SENR9777-03
December 2004

Systems Operation Testing and Adjusting

1103 and 1104C Engines

DC (Engine)
DD (Engine)
DJ (Engine)
DK (Engine)
RE (Engine)
RG (Engine)
RJ (Engine)
RR (Engine)
RS (Engine)
DF (Engine)
DG (Engine)

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “DANGER”, “WARNING” or “CAUTION”. The Safety Alert “WARNING” label is shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

Operations that may cause product damage are identified by “NOTICE” labels on the product and in this publication.

Perkins cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method or operating technique that is not specifically recommended by Perkins is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Perkins dealers have the most current information available.

⚠ WARNING

When replacement parts are required for this product Perkins recommends using Perkins replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

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Systems Operation Section

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Engine Design

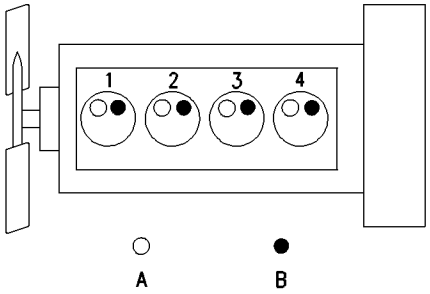

Illustration 1 g00984281

1104 example of the layout of the valves

(A) Inlet valve
(B) Exhaust valve

1104 Engine Specification

Industrial

Type ..... Four cylinder and four stroke

Type of combustion ..... Direct injection

Bore ..... 105 mm (4.134 inch)

Stroke ..... 127 mm (5.00 inch)

Displacement ..... 4.4 L (268 in^3)

Compression ratio

Naturally aspirated 19.25:1

Turbocharged 18.23:1

Number of cylinders 4

Cylinder arrangement ..... In-line

Firing order 1, 3, 4, 2

1104 Engine Specification

Genset

Type ..... Four cylinder and four stroke

Type of combustion ..... Direct injection

Bore ..... 105 mm (4.134 inch)

Stroke ..... 127 mm (5.00 inch)

Displacement ..... 4.4 L (268 in^3)

Compression ratio

Naturally aspirated 19.25:1

Turbocharged 1104A engines 17.2:1

Turbocharged 1104C engines 18.23:1

Number of cylinders 4

Cylinder arrangement ..... In-line

Firing order 1, 3, 4, 2

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction. ..... Clockwise

The front of the engine is opposite the flywheel end of the engine. The left side of the engine and the right side of the engine are determined from the flywheel end. Number 1 cylinder is the front cylinder of the engine.

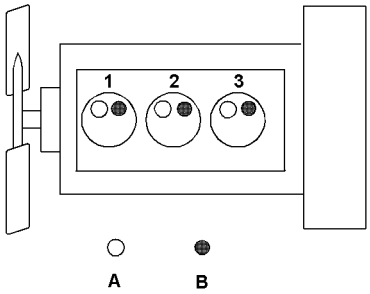

Illustration 2 g01116461

1103 example of the layout of the valves

(A) Inlet valve
(B) Exhaust valve

1103 Engine Specification

Industrial

Type ..... Three cylinder and four stroke

Type of combustion ..... Direct injection

Bore ..... 105 mm (4.133 inch)

Stroke ..... 127 mm (5.00 inch)

Displacement ..... 3.3 L (201 in^3)

Compression ratio

Naturally aspirated 19.25:1

Turbocharged 18.23:1

Number of cylinders 3

Cylinder arrangement ..... In-line

Firing order 1, 2, 3

1103 Engine Specification

Genset

Type ..... Three cylinder and four stroke

Type of combustion ..... Direct injection

Bore ..... 105 mm (4.133 inch)

Stroke ..... 127 mm (5.00 inch)

Displacement ..... 3.3 L (201 in^3)

Compression ratio

Naturally aspirated 19.25:1

Turbocharged 1103A engines 17.2:1

Turbocharged 1103C engines 18.23:1

Number of cylinders 3

Cylinder arrangement ..... In-line

Firing order 1, 2, 3

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction. ..... Clockwise

The front of the engine is opposite the flywheel end of the engine. The left side of the engine and the right side of the engine are determined from the flywheel end. Number 1 cylinder is the front cylinder of the engine.

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General Information

Engine Description

Note: When you are ordering new parts, refer to the engine identification number in order to receive the correct parts. Refer to the Operation and Maintenance Manual, “Product Identification Information” for the correct numbers for your engine.

The engine cylinders are arranged in-line. The engines are controlled by a mechanically governed fuel injection pump.

