University of Glasgow

# UESTC 3003: Electronic System Design

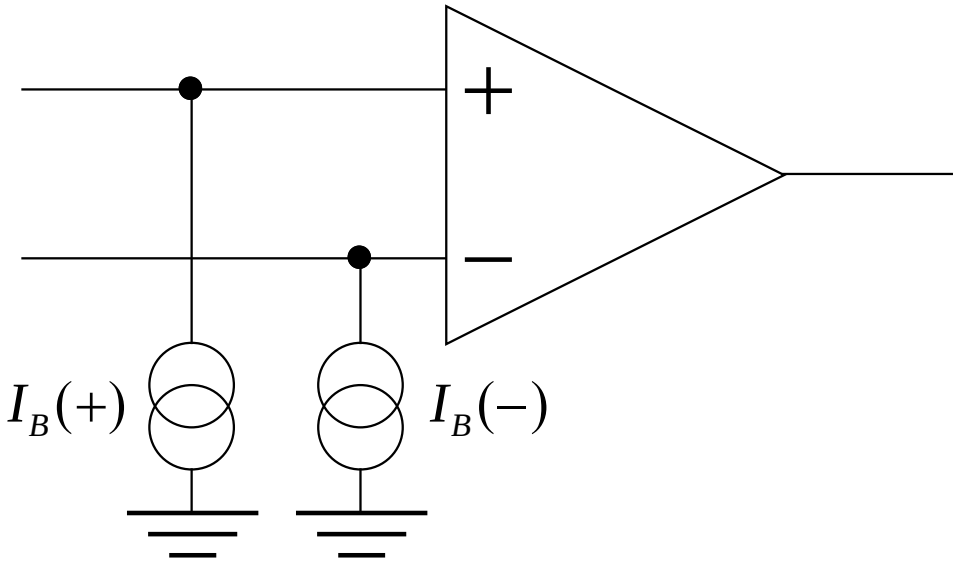
*Static Errors*

Lecture 2.3: Bias Current Blues (1)

**Dr Duncan Bremner**

WORLD CHANGING GLASGOW

# Revision of previous section…



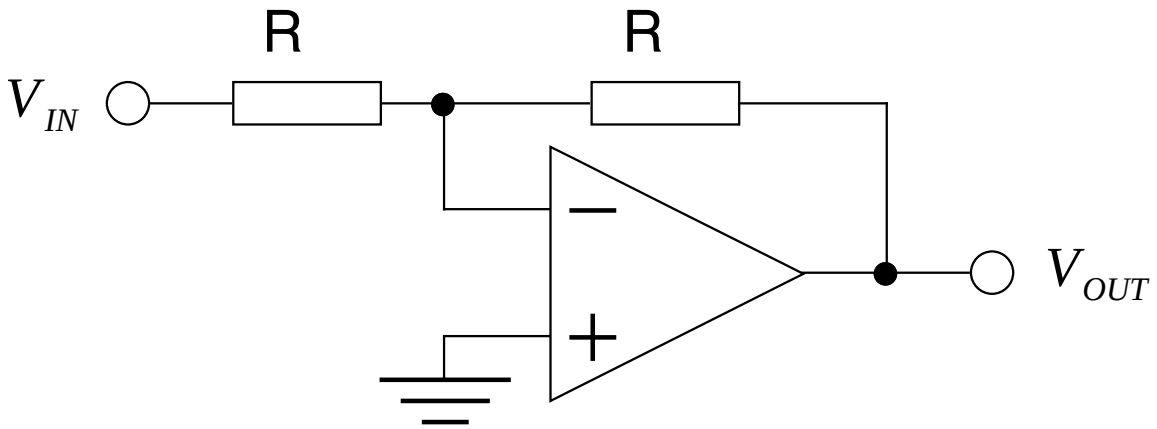

Perfect Opamp + Current sources
= model of a real opamp

$$I_B(+) \approx I_B(-)$$

For simple opamp. (Not always)

$$I_B \equiv \frac{I_B(+) + I_B(-)}{2}$$ (i.e. the average current)

