PHYSIO CONTROL

OPERATING INSTRUCTIONS

LIFEPAK® 11
diagnostic cardiac monitor

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.

This instrument complies with Part 68, FCC rules
FCC Registration Number: 2BEUSA-73228-DT-E
Ringer Equivalence: 0.4B
USOC Jack: RJ11C
IC Certification Number: 1449 4762 A
IC Load Number: 2

Product Recycling Instructions

Recycle the device at the end of its useful life.

- **Preparation**
  The device should be clean and contaminant–free prior to being recycled.
- **Device Recycling Assistance**
  The device should be recycled according to national and local regulations. Contact your local Physio-Control representative for assistance.
- **Recycling of Disposable Electrodes**
  After disposable electrodes are used, follow your local clinical procedures for recycling.
- **Packaging**
  Packaging should be recycled according to local and national regulations.

Corporate Headquarters
11811 Willows Road Northeast
Post Office Box 97006
Redmond, WA 98073–9706
Telephone: 206.867.4000
Toll Free (USA only):800.422.1142
Fax: 206.885.6507

European Union Contact
Physio-Control UK Ltd.
Leamington Court
Andover Road, Newfound
Basingstoke, Hampshire
RG23 7HE United Kingdom
Telephone: 44.1256.782.727
Fax: 44.1256.782.728

P/N 805493-001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PREFACE

Features of the LIFEPAK® 11 diagnostic cardiac monitor

The LIFEPAK 11 diagnostic cardiac monitor is a portable, battery-powered instrument providing Electrocardiogram (ECG) monitoring and 12-lead ECG capability. ECG data may be displayed on a Liquid Crystal Display (LCD) screen and printed on a 100mm recorder. The monitor can store ECG data and basic patient information for multiple patients. The CODE SUMMARY™ critical event record summarizes important events for each patient.

The monitor can transmit patient data via telecommunications to a Physio-Control® RS 100 receiving station located at another site such as a hospital. This allows hospital personnel access to patient data before the patient arrives at the hospital which may improve efficiency and patient care.

The LIFEPAK 11 monitor also provides computerized analysis of 12-lead ECG data. This computerized ECG analysis provides an additional tool to aid in determination and diagnosis of cardiac conditions. It is intended for use under the supervision of qualified medical personnel. It is currently recommended that all computerized ECG analysis should be overread by a physician. All interpretive 12-Lead ECG reports provided by the LIFEPAK 11 monitor include the printed message **UNCONFIRMED**.

The LIFEPAK 11 monitor may be connected to a compatible LIFEPAK defibrillator to allow ECG monitoring through defibrillation paddles or electrodes. Other monitor features include password-protected configurations, 3- and 4-channel recording formats, and internal self-tests.

To aid in understanding the operating controls and screen messages, the button labels and screen messages appear in text in CAPITAL LETTERS such as RECORD or LEAD II.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Physio-Control Corporation

Manufacturer's Address: 11811 Willows Road NE
P.O. Box 97006
Redmond, WA 98073-9706
USA

declares that the CE–marked product

Product Name: LIFEPAK® 11 diagnostic cardiac monitor
Model Number: 805300

complies with 93/42/EEC (Medical Device Directive) Class IIa:

Safety:	EN60601-1:1990/ IEC 601-1:1988/ DIN VDE 0750-T1 12.91; Class II, Type BF with CF parts/ Continuous operation. IEC 601-2-4:1983	
EMC:	EN60601-1-2: 1993	
	CISPR 11:1990/EN 55011:1991	– Class B, Group 1
	IEC 1000 PT4-2/EN61000 PT4-2 1st edition	– 3kV CD, 8 kV AD
	IEC 1000 PT4–3 1st edition	– 3 V/m
	IEC 1000 PT4-4/EN61000 PT4-4 1st edition	– 0.5 kV Signal Lines – 1 kV Power Lines
	IEC 1000 PT4-5/EN61000 PT4-5 1st edition (formerly IEC 801-5)	– Installation Class 3

Supplementary Information:

1) Included are the following accessories and interconnecting cables:
Patient ECG Cable Assembly, 805265
LIFE·PATCH® ECG electrodes, 800139
FASTPAK® Battery, p/n 09–10424
AC Auxiliary Power Supply, p/n 806311
Power Supply Interconnection Cable p/n 804219
Power Supply Interconnection Cable (Y–Cable), p/n 3006462

2) This product also complies with:
UL2601–1:1994, UL 544, CSA C22.2 No. 601.1, CSA C22.2 No. 125

Redmond, October 18, 1995

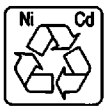
Michael D. Willingham, VP Quality and Regulatory Affairs

Symbols

Any or all of the following symbols may appear in this manual or on the LIFEPAK 11 diagnostic cardiac monitor or accessories:

Protective ground (earth) terminal

Equipotentiality connector



Recycle battery

Recycle battery

Static Sensitive Device (SSD)

Alternating current

Direct current

Voltage direct current

Positive terminal

Negative terminal

Defibrillation protected, type CF patient connection

Attention, consult accompanying documents

Accessory device connector (receiving station modem)

RECEIVING STATION connector (receiving station modem)

ACCESSORY DEVICES connector (receiving station modem)

AC ADAPTER connector (receiving station modem)

LINE connector (receiving station modem)

PHONE connector (receiving station modem)

CELLULAR INTERFACE connector (cellular modem)

CARDIAC MONITOR connector (cellular modem)

Glossary

The following terms may be helpful in understanding the operation of the LIFEPAK 11 monitor or accessories.

AHA	American Heart Association
cellular	Mobile telecommunications mode that employs a portable telephone supported by a mobile telephone network service.
FCC	Federal Communications Commission
IEC	International Electrotechnical Commission
landline	Stationary telecommunications mode that requires connection through a land-based telephone network service.
PSTN	Public Switched Telephone Network is the telephone network service connecting public telephone users in the United States.
REN	Ringer Equivalence Number is a measure of the load presented to a telephone network by connecting devices such as modems or telephones.

SAFETY INFORMATION

This section provides important information to help you operate the LIFEPAK 11 diagnostic cardiac monitor. Familiarize yourself with all of these terms and warnings.

Definition of Terms

The following safety-related terms are used either in this manual or on the LIFEPAK 11 monitor:

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

General Warnings

Each section contains warnings that apply specifically to the functions described in the section. The following are general warnings that apply to all monitor functions.

⚠ WARNINGS

Possible shock or fire.

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 or gas-sterilize this device or accessories unless otherwise specified.

Safety risk.

Use of non-Physio-Control electrodes, batteries, cables, accessories, adapter devices, or other parts may cause the device to operate improperly.

Possible fire or explosion.

Do not use this device near flammable gases or anaesthetics.

Safety risk and possible equipment damage.

Monitors, defibrillators, 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.

Possible electrical interference with ECG monitoring.

Electronic equipment which emits strong electromagnetic or radio frequency signals can cause electrical interference with ECG monitor operation. This interference may distort the displayed or recorded ECG signal, thereby preventing accurate rhythm analysis. Avoid operating this device near equipment of this type such as cauterizers or diathermy equipment. Avoid operating this device near (typically within six inches) two-way radios or cellular phones.

Possible shock.

During patient monitoring, unconnected electrode lead wires may provide an electrical path to ground. Do not allow unconnected lead wires to contact other equipment or conductive surfaces. Connect lead wires as described in these Operating Instructions.

BASIC ORIENTATION

This section provides a basic orientation to the operation of the LIFEPAK 11 diagnostic cardiac monitor and describes how to prepare the monitor for use. Topics include:

Unpacking and Initial Inspection

After you remove the LIFEPAK 11 monitor from the shipping container, examine the entire monitor and all cables and accessories for any signs of damage. Make sure you have all required supplies and accessories including cables, batteries, and recorder paper. Save the shipping container and foam inserts for use in shipping the monitor.

Controls and Indicators

Figures 2-1 through 2-4 and Tables 2-1 through 2-4 provide an overview of the controls and indicators for the LIFEPAK 11 monitor.

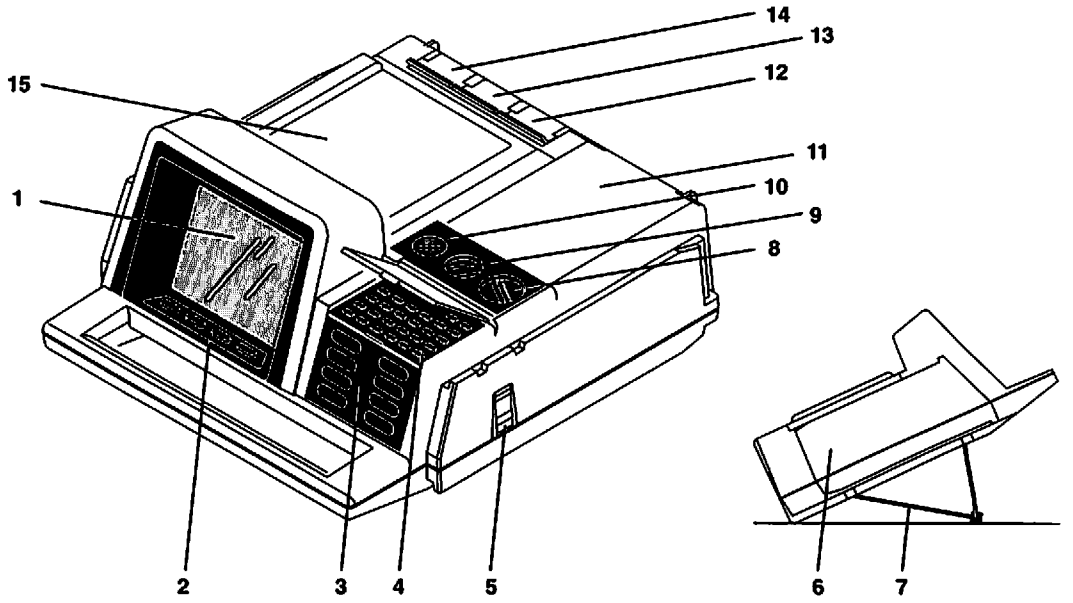


Figure 2-1 Controls and indicators

Table 2-1 Controls and indicators

1	Screen	A Liquid Crystal Display (LCD) where the ECG waveform, ECG data, and screen messages appear.
2	Softkeys	Four buttons whose functions change according to the operation displayed on the LCD screen.
3	Function buttons	Eight buttons with dedicated functions: LEAD SELECT RECORD ECG SIZE 12 LEAD VOL TRANSMIT EXIT CODE SUMMARY

Table 2-1 Controls and indicators, continued

4	Alphanumeric Keypad	A set of alphanumeric buttons that allow entry of patient information or marking of user-defined events during patient care.
5	Defibrillator Slide Contacts	Flexible metal contacts that allow communication between the LIFEPAK 11 monitor and the LIFEPAK 11/LIFEPAK 5/LIFEPAK 250 defibrillator when they are connected. The devices slide and lock together along the right side of the monitor.
6	Slide Connector	Not used (internal connector at rear is for factory use only).
7	Tilt Bail	Tilts up the monitor.
8	POWER Switch	Switches between OFF, battery power (BATT), and auxiliary power (AUX).
9	CONTRAST Control	Rotary control for adjusting the screen contrast for best viewing in varied lighting conditions.
10	ELECTRICALLY ISOLATED ECG Patient Cable Connector	Connector for the patient ECG cable.
11	Battery	Single +12Vdc nickel-cadmium rechargeable battery that powers the monitor when the POWER switch is set to BATT.
12	AUX POWER Connector	Allows connection of the Auxiliary Power Supply. This powers the monitor when the POWER switch is set to AUX. Auxiliary Power Supply may not be available for use in all countries. Contact your local Physio-Control representative.
13	LANDLINE Connector	Allows direct connection of the monitor to the public telephone network. The monitor can transmit data through its internal modem to an RS 100 receiving station using the telephone network. May not be available for use in all countries.
14	SYSTEM CONNECTOR	Allows connection to an external modem for telecommunication of patient reports. Also allows access to a real-time analog ECG Out signal. May not be available for use in all countries.
15	Strip Chart Recorder	Provides 100mm-wide recording of ECG waveform and recorded ECG, 12-Lead ECG, and CODE SUMMARY reports.

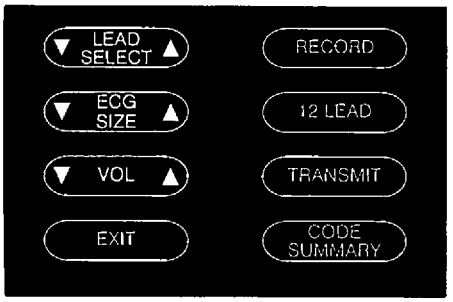
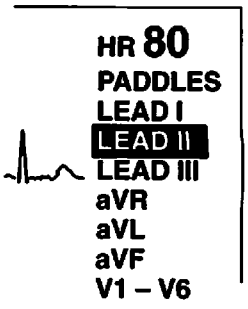
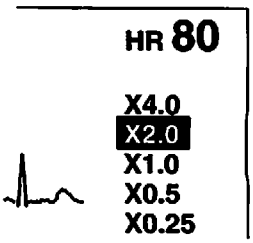


Figure 2-2 Function buttons

Table 2-2 Function button descriptions

LEAD SELECT	Controls the selection of the ECG lead. When LEAD SELECT is pressed, the ECG lead menu appears with the displayed lead highlighted. Lead selections V1 - V6 are only available if the precordial leads are connected. 
ECG SIZE	Adjusts the display size of the ECG trace. When ECG SIZE is pressed, the ECG size menu appears with the displayed size highlighted. 
VOL	Adjusts the audio volume for the QRS systole tones or landline data transmission tones. VOL does not affect the volume of any service or warning tones.
EXIT	Halts any active task such as acquiring a 12-Lead ECG report, printing, or transmitting.
RECORD	Activates or halts the recorder and initiates storage of a recorded ECG report into memory.
12 LEAD	Initiates the acquisition, storage, and printing of a 12-Lead ECG report.
TRANSMIT	Pressing TRANSMIT causes the monitor to display the Transmit screen. Softkeys allow selection of the report, location or destination phone number, and communication mode for transmission. Pressing TRANSMIT again causes the report to transmit. Transmission capability may not be available in all countries.
CODE SUMMARY	Initiates or halts printing of a CODE SUMMARY report. The CODE SUMMARY report printing overrides any other active task such as acquiring a 12-Lead ECG report.

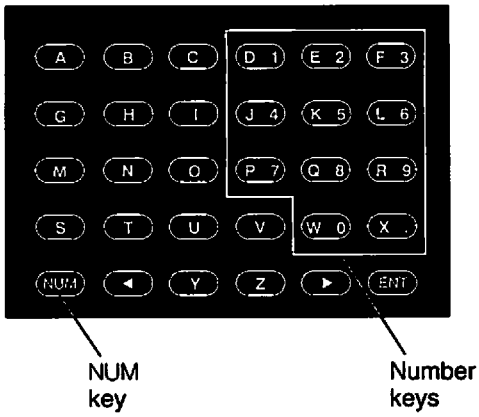


Figure 2-3 Alphanumeric keypad

Table 2-3 Alphanumeric keypad descriptions

NUM	Enables or disables the use of number keys. When the number keys are enabled, NUM LOCK is displayed on the screen. The number keys are automatically enabled for number-only fields.
◄	Moves the cursor to the left one space and deletes the existing character.
►	Moves the cursor to the right one space and enters a space in the field.
ENT	Advances the cursor to the next available field.

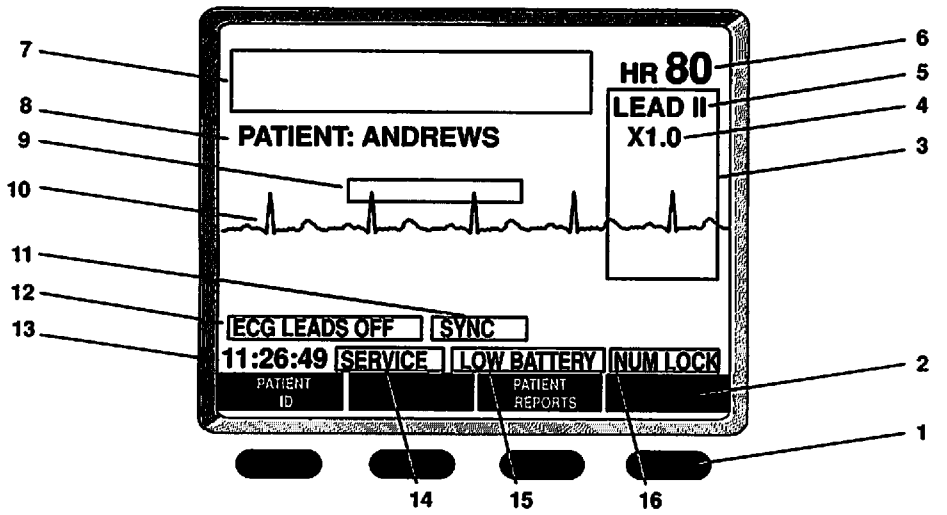


Figure 2-4 Screen and softkeys

Table 2-4 Screen and softkey descriptions

1	Four softkeys located under the LCD screen have different functions according to the operation displayed on the LCD screen. The softkey functions are defined by the displayed labels such as PATIENT ID or PATIENT REPORTS in the example above. A blank label indicates the softkey is not used for the current screen.
2	The displayed labels for the softkeys located directly below.
3	Location of the menus displayed when selecting a different ECG lead or changing ECG size.
4	Current ECG size (can be X4.0, 2.0, 1.0, 0.5, or 0.25).
5	ECG lead currently displayed.
6	Patient heart rate is displayed over range of 20 to 300 beats per minute (bpm). When the display is HR - - - heart rates are outside the range of 20 to 300 bpm.
7	Three-line field for displaying messages.
8	One-line field for displaying the current patient name or identification number.
9	Field for display of CONNECT LEADS message when ECG leads are disconnected.
10	ECG trace updates from left to right across the screen.
11	SYNC message is displayed if a LIFEPAK 11 defibrillator/pacemaker or compatible LIFEPAK defibrillator with synchronous cardioversion capability is connected to the monitor and the synchronizing function is enabled.
12	Field for display of message when ECG leads are disconnected.
13	Time is displayed in a 24-hour format.
14	SERVICE message indicates the monitor needs service.
15	LOW BATTERY message flashes if the monitor battery voltage is low.
16	NUM LOCK message is displayed if the number keys are enabled on the alphanumeric keypad.

Connecting Power

The power for the LIFEPAK 11 monitor can be supplied by a rechargeable, +12Vdc nickel-cadmium FASTPAK® battery or the AC Auxiliary Power Supply. To apply power, turn the POWER switch to BATT (battery power) or AUX (Auxiliary Power Supply).

The Auxiliary Power Supply may not be available for use in all countries. Contact your local Physio-Control representative.

Power-on instructions in this manual refer to BATT unless otherwise noted. The AUX selection can be used if the Auxiliary Power Supply is connected.

FASTPAK Battery

A new, fully-charged FASTPAK battery installed in the LIFEPAK 11 monitor provides power for a minimum of 60 minutes of monitoring and 20 minutes of recorder operation within the operating temperature of 15 to 35°C (59 to 95°F). The monitor flashes the LOW BATTERY message and beeps when the battery needs to be replaced. Promptly replace the battery when the LOW BATTERY message is displayed. Always keep additional fully-charged FASTPAK batteries available for replacement.

To install the battery:

1. Align the battery with the battery well so battery clip is toward connector pins.
2. Insert end of 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, push in the clip at the rear of the battery and lift it up and out of the battery compartment.

⚠ WARNING **Possible loss of power during patient care.**

Using an improperly maintained battery to power the LIFEPAK 11 monitor may cause premature power loss. Use the Physio-Control® Battery Support System to properly maintain the batteries.

Use the Physio-Control Battery Support System to properly maintain the FASTPAK batteries to maximize battery life and performance. For detailed information about battery recharging and maintenance, refer to page 9-12.

AC Auxiliary Power Supply

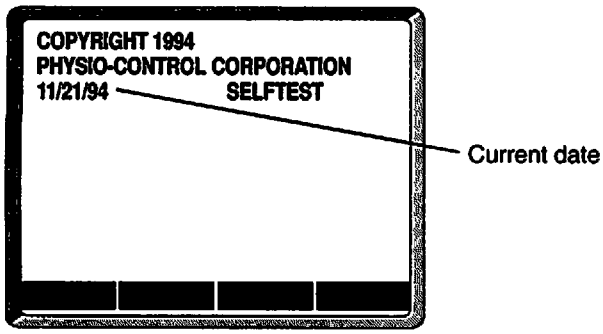
The AC Auxiliary Power Supply provides an alternative power source for the LIFEPAK 11 monitor. The Auxiliary Power Supply powers the monitor while slow-charging the installed FASTPAK battery. The Auxiliary Power Supply can also power the monitor with no battery installed. For operating information, refer to the AC Auxiliary Power Supply Operating Instructions. The AC Auxiliary Power Supply may not be available for use in all countries. Contact your local Physio-Control representative.

⚠ WARNING **Possible loss of power during patient care.**

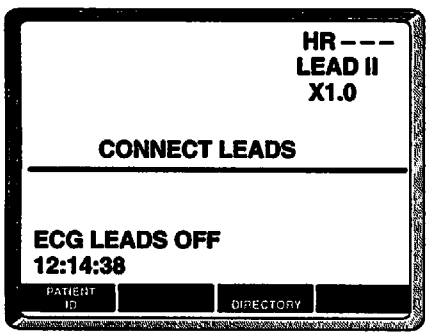
The AC Auxiliary Power Supply recharges the FASTPAK battery installed in the monitor, but does not perform the reconditioning procedures required to properly maintain the battery. Using an improperly maintained battery to power the LIFEPAK 11 monitor may cause premature power loss. Use only the Battery Support System to properly maintain batteries.

Power-On Settings and the Home Screen

When power is applied to the LIFEPAK 11 monitor, the monitor performs internal selftests and displays the selftest message:



After a few seconds, the monitor displays the Home screen:

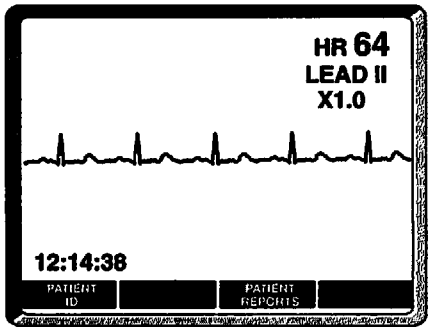


When power is first applied to the monitor:

- Displayed ECG size is always X1.0
- QRS volume is always off.

Other power-on settings such as the displayed ECG lead can be configured as part of the Startup Defaults in the User Configuration Options (described on page 10-3).

If the patient ECG cable and ECG leads are connected to the monitor and a patient, the monitor displays the ECG waveform on the Home screen:



The monitor defines a new patient by assigning a unique patient identification (patient ID) based on the date and time of power-on. Any recorded reports (such as recorded ECG or 12-Lead ECG) are assigned that patient ID until power is turned off. If the power is briefly interrupted (by replacing the battery or by rotating the POWER switch from BATT to AUX), the monitor retains the current settings and patient identification when power is restored.

If you interrupt power for more than approximately one minute or turn the POWER switch to OFF, at power-on the monitor defines a new patient. The settings revert to monitor power-on defaults.

When you disconnect the monitor from a patient, be sure to turn monitor power off and then on again before connecting to a new patient. The monitor defines a new patient and patient ID when the monitor is turned off then on. This ensures new patient reports are assigned to the new patient and not to the previous patient.

Loading Recorder Paper

To load paper in the recorder, follow the steps illustrated in Figure 2-5:

1. Press in the recorder door latch to release the door.
2. Lift up the recorder door.
3. Remove the empty paper spool.
4. Insert a new paper roll with the graph side facing up. Make sure the end of the paper extends outward so it is exposed when the recorder door is closed.
5. Lower the recorder door and push down on the door as indicated on the door label until the door clicks shut.

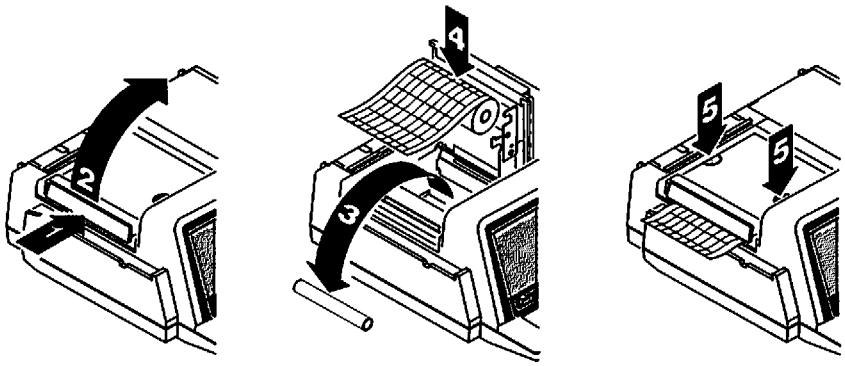


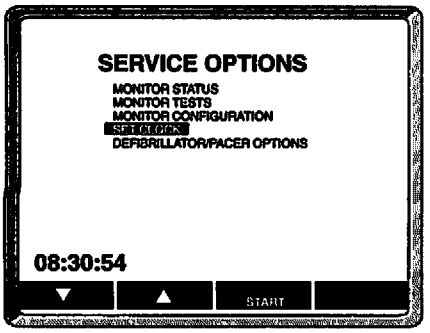
Figure 2-5 Loading recorder paper

Setting the Clock

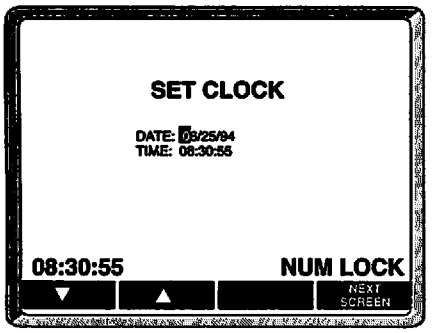
To check the date and time, press RECORD to start the recorder. After the report is printed, press RECORD to turn off the recorder. Check the date and time printed in the upper left corner of the report.

To set the clock:

1. Turn the monitor POWER switch to OFF.
2. Press and *hold down* the TRANSMIT button and the VOL ∇ or VOL Δ button.
3. Turn POWER switch to BATT while holding down the buttons for several seconds until the monitor displays the Service Options screen:



4. Press the ∇ softkey as required to highlight SET CLOCK.
5. Press the START softkey to display the Set Clock screen:



6. Use the alphanumeric keypad to set the date and time. Press the ∇ or Δ softkeys to advance through the fields.
7. After setting the date and time, press EXIT twice to exit to the Home screen.

Do not attempt to use any Service Options except SET CLOCK. Other Service Options are reserved for use by technical service personnel.

Selecting the Patient ECG Cable

The patient ECG cable consists of the main cable and two attachments. The attachments allow limb lead monitoring, precordial lead monitoring, and acquisition of a 12-Lead ECG report. For cable requirements for ECG monitoring, refer to page 3-2. For cable requirements for 12-lead ECG acquisition, refer to Figure 4-1.

Handling and Storing the Patient ECG Cable

Following these handling and storage suggestions will extend the useful life of the ECG cable:

- Disconnect the cable from the monitor prior to coiling the cable and storing in the soft pouch or
- If the cable is left connected to the monitor between uses, follow the recommended coiling practices outlined below:
  - Hold cable 6 to 8 inches from the cable connector at the monitor end
  - Coil cable toward the cable connector
  - Avoid twisting cable at connector when placing in pouch

Transporting in Optional Soft Carrying Case

An optional soft carrying case is available to help protect the LIFEPAK 11 monitor during transport. Different soft case versions are available to accommodate the monitor only or a monitor combined with a defibrillator. Pouches in the soft case allow storage of ECG cables, electrodes, and extra batteries or accessories.

