PHYSIO CONTROL

OPERATING INSTRUCTIONS

LIFEPAK® 10C
defibrillator/monitor/pacemaker

IMPORTANT

Federal (USA) law restricts this device to sale by or on the order of a physician.

This instrument is to be used by authorized medical personnel only.

Device Tracking

(USA only, including US government-owned units)
Under the Safe Medical Devices Act of 1990, defibrillator manufacturers and distributors are required to track the location of defibrillators. If your defibrillator has been sold, donated, lost, stolen, exported, or destroyed or if it was not obtained directly from Physio-Control, please notify Physio-Control at 1.800.442.1142, extension 4530.

Responsibility for Information

It is the responsibility of our customers to assure that the appropriate person(s) within their organization have access to this information.

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PREFACE

About defibrillation

The LIFEPAK® 10C defibrillator/monitor/pacemaker is a therapeutic medical device intended for use by or under the direction or guidance of a physician. Direct current defibrillation is a recognized means of terminating certain potentially fatal cardiac dysrhythmias.

A direct current defibrillator applies a brief, high-energy pulse of electricity to the heart. This energy may be delivered either through external paddles or electrodes on the chest.

Defibrillation is only one aspect of the medical care required to resuscitate a patient in ventricular fibrillation. Depending on the situation, other supportive measures may include:

- establishment and maintenance of a patent airway
- ventilation, including administration of oxygen
- maintenance of blood circulation
- pharmacologic measures.

Among other factors, it is recognized that the likelihood of successful resuscitation of a patient is related to the length of time between the onset of ventricular fibrillation and defibrillation. Rapid defibrillation and prompt follow-up care are essential. The physiological state of the patient may affect the likelihood of successful defibrillation or skeletal muscle contractility. Thus, failure to convert the dysrhythmia or to resuscitate a patient is not a reliable indicator of defibrillator performance. Similarly, the patient's muscular response to the defibrillator shock is not a reliable indicator of the energy delivered. Refer to the booklet *Defibrillation: What You Should Know* for further information (refer to page 6-19 for ordering information).

Daily inspection is important to determine the state of readiness of the equipment. In addition, the device must be kept in proper operating condition at all times through routine maintenance, testing, and repair by a qualified service technician. Refer to the *LIFEPAK 10C defibrillator/monitor/pacemaker Service Manual* for additional service information.

Terms

The following safety-related terms are used either in this manual or on the LIFEPAK 10C defibrillator/monitor/pacemaker:

Danger:	Immediate hazards which will result in serious personal injury or death.
Warning:	Hazards or unsafe practices which could result in serious personal injury or death.
Caution:	Hazards or unsafe practices which could result in minor personal injury or product/property damage.

General Warnings

In addition to the following warnings, other warnings are provided near the beginning of each section.

⚠ WARNINGS

Possible loss of power during patient care.

Proper care and maintenance of batteries is vital to the performance of the LIFEPAK 10C defibrillator/monitor/pacemaker. Always carry a spare, fully-charged, properly-maintained battery.

Shock hazard.

When discharged, this defibrillator delivers up to 360 joules of electrical energy. Unless discharged properly as described in these Operating Instructions, this electrical energy may cause personal injury or death. Do not attempt to operate this device unless you are thoroughly familiar with these Operating Instructions and the function of all controls and indicators, as well as the connections and accessories.

Shock or fire hazard.

Do not immerse any portion of this device in water or other fluids. Avoid spilling any fluids on device or accessories. Do not autoclave this device or accessories unless otherwise specified.

Possible fire or explosion.

Do not use this device in the presence of flammable gases or anesthetics. Use care when operating this device close to oxygen sources (such as bag-valve-mask devices or ventilator tubing).

Possible improper device performance.

Use only Physio-Control ECG and QUIK-COMBO™ cables, electrodes, and Physio-Control batteries. Substitution of non-Physio-Control cables, electrodes, or batteries may cause the device to perform improperly.

Possible interference with implanted devices.

Magnets inside the standard defibrillation paddles may affect the function of an implanted device. Avoid placing standard paddles near an implanted device. Check function of implanted device after using standard paddles.

Possible electrical interference with ECG monitoring.

Equipment that emits certain radio frequency signals can cause electrical interference and distort the displayed or recorded ECG signal, thereby preventing accurate rhythm analysis. To minimize radio interference, move or reposition equipment away from defibrillator.

Safety risk and possible equipment damage.

Defibrillators, monitors, pacemakers, and their accessories (including electrodes and cables) contain ferromagnetic materials. As with all ferromagnetic equipment, these products must not be used in the presence of the high magnetic field created by a Magnetic Resonance Imaging (MRI) device. The high magnetic field created by an MRI device will attract the equipment with a force sufficient to cause death or serious personal injury to persons between the equipment and the MRI device. This magnetic attraction may also damage the equipment. Consult with the MRI manufacturer for more information.

⚠ CAUTIONS

To help prevent component damage, the device should not be mounted near vibration sources such as engine struts and landing gear.

The device may be damaged by mechanical/physical abuse (e.g., immersion in water, drop exceeding 30 inches with carrying case, drop exceeding 18 inches without carrying case).

Symbols

The symbols below may be found in this manual or on various configurations of the LIFEPAK 10C defibrillator/monitor/pacemaker and accessories.

Off (power: disconnection from the AC mains)

On (power: connection to the AC mains)

Defibrillation protected, type CF patient connection

Defibrillation protected, type BF patient connection

On labels: Attention, consult accompanying documents
On status display: Contact qualified service technician

Caution, high voltage

Protective earth (ground)

Fuse

Equipotentiality connector

\+ Positive input terminal

− Negative input terminal

12V DC Output cable

12V DC Input cable


Paddles

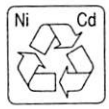

Battery


Plug


Output


AC current


Output AC/Digital



Recycle battery

Recycle battery

BASIC OPERATION

This section describes the basic operation of the LIFEPAK 10C defibrillator/monitor/pacemaker. Topics include:

Introduction

The LIFEPAK 10C defibrillator/monitor/pacemaker is a complete cardiac life support system used by paramedics, hospital staff, and other authorized healthcare providers. The defibrillator/monitor/pacemaker provides electrocardiogram (ECG) monitoring, defibrillation, synchronized cardioversion, and noninvasive pacing. It also allows single-cable, hands-free defibrillation, pacing, and monitoring therapy with the QUIK-COMBO™ pacing/defibrillation/ECG electrodes. The QUIK-COMBO electrodes allow patient transfer to other Physio-Control devices which use QUIK-COMBO electrodes.

The LIFEPAK 10C defibrillator/monitor/pacemaker includes the CODE SUMMARY™ critical event record which automatically stores critical events in memory. A 50mm thermal array printer provides printed copies of ECG monitoring and CODE SUMMARY reports. A cardioscope displays ECG monitoring. A Liquid Crystal Display (LCD) presents operating information such as heart rate, lead selection, and pacing current selection. Any one of three rechargeable NiCad batteries or an optional AC or DC Auxiliary Power Module provide power for the device.

Controls, Indicators, and Connectors

Figures 1-1 through 1-5 and Tables 1-1 through 1-5 provide an overview of the controls, indicators, and connectors for the LIFEPAK 10C defibrillator/monitor/pacemaker.

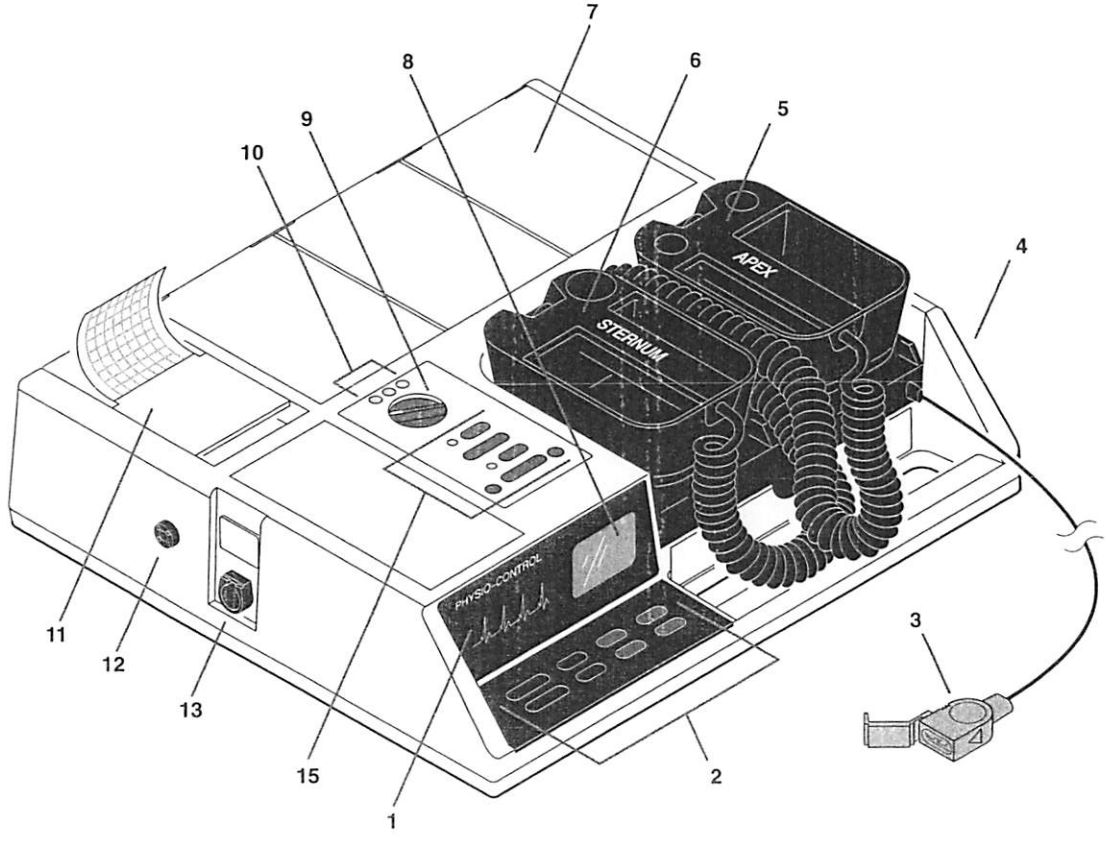


Figure 1-1 LIFEPAK 10C defibrillator/monitor/pacemaker controls, indicators, and connectors

Table 1-1 Controls, indicators, and connectors

1	Cardioscope	Non-fade display; ECG trace moves from right to left.
2	Function Buttons	Eight front-panel function buttons (see page 1-4).
3	QUIK-COMBO therapy cable	Allows hands-free defibrillation, pacing, or monitoring using QUIK-COMBO electrodes. Standard paddles must be stowed securely in paddle wells during use of QUIK-COMBO electrodes.
4	ELECTRICALLYISOLATED ECG Connector (far side, not shown)	Connection for 6-pin, 3-lead ECG cable (AHA or IEC version available).
5	APEX Paddle	QUIK-LOOK®, QUIK-CHARGE® defibrillation paddle with CHARGE, RECORD, and discharge button. Also serves as positive ECG electrode during standard paddle monitoring. (For button descriptions, see page 1-7.)
6	STERNUM Paddle	QUIK-LOOK defibrillation paddle with discharge button and ENERGY select dial. Also serves as negative ECG electrode during standard paddle monitoring. (For button descriptions, see page 1-7.)
7	Battery	Replaceable, rechargeable power source. Physio-Control® FASTPAK, LIFEPAK 5 FASTPAK or Battery Pak batteries may be used.
8	Status Display	Alphanumeric information indicates heart rate, AVAILABLE ENERGY, lead selected, SYNC mode, DIAG mode, pacing current and rate, pacing electrode connection message (LEADS), and service indicator (see page 1-6).
9	1 POWER	Rotary switch turns device power on or OFF. Select one of three batteries or, if available, auxiliary power source (AUX).
10	Low Battery Indicator	When indicator is: • Flashing - battery in use is nearly depleted; immediately switch to a charged battery. • Continuously on - battery in use is depleted; replace depleted battery. The device may shut down with no low battery indication if the battery is damaged, improperly maintained, or depleted (e.g., if battery is very low on charge and operator attempts to charge defibrillator.)
11	Recorder	Thermal array recorder which prints ECG trace and annotations on 50mm thermal paper. Activated by RECORD button (see page 1-4).
12	MIEMSS Modulator Connector (optional)	Allows simultaneous output of one unmodulated and two modulated ECG signals.
13	AUX Connector	Allows connection to AC or DC Auxiliary Power Module to provide operating power. Also provides output (modulated or unmodulated) for ECG transmission (1V/mV ECG deflection).
14	Bail Incline (not shown)	Bail incline on bottom may be extended to tilt up device.
15	Pacemaker Controls	Controls for noninvasive pacemaker (see page 1-5).

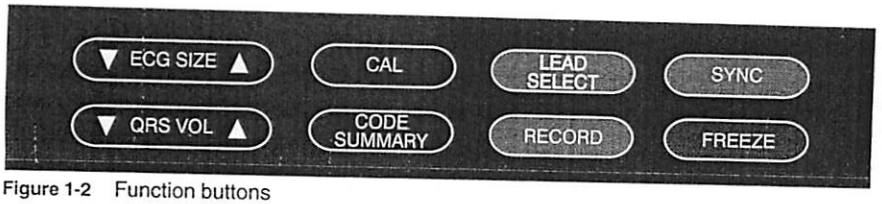


Figure 1-2 Function buttons

Table 1-2 Function button descriptions

▼ ECG SIZE ▲	Adjusts vertical size of ECG trace on cardioscope and recorder from 0.2 to 4.0cm/mV. Press ▲ to increase or ▼ to decrease ECG size.
▼ QRS VOL ▲	Adjusts systole beeper volume. Press ▲ to increase, ▼ to decrease.
CAL	Superimposes 1mV calibration signal on cardioscope and recorder (not active in SYNC mode).
CODE SUMMARY	Activates printing of report summarizing critical events (i.e., pre- and post-defibrillation/cardioversion events, pacing parameters, and selected monitored ECG segments).
LEAD SELECT	Selects ECG input: Paddles, Leads I, II, III. Press to change lead. Device may be programmed to power up in Paddles or Lead II.
RECORD	Activates thermal array recorder which prints time, date, ECG lead, ECG size, heart rate, SYNC (if activated), and pacing parameters. Press RECORD again to stop recorder. RECORD on APEX paddle performs identically. If device is programmed to enable diagnostic frequency response mode, holding RECORD down for more than 1 second selects diagnostic mode (DIAG) and starts recorder. Diagnostic mode must be reselected with each new recording. Recorder runs continuously in diagnostic mode.
SYNC	Selects synchronized mode. To return to asynchronous mode, press SYNC again. Defibrillator automatically returns to asynchronous mode after discharge.
FREEZE	Freezes cardioscope trace. Recorder continues to print delayed trace.

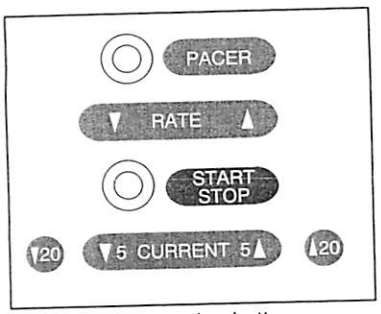


Figure 1-3 Pacemaker buttons

Table 1-3 Pacemaker button descriptions

PACER	Turns pacemaker power on. Light adjacent to PACER illuminates when pacemaker is on. Pacemaker power can be turned off by pressing PACER again, charging defibrillator, or selecting Paddles lead.
RATE	Selects pacing rate: 40–170bpm selectable in 10bpm increments. Press ▲ to increase rate; press ▼ to decrease rate.
START STOP	Starts or stops delivery of pacing energy via QUIK-COMBO electrodes. When START/STOP is first pressed to start delivery, the adjacent indicator light flashes off with each delivered pacing pulse delivered and a pacing spike displays on the ECG trace. Any one of the following actions stops delivery of pacing energy: • Press START/STOP again • Press PACER • Select Paddles lead • Charge defibrillator
20 5 CURRENT 5 20	Increase or decrease pacing current. Adjustable from 0 to 200mA in 5mA or 20mA increments. Press ▲ to increase, ▼ to decrease.

