

Coolant Requirements For Engine Cooling Systems



13400 Outer Drive, West, Detroit, Michigan 48239-4001
Telephone: 313-592-5000
www.demanddetroit.com

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1 Preface

1.1 Preface

Extended Life Coolants (ELC)

Extended Life Coolant (ELC) contains Organic Acid Technology (OAT) which provides corrosion protection and inhibits liner cavitation. These coolants require less maintenance over the useful life of the engine.

ELC antifreeze coolants are commercially available from Detroit™ (recommended) and other manufacturers as either concentrated or pre-mixed formulations. Concentrated antifreeze coolants should be mixed at 50% (50% antifreeze/50% water). All ELCs used must also meet Detroit 93K217 specification. Detroit™ requires that these types of coolants to be free of nitrite and phosphate. Detroit™ has found that ELCs containing nitrite may lead to a breakdown of the coolant and subsequent damage to the cooling system.

These types of coolants should not be mixed with Standard Life Coolants. If an ELC antifreeze coolant and an SLC antifreeze coolant are mixed, damage may not result, but the long-life advantages of the ELC antifreeze coolant will be lost. In this event, the coolant should be re-inhibited with OAT inhibitors and confirmed by analysis or else it must be maintained as an SLC antifreeze coolant.

Standard Life Coolant (SLC)

Standard Life Coolant (SLC) contains inhibitor salts, including nitrites, to prevent liner cavitation. These coolants require interval testing to maintain inhibitor concentration.

SLC antifreeze coolants are commercially available from Detroit™ (recommended) and other manufacturers as either concentrated or as pre-mixed antifreeze. Concentrated antifreeze coolants should be mixed at 50% (50% antifreeze/50% water). All fully formulated coolants used must also meet Detroit 93K217 specification.

NOTE:

Fully formulated antifreeze does not require a dosage of Supplemental Coolant Additive (SCA) at initial use.

Silicated Organic Acid Technology (Si-OAT)

Silicated Organic Acid technology (Si-OAT) should only be topped off with Silicated Organic Acid technology (Si-OAT) listed on DFS 93K217. Do not mix with other coolants even if they are the same color.

Concentrated antifreeze coolants should be mixed at 50% (50% antifreeze/50% water).

2 Introduction

2.1 Introduction

This publication is intended to specify the coolants, filters and maintenance intervals required for the diesel-fueled engines manufactured and marketed by Detroit™.

Selection of the properly approved coolant and filter in conjunction with mandatory coolant and filter maintenance is required to achieve optimal performance Detroit™ engines. Operating Detroit engines with unapproved coolants and filters may void the manufacturer's warranty.

NOTE:

For off-highway engine coolant requirements, refer to MTU® Technical Publication, Fluids and Lubricants, Specification, A001061/32E. This bulletin is available from authorized MTU Detroit™ distributors.

3 Coolant Fill Options

3.1 Coolant Fill Options

The coolants recommended for use in Detroit™ engines are listed in the tables below. This publication will give a complete explanation of their use.

NOTICE: Required specifications for water, Ethylene Glycol (EG), Propylene Glycol (PG), inhibitor packages, and inhibitor concentration are included in the appendix of this publication. To avoid possible engine damage from inadequate or over-concentrated coolant, this publication should be read thoroughly before replacing or topping-off coolant.

Table 1.

DD5, DD8, DD13, DD15, and DD16 Coolant Fill Options		
Engine Series	Coolant Factory Fill Options	Service Fill Options
DD5, DD8, DD13, DD15, DD16	Extended Life Coolant (ELC) - Organic Acid Technology (OAT)	Detroit Power Cool Plus or refer to 93K217 list of approved coolants at DTNAConnect.com
	Standard Life Coolant (SLC) - Conventional	Detroit Power Cool or refer to 93K217 list of approved coolants at DTNAConnect.com

Table 2.

Legacy Engine Coolant Fill Options		
Engine Series	Coolant Fill Options	Service Fill Options
Series 50, Series 55, Series 60, MBE900, MBE4000	Ethylene Glycol based antifreeze coolant + SLC corrosion inhibitors	Detroit Power Cool or refer to 93K217 list of approved coolants at DTNAConnect.com
	Propylene Glycol based antifreeze coolant + SLC corrosion inhibitors	No Detroit™ product available. Refer to 93K217 list of approved coolants at DTNAConnect.com
	Water based coolant + SLC corrosion inhibitors ¹	Deionized Water + Detroit Genuine Coolant 3000
	Ethylene Glycol based antifreeze coolant + ELC inhibitors	Detroit Power Cool Plus or refer to 93K217 list of approved coolants at DTNAConnect.com
	Propylene Glycol based antifreeze coolant + ELC inhibitors	No Detroit™ product available. Refer to 93K217 list of approved coolants at DTNAConnect.com
	Water based coolant + ELC inhibitors ¹	Deionized Water + Detroit Genuine Coolant Plus 6000

¹Water-only coolant systems offer no freeze protection and should not be used where ambient temperatures can fall to 0°C (32°F).

