

DEF INLINE FILTER SERVICE MANUAL (GEN 2)

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VERSION HISTORY

Version	Implemented By	Revision Date	Reason
A	C. Thomas	16-March-18	Initial release
B	C. Thomas	18-June-18	Fig 2, 5, 6, 7: Latest images; 2.1.1: Protrusion precaution; 2.1.2: Opposite flow mounting; 3.1: Hot surface/fluid precaution
C	C. Thomas	18-June-18	Table 1: Heated description; 1.3.1: Non-polarity of heater wires
D	C. Thomas	26-June-18	Fig 5: Mounting surface note; 2.1.2: Mounting bracket surface

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1 INTRODUCTION

1.1 Purpose of Service Manual

This service manual informs Shaw Development customers of the procedure for installing and servicing the DEF Inline Filter (Relevant Shaw part numbers are shown in Table 1.). This procedure provides the necessary steps and precautions for installing the DEF Inline Filter assembly as well as replacing the filter cartridge when required.

1.2 Definitions and Notes

- NOTE: [Warnings () and Notes (NOTE)] – These adjuncts are used throughout the document to highlight/emphasize important items for consideration.
- NOTE: All weights and measurements are in US units and their standard Metric conversions are enclosed in parentheses.
- NOTE: Images are for reference only. Actual DEF Inline Filter assembly and features may vary.
- NOTE: The DEF Inline Filter Assembly in its entirety and the DEF Inline Filter cartridge subassembly component are the only replaceable items of this product. No other DEF Inline Filter component, feature, etc., is replaceable.

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1.3 Applicable Part Numbers, Assemblies and/or Applications

This section outlines the features, components and configurations of the DEF Inline Filter assembly. Figures 1 and 2 identify its external features.

