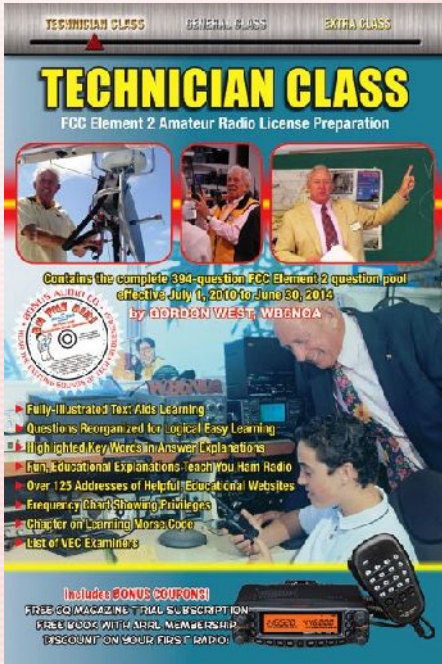
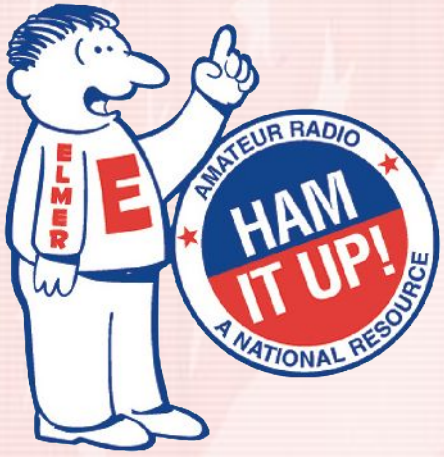
Technician Licensing Class

Go Picture These!

Presented by





Amateur Radio Technician Class
Element 2 Course Presentation

ELEMENT 2 SUB-ELEMENTS
(Groupings)

- **About Ham Radio**
- **Call Signs**
- **Control**
- **Mind the Rules**
- **Tech Frequencies**
- **Your First Radio**
- **Going On The Air!**
- **Repeaters**
- **Emergency!**
- **Weak Signal Propagation**

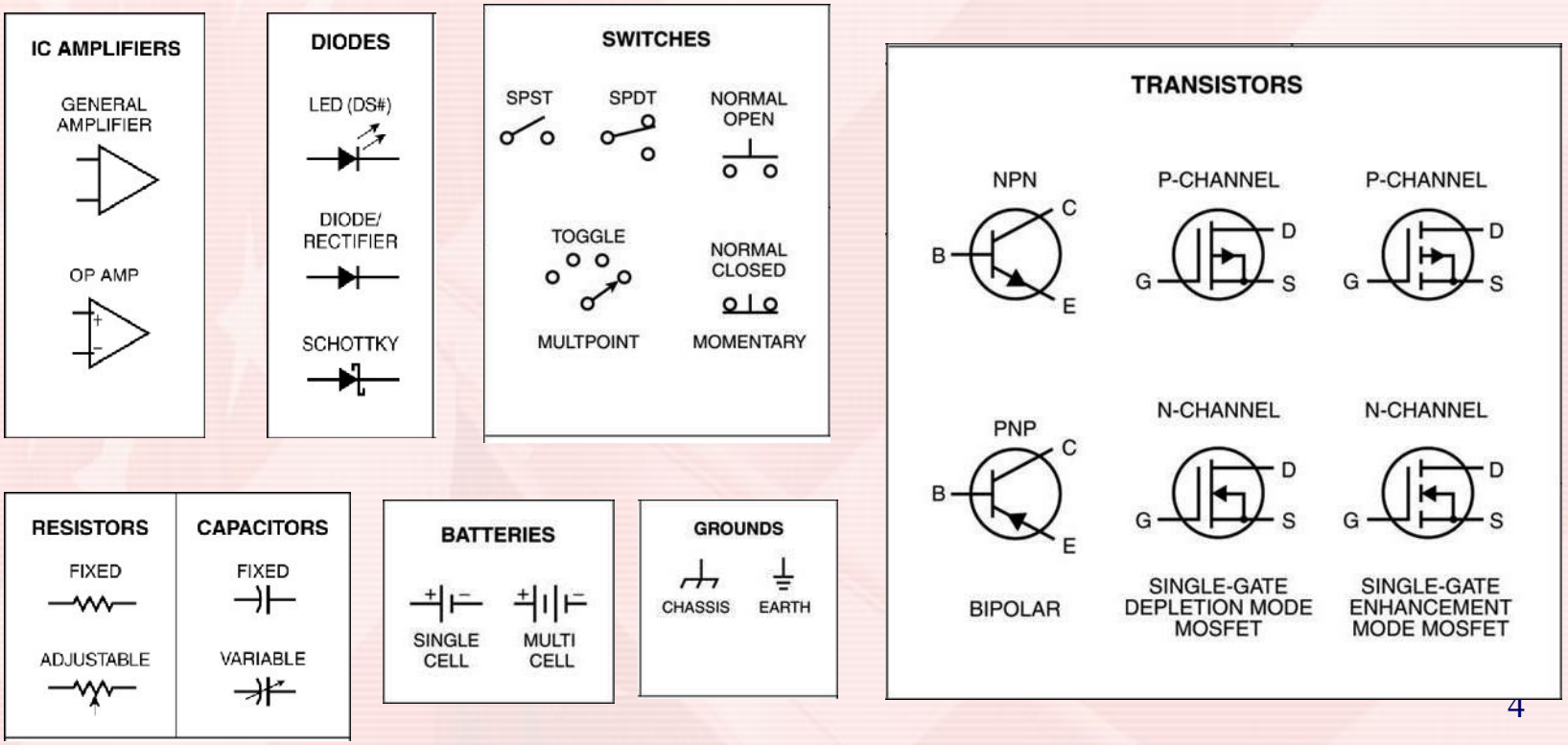
Amateur Radio Technician Class
Element 2 Course Presentation

- **ELEMENT 2 SUB-ELEMENTS (Groupings)**
  - **Talk to Outer Space!**
  - **Your Computer Goes Ham Digital!**
  - **Multi-Mode Radio Excitement**
  - **Run Some Interference Protection**
  - **Electrons – Go With the Flow!**
  - **It's the Law, per Mr. Ohm!**
  - **Go Picture These!**
  - **Antennas**
  - **Feed Me with Some Good Coax!**
  - **Safety First!**

Go Picture These!

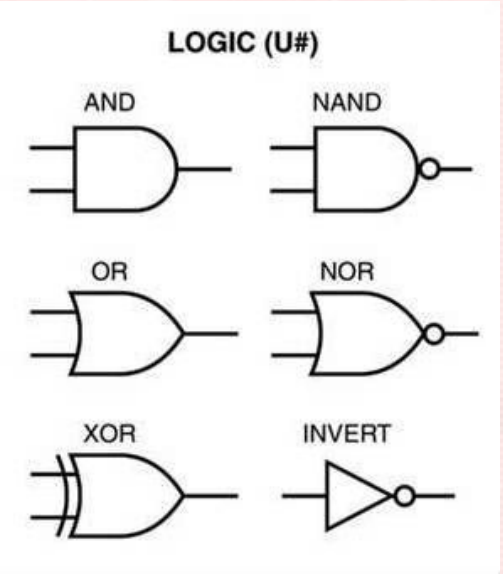
- T6C1 Schematic symbols is the name for standardized representations of components in an electrical wiring diagram.

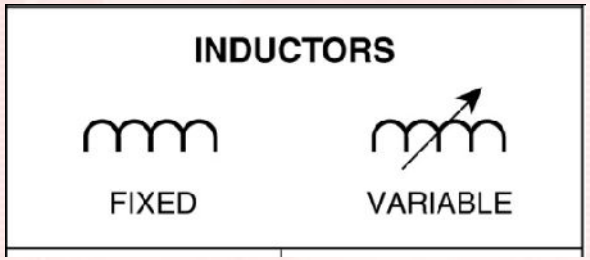
Schematic Symbols

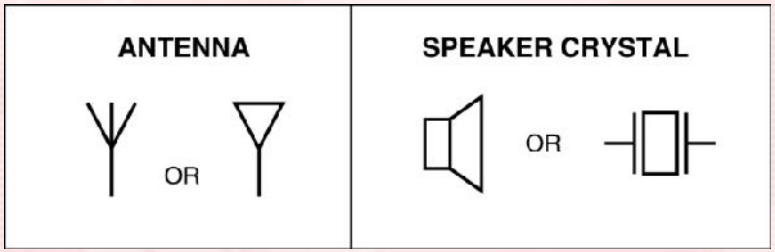


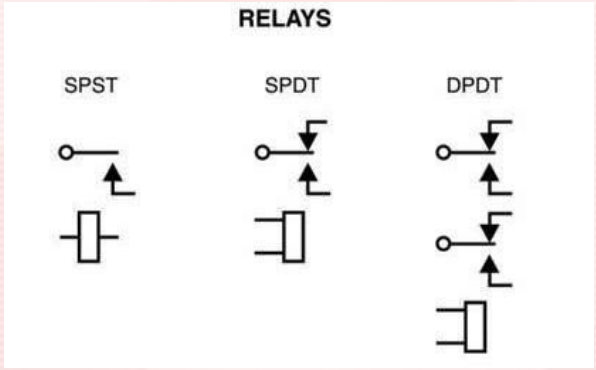
Go Picture These!

