Recreation Vehicle Industry Association

Recreation Vehicle

Study Guide for Electrical Specialty
Study Guide for the RV
Certified RV Electrical Specialist Test
Compiled by the Recreation Vehicle Industry Association

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Overview

The purpose of this Study Guide is to help the Recreation Vehicle (RV) Service Technician prepare to take and pass the RVIA/RVDA Certified RV Electrical Specialist Test.

Note: The Certified RV Service Technician and Specialist is a Recreational Vehicle Industry designation. It does not constitute licensing or permission to perform any function or task controlled by state or local regulations. Technicians are required to meet all state and local requirements before performing any regulated tasks.

What is an RV Service Technician?

Recreation vehicles have come a long way since the early days of the RV Industry, especially in the technical sense. So much so, it takes training, dedication and the command of specialized skills to become a successful RV service technician.

Today’s service technician must acquire and apply intelligent troubleshooting skills covering the vast amount of technical equipment found within a wide range of recreation vehicle types. In addition, a qualified RV service technician must be proficient with a variety of hand and powered tools and have the ability to read, understand, implement and install numerous accessories and add-on components common to the RVing lifestyle. Performing proper and complete preventive maintenance procedures is yet another must-have skill the qualified service tech will master.

The reward is that, once the above is accomplished, a valued RV service technician will seldom (if ever), be without a job. To this day, there remains a remarkable shortage of qualified RV service technicians in the industry to staff not only traditional RV dealerships, but also those of stand-alone service shops and repair centers that are constantly seeking qualified individuals. There are many service technicians that open their own mobile RV repair business.

The bottom line is that all good RV service technicians will always have work, even during the toughest of economic times. It’s been proven; serious RVers will never entirely give up their lifestyle. They may take shorter, less frequent excursions, but even when fuel costs approach record highs, they will still be using that RV! And that’s the very reason it is an attractive option to become a professional RV service technician.

RVST Career Ladder

The Service Technician Career Ladder was developed and launched through the combined efforts of the RV Dealer Association (RVDA), the RV Industry Association (RVIA) and the Certification Governing Board.
Before the Career Ladder was established there was only one way to become a Certified RV Technician and that was to take and pass a comprehensive certification test. With the launch of the Career Ladder there are now two paths to certification. There is the traditional path through the existing RV Service Technician Certification Test and an alternate path through achieving Specialty Certifications.

The certification process begins with the Candidate level which provides a basic orientation to the RV Service Technician career. Next comes the Registered Technician level where the core knowledge of propane, basic electrical, and other skills are mastered. The technician can then move on to one of two paths. He can choose to take the comprehensive test which covers all subjects required for certification or master certification or he can choose to move through the individual specialties.

- Appliances
- Body
- Chassis
- Electrical Systems
- Plumbing

Once a technician holds all five Specialties, or passes the full certification test at the master level, and meets the time-in-service requirement he becomes a Master Certified RV Technician.

What You Must Know to Pass the RV Electrical Specialist Test

The curriculum for the RV Electrical Specialist begins with the DACUM Chart Job and Task Analysis. This document outlines all the Duties, Tasks and Steps a Specialist is expected to know. The DACUM is also known as the RV Service Technician Standard and is further broken down to align with the levels of the RVST Career Path.
This study guide is focused on the Electrical Specialist level of the Career Path.

The Electrical Specialist Chart lists all of the Duties, Tasks and Steps associated with the Electrical Specialist level.

Each section begins with the Duties, which will list the main topics covered. The Duties are followed by the activities a specialist must be able to perform in each area. This list was developed by working technicians, educators and subject matter experts from across the country and will provide a valuable check list of what to study for the test.

It should be noted that the number of questions in each area may not equal the number of tasks listed. Some of the tasks are complex and broad in scope and may be covered by several questions. Other tasks are simple and narrow in scope and one question may cover several tasks. The main objective in listing the tasks is to describe accurately what is done on the job, not to make each task correspond to a particular test question.

The Electrical Specialist Standards Chart begins below.

Sample questions will follow. Although these same questions will not appear on actual tests, they are in the same format and cover the same topics as the actual test questions.

Resource list

The following resources are available to help you prepare for the Electrical Specialist Test. The RVIA Textbooks and publications are available through the RVIA Store at www.rvia.org.

- Electrical Systems – RVIA Textbook
- Electricity DeMystified – Stan Gibilisco
- Electrical Sign-off Sheets

Taking the test

Get plenty of rest the night before so you will be alert and efficient. Arrive early enough to fine the building and testing room. Be sure to bring your test center admission ticket and current photo I.D. The proctor will instruct you in filling out the answer booklet if taking the written test or how to log on to the computer if you are taking the on-line test.

Once testing has begun, keep track of time Do not spend too long on any single question. Be sure to read each question carefully so you understand exactly what is being asked. Do not mark answers in the test booklet if taking the written test; they must be marked on the answer sheet. Your test will not be scored if your answers are not on the answer sheet.

If a question is difficult, mark the answer that you think is correct and put a check by it in the test booklet. (Computer-based tests allow you to do this on screen.) Then go on to the next question. If you finish before time is up, you may go back to the question that you have checked.

It is to your advantage to answer every question. Do not leave any answers blank. Your score will be based only on the number of correct answers you give.
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<td>c Service/inspect inverters/charger</td>
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<td>--verify charging voltage, amperage and compatibility with type of battery</td>
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<td>--verify use of appropriate overcurrent protection devices</td>
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<td>--verify proper ventilation and air circulation</td>
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<td>--verify connections</td>
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<td>--verify capacity</td>
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<td></td>
<td>--clean fan, grills, etc.</td>
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<td>--test input voltage (DC)</td>
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<td>--test output voltage (AC)</td>
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<td>--ground(s)</td>
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<td></td>
<td>--connections (clean and tight)</td>
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### 120-Volt Electrical

#### C. AC ELECTRICAL SYSTEM

**12** Perform AC voltage system inspection and tests

- **a** Perform visual inspection of AC system and components
- **b** Check polarity of the system
- **c** Measure system voltage
  - --static voltage
  - --loaded voltage
- **d** Measure system amperage
- **e** Measure resistance
- **f** Perform hot skin/chassis test
- **g** Perform GFCI systems test
- **h** Perform continuity test
- **j** Complete proper documentation on test results
- **j** Verify proper circuit breakers including HACR breaker