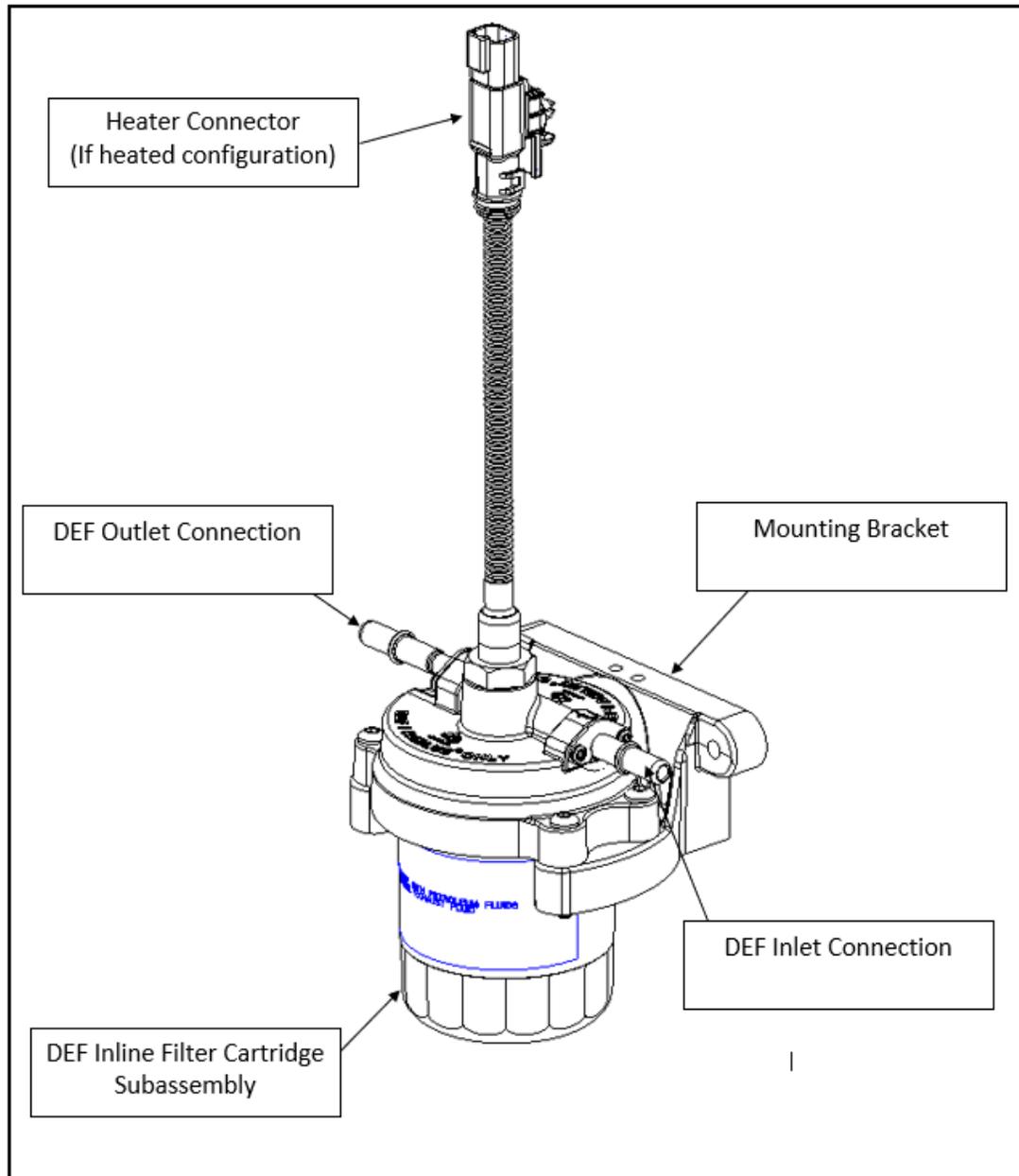


Figure 1: DEF Inline Filter Assembly with heater

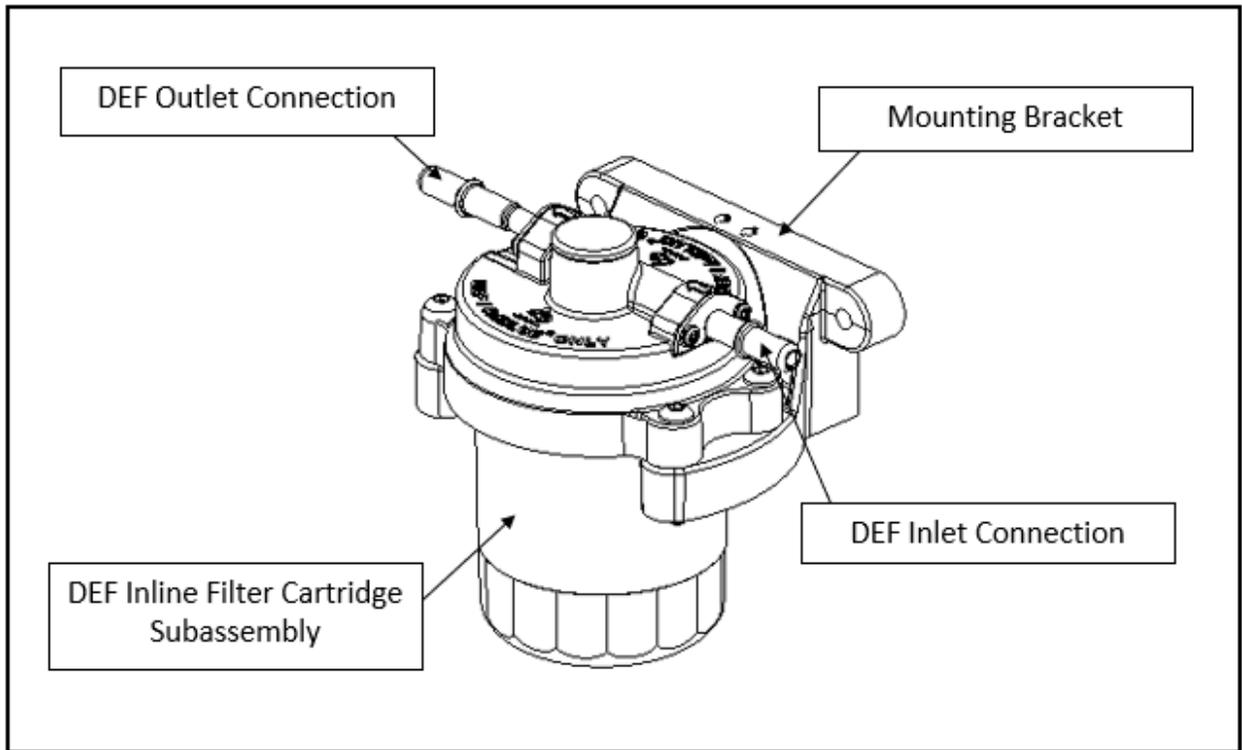


Figure 2: DEF In-line Filter Assembly without heater

Table 1

	Source	Document No.	Title/Description
1	Shaw	DF2-404-24FD-6610	Inline Filter, DEF, Heated, 40 μ (contains a heater element and two 3/8" quick connectors per SAE J2044 on the DEF Inline Filter mounting base)
2	Shaw	DF2-404-0000-6610	Inline Filter, DEF, Non-Heated, 40 μ (contains two 3/8" quick connectors per SAE J2044 on the DEF Inline Filter mounting base and no heater element)
3	Shaw	DF2-404-24FD-5510	Inline Filter, DEF, Heated, 40 μ (contains a heater element and two 5/16" quick connectors per SAE J2044 on the DEF Inline Filter mounting base)
4	Shaw	DF2-404-0000-5510	Inline Filter, DEF, Non-Heated, 40 μ (contains two 5/16" quick connectors per SAE J2044 on the DEF Inline Filter mounting base and no heater element)
5	Shaw	DF2-204-24FD-6610	Inline Filter, DEF, Heated, 20 μ (contains a heater element and two 3/8" quick connectors per SAE J2044 on the DEF Inline Filter mounting base)
6	Shaw	DF2-204-0000-6610	Inline Filter, DEF, Non-Heated, 20 μ (contains two 3/8" quick connectors per SAE J2044 on the DEF Inline Filter mounting base and no heater element)
7	Shaw	DF2-204-24FD-5510	Inline Filter, DEF, Heated, 20 μ (contains a heater element and two 5/16" quick connectors per SAE J2044 on the DEF Inline Filter mounting base)
8	Shaw	DF2-204-0000-5510	Inline Filter, DEF, Non-Heated, 20 μ (contains two 5/16" quick connectors per SAE J2044 on the DEF Inline Filter mounting base and no heater element)

The DEF inlet line connects the DEF tank to the DEF Inline Filter. The DEF outlet line connects the DEF Inline Filter to the DEF supply module (pump).