Schematic Symbols





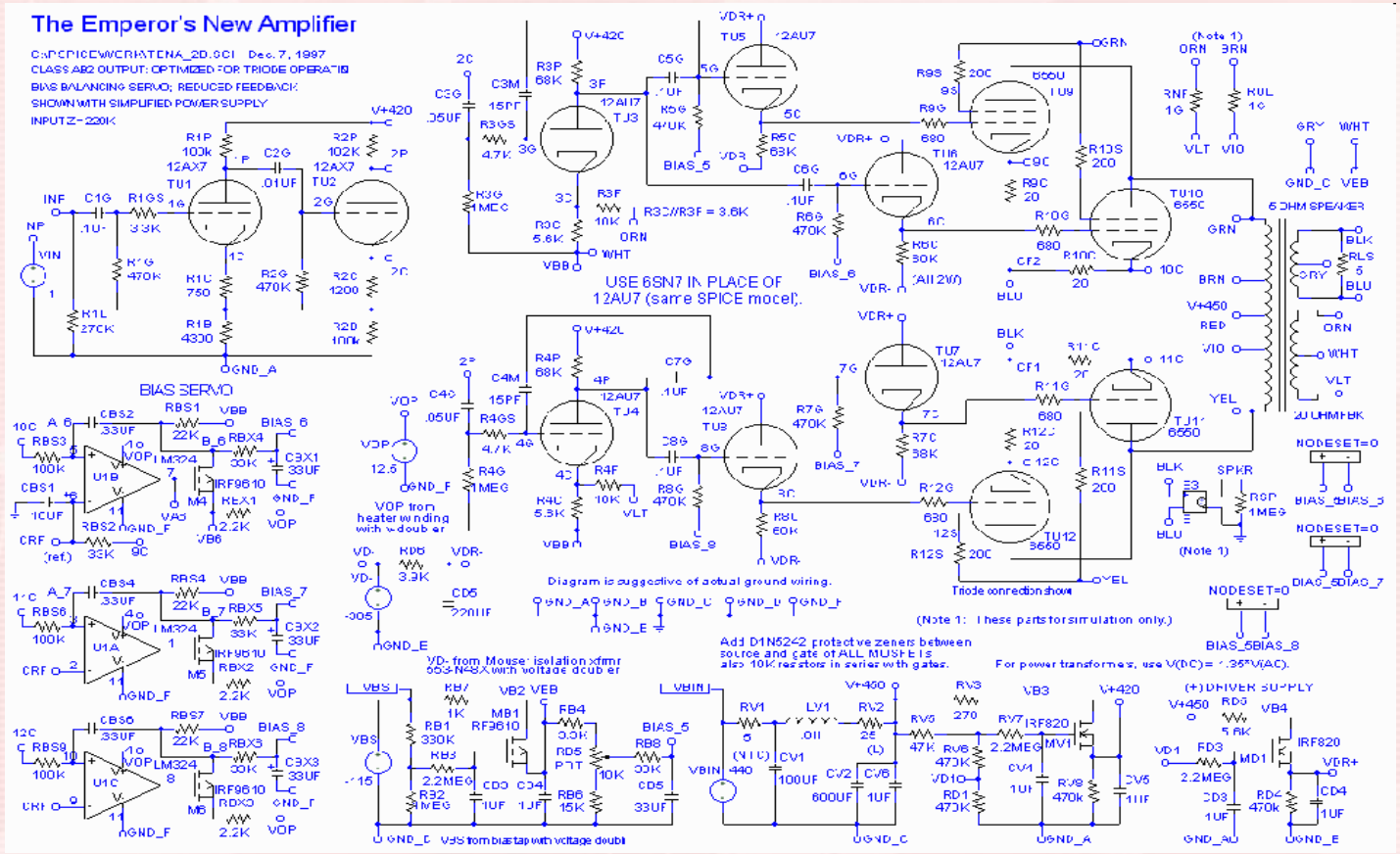




- T6C12 The symbols on an electrical circuit schematic diagram represent electrical components.

Go Picture These!

- T6C13 The way electrical components are interconnected accurately represent electrical circuit schematic diagrams.



Go Picture These!

- T6C10 Component 3 in figure T3 is a variable inductor.

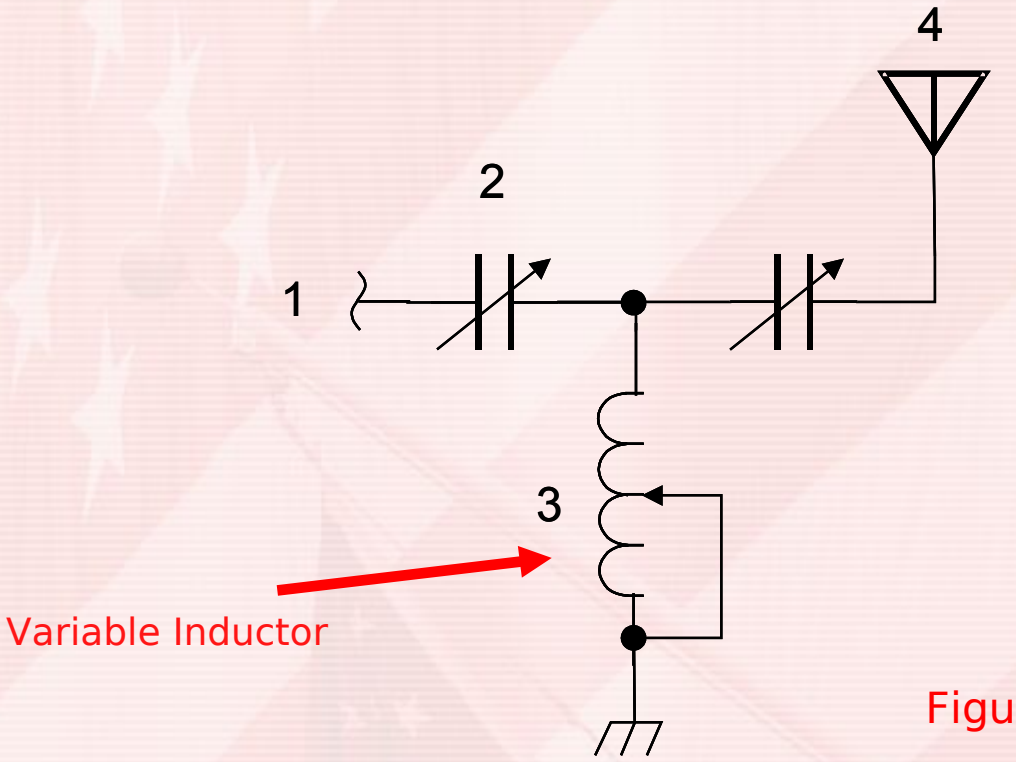


Figure T3

Go Picture These!

- T6C11 Component 4 in figure T3 is an antenna.

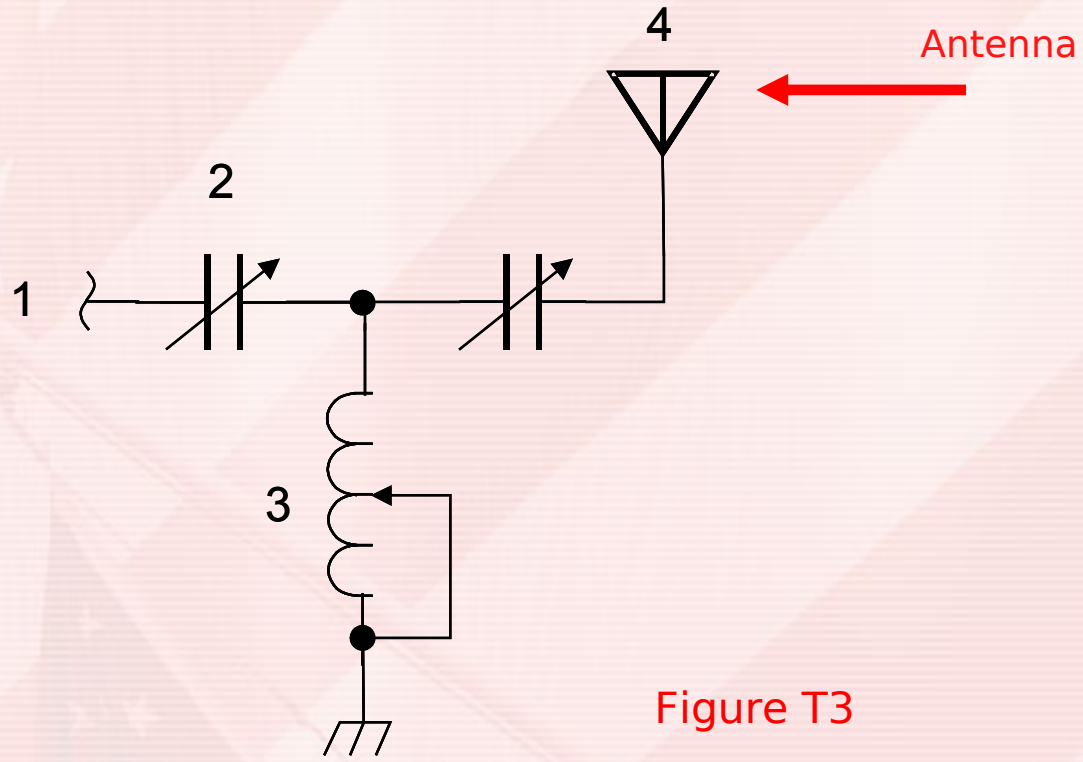
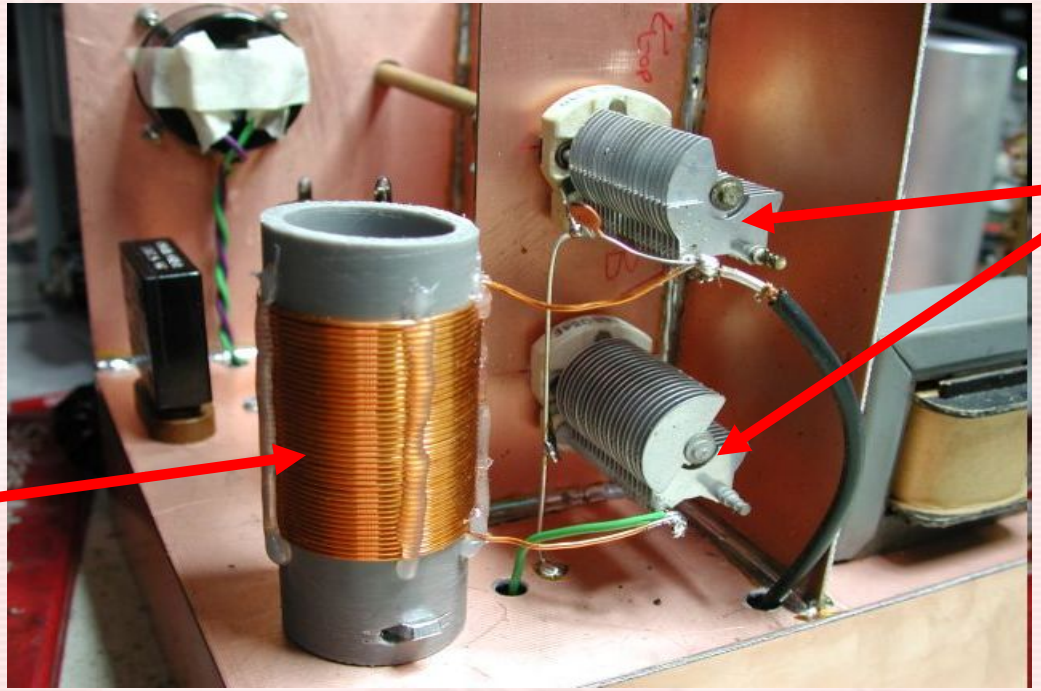


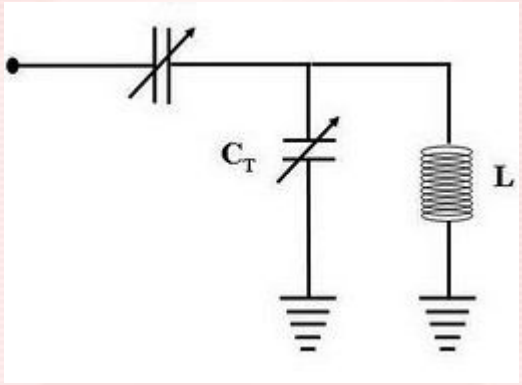
Figure T3

Go Picture These!

- T6D8 A capacitor is used together with an inductor to make a tuned circuit.



Tank Circuit or Tuned Circuit



Tank Circuit Schematic

Go Picture These!

T6C2 Component 1 in figure T1 is a resistor.

