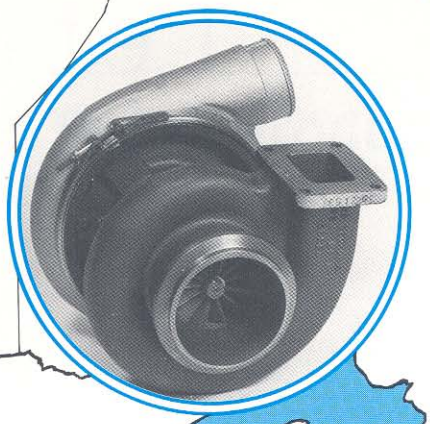
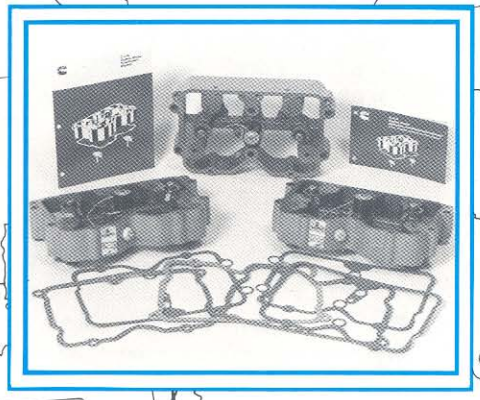
PARTS PRO CLASSIC

CLASSIC EDITION #3

Parts Pro Classic is provided as a historical reference. Special offers, prizes and awards no longer apply to this edition. Current Parts Pro issues along with all Parts Pro Classics may be found at **(click) qsol.cummins.com.**

Cummins
Parts Professional





PARTS PROFESSIONAL 3

Letters

Single Disc Fuel Pump

Looking for genuine parts to overhaul a "Workhorse"? A Cummins HB6 4⅞" bore.

Dear Cummins Parts Professional:

I would like to take a moment to thank all of you who participated in previous field tests and reviews. The field tests have helped to make the Parts Professional a success. I extend a respective thanks to Steve McKee and Art Rotter, Cummins West, for setting up a very thorough field test group. The field test group greatly enhanced the quality of this booklet to better meet your needs as Cummins Parts Professionals.

A special thanks to Mr. Bill Galusha, partsman for the Omaha Distributor. Bill, a 1983 Parts CST winner, contributed a great deal of research for this booklet. Keep up the good work Bill! I would also like to thank Mr, Richard Prowl of R&R Diesel, McDonalds Pass, Montana, for the great photos of his 1951 Autocar Wrecker powered by an "HB6" Cummins 4 7/8" bore with a single-disc fuel pump. It's great to know we can keep 'em humming and keep'em Genuine!

I invite you to write with ideas for the Parts Professional series. This publication is for you!

Be a Parts Professional

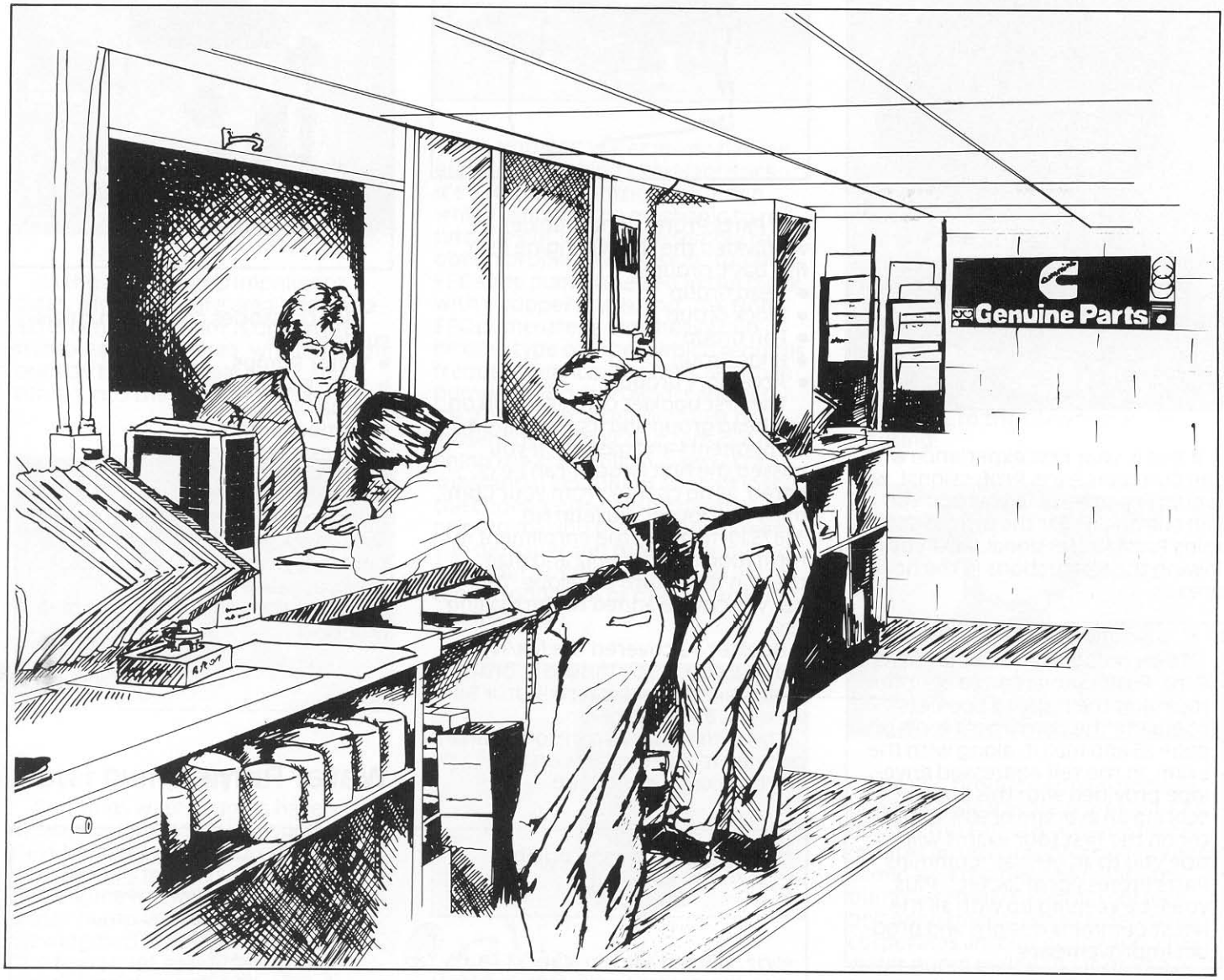
Joan E. Mobley

J.E. Mobley/cm

Parts Training

Cummins Engine Company, Inc.
Mail Code 40911
Box 3005
Columbus, IN 47202-3005

Cummins Parts Professional Tests - Product Familiarity is the Key to Selling Success