For detailed descriptions regarding a specific DEF Inline Filter assembly model, refer to the part drawing.

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For the purposes of this manual, the DEF Inline Filter assembly consists of two components:

- DEF Inline Filter mounting base
- DEF Inline Filter cartridge subassembly

1.3.1 DEF Inline Filter Assembly DF2-X04-24FD-XX10

These models of the DEF Inline Filter contain a heater element on the mounting base. Refer to Figure 1. The heater is the electrical feature of the DEF Inline Filter responsible for preventing DEF from freezing, as well as thawing frozen DEF.

The power circuit must be capable of 15 amps steady state current with inrushes of up to 30 amps. It is recommended to use 16 AWG with appropriate fusing. It must not share its power circuit with unsuppressed inductive loads.

⚠ Relay coils and DC motors (fans) on the same power circuit should be avoided.

The DEF Inline Filter heater utilizes a Deutsch DT04-2P connector with nickel plated terminals. The mating connector is the **Deutsch DT06-2S connector, which is not included** in the DEF Inline Filter assembly. Refer to Figure 3 for the DEF Inline Filter heater connector and its respective mating connector.

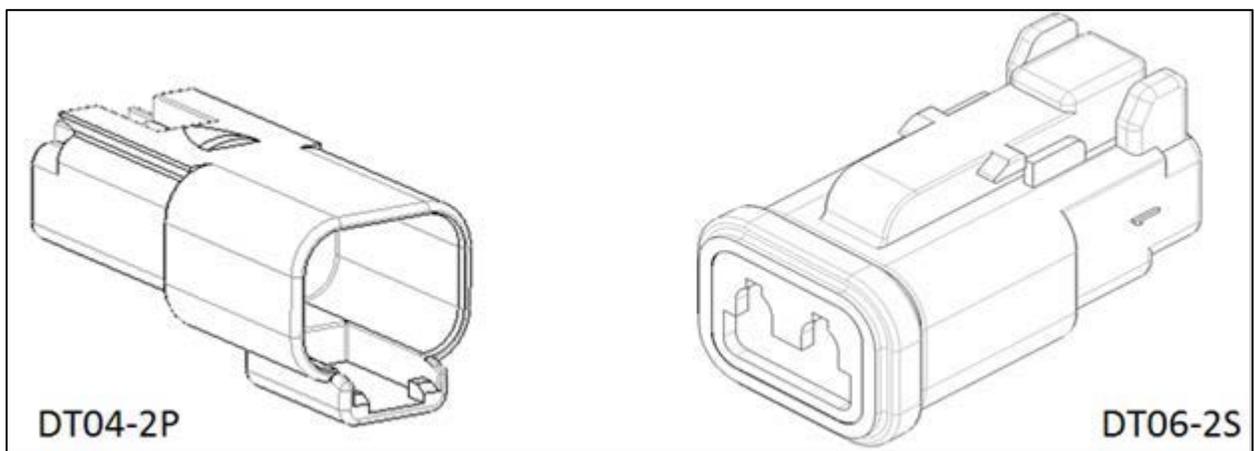


Figure 3: DEF Inline Filter heater connectors

Note that the heater wires have no polarity requirement.

1.3.2 DEF Inline Filter Assembly DF2-X04-0000-XX10

These models of the DEF Inline Filter do not contain a heater. Refer to Figure 2.

1.3.3 DEF Inline Filter Cartridge Subassembly

The DEF Inline Filter cartridge subassembly is a replaceable item. In the event of damage to the filter cartridge, the complete cartridge subassembly must be replaced. For instructions on removing and installing the cartridge subassembly, refer to section 3.1.

1.4 Required Tools and Equipment

An 80 mm 15-flute cap filter wrench is required to torque the filter bowl. In addition, an appropriately sized wrench will be needed to torque the 1/4 inch (or M6) fasteners through the mounting bracket.

1.5 Applicable Documents and Drawings

Table 3

	Source	Document No.	Title/Description
1	Shaw	DF2_NUMBER_CHART	Inline Filter, DEF
2	Shaw	DFC2_NUMBER_CHART	Filter Cartridge Replacement

2 PROCEDURE

Prior to starting work, read this bulletin completely and ensure that all equipment and parts are available.

2.1 DEF Inline Filter Assembly Installation

The following sections provide the steps for mounting and installation of the DEF Inline Filter assembly.