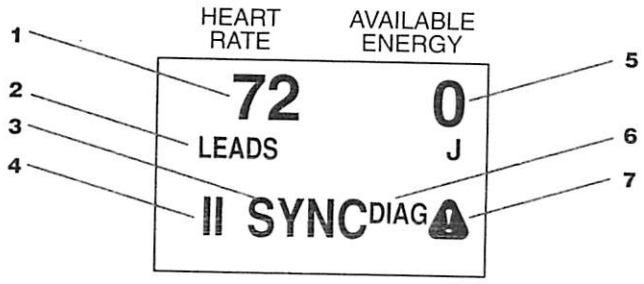


Figure 1-4 Status display indicators

Table 1-4 Status display description

1	Heart Rate	Displays two functions: • PACER off–displays measured heart rate from ECG cable, QUIK-COMBO electrodes, or standard paddles; range: 20–295 beats per minute (bpm); symbol - - - indicates heart rate is outside the range of 20–295bpm. • PACER on–displays selected (not measured) pacing rate from pacemaker control panel; range: 40–170 bpm.
2	LEADS Indicator	LEADS message displays when: • Pacing is attempted without connecting the QUIK-COMBO therapy cable to the QUIK-COMBO electrodes. • QUIK-COMBO electrodes detach during pacing current delivery. • During pacing, ECG monitoring is attempted in paddles lead .
3	SYNC Mode Indicator	SYNC message appears on status display indicating synchronized mode is enabled. Message blinks off with each detected QRS.
4	Lead Selection Indicator	Alphanumerics on status display identify lead selection: I II III — Lead I, II, or III — Paddles lead.
5	Available Energy	Displays two functions: • PACER off–displays independent confirmation of energy level selected on ENERGY select dial (0–360J); a single tone sounds when charging is complete. • PACER on–displays pacing current (0–200mA) selected from pacemaker control panel.
6	DIAG Mode Indicator	DIAG message displays when diagnostic frequency response mode is enabled.
7	Service Indicator	Symbol indicates service is needed. If symbol displays continuously, have device promptly examined by a qualified service technician.

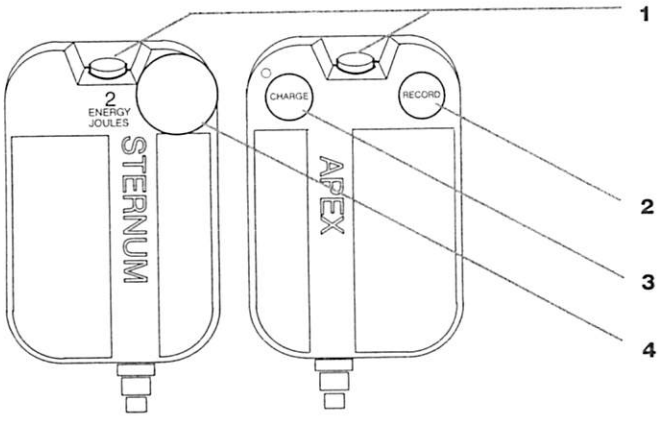


Figure 1-5 Paddle buttons

Table 1-5 Paddle button descriptions

1	Discharge Buttons	Red buttons discharge the defibrillator. Both buttons must be pressed simultaneously to deliver energy. Energy is not delivered unless device is fully charged to selected energy level.
2	RECORD Button	Activates recorder. Functions identically to RECORD button on front panel.
3	3 CHARGE Button	Amber button initiates defibrillator charge cycle. Adjacent CHARGE indicator flashes when device is charging and glows steadily when fully charged. A single tone sounds when charging is complete.
4	2 ENERGY JOULES Dial	Rotary dial selects 1 of 9 discrete energy levels for defibrillation: 0, 5, 10, 20, 50, 100, 200, 300, or 360 joules.

Setting the Clock

To activate clock set-up mode:

1. Turn the POWER switch to OFF. Then press and hold RECORD on the APEX paddle and turn the POWER switch to a power source. The heart rate section of the status display flashes the numbers 00. These numbers represent the hour digits of the 24-hour clock.
2. Press QRS VOL until the desired hour is displayed.
3. Press ▲ on ECG SIZE to scroll through the remaining clock settings in the heart rate display in the following order:
   - Minutes (0–59)
   - Month (1-12)
   - Day (1-31)
   - Year (0-99; the year 2000 shows as 00, 2001 as 01, etc.)
4. Press ▲ on QRS VOL to change any of the clock settings.
5. Turn the POWER switch to OFF to terminate the clock setting mode.
6. To examine the clock setting, turn the POWER switch to a power source and press RECORD to start the recorder. Examine the printed strip and confirm the proper time and date is printed.

ECG Electrode Requirements

Electrode quality is critical for obtaining an undistorted ECG signal. Always check the date code on electrode packages for expiration date before patient use. Do not use electrodes with expired date codes.

For best ECG monitoring results, use silver/silver chloride (Ag/AgCl) electrodes such as Physio-Control LIFE•PATCH® ECG electrodes. The silver/silver chloride electrodes allow much faster post-defibrillation ECG display on the cardioscope than other electrode types.

Avoid using stainless steel electrodes; these electrodes can delay post-defibrillation ECG display on the cardioscope for 10 seconds or longer. If stainless steel electrodes must be used, perform careful patient evaluation including an extended period of cardioscope observation before pursuing further therapy.

QRS Detection

QRS detection is essential for use of the digital heart rate display, systole tone (QRS VOL), synchronized cardioversion, and noninvasive demand pacing.

The QRS detector in the LIFEPAK 10C defibrillator/monitor/pacemaker selectively detects QRS complexes. It discriminates against most noise, muscle artifact, T-waves, and other spurious signals.

Detection of QRS complexes and rejection of other signals depends on the proper setting of ECG size. If ECG size is set too low, QRS complexes will not be detected; no systole tones or sense (synchronizer) markers appear and the heart rate display is incorrect. If ECG size is set too high, systole tones and sense (synchronizer) markers may occur on spurious signals and the heart rate display may be incorrect.

The LIFEPAK 10C defibrillator/monitor/pacemaker displays a heart rate between 20 and 295bpm. Patient rates outside this range do not yield valid systole tones or heart rate display.

Monitoring Patients with Invasive Pacemakers

The LIFEPAK 10C defibrillator/monitor/pacemaker rejects most pacemaker impulses from internally implanted pacemakers. It does not use the pacemaker pulse for heart rate calculation or synchronization. Large amplitude pacemaker spikes can overload the QRS complex detector circuitry so that no paced QRS complexes are counted, resulting in blanking (heart rate displays - - -) of the heart rate display. To help minimize ECG pickup of large unipolar pacemaker pulses when monitoring patients with internal pacemakers, place ECG electrodes so the line between the positive and negative electrodes is perpendicular to the line between the pacemaker generator and the heart.

Smaller amplitude internal pacemaker pulses may not be distinguished clearly on the cardioscope and/or the recording strip in leads or paddles monitoring modes. To help distinguish internal pacemaker pulses on the recorder, try using the diagnostic mode. To help distinguish internal pacemaker pulses on the cardioscope and the recorded ECG strips, the leads monitoring mode can be programmed during set-up mode to agency frequency response. Refer to the LIFEPAK 10C defibrillator/monitor/pacemaker Service Manual or contact a qualified service technician for assistance.

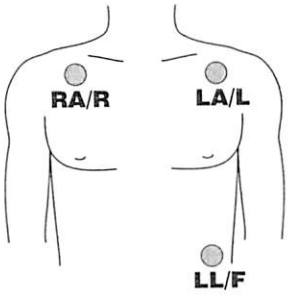
ECG Monitoring Procedure

To perform 3-lead ECG monitoring:

1 Turn the 1 POWER switch to a power source.

2 Connect the patient ECG cable to the ELECTRICALLY ISOLATED ECG connector located on the right side panel.

3 Identify the appropriate electrodes sites on the patient:



AHA Labels		IEC Labels	
RA	Right Arm	**R**	Right
LA	Left Arm	**L**	Left
LL	Left Leg	**F**	Foot

Figure 2-1 Electrode placement

4 Prepare patient's skin for electrode application:
- Remove excessive hair at electrode site. Avoid locating electrodes over tendons and major muscle masses.
- For oily skin, clean skin with alcohol pad.
- Dry site with brisk rub.

5 Apply ECG electrodes:
- Inspect electrode package and confirm package is sealed and date is not expired. Carefully tear open foil package and remove electrode carrier.
- Attach an electrode to each of the lead wires.
- Grasp electrode tab and peel electrode from carrier.
- Inspect electrode gel and make sure gel is intact (discard electrode if gel is not intact).
- Hold electrode taut with both hands. Apply the electrode flat to the skin. Smooth tape outwardly in all directions. Do not press the center of the electrode.

6 Press LEAD SELECT to select desired lead (leads I, II, III, are available).

7 Adjust ECG SIZE if necessary. Size is automatically set to gain of x1 at power-on. To properly count heart rate during routine monitoring, the ECG size may need to be adjusted as follows:
- Press VOL ▲ until the QRS complexes are audible.
- Press ECG SIZE ▼ or ▲ until the systole beeper coincides with every QRS complex.
- Adjust VOL ▼ or ▲ as desired.

8 Secure the patient ECG cable with the cable clasp.

9 To print an ECG strip, press RECORD. To stop the recorder, press RECORD again.

Monitoring Warnings

⚠ WARNINGS

Safety risk.

Use only Physio-Control patient ECG cables listed in this manual. Substitution of non-Physio-Control patient ECG cables may result in inaccurate ECG data.

Possible misinterpretation of cardioscope ECG data.

The cardioscope frequency response is only intended for rhythm identification. Use the recorder in DIAG mode for diagnostic interpretations.

Possible misinterpretation of ECG recordings.

When attempting to visually detect subtle ECG characteristics such as ST segment abnormalities, use the recorder only in diagnostic frequency response mode (DIAG). The monitor frequency response mode does not provide the resolution required for diagnostic and ST segment interpretation, and is intended only for basic ECG rhythm identification.

Possible electrical interference with ECG monitoring.

Do not operate this device in conjunction with electrocautery or diathermy equipment. Such equipment, as well as equipment which emits strong radio frequency signals, can cause electrical interference and distort the ECG signal displayed by the monitor, thereby preventing accurate rhythm analysis.

Standard Paddles Monitoring Procedure

To monitor with standard paddles:

1. Turn the 1 POWER switch to a power source. The device performs a 5-second, self-diagnostic test; all indicator lights and all status display messages illuminate momentarily.

   The defibrillator may be programmed to power-on with Lead II selected (initial factory setting) or Paddles lead selected. For assistance in changing the power-on lead selection, contact a qualified service technician.

2. Press LEAD SELECT to select paddles lead ( ).
3. Apply conductive gel over the entire paddle electrode surface.
4. Place paddles firmly on patient's bare torso. The standard paddle electrode placement is STERNUM paddle on the patient's right upper torso below the clavicle and the APEX paddle lateral to the patient's left nipple in the midaxillary line.
5. Observe cardioscope to evaluate patient's rhythm.

When the device is turned on, the ECG size is x1. The ECG size may need to be adjusted if the QRS complex is not clearly visible on cardioscope.

ECG monitoring after defibrillation is usually delayed by a defibrillation recovery time of a few seconds. During this time, it may not be possible to determine defibrillation results from the monitor trace.

MONITORING

Patient ECG can be monitored with the standard paddles using the QUIK-LOOK defibrillation paddle feature, the 3-lead patient ECG cable, or the disposable QUIK-COMBO electrodes. For information about QUIK-COMBO electrodes refer to Section 5. Topics in this section include:

Event Storage Priority

The CODE SUMMARY record has the capacity to store approximately 22 ECG events (including defibrillation, pacing, and ECG recording) and 50 event preambles (the annotation to the left of the ECG segment). Events are stored in chronological order.

If the CODE SUMMARY memory is full, information is retained in the following priority:

1. First and last defibrillation event preambles (with ECG segments)
2. Defibrillation and pacing event preambles (without ECG segments)
3. Recorded ECG event preambles (without ECG segments)
4. Defibrillation and pacing event preambles (with ECG segments)
5. Recorded ECG event preambles (with ECG segments).

To allow room for preambles that have priority over ECG segments, ECG segments are erased in reverse chronological order.

Recorded ECG Format

Each time the recorder is activated, a 6-second recorded ECG report is stored which includes ECG information 3 seconds before and 3 seconds after RECORD was pressed. The format is illustrated in Figure 3-3.

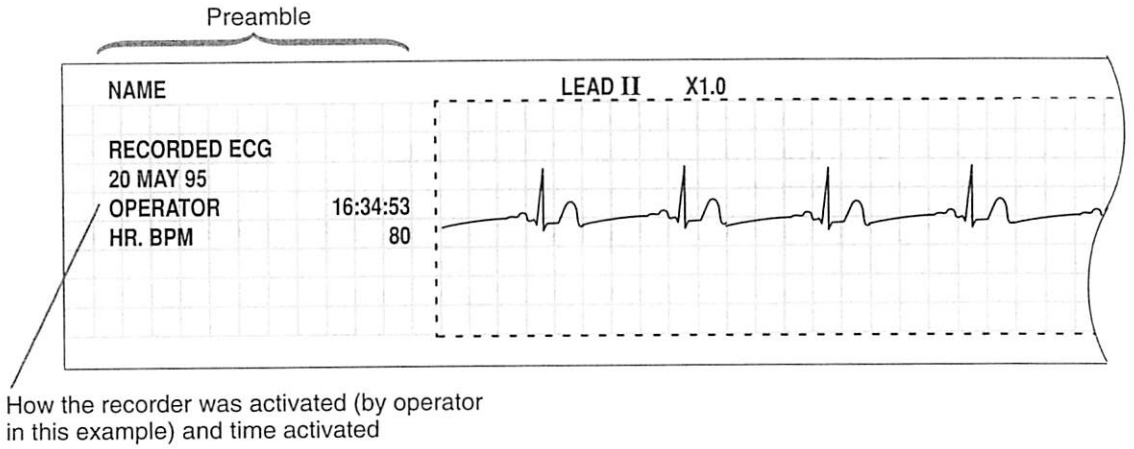


Figure 3-3 Example of recorded ECG format

Noninvasive Pacing Format

Whenever pacing is activated and pacing controls remain unchanged for at least 10 seconds, a 6-second pacing report is recorded. The format is illustrated in Figure 3-4.

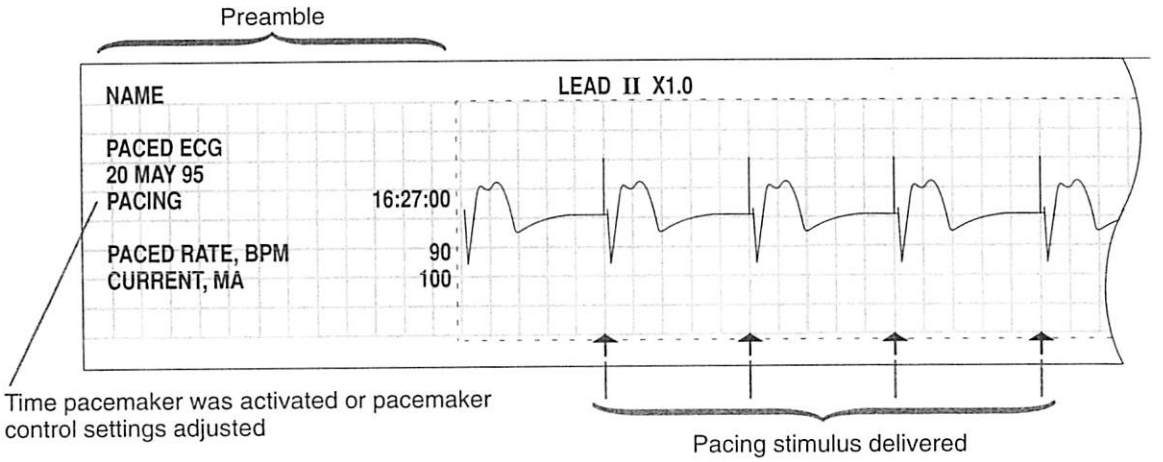


Figure 3-4 Example of noninvasive pacing format

Format of CODE SUMMARY Reports

The format of the CODE SUMMARY report and each event type is described in the following paragraphs.

