



SERVICE TRAINING

TECHNICAL PRESENTATION



785C (1HW), 785D (MSY), 789C (2BW) LARGE OFF-HIGHWAY TRUCKS

Service Training Meeting Guide (STMG)

785C (1HW), 785D (MSY), 789C (2BW) LARGE OFF-HIGHWAY TRUCKS

TEXT REFERENCE

AUDIENCE

Level II--Service personnel who understand the principles of machine systems operation, diagnostic equipment, and procedures for testing and adjusting.

CONTENT

This presentation provides basic maintenance information and describes the systems operation of the engine, power train, steering, hoist, and the air system and brakes for the 785C/789C Off-highway Trucks. The Automatic Retarder Control (ARC) and the Traction Control System (TCS) are also discussed.

OBJECTIVES

After learning the information in this meeting guide, the serviceman will be able to:

1. locate and identify the major components in the engine, power train, steering, hoist and the air system and brakes;
2. explain the operation of the major components in the systems; and
3. trace the flow of oil or air through the systems
4. identify what is new and different on the 785D 3512C HD engine along with RAXL filtration

REFERENCES

784C Tractor/785C Truck Service Manual	SENR1485
784C Tractor/785C Truck Operation and Maintenance Manual	SEBU7173
785C Truck with High Altitude Arrangement (HAA) Operation and Maintenance Manual	SEBU7176
789C Truck Service Manual	SENR1515
789C Truck Operation and Maintenance Manual	SEBU7174
Cold Weather Recommendations for Caterpillar Machines	SEBU5898
Caterpillar Machine Fluids Recommendations	SEBU6250

PREREQUISITES

Interactive Video Course "Fundamentals of Mobile Hydraulics"	TEMV9001
Interactive Video Course "Fundamentals of Electrical Systems"	TEMV9002
STMG 546 "Graphic Fluid Power Symbols"	SESV1546

Estimated Time: 24 Hours
Visuals: 268 Visuals
Serviceman Handouts: 16 Data Sheets
Form: SERV1857
Date: 06/08

SUPPLEMENTAL MATERIAL

Reference Manuals

Fluid Power Graphic Symbols User's Guide	SENR3981
Flexxaire™ Fan Installation and Maintenance Manual	SEBC1152
Automatic Lubrication System	SENR4724
Off-Highway Truck/Tractors Vital Information Management System (VIMS) --System Operation"	REN2630
Off-Highway Truck/Tractors Vital Information Management System (VIMS) --Testing and Adjusting Troubleshooting"	REN2631
Variable Speed Fan Clutch"	SENR8603
Oil Renewal System"	REN2223
Off-Highway Truck/Tractors Brake Electronic Control System"	SENR1503

Specification Sheets

785C Off-highway Truck	AEHQ5320
789C Off-highway Truck	AEHQ5321
793C Update Off-highway Truck	AEHQ5186

Salesgrams and Product Bulletins

Salesgram "Vital Information Management System (VIMS)"	TELQ4478
Training Bulletin "Caterpillar Transmission/Drive Train Oil"	TEJB1002
Product Bulletin "Reporting Particle Count By ISO Code"	PEJT5025
Salesgram "Caterpillar Extended Life Coolant"	TEKQ0072
Salesgram "785C/789C/793C Mining Truck Introduction"	TELQ4459
Salesgram "Cat 769, 771, 773, 775, 777, 785 and 789 Flexxaire™ Fan Custom Attachment"	TELQ4010
Product Bulletin "793C Off-highway Truck"	TEJB3060

Video Tapes

793C Off-highway Truck--Service Introduction	SEVN4016
793C Off-highway Truck--Marketing Introduction	AEVN3742
Suspension Cylinder Charging	TEVN2155
Introduction to the Automatic Electronic Traction Aid (AETA)	SEVN9187
3500 Engines--EUI Service Introduction	SEVN2241
Mining Trucks--Cleanliness and Component Life	SEVN4142