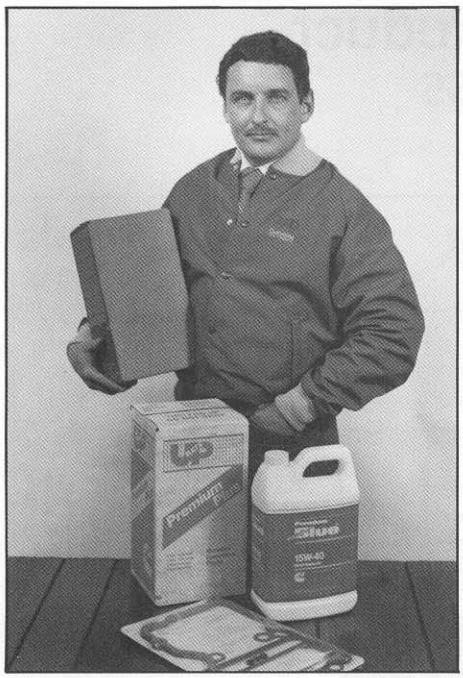


- What's New?
- How's this improved component going to help me?
- Can you tell me how this fits?
- How will this Uprate kit improve my mileage and performance? Will it pay for itself?
- Can I turn this core in for a Cummins ReCon even if it's cracked?

This is just a sampling of the questions that Cummins Parts Professionals are hit with every day. It's tough to keep up with all the new information, plus give advice on how things go together and provide accurate up-to-date information on genuine Cummins parts. That's where the Cummins Parts Professional series can help you out.

In this issue we'll be looking at new Cummins NH/NT Accessory Components, plus we'll have the usual features on Cummins ReCon Components, Parts News Update, New Products, Product Consolidations, Product Improvements and a new feature covering Fleetguard.

We've also put together another Parts Professional Exam to quiz your knowledge on accessories and some of the other information in this issue. By the way, if you haven't been counting, this is the third exam. The people who have been taking the exams all along will be eligible for a Cummins Parts Professional Jacket after they've taken the fourth exam.



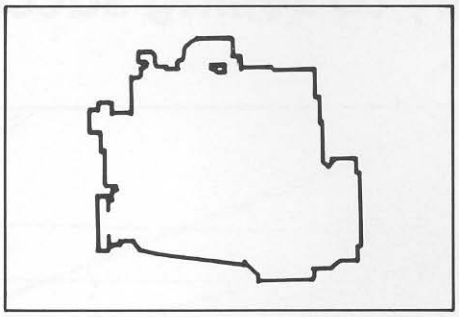
If this is your first experience with the Cummins Parts Professional, we would like to remind you that you can still qualify for the official Cummins Parts Professional Jacket by following the instructions in the boxed area.

INSTRUCTIONS

To be recognized as a Cummins Parts Professional and to continue receiving the training booklets, complete the enrollment form on page 25 and mail it, along with the exam, in the self addressed envelope provided with this booklet. Scoring an average of 90% or better on the first four exams will entitle you to an official "Cummins Parts Professional Jacket." Plus, you'll be keeping up with all the latest Cummins designs and product improvements.

Participating in the Parts Professional program will help you learn more about Cummins products. You'll gain the competitive edge which, in turn will enhance your earning capabilities.

Engine Groups



In Parts Professional booklet #1, we divided the NH/NT engine into five basic groups:

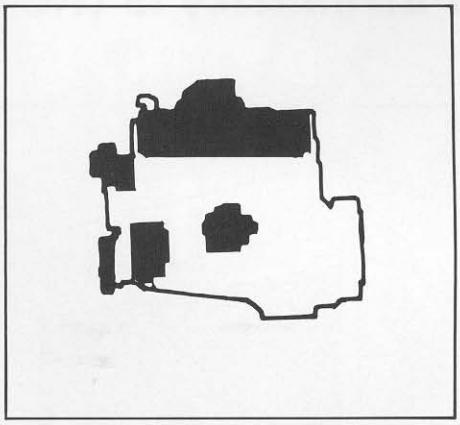
- Head Group
- Block Group
- Pan Group
- Ends Group
- Accessory Group

The first booklet concentrated on the head group and its associated components and gaskets. If you missed the first issue, it can be ordered, at no charge, from your Cummins distributor, Bulletin No. 3387320-1R. Fill in the enrollment information and the quiz and mail them in the return envelope. This will get your name added to the mailing list.

Booklet #2 covered the NH/NT block group. If you missed it, order it from your Cummins distributor Bulletin No. 3387320-2R.

This is the third Parts Professional booklet. It concentrates on the NH/NT accessories group.

Accessories



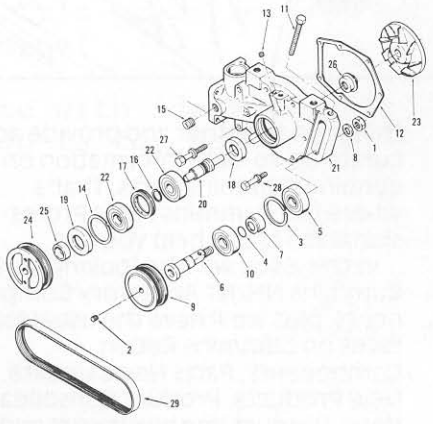
The accessories covered in this issue include:

- Water Pumps
- Lube Pumps
- Lube Oil Coolers
- Turbochargers
- Accessory Drives
- C BRAKE
- Vibration Dampers

We'll be looking at each of them separately, going into basic operation, design changes, standardizations, Uprate information, maintenance and other important points.

Water Pumps

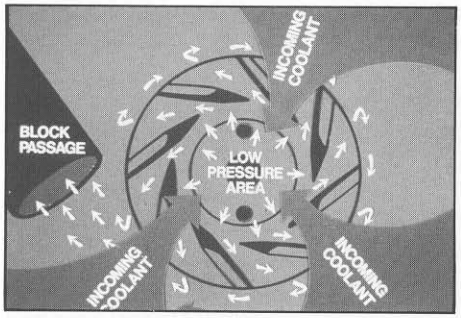
BIG CAM IV WATER PUMP



REF. NO.	PART NUMBER	PART NAME	NO. REQ'D.
		WATER PUMP/IDLER GEAR All Models	
	3045944	Assembly, water pump and idler gear	
	AR-45189	Assembly, water pump idler	
1	S-201	Nut	1
2	S-965-E	Plug, pipe	1
3	S-16255	Ring, retaining	1
4	145506	Seal, O-ring	1
5	3038998	Seal, oil	1
6	208119	Shaft, idler	1
7	208120	Spacer, mounting	1
8	213082	Washer, plain	1
9	215397	Pulley, idler	1
10	3010150	Bearing, ball	1
11	182706	Capscrew	1
	3801595	Kit, water pump	1
12	3002385	Gasket, water pump	1
	(3045943)	Assembly, water pump	
13	3025458	Plug, pipe (1/8)	2
14	S-16255	Ring, retaining	1
15	3013786	Plug, pipe (3/8)	1
16	112302	Ring, retaining	1
17	196844	Spacer, bearing	1
18	3038997	Seal, oil	1
19	3038998	Seal, oil	1
20	3000889	Shaft, water pump	1
21	3045163	Body, water pump	1
22	3010150	Bearing, ball	2
23	3000888	Impeller, water pump	1
24	3026013	Pulley, water pump (3025861)	1
25	203097	Sleeve, wear	1
26	3033677	Assembly, seal and seat	1
		MOUNTING PARTS All Models	
27	3012469	Capscrew, captive (3/8-24 x 3-1/4)	2
28	3012468	Capscrew, captive (3/8-24 x 2-1/4)	4
29	217638	Belt, V-ribbed	1

Water Pump Operation

The water pump is designed to circulate coolant through the cooling system to absorb excess heat.

