

SkillsUSA 2015 Contest Projects

Power Equipment 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.



Contestant Number _____

2014
Power Equipment Technology
Contestant Sign-Off Sheet

Station #1 _____ Station #2 _____ Station #3 _____

Station #4 _____ Station #5 _____ Station #6 _____

Station #7 _____ Station #8 _____ Station #9 _____

Station #10 _____ Station #11 _____ Station # 12 _____

Resume Y _____ N _____

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Ferris IS3100

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts

Engine Info Provided: Model #5900559-IS3100Z

Please locate the Evaporative Canister on the table.

What is the reference number for this component? _____**2**_____ (3pts)

What is the part number for a replacement part? ____**313036**_____ (4pts)

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Ferris IS3100

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts

Engine Info Provided: Model #5900559-IS3100Z

Please locate the Evaporative Canister on the table.

What is the reference number for this component? _____ (3pts)

What is the part number for a replacement part? _____ (4pts)

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Model 12

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts
- Obtain Pricing

Engine Info Provided: Model #122037-0550-B8

Please locate the Governor gear on the table.

What is the reference number for this component? _____ (3pts)

What is the part number for a replacement part? _____ (3pts)

What is the price for this component? _____ (3Pts)

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Model 38

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts
- Obtain Pricing

Engine Info Provided: Model #386447-3020-G1

Please locate the Rectifier/Regulator on the table.

What is the reference number for this component? _____ **2** _____ (3pts)

What is the part number for a replacement part? _____ **841170** _____ (3pts)

What is the price for this component? _____ **\$137.20** _____ (3Pts)

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Model 38

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts
- Obtain Pricing

Engine Info Provided: Model #386447-3020-G1

Please locate the Rectifier/Regulator on the table.

What is the reference number for this component? _____ (3pts)

What is the part number for a replacement part? _____ (3pts)

What is the price for this component? _____ (3Pts)

Contestant #



Score

2014
Briggs & Stratton
Station # 2 – Parts Identification

SCENARIO – Model 12

This section of the competition tests your ability to:

- Identify parts
- Locate replacement parts
- Obtain Pricing

Engine Info Provided: Model #122037-0550-B8

Please locate the Governor gear on the table.

What is the reference number for this component? _____ **219** _____ (3pts)

What is the part number for a replacement part? _____ **693578** _____ (3pts)

What is the price for this component? _____ **\$9.05** _____ (3Pts)



Power Equipment Technology
Station #2
Parts Identification (Peerless)
Instructions
(25 points)

This phase of the competition will test your ability to identify parts and describe their function on the transmission.



1. Use the transmission identification decal above for reference when looking up the parts. List the transmission model and spec number on the score sheet.
2. You will need to locate the reference numbers on the illustrated parts list for each part.
3. Determine the service part numbers using the parts list for each part.
4. Give a brief description illustrating your knowledge of the function of the individual part identified.

Each contestant must enter the required information on the **Score Sheet**.

Do not write on this page.



Power Equipment Technology

Station # 2

Parts Identification (Kohler)

Judges Answer Sheet

(25 points)

Model and Spec No.: 700-093A (2 points)

1.a. Part Name: Shift Key (1 points)

b. Reference No.: 8 (1 points)

c. Part No.: 792089B (1 points)

d. Function of Part: (3 points)
(Only a brief description is needed)

The shift keys engage the different spur gears to allow the transmission to select the correct gear and drive the shifter/brake (output) shaft. The gears can be multiple forward speeds or a reverse.

2.a. Part Name: Spur Gear (2 points)

b. Reference No.: 53 (2 points)

c. Part No.: 778121A (2 points)

d. Function of Part: (3 points)
(Only a brief description is needed)

The spur gears is one of the gears that the shift keys engage. The shift keys now lock the spur gear and the shifter shaft together to allow the shifter shaft to rotate and do work outside of the transmission.

e. How did you identify that this is the correct part?

(2 points)

I counted the number of teeth and determined there was the gaps for the shifter keys to engage. The other spur gear has splined teeth internally.

3.a. Part Name:

Brake Disc

(1 points)

b. Reference No.:

36

(1 points)

c. Part No.:

790003

(1 points)

d. Function of Part:

(3 points)

(Only a brief description is needed)

The brake disc is attached to the shifter/brake (output) shaft. When the brake is activated the brake pads squeeze the disc. This slows down and stops the shifter/brake (output) shaft bringing the unit to a stop. The unit could be a mower or anything that the output shaft is connected to.

Contestant #



Score

Power Equipment Technology
Station # 2
Parts Identification (Peerless)
Answer Sheet
(25 points)

Model and Spec No.: _____ (2 points)

1.a. Part Name: _____ (1 points)

b. Reference No.: _____ (1 points)

c. Part No.: _____ (1 points)

d. Function of Part: _____ (3 points)
(Only a brief description is needed)

2.a. Part Name: _____ (2 points)

b. Reference No.: _____ (2 points)

c. Part No.: _____ (2 points)

d. Function of Part: _____ (3 points)
(Only a brief description is needed)

2 e. How did you identify that this is the correct part?

(2 points)

3.a. Part Name:

(1 points)

b. Reference No.:

(1 points)

c. Part No.:

(1 points)

d. Function of Part:

(Only a brief description is needed)

(3 points)



Power Equipment Technology Station #2 Parts Identification (Kohler) Instructions (25 points)

This phase of the competition will test your ability to identify parts and describe their function on the engine.

KOHLER	
IMPORTANT ENGINE INFORMATION	
THIS ENGINE MEETS U.S. EPA PH2 AND CA 2008 AND LATER EXH EMISSION REGS FOR SI SORE. USING DELEGATED ASSEMBLY FOR AFTERTREATMENT.	
FAMILY JXFS-0W3G	
TYPE APP	
DISPL. (CC) 725	
MODEL NO. SV720S	
SPEC. NO. SV720-0025	
SERIAL NO. 3532105627	
BUILD DATE	
OEM PROD. NO.	
EMISSION COMPLIANCE PERIOD:	
EPA:	CARB:
CERTIFIED ON:	
REFER TO OWNER'S MANUAL FOR HP RATING, SAFETY, MAINTENANCE AND ADJUSTMENTS	
1-800-544-2444 KohlerEngines.com	
KOHLER CO. KOHLER, WISCONSIN USA	

1. Use the engine identification decal above for reference when looking up the parts. List the engine model and spec number on the score sheet.
2. You will need to locate the reference numbers on the illustrated parts list for each part.
3. Determine the service part numbers using the parts list for each part.
4. Give a brief description illustrating your knowledge of the function of the individual part identified.