Booklets

Know Your Cooling System	SEBD0518
Diesel Fuels and Your Engine	SEBD0717
Oil and Your Engine	SEBD0640
C-Series Mining Trucks--3500B Diesel Engines	LEDH8400

Special Instructions

Repair of 4T8719 Bladder Accumulator Group"	SEHS8757
Using 1U5000 Auxiliary Power Unit (APU)"	SEHS8715
Using the 1U5525 Attachment Group"	SEHS8880
Suspension Cylinder Servicing	SEHS9411

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NOTES



1

INTRODUCTION

Shown is the 789C Off-highway Truck. The "C" Series trucks are the same as the "B" Series except for the following changes: 3500B engines, improved cab, two different Electronic Control Modules (Transmission/Chassis and Brake) and an electronically controlled hoist. The 789C also has a 40% larger cooling system with a shunt tank located above the radiator.

The second generation Electronic Programmable Transmission Control (EPTC II) has been replaced with the Transmission/Chassis Electronic Control System. The Transmission/Chassis Electronic Control Module (ECM) controls the same functions as the EPTC II plus the hoist and some other functions.

The Automatic Retarder Control (ARC) and the Traction Control System (TCS) control modules have been replaced with one Brake System ECM. The Brake System ECM controls both the ARC and the TCS functions. The TCS is now connected to the CAT Data Link and the Electronic Technician (ET) service tool can be used to diagnose the TCS.

The load carrying capacities and the Gross Machine Weights (GMW) of the "C" Series trucks are:

785C: 118 to 136 Metric tons (130 to 150 tons)
249480 kg (550000 lb.) GMW

789C: 154 to 177 Metric tons (170 to 195 tons)
317520 kg (700000 lb.) GMW



2

Shown is the right side of a 789C truck. The large air tank on the right platform supplies air for starting the truck and for the service and retarder brake system.

The hoist, brake, and torque converter hydraulic tank (rear) and the transmission hydraulic tank (front) are also visible. The transmission hydraulic system is separate from all the other hydraulic systems.



3

Shown is the front of a 789C truck. The 789C is similar in appearance to the 793C and may be difficult to identify from a distance. The 793C can be identified by the four air filters and the diagonal access ladder. The 789C has only two air filters and is equipped with two vertical ladders.

The "C" Series trucks use a folded core radiator. The folded core radiator provides the convenience of repairing or replacing smaller individual cores.



4

The truck bodies on "C" Series trucks are mandatory options. Two body styles are available for the "C" Series trucks:

- A 12 degree flat floor design that provides uniform load dumping, excellent load retention, and a low center of gravity.
- A dual-slope design with a "V" bottom main floor to reduce shock loading, center the load, and reduce spills.

All internal wear surfaces of the truck bodies are made with 400 Brinell hardness steel. All attachment body liners are also made with 400 Brinell hardness steel. The external components of the bodies are made of steel with a yield strength of 6205 bar (90000 psi).

The forward two-thirds of the body floor is made with 20 mm (.79 in.) thick 400 Brinell steel plate. The rear one-third of the body floor is made with a 10 mm (.39 in.) thick 400 Brinell sub plate and a 20 mm (.79 in.) thick 400 Brinell body grid liner plate. As an option, the grid liner plate can be made with 500 Brinell steel.

The rear suspension cylinders absorb bending and twisting stresses rather than transmitting them to the main frame.

