

Subelement G4 - Amateur Radio Practices

Group G4A - Station configuration and operation

G4A01 (B)

What is the purpose of the notch filter found on many HF transceivers?

- A. To restrict the transmitter voice bandwidth
- B. To reduce interference from carriers in the receiver passband
- C. To eliminate receiver interference from impulse noise sources
- D. To remove interfering splatter generated by signals on adjacent frequencies

G4A02 (C)

What is the benefit of using the opposite or "reverse" sideband when receiving CW?

- A. Interference from impulse noise will be eliminated
- B. More stations can be accommodated within a given signal passband
- C. It may be possible to reduce or eliminate interference from other signals
- D. Accidental out-of-band operation can be prevented

G4A03 (C)

How does a noise blanker work?

- A. By temporarily increasing received bandwidth
- B. By redirecting noise pulses into a filter capacitor
- C. By reducing receiver gain during a noise pulse
- D. By clipping noise peaks

G4A04 (B)

What is the effect on plate current of the correct setting of a vacuum-tube RF power amplifier's TUNE control?

- A. A pronounced peak
- B. A pronounced dip
- C. No change will be observed
- D. A slow, rhythmic oscillation

G4A05 (C)

Why is automatic level control (ALC) used with an RF power amplifier?

- A. To balance the transmitter audio frequency response
- B. To reduce harmonic radiation
- C. To prevent excessive drive
- D. To increase overall efficiency

G4A06 (C)

What is the purpose of an antenna tuner?

- A. Reduce the SWR in the feed line to the antenna
- B. Reduce the power dissipation in the feedline to the antenna
- C. Increase power transfer from the transmitter to the feed line
- D. All these choices are correct

G4A07 (A)

What happens as a receiver's noise reduction control level is increased?

- A. Received signals may become distorted
- B. Received frequency may become unstable
- C. CW signals may become severely attenuated
- D. Received frequency may shift several kHz

G4A08 (D)

What is the correct adjustment for the LOAD or COUPLING control of a vacuum tube RF power amplifier?

- A. Minimum SWR on the antenna
- B. Minimum plate current without exceeding maximum allowable grid current
- C. Highest plate voltage while minimizing grid current
- D. Desired power output without exceeding maximum allowable plate current

G4A09 (C)

What is the purpose of delaying RF output after activating a transmitter's keying line to an external amplifier?

- A. To prevent key clicks on CW
- B. To prevent transient overmodulation
- C. To allow time for the amplifier to switch the antenna between the transceiver and the amplifier output
- D. To allow time for the amplifier power supply to reach operating level

G4A10 (B)

What is the function of an electronic keyer?

- A. Automatic transmit/receive switching
- B. Automatic generation of dots and dashes for CW operation
- C. To allow time for switching the antenna from the receiver to the transmitter
- D. Computer interface for PSK and RTTY operation

G4A11 (B)

Why should the ALC system be inactive when transmitting AFSK data signals?

- A. ALC will invert the modulation of the AFSK mode
- B. The ALC action distorts the signal
- C. When using digital modes, too much ALC activity can cause the transmitter to overheat
- D. All these choices are correct

G4A12 (C)

Which of the following is a common use of the dual-VFO feature on a transceiver?

- A. To allow transmitting on two frequencies at once
- B. To permit full duplex operation -- that is, transmitting and receiving at the same time
- C. To transmit on one frequency and listen on another
- D. To improve frequency accuracy by allowing variable frequency output (VFO) operation

G4A13 (A)

What is the purpose of using a receive attenuator?

- A. To prevent receiver overload from strong incoming signals
- B. To reduce the transmitter power when driving a linear amplifier
- C. To reduce power consumption when operating from batteries
- D. To reduce excessive audio level on strong signals

Group G4B - - Tests and test equipment

G4B01 (D)

What item of test equipment contains horizontal and vertical channel amplifiers?

- A. An ohmmeter
- B. A signal generator
- C. An ammeter
- D. An oscilloscope

G4B02 (D)

Which of the following is an advantage of an oscilloscope versus a digital voltmeter?

