CONTENTS

1 LUBRICATION

The efficiency and life expectancy of mechanical equipment is largely dependent on 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.

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

2 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.

2.1 HOSE 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 damaging areas. Since all machinery vibrate and move to a certain extent, clamps and ties can fatigue over time. To ensure proper support, inspect fasteners frequently and tighten or replace them as necessary.

⚠ WARNING

Personal injury and property damage may result from fire caused by leaking flammable fluids.

2.1.1 Leaks

Hoses have a limited service life. Thoroughly inspect hoses annually. Look for surface damage or indications of twisted, worn, crimped, cracked or leaking lines. Replace damaged hoses immediately.

2.1.2 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 12 months. 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.

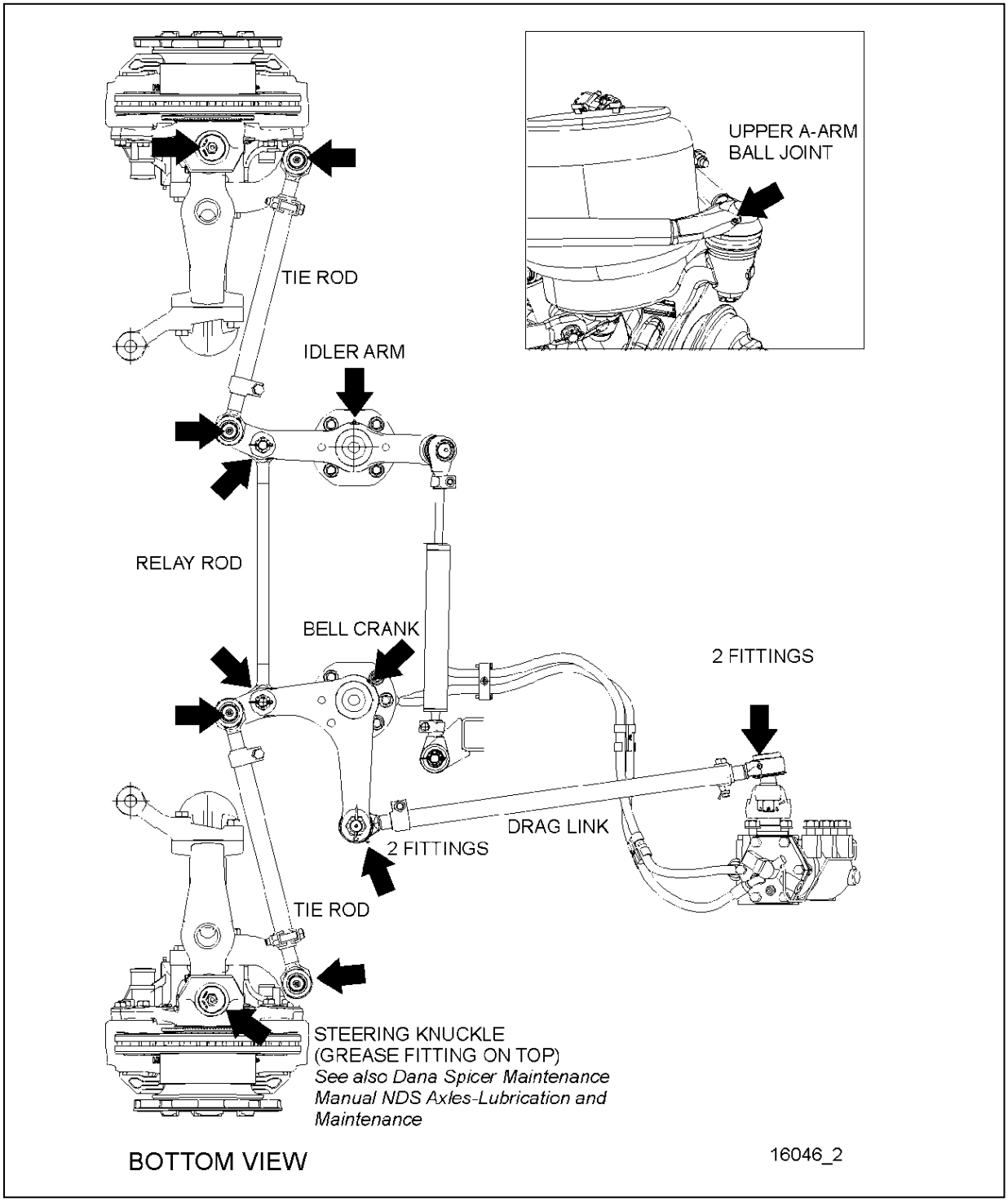

FIGURE 1: LUBRICATION FITTING LOCATIONS - INDEPENDENT FRONT SUSPENSION VEHICLES (TYPICAL)

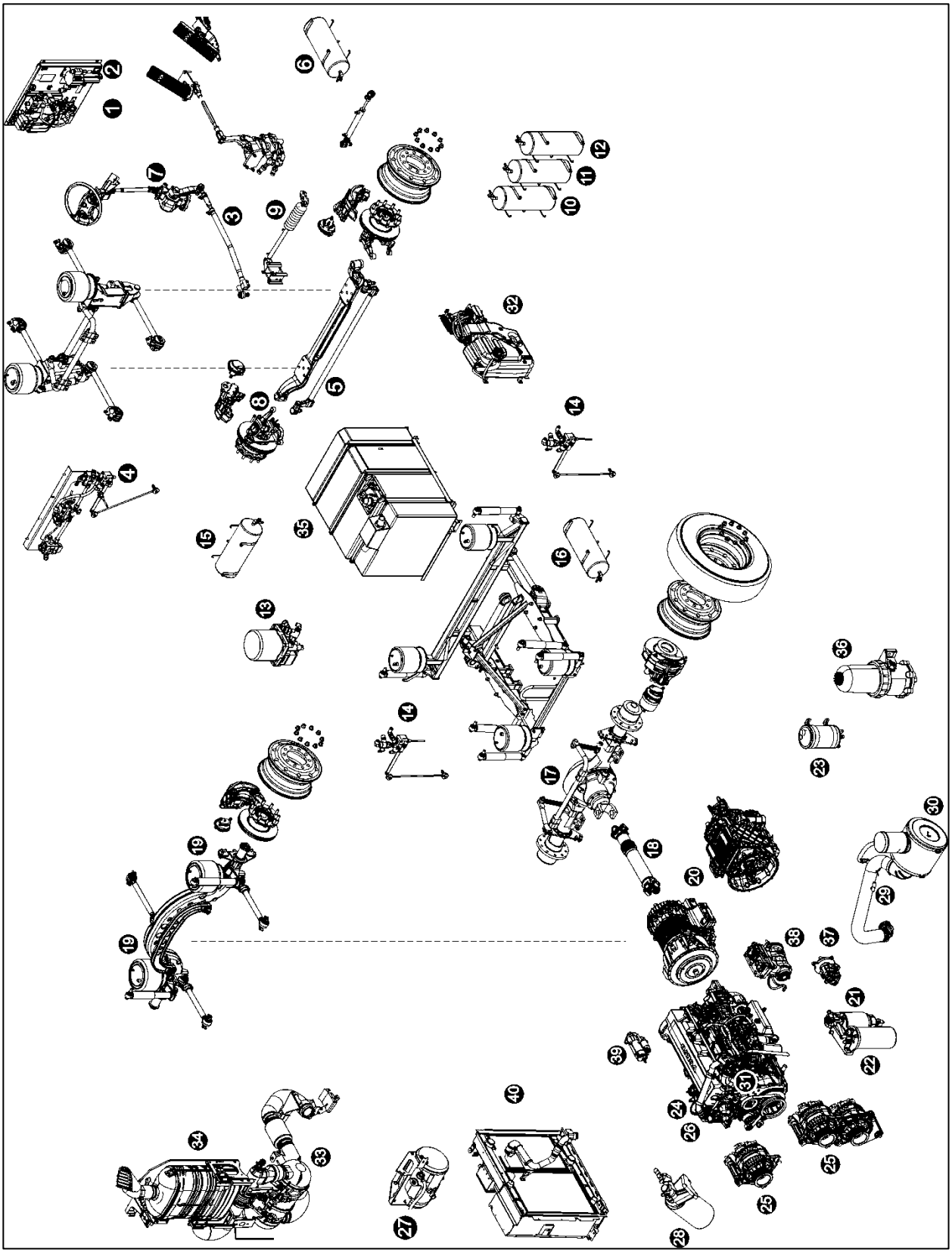

FIGURE 2: LUBRICATION AND SERVICING POINTS (I-BEAM FRONT AXLE SHOWN) TYPICAL

1 Accessories air tank drain cock
2 Accessories air filter
3 Steering drag link
4 Height control valve (front)
5 Steering tie rod
6 Accessories air tank
7 Steering column U-joints
8 Steering knuckle pins
9 Steering damper cylinder
10 Emergency / parking brake overrule tank
11 Secondary air tank
12 Kneeling air tank
13 Air dryer
14 Height control valve (rear)
15 Wet air tank
16 Primary air tank
17 Differential
18 Propeller shaft
19 Tag axle lever pivot
20 Transmission
21 Primary fuel filter
22 Secondary fuel filter
23 Power steering fluid tank
24 Engine oil filter
25 Alternators
26 Allison transmission oil dipstick
27 Engine coolant surge tank
28 Coolant filter & conditioner
29 Engine air filter restriction indicator
30 Engine air filter
31 Engine oil dipstick and filler tube
32 DEF tank
33 Diesel particulate filter
34 SCR catalytic converter
35 Diesel fuel tank
36 Davco Fuel Pro 382 fuel filter
37 Power steering pump
38 Air compressor
39 Starter
40 Cooling Assembly (Radiator & CAC)

