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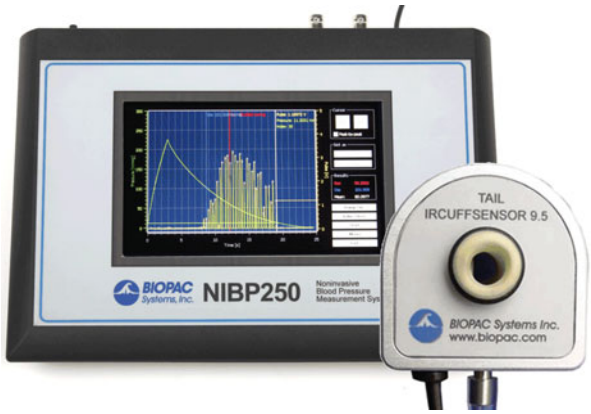
NON-INVASIVE SMALL ANIMAL TAIL BLOOD PRESSURE SYSTEMS

NIBP250 Blood Pressure Amplifier

NIBP200A Blood Pressure System



NIBP Amplifiers with built-in pump automatically inflate the tail cuff to occlude the vessel in the tail of a rat or similar small animal, and then slowly deflate the cuff when the inflation point is reached, providing a linear drop in pressure. A single control starts both the inflation and deflation cycles, making the system very operator-friendly. Amplifiers have two analog outputs for pressure and pulse waveforms, plus gain adjustment to amplify or attenuate the pulse signal. Systolic, diastolic, and mean BP values.

- **NIBP250** Touchscreen LCD controls and displays data for local analysis and storage. Use as a stand-alone system or interface to BIOPAC or third-party A/D hardware. USB 1.1 compatible flash memory port and SD card slot.
- **NIBP200A** Amplifier for use with Tail Cuff Sensor.

Systems include:

- Amplifier order NIBP250 or NIBP200A
- One tail cuff sensor (request size):

  RXTCUFSENSOR9.5 = 9.5 mm, 100-220 g
  RXTCUFSENSOR11 = 11 mm, 200-280 g
  RXTCUFSENSOR13 = 13 mm, 250-350 g
- One small animal restrainer:

  RXRESTRAINER-S, 70-150 g (small rat)
  RXRESTRAINER-M, 150-200 g (medium rat)
  RXRESTRAINER-L, 250-350 g (large rat)
- Optional MRI-conditional sensors available – add to an existing NIBP200A system

  RXCUFSEN9.5-MRI = 9.5 mm, 100-220 g
  RXCUFSEN11-MRI = 11 mm, 200-280 g
  RXCUFSEN13-MRI = 13 mm, 250-350 g

  MRI Use: MR Conditional

  Condition: Animal use only; tested to MR field strength 3T

  RXTCUFSENSOR 9.5/11/13 Components—MRI chamber room components only:

  Sensor Housing: Delrin®
  SensorType: Infrared
  Sensor Tubing: Latex
  Cable: Dual Fiber Optical Cable
  Air Line: Tygon® Tubing

- Analog outputs: pressure 0-3 V DC, Pulse 0-4 V DC
- Output cables: pressure cable and pulse cable
- Interface cables: to BIOPAC or third-party A/D hardware
- User's Manual

Optional Tail Heater: TAILHEATA 110 V or TAILHEATB 220 V

SPECIFICATIONS

Cut-off Pressure Range:	100 – 300 mmHg (adjustable by 1mmHg steps)
Pressure Accuracy:	300 mmHg Full Scale 1%
Pressure Sensitivity:	0.1 mmHg
Pressure Signal output:	300 mmHg/3 Volt DC
Pulse Gain Levels:	x1, x2, x4, x5, x8, x16, x32 (adjustable)
Pulse Signal Output:	0 – 4 Volt DC
Pulse Display:	Pulse intensity is displayed on A2, derived from plethysmographic measure The tail sensor detects blood flow and pulse intensity is increased or decreased, depending on the flow ratio.
LCD Display:	7" 800 x 480 TFT (NIBP250)
User Interface:	Resistive Touch Panel (NIBP250)
Analog outputs:	Two BNC connectors for uncalibrated pressure and pulse signals
Triggers:	Two BNC connectors for TTL Compatible trigger in and out signals
Power Supply:	12 Volt 2 Amp – External

NIBP 00A/NIBP 0 SYSTEM CONNECTIONS

NIBP 00A Front Panel

NIBP 00A Rear Panel

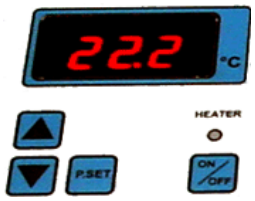
1. Connect the CBL150-PRE cable (or CBL35-PRE cable for MP36/35 hardware).
    a. BNC to the PRESSURE output on the back panel of the unit.
    b. Other end to A1 on the front of the AMI100D/HLT100C/UIM100C (or CH 1 of the MP36/35 unit).
2. Connect the CBL150-PLS cable (or CBL35-PLS for MP36/35 hardware).
    a. BNC to the PULSE output on the back panel of the unit.
    b. Other end to A2 on the front of the AMI100D/HLT100C/UIM100C unit (or CH 2 of the MP36/35 unit).
3. Connect the IRSENSOR.
    a. Black cord to the sensor input on the front panel of the NIBP200A (back panel on NIBP250).
    b. Tubing in the cuff on the front panel of the NIBP200A (back panel on NIBP250).
4. Connect the power.
    a. AC300 adapter to the 12 V DC input on the back panel of the NIBP200A.
    b. AC300 to Mains power.
5. Switch the POWER on.

ANIMAL PREPARATION

Optional Heating Chamber

Restrainer Animal Holders

Tail Cuff/Sensor

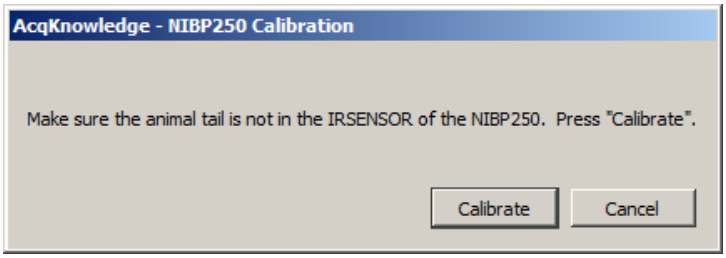


1. Turn the Animal Heating Chamber on.
2. Set the temperature value (press and hold P.Set and then press the up or down arrow to reach the desired value).
   - For accurate noninvasive blood pressure measurement, the animal or its tail should be warmed to 32° C.
3. Press the Heater button to start heating to the selected temperature value.
4. Place the animal inside the RESTRAINER "Animal Holder" (select the suitable size for the animal volume).
   - Leave the tail outside.
   - Adjust the length to obtain a position where the animal has limited movement.
5. Place the RESTRAINER (with the animal) in the heating section of the Animal Heating Chamber.
6. Wait approximately 30 minutes for the animal to reach the selected temperature.
7. Remove the RESTRAINER from the Animal Heating Chamber.
8. Connect the IRSENSOR to the tail of the animal inside the RESTRAINER.
9. Check if the sensor just fits to the tail. The sensor should be between the mid point of tail and tail end (spinal column). To achieve this, a suitable sensor should be selected.
10. Wait for the animal to relax and become inactive before starting measurements.

TIP *Before starting the experiment, to condition the animal, put the animal inside the holder several times a day and repeat the heating each time.*

SOFTWARE SETUP for AcqKnowledge 4.1 and higher

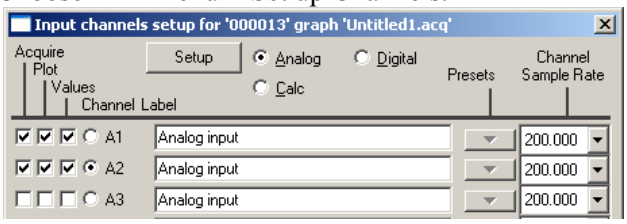
1. Launch Acq*Knowledge* 4.x.
2. Select the "Create/Record a new experiment" option.
3. Select "MP160/150 > Set Up Data Acquisition > Channels > "Add New Module..."
   a. From the new module list, select AMI100D-HLT100C-A1 (MP160) or UIM100C-A1(MP150), (or whichever channel CBL150-PRE pressure cable is connected to) and click "Add."
   b. From the AMI100D/HLT100C (MP160) or UIM100C (MP150) Transducer list, select "NIBP200A – Small Animal Tail BP, Pressure" or "NIBP250 – Small Animal Tail BP, Pressure" and click OK.
   c. Click "Calibrate" in the resulting Calibration dialog.



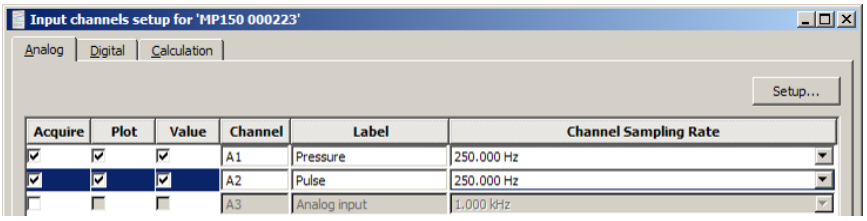
4. Repeat "Add New Module…" portion of Step 3.
   a. From the new module list, select AMI100D-HLT100C-A2 (MP160) or UIM100C-A2 (MP150) (or whichever channel CBL150-PLS pulse cable is connected to) and click "Add."
   b. From the AMI100D/HLT100C (MP160) or UIM100C (MP150) Transducer list, select "NIBP200A – Small Animal Tail BP, Pulse" or "NIBP250 – Small Animal Tail, Pulse" and click OK.

SOFTWARE SETUP for AcqKnowledge 4.0 and earlier

1. Launch the BIOPAC software.
2. Choose "MP menu > Set up Channels."



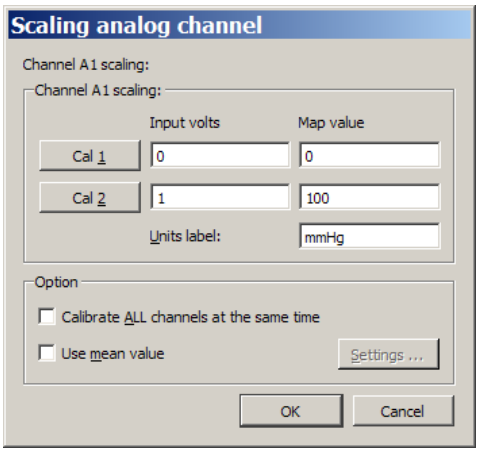
or



3. Enable analog inputs A1 and A2 and select the Acquire, Plot and Value options.
   - If desired, enter channel Labels: A1 Pressure and A2 Pulse.

4. Calibrate for the pressure measurement of IRSENSOR.
   a. Select A1 (Pressure) and click Setup and establish these settings:

	Input volts	Scale Map value
Cal 1	0	0
Cal	1	100
	Units Label	mmHg



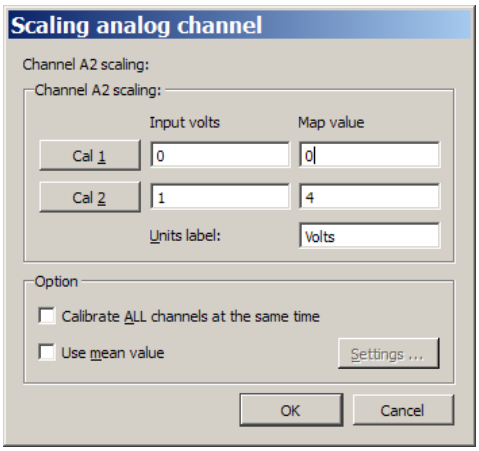
   The scaling must be adjusted as the cut-off pressure switch settings are changed. If the pressure switch is set to 300 mmHg, then the settings should be:

	Input volts	Scale Map value
Cal 1	0	0
Cal	3	300
	Units Label	mmHg

   b. Click OK as needed to close out of A1 setup.

5. Calibrate for the pulse measurement of IRSENSOR.
   a. Ensure that the tail is not inside the IRSENSOR and it is empty, and the sensor resides freely.
   b. Select A2 (Pulse) and click Setup and establish these settings:

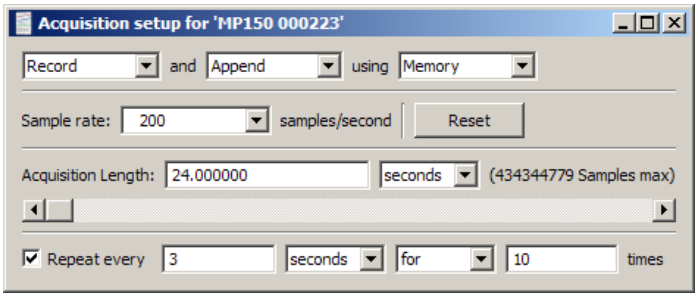
	Input volts	Scale Map value
Cal 1	0	0
Cal	1	4
	Units Label	Volts



   c. Click OK as needed to close out of A2 setup and the Setup Channels dialog.

