

Blood Pressure Monitor

Welcome to ABC Health Products! As ABC's newest electro-mechanical engineer, you have been assigned to a design team to modify an existing blood pressure monitor to allow more flexibility and data collection for the company's R & D projects. This prototype will be used as a test bed to collect data for the product development teams.

Your research team leader wants a monitor that will automatically cycle to measure blood pressure and record the details on a pressure vs. time graph so that the company can develop new algorithms for calculating the blood pressure. Since there is no need for you to re-invent the basic parts of a blood pressure system, like the cuff or control valves, you will re-purpose the parts from a commercially-available, consumer blood pressure monitor.

The R & D team has developed the following design criteria:

- The cuff is placed on the upper arm to pressurize the arteries, just like other blood pressure monitoring devices.
- A Pressure Sensor is connected to the cuff and is used to monitor the pressure in the cuff in units of mm Hg. The cuff is automatically pressurized with the pump from the consumer monitoring system.
- As the system pressurizes, the exhaust valve should be held closed so the cuff will automatically deflate if the power fails.
- The on-screen display should include a graph of cuff pressure vs. time and a large, easily-readable indicator of live cuff pressure readings.
- Your program should be set up to stop inflation and produce a brief visual or audible signal when the cuff pressure has reached 165 mm Hg. The pressure release valve should slowly release pressure out of the cuff at this point. The exhaust valve should remain closed while the pressure bleeds out of the cuff.
- When the cuff pressure reaches 30 mm Hg the exhaust, the valve should open and allow the cuff to quickly deflate.

You will complete your test bed using Vernier sensors, a LabQuest interface, Logger *Pro* software (or a stand-alone LabQuest 2), and a variety of output devices shown in the Materials list.

MATERIALS

Vernier LabQuest 2 or
LabQuest interface with computer running
Logger *Pro* software
LabQuest power supply

Output Devices

5 VDC buzzer
5 VDC/120 mA lamp
5 VDC exhaust valve*
5 VDC air pump*
pressure relief valve*
green LED (with 120 Ω resistor)
red LED (with 160 Ω resistor)

Digital Control Unit (DCU)
Vernier Blood Pressure Sensor

Construction Materials

blood pressure cuff*
aquarium tubing to fit pump etc.
from commercial system
luer-lock connectors for tubing
cardboard, foam core, or pegboard
cable ties
labels
colored markers

**From the commercial blood pressure system.*

DESIGN AND CONSTRUCTION TIPS

- Following the Engineering Process will save you time and energy! First, consider the design requirements and constraints, and then start brainstorming ideas. Using an Engineering Design Sheet can guide you through the process.
- Using Logger *Pro* or a LabQuest 2, the DCU can control up to three different output lines. Each line can be connected to a different output device.
- The system will be more robust, reliable, and easier to control if you attach the air handling components and tubing to a mounting board.