

Current Loop Transmitter Configurations

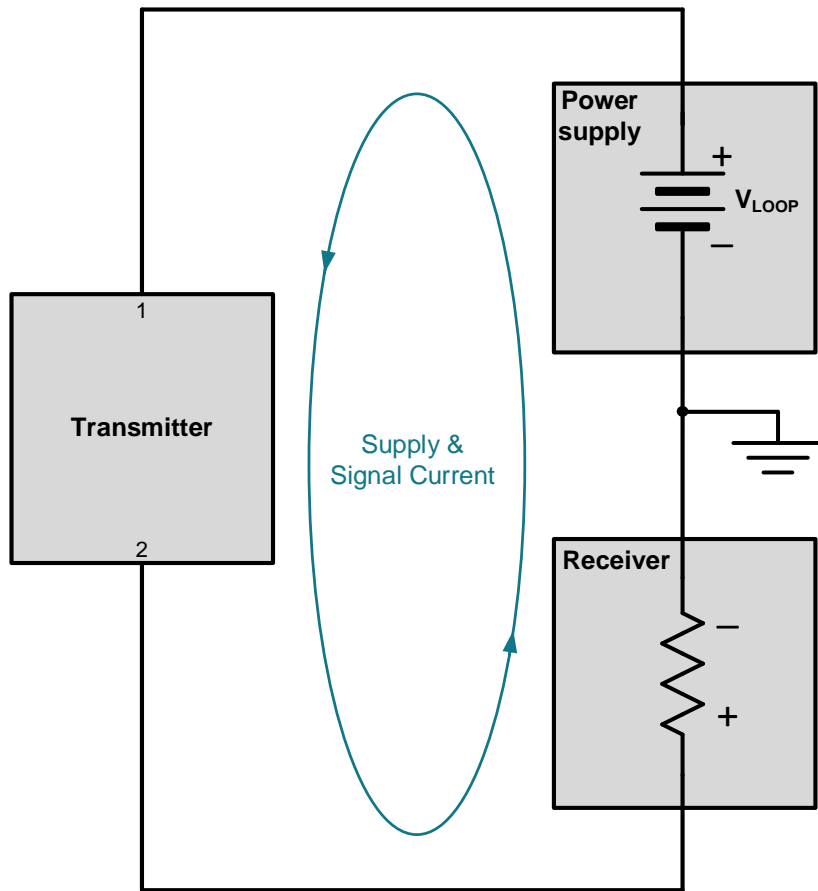
TI Precision Labs – Current Loop Transmitters

