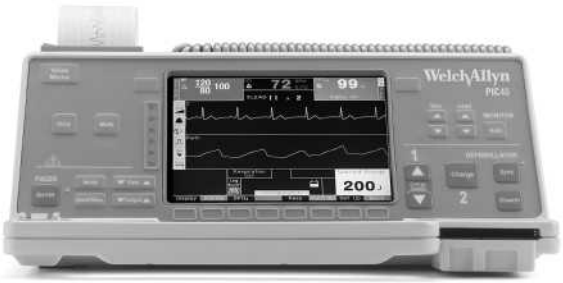
Portable Intensive Care System



PIC40

PIC50

User's Manual

Part Number 991010 - Revision L

Welch Allyn®

Welch Allyn®

Portable Intensive Care System

USER INSTRUCTION MANUAL

Model: PIC 40 and PIC 50

Software Revision X3 through X9*
*Reference Addendum

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a Welch Allyn Company

1000 Asbury Drive, Buffalo Grove, Illinois 60089

847/520-0300 (Telephone)

800/462-0777 (Toll-Free)

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Welch Allyn Part Number 991010 - Revision L

Foreword

This manual is intended to provide information for the proper operation of the Welch Allyn PIC 40 and PIC 50.

DO NOT ATTEMPT TO USE THIS EQUIPMENT WITHOUT THOROUGHLY READING AND UNDERSTANDING THESE INSTRUCTIONS.

User's Responsibility

The user is required to be trained in basic monitoring, vital signs assessment and emergency cardiac care. The user should be completely knowledgeable of the information in the User Instruction Manual. As with all other electronic patient care monitors, good clinical judgment should be used when operating the Welch Allyn PIC.

User must save all shipping containers and packaging materials. When shipping the PIC System and accessories for calibration, service, or upgrades, the original shipping containers and packaging materials must be used.

Manufacturer's Responsibility

Welch Allyn, is responsible for the safety, reliability and performance of the Welch Allyn Portable Intensive Care System, only if the following three conditions are met:

- Assembly operations, extensions, readjustments, modifications or repairs are carried out by persons authorized by Welch Allyn.
- The electrical installation of the relevant room complies with the appropriate requirements.
- The PIC equipment is used in accordance with the instructions for use.

To ensure patient safety and proper operation, use only Welch Allyn authorized parts and accessories.

FDA Medical Device Registration

The FDA Safe Medical Device Act stipulates that each end-user is required under penalty of law, to register with the manufacturer all information pertinent to each medical device.

Please fill out the attached FDA Medical Device Registration postcard and return it promptly to Welch Allyn. This card must be filled in and returned within 30 days of product delivery.

If the medical device is transferred from your possession, you must notify Welch Allyn of the new registration information.

Please contact Welch Allyn (800/462-0777) if you have any questions regarding this notice.

Declaration of Conformity

Manufacturer: Medical Research Laboratories, Inc.
a Welch Allyn Company
1000 Asbury Drive
Buffalo Grove, IL 60089
USA
Phone (847) 520-0300
Fax (847) 520-0303

Welch Allyn Ireland
Navan Business Park
Dublin Road
Navan, Co. Meath
Republic of Ireland
Phone 011-353-466-7775
Fax 011-353-466-7128

declares that the CE-marked product
Product Name: PIC40/PIC50 (Portable Intensive Care)

Base Units	
971085 — PIC50, 5-lead, Regular	972042 — 5-lead, monochrome display
971081 — PIC50, 5-lead, Basic	971044 — 5-lead, monochrome display, without defib
971082 — PIC50, 5-lead, Deluxe	973092 — PIC40, Basic
971086 — PIC50, 12-lead, Regular	973093 — PIC40, NIBP
971083 — PIC50, 12-lead, Basic	973094 — PIC40, Pacing, NIBP
971084 — PIC50, 12-lead, Deluxe	973095 — PIC40, Pacing

Options	
971001 — NIBP and Temp.	971018 — 12-lead, Analysis
971005 — Voice Memo™	971019 — 12-lead FAX trans.
971008 — SAED	971024 — Data Card Record/Review
971016 — CO_2	971074 — Nellcor, SPO_2
971017 — IBP	

Device Type: Defibrillator / External Transcutaneous Pacemaker / Multifunction Monitor

complies with Council Directive 93/42/EEC (Medical Device Directive) of 14 June 1993 class IIb Annex II

Standards

General: ISP 9001
EN 46001

Safety: IEC 601-1 / EN 60601-1 Class I, Continuous operation
Type BF (with external paddles) or
Type CF (with internal paddles)
IEC 601-1-4 / EN 60601-1-4
IEC 601-2-4 / EN 60601-2-4
IEC 601-2-25 / EN 60601-2-25
IEC 601-2-27 / EN 60601-2-27
IEC 601-2-30 / EN 60601-2-30
IEC 601-2-34 / EN 60601-2-34
IEC 1441 / EN1441
EN 865
EN 475

EMC EC 601-1-2/EN 60601-1-2

_____ _____

Joel Orlinsky
Director of Q.A. and Regulatory Affairs

Date

Table of Contents

CHAPTER 1: SAFETY INFORMATION

This chapter provides informaton on the safe operation of the Welch Allyn Portable Intensive Care (PIC) System.

Chapter Overview:

Symbols and Icons

Symbols

Graphical symbols, letter symbols and signs listed below may be found on the PIC System and accessories distributed by Welch Allyn. Please note the use of these symbols for safe and proper use of the equipment.


Alternating current


For indoor use only (on battery charger only)


Attention, consult accompanying documents

Negative input terminal

Auxiliary power operation


Positive input terminal


Caution, high voltage


Power off


Dangerous voltage


Power on


Defibrillator protected, type BF patient connection


Recycle battery


Defibrillator protected, type CF patient connection


Protective earth (ground)


Earth (ground)


Defibrillator discharge button


Release

The symbols listed below may by found throughout this manual.


WARNING: Hazards or unsafe practices that could result in severe personal injury or death.


CAUTION: Hazards or unsafe practices that could result in minor personal injury or product damage.


NOTE: Points of particular interest for more efficient or convenient operation.

Icons

Graphical and text icons listed below may be found on the display of the PIC System during operation.


Alarm off


Alarm on


Alarm lower limit set


Alarm upper limit set

Automatic HR Alarm set

Alarm - push to disable

Animated recording icon


Battery full

Battery low warning


Battery (partially depleted)

Auxiliary power


Blood pressure pump 1


Blood pressure pump 2


Calibration pulse

12-lead

Check chart recorder

Auto heart rate undetermined

Auto heart rate set at 60 BPM


Mute

One volt output


QRS beeper off


QRS beeper on

Volume level


Supervisor menu locked


Supervisor menu unlock


Notch filter On

Analyze

Internal log

Card review card usage

Carbon dioxide on

Invasive blood pressure

Carbon dioxide off

Analyze 12-lead

Resets to patient 001 in card review

Card Review/ 12-lead next page

SAED CPR timer

12-lead save function

Latching connection

Fax/modem

Do not sterilize

Card review/ 12-lead printer

Press here to unlatch

Card review card usage and location

Quick access Log button

12-lead analysis page up

12-Lead analysis page down

General Precautions

The Welch Allyn PIC is intended for use by trained, authorized medical personnel who are familiar with basic monitoring, vital signs assessment and emergency cardiac care. The PIC is also intended for use by physicians at the scene of an emergency or in a hospital emergency room.

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

Any authorized person using the Welch Allyn PIC should be completely knowledgeable of the information in the User Instruction Manual.

The defibrillator function of the PIC is used to treat: ventricular fibrillation and pulseless ventricular tachycardia. The biphasic waveform employed by the PIC has not been clinically tested on pediatric patients. The device has not been evaluated for cardioversion of atrial fibrillation or direct (internal) cardiac defibrillation. The semi-automatic mode should not be used on pediatric patients less than 8 years old.

Accessories

Use only authorized Welch Allyn accessories listed in the Introduction chapter of this manual. Use of unauthorized accessories may cause the device to operate improperly and provide false measurements.

Sterilization

Do Not attempt to sterilize any accessory or equipment.

Battery Care

Proper care and maintenance of the Welch Allyn batteries is important to insure continuous operation during patient care. If the batteries are not maintained properly, loss of power during patient care could result, affecting patient care. Always have a fully charged battery pack available as a back-up.

Dropped or Damaged

If this device has been dropped or damaged in any way, refer the device to qualified service personnel for verification of performance and/or servicing.

Ingress of Liquids

To achieve the specified level of protection against spilled or splashed liquids, thoroughly dry all exposed surfaces of this device prior to operation or connections to mains power.

Electrical Shock

Hazard: Do not use the PIC if it has been immersed in a liquid or if liquid has spilled on it. Do not clean the PIC with alcohol, ketone, or any flammable agent. Do not autoclave the PIC. Conductive parts of electrodes and connectors, for applied parts, should not contact other conductive parts including earth.

Electrical Shock (Internal)

Hazard: This device does not contain any user-serviceable parts. Do not remove instrument covers or attempt to repair the Welch Allyn PIC System. Refer servicing to qualified personnel.

Electrodes (Disposable)

When obtaining a new supply of disposable electrodes for monitoring, defibrillation or pacing, verify that they will properly connect to the existing Welch Allyn cables prior to putting in service. Do not use if gel is dry.

Energy Discharge

Hazard: The PIC can deliver 360 Joules of electrical energy. If this electrical energy is not discharged properly, as described in the User Instruction Manual, the electrical energy could cause personal injury or death to the operator or bystander.

Expiration Date

Always verify expiration dates on dated items such as disposable defibrillation or pacing pads, monitoring electrodes and battery packs. If the expiration date has passed, replace the disposable items immediately.

Ferromagnetic Equipment

Biomedical equipment and accessories, such as ECG electrodes, cables, and oximeter probes contain ferromagnetic materials. Ferromagnetic equipment must not be used in the presence of high magnetic fields created by magnetic resonance imaging (MRI) equipment.

The large magnetic fields generated by an MRI device can attract ferromagnetic equipment with an extremely violent force, which could cause serious personal injury or death to persons between the equipment and the MRI device.

Labels

Observe all PRECAUTION and WARNING labels on the Welch Allyn PIC System and Quick Charger/Conditioner.

Operating Near Oxygen

Hazard: Care should be exercised when operating the Welch Allyn PIC and Welch Allyn Quick Charger/Conditioner in the presence of oxygen sources (such as near bag-valve-mask devices or ventilators), flammable gases or anesthetics. These environments can produce fire or explosion hazards.

Patient Physical Harm

Place the PIC System, accessories and cables in a position where they cannot harm the patient should they fall. Keep all cables and hoses away from patient's neck.

Performance

The Welch Allyn PIC System may not meet performance specifications if stored, transported, or used outside the specified storage or operating environmental range limits.

Treatment Summary Log

To prevent incorrect trending data from being printed, clear the Treatment Summary Log from the Recorder-Log menu prior to use on a new patient.

Monitoring Precautions

- **WARNING: PACEMAKER PATIENTS**. The Welch Allyn PIC includes a pacemaker rejection circuit. The following warning is in accordance with the disclosure requirement of AAMI Standard EC13-3.1.2.1 (8): The rate meter may continue to count the pacemaker rate during some occurrences of cardiac arrest or some arrhythmias. Do not rely upon the heart rate meter alarms to assess the patient's condition. Keep pacemaker patients under close surveillance. Pacemaker pulses of the type specified in AAMI EC13-1992, section 3.1.4, are detected at amplitudes greater than ± 20mV and rejected by the heart rate display. However, pacemaker pulses that are superimposed on the ECG at very low amplitudes may be counted by the heart rate display. NOTE: This warning is an AAMI requirement that applies to all ECG monitors, regardless of make or model.
- Use only Welch Allyn patient cables. Other cables can produce excessive artifact, causing an inability to interpret the ECG.
- Use only ECG electrodes that meet the AAMI standard for electrode performance (AAMI EC-12). Use of electrodes not meeting this AAMI standard could cause the ECG trace recovery after defibrillation to be significantly delayed.
- The type of surface electrode and the technique used in applying the electrodes are major factors in determining the quality of the signal obtained. Use high-quality, silver-silver chloride electrodes. These electrodes are designed to provide excellent baseline stability, provide rapid recovery from defibrillation, and minimize artifacts from patient movement.
- When attempting to interpret subtle ECG changes (ST segments, etc.), use only the diagnostic frequency response mode. Other frequency response settings may cause misinterpretation of the patient's ECG. See Frequency Response in chapter 13 for further details.
- Excessive artifact can result due to improper skin preparation of the electrode sites. Follow skin preparation instructions in chapter 4.
- Do not operate the PIC System in conjunction with electrocautery or diathermy equipment. Such equipment, as well as equipment that emits strong radio frequency signals, can cause electrical interference and distort the ECG signal displayed by the monitor, thereby preventing accurate rhythm analysis.

- Do not operate the PIC in close proximity to any other monitor with respiration measurements. The two devices could affect the respiration accuracy.
- Any external connection to the 1V or MOD outputs must comply with clause 19 of IEC 601-1 for leakage current and must not exceed 450 mA.
- Shock Hazard: Use of accessories, other than those specified in the operating instructions, may adversely affect patient leakage currents.
- Certain line-isolation monitors may cause interference on the ECG display and may inhibit heart rate alarms.

Defibrillator Precautions

- The Welch Allyn PIC can deliver 360 joules of electrical energy. If this electrical energy is not discharged properly, as described in the User Instruction Manual, the electrical energy could cause personal injury or death to the operator or bystander.
- The operator and all other people must stand clear of the patient, the bed and all conductive surfaces (that are in contact with the patient) during defibrillation. The electrical energy delivered to the patient could also be delivered to any other person who is in contact with the patient or the conductive surface.
- Do not use the defibrillator in the presence of oxygen sources (such as near bag-valve-mask devices or ventilators), flammable gases or anesthetics. These environments can produce fire or explosion hazards.
- After a synchronized cardioversion, the SYNC mode may be cleared after each shock or disarm. The user may have to reselect (press) the SYNC button after each synchronized cardioversion shock performed on a patient. The PIC can be configured in the Supervisor-Defibrillation Set-up menu to remain in the SYNC mode after each synchronized cardioversion.
- Synchronized cardioversion can be performed in the paddle monitoring mode. However, it is possible that artifact can be produced by the moving paddles, which could cause the defibrillator to trigger on the artifact. It is recommended that monitoring in leads I, II or III be used during synchronized cardioversion. Paddle monitoring should not be used for elective cardioversions procedures.

- To avoid stress to the defibrillator or the tester, never attempt to repeatedly charge and discharge the defibrillator in rapid succession. If a need for repetitive testing arises, allow a waiting period of at least 2 minutes for every third discharge.
- Monitoring ECG through the paddles may result in inaccurate heart rate display due to artifact.
- In the SYNC mode, the defibrillator will not discharge without a command signal (R-wave detection) from the ECG monitor indicated by a SYNC marker on the trace, flashing SYNC indicator, and an audible beep if the R-wave beeper is enabled.
- Do not use the defibrillator if excessive condensation is visible on the device. Wipe only the outside with a damp cloth.
- Use only Welch Allyn-approved disposable defibrillation and pacing pads and cables.
- Defibrillator paddles should be kept clean and dry when not in use. When preparing electrodes and during defibrillation procedures, extreme care should be exercised to prevent gel or any conductive material from forming a contact between the operator and the paddles. Do not allow gel or any other conductive material to form an electrical bridge between the defibrillator electrodes or to the monitoring electrodes. Electrical arcing and/or patient burns could occur during defibrillation. Arcing and patient burns could prevent sufficient energy delivery to the patient.

- **WARNING**: If conductive gel forms a continuous path between the defibrillator electrodes, delivered energy may be dramatically reduced to zero. In this case, reposition the electrodes to eliminate the shunting path before attempting additional shocks.
- Improper defibrillation technique can cause skin burns. To limit possible skin burns, use only Welch Allyn defibrillation gel on paddles, insure the gel covers the entire paddle surface and press firmly against patient's chest.
- Disposable defibrillation electrodes must be used in accordance with the manufacturer's instructions. Do not use expired, dry electrodes or reuse disposable electrodes, as improper patient contact may result in patient burns and inability of the device to function properly.

- The device contains an automatic disarm of the capacitor bank. If the operator has not delivered the charge to a patient or test load, an internal timer will disarm the capacitor bank 1 minute in manual mode and 30 seconds in SAED Basic or SAED Basic+ mode after the ready charge signal. The ready charge signal is indicated by a continuous audible tone and the energy availability graph displayed on the monitor.
- If a new energy level is selected after the charge button is pushed and while the defibrillator is charging, defibrillator will automatically charge to the new energy selection. The CHARGE button need not be pressed again to select the new energy level.
- Disconnect from the patient any medical electronic device that is not labeled “defibrillation protected.”
- Before charging the defibrillator, verify that the energy selected on the display is the desired output.
- Some erythema of the skin and/or minor burns may occur during defibrillation. Use proper defibrillation techniques, as outlined in the User Instruction Manual, to minimize erythema/burns.

External Pacing Precautions

- Defibrillation will take priority over external pacing. Should the defibrillator be charged during the administration of external pacing, the pacer will automatically be turned off and the defibrillator will charge to the selected energy.
- Transcutaneous pacing should not be used to treat V FIB (ventricular fibrillation). In cases of V FIB, immediate defibrillation is advised.
- Transcutaneous pacing may cause discomfort ranging from mild to severe, depending on the patient’s tolerance level, muscle contractions and electrode placement. In certain cases, discomfort may be decreased by slightly relocating the pacing pads.
- It is important to monitor the patient closely to verify that both mechanical and electrical capture are occurring. Electrical capture can be verified by observing the presence of a large ectopic beat after the pacing pulse is delivered. The size and morphology of the beat are dependent on the patient. In some instances the beat may appear as a relatively normal looking QRS pulse. Mechanical capture can be verified by checking for signs of increased blood flow i.e., reddening of

the skin, palpable pulses, increased blood pressure, etc. (See chapter 8). Continuously observe the patient during pacing administration, to insure capture retention. Do not leave the patient unattended when administering external pacing therapy.

- Some erythema of the skin and/or minor burns may occur under the pacing electrodes in some patients. For prolonged periods of pacing (>4 hours), periodically inspecting the skin beneath the electrodes (when patient's condition allows) is recommended. Discontinue external pacing if the skin is affected and if another form of pacing is available.
- Disposable defibrillation/pacing electrodes must be used in accordance with the manufacturer's instructions. Do not use expired, dry electrodes or reuse disposable electrodes, as improper patient contact may result in patient burns and inability of the device to function properly.
- The pacing rate determination can be adversely affected by artifact. If the patient's pulse and the heart rate display are significantly different, external pacing pulses may not be delivered when required.

- **WARNING: PACEMAKER PATIENTS**. The Welch Allyn PIC includes a pacemaker rejection circuit. The following warning is in accordance with the disclosure requirement of AAMI Standard EC-13-3.1.2.1 (8): The rate meter may continue to count the pacemaker rate during some occurrences of cardiac arrest or some arrhythmias. Do not rely upon the heart rate meter alarms to assess the patient's condition. Keep pacemaker patients under close surveillance. Note: This warning is an AAMI requirement that applies to all ECG monitors, regardless of make or model.
- Artifact and ECG noise can make R-wave detection unreliable, affecting the HR meter and the demand mode pacing rate. Always observe the patient closely during pacing operations. Consider using asynchronous pacing mode if a reliable ECG trace is unobtainable.

Pulse Oximeter Precautions

- Keep the Welch Allyn finger probe clean and dry.
- SpO_2 measurements may be affected by certain patient conditions: severe right heart failure, tricuspid regurgitation or obstructed venous return.
- SpO_2 measurements may be affected when using intravascular dyes, in extreme vasoconstriction or hypovolemia or under conditions where there is no pulsating arterial vascular bed.
- SpO_2 measurements may be affected in the presence of strong EMI fields, electrosurgical devices, IR lamps, bright lights, improperly applied sensors; the use of non-Welch Allyn sensors, or damaged sensors; in patients with smoke inhalation, or carbon monoxide poisoning, or with patient movement.
- Tissue damage can result if sensors are applied incorrectly, or left in the same location for an extended period of time. Move sensor every 4 hours to reduce possibility of tissue damage.
- Do not use any oximetry sensors during MRI scanning. MRI procedures can cause conducted current to flow through the sensors, causing patient burns.
- Do not apply SpO_2 sensor to the same limb that has an NIBP cuff. The SpO_2 alarm may sound when the arterial circulation is cut off during NIBP measurements, and may affect SpO_2 measurements.

- **WARNING**: In some instances, such as obstructed airway, the patient's breathing attempts may not produce any air exchange. These breathing attempts can still produce chest size changes, creating impedance changes, which can be detected by the respiration detector. It is best to use the pulse oximeter whenever monitoring the respirations, to accurately depict the patient's respiratory condition.

Non-Invasive Blood Pressure Precautions

- Only a physician can interpret pressure measurements.
- Blood pressure measurement results may be affected by the position of the patient, his or her physiological condition and other factors.
- Substitution of a component different from that supplied by Welch Allyn (e.g., cuff, hoses, etc.) may result in measurement error. Use only Welch Allyn cuffs and hoses.
- Do not use a blood pressure cuff on the limb being used for IV infusion or for SpO_2 monitoring.
- Accurate pressure readings may not be achieved on a person experiencing arrhythmias, shaking, convulsions or seizures. Medication may also affect pressure readings. The correct-size cuff is essential for accurate blood pressure readings.
- Blood pressure hoses must be free of obstructions and crimps.
- If the patient's cuff is not at heart level, an error in measurement may result.
- When monitoring blood pressure at frequent intervals, observe the cuffed extremity of the patient for signs of impeded blood flow.

- **WARNING**: THIS DEVICE IS NOT APPROVED FOR USE ON NEO-NATAL PATIENTS.
- Do not monitor one patient's NIBP while monitoring another patient's ECG.
- Blood pressure measurement may be inaccurate if taken while accelerating or decelerating in a moving vehicle.
- If an NIBP measurement result is questionable or "motion" indication is displayed, repeat the measurement. If the repeated measurement result is still questionable, use another blood pressure measurement method.
- Do not use the NIBP on cardiopulmonary bypass patients.

Battery Precautions

- Use only Welch Allyn SmartPak or Welch Allyn SuperPac batteries in the Welch Allyn PIC. Use of any other battery can damage the Welch Allyn PIC and not provide sufficient power, inhibiting patient care.
- If the Low Battery indication occurs at any time during operation, immediately replace the battery pack with a battery pack known to be fully charged. Always have a fully charged battery pack available as a back-up.
- Due to the critical nature of all batteries, replacement of the Welch Allyn batteries is recommended at 24-month intervals.
- Proper care and maintenance of the Welch Allyn batteries is important to ensure continuous operation during patient care. If the batteries are not maintained properly, loss of power during patient care could result, affecting patient care.
- The battery packs contain materials such as stainless steel, cadmium and nickel, which can be recycled. They must be disposed of properly. Consult local authorities for proper disposal.

Charger Precautions

- Charge only Welch Allyn SmartPak or SuperPac batteries in the Welch Allyn Quick Charger/Conditioner. Charging any other battery can cause damage to the Quick Charger.
- Do not insert objects into or block the charger's ventilation ports.
- When testing the defibrillator on the charger's defibrillation output tester, ensure that the paddle surface is positioned properly in the paddle test well. Do not use gel during this test, and ensure that the paddle surface is not contacting the metal charger frame. When discharging the paddles into the tester, press the paddles firmly into the test well to prevent pitting the paddle surfaces.
- Only test Welch Allyn defibrillators on the charger's defibrillation output tester. Testing other brands of defibrillators will damage the charger's defibrillation output tester.
- Do not take charger or paddle holder apart or attempt to repair it yourself.
- The Welch Allyn charger should not be used in the presence of flammable anesthetics or materials.
- If the charger has been dropped or shows visible signs of abuse, refer device to qualified service personnel for verification of proper operation.
- Do not immerse the charger or expose it to water or other liquids.
- Wipe only the outside with a damp cloth.
- Tighten clamp onto power cord to prevent its accidental removal.
- Unplug the charger prior to changing the fuse.
- Use only the Welch Allyn Quick Charger to power the Welch Allyn PIC System from an auxiliary power source.
- Do not use the Welch Allyn Quick Charger to power any non-Welch Allyn devices.
- A depleted battery could increase defibrillator charge times.
- It is recommended that a fully charged battery be inserted in the PIC System even when operating on auxiliary power.

NOTE: The PIC System will operate from an auxiliary power source without a battery inserted or if the inserted battery is depleted. However, under these circumstances, defibrillator charge time will be slightly longer (10 seconds typical, 15 sec. maximum).

SAED Precautions

- **WARNING: Cardiac Pacemakers**. The presence of an internal cardiac pacemaker may adversely affect analysis results. If it is known, or suspected, that the patient is fitted with a cardiac pacemaker, follow your own locally-established procedure for dealing with defibrillation of such patients.
- The PIC, in SAED mode, should only be applied to victims of cardiac arrest who exhibit unconsciousness, absence of breathing, and absence of pulse.
- Excessive motion may affect analysis results. ECG analysis should not be performed when the patient is being moved. Stop all patient movement and do not touch patient when the ECG analysis is in process. Take precautions to eliminate sources of motion or artifact before monitoring in SAED mode.

IBP Precautions

- To insure compatibility and electrical safety, accessory pressure sensors should comply with ANSI/AAMI BP-22 and IEC 601-2-34 for IBP or ANSI/AAMI NS28 for ICP
- Follow instructions supplied with any accessory pressure sensor regarding calibration and removal of trapped air.
- Avoid touching metal parts of any transducer while it is in contact with the patient.
- Do not reuse any components that are labeled for single use only.
- Transducers should be rated to withstand an accidental drop of at least a meter onto a hard surface.
- Transducers that are subject to immersion in liquids should be rated as watertight.

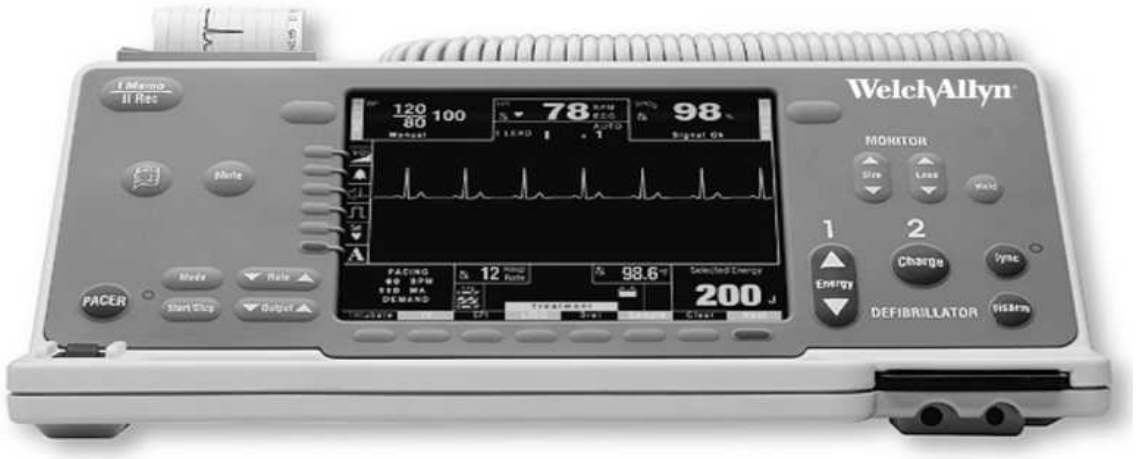
CO_2 Precautions

- Do not use CO_2 sensor during MRI scanning. MRI procedures can permanently damage the CO_2 sensor.
- CO_2/$ETCO_2$ measurements may be affected by the presence of interfering gases or vapors. Do not use on a patient being administered oxygen or nitrous oxide.
- Use only Welch Allyn CO_2 sensors and adapters.
- Do not reuse airway adapters that are labeled for single patient use.
- Prior to using airway adapter check for lodged obstructions. After attaching, check the sensor for proper placement of the sensor.
- If using the CO_2 Monitor for extended critical care, replace the airway adapter every 24 hours or when it becomes occluded.
- Do not use with patients with a low tidal volume, such as patients younger than 3 years of age or weighing less than 22 pounds, or patients with a respiration rate greater than or equal to 60 breaths per minute.
- Accuracy is based upon 1 atmospheric pressure and no residual CO_2 gas left in the sensor from previous expiration. The CO_2 trace will be displayed as if that is the case.

CHAPTER 2: INTRODUCTION

This chapter introduces the Welch Allyn Portable Intensive Care (PIC) System beginning with a brief listing of features and benefits. This is followed by an explanation of the part numbers and checklists of available options and accessories. The chapter concludes with procedures and considerations for unpacking, installing, and operating the system.

Chapter Overview:



Welch Allyn Portable Intensive Care (PIC) System

Product Overview

The Welch Allyn Portable Intensive Care (PIC) System is an extremely flexible device that incorporates an ECG monitor, defibrillation (manual and semi-automated), external pacer, pulse oximeter, non-invasive blood pressure, and respiration monitoring. The PIC System's small, lightweight package makes it ideal for transport situations, and it has been designed for use in and out of the hospital.

Key Features

- Flexible design
- Small, lightweight
- Pulse oximetry and NIBP options available
- Large (6.5") bright, easy-to-read display
- Three simultaneous traces
- Treatment Summary documentation
- Voice Memo™ storage and retrieval
- Card review
- User-configurable options
- Simple menus
- Hands-free defibrillation
- Mains (AC) and battery power capability
- Upgradable for future expansion

Flexible Design

The PIC has been designed to allow additional monitoring options to be installed anytime in the future. System can grow with your needs.

Small, Lightweight

Weighing only 10 pounds, and not much larger than a cardiac monitor, this full-function intensive care tool is ideal for transport/portable applications.

Multiparameter Monitoring

Using surface mount component technology, miniaturization allows pacing, pulse oximetry, NIBP, respiration, and temperature to be added in the same small package as the ECG monitor and defibrillator.

Large, Bright Display

A large, bright display allows viewing the critical parameters from across the room and from any angle.

Three Simultaneous Traces

ECG, plethysmograph, and/or respirations waveforms can be displayed at one time, thus providing more information with which to assess the patient.

Treatment Summary

Welch Allyn-exclusive documentation systems will record the time and ECG sample of key ACLS procedures and drugs for future retrieval.

Voice Memo

A quick and convenient means of documenting important information. When you are busy treating the patient and you need to document an important piece of information (initial vital signs, medications, allergies, etc.), just press the Voice Memo™ button and the audio information will be digitally recorded in the PIC . The recorded information can be played back directly from the PIC .

Card Review

The PIC System's Card Review option is a unique feature used to assist the operator in reviewing patient information that has been recorded to a data card including ECG, event, and speech data. The Card Review feature groups ECG, event, and speech data into individual patient records. This information can be viewed and printed on the PIC System using the Card Review menu or viewed and printed on a PC using Welch Allyn provided SmartView software.

User-Configurable Options

Allows flexibility by configuring the PIC to meet the needs of your department, shift or patient.

Simple Menu

Includes Supervisor menus to eliminate confusing menus during emergency use.

Hands-Free™ Defibrillation Pads

Compatible with disposable multifunction monitoring/defibrillation/ pacing pads, allowing fast, convenient and safe defibrillation and pacing.

Mains (AC) and Battery power capability

Can operate from NiCad or NiMH quick-change battery packs, AC mains or 12V operation.

Upgradable Design

The design will allow for future expansion of enhanced 12-lead monitoring, fax modem transmissions, semi-automatic (shock advisory) defibrillation capability, invasive pressures, and CO_2 monitoring.

Indications for Use

Without the SAED option, the PIC is intended primarily for use by emergency responders, trained in advanced life support, cardiac care techniques, interpretation of ECG waveforms, and the use of the PIC. With the SAED option, the PIC may be used by emergency responders, trained in basic life support, cardiac care techniques, and the use of the PIC. The usage may be in an ambulance or at the scene of an emergency. The PIC is also intended for use by (or on the order of) physicians at the scene of an emergency or in a hospital emergency room, intensive care unit, cardiac care unit, or other similar areas of a hospital. It is also intended to be used during the transport of patients between any of the locations mentioned above. The patient population will consist of adults and children (described below), and will consist of patients both with and without heart dysfunction. The PIC will be used primarily on patients experiencing symptoms of cardiac arrest or in a post trauma situation. It may also be used whenever it is required to monitor any of those functions that are included (as options) in the device. Indications for each of the specific functions are discussed below.

Defibrillator Function

The defibrillator function of the PIC is used to treat: ventricular fibrillation and pulseless ventricular tachycardia. The biphasic waveform employed by the PIC has not been clinically tested on pediatric patients. The device has not been evaluated for cardioversion of atrial fibrillation or direct (internal) cardiac defibrillation. The semi-automatic mode should not be used on pediatric patients less than 8 years old.

ECG Monitor Function

The ECG monitor function of the PIC is used to monitor and/or record ECG waveform and heart rate, and to alarm when heart rate is above or below limits set by the operator. The PIC also provides output signals for the purpose of sending ECG waveforms to a remote monitor via direct connection, telephone, or radio transmission. Patients may range from neo-natal to adult.

External Transcutaneous Pacemaker Function

The external transcutaneous pacing function of the PIC is used for the emergency treatment of hemodynamically compromising bradycardia, bradycardia with escape rhythms that are unresponsive to pharmacologic therapy, refractory tachycardia (supraventricular or ventricular), and bradyasystolic cardiac arrest. Patients may range from pediatric to adult.

Non-Invasive Blood Pressure Function

The non-invasive blood pressure function of the PIC is used to make non-invasive measurements of arterial pressure and heart rate, and to alarm if either parameter is outside of the limits set by the user. Measurements are made using an inflatable cuff on the patient's arm or (occasionally) leg. Patients may range from pediatric to adult.

Temperature Monitor Function

The temperature monitor function of the PIC is used to make continuous measurements of rectal, esophageal, or surface temperature, and to alarm if the temperature is outside of the limits set by the user. It is used on patients ranging from neo-natal to adult.

Pulse Oximeter Function

The pulse oximeter function of the PIC is used to monitor pulse rate and oxygen saturation of arteriolar hemoglobin, and to alarm if either parameter is outside of the limits set by the user. It is used on patients ranging from neo-natal to adult. Measurements are made non-invasively at remote sites such as a finger, toe, ear lobe, bridge of nose, etc. It is used on patients ranging from neo-natal to adult.

Respiration Rate Monitor Function

The respiration rate monitor function of the PIC is used to continuously monitor respiration rate and to alarm if the rate falls outside of the range set by the operator. The patients range from neo-natal to adult. Because the measurement method actually measures respiratory effort, apnea episodes with continued respiratory effort (such as obstructive apnea) may not be detected. It is not intended to be used as an apnea monitor. It is used on patients ranging from neo-natal to adult.

CO_2 Monitor Function

The respiration rate monitor function of the PIC is used to measure the concentration of carbon dioxide in a gas mixture to aid in determining the patient's ventilatory status. This device is intended as an indicator of patient carbon dioxide concentration during expiration and is not intended as the sole basis for medical diagnosis.

This CO_2 monitor is intended for use with patients 3 years of age and older. This device is not recommended for patients with low tidal volume such as patients younger than 3 years of age or weighing less than 22 pounds, or patients with a respiration rate greater than or equal to 60 breaths per minute.

Part Numbers

PIC System Part Numbering

Welch Allyn uses a part numbering system that allows both the user and service technician to understand what type of unit and installed options are in each PIC System.

PIC50

All Basic base units include Color Display, Nellcor Oximeter (971074) and Voice Memo (971005)

971081 PIC50, 5-Lead

971083 PIC50, 12-Lead

All Deluxe base units include Color Display, Nellcor Oximeter (971074), Voice Memo (971005), and Blood Pressure (971001)

971082 PIC50, 5-Lead

971084 PIC50, 12-Lead

All regular base units include Color Display and no options:

971085 PIC50, 5-Lead

971086 PIC50, 12-Lead

PIC40

All units have Color Display

973092: PIC40, Basic

973093: PIC40 with Blood Pressure (971001) option

973094: PIC40 with Blood Pressure (971001) and Pacing (971091) options

973095: PIC40 with Pacing (971091) option

Destination Codes:

Destination code denotes required language and power options

E = English - US

S = Spanish - Europe

G = German

F = French

I = Italian

P = Portuguese

U = English - UK

A = Australia

M = Mexico - Spanish Central and South America

T = South Africa

W = English - World

Options and Accessories

The following options and accessories are available for the PIC. For future reference, check off which options and accessories you currently have from the information provided on the packing list. Should you want to upgrade your system or purchase additional accessories, please contact Welch Allyn at (800) 462-0777.

Options Available

❑	971074	Pulse oximeter	❑ 971024	Data Card Review/Record
❑	971001	NIBP and Temperature	❑ 971016	CO_2
❑	971005	Voice Memo™	❑ 971017	IBP
❑	971008	SAED	❑ 971018	12-Lead Analysis
❑	971019	Fax		

Accessories

❑	971106	Adult paddles	❑ 001790	3-lead patient cable
❑	971108	Adult deluxe paddles	❑ 001794	3-lead patient cable w/intnl color code
❑	001537	Pediatric adapters (set)	❑ 001795	5-lead patient cable
❑	971107	Hands-free defibrillator adapter	❑ 001796	5-lead patient cable w/intnl color code
❑	900322	Hands-free defibrillator tester	❑ 001720	Bitrode limb electrodes
❑	001636	Welch Allyn Smart Pak battery	❑ 001834	12 Lead breakaway patient cable
❑	001638	Welch Allyn Smart Pak Plus battery	❑ 001837	12 Lead breakaway patient cable IEC
❑	001647	Welch Allyn SuperPac	❑ 001798	3 Lead patient cable for 12 Lead
❑	900214	Carrying case	❑ 001948	3 Lead patient cable for 12 Lead, IEC
❑	900223	Carrying case for unit with integral charger	❑ 980139	3 Lead Simulator
❑	971104	Welch Allyn Quick Charger	❑ 980140	12 Lead Simulator
❑	001739	Recorder paper	❑ 001938	Fax output cable
❑	001966	SPO_2 adapter cable	❑ 001726	ECG electrodes
❑	002111	Finger probe, reusable, adult	❑ 002051	Defibrillator gel
❑	002052	KLEAN TRACE™ conductive spray	❑ 001853	Multipurpose electrodes (adult)

❑	001942	NIBP Adult disposable cuff	❑	001828	Multipurpose electrodes (child)
❑	001943	NIBP Thigh disposable cuff	❑	001930	Adult disposable tympanic temp sensor
❑	001944	NIBP hose for use with disposable cuffs - 6’	❑	001931	Pediatric disposable tympanic temp sensor
❑	001945	NIBP Pediatric disposable cuff	❑	001932	Reusable 10 ft extension cable for all disposable temp sensors
❑	001946	NIBP hose for use with disposable cuffs - 10’	❑	001933	Calibration check plug
❑	001911	NIBP adult thigh cuff	❑	001950	CO_2 airway adapter - Qty 5
❑	001915	NIBP adult large arm cuff	❑	001951	CO_2 airway adapter - Qty 50
❑	001912	NIBP adult arm cuff	❑	001954	CO_2 adapter
❑	001913	NIBP child cuff	❑	001934	CO_2 sensor
❑	001914	NIBP infant cuff	❑	001910	SmartView Software and Manual
❑	001922	NIBP cuff hose, 6ft.	❑	980136	CardioLog memory card – 4mb
❑	001923	NIBP cuff hose, 10ft	❑	980137	CardioLog memory card – 8mb
❑	001957	IBP Adapter Cable	❑	980138	CardioLog memory card – 16mb
❑	001927	Disposable skin temperature sensor	❑	971029	Internal Charger
❑	971126	Hands free adapter, straight	❑	001941	Quick combo pad adapter
❑	981120	Defib cable tester	❑	002129	Welch Allyn to Zoll pad adapter cable
❑	981122	2-bay charger, SuperPac	❑	981124	1-bay charger, SuperPac

Initial Installation Evaluation

To determine the initial installation condition of the Welch Allyn PIC System after shipment, follow the simple steps below.

Unpacking Instructions

Visually inspect the carton and the equipment for any signs of damage or mishandling (carton perforations, cuts or dents, bent or collapsed corners, or broken carton seal). If damaged, contact Welch Allyn immediately.

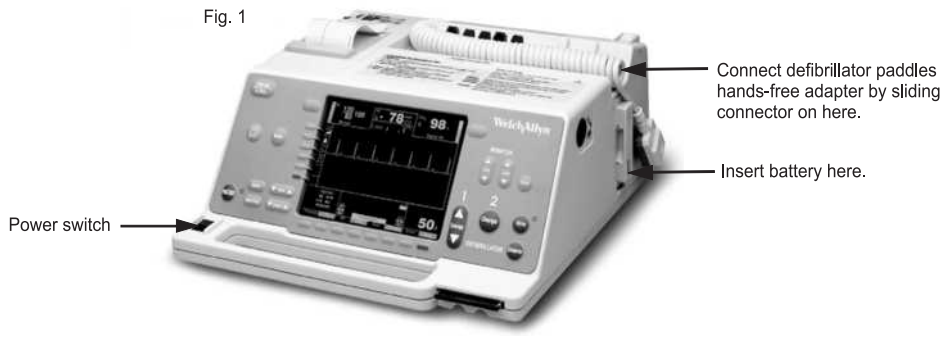
BEFORE PROCEEDING FOLLOW STEPS 1-2-3

1. Open and carefully unpack each carton.
2. Examine the instrument and accessories for signs of damage.
3. Check the packing list to determine that all accessories have been received.

Save all packing materials, invoicing and any other paperwork.

If any problem is encountered in unpacking the PIC System, contact the Welch Allyn Service Department at (847) 520-0300 for further instructions.

Fig. 1



TO DETERMINE INITIAL INSTALLATION CONDITION

In order to ensure that the device is running properly after shipping, follow the instructions below.

1. Connect defibrillator multipurpose hands-free adapter (see Fig. 1).
2. Charge all batteries prior to first use.
3. Insert a fully charged Welch Allyn Smart Pak battery into the battery slot, or use the auxiliary power cable from the Welch Allyn Quick Charger or use the AC power cord from the paddle holder.

4. Press the PIC System power switch to on.
5. The PIC System will perform a series of self-tests and a "Self-Test Passed" message will be printed on the chart recorder paper.
6. Installed options will appear on the display after the self-test has been completed. Compare the installed options on the display with the options you checked off on previous page.
7. To set time and date, see chapter 13.
8. Perform daily/shift test, see chapter 16.
9. To review default menu settings, see chapter 13.

If you note any discrepancies, please contact Welch Allyn with your model and serial number.

Summary of Operations

CAUTION: The Summary of Operations should be used as a reference only by those who have already read the User Instruction Manual. Please read the User Instruction Manual completely before using the PIC System.

System Setup

a. Press **POWER** switch to OFF.

b. Connect appropriate options and accessory equipment.

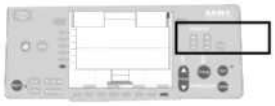
c. Install charged battery or auxiliary power source.

d. Press **POWER** switch to ON.

e. Clear log if the graph indicates a previous patient's events are in the log.

f. Verify that the configuration menus are set appropriately.

ECG Monitoring



a. Connect ECG patient cable, multipurpose hands-free adapter or paddles to the PIC System.

b. Prep patient's skin and connect electrodes to patient.

c. Select appropriate **LEAD**.

d. Adjust **SIZE** as necessary.

Defibrillating

a. Monitor patient's ECG with the patient cable, multipurpose hands-free adapter or paddles.

b. Apply gel to paddles or apply Multipurpose electrodes to patient.

c. Select energy by pressing the **ENERGY SELECT** up/down buttons.

d. Press **CHARGE** button on front panel or on apex paddle (deluxe paddles).

e. After the defibrillator charges to the selected energy (a continuous charge tone will be heard), visually and verbally clear the patient.

f. Place the paddles firmly on the patient's chest.

g. To discharge the defibrillator, press both **DISCHARGE** buttons on the paddles or press the **DISCHARGE** button on the multipurpose hands-free adapter.

Non-Invasive Pacing

a. Monitor patient's ECG with the ECG patient cable. Set lead to I, II, or III.

b. Apply multipurpose pads to patient as illustrated on package.

c. Connect multipurpose pads to multipurpose hands-free adapter.

d. Press the **PACER ON/OFF** button to turn on pacer.

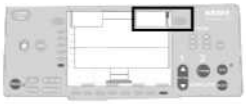
e. Press the **MODE** button to select either DEMAND or ASYNC modes.

f. Press the **RATE** button to select the desired rate.

g. Press the **START/STOP** button to initiate pacing.

h. Press the **OUTPUT** up arrow to increase the pacing output current, until capture is obtained. Note: If the defibrillator is charged, the pacer will automatically turn off.

Monitoring SpO_2



a. Attach appropriate SpO_2 sensor to the patient and to the PIC System.

b. Press the button next to the SpO_2 window to turn on the SpO_2 monitor.

c. To display the patient's plethysmograph, select Pleth in the display - Trace menu.

Monitoring NIBP

a. Attach the appropriate-size cuff and hose to the PIC System.

b. Apply the cuff snugly to the limb of the patient.

c. Select the NIBP mode (manual or automatic) from the NIBP configuration menu. In AUTO mode, select desired time interval.

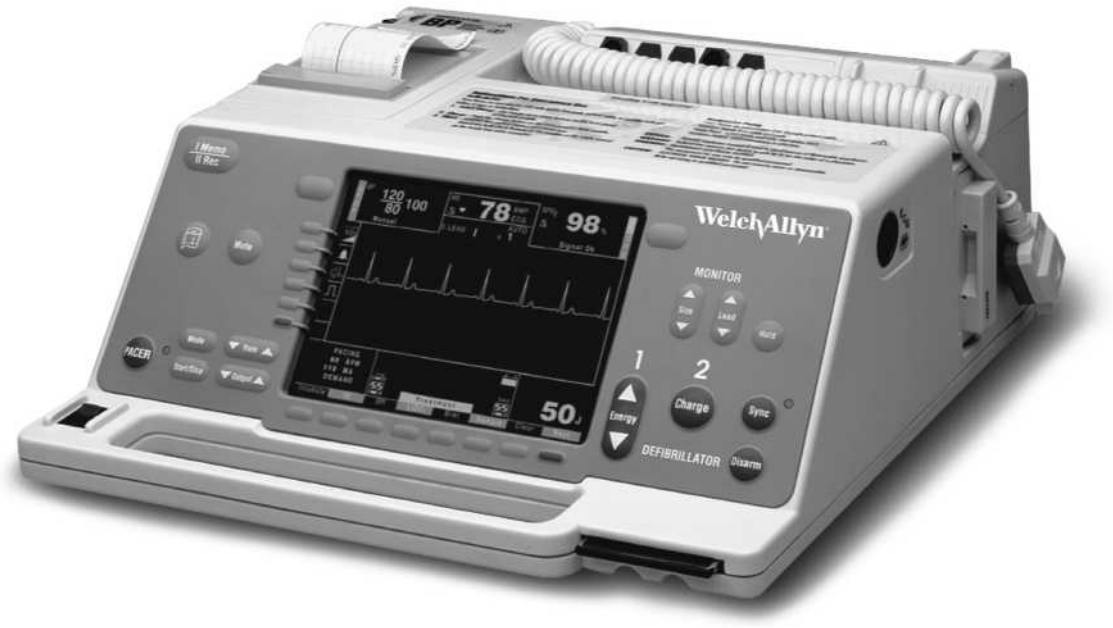
d. Press the button next to NIBP window to START NIBP measurement.

e. During a measurement, press the button next to NIBP window to stop the NIBP measurement. The cuff will deflate.

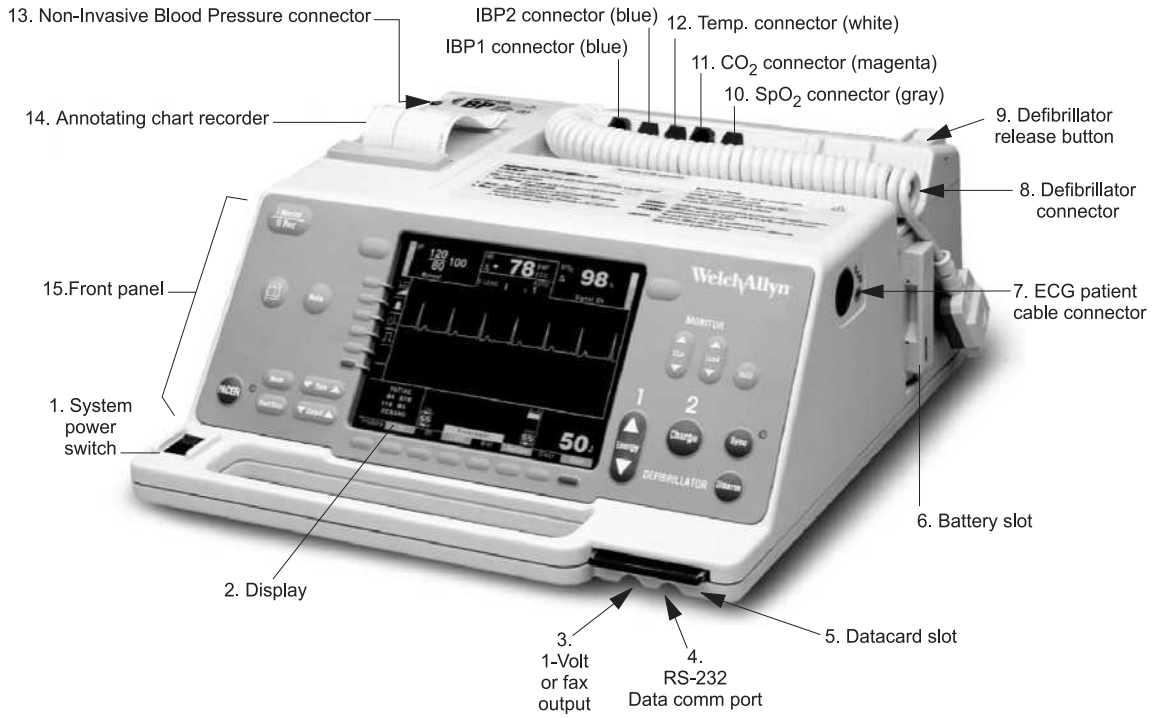
CHAPTER 3: PIC SYSTEM OVERVIEW

This chapter describes the Welch Allyn Portable Intensive Care (PIC) System operations, including interfaces, controls and indicates, and display windows. It also describes the operation of the PIC System paddles.

Chapter Overview:



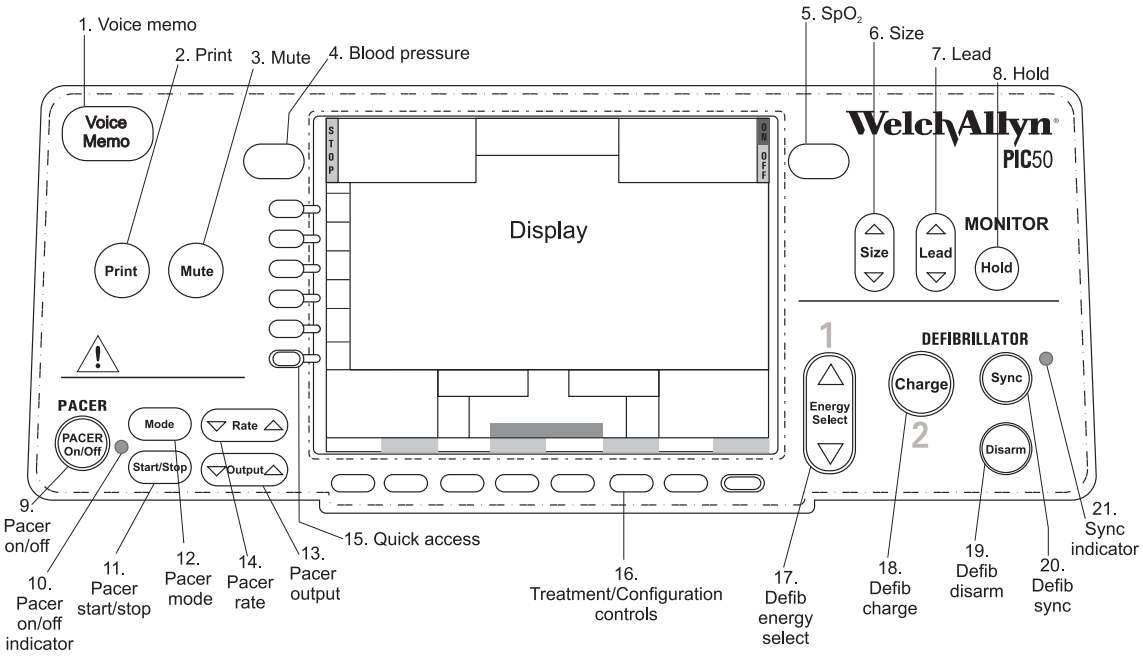
PIC System Interfaces



1.	**System power switch**	Switch for main system power.
2.	**Display**	6.5" screen that displays ECG and other parameter information.
3.	**1-Volt output or fax (optional)**	Provides an analog output scaled to 1V output for a 1mV input signal. Used for telemetry radio transmissions.
	Fax output (optional)	Provides fax transmission capability on 12-Lead PIC's.
4.	**RS-232 Data com port**	Download the internal log to a computer, external, or wireless device.
5.	**Datacard slot**	For system upgrades, data recording and configuring.
6.	**Battery slot**	Accepts Welch Allyn SmartPak Plus or Welch Allyn SuperPac batteries

7.	**ECG Patient Cable Connector**	Accepts 3-lead, 5-lead, 12-lead Welch Allyn patient cables. *NOTE: Only use Welch Allyn patient cables. Excessive artifact could result.*
8.	**Defibrillator connector**	Allows connection of external paddles, or hands-free adapter.
9.	**Defibrillator release button**	Unlocks the defibrillation connector from the defibrillator, to allow removal of external paddles, or hands-free adapter. *NOTE: When sliding defibrillation connector, make sure the release button clicks into place and returns to its up position.*
10.	**SpO_2 connector (optional)**	Allows connection of Welch Allyn pulse oximeter sensors.
11.	**CO_2 Connector (optional)**	Allows connection of Welch Allyn CO_2 cable or cable adapter.
12.	**Temp connector (optional)**	Allows connection of Welch Allyn temperature probe.
13.	**NIBP connector (optional)**	Allows connection of Welch Allyn non-invasive blood pressure cuffs.
14.	**Annotating Chart recorder**	Accepts standard 50 mm paper.
15.	**Front panel**	Control panel with buttons for PIC System operation.

PIC System Controls and Indicators



1.	**Voice memo**	Allows documentation of audio messages.
2.	**Print**	Activates and deactivates the chart recorder.
3.	**Mute**	Pressing the **MUTE** button once causes all audio alarms and tones to be muted for 90 seconds (except defibrillator charge tones).
4.	**Blood pressure (optional)**	Starts or stops cuff inflation.
5.	**SpO_2 (optional)**	Turns on or off the pulse oximeter.
6.	**Size**	Selects ECG trace sizes.
7.	**Lead**	Selects ECG input source.
8.	**Hold**	Freezes the traces on the display.
9.	**Pacer on/off**	Turns on/off pacer circuit.
10.	**Pacer on/off indicator**	Automatically illuminates during pacing activity.

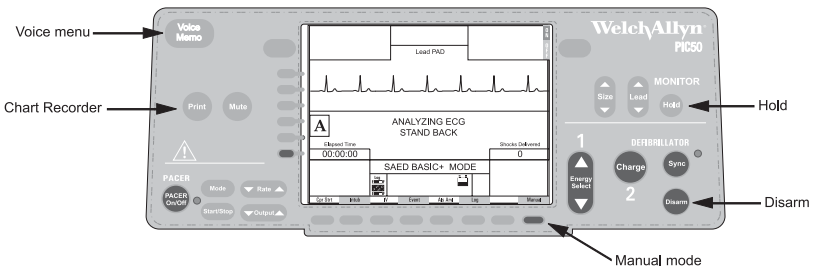
11. Pacer start/stop	Delivers pacing stimulus to the patient or pauses delivering pacing stimulus to the patient.
12. Pacer mode	Changes pacing mode from DEMAND to ASYNC.
13. Pacer output	Selects pacing output current.
14. Pacer rate	Selects pacing output rate.
15. Quick access	Initiates menu functions appearing adjacent to each button on the display when PIC System is on.
16. Treatment/Configuation controls	Treatment allows documentation of specific treatment summary events and Configuration allows access to menu windows.
17. Defib energy select	Selects defibrillation energy levels.
18. Defib charge	Initiates defibrillator to charge to selected energy.
19. Defib disarm	Disarms charged defibrillator internally.
20. Defib sync	Activates the synchronization mode.
21. Sync indicator	Light that indicates sync activation.

PIC System Display Windows and Modes

When the Semi-Automatic External Defibrillation (SAED) option has been installed, the PIC can be configured to power up in one of three modes; SAED Basic, SAED Basic +, Manual defibrillation mode. Each mode has a unique display and some controls and indicators may be deactivated (Refer to Defibrillator Controls and Indicators section). The SAED Basic + mode has been designed to all those BLS personnel who have completed additional training to assess the patients vital signs (NIBP and Pulse Ox). In the SAED Basic + mode the operator would be able to operate the Pulse Oximeter and the Non-Invasive Blood Pressure. In the SAED Basic mode these parameters have been disabled to simplify operations.

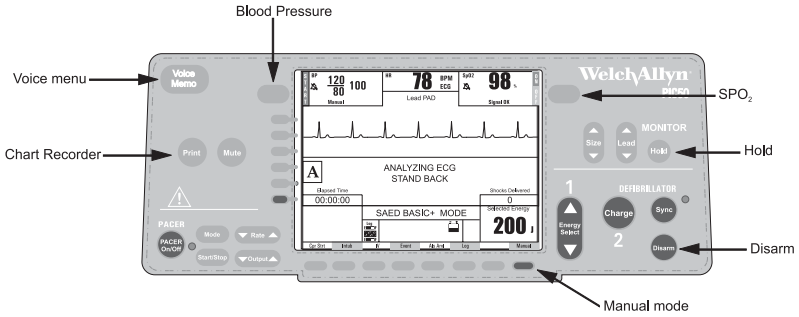
SAED Basic Mode

If the PIC has been configured to power-up in the SAED Basic mode, only the voice memo (supervisor configurable), chart recorder, hold and disarm controls will be active. Below is an example of the active controls and display.



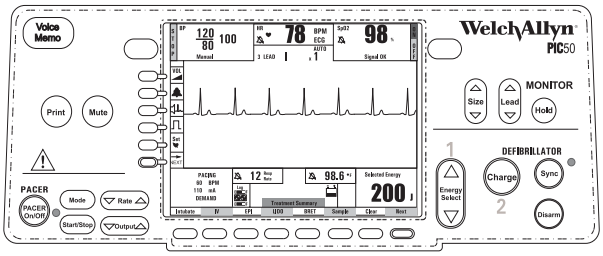
SAED Basic + Mode

If the PIC has been configured to power-up in the SAED Basic + mode, the voice memo (supervisor configurable), chart recorder, hold, blood pressure, SpO_2, treatment summary and disarm controls will be active. Below is an example of the active controls and display.



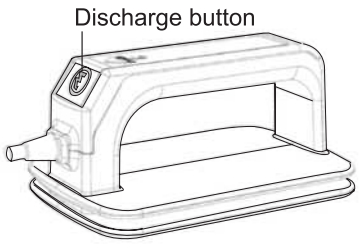
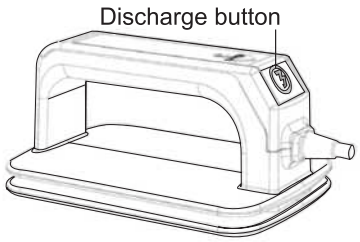
Manual Mode

If the PIC has been configured to power-up in the Manual Defibrillation mode, all the controls will be active. Below is an example of the display.

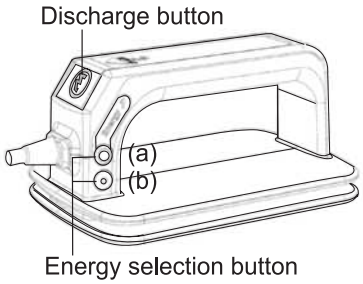
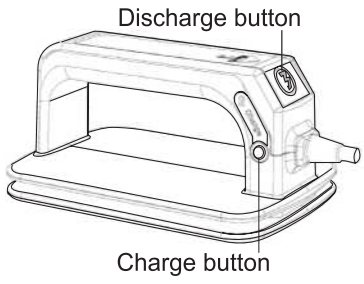


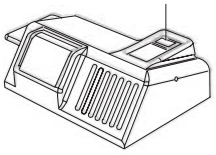
PIC System Defibrillation Paddles

Standard adult paddles

Sternum Paddle	Apex Paddle
	

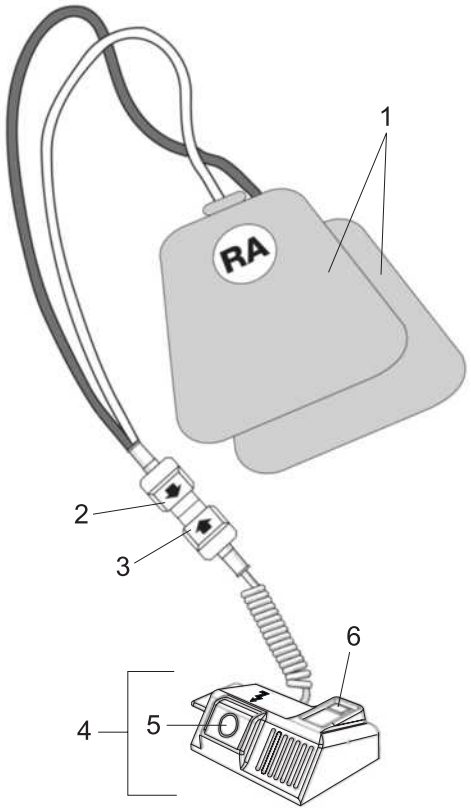
Deluxe adult paddles (optional)

Sternum Paddle	Apex Paddle
	

Defibrillator Connector
Defibrillator connector release button  *Note: When sliding the defibrillator adapter on, make sure the release button clicks into place and returns to its up postition.*

PIC System Defibrillation Hands-Free™ Pads

Multipurpose Hands-Free Adapter and Electrodes (optional)



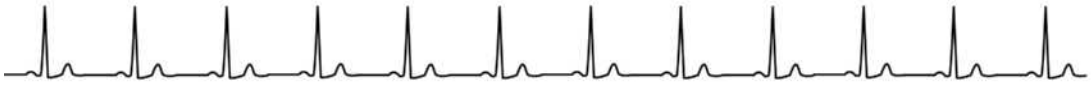
1. **Multipurpose Pads**
2. **Pad Connector** — Connects to patient connector.
3. **Patient Connector** — Accepts disposable monitoring / defibrillation /non-invasive pacing pads. (Welch Allyn part # 001853)
4. **Multipurpose Hands-Free Adapter**
5. **Shock Button** — Hands-free discharge button
6. **Adapter Release Button** — Unlocks the adapter connector from the defibrillator to allow removal.

NOTE: When sliding the multipurpose hands-free adapter on make sure the release button clicks into place and returns to its up position.

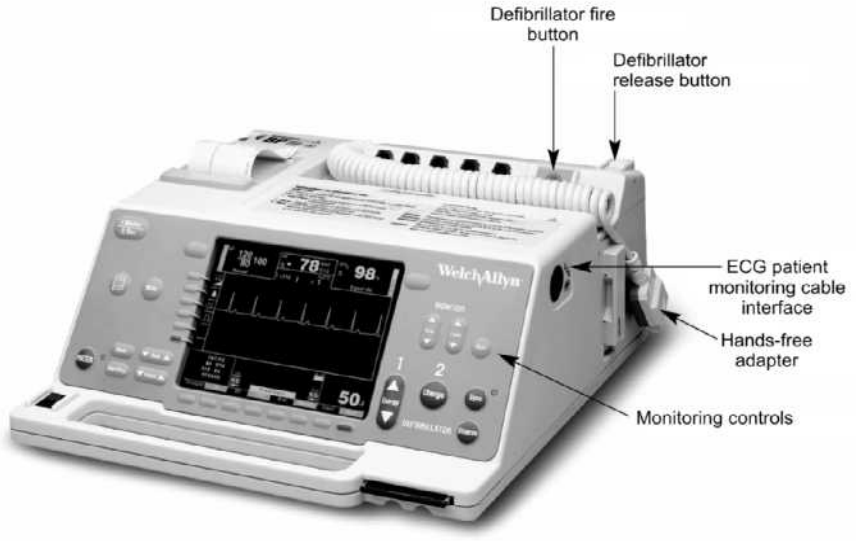
CHAPTER 4: ECG MONITORING

This chapter describes the ECG Monitoring process including how to use the standard and quick access controls and displays. It provides instructions for conducting ECG monitoring and concludes with a discussion of output options.