- A. An oscilloscope uses less power
- B. Complex impedances can be easily measured
- C. Greater precision
- D. Complex waveforms can be measured

G4B03 (A)

Which of the following is the best instrument to use for checking the keying waveform of a CW transmitter?

- A. An oscilloscope
- B. A field strength meter
- C. A sidetone monitor
- D. A wavemeter

G4B04 (D)

What signal source is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal?

- A. The local oscillator of the transmitter
- B. An external RF oscillator
- C. The transmitter balanced mixer output
- D. The attenuated RF output of the transmitter

G4B05 (D)

Why do voltmeters have high input impedance?

- A. It improves the frequency response
- B. It allows for higher voltages to be safely measured
- C. It improves the resolution of the readings
- D. It decreases the loading on circuits being measured

G4B06 (C)

What is an advantage of a digital multimeter as compared to an analog multimeter?

- A. Better for measuring computer circuits
- B. Less prone to overload
- C. Higher precision
- D. Faster response

G4B07 (B)

What signals are used to conduct a two-tone test?

- A. Two audio signals of the same frequency shifted 90 degrees
- B. Two non-harmonically related audio signals
- C. Two swept frequency tones
- D. Two audio frequency range square wave signals of equal amplitude

G4B08 (A)

What transmitter performance parameter does a two-tone test analyze?

- A. Linearity
- B. Percentage of suppression of the carrier and undesired sideband for SSB
- C. Percentage of frequency modulation
- D. Percentage of carrier phase shift

G4B09 (D)

When is an analog multimeter preferred to a digital multimeter?

- A. When testing logic circuits
- B. When high precision is desired
- C. When measuring the frequency of an oscillator
- D. When adjusting circuits for maximum or minimum values

G4B10 (A)

Which of the following can be determined with a directional wattmeter?

- A. Standing wave ratio
- B. Antenna front-to-back ratio
- C. RF interference
- D. Radio wave propagation

G4B11 (C)

Which of the following must be connected to an antenna analyzer when it is being used for SWR measurements?

- A. Receiver
- B. Transmitter
- C. Antenna and feed line
- D. All these choices are correct

G4B12 (B)

What effect can strong signals from nearby transmitters have on an antenna analyzer?

- A. Desensitization which can cause intermodulation products which interfere with impedance readings
- B. Received power that interferes with SWR readings
- C. Generation of harmonics which interfere with frequency readings
- D. All these choices are correct

G4B13 (C)

Which of the following can be measured with an antenna analyzer?

- A. Front-to-back ratio of an antenna
- B. Power output from a transmitter
- C. Impedance of coaxial cable
- D. Gain of a directional antenna

Group G4C - - Interference to consumer electronics; grounding and bonding

G4C01 (B)

Which of the following might be useful in reducing RF interference to audio frequency circuits?

- A. Bypass inductor
- B. Bypass capacitor
- C. Forward-biased diode
- D. Reverse-biased diode

G4C02 (C)

Which of the following could be a cause of interference covering a wide range of frequencies?

- A. Not using a balun or line isolator to feed balanced antennas
- B. Lack of rectification of the transmitter's signal in power conductors
- C. Arcing at a poor electrical connection
- D. Using a balun to feed an unbalanced antenna

G4C03 (C)

What sound is heard from an audio device experiencing RF interference from a single sideband phone transmitter?

- A. A steady hum whenever the transmitter is on the air
- B. On-and-off humming or clicking
- C. Distorted speech
- D. Clearly audible speech

G4C04 (A)

What sound is heard from an audio device experiencing RF interference from a CW transmitter?

- A. On-and-off humming or clicking
- B. A CW signal at a nearly pure audio frequency
- C. A chirpy CW signal
- D. Severely distorted audio

G4C05 (D)

What is a possible cause of high voltages that produce RF burns?

- A. Flat braid rather than round wire has been used for the ground wire
- B. Insulated wire has been used for the ground wire
- C. The ground rod is resonant
- D. The ground wire has high impedance on that frequency

G4C06 (C)

What is a possible effect of a resonant ground connection?

