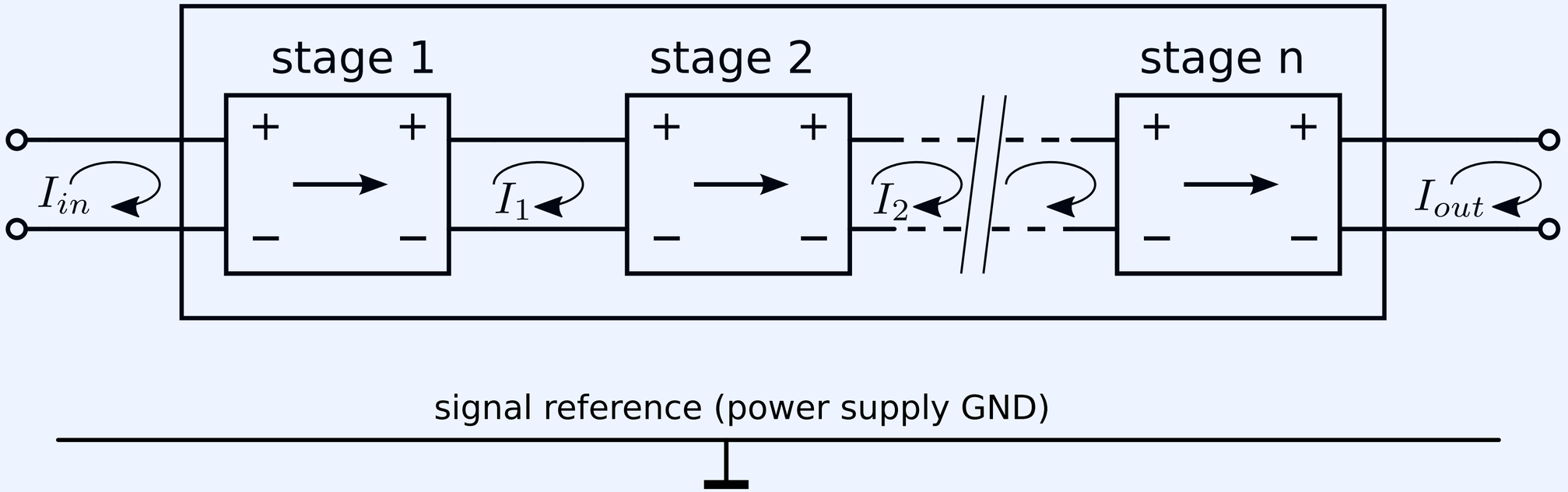
Structured Electronic Design
Interconnecting Controller Stages