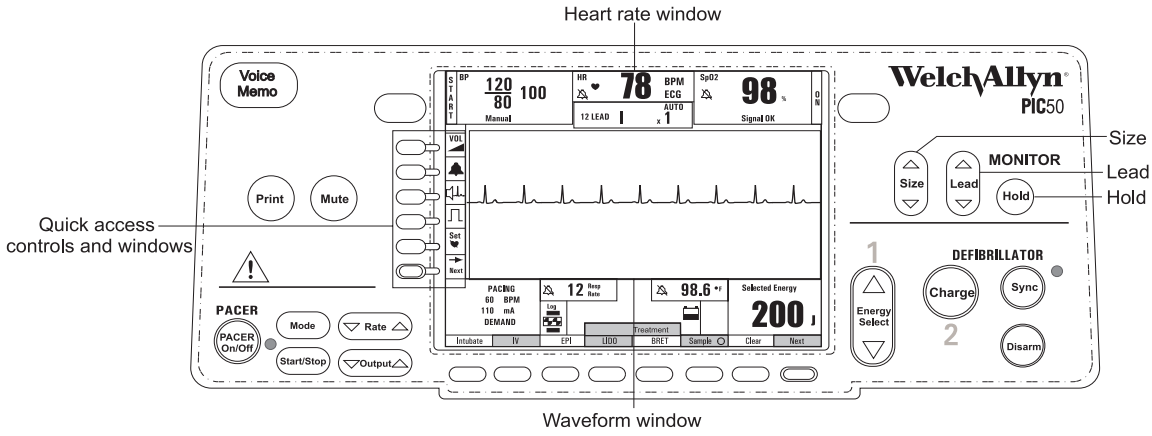
Chapter Overview.



CAUTION: ***First read chapter 1, Safety Information, before proceeding with this chapter.***



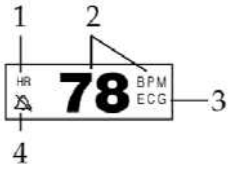
ECG Monitoring Controls and Displays



ECG monitoring functions on the PIC System are viewed and controlled by the highlighted areas illustrated at left.

NOTE: The following description and operation of the ECG monitoring portion of the PIC System depicts normal factory default settings. In chapter 13 we will discuss user configurations of the ECG monitoring system.

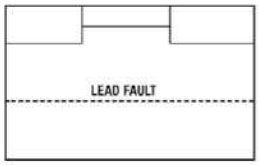
Heart Rate Window



1. HR Indicates the Heart Rate Window.
2. **78 BPM** indicates heart rate displayed in beats per minute. (flashing heart rate indicates an alarm limit has been exceeded)
3. ECG abbreviation indicates the origin of the heart rate. In this case, the source of the heart rate is derived from the ECG electrodes. The PIC will derive the heart rate from the optimal source:

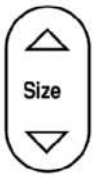
   Priority 1 = **ECG** electrodes, 2 = **OX** sensor or 3 = **BP** cuff.
4. Bell symbols in the "Heart Rate window" indicate the status of the HR alarm: (alarm off), (alarm on), (alarm upper limit set), (alarm lower limit set), (automatic HR alarm set).

Lead Fault

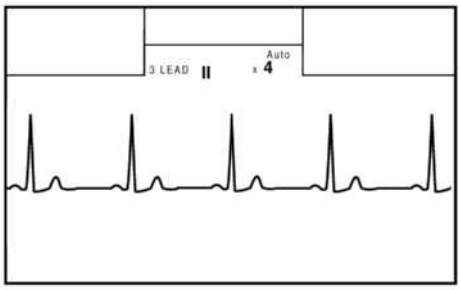


The ECG trace will be replaced with a dotted line and the words **LEAD FAULT** to indicate a lead fault condition. Lead fault condition maybe occur due to improper connections on the patient cable; lead wires should be inspected for proper contact and connection. Replace the electrodes if necessary. In rare cases, an excessive offset voltage on the ECG electrodes may cause a lead fault condition.

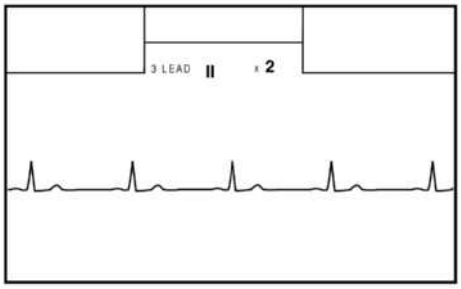
Size



Pressing the **SIZE** button selects ECG trace sizes from 0.125cm/mv to 4cm/mv and automatic trace sizing. Pressing the up arrow will increase the ECG size. Pressing the down arrow will decrease the ECG size. The AUTO size setting will automatically select the proper gain to fit the ECG in the waveform window. When the PIC is turned on, the default setting is 1 cm/mv.



Example: Autosize is set and 4cm / mV was selected



Example: Manual size set at 2cm / mV

Lead

Pressing the **LEAD** button selects the ECG input. Pressing up or down lead arrows will change the lead selection. If the 3-lead cable is configured in the display menu, the following lead options are available:

Lead I selected

Lead II selected

Lead III selected

If the 5-lead cable is configured in the "patient cable" menu, the above lead selections and the following lead selections are available:

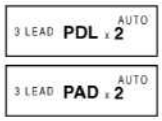
Lead aVR selected

Lead aVL selected

Lead aVF selected

Lead V selected

If a paddle set or hands-free adapter cable is connected, the following additional lead options are also available:



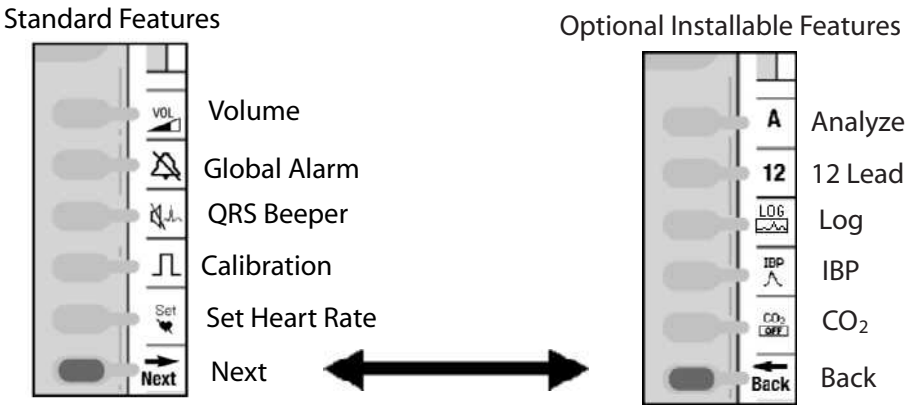
Lead paddles selected

Lead pads selected

Hold

Pressing and holding the **HOLD** button will freeze the trace(s) in the trace window. When the hold button is released the traces will resume. (Chart recorder is not affected by the hold button).

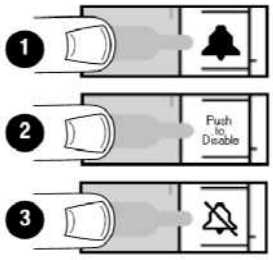
Quick Access Controls and Displays



Volume 

The quick access volume increases and decreases the volume of the PIC System. There are four volume settings that can be selected with each press of the **VOLUME** button.The volume ramp ( ) indicates the volume level selected.

Alarm 



The quick access global alarm enables or disables all set alarm parameters. When the PIC System is turned on, the global alarm will default to the last setting at system shutdown, either enabled ( ) or disabled ( ).

To enable global alarms, press the **GLOBAL ALARM** button (1) to display the alarm on icon ( ). (*With the global alarms enabled, any set alarm parameter will be enabled*).

To disable global alarms, press the **GLOBAL ALARM** button two times. The first press of the button (2) will change the icon to PUSH TO DISABLE. The second press (3) will change the alarm icon to OFF ( ).

If the button is not pressed a second time within 10 seconds, global alarms will automatically revert to enabled ( ). (*With the global alarm disabled, all parameter alarms will be disabled*).

QRS Beeper Icon

The quick access QRS beeper turns the beeper on and off.

Beeper OFF = Beeper ON =

Calibration Icon

The quick access calibration control is used to send a calibration signal to the monitor, chart recorder, 1V and modulated outputs.

NOTE: Cal button is disabled in x4 gain setting.

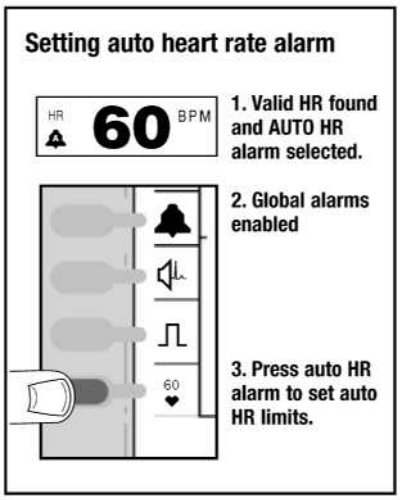
Auto Heart Rate

The quick access auto heart rate (HR) control is used to set the automatic HR alarm.

IN ORDER TO SET THE AUTO HR ALARM LIMITS:

There must be a valid heart rate displayed in the HR window.

To set the automatic HR alarm limits, press the quick access the **AUTO HR** button. The patient's heart rate, at the moment the button was pressed, will be displayed above the "heart" (60). The monitor automatically sets the upper and lower heart rate alarms, at + 20% of that heart rate set point or + 10 beats, whichever is greater. Each press of the **AUTO HR** button will adjust the heart rate set point and reset the auto HR alarm limits.

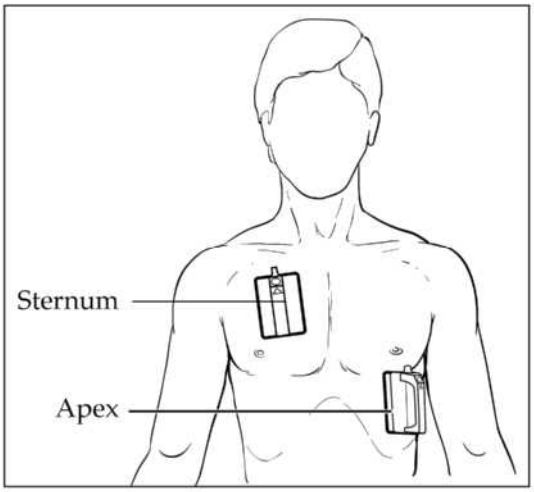


If an alarm parameter is exceeded, an audible tone will sound and the heart rate will flash.

If there is no heart rate in the HR window, the upper and lower heart rate limits will be undetermined and the "set heart rate icon" (Set) will appear.

ECG Monitoring Operation Procedures

MONITORING WITH DEFIBRILLATOR PADDLES

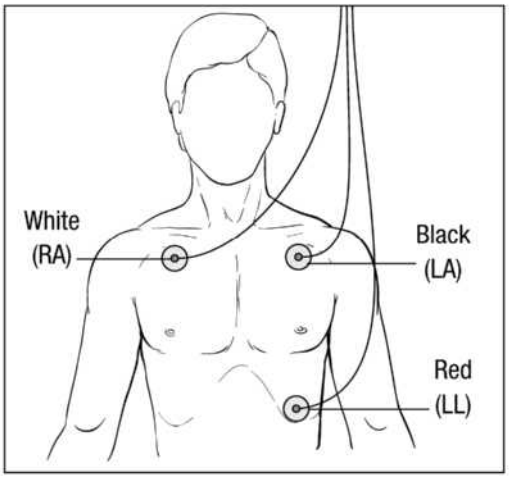


Paddle Placement

1. Press **POWER** switch on. Set the **LEAD** to PDL (paddles).
2. Apply gel to paddles and place the sternum paddle firmly against the patient's chest inferior to the right clavicle and lateral to the upper sternum; place the apex paddle in the anterior-axillary line, inferior and lateral to the patient's left nipple, as shown to the right.
3. Observe the patient's electrocardiogram on the display. Adjust size of the ECG trace with the **SIZE** control button as necessary.

NOTE: The type of electrode and the technique used in preparing the skin are major factors in determining the quality of the ECG signal obtained. Use high-quality, silver-silver chloride electrodes. These electrodes are designed to provide excellent baseline stability, rapid recovery from defibrillation, and minimize artifact from patient movement. Do not use electrodes if gel is dry.

MONITORING WITH 3 LEAD PATIENT CABLE



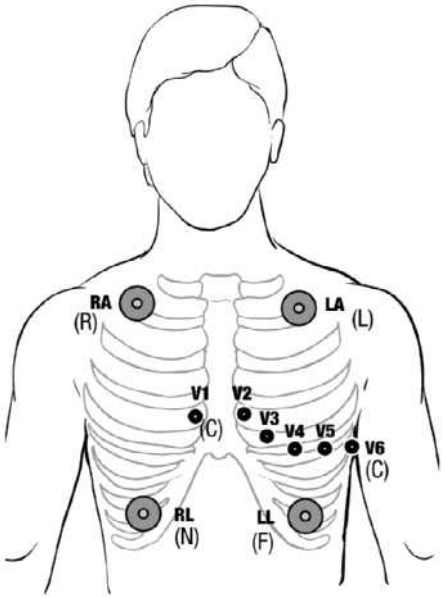
3-Lead Electrode Placement

1. Press **POWER** switch ON.
2. Insure that the display indicates a 3-lead patient cable has been configured. If not, see chapter 13 for setting patient cable.
3. Thoroughly prep patient skin for electrode attachment. Clean and dry skin sites preferably with a coarse, dry terry cloth. Next, clean skin with alcohol and allow to dry completely before applying pads.
4. Connect each lead of the 3-lead patient cable to the appropriate disposable electrode. Arrange the electrodes as shown to the right. (Make sure that the ECG electrodes are placed to allow defibrillation if necessary).

5. Insert the patient cable plug into the input ECG connector on the PIC System.
6. Select the proper lead setting for the desired lead configuration by pressing the **LEAD** button to the appropriate position: I, II, or III.
7. Observe the patient's electrocardiogram on the display. Adjust size of the ECG trace with the **SIZE** button as necessary.

MONITORING WITH 5-LEAD PATIENT CABLE

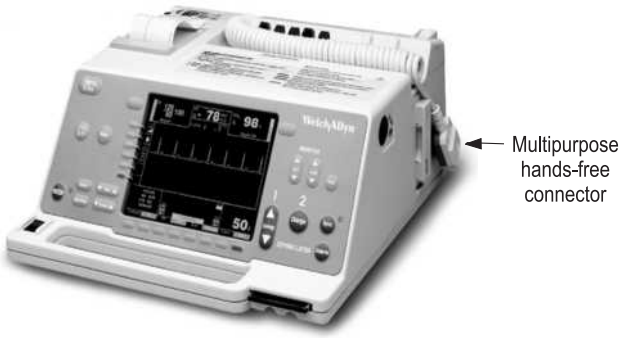
1. Press **POWER** switch ON.
2. Insure that the display indicates a 5-lead patient cable has been configured. If not, see chapter 13 for setting patient cable.
3. Thoroughly prepare patient skin for electrode attachment. Clean and dry skin sites preferably with a coarse, dry terry cloth. Next, clean skin with alcohol and allow to dry completely before applying pads.
4. Connect each lead of the 5-lead patient cable to the appropriate disposable electrode. Arrange the electrodes as shown below. (Make sure that the ECG electrodes are placed to allow defibrillation if necessary).
5. Insert the patient cable plug into the input ECG connector on the PIC System.
6. Select the proper lead setting for the desired lead configuration. Press the **LEAD** button to the appropriate position corresponding to the desired configuration.
7. Observe the patient's electrocardiogram on the display. Adjust size of the ECG trace with the **SIZE** button as necessary.



5-Lead Electrode Placement

5-Lead Electrode Placement		
Color lead		**Location**
AHA	**IEC**	
Green (RL)	Black (N)	Right mid-clavicular line, between 6th and 7th intercostal space
Red (LL)	Green (F)	Left mid-clavicular line, between 6th and 7th intercostal space
White (RA)	Red (R)	Right mid-clavicular line, directly below clavicle
Black (LA)	Yellow (L)	Left mid-clavicular line, directly below clavicle
Brown (V)	White (C)	Chest - Place per figure at left for V1-V6
		V1 - 4th intercostal space at right sternal margin
		V2 - 4th intercostal space at left sternal margin
		V3 - Midway between V2 and V4 leads
		V4 - 5th intercostal space at mid-clavicular line
		V5 - Same transverse level as V4 at left anterior-axillary line
		V6 - Same transverse level as V4 at left mid-axillary line

MONITORING WITH "HANDS-FREE" DEFIBRILLATION PADS

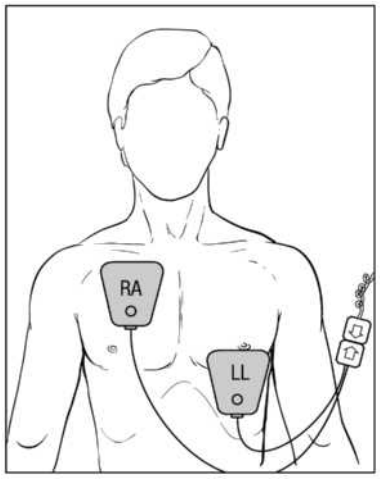


CAUTION: ***Be sure that the hands-free adapter is firmly seated in the defib connector before monitoring with "hands-free" defibrillation pads.***

CAUTION: ***Use only R2 multifunction pads with Welch Allyn hands-free adapter. Do not connect R2 ECG sets to the Welch Allyn hands-free adapter; an ECG will not be obtained.***

1. Press **POWER** switch ON. Press the **LEAD** button to the PAD position.
2. Connect the disposable defibrillation pads to the hands-free adapter cable.
3. Remove or loosen clothing if necessary for application of pads. Clean and dry skin sites preferably with a coarse, dry terry cloth.
4. Check expiration date on the multipurpose pads package. Remove multipurpose defibrillation pads from packaging. Remove the protective cover and apply the pads to the patient in the position illustrated here. Do not use if gel area is dry.

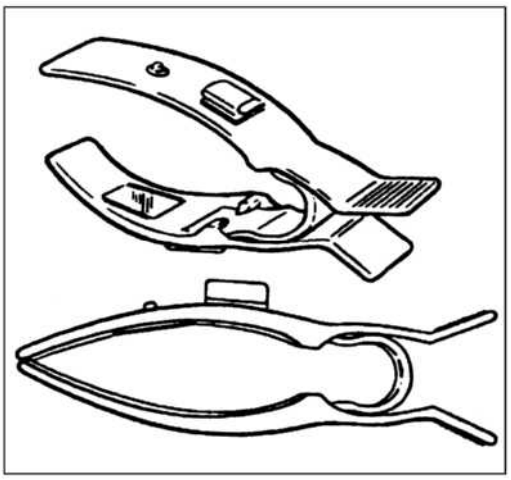
Hands-Free Pad Placement



5. When applying pad, gently adhere opposite edge of pad to patient and lightly roll pad against patient's skin.
6. Observe the patient's electrocardiogram on the monitor scope.
7. Adjust **SIZE** control as necessary.

NOTE: Apex-anterior or apex-posterior placement of pads results in a modified Lead II ECG trace.

MONITORING WITH WELCH ALLYN BITRODE®



BITRODE®

1. Press **POWER** switch ON.
2. Insure that the display indicates 3-lead patient cable has been selected.
3. Attach the black and red leads of the standard 3-lead patient cable to the dual contact Welch Allyn BITRODE® by snapping the clip on the lead over the lead terminals. Similarly, attach the white lead to the single-contact Welch Allyn BITRODE®. Press the **LEAD** button to select the LEAD I or LEAD II position.
4. Squeeze a small amount of Welch Allyn 2051 ELECTRODE GEL onto the contact area on the inner portion of each limb clip, or apply Welch Allyn 2052 KLEAN TRACE on the patient's arms where the Welch Allyn BITRODE® contact will be placed.
5. Place the dual-contact clip on the patient's left wrist, or on the forearm if the wrist is not large enough to provide adequate clamping force by the Welch Allyn BITRODE®. Place the single-contact clip on the patient's right inner wrist (or inner forearm if necessary). Make sure that the clips and arms are positioned and attached so minimum arm movement is allowed, to preclude possible artifact on the display. This will give a Lead I ECG.

NOTE: If a weak signal is being obtained up in above configuration (Lead I), then the dual contact Welch Allyn BITRODE® can be placed on left ankle to monitor in Lead II Mode.

Outputs

1 Volt Output (optional)

Provides an analog ECG output scaled to 1 Volt out for a 1mV input signal. The 1V output is routinely used to transmit ECG over telemetry. The frequency response of the output signal will match the display frequency response selection, except that the upper frequency limit will be 100 Hz.

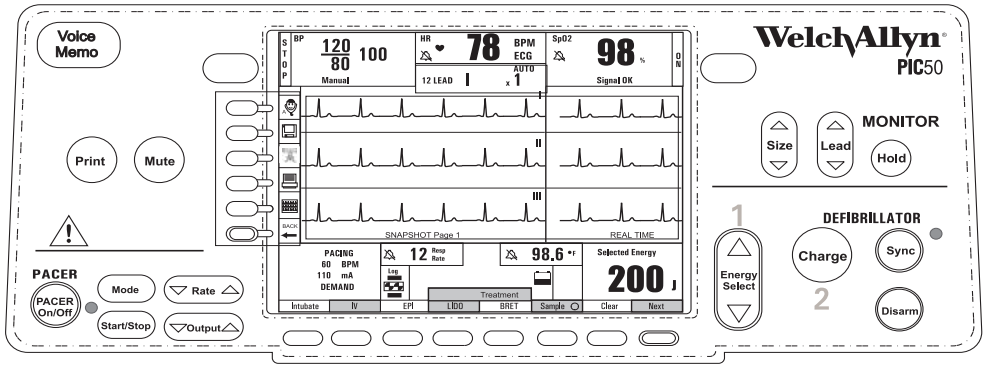
CHAPTER 5: 12-LEAD MONITORING *(OPTIONAL)*

This chapter describes the controls, displays and operation of the Basic 12-lead option. It includes a discussion of the basic 12-lead controls and displays, the process for entering patient ID information, and monitoring procedures.

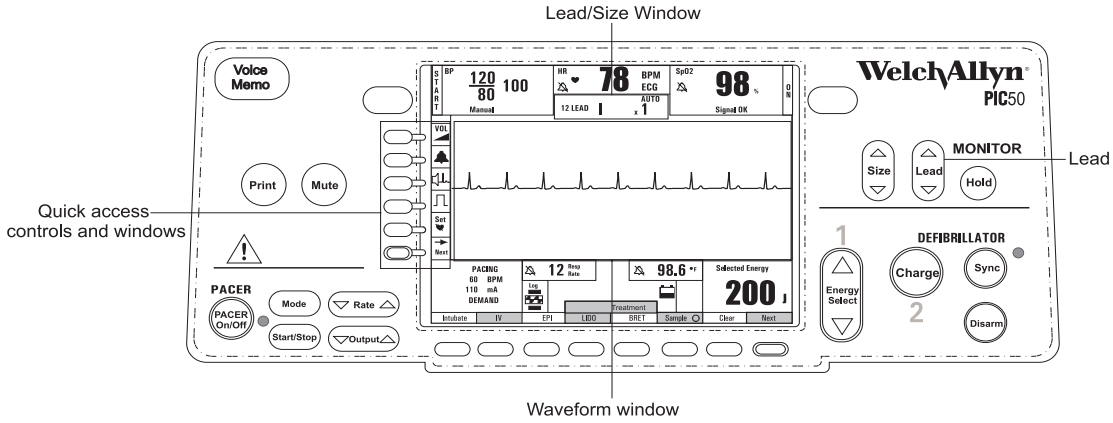
Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.

NOTE: Before reading this chapter review chapter 4, ECG monitoring, to familiarize yourself with basic ECG monitoring controls, displays and operation procedures.



Basic 12-lead Monitoring Controls and Display



The illustration above highlights the areas that are used to operate the 12-lead option, if it is installed in the PIC System. If needed refer to chapter 4 for basic ECG monitoring information.

NOTE: The following description and operation of the 12-lead portion of the PIC System depict normal factory default settings.

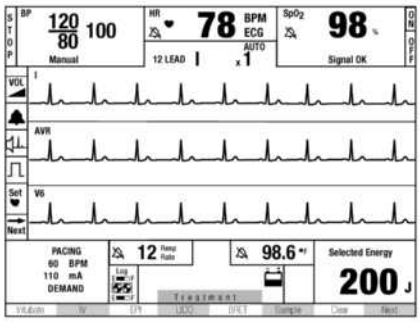
Lead Selection

When the 12-lead patient cable is connected the following lead options are available by pressing the **LEAD** button:

12-lead I x1	12-lead aVR x1	12-lead V1 x1	12-lead V4 x1
12-lead II x1	12-lead aVL x1	12-lead V2 x1	12-lead V5 x1
12-lead III x1	12-lead aVF x1	12-lead V3 x1	12-lead V6 x1

Waveform Window

The Basic 12-lead waveform window can display either 1, 2 or 3 traces.



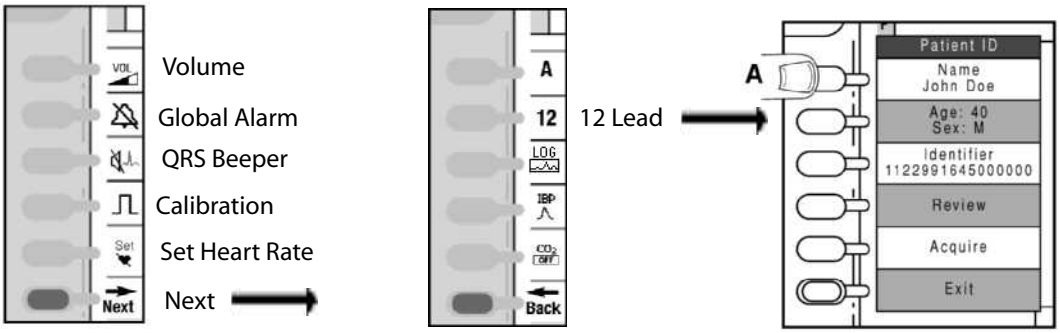
To add or remove traces from the waveform window access the trace menu by pressing **NEXT** –> **DISPLAY**–> **TRACES** in the treatment summary menu.

Once in the Trace Menu you can select the waveform you would like displayed in waveform windows 2 or 3. Selectable options include Resp, Pleth, I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 and OFF. Pressing **SAVE** will display your selection in the highlighted waveform window.

*NOTE: Pressing the **LEAD** button will allow the user to select the displayed ECG lead in waveform 1 window only.*

12-lead Quick Access Functions

If the 12-lead option is installed a Next icon will appear at the bottom of the quick access window (see below). All other quick access controls function as described on page 4.5.



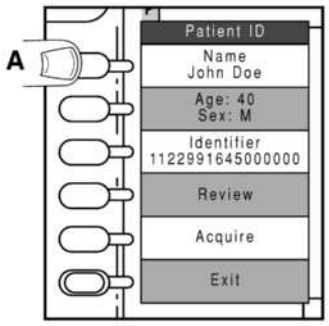
Quick access controls

Entering Patient ID information

Patient Information

The operator can enter specific information about each individual patient such as Name, Age, Sex and an identifier code to be used for documentation.

To begin, press the "**12**" button of the quick access window to display the Patient ID menu.



The defaults for the Patient ID menu are:

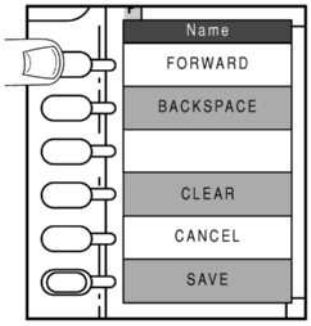
Name: John Doe
Age: 40
Sex: M

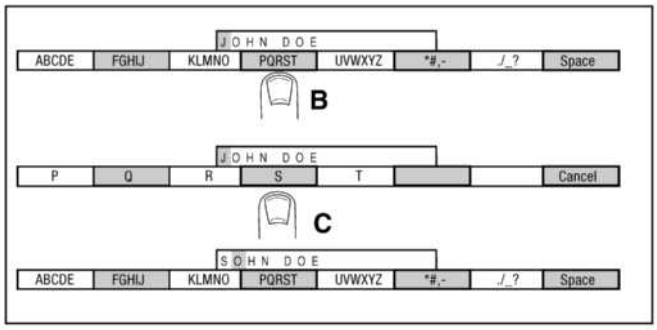
Identifier: today's date followed by the time and serial number (mmddyyhhmm000000).

ENTERING PATIENT'S NAME

1. Press the **NAME** button (A). The Name menu appears giving the operator the option of moving the cursor forward or backward; or clearing, canceling or saving the entry.

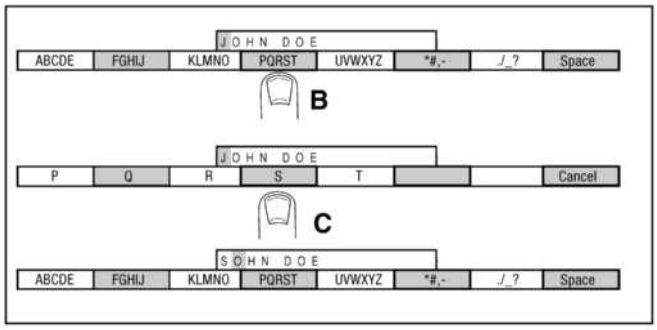
NOTE: After pressing the name button the treatment window options are replaced by an alpha/numeric window. The default name "John Doe" is displayed just above the alpha/ numeric window with an active cursor highlighting the first letter of the name.





2. Enter a new name by pressing once on the group of characters containing the letter of your choice (B). The menu will be replaced with a menu displaying the individual letters "P-Q-R-S-T." (In this case we want to change the "J" to an "S").

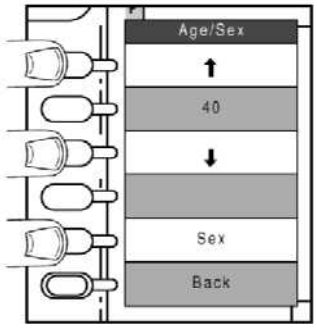
3. Next, press on the actual character (C). Your selection will be entered and the cursor will move to the next letter in the name. Continue this procedure to complete the name.



4. Pressing the **SAVE** button in the Name menu will save the name selection and return to the patient ID menu.

ENTERING PATIENT'S AGE/SEX

NOTE: The Default setting on patient's age is 40.



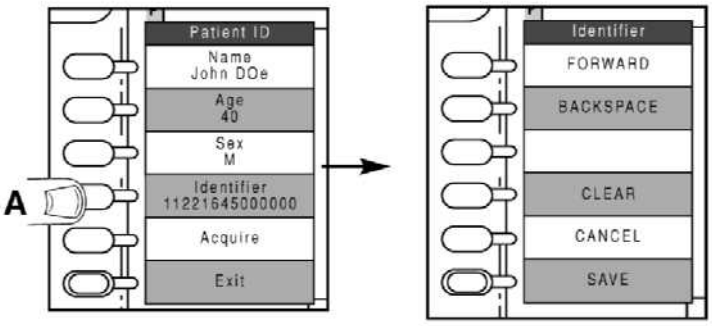
1. Press the **AGE/SEX** button to display the Age/Sex Menu.
2. Pressing the up or down arrows will increase or decrease the displayed number by increments of 5, from 15 to 100.
3. Press the **SEX** button to toggle between "M" for male and F for female.
4. Once the age/sex is selected, press **BACK** to return to the Patient ID menu.

ENTERING A NEW PATIENT IDENTIFIER

The PIC System 12-lead automatically gives each patient a unique identifier that is comprised of the current date, time and the unit serial No. at which monitoring began. The operator can change the automatic patient identifier by following the instructions below.

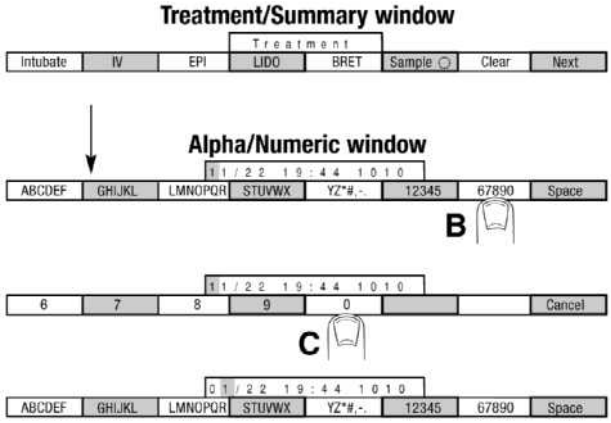
1. Press the **IDENTIFIER** button (A). The Identifier menu appears in place of the Patient ID menu and the Treatment Summary window is replaced with the Alpha/Numeric window. The

operator has the option of moving the cursor forward or backward; or clearing, canceling or saving the entry.



NOTE: After pressing the identifier button the treatment summary window options are replaced by an alpha/numeric window. The default Identifier "Date and time" is displayed just above the alpha/ numeric window with an active cursor in the first space of the identifier code.

2. Using the Alpha/Numeric window options enter a new character by pressing once on the group of characters containing character of your choice (B). (In this case we want to change the first character of the identifier, "1", to a "0")
3. Then press on the actual character (C). Your selection will be entered and the cursor will move to the next character in the identifier. Continue this procedure to complete the name.
4. Pressing the **SAVE** button in the Identifier Menu will save the selection and return to the patient ID menu.

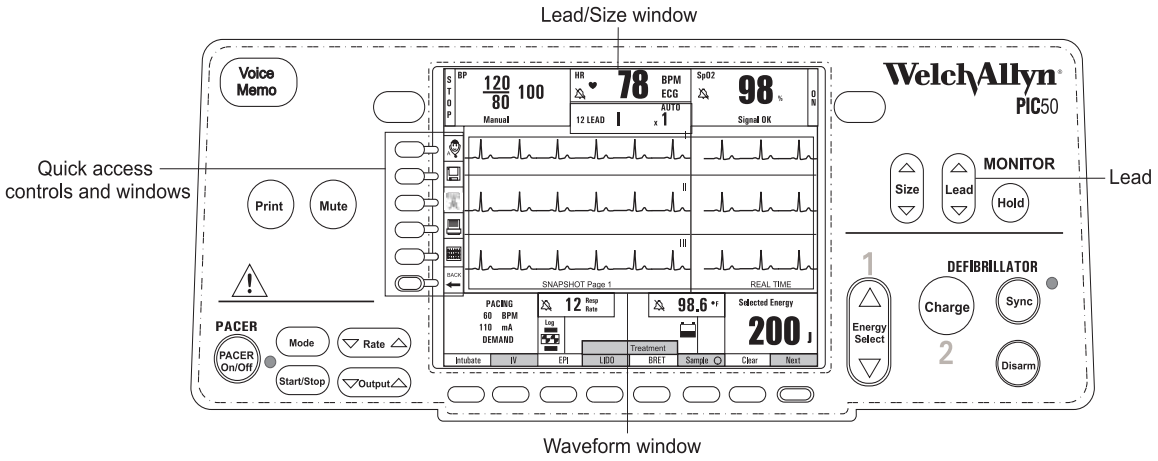


Monitoring in Normal 12-Lead Mode

Basic 12-lead mode is the default start up mode of the PIC System if the 12-lead option is installed and the 12-lead cable is connected. In this mode the operator will be able to view each of 12-leads in the waveform window.

1. Press the PIC System's **POWER** switch on.
2. The lead window will automatically sense the type of patient cable inserted into the PIC System. Check the lead window to insure that the display indicates a 12-lead patient cable is inserted into the patient connector.
3. Thoroughly prep patient skin for electrode attachment. Clean and dry skin sites preferably with a coarse, dry terry cloth. Next, clean skin with alcohol and allow to dry completely before applying pads.
4. Connect each lead of the 12-lead patient cable to the appropriate disposable electrode. Arrange the electrodes as shown on page 4.7. (Make sure that the ECG electrodes are placed to allow defibrillation if necessary).
5. Observe the patient‘s electrocardiogram on the **DISPLAY**. Adjust size of the ECG trace with the **SIZE** button as necessary.
6. The displayed lead in the waveform 1 window can be selected by pressing the **LEAD** button.

Active 12-lead Monitoring Controls and Displays

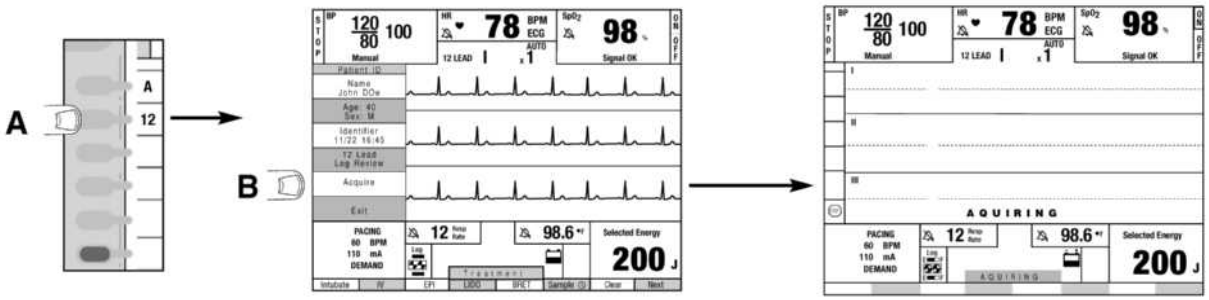


Monitoring in Active 12-lead Mode

The Active 12-lead Mode is an easy way of analyzing, storing and transmitting 12-lead data. This mode is a useful tool when there is a need for more in-depth information about the patient's cardiac condition. The Active 12-lead Mode acquires and analyzes 10 seconds of 12-lead ECG. Once acquired, the operator can view the ECG on the PIC System's display, along with a real-time trace of each lead.

ENTERING THE ACTIVE 12-LEAD MODE

1. Press the PIC System's **POWER** switch on.
2. The PIC will automatically sense the type of patient cable inserted into the PIC system. Check the lead window to insure that the display indicates a 12-lead patient cable is inserted into the patient connector.
3. Press the **12** button (A) on the quick access window. This will display the Patient ID menu and change the waveform window to display 3 traces. The display initially displays leads I, II, III. The frequency response in Active 12-lead mode will be set to either diagnostic (.05-150 Hz) or filtered diagnostic (.25 - 40 Hz) as configured in the supervisor menu.
4. Acquire New 12-Lead Snapshot
   a Press the **ACQUIRE** button (B). This will enter you into the Active 12-lead Mode. The PIC System will begin storing 10 seconds of 12-lead ECG information. The word ACQUIRING will blink in the waveform window and the quick access window will blank except for a stop icon at the bottom.

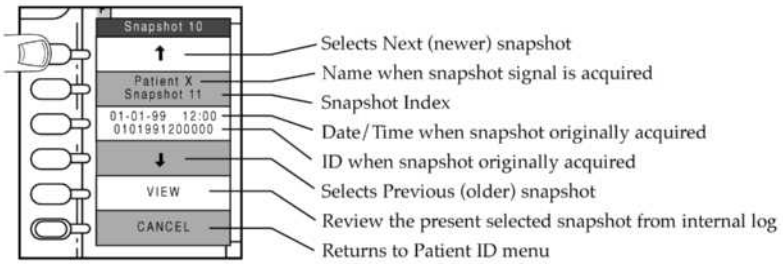


NOTE: To stop 12-lead acquisition, press the **STOP** *button and the patient ID menu will appear.*

b. After approximately 10 seconds, the PIC System will prompt the user that it has completed acquisition. A snapshot and real-time window will appear, each showing leads I, II, and III. The Quick access window will have also changed to display Analysis, Save, Fax, Print, Page, and Back icons.

Review old 12-lead Snapshot

Press the **12-LEAD LOG REVIEW** button. If at least one 12-Lead snapshot is in the internal log, the 12-Lead Log Review menu will display which allows selecting from the 10 most recent acquired snapshots.



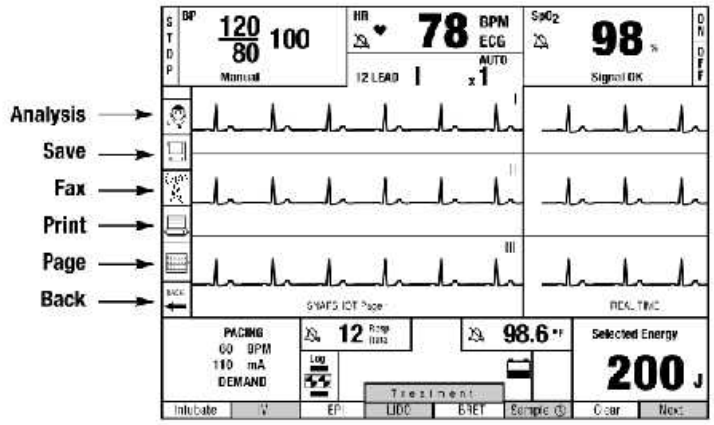
NOTE: The most recent snapshot header information is displayed initially in the 12-Lead Review Menu.

If **VIEW** is pressed, the presently selected snapshot from the internal log will be drawn on the screen for review. The quick access window will change to display analysis, save, send, print, page and back icons.

NOTE: If more than 10 snapshots are stored, the oldest snapshots will be overwritten.

Active 12-lead Display

After the PIC system has either acquired a new 12-Lead snapshot, or reviewed an old 12-Lead snapshot from the internal log the display is divided into a SNAPSHOT window on the left and a real-time ECG window on the right. The snapshot window first displays 3.33 seconds of stored information from leads I, II, and III. The real-time window will display a real-time trace of the corresponding leads I, II, and III.



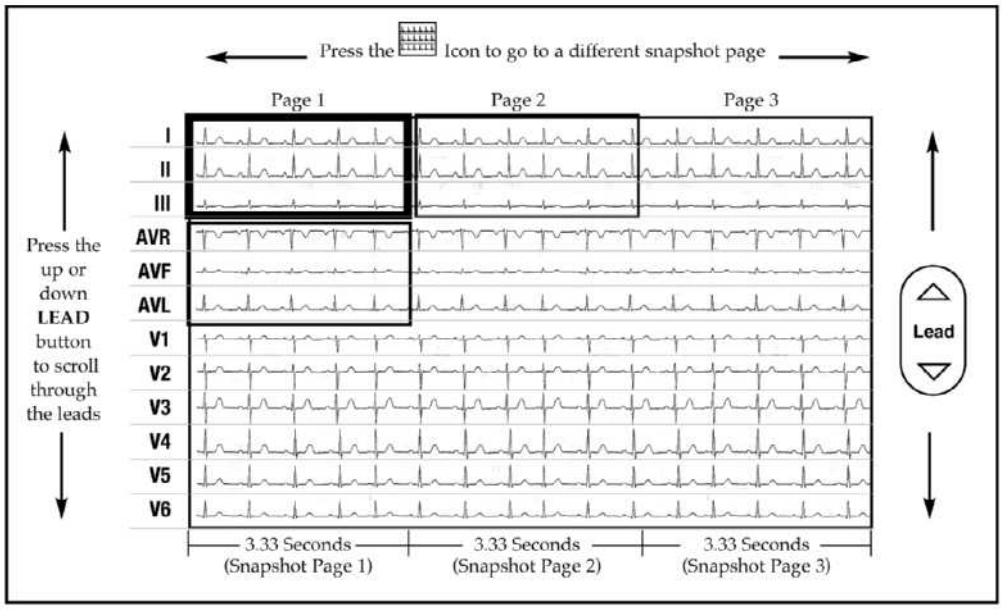
VIEWING THE SNAPSHOT INFORMATION

The snapshot of each lead is 10 seconds in duration. The snapshot window displays 3.33 seconds of each of 3 leads at a time. Each snapshot consists of 3 pages of 3.33 seconds of ECG.

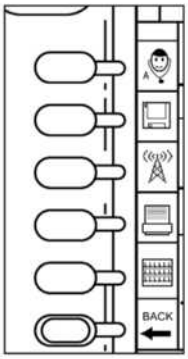
a) Leads I, II, III are displayed first in page one of the snapshot window.

b) To scroll through the other 9 leads, press the up or down **LEAD** arrow button. The same 3.33 seconds of ECG for the next set of 3 leads will be displayed.

c) To go to page two of the snapshot window and view the next 3.33 seconds of ECG information, press the **PAGE** button in the quick access window.



Quick Access Functions of the Active 12-lead Mode



After the PIC system has acquired the 12-lead information the operator can use the quick access functions to review, store, and transmit data to a remote location by pressing any of the quick access buttons.

Analyze Function
If installed, the analyze function displays the diagnostic results of the acquired 12-lead ECG. See chapter 18 for details and instructions for 12-lead interpretive analysis.

Save Function
If a data card is installed, pressing the save button will download the acquired 12-lead information to the PIC System's PCMCIA data card.

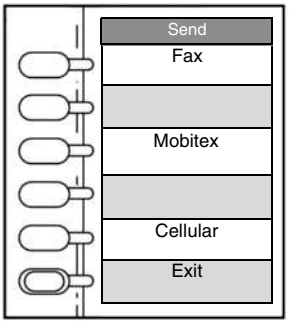
Autosave Function
If a data card is installed, printing or faxing a 12-lead snapshot will automatically save the snapshot to the datacard. An "S" will appear on the save icon indicating that the current snapshot has been saved.

NOTE: Each 12-lead snapshot is automatically saved to the internal log in a rotary queue which stores the 8 most recent snapshots.

NOTE: Transmission time after connecting will be approximately 1 minute 40 seconds at 9600 baud. This time will be slightly longer if a datacard is installed.

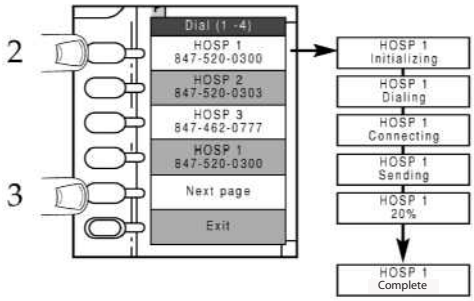
Send Function

Optional functions for the remote transmission of 12-lead ECG data include fax, Mobitex, and Cellular.



NOTE: For instructions on Mobitex and Cellular operation see Chapter 19.

If the fax option is purchased, the fax output cable (001949) must be connected to the fax output jack and to a wall phone jack or to the cellular phone adapter (900241) before initiating a fax operation.



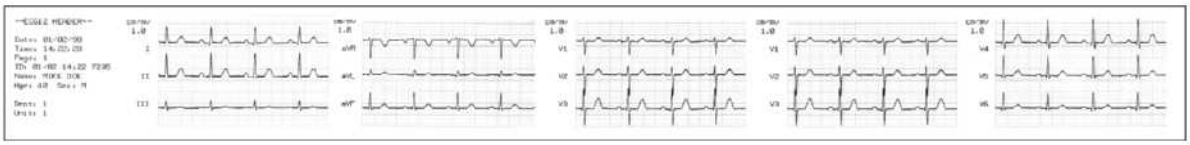
OPERATION OF THE FAX FUNCTION:

1. Select the page (1, 2, or 3) of ECG data to fax (See page function on the following page).
2. Press the **FAX** button. A selection of 12 previously programmed phone numbers and 4 user programmed numbers will be displayed.

   If the user dial menu, on the 4th menu page is selected, a alpha numeric entry menu will be displayed on the bottom of the screen. The user can enter a phone number using the technique described previously in this chapter.
3. Press the appropriate location/phone number to send the stored 12-lead data or press **NEXT PAGE** to display the next page of phone numbers.

4. A sequence of status messages consisting of Initializing, Dialing, Connecting, sending, 20%, 40%.....100%, Complete, will display in the box of the number that was selected. A fax transmission summary will be printed on the chart recorder and stored in the log.

NOTE: Fax transmission phone numbers are entered in the Supervisor Menu. See chapter 13.



Print Function

Pressing the print button will print 3 seconds of each lead in groups of three, along with the patient ID information. Select the desired page (1, 2, or 3) of ECG data before printing.

NOTE: The format of the 12-lead print-out can be changed from the Supervisor>12-Lead>Printer menu. The print-out shown above is the default 3x4 I/II/III format.

Page Function

This functions allows the operator to view 3 snapshot pages of 12-lead ECG data. See previous section, "Viewing the Snapshot Information."

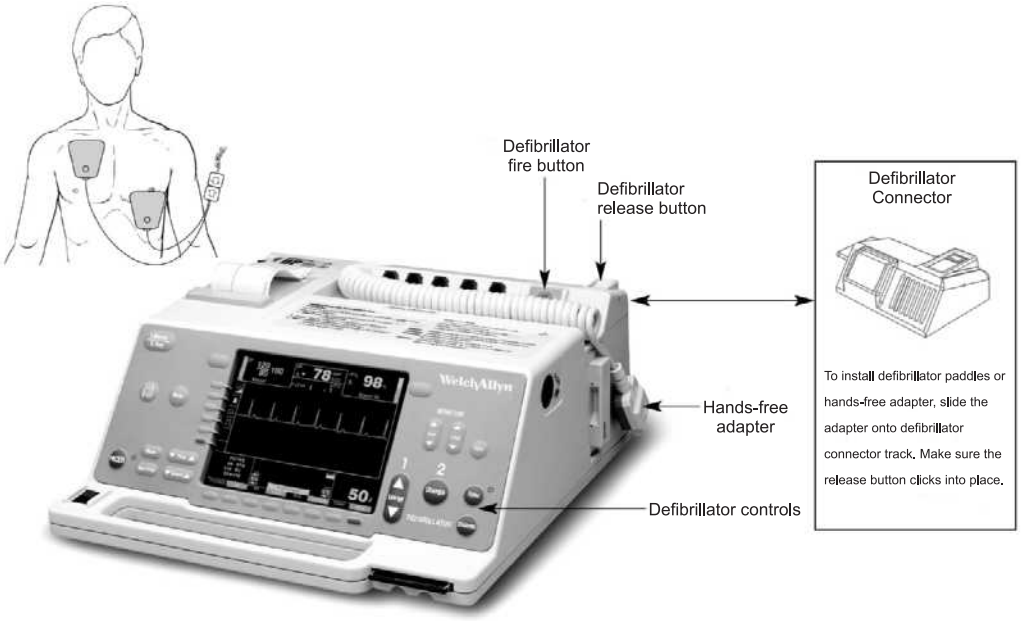
CHAPTER 6: MANUAL DEFIBRILLATION

This chapter describes the manual mode defibrillator controls and displays. It provides operating instructions for manual defibrillation and using external paddles and the multi-purpose hands-free adapter.

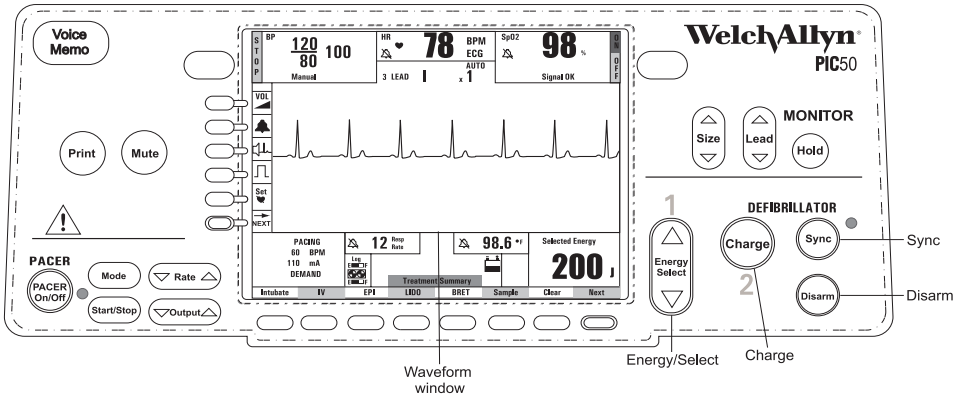
Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.

NOTE: The unit has an automatic defibrillator disarm mode. If energy is not delivered to a patient or load, an internal timer will disarm the defibrillator after 1 minute in manual mode.



Manual Defibrillator Controls and Displays



Defibrillation functions on the PIC System are viewed on and controlled by the areas illustrated above.

NOTE: The following operations of the defibrillator depict normal factory default settings. In chapter 13 we will discuss user configurations of the defibrillator.

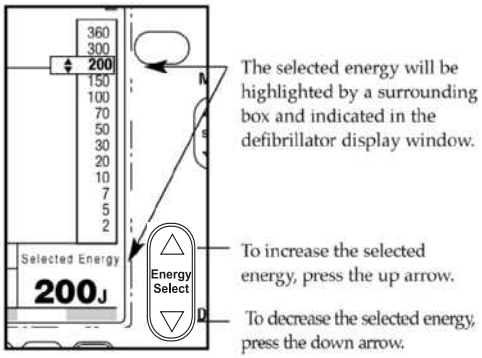
Initial Displays

When the PIC System is turned on the default selected energy is displayed (**200 J**, as illustrated at left). The defibrillator is not charged.

CONNECT PADDLES in the defibrillator window indicates the defibrillator paddles or multipurpose hands-free adapter are not attached or are not seated firmly in the defibrillator connector.

Energy Select

The **ENERGY SELECT** button is used to select defibrillator energy. Pressing either the up or down arrow will cause the Energy Range Bar to be displayed on the right side of the display.



Energy Range Bar

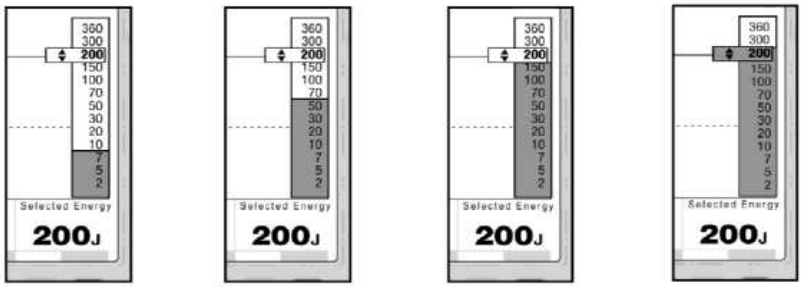
NOTE: The default energy level, upon power start up, can be changed to a lower or higher setting. See Configuring the Defibrillator (supervisor menus) later in this chapter.

Charge

The **CHARGE** button initiates the defibrillator charge. When the charge button is pressed, a periodic audible tone will sound; the energy range bar graph will highlight the relative charge state until it reaches the selected energy.

When the defibrillator is fully charged, the periodic tone will change to a continuous tone and the highlighted energy range bar graph will include the selected energy.

NOTE: If the energy selection is changed during the charge sequence, the unit will automatically charge to the new energy level and the display will be updated accordingly.



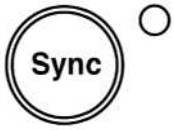
Charging -> Fully Charged

Disarm

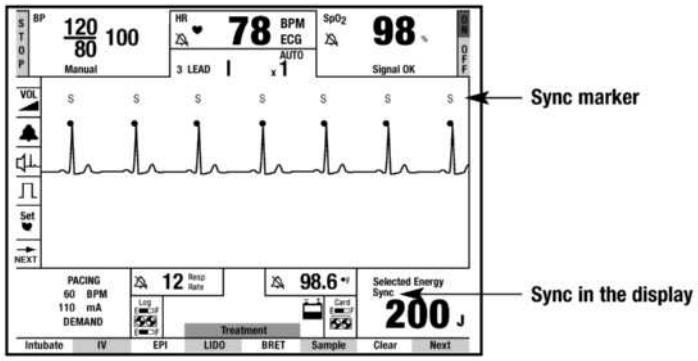
Pressing the **DISARM** button will safely discharge the defibrillator internally and the energy range bar display will disappear.

NOTE: Note: The unit contains an automatic disarm of the defibrillator, If the operator has not delivered the energy to a patient or load, an internal timer will disarm the defibrillator after 1 minute when in manual mode.

Sync



Pressing the **SYNC** button activates the synchronization mode and illuminates the SYNC indicator light, which flashes off when a QRS has been detected. Sync will appear on the display and a SYNC marker will also appear over the portion of the ECG that the defibrillator will trigger on. Pressing the **SYNC** button again reverts to the asynchronous mode.



NOTE: After synchronized cardioversion discharge, the defibrillator can be configured to remain in the Sync mode or revert to the asynchronous mode (See configuring the defibrillator [Supervisor Menus] in chapter 13).

NOTE: The factory default Sync setting after discharge is the asynchronous mode.

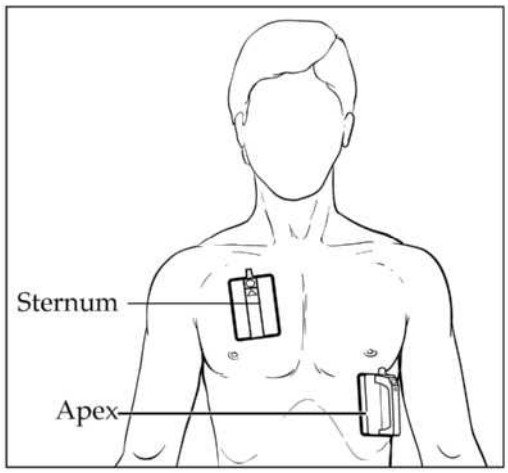
Manual Defibrillation Operation Procedures

Defibrillation with External Paddles

1. Press **POWER** switch to ON.
2. Apply electrode gel to the center of one paddle electrode. Lightly press the paddle electrodes together and spread the gel evenly over both paddle surfaces. Make sure gel covers the entire paddle surface. Do not allow any gel to touch the paddle handle or the operators hands.
3. Press the **ENERGY SELECT** button on the front panel up or down to select the desired energy level (energy selection is also available on the deluxe paddle set).
4. Pressing the **CHARGE** button on the defibrillator panel to charge the defibrillator (charge selection is also available on the deluxe paddle set). An audible periodic tone will sound indicating that the unit is charging. The energy range bar graph on the right side of the display will highlight the relative charge state until it reaches the selected energy. When the unit is fully charged, the periodic tone will change to a continuous tone and the highlighted energy range bar graph will include the selected energy.

NOTE: If the selected energy is changed after charging has been activated, additional time may be required to charge to the new energy.

5. Place the sternum paddle firmly against the patient's chest inferior to the patient's right clavicle and lateral to the upper sternum; place the apex paddle in the anterior-axillary line, inferior and lateral to the patient's left nipple, as shown below.



Paddle Placement

6. With the paddles in proper position, clear all personnel; visually ensure all personnel are clear (including the operator) from patient contact. Press the ϟ button on each paddle simultaneously.

NOTE: If defibrillation is not required, pressing the **DISARM** *button located on the front panel will discharge the energy internally.*

Delivered Energy

7. Observe the effect of the delivered countershock by observing the patient's ECG on the display. The amount of energy delivered will appear in the defibrillation display window. Verify that the proper amount of energy has been delivered.

8. For additional countershocks, repeat steps 3-8.

NOTE: For monitoring through the defibrillator paddles, the ECG waveform can be monitored immediately after the FIRE buttons are released, as long as the paddles are held in place, and the LEAD select is set to PDL (Paddles).

9. To secure the instrument, turn the power switch to Off. Clean the paddle electrodes, patient cables and controls as outlined in chapter 16.

10. If battery power was used, recharge the battery by connecting the unit to AC power, or replace the used battery with a fresh, fully charged battery and check that there are sufficient supplies for the next use (defib gel, recorder paper, ECG electrodes, etc.).

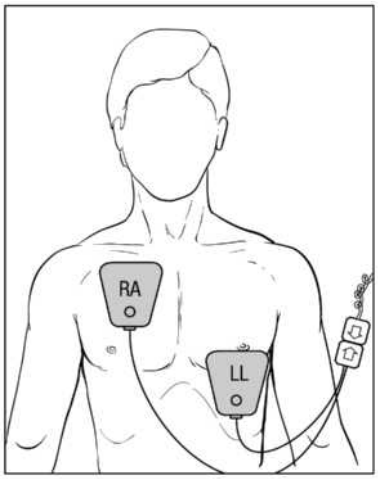
Defibrillation with Multipurpose Hands-Free Adapter

Connect the multipurpose hands-free adapter by sliding it onto the defibrillator connector track. Make sure the release button clicks into place and is in the up position.

1. Press **POWER** switch to ON, and ensure lead selector is set to PAD.

2. Remove or loosen patient's clothing if necessary for application of pads. Clean and dry skin sites, preferably with a coarse, dry terry cloth. Shave patient if appropriate. To remove lotions or moisturizer clean patient's skin with alcohol and allow to dry completely before applying pads.

3. Check expiration date; do not use pads that have expired. Remove disposable multipurpose pads from packaging. Use Welch Allyn multipurpose electrodes model 001853 for adult patients, pediatric multipurpose electrodes model 001828 for pediatric patients (<10kg). Remove the protective cover from the pads and apply the pads to the patient in the position illustrated below or according to pad package. Do not use if gel area is dry.



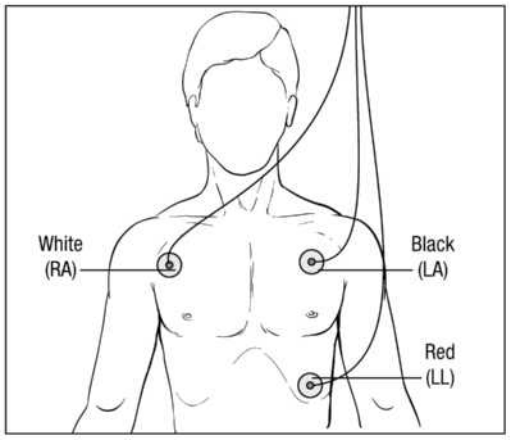
Hands-Free
Pad Placement

4. Press the **ENERGY SELECT** button on the front panel up or down to select the desired energy level.
5. Pressing the **CHARGE** button on the defibrillator panel to charge the defibrillator. An audible tone will sound periodically indicating that the unit is charging. The energy range bar on the right side of the display will highlight the relative charge state until it reaches the selected energy. When the unit is fully charged, the periodic tone will change to a continuous tone and the highlighted energy range bar will include the selected energy.
6. Visually and verbally ensure that all personnel (including the operator) are clear from the patient. Press the ϟ button on the multipurpose hands-free adapter to deliver energy.
7. Observe the effect of the delivered countershock by observing the patient's ECG on the display. The amount of energy delivered will appear in the defibrillation display window. Verify that the proper amount of energy has been delivered.
8. For additional countershocks, repeat steps 4 through 8.
9. To secure the instrument, turn the power switch to Off. Clean the patient cables and controls as outlined in Chapter 16.
10. If battery power was used, recharge the battery by connecting the unit to AC power, or replace the used battery with a fresh, fully charged battery and check that there are sufficient supplies for the next use.

WARNING: ***Elective cardioversion should only be performed while monitoring patient with patient cable and electrodes or hands-free defibrillator pads. Although the device will allow synchronized cardioversion in the PDL (paddle) lead selection, it is not recommended that Sync be performed in the PDL lead. Artifact can be generated from the paddle cables, which could cause the defibrillator to discharge on the artifact.***

Performing Synchronized Cardioversion

1. Press **POWER** switch to ON.
2. Attach an ECG electrode to each lead of the patient cable. Attach the electrodes to the patient. Position the electrodes to allow immediate placement of the defibrillator paddles.



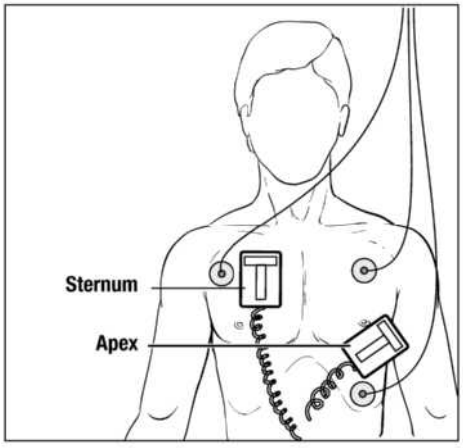
Electrode Placement

3. Connect the ECG patient cable to the ECG input connector. Press the **LEAD** button to select lead II position (if using the hands-free defibrillator pads, select PAD lead position). If using 5-lead patient cable (see chapter 13 to change 3-lead selection to 5-lead) select lead II position. Observe the patient's ECG on the display.
4. Apply electrode gel to the center of one paddle electrode. Lightly press the paddle electrodes together and spread the gel evenly over both paddle surfaces. Make sure the gel covers the entire paddle surface. Do not allow any gel to touch the paddle handle or the operator hands.
5. Press the **SYNC** button to engage the synchronizer. The light next to the Sync button will illuminate and an "S" marker will appear over the portion of the ECG that the defibrillator will trigger on. The Sync light will flash off with each Sync marker.

NOTE: If the marker pulse does not appear over the R wave, turn lead select to another position (I, II, III) or adjust ECG size. If the Sync marker is not obtained, the defibrillator will not discharge. Do not switch the lead from PADS if monitoring with hands-free defibrillation pads.

