

# NON-INVASIVE BLOOD PRESSURE SIMULATORS



**NIBP-1030**



**NIBP-1030-BE**



**NIBP-1020**



**NIBP-1010**

**USER MANUAL**



**BC BIOMEDICAL  
NIBP-1000 SERIES  
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## **WARNING - USERS**

The NIBP-1000 Series is for use by skilled technical personnel only.

## **WARNING - USE**

The NIBP-1000 Series is intended for testing only and should never be used in diagnostics, treatment or any other capacity where it would come in contact with a patient.

## **WARNING - CONNECTIONS**

All connections to patients must be removed before connecting the DUT to the NIBP-1000 Series. A serious hazard may occur if the patient is connected when testing with the NIBP-1000 Series. Do not connect any leads from the patient directly to the NIBP-1000 Series or DUT.

## **CAUTION - MODIFICATIONS**

The NIBP-1000 Series is intended for use within the published specifications. Any application beyond these specifications or any unauthorized user modifications may result in hazards or improper operation.

## **CAUTION - ADAPTER**

Turn Power Off and unplug any Battery Eliminator before cleaning the surface of the NIBP-1000 Series.

## **CAUTION - CLEANING**

Do not immerse. The NIBP-1000 Series should be cleaned by wiping gently with a damp, lint-free cloth. A mild detergent can be used if desired.

### **CAUTION - LIQUIDS**

**Do not submerge or spill liquids on the NIBP-1000 Series. Do not operate the NIBP-1000 Series if internal components may have been exposed to fluid.**

### **CAUTION - SERVICE**

**The NIBP-1000 Series is intended to be serviced only by authorized service personnel. Troubleshooting and service procedures should only be performed by qualified technical personnel.**

### **CAUTION - INSPECTION**

**The NIBP-1000 Series should be inspected before each use for wear and should be serviced if any parts are in question.**

### **CAUTION - ENVIRONMENT**

**Exposure to environmental conditions outside the specifications can adversely affect the performance of the NIBP-1000 Series. Allow the NIBP-1000 Series to acclimate to specified conditions for at least 30 minutes before attempting to operate it.**



## NOTICE – CE



The NIBP-1000 Series Simulators bear the  mark  
Based on the following testing standards:

**ELECTROMAGNETIC COMPATIBILITY DIRECTIVE**  
**EMC – Directive 89/336/EEC and 2004/108/EC as amended by  
92/31/EEC, 93/68/EEC and Directive 91/263/EEC [ TTE/SES ]**

**EN 61326-1:1997 + A1:1998 + A2:2001 + A3:2003**  
**“Electrical equipment for measurement, control and  
laboratory use – EMC requirements”**

This equipment has been type tested by an independent, accredited testing laboratory  
and compliance was demonstrated to the above standard to the extent applicable.

### EMISSIONS Radiated and Line Conducted Emissions

EN 61000-3-2	Harmonic Current Emissions
EN 61000-3-3	Voltage Fluctuation and Flicker

### IMMUNITY– CLASS C

EN 61000-4-2	Electrostatic Discharge
EN 61000-4-3	Radiated Electric Field Immunity
EN 61000-4-4	Electrical Fast Transients / Bursts
EN 61000-4-5	Surge Voltage
EN 61000-4-6	Conducted Disturbance
EN 61000-4-11	Voltage Dips and Short Interrupts

### **LOW VOLTAGE DIRECTIVE** **EC – Directive 73/23/EC**

**EN 61010-1:2001**  
**“Safety requirements for electrical equipment for measurement, control, and  
laboratory use – General requirements”**

This equipment has been type tested and compliance was demonstrated  
to the above standard to the extent applicable.

## NOTICE – SYMBOLS

<u>Symbol</u>	<u>Description</u>
	<b>Caution</b> (Consult Manual for Further Information)
	<b>Center Negative</b>
	Per European Council Directive 2002/95/EC, do not dispose of this product as unsorted municipal waste.

## NOTICE – ABBREVIATIONS

AC	Alternating Current
BP	Blood Pressure
BPM	Beats per minute
brpm	breaths per minute
C	Celsius
°	degree(s)
DUT	Device Under Test
Dias	Diastolic
ECG	Electrocardiogram
Euro	European
F	Fahrenheit
HR	Heart Rate
Hz	hertz
kg	kilogram
μV/V/mmHg	microvolts(s) per Volt per mmHg
mA	milliampere(s)
mm	millimeter(s)
mmHg	millimeter(s) of mercury
mV	millivolt(s)
min	minute(s)
Neo	Neonatal
NSR	Normal Sinus Rhythm
Ω	ohm(s)
Lbs	pounds
sec	second(s)
Syst	Systolic
USA	United States of America
VDC	Volts Direct Current
VRMS	Volts Root Mean Square

## **NOTICE – DISCLAIMER**

BC GROUP INTERNATIONAL, INC. WILL NOT BE RESPONSIBLE FOR ANY INJURIES SUSTAINED DUE TO UNAUTHORIZED EQUIPMENT MODIFICATIONS OR APPLICATION OF EQUIPMENT OUTSIDE OF THE PUBLISHED INTENDED USE AND SPECIFICATIONS.

## **NOTICE – DISCLAIMER**

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## **NOTICE – CONTACT INFORMATION**

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<p style="text-align: center;"><b>BC BIOMEDICAL</b> <b>NIBP-1000 SERIES</b> <b>NON-INVASIVE BLOOD PRESSURE SIMULATORS</b></p>
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The NIBP-1000 Series is a family of microprocessor-based, high-precision Non-Invasive Blood Pressure (NIBP) Simulators. The units are small, easy to use and have multiple features to fit many different applications. The NIBP-1010 is the basic model, which includes built-in manometer function. The NIBP-1020 adds realistic, full QRS and respiration ECG waveforms. The NIBP-1030 additionally offers Invasive Blood Pressure, Temperature, Arrhythmias and a Leak Rate test mode.

The graphical display provides multiple screens containing pressure in mmHg, a plot of the overall pressure, or a close-up of the BP waveform.

The following are highlights of the main features:

NIBP-1010 (BASIC FEATURES, NIBP ONLY):

- LARGE BACKLIT GRAPHICAL LCD DISPLAY WITH CURSOR SELECTION OF OPTIONS AND PARAMETERS
- FULL RANGE MANOMETER
- ADULT, NEONATAL, HYPERTENSIVE, AND HYPOTENSIVE MODES
- $\pm 500$  mmHg PRESSURE RANGE
- DIGITAL PRESSURE ENVELOPE OFFSET
- OPTIONAL PEAK PRESSURE DETECT WITH SIMPLE RESET
- SpO<sub>2</sub> READY – COMPATIBLE WITH MSP-2100 MODULE
- DIGITAL CALIBRATION – NO POTS TO TURN
- SELECTABLE DISPLAY OPTIONS AND DIGIT SIZES
- SOFTWARE ADJUSTABLE CONTRAST
- FLASH PROGRAMMABLE
- BATTERY LIFE DISPLAY (0 TO 100%)
- OPTIONAL RECHARGEABLE NiMH BATTERIES
- BATTERY ELIMINATOR
- RS-232 INTERFACE

NIBP-1020 ADDS:

- ECG OUTPUT WITH FULL NSR WAVEFORM
- SINUSOIDAL RESPIRATION SIMULATION
- ECG TEST WAVEFORMS
- PACE WAVEFORM
- OPTIONAL PEAK PRESSURE DETECT WITH ECG ALARM TEST
- ECG SYNCHRONIZED WITH BLOOD PRESSURE

NIBP-1030 ADDS:

- SYNCHRONIZED INVASIVE BLOOD PRESSURE OUTPUT
- SELECTABLE IBP SENSITIVITY 5 OR 40  $\mu\text{V/V/mmHg}$
- STATIC IBP SIMULATION  $-10\text{mmHg}$  TO 400 mmHg
- LEAK RATE TEST
- ECG ARRHYTHMIA WAVEFORMS
- ECG ARRHYTHMIA SEQUENCE
- YSI 400 AND 700 SERIES TEMPERATURE SIMULATION

AVAILABLE MODELS:

NIBP-1010	BASIC UNIT
NIBP-1010-P	+ PEAK
NIBP-1010-BP	+ BATTERY & PEAK
NIBP-1010-KIT	NIBP-1010-BP, 5 ADAPTERS & SOFT CARRYING CASE
NIBP-1020	BASIC UNIT WITH ECG
NIBP-1020-PA	+ PEAK & ALARM
NIBP-1020-BPA	+ BATTERY, PEAK & ALARM
NIBP-1020-KIT	NIBP-1020-BPA, 5 ADAPTERS & SOFT CARRYING CASE
NIBP-1030	BASIC UNIT WITH ECG, IBP, TEMP, PEAK & ALARM + MANY MORE
NIBP-1030-B	+ BATTERY
NIBP-1030-BE	+ UNIVERSAL PATIENT LEAD POST ECG CONNECTORS
NIBP-1030-KIT	NIBP-1030-B, 5 ADAPTERS & SOFT CARRYING CASE
NIBP-1030-EKIT	NIBP-1030-BE, 5 ADAPTERS & SOFT CARRYING CASE

STANDARD ACCESSORIES:

- BC20-40614 AC POWER ADAPTER (EURO)  
(OR)
- BC20-40613 AC POWER ADAPTER (USA)

OPTIONAL ACCESSORIES:

