AccuPulse™ NIBP Simulator

Operation Manual

PN: 1500-00-02 Rev 00

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Clinical Dynamics

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Notices

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Trademarks

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Patents

The **Accu**Pulse is protected by U.S. Patent 5,027,641.

Restrictions and Liabilities

The information contained in this manual is subject to change. Any changes made to the information in this manual will be included in future manuals. No responsibility is assumed by Clinical Dynamics for the use or reliability of calibrations, software upgrades or equipment not supplied by Clinical Dynamics or its authorized dealers and authorized service centers.

The contents of this document, including all figures and drawings, are proprietary information of Clinical Dynamics Corporation, provided solely for purposes of operation, maintenance or repair, and dissemination for other purposes or publication, or copying thereof is prohibited without prior written consent by Clinical Dynamics Corporation, Wallingford, Connecticut.

In the interest of continued product improvement, all specifications are subject to change without notice.

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Revision History

1 April 2006 – First Release

Warranty Service & Shipping Instructions

Warranty Service

All repairs on products under warranty must be performed or approved in writing by Clinical Dynamics Service personnel. *Unauthorized repairs will void the warranty.*

Assistance

If the product fails to function properly, or if assistance, service or spare parts are required, contact Clinical Dynamics Customer Service at 800-247-6427 or visit our web site, www.clinicaldynamics.com and select the SERVICE & SUPPORT MENU. Select CALIBRATION / SERVICE REQUEST to fill out a Request for Calibration/Service Form. After this form has been submitted, a Clinical Dynamics' Service Representative will contact you to help solve your problem. Before contacting Clinical Dynamics, please attempt to duplicate the problem and to check all accessories to ensure that they are not the cause of the problem. Prior to calling, please be prepared to provide:

1. Product name, model number and serial number.

2. A complete description of the problem including the conditions under which the problem occurred. Ideally, a written problem description would be provided, allowing for more efficient handling of your initial service request and the subsequent diagnosis and remedy of the problem.

3. Your institution's complete name and address with a contact name and phone number.

4. A purchase order number if the product needs non-warranty service or if you are ordering spare parts.

Returning a Product for Service

Contact Clinical Dynamics Customer Service at 800 247-6427 and provide the information listed above under Assistance. If it is determined that you need to ship the unit back, it is highly recommended that you pack the product in its original shipping carton and packing materials, provided that they are still useable. If the original packaging is not available, select a sturdy corrugated carton large enough to hold whatever items you are returning, *and also to allow 4 to 6 inches of packing material on all sides of the items.* Whether you use the original packaging or an appropriate substitute, please follow these packing instructions:

1. Remove all hoses, cables, power cords and any other accessories from the instrument and, if possible, place the instrument is a clean plastic bag. *Note: if you are using substitute packaging, it is essential that you seal the instrument in a clean, static free plastic bag or in clean bubble wrap in order to prevent packing material from entering the product.*

2. Pack only the accessories you are requested to return; place them in a separate bag.

3. If you are using substitute packaging, create a foundation of 4 to 6 inches of packing material (either bubble wrap or packing "peanuts") at the bottom of the carton.

4. Insert the instrument and the accessory bag into the shipping carton.

5. If you are using substitute packaging, fill the 4 sides and the top of the carton with 4 to 6 inches of packing material (either bubble wrap or packing "peanuts"). Ensure that the instrument and accessory bag are held firmly in place by the packing material.

6. Please place paperwork such as the purchase order, contact info and reasons for return in the top of the carton.

7. Close the carton and securely seal it with tape; since in most cases the carton will have been previously used, it may be necessary to reinforce the original tape on the bottom of the carton.

8. Ship the product via whatever carrier (UPS, FedEx, etc.) is most convenient. However, please be aware that, depending on where you are shipping from, standard UPS shipping could take as long as 7 business days. Unless other arrangements are made, Clinical Dynamics will return the repaired product to you via UPS.

9. Shipping insurance is optional. Claims for damage to the product during shipping must be initiated by the shipper.

Additional Instructions for International Shipments

Customers outside the United States must include a "pro-forma invoice" for customs purposes as part of their shipping documents. It is imperative that the name of the product appears exactly as follows:

AccuPulse Test Equipment

The use of any other product name could add unnecessary delays when shipping internationally.

Table of Contents

Warranty

Clinical Dynamics Corporation warrants to the purchaser that the **Accu**Pulse Non-Invasive Blood Pressure Simulator shall be free from defects in material and workmanship for three years for U.S. customers and a one year warranty for International customers from the date of purchase. To maintain a three year warranty, **Accu**Pulse must be sent directly to Clinical Dynamics for annual calibration during warranty period. Otherwise, a one year warranty applies. Clinical Dynamics' sole obligation with respect to any such defect is limited to the repair with new or remanufactured parts, or at Clinical Dynamics' option, replacement of the **Accu**Pulse, or refund of the purchase price.

This warranty is made on the condition that prompt notification of a defect is given to Clinical Dynamics within the warranty period. Clinical Dynamics shall have the sole right to determine whether a defect exists.

This warranty extends to the original purchaser only. This warranty does not apply to an **Accu**Pulse NIBP Simulator that has its tamper seals removed or cut, altered, subjected to misuse, negligence, unauthorized repair, or accident, or operated other than in accordance with the instructions.

This warranty represents the exclusive obligation of Clinical Dynamics and the exclusive remedy of the purchaser regarding defects in an **Accu**Pulse NIBP Simulator. **This warranty is given in lieu of any expressed or implied warranties, including the warranty of merchantability or fitness for a particular purpose, which warranties are disclaimed. No person is authorized to modify, in any manner, Clinical Dynamics' obligation described above.**

Clinical Dynamics shall not, in any case, be liable for special, incidental or consequential damages arising from breach of warranty, breach of contract, negligence or any other legal theory.

Precautions

Warnings

It is imperative that the user read the **Accu**Pulse Operation Manual carefully before operating **Accu**Pulse NIBP Simulator.

Magnetic Media Caution

A strong magnetic field exists at the left rear of the **Accu**Pulse chassis. Please avoid placing magnetically sensitive materials, such as computer media, in this vicinity.

