



# Smartdop 30EX

Quick-Start Guide

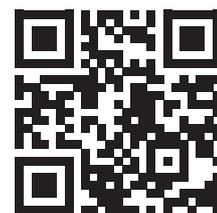
# INDEX

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- 3 MAIN FEATURES & CONTROLS
- 4 INITIAL SET-UP
- 5 OBTAINING DOPPLER WAVEFORMS USING THE 8MHZ PROBE
- 6 DOPPLER WAVEFORM INTERPRETATION
- 7-9 OBTAINING ABI & TBI PRESSURES
- 10 SEGMENTAL PRESSURES
- 11 VENOUS REFLUX STUDIES
- 12 PULSE VOLUME RECORDING
- 13 SMART-V-LINK SOFTWARE

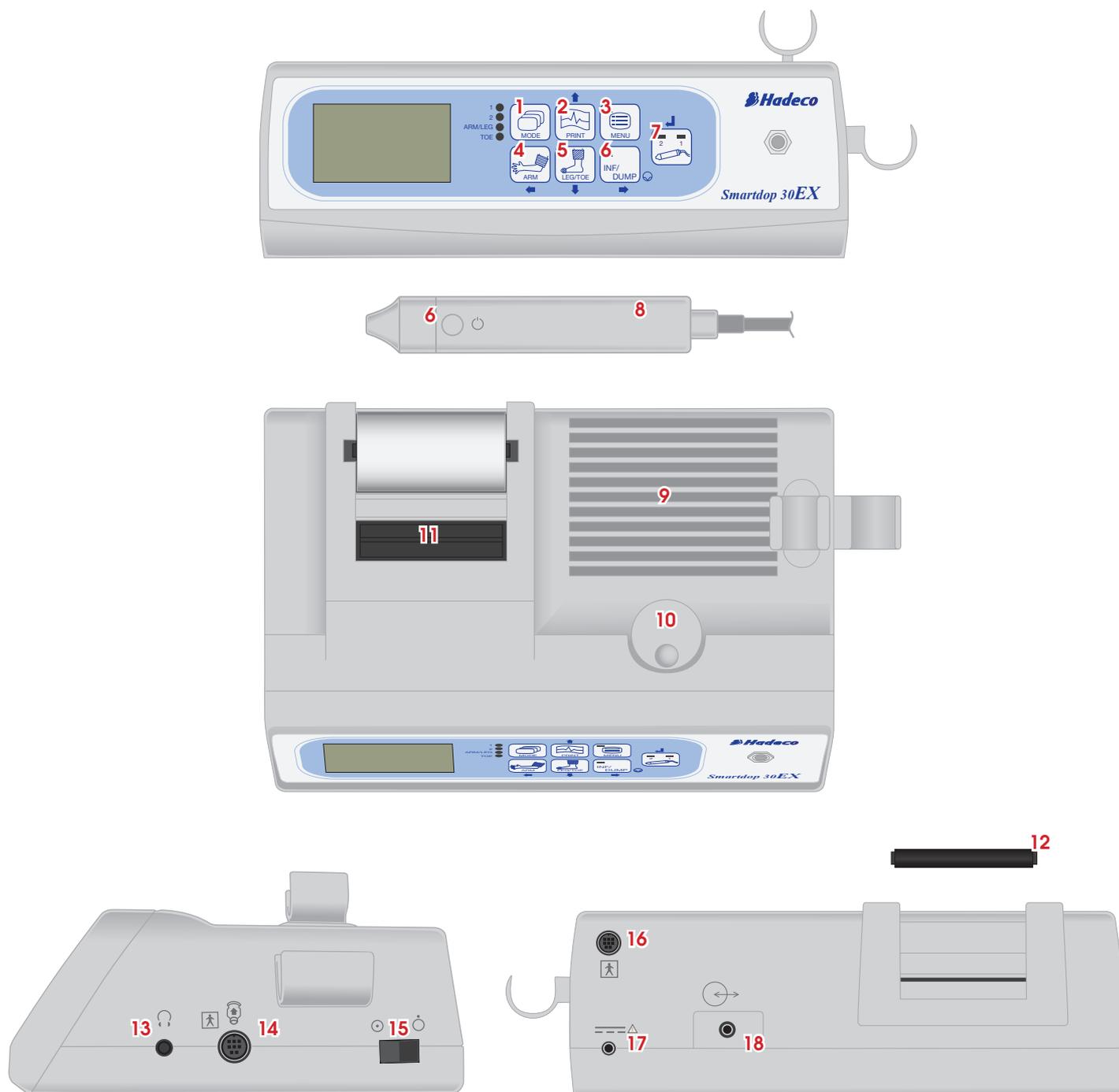
# INSTRUCTIONAL VIDEO

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In conjunction with this manual, we have produced a video that demonstrates how to perform ABI and TBI studies using the Smartdop 30EX. Scan the QR Code above for access.

