Operating Instructions

LIFEPAK® 9A

defibrillator/monitor

PHYSIO CONTROL

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.

Corporate Headquarters
11811 Willows Road Northeast
Post Office Box 97006
Redmond, WA 98073-9706 USA
Telephone: 206.867.4000
Toll Free (USA only): 800.426.8047
Fax: 206.867.4161

Litho in USA.

P/N 805383-003

Table of Contents

3 Monitoring the Patient

4 Recording Patient Data

5 Defibrillation/Cardioversion

6 Maintaining the Equipment

7 Appendices/Change Summary

8 Index

List of Figures

List of Tables

General Information

This manual provides information on the operation of the LIFEPAK® 9A defibrillator/monitor. This information is distributed in the following sections:

Section 1 **Safety Information**

This section contains general warnings which help the user operate the LIFEPAK 9A defibrillator/monitor safely.

Section 2 **Basic Operations**

This section provides descriptions of the basic operations of the LIFEPAK 9A defibrillator/monitor.

Section 3 **Monitoring the Patient**

This section describes patient monitoring with standard paddles and electrodes.

Section 4 **Recording Patient Data**

This section describes the recording feature of the LIFEPAK 9A defibrillator/monitor.

Section 5 **Defibrillation/Cardioversion**

This section provides information on patient defibrillation and synchronized cardioversion.

Section 6 **Maintaining the Equipment**

This section describes periodic tests to help detect potential problems in a timely fashion.

Section 7 **Appendices/Change Summary**

This section contains supplemental information and a listing of all revisions to the manual.

Section 8 **Index**

The index provides a cross-reference of information in the manual.

The following sections provide a brief overview of the basic functions of the LIFEPAK 9A defibrillator/monitor.

About Defibrillation

The LIFEPAK 9A defibrillator/monitor 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, electrodes on the chest, or through internal paddles applied directly to the heart.

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 *"Defibrillation: What You Should Know"* booklet for further information.

Daily testing 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 and repair by a qualified service technician. Refer to the Service Manual for further service information.

Symbols

The following symbols are found on various configurations of the LIFEPAK 9A defibrillator/monitor and accessories:

Off (power: disconnection from the ac mains)

On (power: connection to the ac power source)

Defibrillation protected, type BF patient connection

Defibrillation protected, type CF patient connection

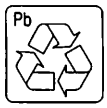
Attention, consult accompanying documents.

Caution, high voltage

Protective earth (ground)

Fusible link

Equipotentiality connector



Recycle battery symbol

Output

AC current

ECG Out

Introduction

This section contains general warnings which help the user operate the LIFEPAK®9A defibrillator/monitor safely. Become familiar with the following terms and General Warnings.

Terms

Terms used in this manual and on the LIFEPAK 9A defibrillator/monitor:

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.

Warnings

In addition to the following general warnings, other warnings are provided near the beginning of each section. Refer to Section 7, Appendix A for additional safety information.

⚠ WARNINGS

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.

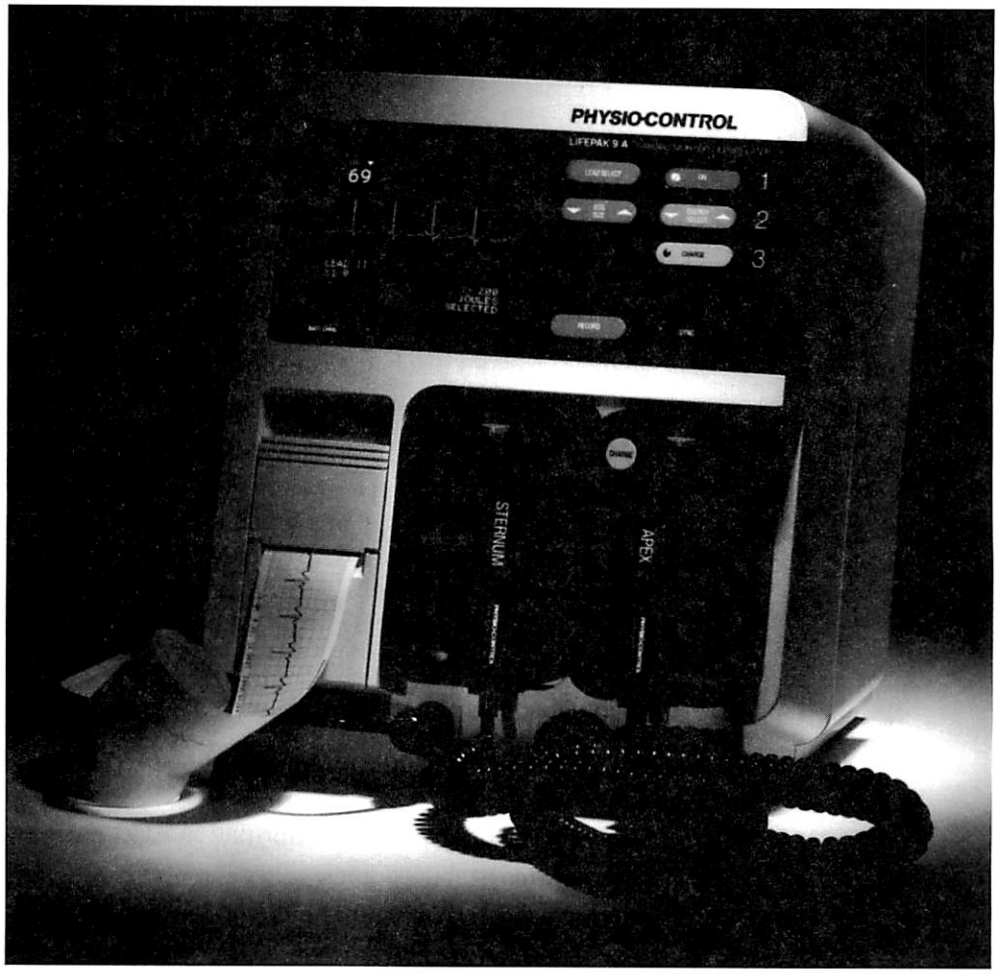
Do not clean with alcohol, ketones, or other flammable agents. Do not autoclave this device or accessories unless otherwise specified.

Possible fire or explosion. Use care when operating this device close to oxygen sources (such as bag–valve–mask devices or ventilator tubing) and flammable gases and anesthetics.

Safety risk. Use of non–Physio–Control defibrillation electrodes, batteries, accessories, or adapter devices may cause the device to operate improperly.

Possible interference with implanted devices. Magnets inside the standard defibrillation paddles may affect the function of an implanted pacemaker or implanted defibrillator if paddles are positioned over or near implanted devices. Have function of implanted device checked after using standard paddles.

Safety risk and possible equipment damage. Defibrillators, monitors, 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 the MRI manufacturer for more information.



Introduction

The LIFEPAK 9A defibrillator/monitor is a complete cardiac life support system for crash cart needs used by hospital staff and other authorized healthcare providers.

This device is intended for use in the diagnosis and treatment of certain cardiac dysrhythmias. Refer to American Heart Association (AHA) or equivalent guidelines regarding standards of care for defibrillation and synchronized cardioversion. The LIFEPAK 9A defibrillator/monitor offers the following options and features:

Shock Advisory Adapter

The Shock Advisory Adapter allows health care providers to use any of the LIFEPAK 9 family of defibrillators as Automatic External Defibrillators (AEDs). The Shock Advisory Adapter identifies shockable rhythms and provides messages on the monitor screen to guide first responders through proper operation of the defibrillator.

Defibrillation Adapter

The adapter provides discharge capability from the LIFEPAK 9A defibrillator/monitor using several paddle options.

Paddle Options

Physio-Control offers six different paddle options in addition to the standard hard paddles. These options allow clinicians to provide defibrillation therapy in a broad range of settings and can simplify the delivery of therapy. Standard hard paddles and the following three paddle options plug directly into the defibrillator:

- Pediatric paddles (attach to standard hard paddles)
- Posterior paddle (attaches to standard hard paddles)
- Internal paddles and handles *with* discharge control.

Each of the following paddle options must be used with the Defibrillation Adapter:

- FAST-PATCH® disposable defibrillation/ECG electrodes
- External sterilizable paddles
- Internal paddles and handles *without* discharge control.

Service Diagnostics

Device self-diagnostics automatically alert the operator at power up and during operation when certain service needs are identified. Defibrillation usage history is also automatically stored, and calibration is possible through onscreen tests which can be accessed by service or biomedical personnel.

Post-Sale Support

Physio-Control has one of the largest sales and technical service teams in the industry. Physio-Control responds to service calls as quickly as possible. Arrangements are made to perform repairs or a loaner is provided. Local sales and service representatives are available worldwide to offer support for inservicing and technical needs.

Educational Support

With each LIFEPAK 9A defibrillator/monitor, our customers receive an inservice videotape and a copy of our educational booklet *"Defibrillation: What You Should Know."* For further information, contact your Physio-Control sales consultant.