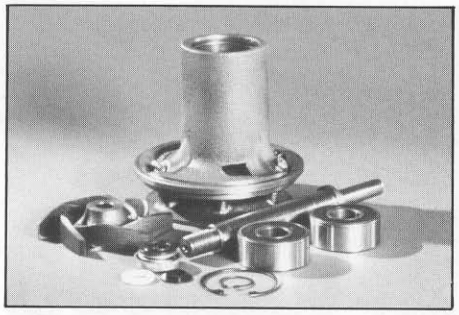


As the water pump impeller rotates, a low pressure area is formed at its center. Coolant is drawn into this low pressure area, whirled to the outside by centrifugal force, and forced into the coolant passages.

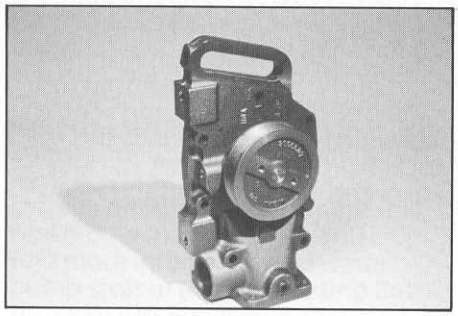
Water Pump Styles

Cummins water pumps have changed significantly through the development of the Non-FFC Small Cam models to the current Big Cam FFC engine models. We'll discuss the water pump improvements by reviewing two styles of water pumps. The two styles are shown in the photo, the Non-FFC or eccentric and the FFC suitcase handle pump.

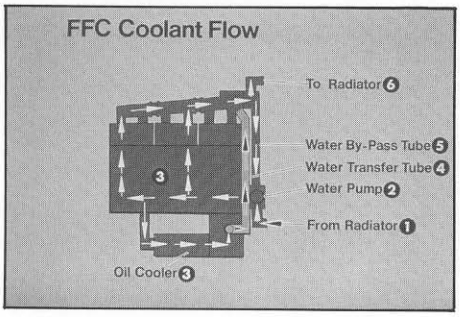
Let's first take a look at the Non-FFC style pump. These water pumps were primarily used on Small Cam engines produced before 1971. Looking at the Non-FFC water pump and its' design characteristics will reveal the differences between the Non-FFC "eccentric" and the FFC or "Full-Flow Cooling" water pump currently in use today. For all of you who are not familiar with the Non-FFC pump "eccentric pump" simply means that the pulley center is offset so that when the water pump body is rotated the pulley tensions the V-belt.



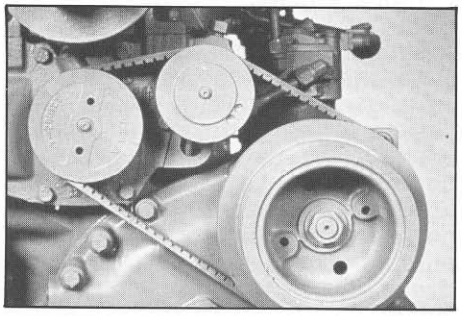
The Non-FFC water pump has several distinguishing characteristics. It's a round eccentric style pump which requires the mechanic to rotate the entire pump assembly to obtain proper belt tension. The Non-FFC style pump is sealed in the block with a copper crush ring. The Non-FFC pump uses a very heavy non-flexible type of V-belt which requires frequent service. The Non-FFC style pump is difficult to adjust and service. The pump assembly must be loosened to adjust belt tension, loosening the assembly may result in a substantial amount of coolant loss if the cooling system isn't drained prior to making the belt adjustment. The difficulty and the time required to obtain proper belt tension led to the introduction of the FFC water pump design.



The FFC or "suitcase handle" style water pumps were first introduced in 1971 for use on Small Cam Full-Flow-Cooling engine models. FFC "full-flow-cooling" actually means that all lubricating oil passes through the oil cooler and oil filter before it reaches the engine components. Looking at the water pump the FFC Small Cam engine offered many refinements which increased component reliability, engine performance and fuel economy.

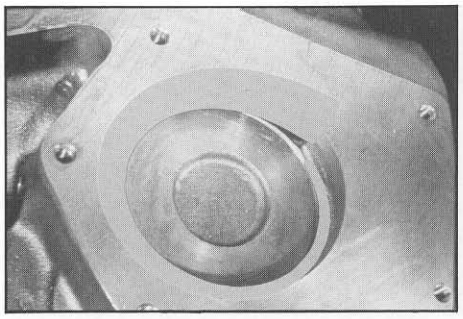


In the Non-FFC engine coolant flows directly through the oil cooler to the water pump. In the FFC models, coolant enters the water pump from the radiator and the water bypass tube. At the rear water header plate, approximately thirty-five percent of the coolant is diverted through the oil cooler and on to the water transfer tube and thermostat housing. The remaining coolant circulates through the engine, then goes to the thermostat housing.



The FFC produced many positive benefits over the previous Non-FFC design. The FFC water pump incorporates an integral idler pulley which eliminated the need to rotate the pump assembly to obtain correct belt adjustment. The FFC design incorporates an idler pulley and a fixed water pump pulley and is driven by two smaller more flexible V-belts, which are easier to adjust and are more durable. The pulleys attributed to longer belt life and the belts were much easier to service than the less flexible V-belts used on the Non-FFC engines.

The Big Cam (2 1/2" camshaft) engines were introduced in 1976. The Big Cam design once again changed the characteristics of the water pump.

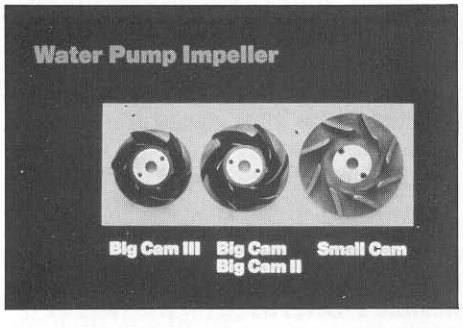


A volute cast into the block increased water pump efficiency by requiring 50% less horsepower to drive the pump, thus lowering parasitic load to produce improved fuel economy.