6. Choose "MP menu > Set up Acquisition" and establish the following settings:

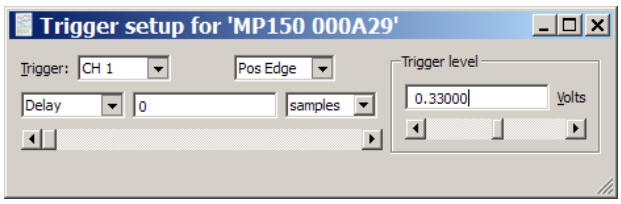
   Mode = Record and Append to Memory
   Sample Rate = 200 samples/second
   Total Length = 24 seconds
   Repeat = every 3 seconds for 10 times



7. Exit Set up Acquisition dialog.

8. Choose "MP menu > Setup Trigger" and establish the following settings:

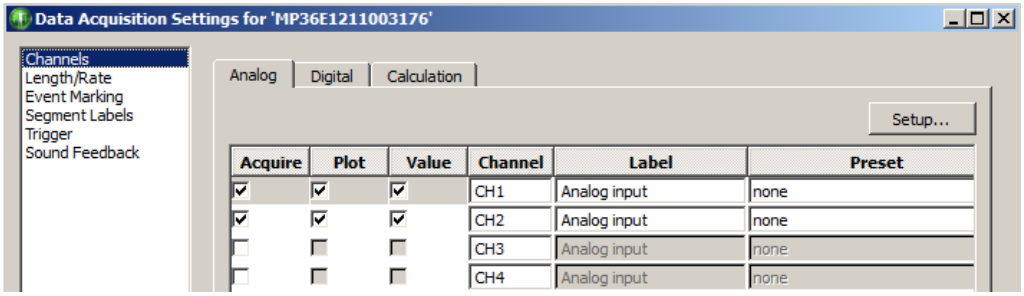
   Trigger = CH 1, Pos Edge
   Trigger Level = 0.33 Volts
   (based on 1 V ≈ 100 mmHg)
   Delay = 0 samples



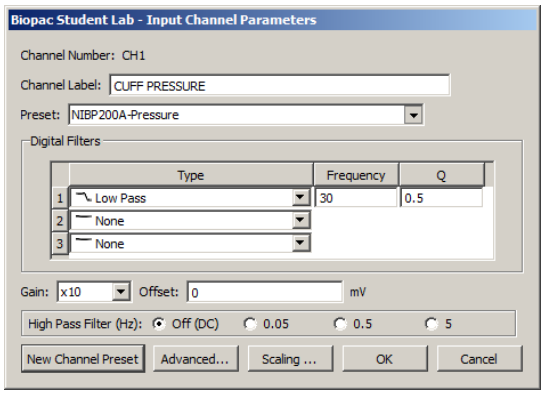
9. Close out of Triggering dialog.

SOFT ARE SETUP for Ac *Knowledge* .x or BSL .x with MP x Hardware

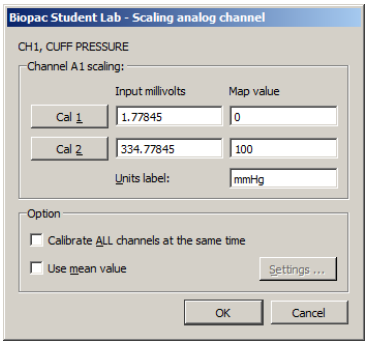
1. Launch the software.
2. Select the "Create/Record a new experiment" option.
3. If necessary, choose "MP3x > Set up Data Acquisition > Channels."
4. Enable analog inputs CH1 and CH2 and select the Acquire, Plot and Value options.



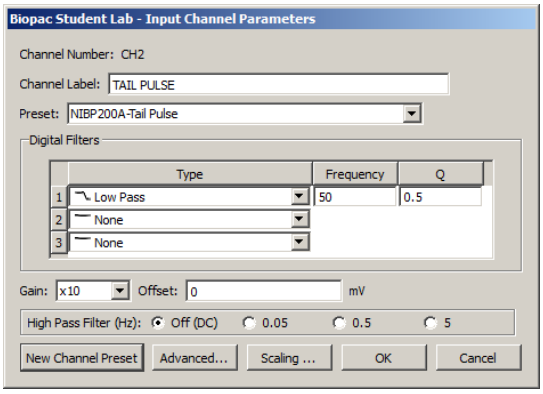
5. Select CH1 and click "Setup.".
6. Click "New Channel Preset," enter "NIBP200A-Pressure" and click OK.
7. Establish the following settings:
   - Channel Preset = NIBP200A-Pressure
   - Channel Label = CUFF PRESSURE
   - Gain = x10
   - Input Coupling = DC
   - Filter = 1
   - Type = Low Pass
   - Frequency = 30
   - Q = 0.5



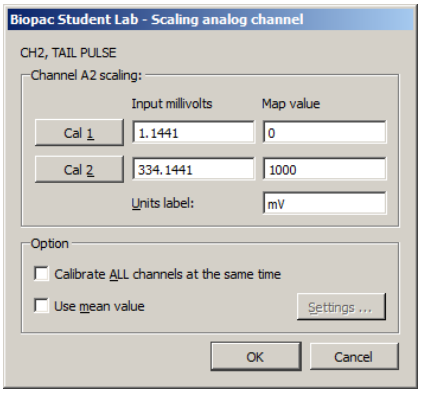
8. Calibrate for the pressure measurement of IRSENSOR.
   a. Click "Scaling" button and establish the following settings:
      Map values
         Cal1 = 0
         Cal2 = 100
      Units label = mmHg
   b. Click the Cal 1 button.
   c. Add "333" to the Cal 1 Input value, and enter the result in Cal 2 Input value (Cal 2 = Cal 1 + 333)
   d. Click OK as needed to exit the CH1 "Scaling" and Input "Channel" setup dialogs.



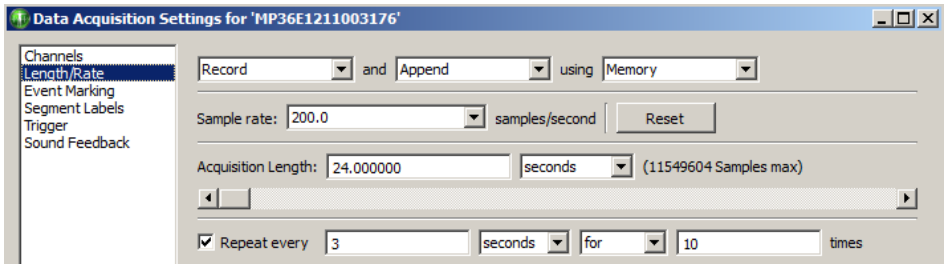
9. Select CH2 and click "Setup."
10. Click "New Channel Preset," enter "NIBP200A-Tail Pulse" and click OK.
11. Establish the following settings:
    - Channel Preset = NIBP200A-Tail Pulse
    - Channel Label = TAIL PULSE
    - Gain = x10
    - Input Coupling = DC
    - Filter = 1
    - Type = Low Pass
    - Frequency = 50
    - Q = 0.5



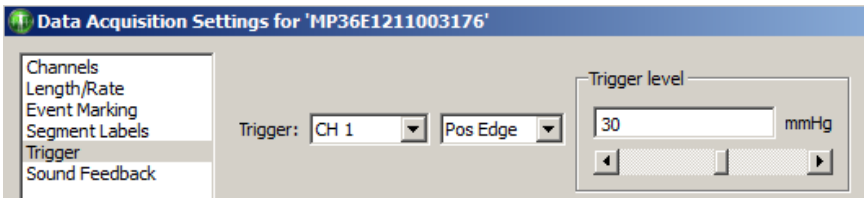
12. Calibrate for the pulse measurement of IRSENSOR.
    a. Ensure that the tail is not inside the IRSENSOR, and that the sensor resides freely.
    b. Click "Scaling" button and establish the following settings:
        Map values
            Cal 1 = 0
            Cal 2 = 1000
        Units label = mV
    c. Click the Cal 1 button.
    d. Add "333" to the Cal 1 Input value and enter the result in Cal 2 Input value (Cal 2 = Cal 1 + 333)
    e. Click OK as needed to exit the CH2 "Scaling" and "Input Channel" setup dialogs.



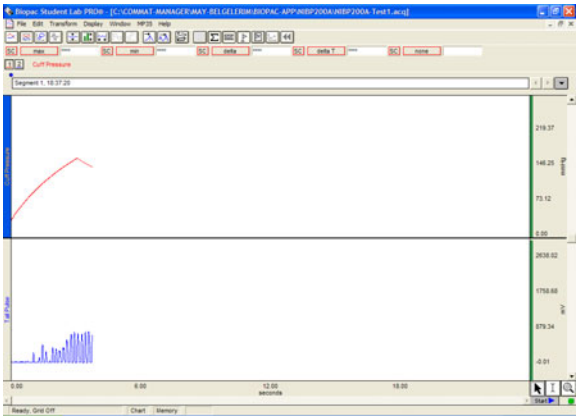
13. Choose "MP3x > Set Up Data Acquisition > Length/Rate" and establish the following settings:
    - Mode = Record and Append using Memory
    - Sample Rate = 200 samples/second
    - Acquisition Length = 24 seconds
    - Repeat = every 3 seconds for 10 times



14. Choose "Trigger" and establish the following settings.
    Trigger = CH 1, Pos Edge
    Trigger Level = 30 mmHg
15. Exit the Data Acquisition Settings dialog.



RECORDING

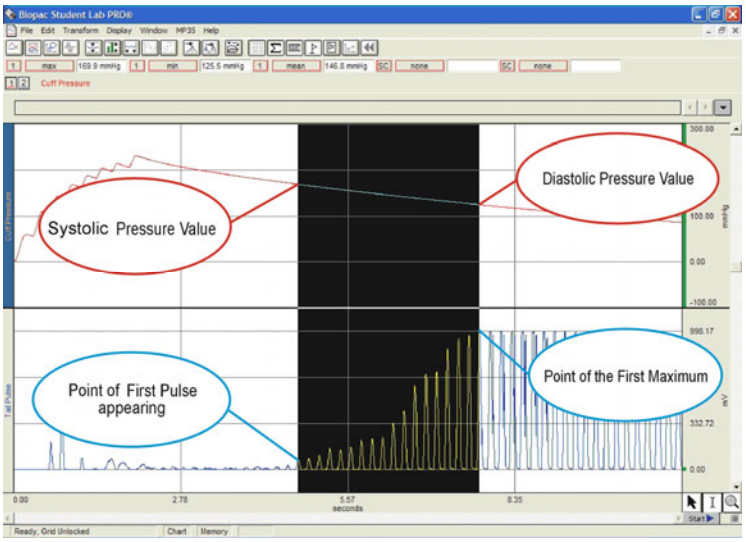


1. Confirm that the animal is ready and that the IRSENSOR is attached to the tail.
2. Click “Start” in the BIOPAC software window.
3. Press START button on the front panel of NIBP200A.
   - IRSENSOR will pump up the Cuff automatically.
   - When the Cuff Pressure on A1 reaches 30 mmHg, the cuff pressure and tail pulse signals will be generated.
   - The recording will stop automatically after 24 seconds.
4. Press START to continue with the next measurement and repeat as necessary.
5. Choose File > Save or Save as when done.

TIP *A generally accepted application is that for each animal, 10 measurements are recorded and mean values are calculated. In the append mode, 10 consecutive measurements can be made in the same file.*

NIBP 00A ANALYSIS

Calculation of Systolic, Diastolic and Mean.



1. Click the Calculation Label.
2. Select from the list Max, Min, Mean for three different Labels.
3. Select Channel 1 as channel option.
4. Select cursor ‘I’ from the cursor option on the bottom right of the screen.
5. On the graphical display, starting from the point of first pulse, select an area to the maximum.
6. Review the results for Max (Systolic), Min (Diastolic), and Mean measurements.