**13** **Service AC power sources**

- **a** Shore power voltage
  - --measure unloaded (static) voltage
--measure loaded voltage
--check polarity

b Generator voltage and frequency
--measure unloaded (static) voltage
--measure loaded voltage
--measure the no load and full load frequency

c Measure inverter output (loaded)

d Inspect and verify power cord components
--cords, adapters, connecting plugs, etc.
--check adapter polarity

e Verify separation of AC power sources (generators, shore cord, and inverter)
--manual plug in
--transfer switch (automatic or manual) (breaks both hot and neutral)
--verify transfer switch capacity

f Verify voltage compatibility (30 amp, 50 amp) of connections

14 Service AC wiring/distribution system

a Inspect/test/replace circuit breakers

b Inspect/replace distribution panel boards

c Check wiring connections and terminals

d Identify short/open/ground circuits

e Inspect/replacement switches, relays and solenoid

f Verify wire specifications (temperature rating, type, size, etc.)

g Visually inspect wiring protection

h Verify ground connection

i Check/replace receptacles

j Replace receptacle covers (exterior)

k Check/replace GFCl (Ground Fault Circuit Interruption Protection)
--verify proper outlets are GFCl protected

l Verify neutrals isolated from ground

m Verify slideout room section ground continuity to main unit

n Energy management systems
--reset
--reconfigure priority scheme
--replace
--analyze diagnostic information from unit

o Add electrical device or circuit
--check load requirement and source availability
--proper overcurrent protective devices
--wiring (size vs. ampacity)
--insulation (application, material type and temperature rating)
--support
--installation
--ground(s)
--connections (clean and tight)
--verify voltage compatibility (120 volt) of connections

p Add alternative/additional electrical source
## Electronics and Brake Controllers

### E. BRAKE, SUSPENSION AND TOWING SYSTEMS

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### L. TECHNICAL SKILLS

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<td>--install/repair television/AV distribution system</td>
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<td>--install/repair electric steps</td>
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## Generators

### G. GENERATORS

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</table>
---breather system
---governor springs, linkage and brackets
---vibration isolators
d  Verify engine operation

53  Inspect/maintain/repair generator section and control system

a  Verify output voltage and frequency (no load and full load) without using the coach
b  Repair/replace components
   --stator testing for opens, grounds, and shorts
   --rotor testing for opens, grounds, and shorts
   --brush block assembly/brushes
   --voltage regulator and control (interpret diagnostic codes)
   --start solenoid
   --circuit breaker
   --control fuses
   --wire and wire harnesses and connectors
   --control relays
   --generator drive system
c  Install new generator

54  Inspect/test/maintain remote start and auto generator start panels (AGS)

a  Check for battery voltage
b  Check demand signal from air conditioner
c  Confirm presence of the safety lockout; input connection

55  Troubleshoot generator faults

a  Troubleshoot - will not start
b  Troubleshoot no will not crank
c  Troubleshoot starts but will not run
d  Diagnose AC voltage output (including high and low)
e  Troubleshoot surging
f  Troubleshoot frequency output (high and low)
g  Troubleshoot intermittent operation or unintentional shut down
h  Troubleshoot using resistive load (not coach load)

**Sign-off Sheet Required Knowledge**

There are three sign-off sheets associated with the Electrical Specialist. You must know how to do each test and in what order the steps are performed. The three sign-off sheets are included in Appendix I at the end of this study guide. The entire group of 14 sign-off sheets can be downloaded from the RV Learning Center’s web site, [www.rvlearningcenter.com](http://www.rvlearningcenter.com).

Print the sign-off sheets and perform the tests. Practice the tests until you are sure that you have thoroughly learned each one.

1. **AC Electrical Systems Tests**
   a. Hot Skin
   b. Polarity
2. **AC Electrical Tests**
   a. Voltage
   b. Amperage

3. **DC Electrical Tests**
   a. Voltage
   b. Amperage
   c. Continuity

**Practice Questions**

The Electrical Specialty Test has 81 questions with a time limit of 75 minutes. These sample questions cover the same material as the actual test, but they are not the same questions. An answer key follows the practice questions. If you find that your knowledge is weak in certain areas, re-read the study material. Memorizing the answers to these questions will not assure a passing score on the actual test.

**DC Electrical**

1. Which of these is a correct statement regarding use of a multimeter?
   A. Connect a voltmeter in series in a circuit.
   B. Connect an ammeter in series in a circuit.
   C. Connect an ammeter in parallel in a circuit.
   D. Connect an ohmmeter in a live circuit.

2. The battery shown in the illustration has 12-volts potential. With the voltmeter connected as shown, what should the voltmeter reading be?

   ![Diagram](image)

   A. 0 volts
   B. 2 volts
   C. 6 volts
   D. 12 volts
3. The battery in the illustration above is charged to 12-volts. If a voltmeter is placed across (in parallel with) one of the 5 lamps in the illustration below, the voltmeter would read _______.

   ![Illustration of five lamps](image)

A. 0 volts  
B. 2 volts  
C. 5 volts  
D. 12 volts  

4. A 0 - 90 ohm propane sending unit circuit is being diagnosed and found to have an open circuit. With this kind of fault, the receiver reads _______.

   A. empty  
   B. one half full  
   C. full  
   D. beyond full  

5. If a voltmeter were being used to check continuity in the circuit shown, at which of these measuring points would 12 volts be read on the meter?

   ![Circuit diagram](image)

A. A to B  
B. B to C  
C. E to F  
D. G to H
6. Continuity is being checked in the circuit shown above. Technician A says that 12 volts will be measured from point B to C. Technician B says that 0 volts (no voltage drop) will be measured from point D to E. Who is correct?

A. A only  
B. B only  
C. Both A and B  
D. Neither A nor B

7. Based on the wattage used as shown in the circuit, what is the total current draw from the battery?

A. 10 watts  
B. 25 watts  
C. 100 watts  
D. 300 watts

8. If switch S2 is closed, what will happen to the total current draw in this circuit?
9. What happens to current draw if S2 is closed?

- A. Go to zero
- B. Go down
- C. Remain the same
- D. Go up

10. When 12-volt DC batteries are connected as shown, what is the voltage seen across points A to B (load) in the illustration?
A. 12 volts DC  
B. 24 volts DC  
C. 36 volts DC  
D. 48 volts DC

11. Technician A says that a fully charged lead-acid battery should read no less than 12.65 volts DC. Technician B says that a fully charged gel-cell battery should read no less than 13.0 volts DC. Who is correct?  
   A. A only  
   B. B only  
   C. Both A and B  
   D. Neither A nor B

12. RV Technician A says that if the input voltage to a linear converter drops, output voltage will drop. RV Technician B says that if input voltage to a linear converter rises, output voltage will be regulated. Who is correct?  
   A. A only  
   B. B only  
   C. Both A and B  
   D. Neither A nor B

13. An absorbed glass mat (AGM) battery has experienced plate sulfation and slightly differing cell voltages. Which of these procedures could be used to correct the problem?  
   A. Fast charge the battery at 13.4 volts for 30 minutes.  
   B. Fast charge the battery at 14.4 volts for 30 minutes.  
   C. Condition the battery at 15.0 volts for 1 hour.  
   D. Equalize the battery at 15.5 volts for 3 hours.

