SkillsUSA
2010 Contest Projects

Diesel 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.

Diesel Equipment Technology
This year, Delmar, a part of Cengage Learning is making their online ASE Test Preparation tools available to all instructors and competitors immediately. This means that some competitors may be able to use the tool in advance of their district and state competitions.

Instructors should only share with materials competitors.

Access will be terminated when the National Competition begins.
Please use the contact information below to get the necessary link
jonathan.sweeney@cengage.com | www.delmarlearning.com

DET #5

2010 Job Interview Station - Orientation

SkillsUSA.

Interview Orientation – Someone must say this before each round begins.

"The interview station is based on a scenario where you are applying for an apprentice technician job at a John Deere construction dealership.

You will have two tasks.

The first is to fill out an application. You will be judged on the clarity of your application.

Proctors will be present to answer any questions you may have about the application itself.

The second task is to go through a mock interview.

In this, you will be judged on your self presentation and on the depth and maturity of your answers.

Two interviews will be conducted at a time, the remaining contestants will fill out their application.

Do not worry if you haven't completed your application when you are called for your interview.

You will have 20 minutes total in this rotation to complete the application.

Are there any questions?"

Send four contestants to application tables.

Send two contestants to the interview areas.

VET #6

2010 Job Interview Station - Written Test

SkillsUSA

APPLICATION FOR EMPLOYMENT

(An Equal Opportunity Employer)

DATE

PLEASE PRINT AND COMPLETE ALL SECTIONS (USE BALLPOINT PEN)

PERSONAL INFORMATION

NAME LAST	FIRST	MIDDLE	CONTESTANT NUMBER

PRESENT ADDRESS NUMBER & STREET	CITY	STATE	ZIP CODE

E-MAIL ADDRESS	CELLULAR TELEPHONE NUMBER	HOME TELEPHONE NUMBER
	( ) -	( ) -

HAVE YOU EVER USED ANOTHER NAME? ☐ YES ☐ NO

IF YES, PLEASE PROVIDE OTHER NAMES USED

HAVE YOU EVER PLED GUILTY OR "NO CONTEST" TO, OR BEEN CONVICTED OF, A MISDEMEANOR OR FELONY? ☐ YES ☐ NO

IF YES, PLEASE GIVE DATE AND DETAILS

(Answering yes to this question does not constitute an automatic bar to employment. Factors such as age and time of the offense, seriousness and nature of the violation, and rehabilitation will be taken into account. Do not include minor traffic citations and arrests or convictions which have been sealed or expunged in answering this question.)

EMPLOYMENT DESIRED

POSITION DESIRED	DATE YOU CAN START	SALARY DESIRED

EDUCATION

SCHOOL LEVEL	NAME & LOCATION (CITY, STATE) OF SCHOOL	GRADUATE?	SUBJECTS STUDIED/MAJOR
HIGH SCHOOL			
COLLEGE			
TRADE, BUSINESS CORRESPONDENCE SCHOOL			

SUBJECTS OF SPECIAL STUDY OR RESEARCH WORK

SPECIAL TRAINING

SPECIAL SKILLS

2010 Job Interview Station - Written Test

SkillsUSA

EMPLOYMENT HISTORY	List your most recent employment first. Resumes will not be accepted in place of a completed application form. Respond completely to all information in this section.

1

NAME & ADDRESS OF PRESENT OR MOST RECENT EMPLOYER

STARTING DATE	LEAVING DATE
JOB TITLE	

NAME & TITLE OF SUPERVISOR

DESCRIPTION OF WORK

REASON FOR LEAVING

GENERAL EMPLOYMENT INFORMATION

HAVE YOU EVER BEEN TERMINATED OR ASKED TO RESIGN FROM ANY JOB? ☐ YES ☐ NO

IF YES, PLEASE EXPLAIN THE CIRCUMSTANCES

ARE THERE ANY GAPS IN YOUR EMPLOYMENT HISTORY? ☐ YES ☐ NO

IF YES, PLEASE EXPLAIN

IF YES, PLEASE EXPLAIN

ARE YOU LEGALLY AUTHORIZED TO WORK IN THE U.S.? ☐ YES ☐ NO (PROOF SUFFICIENT TO SATISFY U.S. IMMIGRATION LAWS IS A REQUIREMENT OF EMPLOYMENT)

IF HIRED, CAN YOU FURNISH PROOF THAT YOU ARE OVER 16 YEARS OF AGE? ☐ YES ☐ NO

ARE YOU CAPABLE OF SATISFACTORILY PERFORMING THE ESSENTIAL JOB DUTIES REQUIRED OF THE POSITION FOR WHICH YOU ARE APPLYING? ☐ YES ☐ NO

REFERENCES

Include only individuals familiar with your work ability. DO NOT include relatives.

NAME	RELATIONSHIP	YEARS KNOWN
1.		
2.		

SIGNATURE OF APPLICANT	DATE

DET #8

Verbal Presentation Test

2010 Job Interview Station - Interview Questions

SkillsUSA

Contestant Number:_____

1. Tell me about yourself.

2. What made you decide to pursue the diesel industry for your career?

3. What have been some of your major accomplishments at school or work?

4. What are you looking for in a company?

5. If you could create the perfect job, what would it involve?

6. Tell me about a time when you had difficulty maintaining composure at school or work. How did you handle the situation?

7. What motivates you to succeed in a job?

8. Tell me about an area (work skill or personality trait) where you could use improvement.

9. What separates you from the other students here?

10. What questions do you have for me?

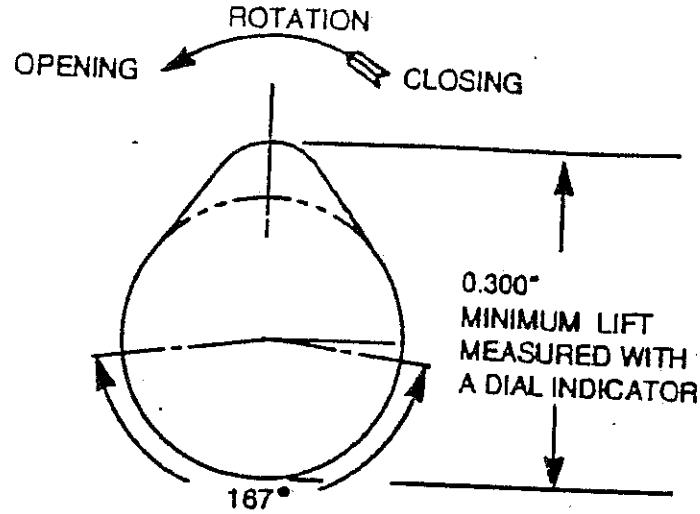
Contestant #_____

2010
Skills USA – VICA
Championships

Station #1
Precision Measurements

Contestant Score_____

INTAKE CAM CONTOURS



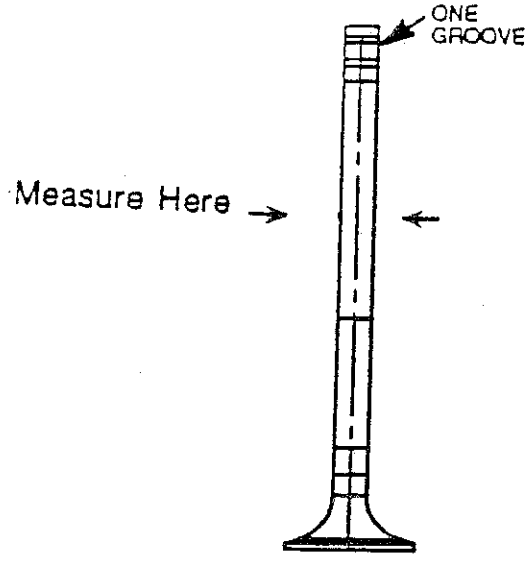
CONTOUR OF INLET CAMS

1. Set up base mount dial indicator and measure the lift on the intake lobe. Is it within specifications?

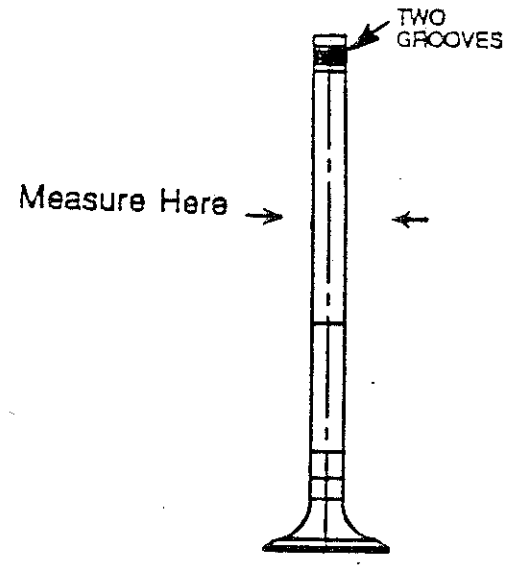
No _____

Yes _____

INLET AND EXHAUST VALVE



INLET VALVE



EXHAUST VALVE

2. **Using the valve spring compressor, disassemble and remove the inlet valve. Measure and record the stem diameter in metric and install valve.**

