

SERVICE MANUAL

SERVICE MANUAL SECTION

CF 500, CF 600 Intake Air Distribution/Filtering and Charge Air Cooler

Truck Model: CF 500

Truck Model: CF 600

S12014

04/29/2005

S12014

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.

Follow all warnings, cautions, and notes.

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Table of Contents

Safety Information.....	1
Intake Air Distribution and Filtering.....	1
Specifications.....	1
Description and Operation.....	1
Diagnosis and Testing.....	2
Symptom Chart.....	2
General Procedures.....	5
Charge Air Cooler Repairs.....	5
Leak Test — Charge-Air-Cooler.....	7
Removal and Installation.....	7
Air Cleaner Element.....	7
Air Cleaner.....	7
Charge Air Cooler.....	8

II CF 500, CF 600 INTAKE AIR DISTRIBUTION/FILTERING AND CHARGE AIR COOLING

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Safety Information

NOTE: Read the following before starting the service procedure.

The information contained in this International Service Manual Section was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure to understand all of the procedures and instructions before you begin work on the unit.

International uses the following types of notations to give warning of possible safety problems and to give information that will prevent damage to the equipment being serviced or repaired.



WARNING: A warning indicates procedures that must be followed exactly. Personal injury or possible death can occur if the procedure is not followed.

CAUTION: A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur.

NOTE: A note indicates an operation, procedure or instruction that is important for correct service.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required can cause injury to service personnel or damage to vehicle components.

This service manual section is intended for use by professional technicians, NOT a “do-it-yourselfer.” It is written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the service section applies to your vehicle. See your International Truck Dealer for information on whether this service section applies to your vehicle.

Intake Air Distribution and Filtering

Specifications

Table 1 Torque Specifications

Description	Nm	lbf-ft	lb-in
Air cleaner mounting nuts	31	23	—
Charge-air-cooler mounting nuts	31	23	—
Charge-air-cooler duct clamps	12	9	—
Air cleaner outlet pipe clamp	5	—	44
A/C condenser mounting nuts	31	23	—

Description and Operation

The intake air system consists of the following:

- Air cleaner element
- Air cleaner element housing
- Mass air flow (MAF) sensor
- Air cleaner outlet tube
- Air cleaner intake tube
- Engine charge-air-cooler
- Charge-air-cooler ducts (inlet and outlet)
- Clamps

The engine intake air system:

- cleans intake air with a replaceable air cleaner element.
- measures airflow and intake air temperature with a MAF sensor. For additional information, refer to EGES-305, Engine Diagnostics Manual.

The charge-air-cooler subsystem cools and increases the density of the compressed turbocharger air.

The engine air cleaner contains an air cleaner element made of treated, pleated paper, which must be replaced periodically as scheduled. Engine performance and fuel economy are adversely affected when maximum restriction of the air cleaner element is reached.

Diagnosis and Testing

Symptom Chart

Table 2 Symptom Chart

Condition	Possible Sources	Action
Excessive black smoke under load/low power	<p>A. High restriction caused by foreign material blocking air inlet screen.</p> <p>B. High restriction caused by the air inlet iced over.</p> <p>C. High restriction caused by foreign material blocking the air intake drain tube.</p> <p>D. Leaks at air intake joints due to loose clamps or disconnected ducts.</p> <p>E. Restriction in the air cleaner element.</p> <p>F. Pressurized air leaking from loose connections or cracks in the charge-air-cooler, ducts or intake components.</p> <p>G. Leaks or restrictions in the exhaust system will cause the turbine and impeller to operate at a lower speed and reduce the amount of air being forced into the cylinders.</p> <p>H. A restriction in the pressure side of the intake air system will change the air-to-fuel ratio.</p> <p>I. A malfunctioning or misadjusted turbocharger wastegate can result in low boost pressures.</p> <p>J. Failure of the turbocharger internal components. A bearing failure can produce friction, reducing the speed of the rotor assembly. Bearing failure can cause the compressor and impeller blades to rub the housing, reducing the rotor assembly speed.</p>	<p>A. REMOVE foreign material.</p> <p>B. CHECK the air intake pipe. If frozen, carefully thaw out.</p> <p>C. REMOVE foreign material.</p> <p>D. INSPECT air intake joints. REATTACH ducts and TIGHTEN clamps to specification.</p> <p>E. INSTALL a new air cleaner element.</p> <p>F. CHECK the entire intake air system for leaks. CARRY OUT the charge-air-cooler leak test. REFER to Leak Test — Charge-Air-Cooler under Charge Air Cooler Repairs within this section. REPAIR the intake air system. TEST the system for normal operation.</p> <p>G. REPAIR the exhaust system. REFER to Exhaust System in S07002. TEST the system for normal operation.</p> <p>H. CHECK for restricted or leaking charge-air-cooler. CARRY OUT the charge-air-cooler leak test. REFER to Leak Test — Charge-Air-Cooler under Charge Air Cooler Repairs within this section. REPAIR the intake air system. TEST the system for normal operation.</p> <p>I. CHECK the turbocharger wastegate function and adjustment. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p> <p>J. CARRY OUT the bearing clearance check. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p>

