

# 900MA/MAM and 1000MA/MAM (for marine applications)

## Fuel Filter/Water Separator

Instruction Part Number 19526 Rev B



Racor Turbine Series fuel filter/water separator protects the precision components of your engine from dirt, rust, algae, asphaltines, varnishes and especially water, which is prevalent in low distillate fuels. Contaminants are removed from fuel using the following legendary three stage process:

### **Stage 1—Separation**

Using the fuel flow, the stationary turbine separates large solids and free water through enhanced centrifugal force.

### **Stage 2—Coalescing**

Smaller water droplets and solids coalesce on the conical baffle and fall to the collection bowl.

### **Stage 3—Filtration**

Engines will benefit from near 100% water separation and fuel filtration with Racor's proprietary Aquabloc® water repelling media. The replaceable filters are available in 2, 10, and 30 micron ratings.



ABS/BV



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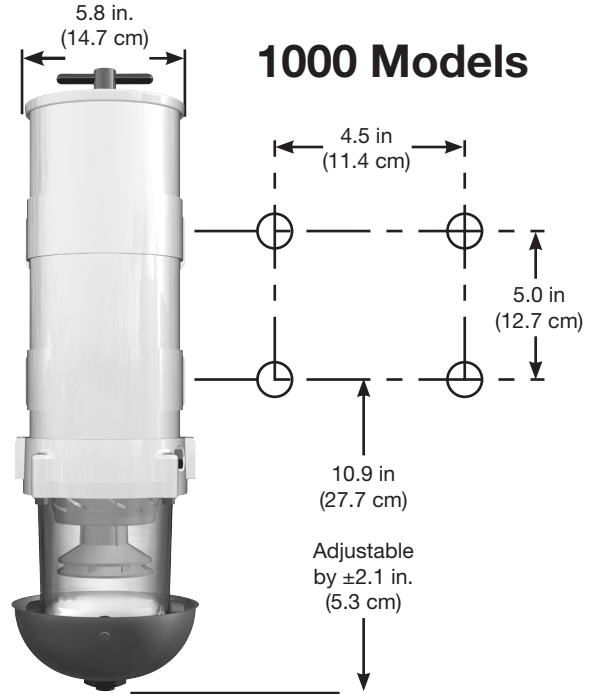
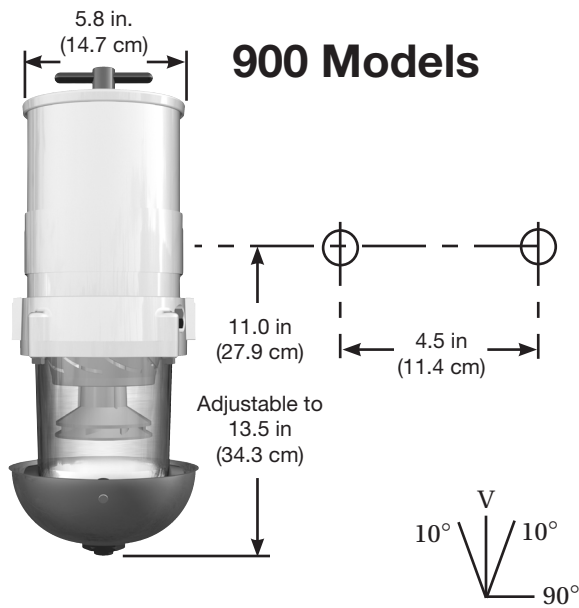
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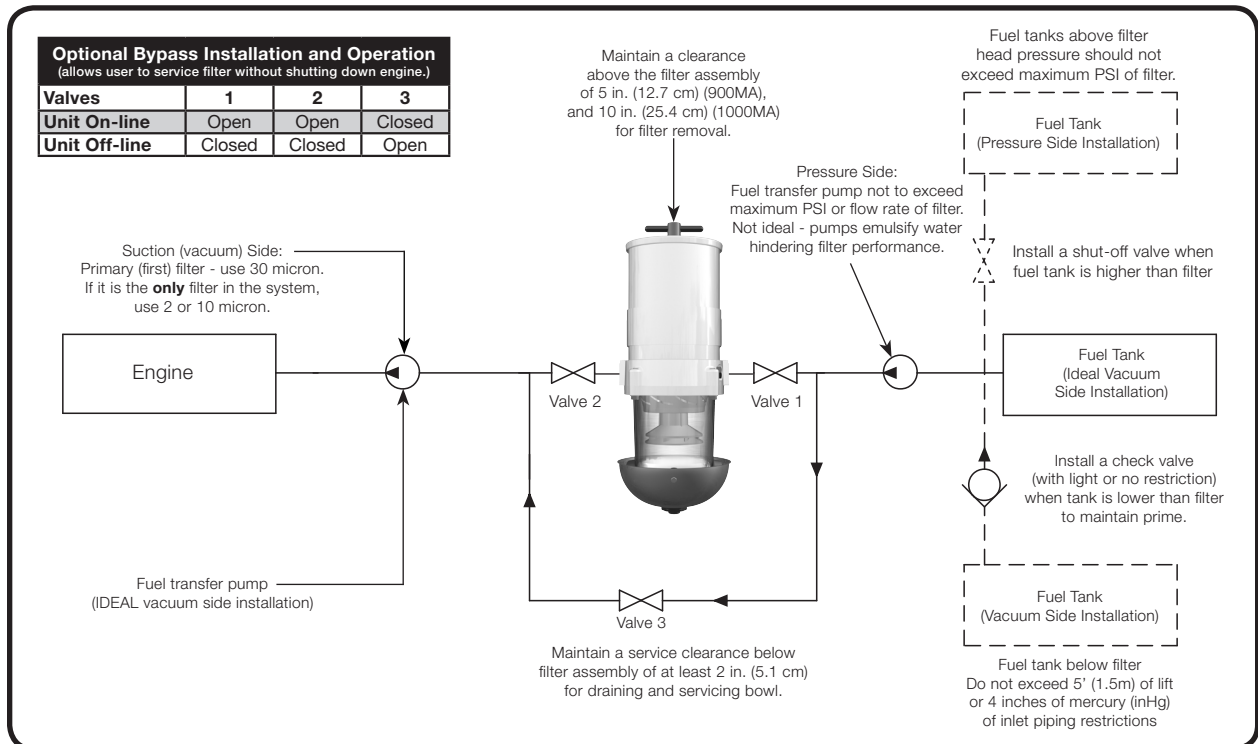
# Mounting Information