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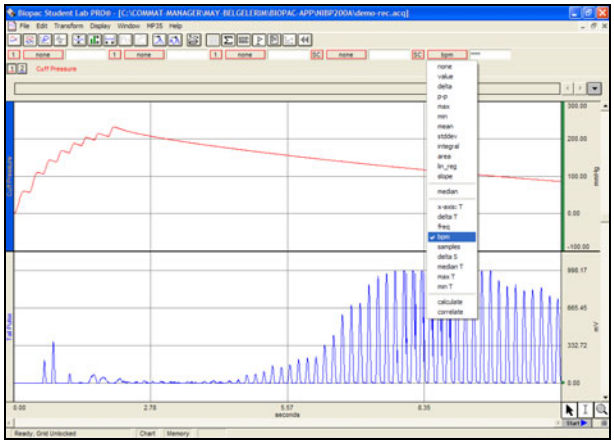
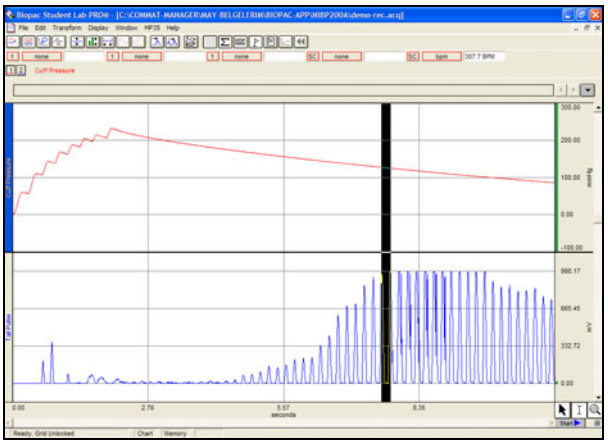
Calculation of BPM Heart





1. Set a measurement for **BPM**.
2. Use the I-beam cursor to select the maximum points of the peaks of the CH2 pulse waveform.
3. Review the results for BPM (Heart Rate value) for each peak.

NIBP 0 UIC GUIDE

PREPARE

- With unit turned off, attach the sensor and cuff connectors.
- Turn on unit and wait for the Main Screen to appear.
- Prepare the animal and attach sensor-cuff to tail.

AC UIRE

- When preparation is complete: Press the “Start” button on the Main Screen. The button label changes to “Stop” and you can halt the acquisition at any time.
- When the acquisition starts, the unit automatically closes the leakage valve and begins inflating the cuff.
- After pressure reaches the maximum level, the pump stops and opens the leakage valve to release the pressure.
- After the pressure is fully released, the acquisition stops.

NIBP 0 ANALYSIS

The NIBP250’s automated peak detection system marks the peak of each pulse with a white cross, and is enabled by selecting the "Peak by peak" option on the Main Screen. This feature makes it easier to identify the individual pulses. To determine the systolic and diastolic values:

1. Select the "Peak by peak" box on the main screen.
2. Use the right (or left) cursor button to locate the first pulse's white cross and press the "Systolic" button. (You may also place the cursor using the touch screen.) The system will record and display the systolic blood pressure value.
3. Use the cursor button (or touch screen) to move to the pulse with the highest peak and then press the "Diastolic" button. The system will record and display the diastolic blood pressure value..

You may change your cursor peak positions at anytime during the analysis.

After measurement is complete, press the Save button under “Results.” An automatically generated result code will be displayed at the top of the results section.

For analysis in BIOPAC Acq*Knowledge* or BSL *PRO* software, see previous page for NIBP200A.

SAVE RESULTS

- Previously saved results can be displayed by pressing the "Load" button under "Results."
- Placing the cursor on a desired measurement and pressing OK will load the recorded pressure, pulse curves and previously calculated results.
- After loading is complete, you can easily evaluate the results and re-analyze any measurements.

TURN OFF

- Before turning off the unit, be sure that the current measurement was saved.
- Power off the unit by switching the power button on the back

TROUBLESHOOTING

Tail Pulse signals are not regular.

- The animal may be under stress, resulting in excessive tail movement. Remove the animal from the RESTRAINER holder until it calms down before continuing with the experiment.
- The tail may not be sufficiently warmed or cooled down. Put the animal in the Tail Heater Chamber and repeat the heating process. Make sure the tail temperature is 32° C.
- Tail Cuff sizing may be incorrect. Check Table 5 on the following page for sizing descriptions.
- Tail Cuff Sensor position may be incorrect. Try re-attaching the sensor in a different location on the tail. The optimal location is between the mid-point of tail and base of tail (spinal column).

Compressor is working continuously.

- Immediately turn off the NIBP system.
- Remove the Tubing from the Cuff connector on the panel of NIBP system
- Turn the system back on.
- Close the air outlet by pressing the finger on the Cuff output and press the "Start" button. The compressor will work for a few seconds and stop (please inform BIOPAC if the Compressor does not stop). The pressure chart should be viewable on the screen.
- If the Compressor stops automatically, it means that the system is working normally.

There is leakage in the tubing connections and Cuff of the IRSENSOR.

- Make sure the tubing is securely attached.

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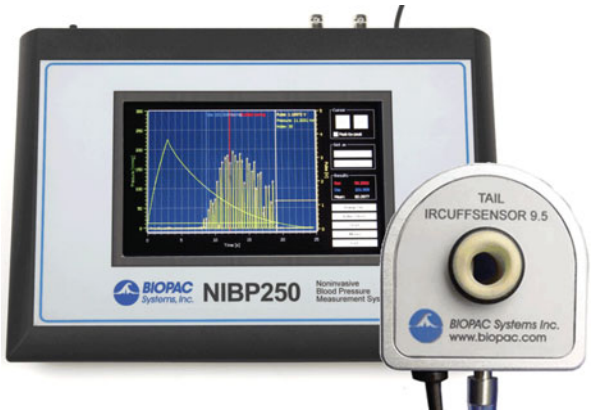

NIBP Amplifiers with built-in pump automatically inflate the tail cuff to occlude the vessel in the tail of a rat or similar small animal, and then slowly deflate the cuff when the inflation point is reached, providing a linear drop in pressure. A single control starts both the inflation and deflation cycles, making the system very operator-friendly. Amplifiers have two analog outputs for pressure and pulse waveforms, plus gain adjustment to amplify or attenuate the pulse signal. Systolic, diastolic, and mean BP values.

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- **NIBP200A** Amplifier for use with Tail Cuff Sensor.

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- One tail cuff sensor (request size):

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- One small animal restrainer:

  RXRESTRAINER-S, 70-150 g (small rat)
  RXRESTRAINER-M, 150-200 g (medium rat)
  RXRESTRAINER-L, 250-350 g (large rat)
- Optional MRI-conditional sensors available – add to an existing NIBP200A system

  RXCUFSEN9.5-MRI = 9.5 mm, 100-220 g
  RXCUFSEN11-MRI = 11 mm, 200-280 g
  RXCUFSEN13-MRI = 13 mm, 250-350 g

  MRI Use: MR Conditional

  Condition: Animal use only; tested to MR field strength 3T

  RXTCUFSENSOR 9.5/11/13 Components—MRI chamber room components only:

  Sensor Housing: Delrin®
  SensorType: Infrared
  Sensor Tubing: Latex
  Cable: Dual Fiber Optical Cable
  Air Line: Tygon® Tubing

- Analog outputs: pressure 0-3 V DC, Pulse 0-4 V DC
- Output cables: pressure cable and pulse cable
- Interface cables: to BIOPAC or third-party A/D hardware
- User's Manual

Optional Tail Heater: TAILHEATA 110 V or TAILHEATB 220 V

SPECIFICATIONS

Cut-off Pressure Range:	100 – 300 mmHg (adjustable by 1mmHg steps)
Pressure Accuracy:	300 mmHg Full Scale 1%
Pressure Sensitivity:	0.1 mmHg
Pressure Signal output:	300 mmHg/3 Volt DC
Pulse Gain Levels:	x1, x2, x4, x5, x8, x16, x32 (adjustable)
Pulse Signal Output:	0 – 4 Volt DC
Pulse Display:	Pulse intensity is displayed on A2, derived from plethysmographic measure The tail sensor detects blood flow and pulse intensity is increased or decreased, depending on the flow ratio.
LCD Display:	7" 800 x 480 TFT (NIBP250)
User Interface:	Resistive Touch Panel (NIBP250)
Analog outputs:	Two BNC connectors for uncalibrated pressure and pulse signals
Triggers:	Two BNC connectors for TTL Compatible trigger in and out signals
Power Supply:	12 Volt 2 Amp – External

NIBP 00A/NIBP 0 SYSTEM CONNECTIONS

NIBP 00A Front Panel

NIBP 00A Rear Panel

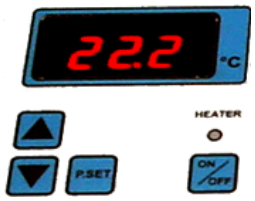
1. Connect the CBL150-PRE cable (or CBL35-PRE cable for MP36/35 hardware).
    a. BNC to the PRESSURE output on the back panel of the unit.
    b. Other end to A1 on the front of the AMI100D/HLT100C/UIM100C (or CH 1 of the MP36/35 unit).
2. Connect the CBL150-PLS cable (or CBL35-PLS for MP36/35 hardware).
    a. BNC to the PULSE output on the back panel of the unit.
    b. Other end to A2 on the front of the AMI100D/HLT100C/UIM100C unit (or CH 2 of the MP36/35 unit).
3. Connect the IRSENSOR.
    a. Black cord to the sensor input on the front panel of the NIBP200A (back panel on NIBP250).
    b. Tubing in the cuff on the front panel of the NIBP200A (back panel on NIBP250).
4. Connect the power.
    a. AC300 adapter to the 12 V DC input on the back panel of the NIBP200A.
    b. AC300 to Mains power.
5. Switch the POWER on.

ANIMAL PREPARATION

Optional Heating Chamber

Restrainer Animal Holders

Tail Cuff/Sensor

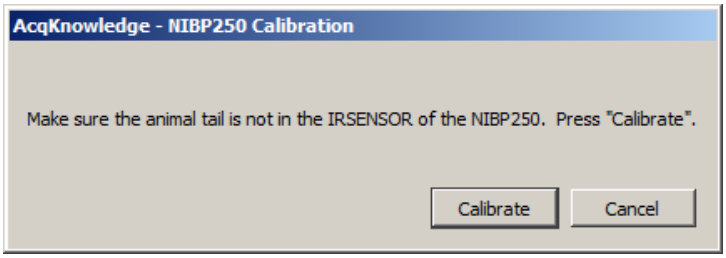


1. Turn the Animal Heating Chamber on.
2. Set the temperature value (press and hold P.Set and then press the up or down arrow to reach the desired value).
   - For accurate noninvasive blood pressure measurement, the animal or its tail should be warmed to 32° C.
3. Press the Heater button to start heating to the selected temperature value.
4. Place the animal inside the RESTRAINER "Animal Holder" (select the suitable size for the animal volume).
   - Leave the tail outside.
   - Adjust the length to obtain a position where the animal has limited movement.
5. Place the RESTRAINER (with the animal) in the heating section of the Animal Heating Chamber.
6. Wait approximately 30 minutes for the animal to reach the selected temperature.
7. Remove the RESTRAINER from the Animal Heating Chamber.
8. Connect the IRSENSOR to the tail of the animal inside the RESTRAINER.
9. Check if the sensor just fits to the tail. The sensor should be between the mid point of tail and tail end (spinal column). To achieve this, a suitable sensor should be selected.
10. Wait for the animal to relax and become inactive before starting measurements.

TIP *Before starting the experiment, to condition the animal, put the animal inside the holder several times a day and repeat the heating each time.*

SOFTWARE SETUP for AcqKnowledge 4.1 and higher

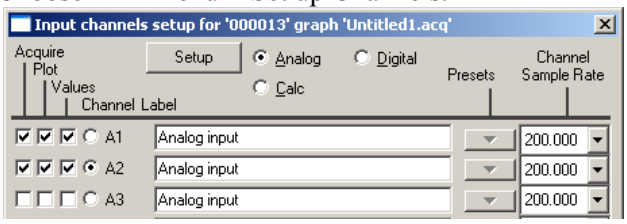
1. Launch Acq*Knowledge* 4.x.
2. Select the "Create/Record a new experiment" option.
3. Select "MP160/150 > Set Up Data Acquisition > Channels > "Add New Module..."
   a. From the new module list, select AMI100D-HLT100C-A1 (MP160) or UIM100C-A1(MP150), (or whichever channel CBL150-PRE pressure cable is connected to) and click "Add."
   b. From the AMI100D/HLT100C (MP160) or UIM100C (MP150) Transducer list, select "NIBP200A – Small Animal Tail BP, Pressure" or "NIBP250 – Small Animal Tail BP, Pressure" and click OK.
   c. Click "Calibrate" in the resulting Calibration dialog.



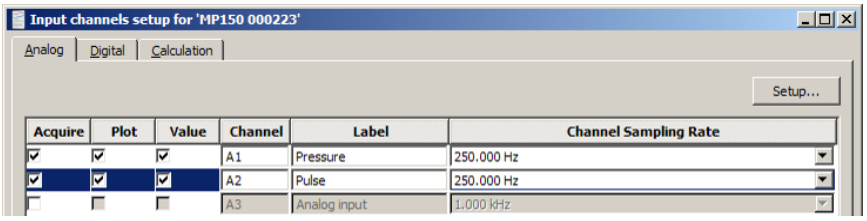
4. Repeat "Add New Module…" portion of Step 3.
   a. From the new module list, select AMI100D-HLT100C-A2 (MP160) or UIM100C-A2 (MP150) (or whichever channel CBL150-PLS pulse cable is connected to) and click "Add."
   b. From the AMI100D/HLT100C (MP160) or UIM100C (MP150) Transducer list, select "NIBP200A – Small Animal Tail BP, Pulse" or "NIBP250 – Small Animal Tail, Pulse" and click OK.

