BC Biomedical
A UNIT OF BC GROUP INTERNATIONAL, INC.

NON-INVASIVE BLOOD PRESSURE SIMULATORS

NIBP-1030

NIBP-1030-BE

NIBP-1040-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 CE 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

Symbol	Description
	**Caution** (Consult Manual for Further Information)
	**Center Negative**
	**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

BC BIOMEDICAL
BC GROUP INTERNATIONAL, INC.
3081 ELM POINT INDUSTRIAL DRIVE
ST. CHARLES, MO 63301
USA

1-800-242-8428
1-314-638-3800

www.bcgroupintl.com
sales@bcgroupintl.com

BC BIOMEDICAL
NIBP-1000 SERIES
NON-INVASIVE BLOOD PRESSURE SIMULATORS

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 NIBP-1040 adds Fetal/Maternal ECG and an IUP waveform, as well as Cardiac Output simultaions.

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:

<u>NIBP-1010 (BASIC FEATURES, NIBP ONLY):</u>

- LARGE BACKLIT GRAPHICAL LCD DISPLAY WITH CURSOR SELECTION OF OPTIONS AND PARAMETERS
- FULL RANGE MANOMETER
- ADULT, NEONATAL, HYPERTENSIVE, AND HYPOTENSIVE MODES
- ± 500 mmHg PRESSURE RANGE
- DIGITAL PRESSURE ENVELOPE OFFSET
- OPTIONAL PEAK PRESSURE DETECT WITH SIMPLE RESET
- SpO_2 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

<u>NIBP-1020 ADDS:</u>

- 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 µV/V/mmHg
- STATIC IBP SIMULATION –10mmHg TO 400 mmHg
- LEAK RATE TEST
- ECG ARRHYTHMIA WAVEFORMS
- ECG ARRHYTHMIA SEQUENCE
- YSI 400 AND 700 SERIES TEMPERATURE SIMULATION

NIBP-1040 ADDS:

- CARDIAC OUTPUT, FETAL/MATERNAL MODE

AVAILABLE MODELS:

NIBP-1010	BASIC UNIT
NIBP-1010-P	+ PEAK
NIBP-1010-BP	+ BATTERY & PEAK
NIBP-1010KIT	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-1020KIT	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-1030KIT	NIBP-1030-B, 5 ADAPTERS & SOFT CARRYING CASE
NIBP-1030KIT-E	NIBP-1030-BE, 5 ADAPTERS & SOFT CARRYING CASE
NIBP-1040KIT-E	NIBP-1040-BE WITH ECG, IBP, TEMP, PEAK & ALARM, CARDIAC OUPUT, FETAL/MATERNAL, 5 ADAPTERS & SOFT CARRYING CASE

STANDARD ACCESSORIES:

- MCO-2100 CARDIAC OUTPUT MODULE (NIBP-1040 ONLY)
- BC20-21112 AC POWER ADAPTER (INTERCHANGEABLE)

OPTIONAL ACCESSORIES:

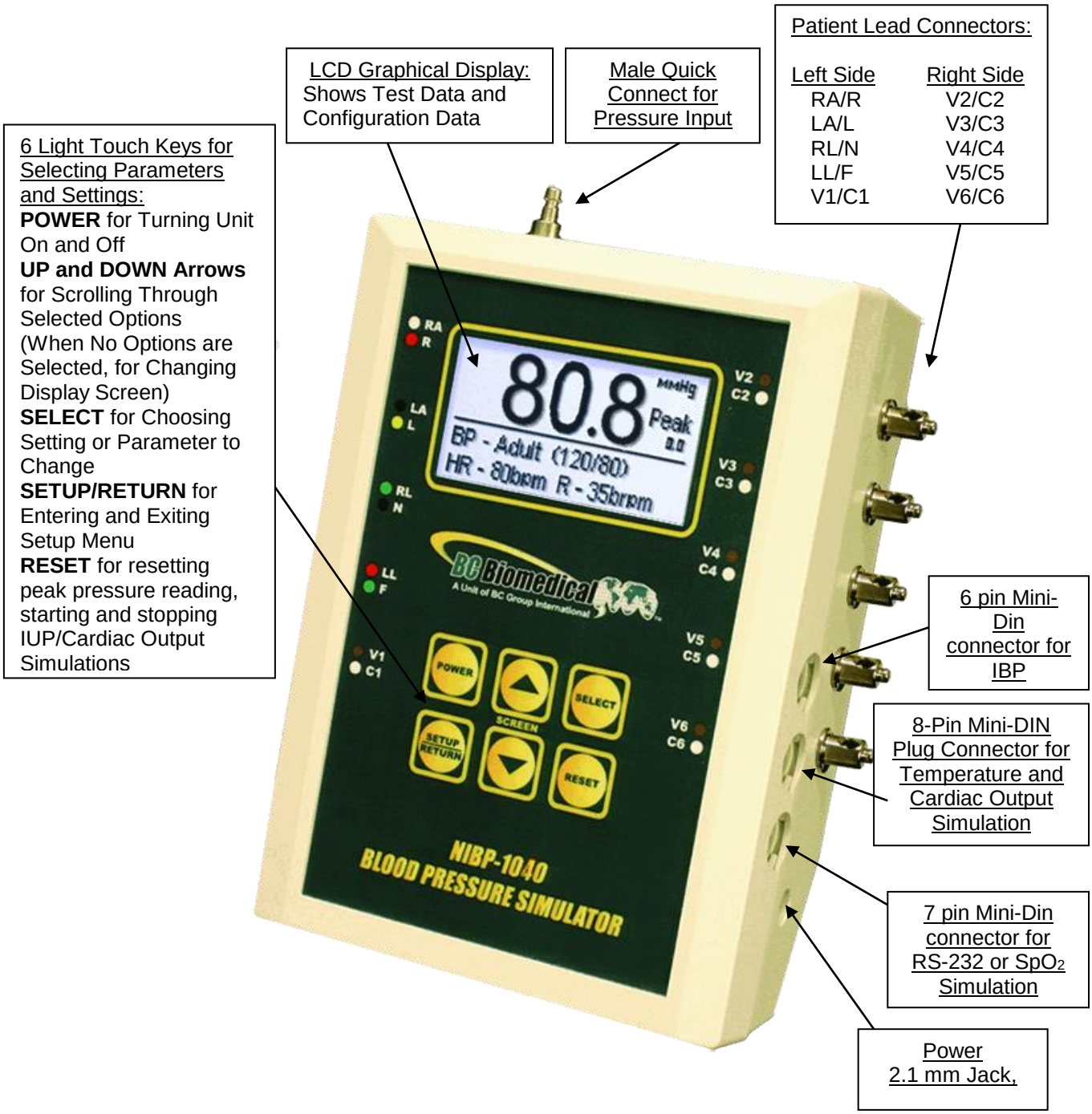
- BC20-40714 DINAMAP/CRITIKON ADAPTER
- BC20-40715 QUICK DISCONNECT ADAPTER
- BC20-40716 LUER ADAPTER
- BC20-40717 MARQUETTE ADAPTER
- BC20-40608 BULB ADAPTER

- 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
- BC20-41534 FETAL ECG SCALP ELECTRODE CABLE
- MSP-2100 PULSE OXIMETRY MODULE (ALLOWS NIBP TO SIMULATE SpO_2 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
- BC20-41361 USB RS-232 COMMUNICATION CABLE (USB-A TO MINI-DIN)
- BC20-30111 SOFT CARRYING CASE

- INVASIVE BLOOD PRESSURE (IBP) CABLES:
  FOR A COMPLETE LIST CONSULT THE BC GROUP WEBSITE AT WWW.BCGROUPINTL.COM

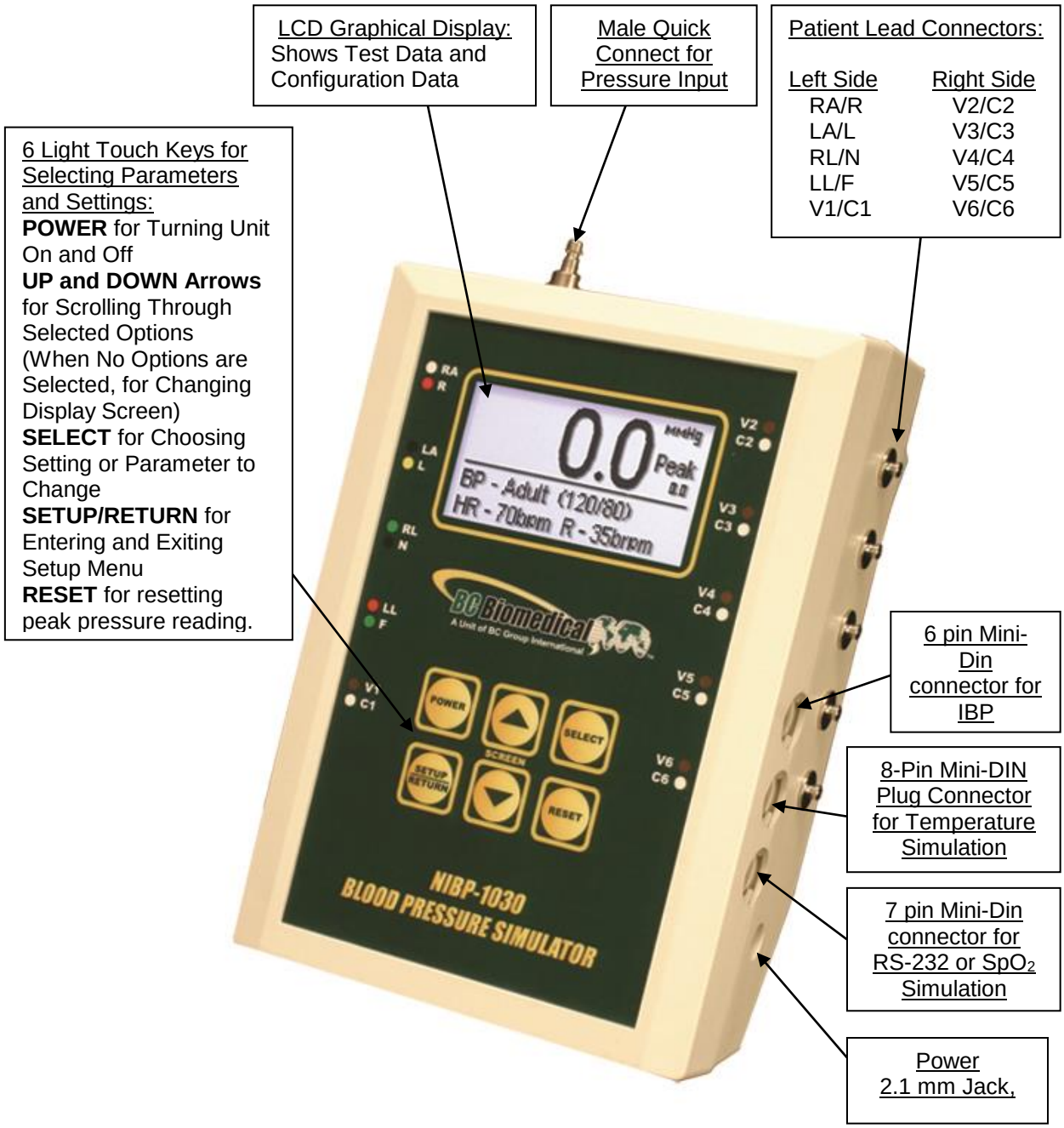
OVERVIEW

This section looks at the layout of the NIBP-1040-BE and gives descriptions of the elements that are present.