Each contestant must enter the required information on the **Score Sheet**.

Do not write on this page.



Power Equipment Technology

Station # 2

Parts Identification (Kohler)

Judges Answer Sheet

(25 points)

1. Model and Spec No.: SV720-0025 (1 points)
- 2.a. Part Name: Oil Pump Assembly (1 points)
- b. Reference No.: 3 (1 points)
- c. Part No.: 32 393 08-S (1 points)
- d. Function of Part: (3 points)
(Only a brief description is needed)

The oil pump is designed to take oil from the lowest portion of the engine and pump it through the filter into the crankpin area to lubricate the connecting rod bearing, and then up to the top main bearing surface.

- 3.a. Part Name: Kit, Governor Gear w/Pin (1 points)
- b. Reference No.: 4 (1 points)
- c. Part No.: 24 043 12-S (1 points)
- d. Function of Part: (3 points)
(Only a brief description is needed)

The governor regulates engine speed to stay constant as load is applied and removed.

- 4.a. Part Name: Kit, 15 Amp Stator (1 points)
- b. Reference No.: 11 (1 points)
- c. Part No.: 237878-S (1 points)
- d. Function of Part: (3 points)
(Only a brief description is needed)

The stator creates AC voltage as the magnets under the flywheel pass over the windings. Each post of the stator has copper wire wound inverse of the adjacent post. The magnets in the flywheel are mounted with "like" poles together. This voltage is delivered to the Rectifier-Regulator.

- 5.a. Part Name: Rectifier-Regulator (1 points)
- b. Reference No.: 10 (1 points)
- c. Part No.: 41 403 09-S (1 points)
- d. Function of Part: (3 points)
(Only a brief description is needed)

The Rectifier-Regulator changes the AC voltage from the stator to DC voltage then regulates the voltage to a range that the battery can accept for charging.

Score



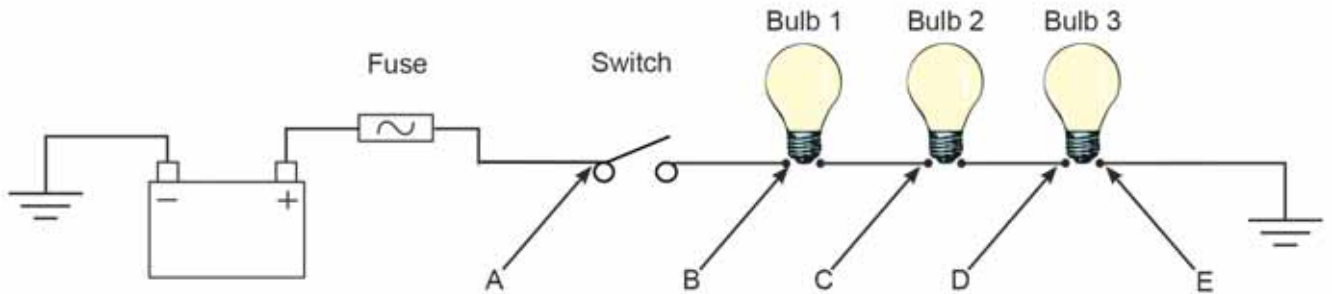
Contestant Number

2014
Power Equipment Technology
Station # 3 – Electrical Testing

Contestant Worksheet
(100 POINTS)

EACH QUESTION IS WORTH 10 POINTS

1. Construct the following circuit



2. Close the switch to turn light bulbs ON.

3. Measure voltage at (leave black meter lead on ground for these tests ONLY):

A. _____ B. _____ C. _____ D. _____ E. _____

4. What is the voltage drop across (red meter lead and black meter lead will alternate positions in this test):

A to B _____ B to C _____ C to D _____ D to E. _____

5. Did you notice mV on the screen for any of the above tests and what voltage is mV less than? _____

Score



Contestant
Number

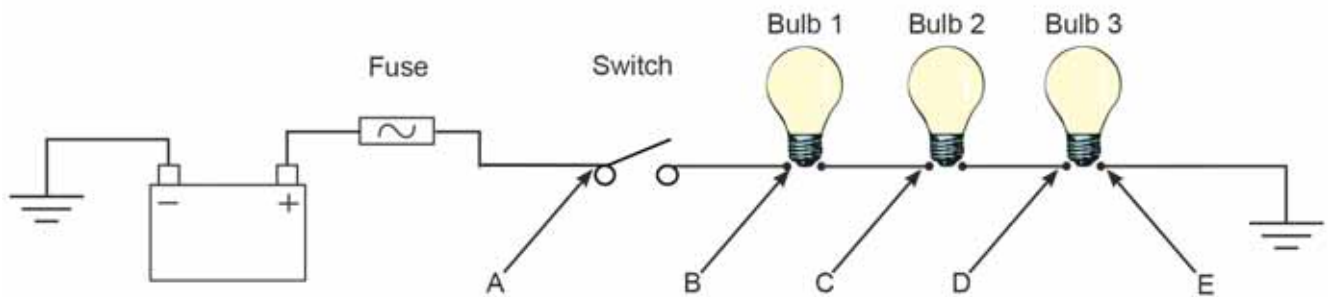
2014
Power Equipment Technology
Station # 3 – Electrical Testing

JUDGES SHEET

(100 POINTS)

EACH QUESTION IS WORTH 10 POINTS

1. Construct the following circuit



2. Close the switch to turn light bulbs ON.

3. Measure voltage at (leave black meter lead on ground for these tests ONLY):

Anywhere within these ranges is an acceptable answer.

A. 11.7-13.0V B. 11.7-13.0V C. 7.0- 8.5V D. 3.5-4.5V E. 0V or mV

4. What is the voltage drop across (red meter lead and black meter lead will alternate positions in this test):

A to B 0 or mV B to C 3.5 – 4.5V C to D 3.5-4.5V D to E. 3.5-4.5V

5. Did you notice mV on the screen for any of the above tests and what voltage is mV less than? 0V or Zero



2014

**Power Equipment Technology
Station # 3 – Electrical Testing**

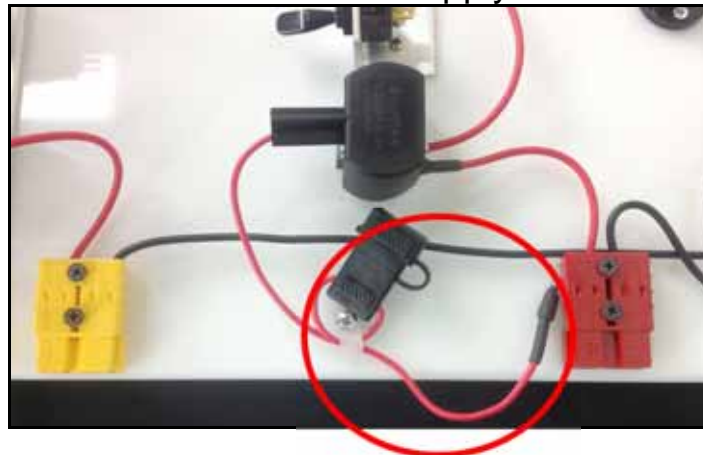
(100 Points)

SCENARIO

This station will test your ability to use electrical testing tools (DVOM) and your understanding of wiring and testing a basic series circuit.