Note: Mount filter assembly as close to vertical (V) as possible. Do not exceed 10° from vertical or assembly may not function properly. *Fastener size is 3/8" (M10) for mounting brackets.*

*Adjust mounting brackets (900 models have one, 1000 models have two) for a secure fit.*

# Installation Diagram



# Installation Guidelines

These *customer supplied* materials should be on hand before beginning installation.

- Shop Towels
- Mounting Hardware (3/8")
- Inlet/Outlet Fittings
- Fuel Hose
- Clean Diesel Fuel (about 1 gal.)
- Clean Motor Oil
- Thread Sealant (no thread tapes)

## ***Positioning The Filter Assembly***

Install filter assembly on suction side of fuel transfer pump for optimum water separating efficiency. *See Installation Diagram.*

Keep fuel line restrictions to a minimum. Locate the filter assembly between horizontal planes of the bottom of the fuel tank and inlet of fuel pump, if possible. If filter assembly is installed in an application where the fuel tank is higher than the filter, a shut-off valve must be installed between the tank and filter assembly INLET. This will be used when servicing the replacement filter.

## ***BEFORE Installing The Filter Assembly***

- Obtain good ventilation and lighting.
- Maintain a safe working environment.
- Engine must be off for installation.
- DO NOT smoke or allow open flames near installation.

## ***Installing The Filter Assembly***

- Completely remove any suction side filters in fuel system between fuel tank and fuel pump. This is where the Racor filter will mount. Leaving these filters in place will add to fuel system restriction. Filter heads cast into the engine or that are non-removable or hard piped should be serviced with a new filter and left in place.
- Keep fuel flow restriction to a minimum. Always use the maximum size fuel hose possible. Do not make sharp bends with flexible hose as kinks may occur. Avoid use of two 45° elbow fittings where one 90° elbow will work.

- When routing hose, avoid surfaces that move, have sharp edges, or get hot (such as exhaust piping).
- Avoid using one-way check valves that have an opening pressure higher than 0.5 PSI (0.03 bar).