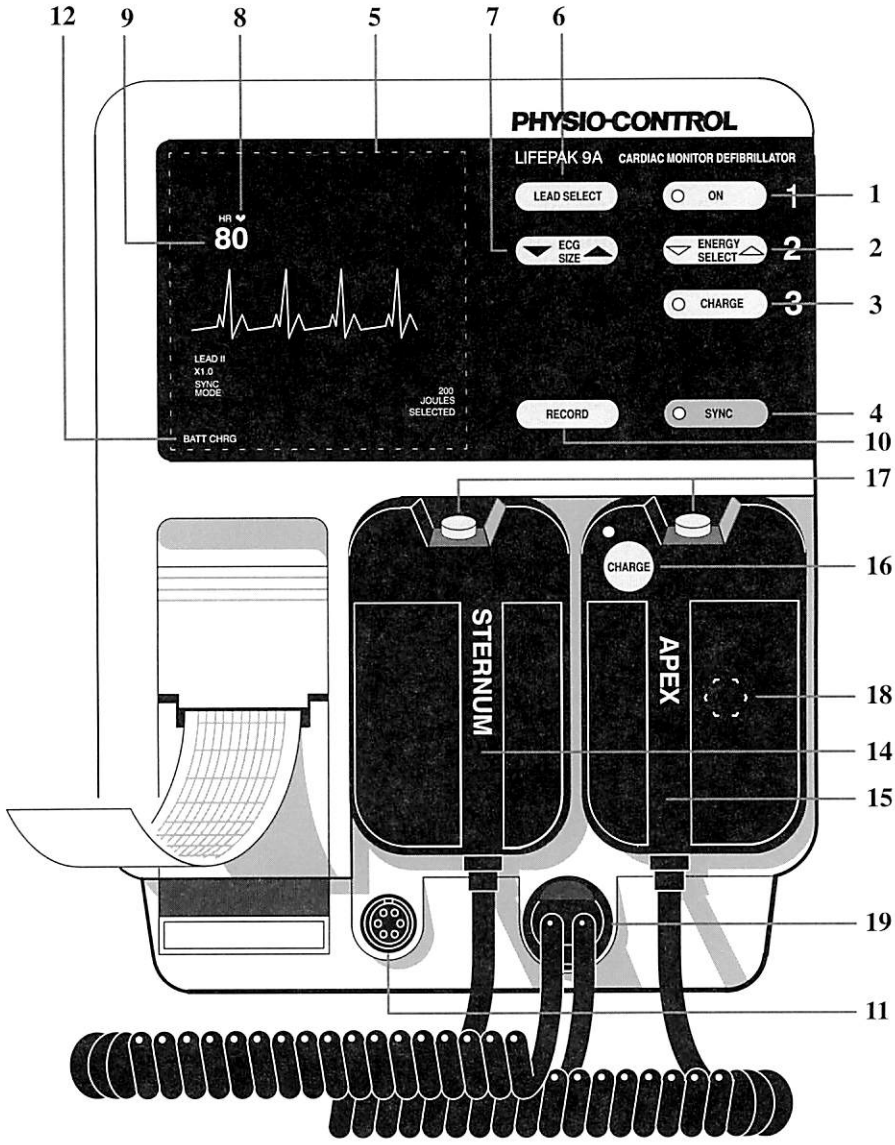


Figure 2-1 Front panel view (representation only)

Controls and Indicators

This section describes the controls and indicators found on the LIFEPAK 9A defibrillator/monitor. Their locations are noted on Figure 2-1 and Figure 2-2. Table 2-1 and Table 2-2 contain operation descriptions.

Table 2-1 Front panel controls and indicators

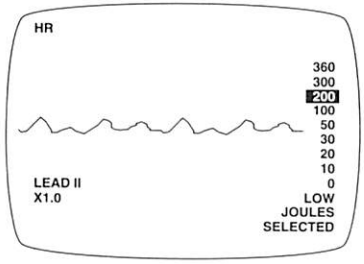
1	ON	Button activates the instrument. Indicator light shows power on status. , ac power selection is controlled via MAINS POWER switch on rear panel.
2	▼ ENERGY SELECT ▲	Button selects energy levels. Energy levels appear on right side of the monitor screen. Two ranges, high and low, are available. Energy level selected is highlighted on monitor screen. At power on, 200 joules is selected with standard paddles (defaults to 10 joules when internal defibrillation handles are installed). Energy selection range stays on screen for 10 seconds following the last energy level selected or until another button is pressed.
	High Range Energy Select 	High range energy display shows LOW, 0, 10, 20, 30, 50, 100, 200, 300, and 360 joules. When in high range, selecting the LOW setting causes the low energy selection range to appear.

Table 2-1 Front panel controls and indicators, *continued*

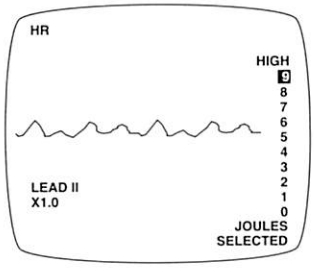
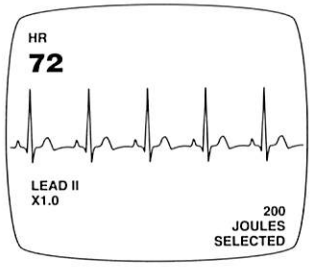
	Low Range Energy Select 	Low range energy display shows 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and HIGH joules. When in low range, selecting HIGH setting causes the high energy selection range to appear.
	JOULES SELECTED Message 	Message appears in lower right corner of the monitor screen indicating the number of joules selected. At power on, 200 joules is selected with standard paddles (defaults to 10 joules when internal defibrillation handles are installed).
3	CHARGE	Button initiates defibrillator charge cycle. Button indicator light flashes when device is charging and glows steadily when selected energy is reached. Charged energy is available for approximately one minute.

Table 2-1 Front panel controls and indicators, *continued*

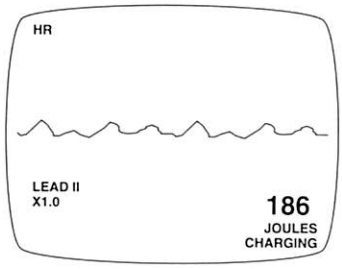
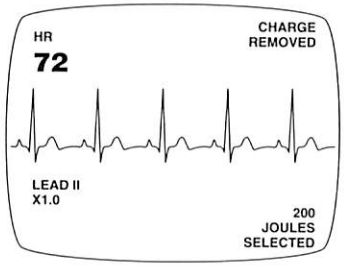
JOULES CHARGING Message  	Message appears in lower right corner of the monitor screen while defibrillator charges. Increasing numbers indicate energy level as defibrillator charges.
JOULES AVAILABLE Message (not shown)	Message appears in lower right corner of the monitor screen when defibrillator is charged to selected energy. Message is accompanied by a charge complete tone. The amount of stored energy appears in bold numbers above JOULES AVAILABLE message.
CHARGE REMOVED Message  	When defibrillator charge is no longer available, the CHARGE REMOVED message appears in the upper right corner of the monitor screen for five seconds. If standard or optional paddles become disconnected when device is charging or charged, energy is removed and CHARGE REMOVED message is displayed for five seconds or until CHARGE is pressed again. If defibrillator is charging or charged, pressing ENERGY SELECT causes the charge to be removed. A CHARGE REMOVED message will appear in the upper right corner of the monitor screen for five seconds or until CHARGE is pressed again.

Table 2-1 Front panel controls and indicators, *continued*

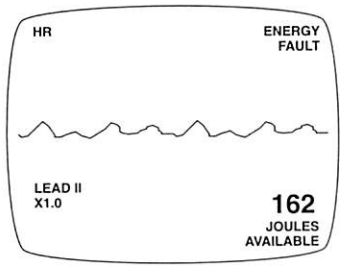
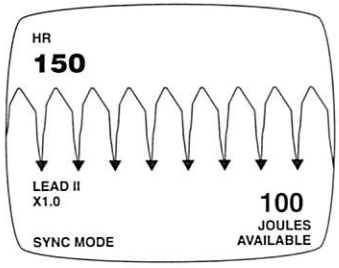
	ENERGY FAULT Message  	If selected energy and stored energy disagree, a flashing ENERGY FAULT message appears in the upper right corner of the monitor screen, accompanied by an audible tone. Message remains until energy is delivered or removed automatically (after approximately 60 seconds), new energy is selected, or power is turned off. Message indicates that system requires examination by a qualified service technician.
4	SYNC	Button selects synchronized mode and indicator light illuminates. Whenever a QRS is detected the indicator light flashes. To return to defibrillate (asynchronous) mode, press SYNC again.
	SYNC MODE Message  	Message appears in lower left corner of the monitor screen when sync mode is selected. Sync markers (▼) appear on each detected QRS.

Table 2-1 Front panel controls and indicators, *continued*

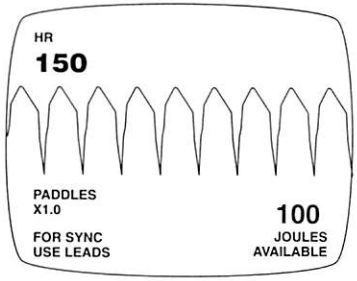
	FOR SYNC: USE LEADS Message 	While monitoring with standard paddles, message appears in lower left corner of the monitor screen when sync mode is attempted. Message flashes for three seconds, accompanied by three short tones. Sync mode is not activated.
5	Monitor Screen	Monitor screen has a non-fade display. ECG trace moves from right to left.
6	▼ LEAD SELECT ▲	Button selects ECG input: Standard (STD), PADDLES, and LEADS I, II, III. Press to advance one position. SETUP menu (described in Service Manual) allows selection of LEAD II or PADDLES as the default lead setting available at power on. Alphanumerics on screen indicate lead selected.
7	▼ ECG SIZE ▲	Control adjusts vertical size of ECG trace on monitor screen and recorder. X1.0 gain selected automatically at power on. Alphanumerics on screen quantify actual gain selected from 0.2 cm/mV to 4.0 cm/mV.
8	♥	QRS sense symbol (♥) flashes when QRS is detected.
9	Heart Rate	Digital display of heart rate from 20-300bpm.

Table 2-1 Front panel controls and indicators, *continued*

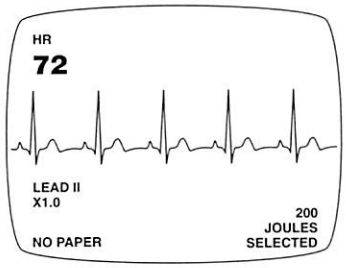
10	RECORD	Button prints ECG on ECG paper designed for thermal array recorders. Pressing the RECORD button annotates time, date, ECG lead, ECG gain, heart rate, and defibrillation, when violated.
	NO PAPER Message 	The NO PAPER message flashes in the lower left corner of the monitor screen accompanied by three short tones whenever ECG paper is depleted and RECORD is pressed.

Table 2-1 Front panel controls and indicators, *continued*

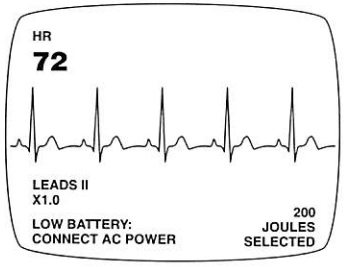
11	Patient ECG Cable Connector	Connector links the Physio-Control 3-lead 6-pin patient ECG cable to the electrodes.
12	BATT CHRG Indicator (yellow backlight)	When illuminated, the message indicates battery is charging and power source is ac line.
	LOW BATTERY: CONNECT AC POWER Message 	Message appears in lower left corner of monitor screen, accompanied by three short tones every 20 seconds. Message indicates minimum battery reserve is available and ac power should be connected promptly. Message blanks when ac power is connected.