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Table 2 Symptom Chart (cont.)

Condition	Possible Sources	Action
High oil consumption	<p>A. A restricted or damaged oil return passage will cause the turbocharger housing to become pressurized, causing engine oil to migrate past the turbocharger seals.</p> <p>B. If there is an excessive amount of engine oil in the turbocharger housing and no other causes are found for the excessive oil consumption.</p> <p>C. Excessive crankcase pressure will not allow the oil to drain from the turbocharger. This will load the bearing housing and allow the engine oil to leak past the compressor seals and into the engine.</p>	<p>A. CLEAN or REPAIR as necessary. RESTORE the vehicle. TEST the system for normal operation.</p> <p>B. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p> <p>C. REFER to EGES-305, Engine Diagnostics Manual for causes of the excessive blow-by.</p>
Boost pressure high/low	<p>A. Turbocharger wastegate failure or misadjustment can result in excessively high or low boost pressures. Low boost pressures can cause excessive smoke and low power. High boost pressures can cause major engine damage.</p> <p>B. Pressurized air leaking from loose connections or cracks in the charge air cooler, ducts or intake manifold runners.</p> <p>A restriction in the pressure side of the intake air system will change the air-to-fuel ratio.</p> <p>Leaks or restrictions in the exhaust system will cause the turbine and impeller to operate at a lower speed and reduce the amount of air being forced into the cylinders.</p>	<p>A. CHECK the turbocharger wastegate function and adjustment. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p> <p>B. REFER to Excessive black smoke under load/low power within this symptom chart.</p>

CF 500, CF 600 INTAKE AIR DISTRIBUTION/FILTERING AND CHARGE AIR COOLING

Table 2 Symptom Chart (cont.)

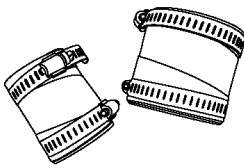
Condition	Possible Sources	Action
Noise/Vibration	<p>A. Leaks in the intake air system.</p> <p>B. Rattles due to loose air cleaner support brackets.</p> <p>C. Foreign material in the intake air system.</p> <p>D. Leaks in the exhaust system.</p> <p>E. Foreign material in the exhaust system.</p> <p>F. Foreign material in the turbocharger.</p> <p>G. Minor nicks or dents in the compressor or turbine wheel.</p>	<p>A. REPAIR or INSTALL new intake air system components as necessary. TIGHTEN the clamps to specification. TEST the system for normal operation.</p> <p>B. REPAIR or INSTALL new brackets as necessary. TIGHTEN fasteners to specification.</p> <p>C. CHECK the intake air system for foreign material. CLEAN, REPAIR or INSTALL new intake air system components as necessary. TEST the system for normal operation.</p> <p>D. REPAIR or INSTALL new exhaust system components as necessary. REFER to Exhaust System in S07002. TEST the system for normal operation.</p> <p>E. CHECK the exhaust system for foreign material. CLEAN, REPAIR or INSTALL new exhaust system components as necessary. REFER to Exhaust System in S07002. TEST the system for normal operation.</p> <p>F. CHECK the turbocharger for signs of damage due to rotor assembly damage. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p> <p>G. INSTALL a new turbocharger as necessary. REFER to EGES-300, Engine Service Manual.</p>

If the problem cannot be diagnosed using the preceding symptom chart, refer to EGES-305, Engine Diagnostics Manual for additional information.

General Procedures

Charge Air Cooler Repairs

Table 3 Special Tool

Item	Specification
 <p>ST2918-A</p>	<p>Plugs, Charge-Air-Cooler ZTSE4689</p>

NOTE: In the event the charge-air-cooler is contaminated internally from turbocharger failure or any other cause, cleaning the unit is NOT RECOMMENDED. The only effective service is to REPLACE the entire unit.