14. RV Technician A says that a starting battery is useful for supplying power for prolonged energy-draining periods. RV Technician B says that a deep-cycle battery can best be used as a cranking motor battery. Who is correct?  
   A. A only  
   B. B only  
   C. Both A and B  
   D. Neither A nor B

15. Which of these is a good reason for disconnecting the negative battery cable connection first?  
   A. In case the wrench touches a metal part of the vehicle.  
   B. In case the battery positive cable connection is too tight to get loose.  
   C. In case the battery positive cable connection is sulfated.  
   D. In case the battery positive cable connection cannot be easily accessed.

16. The specific gravity of a wet-cell battery reads 1.125. This means that the battery is ______ charged.
17. The electrolyte in a wet-cell lead acid battery consists of
   A. phosphoric acid and seltzer water.
   B. hydrochloric acid and bottled water.
   C. muriatic acid and tap water.
   D. sulfuric acid and distilled water.

18. How much amperage can be safely handled by 14 gauge NM cable?
   A. 10 amps
   B. 12 amps
   C. 15 amps
   D. 20 amps

19. Resistance in a circuit will increase under any of these conditions EXCEPT for
   A. increased wire length.
   B. smaller wire diameter.
   C. hot wiring.
   D. a larger fuse.

20. RV Technician A says electricity is produced when a magnet is moved through a
    winding, RV Technician B says that magnetism is produced when electricity is
    applied to a coil. Who is correct?
    A. A only
    B. B only
    C. Both A and B
    D. Neither A nor B

21. Which of these types of cables is best used for applications which are subjected to
    vibration?
    A. Coaxial cable
    B. Solid core copper cable
    C. Stranded copper cable
    D. Aluminum stranded cable

22. Any of these could cause a starter motor to crank slowly EXCEPT for
    A. too large battery cables.
    B. corroded battery connections.
    C. corroded starter ground.
    D. low battery voltage.
23. A cranking battery in good condition has an open-circuit reading of 12.6 VDC. When the starter is engaged, voltage at the starter solenoid’s B+ terminal to ground should be no less than
   A. approximately 12.0 volts.
   B. approximately 12.2 volts.
   C. approximately 12.4 volts.
   D. approximately 12.6 volts.

24. The marker lights on an RV trailer are found to be glowing dimly as compared to those on the tow vehicle. Any of these could be the cause EXCEPT
   A. a chaffed wire in the trailer wiring harness.
   B. a poor ground connection on the trailer.
   C. corrosion in the trailer hitch electrical connector.
   D. an open in the trailer wiring harness.

25. Which of these statements is true about the 3-post isolator shown above?
   A. Ignition power should be connected to terminal B.
   B. Vehicle ground should be connected to terminal C.
   C. The coach battery should be connected to terminal A.
   D. The coach battery should be connected to C.

26. The batteries used in RV applications are? _____ .
   A. lead carbon
   B. steel carbon
   C. lead acid
   D. steel acid

27. Two 12V batteries connected in series provide _____ VDC.
   A. 6
   B. 12
   C. 24
   D. 48

28. A _____ is the only type of converter that must have a battery attached for proper operation.
   A. switchmode
   B. ferro-resonant
   C. linear
29. A gassing battery gives off _______.
   A. sulfur oxide
   B. oxygen
   C. nitrogen
   D. hydrogen

30. If the speed of an unregulated alternator is doubled, the output/voltage will _______.
   A. remain the same
   B. double
   C. quadruple
   D. decrease

31. A fully charged battery at rest will show an approximate voltage of ___ DC volts.
   A. 14.5
   B. 14.1
   C. 12.8
   D. 12.0

32. On a linear converter, the output is _______.
   A. filtered and variable
   B. variable and unfiltered
   C. filtered and constant
   D. unfiltered and constant

33. Paralleling batteries increases _______.
   A. voltage
   B. resistance
   C. capacity
   D. inductance

34. Before removing and installing a replacement power converter you would _______.
   A. turn the branch AC circuit breaker on
   B. always disconnect battery and AC power supply
   C. always disconnect battery isolator
   D. always short across battery terminal (+) to ground to discharge convertor filters

35. The battery disconnect system in a vehicle is primarily used to _______.
   A. change the batteries
   B. prevent premature battery discharge
   C. balance the voltage between batteries
   D. be a constant source of AC voltage

36. A capacitor is a device that _______.

D. exponential
A. temporarily stores electrical energy
B. is used to check electrical pressure
C. indicates direction of a magnetic field
D. measures electrostatic force between charged particles

37. The linear converter has ______ output.
   A. filtered and variable
   B. variable and isolated
   C. variable and unfiltered
   D. isolated and unfiltered

38. What type of battery is used in an RV's 12v system?
   A. alkaline
   B. lead acid
   C. nickel cadmium
   D. dry cell

39. To safely remove a battery from a vehicle, the negative lead should be removed ______.
   A. last
   B. first
   C. first, only if convenient
   D. doesn't make a difference

40. Chemically produced electricity is commonly produced from ______.
    A. 110 outlets
    B. generators
    C. batteries
    D. gasoline

41. The type of power produced by the oldest type of RV converter is ______.
    A. 12 Volt AC
    B. 12 Volt pure DC
    C. 12 Volt Unfiltered DC
    D. 12 Volt Square Wave

42. Connecting batteries in parallel will ______.
    A. increases voltage
    B. increases current
    C. increases amp-hour capacity
    D. cause immediate failure

43. Connecting batteries in series will ______.
    A. increases voltage
    B. increases current
    C. increases amp-hour capacity
D. cause immediate failure

44. The Specific Gravity of a fully charged lead acid battery is?
   A. 1.285
   B. 1.265
   C. 1.225
   D. 1.155

45. Which type of battery is most often used for the chassis battery?
   A. lead acid gelled
   B. deep-cycle
   C. nickel cadmium
   D. automotive

46. When you connect four 6V, 200-amp DC batteries in series you will get ________.
   A. 6 VDC, 200 amps
   B. 24 VDC, 200 amps
   C. 6 VDC, 800 amps
   D. 24 VDC, 800 amps

47. When you connect four 6V, 200-amp DC batteries in parallel you will get ________.
   A. 6 VDC, 200 amps
   B. 24 VDC, 200 amps
   C. 6 VDC, 800 amps
   D. 24 VDC, 800 amps

48. To determine correct wire size, you must calculate the ____ load.
   A. switch
   B. hardness
   C. amperage
   D. voltage

49. When replacing fuses on any appliance, you should always use one with ________.
   A. a higher amp and volt rating
   B. a lower amp rating
   C. the same amp and volt rating
   D. the same amp and higher volt rating

50. 12 volt DC blower motors are ____ protected.
   A. split
   B. thermally
   C. moisture
   D. AC

51. A diode should have continuity in ________.
   A. one direction
B. two directions  
C. three directions  
D. four directions

52. When stripping a wire, you should strip only _______.
   A. an area to fit in the connector  
   B. 1/8" larger than the connector  
   C. 1/4" larger than the connector  
   D. 3/8" larger than the connector

53. A water pump runs continuously with the control relay de-energized. Which of the following is the most likely cause?
   A. An open wire to the pump.  
   B. A shorted pump.  
   C. The switch remains open.  
   D. The switch remains closed.