Table 2-1 Front panel controls and indicators, *continued*

13	SERVICE Message (not shown)	Whenever a SERVICE message flashes in the lower left corner of the monitor screen, there is a condition requiring examination by a qualified service technician.
14	STERNUM Paddle	QUIK-LOOK® defibrillation paddle with one discharge button serves as negative ECG electrode during paddle monitoring.
15	APEX Paddle	QUIK-LOOK, QUIK-CHARGE® defibrillation paddle with second discharge button serves as positive ECG electrode during paddle monitoring.
16	CHARGE (QUIK-CHARGE Control)	Button charges defibrillator from APEX paddle. Button indicator light flashes during charge cycle and glows steadily when energy has reached preselected level.
17	Discharge Buttons	Buttons discharge defibrillator. *Both* buttons must be pressed *simultaneously* to deliver energy to the paddles. Energy will not be delivered unless device is fully-charged to preselected level.

Table 2-1 Front panel controls and indicators, *continued*

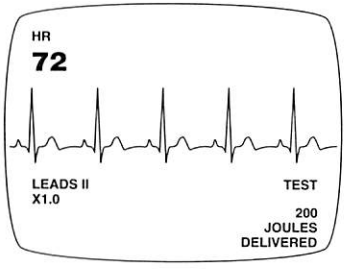
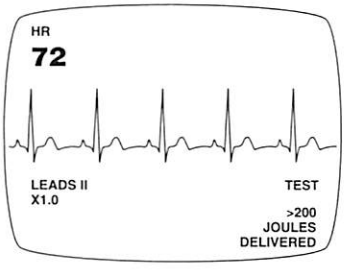
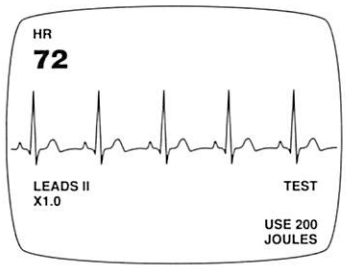
18	Test Load Contacts	Contacts supply 50 ohm defibrillator test load. Metal contacts under paddles receive defibrillation pulse from paddles and tests at 200 joules only.
	TEST 200 JOULES DELIVERED Message 	Message appears for five seconds in the lower right corner of the monitor screen, indicating successful completion of test. Recorder prints time, date, defibrillator mode, and TEST 200 JOULES DELIVERED.
	TEST< 200 (or > 200) JOULES DELIVERED Message 	Message appears in the lower right corner of the monitor screen, indicating test is unsuccessful. Recorder prints time, date, defibrillator mode, and TEST < 200 (or > 200) JOULES DELIVERED.

Table 2-1 Front panel controls and indicators, *continued*

	TEST USE 200 JOULES Message 	If test is attempted with energy levels other than 200 joules, message appears in the lower right corner of the monitor screen.
19	Defibrillation Output Connector	Connector connects the following directly into the defibrillator/monitor: Physio-Control standard hard paddles, internal handles with discharge control, Defibrillation Adapter, and Shock Advisory Adapter.

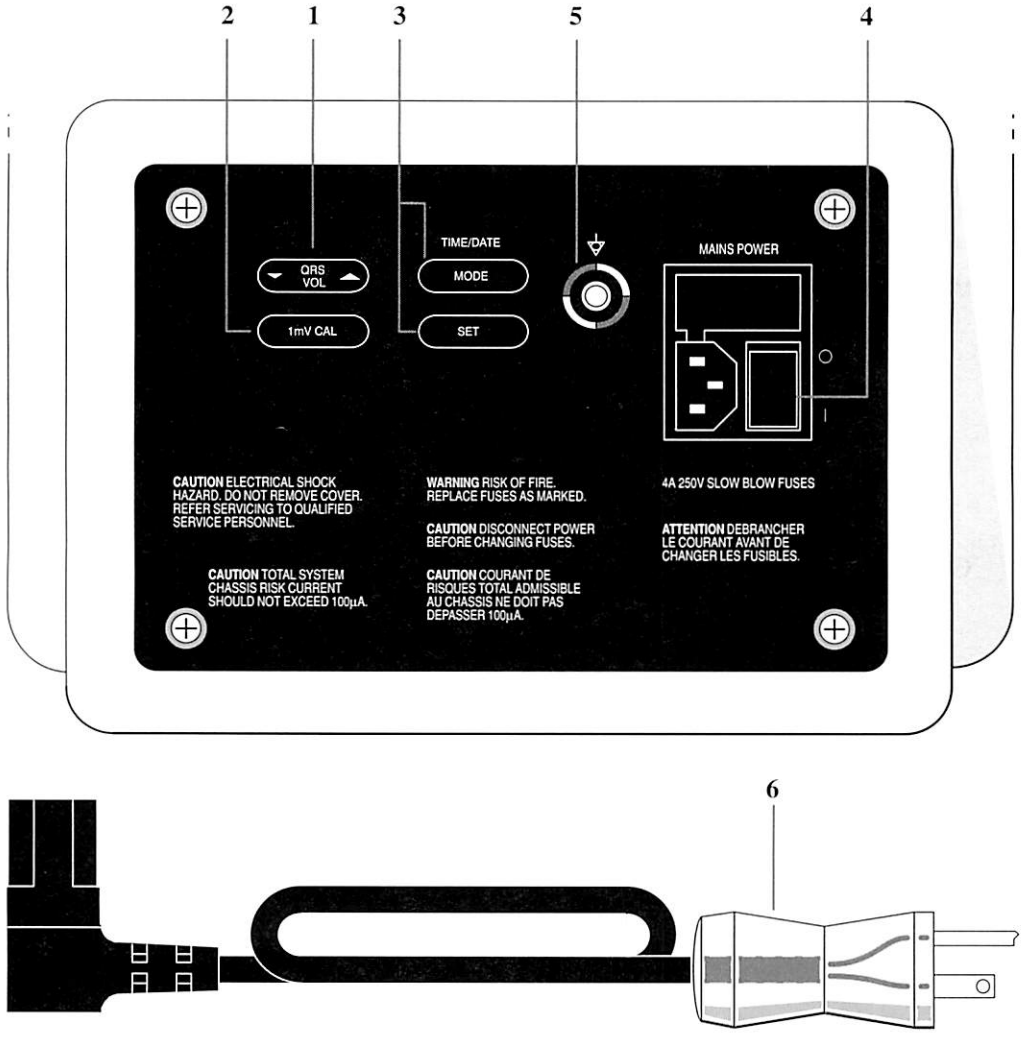


Figure 2-2 Rear panel view

Table 2-2 Rear panel controls and indicators

1	▼QRS VOL▲	Button adjusts the volume of systole "beeper". Last setting remains in memory at power off.
2	1mV CAL	When pressed, button superimposes 1mV calibration signal on monitor screen and recorder.
3	TIME/DATE MODE and SET	Buttons set date and time.
4	MAINS POWER	Rocker switch selects ac line power with battery charging (ON or I position) or battery power with ac power off (O position). Battery will not charge if MAINS POWER switch is left in off or O position (refer to AC Line and Battery Operation, page 2-17 for more information).
5	Ground	Label identifies equipotential ground tie point.
6	Power Cord	Cable connects to grounded ac receptacle. Check that label on bottom of instrument matches available voltage/frequency.

AC Line and Battery Operation

The LIFEPAK 9A defibrillator/monitor may be operated using ac line or dc battery power.

⚠ WARNING

Possible defibrillator shutdown. When operating on battery power, the large current draw required for defibrillator charging may cause the defibrillator to reach shutdown voltage levels with no low battery warning. If the defibrillator shuts down without warning, or if a LOW BATTERY CONNECT AC POWER message appears on the monitor screen, immediately connect the ac power cord to an outlet.

Refer to Section 7, Appendix A for additional safety information.

AC Operation

The LIFEPAK 9A defibrillator/monitor operates on ac line power when the power cord is connected to an ac outlet. The rear panelAC MAINS POWER switch must also be set to I (ON). When the power cord is connected to an ac outlet, the battery charges and the BATT CHRG message on the monitor screen illuminates. When the device is not being used, the battery charge will be maintained if the power cord is connected to an ac outlet with the device power off.

Battery Operation

The LIFEPAK 9A defibrillator/monitor automatically operates on battery power when the power cord is disconnected from an ac outlet. A new, fully-charged battery will typically provide seventy-five 360 joule discharges, or approximately 90 minutes of continuous monitoring before the device powers off.

When the LOW BATTERY CONNECT AC POWER message appears on the monitor screen, immediately plug power cord into an ac outlet to continue use; this supplies power and begins recharging the battery. Frequently occurring low battery messages indicate that the battery may need to be replaced.

Recharge fully-depleted batteries to full capacity whenever possible. A fully-depleted battery can be recharged to 90% capacity in three hours. Charge time to full capacity is 24 hours.

New batteries, or batteries which have been stored for a prolonged time, need to be charged by installing them in the LIFEPAK 9A defibrillator/monitor with the power cord plugged into an ac outlet.

For further information regarding battery performance, see General Specifications, page 6-22.

Battery Life

The LIFEPAK 9A defibrillator/monitor has a sealed lead-acid battery which is intended to be used for standby operation and performs best when the device is plugged into an ac outlet when not in use. Frequent use of the battery when it is at minimum reserve capacity will reduce the battery life.

End of battery life is inevitable. As batteries age, their charge capacities diminish. Batteries should be replaced every two years as a preventive maintenance measure.

Recycling Batteries

Recycle batteries according to local regulations. Otherwise, contact the local Physio-Control service technician for information on returning batteries.

Setting the Clock

To set the clock:

1. Press ON.
2. Press TIME/DATE MODE button on rear panel. Day, month, year, hours, and minutes will be displayed in the lower left corner of monitor screen. The single minutes field will be highlighted.
3. Press TIME/DATE SET button on rear panel to change the single minute setting. Each time the button is pressed, the value of the field increases by one increment. When the maximum value for a field is reached, the display rolls over to the lowest value for that field.
4. Press MODE again to advance to next time/date field. Press SET to increase values. Repeat process to adjust year, month, and day.
5. After proper day has been selected, press MODE again to remove clock setting display from the monitor screen.
6. Confirm proper clock setting by pressing RECORD. The printed strip should include proper time/date annotation.

