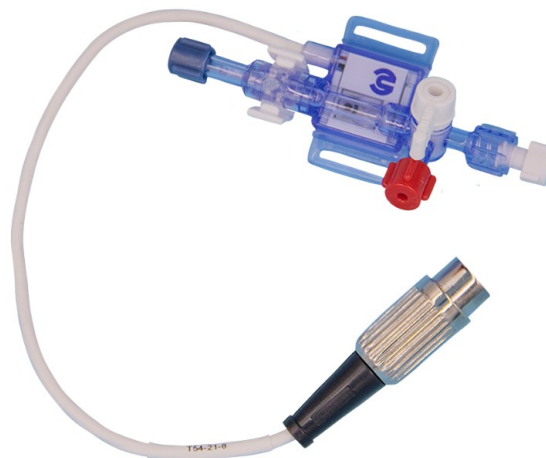


BP-100/102 Intravascular Blood Pressure Transducer

Technical Note



BP-100



BP-102

Overview

The BP-100/102 Intravascular Blood Pressure Transducer is a clinical blood pressure transducer modified for use with digital recording equipment in research applications. It consists of an active element and a separate (included) molded 5 ft. extension cable. Although the elements are rugged and will stand up to repeated use, they are not permanent. Replacement elements can be purchased directly from iWorx Systems, Inc.

The BP-102 integrates a 3cc flush device and stopcock. The sensor employed in this blood pressure (BP) transducer, and all disposable BP transducers, is a strain gauge. The pressure output of the gauge is linear. This makes transducer calibration very straightforward.



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On the BP-100, the transducer element is open at both ends. One end is typically connected to a blood vessel with a piece of heparinized PE tubing. The other end of the element is connected through a 3-way stopcock to a syringe which is used for flushing the transducer and the lines. The BP-102 has a pinch valve on one end for flushing the device; the blood vessel tubing should be connected to the 3-way stopcock on the other end. To accurately report pressure, these transducers must be completely filled with fluid. Bubbles in the transducer or the lines will produce inaccurate results.

How to Use the BP-100/102

Equipment Setup

- 1) Plug the connector of a DIN8 extension cable into one of the DIN8 transducer inputs of an iWorx data acquisition unit or amplifier. Plug the DIN8 connector of the BP-100/102 into the DIN8 extension cable.
- 2) Attach the cannula from the subject's artery to either end of the BP-100 or to the 3-way stopcock on the BP-102. The cannula, stopcock, and transducer should be filled with heparinized saline solution to prevent clotting.

Start the Software

When using an iWorx data acquisition system with its own DIN8 transducer inputs, or an iWorx amplifier like the ETH-256 or the ETH-401, coupled to an iWorx data acquisition device:

- 1) Open LabScribe by double-clicking on the desktop shortcut.
- 2) When the program opens, select **Preferences** from the **Edit** menu (or from the **LabScribe** menu on a Macintosh). Click on the **Channel** button. In the **Channel** preferences dialog, name the channel to which the BP-100/102, or the amplifier supporting the BP-100/102, is connected. Set the **Mode/Function** for this channel to **DIN8**. Set the sampling rate and display time. Click **OK**.

Calibration

There are two ways to calibrate the BP-100/102.

Method 1: Manometer Calibration

- 1) Turn the valve of the 3-way stopcock so that the line going to the animal is closed.
- 2) Connect a manometer to the open port on the 3-way stopcock.
- 3) Check that the pressure on the manometer is 0 (zero) mmHg. Start recording.
- 4) Pressurize the manometer to 100 mmHg and adjust the range displayed on the data acquisition device so that the change in the signal from 0 to 100 mmHg can be seen easily.
- 5) Mark the record to indicate 100mmHg.



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- 6) Bleed pressure from the manometer until it drops back to 50mmHg. Mark the record again.
- 7) Stop recording the signal.
- 8) Position the section of the recording that contains the step from 100mmHg to 50mmHg in the center of the screen.
- 9) Position one of the blue cursors in the **Main window** in the 100mmHg section of the recording.
- 10) Position the second cursor in the 50mmHg section.
- 11) Right-click on the recording window of the channel to which the BP-100/102 is connected.
- 12) Select **Units** from the right-click menu of the recording channel.
- 13) Select **2 point calibration** from the **Units Conversion** dialog. Notice that the voltages from the positions of the cursors are automatically entered into the left side data boxes.
- 14) Enter the two pressures, 50 and 100, used in the calibration recording in the corresponding boxes on the right side of the conversion equations.
- 15) Enter the name of the units, **mmHg**, in the box below the pressures.
- 16) Put a check mark in the box next to **Apply Units to all blocks**.
- 17) Click on the **OK** button in the lower right corner of the window to activate the units conversion.