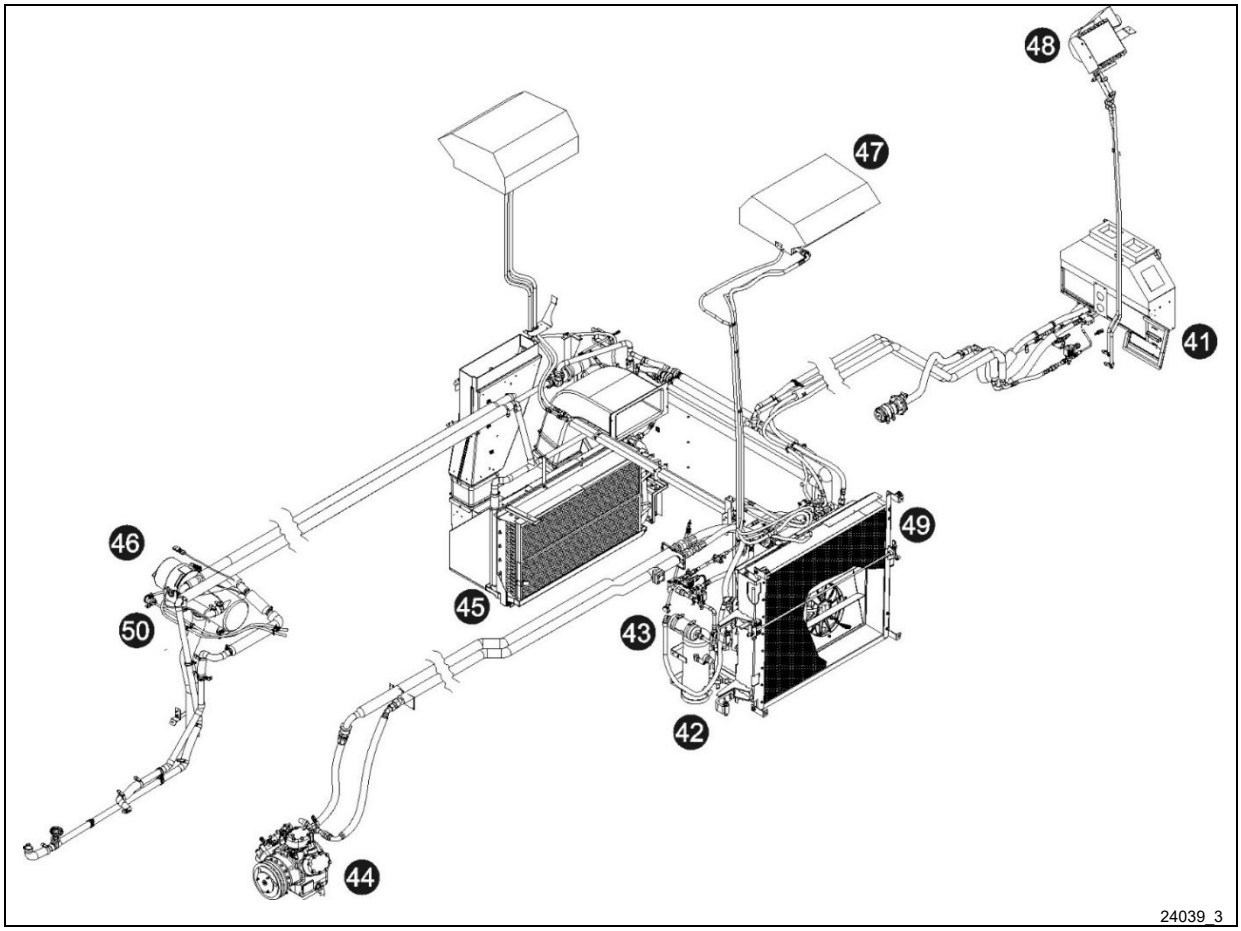

FIGURE 3: LUBRICATION AND SERVICING POINTS – HVAC UNIT

41	HVAC air filter – driver's unit	46	Coolant preheater
42	A/C receiver tank	47	A/C system – passenger's overhead console
43	Refrigerant moisture indicator	48	Upper windshield defrost unit
44	A/C compressor	49	Condenser coil
45	HVAC air filter – passenger's unit	50	Preheater fuel filter

3 LUBRICATION AND SERVICING SCHEDULE - COACHES

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.

IMPORTANT NOTE
Refer to the manufacturer's documentation included in this maintenance manual for specific manufacturer's maintenance requirements.

OPERATING CONDITION

Use the information that follows to determine the operating condition and usage applicable to your vehicle

Heavy	Normal	Economy
Between 5 mpg and 6 mpg Between 39 L/100 km and 50 L/100 km	Between 6 mpg and 7.5 mpg Between 31 L/100 km and 39 L/100 km	Greater than 7.5 mpg Less than 31 L/100 km

LUBRICATION AND SERVICING SCHEDULE

H3 Series coaches

X3 Series coaches

H3 VIP commercial use

X3 VIP commercial use

The maintenance procedures are found in their respective sections of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

PROCEED TO MAINTENANCE OPERATION EVERY

Proceed to maintenance operation at miles, km, months or hours whichever comes first

			Item	Month	6 250 mi / 10 000 km	12 500 mi / 20 000 km	31 250 mi / 50 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	106 000 mi / 170 000 km	125 000 mi / 200 000 km	150 000 mi / 240 000 km	185 000 mi / 300 000 km	250 000 mi / 400 000 km	300 000 mi / 500 000 km	500 000 mi / 800 000 km	600 000 mi / 960 000 km	Lubricant / Fluid [1]
GENERAL																		
1	Flexible hoses – thoroughly inspect all hoses, tighten the hose clamps to prescribed torque			12				●										
01 ENGINE																		
1	extended drains B	Engine oil & filter – heavy operating condition, change every 40 000 mi / 65 000 km / 1 300 hours	24															B
2		Engine oil & filter – economy & normal operating condition, change every 55 000 mi / 90 000 km / 1 600 hours	24															B
3	extended drains A	Engine oil & filter – heavy operating condition, change every 45 000 mi / 70 000 km / 1 400 hours	24															A
4	(factory filled)	Engine oil & filter – economy & normal operating condition, change every 60 000 mi / 95 000 km / 1 700 hours	24															A
5	Air cleaner – change filter element when indicated by restriction indicator or after a maximum of 2 years		29 30	24														
6	Drive belts (all) – check tension, inspect for cracks or frayed material, change belt that display obvious wear or defects			6			●											★
7	Valve & injector clearance – initial adjustment (2 500 hrs. or →)											●						★
8	Valve & injector clearance – check & adjust (5 000 hrs. or →)														●			★
9	Drive belt tensioners & idlers (water pump, A/C compressor, alternators) – remove belts, check for noisy bearings, play, bushing play			3														★
10	Drive belt tensioners & idlers (water pump, alternators) – change proactively											●						★
03 FUEL																		
1	Primary & secondary fuel filters – change at every engine oil change		21 22															
2	Preheater fuel filter – change		50	12				●										

★= Specialty tool required. You will find the SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE table and the LUBRICANTS SPECIFICATIONS table following this Lubrication and Servicing Schedule.

[1] See paragraph 6.0 FLUIDS AND LUBRICANTS SPECIFICATIONS of this section for lubricant specifications.

LUBRICATION AND SERVICING SCHEDULE

H3 Series coaches

X3 Series coaches

H3 VIP commercial use

X3 VIP commercial use

The maintenance procedures are found in their respective sections of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

			Item	Month	PROCEED TO MAINTENANCE OPERATION EVERY Proceed to maintenance operation at miles, km, months or hours whichever comes first 6 250 mi / 10 000 km	12 500 mi / 20 000 km	31 250 mi / 50 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	106 000 mi / 170 000 km	125 000 mi / 200 000 km	150 000 mi / 240 000 km	185 000 mi / 300 000 km	250 000 mi / 400 000 km	300 000 mi / 500 000 km	500 000 mi / 800 000 km	600 000 mi / 960 000 km	Lubricant / Fluid [1]
04 EXHAUST AND AFTERTREATMENT SYSTEM																		
1	Diffuser assembly, rain cap & drain tube – check proper functioning, clean		34	12														
2	DEF pump filter – change	heavy operating condition (5 500 hrs. or →)	32										●					
		normal operating condition (7 000 hrs. or →)												●				
		economy operating condition (9 000 hrs. or →)													●			
3	DEF tank – drain, clean with water, clean filler neck strain	heavy operating condition (5 500 hrs. or →)	32										●					
		normal operating condition (7 000 hrs. or →)												●				
		economy operating condition (9 000 hrs. or →)													●			
4	DPF filter – either clean or change filter cartridge	heavy operating condition, every 400 000 mi / 650 000 km (10 000 hrs.)	33															★
		normal operating condition, every 480 000 mi / 772 000 km (12 000 hrs.)																★
		economy operating condition, every 600 000 mi / 965 000 km (15 000 hrs.)																★
05 COOLING																		
1	Coolant filter housing shut-off valve – rotate the handle periodically to keep the spindle rotation smooth		28	6														
2	Coolant surge tank – test coolant solution		27	12		●												★
3	Radiator – inspect exterior core & clean with low pressure water jet if necessary		40							●								
4	Coolant filter – change (Long-Life Filter without additives to be used with Extended Life Coolant)		28	12								●						
5	Coolant filter housing shut-off valve spindle – apply fresh grease		28	12								●						P
6	Cooling system – drain, flush & refill (Extended Life Coolant) every 750 000 mi [2] / 1 200 000 km [2]		27	96														E ★
06 ELECTRICAL																		
1	Power cables inspection – Perform MI15-24			3														
2	Battery terminals – clean & coat terminals with Nyogel			12														
3	Alternators – remove belts, check for noisy bearings, bearing play			3		●												
07 TRANSMISSION [3]																		
1	**Allison** – change transmission fluid, Main & Lube filters (Refer to TABLE 1 in *Section 07: Transmission* for Main & Lube filter change intervals). **Conditions:** filled with TES389 approved fluid + Prognostics mode disabled		20															M
2	**Allison** – change transmission fluid, Main & Lube filters (Refer to TABLE 2 in *Section 07: Transmission* for Main & Lube filter change intervals).		20															L