- A. Overheating of ground straps
- B. Corrosion of the ground rod
- C. High RF voltages on the enclosures of station equipment
- D. A ground loop

G4C07 (A)

Why should soldered joints not be used in lightning protection ground connections?

- A. A soldered joint will likely be destroyed by the heat of a lightning strike
- B. Solder flux will prevent a low conductivity connection
- C. Solder has too high a dielectric constant to provide adequate lightning protection
- D. All these choices are correct

G4C08 (A)

Which of the following would reduce RF interference caused by common-mode current on an audio cable?

- A. Place a ferrite choke on the cable
- B. Connect the center conductor to the shield of all cables to short circuit the RFI signal
- C. Ground the center conductor of the audio cable causing the interference
- D. Add an additional insulating jacket to the cable

G4C09 (D)

How can the effects of ground loops be minimized?

- A. Connect all ground conductors in series
- B. Connect the AC neutral conductor to the ground wire
- C. Avoid using lock washers and star washers when making ground connections
- D. Bond equipment enclosures together

G4C10 (A)

What could be a symptom caused by a ground loop in your station's audio connections?

- A. You receive reports of "hum" on your station's transmitted signal
- B. The SWR reading for one or more antennas is suddenly very high
- C. An item of station equipment starts to draw excessive amounts of current
- D. You receive reports of harmonic interference from your station

G4C11 (C)

What technique helps to minimize RF "hot spots" in an amateur station?

- A. Building all equipment in a metal enclosure
- B. Using surge suppressor power outlets
- C. Bonding all equipment enclosures together
- D. Placing low-pass filters on all feed lines

G4C12 (D)

Why must all metal enclosures of station equipment be grounded?

- A. It prevents a blown fuse in the event of an internal short circuit
- B. It prevents signal overload
- C. It ensures that the neutral wire is grounded
- D. It ensures that hazardous voltages cannot appear on the chassis

Group G4D - - Speech processors; S meters; sideband operation near band edges

G4D01 (A)

What is the purpose of a speech processor in a transceiver?

- A. Increase the apparent loudness of transmitted voice signals
- B. Increase transmitter bass response for more natural-sounding SSB signals
- C. Prevent distortion of voice signals
- D. Decrease high-frequency voice output to prevent out-of-band operation

G4D02 (B)

How does a speech processor affect a single sideband phone signal?

- A. It increases peak power
- B. It increases average power
- C. It reduces harmonic distortion
- D. It reduces intermodulation distortion

G4D03 (D)

What is the effect of an incorrectly adjusted speech processor?

- A. Distorted speech
- B. Excess intermodulation products
- C. Excessive background noise
- D. All these choices are correct

G4D04 (C)

What does an S meter measure?

- A. Carrier suppression
- B. Impedance
- C. Received signal strength
- D. Transmitter power output

G4D05 (D)

How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

- A. It is 10 times less powerful
- B. It is 20 times less powerful
- C. It is 20 times more powerful
- D. It is 100 times more powerful

G4D06 (A)

How much change in signal strength is typically represented by one S unit?

- A. 6 dB
- B. 12 dB
- C. 15 dB
- D. 18 dB

G4D07 (C)

How much must the power output of a transmitter be raised to change the S meter reading on a distant receiver from S8 to S9?

- A. Approximately 1.5 times
- B. Approximately 2 times
- C. Approximately 4 times
- D. Approximately 8 times

G4D08 (C)

What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

- A. 7.178 MHz to 7.181 MHz
- B. 7.178 MHz to 7.184 MHz
- C. 7.175 MHz to 7.178 MHz
- D. 7.1765 MHz to 7.1795 MHz

G4D09 (B)

What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

- A. 14.347 MHz to 14.647 MHz
- B. 14.347 MHz to 14.350 MHz
- C. 14.344 MHz to 14.347 MHz
- D. 14.3455 MHz to 14.3485 MHz

G4D10 (A)

How close to the lower edge of a band's phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

- A. At least 3 kHz above the edge of the segment
- B. At least 3 kHz below the edge of the segment
- C. At least 1 kHz below the edge of the segment
- D. At least 1 kHz above the edge of the segment

G4D11 (B)

How close to the upper edge of a band's phone segment should your displayed carrier frequency be when using 3 kHz wide USB?

