Lecture 4 Worksheet

Geosc 597-003
Techniques of Geophysical Experimentation

February 9, 2021

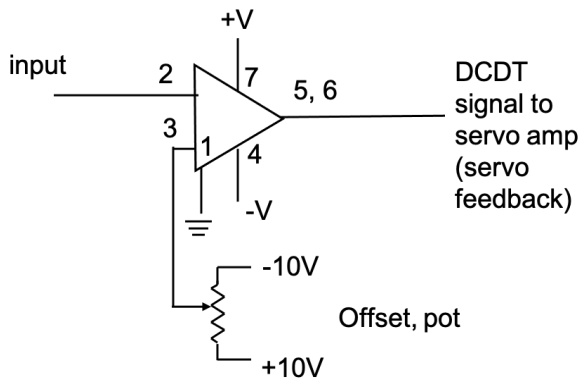
Preparatory Reading

Read about differential amplifiers before class:

- https://www.electrical4u.com/differential-amplifier/.
- INA105 Precision Unity Gain Differential Amplifier – *TGE-SP21/resources/INA105.pdf*

In-class Activity

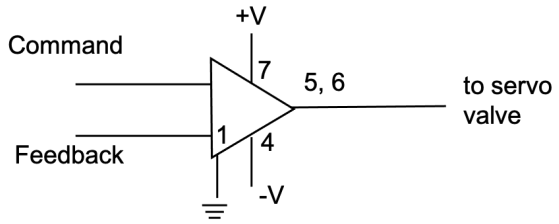
The goal of this activity is to learn about differential amplifier, feedback, and servo-control using the biaxial deformation apparatus in the Rock Mechanics Lab.



Displacement Control – Vertical Ram:

1. Start with a balanced system, so that the servo error signal is zero. This means that the command and feedback are the same.
2. **What is the output voltage of the DCDT?**
3. Now let's look at what happens to the DCDT output when we offset the signal using just the offset pot.
4. **After turning the pot 360° what is the output voltage of the DCDT?**
5. Is that what you expected?
6. Now let's lock the ram –or just turn off the hyd. power supply.
7. Turn the pot 360° – what output voltage do you expect? **What is the measured output voltage of the DCDT?**

Servo Feedback – Vertical Ram:



1. Where can the command originate?
2. Where can the feedback originate?
3. Let's use *Panel* for the command and *Disp* for the feedback.
4. Start with a balanced system, so that the servo error signal is zero. This means that the command and feedback are the same.
5. Increase the voltage to the command. **What happens to the output voltage of the feedback (DCDT)?**
6. Now let's send a continuously varying signal into the command: use *Ext2* for the command and *Disp* for the feedback.
7. Start with a balanced system, so that the servo error signal is zero. This means that the command and feedback are the same.
8. Send in 10 digital counts per second. W**hat happens to the output voltage of the feedback (DCDT)?**
9. Now look at what happens when we lock the system and change the command
10. Use Ext2 for the command and Disp for the feedback.
11. Start with a balanced system, so that the servo error signal is zero. This means that the command and feedback are the same.
12. Lock the ram and then send in 1000 counts to the command.
13. **Is it a good idea to unlock the ram right now? (yes/no)**
14. **What happens when you unlock?**
15. **What is the output voltage of the feedback (DCDT)?**

Homework

Analyze this circuit and determine the voltage at:

- Pin 1 in switch position 1, 2, and 3.
- Pin 5 in switch position 1, 2, and 3.