[2] Provided an engine coolant fluid analysis is done at 600 000 miles / 965 000 km with satisfactory results

[3] In the absence of a fluid analysis program, the fluid change interval listed in Table 1, Table 2 & Table 3 should be used. Change filters according to Table 1, Table 2 & Table 3 even if a fluid analysis shows that the fluid doesn't need to be changed.

LUBRICATION AND SERVICING SCHEDULE

H3 Series coaches

X3 Series coaches

H3 VIP commercial use

X3 VIP commercial use

The maintenance procedures are found in their respective sections of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

			Item	Month	PROCEED TO MAINTENANCE OPERATION EVERY: 6 250 mi / 10 000 km	12 500 mi / 20 000 km	31 250 mi / 50 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	106 000 mi / 170 000 km	125 000 mi / 200 000 km	150 000 mi / 240 000 km	185 000 mi / 300 000 km	250 000 mi / 400 000 km	300 000 mi / 500 000 km	500 000 mi / 800 000 km	600 000 mi / 960 000 km	Lubricant / Fluid [1]
	Conditions: filled with TranSynd or TES295/TES668 synthetic fluid only (no mixture[4,5]) + Prognostics mode disabled																	
3	**Allison** – change fluid & filters when indicated by TRANSMISSION SERVICE indicator or 60 months whichever occurs first. In addition, change filters with every fluid change. **Conditions:** filled with TranSynd or TES295/TES668 synthetic fluid only (no mixture[3,4]) + Prognostics mode enabled		20	60														L
4	**Allison** – change fluid & filters when indicated by TRANSMISSION SERVICE indicator or 24 months whichever occurs first. In addition, change filters with every fluid change. **Conditions:** transmission filled with TES389 approved fluid with Prognostics mode enabled		20	24														M
5	Transmission oil cooler, change unit if vehicle is equipped with transmission retarder			24														
6	**Volvo I-Shift** extended drains[6] change fluid & filter	heavy & normal operating condition	20	60												●		N
		economy operating condition, every 525 000 mi / 844 000 km	20	60														N
09 PROPELLER SHAFT																		
1	Perform Spicer's Driveshaft "Inspection Procedures" [7]		18				●											
2	Grease one fitting on each universal joint		18	6					●									P
10 FRONT I-BEAM AXLE																		
1	Steering knuckle kingpins – grease two fittings per knuckle		8	6	●													P
2	Steering knuckle kingpins – inspect, check permissible slackness		8	6			●											
11 REAR AXLES																		
1	Meritor drive axle – check differential oil level, add if necessary, every 25 000 mi / 40 000 km		17	6														
2	Tag axle lever pivot (X3 Series only) – grease one fitting on each pivot		19	6	●													P
3	**Meritor** drive axle – change differential oil, clean breather		17	12					●									G
4	**Meritor** drive axle – change differential oil, clean breather (with full synthetic oil)		17	48										●				H
5	**ZF** Drive axle – check differential oil level, add if necessary at every engine oil change		17															I
6	**ZF** Drive axle – change differential oil and breather		17	36						●								I

[4] When the transmission contains a mixture of fluids (defined as the quantity of non-TranSynd or non-TES295/non-TES668 fluid remaining in the transmission after a fluid change combined with the quantity of TranSynd or TES295/TES668 required to fill the transmission to the proper level), perform the fluid and filter change according to the TES389 intervals.

[5] Extended TranSynd or TES295/TES668 fluid and filter change intervals are only allowed with Allison High-Capacity filters.

[6] For normal and heavy operating conditions using oil approved for extended drains.

[7] Refer to "Spicer Driveshafts Service Manual DSSM0100".

12 BRAKE & AIR SYSTEM																	
1	Check correct functioning of the adjuster, check smooth operation of caliper over its full range of movement, check the adjuster cap condition, check sealing elements, check caliper running clearance, check condition of the guide pin covers at every pad replacements or once a year whichever comes first		12														
2	ABS & Electronic Stability Control systems – check proper functioning		12														★
3	Air tanks – drain water from all tanks		6		●												
4	Brake pads & discs – check wear				●												
5	Accessories air filter – change filter element	2	24					●									
6	Air dryer – change cartridge	13	24					●									
13 WHEELS, HUBS & TIRES																	
1	Unitized hub bearing, front and tag axle – inspect, check end play	8	12			●											★
2	Meritor drive axle bearing – check end play	17	12					●									
3	ZF Drive axle – check compact bearing axial play	17	12					●									★
4	ZF Drive axle – change grease in compact bearing	17	72												●		J ★
14 STEERING																	
1	**I-beam**: Tie rod – perform "Tie Rod Inspection Procedure" (tube, ball joint, fine adjustment sleeve, corrosion)	5	12														
2	**I-beam**: Steering damper cylinder – grease one fitting at rod end	9	6	●													P
3	**ALL:** Drag link end ball joints – inspect for corrosion	3	12														
4	**IFS** [8]: Steering knuckle (king) pins – grease fitting on top & bottom		6	●													P
5	**IFS**: Tie rod ends – grease fitting		6	●													P
6	**IFS**: Drag link ends – clean and grease two fittings at each end		6	●													P
7	**IFS**: Idler arm – grease fitting		6	●													P
8	**IFS**: Bell crank – grease fitting		6	●													P
9	**IFS**: Relay rod ends – grease one fitting at each end		6	●													P
10	**IFS**: Steering knuckle (king) pins – check play	8	6			●											
11	**ALL**: Power steering reservoir filter element – change	23	12														
12	**ALL**: Power steering fluid – check fluid condition (color) through visual inspection and change if required. Check level, add if necessary	23	12					●									D
13	**ALL**: Steering system – check play	7	12										●				
16 SUSPENSION																	
1	IFS [7] upper a-arm ball joint – grease fittings		6	●													Q
18 BODY																	
1	Structure inspection for corrosion – Perform MI15-18 every 5 years for normal duty vehicles and normal environment operation																
2	Structure inspection for corrosion – Perform MI15-18, every 2 years starting from the 5th year in service for severe duty vehicles and harsh environment operation																
22 HEATING & AIR CONDITIONING																	
1	Evaporator compartment & driver's HVAC units – clean heater core with low air pressure		12														
2	Evaporator compartment & driver's HVAC units – clean evaporator core with low air pressure		12														
3	Condenser compartment & driver's HVAC units – clean condenser core with low air pressure		12														
4	A/C compressor – check oil level and color, add if necessary	44	12														F
5	A/C compressor – change oil, clean oil filter and magnetic plug	44	36														F ★
6	A/C compressor – empty shaft seal oil collection tube	44	1														
7	A/C receiver tank – check refrigerant level, add if necessary	42	6	●													

[8] IFS=Independent Front Suspension

8	Filter dryer unit – check refrigerant moisture indicator, change filter dryer unit according to moisture indicator	43	6	●														
9	Passenger's unit 2-part air filter – clean or change	45	6		●													
10	**X3 Series only**. Evaporator compartment door fresh air intake filter – clean or change		6		●													
11	Parcel rack fans air filter – clean or change	47	6		●													
12	Driver's HVAC unit return air filter – clean or change	41	6		●													
23 ACCESSORIES																		
1	AFSS extinguisher tank – have the fire extinguisher rebuilt by a qualified fire protection equipment company familiar with the extinguisher used		72															
2	AFSS extinguisher tank – have the fire extinguisher cylinder hydrostatically tested by a qualified fire protection equipment company		144															