785C/789C MAINTENANCE



WALK AROUND INSPECTION

5

WALK AROUND INSPECTION

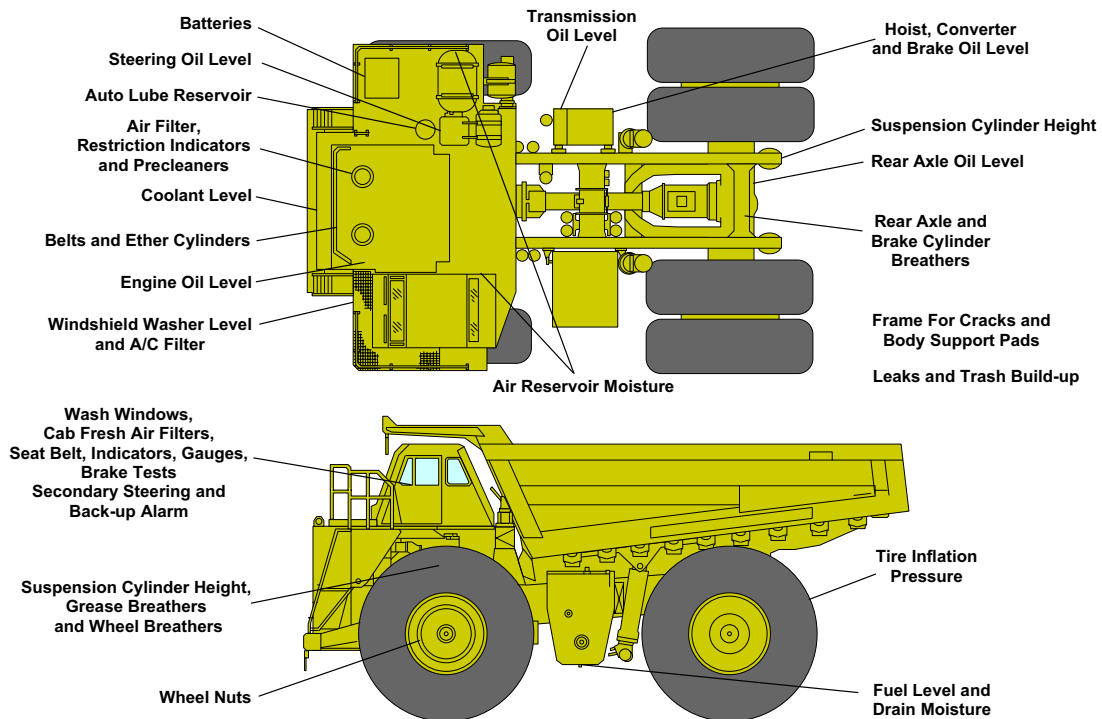
Before working on or operating the truck, read the Operation and Maintenance Manual thoroughly for information on safety, maintenance, and operating techniques.

Safety Precautions and Warnings are provided in the manual and on the truck. Be sure to identify and understand all symbols before starting the truck.

The first step to perform when approaching the truck is to make a thorough walk around inspection. Look around and under the truck for loose or missing bolts, trash build-up and for coolant, fuel, or oil leaks. Look for indications of cracks. Pay close attention to high stress areas as shown in the Operation and Maintenance Manual.

INSTRUCTOR NOTE: The form numbers for the Operation and Maintenance Manuals are provided under "References" on Page 2.