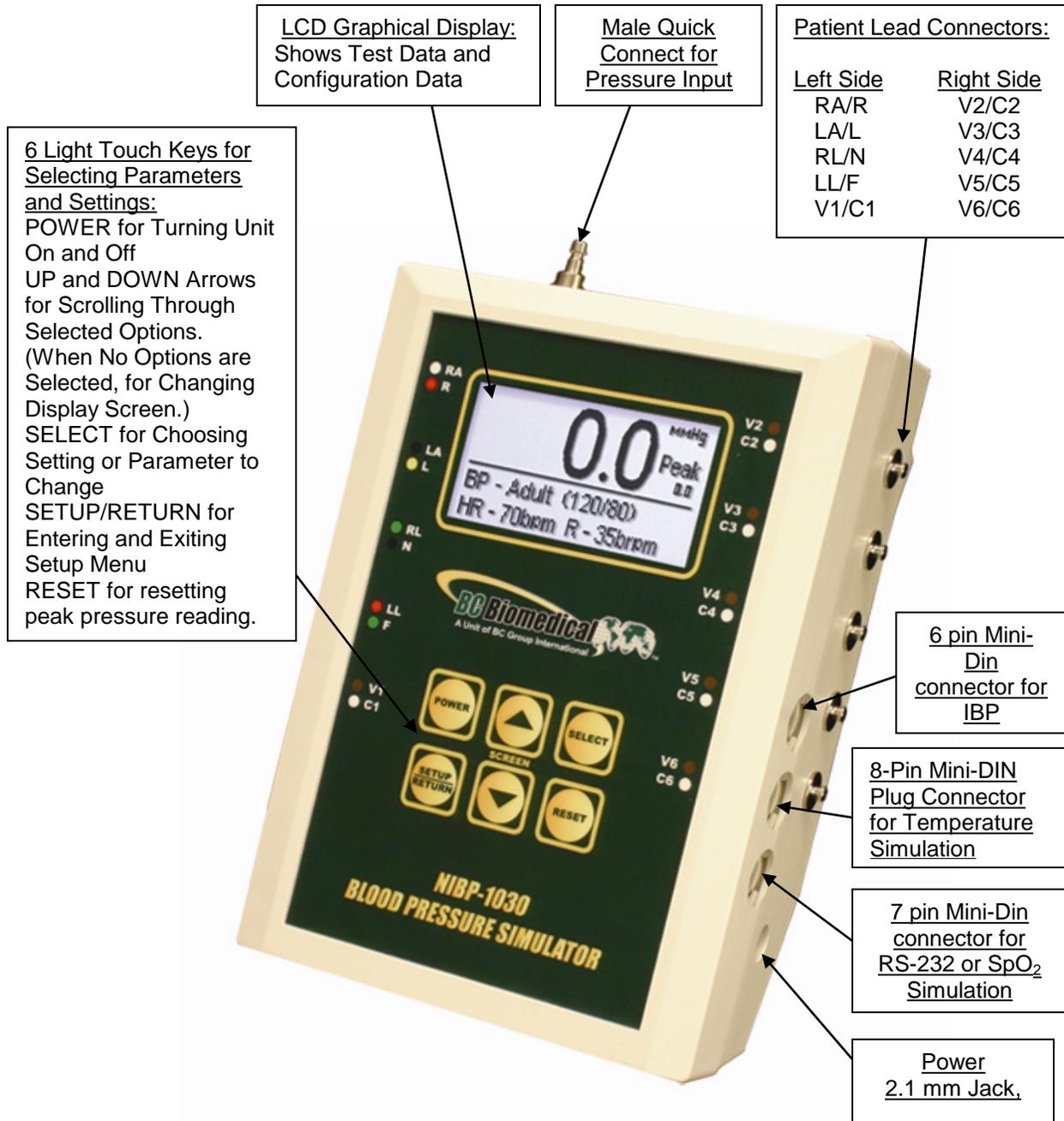
- BC20-40714 DINAMAP/CRITIKON ADAPTER
- BC20-40715 QUICK DISCONNECT ADAPTER
- BC20-40716 LUER ADAPTER
- BC20-40717 MARQUETTE ADAPTER
- BC20-40608 BULB ADAPTER
- BC20-40602 NIBP FITTING KIT (HP CUFF ADAPTER, INFLATION BULB, CPC CONNECTOR, QUICK COUPLER WITH 1/8" MNPT AND SILICONE TUBING AND TEE)
- BC20-40605 NIBP ADAPTER KIT (11 CONNECTORS)

- BC20-41333 UT-1 YSI-400 TEMPERATURE SIMULATION CABLE
  - BC20-41334 UT-2 YSI-700 TEMPERATURE SIMULATION CABLE
  - MSP-2100 PULSE OXIMETRY MODULE (ALLOWS NIBP TO SIMULATE SpO<sub>2</sub> OUTPUT WHEN USED WITH FingerSims™)
  - FingerSim™ KIT COMPLETE STARTER KIT (INCLUDES 80%, 90% AND 97% FingerSims™, FingerSim™ HOLDER, AND CARRYING CASE)
  - FingerSim™ SET REPLACEMENT KIT (80%, 90% AND 97% FingerSims™ ONLY)
  - BC20-41337 RS-232 COMMUNICATIONS CABLE (MINI-DIN TO DB-9F)
  - BC20-41339 USB COMMUNICATIONS ADAPTER (DB-9M to USB-A) FOR USE WITH BC20-41337
  - BC20-30111 SOFT CARRYING CASE
- INVASIVE BLOOD PRESSURE (IBP) CABLES:  
FOR A COMPLETE LIST CONSULT THE BC GROUP WEBSITE AT  
[WWW.BCGROUPINTL.COM](http://WWW.BCGROUPINTL.COM)

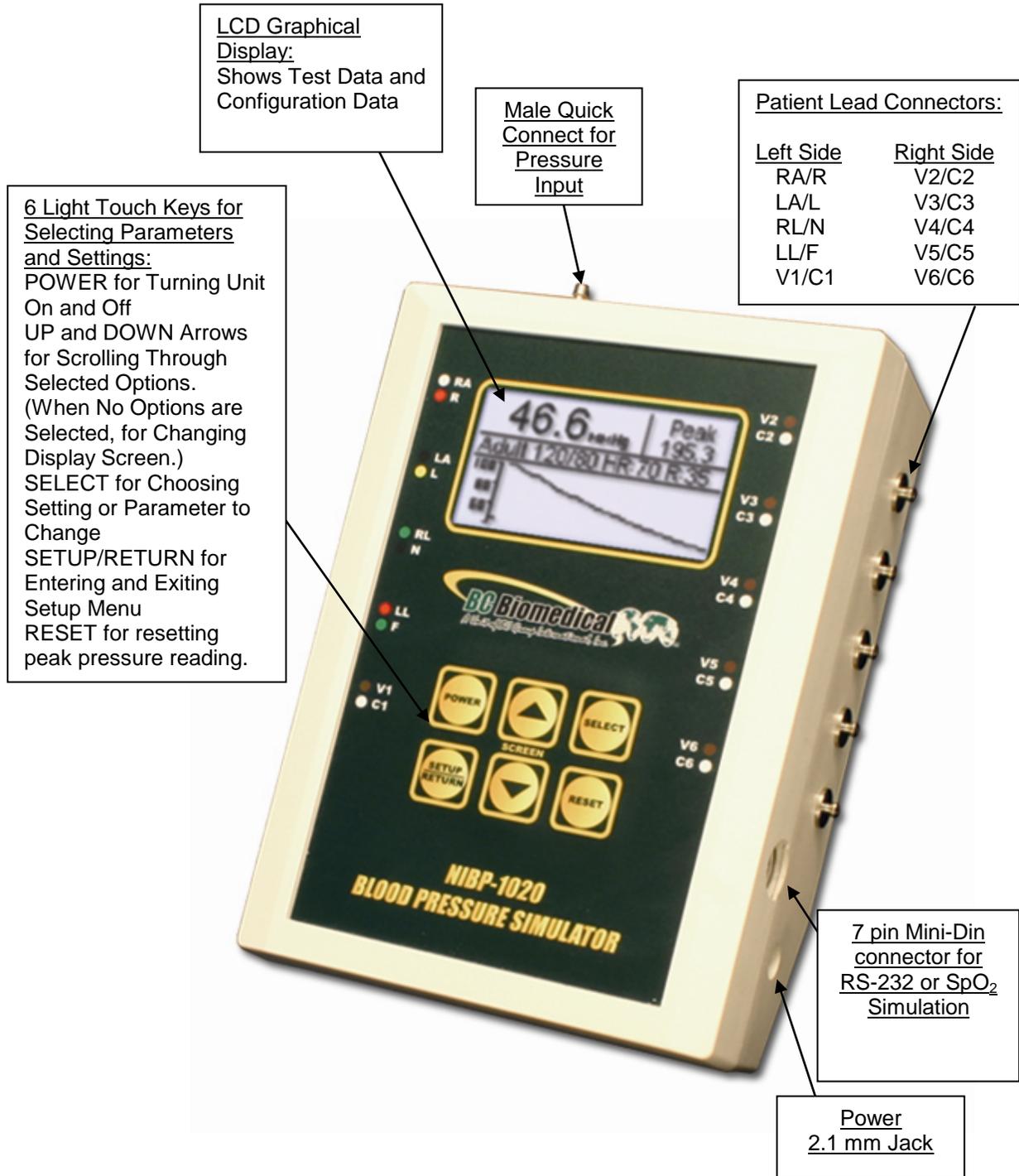
# OVERVIEW

This section looks at the layout of the NIBP-1030 and gives descriptions of the elements that are present.

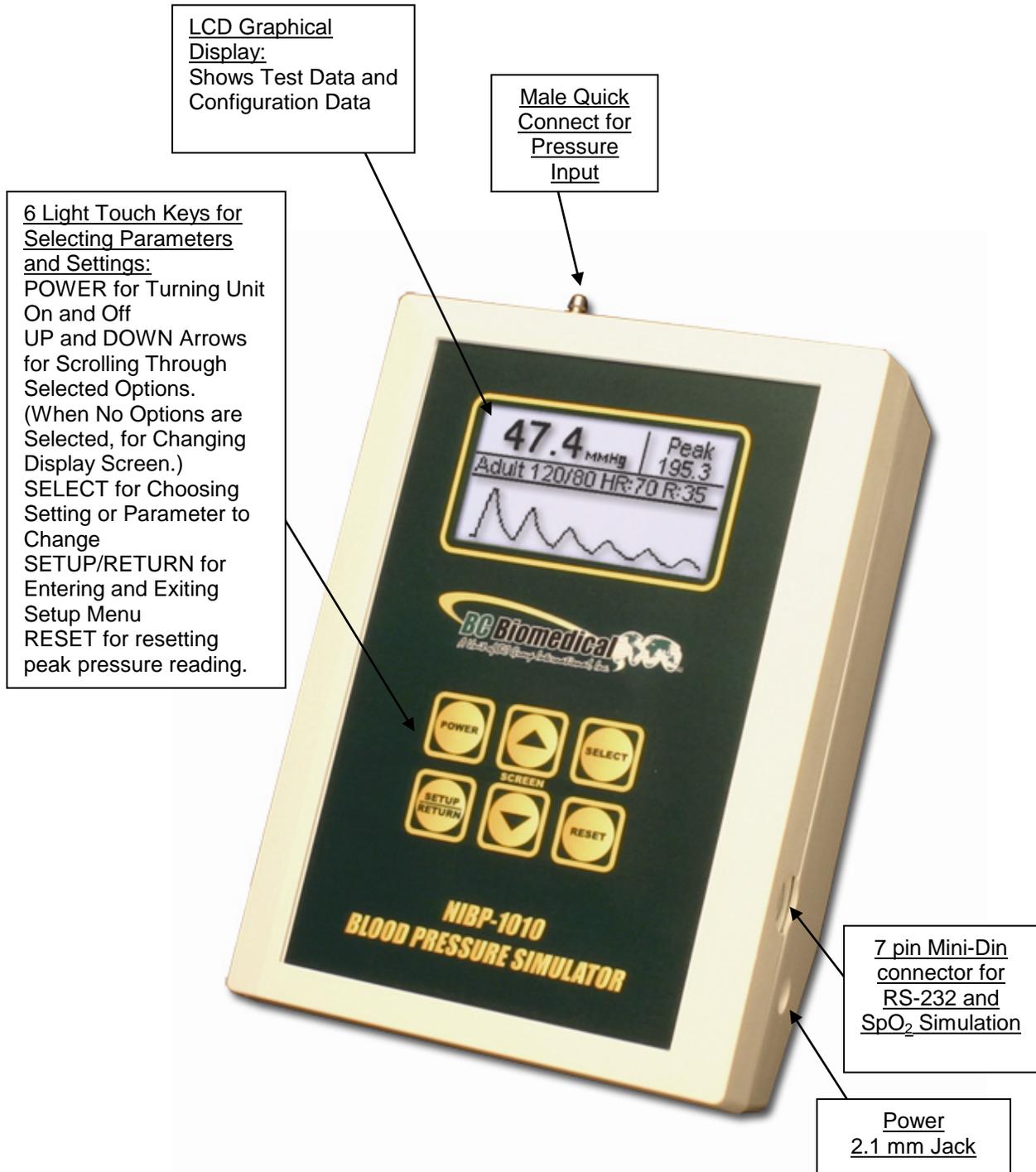
NOTE: The NIBP-1030-BE model is different from the unit shown below in that it uses universal patient lead banana posts that allow for the use of snaps and/or banana-type patient leads.