6. Press **ENERGY SELECT** button on the front panel up or down to select the desired energy level.

7. Charge the defibrillator by pressing the **CHARGE** button on the defibrillator panel, or the **CHARGE** button on the deluxe apex paddle. An audible tone will sound periodically, indicating that the unit is charging. The energy range bar on the right side of the display will highlight the relative charge state, until it reaches the selected energy. When the unit is fully charged, the periodic tone will change to a continuous tone and the highlighted energy range bar will include the selected energy.



Cardioversion Paddle Placement

8. Place the sternum paddle firmly against the patient's chest inferior to the patient's right clavicle and lateral to the upper sternum; place the apex paddle in the anterior-axillary line, inferior and lateral to the patient's left nipple, as shown to the right.

9. To discharge, hold the paddles firmly in place, then press and hold both **DISCHARGE** buttons down until the defibrillator discharges.

NOTE: Discharge may not be immediate upon pressing the paddle ϟ buttons. This is normal. Keep the fire buttons depressed until the defibrillator discharges.

*NOTE: For any additional shocks, the **SYNC** button may or may not need to be pressed. This depends on the supervisor cardioversion mode setting.*

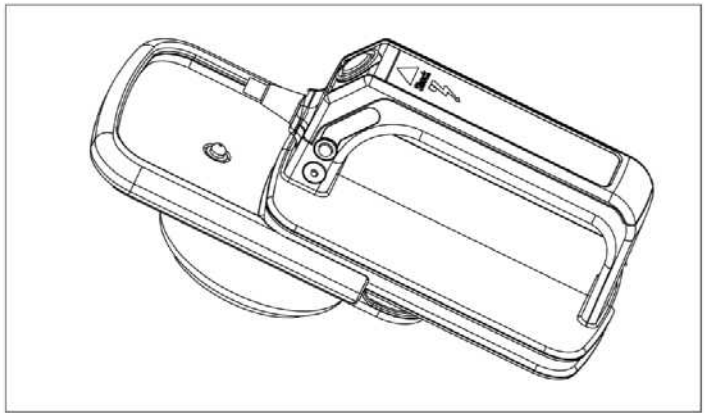
10. To negate the cardioversion after the ϟ buttons are pressed but before the next QRS wave is detected and the defibrillator discharges, merely release both **DISCHARGE** buttons. The defibrillator will not fire. When ready to defibrillate again, firmly position the paddles, then press and hold the **DISCHARGE** buttons until a QRS wave is detected and the defibrillator delivers the energy.
11. Press the **DISARM** button on the front panel to disarm defibrillator at any time during procedure.

Defibrillation with Pediatric Adapter

CAUTION: *There is no energy limit for pediatric electrodes. Care should be exercised to insure appropriate selection of defibrillation energy level for pediatric patients.*

NOTE: To facilitate rapid defibrillation for pediatric use, the power on default defibrillation energy can be auto set in the supervisor-defib menu.

1. Shut the unit off before attaching the pediatric electrodes to the paddles.
2. Slide the pediatric electrode onto the adult paddle set. Be sure to slide the electrode in the end for a snug fit.



Pediatric Electrodes

3. Follow instructions for defibrillating with external paddles to defibrillate patient.

NOTE: Pediatric defibrillation research has shown that adult paddles should be used as soon as chest size permits.The larger paddle size has been found to help decrease transthoracic impedance, thus facilitating cardioversion and defibrillation.

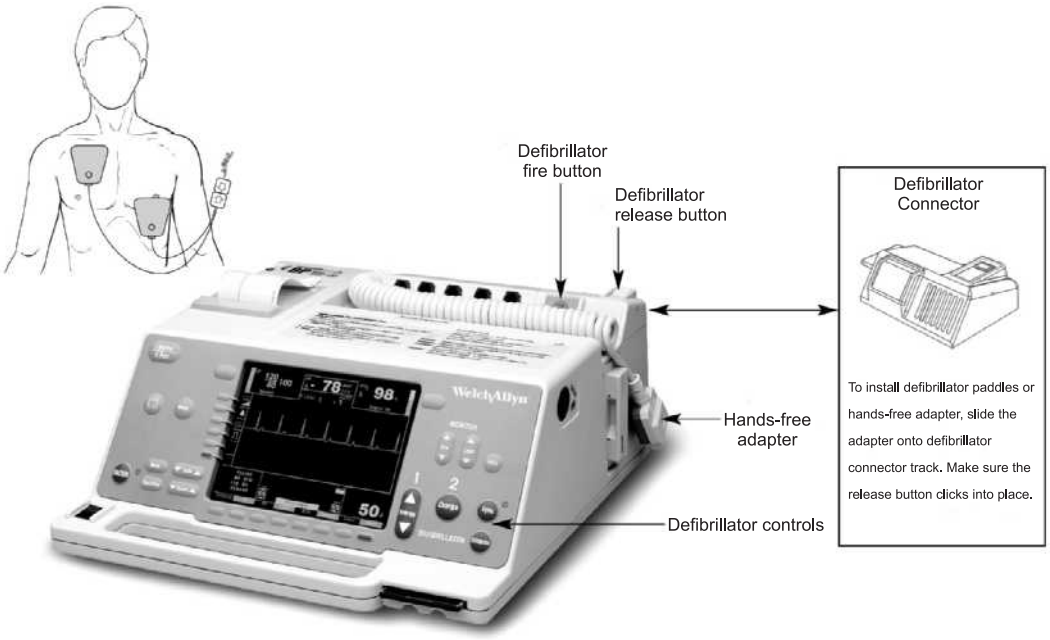
CHAPTER 7: SEMI-AUTOMATED EXTERNAL DEFIB (OPTIONAL)

This chapter describes the functions and operation of the Semi-Automated External Defibrillation (SAED) unit, including using Multipurpose Hands-Free Pads and Paddles.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information before proceeding with this chapter.

NOTE: The unit contains an automatic disarm of the SAED. If the operator has not delivered the energy to a patient or load, an internal timer will disarm the defibrillator after 30 seconds.

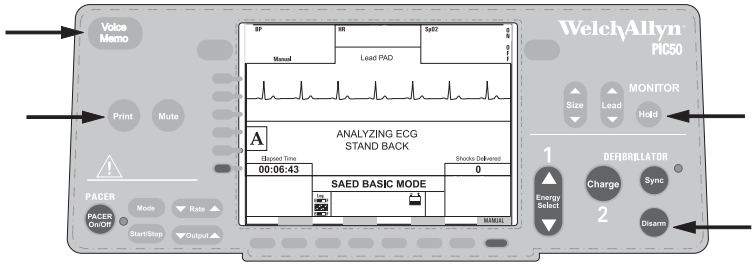


SAED Basic Mode

Defibrillation Modes

When the Semi-Automatic Defibrillation (SAED) option has been installed, the PIC can be configured to power up in either SAED Basic, SAED Basic+, or Manual defibrillation mode.

If the PIC has been configured to power-up in the SAED Basic mode, only the controls that have been highlighted below will be active. All other controls will be disabled to simplify operations.



Available options in SAED Basic mode are highlighted below:

NOTE: The Pulse Oximeter, Non-invasive Blood Pressure, Pacer, and Treatment Summary menu will not be available in basic mode.

In the SAED Basic mode, the PIC will continuously monitor the patient's ECG and determine if a shockable rhythm is present. When a shockable rhythm is detected, the PIC will automatically select the appropriate energy (based on the energy protocol selected in the Supervisor configuration menu), and automatically charge the defibrillator to the selected energy. After three consecutive No Shock analysis results, the PIC will display text and provide a voice prompt to "Check Pulse, If no pulse start CPR." After each set of three consecutive defibrillation attempts the PIC will provide the same text and voice prompts and enter into CPR mode when the A (Analyze) button and CPR timer 

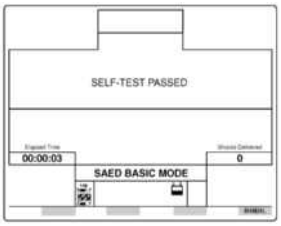
displays.

NOTE: If an ECG rhythm is potentially shockable it may qualify as 2 No Shock analysis results to hasten entry into CPR mode.

During CPR mode, the PIC System continues to monitor for shockable rhythms. If a shockable rhythm is detected during CPR mode, the A (Analyze) button will flash. If the operator is performing CPR, the A should be ignored. Pressing the A button will abort the CPR cycle, and analysis cycle will restart.

In the SAED Basic mode, access to the manual defibrillation mode may be “Locked Out” by a Passcode.

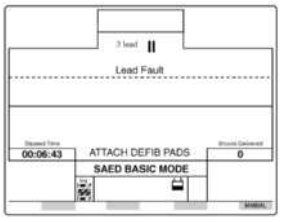
SAED Basic Displays



Self-Test Passed

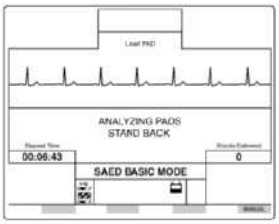
Indicates the SAED Basic mode has been selected and the power on.

Lead Fault



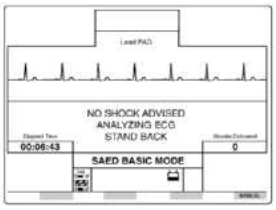
Indicates a lead fault condition. Neither the defibrillation electrodes or the 3-lead ECG cable have been properly attached to the patient. Check to see that the defibrillation electrodes have been properly attached to the patient and to the Hands-free adapter. The PIC will announce “CHECK DEFIB ELECTRODES”, during this condition. The display will indicate LEAD FAULT and "------" in lieu of an ECG to signify lead fault.

Analyzing Pads



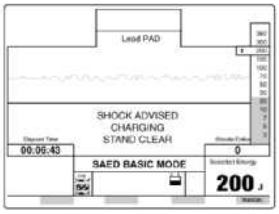
Indicates the electrodes have been properly attached and the PIC is monitoring the patient’s ECG for criteria that may indicate a shockable rhythm. The PIC will announce “STAND BACK, ANALYZING ECG.” Avoid touching or moving the patient. Touching or moving the patient can cause artifact which may interfere with the analysis process.

No Shock Advised



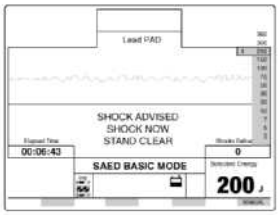
Indicates the PIC has completed one analysis of the patient’s ECG and that No Shock was advised. The PIC resumes monitoring the patient. Two BEEPs will be heard, signifying no shock advised result of the initial analysis. After 3 consecutive No Shock analyses the PIC displays CHECK PULSE, IF NO PULSE START CPR. The PIC will continue to assess the patient's heart rhythm. If the signal is non-shockable, No Shock Advised will continue to flash on the display and an audible beep sounds every minute, but if the PIC detects a shockable rhythm it will direct the operator to stand back as it begins to analyze the patient's heart rhythm.

Shock Advised - Charging - Stand Clear



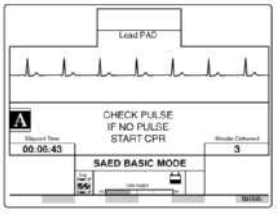
Indicates the PIC completed analyzing the patient's ECG and that a shockable rhythm was detected. The PIC will automatically select the proper energy and begin to charge the defibrillator. The display will indicate SHOCK ADVISED, CHARGING and to STAND CLEAR. The PIC will announce, "SHOCK ADVISED, STAND BACK". Periodic tones will be heard to signify the defibrillator is charging. The energy bar graph on the right of the display will indicate the relative charge state.

Shock Advised - Shock Now - Stand Clear



Indicates a shockable rhythm is still detected and that the defibrillator has completed charging to the selected energy. The display will indicate SHOCK ADVISED, SHOCK NOW, STAND CLEAR.The PIC will announce "SHOCK NOW" and the periodic charging tones will change to a steady tone, signifying that the defibrillator is fully charged. Make sure everyone is CLEAR of the patient, announce CLEAR and press the discharge button to deliver the shock. The shock must be delivered within 30 seconds. If the defibrillator remains charged for over 30 seconds, the PIC will disarm the energy safely internally, as a safety precaution. The energy bar graph will disappear.

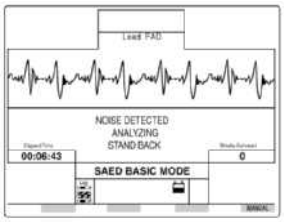
Check Pulse



After each set of 3 consecutive defibrillation attempts the PIC advises the operator to CHECK PULSE, IF NO PULSE START CPR. After 60 (or 30 or 90 if configured) seconds, the PIC will announce "STOP CPR" and resume monitoring the patient's ECG.

NOTE: If an ECG rhythm is potentially shockable, it may qualify as 2 No Shock analysis results to hasten entry into CPR mode.

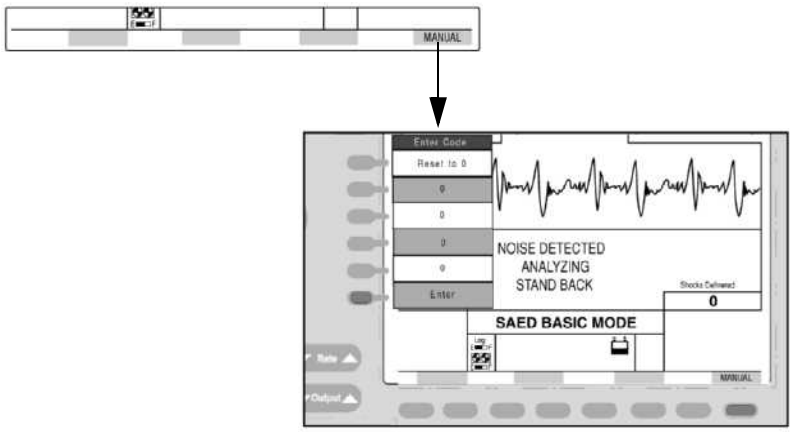
Noise Detected or Motion Detected



Indicates during an analysis period that noise was detected in the ECG and that the analysis was not completed. Take measures to eliminate the source of motion or artifact. Avoid touching or moving the patient while analyzing. The display will indicate "NOISE DETECTED"or "MOTION DETECTED." The PIC will announce "Motion Detected" only if the current ECG rhythm is potentially shockable.

Changing to Manual Defibrillation Mode

Advanced Life Support (ALS) personnel can exit the SAED mode and operate the PIC as a manual defibrillator by pressing the **MANUAL** button on the bottom menu.

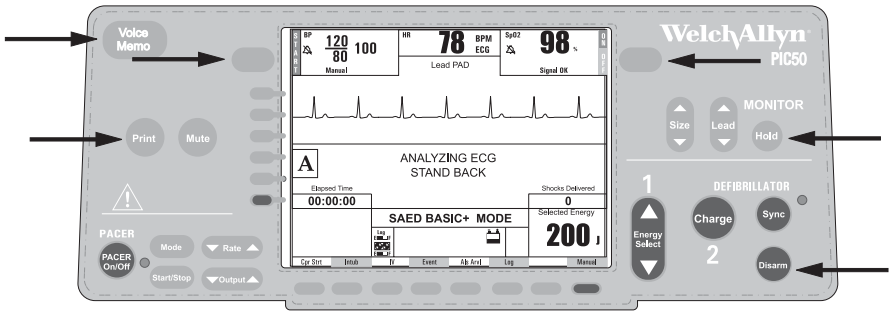


The PIC can be configured to require a passcode to enter the manual mode (see Configuring the SAED in chapter 13). This feature prevents unauthorized users from using the manual defibrillation mode. If the PIC has been configured to require a passcode, it will prompt the user to enter the code when the **MANUAL** button is pressed. The 4 digit code is entered by repeatedly pressing the secondary menu buttons to increment each of the 4 digits. Upon pressing the **ENTER** button, the PIC will change to the manual mode if the correct passcode or the supervisor access code was entered.

NOTE: All information in the Treatment Summary Log will remain intact after switching to Manual Mode.

SAED Basic+ Mode

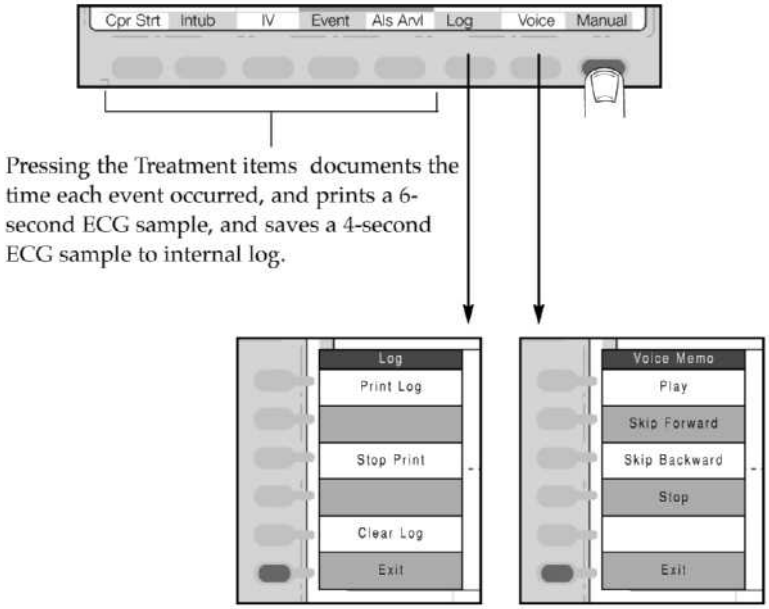
If the PIC has been configured to power-up in the SAED Basic+ mode, only the controls that have been highlighted below will be active. If the Pulse Oximeter and/or the Non-Invasive Blood Pressure are installed options, they will be available in the SAED Basic+ Mode. Below is a sample display in SAED Basic+ mode:



The display messages for the SAED Basic+ mode are the same for the SAED Basic mode. Refer to the SAED Basic mode display section for the explanation of the SAED Basic+ display messages.

SAED Basic+ Treatment Menu

In the SAED Basic+ Mode the Treatment Menu will appear as shown below:



SAED Operation Procedures

Indications for Using SAED Mode

The PIC has been designed to be used by emergency care personnel who have been trained in basic life support, cardiac care techniques and the use of the PIC. The PIC, in SAED mode, should only be applied to victims of cardiac arrest who exhibit:

- Unconsciousness
- Absence of breathing
- Absence of pulse

Contraindications for Using SAED Mode

The PIC should not be used in the SAED Mode when the patient:

- Is Consciousness
- Is Breathing
- Has a Pulse

The ECG analysis should not be used when the patient is being moved or transported. Patient movement can cause artifact, which can interfere with the analysis process. Stop all patient movement and do not touch patient when the ECG analysis is in process.

CAUTION: SAEDs are not designed to treat pediatric ECG rhythms. The American Heart Association recommends SAEDs only on patients who are over 8 years old. Do not use the PIC in the SAED mode on patients who are less than 8 years old.

Defibrillation with Multipurpose Hands-free Adaptor

Insure the Multipurpose hands-free adapter has been connected to the PIC properly.

The PIC has been designed to allow monitoring of the ECG using the multipurpose defibrillation electrodes or a 3-Lead ECG cable. If the multipurpose electrodes are used the PIC automatically sets the ECG Lead selection to PADS and the ECG Size to x1. The ECG Lead selection and ECG Size can not be changed in the SAED mode.

If only the ECG electrodes are attached to the patient the PIC automatically sets the ECG Lead selection to Lead II and the ECG Size to x1. If both ECG electrodes and Multipurpose Defibrillation electrodes are attached to the patient, the Lead Selector will default to the PAD selection. The PIC will acquire the patient's ECG from the more reliable ECG source - the Multipurpose electrodes rather than from the smaller ECG electrodes.

Should the multipurpose electrodes become detached while the ECG electrodes are attached, the PIC will announce “CHECK DEFIB ELECTRODES” and automatically switch over to monitoring through the ECG electrodes.

NOTE: The ECG Lead indicator will signify Lead II. If a shockable rhythm is detected, the PIC will prompt you to ATTACH DEFIB PADS and will not allow you to defibrillate.

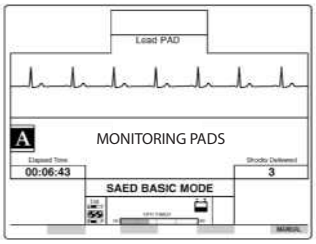
EMS Mode

EMS mode is a feature specifically designed for the use by an Emergency Medical Technician. EMS mode is recommended when continuous SAED mode analysis is required while transporting a patient or performing another procedure such as intubation. EMS Mode is a supervisor selectable mode of operation that performs continuous background analysis, but requires the user to press the A button for full analysis in response to a prompt from the PIC. The following section describes the operation and various features of EMS mode.

Background Monitoring

When the unit is powered on in EMS mode, it is automatically set to a *Voice Off* mode. This means that the PIC will analyze silently and will not speak any voice prompts unless it detects a shockable rhythm.

If a shockable rhythm is detected, the screen will change and the PIC will speak and display **CHECK PATIENT.**



When the "CHECK PATIENT" prompt is spoken, the user should verify that the patient is pulseless, apneac, and unconscious, and eliminate sources of motion artifact before pressing the A button to Enter *Voice On* mode. In *Voice On* mode, the PIC will issue verbal prompts, fully analyzing the patient’s heart rhythm and charging the defibrillator if necessary. Follow normal SAED mode operating procedures in *Voice On* mode.

NOTE: The A button can be pressed at any time in EMS mode to perform a full analysis of the patient's heart rhythm

NOTE: The "Check Patient" prompt may be spoken in response to excessive motion artifact or CPR. Eliminate sources of motion artifact before pressing the A button.

If defibrillation is necessary, the PIC will perform the normal three-charge SAED protocol set by the supervisor. If a patient is successfully defibrillated, the PIC will return to *Voice Off* mode. If three successive shocks are delivered, the CPR timer will begin after the third shock. Following completion of CPR, the unit will speak "Stop CPR" and return to *Voice Off* mode to continue background monitoring.

To Enable EMS Mode:

1. Go to the Setup Menu and select Supervisor.
2. Enter the Supervisor passcode.
3. Next, enter the SAED menu and select EMS Mode On. The unit will reboot with EMS Mode ON.

Follow the same procedure to turn the EMS Mode OFF.

SAED Mode Operation with Multipurpose Hands-Free Pads

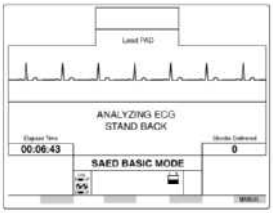
Monitoring and Defibrillation

PROPER MONITORING AND DEFIBRILLATION IN THE SAED MODE

1. Assess Patient. Confirm the patient exhibits:
   - Unconsciousness
   - Absence of breathing
   - Absence of pulse
2. Press **POWER** switch to ON. Ensure Self-Test Passed and battery icon is not LOW.
3. Remove or loosen patient's clothing if necessary for application of pads.

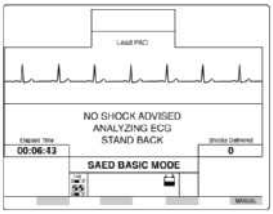
4. Check expiration date of the pads. Do not use pads that have expired. Remove disposable multipurpose pads from packaging. Use Welch Allyn Multipurpose electrodes Model 001853 for adult patients and Model 001828 for pediatric patients (<10kg). Remove protective cover from pads and apply the pads to the patient. Apply the RA pad to the patient's right side – to the side of the breast bone and below the collar bone. Apply the LL pad over the patient's ribs to the left of the nipple.
5. Follow display messages and voice prompts.

Analyzing ECG, Stand Clear



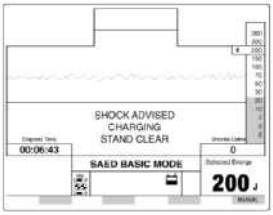
Indicates the PIC has detected a valid ECG source (PADS or Lead II) and is analyzing the patient's ECG to assess if it is a shockable rhythm. The PIC will announce "STAND BACK, ANALYZING". Avoid touching or moving the patient, Touching or moving the patient can cause artifact which may interfere with the analysis process.

No Shock Advised, Monitoring ECG



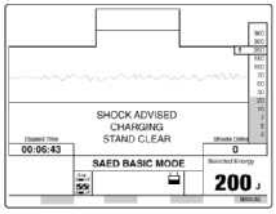
Indicates the PIC has completed one analysis of the patient's ECG and that No Shock was Advised. The PIC resumes monitoring the patient. Two BEEPs will be heard, signifying the No Shock Analysis result. After 3 consecutive No Shock analyses the PIC displays CHECK PATIENT, IF NO PULSE START CPR. The PIC will also announce "CHECK PULSE, IF NO PULSE, START CPR. The PIC will continue to assess the patient's heart rhythm. If the signal is non-shockable, No Shock Advised will continue to flash on the display and an audible beep sounds every minute, but if the PIC detects a shockable rhythm it will direct the operator to stand back as it begins to analyze the patient's heart rhythm.

Shock Advised, Charging, Stand Clear



Indicates the PIC completed analyzing the patient's ECG and that a shockable rhythm was detected. The PIC will automatically select the proper energy and begin to charge the defibrillator. The display will indicate SHOCK ADVISED, CHARGING and to STAND CLEAR.The PIC will announce, "SHOCK ADVISED, STAND BACK". Periodic tones will be heard to signify the defibrillator is charging. The energy bar graph on the right of the display will indicate the relative charge state.

Shock Advised, Stand Clear, Shock Now



Indicates a shockable rhythm is still detected and that the defibrillator has completed charging to the selected energy. The display will indicate SHOCK ADVISED, STAND CLEAR, SHOCK NOW. The PIC will announce “SHOCK NOW” and the periodic charging tones will change to a steady tone, signifying that the defibrillator is fully charged.

Make sure everyone is CLEAR of the patient, announce CLEAR and press the discharge button on the Multipurpose Hands-free adapter to deliver the shock.

The shock must be delivered within 30 seconds. If the defibrillator remains charged for over 30 seconds, the PIC will disarm the energy safely internally, as a safety precaution. The energy bar graph will disappear.

Observe the patient’s response and follow the PIC’s display and voice prompts.

If you would like to abort the defibrillation, press the **DISARM** button on the front panel to discharge the defibrillator internally and safely.

Defibrillation with Paddles while in SAED mode

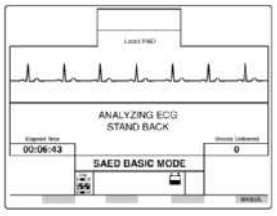
Ensure the Welch Allyn paddles and ECG patient cable have been connected to the PIC properly. The PIC has been designed to allow monitoring of the ECG using a 3-Lead ECG cable. The PIC automatically sets the ECG Lead selection to Lead II and the ECG Size to x1. The ECG Lead selection and ECG Size can not be changed in the SAED mode. If ECG electrodes and Multipurpose Defibrillation electrodes are attached to the patient, the Lead Selector will default to the PAD selection. The PIC will acquire the patient's ECG for the more reliable ECG source - the Multipurpose electrodes rather than from the smaller ECG electrodes.

WARNING: Do not use paddles for defibrillation unless you have been trained in the proper use of paddles.

STEPS INVOLVED IN DEFIBRILLATING WITH PADDLES

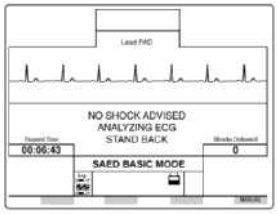
1. Assess Patient. Confirm the patient exhibits:
   - Unconsciousness
   - Absence of breathing
   - Absence of pulse
2. Press **POWER** switch to ON. Ensure Self-Test Passed and battery icon is not LOW.
3. Thoroughly prep patient skin for ECG electrode attachment. Clean and dry skin sites preferably with a coarse, dry terry cloth.
4. Connect each lead of the 3-Lead patient cable to the appropriate disposable electrode. Arrange the electrodes as shown in chapter 4. Make sure that the ECG electrodes are placed to allow defibrillation if necessary.
5. Follow display messages and voice prompts.

Analyzing ECG, Stand Clear



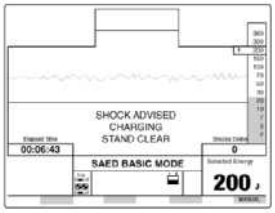
Indicates the PIC is analyzing the patient's ECG to assess if it is a shockable rhythm. The PIC will announce "STAND BACK, ANALYZING". Avoid touching or moving the patient. Touching or moving the patient can cause artifact which may interfere with the analysis process.

No Shock Advised, Monitoring ECG



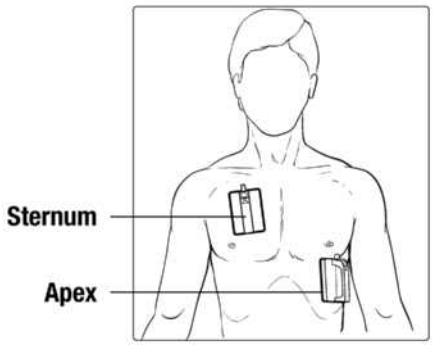
Indicates the PIC has completed one analysis of the patient's ECG and that No Shock was Advised. The PIC resumes monitoring the patient. Two BEEPs will be heard, signifying the No Shock analysis result. After three consecutive No Shock analyses the PIC displays CHECK PATIENT, IF NO PULSE START CPR. The PIC will also announce "CHECK PULSE, IF NO PULSE, START CPR. The PIC will continue to assess the patient's heart rhythm. If the signal is non-shockable, No Shock Advised will continue to flash on the display and an audible beep sounds every minute, but if the PIC detects a shockable rhythm it will direct the operator to stand back as it begins to analyze the patient's heart rhythm.

Shock Advised, Charging, Stand Clear



Indicates the PIC completed analyzing the patient's ECG and that a shockable rhythm was detected. The PIC will automatically select the proper energy and begin to charge the defibrillator. The display will indicate SHOCK ADVISED, CHARGING, and STAND CLEAR. Periodic tones will be heard to signify the defibrillator is charging. The energy bar graph on the right of the display will indicate the relative charge state.

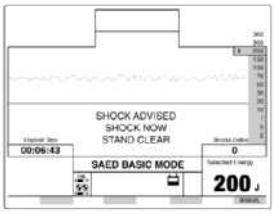
While Defibrillator is Charging



Apply defibrillation gel to the center of one paddle electrode. Lightly press the paddle electrodes together and spread the gel evenly over both paddle surfaces. Make sure gel covers the entire paddle surface. Do not allow any gel to touch the paddle handle or the operators hands.

Place the sternum paddle firmly against the patient's chest inferior to the patient's right clavicle and lateral to the upper sternum. Place the Apex paddle in the anterior-axillary line, inferior and lateral to the patient's left nipple, as shown to the left.

Shock Advised, Stand Clear, Shock Now



After the defibrillator has completed charging to the selected energy, the display will indicate SHOCK ADVISED, SHOCK NOW, STAND CLEAR. The PIC will announce “SHOCK NOW” and the Periodic charging tones will change to a steady tone, signifying that the defibrillator is fully charged. With the paddles in the proper position, clear all personnel, visually and verbally say CLEAR to ensure all personnel are clear (including the operator) from patient contact. Press the discharge buttons on both paddles simultaneously.

The shock must be delivered within 30 seconds. If the defibrillator remains charged for over 30 seconds, the PIC will disarm the energy safely internally, as a safety precaution

The energy bar graph will disappear.

Observe the patient’s response and follow the PIC’s display and voice prompts.

If you would like to abort the defibrillation, press the **DISARM** button on the front panel to discharge the defibrillator internally and safely.

CHAPTER 8: EXTERNAL PACING

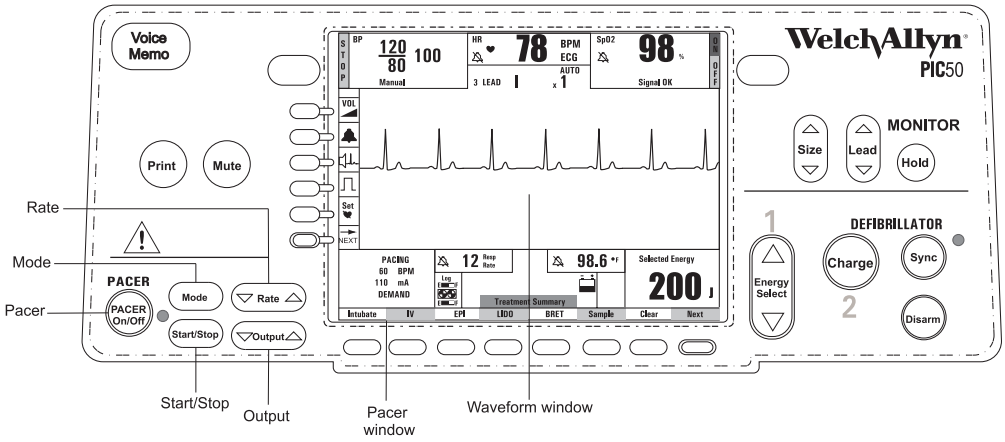
This chapter discusses the controls and displays used when conducting external transcutaneous pacing with the PIC System.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.

NOTE: External transcutaneous pacing is used for the emergency treatment of hemodynamically compromising bradycardia, bradycardia with escape rhythms that are unresponsive to pharmacological therapy, refractory tachycardia (supraventricular or ventricular) and bradyasystolic cardiac arrest.

External Pacer Controls and Displays



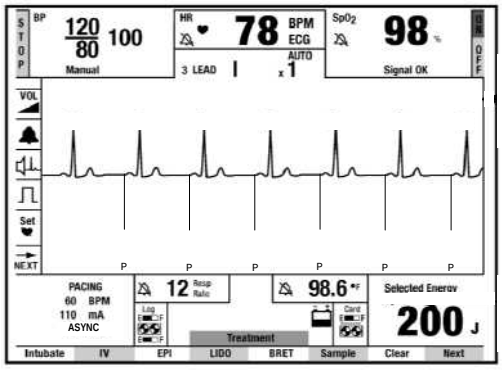
External pacing functions on the PIC System are viewed on and controlled by the areas illustrated above.

NOTE: The following operations of the external pacer depict normal factory default settings. Later, in chapter 13, we will discuss supervisor configurations of the external pacer.

Initial Displays

When the PIC System is powered on, the external pacer default position is off. To turn on the external pacer press the **PACER** button. When the pacer turns on, the default parameters will be displayed in the pacing window.

ECG During Pacing

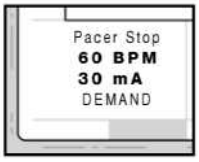


As seen in the above illustration, when the PIC is externally pacing a patient, small, downward pacer-marker spikes will appear when a pacing pulse occurs, identified by the letter "P" below that spike.

NOTE: If a patient has an internal (implanted) pacer, pacer-marker spikes, without the letter "P", will appear on the ECG when an internal pacing pulse is detected. However, very weak pacemaker pulses my not consistently produce markers. Therefore, always check patient history, especially when wide QRS complexes indicate the presence of an internal pacemaker.

NOTE: Pacer markers may inadvertently be generated by high frequency external interference. Therefore, randomly occurring, infrequent pacer-marker spikes may be seen on the ECG and may not signify the presence of an internal pacemaker. If inadvertent spikes are frequent enough to create a nuisance, attempt to eliminate any close sources of interference or move to a different location.

Pacing Messages



PACER STOP indicates that pacer is on and paused (will not deliver pacing pulses to patient). **60 BPM** indicates pacing rate set at 60 beats per minute. **30 MA** indicates the pacer output in milliamperes. **DEMAND** indicates that the pacer is set in demand mode.

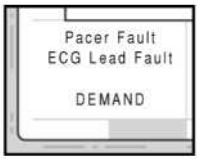
Pacer Faults

Messages may appear if the pacer detects a fault condition

Pads Lead Fault

The pads lead fault indicates that the multipurpose hands-free adapter has not been installed or that the multipurpose pads have not been attached to the patient or multipurpose hands-free adapter. To correct fault, install the multipurpose hands-free adapter and connect the hands free Pads to the adapter and patient.

ECG Lead Fault



The ECG lead fault occurs when lead wires are not properly connected to the ECG electrodes. To correct fault, confirm the ECG lead wires are attached to the ECG electrodes and the electrodes are properly applied to the patient.

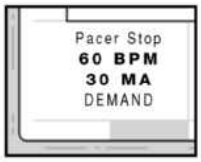
Restart Pacer

When the pacer is active and a lead fault is detected, after the connection is restored a flashing RESTART PACER will be displayed and a triple beep will sound. Pressing the **START/STOP** button will resume pacing.

Lead Selector Fault

This display indicates that the lead selector is not set to leads I, II, or III. Select lead I, II, or III to allow pacing.

Pacer Control



Pressing the **PACER** button turns on the pacer. The initial pacing parameters will be displayed in the pacing window. Pressing the **PACER** button again will turn off the pacer.

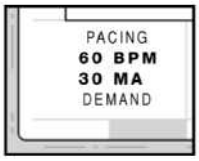
NOTE: When the pacer is on and the defibrillator has been charged, the pacer will automatically be turned off for safety reasons.

Pacing Indicator

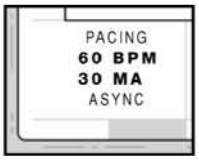
When the pacer is on but the pacing output is paused, the indicator will illuminate a steady orange light. When the pacer is on and the output is not paused, the light will be green. In this state the pacer will deliver a pacing pulse to the patient if it is required. When a pacing pulse is delivered to the patient, the green light will flash off. When the pacer is on and there is an ECG lead fault or a pacer lead fault, the indicator will be red.

Mode

Pressing **MODE** button changes the pacing mode from demand to async mode. The selected mode will be displayed in the pacing window.



Demand Mode



Async Mode

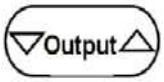
NOTE: The initial pacing mode can be set in the Pacing Supervisor Menus. See chapter 13.

Rate

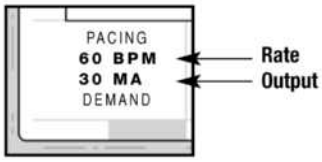
Pressing the **RATE** button selects the pacing output rate measured in beats per minute (BPM). Pressing the up arrow will increase the rate. Pressing the down arrow will decrease the rate. When the pacing rate is below 100 BPM, each press of the **RATE** button will change the pacing rate by 5 BPM. When the pacing rate is above 100 BPM, each press of the **RATE** button will change the pacing rate by 10 BPM.

NOTE: The initial pacing output rate can be set in the pacing supervisor menus. See chapter 13.

Output

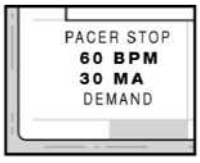


Pressing the **OUTPUT** button selects the pacing output current measured in milliamperes (mA). Pressing the up arrow will increase the selected output by 10 mA. Pressing the down arrow will decrease the selected rate by 5 mA.



Start/Stop

Pressing the **START/STOP** button will allow pacing or pause the delivery of pacing stimulus to the patient. When the pacer is in the paused mode, a PACER STOP message will be displayed in the Pacer Window. When the pacer is not paused, a PACING message will be displayed in the pacer window.

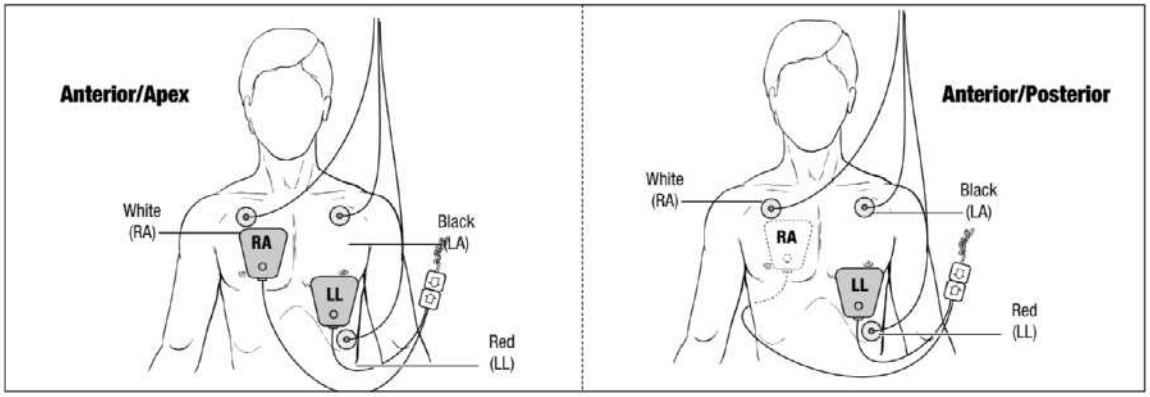


Pacing

Pacing Stopped (paused)

NOTE: Whenever a pacer or ECG lead fault occurs, the pacer will automatically stop and a fault message will be displayed in the pacer window.

External Pacer Operation Procedures



To perform external pacing, perform the following steps.

1. Press **POWER** switch to ON.
2. Apply ECG monitoring electrodes as illustrated above (return to chapter 4 for more details if needed).
3. Connect Welch Allyn ECG patient cable to the patient and the PIC System.
4. Connect the multipurpose hands-free adapter to the PIC System. Make sure that the connector locks into place.
5. Apply multipurpose defibrillation/pacing electrodes to patient as illustrated on the electrode package. Use Welch Allyn Multipurpose electrodes model 001789 for adult patients and model 001781 for pediatric patients (<10kg).
6. Connect multipurpose defibrillation/pacing electrodes to the multipurpose hands-free adapter.
7. Press **LEAD** and select I, II, or III to provide the largest-amplitude QRS complex.
8. Press **SIZE** and adjust size to insure proper sensing of the patient's heart rate. Confirm that the displayed heart rate coincides with the patient's heart rate.
9. Press **PACER** to turn pacer on, the pacer window will become active. The pacer indicator will illuminate orange, indicating that the pacer is stopped and that no pacer pulses are being delivered to the patient

NOTE: When the pacer is on, the lead selection will be restricted to Leads I, II or III.

10. Press **RATE** button to select the desired pacing rate.

NOTE: The initial pacing output rate can be set in the Pacing Supervisor Menus. See chapter 13.

11. Press the **MODE** button to select the appropriate therapy. Each time the **MODE** button is pressed, the pacing mode will change between demand and async mode. The selected mode will be displayed in the pacing window.

NOTE: The initial pacing mode can be set in the Pacing Supervisor Menus. See chapter 13.

In **DEMAND MODE**, pacing pulses will be inhibited by the patient's QRS complexes that occur during a time interval that is dependent on the setting of the rate control. If during that interval no QRS complexes occur, a pacing pulse will be delivered to the patient. In the demand mode, the pacer supplies the required number of pacing pulses to maintain the patient's heart rate at approximately the rate selected in the pacing rate window. Due to the delay between delivered pacing pulse and the patient's response, the heart rate display may read less than what is selected on the pacer rate window. How much less will depend on the time it takes the heart to respond to the pacing stimulus.

In the **ASYNC MODE**, pacing pulses are not dependent on the patient's cardiac activity. The pacer will deliver pacing pulses at the selected pacing rate.

12. Press the **START/STOP** button to initiate pacing. The pacing display will indicate **pacing** and the orange pacing light will change to green, indicating the pacer is active. Each time a pacing pulse is delivered to the patient, the green light will flash off briefly.

13. Ensure that the pacing pulses are occurring in the appropriate position of the cardiac cycle.

14. Press the **OUTPUT** button to adjust the pacing current output. Pressing the up arrow will increase the current by 10 mA. Pressing the down arrow will decrease the current by 5 mA. Slowly increase the output current while observing the ECG for evidence of electrical capture. Check patient's pulse or blood pressure to verify mechanical capture. Select the lowest output current that will achieve both electrical and mechanical capture.

Electrical capture can be verified by noting a large ectopic beat approximately 100 msec after the pacing pulse is delivered to the patient.The morphology of this pulse may vary widely from patient to patient, sometimes appearing as a relatively normal QRS complex.

Mechanical capture can be verified by monitoring the physical condition of the patient. Check for the following physiological signs: reddening of the skin, palpable pulses, increased blood pressure and other signs of increased blood flow.

NOTE: The initial pacing output rate will automatically be set to the lowest current output to prevent accidental high currents from being delivered to the patient. External transcutaneous pacing may be uncomfortable for certain patients. Depending upon local protocol, consider administering a sedative or analgesic should the pacing therapy become uncomfortable.

15. To stop (pause) the delivery of pacing pulses momentarily, press the **START/STOP** button.The pacing display will indicate **pacer stopped** and the pacing indicator light will change from green to orange. The rate and output settings will remain the same as what was selected prior to the **START/STOP** button being pressed. To re-initiate pacing, press the **START/STOP** button again.

NOTE: Should the patient require defibrillation during pacing, follow the defibrillation procedure as outlined in chapter 6. When the defibrillator is charged the pacer will automatically be turned off for safety reasons.

If a LEAD FAULT occurs, the display will indicate the faulting leads (ECG or pads). During lead fault conditions, the pacer light will illuminate red to caution the operator that a lead fault condition exists. In an ECG Lead Fault check that the ECG electrodes and patient cable are connected properly. In a Pads Lead Fault, check to see that the multipurpose electrodes and multipurpose hand-free adapter are connected properly. When the lead fault has been corrected, the lead fault message will be removed from the display and the pacing indicator will change from red to orange. To begin pacing again, press the **START/STOP** button.

*NOTE: Should a lead fault occur after you have achieved capture, the pacer will automatically revert to the stop mode. The rate and output current settings will remain at the last settings used before the lead fault occurred. To resume pacing, correct the lead fault and press the **START/STOP** button.*

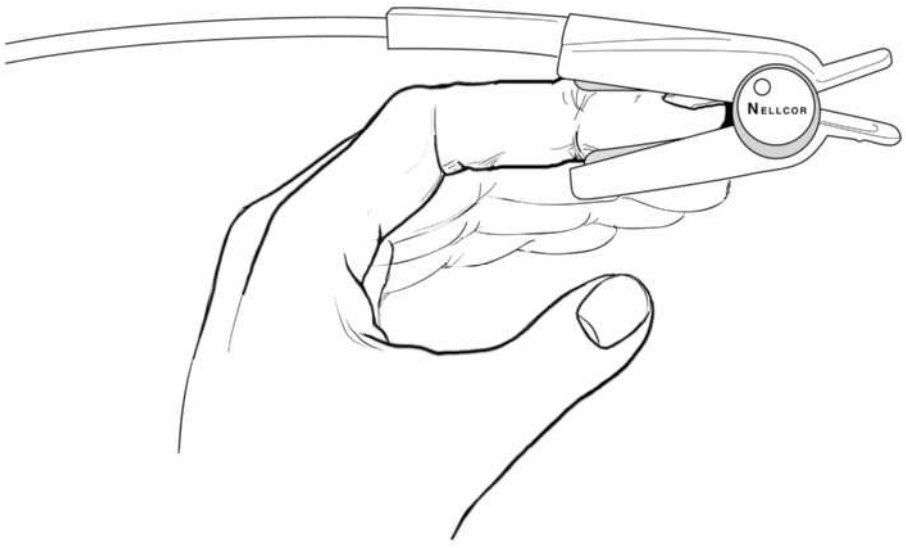
CHAPTER 9: PULSE OXIMETER

This chapter provides information on the use of the pulse oximeter controls, displays, and its operation.

Chapter Overview:

NOTICE: ***Purchase of this instrument confers no express or implied license under any Mallinckrodt patent to use this instrument with any oximetry sensor that is not manufactured by Mallinckrodt.***

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.



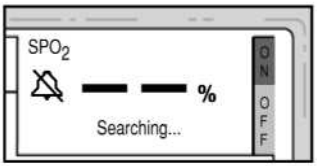
Pulse Oximeter Controls and Displays

Pulse oximeter functions are displayed in the SpO_2 window. Pressing the button turns on or off the pulse oximeter. The SpO_2 display will highlight either on or off to show the current state. Pressing the **SPO2** button again will change the state.

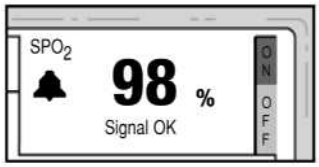
NOTE: The following operations of the pulse oximeter depict normal factory default settings. In chapter 13, we will discuss configuring the pulse oximeter.

SpO_2 Window

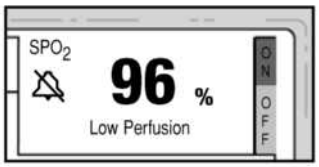
When the PIC System is powered ON, **SpO_2** will appear in the upper left corner of the SpO_2 window, indicating that the SpO_2 option is installed and **OFF** will be highlighted by default.



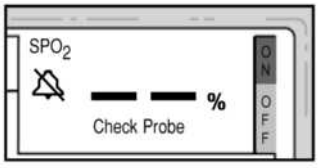
Pressing the SpO_2 button turns on the pulse oximeter and highlights ON**. Testing...** then **Searching...** will appear in the window indicating that the pulse oximeter is searching for a recognizable waveform. The unit will automatically adjust to achieve proper recognition. Bell symbols in the SpO_2 window indicate the status of the SpO_2 alarm: (alarm off), (alarm on), (alarm upper limit set), (alarm lower limit set).



Signal OK indicates that the pulse oximeter has found a recognizable pulse waveform; the saturation measurement will be displayed as a percentage. If the alarm is on and the saturation measurement flashes, the SpO_2 alarm limits have been exceeded.

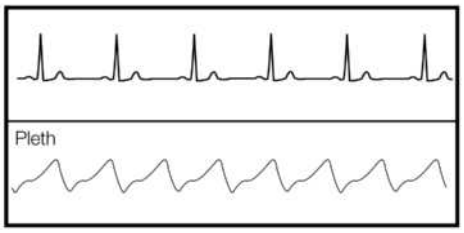


Low Perfusion indicates a weak pulse signal. This does not constitute an error condition, but a low perfusion condition may result in an inaccurate saturation determination. Corrective steps should be taken to increase perfusion in the area of the probe. The patient's arm should be positioned so the probe is near the level of the heart and circulation is not restricted. If a low perfusion condition persists, try placing the probe on a different digit. Inflating a blood pressure cuff on the same arm that the Welch Allyn finger probe is attached to may result in a low perfusion condition, due to constriction of the artery by the blood pressure cuff. It is therefore recommended that simultaneous blood pressure and oxygen saturation measurements be performed on different arms. Some shades of nail polish or long nails can also interfere with SpO_2 readings.

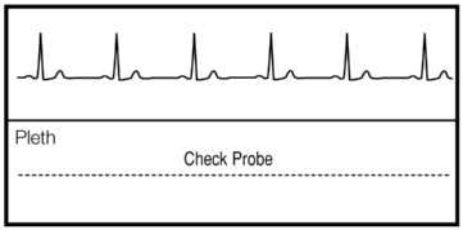


Check Probe indicates the probe is either not connected, not properly connected or the probe may be defective.

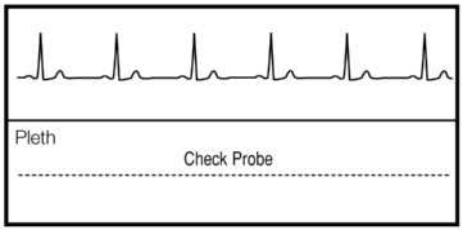
Pleth Waveform Window



If the Pleth waveform window is active (see ”User Menus – Display" in chapter 13) the Pleth waveform can be viewed.



If the Pleth waveform window is active and the SpO_2 monitor is turned off, **Oximeter Off** will be displayed in the Pleth waveform window.



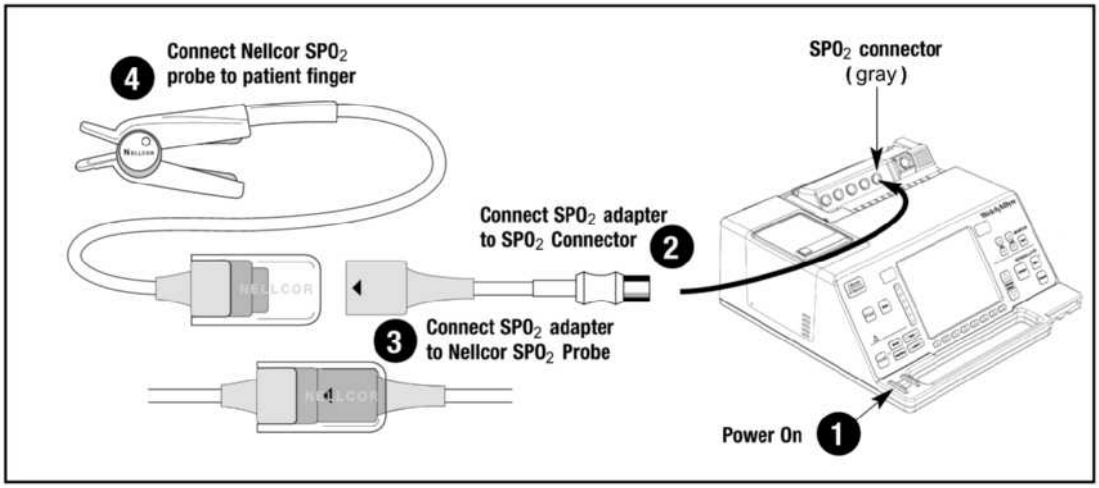
If the Pleth waveform window is active, the SpO_2 monitor is turned on, and the probe is either not connected, not properly connected, or defective, then **Check Probe** will be displayed in the pleth waveform window.

Pulse Oximeter Operation Procedures

The PIC System can provide non-invasive SpO_2 pulse oximeter measurements.

NOTE: SpO_2*-style pulse oximeters measure the fractional oxygen saturation of arterial hemoglobin from peripheral sites, such as fingers, toes, etc. The term* SpO_2 *typically refers to invasive oxygen saturation measurements from arterial blood samples.*

SpO_2 style pulse oximeter measurements may be affected by numerous factors such as bright lights, improperly applied probes, use of non-Welch Allyn probes, patient conditions/movements. The clinician should use good clinical judgment when interpreting SpO_2 measurements. Should the clinician question an SpO_2 measurement, an arterial blood gas oxygen saturation measurement should be obtained.



1. Press **POWER** switch to ON.
2. Connect the Nellcor™ SpO_2 probe to the PIC System.
3. Connect SpO_2 adapter to Nellcor™ SpO_2 probe.
4. Select the index, middle or fourth finger of the patient. Attach the Welch Allyn finger probe to the patient by inserting the patient's finger into the probe until the finger touches the inside probe wall.

NOTE: Be sure the patient's hand is relaxed and that no tension is exerted on the probe cable.

5. Press the **SPO2** button on the front panel, the ON indicator will be highlighted in the SpO_2 window, signifying the pulse oximeter is on. The display will show **Searching...** indicating the pulse oximeter is searching for a recognizable pulse waveform. Once the measurement has been established, the percentage of oxygen saturation will be displayed in the SpO_2 window.

   If the patient's ECG is not being monitored from the ECG patient cable, the Nellcor™ SpO_2 probe will automatically assess the patient's heart rate. The heart rate will be displayed in the ECG window. An OX appearing in the heart rate window indicates the heart rate is being derived from the NellcorTM SpO_2 probe.

6. To display the patient's plethysmograph, see "User Menus - Display" in chapter 13.

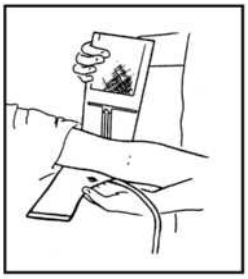
7. When pulse oximeter monitoring is finished, remove the probe from the patient's finger and disconnect the probe from the oximeter. Clean the probe with soap and water or with alcohol, and store it in a clean, dry place.

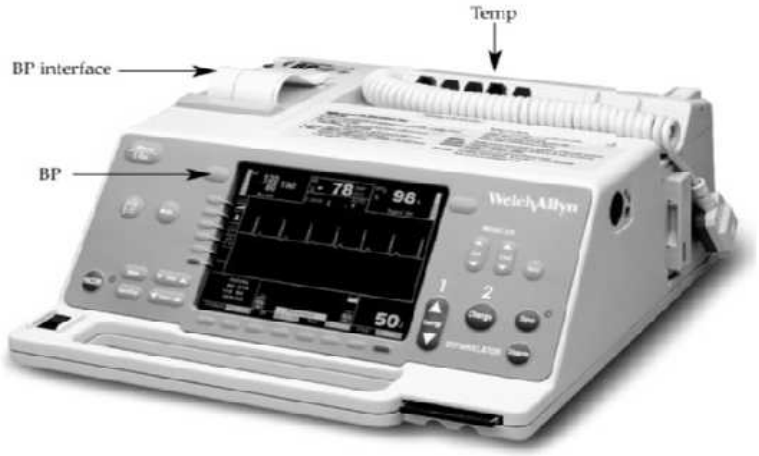
CHAPTER 10: NIBP AND TEMPERATURE

This chapter provides information on the NIBP and TEMP controls, displays, and operations procedures.

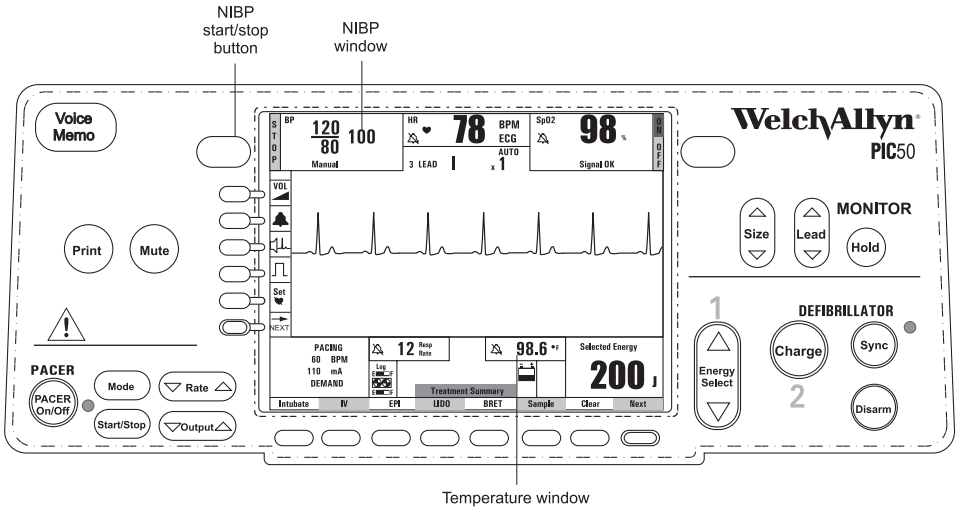
Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.





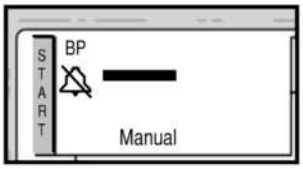
NIBP and Temperature Controls and Displays



NIBP and temperature functions on the PIC System are viewed on and controlled by the areas shown above.

NOTE: The following operations of the NIBP and temperature depict normal factory default settings. In chapter 13 we will discuss manual and supervisor configurations of the NIBP and temperature menus.

NIBP Displays

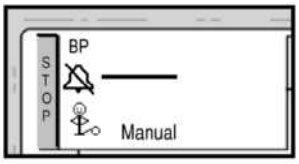


When the PIC System is powered on, the NIBP default position is off. **BP** indicates the non-invasive blood pressure option has been installed in the PIC System. **Manual** indicates the NIBP mode is set to manual operation (if the NIBP mode is set to automatic or stat then **Auto** or **Stat** will be displayed in the NIBP window respectively).

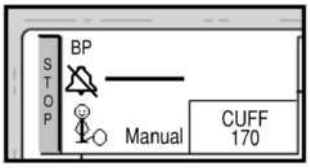
The alarm icon in the BP window indicates the NIBP alarm condition.

= NIBP alarm is off, = NIBP alarm is on, = NIBP alarm on (a systolic or diastolic upper limit is set), = NIBP alarm on (a systolic or diastolic lower limit is set).

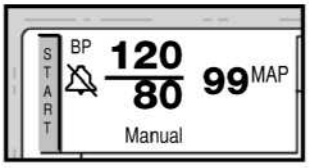
START indicates what action would occur if the **NIBP** button were pushed. For example, if the NIBP button is pressed while the NIBP window displays START the NIBP would start to pump and take a measurement.



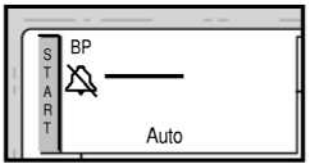
The blood pressure icons and will animate pumping while the cuff is inflating and deflating (during a measurement).



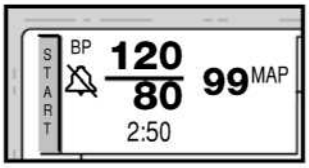
When the cuff has reached the initial inflation pressure the display will indicate the cuff pressure in mmHg. The example at the left indicates the cuff pressure is 170 mmHg. The cuff will deflate in a stepped sequence and will update the pressure reading in the display at each step.



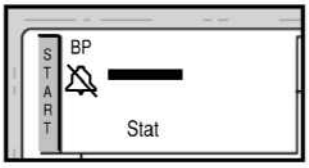
This display indicates a completed blood pressure reading. This information will stay on the display until the next reading. If the alarms have been turned on and the BP values are flashing, an alarm parameter has been exceeded.



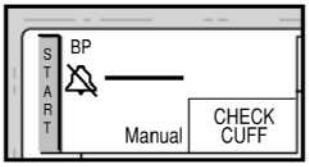
This display indicates the blood pressure mode is set to Auto. Press the **NIBP** button to initiate the first reading in the automatic mode.



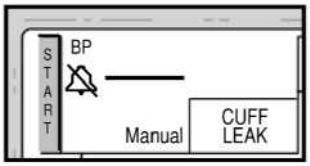
The timer indicates the time remaining **2:50** (minutes : seconds) before the next automatic measurement. The displayed blood pressure indicates the last blood pressure measurement.



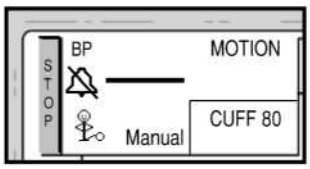
This display indicates the blood pressure mode is set to Stat. Press the **NIBP** button to initiate the first reading in the Stat mode.



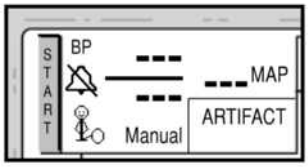
CHECK CUFF message indicates the blood pressure unit has detected that the cuff is not attached or a possible air blockage in either the cuff or the cuff hose exists.



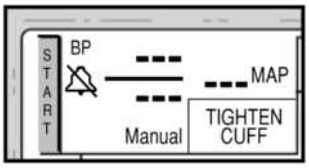
CUFF LEAK message indicates a possible air leakage. Check the fittings for a secure fit at both the PIC and cuff ends of the hose. Inspect the hose and cuff for any cuts or punctures. Ensure that the cuff has been applied to the limb properly.



MOTION indicates the blood pressure unit sensed excessive motion or shaking by the patient, which can obscure the blood pressure signal. If a motion alarm sounds during a pressure determination, the pressure measurement should be considered suspect and another measurement should be obtained.



ARTIFACT indicates the blood pressure unit sensed sudden change in a blood pressure, excessive arrhythmias or other artifacts that obscured the blood pressure signal. Dashes in the systolic, diastolic and MAP area indicate the blood pressure unit was unable to compute a measurement due to the excessive artifact.



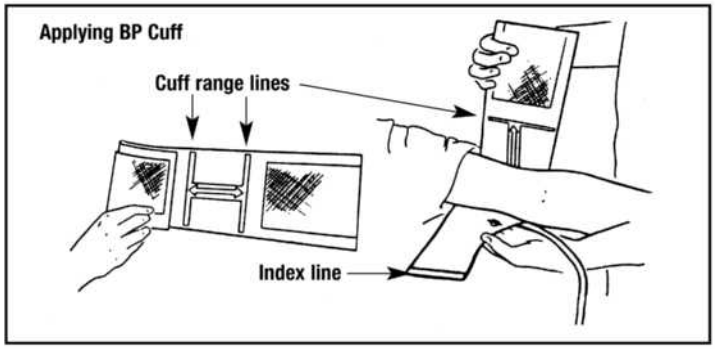
TIGHTEN CUFF indicates the blood pressure unit sensed the patient's pulse was too weak to allow for an accurate measurement. The pressure pulses must be of sufficient amplitude to allow the blood pressure measurement. A loose cuff will often result in decreased sensitivity to pressure pulses. Making sure that a properly sized cuff is applied and that the cuff is fitted snugly will reduce the likelihood of TIGHTEN CUFF messages.

NIBP Operation Procedures

NIBP Setup

TO PREPARE THE PIC FOR NIBP

1. Press **POWER** switch to ON.
2. Attach the appropriate-size cuff and hose to the PIC System
3. Apply the cuff snugly to the limb of the patient. If the cuff is too loose or too tight, inaccurate readings may result. The cuff should never be applied so tightly as to impede venous return between blood pressure measurements. (*Be sure the index line falls between the two range lines on the blood pressure cuff.*)



4. Verify that the mode (**Manual**, **Auto**, or **Stat**) displayed in the NIBP window is the desired mode of operation. The mode can be changed from the NIBP configuration menu (see User Menus - NIBP in chapter 13).