1. Determine what type of damage has been done to the charge-air-cooler.
2. Refer to the Charge-Air-Cooler Cross Reference Chart to determine if the damage is repairable and what type of repair can be made.

Table 4 Cross Reference Chart

Condition	Action to Take
Tubes torn or cracked.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tubes dented, kinked or bent resulting in a round edge (radius less than 1 mm (0.04 in) [1/32 in]).	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tubes dented, kinked or bent resulting in a round edge (radius greater than 1 mm (0.04 in) [1/32 in]).	No repair required.
Holes in tubes less than 1 mm (0.04 in) (1/32 in) in all directions on tube surface.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
External fins crushed or bent; no more than 1 mm (0.04 in) (1/32 in) height reduction per fin row and the sidemember-to-sidemember dimension is within specification (687 mm [26-3/4 in]).	No repair required.
External fins pushed in with no tearing.	Straighten the fins.

CF 500, CF 600 INTAKE AIR DISTRIBUTION/FILTERING AND CHARGE AIR COOLING

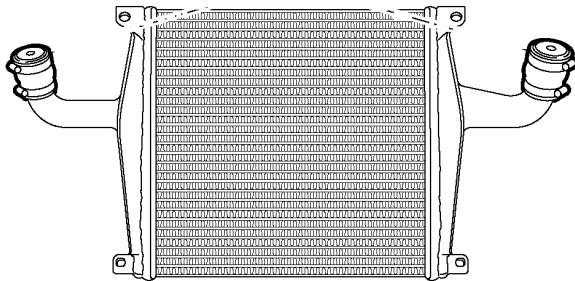
Table 4 Cross Reference Chart (cont.)

Condition	Action to Take
External fins pushed in with tearing less than 10 mm (0.4 in) (3/8 in) deep from core face. Also tearing is less than 20 percent of a given fin row and less than 5 percent of the total fin rows.	Remove loose fin material and straighten.
External fins pushed in with tearing or more than 10 mm (0.4 in) (3/8 in) from face core or more than 20 percent of a given row or more than 5 percent of the total fin row.	Install a new charge air cooler. For additional information, refer to Charge Air Cooler in this section.
Sidemembers bent or dented.	Straighten the sidemember to original form. If the tubes are dented or the fins crushed, then straighten.
Sidemember surfaces cracked or broken through.	Install a new charge air cooler. For additional information, refer to Charge Air Cooler in this section.
Headers bent or dented, with more than 3 tube or tube-to-header leaks or a crack width greater than 2 mm (0.08 in) (1/16 in).	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Headers cracked.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tank walls dented but not cracked or broken through, and fit and function of cooler is not affected.	No repair required.
Tanks cracked. Crack is no more than 2-mm (0.08-in) (1/16-in) wide and 20-mm (0.8-in) (3/4-in) long.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tanks cracked. Crack is more than 2-mm (0.08-in) (1/16-in) wide or more than 20-mm (0.8-in) (3/4-in) long.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tanks punctured. Hole is no more than 5 mm (0.2 in) (3/16 in) in all directions on tank surface.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tanks punctured. Hole is more than 5 mm (0.2 in) (3/16 in) in any direction on tank surface.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Tank-to-header welds cracked or porous.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Threads stripped in tapped holes.	Drill out stripped threads and tap to accept correct helicoil.
Bosses and mounting brackets cracked or broken off, but crack or fractured surface does not go into tank wall.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Bosses or mounting brackets cracked or broken off, and crack goes into tank wall.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.
Mounting pins or other hardware cracked, broken or otherwise damaged and repair will not affect fit, function or durability.	Repair to original condition.
Mounting pins or other hardware cracked, broken or otherwise damaged and repair does affect fit, function or durability.	Install a new charge-air-cooler. For additional information, refer to Charge Air Cooler in this section.

Leak Test — Charge-Air-Cooler

NOTE: To make sure of correct performance, all repaired charge-air-coolers must be leak tested and pressure checked prior to painting or installing into the vehicle.

