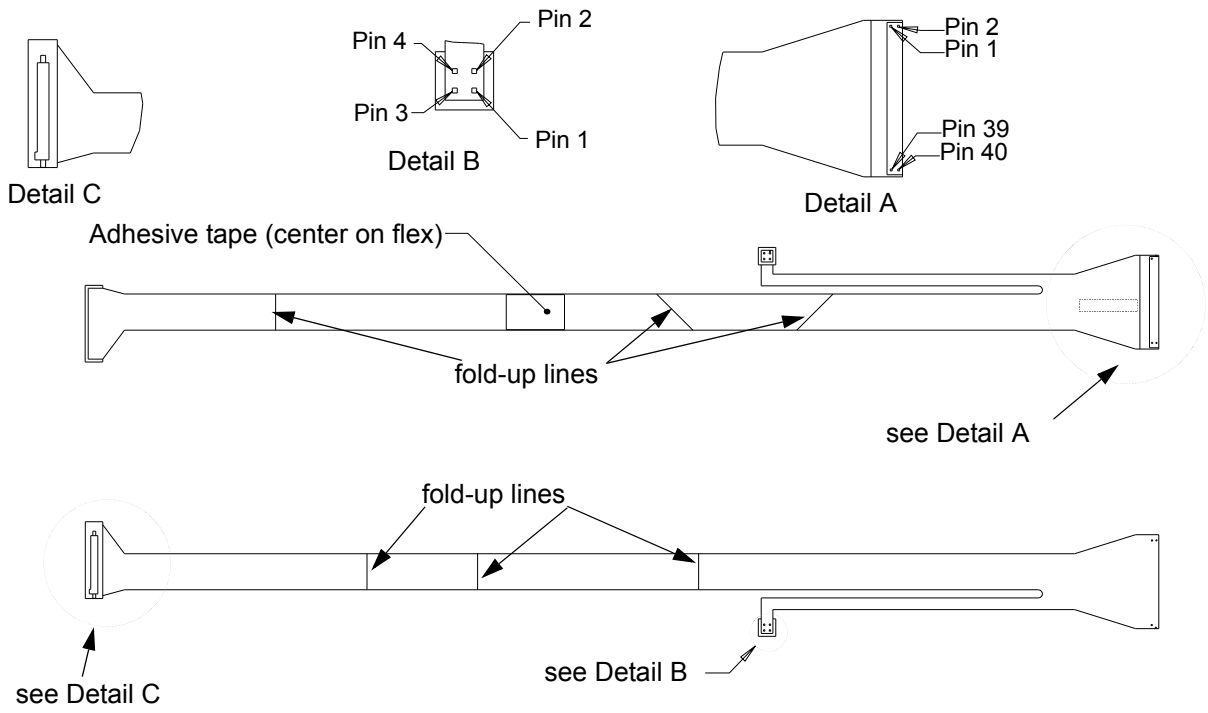


7. If removed, press the fastener (225) into the printer shroud to secure the J45 flex connector.
8. Insert the printer bezel (83) ensuring that it is flush with the bottom case.
9. Connect the W14 Printer Flex Cable to the J1 connector on the printer. The cable should lay flat against the rear of the printer.
10. Ensure that the W14 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 A07 Battery**.
18. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

W14 Printer Flex Cable Diagrams

REF **21300-008058**



Bottom Case *(continued)*

A13 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:

- **A07 Battery**
- **Top case**
- **Front case**

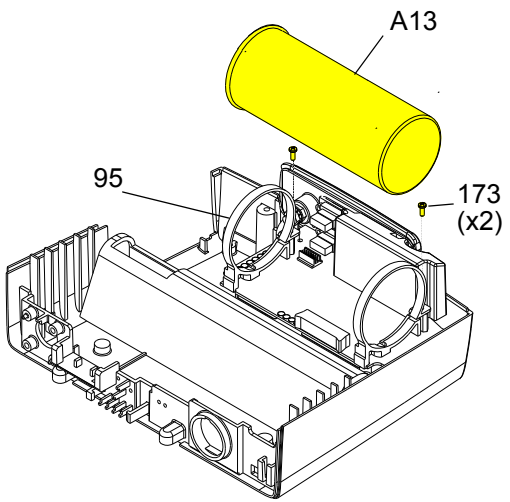
To remove the A13 Energy Capacitor:

1. If the boardstack assembly was not removed, remove and discard the screw from the ground cable (221).
2. Disconnect the W10 Power/Therapy Cable from the A04 Therapy PCB at J17.
3. Pull the boardstack assembly away from the printer shroud (89) and the power module.
4. Disconnect the W07/A13 Capacitor Discharge Cable from the A04 Therapy PCB at J2.

(Continued on next page)

Bottom Case *(continued)*

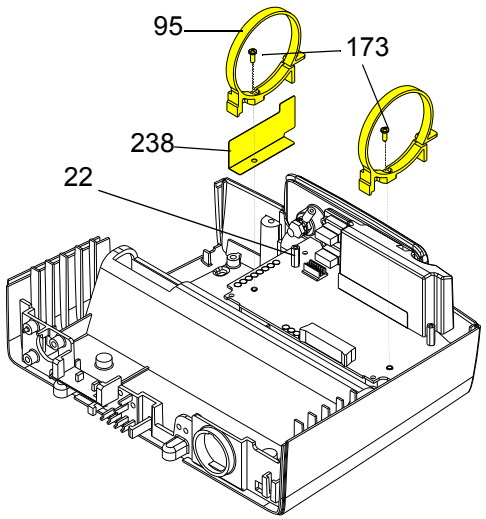
A13 Energy Capacitor Removal *(continued)*



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 (173) from the rear of the capacitor brackets (95).
7. Lift the capacitor (A13) out of the capacitor brackets.
8. Remove the capacitor sleeve with foam tape (162 and 93) from the capacitor.
9. If removing the capacitor brackets (95), remove and discard the two 4-40 × 0.312 screws (173) from the front of the capacitor brackets (95) and remove the capacitor brackets (95) and the capacitor shield (238) (see illustration on next page).

Bottom Case *(continued)*

A13 Energy Capacitor Installation



To install the A13 Energy Capacitor:

1. Ensure that two capacitor bracket standoffs (22) are on the power module.
2. Install the capacitor shield (238) and the two capacitor brackets (95) onto the standoffs using two new 4-40 × 0.312 screws (173); 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 (95) 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 (173) into the capacitor brackets; torque to 6.8 in-lb.

(Continued on next page)

Bottom Case *(continued)*

A13 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 A04 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 A04 Therapy PCB at J17. Reseat the boardstack assembly.
11. Install a new 4-40 × 0.312 screw (173) and fasten the ground cable (221) to the boardstack; torque to 6.8 in-lb.
12. **Install the front case**.
13. **Install the top case**.
14. **Install the A07 Battery**.
15. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

A03 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:

- **A07 Battery**
- **Top case**
- **Printer module**
- **Capacitor (optional removal)**
- **Boardstack (optional removal)**

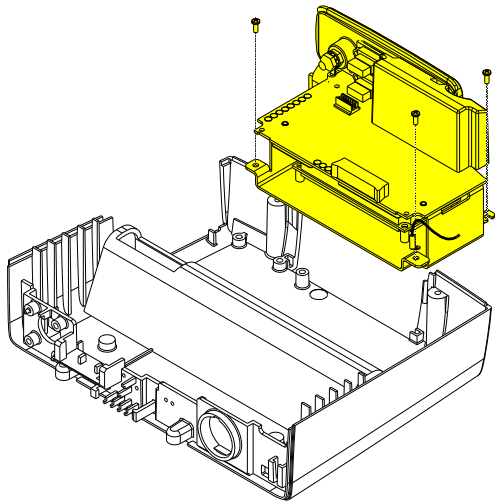
To remove the power module assembly:

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 A04 Therapy PCB at J17.
3. Disconnect the W09 26-Pin Cable from the A04 Therapy PCB at J16.

(Continued on next page)

Bottom Case *(continued)*

A03 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 A13 Energy Capacitor** (complete steps 6 through 9).
6. Remove and discard the forward right 4-40 × 0.312 screw (173) that secures the right side of the power module and grounding harness (221).

   Note: Remove the grounding harness (221) 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 (173) that secures the left side of the power module.
8. Loosen the rear 4-40 × 0.312 screw (173) 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)*

A03 Power Module Installation

To install the power module assembly:

1. Ensure that the right rear corner 4-40 × 0.312 screw (173) 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 (173) in the power bracket's left forward corner; torque to 6.8 in-lb.
4. Insert a 4-40 × 0.312 screw (173) through the grounding strap (221) 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 (173) in the rear right corner; torque to 6.8 in-lb.
6. **Install the A13 Energy Capacitor**, if it was removed.
7. **Install the boardstack**, if it was removed.

Bottom Case *(continued)*

A03 Power Module Installation *(continued)*

8. Connect the 4-pin W10 Power/Therapy Cable connector to the A04 Therapy PCB at J17.
9. **Install the A12 Printer Module**.
10. **Install the front case**.
11. **Install the top case**.
12. **Install the A07 Battery**.
13. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

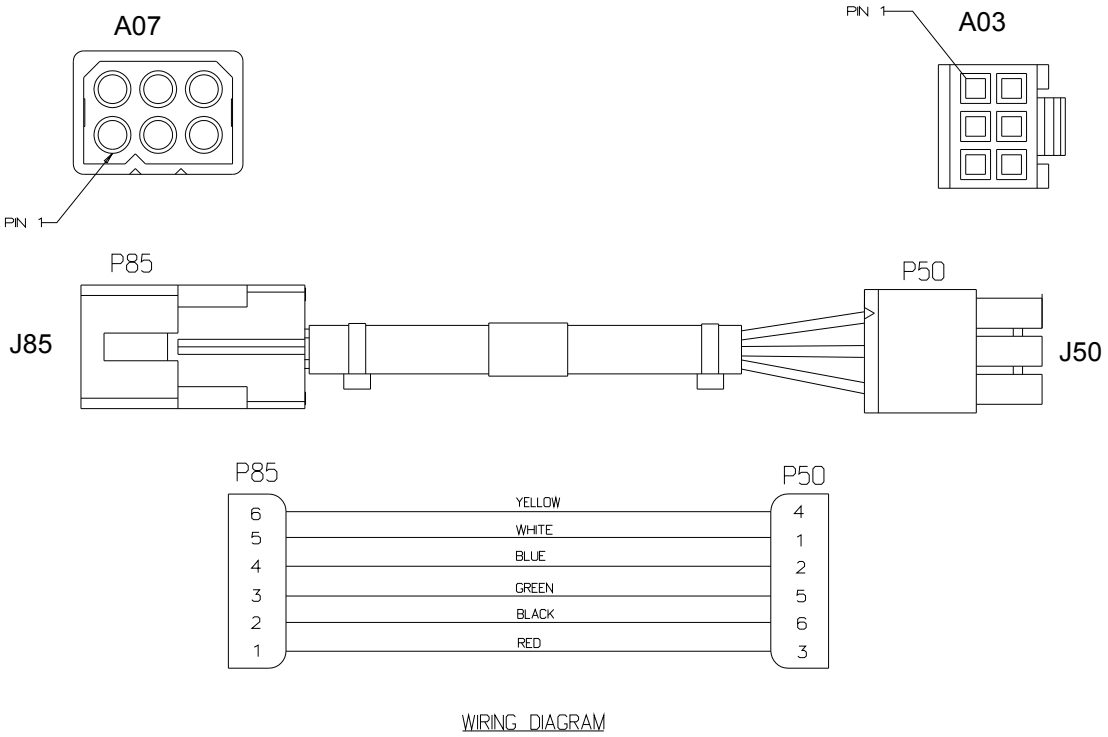
A03 Power Module Diagram

REF **21330-001569** (RoHS)

