



BI002302
A6474X413
November 2012

Operation Manual

SH650D Shield Hauler

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Machine Mounted Controls

Table 1: Gauges

Gauge	Function	Operating Value
1. EXH TEMP	Monitors the temperature of the exhaust gas.	
2. BRAKE PSI	Monitors the pressure in the brake circuit.	0 psi when brakes are not engaged. 1,800 psi when brakes are engaged.
3. EXHAUST H2O	Monitors the back pressure across the dry filter.	Maximum back pressure = 60 inches of water (read with engine in neutral at high idle).
4. DIF-LOCK PSI	Monitors the pressure in the differential lock circuit.	0 psi when dif-locks are not engaged. 800 psi when dif-locks are engaged.
5. INTAKE H2O	Monitors inlet vacuum pressure and provides a visual indication of when the air inlet filter needs servicing.	Maximum restriction = 26 inches of water.
6. PILOT PSI	Monitors the hydraulic pilot circuit pressure.	500 psi
7. AIR PSI	Monitors the pressure in the pneumatic system.	120 - 150 psi
8. TRANSMISSION TEMP	Monitors the temperature of the transmission oil.	Maximum temperature = 250 F.
9. SYSTEM PSI	Monitors the hydraulic system pressure.	2,800 psi If 3,000 psi or greater, shut down and call for service.
10. ACCUM PSI	Monitors the pressure in the accumulator circuit (should be the same as the system pressure). The accumulator circuit provides the pressure necessary to release the brakes.	1,800 psi
11. TRANSMISSION PSI	Monitors the oil pressure in the transmission.	Greater than 160 psi.
12. ENGINE OIL PSI	Monitors the pressure of the engine oil.	If the pressure drops below 15 psi, machine will shut down.
13. ENGINE COOLANT TEMP	Monitors the temperature of the coolant in the engine.	If the temperature exceeds 200° F, the machine will shut down.
14. TACHOMETER	Displays the engine rpms.	

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Table 1, continued: Engine troubleshooting

Symptom	Probable Cause	Test, Check, or Remedy
Oil in cooling system	Leaking head gasket	Install new head gasket
Mechanical noise (knock) in engine	Connecting rod bearing failure	Call Caterpillar Service Representative
	Timing gear damaged	Call Caterpillar Service Representative
	Crankshaft damaged	Call Caterpillar Service Representative
Excessive fuel consumption	Fuel system leaks	Inspect fuel system and make repairs as necessary
	Fuel and combustion noise	Small increases in fuel consumption may be the result of defective fuel nozzles, rough running, or factors causing loss of power (see previous sections)
	Incorrect fuel injection timing	Call Caterpillar Service Representative
Loud valve noise or valve drive component noise	Valve spring damage	Call Caterpillar Service Representative
	Camshaft damage	Call Caterpillar Service Representative
	Valve lifter damage	Call Caterpillar Service Representative
	Valve damage	Call Caterpillar Service Representative
Little movement of rocker arm and excessive valve clearance	Excessive valve clearance	Call Caterpillar Service Representative
	Insufficient lubrication	Check lubrication in valve compartment. There must be a strong flow of oil at high engine rpm but only a small flow at low engine rpm. Oil passages must be clean, especially those sending oil to the cylinder head.
	Rocker arm worn at face that contacts valve	Call Caterpillar Service Representative
	End of valve stem worn	Call Caterpillar Service Representative
	Worn push rods	Call Caterpillar Service Representative
	Worn valve lifters	Call Caterpillar Service Representative
	Damaged valve lifters	Call Caterpillar Service Representative
	Worn cams on camshaft	Call Caterpillar Service Representative
Oil at the exhaust	Excessive oil in the valve compartment	Call Caterpillar Service Representative
	Worn valve guides	Call Caterpillar Service Representative
	Worn piston rings	Call Caterpillar Service Representative