Table 3.

Freightliner EconicSD Coolant Fill Options		
Engine Series	Coolant Factory Fill Options	Service Fill Options
DD8	Silicated Organic Acid technology (Si-OAT)	refer to 93K217 list of approved coolants at DTNAConnect.com

Additional approved coolant products can be found on the Detroit 93K217 list at [DTNAConnect \(https://dtnacontent-dtna.prd.freightliner.com/content/public/TechLit/lubricants_fuel_coolants.html\)](https://dtnacontent-dtna.prd.freightliner.com/content/public/TechLit/lubricants_fuel_coolants.html).

4 Coolants for Detroit™ Engines

4.1 Coolants for Detroit™ Engines

The intent of this bulletin is to provide the requirements, directions, and information required to ensure cooling system protection for Detroit™ engines. These recommendations are general rules and reflect years of experience, technology research, and product development. Specific concerns not covered by this publication should be addressed to your local Detroit™ representative. The coolant used in Detroit™ engines must meet **DFS 93K217 Specification** with the following basic requirements:

- Provide an adequate heat transfer medium.
- Protect against cavitation damage to both cylinder liners and water pumps.
- Provide a corrosion/erosion-resistant environment.
- Prevent formation of scale or sludge deposits.
- Be compatible with cooling system hose and seal materials.
- Provide adequate freeze protection.

The rest of this section will describe the requirements for the proper usage of the water, antifreeze, and corrosion inhibitors. It will also describe the coolants and additives that are not recommended by Detroit™ and have been proven harmful to Detroit™ engines.

4.2 Coolants NOT Permitted

The following coolants are not to be used in Detroit™ engines:

- **Automotive/Passenger car-type coolants** must not be used in Detroit™ engines because they offer no liner pitting protection. Also, these types of coolants generally contain high levels of phosphates and silicates.
- **Methyl alcohol-based antifreeze** must not be used in Detroit™ engines because of its effects on the nonmetallic components of the cooling system and its low boiling point.
- **Methoxy propanol-based antifreeze** must not be used in Detroit™ engines because it is not compatible with fluorocarbon elastomer seals found in the cooling system.
- **Glycol-based coolants formulated for Heating/Ventilation/Air Conditioning (HVAC)** must not be used in Detroit™ engines. These coolants generally contain high levels of phosphates, which will form deposits on hot internal engine surfaces, reduce heat transfer, and cause water pump seal leaks.
- **Waterless-type coolants** must not be used.
- **Nitrite Organic Acid Technology (NOAT)** must **not** be used in Detroit™ engines because with poor maintenance components become more vulnerable.

4.3 Non-Formulated Additives NOT Permitted

The following additives should not be used in Detroit™ engines:

- **Soluble Oils:** Soluble oil additives are not approved for use in Detroit™ engine cooling systems. A small amount of oil adversely affects heat transfer. For example, a 1.25% concentration of soluble oil increases the fire deck temperature 6%. A 2.50% concentration increases the fire deck temperature 15%. The use of soluble oil additives may result in engine overheating and/or failure.
- **Chromates:** Chromate additives are not approved for use in Detroit™ engine cooling systems. Chromate additives can form chromium hydroxide, commonly called “green slime.” This, in turn, can result in engine damage due to poor heat transfer. Cooling systems operated with a chromate-inhibited coolant must be chemically cleaned with Detroit™ Genuine Coolant **Twin Pack** cooling system cleaner/conditioner (or equivalent sulfamic acid/sodium carbonate cleaner) and flushed.
- **Phosphate Inhibitors:** Phosphate has tendency to form deposits on surfaces transferring high heat which ultimately affect cooling capabilities. Phosphate deposits on water pump seals will result in coolant leakage across seal faces.

5 Maintenance

5.1 Maintenance

This section describes procedures needed to maintain the proper coolant level and concentration.

5.2 Topping Off Coolant

The coolant level should be checked daily and at each service interval. If topping off is necessary, add coolant which is identical to the initial-fill coolant. Extended Life Coolants (ELC) also known as Organic Acid Technology Coolants (OAT) should be topped-off with a coolant of the same formulation; Standard Life Coolants (SLC) also known as Conventional should also be topped-off with a coolant of the same formulation.