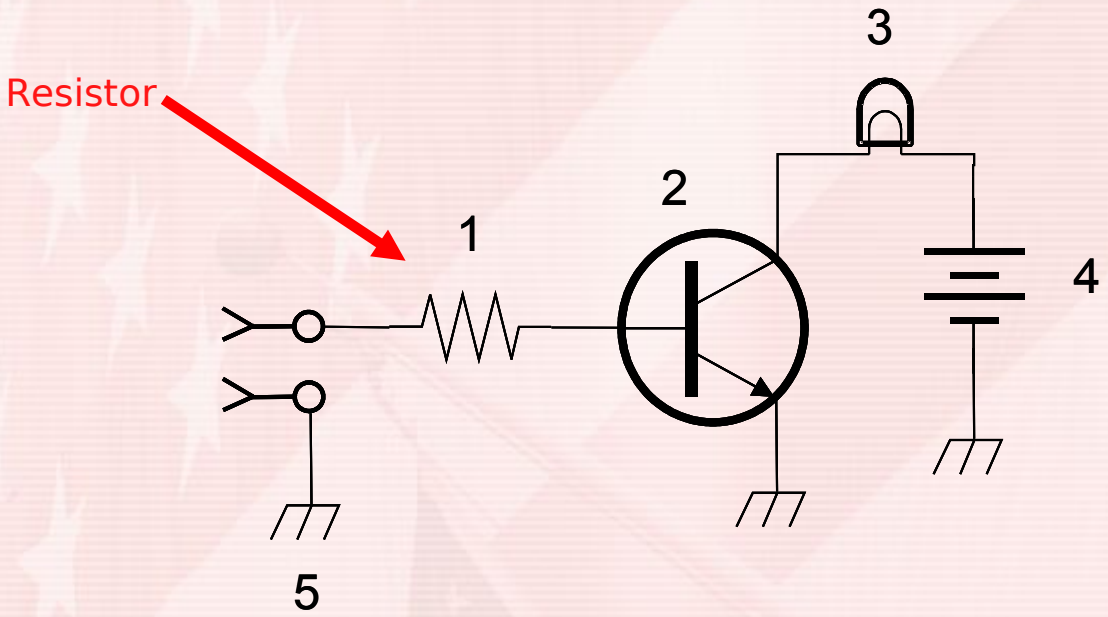


Figure T1

Go Picture These!

- T6C3 Component 2 in figure T1 is a transistor.

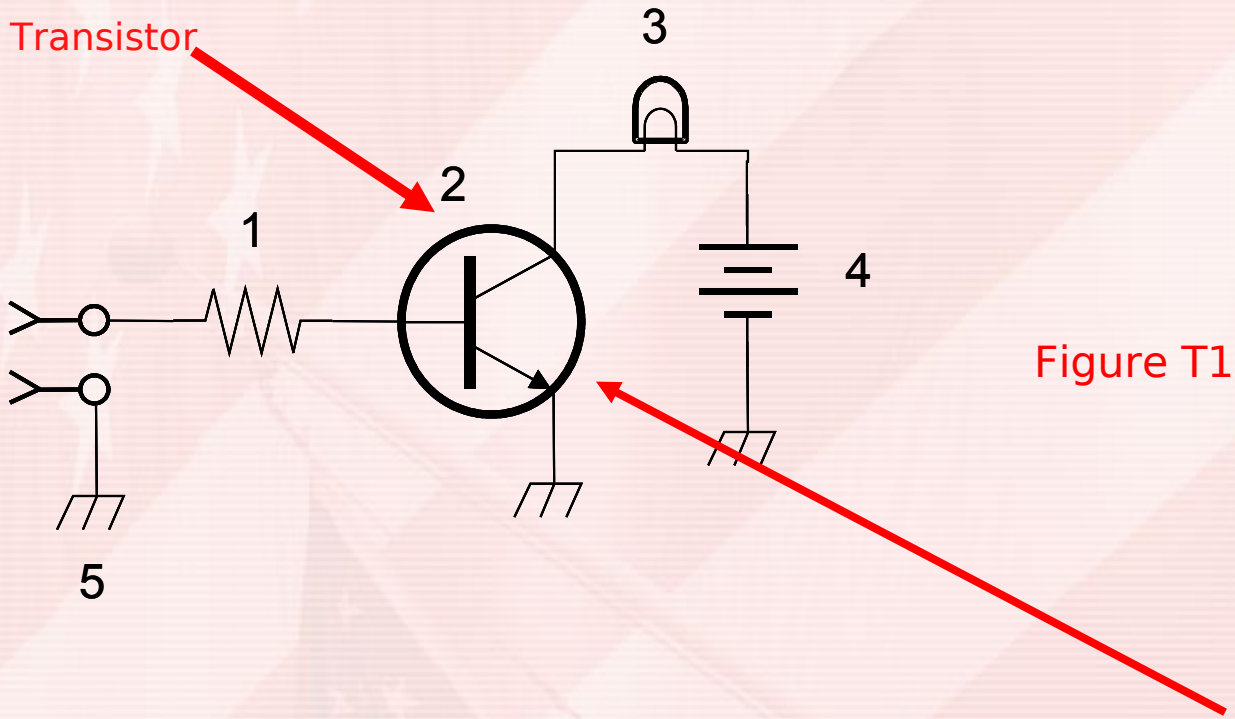


Figure T1

- T6D10 To control the flow of current is the function of component 2 in Figure T1.

Go Picture These!

- T6C4 Component 3 in figure T1 is a lamp.

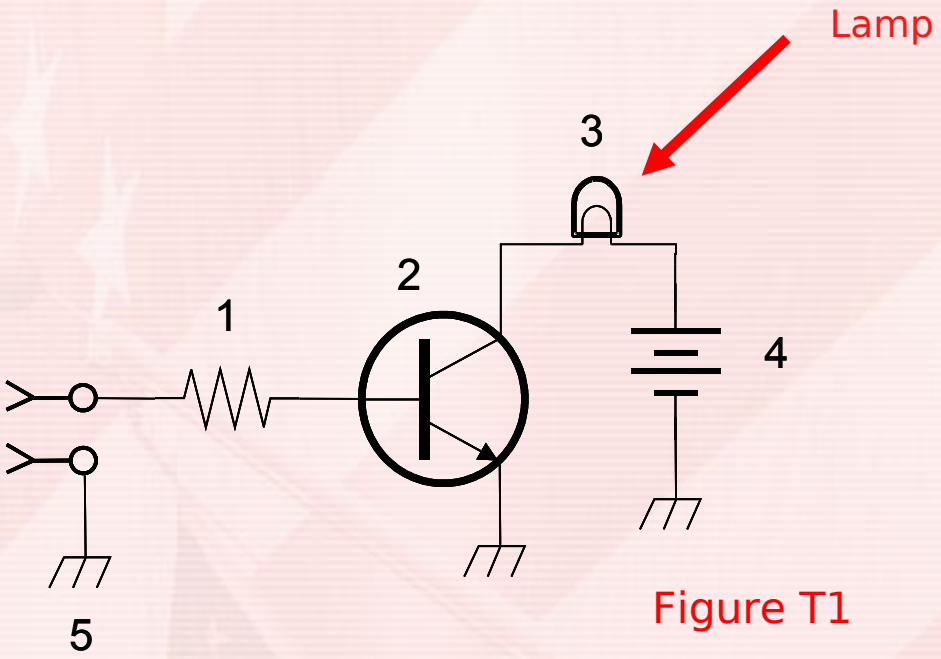


Figure T1

Go Picture These!

- T6C5 Component 4 in figure T1 is a battery.

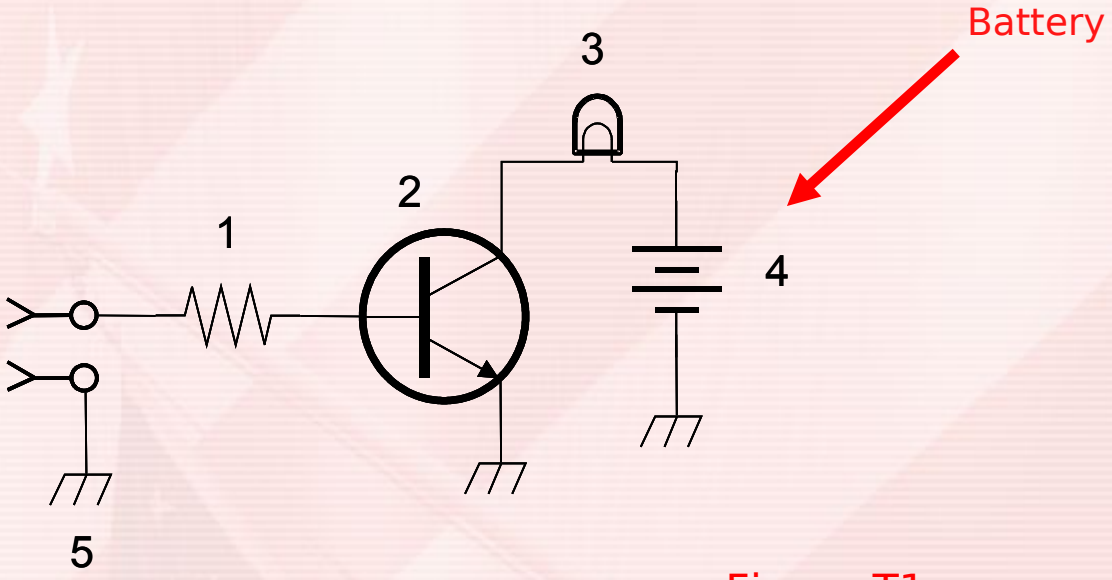


Figure T1

Go Picture These!

- T6D3 A single-pole single-throw switch is represented by item 3 in figure T2.

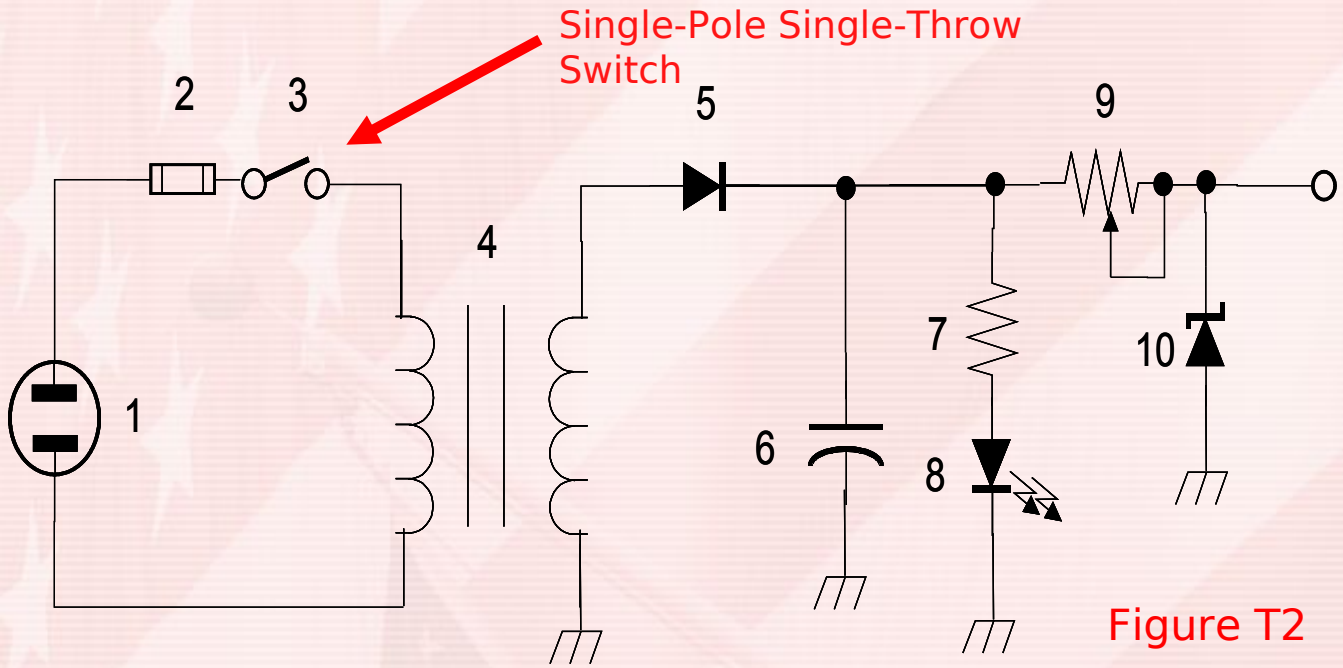


Figure T2

Go Picture These!

