

SkillsUSA

2015 Contest Projects

Marine Service Technology

Click the “Print this Section” button above to automatically print the specifications for this contest. Make sure your printer is turned on before pressing the button.

PRE
DELIVERY
INSPECTION
STATION

#

In this station you will perform a Pre delivery inspection on both the boat and trailer. You will fill in all blank spaces on both pages with information about the boat and trailer.

- Put a check mark in the OK box if it has what it is asking for and works properly.
- If the boat or trailer doesn't have the item or component put a check in the N/A box.
- If the item doesn't work put a check mark in the Inoperative box.

On the PDI sheet it asks for the Tech, please put your Id # in that space on both pages.

Tools you will need: torque wrench and socket, battery pack, trailer harness, tire pressure gauge and Safety glasses.

Boat:

Ok	N/A	Inoperative
----	-----	-------------

- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Steering wheel straight with motor |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Steering turns motor correct direction |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Instruments and gauges correctly installed |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Depth finder(s) and transducer(s) secured |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Switches function correctly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Running lights present and function correctly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | All drain plugs in boat (includes live-well(s)) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Drains in compartments clear of debris |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Table and legs in boat |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Fire extinguisher(s) present and fully charged |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | All seats and pedestals in boat |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Fuel tank(s) and hose in boat |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Primer bulb oriented correctly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Canopy/canvass fits properly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Compartment latches work properly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Carpet stain free and glued properly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Decals free of defects |

Boat manufacturer:

Boat model:

Boat serial (HIN):

Engine manufacturer:

Engine model:

Engine serial:

Trailer:

- | | | | |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Boat fits properly on trailer |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Bow stop adjusted and secured |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Winch strap secured and operates correctly |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Safety cable installed and secured |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Tie downs installed and secured |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Transom saver correct type and length |

Trailer manufacture:

Trailer model:

Trailer serial:

☐ ☐ ☐ Dolly jack functions properly

Trailer continued:

Ok N/A Inoperative

☐ ☐ ☐ Safety chains installed and operate freely

☐ ☐ ☐ Trailer lights tested

☐ ☐ ☐ Lug nuts torqued to specification (90 foot pounds) present torque wrench to judge for inspection

☐ ☐ ☐ Tire pressure correct on all tires Record tire pressure: R: _____ L: _____

☐ ☐ ☐ Spare mounted and secured

☐ ☐ ☐ Wheel grease caps installed

☐ ☐ ☐ Brake fluid full

Processing Questions:

What items should be checked before starting the engine?

- ☐ Lower unit gearcase oil level
- ☐ Idle speed
- ☐ Engine oil level
- ☐ Gear shift operation and acceleration from idle
- ☐ Propeller nut torque

What items should be checked while the engine is running?

- ☐ Lower unit gearcase oil level
- ☐ Idle speed
- ☐ Engine oil level
- ☐ Gear shift operation and acceleration from idle
- ☐ Propeller nut torque

Wipe down boat with rag and cleaner when done. SCORE _____ Each item worth 2 points

CDM TEST

COVER SHEET



MARINE MECHANICS INSTITUTE

ID # _____ STATION # _____

Student ID. _____ Station # _____

Test each of the CDMs provided and record your findings in the boxes below.

Resources: Meter, Harness and the **Capacitor Discharge Module Resistance Test, Digital Meter** page for specifications

CDM Coil Test	A	B	C	D
Stop diode FB				
Stop diode RB				
Return ground path diode RB				
Return ground path diode FB				
CDM trigger input resistance				
Coil secondary impedance				

Which CDM or CDMs were within Specification? _____

RB stands for Reverse Bias

FB stands for Forward Bias

Points available 200

Points awarded _____

2015 Marine Service Technology SkillsUSA Final Exam

PLEASE do not write on this test.
Please use the provided **ANSWER SHEET**.

