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# CCTA Test 8: Amplified Pressure Sensor Calibration

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## Objective

To verify the performance of the INA118P instrumentation amplifier used to boost the pressure sensor’s signal. This test ensures the amplified voltage output remains within the 0–3.3 V range readable by an Arduino, while achieving the expected gain.

## Equipment Needed

Table 1: Test apparatus

|  |  |
| --- | --- |
| Item | Purpose |
| Pressure transducer | Source signal to be amplified |
| INA118P Instrumentation Amp | Amplify low-level pressure signal |
| Resistors (for gain setting) | Configure amplifier gain |
| Arduino or multimeter | Measure amplified output |
| Syringe + manometer | Apply known pressures (25–150 mmHg) |
| Breadboard + wires | Temporary circuit setup |

## Test Procedure

1. **System Setup**
   1. Assemble the INA118P amplifier circuit with selected resistor values for ~1000 gain.
   2. Connect the amplifier input to the pressure transducer output.
   3. Power the amplifier using a single supply (typically 5V or 3.3V) and connect the output to a multimeter or Arduino ADC pin.
2. **Data Collection**
   1. Apply incremental pressures (same steps as Test 9): 25, 50, 75, 100, 125, 150 mmHg.
   2. At each step, record the amplified voltage output.
   3. Monitor for amplifier saturation (especially near 3.3V limit).
3. **Data Analysis**
   1. Theoretical amplified output = Raw signal (from Test 9) × gain (e.g., 1000).
   2. Compare recorded amplified outputs to these expectations.
   3. Check for nonlinearity or saturation at high pressures.

## Test Results

Table 2: Pressure signal Amplification Results

|  |  |  |
| --- | --- | --- |
| Pressure (mmHg) | Raw Voltage (mV) | Measured Output (V) |
| 25 | 0.625 | 0.63 |
| 50 | 1.25 | 1.27 |
| 75 | 1.875 | 1.88 |
| 100 | 2.5 | 2.52 |
| 125 | 3.125 | 3.13 |
| 150 | 3.75 | 3.21 (saturation) |

## Discussion

The instrumentation amplifier provided consistent signal gain across the measured pressure range, closely aligning with theoretical expectations. However, some saturation was observed near 150 mmHg, likely due to single-supply voltage limitations. This suggests that the upper usable range may be slightly below the amplifier’s rail-to-rail limits. Nevertheless, for pressures up to ~125 mmHg, the system provides reliable, linear amplification suitable for Arduino ADC input. Final calibration will factor in amplifier behavior and any non-linearities identified here. Once the values are recoded, they need to be added in the Arduino code (in the Function: interpolatePressure)