Preferred

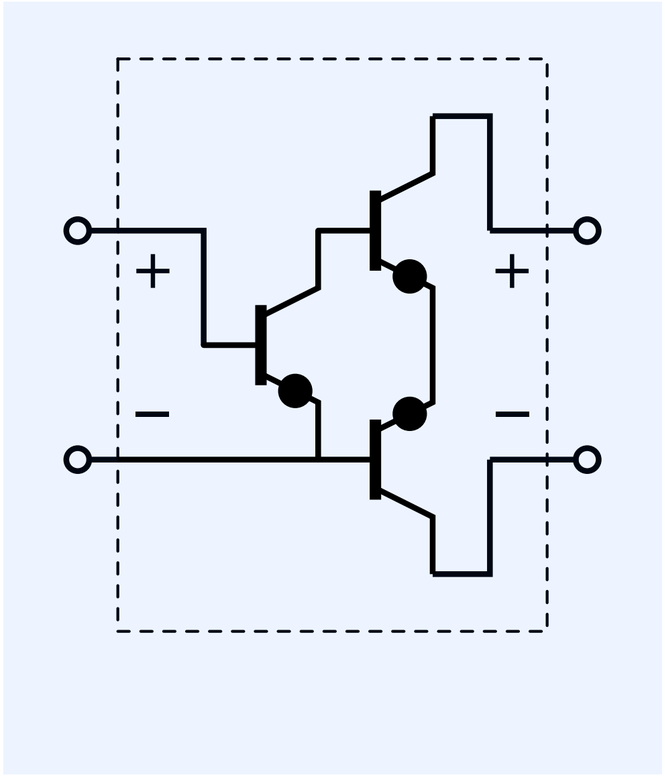


Method: Input of stage i+1 connected to output of stage i

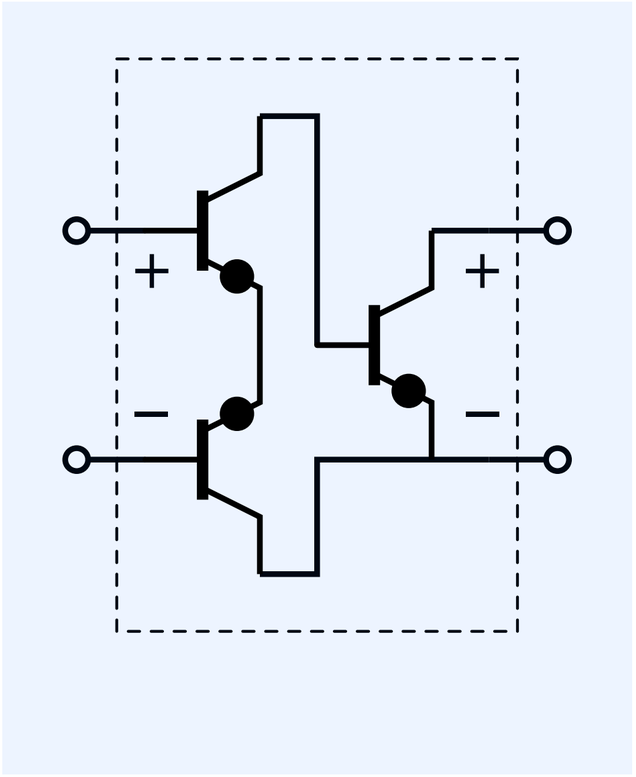
Three or four controller teminals:

- Only input port and output port terminals
- Internal nodes: infinite impedance to signal reference
  - Maximize CMRR
  - Maximize loop gain

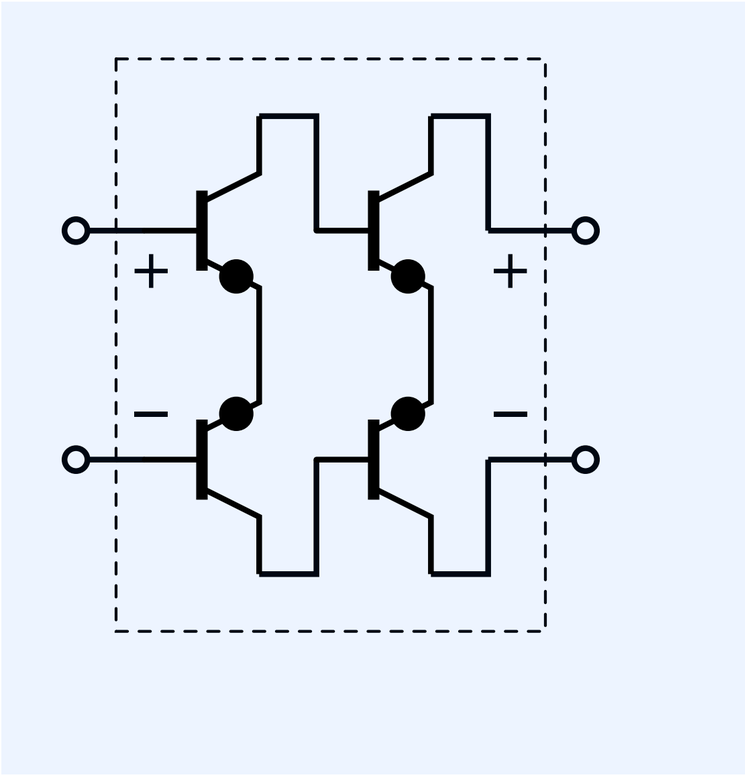
Preferred two-stage solutions



Two-stage controller with anti-series output stage.