Setting Up User Configuration Options

The User Configuration Options allow you to define operating features for the LIFEPAK 11 monitor such as power-on default settings and 12-lead ECG operating functions. Access to the options requires a password. For information about accessing and defining the options, refer to Section 10.

MONITORING THE PATIENT ECG

This section describes limb lead monitoring and precordial lead monitoring. Monitoring with the LIFEPAK 11 defibrillator/pacemaker is described in Section 8. Topics in this section include:

Warnings

These warnings apply specifically to monitoring.

⚠ WARNINGS

Possible misinterpretation of ECG data on LCD screen.
The ECG data displayed on the LCD screen is intended only for basic ECG rhythm identification. When you perform diagnostic interpretation, use the ECG data obtained from the recorder in DIAG mode.

Possible misinterpretation of ECG data on recordings.
The lower resolution monitor frequency response mode does not provide the resolution required for you to perform diagnostic and ST segment interpretation of recorded ECG data. When attempting to visually detect subtle ECG characteristics such as ST segment abnormalities from recorded ECG data, use the recorder only in diagnostic frequency response mode (DIAG)

Connecting the Patient ECG Cable

The patient ECG cable is illustrated in Figure 3-1. To connect the cable for monitoring:

1. Insert the main cable connector into the green ELECTRICALLY ISOLATED ECG connector on the monitor.
2. Connect the limb lead attachment to the main cable (if the precordial lead attachment is not needed, cover the unused connector with the protective flap).
3. For precordial lead monitoring, connect the precordial lead attachment to the main cable. (Disconnect the precordial lead attachment when not in use.)

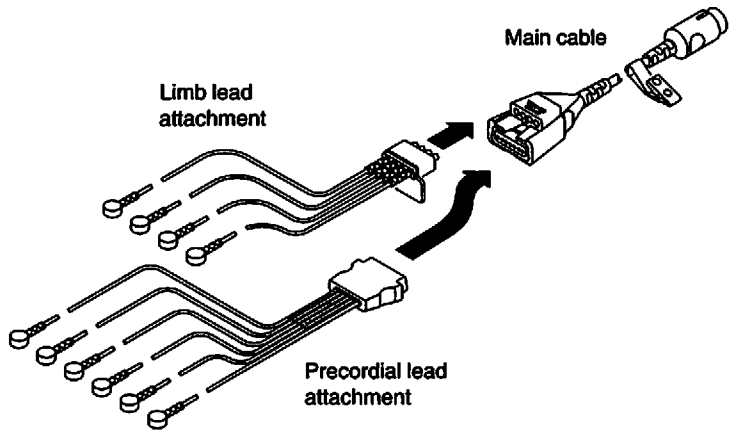


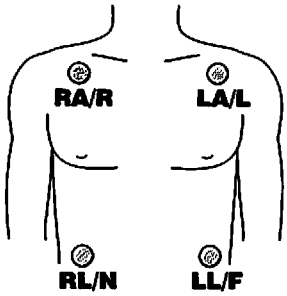
Figure 3-1 Patient ECG cable and attachments

ECG Monitoring Procedure

Limb Lead Monitoring

To perform limb lead ECG monitoring:

1 Turn the POWER switch to BATT and adjust CONTRAST as needed.
2 Make sure the main cable and limb lead attachment are connected as shown in Figure 3-1.
3 Identify the appropriate electrodes sites on the patient as shown in Figure 3-2.



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

Figure 3-2 Limb lead electrode placement

4 Prepare patient's skin for electrode application:
- Shave 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.
- Secure the cable with the cable clasp.

6 Press LEAD SELECT to select desired limb lead (leads I, II, III, aVR, aVL, and aVF are available).
7 Adjust ECG SIZE if necessary. Size is automatically set to gain of X1.0 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 ECG cable with the cable clasp.
9 To obtain a recorded ECG report, press RECORD to activate the recorder and store the report. Press RECORD again or press EXIT to stop the recorder. Refer to page 5-4 for a complete description of ECG recording.

Precordial Lead Monitoring

The precordial (chest) leads (V1 through V6 for AHA, or C1 through C6 for IEC) are available for monitoring when the precordial lead attachment is connected to the main cable. To perform precordial lead ECG monitoring:

1. Insert the precordial lead attachment into the main cable as shown in Figure 3-1.
2. Follow the steps listed for limb lead monitoring beginning on page 3-3. Place the precordial lead electrodes on the chest as shown in Figure 4-3.

Paddles Lead Monitoring

When using the LIFEPAK 11 monitor with a compatible defibrillator, patient ECG can be monitored in PADDLES lead using the QUIK-LOOK paddle feature or by applying QUIK-COMBO electrodes. Refer to Operating Instructions for the PADDLES lead monitoring procedures.

Color Coding for ECG Leads

The lead wires and the electrode snaps for the patient ECG cable are color-coded according to AHA or IEC standards as listed in Table 3-1.

Table 3-1 ECG leads color codes

Leads	AHA Label	AHA Color	IEC Label	IEC Color
Limb Leads	RA	White	R	Red
	LA	Black	L	Yellow
	RL	Green	N	Black
	LL	Red	F	Green
Precordial Leads	V1	Red	C1	Red
	V2	Yellow	C2	Yellow
	V3	Green	C3	Green
	V4	Blue	C4	Brown
	V5	Orange	C5	Black
	V6	Violet	C6	Violet

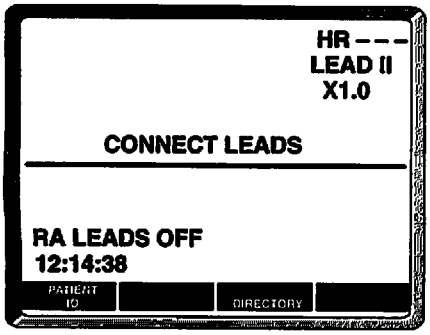
ECG Electrode Requirements

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. The disposable electrodes are intended for a single use; do not reuse disposable electrodes.

For best ECG monitoring results, use silver/silver chloride (Ag/AgCl) electrodes such as Physio-Control LIFE•PATCH® ECG electrodes. Post-defibrillation display of ECG on the screen is faster using silver/silver chloride electrodes than with other electrode types.

Leads Off Messages During Monitoring

If an ECG lead electrode disconnects during monitoring, the monitor emits an audible alarm and displays a leads off message. For example, if the RA lead electrode disconnects while monitoring in lead II, the monitor displays the CONNECT LEADS message and the flashing RA LEADS OFF message as shown below:



The monitor continues to flash the RA LEADS OFF message and periodically emit three beeps until you reconnect the RA lead electrode or turn POWER to OFF.

If two or three electrodes disconnect, the monitor displays the electrode names (such as LA RA LEADS OFF). If more than three electrodes disconnect, the message is ECG LEADS OFF.

The RL electrode does not have the ability to sense a (dis)connection. If the RL electrode disconnects during monitoring, a leads-off message does not appear. However, the quality of the ECG trace may be affected.

Monitoring Patients with Internal Pacemakers

The LIFEPAK 11 monitor typically does not use internal pacemaker pulses to calculate heart rate. However, when using the QUIK-COMBO electrodes or standard paddles to monitor in PADDLES lead, the monitor may detect internal pacemaker pulses as QRS complexes. This may result in an inaccurate heart rate display.

Large amplitude pacemaker spikes can overload the QRS complex detector circuitry so that no paced QRS complexes are counted. 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 in PADDLES lead. For greater visibility of internal pacemaker pulses, use agency or diagnostic mode frequency response.

Troubleshooting Tips for ECG Monitoring

If problems occur while monitoring, check the list of observations in Table 3-2 for aid in troubleshooting. For basic troubleshooting problems such as no power, refer to Troubleshooting on page 9-18.

Table 3-2 Troubleshooting tips for ECG monitoring

	Observation	Possible Cause	Corrective Action
1	Monitor screen display blank with POWER on.	CONTRAST needs adjustment.	• Adjust CONTRAST.
		Monitor battery low.	• Replace with fully-charged battery.
		Screen not functioning properly.	• Print ECG data on recorder as backup *and* contact service personnel for repair.
2	Any of these messages displayed: CONNECT LEADS CONNECT ECG LEADS ECG LEADS OFF xx LEADS OFF	One or more ECG electrodes disconnected.	• Confirm ECG electrode connections.
		ECG cable is not connected to monitor.	• Confirm cable connections.
		Poor electrode-to-patient adhesion.	• Reposition cable and/or lead wires to prevent electrodes from pulling away from patient. • Prepare skin per page 3-3 and replace electrode(s).
		Broken lead wire.	• Press LEAD SELECT to monitor another lead. • Select PADDLES lead and use standard paddles or QUIK-COMBO electrodes for ECG monitoring. • Check cable continuity.
3	Poor ECG signal quality.	Poor electrode-skin contact.	• Reposition cable and/or lead wires to prevent electrodes from pulling away from patient. • Prepare skin per page 3-3 and replace electrode(s).
		Outdated, corroded, or dried-out electrodes.	• Check date codes on electrode packages. • Use only unexpired silver/silver chloride electrodes. Leave electrodes in sealed pouch until time of use.
		Loose connection.	• Check/reconnect cable connections.
		Damaged cable or connector/leadwire.	• Inspect main cable and attachments. Replace if damaged. • Test cable with simulator and replace if malfunction observed.
		Noise because of radio frequency interference (RFI).	• Check for equipment causing RFI (such as a radio transmitter) and relocate or turn off equipment power.

Table 3-2 Troubleshooting tips for ECG monitoring, continued

Observation		Possible Cause	Corrective Action
4	Baseline wander (low frequency/high amplitude artifact).	Inadequate skin preparation.	• Prepare skin as described on page 3-3 and reapply electrodes.
		Poor RL electrode-skin contact.	• Check RL and other electrodes for proper adhesion.
5	Fine baseline artifact (high frequency/low amplitude artifact).	Inadequate skin preparation.	• Prepare skin as described on page 3-3 and reapply electrodes.
		Isometric muscle tension in arms/legs.	• Confirm that limbs are resting on a supportive surface.
		RL electrode disconnect.	• Check RL and other electrodes for proper adhesion.
6	Systole beeps not heard.	Volume too low.	• Press VOL up until systole beeps can be heard.
7	Systole beeps do not occur with each QRS complex.	QRS amplitude too small to detect.	• Adjust ECG SIZE until beeps occur with each QRS complex.
8	Monitor displays flatline ECG trace with no CONNECT LEADS message.	PADDLES lead displayed but patient connected through ECG cable.	• Press LEAD SELECT to display one of the limb or precordial leads.
9	Heart rate (HR) display different than pulse rate.	ECG size set too high or too low.	• Adjust ECG size up or down.
		Monitor detecting the patient's internal pacemaker pulses.	• Change monitor lead or reduce ECG size.

ACQUIRING A 12-LEAD ECG

This section describes how to acquire a 12-Lead ECG, including:

12-Lead ECG Procedure

To acquire a 12-Lead ECG:

1 Turn the POWER switch to BATT and adjust CONTRAST as needed.

2 Insert the limb lead and the precordial lead attachments into the main cable as shown in Figure 4-1.

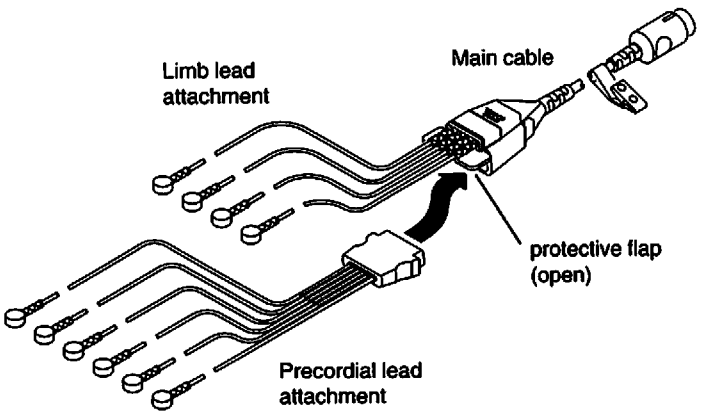


Figure 4-1 12-Lead ECG attachments for patient ECG cable

3 Insert the main cable connector into the green ELECTRICALLY ISOLATED ECG connector on the monitor.

4 Identify the appropriate electrodes sites on the patient as described on page 4-3.

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

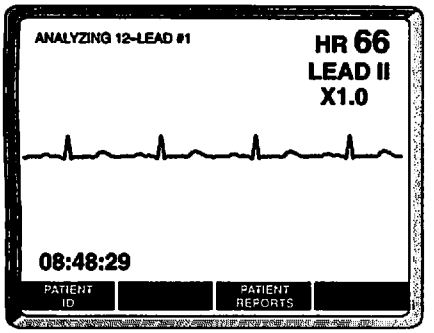
⚠ WARNING **Possible inability to obtain diagnostic-quality 12-Lead ECG reports**

Do not use previously unpackaged electrodes or electrodes with expired date codes. Such electrodes may impair signal quality. Use only electrodes removed from a sealed package immediately before use and follow the procedure for electrode application.

6 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 10 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.
- Secure the cable with the cable clasp.

7 Encourage the patient to remain as still as possible, and provide support as needed.

8 Press 12 LEAD once to acquire and print the 12-Lead ECG report. Observe the status messages in the upper left corner of the monitor screen:



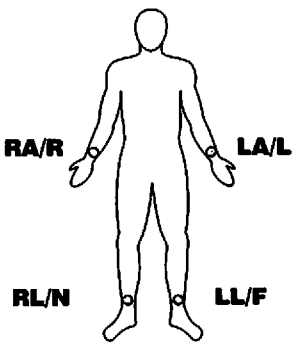
9 If the monitor detects signal noise (such as patient motion or a disconnected electrode), the 12-lead acquisition is interrupted until noise is removed. Take appropriate action as required (such as reconnecting leads). Troubleshooting tips are provided on page 4-12.

Press EXIT to stop the 12-lead ECG acquisition.

Identifying 12-Lead Electrode Sites

Limb Lead Electrode Sites

When acquiring a 12-Lead ECG report, limb lead electrodes are typically placed on the wrists and ankles as shown in Figure 4-2. The limb lead electrodes can be placed anywhere along the limbs. However, do not place the limb lead electrodes on the torso when acquiring a 12-Lead ECG report.



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

Figure 4-2 Limb lead electrode placement for 12-lead ECG

Precordial Lead Electrode Sites

The six precordial (chest) leads are placed on specific locations as shown in Figure 4-3 and summarized in Table 4-1. Proper placement is important for accurate diagnosis and should be identified as follows (leads are V1 through V6 for AHA, or C1 through C6 for IEC; refer to Table 3-1 on page 3-4 for color codes):

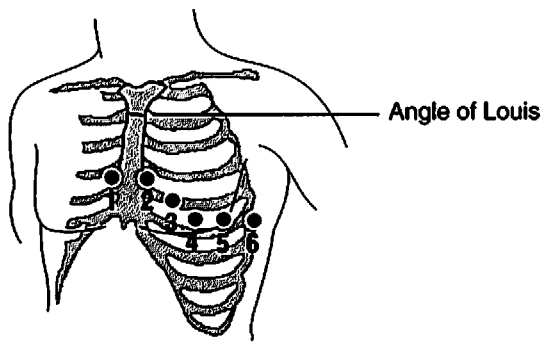


Figure 4-3 Precordial lead electrode placement

Table 4-1 Precordial lead electrode placement

Lead		Location
V1	C1	Fourth intercostal space to the right of the sternum.
V2	C2	Fourth intercostal space to the left of the sternum.
V3	C3	Directly between leads V2 and V4.
V4	C4	Fifth intercostal space at midclavicular line.
V5	C5	Level with V4 at left anterior axillary line.
V6	C6	Level with V5 at left midaxillary line (directly under the midpoint of the armpit).

Locating the V1 position (fourth intercostal space) is critically important because it is the reference point for locating the placement of the remaining V leads. To locate the V1 position:

1. Place your finger at the notch in the top of the sternum.
2. Move your finger slowly downward about 1.5 inches (3.8 centimeters) until you feel a slight horizontal ridge or elevation. This is the "angle of Louis" where the manubrium joins the body of the sternum.
3. Locate the second intercostal space on the right side, lateral to and just below the angle of Louis.
4. Move your finger down two more intercostal spaces to the fourth intercostal space which is the V1 position.

Other important considerations:

- When placing electrodes on female patients, always place leads V3-V6 *under* the breast rather than *on* the breast.
- Never use the nipples as reference points for locating the electrodes for men or women patients because nipple locations may vary widely.

Screen Messages During 12-Lead ECG

The typical sequence of screen messages that are displayed after you press 12 LEAD is:

ACQUIRING 12-LEAD #x
ANALYZING 12-LEAD #x
STORING 12-LEAD #x
PRINTING 12-LEAD #x

Each message is displayed in sequence for a few seconds while the monitor performs the associated activity ("x" is the number of the report).

Data Acquisition Mode

The monitor acquires 10 seconds of ECG data for each 12-lead ECG requested. The monitor can be configured to analyze the 10 seconds of data *before* you press 12 LEAD (the PRE option) or 10 seconds of data *after* you press 12 LEAD (the POST option).

If you configure the monitor for the PRE option, the message ACQUIRING 12-LEAD #x does not appear because the data is already acquired when you press 12 LEAD. For information about configuring this mode, refer to page 10–6.

ECG Override

To acquire a 12-lead ECG, the monitor must collect 10 seconds of undistorted data. If the monitor detects signal noise while acquiring data (such as patient motion or a disconnected electrode), the monitor displays the message WAITING FOR GOOD DATA. The monitor displays this message as long as signal noise is detected. When signal noise is eliminated, the monitor removes the message and resumes acquiring data.

While the monitor displays the message WAITING FOR GOOD DATA, you can choose to press 12 LEAD again and force the monitor to acquire the 12-Lead ECG report regardless of detected signal noise or disconnected leads. Any 12-Lead ECG reports acquired in this way are annotated with the following message:

ECG OVERRIDE: DATA QUALITY PROHIBITS INTERPRETATION

No interpretation or justification information is printed on this type of 12-Lead ECG report.

Description of Printed 12-Lead ECG Report

The monitor can be configured to print the 12-Lead ECG report in a 3-channel or a 4-channel format.

To protect recorder printouts after printing:
- Avoid extended exposure to direct sunlight
- Do not store in plastic folders (use paper only)
- Do not apply tape or adhesives to the printed side.

The 3-Channel Format

Figure 4-4 presents an example of a 12-Lead ECG report printed in the 3-channel format that includes 2.5 seconds of data from each of the 12 leads. The sequence of leads for the 3-channel format is always printed in the order shown. 12-Lead ECG reports are always acquired and printed in diagnostic frequency response. The 12-Lead ECG reports can be reprinted in monitor frequency response if desired.

The computerized ECG analysis statements shown in the upper right corner of Figure 4-4 are described on page 4-8.

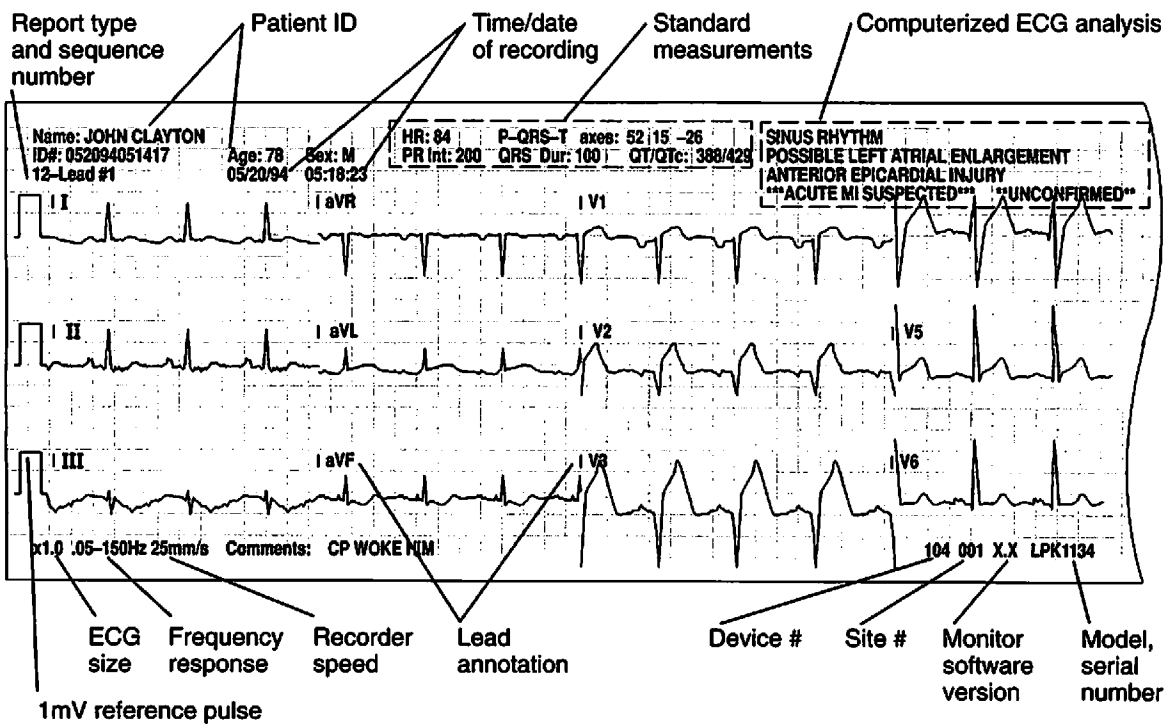


Figure 4-4 Example of printed 3-channel 12-Lead ECG report

As shown in Figure 4-5, the monitor acquires and analyzes 10 seconds of data for all 12 leads, then prints 2.5-second portions for each lead.

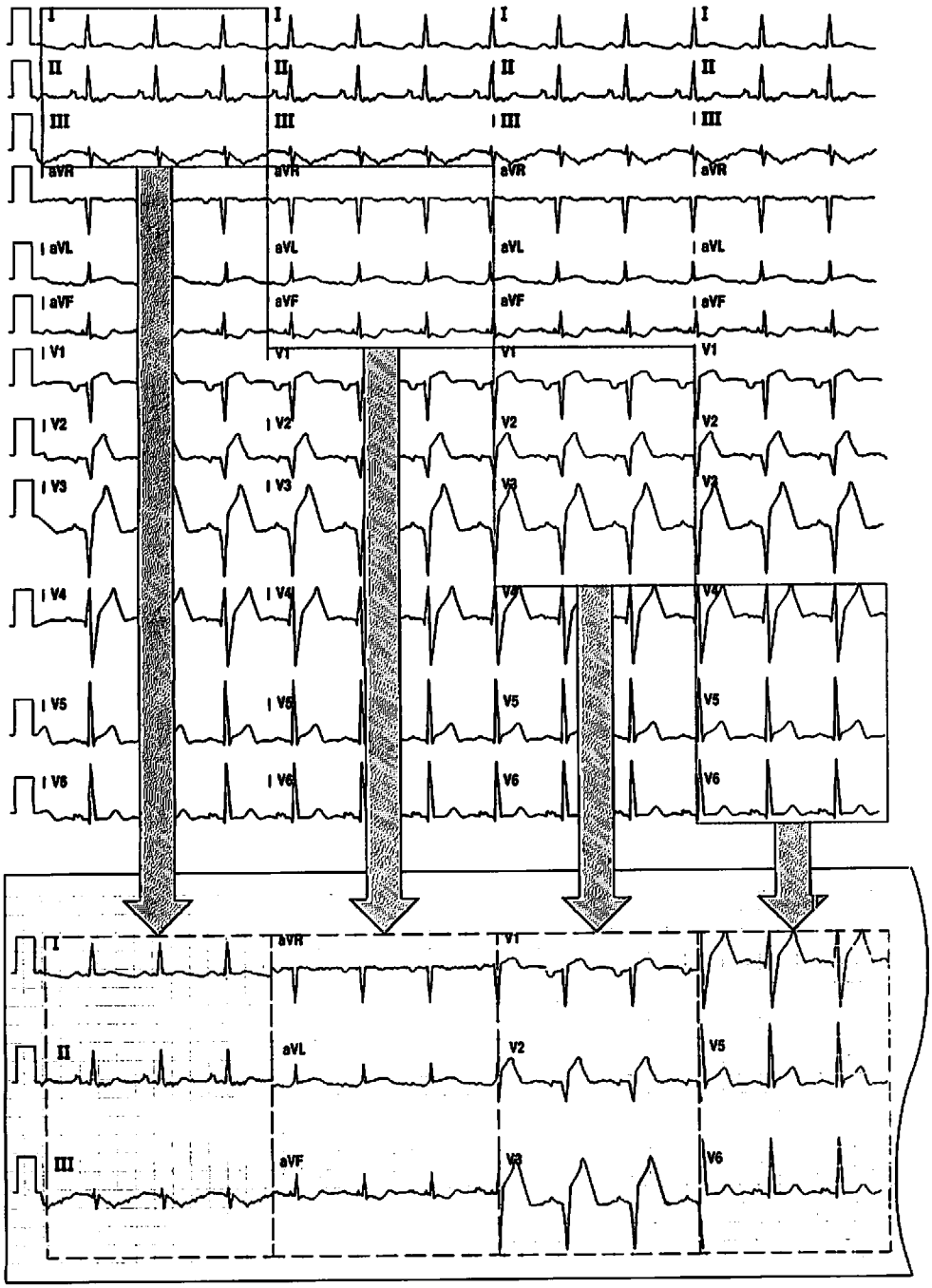


Figure 4-5 12-Lead ECG data portions printed in 3-channel format

The 4-Channel Format

Figure 4-6 presents an example of a 12-lead ECG report printed in the 4-channel format. The 4-channel format consists of the median complex (or "median beat") derived for each of the 12 leads and 10 seconds of data for Lead II. For a description of how the monitor derives the median beat, refer to page 4-10.

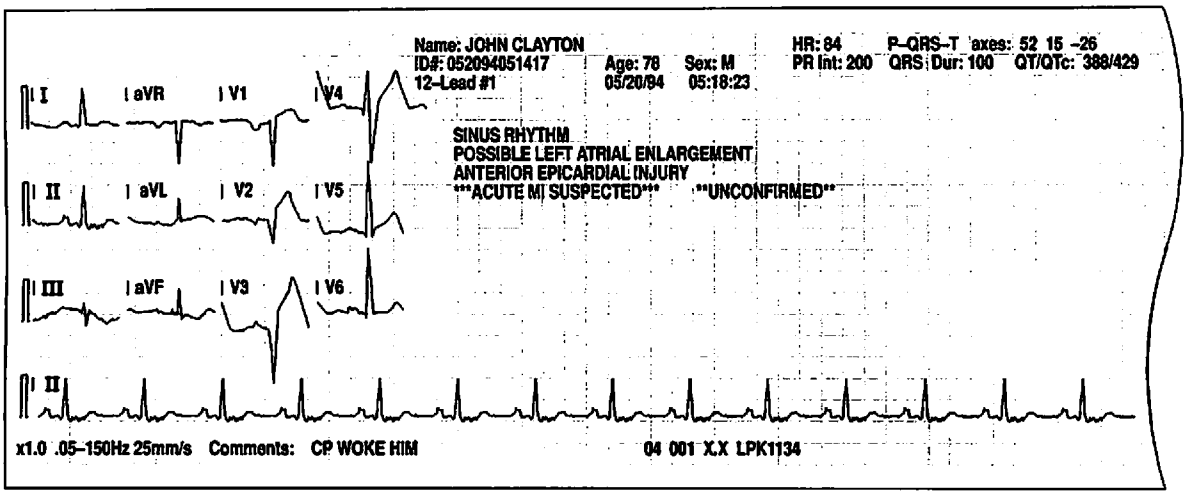


Figure 4-6 Example of printed 4-channel 12-Lead ECG report

If the printer speed is set to 50mm/s for report reprints in the 4-channel format, the median beats are printed at 50mm/s, but the Lead II data is printed at the bottom at 25mm/s.