- T6C9 Component 4 in figure T2 is a transformer.

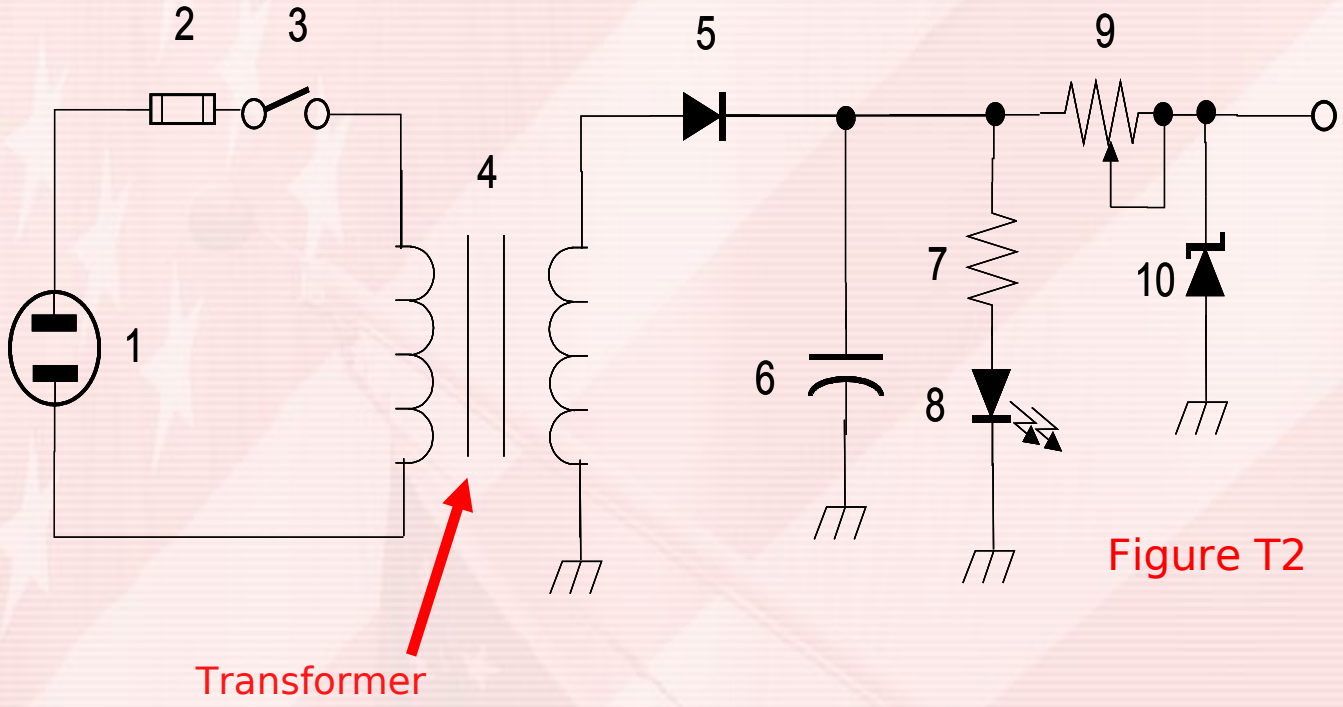


Figure T2

Go Picture These!

- T6C6 Component 6 in figure T2 is a capacitor.

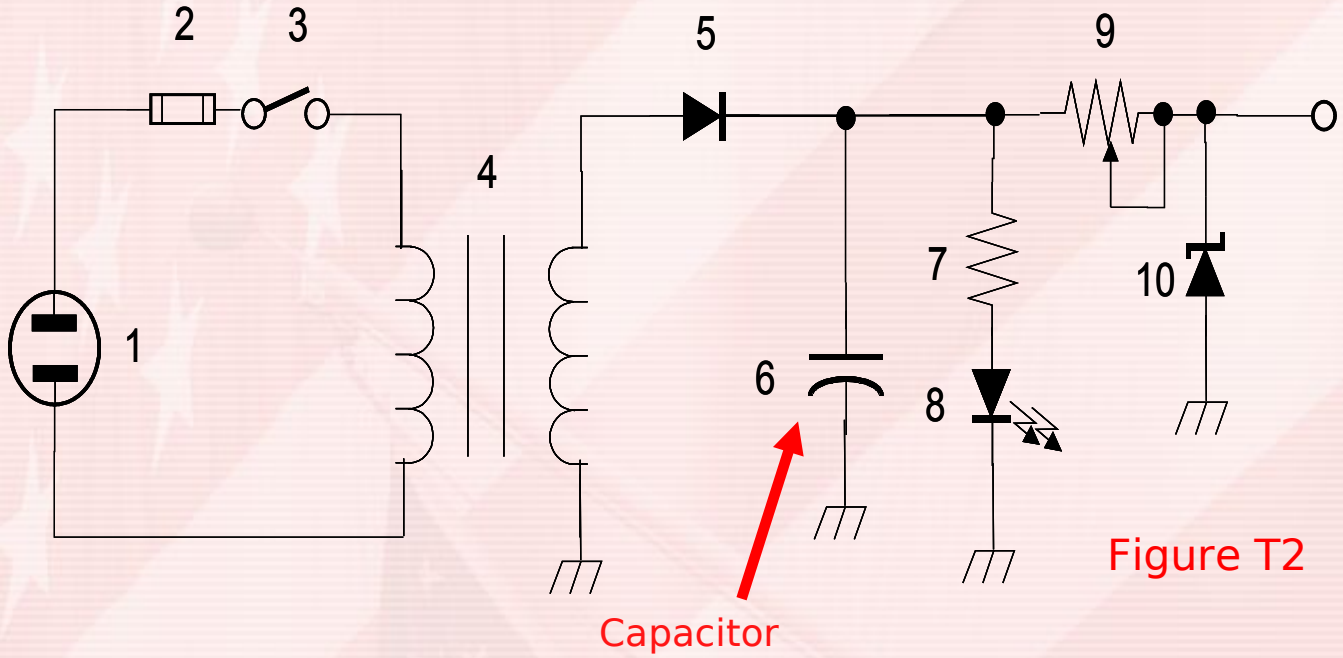


Figure T2

Go Picture These!

- T6C7 Component 8 in figure T2 is a light emitting diode.

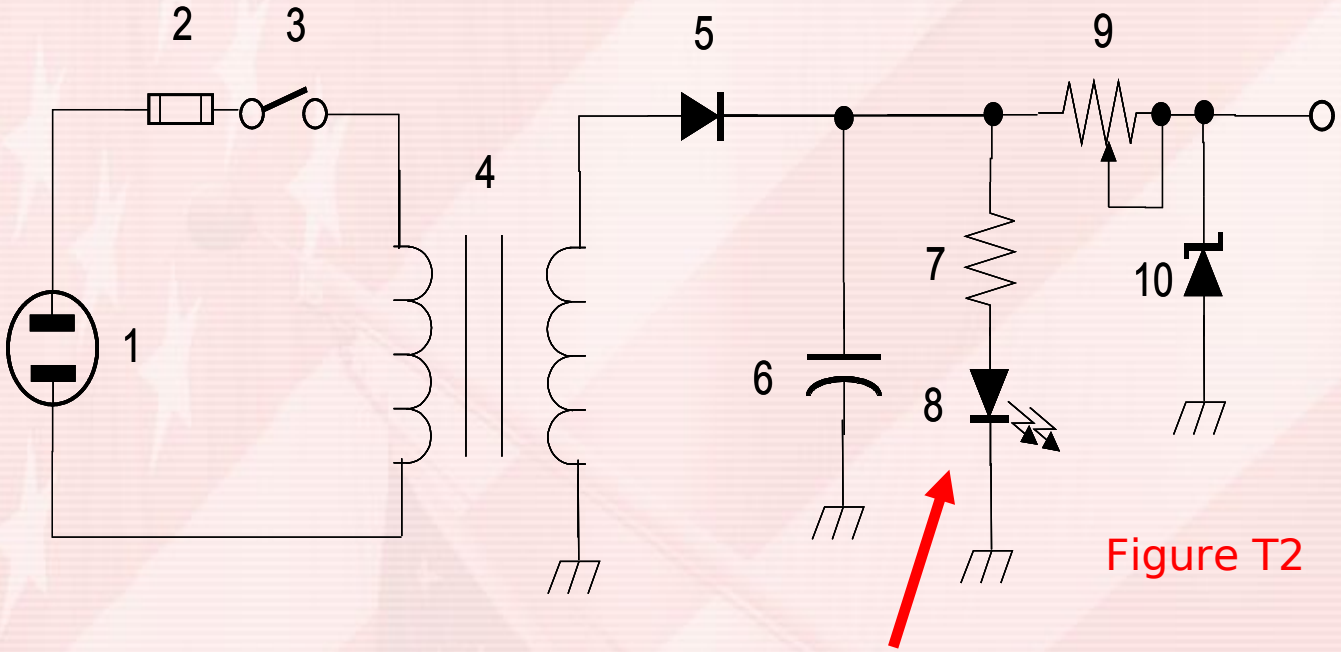


Figure T2

Go Picture These!

- T6C8 Component 9 in figure T2 is a variable resistor.