   Answer _____

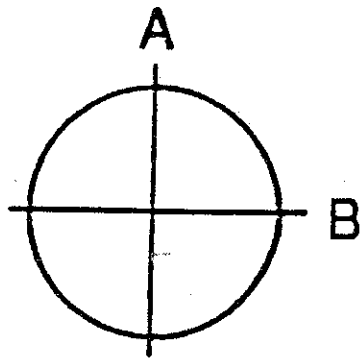
3. **Using the valve spring compressor, disassemble and remove the exhaust valve. Measure and record the stem diameter in U.S. standard install valve.**

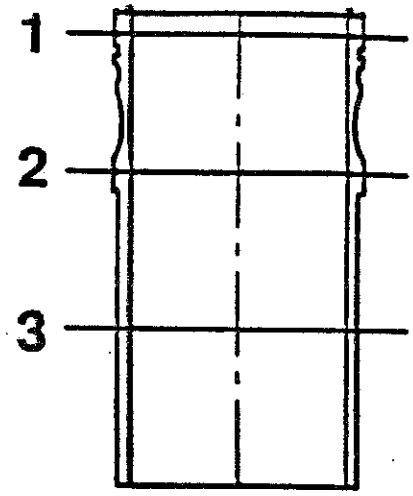
   Answer _____

4. (For Judge) was it disassembled and assembled correctly?

   Yes _____ No _____

CYLINDER SLEEVE (LINER) MEASUREMENTS



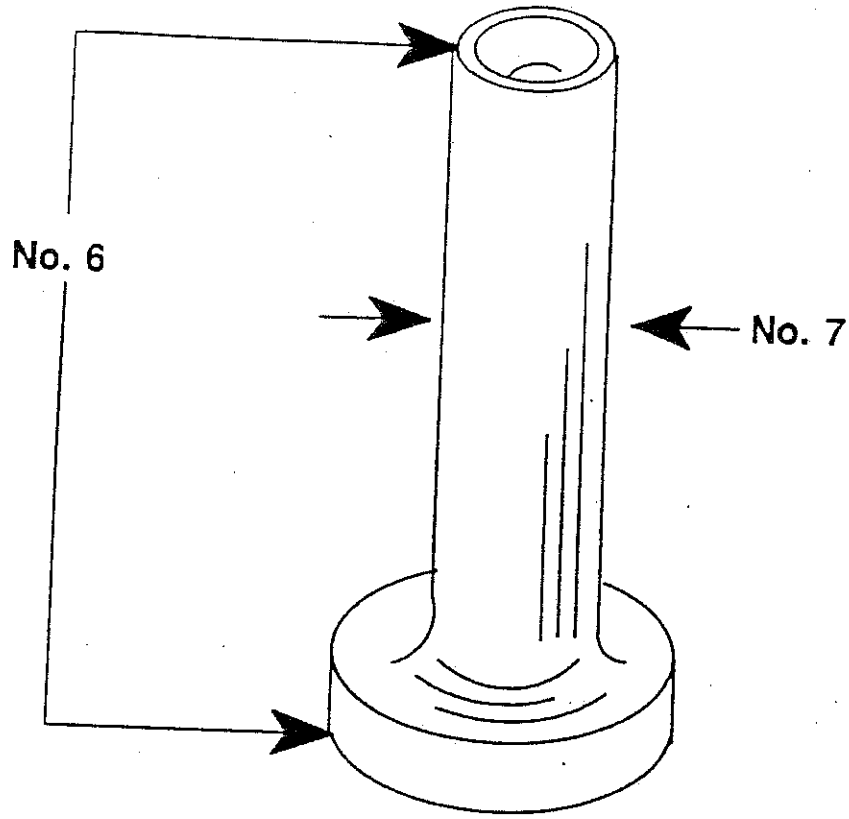


5. Using the dial bore gauge, measure at the 3 positions shown in the liner, then rotate bore gauge 90° and measure at those locations again.

Is the liner tape or out-of-round more than .003?

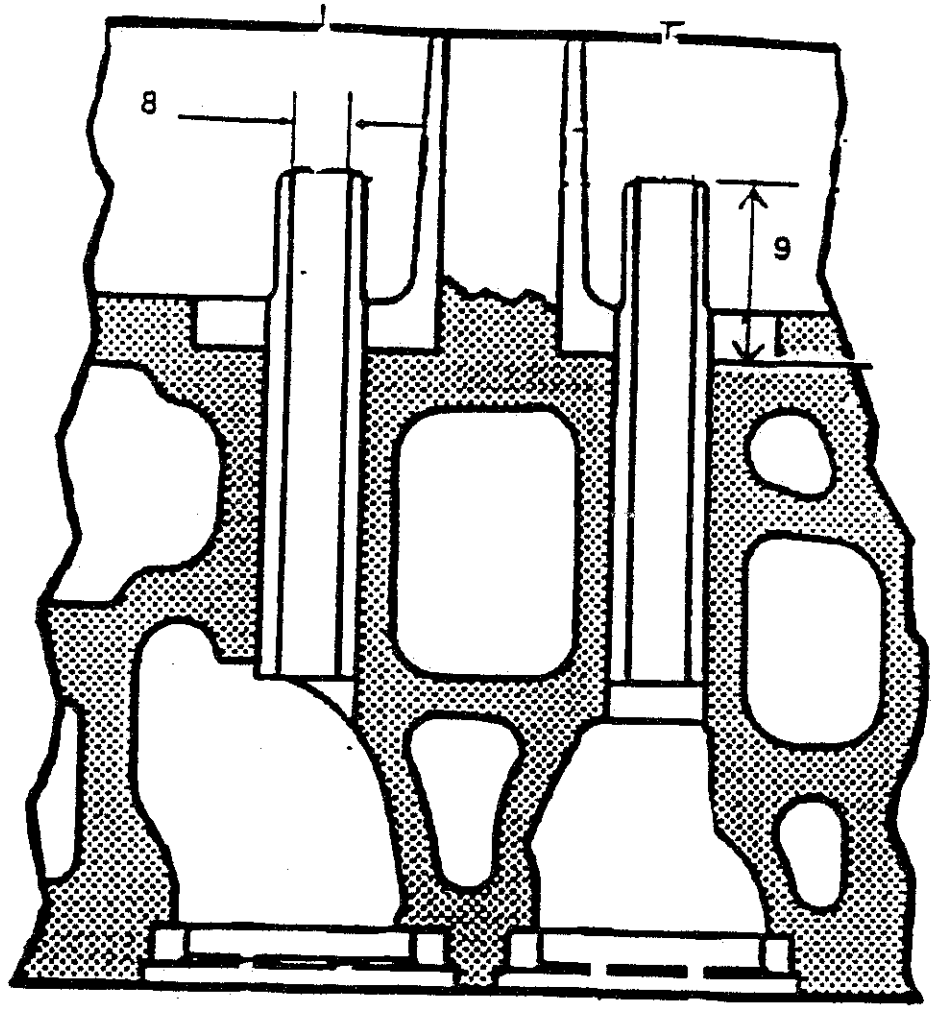
Yes _____ No _____

LIFTER



6. Using the dial caliper, measure and record the length in U.S. Standard. _____

7. Using the metric micrometer, measure and record the shank dimension in metric. _____



8. Using an inside telescoping gauge and a micrometer, record the valve guide diameter in U.S. standard. _____

9. Using a depth micrometer, measure and record valve guide extension in U.S. standard. _____

10. What is the clearance between the valve stem (question # 3), and valve guide that was measured in question # 8.

in U.S. standard. _____

Station # 2 Live Engines

THIS IS A LIVE ENGINE STATION. You will be performing maintenance task and inspections as well as accessing fault codes with the computer.
Complete the task in the order given below under Contestant Task.
The equipment in this station is in the shop for repairs due to an **Engine overheat condition.** Be careful to insure the job is complete.