Proper Battery Maintenance

To maintain battery life, it is recommended that the battery be cycled (discharged and fully recharged) after every 30 to 45 days to provide optimum battery performance throughout the life of the battery.

Optimum Performance

For optimum **Accu**Pulse performance, it is recommended that the **Accu**Pulse be allowed to "warm up" for 5 minutes before use.

For accurate results, it is recommended that the correct CalTable™ selection be used along with the adapter hoses provided with the **Accu**Pulse. If you should damage or misplace these adapter hoses, please contact the factory for replacement. Use of adapter hoses other than those provided by Clinical Dynamics may result in inaccurate test results.

Section 1. Introduction

General

Congratulations on selecting the **Accu**Pulse™ NIBP Simulator for your non-invasive blood pressure (NIBP) monitor testing and simulation needs. **Accu**Pulse is the first "third-generation" NIBP simulator on the market, and is the result of Clinical Dynamics' 15-year leadership in NIBP simulation technology. **Accu**Pulse provides everything needed for quality–control testing of any oscillometric NIBP monitor, including the following:

- Dynamic BP simulation with CalTables™
- CalTables™ provide simulation accuracy of better than ±0.5 mmHg, which means the NIBP monitor readings will match the **Accu**Pulse BP settings
- CalTables™ for most popular NIBP monitors, and quarterly CalTable™ updates via Clinical Dynamics' website. **Accu**Pulse can store 24 CalTables™ on-board
- Integrated cuff support for self-contained adult and neonatal simulation
- High-resolution static calibration, accuracy exceeds requirements of EN-1060, Part 3
- Leak test
- Over-pressure, "pop-off" valve test
- "One-touch" autosequences
- Complete set of post-measurement statistics including measurement time, peak pressure, inflation time, inflation rate, minimum pressure, deflation time and deflation rate
- Detailed post-measurement statistics for each simulated pulse including total number of pulses, 5 msec timestamp, cuff pressure for that pulse and instantaneous deflation rate for that pulse
- High-resolution graphic display of the pressure inflation/deflation facilitates diagnosing problems with the NIBP monitor's pneumatic control subsystem
- Comprehensive library of remote control commands

Selectable CalTables™: Accu Pulse's new CalTable™ Technology is the first NIBP Simulator to accurately test NIBP monitors. Selectable CalTables™ is the answer to the industry's issue of accurate and consistent testing of NIBP monitors with NIBP Simulators. Select the appropriate CalTable™ on **Accu**Pulse and then use the defined presets for accurate NIBP monitor testing. **Accu**Pulse can store up to 20 defined CalTables™ and 4 additional User Defined CalTables™ for accurate testing of NIBP Monitors. These CalTables™ are approved for testing and developed by working directly with the NIBP monitoring manufacturers to assure accurate testing. New CalTables™ are continuously being released, please visit our web site, www.clinicaldynamics.com, for updates.

AccuPulse also includes three test modes:

Blood Pressure Test Mode: Selectable CalTables™ and physiologically correct Adult and Neonate non-invasive blood pressures provide accurate verification testing of blood pressure monitors. **Accu**Pulse also provides the widest adult and neonatal simulation range of any NIBP Simulator.

Leak Test Mode with High Accuracy Digital Manometer: Automatically tests the leak rate of the blood pressure monitor, cuff and hose assembly. This mode also provides a high accuracy digital manometer.

Over-Pressure Test Mode: Automatically tests operation of the blood pressure monitor's pressure relief valve and records the setpoint when pressure is released by the relief valve.

In addition to these test modes, **Accu**Pulse also incorporates a high-resolution graphic display, internal battery, internal pump, built-in adult and neonatal cuff supports, and a compact and lightweight enclosure.

Documentation Comments

Clinical Dynamics has attempted to present all information as clearly and error-free as possible. However, if you detect any errors or omissions, or wish to suggest improvements to the manual, please mail, fax or email your comments to:

Clinical Dynamics Corporation
10 Capital Drive
Wallingford, CT 06492
Attn: Technical Support Department
Fax: (203) 269-3402
Email: techsupport@clinicaldynamics.com

Intended Audience

This Operation Manual is intended for end users of the **Accu**Pulse NIBP Simulator. It contains installation and operation instructions, applications notes and product specifications. *To achieve satisfactory results, it is imperative that the operator read this manual thoroughly before attempting to use the Simulator.*

Section 2. Product Description

Overview

The **Accu**Pulse NIBP Simulator includes CalTables™ Technology for accurate NIBP monitor testing. The following list presents the benefits and features of **Accu**Pulse:

- **Selectable CalTables™: Accu**Pulse's new CalTable™ Technology provides the first NIBP Simulator to accurately test NIBP monitors. Selectable CalTables™ is the answer to the industry's issue of accurate and consistent testing of NIBP monitors with NIBP Simulators. Select the appropriate CalTable™ on **Accu**Pulse and then use the defined presets for accurate NIBP monitor testing.
- **Accu**Pulse simulates physiologically correct waveforms, the proper way to correctly test and validate a NIBP monitor.
- **Accu**Pulse's Simulation Engine is designed with very low friction components, resulting in virtually no wear; and we offer a lifetime warranty on the Simulation Engine.
- Widest Range of Neonatal Simulation – 6 Neonatal presets from 35/15 to 150/120
- Patented NIBP Simulation Technology - U.S. Patent 5,027,641
- **Accu**Pulse always tests the NIBP Monitor cuff, which can be a major source of problems.
- **Accu**Pulse is the only NIBP Simulator that has built in Adult and Neonatal Cuff Supports.
- **Accu**Pulse provides a high accuracy digital manometer
- **Accu**Pulse has the smallest footprint of any full featured NIBP Simulator, which benefits customers with limited bench space.
- **Accu**Pulse is half the weight of other NIBP Testers, has an internal battery and includes built-in cuff supports. All of which are important features for mobile biomedical engineers.
- **Accu**Pulse has a 320 x 240 High Resolution Graphical Display. It is the only NIBP Simulator that displays the cuff inflation/deflation waveform, which can be useful for diagnosing unusual NIBP Monitor behavior.

