



Tech Tip

FILTERS 124

SERVICING DODGE'S TURBO DIESEL Air Filter and Fuel System Precautions

Turbo-charged diesel engines have a healthy appetite for air, consuming large volumes of it. Keeping the air system clean is the key to good engine performance. With an air system restriction, some major engine performance conditions will occur and damage to the system is almost certain. In most cases, the engine will get the needed air supply before progressing to an engine stalling condition. During the process of overcoming the restriction, the filter may become distorted or pulled from its mounted position. When the filter seal is broken, unfiltered air is introduced into the engine, often promoting engine damage. Sometimes, the filter will retain its configuration during the restriction and the air box will distort, allowing the filter seal to separate from the air box housing, or the filter to be pulled into the air box.

This condition is not uncharted territory, and is not unique to Chrysler. Ford has certainly had a challenge with the Power Stroke diesel engines and the same conditions. Many of the problems were due to improper maintenance service intervals. Ford made numerous filter design changes, an air-box housing change, the addition of an electronic service minder that illuminates a dash light when a restriction occurs, and eventually a reroute of the fresh air inlet from the inner fender to the radiator support. The re-routing was to eliminate water entry from road splash and to reduce the entry of debris, especially on off-road and severe service vehicles. The combined modifications,

plus vehicle owner/operator awareness has proved to be successful. Most of Ford's current failures are due to air box housing damage, resulting from installer error when replacing the air filter, or filters that are totally clogged with debris.

We are experiencing the same pattern failures with the Dodge turbo-diesel trucks, and engineering changes are taking place in the filter design. Increasing the strength of the filter will help prevent some of the described conditions, and some filter manufacturers have done that, but it is not the total solution. Making a filter strong enough to withstand the pressures of a restriction will offer no protection to the integrity of the air box housing. Keeping the air-way clean and the filter dry is imperative. Chrysler advises that periodic inspections of the air filter should be performed. Chrysler recommends a visual inspection of the service minder gauge *fitted on the air cleaner housing*, rather than removing the filter for a visual inspection. That may sound strange, *but the service minder gauge may reflect more information than can be obtained from a visual inspection of the filter*. Read on for a better understanding of this claim.

AIR FILTER SERVICE MINDER

The air filter service minder gauge will determine when the filter element is restricted and should be replaced. The gauge consists of a diaphragm and calibrated spring sealed in a

plastic housing. A yellow disc attached to the diaphragm moves along a graduated scale marked on the filter minder in relation to an airflow restriction. A ratchet mechanism will position the yellow disc at the filter's highest restriction level. This method is based on the drop in air pressure created when the filter becomes restricted. When the yellow disc reaches the red colored zone, the filter must be replaced. Once the filter has been replaced, the filter service minder should be reset by depressing the rubber button on top of the filter minder. The yellow disc should move back to the up position.

In the previous paragraph we stated that you should read on for a better understanding and appreciation of the service minder and how it could provide additional information. Here's why...if the filter service minder gauge has reached the red zone and the filter element appears to be clean, there is an important message in this gauge reading and it should not be ignored. One of two conditions has occurred:

- 1) *Snow or ice has built up on the fresh air intake to the filter, restricting the air flow.*
- 2) *The filter has been subjected to water due to heavy rains and road splash entering the fresh air intake.*

The fresh air system on the Dodge truck pulls air from the inner fender well, where it can be subjected to water entry. The water can result in damage to the filter element (see illustration #1). Obviously, this filter has lost its sealing ability in relation to the air box housing, allowing unfiltered air to enter the engine. The water will seal the filter and restrict the airflow in the same manner as a filter element that is plugged with debris. The engine will usually get the needed air. It may collapse the air filter, suck it into the air box or collapse the air box in the

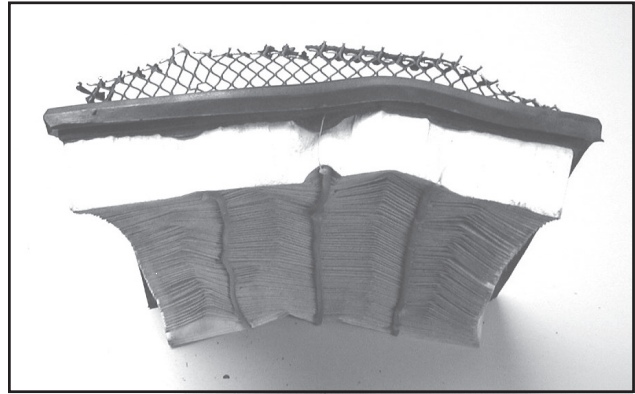


ILLUSTRATION 1
FILTER DAMAGED FROM WATER ENTRY

process. Read the service minder. It can save you and the customer much frustration and maybe a good engine. Make it a point to question the customer to determine if the vehicle has been subjected to excessive amounts of water. Most of our encounters with damaged filters have involved trucks that were operated in areas that have encountered excessive levels of rainfall.

CRACKED HOUSING COVER

The fuel filter is secured in its housing by a plastic screw-on cap or housing cover. The plastic cap has become a common replacement item due to improper filter installation procedures. The top of the plastic cap incorporates a 11/8-inch hex head. Some of the caps include a squared opening in the center of the hex head (see illustration #2). When making a filter installation, some are using a tool in the squared opening to unscrew the cap from the filter housing, resulting in cracks in the plastic cover. Do not use this opening to gain access to the fuel filter. Adjustable wrenches are also being used on the hex head, resulting in damaged filter caps. Chrysler recommends using an 11/8-inch six point socket to remove the cap from the filter housing.