Contestant Task:
1. Ensure the engine is ready to start
2. Start the engine; check that engine is running properly.
3. Use the Laptop computer to document and verify active fault codes
4. Locate troubleshooting tree for any active codes
5. Locate circuit on wiring diagram of active fault component.
6. Describe the failure mode of the component
7. Clear any inactive fault codes and verify proper operation of the component
8. Inspect the drive belt that is on the bench for reuse, (good or bad)
9. Check the SCA concentration level of the sample coolant on the bench. Record you findings_____.
10. Using the refractometer check the concentration level of the Diesel Exhaust Fluid (DEF) sample on the bench. Record your findings_____.
11. Answer Task 1, 2, & 3 questions concerning Truck Dash Operator Interface with Aftertreatment lights.

Score Sheet 2010
Live Diesel Engine Diagnostic - Test Station 2
Total Number of Possible Points = 100

Contestant # _____ Time _____

Points Possible	Required Steps to Get Points	Points Awarded
2	General walk around before starting engine	
2	Checked oil level	
2	Checked coolant level	
8	Student located belt missing or off pulley	
8	Student installed belt properly	
4	Student connected Laptop to correctly	
4	Navigated laptop to fault codes	
4	Recorded active fault (coolant sensor)	
4	Proper use of Multimeter and settings	
4	Used test leads where required	
4	Located circuit on wiring diagram	
6	Followed troubleshooting tree	
4	Contestant described failure mode properly	
4	Cleared inactive fault codes	
4	Navigated laptop to proper screen to record coolant temp	
4	Contestant provide correct inspection on belt	
2	Coolant SCA test performed properly	
2	Coolant SCA test results recorded are correct	
2	DEF concentration test performed properly	
2	DEF test results recorded are correct	
8	DPF Task one	
8	DPF Task two	
8	DPF Task three	

100 Total Possible Points

Total Points Scored _____

SkillsUSA
VICA

2010 DIESEL SKILLS
JUDGES INSTRUCTIONS
Station # 3

1) THIS IS A BASIC ELECTRICAL TEST CONSISTING OF MARKER LIGHTS, TURN SIGNAL, BRAKE LIGHT AND STARTER SYSTEMS.

2) THE SCHEMATIC LOCATED ON EACH TEST BOARD IS FOR THE LIGHT SYSTEM ONLY (STOP, TAIL, TURN AND MARKER LIGHTS). THE SCHEMATIC DOES NOT INCLUDE THE STARTER SYSTEM.

3) YOU WILL NEED TO DEMONSTRATE YOUR ABILITY TO USE THE "DVOM" WHILE DIAGNOSING THE PROBLEMS LISTED.

4) YOU ARE NOT REQUIRED TO REPAIR ANY PROBLEM YOU HAVE DIAGNOSED.

5) THERE IS A JUMPER WIRE PROVIDED FOR YOU TO USE, YOU DO NOT NEED TO USE IT TO DIAGNOSE THE PROBLEMS ON THE BOARD. PLEASE USE CAUTION IF YOU USE A JUMPER WIRE. THE JUDGE MAY STOP YOU IF YOU WILL CAUSE A SHORT CIRCUIT AND POINTS MAY BE DUDUCTED FROM YOUR SCORE IF YOU CAUSE A SHORT.

6) YOU HAVE 35 MINUTES TO COMPLETE THIS TEST. SOMEONE WILL GIVE YOU A 5-MINUTE WARNING NEAR THE END OF THE SESSION.

7) NO TALKING DURING OR AFTER THE TEST. AFTER YOU ARE FINISHED, GIVE YOUR CLIPBOARD WITH THE TEST TO THE JUDGE AND RETURN TO YOU CHAIR.

8) FOLLOW ALL SAFTEY PRECAUTIONS AT ALL TIMES.

Kansas City 2010
Heavy Equipment Technician
Station #4

Contestant #:

Note: All contestants must have bump hats and safety glasses.

TOTAL

GAS WELD—(34 POINTS POSSIBLE)

SCORE

	POINTS
Procedure to open tanks	3
Correctly adjust gauges	3
Light torch and adjust flame	4
Proper handling of torch:	
A) Connection of heat	3
B) Feeding of filter rod	3
Quality of braze and weld	8
Procedure of shutting down tanks and gauges	4
Coiling of hoses and putting equipment back in place	3
Ability to work safely	3

SHOP TOOLS---(33 POINTS POSSIBLE)

SCORE

Attention to instructions & ability to follow orders	10
Ability to complete task	10
Ability to work safety	3
Assemble to standard	10

Improper assembly of components - 1 point each
Improper assembly of (bolts, washers, nuts) – 1 point each

ARC WELD—(33 POINTS POSSIBLE)

SCORE

	POINTS
Ability to turn on and set proper heat range for size of welding rod and work	5
Proper use of protection equipment (welding helmet, gloves, long sleeves, shielding others from ray of arc)	5
Ability to use and protect equipment properly:	
A) Ground - disconnect/connect	4
B) Strike and hold arc	2
C) Angle of welding rod	2
D) Speed and direction of rod travel	2
Quality of welds	5
Shutdown equipment and put away tools	3
Ability to work safely	5

VET - #5

Chassis Station

This station will cover measuring driveline component slopes, working angle of two joints, and identifying chassis and brake components.

To successfully complete this task, students will need to have an understanding of decimals, basic mathematics, and the ability to follow instructions. Students will also need to understand the setup and usage of the digital protractor and calculate the working drive line angle.

Students will also know the components and component locations as well as complete a 28 question written test.

DET #5

2010 Skills USA

Diesel Equipment Technology Contest

Station Chassis

Welcome to Station #5, the Chassis Station. This station will cover measuring driveline component slopes, working angle of two joints, and identifying chassis components. You will have a total of 30-35 minutes to complete your tasks. Half will start with the written test and half will begin with the hands on portion. You will change positions halfway through the allotted time. You may ask questions about your tasks at each workstation. Any special tools will be provided at each work station. After you complete your task, please return to your seat. **Please write legibly**. If we can not read an answer it will be marked incorrect. (Each question is worth 2 points

1. Axle alignment on a tandem rear leaf spring suspension is adjusted by
   a. Changing the length of the torque rods
   b. installing wedge type spacers
   c. rotating the eccentric bolts on the front axle
   d. both a and c

2. Suspension system torque arms are used to
   a. Mount the leveling valve
   b. Equalize load between the axles
   c. Reduce wheel hop
   d. Control axle torque

3. The _____ uses universal joints.
   a. steering column
   b. pitman arm
   c. tie-rod assembly
   d. steering wheel

4. The _____uses ball joints.
   a. Steering wheel
   b. Steering gear
   c. Tie-rod end
   d. Steering knuckle

5. _____ is defined as the forward or rearward tilt of the kingpin centerline when viewed from the side of the vehicle.
   a. Kingpin inclination
   b. Camber
   c. Caster
   d. Toe

6. _____is defined as the inward or outward tilt of the top of the tires when viewed from the front of the vehicle.
    a. Ackerman geometry
    b. Caster
    c. Camber
    d. Toe

7. _____can be corrected using shims.
    a. Kingpin inclination
    b. Toe
    c. Caster
    d. Camber

8. The _____connects the Pitman arm to the steering arm.
    a. Tie-rod assembly
    b. Drag link
    c. Cross shaft
    d. Steering column

9. Symptoms of a vehicle that is out-of-alignment include:
    a. Wandering
    b. Tire wear
    c. Hard steering
    d. All of the above

10. The _____ of a clutch is a driven member.
    a. Cross shaft
    b. Clutch disc
    c. Intermediate plate
    d. Pressure plate

