



Non-Invasive Blood Pressure Simulator



NIBP-1010



NIBP-1020

USER MANUAL

**BC BIOMEDICAL
NIBP-1000 SERIES
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WARNING

All connections to patients must be removed before connecting the Device Under Test (DUT) to the Simulator. A serious hazard may occur if the patient is connected when testing with the Simulator. Do not connect any leads from the patient directly to the Simulator or DUT.

NOTICE

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<p style="text-align: center;">BC GROUP NIBP-1000 SERIES NON-INVASIVE BLOOD PRESSURE SIMULATORS</p>
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The Model 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-1020, offers ECG waveforms that are full QRS and respiration waveforms that look real.

The graphics display not only provides multiple screens that give the pressure digitally in mmHg, but also offers views of the plot of the overall pressure or a close-up of the BP waveform.

The following are highlights of some of the main features:

NIBP-1010 (BASIC FEATURES, NIBP ONLY):

- LARGE GRAPHICS DISPLAY WITH CURSOR SELECTION OF OPTIONS AND SETUP OF PARAMETERS
- FULL RANGE MANOMETER
- ADULT, NEONATAL AND HYPERTENSIVE MODES
- 0-500 mmHg PRESSURE RANGE
- +/- 1% OF READING PRESSURE ACCURACY
- OPTIONAL PEAK PRESSURE DETECT WITH SIMPLE RESET
- SpO₂ 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
- RS232 INTERFACE

NIBP-1020 (NIBP, ECG PACE & RESP)

HAS ALL THE BASIC MODEL FEATURES PLUS:

- 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

AVAILABLE MODELS:

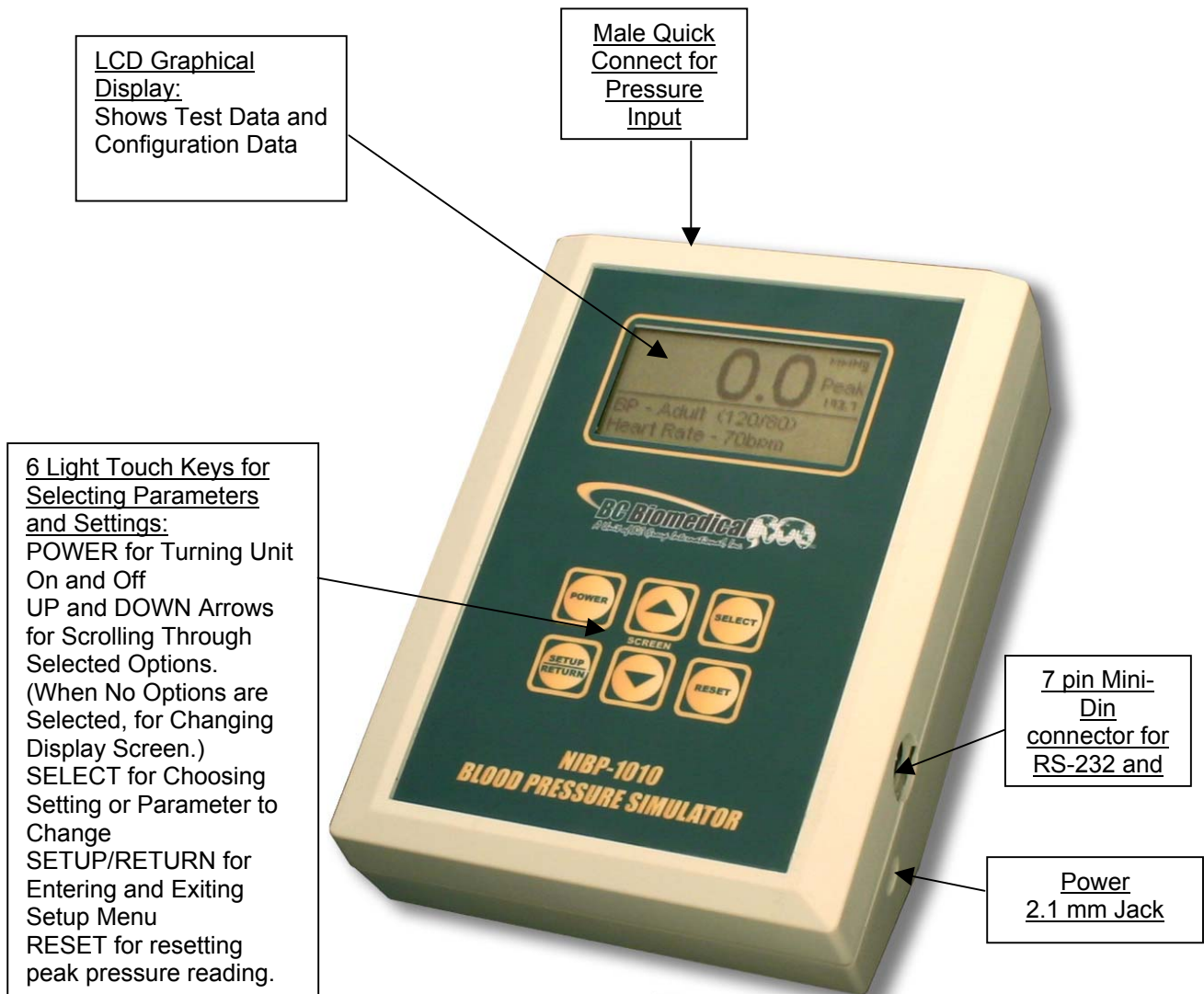
NIBP1010	BASIC UNIT
NIBP1010-P	+ PEAK
NIBP1010-BP	+ BATTERY & PEAK
NIBP1020	BASIC UNIT WITH EKG
NIBP1020-PA	+ PEAK & ALARM
NIBP1020-BPA	+ BATTERY, PEAK & ALARM
NIBP1000-KIT	NIBP1020-BPA, 5 ADAPTERS & SOFT CARRYING CASE