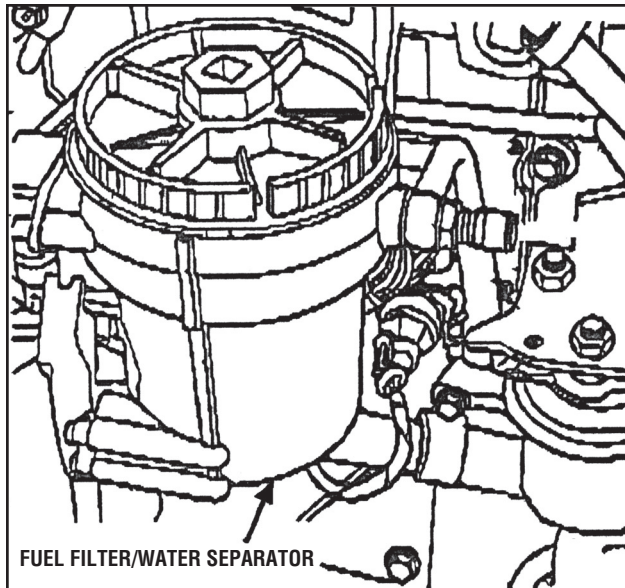


ILLUSTRATION 2
HEXHEAD AND SQUARED OPENING

Removing the cover is more difficult than making the new installation. This is due to the composition of the material in the O-ring. By design, the O-ring will swell when subjected to diesel fuel. This promotes a better seal between the plastic cap and the filter housing. A new O-ring should be installed with each filter replacement and the cover cap should not be torqued greater than 25 ft. lbs.

FUEL FILTER/WATER SEPARATOR

The system is fitted with a fuel filter and water separator assembly. Its purpose is to protect the injection pump and injectors by removing water and contaminants from the fuel. The system allows fuel to pass through, but restricts any water, diverting it to the bottom of the canister. A water-in-fuel (WIF) sensor is fitted to the canister. The sensor is designed to send a signal to the ECM when water in the fuel filter/water separator reaches a determined level. The resistance across the WIF sensor varies in relation

to the level of water in the separator. Once the resistance reaches a determined range, the ECM activates the water-in-fuel warning lamp.

The filter housing is fitted with a drain valve to remove excess water, or to completely drain the housing when replacing the fuel filter or other related components. A drain hose is positioned on the bottom of the drain valve and should be placed in a catch container when draining the system.

A fuel heater is also positioned in the filter housing. The purpose of the heater is to prevent the diesel fuel from waxing or gelling during cold weather conditions. When the ambient temperature is below 45 degrees F, a temperature sensor allows current to flow to the heating element to warm the fuel. The system operates via a fuel heater relay located in the power

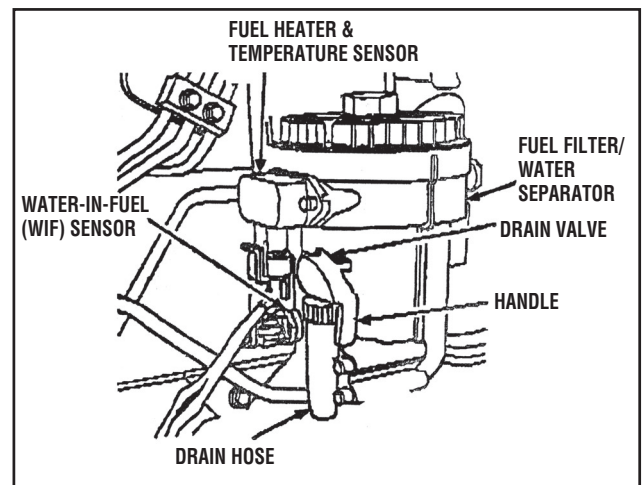


ILLUSTRATION 3

distribution center and is not an ECM controlled component (see illustration #3 for component identification).

BLEEDING THE SYSTEM

When servicing the fuel system, disconnecting components up to the injection pump should

not require bleeding air from the system. Running the system out of fuel or disconnecting the high pressure lines at the injection pump will require bleeding the system at the injectors.

When replacing the fuel filter, fill the filter housing with clean diesel fuel. Failure to fill the housing with fuel may require manual bleeding of the system.

CAUTION: HIGH PRESSURE

To prevent personal injury, precautions must be taken when leak checking the system. There are six high pressure fuel lines located between the fuel injection pump and the fuel injector connector tubes. All other lines up to the injection pump are considered low pressure. The high pressure lines must be secured in their holders and they should not make contact with each other. Do not attempt to weld or repair the lines. If found kinked or damaged, they must be replaced.

Fuel pressure in the high pressure lines can exceed 17,000 psi. It is normal for the lines to expand and contract due to the high pressure pulses that are generated.

WARNING: When checking for high-pressure fuel leaks, do not use your fingers. The fuel can be injected into your skin, resulting in the loss of fingers or limbs. Perform any leak checks with a piece of paper or cardboard, just as you would leak check a high-pressure hydraulic hose.

When troubleshooting a turbo-diesel application, keeping an open mind and being observant is the key to making an accurate diagnosis. If you observe a damaged air filter, a filter improperly positioned in the air box or a damaged air box, look for evidence of a filter or air inlet restriction. The filter may be packed with debris, or it may be clean...with a service minder in the restricted (red) zone. In the latter case, go for water entry into the air intake, contaminating the filter. Your observations and communication with the customer can prevent some costly engine repair. Remember, service is what we sell. Be observant and make the necessary service and maintenance recommendations.

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