1. Diesel fuel has a greater susceptibility than gasoline fuel to:
 - a. microbial growth.
 - b. volatility reduction.
 - c. phase separation.
 - d. evaporation.
2. If the engine operating temperature increases dramatically, the MOST PROBABLE cause is:
 - a. old or clogged exhaust risers.
 - b. incorrect fuel/air mixture.
 - c. spark plugs of the incorrect heat range
 - d. restricted air inlet.
3. Which of the following colors are appropriate for use as a DC negative conductor?
 - a. Yellow and black
 - b. Green and orange
 - c. White and blue
 - d. Red and orange
4. According to ABYC standards, boats with sleeping births shall not have ventilation openings on aft-facing surfaces. The reason is:
 - a. risk of water migration into the boat.
 - b. lack of air in accommodations spaces.
 - c. excessive air circulation.
 - d. risk of exhaust gases entering accommodations spaces.
5. According to AWG cable sizing, as the gauge number increases, the cable diameter:
 - a. does not change.
 - b. decreases.
 - c. increases.
 - d. has a higher thermal rating.
6. On 4-stroke outboard engines, valve tappet clearance is checked:
 - a. according to ABYC standards.
 - b. on a cold engine.
 - c. based on manufacturer's specifications.
 - d. on either a warm or a cold engine.
7. The PRIMARY function of hydraulic fluid in a typical steering or tilt/trim system is to:
 - a. transmit power.
 - b. lubricate moving parts.
 - c. dissipate heat.
 - d. prevent freezing.
8. Which of the following components does NOT require overcurrent protection?
 - a. Bow thruster
 - b. Starter motor
 - c. DC panel board
 - d. Bilge blower

9. On an inboard powered boat with a 2:1 gear ratio in the transmission, the propeller will turn at:
 - a. 1/4 times engine RPM.
 - b. 2 times engine RPM.
 - c. engine RPM.
 - d. 1/2 times engine RPM.
10. The minimum bend radius of a control cable is based on:
 - a. 300 CFM.
 - b. sheathing material.
 - c. cable strand count.
 - d. manufacturer's recommendations.
11. A technician is winterizing a potable water system. Which type of antifreeze should s/he use?
 - a. Methyl ethyl ketone
 - b. Ethylene glycol.
 - c. Propylene glycol
 - d. Chlorine bleach and water
12. The technician should reference specifications for electrically operated fuel pumps and ensure that the pump's pressure ratings do not exceed the specifications provided by the:
 - a. pump manufacturer.
 - b. engine manufacturer.
 - c. ABYC.
 - d. USCG.
13. Identify the insulation that should be applied to an oil pressure sending wire, according to ABYC standards.
 - a. Tan
 - b. Light blue
 - c. Pink
 - d. Dark gray
14. Lower unit seals serve two primary functions. They are:
 - a. position the propeller shaft and seal oil into gear case.
 - b. seal lubricant into the gear case and seal water out of the gear case.
 - c. control prop shaft radial runout and seal water out of the gear case.
 - d. control prop shaft centrifugal force and drive unit torque.
15. Which of the following portrays the MOST APPROPRIATE customer service skills by a marine service technician?
 - a. A marine service technician speaking to a customer calmly and making eye contact
 - b. A marine service technician blaming a customer.
 - c. A marine service technician speaking to customer calmly while looking around the room
 - d. A marine service technician speaking to customer, rolling his eyes and waving his arms
16. With a switch in the closed position, the technician reads 6.8 volts on the meter. The diagnosis is:
 - a. the circuit has faulty wiring.
 - b. the battery has insufficient capacity.
 - c. the switch is bad.
 - d. the battery needs recharging.

17. Modern batteries dictate that battery conductance testing be used to determine the condition of the battery. To conduct the conductance test, the technician must first typically input the battery's:
- voltage.
 - impedance.
 - reserve capacity
 - CCA or MCA rating.
18. What test is performed with an ohm meter?
- Voltage drop test
 - Wattage draw test
 - Continuity test
 - Amperage draw test
19. Helicoils are often used to:
- replace stripped threads.
 - increase torque tension.
 - repair cracked engine blocks.
 - repair cracked cylinder heads.
20. Upon removal of a fuel pump cover, the technician finds a jelly-like substance. The likely cause is:
- inadequate ethanol mixture.
 - improper use of fuel stabilizers.
 - old, water-contaminated fuel.
 - fiberglass fuel tank deterioration.
21. A customer complains that his/her DC cabin lights seem to be failing prematurely. The most likely cause for this could be:
- loose connection.
 - over voltage to the bulbs.
 - poor ground.
 - improper wire gauge.
22. When talking to a customer, marine service technicians should be:
- forceful.
 - polite.
 - reserved.
 - stern.
23. Pipe schedule refers to:
- material properties.
 - life expectancy in years.
 - wall thickness.
 - suitability for underground use.
24. What is the FIRST thing to check for when a diesel boat has low power and emits no smoke?
- Incorrect fuel pump timing
 - High injector pop pressure
 - Blocked or contaminated fuel filter
 - Restricted air filter
25. Historically, woods commonly used in marine construction are mahogany and teak. The primary reason for their use was that they:
- are naturally oilier than other woods.
 - are more fire retardant than other woods.
 - bend more easily than other woods.
 - are lighter than other woods.