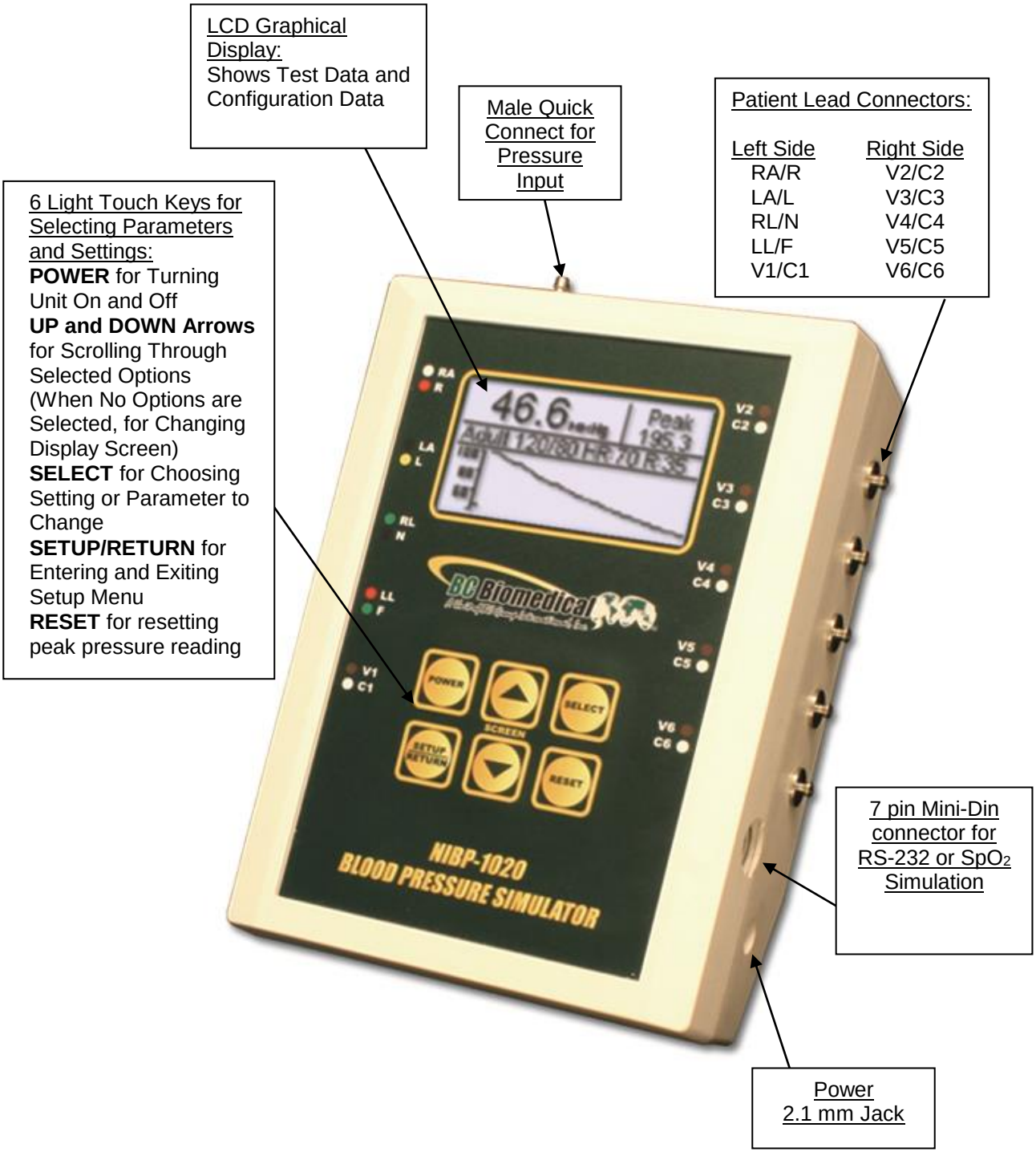


This section looks at the layout of the NIBP-1030 and gives descriptions of the elements that are present.

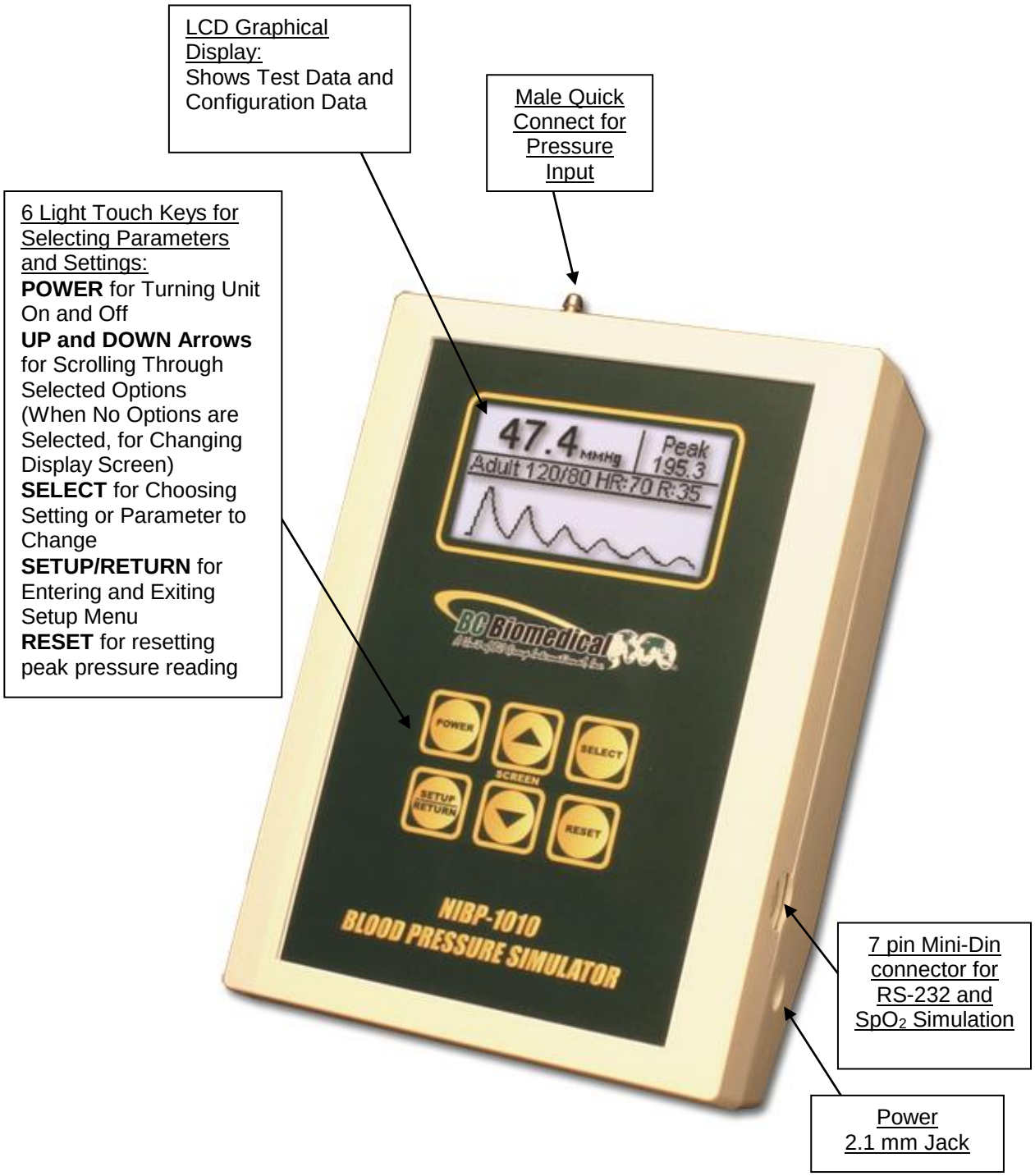
NOTE: The NIBP-1030-BE model is different from the unit shown below in that it uses universal patient lead banana posts that allow for the use of snaps and/or banana-type patient leads.



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.