Report Overview

Each CODE SUMMARY report is preceded by an overview which lists general information as illustrated in Figure 3-1.

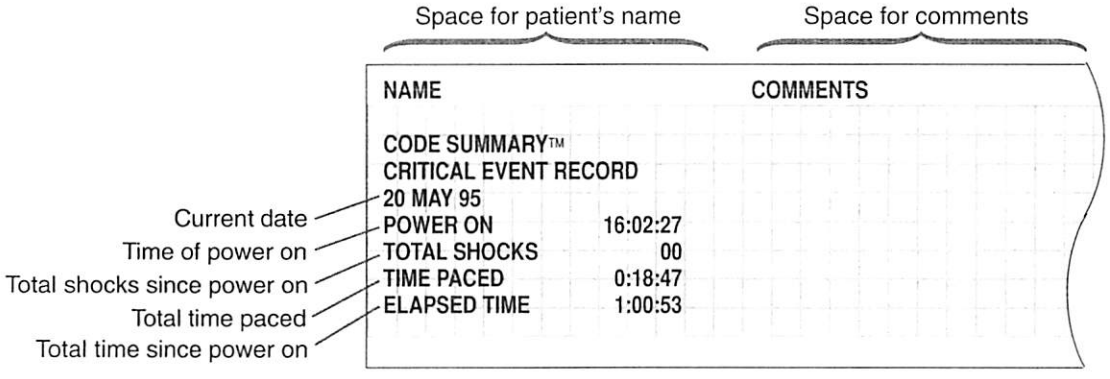


Figure 3-1 Example of CODE SUMMARY report overview

Defibrillation Format

The format for a defibrillation event is illustrated in Figure 3-2. The ECG information includes 3 seconds before discharge and 5.5 seconds after discharge (following a 3-second delay after discharge to allow the defibrillation effect to dissipate). Because ECG information is recorded before and after each discharge, the CODE SUMMARY report requires at least 7 seconds between discharges in order to record each discharge.

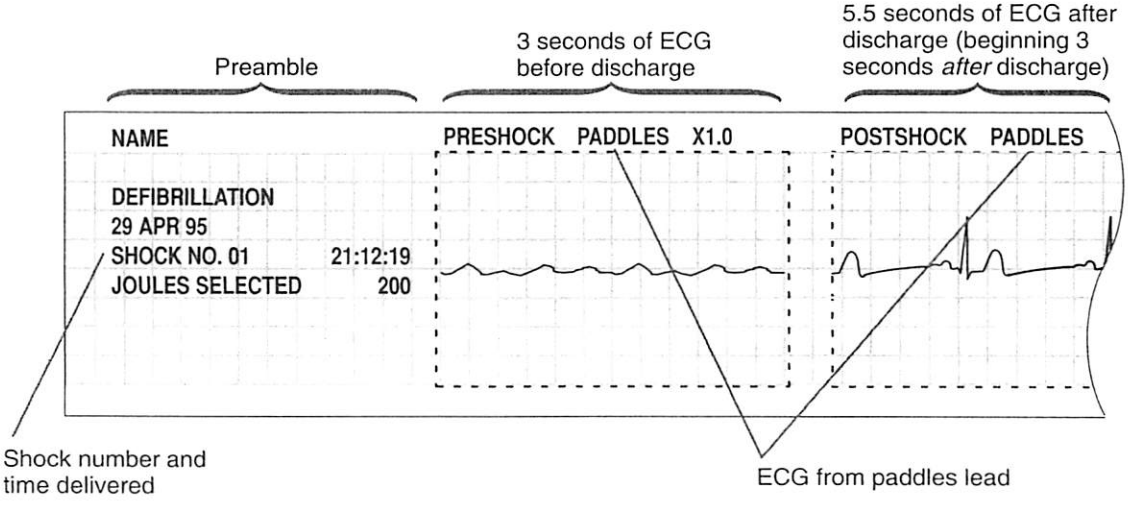


Figure 3-2 Example of defibrillation format

Handling Recordings

To help prevent the ECG annotation and tracing from fading or disappearing, follow these guidelines for thermal sensitive paper:

- Do not apply tape or other adhesives over printed information (adhesives may be applied to back of the paper).
- Store only in paper folders; do not store or file with plastics; avoid storing in temperatures exceeding 26.7°C (80°F) and relative humidity exceeding 70%.
- Avoid extended exposure to sunlight.

CODE SUMMARY Critical Event Record

The CODE SUMMARY critical event record documents critical events during resuscitation. It records defibrillation and cardioversion details, operator-selected ECG segments, and pacing parameters in chronological order. Resuscitation details are prioritized for retention of the most critical events.

The CODE SUMMARY record does not store ECG data in DIAG mode. The CODE SUMMARY record stores ECG data at the monitoring frequency response (agency or domestic) selected in set-up.

Description of CODE SUMMARY Record

Critical events are retained in memory whenever the LIFEPAK 10C defibrillator/monitor/pacemaker is on. If power is removed, the CODE SUMMARY record may still be printed by applying power within five minutes and pressing CODE SUMMARY. After five minutes without power, CODE SUMMARY information may not be recovered.

Standard use of the recorder is available at any time by pressing RECORD once to interrupt CODE SUMMARY report printing, then pressing RECORD again to initiate recording. This does not delete information already stored in the CODE SUMMARY record.

If there is no paper in the recorder and the operator presses RECORD, additional ECG information is not stored in the CODE SUMMARY record. However, defibrillation, synchronized cardioversion, and pacing information is stored.

The CODE SUMMARY record only stores defibrillation and/or strip chart recording events if they are separated by at least a seven-second interval (i.e., if two defibrillation shocks are delivered within seven seconds, only the first shock is stored in the CODE SUMMARY record). The CODE SUMMARY record does not print whenever the defibrillator is charging. This helps prevent historical CODE SUMMARY data from being interpreted as real-time data.

Printing the CODE SUMMARY Report

To print the CODE SUMMARY report:

1. Press CODE SUMMARY to initiate printing; unless interrupted, printing continues until the entire report is printed.
2. To interrupt printing, press CODE SUMMARY again.
   The CODE SUMMARY report printing is also interrupted if RECORD or CHARGE are pressed, power is turned off, or the recorder runs out of paper.
3. To resume printing, press CODE SUMMARY again. The recorder resumes printing beginning with the last event printed unless the interruption was caused by paper depletion. In this case, the recorder resumes printing beginning with the last three events printed.

Loading Paper

The recorder is equipped with an out-of-paper sensor to protect the recorder printhead. The sensor automatically turns off the recorder if paper runs out or the recorder door is open.

To load the paper:

1 Lift up the slotted edge of the front recorder door to open the recorder.
2 Remove empty paper roll.
3 Insert new paper roll, grid facing forward.
4 Pull out a short length of paper.
5 Pull the rear recorder door toward you and push down on the front recorder door to close.

⚠ CAUTION **Possible equipment damage.**

Use only paper designed for thermal array recorders. Use of other types of paper may damage the print head.

Using the Recorder

To record:

1 Press RECORD.
2 Adjust ECG SIZE if necessary.
3 To stop printing, press RECORD again.

Recording can be performed with any lead selected.

Diagnostic Recording

If the diagnostic frequency response mode (DIAG) has been enabled during set-up, holding RECORD down for more than one second selects DIAG and turns on the recorder. The ECG signal now prints at a frequency response of 0.05 –100Hz (per AHA recommendations).

The DIAG mode must be reselected with each new recording. The recorder operates continuously when in DIAG mode.

Recorder Annotation

The recorder prints the time, date, ECG lead, ECG size, heart rate, defibrillation/synchronization parameters, pacing parameters, and CODE SUMMARY record. The beginning of each annotation is marked by an arrow symbol (▶).

While on, the recorder prints updated annotation information every 20 seconds. The recorder also updates the annotation if changes are made to lead selection, pacing parameters, or SYNC mode.

If FREEZE is pressed while the recorder is printing, the printing continues unaffected until FREEZE is released. At that time, frozen information is printed and annotated by ////ECG-FREEZE////. The recording function then returns to delayed mode.

If the recorder is on when the defibrillator is discharged, the recorder annotates the time, date, AVAILABLE ENERGY, and SYNC (if energy is transferred in SYNC mode) after discharge.

RECORDING

This section describes how to record patient information. Topics include:

STANDARD PADDLES DEFIBRILLATION

This section describes defibrillation and synchronized cardioversion using standard paddles. For information about defibrillation using QUIK-COMBO electrodes, refer to Section 5. Topics in this section include:

Defibrillation Warnings

⚠ WARNINGS

Shock hazard.

When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the metal paddle plates or QUIK-COMBO electrodes when discharging the defibrillator.

Shock hazard.

If a person is touching the patient, bed, or any conductive material in contact with the patient during defibrillation, the delivered energy may be partially discharged through that person. Make sure everyone stands away from the patient, bed, and other conductive material before discharging the defibrillator.

Shock hazard.

Do not discharge the defibrillator into the open air. To internally remove an unneeded electrical charge, rotate the ENERGY select dial on the STERNUM paddle or turn the defibrillator POWER switch to OFF.

Shock hazard.

Conductive gel (wet or dry) on the paddle handles can allow the electrical energy to discharge through the operator during defibrillation. Be sure to completely clean the paddle plates, handles, and storage wells after defibrillation.

Possible fire, burns and ineffective energy delivery.

Do not discharge standard paddles on QUIK-COMBO electrodes or ECG electrodes. Do not allow physical contact between the ECG electrodes and the paddles, combination electrodes or defibrillation gel. Such contact can cause electrical arcing and patient skin burns during defibrillation and may divert defibrillating energy away from the heart muscle.

Possible skin burns.

During defibrillation, air pockets between the skin and paddle plates can cause patient skin burns. To help prevent air pockets, completely cover paddle plates with conductive gel and press paddles firmly against the patient. The conductive gel must not be dried out.

Possible burns and ineffective energy delivery.

A gel pathway on the skin between the paddles will cause the current to arc between paddles and divert defibrillating energy away from the heart muscle. Do not allow conductive gel to become continuous between paddle sites.

Possible paddle damage and skin burns.

Do not discharge the defibrillator with the paddle plates shorted together because this may pit or damage the paddle plate surface. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.

Possible interference with implanted devices.

When cardioversion or defibrillation is performed on a patient with an implanted device, avoid placing the paddles over the implanted device because defibrillation may cause device malfunction. Check function of device after defibrillation.

⚠ CAUTION **Possible equipment damage.**

Disconnect any equipment from patient which may be damaged by defibrillator shock. This may include external transvenous pacing devices.

Paddle Usage/Options

When using standard defibrillation paddles, a conductive interface designed for defibrillation such as defibrillation gel, paste, or gel pads must be used between the paddle electrode surface and the skin.

The LIFEPAK 10C defibrillator/monitor/pacemaker is equipped with standard adult defibrillation paddles. Optional pediatric and posterior paddles are also available. The standard adult paddles may be used for any pediatric patients weighing greater than approximately 10kg (22 lbs) as long as the paddles fit completely on the chest and there is a least 1 inch of space between the paddle electrodes. Pediatric paddles should be used for patients less than 10kg or those whose chests are too small to accommodate the standard paddles.

For more information about using pediatric or posterior paddles, refer to the accessory operating instructions.

Standard Paddle Placement

Anterior-Lateral

The standard paddle electrode placement is illustrated in Figure 4-1:

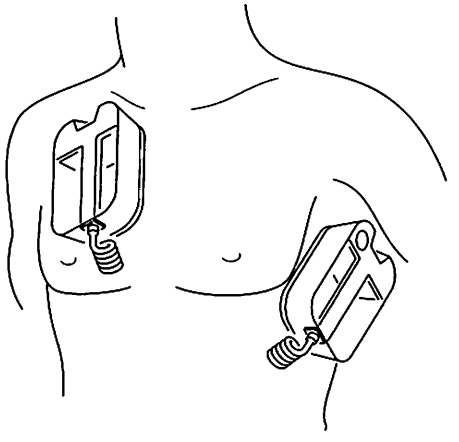


Figure 4-1 Standard paddle anterior-lateral placement

- STERNUM paddle on the patient's right upper torso, lateral to the sternum and below the clavicle.
- APEX paddle lateral to the patient's left nipple in the midaxillary line, with the center of the paddle electrode in the midaxillary line if possible.

Anterior-Posterior

There are two possible anterior-posterior paddle placements:

- The preferred position is to place the STERNUM paddle anteriorly over the left precordium and the APEX paddle posteriorly behind the heart in the infrascapular area.
- An alternative is to place the STERNUM paddle over the cardiac apex and the APEX paddle on the patient's right posterior infrascapular area.

Special Placement Situations

Implanted pacemaker patients. If possible, place paddles away from the internal pacemaker generator to help prevent damage to the pacemaker.

Patients with implanted defibrillators. Apply paddles in the preferred placement, APEX-STERNUM (anterior-lateral), and treat this patient like any other patient requiring emergency care. If defibrillation is unsuccessful, it may be necessary to increase the energy level or to use the alternate electrode placement (anterior-posterior) due to the insulation of implanted defibrillator electrodes.

Standard Paddles Defibrillation Procedure

To defibrillate using standard paddles:

1. Turn the POWER switch to a power source.
2. Apply defibrillation gel over entire paddle electrode surface.
3. Turn the ENERGY dial to the desired energy level. The defibrillator will not charge if the dial is between settings.
4. Place defibrillator paddles firmly on patient's chest.
5. Press CHARGE on APEX paddle. While the defibrillator is charging, the CHARGE indicator light flashes and the numbers increase in the AVAILABLE ENERGY display until the energy reached the selected level. A single tone sounds when the defibrillator is fully charged.
6. Make sure all personnel, including the operator, stand clear of the patient, bed, and any equipment connected to the patient.
7. Discharge the defibrillator by simultaneously pressing both paddle discharge buttons. The defibrillator will not discharge until it completes charging to the selected energy level.

   If paddle discharge buttons are not pressed within 60 seconds, the stored energy is automatically removed within the defibrillator.
8. Observe patient and cardioscope to determine results. If additional countershock is necessary, repeat this procedure beginning at step 3.
9. To internally discharge an unwanted charge, rotate the ENERGY dial.
10. To turn off the defibrillator, turn POWER to OFF.
11. Thoroughly clean defibrillator paddles and store them in the paddle storage area.

    If the ENERGY dial is rotated after charging is initiated, the AVAILABLE ENERGY display blanks, the charge indicator light goes out, and energy is internally removed. To reinitiate charging, press CHARGE.

Synchronized Cardioversion Procedure Using Patient ECG Cable

⚠ WARNING Possible improper synchronization.

Monitoring the ECG through the standard paddles (QUIK-LOOK monitoring) could introduce artifact and lead to improper synchronization during cardioversion. Always use the patient ECG cable or the QUIK-COMBO electrodes to monitor ECG during synchronized cardioversion.

There are two ways to monitor ECG for synchronized cardioversion:

- Use the patient ECG cable with ECG electrodes and select Lead I, II, or III as described below.
- Use the QUIK-COMBO electrodes and select paddles lead as described on page 5-7.