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Operation Manual

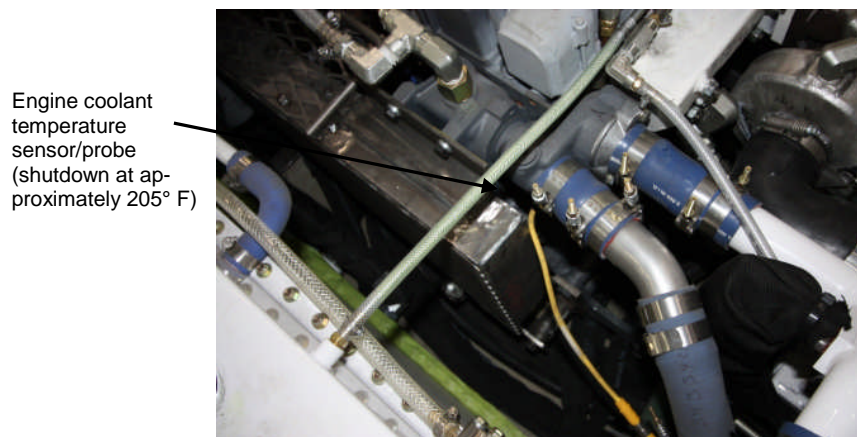
SEMS 2 Electronic Monitoring System

Run solenoid sensor

The run solenoid sensor is located in the center bay of the machine with the engine monitoring system (Fig. 5). This sensor monitors the run solenoid. If the solenoid is not working, the solenoid valve will open, exhausting air pressure from the system causing the fuel shutdown cylinder to close the fuel rack. When the fuel rack closes, no fuel is sent to the engine and the engine shuts down.

Fig. 5: Run solenoid sensor**Engine coolant temperature sensor**

The engine coolant temperature sensor is located in the engine compartment (Fig. 6). This sensor monitors the engine coolant temperature and is set at 205° F (96° C). When the engine coolant temperature exceeds this value, the sensor will stop power to the solenoid valve. This valve will open exhausting air pressure from the system causing the fuel shutdown cylinder to close the fuel rack. When the fuel rack closes, no fuel is sent to the engine and the engine shuts down.

Fig. 6: Engine coolant temperature sensor

This manual is intended to provide GENERAL product information. The illustrations, descriptions and procedures contained in this publication apply only to THIS machine. Caterpillar reserves the right to revise models and designs without prior notice.

This machine was manufactured under the guidelines, procedures and requirements of the appropriate government regulatory agencies.

At the completion of the manufacturing process, this unit was issued the appropriate approval numbers and nameplates indicating it met the technical requirements of these regulatory agencies. Any change to the design or structure of this unit, without the consent of Caterpillar and these regulatory agencies, or any repair or replacement of parts contrary to Caterpillar's instructions, may invalidate these approvals and render this unit unsafe to operate.

Strict compliance with all laws, regulations and practices regarding the safe operation and maintenance of underground mining equipment and strict adherence to the instructions in this manual is necessary for the personal safety of those working on or around this unit.

While this manual attempts to anticipate the most important operations and maintenance needs for this unit, unforeseen circumstances may arise that have not been addressed in this manual. If any concerns or questions arise, please contact your Service Representative immediately.

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Maintenance Schedule

Table 5, continued: Lubrication and maintenance schedule

Item	Description	Places	Lubricant	Specification
39	Axle oil level (Check)	2	Hypoid gear oil SAE 90W	
40	Planetary wheel end oil level (Check)	4	Hypoid gear oil SAE 90W	
41	Carbon monoxide (CO) sampling			
	Every 100 hours			
42*	Engine oil and filter	Change	10W40 API CF/ 4	
43	Primary fuel filter (change)	1		
44	Secondary fuel filter (change)	2		
	Every three months			
45	Axle oil (Change)	2	Hypoid gear oil SAE 90W	
46	Planetary wheel end oil (Change)	4	Hypoid gear oil SAE 90W	
47	Wet disc brake wear (Check)	4		
48	Hydraulic oil (Change)	1		Spec. 100-12
49	Tank suction strainer (Clean/change)	1		
50	Winch oil (Change) (if equipped)	1	API GL4 (140) Gear oil Peragma Grade 8	
	Every 500 hours			
51	Transmission fluid and filter	Clean		
52	Radiator coolant	Change	Avia Antifreeze Extra Glysantin G 48 DEA radiator anti- freeze Shell GlycoShell	
53	Exhaust heat exchanger	Inspect		
	Every 1000 hours			
54	Scrubber heat exchanger	Clean		
	Every 6 months			
55	Power system permissibility: intake system			
56	Power system permissibility: shutdown circuit testing			