Silicated Organic Acid technology (Si-OAT) should only be topped off with Silicated Organic Acid technology (Si-OAT) listed on DFS 93K217. Do not mix with other coolants even if they are the same color.

5.3 Coolant Maintenance Intervals

The following tables contain the coolant maintenance intervals.

5.3.1 Extended Life Coolant Additive Maintenance Procedures

The concentration of ELC corrosion inhibitors will gradually deplete, at a much slower rate than SLC corrosion inhibitors, during normal engine operation. Corrosion inhibitor limits are established by the coolant manufacturer. Therefore Detroit™ recommends following the manufacturer's recommendations as to minimum and maximum limits.

Freeze Point Check

To best measure the quality of anti-freeze coolant, a check of the freeze point (glycol concentration), by refractometer, should be performed at each service interval to ensure anti-freeze levels are within specification. Detroit™ requires a freeze point between -31°C and -42°C (-24°F and -44°F) to guarantee optimal engine protection. The exception would be certain regions that require a freeze point of (-51°C) -60°F to protect against colder climates.

Laboratory Testing

Laboratory testing is the best practice for determining ELC coolant quality and will provide vital information regarding the engine performance. A factory coolant analysis program is available through authorized Detroit™ service outlets. To verify coolant acceptability, submit a sample for coolant analysis according to Table "Extended Life Coolant".

However, a laboratory meeting ISO 17025 requirements may be used in place of the Detroit™ Genuine Parts Program laboratory.

OAT Detection Strips

OAT Detection Strips that monitor the organic acid levels can be used to test the concentration of corrosion inhibitors in the anti-freeze coolant. Detroit™ recommends consultation with your coolant manufacturer's technical representative for proper application.

ELC Enhancers/Extenders

ELC enhancers/extenders can be used to extend the life of the coolant. These products should be added to your anti-freeze coolant when corrosion inhibitors fall below manufacturer's recommendations. Detroit™ recommends consultation with your coolant manufacturer's technical representative for proper application.

Extended Life Coolant Maintenance Intervals

Table 4.

Extended Life Coolant Maintenance Intervals (also known as OAT):					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
Series 40, 50, 60	Not Applicable	Every 100,000 miles (160,000 km) or 1 year ⁵	Every 70,000 miles (112,000 km) or 1 year ⁵	Every 50,000 miles (80,000 km) or 1 year ⁵	Refer to section "Extended Life Coolant Additive Maintenance Procedures"
MBE4000, MBE900	Not Applicable	Every 100,000 miles (160,000 km) or 1 year ⁵	Every 70,000 miles (112,000 km) or 1 year ⁵	Every 50,000 miles (80,000 km) or 1 year ⁵	
DD13	130,000 miles (210,000 km) or 1 year ⁵	110,000 miles (178,000 km) or 1 year ⁵	80,000 miles (128,000 km) or 1 year ⁵	70,000 miles (112,000 km) or 1 year ⁵	
DD15	150,000 miles (242,000 km) or 1 year ⁵	120,000 miles (194,000 km) or 1 year ⁵	90,000 miles (144,000 km) or 1 year ⁵	70,000 miles (112,000 km) or 1 year ⁵	
DD16	Not Applicable	110,000 miles (178,000 km) or 1 year ⁵	80,000 miles (128,000 km) or 1 year ⁵	70,000 miles (112,000 km) or 1 year ⁵	
1. Efficient Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 7 miles per gallon with minimal city stop-and-go operation and minimum idle.					
2. Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 6 miles per gallon with minimal city stop-and-go operation.					
3. Short Haul service applies to vehicles that annually travel up to 30,000 to 60,000 miles (48,000 to 96,000 km) and average between 5.1 and 5.9 miles per gallon.					
4. Severe service applies to vehicles that annually travel up to 30,000 miles (48,000 km) and average less than 5 miles per gallon or that operate under severe conditions. Severe service also applies to RV applications. Service applies to vehicles that annually travel up to 30,000 miles (48,000 km) or that operate under severe conditions. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 5.

Extended Life Coolant Maintenance Intervals (also known as OAT):					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD5	Not Applicable	Every 100,000 miles (160,000 km) or 1 year ⁵	Every 90,000 miles (145,000 km) or 1 year ⁵	Every 70,000 miles (113,000 km) or 1 year ⁵	Refer to section "Extended Life Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD5 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 12.0 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 10.1 and 11.9 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 6.

Extended Life Coolant Maintenance Intervals (also known as OAT):					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD8	Not Applicable	Every 120,000 miles (193,000 km) or 1 year ⁵	Every 110,000 miles (177,000 km) or 1 year ⁵	Every 72,000 miles (145,000 km) or 1 year ⁵	Refer to section "Extended Life Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD8 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 8.5 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 6.5 and 8.5 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 7.

