SECTION 24: LUBRICATION

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1. LUBRICATION

The efficiency and life expectancy of mechanical equipment is largely dependent upon proper lubrication and servicing. All mechanical components rely on a lubricating film between moving parts to reduce friction, prevent wear and oxidation. Proper lubrication also helps cool the parts and keep dirt particles away from mating surfaces. Efficient lubrication depends upon using the right type of lubricant, at specified intervals and by filling to correct capacities. Past experience shows that many service problems can be traced to an improper lubricant or to incorrect lubrication procedures.

A comprehensive maintenance and lubrication program is important to ensure the long service life this vehicle was designed for and to avoid costly repairs and associated downtime caused by premature part failure.

A lubrication schedule is included in this section to give the location of key service points on the vehicle as well as the lubricant specifications for each component to be serviced. Specific instructions on how to check and service different components are covered in their respective sections in this maintenance manual.

The recommended lubrication intervals are based on normal operating conditions and mileage accumulation.

Shorten the intervals if your vehicle operates in more severe conditions. Severe conditions include heavy towing, high vehicle weight or operation in mountainous areas. Some parts and equipment referred to in this section may not be installed on your vehicle. Check your vehicle's "Coach Final Record" for equipment list.

Dispose of used lubricants and filters in an environmentally safe manner, according to federal and/or local recommendations.

1.1 FIRST SERVICE ON NEW VEHICLE

Perform the following maintenance procedures after the first 3,000 miles (5 000 km) of operation (unless otherwise specified). Once initial maintenance is performed, refer to

recommended intervals in the lubrication schedule.

Repeat a component's initial maintenance procedure when it has undergone a major repair.

1.1.1 Differential

Factory-filled oil in differential on new vehicle should be replaced after 3,000 miles (5 000 km) of initial operation or after major servicing.

1.1.2 Coolant Strainer

The coolant strainer is designed to recover the soldering residues trapped inside the coolant lines during their initial assembly; perform initial cleaning once vehicle has run approximately 3,000 miles (5 000 km), then according to the lubrication and servicing schedule.

NOTE

If additional soldering has been performed on any point of coolant piping, clean coolant system strainer as outlined for a new vehicle at 3,000 miles (5 000 km).

1.1.3 Allison World Automatic Transmission

Change oil and filter cartridges after first 5,000 miles (8,000 km) of initial operation, then according to the lubrication and servicing schedule.

1.1.4 ZF-ASTRONICTransmission

No initial oil or filter change necessary. Refer to regular lubrication and servicing schedule.

1.1.5 Engine

Since engine break-in has been done in factory, there is no special break-in, so oil should be changed according to the lubrication and servicing schedule intervals. Since some oil consumption by engine is normal, check oil level daily with engine stopped and add to FULL mark on dipstick if necessary. Furthermore, the engine oil filter should be replaced each time the engine oil is changed.

2. LUBRICATION AND SERVICE SCHEDULE

Following this service schedule is the most economical and easiest way to ensure your vehicle performs at its best, safest and longest. Also, unscheduled maintenance will be minimized since inspection should expose potential problems before they become major ones.

2.1 ENGINE OIL CHANGE INTERVALS

The engine oil change intervals are related to the operating conditions, such as vehicle load, speed, etc., and may vary. It is recommended however, that the oil change be performed after every 12,500 miles (20 000 km).

The drain intervals may then be gradually increased or decreased with experience on a specific lubricant, considering the recommendations of the oil supplier (analysis of drained oil can be helpful), until the most practical service condition has been established.

Solvents should not be used as flushing oils. Dilution of the fresh refill oil supply can occur, which may be detrimental for the engine.

Engine oil temperature should be checked every 25,000 miles (40 000 km) to determine oil cooler efficiency. This check should be made by inserting a steel jacketed thermometer in the dipstick opening, immediately after stopping a hot, loaded engine. If the oil temperature exceeds the coolant temperature by more than 60 °F (33 °C), the oil cooler may be clogged.

For detailed oil specifications, refer to "Detroit Diesel Series 60 Service Manual" under heading "Lubricating Oil for Detroit Diesel Engines".