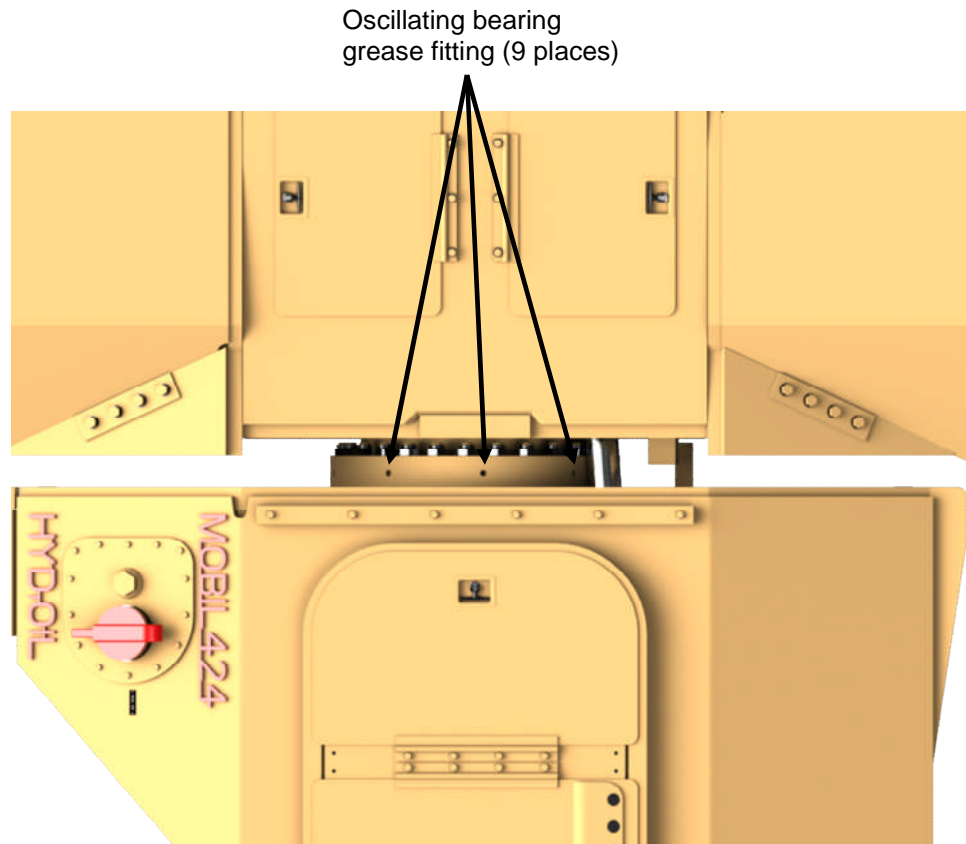
* Change engine oil and filter after the first 50 hours of operation and then every 100 hours of operation.

Maintenance Instructions

Oscillating Bearing

Lubricate the oscillating bearing (9 places) with Spec. 100-3 through the grease fittings located around the bearing (Fig. 9). Pump grease into the fittings until new grease can be observed coming out of the bearing.

Fig. 9: Oscillating bearing lubrication



Maintenance Instructions

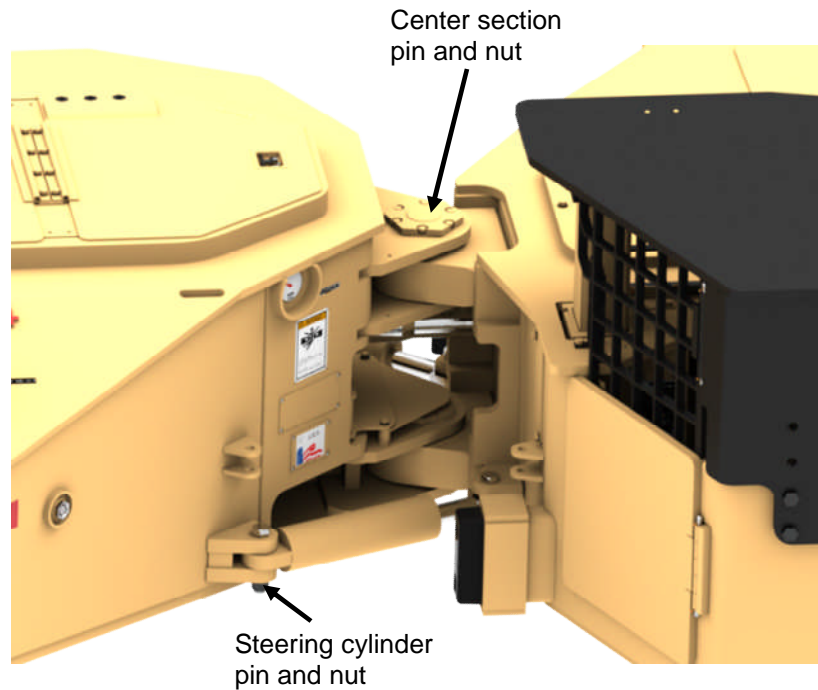
Steering Cylinder Pins and Nuts

Inspect the steering cylinder pins and nuts for looseness or wear (Fig. 19). Tighten (1480 - 1500 ft. lbs.) where necessary and replace any worn parts.

Center Section Pins and Nuts

Inspect the center section pins and nuts for looseness or wear (Fig. 19). Tighten (680 - 720 ft. lbs.) where necessary and replace any worn parts.