54. When testing a good diode with an ohmmeter and then measuring this part again with the leads reversed, you should have
   A. two low readings.  
   B. two high (infinite) readings.  
   C. one high (infinite) and one low reading.  
   D. This is an incorrect test.

55. A clearance lamp circuit has a 15 amp fuse installed, What is the maximum draw that should be applied to that circuit?
   A. 15 amps  
   B. 12 amps  
   C. 18 amps  
   D. 10 amps

AC Electrical

56. An RV “hot skin” condition is most likely caused by
   A. excessive shore power voltage.  
   B. reversed polarity at the shore power plug.  
   C. a defective GFCI in the circuit.  
   D. an open neutral connection.

57. Which of these could cause a ground fault interrupter (GFCI) to trip?
   A. A leakage of 4 to 6 millivolts.  
   B. A leakage of 6 to 10 ohms.  
   C. A leakage of 4 to 6 milliamps.  
   D. A leakage of 6 to 10 milliwaters.
58. All of these statements about conducting a high-potential (“hot-pot”) leakage test on an RV are true EXCEPT
   A. voltage is applied across the Black and the White wires.
   B. voltage is applied across the Neutral and the White wire.
   C. voltage is applied across the Neutral and the Black wire.
   D. the Black and White wires may be connected together for the test.

59. Which of these could cause a failure of external 120 volt AC (shore power) to provide electricity to an RV?
   A. A faulty generator.
   B. A faulty transfer switch.
   C. A faulty GFCI.
   D. A faulty battery isolator.

60. After an RV Technician connects an ammeter into a live AC circuit, the internal ammeter fuse blows. Which of these is the most likely cause?
   A. The circuit voltage is too high.
   B. The ammeter is set to DC.
   C. The ammeter was connected in parallel with a load.
   D. The ammeter was connected in series with a load.

61. All of these statements about GFCI circuits are true EXCEPT
   A. a GFCI can protect outlets wired downstream of the GFCI.
   B. if a fault occurs downstream from the GFCI, all downstream outlets are affected.
   C. if the GFCI trips, downstream outlets will not be affected.
   D. if the GFCI is wired incorrectly, all downstream outlets are affected.

62. Power in one of the 120 volt AC circuits in an RV is found to be intermittent. Which of these could be the cause?
   A. A defective shore power connection.
   B. A faulty connection at the breaker panel.
   C. A faulty generator.
   D. A faulty inverter.

63. RV Technician A says that one purpose of a Hi-Pot test is to find out if the shore power connection to the RV is wired correctly. RV Technician B says one purpose of a Hi-Pot test is determine if there are any problems in the RV’s DC wiring. Who is correct?
   A. A only.
   B. B only.
   C. Both A and B.
   D. Neither A nor B.

64. Which of these might cause a fault (burned wiring) at the transfer switch of an RV after it is connected to 50 amp shore power?
A. The shore power receptacle has reversed wiring.
B. The transfer switch contacts are faulty.
C. An open circuit in an appliance has caused the transfer switch to fail.
D. The neutral is insulated from ground in the shore power connector.

65. What could happen if the 120 volt AC neutral and ground wires were bonded at the RV’s breaker panel?
   A. There is no problem because the panel is correctly wired.
   B. If a receptacle in the RV is wired backwards, the coach skin could become “hot”.
   C. Some appliances would not work correctly.
   D. All of the circuit breakers would trip.

66. How much voltage would a voltmeter read if its leads are inserted into the “hot” cavities of two live 120 volt receptacles which are on opposite legs of a breaker panel?
   A. 0 volts
   B. 120 VDC
   C. 0 VAC
   D. 240 VAC

67. RV technician A says that a converter outputs 12 VDC from 120 VAC input. RV Technician B says that an inverter does the same thing. Who is correct?
   A. A only.
   B. B only.
   C. Both A and B.
   D. Neither A nor B.

68. When an RV manufacturer installs an inverter in an RV, the purpose of the inverter is to
   A. provide 12 VDC vehicle battery power to the coach.
   B. protect the vehicle battery from being discharged by electrical loads in the coach.
   C. transform 12 VDC coach battery power to 120 VAC for coach electrical loads.
   D. Convert 120 VAC power to 12 VDC power for loads in the coach.

69. If a 50 amp (split phase) RV cable connector is adapted for use with a 30 amp RV shore power receptacle, what happens to the potential (voltage) across the two 50 amp legs at the RV breaker panel?
   A. There is no voltage across the legs because they are in phase with each other.
   B. There is 220 volts across the 2 legs because they are out of phase with each other.
   C. Only one of the 2 legs will have power; the other will have no power.
D. There is no voltage on either leg because 50 amp service cannot be connected to a 30 amp shore power connector.

70. An RV Technician is using a voltmeter to check for power in a live 50 amp distribution panel. What voltage reading would be seen if the voltmeter leads were placed across both legs?
   A. 0 volts DC.
   B. 120 volts AC.
   C. 240 volts DC.
   D. 240 volts AC.

71. Due to a generator malfunction, voltage being fed into a resistive load is raised from its nominal 120 volts AC to 140 VAC. What happens to the amperage?
   A. It is rejected by the load device.
   B. It goes down.
   C. It stays the same.
   D. It goes up.

72. The primary in a 120 volt AC transformer experiences a short across several of its windings. What is the effect on the circuit?
   A. Voltage goes up.
   B. Amperage goes down.
   C. Watts go down.
   D. Resistance goes down.

73. If an RV has a hot skin condition when plugged into shore power, the RV Technician can detect it by
   A. using a voltmeter to measure from hot to neutral in one of the RV’s receptacles.
   B. using an ohmmeter to measure from neutral to a good ground.
   C. using an ammeter to measure from hot and neutral in one of the RV’s receptacles.
   D. using a voltmeter to measure from an RV bare metal surface to a good earth ground.