Computerized ECG Analysis

Computerized ECG analysis statements are available for printing on LIFEPAK 11 monitor 12-Lead ECG reports. The following pages present a brief description. For more information, refer to the *Physician's Guide to Computerized ECG Analysis.*

There are three possible types of information:

- Interpretation statements
- Justification statements (printed in brackets)
- The ***ACUTE MI SUSPECTED*** message.

Figure 4-7 shows a sample portion of a 12-Lead ECG report with all three types of information.

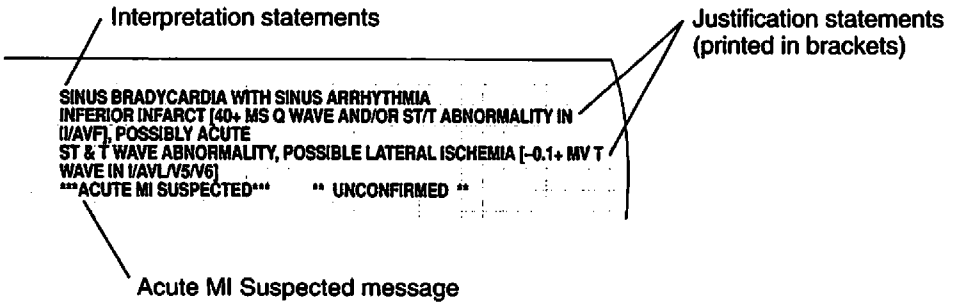


Figure 4-7 Computerized ECG analysis statements

The monitor is configured to allow printing of interpretation statements and the ACUTE MI message, and to inhibit printing of justification statements. To reconfigure printing options, refer to page 10-6.

Patient Treatment and Computerized ECG Analysis

Computerized ECG analysis should not be used to withhold or prescribe patient treatment without review by qualified medical personnel. All 12-Lead ECG interpretation statements provided by the LIFEPAK 11 monitor include the printed message **UNCONFIRMED**.

Interpretation Statements

The interpretation statements are classified in accordance with the Tenth Bethesda Conference on Optimal ECG. There are three categories of statements as shown in Table 4-2.

Table 4-2 Categories of 12-lead ECG interpretation statements

Category	Description	Examples
A	Diagnosis of an anatomic lesion or pathophysiologic state	• ANTERIOR INFARCT • RIGHT VENTRICULAR HYPERTROPHY
B	Diagnosis of electrophysiologic changes*	• ATRIAL FIBRILLATION • RIGHT BUNDLE BRANCH BLOCK
C	Descriptive ECG features	• NONSPECIFIC T WAVE ABNORMALITIES • LONG QT INTERVAL

* Ventricular Tachycardia and Ventricular Fibrillation are not among the diagnostic statements available by computerized ECG analysis.

Justification Statements

The justification statements explain the basis for the interpretation statements. The justification statements indicate the criteria met by the patient ECG data during computerized analysis.

Table 4-3 provides two examples of interpretation statements and corresponding justification statements. For a complete listing and explanation of interpretation and justification statements, refer to the *Physician's Guide to Computerized ECG Analysis.*

Table 4-3 ECG criteria for justification and interpretation statements

Interpretation Statement	Justification Statement
ANTERIOR INFARCT	[40+ MS Q WAVE AND/OR ST/T ABNORMALITY IN V3/V4]
T WAVE ABNORMALITY, CONSISTENT WITH INFERIOR ISCHEMIA	[-0.5+ MV T WAVE IN II/AVF]

The ***Acute MI Suspected*** Message

The LIFEPAK 11 monitor prints the message ***ACUTE MI SUSPECTED*** when patient data meet certain ECG criteria associated with Acute Myocardial Infarction (AMI). Conventional 12-lead interpretive algorithms depend primarily on the presence of pathologic Q waves to detect AMI. However, other electrophysiologic changes such as localized ST-segment elevation and T-wave abnormality often appear in the early evolution of AMI before pathologic Q waves are present. Unless conventional algorithms are modified to include these other changes often present in the acute phase, AMI is not detected in its very early stages.

The computerized ECG analysis for the LIFEPAK 11 monitor includes ST-segment elevation and T-wave abnormalities among the decision criteria for AMI. This expanded ECG criteria increases the capability for early AMI detection for the LIFEPAK 11 monitor.

Deriving the Median Beat

The interpretation statements pertaining to myocardial injury, infarct, and ischemia are derived from measurements made on a signal-averaged beat (median beat) formed for each of the 12 leads. The computerized ECG analysis selects three representative beats from the ten seconds of data for each lead and averages the three beats to derive the median beat for that lead.

Figure 4-8 illustrates this signal-averaging as applied to lead V3. The median beats used for analysis are printed in the 4-channel format of the 12-Lead ECG report. In the example in Figure 4-8, the monitor detects ST-segment elevation which meets the criteria for printing the message ***ACUTE MI SUSPECTED*** in the interpretation statements.

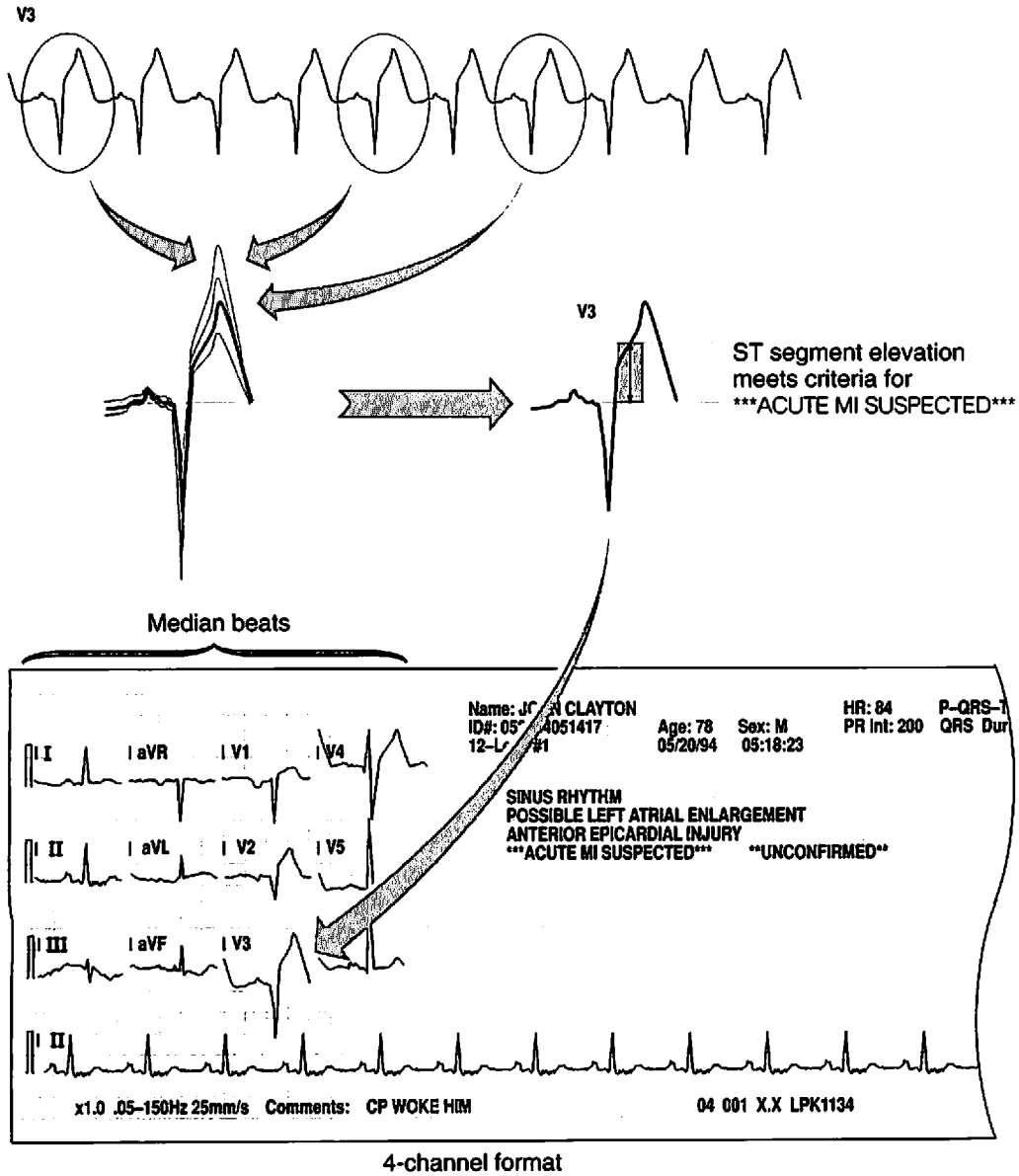


Figure 4-8 Deriving the median beat

Troubleshooting Tips for Acquiring a 12-Lead ECG

If problems occur while acquiring a 12-Lead ECG report, check the list of observations in Table 4-4. For basic troubleshooting problems such as no power, refer to Troubleshooting on page 9-15.

Table 4-4 Troubleshooting tips for 12-Lead ECG

Observation	Possible Cause	Corrective Action
1 Any of these messages displayed: CONNECT LEADS CONNECT ECG LEADS ECG LEADS OFF xx LEADS OFF	One or more ECG electrodes disconnected.	• Confirm ECG electrode connections.
	ECG cable is not connected to monitor.	• Confirm cable connections.
	Poor electrode-to-patient adhesion.	• Reposition cable and/or lead wires to prevent electrodes from pulling away from patient. • Prepare skin per page 4-2 and replace electrode(s).
	Broken lead wire.	• Check cable continuity.
2 Noisy signal and/or message displayed: WAITING FOR GOOD DATA. WAITING FOR GOOD DATA may be caused by noise in a lead(s) other than the displayed lead. To investigate, press 12 LEAD again to override the message. Examine the printout to determine which lead(s) is affected by noise. Replace or reposition the affected electrode(s) and lead wire(s).	Poor electrode–skin contact.	• Reposition cable and/or lead wires to prevent electrodes from pulling away from patient. • Prepare skin per page 4-2 and replace electrode(s) if necessary.
	Loose connection.	• Check/reconnect cable connections.
	Patient motion.	• Encourage patient to lie quietly.
	Vehicle motion.	• Stop vehicle while acquiring 12-lead ECG data (may resume transport when STORING 12-LEAD #x message appears).
	Outdated, corroded, or dried-out electrodes.	• Check date codes on electrode packages. • Use only unexpired silver/silver chloride electrodes; leave electrodes in sealed pouch until time of use.
	Radio Frequency Interference (RFI).	• Check for equipment causing RFI (such as a radio transmitter) and relocate or turn off equipment power.
	Damaged cable or connector.	• Inspect main cable and attachments. Press LEAD SELECT to display each available lead and check for presence of ECG signal in each lead. Replace cable if damage or malfunction discovered.
3 Recorder paper jams, slips, misfeeds, or print quality is poor.	Recorder malfunction.	• Reprint the report from the directory. • Refer to Troubleshooting Tips for Recording, page 5-9.
4 Monitor does not complete 12-lead ECG operation sequence.	Operator pressed another function button (such as RECORD) before 12-lead ECG sequence completed.	• Press 12 LEAD to acquire another 12-lead ECG. Allow enough time for sequence to complete.

Table 4-4 Troubleshooting tips for 12-Lead ECG, continued

Observation	Possible Cause	Corrective Action
5 Baseline wander (low frequency/high amplitude artifact).	Inadequate skin preparation.	• Prepare skin as described on page 4-2 and reapply electrodes.
	Poor RL electrode-skin contact.	• Check RL and other electrodes for proper adhesion.
6 Fine baseline artifact (high frequency/low amplitude artifact).	Inadequate skin preparation.	• Prepare skin as described on page 4-2 and reapply electrodes.
	Isometric muscle tension in arms/legs.	• Confirm that limbs are resting on a supportive surface.
	RL electrode disconnect.	• Check RL and other electrodes for proper adhesion.

CREATING PATIENT REPORTS

This section describes how to create patient reports. Topics include:

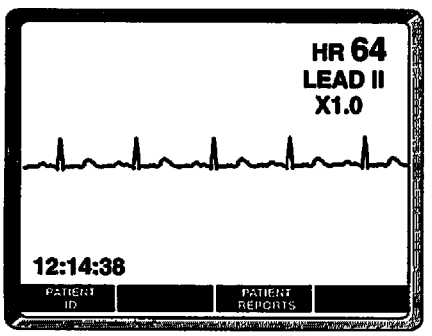
Patient Report Types

The LIFEPAK 11 monitor generates five types of patient reports:

CODE SUMMARY™	This is a summary report that the monitor software creates for each patient. This summary may include some or all of the following: • Patient Identification Data • Event Log • Recorded ECG Report • 12–Lead ECG Report • Defibrillation Report • Pacing Event Report An example of the Code Summary report is shown in detail in Figure 5-4.
Recorded ECG	This report is a recording of the displayed ECG and of data collected by two other leads during monitoring. Refer to Figure 5-1 on page 5-4.
12–LEAD ECG	This diagnostic report is described in Section 4, "Acquiring a 12-lead ECG." Refer to Figure 4-4.
Defibrillation	This ECG report is annotated with the JOULES SELECTED measurement and SYNC ON if synchronized cardioversion is selected. It is automatically generated and stored when energy is discharged. Refer to Figure 8-3.
Pacing Event	This ECG report is annotated with the pace rate, pace current, and pace mode. It is automatically generated and stored at the onset of pacing and when pacing is set, changed, or stopped. Refer to Figure 8-4.

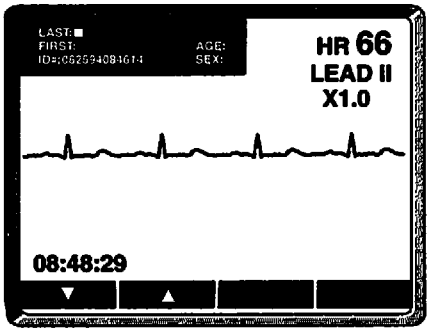
Entering the Patient ID

When you connect the ECG electrodes to the patient after applying power to the monitor, the monitor displays the Home screen. The Home screen is the background screen that is displayed during ECG monitoring:



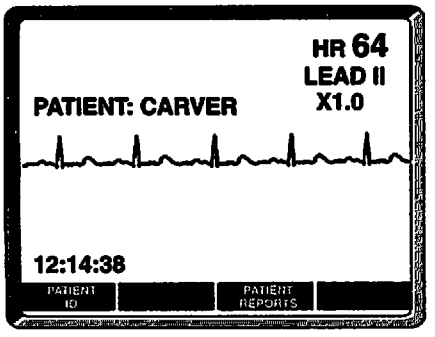
When the Home screen first appears at power-on, no patient name or identification (ID) number is displayed. To enter patient data:

1 Press the PATIENT ID softkey. The Patient ID screen is displayed with the Patient ID field in the upper left corner:



2 Use the alphanumeric keypad to enter the name, ID, age, and sex. Press the ENT key or the ▽ or △ softkeys to move through the fields. After advancing past the SEX: field, the COMMENTS: field is displayed:

3 After entering patient data, press EXIT to return to the Home screen. The Home screen now includes the last name of the patient (CARVER in this example):



The monitor assigns each new patient a unique ID composed of the date and time power is applied, such as ID#:062594084614 on the *next* page. You can change this ID on the Patient ID screen if you desire; however, it may be helpful to leave the original ID unchanged for ease in tracking patients.

You can configure the monitor to display the ID (such as PATIENT: 062594084614) rather than the last name. Refer to the PRIMARY FILE IDENTIFIER in the Startup Defaults, page 10-7.

You can configure the monitor to disable the Patient ID screen and prevent editing of the ID. In this case, the PATIENT ID softkey and patient name are not displayed on the Home screen. Each patient is identified only by the unique ID assigned by the monitor. Refer to PATIENT ID SCREEN AVAILABLE? in the Device Features, page 10-6.

Activating the Recorder

To initiate a recorded ECG report:

1 Press RECORD. This activates the recorder and causes the monitor to store a recorded ECG report in memory.

2 To stop the recorder, press RECORD again or press EXIT.

Recorded ECG Report

The recorded ECG report is shown and described in Figure 5-1. The printed report includes ECG data and patient data from the Patient ID field.

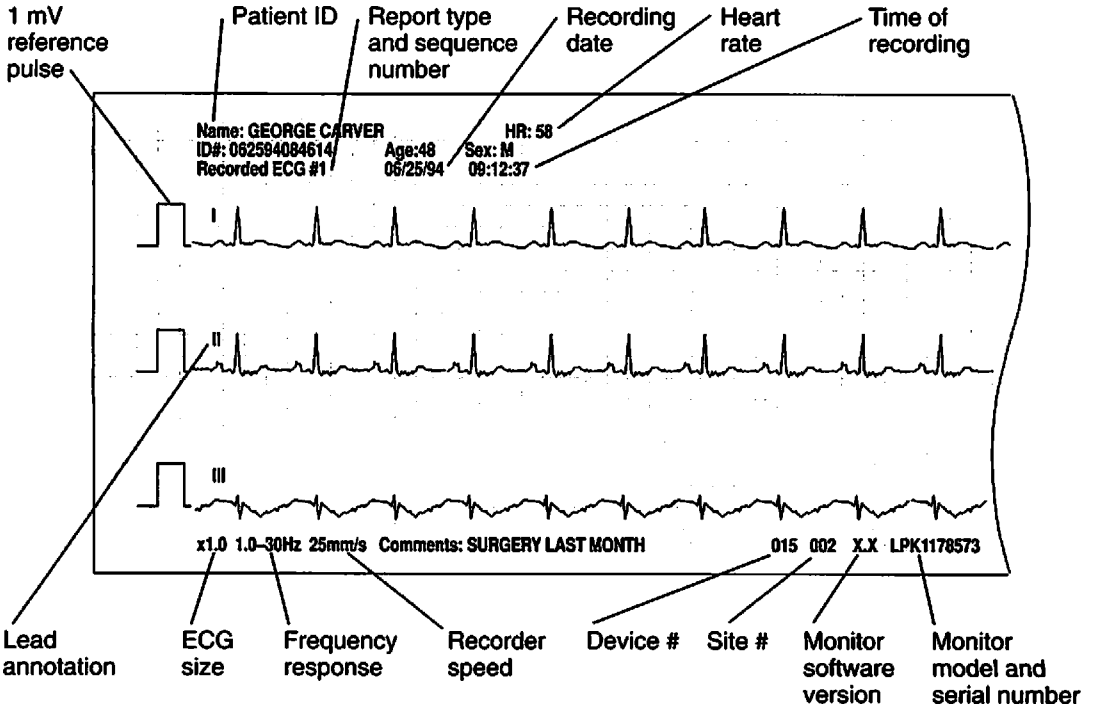


Figure 5-1 Recorded ECG report example

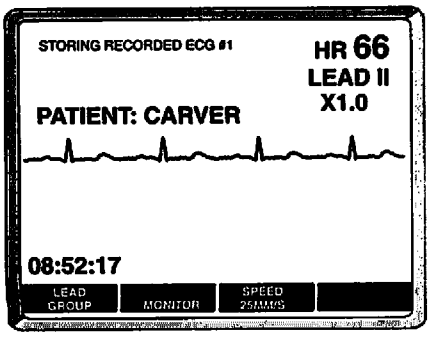
The recorded ECG report stored in memory consists of eight seconds of data: three seconds before you press RECORD, and five seconds after.

To protect recorder printouts after printing:

- Avoid extended exposure to direct sunlight.
- Do not store in plastic folders (use paper only).
- Do not apply tape or adhesives over tracings or annotations.

Recording Screen

While storing the recorded ECG report in memory, the monitor displays the Recording screen with the message STORING RECORDED ECG #x in the upper left corner (x is the report sequence number):



After storing the report, the monitor displays the recorder status message RECORDING. The recorder continues to print until you press RECORD or EXIT.

The three softkeys on the Recording screen allow you to change the current printing format (they do not change the content or format of the recorded ECG report stored in memory):

LEAD GROUP	Selects which group of three leads is printed as described in the next paragraph.
MONITOR	Selects frequency response for the printed strip. Pressing softkey changes to MONITOR (1.0–30Hz) or DIAG (diagnostic, 0.05–150Hz).
SPEED 25MM/S	Changes recorder speed (5, 10, 25, or 50mm/s).

If recording in *PADDLES* lead, the printed frequency response is always 2.2–30Hz and the MONITOR softkey is not displayed.

Lead Group

Each of the twelve possible leads is associated with two other leads in a "lead group." There are six possible lead groups:

- Default lead group (you can define)
- *PADDLES* (only the paddles lead is printed if selected)
- I, II, III
- aVR, aVL, aVF
- V1, V2, V3
- V4, V5, V6

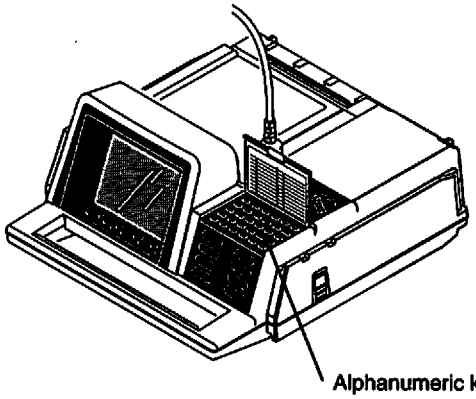
When the recorded ECG report is stored in memory and printed, ECG data is stored and printed for the displayed lead and the other two leads in the associated lead group. For example, Lead II is displayed in the screens on page 5-2. After you press RECORD, the recorder prints the data as shown in Figure 5-1 which includes rhythms for Leads I, II, and III. This is the lead group associated with Lead II.

Although five of the lead groups are predefined (such as Leads I, II, III above), you can configure any three of the 12 leads to be the default lead group. The default lead group is always printed if the lead displayed at the time you press RECORD is included in the default lead group. Refer to Default Printer Lead Group on page 10-10 for more information.

Marking Events with Event Keys

During patient care you may use the alphanumeric keys as "event keys" to mark important events into the CODE SUMMARY report. Typical events may be the administration of drugs or other therapies. The event keys are predefined through the Event Key Definitions option described on page 10-10.

For example, Figure 5-2 shows a monitor with 10 event keys defined. The operator has written the event key definitions onto the erasable label under the keypad cover for quick reference.



EVENT KEY DEFINITIONS

KEY	EVENT	KEY	EVENT
A	Atropine	B	Bretylium
C	CPR	E	Epinephrine
I	Intubate	L	Lidocaine
O	Oxygen	P	Procainamide
V	Verapamil	X	Event Mark

Figure 5-2 Event key definitions

Marking the Event

To mark an event:

1. Lift up the keypad cover to access the keypad.
2. Confirm the monitor is displaying the Home screen (or press EXIT to return to the Home screen).
3. Press the desired event key. The monitor displays the Event Key screen as shown in Figure 5-3.
4. Press ENT to mark or store the event into the patient's CODE SUMMARY report. The Home screen reappears.

For example, an operator using the monitor shown in Figure 5-2 can press the event key O for oxygen after administering oxygen. The monitor displays the Event Key screen as shown in Figure 5-3. The operator presses ENT to store the event in the patient's CODE SUMMARY report. When the CODE SUMMARY report is printed, the oxygen and time administered are listed as one of the events.

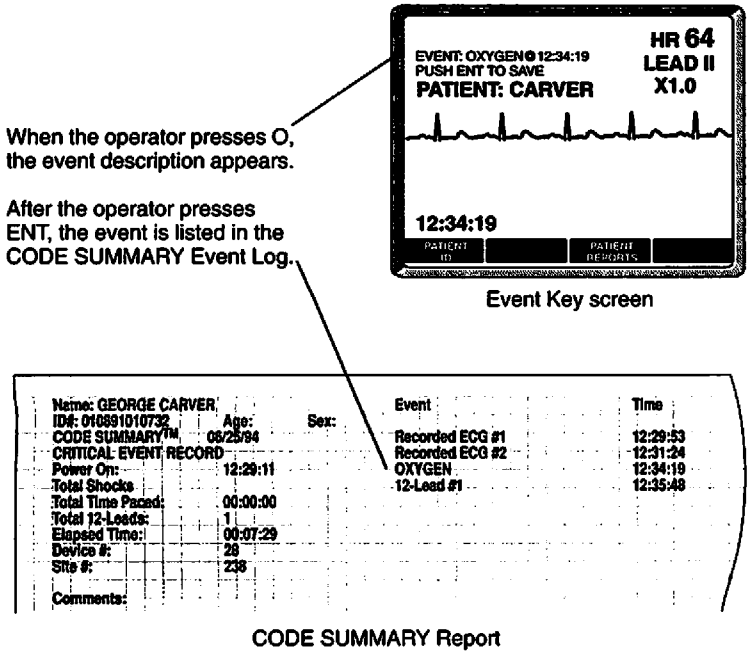


Figure 5-3 Event Key screen and CODE SUMMARY report

After you press the event key, the monitor displays the Event Key screen until you press ENT to store the event or cancel the event by pressing another key or button. If you do not press ENT, the event is not stored. After an event is stored, it cannot be removed from the CODE SUMMARY report.

Other Operations and Event Keys

Event keys cannot be used while another operation is underway such as operating the recorder, acquiring a 12-Lead ECG report, or transmitting. If another operation is underway, pressing an event key has no effect.

Printing the CODE SUMMARY Report

The LIFEPAK 11 monitor automatically compiles a CODE SUMMARY report for each patient consisting of a Code Abstract and patient reports (recorded ECG reports and 12-Lead ECG reports). The Code Abstract includes patient identification and instrument data and the Event Log as shown in Figure 5-4. The Event Log lists in chronological order all patient reports, operator-initiated event key annotations, and other events such as completed transmissions.

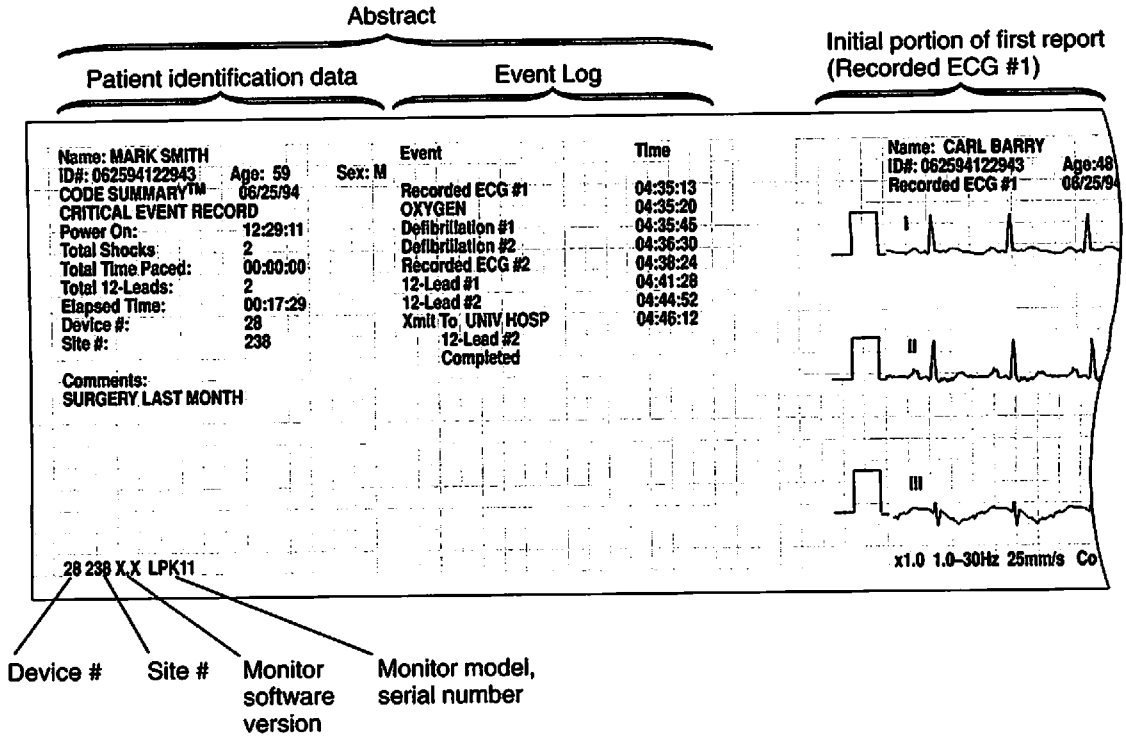


Figure 5-4 Example of CODE SUMMARY report

To print a CODE SUMMARY report for the current patient:

1 Press CODE SUMMARY. The recorder begins printing the report and automatically stops when the report is complete.

2 To interrupt printing, press CODE SUMMARY again or press EXIT. If you press CODE SUMMARY again, the CODE SUMMARY report starts printing from the beginning.

