

T1B - Frequency allocations; Emission modes; Spectrum sharing; Transmissions near band edges; Contacting the International Space Station; Power output.

T1B03 [97.301(a)]: Which frequency is within the 6 meter amateur band?

300 million meters per second / ? meters per cycle = ? million cycles per second (million hertz)

$$300 / 6 \text{ meters (per cycle)} = 50 \text{ MHz}$$

(6 meter band is 50.0 – 54.0 MHz)

52.525 MHz - - - - - (page 7-9)

T1B04 [97.301(a)]: Which amateur band are you using when your station is transmitting on 146.52 MHz?

300 million meters per second / ? million cycles per second (million hertz) = ? meters per cycle

$$300 / 146.52 \text{ (MHz)} = 2.04 \text{ meters (per cycle)}$$

(2 meter band is 144.0 – 148.0 MHz)

2 meter band - - - - - (page 7-9)

T5A – Current and voltage: terminology and units, conductors and insulators, alternating and direct current.

T5A01: Electrical current is measured in which of the following units?

Amperes - - - - - (page 3-1)

T5A02: Electrical power is measured in which of the following units?

Watts - - - - - (page 3-7)

T5A03: What is the name for the flow of electrons in an electric circuit?

Current - - - - - (page 3-1)

T5A04: What are the units of electrical resistance?

Ohms - - - - - (page 3-5)

T5A05: What is the electrical term for the electromotive force (EMF) that causes electron flow?

Voltage - - - - - (page 3-1)

T5A06: What is the unit of frequency?

Hertz - - - - - (page 2-3)

T5A07: Why are metals generally good conductors of electricity?

They have many free electrons - - - - - (page 3-5)

T5A08: Which of the following is a good electrical insulator?

Glass - - - - - (page 3-5)

T5A09: Which of the following describes alternating current?

Current that alternates between positive and negative directions - - - - - (page 3-1)

T5A10: Which term describes the rate at which electrical energy is used?

Power - - - - - (page 3-7)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
[4 Exam Questions - 4 Groups]
2018-2022

T5A11: What type of current flow is opposed by resistance?

- Direct current
- Alternating current
- RF current

All these choices are correct- - - - - - (page 3-5)

T5A12: What describes the number of times per second that an alternating current makes a complete cycle?

Frequency - - - - - (page 2-3)

T5B - Math for electronics: conversion of electrical units, decibels

T5B01: How many milliamperes is 1.5 amperes?

amperes X 1000 = milliamperes

1.5 amperes X 1000 = 1,500 milliamperes

1,500 milliamperes - - - - - (page 2-2)

T5B02: Which is equal to 1,500,000 hertz?

hertz ÷ 1000 = kiloHertz

1,500,000 hertz ÷ 1000 = 1,500.000 kilohertz

1500 kHz - - - - - (page 2-2)

T5B03: Which is equal to one kilovolt?

kilovolt X 1000 = volts

1.000 kilovolt X 1000 = 1,000.000 volts

One thousand volts - - - - - (page 2-2)

T5B04: Which is equal to one microvolt?

microvolt ÷ 1,000,000 = volts

1. microvolt ÷ 1,000,000 = 0.0000001 volts

One one-millionth of a volt - - - - - (page 2-2)

T5B05: Which of the following is equivalent to 500 milliwatts?

milliwatts ÷ 1000 = watts

500. milliwatts ÷ 1000 = 0.500 watts

0.5 watts - - - - - (page 2-2)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
 [4 Exam Questions - 4 Groups]
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T5B06: Which is equal to 3000 milliamperes?

$$\text{milliamperes} \div 1000 = \text{amperes}$$

$$3,000. \text{ milliamperes} \div 1000 = 3.000 \text{ amperes}$$

3 amperes - - - - - (page 2-2)

T5B07: Which is equal to 3.525 MHz?

$$\text{megahertz} \times 1000 = \text{kilohertz}$$

$$3.525 \text{ megahertz} \times 1000 = 3,525.000 \text{ kilohertz}$$

3525 kHz - - - - - (page 2-2)

T5B08: Which is equal to 1,000,000 picofarads?

$$\text{picofarads} \div 1,000,000 = \text{microfarads}$$

$$1,000,000. \text{ picofarads} \div 1,000,000 = 1.000000 \text{ microfarads}$$

1 microfarad - - - - - (page 2-2)

