

# Hand-Sensing Dryer

Public restrooms are havens for bacterial infections. Users generally touch flush valves for toilets and urinals, door pulls and locks, handles for hot and cold water faucets, soap dispensers, trash containers, and sometimes diaper-changing stations. Washing your hands before leaving the restroom is the most effective way to prevent the spread of infectious diseases, but the method of drying your hands often results in recontamination. Scientific research has shown that warm air hand dryers are more hygienic for drying hands than paper towel drying; however, a dryer with hands-free operation improves sanitation even more by eliminating contaminated push buttons. Touchless hand dryers have the added benefit of reducing maintenance and utility costs. As a STEM extension to the “Graphing Your Motion” experiment, you will create your own automatic hand dryer using a Vernier Digital Control Unit (DCU) to turn on a small DC fan when the Motion Detector senses the presence of your hands.

## OBJECTIVES

- Turn on a fan when the Motion Detector senses the presence of your hands.
- Control a sensor-based system with the DCU.

## REFERENCE EXPERIMENTS

“Graphing Your Motion” – Experiment 33 from *Middle School Science with Vernier*

“Graphing Your Motion” – Experiment 35 from *Physical Science with Vernier*

“Graph Matching” – Experiment 1 from *Physics with Vernier*

## EQUIPMENT

Vernier interface with a digital port  
Logger *Pro*  
computer  
USB cable  
Motion Detector

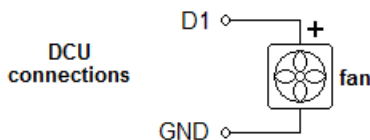
Digital Control Unit (DCU)  
DCU Cable  
LabQuest or LabPro power supply  
5 VDC fan

## BACKGROUND

In this extension, you will be using the DCU as a digital switch to power the fan based on the proximity of your hands to the Motion Detector. The DCU is an electronic device that allows you to control up to six lines for on/off control of fans, LEDs, motors, or other DC electrical components. The DCU connects to any DIG port on a Vernier interface and is powered by either the LabQuest or LabPro DC power supply. A 9-pin cable with bare wires on one end is supplied for use in building projects. There are connections for the six digital lines, plus a power connection and two ground connections. The color code of the wires is identified on a label attached to the cable.

## EQUIPMENT SETUP

1. Plug the 9-pin cable into the socket on the side of the DCU.
2. Connect the fan to the D1 and GND leads on the DCU cable.



**Tip:** DC fans often have polarity. Connect the positive lead (red wire) to D1 and the negative lead (black wire) to GND. You can connect to either one of the two GND lines.

3. Connect a power supply to the DCU.
4. Connect the DCU to the DIG1 port on the interface.
5. Plug the Motion Detector into the DIG2 port on the interface.
6. Set the sensitivity switch on the Motion Detector to the short-range (cart) setting.  
(**Note:** Older blue models do not have a sensitivity switch.)
7. Connect the interface to the computer.

## SOFTWARE SETUP

1. Start Logger Pro.
2. From the Experiment menu, choose Set Up Sensors and select your interface.
3. Drag the Digital Control Unit icon to the DIG/SONIC1 button.
4. Click on the DIG/SONIC1 button and select Digital Out.

**Tip:** You must have the Motion Detector plugged into the interface for this option to be available.

5. In the configuration window, check the box next to Turn ON When.

**Tip:** The default configuration is to turn on DCU line 1. There may be situations when you will want to turn on a fan and an indicator light at the same time. You have the option to turn on up to three electronic components simultaneously. Note the allowable combinations of digital lines in the drop-down list.

6. Check the radio button next to Less Than, and enter a value of 0.25 meters (25 cm).
7. Click OK and close all configuration windows.
8. Click the Collect button to begin operation.

**Tip:** If you prefer continuous operation instead of a timed interval, check the Repeat option in the Experiment ► Data Collection window.