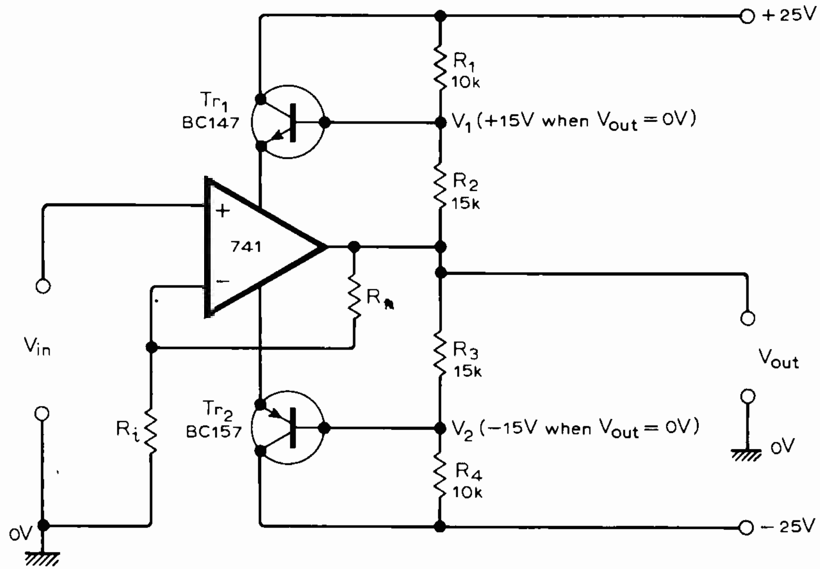
Circuit Ideas



Increased output voltage for op-amps

The circuit shown uses a 741 i.c. and will produce a typical peak to peak output voltage swing of 37V using a ±25V supply. Power is supplied to the i.c. by Tr_1 and Tr_2 whose bases are kept 30V apart by the divider chain. As the output voltage varies, the current in one half of the divider chain increases and the current in the other half decreases by the same amount. This causes the potential between the bases of Tr_1 and Tr_2 to remain constant and allows the power supply for the i.c. to vary between the limits of ±Vcc in sympathy with the output signal. For the non-inverting amplifier shown

$$\frac{R_1}{R_2}=\frac{(+V_{cc})-V_1-V_{out}}{V_1-V_{out}}$$

and $$\frac{R_4}{R_3}=\frac{(-V_{cc})-V_2-V_{out}}{V_2-V_{out}}$$

and gain $$=\frac{V_{out}}{V_{in}}=\frac{R_f+R_i}{R_i}$$

The gain must not exceed a value dependent upon the output voltage swing otherwise the input voltage will exceed the power supply voltage of the i.c. Therefore,

$$\text{Gain}\leqslant\frac{V_{out\ pk}}{\dfrac{R_4\ (V_{out\ pk}-(-V_{cc}))}{R_3+R_4}+a+(-V_{cc})}$$

for positive half cycles, and

$$\text{Gain}\leqslant\frac{V_{out\ pk}}{\dfrac{R_1\ (V_{out\ pk}-(+V_{cc}))}{R_1+R_2}-a+(+V_{cc})}$$

for negative half cycles, where $-a$ is absolute maximum input voltage − input voltage range (3V typical) and $V_{out\ pk}$ is peak output voltage.

Further restrictions are imposed if the amplifier is connected in the inverting mode because the i.c. inputs are always at 0V and therefore the power supply voltage can only swing by ±12V.

Colin D. Ride,
Mickleover,
Derby.