2.1.1 Engine Oil Reserve Tank

An oil reserve tank with a capacity of 8.4 US quarts (8,0 liters) (optional) is connected to the crankcase by a hose with a shutoff valve, allowing oil to be added to crankcase by opening valve. Comparison of oil levels in sight gauge, before and after adding oil to crankcase, shows approximately how much oil has been added.

Filling of this tank can be made by opening the rear engine doors. The tank is mounted on R.H. side of engine compartment, over the A/C compressor.

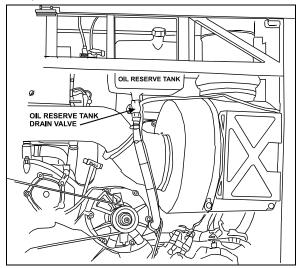


FIGURE 1: ENGINE OIL RESERVE TANK

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2.2 COLD WEATHER OPERATION

The proper selection of the engine oil grade will ease cold weather starting (refer to the lubrication and servicing schedule for the engine oil grade recommendation). Other practical considerations, such as the use of batteries, cables and connectors of adequate size, proper setting of voltage regulator, ether starting aid, oil and coolant heater systems, and proper fuel selection will ease cold weather starting.

2.3 FLEXIBLE HOSE MAINTENANCE

The performance of engine and equipment are greatly related to the ability of flexible hoses to supply lubricating oil, air, coolant, and fuel oil. Maintenance of hoses is an important step to ensure efficient, economical, and safe operation of the engine and related equipment.

2.3.1 Pre-Starting Inspection

Check hoses daily as part of the pre-starting inspection. Examine hose for leaks, and check all fittings, clamps, and ties carefully. Ensure that hoses are not resting on or touching shafts, couplings, heated surfaces including exhaust manifolds, any sharp edges, or other obviously

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damaging areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with time. To ensure proper support, inspect fasteners frequently and tighten or replace them as necessary.

2.3.2 Leaks

Investigate leaks immediately to determine if fittings have loosened or cracked, and also if hoses have ruptured or worn through. Take corrective action immediately. Leaks are not only potentially detrimental to machine operation, but can also result in added expenses caused by the need to replace lost fluids.

\triangle CAUTION \triangle

Personal injury and/or property damage may result from fire due to the leakage of flammable fluids, such as fuel or lube oil.

Service life

The limited service life of a hose is determined by the temperature and pressure of the gas or fluid within it, the time in service, its installation, the ambient temperatures, amount of flexing, and the vibration it is subjected to. With this in mind, it is recommended that all hoses be thoroughly inspected at least every 500 operating hours or after 15,000 miles (24 000 km). Look for surface damage or indications of damaged, twisted, worn, crimped, brittle, cracked, or leaking lines. Hoses having a worn outer surface or hoses with a damaged metal reinforcement should be considered unfit for further service.

It is also recommended that all hoses in this vehicle be replaced during major overhaul and/or after a maximum of five service years. Quality of replacement hose assemblies should always be equal to or superior to those supplied by the Original Equipment Manufacturer.