Bottom Case *(continued)*

W08 Battery Cable Diagrams

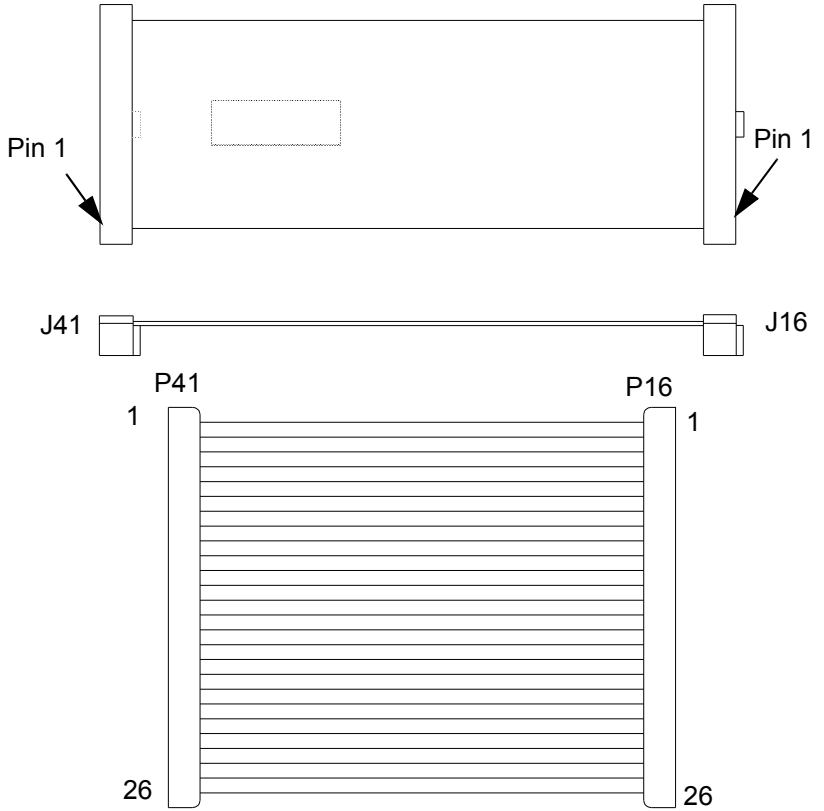
REF **21330-001166**



Bottom Case *(continued)*

W09 26-Pin Cable Diagrams

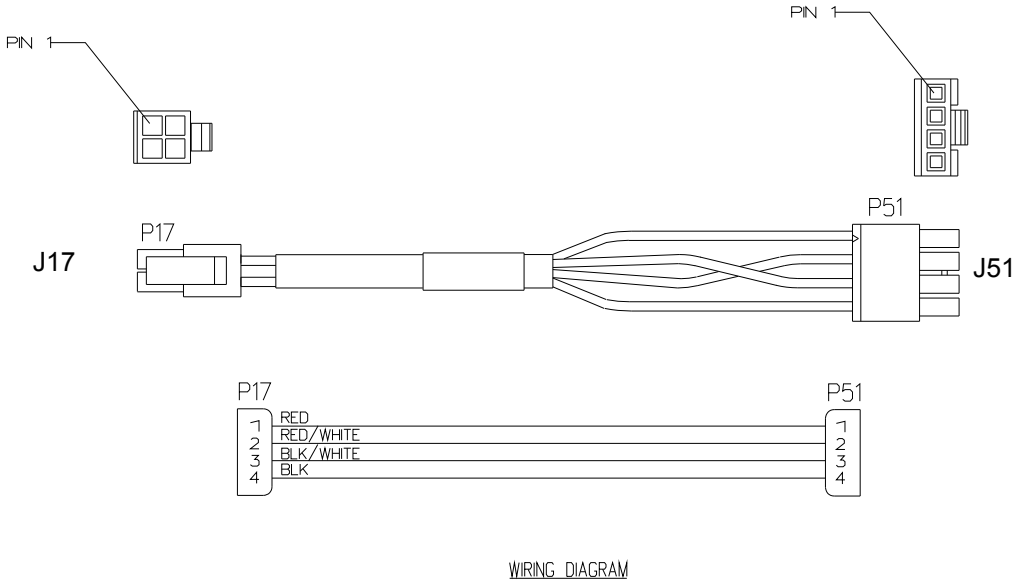
REF **21300-004669**



Bottom Case *(continued)*

W10 Power/Therapy Cable Diagrams

REF **21330-001165**

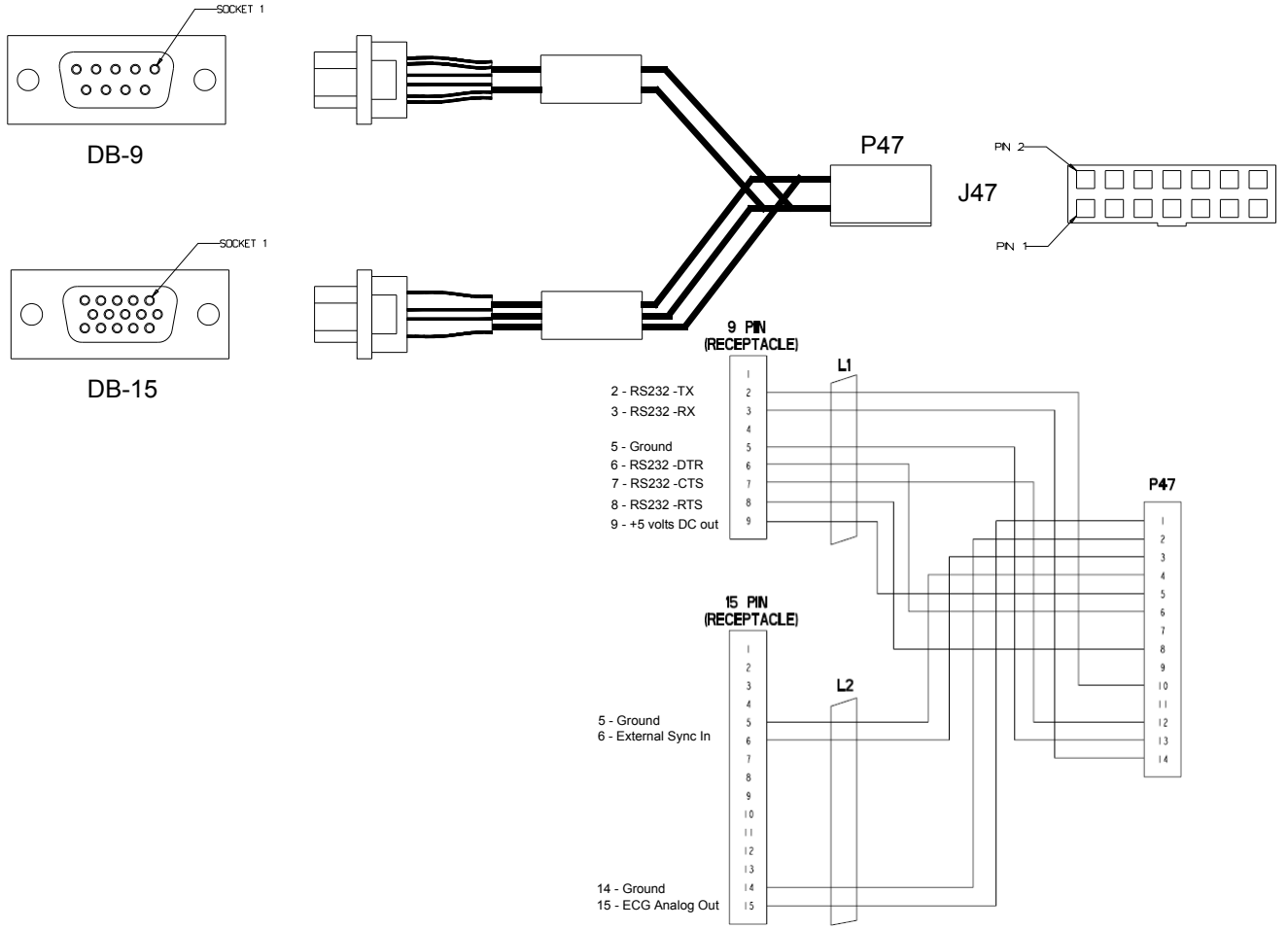


WIRING DIAGRAM

Bottom Case *(continued)*

W11 ECG Sync/System Cables Diagrams

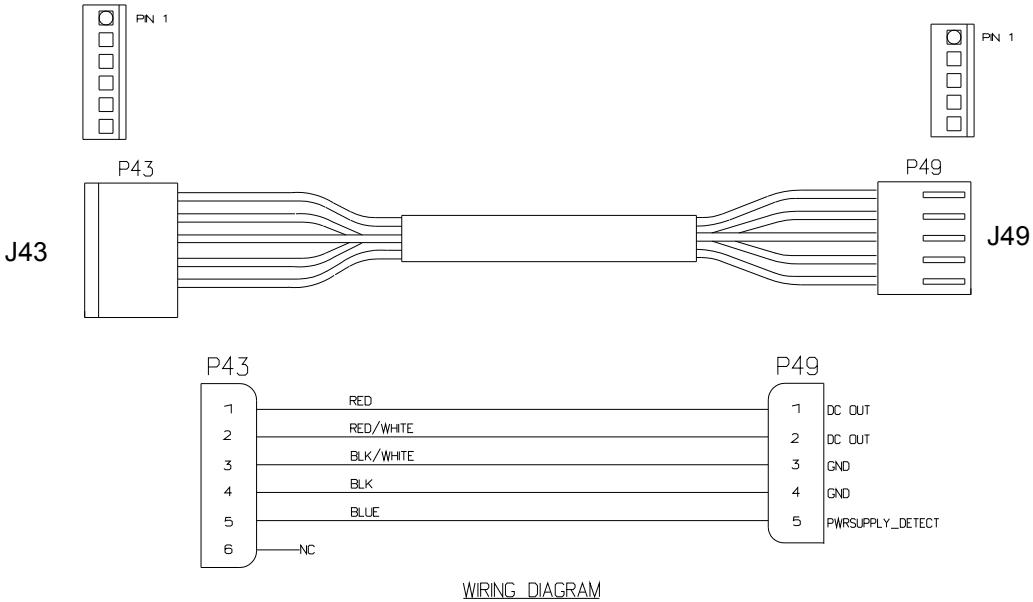
REF **21300-007072**



Bottom Case *(continued)*

W13 AC Power Cable Diagrams

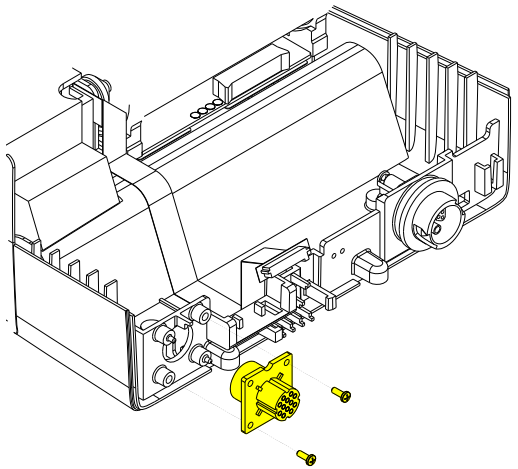
REF **21330-001164**



WIRING DIAGRAM

Bottom Case *(continued)*

W06 ECG Connector Removal



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

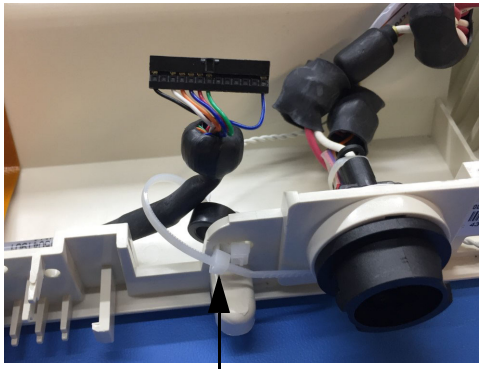
- **A07 Battery**
- **Top case**
- **Front case**
- **Boardstack**

To remove the W06 ECG Connector:

1. Cut the cable tie, then remove and discard the two 4-40 x 0.312 screws (173) 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)*

W06 ECG Connector Installation



REF 21300-000499
Cable Tie Retainer

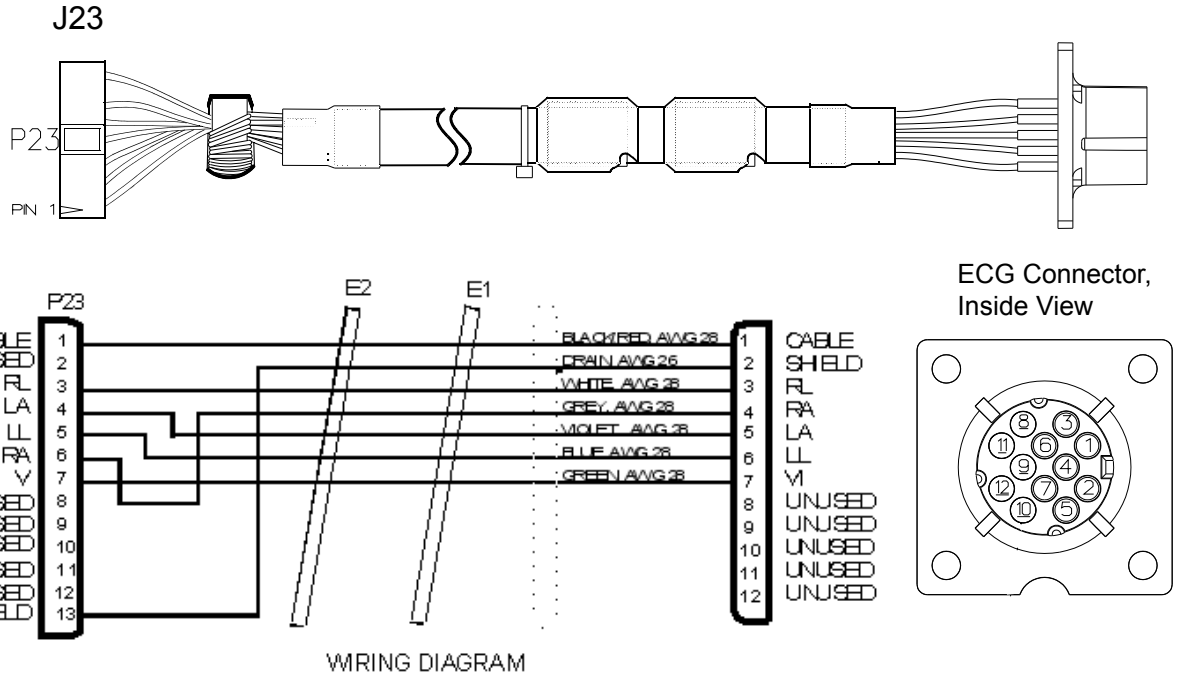
To install the W06 ECG Connector:

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 (173) 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 receptable cable.
6. **Install the boardstack**.
7. **Install the front case**.
8. **Install the top case**.
9. **Install the A07 Battery**.
10. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

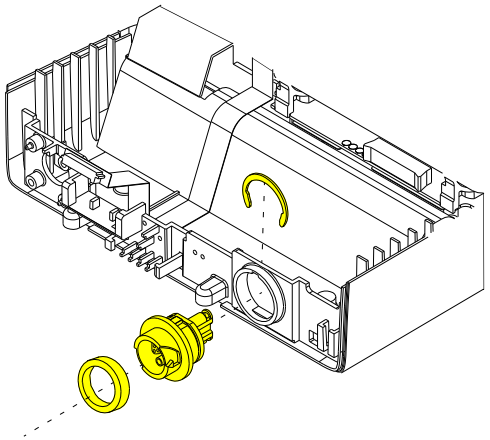
W06 ECG Connector Assembly Diagrams

REF **21330-001521**
(RoHS)



Bottom Case *(continued)*

W01 Therapy Connector Removal



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

- **A07 Battery**
- **Top case**
- **Front case**
- **Boardstack**

To remove the W01 Therapy Connector Assembly:

1. Remove the Therapy Connector Seal (268) from the W01 Therapy Connector.
2. Remove the retaining ring (111) 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)*

W01 Therapy Connector Installation

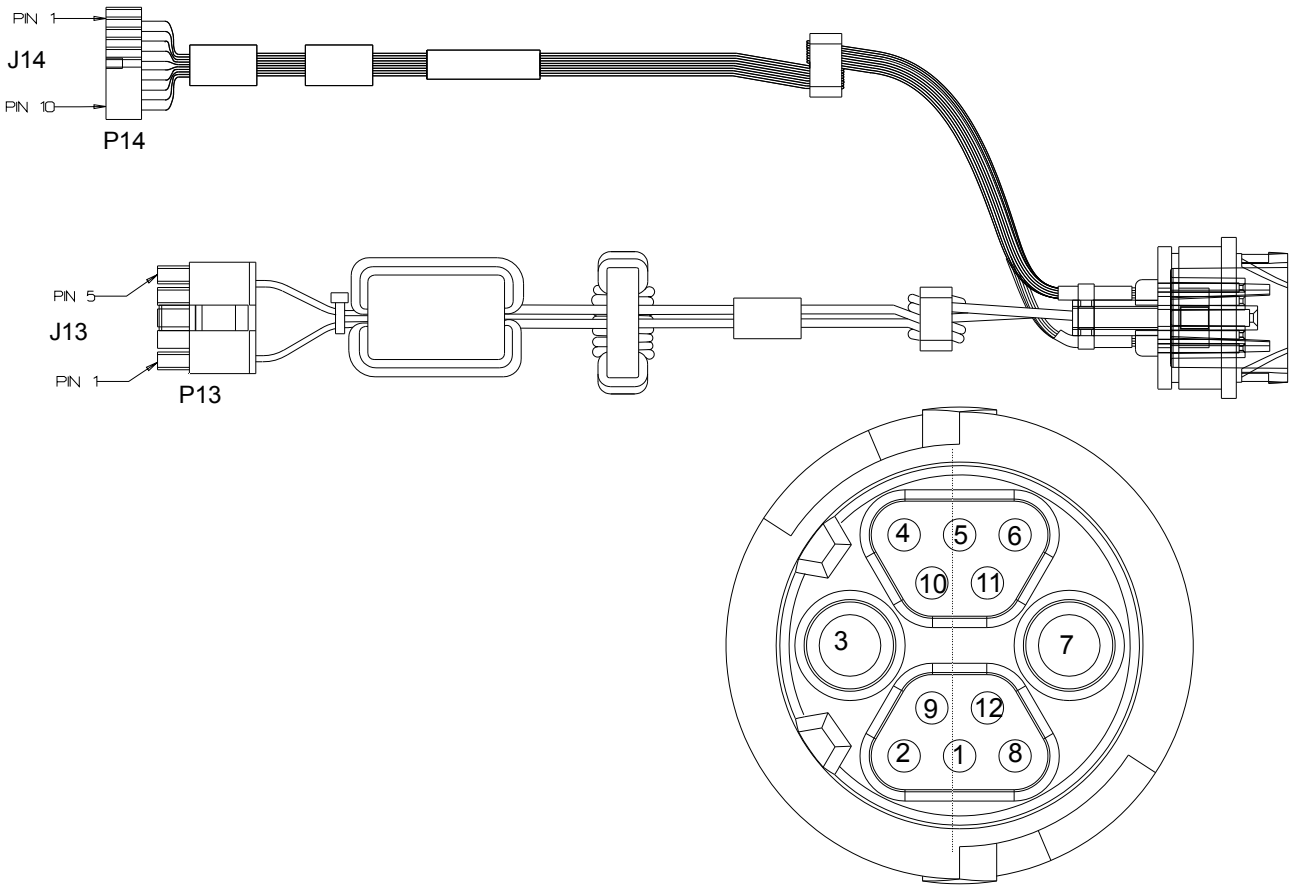
To install the W01 Therapy Connector Assembly:

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 (111) onto the back of the W01 Therapy Connector Assembly.
3. Install the Therapy Connector Seal (268) onto the W01 Therapy Connector.
4. **Install the boardstack**.
5. **Install the front case**.
6. **Install the top case**.
7. **Install the A07 Battery**.
8. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

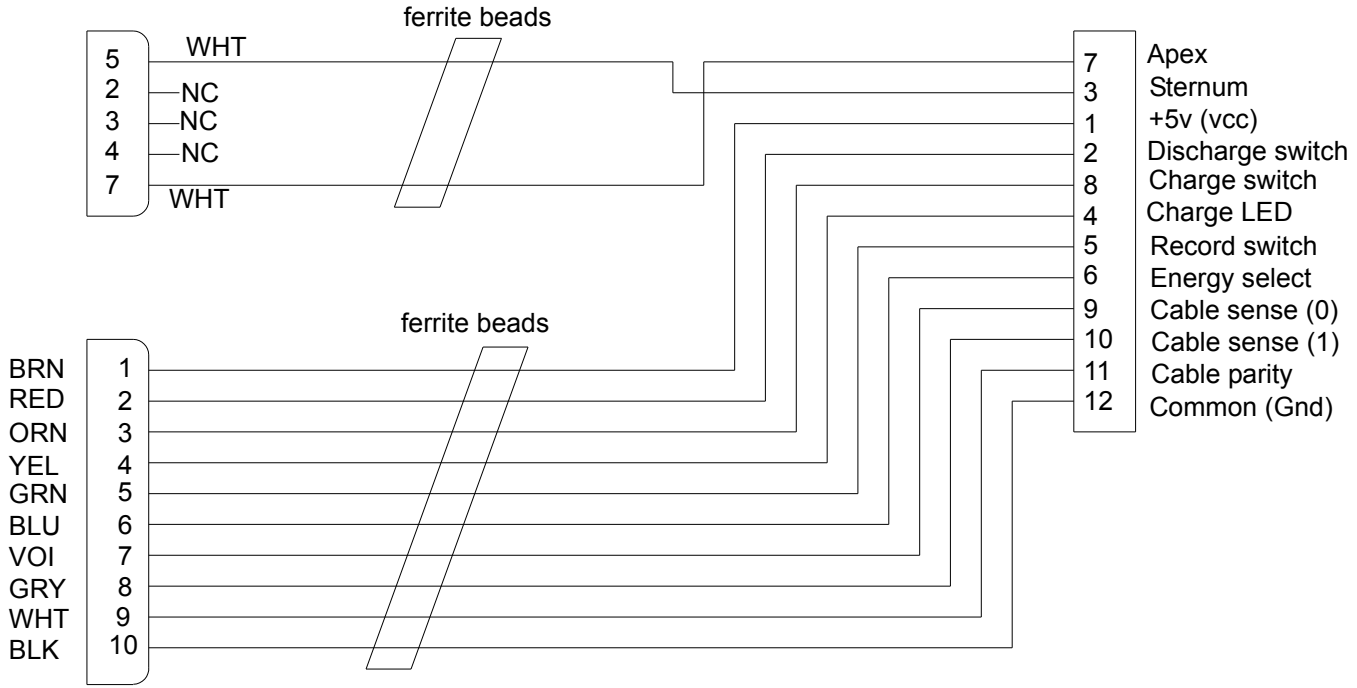
W01 Therapy Connector Assembly Diagrams

REF **21300-007366** (RoHS)