3.1 COACHES LUBRICATION AND SERVICING SCHEDULE CHANGE LOG

	CHANGE LOG - LUBRICATION AND SERVICING SCHEDULE	DATE
1	ADDED: 11 REAR AXLES – Lubrication intervals for ZF drive axle. 13 REAR AXLES – ZF drive axle compact bearing maintenance	Apr.26, 2016
2	ADDED: 14 STEERING – Steering system play inspection	Aug.18, 2016
3	REMOVED: 06 ELECTRICAL – HD10 Bosch alternators brushes inspection & replacement	Nov.10, 2016
4	UPDATE: 01 ENGINE – Engine oil & filter change interval extended if using appropriate oil	Dec.15, 2016
5	REMOVED: 05 COOLING – Coolant filter – change at every engine oil change (…with Fully Formulated Coolant)	Dec.15, 2016
6	REMOVED: 05 COOLING – Cooling system – drain, flush & refill (fully formulated coolant)	Dec.15, 2016
7	UPDATE: 01 ENGINE – Drive belt tensioners & idlers – check for noisy bearings, play, bushing play, was 300 000 mi, changed to 3 months	June 7, 2017
8	ADDED: 01 ENGINE – Drive belt tensioners & idlers – change proactively	June 7, 2017
9	UPDATE: 06 ELECTRICAL – HD10 Bosch alternators drive belt – inspection, was 12 months, changed to 3 months	June 7, 2017
10	UPDATE: 14 STEERING – Power steering fluid drain, was 50 000 mi, changed to “check condition at 100 000 mi”	Nov.15, 2017
11	UPDATE: 14 STEERING – Power steering reservoir filter element change, was 50 000 mi/12 months, changed to 12 months	Nov.15, 2017
12	UPDATE: 22 HEATING & AIR CONDITIONING – change oil, clean oil filter – recommended servicing changed to a formal servicing	Nov.15, 2017
13	REMOVED: 05 COOLING – Radiator fan gearbox oil check/drain & drive belt check	April 9, 2018
14	ADDED: 05 COOLING – Coolant filter housing shut-off valve – rotate valve handle and grease spindle	April 9, 2018
15	REMOVED: 07 TRANSMISSION – I-Shift transmission regular drains	April 9, 2018
16	REMOVED: 14 STEERING – I-Beam: tie rod end ball joints – inspect for corrosion	June 5, 2019
17	REMOVED: 14 STEERING – I-Beam: tie rod end– clean & grease one fitting at each end	June 5, 2019
18	ADDED: 14 STEERING – Perform tie rod inspection procedure	June 5, 2019
18	REMOVED: 14 STEERING – I-Beam: tie rod end– clean & grease one fitting at each end	June 5, 2019
19	REMOVED: 01 ENGINE – Regular drains C	May 28, 2020
20	ADDED: 06 ELECTRICAL – Alternators – remove belts, check for noisy bearings, bearing play	Sept 28, 2022
21	ADDED: 01 ENGINE – New Economy operating condition	June 01,2023
22	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF pump filter – operating conditions added, and intervals increased	June 01,2023
23	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF tank – drain, clean… – operating conditions added, and intervals increased	June 01,2023
24	REMOVED: 04 EXHAUST AND AFTERTREATMENT SYSTEM – Aftertreatment Hydrocarbon Injector (AHI) nozzle – change (4 500 hrs.)	June 01,2023
25	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DPF filter – either clean … – operating conditions added, and intervals increased	June 01,2023
26	ADDED: 07 TRANSMISSION – Operating condition added for I-Shift	June 01,2023

4 SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE OF THE VEHICLES

Use this list of specialty tools in conjunction with the LUBRICATION AND SERVICING SCHEDULE

SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE				
	MAINTENANCE DESCRIPTION	TOOL #	SPECIALITY TOOL DESCRIPTION	PART #
01 ENGINE				
drive belts and idlers		1	belt tensioner wrench	010032
valves & injectors		2	engine cranking adapter	88840317
		3	feeler gauge 2.45-2.55	88880052
		4	feeler gauge set	85111377
		5	setting tool 3.20, 3.85	88800232
03 FUEL				
Davco Fuel Pro system		6	collar spanner wrench	530224
04 EXHAUST AND AFTERTREATMENT SYSTEM				
DPF filter – either clean or change		7	DPF removal tool	680790
05 COOLING				
test coolant solution		8	refractometer coolant/DEF	88890105
cooling system drain, flush & refill		9	coolant extractor (optional)	85112740
		10	tube with connector (optional)	9996049
06 ELECTRICAL				
		11	none	
07 TRANSMISSION				
		12	none	
09 PROPELLER SHAFT				
		13	none	
10 FRONT AXLE				
		14	none	
11 REAR AXLE				
		15	none	
12 BRAKE & AIR SYSTEM				
ABS & Electronic Stability Control systems – check proper functioning		16	ACOM diagnostic software available free of charge	Bendix website
13 WHEEL, HUBS & TIRES				
Hub bearing, front & tag axle – inspect		17	dial indicator with magnetic base	*

	MAINTENANCE DESCRIPTION	TOOL #	SPECIALITY TOOL DESCRIPTION	PART #
ZF Drive Axle - check compact bearing axial play		18	14 mm hex drive socket	*
		19	E20 Torx socket (external)	*
		20	dial indicator with magnetic base	*
ZF Drive Axle - change grease in compact bearing		18	14 mm hex drive socket	*
		19	E20 Torx socket (external)	*
		21	spanner wrench 5870 401 146	N67817-21
		22	lifting bracket 5870 281 043	19400451
		23	driver 5870 050 007	19400449
		24	handle 5870 260 004	N67817-19
		25	driver 5870 051 053	N67817-16
		26	seal installer 5870 651 085	19400265
		27	pry bar 5870 345 071	N78017-20
14 STEERING				
		28	none	
16 SUSPENSION				
		29	none	
18 BODY				
		30	none	
22 HEATING & AIR CONDITIONING				
A/C compressor – change oil, clean oil filter		31	Refrigerant recovery unit	
Lang electromagnetic clutch – removal tool		32	Puller	680888

*: Common tool. Contact your local tool supplier

5 LUBRICATION AND SERVICING SCHEDULE - MOTORHOMES

LUBRICATION AND SERVICING SCHEDULE H3-45 VIP & X3-45 VIP MOTORHOMES (Private Use) A red stripe in the left margin of the schedule highlights the latest changes	ITEM	EVERY (months)	LUBRICANT / FLUID [9]
GENERAL			
All flexible hoses **–** inspect		12	
H3 VIP Series only: Main power compartment fan air filter – inspect		12	
01 ENGINE			
Engine oil and filters – change	24	12	A B
Air cleaner – change filter element	30	24	
Engine mounted alternators & house alternator(s) – change drive belts and intermediary drive belts		24	
Drive belts (all) – check tension, inspect for cracks or frayed material, change belt that display obvious wear or defects		12	
Drive belts (all) – change		24	
Drive belt tensioners & idlers (water pump, A/C compressor, alternators) – remove belts, check for noisy bearings, play, bushing play		3	
Valves and injectors – initial adjustment: after 2 500 hours or 36 months whichever occurs first	24	36	
Valves and injectors – check and adjust: every 5 000 hours or 72 months whichever occurs first	24	72	
03 FUEL			
Primary fuel filter & secondary fuel filter – change at every engine oil change	21, 22		
04 EXHAUST AND AFTERTREATMENT SYSTEM			
DPF filter – either clean or change filter cartridge after 10 000 hours	33		
DEF tank – drain and clean with water, clean filler neck strainer	32	36	
Diffuser assembly, rain cap & drain tube – check proper functioning, clean	34	24	
DEF pump – change filter element	32	36	
05 COOLING			
Coolant surge tank – test coolant solution	27	12	
Coolant filter housing shut-off valve – rotate the handle periodically to keep the spindle rotation smooth & free. Apply fresh grease on the spindle if needed	28	12	P
Coolant filter – change (Long-Life filter with Extended Life Coolant)	28	12	
Cooling system – drain, flush & refill (with Extended Life Coolant)	27	96	E
06 ELECTRICAL			
Alternators – remove belts, check for noisy bearings, bearing play		3	
Battery terminals – clean and coat terminals		12	
Power cables inspection – Perform MI15-24		24	
07 TRANSMISSION [10]			
Filled with TES389 approved fluid, with **Prognostics mode disabled** – see TABLE 1 in *Section 07: Transmission* for fluid and filter change	20		M

[9] See paragraph 6.0 of this section for lubricant specifications.
[10] In the absence of a fluid analysis program, the fluid change interval listed in Table 1, Table 1 & Table 3 should be used. Change filters according to Table 1, Table 2 & Table 3 even if a fluid analysis shows that the fluid doesn't need to be changed.

LUBRICATION AND SERVICING SCHEDULE H3-45 VIP & X3-45 VIP MOTORHOMES (Private Use) A red stripe in the left margin of the schedule highlights the latest changes	ITEM	EVERY (months)	LUBRICANT / FLUID [9]
Filled with TranSynd or TES295/TES668 approved fluid only, no mixture[11], with **Prognostics mode disabled** – See TABLE 2 in *Section 07: Transmission* for fluid and filter change	20		L
Filled with TranSynd or TES295/TES668 approved fluid only, no mixture with **Prognostics mode enabled** [12] - Change fluid & filters when indicated by TRANSMISSION SERVICE indicator or 60 months whichever occurs first. In addition, change filters with every fluid change.	20	60	L
Filled with TES389 approved fluid only, no mixture with **Prognostics mode enabled** – Change fluid & filters when indicated by TRANSMISSION SERVICE indicator or 24 months whichever occurs first. In addition, change filters with every fluid change.	20	24	M
09 PROPELLER SHAFT			
Universal joint – grease on fitting on each universal joint	18	12	P
11 REAR AXLE			
Drive axle – check differential oil level, add if necessary	17	12	
Drive axle – change differential oil, clean breathers	17	12	G
Tag axle lever pivot (X3 Series only) – grease one fitting on each pivot	19	12	P
Drive axle – change differential oil, clean breathers (with full synthetic oil)	17	48	H
12 BRAKE & AIR			
Air tanks – drain water from all tanks		12	
Brake pads & discs – check wear		12	
Check correct functioning of the adjuster, check smooth operation of caliper over its full range of movement, check the adjuster cap condition, check sealing elements, check caliper running clearance, check condition of the guide pin covers at every pad replacements or once a year whichever comes first		12	
ABS & electronic stability control systems – check proper functioning		12	
Air dryer – change cartridge	13	24	
Accessories air filter – change filter element	2	48	
13 WHEELS, HUBS & TIRES			
Unitized hub bearing, front and tag axle – inspect, check end play	8	12	
14 STEERING			
Steering knuckle (king) pins – check play	8	12	
Steering knuckle (king) pins – grease fitting on top & bottom	8	12	P
Tie rod ends – clean and grease one fitting at each end		12	P
Drag link ends – clean and grease two fittings at each end		12	P
Tie rod end & drag link end ball joints – inspect for corrosion		12	
Power steering reservoir filter element – change	23	24	
Power steering fluid – check fluid condition (color) through visual inspection and change if required. Check level, add if necessary	23	12	D
Idler arm – grease fitting		12	P
Bell crank – grease fitting		12	P
Relay rod ends – grease one fitting at each end		12	P
Steering system – check play		60	