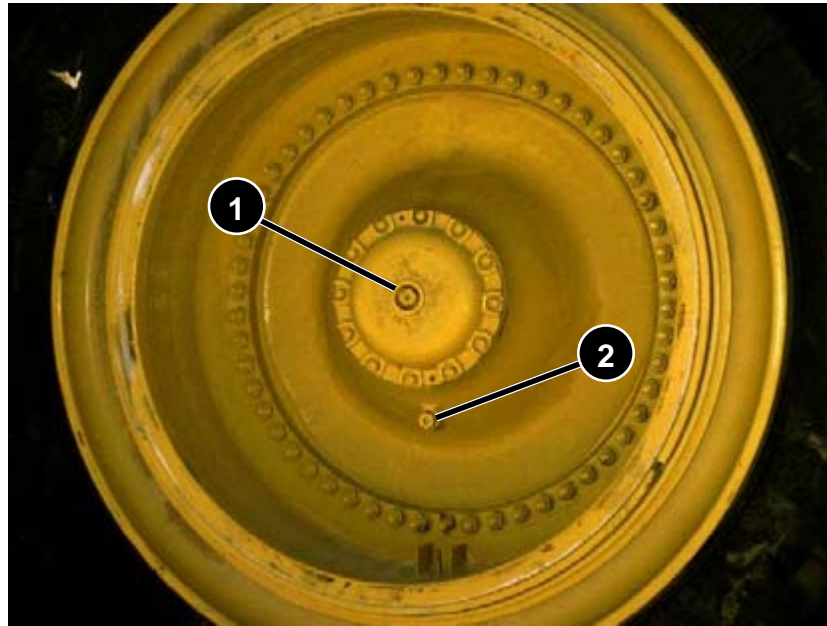
10 HOURS/DAILY MAINTENANCE CHECKS



6

The following list identifies the items that must be serviced every 10 Hours or Daily.

- Walk around inspection: Check for loose or missing bolts, leaks, and cracks in frame structures
- Suspension cylinders: Measure/recharge
- Transmission oil: Check level
- Hoist, converter and brake system oil: Check level
- Rear axle oil: Check level
- Fuel tank: Drain moisture
- Engine crankcase oil: Check level
- Radiator: Check level and radiator core plugging
- Air filters and precleaners: Check restriction indicators and precleaner dirt level
- Steering system oil: Check level
- Air tanks: Drain moisture
- Brakes: Check operation
- Indicators and gauges: Test operation
- Seat belt: Inspect
- Back-up alarm: Test operation
- Secondary steering: Test operation



7

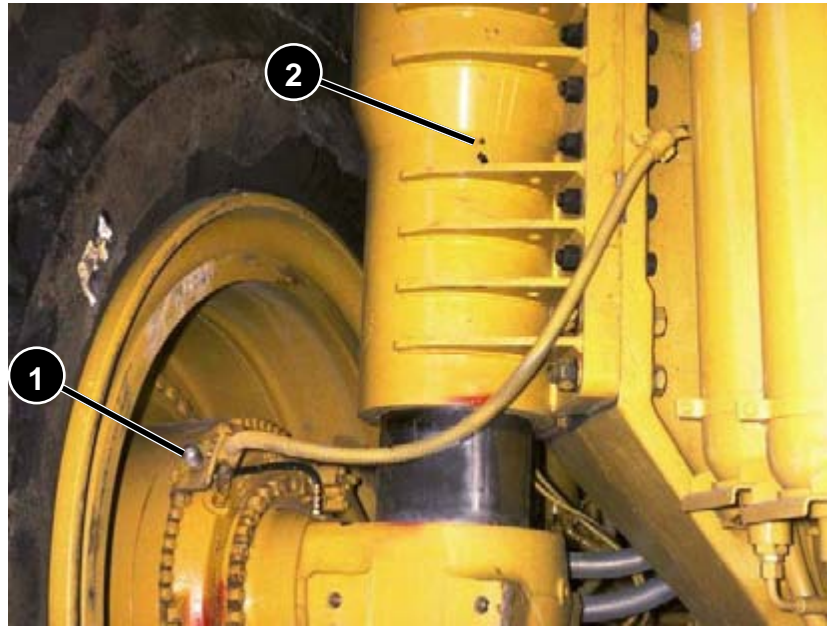
The front wheel bearing oil level is checked and filled by removing the plug (1) in the center of the wheel bearing cover. The oil should be level with the bottom of the plug hole. The fill plug is a magnetic plug. Inspect the fill plug weekly for metal particles. If any metal particles are found, remove the wheel cover and inspect the bearings for wear. The oil is drained by removing the drain plug (2).

The service interval for changing the front wheel bearing oil is 500 hours.

Use only Final Drive and Axle Oil (FDAO) or Transmission Drive Train Oil (TDTO) with a specification of (TO-4) or newer. FDAO and TDTO TO-4 provides increased lubrication capability for bearings.