## MAIN FEATURES & CONTROLS



- |                          |                               |
|--------------------------|-------------------------------|
| 1. Mode Button           | 10. Speaker Volume Control    |
| 2. Print Button          | 11. Printer                   |
| 3. Menu Button           | 12. Paper Roll Shaft          |
| 4. Arm Button            | 13. Headphone Inlet           |
| 5. Leg/Toe Button        | 14. Probe Connection Port 1   |
| 6. Inflate/Dump Button   | 15. On/Off Switch             |
| 7. Probe Selector Button | 16. Probe Connection Port 2   |
| 8. 8MHz Probe            | 17. AC Power Inlet            |
| 9. Speaker               | 18. Doppler/Computer USB Port |

This document will offer instructions on how to obtain T.B.I.'s on the Smartdop 30EX. In order to perform these tests the following accessories are required:

- Arm and Toe Cuffs
- PG-21 PPG Probe (sold separately)
- PPG Toe Clip or Tape to attach PPG Probe to Toe

For a more detailed explanation on the Features and Controls for the Smartdop 30EX, please refer to the Manufacturers Operating Manual supplied with the device.

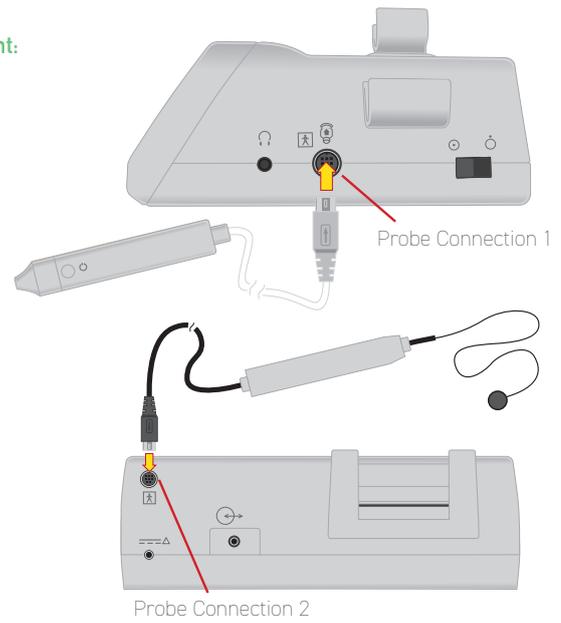
## INITIAL SET-UP

### The Smartdop 30EX has numerous functions in non invasive vascular assessment:

- Qualitative interpretation of Doppler waveforms
- Ankle Brachial Index
- Toe Brachial Index
- Absolute Toe Pressures
- Qualitative interpretation of Pulsed Volume waveforms
- Segmental Pressure Studies
- Venous Reflux Studies

### To prepare for performing vascular studies:

- Insert the 8 MHz probe by lining up the round mark on the connection end of the probe to the 12 o'clock position and gently push into the Probe Connection 1 located on the right side of the Doppler.
- Insert the PPG probe into the probe connection 2 at the back of the Doppler (PPG Probe is sold separately).



## BATTERY

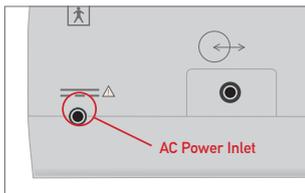
To check the battery level press the MENU button.

This will show the battery level in 4 stages:

Charge **ONLY** when the battery level is low.



1. To charge plug the AC adaptor into the rear of the unit.



2. When charging the MODE LED lights will begin to illuminate sequentially.



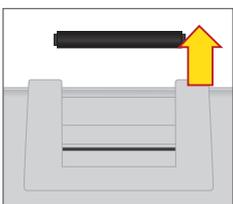
3. When charge is complete the MODE LED lights will stop flashing.



