EXPERIMENT 4

BASIC APPLICATIONS OF OPERATIONAL AMPLIFIERS

4.1 Objective

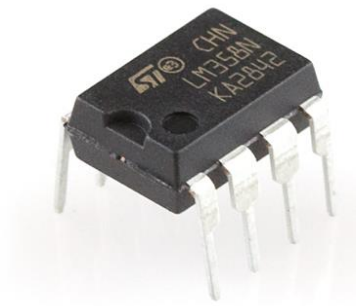
In this experiment the basic properties of operational amplifiers (op-amp's) will be introduced and building circuits with op-amp will be learned. Basic op-amp circuits such as voltage follower (buffer), comparator, inverting/non-inverting amplifiers will be investigated.

4.2 Equipment List

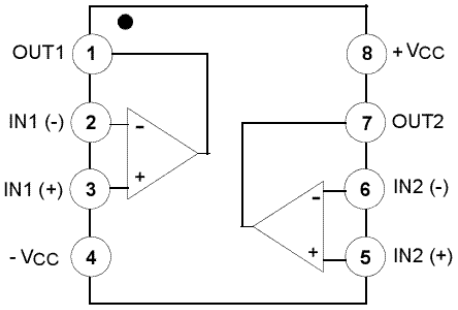
1. DC Power Supply
2. Op-Amp: 1 x LM 358,
3. Resistors: 1 kΩ, 1.8 kΩ, 3.3 kΩ,
4. Capacitor: 100 μF

4.3 Useful Information for the Experiment

Note that LM 358 Integrated Circuit (IC) includes 2 op-amps in it as shown in Fig. 4.1b. They are connected to the positive and negative source pins and you can use both of them independently. The IC package is shown in Fig. 4.1a.

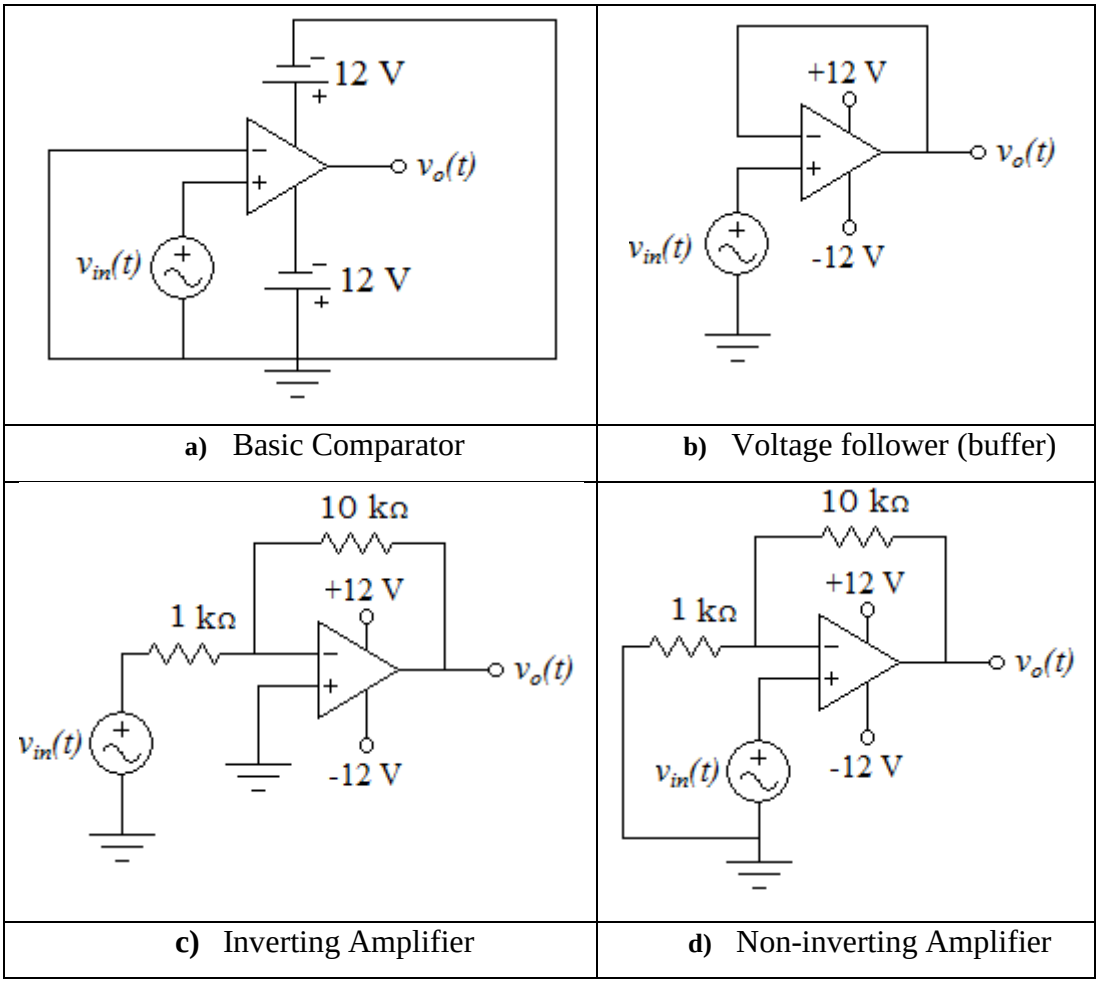


a) LM 358 Op-amp package



b) LM 358 Pin Diagram

Figure 4.1 LM 358 Op-Amp



a) Basic Comparator

b) Voltage follower (buffer)

c) Inverting Amplifier

d) Non-inverting Amplifier

Figure 4.2 Basic Op-Amp Circuits

4.4 Experimental Work

1. Setup the circuit in Figure 4.2 (a).
   - **i.** **Observe and plot** $V_{in}(t)$ and $V_o(t)$ for $\boldsymbol{V_{in}(t) = 5\sin(2000\pi t)}$
   - **ii.** Repeat step "**i**" above for $\boldsymbol{V_{in}(t) = 10\sin(2000\pi t)}$

2. Repeat Step 1 for the circuit in Figure 4.2 (b) and **plot the results into the graph paper.**
3. Setup the circuit in Figure 4.2 (c) and **plot the results into the graph paper.**
   - **i.** Observe and plot $V_{in}(t)$ and $V_o(t)$ for $\boldsymbol{V_{in}(t) = 0.5\sin(2000\pi t)}$
   - **ii.** Repeat step "**i**" above for $\boldsymbol{V_{in}(t) = 5\sin(2000\pi t)}$

4. Repeat Step 1 for the circuit in Figure 4.2 (d) and **plot the results into the graph paper.**
   - Compare the results when the amplitude of the input signal is changed. Do the $v_{in}(t)$ versus $v_o(t)$ graphs change with respect to the amplitude level of the input? Why?