To perform synchronized cardioversion when using the patient ECG cable:

1. Turn POWER switch to a power source.
2. Attach patient ECG cable and ECG electrodes. For proper placement of electrodes refer to ECG Monitoring Procedure on page 2-3.
3. Select lead with optimum QRS complex amplitude (positive or negative).
4. Press SYNC. Confirm the SYNC message on the status display blinks off with each detected QRS complex.
5. Observe the cardioscope. Confirm that a triangle sense marker appears near the middle of each QRS complex. If the sense markers do not appear or are displayed in the wrong locations, adjust ECG SIZE, select another lead, or reposition ECG electrodes. (It is normal for the sense marker location to vary slightly on each QRS complex.)
6. Rotate the ENERGY dial to select the desired energy. The defibrillator will not charge if the dial is between settings.
7. Prepare and place standard paddles on patient's chest.
8. Press CHARGE to charge defibrillator. Confirm the CHARGE indicator light flashes and the AVAILABLE ENERGY display indicates the energy level. When the single tone sounds the defibrillator is fully charged.
9. Make certain all personnel, including operator, stand clear of the patient, bed, and any equipment connected to the patient.
10. Press and **hold** paddle discharge buttons until discharge occurs with next detected QRS complex. Release discharge buttons.
11. Observe patient and cardioscope. If synchronized cardioversion needs to be reattempted, press SYNC again and repeat procedure from step 5. (The defibrillator automatically returns to asynchronous mode after each discharge.)
12. To internally remove an unwanted charge, rotate the ENERGY select dial.
13. To turn off the defibrillator, turn POWER to OFF.
14. Thoroughly clean the paddles and store them in the paddle storage area.

The asynchronous defibrillation mode is automatically selected when the defibrillator powers on. The defibrillator automatically returns to asynchronous mode after each discharge.

Possible Causes of Pacing Interruption

If QUIK-COMBO electrodes become detached during pacing, the LEADS message is displayed and an audible alarm sounds. The pacing rate maintains its pre-alarm setting; however, the current resets to 0mA. Reattaching the QUIK-COMBO electrodes silences the audible alarm and removes the LEADS message. The pacing rate is maintained, but the current remains at 0mA unless increased by the operator.

Pacing therapy cannot be initiated or maintained in paddles lead. If the paddles lead is selected when cycling through leads during pacing, the current returns to 0mA and pacing therapy stops. If the paddles lead is selected and pacing is attempted, the LEADS message displays accompanied by an audible alarm.

Use of radio equipment while pacing may cause the current delivery to stop, the service message to appear, and an audible alarm to sound. To minimize radio interference, move radio equipment farther away from the defibrillator/monitor/pacemaker. If unable to move radio away, reorient the radio. Press PACER to stop the tones and erase the service message. To reinitiate pacing, follow the Pacing Procedure beginning with step 8 on page 5-9.

Defibrillation During Noninvasive Pacing

To defibrillate during noninvasive pacing:

1. Turn the ENERGY dial to the desired energy level. The defibrillator will not charge if the dial is between settings.
2. Press CHARGE on the APEX paddle to charge the defibrillator. A single tone sounds when the defibrillator is fully charged.

   When CHARGE is pressed, pacing stops immediately (pacing control settings return to 40ppm and 0mA) and lights adjacent to PACER and START/STOP buttons go off. The HEART RATE display measures the patient's intrinsic rate in beats per minute and the AVAILABLE ENERGY display indicates the selected energy in joules.
3. Make certain all personnel, including the operator, stand clear of the patient, bed, and any equipment connected to the patient.
4. Discharge the defibrillator by simultaneously pressing both paddle discharge buttons.
5. Observe the patient and cardioscope. If additional countershock is necessary, repeat the procedure beginning at step 2.
6. To internally discharge an unwanted charge, rotate the ENERGY dial.

Patient Care Transfer to a Different Device

To transfer patient care between devices equipped to use QUIK-COMBO electrodes:

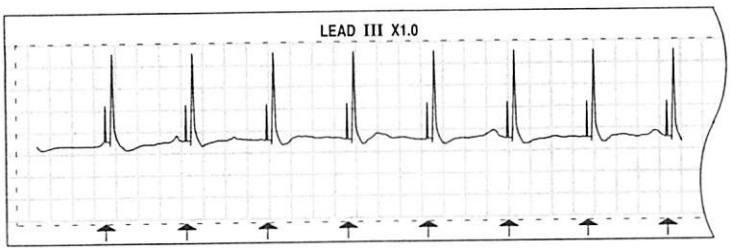
1. Power off the device.
2. Disconnect the QUIK-COMBO electrode cable from the QUIK-COMBO therapy cable on the device. Leave the electrodes on the patient.
3. Connect the QUIK-COMBO electrode cable to the QUIK-COMBO therapy cable on the next device.
4. Follow instructions for the desired therapy.
5. Close the protective cover on the QUIK-COMBO therapy cable connector.

ECG Distortion During Pacing

ECG electrodes pick up pacing current. Therefore, ECG distortion during pacing is sometimes evident. It is important to distinguish between electrical capture and the ECG distortion caused by pacing current in order to avoid misinterpretation.

ECG distortion may occur immediately following the pacing stimulus. ECG distortion morphology is variable; however, ECG distortion without electrical capture returns to the ECG baseline without evidence of a T-wave.

Electrical capture is accompanied by a pulse unless the patient is suffering from pulseless electrical activity (electro-mechanical disassociation). Pacing distortion is *not* accompanied by a pulse. If ECG distortion is severe, select another lead or reposition ECG electrodes away from the QUIK-COMBO electrodes. The example in Figure 5-7 shows pacing pulses followed by high amplitude pacing distortion.



Pacing stimulus followed by high amplitude pacing distortion

Figure 5-7 ECG recording strip with distortion (not to scale)

Pacemaker Refractory Period

The LIFEPAK 10C pacemaker has a refractory period which is a brief, variable (rate dependent) period of time following the pacing pulse in which the pacemaker will not sense electrical activity. The presence of the refractory period allows the set pacing rate to be maintained. Intrinsic activity which occurs during the pacemaker's refractory period is not sensed as illustrated in Figure 5-8.

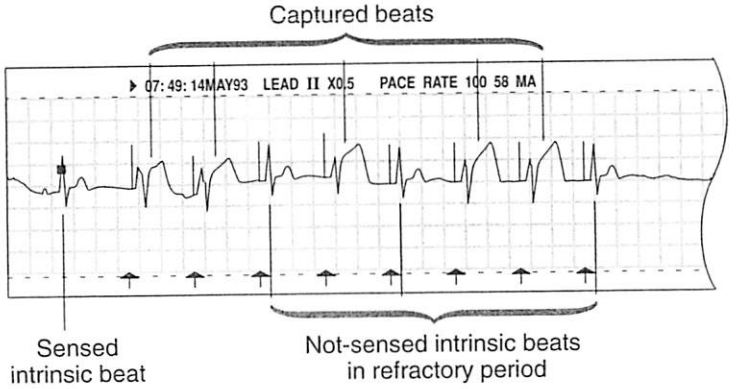


Figure 5-8 Pacemaker refractory period (not to scale)

Assessing for Capture

During pacing, the patient should be visually monitored at all times, and should be assessed for both electrical and mechanical (ventricular) capture. Skeletal muscle twitching should be expected, but it is not an indication of pacing capture.

It could be difficult to interpret the ECG signal when pacing at a rapid rate. In some patients the ECG signal could be easier to interpret in lead I.

Electrical capture stimulated by noninvasive pacing is evidenced by a wide (>120ms) QRS complex followed by a tall, broad T-wave. The QRS complex can be a positive (upward) or negative (downward) deflection. In either case, the most distinctive evidence of electrical capture is the presence of a tall, broad T-wave. It is much like capture seen in temporary transvenous or permanent pacing. In some patients, capture may be less obvious, noted only as a change in the QRS complex configuration. Figure 5-5 presents examples of electrical capture.

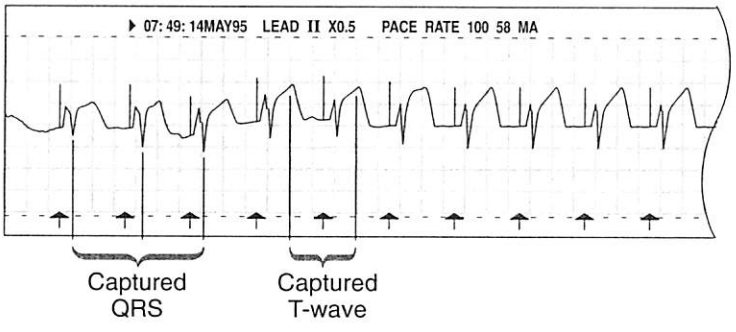


Figure 5-5 ECG recording strip of electrical capture (not to scale)

Many patients achieve capture at 50 to 90mA; however, individual thresholds vary markedly. Hypoxia, acidosis, and other physiologic variables may lead to high capture thresholds. Current must be adjusted upward until capture is achieved. Figure 5-6 provides examples of sensed intrinsic beats and captured beats.

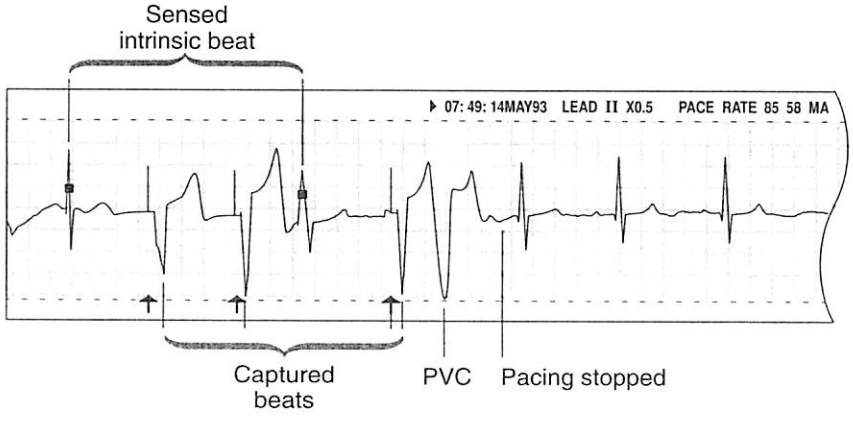


Figure 5-6 Electrical capture with intrinsic beat activity (not to scale)

Mechanical or ventricular capture is evidenced by signs of improving cardiac output. Palpate for a carotid or femoral pulse (right side preferred) and check color and temperature of skin. Check for improving blood pressure and level of consciousness.

- Dry skin. Briskly wipe the skin dry with a towel or gauze. This mildly abrades the skin and removes oils, dirt, and other debris for better electrode adhesion to the skin.
- Do not use alcohol, tincture of benzoin, or antiperspirant to prepare the skin.

4 Apply QUIK-COMBO electrodes to the patient.

5 Connect the QUIK-COMBO therapy cable to the QUIK-COMBO electrode cable.

6 To monitor ECG, connect the patient ECG cable, apply ECG electrodes, and select lead I, II, or III. To receive the best monitoring signal, make sure there is adequate space between the ECG electrodes and the QUIK-COMBO electrodes.

7 Press PACER. Confirm the adjacent indicator illuminates indicating the pacemaker power is on.

8 Select desired pacing rate. (The pacemaker powers up at a rate of 40ppm.)

9 Observe cardioscope. A sense marker should appear on each intrinsic QRS complex for the patient. If intrinsic beats are not present, omit this step. If the sense markers are not present on the QRS complexes or appear elsewhere, adjust ECG SIZE. If this fails, select another lead and readjust ECG SIZE.

10 When the device is sensing properly, activate pacing by pressing START/STOP. For each delivered pacing stimulus, the PACER indicator flashes off and a positive pace displays on the ECG waveform.

11 Increase current slowly (the current level begins at 0mA). Consider use of sedation or analgesia if patient is uncomfortable. Observe cardioscope for evidence of electrical pacing capture. Palpate patient's pulse or check blood pressure to assess for perfusion (mechanical capture).

12 When activated, the ECG and CODE SUMMARY recordings show the pacing parameters. Each pacing stimulus is marked with an arrow (↑) on the lower edge of ECG paper.

13 To stop pacing, press START/STOP again or press PACER. The adjacent indicator lights go off.

14 To remove pacing electrodes from skin, slowly peel from edge.

ECG Monitoring During Pacing

ECG monitoring during pacing must be performed through ECG electrodes and the patient ECG cable rather than through the QUIK-COMBO electrodes. During pacing, the cardioscope displays pace markers followed by any resultant QRS complexes. The recorder annotates pacing information and indicates each delivered pacing stimulus with a bold-faced arrow (↑) immediately below the stimulus. Monitoring or recording from systems other than the LIFEPAK 10C defibrillator/monitor/pacemaker could be difficult due to the large offsets produced by pacing currents.

The following information may be useful in obtaining the best ECG display possible.

- Use the Physio-Control patient ECG cable.
- Be sure skin beneath ECG electrode sites is dry and excessive hair is removed.
- Apply ECG electrodes as follows: RA to patient's far upper right torso beneath the clavicle; LA to far upper left torso beneath the clavicle; LL to lower left torso. These locations could minimize ECG artifact due to motion.
- Select lead I, II, or III for the most prominent QRS display.

Response to Noninvasive Pacing

Externally applied pacing stimuli may produce skeletal muscle contractions. It may be necessary to secure tubing, cables, etc. to prevent their displacement.

When using noninvasive pacing on unconscious patients, the patient's level of consciousness may improve during pacing. Patient discomfort associated with noninvasive pacing may occur. Discomfort may be minimized by administration of a sedative or analgesic or repositioning the QUIK-COMBO electrode with the heart label to the V6 electrode position or to the epigastric area. Repositioning of this electrode could result in a lower capture threshold, thus reducing discomfort.

Noninvasive Pacing

The LIFEPAK 10C defibrillator/monitor/pacemaker can be used to perform demand mode pacing with QUIK-COMBO electrodes. Pacing cannot be performed with this device using any other types of electrodes. Follow the usual protocols for patients requiring noninvasive pacing, including support of airway, breathing and circulation, and drug therapy.

Proper functioning of the demand mode pacemaker depends on the operator correctly adjusting the ECG size to allow sensing of intrinsic cardiac activity. The LIFEPAK 10C pacemaker senses intrinsic QRS activity and inhibits the pacing stimulus for the cycle. If QRS activity is not sensed because the ECG size is set incorrectly or the ECG leads or paddles leads are detached, the device paces asynchronously at the selected rate.

Be sure to place the QUIK-COMBO electrodes in the proper locations as described in the Pacing Procedure. Improper placement of the electrodes can make a significant difference in the capture threshold.

For further information regarding noninvasive pacing, refer to the booklet *Noninvasive Pacing: What You Should Know.* Refer to page 6-19 for ordering information.

⚠ WARNINGS

Possible patient skin burns during prolonged pacing.

Prolonged noninvasive pacing may cause patient skin irritation and burns, especially with higher pacing current levels. Discontinue noninvasive pacing if skin becomes irritated and another method of pacing is available.

Possible improper pacing.

The ECG size must be properly adjusted in order to detect intrinsic complexes and deliver pacing pulses when appropriate. If ECG size is set too high or too low, pacing pulses may not be delivered when required.

Possible ineffective pacing therapy.

Do not use QUIK-COMBO electrodes for longer than 12 hours of continuous pacing. Replace the QUIK-COMBO electrodes with new ones after 12 hours of continuous pacing.

Possible interruption of therapy.

Use of radio transmitters while pacing may cause pacing therapy to stop. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio.

Pacing Procedure

⚠ WARNING **Shock hazard.**

Make sure standard paddles are securely stored in paddle wells during pacing.