11. All of the following are parts of the clutch cover except:
    a. Release lever
    b. Pressure spring
    c. Pressure plate
    d. Adapter ring

12. The _____is splined to the input shaft of the transmission.
    a. Release bearing
    b. Pressure plate
    c. Clutch disk
    d. Flywheel

13. In an air brake system the _____functions as a lever.
    a. Rotor
    b. Brake chamber
    c. Caliper
    d. Slack adjuster

14. In an air brake system the _____ sets the system cut-in and cut-out pressures.
    a. Wet tank
    b. Supply tank
    c. Governor
    d. Air dryer

15. A _____is required on all air brake system air tanks.
    a. Unloader valve
    b. Safety valve
    c. Drain cock
    d. Pressure protection valve

16. When the parking brake is released air leaks from the exhaust port of the brake relay valve. The most likely cause is a _____.
    a. faulty quick release valve.
    b. leaking park brake chamber diaphragm.
    c. Back feed from the air dryer.
    d. Air governor valve set too high

17. Driver complains his truck steering is tight and will not return to straight ahead after a turn. A possible cause could be _____ .
    a. Slipping power steering belt.
    b. Incorrect camber setting
    c. Seized king pin bushings
    d. Sticking relief valve in power steering pump

18. Truck pulls to the right under braking. Technician A states the brakes may not be adjusted evenly. Technician B states that a pinched air line could be the cause. Who is correct?
    a. Technician A only.
    b. Technician B only.
    c. Both A & B
    d. Neither A or B.

19. While servicing a truck with air brake the technician finds oil in the primary air tank. The most likely cause would be _____ .
    a. Restriction in the air dryer
    b. Failing air compressor
    c. Incorrect oil viscosity
    d. Defective pressure protection valve

20. During a routing inspection a technician finds a leaking wheel seal. The most likely cause of failure could be _____.
    a. Wheel having too much lateral run out.
    b. Incorrect axle inclination
    c. Loose wheel bearing
    d. Slack adjuster set beyond limit.

21. Technician found excess wear on one wheel while inspecting air brakes. Possible causes could be _____ .
    a. Seized brake camshaft bushing
    b. QR-1 valve.
    c. Sticking foot valve
    d. Low air supply in primary air tank.
22. Driver notices a vibration in the drive train while decelerating. One possible cause could be _____ .
    a. Incorrect suspension ride height adjustment
    b. Incorrect clutch adjustment
    c. Worn clutch brake
    d. Missing pinion snubber
23. The clutch brake will not stop the input shaft from turning making engagement in low and reverse difficult. The cause could be all except _____ .
    a. Warped clutch disc
    b. Seized pilot bearing
    c. Leaking range valve
    d. Worn clutch brake facing
24. Steer axle tire wear on the inside tread tapering out is most likely caused by _____ .
    a. Too much caster
    b. Too little caster
    c. Wheels toed out
    d. Wheels toed in
25. Low air pressure warning light/buzzer on vehicles with air brakes should activate below _____.
    a. 120 psi
    b. 90 psi
    c. 60 psi
    d. 30 psi
26. On vehicles with air brakes a loss of air pressure below _____ will activate the parking brake.
    a. 120 psi
    b. 90 psi
    c. 60 psi
    d. 30 psi
27. The purpose of the QR-1 valve is _____ .
    a. Prevent loss of air in primary tank if compressor fails
    b. Set parking brake when system falls below 90 psi
    c. Speed brake release times
    d. Allow driver to apply air to trailer brakes
28. A truck with air suspension the sits too high when pulled out from the trailer. The most likely cause would be _____ .
    a. Leaking air bag
    b. Too high pressure in primary air tank
    c. Improperly adjusted air leveling valve
    d. Sticking unloader valve

#5

Diesel Equipment Technology Contest

Chassis Station

Contest Time 30 – 35 minutes - 100 Points

Contestant # _____ Total Score _____

Welcome to Station #5, the Chassis Station. This station will cover measuring driveline component slopes, working angle of two joints, and identifying chassis components. You will have a total of 30–35 minutes to complete your tasks. Half will start with the written test and half will begin with the hands on portion. You will change positions half way through the allotted time. You may ask questions about your tasks at each work station. Any special tools will be provided at each workstation. After you complete your task, please return to your seat. **Please write legibly.** If we cannot read an answer it will be marked incorrect.

Driveshaft Exercise: Measure driveline components at the designated/marked locations.

A. Slope/Angle of the Front Driveshaft (+/- .5°) _____ (5 points)
B. Slope/Angle of the Transmission (+/-.5°) _____ (5 points)
C. Slope/Angle of the Front Drive Axle (+/-.5°) _____ (5 points)
D. Working angle of A & C (+/- 1°) _____ (5 points)
E. Working angle of A & B (+/- 1°) _____ (5 points)
F. Identify Drag Link tag # _____ (2 points)
G. Identify Tie Rod tag # _____ (2 points)
H. Identify Front Spring Shackle tag # _____ (2 points)
I. Identify Pitman Arm tag # _____ (2 points)
J. Identify Primary Air Reservoir tag # _____ (2 points)
K. Identify Governor tag # _____ (2 points)

SkillsUSA

2010 - Transmission

Contestant #: _____ **Score:** _____

Station #: 6 **Judge:** _____

_____ **1)** Using the Service Manual provided at this station, completely assemble the RTLO-16718 Shift Bar Housing.

(Circle the correct answer on questions 2 thru 6)

_____ **2)** In the following nomenclature, what does the '9' represent?

'RTLO-20913A'

A. Design Level – Improved Seal System
B. Ratio Set
C. Number of Forward Speeds
D. Nominal Torque Capacity

_____ **3)** What is the correct torque value for the shift yoke lockscrews?

A. 20-25 lb/ft
B. 8-12 lb/ft
C. 35-45 lb/ft
D. 18-22 lb/ft

_____ **4)** The filter/regulator assembly regulates the air pressure to:

A. 38-43 PSI
B. 58-63 PSI
C. 48-53 PSI
D. 68-73 PSI

_____ **5)** Once the shift bar housing has installed on the main case, the capscrews should be torqued to the following value:

A. 25-35 lb/ft
B. 35-45 lb/ft
C. 45-55 lb/ft
D. 55-65 lb/ft

_____ **6)** Referring to the power flow section for a 13-speed transmission, how many gearsets are being used while in 3rd gear? (Note: One gearset equals three mating gears)

A. None – Straight through the box
B. 2
C. 3
D. 4

SkillsUSA 2010
Diesel Equipment Technology Competition
Drive Axle – Station #7

SCORE

Component Identification and Axle Operation

1. Using the inter-axle differential [IAD] assembly from a Meritor forward drive axle, identify each component of the inter-axle differential. Write your answers below:

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

2. Using the inter-axle differential [IAD] assembly from a Meritor forward drive axle trace the power flow through the assembly. Conditions are; normal driving conditions, IAD unlocked. Start with first component receiving torque and finish with last component delivering torque. Write your answers below:

   1st component _____.
   2nd component _____.
   3rd component _____.
   4th component _____.

3. Using the inter-axle differential [IAD] assembly from a Meritor forward drive axle, which two [2] components are delivering torque equally?
   - _____.
   - _____.

4. Using the inter-axle differential [IAD] assembly from a Meritor forward drive axle, answer the following questions.
   - Which one component drives the rear drive axle ?
     _____
   - Which one component drives the forward drive axle ?
     _____

5. Using the main differential assembly from a Meritor drive axle, identify each component of the main differential. Write in your answers below.

   Item F _____.
   Item G _____.
   Item H _____.
   Item I _____.