74. In order for a hot skin test to be accurate, all of these must be done EXCEPT
   A. the RV must be plugged into a live source of shore power.
   B. the RV panel breakers should be turned to the ON position.
   C. check for voltage between an RV receptacle’s hot cavity and a bare RV ground.
   D. check for potential between an RV bare metal surface and a good earth ground.

75. In the converter shown below, what should the secondary center-tap output voltage be when measured to ground?
76. Which of these best describes what an energy management system does?
   A. It automatically removes loads to prevent overloading the generator or shore power.
   B. It monitors the AC load and manages the output from the generator.
   C. It protects the vehicle battery from being discharged when the vehicle is not running.
   D. It protects the RV system if the shore power plug is incorrectly polarized.

77. A mobile RV air conditioning system is being installed. Which of these kinds of wiring would typically be used?
   A. 14/2 Romex cable.
   B. 12/2 NM type cable.
   C. 10/2 AWG in conduit.
   D. 10/3 in BX sheathing.

78. An RV comes equipped with a 3-prong shore power connector. Which of these options best describes how to connect a 240 volt appliance for use in this RV?
   A. Upgrade the shore power cord with a 4-prong shore power plug.
   B. Use a 3-prong to 4-prong adaptor and plug into a 50 amp shore power pedestal.
   C. Use a 2:1 transformer to step the appliance down to 120 volts.
   D. It should not be connected because a 240 volt appliance should not be used in this RV.

79. Current supplied by commercial power lines and RV generators is known as

   A. alternating current
   B. direct current
   C. inducted current
   D. accelerating current
80. Black (Hot), White (Neutral) and Ground provide____ volts.
   A. 12
   B. 120
   C. 240
   D. 480

81. An inverter is used to change_______.
   A. 120V AC to 12V DC
   B. 12V DC to 24V DC
   C. 12V DC to 120V AC
   D. 120V AC to 24V DC

82. The function of an auto transfer switch_______.
   A. connects all power sources together
   B. only used with battery chargers
   C. allows only one power source to the vehicle's circuit at a time
   D. moves the vehicle electrical control from front dash area to entertainment center

83. 50 amp service provides______. 
   A. one 120 volt line at 50 amps
   B. one 240 volt line at 50 amps
   C. two lines of 120 volts at 50 amps each
   D. two lines of 240 volts at 50 amps each

84. As the gauge of copper wire increases, its diameter______. 
   A. decreases in size
   B. changes composition
   C. increases in size
   D. varies in length

85. If a customer complains of receiving shocks from his/her vehicle when plugged in, 
   the first test should be a_______.
   A. polarity check of the shore cord
   B. polarity check of the battery system
   C. voltage check
   D. converter voltage check

86. Wet location covers are required on all AC receptacles located_______.
   A. outside
   B. in the bathroom
   C. in the kitchen
   D. bedroom

87. The neutral wire connected to the 120V AC shoreline power should be ungrounded
A. in all 120V AC RV wiring.
B. only in RV's employing 3 or more branch circuits.
C. only when 30 amp service is used.
D. only in "Class A" motor homes.

88. A conductor is used to _______.
   A. transfer electricity from one point to another
   B. resists electrical current
   C. allow current to leak to ground
   D. induces electricity to other wires

89. When making a 120V AC connection to a screw, the wire should be circled around
the screw post connection in a ____ direction.
   A. counter clockwise
   B. left hand
   C. clockwise
   D. opposite

90. 1000 feet of 14 gauge wire whose temperature is 70 degrees F has a resistance that is
____________ 1000 feet of 10 gauge wire at the same temperature.
   A. equal to
   B. larger than
   C. less than
   D. no difference

91. Proper connection of the white wire and the bare copper wire in a 120 VAC
distribution panelboard is _____.
   A. isolated from each other
   B. wire together
   C. must be connected to ground rod
   D. never used

92. A 10-3 non-metallic sheathed cable consists of _____.
   A. two hots (black and red), one neutral (white), and one ground (bare or green)
   B. two hots (black and blue), one neutral (white), and one ground (green)
   C. two hots (black and white), one neutral (white), and one ground (green)
   D. two hots (black and red), one neutral (white), and one ground (brown)

93. The amount of amperage that can be carried by a 10 gauge wire versus a 16 gauge
wire is _______.
   A. lower
   B. higher
   C. equal
   D. not measurable
94. What minimum gauge wire should be used for a 30 amp circuit?
   A. 8
   B. 10
   C. 12
   D. 14

95. When splicing a 120 VAC wire you must
   A. use listed electrical tape.
   B. use a junction box.
   C. use both listed electrical tape and a junction box.
   D. 120 VAC wire is not spliced.

96. If a GFCI receptacle is properly wired, what condition exits?
   A. Polarity tests are not necessary.
   B. Involved circuit must have circuit breaker protection.
   C. All receptacles downstream will be GFCI protected.
   D. Vehicle grounding for interior lights is not required

97. What procedure must be used when passing all conductors through bulkheads and/or partitions?
   A. Employ clamp & grommets to prevent chaffing.
   B. Wire tie all parallel wires.
   C. Add heat retardant material.
   D. Separate dissimilar wires colors.

98. What should be performed when a bonding strap or bonding screw is present in a distribution panelboard intended for use in an RV?
   A. Attach strap or screw to panel.
   B. Discard strap or screw.
   C. Add electrical clamp harness.
   D. Attach strap or screw to ground.

99. When installing a new 120 VAC receptacle when is a GFCI not required?
   A. In bathroom.
   B. Six feet from wet location.
   C. Exterior of RV.
   D. Two feet from a battery location.

100. What occurs when two adjacent conductors make electrical contact and bypass a portion of a circuit?
    A. A ground.
    B. An open.
    C. A short.
    D. The circuit resistance increases.

101. Bonding clamps are designed and installed to ________.
A. safely conduct current likely to be imposed between two metal parts  
B. act as a fuseable link when installing electrical components  
C. create a common connection on the load wire of two or more components  
D. alternate route for load distribution

**Brake, Suspension and Towing Systems**

102. A brake controller is being installed in a pickup truck for towing an RV. Which of these is the best option for connecting to the truck’s electrical circuit?
   A. Use 14 gauge solid copper wire with a fast-blow fuse.  
   B. Use 12 gauge stranded copper wire with a slow-blow fuse.  
   C. Use 10 gauge stranded wire with a 25 amp fuse.  
   D. Use 12 gauge stranded wire with a 20 amp self-resetting circuit breaker.