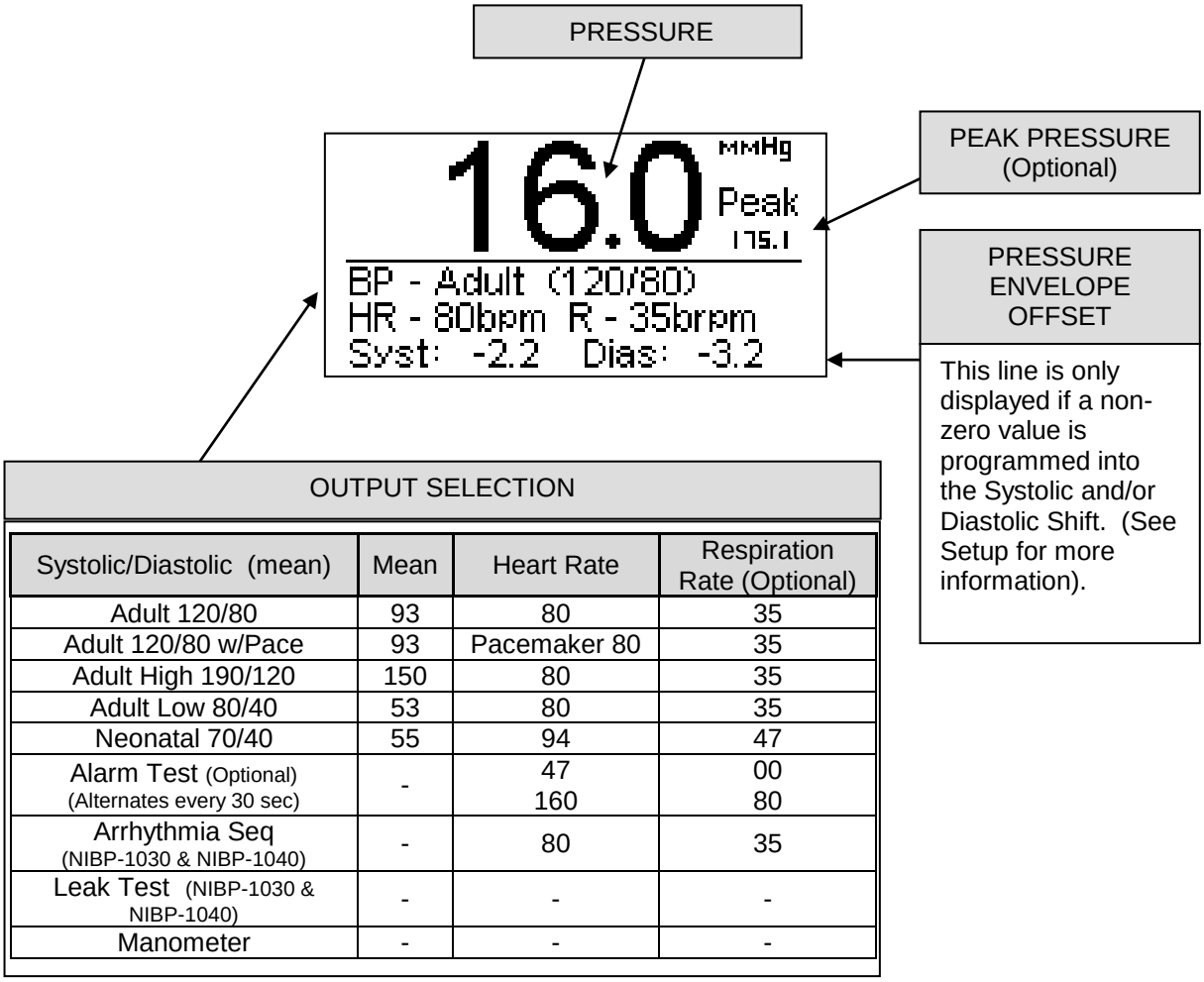
SCREENS

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:



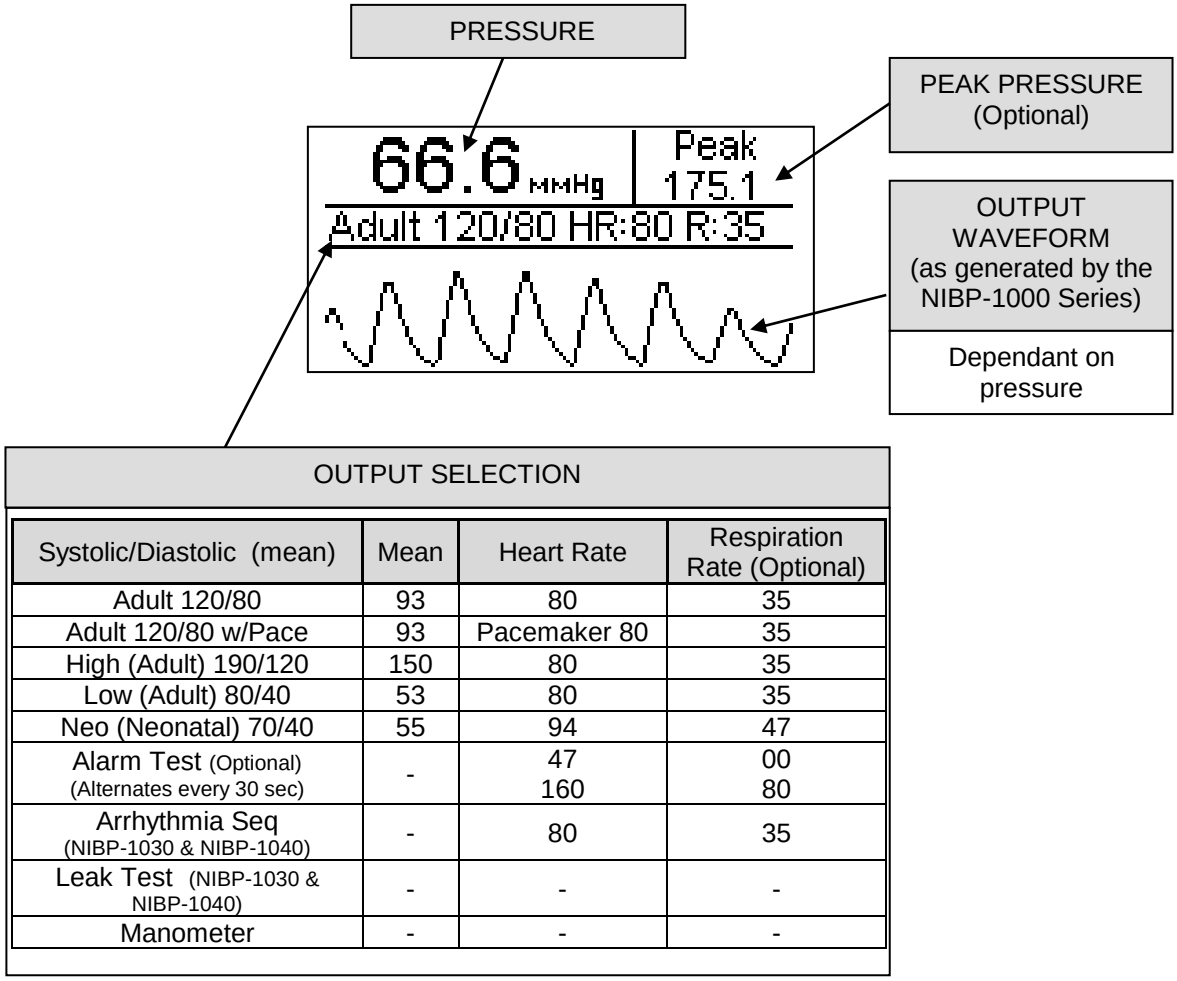
Systolic/Diastolic (mean)	Mean	Heart Rate	Respiration Rate (Optional)
Adult 120/80	93	80	35
Adult 120/80 w/Pace	93	Pacemaker 80	35
Adult High 190/120	150	80	35
Adult Low 80/40	53	80	35
Neonatal 70/40	55	94	47
Alarm Test (Optional) (Alternates every 30 sec)	-	47 160	00 80
Arrhythmia Seq (NIBP-1030 & NIBP-1040)	-	80	35
Leak Test (NIBP-1030 & NIBP-1040)	-	-	-
Manometer	-	-	-

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

NOTE

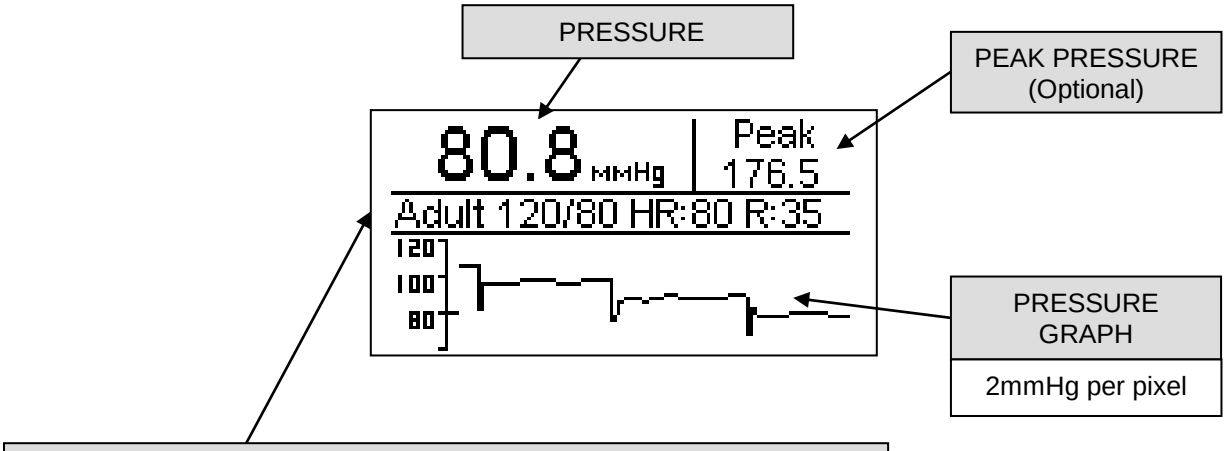
This waveform is not intended to be physiologically correct.

The display will resemble the following:



Systolic/Diastolic (mean)	Mean	Heart Rate	Respiration Rate (Optional)
Adult 120/80	93	80	35
Adult 120/80 w/Pace	93	Pacemaker 80	35
High (Adult) 190/120	150	80	35
Low (Adult) 80/40	53	80	35
Neo (Neonatal) 70/40	55	94	47
Alarm Test (Optional) (Alternates every 30 sec)	-	47 160	00 80
Arrhythmia Seq (NIBP-1030 & NIBP-1040)	-	80	35
Leak Test (NIBP-1030 & NIBP-1040)	-	-	-
Manometer	-	-	-

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



OUTPUT SELECTION

Systolic/Diastolic (mean)	Mean	Heart Rate	Respiration Rate (Optional)
Adult 120/80	93	80	35
Adult 120/80 w/Pace	93	Pacemaker 80	35
High (Adult) 190/120	150	80	35
Low (Adult) 80/40	53	80	35
Neo (Neonatal) 70/40	55	94	47
Alarm Test (Optional) (Alternates every 30 sec)	-	47 160	00 80
Arrhythmia Seq (NIBP-1030 & NIBP-1040)	-	80	35
Leak Test (NIBP-1030 & NIBP-1040)	-	-	-
Manometer	-	-	-

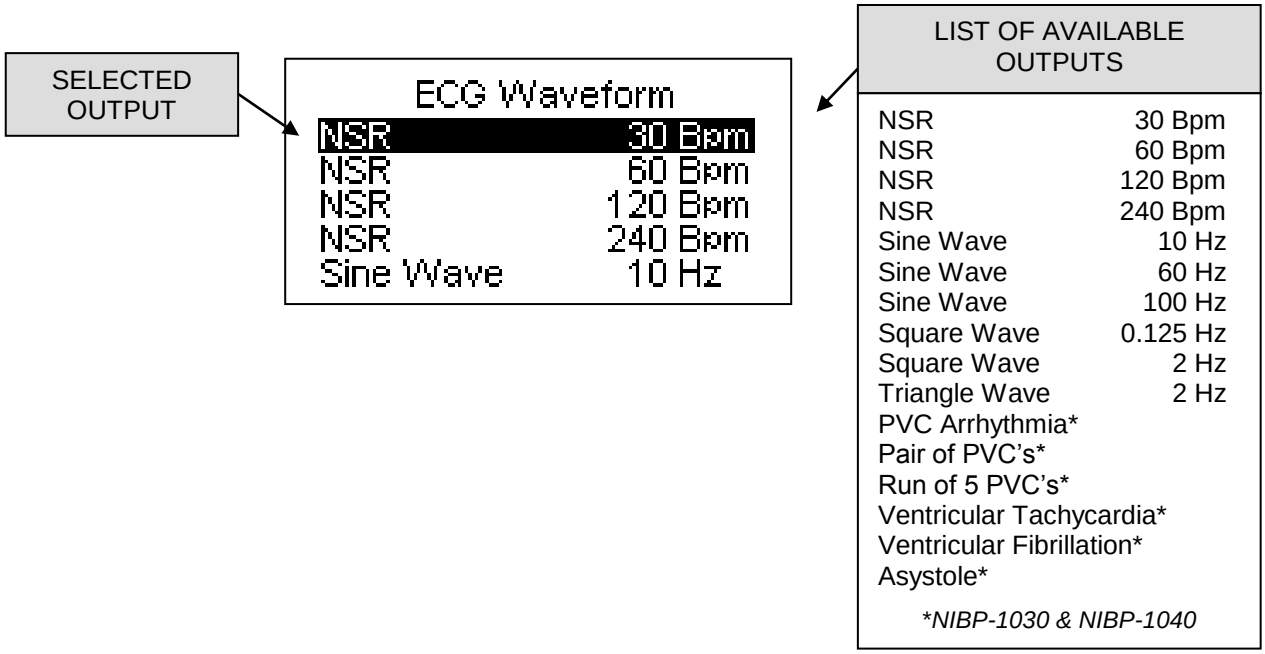
ECG OUTPUT SCREEN – This screen shows the selected ECG output mode.