- Construct the series circuit as shown in the schematic below.
- Make sure to use the **FUSED** power supply on the board for power, clip a jumper wire to the spade terminal on the end of this wire
- The black plastic toggle switch is the switch referenced in the schematic to use for your circuit
- Utilize the **GROUND STRIP** in the upper left corner of the board to make your circuits complete.

Fused Power Supply location



JUDGE



**2014
Power Equipment Technology
Station # 4**

Rewind Starter Repair

Score Sheet

**Maximum Value: 75 points
Time Allowed: 30minutes**

This section tests your ability to diagnose and repair a rewind starter. Your score is based on the correct repair of the starter and the use of the necessary parts.

Engine: Briggs & Stratton **120H02-0100-B1**

Judge: The brake spring is missing and both starter dogs are damaged. The contestant should order and install the bold items below. Subtract 5 points for each incorrect part number ordered.

1. Part Number: **281505S**_____ 10 points
2. Part Number: **281505S**_____ 10 points
3. Part Number: **691855**_____ 10 points

When repaired correctly, the white pawls should be held in position by the retainer plate. When the rope is pulled, they should feed smoothly from the hub of the starter and retract smoothly when the rope is allowed to return.

Points: 30 for correct parts used

45 for correct starter repair

JUDGE



**2014
POWER EQUIPMENT TECHNOLOGY
Station # 5**

Ignition


Maximum Value: 95 points

Time Allowed: 30 minutes

1. Match the components from a Briggs & Stratton Magnatron Ignition Armature on the attached page with their correct names.

- 1. Trigger Coil _____ **A** _____
- 2. High Tension Lead _____ **C** _____
- 3. Darlington Transistor _____ **F** _____
- 4. Lamination Stack _____ **B** _____
- 5. Primary Winding _____ **E** _____
- 6. Secondary Winding _____ **D** _____

10 pts each

2. What is the item on the table marked  used for?
spark tester, ignition tester

14 pts

3. Most Briggs & Stratton Ignition systems are: Please circle correct answer
- a. Hot tube systems
 - b. Capacitive Discharge systems
 - c. Magneto systems**
 - d. Plasma systems

11 pts

10 pts

4. The air gap between the Ignition Armature and Flywheel Magnets controls the energy the ignition develops. The smaller the gap, the hotter the spark at the spark plug. The wider the gap, the weaker the spark at the spark plug. True or False Please circle correct answer

Contestant #



Score

**2014
POWER EQUIPMENT TECHNOLOGY
Station # 5**


Ignition

**Maximum Value: 95 points
Time Allowed: 40 minutes**

1. Match the components from a Briggs & Stratton Magnatron Ignition Armature on the attached page with their correct names.

10 pts each

- 1. Trigger Coil _____
- 2. High Tension Lead _____
- 3. Darlington Transistor _____
- 4. Lamination Stack _____
- 5. Primary Winding _____
- 6. Secondary Winding _____

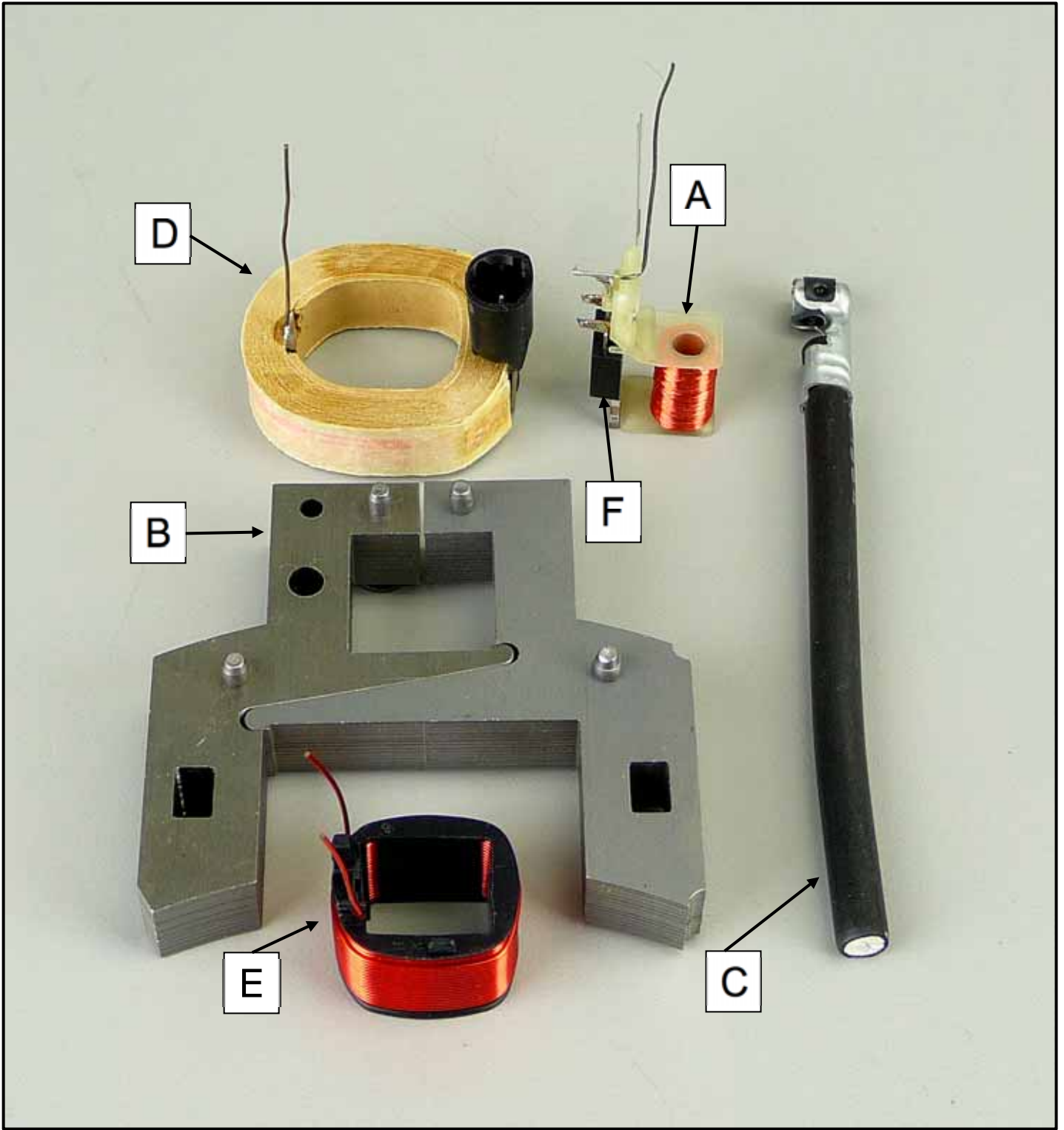
2. What is the item on the table marked  used for?