NOTE: When the PIC System is turned off, the NIBP will remain in the mode last used.

NOTE: The START or STOP shown in the display will change as the **NIBP** *button is pressed. The word displayed indicates what will happen when the* **NIBP** *button is pressed. For example, if START is displayed, then pressing the* **NIBP** *button will start the NIBP monitor.*

Manual Mode Measurement

TAKING A MEASUREMENT IN THE MANUAL MODE

1. Press the **NIBP** button, the START will change to STOP. The NIBP monitor will inflate the cuff to the initial cuff pressure. The NIBP monitor has an automatic cuff detection and will inflate the cuff to the proper pressure accordingly. (NIBP monitor will inflate adult, thigh and child cuffs to 154 mmHg and will inflate infant cuffs to 125 mmHg.)

2. After the initial cuff pressure has been reached, the display will indicate the cuff pressure and begin deflating the cuff in a stepped sequence, monitoring the pressure pulses until a measurement can be made.
3. To cancel the measurement at any time and to deflate the cuff, press the **NIBP** button, the STOP will change to START.
4. If the NIBP monitor is unable to make a determination of the systolic pressure, the cuff will automatically re-inflate and attempt another measurement. Adult, thigh, and child cuffs will re-inflate to 190 mmHg and infant cuffs will re-inflate to 142 mmHg. If the PIC is still unable to obtain a measurement the adult, thigh and child cuffs will automatically re-inflate to 250 mmHg and attempt a third measurement.
5. When a measurement is complete, the systolic, diastolic, and MAP pressures will be displayed.

Auto Mode Measurement

TAKING A MEASUREMENT IN THE AUTO MODE

1. Select the desired interval from the NIBP configuration menu (see User Menus - NIBP in chapter 13).
2. Press the **NIBP** button to initiate the first reading in the automatic mode; the START indicator will change to STOP. The NIBP monitor will inflate the cuff to the initial cuff pressure. The NIBP monitor has an automatic cuff detection and will inflate the cuff to the proper pressure accordingly. (The NIBP monitor will inflate adult, thigh and child cuffs to 154 mmHg and will inflate infant cuffs to 125 mmHg.) The inflation pressure will also adjust itself based on the last reading (30 mmHg over the last systolic reading).
3. If the NIBP monitor is unable to make a determination of the systolic pressure, the cuff will automatically re-inflate and attempt another measurement. Adult, thigh and child cuffs will re-inflate to 190 mmHg and infant cuffs will re-inflate to 142 mmHg. If the PIC is still unable to obtain a measurement the adult, thigh and child cuffs will automatically re-inflate to 250 mmHg and attempt a third measurement.
4. After the initial cuff pressure has been reached, the display will indicate the cuff pressure and begin deflating the cuff in a stepped sequence, monitoring the pressure pulses until a measurement can be made.

5. To cancel the measurement at any time and to deflate the cuff, press the **NIBP** button, the STOP will change to START. The NIBP monitor will remain in the automatic standby mode. To return to automatic measurements at regular intervals, press the **NIBP** button again, the START will change to STOP.
6. When the measurement is complete, the cuff will deflate and the systolic, diastolic and MAP pressures will be displayed in the BP window. The NIBP monitor will wait until the selected auto cycle time has elapsed before taking another reading. A timer will appear in the BP window, indicating the time remaining before the next measurement will begin.
7. To return to the manual mode, select manual in the NIBP configuration menu (see User Menus - NIBP in chapter 13).

Stat Mode Measurement

TAKING A MEASUREMENT IN THE STAT MODE

1. Select Stat in the NIBP configuration menu (see User Menus - NIBP in chapter 13).
2. Press the **NIBP** button to initiate the first reading in the stat mode. The START will change to STOP. The NIBP monitor will inflate the cuff to the initial cuff pressure. The NIBP monitor has an automatic cuff detection and will inflate the cuff to the proper pressure accordingly. (The NIBP monitor will inflate adult, thigh and child cuffs to 154 mmHg and will inflate infant cuffs to 125 mmHg.) The inflation pressure will also adjust itself based on the last reading (30 mmHg over the last systolic reading).
3. If the NIBP monitor is unable to make a determination of the systolic pressure, the cuff will automatically re-inflate and attempt another measurement. Adult, thigh and child cuffs will re-inflate to 190 mmHg and infant cuffs will re-inflate to 142 mmHg. If the PIC is still unable to obtain a measurement the adult, thigh and child cuffs will automatically re-inflate to 250 mmHg and attempt a third measurement.
4. After the initial cuff pressure has been reached, the display will indicate the cuff pressure and begin deflating the cuff in a stepped sequence, monitoring the pressure pulses until a measurement can be made.
5. To cancel the measurement at any time and to deflate the cuff, press the **NIBP** button, the STOP will change to START. The NBIP monitor will remain in the stat standby mode. To return to stat measurements, press the **NIBP** button again, the START will change to STOP.

6. When the measurement is complete, the cuff will deflate and the systolic, diastolic and MAP pressures will be displayed in the BP window. The NIBP monitor will immediately begin taking another reading.
7. After five minutes the NIBP monitor will automatically change to stat standby mode and the STOP will change to START. To return to stat measurements, press the **NIBP** button again, the START will change to STOP.
8. To return to the manual mode, select manual in the NIBP configuration menu (See User Menus - NIBP in chapter 13).

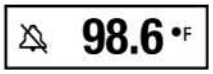
Temperature Display and Operation Procedures

Temperature Display

When the PIC System is powered on, the temperature window will display NO TEMP PROBE if the temperature probe is not connected.

The alarm icon in the temperature window indicates the temperature alarm condition. = Temp alarm is off, = Temp alarm is On, = Temp alarm upper limit is set, = Temp alarm lower limit is set.

If a temperature probe is connected and taking a reading, the temperature will be displayed in the temperature window. The reading will gradually increase and settle at the patient's body temperature in approximately 70 seconds. A flashing temperature means that the temperature has exceeded the temperature alarm limits.



NOTE: The temperature reading can be set to either Celsius or Fahrenheit in the supervisor SETUP / TEMP menu. See chapter 13.

Measuring Temperature

TAKING A TEMPERATURE MEASUREMENT

1. Press **POWER** switch to ON.
2. Connect the Welch Allyn Temperature Probe to the connector marked Temp. If the probe is not connected properly a NO TEMP PROBE indication will appear in the temperature window.
4. Monitor the patient's temperature using standard continuous temperature monitoring techniques. Patient's temperature will be displayed in the temperature window.
5. After temperature monitoring has been completed, disconnect the probe. Clean the probe and store it in a clean, dry place.

NOTE: Only use YSI 400 series compatible probes.

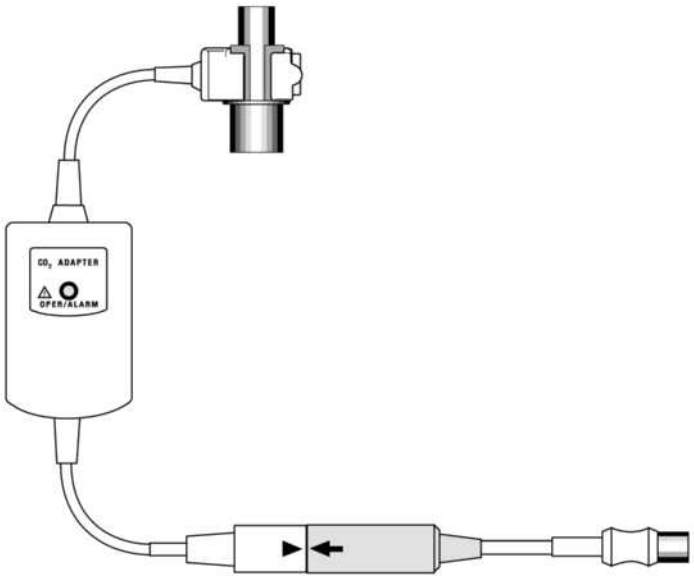
CHAPTER 11: RESPIRATION AND CO_2

(OPTIONAL)

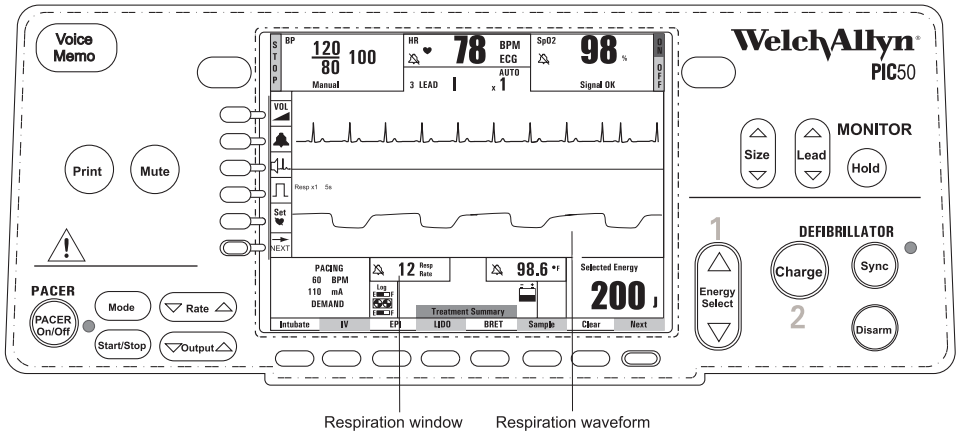
This chapter provides information on the respiratory displays and operation procedures. It also provides information about the optional CO2 monitoring functions.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.



Respiration Display



The respiratory functions on the PIC System are viewed in the Resp window and on the waveform trace.

NOTE: The following operations of the respiration monitor depict normal factory default settings. In chapter 13 we will discuss configuring the respiration monitor.

Measurement of Resp Rate

The PIC System has the capability of providing respiration rate measurements utilizing the impedance pneumography technique, (5 lead units only) or the optional CO_2 Monitor. The impedance pneumography technique sends a safe, low-amplitude, high-frequency signal through the ECG electrodes or hands-free pads to measure the patient's thoracic impedance.

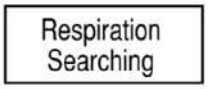
During inhalation and exhalation, the chest size changes, resulting in changes of the patient's thoracic impedance. The PIC System measures the impedance between the RA and LL electrodes or hands-free pads. The impedance changes are displayed as a waveform in the respiration waveform window, and analyzed to calculate a breath rate that is then displayed in the Resp window.

Apnea

The respiration window will display “0” for patient apnea conditions (respiration rate of less than 3 breaths per minute or without a breath for more than 20 seconds).

Resp Window Display

When the PIC System is powered on, **Respiration Off** will appear in the Resp window. This indicates that the respiration monitor is not active.



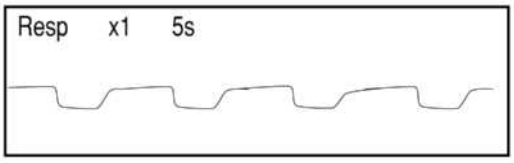
When the respiration monitor begins to analyze a patient's respirations, Respiration Searching will appear in the Resp window.

Once the respiration monitor has determined the respiration rate, it will appear in the Resp window. The alarm icon will also indicate the alarm status. In this example, the alarm is off.

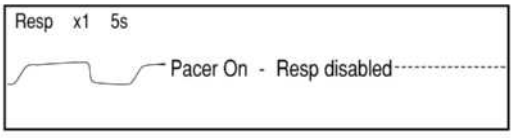
WARNING: ***In some instances, such as obstructed airway, the patient's breathing attempts may not produce any air exchange. These breathing attempts can still produce chest size changes, creating impedance changes, which can be detected by the respiration detector. It is best to use the pulse oximeter whenever monitoring the respirations to accurately assess the patient's respiratory condition.***

Resp Waveform Window

The waveform window can display the respirations and/or the plethysmograph waveform with the ECG waveform when properly configured. (see User Menus - Display in chapter 13 or see below).



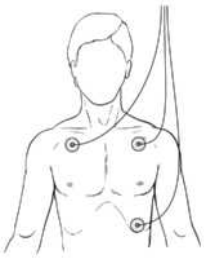
When configured, the waveform window will display a respiration waveform. Resp indicates the respiration waveform window. In this example x1 indicates the waveform size and 5s indicates the waveform speed in seconds.



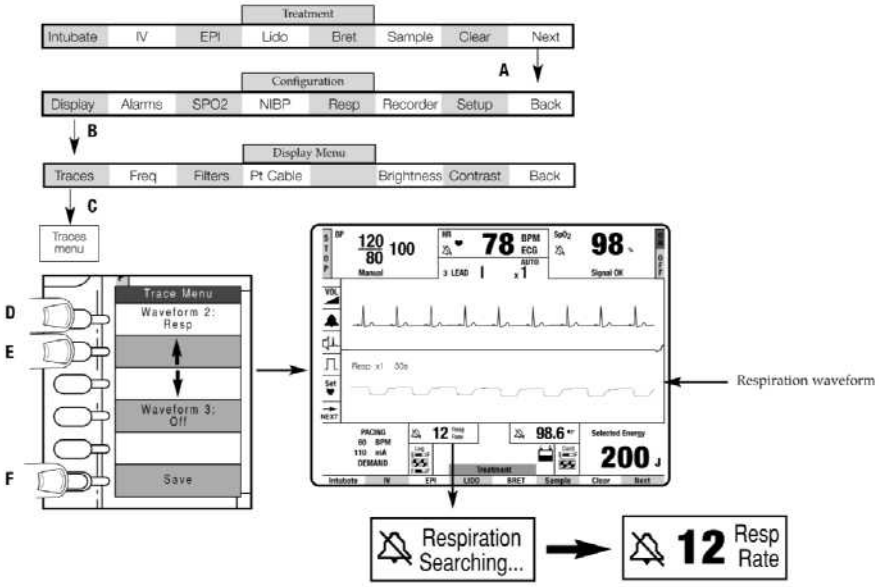
NOTE: *If the external pacer has been turned on, the respiration detector will be disabled and a status message will be displayed in the respiration waveform window indicating Pacer On - Resp disabled. See below.*

Respiration Operation Procedures

NOTE: Respiration monitoring through ECG Electrodes on pads is not available on units with the 12-lead option installed.



1. Connect either ECG electrodes or hands-free pads to the patient.
2. Press **POWER** switch to ON.
3. To activate the respiration monitor you must select the respiration waveform in the Traces menu, see instructions below.



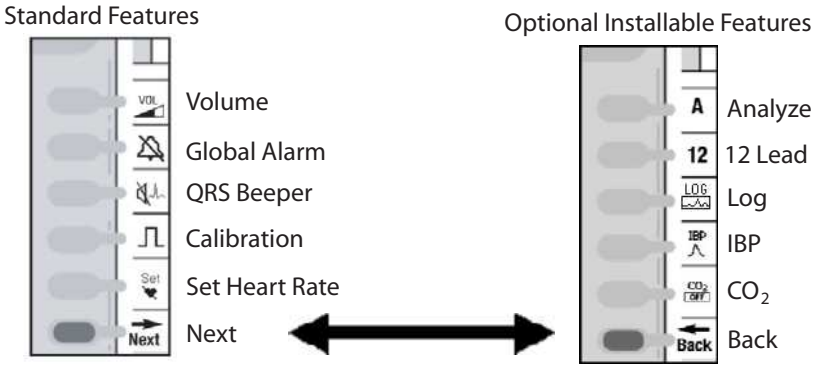
Press **Next** on the Treatment Summary menu (A). Then press **Display** (B), then **Traces** (C). When the Traces menu pops up, press waveform 2 (D). Next press the up arrow to select **Respirations** (E). Press **Save** (F) to enter your selection and change the display.

When the respiration waveform window is selected, **Respiration Searching** will be displayed. The respiration waveform will appear in the waveform window and the resp rate will be displayed in the respiration window.

CO_2 (optional)

The next four pages describe the controls, displays, and operation of the CO_2 monitoring functions. If installed, the CO_2 option replaces respiration features and operation described previously in this chapter.

NOTE: The following description and operation of the CO_2 monitoring portions of the PIC System depict normal factory default settings. In chapter 13 we will discuss user configurations of the CO_2 monitoring systems.



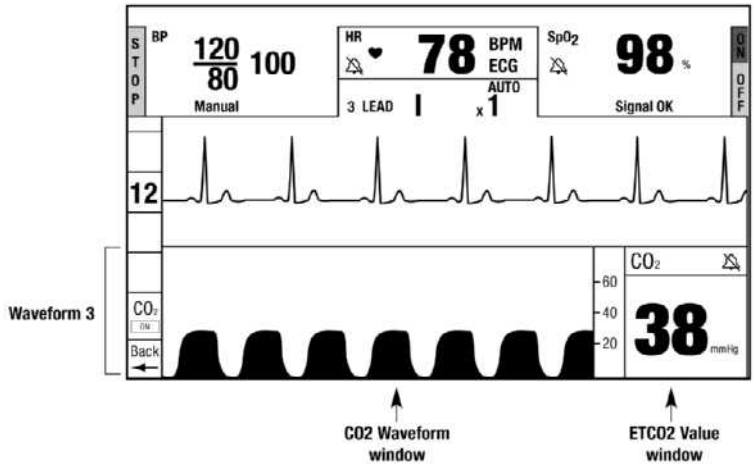
CO_2 ACCESS

If the CO_2 monitoring function is installed a **NEXT** icon will appear at the bottom of the quick access window (see above). Pressing **NEXT** (A) will allow access to an additional Quick Access menu containing the "CO_2" icon.

Turning on CO_2

The CO_2 option is set to ON or OFF upon startup based on its state at last PIC power off. Pressing the **CO_2** quick access button (B) will turn on CO_2 highlight the CO_2 icon, and turn on the power light on the CO_2 sensor. Waveform 3 is automatically opened or changed from its current setting to display CO_2 information, unless IBP1 and IBP2 are enabled. The CO_2trace will be displayed in the left portion while the $ETCO_2$ value, alarm status and size will appear on the right of the waveform 3 window.

Select the CO_2 unit of measure, either mmHg or kPa, from the supervisor setup menu. See Supervisor Menus – CO_2 Units in chapter 13 for instructions on how to change units of measure.



NOTE: Upon activation of the CO_2 monitoring function, the display will change such that the CO_2 trace will be presented in waveform 3. If the display was previously in 1 or 2-trace mode, the CO_2 trace will be presented in waveform 3 with the previous trace(s) still displayed. If the display was previously in 3-trace mode, the CO_2 trace will replace the previously displayed trace in waveform 3, but if the IBP1 and IBP2 traces are active, then the $ETCO_2$ value will display at the end of trace 1.

NOTE: While CO_2 monitoring is activated no other trace parameters can be selected for display in waveform 3.

Turning Off CO_2

Pressing the **CO_2** quick access button a second time will change ON to OFF and the button will become un-highlighted. The CO_2 value window and CO_2 trace will automatically be removed from waveform 3 and the power light on the CO_2 sensor will turn off unless CO_2 Trend is displayed in another trace.

NOTE: Upon deactivation of the CO_2 Monitoring function the CO_2 trace will no longer be presented in waveform 3. The previous traces displayed prior to enabling the CO_2 monitoring function shall be restored.

The CO_2 trace plots the instantaneous CO_2 partial pressure measurements as a function of time in histogram format (a capnogram).

NOTE: Accuracy is based upon 1 atm pressure and no residual CO_2 gas left in the sensor from previous expiration. The CO_2 trace will be displayed as if that is the case, which may affect readings.

CO_2 Trend ACCESS

CO_2 Trend can be displayed while CO_2 is ON or OFF. To display the CO_2 Trend trace access the traces menu by pressing **Next –> Display –> Traces** in the Treatment Summary window of the PIC System display.

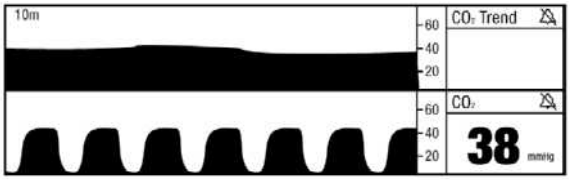
Once in the Trace menu the user can select waveform 2 or 3 to display the CO_2 Trend. Select CO_2 Trend in waveform window 2 or 3 and press SAVE. The power to CO_2 sensor will be powered on unless already on due to CO_2 trace being activated. The CO_2 Trend trace displays a historical representation of the patient's end-tidal CO_2 ($ETCO_2$) values. The value in the upper left corner of the waveform window indicates the time-period over which the measurement is being made, 10 min. is the default setting. See User Menus – CO_2 Monitoring in chapter 13 for instructions on how to change trace configurations.

$ETCO_2$ Value Window

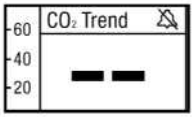
When the CO_2 or CO_2 Trend traces are added to the waveform window the $ETCO_2$ value windows will appear on the right side of the respective waveform window. CO_2 or CO_2 Trend will appear in the upper left corner of the window indicating that the CO_2 waveform is active. If both waveforms are displayed, $ETCO_2$ value will be displayed in the CO_2 window only.

Bell symbols in the or $ETCO_2$ value windows indicate the status of the $ETCO_2$ alarm: enabled (alarm on), or disabled (alarm off), (alarm upper limit set), (alarm lower limit set). Refer to Chapter 14 for instructions on how to change alarm settings. The $ETCO_2$ alarm settings apply to both the CO_2 and CO_2 Trend waveforms.

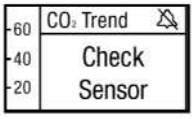
When there is measurement available, the most recent $ETCO_2$ values shall be displayed in the $ETCO_2$ value windows. The value is updated with each breath.



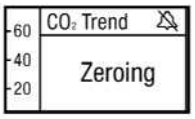
The CO_2 and CO_2 Trend trace measurements' ranges are indicated via a scale bar displayed in the left portion of the CO_2 and CO_2 Trend value windows. The marked values are 20, 40, and 60 mmHg for the default settings.



A "– –" will appear if no (apnea) or invalid data is being received from the sensor, or if the sensor is not connected to a patient.



CHECK SENSOR indicates the CO_2 cable is not attached to the unit or the CO_2 adapter is not functional.



ZEROING indicates the CO_2 sensor is re-calibrating itself. There will be no measurements made during this 1.8 second period and the display will return to normal shortly.

Measurement of Resp Rate Using CO_2 Monitoring

Respiration data is sourced from ECG leads or CO_2 sensor, and defaults to CO_2 sensor if active because of improved accuracy and response.

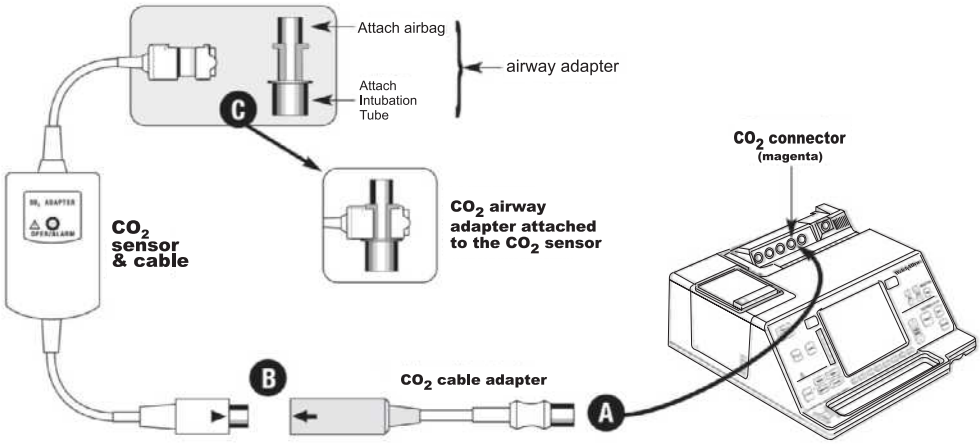
Upon the activation of either CO_2 or CO_2 Trend Monitoring, Respiration Searching will appear in the Resp value window. If a Respiration trace window had been displayed, it will be removed while CO_2 and/or CO_2 Trend is displayed.

Once the CO_2 or CO_2 Trend monitor has determined the respiration rate, it will appear in the Resp value window. The alarm icon will also indicate the Resp alarm status.

NOTE: The respiration alarms status will become active upon the reading of a respiration rate via the ECG monitor or the CO_2 monitor.

CO_2 Typical Usage Procedures

CAUTION: Do not use on patients with a low tidal volume, such as patients younger than 3 years of age or weighing less than 22 pounds, or patients with a respiration rate greater than or equal to 60 breaths per minute.



CO_2 and $ETCO_2$ Options

USING THE CO_2 AND $ETCO_2$ OPTION

1. Press the **POWER** switch to ON (A).
2. Connect Welch Allyn CO_2 cable, CO_2 sensor, Airbag, and Intubation tube.
   a. Connect the Welch Allyn CO_2 cable adapter to the Welch Allyn CO_2 connector.
   b. Connect the Welch Allyn CO_2 cable adapter to the Welch Allyn CO_2 sensor.
   c. Connect the Welch Allyn airway adapter to the Welch Allyn CO_2 sensor.

CAUTION: Do not reuse airway adapters that are labeled for single patient use.

CAUTION: Prior to using airway adapter check for lodged obstructions. After attaching check the adapter for proper placement of the sensor.

NOTE: If using the CO_2 monitor for extended critical care, replace the airway adapter every 24 hours or when it becomes occluded.

3. Place smaller end of airway adapter into the intubation tube. Make sure the airway adapter sits comfortably without discomfort. Secure with tape if patient is unconscious.

4. Press the **NEXT -> CO_2** button on the quick-access menu. The power light on CO_2 sensor will activate. The CO_2 waveform and value window will be displayed in waveform 3. The CO_2 value window will show **Zeroing**. Once the measurement has been established, the most recent $ETCO_2$ measurement will be displayed in the CO_2 value window. The Resp value window will show **Respiration Searching** to indicate that the unit is analyzing the patient's respirations. Once the respiration rate is determined it will appear in the Resp value window.

5. Select the CO_2 Trend trace in waveform 2 of the Traces menu. The CO_2 Trend trace will be displayed in the waveform 2 window and the CO_2 Trend value window will appear on the right side of the window. It will show the most recent CO_2 Trend measurement, and the $ETCO_2$ Trend waveform will begin displaying trend information.

CHAPTER 12: DOCUMENTATION

This chapter provides information on the PIC System documentation capabilities. It describes each type of documentation and provides instructions for creating it.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information before proceeding with this chapter.

NOTE: The recorder will annotate ECG waveforms and system annotation. The paper is thermal-sensitive and care should be exercised to prevent loss of recorded information. Avoid extended exposure to sunlight, high temperatures or humidity and contact with adhesive tapes.

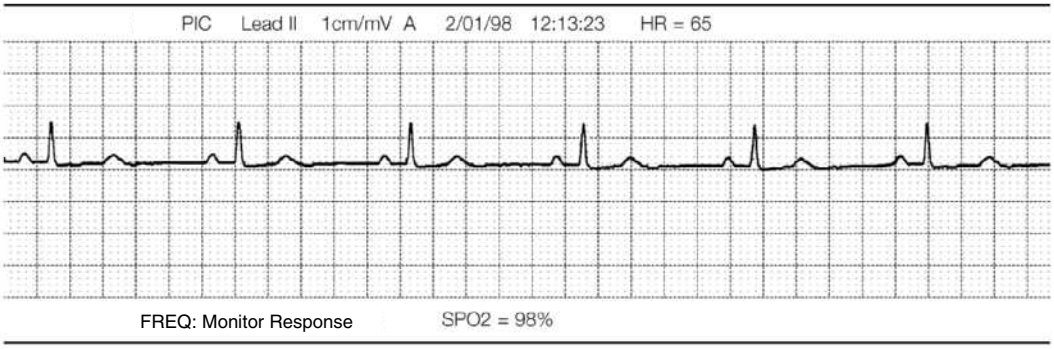
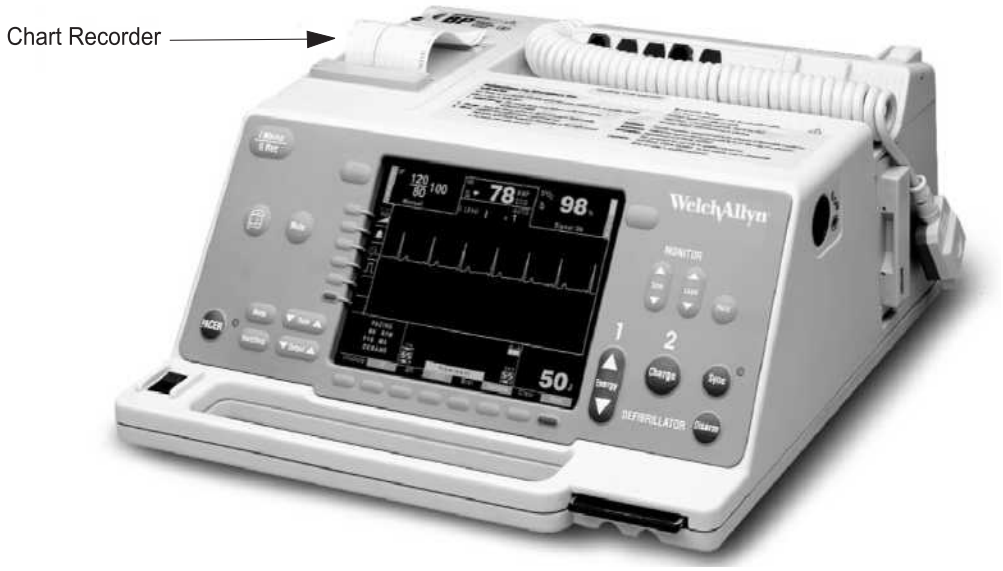


Chart Recorder Printouts



System On Header

Each time the PIC is powered on, the unit will perform a self-test and the results of the test will be printed on the header. The date and time the system was turned on and software revision level will be printed on the header (if the device has been turned off for more than 2 minutes).

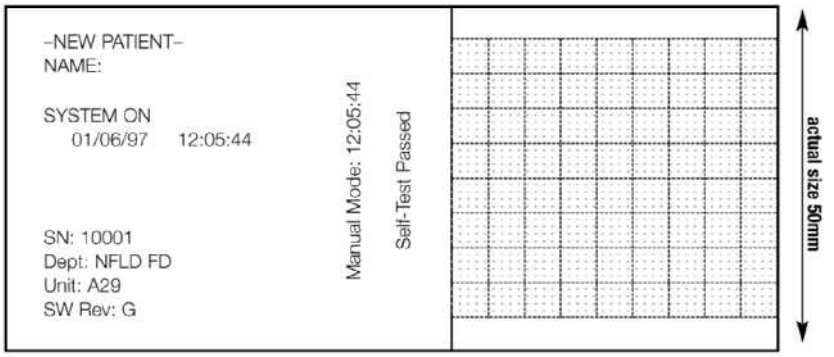
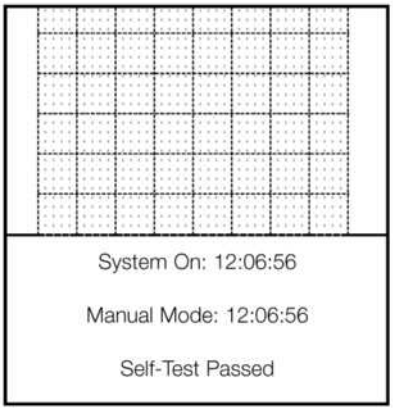


Chart Recorder Startup Printout

If the device was switched off briefly, for less than 2 minutes (e.g., to change the battery), the device will assume that the same patient is being monitored and the startup header (shown at right) will be displayed when turned on.



TURNING ON/OFF THE CHART RECORDER

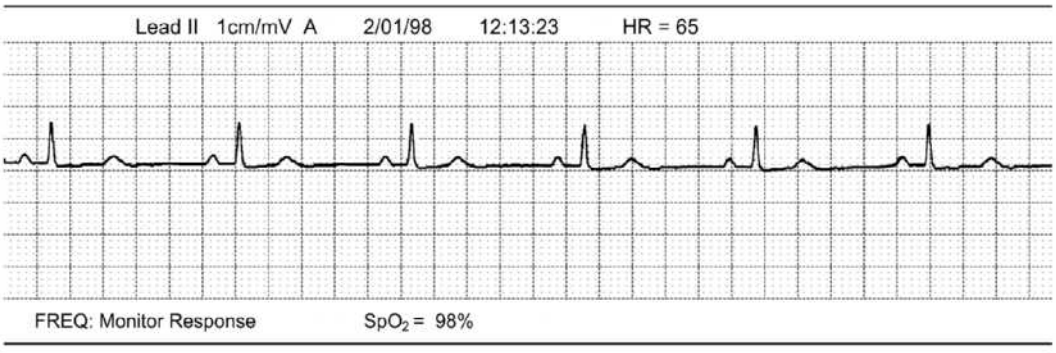
1. Press **PRINT** button to begin printing.
2. Press **PRINT** button again to stop printing.

Manual Printout

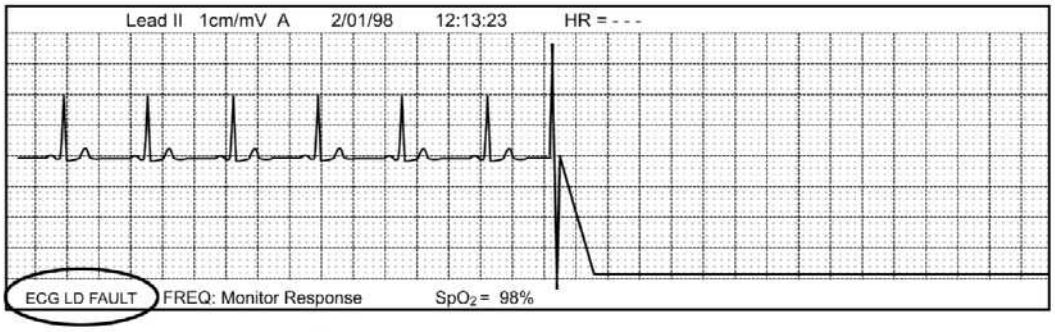
Each time the chart recorder button is pressed, the following information will be printed:

Welch Allyn PIC

- Date
- Time
- ECG Lead (LEAD)
- ECG Size (“A” indicates AUTO sizing setting)
- Frequency Response (FREQ)
- Heart Rate (HR)
- Sync on (if activated)
- SpO2 reading
- OX = Off or OX = On
- Ñ = Notch On or ____ = Notch Off



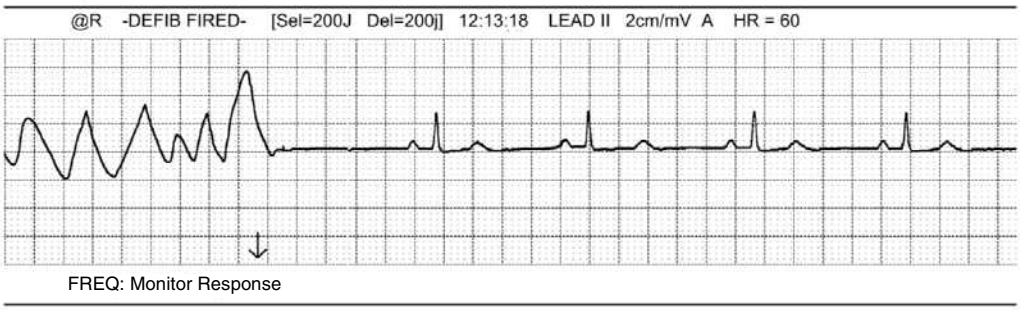
Standard Printout



ECG Lead Fault

Defibrillation

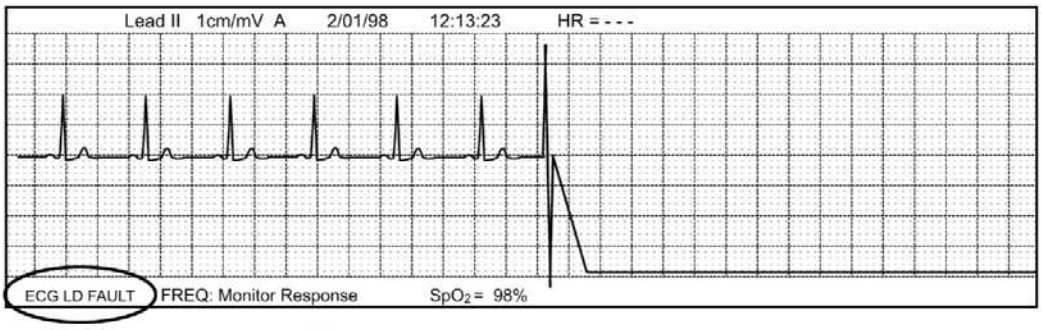
After the defibrillator has been discharged, the chart recorder will automatically run for 12 seconds, providing 4 seconds of pre-shock ECG and 8 seconds of post-shock ECG. In addition, the selected defibrillation energy will be printed.



Defibrillation

Pacer Activation

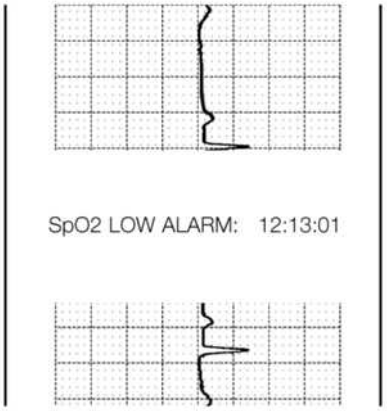
After the pacer has delivered pacing pulses, the chart recorder will automatically run for 8 seconds, providing 4 seconds of pre-pace ECG and 4 seconds of post-pace ECG. In addition to the standard chart annotation, the pacing rate, output, and mode information will be printed.



Sample of Treatment Summary

Alarm Condition

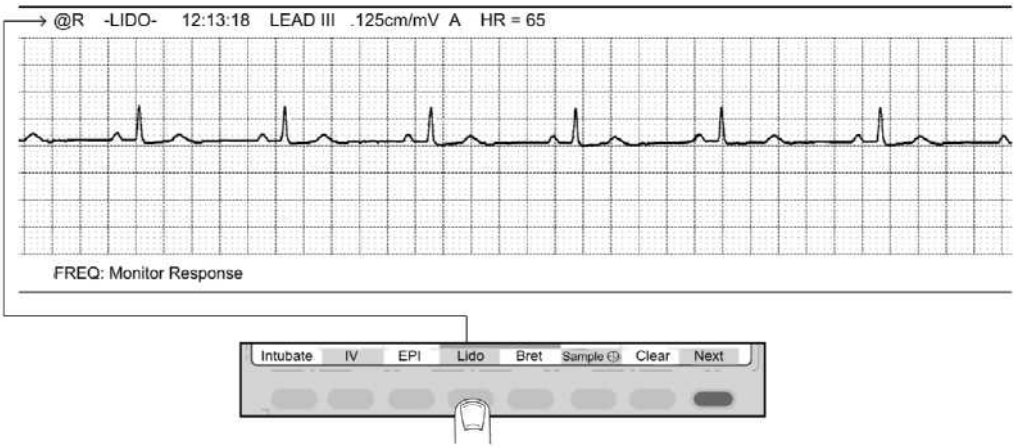
If the global alarms are enabled and a parameter's alarm limit is exceeded, the alarm condition and the time will be printed on the chart recorder.



Treatment Summary

Common ACLS treatment events are labeled for each button to assist in providing a Treatment Summary of the incident. Pressing any of the treatment buttons will store a 4-second ECG sample in memory along with the type of event, time, date, as well as other status annotation information.

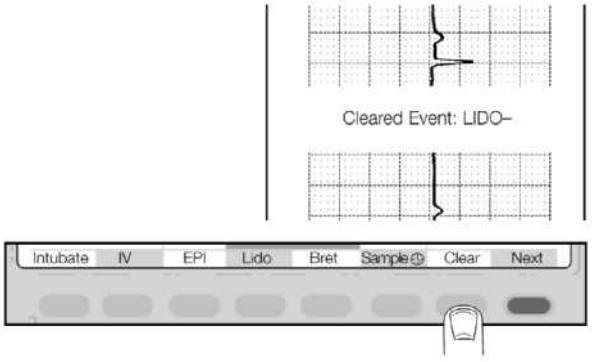
NOTE: If a subsequent ACLS treatment event button is pressed before the chart recorder has completed printing the information of the previous ACLS treatment event, a low tone will sound indicating that the second event was not stored into the log or printed on the chart recorder.

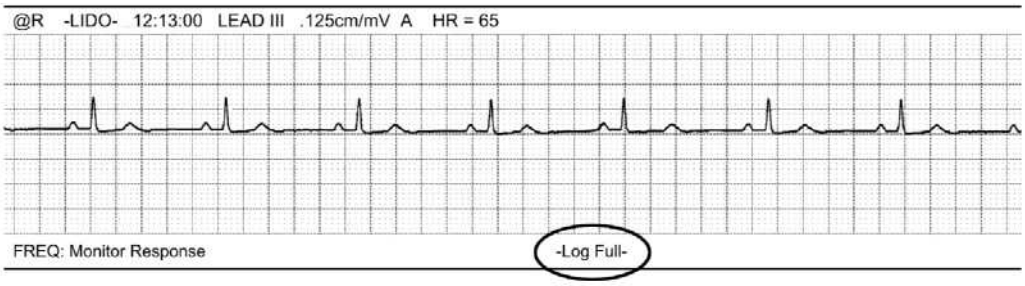


Clearing Event

To clear a Treatment Summary event, press the **CLEAR TREATMENT SUMMARY** button. A message indicating that the event was cleared will be printed on the chart recorder and the cleared event will be erased form the internal log.

NOTE: You can only clear the immediately preceding event.

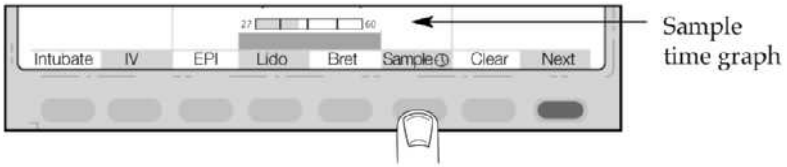




If the Treatment Summary log is full and a **TREATMENT SUMMARY EVENT** button is pressed (e.g., "–LIDO–"), the event will be printed and a "Log Full" message will be printed. The event will not be saved in the Treatment Summary log. "Log Full" printouts should be saved and added to the log printout to provide a complete history of the event.

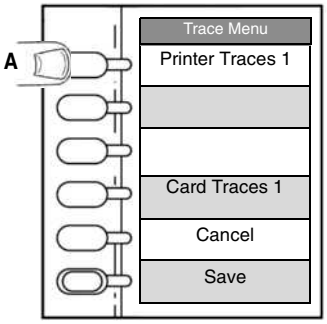
Pulse Timer

The Pulse Timer is activated by pressing the **SAMPLE** button, illustrated below. The Pulse Timer allows the operator to take a patients pulse by timing one 60 second interval. When the operator presses the Sample button two "beeps" sound at 0, 15, 30, 45, and 60 seconds. The time duration is illustrated in the sample time graph. At the end of 60 seconds the sample time graph disappears.



The Recorder Traces Menu

The Traces Menu, under the Recorder Menu, allows the operator to choose whether 1 or 3 traces are printed to the chart and whether 1 or 3 traces are recorded to the card.



Three trace mode will automatically disable voice recording in manual mode. The following traces can be printed to the chart recorder while in three trace mode:

Display Traces	Chart Recorder Traces
1 ECG	1 ECG
2 ECG	2 ECG
3 ECG	top ECG trace on the display
2 ECG and 1 IBP	2 ECG and 1 IBP
1 ECG and 2 IBP	1 ECG and 2 IBP

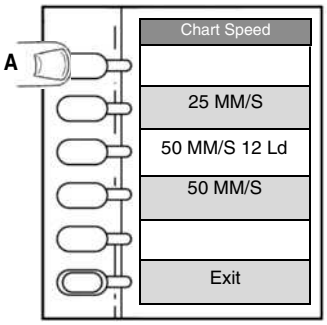
Trace Speed Menu

The Speed Menu, under the Recorder Menu, allows the operator to select the speed of the chart recording during trace output.

25 mm/s - All chart printouts are at 22 mm/s

50 mm/s 12 Ld - Only 12 Lead snapshots print at 50 mm/s

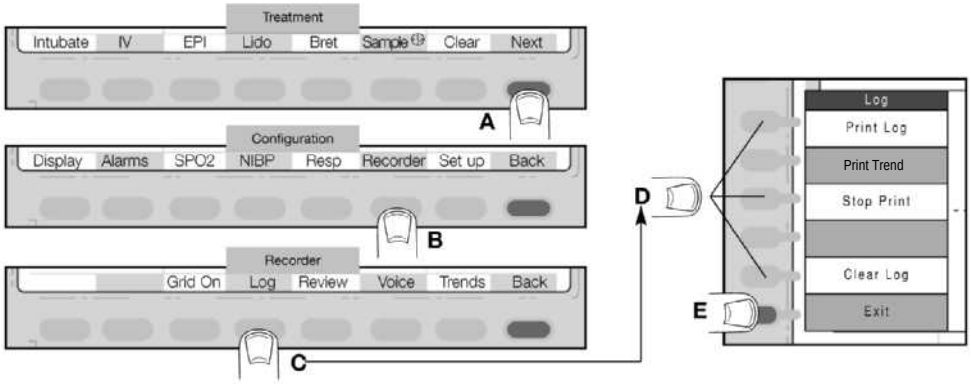
50 mm/s - All chart printouts are at 50 mm/s



Log Functions

Clear Log or Print Log

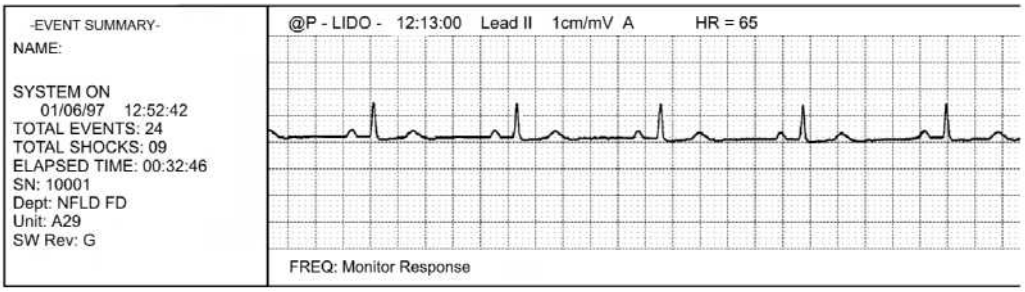
To print out or clear the log, follow the steps below. Begin by pressing **NEXT** in the Treatment Summary menu (A). Then press **RECORDER** in the Configuration menu (B). Next press **LOG** to enter the Log menu (C). From the Log menu the user can print the log, stop printing the log or clear the log (D). To exit, press **EXIT** (E).



Print Log

A Treatment Summary printout is printed for each patient when the Log is printed out. The Treatment Summary includes a place for the patient's name, the time and date that system power was turned on, the total number of ECG events stored for that patient, the total number of defibrillator shocks delivered to that patient, and the elapsed time the system was on.

The Treatment Summary is followed by a printout of all the ECG samples stored for that patient. At the end of the ECG traces, a System Off message will be printed along with the time the system was powered down. If the system was powered down for more than two minutes, a new patient is assumed and a new event summary is generated. If the system is powered down for less than 2 minutes (e.g., for a battery change), it is assumed that the same patient is being monitored and subsequent events will be added to the current Treatment Summary Log. Multiple copies of the Treatment Summary Log can be printed by printing the log again after the System Off message is printed.



Print Trend

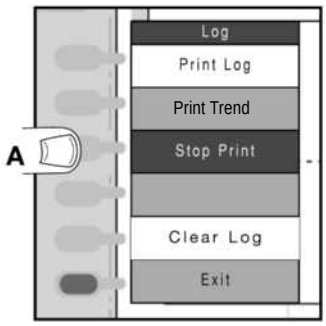
A Trend Summary is printed for each patient when Print Trend is pressed. The Trend Interval must be On (see User Menus - Recorder). If the Trend Interval is set to B/P, a trend event will be generated when a BP reading occurs. If the Trend Interval is set to a time interval, a trend event will be generated at each elapsed time interval.

The Trend Summary information includes a place for the patient's name, the date and time when the system was powered on, the total number of ECG events stored for the patient, the total number of shocks delivered to the patient, and the elapsed time the system was on. If the system is powered down for more than two minutes, a new patient is assumed and a new Trend Summary is generated. If the system is powered down for less than two minutes, it is assumed that the same patient is being monitored and subsequent events will be added to the current Trend Summary printout.

EVENT SUMMARY NAME: Jonathan Wilkens	Time =====	HR ===	OX ===	BP ==========		CO2 (mmHg) ==========	Temp =====	IBP1 =========	IBP2 =========
SYSTEM ON	08:54:03	59	N/A	118/60	93	8 [0:33]	98.3	---/--- ---	---/--- ---
03/04/01 08:52:00	08:54:43	54	N/A	120/60	95	29 [29:29]	98.5	---/--- ---	---/--- ---
TOTAL EVENTS: 09	08:55:57	59	N/A	124/60	93	-- [--:--]	98.5	---/--- ---	---/--- ---
TOTAL SHOCKS: 07	08:56:40	63	N/A	124/60	94	-- [--:--]	98.6	---/--- ---	---/--- ---
ELAPSED TIME: 00:09:30	08:56:43	65	N/A	124/60	94	-- [--:--]	98.6	---/--- ---	---/--- ---
S/N: 0	08:57:15	66	N/A	126/60	96	-- [--:--]	98.7	---/--- ---	---/--- ---
Dept: 1	08:58:24	67	N/A	126/60	96	-- [--:--]	98.6	---/--- ---	---/--- ---
Unit: 1	09:00:07	68	N/A	127/60	97	-- [--:--]	98.6	---/--- ---	---/--- ---
SW Rev: S4-	09:01:02	72	N/A	128/60	98	-- [--:--]	98.6	---/--- ---	---/--- ---

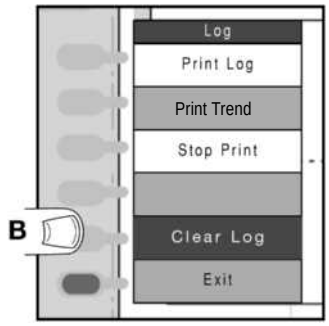
Vital patient data in the Trend Summary is printed as a tabular display. The Trend Summary events include the time the summary information was acquired, heart rate (HR), pulse oximeter reading (OX), blood pressure (BP), carbon dioxide level (CO_2) indicating the set units, invasive Pressure (IBP1, IBP2), temperature (Temp), and the respiration rate (Resp).

Stop Print



To stop printing the Treatment Summary Log while it is printing, press **STOP PRINT** (A). The information in the log will not be affected.

Clear Log

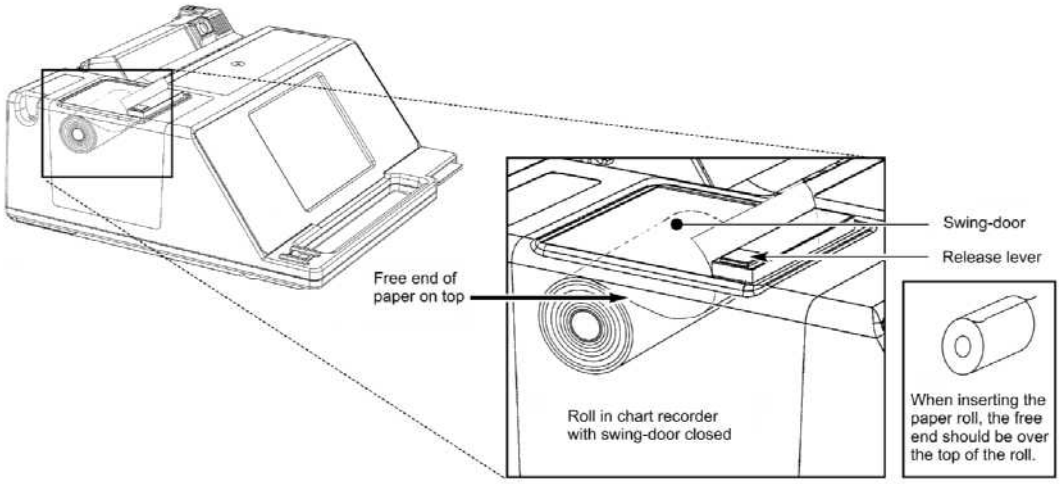


To clear the Treatment Summary Log and the voice memo log, press **CLEAR LOG** (B) button.

NOTE: To prevent the previous patient's Treatment Summary Data to be printed with a new patient's data, always clear the log prior to starting a new patient.

Loading Chart Paper

The check recorder icon ( ) will appear in the message window of the display when the chart paper is empty or the chart recorder door is not closed properly.



NOTE: The low paper indicator is signified by a black or red strip at the top of the chart recorder paper. When the indicator appears, approximately 8 feet of paper is left on the roll.

LOADING CHART PAPER

1. Open the door by pushing on the release lever located on the side of the chart recorder.
2. Remove the empty spool core. Place the new roll of ECG paper with the free end of the paper on top of the roll. Insert the new spool until it snaps onto the spool retaining arms. The spool should be positioned so the inside or shiny side of the paper contacts the thermal array print head. The spool should feed paper from the top.
3. Pull out approximately 2-3 inches of paper and bring the free end of the paper around to the front of the swing-out door; then completely close the door.
4. With the power switch on, press the chart recorder button and allow the paper to feed through the roller automatically.

NOTE: If icon flashes on the display, the paper is probably not moving freely through the slot in the door or the door is not completely shut. Open the door and make sure the paper moves freely through the slot after closing the door again.

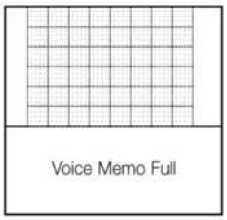
If the chart recorder runs, but nothing is printed, the paper is in backwards. Rotate the spool so the inside of the paper contacts the print head.

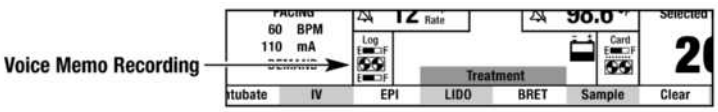
Voice Memo

PIC contains a unique feature to assist the operator in documenting information when a pen and paper may not be available. Pressing the **VOICE MEMO** button on the front panel will digitally record speech. The PIC can record up to 24 seconds of speech to the internal log and up to 2 hours of speech to a memory card (if option was purchased). To record speech, press and hold the **VOICE MEMO** button. As soon as the button is released the recorder will stop.

NOTE: For memory card recording, the voice memo mode can be setup in Supervisor –> Audio menu to be either: Memo (press and hold to record), Start/Stop (press to start, press again to stop recording), or Continuous (automatically records all the time). See Supervisor Menu - Setup in chapter 13.

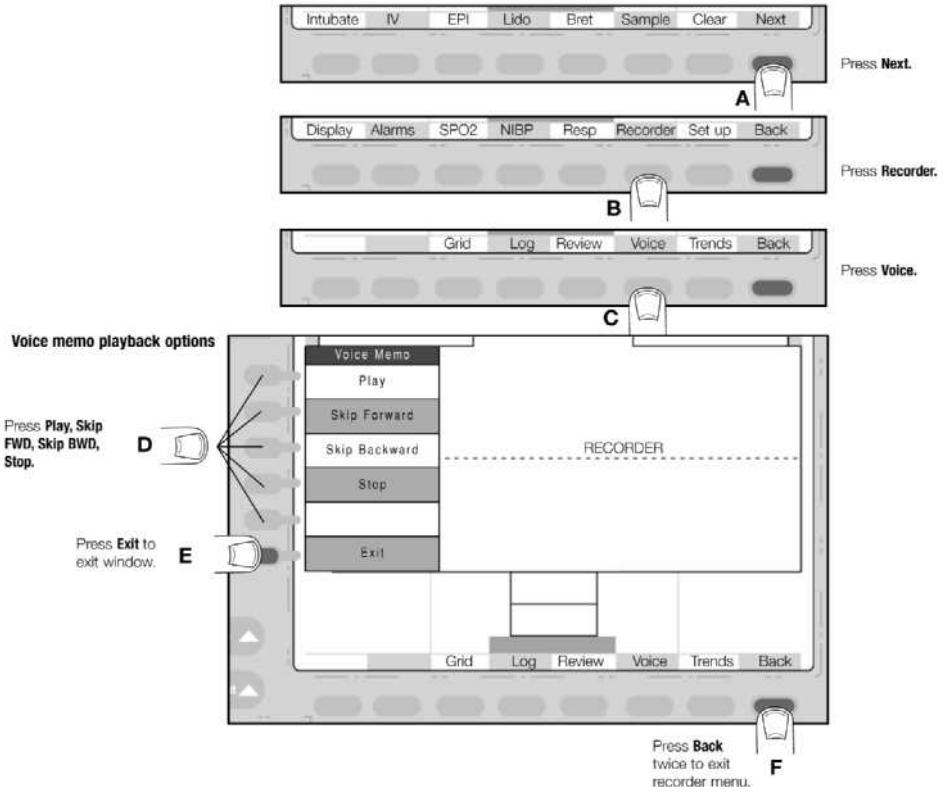
During audio recording, the wheels of the tape icon ( ) will spin, indicating the recorder is recording. When the voice "Internal Log" memo is full and the voice memo button is pressed, the words "Voice Memo Full" will be printed on the chart recorder. Any further voice messages will not be recorded until the internal voice memo is cleared.





NOTE: If memory card is installed and record option is purchased, voice record defaults to memory card rather than internal log.

Speech events in the internal log can be played back directly from the PIC, in the Recorder "Voice" configuration menu. Follow steps below to play, skip forward, skip backward (currently playing audio only), or stop internal log's audio events.



Using the Welch Allyn Data Card

Card Review (optional)

The PIC System's Card Review option is a unique feature used to assist the operator in reviewing patient information that has been recorded to a data card including ECG, event, and speech data. The Card Review feature groups ECG, event, and speech data into individual patient records. This information can be viewed and printed on the PIC System using the Card Review menu or viewed and printed on a PC using Welch Allyn's SmartView software.

CAUTION: During Card Review, all other PIC functionality will be disabled, including Defibrillator and Pacer functionality. In addition, the PIC will not allow entry into the Card Review mode unless both the Defibrillator and Pacer are in the inactive or paused states.

Record / Review Options

The abilities to record and review data to the data card are separately purchasable options. If the record option has been installed and a Welch Allyn data card is inserted into the PCMCIA slot, the "No Card" icon will change to a card gauge icon and moving dots will indicate ECG and Events are being recorded to the card.

If the Review option has been installed and a Welch Allyn-compatible data card is inserted, "Review" can be chosen in the Configuration window Recorder menu. The Review options allows the operator to view and print recorded patient information on the PIC System. If the Review menu does not appear this option is not installed. The options can be purchased from Welch Allyn and installed through the Supervisor Setup Menu (see chapter 13).

As another indicator, if the voice option is installed the voice recorder icon will move directly under the card gauge rather than under the internal log gauge, which indicates the destination for voice memos has changed to the card.

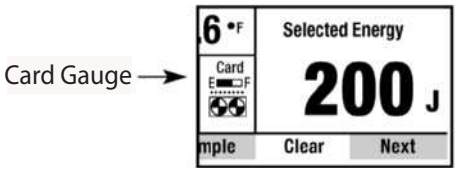
Card Review Icons

NOTE: Use only Welch Allyn supplied CardioLog cards to guarantee compatibility and performance.

Data Card Indicators

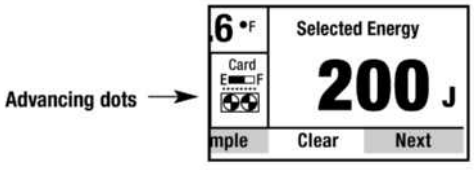
When a data card is inserted into the PIC System the following indicators may be seen to the left of the Defibrillator Energy window:

Remaining Data Card Capacity



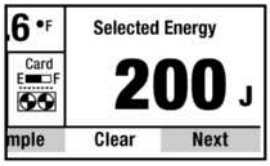
Remaining data card capacity is indicated by a single gauge representing the space occupied on the card. The gauge will be displayed if a properly formatted card with remaining storage capacity is inserted in the PIC.

Event Recording Dots



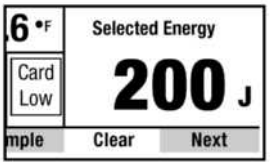
Advancing dots shall be displayed whenever ECG or Events are being recorded to the card.

Voice Cassette Icon



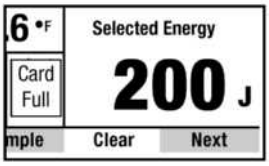
The voice cassette icon shall be displayed beneath the card gauge, instead of below the log gauge, if a properly formatted card is inserted and the Voice Memo option is installed. The wheels of the tape icon will rotate when speech is being recorded to the card.

Card Low



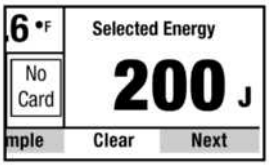
Displayed with accompanying tone when there are 5, 3, and 1 minutes of capacity remaining on the card.

Card Full



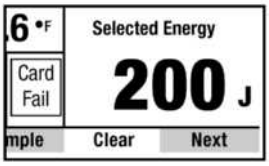
Displayed with accompanying tone when there is no more capacity on the card.

No Card



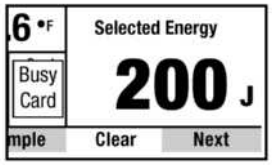
Displayed when no data card is inserted into the PIC.

Card Fail



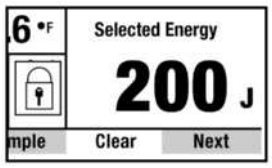
Displayed when an unformattable, unformatted, or unreadable card is inserted.

Busy Card



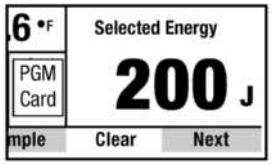
Displayed when a data card is being formatted or whenever data is being read from the data card.

Card Lock



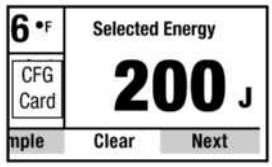
Displayed when data card has write-protect on.

PGM Card



Displayed when a properly formatted program card is inserted into the PIC, with write-protect on or off.

CFG Card



Displayed when a properly formatted configuration card is inserted into the PIC, with write-protect on or off.

Formatting the Data Card

A data card can be erased and formatted in the Card Menu.

FORMATTING THE DATA CARD

1. Switch the write-protect switch to off (on the back of the PCMCIA card, move switch to left), which allows the card to be formatted, and insert the card into the PIC System.
2. Use the configuration window to access the Card Menu window by pressing Next –> Set Up –> Supervisor–> Diag –> Card. (See chapter 13 for more detailed information).

NOTE: Upon entry into the Card Menu, data recording to the data card will be halted. Upon exiting, data recording will restart if the card has not been formatted.

3. In the Card Menu, press **CARD ERASE** to begin formatting. The Card Busy display will be shown. Format status will be displayed on the screen. The formatting process will take a few minutes to complete, depending on the size of the card.

NOTE: After formatting a card, it must be removed and reinserted or the PIC power must be cycled to begin data recording.

Viewing Card Information

In the Card Menu, card information can be shown by pressing **CARD INFO** (see chapter 13 for more detailed information). If a valid and properly formatted Welch Allyn-compatible card is detected the following information will be presented.

- Card Contents
- Card Type
- Card Size (in KB)
- Format Count (# of times formatted on a PIC or PC)
- Format Date (last format date)

If no card or an unreadable card is detected when pressing "Card Info", entry into the Card Info menu will be prevented and a warning tone will sound.

Recording Data

If the Review/Recording option is installed and an Welch Allyn data card is inserted, patient information will be automatically recorded to the Welch Allyn data card whenever the PIC System is turned on. The following patient data is recorded to the data card:

- ECG data that is displayed in waveform 1 will be recorded to the data card whenever an Welch Allyn-compatible data card is inserted.
- Status Events and Trend Data are recorded to the data card as they occur.
- Audio is recorded to an Welch Allyn-compatible data card when the Voice memo button is pressed or when the unit is operating with continuous voice recording enabled.

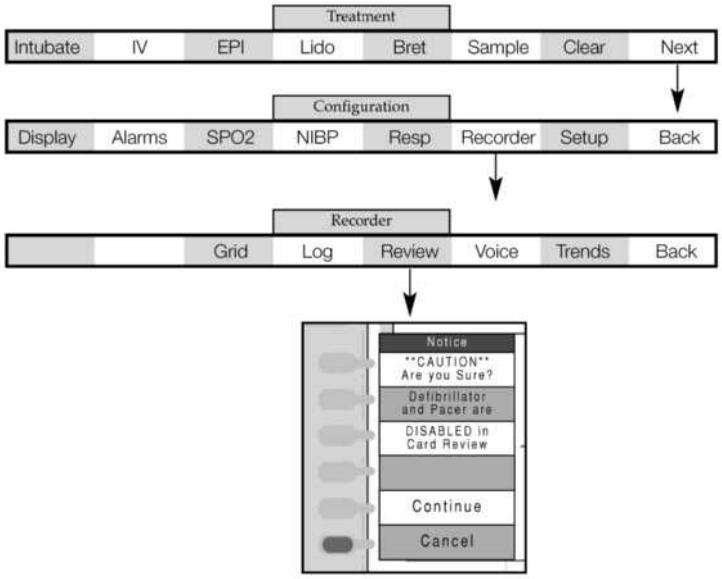
NOTE: When recording data make sure that the write-protect switch is off to allow the writing of information to the data card.