Section 3. Functional Description

General

The **Accu**Pulse NIBP Simulator provides accurate verification testing of blood pressure monitors. **Accu**Pulse is the first accurate NIBP Simulator that uses physiologically correct waveforms for testing blood pressure monitors. **Accu**Pulse includes:

- **Selectable Calibration Tables: Accu**Pulse's new CalTable™ Technology provides the first commercially available NIBP Simulator to accurately test NIBP monitors.
- **Accu**Pulse's simulation engine is designed with very low friction components, resulting in virtually no wear and precise simulation.
- A High Accuracy Digital Manometer
- Leak Test Mode for testing the leak rate of the blood pressure monitor, cuff and hose assembly.
- Over-Pressure Test Mode for testing operation of the blood pressure monitor's pressure relief valve.
- A High Resolution Graphical Display
- Internal NiMH Battery
- Internal Pump
- Built-In Adult and Neonatal Cuff Supports
- Compact, Lightweight and Rugged Enclosure

Oscillometric Blood Pressure Measurement Principles

Unlike auscultatory NIBP measurement which uses a stethoscope or microphone, the oscillometric method uses the pulses or oscillations in the cuff pressure to determine the patient's blood pressure. The cuff is inflated above the systolic pressure then deflated linearly or step-wise. When the cuff pressure is high, the pulse amplitude is small; but as the cuff pressure decreases, the pulse amplitude increases and then begins to decrease. During deflation, the amplitude of each cuff oscillation is measured and stored along with the cuff pressure at which the oscillation occurred. The oscillation amplitude is then plotted against the cuff pressure to produce the "oscillation envelope" curve. The oscillation envelope is then used to determine the patient's blood pressure. It is

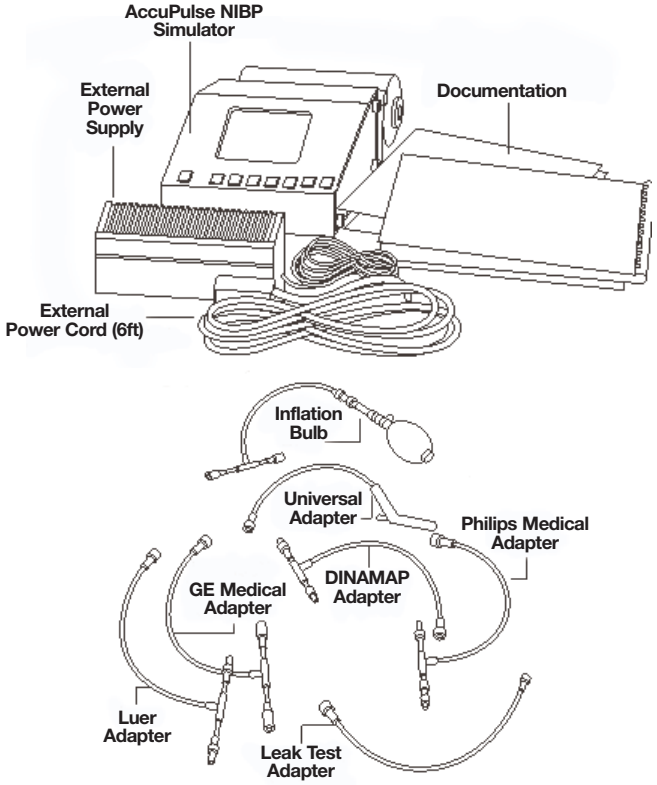
widely accepted that the mean arterial pressure (MAP) occurs at the peak of the envelope, where the cuff oscillation amplitudes are maximum. Unfortunately, there are no generally accepted formulas for determining the systolic and diastolic pressures. NIBP monitor manufacturers have developed unique, proprietary algorithms for estimating the systolic and diastolic pressures from the oscillation envelope.

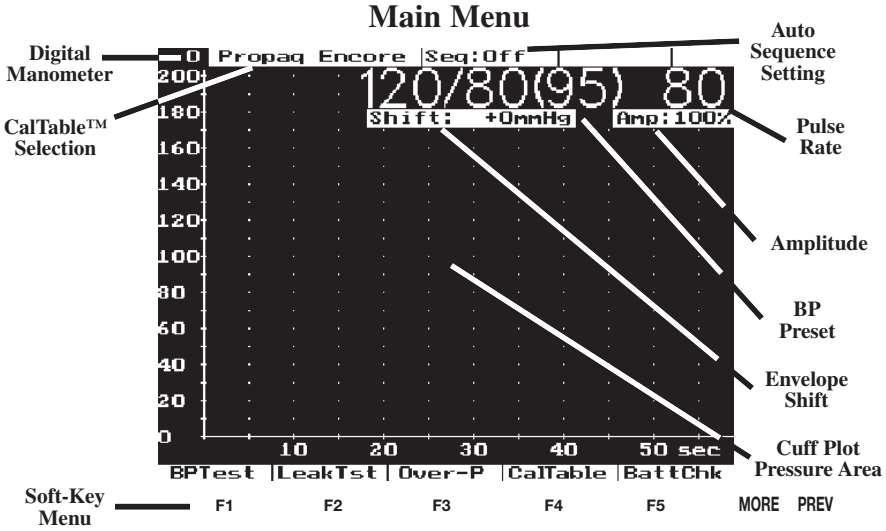
Section 4. Operation

Contents Checklist

- 1 **Accu**Pulse NIBP Simulator
- 1 External Power Supply
- 1 Power Cord
- 1 Philips Medical Adapter Hose
- 1 DINAMAP Adapter Hose
- 1 Luer Adapter Hose
- 1 GE Medical (O-ring)Adapter Hose
- 1 Universal Hose (5/32" ID hose & barb)Adapter Hose
- 1 Leak-Test (plugged at distal end) Hose
- 1 Inflation Bulb with "T" fitting
- 1 Adult Cuff Support (built-in)
- 1 Neonatal Cuff Support (built-in)
- 1 Operation Manual
- 1 Service Manual (optional)

Figure 1: Contents Checklist Illustration





Initial Power-Up Sequence

1. Connect the external power supply to a power source, or if charged, operate from the internal battery.

2. Connect the power supply to the DC Voltage jack located at the rear of the right panel of the **Accu**Pulse. The green LED will illuminate to indicate the presence of power.