Check the tire inflation pressure. Operating the truck with the wrong tire inflation pressure can cause heat build-up in the tire and accelerate tire wear.

NOTE: Care must be taken to ensure that fluids are contained while performing any inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid in suitable containers before opening any compartment or disassembling any component containing fluids. Refer to the "Tools and Shop Products Guide" (Form NENG2500) for tools and supplies suitable to collect and contain fluids in Caterpillar machines. Dispose of fluids according to local regulations and mandates.



8

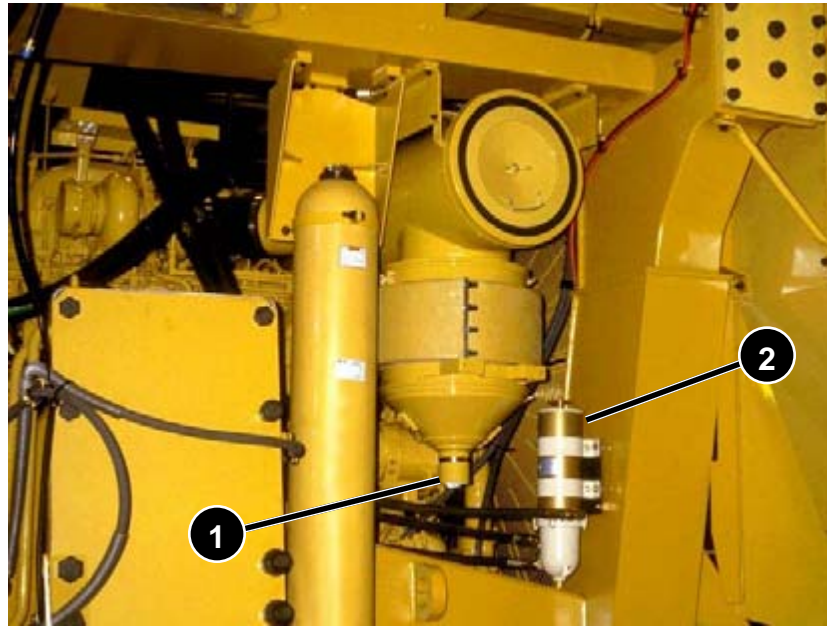
Check the front suspension cylinders for leaks or structural damage. Check the charge condition of the front suspension cylinders when the truck is empty and on level ground. Measure the charge height of the suspension cylinders and compare the dimension with the dimension that was recorded the last time the cylinders were charged. Recharge the cylinders with oil and nitrogen if necessary.

Inspect the condition of the front wheel bearing axle housing breather (1). The breather prevents pressure from building up in the axle housing. Pressure in the axle housing may cause brake cooling oil to leak through the Duo-Cone seals in the wheel brake assemblies.

Two grease outlet fittings (2) are located on the front of each suspension cylinder. The grease supply line for the Auto Lubrication System is located at the rear of the suspension cylinder. No grease outlet fittings should be located on the same side of the suspension cylinder as the grease fill location. An outlet fitting positioned on the same side of the suspension cylinder as the grease fill location will prevent proper lubrication of the cylinder.

Make sure that grease is flowing from the outlet fittings to verify that the suspension cylinders are being lubricated and that the pressure in the cylinders is not excessive.

INSTRUCTOR NOTE: For more detailed information on servicing the suspension system, refer to the Special Instruction "Suspension Cylinder Servicing" (Form SEHS9411).