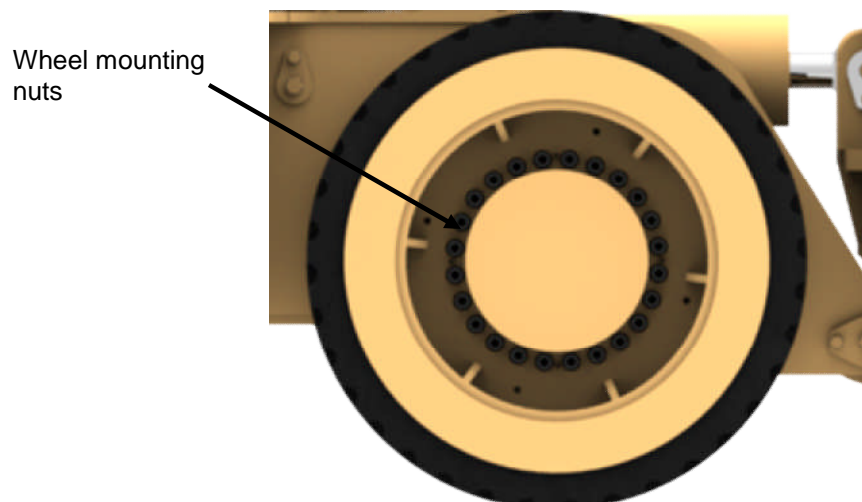
Fig. 19: Steering cylinder and center section pins and nuts



Wheel Mounting Nuts

Check the wheel mounting nuts (Fig. 20) on all four wheels and torque (217 ft-lbs) as required.

Fig. 20: Wheel mounting nuts



Maintenance Instructions

Every 3 months

The purpose of this section is to describe the maintenance procedures that are required every 3 months:

1. Change the axle oil
2. Change the planetary wheel end oil
3. Check the wet disc brakes for wear
4. Change the hydraulic oil and tank suction strainer
5. Change the winch oil (if equipped with winch)

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Maintenance Instructions

Exhaust Heat Exchanger

The exhaust inlet and outlet ports should be visually examined to insure:

- There is no green fluid in the exhaust outlet indicating a leaking tube bundle or cracked housing
- The cooling fins do not contain any appreciable accumulation of soot. The definition of appreciable would be indicated by a pressure drop of greater than 8 inches across the exchanger.

Servicing heavy duty air filter elements

When to Service?

The element in any air cleaner should be serviced when the maximum allowable restriction, established by the engine manufacturer, has been reached. The element should not be serviced on the basis of visual observation because this will generally lead to over-servicing. Over-servicing will cause increased service cost, both time and material, and may cause dust contamination of the engine due to element damage from excessive handling, increased chance of improper installation of element, and increased initial inefficiencies.

Achieving Maximum Air Filter Efficiency

The efficiency of an air filter increases as it is used. As soon as the air filter is put into operation, it begins to remove dust particles. As these particles accumulate throughout the filter, the microscopic openings in the filter medium become obstructed, causing the filter to trap increasingly finer dust particles, resulting in a more efficient medium. As the filter continues to plug with contamination, the restriction to air flow will increase. Most engine manufacturers establish a maximum degree of vacuum in the air induction system that the engine can tolerate and still operate efficiently.

What instruments are used to measure restriction?

Restriction is best recorded by a water manometer, an air cleaner service indicator, or a dial gauge calibrated in inches of water or Kpa (other units may also be used). Since some users will not have a water manometer or dial gauge available, the use of permanently mounted service indicators should be considered. The indicator should be mounted in an area where the operator can monitor the condition of the element constantly.

How is restriction measured?

Restriction is measured in the air cleaner outlet tap (if provided), at a tap in the air transfer tube, or within the engine intake manifold. Accurate restrictions can only be measured at maximum airflow. On naturally aspirated or supercharged (not turbocharged) diesels, the maximum airflow occurs at maximum RPM (high idle) without regard for engine power. On gasoline, LP, or turbocharged diesel engines, the maximum airflow occurs only at maximum engine horsepower at governed RPM. Most engine manufacturers suggest a maximum allowable restriction between 15 and 20 inches of water (3.75 - 5.00 Kpa) for gas and LP engines, and from 20 to 30 inches of water (5.00 - 7.50 Kpa) for diesel engines. Exceeding these maximums will affect engine performance.

The operator should not be alarmed when the signal on the restriction indicator begins to appear. The air filter manufacturer furnished designed the element to withstand several times these recommended maximums without collapsing or leaking dirt into the engine.