Contestant # ____ **Drive axle #_____** **Score_____**

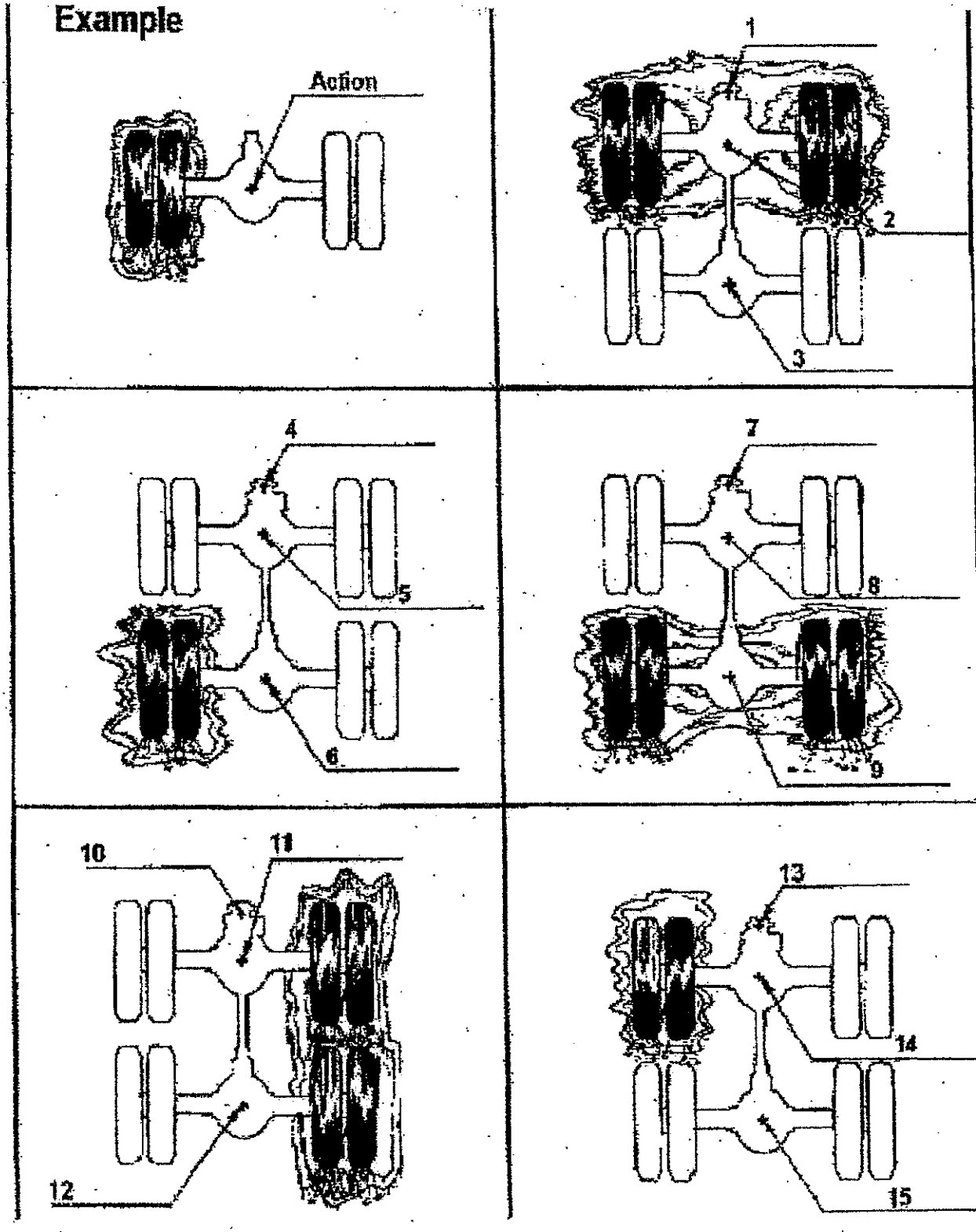
SkillsUSA 2010
Diesel Equipment Technology Competition
Drive Axle – Station #7

6. Using the Illustrations on the following page, identify whether or not differential ***action*** is taking place in each of the three [3] differentials. Complete the blanks with one of the following two choices. **NOTE: The spinning wheels are spinning at the same speed.**

   - Action
   - No action

SkillsUSA Competition

Drive Axle Station # 7



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SkillsUSA 2010
Diesel Equipment Technology Competition
Drive Axle – Station #7

7. Locking in the driver controlled differential lock [DCDL], will eliminate differential action on which of the following components? Circle letter of the one correct answer:

   a. The main differential of the selected drive axle.
   b. The inter-axle differential.
   c. Both A and B.
   d. All of the above.

8. Locking in the inter-axle differential, will eliminate differential action on which of the following components? Circle letter of the one correct answer:

   a. The main differential of the forward drive axle.
   b. The main differential of the rear drive axle.
   c. The inter-axle differential.
   d. All of the above.

9. Correctly assemble the main differential assembly, including all thrust washers. Only install 2 bolts finger tight.

10. Correctly assemble the inter-axle differential assembly.

Contestant # ____ **Drive axle #**_____ **Score**_____

SkillsUSA 2010
Diesel Equipment Technology Competition
Drive Axle – Station #7
Axle Identification and Inspection

1. What is the gear ratio of this drive axle?

   _____

2. Measure the input shaft end play.

   Measured end play is:

   _____

   Specification end play is:

   _____

   Is the end play within specification? Yes _____ No _____

3. Measure the ring gear run out.

   Measured run out is:

   _____

   Specification for ring gear run out is:

   _____

   Is the run out within specifications? Yes _____ No _____

Contestant # ____ **Drive axle #_____** **Score_____**

SkillsUSA 2010
Diesel Equipment Technology Competition
Drive Axle – Station #7

4. Measure the ring gear backlash.

   Measured backlash is:

   _____

   Specification for backlash is:

   _____

   Is the backlash within specifications?

   _____

5. If the backlash were out of specifications how would you correct it?

   _____
   _____
   _____
   _____

6. Is this carrier equipped with an oil pump?

   Yes _____ No _____

7. Is this carrier equipped with a driver controlled differential lock?

   Yes _____ No _____

Contestant # ____ **Drive axle #_____** **Score_____**

DET #9

Skills USA
2010 National Skills Competition

Number_____

Directions: Circle the correct response for each item.

1. What occurs in a hydraulic system if fluid flow is restricted?

    a. Fluid flow rate and pressure decrease
    b. Fluid flow rate decreases and pressure increases
    c. Fluid flow rate and pressure increase
    d. Fluid flow rate increases and fluid pressure decreases
    e. None of the above

2. Which hydraulic component is designed to use fluid flow and pressure to produce mechanical motion and thus do work?

    a. Pump
    b. Line
    c. Cylinder
    d. Tank
    e. a and d

3. Hydraulics can best be defined as:

    a. The use of liquid under controlled pressure to do work
    b. Generating electricity with waterpower
    c. Using mechanical advantage to lift large loads
    d. A way of compressing gas to turn it into liquid
    e. None of the above

4. Which of the following functions are performed by the tank in a typical hydraulic system?

    a. Allows air to separate from the oil
    b. Allows contaminant to settle out of oil
    c. Cools hydraulic fluid
    d. All of the above

5. A charge pump supplies flow to the outlet of a larger pump to prevent cavitation.

    a. True
    b. False

6. A closed loop system that uses a hydraulic pump and motor to transfer power is called:

    a. Reciprocating drive
    b. Rotary drive
    c. High drive
    d. Hydrostatic drive
    e. None of the above

7. Pump displacement is calculated by measuring which of the following?

    a. The volume of fluid pumped in one minute
    b. The average pressure during one revolution of the pump
    c. The volume of the fluid pumped during one revolution of the pump
    d. None of the above

8. An orifice in an oil passage causes:

    a. A lower oil pressure on the downstream side of the orifice when there is no oil flow
    b. A lower oil pressure on the downstream side of the orifice when there is oil flow
    c. A lower oil pressure on the downstream side of the orifice at all times
    d. None of the above

9. In a variable displacement piston pump, when the swashplate angle is increased, _____ is increased.

    a. Displacement
    b. RPM
    c. Pressure
    d. a and c
    e. None of the above

10. In a hydraulic system, valves control:

    a. Pressure
    b. Direction of flow
    c. Quantity of flow
    d. a and b
    e. a, b, and c

11. What hydraulic component applies a force to a fluid and causes it to flow?

    a. Actuator
    b. Pump
    c. Conductor
    d. Cylinder
    e. a and d

12. Pressure is defined as:

    a. Force of a fluid per unit area
    b. Excessive flow in the system
    c. The lifting capacity of a system
    d. The fluid volume of a system
    e. None of the above