2.1.1 Precautions

When mounting the DEF Inline Filter Assembly onto a vehicle, the following criteria should be met to prevent potential damage or impaired functionality to the DEF Inline Filter assembly:

-  *DO NOT mount DEF Inline Filter Assembly in areas that are prone to flying debris or exposed to high temperatures as this may damage the DEF Inline Filter.*
-  *To prevent damage or injury to objects or persons, DO NOT mount DEF Inline Filter Assembly such that it protrudes externally from the vehicle.*
-  *Ensure that the mounting surface and surrounding environment are compatible with intermittent exposure to DEF.*

- ⚠️ *Ensure that the DEF Inline Filter Assembly is not a step point.*
- ⚠️ *DO NOT use the DEF Inline Filter as a handle.*
- ⚠️ *Protect the DEF Inline Filter Assembly from damage during handling or storage in the customer's assembly facility and when installing the device onto equipment.*

NOTE: Follow SCR/Emissions guidelines for proper DEF hose routing.

2.1.2 Mounting Guidelines

The Shaw DEF Inline Filter assembly is intended to be mounted between the DEF tank assembly and the DEF supply module (pump). Refer to Figure 4.

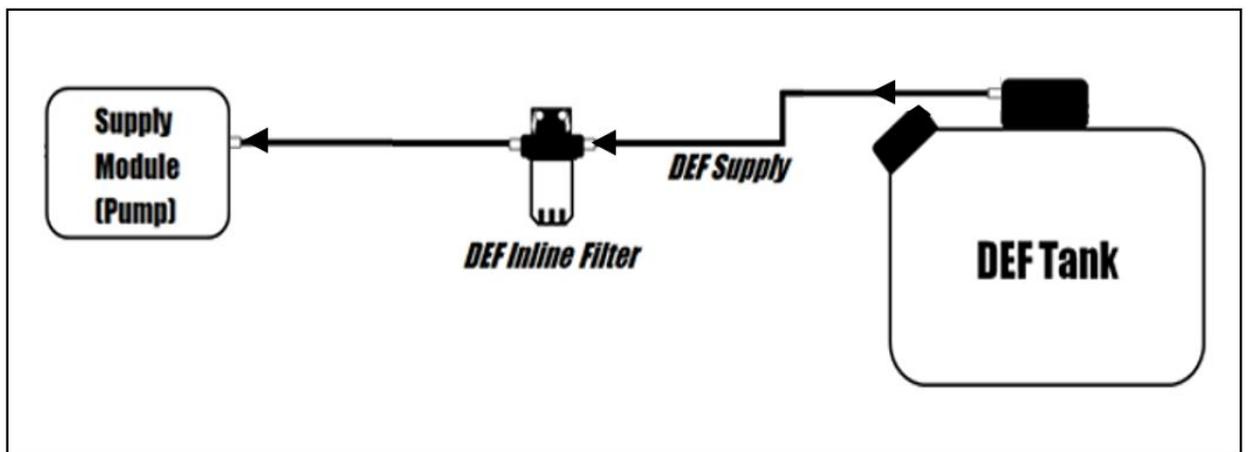


Figure 4: DEF Inline Filter location

It should be mounted such that the filter cartridge is oriented downward within $\pm 5^\circ$ of vertical as shown in Figure 5. DEF hose connections should be horizontal when the equipment is parked on level ground.