(NIBP-1020, NIBP-1030, & NIBP-1040 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.

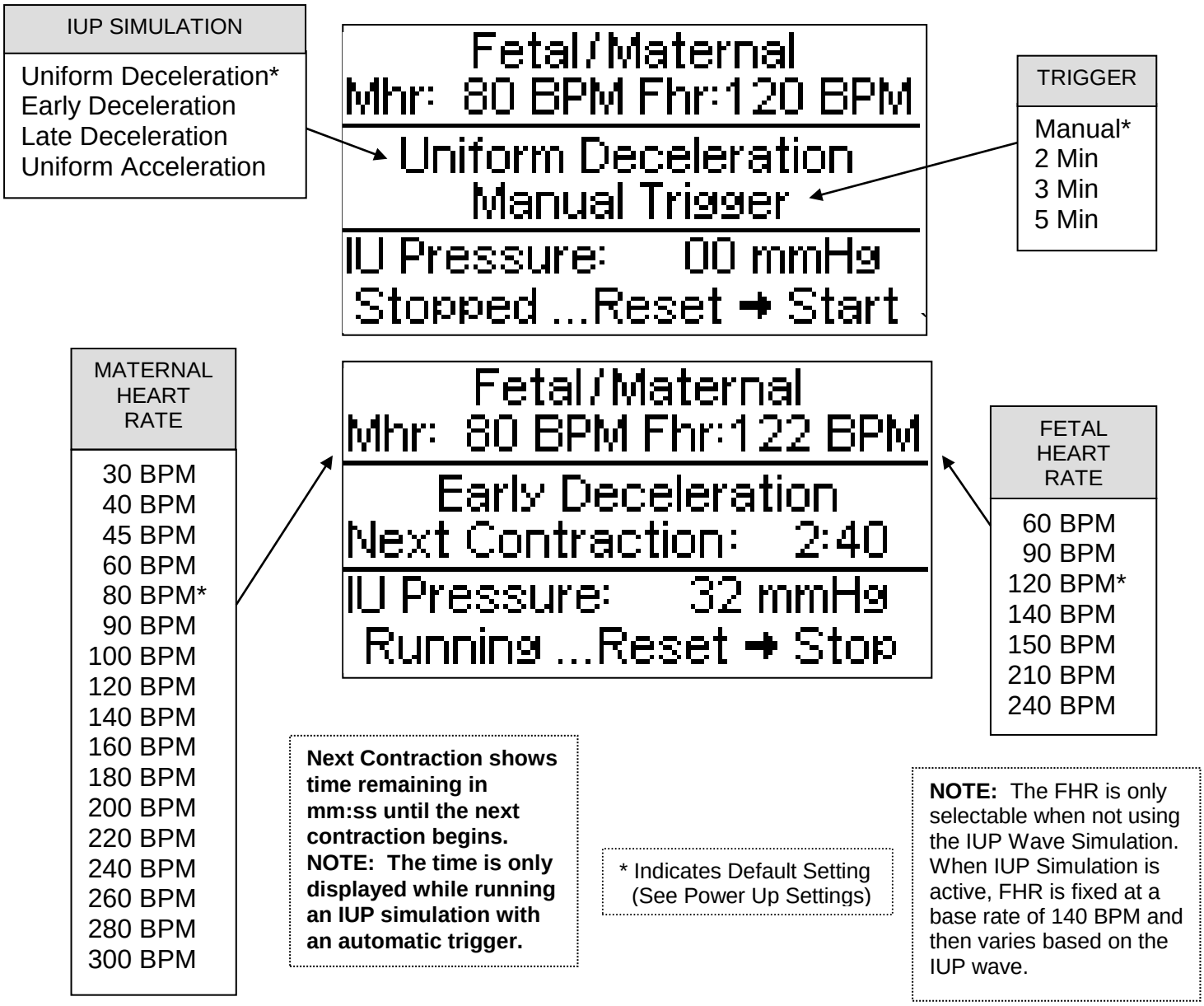
The display will resemble the following:



FETAL/MATERNAL SCREEN – This screen shows the select Fetal/Maternal output mode.

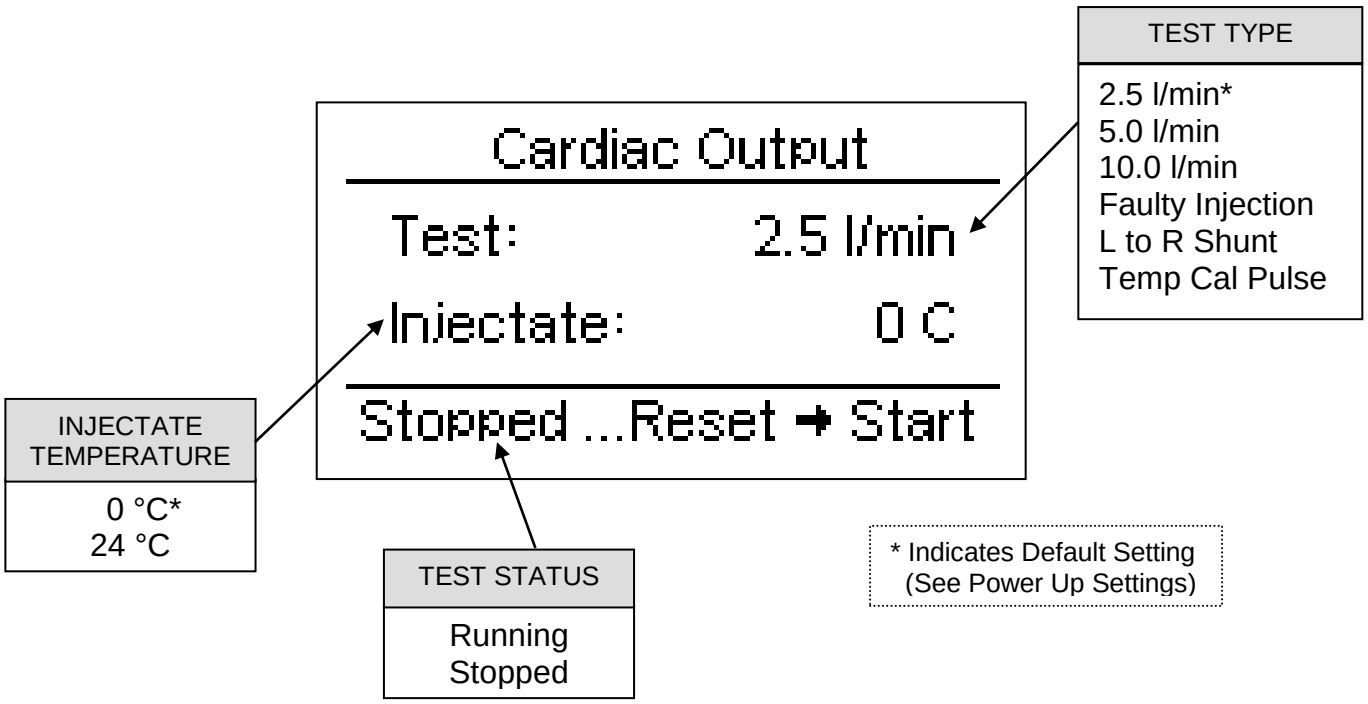
(NIBP-1040 ONLY)

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



NOTE: The Transducer Sensitivity (5 mV/V/mmHg or 40 mV/V/mmHg) must be set to correlate with the monitoring equipment before simulation can begin. (See SETUP for selection information).

CARDIAC OUTPUT SCREEN – This screen shows the select options and status of the Cardiac Output Test. (NIBP-1040 ONLY)

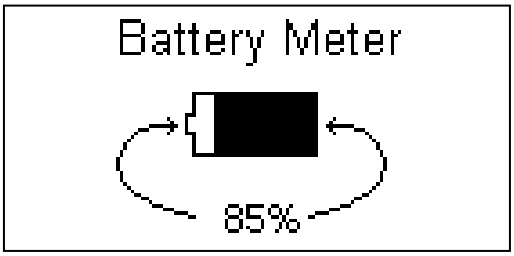


BATTERY INDICATOR SCREEN – This screen shows the status of the battery voltage level with Built-In Battery Option only.

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.

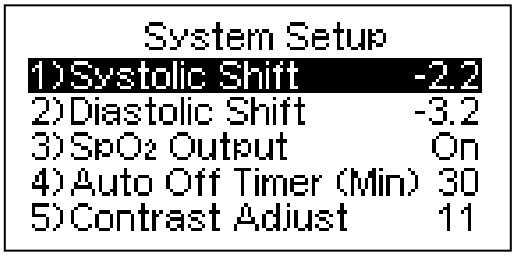
The display will resemble the following:



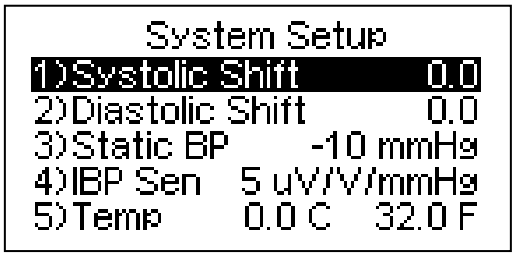
Batteries charge from provided AC power adapter. While the batteries are charging, the display will flash “charging.”