OPTIONAL ACCESSORIES:

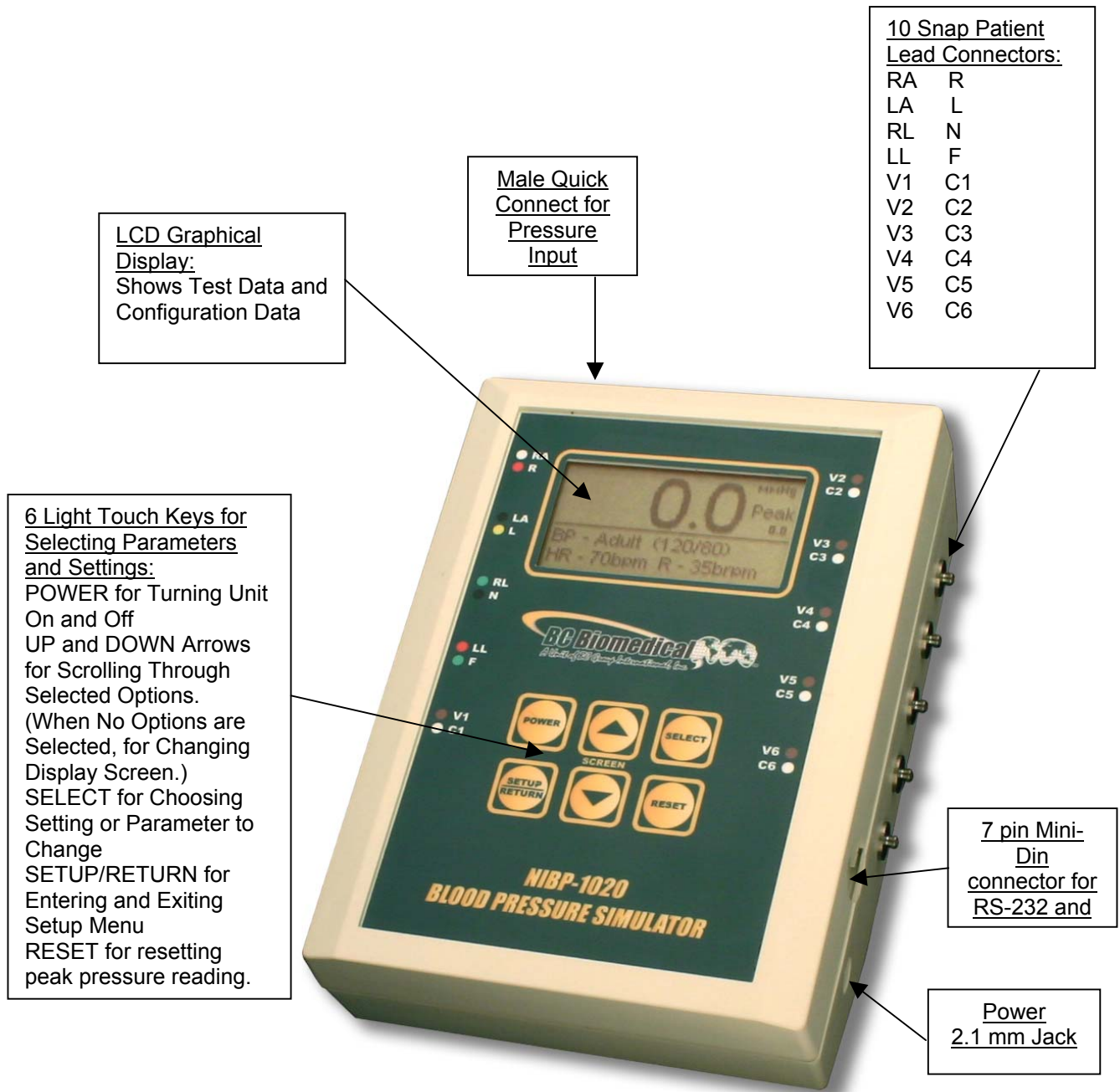
- BC20-30111 SOFT CARRYING CASE
- BC20-40714 DINAMAP/CRITIKON ADAPTER
- BC20-40715 QUICK DISCONNECT ADAPTER
- BC20-40716 LUER ADAPTER
- BC20-40717 MARQUETTE ADAPTER
- BC20-40608 BULB ADAPTER
- BC20-40602 NIBP FITTING KIT (HP CUFF ADAPTER, INFLATION BULB, CPC CONNECTOR, QUICK COUPLER WITH 1/8" MNPT AND SILICONE TUBING AND TEE)
- BC20-40605 NIBP ADAPTER KIT (11 CONNECTORS)