## ***Priming Instructions***

1. Remove T-handle and lid from top of filter assembly.
2. Fill filter with clean fuel.
3. Lubricate lid gasket and T-handle O-ring with clean fuel or motor oil.
4. Replace lid and T-handle and tighten snugly by hand only—do not use tools.
5. If applicable, refer to equipment operator's service manual to complete fuel priming procedure.
6. Start engine and check for fuel system leaks. Correct as necessary with engine off and pressure relieved from filter assembly.

# Service Instructions

## ***Draining Water***

Frequency of water draining is determined by the contamination level of the fuel. Inspect or drain collection bowl of water daily or as necessary. Collection bowl must be drained before contaminants reach the bottom of the turbine (inside the bowl), or when the Water Detection Module (optional) indicates a drain is required.

## ***Suction Side Applications***

1. Close inlet valve (or valve #1) and open self-venting drain on bottom of bowl.
2. Close drain after all water and contaminants have been evacuated—DO NOT leave drain open too long as it will eventually completely drain entire filter of water AND fuel.
3. Follow ***Priming Instructions***.

## ***Pressure Side Applications***

1. Open self-venting drain on bottom of bowl. Head pressure will push any water and contaminants out of drain while keeping filter primed.
2. Close drain after all water and contaminants have been evacuated—DO NOT leave drain open too long as it will eventually completely drain entire filter of water AND fuel, and possibly drain entire tank.

# Filter Replacement

Frequency of filter replacement is determined by the contamination level of your fuel. Replace filter every 500 hours, every other oil change, when vacuum gauge (optional) reads between 7 to 10 inches of mercury (inHg), if power loss is noticed, or annually, whichever occurs first.

**Note—always carry extra replacement filters as one tankful of excessively dirty fuel can plug a filter.**

Use only genuine Racor Aquabloc® replacement filters—see *Part List*.

## All Applications

1. Isolate the filter assembly with bypass or shut-off valves, if applicable.
2. Remove T-handle and lid.
3. Remove filters by holding bail handles and slowly pulling upward with a twisting motion. Dispose properly according to local regulations.
4. Remove and discard old lid gasket and T-handle O-ring and clean seal glands of any dirt or

debris. Lubricate new gasket and seal (supplied with new filter) with motor oil or diesel fuel before installation.

5. Refer to Priming Instructions, otherwise, fill unit with clean fuel, replace lid and T-handle and tighten snugly by hand only—**do not use tools**.
6. Open any closed valves; if applicable.

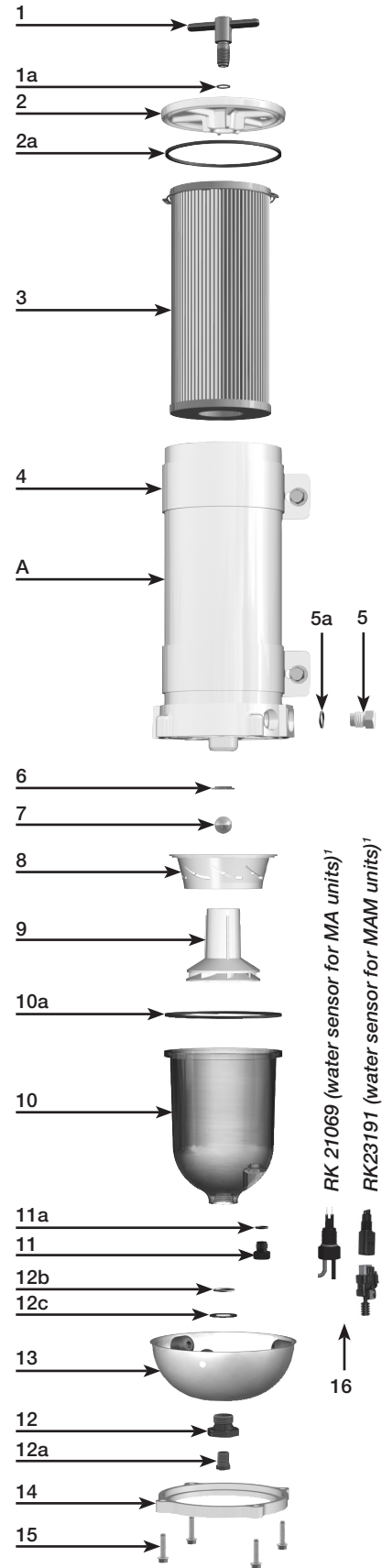
**Note—above ground tanks or transfer pump applications may use head pressure to prime filter assembly.**

