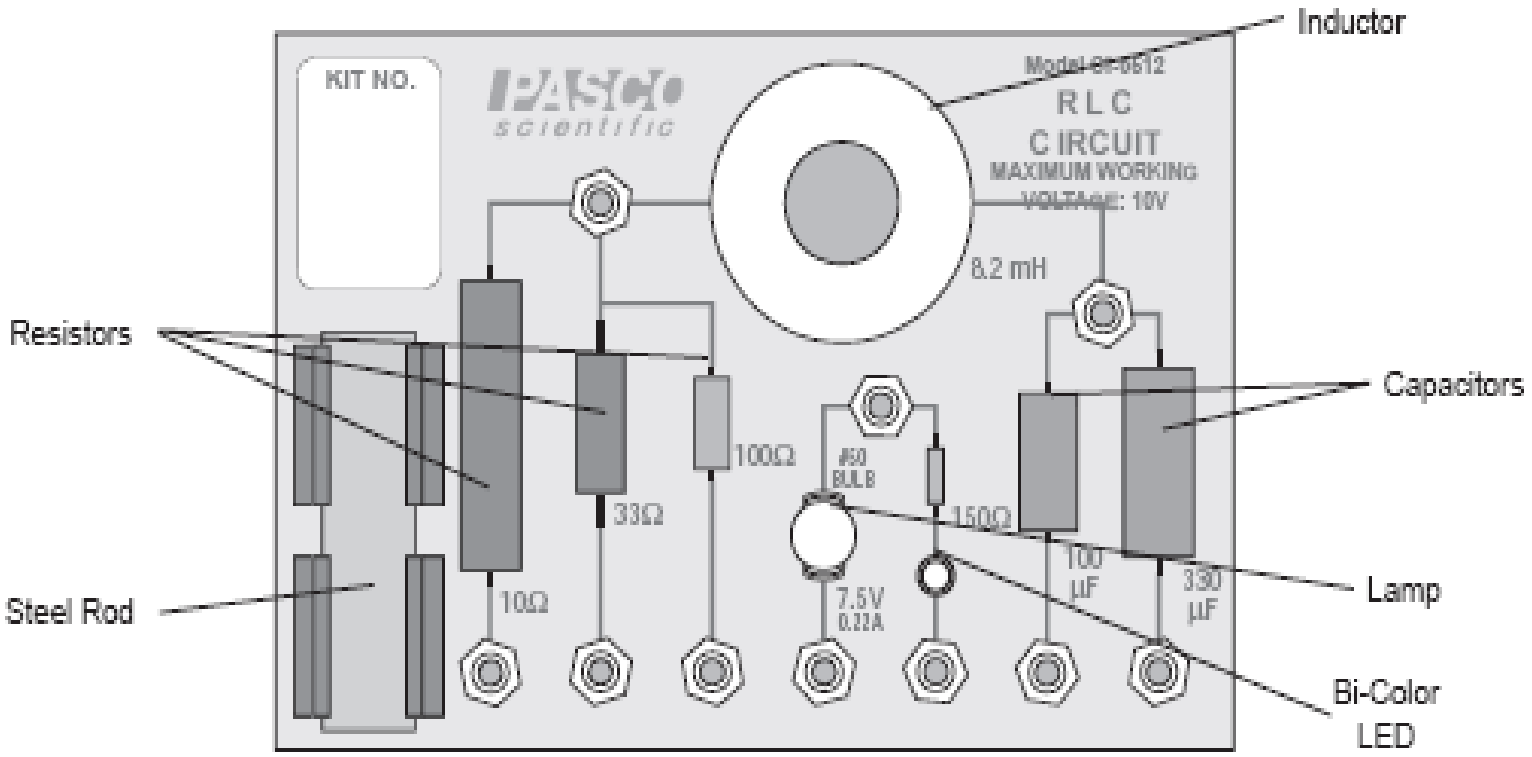