T5B09: Which decibel value most closely represents a power increase from 5 watts to 10 watts?

$$\text{Power DB} = 10 * \text{LOG} (\text{Change})$$

$$\text{Change} = (\text{to watts} / \text{from watts}) = (10 \text{ watts} / 5 \text{ watts}) = 2$$

$$\text{Power DB} = 10 * \text{LOG} (2) = 10 * 0.3010299957 = 3.010299957$$

(Rule: If power doubles or halves, it changes by ± 3 dB)

3 dB - - - - - (page 4-8)

T5B10: Which decibel value most closely represents a power decrease from 12 watts to 3 watts?

$$\text{Power DB} = 10 * \text{LOG} (\text{Change})$$

$$\text{Change} = (\text{to watts} / \text{from watts}) = (3 \text{ watts} / 12 \text{ watts}) = 0.25$$

$$\text{Power DB} = 10 * \text{LOG} (0.25) = 10 * -0.6020599913 = -6.020599913$$

(Rule: If power quadruples or fourths, it changes by ± 6 dB)

-6 dB - - - - - (page 4-8)

T5B11: Which decibel value represents a power increase from 20 watts to 200 watts?

$$\text{Power DB} = 10 * \text{LOG} (\text{Change})$$

$$\text{Change} = (\text{to watts} / \text{from watts}) = (200 \text{ watts} / 20 \text{ watts}) = 10$$

$$\text{Power DB} = 10 * \text{LOG} (10) = 10 * 1 = 10$$

(Rule: If power increase by tens or reduces by tenths, it changes by ± 10 dB)

10 dB - - - - - (page 4-8)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
[4 Exam Questions - 4 Groups]
2018-2022

T5B12: Which is equal to 28,400 kHz?

$$\text{kilohertz} \div 1000 = \text{megahertz}$$

$$28,400. \text{ kilohertz} \div 1000 = 28.400 \text{ megahertz}$$

28.400 MHz - - - - - (page 2-2)

T5B13: Which is equal to 2425 MHz?

$$\text{Megahertz} \div 1000 = \text{gigahertz}$$

$$2,425. \text{ megahertz} \div 1000 = 2.425 \text{ gigahertz}$$

2.425 GHz - - - - - (page 2-2)

T5C - Capacitance and inductance terminology and units; Radio frequency definition and units; Impedance definition and units; Calculating power

T5C01: What describes the ability to store energy in an electric field called?

Capacitance - - - - - (page 3-8)

T5C02: What is the unit of capacitance?

The farad - - - - - (page 3-8)

T5C03: What describes the ability to store energy in a magnetic field called?

Inductance - - - - - (page 3-8)

T5C04: What is the unit of inductance?

The henry - - - - - (page 3-8)

T5C05: What is the unit of impedance?

The ohm - - - - - (page 3-10)

T5C06: What does the abbreviation “RF” mean?

Radio frequency signals of all types - - - - - (page 2-4)

T5C07: What is the abbreviation for megahertz?

MHz - - - - - (page 2-3)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
 [4 Exam Questions - 4 Groups]
 2018-2022

T5C08: What is the formula used to calculate electrical power (P) in a DC circuit?

$$\frac{P}{E | I} \qquad \begin{array}{l} P = E * I \\ E = P \div I \\ I = P \div E \end{array}$$

$$P = E * I \quad \text{or} \quad P = I * E$$

P = I x E. Power (P) equals voltage (E) multiplied by current (I) - - - - (page 3-7)

T5C09: How much power is delivered by a voltage of 13.8 volts DC and a current of 10 amperes?

$$\frac{P}{E | I} \qquad P = E * I$$

$$P = E * I = 13.8 \text{ volts} * 10.0 \text{ amperes} = 138.00 \text{ watts}$$

138 watts - - - - - (page 3-7)

T5C10: How much power is delivered by a voltage of 12 volts DC and a current of 2.5 amperes?

$$\frac{P}{E | I} \qquad P = E * I$$

$$P = E * I = 12.0 \text{ volts} * 2.5 \text{ amperes} = 30.0 \text{ watts}$$

30 watts - - - - - (page 3-7)

T5C11: How much current is required to deliver 120 watts at a voltage of 12 volts DC?

$$\frac{P}{E | I} \qquad I = P \div E$$

$$I = P \div E = 120 \text{ watts} \div 12 \text{ volts} = 10 \text{ amperes}$$

10 amperes - - - - - (page 3-7)

T5C12: What is impedance?