SETUP

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



NIBP-1010 and NIBP-1020



NIBP-1030 and NIBP-1040

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

System Setup Configuration		
Parameter	**Description**	**Range**
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 & NIBP-1040)	Adjusts the Static Blood Pressure Output.	-10 to 400 mmHg
IBP Sens (NIBP-1030 & NIBP-1040)	Selects the Invasive Blood Pressure Output sensitivity.	5 µV/V/mmHg 40 µV/V/mmHg
Temp (NIBP-1030 & NIBP-1040)	Selects the simulated Temperature output.	0, 24, 30, 35, 37, 40, 42 C
SpO_2 Output	This parameter determines whether the SpO_2 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.

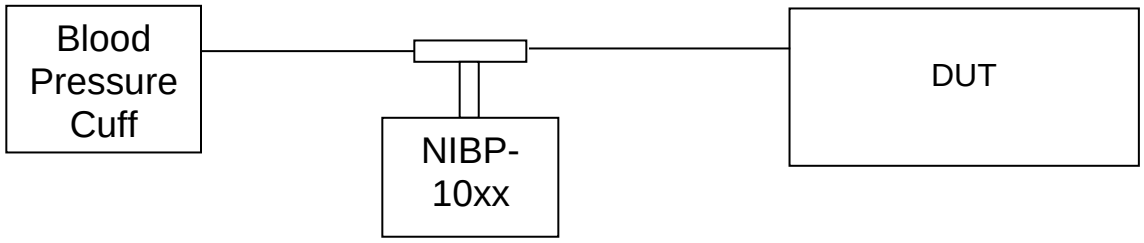
The normal technique used is to run the monitor against a fixed source like the NIBP-1000, with the understanding that each manufacturer has a predictable error from this norm. While this is generally the most direct method, users have asked for a method to correct for this difference, making the monitors 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 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:



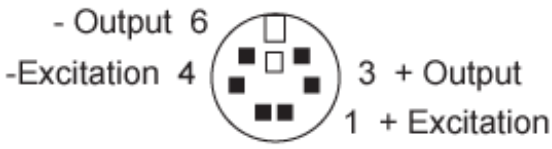
NOTE: Roll the cuff tightly on itself or around a mandrel.

Connecting Patient Leads

For models with ECG output, snaps or patient lead test posts (NIBP-1030-BE and NIBP-1040-BE ONLY) are provided along the sides and are identified by the markings on the overlay.

Connecting IBP Cables (NIBP-1030 & NIBP-1040 ONLY)

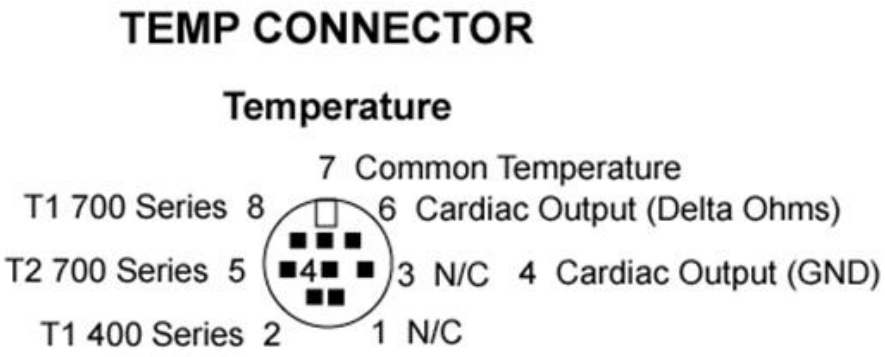
For models with IBP output, connect the DUT-appropriate IBP test cable between the NIBP IBP Connector (6-pin Mini-DIN as pictured below) and the DUT. The pin-out shown below for the Mini-DIN connector is the industry standard configuration used on most modern patient simulators. As such, there are many 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 & NIBP 1040 ONLY)

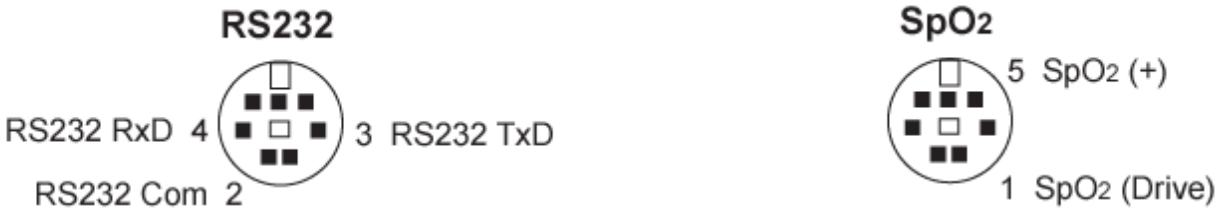
For the models with Temperature output, connect the DUT-appropriate Temperature Simulation test cable between the NIBP Temperature Connector (8-pin Mini-DIN as pictured below) and the DUT.



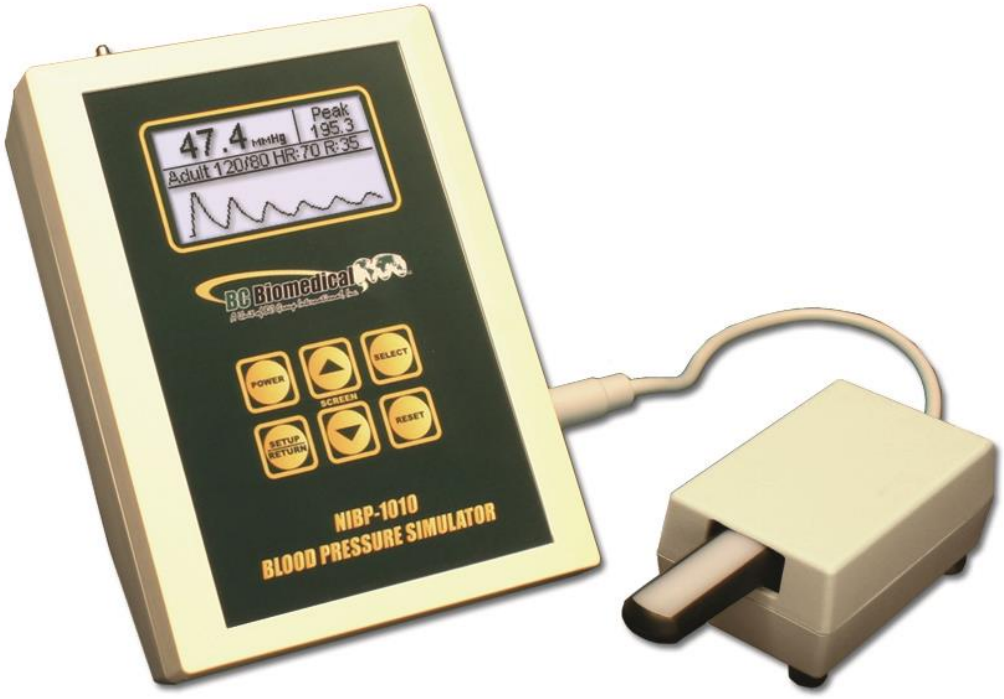
NOTE: Mini-DIN pinout viewed from NIBP Connector Side

Auxiliary Connector

The Auxiliary connector can be used for either standard RS-232 Serial communications using an optional accessory cable or for SpO_2 simulation using the optional accessory MSP-2100 SpO_2 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 µV/V/mmHg and 40 µV/V/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.

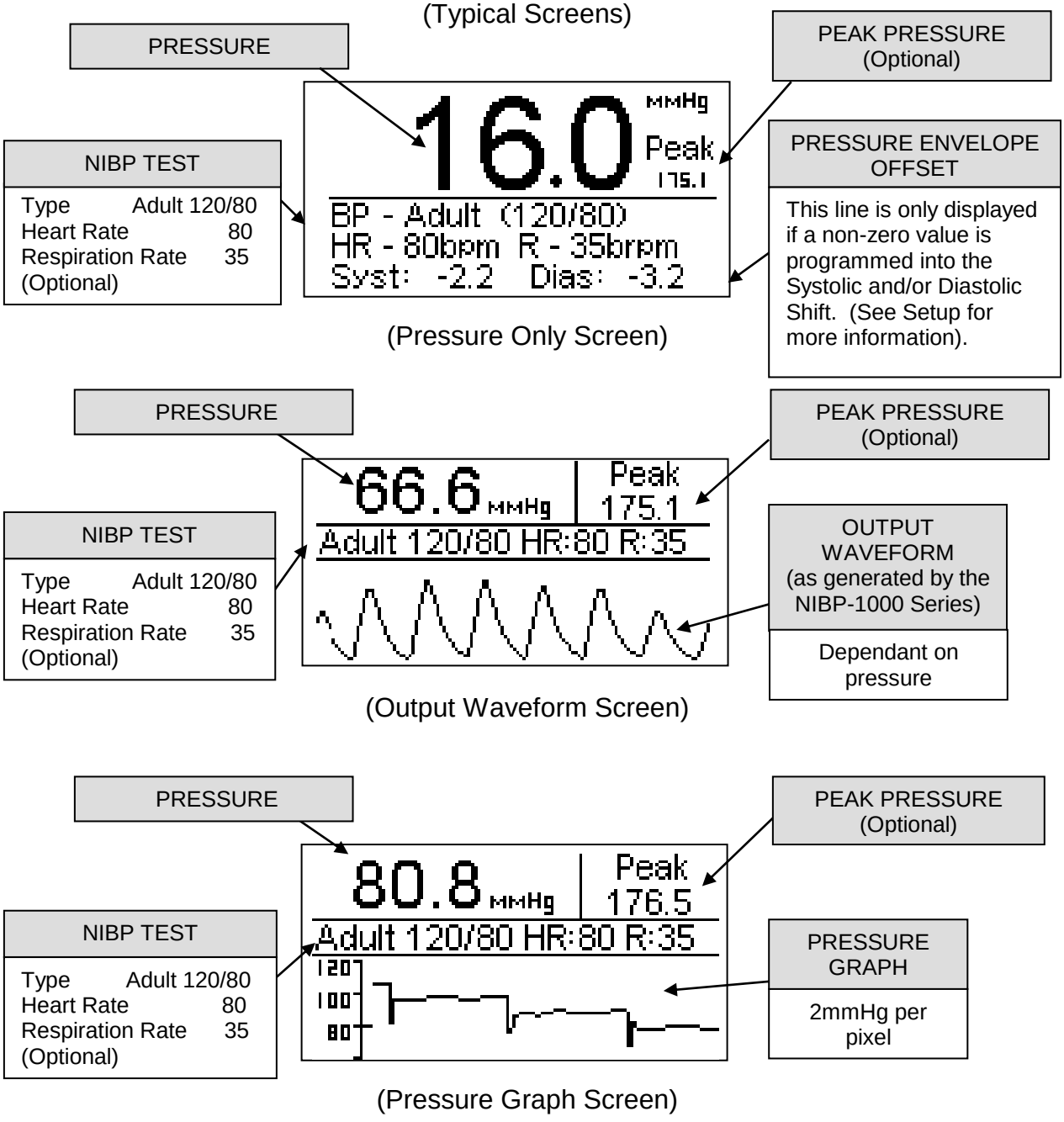
The NIBP output mode can be changed by pressing the 

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:

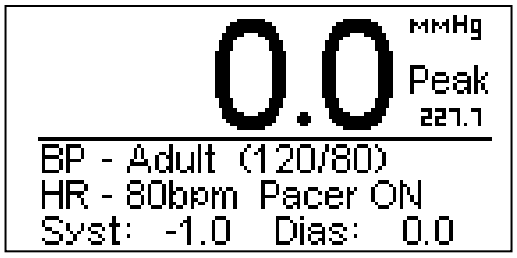
NOTE: The screens for the first test will have the individual components labeled. The component labels for subsequent tests are the same.