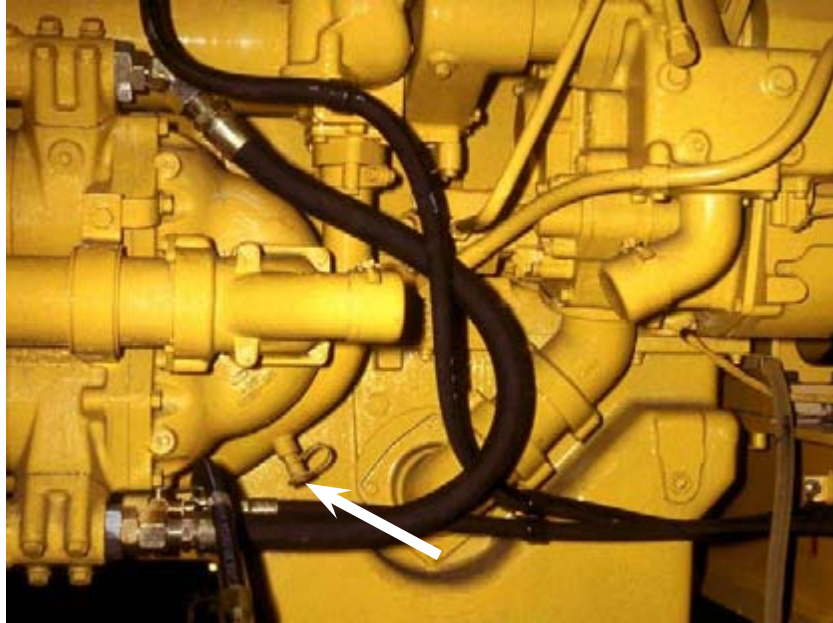
9

On the 785C truck, an air filter housing and a precleaner are located behind the front wheels on both sides of the truck. Check the dust valves (1) for plugging. If necessary, disconnect the clamp and open the cover for additional cleaning.

The dust valve is OPEN when the engine is OFF and closes when the engine is running. The dust valve must be flexible and close when the engine is running or the precleaner will not function properly and the service life of the air filters will be reduced. Replace the rubber dust valve if it becomes hard and brittle.

The "C" Series trucks may have the optional primary fuel filters with a water separator (2). Two primary filter/water separators are installed, one on each side of the truck. Open the drain valve at the bottom of each housing to drain the water when required. The drain interval is determined by the humidity of the local climate.

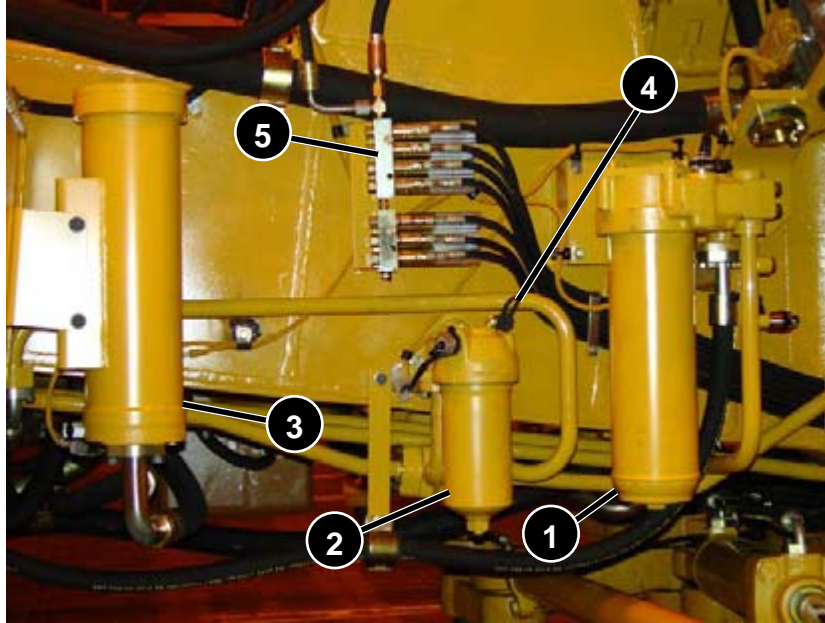
Replace the filter element in each housing every 500 hours or when restricted. The filter elements are removed from the top of the housings.



10

Shown is the right side of the 3512B engine used in the 784C tractor and 785C truck.

Engine oil samples can be taken at the Scheduled Oil Sampling (S•O•S) tap (arrow) located in the tube between the engine oil cooler and the engine oil filters.