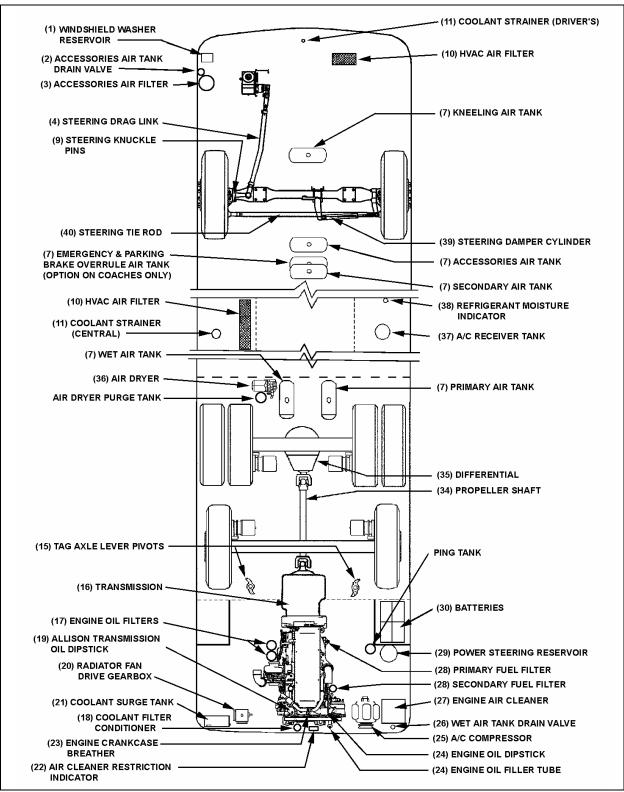


FIGURE 2: LUBRICATION AND SERVICING POINTS ON I-BEAM FRONT SUSPENSION VEHICLES

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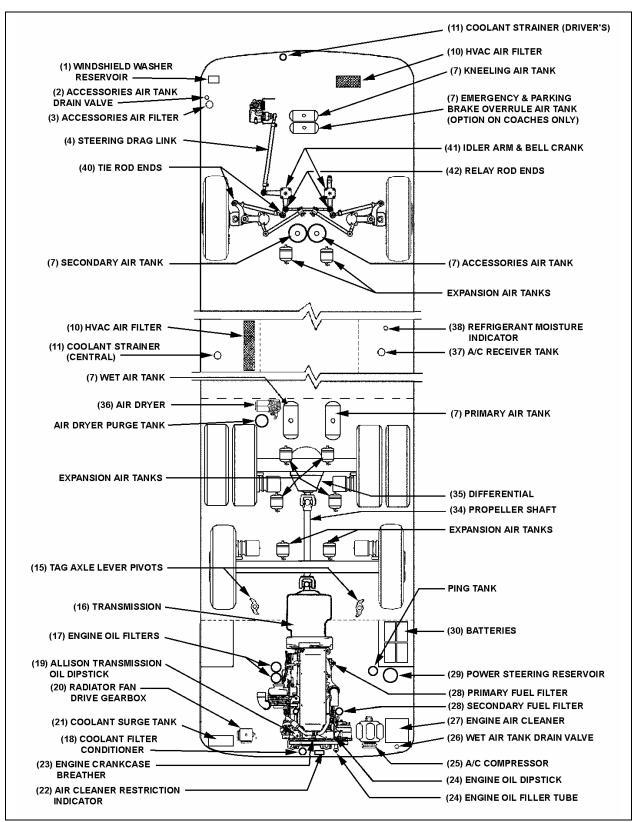


FIGURE 3: LUBRICATION AND SERVICING POINTS ON INDEPENDENT FRONT SUSPENSION VEHICLES

2.4 WALK-AROUND INSPECTION

It is good practice to make a basic visual inspection of key areas on the vehicle every day (or before every trip for private coaches) and to correct any problem found.

	OUTSIDE THE VEHICLE
ITEM*	DESCRIPTION
	Check for leaks under vehicle and in engine compartment.
	Check that baggage and service compartment doors close properly.
	Inspect tires and wheels for correct tire pressure, wear or damage and for missing wheel studs and nuts.
1	Check windshield washer fluid level and add if necessary.
	Check condition of windshield wiper blades.
	Verify proper operation of all road lights, signal lights, brake lights, marker lights and back- up lights; Replace light bulbs as required.
2, 26	Drain accumulated water in accessory and wet air tanks.

	ENGINE COMPARTMENT
ITEM*	DESCRIPTION
24	Check engine crankcase oil level; Add if necessary.
19	Check Allison transmission oil level (can be checked from push-button shift selector); Add if necessary.
29	Check power steering reservoir fluid level; Add if necessary.
21	Check coolant surge tank fluid level; Add if necessary.
28	Drain accumulated water in primary fuel filter/water separator (if equipped). Visually check fuel filter cartridge (Fuel-Pro 382 equipped vehicles only).
22, 27	Check air cleaner restriction indicator; Replace air cleaner when red signals locks in full view.

	INSIDE THE VEHICLE
ITEM*	DESCRIPTION
	Check for proper operation of the entrance door.
	Check that emergency exit windows and roof escape hatches can be opened, then close all windows and hatches securely.
	Verify proper operation of windshield wiper/washer.
	Adjust and clean mirrors as needed for adequate rear-view vision.
	Start engine and check for proper operation of all gauges and indicator lights.
	Check for proper operation of electric and air horns and back-up alarm.
	Perform a brake test. Check both primary and secondary pressure gauges.