13. To increase the flow rate of a fixed displacement pump, which of the following must be done?

    a. Increase the pressure relief valve settings
    b. Increase the drive speed or RPM of the pump
    c. a and b
    d. None of the above

14. How much pressure is necessary within a hydraulic system to support a 1000 pound load if the area of the piston supporting the load is 5 square inches?
    a. 0.05 pounds per square inch
    b. 20 pounds per square inch
    c. 200 pounds per square inch
    d. 2000 pounds per square inch
    e. None of the above

15. The upstream pressure of a main system relief valve is regulated by:

    a. The upstream pressure only
    b. The downstream pressure only
    c. The spring force only
    d. Both a and c

16. The path of oil flow in a gear type pump is:

    a. Through the center between the gears
    b. Around the outside between the gears and the housing
    c. Around the ends of the gears by the shafts
    d. Both a and c

17. The outlet pressure of a pressure reducing valve is regulated by:

    a. The spring force only
    b. The inlet pressure only
    c. The outlet pressure only
    d. Both a and c

18. The difference in pressure in a differential pressure valve is determined by:

a. The upstream pressure only
b. The downstream pressure only
c. Both the upstream and the downstream pressure
d. The spring force and the valve spool size

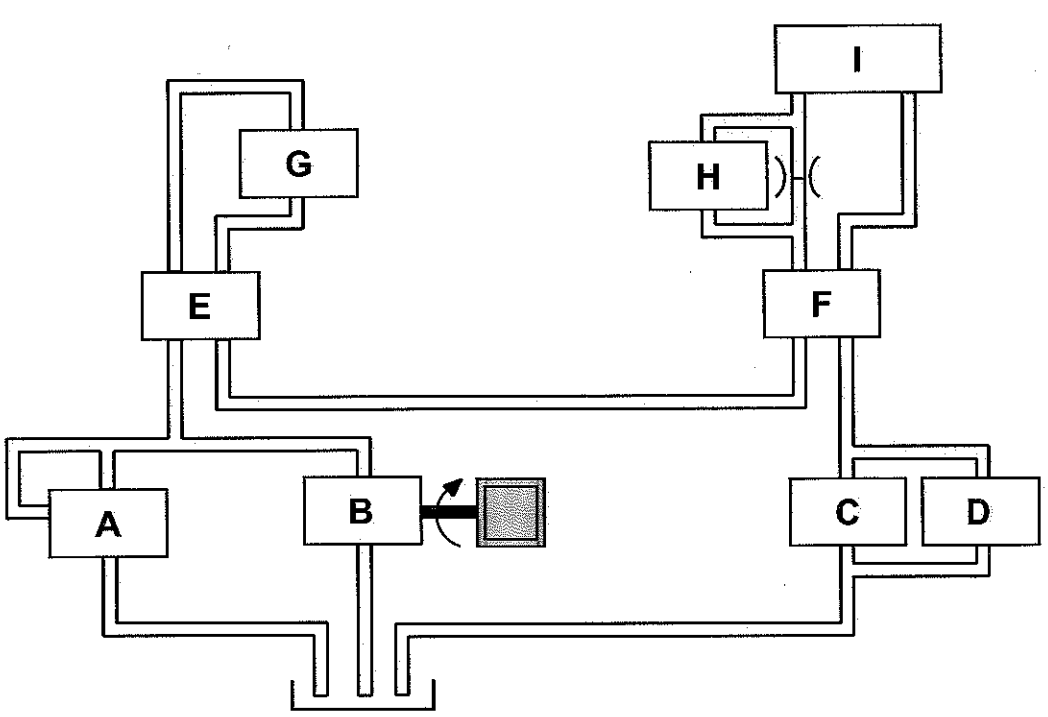
19. Accumulators are used in hydraulic systems to:

a. Permit the use of smaller pumps
b. Provide emergency steering and brakes
c. Maintain constant pressure
d. All of the above

20. What two factors affect the amount of fluid pressure required to lift a load?

a. Input force and the area on which the input force is applied
b. Input force and the resulting fluid pressure
c. Resisting force of the load and the area on which fluid exerts pressure to support the load
d. Maximum fluid pressure and the area on which that pressure is exerted

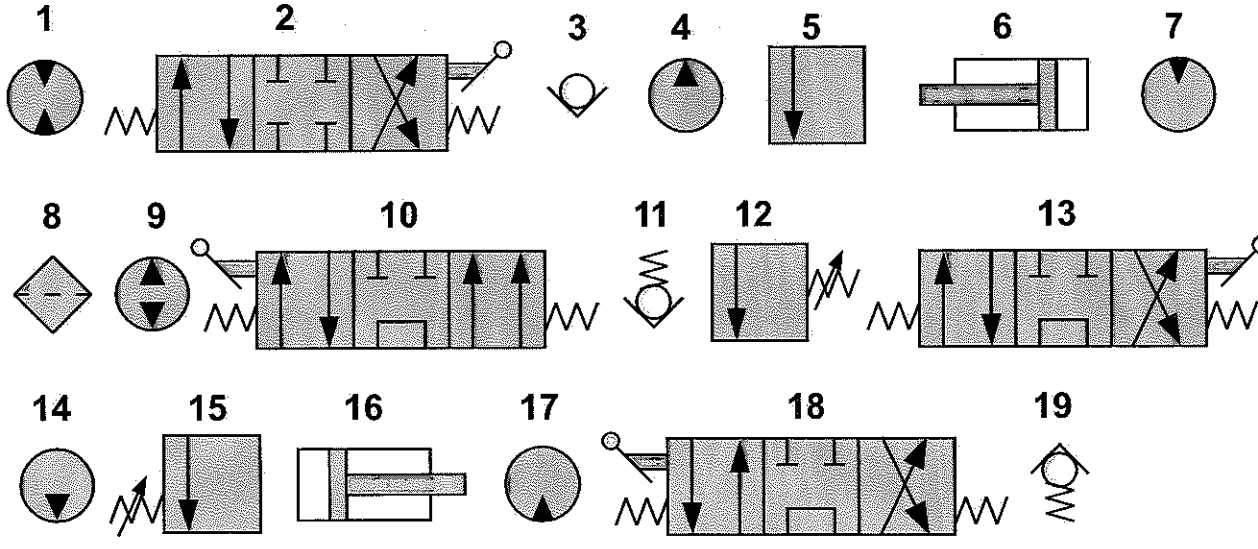
HYDRAULIC TEST



A ____
B ____
C ____
D ____
E ____
F ____
G ____
H ____
I ____

This is an open center, series circuit. The system is protected with an adjustable main relief valve. The mono-directional pump supplies the bi-directional track motor valve first and the cylinder valve second before returning to the tank through the filter with a bypass valve. The two-way cylinder is to retract rapidly with unrestricted inlet flow and extend slowly. Place the number for the proper ISO symbol beside the appropriate letter for the location in the column on the right. Symbols may be used more than once.

ISO SYMBOLS



Skills USA
2010 National Competition

Number _____

Component Identification: On the machine, match the tag number attached to the component using the list below. Write the tag number next to the component name. There are more tags on the machine than components listed below.

Using the schematic, write the part number for each of the hydraulic components listed. For this exercise, your machine is a 289C with XPS High Flow.

Tag Number	Schematic Part Number	Component
_____	_____	Lift Cylinder
_____	_____	Travel Motor
_____	_____	Implement Control Valve
_____	_____	Pilot Accumulator
_____	_____	Tilt Cylinder (two (2) possible correct answers)
_____	_____	Implement Pump
_____	_____	Hydraulic Oil Reservoir
_____	_____	Hydraulic Oil Filter
_____	XXX	Lift Arm Brace
_____	_____	Hydraulic Oil Cooler
_____	_____	Auxiliary Hydraulic Quick Couplers (two (2) possible correct answers)
_____	_____	Travel Propel Pump
_____	_____	Hydraulic Cooling Fan

DET #10

Instructions to Contestants

"Please put your number atop the sheet. This PM Inspection Station has 2 parts. You will be starting on Part (1 or 2).

"Make each check; if OK put a checkmark in the OK box. If not OK, briefly describe what is wrong in the Not OK box including position, if applicable. Some checks require you to record a number."

"Do not go inside the cab; there is no need to start the engine. ."