# Specifications

		900MA or 900MAM	1000MA or 1000MAM
<b>Maximum Flow Rate:</b>		90 GPH (341 LPH)	180 GPH (681 LPH)
<b>Port Size</b>		7/8"-14 UNF (SAE J1926) (female threads)	7/8"-14 UNF (SAE J1926) (female threads)
<b>Min. Service Clearance: Above Assembly Below Assembly</b>		7.5 in. (19.1 cm) 2.0 in. (5.1 cm)	10.0 in. (25.4 cm) 2.0 in. (5.1 cm)
<b>Replacement Filter: (2 micron) (10 micron) (30 micron)</b>		2040SM-OR or 2040N-02 2040TM-OR or 2040N-10 2040PM-OR or 2040N-30	2020SM-OR or 2020N-02 2020TM-OR or 2020N-10 2020PM-OR or 2020N-30
<b>Height</b>	<b>MA MAM</b>	17.0 in. (43.2 cm) 16.5 in. (41.9 cm)	22.0 in. (55.9 cm) 21.9 in. (54.5 cm)
<b>Depth</b>		7.0 in. (17.8 cm)	7.0 in. (17.8 cm)
<b>Width</b>		6.0 in. (15.2 cm)	6.0 in. (15.2 cm)
<b>Weight (dry)</b>	<b>MA MAM</b>	6.0 lb (2.7 kg) 7.0 lb (3.2 kg)	10.0 lb (4.5 kg) 11.0 lb (5.0 kg)
<b>Clean Pressure Drop</b>		0.30 PSI (0.021 bar)	0.43 PSI (0.03 bar)
<b>Maximum Allowable Working Pressure</b>		25 PSI (1.7 bar)	25 PSI (1.7 bar)
<b>Water Removal Efficiency</b>		99%	99%
<b>Ambient Temperature Range</b>		-40° to +255°F (-40° to +124°C)	
<b>Maximum Fuel Temperature</b>		190°F (88°C)	

# Part List

Part Number	Description
1	RK 11-1945 (Brass) RK23183 (Stainless Steel) T-handle and O-ring Kit (includes 1a) (9/16"-18 UNF Threads) <b>Hand Tighten</b>
1a	RK11350 T-handle O-ring
2	RK 11-1933-04 Lid Kit (includes 2a)
2a	RK11007 Lid Seal
3	2040N-02 (2 micron), or 2040N-10 (10 micron), or 2040N-30 (30 micron) 900MA/MAM (includes 2a)
	2020N-02 (2 micron), or 2020N-10 (10 micron), or 2020N-30 (30 micron) 1000MA/MAM (includes 2a)
4	RK11-2006 RK11-2008 900MA/MAM Clamp Bracket Kit 1000MA/MAM Double-welded Clamp Bracket Kit
<b>A</b>	<i>(not sold seperately)</i> <b>900MA/MAM Body/Housing</b> <b>1000MA/MAM Body/Housing</b>
5	RK 11-1679 Feed-thru Plug Kit (includes 5a) <b>Tighten 15 in. lbs (1.69 Nm) max.</b>
5a	43506 Plug O-ring
6	RK 11028B Check Ball Seal
7	Check Ball
8	RK 11-1939 Conical Baffle Kit (includes 6, 7, and 10a)
9	Turbine Centrifuge Kit <b>Hand Tighten</b>
10	RK 11-1606-1 (MA models) RK 11734-03 (MAM models) Clear Bowl Kit (includes 10a, 11, and 11a) Metal Bowl Kit (includes 10a, 11, and 12a)
10a	RK11007 Bowl Seal
11	RK 20126 (MA models) RK 20022 (MAM models) Plastic Bowl Plug Kit (includes 11a) Metal Bowl Plug Kit (includes 11a) <b>Tighten 15 in. lbs (1.69 Nm) max.</b>
<b>11a</b>	<i>(not sold seperately)</i> <b>Water Probe or Plug O-ring</b>
12	RK 11-1910 Bowl Drain fitting Kit (includes 12a, 12b, and 12c) <b>Tighten 30 in. lbs (3.39 Nm) max.</b>
12a	918-N4 Drain Plug
<b>12b</b>	<i>(not sold seperately)</i> <b>Drain Fitting O-ring</b>
<b>12c</b>	<i>(not sold seperately)</i> <b>Bowl Drain Washer</b>
13	RK 11868 MA Heat Deflector Kit (includes 12)
14	RK 11037A Bowl Ring Kit (includes 10a and 15)
15	RK 11542 Bowl Fasteners (4ea.) <b>Tighten 60 in. lbs (6.78 Nm) max.</b>



