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# CCTA Test 6: Flow Sensor Calibration

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## Objective

To determine the calibration relationship between the flow sensor output and the true flow rate of the system. This test establishes a best-fit model that can be implemented in software to convert raw sensor outputs to accurate flow measurements.

## Equipment Needed

Table 1: Test Apparatus

|  |  |
| --- | --- |
| Item | Purpose |
| Diaphragm pump (BYT-7A111) | Device under test |
| Flow sensor | Measures flow, requires calibration |
| Power supply (0–12V DC) | To vary pump input voltage |
| 2-Liter Jug | Reference for true volumetric flow |
| Stopwatch | To record fill time |
| Tubing (3/8 inch) + water | Simplified fluid circuit |

## Test Procedure

1. **System Setup**
   1. Simplify the flow circuit to a single inlet and outlet tube.
   2. Connect the diaphragm pump and ensure a sealed, water-filled setup.
   3. Position the 2L jug to collect output flow from the pump.
2. **Data Collection**
   1. Select input voltages ranging from 3V to 7V (in 1V steps).
   2. For each voltage, run the pump and measure the time to fill a 2L jug (repeat for 3 trials and average).
   3. Record the corresponding flow sensor readings in real-time during each trial.
3. **Data Analysis**
   1. Calculate the true flow rate using:  
      ​
   2. Convert flow to L/min as needed.
   3. Plot sensor reading vs. true flow rate to generate a calibration curve.
   4. Fit a model (e.g., linear or polynomial) to the data to define the mapping from sensor output to flow rate.

## Test Results

Table 2: Flow calibration Results

|  |  |  |
| --- | --- | --- |
| Input Voltage (V) | Sensor Reading (L/min) | True Flow Rate (L/min) |
| 3.0 | 0.36 | 1.08 |
| 4.0 | 1.29 | 1.76 |
| 5.0 | 2.09 | 2.50 |
| 6.0 | 2.74 | 2.90 |
| 7.0 | 3.22 | 3.36 |

* The sensor output increases monotonically with the true flow rate, as expected.
* A linear trend is visible between the sensor readings and true flow from ~1 to 3.5 L/min.
* The data will be used to fit a calibration curve of the form:  
   or a higher-order polynomial if needed, based on residuals.
* This calibration equation will then be implemented in the Arduino code (in the Function: readFlowSensor) to convert live sensor data into flow rates with improved accuracy.