SOFTWARE SETUP for AcqKnowledge 4.0 and earlier

1. Launch the BIOPAC software.
2. Choose "MP menu > Set up Channels."



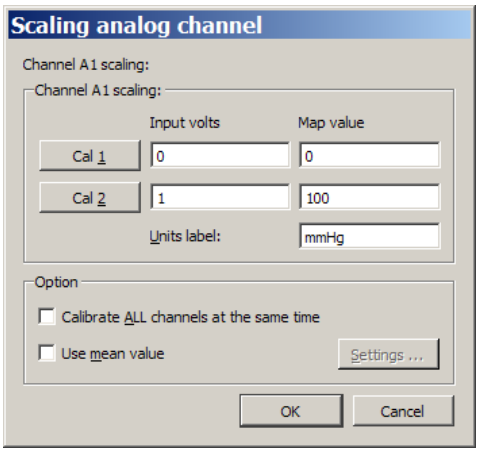
or



3. Enable analog inputs A1 and A2 and select the Acquire, Plot and Value options.
   - If desired, enter channel Labels: A1 Pressure and A2 Pulse.

4. Calibrate for the pressure measurement of IRSENSOR.
   a. Select A1 (Pressure) and click Setup and establish these settings:

	Input volts	Scale Map value
Cal 1	0	0
Cal	1	100
	Units Label	mmHg



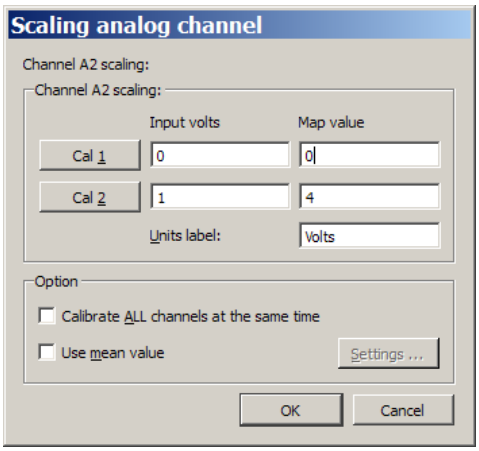
   The scaling must be adjusted as the cut-off pressure switch settings are changed. If the pressure switch is set to 300 mmHg, then the settings should be:

	Input volts	Scale Map value
Cal 1	0	0
Cal	3	300
	Units Label	mmHg

   b. Click OK as needed to close out of A1 setup.

5. Calibrate for the pulse measurement of IRSENSOR.
   a. Ensure that the tail is not inside the IRSENSOR and it is empty, and the sensor resides freely.
   b. Select A2 (Pulse) and click Setup and establish these settings:

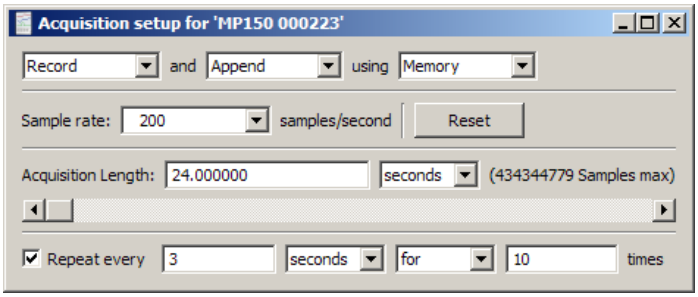
	Input volts	Scale Map value
Cal 1	0	0
Cal	1	4
	Units Label	Volts



   c. Click OK as needed to close out of A2 setup and the Setup Channels dialog.

6. Choose "MP menu > Set up Acquisition" and establish the following settings:

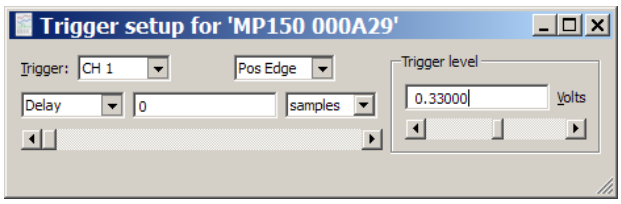
   Mode = Record and Append to Memory
   Sample Rate = 200 samples/second
   Total Length = 24 seconds
   Repeat = every 3 seconds for 10 times



7. Exit Set up Acquisition dialog.

8. Choose "MP menu > Setup Trigger" and establish the following settings:

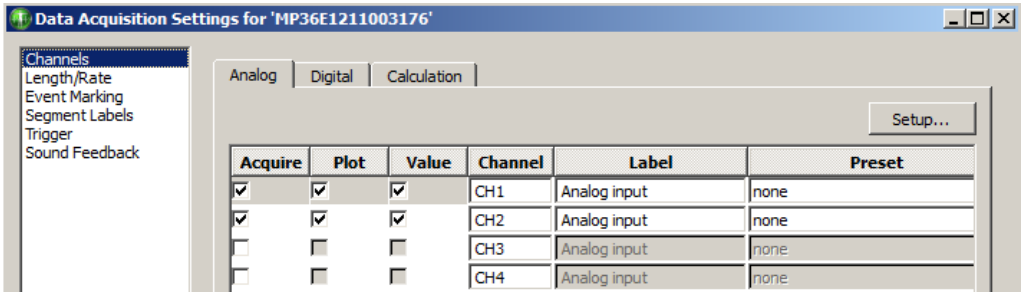
   Trigger = CH 1, Pos Edge
   Trigger Level = 0.33 Volts
   (based on 1 V ≈ 100 mmHg)
   Delay = 0 samples



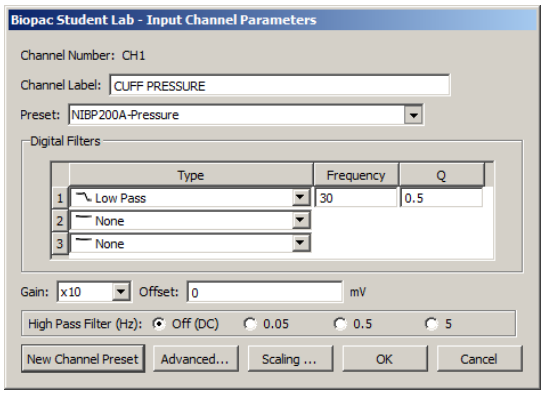
9. Close out of Triggering dialog.

SOFT ARE SETUP for Ac *Knowledge* .x or BSL .x with MP x Hardware

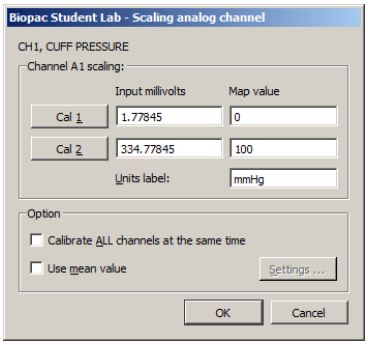
1. Launch the software.
2. Select the "Create/Record a new experiment" option.
3. If necessary, choose "MP3x > Set up Data Acquisition > Channels."
4. Enable analog inputs CH1 and CH2 and select the Acquire, Plot and Value options.



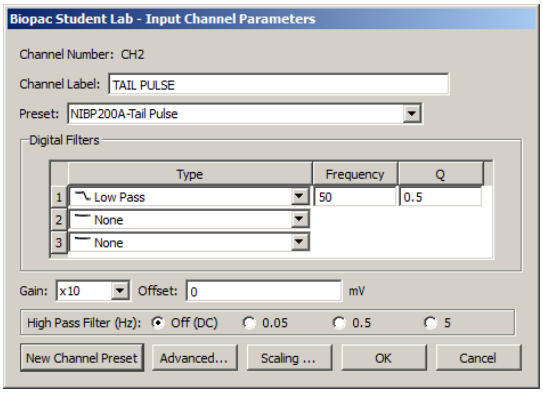
5. Select CH1 and click "Setup.".
6. Click "New Channel Preset," enter "NIBP200A-Pressure" and click OK.
7. Establish the following settings:
   - Channel Preset = NIBP200A-Pressure
   - Channel Label = CUFF PRESSURE
   - Gain = x10
   - Input Coupling = DC
   - Filter = 1
   - Type = Low Pass
   - Frequency = 30
   - Q = 0.5



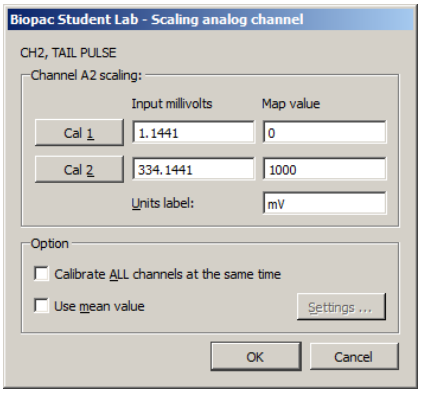
8. Calibrate for the pressure measurement of IRSENSOR.
   a. Click "Scaling" button and establish the following settings:
      Map values
         Cal1 = 0
         Cal2 = 100
      Units label = mmHg
   b. Click the Cal 1 button.
   c. Add "333" to the Cal 1 Input value, and enter the result in Cal 2 Input value (Cal 2 = Cal 1 + 333)
   d. Click OK as needed to exit the CH1 "Scaling" and Input "Channel" setup dialogs.



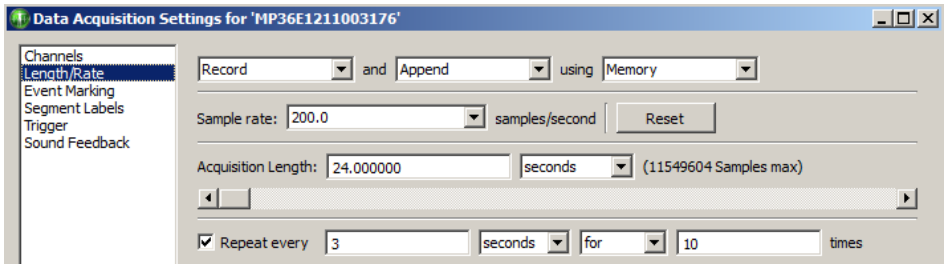
9. Select CH2 and click "Setup."
10. Click "New Channel Preset," enter "NIBP200A-Tail Pulse" and click OK.
11. Establish the following settings:
    - Channel Preset = NIBP200A-Tail Pulse
    - Channel Label = TAIL PULSE
    - Gain = x10
    - Input Coupling = DC
    - Filter = 1
    - Type = Low Pass
    - Frequency = 50
    - Q = 0.5



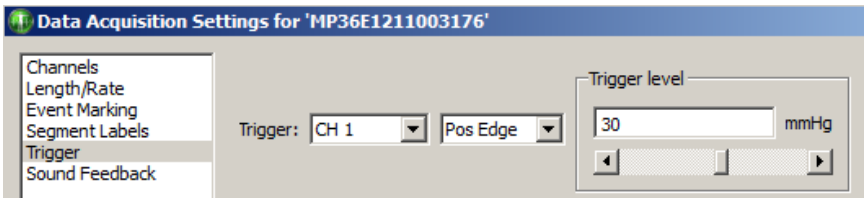
12. Calibrate for the pulse measurement of IRSENSOR.
    a. Ensure that the tail is not inside the IRSENSOR, and that the sensor resides freely.
    b. Click "Scaling" button and establish the following settings:
        Map values
            Cal 1 = 0
            Cal 2 = 1000
        Units label = mV
    c. Click the Cal 1 button.
    d. Add "333" to the Cal 1 Input value and enter the result in Cal 2 Input value (Cal 2 = Cal 1 + 333)
    e. Click OK as needed to exit the CH2 "Scaling" and "Input Channel" setup dialogs.



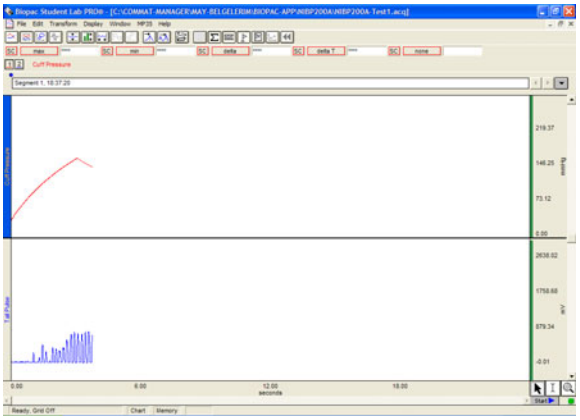
13. Choose "MP3x > Set Up Data Acquisition > Length/Rate" and establish the following settings:
    - Mode = Record and Append using Memory
    - Sample Rate = 200 samples/second
    - Acquisition Length = 24 seconds
    - Repeat = every 3 seconds for 10 times



14. Choose "Trigger" and establish the following settings.
    Trigger = CH 1, Pos Edge
    Trigger Level = 30 mmHg
15. Exit the Data Acquisition Settings dialog.