This section looks at the layout of the NIBP-1020 and gives descriptions of the elements that are present.



This section looks at the layout of the NIBP-1010 and gives descriptions of the elements that are present.



## KEYS

Six tactile-touch keys are provided for system operation:



– This key turns the unit off and on. The unit will return to the screen that was active when it was turned off.



– In the DISPLAY MODE, these keys toggle the display through the available main screens.

In the SELECT MODE, if a parameter has been highlighted, these keys will scroll through the available settings.



– On the Main screen, this key sequences through the available NIBP or ECG simulations. On the Setup screen, there are a number of parameters that may be selected and changed. This key sequences the cursor (Highlight) through those parameters.



– This key is used to RESET the peak pressure reading or to begin a Leak Test.



– This key toggles the unit into and out of the Setup Mode. Depressing this key will enter the Setup screen where the configuration can be viewed and adjusted. Depressing the key again will exit the Setup Mode and return to the previously viewed main screen.

# SCREENS

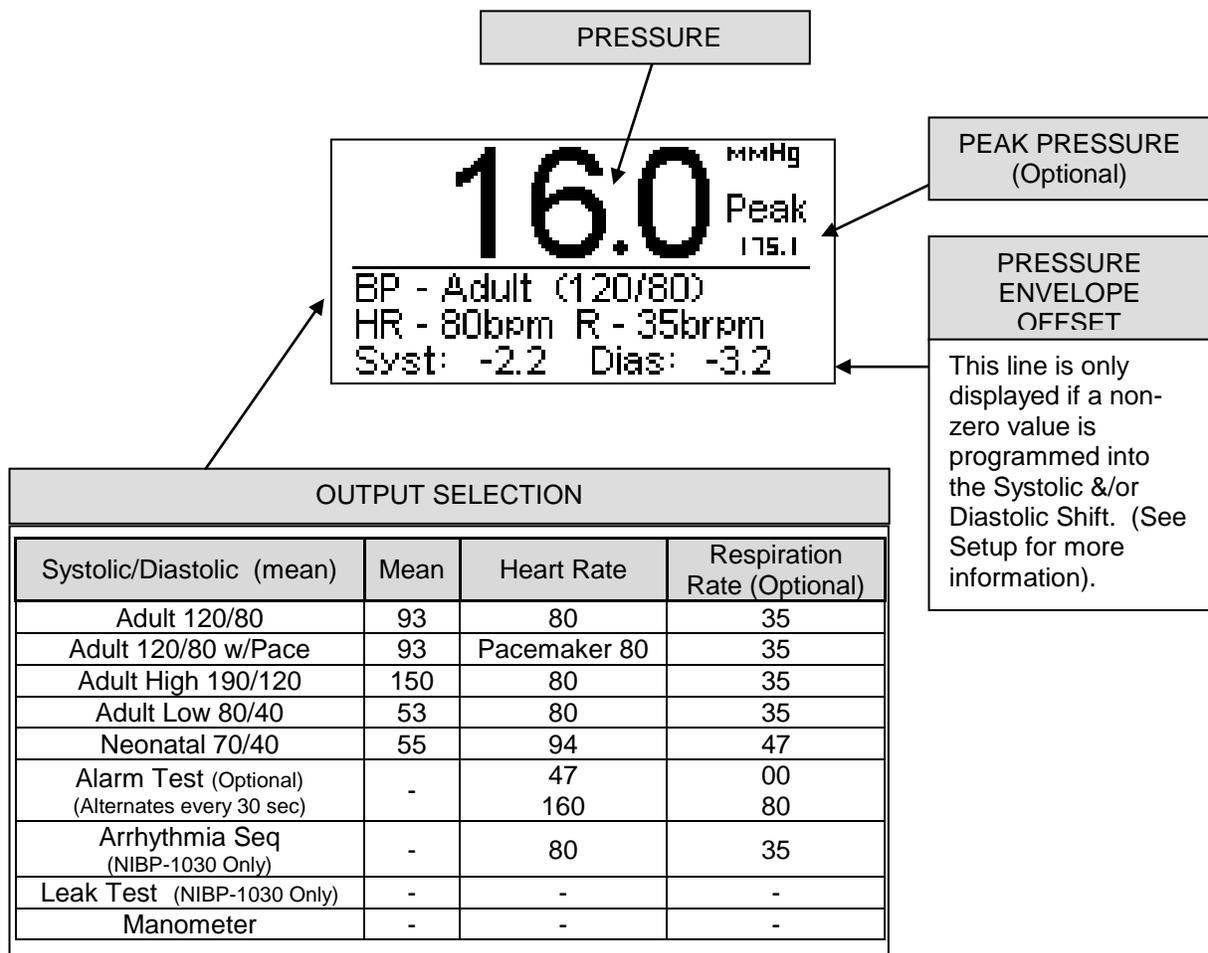
**MAIN SCREENS** – There are five main screens: Pressure Only, Pressure with Output Waveform, Pressure with Pressure Graph, ECG (optional) and Battery Indicator (optional).

The available screens can be toggled using  .

**PRESSURE ONLY SCREEN** – This screen has a large pressure display, as shown below.

Also displayed on this screen is the peak pressure and selected output waveform

The display will resemble the following:

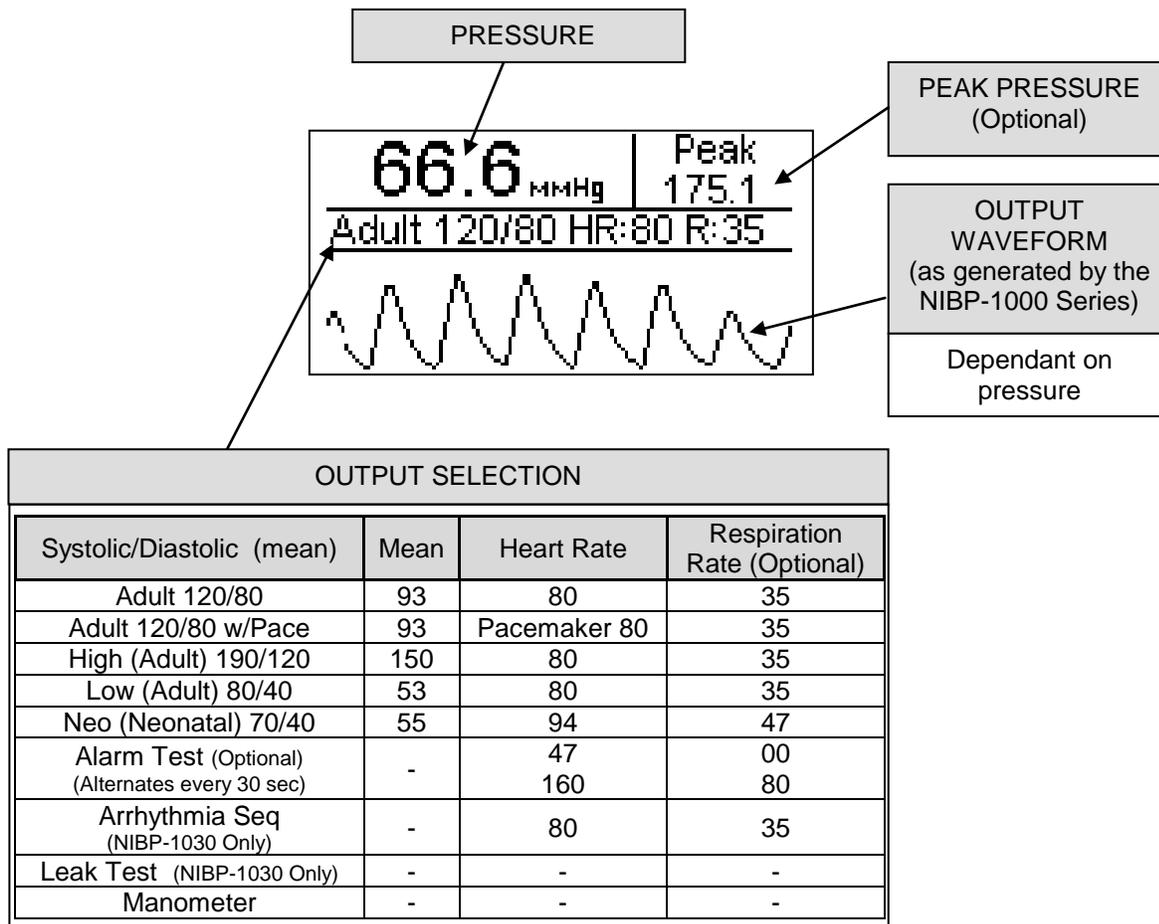


**OUTPUT WAVEFORM SCREEN** – This screen shows the pressure, peak pressure, output selection, and output waveform.

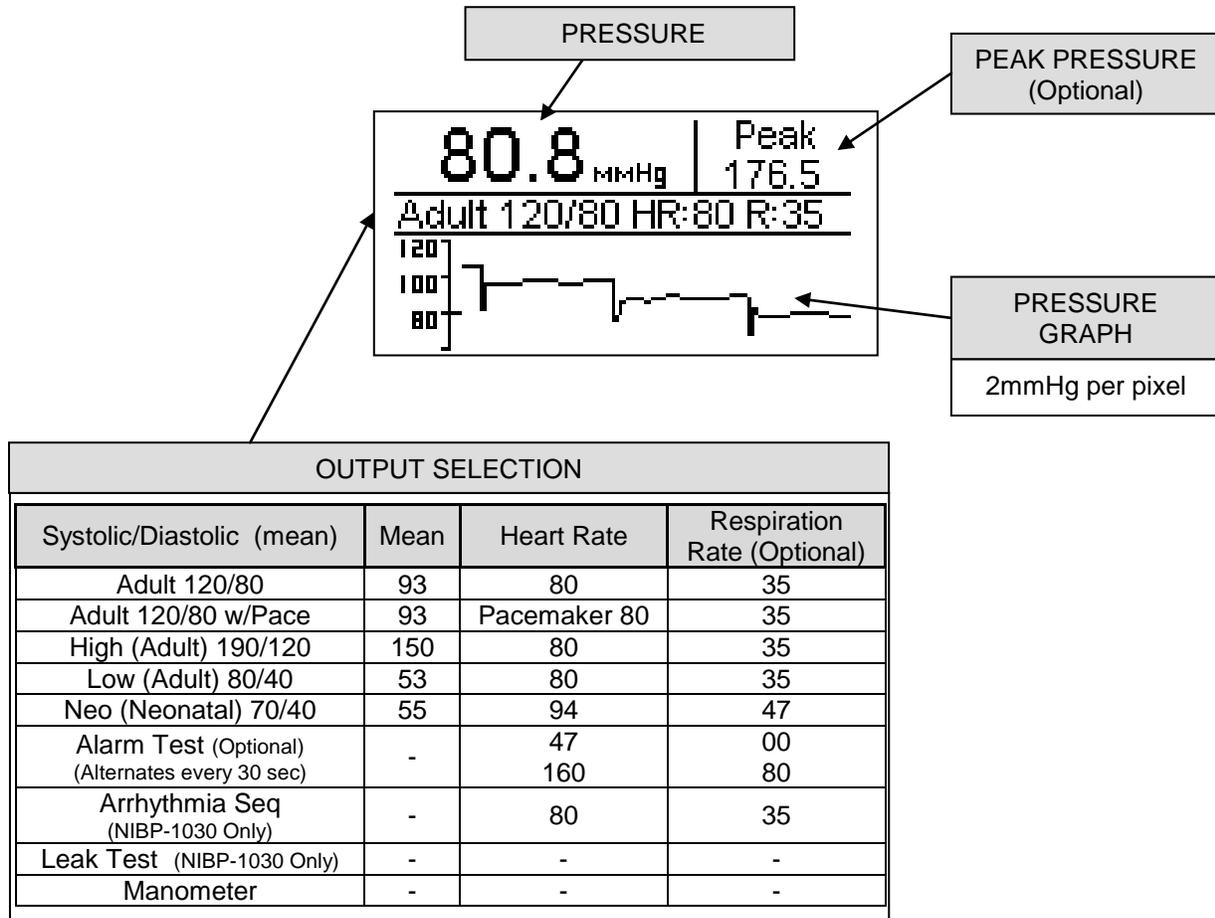
**NOTE**

**This waveform is not intended to be physiologically correct.**

The display will resemble the following:



**PRESSURE GRAPH SCREEN** – This screen provides a graph of the pressure, as well as, the pressure, peak pressure and output selection



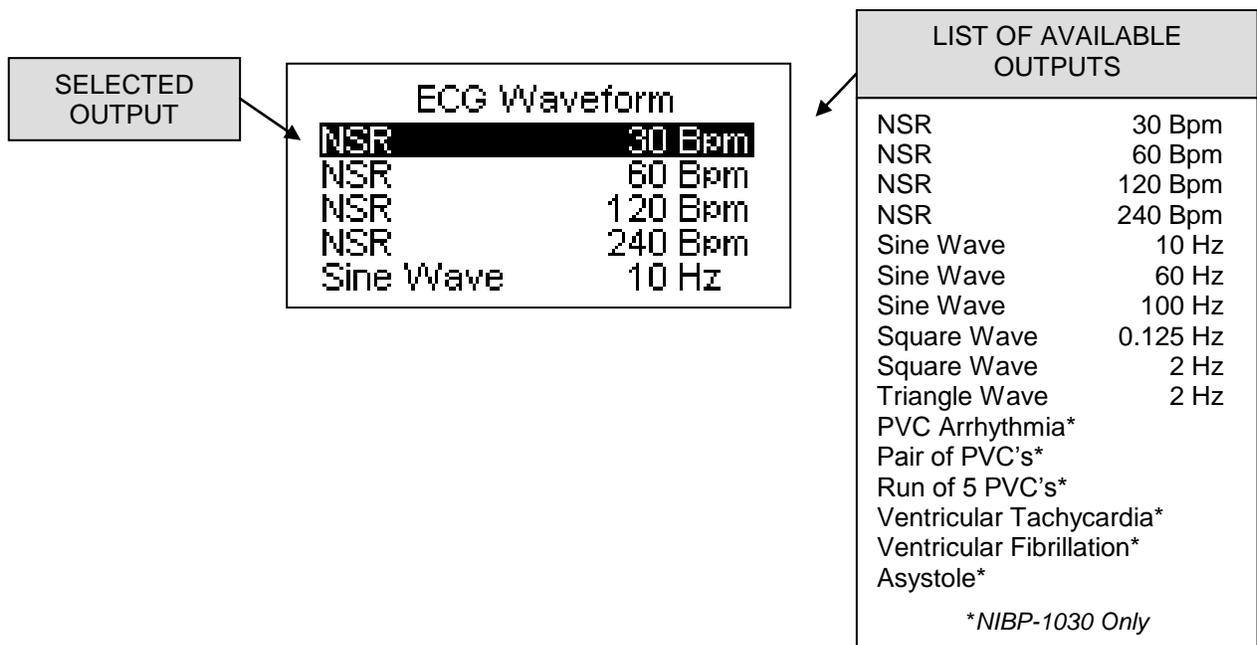
**ECG OUTPUT SCREEN** – This screen shows the selected ECG output mode.

(NIBP-1020 & NIBP-1030 units only)

NOTE: While in this mode, the NIBP simulation does not run.

NOTE: NSR ECG output is active during NIBP testing at the rate stipulated for the selected test.

The display will resemble the following:

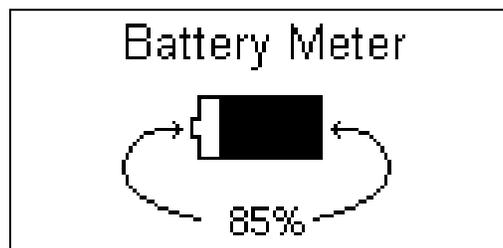


**BATTERY INDICATOR SCREEN** – This screen shows the status of the battery voltage level with Built-In Battery Option only.

NOTE: It is only an estimate of the battery life remaining.

When the level reaches 10%, the BP simulation mode will be disabled; however, the Manometer and ECG (optional) will continue to function. Once the battery level reaches 0%, the unit will automatically turn itself off to avoid damaging the batteries.

The display will resemble the following:



Batteries charge from provided AC power adapter. The charge time is about 4 hours from full discharge. While the batteries are charging, the display will flash “charging.”

# SETUP

The Setup Mode allows the user to adjust the configuration of the simulator. The Setup screen can be entered using the  key. The parameters can be changed by using  key to highlight the line and   to toggle the available options. The Setup screen can be exited using the  key.

System Setup	
1) Systolic Shift	-2.2
2) Diastolic Shift	-3.2
3) SpO <sub>2</sub> Output	On
4) Auto Off Timer (Min)	30
5) Contrast Adjust	11

NIBP 1010 and NIBP 1020

System Setup	
1) Systolic Shift	0.0
2) Diastolic Shift	0.0
3) Static BP	-10 mmHg
4) IBP Sen	5 uV/V/mmHg
5) Temp	0.0 C 32.0 F

NIBP 1030

The following is a breakdown of the parameters available in the configuration of the unit and their available options:

<b>System Setup Configuration</b>		
<b>Parameter</b>	<b>Description</b>	<b>Range</b>
Systolic Shift	Adjusts the Systolic Output of the NIBP Simulation. This is not a direct mmHg adjustment.	±50.0
Diastolic Shift	Adjusts the Diastolic Output of the NIBP Simulation. This is not a direct mmHg adjustment.	±50.0
Static BP (NIBP-1030 Only)	Adjusts the Static Blood Pressure Output.	-10 to 400 mmHg
IBP Sens (NIBP-1030 Only)	Selects the Invasive Blood Pressure Output sensitivity.	5 µV/V/mmHg 40 µV/V/mmHg
Temp (NIBP-1030 Only)	Selects the simulated Temperature output.	0, 24, 30, 35, 37, 40, 42 C
SpO <sub>2</sub> Output	This parameter determines whether the SpO <sub>2</sub> output pulse is active. The output drives an MSP-2100 FingerSim Module.	Off/On
Auto Off Timer	Determines the period of inactivity before the unit is turned OFF. A timer is started when the unit is turned ON and is reset each time a key is pressed. When the timer reaches the value set in this parameter, the power is automatically turned OFF. (NOTE: Setting this parameter to 0 disables the Auto Off timer. When running from line power, the unit does not automatically shut off. Auto Off timer is inactive during a test.)	0-30 Minutes
Contrast Adjust	Sets the contrast of the display screen.	0-20
Backlight	Off – Always off 1-30 sec – The elapsed time after which the backlight will automatically turn off. ON – Always ON. The Default setting is 30 seconds.	Off, 1-30 sec, ON
Battery Life	Available only with Battery Option installed. Displays current life of the battery. At 10%, a warning screen will appear. At 0%, the unit will power down automatically.	0-100% (Read Only)
Software	Displays current software program.	(Read Only)

**SYSTOLIC AND DIASTOLIC SHIFT** – The NIBP-1000 Series is equipped with the option to shift test results to compensate for different methods of measuring Oscillometric NIBP by various manufacturers and models of devices under test.

**CAUTION**

**These adjustments must be used with caution as they will allow the user to adjust the output results to invalid values.**

**These adjustments should only be used to aid in the simplification of testing and with documented controls.**

There are no absolute standards for Oscillometric NIBP readings; therefore, for a number of reasons (including patents, technology, etc.), each manufacturer has established a different method for evaluating the oscillometric pulses. Due to these varying methods, precisely the same waveforms will give different results on different manufacturer's units.