The CODE SUMMARY report printing also stops if you press RECORD, 12 LEAD, or TRANSMIT, or if the recorder runs out of paper.

When the LIFEPAK 11 monitor is connected to the LIFEPAK 11 defibrillator/pacemaker, the monitor stores Total Shocks, Total Time Paced, and accompanying ECG reports in the CODE SUMMARY report.

When the LIFEPAK 11 monitor is connected to the LIFEPAK 5 or 250 defibrillator, the monitor cannot receive or store any pre- or post-shock data from the defibrillator. Therefore, shock data is not recorded in the CODE SUMMARY report. To document defibrillation or synchronized cardioversion events when using either of these defibrillators, make sure the recorder is operating during the defibrillation procedure. The date, time, and discharge offset is printed on the recorder paper.

CODE SUMMARY Report Formats

You can configure the monitor to print the CODE SUMMARY in one of the following formats:

Long format includes:	Code Abstract Defibrillation reports Pacing Event reports Recorded ECG reports 12-Lead ECG reports
Medium format includes:	Code Abstract Defibrillation reports Pacing Event reports Recorded ECG reports
Short format includes:	Code Abstract

Even if the CODE SUMMARY report is configured to print in the medium or short format, the monitor still stores all reports in memory. The configured format determines only which reports are printed when the CODE SUMMARY button is pressed. To configure the CODE SUMMARY report format, refer to page 10–6.

Memory Capacity and Report Storage

Patient reports are retained in memory when POWER is turned to OFF or the battery is removed. The number of patient reports that can be stored depends on various factors including the complexity of the ECG waveforms in the reports. Ordinarily, the monitor memory is able to store at least 33 recorded ECG reports or 50 12-Lead ECG reports. When the monitor reaches the limits of memory capacity, it begins deleting stored patient reports on a "first in, first out" priority to accommodate new reports. Deleted reports cannot be retrieved.

Troubleshooting Tips for Recording

If problems occur while operating the recorder, check the list of observations in Table 5-1. For basic troubleshooting problems such as no power, refer to Troubleshooting on page 9-15.

Table 5-1 Troubleshooting tips while operating the recorder

Observation	Possible Cause	Corrective Action
1 CHECK PAPER message:	Recorder is out of paper or paper is jammed.	• Check paper supply and paper roll position.
	Wrong type paper (non-Physio-Control).	• Replace paper with new roll of Physio-Control 100mm recorder paper.
2 RECORDER DOOR OPEN message:	Recorder door not latched.	• Latch recorder door by pushing down on PUSH labels marked on top of door.
3 Paper jams, slips, or feeds unevenly.	Dust or debris in recorder.	• Open door and clean recorder as described on page 9-3.
	Wrong type paper (non-Physio-Control).	• Replace paper with new roll of Physio-Control 100mm recorder paper.
4 Printing is too light or too dark.	Wrong type paper (non-Physio-Control).	• Replace paper with new roll of Physio-Control 100mm recorder paper.
5 Message printed on report ***WARNING: DATA ERROR DETECTED, INVALID REPORT***:	Monitor detects data error in report.	• Acquire another report if possible (current report is invalid and cannot be transmitted).

RETRIEVING PATIENT REPORTS

This section describes how to select, print, or delete reports for the "current patient" or for any patient through the patient directory. Topics include:

Defining Current Patient and Previous Patients

To retrieve patient reports and use the patient directory, it is important to understand the difference between the current patient and previous patients:

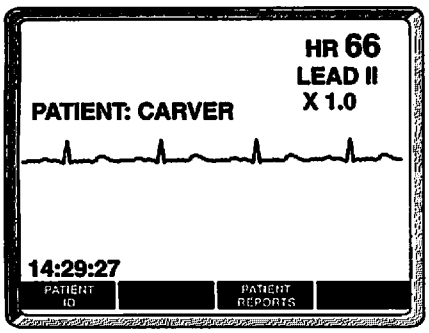
- **Current patient** is the patient currently connected to the monitor.
- **Previous patients** are patients who were previously connected to the monitor and have reports stored in monitor memory in the patient directory.

Current Patient Reports

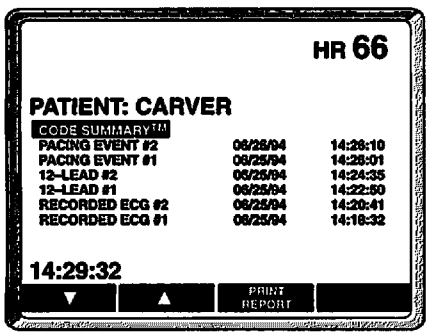
These procedures explain how to print or delete current patient reports.

Printing a Current Patient Report

To print a report for the current patient, begin at the Home screen:

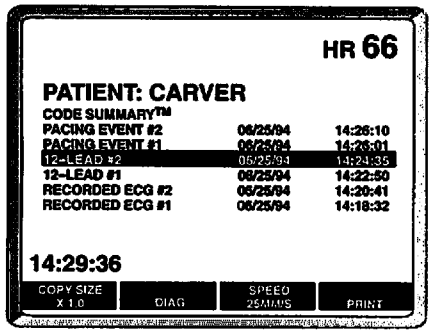


1 Press the PATIENT REPORTS softkey to access the Patient Reports screen. The current patient's reports are listed in chronological order with the most recent report listed at the top:



2 Press the ▽ or △ softkeys to highlight the desired report.

3 Press the PRINT REPORT softkey to display the Print Report screen (displayed only for non-CODE SUMMARY reports):



4 If desired, press softkeys:
- COPY SIZE changes copy size to X0.25, 0.5, 1.0, 2.0, or 4.0 (default is same as when report was stored).
- MONITOR changes frequency response to DIAG (diagnostic) or MONITOR (default is same as when report was stored).
- SPEED changes print speed to 25 or 50mm/S.

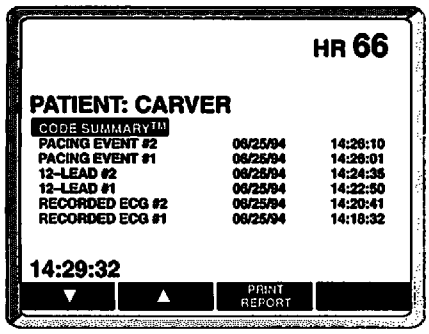
5 Press PRINT softkey to print report.

6 Press EXIT to return to the Home screen.

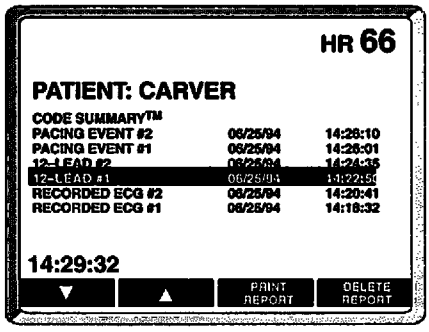
Deleting a Current Patient Report

You can delete any report for the current patient except the CODE SUMMARY report.
To delete a current patient report:

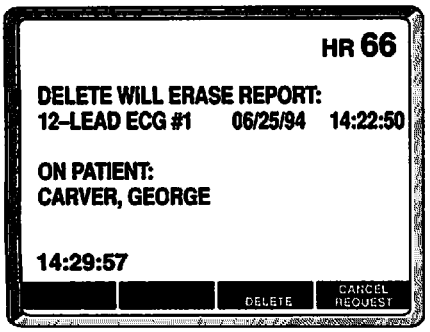
1 At the Home screen, press the PATIENT REPORTS softkey to access the Patient Reports screen:



2 Press the ▽ or △ softkeys to highlight the desired report:



3 Press the DELETE REPORT softkey to display the Delete Report screen:



4 You can delete the report or cancel the delete request:
- To delete the report, press the DELETE softkey. The Patient Reports screen is then displayed without the deleted report.
  After the report is deleted it cannot be recovered. However, the deleted report remains listed in the Event Log in the CODE SUMMARY report.
- To cancel the delete request, press the CANCEL REQUEST softkey or press EXIT. The Patient Reports screen is then displayed.

5 To exit the Patient Reports screen and return to the Home screen, press EXIT.

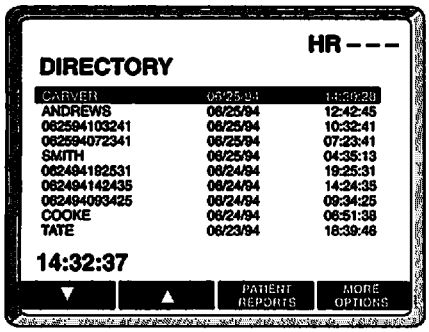
Patient Directory and Previous Patient Reports

All the reports for previous patients and the current patient are accessible through the patient directory.

Gaining Access to the Directory

To gain access to the directory:

1 Turn the monitor POWER switch to BATT and adjust CONTRAST as needed.
2 Disconnect the patient cable from the monitor or the patient.
3 From the Home screen, press the DIRECTORY softkey to display the Patient Directory screen:



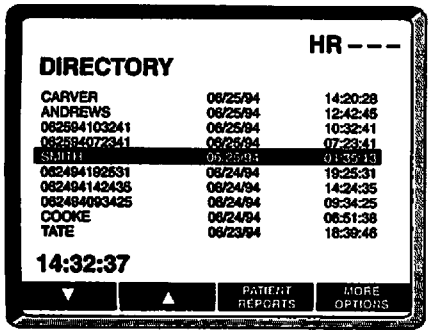
Patients are listed in chronological order in the directory with the most recent patient listed at the top. If more than 10 patients are listed, additional screens are accessible.

To exit the Patient Directory screen and return to the Home screen, press EXIT.

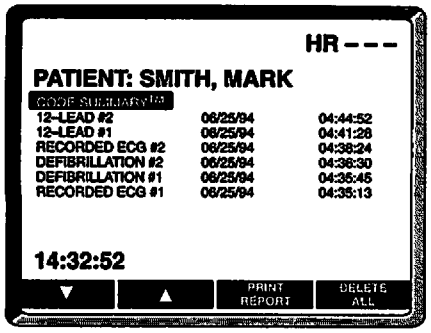
Printing a Report for Any Patient

To print a report for any patient:

1 From the Patient Directory screen, press ▽ or △ to highlight the desired patient (such as SMITH below):



2 Press the PATIENT REPORTS softkey to display the Patient Reports screen:



3 Press the ▽ or △ softkeys to highlight the desired report.

4 Press the PRINT REPORT softkey to print the report. For non-CODE SUMMARY reports, press additional softkeys to change copy size, recorder frequency response, and speed (if desired). Then press the PRINT softkey. The recorder prints the report. (The default copy size and frequency response is the same as when the report was stored.)

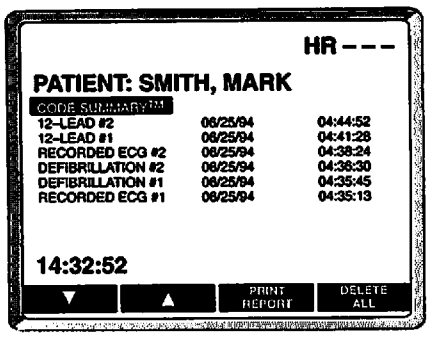
5 After printing, press EXIT to return to the Patient Directory screen. To return to the Home screen, press EXIT again.

Deleting a Report for Any Patient

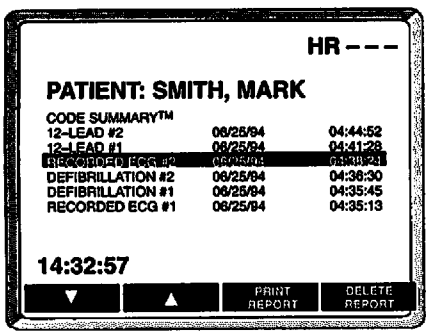
To delete a report for any patient:

1 From the Patient Directory screen, press ▽ or △ to highlight the desired patient.

2 Press the PATIENT REPORTS softkey to display the Patient Reports screen:



3 Press the ▽ or △ softkeys to highlight the desired report:



4 To delete:

- For the CODE SUMMARY report, press the DELETE ALL softkey on the Patient Reports screen. Confirm you want to delete all reports *and* the patient entry for that patient, then press the DELETE softkey (or press the CANCEL REQUEST softkey to cancel the delete). Deleting the CODE SUMMARY report deletes the patient entry from the patient directory list.
- For a non-CODE SUMMARY report, press the DELETE REPORT softkey on the Patient Reports screen. Confirm you want to delete the selected report, then press the DELETE softkey (or press the CANCEL REQUEST softkey to cancel the delete).
  Deleted reports cannot be recovered, but they remain listed in the CODE SUMMARY report Event Log (assuming, the CODE SUMMARY report has not been deleted).

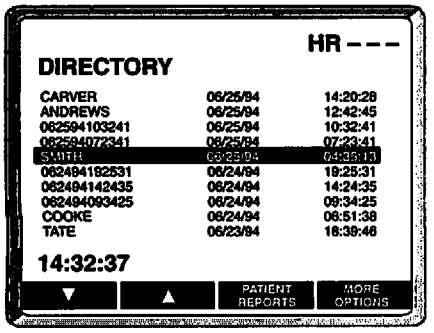
5 If the Patient Reports screen is displayed, press EXIT to return to the Patient Directory screen. To return to the Home screen, press EXIT again.

Deleting All Reports for a Single Patient

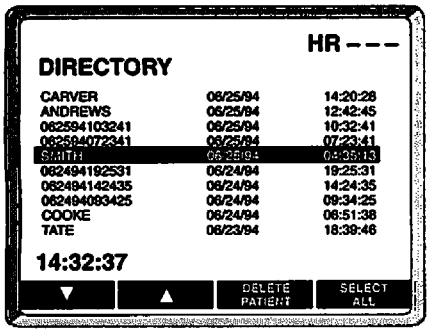
There are two ways to delete all reports for a single patient:

- Delete the patient's CODE SUMMARY report as described in the previous procedure on page 6-6
- Use the MORE OPTIONS softkey on the Patient Directory screen as described below:

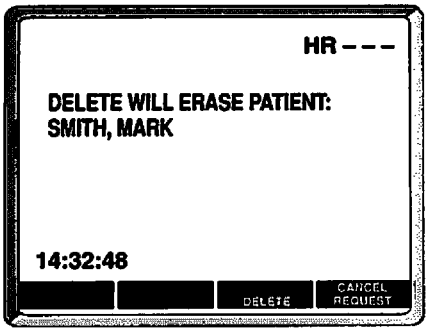
1 From the Patient Directory screen, press ▽ or △ to highlight the desired patient.



2 Press the MORE OPTIONS softkey to display the More Options screen:



3 Press the DELETE PATIENT softkey to display the Delete Patient screen:



4 Confirm that you want to delete the reports for that patient, then press the DELETE softkey (or press CANCEL REQUEST softkey to cancel). The reports are deleted and the patient entry is removed from the patient directory list. The deleted reports cannot be recovered.

5 After the reports are deleted, the Patient Directory screen is displayed. To return to the Home screen, press EXIT.

Printing the Directory Patient List

To print the directory patient list:

1 From the Patient Directory screen, press the MORE OPTIONS softkey to display the More Options screen as shown in the previous procedure.

2 Press the SELECT ALL softkey to highlight all patients in the directory:

3 Press the PRINT DIRECTORY softkey to print the directory patient list.

4 After printing, press EXIT to return to the Patient Directory screen. To return to the Home screen, press EXIT again.

Deleting the Entire Directory Contents

To delete the entire contents of the directory (except for reports for a current patient):

1 From the Patient Directory screen, press the MORE OPTIONS softkey to display the More Options screen.

2 Press the SELECT ALL softkey to highlight all patients in the directory as shown in the previous procedure.

3 Press the DELETE ALL softkey.

4 Confirm that you want to delete the entire directory (except for current patient reports which are not deleted), then press the DELETE softkey (or press CANCEL REQUEST softkey to cancel). The deleted reports cannot be recovered.

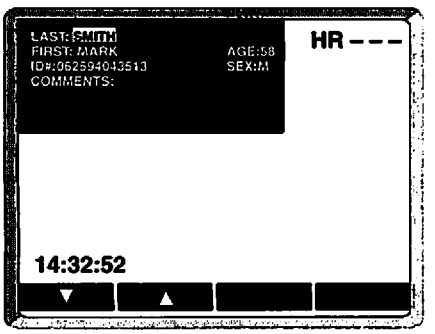
5 After the reports are deleted, the Patient Directory screen is displayed. To return to the Home screen, press EXIT.

Editing the Patient ID from the Directory

Any editing changes made to the patient ID from the directory are applied to all reports stored for that patient. To edit the patient ID:

1 From the Patient Directory screen, press ▽ or △ to highlight the desired patient.

2 Press the MORE OPTIONS softkey on the Patient directory screen, then press the PATIENT ID softkey to display the Patient ID screen:



3 Press the ENT key or the ▽ or △ softkeys to move through the patient ID fields. Use the alphanumeric keypad to enter data.

4 Press EXIT to return to the Patient Directory screen.

Transmitting Reports

You may transmit any or all patient reports from the patient directory. For detailed procedures, refer to page 7-9.

DATA COMMUNICATIONS

This section describes how to transmit a patient report from the LIFEPAK 11 diagnostic cardiac monitor to another location via telecommunications. This section includes:

Overview of Data Communications

The LIFEPAK 11 monitor can transmit patient reports by telephone in two basic ways:

- Landline communications
- Cellular communications.

The capability to transmit patient data via telecommunications may not be available in all countries. Contact your local Physio-Control representative for more information.

Landline Communications

When a landline is available, the monitor can be connected by modem to the Public Switched Telephone Network (PSTN). Upon command from the operator, the LIFEPAK 11 monitor transmits the patient report to the RS 100 receiving station through the PSTN.

The type of modem and connections vary in different countries. In the US and Canada, the LIFEPAK 11 monitor provides an internal modem that can be connected directly to the PSTN as shown in Figure 7-1.

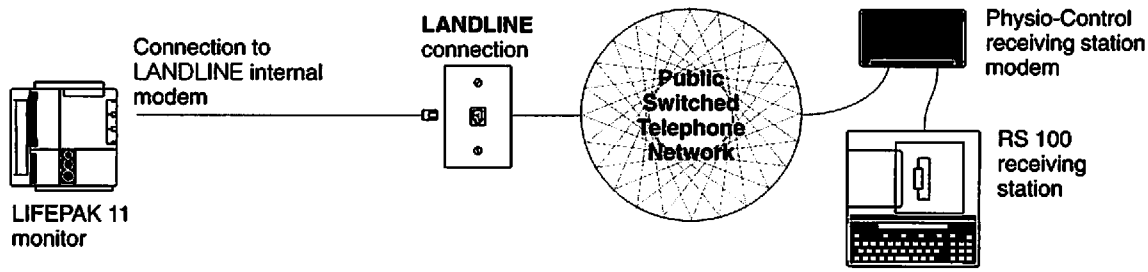


Figure 7-1 Typical landline communications (US and Canada)

Outside the US and Canada, a non-Physio-Control external modem is used for landline communications as shown in Figure 7-2. (The LANDLINE connector and internal modem are not available outside the US and Canada.)

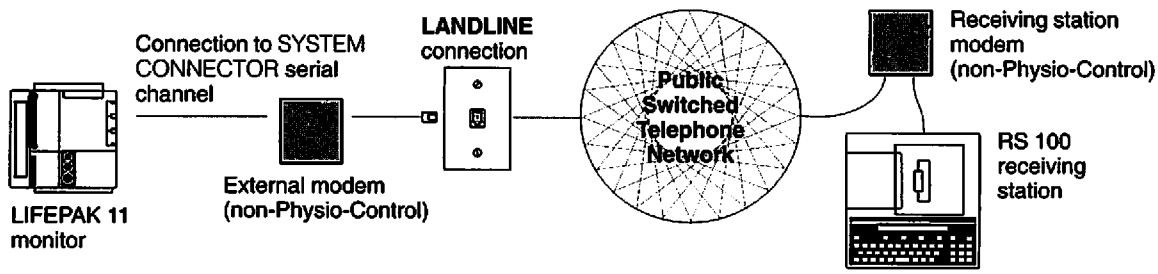


Figure 7-2 Typical landline communications (Outside US and Canada)

Cellular Communications

Cellular phone equipment is typically hand-carried or mounted in a vehicle as shown in Figure 7-3. The external cellular modem connects to the monitor SYSTEM CONNECTOR serial channel and the PSTN-compatible cellular phone. The monitor transmits the patient report through the modem and cellular phone to the RS 100 receiving station via the cellular telephone network and the PSTN.

In the US and Canada, the Physio-Control CELLPAK™ kit provides a soft case that can be used for hand-carrying. The CELLPAK case accommodates the Physio-Control® cellular modem, a PSTN-compatible cellular phone (supplied by the customer), cables, and accessories. Outside the US and Canada, contact the local Physio-Control representative for assistance in selecting a cellular modem, cellular phone, and accessories.

As an alternative to hand-carrying, the cellular modem and a cellular phone can be installed in a vehicle. A roof-mounted antenna can be used to improve cellular transmission.

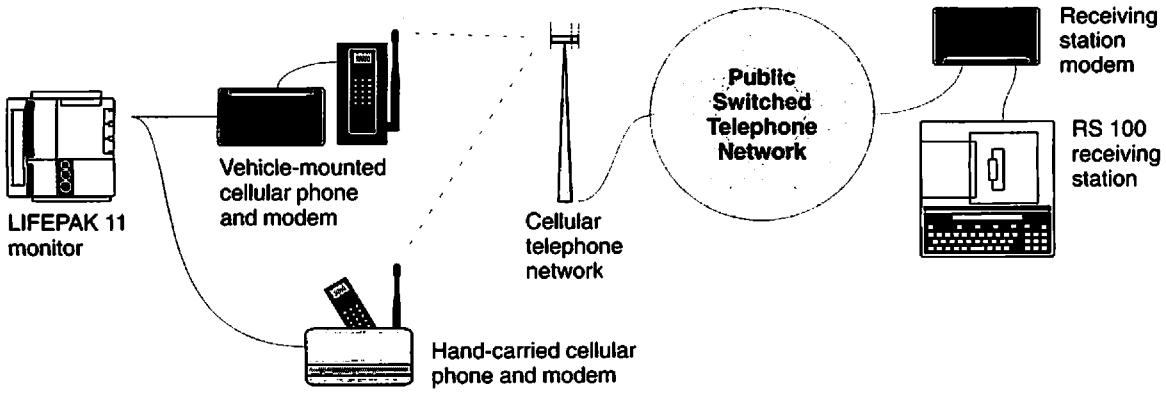


Figure 7-3 Typical cellular communications

⚠ CAUTION **Possible electrical interference and device malfunction.**

When cellular phone power is on, the cellular phone emits low-power (typically <3W) radio frequency signals. Avoid operating a cellular phone near electronic equipment not manufactured by Physio-Control Corporation. Before operating a cellular phone near other equipment, refer to the operating instructions for that equipment. Turn off cellular phone power when not in use.

RS 100 receiving station

The RS 100 receiving station receives, prints, and stores patient reports from the LIFEPAK 11 monitor. In a typical application, the RS 100 receiving station is located at the hospital emergency room where medical personnel can review patient reports before the patient arrives.

As shown in Figure 7-1, Figure 7-2, and Figure 7-3, the RS 100 receiving station typically connects to the PSTN through an external receiving station modem. For the US and Canada, the RS 100 receiving station also contains an internal modem (not illustrated) that can be used to download reports to a storage device. Outside the US and Canada, the RS 100 receiving station downloads reports through the external modem. For more information about the operation and capabilities of the RS 100 receiving station and the Physio-Control receiving station modem, refer to the *RS 100 receiving station Operating Instructions.*

Data Communications and Treatment Protocol

When considering any treatment protocol that involves the transmission of patient data by telecommunications, some limitations must be recognized. Successful communication depends on access to public or private network services that may or may not always be available. This is especially true for cellular communications which is influenced by many factors such as geography, location, weather, and the number of competing cellular service users. Therefore, treatment protocol must always take into account the fact that data transmission *cannot be assured* using landline or cellular communications. Your treatment protocol must include contingency planning for incomplete transmissions.

Equipment Connections

Before transmitting reports, make sure the monitor and accessories are properly connected as described in this section. Although other types of equipment and connections are possible, these are the typical and recommended connections using accessories and compatible equipment tested by Physio-Control. For information about connecting the RS 100 receiving station and accessories, refer to the *RS 100 receiving station Operating Instructions.* Contact your local Physio-Control representative for more information.

Before transmitting reports, confirm that the LIFEPAK 11 monitor and the RS 100 receiving station are configured for the same language. If two different languages are configured, the RS 100 receiving station prints reports in a mixture of the two languages. The language selection for the LIFEPAK 11 monitor is one of the Service Options described in the *LIFEPAK 11 monitor Service Manual.*

Modem Selection

The Physio-Control external cellular modem has been tested for use with the LIFEPAK 11 monitor in the US and Canada. Similarly, the Physio-Control receiving station modem has been tested for use with the RS 100 receiving station in the US and Canada. Physio-Control does not recommend or provide support for use of non-Physio-Control modems in the US and Canada.

Outside the US and Canada, contact your local Physio-Control representative for assistance in selecting an external modem. Note that the LIFEPAK 11 monitor provides a Modem Initialization option which allows entry of character strings to initialize a non-Physio-Control modem (the Modem Initialization option does not pertain to a Physio-Control modem). Refer to page 10-7 for a description of the option.

The LIFEPAK 11 monitor communications connectors and capabilities are described in Table 7-1. For additional technical information, refer to the *LIFEPAK 11 monitor Service Manual.*

Table 7-1 LIFEPAK 11 monitor communications

Connector	Description	Typical Application
SYSTEM CONNECTOR	Connection to serial channel (compatible with EIA-RS232E)	Connection to external cellular modem
LANDLINE	RJ11 connection to internal modem (compatible with Bell 212A/CCITT V.22 1200bps)	Direct landline connection to PSTN (connector and modem not available outside US and Canada)

The internal modem (available only in the US and Canada) is not intended for cellular communications. Use only the SYSTEM CONNECTOR and external modem for cellular communications.

For successful cellular transmission, the external modems connected to the LIFEPAK 11 monitor and the RS 100 receiving station must have compatible auto-error-handling protocol. In the US and Canada, use the Physio-Control cellular modem and the Physio-Control receiving station modem. For more information about modem compatibility, refer to the *LIFEPAK 11 monitor Service Manual* and the *RS 100 receiving station Service Manual* or contact your Physio-Control representative.

Landline Connections

The landline connections vary in different countries. Consult your local Physio-Control representative for more information.