- A. At least 3 kHz above the edge of the band
- B. At least 3 kHz below the edge of the band
- C. At least 1 kHz above the edge of the segment
- D. At least 1 kHz below the edge of the segment

G4E01 (C)

What is the purpose of a capacitance hat on a mobile antenna?

- A. To increase the power handling capacity of a whip antenna
- B. To reduce radiation resistance
- C. To electrically lengthen a physically short antenna
- D. To lower the radiation angle

G4E02 (D)

What is the purpose of a corona ball on an HF mobile antenna?

- A. To narrow the operating bandwidth of the antenna
- B. To increase the "Q" of the antenna
- C. To reduce the chance of damage if the antenna should strike an object
- D. To reduce RF voltage discharge from the tip of the antenna while transmitting

G4E03 (A)

Which of the following direct, fused power connections would be the best for a 100-watt HF mobile installation?

- A. To the battery using heavy-gauge wire
- B. To the alternator or generator using heavy-gauge wire
- C. To the battery using insulated heavy duty balanced transmission line
- D. To the alternator or generator using insulated heavy duty balanced transmission line

G4E04 (B)

Why should DC power for a 100-watt HF transceiver not be supplied by a vehicle's auxiliary power socket?

- A. The socket is not wired with an RF-shielded power cable
- B. The socket's wiring may be inadequate for the current drawn by the transceiver
- C. The DC polarity of the socket is reversed from the polarity of modern HF transceivers
- D. Drawing more than 50 watts from this socket could cause the engine to overheat

G4E05 (C)

Which of the following most limits an HF mobile installation?

- A. "Picket fencing"
- B. The wire gauge of the DC power line to the transceiver
- C. Efficiency of the electrically short antenna
- D. FCC rules limiting mobile output power on the 75-meter band

G4E06 (C)

What is one disadvantage of using a shortened mobile antenna as opposed to a full-size antenna?

- A. Short antennas are more likely to cause distortion of transmitted signals
- B. Q of the antenna will be very low
- C. Operating bandwidth may be very limited
- D. Harmonic radiation may increase

G4E07 (D)

Which of the following may cause receive interference to an HF transceiver installed in a vehicle?

- A. The battery charging system
- B. The fuel delivery system
- C. The control computers
- D. All these choices are correct

G4E08 (A)

In what configuration are the individual cells in a solar panel connected together?

- A. Series-parallel
- B. Shunt
- C. Bypass
- D. Full-wave bridge

G4E09 (B)

What is the approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell?

- A. 0.02 VDC
- B. 0.5 VDC
- C. 0.2 VDC
- D. 1.38 VDC

G4E10 (B)

Why should a series diode be connected between a solar panel and a storage battery that is being charged by the panel?

- A. To prevent overload by regulating the charging voltage
- B. To prevent discharge of the battery through the panel during times of low or no illumination
- C. To limit the current flowing from the panel to a safe value
- D. To prevent damage to the battery due to excessive voltage at high illumination levels

G4E11 (D)

What precaution should be taken when connecting a solar panel to a lithium iron phosphate battery?

- A. Ground the solar panel outer metal framework
- B. Ensure the battery is placed terminals-up
- C. A series resistor must be in place
- D. The solar panel must have a charge controller

Subelement G5 - Electrical Principles

Group G5A - - Reactance; inductance; capacitance; impedance; impedance transformation; resonance

G5A01 (C)

What happens when inductive and capacitive reactance are equal in a series LC circuit?

- A. Resonance causes impedance to be very high
- B. Impedance is equal to the geometric mean of the inductance and capacitance
- C. Resonance causes impedance to be very low
- D. Impedance is equal to the arithmetic mean of the inductance and capacitance

G5A02 (B)

What is reactance?

- A. Opposition to the flow of direct current caused by resistance
- B. Opposition to the flow of alternating current caused by capacitance or inductance
- C. Reinforcement of the flow of direct current caused by resistance
- D. Reinforcement of the flow of alternating current caused by capacitance or inductance

G5A03 (D)

Which of the following is opposition to the flow of alternating current in an inductor?