Method 2: Conversion Factor

The output of the transducer element used in the BP-100/102 has a very high degree of linearity. The output of the BP-100/102 is 5 microvolts (μV) per millimeter of mercury (mmHg) for every volt of excitation voltage applied (V). If 10 Volts ($\pm 5\text{V}$) are applied to the BP-100/102 as the excitation voltage, the output of the BP-100/102 is 50 microvolts per millimeter of mercury ($\mu\text{V}/\text{mmHg}$) at 1X gain. When the BP-100/102 is used with a transducer input of an iWorx data acquisition unit or the ETH-256 or ETH-401 amplifier, a gain of x400 is automatically applied to the output signal. For example, if a BP-100/102 is connected to a DIN8 transducer input of the data acquisition unit, a 20mV signal displayed on the LabScribe **Main window** is equal to 1mmHg:

$$5\mu\text{V}/\text{V applied}/\text{mmHg} \times 10\text{V applied} = 50\mu\text{V}/\text{mmHg}$$

$$50\mu\text{V}/\text{mmHg} \times \text{X400 gain} = 20\text{mV}/\text{mmHg}$$

Since the voltage applied to the transducer by any of these devices is 10V, the inverse of this factor can be used to convert the voltage output of the BP-100/102 to pressure:

$$(1000\text{mV}/\text{V})/(20\text{mV}/\text{mmHg}) = 50\text{mmHg}/\text{V recorded}.$$



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The BP-100/102 can be calibrated by using the calibration factor, 50mmHg/V, on the **Units Conversion** window of the recording channel, as follows:

- 1) Record a few seconds of data from the BP-100/102.
- 2) Right-click on the recording window of the channel to which the BP-100/102 is connected.
- 3) Select **Units...** from the right-click menu of the recording channel.
- 4) Select **Slope & Offset** from the menu in the upper left corner of the **Units Conversion** window.
- 5) In the box to the right of **slope**, enter the number **50** if the BP-100/102 is connected to an iWorx data acquisition unit with DIN 8 inputs, or an ETH-256 or ETH-401 with its gain set at X1. If additional gain is applied to the output of the BP-100/102 when it is used with an ETH-256, the **slope** is equal to **50** divided by the gain factor. For example, if a gain of x5 is applied to the output of the BP-100/102, the conversion factor entered as the **slope** is **10**.
- 6) In the box to the right of **offset**, enter the number **0**.
- 7) In the box to the right of **Name**, enter **mmHg**.
- 8) Put a check mark in the box next to **Apply Units to all blocks**.
- 9) Click on the **OK** button in the lower right corner of the window to activate the units conversion.

Care

- 1) After using the BP-100 transducer, flush out the element using a syringe that is attached to the transducer with a 3-way stopcock and filled with distilled water. Open the 3-way stopcock on the transducer to the air and allow all the parts of the element to dry. The BP-102 includes an integrated 3cc flush device and stopcock. Open the pinch valve at the far end while flushing water through the transducer. The BP-100/BP-102 pressure transducers are reusable, typically up to 3-6 months, although this will depend on how well the sensor is flushed and cleaned after use.
- 2) During testing or use, do not apply too much pressure to the sensor. Pressures of 500 mmHg or more can fracture the plastic enclosure and cause leaks.
- 3) The removable caps supplied with the transducer element are only dust covers; these caps are not airtight.
- 4) These transducers are nonlinear at pressures less than 7mmHg.



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Technical Data and Specifications

SPECIFICATIONS	
Operating Pressure	+0.50 to +300 mmHg
Over Pressure	-500 to +100 mmHg
Sensitivity	5 μ V/V/mmHg at X1 Gain
Excitation Voltage	+5
Temperature Effect	+0.25 mmHg/oC
Impedance	<900 W



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