NOTE: Treatment Summary events will also be recorded to the internal Log during data card recording.

Reviewing Data in the Welch Allyn Data Card

Card Review Display

To review data on the data card the operator needs to access the "Card Review" menu in the configuration menu. (see below).



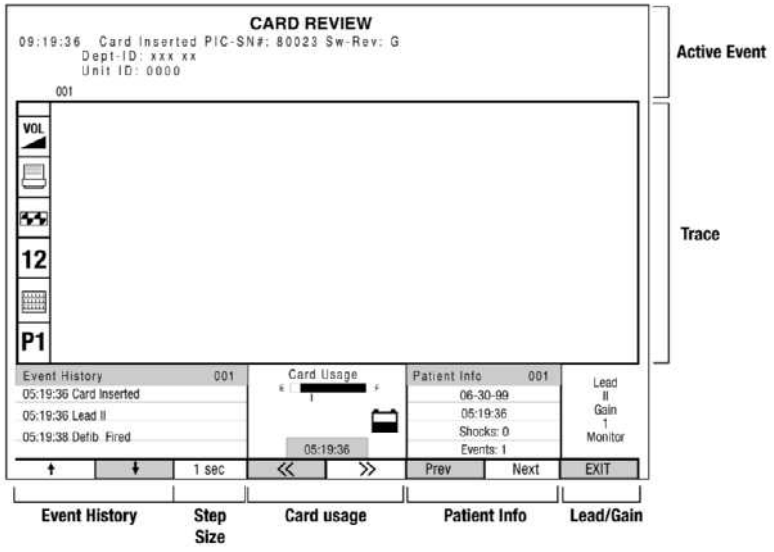
Upon pressing **REVIEW** the Review Menu will appear. It will caution you that if this option is selected, Continue is pressed, the operator will not be able to monitor, pace, or defibrillate the patient.

CAUTION: All PIC functionality is disabled during Card Review. In addition, the Card Review menu will be locked out if the PIC is currently Pacing.

NOTE: Welch Allyn-compatible data card must be inserted in order to access the Card Review menu. Switch the write-protect switch to on before inserting the card into the PIC System to prevent any further information from being appended on to the data card while reviewing.

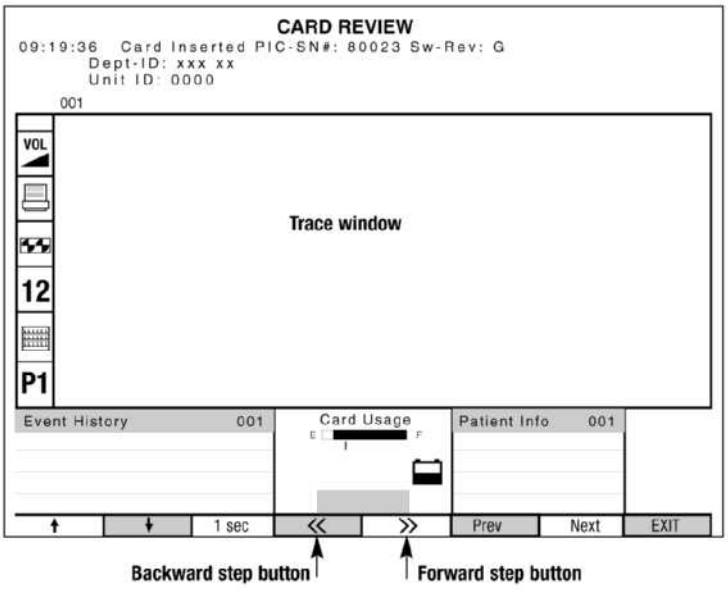
Card Review Windows

When **CONTINUE** is pressed, the entire PIC System display will be replaced by the Card Review display. Information from the Welch Allyn data card will be shown. In the Card Review display there will be Trace, Event History, Active Event, Patient, Lead/Gain, and Card Usage windows.



Trace Window

The Trace Window occupies the same space as the waveform window during normal PIC System operating modes. The Trace Window allows only one trace (waveform 1) to be displayed in the window, unless a 12-lead snapshot is being viewed, in which case 3 traces will be displayed.

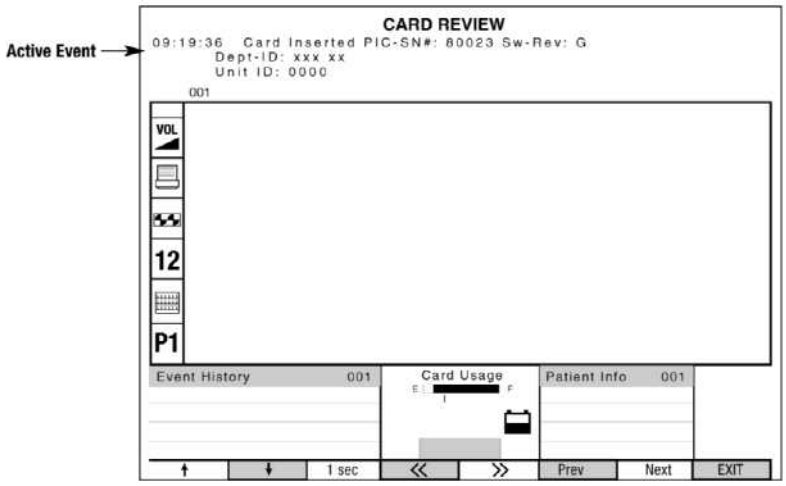


The trace can be moved by using the ECG step-size, backward step (**<<**), and forward step (**>>**) buttons. The ECG step-size button toggles between 1 second, 5 seconds, 30 seconds, 1 minute, and 5 minutes. The **<<** and **>>** buttons step the trace backwards and forwards the selected step-size.

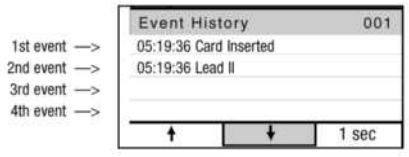
Sync and Pace markers are displayed similarly to their real-time display. A Defib Fired mark is displayed as "↓" on the bottom of the Trace Window, indicating the point at which the defibrillator was discharged.

Active Event Window

The Active Event Window is located at the top of the display. It contains detailed information of the active event being previewed. The event timestamp is listed along with all other relevant information. Just above the trace window, in the Active Event Window, is the event number of the currently displayed event (also the same number as in the Event History window).



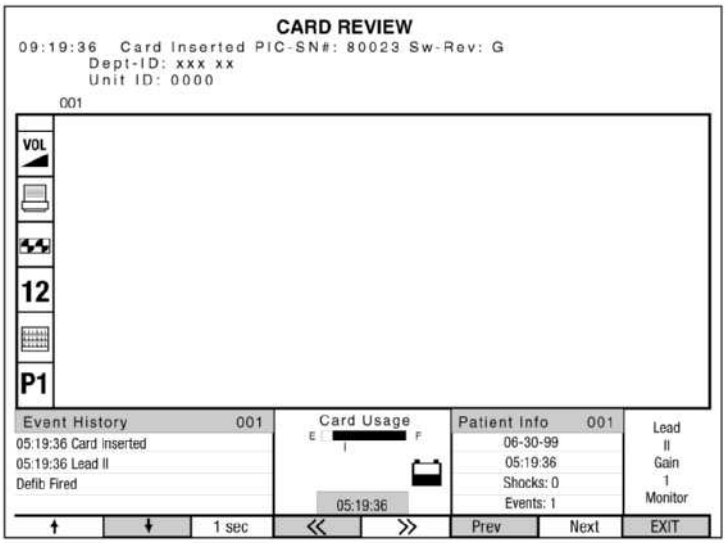
Event History Window



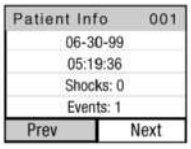
The Event History Window is located in the lower left corner of the display. The window has a title row that includes the words Event History as well as the event number of the active event. The active event being previewed is the first event listed in the Event History Window and its originally associated ECG is displayed in the Trace Window with other relevant information displayed in the Active Event Window. All other events for the current patient are listed in the Event History Window with the timestamp of occurrence. If the ECG is advanced the active event will not change until the ECG for the next event listed is shown in the Trace Window. The active event will become the event that corresponds to the displayed ECG.

Viewing Active Events

The active event can be changed by pressing "▲" or "▼". These buttons are located below the Event History Window. The "▲" steps to the previous event for the current patient. If there is no previous event a warning tone sounds and does not change events. The "▼" steps to the next event for the current patient. If there is no next event a warning tone sounds and does not change events.



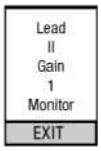
Patient Window



The Patient Window is located in the lower right-center of the display. The window has a title row that displays the words Patient Info and the patient number. The first patient on the data card is patient number 001. Below the title bar is the date and time the active patient's data was recorded, the number of shocks recorded, and the number of events recorded.

Use the **PREV** and **NEXT** buttons located below the Patient Window to choose another patient if more than one is recorded on the data card. Prev steps to the previous patient on the data card. If there is no previous patient the unit will beep twice and will advance to the last patient on the data card. Next steps to the next patient on the data card. If there is no next patient the unit will beep twice and will reset to the first patient on the data card.

Lead/Gain Window

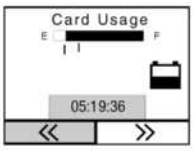


The Lead/Gain Window is located in the lower right corner of the display. The ECG lead source for the active ECG event displayed in the Trace Window is displayed below the word Lead. The ECG size/gain for the active ECG event displayed in the Trace Window is displayed below the word Gain. The ECG frequency response for the active ECG event displayed in the Trace Window is shown at the bottom of the window.

The ECG size/gain can be changed by depressing the Size button in the face of the unit. The ECG lead source button is only active when displaying a 12-lead event; depressing the Lead button on the face of the unit will cause the next group of three leads to be displayed.

NOTE: Upon entry into the Card Review menu, the size/gain will be set to 1 cm/mv by default.

Card Usage Window



The Card Usage Window is located in the lower center of the display. A card usage gauge is displayed and a small tick indicates where the displayed ECG data is located on the card. The ECG clock indicates the timestamp for the displayed ECG data. The clock changes when changing ECG, Events, Patients, or Speech.

Quick-Access Buttons

Volume

Adjusts the volume for Voice Memo playback.

Printer

Prints the current patient information header, the four events currently displayed in the Event History Window, and 12 seconds of single trace ECG (4 seconds preceding the active event and 8 seconds following the active event (if available).

NOTE: Printout of a 12-lead event will be of the same format as that selected in the Supervisor>12Lead>Printer menu. (see page 5.8)

Cassette

If the active event is a voice memo event it will playback the entire memo until conclusion. The ECG snapshots will advance every five seconds while the Voice Memo is playing to synchronize ECG and events to the speech playback.

12-Lead

If the active event is a 12-lead event it will display the snapshot data in the Trace Window. By pressing the **12** button the Lead button will be active to allow the selection of leads shown in the Trace Window. The **12** button activates the NextPage icon and the Analysis icon.

Analysis

If the active event is a 12-lead event, press the Analysis icon to analyze the data for interpretation. See chapter 18, 12-lead Interpretive Analysis for details.

NextPage

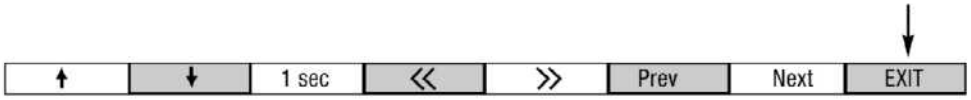
If the active event is a 12-lead event it will display the next 3.3 seconds of the displayed traces.

P1

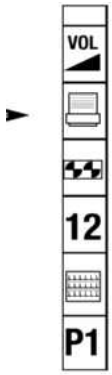
Resets to Patient 001, the first patient on the data card. The card will be rescanned to determine its usage and capacity. This function also allows for the capability to review a different data card without having to reboot (i.e., – Insert the memory card first, then press P1).

Exit

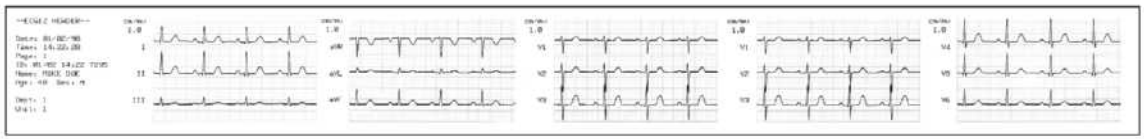
To exit the Card Review menu press the Exit button. It is the bottom button on the right. The PIC will reboot.



Printing



To print out the Card Review press the printer quick-access button. The information printed will include current patient information, the four events currently displayed in the Event History Window, and 12 seconds of single trace ECG (4 seconds preceding the active event and 8 seconds following the active event [if available]). A vertical line will encase the Card Review printout to separate it from Log Printouts and/or Sample Printouts. Printout of a 12-lead event will be the same format as that selected in the Supervisor> 12Lead> Printer menu (see page 5.8).



Voice Memo Review

There are two voice memo playback modes, corresponding to the two voice memo recording modes (Manual and Automatic).

Manual Voice Memo Mode

Voice Memo events are generated by the user depressing the Voice Memo button on the PIC System display. The recorded voice events are listed in the Event History Window. To playback speech the active event must be a Voice Memo event. Press the Cassette quick-access button. (The Cassette button will be "grayed out," or inactive, when the active event is not a Voice Memo event.) As the speech plays the ECG will advance every 5 seconds to simultaneously show ECG events and speech events. The Cassette button will remain highlighted during the speech playback. When the Voice Memo event is completed the presently displayed ECG will remain in the Trace Window. To stop playback any button can be pressed. When stopped, the presently displayed ECG will remain in the Trace Window.

Automatic Voice Memo Mode

Automatic Voice Memo mode can be enabled for both SAED and MANUAL modes (see chapter 13 for more information). Automatic Voice Memo events are not listed in the Event History Window. The Cassette quick-access button will never be "grayed out;" it will always be active. When the Cassette button is pressed the Voice Memo will start playback at the time of the present ECG trace displayed in the Trace Window. As the speech plays the ECG will advance every 5 seconds to simultaneously show ECG events and speech events. The Cassette button will remain highlighted during the speech playback. The Voice Memo will not stop until the end of the recorded information on the data card. To stop playback any button can be pressed. When stopped, the presently displayed ECG will remain in the Trace Window.

CHAPTER 13: MENUS

This chapter covers in detail all the User and Supervisory Configuration Menu Options available in the PIC System.

Chapter Overview:

User Menu Overview

Configuration Menu	Submenu	Choices	Choice Range	Factory Default
Display	Traces	Waveform2 Waveform3	Off, Resp, Pleth, CO2 Trend, I, II, III, aVR, aVL, aVF, V1-6	Off Off
	Freq	Limited (2-20 Hz) Monitor (.67-40 Hz) Diagnostic (0.05-150 Hz) Filtered Diagnostic (0.25-40 Hz)		Monitor
	Filter	Off, On		On
	Pt Cable	3-lead 5-Lead		3-Lead
Alarms	HR Alarms	Off, On, Auto UL: Disabled, On LL: Disabled, On	 60 - 300 BPM; by 5's 20 - 120 BPM; by 5's Automatically determined	Off 120 50
	SPO_2 Alarms†	Off, On UL: Disabled, On LL: Disabled, On	70% - 99%; by 1's 60% - 99%; by 1's	Off 99 85
	BP Alarms†	NIBP IBP1 IBP2	Off, On, Set Sys, Set Dia Sys UL: Disabled, On, 30 - 250 by 5's Sys LL: Disabled, On, 30 - 250 by 5's Dia UL: Disabled, On, 25 - 250 by 5's Dia LL: Disabled, On, 25 - 250 by 5's	Off 160 80 130 50
	Resp Alarm	Off, On UL: Disabled, On LL: Disabled, On	 20 - 150; by 5's 3 - 100; by 5's > 15 and by 1's < 15	Off 30 5
	Temp Alarm†	Off, On UL: Disabled, On LL: Disabled, On	 99 - 109; by 1's 85 - 98; by 1's	Off 100°F 95°F
	CO_2 Alarms†	Off, On UL: Disabled, On LL: Disabled, On	 10-100 mmHg, 2-14 kPa 3-50 mmHg, 0.4-6 kPa	Off 40mmHg,5kPa 5mmHg,.5kPa
SPO_2†	Size	x.25, x.5, x1, x2		0.25
NIBP†	NIBP	Manual Auto Stat	 1, 2, 3, 5, 10, 15, or 30	Manual 5
Respiration	ECG Resp Setup	Size Speed Response	x1, x2, x4 5, 10, 20, 30, 60 sec Slow, Normal, Fast	1 30 Normal
	CO_2 Setup	Size Speed Response	0-20, 0-40, 0-80 mmHg 0-4, 0-8, 0-12 kPa 5, 10, 20 sec slow, normal, fast	
	Trend	Speed	10 min, 30 min, 2 hr, 6 hr, 12 hr	
Recorder	Speed	25 mm/s 50 mm/s 12 Ld 50 mm/s		25 mm/s
	Traces	Printer Traces Card Traces	1,3 1,3	1 1
	Print Grid	On, Off		On
	Log	Print Log, Print Trend, Stop Print, Clear Log		
	Review†	Continue, Cancel		
	Voice Memo† Trends	Play, Skip Fwd, Skip Bwd, Stop On, Off at B/P, 30 sec, 1, 2,3, 5 min		 On at B/P

Configuration Menu	Submenu	Choices	Choice Range	Factory Default
Set Up	Suprvsr	Enter code, reset to 0	0 -9	1, 2, 3, 4
	Date	Month Day Year	January thru December 0 - 31 99, 00, 01, 02, 03....	
	Time	Hour Minute	1 - 23 0 - 60	
	Active Shift	Shift 1, Shift 2, Shift 3, Defaults		
	Data Xfr†	Not Used, Mobitex, SmartLink		Not Used

† If option has been purchased.

Supervisor Menu Overview

Menu	Submenu	Choices	Choice Range	Factory Default
Defibrillator	Ext Energy		2, 5, 7, 10, 20, 30, 50, 70, 100, 150, 200, 300, 360	200 Joules
	Int Energy		2,3,4,5,6,7,8,9,10,20,30,50	20 Joules
	Mode (sync after cv)	On, Off		Off
	Charge Alarm	Alarm Volume, Max. Volume	OK	
Pacer	Rate		30 - 180; by 5's < 100 and 10's > 100	60
	Mode	Async or Demand		Demand
SAED†	Set ALS Code	0 0 0 0 Cancel	0-9 0-9 0-9 0-9 Required, not required	1 2 3 4 Required
	E Prot (SAED Protocol)	200-200-360 or 200-300-360		200-300-360 Joules
	SAED Audio†	Memo, Start/Stop, Continuous		Continuous†/ Memo
	Startup	Manual, Basic+, Basic		Basic
12 Lead†	Phone	Name, Prefix, Phone Number, Postfix, Receiver Type	16 phone numbers	
	Printer	2x6 I/V1, 2x6 V1/V2, 3x4 I/II/III		3x4 I/II/III
	Fax	Grid Audio Output Baud Rate Fast Fax	Full Grid, Partial Grid On, off 2400, 4800, 7200, 9600 Enabled, Disabled	Full Grid On Disabled
	Freq	Filt Diag, Diagnostic		
	Analysis	Manual, Automatic		
	Copies	1, 2, 3, 4, 5		1
Set Up	Shifts	Save as 1, 2, 3, Save to card, Load from card		
	Treatment	Button 1, 2, 3, 4, 5	Intubate, Lido, Bret, CPR, Arrival, Event, Atrop, IV/Surg, Sedate, Narcotic, Dry-Agt Anesth, Custom1-2-3-4-5, Sample, IV, EPI	Intubate IV, EPI, Lido, Atrop
	Upgrade	SAED, CO2, IBP, ADV, Record, Review, Biphasic, Pacer, Fax, Analysi, Mobitex, DataRd		
	Unit ID	Department ID, Unit ID		1,1
	Code	0 0 0 0 Cancel	0 - 9 0 - 9 0 - 9 0 - 9	1 2 3 4
	Printer	Alarms Defib/Pacer Trending Treatments Miscellaneous	On, Off On, Off On, Off On, Off On, Off	On On On On On

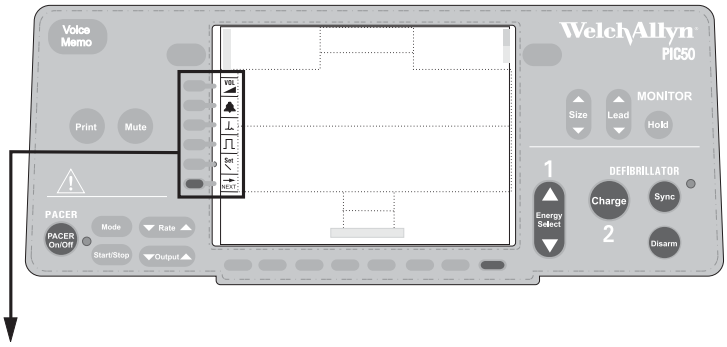
Menu	Submenu	Choices	Choice Range	Factory Default
	More	Date	mm/dd/yy, dd/mm/yy, yy/mm/dd	mm/dd/yy
		Temp	Fahrenheit (°F), Celsius (°C)	°F
		Line Freq	60 Hz, 50 Hz	60 Hz
		Audio†	Voice Prompts (Enabled, Disabled)	Disabled
			Voice Mode (Memo, Start/Stop, Continuous)	Memo
			Voice Log (Enabled, Disabled)	Enabled
		Language	English, Spanish, French, German, Portuguese, Italian	
		Lead	I, II, III	II
		CO2†	mmHg, kPa	mmHg
		Data Xfr†	Mobitex	
Diagnostic	Software Rev	Motherboard, Preamp, Defib, Oximeter, BP		
	Modem	Run Self Test		
	Card	Card Info		
		Card Erase		
		Program PIC		
	Cal	NIBP†	Pump Up, Pump Down	
		SPO2†	-2, -1, 0, 1, 2	
		Mod Out	0 m V, 1 mV, + MAX, - MAX, Off	
		CO2†	Simulate, Reset	
Alarms		Active Shift,		Active Shift
		User		

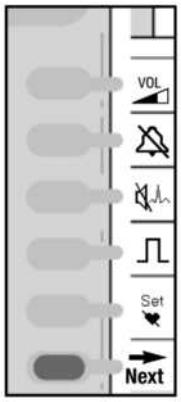
† If option has been purchased.

Quick Access Buttons and Icons

Quick Access buttons and icons are located along the left side of the PIC display window. Press a button next to an icon to select a PIC System option or function.

Basic Quick Access Buttons and Icons





VOLUME: Adjusts the overall volume on the PIC System.

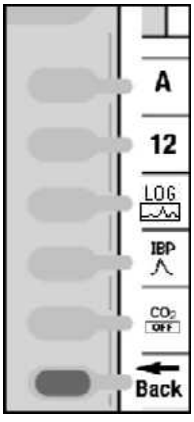
GLOBAL ALARMS: Enables and disables global alarms.

QRS BEEPER: Enables and disables the QRS Beeper.

CALIBRATION: Calibrates the display.

SET HEART RATE: Sets the value to be use in automatic HR alarm settings.

NEXT: Open another Quick Access window if advanced options (12-lead, CO_2, IBP, etc.) are available.



ADVISORY (optional): Analyzes current ECG as shockable or non-shockable.

12-LEAD (optional): Allows the operator to acquire a 12-lead analysis.

LOG: Allows the operator to print or clear the log.

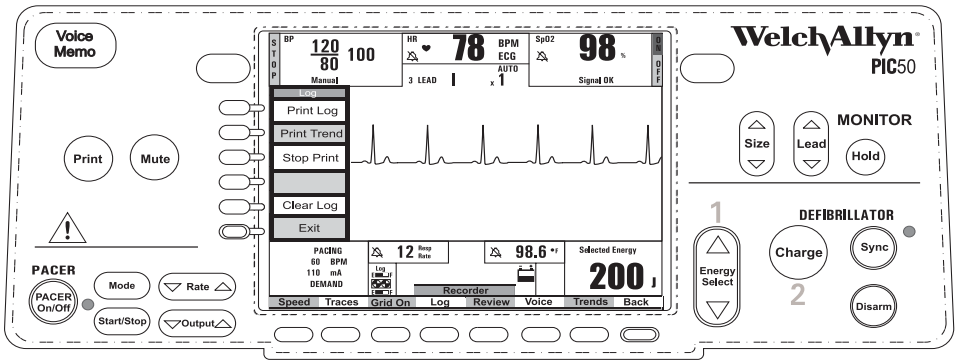
IBP (optional): Allows the operator to measure pressure invasively.

CO_2 (optional): Allows the operator to measure end-tidal carbon dioxide levels.

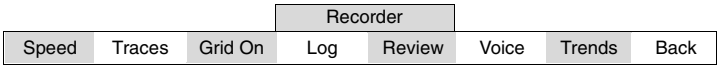
BACK: Return to the previous quick access window.

Quick Access Buttons and Pop-Up Menus

The Quick Access buttons are also used to select pop-up menu options, including the User and Supervisor menu options.

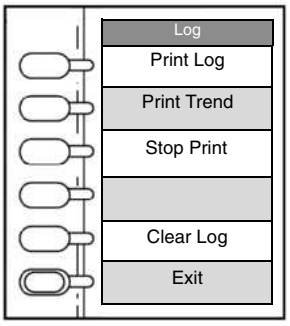


Sample Menu



When you select an item on a menu located along the bottom of the PIC window, a pop-up menu will display next to the Quick Access buttons (along the left side of the display).

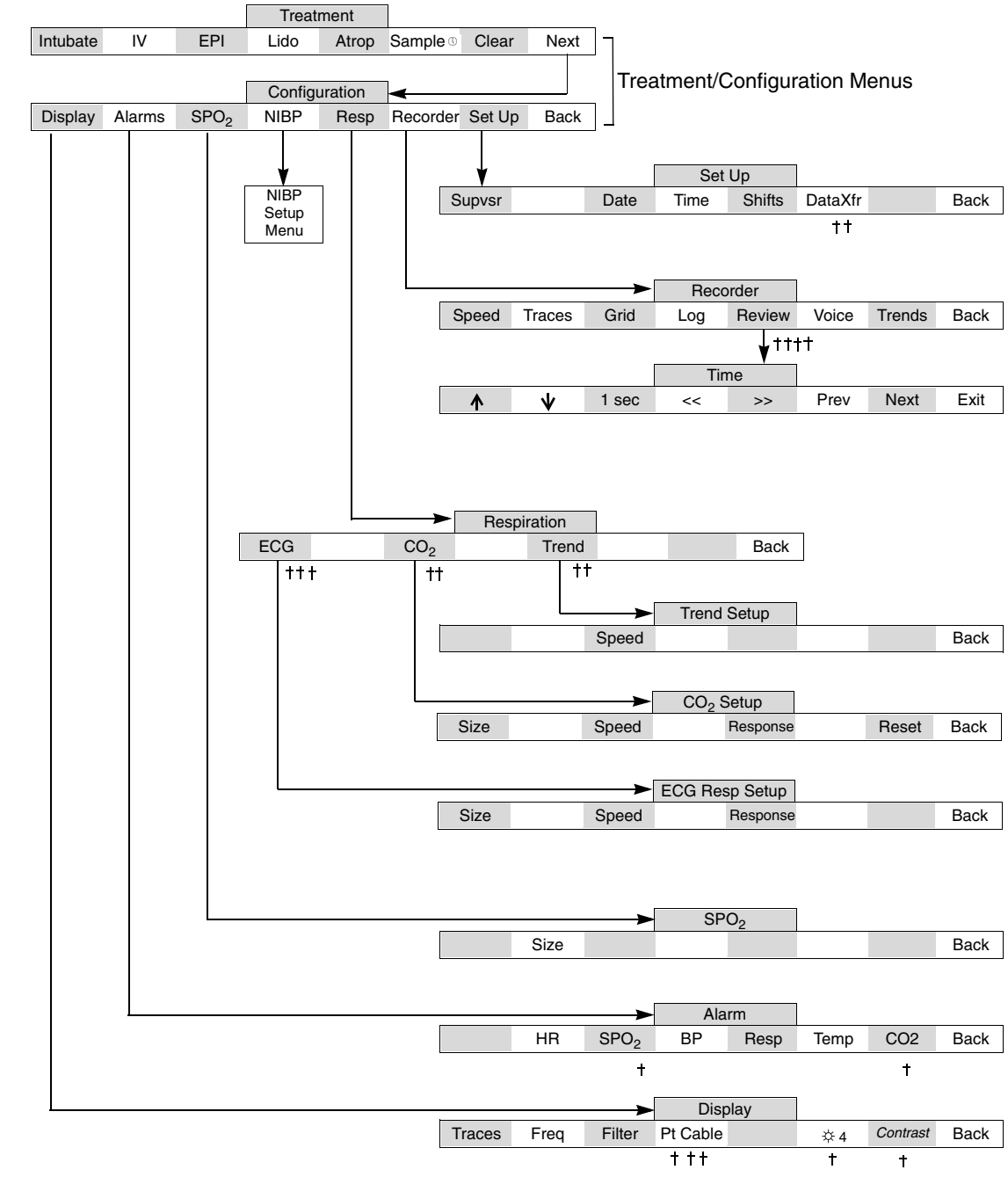
Sample Pop-Up Menu



To select a pop-up menu option (or enter information), press the **QUICK ACCESS** (A) button located next to your selection.

User Menus

User menus can be accessed by all operators and do not require a supervisor pass code. Operators can configure a variety of PIC system options including some of the display features. The User menus are shown in the following diagram. This section also provides an explanation of how to access and set User menu options.



† Available only if purchased

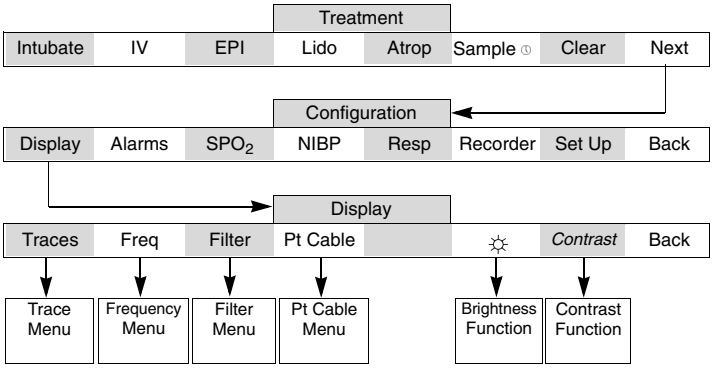
†† Available only in 12-Lead PIC

††† Available only in 5-Lead PIC

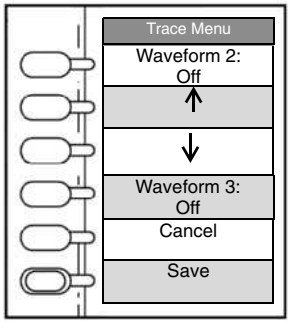
†††† Visible only if memory card is in place

User Menus – Display

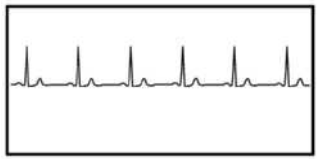
The Display menu options allow users to configure the PIC Display area to show multiple traces; choose frequencies, patient cable, and filter options; and adjust the brightness and contrast (if the display type supports variable brightness and contrast). The Display options are accessed from the Treatment/Configuration menus.



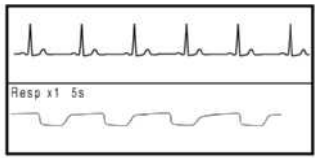
Trace Menu



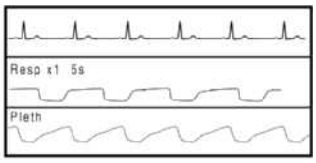
In the Trace menu, users can choose from several ECG trace display parameters including Resp, Pleth, CO2 Trend or Off for waveforms 2 or 3. If the PIC includes the 12-lead option, users can select lead I, II, III, aVR, aVL, aVF, V1, 2, 3, 4, 5, 6, ETCO2, Pleth, or Off for waveform 2 or 3. Press the **UP** and **DOWN** arrow buttons to select an option. Press **SAVE** to save the current selections.



ECG Waveform

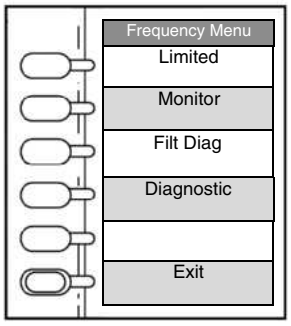


ECG and Waveform 2: Resp



EGC, Resp, and Pleth Waveform

Frequency Menu



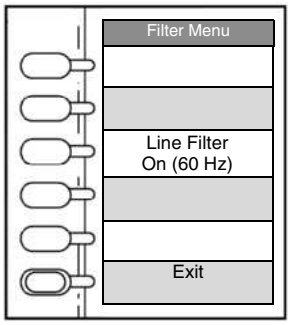
Use the Frequency menu selections to set the display and chart recorder responses. Four frequency options are available:

- **Limited** response is best used for paddle monitoring applications.
- **Monitor** response is best used for general ECG monitoring applications.
- **Filt Diag** is best used in the field when noise and or artifacts are a problem. This option is only available if the 12-Lead Preamp Board (ECG option) is installed. This selection does not affect the filtering used to acquire a 12-lead sample.
- **Diagnostic** response should be used when attempting to interpret subtle ECG changes (ST segments).

Press the button next to a frequency to select it. A bold outlined box indicates the selected frequency.

Press **EXIT** to return to the Display Configuration menu.

Filter Menu

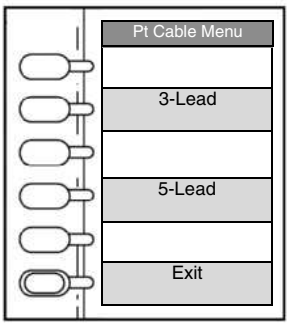


In the Filter menu, press the Line Filter button to turn line filters On or Off. The filters remove AC (mains) line interferences emitted from power lines and other electrical apparatus. Turn the filter off for optimal diagnostic response.

Press **EXIT** to return to the Display Configuration menu.

NOTE: To select a different line frequency, refer to Supervisor Line Frequency menu.

Patient (Pt) Cable Menu



In the Patient Cable menu, users can select a 3-lead or 5-lead patient cable. Press the corresponding button to choose a lead configuration. A bold outlined box indicates the selected configuration.

If the patient cable inserted into the PIC System does not match the selected patient cable configuration, a lead fault alarm may sound.

Press **EXIT** to return to the Display Configuration menu.

NOTE: This menu is not available on PIC Systems with 12-lead preamplifiers because the 12-lead preamp auto-detects the patient cable type.

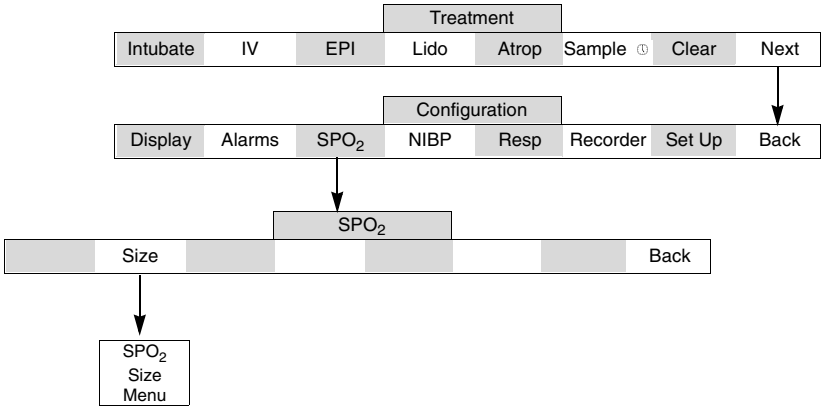
Brightness and Contrast Options

The level of brightness and contrast in the PIC display is adjustable. Press the **BRIGHT** button to brighten the display. Press the **CONTRAST** button to add contrast to the display. Each press of a button will increase the brightness or contrast setting until the highest setting is reached. The next press of the button will return the setting to the lowest level.

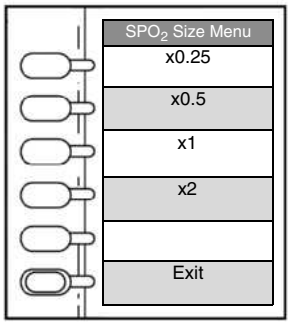
NOTE: The Brightness and Contrast buttons are only visible if your display type supports variable brightness and contrast.

User Menus – SPO_2

From the SPO_2 menu, users can configure the pulse oximeter size. The Pleth (Plethysmograph waveform) display is automatically gain controlled and is not directly proportional to the pulse volume. The SPO_2 options are accessed from the Treatment/Configuration menus.



SPO_2 Size Menu



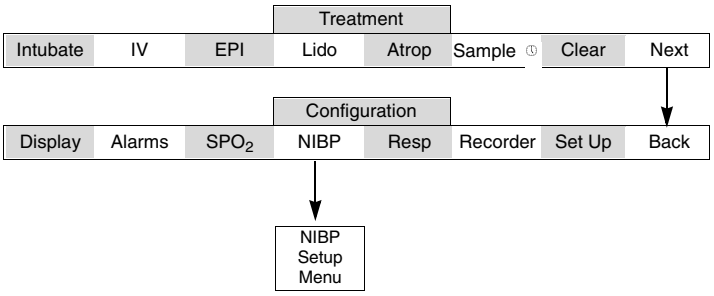
In the SPO_2 Size menu, users can choose from four Pleth sizes. A bold outlined box indicates the selected size. To choose a different size configuration, press the corresponding button.

Press **EXIT** to return to the SPO_2 Configuration menu.

NOTE: The Plethysmograph waveform is automatically gain controlled to optimize the waveform display. The waveform will not correlate with the patient's pulse strength.

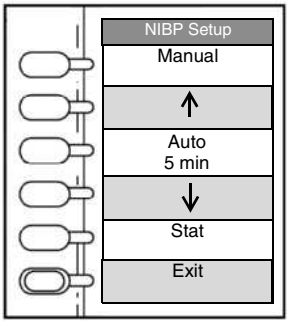
User Menus – Non-Invasive Blood Pressure

The three non-invasive blood pressure (NIBP) reading modes are available. Users select the NIBP mode from the NIBP Setup menu, which is accessed through the Treatment/Configuration menus.



NIBP Setup Menu

In the NIBP Setup menu, users can select the Manual, Auto, or Stat mode.



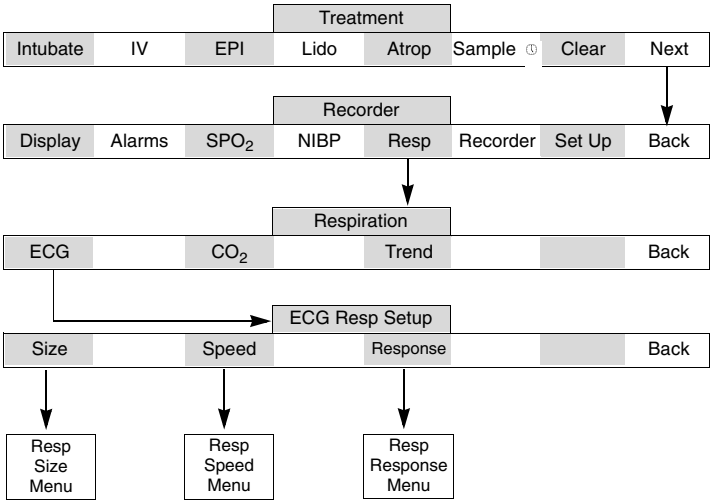
- **Manual**: a blood pressure reading will be taken each time the **NIBP** button is pressed.
- **Automatic** (**Auto**): a blood pressure reading will be taken at the indicated interval. To increase or decrease the interval, press the **UP** or **DOWN** arrow buttons.
- **Stat**: blood pressure readings will be taken one after another for five minutes starting from the time the **NIBP** button is pressed.

A bold outlined box indicates the selected NIBP Setup configuration. Press **EXIT** to return to the Configuration menu.

User Menus – Respiration (ECG)

Respiration data is sourced from ECG leads. Users can configure the size, speed, and response settings of the ECG respiration display using the Respiration menus. Access the Respiration menus from the Treatment/Configuration menus.

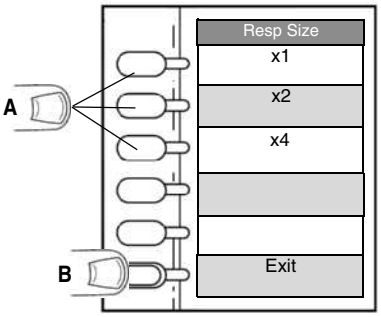
NOTE: ECG Respiration is not available for 12-lead unit.



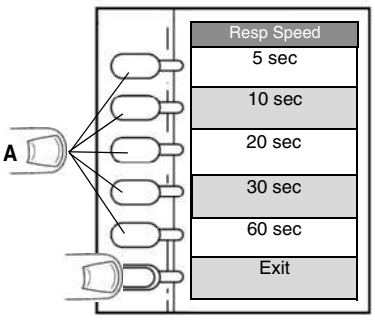
Resp Size Menu

Use the Resp Size menu to adjust the size of the displayed respiration trace. Press **x1**, **x2**, or **x4** (A) to select the waveform size. A bold outlined box indicates the selected size.

Press **EXIT** (B) to return to the Resp Configuration menu.



Resp Speed Menu

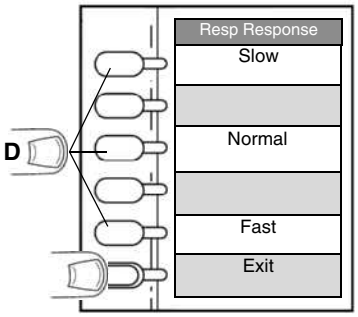


Use the Resp Speed menu to adjust the Respiration trace speed on the display and allow manual calculation of the respiratory rate. The respiration waveform speed (time it takes the trace to travel from the left side to the right side of the display) options are 5, 10, 20, 30, or 60 seconds (C).

A bold outlined box indicates the selected speed. Press **EXIT** to return to the Resp Configuration menu.

Response Menu

Use the Respiration Response menu to select the averaging interval that will be used during a respiration measurement.



Slow: averages the respiratory rate on a moving 60-second average.

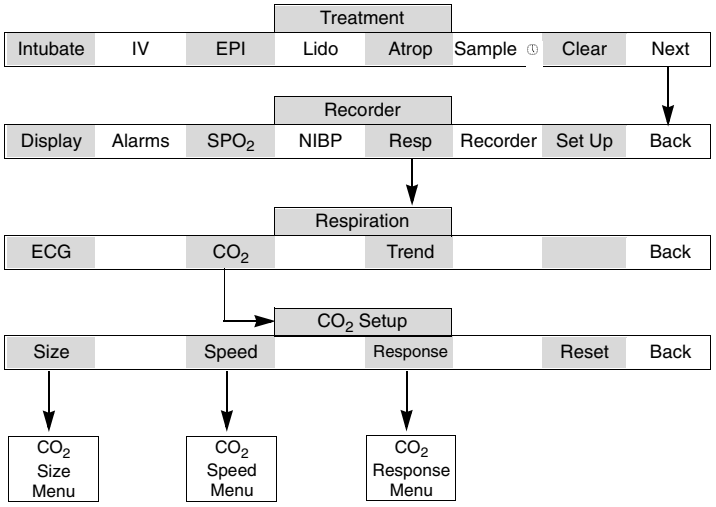
Normal: averages the respiratory rate on a moving 30-second average.

Fast: averages the respiratory rate on a breath-by-breath basis.

Press a button (D) to select a response rate. A bold outlined box indicates the selected response. Press **EXIT** to return to the Resp Configuration menu.

User Menus – Respiration (CO_2)

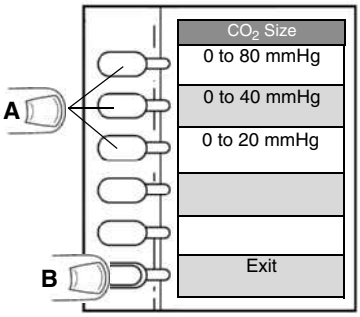
Respiration data is sourced from ECG leads or the CO_2 sensor, and defaults to the CO_2 sensor, if active, for improved accuracy and response. Use the CO_2 menu to configure the CO_2 size, speed, and response display settings. Access this menu from the Treatment/ Configuration menus.



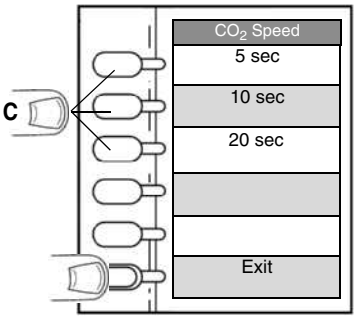
CO_2 Size Menu

Use the CO_2 Size menu to select the displayed CO_2 trace size. Press a button (A) to select a size scale. When kPa is the selected unit, the scale sizes are 0-12 kPa, 0-8 kPa, and 0-4 kPa. A bold outlined box indicates the selected option.

Press **EXIT** (B) to return to the CO_2 Configuration menu.



CO_2 Speed Menu

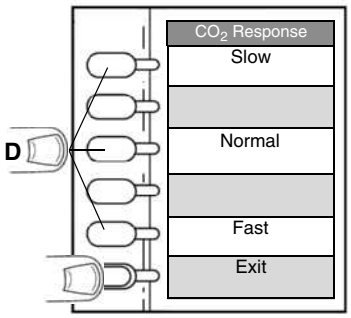


Use the CO_2 Speed menu to adjust the displayed CO_2 trace speed (5, 10, or 20 seconds) and allow manual calculation of the respiratory rate. Press a button (C) to select the trace redraw speed (time trace travels from the left side of the display to the right). A bold outlined box indicates the selected speed.

Press **EXIT** to return to the CO_2 Configuration menu.

CO_2 Response Menu

CO_2 Response adjusts the averaging interval during a CO_2 measurement. Press a button (D) to select a rate.



Slow averages the CO_2 level on a moving 60-second average.

Normal averages the CO_2 level on a moving 30-second average

Fast averages the CO_2 level on a breath-by-breath basis.

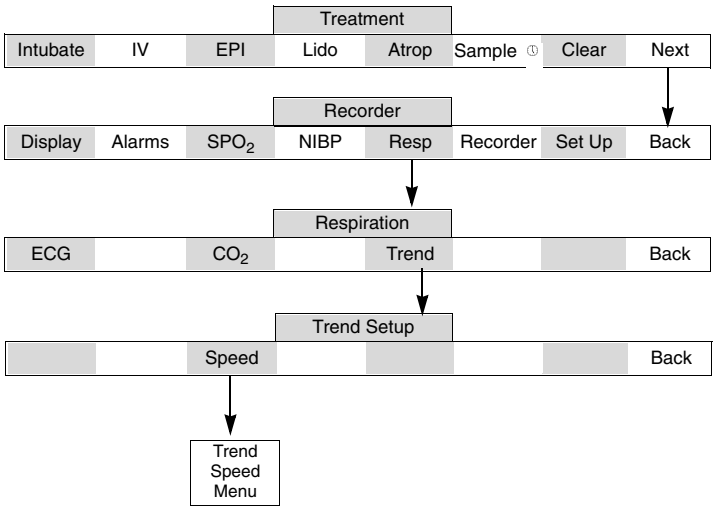
A bold outlined box indicates the selection. Press **EXIT** to return to the CO_2 Configuration menu.

Reset Option

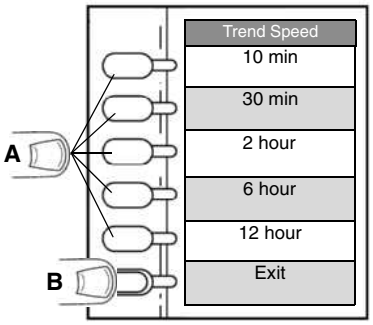
The Reset option sends a Reset signal to the CO_2 sensor. The signal is used for diagnostic purposes only.

User Menus – Respiration (Trend)

Use the Trend Respiration menu to configure the trend speed setting. This menu is accessible through the Treatment/Configuration menus.



Trend Speed Menu



Use the Trend Speed to select the amount of time the system will monitor the ECG or CO_2 function. The options are 10 min, 30 min, 2 hours, 6 hours, or 12 hours (A). The selected option is used to determine the maximum, minimum, and mean rate for each of 120 intervals. Depending on the option selected, the display trace segments (max, min, and mean) will be 5 sec, 15 sec, 1 min, 3 min, and 6 min respectively.

A bold outlined box indicates the selected speed. Press **EXIT** (B) to return to the Trend Configuration menu.

User Menus – Recorder

The Recorder menu allows users to configure the system recording options including print grid, log, review option, voice memo, and trends. Access to this menu is through the Treatment/Configuration menus.

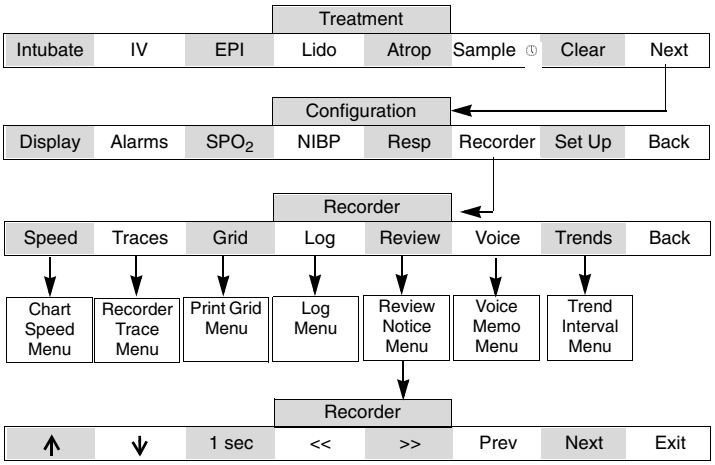
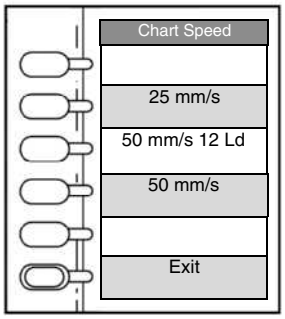


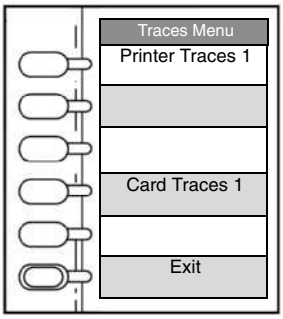
Chart Speed Menu

The Chart Speed menu allows the operator to select the speed of the chart recording during the trace output.



Traces Menu

The Traces menu allows the operator to choose whether 1 or 3 traces are printed to the chart and whether 1 or 3 traces are recorded to the card.



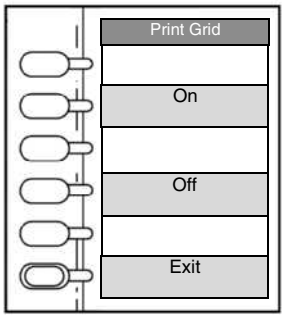
Three trace mode will automatically disable voice recording in manual mode. The following traces can be printed to the chart recorder while in three trace mode:

Display Traces	Chart Recorder Traces
1 ECG	1 ECG
2 ECG	2 ECG
3 ECG	top ECG trace on the display
2 ECG and 1 IBP	2 ECG and 1 IBP
1 ECG and 2 IBP	1 ECG and 2 IBP

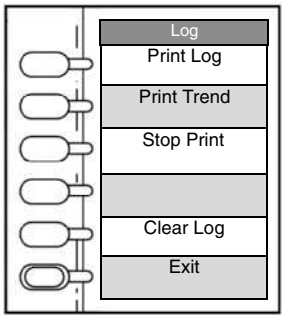
Print Grid Menu

In the Print Grid menu, users can choose to print or not print a grid on the chart paper. Press the **ON** button to print a grid on plain white paper. Select **OFF** and a grid will not be printed. A bold outlined box indicates the selected option.

Press **EXIT** to return to the Recorder Configuration menu.



Log Menu



The Log menu allows the user to print, review, or clear the internal log.

See chapter 12 for specific instructions on how to use this function.

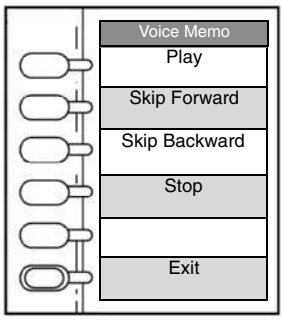
Press **EXIT** to return to the Recorder Configuration menu.

Voice Memo™ Menu

The Voice Memo™ menu allows the user to select play, skip forward, skip backward, and stop options for voice memo recordings stored in the PIC.

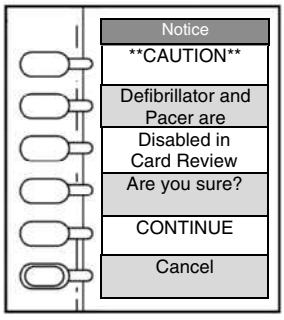
See chapter 12 for instructions on how to use this function.

Press **EXIT** to return to the Recorder Configuration menu.



NOTE: This menu is not visible if the speech card option is not installed.

Review Menu



If the Memory Card Review option was purchased and a valid datacard is inserted, users will be able to review patient data stored on the card on the PIC display.

See chapter 12 for instructions on how to use this option.

Press **EXIT** to return to the Recorder Configuration menu.

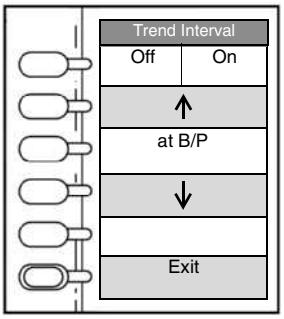
Trend Interval Menu

Use the Trend menu to record patient vital signs (BP, HR, OX, Temp, Resp, IBP) to the internal log and printer at every trend interval.

If set to **Off**, trend data will not be collected.

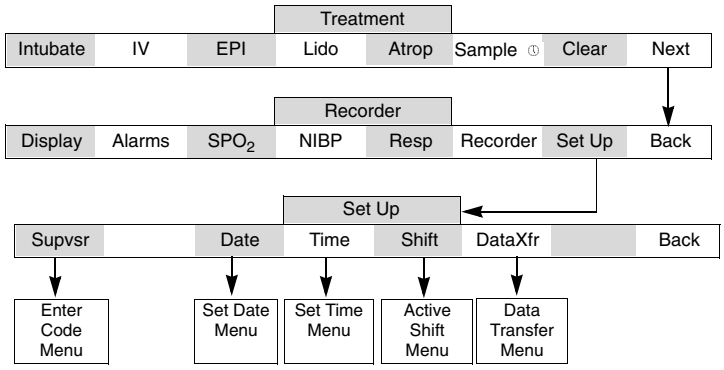
If set to **On**, a trend event will be generated at each elapsed time interval.

If set to **at B/P**, a trend event will be generated each time a BP reading occurs.

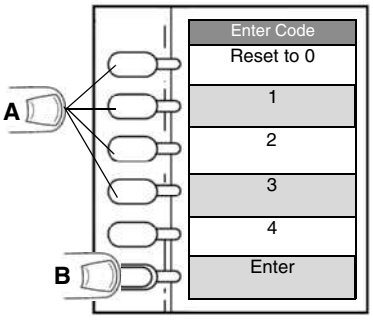


Press **EXIT** to return to the Recorder Configuration menu.

User Menus – Setup



Enter Code Menu

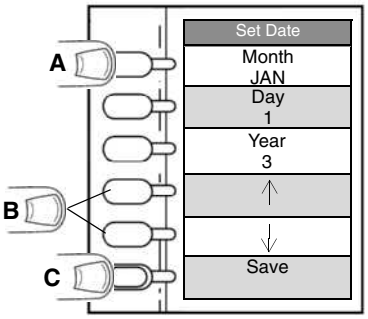


The default access code for entry to the Supervisor menus is 1, 2, 3, 4. Supervisors may change this code in the Supervisor Menus. Press a button to increment the corresponding digit (A). When all four digits are entered, press **ENTER** (B) to access the Supervisor menu. To reset the code, press the **RESET TO 0** button. The Lock ( ) icon on the Supervisor menu title block will open ( ) when the correct code is entered. If the wrong code is entered the" " will remain locked.

NOTE: If the code is lost, contact your Welch Allyn authorized service representative.

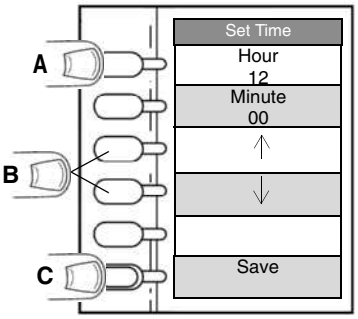
Set Date Menu

To select the month option, press the corresponding button (A). A bold outlined box indicates the selected option. Press the **UP** or **DOWN** arrow buttons (B) to select a specific month. Follow the same procedure to set the day and year. When finished, press **SAVE** (C).



Set Time Menu

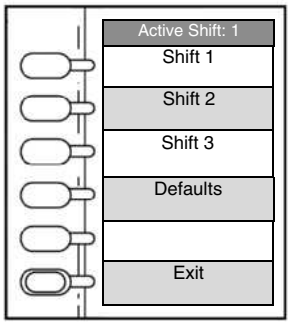
To select the hour option, press the corresponding button (A). A bold outlined box indicates the selected option. Press the **UP** or **DOWN** arrow buttons (B) to select the hour. Follow the same procedure to set the minute. When finished, press **SAVE** (C).



Active Shift Menu

The Active Shift menu allows the user to select predetermined shift settings options established by the supervisor. This option enables the user to save the user configurable menu items as shift 1, 2, or 3. Press the corresponding button to activate shift 1, 2, or 3. Then press **EXIT** to change to the settings for the selected shift settings.

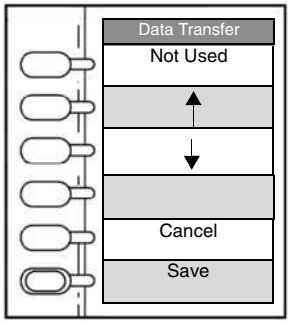
Refer to Supervisor Menu - Setup/Active Shifts for additional information.



NOTE: An asterisk next to a shift number indicates the settings for that shift have been saved.

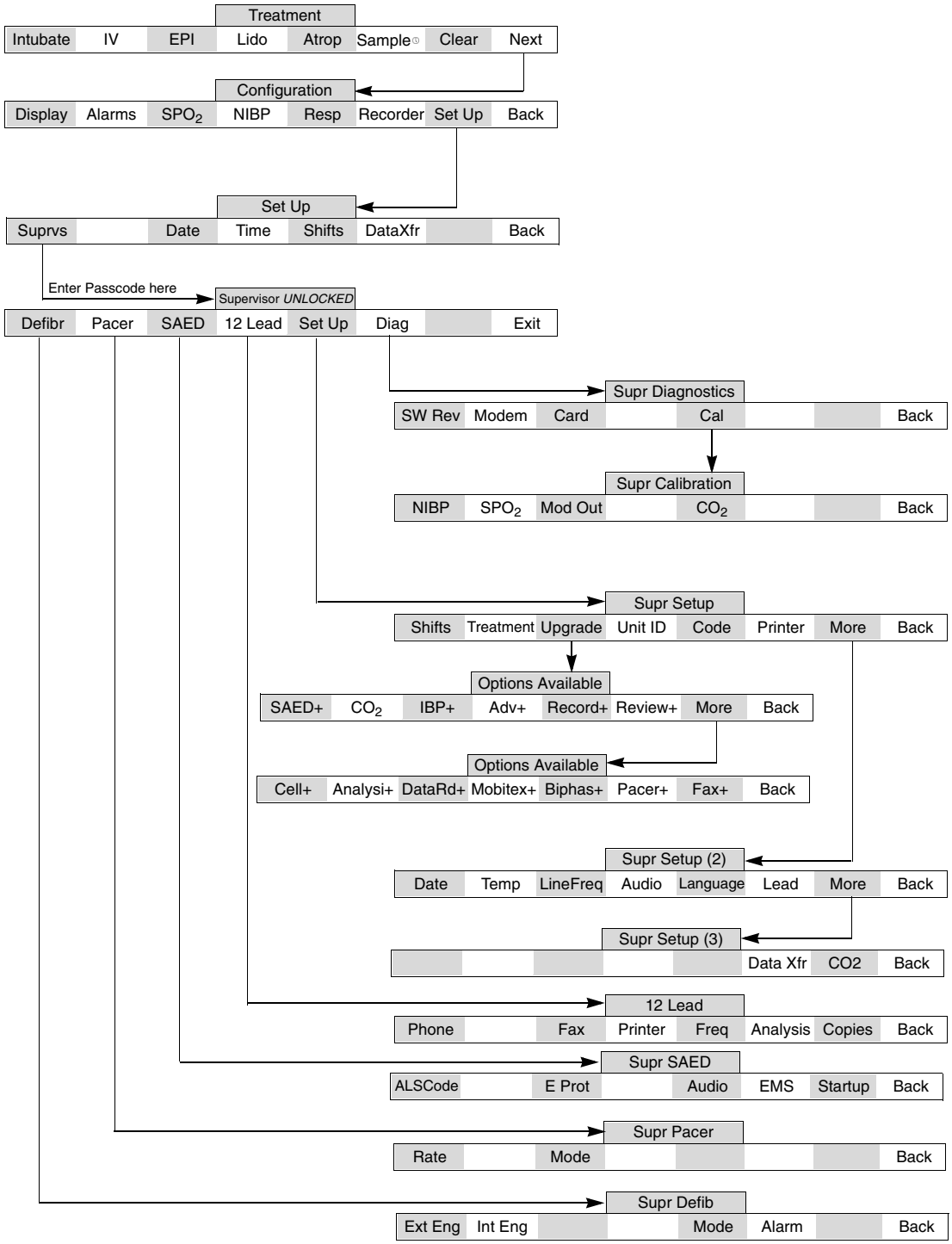
Data Transfer Menu

Use the Data Transfer menu to select the type of modem for 12-lead fax transmissions. Select Not Used or Mobitex depending on options purchased.



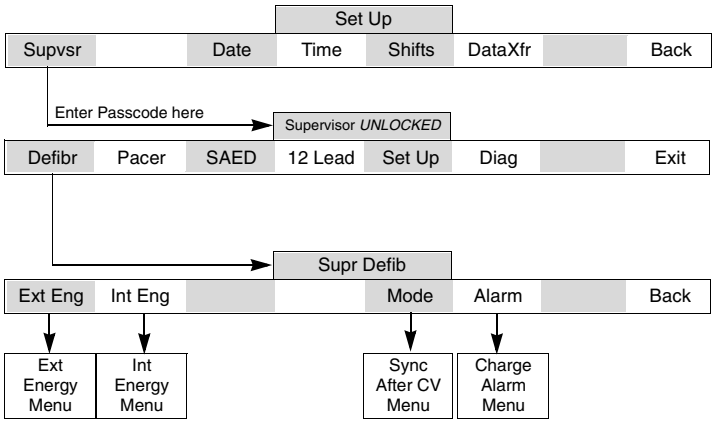
Supervisor Menus

The Supervisor menus are only available to a supervisor after the successful entry of the supervisor passcode. Using these menus, a supervisor can configure the installed options. The following diagram shows the structure of each Supervisor menu. This section explains how to access and configure the Supervisor menu options.



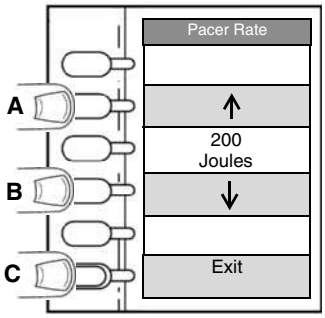
Supervisor Menus – Defibrillator

A supervisor can configure the defibrillator external and sync settings from the Defibrillator menu. This menu is accessible through the Treatment/Configuration/Set Up menus.



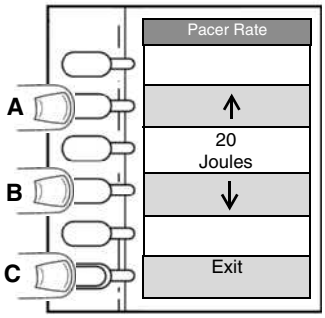
External Energy Menu

The Ext (External) Energy menu sets the default energy selected when the PIC is first turned on. The selected setting displays in this menu. To change the setting, press the **UP** arrow (A) or **DOWN** arrow (B) to increase or decrease the selection. Options are 2, 5, 7, 10, 20, 30, 50, 70, 100, 150, 200, 300, or 360 joules. Press **EXIT** (C) to return to the Defibrillator (Supr Defib) menu.