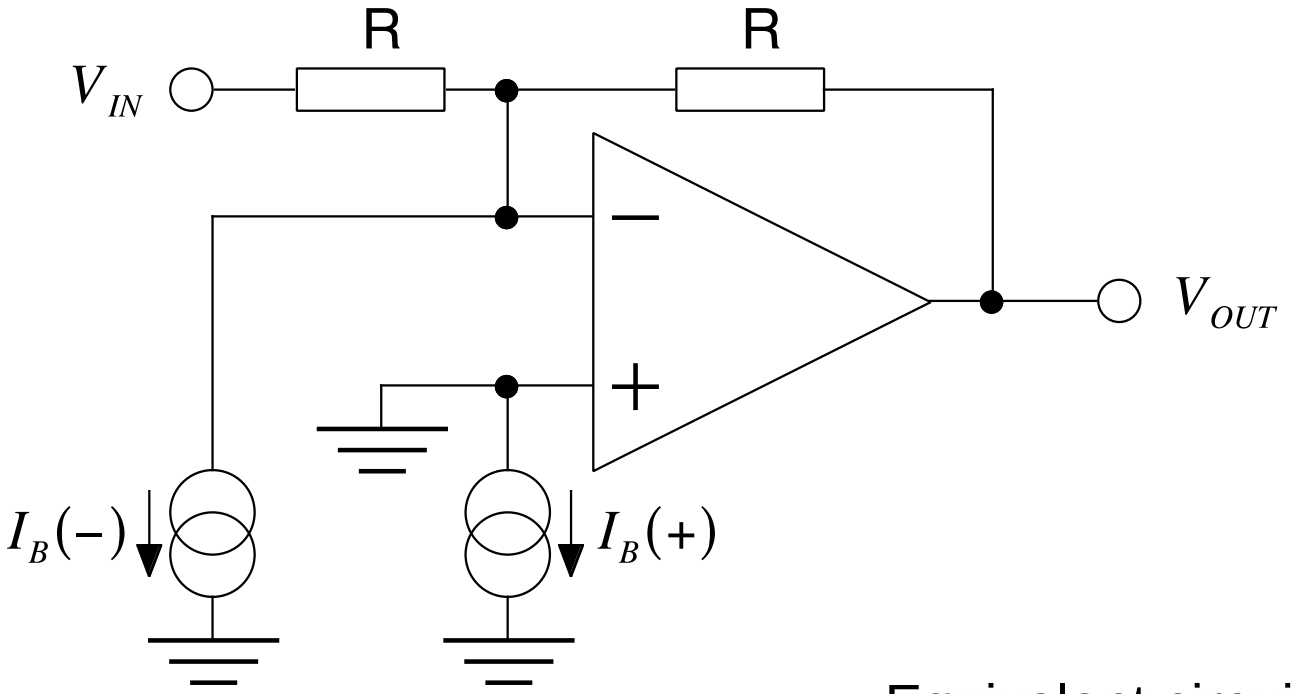
# Bias Current Blues




Perfect opamp $V_{OUT} = -(V_{IN})$

Independent of the value of R

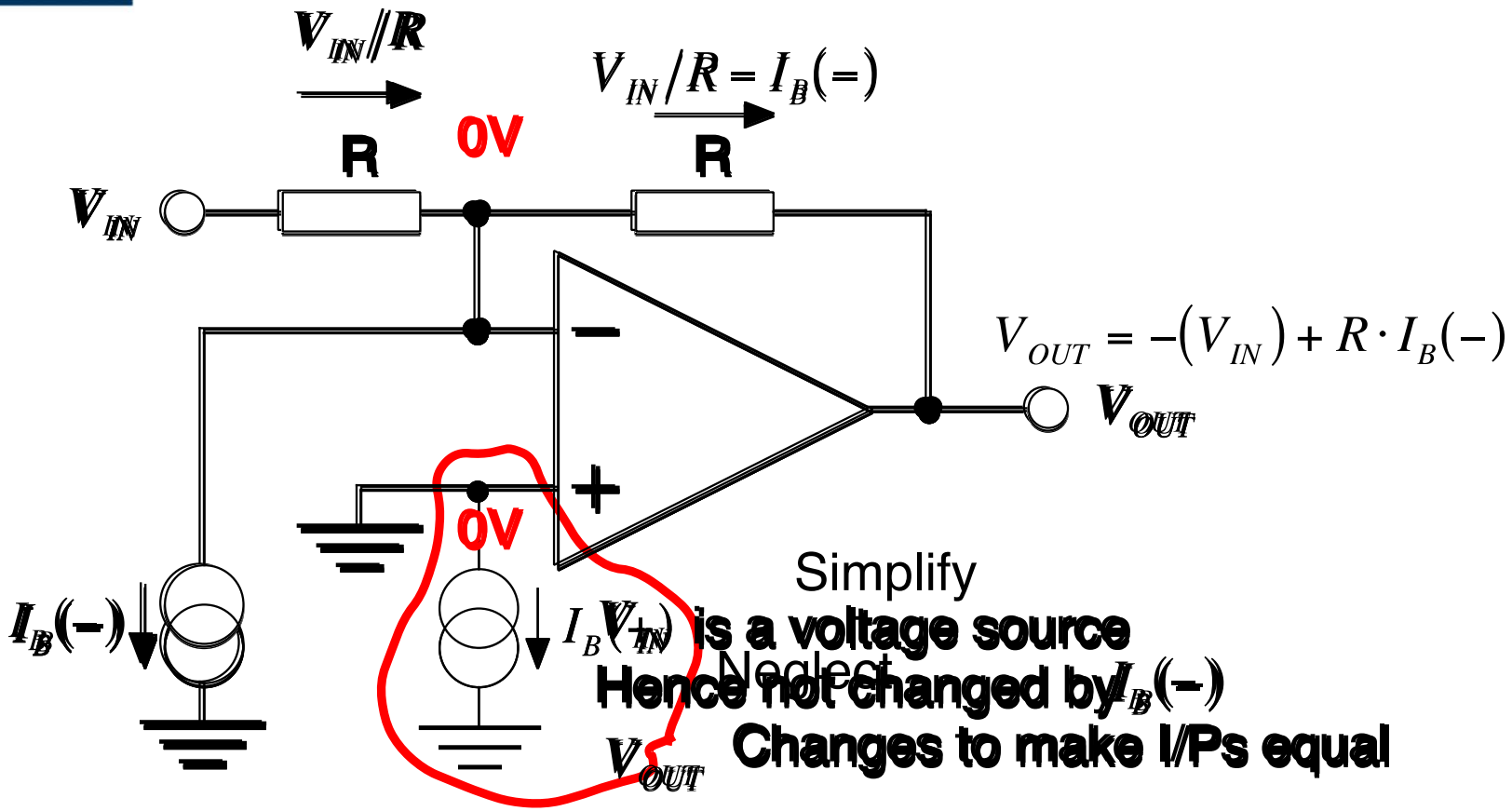