Extended Life Coolant Drain Intervals (also known as OAT):	
Engine Series	ELC
Series 60, 50, 40	600,000 miles (965,600 km) or 4 years
MBE4000, MBE900	
DD5, DD8, DD13, DD15, DD16	

5.3.2 Standard Life Coolant Additive Maintenance Procedures

The concentrations of SLC inhibitors will gradually deplete during normal engine operation. SCAs replenish the protection for cooling system components and must be added to the cooling system on an as needed basis. Below are test procedures that will assist in determining the inhibitor concentration.

5.3.2.1 Coolant Test Procedure

3-Way Test Strips

Nitrite concentration is an indication of the overall coolant inhibitor concentration in SLC formulations. These coolants must be tested for nitrite concentration at the regular intervals as listed in Table "Standard Life Coolant". Detroit™ Genuine Fluid Analysis 3-Way Test Strips (or equivalent) are recommended. Use these test strips to measure nitrite and glycol concentrations. Cavitation/corrosion protection is indicated on the strip by the level of nitrite concentration. Freeze/boil-over protection is determined by glycol concentration.

Laboratory Testing

As an alternative to the test strips, a factory coolant analysis program is available through authorized Detroit™ service outlets. To verify coolant acceptability, submit a sample for coolant analysis according to Table "Standard Life Coolant".

Standard Life Coolant Maintenance Intervals

Table 8.

Standard Life Coolant (also known as Conventional) Maintenance Intervals:					
Service Application	Efficient	Long	Short	Severe ⁴	Action Required
Engine Series	Long Haul ¹	Haul ²	Haul ³		
Series 40, 50, 60	Not Applicable	Every 30,000 miles (48,000 km) or 1 year ⁵	Every 20,000 miles (32,000 km) or 500h, or 6 months ⁵	Every 15,000 miles (24,000 km) or 300h, or 3 months ⁵	Refer to section "Standard Life Coolant Additive Maintenance Procedures"
MBE4000, MBE900	Not Applicable	Every 30,000 miles (48,000 km) or 1 year ⁵	Every 15,000 miles (24,000 km) or 500h, or 6 months ⁵	Every 10,000 miles (16,000 km) or 300h, or 3 months ⁵	
DD13	65,000 miles (105,000 km)	55,000 miles (89,000 km) or 1 year ⁵	40,000 miles (64,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	
DD15	75,000 miles (121,000 km)	60,000 miles (97,000 km) or 1 year ⁵	45,000 miles (72,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	
DD16	Not Applicable	55,000 miles (89,000 km) or 1 year ⁵	40,000 miles (64,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	

Standard Life Coolant (also known as Conventional) Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
1. Efficient Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 7 miles per gallon with minimal city stop-and-go operation and minimum idle.					
2. Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 6 miles per gallon with minimal city stop-and-go operation.					
3. Short Haul service applies to vehicles that annually travel up to 30,000 to 60,000 miles (48,000 to 96,000 km) and average between 5.1 and 5.9 miles per gallon.					
4. Severe service applies to vehicles that annually travel up to 30,000 miles (48,000 km) and average less than 5 miles per gallon or that operate under severe conditions. Severe service also applies to RV applications. Service applies to vehicles that annually travel up to 30,000 miles (48,000 km) or that operate under severe conditions. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 9.

Standard Life Coolant (also known as Conventional) Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD5	Not Applicable	Every 50,000 miles (80,000 km) or 1 year ⁵	Every 45,000 miles (72,000 km) or 3,000 hrs, or 1 year ⁵	Every 35,000 miles (56,000 km) or 1,000 hrs, or 1 year ⁵	Refer to section "Standard Life Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD5 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 12.0 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 10.1 and 11.9 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 10.

Standard Life Coolant (also known as Conventional) Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD8	Not Applicable	Every 60,000 miles (96,000 km) or 2,000 hrs or 1 year ⁵	Every 55,000 miles (88,000 km) or 1,800 hrs, or 1 year ⁵	Every 45,000 miles (72,000 km) or 1,500 hrs, or 1 year ⁵	Refer to section "Standard Life Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD8 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 8.5 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 6.5 and 8.5 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 11.