103. A 7-pin towing connector is being wired to a trailer with electric brakes. Which color of wire should be used for the brake circuit?
   A. Yellow.  
   B. Blue.  
   C. White.  
   D. Black.

104. A brake controller actuator is being installed in an SUV. What is the best way to determine the proper fuse size to be used?
   A. Use a fuse one size smaller than the kind normally approved for the trailer.  
   B. Use a fuse size equal to 3 amps per brake magnet used in the brake system.  
   C. Use a fuse that is rated for 5 amps per brake magnet used in the brake system.  
   D. Use a fuse that is recommended by the owner of the trailer.

105. Another name to describe an inertia-type brake control system is
   A. time based system.  
   B. swinging pendulum system.  
   C. proportional system.  
   D. actuator type system.

106. A 5th wheel trailer electric brake system experiences grabbing brakes. Any of these descriptions could be the cause EXCEPT
   A. the threshold adjustment is set incorrectly.  
   B. the level adjustment is set incorrectly.  
   C. the brake sensor adjusting wheel threshold is set incorrectly.  
   D. the pendulum is stuck and prevented from working correctly.

107. Which component is NOT a part of a typical electrical trailer drum brake assembly?
   A. slave cylinder.  
   B. magnet assembly.  
   C. adjuster screw assembly.
D. brake shoes.

108. A pulse preventer is a _____.
   A. relay
   B. capacitor
   C. diode
   D. switch

109. A single electromagnet for 7" to 12" trailer brake assemblies should have approximately _______ resistance.
   A. 3-4 ohms
   B. 12 ohms
   C. 6-8 ohms
   D. .03-.04 ohms

110. Electric trailer brakes are designed to operate on______.
    A. 12VDC
    B. 24VDC
    C. 120VAC
    D. 6VDC

111. Checking the electromagnet for proper wear will involve the use of a______.
    A. straight edge
    B. VOM meter
    C. rasp
    D. sight gauge

112. The breakaway switch must be mounted in______.
    A. the tow vehicle engine compartment
    B. a swivel configuration
    C. a protective compartment
    D. compliance to the national transportation safety code

**Generators**

113. The AC single-phase frequency output of a generator is determined by all of these EXCEPT
    A. the speed of the engine.
    B. the type of fuel used.
    C. the generator governor setting.
    D. the number of rotor windings.

114. Which of these is the best type of non-conductive fuel line to be used between the fuel supply and a generator installed in an RV?
    A. Reinforced polyurethane tubing.
    B. Rubber braided tubing.
    C. Neoprene tubing.
    D. Braided steel rubber tubing.
115. Which of these is the best reason for exercising the generator in an RV?
   A. To keep fresh fuel in the fuel system.
   B. To prevent sludge buildup in the engine cooling system.
   C. To keep the generator’s engine shrouding free of debris.
   D. To prevent the carburetor linkage from becoming fouled.

116. Ideally, an RV generator should be exercised every:
   A. day.
   B. week.
   C. month.
   D. year.

117. An air-cooled generator in an RV experiences overheating. Which of these is the most likely cause?
   A. The fuel mixture is too rich.
   B. The cooling shroud is blocked with debris.
   C. The governor adjustment is set incorrectly.
   D. The wrong type of gasoline is being used.

118. A low oil pressure switch for a generator has been removed from the engine and is being checked for continuity. Which of these could the RV Technician use to test it?
   A. A non-self powered test light.
   B. A digital voltmeter.
   C. An ohmmeter.
   D. A noid light.

119. A generator engine is emitting black smoke from its exhaust. This is an indication of
   A. worn piston rings.
   B. burned valves.
   C. a leaking head gasket.
   D. a rich fuel mixture.

120. What is the purpose of DC exciter voltage supplied to a generator?
   A. To “jump start” the field windings upon engine startup.
   B. To enable the stator windings to become energized.
   C. To control the generator’s RPM.
   D. To control the generator’s output frequency.

121. Which of these component(s) in a generator determines the output as load on the generator is increased or decreased?
   A. The rotor field windings.
   B. The stator battery charge winding.
   C. The stator power windings.
D. The initialization windings.

122. When the field current supplied to the generator’s rotor is increased, generator output
A. will stabilize.
B. will go down.
C. fluctuate.
D. will go up.

123. Referring to the schematic below, which component allows the cranking motor to start cranking the generator’s engine?

A. BCR
B. SC
C. ISD
D. LOP
124. Referring to the schematic above, which component converts AC battery charging winding output to DC for charging the 12 volt battery?

A. IM1
B. ISD
C. BCR
D. SW1
125. Referring to the schematic below, which of these components shuts down the engine?

A. BCR  
B. CR1  
C. IM1  
D. ISD

126. A 60 Hz generator designed to rotate at 1800 RPM will have a
A. 2-pole rotor.
B. 4-pole rotor.
C. 2-pole stator
D. 4-pole stator.

127. When a load is placed on a generator with automatic generator start (AGS) system, the generator fails to crank and start up. Any of these could be the cause EXCEPT
   A. a faulty starter solenoid.
   B. an improperly set DIP switch.
   C. a faulty low oil pressure (LOP) switch.
   D. a faulty vehicle cranking battery.

128. An RV generator is being serviced. What should the RV Technician do to prevent the generator from automatically starting?
   A. Disconnect the generator battery positive cable.
   B. Disconnect the generator battery negative cable.
   C. Disconnect the vehicle cranking battery.
   D. Disconnect the spark plug HV lead.

129. Any of these methods may be commonly used to cause a generator to crank and start EXCEPT
   A. a remote panel.
   B. AGS.
   C. a hand crank.
   D. a wireless remote.

130. Which of these would cause an AGS to activate?
   A. Select startup from a hand-held remote.
   B. Select startup from a remote panel.
   C. Have a low coach battery SOC.
   D. Have a low vehicle battery SOC.

131. An RV Technician is using an ohmmeter to check the windings of a generator’s fields and finds that their resistance is below specifications. Which of these is the most likely cause?
   A. Defective slip rings.
   B. Shorted rotor windings.
   C. Defective brushes.
   D. Shorted stator windings.

132. To check a rotor for defective windings, an RV technician should use a(n)
   A. growler.
   B. voltmeter.
   C. ammeter.
   D. ohmmeter.
133. A generator bogs down when a heavy load is placed on it, yet the generator’s load (wattage) rating has not been exceeded. The RV technician should first check for
   A. low engine compression.
   B. burned valves.
   C. a plugged exhaust system.
   D. a plugged spark arrestor.

134. A generator experiences low output frequency. Which of these could be the cause?
   A. Worn slip rings.
   B. Low exciter current.
   C. Worn brushes.
   D. Low engine RPM.