11

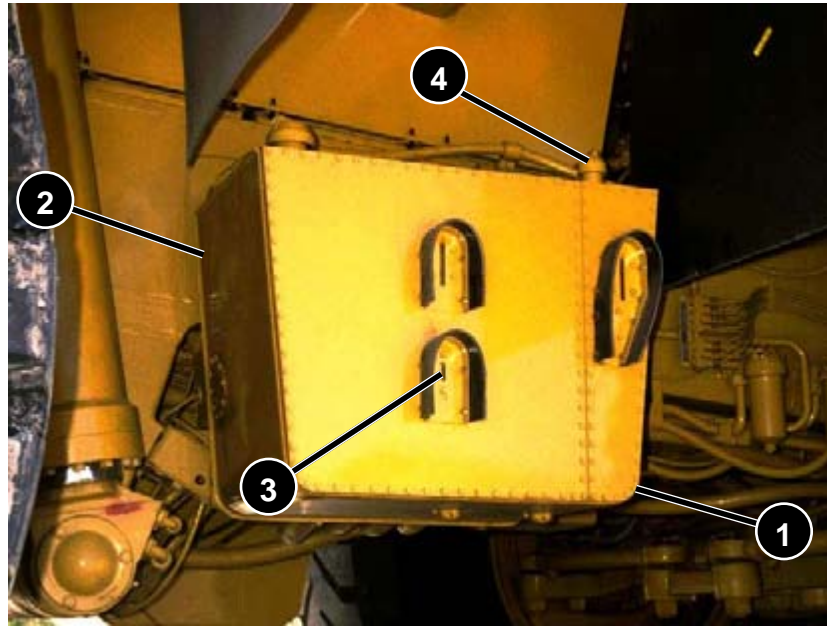
Located behind the right front tire is the transmission charging filter (1), the transmission lube filter (2), and the torque converter charging filter (3). Transmission oil samples can be taken at the Scheduled Oil Sampling (S•O•S) tap (4).

An oil filter bypass switch is located on each filter. The transmission oil filter bypass switches provide input signals to the Transmission/Chassis ECM. The Transmission/Chassis ECM sends the signals to the VIMS, which informs the operator if the filters are restricted. The torque converter charging filter bypass switch provides an input signal directly to the VIMS.

One of the three injector banks (5) for the automatic lubrication system is also in this location. These injectors are adjustable and regulate the quantity of grease that is injected during each cycle.

A solenoid air valve provides a controlled air supply for the automatic lubrication system. The solenoid air valve is controlled by the Vital Information Management System (VIMS), which energizes the solenoid ten minutes after the machine is started. The VIMS energizes the solenoid for 75 seconds before it is de-energized. Every 60 minutes thereafter, the VIMS energizes the solenoid for 75 seconds until the machine is stopped (shut down). These settings are adjustable through the VIMS keypad in the cab (LUBSET and LUBMAN).

INSTRUCTOR NOTE: For more detailed information on servicing the automatic lubrication system, refer to the Service Manual module "Automatic Lubrication System" (Form SENR4724).



12

Shown are the transmission hydraulic tank (1) and the hoist, converter and brake hydraulic tank (2). Both tanks are equipped with oil level sight gauges.

The oil level of both hydraulic tanks should first be checked with cold oil and the engine stopped. The level should again be checked with warm oil and the engine running.

The lower sight gauge (3) on the hoist, converter and brake hydraulic tank can be used to fill the tank when the hoist cylinders are in the RAISED position. When the hoist cylinders are lowered, the hydraulic oil level will increase. After the hoist cylinders are lowered, check the hydraulic tank oil level with the upper sight gauge.

Inspect the hoist, converter and brake hydraulic tank breather (4), and the transmission hydraulic tank breather (behind the mud flap) for plugging.