Standard Life Coolant (also known as Conventional) Drain Intervals:	
Engine Series	SLC
Series 60, 50, 40	300,000 miles (482,800 km) or 2 years
MBE4000, MBE900	
DD5, DD8, DD13, DD15, DD16	

5.3.2.2 Supplemental Coolant Additives (SCA)

Supplemental Coolant Additive (SCA) Solutions- for Ethylene or Propylene Glycol-based Antifreeze Coolants

The coolant must be maintained with the proper concentration of corrosion inhibitors. As the concentration of inhibitors deplete, additional SCA must be added to the coolant as indicated by a nitrite concentration of 900 PPM, or less. If the nitrite concentration is greater than 900 PPM, do not add additional SCA. If the nitrite concentration is above 3200 PPM, the system is over-inhibited. The system should be partially drained and filled with a 50/50 mix of water and EG or PG.

Supplemental Coolant Additive (SCA) Solutions - for Water-based Coolants (Legacy Engines Only)

In warm climates where freeze protection is not required, water only with corrosion inhibitors is approved for use. Water-only systems need to be treated with the proper dosage of corrosion inhibitors. Detroit™ approved conventional SCA or OAT corrosion inhibitors must be added to the water to provide required corrosion and cavitation erosion protection.

Need-Release Coolant Filters (STANDARD LIFE COOLANT ONLY ¹)

Need-Release coolant filters are available for Series 50, Series 60 and pre-2016 DD series engines. Membranes in the filters release SCAs before the coolant approaches a corrosive condition, protecting the engine from corrosion. The need-release elements release the SCA charge as needed, as opposed to the maintenance SCA elements, which instantaneously release the

SCA charge. Need-release coolant filter elements should be replaced after one year or 100,000 miles (160,000 km), or 3,000 operating hours, whichever comes first.

1. Need-Release filters are not to be used with ELC type coolants. Such use will cause serious damage to the engine.

5.3.3 Silicated Organic Acid technology (Si-OAT) Coolant Additive Maintenance Procedures

Detroit™ recommends following the manufacturer's recommendations as to minimum and maximum limits.

Freeze Point Check

To best measure the quality of anti-freeze coolant, a check of the freeze point (glycol concentration), by refractometer, should be performed at each service interval to ensure anti-freeze levels are within specification. Detroit™ requires a freeze point between -31°C and -42°C (-24°F and -44°F) to guarantee optimal engine protection. The exception would be certain regions that require a freeze point of (-51°C) -60°F to protect against colder climates.

Laboratory Testing

Laboratory testing is the best practice for determining Silicated Organic Acid technology (Si-OAT) coolant quality and will provide vital information regarding the engine performance.

5.3.4 Silicated Organic Acid Technology (Si-OAT) Coolant Maintenance Intervals

Table 12.

Silicated Organic Acid Technology (Si-OAT) Coolant Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
Series 40, 50, 60	Not Applicable	Every 30,000 miles (48,000 km) or 1 year ⁵	Every 20,000 miles (32,000 km) or 500h, or 6 months ⁵	Every 15,000 miles (24,000 km) or 300h, or 3 months ⁵	Refer to section "Silicated Organic Acid technology (Si-OAT) Coolant Additive Maintenance Procedures"
MBE4000, MBE900	Not Applicable	Every 30,000 miles (48,000 km) or 1 year ⁵	Every 15,000 miles (24,000 km) or 500h, or 6 months ⁵	Every 10,000 miles (16,000 km) or 300h, or 3 months ⁵	
DD13	65,000 miles (105,000 km)	55,000 miles (89,000 km) or 1 year ⁵	40,000 miles (64,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	
DD15	75,000 miles (121,000 km)	60,000 miles (97,000 km) or 1 year ⁵	45,000 miles (72,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	
DD16	Not Applicable	55,000 miles (89,000 km) or 1 year ⁵	40,000 miles (64,000 km), 895 hours or 1 year ⁵	35,000 miles (56,000 km), 640 hours or 6 months ⁵	
1. Efficient Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 7 miles per gallon with minimal city stop-and-go operation and minimum idle.					
2. Long Haul (over-the-road transport) service applies to vehicles that annually travel more than 60,000 miles (96,000 kilometers) and average greater than 6 miles per gallon with minimal city stop-and-go operation.					
3. Short Haul service applies to vehicles that annually travel up to 30,000 to 60,000 miles (48,000 to 96,000 km) and average between 5.1 and 5.9 miles per gallon.					
4. Severe service applies to vehicles that annually travel up to 30,000 miles (48,000 km) and average less than 5 miles per gallon or that operate under severe conditions. Severe service also applies to RV applications. Service applies to vehicles that annually travel up to 30,000 miles (48,000 km) or that operate under severe conditions. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 13.