The cylinder head assembly has one inlet valve and one exhaust valve for each cylinder. Each valve has one valve spring. The pistons have two compression rings and an oil control ring.

It is important to ensure the correct piston height so that the piston does not contact the cylinder head. The correct piston height also ensures the efficient combustion of fuel.

The 1104 engine crankshaft has five main journals. End play is controlled by thrust washers that are located on both sides of the center main bearing.

The 1103 engine crankshaft has four main journals. End play is controlled by thrust washers that are located on both sides of the number three main bearing.

The timing case has a hole that corresponds with a hole in the crankshaft. Use an alignment pin to find TC. The camshaft gear has a timing hole that corresponds with a timing hole in the timing case. The timing holes ensure that the camshaft and the crankshaft are in time with each other.

The crankshaft gear rotates the idler gear. The idler gear rotates the camshaft gear and the fuel injection pump gear. The idler gear for the engine oil pump is rotated by the crankshaft gear. This idler rotates the engine oil pump.

The fuel injection pump is a gear-driven pump that is mounted to the back of the front housing. The fuel transfer pump is electrically operated. The fuel transfer pump has an integral fuel filter. The fuel transfer pump is usually located on the left hand side of the cylinder block. Some applications may have the fuel transfer pump and the water separator (if equipped) relocated off the engine.

The oil pump is driven by an idler gear. The engine oil pump sends lubricating oil to the main oil gallery. The oil relief valve is internal to the oil pump.

Coolant from the bottom of the radiator passes through the water pump. The water pump is driven by the idler gear.

Lifting the Engine

NOTICE

Failure to follow recommended procedures for handling or transporting engines can lead to engine damage.

To avoid possible engine damage, use the following procedure.

When you are lifting or moving the engine, use the following procedures in order to prevent engine damage.

1. Do not tilt the engine to an extreme angle unless the lubricating oil is first drained from the oil pan.

2. Do not turn the engine onto a side or an end surface unless the lubricating oil is first drained from the oil pan.

3. If the oil is not drained prior to tilting the engine or turning the engine onto a side or an end surface, the lubricating oil from the oil pan can flow into the intake manifold and the cylinder bores. This situation could cause a hydraulic lock in the engine. Hydraulic lock can severely damage the engine.