   If any front panel button is pressed or the device is turned off while setting the clock, the clock set mode will be terminated without implementing any changes.

Monitoring the Patient

Patient ECG can be monitored with standard paddles using the QUIK-LOOK defibrillation paddle feature, the 3-lead patient ECG cable, or through FAST-PATCH disposable defibrillation/ECG electrodes. For information regarding disposable defibrillation electrodes refer to the Operating Instructions for defibrillation electrodes.

Note. Text references to buttons and displayed messages are indicated in CAPITAL LETTERS.

Refer to Section 7, Appendix A for additional safety information

⚠ WARNINGS

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

Possible misinterpretation of monitor screen ECG data. The monitor screen 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 recorder normally operates in monitor frequency response mode. It does not provide the resolution required for diagnostic and ST segment interpretation, and is intended only for basic ECG rhythm identification.

⚠ WARNING

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 displayed or recorded ECG signal, thereby preventing accurate rhythm analysis.

Monitor Lead Mode

The monitor will power on in one of two leads as described below. The preselected lead (mode) may be selected by a qualified service technician using the SETUP menu.

- Mode 1: The monitor preselects PADDLES lead.
- Mode 2: The monitor preselects Lead II.

For information on how to change the modes, see the Service Manual, or contact a qualified service technician.

Standard Paddles Monitoring Procedure

To monitor through QUIK-LOOK paddles:

1. Press ON. The device performs a self-diagnostic test; all indicator lights and all status display messages illuminate momentarily.
2. Press LEAD SELECT to PADDLES position.

   The device will preselect LEAD II whenever it is powered on. For information on how to change this selection to PADDLES, contact a qualified service technician.
3. Apply conductive gel over entire paddle electrode surface.
4. Place paddles firmly on patient's bare torso. The standard paddle placement is STERNUM to the patient's right upper torso below the clavicle and the APEX lateral to the patient's left nipple in the midaxillary line.
5. Observe monitor screen to evaluate patient's rhythm.

When the device is turned on, the ECG gain will be at X1.0. ECG SIZE may need to be adjusted if QRS complex is not clearly visible on monitor screen.

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.

Using the Three-Lead Patient ECG Cable

The LIFEPAK 9A defibrillator/monitor has a shielded 3-lead ECG cable. The cable allows patient monitoring of leads I, II, or III.

ECG Electrode Requirements

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

For best ECG monitoring results, silver/silver chloride (Ag/AgCl) electrodes such as Physio-Control LIFE•PATCH® ECG electrodes should be used with this equipment. Post-defibrillation visualization of ECG on the monitor screen using silver/silver chloride electrodes will be much faster than with other electrode types.

Color Coding for ECG Leads

The lead wires are color coded according to AHA or IEC standards. When other lead configurations are desired, use the following information as a guide.

Table 3-1 ECG leads color codes

Lead	Bipolar Lead and Reference		AHA	IEC
I	RA	Negative Electrode	White	Red
	LA	Positive Electrode	Black	Yellow
	LL	Reference	Red	Green
II	RA	Negative Electrode	White	Red
	LA	Reference	Black	Yellow
	LL	Positive Electrode	Red	Green
III	RA	Reference	White	Red
	LA	Negative Electrode	Black	Yellow
	LL	Positive Electrode	Red	Green

RA= Right Arm LA= Left Arm LL= Left Leg

When electrodes and lead wires are attached as above, leads I, II, or III are obtained by pressing LEAD SELECT.

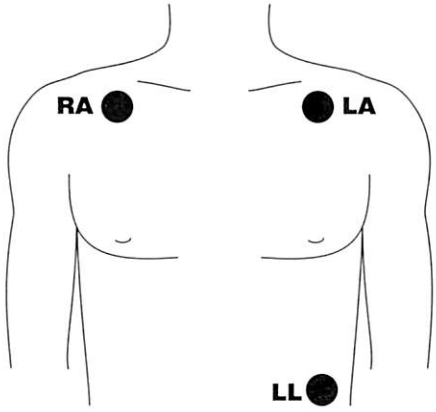


Figure 3-1 ECG electrode placement for leads I, II, and III

Skin Preparation

Monitoring results will be best when the skin electrode sites are properly prepared as follows:

1. Shave excessive hair at electrode site. Avoid locating electrodes over tendons and major muscle masses.
2. For oily skin, clean skin with alcohol pad and let dry completely.
3. Prepare site with brisk dry rub. Avoid damage or abrasion of skin surface.
4. Carefully tear open foil package and remove electrode carrier.
5. Attach lead wire to electrode.
6. Grasp electrode tab and peel electrode from carrier.
7. Apply to patient only if gel is in solid state.
8. Hold electrode taut with both hands. Apply the electrode flat to skin. Smooth tape outwardly in all directions. Do not press center of electrode.

ECG Cable Monitoring Procedure

To monitor the ECG cable:

1. Attach 6-pin ECG cable to ELECTRICALLY ISOLATED ECG connector located on the front panel.
2. Prepare patient's skin for electrode application and apply electrodes. Refer to Skin Preparation, above.
3. Press ON.
4. Press LEAD SELECT to select desired lead.
5. Adjust ECG SIZE if necessary. Size is automatically set to gain of X1.0 at power up. To properly count heart rate during routine monitoring and to accurately detect QRS complexes during synchronized cardioversion, the ECG size may need to be adjusted as follows:
   - Press QRS VOL ▲ or ▼ until audible.
   - Press ECG SIZE ▲ or ▼ until systole beeper coincides with every QRS complex.
   - Adjust QRS VOL ▲ or ▼ as desired.
6. Secure and support the ECG cable.

QRS Detection

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

The QRS detector in the LIFEPAK 9A defibrillator/monitor selectively detects QRS complexes. It discriminates against most noise, muscle artifact, T-waves, and other false signals.

Detection of QRS complexes and rejection of other signals depends on setting the ECG size control properly. If ECG size is set too low, QRS complexes will not be detected; no systole tones or sense (synchronizer) markers appear and 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 9A defibrillator/monitor displays a heart rate between 20 and 300bpm. Patient rates outside this range do not yield valid systole tones or heart rate display.

Monitoring Patients with Invasive Pacemakers

⚠ WARNING

Possible interference with implanted devices. Magnets inside the standard defibrillation paddles may affect the function of an implanted pacemaker or implanted defibrillator if paddles are positioned over or near implanted devices. Have function of implanted device checked after using standard paddles.

The LIFEPAK 9A defibrillator/monitor rejects most pacemaker pulses 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 no paced QRS complexes are counted, resulting in blanking of the heart rate display.

The following may be helpful to minimize ECG pickup of large pacemaker pulses when monitoring patients with internal pacemakers:

- Place ECG electrodes so a straight line drawn between the positive electrode and negative electrode intersects a line between the pacemaker generator and the heart at right angles. Electrode placement is not as critical when the pacemaker is bipolar.
- If internal pacemaker pulse artifact continues to disrupt the heart rate display or synchronizes function when monitoring with defibrillation electrodes and the Defibrillation Adapter, monitoring with the ECG cable may improve pacemaker pulse rejection.
- Smaller amplitude internal pacemaker pulses may not be visualized on the monitor screen and/or the recording strip in leads or paddles monitoring modes. To improve the visualization of internal pacemaker pulses on the recorder, try using the diagnostic mode. Refer to the LIFEPAK 9A defibrillator/monitor Service Manual or contact a qualified service technician to engage the diagnostic frequency response for the recorder.

Recording Patient Data

The recorder is equipped with an out-of-paper sensor to protect recorder print head. The sensor automatically turns off recorder if it runs out of paper or if recorder door is opened.

Note. Text references to buttons and displayed messages are indicated in CAPITAL LETTERS.

Printing a Recording

Recording can be done in any lead selected. The recorder operates in an eight-second delayed ECG mode.

1. Press RECORD.
2. Adjust ECG SIZE if necessary.
3. Press RECORD to stop printing.

Recorder Annotation

The annotating recorder prints the following: time, date, ECG lead, ECG size, heart rate, defibrillation/synchronization, and test load data.

The beginning of each annotation is marked by the symbol ▶. Updated annotation information prints every 20 seconds when recorder is on. Changes made in lead selection or sync mode will update the annotation.

Discharging defibrillator while recorder is on updates time, date, joules, and synchronize (if selected) annotation.

Diagnostic Recording

If the diagnostic frequency response mode (DIAG) has been enabled during SETUP, the ECG signal will be recorded at a frequency response of 0.05 -100Hz.

Care of 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.

Paper Loading

⚠ CAUTION

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

To load paper into the recorder (see Figure 4-1):

1. Pull out top of recorder; recorder will open for paper insertion.
2. Remove old paper roll.
3. Insert new paper roll with grid facing up.
4. Pull out a short length of paper.
5. Close recorder case. Press bottom recorder door up (*see* 1, *Figure 4-1)* and in and press top recorder door down (*see* 2, *Figure 4-1*).
6. Press RECORD to print and advance paper.

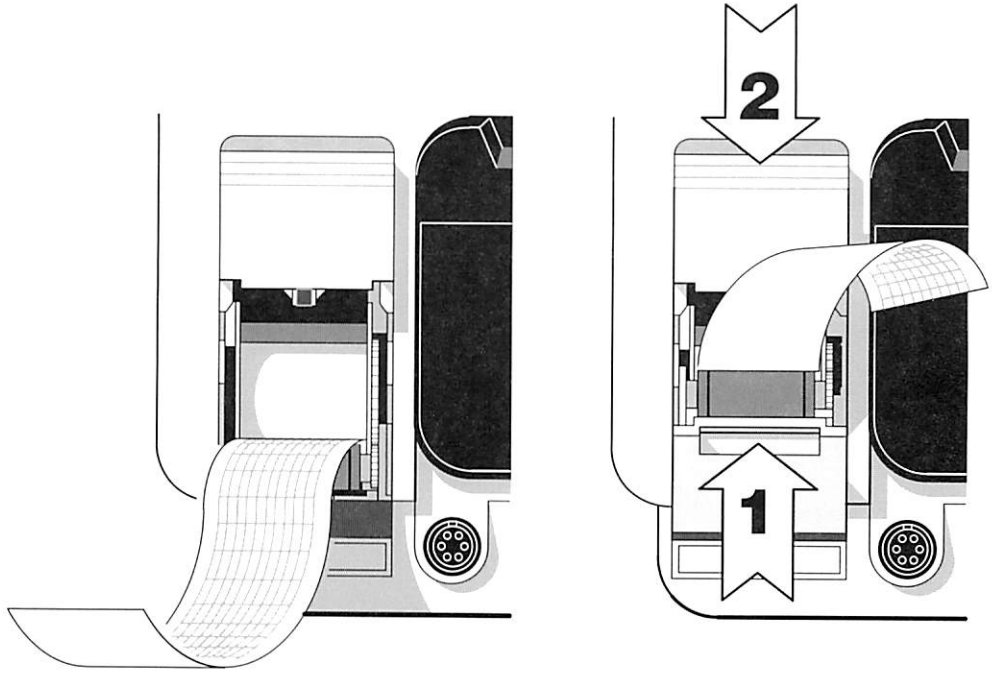


Figure 4-1 Loading paper into the recorder

Defibrillation

Defibrillation success depends upon many factors; only device operational factors are addressed here. Refer to the *"Defibrillation: What You Should Know"* booklet for additional information. (See page 6-17 for order information.)