14 pts

3. Most Briggs & Stratton Ignition systems are: Please circle correct answer **11 pts**
- a. Hot tube systems
 - b. Capacitive Discharge systems
 - c. Magneto systems
 - d. Plasma systems

4. The air gap between the Ignition Armature and Flywheel Magnets controls the energy the ignition develops. The smaller the gap, the hotter the spark at the spark plug. The wider the gap, the weaker the spark at the spark plug. **True or False** Please circle correct answer

10 pts



JUDGE



**2014
Power Equipment Technology
Station # 6**

Failure Analysis

Score Sheet

Maximum Value: 75 points

Time Allowed: 30minutes

This section tests your ability to correctly diagnose a failure of an engine or engine component. Your score is based on your responses to the questions below.

Engine: Briggs & Stratton **28Q777-6053-E2**

A customer reports that his lawn tractor would not start. He eventually traced the problem to a defective ignition switch. He purchased a replacement at an auto parts store. The engine still would not start so the equipment was brought to you for repair.

Your testing determines that the engine's ignition system is not functioning. The ignition armature was removed and now sits in front of you.

- 1. B**
- 2. D**
- 3. D**
- 4. B**
- 5. D**

Each question is 15 points

Contestant # _____



Score _____

2014
Power Equipment Technology
Station # 6

Failure Analysis

Maximum Value: 75 points

Time Allowed: 40 minutes

This section tests your ability to correctly diagnose a failure of an engine or engine component. Your score is based on your responses to the questions below.

Engine: Briggs & Stratton **28Q777-6053-E2**

A customer reports that his lawn tractor would not start. He eventually traced the problem to a defective ignition switch. He purchased a replacement at an auto parts store. The engine still would not start so the equipment was brought to you for repair.

Your testing determines that the engine's ignition system is not functioning. The ignition armature was removed and now sits in front of you.

Circle the letter of the correct answer.

- 1) What physical damage is evident on the armature body?
 - a. Abrasion
 - b. Blistering
 - c. Wear
 - d. None



- 2) What will cause this type of damage?
 - a. Engine overheating
 - b. Defective armature
 - c. There is no damage
 - d. None of the above

- 3) What is the correct repair procedure for this condition?
 - a. Reassemble and tighten loose wires
 - b. Replace the battery in the ignition armature
 - c. Recharge the ignition armature battery
 - d. Replace the ignition armature

- 4) What evidence from the customers' story provides you with the best information as to what may be wrong with the equipment?
 - a. The customer is an untrained technician and should not have been working on this equipment
 - b. The customer purchased the ignition switch from an auto parts store and replaced it
 - c. The customer brought it to you in the first place
 - d. The information provided by the customer did not help in the diagnosis of the problem at all

- 5) How would you determine if the starting problem is a faulty ignition armature or an issue with the safety interlock system?
 - a. Replace the armature and see if that fixes the problem
 - b. Replace the wiring harness and see if that fixes the problem
 - c. Ask the customer for more detailed information
 - d. Isolate the armature from the equipment and test for spark

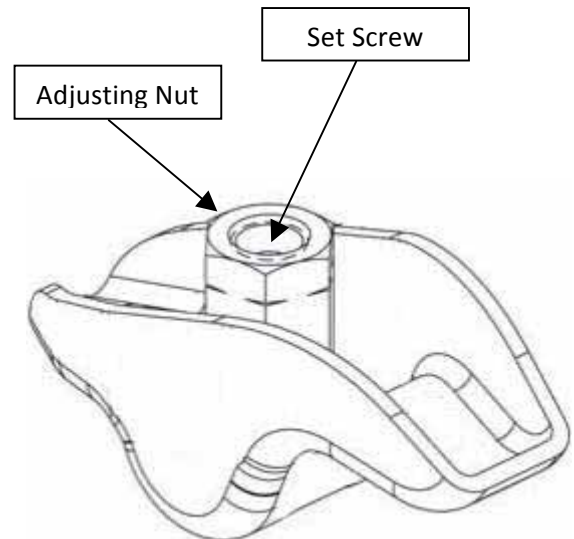
Each question is 15 points

Adjust Valve Clearance (Lash)

1. Loosen set screw before making adjustments.
2. Turn adjusting nut in pivots down (clockwise) only enough to capture push rods in recesses.
3. Rotate crankshaft to establish TDC on the compression stroke for cylinder 1.
Check for:
 - a. Compression will be felt through spark plug hole.
 - b. Keyway of crankshaft will be aligned with cylinder 1.
 - c. No rocker arm/push rod movement if crankshaft is rotated slightly back and forth. If they are moving, rotate crankshaft 1 full revolution.
4. Insert a 0.127 mm (0.005 in.) feeler gauge between end of 1 valve and rocker arm. Turn adjustment nut until a slight drag is felt. Hold in this position and tighten setscrew securely. After tightening recheck adjustment. Proper clearance for all valves is 0.101/0.152 mm (0.004/0.006 in.).
5. Repeat procedure for other valve on side 1.
6. Viewed from PTO end, rotate crankshaft 270° (3/4 turn) counterclockwise and align crankshaft keyway with cylinder 2. This cylinder should now be at TDC on the compression stroke.
7. Repeat steps 4-5 for setting valve clearance on side 2.
8. Rotate crankshaft to check for free operation of valve train. Check for clearance between valve spring coils at full lift, or bending of push rod(s) can occur. Minimum allowable clearance is 0.25 mm (0.010 in.).