Presented by Katlynne Jones

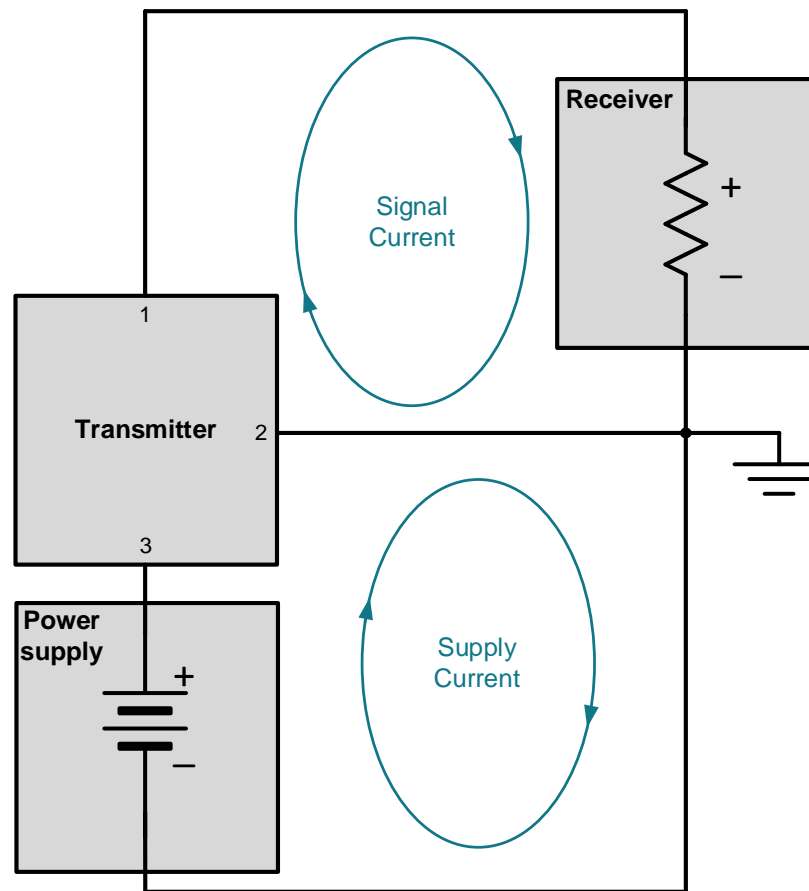
Prepared by Katlynne Jones

Transmitter configurations

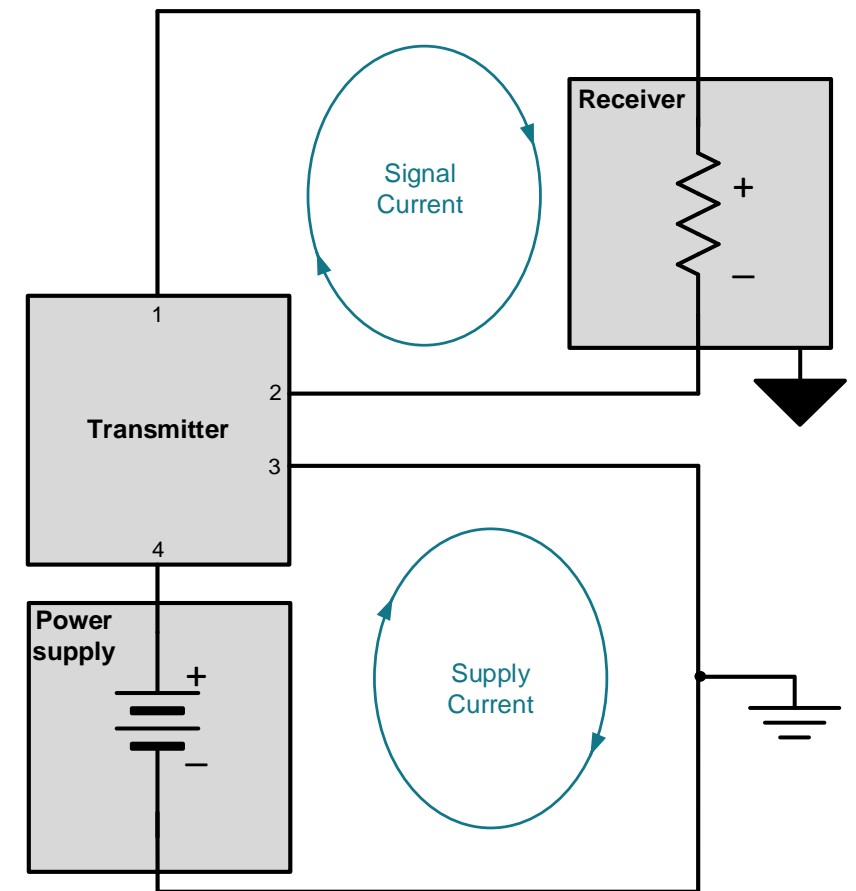
2-wire block diagram



3-wire block diagram



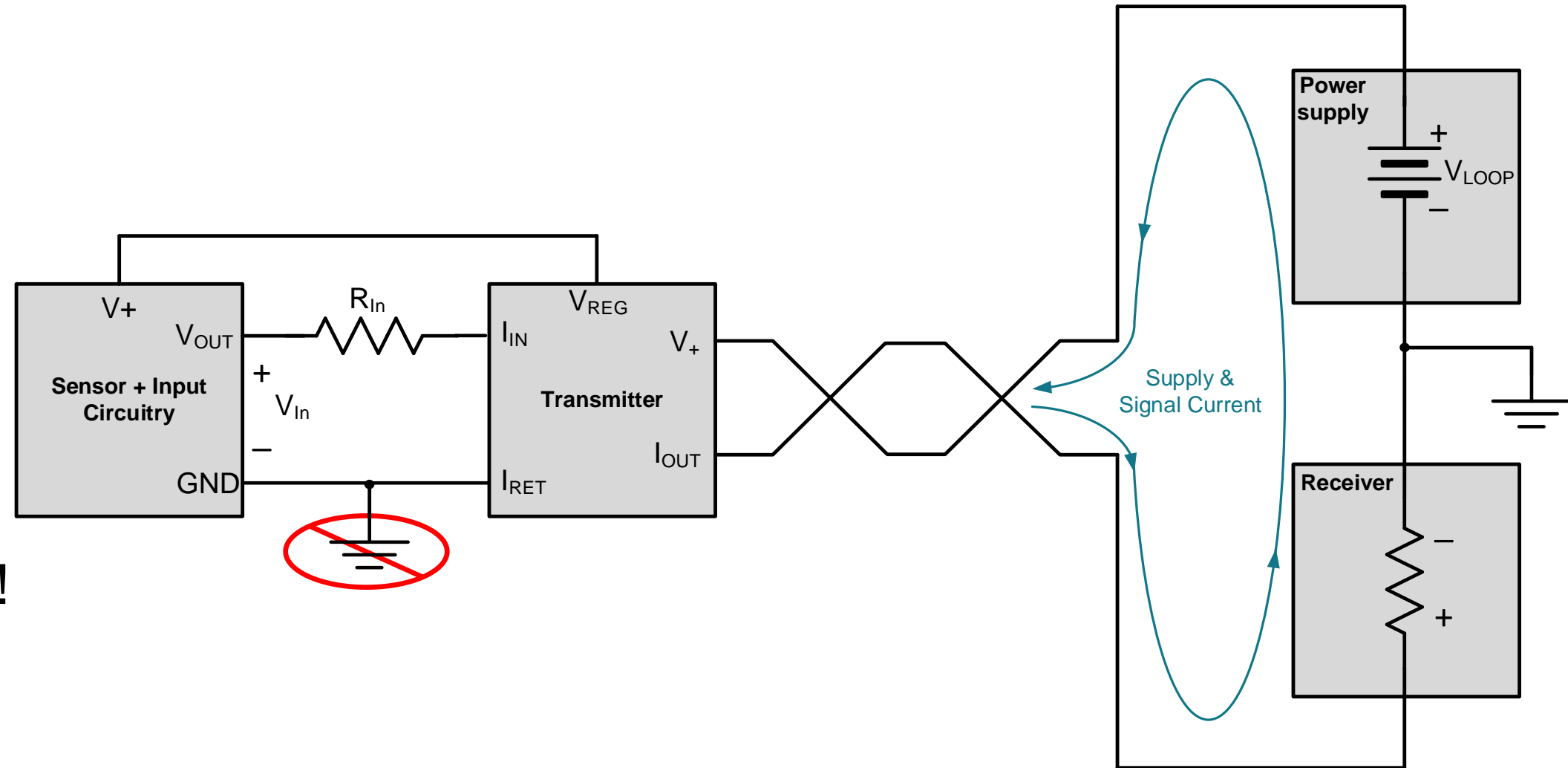
4-wire block diagram



2-wire transmitter

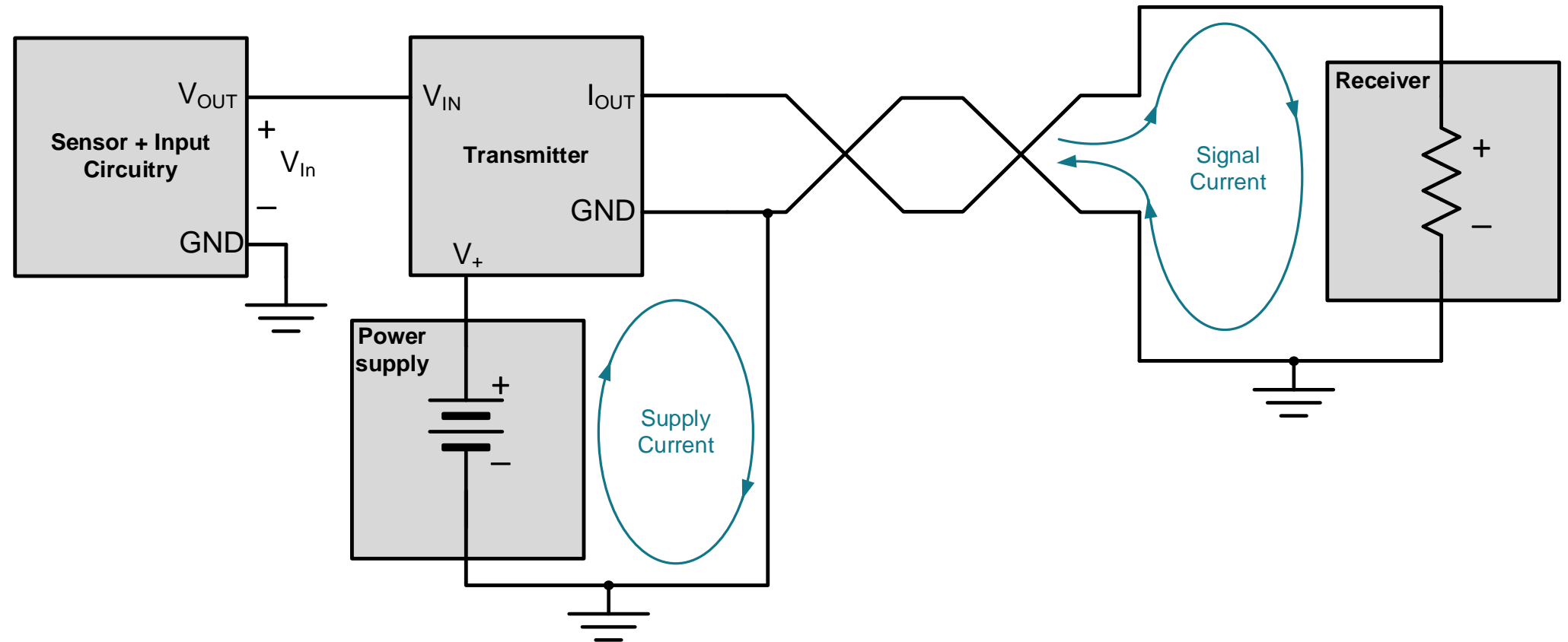
- 2-wire transmitter block diagram

- 2 wires create a loop that transmits the signal current and transmitter power
- I_{RET} cannot be grounded to V_{LOOP} !
- Transmitter, sensor, and input circuitry must consume $<4\text{mA}$