This section covers defibrillation using standard paddles, pediatric paddles, and posterior paddle. For defibrillation using internal handles *with* discharge control, internal handles *without* discharge control, external sterilizable paddles, or FAST-PATCH disposable defibrillation/ECG electrodes, refer to the specific operating instructions for each paddle option.

Note. Text references to buttons and displayed messages are indicated in CAPITAL LETTERS.

For additional safety information, refer to Section 7, Appendix A.

⚠ WARNINGS

Shock hazard. When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the paddle electrode surface or defibrillation electrodes.

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.

⚠ WARNINGS

Possible burns and ineffective energy delivery. Do not allow physical contact between the ECG electrodes and the paddles, defibrillation 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.

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 electrode surfaces, handles, and paddle storage area after defibrillation

Possible skin burns. During defibrillation, air pockets between the skin and paddle electrode surfaces or defibrillation electrodes can cause patient skin burns. To help prevent air pockets, completely cover paddle electrode surfaces with conductive gel and press paddles firmly against the patient, or make sure self-adhesive defibrillation electrodes completely adhere to the skin. The conductive gel or electrodes must not be dried out.

Possible interference with implanted pacemakers. When cardioversion or defibrillation is performed on patients with permanent pacemakers, care should be taken to avoid placing the paddles/defibrillation electrodes near the pacemaker's generator since defibrillation can cause pacemaker malfunction. Check pacing thresholds for implanted pacemaker patients.

Possible interference with implanted devices. Check function of implanted devices after defibrillation or synchronized cardioversion.

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 (wet or dry) to become continuous between paddle sites.

⚠ WARNINGS

Possible paddle damage and skin burns. Do not discharge the defibrillator with the paddle electrode surfaces together because this may pit or damage the paddle plate surfaces. Pitted or damaged paddle electrode surfaces can cause patient skin burns during defibrillation.

Shock hazard. Do not discharge the defibrillator into the open air. To remove an unneeded charge, press ENERGY SELECT or remove defibrillator power by pressing the ON button.

Paddle Options

The LIFEPAK 9A defibrillator/monitor standard paddles are for use on adults. They may also be used for any pediatric patient as long as the paddles fit completely on the chest and there is a least one inch of space between the paddle electrodes. Pediatric paddles should be used for patients whose chests cannot accommodate the space required for standard paddles.

Options that Connect to the Defibrillator

In addition to standard paddles there are six paddle options for special needs. The first three are color coded with *black* connectors and are plugged directly into the *black* defibrillator output connector.

- Pediatric paddles (attaches to standard hard paddles)
- Posterior paddle (attaches to standard hard paddles)
- Internal paddles and handles with discharge control.

Options that Connect to the Defibrillation Adapter

The next three options are color coded with *gray* connectors and require the use of the Defibrillation Adapter.

- FAST-PATCH disposable defibrillation/ECG electrodes
- External sterilizable paddles
- Internal paddles and handles without discharge control.

Each adapter and paddle option has its own Operating Instructions; refer to these instructions before use.

Paddle Placement

Anterior-Lateral

The standard paddle placement is (see Figure 5-1):

- STERNUM paddle to 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

Patients with implanted pacemaker. If possible, place paddles away from internal pacemaker generator to help prevent damage to the pacemaker.

Patients with implanted defibrillators. Apply paddles in the preferred placement, anterior-lateral (sternum-apex), and treat this patient as 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 insulative properties of implanted defibrillator electrodes.

Standard Paddles Defibrillation Procedure

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

1. Press ON. 200 JOULES SELECTED will appear in lower right corner of the monitor screen.
2. Apply defibrillation gel over entire paddle electrode surface.
3. If other than 200 joules is desired, press ENERGY SELECT and select the energy to be delivered.
4. Press CHARGE on defibrillator front panel or on APEX paddle. Indicator lights on CHARGE and APEX paddle will flash while device is charging. A JOULES CHARGING message will appear in lower right corner of the monitor screen. Increasing numbers indicate energy level as the defibrillator charges.
5. Place defibrillator paddles firmly on patient's chest.

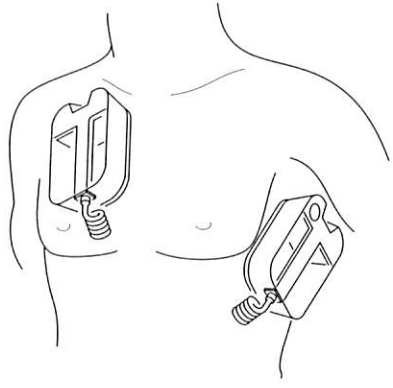


Figure 5-1 Anterior-lateral (sternum-apex) placement

6 Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.

7 Discharge defibrillator by simultaneously pressing both paddle discharge buttons when it reaches full charge. The defibrillator will not discharge until it completes charging to the selected energy level. If paddle discharge buttons are not pressed within 60 seconds, stored energy is removed automatically.

8 Observe patient and monitor screen to determine results. If additional countershock is necessary, repeat from step 3 above.

9 To remove unwanted charge, press ENERGY SELECT. A CHARGE REMOVED message will appear in upper right corner of the monitor screen for five seconds accompanied by three beep tones.

10 To turn off defibrillator, press ON again.

11 Thoroughly clean defibrillator paddles and store them in paddles storage area.

Using Pediatric Paddles

For detailed instructions regarding pediatric paddles, refer to the Pediatric Paddles Operating Instructions.

1 Slide pediatric paddles over clean standard paddles. An audible click will be heard when fully engaged.

2 Apply defibrillation gel to pediatric paddle electrode surface and place in the standard defibrillation position.

3 Select appropriate energy for weight of child per AHA recommendations (or equivalent guidelines).

4 Follow Standard Paddles Defibrillation Procedure (page 5-5).

Using the Posterior Paddle

For detailed instructions regarding the posterior paddle, refer to the Posterior Paddle Operating Instructions.

1 Slide posterior paddle attachment over clean, standard APEX paddle. An audible click will be heard when fully engaged.

2 Apply defibrillation gel to posterior paddle electrode surface.

3 Lift or turn patient and position the posterior paddle.

4 Apply defibrillation gel to STERNUM paddle electrode surface.

5 Follow Standard Paddles Defibrillation Procedure (page 5-5), using the anterior-posterior paddle placement (page 5-4).

Synchronized Cardioversion

Asynchronous (defibrillation) mode is automatically selected when the defibrillator is powered on. Device automatically returns to asynchronous mode after each synchronized discharge.

Note. Text references to buttons and displayed messages are indicated in CAPITAL LETTERS.

Monitoring During Synchronized Cardioversion

There are two ways to monitor ECG for synchronized cardioversion:

- Use 3-lead patient ECG cable and electrodes and select lead I, II, or III.
- Use the Defibrillation Adapter with the FAST-PATCH disposable defibrillation/ECG electrodes. Refer to the Defibrillation Adapter and FAST-PATCH disposable defibrillation/ECG electrodes Operating Instructions.

For proper synchronization, ECG size must be adjusted correctly. Refer to QRS Detection, page 3-6 for more details.

Sync markers indicate the time of QRS detection used to synchronize discharge of the defibrillator. Markers may appear to move slightly from complex to complex; this is normal.

Sync mode will not operate using standard paddles in paddles lead. If attempted, a FOR SYNC: USE LEADS message will appear in the lower left corner of the monitor screen.

Synchronized Cardioversion Procedure

If using defibrillation electrodes, refer to the Synchronized Cardioversion Procedure in the Defibrillation Adapter Operating Instructions.

1. Press ON.
2. Attach ECG cable and ECG electrodes. For proper placement of electrodes refer to Color Coding for ECG Leads, page 3-4.
3. Select lead with optimum QRS complex amplitude (positive or negative).
4. Press SYNC. The amber light on the SYNC button blinks with each detected QRS complex.
5. Observe monitor screen. Confirm that the sync marker appears on the QRS complex. If the marker does not appear or appears on the T-wave: adjust ECG SIZE ▲ or ▼, change to another lead, or reposition the ECG electrodes so sync markers occur only on the QRS complex.

   Occasionally, sync markers may occur near the end of the QRS complex. Sometimes, adjusting ECG size to minimum, then adjusting upward will move the marker closer to the middle of the QRS.
6. Prepare and position paddles on patient's torso. Refer to Standard Paddles Defibrillation Procedure, page 5-5.
7. Press ENERGY SELECT to choose the energy to be delivered.
8. Press CHARGE. A single tone sounds when charge is complete. Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.
9. Press and *hold* paddle discharge buttons until discharge occurs with next detected QRS complex.
10. Observe patient and monitor screen. If synchronized cardioversion needs to be reattempted, Press SYNC again. Device automatically returns to asynchronous mode after each synchronized discharge.
11. To remove an unwanted charge, press ENERGY SELECT.
12. To turn off defibrillator, press ON.
13. Thoroughly clean paddles and store them in storage area.

Testing

Periodic testing of the LIFEPAK 9A defibrillator/monitor and accessories helps to detect possible electrical and mechanical problems, and keeps personnel acquainted with normal operating procedures. Contact a qualified service technician if device or accessory discrepancies are noted. Refer to the Maintenance and Testing Schedule, page 6-6.