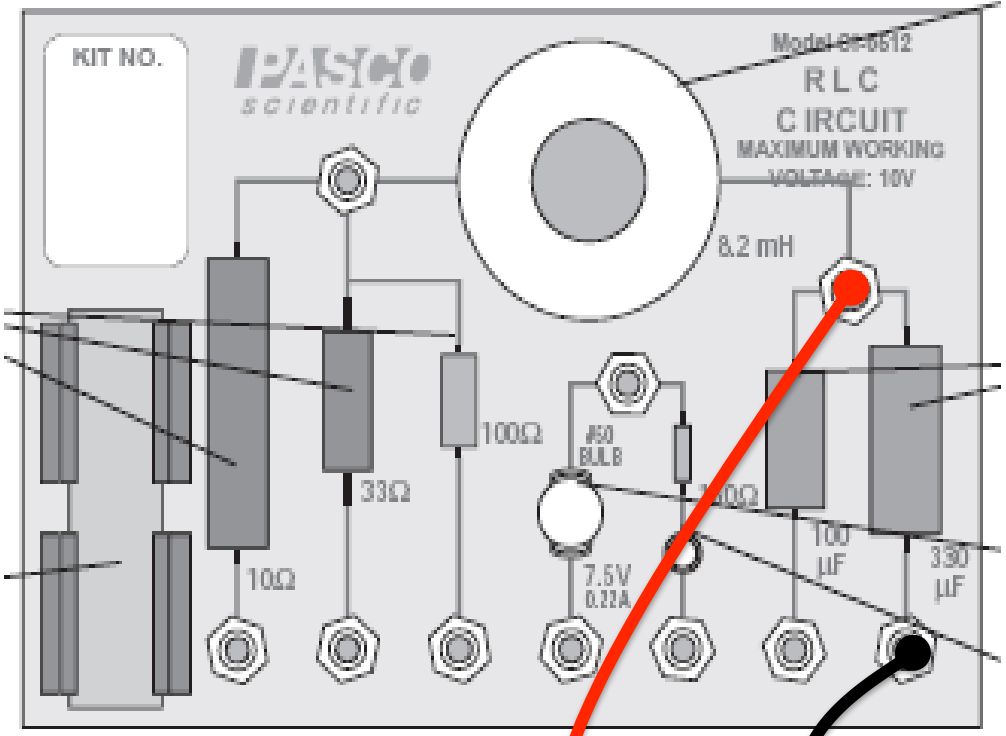
Capacitor Lab