Operational Issues

Maintenance scheduling

- Utilize an oil analysis program to determine optimum intervals for engine service. An excellent program to use is the CAT SOS oil analysis program available from your local Caterpillar dealer.
- Examine the possibility of splitting the preventive maintenance intervals between engine systems and vehicle systems. For example, the engine could be serviced at 100 hour intervals while the remaining vehicle systems might only be serviced at 250 hours. This could be a method of achieving better attention to detail as well as optimized intervals.
- Examine the fleet profile and optimize the preventive maintenance schedule to ensure utility equipment doesn't become over-serviced at the expense of production equipment being under serviced.
- The service interval for the intake system is probably the most critical point, directly affecting engine performance and emissions. Specified intervals for intake systems only go part way to solving this. Vehicle operators must be made part of this process and educated as to it's importance. They must become stakeholders in the process and become responsible for engine operation and service. When an operator suspects the need for intake service, he should be able to take the necessary action himself. For a detailed explanation of how to properly service an air intake system, refer to Section II (six engine systems).

Engine tune-ups

- Intervals for engine tuneups should be determined by engine performance and exhaust emissions . The UGAS tool is an excellent method of achieving this. In many case, scheduling tuneup intervals on the basis of hours lapsed since the last tuneup leads to poorer engine performance. An engine that may be performing optimally may be scheduled for a tuneup by hours and end up performing more poorly afterwards.
- Have engine manufacturer service representatives train the mechanics hands on in proper tuneup techniques.
- Mechanics should be encouraged to use a diagnostic before starting tuneups. Before opening up the engine, the mechanic should be trained to look for clues using basic diagnostics such as turboboost pressure, air/fuel ratio, timing advance, etc.

System Specific Information

Low turbocharger boost pressure

Turbo boost pressures are similar for two- and four-stroke-cycle engines. Strategically placed small pipe plugs on the engine can be accessed to isolate the turbocharger boost pressure from the air box pressure on two-cycle engines such as the Detroit Diesel 2 stroke models.

There are many causes for low turbocharger boost pressure, which include:

- A high exhaust back pressure condition. (Check for plugged or restricted after treatment devices or exhaust deflectors.)
- Exhaust gas leaks feeding to the turbo from the engine. (Check for telltale signs of black soot around turbo exhaust connections.)
- Leaking fittings, connections, or intake manifold gasket from outlet side of turbo (usually accompanied by a high-pitched whistle under load due to pressurized air leaks).
- Plugged turbocharger safety screen if used on the inlet or outlet side. Plugged or damaged air system after cooler. (Check the temperature drop across the aftercooler. Refer to manufacturer's specifications for your particular application.)
- Possible turbocharger internal damage (check the condition of the turbine and compressor vanes for damage with the engine stopped)
- Leaking gasket between direct-mounted Turbocharger and the blower housing on a Detroit Diesel two-cycle engine
- Low air box pressure on a two-cycle Detroit Diesel engine caused by any of the following conditions: leaking inspection covers on the block, leaking cylinder block-to-end-plate gaskets, a plugged blower inlet screen, or a partially stuck closed emergency air system shutdown valve.

High exhaust back pressure

The exhaust system (Fig. 5) must be laid out in such a manner that the maximum permissible exhaust backpressure, as prescribed by the engine manufacturer, is not exceeded. A slight backpressure (refer to manufacturer's recommendations for maximums, generally no more than 25 inches of water) in the exhaust system is normal, but excessive exhaust backpressure will affect the operation of the diesel engine. The use of after treatment devices, such as catalytic converters, flame arrestors, water scrubbers, or particulate traps, will increase the engine exhaust backpressure. Excessive exhaust backpressure has a similar effect on engine performance and emissions as an intake restriction. Power output reduction and increased exhaust temperature will become a problem. Carbon monoxide, black smoke, and particulate emissions will also increase, counteracting the effect of the after treatment device. Improper maintenance could lead to plugging of the after treatment device and could create a flow restriction in excess of the manufacturer's recommended limits.

System Specific Information

Intake system recommendations

In a mining applications, the intake system becomes the most critical engine system affecting exhaust emissions. Problems associated with intake air are magnified in every other engine system's performance.