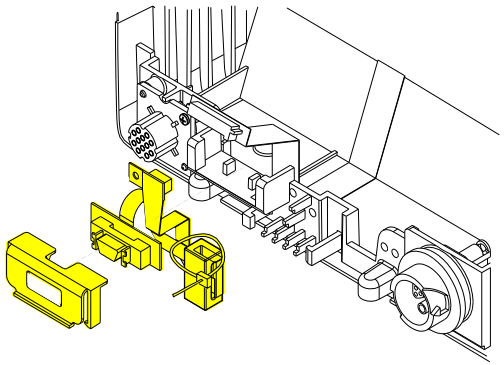
Bottom Case *(continued)*

W01 Therapy Connector Assembly Wiring Diagram



Bottom Case *(continued)*

W05 SpO2 Connector Removal



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

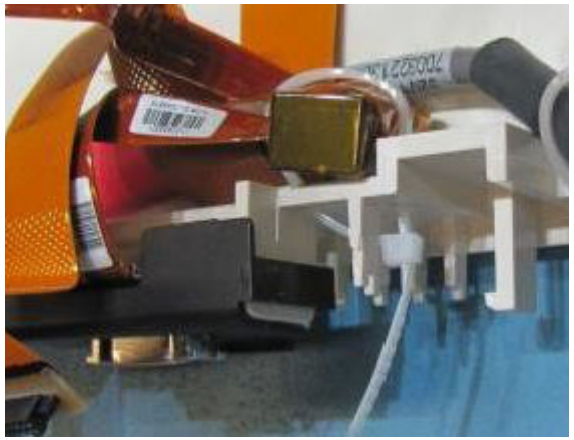
- **A07 Battery**
- **Top case**
- **Front case**
- **Boardstack**
- **W03 IrDA Port**

To remove the W05 SpO2 Connector Assembly:

1. Remove the cable tie retainer (229) 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 (113), 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)*

W05 SpO2 Connector Installation



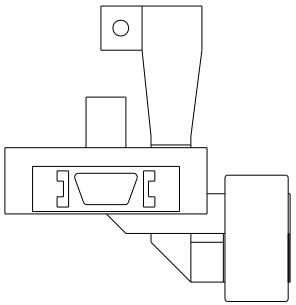
To install the W05 SpO2 Connector Assembly:

1. Place the W05 SpO2 input connector into the locating detail in the bottom case.
2. Position the SpO2 connector mounting clip (113) 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 (229) 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 A07 Battery**.
10. Complete the LIFEPAK 20e Device PIP.

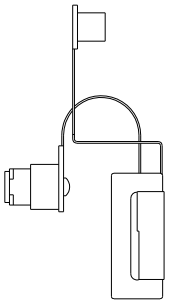
(Continued on next page)

Bottom Case *(continued)*

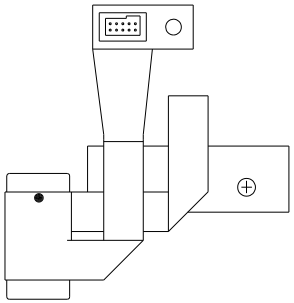
W05 SpO2 Assembly Diagrams
REF **21300-004234**



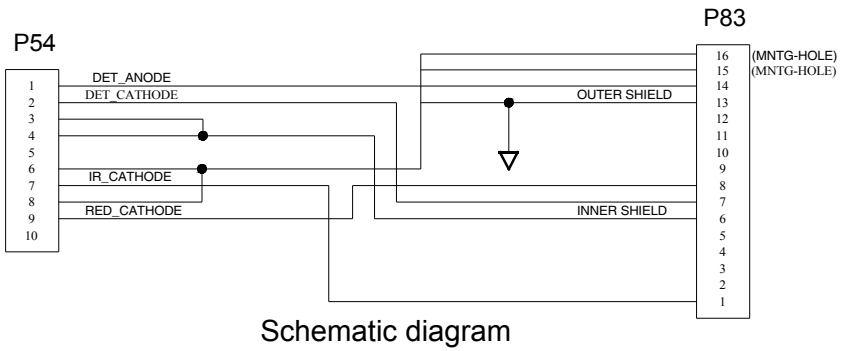
Front view



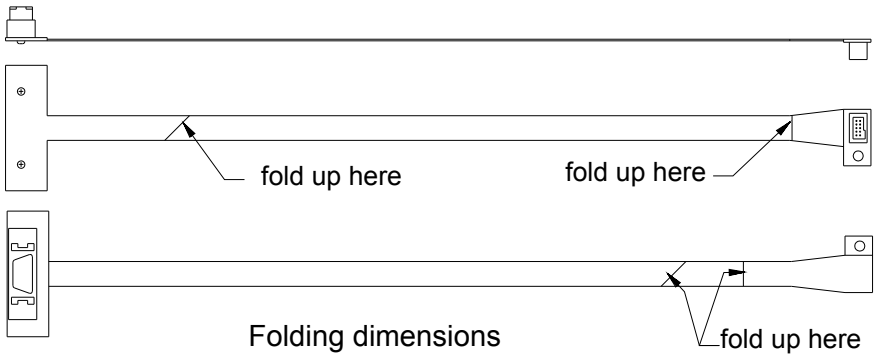
Side view



Back view



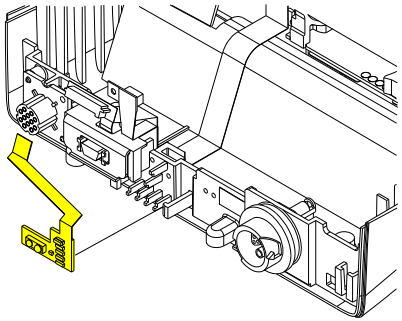
Schematic diagram

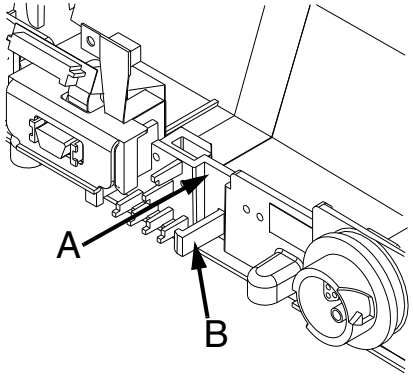


Folding dimensions

Bottom Case *(continued)*

W03 IrDA Assembly Removal





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

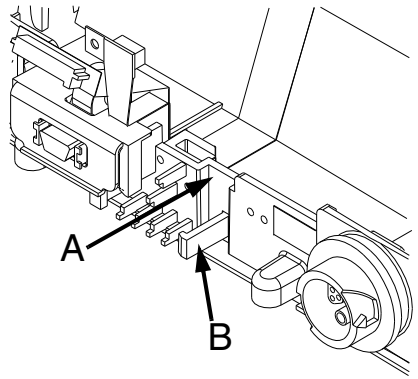
- **A07 Battery**
- **Top case**
- **Front case**
- **Boardstack (optional removal)**

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 (255) using a 3/32 allen 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)*

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 (255) using a 3/32 allen 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)*

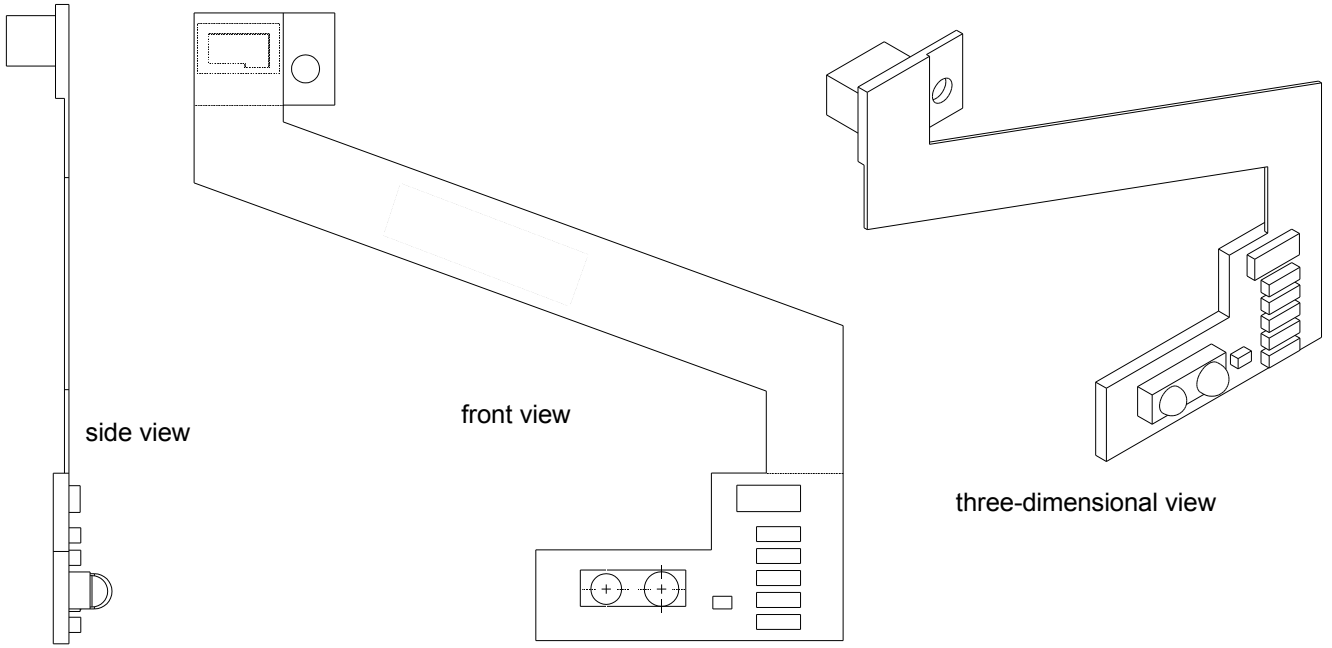
W03 IrDA Assembly Installation *(continued)*

7. **Install the front case**.
8. **Install the top case**.
9. **Install the A07 Battery**.
10. Complete the LIFEPAK 20e Device PIP.

Bottom Case *(continued)*

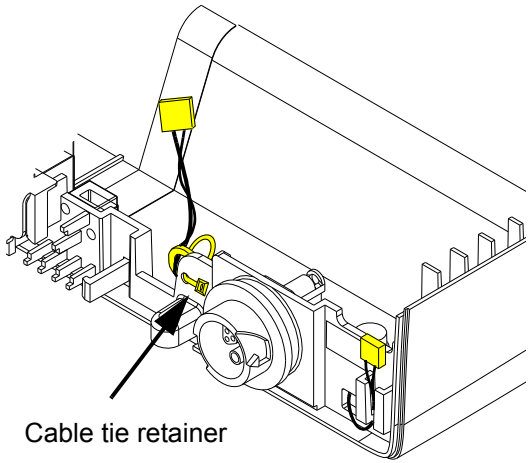
W03 IrDA Assembly Diagrams

REF **21300-004235**



Bottom Case *(continued)*

W25 Speaker Harness Extension Cable Removal



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

- **A07 Battery**
- **Top case**
- **Front case**
- **Boardstack**

Note: To remove the W25 Speaker Harness Extension Cable:

1. Disconnect the W25 Speaker Harness Extension Cable from the W02 Speaker Assembly (part of front case removal).
2. Disconnect the other end of the W25 Speaker Harness Extension Cable from the A01 System PCB at J5 (part of boardstack removal).
3. Cut the cable tie retainer (229) securing the ferrite ring to the bottom case.
4. Remove the connector from the holder and feed the W25 Speaker Harness Extension Cable under the W01 Therapy Connector Assembly. Remove the cable from the bottom case.

Bottom Case *(continued)*

W25 Speaker Harness Extension Cable Installation

To Install the W25 Speaker Harness Extension Cable:

1. Feed the W25 Speaker Harness Extension Cable under the W01 Therapy Connector Assembly.
2. Insert the W25 Speaker Harness Extension Cable into the holder in the bottom case.
3. Install the cable tie retainer (229) 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 A07 Battery**.
8. Complete the LIFEPAK 20e Device PIP.

Final Assembly

Device Labeling Including Label Set (12)

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):

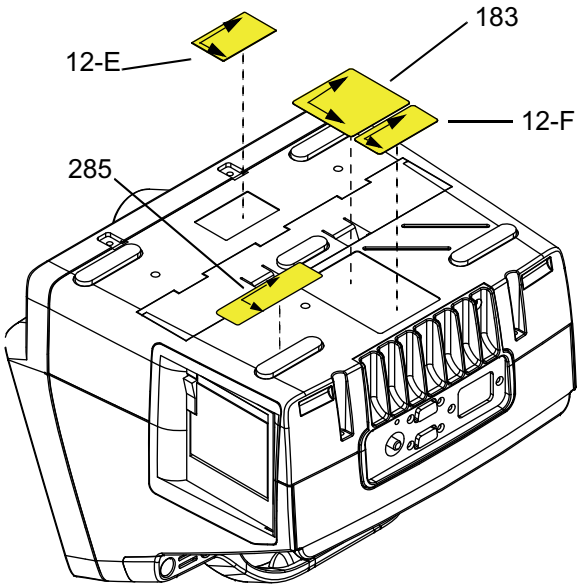
Item	REF	Part Description	Note
12 - Label set	21501-001029	Rear connector label	A in **Labels Assembly diagram**
12 - Label set	21501-000894	Front connector label, ENG (SpO2)	B in **Labels Assembly diagram**
12 - Label set	21501-000879	Front connector label, ENG (no SpO2)	B in **Labels Assembly diagram**
12 - Label set	21501-000909	Physio-Control logo label	C in **Labels Assembly diagram**
12 - Label set	21501-001622	Product ID label	D in **Labels Assembly diagram**
12 - Label set	21501-000088	FDA label	E in **Labels Assembly diagram**
12 - Label set	21501-000779	Masimo patent label	F in **Labels Assembly diagram**
23	Multiple REF	Manual latch label	**Select language**
183	21501-002888	Serial Number, LP20E	**SN label illustration**
284	21501-001935	Label - Adult VF Dose, ENG	**Select language**
285	21501-002882	Label-UDI	See **Labels Assembly diagram**

Final Assembly *(continued)*

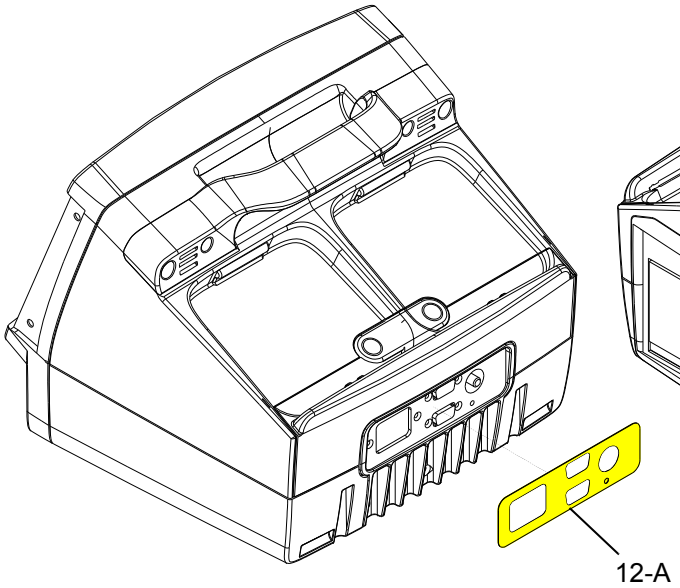
Label Placement Diagrams

Refer to the **parts list** for label description.