To pace, perform the following:

1 Turn the POWER switch to a power source.

2 Identify the electrode sites on the patient. For pacing, use either the anterior-lateral or anterior-posterior position (described on pages 5-3 and 5-4).

3 Prepare patient's skin for electrode application.

- Remove excessive hair as much as possible. Avoid nicking or cutting the skin if using a shaver or razor. Avoid placing electrodes over broken skin if possible.
- Clean skin. If ointment is on the patient's chest, use soap and water to clean the skin.

Synchronized Cardioversion Procedure

⚠ WARNING Shock hazard.

Make sure standard paddles are securely stored in paddle wells before synchronized cardioversion with QUIK-COMBO electrodes.

To perform synchronized cardioversion using QUIK-COMBO electrodes:

1. Turn the POWER switch to a power source.
2. Identify the electrode sites on the patient. For synchronized cardioversion, use either the anterior-lateral or anterior-posterior position (described on pages 5-3 and 5-4).
3. Prepare the patient's skin for electrode application:
   - Remove excessive hair as much as possible. Avoid nicking or cutting the skin if using a shaver or razor. Avoid placing electrodes over broken skin if possible.
   - Clean skin. If ointment is on the patient's chest, use soap and water to clean the skin.
   - Dry skin. Briskly wipe the skin dry with a towel or gauze. This mildly abrades the skin and removes oils, dirt, and other debris for better electrode adhesion to the skin.
   - Do not use alcohol, tincture of benzoin, or antiperspirant to prepare the skin.
4. Apply QUIK-COMBO electrodes to the patient in anterior-lateral or anterior-posterior position.
5. Connect the QUIK-COMBO therapy cable to the QUIK-COMBO electrodes.
6. To monitor ECG when using the anterior-lateral placement, select paddles lead ( ). To monitor ECG when using the anterior-posterior placement, connect the patient ECG cable, apply ECG electrodes, and select lead I, II, or III. To receive the best monitoring signal, make sure there is adequate space between the ECG electrodes and the QUIK-COMBO electrodes.
7. Press SYNC. Confirm the SYNC message on status display blinks with each detected QRS complex.
8. Observe the cardioscope. Confirm that a triangle sense marker appears near the middle of each QRS complex. If the sense markers do not appear or are displayed in the wrong locations, adjust ECG SIZE, select another lead, or reposition electrodes. (It is normal for the sense marker location to vary slightly on each QRS complex.)
9. Turn the ENERGY dial to select the desired energy level. The defibrillator will not charge if the dial is between settings.
10. Press CHARGE on APEX paddle. While the defibrillator is charging, the CHARGE indicator light flashes and the numbers increase in the AVAILABLE ENERGY display until the energy reaches the selected level. A single tone sounds when the defibrillator is fully charged.
11. Make certain all personnel, including the operator, stand clear of the patient, bed, and any equipment connected to the patient.
12. Press and **hold** both paddle discharge buttons until discharge occurs with the next detected QRS complex. Release the discharge buttons.
13. If synchronized cardioversion needs to be reattempted, press SYNC again and repeat this procedure beginning with step 8. (The defibrillator automatically returns to asynchronous mode after each discharge.)
14. To internally remove an unwanted charge, rotate the ENERGY dial.

Defibrillation Procedure

⚠ WARNINGS

Shock hazard.

Make sure standard paddles are securely stored in paddle wells before defibrillation with QUIK-COMBO electrodes.

Shock hazard.

When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the metal paddle plates or QUIK-COMBO electrodes when discharging the defibrillator.

Shock hazard.

If a person is touching the patient, bed, or any conductive material in contact with the patient during defibrillation, the delivered energy may be partially discharged through that person. Make sure everyone stands away from the patient, bed, and other conductive material before discharging the defibrillator.

To defibrillate using QUIK-COMBO electrodes:

1 Turn the POWER switch to a power source.

2 Identify the electrode sites on the patient. For defibrillation, use either the anterior-lateral or anterior-posterior position (described on pages 5-3 and 5-4).

3 Prepare the patient's skin for electrode application:
- Remove excessive hair as much as possible. Avoid nicking or cutting the skin if using a shaver or razor. Avoid placing electrodes over broken skin if possible.
- Clean skin. If ointment is on the patient's chest, use soap and water to clean the skin.
- Dry skin. Briskly wipe the skin dry with a towel or gauze. This mildly abrades the skin and removes oils, dirt, and other debris for better electrode adhesion to the skin.
- Do not use alcohol, tincture of benzoin, or antiperspirant to prepare the skin.

4 Apply QUIK-COMBO electrodes to the patient in anterior-lateral or anterior-posterior position.

5 Connect the QUIK-COMBO therapy cable to the QUIK-COMBO electrodes.

6 Turn the ENERGY dial to the desired energy level. The defibrillator will not charge if the dial is between setttings.

7 Press CHARGE on APEX paddle. While the defibrillator is charging, the CHARGE indicator light flashes and the numbers increase in the AVAILABLE ENERGY display until the energy reaches the selected level. A single tone sounds when the defibrillator is fully charged.

8 Make certain all personnel, including the operator, stand clear of the patient, bed, and any equipment connected to the patient.

9 Discharge the defibrillator by simultaneously pressing both paddle discharge buttons.

10 Observe the patient and cardioscope. If additional countershock is necessary, repeat the procedure beginning at step 6.

11 To internally remove an unwanted charge, rotate the ENERGY dial.

Connecting the QUIK-COMBO Electrode Cable

To connect the QUIK-COMBO therapy cable to the QUIK-COMBO electrodes:

1 Open the protective cover on the QUIK-COMBO therapy cable connector as shown in Figure 5-4.

2 Insert the QUIK-COMBO electrode connector into the QUIK-COMBO therapy cable connector by aligning the arrows and pressing the connectors together.

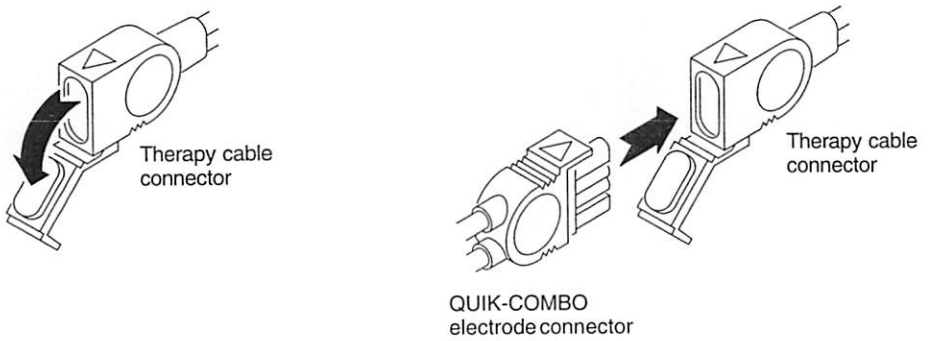


Figure 5-4 Removing cover and pushing connectors together

When the therapy cable is not in use, close the protective cover.

Monitoring Procedure

To monitor using QUIK-COMBO electrodes:

1 Make sure the standard paddles are securely stowed in the paddle wells.

2 Turn the POWER switch to a power source.

3 Identify the electrode sites on the patient. For monitoring, use only the anterior-lateral position described on page 5-3.

4 Prepare patient's skin for electrode application:
- Remove excessive hair at electrode site.
- For oily skin, clean skin with alcohol pad.
- Dry site with brisk rub.

5 Apply the QUIK-COMBO electrodes:
- Inspect electrode package and confirm package is sealed and date is not expired. Carefully tear open foil package and remove electrode.
- Peel back protective liner on the electrodes slowly, beginning with the cable connector end.
- Place electrodes on patient's chest in anterior-lateral position.
- Smooth the electrode center and edges onto the patient's chest. Eliminate air pockets between the gel surface and the skin. Firmly press all adhesive edges to the skin.

6 Connect the QUIK-COMBO therapy cable to the QUIK-COMBO electrodes.

7 Select paddles lead ( ).

8 Observe cardioscope.

Remove electrodes from the skin by slowly peeling back from the edge.

Anterior-Posterior Placement

This placement allows for pacing and defibrillation, but not for monitoring. (The ECG signal obtained through the electrodes in this position is not a standard lead.)

1 Inspect the electrode package and confirm the package is sealed and the date is not expired. Carefully tear open the package and remove the electrodes.
2 Slowly peel back the protective liner from the electrode beginning with the cable connection end as shown in Figure 5-1.
3 Place the anterior (❤) electrode over the left precordium as shown in Figure 5-3. The upper edge of the electrode should be below the nipple. Avoid placement over the nipple, the diaphragm, or the bony prominence of the sternum if possible.

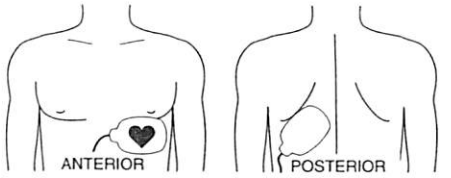


Figure 5-3 Anterior-posterior placement

4 Place the posterior electrode behind the heart in the infrascapular area as shown in Figure 5-3. For patient comfort, place the cable connection away from the spine. Do not place the electrode over the bony prominences of the spine or scapula.
5 For each electrode, smooth out the electrode center and edges onto the patient's body to eliminate air pockets between the gel surface and the skin. Firmly press all adhesive edges to the skin.

Special Placement Situations

When placing electrodes, be aware of the special requirements in these possible situations:

Obese patients or patients with large breasts. Apply QUIK-COMBO electrodes to a flat area on the chest, if possible. If skin folds prevent good adhesion, it could be necessary to spread skin folds apart to create a flat surface.

Thin patients. Follow contour of the ribs and spaces when pressing the electrodes onto the torso. This limits air spaces or gaps under the electrodes and promotes good skin contact.

Patients with implanted pacemaker. If possible, place electrodes away from internal pacemaker generator.

Patients with implanted defibrillators. Apply QUIK-COMBO electrodes in the anterior-lateral position and treat this patient as any other patient requiring emergency care. If defibrillation is unsuccessful, it may be necessary to try alternate electrode placement (anterior-posterior) due to the insulative properties of implanted defibrillator electrodes.

Removing and Replacing Electrodes

Replace QUIK-COMBO electrodes after 12 hours of continuous pacing, 50 defibrillation shocks, or 24 hours on the skin. To remove or replace QUIK-COMBO electrodes:

1 Remove the QUIK-COMBO electrodes from the skin by slowly peeling back from the edge. Discard the electrodes.
2 Clean and dry the patient's skin.
3 Apply new QUIK-COMBO electrodes. Change the position slightly from the previous position to help prevent skin burns.

QUIK-COMBO Electrode Placement

⚠ WARNING

Possible interference with implanted device.

When cardioversion or defibrillation is performed on a patient with an implanted device, avoid placing the QUIK-COMBO electrodes over the implanted device because defibrillation may cause device malfunction. Check function of implanted device after defibrillation.

The following paragraphs describe the two methods of electrode placement when using QUIK-COMBO electrodes.

Anterior-Lateral Placement

This placement allows for ECG monitoring, defibrillation, synchronized cardioversion, and noninvasive pacing.

1 Inspect the electrode package and confirm the package is sealed and the date is not expired. Carefully tear open the package and remove the electrodes.

2 Slowly peel back the protective liner from the electrode beginning with the cable connection end as shown in Figure 5-1.

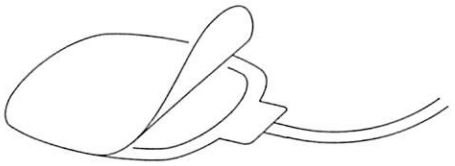


Figure 5-1 Peeling the liner from the electrode

3 Place the anterior electrode on the patient's upper right torso, lateral to the sternum and below the clavicle as shown in Figure 5-2.

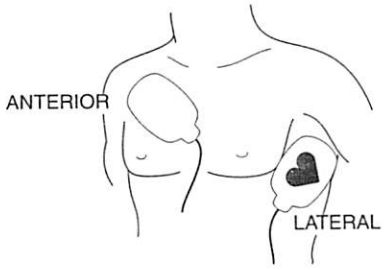


Figure 5-2 Anterior-lateral placement

4 Place the lateral (❤) electrode lateral to the patient's left nipple in the midaxillary line, with the center of the electrode in the midaxillary line if possible as shown in Figure 5-2.

5 For each electrode, smooth out the electrode center and edges onto the patient's body to eliminate air pockets between the gel surface and the skin. Firmly press all adhesive edges to the skin.

About QUIK-COMBO Electrodes

⚠ WARNINGS

Shock or fire hazard.

Do not immerse any portion of the QUIK-COMBO cables or electrodes in water or other fluids. Avoid spilling any fluids on the device, cables, connectors, or electrodes. Do not autoclave, steam, or gas sterilize unless otherwise specified. Do not clean the QUIK-COMBO electrodes or their permanently attached electrode cable with isopropyl alcohol.

Inability to deliver therapy.

Only QUIK-COMBO electrodes can be used with the QUIK-COMBO therapy cable.

Possible skin burns and ineffective energy delivery.

Use of QUIK-COMBO electrodes that are dried out or damaged may cause electrical arcing and patient skin burns during therapy. To help prevent drying or damage, do not use electrodes if they have been removed from the foil package for more than 24 hours. Replace after 50 shocks or 12 hours of continuous pacing. Do not use electrodes beyond the expiration date. Inspect electrodes to make sure adhesive is intact and undamaged.

Possible skin burns.

During defibrillation or pacing, air pockets between the skin and QUIK-COMBO electrodes can cause patient skin burns. Make sure self-adhesive QUIK-COMBO electrodes completely adhere to skin. If the position must be changed, remove and replace the electrodes.

QUIK-COMBO electrodes are pre-gelled, self-adhesive electrodes for hands-free defibrillation, noninvasive pacing, ECG monitoring, and synchronized cardioversion. These electrodes are for use with only specially adapted or upgraded Physio-Control devices such as the LIFEPAK 10C defibrillator/monitor/pacemaker.

A QUIK-COMBO electrode set:

- is a substitute for standard paddles
- allows delivery of a combination of therapies through the same set of electrodes
- connects to any Physio-Control device equipped with QUIK-COMBO therapy cables to allow patient transfer between devices without removing the electrodes from the patient
- provides a lead II monitoring signal when placed in the anterior-lateral position
- restores the ECG trace on the monitor quickly following defibrillation.

The QUIK-COMBO electrodes are disposable and not sterile. They are radiolucent except for connecting wires and points where wires attach to the electrodes. The QUIK-COMBO electrodes are intended for a single patient application. Once applied, they should not be moved. One electrode set can be used for up to 50 shocks at any energy setting, can withstand a continuous pacing current for 12 hours, and can remain on the patient for 24 hours. After 24 hours, remove QUIK-COMBO electrodes, clean the patient's skin, and apply a new set of electrodes.

When using QUIK-COMBO electrodes, make sure the electrodes:

- fit completely on the chest
- have at least one inch of space between electrodes
- do not overlap bony prominences of sternum or spine.

QUIK-COMBO electrodes can be used on pediatric patients if the placement meets the conditions noted previously. These conditions are normally met by children weighing 10kg (22lbs) or more.

To help prevent damage to QUIK-COMBO electrodes:

- Do not fold electrodes.
- Do not trim electrodes.
- Do not crush electrodes under heavy objects.
- Do not autoclave, gas sterilize, immerse in fluids, or clean electrodes with alcohol or solvents.

QUIK-COMBO ELECTRODES PROCEDURES

This section describes the use of QUIK-COMBO electrodes. Topics include:

MAINTENANCE AND TESTING

This section describes how to perform operator-level maintenance, testing, and troubleshooting. Topics include:

General Maintenance and Testing

Periodic maintenance and testing of the LIFEPAK 10C defibrillator/monitor/pacemaker and accessories is important to help prevent and detect possible electrical and mechanical problems and keep personnel acquainted with normal operating procedures. If testing reveals a possible problem, refer to Troubleshooting on page 6-14. If the problem cannot be corrected, remove the device from active service and immediately contact a qualified service technician. For testing information regarding accessories, refer to the accessory Operating Instructions.