4. The engine oil should be refilled to the correct level before the engine is started.

1104 Engine Model Views

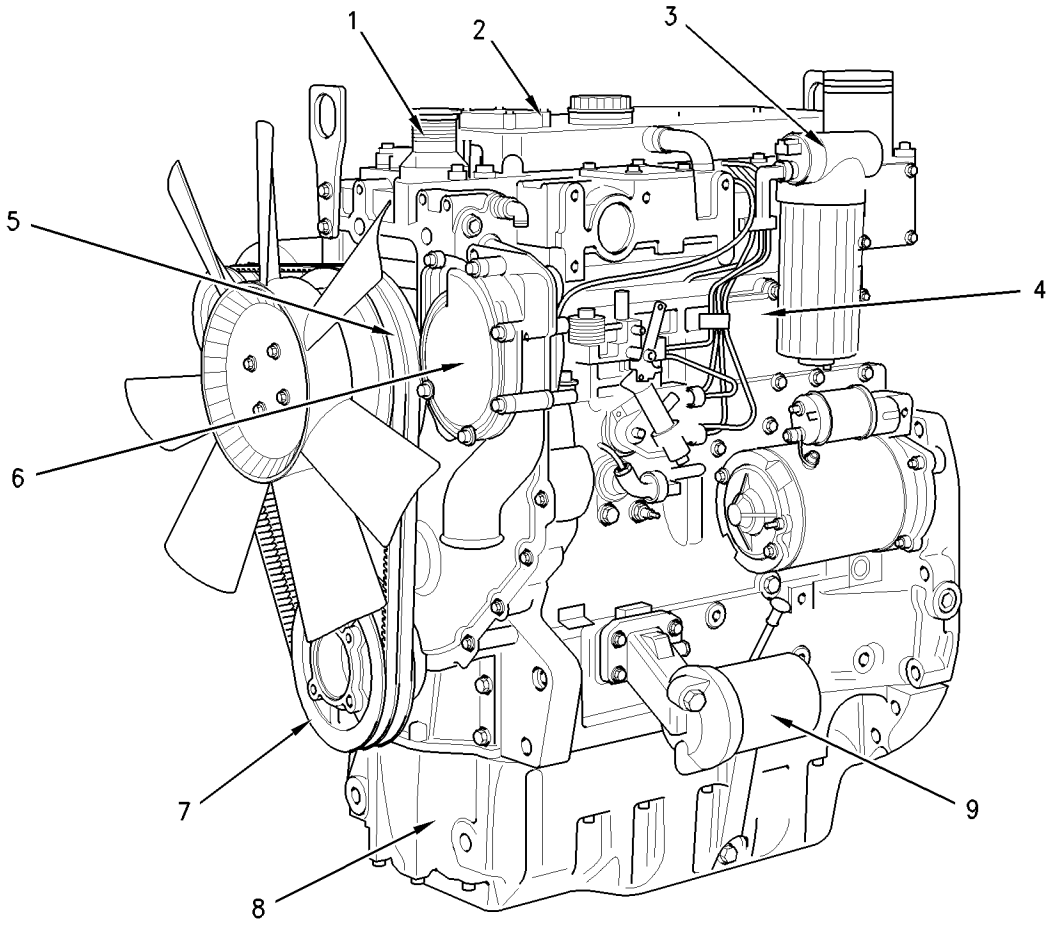

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Illustration 3

(1) Water temperature regulator housing
(2) Valve mechanism cover
(3) Fuel transfer pump and fuel filter
(4) Engine oil cooler
(5) Fan drive
(6) Water pump
(7) Crankshaft pulley
(8) Oil pan
(9) Engine oil filter

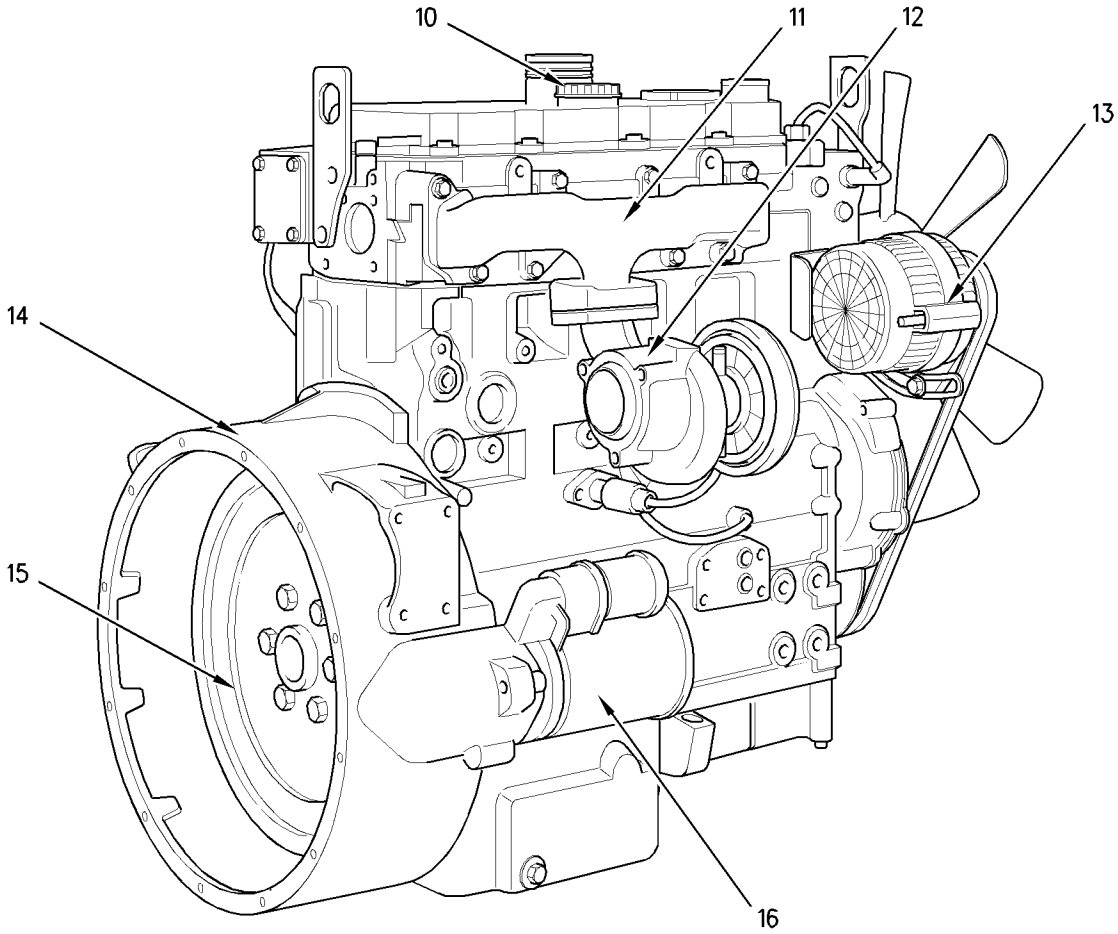

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Illustration 4

(10) Engine oil filler cap
(11) Exhaust manifold
(12) Turbocharger
(13) Alternator
(14) Flywheel housing
(15) Flywheel
(16) Starter motor