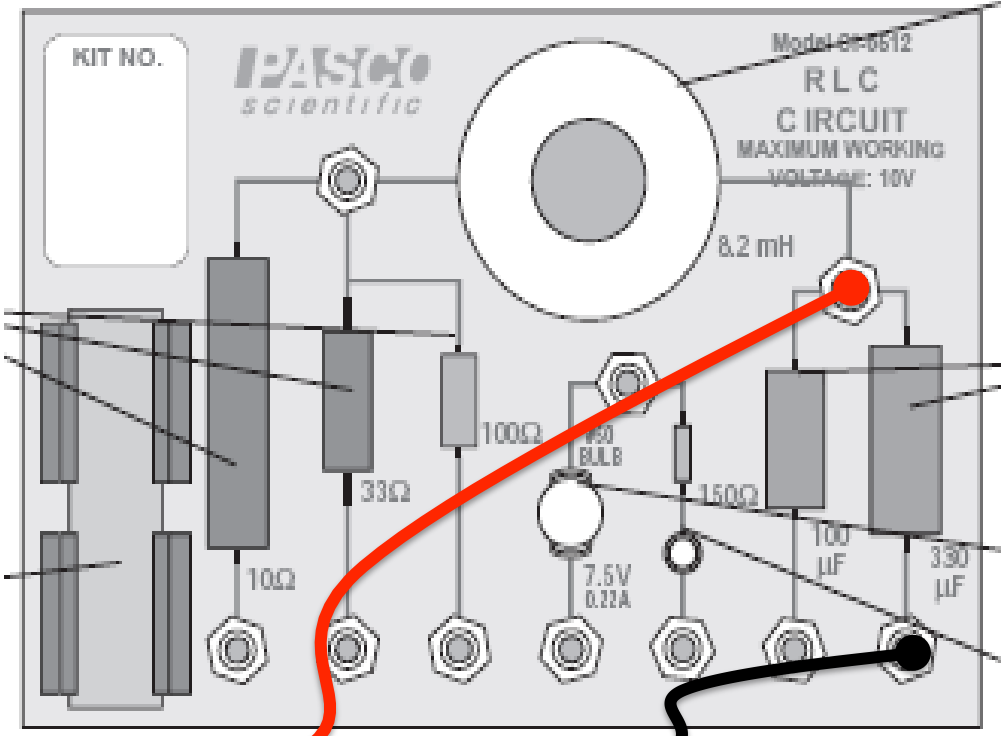
Basic Properties


Inductor
KIT NO.
scientific
Model ER-0512
R L C
C IRCUIT
MAXIMUM WORKING
VOLTAGE: 10V
8.2 mH
Resistors
Capacitors
100Ω
#50
BULB
33Ω
150Ω
100
µF
330
µF
Steel Rod
10Ω
7.5V
0.22A
Lamp
Bi-Color
LED


KIT NO.
PASCO
scientific
Model CI-6512
R L C
C IRCUIT
MAXIMUM WORKING
VOLTAGE: 10V
8.2 mH
100Ω
#50
BULB
33Ω
10Ω
7.5V
0.22A
100
µF
330
µF


RAYOVAC
Heavy Duty

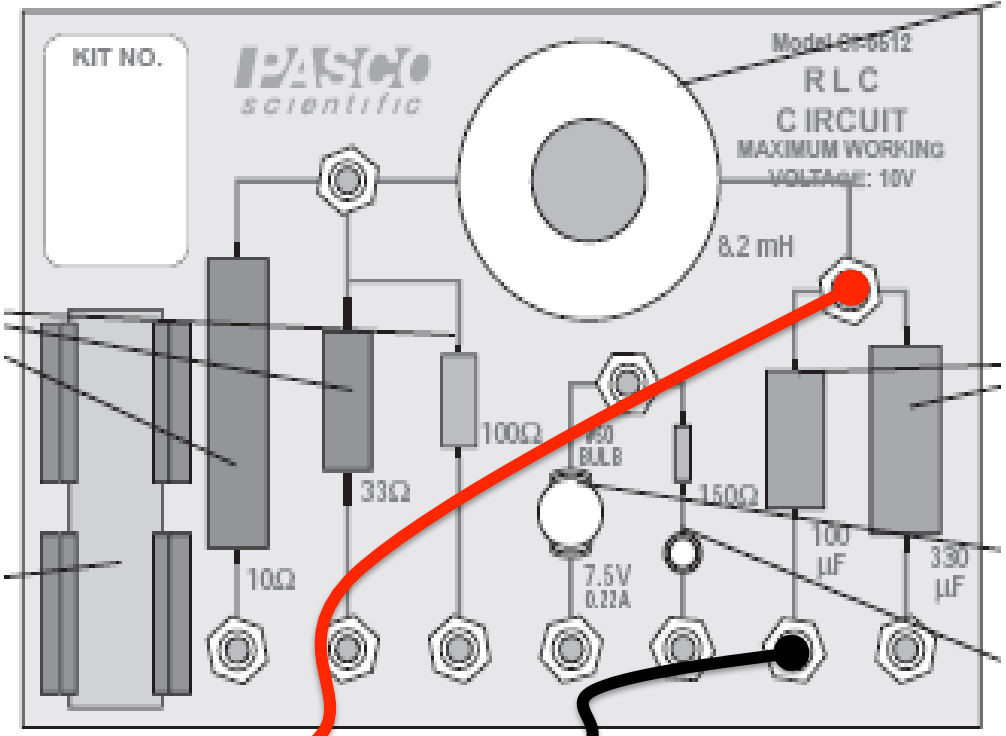

1.531
V
EXTECH
380771
DATA-H
RANGE
nF
µF
kHz
hFE
µA
mA
10A
Ω
V
10A
mA Cx
COM
CAT II


KIT NO.
PASCO
scientific
Model CI-6512
R L C
C IRCUIT
MAXIMUM WORKING
VOLTAGE: 10V
8.2 mH
100Ω
33Ω
10Ω
BULB
7.5V
0.22A
150Ω
100
µF
330
µF