RECORDING

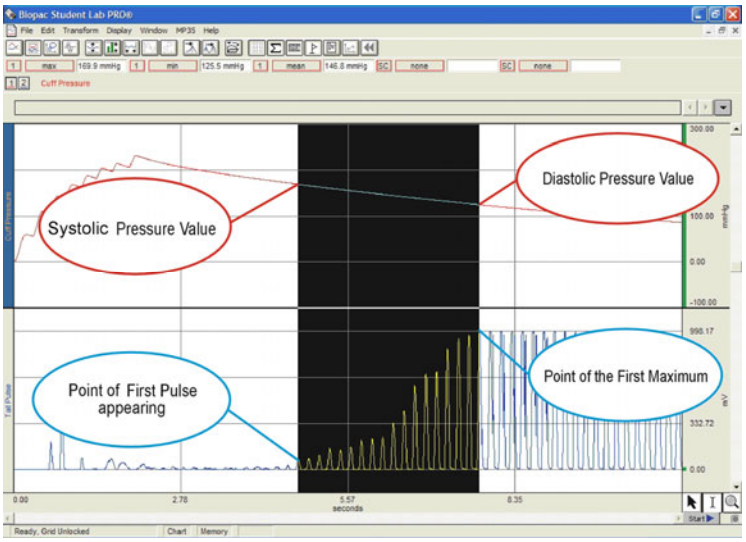


1. Confirm that the animal is ready and that the IRSENSOR is attached to the tail.
2. Click “Start” in the BIOPAC software window.
3. Press START button on the front panel of NIBP200A.
   - IRSENSOR will pump up the Cuff automatically.
   - When the Cuff Pressure on A1 reaches 30 mmHg, the cuff pressure and tail pulse signals will be generated.
   - The recording will stop automatically after 24 seconds.
4. Press START to continue with the next measurement and repeat as necessary.
5. Choose File > Save or Save as when done.

TIP *A generally accepted application is that for each animal, 10 measurements are recorded and mean values are calculated. In the append mode, 10 consecutive measurements can be made in the same file.*

NIBP 00A ANALYSIS

Calculation of Systolic, Diastolic and Mean.



1. Click the Calculation Label.
2. Select from the list Max, Min, Mean for three different Labels.
3. Select Channel 1 as channel option.
4. Select cursor ‘I’ from the cursor option on the bottom right of the screen.
5. On the graphical display, starting from the point of first pulse, select an area to the maximum.
6. Review the results for Max (Systolic), Min (Diastolic), and Mean measurements.

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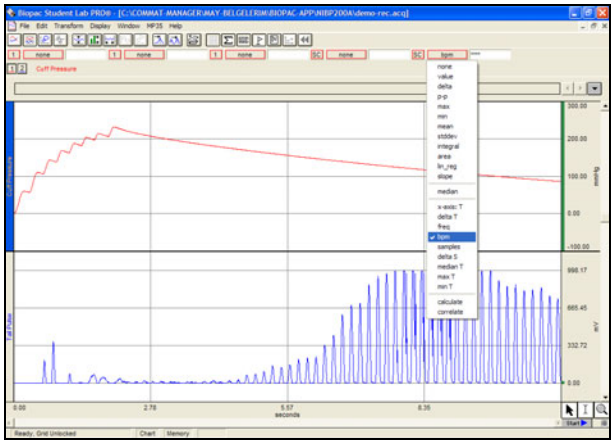
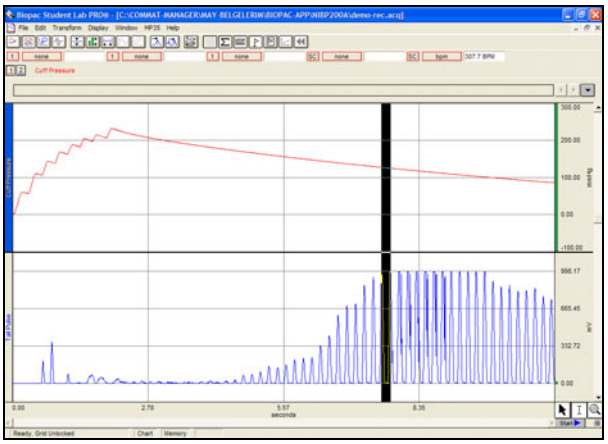
Calculation of BPM Heart





1. Set a measurement for **BPM**.
2. Use the I-beam cursor to select the maximum points of the peaks of the CH2 pulse waveform.
3. Review the results for BPM (Heart Rate value) for each peak.

NIBP 0 UIC GUIDE

PREPARE

- With unit turned off, attach the sensor and cuff connectors.
- Turn on unit and wait for the Main Screen to appear.
- Prepare the animal and attach sensor-cuff to tail.

AC UIRE

- When preparation is complete: Press the “Start” button on the Main Screen. The button label changes to “Stop” and you can halt the acquisition at any time.
- When the acquisition starts, the unit automatically closes the leakage valve and begins inflating the cuff.
- After pressure reaches the maximum level, the pump stops and opens the leakage valve to release the pressure.
- After the pressure is fully released, the acquisition stops.

NIBP 0 ANALYSIS

The NIBP250’s automated peak detection system marks the peak of each pulse with a white cross, and is enabled by selecting the "Peak by peak" option on the Main Screen. This feature makes it easier to identify the individual pulses. To determine the systolic and diastolic values:

1. Select the "Peak by peak" box on the main screen.
2. Use the right (or left) cursor button to locate the first pulse's white cross and press the "Systolic" button. (You may also place the cursor using the touch screen.) The system will record and display the systolic blood pressure value.
3. Use the cursor button (or touch screen) to move to the pulse with the highest peak and then press the "Diastolic" button. The system will record and display the diastolic blood pressure value..

You may change your cursor peak positions at anytime during the analysis.

After measurement is complete, press the Save button under “Results.” An automatically generated result code will be displayed at the top of the results section.

For analysis in BIOPAC Acq*Knowledge* or BSL *PRO* software, see previous page for NIBP200A.

SAVE RESULTS

- Previously saved results can be displayed by pressing the "Load" button under "Results."
- Placing the cursor on a desired measurement and pressing OK will load the recorded pressure, pulse curves and previously calculated results.
- After loading is complete, you can easily evaluate the results and re-analyze any measurements.

TURN OFF

- Before turning off the unit, be sure that the current measurement was saved.
- Power off the unit by switching the power button on the back

TROUBLESHOOTING

Tail Pulse signals are not regular.

- The animal may be under stress, resulting in excessive tail movement. Remove the animal from the RESTRAINER holder until it calms down before continuing with the experiment.
- The tail may not be sufficiently warmed or cooled down. Put the animal in the Tail Heater Chamber and repeat the heating process. Make sure the tail temperature is 32° C.
- Tail Cuff sizing may be incorrect. Check Table 5 on the following page for sizing descriptions.
- Tail Cuff Sensor position may be incorrect. Try re-attaching the sensor in a different location on the tail. The optimal location is between the mid-point of tail and base of tail (spinal column).

Compressor is working continuously.

- Immediately turn off the NIBP system.
- Remove the Tubing from the Cuff connector on the panel of NIBP system
- Turn the system back on.
- Close the air outlet by pressing the finger on the Cuff output and press the "Start" button. The compressor will work for a few seconds and stop (please inform BIOPAC if the Compressor does not stop). The pressure chart should be viewable on the screen.
- If the Compressor stops automatically, it means that the system is working normally.

There is leakage in the tubing connections and Cuff of the IRSENSOR.

- Make sure the tubing is securely attached.

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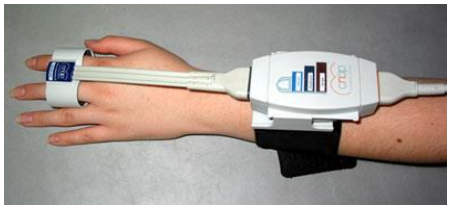
NIBP100D NONINVASIVE BLOOD PRESSURE MONITORING SYSTEM



The NIBP100D Noninvasive Blood Pressure Monitoring System is suitable for small children (~4-5 years) to large adults

- **Accurate noninvasive blood pressure values**
- **Comfortable for subjects to wear**
- **Real-time, continuous, noninvasive blood pressure**
- **Easy to use**

The NIBP100D noninvasive blood pressure system provides a continuous, beat-to-beat, blood pressure signal recorded from the fingers of a subject. The system outputs a continuous blood pressure waveform that is similar to a direct arterial pressure waveform. The monitor displays values for systolic, diastolic, mean blood pressure, and heart rate.

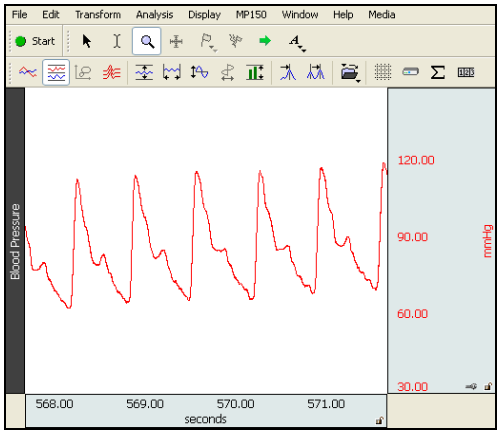
The noninvasive blood pressure (NIBP) monitoring system uses a double finger cuff that is comfortable for the subject to wear and easy to place on the hand. The cuffs (included with system) come in three sizes to accommodate children through large adults.

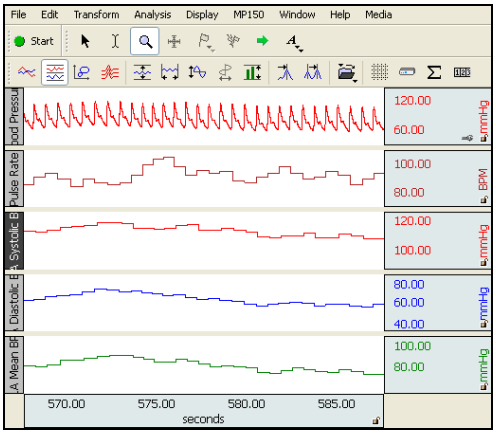
The NIBP100D interfaces with an MP160/150 Data Acquisition System (or third-party data acquisition system), via a DA100C and TCI105 Interface Connector. It is also compatible with the MP36/36R/35/45 Data Acquisition System via a BSL-TCI5 transducer and CBLHLT1 cable. The Acq*Knowledge* or BSL *PRO* software displays the blood pressure signal, plus systolic, diastolic, mean blood pressure and heart rate. It will also provide a detailed beat-to-beat analysis of the blood pressure signal.

The NIBP100D is calibrated using a standard blood pressure cuff that is placed around the subjectôs upper arm. The unit automatically takes a blood pressure measurement from the subject and uses the value for calibration purposes. During the calibration process the system locates the pulse at the finger and performs a partial occlusion. It will switch from one finger to the next during the course of the recording to relieve the pressure from the occluded finger. The interval between finger rotations is user-selectable and can be as long as 60 minutes. During the rotation, the system takes another calibration reading to ensure that values are accurate.

The system is very user friendly and the initial setup and calibration period takes less than three minutesð that time includes placing the cuff around the upper arm and the sensor on the fingers. Placing the finger sensor is as simple as sliding the subjectôs fingers through the two cuffs.

The system employs a vascular unloading technique to measure blood pressure at the fingers. A refined version of the Penáz' principle is used to deliver a continuous noninvasive blood pressure signal. The method is based on concentrically interlocking control loops for accurate long-term readings of finger blood pressure.





Updated: 6.28.2017

HYPERBARIC/HYPOBARIC CHAMBER SETUP

1. Cuff controller and CNAP monitor must be in the same chamber with the same"pressure" environment as both are equipped with pressure sensor for surrounding pressure.
2. Pressure must be increased / decreased continuously rather than abruptly.
3. Hypobaric: take measures against overheating of the device as conventional cooling is limited (dim CNAP display low; do not restrict airflow through case).
4. No draught on cuff.
5. Hand on heart level in steady position.