When filling the hydraulic tanks after an oil change, fill the tanks with oil to the FULL COLD mark on the sight gauge. Turn on the engine manual shutdown switch (see Visual No. 25) so the engine will not start. Crank the engine for approximately 15 seconds. The oil level will decrease as oil fills the hydraulic systems. Add more oil to the tanks to raise the oil level to the FULL COLD mark. Crank the engine for an additional 15 seconds. Repeat this step as required until the oil level stabilizes at the FULL COLD mark.

Turn off the engine manual shutdown switch and start the engine. Warm the hydraulic oil. Add more oil to the tank as required to raise the oil level to the FULL WARM mark.



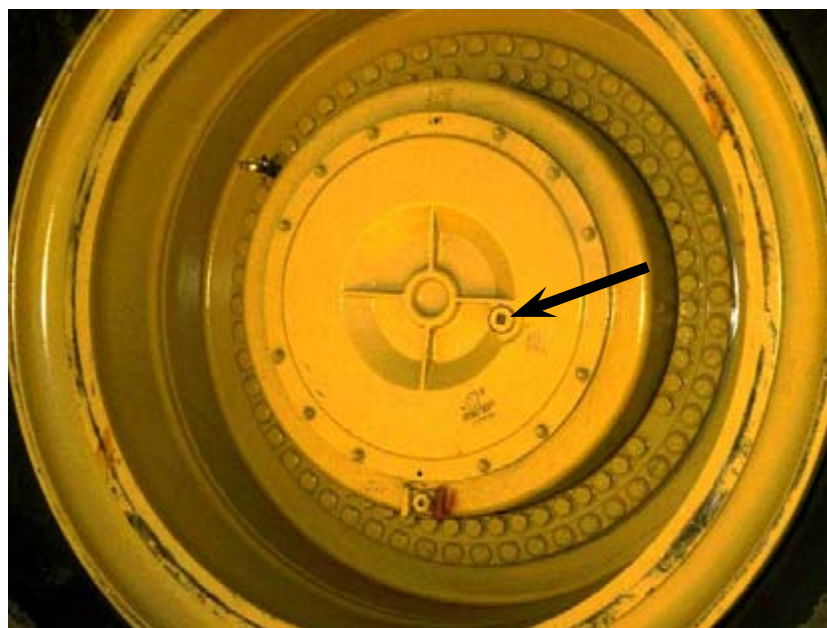
In both tanks, use only Transmission Drive Train Oil (TDTO) with a specification of TO-4 or newer.

TDTO TO-4 oil:

- Provides maximum frictional capability required for clutch discs used in the transmission, torque converter and brakes.
 - Increases rimpull because of reduced slippage.
 - Increases brake holding capability by reducing brake slippage.
 - Controls brake chatter.
 - Provides maximum frictional capability required for gears.
-

NOTICE

Failure to correctly fill the hydraulic tanks after an oil change may cause component damage.



13

The rear axles are equipped with double reduction planetary-type final drives (see Visual No. 122). Rotate the final drive until the cover and plug are positioned as shown. The final drive oil level is checked and filled by removing the magnetic plug (arrow). The oil should be level with the bottom of the plug hole. Fill the rear axle housing with oil before filling the final drives with oil. Allow enough time for the oil to settle in all of the compartments. This can be as much as 20 minutes during cold temperatures.

The magnetic inspection plugs should be removed weekly from the final drives and checked for metal particles. For some conditions, checking the magnetic plugs is the only way to identify a problem which may exist.

Use only Final Drive and Axle Oil (FDAO) or Transmission Drive Train Oil (TDTO) with a specification of (TO-4) or newer. FDAO and TDTO TO-4 oil provides:

- Maximum lubrication capability required for gears.
- Increased lubrication capability for bearings.

NOTICE

The rear axle is a common sump for the differential and both final drives. If a final drive or the differential fails, the other final drive components must also be checked for contamination and then flushed. Failure to completely flush the rear axle after a failure can cause a repeat failure within a short time.