Choosing PNP vs NPN and NO vs NC
Basic electrical wiring in typical automation sensor applications

PNP or NPN? How does the sensor provide its signal to the controller?

### PNP (sourcing)
- Sensor delivers (sources) positive 24V DC to the load or input

### VS

### NPN (sinking)
- Sensor connects (sinks) Negative or 0V DC common to the load or input

#### Benefits and Info
- More widely stocked in North America and European component suppliers
- More commonly used in North American and European automation equipment

#### Gotchas
- Sensors are more vulnerable to short circuit states
- Sensor vs PLC perspective: Ambiguity
  - Sensor: Sourcing
  - PLC: Sinking

#### Benefits and Info
- More widely stocked in Asia and Asian transplant component suppliers
- More commonly used in Asia and Asian transplant automation equipment

#### Gotchas
- An unintentional grounded load can cause false signal detection at PLC
- Sensor vs PLC perspective: Ambiguity
  - Sensor: Sinking
  - PLC: Sourcing

Why NO or NC? Selecting the state of the unpowered device.

### Normally Open (NO, N/O) VS Normally Closed (NC, N/C) VS Complimentary (NO+NC)

#### What is it?
- Sensor provides signal when target is present
  - Pin 4: BK
  - Pin 2: WH

#### Benefits and Info
- Typically pin 4 of sensor (BK)
- Most common usage for automation sensors
- Positive detection (signal with target)

#### Gotchas
- Can be software designed to be normally closed in PLC logic
- No signal if target present but broken wire (signal can’t pass broken wire)
- False detection if short circuit

- Sensor provides signal when target is absent
  - Pin 2: WH
  - Pin 4: BK

#### Benefits and Info
- Typically pin 2 of sensor (WH)
- Broken wire detection
- Negative detection (signal when target missing)

#### Gotchas
- Can be designed around with PLC logic
- False detection of target if broken wire (looks like target present)

#### Benefits and Info
- Provides status on sensor presence
- Used for logic decisions made later, can require more wiring and inputs

#### Gotchas
- Some vendors offer sensors with normally closed on pin 4 (BK)
- Requires 4-wire cable