Overview

In this unit your students should:

- find out how an op-amp can be made into a voltage follower
- understand that a voltage follower has a voltage gain of +1
- understand that a voltage follower can provide power gain
- meet the transfer characteristic of an op-amp voltage follower

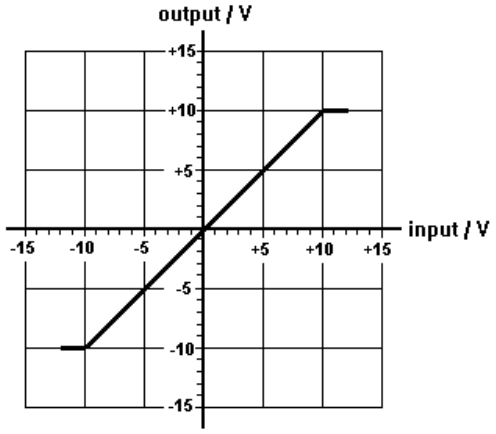
This should not require more than 3 hours of class time.

Hour	Suggested Activity
1	Launch students straight into the **Loading a voltage divider** practical. This should give them some idea about the usefulness of a voltage follower. As they finish, get them to start questions 1 and 2 of the **Voltage Followers** exercises. Ask students to complete questions 1 to 3 of the **Voltage Followers** exercises before the next session.
2	Discuss their answers to questions 1 to 3 of the **Voltage Followers** exercises. Set them to do the **Transfer characteristic of a voltage follower** practical. Note that the TL084 op-amp output saturates high when the non-inverting input goes below about -4 V, so this is a region to be avoided. As they finish, let them start answering question 4 of the **Voltage Followers** exercises. Ask them to answer question 1 on page 97 of the text book before the next session.
3	Get students to work through question 4 of the **Voltage Followers** exercises. Then go through the derivation of the gain formula for a non-inverting amplifier, emphasising how this leads to an amplifier which is automatically linear provided that it doesn't saturate. Ask them to answer question 2 on page 98 of the text book before the next session.

Model Answers

1 (a) Any difference in voltage between the input and output results in a change in the output which reduces that difference. The only stable setting is for the output and input to sit at the same voltage.

(b)



2 (a) $I = V/R = 5 / 100\times10^{3} = 5.0\times10^{-5}$ A or 50 μA

(b) $P = VI = 5 \times 5.0\times10^{-5} = 2.5\times10^{-4}$ W or 0.25 mW

(c) $I = V/R = 5 / 16 = 3.1\times10^{-1}$ A

$P = VI = 5 \times 3.1\times10^{-1} = 1.6$ W

(d) power gain = $1.6 / 2.5\times10^{-4} = 6.4\times10^{3}$ or 6400