^{*} Item numbers refer to figures 2 and 3.

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2.5 LUBRICATION AND SERVICING SCHEDULE

2.6 LUBRICANT AND COOLANT SPECIFICATIONS

ITEM*	DESCRIPTION	SPECIFICATIONS
24	Engine Oil	SAE Viscosity Grade: 15W40 API Classification: CI-4
29	Power Steering Oil	Automatic Transmission Oil (Dexron-IIE or Dexron-III)
18, 21	Engine Coolant	Low silicate, ethylene glycol coolant 50% antifreeze/water solution is normally used Antifreeze concentration should be between 30% and 67%
25	A/C Compressor Oil	Polyolester Oil, HFC 134a compatible: Castrol SW-68 (POE) or equivalent
35	Differential Oil	Multigrade gear oil meeting MIL-L-2105-D: 85W/140. If temperature drops below 10°F (-12°C), 80W90 should be used. Below -15°F (-26°C), 75W90 should be used. (In extreme conditions or for better performance, full synthetic gear oil can be used.)
20	Fan Gearbox Oil	Synthetic oil: Mobil SHC 630
19	Allison Automatic Transmission Oil	Dexron-IIE, Dexron-III or TranSynd
19	ZF-ASTronic Transmission Oil	Castrol Syntrans Grade SAE 75W-85 (Synthetic)
	Multi Purpose Grease	Good quality lithium-base grease: NLGI No.2 Grade is suitable for most temperatures NLGI No.1 Grade is suitable for extremely low temperatures

^{*} Item numbers refer to figures 2 and 3.

2.7 PART NUMBER SPECIFICATIONS

ITEM*	DESCRIPTION	PRÉVOST NO
17	Engine Oil Filters	#510458
29	Power Steering Reservoir Oil Filter	#660528
27	Engine Air Cleaner Filter	#530197
38	Refrigerant Filter Dryer Unit	#950262
28	Engine Primary Fuel Filter	#510137
28	Engine Primary Fuel Filter With Water Separator (Optional)	#531407
28	Engine Secondary Fuel Filter	#510128
28	Secondary "Racor" Fuel Filter	#531390
18	Engine Coolant Precharge Unit	#550629
18	Engine Coolant Filter/Conditioner	#550630
10	A/C And Heating Driver's Air Filter	#871147871144
10	A/C And Heating Cabin's Air Filter	#871051
16	Allison World (WT) Automatic Transmission Oil Filter Kit	#571709
11	Coolant Strainer	#871029
3	Accessories Air Filter	#641340
36	Air Dryer Cartridge	#641244
	Alternator drive belt, 85-1/2 in. (2 alternators)	#5060055
	Alternator drive belt, 72 in. (1 alternator, limp home)	#5060056
	Fan gearbox drive belt	#506688
	Compressor drive belt BX100	#506864
	Windshield wiper blade	#800329

^{*} Item numbers refer to figures 2 and 3.