135. An on-line gasoline fueled RV generator stumbles and quits running. Which of these is the most likely cause?
   A. A dead coach battery.
   B. Low fuel level in the vehicle fuel tank.
   C. An electrical overload.
   D. Low fuel level in the coach fuel tank.

136. The field strength (magnetism) in a generator can be increased by
   A. increasing the AC power going to the stator.
   B. supplying more DC voltage to the rotor.
   C. increasing the RPM of the generator.
   D. decreasing the load on the generator.

137. When a generator is equipped with a manual carburetor preheater, the lever should be moved to the winter position when the temperature is below ________.
   A. 32°F (0°C)
   B. 40°F (4°C)
   C. 45°F (7°C)
   D. 50°F (10°C)

138. The device that automatically allows only one source of 120 VAC power to be used by the RV at any time is called a/an
   A. safety relief valve.
   B. automatic transfer switch.
   C. circuit breaker.
   D. automatic demand regulator.

139. A customer wants to add a generator but does not know what size generator is needed. Determine what the minimum operating requirements are to run the following appliances simultaneously: air conditioner, microwave, refrigerator, electric water heater, coffee maker and converter. Using the “Typical Power
Requirements of Common Appliances” table and the highest value, what generator size should be recommended?

<table>
<thead>
<tr>
<th>Appliance or Tool</th>
<th>Rating (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>1400-2000</td>
</tr>
<tr>
<td>Battery Charger</td>
<td>132</td>
</tr>
<tr>
<td>Blender</td>
<td>600</td>
</tr>
<tr>
<td>Coffee Maker</td>
<td>650</td>
</tr>
<tr>
<td>Converter</td>
<td>300-500</td>
</tr>
<tr>
<td>Electric Stove (per element)</td>
<td>350-1000</td>
</tr>
<tr>
<td>Fan</td>
<td>25-100</td>
</tr>
<tr>
<td>Microwave Oven</td>
<td>1400-2000</td>
</tr>
<tr>
<td>Radio</td>
<td>50-100</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>125-325</td>
</tr>
<tr>
<td>Electric Water Heating Element</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Television</td>
<td>300-750</td>
</tr>
<tr>
<td>Toaster</td>
<td>750-1200</td>
</tr>
<tr>
<td>Air Conditioning Heating Element</td>
<td>1500</td>
</tr>
</tbody>
</table>

A. 3 - 5 kW  
B. 5 - 7 kW  
C. 7 - 10 kW  
D. 15 - 20 kW  

140. When installing a fuel tank on a towable unit the fuel tank should be installed __________ of the generator.
A. above the level  
B. below the level  
C. at the same level  
D. It does not matter.

141. This electronic device, found on newer RV generators, is not repairable and applies battery voltage to the rotor. It also monitors the output voltage of the stator.
A. ignition magneto  
B. voltage regulator  
C. commutator  
D. electronic variable speed governor

142. To bench test a start solenoid, connect an ohmmeter to the two large terminals and apply 12-volts DC to the two smaller terminals. On the meter, a good solenoid will indicate ________.
A. continuity  
B. infinity  
C. about 800-ohms  
D. 12-volts at the two large terminals
143. Increasing the generator output load would have what effect on the rotor field voltage?
   A. Increase voltage.
   B. Decrease voltage.
   C. No change to voltage.
   D. Reverse polarity of voltage.

144. If voltage output is below nominal, the voltage regulator will _____.
   A. Shutoff
   B. Trip the circuit breaker
   C. Increase DC voltage to the rotor
   D. Decrease DC voltage to the rotor

145. The rotor becomes an electromagnet when _____.
   A. DC voltage is supplied through the brush block, slip ring and into the windings
   B. AC voltage is supplied through the brush block, slip ring and into the winding
   C. The north and south poles meet
   D. When load is applied

146. A possible cause of a hunting or surging AC generator would be a/an _____.
   A. Rich fuel mixture
   B. Incorrect governor adjustment
   C. Restricted exhaust system
   D. Incorrect ignition timing

147. With the generator running and AC output yielding low frequency, what is a probable cause?
   A. Low engine speed.
   B. Low exciter voltage.
   C. High exciter voltage.
   D. Defective output circuit breaker.

148. The speed/frequency differential between no-load and full-load conditions is known as _____.
   A. Droop
   B. Sag
   C. Apex
   D. Null

149. On diesel engines the governor controls the _____.
   A. Regulator
   B. Carburetor
   C. Injector pump
   D. Fuel pump
150. The electro-mechanical switching device used to connect the battery voltage to the 
generator starter is called the ______.
   A. starter relay  
   B. ignition coil  
   C. condenser coil  
   D. magneto

151. A customer complains of always finding oil-fouled spark plugs. Which of the 
following symptoms will not cause oil-fouled plugs?
   A. Low engine compression.  
   B. Faulty or soiled crankcase breather.  
   C. Dirty air filter element.  
   D. Worn piston rings and/or valve guides.

152. To clean a spark arrester, remove the clean-out plug from the muffler and run the 
generator ______.
   A. until white smoke emits from the exhaust  
   B. under a heavy load for one hour  
   C. for 15 to 20 minutes  
   D. Never clean the spark arrester; always replace it.

Technical Skills
153. The number and size of solar panels required to be installed on the roof of an RV is 
determined by all of these factors EXCEPT
   A. the total number of storage batteries.  
   B. the ampere-hour rating of each storage battery.  
   C. the brand (manufacturer) of the storage batteries.  
   D. the electrical load on the storage batteries.

154. Solar panels are being installed on the roof of an recreational coach. Technician A 
says that the panels should be installed at an angle so that they can directly face the 
sun. Technician B says that it’s important to leave a 1 inch space between the 
panels and the roof. Who is correct?
   A. A only  
   B. B only  
   C. Both A and B  
   D. Neither A nor B

155. A solar panel is being wired to an RV charging system. RV Technician A says the 
panel should be wired directly to the storage batteries. RV Technician B says that a 
circuit breaker should be installed between the storage batteries and the inverter.
   A. A only  
   B. B only  
   C. Both A and B  
   D. Neither A nor B
156. Whenever a tow vehicle’s engine is running, a whining noise corresponding to engine RPM is heard in radio. Any of these could be the cause EXCEPT
A. a poor ground connection at the radio.
B. a faulty filter capacitor in the charging system.
C. poor shielding of the radio antenna.
D. a faulty charging system voltage regulator.
## Answer Key for Practice Questions