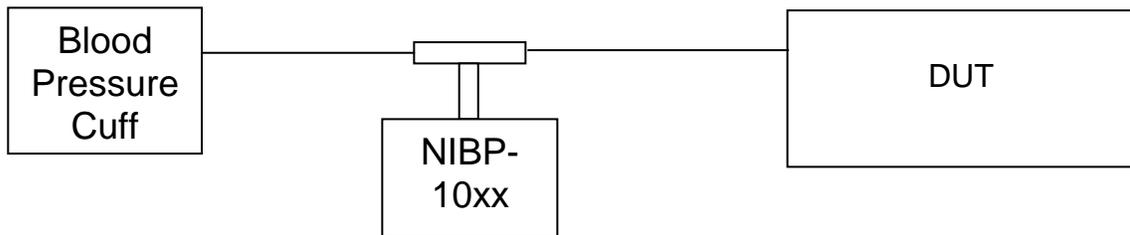
The normal technique used is to run the monitor against a fixed source like the NIBP-1000, with the understanding that each manufacturer has a predictable error from this norm. While this is generally the most direct method, users have asked for a method to correct for this difference, making the monitors read the same as the test unit. The Systolic and Diastolic Shift settings allow for just such correction.

These adjustments are indicated in a line added to the main display to inform the user of any shift that has been programmed into the system. This is done so there is no misunderstanding of the meaning of the results.

## CONNECTIONS

### Connecting Pressure Cuffs

The NIBP-1010, NIBP-1020 and NIBP-1030 Blood Pressure Simulators are connected between the blood pressure cuff and the DUT (Patient Monitor). The blood pressure cuff should be disconnected from the DUT and a 'T' adapter inserted between the cuff and the DUT. The NIBP simulator is then connected to the open side of the 'T' adapter as pictured below:



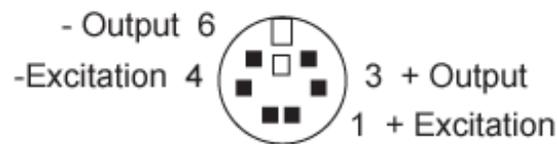
NOTE: Roll the cuff tightly on itself or around a mandrel.

### Connecting Patient Leads

For models with ECG output, snaps or patient lead test posts (NIBP-1030-BE only) are provided along the sides and are identified by the markings on the overlay.

### **Connecting IBP Cables (NIBP-1030 ONLY)**

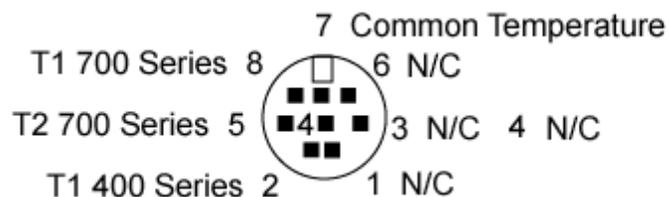
For models with IBP output, connect the DUT-appropriate IBP test cable between the NIBP-1030 IBP Connector (6-pin Mini-DIN as pictured below) and the DUT. The pin-out shown below for the Mini-DIN connector is the industry standard configuration used on most modern patient simulators. As such, there are many existing cables that may be used or you may obtain the proper cable from BC Group.



**NOTE: Mini-DIN pinout viewed from NIBP Connector Side**

### **Connecting Temperature Simulation Cables (NIBP-1030 ONLY)**

For the models with Temperature output, connect the DUT-appropriate Temperature Simulation test cable between the NIBP-1030 Temperature Connector (8-pin Mini-DIN as pictured below) and the DUT.



**NOTE: Mini-DIN pinout viewed from NIBP Connector Side**

## Auxiliary Connector

The Auxiliary connector can be used for either standard RS-232 Serial communications using an optional accessory cable or for SpO<sub>2</sub> simulation using the optional accessory MSP-2100 SpO<sub>2</sub> module available from BC Biomedical.



**NOTE: Mini-DIN pinout viewed from NIBP Connector Side**



## **THEORY OF OPERATIONS**

### **NIBP (Non-Invasive Blood Pressure) Function**

A stepping motor and piston pressure engine is used to generate the output waveforms. A precision pressure sensor is used to measure the pressure of the cuff. The pressure sensor is read by a 16-bit differential Analog to Digital converter.

The cuff pressure is monitored and the motor/piston assembly reacts to provide the correct response based on the selected mode.

### **IBP (Invasive Blood Pressure) Function**

A Digital to Analog converter is used to generate the IBP waveforms. The output circuit is fully isolated and capable of switching between the two standard sensitivities (5  $\mu\text{V}/\text{V}/\text{mmHg}$  and 40  $\mu\text{V}/\text{V}/\text{mmHg}$ ).

### **Temperature**

There is an 8-pin mini-DIN plug connector on the right side of the unit for connection of a Temperature cable. Temperatures are simulated for both YSI 400 and YSI 700 probe types. There are seven different temperatures selectable for each.

### **ECG Function**

A Digital to Analog converter is used to generate the ECG outputs based on stored waveform data for standard ECG and Arrhythmias.

### **Respiration Function**

A Digital to Analog converter is used to generate the respiration waveform. The respiration output is present on the LA ECG lead only. Refer to Monitor manual to determine which lead the Monitor uses for respiration. It may be necessary to reverse the LA and LL leads for respiration to be detected.

## RUNNING A TEST

Depending on the model, there are up to 9 Basic Test Modes and 3 Sub-Test Modes. This section will walk through each of the tests and their basic operation.

The Main Tests are accessible with a single key. The  key will scroll through the following tests in a continuous loop:

- Adult 120/80
- Adult 120/80 w/Pace
- Adult High 190/120
- Adult Low 80/40
- Neonatal 70/40
- Alarm Test
- Arrhythmia Seq
- Leak Test
- Manometer

### BASIC TEST MODES

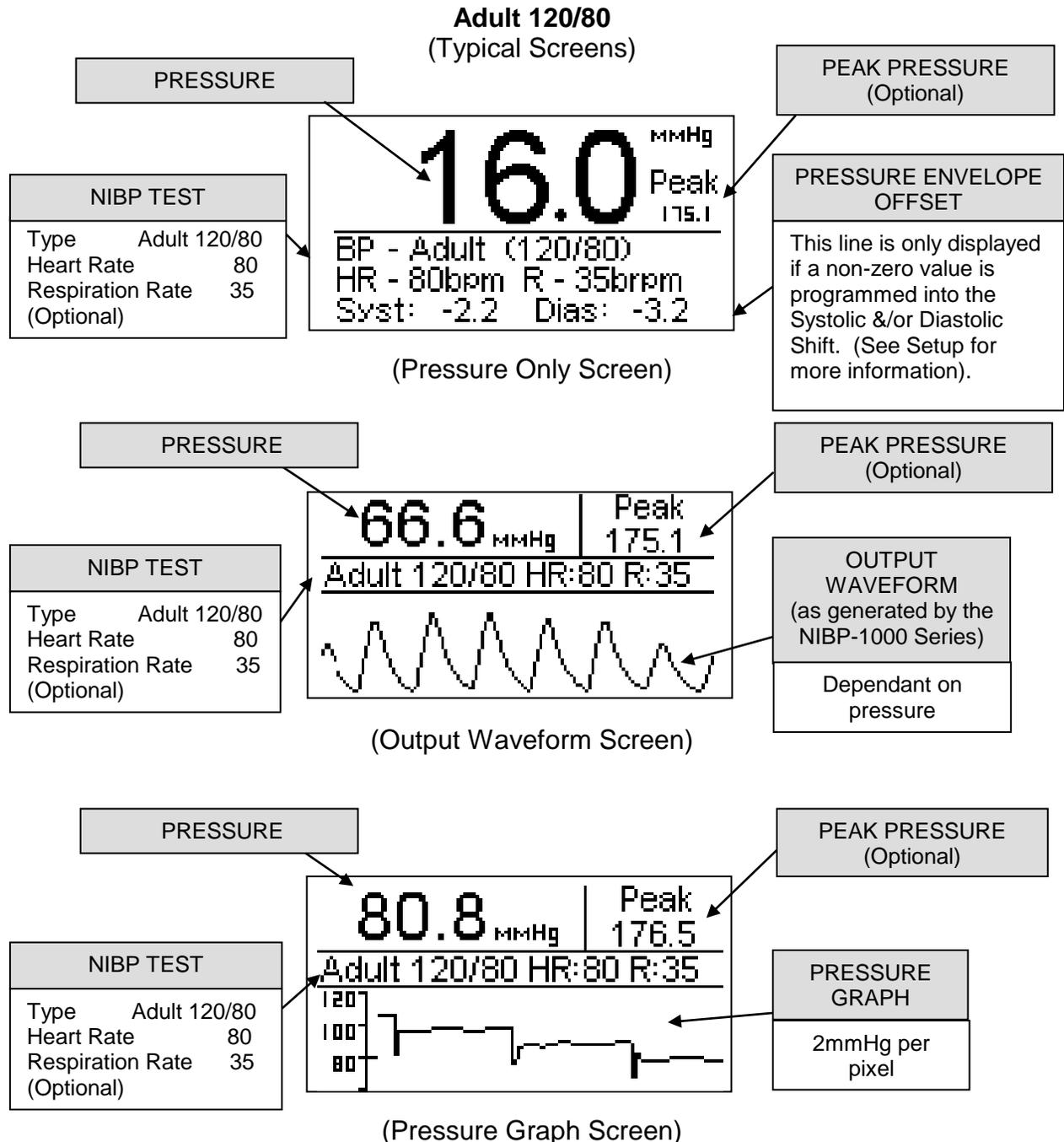
#### **NIBP:**

The first 5 test modes deal with various NIBP setups. To run an NIBP simulation, the cuff and monitor are connected to the pressure input. Then the measurement is initiated by the monitor and the NIBP Simulator will output the proper waveform based on the cuff pressure provided by the monitor and the selected simulation.

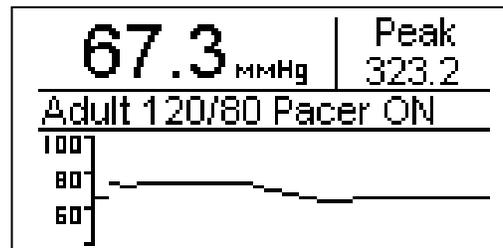
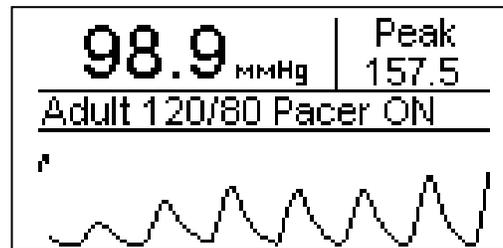
The NIBP output mode can be changed by pressing the  key. Once the desired operating mode is selected, the output will automatically begin when the correct pressure is detected.