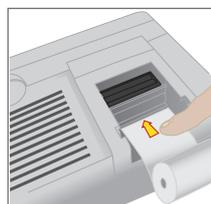
4. Remove AC adapter before beginning any studies.

## LOADING THE PRINTER

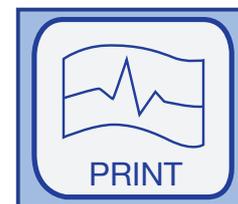
1. Remove the paper roll shaft.



2. Insert and hold the edge of the paper into the paper entry slot located under the printer.



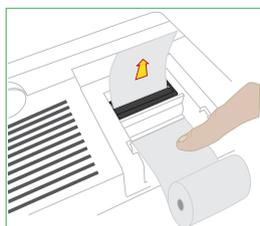
3. Apply slight pressure to the paper and press the PRINT button.



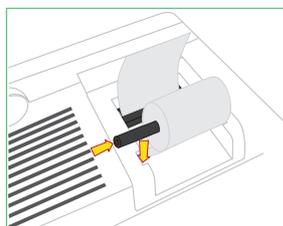
## INITIAL SET-UP

### LOADING THE PRINTER (cont.)

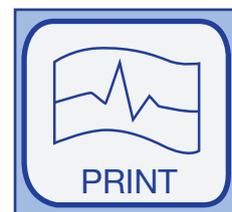
4. As the paper catches it will feed through the printer.



5. Place the paper roll shaft into the paper roll and snap the shaft and the paper roll into the roller guide.

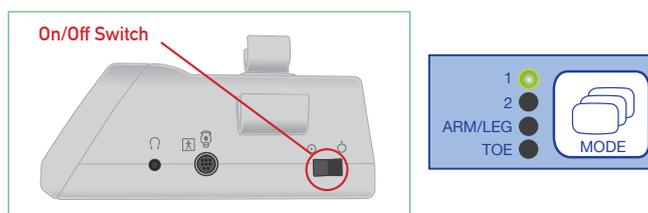


6. When a sufficient amount of paper has been fed through press the **PRINT** button again to stop the printer. Tear off the excess paper.

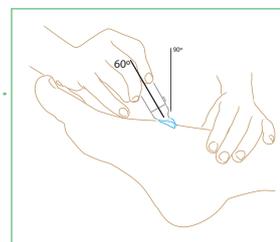


## OBTAINING DOPPLER WAVEFORMS USING THE 8MHZ PROBE

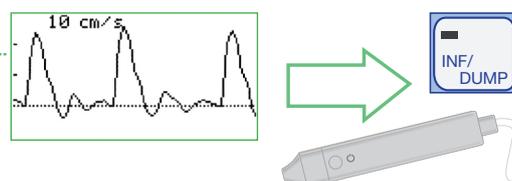
1. Switch on the Smartdop 30EX. Press the **MODE** button until the Mode 1 LED is selected.



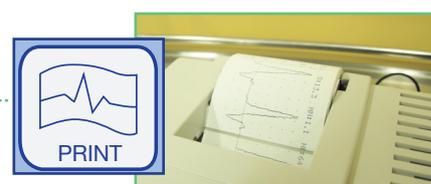
2. Apply ultrasound gel to the skin. Place the probe on the artery against the flow at a 60 degree angle and adjust the probe to locate the best sound (Note: if the probe is positioned perpendicular to the vessel the resulting sound and waveform will appear monophasic incorrectly suggesting a severely occluded vessel).



3. Watch the waveforms on the LCD screen. When it becomes steady, wait 5 seconds or more without moving the probe and then press the probe button or the **INF/DUMP** to freeze the waveform.



4. Press the **PRINT** button to print the waveform. The printer will stop automatically or you can press the **PRINT** button again to stop it after the required number of waveforms have been printed. It is advised that the print out is copied or scanned as the thermal paper will fade with time.



5. If you would like to store the waveform in the Doppler memory press the **MENU** button to go to the menu screen, use the arrow buttons to scroll to memory, press enter to display the sub menu, select store from the menu options and press enter to highlight the memory number. The next available memory number will be selected. Scroll up or down to change or press enter to select.