1103 Engine Model Views

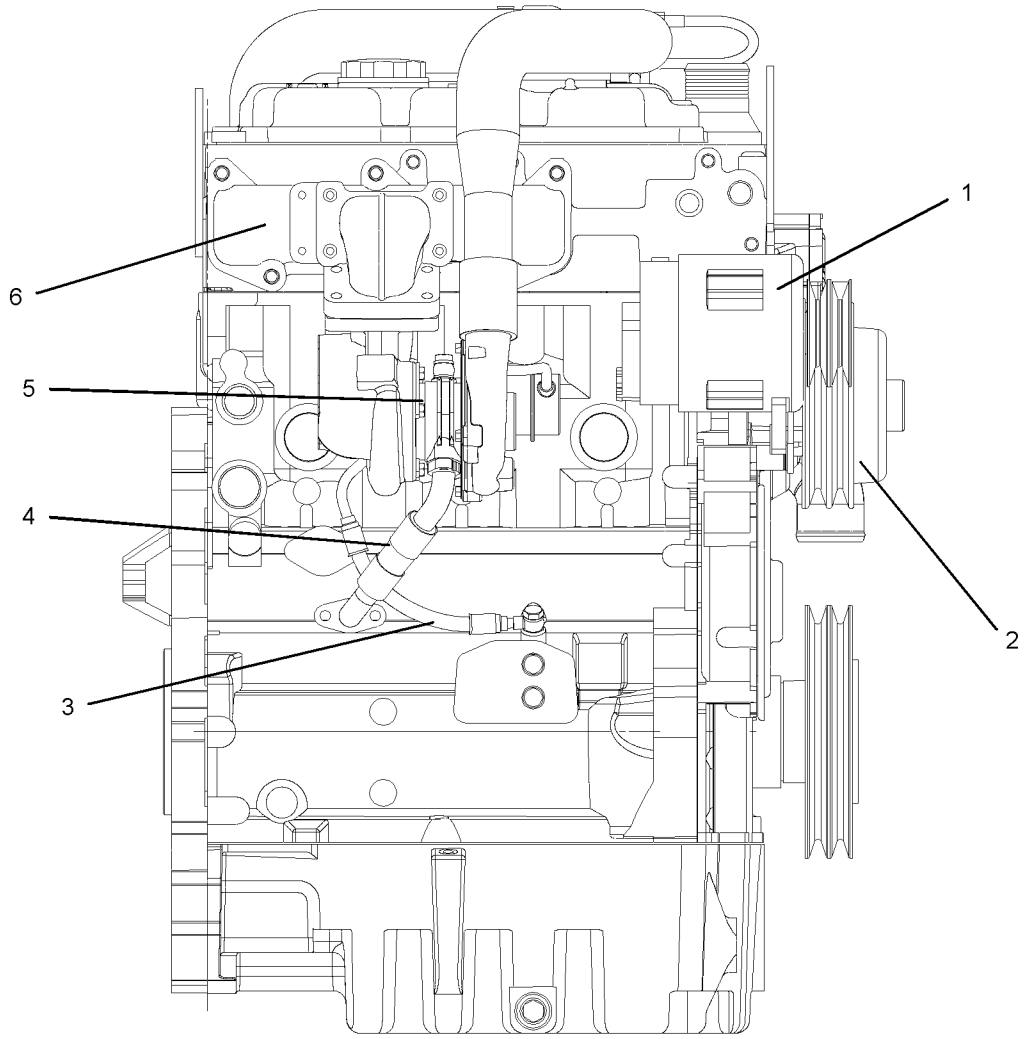

Illustration 5 g01011348

(1) Alternator
(2) Fan pulley
(3) Turbocharger oil supply
(4) Turbocharger oil drain
(5) Turbocharger
(6) Exhaust manifold

