MASSACHUSETTS INSTITUTE OF TECHNOLOGY

6.071 Introduction to Electronics, Signals and Measurement

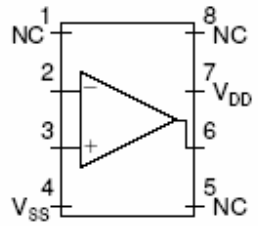
Spring 2006

Laboratory 20: Introduction to the Op-Amp

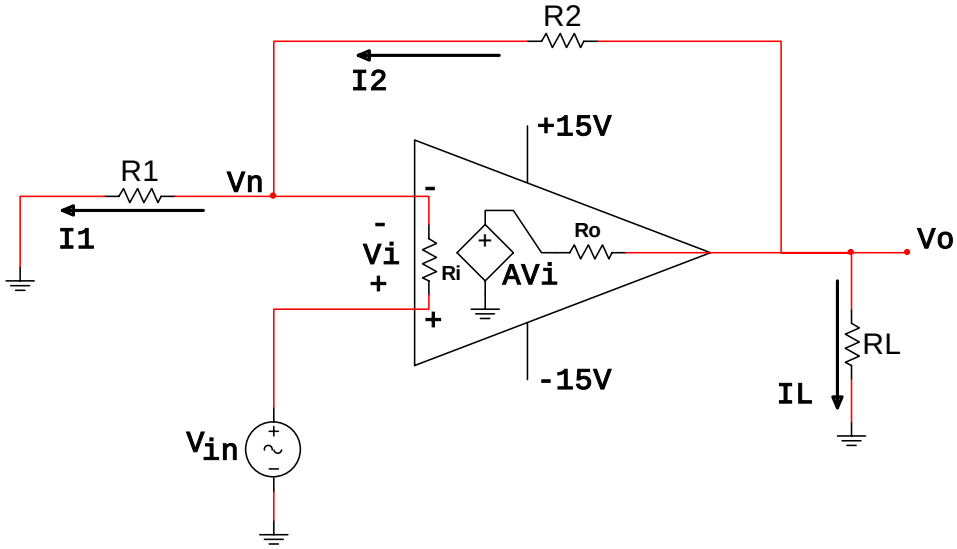
In this lab we will explore the fundamental non-inverting (op-amp) amplifier circuit.

To construct the circuit we will use the LF356 op amp. The 356 is a good, cheap, easy to work with op amp well suited to most basic circuits. More expensive op amps tend to sacrifice op-amp ideality (finite input current, stability, power supply reject, etc.) for specific purposes (high speed, low noise etc.) and can be much more difficult to work with. The data sheet for the 356 is available in the class web site.

The pinout of the 356 is the same as that of another widely used op amp, the 741, and is shown below.



Use this op-amp to construct the circuit shown below. Select R1 and R2 to achieve a gain of 3.



Make the following connections to your data acquisition system

ACH0+, Supply+ : Vin
ACH1+ : Vo
ACH2+ : Vn
V_{DD} : +15 Volts
V_{SS} : -15 Volts
ACH0-, ACH1-, ACH2- : Ground

Down load the LabView instrument called **Op-Amp1.vi** from the Labs section. Run the instrument and answer the following questions

1. For Vin=2 Volt measure and record the following

   Vn=
   Vo=
   I1=
   I2=
   IL=

   Compare I1 and I2. How close are they? What about Vn and Vi?

2. Does I1+I2+IL satisfy KCL? If not what other currents should be considered?

3. A is the open loop gain of the op-amp. Ri and Ro are the input and output resistance of the op-amp device (NOT THE CIRCUIT THAT YOU HAVE CONSTRUCTED)

   What value of A results in a 5% difference between the measured and the simulated output voltage Vo?

4. For Vin>5Volts what is the output?

5. For Vin=-2 Volts What is Vo?

6. Arrange your circuit to be a follower by making R2=0 and R1=infinity. Observe the circuit operation. Justify your observation.