OVERVIEW

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



This section looks at the layout of the NIBP-1020 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



– 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.

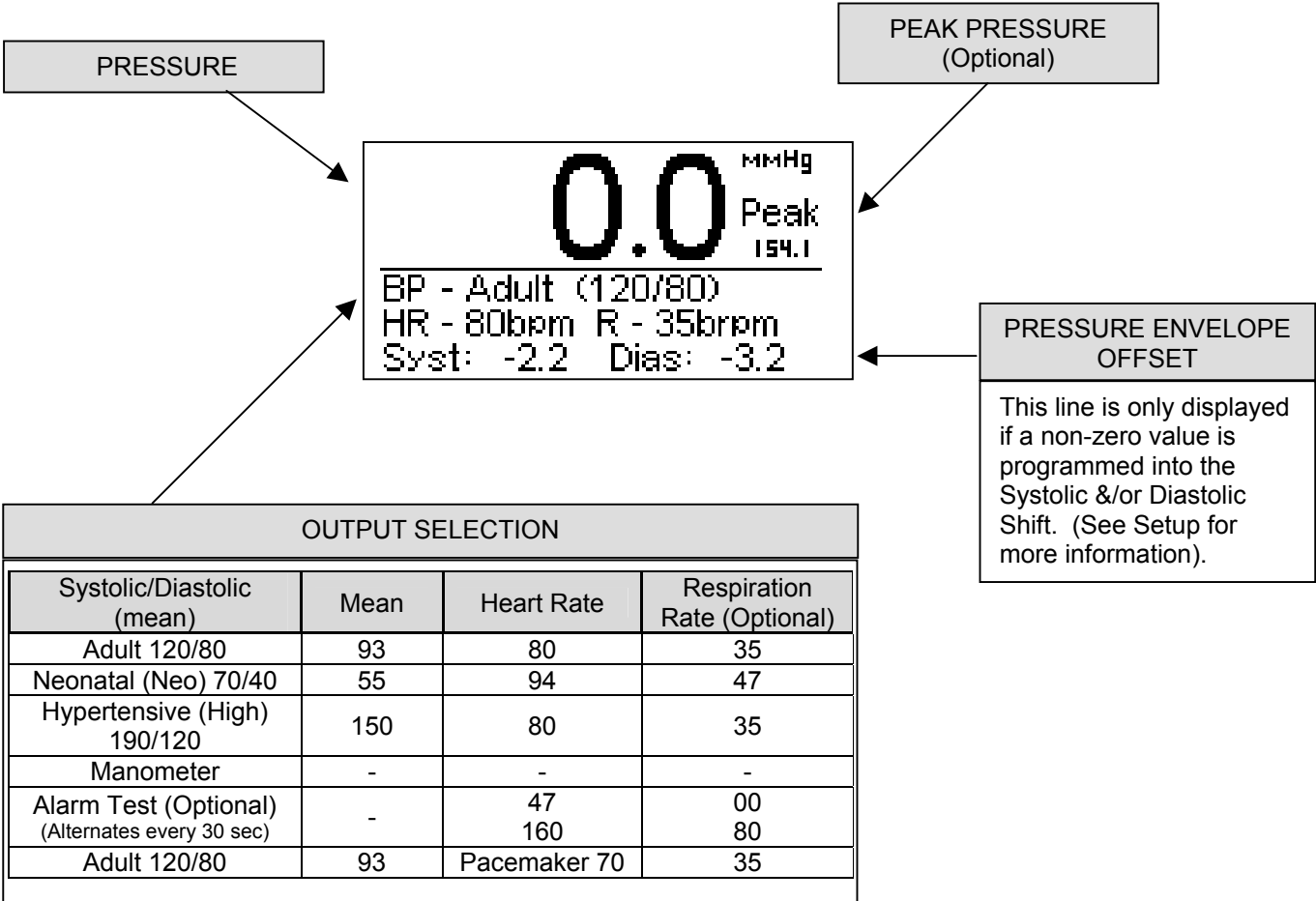
SCREENS