3. Press the POWER switch to power-up the **Accu**Pulse.

4. Adjust the CONTRAST control for the optimum contrast. The CONTRAST control is located under the right side of the front panel, in the middle, under the overhang of the right side of the panel.

5. The screen momentarily displays its power-up message indicating the firmware version in use. This version number is needed for any telephone technical support. Note: Press and hold any key (except POWER key) to freeze the Power-Up and Self Test Diagnostics Screens.

6. Follow the on-screen instructions to auto-zero **Accu**Pulse if automatic self test fails.

7. The **Accu**Pulse is now at the Main Menu Screen shown above.

Connecting To the Blood Pressure Monitor

1. Select the appropriate adapter hose using the following table and the Contents Checklist Illustration on page 5-1, which illustrates the hoses and can be used as a guideline for selecting the appropriate adapter hose:

Blood Pressure Monitor	Adapter Hose
DINAMAP	Dinamap
CAS Medical	Luer
Datascope	Luer
Philips Medical	Philips Medical
GE Medical	GE Medical
Invivo	Luer
Colin Medical	Luer
Criticare	Luer
SpaceLabs	Luer or Universal
All Other NIBP Monitors	Universal

If none of the above adapter hoses appear to match your tubing/cuff interface and if your cuff has a standard “Universal-style” 5/32" ID rubber hose, you can use the universal adapter hose.

If you have questions regarding selection of the adapter hose, please contact:

Technical Support
Clinical Dynamics Corporation
10 Capital Drive
Wallingford, CT 06492
Phone: (203) 269-0090 Fax: (203) 269-3402
Email: techsupport@clinicaldynamics.com

2. Assuming you are using an adult cuff, wrap the cuff around the **Accu**Pulse cuff support on the back of the **Accu**Pulse just as you would wrap it around a patient’s arm. You should be able to fit a pencil between cuff and mandrel. Please see Figure 2 “Wrapping the Cuff Around the Cuff Support” illustration below:

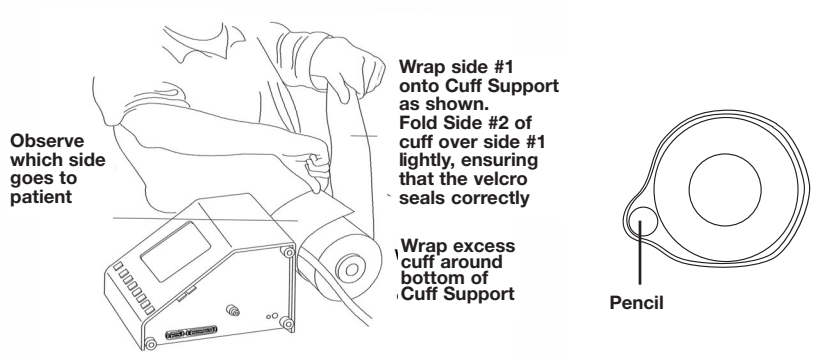


Figure 2. Wrapping the Cuff Around the Cuff Support

3. Connect the longest section of the adapter hose to **Accu**Pulse.

4. Disconnect the cuff from the blood pressure monitor hose. (As if you were going to replace the cuff.) In the case of a dual-lumen hose, only one of the hoses should be connected.

5. Connect the cuff to one short side of the adapter hose "T" and the tubing to the other side of the "T". Ensure that an airtight seal is achieved on all three couplings. Please refer to Figure 3 "Connecting **Accu**Pulse to the NIBP Monitor" illustration below:

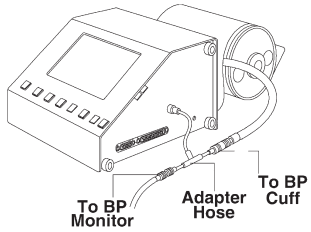
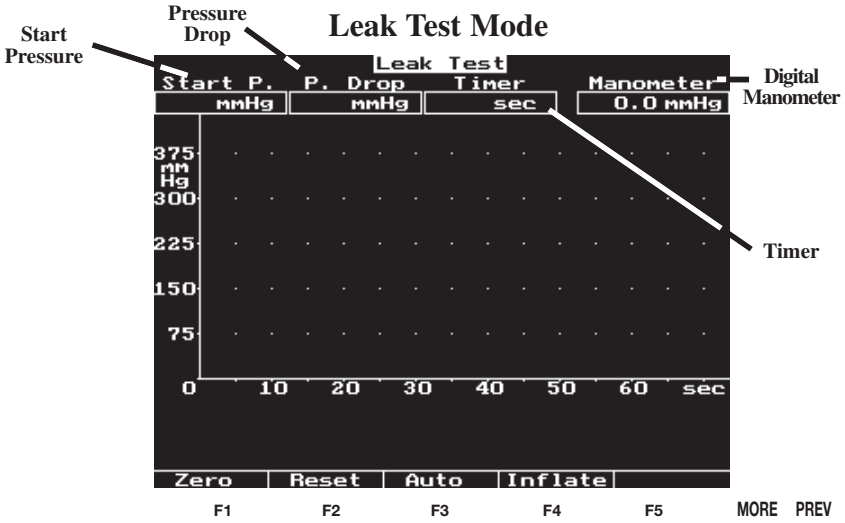


Figure 3. Connecting **Accu**Pulse to the NIBP Monitor



The Leak Test Mode allows the user to evaluate the system under test for leaks and to help determine the source of any leaks. This mode provides an oscilloscope-like display of pressure versus time. The pressure scale is 0 to 400 mmHg with each pixel representing 3 mmHg. The time scale is 0 to 70 seconds with each pixel representing ½ second. An indication of the unit's periodic auto zero will appear above the F1 key.

The Leak Test mode is used to determine the rate of leakage of the pneumatic system. If this rate exceeds the manufacturers' specifications, the Leak Test mode may then be used to determine the source of those leaks. By performing the test while using a clamp to isolate portions of the pneumatic circuit, the user can isolate the leaking component.

1. From the Main Menu, press the F2 (LeakTst) key and place the monitor in the calibration or service mode. (See your NIBP Monitors Service Manual for instructions on how to enter calibration or service mode.) Please check all connections.