- A. Conductance
- B. Reluctance
- C. Admittance
- D. Reactance

G5A04 (C)

Which of the following is opposition to the flow of alternating current in a capacitor?

- A. Conductance
- B. Reluctance
- C. Reactance
- D. Admittance

G5A05 (D)

How does an inductor react to AC?

- A. As the frequency of the applied AC increases, the reactance decreases
- B. As the amplitude of the applied AC increases, the reactance increases
- C. As the amplitude of the applied AC increases, the reactance decreases
- D. As the frequency of the applied AC increases, the reactance increases

G5A06 (A)

How does a capacitor react to AC?

- A. As the frequency of the applied AC increases, the reactance decreases
- B. As the frequency of the applied AC increases, the reactance increases
- C. As the amplitude of the applied AC increases, the reactance increases
- D. As the amplitude of the applied AC increases, the reactance decreases

G5A07 (D)

What is the term for the inverse of impedance?

- A. Conductance
- B. Susceptance
- C. Reluctance
- D. Admittance

G5A08 (C)

What is impedance?

- A. The ratio of current to voltage
- B. The product of current and voltage
- C. The ratio of voltage to current
- D. The product of current and reactance

G5A09 (B)

What unit is used to measure reactance?

- A. Farad
- B. Ohm
- C. Ampere
- D. Siemens

G5A10 (D)

Which of the following devices can be used for impedance matching at radio frequencies?

- A. A transformer
- B. A Pi-network
- C. A length of transmission line
- D. All these choices are correct

G5A11 (B)

What letter is used to represent reactance?

- A. Z
- B. X
- C. B
- D. Y

G5A12 (D)

What occurs in an LC circuit at resonance?

- A. Current and voltage are equal
- B. Resistance is cancelled
- C. The circuit radiates all its energy in the form of radio waves
- D. Inductive reactance and capacitive reactance cancel

Group G5B - - The decibel; current and voltage dividers; electrical power calculations; sine wave root-mean-square (RMS) values; PEP calculations

G5B01 (B)

What dB change represents a factor of two increase or decrease in power?

- A. Approximately 2 dB
- B. Approximately 3 dB
- C. Approximately 6 dB
- D. Approximately 9 dB

G5B02 (C)

How does the total current relate to the individual currents in a circuit of parallel resistors?

- A. It equals the average of the branch currents
- B. It decreases as more parallel branches are added to the circuit
- C. It equals the sum of the currents through each branch
- D. It is the sum of the reciprocal of each individual voltage drop

G5B03 (B)

How many watts of electrical power are consumed if 400 VDC is supplied to an 800-ohm load?

- A. 0.5 watts
- B. 200 watts
- C. 400 watts
- D. 3200 watts

G5B04 (A)

How many watts of electrical power are consumed by a 12 VDC light bulb that draws 0.2 amperes?

- A. 2.4 watts
- B. 24 watts
- C. 6 watts
- D. 60 watts

G5B05 (A)

How many watts are consumed when a current of 7.0 milliamperes flows through a 1,250-ohm resistance?

- A. Approximately 61 milliwatts
- B. Approximately 61 watts
- C. Approximately 11 milliwatts
- D. Approximately 11 watts

G5B06 (B)

What is the PEP produced by 200 volts peak-to-peak across a 50-ohm dummy load?

- A. 1.4 watts
- B. 100 watts
- C. 353.5 watts
- D. 400 watts

G5B07 (C)

What value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

- A. The peak-to-peak value
- B. The peak value
- C. The RMS value
- D. The reciprocal of the RMS value

G5B08 (D)

What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120 volts?

- A. 84.8 volts
- B. 169.7 volts
- C. 240.0 volts
- D. 339.4 volts

G5B09 (B)

What is the RMS voltage of a sine wave with a value of 17 volts peak?

- A. 8.5 volts
- B. 12 volts
- C. 24 volts
- D. 34 volts

G5B10 (C)

What percentage of power loss is equivalent to a loss of 1 dB?