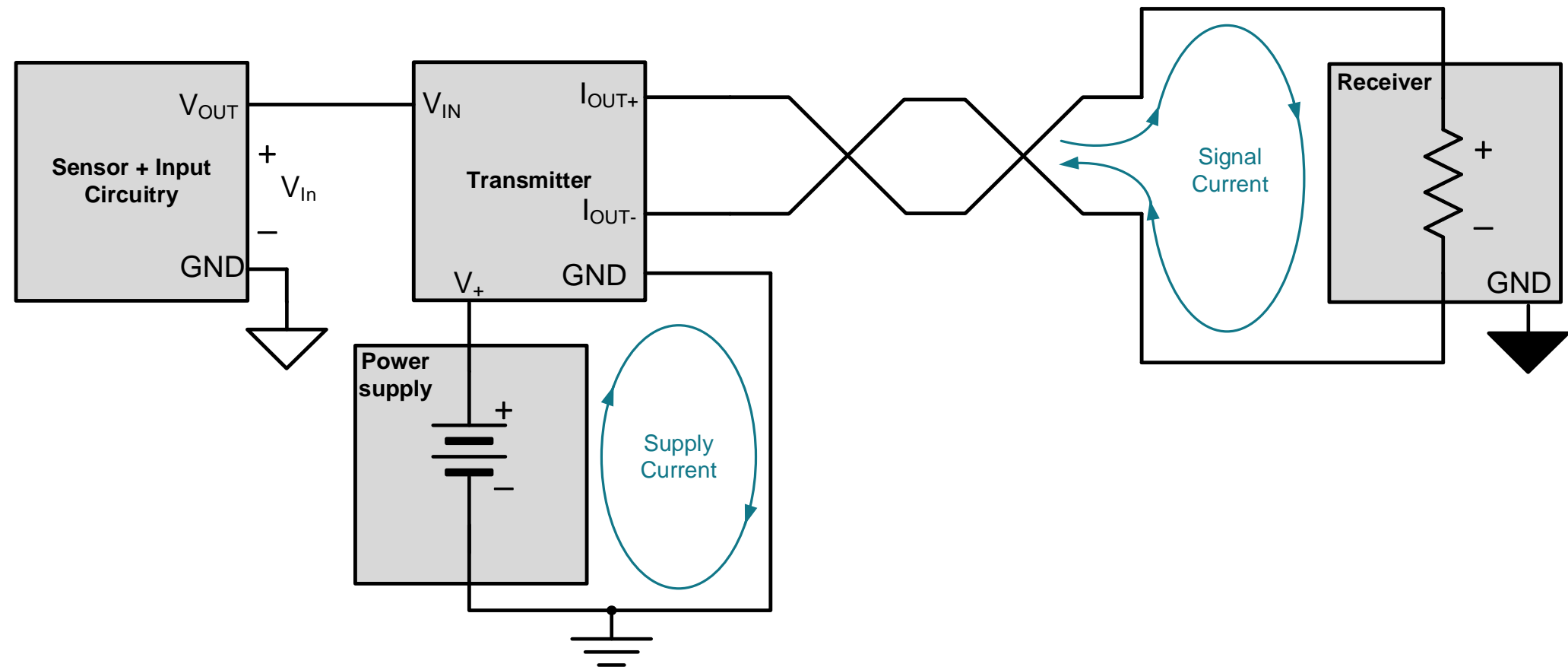
3-wire transmitter

- 3-wire transmitter block diagram
 - 3 wires create separate loops for the signal current and transmitter power
 - Transmitter ground is shared with the receiver
 - Can use 0-20mA, or 0-24mA ranges as well