2. F1 (Zero) will zero the **Accu**Pulse. F2 (Reset) will reset the Leak Test. F3 (Auto) / F3 (Manual) toggles between automatic mode where the internal pump is used and manual mode where the inflation bulb is used. When F3 (Manual) is selected, the F4 key changes from F4 (Inflate) to F4 (Start). Please use the inflation bulb provided to compete a manual Leak Test.

3. Press the F4 (Inflate) to start the Leak Test. After the pressure stabilizes, the Leak Test will begin automatically and last 60 seconds.

4. When in Leak Test mode, the top of the display has digital readouts labeled “Start P.” (P=Pressure), “P. Drop”, “Timer” and “Manometer”. At the end of sixty seconds, the “Pressure Drop” and “Timer” displays will freeze and display the pressure drop as the leak rate in mmHg per minute. This should be within specifications for the NIBP monitor.

5. While this test is running, you can check the Static Calibration of your NIBP monitor. Compare the **Accu**Pulse manometer in the upper right corner to the pressure on the NIBP monitor.

6. Press the PREV key to return to the Main Menu Screen.

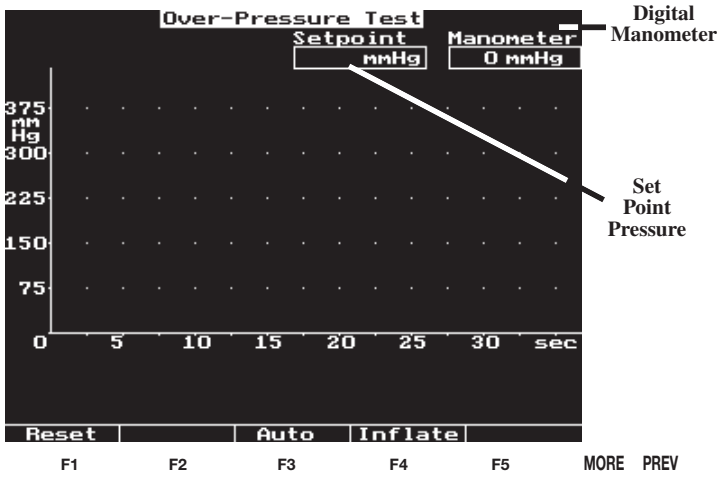
High Accuracy Digital Manometer

In the Leak Test Mode, a high accuracy (0.5 mmHg accuracy, 0.1 mmHg resolution) digital manometer is also available.

The pressure is displayed in the upper right hand corner of the **Accu**Pulse screen. The bottom section of the display in Leak Test Mode (on page 4-5) describes the function keys.

Press the PREV key to return to the Main Menu Screen.

Over-Pressure Test Mode



An indication of the unit’s periodic auto zero will appear above the F1 key.

1. From the Main Menu, Press the F3 (Over-P) key then place the NIBP monitor in the calibration or service mode. (See your NIBP monitor’s Service Manual for instructions on how to enter calibration or service mode.) Please check all connections.

2. Press the F4 (Inflate) key to start the Over-Pressure Test and use **Accu**Pulse’s internal pump. Note: If you wish to use manual inflation mode, press F3 (Auto), which will then become F3 (Manual) and use the inflation bulb provided with the **Accu**Pulse to pump up the NIBP monitor under test. The Over-Pressure Test will determine whether the over pressure valve is releasing at the correct pressure (consult the NIBP monitor’s Service Manual for over pressure test specifications). To stop the test and start over, press F1(Reset).

3. At the over pressure point, the monitor should release the pressure. The display will indicate the over pressure point and the pressure waveform will be displayed. On some monitors, the pressure will not drop to zero but will settle just below the set point. In this case, set point pressure can be read from the screen.

4. Press the PREV key to return to the Main Menu.

NIBP Monitor Calibration Tables Screen

1. From the Main Menu, press the F4 (CalTable™) key to enter the NIBP Monitor Calibration Table screen.

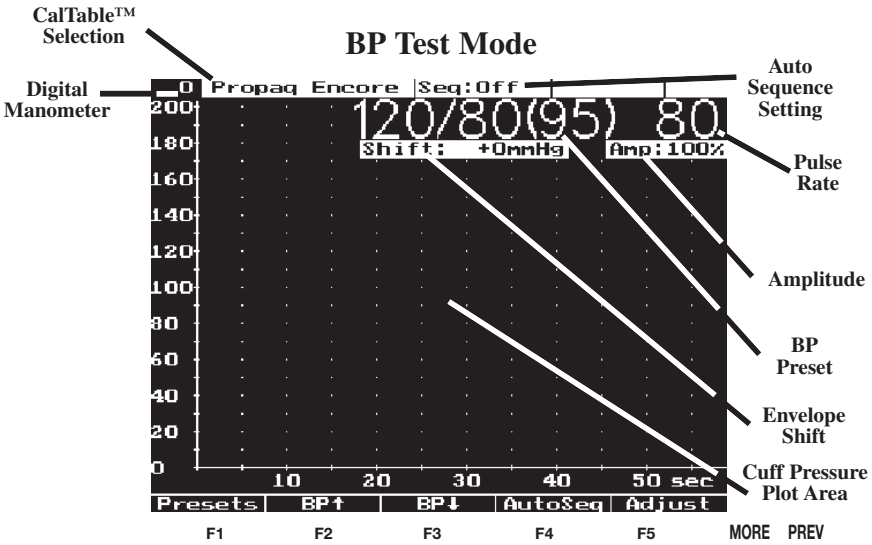
2. Press the F2(<->), F3(Arrow Up) and F4(Arrow Down) – Navigation keys to select the desired calibration table. If the monitor being tested is not available, please use the Propaq Encore CalTable™.

3. Press F5 (Enter) to select the CalTable™. Once you have pressed F5 (Enter) you will automatically be put into the BP Test Menu Screen to start testing the NIBP monitor. The second upper left box in the BP Test Menu Screen will display the CalTable™ selected.

4. Press the PREV key to go back to prior menu without saving changes.

Note**:** Spare CalTables™ are open "slots" for future expansion, F5 (Enter) will have no affect on a highlighted spare. "User" defined CalTables™ may be selected only if they have been loaded. Loading these slots can be done by visiting our web site. Please contact tech support for details. Clinical Dynamics has only released CalTables™ that have been certified for accuracy by the respective NIBP monitor manufacturers. New CalTables™ are continuously being released, please visit our web site for CalTable™ updates at www.clinicaldynamics.com.