There are 5 selectable NIBP Basic Test Modes; Adult, Adult w/pace, Adult High, Adult Low and Neonatal. The displays will resemble the following examples:

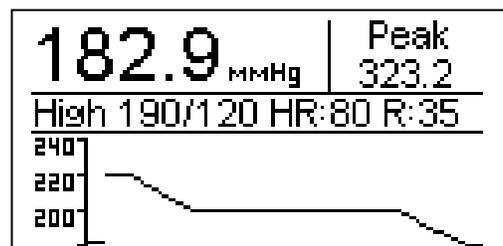
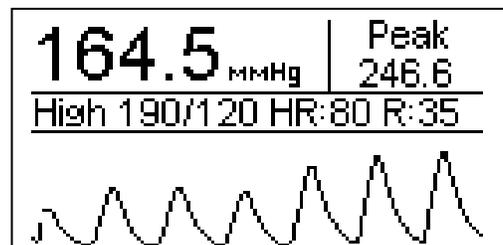
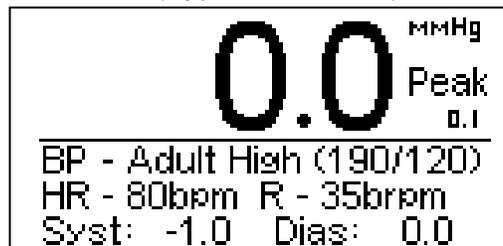
NOTE: The screens for the first test will have the individual components labeled. The component labels for subsequent tests are the same.



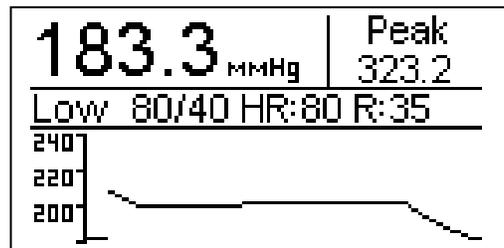
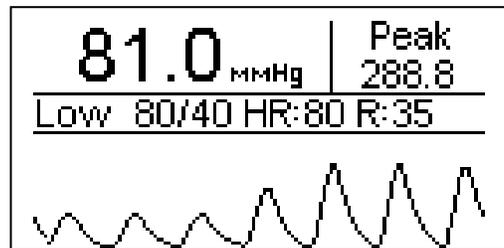
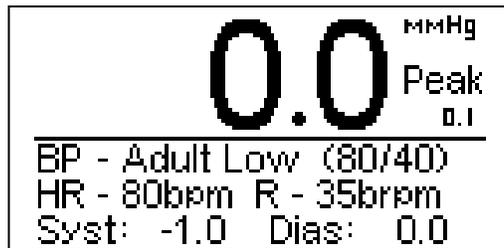
**Adult 120/80 with Pace**  
(Typical Screens)



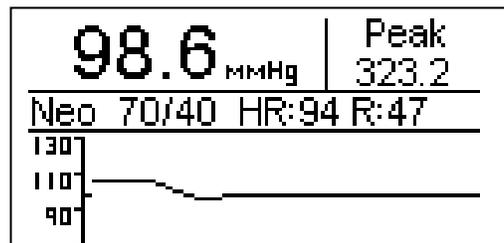
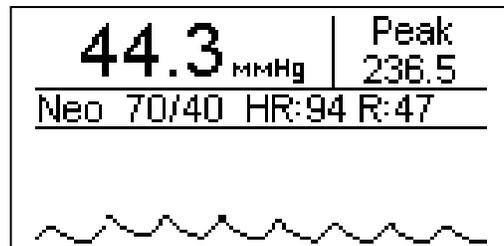
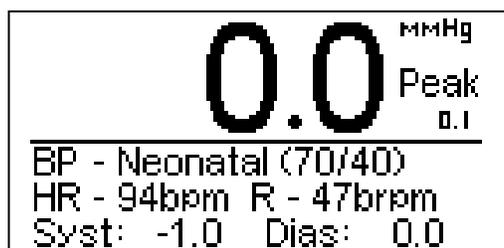
**Adult High 120/80**  
(Typical Screens)



**Adult Low 80/40**  
(Typical Screens)



**Neonatal 70/40**  
(Typical Screens)

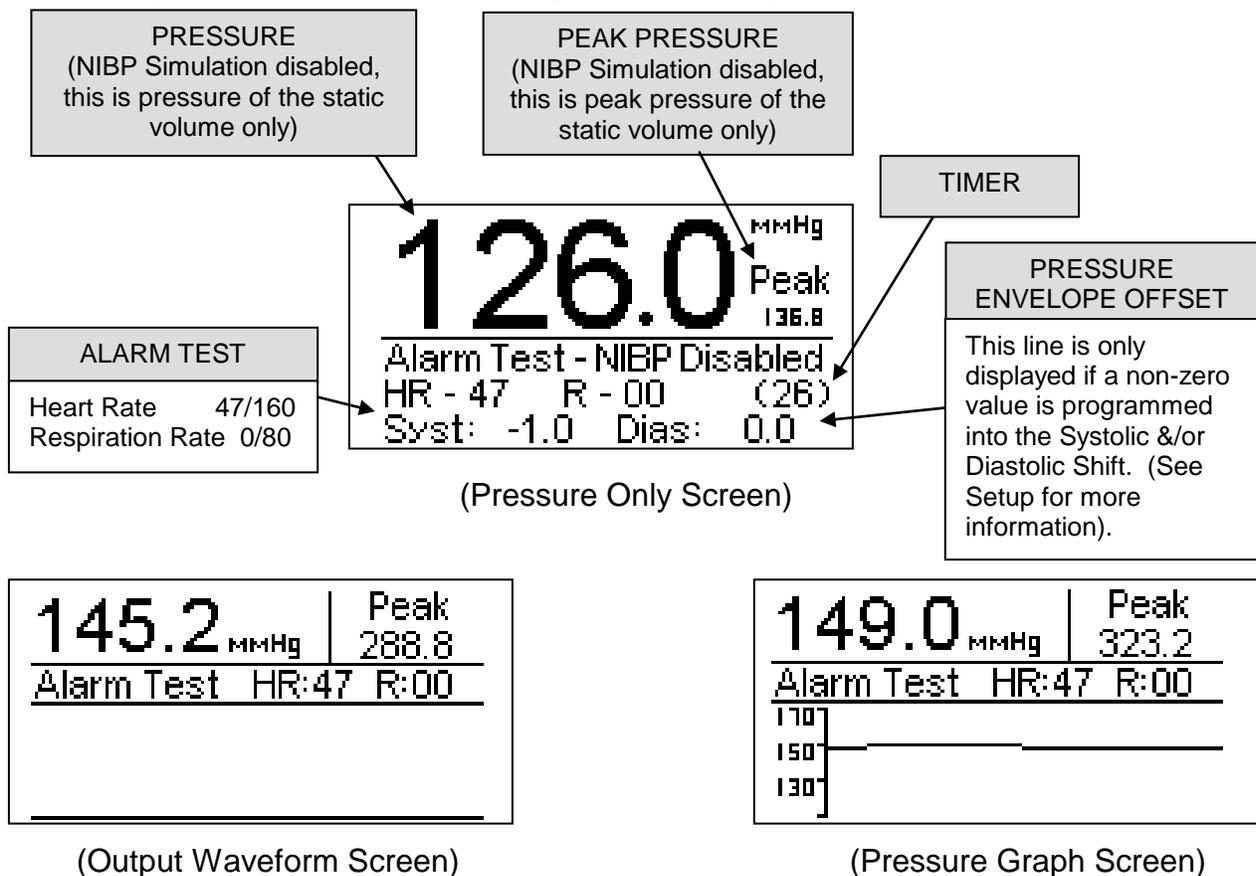


## ALARM TEST:

Use the  key to cycle through the Test Modes until Alarm Test appears. The purpose of this function is to help test the alarms of the monitor under test. The ECG output will alternate from a 47 BPM NSR with apnea respiration (0 brpm) to 160 BPM NSR with 80 brpm respiration. The time interval between alternations is 30 seconds. A count down timer is displayed to indicate the time still remaining for the current output.

NOTE: While in this mode, the NIBP simulation output is disabled. Pressure readings in the screens below are only manometer-type readings of static pressure applied.

The displays will resemble the following examples: (Typical Screens)



## ARRHYTHMIA SEQUENCE: (NIBP-1030 Only)

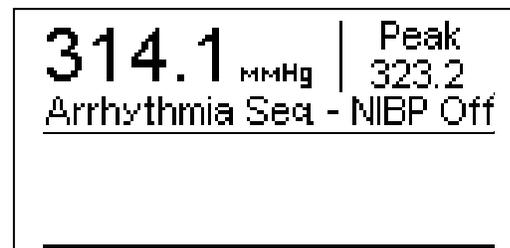
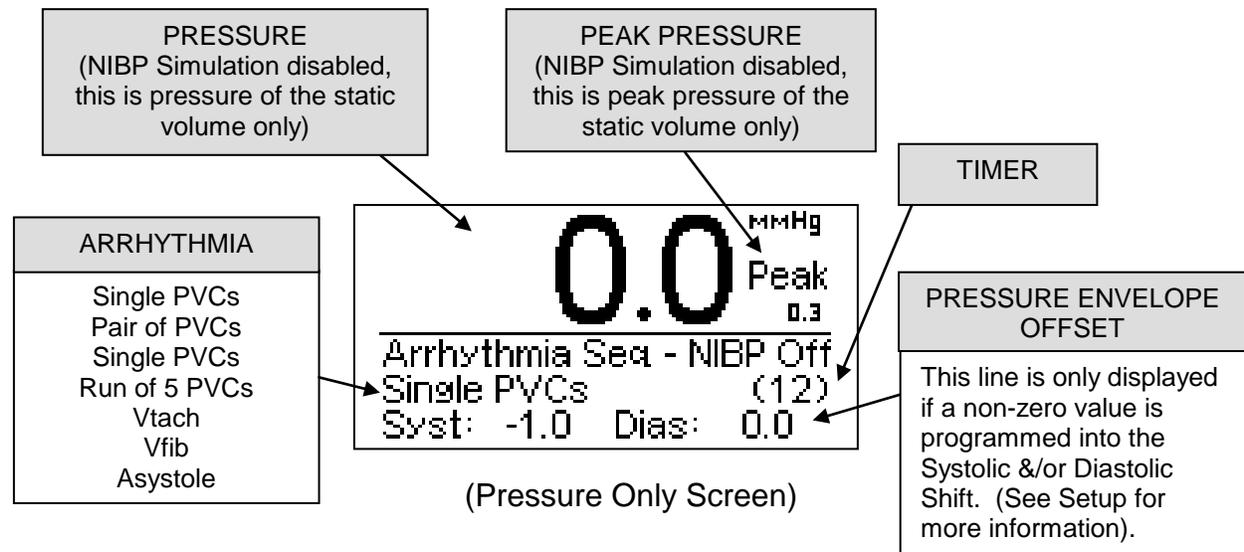
Use the  key to cycle through the Test Modes until Arrhythmia Sequence appears.