Silicated Organic Acid Technology (Si-OAT) Coolant Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD5	Not Applicable	Every 50,000 miles (80,000 km) or 1 year ⁵	Every 45,000 miles (72,000 km) or 3,000 hours or 1 year ⁵	Every 35,000 miles (56,000 km) or 1,000 hours or 1 year ⁵	Refer to section "Silicated Organic Acid technology (Si-OAT) Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD5 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 12.0 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 10.1 and 11.9 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 14.

Silicated Organic Acid Technology (Si-OAT) Coolant Maintenance Intervals:					
Service Application	Efficient Long Haul ¹	Long Haul ²	Short Haul ³	Severe ⁴	Action Required
Engine Series					
DD8	Not Applicable	Every 60,000 miles (96,000 km) or 2,000 hours or 1 year ⁵	Every 55,000 miles (88,000 km) or 1,800 hours or 1 year ⁵	Every 45,000 miles (72,000 km) or 1,500 hours or 1 year ⁵	Refer to section "Silicated Organic Acid technology (Si-OAT) Coolant Additive Maintenance Procedures"
1. Efficient Long Haul is not applicable to the DD5 engine.					
2. Long Haul service (over-the-road transport) applies to vehicles that annually travel more than 60,000 miles (96,000 km) and average greater than 8.5 miles per gallon with minimal city stop-and-go operation. Examples of Long Haul service are: regional delivery that is mostly freeway mileage, interstate transport, and any road operation with high annual mileage.					
3. Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 6.5 and 8.5 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.					
4. Severe service applies to vehicles that average below 10.0 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service.					
5. Whichever comes first.					

Table 15.

Silicated Organic Acid Technology (Si-OAT) Coolant Drain interval:	
Engine Series	Si-OAT
Series 60, 50, 40	300,000 miles (482,803 km) or 3 years
MBE4000, MBE900	
DD5, DD8, DD13, DD15, DD16	

6 Cooling System

This section includes information on the following:

- Changing coolant at the end of the coolant drain interval.
- Changing coolant types.
- Cooling system contamination.

Coolant Change

- At the end of a coolant drain interval, remove the used coolant by following the drain procedure provided in the engine service literature and re-fill with fresh coolant.
- Note that not all drain procedures for a specific application have the ability to drain all of the used coolant from the cooling system. For these applications, a drain and flush process might be needed to ensure as much used coolant is removed from the cooling system before installing new coolant. A drain and flush process includes draining as much coolant out of the system as possible and thoroughly flushing the system with de-ionized water or water that meets water requirements outlined in Appendix B, Refer to section "Water Requirements".
- When new coolant is installed, circulate the system should and use a refractometer to ensure the new coolant is not diluted with residual water from the flush process. For example, if enough residual water is in the system, use concentrated coolant to re-balance the concentration so the desired ratio for your application is reached. Circulate the system and use a refractometer to recheck the concentration. The suggested mixing ratio is 50/50 (50% antifreeze / 50% water) for regular climate or 60/40 (60% antifreeze / 40% water) for colder climates.

Changing Coolant Technologies

- Follow cooling system flushing recommendations outlined in Coolant Change section.
- To ensure there is no mixing between the old technology and new technology, full chemical analysis should be conducted.
- If possible, coordinate with your coolant supplier for additional support when changing coolant technologies.

Cooling System Contamination

- Follow cooling system flushing recommendations outlined in Coolant Change section.
- If a coolant system failure occurs that results in coolant contamination, a complete cooling system flush is required. If the contamination cannot be removed via a clean water flush, a cooling system cleaner can also be used. Please contact the DTNA Aftermarket for available cooling system cleaning products.
- If a cleaner is used, it is important to complete a chemical analysis to ensure there is no interaction between the newly installed coolant and any residual cleaner from the flush process.
- If possible, please work with the cleaner supplier for additional support when using a cooling system cleaner.

7 Appendix A - Definitions

7.1 Appendix A - Definitions

Antifreeze:

A substance that is added to the water in a vehicle's cooling system that lowers the freeze point to prevent freezing. The two most common antifreezes are ethylene glycol (EG) and propylene glycol (PG).

Coolant:

A fluid that transfers heat from the engine by circulation.

Extended Life Coolant (ELC): AKA - Long-Life Coolant or Organic Acid Technology:

These types of coolants have been formulated to extend the service interval of the coolant. Example of ELC is Power Cool Plus.

Fully Formulated:

Antifreeze that contains all the necessary inhibitors to protect a diesel engine and does not, therefore, require a pre-charge of Supplemental Coolant Additive before its first use.

Initial-Fill:

The coolant that is used in a new or rebuilt engine, or used any time the cooling system is emptied and then refilled with new coolant.

Standard Life Coolant (SLC): AKA - Fully-Formulated or Conventional Coolant:

These types of coolants use supplemental coolant additives (SCA) to protect against corrosion or mechanical wear. Example of SLC is Power Cool.