SPECIFICATIONS

*For complete specifications, see the **NIBP100D User Manual** online under the product page "Support" tab.*

Components

- **Double-Cuff Finger Sensors** ï one each size
  - **L** 24 - 28 mm dark red, **M** 18 - 24 mm Dark blue, **S** 10 - 18 mm Light blue
  - Finger cuff sensors are a consumable item and typically last ~12 months based on 3-4 hours/week.
- **Blood Pressure Cuffs** ð one each size, latex-free
  - **Child** (12 ï 19 cm), **Small Adult** (17 ï 25 cm), **Adult** (23 ï 33 cm), **Large Adult** (31 ï 40 cm)
- **NIBP100D Monitor**
  - Dimensions 280 x 270 x 250 mm (11 x 10.6 x 9.8 in.)
  - Weight 7.5 Kg (16.6 lbs) including components and accessories necessary for operability of device
  - Battery Sealed lead gel, operating time = 2 hrs (fully charged battery, normal conditions)

Electrical properties

- Nominal voltage: 18 VDC ±10%
- Nominal current: 3 A
- Operability: No time-limit if powered by external mains adapter, at least 2 hrs if on battery-operation (fully charged battery)

NIBP100D continuous noninvasive arterial pressure

- Parameter classification
  - Sys, Dia, Mean [mmHg]
  - Pulse [bpm]
- Measuring range
  - Sys: 40 - 250 mmHg (5.3 ï 33.3 kPa)
  - Dia: 30 - 210 mmHg (4 - 28 kPa)
  - Mean: 35 - 230 mmHg (4 ï 30.6 kPa)
  - Heart rate indication range 20-200 bpm
  - Accuracy ±5 mmHg (0.6 kPa)
- Display resolution 1 mmHg (0.1 kPa)
- Inflation pressure
  - Typ.: 120 mmHg (16 kPa)
  - Min.: 30 mmHg (4 kPa)
  - Max.: 300 ±10 mmHg (41.3 kPa ±1.3 kPa)
- Excess pressure limit
  - 300 ±10 mmHg (40 kPa ±1.3 kPa)
  - Response time: < 3 sec.
  - Deflation time: < 15 sec
  - Protection against electric shock: Type BF

Output

- Sensor bridge voltage: 2 ï 10 V (external monitor)
- Sensitivity: 5 µV/V/mmHg
- BP Wave Out: CNAPÊ transducer cable 0.3 m; connector RJ11 6P4C (e.g. Abbott IBP catheter)
- Delay of analog out signal: 50 msec (fixed)

Interface

- To DA100C via TCI105 (sold separately)

External mains adapter

- Nominal voltage: 100 ï 240 VAC
- Power frequency: ~50/60 Hz
- Power output: 18 V, 3.3 A
- Safety class: Class II with functional earth
- Earth leakage current: < 500 µA

Compliance and Approvals			
Safety class II (IEC 60601)	• IEC 60601-1	• IEC 60601-1-6	• EN 1060-4 (NBP)
Class II b (93/42/EEC)	• IEC 60601-1-2	• IEC 60601-1-8	• ISO 81060-2 (NBP)
Patent applied part type BF	(defibrillation proof)	• IEC 80601-2-30	

Intellectual Property				
Patents	• US 6,669,648	• US 8,343,062	• JP 4.414.767	CE
	• EP 1 179 991	• EU 2 493 370	• JP 20075508872	
	• US 8,114,015	• US 8,814,800 B2	• CN 102647940	
	• EP 1 675 507	• EP 2 493 373	plus another 66 patents	

The NIBP100D CNAPÊ Monitor 500 is CE and FDA approved.

Note: Electric and magnetic fields may interfere with the functional reliability of the device, so avoid using the NIBP100D CNAPÊ Monitor 500 close to devices emitting powerful electromagnetic fields, e.g. x-ray equipment, diathermy applications or magnetic resonance tomographs.

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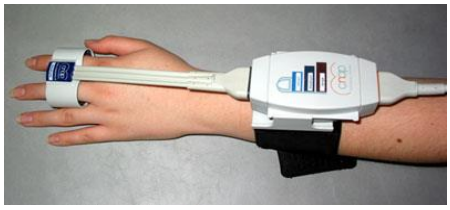
NIBP100D NONINVASIVE BLOOD PRESSURE MONITORING SYSTEM



The NIBP100D Noninvasive Blood Pressure Monitoring System is suitable for small children (~4-5 years) to large adults

- **Accurate noninvasive blood pressure values**
- **Comfortable for subjects to wear**
- **Real-time, continuous, noninvasive blood pressure**
- **Easy to use**

The NIBP100D noninvasive blood pressure system provides a continuous, beat-to-beat, blood pressure signal recorded from the fingers of a subject. The system outputs a continuous blood pressure waveform that is similar to a direct arterial pressure waveform. The monitor displays values for systolic, diastolic, mean blood pressure, and heart rate.

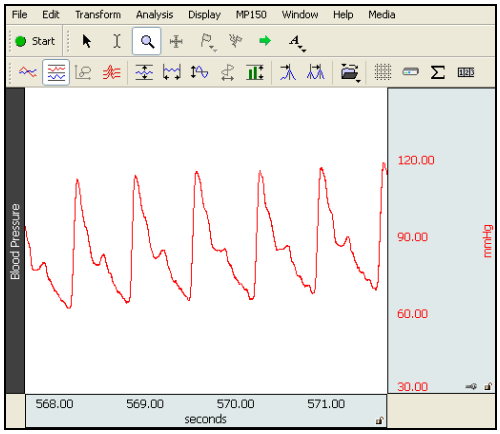
The noninvasive blood pressure (NIBP) monitoring system uses a double finger cuff that is comfortable for the subject to wear and easy to place on the hand. The cuffs (included with system) come in three sizes to accommodate children through large adults.

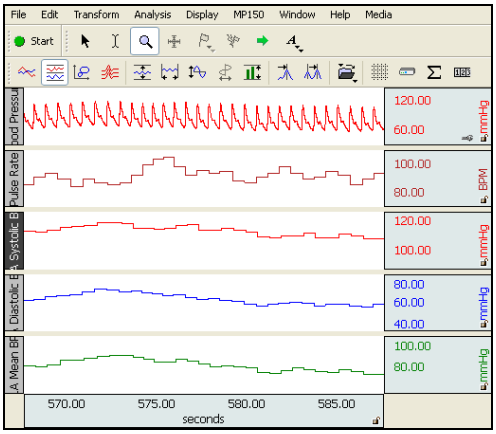
The NIBP100D interfaces with an MP160/150 Data Acquisition System (or third-party data acquisition system), via a DA100C and TCI105 Interface Connector. It is also compatible with the MP36/36R/35/45 Data Acquisition System via a BSL-TCI5 transducer and CBLHLT1 cable. The Acq*Knowledge* or BSL *PRO* software displays the blood pressure signal, plus systolic, diastolic, mean blood pressure and heart rate. It will also provide a detailed beat-to-beat analysis of the blood pressure signal.

The NIBP100D is calibrated using a standard blood pressure cuff that is placed around the subjectôs upper arm. The unit automatically takes a blood pressure measurement from the subject and uses the value for calibration purposes. During the calibration process the system locates the pulse at the finger and performs a partial occlusion. It will switch from one finger to the next during the course of the recording to relieve the pressure from the occluded finger. The interval between finger rotations is user-selectable and can be as long as 60 minutes. During the rotation, the system takes another calibration reading to ensure that values are accurate.

The system is very user friendly and the initial setup and calibration period takes less than three minutesð that time includes placing the cuff around the upper arm and the sensor on the fingers. Placing the finger sensor is as simple as sliding the subjectôs fingers through the two cuffs.

The system employs a vascular unloading technique to measure blood pressure at the fingers. A refined version of the Penáz' principle is used to deliver a continuous noninvasive blood pressure signal. The method is based on concentrically interlocking control loops for accurate long-term readings of finger blood pressure.





Updated: 6.28.2017

HYPERBARIC/HYPOBARIC CHAMBER SETUP

1. Cuff controller and CNAP monitor must be in the same chamber with the same"pressure" environment as both are equipped with pressure sensor for surrounding pressure.
2. Pressure must be increased / decreased continuously rather than abruptly.
3. Hypobaric: take measures against overheating of the device as conventional cooling is limited (dim CNAP display low; do not restrict airflow through case).
4. No draught on cuff.
5. Hand on heart level in steady position.

SPECIFICATIONS

*For complete specifications, see the **NIBP100D User Manual** online under the product page "Support" tab.*

Components

- **Double-Cuff Finger Sensors** ï one each size
  - **L** 24 - 28 mm dark red, **M** 18 - 24 mm Dark blue, **S** 10 - 18 mm Light blue
  - Finger cuff sensors are a consumable item and typically last ~12 months based on 3-4 hours/week.
- **Blood Pressure Cuffs** ð one each size, latex-free
  - **Child** (12 ï 19 cm), **Small Adult** (17 ï 25 cm), **Adult** (23 ï 33 cm), **Large Adult** (31 ï 40 cm)
- **NIBP100D Monitor**
  - Dimensions 280 x 270 x 250 mm (11 x 10.6 x 9.8 in.)
  - Weight 7.5 Kg (16.6 lbs) including components and accessories necessary for operability of device
  - Battery Sealed lead gel, operating time = 2 hrs (fully charged battery, normal conditions)

Electrical properties

- Nominal voltage: 18 VDC ±10%
- Nominal current: 3 A
- Operability: No time-limit if powered by external mains adapter, at least 2 hrs if on battery-operation (fully charged battery)

NIBP100D continuous noninvasive arterial pressure

- Parameter classification
  - Sys, Dia, Mean [mmHg]
  - Pulse [bpm]
- Measuring range
  - Sys: 40 - 250 mmHg (5.3 ï 33.3 kPa)
  - Dia: 30 - 210 mmHg (4 - 28 kPa)
  - Mean: 35 - 230 mmHg (4 ï 30.6 kPa)
  - Heart rate indication range 20-200 bpm
  - Accuracy ±5 mmHg (0.6 kPa)
- Display resolution 1 mmHg (0.1 kPa)
- Inflation pressure
  - Typ.: 120 mmHg (16 kPa)
  - Min.: 30 mmHg (4 kPa)
  - Max.: 300 ±10 mmHg (41.3 kPa ±1.3 kPa)
- Excess pressure limit
  - 300 ±10 mmHg (40 kPa ±1.3 kPa)
  - Response time: < 3 sec.
  - Deflation time: < 15 sec
  - Protection against electric shock: Type BF

Output

- Sensor bridge voltage: 2 ï 10 V (external monitor)
- Sensitivity: 5 µV/V/mmHg
- BP Wave Out: CNAPÊ transducer cable 0.3 m; connector RJ11 6P4C (e.g. Abbott IBP catheter)
- Delay of analog out signal: 50 msec (fixed)

Interface

- To DA100C via TCI105 (sold separately)

External mains adapter

- Nominal voltage: 100 ï 240 VAC
- Power frequency: ~50/60 Hz
- Power output: 18 V, 3.3 A
- Safety class: Class II with functional earth
- Earth leakage current: < 500 µA

Compliance and Approvals			
Safety class II (IEC 60601)	• IEC 60601-1	• IEC 60601-1-6	• EN 1060-4 (NBP)
Class II b (93/42/EEC)	• IEC 60601-1-2	• IEC 60601-1-8	• ISO 81060-2 (NBP)
Patent applied part type BF	(defibrillation proof)	• IEC 80601-2-30	

Intellectual Property				
Patents	• US 6,669,648	• US 8,343,062	• JP 4.414.767	CE
	• EP 1 179 991	• EU 2 493 370	• JP 20075508872	
	• US 8,114,015	• US 8,814,800 B2	• CN 102647940	
	• EP 1 675 507	• EP 2 493 373	plus another 66 patents	

The NIBP100D CNAPÊ Monitor 500 is CE and FDA approved.

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OXYSSH-SYS HUMAN OXIMETRY (SpO_2) SYSTEM

This Human Pulse Oximetry System includes everything required to record SpO_2, Heart Rate, and Pulse with an MP36R Research System or MP36, MP35 or MP45* Education System.

Human SpO_2 System components:

OXYSSH Oximeter module for MP3X/45

BSLCBL15 Pulse cable for OXYSS

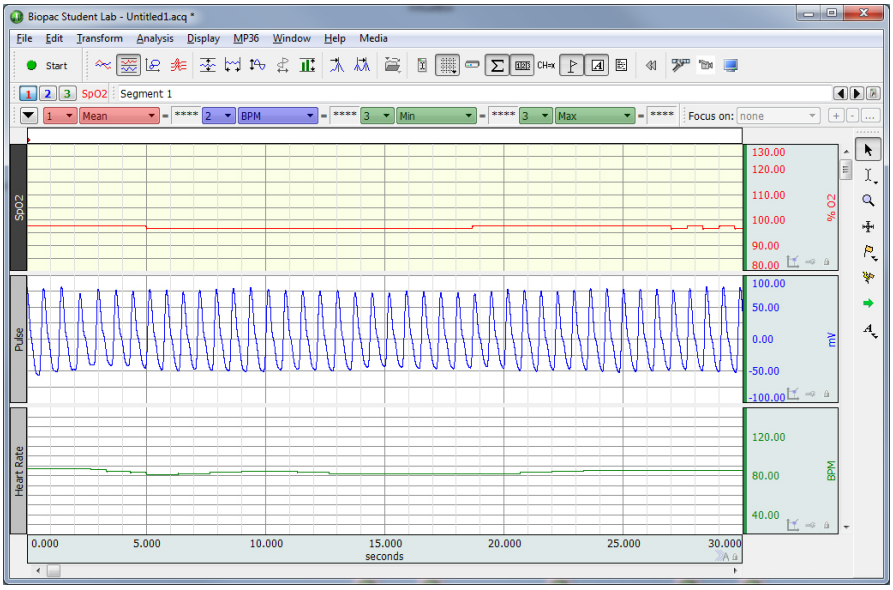
BSLCBL16 Rate cable for OXYSS

TSD124A SPO_2 Finger Transducer*

To access optional auxiliary Status output, add the BSLCBL14A adapter.