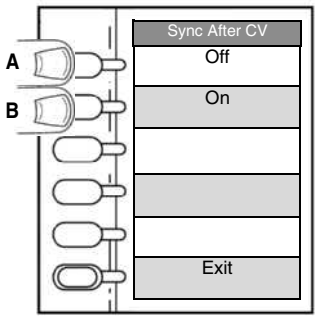


Internal Energy Menu

The Int (Internal) Energy menu sets the default energy selected when the PIC is first turned on. The selected setting displays in this menu. To change the setting, press the **UP** arrow (A) or **DOWN** arrow (B) to increase or decrease the selection. Options are 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 50 Joules. Press the **EXIT** (C) to return to the Defibrillator (Super Defib) menu.



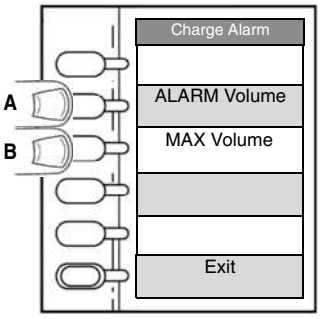
Sync After CV Menu



The Sync after CV (cardioversion) menu allows the user to configure the defibrillator to stay in the sync mode after each synchronized cardioversion. If this option is **Off** (A), the defibrillator will revert to the asynchronous mode. If this option is **On** (B), the defibrillator will remain in the Sync mode after each cardioversion.

Press **EXIT** to return to the Defibrillator (Supr Defib) menu.

Charge Alarm Menu

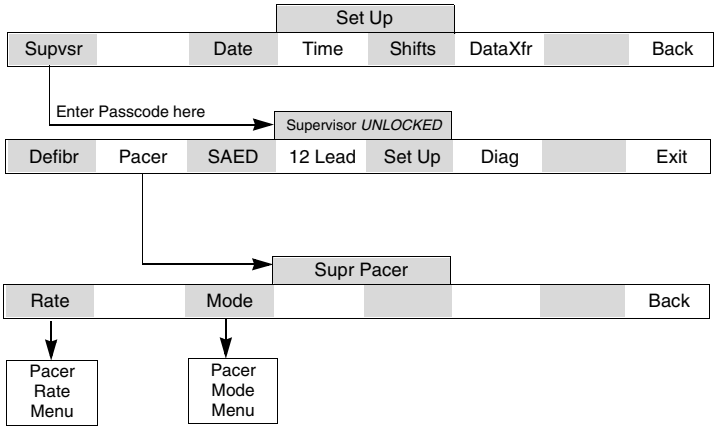


The Charge Alarm menu allows the user to select the Charge Alarm volume setting. Press the **ALARM VOLUME** button to use the Volume icon in the Quick Access window to adjust the charging tone. Press the **MAX VOLUME** button to set the charging tone to the maximum volume and by-pass the Volume icon.

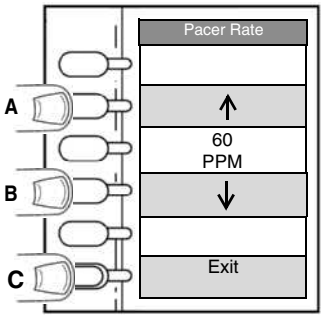
A bold, outlined box indicates the selected option. Press **EXIT** (C) to return to the Defibrillator (Supr Defib) menu.

Supervisor Menus – Pacer

The Supervisor/Pacer menu is used to configure the power on mode and initial rate. This menu is accessible through the Treatment/ Configuration/Set Up menus.

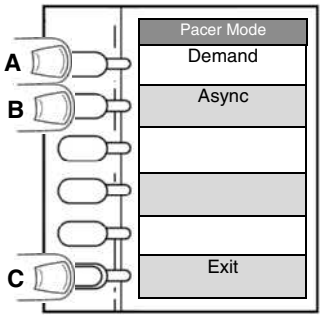


Pacer Rate Menu



Use the Pacer Rate menu to set the power on pacer rate setting. The range is from 30 to 180 PPM's. Press the **UP** arrow (A) or **DOWN** arrow (B) button to increase or decrease the pulse per minute (PPM) selection. Press **EXIT** (C) to close Pacer Rate menu.

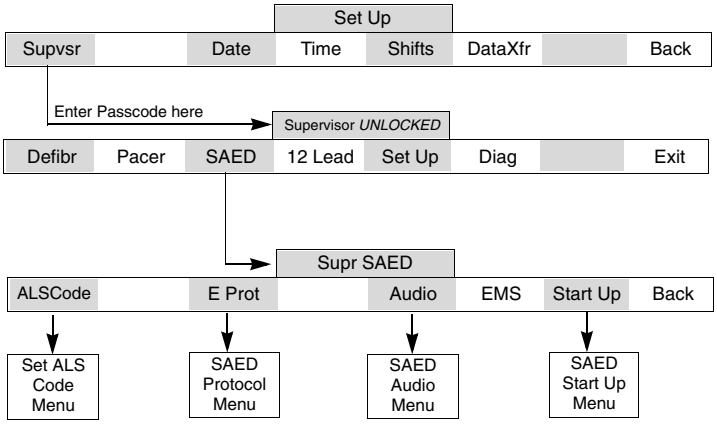
Pacer Mode Menu



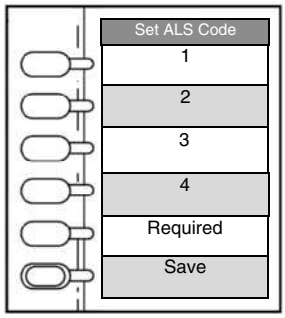
Use the Pacer Mode menu to set the power-on pacing mode. Press the **DEMAND** (A) or **ASYNC** (B) button. If Demand is selected, the PIC will supply pacing as needed. If Async is selected, the PIC will provide continuous pacing. A bold outlined box indicates the selected option. Press **EXIT** (C) to close Pacer Mode menu.

Supervisor Menus – SAED

The supervisor can use the SAED Menu to change the SAED configuration settings. This menu is accessible through the Treatment/Configuration/Set Up menus.

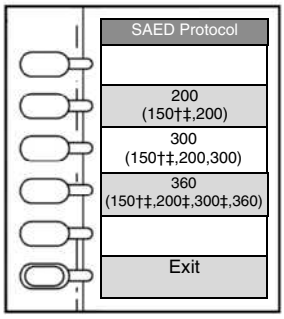


Set ALS Code Menu



The supervisor may use this menu to setup a separate pass code that allows ALS personnel to enter the Manual Defib mode from the SAED mode.

SAED Protocol Menu



Use the SAED Protocol menu to select an energy protocol. Press a corresponding button to select an option, then press **EXIT** to save the setting.

† The 150 Joules energy level selection is only available on biphasic units with a defibrillator software revision of L6 or newer. (Please see the diagnostic menu section for instructions on how to determine the software revision of the unit.)

‡ This energy level selection is only available on biphasic units.

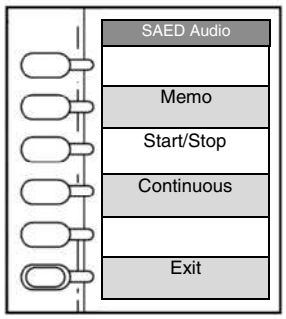
SAED Audio Menu

Use the SAED Audio menu to select a Voice Memo option:

Memo: User must press and hold the **MEMO** button to record audio. Recording will end when button is released.

Start/Stop: User must press the **MEMO** button to record audio. Recording will end when button is pressed again.

Continuous: Recording will start when the PIC is turned on if a data card is inserted.

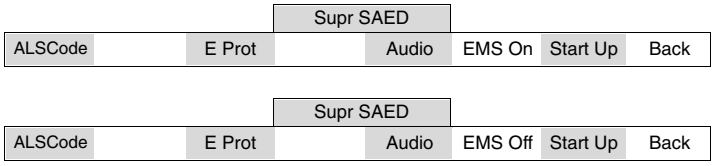


NOTE: Continuous Voice recording is turned off during 12-lead acquisition.

EMS Mode

EMS mode is a feature specifically designed for the use by an Emergency Medical Technician. EMS mode is recommended when continuous SAED mode analysis is required while transporting a patient or performing another procedure such as intubation. EMS Mode is a supervisor selectable mode of operation that performs continuous background analysis, but requires the user to press the A button for full analysis in response to a prompt from the PIC. The following section describes the operation and various features of EMS mode.

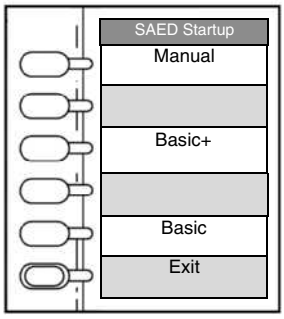
To toggle EMS mode push the coresponding menu button. Once the desired selection is made, cycle the power off and on.



SAED Startup Menu

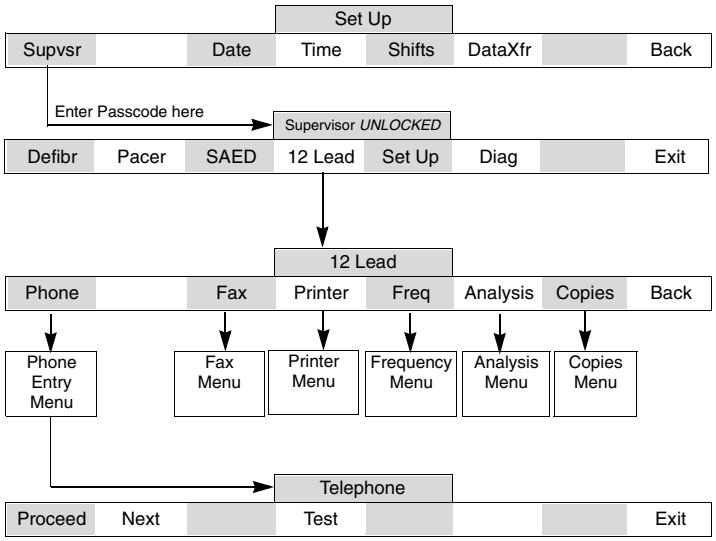
Use the SAED Startup menu to select either Manual, Basic+, or Basic as the PIC startup option. Your selection will be in effect the next time the unit is started.

NOTE: The ALS supervisor passcode must be entered to go from Basic+ or Basic mode to Manual mode.

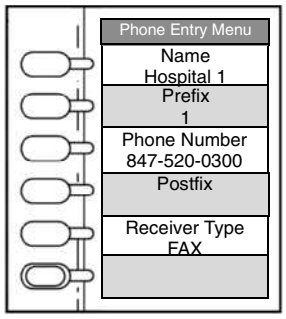


Supervisor Menus – 12-Lead

A supervisor can configure options that are specific to collecting and transmitting 12-lead data. These options include telephone and fax numbers, the number of printout copies produced, and frequency and analysis settings. This menu is accessible through the Treatment/ Configuration/Set Up menus.

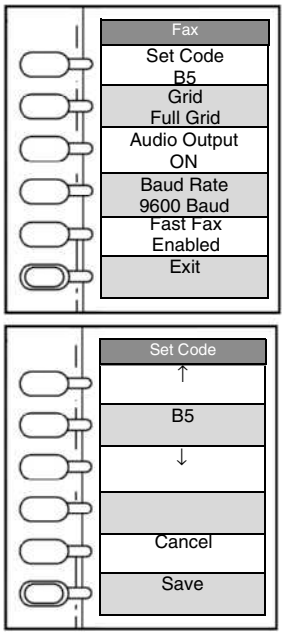


Phone Entry Menu



The Phone Entry menu allows the operator to add, edit, or delete up to 16 telephone numbers that can be used to transmit 12-lead data. Once selected, a telephone-specific menu, located along the bottom of the display area, is available.

Fax Menu



The Fax menu controls the output of the fax display for the 12-lead data.

Set Code: Different countries have different fax protocols and are identified by certain codes. Set this code according to the country in which the fax will be received in the Set Code menu that will appear. Please see Appendix A for a list of fax country codes.

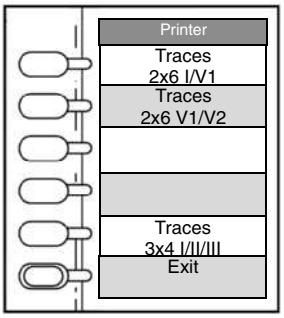
Grid: Full grid (default setting) provides grid masks every 0.2 cm. Partial grid (alternative setting) provides grid masks every 1.0 cm and reduces fax transmission time by as much as 30 seconds.

Audio Output: If hardware is installed, **On** (default) enables and **Off** disables Fax audio output during dialing and negotiating phases.

Baud Rate: Affects the fax transmission time. Select a rate that will work with your cellular service; 2400, 4800, 7200, and 9600 (default) available.

Fast Fax: Disabled is the default. When enabled, only 1 lead of the real-time ECG trace displays and transmission time decreases. Fast Fax is automatically enabled during a fax transmission when SPO_2 is on.

Printer Menu



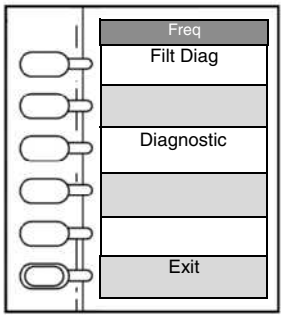
Use the Printer Menu to change 12-Lead printing formats. 3x4 I/II/III is the default format, it prints three rows by four columns of ECG traces. 2x6 I/V1 format prints two rows by six columns with leads I and V1 in the first column. The 2x6 V1/V2 prints two rows by six columns with leads V1 and V2 in the first column.

Freq Menu

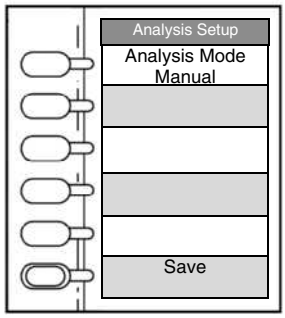
The Freq menu controls the Rolloff Filter used when acquiring a 12-lead snapshot. The Freq Menu only affects the real-time display and the acquired signal.

Listed below are the frequency values for each mode of operation:

Limited (2 - 20 Hz)
Monitor (0.67 - 40 Hz)
Diagnostic (0.05 - 150 Hz)
Filtered Diagnostic (0.35 - 40 Hz)

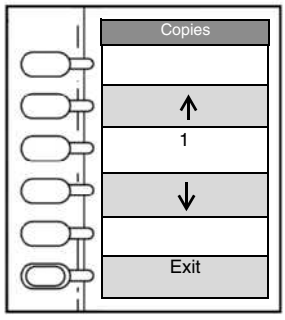


Analysis Setup Menu



The Analysis Setup menu is used to select the Automatic or Manual modes for conducting an analysis of 12-lead input. In Automatic mode, the analysis begins immediately after the data is collected. In Manual mode, the operator must initiate the analysis after the data is collected.

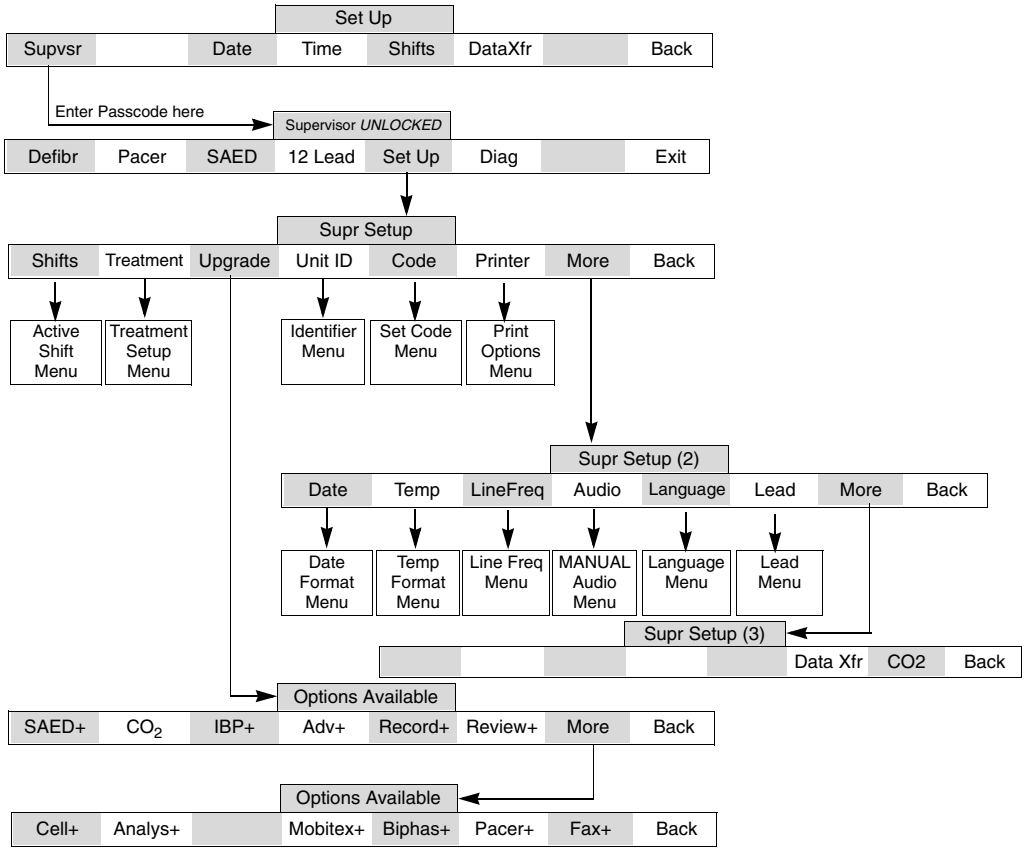
Copies Menu



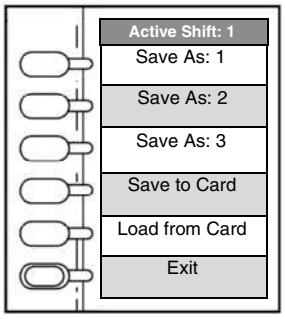
The Copies menu controls how many printed copies of the 12-lead data will be produced when the print icon button is pressed.

Supervisor Menus – Setup

Supervisors are able to access and change the options in the Set Up menus. The date format, language, and the supervisor entry passcode are examples of options that supervisors can configure from these menus.

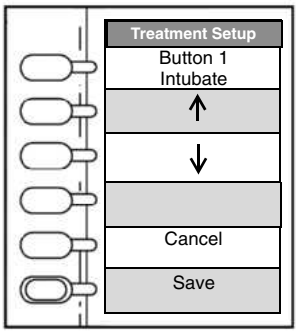


Active Shift Menu



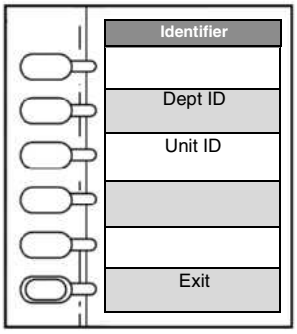
The Active Shift menu allows the supervisor to select and save PIC configurations for use by specific shift. It also allows loading from and saving the log to a memory card.

Treatment Setup Menu



The Treatment Setup menu allows the supervisor to choose and customize the bottom treatment summary/menu window buttons. Press the **UP** and **DOWN** arrow buttons to scroll through the available options.

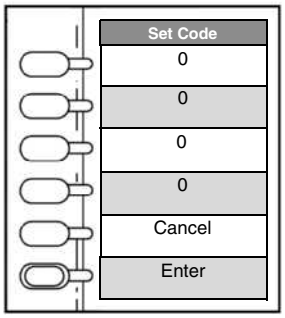
Unit ID



The Unit ID menu allows the supervisor to set unit and department IDs. This information is printed in the "System On" heading on the chart recorder.

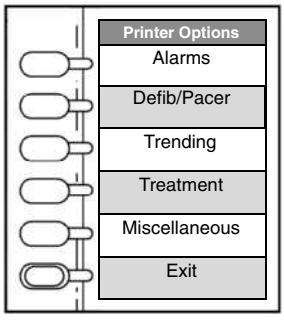
Set Code Menu

The default access code for accessing the supervisor menus is 1, 2, 3, 4. To set a new supervisor code, enter a number of your choice, 0-9, in all four number areas. Press **CANCEL** to cancel the number code selection. Press **ENTER** to save the new code.



NOTE: Be sure to write down the new supervisor passcode and store it in a safe place.

Printer Options



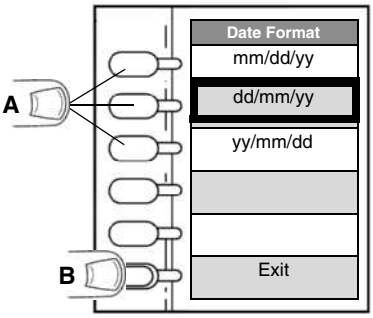
The Printer Options menu allows the supervisor to control the printout information on the chart recorder. Turn an option On to include it in the printout. Turn an option Off to exclude it from the printout (but it will be sent to the log).

Date Format Menu

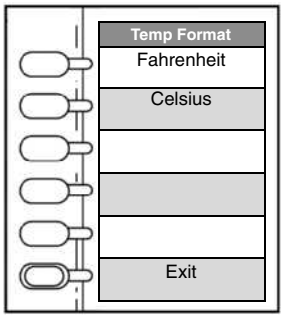
Use this menu to set the date format for displaying the month, day, and year:

mm/dd/yy = month/day/year
dd/mm/yy = day/month/year
yy/mm/dd = year/month/day

To select a format, press the corresponding button (A), then press **EXIT** (B).

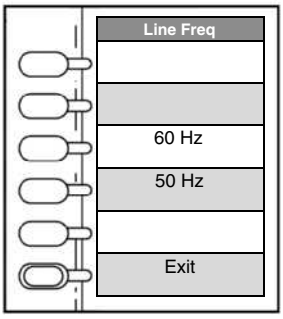


Temp Format Menu



Temperatures readings can be set to display in Fahrenheit (°F) or Celsius (°C). Press the corresponding Fahrenheit or Celsius button to select an option. A bold outlined box indicates the selected option. Press **EXIT** to return to the Supervisor Calibration menu.

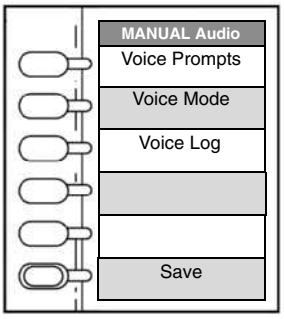
Line Freq Menu



The Line Frequency menu allows the supervisor to choose the desired line frequency, either 50 or 60 Hz.

Press **EXIT** to return to the Supervisor Calibration menu.

Manual Audio Menu

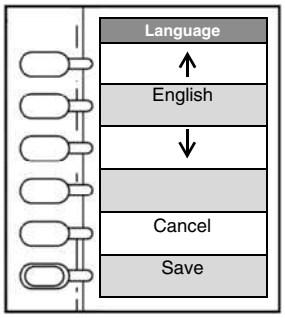


Use the Audio menu to select the voice prompts, voice memo, and voice log modes. These options are only available if purchased.

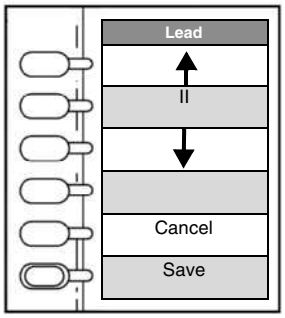
Press **EXIT** to return to the Supervisor Calibration menu.

Language

The Language menu allows the supervisor to select the language used in the display. The available languages are English, Spanish, French, German, Portuguese, and Italian. To change a language selection, press the arrow buttons to change the language, then press Save. Turn the PIC off, then restart it to activate the language option.



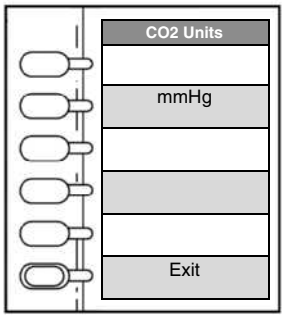
Lead Menu



The Lead menu allows the supervisor to change the default lead displayed on start-up.

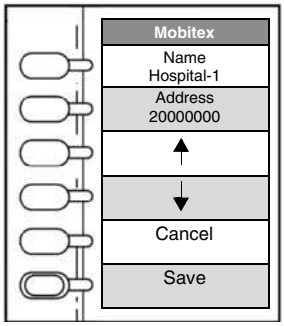
CO_2 Units Menu

Use the CO_2 Units menu to change the unit of measure for displayed CO_2 and $ETCO_2$ readings. Select mmHg or kPa.



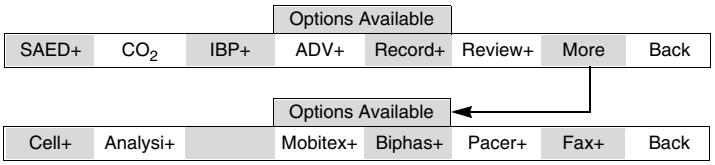
Data Transfer Menu

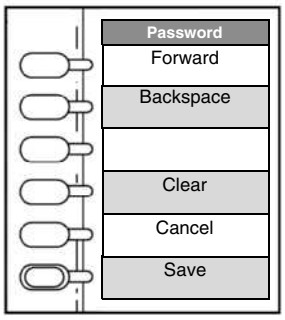
Use the Data Transfer Menu to program up to 16 different MAN addresses for Mobitex™ modems.



Upgrade Password Menu

The Upgrade menu allows the addition of options to the PIC System in the field. Contact your Welch Allyn customer service representative for instructions on upgrading the PIC System.





ENTERING THE UPGRADE PASSWORD

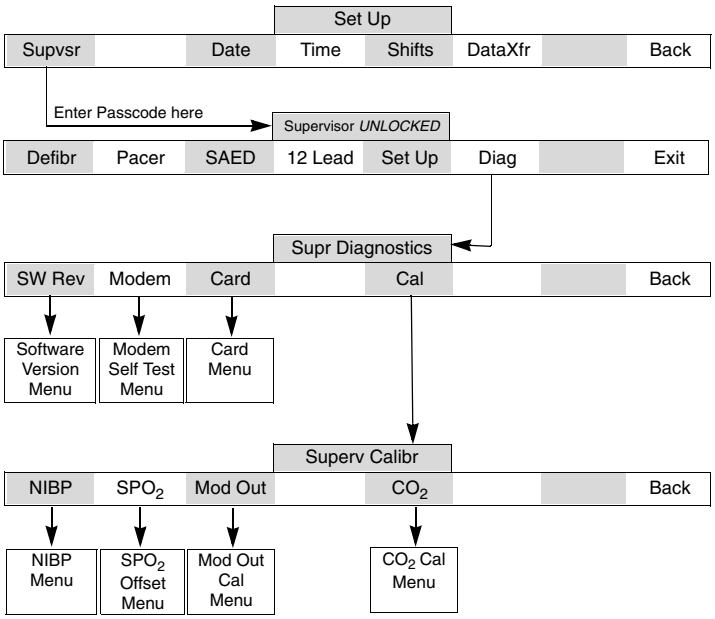
The Password menu gives the operator the option of moving the cursor forward or backward; or clearing, canceling, or saving the entry. Follow these instructions to upgrade the password.

1. Enter a new character by pressing once on the group of characters containing the character of your choice (B). (In this case we want to change the "1" to a "0".)

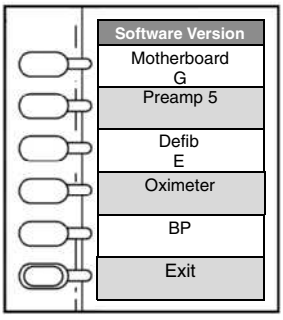
NOTE: The upgrade menu window is replaced by a numeric window. The password is displayed just above the numeric window with an active cursor in the first space.

2. Press on the actual character (C). Your selection will be entered and the cursor will move to the next character in the identifier. Continue this process to complete the password.
3. Press the **SAVE** button in the Password menu to save the selection and return to the Upgrade menu. A “+” symbol should now appear after Adv, indicating that the option was successfully installed.

Supervisor Menus – Calibration

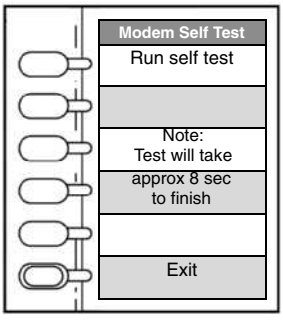


Software Version Menu



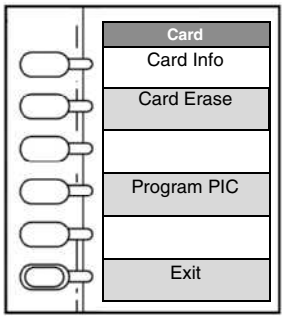
The Software Version menu provides information about the software installed for the motherboard, preamp, defibrillator, oximeter, and blood pressure board.

Modem Self Test



The Modem Self Test menu allows the supervisor to run a modem self test.

Card Menu

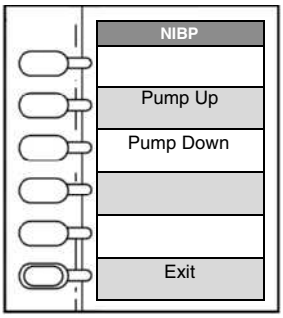


From the Card menu, the supervisor can get information about the memory card (size, type, contents, format count, and format date), erase the memory card, and program the Welch Allyn PIC from a programmable card.

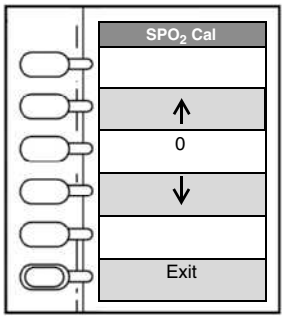
NIBP Cal Menu

The NIBP Calibration menu is used by authorized service personnel to calibrate the PIC blood pressure measurement capabilities.

WARNING: ***This menu should be used only by authorized service personnel. DO NOT attempt to calibrate the blood pressure when the PIC System is being used on a person.***

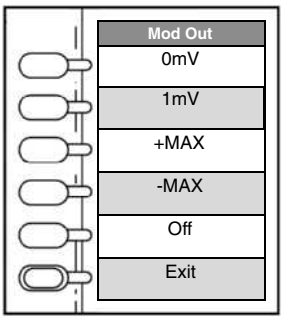


SPO_2 Cal Menu



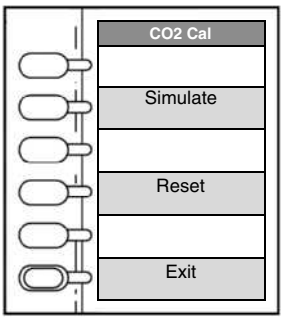
From the SPO_2 Cal menu, the supervisor can press the up/down arrow buttons to select a bias calibration. The options are 0, ±1, or ±2.

Mod Out Cal Menu



From the Mod Out Cal menu, the supervisor can test the calibration of the 1V out connection. Press 0mV and the measured voltage should be 0V. Press 1mV and the measured voltage should be 1V. Press +MAX and the measured voltage should be less than 4.52V. Press -MAX and the measured voltage should be less than -4.76V.

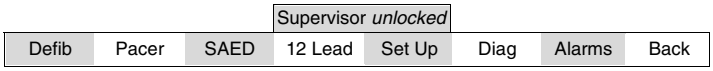
CO_2 Cal Menu



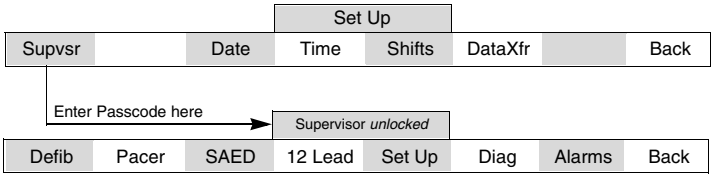
From the CO_2 menu, the supervisor can check the CO_2 calibration based on a 40 mmHg simulated trapezoidal signal.

Supervisor Menus - Alarms

The UNLOCKED Supervisor menubar displays the “Alarms” option as shown below.

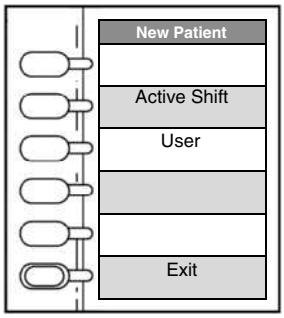


The Supervisor/Alarms menu allows the user to select whether or not alarms settings will be reset to their shift default when a new patient event is triggered This menu is accessible through the Treatment/ Configuration/Set Up menus.



Supervisor Alarms Menu

From the New Patient menu, the supervisor can enable either the Active Shift or User options. The Active Shift selection will restore all alarms to their default settings each time a new patient event is created, while the User selection will retain all current alarm settings whenever a new patient event is created.



CHAPTER 14: ALARMS

This chapter provides information about the PIC System alarms and alarm parameters, including the display icons and indicators.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information before proceeding with this chapter.

Global Alarm and Alarm Icons

Alarms are available for all parameters:

SPO_2	**NIBP**	**IBP**
HR	**Resp**	**CO_2**
Temp		

Alarm

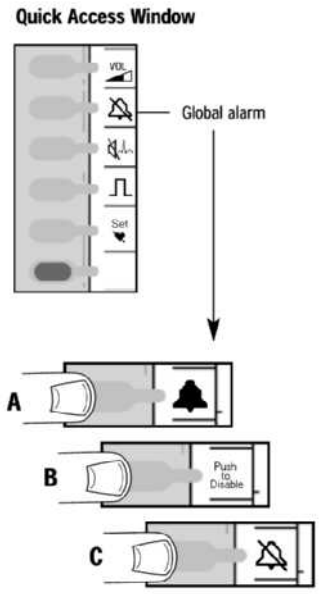
All alarm parameters can be globally disabled by the **GLOBAL ALARM** button located in the quick access window.

The quick access **GLOBAL ALARM** button enables or disables all set alarm parameters. When the PIC System is turned on, the global alarm will default to the last setting at system shutdown, either enabled (🔔) or disabled (🔕).

To enable global alarms, press the **GLOBAL ALARM** button (A) to display the alarm on icon ( ) (with the global alarms enabled, any set alarm parameter will be enabled).

To disable global alarms, press the **GLOBAL ALARM** button twice. The first press of the button (B) will change the icon to PUSH TO DISABLE ( ). The second press (C) will change the alarm icon to OFF ( ).

If the button is not pressed a second time within 10 seconds, global alarms will automatically revert to enabled ( ) (with the global alarm disabled, all parameters alarms will be disabled).



Alarm Icons

Off

On

Auto

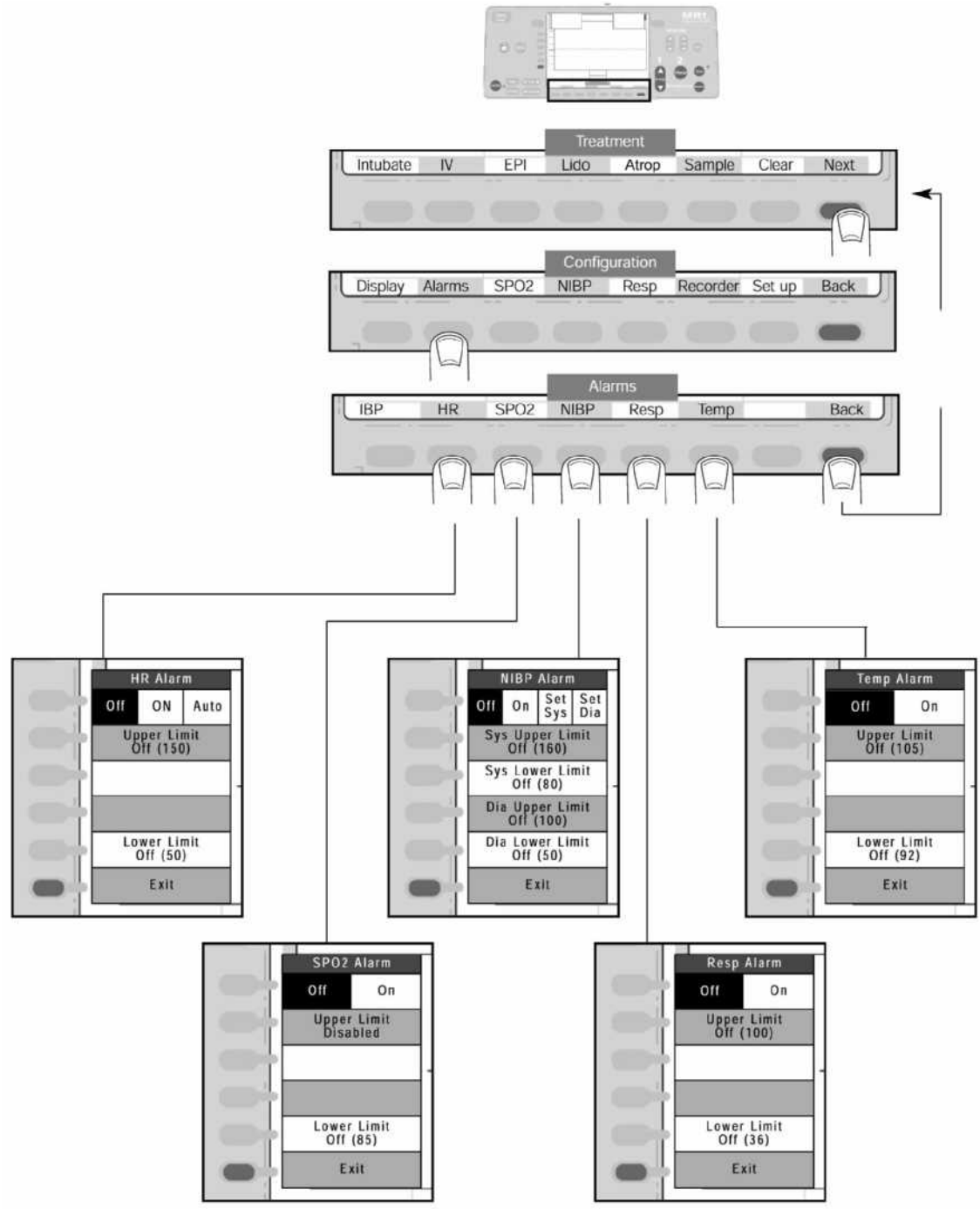
Lower limit set, upper limit disabled

Upper limit set, lower limit disabled

Supervisor Alarms Setting

If the Supervisor Alarms menu is set to **Active Shift**, the alarm settings changed by the user will be reset to the current shift setting after the PIC has been powered down for 2 minutes.

Alarm Configurations (User Menus)



Heart Rate Alarms

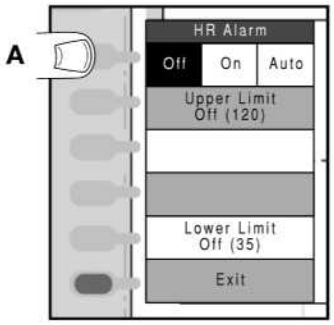
Heart Rate Window

In the HR alarm menu, the HR alarms can be set to either OFF, ON, or AUTO. The appropriate alarm icon appears in the heart rate window indicating the current state of the alarm.

Setting HR Alarms

SETTING HR ALARMS TO OFF

To set the HR alarm to off press the **OFF / ON / AUTO** button (A) until **Off** is highlighted. When the HR alarm is set to **Off** the upper and lower limits will each display Off and a number in parenthesis. The number indicates the current set HR limit that will be active when the HR alarm is turned back on.



Example:

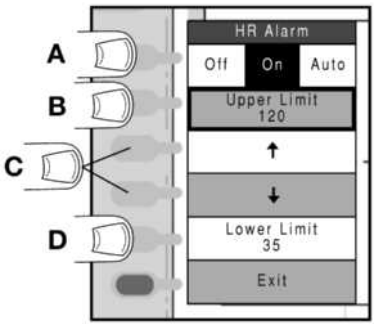
HR alarm off, upper limit setting is 120

HR alarm off, lower limit setting is 35

NOTE: If a limit is disabled, the word DISABLED will appear instead of Off (number).

SETTING HR ALARMS TO ON

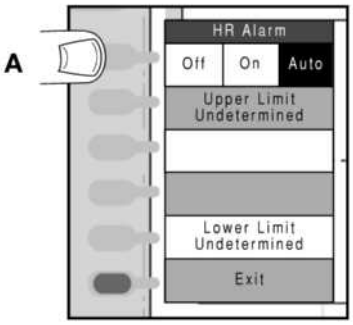
1. Set the HR alarm to on by pressing the **OFF / ON / AUTO** button (A) until On is selected. If the upper and lower limits are set, the alarm on icon ( ) will appear in the HR window and the global alarms will be enabled.



2. Set the upper limit. The upper limit can be either set or disabled. To set the upper limit, press the **UPPER LIMIT** button (B). A bold line will appear around the box. Press the up or down arrow (C) to increase or decrease the upper limit value. You can disable the upper limit by pressing the **UPPER LIMIT** button again to display **Disabled** below the words **Upper Limit**. The alarm icon in the heart rate window will display the appropriate status.

3. Set the lower limit. The lower limit can be either set or disabled. To set the lower limit press the **LOWER LIMIT** button (D). A bold line will appear around the box. Press the up or down arrow (C) to increase or decrease the lower limit value. You can disable the lower limit by pressing the **LOWER LIMIT** button again to display **Disabled** below the words **Lower Limit**. The alarm icon in the heart rate window will display the appropriate status.
4. Exit. Press **EXIT** to leave menu.

SETTING AUTO HR ALARM

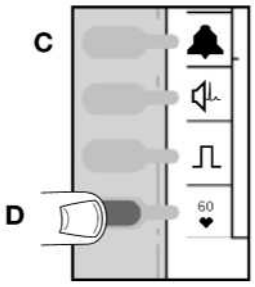


1. Set the HR alarm to auto by pressing the **OFF / ON / AUTO** button (A) until Auto is selected. When the HR alarm is set to auto, the auto alarm icon ( ) will appear in the HR window and the global alarms will be turned On (C).

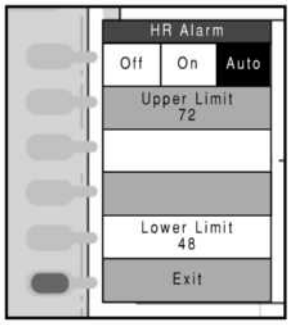
NOTE: The upper and lower limits will be undetermined if a valid ECG is not present.

2. Exit. Press **EXIT** to leave the HR alarm menu.

3. **To set the automatic HR alarm limits**, press the quick access button **AUTO HR** (D) next to the Set icon. The patient's heart rate, at the moment the button was pressed, will be displayed above the "heart" (60). The HR alarm monitor automatically sets the upper and lower heart rate limits, at +20% of that heart rate set point or +10 beats, whichever is greater. Each press of the **AUTO HR** button will adjust the heart rate set point and reset the auto HR alarm limits.



4. You can view the upper and lower limits that were set by going back to the HR alarm menu. The undetermined upper and lower limits have been replaced with automatically set values.



NOTE: In either the On or Auto mode, if the alarm parameters have been exceeded, an audible tone will sound and the patients heart rate measurement will flash in the heart rate window.

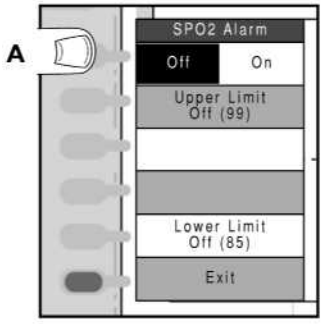
Pulse Oximeter (SPO_2) Alarm

In the SpO_2 alarms menu, the SpO_2 alarms can be set Off or On. The appropriate alarm icon appears in the SpO_2 window indicating the current state of the alarm.

Setting SpO_2 Alarms

SETTING SPO2 ALARM TO OFF

To set the SpO_2 alarm to off, press the **OFF/ON** button (A) until Off is highlighted. When the SpO_2 alarm is set to Off the upper and lower limits will each display Off and a number. The number indicates the current set SpO_2 limit that will be active when the SpO_2 alarm is turned on. See example below.



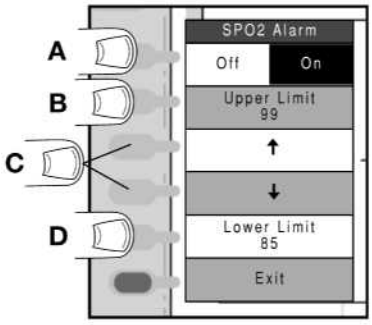
SPO_2 alarm off, upper limit setting is 99

SPO_2 alarm off, lower limit setting is 85

NOTE: If a limit is disabled, the word DISABLED will appear instead of Off (number).

SETTING SPO_2 ALARM TO ON

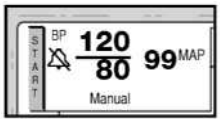
To set the SpO_2 alarm to on, press the **OFF/ON** button (A) until On is highlighted. When both the upper and lower SpO_2 alarm limits are set to On, the alarm on icon (🔔) will appear in the SpO_2 window and the global alarms will be turned on.



1. Set the upper limit. Press the **UPPER LIMIT** button (B) to select upper limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the upper limit value. You can disable the upper limit by pressing the upper limit button again to display Disabled below the words Upper Limit. The alarm icon in the SpO_2 window will display the appropriate status.

2. Set the lower limit. Press the **LOWER LIMIT** button (D) to select lower limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the lower limit value. You can disable the lower limit by pressing the lower limit button again to display Disabled below the words Lower Limit. The alarm icon in the SpO_2 window will display the appropriate status.
3. Exit. Press **EXIT** to leave menu.

Non-Invasive Blood Pressure (NIBP) Alarm



In the NIBP alarms menu, the NIBP alarms can be set **Off** or **On**. The appropriate alarm icon appears in the BP window indicating the current state of the alarm.

Setting NIBP Alarms

SETTING NIBP ALARM TO OFF

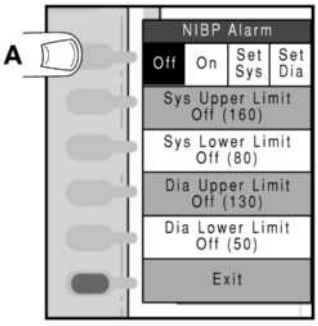
To set the NIBP alarm to off, press the **OFF/ON/SET SYS/SET DIA** button (A) until **Off** is highlighted. When the NIBP alarm is set to **Off**, the upper and lower limits will each display Off and a number. The number indicates the current set NIBP limit that will be active when the NIBP alarm is turned back on. See example below.

NIBP alarm off, Sys upper limit is 160

NIBP alarm off, Sys lower limit is 80

NIBP alarm off, Dia Upper limit is 130

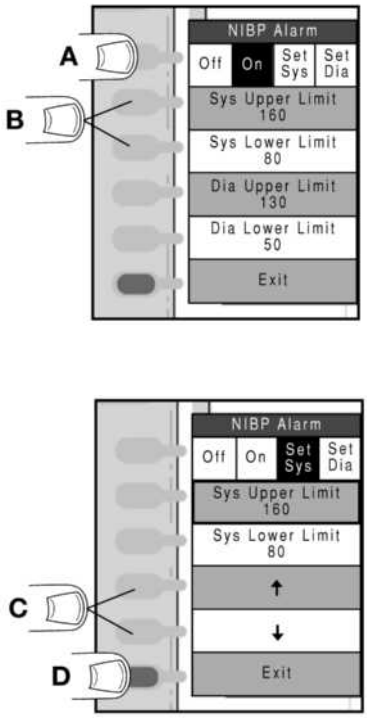
NIBP alarm off, Dia Lower limit is 50



NOTE: If a limit is disabled, the word disabled will appear instead of Off (number). Setting NIBP alarm to on.

To set the NIBP alarm to on, press the **OFF/ON/SET SYS/SET DIA** button until On is highlighted. When an upper and lower NIBP alarm limit is set to On, the alarm on icon (🔔) will appear in the IBP window and the global alarms will be turned on. Current settings for systolic (Sys) and diastolic (Dia) will be listed.

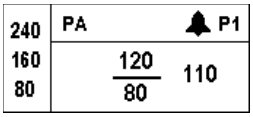
SETTING SYSTOLIC AND DIASTOLIC LIMITS



1. To set the systolic or diastolic limits, press the **OFF/ ON/SET SYS/SET DIA** button (A) until Set Sys or Set Dia is highlighted.
2. Select either the upper or lower systolic/diastolic limit to set limits (B). The limit selected will be surrounded by bold outlined box.
3. Press the up or down arrows (C), to increase or decrease the limit value. You can disable either limit by pressing the upper or lower systolic/diastolic limit button again to display Disabled. The alarm icon in the BP window will display the appropriate status.
4. Press **EXIT** (D) to leave menu.

NOTE: Both systolic and diastolic upper or lower limits must be disabled for the alarm icon in the IBP window to display an upper(🔔) or lower (🔔) limit icon.

Invasive Blood Pressure (IBP) Alarm



In the IBP1 and IBP2 alarms menu, the IBP alarms can be set **Off** or **On**. The IBP Alarms must be set for each channel, IBP1 and IBP2. The appropriate alarm icon appears in the IBP window indicating the current state of the alarm.

Setting IBP Alarms

SETTING IBP ALARM TO OFF

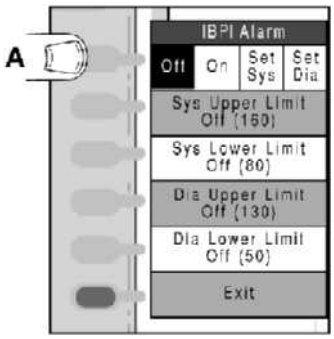
To set the IBP alarm to off, press the **OFF/ON/SET SYS/SET DIA** button (A) until **Off** is highlighted. When the IBP alarm is set to **Off**, the upper and lower limits will each display Off and a number. The number indicates the current set IBP limit that will be active when the IBP alarm is turned back on. See example below.

IBP1 alarm off, Sys upper limit is 160

IBP1 alarm off, Sys lower limit is 80

IBP1 alarm off, Dia Upper limit is 130

IBP1 alarm off, Dia Lower limit is 50

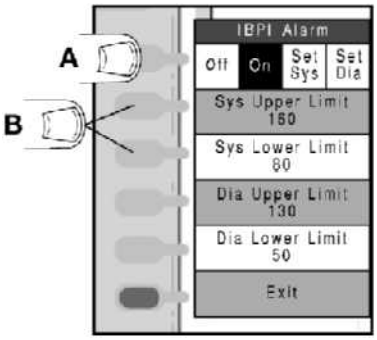


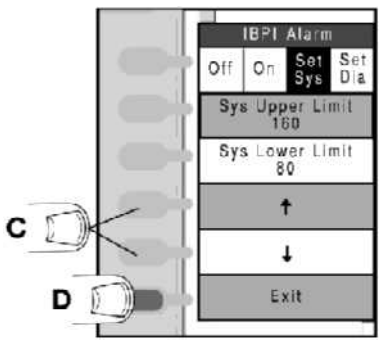
NOTE: If a limit is disabled, the word disabled will appear instead of Off (number). Setting IBP alarm to on will enable the alarm.

To set the IBP alarm to on, press the **OFF/ON/SET SYS/SET DIA** button until On is highlighted. When an upper and lower IBP alarm limit is set to On, the alarm on icon (🔔) will appear in the IBP window and the global alarms will be turned on. Current settings for systolic (Sys) and diastolic (Dia) will be listed.

SETTING SYSTOLIC AND DIASTOLIC LIMITS

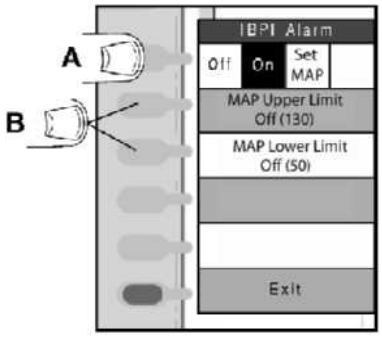
If the IBP source is set to ART a systolic/diastolic menu will be displayed.





1. To set the systolic or diastolic limits, press the **OFF/ON/SET SYS/SET DIA** button (A) until Set Sys or Set Dia is highlighted.
2. Select either the upper or lower systolic/diastolic limit to set limits (B). The limit selected will be surrounded by bold outlined box.
3. Press the up or down arrows (C), to increase or decrease the limit value. You can disable either limit by pressing the upper or lower systolic/diastolic limit button again to display Disabled. The alarm icon in the BP window will display the appropriate status.
4. Press **EXIT** (D) to leave menu.

NOTE: Both systolic and diastolic upper or lower limits must be disabled for the alarm icon in the IBP window to display an upper(🔔)or lower (🔔) limit icon.



OTHER IBP SOURCES

When the IBP source is set to CVP, ICP, PA or MISC P then only the MAP (Mean Arterial Pressure) alarm can be set.

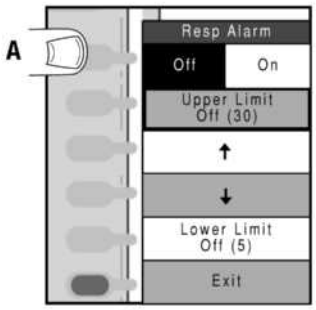
Resp Alarm

In the Resp alarm menu, the Resp alarm can be set Off or On. The appropriate alarm icon appears in the Resp window indicating the current state of the alarm.

Setting Resp Alarms

SETTING RESP ALARM TO OFF

To set the Resp alarm to off, press the **OFF/ON** button (A) until **Off** is highlighted. When the Resp alarm is set to **Off** the upper and lower limits will each display **Off** and a number. The number indicates the current set Resp limit that will be active when the Resp alarm is turned back on. See example below.



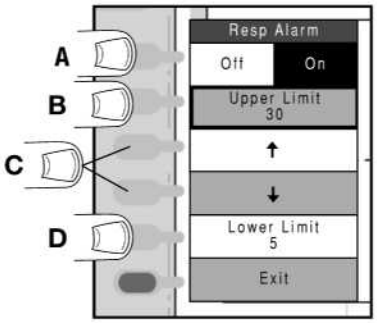
Resp alarm off, upper limit setting is 30

Resp alarm off, lower limit setting is 5

*NOTE: If a limit is **disabled**, the word disabled will appear instead of Off (number).*

Setting Resp Alarm to ON

To set the Resp alarm to on, press the **OFF/ON** button (A) until **On** is highlighted. When both the upper and lower Resp alarm limits are set to **On**, the alarm on icon ( ) will appear in the Resp window, the global alarms will be turned on, and the box surrounding the upper limit will be highlighted.

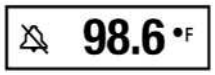


1. Set the upper limit. Press the **UPPER LIMIT** button (B) to select upper limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the upper limit setting by 5 RPM. You can disable the upper limit by pressing the upper limit button again to display Disabled below the words Upper Limit. The alarm icon in the Resp window will display the appropriate status.

2. Set the lower limit. Press the **LOWER LIMIT** button (D) to select lower limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the lower limit value (the limit will change by 1 below 15 RPM and by 5 above 15 RPM). To disable the lower limit alarm press the lower limit button again to display Disabled below the words lower Limit. The alarm icon in the Resp window will display the appropriate status.

3. Exit. Press **EXIT** to leave menu.

Temp Alarm

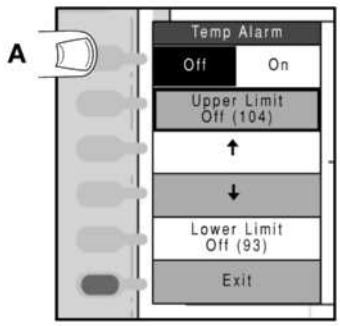


In the Temp alarm menu, the Temp alarm can be set **Off** or **On**. The appropriate alarm icon appears in the Temp window indicating the current state of the alarm.

Setting Temp Alarm

SETTING TEMP ALARM TO OFF

To set the Temp alarm to off, press the **OFF/ON** button (A) until **Off** is highlighted. When the Temp alarm is set to **Off** the upper and lower limits will each display **Off** and a number. The number indicates the current set Temp limit that will be active when the Temp alarm is turned back on. See example below.



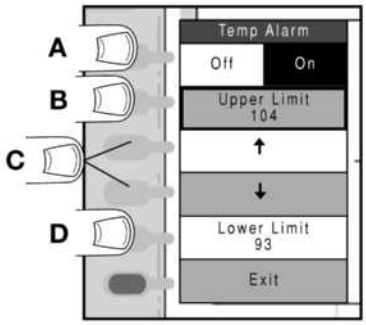
Temp alarm off, upper limit is 104

Temp alarm off, lower limit is 93

*NOTE: If a limit is disabled, the word **Disabled** will appear instead of Off (number).*

SETTING TEMP ALARM TO ON

To set the Temp alarm to on, press the **OFF/ON** button (A) until **On** is highlighted. When both the upper and lower Temp alarm limits are set to **On**, the alarm on icon ( ) will appear in the Temp window, the global alarms will be turned on, and the box surrounding the upper limit will be highlighted.



1. Set the upper limit. Press the **UPPER LIMIT** button (B) to select upper limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the upper limit value. You can disable the upper limit by pressing the upper limit button again to display **Disabled** below the words Upper Limit. The alarm icon in the Temp window will display the appropriate status.
2. Set the lower limit. Press the **LOWER LIMIT** button (D) to select lower limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the lower limit value. To disable the lower limit alarm press the lower limit button again to display Disabled below the words lower Limit. The alarm icon in the Temp window will display the appropriate status.
3. Exit. Press **EXIT** to leave menu.

End-Tidal CO_2 ($ETCO_2$) Alarm

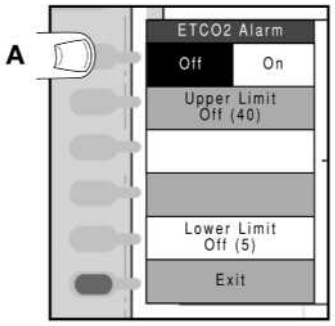
The $ETCO_2$ alarm settings apply to both the CO_2 and $ETCO_2$ waveforms. Bell symbols in the CO_2 or $ETCO_2$ value windows indicate the status of the $ETCO_2$ alarm: enabled ( ), disabled ( ), alarm upper limit set ( ), or alarm lower limit set ( ).

In the $ETCO_2$ alarms menu, the $ETCO_2$ alarms can be set **Off** or **On**. An alarm icon will appear in the CO_2 and $ETCO_2$ value window in the appropriate waveform window indicating the current state of the alarm.

Setting $ETCO_2$ Alarm

SETTING THE $ETCO_2$ ALARM TO OFF

To set the $ETCO_2$ alarm to off, press the **OFF/ON** button (A) until **Off** is highlighted. When the $ETCO_2$ alarm is set to **Off** the upper and lower limits will each display **Off** and a number. The number indicates the current set $ETCO_2$ limit that will be active when the $ETCO_2$ alarm is turned on. See example below.



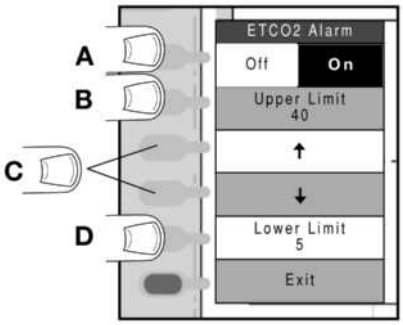
$ETCO_2$ alarm off, default upper limit setting is 40

$ETCO_2$ alarm off, default lower limit setting is 5

*NOTE: If a limit is disabled, the word **DISABLED** will appear instead of **Off** (number).*

SETTING THE $ETCO_2$ ALARM TO ON

To set the $ETCO_2$ alarm to on, press the **OFF/ON** button (A) until **On** is highlighted. When both the upper and lower $ETCO_2$ alarm limits are set to **On**, the alarm on icon ( ) will appear in the CO_2 and $ETCO_2$ value windows and the global alarms will be turned on.



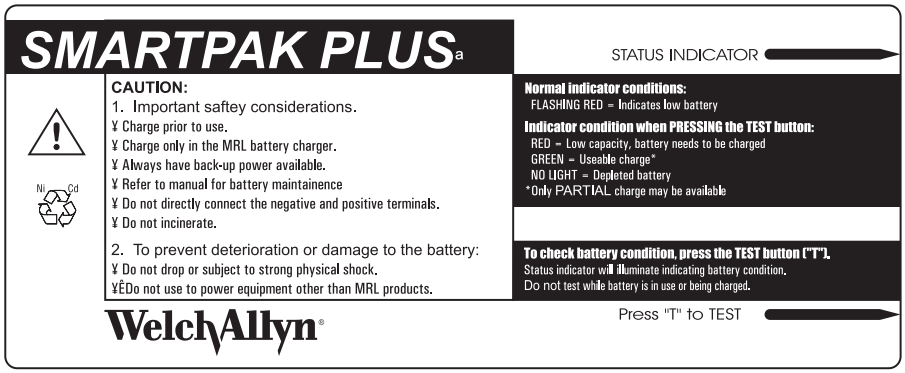
1. **Set the upper limit**. Press the **UPPER LIMIT** button (B) to select upper limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the upper limit value. You can disable the upper limit by pressing the upper limit button again to display **Disabled** below the words **Upper Limit**. The alarm icon in the CO_2 and $ETCO_2$ value windows will display the appropriate status.
2. **Set the lower limit**. Press the **LOWER LIMIT** button (D) to select lower limit. A bold line will appear around the box. Press the up or down arrows (C) to increase or decrease the lower limit value. You can disable the lower limit by pressing the lower limit button again to display **Disabled** below the words **Lower Limit**. The alarm icon in the CO_2 and $ETCO_2$ value windows will display the appropriate status.
3. Exit. Press **EXIT** to leave menu.

CHAPTER 15: POWER SOURCE

This chapter provides information on the safe use of the Welch Allyn PIC System power source, including controls and indicators, and procedures for charging, operation, and maintaining the equipment.

Chapter Overview:

CAUTION: First read chapter 1, Safety Information, before proceeding with this chapter.



General Safety Precautions

Welch Allyn Quick Charger Conditioner

The Welch Allyn Quick Charger/Conditioner provides the user with charging/conditioning capability that, when combined with proper battery care and maintenance, will result in consistent battery performance and prolonged battery life. To ensure that you get optimum performance from your Welch Allyn battery packs, please read this manual carefully and follow the recommendations for battery care and maintenance.

General Safety Precautions

- Do not insert objects into or block the charger's ventilation ports.
- Charge only Welch Allyn battery packs in this charger.
- Avoid touching defibrillator paddles to the metal charger frame.
- Do not take charger apart or attempt to repair it yourself.
- Do not use the defibrillator tester for testing defibrillators other than Welch Allyn defibrillators.
- The Welch Allyn charger should not be used in the presence of flammable anesthetics or materials.
- If charger has been dropped or shows visible signs of abuse, refer unit to qualified service personnel for verification of proper operation.
- Do not immerse the charger or expose it to water or other liquids.
- Wipe only the outside with a damp cloth.
- Clamp power cord and tighten knob to prevent accidental removal.
- Unplug charger prior to changing fuse.

Welch Allyn Batteries

- Do not incinerate.
- Do not directly connect the negative and positive terminals together.
- Use only the Welch Allyn Quick Charger to charge Welch Allyn batteries.

To prevent deterioration or damage to the battery:

- Do not drop or subject to strong physical shock.
- Do not use Welch Allyn batteries to power equipment other than Welch Allyn products.

Power Supply/Paddle Holder (option 971029)

The PIC can operate from AC line or battery power. The AC line power cord is located in the back of the PIC and can be connected directly to any AC power source worldwide with the use of the proper power cable. Contact Welch Allyn for more information on the power cables to fit your standard AC voltage.

AC Power Indicator The line power indicator is illuminated green when the unit is plugged into an AC outlet.

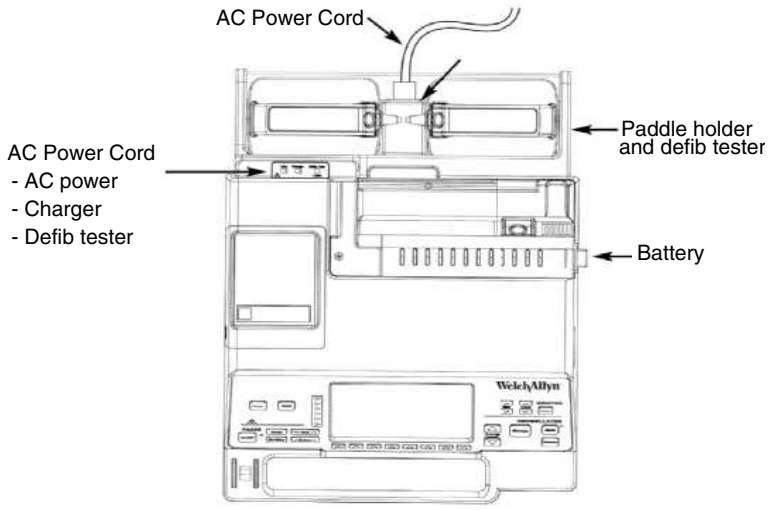
Charge Indicator Yellow light is illuminated continuously to indicate that a battery is charging. The yellow light will flash when the battery is fully charged.