Landline Connections in US and Canada

The landline connections for the US and Canada are illustrated in Figure 7-4. The required equipment and services are summarized in Table 7-2.

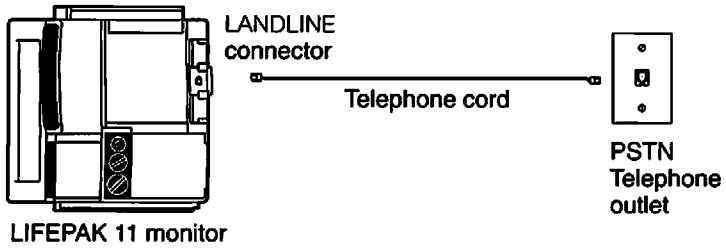


Figure 7-4 Landline connections (US and Canada)

Table 7-2 Equipment and services for landline communications

Equipment/Service	US and Canada	Outside US and Canada
PSTN service access	• Customer provides	• Customer provides
Modem	• Monitor internal LANDLINE modem (external modem not applicable)	• External modem (non-Physio-Control; customer provides)
Cables	• Telephone cord with RJ11 connectors (Physio-Control part no. 805500*)	• Monitor-to-OTS modem cable (Physio-Control part no. 3005939*; available with DB9 or DB25 connector) • Telephone cord compatible with modem and network service (customer provides)

*Refer to page 9–17 for ordering information.

Make sure you connect the telephone cord to a standard telephone line outlet for access to the Public Switched Telephone Network. This is the same type of analog telephone line outlet used in a private home or required for FAX machines or modems. Do *not* connect the telephone cord to an outlet for a digital telephone or computer network. Even though the physical connectors are compatible, the monitor cannot transmit reports and can disrupt the operation of devices connected to that line.

Landline Connections Outside the US and Canada

The landline connections outside the US and Canada are illustrated in Figure 7-5. The required equipment and services are summarized in Table 7-2.

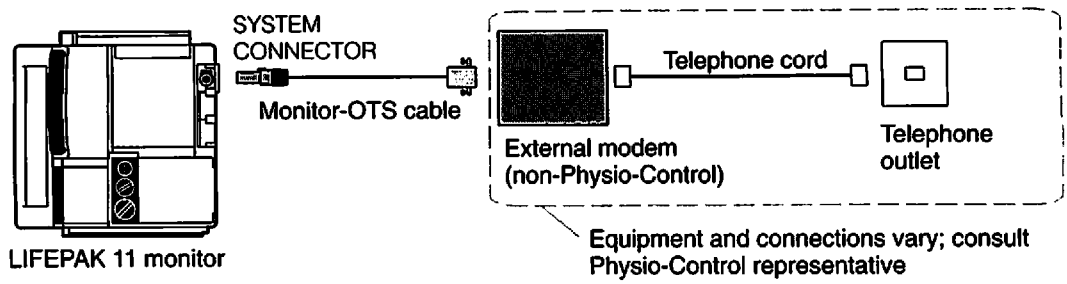


Figure 7-5 Landline connections (outside US and Canada)

Cellular Connections

The cellular connections vary in different countries. Consult your local Physio-Control representative for more information.

Cellular Connections in US and Canada

The typical cellular connections for the US and Canada are illustrated in Figure 7-6. The required equipment and services are summarized in Table 7-3. The exact cellular phone connections and equipment may vary depending on the type of cellular phone you use.

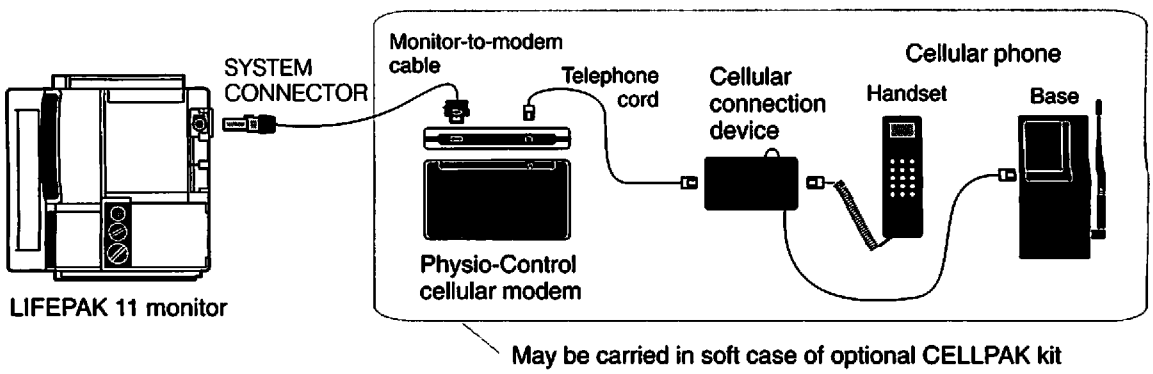


Figure 7-6 Cellular connections (US and Canada)

Table 7-3 Equipment and services for cellular communications

Equipment/Service	US and Canada	Outside US and Canada
Cellular phone supporting PSTN-signaling	• Customer provides*	• Customer provides
Cellular phone network access	• Customer obtains	• Customer obtains
Modem	• Physio-Control cellular modem (Physio-Control part number 805410**)	• External modem (non-Physio-Control; customer provides)
Cables and accessories	• Monitor-to-modem cable (Physio-Control part no. 805635**) • Telephone cord with RJ11 connectors (Physio-Control part no. 805500**)	• Monitor-to-OTS modem cable (Physio-Control part no. 3005939**; available with DB9 or DB25 connector) • Additional cables or equipment as needed (customer provides–consult phone supplier)

*CELLPAK case physically accommodates Motorola® MC480 Attaché cellular phone (available in US and Canada).
**Refer to page 9-17 for ordering information.

For easy transport, the optional Physio-Control CELLPAK case can accommodate the cellular modem, cellular phone, phone battery, required accessories, and cables. Although the cellular modem is compatible with any PSTN-compatible cellular phone, the CELLPAK case is designed to physically accommodate the Motorola MC480 Attaché cellular phone. For information about the content and cable connections for the CELLPAK case, refer to the *CELLPAK kit Reference Guide*.

Cellular Connections Outside the US and Canada

The typical cellular connections for the US and Canada are illustrated in Figure 7-7. The required equipment and services are summarized in Table 7-3. The exact cellular connections vary depending on the type of cellular phone and modem you use.

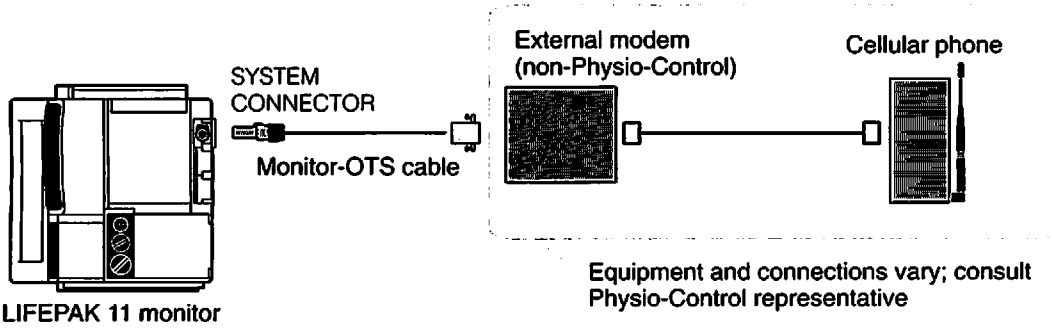


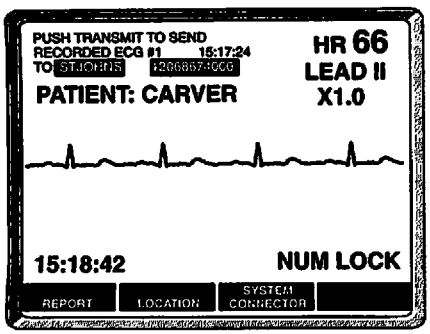
Figure 7-7 Cellular connections (outside the US and Canada)

Transmitting a Report for the Current Patient

To transmit a report for the current patient:

1 Check phone cable connections (pages 7-5 or 7-6). For cellular communications, apply power to cellular phone; position the cellular phone a minimum of six inches away from the monitor and patient connections to help reduce possible radio frequency interference with monitoring.

2 Press TRANSMIT button on monitor to display the Transmit screen:



3 Confirm that the report you want to transmit is displayed in the upper left corner, or press the REPORT softkey as required to select the desired report to transmit. The most recently acquired report is displayed first.

When a CODE SUMMARY report is transmitted, it contains only the reports included for the configured CODE SUMMARY report format (long, medium, or short).

4 Confirm the desired transmit location and number are displayed in the upper left corner of the screen, or do one of the following:

- Press the LOCATION softkey as required to select one of the stored transmit location numbers or
- Enter the telephone number on the monitor alphanumeric keypad.
  - You can add a prefix (such as an area code) to a stored location number. First, press the LOCATION softkey to display the stored number desired, then enter the desired prefix using the alphanumeric keypad (the stored number is blank while you add the prefix). Press LOCATION again to add the stored number to the displayed prefix.
  - Either of two text characters may be specified as part of the number (if NUM LOCK is displayed, press the NUM key to enable alpha keys):
    P causes pulse dialing
    W inserts a two-second wait period.

5 Confirm the desired transmission connector is selected: SYSTEM CONNECTOR softkey label indicates cellular connection, LANDLINE softkey label indicates landline connection. Press the softkey to change selection if required.

6 After confirming the report, transmit location, and transmission connection, press TRANSMIT again to transmit the report.

7 Observe screen messages during transmission and take appropriate action if needed (troubleshooting tips are listed on page 7-12).

8 When transmission is complete (the TRANSMISSION COMPLETE message is displayed), press EXIT to return to the Home screen. For cellular communications, turn off power to the cellular phone.

To cancel a transmission in progress, press EXIT. Transmission also is cancelled if you press RECORD, 12 LEAD, or CODE SUMMARY during transmission.

After any transmission attempt, the transmission result (Completed, Cancelled, or Failed) is listed in the CODE SUMMARY report Event Log along with the time of transmission and report type.

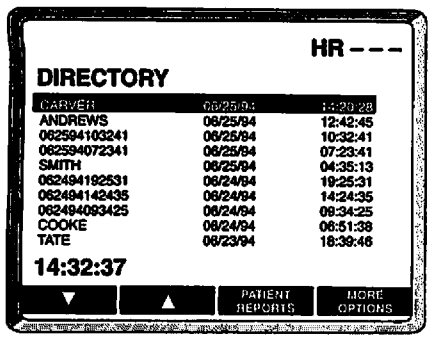
Transmitting Reports from the Directory

To transmit reports from the patient directory:

1 Check phone cable connections (pages 7-5 or 7-6). For cellular communications, apply power to cellular phone; position the cellular phone a minimum of six inches away from the monitor and patient connections to help reduce possible radio frequency interference with monitoring.

2 Disconnect the patient cable from the monitor or the patient.

3 Press DIRECTORY softkey to display the Patient Directory screen:



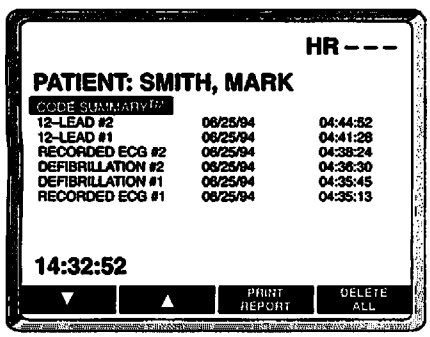
Now that you have accessed the patient directory, you may transmit a single report for any patient, transmit all reports for a patient, or transmit the entire directory contents.

Transmitting a Single Report for Any Patient

To transmit a single report from the directory:

1 From the Patient Directory screen, press softkeys ▽ or △ to highlight the desired patient.

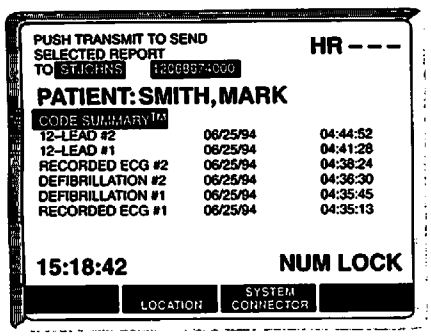
2 Press the PATIENT REPORTS softkey to display the Patient Reports screen:



3 Press softkeys ▽ or △ to highlight the desired report to transmit.

When a CODE SUMMARY report is transmitted, it contains only the reports included for the configured CODE SUMMARY report format (long, medium, short).

4 Press TRANSMIT to display the Transmit Report screen:



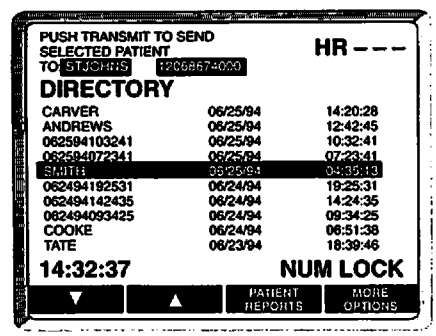
5 Perform steps 4 through 8 on page 7-8 to transmit the report.

Transmitting All Reports for a Patient

To transmit all reports for a single patient:

1 From the Patient Directory screen, press softkeys ▽ or △ to highlight the desired patient.

2 Press TRANSMIT to display the Transmit Patient screen:

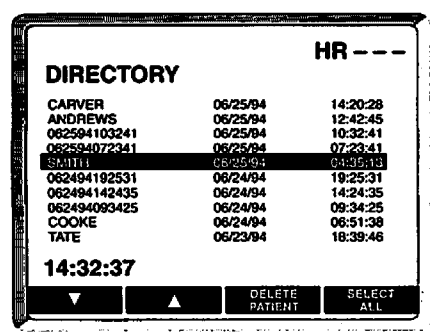


3 Perform steps 4 through 8 beginning on page 7-8 to transmit the reports.

Transmitting the Entire Directory Contents

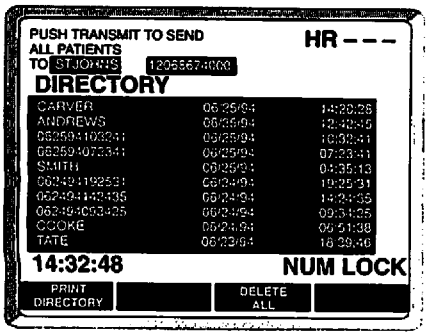
To transmit the entire contents of the directory:

1 From the Patient Directory screen, press the MORE OPTIONS softkey to display the More Options screen:



2 Press the SELECT ALL softkey to highlight all patients in the directory.

3 Press TRANSMIT to display the Transmit Directory screen:



4 Perform steps 4 through 8 on page 7-8 to transmit the entire directory contents.

Configuration Options for Transmitting Reports

There are several transmission options which you may configure according to your needs:

- Preset transmit location names and telephone numbers (maximum nine locations)
- Default transmission connector (SYSTEM CONNECTOR or LANDLINE) displayed on Transmit screen
- Optional audible tones during transmission (for landline only).

To configure these options, refer to Startup Defaults and Transmit Set-Up on pages 10-7 and 10-8.

Screen Messages During Successful Transmission

During a successful transmission the monitor typically displays the following sequence of messages:

WAITING FOR DIAL TONE
MODEM INITIALIZATION
DIALING
TRANSMITTING
xx% TRANSMITTED
TRANSMISSION COMPLETE

If transmission is unsuccessful, refer to the troubleshooting information as follows.

Troubleshooting Tips During Transmission

Troubleshooting tips are provided in separate tables for cellular and landline communications. For help in troubleshooting other monitor problems, refer to Troubleshooting on page 9-15. Before troubleshooting, be sure to have available replacement communication cables and fully-charged batteries.

Troubleshooting Tips for Cellular Transmission

If problems occur during cellular transmission, check the list of observations in Table 7-4 for aid in troubleshooting.

Table 7-4 Troubleshooting tips during cellular transmission

Observation	Possible Cause	Corrective Action
1 Immediate, loud, rapid, busy signal.	Cellular service busy.	• Press EXIT to cancel transmission, then retry in 30-60 seconds.
	No cellular service at present location.	• Move to another location and retry.
2 BUSY* message and standard busy signal.	Destination receiving station may be busy receiving a report from another device.	• Press EXIT to cancel transmission, then retry in 30-60 seconds. If busy signal persists, use phone handset to call destination and determine whether receiving station modem answers.
3 Repeated ringing followed by CONNECTION FAILED* message.	Receiving station power not on or cables not connected at destination.	• Call and confirm destination receiving station power is on and cables are properly connected.
	Wrong phone number.	• Confirm phone number.
	Receiving phone line not active.	• Confirm destination receiving station phone line is active.
4 MODEM INITIALIZATION message followed by CONNECTION FAILED* message.	Invalid modem initialization string (non-Physio-Control modems only).	• Check string in modem initialization option.
5 CHECK PHONE message.	Phone power off.	• Turn on phone power.
	Cable not connected or damaged cable.	• Check cable connections and retry. If problem persists, replace cable.
	Phone battery low.	• Install charged phone battery.
	Antenna not extended or securely connected.	• Confirm antenna is properly extended and connected.
6 CHECK CABLE message.	Monitor-to-modem (SYSTEM CONNECTOR) cable is not plugged in **and** no destination phone number is entered.	• Check monitor-to-modem cable and enter a destination phone number.
7 NO PHONE NUMBER message.	No phone number entered.	• Enter destination phone number by pressing LOCATION softkey or using alphanumeric keypad.

Table 7-4 Troubleshooting tips during cellular transmission, continued

Observation	Possible Cause	Corrective Action
8 TRANSMISSION FAILED* message.	Noisy phone line or poor cellular service.	• Retry. If problem persists, move to another location and retry.
	Destination receiving station memory full.	• Retry transmission later or transmit to another destination.
	Monitor battery low.	• Replace with fully-charged, properly-maintained battery.
	Damaged or disconnected antenna.	• Check antenna and connections.
9 WAITING FOR DIAL TONE message displayed for one or two minutes.	Phone battery low.	• Replace phone battery.
	Antenna not extended.	• Extend antenna.
	Monitor battery low.	• Replace with fully-charged, properly-maintained battery.
10 Transmission starts but is very slow or fails to complete.	Monitor battery low.	• Replace with fully-charged, properly-maintained battery.
	Phone battery low.	• Replace phone battery.
	Poor cellular service in present location.	• Move to another location and retry.

*Monitor automatically retries transmission once after CONNECTION FAILED, TRANSMISSION FAILED, or BUSY message.

Troubleshooting Tips for Landline Transmission

If problems occur during landline transmission, check the list of observations in Table 7-5 for aid in troubleshooting. The audible landline transmission tones may help identify problems. If the tones are not audible, they may be enabled as described on page 10-7 (set TRANSMISSION AUDIO to ON or AUTO).

Table 7-5 Troubleshooting tips during landline transmission

Observation	Possible Cause	Corrective Action
1 BUSY* message and standard busy signal.	Destination receiving station may be busy receiving a report from another device.	• Press EXIT to cancel transmission, then retry in 30-60 seconds. If busy persists, use phone handset to call destination and determine whether receiving station modem answers.
2 Repeated ringing followed by CONNECTION FAILED* message.	Receiving station power not on or cables not connected at destination. Wrong phone number. Receiving phone line not active.	• Call and confirm destination receiving station power is on and cables are properly connected. • Confirm phone number. • Confirm destination receiving station phone line is active.
3 MODEM INITIALIZATION message followed by CONNECTION FAILED* message.	Invalid modem initialization string (non-Physio-Control modems only).	• Check string in modem initialization option.
4 CHECK PHONE message.	RJ11 telephone cord not plugged in. RJ11 telephone cord plugged into inactive or digital phone jack.	• Confirm RJ11 cord plugged into monitor and phone jack. • Plug RJ11 cord into a different analog phone jack and retransmit (analog phone jacks are the type used for a FAX machine or computer modem).
5 DIALING or REDIALING message displayed for up to two minutes.	Receiving station power not on or cables not connected at destination. Wrong phone number. Receiving phone line not active.	• Call and confirm destination receiving station power is on and cables are properly connected. • Confirm phone number. • Confirm destination receiving station phone line is active.
6 NO PHONE NUMBER message.	No phone number entered.	• Enter destination phone number by pressing LOCATION softkey or using alphanumeric keypad.
7 TRANSMISSION FAILED* message.	Noisy phone connection. Destination receiving station memory full. Monitor battery low.	• Retry transmission. • Retry transmission later or transmit to another destination. • Replace with fully-charged, properly-maintained battery.
8 WAITING FOR DIAL TONE message.	Monitor battery low.	• Replace with fully-charged, properly-maintained battery.
9 Transmission starts but is very slow or fails to complete.	Monitor battery low.	• Replace with fully-charged, properly-maintained battery.

*Monitor automatically retries transmission once after CONNECTION FAILED, TRANSMISSION FAILED, or BUSY message.

DEFIBRILLATION/CARDIOVERSION/PACING

This section provides general information about using the LIFEPAK 11 diagnostic cardiac monitor with LIFEPAK 11, LIFEPAK 5, or LIFEPAK 250 defibrillators. This section does not include operation of the LIFEPAK 11 defibrillator/pacemaker with the LIFEPAK 11 monitor. For detailed instructions regarding use of the LIFEPAK 11 defibrillator/pacemaker, including Troubleshooting Tips, refer to the LIFEPAK 11 defibrillator/pacemaker Operating Instructions.

Topics in this section include:

This section provides only a basic overview of how the LIFEPAK 11 defibrillator/pacemaker, LIFEPAK 5 defibrillator or LIFEPAK 250 defibrillator is used in conjunction with the LIFEPAK 11 monitor. This section is not intended to replace the information provided in the specific defibrillator Operating Instructions.

Before using a defibrillator, the operator must be familiar with all of the safety information and operating instructions provided in the LIFEPAK 11, LIFEPAK 5 or LIFEPAK 250 defibrillator Operating Instructions. For clinical information, refer to these booklets: *Defibrillation: What You Should Know* and *Noninvasive Pacing: What You Should Know.*

Before using the LIFEPAK 11 monitor, be sure that the LIFEPAK 11 defibrillator/pacemaker, LIFEPAK 5 or LIFEPAK 250 defibrillator is operating properly and has been properly tested and maintained.

Defibrillation Warnings

The term "defibrillator" in the warnings below refers to either the LIFEPAK 11, LIFEPAK 5 or LIFEPAK 250 defibrillator, when used with the LIFEPAK 11 monitor.

⚠ WARNINGS

Possible shock.

When discharged, the defibrillator delivers up to 360 joules of electrical energy. Unless discharged properly as described in the defibrillator 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, the defibrillator Operating Instructions, and the function of all controls and indicators, as well as the connections and accessories.

Possible shock or burns and ineffective energy delivery.

The presence of precordial lead electrodes and lead wires may interfere with the recommended placement of hard paddles or defibrillation electrodes and prevent effective energy delivery. Do not allow physical contact between ECG electrodes and the paddles, defibrillation electrodes, or defibrillation gel. Before performing defibrillation, remove from the patient any precordial lead electrodes and lead wires which may interfere with energy delivery.

Possible improper synchronization.

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

Connecting and Disconnecting the Monitor and Defibrillator

To connect the LIFEPAK 11 monitor to a LIFEPAK 11, LIFEPAK 5 or LIFEPAK 250 defibrillator:

1. Place the defibrillator behind the monitor as shown in Figure 8-1, aligning the slide contacts.
2. Slide the defibrillator forward until the lock button clicks in place.
3. Confirm electrical connection by applying power to both units and pressing the SYNC button on the defibrillator. Verify that SYNC is displayed on the monitor screen.
4. Turn both units off.

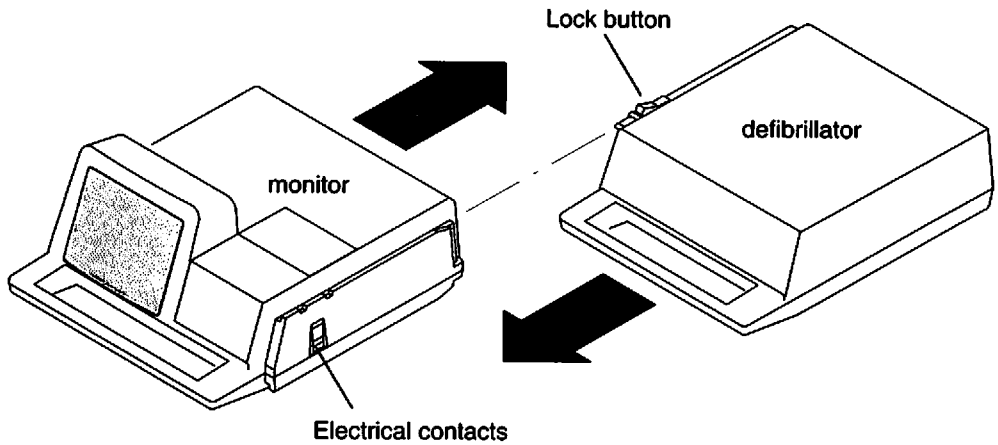


Figure 8-1 Connecting the monitor and defibrillator

To disconnect the LIFEPAK 11 monitor from a LIFEPAK 11, LIFEPAK 5 or LIFEPAK 250 defibrillator:

1. Position your left hand on the monitor handle as shown in Figure 8-2. Press and hold the lock button with your right hand.
2. Separate the monitor and defibrillator using left-thumb pressure on the defibrillator handle.
3. Pull the monitor toward you while pushing the defibrillator away from you.

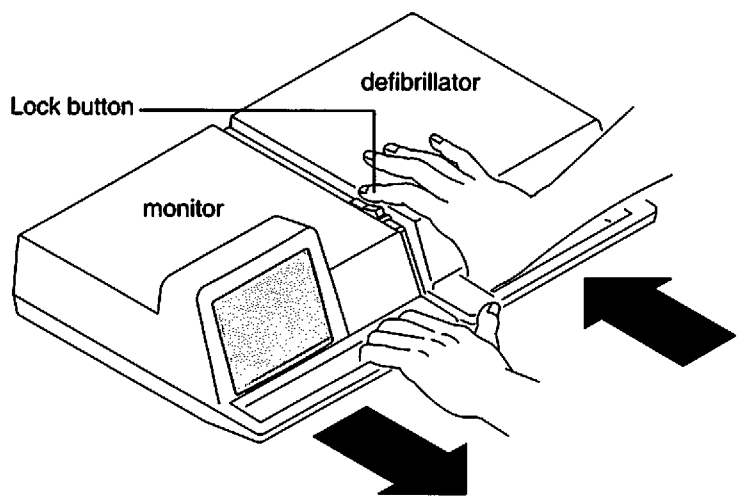


Figure 8-2 Disconnecting the monitor and defibrillator

Monitor and Defibrillator Battery Power

When connected, the monitor and defibrillator can pass electrical signals through the electrical contacts. However, the defibrillator and monitor do not share power from either batteries or an auxiliary power source. For more information about monitor battery power, refer to page 2-7. For more information about defibrillator battery power, refer to the defibrillator Operating Instructions. Note that the LOW BATTERY message on the monitor screen applies only to the monitor and not to the defibrillator.

Automatic Storing of Defibrillation Events for the LIFEPAK 11 monitor/defibrillator/pacemaker

When the LIFEPAK 11 monitor and LIFEPAK 11 defibrillator are connected, defibrillation events are stored automatically in the Code Summary report. Defibrillation events are described and illustrated on page 8-5.

Automatic Storing of Pacing Events for the LIFEPAK 11 monitor/defibrillator/pacemaker

When the LIFEPAK 11 monitor and the LIFEPAK 11 defibrillator/pacemaker are connected, pacing events are automatically stored in the Code Summary report. Pacing events are described and illustrated in this section on page 8-6.