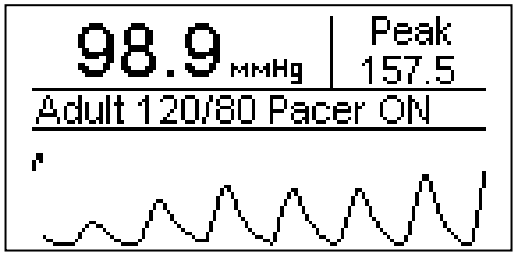
Adult 120/80
(Typical Screens)

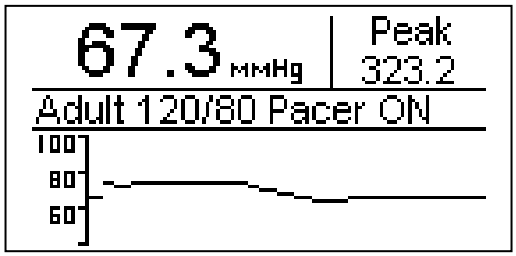


Adult 120/80 with Pace

(Typical Screens)

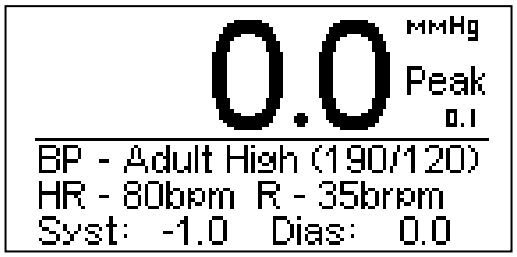


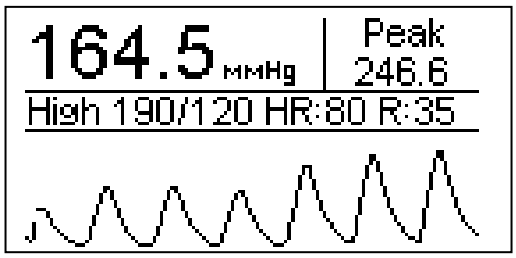




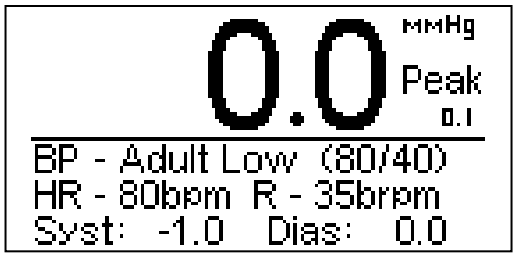
Adult High 120/80

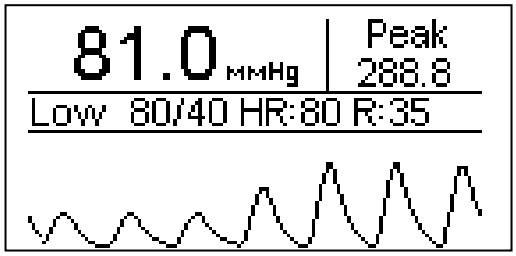
(Typical Screens)

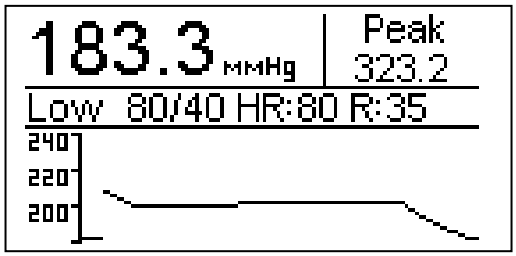




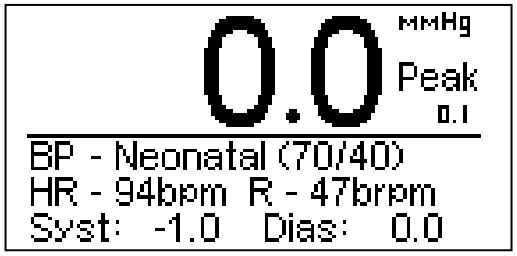
Adult Low 80/40
(Typical Screens)

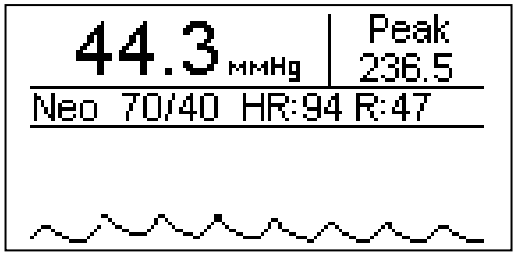


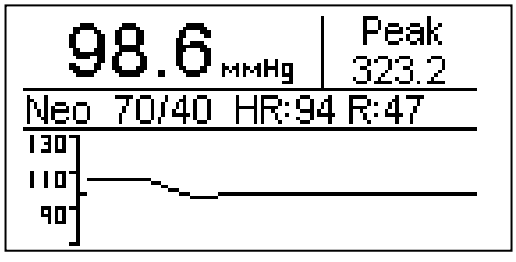




Neonatal 70/40
(Typical Screens)





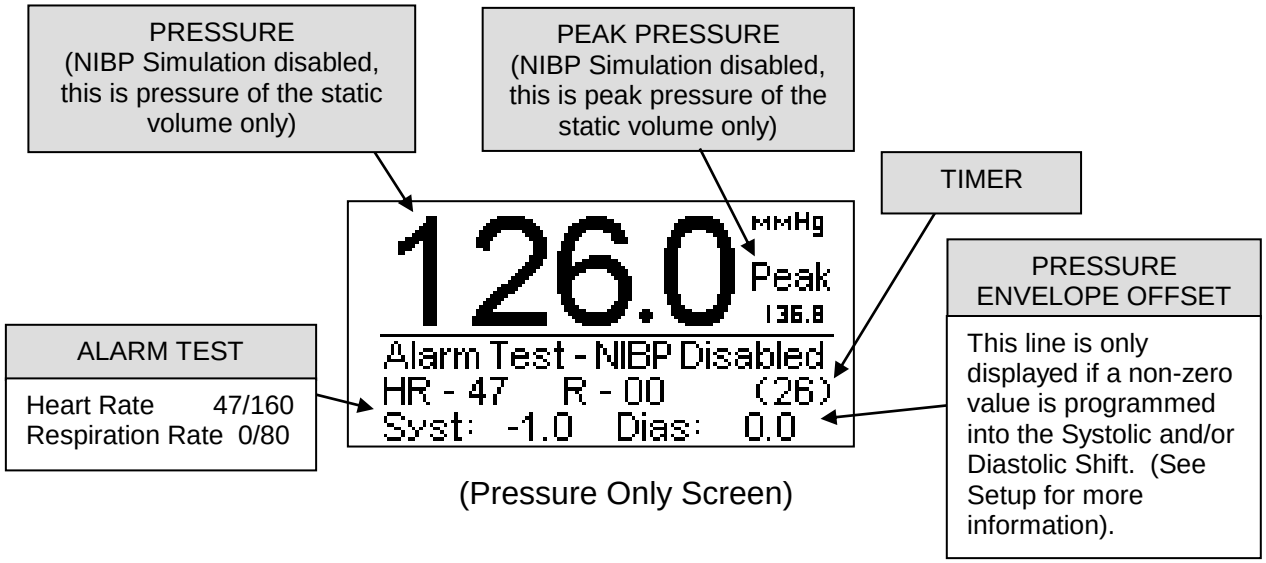


ALARM TEST:

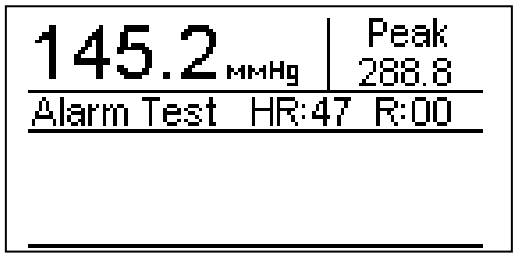
Use the SELECT key to cycle through the Test Modes until Alarm Test appears. The purpose of this function is to help test the alarms of the monitor under test. The ECG output will alternate from a 47 BPM NSR with apnea respiration (0 brpm) to 160 BPM NSR with 80 brpm respiration. The time interval between 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.