Power is via the MP input so no external power supply is required.

* The Oximeter module also accepts optional Ear Clip Transducer (TSD124B) and Flex Wrap Transducer (TSD124C). The Human SpO_2 Transducers (TSD124A/B/C) output SpO_2 via a 1.8 m (6') cable terminated in a DB9 Male connector for an MP device analog CH input.



There are three auxiliary outputs (3.5 mm stereo jacks):

PULSE BSLCBL15 (uncalibrated) output cable is 3.5 mm male mono phone plug with 1.8 m (6') cable to DB9 Male; attenuates by 5 and employs 3.32 K Ohm resistor.

RATE BSLCBL16 output cable is 3.5 mm male mono phone plug with 1.8 m (6') cable to DB9 Male; attenuates by 5 and employs 7.62 K Ohm resistor.

STATUS BSLCBL14 add-on required for optional output , which is 3.5 mm male mono phone plug with 3 m (10') cable to DB9 Male; attenuates by 10, which translates 10 V to 1 V.

* When used with the MP45 two-channel system, only one of the three auxiliary outputs can be used in conjunction with the SpO_2 output.

OXYSSH-SYS Specifications

Outputs:	SpO_2 OXYSSH	Pulse BSLCBL15	Rate BSLCBL16	Status BSLCBL14 add-on
Range	0 – 100 % O_2	+- 250 mV	18 – 321 BPM	0 – 200 mV
Averaging:	4-beat average*	No	4-beat average*	No
Accuracy:	+- 2 digits for 70 – 100 %O_2	N/A	+- 3 digits, no motion, +- 5 digits with motion	+- 5 mV
Update Rate (samples/sec)	3	75	3	75

Measurement Wavelengths and Output Power:

Red:	660 nanometers @ 0.8 mV maximum average
Infrared:	910 namometers @ 1.2 mW maximum average
Finger transducer placement:	index, middle or ring fingers
Subject weight requirement**:	> 30 Kg (66 Lbs)
Operating Temperature Range:	0- 40 deg. C (32 – 104 deg. F)
Operating Humidity Range:	10 – 90% non-condensing
Weight:	366 grams (excluding BSLCBL14 cable)
Size of OXYSSH module:	9.5 cm x 6.5 cm x 3 cm
Length of MP interface cables:	1.8 m
Length of finger transducer cable:	1 m

Notes:

* SpO_2 and Rate outputs use 4-beat average values that are updated on every pulse beat.

**Subject weight requirement is based on the design of the Adult finger clip transducer that is included with the OXYSSY-SYS.

Status Indicators:

The OXYSSH outputs status information in two ways: (1) via LEDs on the OXYSSH module and (2) via output voltage levels on Status auxiliary output. A green blinking LED indicates the pulse oximeter is working properly and detecting SpO_2. An Orange blinking LED indicates an error condition (i.e., finger is not detected,) or the level of perfusion may be too low to measure SpO_2. If the status is indicating low perfusion, see Appendix 2: Troubleshooting. The blink pattern of the LEDs (number of blinks in quick succession) provides more detailed information as shown in the following table:

OXYSSH Status condition	Green LED	Orange LED	Status Output
High Perfusion: working with amplitude of high signal quality	1 blink	Off	210 mV
Medium Perfusion: working with amplitude of moderate signal quality	2 blinks	Off	185 mV
Low Perfusion: working with amplitude of low signal quality	3 blinks	Off	170 mV
Sensor Alarm Error: finger transducer is providing an unusable signal	Off	1 blink	< 5mV
Out of Track Error: an absence of consecutive good pulse signals	Off	2 blinks	< 5 mV
Artifact Error: a detected pulse beat didn't match the current pulse interval	Off	2 blinks	13 mV
Sensor Disconnect Error – finger transducer is not connected to OXYSSH module or sensor is inoperable	Off	3 blinks	< 5 mV

Note: The stated output voltages are approximate and can vary by as much as +- 5mV when the OXYSSH is working (Green LED blinking) and +- 2 mV when there is an error condition.

OXYSSH Setup and Calibration

Setup:

1. Turn OFF MP unit. If using the MP45, it must be turned OFF by disconnecting the USB cable from the computer.
2. OXYSSH Connections:
   a. Plug the TSD124A Finger clip transducer into the "Transducer" input on the OXYSSH.
   b. Plug the 3.5 mm phone plug on the "Pulse"-BSLCBL15 cable into OXYSSH output labeled "Aux. - Pulse".
   c. Plug the 3.5 mm phone plug on the "Rate"-BSLCBL16 cable into the output labeled "Aux. - Rate".
   d. If monitoring "Status", plug the 3.5 mm phone plug on the optional BSLCBL14 into the output labeled Aux. – Status.

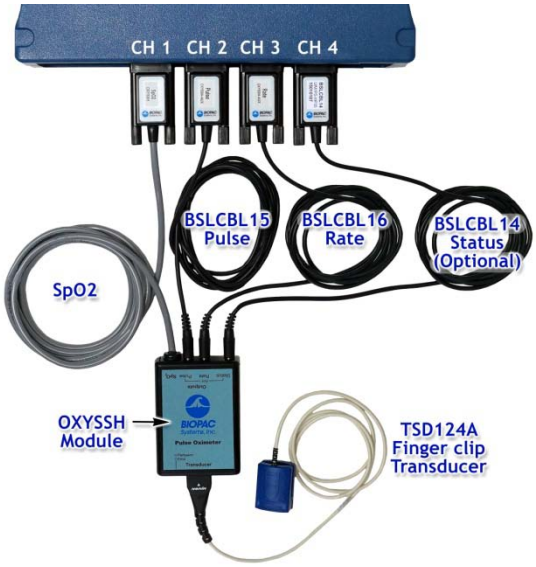


Figure 1

3. MP connections:*
   a. Plug in the "SpO2" cable into CH 1.
   b. Plug the "Pulse"-BSLCBL15 cable into CH 2.
   c. Plug the "Rate"-BSLCBL16 cable into CH 3.
   d. Plug the BSLCBL14 (Status) cable into CH 4 (Optional).

Note* The MP45 (not shown) is a two channel device, so only one of the auxiliary outputs can be used.

4. Turn ON the MP unit. If using the MP45, plug the USB cable into the computer.

Connecting TSD124A Finger Clip Transducer to Subject:

To obtain optimal pulse oximeter data, the finger clip transducer must be positioned at or near heart level and the **Subject** must be seated, relaxed and fingers should be warm. The finger transducer can be placed on the index, middle or ring finger. Make sure that the side of the clip displaying the finger graphic is properly oriented. The hand should be positioned so that there is no additional pressure placed on the transducer, and motion artifact should be minimized. Two recommended positions are:

- Hand resting in lap with palm facing up.
- Arm resting on arm rest with palm facing up.

Although it is possible to record pulse oximetry data during exercise, it is not recommended as it is difficult to control motion artifact. For resting vs. exercise comparisons, consider taking recordings only in the resting and post exercise state. After recording the "at rest" portion, click **Stop**. The **Subject** can then remove the finger clip transducer and begin exercising. Immediately after stopping exercise, the **Subject** must quickly return to a seated and relaxed position, reapply the finger transducer, and continue the recording.

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Calibration:

If using BSL 4.1 or higher, or Acq*Knowledge* 4.4 or higher with MP36R, follow the steps below. If using software prior to BSL 4.0, it will be necessary to manually setup all channel parameters referencing Appendix 1 and then proceed starting at Step 4. (Acq*Knowledge* versions prior to 4.1 do not offer MP36R support.)

1. After launching the software, choose "**Create/Record a new experiment**" from the Startup dialog and click "**OK**" to display the "**Data Acquisition Settings**"dialog. Alternately, if the software is already running, select "**Set Up Data Acquisition**" from the MP menu.
2. From the **Channels > Preset** pop-up menu list, choose the correct preset for each of the four channels as shown below.

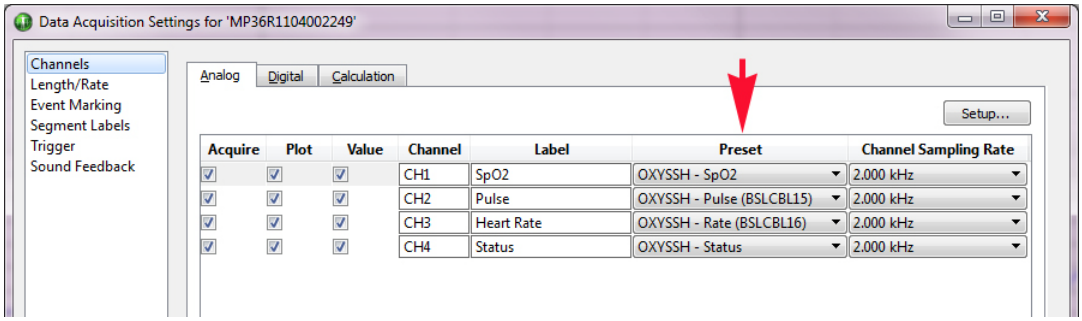

Figure 2

3. Exit the "**Data Acquisition Settings**" dialog using the "**Close**" button.
4. Click "**Start"** followed by "**Stop"** to record a small amount of data, which sets up the graph display.
5. Instruct the **Subject** to remove finger from the finger clip transducer.
6. Using the arrow selection tool, click the wrench button in the units (% O2) region of **CH 1** (SpO2) as shown in Figure 3 to display the Scaling dialog shown in Figure 4.
7. Click "**Cal 1**" to update the "**Input millivolts**" value and make sure the corresponding "**Map value**" is **127** % O2.
8. Click "**OK**" to close the dialog.

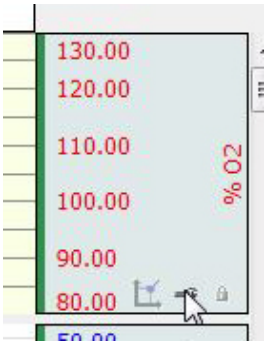

Figure 3

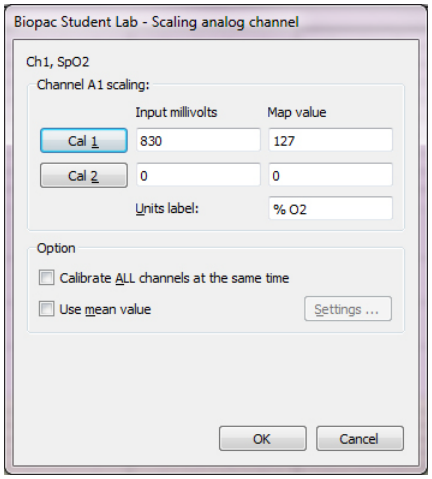

Figure 4

9. It may be useful to enable **textual value display** in order to show the numerical values for SpO_2 during the recording. This option is not available in software prior to BSL 4.0. To enable, position the arrow cursor over the numerical values in the vertical scale region and click the mouse button. The dialog shown in Figure 5 will appear. Check the "**Show textual value display**" box and click "**OK**" to close the dialog.

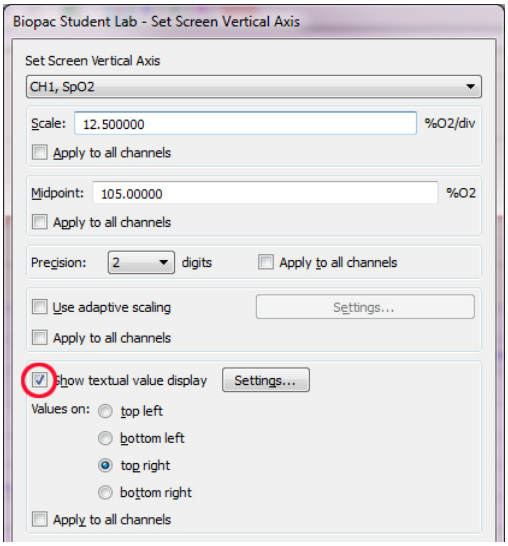

Figure 5

10. Click the wrench button in the units (BPM) region of **CH 3** (Heart Rate) to display the Scaling dialog shown in Figure 6.
11. Click "**Cal 1**" and make sure the corresponding "**Map value**" is **511** BPM.
12. Click "*OK*" to close the dialog.
13. Enable the "**Show textual value display**" option for CH 3.