Some points worth considering in maintaining intake systems:

- The ducting and piping for the intake system should utilize two spring loaded band clamps at each rubber hose connection.
- The entire system (ducting, filter housing, gaskets, etc.) should be tested every 100 hours for integrity and leaks. The use of ether spray is not recommended under any circumstances due to danger of fire and explosion and possible engine damage. The best test method is a compressed air charge system described in the next section.
- The location and installation of intake filter housings should be evaluated. Ideally, they should be situated away from heat sources (exhaust) and dust sources (tires). They should also be installed to facilitate easy service.
- Every underground diesel engine should be equipped with a two-stage intake filter system with a radial type seal at the back of the filter for failsafe protection.
- Inspect intake filter system and verify that it is sized correctly to meet engine requirements. Refer to filter manufacturer's recommendations.
- Verify that ducting is of sufficient size without unnecessary restrictions.
- Ensure that intake filter housing is installed as close to the engine intake manifold as possible.
- On engines equipped with dual intake filters, ensure that there is a common connection to both housings to prevent balance problems, such as turbo overspeed.
- Do not rely solely on intake restriction indicators located at the filter housing. Proper gauges should be installed at the operator dash. It is imperative that operators be educated on the use and importance of these gauges.
- The mechanics should service intake systems at minimum intervals. This would be at least a weekly inspection and filter service, if required. Once again, it is imperative that operators be educated and empowered to monitor the intake system and perform necessary service immediately upon detection of a problem.

System Specific Information

Emissions testing protocol

- Start the analyzer and log on to UGAS software 3-minute calibration
- Perform a steady state engine stall against the converter and hydraulics system (brakes on, wheels chocked, unit in second gear, maximum throttle, along with hydraulic stall). Maximum stall time 60 seconds. Perform Baccarat Smoke Test 60 Seconds Read RPM.
- Enter Bacharach Smoke Value - RPM - Test ID Proceed to Gas Sampling.
- Perform a steady state engine stall against the converter and hydraulics system. Brakes on, wheels chocked, unit in second gear, maximum throttle, along with hydraulic stall. Maximum stall time 60 seconds. Start gas sampling within 60 seconds.
- Print and save the results and repeat the test on the opposite exhaust bank on "V" engines.

Exceeding a 60 second stall condition can potentially cause damage to transmission and hydraulic systems. Use of caution and careful monitoring of all temperatures is advised.

System Specific Information

Fuel system types

Although new diesel engines employ electronic fuel injection and governing systems to reduce exhaust emissions, there are still many diesel engines in operation equipped with mechanical fuel systems.

This section will introduce you to the main types of fuel systems, both mechanically and electronically controlled. Basic fuel injection system types can be categorized as follows:

- Individual unit jerk pumps (Fig. 33)
- Inline pump systems (Fig. 34)
- Distributor pump systems (Fig. 35)
- Cummins PT (pressure-time) fuel systems (Fig. 36)
- Unit injector fuel systems (Fig. 37)

Electronically controlled fuel systems can be applied to all of the mechanical systems listed above.

Fig. 33: Individual unit jerk Pump



Fig. 34: Inline pump system



Fig. 35: Distributor pump



Fig. 36: Cummings PT fuel system



Fig. 37: Unit injector fuel



System Specific Information

Cooling system maintenance

Daily maintenance performed by the operator

- Check the coolant level in the top tank or header tank.
- Check and clean radiator core as necessary.

Monthly maintenance performed by the mechanic

- Check the condition and tension of fan belts; adjust and replace as necessary.
- Check condition of inhibitors.
- Check coolant for proper freeze protection.
- Check the condition of gasket in radiator cap.

Yearly maintenance performed by the mechanic

- Clean the cooling system relief valve.
- Drain, flush and clean complete cooling system. Replace with new coolant mixture.
- Check the condition of all hoses and clamps; tighten and replace as necessary.

Coolant mixture

NEVER use pure water in a diesel cooling system: water is excessively corrosive and lacks the proper heat transfer properties or freeze protection. It is important to have a consistent and accurate method of mixing coolant for proper protection.

The use of ethylene glycol type antifreeze solutions is highly recommended for coolant mixtures. A procedure for premixing and storage of coolant should be used. The solution should be mixed at a level to provide protection that exceeds the system requirements.

Conditioners and inhibitors

Conditioners, such as Nalcool 3000, should be used on a scheduled basis. These products reduce the risk of rust and pitting to the cylinder liners, block and head. They also reduce the buildup of scale and deposits in the cooling system. Most conditioners will provide protection for seals, hoses, gaskets, and metal materials in the cooling system.

System Specific Information

Diesel Emissions - Job Aid Check List

Employee Name: _____

Date: _____


Equipment Type: _____

<i>All Tests To Be Done At Operating Temperature</i>		
Intake System Checks	Left Bank	Right Bank
Filter Indicator Operation		
Measure Restriction		
Pressure Test Intake System		
Exhaust System Checks	Left Bank	Right Bank
Check Backpressure Before Purifier		
Inspect for Leaks		
Check Jake Brake Operation		
Engine System Checks	Ok	Needs Adjusted
High RPM		
Low Idle		
Fuel Pressure, Low Idle		
Fuel Pressure, High Idle		
Intake and Exhaust Valve Adjustment		
Fuel Filters		
Drain Water Separator		
Fuel Temperature		
Cooling System	Ok	Needs Adjusted
Coolant Level		
Radiator Clean (external)		
Belt Tension		
Coolant Condition		
Radiator Cap Condition		