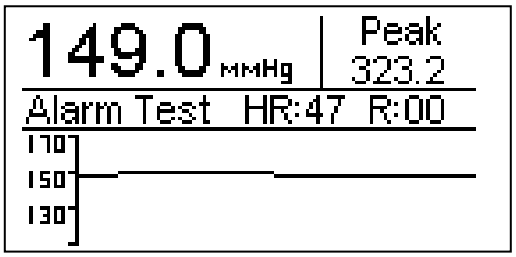
The displays will resemble the following examples: (Typical Screens)



(Pressure Only Screen)



(Output Waveform Screen)



(Pressure Graph Screen)

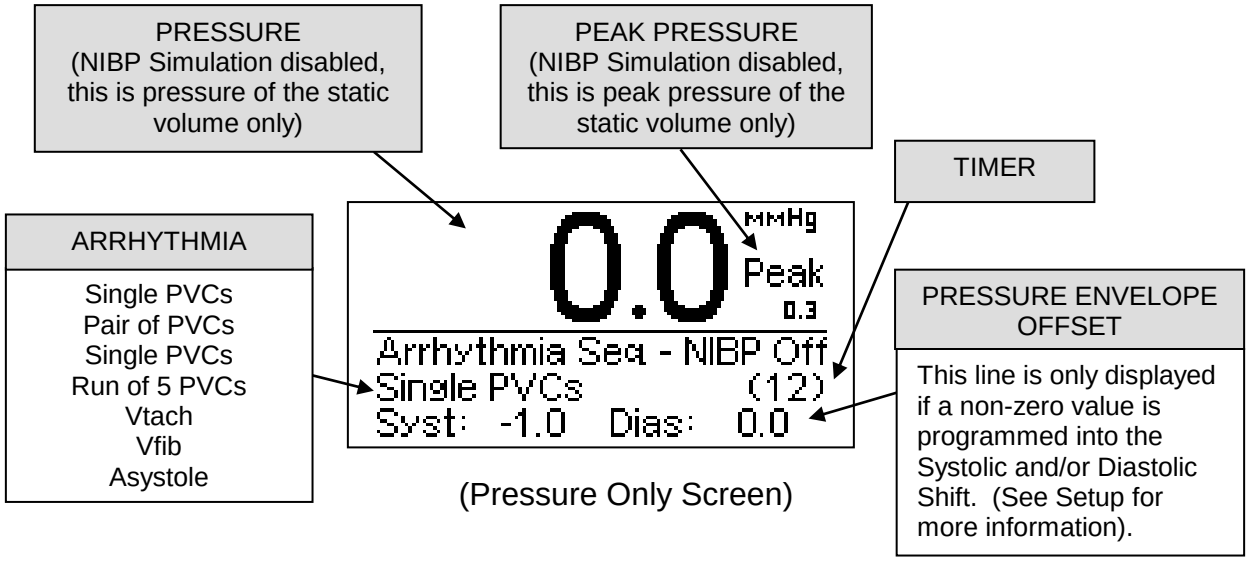
ARRHYTHMIA SEQUENCE: (NIBP-1030 & NIBP-1040 ONLY)

Use the SELECT 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.

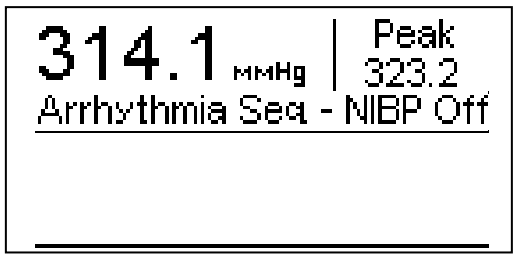
NOTE: While in this mode, the NIBP simulation output is disabled.

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

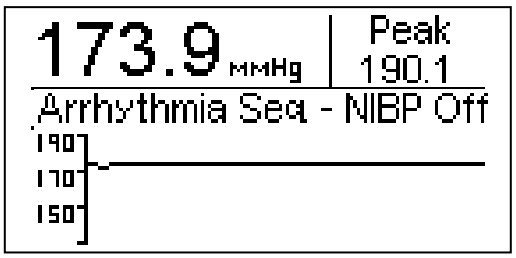
The displays will resemble the following examples: (Typical Screens)



(Pressure Only Screen)



(Output Waveform Screen)



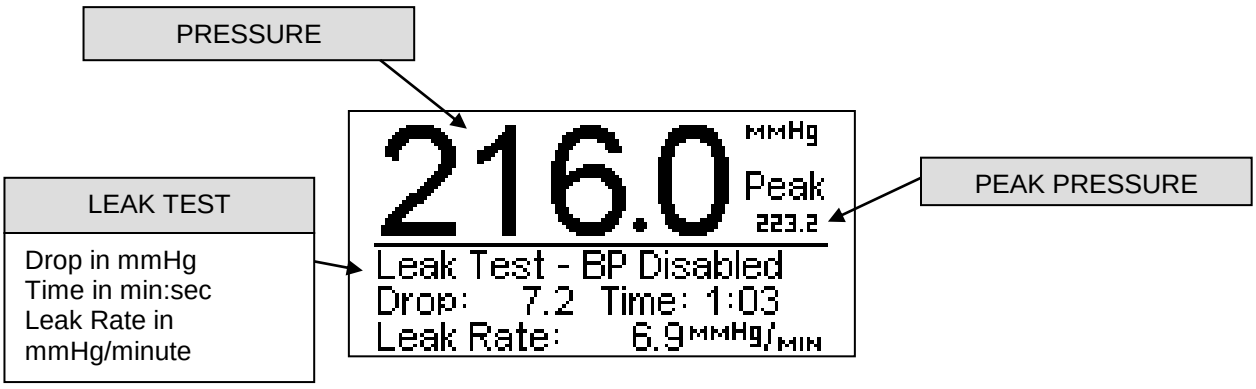
(Pressure Graph Screen)

LEAK TEST: (NIBP-1030 & NIBP-1040 ONLY)

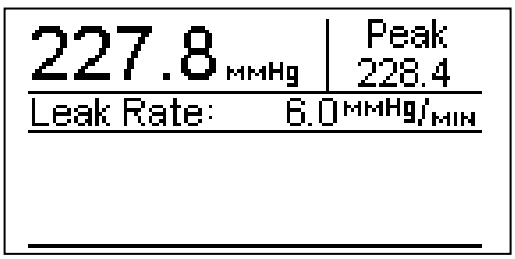
Use the SELECT key to cycle through the Test Modes until Leak Test appears. The purpose of this function is to provide a standard pressure leak test. The pressure input is connected to the system that is to be monitored. Pressure is then applied to the system. The Leak Test is initiated by pressing the RESET 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.

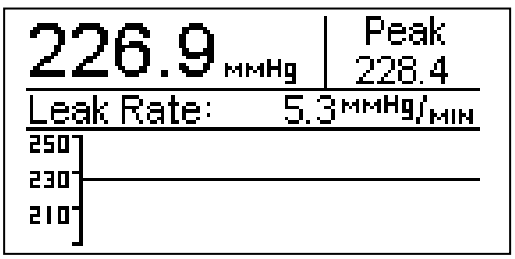
The displays will resemble the following examples: (Typical Screens)



(Pressure Only Screen)



(Output Waveform Screen)



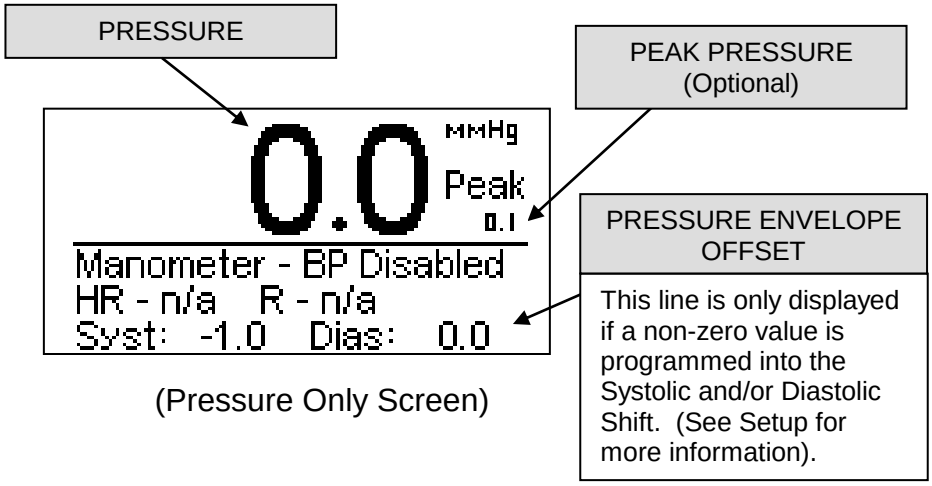
(Pressure Graph Screen)

MANOMETER:

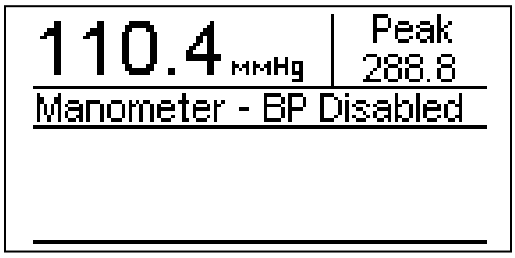
Use the SELECT key to cycle through the Test Modes until Manometer appears. The purpose of this function is to allow the unit to be used strictly as a Manometer with a full scale range of ± 500 mmHg.

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

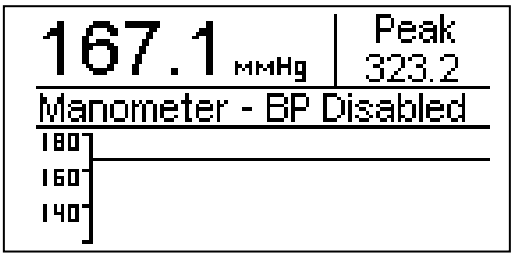
The displays will resemble the following examples: (Typical Screens)



(Pressure Only Screen)



(Output Waveform Screen)



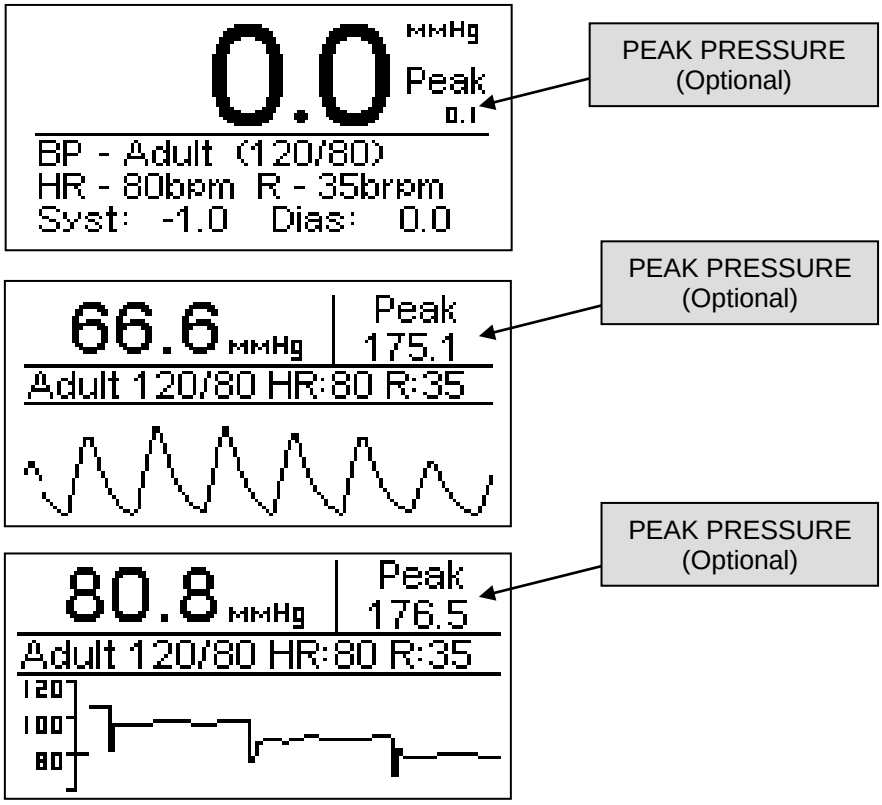
(Pressure Graph Screen)

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 RESET key.