The purpose of this function is to provide a timed sequence of some of the more common Arrhythmias. The test will continually cycle through the 6 arrhythmias in the sequence listed below. A count down timer is displayed to indicate the time still remaining in each step.

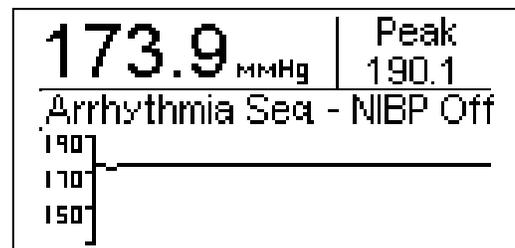
NOTE: While in this mode, the NIBP simulation output is disabled.

Step	Display	Total Time	ECG Output
1	Single PVCs	18 sec	11 NSR, 1 PVC, 11 NSR, 1 PVC
2	Pair of PVCs	9 sec	10 NSR, Pair of PVCs
3	Single PVCs	18 sec	11 NSR, 1 PVC, 11 NSR, 1 PVC
4	Run of 5 PVCs	12 sec	11 NSR, Run of 5 PVCs
5	Vtach	30 sec	15 NSR, VTach
6	Vfib	30 sec	15 NSR, VFib
7	Asystole	30 sec	15 NSR, Asystole

The displays will resemble the following examples: (Typical Screens)



(Output Waveform Screen)



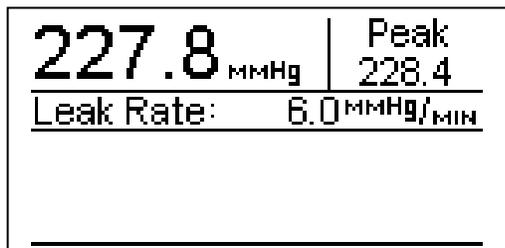
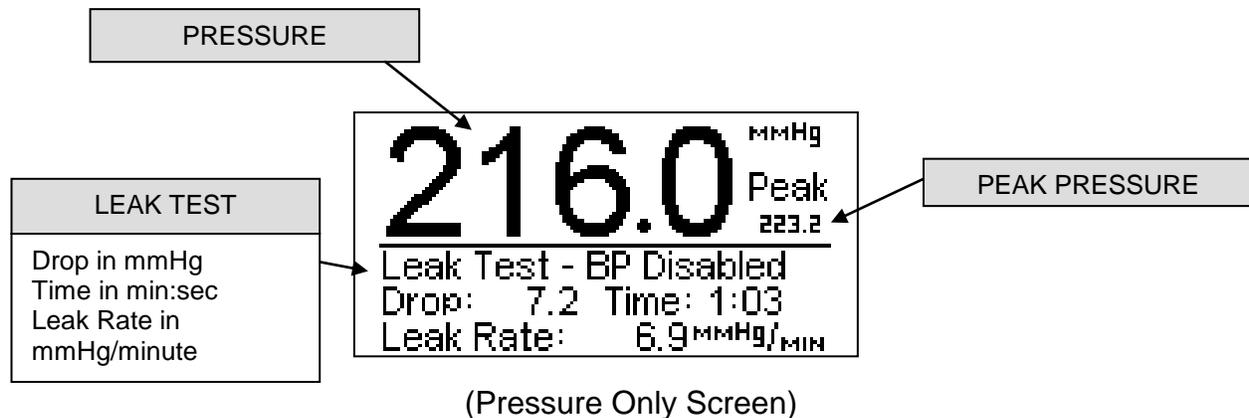
(Pressure Graph Screen)

## LEAK TEST: (NIBP-1030 Only)

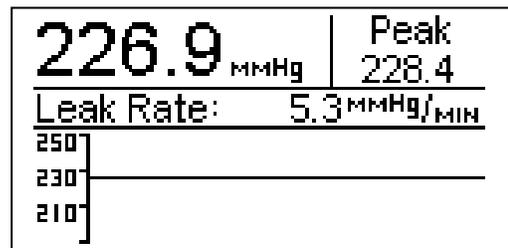
Use the  key to cycle through the Test Modes until Leak Test appears. The purpose of this function is to provide a standard pressure leak test. The pressure input is connected to the system that is to be monitored. Pressure is then applied to the system. The Leak Test is initiated by pressing the  key. The unit traces and displays the pressure drop and the time since the test was initiated. The unit also calculates and displays the leak rate in mmHg per minute.

NOTE: While in this mode, the NIBP simulation output is disabled.

The displays will resemble the following examples: (Typical Screens)



(Output Waveform Screen)



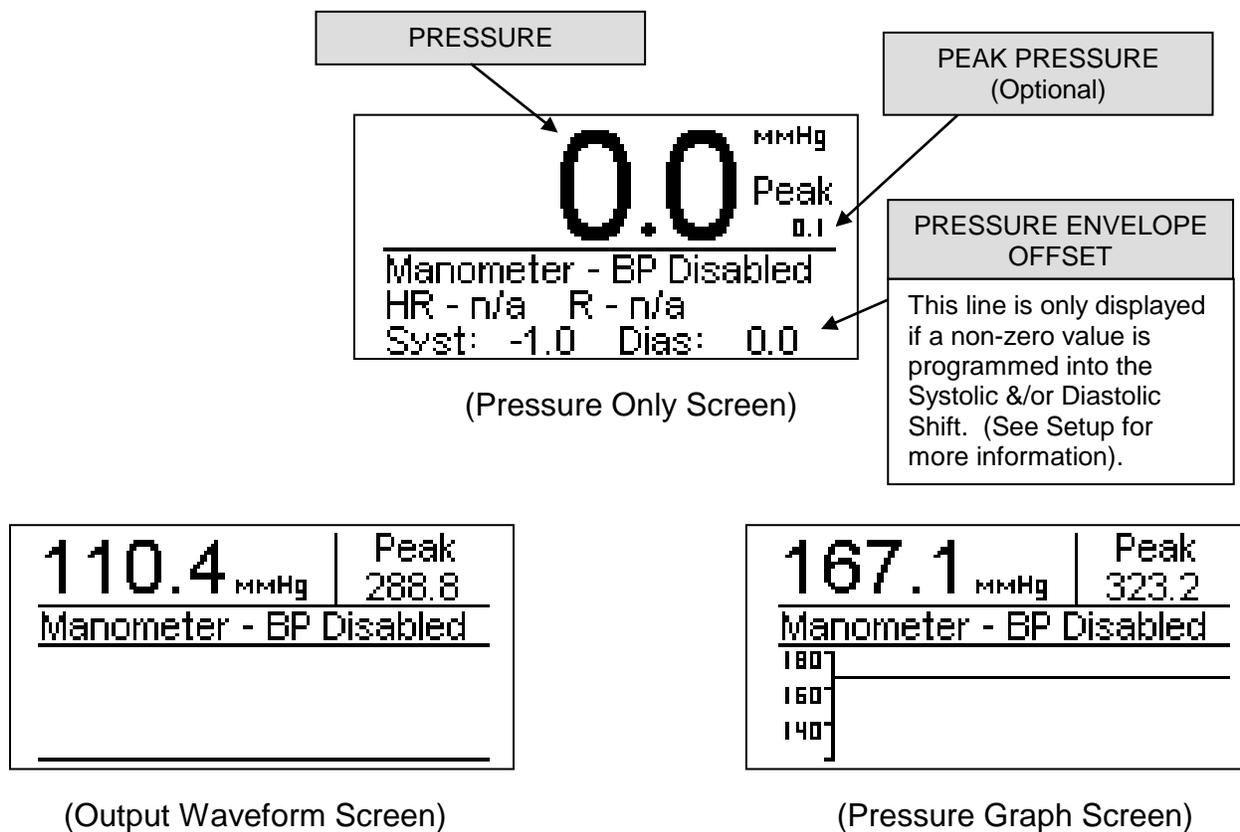
(Pressure Graph Screen)

## MANOMETER:

Use the  key to cycle through the Test Modes until Manometer appears. The purpose of this function is to allow the unit to be used strictly as a Manometer with a full scale range of  $\pm 500$  mmHg.

NOTE: The Graphic Screens are also available in this mode for maximum flexibility

The displays will resemble the following examples: (Typical Screens)

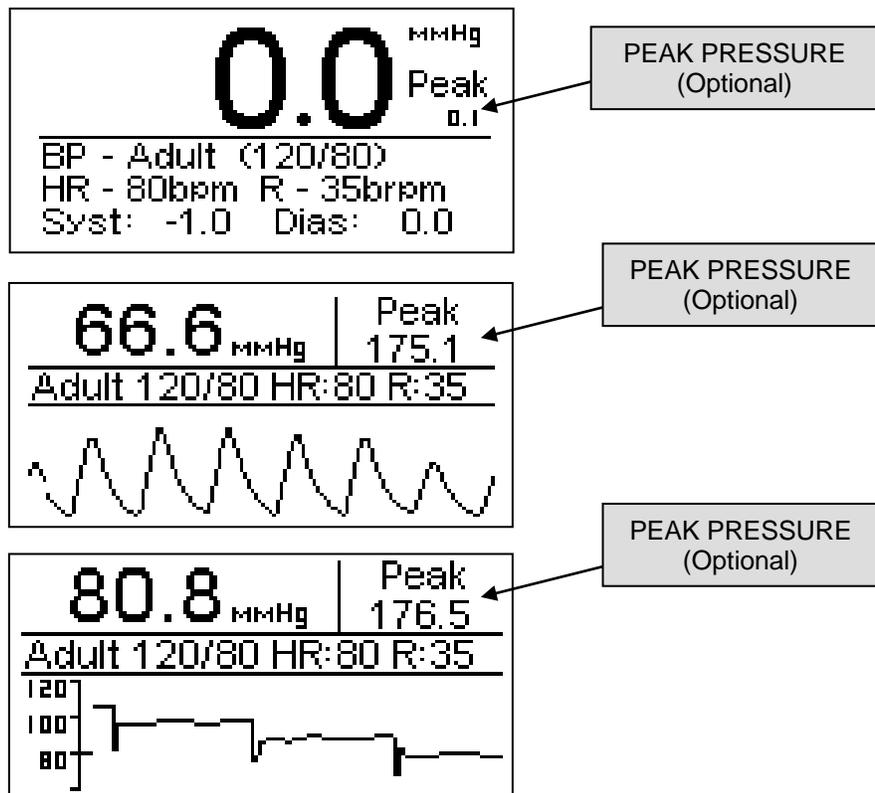


## SUB TEST MODES

### **PEAK: (Optional)**

The optional Peak test feature is available whenever the display is in a pressure mode. It will continuously monitor the pressure input and display and hold the maximum value. This value may be reset at any time by pressing the  key.