Supplemental Coolant Additive:

An additive used in a preventive maintenance program to prevent corrosion, cavitation, and the formation of deposits.

8 Appendix B - General Coolant Information

8.1 Appendix B - General Coolant Information

SLC Antifreeze Coolants

These products are available as Fully Formulated and Phosphate-Free. They are commercially available from Detroit™ (recommended) and other manufacturers as either concentrated antifreeze or as pre-mixed antifreeze. The pre-mixed antifreeze is ready to use, while the concentrated coolant must be mixed with water prior to use. All fully formulated coolants used must also meet Detroit 93K217 specification.

NOTE: Fully formulated antifreeze does not require a dosage of Supplemental Coolant Additive (SCA) at initial use.

ELC Antifreeze Coolants

EG and PG based antifreeze coolants contain Organic Acid Technology (OAT). These coolants require less maintenance over the useful life of the engine.

ELC antifreeze coolants are available as either concentrated or pre-mixed formulations. Concentrated antifreeze coolants should be mixed at 50% (50% antifreeze/50% water). **These types of coolants should not be mixed with SLCs.** If an ELC antifreeze coolant and SLC antifreeze coolants are mixed, damage may not result, but the long-life advantages of the ELC antifreeze coolant will be lost. In this event, the coolant should be re-inhibited with OAT inhibitors and confirmed by analysis or else it must be maintained as an SLC antifreeze coolant.

Water-Only Coolants (Series 50, 55 and 60 only)

In warm climates where freeze protection is not required, water only with corrosion inhibitors is approved for use. Water-only systems need to be treated with the proper dosage of corrosion inhibitors. Detroit™-approved SCA or ELC corrosion inhibitors must be added to the water to provide required corrosion and cavitation erosion protection.

Mixing Ethylene Glycol or Propylene Glycol Antifreeze and Water

It is highly recommended to use a pre-mixed 50/50 antifreeze coolant. However, if a concentrated Ethylene Glycol or Propylene Glycol antifreeze is purchased, mix the antifreeze with water meeting the required quality standards and fill the cooling system. See water requirement below for quality standards. If a pre-diluted coolant is purchased, simply fill the cooling system.

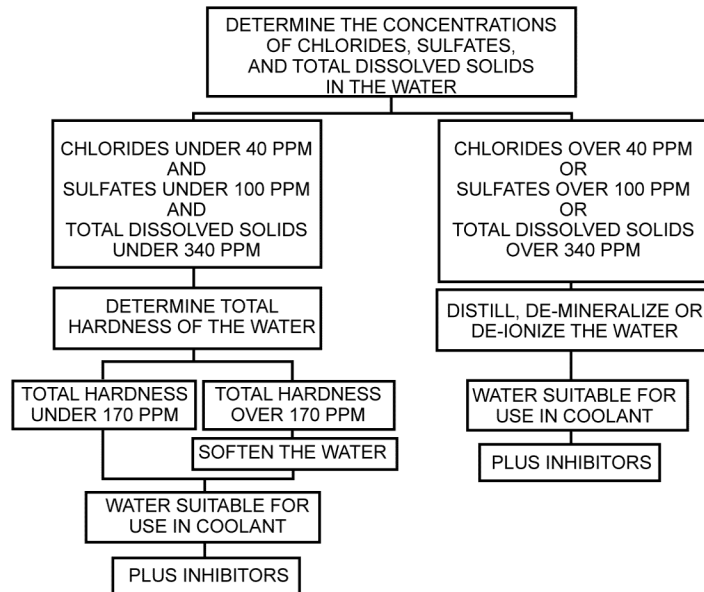
For best overall performance, a coolant consisting of 50% concentration of antifreeze (50% antifreeze, 50% water) is recommended. An antifreeze concentration of over 60% (60% antifreeze, 40% water) is **not recommended** due to poor heat transfer, reduced freeze protection, and possible silicate dropout. An antifreeze concentration below 40% (40% antifreeze, 60% water) offers too little freeze and/or corrosion protection and is **not recommended**.

WATER REQUIREMENTS

Distilled or de-ionized water, which eliminates the adverse effects of minerals in tap water, is preferred. High levels of dissolved chlorides, sulfates, magnesium, and calcium in some tap water causes scale deposits, sludge deposits and/or corrosion. These deposits have been shown to result in water pump failures and poor heat transfer, resulting in overheating. If tap water is used, the mineral content in the water must be below the maximum concentration listed in the table below.

Table 16.