# Bias current blues (2)




Equivalent circuit

NB: The triangular thing is still a PERFECT OPAMP!

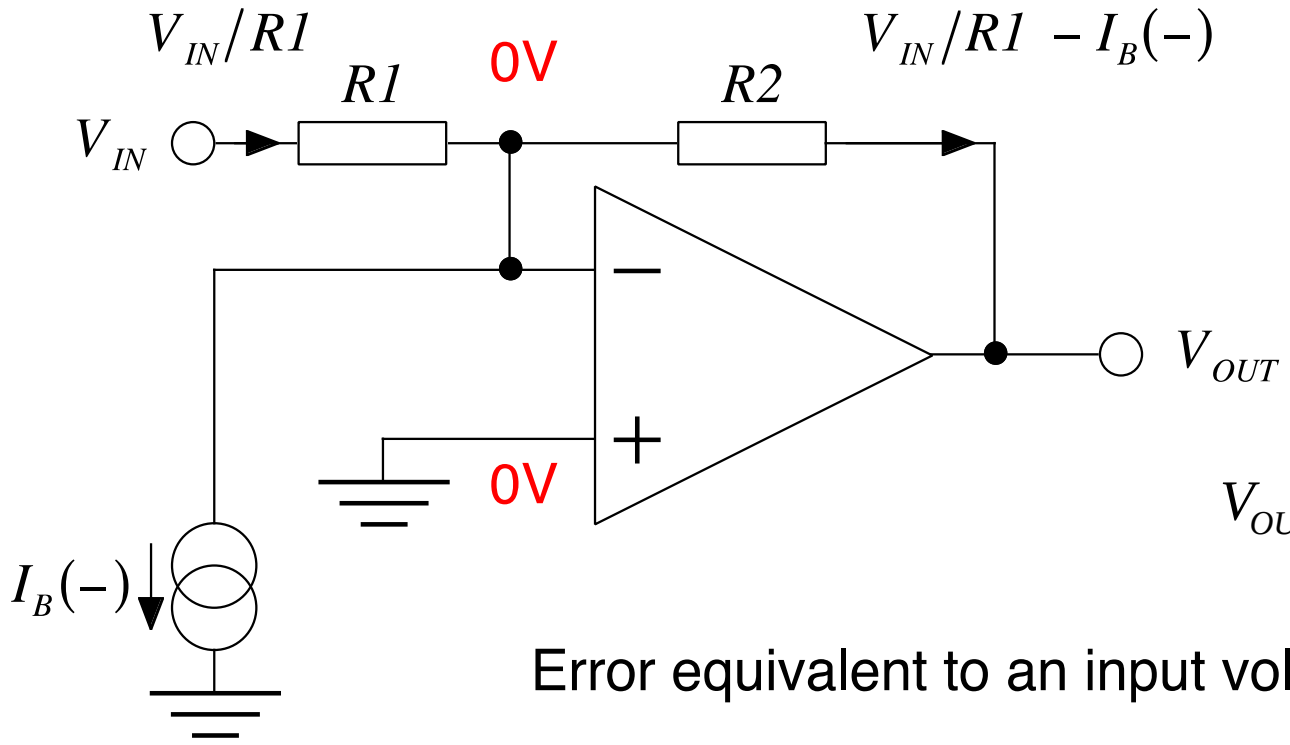
# Bias Current Blues (3)