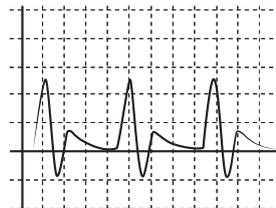
6. Press **INF/DUMP** button to exit the menu and return to the monitoring screen.



## DOPPLER WAVEFORMS - INTERPRETATION

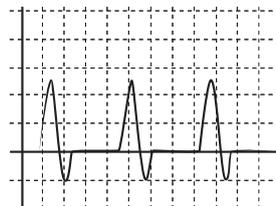
### TRIPHASIC (Normal)

- Triphasic sounds indicate bi-directionality and a compliant artery at the point of probe contact.
- The first long sound is the systolic forward component.
- The second short sound is the reversal component and is seen below the baseline of the waveform print out. It is thought to occur upon closure of the aortic valve.
- The third sound indicates wall motion characteristic of a compliant artery.



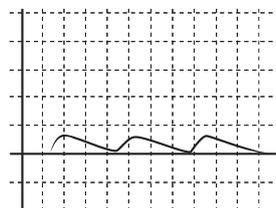
### BIPHASIC (Normal to Mild PAD)

- Biphasic sounds indicate bidirectional flow velocity having both forward systolic and reverse diastolic component but no third component.
- While they are considered normal, the lack of the third component may indicate minor to moderate blood flow impairment or simply improper probe angle this is why it is important to carefully adjust the probe to obtain the best sounds.



### MONOPHASIC (Severe PAD)

- Monophasic sounds are low frequency sounds having a single cycle. They are low in intensity and indicate severe disease.



### ABI

Ankle Brachial Indexes provide quantitative measurements of peripheral circulation. However, elevated readings >1.3 are common with patients with diabetes due to calcification of the vessels which results in an invalid reading.

$$\text{ABI} = \frac{\text{ankle systolic blood pressure}}{\text{brachial systolic blood pressure}}$$

Peripheral arterial disease (PAD)	<0.9
Mild PAD	0.7-0.9
Moderate PAD	0.4-0.69
Severe PAD	<0.4

### TBI

Toe Brachial Indexes are now commonly used as the chance of an invalid reading due to calcification of the vessels is less likely when compared with ankle pressures.

$$\text{TBI} = \frac{\text{toe systolic blood pressure}}{\text{brachial systolic blood pressure}}$$

Normal	0.65-1
Severe/Critical PAD	<0.2

### Absolute Toe Pressures

Absolute toe pressures are also used to indicate wound healing potential.

Absolute toe pressures >30mmHg indicate there is an increased chance of healing.

These quantitative measurements can assist in establishing a baseline to track a patient's progress over time, as well as being an excellent screening tool to identify potential foot health risk.

Reference: International Working Group on the diabetic foot, 2011

# OBTAINING ANKLE BRACHIAL INDEX (ABI) & TOE BRACHIAL INDEX (TBI) PRESSURES

## STAGE 1 – BRACHIAL PRESSURE

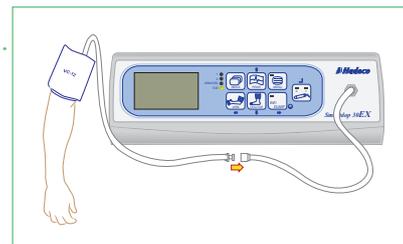
1. With the patient in the supine position place the pressure cuff comfortably ..... snug around the arm.



2. Make sure probe 1 is selected, if not press the probe selector button to change. ....



3. Couple the standard arm cuff to the inflation inlet at the front of the ..... Doppler using the extender tubing.



4. Press the **MODE** button until the Arm/Leg LED light is selected. ....

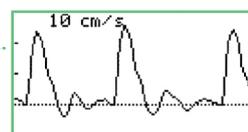


5. Palpate the brachial or radial artery and apply ultrasound gel to the skin.

6. Place the probe on the artery at a 45-60 degree angle against flow ..... and adjust to locate the best sounds.



7. When the waveform on the LCD screen becomes steady and the light on the **INF/DUMP** button starts to flash, press the **INF/DUMP** button or the probe button to activate the automatic cuff inflator.



8. The Smartdop 30EX will automatically inflate 20mmHg above sound cessation and then slowly deflate the cuff until the Doppler sounds return.