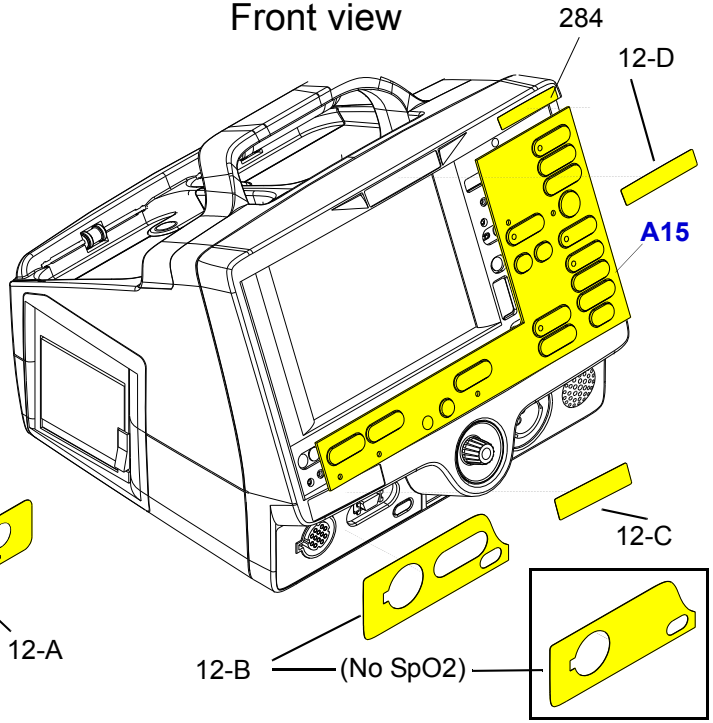
Bottom view



Rear view



Front view



Final Assembly *(continued)*

LIFEPAK 20e Device Label Set Languages

Language	REF	Part Description
English	21501-002660	LIFEPAK 20e label set (no SpO2) 3rd Edition
English	21501-002661	LIFEPAK 20e label set (with SpO2) 3rd Edition
French	21501-002666	LIFEPAK 20e label set (no SpO2) 3rd Edition
French	21501-002667	LIFEPAK 20e label set (with SpO2) 3rd Edition
German	21501-002662	LIFEPAK 20e label set (no SpO2) 3rd Edition
German	21501-002663	LIFEPAK 20e label set (with SpO2) 3rd Edition
Spanish	21501-002670	LIFEPAK 20e label set (no SpO2) 3rd Edition
Spanish	21501-002671	LIFEPAK 20e label set (with SpO2) 3rd Edition

(Continued on next page)

Final Assembly *(continued)*

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

Language	REF	Part Description
Italian	21501-002664	LIFEPAK 20e label set (no SpO2) 3rd Edition
Italian	21501-002665	LIFEPAK 20e label set (with SpO2) 3rd Edition
Swedish	21501-002676	LIFEPAK 20e label set (no SpO2) 3rd Edition
Swedish	21501-002677	LIFEPAK 20e label set (with SpO2) 3rd Edition
Danish	21501-002678	LIFEPAK 20e label set (no SpO2) 3rd Edition
Danish	21501-002679	LIFEPAK 20e label set (with SpO2) 3rd Edition
Dutch	21501-002668	LIFEPAK 20e label set (no SpO2) 3rd Edition
Dutch	21501-002669	LIFEPAK 20e label set (with SpO2) 3rd Edition

(Continued on next page)

Final Assembly *(continued)*

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

Language	REF	Part Description
Finnish	21501-002680	LIFEPAK 20e label set (no SpO2) 3rd Edition
Finnish	21501-002681	LIFEPAK 20e label set (with SpO2) 3rd Edition
Norwegian	21501-002682	LIFEPAK 20e label set (no SpO2) 3rd Edition
Norwegian	21501-002683	LIFEPAK 20e label set (with SpO2) 3rd Edition
Polish	21501-002684	LIFEPAK 20e label set (no SpO2) 3rd Edition
Polish	21501-002685	LIFEPAK 20e label set (with SpO2) 3rd Edition
Portuguese	21501-002672	LIFEPAK 20e label set (no SpO2) 3rd Edition
Portuguese	21501-002673	LIFEPAK 20e label set (with SpO2) 3rd Edition

(Continued on next page)

Final Assembly *(continued)*

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

Language	REF	Part Description
Brazilian	21501-002674	LIFEPAK 20e label set (no SpO2) 3rd Edition
Brazilian	21501-002675	LIFEPAK 20e label set (with SpO2) 3rd Edition
Japanese	21501-002696	LIFEPAK 20e label set (no SpO2) 3rd Edition
Japanese	21501-002697	LIFEPAK 20e label set (with SpO2) 3rd Edition
Chinese	21501-002692	LIFEPAK 20e label set (no SpO2) 3rd Edition
Chinese	21501-002693	LIFEPAK 20e label set (no SpO2) 3rd Edition
Hungarian	21501-002686	LIFEPAK 20e label set (no SpO2) 3rd Edition
Hungarian	21501-002687	LIFEPAK 20e label set (with SpO2) 3rd Edition

(Continued on next page)

Final Assembly *(continued)*

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

Language	REF	Part Description
Czech	21501-002688	LIFEPAK 20e label set (no SpO2) 3rd Edition
Czech	21501-002689	LIFEPAK 20e label set (with SpO2) 3rd Edition
Russian	21501-002690	LIFEPAK 20e label set (no SpO2) 3rd Edition
Russian	21501-002691	LIFEPAK 20e label set (with SpO2) 3rd Edition
Korean	21501-002694	LIFEPAK 20e label set (no SpO2) 3rd Edition
Korean	21501-002695	LIFEPAK 20e label set (with SpO2) 3rd Edition

(Continued on next page)

Final Assembly *(continued)*

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	REF
English	21501-000767
French	21501-000924
German	21501-000925
Spanish	21501-000767
Italian	21501-000932
Swedish	21501-000925
Danish	21501-000924
Dutch	21501-000930
Finnish	21501-000929
Norwegian	21501-000925
Polish	21501-000928

(Continued on next page)

Final Assembly *(continued)*

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	21501-000767
Brazilian	21501-000767
Japanese	21501-000926
Chinese	21501-000927
Hungarian	21501-001349
Czech	21501-001350
Russian	21501-001351
Korean	21501-001352

Final Assembly *(continued)*

Adult VF Dose Label Languages (284)

See **Labels Assembly diagram**

Language	REF
English	21501-001935
French	21501-001858
German	21501-001856
Spanish	21501-001860
Italian	21501-001857
Swedish	21501-001862
Danish	21501-001863
Dutch	21501-001859
Finnish	21501-001864
Norwegian	21501-001865
Polish	21501-001866
Portuguese	21501-001861
Hungarian	21501-001867
Czech	21501-001868
Russian	21501-001869
Chinese	21501-001870
Korean	21501-001871
Japanese	21501-001872

Final Assembly *(continued)*

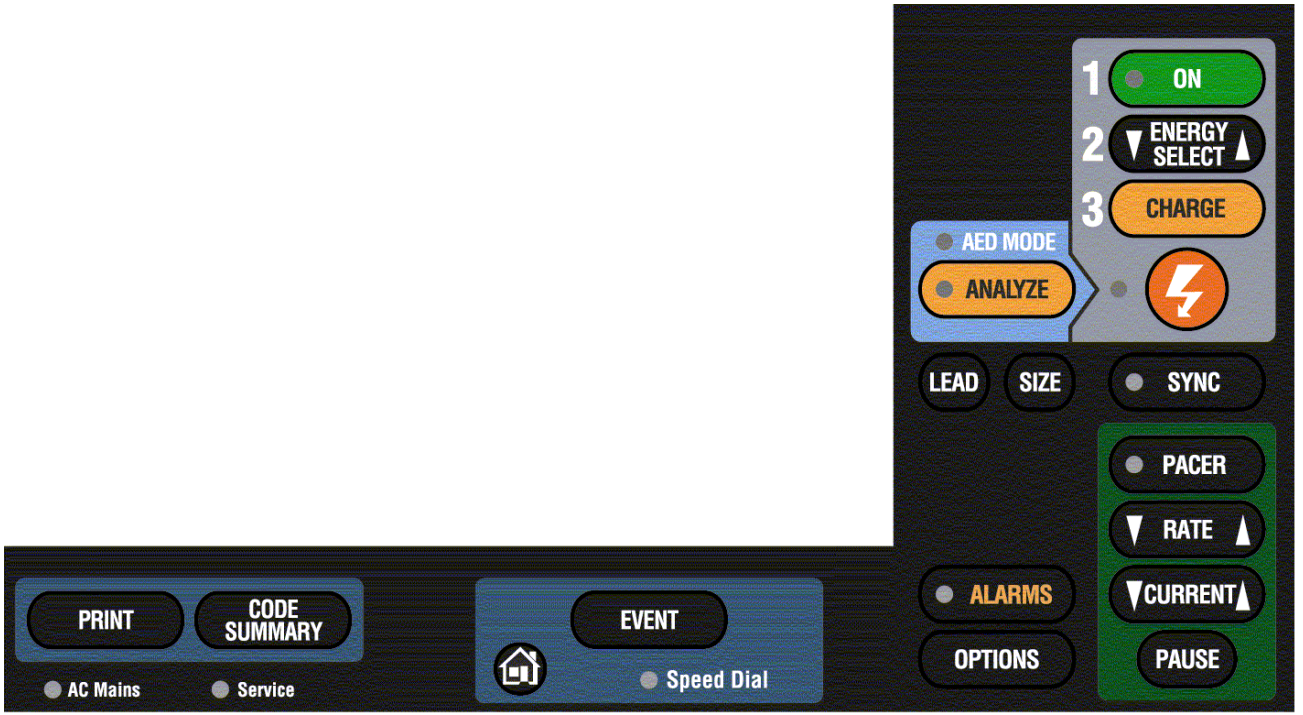
AED Door/Latch Label Kits

REF	Languages	Part Description
21330-001007	English, Spanish, Portuguese, Brazilian	AED door (REF 21300-004252) and Latch label (REF 21501-000767)
21330-001008	German, Swedish, Norwegian	AED door (REF 21300-004252) and Latch label (REF 21501-000925)
21330-001009	Italian	AED door (REF 21300-004252) and Latch label (REF 21501-000932)
21330-001010	French, Danish	AED door (REF 21300-004252) and Latch label (REF 21501-000924)
21330-001011	Dutch	AED door (REF 21300-004252) and Latch label (REF 21501-000930)
21330-001012	Finnish	AED door (REF 21300-004252) and Latch label (REF 21501-000929)
21330-001013	Polish	AED door (REF 21300-004252) and Latch label (REF 21501-000928)
21330-001014	Chinese	AED door (REF 21300-004252) and Latch label (REF 21501-000927)
21330-001015	Japanese	AED door (REF 21300-004252) and Latch label (REF 21501-000926)

Final Assembly *(continued)*

A15 Elastomer Keypad – All Options

(Refer to the **parts list** on the next page for language MINs.)



(Continued on next page)

Final Assembly *(continued)*

A15 Elastomer Keypad - Languages

Language	REF	Part Description
English	21300-004598	Keypad (no Pacing)
English	21300-004231	Keypad (with Pacing)
French	21300-004740	Keypad (no Pacing)
French	21300-004755	Keypad (with Pacing)
German	21300-004741	Keypad (no Pacing)
German	21300-004712	Keypad (with Pacing)
Spanish	21300-004744	Keypad (no Pacing)
Spanish	21300-004713	Keypad (with Pacing)
Italian	21300-004743	Keypad (no Pacing)
Italian	21300-004714	Keypad (with Pacing)
Swedish	21300-004742	Keypad (no Pacing)
Swedish	21300-004715	Keypad (with Pacing)

(Continued on next page)

Final Assembly *(continued)*

A15 Elastomer Keypad - Languages *(continued)*

Language	REF	Part Description
Danish	21300-004748	Keypad (no Pacing)
Danish	21300-004716	Keypad (with Pacing)
Dutch	21300-004747	Keypad (no Pacing)
Dutch	21300-004717	Keypad (with Pacing)
Finnish	21300-004746	Keypad (no Pacing)
Finnish	21300-004718	Keypad (with Pacing)
Norwegian	21300-004749	Keypad (no Pacing)
Norwegian	21300-004719	Keypad (with Pacing)
Polish	21300-004750	Keypad (no Pacing)
Polish	21300-004729	Keypad (with Pacing)
Portuguese	21300-004751	Keypad (no Pacing)
Portuguese	21300-004720	Keypad (with Pacing)

(Continued on next page)

Final Assembly *(continued)*

A15 Elastomer Keypad - Languages *(continued)*

Language	REF	Part Description
Brazilian	21300-004752	Keypad (no Pacing)
Brazilian	21300-004721	Keypad (with Pacing)
Japanese	21300-004753	Keypad (no Pacing)
Japanese	21300-008009	Keypad (with Pacing)
Chinese	21300-004754	Keypad (no Pacing)
Chinese	21300-004723	Keypad (with Pacing)
Hungarian	21300-006164	Keypad (no Pacing)
Hungarian	21300-006163	Keypad (with Pacing)
Czech	21300-006167	Keypad (no Pacing)
Czech	21300-006166	Keypad (with Pacing)
Russian	21300-006170	Keypad (no Pacing)
Russian	21300-006169	Keypad (with Pacing)
Korean	21300-006173	Keypad (no Pacing)
Korean	21300-006172	Keypad (with Pacing)

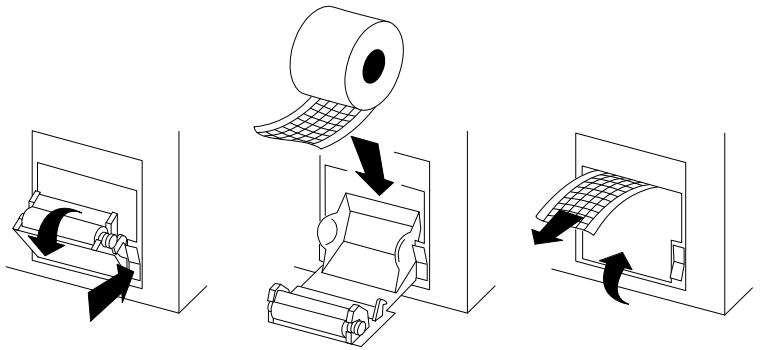
Final Assembly *(continued)*

Installing Printer Paper

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

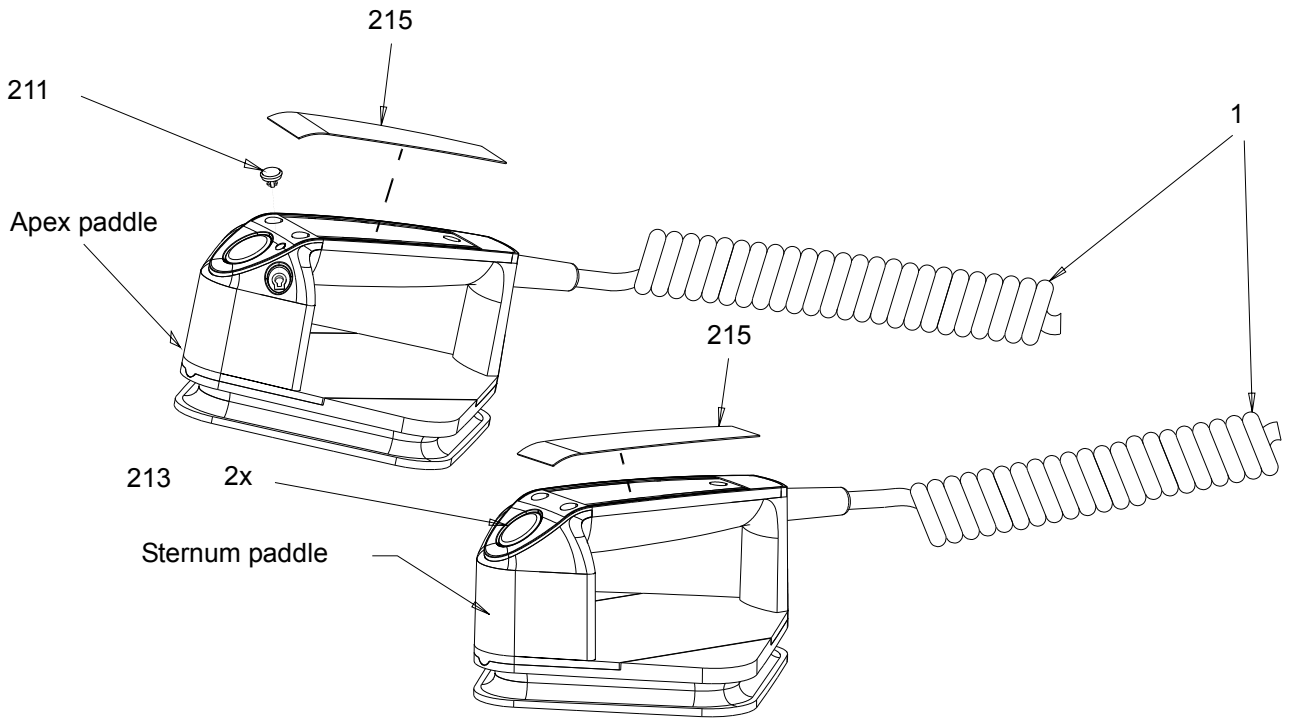
1. Press the printer button located on the left side of the device to open the printer door.
2. Remove the old roll of paper.
3. Insert the new paper roll into the paper chamber, with the end coming from under the roll.

