

ECE321 ELECTRONICS I
FALL 2006

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Lecture 2
28th September, 2006

A decorative header for Chapter 2 featuring a cyan background with a faint, abstract circuit board pattern. The text 'CHAPTER 2' is overlaid on the left side.

CHAPTER 2

Operational Amplifiers

2.1 Ideal Op-amps

2.2 Inverting Amplifier

2.3 Non- Inverting Amplifier

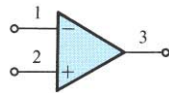
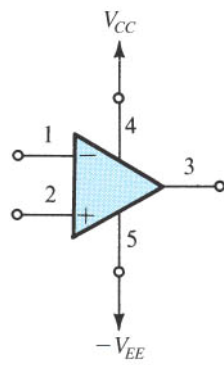
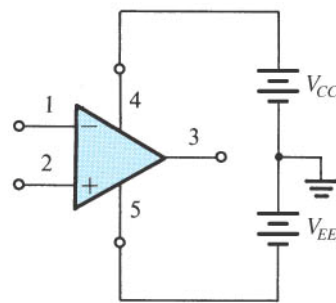


Figure 2.1 Circuit symbol for the op amp.



(a)



(b)

Figure 2.2 The op amp shown connected to dc power supplies.

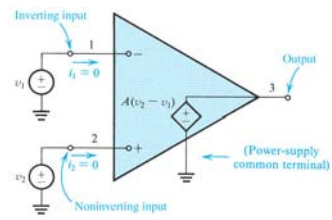


Figure 2.3 Equivalent circuit of the ideal op amp.

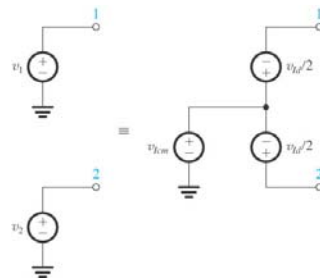


Figure 2.4 Representation of the signal sources v_1 and v_2 in terms of their differential and common-mode components.

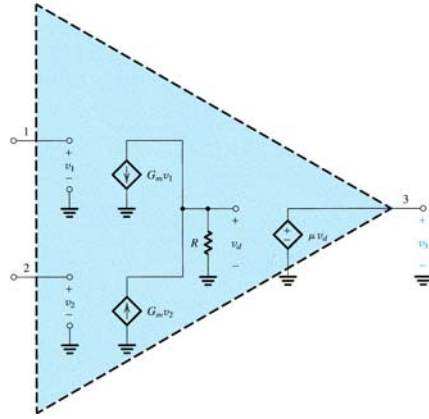


Figure E2.3

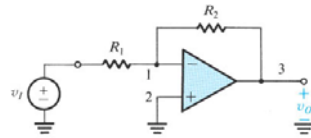


Figure 2.5 The inverting closed-loop configuration.