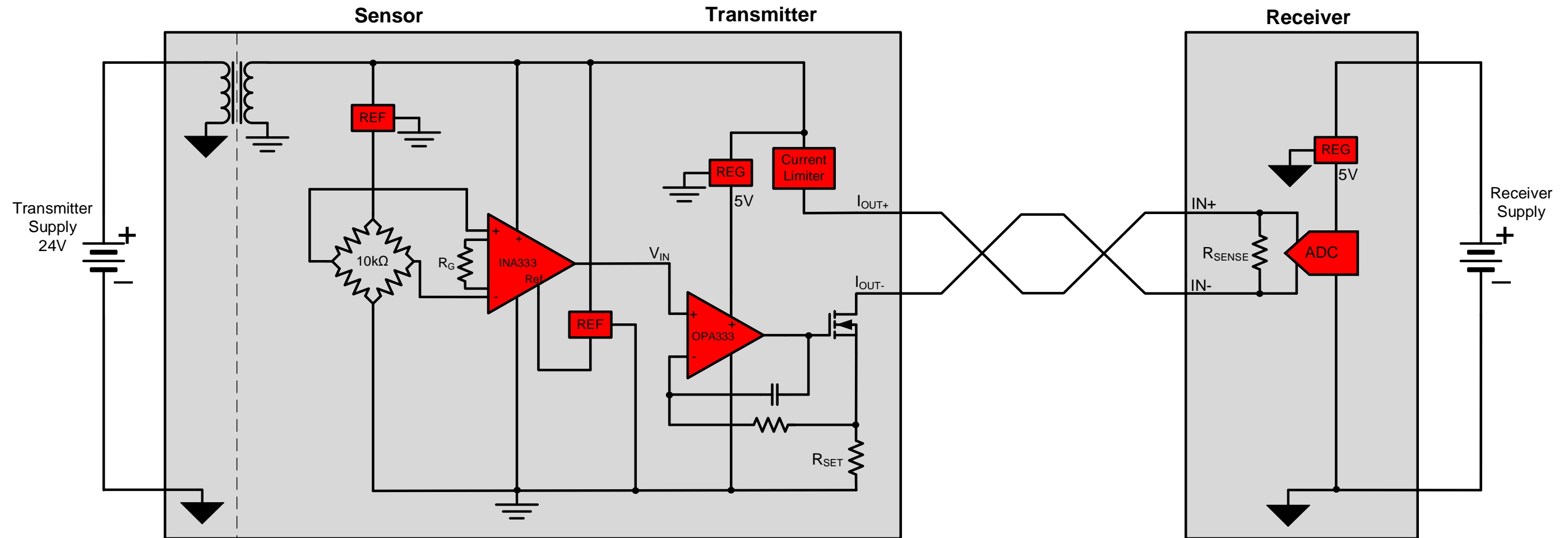


4-wire transmitter

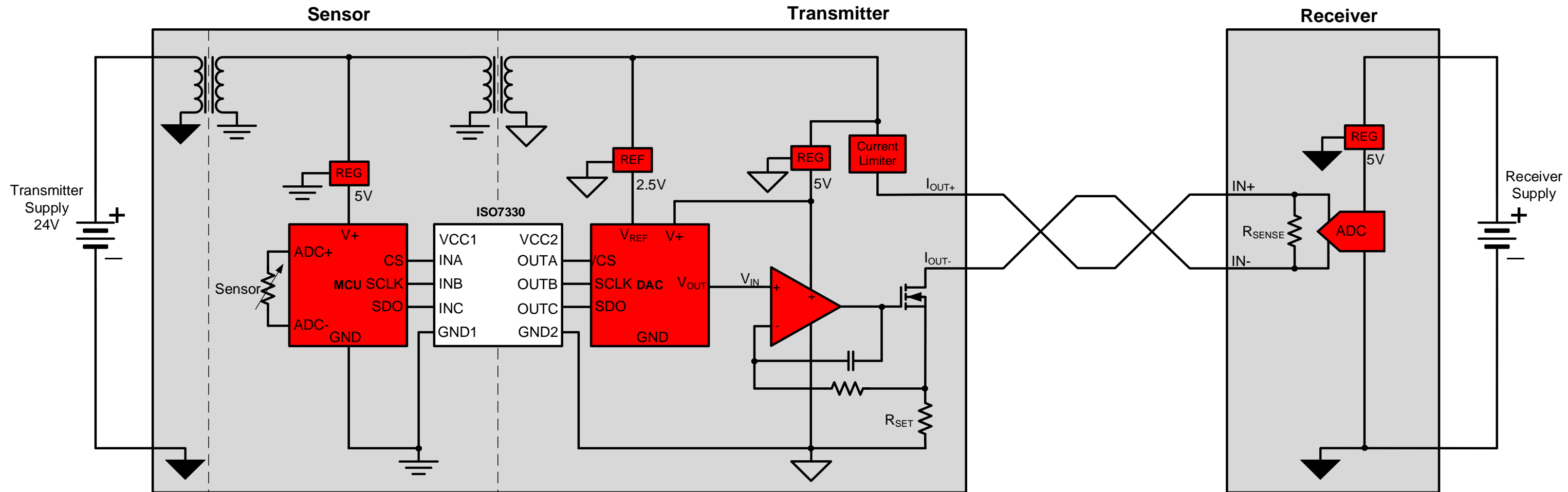
- 4-wire transmitter block diagram
 - 4 wires create separate loops for the signal current and transmitter power
 - Can use 0-20mA, or 0-24mA ranges as well
 - Additional isolation schemes