<sup>1</sup>Must be used with a water detection amplifier—contact Racor for selection info.

# Troubleshooting

Damaged, worn, or dirty seals will allow air ingestion. Inspect and replace all seals as needed. Clean the sealing surfaces of dirt or debris every time the filter is replaced.

Hand tighten T-handle only! Do not use tools for leverage.

If filter is changed or assembly drained for any reason, reprime assembly. Fill to just above top of filter before replacing lid. It is normal for the fuel level to drop during use. This is especially apparent at filter element change-out.

Do not overtighten carriage bolt as this may distort the bracket position.

Do not over tighten self-tapping capscrews to avoid stripping out body threads. After disassembly, start threads by hand prior to using tools. Tighten to 55-65 in. lbs.

The hollow aluminum checkball floats up against the seal when fuel is stopped, preventing fuel bleed-back. If unit loses prime, inspect upstream hose connections first, disassemble unit to inspect seal and ball. (It is normal to hear a "rattling" sound at any time).

Air bubbles or fuel leakage appearing from drain may indicate drain is not closed completely or seal has been clogged with contaminants. Tighten or disassemble and inspect. Tighten to 30-35 in. lbs.

Replace T-handle o-ring and lid gasket with each filter element replacement.

Replace filter every 500 hours, every other oil change, annually, or at first indication of power loss, whichever occurs first.

Filter safety valve

SAE O-ring ports should have a smooth angled seat for sealing. Do not scratch this surface. Check O-ring for damage.

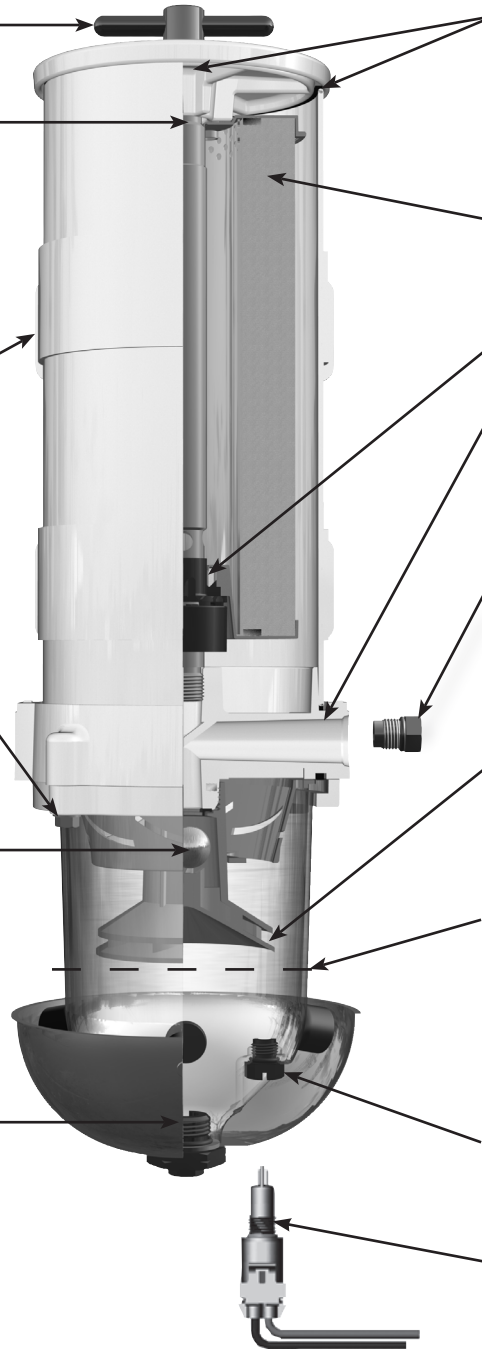
Optional heater port not used on marine models. Plug feed-thru O-ring must not be damaged or swollen. Tighten to 15-20 in. lbs.