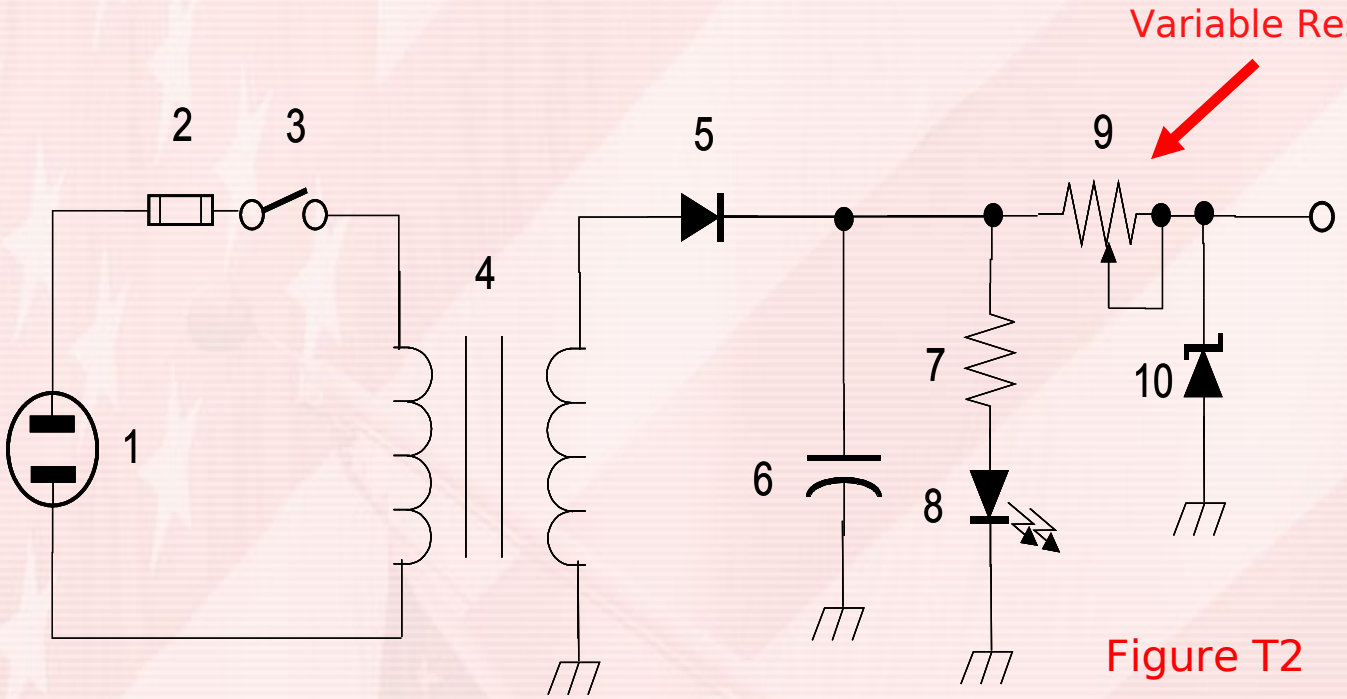


Figure T2

Go Picture These!

- T6D4 A meter can be used to display signal strength on a numeric scale.

S-Meter

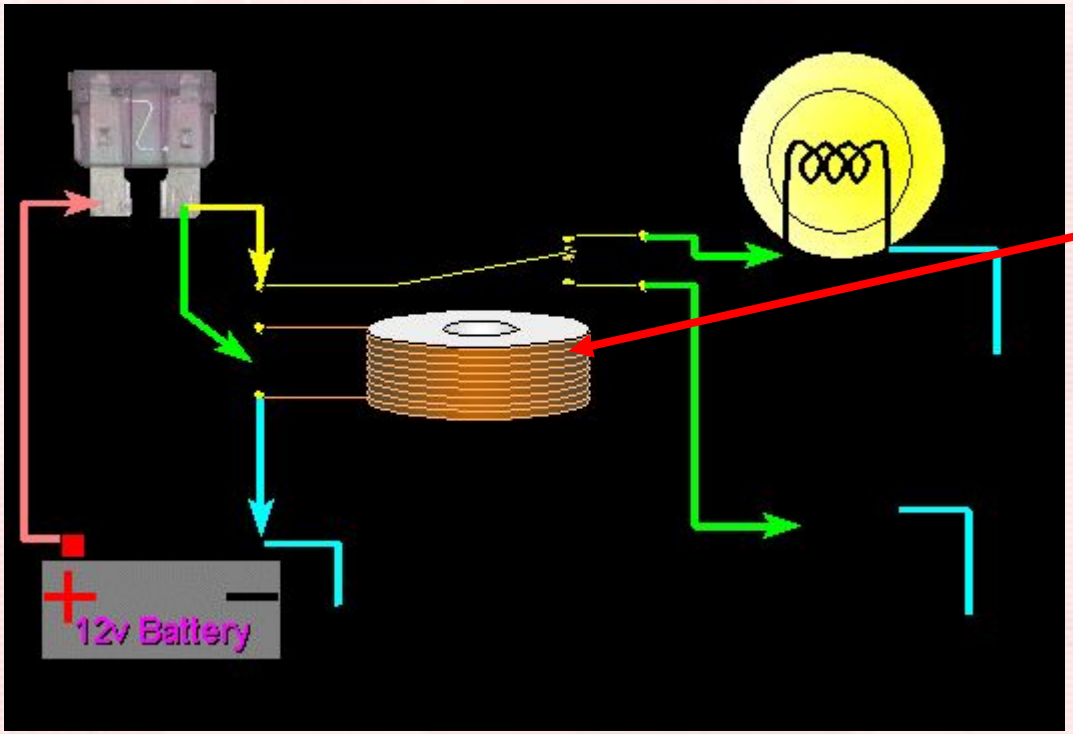
Icom 7600

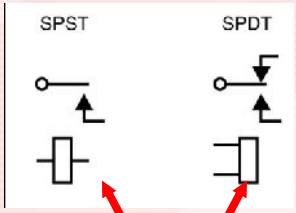
Icom 7800

Go Picture These!

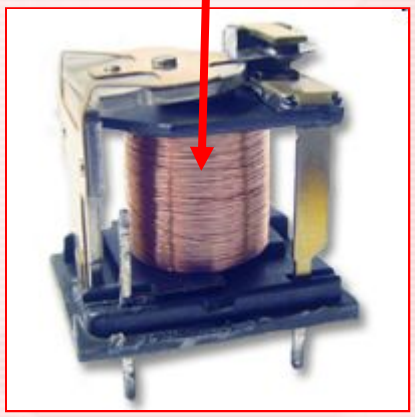
T6D2 A switch controlled by an electromagnet best describes a relay.

Relays





Electromagnets



Go Picture These!

- T5B9 The approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts is 3dB.
  - 3 dB gain is a double of power

dB	Power Change
3 dB	2x Power
6 dB	4x change
9 dB	8x Power
10 dB	10x change
20 dB	100x Power
30 dB	1000x change
40 dB	10,000x Power change
	Power change
	Power change
	Power change

Derivation:

If $dB = 10 \log_{10} \frac{P_1}{P_2}$

then what power ratio is 20 dB?

$$20 = 10 \log_{10} \frac{P_1}{P_2}$$

$$\frac{20}{10} = \log_{10} \frac{P_1}{P_2}$$

$$2 = \log_{10} \frac{P_1}{P_2}$$

Remember: logarithm of a number is the exponent to which the base must be raised to get the number.

$$\therefore 10^2 = \frac{P_1}{P_2}$$

$$100 = \frac{P_1}{P_2}$$

Or $P_1 = 100\ P_2$

20 dB means P_1 is 100 times P_2

- T5B10 The approximate amount of change, measured in decibels (dB), of a power decrease from 12 watts to 3 watts is 6dB.
- T5B11 The approximate amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts is 10 dB.

Go Picture These!

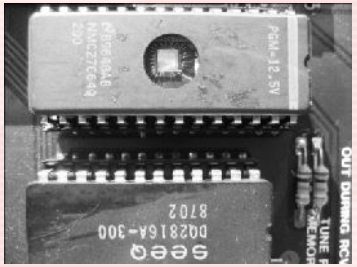
- T6D5 A regulator is a type of circuit that controls the amount of voltage from a power supply.

Voltage Regulators

- T6D6 A transformer is a component commonly used to change 120V AC house current to a lower AC voltage for other uses.

Voltage Transformer

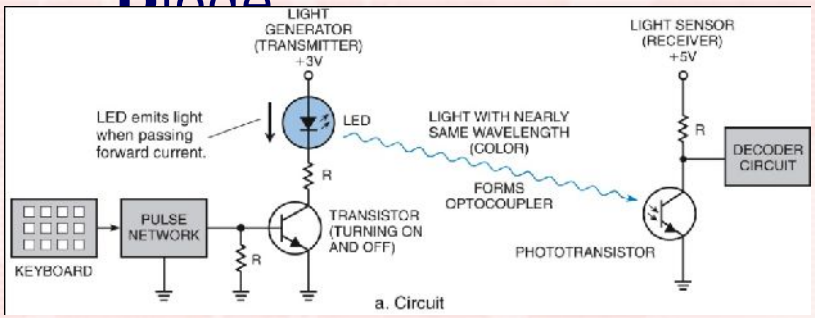
- T6D9 Integrated circuit is the name of a device that combines several semiconductors and other components into one package.

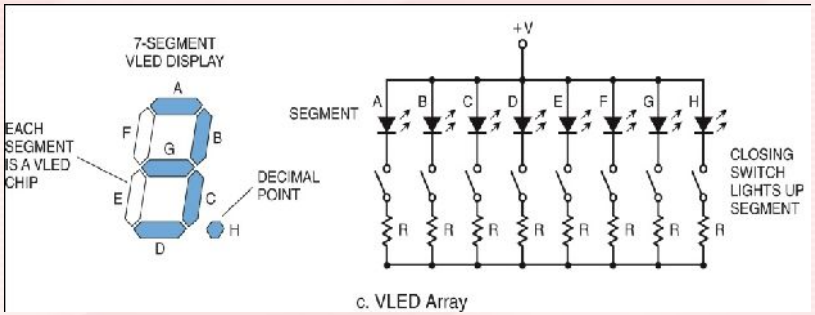


Large-scale integrated circuit chips .

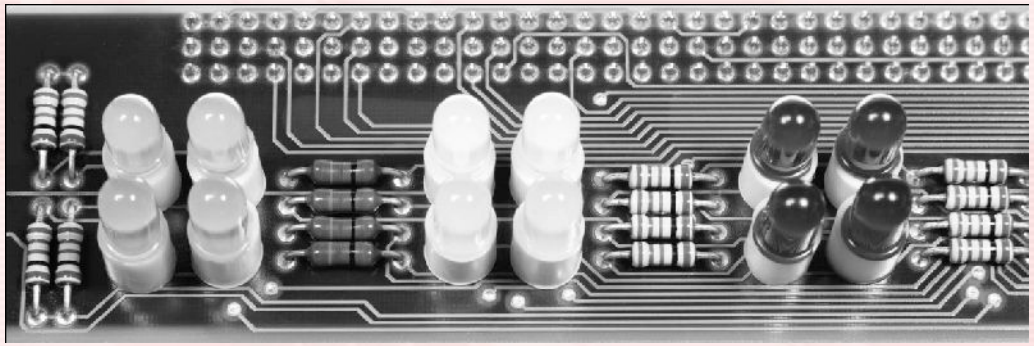
Go Picture These!

- T6B7 The abbreviation "LED" stands for **L**ight **E**mitting **D**iode





- T6D7 An LED is commonly used as a visual indicator.



An array of LEDs and resistors mounted on a printed circuit board

Go Picture These!

- T5B2 1500 kHz is another way to specify a radio signal frequency of 1,500,000 hertz.
- T5B3 One thousand volts are equal to one kilovolt.
- T5B6 If an ammeter calibrated in amperes is used to measure a 3000-milliampere of current, the reading would it to be 3 amperes.