"Keep in mind, there may or may not being anything wrong with the vehicle you are inspecting."

"All the tools and equipment needed are here. Return them to this spot when you are finished using them. Gloves are provided to avoid getting dirty. All items can be inspected without going under the vehicle."

"You will have 15 minutes to complete each part of this station. I will give you a 2-minute warning for each part. When time is called, immediately move to the next part. If you complete before the allotted time, please have a seat and remain quiet until time is called. If you finish both parts before time is called, please have a seat over there and fill out the survey."

"Do you have any questions?" Remember to be safe.

"When they say Start, you may begin. "

PM INPECTION STATION Number _____

2010 Contestant Worksheet

Part 1

Front Axle Brakes		Answers
Record size and type of brake chamber on the steering axle.		Size: Type:
Engine Compartment Inspection	**OK**	**Not OK**
Check all starter cable connections in engine compartment		
Inspect radiator and mounting		
Inspect fan assembly and shroud		
Check for loose wiring		
Inspect coolant hoses and clamps		
Check entire intake system		
Check exhaust and turbo		
Check all belts for condition and alignment		
Check all belt driven components		
Identify EGR valve to judge; inspect EGR components		

Part 2

Behind the cab	OK	Not OK
Visually inspect the trailer air hoses and light cord for condition and mounting		
Check the battery box mounting, and battery hold-downs		
Check battery box cable condition and mounting		
Check quarter fender mounting		
Visually inspect 5th wheel and mounting		
Visually inspect rear springs, shocks, and air bags		
Check mud flaps and mounting		
Inspect axle breathers		
Inspect brake hoses and mounting		

PM INSPECTION STATION 2010 JUDGES SCORING SHEET

Contestant Number _____ Judge Name _____

Total Score _____

(1) Record Contestant Number, (2) Double check your math, (3) Put total score in space ABOVE, and (4) Sign your name in space provided.

Scoring (Part 1)	Each item below is worth 10 points	Score
Front chambers are Type 20 Long Stroke	5 points each	
Turbo inlet clamp missing		
Alternator ground wire loose		
Belt alignment bad		
EGR location and mounting bolt missing	5 points each	
	Subtotal	
xxxxxxxxxxxxxxxxxxxxxxxxx	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	xxxxxxxx
Scoring (Part 2)	**Each item below is worth 10 points**	**Score**
Battery hold down missing		
Missing nut from top of air bag		
5th Wheel slide hose loose		
5th Wheel safety bolt missing		
Axle breather missing A3		
	Subtotal	

SkillsUSA 2010 – Failure Analysis Station #11

You are at the Failure Analysis Station. You will find a total of **three groups** of questions. One of the three groups is **"Parts"** and you are required to identify the cause of the failure on each part. The second group is **"Oil Analysis"** questions that are related to various failure modes. The third group is **"General Knowledge"** questions.

Parts - Group One

- Use supplied parts to answer the following multiple choice questions.
- Inspect each part and determine the type or cause of the failure.
- Circle the answer that best describes the type or cause or the failure.

1. Item "1" is Coolant Test Equipment.-
Which of the tools displayed is the best tool for on sight testing of coolant.

A. Four floating ball tester.
B. Coolant test strips.
C. Refractometer.
D. Float type bulb tester.
E. None of the above

---

2. Item "2" is Tooth Fracture of Idler Gear.

A. Serviceable part. No defect. Return to service.
B. Foreign material damage.
C. Overloading of gear teeth.
D. Oil starvation due to lack of lubricating oil.

---

3. Item "3" is Cam Gear and Mounting Plate.

A. Serviceable part. No defect. Return to service.
B. Damaged thrust surface on gear, requiring replacement.
C. Damaged thrust surface on mounting plate, requiring replacement.
D. Both B & C.

---

4. Item "4" is Ripper Spool Valves.

A. Serviceable part. No defect. Return to service.
B. Contaminated hydraulic system
C. Material defect
D. Lack of lube oil

SkillsUSA 2010 – Failure Analysis Station #11

Parts - Group One - Continued

- Use supplied parts to answer the following multiple choice questions.
- Inspect each part and determine the type or cause of the failure.
- Circle the answer that best describes the type or cause or the failure.

5. Item "5" is a Connecting Rod and Piston Assembly

A. Serviceable part. No defect. Return to service.
B. Defective Connecting Rod.
C. Defective Piston.
D. Both B & C.

---

6. Item "6" is a Turbo Charger Oil Feed Line

A. Serviceable part. No defect. Return to service.
B. Defective fitting.
C. Cracked flare / seat.
D. Crushed braided line.

---

7. Item "7" Coolant Concentration Test
Record ethylene glycol freeze protection level of samples A & B

A. _____

B. _____

---

8. Item "8" is a Piston

A. Serviceable part. No defect. Return to service.
B. Impact damage to piston skirt
C. Piston pin bushing damage.
D. Dropped valve damage on piston dome.

Parts - Group One - Continued

- Use supplied parts to answer the following multiple choice questions.
- Inspect each part and determine the type or cause of the failure.
- Circle the answer that best describes the type or cause or the failure.

9. Item "3" is a Thermostat & Seal.

A. Serviceable part. No defect. Return to service.
B. Damaged thermostat seal. Do not reuse.
C. Worn thermostat housing. OK to reuse.
D. Both "B" and "C"

10.Item "10" is Push Tubes (Push Rods)

A. Serviceable part. No defect. Return to service.
B. Bent push tube. Do not reuse.
C. Damaged ball end. Do not reuse.
D. Damaged cup end. Do not reuse.

11.Item "11" is a Water Pump

A. Serviceable part. No defect. Return to service.
B. Excessive wear to bearing. Do not reuse.
C. Cracked housing. Do not reuse.
D. Defective seal / impeller. Do not reuse.

12.Item "12" is Bent Connecting Rod

A. Engine overspeed
B. Piston pin seizure.
C. Hydrostatic lock.
D. Manufacturing defect

OIL ANALYSIS QUESTIONS

- Circle the answer that best describes the type or cause or the failure.

13. Technician A says that in oil analysis excessive cylinder/valve train wear will show up as high iron levels. Technician B says that excessive piston/ring wear on older engines can show up as high aluminum/chromium levels. Who is correct?

A. Technician A only
B Technician B only
C. Both are correct
D. Neither is correct

---

14. The best method for obtaining an oil sample is?

A. Drain plug method
B. Oil gallery (pressure valve) method
C. Siphon (vacuum) method
D. None of the above

---

15. The four major solid contaminants found in used engine oil is soot, silicon (dirt), fuel, and coolant?

A. True
B. False

---

16. Technician "A" says that a high silicon reading can be caused by dirt entering the engine and contaminating the oil due to a faulty air intake system. Technician "B" says that a high silicon reading can be caused by using too much sealant during engine assembling. Who is correct?

A. Technician A only
B. Technician B only
C. Both are correct
D. Neither is correct

SkillsUSA 2010 – Failure Analysis Station #11

GENERAL KNOWLEDGE QUESTIONS

- Circle the answer that best answers the general knowledge questions.

17. If an engine has a sudden loss of oil and the operator does not shut off the engine and continues to operate it what will be the first major component to fail?

A. Piston / Liner
B. Flywheel
C. Crankshaft / bearings
D. Oil pump

18. If an engine has a sudden loss of coolant and the operator does not shut off the engine and continues to operate it what will be the first major component to fail?

A. Piston / Liner
B. Camshaft / Rollers
C. Water Pump
D. Unit Injector

19. A quart can of engine oil has a marking on the lid of SAE 10w30. Technician "A" says the SAE stands for *"Society Automotive Engineers"* and this oil is a 10 weight viscosity cold and 30 weight viscosity hot. Technician "B" says the SAE stands for *"Special Additive Enabled"* and the 10w30 stands for the types of additives used. Who is right?

A. Technician A only
B. Technician B only
C. Both Technicians A & B
D. Neither Technician A or B

20. Technician "A" says that orange colored diesel fuel should be used in US07 emission and newer on-highway engines. Technician "B" says that blue/green colored diesel fuel should be used in US07 emission and newer on-highway engines. Who is correct?