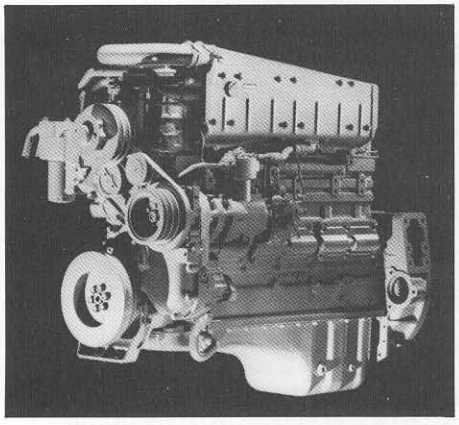
Because the volute was so efficient it allowed the water pump impeller size to be decreased from a 5" cast iron to a 4 1/2" phenolic further reducing parasitic load. A major improvement was the release of the V-ribbed belt, often referred to as the "poly-V". This belt extended service life by as much as 5-6 times over conventional V-belts.

Big Cam II models released in 1980 continued to offer the same water pump and 4 1/2" impeller which were introduced on Big Cam I models. The Big Cam III design introduced in 1982 (SPT 82TO-2) required a lower coolant flow rate to cool the engine. This design change further reduced the horsepower requirements of the pump, and once again decreased the size of the phenolic impeller to 4 inches.

The factory now recommends a 4 1/2" impeller when servicing a Big Cam III Impeller P/N 3000888.

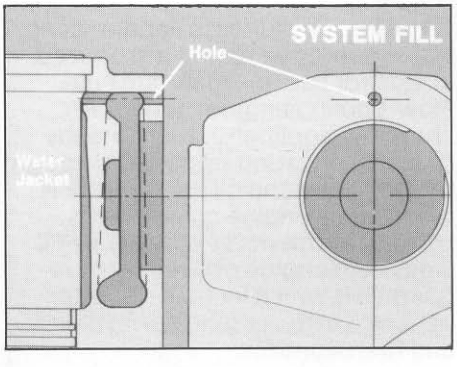


The Big Cam NTC 475 model was originally released in 1981 (SPT 81T1-9) and required the higher flow rate of the Big Cam I and II engine models. This design required a greater coolant flow rate through the aftercooler core and block to properly cool the engine. To achieve the higher coolant flow rate it was necessary to use the 4 1/2 inch impeller.

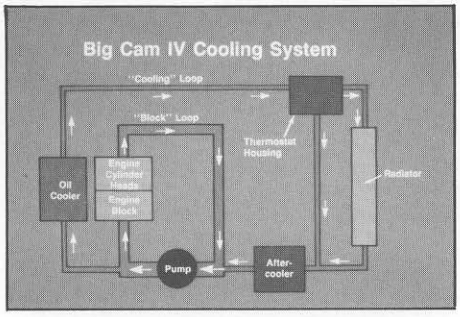


The Big Cam IV was released in 1984 (SPT 84TO-5) this design offers a new concept in cooling and required several changes to the cooling system such as, the aftercooler, thermostat design and coolant flow loops, these changes were discussed in Parts Professional booklet #1(3387320-1R,1RF,1RS) other reference sources are available in the reference section on the back cover of this book.

Proper fill and system venting has always been a major concern for the many applications that Cummins engines are applied to because of the different tilts and customer plumbing requirements. To assure proper fill, required the drilling of a vent hole in the block water pump cavity. The Big Cam IV uses a new water pump body. This water pump includes a new casting with a refined water pump inlet and is vented to match the new water pump vent hole which is machined into the block. The drawing shows the location of the vent hole in the water pump cavity.



The Big Cam IV uses a 2 loop cooling system. The low flow or optimized aftercooled system uses a low flow loop (radiator/aftercooler) and a normal flow loop (block/head). The two loops require the higher coolant flow rate produced by the 4 1/2 inch water pump impeller.



The BCIV block and water pumps will become standard parts for all Big Cam engines.

Water Pump Standardization

As of January 1986 the NH/NT water pump was standardized to simplify service requirements and improve performance. The new water pump assembly for Big Cam I, II, III and IV models is P/N 3045943.

The standardized water pump can be identified by the following:

- Body, P/N 3045163, (has internal vent drillings)
- Impeller, P/N 3000888 (4 1/2" (114mm) diameter, 6 vanes)
- Pulley P/N 3026013 (4 5/16" (110mm) diameter)

To order this assembly, use kit P/N 3801595 which contains the mounting gaskets and the O-ring.

Please note, previous water pump assembly P/N 3022474 is being retained for Big Cam III GMC applications. The difference between the two water pump assemblies is the pulley. This assemlby contains:

- Pulley, P/N 3025935 (4 11/16" (119mm) diameter B.C.III GMC only)

To order this assembly use kit P/N 3801702 which contains the mounting gaskets and the O-ring. This assembly was retained for B.C. III GMC applications to provide adequate belt clearance for the freon compressor bracket.

The Water pump Application Chart includes Current Service part numbers for FFC Suitcase handle style pumps.

Water Pump Application Chart

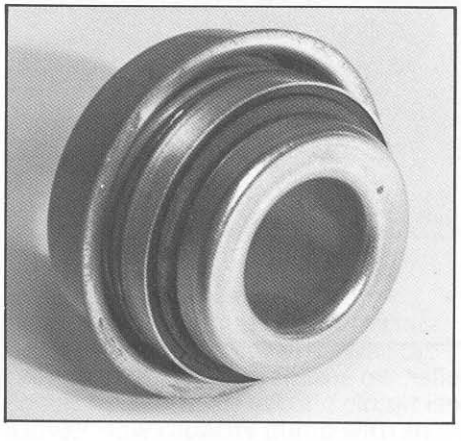
Engine Model	2 GROOVE PULLEY and Belt Drive	V-RIBBED PULLEY (Poly-Vee)
SC FFC T and T/A	3000886	3022475
SC FFC nat/asp	3000896	3024671
SC 80 Tilt	214128 (top inlet)	3022472 (top inlet)
SC Non-FFC	3022471	3027882
BC I, II, III, IV	3000885 BC I, II only	3801595 (3045943)
BC III GMC Only	Not Avail	3801702 (3022474)
BC 80 Tilt	3004746 (top inlet)	3014238 (top inlet) 3036122 (side inlet)

- ( ) equals the water pump assembly part number.
- 2 Groove Pulley not available for BC III and IV.

This is a note concerning 80 degree tilt or horizontal Water Pump applications for small cam and big cam models. Water pumps are always installed with the weep hole pointing down. The top inlet style pump when installed requires that the inlet point toward the cylinder head. The side inlet style pump when installed requires that the inlet point toward the oil cooler.

Cummins Water Pump Seals

Because the water pump forces the coolant out under high pressure, sealing is essential. The water pump seal is one of the most critical components in the water pump, and has undergone many changes. Advanced water pump seal design is a major reason why Cummins water pumps are a market leader. **The silicon-carbide seal has a temperature resistant bellows** designed to resist cooling system chemicals. It has a pressure balanced design and superior face materials for a long life.