MSHA Documentation

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<p>VERIFICATIONS STATEMENTS:</p> <p>1) ALL FUEL LINES ARE INSTALLED TO PROTECT THEM AGAINST ORDINARY DAMAGE IN ORDINARY USE AND THEY ARE DESIGNED, FABRICATED, AND SECURED TO RESIST BREAKAGE FROM VIBRATION.</p> <p>2) THE MANUAL FUEL SHUT OFF IS READILY ACCESSIBLE TO MAINTENANCE PERSONNEL AND LOCATED AS NEAR AS PRACTICAL TO THE FUEL TANK.</p> <p>3) THE FUEL TANK CAPACITY IS SIZED TO PROVIDE NO MORE THAN 31 GALLONS OF FUEL, WHICH IS EQUAL TO FOUR HOURS OPERATION AT FULL LOAD. IT IS OF FIXED POSITION AND THERE ARE NO PROVISIONS FOR SEPARATE AUXILIARY FUEL TANKS.</p> <p>4) MINIMUM FUEL TANK THICKNESS IS .187.</p> <p>5) THE TANK IS FITTED WITH A SELF CLOSING, VENTED FUEL CAP.</p> <p>6) FUEL LINE PIPING IS EITHER STEEL-WIRE REINFORCED OR SYNTHETIC ELASTOMER COVERED HOSE SUITABLE FOR USE WITH DIESEL FUEL THAT HAS BEEN TESTED AND HAS BEEN DETERMINED TO BE FIRE-RESISTANT BY THE MANUFACTURER, OR METAL.</p> <p>7) ALL SEAMS OF THE FUEL TANK NORMALLY WETTED BY FUEL, ARE WELDED.</p>																																																																																																																																																																																																																																																																																																																																																																																																																									
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MSHA Documentation

DRAWING NO. 1655734		SHEET NO. 5			4041 WURNO ROAD PULASKI, VA 24301
DRAWN J. COE	DATE 7/11/11	DIRECTED J. COE	PART 36 MACHINE APPROVAL NUMBERS THAT USE THIS CHECKLIST		
CHECKED J. COE	DATE 7/11/11	APPROVED J. COE			
REVISIONS:	REV 00 39340	REV 01	REV 02	REV 03	MINE SAFETY & HEALTH ADMINISTRATION APPROVED PRINT. NO DEVIATION IS LEGAL UNTIL APPROVED BY MSHA

** REFERENCED ITEMS SHOWN ON MACHINE LAYOUT DIAGRAM.

*** (WEEKLY) DESIGNATES THOSE INSPECTION CHECKS THAT MUST BE PERFORMED DURING THE WEEKLY MAINTENANCE EXAMINATION IN ACCORDANCE WITH 30 CFR, SECTION 75.1914.**

- *2. () CHECK THE BRAKE PAD DRAGGING BY OBSERVING THE BRAKE SYSTEM GAUGE MENTIONED ABOVE WHILE THE CAR IS IN OPERATION AND THE BRAKE IS NOT APPLIED. IF THE PRESSURE IS LESS THAN 1450 PSI , THE BRAKE CIRCUIT SHOULD BE REVIEWED AND THE SOURCE OF INADEQUATE RELEASE PRESSURE DETERMINED.
- 3. () THE BRAKE STATUS IN REGARD TO WEAR, CAN BE DETERMINED BY A WEAR INDICATOR LOCATED ON THE INBOARD FACE OF EACH BRAKE. THE INDICATOR IS PROTECTED BY AN ACORN NUT. REMOVE THE NUT AND DEPRESS THE PLUNGER PROTRUDING FROM THE INDICATOR WEAR FACE. IF THE PLUGGER CAN BE DEPRESSED PAST THE INDICATOR FACE, THE BRAKES ARE WORN AND SHOULD BE SERVICED.
- *4. () PARKING BRAKE TEST
 - A. WITH THE ENGINE OPERATING AND THE MACHINE STATIONARY, APPLY THE PARKING BRAKE (6) **.
 - B. PLACE THE TRANSMISSION GEAR SELECTOR IN FIRST GEAR, HIGH RANGE, AND THE DIRECTIONAL CONTROL SELECTOR IN FORWARD OR REVERSE.
 - C. ACTUATE THE DECLUTCH BYPASS VALVE LOCATED ON THE LEFT SIDE WALL OF THE OPERATOR'S COMPARTMENT AND HOLD DURING THE TEST.