Check Assembly

Slowly rotate crankshaft a minimum of 2 revolutions to check Long block assembly and overall proper operation.





Power Equipment and Technology

Station # 7

Valve Clearance

Judges Answer Sheet

(95 points)

This station will test your ability to properly set valve lash on a 90° V-twin cylinder Kohler engine. Please read the instructions carefully before making adjustments. Please note that cylinder 1 & 2 are labeled on the engine casting and the long end of the crankshaft is the PTO. All tools needed are provided for you and you may write on this sheet. **Each Question is worth 10 points. Each correct setting is worth 15 points.**

1. What is the correct Intake valve clearance?

- 0.127mm or 0.101/0.152mm (0.005in. or 0.004/0.006in.)

2. What is the correct Exhaust valve clearance?

- 0.127mm or 0.101/0.152mm (0.005in. or 0.004/0.006in.)

3. Valve overlap is found at TDC on the compression stroke.

True/False

4. Does this engine use compression release?

Yes/No

For Judges Use Only

5. Is #1 Intake set correctly?

Yes/No

6. Is #1 Exhaust set correctly?

Yes/No

7. Is #2 Intake set correctly?

Yes/No

8. Is #2 Exhaust set correctly?

Yes/No

Contestant #



SkillsUSA
Champions at Work®

Total Score

Judges Use Only

Power Equipment and Technology

Station # 7

Valve Clearance Student Score Sheet (95 points)

This station will test your ability to properly set valve lash on a 90° V-twin cylinder Kohler engine. Please read the instructions carefully before making adjustments. Please note that cylinder 1 & 2 are labeled on the engine casting and the long end of the crankshaft is the PTO. All tools needed are provided for you and you may write on this sheet. **Each Question is worth 10 points. Each correct setting is worth 15 points.**

1. What is the correct Intake valve clearance?

• _____

2. What is the correct Exhaust valve clearance?

• _____

3. Valve overlap is found at TDC on the compression stroke. True/False
(circle your answer)

4. Does this engine use compression release? Yes/No
(circle your answer)

For Judges Use Only

5. Is #1 Intake set correctly? Yes/No

6. Is #1 Exhaust set correctly? Yes/No

7. Is #2 Intake set correctly? Yes/No

8. Is #2 Exhaust set correctly? Yes/No

Score



Contestant Number

Fuel Systems Test

Using the information learned from yesterday's orientation session, answer the following questions. Each question is worth 3 points and the essay question is worth 25 points.

- 3 points 1. Phase separation is when the ethanol absorbs too much water and the water/ethanol falls out of the gas?

True

False

- 3 points 2. Five precautions will delay the deterioration/evaporation of gasoline: Cap containers tightly, Use only EPA approved storage containers, Store containers out of direct sunlight in a location where the temperature stays below 80°F, Use a good quality fuel stabilizer and:

a) Fill containers about 95% full

b) Keep the gas can empty at all times

c) Purchase 5 years worth of gasoline

d) None of the above

- 3 points 3. When water and ethanol are mixed together, the solution has a neutral pH level?

True

False

- 3 points 4. What can corrode a carburetor and its components (bowl, jets, etc.)? Why?

Water and ethanol because it has a corrosive value

- 3 points 5. Ethanol is commonly made from –

a. Corn

b. Peas

c. Wheat

d. Alcohol

- 3 points Fuel Hygiene is the management of the complete fuel system

True

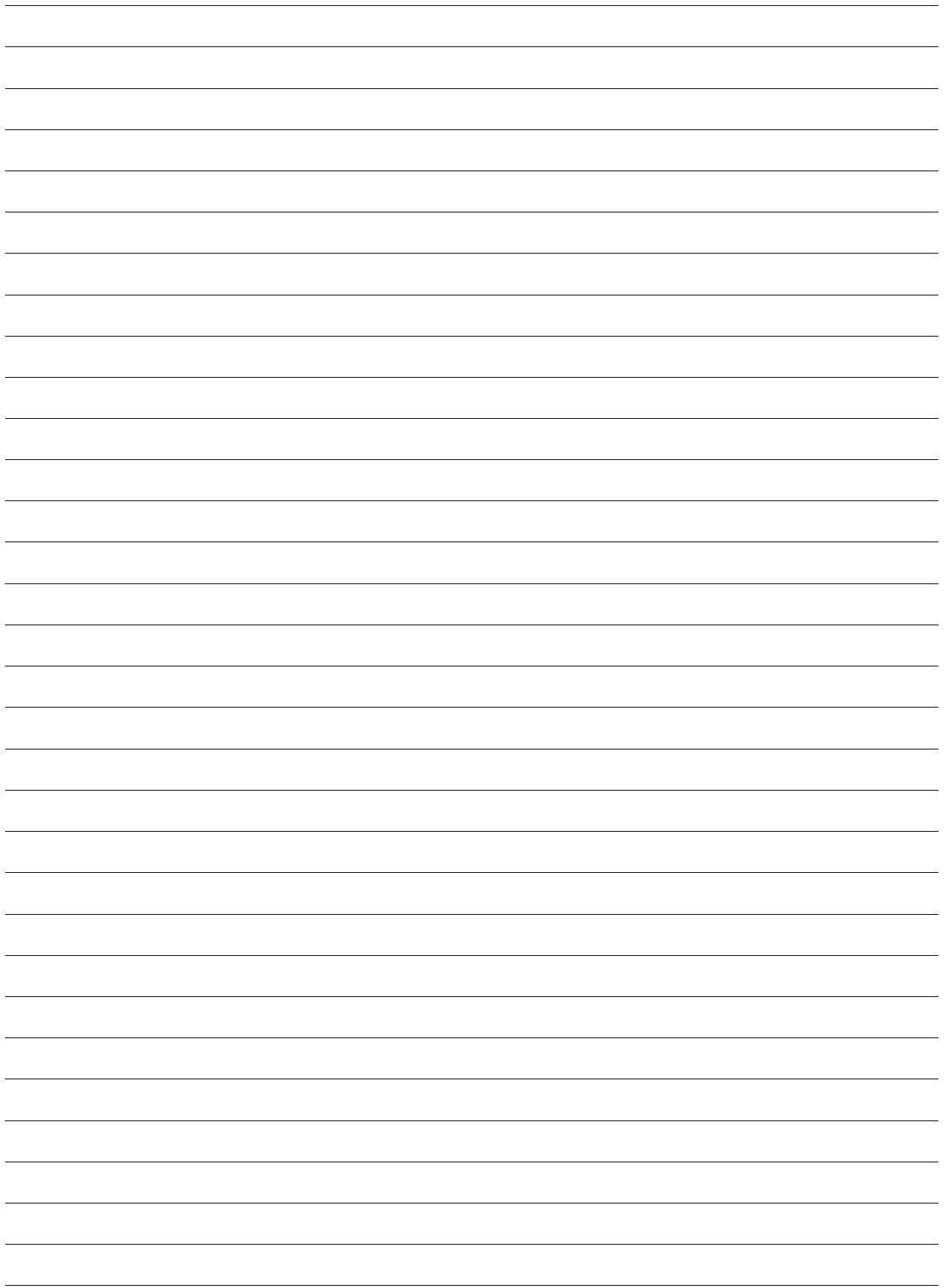
False

- 3 points 6. Biofuels are made from plants?