[11] When the transmission contains a mixture of fluids (defined as the quantity of non-TranSynd/non-TES295/non-TES668 fluid remaining in the transmission after a fluid change combined with the quantity of TranSynd or TES295/TES668 required to fill the transmission to the proper level), perform the fluid and filter change according to the TES389 intervals.

[12] Extended TranSynd or TES295/TES668 fluid and filter change intervals are only allowed with Allison High-Capacity filters.

LUBRICATION AND SERVICING SCHEDULE H3-45 VIP & X3-45 VIP MOTORHOMES (Private Use) A red stripe in the left margin of the schedule highlights the latest changes	ITEM	EVERY (months)	LUBRICANT / FLUID [9]
16 SUSPENSION			
Independent front suspension upper a-arm ball joint – grease fittings		12	Q
22 HEATING & AIR CONDITIONING			
A/C compressor (Bitzer) – empty shaft seal oil collection tube. Perform a visual inspection of the tube every month during the first year of commissioning, drain if necessary.	44	12	
A/C compressor (Bitzer) – check oil level and color	44	12	
A/C compressor (Bitzer) – change oil, clean oil filter and magnetic plug	44	36	F
A/C receiver tank – check refrigerant level, add if required	42	12	
Refrigerant moisture indicator – check filter dryer unit, change according to moisture indicator	43	12	
HVAC/defroster air filters – clean all filter elements	41, 45	12	

5.1 MOTORHOMES LUBRICATION AND SERVICING SCHEDULE CHANGE LOG

	CHANGE LOG - LUBRICATION AND SERVICING SCHEDULE	DATE
1	ADDED: 04 EXHAUST & AFTERTREATMENT SYSTEM - Diffuser assembly, rain cap & drain tube – check proper functioning, clean	Sept.04, 2014
2	UPDATE: 05 COOLING – Cooling system with extended life coolant, drain flush & refill, was 48 months, changed to 96 months	Jan.08, 2015
3	ADDED: 06 ELECTRICAL – Power cables inspection	May 27, 2015
4	ADDED: 04 EXHAUST AND AFTERTREATMENT SYSTEM – AHI nozzle replacement	Aug.12, 2015
5	ADDED: 14 STEERING – Steering system play inspection	Aug.18, 2016
6	UPDATE: 14 STEERING – Steering system play inspection, was 48 months, changed to 60 months	Sept.18, 2016
7	REMOVED: 06 ELECTRICAL –HD10 Bosch alternators brushes inspection & replacement	Nov.10, 2016
8	UPDATE: 14 STEERING – Power steering fluid drain, changed to “check condition”	Nov.15, 2017
9	UPDATE: 14 STEERING – Power steering reservoir filter element change, was 12 months, changed to 24 months	Nov.15, 2017
10	ADDED: 22 HEATING & AIR CONDITIONING – check oil level, change oil, clean oil filter and magnetic plug	Nov.15, 2017
11	REMOVED: 05 COOLING – Radiator fan gearbox oil check/drain & drive belt check	April 9, 2018
12	ADDED: 05 COOLING – Coolant filter housing shut-off valve – Rotate valve handle and grease spindle	April 9, 2018
13	REMOVED: 01 ENGINE – Fluid/lubricant C	May 28, 2020
14	UPDATE: 22 HEATING & AIR CONDITIONING – empty shaft seal oil collection tube, was 1 month, changed to 12 months	Feb 17, 2022
15	ADDED: 06 ELECTRICAL – Alternators – remove belts, check for noisy bearings, bearing play	Sept 28, 2022
16	ADDED: 01 ENGINE – Drive belt tensioners & idlers (water pump, A/C compressor, alternators) – remove belts, check for noisy bearings, play, bushing play	Sept 28, 2022
17	REMOVED: 04 EXHAUST AND AFTERTREATMENT SYSTEM – Aftertreatment Hydrocarbon Injector (AHI) nozzle – change (4 500 hrs.)	June 01,2023
18	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DPF filter – either clean or change … , was 4 500 hours, changed to 10 000 hours	June 16, 2023
19	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF tank – drain, clean with water, clean…, was 12 months, changed to 36 months	June 16, 2023

6 FLUIDS AND LUBRICANTS SPECIFICATIONS

Coaches Schedule	FLUIDS & LUBRICANTS TABLE		Motorhomes Schedule
REF	**SYSTEMS**	**DESCRIPTIONS / SPECIFICATIONS**	
A	Engine Oil	Extended drains A	Volvo Premium Motor Oil VDS-5 [13] (Engine D13 2020 (OBD20) and newer) or Volvo Premium Motor Oil VDS-4.5
B	Engine Oil	Extended drains B	Other Volvo Approved VDS-5 [13] oils (Engine D13 2020 (OBD20) and newer) or Other Volvo Approved VDS-4.5 oils
C	Engine Oil	---	---
D	Power Steering fluid	Automatic Transmission Fluid (ATF), Dexron-IIIF, G, H or Dexron-VI Refer to **Bosch List of lubricants TE-ML 09** for further details	
E	Engine Coolant	Extended Life Coolant (ELC) meeting Volvo specification VCS2B 50/50 concentrated antifreeze/water solution or 50/50 prediluted	
F	A/C Compressor Oil	Central HVAC system: Polyolester oil, HFC 134a compatible; Castrol SW-68 (POE) or equivalent Small HVAC system: PAG oil	
G	Meritor drive axle	**Regular drains**	Refer to Meritor technical bulletin **TP-9539 Approved Rear Drive Axle Lubricants**
H	Meritor drive axle	**Extended drains with Full Synthetic**	Refer to Meritor technical bulletin **TP-9539 Approved Rear Drive Axle Lubricants**
I	ZF Drive Axle	Transmission oil, viscosity SAE 80W-90 among ZF **Lubricant Class 12M.** Refer to ZF **List of lubricants TE-ML 12** for Class 12M approved lubricants. Take note that oil change intervals will differ when using other lubricant class	

[13] VDS-5 oil is not backward compatible. Use only with 2020 (OBD20) engines & newer

Coaches Schedule

FLUIDS & LUBRICANTS TABLE

Motorhomes Schedule

REF	SYSTEMS	DESCRIPTIONS / SPECIFICATIONS	
J	ZF Drive Axle compact bearing (hub unit)	Lithium saponified, multipurpose grease, NLGI No.2 among ZF **Grease Class 12H** Refer to ZF **List of lubricants TE-ML 12** for other approved lubricants. Take note that grease change intervals may differ when using other lubricant class	
K	---	---	
L	Allison Transmission Oil	**Extended drains**	Castrol TranSynd™ Synthetic Transmission Fluid for Allison or TES295 or TES668 approved equivalent
M	Allison Transmission Oil	**Regular drains**	Schedule1 TES389 fluids or approved equivalent
N	Volvo I-Shift Transmission	**Extended drains**	- Volvo I-Shift Transmission Fluid 75W-80 - Mobil Delvac Synthetic Transmission Oil V30 75W-80 (Factory filled) or other Volvo approved oils
O	---	---	
P	Multi Purpose Grease	Good quality lithium-based grease: NLGI No.2 Grade is suitable for most temperatures NLGI No.1 Grade is suitable for extremely low temperatures	
Q	Multi Purpose Grease	Molykote longterm 2/78 grease	

6.1 FLUIDS AND LUBRICANTS SPECIFICATIONS CHANGE LOG

	CHANGE LOG	DATE
1	Lubricant And Coolant Specifications Table – Dexron-VI removed from Ref I. Dexron-VI is no longer recommended for use in commercial on-highway transmission. Allison Service Tip #1099revS	Nov.11, 2015
2	I-Shift transmission: Castrol Syntrans Grade SAE 75W-85 synthetic oil is no longer approved for extended drains interval	Nov 25 2015
3	Added: Lubricants “I” & “J” for ZF drive axle	Apr 26 2016
4	New engine oil specification VDS-4.5 (CK-4) introduced. New oil specification compatible with former D13 engine versions	Dec 15 2016
5	Power steering fluid, Dexron VI added	Nov 15 2017
6	Removed: reference to Castrol Syntrans Grade SAE 75W-85 synthetic oil for I-Shift transmission, regular drains	Apr 9 2017
7	Removed: reference to Volvo Approved VDS-4 oils	May 28 2020
8	New engine oil specification VDS-5 (API FA-4) introduced. New oil specification not compatible with former D13 engine versions	May 28 2020
9	New engine oil in lubricant table, Volvo Premium Motor Oil VDS-5	Nov 05 2020
10	New Allison transmission oil TES668 introduced	Jan 21 2020
11	New engine coolant Volvo specification VCS2B	Feb 01 2024

1 LUBRICATION

The efficiency and life expectancy of mechanical equipment is largely dependent on 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.