26. Proper procedures for bleeding a hydraulic steering system dictate that the technician consult:
- Cartwright's Manual of Marine Repair.
 - manufacturer's instructions.
 - ABYC standards.
 - USCG.
27. Removing dirt particles from engine intake air prevents:
- contamination of the turbo-charger.
 - premature cylinder wear.
 - engine running too hot.
 - excessive valve guide wear.
28. Connecting batteries in parallel is often done to increase battery:
- capacity.
 - inductance.
 - resistance.
 - voltage.
29. There are two popular EFI systems used on 4-cycle marine engines, multi-port and throttle body. The essential difference between the two is:
- throttle body provides an injector for each cylinder.
 - multi-port provides an injector for each cylinder.
 - throttle body is insensitive to manifold pressure.
 - multi-port is insensitive to manifold pressure.
30. When sizing a fuse for a bilge blower motor, it is important to:
- exceed motor current draw rating by 25%.
 - rate the fuse based on motor inrush current.
 - rate the fuse based on supply cable gauge.
 - comply with manufacturer's recommendations.
31. Which of the following must be considered when installing an electric bilge pump?
- Pump discharge flow rate monitor
 - Overcurrent protection
 - Adherence to minimum 1.5 quart; discharge hose requirement
 - Audible indicator of pump operation
32. A technician is winterizing a sanitation system. Which type of antifreeze should s/he use?
- Propylene glycol
 - Ethylene glycol
 - Methyl benzolate
 - Hydroxyl peroxide
33. Regardless of the battery technology used, a battery that is being overcharged may emit:
- sulfur dioxide gas.
 - ammonium chloride gas.
 - nitrogen gas.
 - hydrogen gas.

34. What is the best tool to use when removing a fly wheel from an outboard motor?
- Hammer and punch
 - Pry bar
 - Hammer and impact driver
 - Puller set
35. The relative position of the drive in relation to the boat transom is called:
- angle of attack.
 - trim angle.
 - cavitation point.
 - ventilation point.
36. Which of the following are considered to be normal seawater pump replacement parts?
- Impeller shaft, bearing snap-ring and cover
 - Impeller, gasket and water/oil seals
 - Can plate, impeller and gasket
 - Bearing snap-ring, gasket and water/oil seals
37. The technician observes an oil slick at the exhaust outlet when the boat is being operated. The MOST PROBABLE cause is:
- raw water pump failure.
 - faulty thermostat.
 - a leak in the oil cooler.
 - incorrect air/fuel mixture.
38. The technician is setting up a trailer to achieve a tongue weight of 80 pounds. Using a spring scale, s/he finds the actual tongue weight to be 200 lbs. To adjust this, the technician needs to:
- move the trailer axle forward or shift the boat rearward on the trailer.
 - move the trailer axle rearward or shift the boat rearward on the trailer.
 - move the trailer axle forward or shift the boat forward on the trailer.
 - move the trailer axle rearward or shift the boat forward on the trailer.
39. Based on Ohm's Law, if voltage remains constant and resistance increases, amperage must:
- decrease.
 - increase.
 - stay the same.
 - depend on ambient temperature.
40. During an engine's compression stroke, the piston(s) move(s) from:
- TDC to BDC.
 - ATDC to BDC.
 - BDC to TDC.
 - BTDC to BDC.
41. The voltmeter reading when the technician checks a 12-volt starter system with the engine cranking should be:
- 6 volts.
 - 8 volts.
 - 10 volts
 - 12 volts.