BP Test Mode



1. From the Main Menu, press the F1 (BP Test) key or simply stay in this mode if following the previous instructions from the NIBP Monitor Calibration Tables Menu. Please check all connections to assure a tight and leak-free seal.

2. Start the NIBP Monitor to run a BP Test at the default 120/80 (95) 80 setting.

Note: Please take at least 3 readings at each setting or follow your test procedure. The accuracy of the first reading after the cuff is wrapped is often inaccurate because the cuff is "seating" during the test. After your testing is complete, compare the readings of the monitor with the BP Preset.

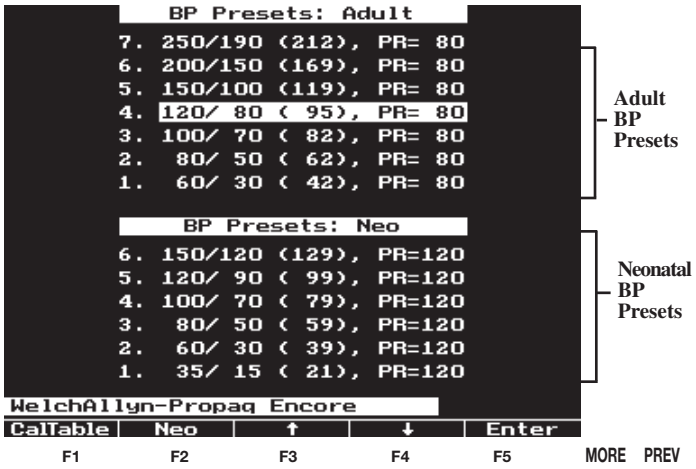
3. Press F1(Presets) to enter BP Presets Screen (covered on page 5-10).

4. F2 (BP Up) and F3 (BP Down) changes BP Preset.

5. F4 (AutoSeq) allows automated step through testing of the BP Presets. Continue to press the F4 (AutoSeq) to select the amount of cycles per BP Preset (one through five or ten consecutive tests per BP Preset available). After the selected number of tests at one BP Preset is complete, the **Accu**Pulse will increment to the next BP Preset to continue testing. After the final BP Preset in either Adult or Neonatal mode (user must select Adult or Neonatal as AutoSequences will run in Adult or Neonatal mode) **Accu**Pulse will stop Advancing Sequence and continue to simulate at the last preset.

6. Press F5 (Adjust) to enter Parameter Adjustments Screen (covered on page 4-11).

BP Presets Screen



(From BP Test Menu/Screen)
Press F1 (Presets) and the 5 function keys will now display

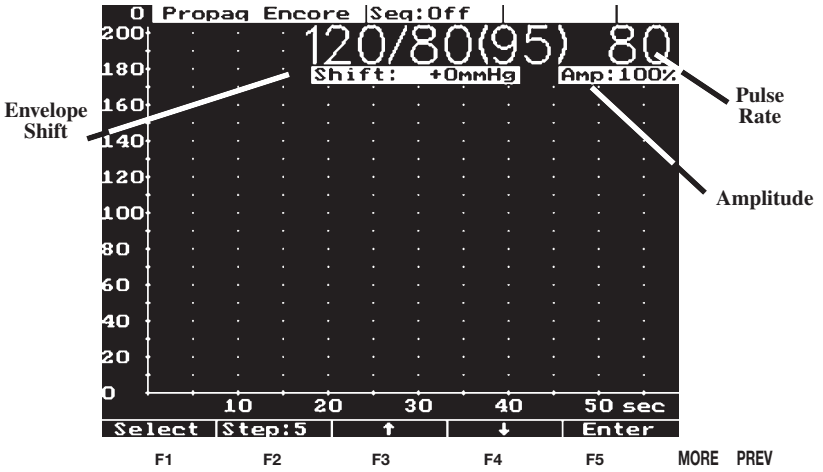
F1 (CalTable™) will lead back to the NIBP Monitor Calibration Tables Menu (covered on page 4-8)

F2 (Adult) / (Neo) toggles back and forth between Adult and Neonatal Presets

F3 (Arrow Up) moves highlight up and F4 (Arrow Down) brings highlight down to select desired BP Presets.

F5 (Enter) selects the BP Preset and returns to the BP Test Menu
Press PREV to return to Blood Pressure Test Mode Screen without saving changes.

Parameter Adjustments Screen



(From BP Test Menu/Screen)
Press F5 Adjust and the Function Keys will now display

F1 (Select) toggles between Pulse Rate, Envelope Shift and Amplitude. The feature selected will flash

F2 (Step: 5) toggles between step increases of 1, 5, 10, 50

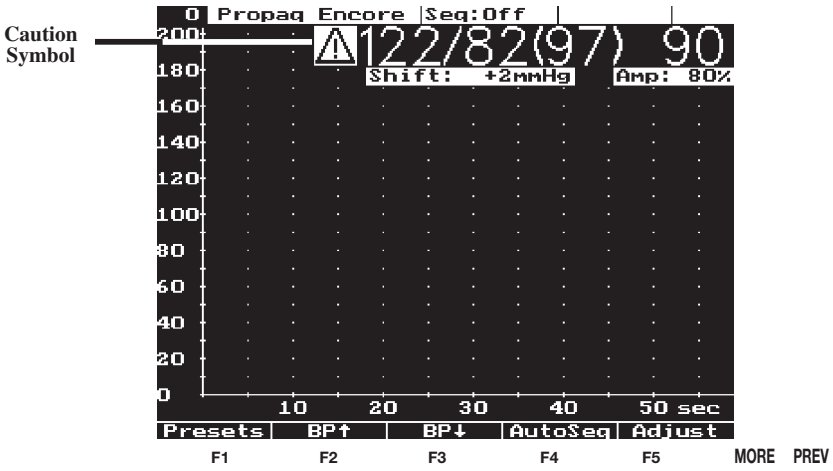
F3 (Arrow Up) increases and F4 (Arrow Down) decreases the feature selected

F5 (Enter) selects the feature change and then returns to the BP Test Menu Screen

PREV key also returns to the previous menu and saves changes.