Defibrillator Test Indicator
Green light is briefly illuminated to indicating that 200J or more has been delivered when testing the defibrillator.

Defibrillator Test Paddle Trays
Paddle trays contain discharge contacts used for testing the defibrillator.

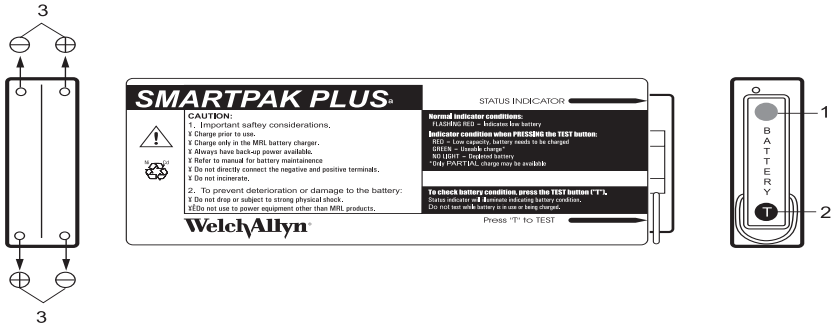
AC Inlet Connector accepts standard IEC 320 line cord with earth ground.

AC Power Cord A variety of cords are available to allow for connection of the PIC to virtually any worldwide AC line power source.



Power Source Controls and Indicators

Welch Allyn SmartPak Plus™ Battery



Welch Allyn SmartPak Plus™ 12-volt battery provides power to the PIC System.

1. **Status indicator**: The status indicator will illuminate when the test button is pressed, unless the battery is totally depleted. A green light represents usable battery power while a red light indicates that the battery is low and should be exchanged for one that is fully charged. To conserve power and extend shelf life, the indicator lights only during a battery test, unless the battery charge becomes low while in use. This will cause the indicator to blink red as an alert to the low battery condition

2. **Test button**: The test button provides a method for testing the SmartPak Plus™ battery in or out of the unit. It initiates a brief load test that simulates the current drain of the monitor.

   To quickly check a SmartPak Plus battery:

   a. Press the test button.

   b. Verify that the status indicator lights green. A red light indicates a low battery. No light during the test indicates a totally depleted battery.

3. **Multiple paired contacts**: Four contacts ensure swift, error-free battery insertion and backup reliability.

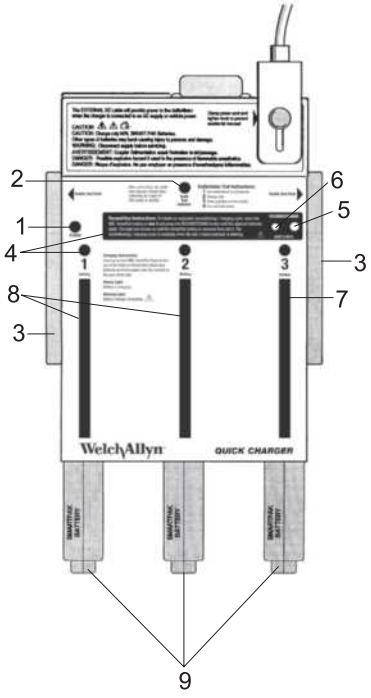
Welch Allyn SuperPac battery

The Welch Allyn SuperPac™ battery is a nickel metal hydride (NiMH) battery. NiMH batteries are less susceptible to the memory effect associated with NiCd batteries. It weighs only a few ounces more than the SmartPak yet provides twice the capacity. There are no light indicators as on the SmartPak batteries due to space limitations inside the battery case. Therefore, utilize the battery status icon on the display to determine battery charge status.

Welch Allyn Quick Charger/Conditioner

Controls and indicators listed below are illustrated on the following graphic.

1. **Power On Indicator**: Green Power On light is illuminated when the unit is plugged into an AC outlet or into vehicular power if equipped with 12V adapter option.
2. **Defibrillator Test Indicator**: Red light is briefly illuminated to indicate delivered defibrillation energy of 200J or more has been delivered by a Welch Allyn defibrillator.
3. **Defibrillator Test Paddle Trays**: Paddle trays containing discharge contacts used for testing Welch Allyn defibrillator.
4. **Battery Charging Indicator**: Yellow light is illuminated continuously to indicate that a Welch Allyn SmartPak battery is charging. The yellow light will flash when the battery is fully charged.
5. **Reconditioning Pushbutton**: Pressing this button will initiate a reconditioning deep-discharge/charge cycle on the battery located in slot #3.
6. **Reconditioning Indicator**: Red light is illuminated to indicate that the battery in slot #3 is undergoing a reconditioning cycle.
7. **Charge/Reconditioning Slot**: Dual-function slot used for either charging or reconditioning battery packs. (Slot #3)
8. **Charge Slots**: Slots used for charging battery packs only. (Slots #1 & 2)
9. **Welch Allyn Batteries**: inserted in Slots # 1, 2, and 3.
10. **AC Inlet**: Connector accepts standard IEC line cord with earth ground.11. **Fuse Holder**: Contains two fuses for 110/220 VAC, use 2-Amp Slo Blow (Welch Allyn #500218). For 220/240 VAC, use 1-Amp Slo Blow (Welch Allyn #500241).
12. **Line Voltage Selecto**r: 100/120 or 200/240 VAC, 50/60Hz.
13. **AC Power Cord**
14. **Auxiliary Power Cable**: Provides auxiliary power source to the PIC.
15. **Auxiliary Power Connector LED**: Indicates rapid charger is supplying power to PIC System and is trickle charging inserted battery.
16. **Power Cord Retainer (clamp)**.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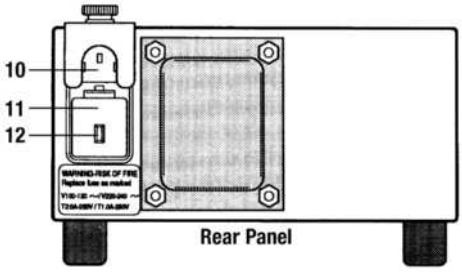
WelchAllyn
QUICK CHARGER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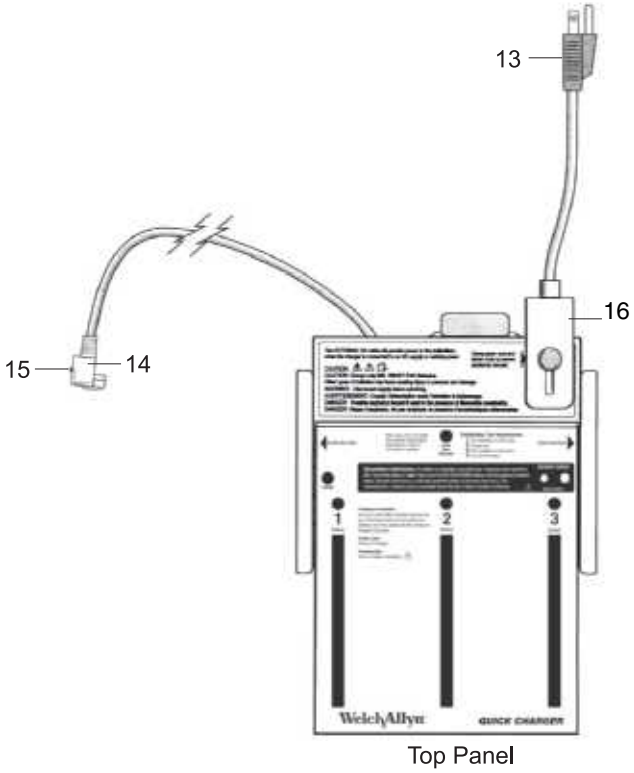
Rear Panel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WelchAllyn
QUICK CHARGER

Top Panel

Battery/Charger/Defibrillator Tester Operation Procedures

Charging Battery Packs with Paddle Holder/Charger (optional)

If purchased the optional paddle holder area of the unit can charge a battery when using AC power. When the paddle holder is installed, the charger will charge a battery that is inserted into the Welch Allyn PIC whenever the AC line power cord is connected to an outlet or the battery can be charged in the quick charger. The yellow "charge" light on the paddle holder is illuminated continuously to indicate that a battery is charging. The yellow light will flash when the battery is fully charged.

Charging Battery Packs with the Welch Allyn Quick Charger/ Conditioner

The Welch Allyn Quick Charger/Conditioner is able to charge three standard Welch Allyn battery packs simultaneously in approximately 4 hours.

1. To initiate a battery pack charge cycle, insert the Welch Allyn battery into any of the three numbered slots in the front of the charger. When the battery has been firmly seated into the contacts at the back of the slot, the yellow light behind the slot will illuminate, indicating that the SmartPak battery is being charged. This light will remain on for the duration of the charging cycle. When the battery is fully charged, the yellow light will flash to indicate it's ready for use.
2. A completely discharged battery SmartPak Plus pack will require approximately 4 hours to recharge and a Welch Allyn SuperPac requires approximately 8 - 10 hours. Charging time varies depending on battery capacity and state of charge. Deeply discharged batteries and those with higher capacity will take longer to charge; partially discharged batteries and those with lower capacity will require less time to charge.

NOTE: Charging battery packs at temperatures above 30°C (86°F) will prolong the charging time and may result in a gradual decline in battery capacity.

3. If a fully charged battery is inserted into the charger, it will be charged for a short period of time while the charger determines its state of charge. When it is determined that the battery is fully charged, the yellow light will begin to flash. This process may take several minutes.

4. Welch Allyn SmartPak contain NiCad batteries, which tend to lose charge capacity if they are repeatedly charged after not being fully discharged or are charged at high temperatures. In order to counteract these cumulative deteriorating effects, it is recommended that you periodically exercise the SmartPak by deeply discharging it in the Reconditioning Slot (Slot #3) before recharging. See reconditioning schedule later in this chapter.
5. Slot #3 on the Welch Allyn Battery Charger has dual charging and reconditioning capabilities. To use slot #3 only to charge a battery pack, follow the directions above.

Conditioning Battery Packs (Important)

INITIATING A BATTERY CONDITIONING CYCLE:

1. Insert the battery into slot #3.
2. Press the red push-button switch on the top of the charger behind slot #3.
3. The red reconditioning light next to the push-button will light, indicating that the battery pack is being exercised.

At the end of the exercise period the charger will automatically begin a normal charge cycle and will illuminate the yellow battery light indicating that the battery is charging. When the yellow battery light begins to flash, the conditioning cycle is complete. The red conditioning light will remain on until the battery is removed, to serve as a reminder that the battery has been exercised. If an additional conditioning cycle is desired, press the push-button again. Allow the battery to remain in the charger until the yellow battery light begins to flash again.

The time required for the discharge cycle to be completed varies depending on battery capacity and state of charge. A fully charged battery with normal capacity will require approximately 8 hours to discharge in the reconditioning slot and a high capacity battery will require 18 hours. Partially discharged batteries will require less time. After the discharge portion of the reconditioning cycle has been completed, the battery pack will undergo a normal charging cycle.

Reconditioning with Paddle Tray/ Charger

To recondition the battery in the unit using the paddle tray/charger option, perform the battery capacity test and reconditioning procedure in chapter 16.9.

Defibrillator Tester

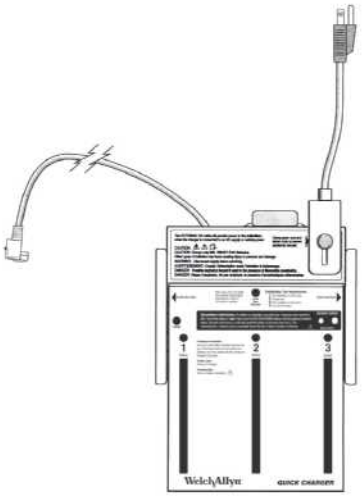
The Welch Allyn Battery Charger and the paddle holder contain a defibrillator tester for verifying the operation of the Welch Allyn defibrillator.

WARNING: Hazardous high voltage is present when the defibrillator is discharged during this test. Observe safety precautions regarding the use of a defibrillator.

TESTING THE DEFIBRILLATOR:

1. Charge the Welch Allyn defibrillator to 200 Joules.
2. Place the defibrillator paddles against the test contacts located on the sides of the battery charger or in the wells of the paddle holder. Make sure that the paddles are not touching any part of the metal charger frame.
3. Discharge the defibrillator into the paddle tray.
4. The red defibrillator test light at the back of the charger should flash indicating that the defibrillator has delivered 200 Joules or greater.

NOTE: Periodically test your defibrillator with a calibrated defibrillator energy tester. Please reference the MRL performance verification procedure (as outlined in the PIC system service manual). The performance verification procedure must be completed by a qualified Biomedical Equipment Technician (BMET).



Auxiliary backup power is available to operate the PIC System. Either connect the Auxiliary Power Cable from the charger into the top of the PIC System or plug in the AC power cable from the back of the paddle holder. The charger's AC power cord must be plugged in, and the green power light must be illuminated to use the backup power. The LED in the auxiliary power cable connector or on top of the paddle tray will illuminate when it is charging the battery in the PIC System. When connected to the PIC System, the auxiliary power cable will trickle charge a battery that is inserted in the PIC System.

NOTE: When operating from auxiliary power only (with no battery or fully depleted battery), defibrillator charge time will be slightly longer (10 seconds typical, 15 sec. maximum).

CAUTION: It is recommended that a fully charged battery be inserted in the PIC even when operating on auxiliary

power.

To achieve optimum performance from your Welch Allyn Quick Charger/Conditioner and SmartPak battery packs:

- Charge battery packs in a moderately cool environment, 5° to 30 °C (41° to 86°F). All NiCad batteries are adversely affected by charging at extreme temperatures and will exhibit a significant decline in useful operating time if charged at temperatures above 95°F (35°C) or below 32°F (°C).
- Keep charger ventilation ports free of obstructions. Install the charger in an area were air is allowed to circulate freely on all sides.
- Do not store battery packs or other objects in between the charging slots or on top of the charger.
- Do not place charger near a heat source or in direct sunlight.
- Allow battery packs to charge fully before removing them from use.
- Perform periodic conditioning cycles on battery packs.

Recommended Reconditioning Schedule

If batteries are charged in moderate temperatures and are used with low to medium frequency (one or less charge/discharge cycles per day), recondition battery packs once every 90 days.

If batteries are charged in a high temperature environment (above 30°C, 80°F) or normally encounter more than one charge/discharge cycle per day, recondition battery packs once every 30 days.

Due to the critical nature of battery packs, replacement of the Welch Allyn batteries is recommended every 24 months. Do not use the battery after the "Do Not use after:_____" date labeled on the battery pak.

Welch Allyn 12 Volt Vehicular Adapter

About the Welch Allyn 12 Volt Vehicular

The Welch Allyn 12 Volt Vehicular Adapter provides continuous monitoring, pacing and defibrillation auxiliary power to the PIC System. The 12 volt adapter can be plugged into the PIC System while the PIC is on or off without interfering with patient monitoring, pacing or defibrillation.

The 12 volt adapter will work with or without a battery inserted in the PIC System. Charge times, however will be slightly slower if there is no battery inserted (not greater than 12 seconds per 360 Joule charge). A fully charged battery inserted, with 12 volt auxiliary power connected, will decrease the charge time to 7 seconds or less.

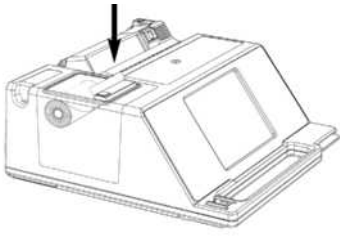
CAUTION: If a battery is inserted in the Welch Allyn PIC System while using the 12 volt adapter, energy from the battery will be utilized for charging and discharging the defibrillator. Therefore, it is recommended that the inserted battery be replaced with a fully charged battery before disconnecting the 12 volt auxiliary power while monitoring a patient and before the next call.

OPERATING THE 12 VOLT ADAPTER

1) Plug the 12 volt plug into the vehicle's 12 volt (cigarette lighter) receptacle.

NOTE: The cigarette lighter receptacle must be on a circuit that can deliver at least 15 amps (check fuse in the vehicle).

2) Plug the auxiliary connector into the Auxiliary Power interface on top of the PIC System to activate auxiliary power supply.



NOTE: A light on the auxiliary connector, indicates that there is a battery inserted in the PIC System and it is being trickle charged.

NOTE: The 12 volt adapter will slowly trickle charge a battery that is inserted in the PIC System, but is not intended to be used for battery charging. To charge the battery properly use the Welch Allyn Rapid Charger.

Welch Allyn Battery Analyzer

The premium charger and maintenance system for Welch Allyn batteries analyzes, conditions, and identifies problem batteries. It analyzes batteries by making capacity measurements while discharging and then automatically recharging the battery. It conditions batteries by charging and discharging to remove voltage depression. It identifies battery packs with open cells, shorted cells, and reversed cells. For information on how to use the battery analyzer, please refer to its operator's manual.

Power Option Comparison Chart

Type	Part No.	Description	Function	Battery Charge	Defib Charge
Auxiliary Power	980132	12 V Adapter PIC	Allows PIC to Operate from 12 V source. Trickle charges battery	No, trickle charge only.	Yes - If connected to vehicle circuit of at least 15 Amps.
Auxiliary Power	981118	AUX Power Supply	Power supply to provide the 12 V required for ambulance mount. Allows 981114 to operate from mains (100-240)	No - Must be used with 981114 (See Kit No. 981119)	No - Must be used with 981114 (See Kit No. 981119)
Auxiliary Power and Battery Charger	971029	Power Supply/ Pad Holder (Integral Charger)	Attaches permanently to the PIC. Allows it to operate from mains (100-240 V AC). Also charges battery.	Yes - Charges a battery in the PIC in 8-10 hours	Yes - Full power from AC mains
Auxiliary Power and Battery Charger	971104	Quick Charger/ Conditioner	Simultaneously charges 3 PIC Batteries and provides auxiliary power to operate from mains (100-240 V AC)	Yes - Charges up to 3 PIC batteries in 8-10 hours	Yes - Full power from AC mains
Auxiliary Power and Battery Charger	981114	Ambulance Mount, PIC, 12 V	Securely fastens the PIC and allows it to operate from 12 V. Also charges battery.	Yes - Charges a battery in the PIC in 8-10 hours	Yes - If connected to a vehicle circuit of at least 15 Amps
Auxiliary Power and Battery Charger	981117	Aux Power Supply/ Battery Charger	Power supply to operate PIC and charge the battery from mains. (110-240 V AC) supply	Yes - Charges a battery in the PIC in 8-10 hours	Yes - Full power from AC Mains
Auxiliary Power and Battery Charger	981119	Ambulance Mount, PIC, Mains	Securely fastens the PIC and allows it to operate from Mains (110-240 V AC). Also charges battery. This kit contains a 981114 and 981118	Yes - Charges a battery in the PIC in 8-10 hours	Yes - Full power from AC mains
Battery Charger Only	900252	4 Bay Charger with Power Supply	Four bay base that allows to power (and mount) up to four single slot chargers in one base.	Yes - Charges up to 4 PIC batteries in 3 hours.	No - Separate Auxiliary Supply is required

Type	Part No.	Description	Function	Battery Charge	Defib Charge
Battery Charger Only	981115	Battery Charger, Single Slot	Battery charger and conditioner for PIC battery pack. Operate from mains (110-240 V AC)	Yes - Charges one PIC battery in 3 hours.	No - Separate Auxiliary Supply is required
Battery Charger Only	981124	Battery Charger, 1 Bay	Battery charger and conditioner for SuperPac. Operate from mains (110-240 V AC)	Yes - Charges one SuperPac battery to 80% in 3 hours.	No - Separate Auxiliary Supply is required
Battery Charger Only	981122	Battery Charger, 2 Bays	Battery charger and conditioner for SuperPac. Operate from mains (110-240 V AC)	Yes - Charges up to two SuperPac batteries to 80% in 3 hours.	No - Separate Auxiliary Supply is required

CHAPTER 16: MAINTENANCE AND CARE

This chapter provides information on maintenance activities including functional checks, cleaning instructions, and scheduled and preventive maintenance of the Welch Allyn Portable Intensive Care (PIC) System.

Chapter Overview:

Maintenance

To insure the readiness and optimum working condition of the PIC System, the following inspections and tests should be performed daily or at each shift change. **In addition to the daily check, performance and calibration testing must be completed by authorized personnel at regularly scheduled intervals, which should not exceed one year. Information such as circuit diagrams, parts lists, descriptions and calibration procedures may be requested from Welch Allyn, to aid in repairing those components designated as field repairable.**

A maintenance log is an important part of a successful maintenance program in which information is recorded on a regular basis. This allows for verification of necessary maintenance and for scheduling periodic requirements such as calibration and certification. Additionally, the log can be used to track the age of accessories such as batteries, which require periodic testing and replacement.

In accordance with the recommendations of the Defibrillator Working Group of the Food and Drug Administration, Welch Allyn has provided an operator's shift check list, which can be copied for use as needed.

Daily/Shift Check Procedure

VISUAL INSPECTION:

1. Inspect the PIC's Performance Calibration Log (located on the bottom of the PIC System) to insure that a PM/ Calibration has been performed within one year.
2. Visually inspect the AC power cord (for the Welch Allyn Quick Charger), auxiliary power cable, ECG patient cable, hands-free and/or paddles adapter, pulse oximeter sensor, blood pressure cuff/hose and sensor, and temperature probe for signs of wear or damage. Replace if damaged.
3. Locate and inspect the batteries, monitoring electrodes, Multipurpose electrodes and paddle gel and ensure they are within the expiration date stamped on the package.
4. **Verify that a charged battery has been fully inserted into the battery compartment of the PIC System.**
5. Inspect the PIC System and Welch Allyn Quick Charger to insure they are clean, that no liquid has been spilled on them and that they have not been damaged.
6. Inspect the chart recorder to insure there is an adequate amount of chart paper.
7. Perform the functional checks as described on the following pages.

MANUAL DEFIBRILLATORS: OPERATORS SHIFT CHECKLIST

Date: _____ Shift: _____ Location: _____

Mfr/Model No.: _____ Serial No. or Facility ID No.: _____

At the beginning of each shift, inspect the unit. Indicate whether all requirements have been met.
Note any corrective actions taken. Sign the form.

	Okay as found	Corrective Action/Remarks
1. Defibrillator Unit		
Clean, no spills, clear of objects on top, casing intact		
2. Paddles (including pediatric adapters)		
a. Clean, not pitted. b. Release from housing easily		
3. Cables/Connectors		
a .Inspect for cracks, broken wire or damage b. Connectors engage securely		
4. Supplies		
*a. Two sets of pads in sealed packages within expiration date b. Monitoring electrodes c. Alcohol wipes d. Hand towels e. Scissors		
5. Power Supply		
a. Battery-powered units (1) Verify fully charged battery in place (2) Spare charged battery available (3) Follow appropriate battery rotation schedule per manufacturer's recommendations b. AC/Battery backup units (1) Plugged into live outlet and maintain battery charge (2) Test on battery power and reconnect to line power		
6. Indicators/ECG Display		
a. Power-On display *b. Self-test OK c. Monitor display functional *d. "Service" message display off *e. Battery charging; low battery light off *f. Correct time display-set with dispatch center		
7. ECG Recorder		
b. Recorder prints a. Adequate ECG paper		
8. Charge/Display Cycle for Paddle or Adhesive Pad Defibrillation		
a. Disconnect AC plug-battery backup units b. Charge to manufacturer's recommended test energy level c. Charge indicators working d. Discharge per manufacturer's instructions e. Reconnect line power		
9. Pacemaker		
a. Pacer output cable intact b. Pacer pads present (set of two) c. Inspect per manufacturer's operational guidelines		
_____ **Major problem(s) identified (OUT OF SERVICE)**		

*Applicable only if the unit has this supply or capability

Signature _____

Functional Checks

Power System

Warning: Keep hands and fingers away from paddle electrodes.

	Function	Response
1	Verify that the AC power cord is firmly connected to the Welch Allyn Quick Charger with the AC cord holder and that the power cord is connected to the appropriate outlet.	Green power light on the Welch Allyn Quick Charger is illuminated.
2	Check each battery slot indicator for proper battery status.	Insert a battery in each battery slot (if a battery is not already in the slot). The Battery Status Indicator Light will illuminate yellow, when a battery has been inserted. When the battery pack has been fully charged, the battery status indicator light will flash yellow.
3	Check the Auxiliary Power cable for proper operation. Connect the auxiliary power cable to the PIC.	The light in the auxiliary power connector will illuminate if a battery is inserted in the PIC System.
4	Press the system power switch on.	The PIC will perform a number of self-tests and print out the results (pass or fail) on the chart recorder.Verify that all the installed options ($Sp0_2$, NIBP, etc.) are displayed in their respective windows. Verify that the AUX. power icon is displayed in the Message window.
5	With no patient cable attached to the PIC, press the Lead Selector button to select Lead I, II, or III.	Verify that a lead fault message is displayed in the waveform window.
6	Press the Lead Selector button to select PDL (paddles).	Verify that a lead fault message is displayed in the waveform window.
7	Apply the paddles to the test contacts on the Welch Allyn Quick Charger.	Verify that the lead fault message disappears from the waveform window and that the trace is in the center of the waveform window.
8	Press the up or down energy select arrow to select 200 Joules on the defibrillator.	Verify that the energy graph is displayed on the right side of the display and that 200J has been selected.

WARNING:
Keep hands and fingers away from paddle electrodes.

	Function	Response
9	Press the CHARGE button on the front panel.	Verify that the energy graph highlights as it charges up to 200J. A periodic tone will sound while the defibrillator is charging. At the completion of the charge cycle, the tone will be constant and the energy graph will fill up to and include 200J. The charge time should be less than 7 seconds.
10	Ensuring the paddles are properly applied to the test contacts, press only the sternum paddle FIRE button and release. Then press only the apex paddle FIRE button and release.	The defibrillator should not discharge.
11	Press both the sternum and apex paddle FIRE buttons. Return the paddles to their holder.	The defibrillator should discharge and the defibrillator test light on the top of the Quick Charger must flash indicating defibrillator discharge. Verify that the Del. Energy in the Defib window is between 190 J and 210 J.
12	Press the SYNC button.	The Defib window should indicate Sync and the Sync Indicator light should illuminate.
13	Press the CHARGE button on the front panel. Apply the paddles to the test contacts on the Quick Charger.	Verify that the energy graph highlights as it charges up to 200J. A periodic tone will sound while the defibrillator is charging. At the completion of the charge cycle, the tone will be constant and the energy graph will fill up to and include 200J.
14	Ensuring that the paddles are properly applied to the test contacts, press both the sternum and apex paddle discharge buttons.	The defibrillator should not discharge.
15	Press the DISARM button on the front panel.	The defibrillator should discharge internally and the charge done tone and graph will disappear.

	Function	Response
16	Remove the paddles from the PIC and connect the hands-free adapter to the defibrillator. Connect the hands-free tester (P/N 900322) to the patient end of the hands-free adapter.	"Connect Paddles" message should appear in the defibrillation window when the paddles have been removed. The "Connect Paddles" message should disappear when the hands-free adapter has been installed.
17	Press LEAD SELECT button until PAD is selected.	The lead fault message should disappear.
18	Press PACER button.	The Pace indicator should illuminate red and "Pacer fault, Set Lead to I II, III" should be displayed in the Pacer window.
19	Connect ECG patient cable to the PIC and to the Welch Allyn Cardiac Demonstrator (P/N 980128). Press the lead button to select lead I.	An ECG trace should appear in the ECG window. In the Pacer window, "Pacer Stop" should appear with the default pacing parameter (i.e., rate and output setting).
20	Press PacerSTART/STOP button on the pacer controls.	The pacer window will indicate pacing. The pacer indicator light will illuminate green and flash off with each delivered pacing pulse.
21	While the pacer is pacing, disconnect the patient cable from the PIC System.	The pacer window should indicate "Pacer Fault, ECG Lead Fault," also "Lead Fault" should appear in the ECG window. The pacer indicator lights red indicating the fault condition and that the pacing output has been suspended.
22	Press PACER button.	Pacer indicator light should turn off and pace window should be blank.
23	Press the SPO2 button.	Verify that the SpO_2 window displays "No Signal."
24	Connect the pulse oximeter sensor to the PIC System and apply it to your finger.	Verify that the SpO_2 window displays "Searching", "Signal OK" and a valid SpO_2 reading.
25	Apply BP cuff. Press NIBP button to take measurement.	Verify that the NIBP window displays a valid blood pressure reading.
26	Press the CHART button until the header and footer are printed out completely.	Verify that the date and time are properly set.

	Function	Response
27	Press the NEXT button on the treatment summary menu. Then press Recorder and Log.	The Log menu should appear next to the quick access buttons.
28	Press Clear Log button to erase the log.	Clearing event storage will be printed to confirm clear.
29	Turn the PIC System off and replace all accessories.	

Mandatory Minimum Preventive Maintenance Schedule

The following items should be performed:

EVERY DAY:

- Complete the daily/shift check procedure.

EVERY MONTH:

- Perform the daily tests (found on check list).
- Inspect unit for wear.
- Inspect paddles for wear.
- Inspect multipurpose hands-free adapter for wear.
- Inspect DC line backup and AC power cables for wear.
- Insure DC line backup makes proper connection to defibrillator.
- Inspect all SmartPak batteries for expiration dates.
- Insure all SmartPak batteries have been reconditioned within 90 days.
- Perform battery capacity test.

EVERY THREE MONTHS:

- In addition to daily and monthly tests: Test ECG patient cable for electrical continuity

EVERY YEAR:

- In addition to daily and monthly and three months tests, it is recommended that Welch Allyn performance verficiation procedure be completed by a qualfied Biomedical Equipment Technician (BMET) every year or according to local requirements.

EVERY TWO YEARS

- Replace ECG patient cables
- Replace paddles and multipurpose hands-free adapters
- Replace all batteries.

EVERY FIVE YEARS

- Replace internal data retention battery. This must be performed by a qualified technician.

Monthly Capacity Test

To evaluate the minimum acceptable capacity of a battery pack, perform the following tests monthly:

1. Test only fully charged battery packs.
2. Operate the defibrillator on battery power at a setting of 360 Joules.
3. Charge the defibrillator and then discharge it into the test load of the battery charger. Repeat this process 10 times, allowing approximately 1 minute between each test shock.
4. Measure the charge time for the 10th shock. This time should be less than 7 seconds for the SmartPak Plus battery or less than 9 seconds for the SuperPac battery.

NOTE: Technique and reaction time are human factors that may affect the consistency of these measurements.

5. If the charge time exceeds the limits given in step 4, recondition the battery pack and perform the test again. If the battery pack again fails the test, consider the age of the battery and the frequency of its use. These factors determine how long a battery can continue to provide adequate performance. A weak battery should be removed from service and replaced with a new, fully charged battery.
6. Keep discharged batteries separated from spare batteries what are charged. For example, when removing a discharged battery from the monitor, never place it in the location intended to carry a spare.

Guidelines for Maintaining Peak Battery Performance

1. Each battery should be identified with a number or letter. An identification mark will be useful in tracking battery performance.
2. Keep extra batteries in the Welch Allyn charger where their status can be quickly determined. A blinking indicator is the most positive indication of a fully charged battery.
3. Always carry at least one fully charged spare battery. If no other source of back-up power is available, two spare batteries are advisable.
4. Rotate spare batteries routinely. The charge level gradually diminishes in a battery after it is removed from the charger.

5. Whenever possible, recharge a partially depleted battery. This can be accomplished following any incident that involves patient monitoring. It will insure maximum operating time for each use, without reliance on spares. The need for a spare can then serve as an alert when an aging battery fails to provide normal operating time.
6. Keep discharged batteries separated from spare batteries that are charged. For example, when removing a discharged battery from the monitor, never place it in the location intended to carry a charged spare.

Battery Capacity Test and Reconditioning Procedure

Due to the critical nature of this equipment, it is important to test PIC batteries at least every 90 days to verify adequate available battery capacity. The test should be performed every 30 days if batteries are charged in a high temperature environment (above 30°C, 80°F) or if they are heavily used (charged and discharged more than once a day). Because this test completely drains the battery, it also serves an important reconditioning cycle that will help insure maximum capacity.

Equipment Required

- Stopwatch or clock to measure elapsed time.
- PIC with only the ECG monitor function activated.

NOTE: Battery run time is different for the various PIC options available. Refer to the following comparison chart to determine typical operating time for specific PIC options and battery types.

Battery Capacity Comparison

Select Options Below to Determine the Minimum Battery Run Time	Part Number	Minimum ECG Monitoring Time (Hours)		
		SmartPak	SmartPak +	SuperPac
PIC with 5-Lead ECG and Mono LCD Display	972042	2	2.5	5
PIC with 5-Lead ECG and Color LCD Display	971085	1.25	1.5	3
PIC with 12-Lead ECG and Color LCD Display	971086	1	1.25	2.5

Procedure

1. Completely charge the battery to be tested. The charger's indicator begins to blink when the battery is fully charged.
2. Disconnect the PIC from AC power, so that it is powered only from the battery to be tested.
3. Turn on the PIC monitor and note the starting time.
4. Verify continued operation at intervals of 30 minutes or less.
5. When the battery power runs out, note the time. This gives you the duration of time that relates directly to battery capacity. Compare this run time to the value, given in the comparison chart above, that corresponds to the PIC and battery type being used.

Acceptable Results

- Battery run time must meet or exceed the minimum time given in the comparison chart.
- Recharge batteries fully prior to placing them back into service.

Corrective Action

- If the actual battery run time is less than the value given in the chart, repeat the test to determine if reconditioning was effective in improving available capacity. If the operating time remains short, remove the battery from service and replace it.
- If battery run time is short, be sure that the correct PIC and battery type have been selected on the comparison chart.
- Verify that the battery is fully charged prior to the capacity test.
- Consider the age of the battery and the frequency of its use. The recommended replacement interval, in this critical application, is every 2 years as indicated on the battery label.

Cleaning Instructions

PIC System Cleaning Recommendations

To clean the PIC System, use a nearly dry cloth containing one of the mild cleaning agents listed below. DO NOT allow cleaning agent or water to run into the crevices or connector opening at any time. Thoroughly wipe off any excess cleaning solution from the PIC system with a dry cloth.

Always check monitor and connector opening for unusual wear, damage or dampness while cleaning.

Use only the recommended cleaning agents listed below:

Recommended Cleaning Agents

- Warm water
- Hydrogen peroxide solution
- Coverage
- Liquid soap
- Wex-cide®
- Formula 409®
- Fantastik®
- Windex®
- T.B.Q.®

Never use these cleaning agents

- Butyl alcohol
- Denatured ethanol
- Freon
- Mild chlorine bleach solution
- Isopropyl alcohol
- Trichloroethane, trichloroethylene
- Acetone
- Vesphene II
- Enviroquat
- Staphene
- Misty
- Glutaraldehyde

Cleaning the BP Cuff

Clean the BP cuff with common hospital disinfectants, including Clorox® (1:10 solution), isopropyl alcohol, Lysol® solution, Phisohex®, Quatricide®, Virex® and Vesphene®. Wash gently with the solution, then rinse. DO NOT allow solution to enter cuff tubes.

Cleaning the SpO_2 Probes

Clean the SpO_2 probes with a cloth that has been slightly dampened with one of the recommended agents listed above. DO NOT submerge the probe or its connector in any liquids or cleaning agents. Thoroughly wipe off any excess cleaning solution with a dry cloth.

Cleaning the Bitrode Limb Electrodes

Clean the Bitrodes with warm water to remove all electrode gel. Accumulated deposits of gel may require the use of a scrub brush. Check each snap contact on each Bitrode for evidence of any gel deposits and clean as needed. After removal of all gel, clean the Bitrodes with any of the recommended cleaning agents and rinse.

NOTE: If gel was found on Bitrode snap contacts, inspect the patient cable snaps for gel deposits (dried gel deposits appear as a greenish discoloration). Gel deposits can damage patient snaps. If dried gel deposits have damaged a snap on the on the patient cable, replace the cable to avoid interference with the ECG signal.

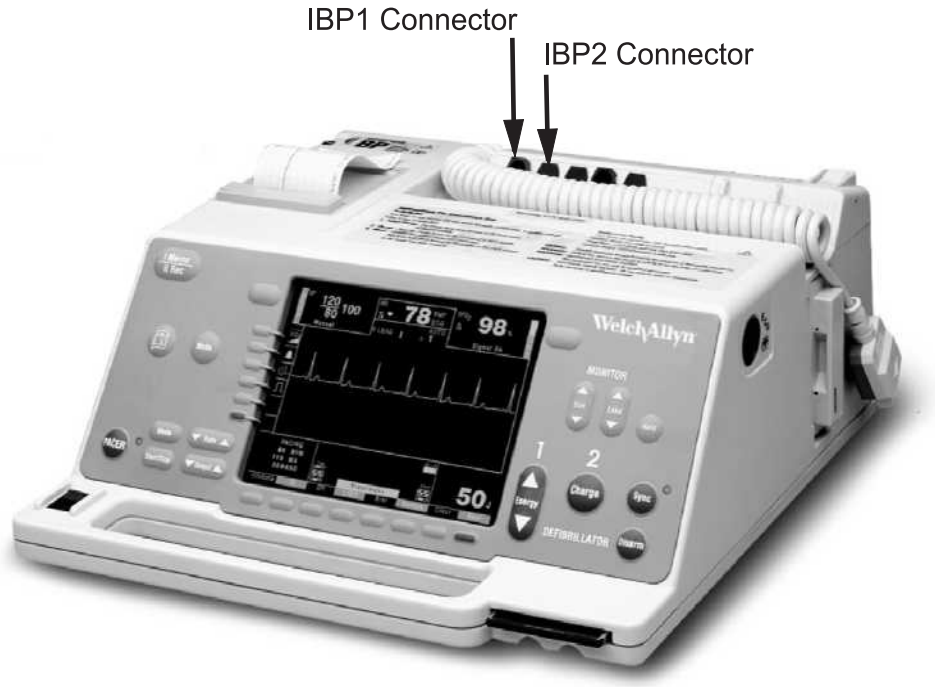
Cleaning Cables and Accessories

Cables, cuff tubing, paddles and other accessories can be wiped clean with a damp cloth moistened in a mild detergent solution or according to manufacturer's instructions.

CHAPTER 17: IBP

This chapter provides information on the IBP controls, displays, displayed waveform names, and the operation procedures.

Chapter Overview:

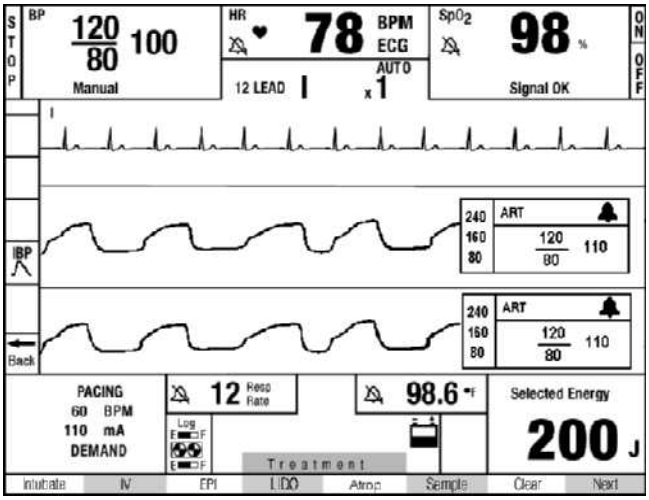


Intended Use

The Welch Allyn IBP option has been designed to measure arterial, venous and intracranial pressures using invasive transducers with 5µV/V/mmHg sensitivity.

IBP Controls and Display

IBP functions on the PIC System are viewed on and controlled by the areas highlighted below. The following operations of IBP depict the normal factory default.



Controls

IBP is operated by using both the **QUICK ACCESS** and **BOTTOM MENU** buttons. If the primary Quick Access menu is displayed, press the **NEXT** button to access the IBP controls. The IBP Quick Access menu allows the user to zero the sensors, scale the traces, and select the IP channel source.

Display

To operate the IBP, the IBP trace must be displayed. Using the **QUICK ACCESS MENU** buttons, the operator can choose to enable two simultaneous trace data from IBP1 or IBP2. Pressure parameters, alarm settings, and status are displayed to the right of the trace.

NOTE: Upon activation of the IBP monitoring function the display will change such that the IBP trace will be presented in waveform 2 or 3. If the display was previously in 1 or 2-trace mode, the IBP trace will be presented in waveform 2 or 3 with the previous trace(s) still displayed. If the display was previously in 3-trace mode, the IBP trace(s) will replace the previously displayed traces in waveform 2 and 3.

NOTE: While IBP monitoring is activated no other trace parameters can be selected for display in the trace that is enabled.

IBP Operation Procedures

Step 1

Attaching equipment to patient and the PIC System

1. Inspect the IBP Adapter Cable (001957) for any damage or fraying. Replace if damage is apparent.
2. Attach the IBP Adapter to the PIC System in the IBP1 or IBP2 Connector.
3. Attach the IBP Adapter Cable to the interface cable and to the transducer according to your transducer manufacturer's directions.

NOTE: Contact Welch Allyn for appropriate interface cable for your transducer.

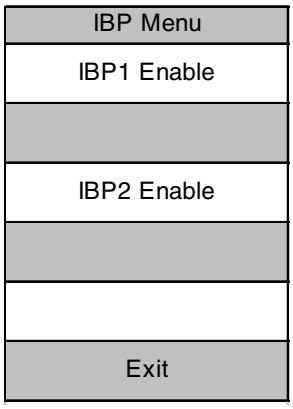
Step 2

Setting up the PIC to view IBP information

Follow the steps below to configure the PIC System's IBP.

1. Turn ON the PIC.
2. Select the **IBP QUICK ACCESS** button to bring up the IBP menu.

3. Select IBP1 Enable or IBP2 Enable, depending on the channel used



NOTE: This will cause the Trace window to display an ECG waveform on top and then display your choice of waveform for IBP1 or IBP2 below. ***Check Sensor*** *will appear in the pressure readings window if a waveform is displayed and no sensor is detected in the IBP connector. If a sensor is detected,* ***Zero Sensor*** *will appear in the Pressure Readings window.*

Step 3 — Zeroing the Sensor

Before IBP information can be viewed in the selected waveform window, the operator must zero the transducer. Zeroing the pressure transducer is extremely important to insure the displayed pressure measurements are accurate.

Transducers should be zeroed frequently. Prior to initiating a change in treatment based upon the measured pressure data, the operator should zero the transducer and confirm the pressure measurement.

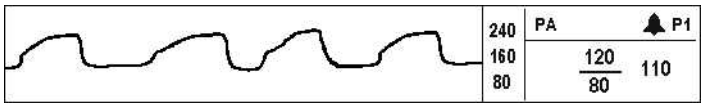
TO ZERO A TRANSDUCER:

1. Go to the Quick Access window and press **NEXT** to view the **IBP** option.
2. Press **IBP** to view the Invasive Pressure Menu.
3. Select IBP1 Enable. Ensure that the channel enabled is the channel connected.
4. Select IBP1 Setup.
5. Close the transducer stopcock to the patient.

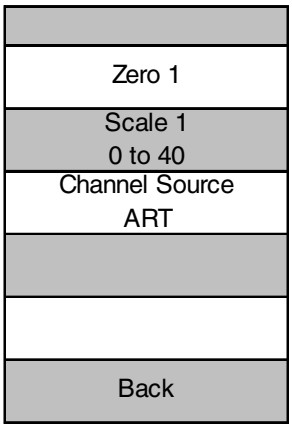
Inv. Pressure
IBP1 Disable
IBP1 Setup
IBP2 Enable
Exit

6. Open the venting stopcock to the air (atmosphere).
7. Press the **ZERO 1** button to zero the transducer connected to the IBP1 Connector. The **Zero Sensor** will change to three dashed lines (---) followed by a pressure reading of 0.
8. Close the Venting Stopcock to the air (atmosphere).
9. Open the Transducer Stopcock to the patient. The patient's pressure measurement will be displayed in the Pressure window.

Zero 1
Scale 1 0 to 300
Channel Source PA
Back



Step 4 Scale Adjustment



The operator can adjust the scale of the desired IBP waveform by pressing the **SCALE** button in the IBP Setup menu.

Each press of the button rotates through the following scale settings: 0-40, 0-80, 0-160, 0-300.

Displayed Waveform Names

To assist the operator in identifying each transducer's source, the pressure waveform display can be labeled with a specific pressure name. It is important that you properly label the transducer in IBP1 and IBP2 with the appropriate pressure name.

Source Name	Description	Displayed Values
ART	Arterial Pressure	Systolic, Diastolic, MAP
CVP	Central Venous Pressure	MEAN
ICP	Intracranial Pressure	MEAN
PA	Pulmonary Arterial Pressure	MEAN
P	Miscellaneous Pressure	MEAN

Step 5 Selecting the Channel Source

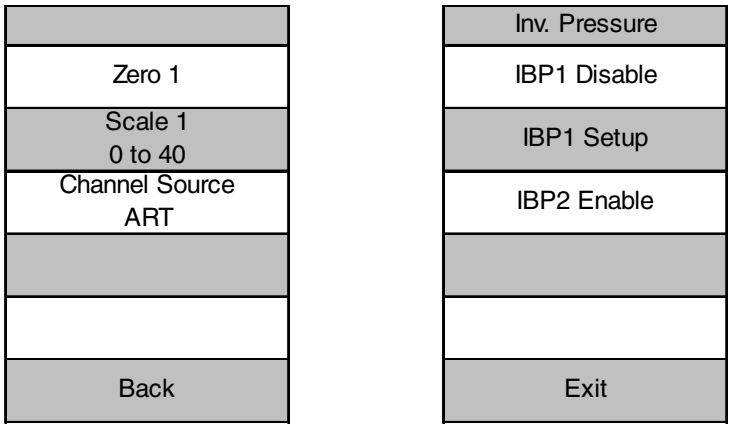
The operator can select the channel source of the desired channel by pressing the **CHANNEL SOURCE** button in the IBP Setup Menu.

Each press of the button rotates through the following channel source settings: **ART** (Arterial Pressure), **CVP** (Central Venous Pressure), **ICP** (Intracranial Pressure), **PA** (Pulmonary Arterial Pressure), or **P** (for miscellaneous pressure).

Step 6

Exiting the Invasive Pressure Menu

Once you have zeroed the transducer, adjusted the scale, and selected the channel source, you can press **BACK** to exit the IBP setup, then press **EXIT** to view patient data.



Printing IBP Traces

IBP Traces that are displayed on the screen will be printed when the print button is pressed (or when the summary event is printed) if the Recorder->Traces Menu->Printer Traces selection is set to 3 traces.

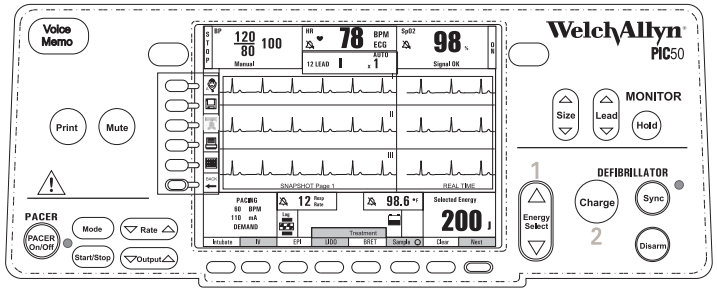
CHAPTER 18: 12-LEAD INTERPRETIVE ANALYSIS *(OPTIONAL)*

This chapter describes the controls, displays, and operation of the 12-Lead Analysis module. It includes a discussion of the process for performing an analysis of 12-Lead ECG data and transmitting it to a remote location via fax. This chapter also includes information on using the 12-Lead Analysis Setup menu to enter remote location address and fax information.

Overview:

CAUTION: Read chapter 1, Safety Information, before proceeding with this addendum.

NOTE: Before reading this addendum, review chapter 4, ECG Monitoring and chapter 5, 12-Lead Monitoring for information on basic ECG and 12-lead displays, operations, and functions.



Warnings and Precautions

The Welch Allyn 12-Lead Resting ECG Analysis software is a computerized ECG interpretation library. When integrated in an electrocardiograph, the ECG Analysis Library is intended to perform ECG waveform rhythm measurements and interpretations on 12-Lead resting ECG signals.

NOTE: The measurements and interpretations generated by the library are intended to assist in diagnosis and should be reviewed by qualified physicians. These measurements and interpretations are not intended as the sole basis for diagnosis.

12-Lead Interpretive Analysis

12-Lead Interpretive Analysis is an option (part number 971018) purchaseable through the upgrade menu (see chapter 13). It enables the PIC to perform interpretive analysis of 12-Lead ECG and allows the user to display, print, or fax the results.

12-Lead Data Acquisition and Analysis

12-Lead Interpretive Analysis is a two-part process–data acquisition followed by data analysis. Collected data may be analyzed immediately after it is collected or it may be saved temporarily (if the PIC has an installed memory card) and recalled for analysis.

For both 12-lead data acquisition and 12-lead interpretive analysis, the user may select either a diagnostic frequency response or a filtered frequency response.

NOTE: The ECG traces printed by the chart recorder and the printout generated when a fax is sent are produced using either the diagnostic or filtered diagnostic as selected by the supervisor. There are two diagnostic frequency options: 0.05-150 Hz Diagnostic Frequency Filter and 0.25-40 Hz Filtered Diagnostic Frequency Filter. See chapters 5 and 13 for information on switching between these two options.

The 12-Lead Interpretive analysis process described in the following procedure may be run in either Automatic or Manual mode.

- **Automatic** - 12-lead data is collected and analysis follows immediately without operator intervention.
- **Manual** - 12-lead data is collected and the operator initiates data analysis.

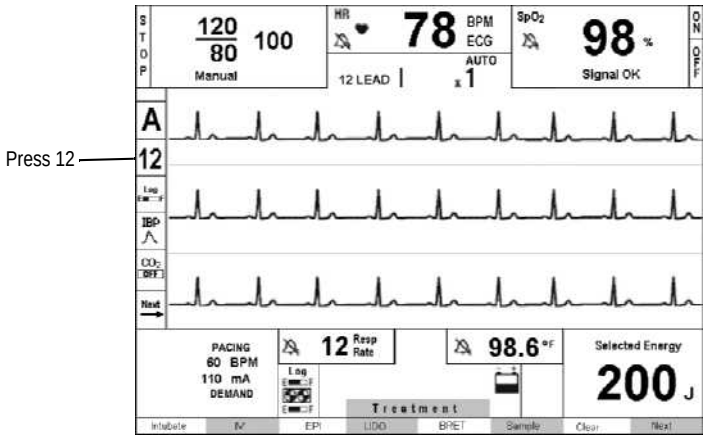
Procedure

12-LEAD DATA ACQUISITION AND ANALYSIS

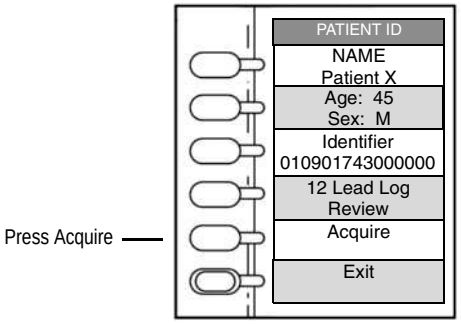
This procedure provides instructions for the collection and analysis of 12-lead data.

NOTE: This procedure is consistent with the acquisition of 12-lead data described in chapter 5. See chapter 5 for additional information on the various functions of 12-Lead Analysis, including collecting and analyzing the data.

1. Make sure a 12-lead cable is properly attached to the PIC and to the patient's chest. See Chapter 5.
2. Press the PIC System Power Switch to turn on the unit. The PIC will sense the patient cable and the words 12-LEAD will display on the screen. The **12** quick access button (on the side menu) will be active.

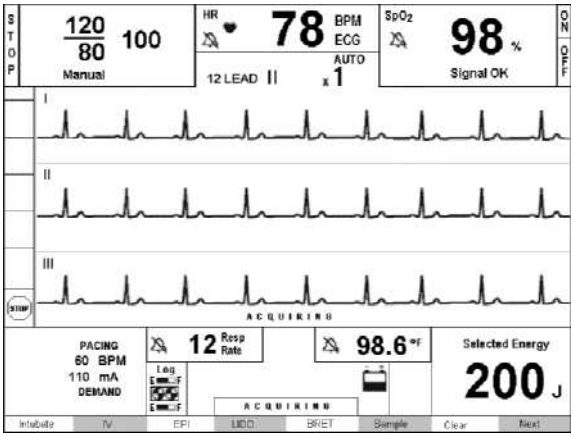


3. Press the **12** quick access button to display patient information on the side menu.



4. (optional) Enter the information for a new patient or select the patient's name from the list of previously entered patients. See chapter 5 for more information.

5. Press the **ACQUIRE** quick access button to begin 12-lead data collection. It will take 10 to 15 seconds to collect the data. The word ACQUIRING will flash in the center of the screen and in the user menu at the bottom of the screen.



NOTE: Push the **STOP** *button to abort the data acquisition process. At the end of data collection, the word SAVING will flash if a memory card is installed in the PIC.*

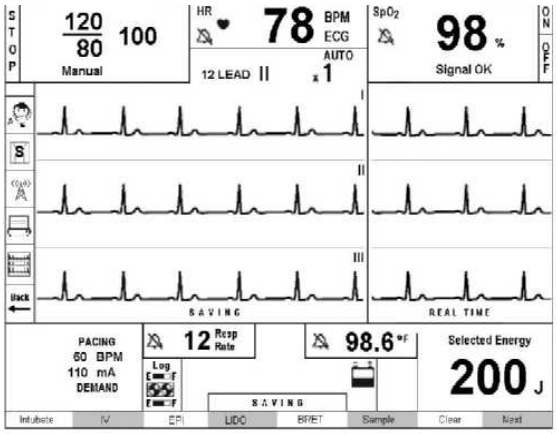
NOTE: Voice memo is turned off during the 12-lead acquisition process.

After data collection, a snapshot of the results will display on the screen. In addition, three traces of continuing real-time ECG monitoring will display on the right-side of the screen.

If the PIC is operating in Automatic mode, the analysis will begin immediately. Go to step 7.

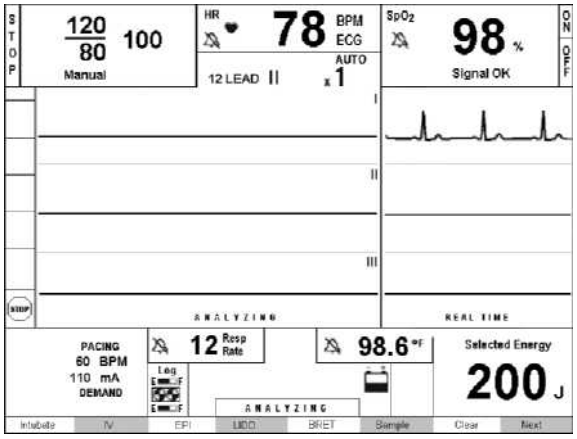
If The PIC is operating in Manual Mode, go to step 6.

In Manual mode, press Analysis

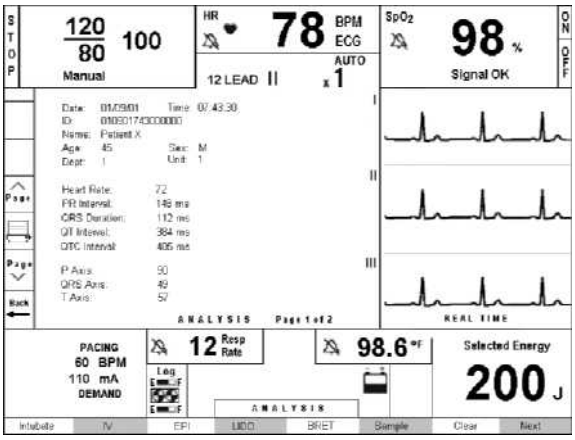


6. (If operating in Manual Mode) Press the **ANALYSIS** ( ) quick access button. The word ANALYZING will display in the center of the screen and in the user menu at the bottom of the screen. Analysis will take 10 to 20 seconds. During this time the screen will be blank except for one real-time ECG trace.

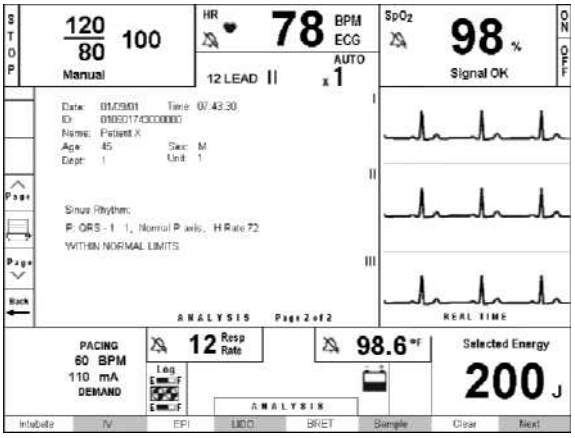
NOTE: Press the **STOP** *button to abort the Analysis process.*



When analysis is done, the results will display on the screen.

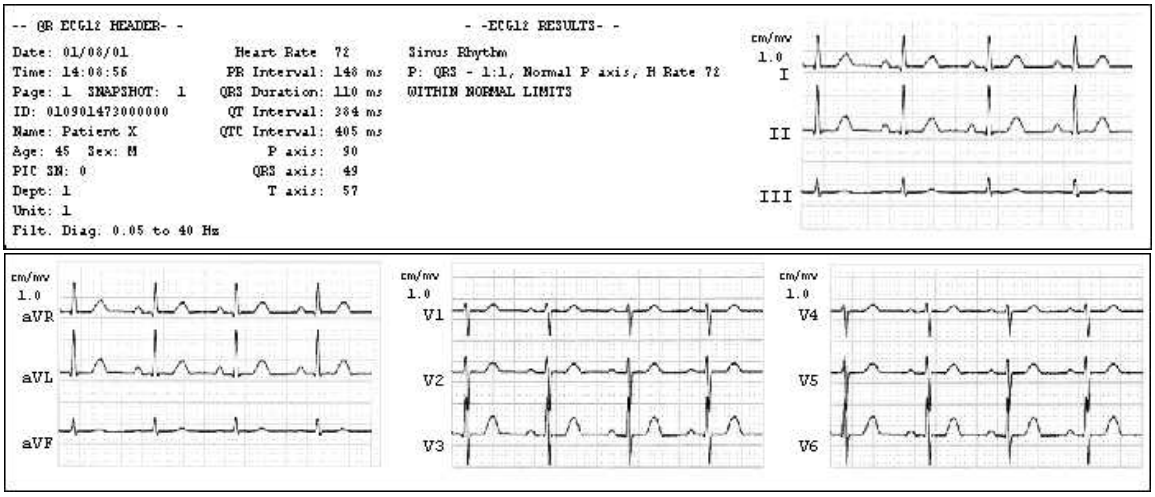


7. Press the **PAGE UP** and **PAGE DOWN** quick access buttons to scroll through the analysis results. The real-time ECG trace will continue to display.



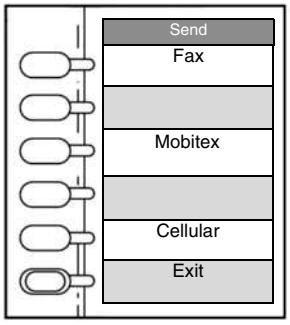
8. (Optional) **Print the results**. Press the **PRINTER** ( ) quick access button to print the analysis data to the chart recorder.

The chart recorder produces a printout along a continuous strip of paper.

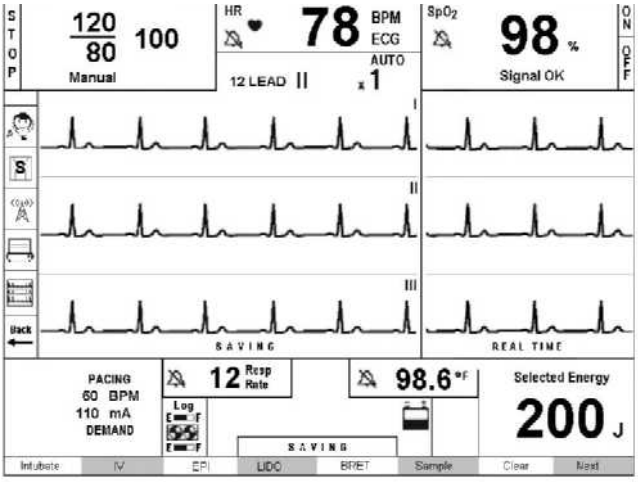


9. (Optional) **Fax or transmit the results**. Press the **BACK** quick access button to retrieve the analysis data. The word RETRIEVING will flash in the center of the screen and in the user menu at the bottom of the screen.

   Press the **FAX/WIRELESS** ( ) quick access button on the side menu to display the Send menu. To send a fax, press Fax then select a fax number, you may also enter a fax number. See Chapter 5 for more information. To send a wireless transmission, press Mobitex or Cellular then select a MAN address. See Chapter 19 for more information.



   Press the quick access button next to the desired fax number to dial the number and send the fax. The fax printout will contain the 12-Lead Interpretive Analysis and the 12-Lead Acquisition data as shown in the following sample.



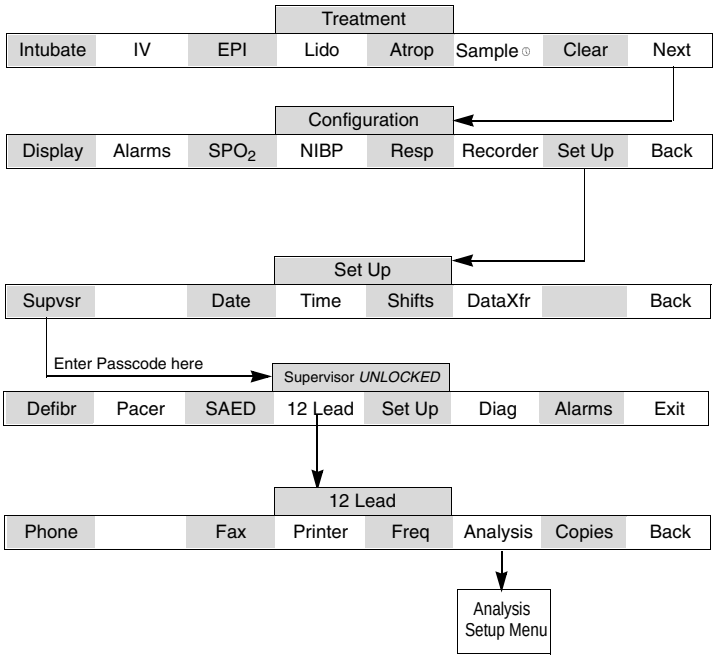
11. (Optional) **Save the results**. Press the **DISK** quick access button on the side menu to save the 12-Lead Interpretive Analysis to the disk on the memory card.

    The PIC will Auto-Save a 12-Lead Interpretive Analysis to the memory card when it is installed before the analysis button is pushed.

NOTE: This option is only available on PIC systems that have a memory card installed.

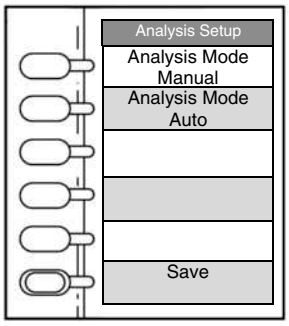
Select Automatic or Manual Mode

Use the 12-Lead Analysis Setup menu to select the Automatic or Manual mode. This menu is available through the Supervisor Treatment/Configuration Menu options. See chapter 13 for more information.



Analysis Setup Menu

The Analysis Setup menu allows the Supervisor to select the Manual or Automatic mode for analyzing 12-lead data. The Manual mode requires the operator to press the Analysis button to start the analysis. The Auto (Automatic) mode starts an analysis at the end of the data acquisition cycle.



CHAPTER 19: WIRELESS TRANSMISSION

This chapter provides information and operation procedures for optional wireless transmission of 12-lead information.

Chapter Overview:

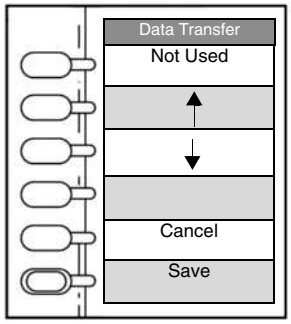
Overview

Wireless transmission is available for 12-lead units and makes it possible to send acquired and analyzed 12-lead snapshots to a PC. There are two modes of wireless transmission, Mobitex and Cellular. Each requires special software and accessories to send and receive wireless transmissions. Contact your sales representative for details.