4-wire transmitter power isolated application

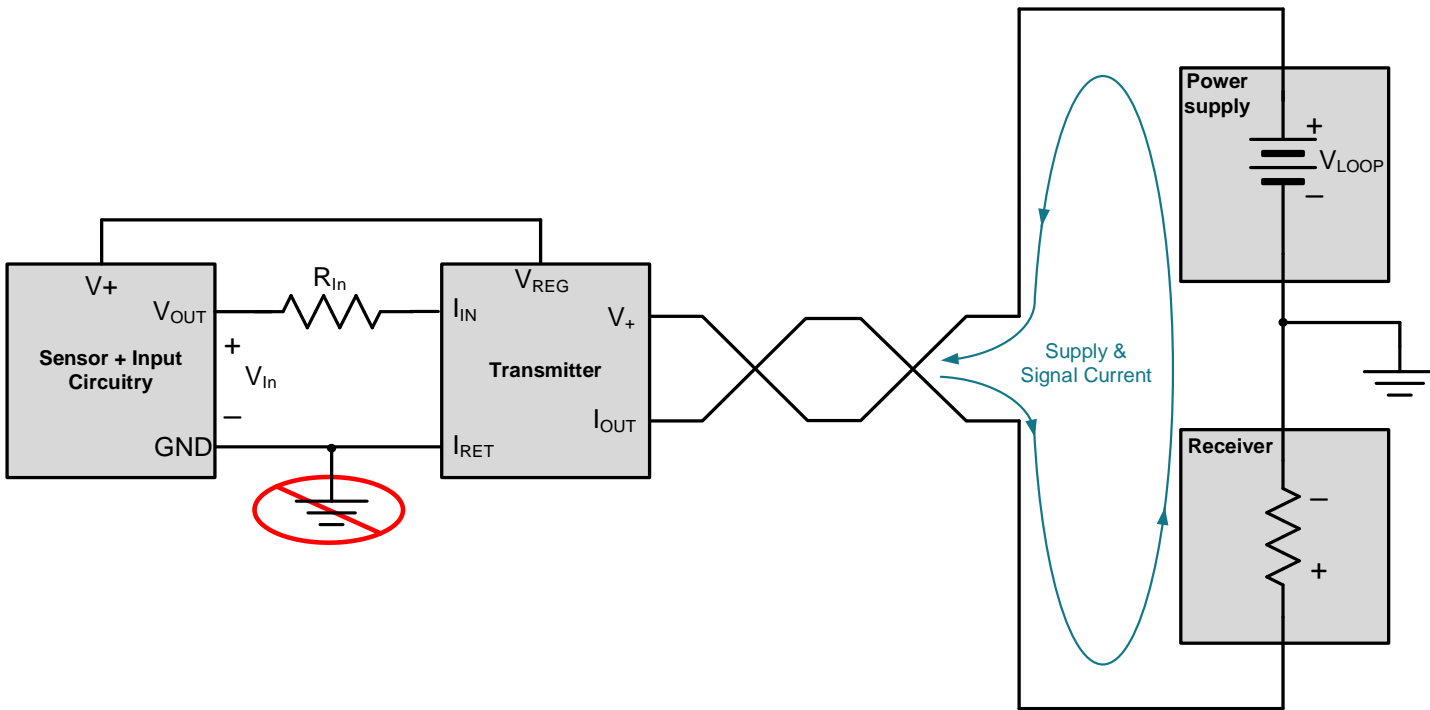


4-wire transmitter fully isolated application

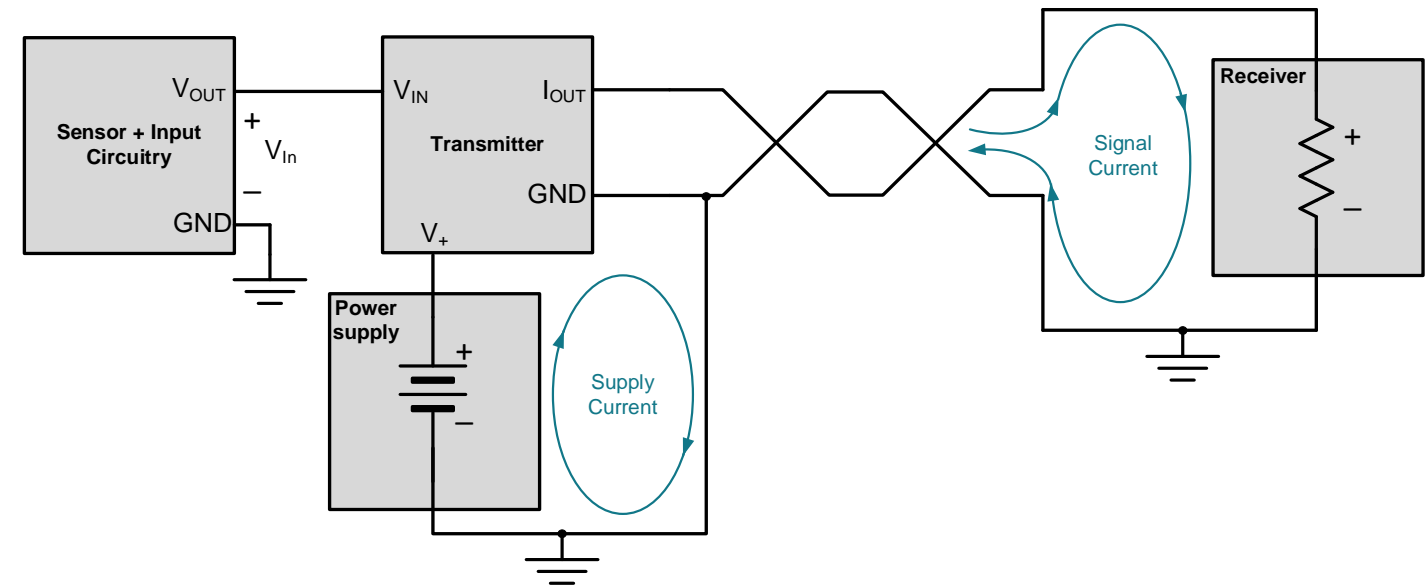


2-wire vs. 3-wire transmitters

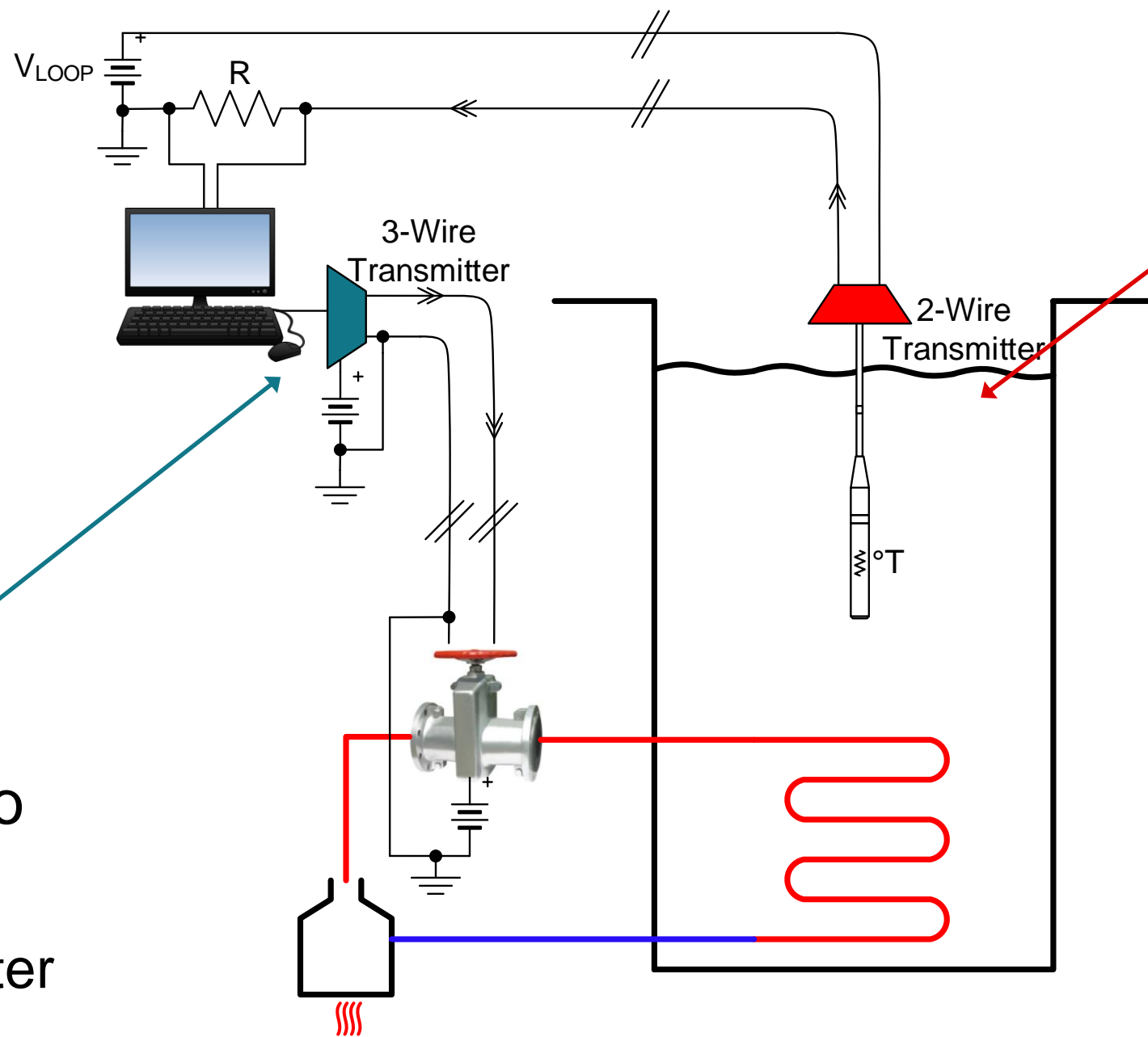
2-Wire transmitter



3-Wire transmitter



Typical 4-20mA applications



Transmit control signals from a control station out to a remote device.

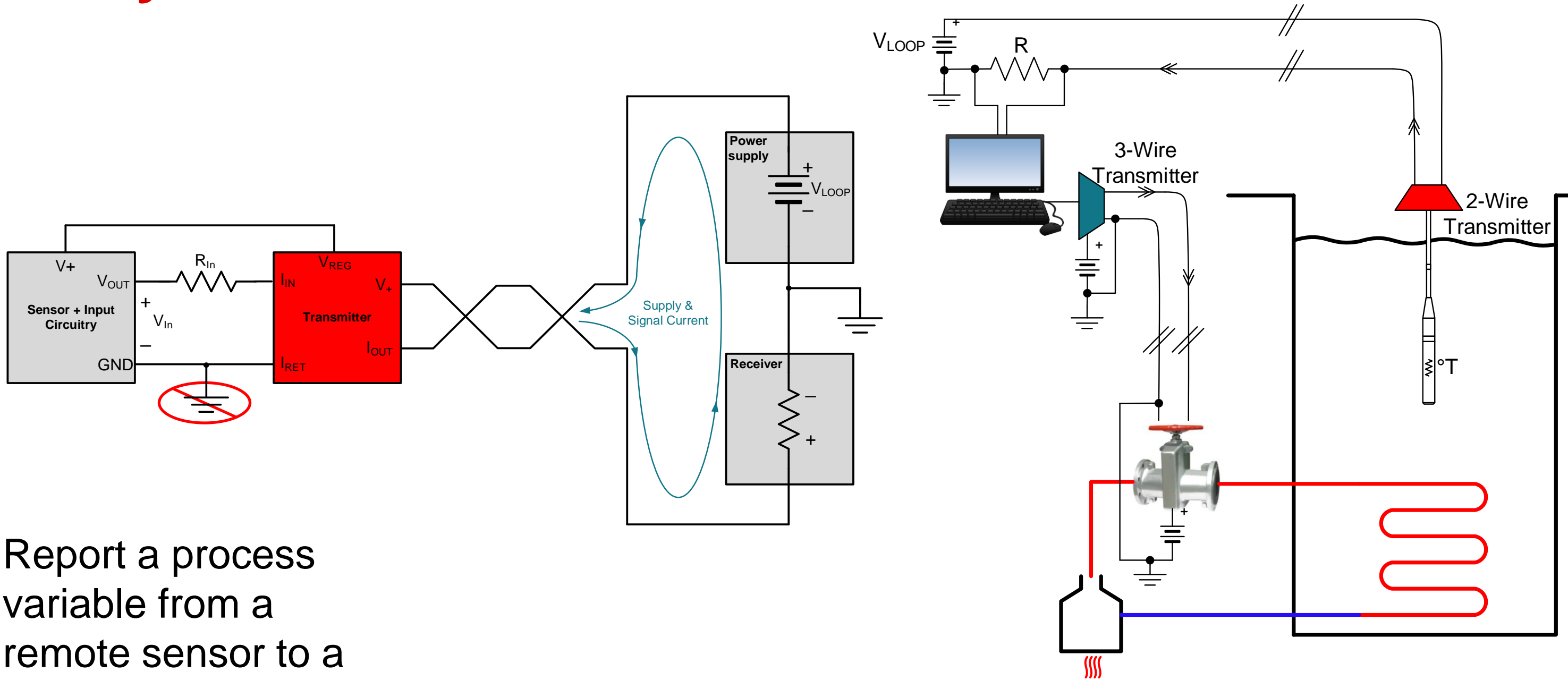
- Valve, actuator, heater
- 3-wire transmitter