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



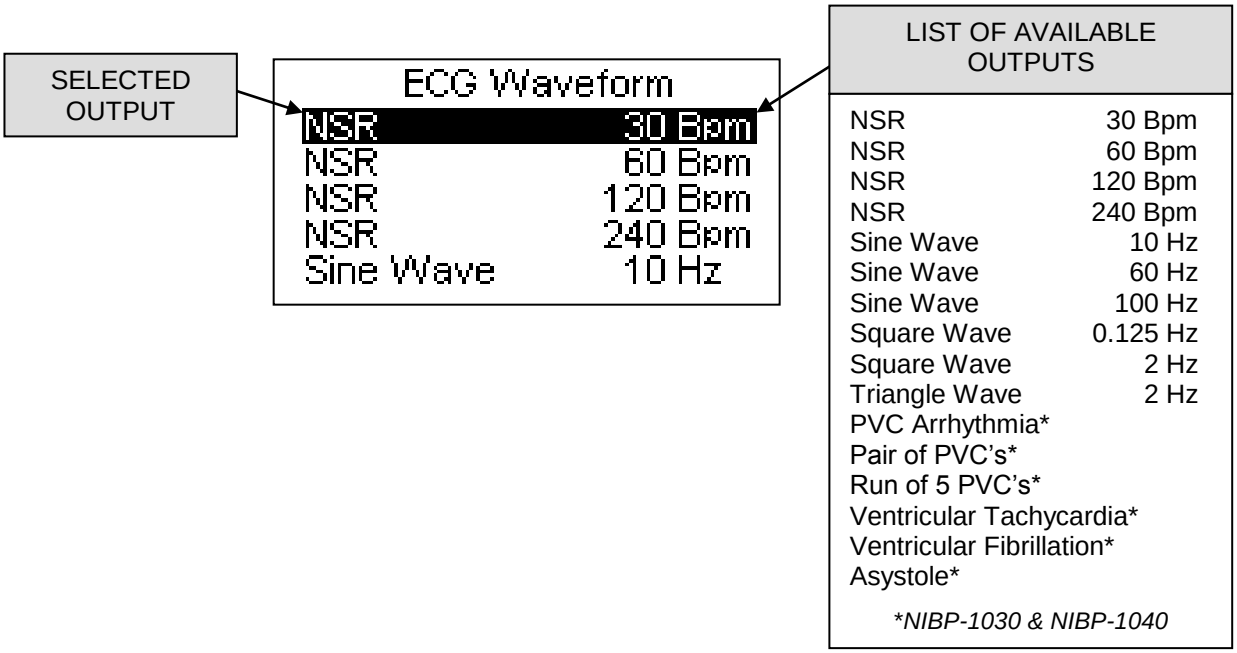
ECG PERFORMANCE TEST: (NIBP-1020, NIBP-1030, & NIBP-1040 ONLY)

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 & NIBP-1040 ONLY).

The display will resemble the following example:



DYNAMIC IBP: (NIBP-1030 & NIBP-1040 ONLY)

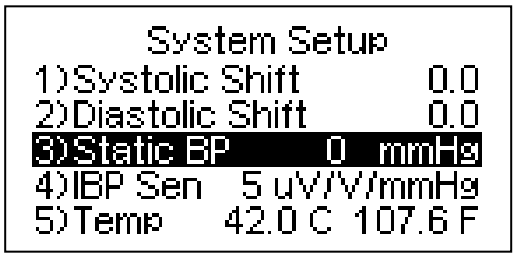
The IBP output matches the NIBP setting in the NIBP mode or the ECG setting in the ECG Waveform mode.

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

STATIC IBP: (NIBP-1030 & NIBP-1040 ONLY)

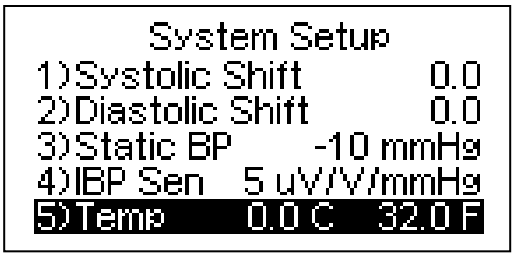
A static Blood Pressure output may be selected in the SETUP mode. This fixed value will remain on the IBP output until changed.

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



TEMPERATURE SIMULATION: (NIBP-1030 & NIBP-1040 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.



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.

IUP SIMULATION: (NIBP-1040 ONLY)

The NIBP-1040 has the ability to simulate a combined Fetal/Maternal ECG. It assumes a Fetal Scalp Electrode and a Maternal Thigh Electrode. Additionally, it produces a pressure waveform to simulate uterine contractions. The waveform may be triggered manually or set to occur periodically. The Intrauterine-Pressure (IUP) curve causes a change in the Fetal Heart Rate (FHR) based on the type of reaction selected. The IUP waveform is on Blood Pressure Channel 1 (BP1) and simulates an Intra-Amniotic catheter connected to a pressure transducer. The base 140 BPM FHR will respond to the contractions based on the setting as follows:

IUP Simulation Type	FHR Response
Uniform Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction but is delayed by 30 seconds.
Early Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction.
Late Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction but is delayed by 45 seconds.
Uniform Acceleration	The FHR goes from 140 BPM up to 175 BPM and back again. The rate follows the 90 seconds bell curve of the contraction.

The IUP Wave is a bell-shaped curve with a peak of 90 mmHg and duration of 90 seconds. When active, the FHR and IUP displays continuously update to show the current output values. The Trigger is set by selecting Manual, 2, 3 or 5 minutes.

If Manual is selected, the 

key is used to start one contraction.

If a Time is selected, the 

key is used to start a continuous cycle with a contraction IUP wave starting every 2, 3 or 5 minutes.

The 

key may be used at any point to cancel the simulation run.

CARDIAC OUTPUT TEST: (NIBP-1040 ONLY)

The NIBP-1040 has the ability to simulate Thermodilution Cardiac Output measurements. Thermodilution allows the calculation of heart volume output by measuring the temperature change of the blood after a specific volume of solution, which is room temperature or cooler (typically 0 °C or 24 °C), is injected into the heart. The blood temperature is measured by a thermistor on the catheter. The NIBP-1040 simulation provides an output curve that the Device Under Test (DUT, Cardiac Output Monitor) takes as a blood temperature input.

The NIBP-1040 drives an external Cardiac Output module. This module (MCO-2100) provides both a common connection point for the cabling and a manual simulation setting for the injectate temperature. Abnormal waveforms are provided to simulate Injectate Failure and Left-to-Right Shunt conditions. A special Calibration Pulse that puts out a 1.5 °C drop in the temperature is also provided.

Setting Up a Test

1) The DUT (Cardiac Output Monitor) needs to be setup to match the NIBP-1040. The following settings are required:

Catheter	Baxter Edwards 93a – 131 – 7f
Calibration Coefficient	0.542 for 0 °C Injectate 0.595 for 24 °C Injectate
Injectate Volume	10 cc
Injectate Temperature	0 °C or 24 °C

2) Connect MCO-2100 Module to the CO/Temp port on the NIBP-1040.

3) Connect the Blood Temperature Sensor Line (BT Thermistor Cable) from the DUT to the small 4-pin connector on the MCO-2100.

4) Connect the Injectate Temperature Sensor Line for the DUT to the larger 4-pin connector on the MCO-2100.

5) Turn on the DUT and the NIBP-1040. The DUT should show a blood temperature of about 37 °C.

6) Adjust the trim pot on the MCO-2100 Module until the DUT shows the desired injectate temperature (0 °C or 24 °C)

MANUAL REVISIONS

Revision #	Program #	Revisions Made
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
Rev 16	DT7355CO, DT7359CH, DT735BCA	NIBP-1040-BE, Fetal/Maternal, Cardiac Output Added

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.

EXCLUSIONS: THIS WARRANTY IS **IN LIEU OF** ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF **MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE.

BC GROUP INTERNATIONAL, INC. IS NOT LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

NO PERSON OTHER THAN AN OFFICER IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR ASSUME ANY LIABILITY.

REMEDIES: THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF **BC GROUP INTERNATIONAL, INC.**, THE REFUND OF THE PURCHASE PRICE.

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 & 1040)	
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 & NIBP-1040)		
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 & NIBP-1040)	
AMPLITUDE	3 mV ± 10%
WIDTH	6 ms ± 5%

RESPIRATION SIMULATION (NIBP-1020, NIBP-1030 & NIBP-1040)		
RATE ACCURACY	± 1%	
IMPEDANCE	DELTA	3.0 Ω ± 10%
	BASELINE	1000 Ω ± 5%

TEMPERATURE SIMULATION (NIBP-1030 & NIBP-1040)	
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

FETAL / MATERNAL SIMULATION (NIBP-1040)	
FETAL HEART RATE	60, 90, 120, 140, 150, 210, 240 BPM
INTER UTERINE PRESSURE RESPONSE TYPES	Uniform Deceleration Early Deceleration Late Deceleration Uniform Acceleration
IUP WAVE	Bell Curve with 90 mmHg Peak and 90 second Width
IUP TRIGGER	Manual Auto: 2, 3, 5 minutes

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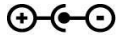
CARDIAC OUTPUT (NIBP-1040)		
INJECTATE VOLUME	10 cc	
INJECTATE TEMPERATURE	0 or 24 °C	
	ACCURACY	± 2%
INJECTATE CALIBRATION COEFFICIENT	0 °C	0.542
	24 °C	0.595
BLOOD TEMPERATURE	37 °C (98.6 °F)	
	ACCURACY	± 2%
CARDIAC OUTPUT	2.5, 5.0, 10.0 L/min,	
	ACCURACY	± 5%
SIMULATIONS	Normal Flow Faulty Injectate Left-to-Right Shunt Temperature Calibration Pulse	
TEMPERATURE CALIBRATION PULSE	1.5 °C Down for 1 sec	
	ACCURACY	± 1%
CATHETER TYPE	Baxter Edwards, 93a-131-7f	

ELECTRICAL	
AC POWER ADAPTER	12 VDC, 500 mA  BC20-21112 (Interchangeable)
BATTERY (OPTIONAL)	Rechargeable NiMH pack (Not user serviceable)
BATTERY RUNTIME	500 Test Cycles between charges

PHYSICAL & ENVIRONMENTAL		
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 & NIBP-1040-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)	

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BC GROUP INTERNATIONAL, INC.
3081 ELM POINT INDUSTRIAL DRIVE
ST. CHARLES, MO 63301
USA

1-800-242-8428
1-314-638-3800

www.bcgroupintl.com
sales@bcgroupintl.com

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