New Cummins water pumps are manufactured with a Cummins designed unitized pressure balanced silicon carbide seal. The unitized silicon carbide facing surface in combination with the low spring force, pressure balanced design reduces friction to the lowest level of any current seal. Even more important, the extreme hardness of silicon carbide means the seal facing surface will not wear out under normal operating conditions. As a result, Cummins testing shows the silicon carbide design is the most durable seal on the market today. You can find more information on water pump seals in Parts Marketing Bulletin #PM/PMSFD-2852.

The competition rarely uses seals designed as well as those of Cummins. They use seals that have a higher friction level or do not resist wear as well as the Cummins seals. In addition, these other seals have significantly different spring tensions, resulting in rapid seal wear and shorter water pump seal life. In other words, these "off-brand" seals are designed to "get the customer out the door, but keep him coming back for more".

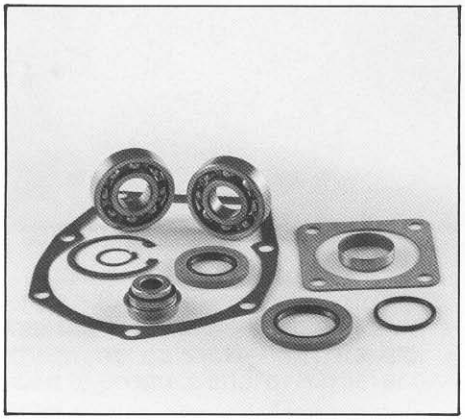
Water Pump Repair Kits

The introduction of the unitized design water pump seal in 1982 resulted in the restructuring of water pump repair kits. This introduction offered a choice of either P/N 3029099 carbon on ceramic seal or a P/N 3033677 silicon carbide seal in service water pump repair kits.

Both minor and major repair kits were structured or restructured. The minor kits contain all the parts necessary to rebuild the NH FFC water pumps with the exception of the impeller, shaft, and bearing spacer. The minor kits also include the mounting and connecting gaskets and o-ring. The major kits contain the above parts plus the impeller, shaft and bearing spacer. Refer to the tables for contents of the new and restructured repair kits.

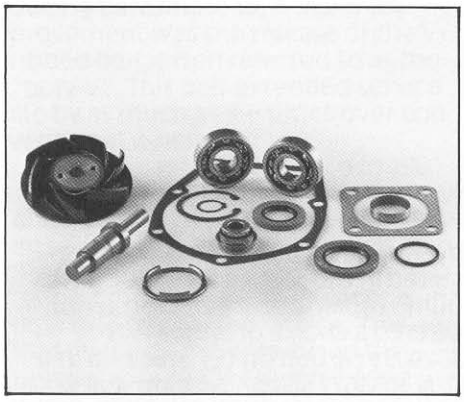
NOTE: Some old minor and major repair kits include selected idler repair parts that are not contained in the new kits. For this reason a separate water pump idler repair kit P/N 3801378 has been created.

Minor Repair Kits



Engine Series	Kit Part Number	Remarks
NH Big Cam I/II/III Small Cam FFC	3801377	Silicon carbide seal (supercedes AR-9932)
NH Big Cam I/II/III Small Cam FFC	3801376	Carbon on ceramic seal

Major Repair Kits



Engine Series	Kit Part Number	Remarks
Small Cam FFC	3801384	Silicon carbide seal over 250 h p (supercedes 3390115)
Small Cam FFC	3801383	Carbon on ceramic seal Over 250 hp
NTC-230 (Small Cam)	3801382	Silicon carbide seal 250 hp and under (supercedes 3390114)
NTC-230 (Small Cam)	3801381	Carbon on ceramic seal (250 hp and under)
Big Cam I/II/III/IV	3801380	Silicon carbide seal (supercedes 3390113)
Big Cam I/II/III/IV	3801379	Carbon on Ceramic Seal
NTA 400 pump	AR-12050	For AR-10740 water pump

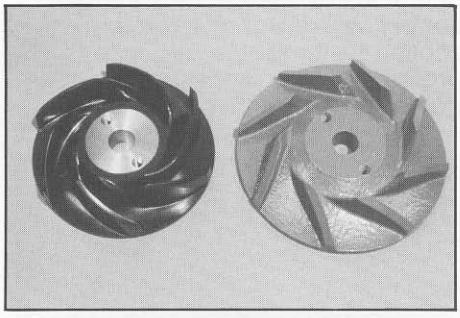
Note, watch the parts professional series for upcoming water pump repair kit Consolidations

Water Pump Impellers

Water pump impellers are available individually. Impellers are normally available in two different materials, cast iron and phenolic. Cast iron impellers were reintroduced to satisfy customer demand.

A special point to note is that ReCon water pumps which contain a cast iron impeller have a -1 suffix on their ReCon part number.

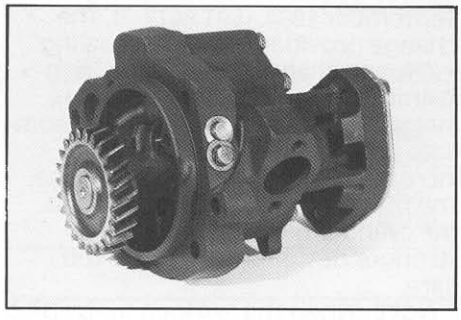
The following chart shows the current phenolic and cast iron part numbers available for the NH and V-903 water pumps.



WATER PUMP IMPELLERS

Water Pump Description	Cast Iron Impeller Part Number	Phenolic Impeller Part Number
NH Big Cam	3602788	3000888
NH Small Cam FFC	208134	3007637
NH Non-FFC	201766	3020479
V-903	201164	3002483

Lube Oil Pumps

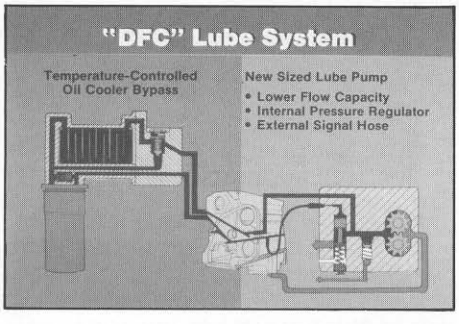


The lube oil pump circulates the lubricating oil through the oil cooler and filter and then through a series of passages in the block to all of the moving parts of the engine.

Cummins manufactures a variety of oil pumps designed to meet the pressure and volume requirements of different engines. All oil pumps are gear driven. We will be concentrating on the DFC, Demand-Flow-Cooling style lube pump used on current NH/NT engines.