For testing information regarding accessories, refer to their individual Operating Instructions.

Note. Text references to buttons and displayed messages are indicated in CAPITAL LETTERS.

Refer to Section 7, Appendix A for additional safety information.

⚠ WARNING

Possible paddle damage and patient burns. Be sure paddles are secured firmly and placed properly (STERNUM on left, APEX on right) in the paddles storage area when discharging. This helps prevent arcing and formation of pits on paddle electrode surfaces. Pitted or damaged paddle electrode surfaces can cause patient skin burns during defibrillation.

Monitor/Recorder Test

Equipment Needed

The LIFEPAK 9A defibrillator/monitor, an ECG cable, and an ECG simulator are the equipment needed to perform a monitor/recorder test.

Test Procedure

To test the monitor/recorder:

1. Connect power cord to grounded ac receptacle. BATT CHRG indicator light should illuminate.
2. Press ON.
3. Press LEAD SELECT to STD.
4. Attach 3-lead patient ECG cable. Do not connect cable to patient or simulator.
5. Press and release rear panel CAL button. Calibration signal should appear on monitor screen.
6. Adjust rear panel QRS VOL so that sound is heard with each calibration signal.
7. Attach 3-lead patient ECG cable to ECG simulator. Power on simulator and set rate to 80.
8. Advance LEAD SELECT through leads I, II, and III. A simulated normal sinus rhythm should appear on the monitor screen.
9. Select LEAD I. Removing the reference lead, LL, should not affect the ECG display. Verify that removing either RA or LA leads results in loss of ECG rhythm.
10. Select LEAD II. Removing the reference lead, LA, should not affect the ECG display. Verify that removing either RA or LL leads results in loss of ECG rhythm.
11. Select LEAD III. Removing the reference lead, RA, should not affect the ECG display. Verify that removing either LL or LA leads results in loss of ECG rhythm.
12. Advance LEAD SELECT to PADDLES. Remove standard paddles from paddle storage area. Gentle paddle shaking should result in interference on the monitor screen. Placing paddle electrode surfaces together should result in a flat trace on the monitor screen.
13. Advance LEAD SELECT to the STD position.

14 Press RECORD. Recorder should run and trace should appear within one second. Press rear panel CAL button several times. Calibration signal should appear on scope and be recorded on ECG paper approximately eight seconds later. Signal recorded should match Figure 6-1 when monitor frequency response is selected on SETUP menu.

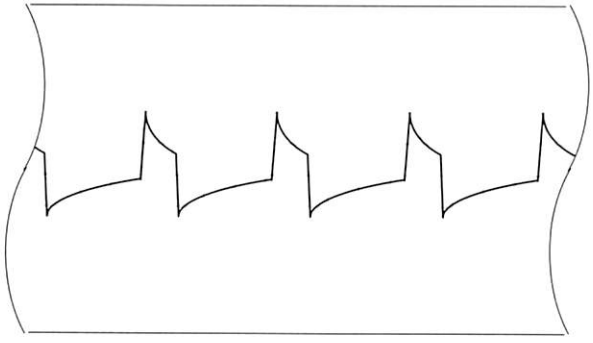


Figure 6-1 Calibration signal at monitor frequency response

If diagnostic frequency response is selected in SETUP, the calibration signal will match Figure 6-2.

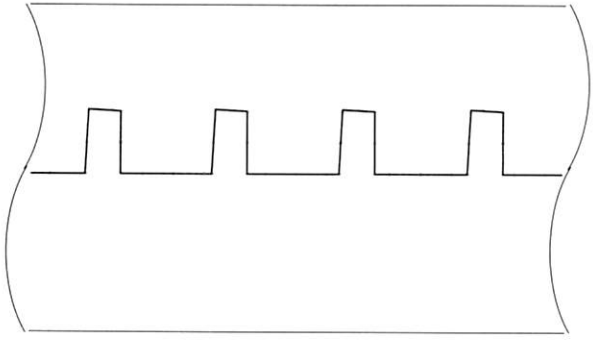


Figure 6-2 Calibration signal at diagnostic frequency response

15 Press RECORD again to power off the recorder.

Defibrillator Test

⚠ CAUTION

Possible equipment damage. Because of heat created as a result of discharge into test load, do not repeat testing of defibrillator more often than 10 times per hour. Do not remove charge by changing ENERGY SELECT or powering off the device more than four times per minute as this may also damage the internal test load.

Equipment Needed

The LIFEPAK 9A defibrillator/monitor is the only equipment needed.

Test Procedure

To test the defibrillator:

1. Paddles should be firmly seated in paddle storage area.
2. Press ON.
3. Press ENERGY SELECT. 200 JOULES SELECTED will appear in the lower right corner of monitor screen.
4. Press CHARGE. JOULES CHARGING will appear in lower right corner of monitor screen. Increasing numbers indicate energy level as defibrillator charges. Defibrillator is ready when the selected energy and the JOULES AVAILABLE messages appear in the lower right corner of monitor screen. CHARGE button indicator light will glow steadily accompanied by a charge complete tone. Charging should take 10 seconds or less.
5. Press the APEX discharge button only and confirm that the device does not discharge.
6. Press the STERNUM discharge button only and confirm that the device does not discharge.
7. Discharge defibrillator by pressing both paddle discharge buttons simultaneously.

   The TEST 200 JOULES DELIVERED message should appear in the lower right corner of screen for approximately four seconds. Recorder will print time, date, and DEFIB TEST 200 JOULES DELIVERED message.

An unsuccessful test will cause a TEST < 200 (or > 200) JOULES DELIVERED message to appear in lower right corner of monitor screen. Recorder will print time, date, and DEFIB TEST < 200 (or >200) JOULES DELIVERED message.

Synchronizer Function Test

Equipment Needed

The LIFEPAK 9A defibrillator/monitor, ECG cable, and ECG simulator are the equipment needed to perform a synchronizer function test.

Test Procedure

To test the synchronizer:

1. Connect 3-lead patient ECG cable to ECG simulator. Select rate of 40.
2. Press ON.
3. Select LEAD II (provides tall QRS).
4. Press SYNC. SYNC MODE message will appear in lower left corner of monitor screen. Adjust ECG size to minimum gain of X0.2 and advance slowly until marker appears within each QRS complex. SYNC button indicator light will flash with each detected QRS.
5. Leave paddles in storage area. Select 200 joules by pressing ENERGY SELECT.
6. Press CHARGE.
7. Press RECORD.
8. Press and hold *both* paddle discharge buttons simultaneously until defibrillator discharges on next detected QRS. Wait approximately eight seconds for the recorder to annotate the synchronized defibrillation event. The annotation identifier ▶ will appear over the QRS complex and align with the sync marker ▼.
9. Defibrillator should return to asynchronous mode. SYNC MODE message no longer appears in lower left corner of monitor screen.

Maintenance and Testing Schedule

The following guideline outlines functional and electrical safety testing of the LIFEPAK 9A defibrillator/monitor at periodic intervals. It complements the internal quality assurance programs of the hospital or clinic.

Testing should be preceded by a thorough visual inspection of the device. Examine the device and accessories for cracks in the case and cables, pitted paddle electrode surfaces, presence of gel on paddles or paddle storage area, and for proper function of controls. If damage is suspected, corrective action should be taken immediately.

While examining the device, the operator should check that all accessories are present and functional.

Physio-Control recommends a minimum program of routine maintenance and testing for clinical personnel (refer to Table 6-1 on page 6-7). Additional preventive maintenance and testing such as electrical safety tests, performance inspection, and calibration should be performed routinely by biomedical personnel. Contact a qualified service technician immediately if device or accessory discrepancies are noted.

A separate checklist entitled *"Manual Defibrillators: Operators Shift Checklist"* is included with shipment of your LIFEPAK 9A defibrillator/monitor.

Table 6-1 Recommended maintenance and testing for clinical personnel

	Daily	After Use	As Required
Clean defibrillator/monitor.		●	●
Check that all necessary supplies and accessories are present (e.g., gel, ECG paper, ECG and pacing cable, electrodes, etc.).	●	●	●
Check/change recorder paper.	●		●
Operational tests: monitor function, defibrillator/sync discharge function with standard paddles, adapters, or paddles options.	●		●
Inspect case, cables, connectors, and accessories for damage.	●		
Verify paddles are clean.	●	●	

Troubleshooting

This brief checklist is intended for nontechnical personnel. If trouble persists after consulting the following checklist, contact a qualified service technician.

Table 6-2 Troubleshooting the monitor

	Observation	Possible Cause/Corrective Action
1	Device does not function when ON is pressed. No trace on monitor screen. ON button does not illuminate.	• Battery discharged below operating level. Test by using line power. • Confirm device is plugged in. (Check that BATT CHRG lamp is on.) • Check for damaged power cord. Replace if necessary. • Check for failed fuse or tripped circuit breaker in building electrical lines.
2	Interference on monitor screen when using 3-lead patient cable for ECG input.	• Confirm that 3-lead patient ECG cable is connected to device and lead I, II, or III is selected. • Check patient skin preparation, electrode contact, electrode placement, or outdated electrodes. • Inspect patient cable. Use only Physio-Control 3-lead patient ECG cable. • Check for the presence of a strong radio frequency electrical field (such as diathermy). Power off noise-generating equipment. • If excessive line (50 or 60Hz) frequency interference is suspected, enable the built-in notch filter via the SETUP menu. Contact a qualified service technician for assistance.
3	Excessive interference on monitor screen when using paddles.	• Check for dirty paddles. • Check that LEAD SELECT is set to PADDLES. • If using FAST-PATCH disposable defibrillation/ECG electrodes, check for poor skin preparation, electrode placement, or outdated electrodes. • Check that appropriate conductive gel is between paddles and skin.