Purchase the wireless transmission option, from the Supervisor>Setup>Upgrade menu. See chapter 13 for instructions. Contact your sales representative for details and necessary codes.

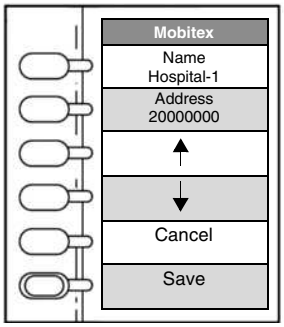
Mobitex Configuration

Selecting the Mode of Transmission



From the Configuration menu select Setup then DataXfr. Use the Data Transfer menu to select the type of wireless transmission. Selecting Mobitex activates the Mobitex™(1) driver to monitor the communication port for a Mobitex™ modem.

Entering a MAN Address



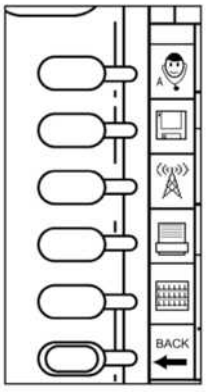
From the Configuration menu select Setup>Supervisor>Setup>DataXfr> Mobitex. Use this menu to program up to 16 different MAN addresses for Mobitex™ modems.

Sending a Mobitex Wireless Transmission

On average, sending a Mobitex™ transmission takes 45 seconds.

Press the "**12**" quick access button to display the Patient ID menu. Either acquire a 12-lead snapshot or retrieve the desired snapshot from the 12-lead log review, see chapter 5 for instructions. The 12-lead quick access buttons will appear.

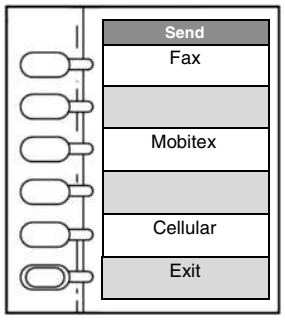
1. Press the **FAX/WIRELESS** button to open the Send menu.



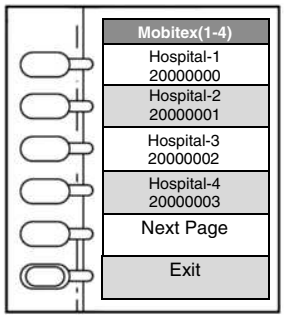
1. Mobitex is a trademark of Telia AB, Sweden.

2. Select Mobitex.

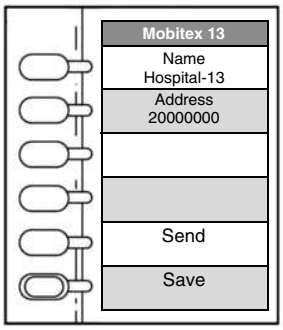
NOTE: Mobitex must be selected in the user Setup>DataXfr menu.



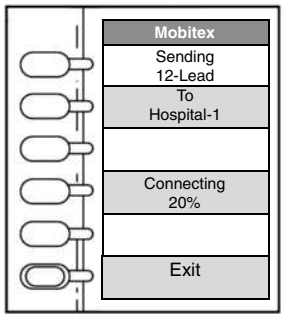
3. Select the receiving Hospital address. 1-12 are programmed in the Supervisor>Setup>DataXfr> Mobitex Menu. Selecting one of the programmed numbers opens the status menu, see step 5. 13-16 are user editable, selecting one of editable numbers opens the editing menu.



4. Pressing the **ADDRESS** button opens a numeric entry screen to manually edit the MAN address. When finished editing, save the numeric entry and press the **SEND** button.



5. The status menu displays the name of the address that is receiving the transmission, the status events and the errors that occur.



Mobitex Status Messages

Status messages will appear in the left menu during the 12-lead wireless transmission.

Opening: The modem is initializing the Mobitex™ modem with the local settings.

Connecting: The local modem is communicating with the modem at the remote address to establish a connection.

Sending: Displays the percentage of the transmission sent.

Disconnecting: The local modem is communicating with the modem at the remote address to terminate a connection.

Complete: Displays when the transmission successfully completes.

Mobitex Error Messages

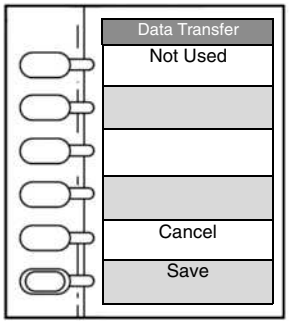
NOTE: If the Mobitex™ modem has just been powered up, allow at least one minute for the PIC to establish network communication.

NOTE: Excessive network traffic can cause some of the errors to occur.

Error	Description	Resolution
Modem-Offline	Indicates that the Mobitex™ modem is not ready.	Verify that the Mobitex™ modem is connected and has power.
No Modem Resp (No Modem Response)	After sending a message to the Mobitex™ modem, the PIC timed out waiting for an acknowledgement.	Verify that the Mobitex™ modem is connected and has power. Cycle the power to the Mobitex™ modem.
No Net Resp (No Net Response)	The PIC successfully sent the data to the Mobitex™ modem, but the modem did not receive a confirmation from the Mobitex™ network.	Wait 30 seconds and retry sending.
No Host Resp (No Host Response)	The PIC unsuccessfully connected to the host computer.	Retry sending the data. If problem persists, verify that the host computer is operating properly.
Host Offline	Confirmation not received from host computer after transmission.	Retry sending the data.
Modem-Failed	Modem is online but cannot be initialized and a modem failure and invalid message were received from the Mobitex™ modem.	Cycle the power to the Mobitex™ modem and retry sending the data after 30 seconds.

Error	Description	Resolution
Network-Offlin (Network-Offline)	The Mobitex™ modem has lost contact with the Mobitex™ network for more than ten seconds.	Verify antenna is connected and placed correctly. If problem persists, verify geographical coverage with network carrier.
Net Buf Full (Network Buffer Full)	The Mobitex™ modem cannot receive messages from the network.	Cycle the power to the Mobitex™ modem and retry sending the data after 30 seconds.
Buffer Full or Rec Buf Full (Receiver Buffer Full)	The Mobitex™ modem cannot receive messages from the PIC.	Cycle the power to the Mobitex™ modem and retry sending the data after 30 seconds.

Cellular Configuration



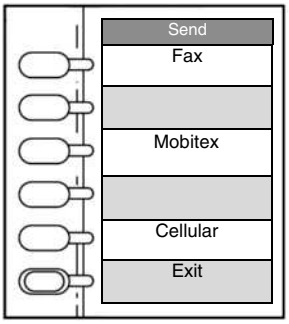
From the configuration menu select Setup then DataXfr. Use the Data Transfer menu to select one of the following:

Mobitex - If the Mobitex option has been purchased

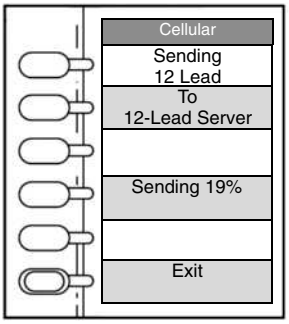
Not Used - If the Cellular option has been purchased but the Mobitex option has not been purchased

Sending a Cellular Wireless Transmission

1. Press the **FAX/WIRELESS** button to open.
2. Verify that the Serial port is connected to the eSync device.
3. Select **CELLULAR**.



4. The status menu displays the status events and the errors that occur.



Cellular Status Messages

Status messages will appear in the left menu during the 12-lead transmission to the eSync device.

Opening:	Initializing the serial port.
Sending:	Displays the percent of the transmission delivered to the eSync device.
Complete:	Delivery of the 12-lead to the eSync device is complete.

NOTE: This does not mean that the 12-lead has been transmitted to the 12-Lead Server. Refer to the status on the eSync device for the actual wireless transmission status of the 12-lead.

Cellular Error Messages

Error	Description	Resolution
No Host Response	The PIC cannot establish communication with the eSync device	Verify serial connection between the PIC and eSync device. Verify operation of the eSync program.

APPENDIX A: SPECIFICATIONS

This chapter provides specification information for the Welch Allyn Portable Intensive Care (PIC) System components, required and optional.

Chapter Overview:

Data Acquistion and Analysis

The PIC is no longer automatically configured to a certain frequency response. There are two diagnostic frequency options: 0.05-150 Hz Diagnostic Frequency Filter and 0.05-40 Hz Filtered Diagnostic Frequency Filter. See chapters 5 and 13 on switching between these two options.

Defibrillator

Waveform Details: The tables below provide details of the waveforms delivered by the PIC when connected to resistive loads of 25, 50, and 100 Ohms and set to its maximum output. The waveforms are characterized by typical values for peak current (I_p), and for monophasic: duration of the output phase (t) or for biphasic: duration of the first output phase (t_{phase1}), and duration of the second output phase (t_{phase2}). The values shown are within 10%.

Waveform: Welch Allyn Model PIC Truncated Exponential Monophasic

Load (Ohms)	I_p (Amps)	t(ms)
25	53.1	10.0
50	27.1	18.8
100	13.7	36.4

Waveform: Welch Allyn Model PIC Truncated Exponential Biphasic

Load (Ohms)	I_p (Amps)	t_{phase1}(ms)	t_{phase2}(ms)
25	52.24	5.64	3.78
50	26.50	11.58	7.68
100	13.33	17.40	9.36

Output Energy Accuracy:

+/- 10% or 1J (whichever is greater) at 50 ohms
+/- 15% or 1J (whichever is greater) at 25 to 100 ohms

Energy Select:
External: 2, 5, 7, 10, 20, 30, 50, 70, 100, 150, 200, 300, 360 J.

Charge Time:
< 7 seconds @ 360 J (with a SmartPak Plus battery after 15 discharges).
<9 seconds @ 360 J (with a SuperPac battery after 15 discharges).
< 15 seconds @ 360 J (no battery, 90% AC mains voltage)

Charge Indicator: Audible and graphic.

Output:

Adult paddles, pediatric adapter and multipurpose hands-free adapter available.

Synchronizer: Delivers energy within 60 msec.

Disarm: Front panel switch.

Monitor / Display:

Input:

3-lead, 5-lead, or 12-lead patient cable, paddles, or multi-purpose hands-free adapter.

Size: 6.5 inches (16.5 cm) diagonal, non-fade.

Type: Electroluminescent (EL), color (TFT), or monochrome (LCD)

Display Resolution: 640 x 480 pixels.

Sweep Speed: 25 mm / sec.

Lead Selections: Paddles (Pads), I, II, III, AVR, AVL, AVF, V1-6.

Frequency Response: (User-selectable).

2 to 20 Hz	Limited mode
1 to 40 Hz	Monitor mode (before Rev. T8/U8)
0.67 to 40 Hz	Monitor mode (SW Rev. T8/U8)
0.05 to 150 Hz	Diagnostic mode
0.05 to 40 Hz	Filtered Diagnostic Mode (SW Rev. T6A/U6A)
0.35 to 40 Hz	Filtered Diagnostic Mode (SW Rev. T7/U7)
0.25 to 40 Hz	Filtered Diagnostic Mode (SW Rev. T8/U8)

(automatically sets chart recorder response)

Common Mode Rejection:

Complies with AAMI EC13-1992 section 3.2.9.10.

Tall T-Wave Rejection:

Meets AAMI EC13-1992, section 3.1.2.1c for 1.2 mV T-wave (1.0 mV with diagnostic response) and 1mV QRS.

Diagnostic Signals Applied to Patient Connections:

Leads off / active noise suppression sensing circuit is < 0.1mA DC. The impedance / respiration detector signal frequency is 45 ± 4kHz at 78mA RMS (117mV RMS into an impedance of 1.5kW) pseudo-sinewave.

Heart Rate Meter: 20 to 300 BPM.

Heart Rate Alarms: User-selectable.

Size: 0.125, 0.25, 0.5, 1, 2, 4 cm/mv and auto-ranging.

Aspect Ratio: 0.5, 0.1, 0.4, 0.8, 1.6, respectively.

ECG Output: 1 V/mV.

Heart Rate Meter Response Time:

Responds to a 40 BPM step increase in heart rate in 2 to 4.5 seconds per AAMI EC-13-1992, section 3.1.2.1.f. Responds to a 40 BPM step decrease in 1.4 to 3.9 seconds per AAMI EC-13-1992, section 3.1.2.1.f. Response times include a 2.5-second display update interval.

Heart Rate Response to Irregular Rhythm: (AAMI EC13-1992, section 4.1.2.1.e.)

Ventricular Bigeminy: 80 BPM (expected)
Slow Alternating Ventricular Bigeminy: 60 BPM (expected)
Rapid Alternating Ventricular Bigeminy: 120 BPM (expected)
Bidirectional Systole: 45 BPM (expected)

Tachycardia Response Time:

Response time to tachycardia alarm is on average 3.43 seconds (with a range of 1.15 to 10.69 seconds) per AAMI EC-13-1992, section 3.1.2.1.g. Response times include a 2.5 second display update interval.

Alarms

Heart Rate, BP, SpO_2, Resp & Temp Alarm:

Audible: 5 pulse, 800 tone, with a PW of 150 msec, a PRI of 225 msec, and a repetition interval of 10 seconds.

Visual: Heart Rate Alarm causes the displayed heart rate to flash at 2 Hz. This display is located at the top of the display and is 0.4" high and 0.28 to 0.840" wide depending on number of digits in the heart rate. Color is amber, black, white, or whatever the color the display text is.

Lead Fault Alarm:

Audible: 3 pulse, 500 Hz, triplet tone with a PW of 200 msec, a PRI of 310 msec. When the HR alarm is set or the pacer is on, the lead fault tone repeats at a repetition interval of 20 seconds.

Visual: Lead Fault condition causes a ”LEAD FAULT” message to be displayed on the trace along with a dashed line the width of the trace. The text is 0.18" high and is the color of the display text. The dashed line is 5" long, the width of the display. The signal is not modulated.

Physiological Alarms (BP, SpO_2, Resp & Temp):

Audible: See Heart Rate Alarm

Visual: Physiological alarms cause the displayed parameter to flash at 2 Hz. Color is amber, white or the same as the display colored text.

Mute Duration: 90 seconds.

Recorder

Type: High-resolution thermal array.

Annotation: Time, date, ECG lead, ECG gain, heart rate, defibrillation and

pacing parameters and treatment summary ACLS events.

Paper Width: 50 mm.

Paper Speed: 25 mm/sec, 50 mm/sec, 12 Lead, 50 mm/sec

Delay: 6 seconds.

Frequency Response:

Automatically set to monitor's frequency response.

Treatment Summary:

7 switches to record key ACLS events (IV, INTUB, EPI, LIDO, ATROP, etc.). Automatically logs into memory the type of event, time and ECG sample.

Tx Summary Log: 28 ECG events or 300 non-ECG events.

Record Modes: Manual and automatic (User-configurable).

Battery

Standard Type: NiCad 12 volt - Welch Allyn SmartPak Plus™.

Standard Capacity:

Up to 2 hours ECG monitoring or 60 full-energy discharges or 1.5 hours combined ECG, SpO_2 and BP monitoring while pacing. Actual operating times will depend on the number of features activated and the duration of their use. Proper battery care is required to maintain maximum available capacity.

Self-Test:

Bi-color LED indicates battery charge state. Green = usable charge, Red = requires charging.

Low Battery Indicator:

Flashing low battery icon on display and flashing LED on battery.

Recharge Rate: 80% in 3.5 hours. 100% in 4.5 hours.

High Capacity Type: NiMH 12 volt - Welch Allyn SuperPac™.

High Capacity:

Up to 4 hours ECG monitoring or 110 full-energy discharges or 3 hours combined ECG, SpO_2 and BP monitoring while pacing. Actual operating times will depend on the number of features activated and the duration of their use. Proper battery care is required to maintain maximum available capacity.

Recharge Rate: 80% in 7.5 hours. 100% in 9.5 hours.

Multiple Paired Contacts:

Insures quick, error-free insertion and backup reliability.

General

Weight: 10 pounds (4.95 kg) (basic configuration).

Size: 13 x 12.5 x 5.3 inches (33 x 31.8 x 13.5 cm).

Operating:

Temperature*: 0 to 45° C
Humidity* (NC): 15 to 95% RH (30 to 90% with CO2 probe)
Vibration*: MIL-STD 810E
Shock / Drop*: MIL-STD 810E
Altitude: Up to 4572 M (15,000 feet)

Transport and Storage:

Temperature: -30 to 70°C (-20 to 70°C with CO2 probe)
Humidity: 15 to 95% RH (non-condensing)
Atmospheric pressure: 860 to 1060 hPa
Shock/vibration: ISTA 1A

Enclosure Protection*:

Solid Foreign Object: IEC 529, IP2X
Water: IEC 529, IPX4.

* All tests performed per AAMI DF-2 Defibrillation Standard.

Operating Power:

Welch Allyn SmartPak or auxiliary power from either Welch Allyn Quick Charger (971104) or the Welch Allyn Power Supply/Paddle Tray (971029).

Electromagnetic Compatibility		
Category	**Standard**	**Level**
Radiated Emissions	EN55011	CISPR11
Conducted Emissions	EN55011	CISPR11
ESD	EN61000-4-2	8KV air 6KV contact
Radiated Susceptibility	EN61000-4-3	3 V/M (10 v/m AAMI DF2 4.3.18.1)
Electrical Fast Transients	EN61000-4-4	1KV
Electrical Fast Surges	EN61000-4-5	2KV
Conducted Susceptibility	EN61000-4-6	3 V/M, 10 V/M
Magnetic Field Emissions	MIL STD RE101	(AAMI DF2 4.3.18.1)
Magnetic Field Susceptibility	MIL STD RS101	1 Gauss, 47 Hz - 1.8 KHz

Pacer

Type: External transmittances pacing.

Pacer Rate: 30 to 180 BPM ± 5%.

Output Current:

30 to 180 mA ± 10% or 5 mA (whichever is greater).

Modes: Demand and asynchronous.

Status Indicators:

ECG lead fault, pace lead fault, pace marker on monitor and chart, start/stop LED

Pulse Type: Rectangular, constant current.

Pulse Width: 20 ms.

Refractory Period: 250 ms.

Output Protection: 360 Joules.

SAED Rhythm Recognition Performance

The PIC SAED algorithm exceeds the requirements of ANSI/AAMI DF39-1993 section 3.3.18 and the sensitivity and specificity levels recommended by the AHA (*Automatic External Defibrillators for Public Access Use: Recommendations for Specifying and Reporting Arrhythmia Analysis Algorithm Performance*). The test database includes shockable rhythms consisting of ventricular fibrillation rhythms (>99uV) and wide-complex ventricular tachycardia at a rate greater than 160 BPM. Non-shockable rhythms include various sinus rhythms including supraventricular tachycardia, atrial fibrillation, atrial flutter, sinus rhythm with PVC's, asystole, pacemaker rhythms, and ventricular tachycardia with a rate less than 160 BPM and/or narrow complexes.

Rhythm Recognition Performance

Rhythm Class	ECG Test Sample Size	Performance Goal	Observed Performance	90% one-sided lower confidence level	Conclusion
Shockable: VF	90	>90% sensitivity	98.7%	97.2%	PIC meets the AAMI DF39 requirement and AHA recommendation
Shockable: VT	33	>75% sensitivity	90.7%	84.6%	PIC meets the AAMI DF39 requirement and AHA recommendation
Nonshockable: NSR	349	>99% specificity (AHA)	100%	100%	PIC meets the AAMI DF39 requirement and AHA recommendation
Nonshockable: asystole	10	>95% specificity	100%	100%	PIC meets the AAMI DF39 requirement and AHA recommendation
Nonshockable: all other rhythms	242	>95% specificity	98.7%	97.8%	PIC meets the AAMI DF39 requirement and AHA recommendation

CO_2 (optional)

Mainstream CO_2: CO_2 and $ETCO_2$ display

Range: 0 to 76 mmHg

Accuracy CO_2: + 4 mmHg (< 40 mmHg), + 10% (> 40 mmHg)

Resolution: 1 mmHg

Respiration Range: 2 - 60 bpm

Apnea Indication: 20 seconds (CO2 level < 5 mmHg)

Pulse Oximeter (optional)

Measurement Range: 31 to 99%.

Heart Rate Range:

30 to 250 BPM ± 5% or 5 BPM whichever is less.

Accuracy:

81 to 99% = ± 2%, 70 to 80% = 3%, 0 to 69% unspecified.

Update Period: Every pulse after 4 valid pulses.

Messages:

Check Probe
Searching
Signal OK
No Signal
Low Perfusion
Alarms Enabled/Disabled (icon)
Testing.

Alarm Limits: 60 lower limit, 70 upper limit to 99%.

Probe: Finger or multi-site probe.

Blood Pressure (optional)

Technique:

Non-invasive oscillometric method, referenced to auscultatory standard, using the 5th Korotkoff sound as the diastolic reference.

Operating Modes: Automatic and manual

I**nitial Cuff Inflation**:

Adult and child: 154 mmHg
Infant: 125 mmHg.

Automatic Cycle Times: 1, 2, 3, 5, 10, 30 minute intervals.

Blood Pressure Range:

Systolic: 30 to 245 mmHg, diastolic: 10 to 210 mmHg.

Heart Rate Range: 30 to 250 BPM ± 10% or 5 BPM.

Blood Pressure Accuracy:

+5 mmHg mean error, +8 mmHg standard deviation.

Blood Pressure Validation:

Blood pressure measurements determined with this device are equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method within the limits prescribed by the American National Standard Institute.

Alarms:

Artifact
Check Cuff
Tighten Cuff
Cuff Leak
Motion

Alarm Limits:

Systolic: 30 to 245 mmHg
Diastolic: 25 to 210 mmHg

IBP

Number of Channels: 2

Display:

Numerical and one or two graphical waveforms

Numerical: Systolic, Diastolic, Mean pressure

Waveform Display Ranges: 40, 80, 160, 300 mmHg

Waveform Labels: ART, CVP, PA, ICP, Misc P

Pressure range: -30 to 300 mmHg

Accuracy: +/- 2 mmHg or 2% of reading, whichever is greater, plus transducer error.

Transducer:

Sensitivity: 5uV/V/mmHg

Offset: +/- 125 mmHg including transducer offset

Excitation Impedance Range: 150 to 10,000 ohms

Excitation Voltage: 4.75 +/- 0.25 VDC

Connector: 6-pin circular MS3100 series

Connect to:	A	B	C	D	E
Signal Type	Sig (-)	Exc (+)	Sig (+)	Exc (-)	shield

Temperature with NIBP (optional)

Measurement Range: 0° to 50° C.

Accuracy: ± 0.2° C.

Resolution: 0.1° C.

Scale: Fahrenheit or Celsius.

Probe: YSI Series 400.

Alarm Limits: High (99-109°F) (37 - 42°C) and low (85-98°F) (29-36°C) alarm limits.

Welch Allyn Quick Charger

Mains (Line) Voltages:

100 to 240 VAC (four user-selectable ranges: 100, 120, 220, 240 VAC)

Mains (Line) Frequency: 50 to 60 Hz

AC Power Consumption:

50 W-while charging batteries only
70 W-while powering monitor
300 W-while charging defibrillator

Charger Bays: Three (charges three batteries concurrently).

Indicators:

Battery Charging/Ready
Reconditioning
Defibrillation Test Indicator
Power On

Reconditioner: Simple, one button operation.

Reconditioning Load: 220 mA ± 10% constant.

Recondition Cycle Time: Dependent on battery capacity and state of charge (typically < 12 hours).

External Power Output Voltage: 13 Volts ± 0.65 V.

Fuse Ratings: Dual Line Fuses

120 VAC-2 Amp SB (Welch Allyn # 500218)
220 VAC-1 Amp SB (Welch Allyn # 500241)

General Charger:

Operating Temperature: 0 to 45°C
Humidity: 15 to 95%
Size: 11.5 x 7.25 x 4.4 inches (29.2 x 18.4 x 11.2 cm)

Defibrillator Tester: Built-in 50 Ohm load.

Paddle Holder/Charger:

Mains (Line) Voltage: 100 to 240 VAC + 10% (autoranging)

Mains (Line) Frequency: 50 to 60 Hz + 5%

AC Power Consumption: 18 W (Typical), Maximum 190 W (while charging defib).

Summary of Studies of Waveform Safety and Effectiveness

Introduction

Over 30 years ago, Medical Research Laboratories (MRL) patented a unique monophasic truncated exponential waveform, which utilized a low peak current, impedance compensated defibrillation waveform. The MRL monophasic waveform was developed as an alternative to the monophasic damped sine (MDS) waveform (often referred to as the Edmark waveform) defibrillator, which was associated with higher peak currents and did not actively compensate for varying patient impedances. In fact, the MRL monophasic waveform defibrillator delivers less than half of the peak current of an MDS waveform defibrillator at equal delivered energies. A new Welch Allyn defibrillator (the Welch Allyn PIC) has been introduced, which offers a biphasic truncated exponential waveform that incorporates MRL's original low peak current, impedance compensation design. The MRL Orbital^{TM} biphasic truncated exponential waveform has been extensively tested in multiple scientific safety and effectiveness studies. Over 524 fibrillation/defibrillation shock episodes have been conducted using the MRL Orbital^{TM} Biphasic waveform comparing it to MDS, MTS and another commercially available 2kV biphasic (360 J capable) defibrillators. Results of three of the scientific safety and effectiveness studies are summarized below.

Study 1

Objective - To evaluate the MRL Orbital^{TM} Biphasic waveform defibrillator against a monophasic damped sinusoidal waveform defibrillator.

Methods - A canine model (n=5, 71±7 lbs) was used in a study that was approved by the Institutional Animal Care and Use Committee. The animals were anesthetized with 20 mpk sodium pentothal i.v., and maintained as required through an intravenous catheter in the foreleg. The external jugular vein was cannulated and a bipolar pacing catheter was introduced under fluoroscopic control and advanced into the right ventricle. The femoral artery was cannulated and an intra-arterial line was placed for continuous measurement of arterial blood pressure. The chest was shaved and defibrillating patch electrodes (R2 part number 3200-1715) were placed on the left and right chest walls.

Fibrillation was induced by delivering 60 Hz current to the right ventricular electrode. The energy required to defibrillate was determined by a protocol that has been used in several other biphasic comparison studies. An initial shock strength of 50 to 70 Joules was

used. If successful, VF is reinduced after a 4 minute rest period, and the shock strength is reduced by approximately 20% for the next defibrillation attempt. If the initial shock fails, a rescue shock is delivered, and after a rest period, VF is again induced. The energy is now increased about 20% for the next defibrillation attempt. This procedure was continued until at least 3 reversals in result were observed with each waveform. Two ED50 estimation procedures were run in parallel, with the device being used alternated on each shock. In practice, actual clinical units were used, so the energy steps were limited to those selectable on the devices tested.

Results - The study consisted of 82 total fibrillation/defibrillation episodes. ID50 peak currents and ED50 delivered energies are shown below for each group. The mean impedance for these animals was 62 ohms. The mean ED50 energies were compared and were found to be significantly different. The significance of difference (p-value) was calculated by the Wald test in each case, and are shown below. The mean ED50 peak current for the biphasic waveform was 39 percent of that required with the MDS waveform.

Summary Table - ED50 & ID50		
Mean	Welch Allyn PIC Biphasic	Monophasic Damped Sine
ID50 Peak Current (Amps)	6.4	16.6
Significance of difference (p-value)	<0.001	
ED50 Delivered Energy (Joules)	26.3	35.3
Significance of difference (p-value)	0.014	
Study 1		

Conclusion - The MRL Orbital^{TM} Biphasic waveform is capable of converting fibrillation episodes using less energy than the MDS waveform, and requires lower peak currents than MDS waveform defibrillators.

Study 2

Objective - Comparison of the defibrillation effectiveness of the MRL Orbital™ Biphasic waveform defibrillator, with a commercially available Biphasic 2KV defibrillator capable of 360 J and a monophasic truncated exponential defibrillator.

Methods - A canine model (n=6, 61.6 ± 5.5 lbs) was used in a study that was approved by the Institutional Animal Care and Use Committee. The animals were anesthetized with an intravenous injection of 20 mg/kg sodium pentothal. They were then intubated with a cuffed endotracheal tube, and maintained on isoflurane gaseous anesthetic. The femoral artery was cannulated and an intra-arterial line was placed for continuous measurement of arterial blood pressure, and for acquiring samples for arterial blood gas and electrolyte monitoring. The chest was shaved and adhesive defibrillating electrode pads were placed on the left and right chest walls.

Fibrillation was induced by delivering 60 Hz current to the external electrodes. The ED50 energy (that required to defibrillate with 50% probability) was determined by a protocol modeled after that of Dixon. An initial shock strength of 30 Joules was used, which was applied after 15 seconds of ventricular fibrillation (VF). If successful, VF was re-induced after a 4 minute rest period, and the shock strength was reduced by one energy step for the next defibrillation attempt. If the initial shock failed, a rescue shock was delivered, and after a rest period, VF was again induced. The energy was now increased one energy step for the next defibrillation attempt. This procedure was continued until a nominal sample size of six episodes was achieved (both sides of the first reversal in result, plus 4 episodes). Three ED50 estimation procedures were run in parallel, with the device being used alternated on each shock. After each of the three independent ED50 estimation procedures had been completed, the entire protocol was repeated twice more, each time starting all devices at an energy of 30 joules. The ED50 peak current and energy was then estimated for each animal by logistic regression analysis. Individual phase durations and overall pulse durations were measured and recorded on each shock.

Results - The study consisted of 344 total fibrillation/defibrillation episodes. The mean ED50 and ID50 estimates (to one decimal place) are shown below. The significance of difference (p-value) was calculated by the Wald test in each case, and are shown below. Also shown are the mean total durations measured for each device.

Summary Table - ED50, ID50, & Duration			
Mean	Monophasic Waveform	Welch Allyn PIC Biphasic	2kV BiphasicWaveform
ID50 Peak Current (Amps)	9.0	6.4	8.3
Significance of difference (p-value)	<0.001 (PIC vs Monophasic)		<0.001 (PIC vs 2kV Biphasic)
ED50 Delivered Energy (Joules)	40.2	21.4	22.7
Significance of difference (p-value)	<0.001 (PIC vs Monophasic)		0.4937 (PIC vs 2kV Biphasic)
Total Duration (msec)	11.9	12.3	13.1
Study 2			

Conclusion - The MRL Orbital™ Biphasic waveform was as effective as the Biphasic 2KV waveform, and more effective than the monophasic waveform. While both biphasic waveforms required less peak current than the monophasic waveform, the MRL Orbital™ Biphasic waveform required statistically less peak current than the 2 KV biphasic waveform defibrillator.

Study 3

Objective - Comparison of the defibrillation effectiveness of the Welch Allyn Orbital™ Biphasic waveform defibrillator, with a commercially available Biphasic 2KV defibrillator capable of 360 J in a simulated higher impedance model.

Methods - A canine model (n=6, 53.7 ± 6.1 lbs) was used in a study that was approved by the Institutional Animal Care and Use Committee. The animals were anesthetized with 20 mpk sodium pentothal i.v., and maintained as required through an intravenous catheter in the foreleg. The femoral artery was cannulated and an intra-arterial line was placed for continuous measurement of arterial blood pressure. The chest was shaved and defibrillating patch electrodes were placed on the left and right chest walls.

Fibrillation was induced by delivering 60 Hz current to the chest electrodes. The energy required to defibrillate was determined by a protocol that has been used in several other biphasic comparison

studies. An initial shock strength of 70 to 100 Joules was used. If successful, VF was re-induced after a 5 minute rest period, and the shock strength was reduced by approximately 20% for the next defibrillation attempt. If the initial shock failed, a rescue shock was delivered, and after a rest period, VF was again induced. The energy was now increased about 20% for the next defibrillation attempt. This procedure was continued until approximately 4 reversals in result were observed with each waveform. Two ED50 estimation procedures were run in parallel, with the device being used alternated on each shock. In practice, actual clinical units were used, so the energy steps were limited to those selectable on the devices tested. The ED50 peak current and energy was then estimated for each animal by logistic regression analysis.

This study simulated a higher impedance patient by having a 32 ohm resistor placed in series with each subject.

Results - The study consisted of 98 total fibrillation/defibrillation episodes. The mean ED50 and ID 50 estimates for peak current and energy for each animal (to one decimal place) are shown below. The significance of difference (p-value) was calculated by the Wald test in each case, and are shown below. Also shown are the mean total durations measured for each device.

Summary Table - ED50 & ID50		
Mean	Welch Allyn PIC Biphasic	2kV Biphasic Waveform
ID50 Peak Current (Amps)	5.8	7.4
Significance of difference (p-value)	<0.001	
ED50 Delivered Energy (Joules)	34.3	32.0
Significance of difference (p-value)	0.885	
Total Duration (msec)	21.3	15.6
Study 3		

Conclusion - The MRL Orbital^{TM} Biphasic waveform was as effective as the 2KV Biphasic waveform in this model of a higher impedance patient. When these devices are compared on the basis of

peak current, the MRL Orbital™ Biphasic required less peak current than the 2KV Biphasic waveform.

Rationale for Animal Studies

Electrical waveforms for transthoracic ventricular defibrillation have been well studied for nearly 50 years. These studies led to the development of monophasic waveforms such as the Edmark, Lown, and truncated exponential waveforms which have now been used in humans for over 30 years. Starting in the early 1980s, biphasic waveforms have been extensively studied in animal models of transthoracic ventricular defibrillation. These studies have shown that a wide variety of biphasic waveforms exhibited superior defibrillation effectiveness to these conventional monophasic waveforms. In many cases, the waveform comparisons performed in animals were repeated in clinical trials involving humans. These studies have conclusively demonstrated that well-designed animal studies can and do predict the results that will be observed in humans.

The reasons for conducting animal trials (as opposed to additional human clinical studies) are:

1. Animal studies can use a much larger sample size (more shocks per subject), and thus, result in far more accurate comparisons.
2. Animal studies do not place human subjects at risk from additional (and clinically unneeded) shocks.
3. The animal hearts can be inspected for damage after the defibrillation studies.

Waveform Safety & Effectiveness Conclusions:

These scientific studies have demonstrated that:

1. The data suggests that the MRL Orbital™ Biphasic waveform in the Welch Allyn PIC is at least as effective as, and may be more effective than either of the two tested monophasic waveforms, appearing to allow termination of fibrillation episodes using lower energies.
2. The MRL Orbital™ Biphasic waveform in the Welch Allyn PIC is as effective as the 2KV biphasic truncated exponential waveform in another commercially available defibrillator.
3. The MRL Orbital™ Biphasic waveform in the Welch Allyn PIC requires less peak current to achieve defibrillation effectiveness than either of the two monophasic waveforms or the 2KV biphasic truncated exponential waveform that is used in another commercially available defibrillator.

Fax Country Codes

Country	Code
Australia	09
Austria	0A
Belgium	0F
Brazil	16
Bulgaria	1B
Canada	20
China	26
Czech Republic	2E
Denmark	31
Finland	3C
France	3D
Germany	42
Greece	46
Hong Kong	50
Hungary	51
India	53
Ireland	57
Israel	58
Italy	59
Japan	00
Korea	61
Luxemburg	69
Malaysia	6C
Mexico	73
Netherlands	7B
New Zealand	7E
Norway	82
Philippines	89

Country	Code
Poland	8A
Portugal	8B
Singapore	9C
South Africa	9F
Spain	A0
Sweden	A5
Switzerland	A6
Thailand	A9
Turkey	AE
Taiwan	FE
United Kingdom	B4
United States	B5

ADDENDUM
PIC40/50 USER INSTRUCTION MANUAL

This addendum provides revisions and additions to the Welch Allyn PIC40/50 User Instruction Manual resulting from changes in software revisions and improvements in system electromagnetic compatibility.

Chapter 3
PIC System Overview

This section of the addendum addresses changes to Chapter 3, *PIC System Overview.* This section addresses the change of the Mute button operation, implemented in Software version X8. The following correction is included:

- PIC System Control and Indicators page 3.4

PIC System Controls and Indicators [correction to page 3.4]

3. Mute Pressing the **MUTE** button once causes all currently active audio alarms and tones to be muted for 90 seconds (except defibrillator charge tone).

Chapter 7
Semi-Automated External Defib (optional)

This section of the addendum addresses changes to Chapter 7, *Semi-Automated External Defib*. The following corrections are included:

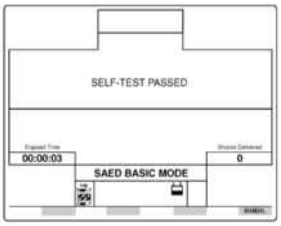
- SAED Basic Displays pages 7.2 - 7.4

SAED Basic Mode [corrections to pages 7.2 - 7.4]

Defibrillation Modes

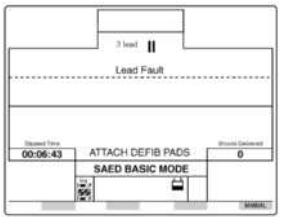
Note: If an ECG rhythm is non-shockable it may qualify as 2 No Shock analysis results to hasten entry into CPR mode.

SAED Basic Displays



Self-Test Passed

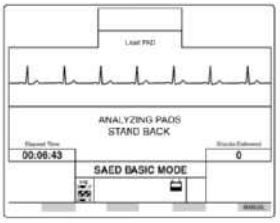
The PIC performs a self test when the power is turned on. The display shows SELF TEST PASSED when the test is successfully completed and the PIC begins SAED Basic Mode operation.



Lead Fault

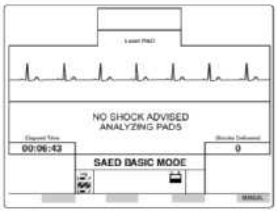
Indicates a lead fault condition. Neither the defibrillation electrodes nor the ECG cables have been properly attached to the patient. Check to see that the defibrillation electrodes have been properly attached to the patient and to the Hands-free adapter. The PIC will announce "Apply defib pads, check ECG electrodes", during this condition. The display will indicate LEAD FAULT and "------" in lieu of an ECG to signify lead fault.

Analyzing Pads



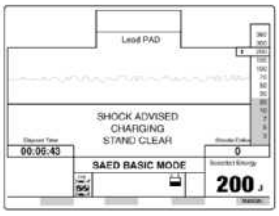
Indicates the electrodes have been properly attached and the PIC is monitoring the patient's ECG for criteria that may indicate a shockable rhythm. The PIC will announce "Stand clear, analyzing heart rhythm." Avoid touching or moving the patient. Touching or moving the patient can cause artifacts which may interfere with the analysis process.

No Shock Advised



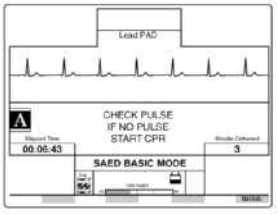
Indicates the PIC has completed one analysis of the patient's ECG and that No Shock was advised. The PIC resumes monitoring the patient. After 3 consecutive No Shock analyses, the PIC displays NO SHOCK ADVISED and ANALYZING PADS. The PIC will announce "No shock advised. Check airway, check breathing, check pulse. If no pulse, start CPR". The PIC will continue to assess the patient's heart rhythm. If the ECG is non-shockable, the display flashes NO SHOCK ADVISED. If the PIC detects a shockable rhythm, it will direct the operator by announcing "Stand clear, analyzing heart rhythm" as it begins to analyze the patient's heart rhythm.

Shock Advised - Charging - Stand Clear



Indicates the PIC completed analyzing the patient's ECG and that a shockable rhythm was detected. The PIC will automatically select the proper energy and begin to charge the defibrillator. The display will indicate SHOCK ADVISED, CHARGING and STAND CLEAR. The PIC will announce, "Shock advised, stand clear". Periodic tones will be heard to signify the defibrillator is charging. The energy bar graph on the right of the display will indicate the relative charge state.

Check Pulse



After each set of three consecutive defibrillation attempts, the PIC advises the operator to CHECK PULSE, IF NO PULSE START CPR. After 60 seconds, the PIC will announce "Stop CPR" and resume monitoring the patient's ECG.

Note: If an ECG rhythm is non-shockable, it may qualify as 2 No Shock analysis results to hasten entry into CPR mode.

Chapter 13
Menus

This section of the addendum addresses the changes to Chapter 13, *Menus*. The following corrections are included:

Supervisor Menu Overview [correction to page 13.4]

Menu	Submenu	Choices	Choice Range	Factory Default
12 Lead†	Printer	2x6 I/V1, 2x6 V1/V2, 3x4 I/II/III, 10 sec. Lead II		3x4 I/II/III

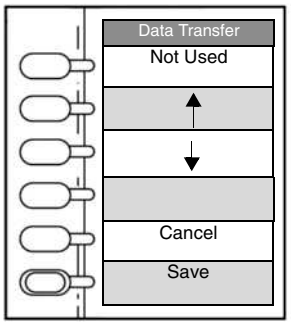
† If option has been purchased.

User Menus – Setup [corrections to page 13.23]

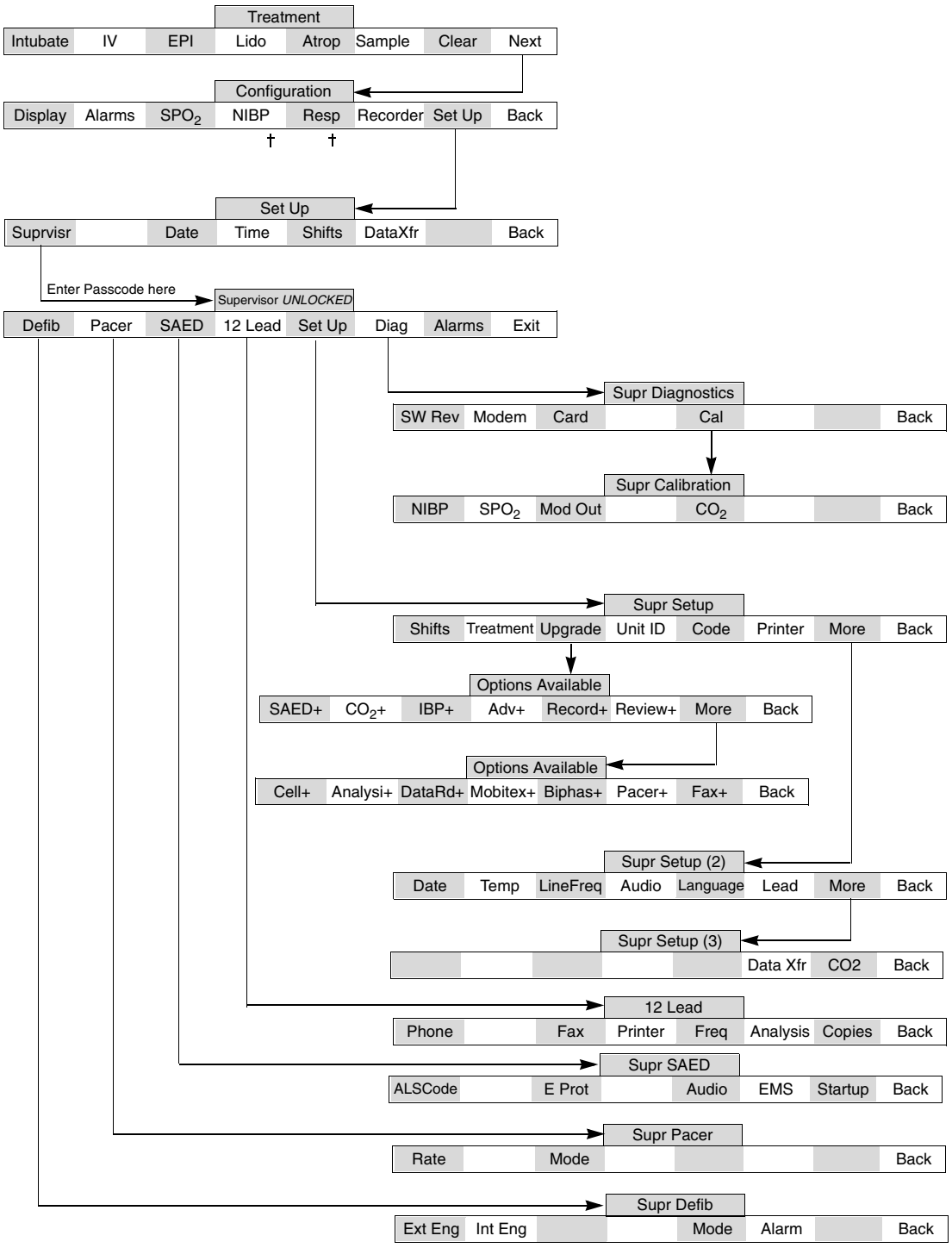
Data Transfer Menu

Use the Data Transfer menu to select the type of modem for 12-lead fax transmissions. Select Not Used or Mobitex depending on options purchased.

If Mobitex option is purchased, data transfer is automatically set to Mobitex on power up. If the cellular option is purchased, data transfer is automatically set to Not Used on power up.

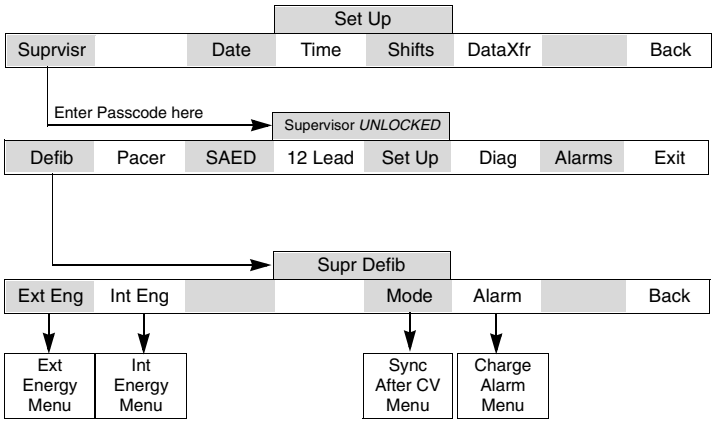


Supervisor Menus [correction to page 13.24]

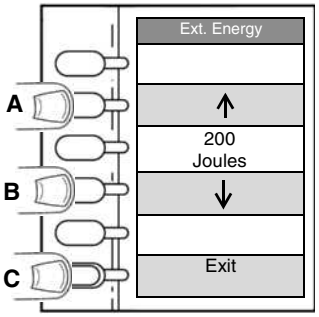


Supervisor Menus – Defibrillator **[corrections to page 13.25]**

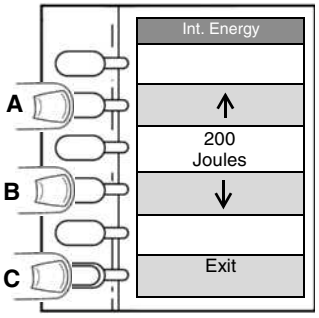
A supervisor can configure the defibrillator energy, sync, and mode settings from the Defibrillator menu. This menu is accessible through the Treatment/Configuration/Set Up menus.



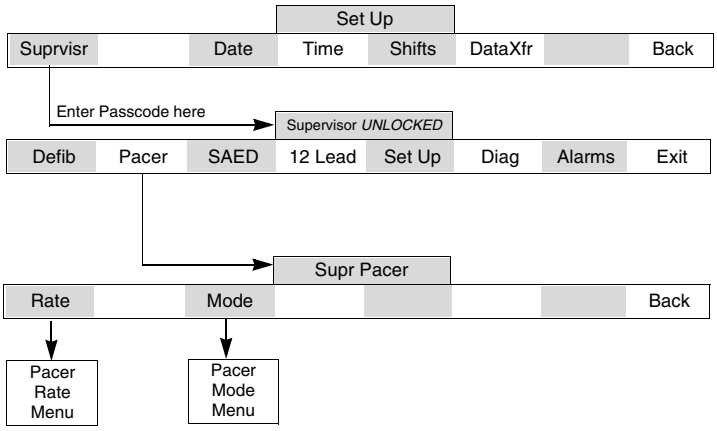
External Energy Menu



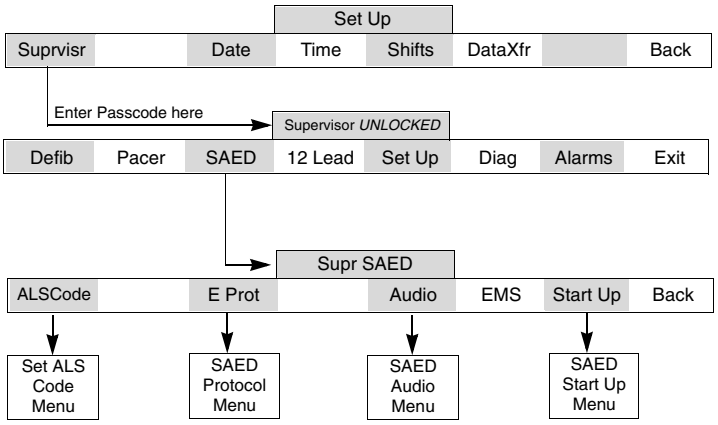
Internal Energy Menu



Supervisor Menus – Pacer [correction to page 13.27]

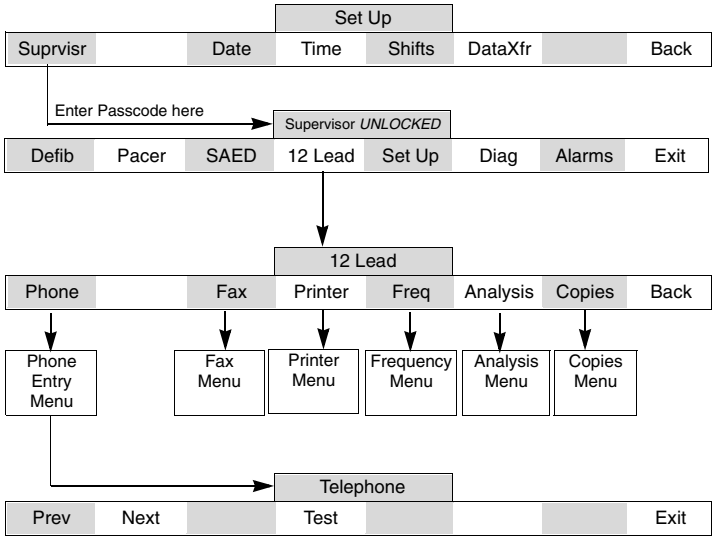


Supervisor Menus – SAED [correction to page 13.28]

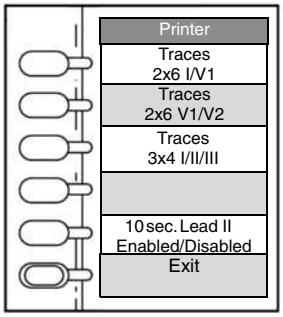


Supervisor Menus – 12-Lead

[corrections to pages 13.30 - 13.31]



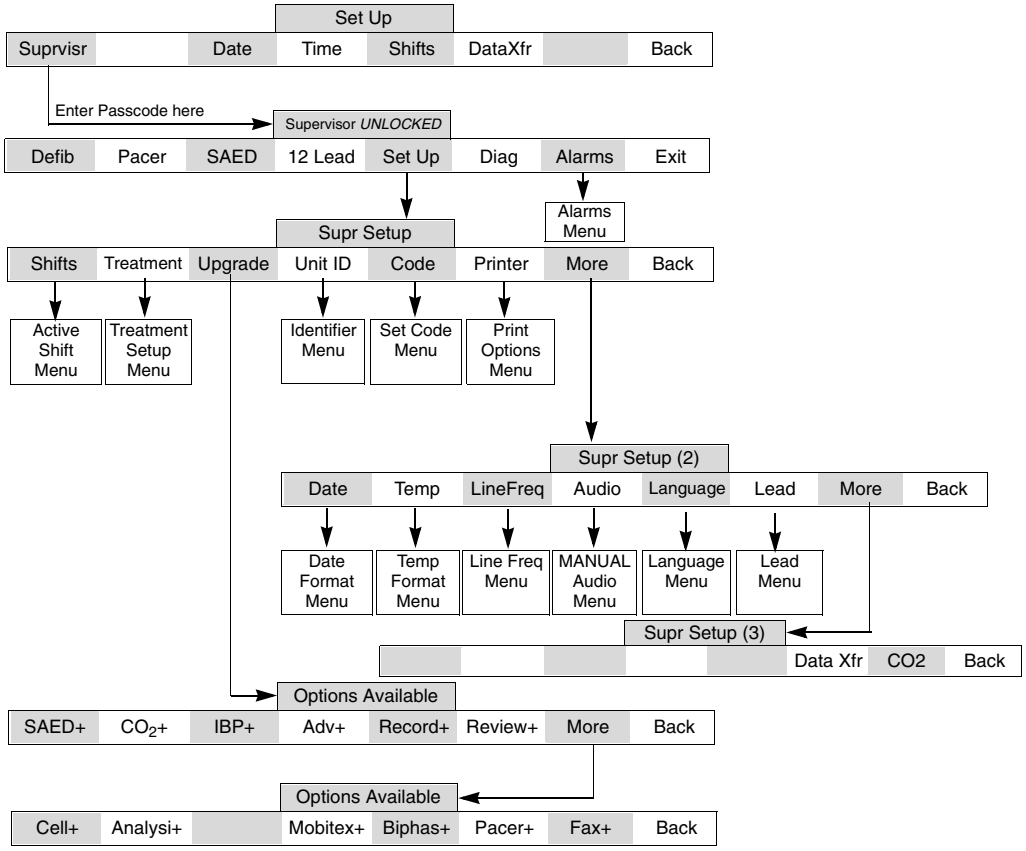
Printer Menu



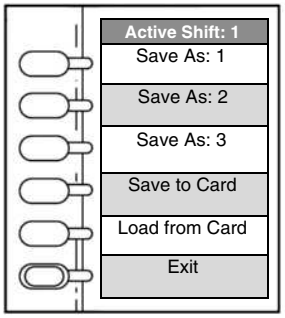
Use the Printer Menu to change 12-Lead printing formats. 3x4 I/II/III is the default format, which prints three rows by four columns of ECG traces. 2x6 I/V1 format prints two rows by six columns with leads I and V1 in the first column. The 2x6 V1/V2 prints two rows by six columns with leads V1 and V2 in the first column.

The 10 sec. Lead II option, when enabled, prints 10 seconds of Lead II data following the 12-lead 3x4 or 2x6 print out.

Supervisor Menus – Setup [corrections to pages 13.33 and 13.36]



Active Shift Menu



The Active Shift menu allows the supervisor to select and save the current PIC configuration parameters for use by a specific shift in the internal memory of the PIC. The current configuration can be saved for Shift 1-3 by pressing **SAVE AS: 1-3**.

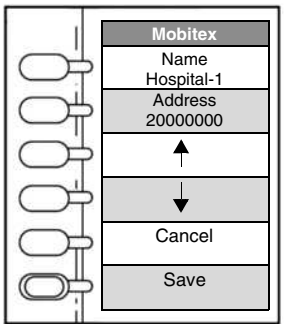
The default shift is Shift 0 unless a specific shift is selected with the Configuration Setup Shifts menu.

Note: The alarms in use depend on the selection of Active Shift or User in the Supervisor Alarms menu.

Press **SAVE TO CARD** to save the configuration parameters for all shifts including the default to a PIC Configuration PCMCIA card. Press **LOAD FROM CARD** to restore the configuration parameters from a PIC Configuration card to the PIC internal memory.

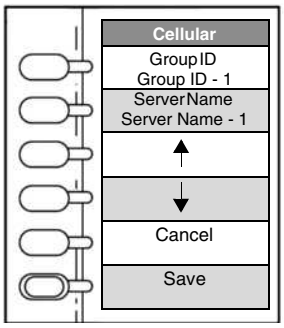
Mobitex Data Transfer Menu

Use the Data Transfer menu to program up to 16 different MAN addresses for Mobitex™ modems.

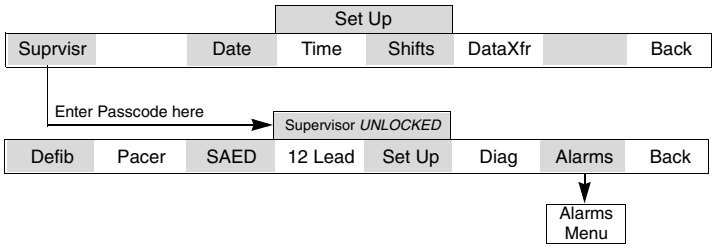


Cellular Data Transfer Menu

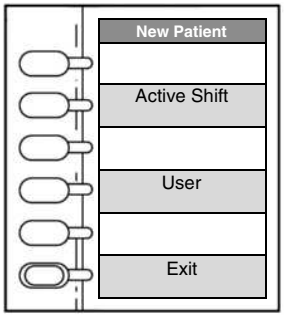
Use the Data Transfer menu to program up to 16 different Group IDs and the corresponding Server Names.



Supervisor – Alarms [correction to page 13.41]



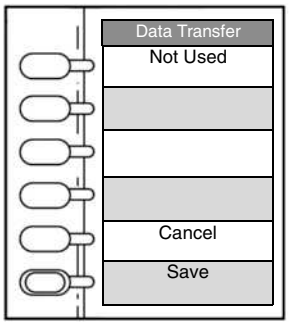
Supervisor Alarms Menu



Chapter 19
Wireless Transmission

This section of the addendum addresses the changes to Chapter 19, *Wireless Transmission*. The following corrections are included:

Cellular Configuration [correction to page 19.6]



From the configuration menu select Setup then DataXfr. Use the Data Transfer menu to select one of the following:

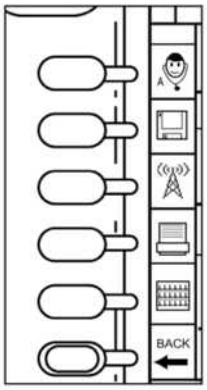
Mobitex - If the Mobitex option has been purchased

Not Used - If the Cellular option has been purchased, but the Mobitex option has not been purchased

Sending a Cellular Transmission

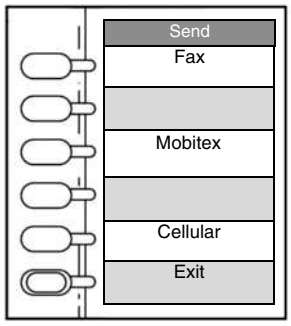
On average, sending a Cellular transmission takes 10-15 seconds. Press the 12 quick access button to display the Patient ID menu. Either acquire a 12-Lead snapshot or retrieve the desired snapshot from the 12-Lead log review, see chapter 5 for instructions. The 12-Lead quick access button will appear.

1. Press the **FAX/WIRELESS** button to open the Send menu.

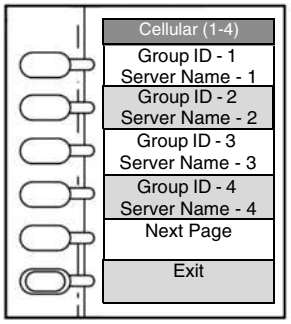


2. Select **CELLULAR**.

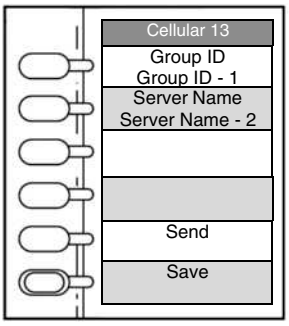
Note: *Cellular option must be purchased.*



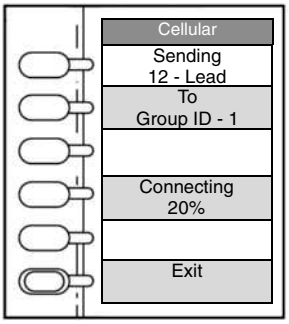
3. Select the receiving Hospital Group ID. 1-12 are programmed in the Supervisor>Setup>DataXfr> Cellular Menu. Selecting one of the programmed numbers opens the status menu, see step 5. 13-16 are user editable, selecting one of the editable entries opens the editing menu.



4. Pressing the **GROUP ID** or **SERVER NAME** button opens a alpha - numerical entry screen to manually edit the selected entry. When finished editing, save the new entry and press the **SEND** button.



5. The status menu displays the Group ID that is receiving the transmission, status, and errors that occur.



Appendix – Specifications

This section of the addendum addresses changes to the Appendix. The following corrections are included:

Recorder

Tx Summary Log: 60 ECG events or 300 non-ECG events.

Electromagnetic Compatability

Category	Standard	Level
Radiated Emissions	EN55011	CISPR11 B
Conducted Emissions	EN55011	CISPR11 B
Harmonic Current Emissions	EN61000-3-2	Class A (per A14 EU limits)
Voltage Fluctuations and Flicker	EN61000-3-3	EU Limits
Radiated Immunity	EN60601-2-4	10 V/m – normal operation
	EN60601-2-4	20 V/m – no defibrillator discharge
	EN60601-2-34	3 V/m – normal operation IBP only
Conducted Immunity	EN61000-4-6	3 Vrms
ESD Immunity	EN61000-4-2	8 kV air 6 kV contact
Magnetic Field Immunity	EN61000-4-8	3 A/m, 50 Hz
Electrical Fast Transient and Burst Immunity	EN61000-4-4	2 kV, 2 min.
Surge and Transient Immunity	EN61000-4-5	1 kV Line to Line 2 kV Line to Earth
Voltage Dips and Interruption Immunity	EN61000-4-11	40%, 5 cycles, 100 ms

Guidance and Manufacturer's Declaration – Electromagnetic Emissions (IEC 60601-1-2 Table 201)

The Welch Allyn PIC is intended for use in the electromagnetic environment specified below. The customer or the user of the PIC should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment – Guidance
RF Emissions CISPR 11	Group 1	The Welch Allyn PIC uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CSPR 11	Class B	
Harmonic Emission IEC 6100-3-2	Class A	The PIC is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Complies	
Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to EMC information provided in this document.		

Guidance and manufacturer's Declaration – Electromagnetic (IEC 60601-1-2 Table 202)

The Welch Allyn PIC is intended for use in the electromagnetic environment specified below. The customer or the user of the PIC should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast Transient / Burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips, Short Interruptions and Voltage Variations on Power Supply Input Lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the PIC requires continued operation during power mains interruptions, it is recommended that the PIC be powered from an uninterruptible power supply or a battery.
Power Frequency (50/ 60 Hz) Magnetic Field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: U_T is the AC mains voltage prior to application of the test level.			

Guidance and Manufacturer's Declaration – Electromagnetic Immunity (IEC 60601-1-2 Table 203)

The Welch Allyn PIC is intended for use in the electromagnetic environment specified below. The customer or the user of the PIC should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the PIC, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
			Recommended Separation Distance
Conducted RF **IEC 61000-4-6**	3 Vrms 150 kHz to 80 MHz outside ISM bands[a]	3 Vrms	$d = 1.17*\sqrt{P}$
	10 Vrms 150 kHz to 80 MHz in ISM bands[a]	3 Vrms	$d = 4*\sqrt{P}$
Radiated RF **IEC 61000-4-3**	10 V/m 80 MHz to 2.5 GHz	10 V/m	$d = 1.20*\sqrt{P}$ 80 MHz to 800 MHz $d = 2.30*\sqrt{P}$ 800 MHz to 2.5 GHz
		3 V/m (IBP only)	$d = 4*\sqrt{P}$ 80 MHz to 800 MHz $d = 7.67*\sqrt{P}$ 800 MHz to 2.5 GHz

Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m).[b]

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[c] , should be less than the compliance level in each frequency range[d] .

Interference may occur in the vicinity of equipment marked with the following symbol:

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

a. The ISM (industrial, scientific, and medical) bands between 150 KHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

b. The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.

c. Field strengths from fixed transmitters, such as base stations for radio (cellular / cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Welch Allyn PIC is used exceeds the applicable RF compliance level above, the PIC should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the PIC.

d. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V_1] V/m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the Welch Allyn PIC (IEC 60601-1-2 Table 205)

The Welch Allyn PIC is intended for use in an environment in which radiated RF disturbances are controlled. The customer or the user of the PIC can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the PIC as recommended below, according to the maximum output power of the communications equipment.

Separation Distance According to Frequency of Transmitter (meters)						
Rated maximum output power of transmitter	**150 kHz to 80 MHz outside ISM bands**	**150 kHz to 80 MHz in ISM bands**	**80 MHz to 800 MHz**	**800 MHz to 2.5 GHz**	**80 MHz to 800 MHz (IBP only)**	**800 MHz to 2.5 GHz (IBP only)**
W	$d = [^{3.5}/_{3}]*\sqrt{P}$	$d = [^{12}/_{3}]*\sqrt{P}$	$d = [^{12}/_{10}]*\sqrt{P}$	$d = [^{23}/_{10}]*\sqrt{P}$	$d = [^{12}/_{3}]*\sqrt{P}$	$d = [^{23}/_{3}]*\sqrt{P}$
0.01	0.17	0.40	0.12	0.23	0.40	0.77
0.1	0.37	1.26	0.38	0.73	1.26	2.43
1	1.17	4.00	1.20	2.3	4.00	7.67
10	3.69	12.65	3.79	7.27	12.65	24.25
100	11.70	40.00	12.00	23.00	40.00	76.7

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 Hz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

Note 3: An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.

Note 4: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.