RAYOVAC
Heavy Duty

Charging

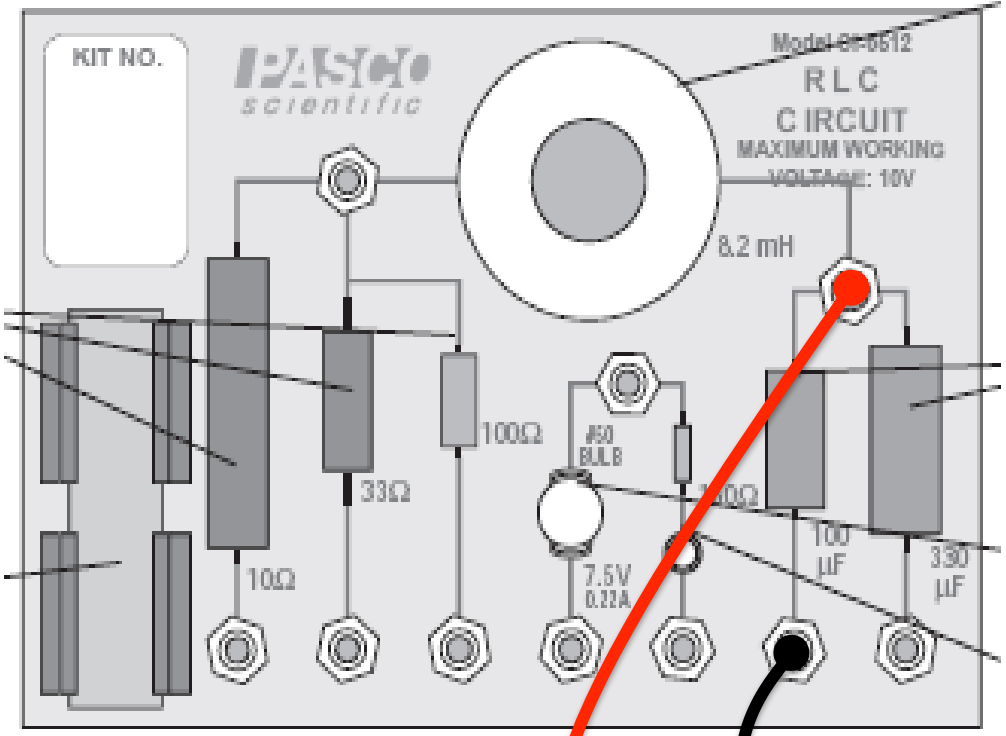

1.531
EXTECH
380771
DATA-H
RANGE
nF
µF
kHz
hFE
µA
mA
10A
Ω
V
10A
mA Cx
COM
CAT II


KIT NO.
PASCO
scientific
Model CI-6512
RLC
CIRCUIT
MAXIMUM WORKING
VOLTAGE: 10V
8.2 mH
10Ω
33Ω
100Ω
BULB
7.5V
0.22A
150Ω
100
μF
330
μF