   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)*

Standard Paddles Labels and Buttons



Final Assembly *(continued)*

Standard Paddles
Parts List

Item	Quantity	REF	Part Description	Note
29	2	21330-001024	Standard paddle adapter assembly	
211	1	Multiple REF	Charge button	Refer to **Charge Button Languages**
213	2	21300-008049	Shock button	
215	2	Multiple REF	Paddle label	Refer to **Standard Paddles Label Languages**

Final Assembly *(continued)*

Standard Paddles Label Languages

Language	REF
English	21501-000823
French	21501-000823
German	21501-000823
Spanish	21501-000824
Italian	21501-000827
Swedish	21501-000823
Danish	21501-000823
Dutch	21501-000823
Finnish	21501-000828
Norwegian	21501-000823
Polish	21501-000829

(Continued on next page)

Final Assembly *(continued)*

Standard Paddles Label Languages *(continued)*

Language	REF
Portuguese	21501-000809
Brazilian	21501-000809
Japanese	21501-000823
Chinese	21501-000807
Hungarian	21501-001428
Czech	21501-001429
Russian	21501-001430
Korean	21501-001431

Final Assembly *(continued)*

Charge Button Languages

Language	REF
English	21300-004886
French	21300-004756
German	21300-004766
Spanish	21300-004757
Italian	21300-004758
Swedish	21300-004759
Danish	21300-004760
Dutch	21300-004766
Finnish	21300-004761
Norwegian	21300-004762
Polish	21300-004763

(Continued on next page)

Final Assembly *(continued)*

Charge Button Languages *(continued)*

Language	REF
Portuguese	21300-004767
Brazilian	21300-004767
Japanese	21300-004764
Chinese	21300-004765
Hungarian	21300-006328
Czech	21300-006329
Russian	21300-006330
Korean	21300-006331

Service Replacement Kits

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

REF	Part Description
40402-000001	KIT-REPAIR, TOP CASE HANDLE
40402-000002	KIT-REPAIR, FRONT CASE
40402-000009	KIT REPAIR, DISPLAY FOR UI (REF 21330-001034)
40402-000010	KIT REPAIR, BACKLIGHT FOR UI (REF 21330-001034)
40402-000014	KIT-REPAIR, MASIMO SPO2 CONNECTOR
40402-000028	KIT-REPAIR, THERAPY PCBA, PACING, ROHS
40402-000029	KIT-REPAIR, THERAPY PCBA, NON-PACING, ROHS
40402-000030	KIT-REPAIR, OEM PCBA, ROHS
40402-000031	KIT-REPAIR, PP PCBA, ROHS
40402-000017	KIT-REPAIR, PCB STACK

(Continued on next page)

Service Replacement Kits *(continued)*

REF	Part Description
40402-000032	KIT-REPAIR, POWER MODULE, **LIFEPAK 20e**, ROHS
40402-000020	KIT-REPAIR, CAPACITOR BRACKET
40402-000021	KIT-REPAIR, CAPACITOR
40402-000036	KIT-REPAIR, THERAPY CONNECTOR, ROHS
40402-000033	KIT-REPAIR, REDUX SC PCBA AND UI PCBA, ROHS
40402-000034	KIT-REPAIR, SPO2 MODULE, ROHS
40402-000035	KIT-REPAIR, MNC FLASH SPO2, ROHS
40402-000027	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
40402-000037	KIT-REPAIR, POST REDUX UI, SC, PRINTER, ROHS
40402-000038	KIT-REPAIR, POST REDUX UI, PRINTER, ROHS
40402-000039	KIT-REPAIR, POST REDUX UI, ROHS
40402-000040	KIT-REPAIR, POST REDUX SC, ROHS

(Continued on next page)

Service Replacement Kits *(continued)*

REF	Part Description
40402-000041	KIT-REPAIR, POST REDUX, PRINTER, ROHS
40402-000042	KIT REPAIR, THERAPY PCBA, PACING, LP20, 4TH ED
40402-000043	KIT REPAIR, THERAPY PCBA, NON-PACING, LP20, 4TH ED
40402-000044	KIT REPAIR, OEM PCBA, LP20, 4TH ED
40402-000045	KIT REPAIR, PP PCBA, LP20, 4TH ED
40402-000047	KIT REPAIR, POST REDUX UI, SC, PRINTER, 4TH ED
40402-000048	KIT REPAIR, POST REDUX UI, PRINTER, 4TH ED
40402-000049	KIT REPAIR, POST REDUX UI, 4TH ED
40402-000050	KIT REPAIR, POST REDUX SC, 4TH ED
40402-000051	KIT REPAIR, POST REDUX, PRINTER, 4TH ED
40402-000052	KIT REPAIR, POWER MODULE,LP20E,4TH ED V2

Service Replacement Kits *(continued)*

KIT-REPAIR, TOP CASE HANDLE
REF **40402-000001**

Item	Quantity	REF	Part Description
2	1	21300-004611	Top case handle
167	2	21300-005334	Machine screw 6-32 x 1.75L
169	2	21300-001032	Machine screw 6-32x0.375L

KIT-REPAIR, FRONT CASE
REF **40402-000002**

Item	Quantity	REF	Part Description
9	1	21300-007086	Front case, pad printed
19	1	21300-004837	Cover plate, door
37	1	21300-004836	Door hinge plate
43	1	21300-004233	Display lens
167	4	21300-005334	Machine screw 6-32 x 1.75L
169	2	21300-001032	Machine screw 6-32x0.375L

Service Replacement Kits *(continued)*

KIT-REPAIR, DISPLAY FOR UI (REF 21330-001034)
REF **40402-000009**

Item	Quantity	REF	Part Description
A11	1	21300-007363	Active Color LCD Display
W15	1	21300-007774	Active Display Cable
43	1	21300-004233	Display lens
173	4	21300-001038	Screws 4-40 x 0.312
266	1	21300-006141	Nylon snap rivet

KIT-REPAIR, BACKLIGHT FOR UI (REF 21330-001034)
REF **40402-000010**

Item	Quantity	REF	Part Description
A08	1	21300-006680	Backlight Inverter
W17	1	21300-004237	Active Backlight Inverter Cable
47	1	21300-004838	Active Display Bracket
203	1	21300-004250	Extender cable (for Sanyo display devices)

Service Replacement Kits *(continued)*

KIT-REPAIR, MASIMO SPO2 CONNECTOR
REF **40402-000014**

Item	Quantity	REF	Part Description
W05	1	21300-004234	SpO2 Flex Assembly
113	1	21300-004602	SpO2 connector mounting clip

KIT-REPAIR THERAPY PCB, PACING
REF **40402-000028**
(RoHS)

Item	Quantity	REF	Part Description
A04	1	21330-001515	Therapy PCB with pacing (RoHS)
123	5	21300-004242	ISO mount, Therapy
161	3	21300-000584	Nut-Hex, SS, Lock 4-40 x 0.250W
185	5	21300-004599	Machine Screw, 4-40 x 0.500L
135	1	21300-004704	Connector - Board Stacker, Modified

Service Replacement Kits *(continued)*

KIT-REPAIR THERAPY PCB, NON-PACING
REF **40402-000029**
(RoHS)

Item	Quantity	REF	Part Description
A04	1	21330-001320	Therapy PCB without pacing (ROHS)
123	5	21300-004242	ISO mount, Therapy
161	3	21300-000584	Nut-Hex, SS, Lock 4-40 x 0.250W
185	5	21300-004599	Machine Screw, 4-40 x 0.500L
135	1	21300-004704	Connector - Board Stacker, Modified

KIT-REPAIR, OEM PCBA
REF **40402-000030**
(RoHS)

Item	Quantity	REF	Part Description
A06	1	21330-001037	OEM Interface PCB (ROHS)
252	1	21300-008019	Machine screw, SEMS 4-40 x 5/16 L, split washer
255	1	21300-005120	Screw-Cap, Hex,4-40 x 0.312 Nylon

Service Replacement Kits *(continued)*

KIT-REPAIR, PATIENT PARAMETER PCBA
REF **40402-000031**
(RoHS)

Item	Quantity	REF	Part Description
A06	1	21330-001266	Patient Parameter PCB (ROHS)
125	1	21300-006430	Screw 4-40 × 1.000L

Service Replacement Kits *(continued)*

KIT-REPAIR, PCB STACK
REF **40402-000017**

Item	Quantity	REF	Part Description
125	1	21300-006430	Screw 4-40 x 1.000L
127	1	21300-004236	Boardstack shield
129	5	21300-004815	Standoff-M/M 0.250 hex, 0.375
149	3	21300-004243	ISO mount, OEM
173	2	21300-001038	Screw, 4-40 x 0.312L
252	5	21300-008019	Machine screw SEMS 4-40 x 5/16 L, split washer
258	1	21300-005187	ISO mount, Parameter
262	1	21300-006038	Nomex shield
264	2	21300-000580	Washer, 0.125ID, 0.312D
278	1	21300-006593	Shield - EMI, PCB Stack

Service Replacement Kits *(continued)*

KIT-REPAIR, POWER MODULE, **LIFEPAK 20e**
REF **40402-000032**
(RoHS)

Item	Quantity	PN	REF	Part Description
A03	1	3317740-000 (RoHS)	21330-001186	Power Supply module (ROHS)

Service Replacement Kits *(continued)*

KIT-REPAIR, CAPACITOR BRACKET
REF **40402-000020**

Item	Quantity	REF	Part Description
95	2	21300-004619	Capacitor Support Bracket
173	4	21300-001038	Screw, 4-40 x 0.312L
238	1	21300-006962	Dielectric shield
22	2	21300-003883	Standoff, 0.188 hex, 0.562L

Service Replacement Kits *(continued)*

KIT-REPAIR, CAPACITOR
REF **40402-000021**

Item	Quantity	REF	Part Description
A13	1	21300-004232	Energy Storage Capacitor
93	2	21300-007458	Foam spacer
162	1	21300-004110	Capacitor dielectric shield
229	1	21300-000499	Cable tie retainer
260	1	21300-005068	Inductive Resistor Assy.
95	2	21300-004619	Capacitor bracket support
173	4	21300-001038	Screw, 4-40 x 0.312L
22	2	21300-003883	Standoff, 0.188 hex,0.562L
238	1	21300-006962	Dielectric shield
241	1	21300-007794	Poron Foam, Capacitor

Service Replacement Kits *(continued)*

KIT-REPAIR, THERAPY CONNECTOR
REF **40402-000036**
(RoHS)

Item	Quantity	REF	Part Description
W01	1	21300-007366	Therapy Connector Assembly (ROHS)
111	1	21300-000149	Therapy retaining ring
268	1	21300-005784	Seal, therapy connector

Service Replacement Kits *(continued)*

KIT-REPAIR, REDUX SC PCBA AND UI PCBA
REF **40402-000033**
(RoHS)

Item	Quantity	REF	Part Description
A01	1	21330-001354	System Controller PCB (ROHS)
A05	1	21330-001345	User Interface PCB (ROHS)
W15	1	21300-007774	Active Display Cable
125	2	21300-006430	Screw 4-40 x 1.000L
127	1	21300-004236	Boardstack shield
129	5	21300-004815	Standoff-M/M 0.250 hex, 0.375
135	1	21300-004704	Boardstack connector
149	3	21300-004243	ISO mount, OEM
173	2	21300-001038	Screws 4-40 x 0.312
240	1	21300-004807	Spacer Foam, UI PCB
252	5	21300-008019	Machine screw, SEMS 4-40 x 5/16 L, split washer

Service Replacement Kits *(continued)*

KIT-REPAIR, REDUX SC
PCBA AND UI PCBA
REF **40402-000033**
(RoHS) *(continued)*

Item	Quantity	REF	Part Description
258	1	21300-005187	ISO mount, Parameter
262	1	21300-006038	Nomex shield
264	2	21300-000580	Washer, 0.125ID, 0.312D
265	1	21300-005578	ISO mount, System Controller (standoff)
278	1	21300-006593	Shield - EMI, PCB Stack

(Continued on next page)

Service Replacement Kits *(continued)*

KIT-REPAIR, SPO2 MODULE
REF **40402-000034**
(RoHS)

Item	Quantity	REF	Part Description
A10	1	21996-000074	MODULE-OEM, PULSE OXIMETER, 3780, ROHS
W05	1	21300-004234	SpO2 Flex Assembly
252	4	21300-008019	Machine screw, SEMS 4-40 x 5/16 L, split washer

Service Replacement Kits *(continued)*

KIT-REPAIR, MNC FLASH SPO2, **LIFEPAK 20e (Nellcor)**
REF **40402-000035**
(RoHS)

Item	Quantity	REF	Part Description
A10	1	21996-000117	MODULE-OEM, PULSE OXIMETER WITH MNC, 3783, ROHS
W05	1	21300-004234	SpO2 Flex Assembly (RoHS)
252	4	21300-008019	Machine screw, SEMS 4-40 x 5/16 L, split washer

Service Replacement Kits *(continued)*

KIT-REPAIR, LED DISPLAY FOR UI (REF 21330-001345) - LED Display and Backlight for Redux UI PCB (REF 21330-001345) or greater requires Redux level PCB software set
REF **40402-000027**

Item	Quantity	REF	Part Description
A08	1	21300-008166	Module-OEM, LED Driver (Backlight Inverter)
A11	1	21300-008077	Active Display, Color LED
W15	1	21300-007774	Active Display Cable
43	1	21300-004233	Display lens
47	1	21300-004838	Active Display Bracket
173	4	21300-001038	Screws 4-40 x 0.312
266	1	21300-006141	Nylon snap rivet

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX UI, SC, PRINTER, ROHS
REF **40402-000037**

Item	Quantity	REF	Part Description
264	2	21300-000580	Washer, Flat, Round, S, Zinc, 0.312D, 0.125ID
252	1	21300-008019	Screw-M, PH, CP, P, Sems, #4-40, 5-16 L, Split Washer
173	16	21300-001038	Screw-M, CS, Z, PH, Nylock, 4-40 X .312L
125	1	21300-006430	Screw, Machine, Panhead, Nylok, 4-40 X 1.000
127	1	21300-004236	Shield - PCB Stack
135	1	21300-004704	Connector-Board Stacker, Modified
265	1	21300-005578	Mount-Isolation, PCB, System Controller
149	3	21300-004243	Mount-Isolation, PCB, OEM

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX UI, SC, PRINTER, ROHS *(continued)*
REF **40402-000037**

Item	Quantity	REF	Part Description
258	1	21300-005187	Mount - Isolation, PCB, Parameter
129	5	21300-004815	Standoff - Male/Male, 0.250 HEX, 0.375L
262	1	21300-006038	Shield - Nomex
278	1	21300-006593	Shield - EMI, PCB Stack
W15	1	21300-007774	Cable - Assembly, Active Color, RoHS
167	4	21300-005334	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
169	2	21300-001032	Screw, PH, SS, P, Nylok, 6-32 X 0.375
W18	1	21300-008056	Flex Assembly - UI to Stack
255	2	21300-005120	Screw, Cap, SKT HD, Hex Rec, 4-40, 0.312L, NYL

Service Replacement Kits *(continued)*

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

REF **40402-000037**

Item	Quantity	REF	Part Description
161	9	21300-000584	Nut-Hex, SS, Lock 4-40 X 0.250W
240	1	21300-004807	Spacer - Foam, LP20 UI PCB
A01	1	21330-001354	PCB Assy - Programmed System Controller, LP20
A05	1	21330-001345	PCB Assy - Programmed User Interface, LP20
A12	1	21240-000001	Printer - 50mm, Thermal Printhead, RoHS

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX UI, PRINTER, ROHS
REF **40402-000038**

Item	Quantity	REF	Part Description
173	13	21300-001038	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
W15	1	21300-007774	Cable - Assembly, Active Color, RoHS
161	3	21300-000584	Nut - Hex, SS, Lock 4-40 X 0.250W
167	4	21300-005334	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
169	2	21300-001032	Screw - PH, SS, P, Nylok, 6-32 X 0.375
A05	1	21330-001345	PCB Assy - Programmed User Interface, LP20
A12	1	21240-000001	Printer - 50mm, Thermal Printhead, RoHS
240	1	21300-004807	Spacer Foam, UI PCB