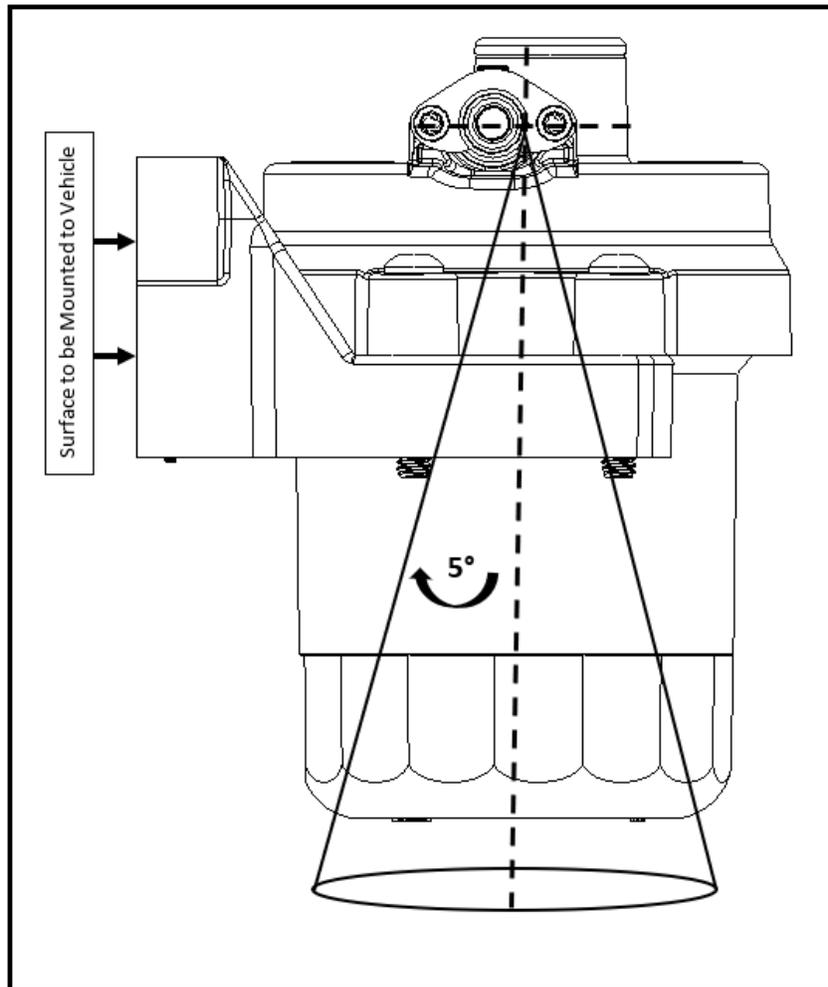


Figure 5: Vertical mounting orientation

The DEF Inline Filter assembly must be mounted directly to the equipment frame or a suitable rigid bracket. Figure 5 indicates the bracket surface that must be used to mount the Inline Filter to the vehicle. The entire indicated surface must be in contact with the vehicle. The wet weight of the DEF Inline Filter assembly is 2 lbs (0.91 kg); ensure the mounting location can withstand this wet weight. This product has been validated per ISO 16750-3, test 7 vibration limits; therefore the operating environment must not conflict with this standard.

- ⚠ *Before installation of DEF hoses, remove the dust caps from the hose connections of the DEF inline filter.*
- ⚠ *Do NOT mount the DEF Inline Filter assembly upside down.*
- ⚠ *Correct mounting of DEF Inline Filter assembly is necessary to allow for proper DEF delivery from DEF tank to DEF supply module (pump).*

Both holes on the mounting bracket must be utilized to secure the DEF inline filter assembly to the mounting surface. The unit should be located in a space that will minimize its vulnerability to flying debris. Proper mounting requires two stainless steel 1/4 inch (or M6) fasteners with one stainless steel 1/2 inch (13 mm) washer at each location. The tightening torque for the fasteners shall be 75-85 in-lbs (8.47-9.60 N-m). Adequate space should be provided for filter serviceability. It is strongly recommended that the installation location provide a minimum of 4 inches (102 mm) clearance for filter cartridge subassembly removal and replacement. Refer to Figure 6 for minimum clearance required for cartridge removal.

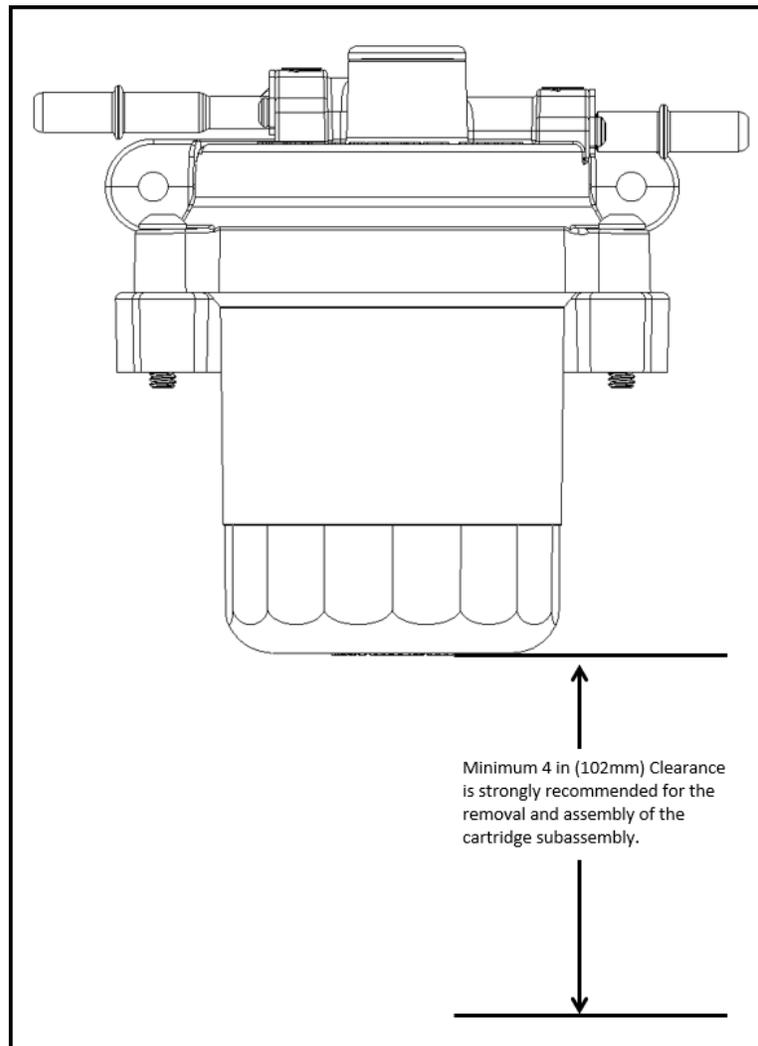


Figure 6: Minimum clearance required for cartridge removal

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The DEF Inline Filter unit is delivered already assembled to the mounting bracket in a predetermined flow direction. If an opposite flow direction is required based on system architecture, this can be achieved by disassembling the 4 bolts attaching the filter assembly to the bracket and rotating the filter assembly 180 degrees, then re-installing the same 4 bolts using a torque of 75 ± 5 in-lbs per bolt. Refer to Figure 7.