RAYOVAC
Heavy Duty

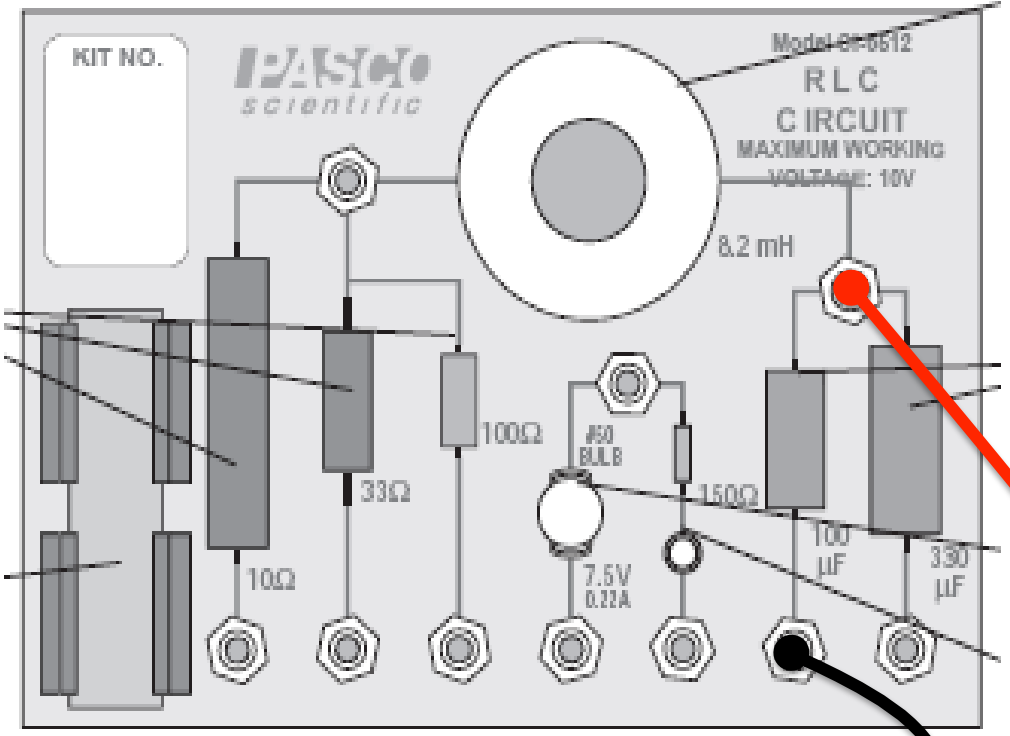
Charging


1.531
EXTECH
380771
DATA-H
RANGE
nF
μF
kHz
hFE
μA
Ω
mA
V
10A
10A
mA Cx
COM
VΩF
CAT II


KIT NO.
PASCO
scientific
Model CI-6512
R L C
C IRCUIT
MAXIMUM WORKING
VOLTAGE: 10V
8.2 mH
100Ω
#50
BULB
33Ω
10Ω
7.5V
0.22A
100
µF
330
µF