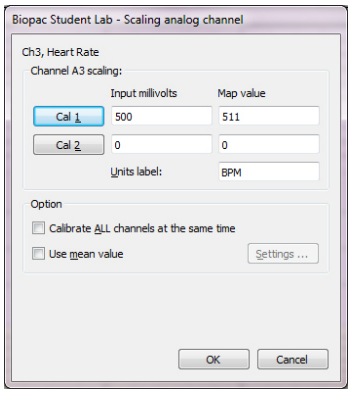

Figure 6

Recording

1. **Subject** attaches the finger clip transducer to index finger and gets into a seated and in a relaxed position.
2. Click "**Start"** to begin the recording. The recording should resemble data shown in Figure 7.

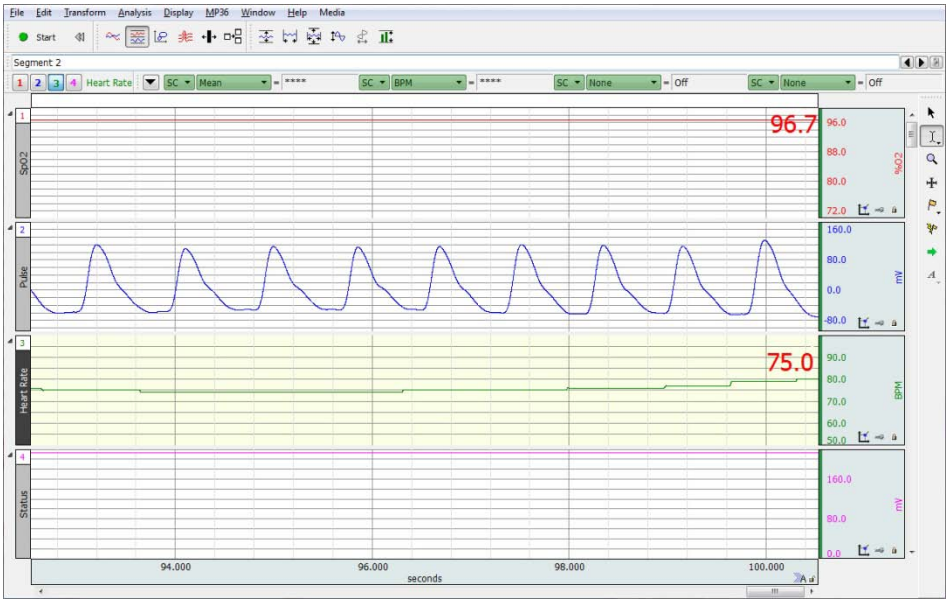

Figure 7

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Appendix 1: Channel Settings

CH 1, "SpO2":

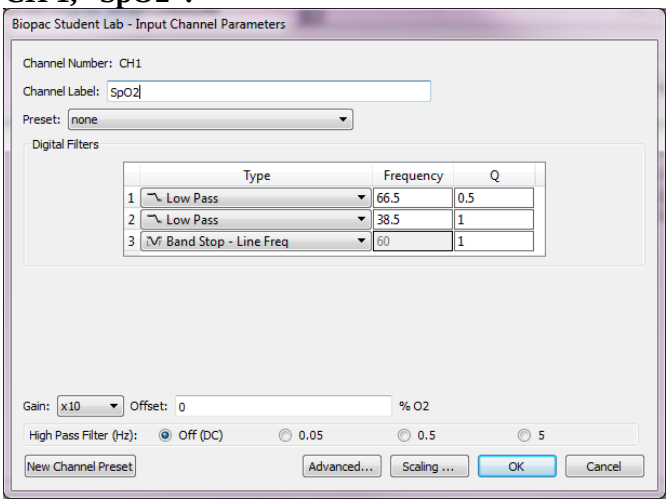

Figure 8

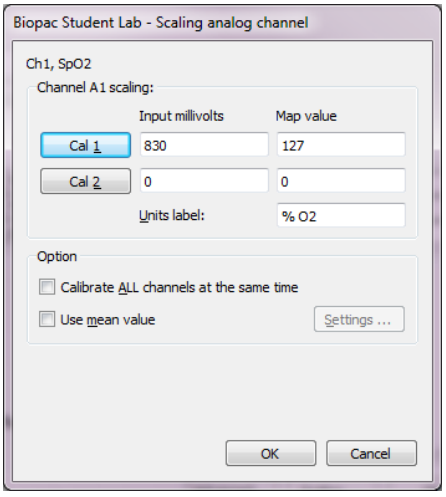

Figure 9

CH 2, "Pulse":

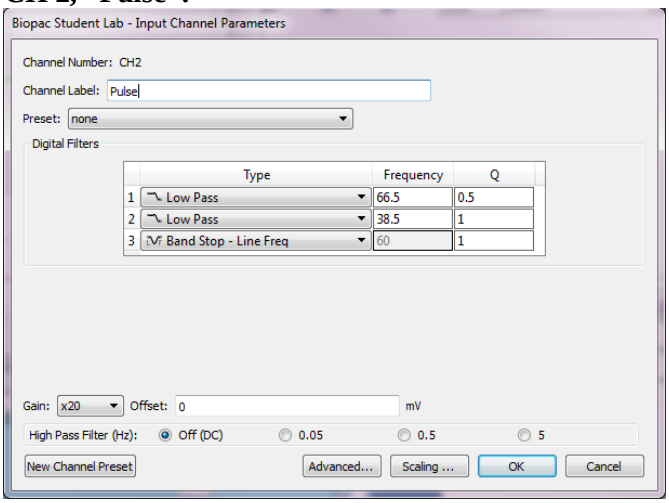

Figure 10

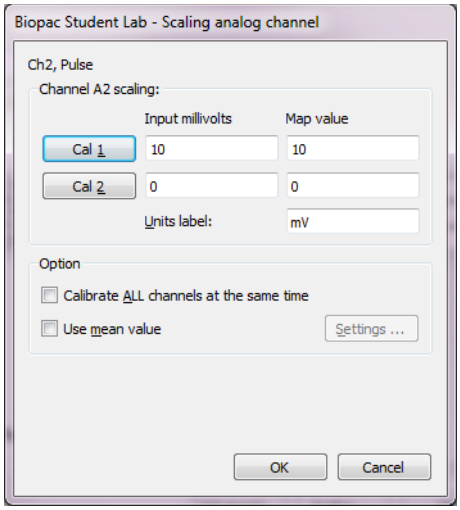

Figure 11

Ch 3, "Rate":

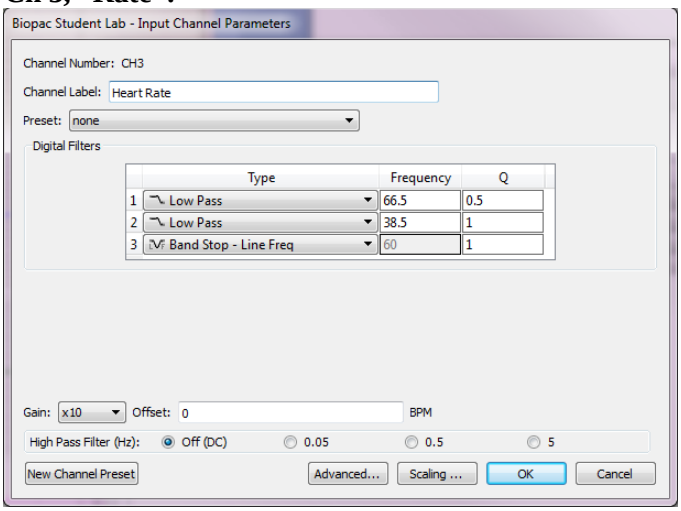

Figure 12

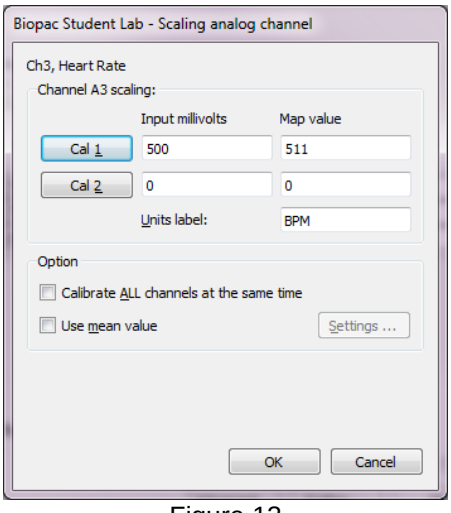

Figure 13

Ch 4, "Status":

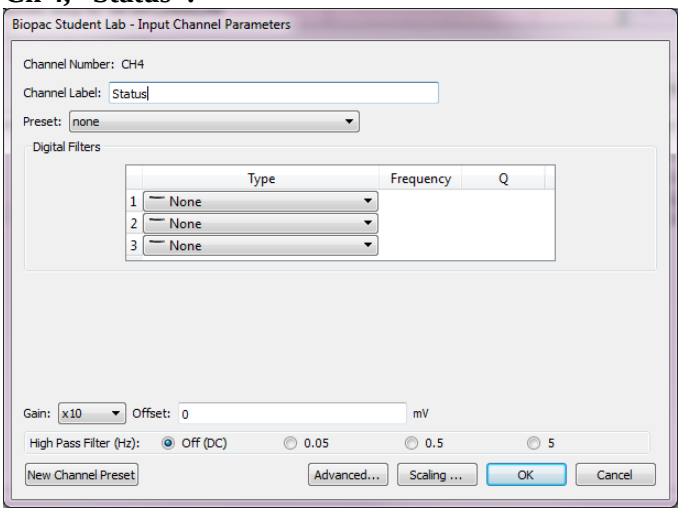

Figure 14

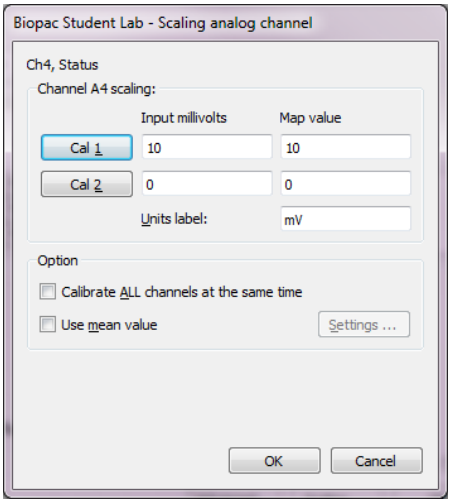

Figure 15

Appendix 2: Troubleshooting

If the status is indicating low perfusion:

- Reposition the finger transducer or place it on an alternate finger.
- Ensure that recording finger is warm. Lower body temperature will give poor readings.
- Make sure the finger transducer is not positioned above heart level.
- Reduce the amount of ambient light around the finger transducer.
- Remove any nail polish.

If the status is indicating an error condition:

- Make sure the finger transducer is plugged all the way into the OXYSSH module.
- Make sure the finger is placed all the way into the finger transducer.
- Turn the MP unit off and then back on.

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IPS100C ISOLATED PO ER SUPPLY MODULE

The IPS100C is used to operate 100-series amplifier modules **independent** of an MP data acquisition unit. The IPS100C module couples the 100-series amplifier outputs directly to any **other** data acquisition system, oscilloscope or chart recorder. Amplifier modules snap onto the side of the IPS100C to receive the necessary isolated power and to direct the modules' output to the front panel of the IPS100C. The IPS100C allows users to operate up to 16 amplifiers on a stand-alone basis. The analog channel outputs are provided via 3.5 mm phone jacks on the front panel. The IPS100C is generally used with animal or tissue preparations. When collecting data from electrodes attached to humans, use the AMI100D/HLT100C module with OUTISOA and INISOA adapters to couple signals to external equipment.

Includes In-line Transformer (AC300A) and USA or EURO power cord.

IMPORTANT USAGE NOTE

Do not use the IPS100C with an MP based system. For a fully isolated recording system using the IPS100C, couple signal inputs and outputs through the AMI100D/HLT100C module and OUTISOA and INISOA adapters, respectively. Contact BIOPAC for details.

IPS100C SPECIFICATIONS

Amplifier Output Access:	16 channels (front panel) – 3.5 mm phone jacks
Isolated Power Access:	±12 V, +5 V @ 100 ma (back panel) – screw terminals
Weight:	610 grams
Dimensions:	7 cm (wide) x 11 cm (deep) x 19 cm (high)
Power Source:	12 VDC @ 1 amp (uses AC300A transformer)

! Newer HLT100C "Rev 2" units, shipped with MP160 Systems and indicated "Rev 2" on the part number/barcode label, cannot physically be used with MP150+UIM combination or an IPS100C.

The HLT100C-MP150 module provides 16 input and 2 output channels. The HLT100C-MP150 is similar in function to the UIM100C Universal Interface Module, but it also provides power to the transducer when making a connection.