9. When finished the SmartDop 30EX will freeze and display the systolic ..... pressure automatically.



10. Press the **ARM** button to save the pressure. ....



11. Press the **INF/DUMP** button to return to the monitoring screen ..... and repeat the test on the other arm.



12. Use the highest arm systolic pressure to calculate the ABI. Therefore if the systolic pressure of the 2nd arm is higher press the **ARM** button again to save the new pressure. This deletes the first pressure previously saved. If the second arm is lower do not press the **ARM** button. This will keep the 1st pressure saved in the memory.



13. Press the **INF/DUMP** button to return to the monitoring screen. ....



# OBTAINING ANKLE BRACHIAL INDEX (ABI) & TOE BRACHIAL INDEX (TBI) PRESSURES (CONT...)

## STAGE 2 – ANKLE PRESSURE

1. Place the pressure cuff comfortably snug around the ankle.



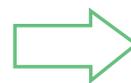
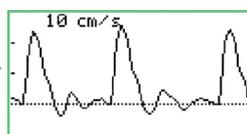
2. Press the MODE button until the Arm/Leg LED light is selected.



3. Apply a generous amount of ultrasound gel on the posterior tibial or dorsalis pedis artery sites. Place the probe on the site against flow and adjust to locate the best sounds.



4. When the waveform on the LCD screen becomes steady and the LED light on the INF/DUMP button begins to flash press the INF/DUMP button or the probe button to activate the automatic cuff inflator.



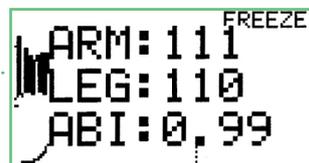
5. When finished the Smartdop 30EX will display the systolic pressure.



6. Press LEG/TOE button to save the ankle pressure.



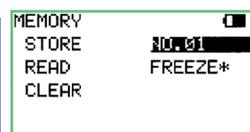
7. The Smartdop 30EX will automatically calculate the ABI by dividing the ankle pressure into the previously saved arm pressure.



8. Press PRINT to print the ABI.



9. To store the waveform to the Doppler memory press the MENU button. Press enter and the next available memory number will be selected, scroll up or down to change or press enter to select.



10. When complete press the INF/DUMP button to return to the monitoring screen.



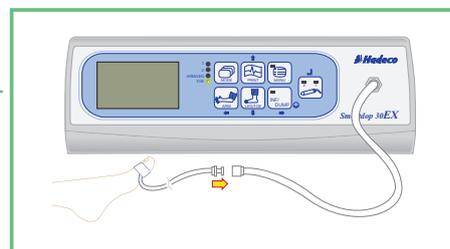
0.91 - 1.3	Normal
<0.90	PAD
>1.3	Non compressible vessels

## OBTAINING ANKLE BRACHIAL INDEX (ABI) & TOE BRACHIAL INDEX (TBI) PRESSURES (CONT...)

### STAGE 3 – TOE PRESSURE

Toe pressure and TBI's use a PPG probe to assess the condition of the small vessels distal to the ankle. These tests are especially useful in those patients who have non compressible larger vessel as a result of diabetes and who have an ABI greater than 1.3. Show patient in supine position with toe cuff in place connected to Doppler with PPG probe taped.

1. Prepare the patient with the foot at the same level as the heart.



2. Use extender tubing to connect the digital cuff to the automatic cuff inflator on the front of the Doppler.

3. Position the PPG Probe, ensuring complete contact between the sensor and the skin. Hold in place with either tape or the PPG Clip. The orientation of the sensor is not relevant. Keep the PPG Probe cable clear of interference by taping it to the dorsum of the foot. Press the **MODE** button until the Toe LED light is selected.



**PLEASE NOTE: DO NOT APPLY ULTRASOUND GEL**

4. When the waveform on the LCD becomes steady and the light on the **INF/DUMP** button is lit press the **INF/DUMP** or probe button to activate the auto cuff inflator. The Smartdop 30EX will automatically inflate the cuff 20mmHg past the point where the waveform ceases then slowly deflates the cuff until the waveform motion returns.

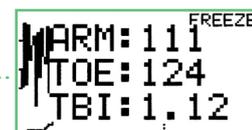


5. When finished the Smartdop 30EX will freeze and display the systolic pressure.

6. Press the **LEG/TOE** button to save the toe pressure.



7. The Smartdop 30EX automatically calculates the TBI by dividing the toe pressure by the previously saved arm pressure.



8. If you would like to print the results press the **PRINT** button.



9. To store the results to the Doppler memory press the **MENU** button. Press enter and the next available memory number will be selected. scroll up or down to change or press enter to select.