- A. 10.9 percent
- B. 12.2 percent
- C. 20.6 percent
- D. 25.9 percent

G5B11 (B)

What is the ratio of PEP to average power for an unmodulated carrier?

- A. 0.707
- B. 1.00
- C. 1.414
- D. 2.00

G5B12 (B)

What is the RMS voltage across a 50-ohm dummy load dissipating 1200 watts?

- A. 173 volts
- B. 245 volts
- C. 346 volts
- D. 692 volts

G5B13 (B)

What is the output PEP of an unmodulated carrier if the average power is 1060 watts?

- A. 530 watts
- B. 1060 watts
- C. 1500 watts
- D. 2120 watts

G5B14 (B)

What is the output PEP of 500 volts peak-to-peak across a 50-ohm load?

- A. 8.75 watts
- B. 625 watts
- C. 2500 watts
- D. 5000 watts

G5C01 (C)

What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

- A. Capacitive coupling
- B. Displacement current coupling
- C. Mutual inductance
- D. Mutual capacitance

G5C02 (A)

What is the output voltage if an input signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

- A. The input voltage is multiplied by 4
- B. The input voltage is divided by 4
- C. Additional resistance must be added in series with the primary to prevent overload
- D. Additional resistance must be added in parallel with the secondary to prevent overload

G5C03 (A)

What is the total resistance of a 10-, a 20-, and a 50-ohm resistor connected in parallel?

- A. 5.9 ohms
- B. 0.17 ohms
- C. 17 ohms
- D. 80 ohms

G5C04 (D)

What is the approximate total resistance of a 100- and a 200-ohm resistor in parallel?

- A. 300 ohms
- B. 150 ohms
- C. 75 ohms
- D. 67 ohms

G5C05 (B)

Why is the primary winding wire of a voltage step-up transformer usually a larger size than that of the secondary winding?

- A. To improve the coupling between the primary and secondary
- B. To accommodate the higher current of the primary
- C. To prevent parasitic oscillations due to resistive losses in the primary
- D. To ensure that the volume of the primary winding is equal to the volume of the secondary winding

G5C06 (A)

What is the voltage output of a transformer with a 500-turn primary and a 1500-turn secondary when 120 VAC is applied to the primary?

- A. 360 volts
- B. 120 volts
- C. 40 volts
- D. 25.5 volts

G5C07 (A)

What transformer turns ratio matches an antenna's 600-ohm feed point impedance to a 50-ohm coaxial cable?

- A. 3.5 to 1
- B. 12 to 1
- C. 24 to 1
- D. 144 to 1

G5C08 (D)

What is the equivalent capacitance of two 5.0-nanofarad capacitors and one 750-picofarad capacitor connected in parallel?

- A. 576.9 nanofarads
- B. 1,733 picofarads
- C. 3,583 picofarads
- D. 10.750 nanofarads

G5C09 (C)

What is the capacitance of three 100-microfarad capacitors connected in series?

- A. 0.33 microfarads
- B. 3.0 microfarads
- C. 33.3 microfarads
- D. 300 microfarads

G5C10 (C)

What is the inductance of three 10-millihenry inductors connected in parallel?

- A. 0.30 henries
- B. 3.3 henries
- C. 3.3 millihenries
- D. 30 millihenries

G5C11 (C)

What is the inductance of a circuit with a 20-millihenry inductor connected in series with a 50-millihenry inductor?

- A. 7 millihenries
- B. 14.3 millihenries
- C. 70 millihenries
- D. 1,000 millihenries

G5C12 (B)

What is the capacitance of a 20-microfarad capacitor connected in series with a 50-microfarad capacitor?

- A. 0.07 microfarads
- B. 14.3 microfarads
- C. 70 microfarads
- D. 1,000 microfarads

G5C13 (C)

Which of the following components should be added to a capacitor to increase the capacitance?

- A. An inductor in series
- B. An inductor in parallel
- C. A capacitor in parallel
- D. A capacitor in series

G5C14 (D)

Which of the following components should be added to an inductor to increase the inductance?

- A. A capacitor in series
- B. A capacitor in parallel
- C. An inductor in parallel
- D. An inductor in series