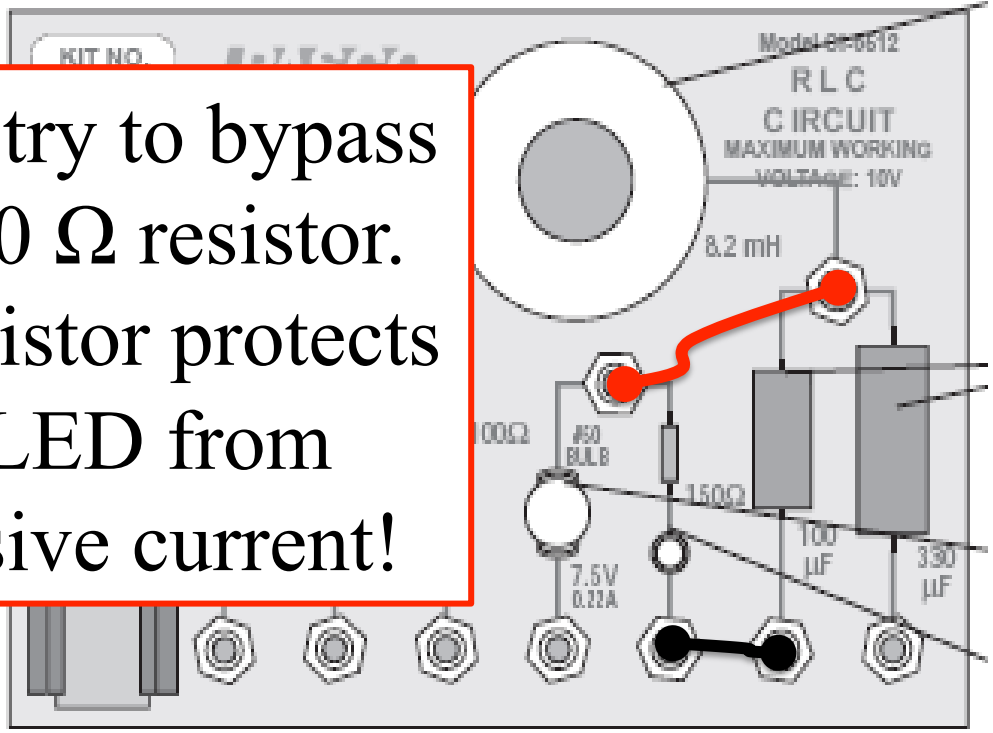

RAYOVAC
Heavy Duty


1.531
V
EXTECH
380771
DATA-H
RANGE
nF
µF
kHz
hFE
µA
mA
10A
Ω
V
10A
mA Cx
COM
CAT II

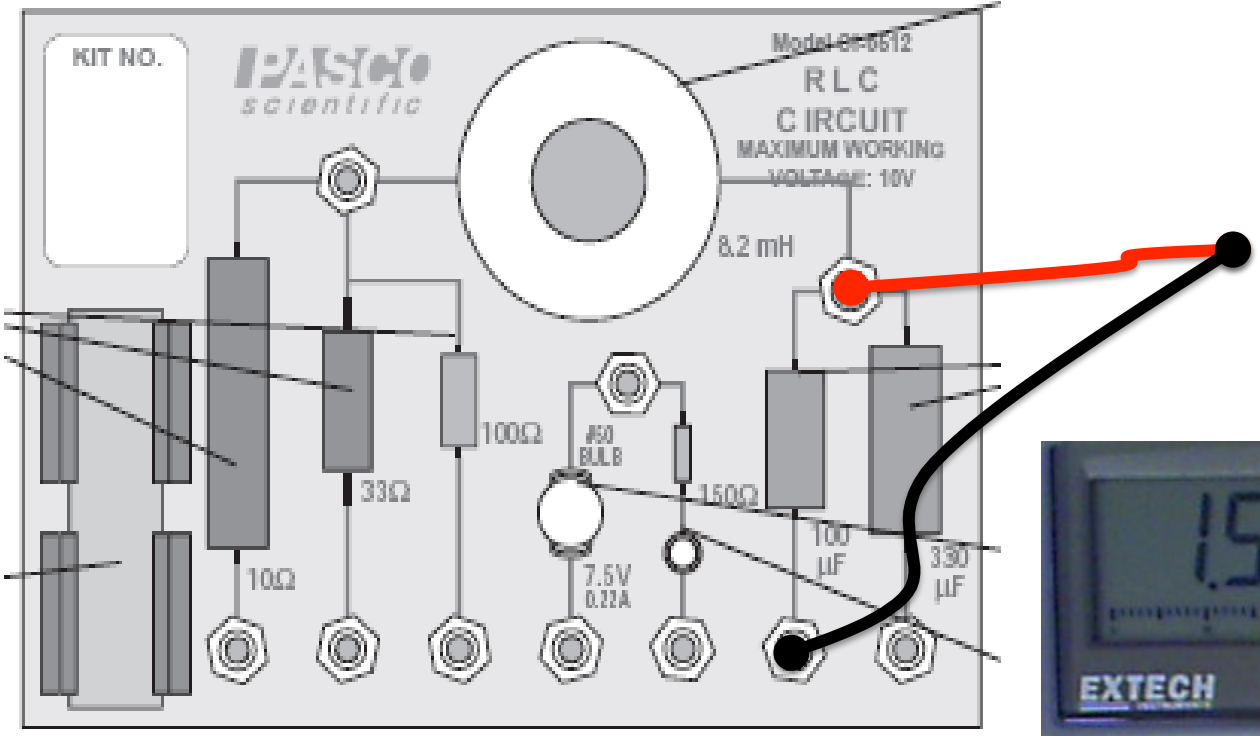


Measuring voltage

Do not try to bypass the 150 Ω resistor. The resistor protects the LED from excessive current!