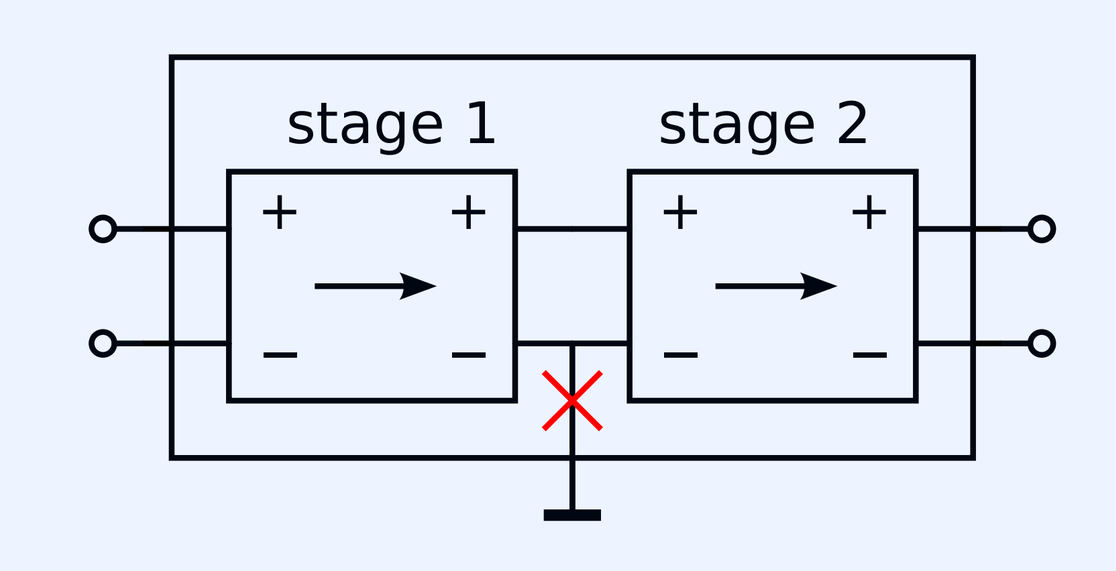


Two-stage controller with anti-series input stage.
A push-pull stage can be used for the second stage.



Fully balanced two-stage controller.

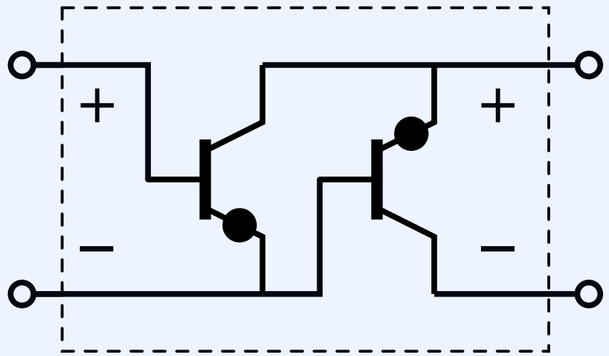
Not preferred



During design of the amplifier concept, the controller was considered a natural two-port.

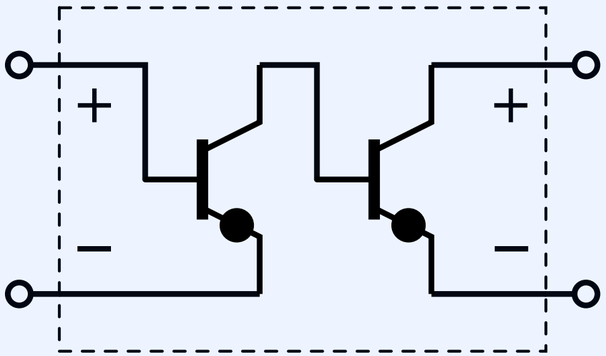
Connection of internal nodes to the signal reference may violate this condition.