Prefix	Scientific Notation Multiplication Factor		Prefix		Multiplication Factor
tera	10^{12}	1,000,000,000,000	deci	10^{-1}	0.1
giga	10^{9}	1,000,000,000	centi	10^{-2}	0.01
mega	10^{6}	1,000,000	milli	10^{-3}	0.001
kilo	10^{3}	1,000	micro	10^{-6}	0.000001
hecto	10^{2}	100	nano	10^{-9}	0.000000001
deca	10^{1}	10	pico	10^{-12}	0.000000000001
unit	10^{0}	1	femto	10^{-15}	0.0000000000000 01

Go Picture These!

Metric	Exponent	English
Tera	10^{12}	Trillion
Giga	10^{9}	Billion
Mega	10^{6}	**Million**
Kilo	10^{3}	**Thousand**
Centi	10^{-2}	Hundredth
Milli	10^{-3}	**Thousandth**
Micro	10^{-6}	**Millionth**
Nano	10^{-9}	Billionth
Pico	10^{-12}	**Trillionth**

- T5B5 0.5 watts is equivalent to 500 milliwatts.
- T5B1 1,500 milliamperes is 1.5 amperes.
- T5B8 One microfarads is equal to 1,000,000 picofarads.
- T5B4 One one-millionth of a volts is equal to one microvolt

Go Picture These!

- T7D8 Rosin-core solder is best for radio and electronic use.
- T7D9 A grainy or dull surface is the characteristic appearance of a "cold" solder joint.
- T7D7 Voltage and resistance are measurements commonly made using a multimeter.

Volt Ohm Meter VOM

Parameter Instrument	Basic Unit	Measuring
Voltage (E)	Volts	Voltmeter
Current (I)	Amperes	Ammeter
Resistance	Ohms10^3	Ohmmeter
Power (P)	Watts	Wattmeter

Digital Volt Ohm Meter
Much more accurate

Go Picture These!

- T7D11 A precaution taken when measuring circuit resistance with an ohmmeter is to ensure that the circuit is not powered.
- T7D6 Attempting to measure voltage when using the resistance setting might damage a multimeter.
- T7D10 When an ohmmeter is connected across a circuit and initially indicates a low resistance and then shows increasing resistance with time, the circuit contains a large capacitor.

Learning how to use a multimeter is an essential skill in testing and repairing radio gear

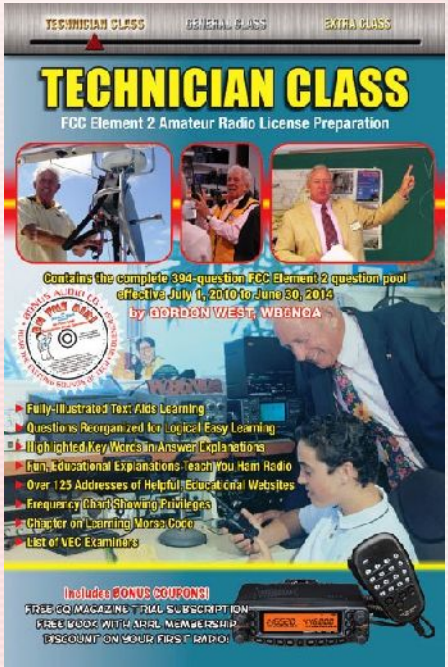
Element 2 Technician Class Question Pool

Go Picture These!

Valid July 1, 2010

Through

June 30, 2014



T6C01 What is the name for standardized representations of components in an electrical wiring diagram?

A. Electrical depictions
B. Grey sketch
C. Schematic symbols
D. Component callouts

T6C12 What do the symbols on an electrical circuit schematic diagram represent?

A. Electrical components
B. Logic states
C. Digital codes
D. Traffic nodes

T6C13 Which of the following is accurately represented in electrical circuit schematic diagrams?

A. Wire lengths
B. Physical appearance of components
C. The way components are interconnected
D. All of these choices

T6C10 What is component 3 in figure T3?

A. Connector
B. Meter
C. Variable capacitor
D. Variable inductor

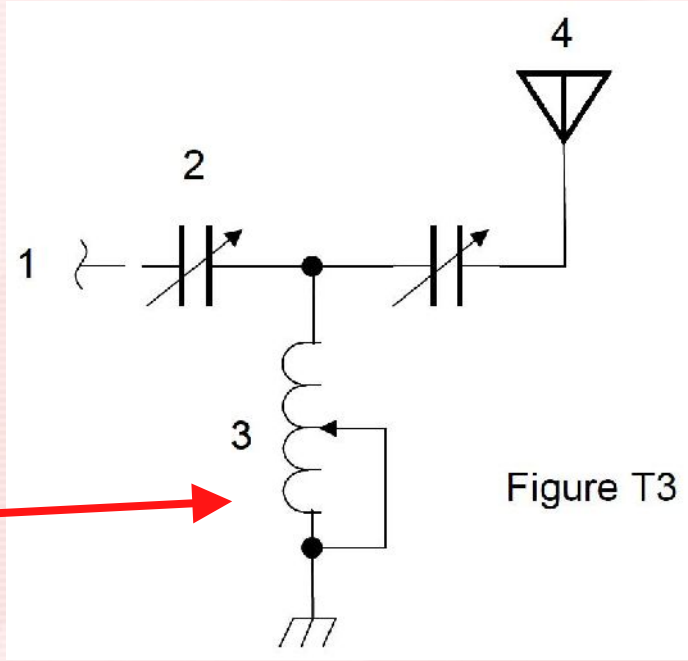


Figure T3

T6C11 What is component 4 in figure T3?

A. Antenna
B. Transmitter
C. Dummy load
D. Ground

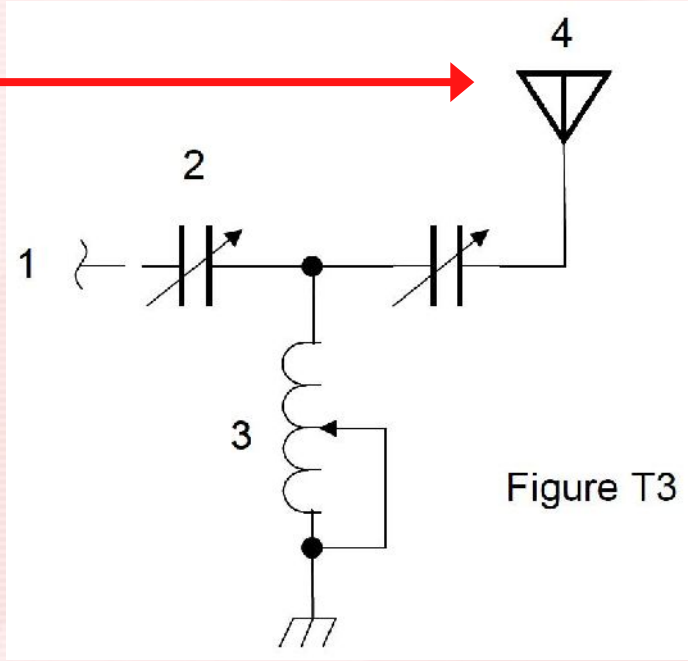


Figure T3

T6D08 Which of the following is used together with an inductor to make a tuned circuit?

A. Resistor
B. Zener diode
C. Potentiometer
D. Capacitor

T6C02 What is component 1 in figure T1?

A. Resistor
B. Transistor
C. Battery
D. connector

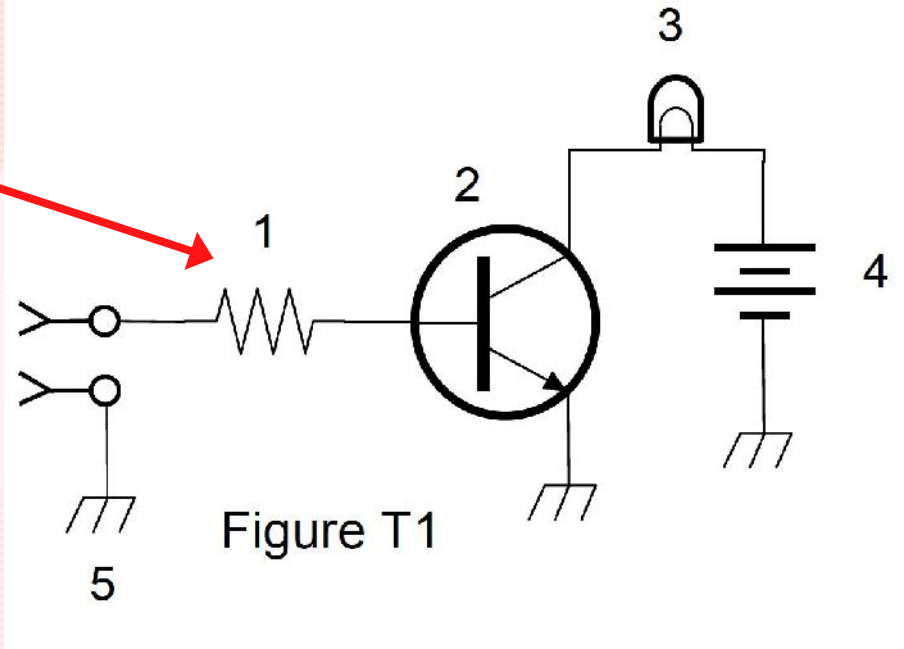


Figure T1

T6C03 What is component 2 in figure T1?

A. Resistor
B. Transistor
C. Indicator lamp
D. Connector

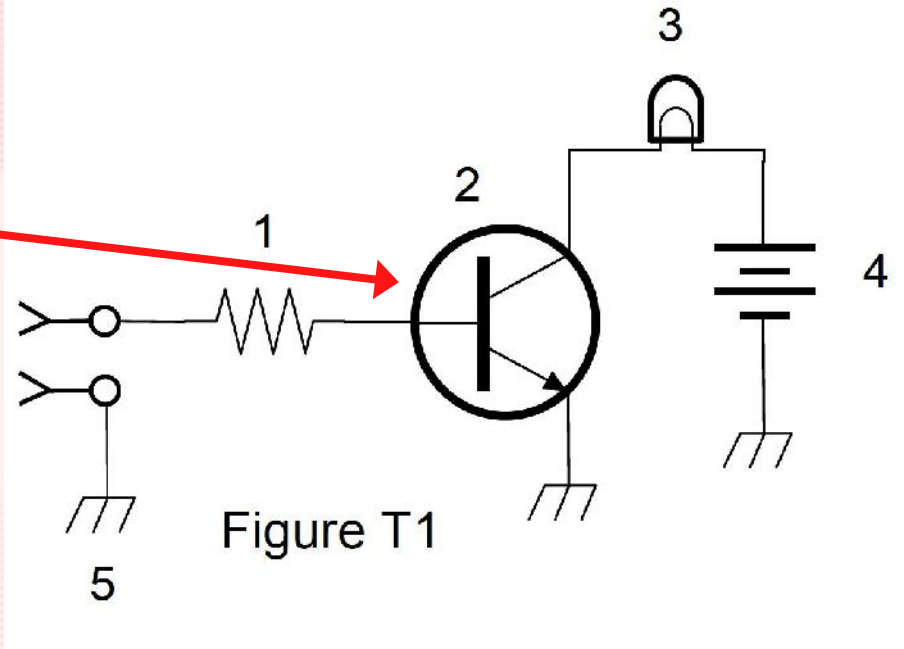


Figure T1

T6D10 What is the function of component 2 in Figure T1?

