

Lab #4 Outboard Motor

Do not start this lab until told that the competition is ready to start.

If there is something you don't understand, you may ask for clarification from the person in charge.

If you have completed this lab early, please check your answers and wait quietly until everyone has finished or all the time is used.

Section 1: Information Retrieval

Using the service manual, locate and record the following specifications and torques.

Locate and record the Model and Serial Number. Determine the following information from the Model and Serial Number.

Model Number:	
Transom Height/Shaft Length:	
Model Description:	
Serial Number:	

Specifications

Cam Driven Sprocket Retaining Bolt Torque	
Spark Plug Number	
Spark Checker Part Number	
Crankpin Oil Clearance	
Maximum RPM	
Tilt relief Pressure	
Recommended Power Tilt Fluid	

Competitor's Name: _____ Province: _____

Section 2: Lower Unit

Following the service manual procedure remove the lower unit to service the water pump and check prop shaft runout.

Torques and Specifications

Torques	
Lower Unit Mount Bolts	
Drain Bolt	
Prop Nut	
Water Pump Cover Bolts	
Retainer for Bearing Carrier	
Specifications	
Prop Shaft Runout	
Recommended Lower Unit Oil	
Lower Unit Gear Ratio	
Clutch Type	

Lower Unit inspection

Remove the lower unit. Remove and inspect the waterpump.

Measure and record the propshaft runout (shaft supplied) _____

Is the propshaft reusable? _____

Record any issues with the waterpump: _____

Competitor's Name: _____ **Province:** _____

Theory of Operation Questions

Answer the following questions in regards to the Lower Unit and Cooling System.

1. What gear should the lower unit be in prior to removal?

2. What is the procedure for refilling the lower unit?

3. Why must you fill it in this manner?

4. What would be the most likely cause of milky gear oil?

5. What would black gear oil indicate?

6. Does this outboard use an open loop or closed loop cooling system?

7. What temperature does the thermostat start to open?

8. Does the water pump utilize a positive displacement design?

9. What is the purpose of the trim tab?

10. Customer orders a new boat. It's a 19' fishing boat that weights approx. 2200 lb. You will be installing a mercury 115HP Fourstroke with the Command Thrust gearcase. Customer wants a regular 3 blade aluminum propeller. A. What size propeller should you order? B. What is the part # of the propeller?

11. Same boat and engine as above. You go water test it and find that you are 200RPM lower than maximum RPM. What prop should you change to?

12. What material is the prop made of (the one installed on the engine)?

13. What is the prop diameter and pitch (the one installed on the engine)?

14. Explain what would change from switching from a 3 blade to a 4-blade propeller.

15. What type of damage to the water pump would dry running cause to the water pump?

Reassemble the lower unit and reinstall. Torque all fasteners. Have the judge verify your torque wrench settings.

Competitor's Name: _____ **Province:** _____

Section 3: Compression

Following the service manual procedure, perform a compression test. Look up all specifications and torques. Record results.

Torques and Specifications

Torques	
Specifications	
Compression Test Minimum	

Compression Test

Perform the test and record the results.

Compression Test Results	
Cylinder 1	
Cylinder 2	
Cylinder 3	
Cylinder 4	

Perform a Leak down test on the problem cylinder only!

1. What position of the piston and valves during this test?
2. Where do you suspect the issue is?
3. What would be your next step?

Competitor's Name: _____ **Province:** _____