A. Technician A only
B. Technician B only
C. Both Technicians A & B
D. Neither Technician A or B

JOHN DEERE SkillsUSA

Written Total Score:

SkillsUSA Diesel Equipment Technology Competition 2010

Braking Systems
Station 12

Written Test **Contestant #_____**

Part 1: Identify the following brake related components on the hydraulic schematic. Mark the corresponding component number next to the name of the component. Each question is worth 2.5 points.

Component	Schematic Number
1. Brake Valve	
2. Brake Accumulator	
3. Brake Pressure Transducer	
4. Axle Circulation Pump	
5. Hydraulic Reservoir	
6. Main Hydraulic Pump	
7. Axle Oil Cooler	
8. Park Brake Solenoid	
9. Park Brake Pressure Switch	
10. Hydraulic Breather Filter	

Written Test

Part 2: Identify the best answer(s) to the questions below.

1. What types of brakes are used in heavy equipment:
    a. Drum
    b. Caliper Dry Disk
    c. Wet Disk
    d. All of the above

2. Select the appropriate definition for Drum Brakes:
    a. Friction resulting from the brake pad clamping down on the disk
    b. Friction resulting from the brake pad pressing out on the outer drum
    c. Friction resulting from the brake pad clamping down on the disk and parts are splashed with oil to dissipate heat

3. Select the appropriate definition for Caliper Dry Disk Brakes:
    a. Friction resulting from the brake pad clamping down on the disk
    b. Friction resulting from the brake pad pressing out on the outer drum
    c. Friction resulting from the brake pad clamping down on the disk and parts are splashed with oil to dissipate heat

4. Select the appropriate definition for Wet Disk Brakes:
    a. Friction resulting from the brake pad clamping down on the disk
    b. Friction resulting from the brake pad pressing out on the outer drum
    c. Friction resulting from the brake pad clamping down on the disk and parts are splashed with oil to dissipate heat

5. The Main Hydraulic Pump shown in the schematic is best described as:
    a. Fixed Displacement
    b. Variable Displacement
    c. Radial Piston
    d. Broken

6. The Axle Circulation Pump shown in the schematic is best described as:
    a. Variable Displacement
    b. Radial Piston
    c. Fixed Displacement
    d. Electric over hydraulic

7. The valve shown in the schematic that routes oil to the Park Brake is best described as:
    a. Pilot operated-spool type
    b. Electric operated solenoid valve
    c. Open centered
    d. Closed centered

8. The Brake Valve in the schematic is best described as a:
    a. Three position spool
    b. Five position spool
    c. Two position spool
    d. One way check valve

9. Item number 3 in the schematic is best described as a:

   a. Filter
   b. Cooler
   c. Pump
   d. None of the above

10. The Park Brake is best described as:

   a. Spring released-hydraulically applied
   b. Spring applied-hydraulically released
   c. Spring applied-air released
   d. Cable applied and released

2010 Brake Station - Orientation

Brake Station Orientation – Say this before each round begins.

"The braking station competition focuses on testing your knowledge of hydraulic braking systems used in off-road equipment. There will be two tasks in this station.

The first task is a written test consisting of a component identification task on a schematic along with ten multiple choice questions.

The second task is a hands-on skills verification where you will be asked to identify components of the braking system on the 4 wheel-drive-loader as well as perform an external brake disk inspection and wear measurement.

You will have access to the John Deere Service Advisor program to assist with component locations. You are welcome to use it if you would like, but you do not need it to effectively complete this activity.

Two hands-on tests will be conducted at a time, the remaining contestants will work on their written tests.

You will have 20 minutes total in this rotation to complete the written test.
You will have 10 minutes to complete the hands-on test.

Are there any questions?"

Send four contestants to written test tables.

Send two contestants to the hands-on area by the 4WD Loader.

JOHN DEERE

SkillsUSA®

SkillsUSA Diesel Equipment Technology Competition--2009

Braking Systems

Station 12

Hands-On Test—10 Minutes **Contestant #_____**

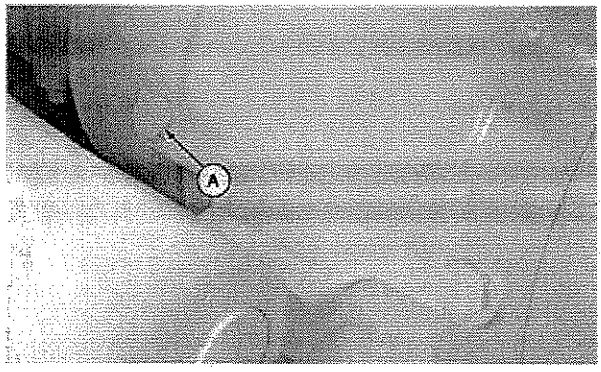
Part 1: Identify the following brake-related components on the machine using the tags provided.—30 points possible—3 points per item.

Component	Tag ID
1. Brake Valve	
2. Brake Accumulators	
3. Main Hydraulic Pump	
4. Brake Pressure Transducer	
5. Hydraulic Reservoir	
6. Park Brake	
7. Axle Oil Dipstick	
8. Park Brake Solenoid	
9. Park Brake Pressure Switch	
10. Brake Pedal	

Hands-On Test

Part 2: Using the tools and measurement equipment provided, perform a Brake Disk Inspection and Measurement.—20 points possible

Brake Disk Inspection (External)

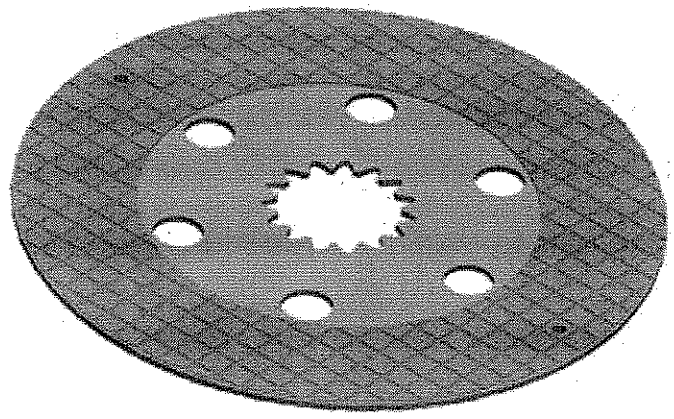


T6523BZ-UN: Brake Inspection Port Plug

LEGEND:

A - Brake Inspection Port Plug
Brake disks can be inspected for wear through the external inspection ports (A).

1. Remove brake inspection port plug (A).

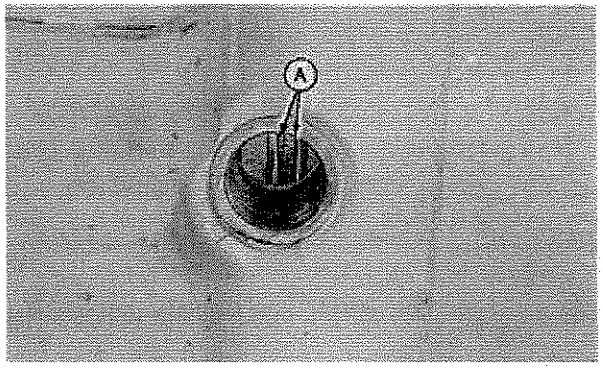


2.

YZ7359-UN: Brake Friction Plate

Replace the disk if oil grooves are no longer visible.

Item	Measurement	Specification
Brake Disk	Thickness (New)	7.57 mm (0.298 in.)
	Groove Depth (Minimum)	0.99 mm (0.039 in.)

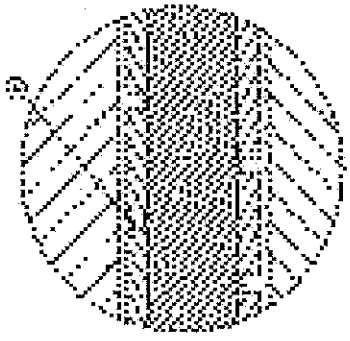
3. 

T6138AZ-UN: Brake Linings

LEGEND:

A - Brake Linings

Inspect the brake linings (A) on brake disk.

4. 

T8137AC-UN: Oil Grooves

LEGEND:

A - Brake Disk Oil Grooves

Remove axle housing and replace brake disc if oil grooves (A) on facing material are no longer visible.