The displays will resemble the following examples: (Typical Screens)

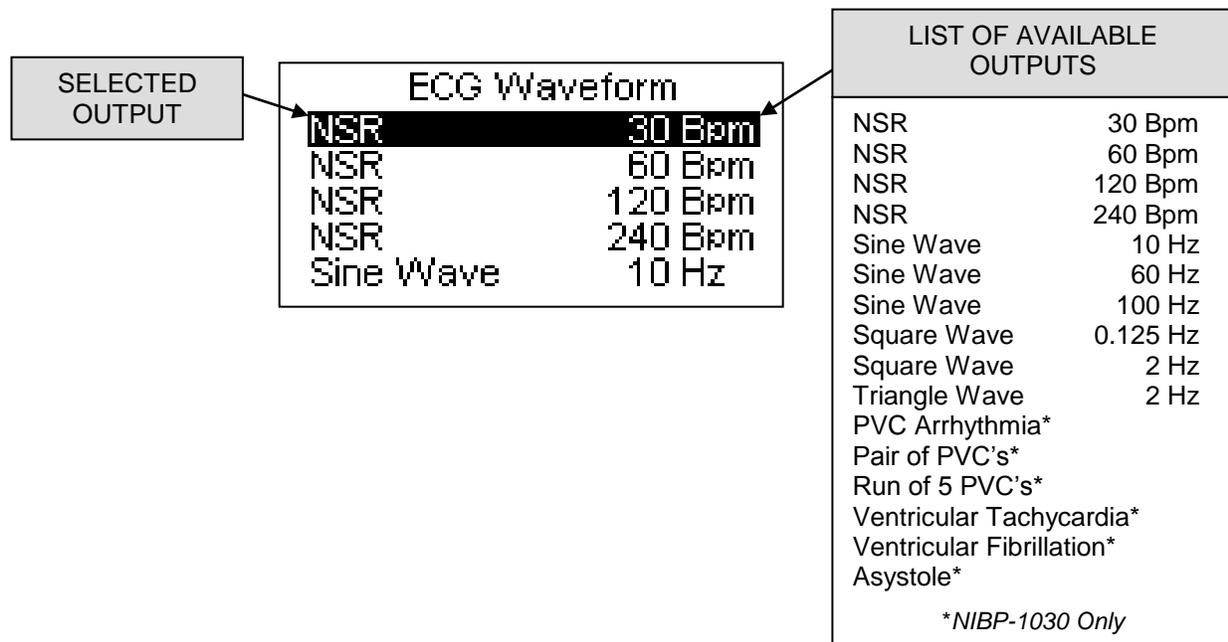


## ECG PERFORMANCE TEST: (NIBP-1020 & NIBP-1030)

The ECG output is selected by pressing  until the ECG Waveforms menu is displayed. The  key is used to choose the desired ECG output. There are 16 fixed waveforms available.

NOTE: While in this mode the NIBP simulation is disabled, but the IBP simulation is active (NIBP-1030 only).

The display will resemble the following example:



### **DYNAMIC IBP: (NIBP-1030 Only)**

The IBP output matches the NIBP setting in the NIBP mode or the ECG setting in the ECG Waveform mode.

NOTE: The IBP sensitivity (5  $\mu\text{V}/\text{V}/\text{mmHg}$  or 40  $\mu\text{V}/\text{V}/\text{mmHg}$ ) must be correctly selected in the SETUP Mode before using IBP. (See Setup section for more information.)

### **STATIC IBP: (NIBP-1030 Only)**

A static Blood Pressure output may be selected in the SETUP mode. This fixed value will remain on the IBP output until changed.

NOTE: The IBP sensitivity (5  $\mu\text{V}/\text{V}/\text{mmHg}$  or 40  $\mu\text{V}/\text{V}/\text{mmHg}$ ) must be correctly selected in the SETUP Mode before using IBP. (See Setup section for more information.)

System Setup	
1) Systolic Shift	0.0
2) Diastolic Shift	0.0
3) Static BP	0 mmHg
4) IBP Sen	5 $\mu\text{V}/\text{V}/\text{mmHg}$
5) Temp	42.0 C 107.6 F

## TEMPERATURE SIMULATION: (NIBP-1030 Only)

The temperature setting can be selected in the SETUP mode. This fixed value will remain on the Temperature output until changed. The output will simulate both YSI 400 and YSI 700 Temperature probes.

System Setup		
1) Systolic Shift		0.0
2) Diastolic Shift		0.0
3) Static BP	-10 mmHg	
4) IBP Sen	5 uV/V/mmHg	
5) Temp	0.0 C	32.0 F

NOTE: Both outputs are available at the output connector simultaneously.

NOTE: On some Patient Monitors, if ECG simulation is active on the NIBP-1030 and you enable Temperature Simulation, the ECG trace may disappear from the Patient Monitor screen. This is a flaw of the Patient Monitor, not the NIBP-1030 Simulator.

## MANUAL REVISIONS

<u>Revision #</u>	<u>Program #</u>	<u>Revisions Made</u>
Rev 01	DT7355CA	Origination
Rev 02	DT7355CA	Specification Information Updated
Rev 03	DT7355CA	Misc. Edits
Rev 04	DT7355CF	Add Systolic/Diastolic adjustments
Rev 05	DT7355CG	Output Selection edited
Rev 06	DT7355CI	Misc. Edits
Rev 07	DT7355CI	Warnings, Cautions, Notices Updated
Rev 08	DT7359CA	NIBP-1030, IBP, ECG Arrhythmia Waveforms Added
Rev 09	DT7359CA	Temperature Added
Rev 10	DT7359CA	Temp Connector Updated, Static 120 Added
Rev 11	DT7355CO, DT7359CH	Address Updated, Screen Captures Updated, Output Selection Charts Updated
Rev 12	DT7355CO, DT7359CH	Misc. Edits
Rev 13	DT7355CO, DT7359CH	Added NIBP-1030-BE model, revised accessories listing, and other miscellaneous edits.
Rev 14	DT7355CO, DT7359CH	Format Updated, Misc. Edits
Rev 15	DT7355CO, DT7359CH	Misc. Edits

## LIMITED WARRANTY

**WARRANTY:** BC GROUP INTERNATIONAL, INC. WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

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## SPECIFICATIONS

### MANOMETER (PRESSURE MEASUREMENT)

RANGE	± 500 mmHg @ 20 °C
ACCURACY	± (1% of Reading + 0.5 mmHg @ 20 °C)

### NON-INVASIVE BLOOD PRESSURE (NIBP) SIMULATION

RATE	80, 94 BPM (NOTE: Synchronized to ECG on NIBP-1020/1030)
ACCURACY	± 1%

### INVASIVE BLOOD PRESSURE (IBP) SIMULATION (NIBP-1030 ONLY)

STATIC PRESSURE	-10, -5, 0, 20, 40, 50, 60, 80, 100, 120, 150, 160, 200, 240, 250, 300, 320, 400 mmHg
ACCURACY	± (1% Full Range + 1 mmHg) or ± (2% Setting + 2 mmHg) whichever is better
IMPEDANCE	300 Ω, ± 10%
EXCITATION RANGE	2 to 16 VRMS
EXCITATION FREQUENCY	DC to 5 kHz
SENSITIVITY	5 or 40 μV/V/mmHg

### ECG SIMULATION (NIBP-1020 & NIBP-1030)

NSR RATE	30, 60, 120, 240 BPM	
PERFORMANCE WAVEFORMS	SINE RATE	10, 60, 100 Hz
	SQUARE RATE	0.125, 2 Hz
	TRIANGLE RATE	2 Hz
RATE ACCURACY	± 1%	
AMPLITUDE	2.75 mV ± 2% @ Lead II	

### PACEMAKER SIMULATION WAVEFORMS (NIBP-1020 & NIBP-1030)

AMPLITUDE	3 mV ± 10%
WIDTH	6 ms ± 5%

<b>RESPIRATION SIMULATION (NIBP-1020 &amp; NIBP-1030)</b>		
RATE ACCURACY	± 1%	
IMPEDANCE	DELTA	3.0 Ω ± 10%
	BASELINE	1000 Ω ± 5%
<b>TEMPERATURE SIMULATION (NIBP-1030 ONLY)</b>		
SENSOR TYPE	YSI Series 400 and 700	
POINTS	0, 24, 30, 35, 37, 40, 42 °C (32, 75.2, 86, 95, 98.6, 104, 107.6 °F)	
ACCURACY	± 0.1 °C	
<b>ELECTRICAL</b>		
AC POWER ADAPTER	12 VDC, 500 mA  BC20-40613 (USA) BC20-40614 (Euro)	
BATTERY (OPTIONAL)	Rechargeable NiMH pack (Not user serviceable)	
BATTERY RUNTIME	500 Test Cycles between charges	
<b>PHYSICAL &amp; ENVIRONMENTAL</b>		
DISPLAY	128 X 64 Pixels Graphical LCD, White LED Backlight	
SIZE	NIBP-1000 through NIBP-1030	7.70 x 5.36 x 4.07 Inches (195.6 x 136.1 x 103.4 mm)
	NIBP-1030-BE	7.70 x 6.15 x 4.07 Inches (195.6 x 156.2 x 103.4 mm)
WEIGHT	< 3.5 Lbs (1.6 kg)	
CONSTRUCTION	ENCLOSURE	ABS Plastic
	OVERLAY	Back-Printed Lexan
OPERATING RANGE	15 to 40 °C (59 to 104 °F)	
STORAGE RANGE	-20 to 65 °C (-4 to 149 °F)	

## NOTES

**NOTES**

**NOTES**





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**NIBP Series User Manual  
08/12 – Rev 15**

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