True

False

- 3 points 7. An engine will run on marginal fuel?
True
False
- 3 points 8. Piston rings and other internal engine components can be destroyed by running marginal fuel?
True
False
- 3 points 9. The sulfur content in Ultra Low Sulfur Diesel (ULSD) has been reduced to _____ for on road use.
a. 10 parts per million
b. 100 parts per million
c. 15 parts per million
d. 500 parts per million
- 3 points 10. Does ethanol mix with 2-stroke engine oil?
Yes
No
- 3 points 11. Volatility describes a gasoline's tendency to form _____?
a. Acids
b. Liquids
c. vapors
d. Solids
- 3 points 12. Ultra Low Sulfur Diesel has increased lubrication?
True
False
- 3 points 13. Semi-Trucks that are pumping out black exhaust smoke probably have a problem with:
a. Water in the fuel
b. Microbial growth
c. Sludge build up in the tanks
d. All of the above
- 3 points 14. Biofuels have the same BTU's as plain fuel?
True
False



Score



Contestant Number

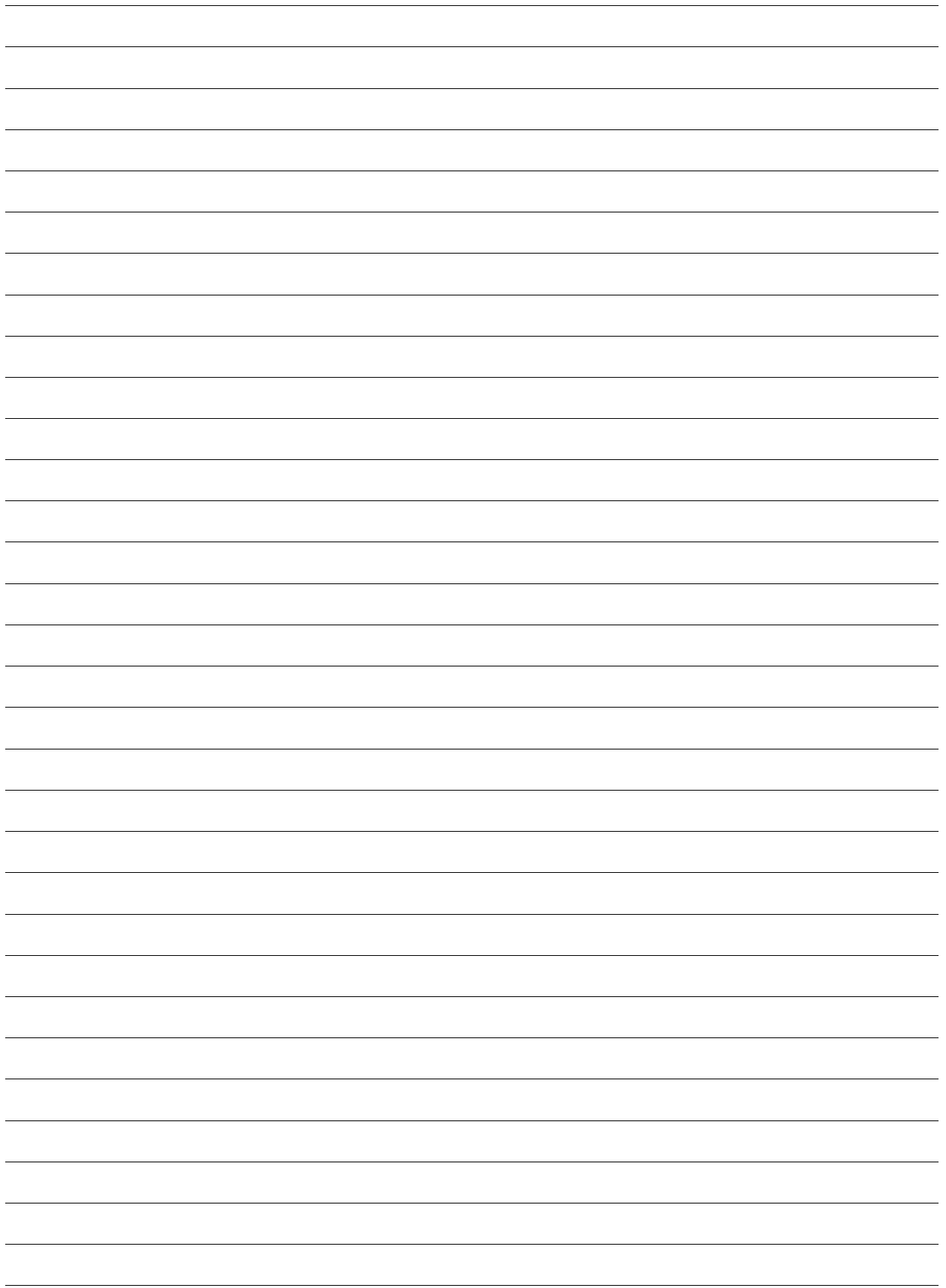
Fuel Systems Test

Using the information learned from yesterday's training session, answer the following questions. Each question is worth 3 points and the essay question is worth 25 points.

- 3 points** 1. Phase separation is when the ethanol absorbs too much water and the water/ethanol falls out of the gas?
True
False
- 3 points** 2. Five precautions will delay the deterioration/evaporation of gasoline: Cap containers tightly, Use only EPA approved storage containers, Store containers out of direct sunlight in a location where the temperature stays below 80°F, Use a good quality fuel stabilizer and:
a) Fill containers about 95% full
b) Keep the gas can empty at all times
c) Purchase 5 years worth of gasoline
d) None of the above
- 3 points** 3. When water and ethanol are mixed together, the solution has a neutral pH level?
True
False
- 3 points** 4. What can corrode a carburetor and its components (bowl, jets, etc.)? Why?