The opposition to AC current flow - - - - - (page 3-10)

T5C13: What is the abbreviation for kilohertz?

kHz - - - - - (page 2-3)

T5D – Ohm’s Law; Series and parallel circuits

T5D01: What formula is used to calculate current in a circuit?

$$\frac{E}{I \mid R}$$

$$\begin{aligned} E &= I * R \\ I &= E \div R \\ R &= E \div I \end{aligned}$$

$$I = E \div R$$

I = E / R. Current (I) equals voltage (E) divided by resistance (R) - - - - (page 3-5)

T5D02: What formula is used to calculate voltage in a circuit?

$$\frac{E}{I \mid R}$$

$$\begin{aligned} E &= I * R \\ I &= E \div R \\ R &= E \div I \end{aligned}$$

$$E = I * R$$

E = I x R. Voltage (E) equals current (I) multiplied by resistance (R) - - - - (page 3-5)

T5D03: What formula is used to calculate resistance in a circuit?

$$\frac{E}{I \mid R}$$

$$\begin{aligned} E &= I * R \\ I &= E \div R \\ R &= E \div I \end{aligned}$$

$$R = E \div I$$

R = E / I. Resistance (R) equals voltage (E) divided by current (I) - - - - (page 3-5)

T5D04: What is the resistance of a circuit in which a current of 3 amperes flows when connected to 90 volts?

$$\frac{E}{I \mid R}$$

$$\begin{aligned} E &= I * R \\ I &= E \div R \\ R &= E \div I \end{aligned}$$

$$R = E \div I = 90 \text{ volts} \div 3 \text{ amperes} = 30 \text{ ohms}$$

30 ohms - - - - - (page 3-6)

T5D05: What is the resistance in a circuit for which the applied voltage is 12 volts and the current flow is 1.5 amperes?

$$\frac{E}{I \mid R}$$

$$\begin{aligned} E &= I * R \\ I &= E \div R \\ R &= E \div I \end{aligned}$$

$$R = E \div I = 12 \text{ volts} \div 1.5 \text{ amperes} = 8 \text{ ohms}$$

8 ohms - - - - - (page 3-6)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
[4 Exam Questions - 4 Groups]

2018-2022

T5D06: What is the resistance of a circuit that draws 4 amperes from a 12-volt source?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$R = E \div I = 12 \text{ volts} \div 4 \text{ amperes} = 3 \text{ ohms}$$

3 ohms - - - - - (page 3-6)

T5D07: What is the current in a circuit with an applied voltage of 120 volts and a resistance of 80 ohms?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$I = E \div R = 120 \text{ volts} \div 80 \text{ ohms} = 1.5 \text{ amperes}$$

1.5 amperes - - - - - (page 3-6)

T5D08: What is the current through a 100-ohm resistor connected across 200 volts?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$I = E \div R = 200 \text{ volts} \div 100 \text{ ohm} = 2 \text{ amperes}$$

2 amperes - - - - - (page 3-6)

T5D09: What is the current through a 24-ohm resistor connected across 240 volts?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$I = E \div R = 240 \text{ volts} \div 24 \text{ ohms} = 10 \text{ amperes}$$

10 amperes - - - - - (page 3-6)

T5D10: What is the voltage across a 2-ohm resistor if a current of 0.5 amperes flows through it?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$E = I * R = 0.5 \text{ amperes} * 2 \text{ ohms} = 1 \text{ volt}$$

1 volt - - - - - (page 3-6)

T5D11: What is the voltage across a 10-ohm resistor if a current of 1 ampere flows through it?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$E = I * R = 1 \text{ ampere} * 10 \text{ ohms} = 10 \text{ volts}$$

10 volts - - - - - (page 3-7)

SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm’s Law
 [4 Exam Questions - 4 Groups]
 2018-2022

T5D12: What is the voltage across a 10-ohm resistor if a current of 2 amperes flows through it?

$$\frac{E}{I} = R$$

$$E = I * R$$

$$I = E \div R$$

$$R = E \div I$$

$$E = I * R = 10 \text{ ohms} * 2 \text{ amperes} = 20 \text{ volts}$$

20 volts - - - - - (page 3-7)

T5D13: In which type of circuit is DC current the same through all components?