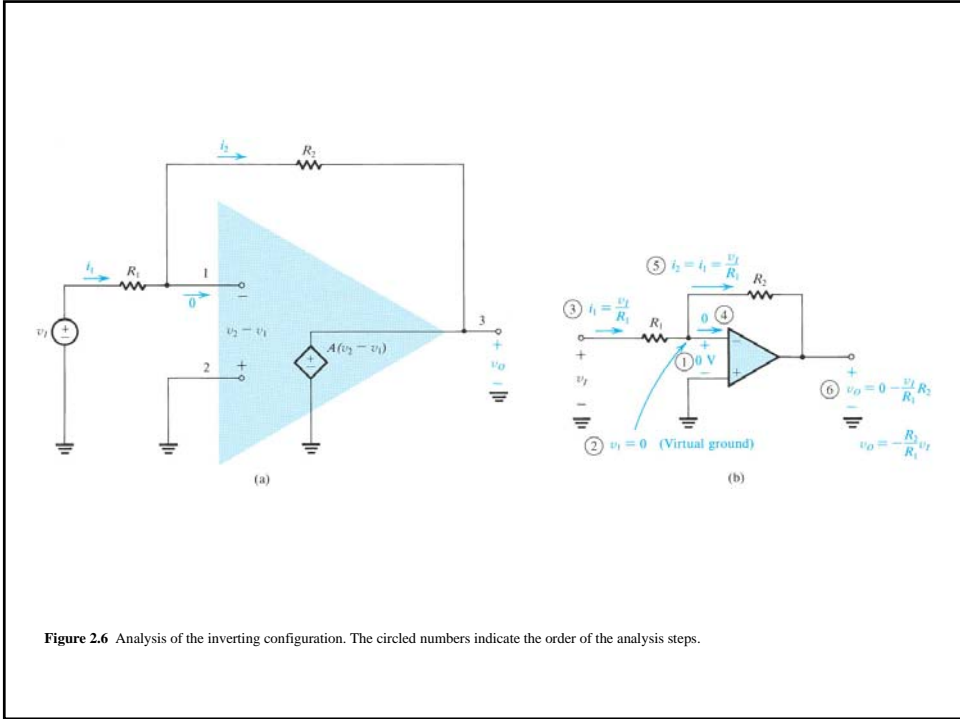


Figure 2.6 Analysis of the inverting configuration. The circled numbers indicate the order of the analysis steps.

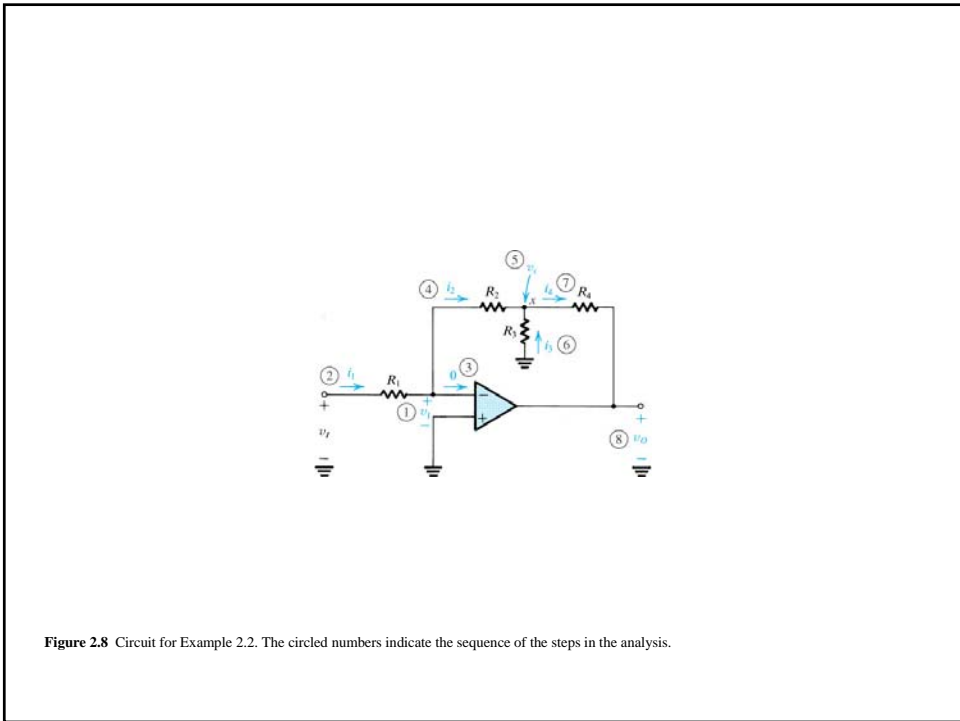


Figure 2.8 Circuit for Example 2.2. The circled numbers indicate the sequence of the steps in the analysis.

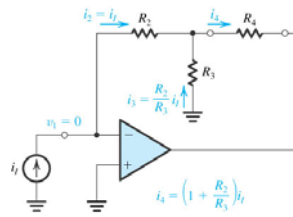


Figure 2.9 A current amplifier based on the circuit of Fig. 2.8. The amplifier delivers its output current to R_L . It has a current gain of $(1 + R_2/R_3)$, a zero input resistance, and an infinite output resistance. The load (R_L), however, must be floating (i.e., neither of its two terminals can be connected to ground).