Routine testing of the monitor consumes battery power. Make sure all batteries are properly maintained and tested as described on page 6-7.

Maintenance and Testing Schedule

Table 6-1 lists the recommended maintenance and testing schedule for clinical personnel. This schedule may be used in conjunction with the internal quality assurance program of the hospital, clinic, or emergency medical service where this monitor is used. A separate checklist entitled *Manual Defibrillators: Operators Shift Checklist* is included with shipment of the LIFEPAK 10C defibrillator/monitor/pacemaker and is available for use.

Additional periodic preventive maintenance and testing such as electrical safety tests, performance inspection, and required calibration should be performed regularly by qualified service personnel.

Table 6-1 Recommended maintenance schedule for clinical personnel

	Daily	After Use	As Required	3 Months	6 Months
Inspect device.	●		●		
Clean device.		●	●		
Check that all necessary supplies and accessories are present (e.g., fully-charged batteries, gel, recorder paper, patient ECG cable, ECG electrodes, QUIK-COMBO electrodes, etc.).	●	●			
Check/change recorder paper.	●				
Operation tests:					
Monitor/Recorder Test	●		●		
Defibrillator Test	●		●		
Synchronous Cardioversion Test	●		●		
Noninvasive Pacing Test	●		●		
Batteries: Reconditioning (alternate with Shelf Life Test below).				●	
Batteries: Shelf Life Test.					●

Inspection

Before any testing, perform a thorough visual inspection of the LIFEPAK 10C defibrillator/monitor/pacemaker case, accessories, and cables as described in Table 6-2.

Table 6-2 Inspection

Items	Inspect for	Recommended Corrective Action
LIFEPAK 10C defibrillator/ monitor/pacemaker case, paddles, and accessories	Gel or foreign substances	Clean as defined in Table 6-3
	Damage or cracks, pits in paddle surfaces, improper mechanical function of controls, covers, keypads, switches, recorder door	Contact service to replace or repair
Battery pins in battery wells	Loose pins	Tighten if loose
	Bent, broken, corroded, worn, or damaged pins	Contact service to replace
Patient ECG cable, QUIK-COMBO therapy cable, paddle cords, and other cables	Gel or foreign substances	Clean as defined in Table 6-3
	While bending and flexing cable, inspect for cracks, damage, cuts or abrasions, extreme wear, exposed inner wires, broken or bent connectors and pins; confirm connectors engage securely	Replace

Cleaning

Clean the LIFEPAK 10C defibrillator/monitor/pacemaker, cables, and accessories as described in Table 6-3. Use only the cleaning agents listed in Table 6-3.

⚠ CAUTION **Possible equipment damage.**

Do not clean any part of the monitor, recorder, or cables with bleach, bleach dilution, or phenolic compounds. Do not use abrasive cleaning agents. Do not steam, autoclave, or gas-sterilize the LIFEPAK 10C defibrillator/monitor/pacemaker or accessories unless otherwise stated in accessory Operating Instructions.

Table 6-3 Recommended cleaning

Item	Cleaning Practice	Recommended Cleaning Agents
LIFEPAK 10C defibrillator/ monitor/pacemaker case, display, paddles and cords, paddles wells, QUIK-COMBO therapy cable, crevices, cracks, cables	Clean with damp sponge or cloth. When cleaning paddle wells, hold down rocker mechanism to push up paddle contacts to access for cleaning.	• Quaternary ammonium compounds • Isopropyl alcohol • Peracetic (peroxide) acid solutions
Recorder	Open doors, remove paper roll, blow dust or debris out of compartment. Clean compartment with soft *dry* cloth.	• *No cleaning agent* (only soft *dry* cloth)
	Clean recorder printhead with soft *dry* cloth.	• *No cleaning agent* (only soft *dry* cloth)
Accessories	Refer to accessory Operating Instructions.	Refer to accessory Operating Instructions.

Monitor/Recorder Test

Equipment Needed

- LIFEPAK 10C defibrillator/monitor/pacemaker
- Patient ECG cable
- QUIK-COMBO 3-Lead Patient Simulator

Test Procedure

1. Turn defibrillator/monitor/pacemaker POWER switch to a power source. Confirm the device completes a self-test with no service indicator displayed.
2. Connect the patient ECG cable to the ECG connector and attach the leads to the patient simulator. The simulator power should remain off.
3. Select lead II on the defibrillator/monitor/pacemaker.
4. Press QRS VOL ▲ 5 times.
5. Press and release CAL. Confirm that a 1mV calibration pulse is displayed on the cardioscope.
6. Turn on simulator power and select NSR. Confirm the monitor displays a normal sinus rhythm with a heart rate of 72. Confirm that QRS tones sound with each beat.
7. Press FREEZE. Confirm the trace on the cardioscope stops. Release FREEZE.
8. Press RECORD. Confirm the recorder operates and prints the ECG trace. Confirm that after approximately 3 seconds, the recorder annotates the time, date, lead II, ECG gain and heart rate on the paper.

⚠ CAUTION **Possible equipment damage.**

Recorder will not run without paper. Use only paper designed for thermal array recorders. Use of any other ECG paper may damage print head.

9. Press RECORD to turn off recorder.
10. While in lead II, remove either the RA or LL lead from the simulator and confirm the NSR ECG trace is no longer displayed. Reconnect the lead.
11. Select lead I and remove either the RA or LA lead from the simulator. Confirm the NSR ECG trace is no longer displayed. Reconnect the lead. Confirm removing the reference lead, LL, does not affect the ECG display.
12. Select lead III and remove either the LA or LL lead from the simulator. Confirm the NSR ECG trace is no longer displayed. Reconnect the lead. Confirm removing the reference lead, RA, does not affect the ECG display.
13. To test the QUIK-COMBO therapy cable, connect the therapy cable to the QUIK-COMBO 3-Lead Patient Simulator.
14. Confirm the standard paddles are securely stored in the paddle wells.
15. Select paddles lead ( ).
16. Confirm the simulator power is on and NSR is selected. Confirm the monitor displays a normal sinus rhythm with a heart rate of 72. Confirm that QRS tones sound with each beat.

Defibrillator Test

Equipment Needed

- LIFEPAK 10C defibrillator/monitor/pacemaker
- Battery Support System
- QUIK-COMBO 3-lead patient simulator
- Timer

Test Procedure

1 Turn the defibrillator POWER switch to a power source.

2 Select 360 joules on the Battery Support System (refer to Battery Support System Operating Instructions if necessary).

⚠ WARNING **Possible paddle damage and patient burns.**

Press paddles firmly onto the Battery Support System test plates when discharging to prevent formation of pits on paddle surfaces. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.

3 Place the standard paddles on the Battery Support System test load plates. Make sure paddle surfaces do not contact your body or any other surface of the Battery Support System.

4 Rotate the ENERGY dial to select 360 joules.

5 Press CHARGE and start the timer.

6 Confirm that the tone indicating full charge sounds within 12 seconds or less.

7 Press RECORD.

8 Press only the APEX discharge button and confirm defibrillator does not discharge. Release the APEX discharge button.

9 Press only the STERNUM discharge button and confirm defibrillator does not discharge. Release the STERNUM discharge button.

10 Apply firm pressure with both paddles on the Battery Support System test load plates and press both paddle discharge buttons simultaneously. Confirm the Battery Support System displays the delivered energy. Confirm the recorder annotates the time, date, and energy selected on the ECG strip.

11 To test the QUIK-COMBO therapy cable, connect the therapy cable to the QUIK-COMBO 3-lead patient simulator.

⚠ WARNING **Shock hazard.**

During defibrillation cable testing, the discharged energy passes through the therapy cable connector. Be sure that the cable connector is securely attached to the testing device.

12 Rotate the ENERGY dial to select 360 joules.

13 Press CHARGE.

14 Discharge the defibrillator by pressing both paddle discharge buttons simultaneously while observing the DEFIB light on the simulator.

15 Confirm that the DEFIB light flashes briefly indicating discharge. If the indicator light does not flash, remove the defibrillator from active service and contact a qualified service technician.

⚠ CAUTION **Possible equipment damage.**

Do not deliver more than 20 defibrillation pulses per hour at maximum energy, with no more than 15 occurring in any 5-minute period. This helps prevent heat build-up in the defibrillator.

Synchronous Cardioversion Test

Equipment Needed

- LIFEPAK 10C defibrillator/monitor/pacemaker
- Battery Support System
- Patient ECG cable
- QUIK-COMBO 3-lead patient simulator

Test Procedure

1. Turn the defibrillator POWER switch to a power source.
2. Connect the patient ECG cable to the defibrillator and the QUIK-COMBO 3-lead patient simulator.
3. Connect the QUIK-COMBO therapy cable to the QUIK-COMBO 3-lead patient simulator.
4. Apply power to the simulator and select bradycardia rhythm.
5. Observe the cardioscope. Press LEAD SELECT as needed to select a lead with tall QRS complexes (positive or negative).
6. Press SYNC. Confirm the SYNC message is displayed. Adjust ECG SIZE until the sense markers appear on the upper portion of the QRS complexes. Confirm the SYNC message blinks off with each detected QRS complex and the heart rate is displayed.
7. Press RECORD to start the recorder.
8. Make sure the standard paddles are securely stored in the paddle wells.
9. Rotate the ENERGY dial on the STERNUM paddle to select 50 joules.
10. Press CHARGE to charge the defibrillator.
11. After the tone sounds indicating full charge, simultaneously press and hold both paddle discharge buttons while observing the cardioscope.
12. Confirm the defibrillator discharges on the next QRS complex.
13. Confirm the defibrillator returns to asynchronous mode (SYNC message no longer displayed) and the recorder annotates the time, date, 50J, and SYNC.

Noninvasive Pacemaker Test

Equipment Needed

- LIFEPAK 10C defibrillator/monitor/pacemaker
- Patient ECG cable
- QUIK-COMBO 3-lead patient simulator

Test Procedure

1. Turn the defibrillator/monitor/pacemaker POWER switch to a power source.
2. Connect the QUIK-COMBO therapy cable to the QUIK-COMBO 3-lead patient simulator.
3. Apply power to the simulator and select bradycardia rhythm.
4. Connect the 3-lead patient ECG cable to the defibrillator/monitor/pacemaker and the simulator.
5. Press LEAD SELECT to select lead II.
6. Press PACER to apply power to the pacemaker. Press RATE ▲ to select 35bpm (same rate as simulator bradycardia rhythm). Confirm the pacer output current is displayed as 0mA.
7. Observe the cardioscope to confirm that the ECG signal from the simulator is displayed. Confirm that sense markers appear on each QRS complex. If sense markers do not appear, or appear elsewhere on the ECG, press ECG SIZE to adjust.
8. Press RATE ▲ and ▼ and confirm that the selected rate changes on the status display. Select a rate of 60.
9. Press START/STOP and confirm the adjacent indicator light flashes off with each pacing spike. Confirm the pacing rate is 60. (Pacing energy is not delivered because the current is 0mA.)
10. Press 20 ▲ and 20 ▼ and confirm the displayed current rate changes in 20mA increments.
11. Press ▲ 5 CURRENT 5 ▼ and confirm the displayed current rate changes in 5mA increments.
12. Increase the output current to 125mA.

13 Observe the cardioscope for captured complexes. Confirm the PACE indicator light on the simulator flashes with each delivered pacing pulse.

14 Disconnect the QUIK-COMBO therapy cable from the simulator. Confirm the pacemaker stops pacing, the LEADS message is displayed, and an audible alarm sounds.

15 Leave the QUIK-COMBO therapy cable disconnected and attempt to reinitiate pacing by pressing START/STOP. Confirm the LEADS message is displayed and an audible alarm sounds.

16 Reconnect the QUIK-COMBO therapy cable to the simulator.

17 Increase the output current to 125mA.

18 Press CHARGE to charge the defibrillator. Confirm the PACER indicator light goes off and the heart rate and available energy are displayed.

19 Turn the defibrillator POWER switch to OFF to internally discharge energy and remove power.

20 Press simulator OFF button to remove power.

Battery Maintenance and Testing

The LIFEPAK 10C defibrillator/monitor/pacemaker uses Nickel-Cadmium (NiCad) batteries. These NiCad batteries must be properly maintained using the Battery Support System to help maximize battery life and performance.

Use only Physio-Control batteries and battery chargers with Physio-Control devices. Use only the Battery Support System for battery maintenance.

⚠ WARNINGS

Possible loss of power during patient care.

Using an improperly maintained battery to power the defibrillator/monitor may cause premature power loss. Use only the Battery Support System to properly maintain batteries.

Possible loss of power during patient care.

Stored batteries lose charge. Failure to charge a stored battery before use may cause premature defibrillator/monitor power loss. Always charge a stored battery before returning it to active service.

Possible loss of power during patient care.

Physio-Control has no information regarding the performance or effectiveness of its LIFEPAK defibrillator/monitors if they are used with non-Physio-Control batteries or battery chargers. Using non-Physio-Control batteries or battery chargers may result in device failure and may void warranty. Use only Physio-Control batteries and the Battery Support System.

Fire or explosion hazard.

The two-well Battery Charger (Physio-Control Part Numbers 9-00284, 9-00288, or 801530) is not designed to charge FASTPAK batteries. Charging FASTPAK batteries in the two-well Battery Charger may reduce battery life and create risk of fire or explosion. Use only the Battery Support System to charge FASTPAK batteries.

⚠ CAUTION **Possible battery damage.**

When the low battery indicator appears, switch power to an alternate battery or auxiliary power module. Do not continue using a discharged battery. Overdischarging can shorten battery life.

Battery Description

Physio-Control FASTPAK, LIFEPAK 5 FASTPAK, or Battery Pak batteries can power the LIFEPAK 10C defibrillator/monitor/pacemaker. The batteries perform similarly but require different charge times:

- Either FASTPAK battery charges in the Battery Support System in approximately 70 minutes.
- The Battery Pak battery charges in the Battery Support System in approximately 4 1/2 hours.

NiCad Battery Performance Factors

Three major factors affect the performance of NiCad batteries: temperature, voltage depression, and the self-discharge rate.

Temperature

Charging a battery at temperatures below 20°C (68°F) or above 25.5°C (78°F) prevents the battery from reaching its full capacity and may lead to irreversible cell damage.

Voltage Depression

Voltage depression is a condition which reduces battery performance, particularly when charging the defibrillator. This condition is often mistakenly called "memory." Voltage depression can usually be reversed by reconditioning the battery every 3 months as described on page 6-10. Voltage depression is caused by either:

1 Repeatedly attempting to add more charge to a fully charged or a nearly fully charged battery, or
2 Extended charging at temperatures above 25.5°C (78°F).

Self-Discharge Rate

Like most batteries, NiCad batteries self-discharge when not used. A new NiCad battery self-discharges approximately 1% of its capacity each day when stored at room temperature. In 10 days a new NiCad battery not installed in the defibrillator/monitor /pacemaker loses approximately 10% of its capacity. The self-discharge rate of the battery can be evaluated by performing a Shelf-Life Test as described on page 6-11. The actual battery self-discharge rate depends on:

- Battery age
- Temperature
- Frequency of use
- Length of time in storage
- Physical battery condition

These factors can combine to significantly increase the battery discharge rate. For example, an older battery stored in higher temperatures may have an accelerated self-discharge rate much greater than 1% a day.

Using the Battery Support System

Use only the Battery Support System to maintain FASTPAK, LIFEPAK 5 FASTPAK, and Battery Pak batteries. Refer to Battery Support System Operating Instructions for more information.

The AC and DC Auxiliary Power Modules do not perform all the procedures required to properly maintain or evaluate battery performance. Although the Power Modules supply a trickle-charge to any batteries installed in the defibrillator/monitor/pacemaker, their primary function is to supply external power to operate the device.