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>3. A</td>
<td>42. C</td>
<td>81. C</td>
<td>120. A</td>
<td></td>
</tr>
<tr>
<td>4. D</td>
<td>43. A</td>
<td>82. C</td>
<td>121. A</td>
<td></td>
</tr>
<tr>
<td>5. A</td>
<td>44. B</td>
<td>83. C</td>
<td>122. D</td>
<td></td>
</tr>
<tr>
<td>8. D</td>
<td>47. C</td>
<td>86. A</td>
<td>125. D</td>
<td></td>
</tr>
<tr>
<td>25. C</td>
<td>64. A</td>
<td>103. B</td>
<td>142. A</td>
<td></td>
</tr>
<tr>
<td>33. C</td>
<td>72. D</td>
<td>111. A</td>
<td>150. A</td>
<td></td>
</tr>
<tr>
<td>34. B</td>
<td>73. D</td>
<td>112. A</td>
<td>151. C</td>
<td></td>
</tr>
<tr>
<td>35. B</td>
<td>74. C</td>
<td>113. B</td>
<td>152. C</td>
<td></td>
</tr>
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</table>
## AC Electrical System Tests
### Sign-Off Sheet

<table>
<thead>
<tr>
<th>Printed Technician Name</th>
<th>ID Number</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Address</th>
<th>Telephone Number</th>
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<table>
<thead>
<tr>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>STEP</th>
<th>Initials</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hot Skin Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare Documentation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make sure shore line is plugged into 120VAC source?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set VOM to AC voltage scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place one probe on a bare metal surface of the RV (i.e., Door frame, Electrical)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place the other probe to an earth ground source (i.e., water pipe)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat the test at least twice changing the placement of the probe?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If there is no voltage reading present the skin is not hot?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any voltage reading indicates an electrical short or reverse polarity?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurately diagnose and repair problems if any exist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Results?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Polarity Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform the test using a ground monitor or circuit tester?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurately diagnose and repair problems if any exist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Results?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GFCI Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare Documentation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Push the test button on the GFI outlet or breaker?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test any 120VAC receptacles within 5 feet of water and all outside receptacles?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use a GFCI Polarity Tester to check outlets that are GFCI protected but have no test button.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurately diagnose and repair problems if any exist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Results?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Measuring AC Voltage, Amperage
### Resistance and Continuity
#### Sign-Off Sheet

<table>
<thead>
<tr>
<th>Printed Technician Name</th>
<th>ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Telephone Number</td>
</tr>
<tr>
<td>City</td>
<td>State</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STEP</th>
<th>Initials</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring AC Voltage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set VOM to highest AC voltage scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure meter capacity is greater than expected voltage?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure AC voltage at various locations (i.e. AC Receptacles)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect black lead to circuit neutral?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect red lead to the live side of the circuit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch VOM down to best range?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the indicated value?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Measuring Amperage (Current)** | | |
| **When using an in-line (series) ammeter or VOM** | | |
| Did the candidate | | |
| Ensure meter capacity is greater than expected amperage? | | |
| Set VOM to highest AC amps scale? | | |
| Turn off power to the circuit? | | |
| Disconnect the circuit at the point where the current is to be measured? | | |
| Install the VOM leads in series between the source of current and the device being measured? | | |
| Turn on the power to the device being measured? | | |
| Switch the VOM scale to the lowest safe range? | | |
| Read the indicated current? | | |
| Turn off power to the circuit? | | |
| Return the circuit to its original condition | | |
| Accurately diagnose and repair problems if any exist? | | |

| **When using a clamp-on meter** | | |
| Did the candidate | | |
| Clamp the jaws of the meter around one of the conductors feeding power to a live electrical circuit or device? | | |
| Read the current draw in amperage? | | |
| Isolate the component from the circuit | | |
| Set the ammeter to the proper amp scale | | |
| Read results on the meter | | |
### Checking Continuity

<table>
<thead>
<tr>
<th>STEP</th>
<th>Initials</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the candidate turn off all VAC power?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolate the component to be checked by disconnecting all the wires?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set the VOM to the Ohms scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place one probe on each terminal of the item to be checked?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorted Circuit (i.e., Two wires touching, or a closed switch). Meter reading will show Zero Ohms (sometimes a meter will read .1 to .3 ohms due to resistance in the meter leads).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Circuit (i.e., Wire cut in half, or a switch that won’t make continuity). Meter reading will show infinity (i.e., most digital meters will read OL or OFL).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounded Circuit (i.e., Bare wire touching ground). Meter will read the same way as a short (zero) when the circuit is tested from a conductor to ground&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the indicated value?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurately diagnose and repair problems if any exist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare the reading to component specifications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Measuring DC Voltage, Amperage, Resistance and Continuity

### Sign-Off Sheet

<table>
<thead>
<tr>
<th>Printed Technician Name</th>
<th>Social Security Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Telephone Number</td>
</tr>
<tr>
<td>City</td>
<td>State</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>STEP</strong></th>
<th><strong>Initials</strong></th>
<th><strong>Date</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring DC Voltage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set VOM to DC voltage scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure meter capacity is greater than expected voltage?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure DC voltage at various locations (i.e. brake lights, tail lights)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect black lead to circuit ground?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect red lead to the live side of the circuit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the indicated value?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Measuring Amperage (Current)</strong></th>
<th><strong>Initials</strong></th>
<th><strong>Date</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>If using an in-line (series) ammeter or VOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set VOM to DC amps scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure meter capacity is greater than expected amperage?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off power to the circuit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnect the circuit at the point where the current is to be measured?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install the VOM leads in series between the source of current and the device being measured?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn on the power to the device being measured?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the indicated value?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off power to the circuit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return the circuit to its original condition?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Measuring Resistance (Ohms)</strong></th>
<th><strong>Initials</strong></th>
<th><strong>Date</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off electrical power?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolate the component from the circuit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set the VOM to the proper Ohms scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read results on the meter?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>STEP</strong></td>
<td><strong>Initials</strong></td>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Checking Continuity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the candidate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn off all VDC power?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolate the component to be checked by disconnecting all the wires?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set the VOM to the Ohms scale?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place one probe on each terminal of the item to be checked?</td>
<td></td>
<td></td>
</tr>
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<td>Shorted Circuit (i.e., Two wires touching, or a closed switch). Meter reading will show Zero Ohms (sometimes a meter will read .1 to .3 ohms due to resistance in the meter leads)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Circuit (i.e., Wire cut in half, or a switch that wont make continuity). Meter reading will show infinity (i.e., most digital meters will read OL or OFL)</td>
<td></td>
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</tr>
<tr>
<td>Grounded Circuit (i.e., Bare wire touching ground). Meter will read the same way as a short (zero) when the circuit is tested from a conductor to ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read the indicated value?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurately diagnose and repair problems if any exist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare the reading to component specifications?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>