Bias current adds error V of $R \cdot I_B(-)$ to O/P

# Bias Current Blues (4)

In the case of an inverting amplifier with gain:




$$V_{OUT} = \frac{-V_{IN}R2}{R1} + I_B R2$$

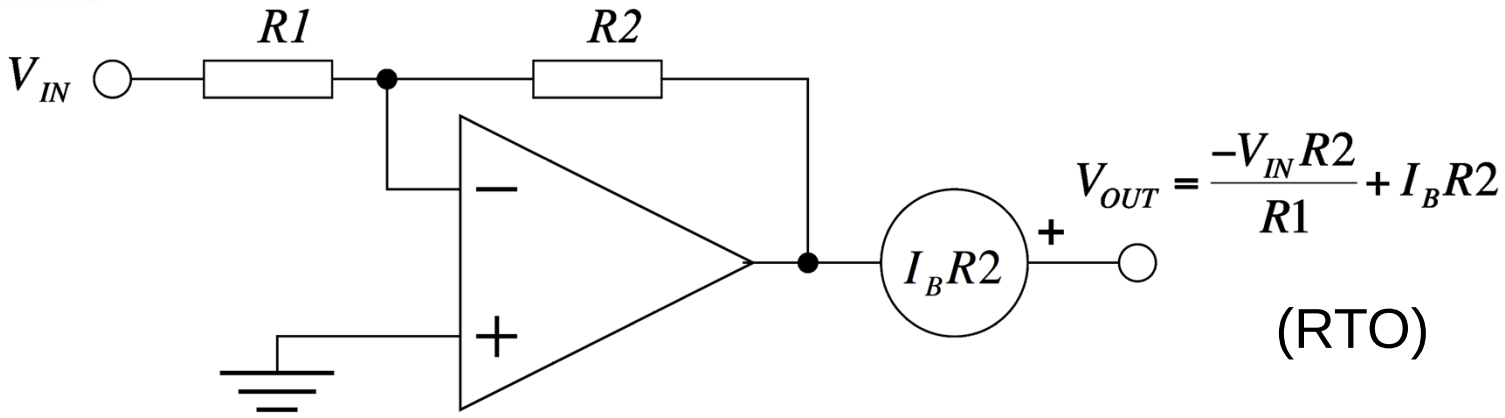
Error equivalent to an input voltage of $V_{IN} - I_B R1$