Air bubbles appearing from turbine are an indication of an upstream leak between Racor inlet and fuel tank pick-up tube.

Drain water (if present) before it gets to this level. At some time, the see-thru contaminant collection bowl may become dirty on the inside. Remove the four bowl ring capscrews and drop the bowl. Clean the inside with hot soapy water, dry off and re-install. Ensure bowl gasket is cleaned, and lubricate with silicone grease prior to reuse.

A plug is installed as standard, but can be replaced with a Water Sensor. Tighten to 15-20 in. lbs.

The water sensor (if equipped) should activate when water contacts tips. Air bubbles or fuel leakage appearing from sensor may indicate it is loose or O-ring is damaged. Tighten to 15-20 in. lbs.





# Troubleshooting

**Note—Correct external fuel leaks immediately! These conditions are dangerous and are a fire hazard. Additionally, reduced engine performance such as: hard starting, stalling, reduced power, and other associated problems will result.**

New filter installations must be filled with fuel and fuel system must be adequately primed following the **engine manufacturer's recommendations**, if applicable. Existing installation difficulties are usually associated with improper priming procedures or damage to the unit or fuel system. The result is either internal air suction or external fuel leakage. Diagnosis should be in these following steps:

1. Check fuel tank level and make sure any fuel delivery valves are in open position, as applicable.
2. Ensure T-handle, bowl fasteners, and fuel fittings are tight. Also verify that bowl drain is closed.
3. If filter is new, check potential restriction at fuel tank draw tube. An in-tank strainer may be plugged.

**Correct Application**—It is very important that filter is not 'under specified' for the application. The maximum fuel flow rating of filter must not be exceeded and engine manufactures maximum fuel inlet restriction, must not be exceeded. Doing so will reduce efficiency and de-gas (pull air from) fuel.

**Filter**—Replacement filters are available in 2, 10, and 30 micron ratings. Filtration needs are based on application, fuel quality, maintenance schedules, and operating climates. A simple rule to remember is, the finer the filtration (i.e. the smaller the number), the more frequent the filter change. **Always carry extra replacement filters with your equipment as one tankful of excessively contaminated fuel can plug a filter.** When clogged to the maximum capacity, filters will have a brown to black color or tar like contaminants may be present - this is normal. An appearance of a multi-colored slime (which may have a foul odor) is an indication of microbiological contamination. This condition must be treated immediately.

**Severe conditions must be corrected by a repair facility.**

**Note**—Never operate Racor unit without the filter in place - the 'filter safety valve' will not expose outlet hole on fuel return tube if filter is removed and fuel will not flow to engine. Instead, punch emergency tab on the top of filter and leave in place. Puncturing emergency tab will bypass all filtration and send unfiltered fuel to your engine. **Service filter as soon as possible to avoid harmful contaminants flowing downstream to engine.**

**Water Sensors**—This feature alerts operator of a high-water condition. The bowl is then drained of water at earliest convenience. Note - a Racor water detection module is needed to work

with the in-bowl sensor. The unit should activate when water reaches sensor tips (and when they measure between 47,000 and 100,000 ohms of resistance, depending on detection module used.) If not, tips may be fouled with a coating. Remove water sensor and clean tips with a cloth. Run a jumper wire between tips with ignition ON to test system. Difficulties usually lie in the wire connections, power source, or an independent ground.

**All Racor filter assemblies are 100% tested to ensure a leak-proof, quality product.**

**Note**—Correct external fuel leaks immediately! In the event difficulties are experienced with your filter assembly or a problem appears to prevent the engine from running smoothly, refer to the procedures on the previous page. **Note**—Apply Parker Super O-lube (part number RK 31605) or equivalent to all seals at major attachment points to maintain integrity, seal elasticity, to fill small voids, and to provide protection from degradation.

**Perform all checks with engine OFF (and applicable valves closed). For replacement parts, refer to the Part List section of this manual.**

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