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 – This screen has a large pressure display, as shown below. Also displayed on this screen is the peak pressure and selected output waveform

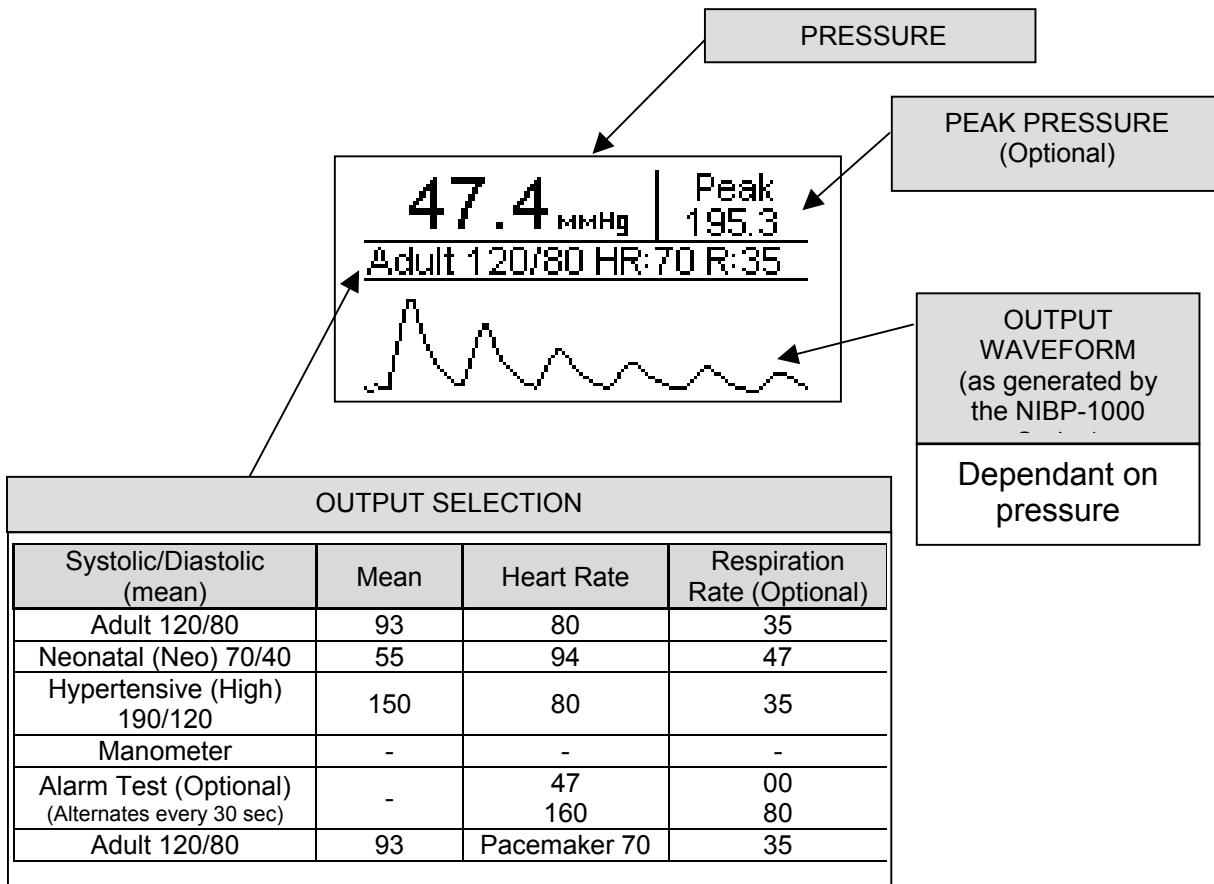
The display will resemble the following:



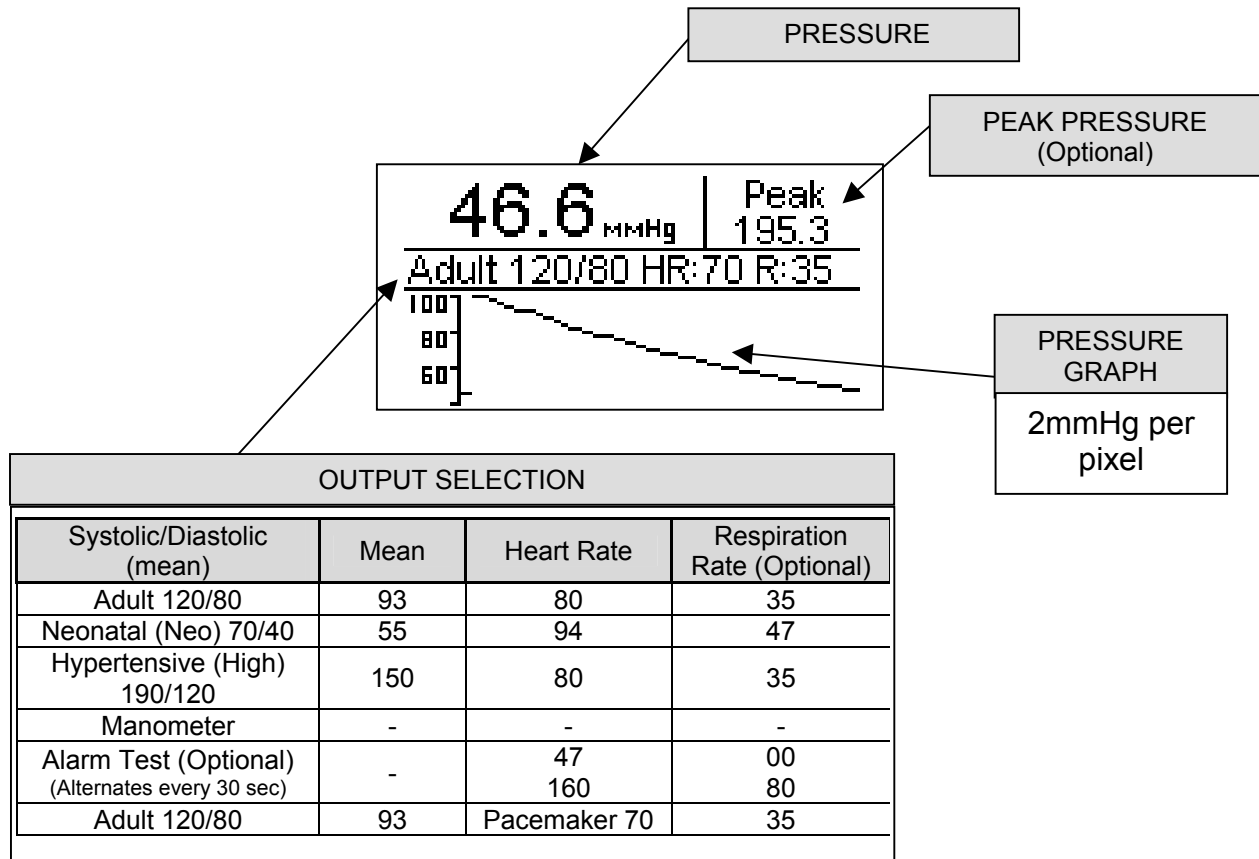
OUTPUT WAVEFORM– This screen shows the output waveform as well as the pressure, peak pressure, and output selection.