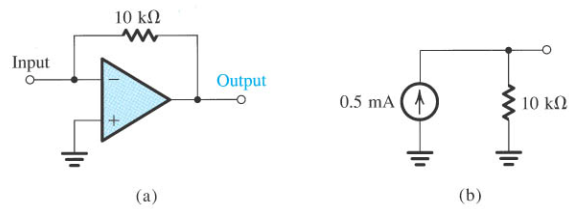


Figure E2.5

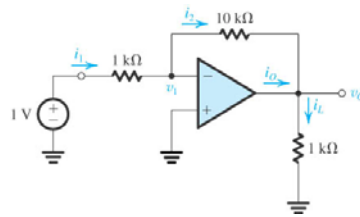


Figure E2.6

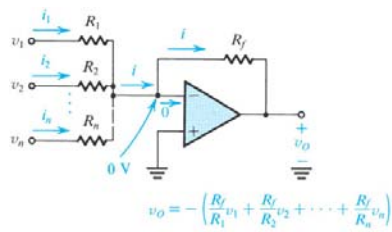


Figure 2.10 A weighted summer.

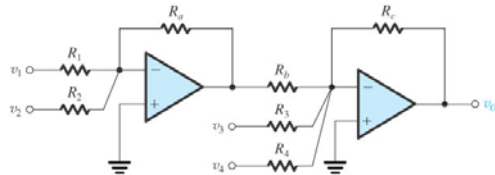


Figure 2.11 A weighted summer capable of implementing summing coefficients of both signs.

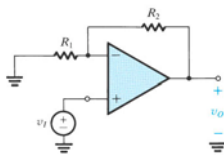


Figure 2.12 The noninverting configuration.

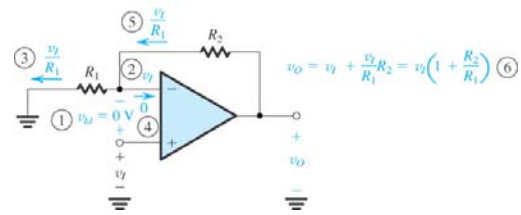


Figure 2.13 Analysis of the noninverting circuit. The sequence of the steps in the analysis is indicated by the circled numbers.

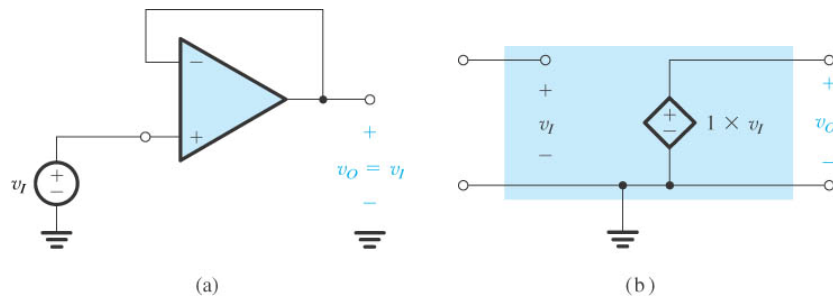


Figure 2.14 (a) The unity-gain buffer or follower amplifier. (b) Its equivalent circuit model.

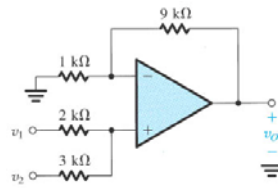


Figure E2.9

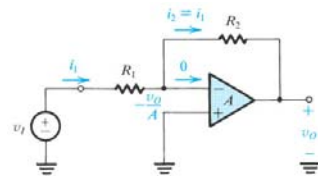


Figure 2.7 Analysis of the inverting configuration taking into account the finite open-loop gain of the op amp.

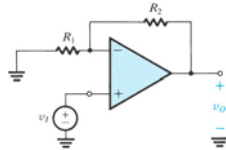


Figure 2.12 The noninverting configuration.

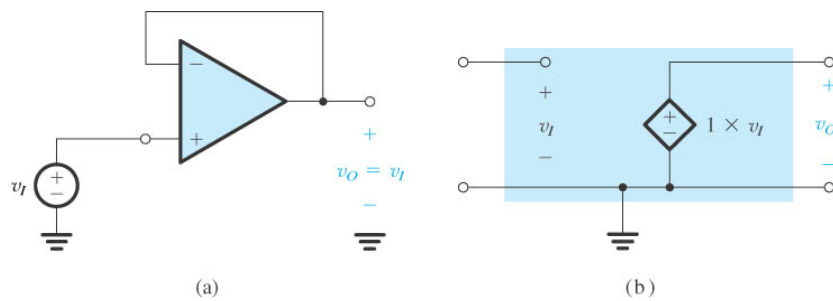


Figure 2.14 (a) The unity-gain buffer or follower amplifier. (b) Its equivalent circuit model.