10. Press the **INF/DUMP** button to return to the monitoring screen and repeat the test on the other foot.



## SEGMENTAL PRESSURES

Segmental pressure studies are used to measure systolic pressures at different levels in the legs to evaluate blood flow and identify the location of blockages of the arteries in the leg.

1. Prepare the patient by placing them in a supine position and wrap the pressure cuff around the required area (above the knee, below the knee or ankle).



2. Turn the Smartdop 30EX on and press the MODE button until Mode 1 light is selected.



3. Apply ultrasound gel to the skin. Place the probe on the artery at a 45-60 degree angle against flow and adjust to locate the best sound.



4. Watch the waveform on the LCD and when it becomes steady wait 5 seconds or more without moving the probe then press the probe button or INF/DUMP button to inflate the cuff.



5. Repeat this at another segment.
6. Pressure differences of less than 20mmHg between adjacent cuff sites on the same legs are considered normal.

## VENOUS REFLUX STUDIES

Venous Reflux Studies are used to assess valvular competency. Normal refill time will exceed 20 seconds. However, if the refill time is between 18-21 seconds it is questionable and this test should be repeated. If the refill time is < 18 seconds a venous reflux condition may exist and further testing is indicated.

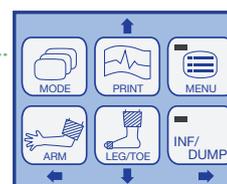
1. Place the patient in a sitting position with feet off the floor.
2. Before beginning the test show the patient how to dorsiflex the foot using the calf muscle as a pump.
3. Turn the Smartdop 30EX on.
4. Ensure the **PROBE 2** selector button is selected. If not, press the probe selector button to change.



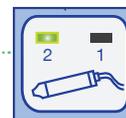
5. Then press the **MODE** button and select venous mode 2.



6. To change the number of times the patient should dorsiflex the foot, scroll using the **ARROW** buttons on the menu control panel until the count is highlighted.



7. Press the **PROBE SELECTOR** button to change the number. The recommended number of times is 5.



8. When finished press the **MENU** button to confirm and begin the test.



9. To start the test press the probe button or the **INF/DUMP** button to activate the timer.

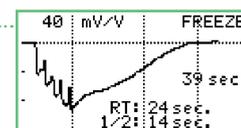


10. Ask the patient to dorsiflex the foot the specified number of times following the foot displayed on the screen.



11. Then have the patient rest the foot.

12. Observe the waveform on the LCD screen which will show a steady motion upward to the baseline.

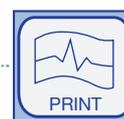


13. When the test is complete the Smartdop 30EX will freeze the results and calculate the recovery time.

14. To save the result press the **MENU** button to go to the menu screen scroll to memory and press enter (or scroll to change memory number).



15. Press the **PRINT** button to print.



## PULSE VOLUME RECORDING (PVR)

PVR's use pneumophlthysmography to identify changes in leg blood volume through waveform pattern analysis.

1. Place the patient in a supine position with the leg and hip rotated outward.

2. Wrap the blood pressure cuff appropriately around the patients leg in the appropriate location (ankle or toe).



3. Use extender tubing to connect the cuff to the automatic cuff inflator on the front of the Doppler.

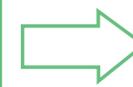
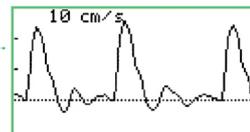
4. Turn the Smartdop 30EX on and press the probe selector button on the front of the device until both probe LED lights are lit.



5. Press **INF/DUMP** to activate the automatic cuff inflator. The Smartdop 30EX will automatically inflate the cuff to 60 mmHg.



6. Watch the Pulse Volume Waveform on the LCD screen. When it becomes steady press the **INF/DUMP** button to freeze the waveform.



7. Press the **PRINT** button to print the waveform.



8. To store the waveform to the Doppler memory press the **MENU** button. Press enter and the next available memory number will be selected, scroll up or down to change or press enter to select.



9. Repeat at other sites if required.





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