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

2 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.

2.1.1 Hose 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 damaging areas. Since all machinery vibrate and move to a certain extent, clamps and ties can fatigue over time. To ensure proper support, inspect fasteners frequently and tighten or replace them as necessary.

⚠ WARNING

Personal injury and property damage may result from fire caused by leaking flammable fluids.

2.1.2 Leaks

Hoses have a limited service life. Thoroughly inspect hoses annually. Look for surface damage or indications of twisted, worn, crimped, cracked or leaking lines. Replace damaged hoses immediately.

2.1.3 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 r**eplaced** 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.

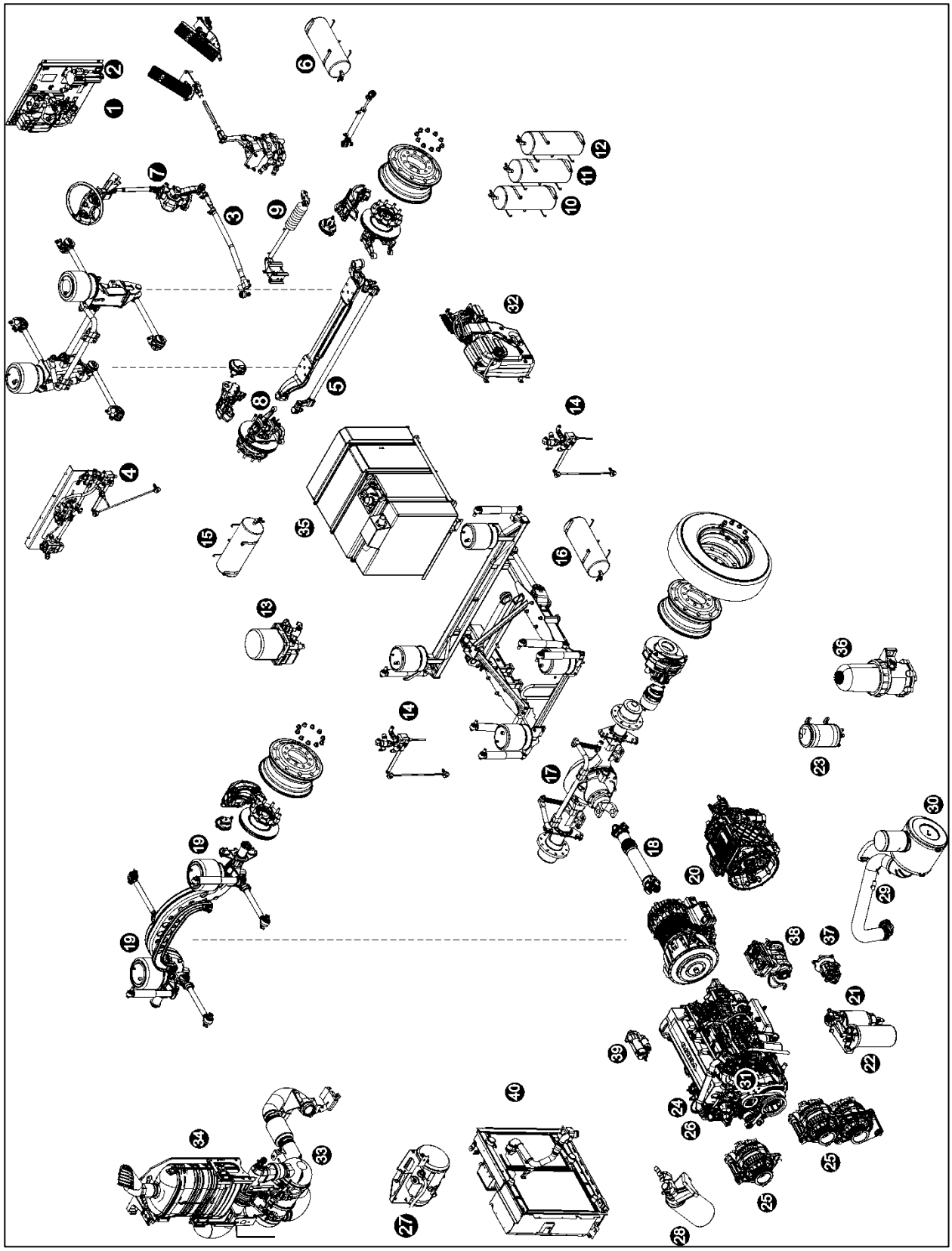

FIGURE 1: LUBRICATION AND SERVICING POINTS (I-BEAM FRONT AXLE SHOWN) TYPICAL

1 Accessories air tank drain cock
2 Accessories air filter
3 Steering drag link
4 Height control valve (front)
5 Steering tie rod
6 Accessories air tank
7 Steering column U-joints
8 Steering knuckle pins
9 Steering damper cylinder
10 Emergency / parking brake overrule tank
11 Secondary air tank
12 Kneeling air tank
13 Air dryer
14 Height control valve (rear)
15 Wet air tank
16 Primary air tank
17 Differential
18 Propeller shaft
19 Tag axle lever pivot
20 Transmission
21 Primary fuel filter
22 Secondary fuel filter
23 Power steering fluid tank
24 Engine oil filter
25 Alternators
26 Allison transmission oil dipstick
27 Engine coolant surge tank
28 Coolant filter & conditioner
29 Engine air filter restriction indicator
30 Engine air filter
31 Engine oil dipstick and filler tube
32 DEF tank
33 Diesel particulate filter
34 SCR catalytic converter
35 Diesel fuel tank
36 Davco Fuel Pro 382 fuel filter
37 Power steering pump
38 Air compressor
39 Starter
40 Cooling Assembly (Radiator & CAC)

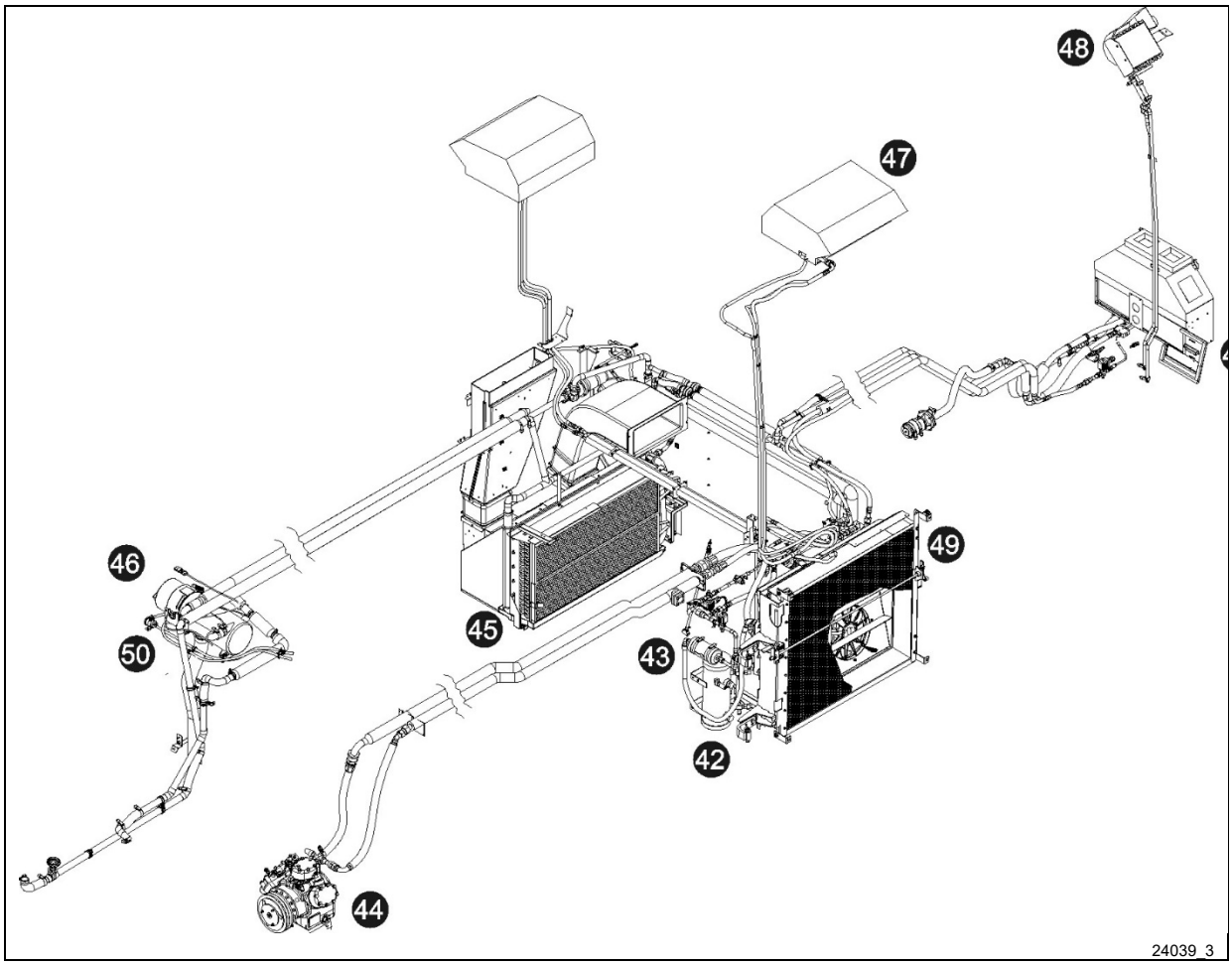

FIGURE 2: LUBRICATION AND SERVICING POINTS – HVAC UNIT

41	HVAC air filter – driver's unit	46	Coolant preheater
42	A/C receiver tank	47	A/C system – passenger's overhead console
43	Refrigerant moisture indicator	48	Upper windshield defrost unit
44	A/C compressor	49	Condenser coil
45	HVAC air filter – passenger's unit	50	Preheater fuel filter

3 LUBRICATION AND SERVICING SCHEDULE • X3-45 COMMUTER

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.