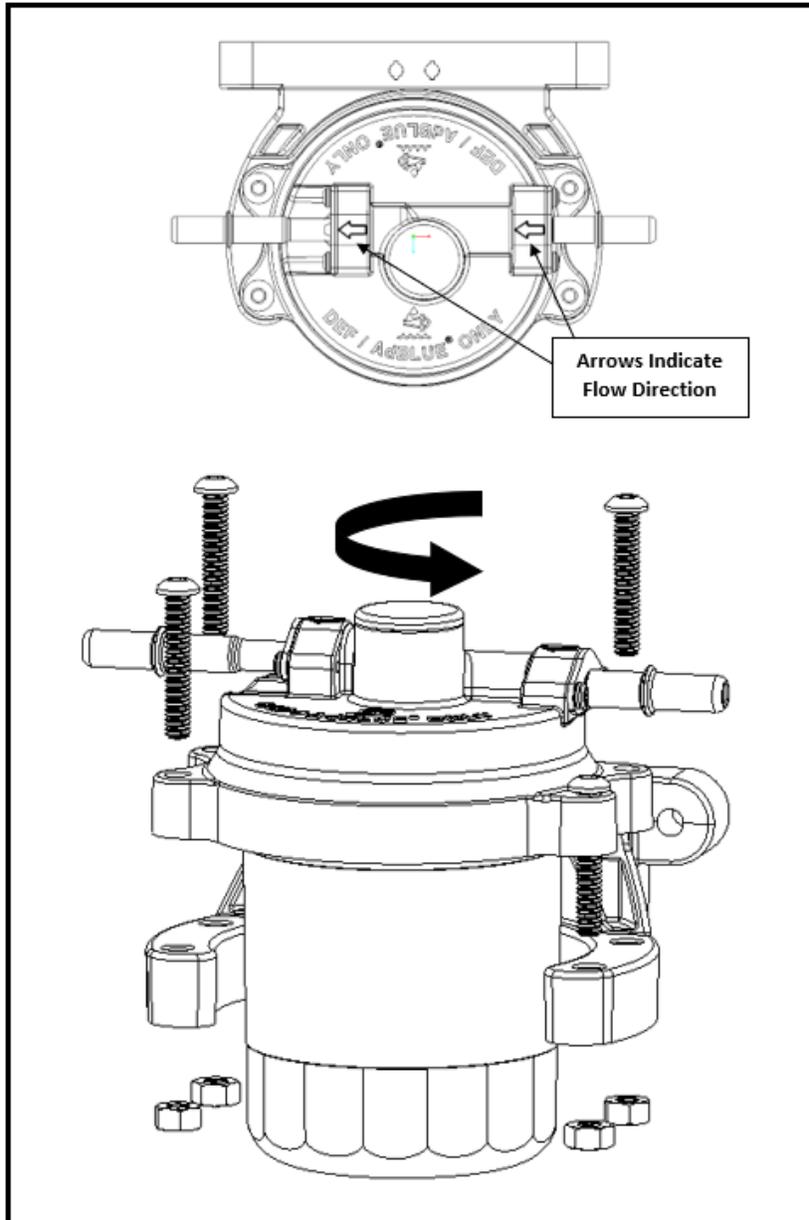


Figure 7: Rotation of Filter Assembly to Achieve Opposite Flow Direction

For heated configurations: In order to have better access to the mounting holes, mount the DEF Inline Filter assembly before attaching the electrical harness with clip to the DEF filter base.

After mounting is complete, insert clip with attached electrical harness into the two holes located between the two base mounting holes. Ensure the "Christmas-tree" retainer on the clip is completely inserted into the larger of the two holes, while the guide is inserted into the smaller one. Refer to Figure 8 for final configuration.