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LUBRICATION AND SERVICING SCHEDULE	Item	Months	6 250 / 10 000	18 750 / 30 000	25 000 / 40 000	31 250 / 50 000	43 750 / 70 000	50 000 / 80 000	56 250 / 90 000	68 750 / 110 000	75 000 / 120 000	81 250 / 130 000	93 750 / 150 000	100 000 / 160 000	106 250 / 170 000	112 500 / 180 000	125 000 / 200 000	131 250 / 210 000	137 500 / 220 000	150 000 / 240 000	156250 / 250 000	162 500 / 260 000	168 750 / 270 000	181 250 / 290 000	187 500 / 300 000	750 / 310	000 / 320	LUBRICANT &/OR PART ²
GENERAL																												
Flexible hoses, thoroughly inspect all hoses	-	12						•						•						Φ)						•	
Front discharge tube, qty:2, check to see if clogged ³		3																										
01 ENGINE																												
Air cleaner, inspect, clean, replace element if required	27	6	0 0	•	•	0	9 9	•	9 4)	•	4	•	•	Q (9 4	•	•	•	9 4	•	•	9 9	•	•	Φ	•	Filter #530197
Engine, change oil and filters. Oil SAE 15W40, API CI-4	17	12	9		•	(•	q		•	9		0		•	•		•	Φ		•	9		•		•	Filter #510458
Engine crankcase breather, clean breather steel mesh	23	12						•						•						q)						•	
03 FUEL																												
Change primary & secondary fuel filters, fill with clean fuel before installation	28	12	9	>	•	(•	•	q	>	٠	9	•	•	4	•	•		•	q	\	•	q	>	•		•	Primary #510137 ; prim. w/sep #531390 ; secondary #510128
05 COOLING																												
Radiator fan drive gearbox,check oil level, add if necessary	20	6	Q Q	•	•	0	9	•	9 0	•	•	Q Q	•	•	•	9 4	•	•	•	9 4	•	•	9 4	9	•			Mobil SHC 630 #180217
Radiator fan drive gearbox, change oil	20	12						•						•						Φ)						Φ	Mobil SHC 630 #180217
Coolant filter/Conditioner, replace element	18	12	9)	•	(•	•	q	•	•	9)	•	9	•	•		•	Ф)	•	q)	•		•	Filter #550630
Coolant surge tank, test coolant solution	21	12	9)	•	(•	•	q	•	•	9)	•	•	•	•		•	q)	•	q)	•		•	
Cooling system, drain, flush and refill	18/ 21	24																									•	Engine coolant
06 ELECTRICAL																												
Battery terminals, clean and coat terminals	30	12																										Battery terminal coating
Bosch alternators, replace brushes & voltage regulator		24												•														Regulator #562981 Brush set #562983
Bosch alternators, replace bearings		48																									•	Bearing, Ball #562972 Bearing, Roller #562976

Proceed to maintenance operation at distance indicated on odometer or specified number of month, whichever comes first.

Proceed to maintenance operation at distance indicated on odometer or specified number of month, whichever comes first.

Proceed to maintenance operation at distance indicated on odometer or specified number of month, whichever comes first.

Discharge tubes are rubber tubes located under vehicle

LUBRICATION AND SERVICING SCHEDULE	Item	Months	6 250 / 10 000	18 750 / 30 000	25 000 / 40 000	31 250 / 50 000	37 500 / 60 000	50 000 / 80 000					(m	ile	s/l	112 500 / 180 000 MX W MX)			F 1	156250 / 250 000	168 750 / 270 000	175 000 / 280 000	187 250 / 290 000	720 /	200 000 / 320 000	LUBRICANT &/OR PART ²
07 TRANSMISSION																											
Allison World Automatic transmission, change oil (standard oil) and filters	16	12	<	>	•		•	•	(•	•		•	•		•	•	•	>	•	•	, ,	•	9)	•	Oil Dexron-IIE or Dexron-III Filters #571709
Allison World Automatic transmission, change oil (only if filled with TranSynd synthetic fluid) and filters ³	16	12						•						9	,					•						•	TranSynd Synthetic Fluid; Filters #571709
ZF-Astronic Automatic Transmission, change oil & filter after 185 000 miles (300 000 km)	16	24																						q)		Castrol Syntrans grade SAE 75W-85
Transmission oil cooler, replace unit if vehicle is equipped with transmission retarder	43	24																									Prévost #550712
09 PROPELLER SHAFT																											
Grease one fitting on each universal joint and slip joint	34	6	0 0	•	•	•	9 9	•	0	0	•	•	0	•	•	9 0	•	0	•	•	9 0	0	0 (9 0	•	0	Multipurpose grease
11 REAR AXLE																											
Differential, check oil level, add if necessary	35	6	0 0	•	•	•	9 9	•	•	0	•	•	•	9 0	•	9 9	•	•	•	•	9 0	0	•	9 0	9	•	Multigrade gear oil
Differential, change oil, clean breathers	35	24												0													Multigrade gear oil
Tag axle lever pivot, grease one fitting on each pivot	15	6	0	9	•	•	4	•	•	•	•	•	•	•	•	0 0	•	•	•	•	9	•	•	9 4	•	•	Multi purpose grease
12 BRAKE & AIR																											
Air tanks, drain water from all tanks		12	9)	•		•	•	-	•	•		•	0		•	•	(•	•	0		•	q)	•	
Accessories air filter, change filter element		24												0												•	Filter element #641340
Air dryer, change cartridge	36	24												0)											•	Cartridge #641244 or 641278

¹ Proceed to maintenance operation at distance indicated on odometer or specified number of month, whichever comes first. ² See paragraph 2.5 & 2.6 of this section for lubricant and part number specifications.