IMPORTANT NOTE
Refer to the manufacturer's documentation included in this maintenance manual for specific manufacturer's maintenance requirements.

OPERATING CONDITION		
Severe Less than 5 mpg Greater than 50 L/100 km	**Heavy** Between 5 mpg and 6 mpg Between 39 km and 50 L/100 km	**Normal** Greater than 6 mpg Less than 39 L/100 km

This schedule is based on the following Commuter typical duty:
12 hrs./day 365 days/year 12 mph

LUBRICATION AND SERVICING SCHEDULE
X3-45 Commuter

The maintenance procedures are found in their respective section of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

			PROCEED TO MAINTENANCE OPERATIONS EVERY (Proceed to maintenance operations at miles, km, months or hours whichever comes first)													
			Item	Month	6 000 mi / 9 500 km	12 000 mi / 19 500 km	18 000 mi / 29 000 km	24 000 mi / 38 500 km	30 000 mi / 48 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	150 000 mi / 240 000 km	200 000 mi / 3220000 km	250 000 mi / 400 000 km	300 000 mi / 483 000 km	Lubricant / Fluid [1]
GENERAL																
1	Flexible hoses – thoroughly inspect all hoses, tighten the hose clamps to prescribed torque			12						●						
01 ENGINE																
1	Extended drains	Engine oil & filter – change every 15 000 mi / 24 000 km	24													A
2	Drive belts (all) – visually inspect for cracks or frayed material, change belt that display obvious wear or defects				●											★
3	Drive belts (all) – change			12						●						★
4	Automatic belt tensioners & idler pulleys – Remove belts, check for noisy bearings, play, bushing play. Perform "AUTOMATIC BELT TENSIONER AND IDLER PULLEYS INSPECTION" procedure									●						★
5	Air cleaner – change filter element when indicated by the filter restriction indicator or after a maximum of two years		29 30	24												
6	Valve & injector clearance [2] – initial adjustment (2500 hrs.)			12								●				★
7	Valve & injector clearance [2] – check & adjust (5000 hrs.)			24											●	★
03 FUEL																
1	Primary & secondary fuel filters – change at every engine oil change		21 22													
04 EXHAUST AND AFTERTREATMENT SYSTEM																
1	Diffuser assembly, rain cap & drain tube – check proper functioning, clean		34					●								
2	DEF tank – clean filler neck strainer (5000 hrs.)		32											●		
3	DEF tank – drain & clean with water (5000 hrs.)		32											●		
4	DEF pump filter element – replace (5000 hrs.)		32											●		
5	Diesel Particulate Filter – either clean or replace (5000 hrs.)		33											●		★
05 COOLING																

★= Specialty tools required. You will find the SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE table and the LUBRICANTS SPECIFICATIONS table following this Lubrication and Servicing Schedule.

[1] See paragraph 5.0 FLUIDS AND LUBRICANTS SPECIFICATIONS of this section for lubricant specifications.

[2] Month interval based on normal duty cycle. On low mileage vehicles, use the mileage interval.

LUBRICATION AND SERVICING SCHEDULE
X3-45 Commuter

The maintenance procedures are found in their respective section of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

		PROCEED TO MAINTENANCE OPERATIONS EVERY													
		Proceed to maintenance operations at miles, km, months or hours whichever comes first													
		Item	Month	6 000 mi / 9 500 km	12 000 mi / 19 500 km	18 000 mi / 29 000 km	24 000 mi / 38 500 km	30 000 mi / 48 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	150 000 mi / 240 000 km	200 000 mi / 3220000 km	250 000 mi / 400 000 km	300 000 mi / 483 000 km	Lubricant / Fluid [1]
1	Coolant filter housing shutoff valve – rotate the handle periodically to keep the spindle rotation smooth	28			●										
2	Coolant surge tank – test coolant solution	27			●										★
3	Radiator – inspect exterior core & clean with low-pressure water jet if necessary	40							●						
4	Coolant filter housing shutoff valve spindle – apply fresh grease	28									●				P
5	Coolant filter – change (Long-Life Filter without additives to be used with Extended Life Coolant)	28	12								●				
6	Cooling system – drain, flush & refill (Extended Life Coolant) every 750 000 mi [3] / 1 200 000 km [3]	27	96												E ★
	06 ELECTRICAL														
1	Power cables inspection – perform Maintenance Information MI15-24							●							
2	Battery terminals – clean & coat terminals with Nyogel								●						
3	Alternators – remove belts, check for noisy bearings, bearing play				●										
	07 TRANSMISSION [4]														
1	Transmission fluid – change (6000 hrs) **Conditions:** Prognostic mode disabled + transmission filled with 100% TranSynd or TES295/TES668 synthetic fluid only (no mixture[5,6]) + using High-Capacity filters	20	48								●				L
2	Transmission Main & Lube filters – change every 75 000 mi / 120 000 km or 36 months or 3000hrs whichever comes first. **Conditions:** same as above	20	36												
	09 PROPELLER SHAFT														
1	Perform Spicer's Driveshaft "Inspection Procedures" [7]	18				●									
2	Grease one fitting on each universal joint	18	6					●							P
	10 FRONT I-BEAM AXLE														
1	Steering knuckle kingpin – grease two fittings per knuckle	8	6	●											P
2	Steering knuckle kingpin – inspect, check permissible slackness	8	6					●							
	11 REAR AXLES														
1	Tag axle lever pivot – grease one fitting on each pivot	19		●											P
2	ZF Drive axle – check differential oil level, add if necessary	17							●						I
3	ZF Drive axle – change differential oil & breather	17								●					I
	12 BRAKE & AIR SYSTEM														
1	Check correct functioning of the adjuster, check smooth operation of caliper over its full range of movement, check sealing elements, check the adjuster cap condition,														

[3] Provided an engine coolant fluid analysis is done at 600 000 miles / 965 000 km with satisfactory results

[4] In the absence of a fluid analysis program, the fluid change interval listed in Table 1, Table 2 & Table 3 should be used. Change filters according to Table 1, Table 2 & Table 3 even if a fluid analysis shows that the fluid doesn't need to be changed.

[5] When the transmission contains a mixture of fluids (defined as the quantity of non-TranSynd or non-TES295/non-TES668 fluid remaining in the transmission after a fluid change combined with the quantity of TranSynd or TES295/TES668 required to fill the transmission to the proper level), perform the fluid and filter change according to the TES389 intervals.

[6] Extended TranSynd or TES295/TES668 fluid and filter change intervals are only allowed with Allison High-Capacity filters.

[7] Refer to "Spicer Driveshafts Service Manual DSSM0100".

LUBRICATION AND SERVICING SCHEDULE
X3-45 Commuter

The maintenance procedures are found in their respective section of the maintenance manual

A red stripe in the left margin of the schedule highlights the latest changes

		PROCEED TO MAINTENANCE OPERATIONS EVERY (Proceed to maintenance operations at miles, km, months or hours whichever comes first)													
		Item	Month	6 000 mi / 9 500 km	12 000 mi / 19 500 km	18 000 mi / 29 000 km	24 000 mi / 38 500 km	30 000 mi / 48 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	150 000 mi / 240 000 km	200 000 mi / 3220000 km	250 000 mi / 400 000 km	300 000 mi / 483 000 km	Lubricant / Fluid [1]
	check caliper running clearance, check condition of the guide pin covers at every pad replacements or once a year whichever comes first														
2	Brake pads & discs – check wear				●										
3	Air tanks – drain water from all tanks				●										
4	Haldex Consep Condenser/Separator – inspect				●										
5	ABS & Electronic Stability Control systems – check proper functioning								●						★
6	Accessories air filter – change filter element	2								●					
7	Air dryer – change cartridge	13								●					
	13 WHEELS, HUBS & TIRES														
1	Unitized hub bearing, front and tag axle – inspect, check end play	8						●							★
2	ZF Drive axle – check compact bearing axial play	17						●							★
3	ZF Drive axle – change grease in compact bearing	17												●	J ★
	14 STEERING														
1	Tie rod – perform “Tie Rod Inspection Procedure” (tube, ball joint, fine adjustment sleeve, corrosion)	5							●						
2	Steering damper cylinder – grease one fitting at rod end	9		●											P
3	Power steering fluid – check fluid condition (color) through visual inspection and change if required. Check level, add if necessary	23						●							D
4	Drag link end – inspect for corrosion	3,5							●						
5	Power steering reservoir filter element – change	23							●						
6	Steering system – check play	7								●					
	16 SUSPENSION														
1	Air springs – inspect			●											
	18 BODY														
1	Front bumper and exterior compartment doors latch – grease fittings								●						P
	22 HEATING & AIR CONDITIONING														
1	Passengers HVAC unit disposable return air filters (2) – change	45		●											
2	Evaporator compartment door fresh air intake filter – clean or change	45		●											
3	Parcel rack fans air filter – clean or change	47		●											
4	Driver HVAC unit return air filter – clean or change	41		●											
5	A/C compressor – check oil level and color	44		●											F ★
6	A/C compressor – empty shaft seal oil collection tube	44		●											
7	A/C receiver tank – check refrigerant level, add if necessary	42			●										
8	Filter dryer unit – check refrigerant moisture indicator, change filter dryer unit according to moisture indicator	43							●						
9	Evaporator compartment & driver’s HVAC units – clean heater core with low air pressure									●					
10	Evaporator compartment & driver’s HVAC units – clean evaporator core with low air pressure	44								●					