Other not preferred



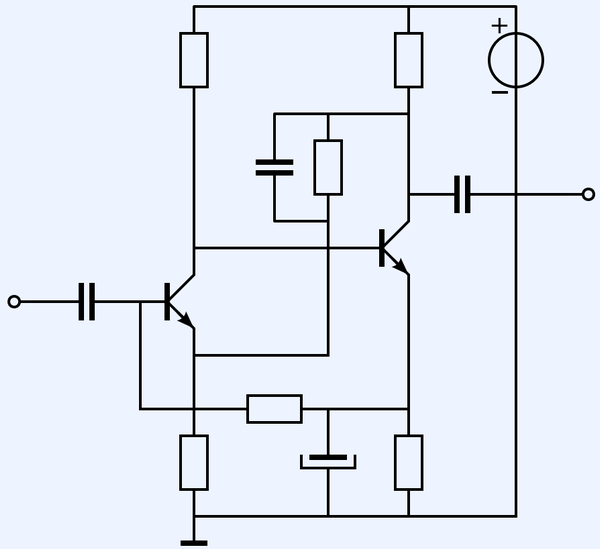
No port isolation:
Second stage converts common-mode voltage into differential-mode current.

Can only be used in combination with a transformer connected to one of the ports.

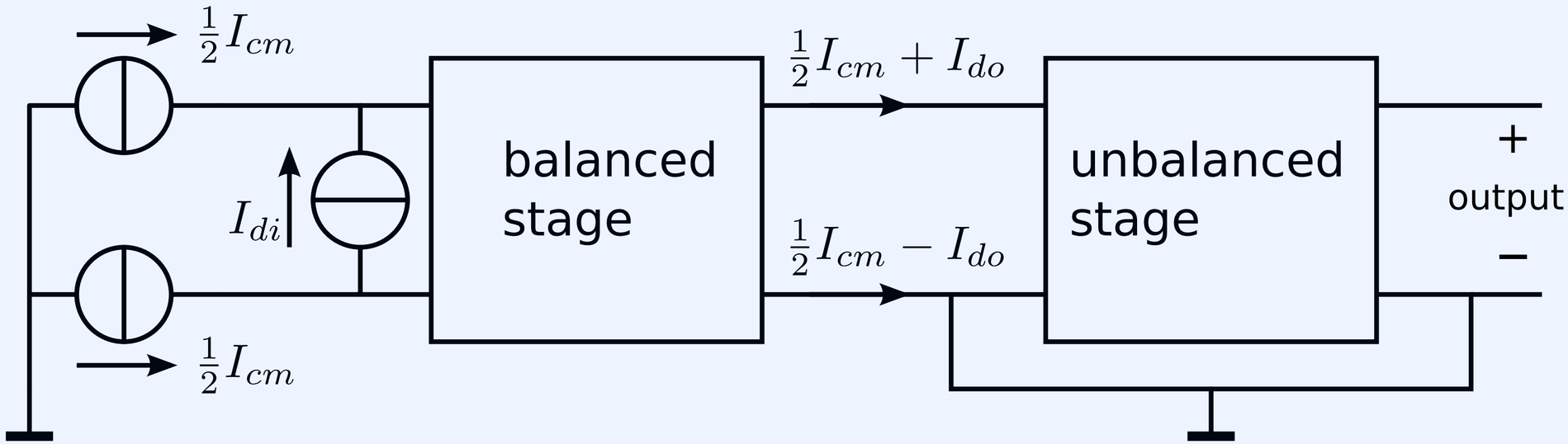


Simple two-transistor controller.
Input current of the second stage flows through the external network.

Popular 2-stage BJT amplifier:
Can you describe the operation of this circuit?



Balanced to unbalanced



Balanced to unbalanced