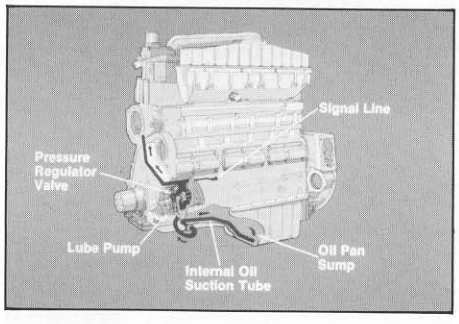
NH/NT engines use the "DFC" (demand flow cooling) lube system which was introduced along with the Big Cam II engine in 1981. The DFC lube system uses a different lube pump and oil cooler support housing than previously used systems. The DFC lube pump has the following distinguishing design features:

- Reduced Main Oil Rifle Pressure
- Maintains More Constant Oil Pressure
- Maintains Proper Oil Temperature



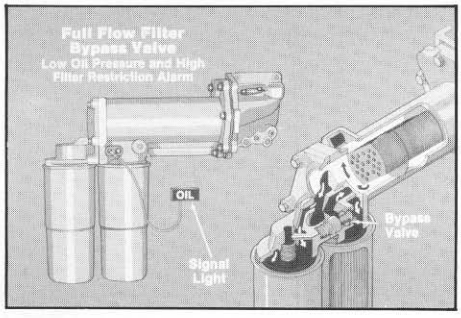
The three features are accomplished by two independent circuits. One circuit consists of a thermostatically controlled bypass in the oil cooler housing. The second circuit is a lower flow capacity pump with an internal pressure regulator and external signal feedback line.

Primary components of the DFC system are the thermostatically controlled bypass valve, internal pressure regulator, lower flow capacity lube oil pump and the external signal line, shown below.



A cold start, high pressure limit valve and a new main rifle pressure regulator valve are integral parts of the pump. By monitoring oil rifle pressure through the external signal line, the DFC lube pump can maintain a lower oil pressure. The system also compensates for different operating conditions such as changes in oil viscosity and filter condition.

Lubricating oil pumps prior to the DFC pump were designed to continuously supply more oil and pressure to the engine than the engine actually required. The DFC regulating system maintains a nominal operating oil pressure of approximately 40 psi (pounds per square inch) instead of approximately 60 psi. From an operator's point of view the most visible change will be lower, more even oil pressure readings on the lube oil pressure gauge.



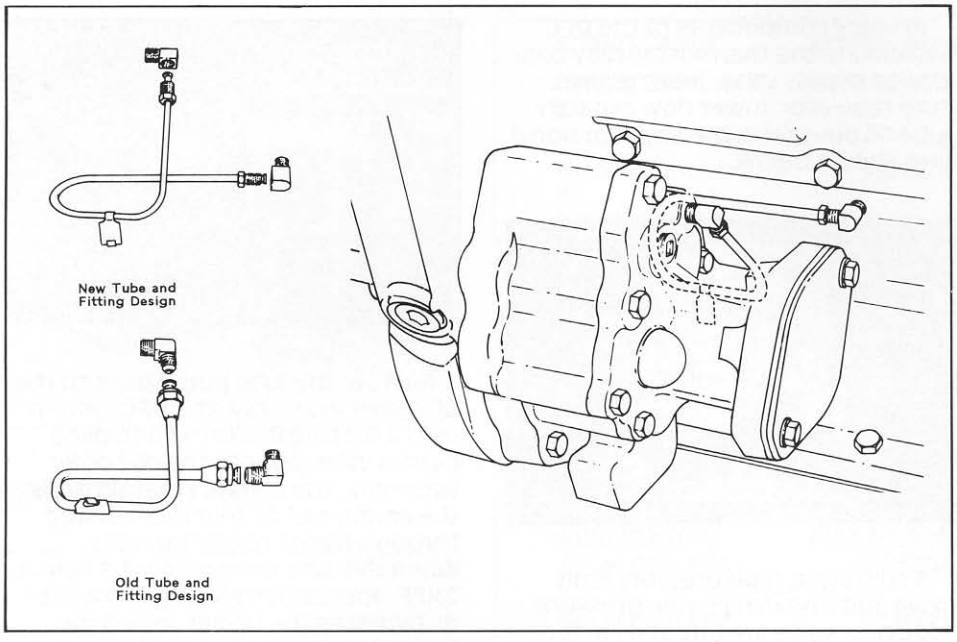
Oil from the lube pump goes to the oil cooler assembly. The DFC system uses a thermostatically controlled bypass valve prior to the oil cooler assembly. The bypass valve controls the amount of oil that is circulated through the oil cooler bundles. When the lube temperature is below 230°F, approximately half of the lube oil bypasses the cooler. When the temperature is above 230°F all the oil is routed through the cooler. This results in more rapid lube oil warm-up and uniform oil temperature.

By closely controlling the oil pressure and temperature, less horsepower is required to operate the pump, thus providing approximately 8 extra horsepower to the flywheel, thereby improving fuel economy and performance.

Horsepower savings result from two distinct advantages. First, a more constant and lower main rifle pressure is maintained. This causes the lubricating oil pump to work less to maintain rifle pressure. The DFC pump produces an optimum oil film on the bearings thereby producing longer life to overhaul. Secondly, oil temperatures are encouraged to reach a higher level during light load and/or cool ambient temperatures. The increased oil temperature reduces engine horsepower frictional losses thereby producing an improvement in fuel economy.

The DFC system reduces oil flow and cooling to "demand" rather than operating continuously at maximum capacity. This system reduces the horsepower required by the oil pump by approximately 4 horsepower at rated speed and load conditions.

Signal Lines



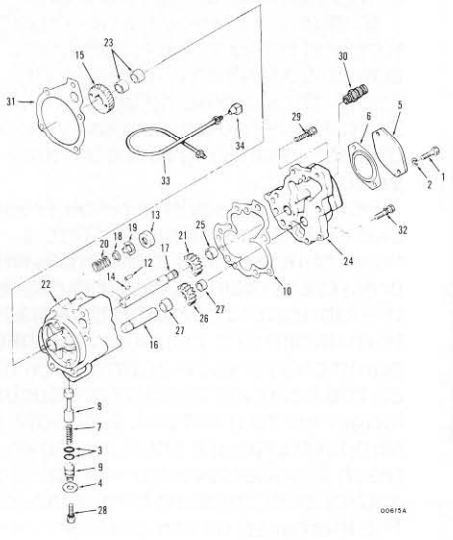
The DFC signal line and the fittings for the lubricating pump and cylinder block were changed as of September 1984. (SPT 84T7-7). The change provided improved sealing.

The line changed from a 1/4 inch (6.4mm) design to a 3/16 (4.8mm) metal line. The fittings changed from flare nuts to tube nuts giving increased support to the signal line. The fittings for the lube pump and the cylinder block changed to a stronger design with an inverted flare.

NOTE: When the 1/4 inch metal DFC line is replaced with the 3/16 inch metal tube, the fittings in the lube pump and the cylinder block must be changed.