Maximum Mineral Concentration in Water		
Minerals	Maximum Concentration	
	Parts per Million	Grains per Gallon
Chlorides	40	2.5
Sulfates	100	5.8
Total Dissolved Solids	340	20
Magnesium + Calcium Content	170	10



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Figure 1. Procedure To Evaluate The Quality Of Water

Recycled Antifreeze

Antifreeze coolant made with ethylene or propylene glycol recycled by reverse osmosis, distillation, and ion exchange and properly re-inhibited to meet ASTM D6471 or D6472 requirements has been demonstrated to provide service equivalent to virgin antifreeze. Recycled antifreeze coolants of these types are preferred. However, suppliers of these recycled glycols must provide evidence the product is free of contaminants listed below:

- Acetates
- Acetone
- Ammonia
- Boron
- Ethanol
- Formates
- Glycolates
- Ketones
- Nitrate
- Nitrite
- Phenols
- Phosphorus
- Silicon
- Toluene

Other recycled coolants, especially coolants recycled through filtration processes, are **not recommended**.

9 Appendix C - Detroit™ Cooling System Maintenance Products

9.1 Appendix C - Detroit™ Cooling System Maintenance Products

Table 17.

Detroit™ Extended Life Coolant (Ethylene Glycol-based)		
Coolant Type	Part Number	Description
Concentrate	OWI 23539616	One Gallon Jug - 4 Per Case (Canada)
	OWI 23519397	One Gallon Jug- 6 Per Case
	OWI 23519394	55-Gallon Drum
Pre-Diluted (50:50)	OWI 2359617	One Gallon Jug - 4 Per Case (Canada)
	OWI 23519396	One Gallon Jug - 6 Per Case
	OWI 23519398	55-Gallon Drum
	OWI 2359084	275-Gallon Tote (Canada)

Table 18.

Detroit Genuine Coolant Plus Extender (for use with Detroit Genuine Coolant Plus)		
Coolant Type	Part Number	Description
IEG Detroit™ Genuine Coolant; Series 50 and Series 60	OWI 23519400	One Quart Bottle - 6 Per Case

Table 19.

Detroit™ Standard Life Coolant (Ethylene Glycol-based)		
Coolant Type	Part Number	Description
Concentrate	OWI 23539622	One Gallon Jug - 4 Per Case (Canada)
	OWI 23512138	One Gallon Jug - 6 Per Case
	OWI 23512139	55-Gallon Drum
	OWI 23513503	Bulk Delivery - 1000 Gallon min.
Pre-Diluted (50:50)	OWI 23539623	One Gallon Jug - 4 Per Case (Canada)
	OWI 23528203	One Gallon Jug - 6 Per Case
	OWI 23518918	55-Gallon Drum
	OWI 23538603	275-Gallon Tote

Table 20.

Detroit™ Genuine Coolant 2000 Supplemental Coolant Additives (SCA)		
Coolant Type	Part Number	Description
IEG Detroit™ Genuine Coolant	PIC 23507858	Pint Bottle - 12 Per Case
	PIC 23507860	5-Gallon Pail
	PIC 23507861	55-Gallon Drum

Table 21.

Detroit™ Genuine Coolant 3000 SCAs		
Coolant Type	Part Number	Description
IEG Detroit™ Genuine Coolant	PIC 23507854	Pint Bottle - 12 Per Case
	PIC 23507855	Half Gallon Jugs - 6 Per Case
	PIC 23507856	5-Gallon Pail
	PIC 23507857	55-Gallon Drum

Table 22.

Detroit Genuine Coolant 3000 SCA Filters (Series 50 and Series 60 Engines Only)		
Coolant Type	Part Number	Description
IEG Detroit™ Genuine Coolant	23507545	4 Ounce (1 Pint Equivalent)
	23508425	8 Ounce (2 Pint Equivalent)
	23508426	12 Ounce (3 Pint Equivalent)
	23507189	16 Ounce (4 Pint Equivalent)
	23508427	32 Ounce (8 Pint Equivalent)
	23508428	53 Ounce (13 Pint Equivalent)

Table 23.

Detroit Genuine Coolant Cooling System Cleaners		
Coolant Type	Part Number	Description
All Types	PIC 201549	Twin pack - 2 Per Case
Standard Life Coolant Only	PIC 200164	One-Half Gallon Jug - 6 Per Case
	PIC 200105	5-Gallon Pail
	PIC 200155	55-Gallon Drum

Table 24.

Detroit Genuine Fluid Analysis Products		
Coolant Type	Part Number	Description
Standard Life Coolant	DDE 23516921	U.S. SLC Test Kit
Extended Life Coolant	DDE 23539088	U.S. ELC Test Kit