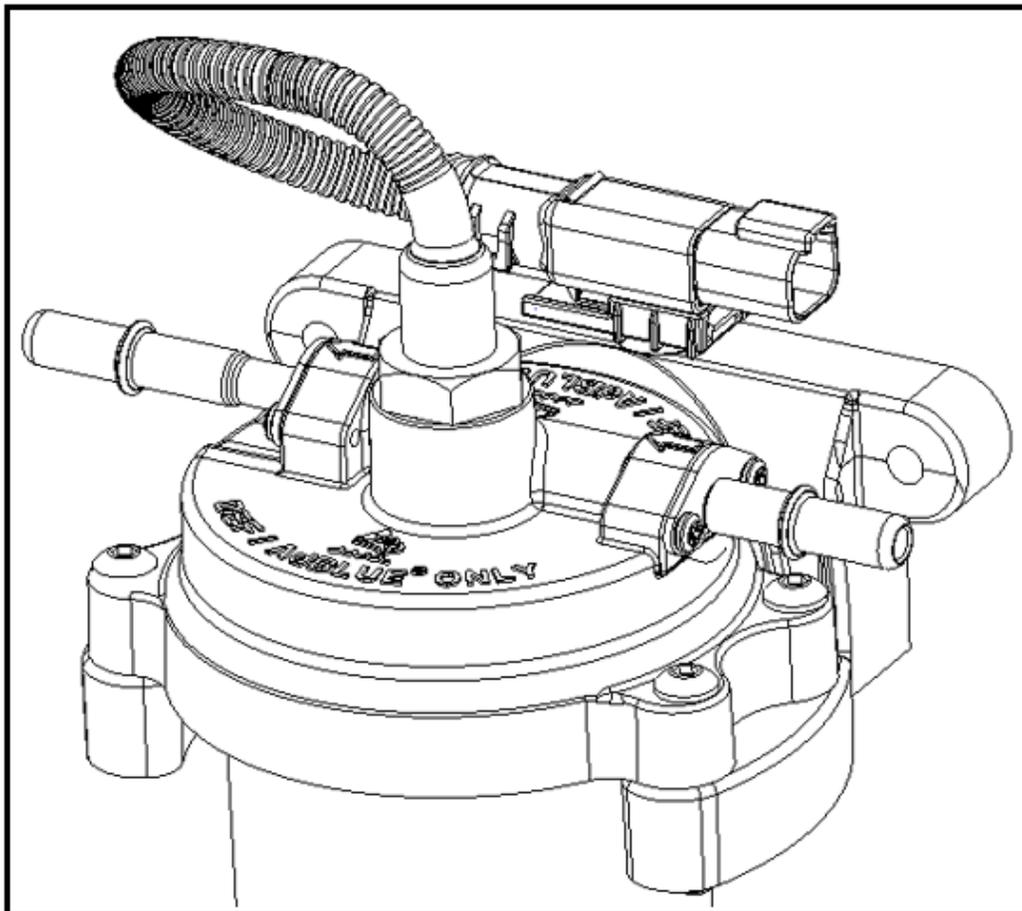


Figure 8: Electrical harness clipped to mounting base

The DEF inline filter assembly should not be located where it can be heated by external heat sources (e.g. exhaust system, engine components, etc.). For optimum performance in cold weather, the DEF inline filter assembly should be shielded from flowing air.

It is recommended that the DEF inline filter assembly be placed in a location that prevents potential damage to the electrical connector and fluid connections. A shield may be

necessary if the DEF inline filter assembly is in a vulnerable location where it could be impacted by foreign objects or stepped on.

DEF lines connected to the DEF inline filter should have support devices a maximum of 8 inches (200 mm) from the connection interface on the DEF inline filter.

2.2 DEF Inline Filter Cartridge Subassembly Installation

The following steps describe the installation procedure for the DEF inline filter cartridge subassembly.

1. Prior to first engine start, remove the filter cartridge subassembly. Use an 80 mm 15-flute cap filter wrench to turn the bowl clockwise. Ensure no debris gets inside the filter cartridge.
2. Fill the filter cartridge subassembly with approximately 40-50 mL of clean DEF. The fluid must be poured into the openings marked "Fill Side". Wait 30 seconds or until DEF level stops falling due to filter soaking. Avoid filling too rapidly to prevent fluid from overflowing. Repeat until the filter cartridge subassembly is at least 3/4 full of DEF (minimum of 150 mL). Once prefill is complete, go to step 3.
3. Insert DEF cartridge subassembly into the underside of the DEF inline filter mounting base. Slowly turn the bowl counterclockwise using an 80 mm 15-flute cap filter wrench, ensuring threads engage properly and no DEF is spilled. Use 1/8 turn past hand tight to a maximum tightening torque of 150 in-lb (16.9 Nm).
4. For additional steps required prior to startup, refer to the engine manufacturer's aftertreatment dosing system service manual/OEM service manual (DEF Inline Filter section).

 *Improper thread engagement can cause damage to DEF inline filter assembly and/or leakage. Care should be taken to avoid cross threading.*

 *If DEF is spilled on any component while installing or removing the DEF inline filter cartridge subassembly, it must be cleaned immediately. Failure to do so can result in DEF buildup and damage to, or malfunction of components.*

3 MAINTENANCE

- ⚠ *If DEF Inline Filter assembly is dropped during installation, removal, or maintenance, inspect for visual cracks and leaks. If cracks and/or leaks are found, DO NOT USE. Replace the complete DEF inline filter assembly.*

3.1 Replacing Filter Cartridge Subassembly

This section provides instructions for proper replacement of the filter cartridge subassembly.