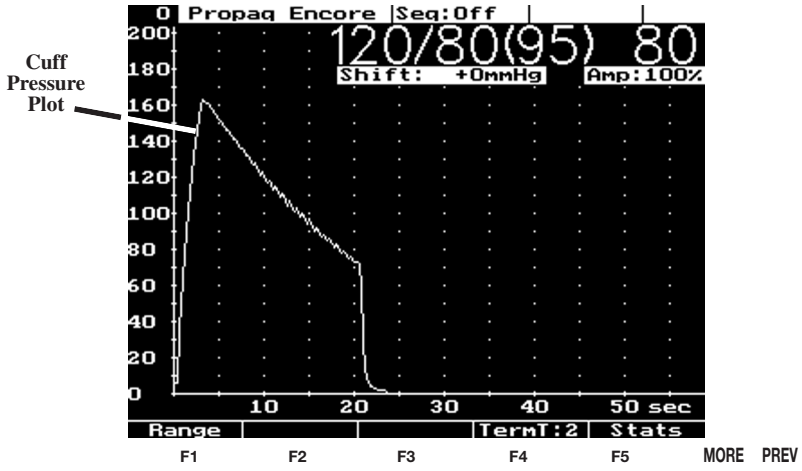
Default Parameter settings are:
PulseRate: 80 bpm (Adult), 120 bpm (Neo)
Shift: +0mmHg
Amp: 100%

Parameter Adjustment with Caution Symbol



IMPORTANT: If either the Pulse Rate, Envelope Shift or Amplitude should be adjusted, a caution symbol will appear next to the BP Preset at the top of the screen as shown in the screen above.

BP Stats Screen – No Stats Displayed



The BP Stats Screen will be displayed at the end of each BP test and has three settings: No Stats, Basic Stats and Advanced Stats.

This screen will show the waveform of the last simulation performed. There are several options for the information displayed.

F1 (Range) shifts the waveform vertically permitting viewing of the currently offscreen portion(s) of the pressure plot.

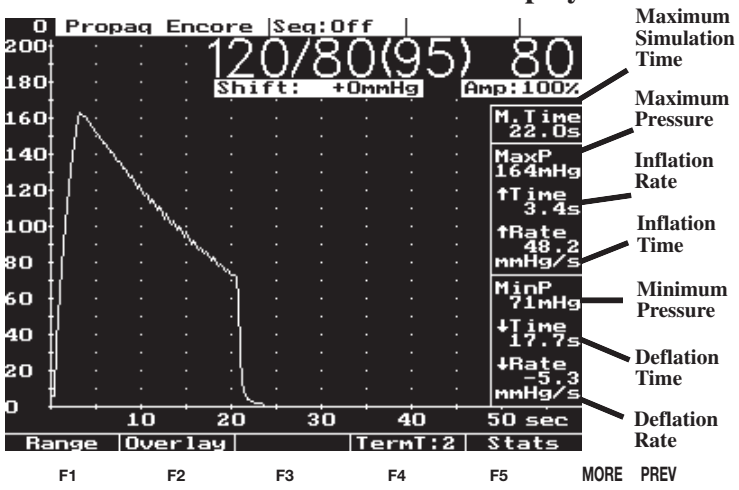
F2 (Overlay) forces the waveform to display through, not hidden by, the STATS data. (Not available with “NoStats”)

F3 (unused)

F4 (TermT: x) Termination Time Out (0-9 seconds) This is the time **Accu**Pulse waits after a BP Test bleed down before assuming the test is complete. If the unit under test should reinflate before the time out completes, **Accu**Pulse will not advance the autosequence. A shorter delay may be needed if running a sequence in a “stat” or “turbo” mode or the **Accu**Pulse will not advance. Conversely, longer timeouts allow for retries without **Accu**Pulse advancing on every attempt, reducing missed readings when running manual or automatic mode testing.

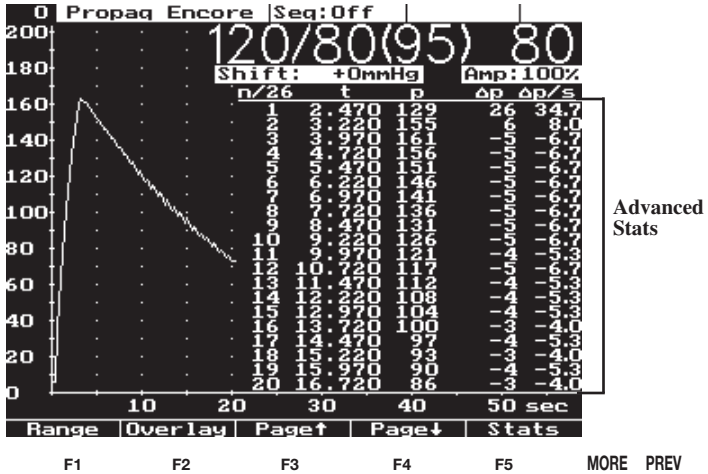
F5 (Stats) provides data on the displayed test result.

BP Stats Screen – Basic Stats Displayed



Press F5 (Stats) to display basic stats. Please see screen above for detailed labels for each stat measured. These are: Maximum Simulation Time, Maximum Pressure, Inflation Rate, Inflation Time, Minimum Pressure, Deflation Time and Deflation Rate.

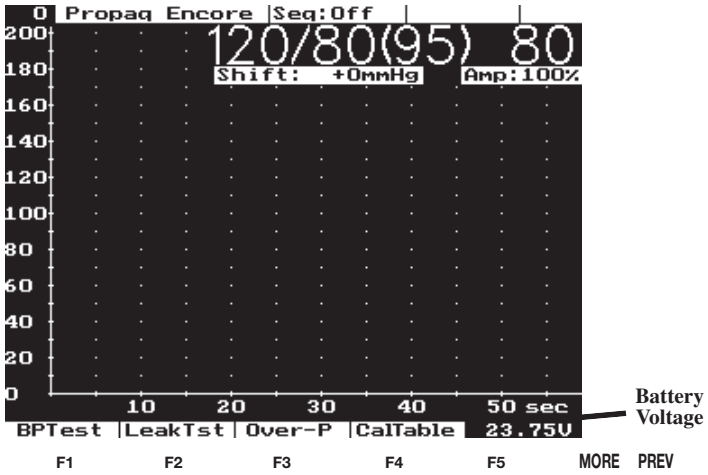
BP Stats Screen – Advanced Stats Displayed



Press F5 (Stats) again to display Advanced Stats. This provides information on individual pulses generated and corresponding time, pressure, and rate of cuff pressure change for each pulse.