- 3 points** 5. Ethanol is commonly made from –
a. Corn
b. Peas
c. Wheat
d. Alcohol
- 3 points** 6. Fuel Hygiene is the management of the complete fuel system
True
False
- 3 points** 7. Biofuels are made from plants?
True
False

- 3 points** 8. An engine will run on marginal fuel?
True
False
- 3 points** 9. Piston rings and other internal engine components can be destroyed by running marginal fuel?
True
False
- 3 points** 10. The sulfur content in Ultra Low Sulfur Diesel (ULSD) has been reduced to _____ for on road use.
a. 10 parts per million
b. 100 parts per million
c. 15 parts per million
d. 500 parts per million
- 3 points** 11. Does ethanol mix with 2-stroke engine oil?
Yes
No
- 3 points** 12. Volatility describes a gasoline's tendency to form _____?
a. Acids
b. Liquids
c. vapors
d. Solids
- 3 points** 13. Ultra Low Sulfur Diesel has increased lubrication?
True
False
- 3 points** 14. Semi-Trucks that are pumping out black exhaust smoke probably have a problem with:
a. Water in the fuel
b. Microbial growth
c. Sludge build up in the tanks
d. All of the above
- 3 points** 15. Biofuels have the same BTU's as plain fuel?
True
False





Power Equipment Technology

Station #9

Running Station

(75 points)

This phase of the competition will test your ability to diagnose an EFI failure using laptop diagnostics. The engine will currently not start or stay running. There may be more than one failure.

Instructions for diagnostic software:

When asked to "Choose Vehicle" you will need to select the correct engine model from the list. The engine model - spec is ECH730-3031.



Only two buttons from the main screen above are needed. The key must be turned "On" to establish a "Connection" on the Status bar.

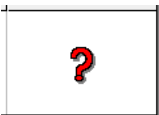


Displays "Diagnostic Trouble Codes"



Data Display (Graph & Meter)

Diagnostic Trouble Codes				
Code	Blink Code	Description	Status	Info.
P0031		Oxygen Sensor Heater Circuit Voltage High	Current	?



Trouble Code Information



Clear Trouble Codes

Trouble Code Information

Trouble Code	Description
P0031	Oxygen Sensor Heater Circuit Voltage High

Detailed Information

This Trouble Code Sets if the Oxygen Sensor Heater Voltage is Too High.

Can be caused by a Faulty Oxygen Sensor/Connections, Damaged Wiring or Faulty ECU/Connections

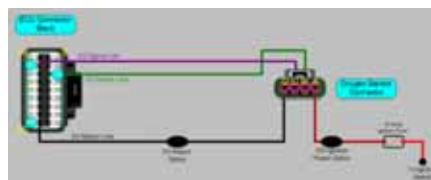


Guided Diagnostics

Follow all instructions. This may include taking voltage or resistance readings.



Wiring Diagram



(Example)

With this information and the tools provided, analyze the situation and determine the following.

- 1.) What number was selected from the “Choose Vehicle” selection list?**
- 2.) What “Current Trouble Code(s)” was/were found with this engine? (example P0031)**
- 3.) What did diagnostic testing indicate? (What did you find wrong with the engine?)**
- 4.) Is the engine repaired and running smooth?**
- 5.) What is the high speed RPM of this engine?**
- 6.) You will need to successfully clear the “Historic” code(s). Are the code(s) cleared?**

(Record your answers on the score sheet provided for you by the judge.)



**Power Equipment Technology
Station # 9
Running Station**

Judges Answer Sheet
(75 points)

- 1) Choose Vehicle:
Select from 1 through 9 **7** (5 points)
- 2) List the "Current Trouble Codes" present **P0230 & P0352** (20 points)
- 3) What did diagnostic testing indicate? (example: shorted wire)
Coil and Pump were unplugged (20 points)
- 4) Is the engine repaired and running smooth? (Y/N) **Yes** (15 points)
- 5) What is the engine high speed RPM? **3600 RPM** (10 points)
- 6) Are all codes cleared? (Y/N) **Yes** (5 points)

Contestant #



Total Points

For Judges Use Only

Power Equipment Technology
Station # 9
Running Station

Answer Sheet

(75 points)

- 1) Choose Vehicle:
Select from 1 through 9 _____ (5 points)
- 2) List the "Current Trouble Codes" present: _____ (20 points)
- 3) What did guided diagnostic testing indicate? (example: shorted wire)
_____ (20 points)
- 4) Is the engine repaired and running smooth? (Y/N) _____ (15 points)
- 5) What is the engine high speed RPM? _____ RPM (10 points)
- 6) Are all codes cleared? (Y/N) _____ (5 points)

Contestant #



Score

2014
Power Equipment Technology
Station # 10 – 2-Stroke Running
SCORE SHEET (90 points)

CUSTOMER COMPLAINT:

The trimmer engine runs well with a full tank of fuel. The engine runs poorly and dies out if tipped sideways to edge or when the fuel tank is less than half full.

WORK DONE SO FAR:

The engine has already passed the compression test, ignition test, crankcase pressure/vacuum test and there are no exhaust restrictions.

TROUBLESHOOT & REPAIR FUEL SYSTEM: (Use **Engine Evaluation Worksheet**)

1. What fuel system repair part(s) or fuel system maintenance part(s) are needed to fix the engine?

Intake fuel line has hole (10pts)

Dirty fuel filter (10pts)

Ask judge for part(s)

(20 Points)

Fuel Filter Install (10pts)

Fuel Line Install (20pts)

2. Repair the engine by correctly replacing the part(s) listed above.

Check fuel filter has clamp & is down in tank (30 Points) Is tank grommet seated? Carb line connections ok?

3. Start repaired engine and test run. (Use **Service Data Sheet** to check rpm specs.)

Check WOT (10pts)

Wide open throttle rpm? ??? Within specs? _____ Check Idle (10pts)

Idle rpm? ??? Within specs? _____ Adjust idle speed (10pts)*

**Adjust idle speed if needed. String head must not turn on idle.*

(30 Points)

4. Name two parts on this engine controlled by emissions regulations?

(10 Points)

- Electronic Ignition System • Spark Plug • Catalytic Converter / Muffler Assembly • Carburetor (complete assembly or replaceable components) • Choke • Fuel-Injection Assembly (or replaceable components)
 - Fuel Tank • Fuel Cap Assembly • Air Filter • Fuel Feed Line (and associated clamps/connectors as applicable)
- (10pts for 2 correct)**

Contestant #



Score

2014
Power Equipment Technology
Station # 10 – 2-Stroke Running
SCORE SHEET (90 points)

CUSTOMER COMPLAINT:

The trimmer engine runs well with a full tank of fuel. The engine runs poorly and dies out if tipped sideways to edge or when the fuel tank is less than half full.