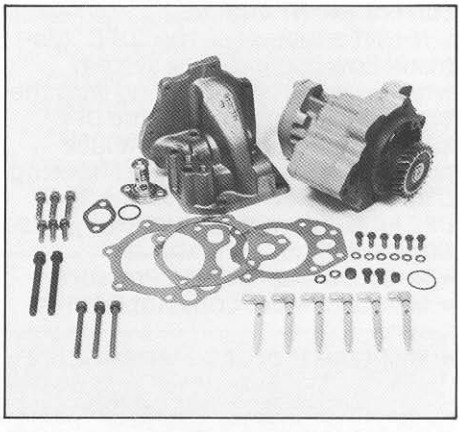
The Big Cam IV parts explosion highlights the Compuchek Nipple Coupling and its part number 3042619.

BIG CAM IV LUBE PUMP



REF. NO.	PART NUMBER	PART NAME	NO. REQ'D.
		LUBE OIL PUMP All Models	
	3045882	Assembly, lube oil pump	1
1	S-112	Capscrew (3/8-16 x 1)	2
2	S-604	Lockwasher (3/8)	2
3	145504	Seal, O-ring	2
4	146161	Washer, plain	1
5	204048	Plate, cover	1
6	3004242	Gasket, hydraulic pump	1
7	3010146	Spring, pressure regulator	1
8	3012529	Plunger, pressure regulator	1
9	3012726	Plug, retainer	1
10	3014778	Gasket, lube oil pump cover	1
11	3014961	Pump, lubricating oil	1
12	69519	Dowel, pin	1
13	179063	Plug, retainer	1
14	183695	Key, plain Woodruff	1
15	204832	Gear, lube oil pump	1
16	3012531	Shaft, idler	1
17	3012532	Shaft, lube oil pump	1
18	3014754	Washer, plain	1
19	3014755	Disc, valve	1
20	3014756	Spring, bypass valve	1
21	3014787	Gear, lube oil pump	1
22	3014798	Body, lube oil pump (3014771)	1
23	69521	Bushing	2
24	3014964	Cover, lube oil pump (3014777)	1
25	69521	Bushing	1
26	3014967	Gear, lube oil pump (3014788)	1
27	199586	Bushing	2
28	3022589	Capscrew, captive (5/16-18 x 5/8)	1
29	3022590	Capscrew, captive (5/16-18 x 1)	7
30	3042619	Nipple, coupling	1
31	3031434	Gasket, lube oil pump	1
32	3034526	Capscrew, captive	2
		PRESSURE SENSING HOSE All Models	
33	3044849	Tube, pressure sensing	1
34	3044854	Elbow, male adapter	2

DFC Uprate

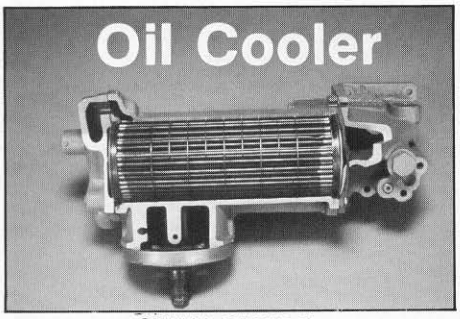


An Uprate DFC lube system kit is available for earlier NT FCC engines. The kit contains the lube pump, new piston cooling nozzles, new oil cooler front support and mounting hardware.

Part No.	Description	Applications
3801228	DFC Lube Pump Conversion Kit	All NT applications except non-FFC Small Cam engines
These kits contain the lube suction hose, remote pressure sensing lines and mounting hardware.		
3801226	DFC Lube Plumbing	All OEM's, Rear Sump Oil Plan
3801227	DFC Lube Plumbing	All OEM's, Front Sump Oil Pan

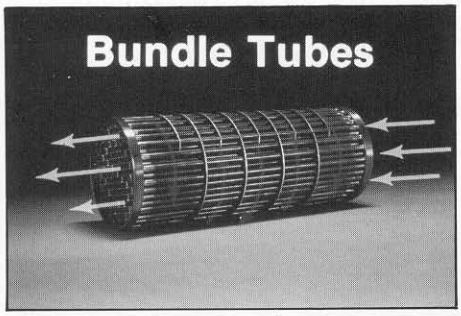
If the DFC lube system is used on a Jacobs Brake equipped engine, the brakes require a Jacobs master piston return spring, Jacobs part numbers 011841 (Small Cam) and 007447 (Big Cam), and inner control valve spring, Jacobs part number 007500.

Oil Cooler



SMALL CAM BCI

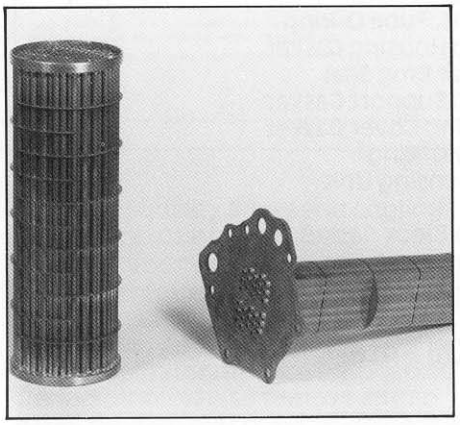
The oil cooler is used to reduce the temperature of the lubricating oil. The oil cooler consists of a housing, an inner element of bundle tubes, gaskets, o-rings and retainers.



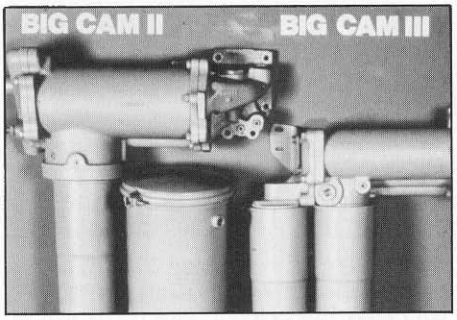
This style of Oil Cooler was used on Small Cam, Big Cam I and II models.

Coolant flows through the bundle tubes and absorbs heat from the oil circulating around the outside of the tubes. An o-ring and a gasket seals the bundle ends to keep the oil and coolant from mixing.

Oil cooler designs have changed drastically over the years as can be seen here in this comparison between the Small Cam/Big Cam I and II oil cooler core, and the Big Cam III oil cooler core.



The Big Cam III and IV oil cooler assembly is much lighter and more efficient. The housing is made of aluminum rather than cast iron. It is a two-pass cooler. The standard spin-on bypass filter (LF 777) is now located at the rear of the oil cooler housing. The threads are different on the bypass and full-flow filter adapters to prevent incorrect installation.



The housing design has changed considerably between the Big Cam I and III oil coolers. As we previously stated, the housing is fashioned from aluminum and incorporates an integral filter head mounting for both the full-flow and bypass filters.