Report a process variable from a remote sensor to a control station.

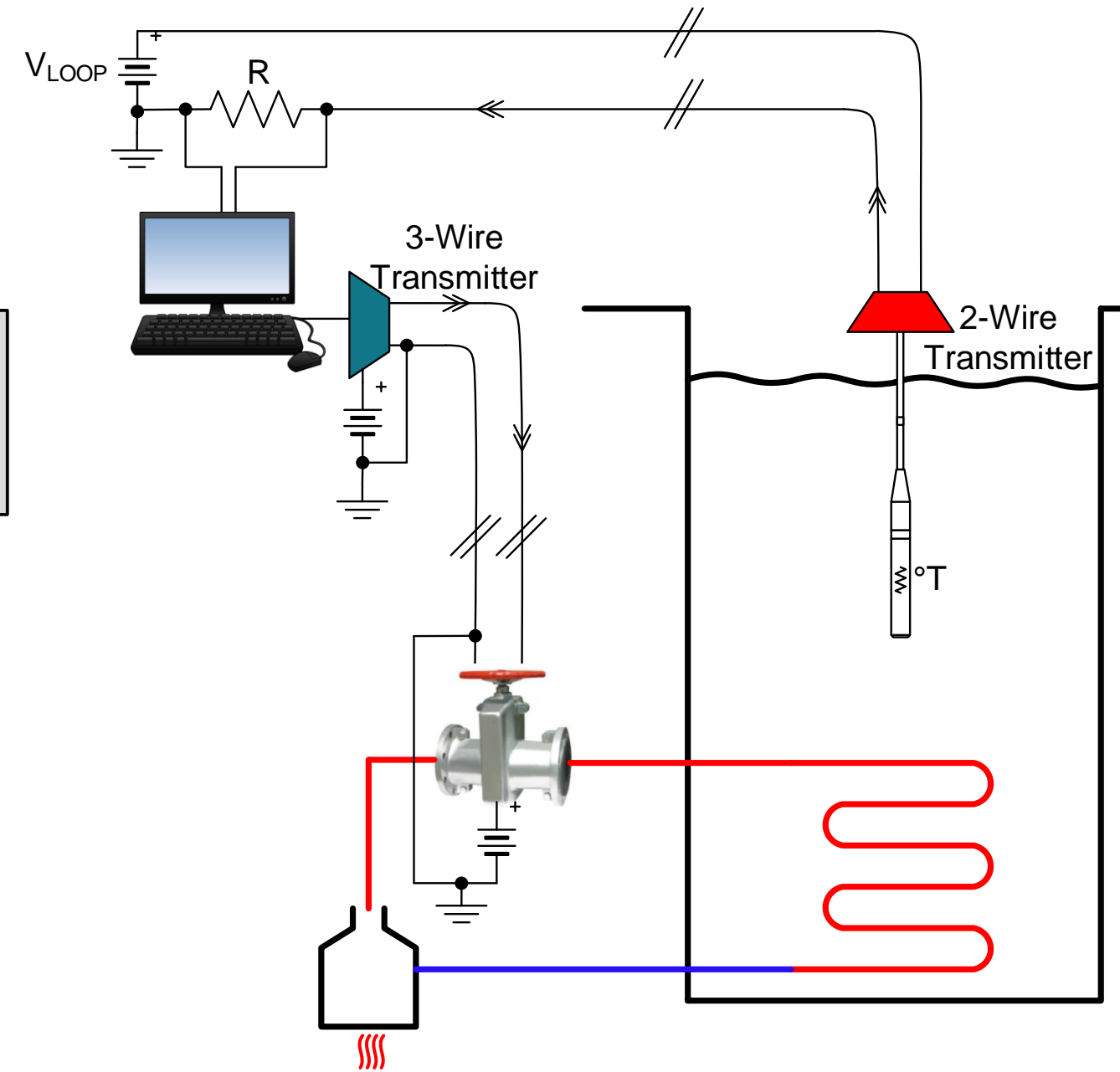
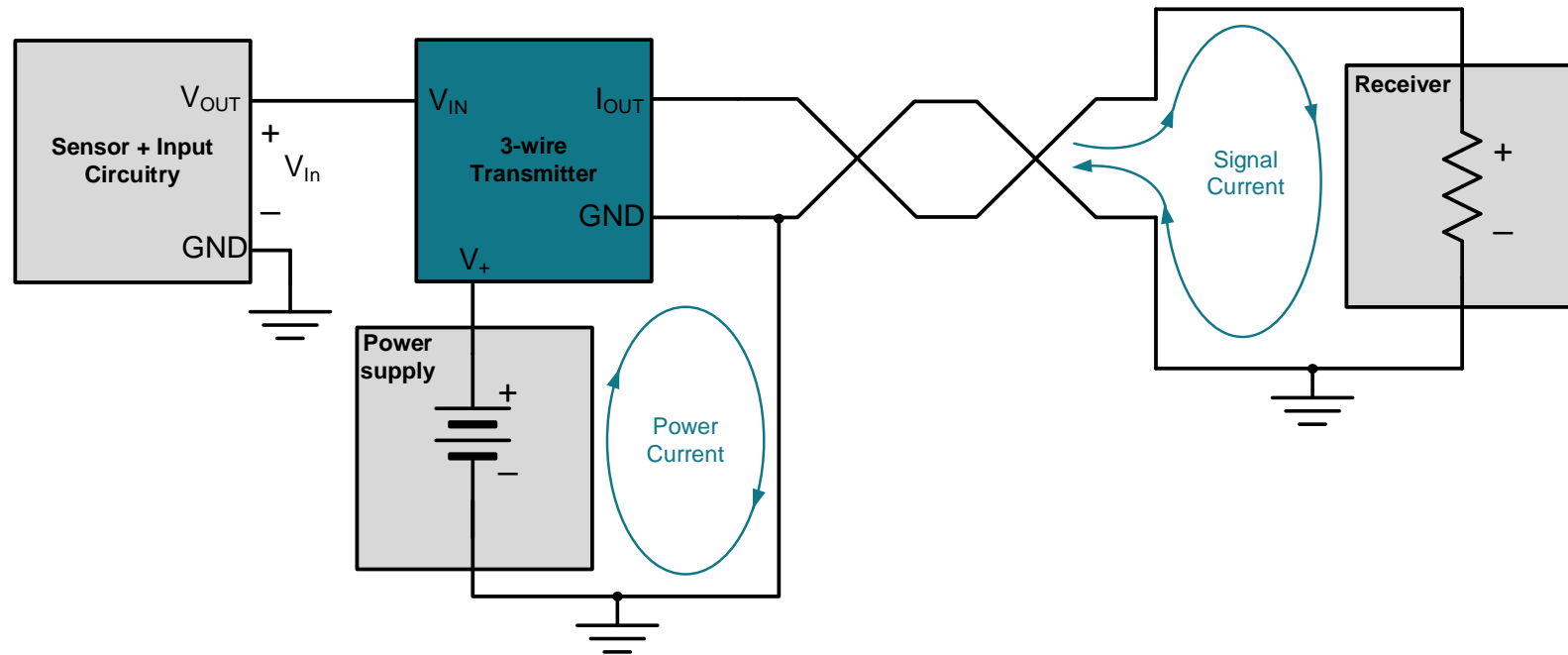
- Temperature, humidity, ambient light
- 2-wire transmitter