Rinsing the exterior of the DEF Inline Filter assembly prior to service is recommended for preventing DEF contamination and prolonging the life of the DEF Inline Filter. Ensure all debris, e.g., dirt, fuel, oil, hydraulic fluid, etc., is completely rinsed off, then follow this procedure:

Removal:

1. Before removal of the DEF Inline Filter cartridge subassembly, ensure a containment vessel is placed underneath in order to catch and dispose of excess DEF left in the filter bowl and hose lines.
2. To remove the DEF Inline Filter cartridge subassembly from the mounting base, turn the cartridge subassembly clockwise using an 80 mm 15-flute cap filter wrench.

- ⚠ *DO NOT clean and reuse a used filter cartridge subassembly.*

- ⚠ *DO NOT reuse old DEF; dispose according to local disposal rules and regulations.*

- ⚠ *When removing the filter cartridge subassembly from a heated DEF Inline Filter, be careful not to touch or damage the heater element. If the heater element is damaged the complete DEF Inline Filter assembly must be replaced.*

- ⚠ *When removing the filter cartridge subassembly from a heated DEF Inline Filter, handle with care as surfaces and fluid may be hot. Take proper precautions to avoid injury.*

Installation:

1. Before installation of the new cartridge subassembly, confirm there is no dirt or other debris inside the thread interfaces of the underside of the filter mounting base.
2. Fill the filter cartridge subassembly with approximately 40-50 mL of clean DEF. The fluid must be poured into the openings marked "Fill Side". Refer to Figure 9. Wait 30 seconds or until DEF level stops falling due to filter soaking. Avoid filling too rapidly to prevent fluid from overflowing. Repeat until the filter cartridge subassembly is at least 3/4 full of DEF (minimum of 150 mL). Once prefill is complete, remove plug and go to step 3.

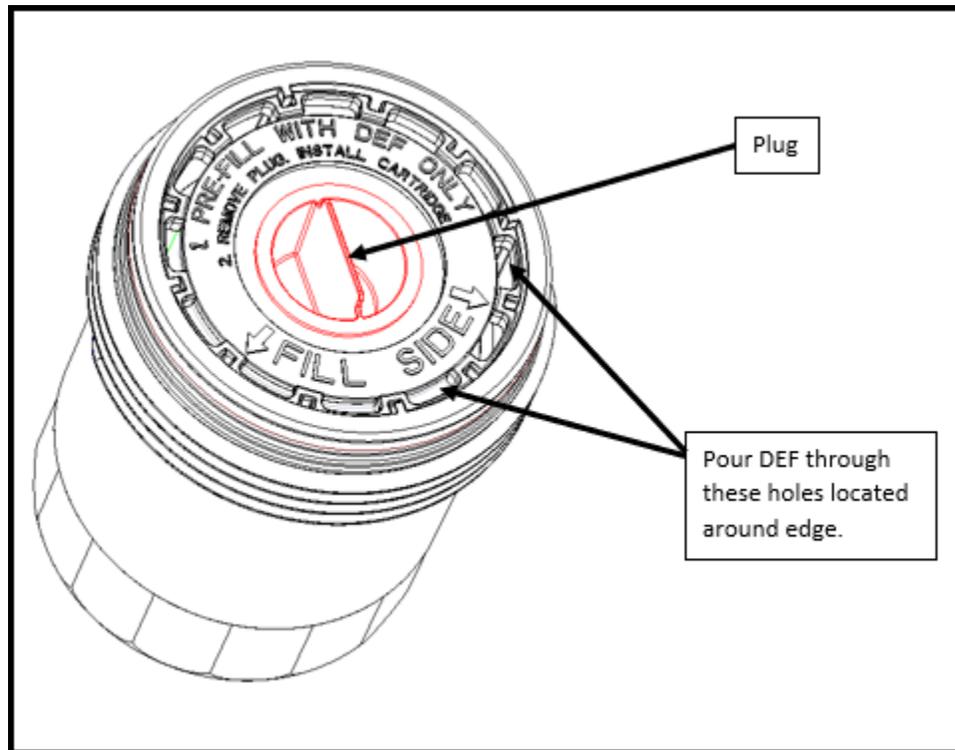


Figure 9: Fill holes and plug location

3. Insert DEF cartridge subassembly into the underside of the DEF inline filter mounting base. Slowly turn the bowl counterclockwise using an 80 mm 15-flute cap filter wrench, ensuring threads engage properly and no DEF is spilled. Use 1/8 turn past hand tight to a maximum tightening torque of 150 in-lb (16.9 Nm).
4. For additional steps required prior to startup, refer to the engine manufacturer's aftertreatment dosing system service manual/OEM service manual (DEF Inline Filter section).

NOTE: In the event of damage to any component (mounting base, DEF connections, heater assembly etc.) other than the filter cartridge subassembly, the entire DEF inline filter assembly must be replaced.

- ⚠ *Improper thread engagement can cause damage to DEF inline filter assembly and/or leakage. Care should be taken to avoid cross threading.*
- ⚠ *If DEF is spilled on any component while installing or removing the DEF inline filter cartridge subassembly, it must be cleaned immediately. Failure to do so can result in DEF buildup and damage to, or malfunction of components.*