To properly maintain batteries, use only the Battery Support System with the following guidelines:

- Charge batteries at the proper temperature.
  The optimum charging temperature is room temperature, or 20 to 25.5°C (68 to 78°F). Batteries charged outside room temperature may not reach full capacity even if the charge time is increased.

- Properly locate the Battery Support System:
  - Place in a well-ventilated area.
  - Keep at room temperature.
  - Do not place in direct sunlight.
  - Do not place near a heat source or an air conditioner.
- Rotate batteries so all batteries in active service are used equally.
- Recondition batteries every three months.
  Reconditioning is a succession of discharge/charge cycles performed in the Battery Support System. Reconditioning a battery helps prevent or reverse effects of voltage depression and helps to keep track of battery capacity.
- Perform Shelf Life Test every six months (or alternate with the Reconditioning Procedure every 3 months).
  The Shelf Life Test evaluates the self-discharge rate of a stored battery.

Installing and Removing a Battery

⚠ WARNING Possible loss of power during patient care.

Battery pins (connectors) in the LIFEPAK 10C defibrillator/monitor/pacemaker and the Battery Support System may be damaged if batteries are dropped or forced into battery wells. Inspect pins routinely for signs of damage.

Do not drop or force a battery into the battery well.

To install a battery:

1 Align the battery with battery well so the battery clip is toward connector pins.
2 Insert the end of the battery opposite the battery clip into the battery well.
3 Firmly press the other end of the battery into the battery well until it clicks into place.

To remove the battery, press the battery clip and lift.

Reconditioning Procedure

Reconditioning is a succession of discharge/charge cycles which may be performed on a battery inserted in the far right compartment of the Battery Support System. Reconditioning a battery helps prevent or reverse the effects of voltage depression and helps keep track of battery capacity.

Perform reconditioning *every three months* according to the Reconditioning Procedure in Figure 6-1. Discard any battery with a capacity reading of less than 80% on the third cycle. For information about ordering copies of the Reconditioning Procedure form, refer to page 6-19.

RECONDITIONING PROCEDURE

For use with the Physio-Control® Battery Support System, FASTPAK® and Battery Pak batteries.
- 80% or greater battery capacity is acceptable
- Alternate every 90 days with Shelf Life Test
- Use Battery Support System at 68–78° F
- For Technical Support, call (800)442-1142 USA

Test Date _____ Battery ID _____

Performed by _____

CHECKLIST (√ circle when done)

○ 1 Charge battery until READY light appears
○ 2 Cycle #1: DISCHG–CHARGE–READY; disregard reading
○ 3 Cycle #2: DISCHG–CHARGE–READY; disregard reading
○ 4 Remove battery for 1 – 4 hrs Begin _____ End _____
○ 5 Cycle #3: DISCHG–CHARGE–READY; bat. cap. =_____%
○ 6 Log Cycle #3 bat. cap.% on back of battery

Cycle #3 bat. cap. 80% or greater?
○ Yes–acceptable
○ No–unacceptable/discard battery

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Figure 6-1 Reconditioning procedure form

Shelf Life Test Procedure

The Shelf Life Test evaluates the self-discharge rate of a stored battery. Perform the Shelf Life Test described in Figure 6-2 *every six months, or alternate it with the Reconditioning Procedure in Figure 6-1 every three months.* Discard any battery with a Shelf Life Test value of more than 20. For information about ordering copies of the Shelf Life Test form, refer to page 6-19.

SHELF LIFE TEST

For use with the Physio-Control® Battery Support System, FASTPAK® and Battery Pak batteries.
- Shelf Life Test Value of 20 or less is acceptable
- Alternate every 90 days with Reconditioning Procedure (Note: Steps 1–5 equals Reconditioning Procedure)
- Use Battery Support System at 68–78° F
- For Technical Support, call (800)442-1142 USA

Test Date _____ Battery ID _____

Performed by _____

CHECKLIST (√ circle when done)

○ 1 Charge battery until READY light appears
○ 2 Cycle #1: DISCHG–CHARGE–READY; disregard reading
○ 3 Cycle #2: DISCHG–CHARGE–READY; disregard reading
○ 4 Remove battery for 1 – 4 hrs Begin _____ End _____
○ 5 **Cycle #3**: DISCHG–CHARGE–READY; bat. cap. =____%
○ 6 Log Cycle #3 bat. cap.% on back of battery
○ 7 Remove battery for 7–8 days and store on shelf
Begin ___/ ___/ ___ End ___/ ___/ ___
○ 8 **Cycle #4**: DISCHG–CHARGE–READY; bat. cap. =____%

Record: **Cycle #3** bat. cap. _____ %
Subtract: **Cycle #4** bat. cap. —_____ %
Result: Shelf Life Test Value =_____ %

Shelf Life Test Value 20 or less?
○ Yes–acceptable ○ No–unacceptable/discard battery

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Figure 6-2 Shelf Life Test form

Battery Maintenance Log

The Battery Maintenance Log shown in Figure 6-3 is available to help track battery maintenance procedures. For information about ordering copies of the Battery Maintenance Log, refer to page 6-19.

BATTERY MAINTENANCE LOG

For use with the Battery Support System for Physio-Control

DATE	I.D. NUMBER	BATTERY TEST PERFORMED	BATTERY TEST RESULTS	BATTERY ACCEPTABLE?	
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity ________ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery

P/N 806019–00 Technical Service 1(800) 442–1142 USA

Figure 6-3 Battery Maintenance Log

Receiving New Batteries

When newly-purchased batteries are received:

- Promptly label each new battery. Use a unique identification number so you can easily track the battery through all maintenance and rotation.
- Recondition each new battery. Because NiCad batteries self-discharge, a new battery may not be fully charged by the time it is received. Recondition a newly purchased battery according to the Reconditioning Procedure on page 6-10.

Storing Batteries

Store batteries in the Battery Support System or on a shelf. Batteries still require routine maintenance, even while in storage. When storing on a shelf:

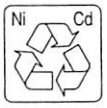
- Store batteries between 4.4° and 26.7°C (40° and 80°F). Cooler temperatures reduce the battery self-discharge rate.
- Never freeze batteries.

Recycling Batteries at the End of Useful Life

When properly maintained, the Physio-Control NiCad batteries should have a battery life of approximately two years. A NiCad battery has reached the end of useful life if *one or more* of the following circumstances occur:

- Battery capacity is less than 80% *after* reconditioning
- There is a difference of *greater than 20* after performing a battery Shelf Life Test
- There is physical damage to the battery case
- The Battery Support System indicates FAULTY when you try to recharge the battery.

To promote awareness of battery recycling, Physio-Control NiCad batteries are marked with one of these symbols:



When a Physio-Control NiCad battery has reached the end of its useful life, recycle the battery as follows.

Battery Recycling in the USA

Recycle NiCad batteries by participating with Physio-Control Corporation in a national battery recycling program. Contact your Physio-Control representative to obtain shipping instructions and battery shipping containers. Do not return your batteries to the Physio-Control Corporate Headquarters in Redmond, Washington, unless instructed to do so by your Physio-Control representative.

Battery Recycling Outside the USA

Recycle NiCad batteries according to national and local regulations. Contact your local Physio-Control representative for assistance.

Troubleshooting

If a problem is detected during operation or testing, refer to the troubleshooting tips in the appropriate table:

- Monitor/recorder problems — Table 6-4 on page 6-14
- Defibrillator problems — Table 6-5 on page 6-16
- Pacemaker problems — Table 6-6 on page 6-17

If the problem cannot be corrected, remove the monitor from active service and contact a qualified service technician for service and repair.

Table 6-4 Troubleshooting the monitor and recorder

Observation	Corrective Action
1 Device does not function when POWER switch is turned to a power source. No trace on cardioscope.	• Confirm batteries are fully charged and secured in battery wells. • Check battery pins in selected battery well for signs of damage. (Power may be intermittent in some cases.) • If using auxiliary power module, confirm it is connected to line power and to defibrillator/monitor.
2 Interference on cardioscope when using patient ECG cable.	• Check patient ECG cable connection to electrodes and patient. • Check for damaged patient ECG cable. • Check patient skin preparation, electrode contact, electrode placement and electrode expiration date. • Check for presence of a strong radio frequency electrical field (such as diathermy, radio signals, etc.). If possible, turn off or move noise-generating equipment. • Check whether paddles lead is selected. Select lead I, II, or III when using patient ECG cable. • If excessive line frequency (50 or 60Hz) interference is suspected in DIAG, select notch frequency and enable the built-in notch filter via set-up menu. Contact a qualified service representative for assistance.
3 Excessive interference (noise) on monitor screen with paddle monitoring (QUIK-LOOK with standard paddles or QUIK-COMBO electrode monitoring).	• Check for paddle electrode surface dirt. • Confirm paddles lead is selected. • If using QUIK-COMBO electrodes, check for proper skin preparation, electrode contact, electrode placement, or expired electrodes. • Confirm that material used between paddles and skin is appropriate for defibrillation. • Confirm standard paddles are properly stowed in paddle wells if using the QUIK-COMBO electrodes. • Confirm that paddle wells are clean.
4 Poor ECG signal on cardioscope when using patient ECG cable. However, CAL does provide a 1mV pulse on cardioscope.	• Confirm lead I, II, or III is selected (*not* paddles lead). • Confirm electrodes are positioned correctly. • Check for defective patient ECG cable.
5 Straight line on cardioscope and recorder when signal is applied or CAL is pressed.	• Increase ECG SIZE.

Table 6-4 Troubleshooting the monitor and recorder, continued

Observation	Corrective Action
6 No ECG signal on cardioscope when using patient ECG cable.	• Confirm lead I, II, or III is selected (not paddles). • Check patient ECG cable. • Confirm ECG electrodes are not positioned too close together
7 No ECG signal on monitor screen with paddle monitoring (QUIK-LOOK with standard paddles or QUIK-COMBO electrode monitoring).	• Confirm paddles lead is selected. • Discharge defibrillator into Battery Support System test load to check paddle cord integrity. • Discharge defibrillator into QUIK-COMBO Patient Simulator to check therapy cable integrity.
8 Recorder does not advance paper.	• Replace battery with fully-charged battery. • Check/replace paper roll. Make sure paper is correctly loaded. • Recorder operating outside of specified operating temperature range. Allow device to cool down or warm up. • Paper not loaded correctly.
9 ECG recording appears wrinkled.	• Check paper. ECG paper may be loaded improperly.
10 ECG recording appears smudged.	• Confirm correct ECG paper is in use. Use only paper designed for thermal array recorders.
11 No systole sound.	• Increase QRS VOL (powers up at zero volume). • Increase ECG SIZE. Gain may be too low for proper QRS detection. • Select another lead or change electrode position. ECG amplitude may be too low in selected lead.
12 No SYNC marker on cardioscope when sync mode is selected.	• Confirm SYNC selected. • Increase ECG SIZE. Gain may be too low for proper QRS detection. • Select another lead or change electrode position. ECG amplitude may be too low in that lead. • Reprep skin and apply new electrodes.
13 SYNC indicator does not blink.	• Increase ECG SIZE. Gain may be too low for proper QRS detection. • Select another lead or change electrode position. ECG amplitude may be too low in that lead.
14 SYNC marker not positioned within QRS complex.	• Adjust ECG SIZE until QRS indicator is properly positioned. • Select another lead or change electrode position. ECG amplitude may be too low in that lead.
15 Heart rate is not displayed.	• Increase ECG SIZE. Gain may be too low for proper QRS detection. • Select another lead or change electrode position. ECG amplitude may be too low in that lead. • Noninvasive pacing in progress (heart rate display replaced by pacing rate). • Patient's heart rate less than 20 bpm. • Reprep skin and apply new electrodes.
16 LOW BATTERY indicator remains flashing despite attempts to charge battery. However, device operates normally using auxiliary power module.	• Replace battery with fully-charged battery. • Use auxiliary power module.

Table 6-4 Troubleshooting the monitor and recorder, continued

Observation	Corrective Action
17 Device shuts down with brief or no LOW BATTERY indicator.	• Battery is damaged, improperly maintained or depleted. (May occur if battery is very low on charge and defibrillation is attempted.) • Switch to fully-charged battery or auxiliary power module.
18 Time or date on recorder incorrect (or 00ERR00 annotated).	• Reset clock as described on page 1-7.
19 Service Indicator appears continuously on status display.	• Device requires service by qualified service technician. (It is normal for service indicator to appear while setting the clock.)

Table 6-5 Troubleshooting the defibrillator

Observation	Corrective Action
1 Charge time to 360 joules exceeds 12 seconds.	• Replace battery with fully-charged battery. • Use auxiliary power module. • Allow device to warm up to 10°C (50°F).
2 Energy is not delivered to patient when both paddle discharge buttons are pressed (using standard paddles or QUIK-COMBO electrodes).	• Device is in SYNC mode and no QRS complexes are detected. • Defibrillator has not yet reached selected energy level (wait for tone indicating full charge). • More than 60 seconds have elapsed since charge done tone. Energy has been internally removed. • Energy has been internally removed because the ENERGY select dial was changed after charge was complete. • Discharge defibrillator into Battery Support System test load to confirm paddle cord integrity. • If using QUIK-COMBO electrodes: – Confirm standard paddles are properly stored in paddle wells. – Confirm therapy cable is properly connected. – If cannot correct problem, try defibrillating patient through standard paddles as a backup.
3 AVAILABLE ENERGY does not match energy selected when defibrillator is fully charged.	• Defibrillator is out of calibration. Contact a qualified service technician.
4 Numbers do not appear or scroll very slowly in AVAILABLE ENERGY window in status display when CHARGE pressed.	• Replace battery with fully-charged battery. • Connect device to auxiliary power module if available.
5 AVAILABLE ENERGY flashes and scrolls to zero after defibrillator discharge.	• Paddles discharged into open air. • Confirm proper paddle pressure and contact is maintained during discharge. • Possible failure in defibrillator discharge pathway (connectors, cables, etc.).
6 Patient didn't "jump" (no muscle response) during defibrillator discharge.	• No action specified. Patient muscle response is variable and depends on patient condition. Lack of visible response to defibrillation does not necessarily mean the discharge did not occur.

Table 6-6 Troubleshooting the pacemaker

Observation	Corrective Action
1 Device does not function when PACER is pressed.	• Replace battery with fully-charged battery. • Use auxiliary power module if available.
2 PACER light on, but START/STOP light does not illuminate when pressed.	• Pacing lead off. Check for LEADS message displayed. Inspect QUIK-COMBO cable and electrode connections. • Paddles lead selected; select another lead.
3 Pacing stops spontaneously.	• PACER power off. Press PACER to apply power. • Detection of an internal failure has occurred. The pacemaker is inoperative and requires service by a qualified service technician. • QUIK-COMBO electrode off. Check for LEADS message. Check QUIK-COMBO cable and electrode connections. • Paddles lead selected. Select lead I, II, or III and reinitiate pacing. • CHARGE has been pressed. • Use of radio equipment while pacing may cause current delivery to stop and the service message to appear accompanied by tones. Press PACER to turn off pacemaker and discontinue service message and tones. To reinitiate pacing, follow steps as outlined in Pacing Procedure. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio. • Replace battery with fully-charged battery or use auxiliary power module if available.
4 No ECG trace on monitor.	• Confirm ECG leads are connected and lead I, II, or III is selected (not paddles lead). Check ECG cable and patient/electrode connections. • Check proper power source is selected.
5 Cardioscope displays interference while pacing.	• ECG electrodes not optimally placed with respect to pacing electrodes. • ECG signal may be difficult to interpret at higher pacing rates. • Select another lead (I, II, or III). • Patient response to pacing is highly variable with respect to capture threshold and ECG distortion. Consider changing pacing rate. Consider moving ECG electrodes away from pacing electrodes to optimize patient response and ECG signal integrity.
6 Capture does not occur with pacing stimulus.	• Increase pacing current level. (Administer sedation/analgesia as needed.) • Check pacing electrode placement. • Consider invasive pacing. Patient response to pacing therapy (noninvasive and invasive) is dependent upon many factors. • Perform Noninvasive Pacemaker Test to confirm pacemaker is delivering energy.
7 LEADS message appears.	• Check for proper use of patient ECG cable during pacing. Select leads I, II, or III. • Inspect QUIK-COMBO cable and electrode connections.
8 Intrinsic QRS complexes not sensed when pacing.	• Adjust ECG SIZE until sense markers are properly positioned. • Amplitude of ECG signal too low in that lead. Select another lead (I, II, or III) or move ECG electrodes. • Intrinsic QRS complexes are occurring during pacemaker's refractory period.