F3 (Page Up) & F4 (Page Down) become active in the Advanced Stats Screen. These keys are used for scrolling page by page to read Advanced Stats from the simulation last completed. This may be useful for advanced users who require detailed stats from each pulse generated during simulation.

Battery Check Menu



AccuPulse has an internal NiMH battery, which eliminates the need for a power supply.

1. Plug in the power supply and fully charge the internal battery for 12 hours. For efficiency, most **Accu**Pulse users charge **Accu**Pulse overnight. Note: It is recommended that you fully charge and discharge the battery every 30 to 45 days to properly maintain the battery and to provide optimum performance throughout the life of the battery.

2. Remove the power cord from the 24V DC jack on the side of the **Accu**Pulse after charging the battery.

3. From the Main Menu, press the F5 (BattChk) key. The F5 key will then display the voltage of the battery. For example, it could read 21.35V. Low Battery Level is approximately 19.00V. Shutoff is about 16V.

Section 5. Specifications

The **Accu**Pulse NIBP Simulator is a microprocessor controlled patient simulator housed in a compact (8 x 5.25 x 12.25 inch), portable (8.0 pounds with battery, 7.5 pounds without battery) aluminum case.

AccuPulse **NIBP Simulator Technical Specifications**

AccuPulse NIBP CalTables™

Datascope Accutorr Plus
GE Medical Dash 4000
GE Medical Dinamap Pro
Philips Medical M3
Welch-Allyn Propaq Encore
Philips Medical VS1
SpaceLabs
Colin Medical
Criticare
CAS
SunTech

Please contact the factory for the availability of other calibration tables, or visit our web site for updates at www.clinicaldynamics.com

BP Presets
Systolic/Diastolic (MAP):

Adult:	Neonatal:
250/190 (212)	150/120 (129)
200/150 (169)	120/90 (99)
150/100 (119)	100/70 (79)
120/80 (95)	80/50 (59)
100/70 (82)	60/30 (39)
80/50 (62)	35/15 (21)
60/30 (42)	

Exact Diastolic, Systolic and MAP values are a function of the specific CalTables™. The BP Presets above are taken from the Welch-Allyn Propaq Encore CalTable™.

Accuracy: ± 0.25 mmHg typical, ± 0.5 mmHg maximum

Oscillometric Pulse
Pulse Amplitude @ MAP: 2.0 mmHg
Pulse Volume Range: 0 to 4.4 ml
Pulse Rise Time: 80 msec (minimum)

Pulse Rate
Pulse Rate Range: 15-330 bpm
Pulse Rate Accuracy: ±1 bpm, 15-200 bpm, ±2 bpm 201-330 bpm

Displayed/Measured Parameters
Dynamic NIBP Cuff Pressure Waveform
Measurement Time: 0.0 to 180.0 seconds
Maximum Inflation Pressure: 0 to 400 mmHg*
Inflation Time: 0.0 to 180.0 sec
Inflation Rate: 0 to 999.9 mmHg/sec
Minimum Pressure: 0 to 400 mmHg*
Deflation Time: 0.0 to 180.0 sec
Deflation Rate: -0.0 to -999.9 mmHg/sec

Digital Manometer
Pressure Range: 0.0 to 400.0 mmHg*
Accuracy: ± 0.5 mmHg, traceable to NIST
Resolution: ± 0.1 mmHg

Leak Test
Start Pressure: 200 mmHg nominal,
10 to 370 mmHg via
Remote Control
Pressure Drop: 0 to 400 mmHg*
Elapsed Time: 60 Seconds
High Resolution Manometer: 0.0 to 400.0 mmHg*

Over-Pressure
Automatically tests operation of the monitor's relief valve
Pop-Off Pressure: 0 to 400 mmHg*
Instantaneous Pressure: 0 to 400 mmHg*

Autosequences
User can utilize autosequences to test NIBP monitors with a specific series of **Accu**Pulse NIBP performance tests.

Cuff Supports
Adult & Neonate mandrels are built into **Accu**Pulse for portability and ease of use.
- Plastic & Aluminum Cylinders
- Adult (3.5" OD, 7.25" width)
- Neonate (1.25" OD, 2.25" width)

Adapter Hoses
Adapter Hoses insert between the NIBP device, cuff and analyzer. These adapters are compatible with oscillometric NIBP monitors.
- Male/Female Luer
- Male/Female Clippard (GE Medical, Draeger/Siemens)
- Colder/CPC (GE Medical, Protocol Systems)
- OBAC Quick Release (Philips Medical)
- Universal 5/32" I.D. Hose

Self Test Accessories
- Pressure Bulb Assembly (tees into any Cuff Adapter)
- Self system leak test hose (plugged at distal end)

* 400.0 mmHg typical

Communication Ports
2 RS-232 (second port available Q3 2006)
1 USB Port (available Q3 2006)

Display
Non-Glare Graphic LCD
CCFL Backlight
Resolution: 240x320 (1/4 VGA)
Thumbwheel contrast control

Power
100-240 VAC, 50 watts, 50-60 Hz, Desktop Switcher
Output: 24VDC @ 2.1A, 6 foot cable
Safety Agency Approvals: UL, CE, TUV
Internal Battery: nickel metal hydride (NiMH)
Voltage: 19.2V
Capacity: 2.5A-Hr, 150 NIBP Simulations
Charge Time: 16 Hours

Weight
8.0 pounds with internal battery

Dimensions
8" Wide x 5" High x 12" Long

Standard Accessories
- External Power Supply & Cord
- Adult & Neonate Cuff Supports (built-in)
- Five Adapter Hoses
- Inflation Bulb with “T” fitting
- Self System Leak Test Hose
- Operation Manual
- Internal Pump
- Internal Battery

Optional Accessories
- Carry Case
- **Accu**Pulse PC Software Utility