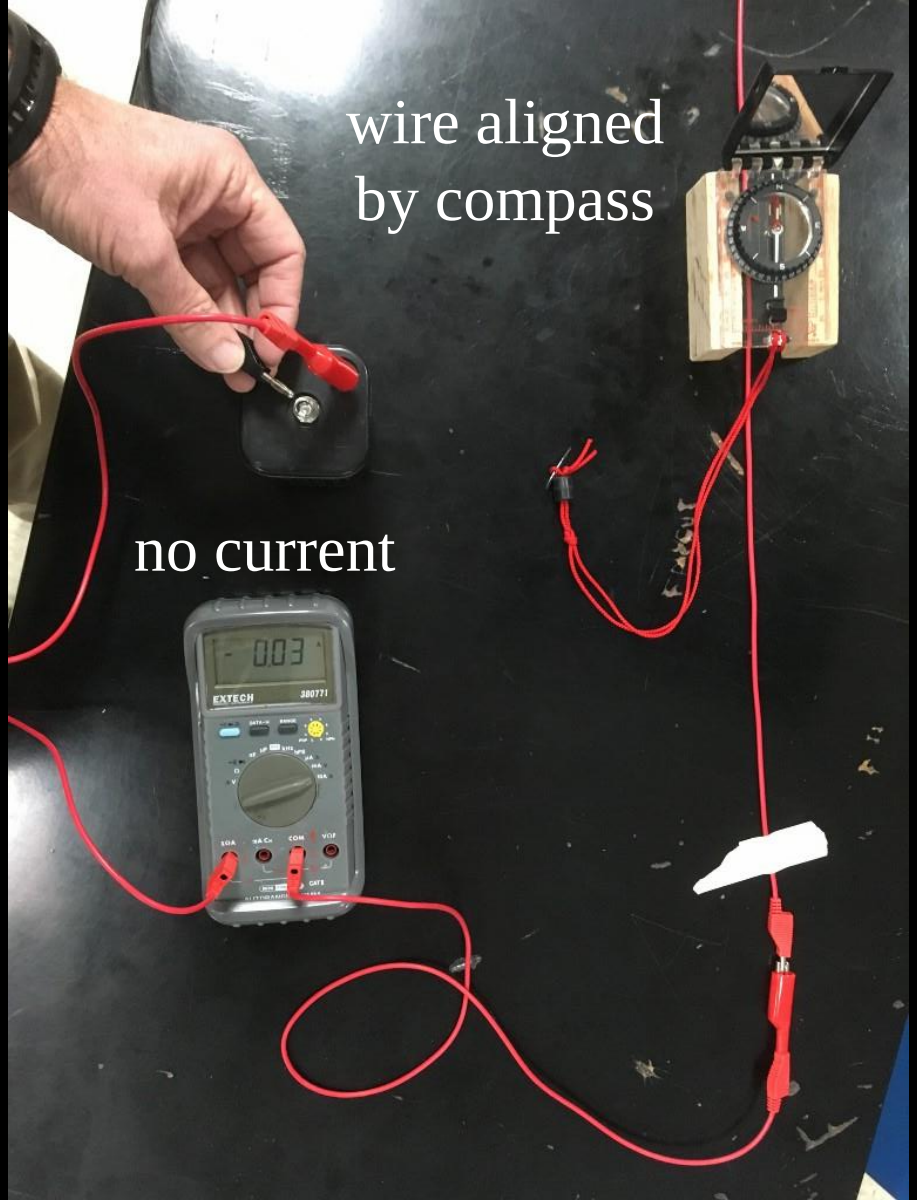
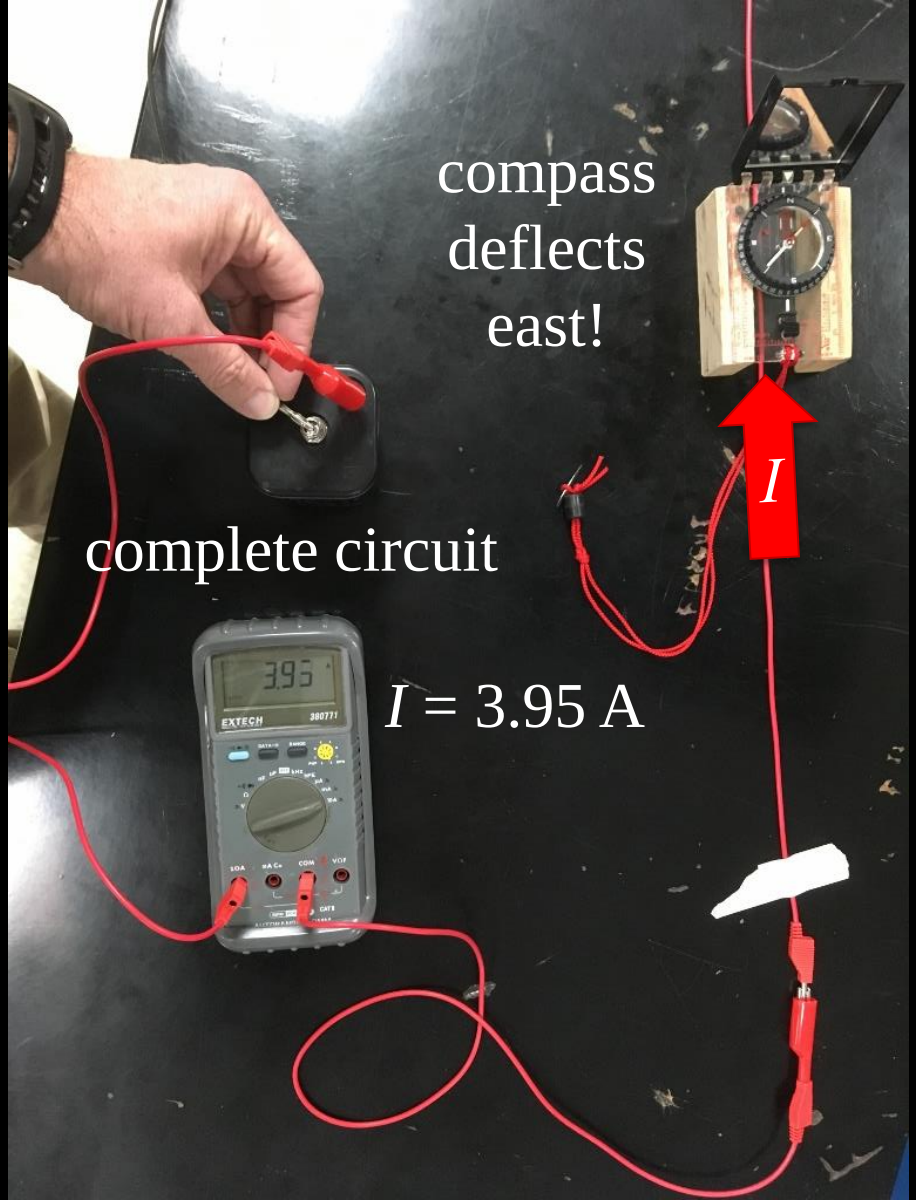
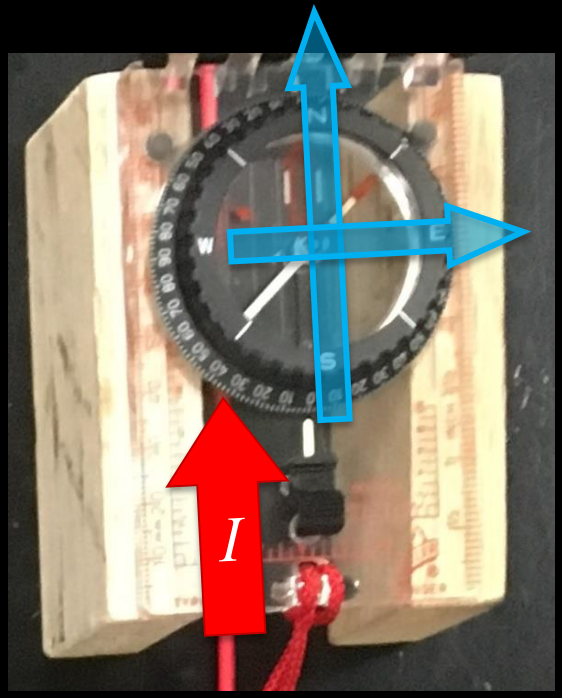
Mini-Lab: Magnetic Field of a Current

1. Goal: Demonstrate the field of a long straight current.
2. Use a compass to align a jumper cable with magnetic north and tape each end to the table stretched taut.
3. Prepare, but do not complete, a circuit with this wire, an ammeter (use the 10 A input), and a 6 V battery.
4. Support the compass a few centimeters above the wire's center and then complete the circuit briefly – only a few seconds. Record: height above the wire, deflection angle, and current. Repeat at a different distance – try doubling!
5. Use earth's field and deflection of compass to find the apparent field of the wire – compare to the field found by theoretical formula. Determine the percent difference.


wire aligned
by compass
no current
- 0.03
EXTECH
380771


compass
deflects
east!
I
complete circuit
3.95
EXTECH
380771
I = 3.95 A

earth's field:
horizontal component = 22 μT
(parallel to wire)



B_{wire} = ??

data:
I = 3.95 A
θ = 42°
h = 4.1 cm

Find B_{wire} two ways:
use deflection θ of compass
and earth's known field,
use current I and distance h
and equation from theory.