Why use 2-wire

Report a process variable from a remote sensor to a control station.



Why use 3-wire

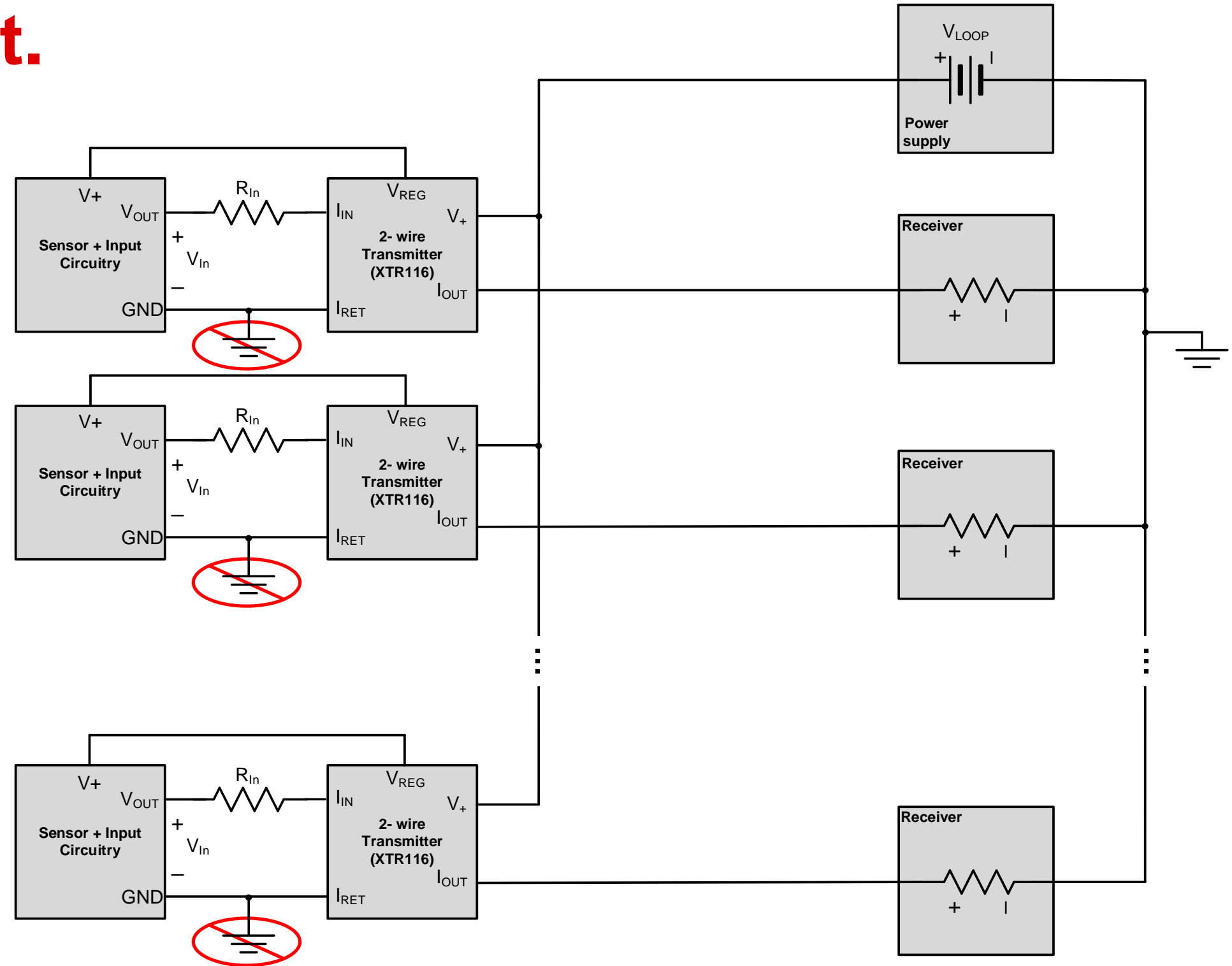


Transmit control signals from a control station out to a remote device.