42. A frequent barrier to reaching an accurate diagnosis of a customer concern is:
- that the time allocated for repair is too short.
 - that the problem is not accurately documented on the repair order.
 - that the cost of repair parts is too high.
 - that replacement parts are no longer available.
43. Spilled battery electrolyte is BEST neutralized using:
- fresh water.
 - fresh water and baking soda.
 - baking powder and water solution.
 - salt water and baking soda mixture.
44. A sticking anti-siphon valve may cause:
- fuel pump failure.
 - excessively lean fuel mixture.
 - carburetor overheating.
 - excessive fuel system pressure.
45. The MOST likely symptom of insufficient spark advance is:
- post ignition.
 - engine skipping.
 - difficulty starting engine.
 - lack of power.
46. In a heat exchanger, coolant and water, or oil, may flow in opposite directions. Why might this be necessary?
- To enhance heat transfer from one fluid to another
 - To maintain system pressure
 - To minimize the risk of silicate dropout
 - To promote antifreeze and water mixing
47. Which of the following metals is the MOST susceptible to a common corrosion type known as poulitice corrosion?
- Miled steel
 - Bronze
 - Copper
 - Aluminum
48. A technician is performing a voltage drop test to an outboard engine electric starter circuit. The tool of choice would be:
- amp meter.
 - ohmmeter.
 - voltmeter.
 - capacitance tester.
49. On 4-stroke engines, intake and exhaust valves typically:
- are interchangeable.
 - have different size heads; the exhaust valve is usually larger.
 - have different size heads; the intake valve is usually larger.
 - are color coded.

50. A technician completes a compression test on a 6-cylinder engine and finds two cylinders with lower than acceptable compression. The next action the technician should take is to:
- tune the engine.
 - overhaul the engine.
 - recondition the valves.
 - consult with the customer.

51. An anchor windlass manufacturer specifies a $1\frac{1}{4}$ inch backing plate under the thru-deck mounting hardware. The installer could achieve this thickness by using two backing plates stacked. To achieve the desired thickness, these plates should be:
- $\frac{3}{4}$ inch and $\frac{1}{2}$ inch material.
 - $\frac{3}{4}$ inch and $\frac{3}{4}$ inch material.
 - $\frac{1}{4}$ inch and $\frac{5}{16}$ inch material.
 - $\frac{7}{8}$ inch and $\frac{3}{32}$ inch material.

52. Determine the correct steering cable length on a boat where the helm is 26 inches from the side of the boat, the engine is centered on an 86-inch wide hull and the helm is 10 feet from the transom.
- 200 inches
 - 230 inches
 - 290 inches
 - 330 inches

53. The maximum number of wire/cable terminations that are allowed to be connected to one terminal stud is:
- 2
 - 3
 - 4
 - 5

54. MSDS means:
- Material Suppression Diagramming Sequence.
 - Material Safety Data Sheets.
 - Machine Safety Data Sheets.
 - Machine Service Data Standards.

55. Which of the following materials is used for cleaning engine parts?
- Mineral spirits
 - Denatured alcohol
 - Kerosene
 - High flash-point solvent

56. Typical multi-port injection system control modules operate at:
- 5 volts.
 - 12 volts.
 - 24 volts.
 - 36 volts.

57. Which of the following pipe schedules has the thinnest wall?
- 20
 - 30
 - 35
 - 40
58. Whenever a customer complaint is related to low voltage, the first thing the technician should check is the:
- AWG size.
 - power source.
 - terminal connections.
 - wire insulation thermal rating.
59. To ensure sufficient cathodic protection levels when servicing the lower unit before winter storage, the technician should:
- coat existing anodes with clear antifouling paint.
 - remove the propeller and lubricate the propshaft.
 - clean, prime and repaint areas where paint has scraped off.
 - drain and refill the gear case.
60. The technician may perform a wet compression test to determine the condition of:
- reed valves.
 - rocker arms.
 - cylinder head.
 - piston rings and valves.
61. The tachometer on a sterndrive boat is registering twice the RPMs that the technician's shop tach shows. The problem may be:
- faulty ECU output.
 - pulse calibration switch on installed tachometer is not set correctly.
 - tachometer gauge case ground has excessive resistance.
 - ignition coil ballast resistor measures excessive resistance.
62. It is best to change the oil in a 4-stroke cycle engine when it is:
- cold.
 - warm.
 - thoroughly heated.
 - slightly cooled.
63. Upon inspecting lower unit bearings, the technician finds rust on the bearing surfaces. The probable cause would be:
- a leaking water pump.
 - damage to the cylinder head gasket.
 - water intrusion into the gear case.
 - a missing seal on the engine drive shaft.
64. When you are sick and unable to work:
- notify your employer at some point during the work day.
 - notify your employer as soon as possible and before your scheduled start time.
 - tell your employer to dock you a sick day when you turn in your time card at the end of the week.
 - it is not required to notify your employer so long as you still have sick leave available.