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



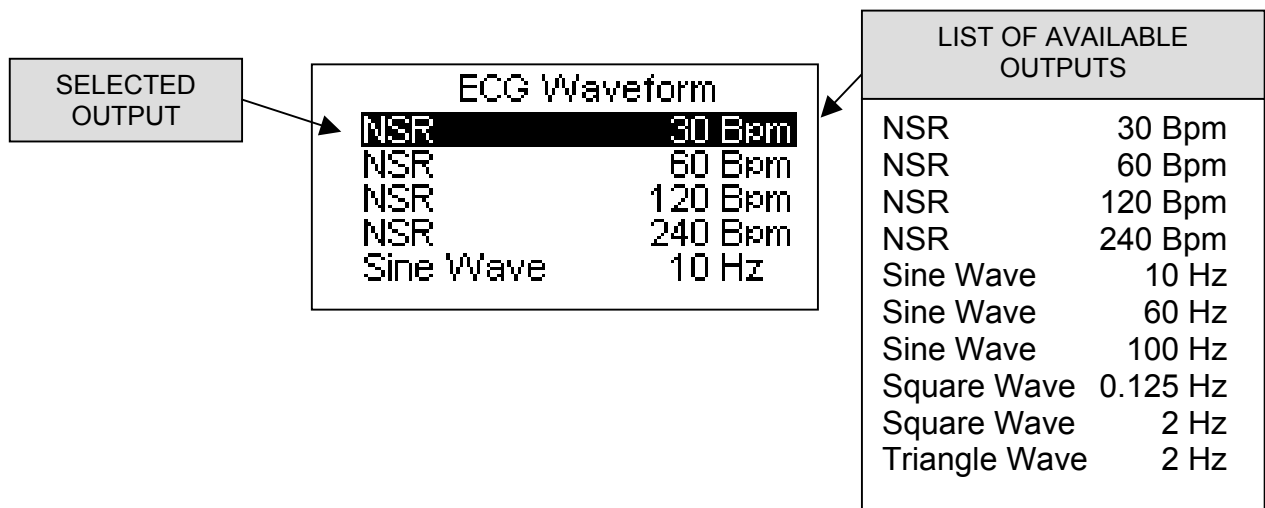
ECG OUTPUT SCREEN – This screen shows the selected ECG output mode.

(NIBP-1020 units only)

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

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

The display will resemble the following:

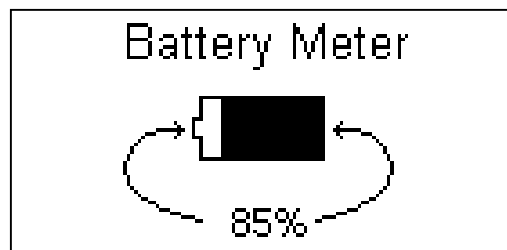


BATTERY INDICATOR SCREEN – This screen shows the status of the battery voltage level with Built-In Battery Option only.

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 wall transformer. The charge time is about 4 hours from full discharge. While the batteries are charging, the display will flash "charging."

CAUTION
**USE ONLY THE WALL TRANSFORMER PROVIDED
WITH THE NIBP-1010 AND NIBP-1020.**

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 ₂ Output	On
4) Auto Off Timer (Min)	30
5) Contrast Adjust	11

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
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 (Min)	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
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.

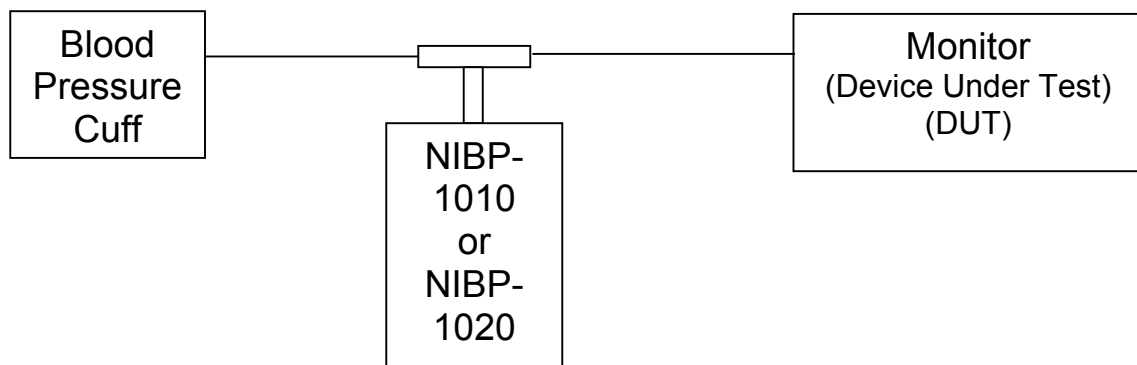
These adjustments are indicated in a line added to the main display to inform the user of any shift that has been programmed into the system. This is done so there is no misunderstanding of the meaning of the results.