Series - - - - - (page 3-2)

T5D14: In which type of circuit is voltage the same across all components?

Parallel - - - - - (page 3-2)

SUBELEMENT T6 – ELECTRONIC AND ELECTRICAL COMPONENTS
[4 Exam Questions - 4 Groups]
2022-2026

T6A - Fixed and variable resistors; Capacitors; Inductors; Fuses; Switches; Batteries

T6A01: What electrical component is used to oppose the flow of current in a DC circuit?

Resistor - - - - - (page 3-8)

T6A02: What type of component is often used as an adjustable volume control?

Potentiometer - - - - - (page 3-8)

T6A03: What electrical parameter is controlled by a potentiometer?

Resistance - - - - - (page 3-8)

T6A04: What electrical component stores energy in an electric field?

Capacitor - - - - - (page 3-8)

T6A05: What type of electrical component consists of two or more conductive surfaces separated by an insulator?

Capacitor - - - - - (page 3-8)

T6A06: What type of electrical component stores energy in a magnetic field?

Inductor - - - - - (page 3-8)

T6A07: What electrical component is usually constructed as a coil of wire?

Inductor - - - - - (page 3-8)

T6A08: What is the function of an SPDT switch?

A single circuit is switched between one of two other circuits - - - - - (page 3-13)

T6A09: What electrical component is used to protect other circuit components from current overloads?

Fuse - - - - - (page 3-12)

T6A10: Which of the following battery is rechargeable?

- Nickel-metal hydride
- Lithium-ion
- Lead-acid gel-cell

All of these choices are correct - - - - - (page 5-17)

SUBELEMENT T6 – ELECTRONIC AND ELECTRICAL COMPONENTS

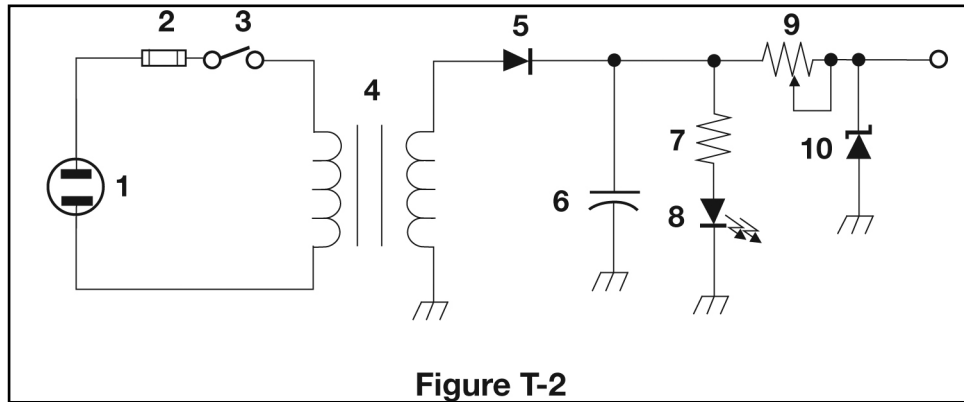
[4 Exam Questions - 4 Groups]

2022-2026

T6A11: Which of the following battery chemistries is not rechargeable?

Carbon-zinc - - - - -

(page 5-17)



T6A12: What type of switch is represented by component 3 in figure T-2?

Single-pole single-throw - - - - -

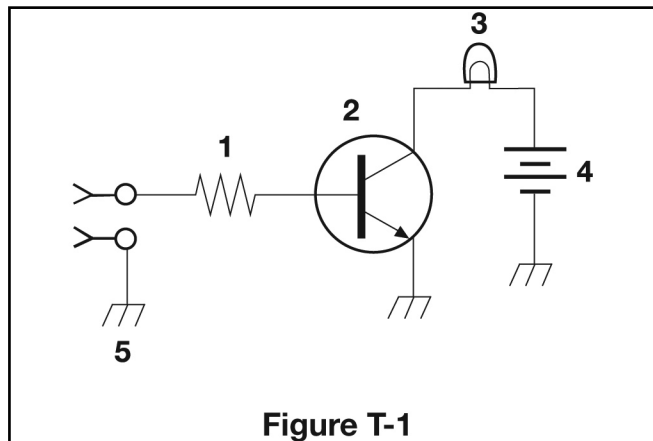
(page 3-13)

T6C - Circuit diagrams: use of schematics, basic structure; Schematic symbols of basic components

T6C01: What is the name of an electrical wiring diagram that uses standard component symbols?