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX UI, ROHS
REF **40402-000039**

Item	Quantity	REF	Part Description
173	13	21300-001038	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
W15	1	21300-007774	Cable - Assembly, Active Color, RoHS
161	3	21300-000584	Nut - Hex, SS, Lock 4-40 X 0.250W
167	4	21300-005334	Screw, Machine, Panhead, Nylok, 6-32 X 1.750
169	2	21300-001032	Screw - PH, SS, P, Nylok, 6-32 X 0.375
A05	1	21330-001345	PCB Assy - Programmed User Interface, LP20
240	1	21300-004807	Spacer Foam, UI PCB

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX SC, ROHS
REF **40402-000040**

Item	Quantity	REF	Part Description
264	2	21300-000580	Washer, Flat, Round, S, Zinc, 0.312D, 0.125ID
252	1	21300-008019	Screw - M, PH, SP, P, Sems, # 4-40, 5-16 L, Split Washer
173	5	21300-001038	Screw - M, CS, Z, PH, Nylock, 4-40 X 0.312L
125	1	21300-006430	Screw, Machine, Panhead, Nylok, 4-40 X 1.000
135	1	21300-004704	Connector - Board Stacker, Modified
129	5	21300-004815	Standoff - Male/Male, 0.250 Hex, 0.375L
262	1	21300-006038	Shield - Nomex
167	4	21300-005334	Screw, Machine, Panhead, Nylok, 6-32 X 1.750

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX SC, ROHS *(continued)*

REF **40402-000040**

Item	Quantity	REF	Part Description
169	2	21300-001032	Screw - PH, SS, P, Nylok, 6-32 X 0.375
161	6	21300-000584	Nut - Hex, SS, Lock 4-40 X 0.250W
255	2	21300-005120	Screw - Cap, SKT HD, HEX REC, 4-40, 0.312L, NYL
A01	1	21330-001354	PCB Assy - Programmed System Controller, LP20
265	1	21300-005578	ISO Mount, System Controller (Standoff)

Service Replacement Kits *(continued)*

KIT - REPAIR, POST REDUX, PRINTER, ROHS
REF **40402-000041**

Item	Quantity	REF	Part Description
A12	1	21240-000001	Printer - 50mm, Thermal Printhead, RoHS

Service Replacement Kits *(continued)*

KIT REPAIR, THERAPY PCBA, PACING, LP20, 4TH ED
REF **40402-000042**

Item	Quantity	REF	Part Description
161	3.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W
185	5.0	21300-004599	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X .500
135	1.0	21300-004704	CONNECTOR-BOARD STACKER, MODIFIED
A04	1.0	21330-001560	PCB ASSY-THERAPY MODULE, PACING, LP20
123	5.0	21300-004242	MOUNT-ISOLATION, PCB, THERAPY

Service Replacement Kits *(continued)*

KIT REPAIR, THERAPY PCBA, NON-PACING, LP20, 4TH
REF **40402-000043**

Item	Quantity	REF	Part Description
135	1.0	21300-004704	CONNECTOR-BOARD STACKER, MODIFIED
185	5.0	21300-004599	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X .500
161	3.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W
A04	1.0	21330-001563	PCB ASSY-THERAPY MODULE, ROHS, LP20
123	5.0	21300-004242	MOUNT-ISOLATION, PCB, THERAPY

Service Replacement Kits *(continued)*

KIT REPAIR, OEM PCBA, LP20, 4TH ED
REF **40402-000044**

Item	Quantity	REF	Part Description
252	1.0	21300-008019	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
255	1.0	21300-005120	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
A06	1.0	21330-001557	PCB ASSY - OEM INTERFACE, MASIMO

Service Replacement Kits *(continued)*

KIT REPAIR, PP PCBA, LP20, 4TH ED
REF **40402-000045**

Item	Quantity	REF	Part Description
A06	1.0	21330-001558	PCB ASSY-PP, 3 CH WITH SIR, LP20-LP20E
124	1.0	21300-006430	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX UI, SC, PRINTER, 4TH ED
REF **40402-000047**

Item	Quantity	REF	Part Description
A01	1.0	21330-001561	PCB ASSY-PROGRAMMED SYSTEM CONTROLLER, LP20
258	1.0	21300-005187	MOUNT-ISLOATION, PCB, PARAMETER
169	2.0	21300-001032	SCREW-PH, SS, P, NYLOK, 6-32 X .375
167	4.0	21300-005334	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
127	1.0	21300-004236	SHIELD - PCB STACK
262	1.0	21300-006038	SHIELD - NOMEX
173	16.0	21300-001308	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L
264	2.0	21300-000580	WASHER, FLAT, ROUND, S, ZINC, .312D, .125ID
240	1.0	21300-004807	SPACER-FOAM, LP20 UI PCB
161	9.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W

(Continued on next page)

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX UI, SC, PRINTER, 4TH ED
REF **40402-000047**
(continued)

Item	Quantity	REF	Part Description
255	2.0	21300-005120	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
W18	1.0	21300-008056	FLEX ASSEMBLY - UI TO STACK
125	1.0	21300-006430	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000
149	3.0	21300-004243	MOUNT-ISOLATION, PCB, OEM
252	1.0	21300-008019	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
265	1.0	21300-005578	MOUNT-ISOLATION, PCB, SYSTEM CONTROLLER
135	1.0	21300-004704	CONNECTOR-BOARD STACKER, MODIFIED
A05	1.0	21330-001562	PCB ASSY - PROGRAMMED USER INTERFACE, LP20

(Continued on next page)

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX UI, SC, PRINTER, 4TH ED
REF **40402-000047**
(continued)

Item	Quantity	REF	Part Description
278	1.0	21300-006593	SHIELD - EMI, PCB STACK
A12	1.0	11241-000015	PRINTER-50MM, THERMAL PRINTHEAD, ROHS
W15	1.0	21300-007774	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
129	5.0	21300-004815	STANDOFF - MALE/MALE, .250 HEX, .375L

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX UI, PRINTER, 4TH ED
REF **40402-000048**

Item	Quantity	REF	Part Description
A05	1.0	21330-001562	PCB ASSY - PROGRAMMED USER INTERFACE, LP20
A12	1.0	11241-000015	PRINTER-50MM, THERMAL PRINTHEAD, ROHS
169	2.0	21300-001032	SCREW-PH, SS, P, NYLOK, 6-32 X .375
161	3.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W
240	1.0	21300-004807	SPACER-FOAM, LP20 UI PCB
W15	1.0	21300-007774	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
167	4.0	21300-005334	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
173	13.0	21300-001308	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX UI, 4TH ED
REF **40402-000049**

Item	Quantity	REF	Part Description
A05	1.0	21330-001562	PCB ASSY - PROGRAMMED USER INTERFACE, LP20
240	1.0	21300-004807	SPACER-FOAM, LP20 UI PCB
167	4.0	21300-005334	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750
169	2.0	21300-001032	SCREW-PH, SS, P, NYLOK, 6-32 X .375
161	3.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W
W15	1.0	21300-007774	CABLE-ASSEMBLY, ACTIVE COLOR, ROHS
173	13.0	21300-001308	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX SC, 4TH ED
REF **40402-000050**

Item	Quantity	REF	Part Description
A01	1.0	21330-001561	PCB ASSY-PROGRAMMED SYSTEM CONTROLLER, LP20
129	5.0	21300-004815	STANDOFF - MALE/MALE, .250 HEX, .375L
265	1.0	21300-005578	MOUNT-ISOLATION, PCB, SYSTEM CONTROLLER
125	1.0	21300-006430	SCREW, MACHINE, PANHEAD, NYLOK, 4-40 X 1.000
173	5.0	21300-001308	SCREW-M, CS, Z, PH, NYLOCK, 4-40 X .312L
161	6.0	21300-000584	NUT-HEX, SS, LOCK 4-40X.250W
167	4.0	21300-005334	SCREW, MACHINE, PANHEAD, NYLOK, 6-32 X 1.750

(Continued on next page)

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX SC, 4TH ED
REF **40402-000050**
(continued)

Item	Quantity	REF	Part Description
255	2.0	21300-005120	SCREW-CAP, SKT HD, HEX REC, 4-40, 0.312L, NYL
252	1.0	21300-008019	SCREW-M, PH, CP, P, SEMS, #4-40, 5-16 L, SPLIT WASHER
135	1.0	21300-004704	CONNECTOR-BOARD STACKER, MODIFIED
169	2.0	21300-001032	SCREW-PH, SS, P, NYLOK, 6-32 X .375
264	2.0	21300-000580	WASHER, FLAT, ROUND, S, ZINC, .312D, .125ID
262	1.0	21300-006038	SHIELD - NOMEX

Service Replacement Kits *(continued)*

KIT REPAIR, POST REDUX, PRINTER, 4TH ED
REF **40402-000051**

Item	Quantity	REF	Part Description
A06	1	21330-001037	OEM Interface PCB (ROHS)
252	1	21300-008019	Machine screw, SEMS 4-40 x 5/16 L, split washer
255	1	21300-005120	Screw-Cap, Hex,4-40 x 0.312 Nylon

KIT-REPAIR, POWER Module,LP20E, 4th ED V2
REF **40402-000052**

Item	Quantity	REF	Part Description
A03	1.0	21330-001569	POWER SUPPLY ASSEMBLY - LIFEPAK 20E,4TH ED,NEW MCU

Device Software Replacement

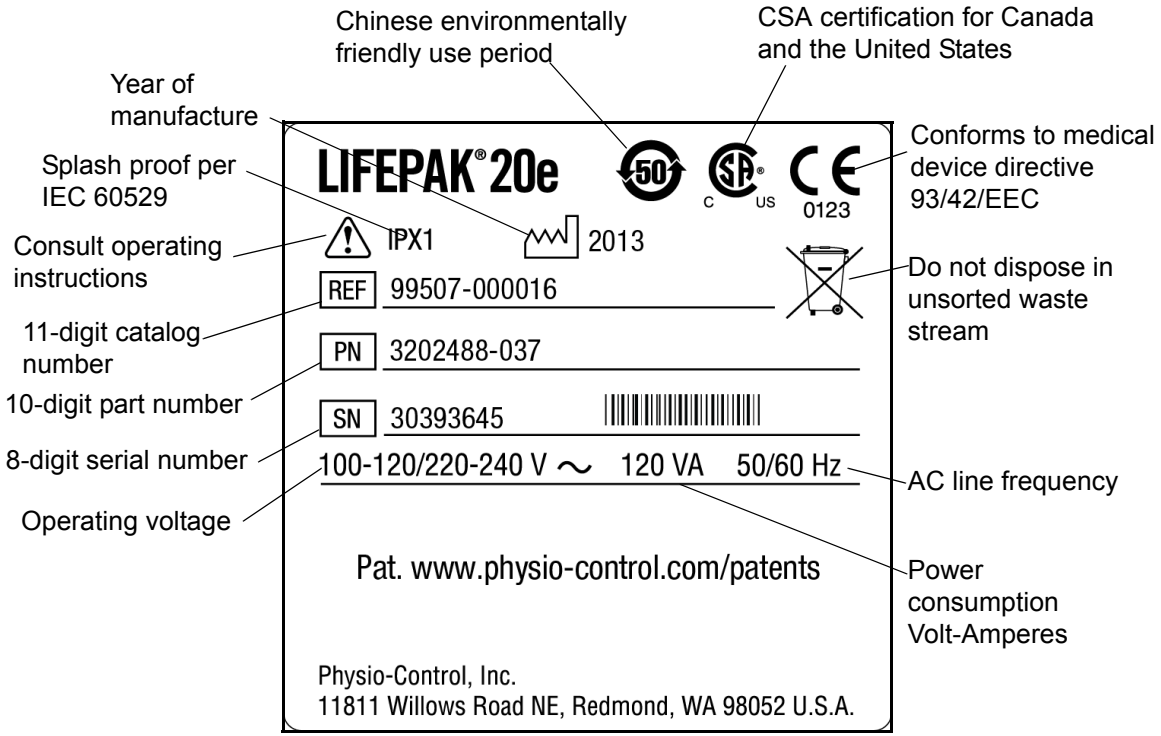
Device configuration settings and system software replacement require tools and procedures that are proprietary to Physio-Control. These procedures and tools may be available for use by customers using LIFENET System Asset Management products. Device configuration and software can also be installed by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

Contact a Physio-Control customer services representative for assistance.

Device Part Number and Serial Number

PN and SN Label

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

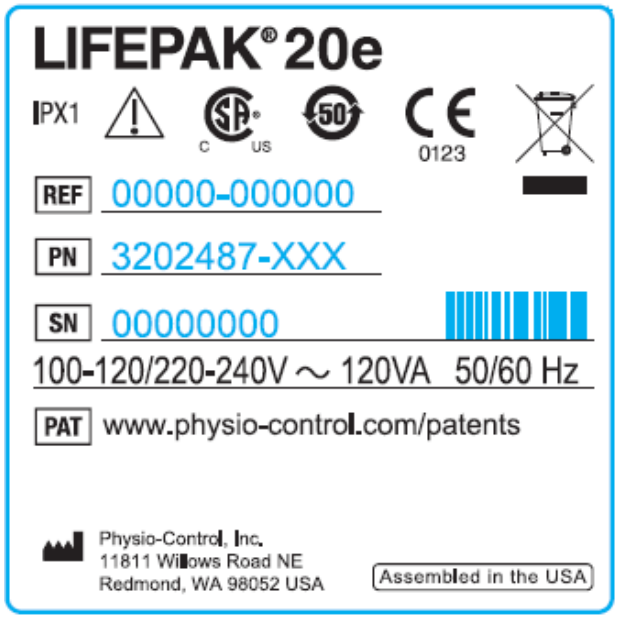


REF 21501-002888
LIFEPAK 20e 2nd Edition

Device Part Number and Serial Number *(continued)*

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.

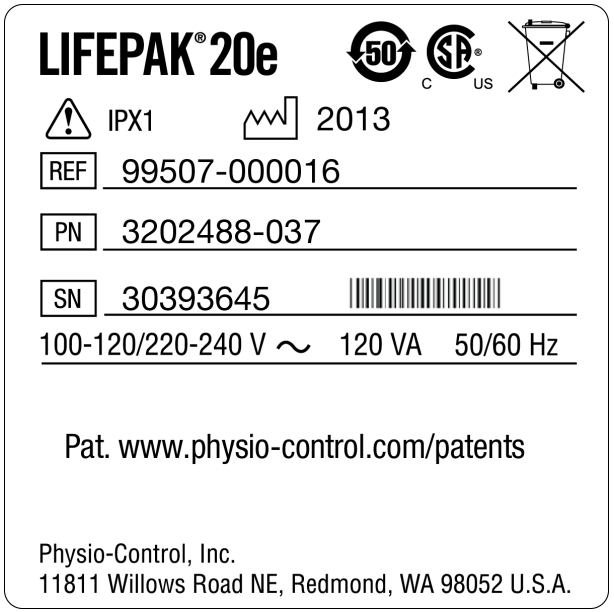


REF 21501-002992
LIFEPAK 20e 3rd Edition

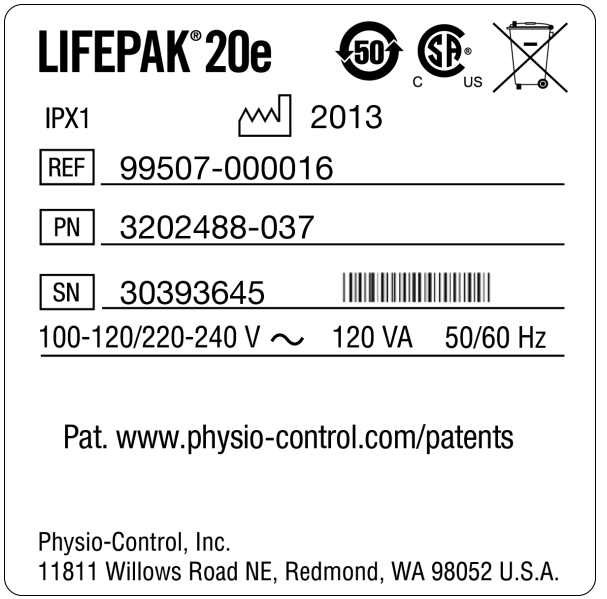
Device Part Number and Serial Number *(continued)*

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 21501-002889
LIFEPAK 20e No CE Mark



REF 21501-002893
LIFEPAK 20e 3rd Edition,
No CE Mark

Device Part Number and Serial Number *(continued)*

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

To order parts, contact your local Physio-Control representative or order online at 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

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 Physio-Control Smart Services representative can assist with this process.