Table 6-2 Troubleshooting the monitor, *continued*

Observation	Possible Cause/Corrective Action
4 No ECG signal on monitor screen when using 3-lead patient ECG cable.	• Confirm that LEAD SELECT is set to I, II or III (not STD or PADDLES). • Check patient ECG cable for damage and replace if necessary.
5 No ECG signal on monitor screen with QUIK-LOOK paddle monitoring.	• Confirm that PADDLES is selected. • Confirm that paddles connector is in place and locked (twist clockwise 1/8 turn). • Inspect paddles and cables for damage and replace if necessary.
6 Recorder does not operate.	• Confirm that recorder has paper and doors are closed.
7 Straight line on monitor screen and recorder when signal is applied or 1mVCAL is pressed.	• ECG size may be set too low. Increase ECG size.
8 No systole sound.	• Increase volume (QRS VOL). • Increase ECG size. • Amplitude of ECG signal is too low in that lead. Select another lead or move electrodes.
9 QRS indicator (♥) fails to flash with each QRS.	• Increase ECG size. • Amplitude of ECG signal is too low in that lead. Select another lead or move electrodes.
10 Heart rate is not present.	• Increase ECG size. • Amplitude of ECG signal is too low in that lead. Select another lead or move electrodes. • Heart rate is below 20bpm or above 300bpm

Table 6-2 Troubleshooting the monitor, *continued*

Observation	Possible Cause/Corrective Action
11 No sync markers on monitor screen.	• PADDLES lead selected while standard paddles connected. Monitor with 3-lead ECG cable or Defibrillation Adapter and defibrillation electrodes. • Press SYNC. • Increase ECG size. • Amplitude of ECG signal is too low in that lead. Select another lead or move electrodes.
12 Sync marker (▼) not positioned within QRS complex.	• Adjust ECG size to minimum gain (X0.2) and gradually increase until QRS indicator is properly positioned. • Amplitude of ECG signal is too low in that lead. Select another lead or move electrodes.
13 LOW BATTERY: CONNECT AC POWER message remains illuminated despite charging attempts. Device operates normally on line power (ac).	• Battery may be depleted. Contact a qualified service technician.
14 BATT CHRG indicator light fails to illuminate when device connected to ac line power. Device otherwise operational.	• Possible battery charge indicator light failure. • Inspect ac power cord for damage. Check that it is properly connected. • Check fuse or tripped circuit breaker in building electrical lines. Device operating from internal battery. • Battery not charging properly. Contact a qualified service technician. • Have battery inspected for proper installation.

Table 6-2 Troubleshooting the monitor, *continued*

Observation	Possible Cause/Corrective Action
15 ECG recording appears smudged.	• Confirm that ECG paper for thermal array recorders is in use.
16 SERVICE message appears in lower left corner of the monitor screen.	• Contact a qualified service technician.
17 Time or date on recorder incorrect.	• Time or date not set properly. Adjust using TIME/DATE MODE and SET buttons on rear panel.
18 Indicator lamps momentarily flash at power on.	• Normal operation of self test.

Table 6-3 Troubleshooting the defibrillator

	Observation	Possible Cause/Corrective Action
1	Charge time to 360 joules exceeds 10 seconds.	• Battery may be depleted. Connect to line power. Allow battery to charge for 24 hours.
2	Numbers in JOULES CHARGING message scroll very slowly when CHARGE is pressed.	• Battery may be depleted. Connect to line power. Allow battery to charge for 24 hours.
3	Energy is not delivered to patient when both paddle discharge buttons are pressed simultaneously.	• Device in Sync mode, but no QRS detected. Adjust ECG size, select another lead, move ECG electrodes, or exit Sync mode. • Defibrillator has not reached full energy selected. Wait for JOULES AVAILABLE message on the monitor screen and charge complete tone. • More than one minute has elapsed and energy has been removed. • ENERGY SELECT was pressed and charge was removed. Press CHARGE again. • Confirm that standard paddles are properly connected and locked into position.
4	Displayed JOULES AVAILABLE does not match energy selected. Accompanied by ENERGY FAULT message and warning tone.	• Perform a test load discharge. Defibrillator energy storage may not meet specifications. Contact a qualified service technician.
5	JOULES CHARGING message does not appear when CHARGE is pressed.	• Battery may be depleted. Connect to line power. Allow battery to charge for 24 hours.

Table 6-3 Troubleshooting the defibrillator, *continued*

Observation	Possible Cause/Corrective Action
6 TEST < 200 (or > 200) JOULES DELIVERED message displays when test load discharge performed.	• Defibrillator energy output may not meet specifications. Contact a qualified service technician.
7 SYNC MODE message does not appear when SYNC mode is selected.	• LEAD SELECT set to PADDLES or STD when using standard paddles. Use 3-lead patient ECG cable and select lead I, II, or III, or use Defibrillation Adapter with defibrillation electrodes.
8 Device does not charge.	• Confirm that standard hard paddles, Defibrillation Adapter, or Shock Advisory Adapter are fully connected and locked to defibrillator. • Selected energy is 0 joules. Change energy selection. • Confirm that standard hard paddles are connected directly into defibrillator/monitor, not into Defibrillation Adapter or Shock Advisory Adapter. Use only the defibrillation cable with the adapters and check that adapter and cable are locked in place.

Warranty Policy

Refer to the warranty statement shipped with the product. Duplicate copies may be obtained in the USA by calling the Physio-Control PARTSLINE™ at 1-800-442-1142.

Use of non-Physio-Control defibrillation electrodes, pacing electrodes, batteries, accessories, parts, or adapter devices may void Safety Agency Certifications and warranty.

Service

If the LIFEPAK 9A defibrillator/monitor requires service, contact a Physio-Control service representative or a qualified service technician. When calling Physio-Control to request service, please identify model and serial number and describe observation. If the device must be shipped to the service center or factory, special packing is necessary to prevent shipping damage.

Circuit diagrams, component parts lists, calibration instructions, and other relevant technical information are found in the LIFEPAK 9A defibrillator/monitor Service Manual.

Outside the USA, contact the local Physio-Control sales or service office.

Cleaning

The LIFEPAK 9A defibrillator/monitor case, paddles, cables, test load contacts, and monitor screen should be cleaned with mild soap and water. Use a damp sponge or towel to clean.

Do not clean with alcohol, ketones, or other flammable agents.

The recorder parts should be cleaned with a damp, soft cloth. Do not use abrasive agents. Do not autoclave or gas sterilize the LIFEPAK 9A defibrillator/monitor or Physio-Control accessories unless otherwise stated.

Replacement Items and Accessories

Contact Physio-Control for the complete part number.

Adapter Options

Defibrillation Adapter.	803747
Shock Advisory Adapter.	803732

Paddles and Electrodes

LIFE•PATCH ECG electrodes, adult

Case of 300 electrodes (10 boxes per case).	800139-300
Box of 30 electrodes, adult (three electrodes per package; 10 packages per box).	800139-030

Accessories that Require Defibrillation Adapter:

FAST-PATCH disposable defibrillation/ECG electrodes. Requires defibrillation electrode cable.	804089
One set (two electrodes).	804545-001
10 sets (20 electrodes).	804545-010
50 sets (100 electrodes).	804545-050
External Sterilizable Paddles.	804507
Internal Handles without discharge control (gas sterilize only).	800441

Internal Paddles for use with Internal Handles without discharge control (steam or gas sterilizable):

2.5 cm (1.0 in.) diameter, pair.	802154-10
3.8 cm (1.5 in.) diameter, pair.	802154-11

5.1 cm (2.0 in.) diameter, pair.	802154-12
6.4 cm (2.5 in.) diameter, pair.	802154-13
8.9 cm (3.5 in.) diameter, pair.	802154-14

Accessories that Do Not Require Defibrillation Adapter:

Internal Handles with discharge control (gas or steam sterilizable).	805249
Internal Paddles for use with Internal Handles with discharge control (steam or gas sterilizable):	
2.5 cm (1.0 in.) diameter, pair.	805355-10
3.8 cm (1.5 in.) diameter, pair.	805355-11
5.1 cm (2.0 in.) diameter, pair.	805355-12
6.4 cm (2.5 in.) diameter, pair.	805355-13
8.9 cm (3.5 in.) diameter, pair.	805355-14
Pediatric paddles, external one each (two required).	800418
Posterior paddle, external adult.	802461

Cables

Defibrillation cable. For use with FAST-PATCH disposable defibrillation/ECG electrodes.	804089
AHA 3-lead patient ECG cable, 6-pin connector, snap type, low noise.	9-10418
IEC 3-lead patient ECG cable, 6-pin connector, snap type, low noise.	800947

Literature

Product literature for the LIFEPAK 9A defibrillator/monitor is available in the following languages:

Table 6-4 LIFEPAK 9A product literature

Title	P/N#	English	French	Spanish	German	Italian	Swedish	Japanese
LIFEPAK 9A defibrillator/monitorOperating Instructions	805383	•	•	•	•	•	•	
LIFEPAK 9A defibrillator/monitorService Manual	805378	•						
LIFEPAK 9 defibrillator/monitor Shock Advisory Adapter Training Manual	805539	•	•	•		•	•	
Booklet: *"Defibrillation: What You Should Know"*	805662	•	•	•	•	•		•

Videos

LIFEPAK 9 defibrillation/monitor Inservice Video Program

- English (NTSC format) 803764
- English (PAL format) 803764
- French (SECAM format) 803764
- German (PAL format) 803764

LIFEPAK 9 defibrillator/monitor Shock Advisory Adapter Inservice Video

- English (NTSC format) 806424
- English (PAL format) 806424

Miscellaneous

DERMA JEL® electrode gel.

• 4 oz. tube.	9-10236-00
• 12 tubes/case.	9-10236-012

ECG paper.
(chemical, 50 mm x 30 m (100 ft.), 40 mm grid).

• One box; three rolls/box (three rolls).	804700-003
• 50 boxes/case (150 rolls).	804700-150

Accessory bag (mounts on side of device). 805485-00

Emergency cart. 800539

• One red security tie for emergency cart (50 ties/package).	200349-001

Patient simulator. 803499

Simulates ventricular fibrillation, motion distortion, and normal sinus rhythm to facilitate training. Includes four AA batteries and two Operating Instructions. Tests function of defibrillation cable, Defibrillation Adapter, and Shock Advisory Adapter.

Consult your Physio-Control representative regarding other available replacement items and accessories.

