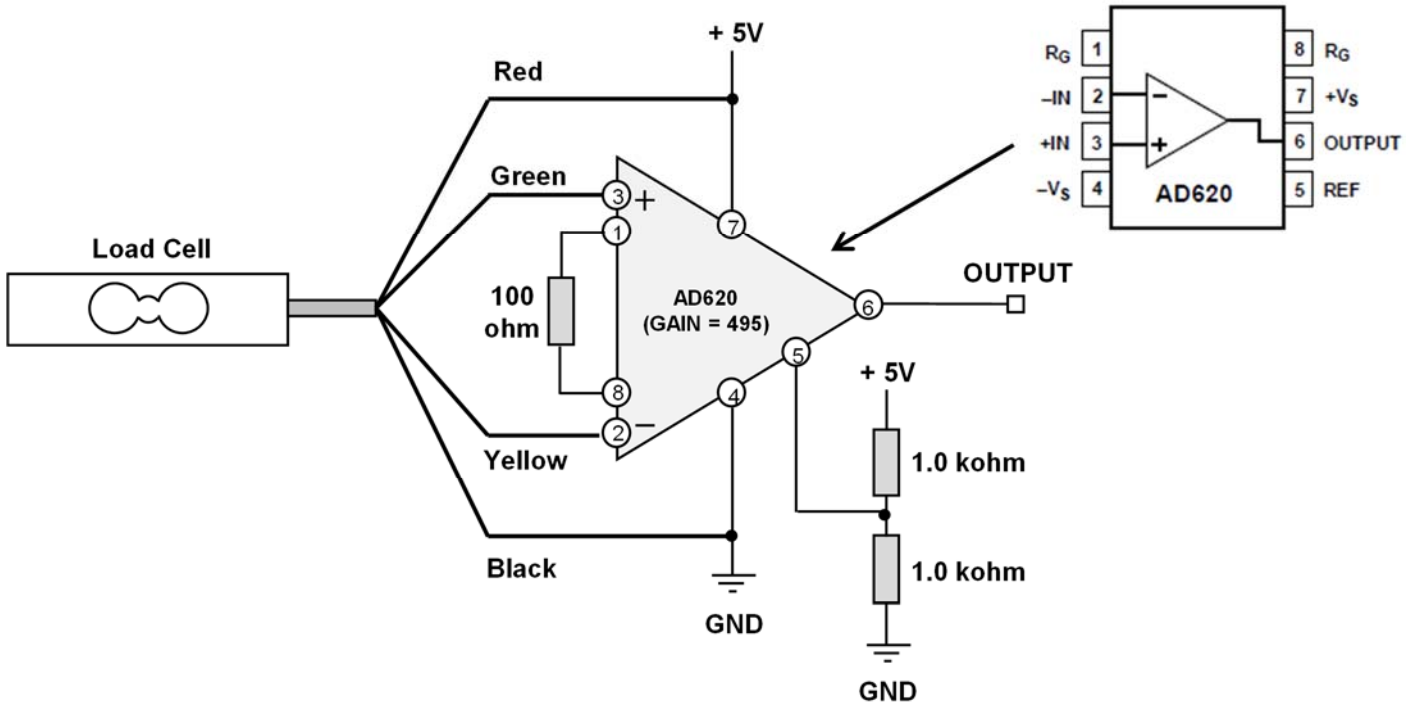


Part1: Load Cell Electronics (40 pts)

The goal of this lab practical is to build and test a load cell measurement system. The circuit consists of the load cell and instrumentation amplifier. Initial testing is performed with the scope.



Parts and Materials:

- Benchtop properly wired to produce +5V and GND.
- AD620 chip with $R_G = 100$ ohm resistor (brown/black/brown) and two 1.0 kohm resistors (brown/black/red)
- Scope Ch1 setting: Probe = 1X, Vertical = 1V/div (scale), -2V (offset); Horizontal = 1 ms/div (scale)
 - NOTE: Remember press "Force Trigger" on the scope to enable Front Panel control!

You must demonstrate the following:

- (1) Neat wiring (10 pts)
- (2) Proper power supply wiring (10 pts)
- (3) Proper scope channel settings (10 pts) **NOTE: Buma will reset the scope before your demo.**
- (4) Measured voltage increases by $\approx 0.5V$ when the 200g weight is placed on the load cell (10 pts)
 - NOTE #1: If the measured voltage is not between 1 and 3.5V **with no weight**, ask Buma for a new load cell.
 - NOTE #2: If you suspect you need a new AD620 chip, ask Buma.

Part 2: Data Acquisition and Processing (60 pts)

Download the “LabPractical_BME386_files.zip” file from the course website and extract all files.

ARDUINO:

- You must properly connect your circuit to pin A0 and GND on the Arduino.
- The Arduino is supposed to record 100 data samples whenever the PC sends a request.
- Buma has written some of the program. Replace any ??? with appropriate code.
- Use $dt = 10\text{ ms}$ and $N = 100$ samples.
- Remember to set the proper COM port!

MATLAB:

- MATLAB is supposed to request data and display ONE plot of Load vs Time (no looping).
- Buma has written a good chunk of the code for you (so kind ...). Replace any ??? with appropriate code.
 - In your code, define the following system parameters (be careful with your units!):
 - $V_{ref} = 2.50\text{ V}$ (NOTE: You will change this value later).
 - Calibration (calibration) = 1.0 (NOTE: You will change this value later).
 - Amplifier gain (A_d) = 495
 - Rated output (RO) = 0.8 mV/V
 - Supply voltage (V_s) = 5 V
 - Rated load (L_{rated}) = 780 g
 - $Load = \text{calibration} * L_{rated} * (V_{meas} - V_{ref}) / (A_d * RO * V_s)$
 - Plot load vs time.
 - Re-run your code as often as necessary to experimentally determine the proper values for V_{ref} and “calibration”.

You must demonstrate the following:

- (1) Properly working Arduino code (20 pts)
- (2) Run your MATLAB code four times to produce correct displays for 0, 50, 100, and 200g (40 pts)

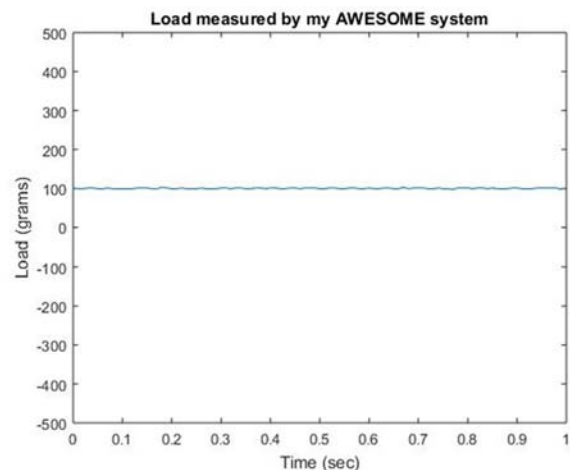


Fig. 1: Example of display for 100g load.