65. Symptoms caused by a kink in a fuel tank vent hose will MOST likely become apparent during:
- fueling.
 - high-speed operation.
 - engine idle.
 - cold weather operation.
66. By design, deep cycle batteries are intended for service that:
- draws relatively low amperage over a long period of time.
 - draws relatively high amperage over a long period of time.
 - draws relatively low amperage over a short period of time.
 - draws relatively high amperage over a short period of time.
67. As part of a new trailer's pre-delivery inspection, it is important to insure that:
- the wheels are matched in size to the tow vehicle.
 - the trailer galvanization meets MIL-spec.
 - the trailer tongue weight exceeds tow vehicle specifications.
 - the wheels are torqued to specifications.
68. A battery system has evidence of an overcharged condition as shown by an accumulation of electrolyte film on the battery's top surfaces. The fault is most likely due to:
- the battery itself.
 - faulty battery isolator.
 - the alternator regulator.
 - faulty starter motor solenoid.
69. One of the two primary functions of a fuel injector is to:
- provide back pressure for the fuel injection pump.
 - control combustion temperature.
 - control fuel temperature.
 - deliver the fuel to the combustion chamber.
70. Micron rating, as it applies to fuel filters, is important because:
- micron size affects fuel flow.
 - micron rating too large will restrict fuel flow.
 - micron rating too small will cause a rich mixture.
 - micron rating too small may affect engine oil pressure.
71. Incorrect sequencing when torquing engine cylinder head bolts may:
- alter piston clearance.
 - warp the cylinder head.
 - alter the engine's compression ratio.
 - have no effect on the engine.
72. Potable water tank vent systems must be designed to insure adequate air intake but minimize the risk of ingress of:
- sea water and rain water.
 - bilge water and sea water.
 - sea water, bilge water and insects.
 - insects and bilge water.

73. A component made of a material that is very electrochemically active could be:
- an insulator.
 - a sacrificial anode.
 - an ionic mass.
 - very noble.
74. Most outboard engines achieve gear reduction in the:
- powerhead.
 - driveshaft housing.
 - engine midsection.
 - lower unit.
75. When measuring amperage on modern electrical equipment, the safest instrument to use is a:
- multi-meter connected in parallel with the circuit.
 - multi-meter connected in series in the circuit.
 - a clamp-type ammeter.
 - a gauss meter.
76. One ampere of electrical current equals:
- .001 mA.
 - 10 mA.
 - 100 mA.
 - 1000 mA.
77. When conducting an ohms resistance test, the technician should insure that:
- the meter's peak reading function is activated.
 - the meter is set on the diode test scale.
 - the circuit is de-energized
 - the meter has the correct polarity.
78. In preparation for a sea trial, the technician is required to:
- activate EPIRB to insure its functionality.
 - verify sufficient fuel and appropriate USCG safety equipment on board.
 - register a float plan with USCG.
 - register a float plan with USCG and verify appropriate USCG safety equipment is on board.
79. Trimming either an outboard engine or I/O drive out:
- lifts the bow of the boat.
 - lowers the bow of the boat.
 - tilts the boat right or left.
 - increases propeller load.
80. When comparing equal lengths of 12AWG and 6AWG copper wire, the 6AWG copper wire can carry higher:
- amperage.
 - inductance.
 - resistance.
 - temperature.