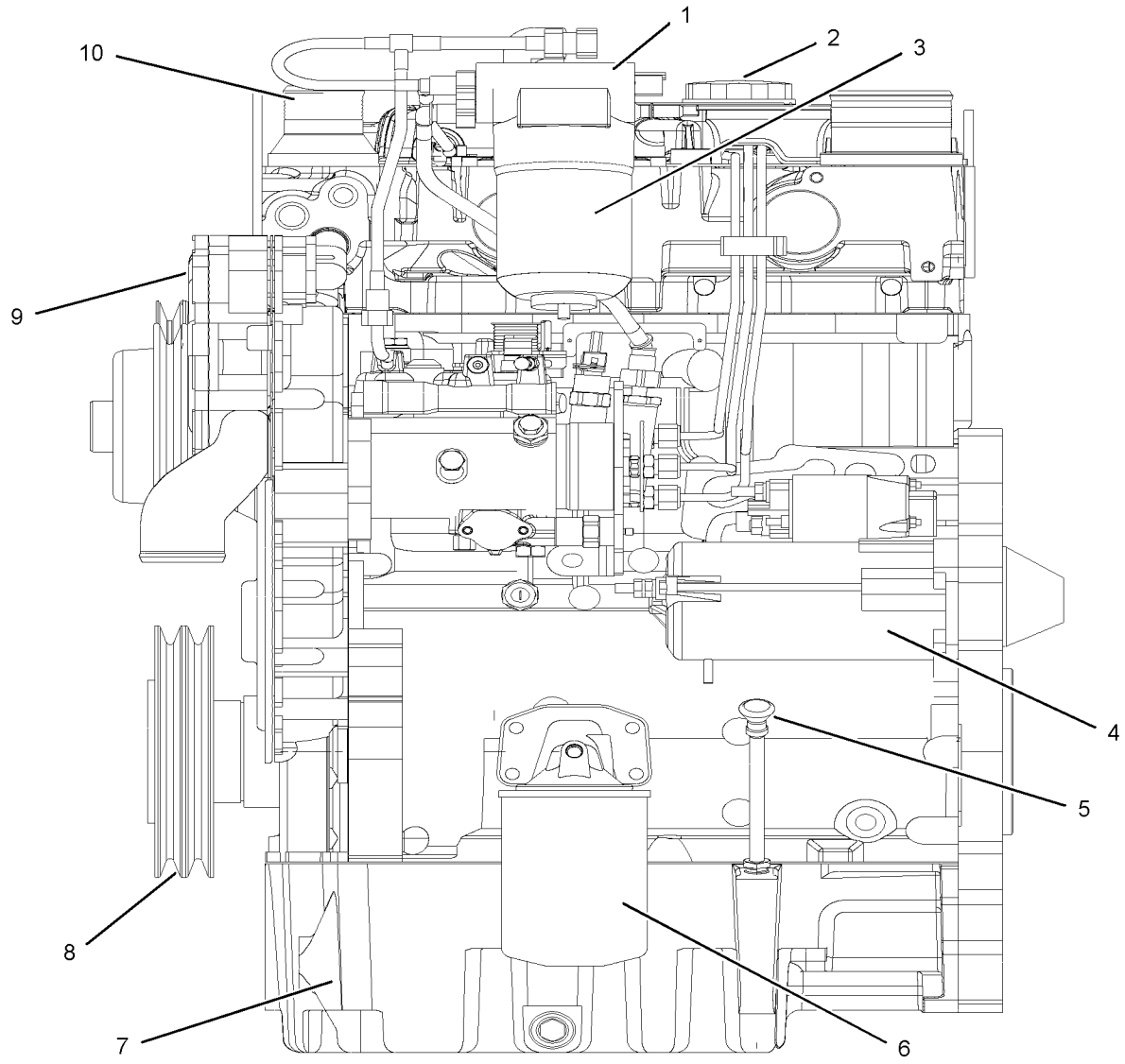

Illustration 6 g01011349

(1) Fuel transfer pump
(2) Oil filler cap
(3) Fuel filter
(4) Starter motor
(5) Dipstick
(6) Oil filter
(7) Oil pan
(8) Crankshaft pulley
(9) Water pump
(10) Water temperature regulator housing

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Fuel System

The Delphi DP210 or the Delphi DPG fuel injection pump is installed on the 1104 engine and the 1103 engine. The Delphi STP fuel injection pump is installed on the 1103 engine only. The Delphi DPA or the Bosch EPVE fuel injection pump is installed on the 1104 engine only.

The fuel transfer pump draws fuel from the fuel tank and through the water separator. When the fuel goes through the water separator, any water in the fuel will go to the bottom of the bowl. The fuel transfer pump sends the fuel at a low pressure to the fuel filter. From the fuel filter, the fuel goes through the supply line to the fuel injection pump.

The fuel injection pump sends fuel through the high pressure fuel line to each of the fuel injectors. The fuel injector sprays the fuel into the cylinder. Fuel that is not injected flows through the fuel return line to the top of the fuel filter, back to the fuel tank.