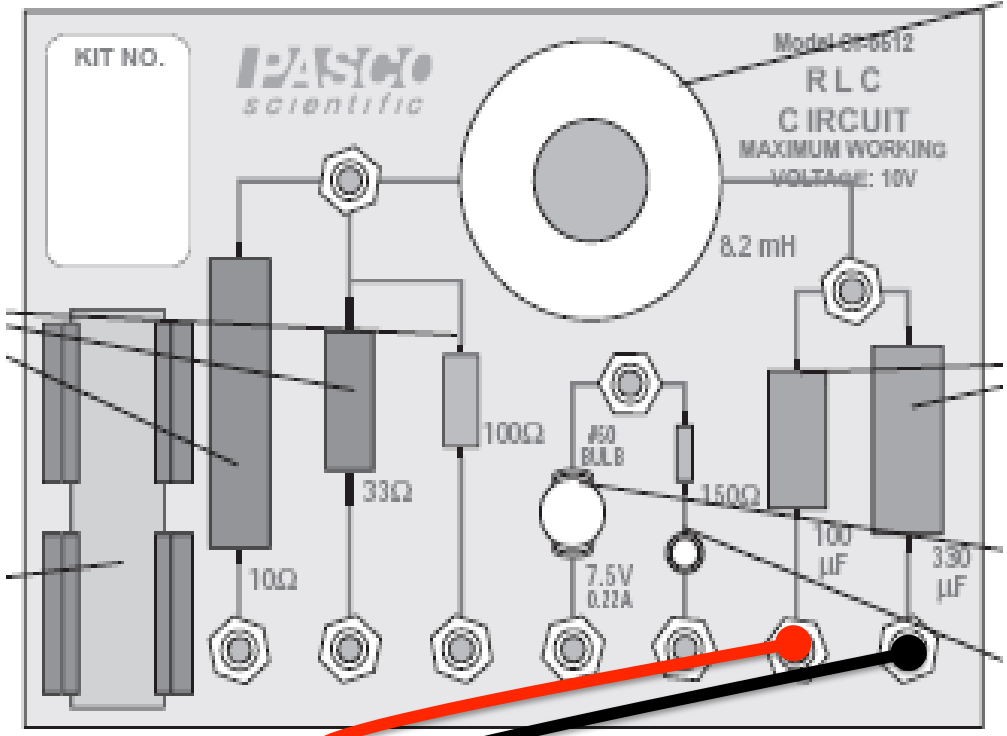
Discharging through resistor/LED combination



RESET!
Complete discharge:
results in zero volts,
zero coulombs.

Experiment 1 – Charge and Discharge

1. Charge either capacitor. Measure voltage of charged capacitor.
2. Discharge capacitor by connecting to the resistor/LED combination.
3. Again measure the voltage of the capacitor.
4. Calculate the energy lost by the capacitor.
5. Repeat with the other capacitor.
6. How do the energy amounts compare? How does this relate to the observed flashes of the LED?
7. What happens if you use the regular light bulb? Similarities? Differences?



Charging
series combo

Experiment 2 – Series Capacitors

1. Completely discharge and "reset" both capacitors to zero volts.
2. Charge the two capacitors at the same time while connected as a unit in series.
3. Then measure the voltage of each capacitor by itself and the series combination.
4. Calculate the amount of charge in each capacitor by itself, based indicated capacitance and the individual voltage. Is it the same? Should it be? Why?

Experiment 3 – Charge one Capacitor with Another

1. Completely discharge and "reset" both capacitors to zero volts.
2. Charge one of the two capacitors by itself and measure its voltage.
3. Then, connect the charged capacitor to the uncharged capacitor and measure the voltage of each.
4. Using the indicated capacitance and the measured voltages, calculate the amount of charge lost by one and calculate the amount of charge gained by the other. Is the amount the same? Should it be?

Experiment 4 – Challenge! Resistance of Voltmeter

1. Completely discharge and "reset" both capacitors to zero volts.
2. Devise an experiment that can be used to determine the resistance of the voltmeter using only the voltmeter setting. Do not use the ammeter setting!
3. Hint: a stopwatch might be useful.
4. Compare your result to previously discussed values.