A. Give off light when current flows through it

B. Supply electrical energy

C. Control ~~the flow of~~ current

D. Convert electrical energy into radio waves

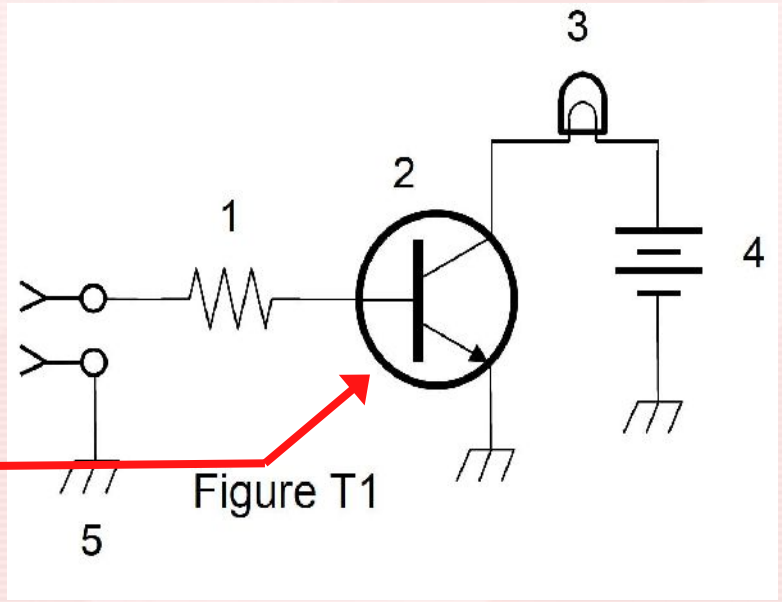


Figure T1

T6C04 What is component 3 in figure T1?

A. Resistor
B. Transistor
C. Lamp
D. Ground symbol

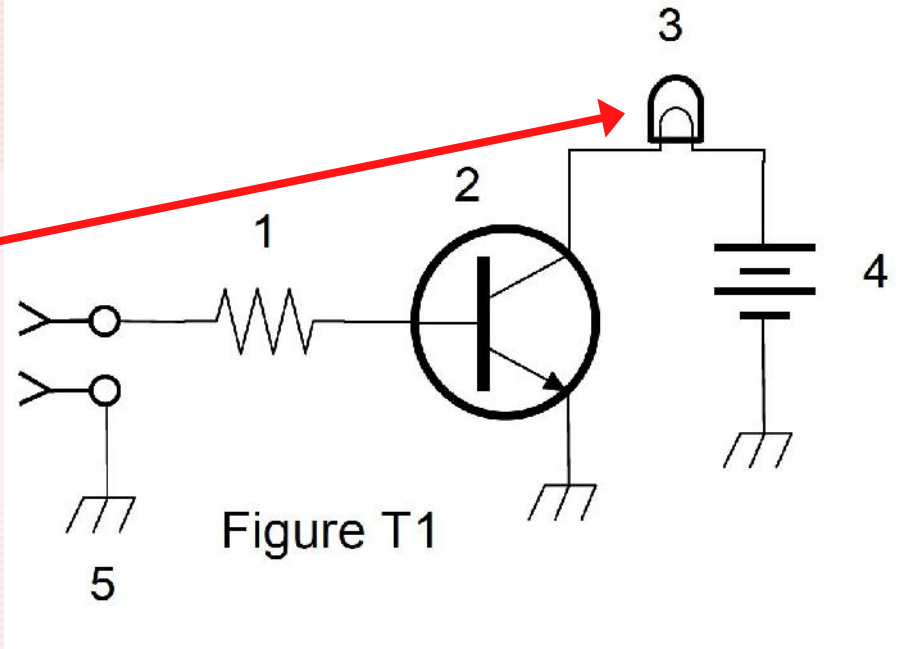


Figure T1

T6C05 What is component 4 in figure T1?

A. Resistor
B. Transistor
C. Battery
D. Ground symbol

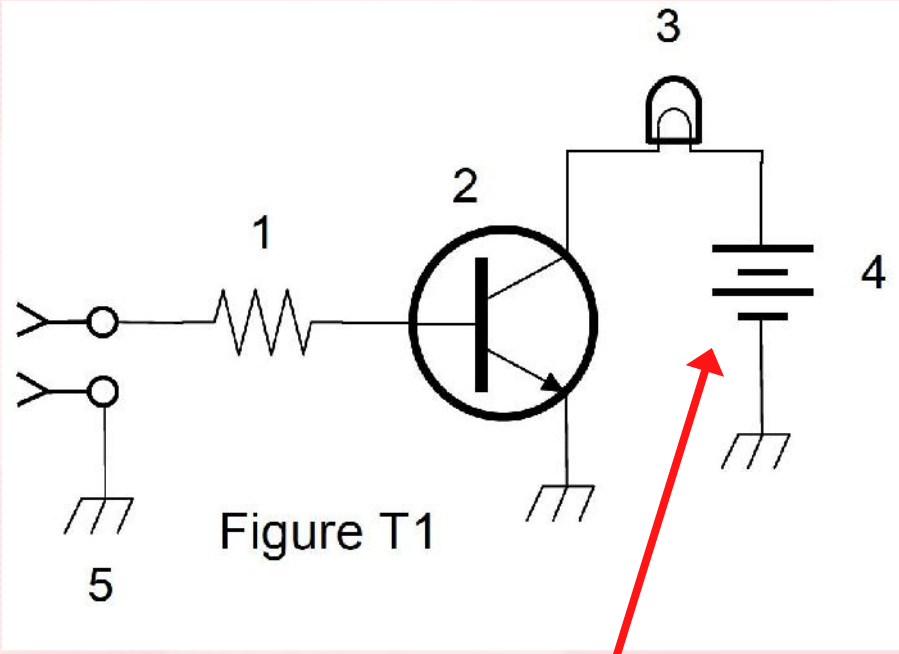


Figure T1

T6D03 What type of switch is represented by item 3 in figure T2?

A. Single-pole single-throw
B. Single-pole double-throw
C. Double-pole single-throw
D. Double-pole double-throw

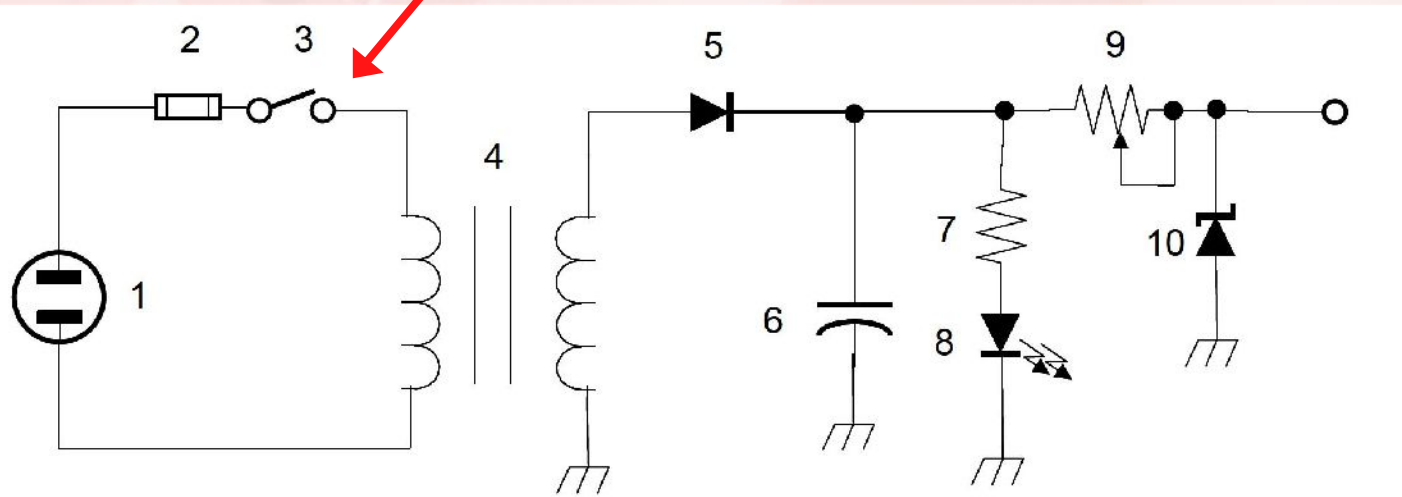


Figure T2

T6C09 What is component 4 in figure T2?

A. Variable inductor
B. Double-pole switch
C. Potentiometer
D. Transformer

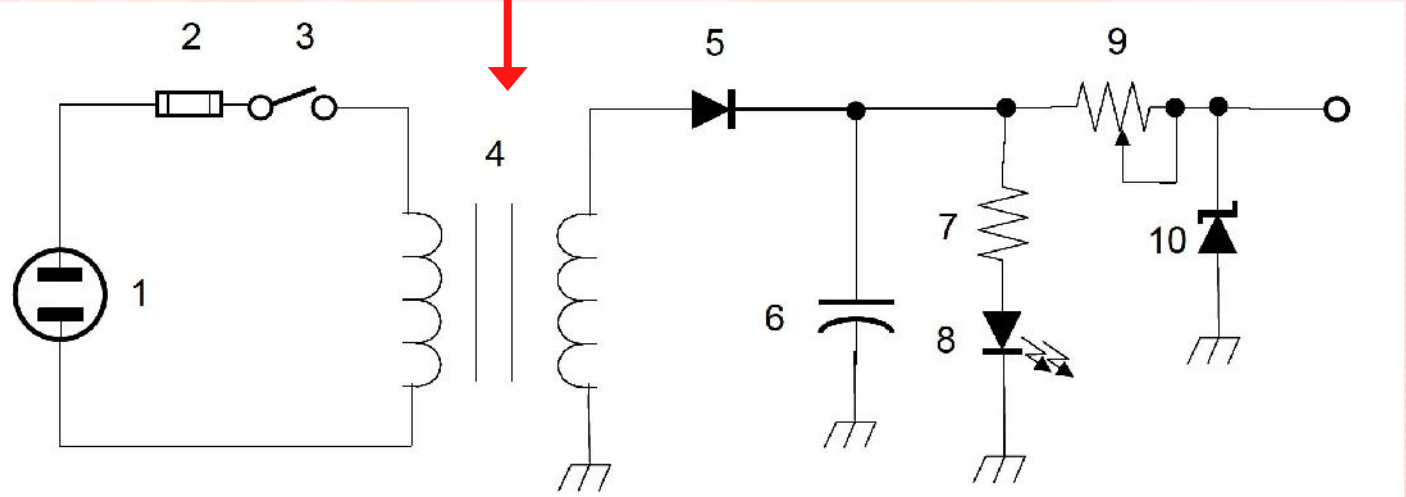


Figure T2

T6C06 What is component 6 in figure T2?