LUBRICATION AND SERVICING SCHEDULE X3-45 Commuter The maintenance procedures are found in their respective section of the maintenance manual A red stripe in the left margin of the schedule highlights the latest changes		PROCEED TO MAINTENANCE OPERATIONS EVERY Proceed to maintenance operations at miles, km, months or hours whichever comes first													
		Item	Month	6 000 mi / 9 500 km	12 000 mi / 19 500 km	18 000 mi / 29 000 km	24 000 mi / 38 500 km	30 000 mi / 48 000 km	50 000 mi / 80 000 km	100 000 mi / 160 000 km	150 000 mi / 240 000 km	200 000 mi / 3220000 km	250 000 mi / 400 000 km	300 000 mi / 483 000 km	Lubricant / Fluid [1]
11	Condenser compartment & driver's HVAC units – clean condenser core with low air pressure									●					
12	A/C compressor – change oil, clean oil filter and magnetic plug										●				F ★
	23 ACCESSORIES														
1	Kidde AFSS extinguisher tank – have the fire extinguisher rebuilt by a qualified fire protection equipment company familiar with the extinguisher used		72												
2	Kidde AFSS extinguisher tank – have the fire extinguisher cylinder hydrostatically tested by a qualified fire protection equipment company		144												
3	Amerex AFSS – Perform inspection and maintenance as described in Maintenance Information MI18-27														

3.1 LUBRICATION AND SERVICING SCHEDULE CHANGE LOG • X3- 45 COMMUTER

	CHANGE LOG - LUBRICATION AND SERVICING SCHEDULE	DATE
1	REMOVED: 14 STEERING – Tie rod end – clean & grease one fitting at each end	June 5, 2019
2	ADDED: 14 STEERING – Perform tie rod inspection procedure	June 5, 2019
3	REMOVED: 01 ENGINE – Fluid/lubricant B	May 28, 2020
4	REMOVED: 04 EXHAUST AND AFTERTREATMENT SYSTEM – Aftertreatment Hydrocarbon Injector (AHI) nozzle – change (4500 hrs.)	June 09, 2023
5	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF tank – clean filler neck strainer, was 2 000 hours/50 000 mi changed to 5 000 hours/250 000 mi	June 16, 2023
6	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF tank – drain & clean with water, was 4 500 hours/100 000 mi changed to 5 000 hours/250 000 mi	June 16, 2023
7	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – DEF pump filter element – replace, was 4 500 hours/100 000 mi changed to 5 000 hours/250 000 mi	June 16, 2023
8	UPDATE: 04 EXHAUST AND AFTERTREATMENT SYSTEM – Diesel Particulate Filter – either clean or replace, was 4 500 hours/250 000 mi changed to 5 000 hours/250 000 mi	June 16, 2023
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4 SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE OF THE VEHICLE • X3- 45 COMMUTER

Use this list of specialty tools in conjunction with the LUBRICATION AND SERVICING SCHEDULE

SPECIALTY TOOLS REQUIRED FOR REGULAR MAINTENANCE				
#	MAINTENANCE DESCRIPTION	TOOL #	SPECIALITY TOOLS DESCRIPTION	PART #
01 ENGINE				
2,3,4	drive belts and idlers	1	belt tensioner wrench	010032
6, 7	valves & injectors	2	engine cranking adapter	88840317
		3	feeler gage 2.45-2.55	88880052
		4	feeler gage set	85111377
		5	setting tool 3.20, 3.85	88800232
03 FUEL				
1	Davco Fuel Pro 382 system	6	collar spanner wrench	530224
04 EXHAUST AND AFTERTREATMENT SYSTEM				
6	DPF filter – either clean or change	7	DPF removal tool	680790
05 COOLING				
2	test coolant solution	8	refractometer coolant/DEF	88890105
6	cooling system drain, flush & refill	9	coolant extractor (optional)	85112740
		10	tube with connector (optional)	9996049
06 ELECTRICAL				
		11	none	
07 TRANSMISSION				
		12	none	
09 PROPELLER SHAFT				
		13	none	
10 FRONT AXLE				
		14	none	
11 REAR AXLE				
		15	none	
12 BRAKE & AIR SYSTEM				
5	ABS & Electronic Stability Control systems – check proper functioning	16	ACOM diagnostic software available free of charge	Bendix website
13 WHEEL, HUBS & TIRES				
1	Hub bearing, front & tag axle – inspect	17	dial indicator with magnetic base	*

#	MAINTENANCE DESCRIPTION	TOOL #	SPECIALITY TOOLS DESCRIPTION	PART #
2	ZF Drive Axle - check compact bearing axial play	18	14 mm hex drive socket	*
		19	E20 Torx socket (external)	*
		20	dial indicator with magnetic base	*
3	ZF Drive Axle - change grease in compact bearing	18	14 mm hex drive socket	*
		19	E20 Torx socket (external)	*
		21	spanner wrench 5870 401 146	N67817-21
		22	lifting bracket 5870 281 043	19400451
		23	driver 5870 050 007	19400449
		24	handle 5870 260 004	N67817-19
		25	driver 5870 051 053	N67817-16
		26	seal installer 5870 651 085	19400265
		27	pry bar 5870 345 071	N78017-20
14 STEERING				
		28	none	
16 SUSPENSION				
		29	none	
18 BODY				
		30	none	
22 HEATING & AIR CONDITIONING				
5	A/C compressor – change oil, clean oil filter	31	Refrigerant recovery unit	
-	Lang electromagnetic clutch – removal tool	32	Puller	680888

*: Common tools. Contact your local tool supplier

5 FLUIDS AND LUBRICANTS SPECIFICATIONS • X3- 45 COMMUTER

Back to schedule	FLUIDS & LUBRICANTS TABLE		
REF	SYSTEM	DESCRIPTIONS / SPECIFICATIONS	
A	Engine Oil	Extended drains	Filled with Volvo Approved VDS-4.5 oils - SAE Viscosity Grade: 10W-30 or Filled with Volvo Approved VDS-5 [8] oils - SAE Viscosity Grade: 5W-30
B	Engine Oil	---	---
C	---	---	---
D	Power Steering fluid	Automatic Transmission Fluid (ATF), Dexron-IIIF, G, H or Dexron-VI Refer to **Bosch List of lubricants TE-ML 09** for further details	
E	Engine Coolant	Extended Life Coolant (ELC) meeting Volvo specification VCS2B 50/50 concentrated antifreeze/water solution or 50/50 prediluted	
F	A/C Compressor Oil	Central HVAC system: Polyolester oil, HFC 134a compatible; Castrol SW-68 (POE) or equivalent	
G	---	---	
H	---	---	
I	ZF Drive Axle	Transmission oil, viscosity SAE 80W-90 among ZF **Lubricant Class 12M.** Refer to ZF **List of lubricants TE-ML 12** for Class 12M approved lubricants. Take note that oil change interval will differ when using other lubricant class	
J	ZF Drive Axle compact bearing (hub unit)	Lithium saponified, multipurpose grease, NLGI No. 2 among ZF **Grease Class 12H** Refer to ZF **List of lubricants TE-ML 12** for other approved lubricants. Take note that grease change intervals may differ when using other lubricant class	
K	---	---	

[8] VDS-5 oil is not backward compatible. Use only on 2020 engines (OBD20)

L	Allison Transmission Oil	**Extended drains**	Castrol TranSynd™ Synthetic Transmission Fluid for Allison or TES295 or TES668 approved equivalent
M	---	---	
N	---	---	
O	---	---	
P	Multi-Purpose Grease	Good quality lithium-based grease: NLGI No. 2 Grade is suitable for most temperatures NLGI No. 1 Grade is suitable for extremely low temperatures	
Q	---	---	

5.1 FLUIDS AND LUBRICANTS SPECIFICATIONS CHANGE LOG • X3- 45 COMMUTER

	CHANGE LOG – FLUIDS & LUBRICANTS	DATE
1	Removed: reference to Volvo Approved VDS-4 oils	May 28 2020
2	New Engine oil specification VDS-5 (FA-4) introduced. New oil specification not compatible with former D13 engine versions	May 28 2020
3	New Transmission oil specification TES668 introduced	Jan 21 2021
4	New engine coolant Volvo specification VCS2B	Feb 01 2024
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