WARNING: RELEASING THE DECLUTCH BYPASS VALVE DURING THE TEST MAY CAUSE THE MACHINE TO LURCH IN FORWARD OR REVERSE DIRECTION AS SELECTED.

NOTE: IF THE DECLUTCH BYPASS VALVE IS RELEASED DURING THE TEST, THE TEST PROCEDURE MUST BE STARTED AGAIN BEGINNING WITH "A" ABOVE.


- D. DEPRESS THE ACCELERATOR TO FULL THROTTLE, ALLOWING THE ENGINE TO PUT THE TRANSMISSION TORQUE CONVERTOR INTO A STALL CONDITION.
- E. AFTER THE TEST, RETURN THE ENGINE TO LOW IDLE, RELEASE THE DECLUTCH BYPASS VALVE AND RETURN THE PARK BRAKE LEVER TO THE "ON" OR "SET" POSITION.

NOTE: IF THE PARKING BRAKE IS OPERATING SATISFACTORILY, THE UNIT WILL NOT MOVE WHEN THE ABOVE PROCEDURE IS FOLLOWED. IF MOVEMENT IS DETECTED, THE PARKING BRAKE MUST BE REPAIRED OR ADJUSTED.

** REFERENCED ITEMS SHOWN ON MACHINE LAYOUT DIAGRAM.

TITLE MACHINE CHECKLIST	DRAWING NUMBER 1655734	SHEET NO. 5	OF 8 SHEETS
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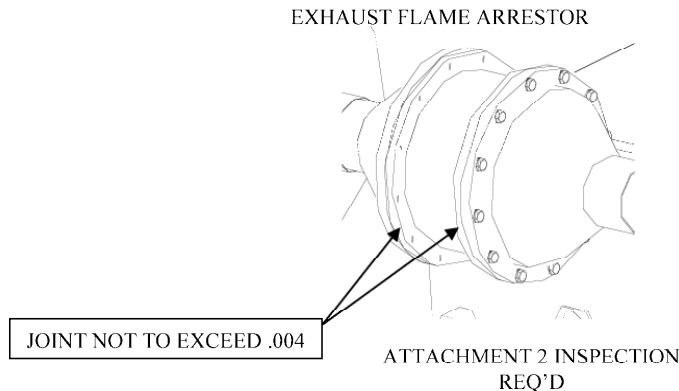
MSHA Documentation

DRAWING NO. 606348		SHEET NO. 7			4041 Wurno Road Pulaski, VA 24301
REDRAWN J. Coe	DATE 8/07/07	DIRECTED J. Coe			
CHECKED M. MEYERS	DATE 7/29/09	APPROVED J. Coe			
REVISIONS:	REV A 1015564 10/29/07	REV B 11994 7/29/09	REV C 25671 12/12/10	REV D	MINE SAFETY & HEALTH ADMINISTRATION APPROVED PRINT. NO DEVIATION IS LEGAL UNTIL APPROVED BY MSHA

*(WEEKLY) DESIGNATES THOSE INSPECTION CHECKS THAT MUST BE PERFORMED DURING THE WEEKLY MAINTENANCE EXAMINATION IN ACCORDANCE WITH 30 CFR, SECTION 75.1914.

*10 () VISUALLY INSPECT THE HARDWARE ON THE FLAME ARRESTOR VERIFYING THAT THE (8) BOLTS AND LOCK WASHERS ARE INSTALLED AS SHOWN IN SKETCH 7.

11. () AT INTERVALS NOT TO EXCEED EVERY 6 MONTHS, REMOVE AND INSPECT THE CORE OF THE EXHAUST FLAME ARRESTOR BY USING A PIN GAUGE. FOLLOW CHECK PROCEDURES LISTED ON ATTACHMENT 2.



SKETCH 7: LOCATIONS OF PERMISSIBLE OPENINGS

*12. () VERIFY THAT THE TEST PORT FLAME ARRESTOR(S) IS/ARE LOCATED AS SHOWN IN SKETCH: 8A. **(NOTE)** POSITION (A) INDICATES PLACEMENT FOR EXHAUST RESTRICTION GAGE, MEASURING TOTAL EXHAUST SYSTEM BACKPRESSURE. POSITION (B) IS FOR OPTIONAL GAGE OR SERVICE POINT FOR DETERMINING PRESSURE DROP ACROSS CO REACTOR. IF OPTIONAL PORT IS NOT USED, A PIPE PLUG MUST BE TIGHTLY INSTALLED.

TEST SHEET TITLE: POWER SYSTEM CHECKLIST					MINE SAFETY & HEALTH ADMINISTRATION APPROVED PRINT. NO DEVIATION OR REVISION IS LEGAL UNTIL APPROVED BY MSHA		
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