Recording Defibrillation Events for the LIFEPAK 5 or LIFEPAK 250 defibrillators

When the LIFEPAK 11 monitor and LIFEPAK 5 or LIFEPAK 250 defibrillator are connected, you can select PADDLES lead to monitor and record the ECG through the paddles. The monitor stores a PADDLES recorded ECG in the CODE SUMMARY report.

Although the LIFEPAK 11 monitor allows paddles lead monitoring, the LIFEPAK 5 (or LIFEPAK 250) defibrillator does not inform the monitor when defibrillation energy is discharged. Therefore, defibrillation or synchronized cardioversion discharges are not automatically stored in memory or included in the Code Summary report.

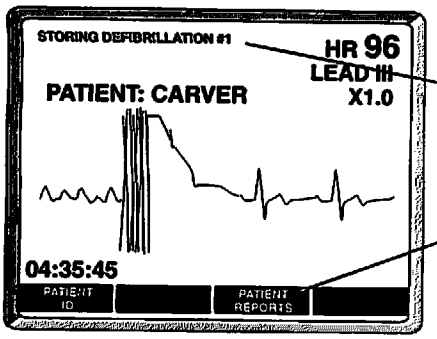
Use either of these recommended ways to acquire a record of a defibrillation event:

- Operate the recorder during defibrillation. The date, time, and patient ECG during the defibrillation will be recorded on the paper printout. Save the printout.
- Use an event key to mark the time of the defibrillation event in the CODE SUMMARY report. (ECG data is not included with the event key.) Note that event keys cannot be used while another operation, such as operating the recorder or acquiring a 12-Lead ECG report, is underway. If another operation is underway, pressing an event key has no effect. For details, refer to page 5-6.

Screen Messages for the LIFEPAK 11 monitor/defibrillator/pacemaker during Defibrillation/Synchronized Cardioversion

When the LIFEPAK 11 monitor is connected to the LIFEPAK 11 defibrillator, the following screen messages are displayed during defibrillation and synchronized cardioversion. For defibrillation and synchronized cardioversion procedures, refer to the LIFEPAK 11 defibrillator/pacemaker Operating Instructions.

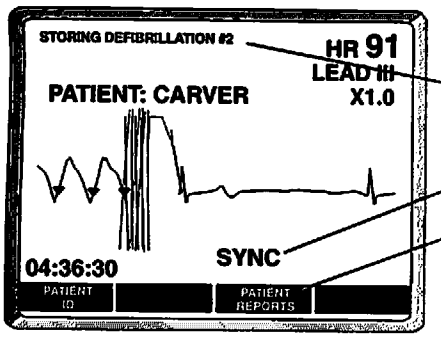
1 Defibrillation–The event is stored automatically at the time of discharge.



Defibrillation event being stored.

Press to view the list of stored reports.

2 Synchronized cardioversion–The event is stored automatically at the time of discharge as a defibrillation event.

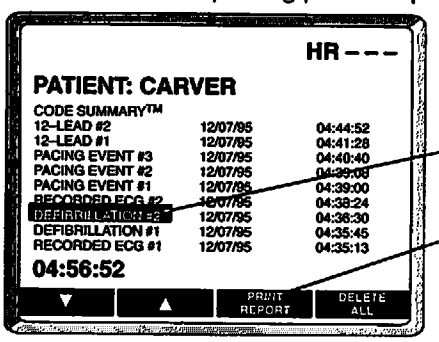


Monitor stores synchronized cardioversion as a defibrillation event.

SYNC displayed for synchronized cardioversion.

Press to view a list of stored reports.

3 To print a report, select a defibrillation event from the list of stored reports. See Section 6 for more information on printing patient reports.



Use arrow keys to select desired report.

Press to print selected report.

Defibrillation/Synchronized Cardioversion Report for the LIFEPAK 11 monitor/defibrillator/pacemaker

Defibrillation and synchronized cardioversion reports consist of 3 seconds of pre-shock and 5-seconds of post-shock ECG data. If the discharge is synchronized to QRS sense markers, Sync On appears on the report. Defibrillation/Synchronized cardioversion reports are stored automatically in the monitor whenever energy is discharged. A defibrillation/synchronized cardioversion report is annotated with a report type and sequence number, energy selected in Joules, and heart rate. A typical synchronized cardioversion report is shown in Figure 8-3. To print or delete a patient report, follow the procedures described in Section 6.

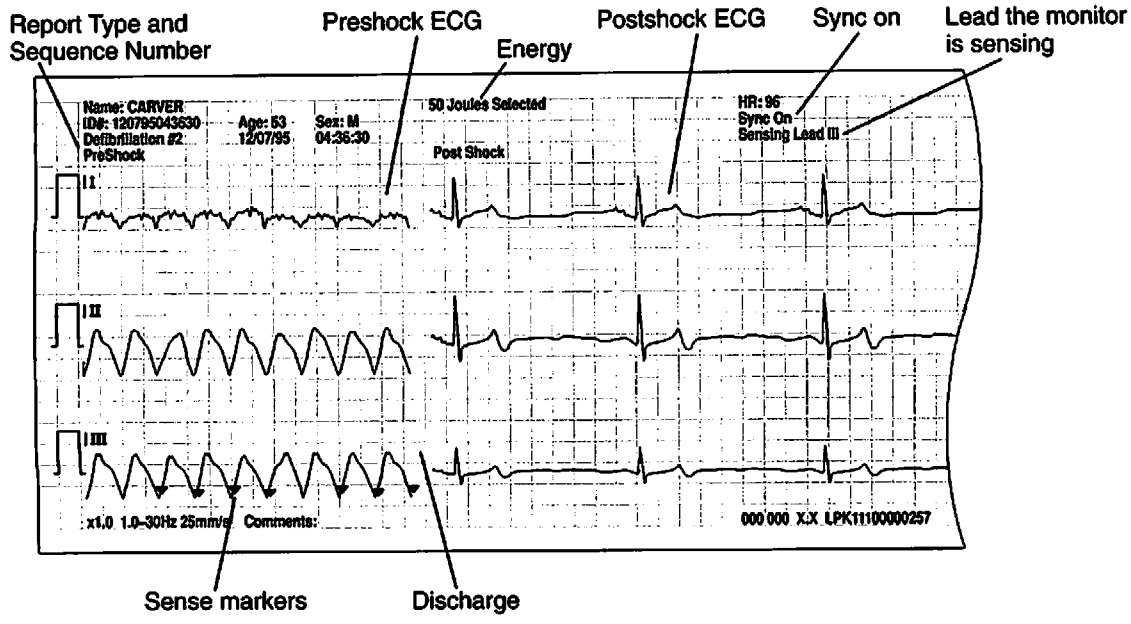


Figure 8-3 Synchronized Cardioversion report

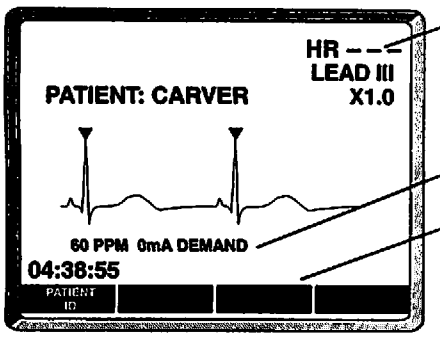
Screen Messages for the LIFEPAK 11 monitor/defibrillator/pacemaker During Pacing

When the LIFEPAK 11 monitor is connected to the LIFEPAK 11 defibrillator/pacemaker, the following monitor screens are displayed during pacing. Pacing events include:

- Pacing started
- Pacing set
- Pacing changed
- Pacing stopped

Refer to the LIFEPAK 11 defibrillator/pacemaker Operating Instructions for pacemaker operating procedures.

1 When you press PACER on the LIFEPAK 11 defibrillator/pacemaker:
- The default settings (ppm, mA, mode) appear
- Sense markers appear on each detected intrinsic QRS complex
- HR data and PATIENT REPORTS softkey disappear

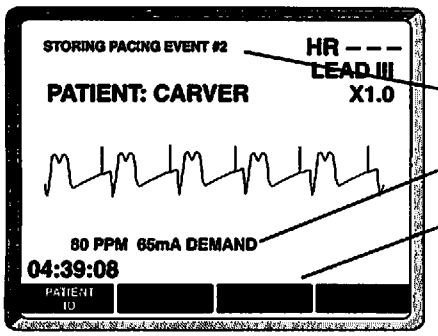


HR data not available with PACER ON.

Default pacer settings

PATIENT REPORTS softkey does not appear when pacer is active.

2 When the pacing rate and current are set or later changed, these parameters are stored in the monitor as a Pacing Event.

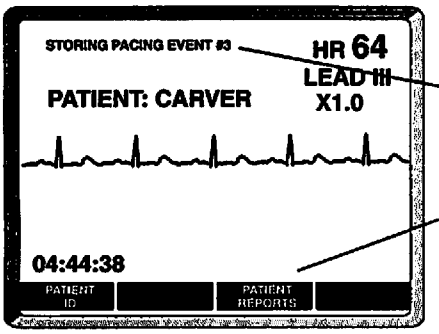


Pacing set event being stored.

PACER settings

During pacing, the PATIENT REPORTS softkey does not appear.

3 When pacing is stopped (PACER OFF), the monitor screen restores HR data and the PATIENT REPORTS softkey appears.

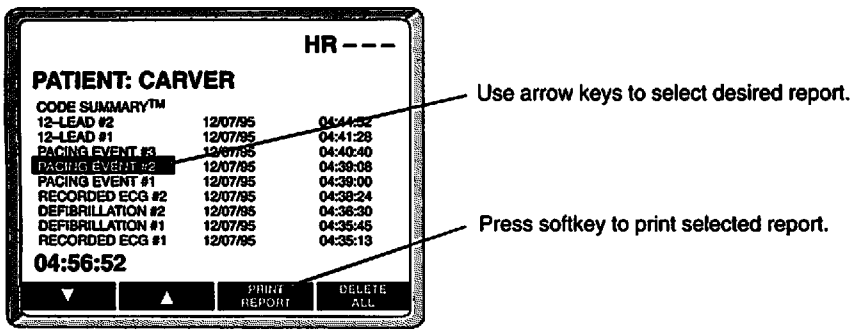


Pacing stopped event being stored.

PATIENT REPORTS softkey appears when pacing is stopped

4 Select pacing event for printing

To print a pacing report, select the desired report and press PRINT REPORT. See Section 6 for more information on printing patient reports.



Pacing Report for the LIFEPAK 11 monitor/defibrillator/pacemaker

A pacing report consists of 3-seconds of pre-event and 5 seconds of post-event ECG data. A pacing report is stored automatically in the monitor when pacing is initiated with the LIFEPAK 11 defibrillator/pacemaker. A pacing report is annotated with the following information:

- Report type and sequence number
- Type of pacing event (Pacing Started, Pacing Set, Pacing Changed, and Pacing Stopped)
- Pacer settings including ppm (pacing rate in pulses per minute) and mA (milliamperes of pacing current).

Pacing Started refers to when pacing current is first delivered; Pacing Set refers to the pacing parameters being established; Pacing Changed refers to when pacing parameters are changed from a previous setting; Pacing Stopped refers to when pacing current ceases. Figure 8-4 shows a typical pacing report. To print or delete a patient report, refer to the procedures described in Section 6.

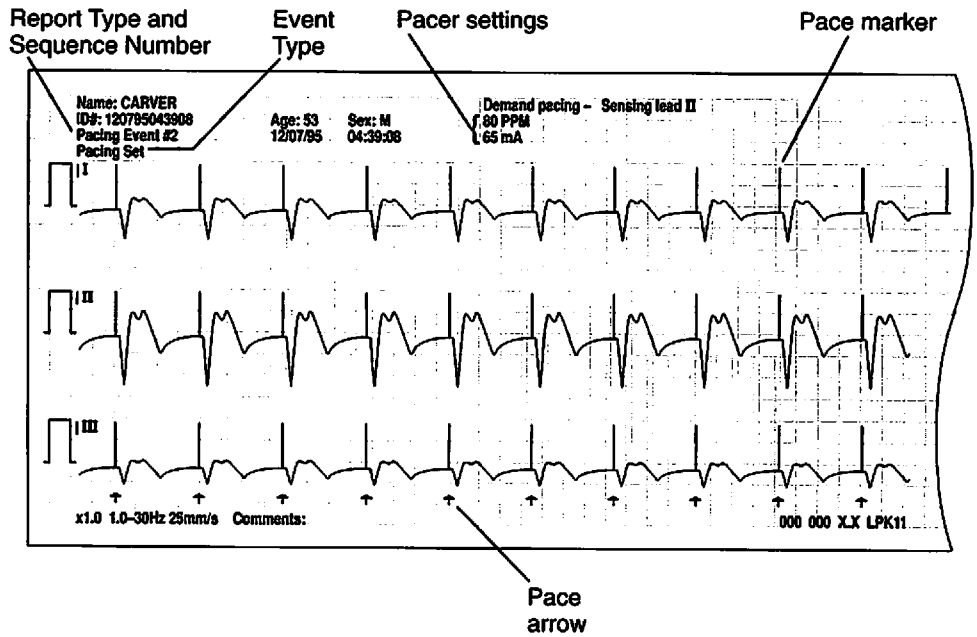


Figure 8-4 Pacing report

Leads Off Messages During Pacing

When pacing for extended periods of time, static may build up on the ECG electrodes, causing the electrodes to wear out. This possibility of static buildup, although unlikely, depends on the following factors:

- Pacing rate
- Pacing current levels
- Electrode placement
- Patient impedance levels

If the electrode wears out, the message ECG LEADS OFF may appear, but pacing continues in non-demand mode. To resume pacing in DEMAND mode, apply new ECG electrodes to the patient. For more information, refer to the pacing troubleshooting tips described in the LIFEPAK 11 defibrillator/pacemaker Operating Instructions.

LIFEPAK 5 defibrillator

The LIFEPAK 5 defibrillator may be connected to the LIFEPAK 11 monitor to allow ECG monitoring using the PADDLES lead and synchronous cardioversion.

ECG Monitoring or Defibrillation

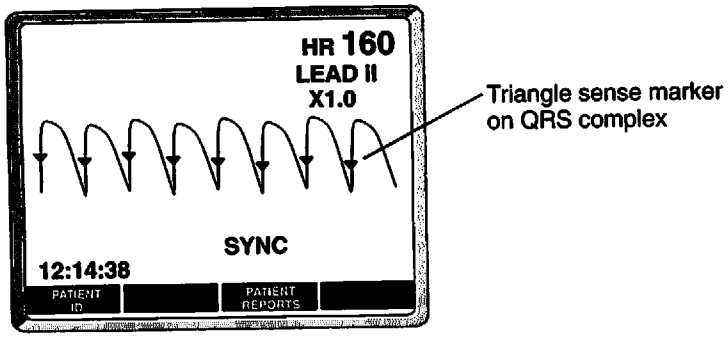
For information about ECG monitoring through paddles or defibrillation, refer to the LIFEPAK 5 defibrillator Operating Instructions.

Synchronized Cardioversion with Standard Paddles

This procedure describes how to perform synchronized cardioversion using the LIFEPAK 5 defibrillator standard paddles while monitoring the patient through the LIFEPAK 11 monitor ECG electrodes. An alternate method of synchronized cardioversion is to install the FAST-PATCH adapter in the LIFEPAK 5 defibrillator and to perform monitoring and defibrillation through the defibrillation electrodes. Refer to the FAST-PATCH adapter Operating Instructions for more information.

To perform synchronized cardioversion with standard paddles:

1. Connect the monitor and defibrillator.
2. Perform the steps required for limb lead ECG monitoring with the LIFEPAK 11 monitor (refer to page 3-3).
3. Slide the paddles out from the storage area.
4. Press and release the black POWER button on the STERNUM paddle and confirm the green light is on.
5. Rotate the ENERGY JOULES switch on the APEX paddle to the desired level.
6. Press the red SYNC button on the defibrillator and confirm the red light in the SYNC button is on.
7. Confirm the monitor displays the Synchronized Cardioversion screen with the SYNC message as shown below. Confirm the triangle sense markers appear on the QRS complexes. If the sense markers do not appear or are displayed in the wrong locations, adjust ECG SIZE, select another lead, or reposition the ECG electrodes so the sense markers appear only on the QRS complexes.



8 Perform the normal cardioversion procedure as described in the LIFEPAK 5 defibrillator Operating Instructions.

After discharging, the defibrillator returns to the asynchronous mode: the red SYNC light is off and the monitor does not display the SYNC message or sense markers.

You may press RECORD on the monitor to activate the recorder and store a Recorded ECG report in memory. The monitor does not store any specific information about the defibrillation event. If you record the ECG while the synchronous mode is enabled, the printed ECG report includes sense markers on the displayed ECG lead and the SYNC ON and SENSING LEAD notation at the top as shown in Figure 8-5.

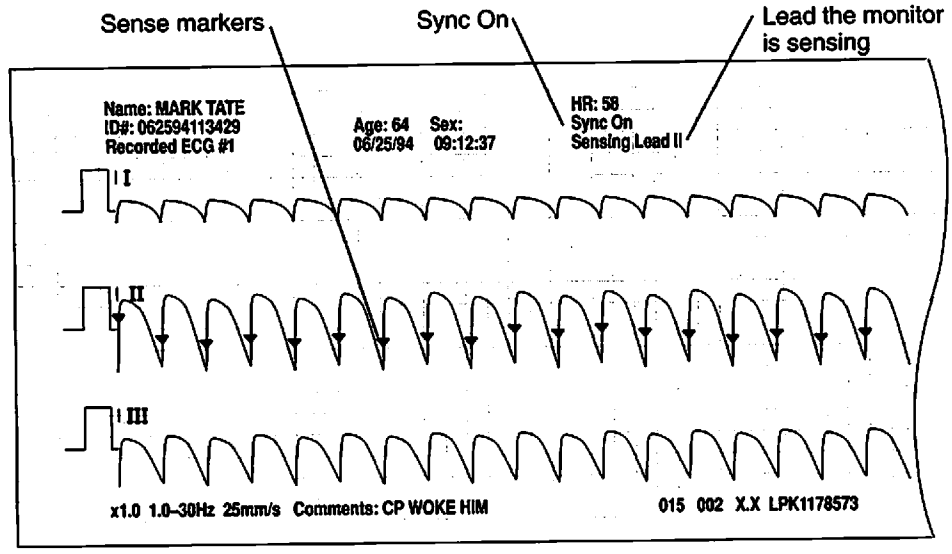


Figure 8-5 Sync notation on an ECG report

LIFEPAK 250 automatic advisory defibrillator

The LIFEPAK 250 automatic advisory defibrillator may be connected to the LIFEPAK 11 monitor to allow PADDLES lead ECG monitoring and defibrillation.

The ECG signal that the LIFEPAK 250 defibrillator supplies to the LIFEPAK 11 monitor is filtered by *both* the defibrillator *and* the monitor before it appears on the monitor screen or recording strip. This extra filtering dampens the displayed and printed ECG signal. Also, smaller amplitude internal pacemaker pulses may not be displayed or printed.

Therefore, the ECG signal from the defibrillator that is displayed on the monitor screen or recording strip should *not* be used for precise arrhythmia analysis. For accurate arrhythmia analysis, monitor the patient directly through the monitor ECG cable, not through the LIFEPAK 250 defibrillator.

Defibrillation

For defibrillation instructions refer to the LIFEPAK 250 defibrillator Operating Instructions.

ECG Monitoring

To monitor ECG with the LIFEPAK 250 defibrillator:

1. Connect the monitor and defibrillator.
2. Refer to the Operating Instructions for the defibrillation electrodes. Connect the defibrillation cables to the electrodes, then apply the defibrillation electrodes to the patient.
3. Rotate the LIFEPAK 11 monitor POWER switch to BATT and select the PADDLES lead.
4. Lift up the LIFEPAK 250 defibrillator display module to apply power to the defibrillator.
5. Observe the ECG signal on the monitor display. Adjust ECG SIZE and VOL as desired.

Troubleshooting Tips During Defibrillation

If problems occur with the LIFEPAK 11 monitor while using the LIFEPAK 5 or LIFEPAK 250 defibrillator (such as monitoring through paddles or synchronized cardioversion), check the list of observations in Table 8-1 for aid in troubleshooting. (For help in troubleshooting problems with the operation of the defibrillator, refer to the specific defibrillator Operating Instructions and Service Manual.) For help in troubleshooting basic monitor operation, refer to Troubleshooting on page 9-15. Troubleshooting tips for the LIFEPAK 11 defibrillator/pacemaker can be found in the LIFEPAK 11 defibrillator/pacemaker Operating Instructions.

Table 8-1 Troubleshooting tips while using a LIFEPAK 5 or LIFEPAK 250 defibrillator and monitor

Observation	Possible Cause	Corrective Action
1 **LIFEPAK 5 defibrillator**: monitor displays no signal when monitoring through QUIK-LOOK paddles.	PADDLES lead not selected.	• Select PADDLES lead.
	Devices not properly connected.	• Disconnect and reconnect monitor and defibrillator.
	Foreign material on electrical contacts where devices connect.	• Disconnect the defibrillator and monitor. Inspect electrical contacts on both devices, remove foreign material, clean, and reconnect.
	Damaged paddles or paddle cables.	• Check paddles and cables by performing test on page 9-6.
2 **LIFEPAK 5 defibrillator**: Monitor displays much signal interference while monitoring ECG in PADDLES lead.	Dirt or foreign material on paddle electrodes.	• Clean paddles.
	Not enough defibrillation gel.	• Check application of gel.
	With FAST-PATCH adapter: improper skin preparation, poor adhesion to patient, or expired electrodes.	• Confirm proper skin preparation, electrode placement and contact, unexpired electrodes.

Table 8-1 Troubleshooting tips while using a LIFEPAK 5 or LIFEPAK 250 defibrillator and monitor, continued

Observation	Possible Cause	Corrective Action
3 **LIFEPAK 5 defibrillator:** Cannot activate synchronous (SYNC) mode.	Devices not properly connected.	• Disconnect and reconnect monitor and defibrillator.
	Foreign material on electrical contacts where devices connect.	• Disconnect the defibrillator and monitor. Inspect electrical contacts on both devices, clean, reconnect.
4 **LIFEPAK 5 defibrillator:** Defibrillator SYNC activated and monitor displays SYNC, but sense marker not displayed or in wrong place.	QRS complexes not adequate size or shape to be detected (sensed) by monitor.	• Press ECG SIZE to adjust so sense markers appear on QRS complex. • Select another lead. • Reposition ECG electrodes.
5 **LIFEPAK 5 defibrillator with FAST-PATCH adapter:** monitor displays no signal when monitoring with defibrillation electrodes.	PADDLES lead not selected.	• Select PADDLES lead.
	FAST-PATCH adapter or paddles not properly installed.	• Remove and reinstall FAST-PATCH adapter and paddles.
	Damaged FAST-PATCH adapter or cables.	• Check FAST-PATCH adapter and cables: set ECG SIZE to X4.0 in PADDLES lead. Grasp defibrillator cable at junction of electrode leads and shake moderately, confirming monitor displays much signal noise. Place metal face of two electrode snaps together and shake moderately. If monitor displays noisy signal, remove adapter and check defibrillator hard paddles by performing test on page 9-6. If hard paddle function is ok, remove FAST-PATCH adapter from use and contact service for repair or replacement.
	Devices not properly connected.	• Disconnect and reconnect monitor and defibrillator.
	Foreign material on electrical contacts where devices connect.	• Disconnect the defibrillator and monitor. Inspect electrical contacts on both devices, clean, and reconnect.
6 **LIFEPAK 250 defibrillator:** Monitor displays much signal interference while monitoring ECG in PADDLES lead.	With FAST-PATCH adapter: improper skin preparation, poor adhesion to patient, or expired electrodes.	• Confirm proper skin preparation, electrode placement and contact, unexpired electrodes.

Table 8-1 Troubleshooting tips while using a LIFEPAK 5 or LIFEPAK 250 defibrillator and monitor, continued

Observation	Possible Cause	Corrective Action
7 **LIFEPAK 250 defibrillator:** Monitor displays no signal while monitoring with defibrillation electrodes.	PADDLES lead not selected on monitor.	• Confirm PADDLES lead selected.
	Devices not properly connected.	• Disconnect and reconnect monitor and defibrillator.
	No defibrillator power.	• Lift up defibrillator display module to confirm power turns on and messages appear on defibrillator display. If no power, replace battery.
	Foreign material on electrical contacts where devices connect.	• Disconnect the defibrillator and monitor. Inspect electrical contacts on both devices, clean, and reconnect.
8 **LIFEPAK5 or 250 defibrillator:** Patient did not "jump" (no visible muscle response during defibrillator discharge).	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.	• No action specified.

MAINTAINING THE EQUIPMENT

This section describes how to perform operator-level maintenance, testing, and troubleshooting for the LIFEPAK 11 monitor and selected accessories. For additional information about accessories, refer to specific accessory Operating Instructions. Topics in this section include:

General Maintenance and Testing

Periodic maintenance and testing of the LIFEPAK 11 monitor 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 with the monitor or accessories, refer to Troubleshooting on page 9-14. 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 9-7.

Maintenance and Testing Schedule

Table 9-1 lists the recommended maintenance and testing schedule for clinical personnel when using the LIFEPAK 11 monitor alone or with the LIFEPAK 5 or LIFEPAK 250 defibrillators.

Note. Refer to the LIFEPAK 11 defibrillator/pacemaker Operating Instructions for the maintenance and testing schedule for the LIFEPAK 11 monitor/defibrillator/pacemaker. 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.

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 9-1 Recommended maintenance schedule for clinical personnel

	Daily	After Use	As Required	3 Months	6 Months
Inspect monitor.	●		●		
Clean monitor.		●	●		
Check that all necessary supplies and accessories are present (e.g., fully-charged batteries, gel, recorder paper, patient ECG cable, electrodes, etc.).	●	●			
Check/change recorder paper.	●				
Operation tests:					
General Test	●				
Patient ECG Cable Test			●		
Landline Transmission Test			●		
Cellular Transmission Test			●		
AUX POWER Test			●		
LIFEPAK 5 defibrillator Test			●		
LIFEPAK 250 defibrillator Test			●		
FASTPAK batteries: Reconditioning (alternate with Shelf Life Test below).				●	
FASTPAK batteries: Shelf Life Test.					●

Inspection

Before any testing, perform a thorough visual inspection of the monitor case, accessories, and cables as described in Table 9-2.

Table 9-2 Inspection

Items	Inspect for	Recommended Corrective Action
LIFEPAK 11 monitor case, accessories	Gel or foreign substances	Clean as defined in Table 9-3
	Damage or cracks, improper mechanical function of controls, covers, keypads, switches, recorder door	Contact service to replace or repair
LIFEPAK 11 monitor battery pins	Loose pins	Tighten if loose
	Bent, broken, corroded, worn, or damaged pins	Contact service to replace
LIFEPAK 11 monitor electrical slide contacts	Gel or foreign substances	Clean as defined in Table 9-3
	Corrosion, deformities, bends, cracks, or breaks (look closely for breaks at location where contact enters the case)	Contact service to replace or repair
LIFEPAK 11 monitor Patient ECG Cable and other cables	Gel or foreign substances	Clean as defined in Table 9-3
	While bending and flexing cable, inspect for cracks, damage, cuts or abrasions, extreme wear, exposed inner wires, broken or bent connectors and pins	Replace

Cleaning

Clean the LIFEPAK 11 monitor, cables, and accessories as described in Table 9-3. Use only the cleaning agents listed in Table 9-3.

⚠ 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 11 monitor or accessories unless otherwise stated in accessory Operating Instructions.