³ When the transmission contains a mixture of fluids (defined as the quantity of non-TranSynd fluid remaining in the transmission after a fluid change combined with the quantity of TranSynd required to fill the transmission to the proper level), perform the fluid and filter change at 25 000 miles (40 200km) or 1 year, whichever comes first.

LUBRICATION AND SERVICING SCHEDULE	Item	Months	6 250 / 10 000	12 500 / 20 000	25 000 / 40 000	31 250 / 50 000	37 500 / 60 000	43 750 / 70 000	<u> </u>		68 750 / 110 000 S	_	(r	nil	es.	R	n) 000 06	200 000	20 000		240 000	156250 / 250 000		175 000 / 280 000	250 / 290	187 500 / 300 000	000 / 320	PART ²
14 STEERING																												
Drag link ends, grease one fitting at each end	4	6	0	94	•	•	•	9 4	•	•	•	9 4	•	•	9 4	•	•	•	0	0	•	9 0	•	•	•	9 4	•	Multi purpose grease
Relay rod ends, grease one fitting at each end	36		0	9 4	9	•	•	9 0	•	•	•	9	•	•	9 4	•	•	•	9 0	0	•	9 4	•	•	•	9 4	•	Multi purpose grease
Steering tie rod ends, grease one fitting at each end	40	6									0																	
Idler arm, grease fitting	41	6	•	94	•	•	•	9 4	•	Φ	•	9	•	•	9 4	•	•	4	•	•	•	9 4	•	•	•	94	•	Multi purpose grease
Bell crank, grease fitting	41	6	0	9	•	•	•	9	•	•	0	9	•	•	0	•	•	0	•	•	0	9	•	•	0	9	0	Multi purpose grease
Steering damper cylinder, grease one fitting at rod end	39	6	0	9 4	•	•	0	9 (•	•	•	•	•	•	0 0	•	•	0	• 0	•	•	9 0	•	•	0	9 0	0	Multi purpose grease
Steering knuckle pins, grease two fittings per knuckle	9	6	0	9 4	•	•	•	9 4	•	•	•	9 4	•	•	9 4	•	•	•	•	0	•	9 4	•	•	•	9 4	•	Multi purpose grease
Power steering reservoir, replace oil and filter cartridges	29	12						9	•						•						•						•	Cartridge #660987
16 SUSPENSION																												
Upper A-Arm Ball Joint, grease fitting	42	6	•	9 4	•	•	•	9 (•	•	•	• •	•	•	• •	•	•	•	•	•	•	• •	•	•	•	• •	•	Molykote longterm 2/78 grease (preferably) or lithium NLGI no2 or no1
22 HEATING & AIR CONDITIONING																												
A/C compressor, check oil level, add if necessary	25										•																	
A/C receiver tank, check refrigerant level, add if necessary	37	6	•	9 4	•	•	•	9	•	•	0	9	•	•	9 9	9	•	•	9	•	•	9 0	•	•	•	9 4	•	HFC 134A
Refrigerant moisture indicator, replace filter dryer unit according to moisture indicator (as needed)	38	6	•	9 4	•	•	•	9 0	•	•	•	• 4	•	•	• 4	•	•	•	• 0	•	•	• •	•	•	•	9 4	•	
A/C and Heating air filters, clean or replace all elements	10		4	•	Q		•	9		•	(•	•	_	•	•		•	q		•	q)	•	•	•	•	
Coolant strainer, check, clean, change cartridge if required	11	12						9							•						•						•	Cartridge #871029
Condenser discharge tube, qty:2, check to see if clogged ³	-	3																										
Evaporator discharge tube, qty:6, check to see if clogged ³	-	3																										
Evaporator motor, condenser motor, recirculating pump drive motor, inspect brush, replace if necessary	-	12						4	•					í	3						•						9	Refer to parts manual

¹ Proceed to maintenance operation at distance indicated on odometer or specified number of month, whichever comes first.

² See paragraph 2.5 & 2.6 of this section for lubricant and part number specifications.

³ Discharge tubes are rubber tubes located under vehicle