Introduction *(continued)*

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)*

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

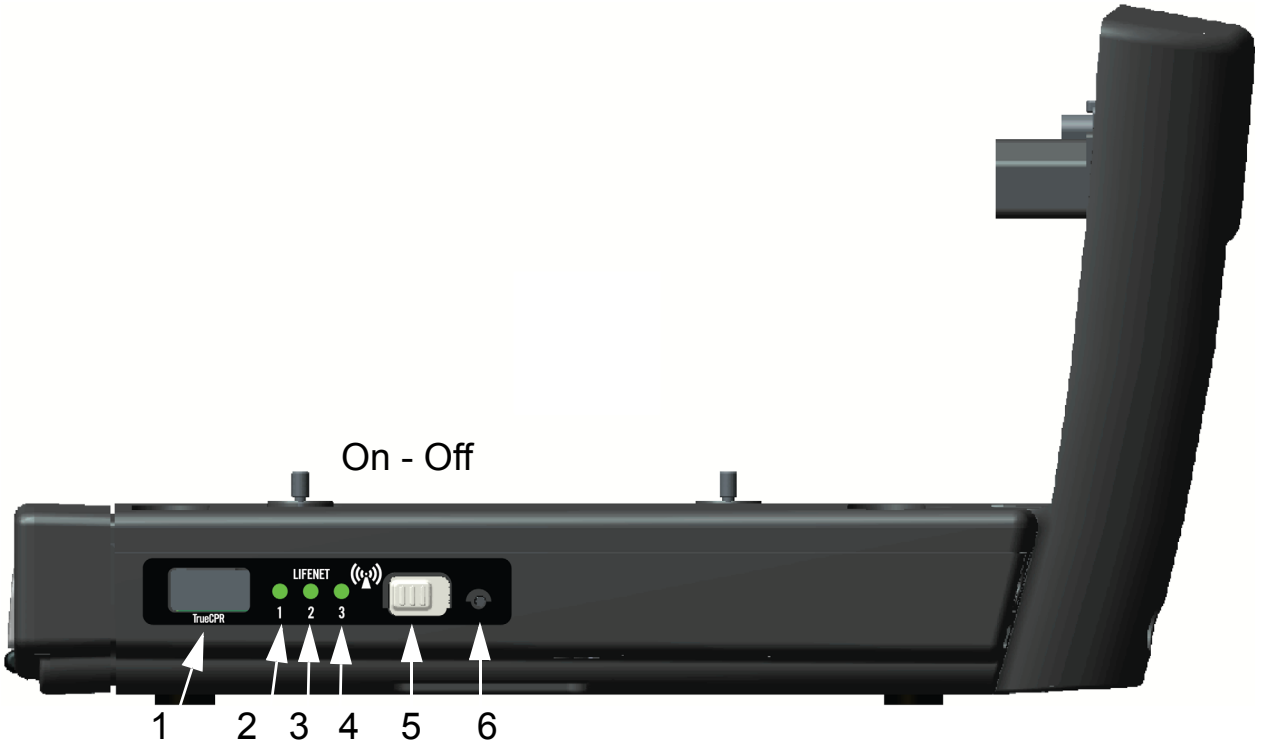
Front Panel

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)*

Side Panel



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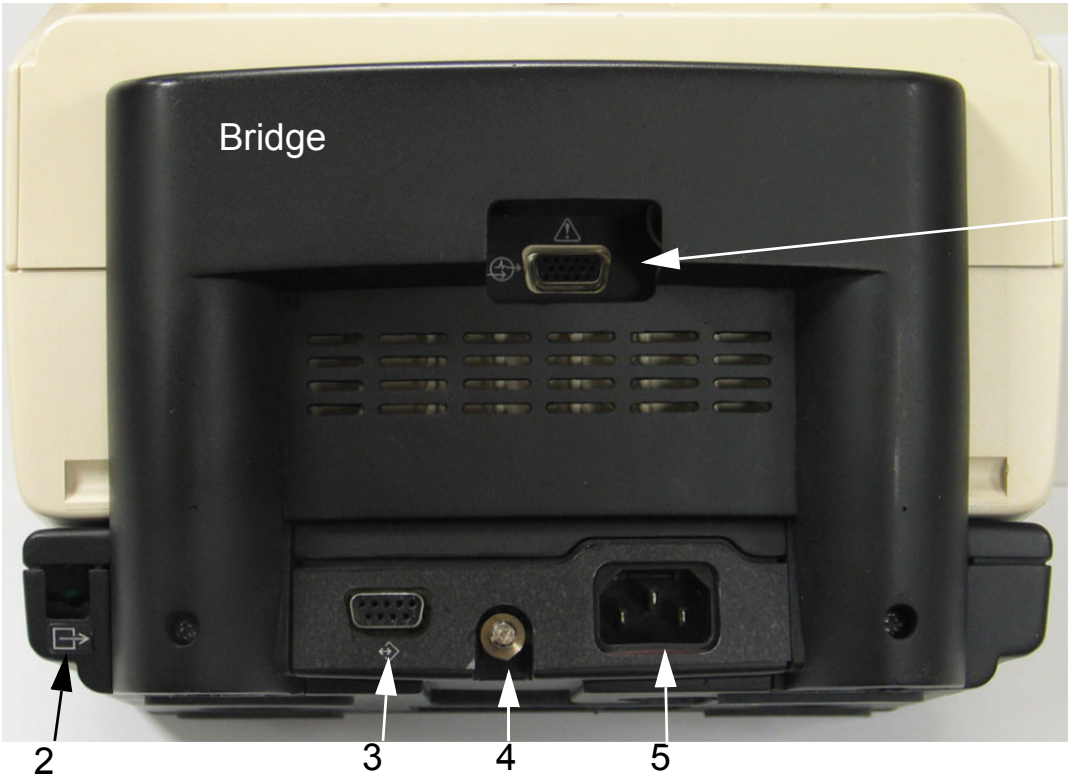
Physical Description and Features *(continued)*

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)*

Back Panel



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Physical Description and Features *(continued)*

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 **Page 2-4**.
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 **Page 2-4**.
4	Ground (equipotential) connector
5	AC power connector. See Warning - Shock hazard on **Page 2-4**.

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	11150-000016
Package - CodeManagement Module, Wireless, CO2 options	11150-000017

CO2 Supplies are ordered from the Physio-Control Accessories Price List 3302108

Functional Description

Introduction

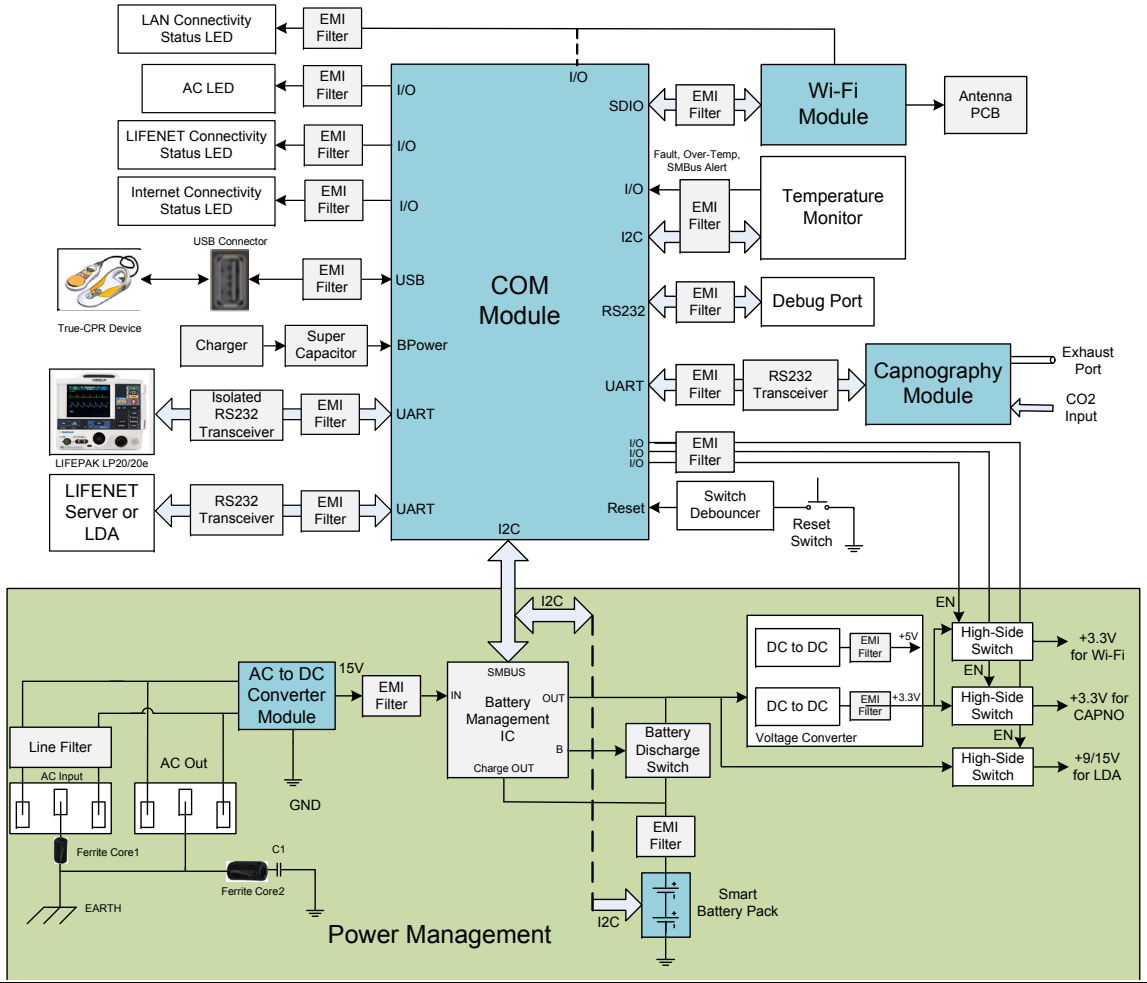
When properly attached to the LIFEPAK 20e device, the CodeManagement Module offers EtCO2 monitoring and Wireless connectivity. This device should be used indoors only (for example, a hospital or therapy center) and is powered by AC (line) power. There is an additional internal battery for use as a backup 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.

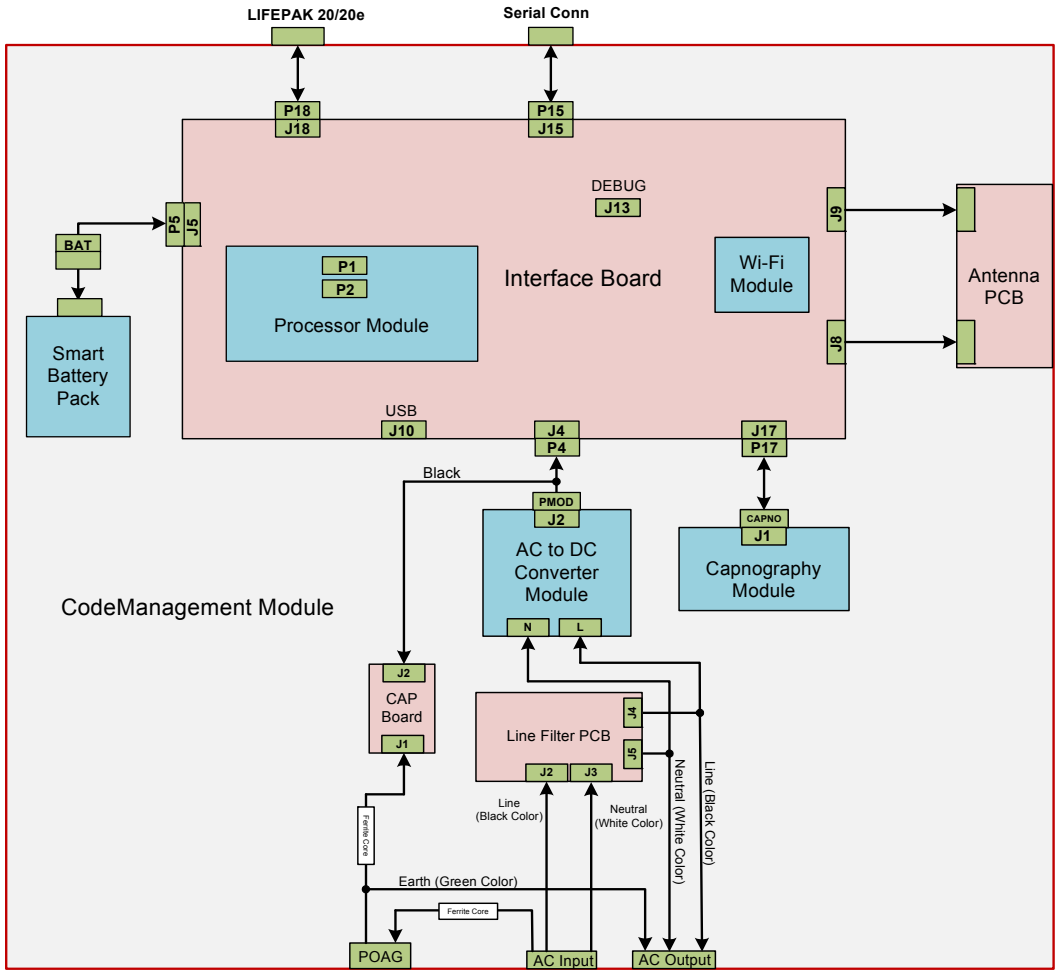
Functional Description *(continued)*

System Block Diagram



Functional Description *(continued)*

Interconnect Diagram



Troubleshooting - Service Events

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	• Press reset button on CodeManagement Module • Reconnection to WI-FI network • Replace CodeManagement Module
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)

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

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

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

Replacement Procedures (continued)

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)

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)

Assembly Tools List

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

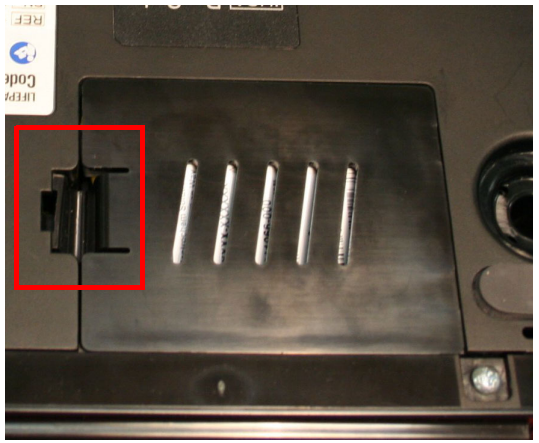
- Static-dissipative mat and wrist strap
- Anti-static rack and/or conductive bags
- Torque screwdriver(s) - required torque settings are 6.8 and 10.0 in-lb.

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)

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:

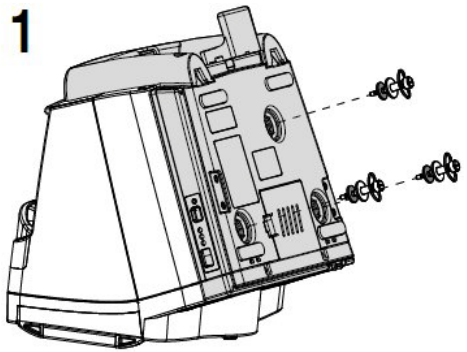
1. Place the device top down. The battery door was previously removed.
2. Connect the device's battery cable to the CodeManagement Module Battery (12).
3. Insert the CodeManagement Module Battery into the lower enclosure battery compartment.

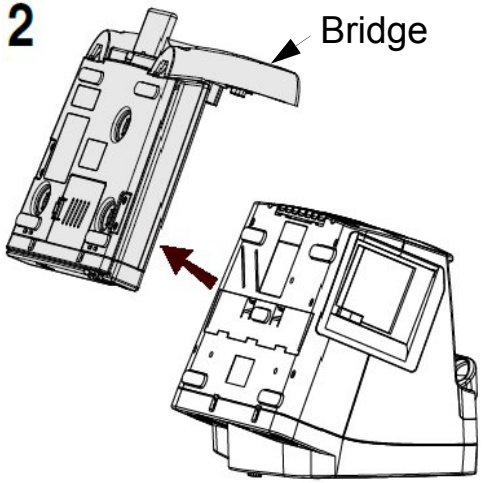
Note: Install the battery in the compartment with the battery label facing out of the device.