Table 9-3 Recommended cleaning

Item	Cleaning Practice	Recommended Cleaning Agents
LIFEPAK 11 monitor case, display, crevices, cracks, cables	Clean with damp sponge or cloth.	• Quaternary ammonium compounds • Isopropyl alcohol • Peracetic acid (peroxide) solutions
LIFEPAK 11 monitor recorder	Lift up door, 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.

LIFEPAK 11 monitor General Test

Equipment Needed

- LIFEPAK 11 monitor
- Fully-charged battery

Test Procedure

1. Thoroughly inspect the LIFEPAK 11 monitor as described in Table 9-2.
2. Remove the battery and inspect the battery pins for damage.
3. Install a fully-charged battery in the monitor. Make sure recorder paper is installed in the recorder.
4. Turn the monitor POWER switch to BATT, adjust the CONTRAST control, and confirm the monitor powers on.
5. After a few seconds confirm the monitor displays a flat-line signal with no SERVICE message displayed.
6. Press RECORD and confirm the recorder prints a recorded ECG report with the time and date. Press RECORD to turn off the recorder.

Patient ECG Cable Test

Equipment Needed

- LIFEPAK 11 monitor
- Patient ECG cable with limb lead and precordial lead attachments
- 12-lead ECG simulator (with batteries)
- Fully-charged battery

Test Procedure

1. Thoroughly inspect the patient ECG cable as described in Table 9-2.
2. Install a fully-charged battery in the monitor. Make sure recorder paper is installed in the recorder.
3. Connect the patient ECG cable with limb lead and precordial lead attachments to the monitor.
4. Connect all cable leads to the 12-lead ECG simulator.
5. Turn the monitor POWER switch to BATT, adjust the CONTRAST control, and confirm the monitor powers on.
6. Turn the simulator power on and select a rhythm.
7. After a few seconds confirm the monitor displays a rhythm with no SERVICE or LEADS OFF messages displayed.
8. Press 12 LEAD and wait for the printout. Examine the printout and confirm a rhythm is printed for each lead.

LIFEPAK 11 monitor Landline Transmission Test

To perform this test, you need access to a destination device that can receive a transmitted report.

Equipment Needed

- LIFEPAK 11 monitor
- Fully-charged battery
- Telephone cord (with RJ11 connectors)
- Access to PSTN telephone line
- Access to destination device (RS 100 receiving station).

Test Procedure

1. Confirm the destination device is on and ready to receive a report. Notify personnel at the destination about the planned test.
2. Install a fully-charged battery in the monitor.
3. Connect the telephone cord to the LIFEPAK 11 monitor LANDLINE connector and to the PSTN telephone line outlet.
4. Turn the monitor POWER switch to BATT and adjust the CONTRAST control.

5 Press the TRANSMIT button on the monitor to display the Transmit Screen.
6 Confirm that the displayed telephone number is correct for the intended destination. If incorrect, enter the appropriate number on the alphanumeric keypad (or press the LOCATION softkey to select the appropriate preset number).
7 Confirm that the third softkey from the left is labeled LANDLINE (or press the SYSTEM CONNECTOR softkey to change the label to LANDLINE).
8 Press the TRANSMIT button again to transmit the report.
9 Confirm that the monitor completes the transmission and displays the message TRANSMISSION COMPLETE.
10 Contact a person at the destination device location and confirm the report was successfully received.

LIFEPAK 11 monitor Cellular Transmission Test

To perform this test, you need access to a destination device which can receive a transmitted report.

Equipment Needed

- LIFEPAK 11 monitor
- Fully-charged battery
- Access to cellular network service
- Access to destination device (RS 100 receiving station).
- Cellular telephone equipment: typically the Physio-Control cellular modem, monitor-to-modem cable, telephone cord, cellular phone, and any required supporting equipment such as a cellular connection device, external antenna, and phone batteries.

Test Procedure

1 Confirm the destination device is on and ready to receive a report. Notify personnel at the destination about the planned test.
2 Install a fully-charged battery in the monitor.
3 Connect the cellular telephone equipment to the monitor (refer to page 7-7 for connection information).
4 Apply power to the cellular phone.
5 Turn the monitor POWER switch to BATT and adjust the CONTRAST control.
6 Press the TRANSMIT button on the monitor to display the Transmit Screen.
7 Confirm that the displayed telephone number is correct for the intended destination. If incorrect, enter the appropriate number on the monitor alphanumeric keypad (or press the LOCATION softkey to select the appropriate preset number).
8 Confirm that the third softkey from the left is labeled SYSTEM CONNECTOR (or press the LANDLINE softkey to change the label to SYSTEM CONNECTOR).
9 Press the TRANSMIT button again to transmit the report.
10 Confirm that the monitor completes the transmission and displays the message TRANSMISSION COMPLETE.
11 Contact a person at the destination device location and confirm the report was successfully received.

LIFEPAK 11 monitor AC AUX POWER Test

The AC Auxiliary Power Supply may not be available for use in all countries. Contact your local Physio-Control representative.

Equipment Needed

- LIFEPAK 11 monitor
- AC Auxiliary Power Supply with access to power source.

Test Procedure

1. Confirm the AC Auxiliary Power Supply is connected to AC power and the rear panel MAINS POWER switch is set to 1 (ON).
2. Confirm the AC Auxiliary Power Supply front panel POWER light is illuminated.
3. Make sure the battery is removed from the monitor.
4. Connect the power module to the monitor.
5. Turn the monitor POWER switch to AUX, adjust the CONTRAST control, and confirm the monitor powers on with no SERVICE message displayed.
6. Install a battery in the monitor and confirm the left battery charging light illuminates on the power module.

LIFEPAK 11 monitor and LIFEPAK 5 defibrillator Test

This procedure tests the PADDLES ECG monitoring function and synchronized cardioversion function for the LIFEPAK 5 defibrillator when connected to the LIFEPAK 11 monitor. To test other defibrillator functions, refer to the defibrillator Operation Instructions.

⚠ WARNING **Shock hazard.**

When discharged as described in this test, the defibrillator delivers up to 20 joules of electrical energy. Unless discharged properly as described in this test, this electrical energy may cause serious personal injury. Do not attempt to perform this test unless you are qualified by training and experience and are thoroughly familiar with these Operating Instructions, the defibrillator Operating Instructions, and the function of all controls, indicators, and any accessories used for the test.

Equipment Needed

- LIFEPAK 11 monitor
- Patient ECG cable with limb lead attachment
- LIFEPAK 5 defibrillator
- ECG simulator (with batteries)
- Fully-charged batteries
- Battery Support System

Test Procedure

1. With the monitor and defibrillator not connected, thoroughly inspect the metal slide contacts where the devices can be joined. Remove any foreign substance.
2. Connect the monitor and defibrillator.
3. Install fully-charged batteries in the monitor and the defibrillator.
4. Turn the monitor POWER switch to BATT, adjust the CONTRAST control, and confirm the monitor powers on.
5. Press the monitor LEAD SELECT to select PADDLES lead.
6. Remove the paddles from the paddle storage area. Hold the paddles apart, gently shake them, and confirm the monitor displays a noisy, distorted signal.
7. Place the paddle electrodes firmly together and confirm the monitor displays a flat-line signal.
8. Connect patient ECG cable with limb lead attachment to the monitor.
9. Connect cable leads to the ECG simulator.
10. Turn simulator power on and select a normal sinus rhythm.
11. Press the monitor LEAD SELECT to select LEAD II.
12. Press the defibrillator POWER switch on the STERNUM paddle and confirm the green light illuminates.
13. Rotate the APEX paddle ENERGY JOULES switch to select 20 joules.
14. Press the red SYNC button on the defibrillator and confirm the red light in the SYNC button is on.

15 Confirm the monitor displays the triangle sense markers on QRS complexes. If sense markers do not appear or appear in the wrong locations, adjust ECG SIZE until they appear on the QRS complexes.
16 Place the paddles firmly on the Battery Support System test load plates. Make sure the paddle electrodes do not contact your hands or any surface except the test load plates.
17 Press the black CHARGE button on the APEX paddle to initiate the charge.
18 When defibrillator is fully charged (the CHARGE light glows steadily) simultaneously press and hold red discharge buttons on both paddles.
19 Confirm the defibrillator discharges when the next sense marker occurs. Confirm the red light in the SYNC button turns off after the discharge.
20 Place defibrillator paddles back into the paddle storage area.

LIFEPAK 11 monitor and LIFEPAK 250 defibrillator Test

This procedure tests the paddles ECG monitoring function for the LIFEPAK 250 defibrillator when connected to the LIFEPAK 11 monitor. To test other defibrillator functions, refer to the defibrillator Operating Instructions.

Equipment Needed

- LIFEPAK 11 monitor
- LIFEPAK 250 defibrillator
- Physio-Control Patient Simulator (with batteries)
- Fully-charged batteries

Test Procedure

1 With the monitor and defibrillator not connected, thoroughly inspect the metal slide contacts where the devices can be joined. Remove any foreign substance.
2 Connect the monitor and defibrillator.
3 Install fully-charged batteries in monitor and defibrillator.
4 Turn the monitor POWER switch to BATT, adjust the CONTRAST control, and confirm the monitor powers on.
5 Press the monitor LEAD SELECT to select PADDLES lead.
6 Connect the defibrillation cable to the Patient Simulator.
7 Press the Patient Simulator ON button to turn on power.
8 Press Patient Simulator NSR button and confirm red indicator is illuminated.
9 Lift up the defibrillator display module to apply power to the defibrillator.
10 Confirm that the monitor displays the NSR ECG rhythm.

Battery Maintenance and Testing

The LIFEPAK 11 diagnostic cardiac monitor uses FASTPAK Nickel-Cadmium (NiCad) batteries. These NiCad batteries must be properly maintained using the Battery Support System to help maximize battery life and performance. For more information, refer to the Battery Support System Operating Instructions and LIFEPAK 11 diagnostic cardiac monitor Service Manual.

⚠ **WARNINGS**

Possible power failure.

Using a battery affected by voltage depression may result in power failure during patient care without warning. Be sure to properly maintain batteries as described in this section.

Possible instrument failure.

Physio-Control has no information regarding the performance or effectiveness of the LIFEPAK 11 monitor if used in conjunction with non-FASTPAK Physio-Control batteries or remanufactured or alternate source batteries or chargers from other sources. Use only the Physio-Control FASTPAK batteries and the Battery Support System.

Possible battery damage.

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

Possible instrument failure.

The AC Auxiliary Power Supply does not maintain batteries. Use only the Battery Support System to maintain batteries. The AC Auxiliary Power Supply does not replace the Battery Support System.

Possible instrument failure.

Failure to charge a stored battery before returning it to active service may result in premature power failure of the monitor or defibrillator during patient care. Always charge a stored battery before returning it to active service.

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) will prevent 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 in Figure 9-1 on page 9-10. 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 the maximum recommended 25.5°C (78°F).

Self-Discharge Rate

Like most batteries, NiCad batteries self-discharge when they are not used. A new NiCad battery self-discharges approximately 1% of its capacity each day when stored at room temperature. In ten days a new NiCad battery not installed in the defibrillator/monitor loses approximately 10% of its capacity. The self-discharge rate of the battery can be evaluated by performing a Shelf-Life Test. 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.

⚠ CAUTION **Possible battery damage.**

Remove and replace a battery when the LOW BATTERY message first appears. Over-discharging can shorten battery life.

Charging a Battery with the Battery Support System

To charge a battery in the Battery Support System:

1. Insert the battery in one of the three battery compartments. Confirm the CHARGE light is on indicating the charge cycle has begun.
2. Periodically check on the battery until the READY light is on (full charge requires approximately 70 minutes). The battery is now fully charged and ready for use.

The FAULTY Light

If the Battery Support System displays the FAULTY light when a battery is installed, leave the battery installed for up to 30 minutes. Then remove and reinsert the battery to reinitiate the charge cycle. If the FAULTY light remains on, discard the battery.

Using the Battery Support System to Maintain Batteries

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. This may lead to *irreversible* cell damage.
- Place the Battery Support System in proper location.
  - 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 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 9-1. 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 9-17.

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

P/N 806017–001 © 1993 Physio-Control Corporation

Figure 9-1 Reconditioning Procedure form

Perform Shelf Life Test Every Six Months

The Shelf Life Test evaluates the self-discharge rate of a stored battery. Perform the Shelf Life Test described in Figure 9-2 *every six months, or alternate it with the Reconditioning Procedure in Figure 9-1 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 9-17.

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

P/N 806018–001 © 1992 Physio-Control Corporation

Figure 9-2 Shelf Life Test

Use Battery Maintenance Log

The Battery Maintenance Log shown in Figure 9-3 is available to help track battery maintenance procedures. For information about ordering copies of the Battery Maintenance Log, refer to page 9-17.

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 © 1992 Physio-Control Corporation Technical Service 1(800) 442–1142 USA

Figure 9-3 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 in Figure 9-1.

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.

Discarding Batteries

When properly maintained, the Physio-Control FASTPAK NiCad batteries should have a battery life of approximately two years. Discard a battery in an environmentally safe manner if *one or more* of the following circumstances occur:

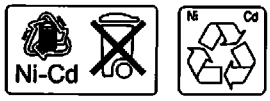
- Battery capacity is less than 80% *after* reconditioning
- There is a difference of *greater than 20* after performing a battery Shelf Life Test
- There is physical damage to the battery case
- The Battery Support System indicates FAULTY when you try to recharge the battery

Recycling Batteries

When properly maintained, the Physio–Control NiCad batteries should have a battery life of approximately 2 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 on of these symbols:



When a Physio–Control NiCad battery has reached the end of its useful life, recycle the battery as described below.

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. Control your local Physio-Control representative for assistance.

Troubleshooting

If a problem with the monitor is detected during operation or testing, refer to the troubleshooting tips in Table 9-4. If the problem cannot be corrected, remove the monitor from active service and contact a qualified service technician for service and repair.

Table 9-4 General troubleshooting tips

Observation	Possible Cause	Corrective Action
1 Monitor screen display blank with POWER on.	Contrast requires adjustment.	• Adjust CONTRAST control.
	Screen display not functioning properly.	• Print ECG on recorder as backup; contact service for repair.
2 No power when POWER switch turned to BATT.	Low battery voltage.	• Replace battery with fully-charged, properly-maintained battery.
	Battery connector pin loose, covered with foreign substance, or damaged.	• Remove battery and inspect pins. Tighten if loose, clean if foreign substance present. Contact service personnel to replace if bent or cracked.
3 No power when POWER switch turned to AUX.	Improper connection between AC Auxiliary Power Module and monitor or power source.	• Check AC Auxiliary Power Supply power source connections and cables. • Make sure AC Auxiliary Power Supply MAINS POWER is set to I (ON).
4 SERVICE message.	Monitor self-test circuitry detects service condition.	• Report occurrence of message to service personnel. To try to remove message, turn off monitor power, then apply power again.
5 ECG monitoring problems.		• Refer to page 3-6.
6 12-lead ECG acquisition problems.		• Refer to page 4-12.
7 Recorder problems.		• Refer to page 5-9.
8 Communications problems.		• Refer to page 7-12.
9 Problems with defibrillation or when monitoring with a defibrillator.		• Refer to Section 8.
10 Clock resets to January 1 and a SERVICE message appears.	Monitor self-test circuitry detects a service condition.	• Contact your Physio-Control service representative.

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 11 monitor requires service as indicated by testing, troubleshooting, or the SERVICE message, 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 11 monitor 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 11 monitor are listed in Table 9-5. For information about ordering, contact the local Physio-Control representative. In the USA, call 1-800-442-1142.

Table 9-5 Supplies, Accessories, and Training Tools

Description	Part Number
AC Auxiliary Power Supply	806311
DC Auxiliary Power Supply	806311
Battery Support System	801807
Battery Support System wall bracket assembly	802562
12-Lead ECG Patient Simulator	805505
Cellular modem	805410
RS 100 receiving station	805285
Receiving station modem	805634
Patient ECG cable (includes main cable, limb lead attachment, and precordial lead attachment)	805265
FASTPAK battery	09-10424
Recorder paper, 100mm	805319
LIFE•PATCH ECG electrodes, adult	800139
Event key label (applied under keypad cover)	806121
Soft carrying case, LIFEPAK 11 monitor only	806099
Soft carrying case, LIFEPAK 11 monitor and LIFEPAK 5 defibrillator	806098
CELLPAK kit (does not include cellular modem or cellular phone)	805505
Cables:	
DC output cable for the AC Auxiliary Power Supply	804219
Telephone cord (with RJ11 connectors)	805500
Monitor-to-modem cable (connects LIFEPAK 11 monitor and Physio-Control cellular modem)	805635
Monitor-to-OTS modem cable (connects LIFEPAK 11 monitor to Off-The-Shelf non-Physio-Control external modem; available with DB9 or DB25 connector—consult Physio-Control)	3005939
Monitor-to-monitor cable (connects two monitors—for transferring configurations only)	806544
Literature:	
LIFEPAK 11 monitor Operating Instructions	805493
LIFEPAK 11 monitor Service Manual	805494
LIFEPAK 11 monitor General Reference Card	806014
LIFEPAK 11 monitor Communications Reference Card	805258
Physio-Control cellular modem Operating Instructions	805313
Physio-Control cellular modem Service Manual	806294
CELLPAK Reference Guide	806332
Physician's Guide to ECG Analysis	805260
Reconditioning Procedure check sheet	806017
Shelf Life Test check sheet	806018
Battery Maintenance Log check sheet	806019

⚠ CAUTION **Possible excessive leakage current.**

Accessories or products other than those described in the *LIFEPAK 11 monitor Operating Instructions* may increase the overall leakage current if connected to the LIFEPAK 11 monitor.

SETUP/CONFIGURATION OPTIONS

The User Configuration Options allow you to define operating features for the LIFEPAK 11 monitor such as device identification numbers, power-on default settings, and 12-lead ECG operating functions. This section describes how to access and define the User Configuration Options:

Overview of Options and Factory Settings

All User Configuration Options are listed in Table 10-1 along with the factory settings. The far right column (User Settings) is blank to allow you to photocopy Table 10-1 and write down the customized settings for your monitor.

Write Down Configurations Before Service or Repair

If the monitor receives service or repair which affects the internal memory components such as replacement of the main printed circuit board, any changes previously made to the option definitions may be lost from memory. Before allowing service or repair, be sure to write down the current User Configuration Options in Table 10-1 so the customized definitions may be reentered after service or repair.

Password Security

To prevent unauthorized access, a security password is required for access to the User Configuration Options. The password definition is part of the Device Identification option and may be changed.

Memory Storage of Configuration Options

User Configuration Option definitions are stored in memory and retained, even after the monitor POWER switch is turned off or the battery is removed. Whenever you redefine options, the option changes are immediately stored in memory.

After redefining an option, do not turn off the power until the software updates the memory and the monitor displays the new option definition. Turning the power off prematurely may cause the User Configuration Options and Service Options to return to their default settings.

Table 10-1 User Configuration Options

Category	Option	Factory Settings	User Settings
DEVICE IDENTIFICATION	SITE #:	000	_____
	DEVICE #:	000	_____
	PASSWORD:	Blank (no password required)	_____
DEVICE FEATURES	PATIENT ID SCREEN AVAILABLE?:	YES	_____
	NUMBER OF 12-LEAD COPIES?:	1	_____
	CODE SUMMARY™ FORMAT?:	LONG	_____
	12-LEAD CHANNEL FORMAT?:	3	_____
	PRINT INTERPRETATION ON 12-LEAD?:	YES	_____
	PRINT JUSTIFICATION ON 12-LEAD?:	NO	_____
	PRINT ACUTE MI MESSAGE?:	YES	_____
	12-LEAD DATA STORAGE MODE?:	2.5	_____
	12-LEAD DATA ACQUISITION MODE?:	POST	_____
	COMMUNICATIONS MODULE?:	NO	_____
STARTUP DEFAULTS	DISPLAY LEAD:	LEAD II	_____
	PRIMARY FILE IDENTIFIER:	NAME	_____
	TRANSMISSION PORT:	SYSTEM	_____
	TRANSMISSION AUDIO:	AUTO	_____
	RECORD FREQUENCY RESPONSE:	MONITOR	_____

TRANSMIT SET-UP

LABEL	DEFAULT RATE*	PHONE NUMBER*

*Factory setting is 38400 default rate, DIRECT connection.

MODEM INITIALIZATION

AT*
AT*
AT*
AT

*Factory settings:
String 1: ATE0V0X4
String 2: ATS12=38S7=60S10=50:E0@M18*H1)M1
String 3: AT\N2\J0W0%C0\A3&D2&S1-K1%G1%B2400
String 4: (blank)

DEFAULT PRINTER LEAD GROUP	CHANNEL 1:	LEAD I	_____
	CHANNEL 2:	LEAD II	_____
	CHANNEL 3:	LEAD III	_____

EVENT KEY DEFINITIONS

KEY	EVENT	KEY	EVENT
X	EVENT MARK		

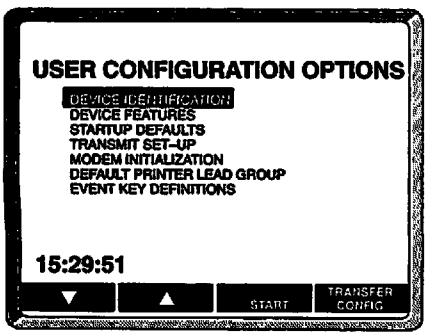
How to Access User Configuration Options

To access the User Configuration Options:

1 Begin with monitor POWER switch OFF.

2 Turn POWER to BATT while pressing and *holding down* the EXIT and CODE SUMMARY buttons. Keep holding down these buttons for several seconds until the Password Screen is displayed:

3 Use the alphanumeric keypad to enter the password, then press the ENT key to display the User Configuration Options screen:



If you do not enter the password correctly, the monitor exits the Password screen and displays the Home screen. To access the Password screen again, perform steps 1 and 2 as described above. If the password is configured as blank (like the factory setting) no password is required (press ENT).

4 Press the ▽ or △ softkeys to highlight the desired option.

5 Press the START softkey to access the options screen. To make changes in the displayed options screen:

- Press softkeys ▽ or △ to move through the fields.
- Press the SET softkey (if available) to change a setting.
- After the desired changes are entered:
- Press the NEXT SCREEN softkey to advance to the next options screen or press EXIT to return to the User Configuration Options screen.

6 After the desired changes are entered, press EXIT to exit the User Configuration Options screen and return to the Home screen.

The TRANSFER CONFIG softkey on the User Configuration Options screen is used when transferring configurations to another monitor. Refer to page 10-11 for the procedure.

Device Identification

The Device Identification options allow entry of a unique site number, device number, and password (for softkey descriptions, refer to Step 5 on page 10-4):

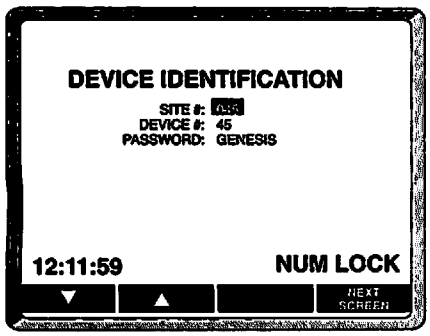


Table 10-2 Device Identification options

Option	Settings	Description
SITE #:	Any number from 0–999.	Number identifier which prints on reports.*
DEVICE #:	Any number from 0–999.	Number identifier which prints on reports.*
PASSWORD:	Maximum of 8 characters (alpha or numeric). May also be blank.	Restricts access to User Configuration Options.

*If the site number or device number are changed, previously stored reports are unaffected. Reports are reprinted with the site number and device number configured at the time the report was stored.

Device Features

The Device Features options define a variety of operating features affecting 12-Lead ECG reports, printing, and the CODE SUMMARY report (for softkey descriptions, refer to Step 5 on page 10-4):

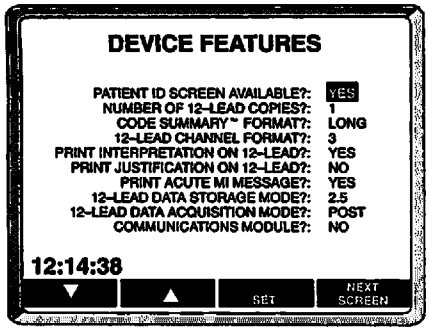


Table 10-3 Device Features options

Option	Settings	Description
PATIENT ID SCREEN AVAILABLE?:	YES or NO.	If YES, the NEXT SCREEN softkey is available on the Home screen and MORE OPTIONS Screen allowing you to enter or change the patient ID. If NO, the softkey is not displayed.
NUMBER OF 12-LEAD COPIES?:	Number 1 to 9.	Number of copies printed when 12-Lead ECG report acquired.
CODE SUMMARY™ FORMAT?:	SHORT, MEDIUM, or LONG.	Format for printing: SHORT (code abstract), MEDIUM (code abstract and Recorded ECG reports), LONG (code abstract, Recorded ECG reports, and 12-Lead ECG reports).
12-LEAD CHANNEL FORMAT?:	3 or 4.	Format for printing: 3- or 4-channel. See Section 4 for details.
PRINT INTERPRETATION ON 12-LEAD?:	YES or NO.	If YES, the ECG interpretation results are printed on 12-Lead ECG reports.
PRINT JUSTIFICATION ON 12-LEAD?:	YES or NO.	If YES, justification for the ECG interpretation results is printed on 12-Lead ECG reports. If the preceding PRINT INTERPRETATION ON 12-LEAD is set to NO, this option is NO.
PRINT ACUTE MI MESSAGE?:	YES or NO.	If YES, the ACUTE MI message is printed on 12-Lead ECG reports when applicable. If the preceding PRINT INTERPRETATION ON 12-LEAD is set to NO, this option is NO.
12-LEAD DATA STORAGE MODE?:	2.5 or 10 seconds.	Defines how many seconds of data are stored for each 12-Lead ECG report.
12-LEAD DATA ACQUISITION MODE?:	PRE or POST.	Determines whether the 12-lead function analyzes the 10 seconds of data acquired before (PRE) or after (POST) the 12 LEAD button is pressed.
COMMUNICATIONS MODULE?:	YES or NO.	Not used at this time.

Startup Defaults

The Startup Defaults options define the power-on settings for five features (for softkey descriptions, refer to Step 5 on page 10-4):

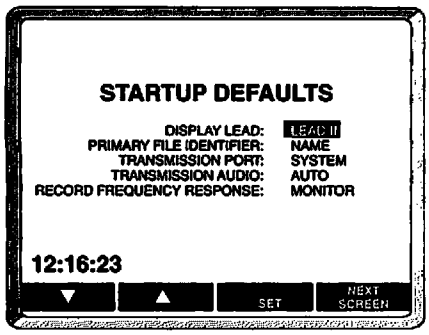


Table 10-4 Startup Defaults options

Option	Settings	Description
DISPLAY LEAD:	LEAD I, II, III, or PADDLES.	Lead displayed at power-on.
PRIMARY FILE IDENTIFIER:	NAME or ID.	Determines whether patient information is presented by name or ID whenever there is not enough room to display both references.
TRANSMISSION PORT:	SYSTEM or LANDLINE.	Default transmission connector at power-on.
TRANSMISSION AUDIO:	ON, AUTO, or OFF.	Determines whether the landline transmission tones are audible. If AUTO, the transmission tones are audible until the carrier is detected, then the tones are disabled.
RECORD FREQUENCY RESPONSE:	MONITOR or DIAG (diagnostic)	Defines the default printer frequency response for continuous recorder operation and non-12-Lead ECG reports (12-Lead ECG reports are always initially printed in diagnostic mode). Every report is stored in memory in diagnostic frequency response. However, each report is printed in the same frequency response that was selected at the time stored unless the operator manually overrides this selection at the time of printing by pressing the MONITOR or DIAG softkey. This manual override only applies to the current report; after the report is printed, subsequent reports are reprinted in the same frequency response selected when they were stored.