1. Install an air pressure gauge in one port of the charge-air-cooler and a regulated air supply in the other port.



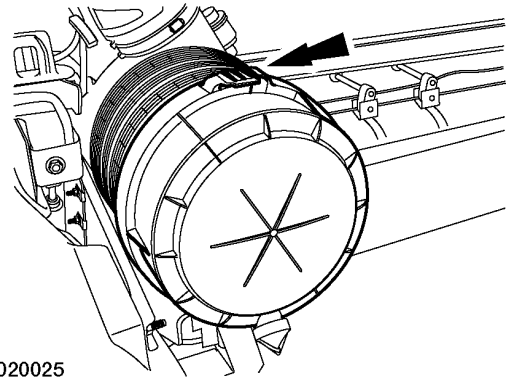
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2. Apply 276 kPa (40 psi) of air pressure.
3. Check charge-air-cooler air pressure loss.
 - If the pressure loss exceeds 34 kPa (5 psi) in 15 seconds, install a new charge air cooler. Refer to Charge Air Cooler in this section.
4. Install a new charge-air-cooler if there is any permanent distortion. For additional information, refer to Charge Air Cooler in this section.

Removal and Installation

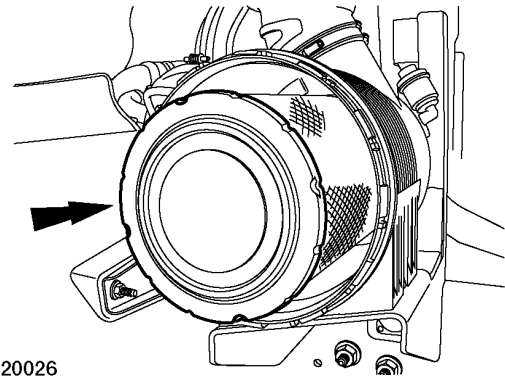
Air Cleaner Element

1. Release the clip and rotate the air cleaner cover clockwise to remove.



N0020025

2. Remove the air cleaner element.

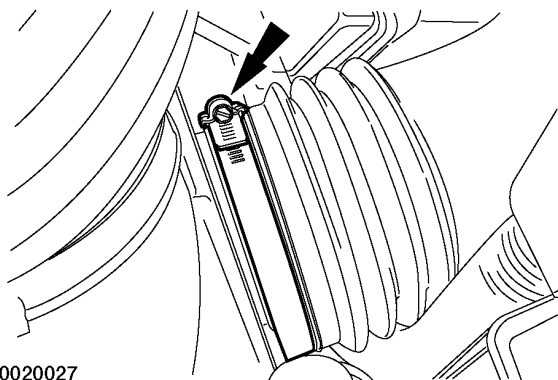


N0020026

3. To install, reverse the removal procedure.
 - Wipe the air cleaner housing out prior to installing the air filter.

Air Cleaner

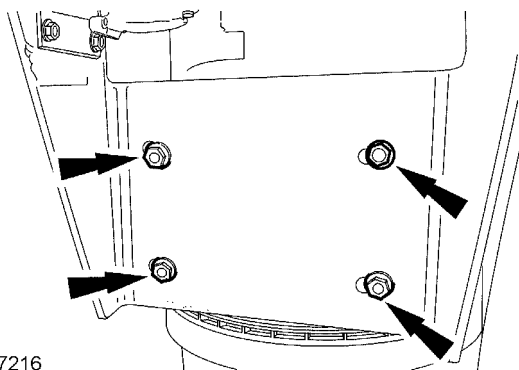
1. Loosen the clamp for the air cleaner outlet pipe.
 - To install, tighten to 5 Nm (44 lb-in).



N0020027

2. Remove the air cleaner retaining nuts. Disconnect the air cleaner outlet pipe and remove the air cleaner.

- To install, tighten the 31 Nm (23 lb-ft).



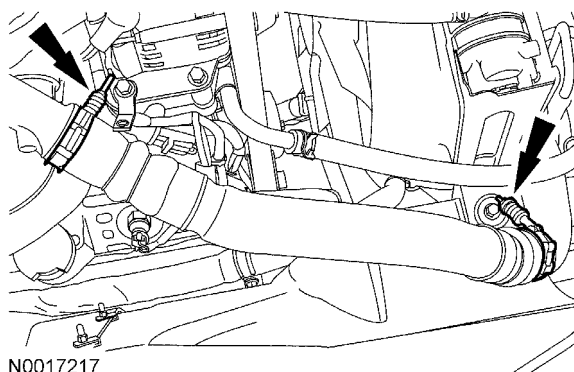
N0017216

3. To install, reverse the removal procedure.

Charge Air Cooler

1. Loosen the clamps and remove the charge-air-cooler (CAC) duct.

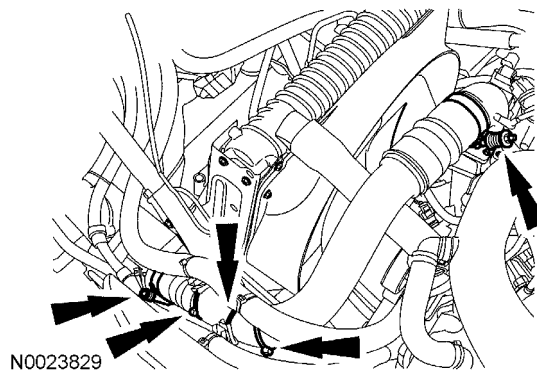
- To install, tighten to 12 Nm (9 lb-ft).