81. Vernier calipers can effectively measure:
- shaft diameter.
 - radial runout.
 - shaft distortion.
 - fastener shear strength.
82. Specifications call for an alignment tolerance of five thousandths of one inch, indicated numerically by:
- 0.0005
 - 0.005.
 - 0.05.
 - 0.5.
83. An engine is designed to operate at 4,200 RPM's but, on sea trial, the maximum engine RPM achieved is 3,800. To achieve 4,200 RPM, you must replace the propeller with one that has:
- more blade rake.
 - more pitch.
 - less pitch.
 - more blade cup.
84. Which of the following gasket materials are appropriate for sealing fuel tank sending units?
- Neoprene
 - Cork
 - Natural rubber
 - Waxed paper
85. If installed in an alternator circuit with a maximum charge rating of 100 amperes, the battery isolator in the image shown must have a minimum amperage rating of:
- 50 amps.
 - 100 amps.
 - 125 amps.
 - 150 amps.
86. When using an infrared heat gun, a technician finds that the temperature of a starter motor cable rises 75°F when the circuit is activated. A probable cause for this condition is:
- the conductor is too large for the circuit.
 - the cable insulation is not appropriate for the circuit.
 - the AWG of the conductor is too small.
 - the AWG of the conductor is too large.
87. Which of the following components does NOT require ignition protection?
- Spark plugs
 - Starter motor
 - Distributor caps
 - Alternators

88. An ohm is a measurement of:
- current.
 - power.
 - resistance.
 - voltage.
89. Oil used in the crankcase of a 4-stroke outboard engine should be:
- an API CD-rated oil.
 - minimally an API SA-rated oil.
 - as specified by the manufacturer.
 - either a detergent or a non-detergent oil.
90. In a water-cooled outboard engine, the water pump impeller is generally located in the:
- cylinder head.
 - cowl assembly.
 - powerhead.
 - lower unit.
91. Which of the following resumes is MOST appropriate for a person who is applying for an entry-level position?
- Multiple page resume
 - Single paragraph resume
 - Single page resume
 - Blank resume
92. Classic contributors to excessive voltage drop are:
- undersized cabling and loose connection(s).
 - undersized cabling and discharged batteries.
 - underrated fuse and loose connection(s).
 - undersized overcurrent protection device and loose connection(s)..
93. On the purchase of a carburetor overhaul kit for \$28.95, where the tax rate is 7.5 %, the tax on the purchase would be:
- \$2.14.
 - \$2.17.
 - \$31.09.
 - \$31.12.
94. Customer service is BEST defined as the ability to:
- create quality products that do not require a lot of support.
 - understand and effectively respond to the customer.
 - make promises to a customer to keep him or her happy.
 - convince the customer that s/he needs the product.
95. Battery switches have several important installation criteria. They include:
- mounting on a bulkhead and readily accessible.
 - mounting in a water-tight location and readily accessible.
 - mounting in the cockpit as close as practicable to the battery.
 - mounting as close as practicable to the battery and readily accessible.

96. The most useful tool for diagnosing running condition problems on an electronically fuel injected marine engine is:
- a proprietary tester/scan tool laptop computer.
 - a multimeter/amp clamp.
 - an infrared sensor.
 - a conductance tester.
97. A customer's hairdryer rated at 1,500 watt, 120VAC will require a minimum overcurrent protection rating of:
- 5 amps.
 - 15 amps.
 - 20 amps.
 - 10 amps.
98. Black, sooty spark plug electrodes may be an indication of:
- a leaking exhaust manifold.
 - excessive air intake temperature.
 - a rich fuel mixture.
 - faulty piston rings.
99. Which of the following mathematically describes the relationship of voltage, current and resistance.
- Faraday's law
 - Ohm's law
 - Watt's law
 - Bernoulli's principle
100. Resistance is measured in
- Amps
 - Watts
 - Volts
 - Ohms



Marine Service Technology

Contestant # _____ Date _____ Score _____

Please fill the correct answer oval completely

☐ A ☒ B ☐ C ☐ D

- | | |
|---|---|
| 1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 22. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 23. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 24. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 25. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 26. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 27. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 28. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 29. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 30. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 10. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 31. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 11. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 32. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 12. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 33. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 13. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 34. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 14. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 35. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 15. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 36. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 16. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 37. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 17. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 38. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 18. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 39. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 19. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 40. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 20. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 41. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 21. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 42. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |

Turn over for remaining answers

43. (A) (B) (C) (D)
44. (A) (B) (C) (D)
45. (A) (B) (C) (D)
46. (A) (B) (C) (D)
47. (A) (B) (C) (D)
48. (A) (B) (C) (D)
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67. (A) (B) (C) (D)
68. (A) (B) (C) (D)
69. (A) (B) (C) (D)
70. (A) (B) (C) (D)
71. (A) (B) (C) (D)