Transmit Set-Up

The Transmit Set-Up option allows entry of phone numbers, labels, and baud rates for transmit locations available through the Transmit screen when transmitting reports. Up to 9 transmit locations may be defined (for softkey descriptions, refer to Step 5 on page 10-4):

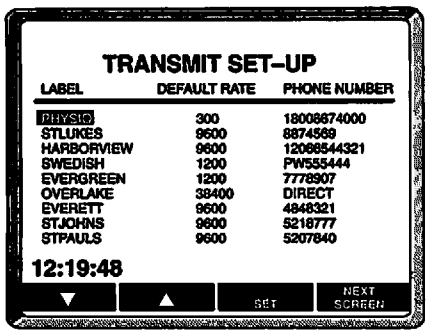


Table 10-5 Transmit Set-Up option

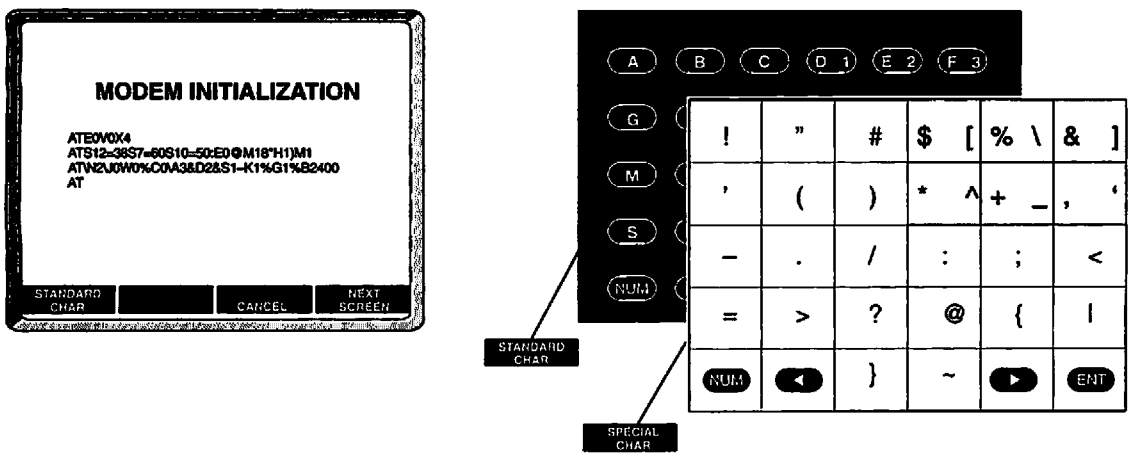
Field	Settings	Description
LABEL	Maximum 10 characters (alpha or numeric).	Name of destination displayed on Transmit screen.
DEFAULT RATE	300, 1200, 2400, 4800, 9600, 19200, or 38400.	Transmission baud rate.
PHONE NUMBER	Maximum 14 digits.* Allowable characters are 0-9, P, W.	Transmission phone number displayed on Transmit screen. If no number is entered, a direct connection is assumed (the monitor supplies the word DIRECT if this field is blank). • P causes pulse dialing. • W inserts a two-second wait period.

*When defining the preset telephone numbers, configure only the local number. The user may add an area code or access code prefix if needed at the time of transmission.

Modem Initialization

The Modem Initialization option allows entry of character strings which the monitor uses to initialize a non-Physio-Control modem (if used). These strings do not pertain to a Physio-Control modem. Up to four 35-character strings may be defined. Only complete commands in each string are valid; commands cannot extend beyond a single line.

The default character strings are shown in the Modem Initialization screen. The LIFEPAK 11 monitor always prefixes every character string with the "AT" command as shown.



When defining your own character strings, you may use the alphanumeric keypad to enter either standard alphanumeric characters or a set of special characters shown above.

To access standard characters:

- Make sure the STANDARD CHAR softkey is displayed.
- To enable or disable the number keys, press the NUM key.

To access special characters:

- Make sure the SPECIAL CHAR softkey is displayed (press the STANDARD CHAR softkey to change the label to the SPECIAL CHAR softkey; press again to change back).
- For the six gray-shaded characters in the upper right, press the NUM key to enable the character on the right (with NUM LOCK message displayed) or enable the left character (no NUM LOCK message displayed).

To redefine the character strings:

1. Enter the desired characters.
2. Press ENT to advance to the next character string.
3. After the desired character strings are defined, press the NEXT SCREEN softkey to advance to the Default Printer Lead Group option screen or press EXIT to return to the Configuration Options screen.

To cancel all text changes entered since accessing the Modem Initialization screen, press the CANCEL softkey.

To restore the original factory default character strings, use the left-arrow backspace key ◄ to clear all text from every line, then press EXIT.

For more information about connecting non-Physio-Control external modems to the LIFEPAK 11 monitor, refer to the *LIFEPAK 11 diagnostic cardiac monitor Service Manual.*

Default Printer Lead Group

This option defines a default group of three ECG leads. If any one of the three leads in the default lead group is displayed on the monitor screen when you press RECORD, the recorder prints the default lead group. Any three of the 12 leads may be selected for the three channels (PADDLES is not available for the default lead group). The initial factory settings are shown below (for softkey descriptions, refer to Step 5 on page 10-4):

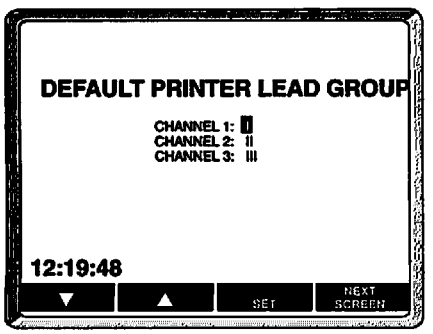


Table 10-6 Default Printer Lead Group options

Option	Settings	Description
CHANNEL 1 CHANNEL 2 CHANNEL 3	Any one of the 12 leads may be selected for any channel.	Default group of three leads which the recorder prints if one of the three leads in the group is selected when the recorder is activated.

Event Key Definitions

The Event Key Definitions option allows definition of up to 20 of the alphanumeric keys as "event markers." If the operator presses one of the defined event keys during monitoring, the corresponding event definition is stored in the patient's CODE SUMMARY report. The Event Key Definitions screen is shown below with some sample event keys defined. Press softkeys ▽ or △ to move through the fields. Press the PRINT SCREEN softkey to print a copy of the event key definitions. Press the NEXT SCREEN softkey to advance to the Device Identification options screen or press EXIT to return to the User Configuration Options screen.

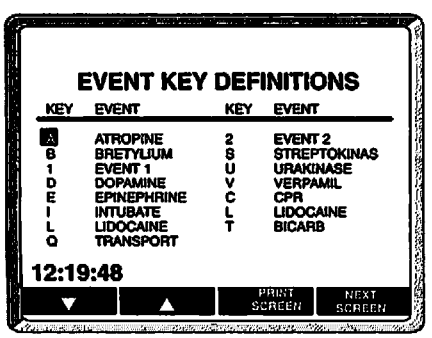


Table 10-7 Event Key Definitions options

Field	Settings	Description
KEY	Any single alphanumeric character.	Event key.
EVENT	Maximum of 12 alphanumeric characters.	Defines event. When operator presses event key during monitoring, this event definition is stored in CODE SUMMARY report.

Transferring Configurations to Another Monitor

The TRANSFER CONFIG softkey on the User Configuration Options screen (page 10-4) allows you to transfer User Configuration Options from one monitor to a second nearby monitor. After transferring configurations, the second monitor is reconfigured with the same User Configuration Options as the originating monitor except for the device number (DEVICE #) which remains unchanged. Both monitors must be displaying the User Configuration Options screen in order to transfer the information. If the second monitor has a later software version that defines additional User Configuration Options not existing in the originating monitor software, these fields are not affected by the transfer.

The monitors must be connected through the SYSTEM CONN connectors using the Monitor-to-monitor cable. The information cannot be transferred through the LANDLINE connector or to a remote monitor via telecommunications.

To transfer configurations, perform the following steps:

1. Make sure that both monitors are displaying the User Configuration Options screen.
2. Connect the Monitor-to-monitor cable (Part Number 806544) to the SYSTEM CONN connector on each monitor.
3. Press the TRANSFER CONFIG softkey on the *originating* monitor to initiate the transfer.
4. Observe the originating monitor screen for the displayed message. Refer to the message description in Table 10-8 and take appropriate action (if required).

Table 10-8 Possible screen messages during configuration transfer

Screen Message	Description
TRANSFERRING CONFIGURATION	Displayed on both monitors while they transfer the information.
TRANSFER COMPLETE	Displayed on both monitors if information transfer successfully completes.
TRANSFER FAILED	Displayed on both monitors (accompanied by three beeps) if they begin transferring information but cannot complete the operation successfully. • To restart the operation, begin with Step 1 above. • To abandon operation, press EXIT to exit to the Home screen.
CHECK CABLE	Displayed by the originating monitor (accompanied by three beeps) if the cable is not connected properly or the receiving monitor is not displaying the User Configurations Options screen. • Reconnect the cable. If the monitors do not resume transfer, repeat the procedure beginning with Step 1 above. • If the Options screen is not displayed, repeat the procedure beginning with Step 1 above.

APPENDIX A: SCREEN MESSAGES

Table A-1 lists and describes screen messages that the LIFEPAK 11 monitor may display during operation. The messages are listed in alphabetical order with a page reference for more information.

If the monitor displays a message not listed in Table A-1, contact Physio-Control Corporation for more information.

Table A-1 Summary of screen messages

Message	Operation	Description	Page
ACQUIRING 12-LEAD #x	Acquiring a 12-Lead ECG	Monitor is acquiring the data for 12-Lead ECG report #x.	4-5
ANALYZING 12-LEAD #x	Analyzing a 12-Lead ECG	Monitor is analyzing the data for 12-Lead ECG report #x.	4-5
BUSY	Data communications	Destination appears busy. Destination phone is busy or not answering.	7-12, 7-14
CANNOT TRANSMIT REPORT	Data Communications	Attempt was made to transmit a report with data error (cannot be transmitted).	7-12, 7-14
CHECK CABLE	Transferring configurations	Displayed by originating monitor if cable is not connected properly or receiving monitor is not displaying User Configurations Options Screen.	10-11
CHECK PADDLES AND ELECTRODES	Defibrillation	Displayed in conjunction with the ENERGY NOT DELIVERED message.	8-13
CHECK PAPER	Creating patient reports	The recorder is out of paper or jammed.	5-4
CHECK PHONE	Data communications	Monitor waiting for response from modem. Cable disconnected or phone service not active.	7-12, 7-14
CONNECT LEADS CONNECT ECG LEADS	ECG monitoring	An ECG electrode is disconnected.	3-5
CONNECTION FAILED	Data communications	Monitor does not transmit successfully and stops trying. Destination phone is busy or not answering.	7-12, 7-14
*** DATA ERROR ***	Data Communications	Report contains a data error (cannot be transmitted).	7-12, 7-14
DATA ERROR DETECTED	Data Communications	Attempt was made to transmit a report with data error (cannot be transmitted).	7-12, 7-14
DIALING	Data communications	Monitor is waiting for dial tone or dialing the phone number. If DIALING displays for a long time with no response, the destination phone may be busy or not answering.	7-11, 7-12, 7-14
ECG LEADS OFF	ECG monitoring	Multiple ECG electrodes are disconnected.	3-5
ENERGY NOT DELIVERED	Defibrillation	No energy was delivered due to open circuit or other condition that prevented the transfer of energy.	8-13
EXCESSIVE NOISE: 12 LEAD REPORT CANCELLED	Acquiring a 12-Lead ECG	This message is displayed if the monitor detects noise too great to record a 12-Lead ECG report, even if you attempt to override the WAITING FOR GOOD DATA message.	4-5
xx LEADS OFF	ECG monitoring	ECG electrode "xx" (such as "RA") is disconnected.	3-5
LA LEADS OFF	ECG monitoring	ECG electrode LA is disconnected.	3-5
LL LEADS OFF	ECG monitoring	ECG electrode LL is disconnected.	3-5

Table A-1 Summary of screen messages, continued

Message	Operation	Description	Page
LOW BATTERY	FASTPAK battery use	Monitor battery voltage is low.	2-7
MODEM INITIALIZATION	Data communications	Monitor is initializing non-Physio-Control external modem.	7-11, 10-9
NO REPORT TO TRANSMIT	Data communications	Attempt was made to transmit a non-12-Lead ECG report to a device which cannot receive non-12-Lead ECG reports.	7-12, 7-14
NO PHONE NUMBER	Data communications	No phone number is specified when transmission attempted.	7-12, 7-14
NUM LOCK	Keypad use	The number keys are enabled on the alphanumeric keypad.	2-5, 2-6
PACING FAULT	Pacing	Pacer has detected a pacing fault condition and pacing function stops.	8-13
PACING LEADS OFF	Pacing	Pacer has detected that the pacing electrodes are not connected or are not making good contact with the patient. Pacing function stops.	8-13
PACING STOPPED	Pacing	Pacing has stopped due to a fault condition or when the pacer is turned off.	8-13
PRINTING 12-LEAD #x	Acquiring a 12-Lead ECG	Monitor is printing 12-Lead ECG report #x.	4-5
PRINTING DEFIBRILLATION #X	Printing patient reports	Monitor is printing defibrillation report #x from the list of stored reports.	8-13
PRINTING PACING EVENT #X	Printing patient reports	Monitor is printing pacing event report #x from the list of stored reports.	8-13
RA LEADS OFF	ECG monitoring	ECG electrode RA is disconnected.	3-5
RECORDER DOOR OPEN	Creating patient reports	The recorder door is open.	5-4
RECORDING	Creating patient reports	Printer is printing the ECG waveforms for the displayed lead and lead group.	5-4
REDIALING	Data communications	Monitor is redialing the phone number. If REDIALING displays for a long time with no response, the destination phone may be busy or not answering.	7-12, 7-14
RL LEADS OFF	ECG monitoring	ECG electrode RL is disconnected.	3-5
SERVICE	Service and repair	The monitor requires service by technical service personnel.	2-6, 9-14, 9-14
STORING 12-LEAD #x	Acquiring a 12-Lead ECG	Monitor is storing the data for 12-Lead ECG report #x.	4-5
STORING DEFIBRILLATION #X	Defibrillation	Monitor is storing data for defibrillation event.	8-13
STORING PACING EVENT #X	Pacing	Monitor is storing data for pacing event.	8-13
STORING RECORDED ECG #x	Creating patient reports	Monitor is storing data for Recorded ECG report #x.	5-4

Table A-1 Summary of screen messages, continued

Message	Operation	Description	Page
SYNC	Synchronized cardioversion	Monitor is connected to a LIFEPAK defibrillator (with synchronous cardioversion capability) and synchronous cardioversion is enabled.	8-4
TOO MANY DIGITS	Data communications	User attempted to specify a phone number with more than 14 digits.	7-12, 7-14
TRANSFER COMPLETE	Transferring configurations	Displayed on both monitors if they successfully complete the information transfer.	10-11
TRANSFER FAILED	Transferring configurations	Displayed on both monitors if they begin transferring information but cannot complete the operation successfully.	10-11
TRANSFERRING CONFIGURATION	Transferring configurations	Displayed on both monitors while they transfer the information.	10-11
TRANSMISSION CANCELLED	Data communications	Operator cancelled transmission in progress by pressing EXIT or another function button.	7-12, 7-14
TRANSMISSION COMPLETE	Data communications	Monitor successfully transmits.	7-11
TRANSMISSION FAILED	Data communications	Monitor could not complete transmission.	7-12, 7-14
xx% TRANSMITTED	Data communications	xx% of the message has been transmitted.	7-11
TRANSMITTING	Data communications	Monitor is transmitting data.	7-11, 7-12, 7-14
Vx LEADS OFF	ECG monitoring	ECG electrode "Vx" (such as "V1") is disconnected.	3-5
WAITING FOR DIAL TONE	Data communications	Monitor waiting for response from modem. Disconnected cable or phone service not active.	7-12, 7-14
WAITING FOR GOOD DATA	Acquiring a 12-Lead ECG	Monitor detects excessive signal interference such as patient motion while acquiring data. Message remains displayed while the monitor attempts to acquire data without interference.	4-5

APPENDIX B: SPECIFICATIONS

Table B-1 lists the specifications for the LIFEPAK 11 diagnostic cardiac monitor.

Table B-1 LIFEPAK 11 diagnostic cardiac monitor specifications

POWER	
AC Input Options	Compatible with Physio-Control AC Auxiliary Power Supply. (The AC Auxiliary Power Supply may not be available for use in all countries; contact your local Physio-Control representative.)
Battery	One nickel-cadmium FASTPAK Battery.
Operating Time	A new fully-charged battery will provide the following prior to shutdown: Typical / Minimum Monitoring only: 2 hours / 1 hour Recording: 1 hour / 20 minutes
Low Battery Indicator	Flashing LOW BATTERY screen message and repeating tone indicate battery is depleted and must be replaced promptly.
Service Indicator	Flashing SERVICE screen message and repeating tone indicate monitor self tests have detected improper operation which may require service attention.
SIZE	
Height	15.7cm (6.2in).
Width	31.2cm (12.3in).
Depth	33.8cm (13.3in).
Weight	5.4kg (11.8lbs) without battery or other accessories.
DISPLAY	100mm (3.9in) wide x 76mm (3.0in) high 640 dot x 200 dot transflective black and white backlit LCD.
DATA MANAGEMENT	
Memory Capacity	50 12-Lead ECG reports or 30 Recorded ECG reports (typical).
Report Types	3-channel or 4-channel 12-Lead ECG report. 3-channel Recorded ECG report. CODE SUMMARY critical event record.
Report Management	Menu-driven selection, printing, transmission, and deletion by patient or individual report.
Event Keys	User-configurable for 20 different event annotations. Event entries recorded in CODE SUMMARY event log.
COMMUNICATIONS	
Serial Data	EIA-RS232E-compatible. Supports Physio-Control cellular modem at 9600bps. Supports TIA/EIA-602-compatible modems at 300, 600, 1200, 2400, 4800, 9600, 19200, and 38400bps (modem must support RTS/CTS flow control).
Internal Modem	1200bps, Bell 212A and CCITT V.22-compatible, RJ11-type connector.
PATIENT ECG CABLE	Three-part design configurable for limb lead or precordial lead monitoring or for 12-lead ECG acquisition with Limb Lead attachment and Precordial Lead attachment.
Length	Approximately 3m (10ft) with all attachments.

Table B-1 LIFEPAK 11 diagnostic cardiac monitor specifications, continued

ECG MONITOR		
Input	All inputs electrically isolated (type CF per IEC 601-1).	
ECG Lead Selection	PADDLES, I, II, III, aVR, aVL, aVF without Precordial Lead attachment.	
	V1, V2, V3, V4, V5, V6 added with Precordial Lead attachment (C1 through C6 for IEC).	
ECG Size	x0.25, x0.5, x1.0, x2.0, x4.0 relative to 10mm/mV.	
Common Mode Rejection	90dB at 60Hz.	
ECG Out Analog Signal	1V/mV at x1.0 gain (for real time ECG signal transmission only; not for transmitting patient reports).	
MONITOR DISPLAY		
Frequency Response	Monitor Quality (Non-Diagnostic)	Nominal Range
	Physio Option	1.0 to 30Hz
	Agency Option	0.5 to 40Hz
	Paddles	2.2 to 30Hz
Heart Rate Meter	20-300bpm.	
	Display symbol "– – –" indicates heart rate is outside range 20-300bpm.	
Sweep Speed	25mm/sec.	
ECG Viewing Area	38mm (1.5in) high x 100mm (3.9in) wide.	
THERMAL ARRAY RECORDER		
Paper Size	100mm (3.9in).	
Print Speed	5, 10, 25, or 50mm/sec.	
Delay	3 seconds.	
Frequency Response	Recorded ECG Report	Nominal Range
	Monitor Quality (Physio Option)	1.0 to 30Hz
	Monitor Quality (Agency Option)	0.5 to 40Hz
	Diagnostic Quality Real Time	0.05 to 150Hz
	Diagnostic Quality Reprints	0.05 to 100Hz
	Paddles	2.2 to 30Hz
	12-Lead ECG Report	Nominal Range
	Monitor Quality Reprints	0.05 to 40Hz
	Diagnostic Quality	0.05 to 150Hz
ENVIRONMENTAL		
Operating Temperature	–10 to +55°C (+14 to +131°F).	
	Operation below 0°C (+32°F) assumes that the unit has been stored (two hours minimum) at +20°C (+68°F) or greater prior to typical clinical use.	
Storage Temperature	–20 to +60°C (–4 to +140°F).	
Atmospheric Pressure	797 to 439mmHg (–570 to +15,000ft).	
Relative Humidity	0 to 95% (non-condensing).	
Water Resistance	IPX4 (splash-proof) per IEC 529	

All specifications at 25°C unless otherwise stated. Specifications subject to change without notice.

APPENDIX C: BASIC OPERATION CHECKLIST

After reviewing this manual, you may use the checklist in Table C-1 to confirm you can perform the listed steps. If you cannot perform any of these steps, review the appropriate sections of this manual. For other operation support, contact your local Physio-Control Corporation representative.

Before performing these steps, review electrode placement locations for limb lead monitoring and 12-lead ECG acquisition. To properly complete all of these steps, you will need the following equipment:

- LIFEPAK 11 monitor and ECG patient cable
- LIFEPAK 5 defibrillator*
- Battery Support System
- Cellular phone equipment
- 12-Lead ECG simulator (with Normal Sinus Rhythm, Ventricular Fibrillation, and Ventricular Tachycardia).

The Basic Operation Checklist for the LIFEPAK 11 defibrillator/pacemaker is provided in the LIFEPAK 11 defibrillator/pacemaker Operating Instructions.

Table C-1 LIFEPAK 11 monitor Basic Operation Checklist

Step		Completed
1	Remove and insert battery.	_____
2	Open recorder door, remove and reinsert paper roll. Close door (press down on PUSH indicators on recorder door).	_____
3	Apply power to monitor.	_____
4	Adjust CONTRAST for best viewing.	_____
5	Assemble patient cable with attachments for 12-lead ECG.	_____
6	Connect patient cable to monitor.	_____
7	Connect patient cable snaps to 12-lead ECG simulator. Apply power to simulator and select NSR (Normal Sinus Rhythm).	_____
8	Press PATIENT ID softkey to access Patient ID screen.	_____
9	Use alphanumeric keypad to enter patient data. (Press ENT to move cursor to next field. Number keys are automatically activated for the AGE field.)	_____
10	Press EXIT to exit Patient ID screen.	_____
11	Press ECG SIZE to adjust gain to X2.0.	_____
12	Press LEAD SELECT to display lead V1.	_____
13	Press RECORD to print Recorded ECG report (press RECORD again to stop).	_____
14	Press 12 LEAD to acquire 12-Lead ECG #1 (observe screen messages; wait until the printing is completed, then go on to the next step).	_____
15	Use alphanumeric keypad to enter an event (press X or some other event key defined for your monitor, then press ENT). **Note.** Events can only be entered from the Home screen; events cannot be entered when another operation is underway such as transmitting, operating the recorder, or acquiring, analyzing, storing, or printing a 12-Lead ECG report.	_____
16	Use alphanumeric keypad to enter a second event.	_____
Data Communications (optional steps 17 through 24). To complete these steps you need access to a telephone line and a Physio-Control® RS 100 receiving station.		
17	Connect cellular phone equipment and cable to monitor SYSTEM CONNECTOR.	_____
18	Turn phone power on and raise or connect antenna as needed.	_____
19	Press TRANSMIT to access Transmit screen.	_____
20	Press REPORT softkey as needed to select RECORDED ECG #1. **Note.** The 3-lead recordings are stored as RECORDED ECG #x and 12-lead ECG reports are stored as 12 LEAD #x.	_____
21	Press LOCATION softkey as needed to display destination phone number or enter destination phone number with monitor alphanumeric keypad.	_____
22	Press TRANSMIT to transmit report (observe status messages on the screen).	_____
23	Press EXIT to return to Home screen.	_____
24	Press CODE SUMMARY to print the CODE SUMMARY report.	_____

Table C-1 LIFEPAK 11 monitor Basic Operation Checklist, continued

Step	Completed
LIFEPAK 5 defibrillator Paddles Monitoring	
25 Connect LIFEPAK 11 monitor and LIFEPAK 5 defibrillator.	_____
26 Confirm battery is installed in defibrillator.	_____
27 Select PADDLES lead on monitor.	_____
28 Remove defibrillator paddles from storage area and hold paddle surfaces together. Confirm flatline is displayed on monitor.	_____
29 Return paddles to paddle storage area.	_____
30 Select lead II on monitor.	_____
Synchronized Cardioversion	
31 Press RECORD on the monitor to operate the recorder.	_____
32 Set the simulator to VT.	_____
33 Remove defibrillator paddles from storage area and press POWER button on STERNUM paddle to apply power.	_____
34 Press red SYNC button on defibrillator. Confirm red light is flashing and monitor displays SYNC message.	_____
35 Adjust ECG SIZE or change displayed lead on monitor as needed to optimize sense marker locations on QRS complexes (triangular markers should appear on each QRS complex).	_____
36 Place paddles firmly on Battery Support System test load plates.	_____
37 Select 20 joules and press the black CHARGE button on the APEX paddle to initiate charge. Loudly announce to anyone else in the area to stand clear.	_____
38 After charging is completed, confirm the shockable VT rhythm, then simultaneously press and hold red discharge buttons on both paddles to discharge.	_____
39 Confirm the defibrillator discharges when the next sense marker occurs. Confirm the red SYNC light is off and the monitor no longer displays the SYNC message.	_____
40 Return paddles to paddle storage area.	_____
41 Press RECORD on the monitor to stop the recorder.	_____
42 Turn the monitor POWER switch to OFF.	_____

APPENDIX D: TELECOMMUNICATIONS NOTICES

Before using the telecommunications functions of the LIFEPAK 11 monitor in the USA or Canada, users should be aware of the following information. Users should also be aware of any other local, state, or national regulations or guidelines which pertain to telecommunications use in their country.

The capability to transmit patient data via telecommunications may not be available in all countries. Contact your local Physio-Control representative for more information.

FCC Notification for US Customers

Under Part 68 of the United States Federal Communications Commission (FCC) regulations, United States customers should be aware of the following:

- This LIFEPAK 11 monitor contains an internal modem (accessible through the LANDLINE connector). This modem complies with Part 68 of FCC regulations. On the underside of the monitor is a label which provides the FCC registration number and Ringer Equivalence Number (REN) for this modem. If requested, this information must be provided to your telephone company.
- This modem is only compatible with a USOC RJ11C jack.
- The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing or answering in response to an incoming call. In most areas, but not all areas, the sum of all RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the telephone line as determined by the total RENs, contact your telephone company to determine the maximum REN for the calling area.
- If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and repair has been made. If this is not done, the telephone company may temporarily disconnect service.
- The telephone company may change its technical operations and procedures; if such changes affect the compatibility or use of this device, the telephone company is required to provide adequate notice of the changes. You will be advised of your right to file a complaint with the FCC.
- If you experience trouble with this modem contact:

  Physio-Control Corporation
  Corporate Headquarters
  11811 Willows Road Northeast
  Post Office Box 97006
  Redmond, WA 98073-9706 USA
  Attention: Technical Support
  1-800-442-1142
- The modem in this LIFEPAK 11 monitor contains no operator-serviceable parts.
- This modem cannot be used on any public coin-operated service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. Please contact the State Public Utilities Commission, public service commission, or corporate commission for further information.

Notification for Canadian Customers

The following information applies to all LIFEPAK 11 monitors sold for use in Canada:

- The Industry Canada (IC) label on this device identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.
- Before installing this equipment, users should make sure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.
- Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.
- Users should make sure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

  CAUTION. Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.
- The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100.

INDEX