N0017217

2. Remove the tie straps. Loosen the clamps and remove the CAC duct.

- To install, tighten to 12 Nm (9 lb-ft).

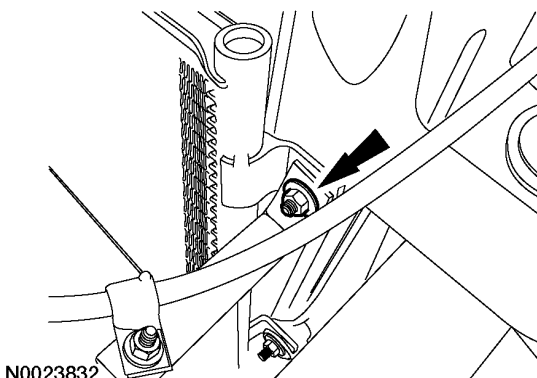


N0023829

NOTE: LH shown, RH similar.

3. Remove the retaining nuts and position the heater hoses aside.

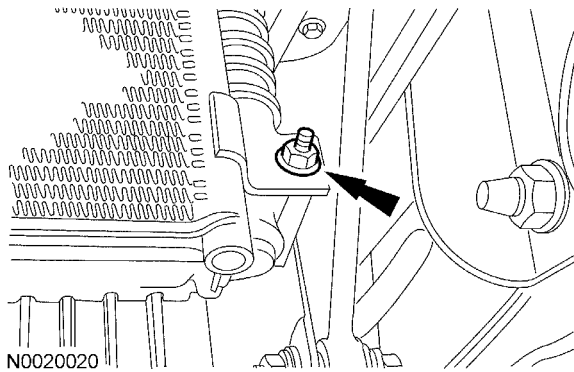
- To install, tighten to 31 Nm (23 lb-ft).



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4. Remove the lower retaining nuts and position the A/C condenser aside.

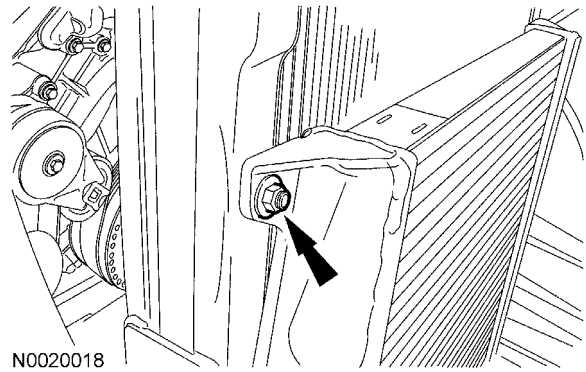
- To install, tighten to 31 Nm (23 lb-ft).



NOTE: RH shown, LH similar.

6. Remove the upper retaining nuts and the CAC.

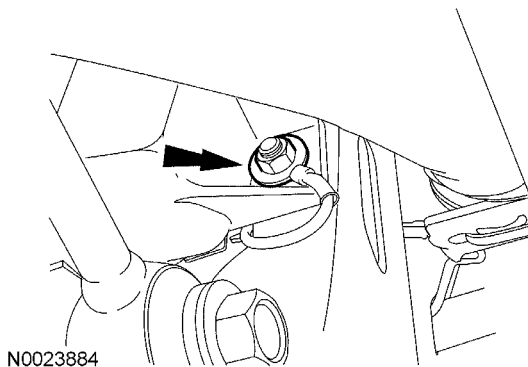
- To install, tighten to 31 Nm (23 lb-ft).



NOTE: LH shown, RH similar.

5. Remove the lower retaining nuts and ground wire.

- To install, tighten to 31 Nm (23 lb-ft).



NOTE: If there is any oil residue, clean both connecting ports and inside surface of the charge-air-cooler duct to prevent the duct from blowing off.

7. To install, reverse the removal procedure.