WORK DONE SO FAR:

The engine has already passed the compression test, ignition test, crankcase pressure/vacuum test and there are no exhaust restrictions.

TROUBLESHOOT & REPAIR FUEL SYSTEM: (Use **Engine Evaluation Worksheet**)

1. What fuel system repair part(s) or fuel system maintenance part(s) are needed to fix the engine?

_____ *Ask judge for part(s)*
(20 Points)

2. Repair the engine by correctly replacing the part(s) listed above.

(30 Points)

3. Start repaired engine and test run. (Use **Service Data Sheet** to check rpm specs.)

Wide open throttle rpm? _____ Within specs? _____

Idle rpm?* _____ Within specs? _____

*Adjust idle speed if needed. String head must not turn on idle.

(30 Points)

4. Name two parts on this engine controlled by emissions regulations?

(10 Points)



2014 Transmission Assembly Station #11 Judges Instructions

This Skill will test the contestant's ability to locate information using the manual provided and apply it to the assembly procedure.

Instructions: The contestant must determine proper assembly procedures and orientation of the component parts and assemble this 700-Series transmission. They will be judged on the following areas:

- Unit Identification from ID Label:** Record the correct unit information from the transmission ID tag on the Post-It-Note® provided. **(3 points)**
- Shift Collar Orientation:** The "thick" side of the shift collar MUST face the key tips and gears. **(5 points)**
- Shift Keys:** The shift collar must connect the two keys at the slotted end of the keys.
2 @ 3 points: Keys in slots; 2 @ 3 points: Keys in collar **(12 points)**
- Gear Orientation:** The orientation of the gears on the 700 is critical because there is a recess on all of them. A shift washer goes on the shaft first, then the largest gear flat side goes towards the shaft shoulder. The shift washers go in between the gears with flat/concave sides of washers to flat sides of gears, working from largest to smallest. **(22 points)**
- Shift washer orientation:** The chamfered (bubbled) side faces toward the shift-key collar, and the flat/concave sides face the flat sides of gears. **(8 points)**
- Thrust Washers:** They all have to fit the shafts and the purpose. **(10 points)**
- Shift-Shaft & Fork Orientation:** The shifter fork should have the pins in the proper place in the shift-collar slot, and be properly located in the case. **(3 points)**
- Bushings:** Tabs and flanges in place, and seated properly. **(12 points)**

Total

75 Points



2014
Power Equipment Technology
Station #11
Power Train
Instructions

NOTE: Due to time limitations, the brake has been left off this transmission, and the shift-detent ball, spring and plug have already been removed. In a working transmission, the brake will be mounted on the outside of the shifter/brake shaft, opposite of the drive sprocket. The shift-detent fits into the top case.

This test will determine your ability to re-assemble a transmission by locating information using the manual provided and applying it to the assembly procedure. Determine the proper procedures and orientation of the component parts. The judge will score you on the following areas:

Unit Identification
Shift Collar Orientation
Shift Keys
Gear Orientation
Shift-Washer Orientation
Thrust Washers
Shift-Shaft-&-Fork Orientation
Bushings

Record the Unit Identification on the Post-It Note[®] pad provided, for collection by the judge. When the assembly is complete, have the judge inspect the assembly. After the judge's inspection, if time allows, the contestant should disassemble the unit in preparation for the next contestant.

2014
Power Equipment Technology
Station #11
Power Train
Contestant Score Sheet

Unit Identification from ID Label _____ (3 points)

Shift Collar Orientation: _____ (5
points)

Shift Keys: 2 @ 3 Points: Keys in slots _____ (12
points)

2 @ 3 Points; Keys in collar

Gear Orientation: _____ (22
points)
2 Points each

Shift-Washer Orientation: 2 Points each _____ (8
points)

Thrust Washers: 2 Points each _____ (10
points)

Shift-Shaft-&-Fork Orientation: _____ (3
points)

Bushings: Installation: 2 Points each; _____ (12
Points)

Bushing position in case: 2 Points

Score



Contestant Number

2014

**Power Equipment Technology – Station #12
Chainsaw Cutting Attachments**

Judge Answer Sheet (75 Points possible)

This Station Tests your ability to:

- ✓ Identify the correct bar and chain for a chainsaw
- ✓ Properly install bar & chain and adjust chain tension on a chainsaw
- ✓ Identify the correct file size to file the chain on a chainsaw

Scenario; A customer has come into your shop and asked you to install a 20” bar & chain loop on his Echo® Chainsaw Model # 650. Using the Oregon® Selector Guide / Catalog provided, answer the following questions:

1. What is the part number for a 20” Oregon® Pro-Lite® Bar to fit this Echo® Chainsaw? **200GLHD176 – (10 Points)**
2. How Many Drive Links are in an Oregon® 72LGX Chain Loop that fits this Echo® Chainsaw? **70 Drivers – (10 Points)**
3. What is the correct File Size for the Oregon® 72LGX Chain? **7/32” – (10 Points)**

Once the questions above have been completed, return this sheet to the judge. The Judge will provide you with the correct Oregon® bar and chain. Wearing gloves for safety, correctly install the Oregon® Bar & Chain on the Echo® Saw and properly tension the chain (45 Points) – 10 for Gloves, 20 for Installed & chain in right direction, 15 for proper tension

Score



Contestant Number

2014
Power Equipment Technology – Station #12
Chainsaw Cutting Attachments

Score Sheet

This Station Tests your ability to:

- ✓ Identify the correct bar and chain for a chainsaw
- ✓ Properly install bar & chain and adjust chain tension on a chainsaw
- ✓ Identify the correct file size to file the chain on a chainsaw

Scenario; A customer has come into your shop and asked you to install a 20” bar & chain loop on his Echo® Chainsaw Model # 590. Using the Oregon® Selector Guide / Catalog provided, answer the following questions:

1. What is the part number for a 20” Oregon® Pro-Lite® Bar to fit this Echo® Chainsaw? _____
2. How Many Drive Links are in an Oregon® 72LGX Chain Loop that fits this Echo® Chainsaw? _____
3. What is the correct File Size for the Oregon® 72LGX Chain? _____

Once the questions above have been completed, return this sheet to the Judge. The Judge will provide you with the correct Oregon® bar and chain. Wearing gloves for safety, correctly install the Oregon® Bar & Chain on the Echo® Saw and properly tension the chain.