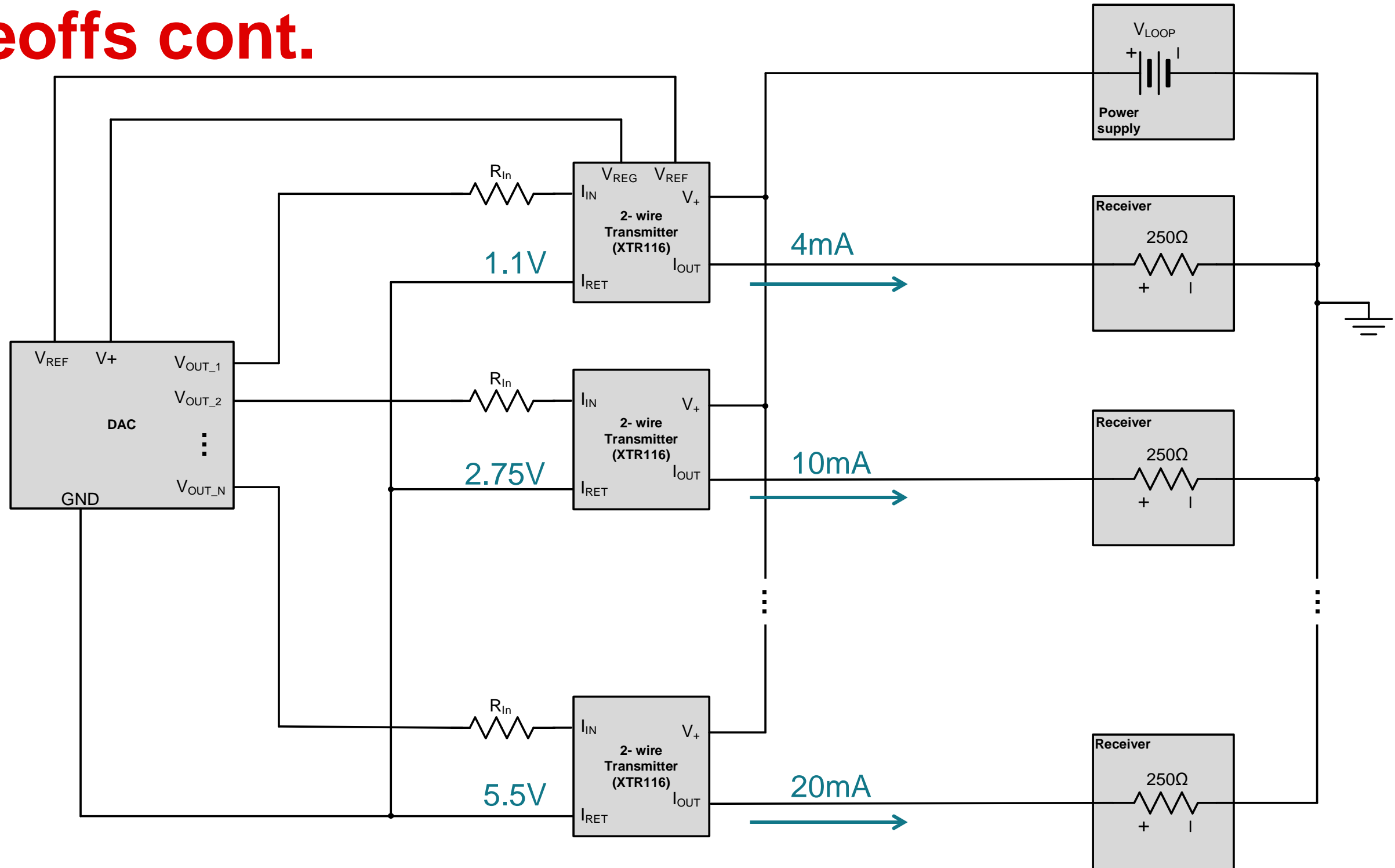
Tradeoffs

- Cost
 - 2-wire tends to be lower cost. 3-wire requires a third cable and if locally powered, requires an additional supply.
- Design
 - More considerations in designing a 2-wire transmitter when supplying the driving circuitry from the transmitter.
 - 4mA current budget
 - Must not connect I_{RET} to V_{LOOP} ground
 - Cannot connect multiple 2-wire transmitters to sensors or DACs with multiple outputs.

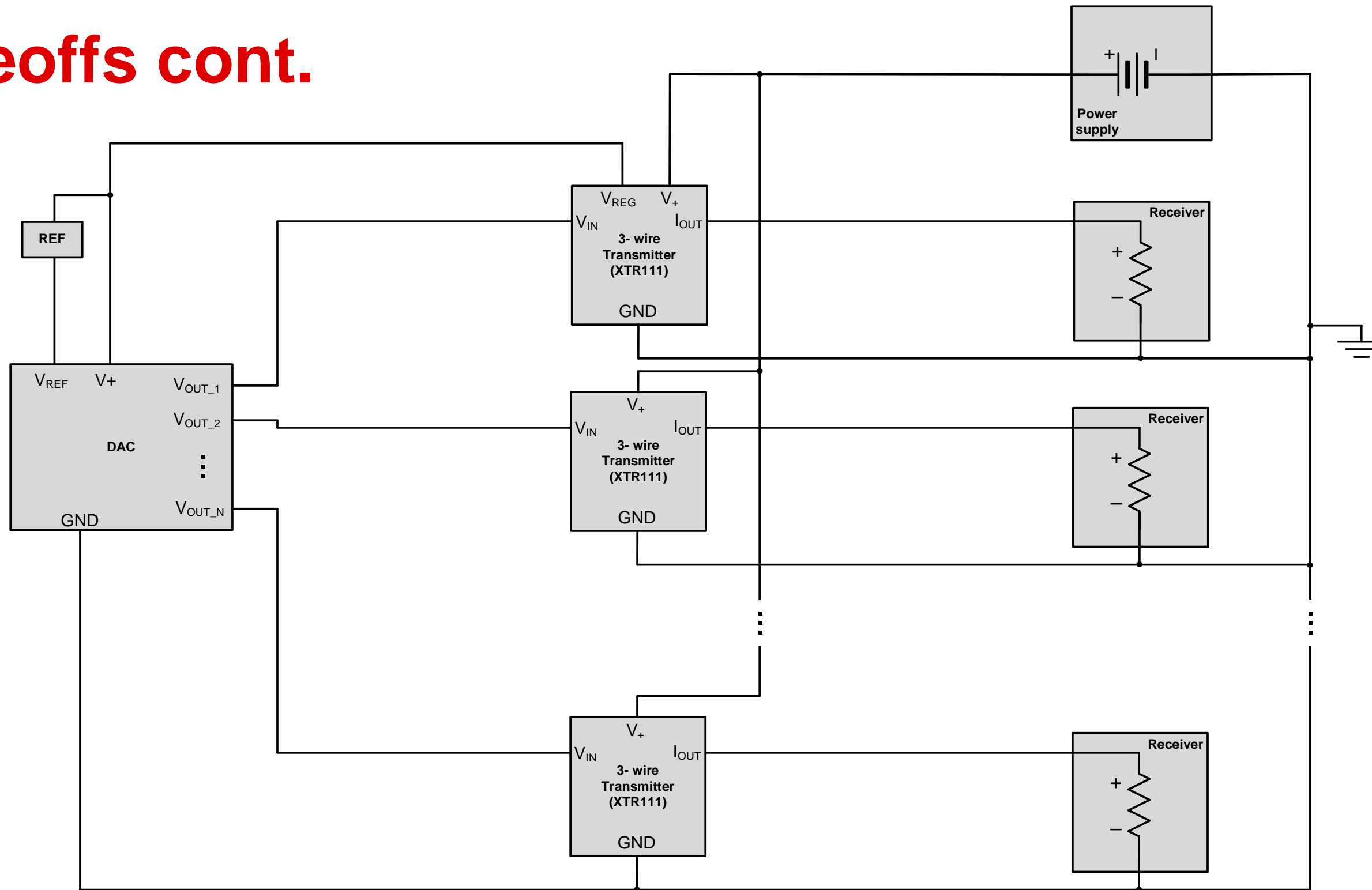
Tradeoffs cont.



Tradeoffs cont.



Tradeoffs cont.



Thanks for your time!
Please try the quiz.

To find more Current Transmitter technical resources and search products, visit:

<https://www.ti.com/amplifier-circuit/special-function/4-20ma-signal-conditioners.html>