Errors may be quoted as “Referred To Output” (RTO) $I_B R2$

or “Referred To Input” (RTI) $-I_B R1$

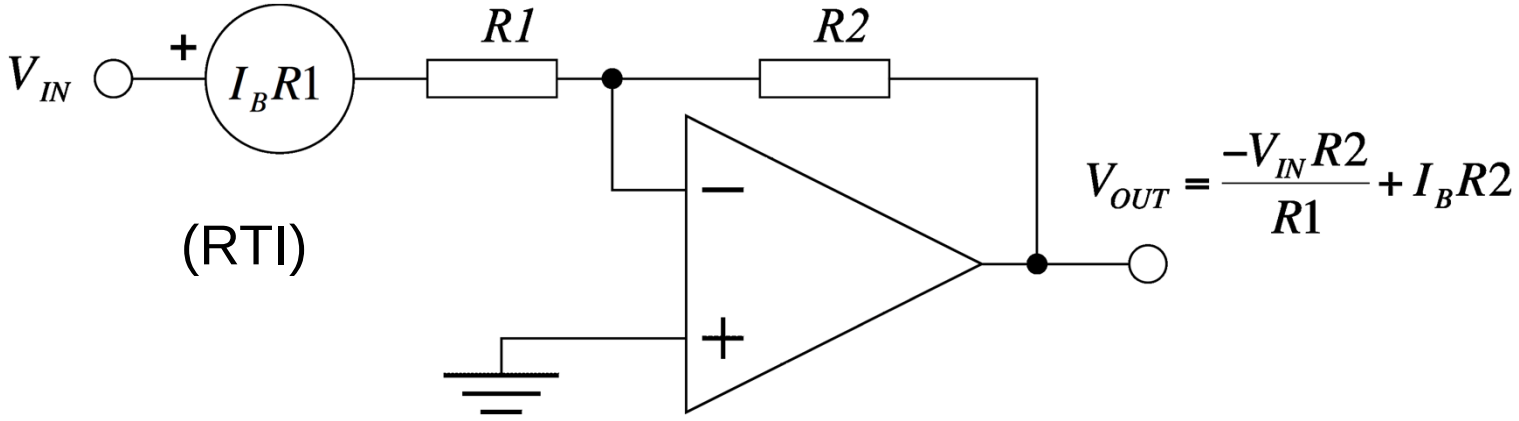
# Bias Current Blues (5)

Circuit is equivalent to…



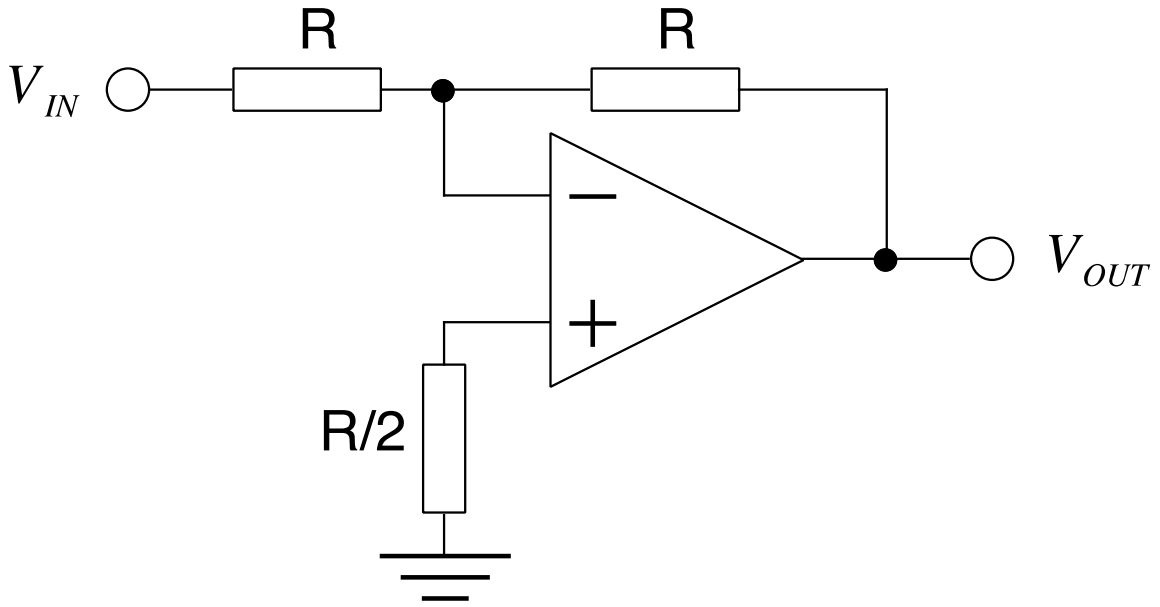

(RTO)

Also equivalent to…




(RTI)

# A Cool Fix (If currents are Equal)




Make DC resistances equal at both inputs

(NOTE: Take care if there are inductors or capacitors about!)


University of Glasgow
Thank you
谢谢
INSPIRING PEOPLE
#UofGWorldChangers
@UofGlasgow