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

Replacement Procedures (continued)

CO2 Micro-Module Removal



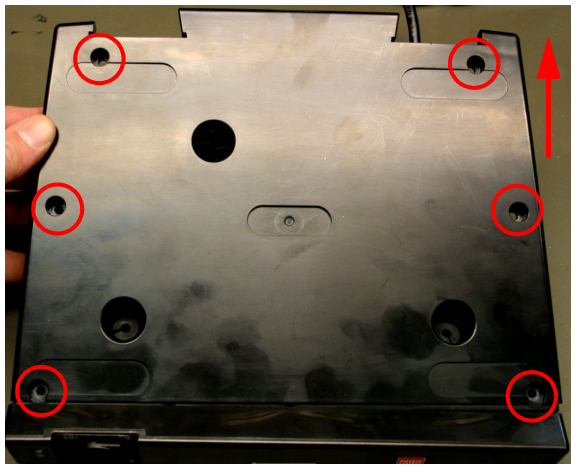


To remove the CO2 Micro-Module:

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)

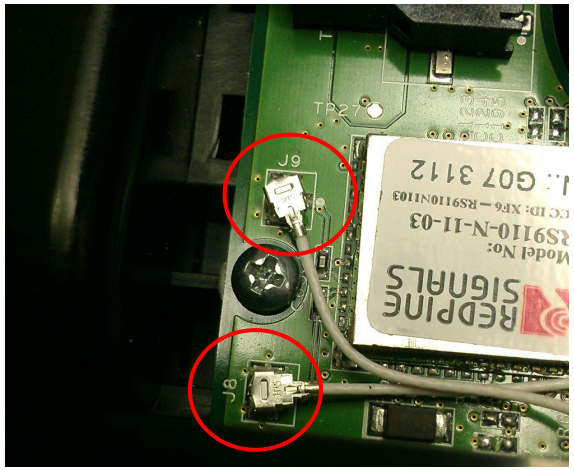
CO2 Micro-Module Removal (continued)

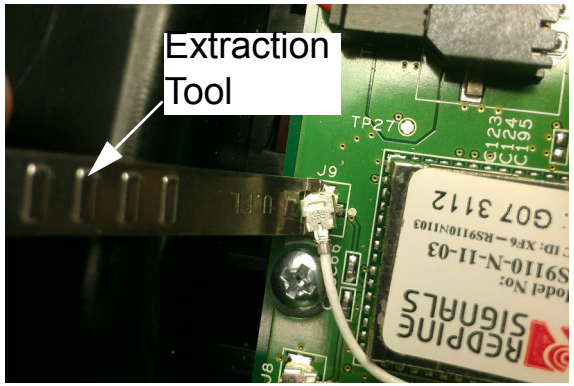


4. Turn the CodeManagement Module over and face the rear of the device. Remove and discard the two 6-32 x 0.375 screws from the back of the device. Lift the Bridge up and away from the rest of the device.
5. Remove and discard the six 6-32 x 0.375 screws that secure the top enclosure to the bottom enclosure.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

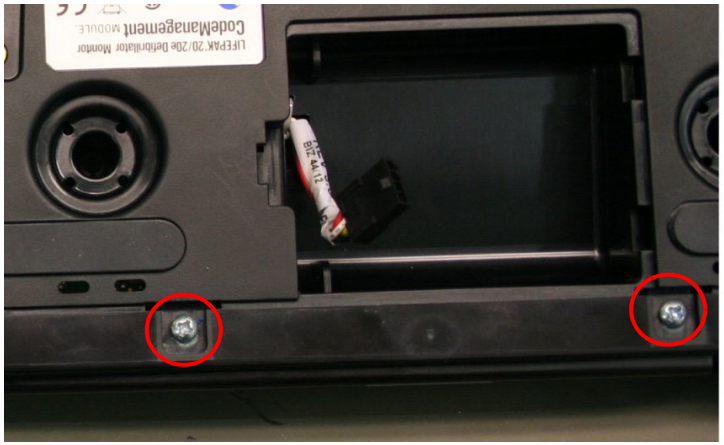
Replacement Procedures (continued)

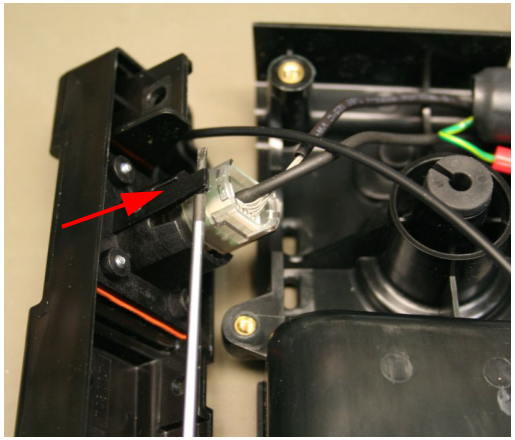
CO2 Micro-Module Removal (continued)





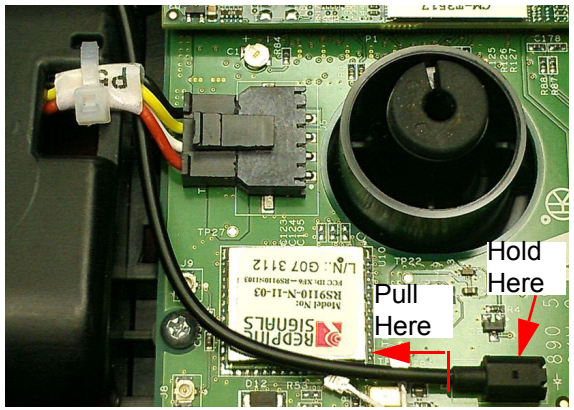
7. Disconnect the two wireless RF antenna wires from the Interface PCB at J8 and J9 connectors using the Antenna Extraction Tool.
8. Turn device over and remove and discard two 6-32 x 0.375 screws from front enclosure. Lift the front enclosure away from the rear enclosure far enough to gain access to 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.

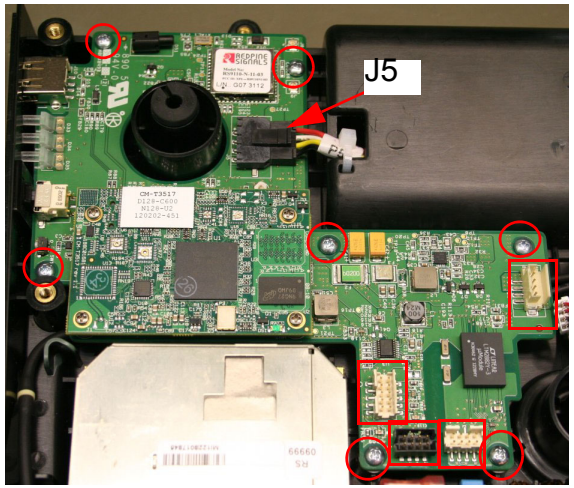




Replacement Procedures (continued)

CO2 Micro-Module Removal (continued)



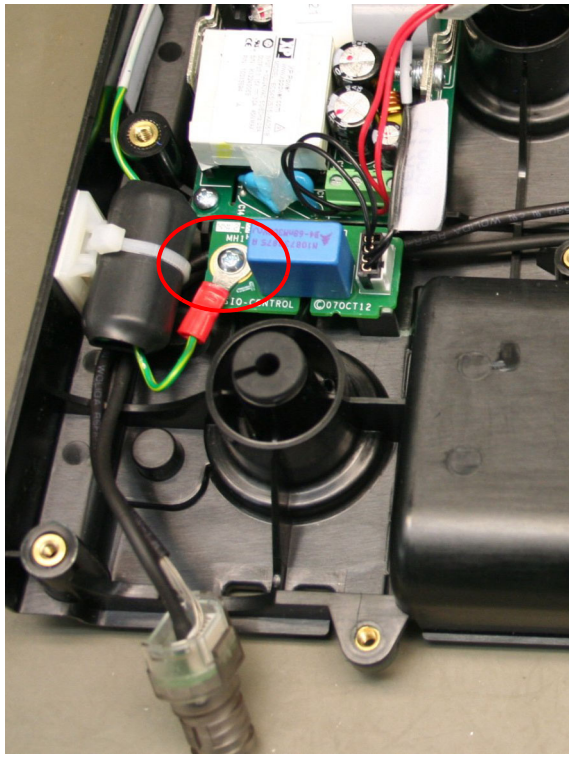


10. Disconnect the LED Fiber Optic cable from the D51 connector on the Interface PCB. Carefully pull fiber optic cable straight out from D51 connector.
11. Set the front enclosure aside.
12. Disconnect Cables at J4, J15, J17 and J18 on Interface PCB.
13. Remove and discard seven 4-40 x 0.25 screws from 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)

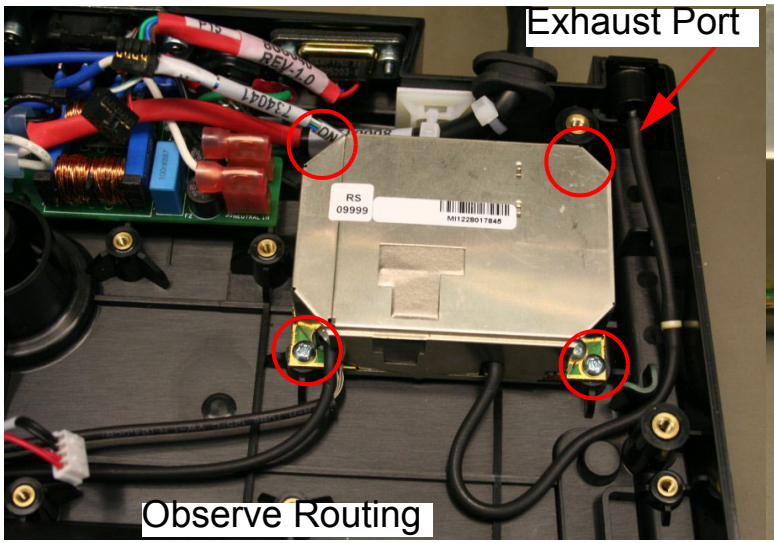
CO2 Micro-Module Removal (continued)

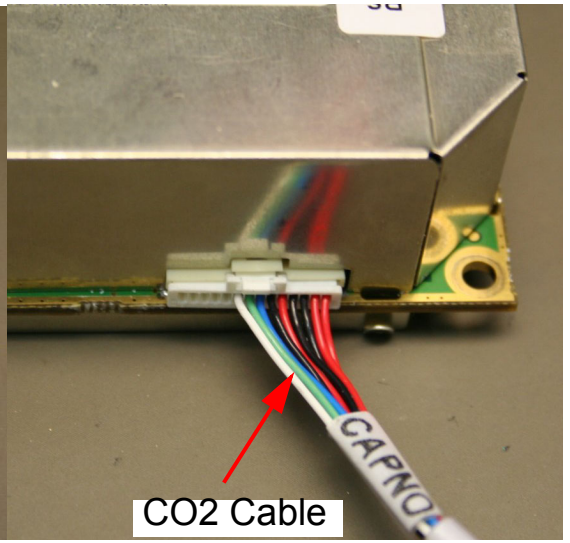


16. Remove and discard one 4-40 x 0.375 screw from Cap PCB. Lift the Cap PCB up and out of the way to gain access to CO2 tubing and cable that are routed under the PCB.
17. Disconnect the exhaust port connector from the CO2 module. Set the exhaust port aside for reuse.
18. Remove and discard four 4-40 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.

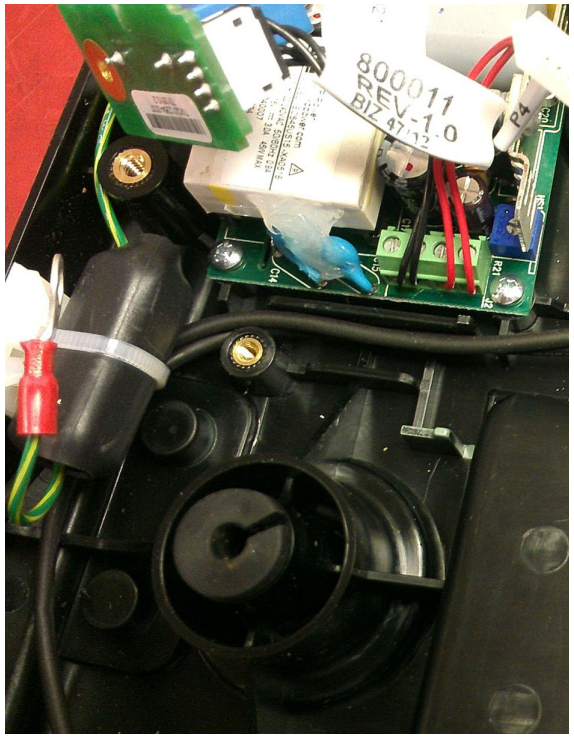
19. Disconnect the CO2 cable from CO2 module for reuse.





Replacement Procedures (continued)

CO2 Micro-Module Installation



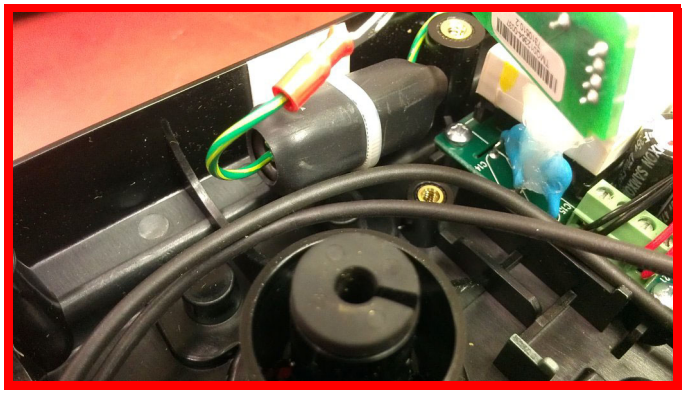
Correct CO2 Input Hose Routing

Note: Numbers in parentheses refer to parts in **Replacement Parts List**.

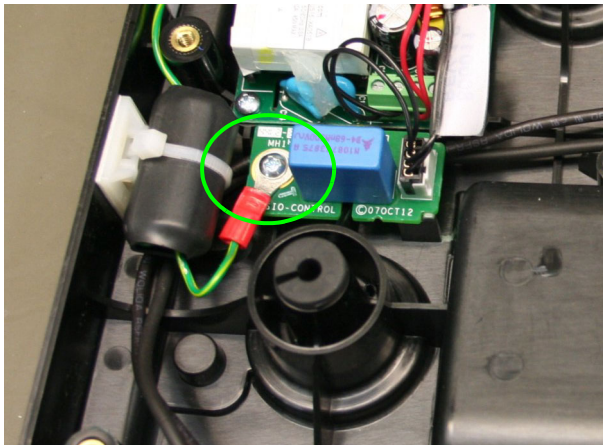
1. Remove replacement CO2 module (18) from static bag.
2. Connect the CO2 cable end marked “Capno” to the CO2 module.
3. Connect Exhaust port fitting to exhaust tubing of CO2 module.

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.

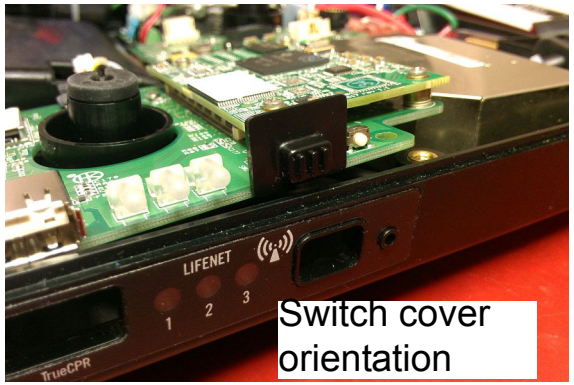


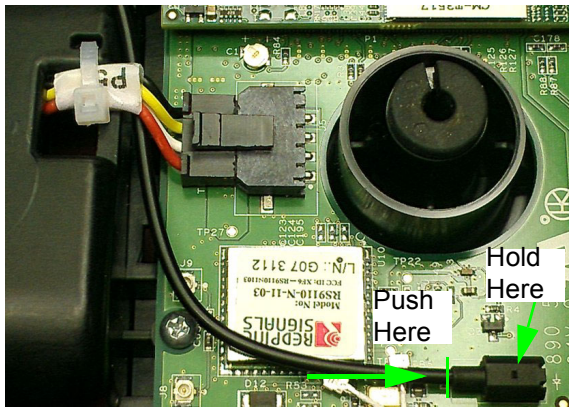
Incorrect Hose Routing



Replacement Procedures (continued)

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's 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)

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)

Replacement Parts List

Item	Quantity	REF	Part Description
0	1	11150-000016	CodeManagement Module
0	1	11150-000017	CodeManagement Module, EtCO2
13	1	21300-008092	Battery Door
12	1	11141-000162	Battery
18	1	21300-008093	CO2 Micro-Module
3	10	21300-000777	6-32 x 0.375 screw
17	7	21300-006251	4-40 x 0.25 screw
10	5	21300-006159	4-40 x 0.375 screw
23	2	21300-008096	RF Antenna Wire
30	4	21300-008095	CO2 Mounting Spacer
7	3	21300-008094	Rubber Mounting Spacer
9	1	21300-007445	CO2 Input Connector Cover
2	4	21300-002137	Foot-Mounting
10	1	21300-008091	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

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

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

Method for End-tidal CO2 calculation:

EtCO2 is a Maximum rather than average value.

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:

The accuracy of the CO2 reading at various respiration rates is tested with a CO2 square wave simulator.