72. (A) (B) (C) (D)
73. (A) (B) (C) (D)
74. (A) (B) (C) (D)
75. (A) (B) (C) (D)
76. (A) (B) (C) (D)
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79. (A) (B) (C) (D)
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81. (A) (B) (C) (D)
82. (A) (B) (C) (D)
83. (A) (B) (C) (D)
84. (A) (B) (C) (D)
85. (A) (B) (C) (D)
86. (A) (B) (C) (D)
87. (A) (B) (C) (D)
88. (A) (B) (C) (D)
89. (A) (B) (C) (D)
90. (A) (B) (C) (D)
91. (A) (B) (C) (D)
92. (A) (B) (C) (D)
93. (A) (B) (C) (D)
94. (A) (B) (C) (D)
95. (A) (B) (C) (D)
96. (A) (B) (C) (D)
97. (A) (B) (C) (D)
98. (A) (B) (C) (D)
99. (A) (B) (C) (D)
100. (A) (B) (C) (D)

Workstation # _____

Contestant # _____

Gear Shimming Station

	Possible Score	Actual Score
Upper Drive Gear Calculation	50	
Lower Drive Gear Calculation	50	
Input / Pinion Gear Calc.	50	
Proper Use of Precision Instruments	10	
Proper Use of Special Tools	10	
Following Procedures	10	
Organization	10	
General Attitude	10	

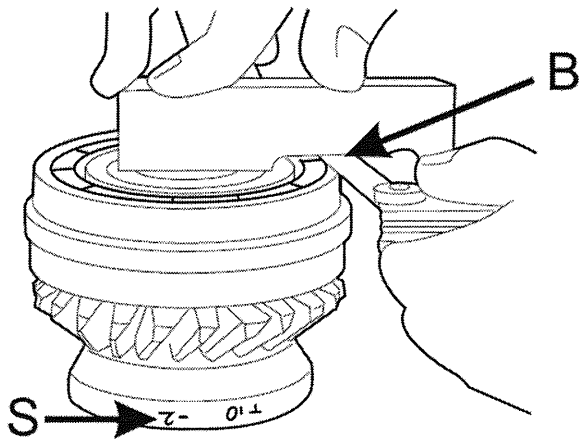
Workstation # _____

Contestant # _____

Shimming Worksheet

Lower Gear		Upper Gear		Pinion Gear	
Shimming Procedure		Shimming Procedure		Shimming Procedure	
Feeler Gauge Measurement (A)		Feeler Gauge Measurement (A)		Average of Measurements (A)	
+/- Gear Etching (S) <i>Note: Reverse sign due to shim location</i>		+/- Gear Etching (S)		Tool Thickness (0.500")	
= Lower Gear required Shims		= Upper Gear required Shims		= Actual Dimension (D)	
					↓
				Actual Dimension (D)	
				+/- Gear Etching (S)	
				= Total Gear Dimension (T)	
					↓
				Total Gear Dimension (T)	
				- Nominal Figure (2.171 or 2.244)	
				= Pinion Gear required Shims	

Lower Output Gear Shimming



20009383

1. Place gear/bearing assembly with gear down, on flat surface.
Protect gear cup surface.
Place shim tool **3849650**, on assembly as shown.
Apply light pressure to hold shim fixture properly on gear. Fixture should be level across top of gear shaft.
2. Take feeler gauge measurement (B) at outer edge of bearing.
Record this measurement, in inches.
3. Find etching on gear, +/- number is shimming allowance (S).
Number represents thousandths of an inch (0.00X").
2 in picture = 0.002"
Add or subtract (S) from measurement (B).
This is shim thickness required to properly position lower output gear in upper gear housing.

NOTICE! For Lower gear, use the following information when adding or subtracting etching (S) from measurement (M).

EXAMPLE;

- If etched number is +2, **SUBTRACT** 0.002 in. from the feeler gauge measurement (B).
- If etched number is -2, **ADD** 0.002 in. to the feeler gauge measurement.
- If etched number is zero (0), use feeler gauge measurement (B) to determine shims.