Specifications

Table 6-5 ECG Monitor specifications

INPUT	Isolated ECG via QUIK-LOOK defibrillator paddles, FAST-PATCH disposable defibrillation/ECG electrodes, 3-lead patient cable.
ECG LEAD SELECTION	Std, Paddles, I, II, III
PATIENT CABLE LENGTH	4.0m (13 ft.); cable 3.1m (10 ft.); leads 0.9m (3 ft.).
COMMON MODE REJECTION	With notch filter engaged, minimum 100dB with respect to chassis ground and 65dB minimum with respect to isolated ground when measured at 60Hz. Common mode range for patient cable input ≥10 volts peak with respect to isolated ground.
MONITOR SCREEN	
Size:	102 mm (4 in.) wide x 76mm (3 in.) tall, non-fade.
Frequency Response:	Non-diagnostic
ECG Leads:	1.0Hz to 40Hz (-3dB).
Paddles:	2.2Hz to 20Hz (-3dB).
Sweep Speed:	25mm/sec.
ECG SIZE	Adjusts amplitude of ECG trace on monitor screen, strip chart recorder, and ECG output.

Table 6-5 ECG Monitor specifications, *continued*

HEART RATE METER	Three-digit readout displays rates from 20 to 300bpm. Heart rates outside this range do not yield valid systole tones or heart rate display. Heart rate meter is disabled during pacing.
1 mV Cal	Button on rear panel simulates a 1mV signal pulse to the ECG input.

Table 6-6 Thermal Array Printer specifications

PAPER:	
Size:	50mm x 30m (100 ft.)
Speed:	25 mm/sec.
Delay:	ECG prints eight seconds after first appearing on the monitor screen.
FREQUENCY RESPONSE:	Non-diagnostic. Diagnostic available through the SETUP menu.
ECG Leads: (non-diagnostic)	1.0Hz to 40Hz (-3dB)
ECG Leads: (diagnostic)	0.05Hz to 100Hz (-3dB)
Paddles:	2.2Hz to 20Hz (-3dB).
ANNOTATION	Time, date, ECG lead, ECG gain, heart rate, defibrillation parameters, pacing parameters, and test load discharges.

Table 6-7 General specifications

SIZE	
Height:	35.2cm (13.9 in.)
Width:	29.7cm (11.7 in.)
Depth:	31.0cm (12.2 in.)
Weight:	13.2kg (29.0 lbs.)
AC INPUT OPTIONS	120 or 240Vac nominal line voltage without adjustment. 50 or 60Hz, with adjustment in SETUP menu.
POWER CORD LENGTH	3m (10 ft.)
BATTERY TYPE	Sealed lead-acid, 3 A-hr; 16 Vdc nominal.
BATTERY CAPACITY	A new, fully-charged battery will provide one of the following prior to shut down:

	Typical	Minimum
360J discharges	75	40
Minutes of monitoring	90	70

LOW BATTERY INDICATOR:	Advises operator to connect ac power.
BATTERY CHARGE INDICATOR:	Illuminates when battery is charging.
SERVICE INDICATOR:	Indicates self-diagnostic routines have detected improper operation requiring service attention.
BATTERY CHARGE TIME	Full charge in 24 hours.
POWER CONSUMPTION	160 watts maximum while monitoring with recorder on and defibrillator charging.
STANDARD PADDLE ELECTRODE AREA	82 square cm

Table 6-8 Environmental specifications

ATMOSPHERIC PRESSURE	797mmHg to 500mmHg (-570 to 11,000 ft.).
RELATIVE HUMIDITY	0 to 95% (non-condensing) between 0 to 34°C (32 to 94°F). 0 to 80% (non-condensing) between 35 to 45°C (95 to 113°F).
TEMPERATURE	
Operating Range:	0 to 45°C (32 to 113°F).
Storage:	-30 to 65°C (- 22 to 149°F).

Table 6-9 Defibrillator specifications

DEFIBRILLATOR WAVEFORM	5 millisecond monophasic pulse (Edmark).
ENERGY SELECT	
External Paddles	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 50, 100, 200, 300, 360 joules
Internal Paddles	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 50 joules
CHARGE TIME	Charge to 360 joules in less than 10 seconds with a fully-charged battery.
CHARGE CONTROLS	Independent momentary button controls on front panel and APEX paddle.
CHARGE INDICATORS	Flashing lamps on paddle and front panel button along with increasing stored energy display on monitor screen indicate charge in progress. Upon full charge, energy available is displayed on the monitor screen and charge completed tone sounds.
PADDLE CORD LENGTH	3 meters (10 feet)
SYNC	Synchronizes defibrillator pulse to patient-generated QRS complex.
SYNC INDICATOR	Inverted triangle marker (▼) on displayed ECG waveform identifies synchronizer trigger point with respect to patient's QRS complex.

All specifications at 20°C unless otherwise stated. Specifications subject to change without notice.

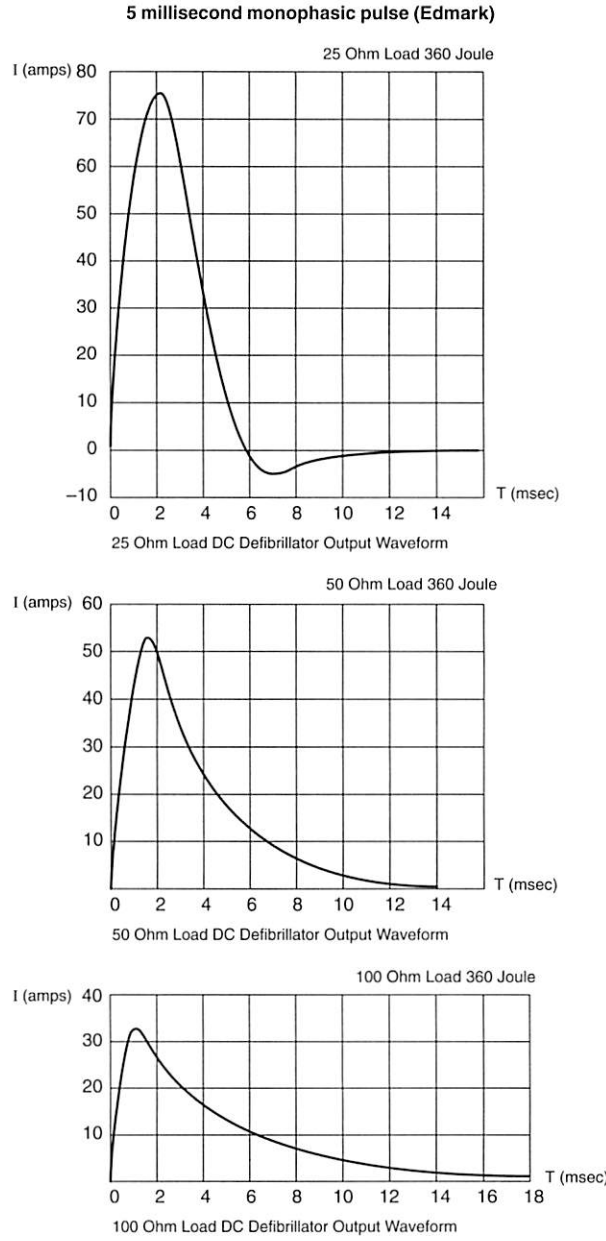


Figure 6-3 Defibrillation waveforms

Appendix A

Warning Reference Guide

All of the warnings provided in the previous sections of this manual are reproduced for reference in this appendix.

General Warnings

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 clean with alcohol, ketones, or other flammable agents. Do not autoclave this device or accessories unless otherwise specified.

Possible fire or explosion. Use care when operating this device close to oxygen sources (such as bag-valve-mask devices or ventilator tubing) and flammable gases and anesthetics.

Safety risk. Use of non-Physio-Control defibrillation electrodes, batteries, accessories, or adapter devices may cause the device to operate improperly.

General Warnings Continued

Possible interference with implanted devices. Magnets inside the standard defibrillation paddles may affect the function of an implanted pacemaker or implanted defibrillator if paddles are positioned over or near implanted devices. Have function of implanted device checked after using standard paddles.

Safety risk and possible equipment damage. Defibrillators, monitors, 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 the MRI manufacturer for more information.

Battery Warning

Possible defibrillator shutdown. When operating on battery power, the large current draw required for defibrillator charging may cause the defibrillator to reach shutdown voltage levels with no low battery warning. If the defibrillator shuts down without warning, or if a LOW BATTERY CONNECT AC POWER message appears on the monitor screen, immediately connect the ac power cord to an outlet.

Monitoring Warnings

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

Possible misinterpretation of monitor screen ECG data. The monitor screen 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 recorder normally operates in monitor frequency response mode. It 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 with electrocautery or diathermy equipment. Such equipment, as well as equipment which emits strong radio frequency signals, can cause electrical interference and distort the displayed or recorded ECG signal, thereby preventing accurate rhythm analysis.

Defibrillation Warnings

Shock hazard. When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the paddle electrode surface or defibrillation electrodes.

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.

Possible burns and ineffective energy delivery. Do not allow physical contact between the ECG electrodes and the paddles, defibrillation 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.

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 electrode surfaces, handles, and paddle storage area after defibrillation

Possible skin burns. During defibrillation, air pockets between the skin and paddle electrode surfaces or defibrillation electrodes can cause patient skin burns. To help prevent air pockets, completely cover paddle electrode surfaces with conductive gel and press paddles firmly against the patient, or make sure self-adhesive defibrillation electrodes completely adhere to the skin. The conductive gel or electrodes must not be dried out.

Defibrillation Warnings Continued

Possible interference with implanted pacemakers. When cardioversion or defibrillation is performed on patients with permanent pacemakers, care should be taken to avoid placing the paddles/defibrillation electrodes near the pacemaker's generator since defibrillation can cause pacemaker malfunction. Check pacing thresholds for implanted pacemaker patients.

Possible interference with implanted devices. Check function of implanted devices after defibrillation or synchronized cardioversion.

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 (wet or dry) to become continuous between paddle sites.

Possible paddle damage and skin burns. Do not discharge the defibrillator with the paddle electrode surfaces together because this may pit or damage the paddle plate surfaces. Pitted or damaged paddle electrode surfaces can cause patient skin burns during defibrillation.

Shock hazard. Do not discharge the defibrillator into the open air. To remove an unneeded charge, press ENERGY SELECT or remove defibrillator power by pressing ON button.

Testing Warning

Possible paddle damage and patient burns. Be sure paddles are secured firmly and placed properly (STERNUM on left, APEX on right) in the paddles storage area when discharging. This helps prevent arcing and formation of pits on paddle electrode surfaces. Pitted or damaged paddle electrode surfaces can cause patient skin burns during defibrillation.

A

B

C

D

T

U

V

W