A. Resistor
B. Capacitor
C. Regulator IC
D. Transistor

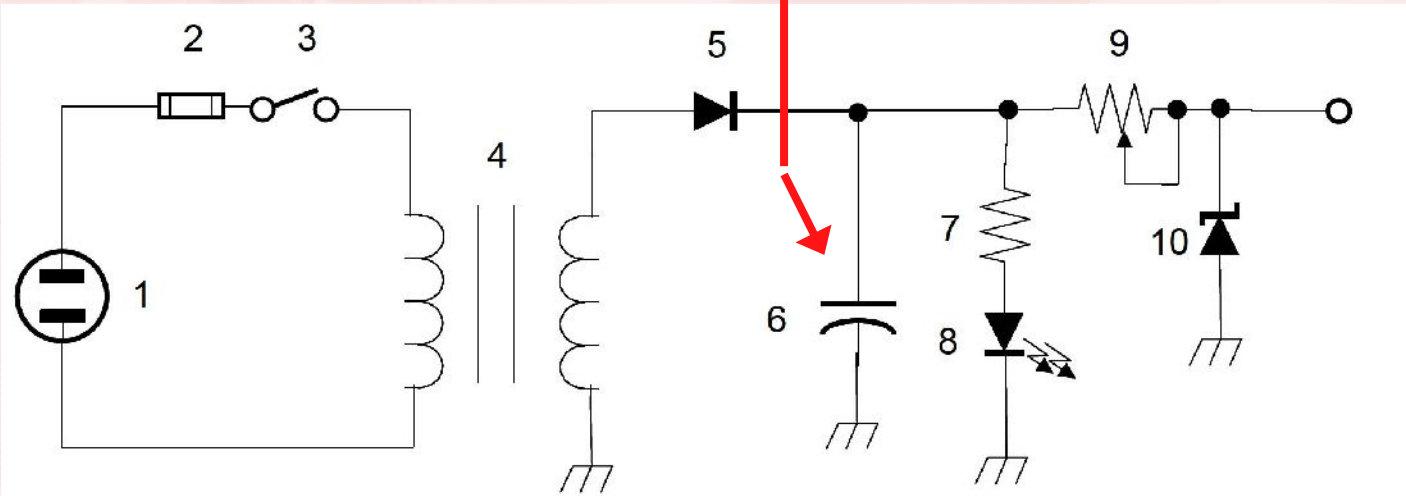


Figure T2

T6C07 What is component 8 in figure T2?

A. Resistor
B. Inductor
C. Regulator IC
D. Light emitting diode

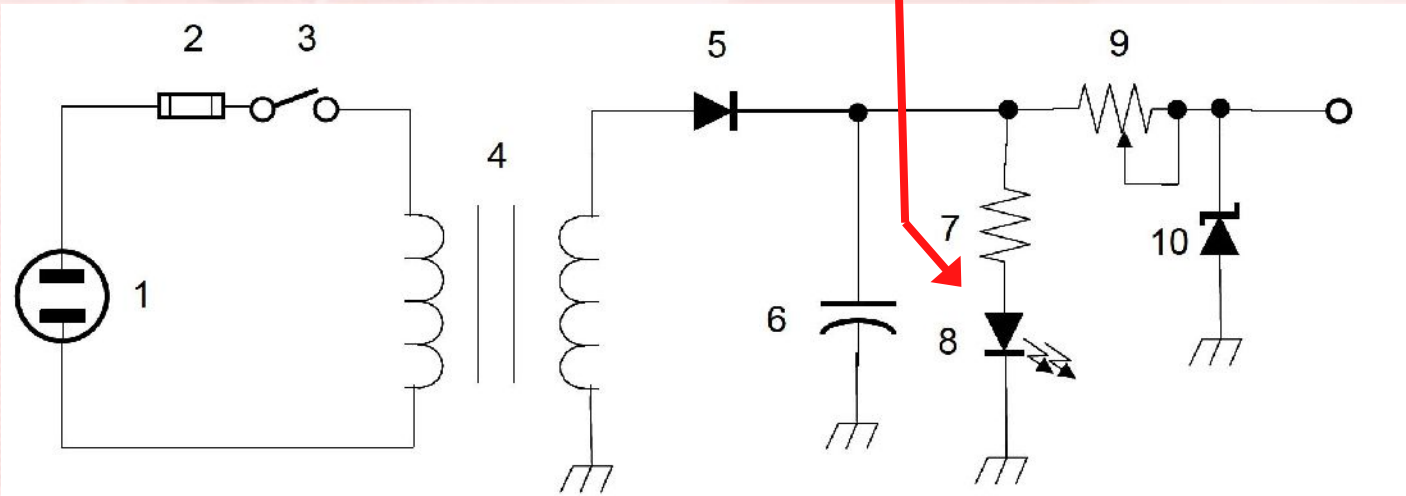


Figure T2

T6C08 What is component 9 in figure T2?

A. Variable capacitor
B. Variable inductor
C. Variable resistor
D. Variable transformer

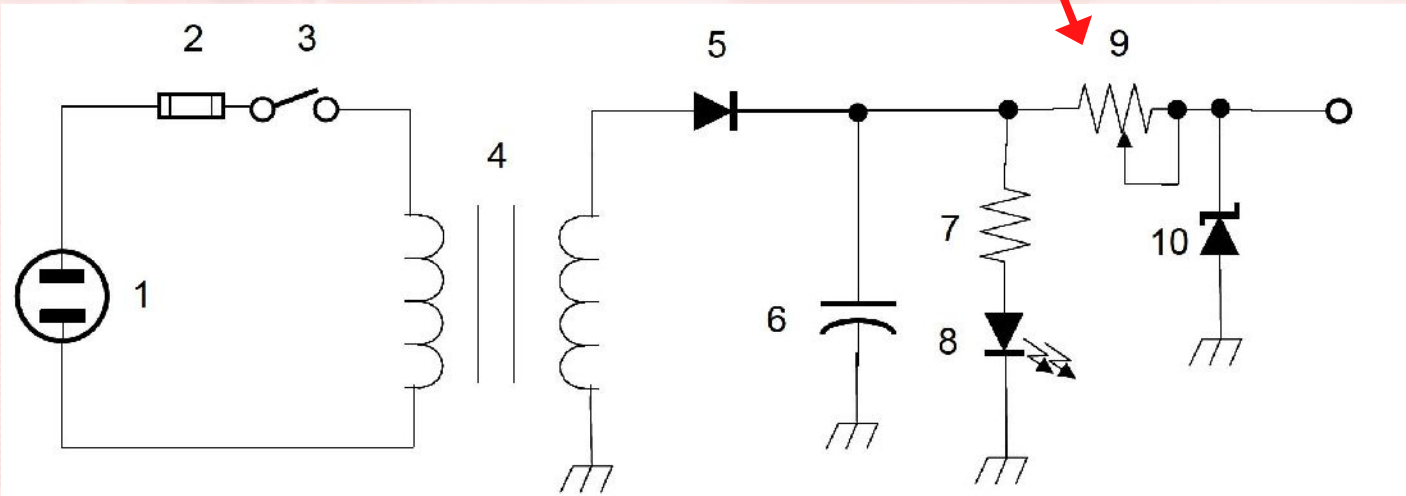


Figure T2

T6D04 Which of the following can be used to display signal strength on a numeric scale?

A. Potentiometer
B. Transistor
C. Meter
D. Relay

T6D02 What best describes a relay?

A. A switch controlled by an electromagnet
B. A current controlled amplifier
C. An optical sensor
D. A pass transistor

T5B09

What is the approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts?

A. 2 dB
B. 3 dB
C. 5 dB
D. 10 dB

T5B10

What is the approximate amount of change, measured in decibels (dB), of a power from 12 watts to 3 watts?

decrease

A. 1 dB
B. 3 dB
C. 6 dB
D. 9 dB

T5B11 What is the approximate amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts?

A. 10 dB
B. 12 dB
C. 18 dB
D. 28 dB

T6D05 What type of circuit controls the amount of voltage from a power supply?

A. Regulator
B. Oscillator
C. Filter
D. Phase inverter

T6D06 What component is commonly used to change 120V AC house current to a lower AC voltage for other uses?

A. Variable capacitor
B. Transformer
C. Transistor
D. Diode

T6D09 What is the name of a device that combines several semiconductors and other components into one package?

A. Transducer
B. Multi-pole relay
C. Integrated circuit
D. Transformer

T6B07 What does the abbreviation "LED" stand for?

A. Low Emission Diode
B. Light Emitting Diode
C. Liquid Emission Detector
D. Long Echo Delay

T6D07 Which of the following is commonly used as a visual indicator?

A. LED
B. FET
C. Zener diode
D. Bipolar transistor

T5B02 What is another way to specify a radio signal frequency of 1,500,000 hertz?

A. 1500 kHz
B. 1500 MHz
C. 15 GHz
D. 15 kHz

T5B03 How many volts are equal to one kilovolt?

A. One one-thousandth of a volt
B. One hundred volts
C. One thousand volts
D. One million volts

T6B06 - If an ammeter calibrated in amperes is used to measure a 3000-milliampere current, what reading would it show?

A. 0.003 amperes
B. 0.3 amperes
C. 3 amperes
D. 3,000,000 amperes

T5B05 500

Which of the following is equivalent to milliwatts?

A. 0.02 watts
B. 0.5 watts
C. 5 watts
D. 50 watts

T5B01 How many milliamperes is 1.5 amperes?

A. 15 milliamperes
B. 150 milliamperes
C. 1,500 milliamperes
D. 15,000 milliamperes

T5B08 How many microfarads are 1,000,000 picofarads?

A. 0.001 microfarads
B. 1 microfarad
C. 1000 microfarads
D. 1,000,000,000 microfarads

T5B04 How many volts are equal to one microvolt?

A. One one-millionth of a volt
B. One million volts
C. One thousand kilovolts
D. One one-thousandth of a volt

T7D08 Which of the following types of solder is best for radio and electronic use?

A. Acid-core solder
B. Silver solder
C. Rosin-core solder
D. Aluminum solder

T7D09 What is the characteristic appearance of a "cold" solder joint?

A. Dark black spots
B. A bright or shiny surface
C. A grainy or dull surface
D. A greenish tint

T7D07 Which of the following measurements are commonly made using a multimeter?

A. SWR and RF power
B. Signal strength and noise
C. Impedance and reactance
D. Voltage and resistance

T7D11 Which of the following precautions should be taken when measuring circuit resistance with an ohmmeter?

A. Ensure that the applied voltages are correct

B. Ensure that the circuit is not powered

C. Ensure that the circuit is grounded

D. Ensure that the circuit is operating at the correct frequency

T7D06 Which of the following might damage a multimeter?

A. Measuring a voltage too small for the chosen scale

B. Leaving the meter in the milliamps position overnight

C. Attempting to measure voltage when using the resistance setting

D. Not allowing it to warm up properly

T7D10 What is probably happening when an ohmmeter, connected across a circuit, initially indicates a low resistance and then shows increasing resistance with time?

A. The ohmmeter is defective
B. The circuit contains a large capacitor
C. The circuit contains a large inductor
D. The circuit is a relaxation oscillator