Service and Repair

⚠ WARNING Possible shock.

Do not attempt to remove the instrument cover to service or repair this instrument. Contact qualified service personnel for service or repair.

If the LIFEPAK 10C defibrillator/monitor/pacemaker requires service as indicated by testing, troubleshooting, or the service indicator, contact the local Physio-Control service representative. In the USA, call Physio-Control Technical Services at 1-800-442-1142.

When calling Physio-Control to request service, identify model and serial number and describe the observation. If the device must be shipped to a service center or the factory, pack the device in the original shipping container, if possible, or in protective packing to prevent shipping damage.

The LIFEPAK 10C defibrillator/monitor/pacemaker Service Manual provides detailed technical information to support service and repair by qualified service personnel.

Warranty

Refer to the warranty statement which is included in the accessory kit shipped with the product. For duplicate copies, contact the local Physio-Control representative. In the USA call 1-800-442-1142.

Supplies, Accessories, and Training Tools

Supplies, accessories, and training tools for the LIFEPAK 10C defibrillator/monitor/pacemaker are listed in Table 6-7. For information about ordering, contact the local Physio-Control representative. In the USA, call 1-800-442-1142.

Table 6-7 Supplies, accessories, and training tools

Description	Part Number
FASTPAK battery	09-10424
Recorder paper, 50mm	804700
LIFE•PATCH ECG electrodes	800139
QUIK-COMBO pacing/defibrillation/ECG electrodes	806086
Pediatric paddle, external (2 required)	800418
Posterior paddle	802461
Battery Support System	801807
Battery Support System wall bracket assembly	802562
QUIK-COMBO Therapy Cable Tester	805550
QUIK-COMBO 3-lead patient simulator	806223
QUIK-COMBO 12-lead patient simulator	806395
12-Lead ECG Adapter	805600
Cables:	
Patient ECG Cable, 3-Lead (AHA, 90-degree angle connector)	805400
Patient ECG Cable, 3-Lead (IEC)	800947
Literature:	
LIFEPAK 10C defibrillator/monitor/pacemaker Operating Instructions	3004087
LIFEPAK 10C defibrillator/monitor/pacemaker Service Manual	3005330
Booklet *Noninvasive Pacing: What You Should Know*	805074
Booklet *Defibrillation: What You Should Know*	805662
Battery Reconditioning Procedure check sheet	806017
Battery Shelf Life Test check sheet	806018
Battery Maintenance Log check sheet	806019

Table B-4 Basic Operation Checklist–Noninvasive Pacing Procedure

Step		Completed
1	Identify the two possible QUIK-COMBO electrode placements for pacing from the electrode package label.	
2	Turn the defibrillator POWER switch to the power source.	
3	Connect the 3-lead patient ECG cable to defibrillator and simulator.	
4	Press LEAD SELECT to select lead I, II, or III.	
5	Connect QUIK-COMBO therapy cable to simulator.	
6	Press simulator ON button, then press BRADY and confirm the BRADY indicator light is on.	
7	Confirm the cardioscope displays a bradycardia rhythm.	
8	Press PACER and confirm the PACER indicator light is on.	
9	Press RATE to select a pacing rate of 80.	
10	Observe the cardioscope and confirm that sense markers appear on each QRS complex. If sense markers do not appear, or appear elsewhere on the ECG, press ECG SIZE to properly adjust or select another lead.	
11	Confirm the standard paddles are securely stored in paddle wells before pacing.	
12	Press START/STOP to start pacing.	
13	Press CURRENT to increase current until electrical capture is observed.	
14	Press START/STOP to stop pacing.	
15	Turn the defibrillator POWER switch to OFF.	
16	Press simulator OFF button to remove power; disconnect cables.	

Table B-3 Basic Operation Checklist–Synchronized Cardioversion Procedure

Step	Completed
1 Identify the two possible QUIK-COMBO electrode placements for cardioversion from the electrode package label.	_____
2 Turn the defibrillator POWER switch to the power source.	_____
3 Select one of the electrode placements:	_____
A Anterior-Lateral _____	
B Anterior-Posterior _____	
4 Connect QUIK-COMBO therapy cable to simulator.	_____
5 Select ECG monitoring method:	
A Anterior-Lateral: Select paddles lead; press simulator ON button and confirm NSR is selected (NSR light is on), or press V-TACH button to select V-TACH (V-TACH light is on).	_____
B Anterior-Posterior: Connect 3-lead patient ECG cable to defibrillator and simulator; press LEAD SELECT to select lead I, II, or III; press simulator ON button and confirm NSR is selected (NSR light is on), or press V-TACH button to select V-TACH (V-TACH light is on).	_____
6 Press SYNC and confirm the SYNC message flashes off with each detected QRS complex.	_____
7 Observe the cardioscope and confirm that sense markers appear on each QRS complex. If sense markers do not appear, or appear elsewhere on the ECG, press ECG SIZE as needed to properly adjust (or select another lead if using 3-lead cable). If using QUIK-COMBO electrode placement A and still cannot obtain proper sense markers, connect 3-lead patient ECG cable to defibrillator and simulator; press LEAD SELECT to select lead I, II, or III, and adjust ECG SIZE.	_____
8 Rotate the ENERGY dial on the STERNUM paddle to select 100 joules.	_____
9 Press CHARGE on the APEX paddle to charge the defibrillator.	_____
10 Confirm the standard paddles are securely stored in paddle wells before discharge.	_____
11 After the defibrillator is fully charged (tone sounds), loudly announce to anyone else present "Stand clear!"	_____
12 Simultaneously press and hold both paddle discharge buttons until the defibrillator discharges on the next QRS complex. Release the discharge buttons. (Unwanted charge may be internally discharged by turning POWER to OFF or rotating the ENERGY dial on the STERNUM paddle.)	_____
13 Turn the defibrillator POWER switch to OFF.	_____
14 Press simulator OFF button to remove power (and disconnect 3-lead patient ECG cable if used).	_____

Table B-1 Basic Operation Checklist–Monitoring Procedure

Step		Completed
1	Identify the QUIK-COMBO electrode placement for monitoring from the electrode package label.	
2	Remove electrodes from package and connect to QUIK-COMBO therapy cable.	
3	Identify which electrode should be placed in lateral position on patient's chest, and which electrode should be placed in anterior position on chest.	
4	Disconnect QUIK-COMBO therapy cable from QUIK-COMBO electrodes and connect to simulator.	
5	Press simulator ON button and confirm the NSR indicator light is on.	
6	Turn the defibrillator POWER switch to the power source.	
7	Confirm the standard paddles are securely stored in paddle wells before monitoring.	
8	Press LEAD SELECT to select paddles lead.	
9	Confirm the cardioscope displays a normal sinus rhythm.	
10	Turn the defibrillator POWER switch to OFF.	
11	Press simulator OFF button to remove power.	

Table B-2 Basic Operation Checklist–Defibrillation Procedure

Step		Completed
1	Identify the two possible QUIK-COMBO electrode placements for defibrillation from the electrode package label.	
2	Connect QUIK-COMBO therapy cable to simulator.	
3	Press simulator ON button to apply power.	
4	Press simulator VF button and confirm the VF indicator light is on.	
5	Turn the defibrillator POWER switch to the power source.	
6	Press LEAD SELECT to select paddles lead and monitor ECG through the QUIK-COMBO therapy cable.	
7	Rotate the ENERGY dial on the STERNUM paddle to select 200 joules.	
8	Press CHARGE on the APEX paddle to charge the defibrillator.	
9	Confirm the standard paddles are securely stored in paddle wells before discharge.	
10	Confirm the cardioscope displays a shockable rhythm (VF).	
11	After the defibrillator is fully charged (tone sounds), loudly announce to anyone else present "Stand clear!," then simultaneously press both paddle discharge buttons to discharge energy.	
12	Turn the defibrillator POWER switch to OFF. (Unwanted charge may be internally discharged by turning POWER to OFF or rotating the ENERGY dial on the STERNUM paddle.)	
13	Press simulator OFF button to remove power.	

APPENDIX B: BASIC OPERATION CHECKLIST

After reviewing this manual, you may use the checklists in Tables B-1 through B-4 to familiarize yourself with the use of QUIK-COMBO electrodes. If you cannot perform any of these steps, review the appropriate sections of this manual. For other operation support, refer to your local Physio-Control Corporation representative. To properly complete all of these steps, you will need the following equipment:

- LIFEPAK 10C defibrillator/monitor/pacemaker with fully-charged battery
- 3-Lead Patient ECG Cable
- QUIK-COMBO electrodes
- Physio-Control QUIK-COMBO 3-lead patient simulator

Table A-1 LIFEPAK 10C defibrillator/monitor/pacemaker Specifications (cont.)

BATTERY	3 NiCad batteries, 12V, 1.0 amp hours each. A single new battery registering at least 100% capacity on the Battery Support System will provide at a minimum: • 45 minutes of monitoring, or • 20 minutes of pacing, or • 25 discharges at 360 joules per battery.
SIZE	
Height	13.3cm (5.3in)
Width	40.6cm (16in)
Depth	37cm (14.6in)
Weight	10kg (22lbs)

All specifications at 25°C unless otherwise stated.

⚠ CAUTION **Possible equipment damage.**

To help prevent component damage, the device should not be mounted near vibration sources such as engine struts and landing gear.

Table A-1 LIFEPAK 10C defibrillator/monitor/pacemaker Specifications (cont.)

ECG OUTPUT	
Unmodulated:	1V/mV at x1 gain
Modulated:	1400Hz ±2% center frequency, 1Vrms ±10%
Frequency response:	Matches strip chart recorder
DEFIBRILLATOR	
Waveform	5msec monophasic pulse (Edmark) per AAMI spec
Energy Selection	0, 5, 10, 20, 50, 100, 200, 300, 360 joules
Charge Time	360 joules in less than 12 seconds above 0°C (32°F)
Paddle Area	Adult: 82cm²
	Pediatric: 16cm²
Coil Cord Length	2.3m (7.5 ft)
Synchronizer	Energy discharge within 20msec of sync marker on cardioscope (triggers to patient-generated QRS complex)
Paddle Controls	Both paddles: energy discharge buttons
	STERNUM: ENERGY select dial rotates to select 0 to 360 joules
	APEX: CHARGE (with indicator light) initiates charging
	RECORD activates strip chart recorder
NONINVASIVE PACEMAKER	
Output Rate	40 to 170 bpm
Rate Accuracy	±1.5% over entire range
Output Waveform	Monophasic, truncated, exponential current pulse 20 ±1msec duration measured at output current ≥10mA peak.
Output Current	0 to 200mA ±10% or 5mA (whichever is greater) for a load of 0 to 800 ohms
Refractory Period	Pacing rates / Refractory period
	40–90 / 340msec ± 3%
	100 / 300msec ± 3%
	110–120 / 250msec ± 3%
	130–140 / 220msec ± 3%
	150–170 / 200msec ± 3%
ENVIRONMENTAL	
Temperature	Standby: 5 to 55°C (41 to 131°F)
	Operating: –10 to 55°C (14 to 131°F) after minimum 2-hour storage at standby temperature
	Storage (exclusive of batteries): –30 to 65°C (–22 to 149°F)
Humidity	0 to 95% (non-condensing) from 0 to 34°C (32 to 93.2°F)
	0 to 80% (non-condensing) from 35 to 55°C (95 to 131°F)
Atmospheric Pressure	797 to 439mmHg (–570 to +15,000 ft)
Vibration	Helicopter Aircraft: MIL-STD-810D, method 514.3 (category 6). Test levels per US Army Aeromedical Research Laboratory Report no. 91-14, section 2.6.3 (March 1991), (UH-1 helicopter, floor under co-pilot's seat).
	Fixed-Wing, Turboprop Transport: (take off and climb). Test level of 0.0016g²/Hz, the maximum level per figure 32(31) of ECRI Report, contract no. 223-77-5035, prepared for FDA (April 1979).
Shock (Drop)	With carrying case (soft case), passes drops of 43 inches from the handle (30 inches from case). This exceeds test levels per ECRI report, contract no. 223-77-5035, prepared for FDA (April 1979).
Sealed Case	MIL-STD-108E and IEC 601-2-4

Table A-1 LIFEPAK 10C defibrillator/monitor/pacemaker Specifications

ECG MONITOR	
ECG Lead Selection	Paddles, I, II, or III
Input	Isolated ECG via QUIK-LOOK defibrillation paddles, QUIK-COMBO electrodes, or 3-lead patient ECG cable
Electrical Isolation and Shielding	Input protected against high voltage defibrillator pulses and radio frequency interference per FDA Standard MDS-201-0004. RF interference depends on distance from RF source, radio output power, radiating efficiency, vehicle environment, etc.
3-Lead ECG Cable Length	4.0m (13ft) total length; 3.0m cable (10ft) with 0.9m leads (3ft)
QUIK-COMBO Therapy Cable Length	3.0m (10ft)
Common Mode Rejection	Minimum 100dB with respect to chassis ground at 60Hz, 65dB minimum with respect to isolated ground when using 3-lead patient ECG cable
CARDIOSCOPE DISPLAY	
Size	72.5mm (2.85 in) x 43.5mm (1.7 in)
Sweep Speed	25mm/sec
Frequency Response	Monitor (domestic): 1 to 30Hz, –3dB Monitor (agency): 0.5 to 25Hz, –1.4dB Expanded freq. response while recorder in DIAG mode: 0.05 to 30Hz, –3dB Paddles: 2 to 20Hz, –3dB
STRIP CHART RECORDER	
Paper Size	50mm x 30m (100 ft)
Paper Speed	25mm/sec
Frequency response:	Monitor (domestic): 1 to 30Hz, –3dB Monitor (agency): 0.5 (–1.4dB) to 40 (–3dB) Hz Diagnostic: 0.05 to 100Hz, –3dB Paddles: 2 to 20Hz, –3dB CODE SUMMARY frequency response: Domestic: 1 to 30Hz Agency: 0.5 to 40Hz
Annotation:	Includes time, date, lead, gain, heart rate, defibrillation and/or pacing parameters
CODE SUMMARY critical event record:	Digitally stored record of critical ECG and device parameters
STATUS DISPLAY	
Heart Rate (bpm):	3-digit readout displays rates from 20 to 295 bpm
Available Energy:	0–360 joules
Pacing Rate:	40–170bpm
Pacing Current:	0–200mA
DIAG message:	Indicates recorder frequency response is 0.05 to 100Hz, –3dB
MONITOR CONTROLS	
ECG SIZE	Adjusts ECG gain
QRS VOL	Adjusts loudness of QRS beeper
CAL	Sends calibration pulse to monitor input
CODE SUMMARY	Activates CODE SUMMARY printout
LEAD SELECT	Selects ECG Input: Paddles, I, II, or III
RECORD	Activates strip chart recorder; activates diagnostic mode if held for more than 1 second (when enabled)
SYNC	Triggers energy delivery to patient's QRS complex
FREEZE	Momentarily halts ECG trace on the cardioscope

APPENDIX A: SPECIFICATIONS

Table A-1 lists the specifications for the LIFEPAK 10C defibrillator/monitor/pacemaker.

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