OPERATIONS

CONNECTING PRESSURE

The NIBP-1010 and NIBP-1020 Blood Pressure Simulators are connected between the blood pressure cuff and the monitor (Device Under Test, DUT).

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.



Roll the cuff tightly on itself or around a mandrel.

CONNECTING PATIENT LEADS

For the NIBP-1020, with ECG output, test snaps are provided along the sides and are identified by the markings on the overlay.

AUX CONNECTOR



THEORY OF OPERATIONS

A motor and piston assembly is used to generate the output waveforms. A differential pressure sensor is used to measure the pressure of the cuff. The pressure sensor is read by a 16-bit differential Digital to Analog converter. The ECG output is performed by a 12-bit Digital to Analog converter. A second 12-bit Digital to Analog converter is used to generate the respiration waveform.

RUNNING A TEST

NIBP:

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-1010 and NIBP-1020 will output the proper waveform based on the cuff pressure.

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

ECG (NIBP-1020 Only):

The ECG output is selected by pressing the UP arrow until the ECG Waveforms menu is displayed. While in this mode, the NIBP simulation is disabled. The select key is used to choose the desired ECG output.

ECG Alarm Mode:

This mode tests 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. While in this mode, the BP simulation output is disabled.

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	Miscellaneous Edits
Rev 04	DT7355CF	Add Systolic/Diastolic adjustments
Rev 05	DT7355CG	Output Selection edited
Rev 06	DT7355CI	Miscellaneous 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

NIBP-1010

Blood Pressure	
RANGE	0-500 mmHg @ 20°C
ACCURACY	+/- (1% of Reading + .5 mmHg)
RATE	80, 94 bpm
ACCURACY	+/- 1%

Physical	
DISPLAYS	LCD Graphical 128 X 64 Pixels
ENCLOSURE	7 x 5 x 4 Inches (177.8 x 127.0 x 101.6 mm) ABS Plastic
WEIGHT	< 3 Lbs (< 1.36 Kg)
FACE PLATE	Lexan, Back printed
OPERATING RANGE	15 to 40 C
STORAGE RANGE	-20 to 65 C

Electrical	
BATTERY ELIMINATOR	12VDC, 500mA 
BATTERY (OPTIONAL)	6 AA NiMH Rechargeable (Not user serviceable)
BATTERY RUNTIME	500 Test Cycles between charges
BATTERY STORAGE LIFE	1 Year from full charge

NIBP-1020

Blood Pressure	
RANGE	0-500 mmHg @ 20°C
ACCURACY	+/- (1% of Reading + .5 mmHg)
RATE	80, 94 bpm (synchronized to ECG)
ACCURACY	+/- 1%


ECG NSR	
RATE	30,60,120,240 BPM
ACCURACY	+/- 1%
AMPLITUDE	2.75 mV
ACCURACY	+/- 2% @ Lead II

ECG Performance	
SINE WAVE	10,60,100 Hz
SQUARE WAVE	0.125, 2.000 Hz
TRIANGLE WAVE	2.000 Hz
RATE ACCURACY	+/- 1%
AMPLITUDE	2.75 mV
AMPLITUDE ACCURACY	+/- 2% @ Lead II

Pacemaker Waveforms	
AMPLITUDE	3 mV
ACCURACY	+/- 10%
WIDTH	3 ms
ACCURACY	+/- 5%

Respiration	
RATE ACCURACY	+/- 1%
IMPEDANCE DELTA	3.0 ohms
ACCURACY	+/- 10%
BASELINE	1000 ohms
ACCURACY	+/- 5%

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