Schematic - - - - -

(page 3-14)



T6C02: What is component 1 in figure T1?

Resistor - - - - -

(page 3-14)

T6C03: What is component 2 in figure T1?

Transistor - - - - -

(page 3-14)

T6C04: What is component 3 in figure T1?

Lamp - - - - -

(page 3-14)

T6C05: What is component 4 in figure T1?

Battery - - - - -

(page 3-14)

SUBELEMENT T6 – ELECTRONIC AND ELECTRICAL COMPONENTS

[4 Exam Questions - 4 Groups]

2022-2026

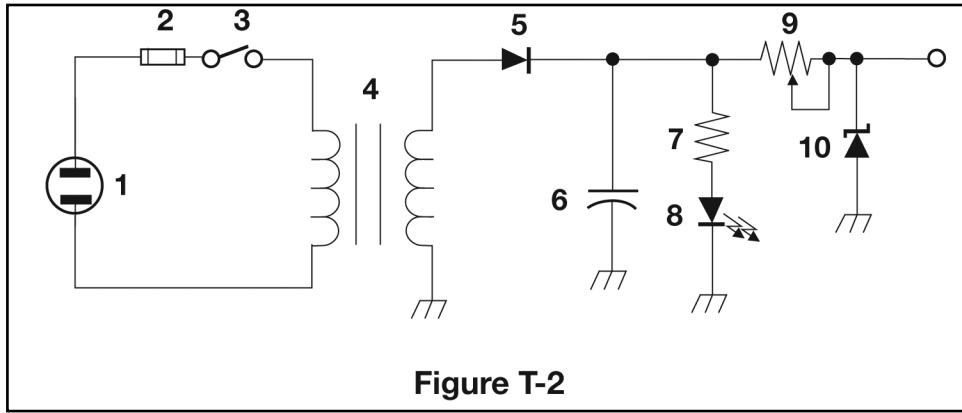


Figure T-2

T6C06: What is component 6 in figure T2?

Capacitor - - - - - (page 3-14)

T6C07: What is component 8 in figure T2?

Light emitting diode - - - - - (page 3-14)

T6C08: What is component 9 in figure T2?

Variable resistor - - - - - (page 3-14)

T6C09: What is component 4 in figure T2?

Transformer - - - - - (page 3-14)

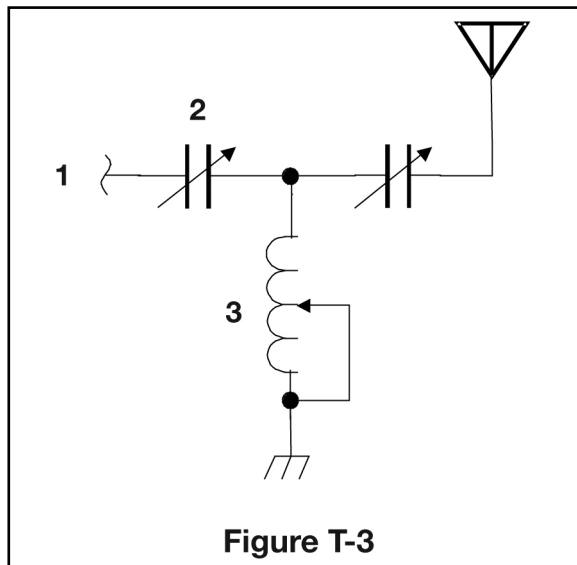


Figure T-3

T6C10: What is component 3 in figure T3?

Variable inductor - - - - - (page 3-14)

T6C11: What is component 4 in figure T3?

Antenna - - - - - (page 3-14)

T6C12: Which of the following is accurately represented in electrical schematics?

Component connections - - - - - (page 3-14)