As of December, 1983, Cummins began offering lube oil cooler maintenance kits which contain the gaskets, O-rings and seals required when replacing the lube oil cooler element. The kit provides an easier way to handle the parts and assures the customer the correct replacement parts. The kit also simplifies the way you do business since the customer must order only one number as opposed to several part numbers. Kit Part Number 3801198 is used on Small Cam, Big Cam I and Big Cam II engines. Kit Part Number 3801199 is required for Big Cam III and IV two pass applications. Specialty applications (e.g. low mount) may require additional gaskets or o-rings. The kits are structured as follows:

LUBE OIL MAINTENANCE KITS

Part Number 3801198 — Kit for Small Cam, Big Cam I, Big Cam II Engines

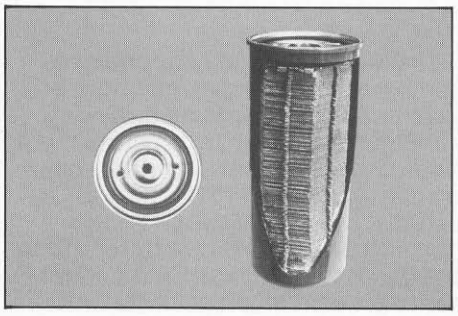
Part Number	Description	Quantity
67946	Bypass Valve Seal	1
212161	Water Trans Tube O-Ring	2
218245	Rear Cover Gasket	1
3006745	Element O-Ring Retainer	2
3007713	Element O-Ring	2
3008017	Support to Block Gasket	1
3010030	Housing to Support Gasket	1
3023868	Valve Body Gasket	1
3045979	Valve Body O-Ring	1

Part Number 3801199 — Kit For Big Cam III, Big Cam IV Engines

Part Number	Description	Quantity
212161	Water Trans. Tube O-Ring	2
3018693	Element to Housing Gasket	1
3018695	Rectangular Ring Seal	1
3018696	Element to Support Gasket	1
3027496	Rear Housing Cover Gasket	1
3045979	Valve Body O-Ring	1
3030808	Pressure Sensing Unit O-Ring	1
3031858	Support to Block Gasket	1
3034579	Seal, Grommet	1

Cummins offers new oil cooler elements for service at reduced prices. The Cummins program began in July, 1985. With a new Cummins cooler you not only get a reduced price, but the Genuine Cummins 1 year/100,000 mile parts warranty.

Oil Filters



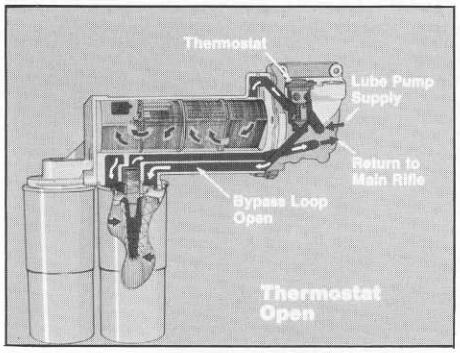
As the oil leaves the oil cooler it passes through the oil filter which traps tiny particles of dirt suspended in the oil, cleaning the oil prior to its entry into the engine.

Maximum engine life is dependent on both full-flow and bypass filters, as well as correct maintenance periods, and the use of the right oil for the engine application.

Full Flow Filters

The full-flow filter on the NH/NT engine is located below the oil cooler. Its purpose is to remove 40 micron absolute particles or larger which may be suspended in the oil. It essentially acts more as a screen than a filter. Fleetguard filters have

smaller "screen openings" than competitive filters keeping out the larger dirt particles that wear critical engine parts.



The full-flow filter is equipped with a bypass valve located at the top of the filter. The purpose of the bypass valve is to allow oil to pass unfiltered to the engine in the event that the filter becomes plugged.

Bypass Filter

The bypass filter on the NH/NT Big Cam III and IV engines is located below the oil cooler housing, it filters out small abrasive particles in a portion of the oil and returns it to the oil pan. Its purpose is to remove 5 micron absolute particles or larger and

BC III and IV SERIES ENGINE MAINTENANCE SCHEDULE [1, 2]

Daily or Refueling	Every 16,000 km (10,000 Mi.), 250 Hours or 6 Months [3]	Every 96,000 km (60,000 Mi.), 1,500 Hours or 1 Year [3]	Every 290,000 km (180,000 Mi.), 4,500 Hours or 2 Years [3]	Annual
• Check operator's report. • Check and bring to proper level - Engine Oil - Coolant • Check fan. • Visually inspect engine for damage, leaks, loose or frayed belts and correct or record for future action. • Drain fuel/water separator.	**Change/Replace** • **Lubricating Oil** • **Lubricating Oil Filters** • **Fuel Filter** • **Coolant Filter** • Replace element on Cummins 2 cylinder air compressors if equipped with an air cleaner. **Check** • Check engine coolant DCA concentration level. Add make-up DCA and change element if required. • Check air intake system for wear points or damage to piping, loose clamps, and leaks. • Check air cleaner element. • Check MVT Actuator operation (if equipped).	**Adjust/Inspect** • Adjust valves and injectors. • Inspect MVT Actuator (if equipped).	**Clean/Calibrate** • Clean and calibrate injectors, fuel pump. **Inspect/Exchange** • Turbocharger • Vibration Damper [4] • Air Compressor **Exchange/Rebuild** • Water pump • Fan hub • Water pump idler pulley assembly	• Steam clean engine. • Check torque on turbocharger mounting nuts. • Check torque on engine mounting bolts. • Replace hoses as required. • Clean BC IV aftercooler filter screen. • Check shutterstats and thermatic fans (if equipped). • Clean cooling system and change coolant and antifreeze (every two years).

[1] The maintenance interval may be adjusted based on the fuel and oil consumption rates of the engine. See Section 2 for the Chart Method.
[2] Follow the manufacturer's recommended maintenance procedures for the Starter, Alternator, Generator, Batteries, Electrical Connections, Exhaust Brake, Air Compressor and Freon Compressor.
[3] At each scheduled maintenance interval, perform all previous checks in addition to the ones specified.
[4] Replace Vibration Damper every 580,000 km (360,000 miles) or 15,000 hours.

to maintain the contaminant level of the oil low enough to prevent premature engine wear. The total lube filtering system, the full-flow and the bypass filters produce a 94.7% absolute micron filtration, thus providing increased service life to overhaul.

Filter Service

Both the full-flow filter and the bypass filter should be serviced at the recommended service interval found in the engines' Operation and Maintenance Manual. Service should be performed at more frequent intervals when the engine is operated under severe conditions.

Fuel and Coolant Filters

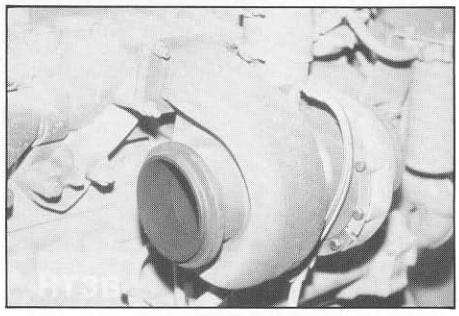
Your customers need to replace their coolant and fuel filters at regular maintenance intervals to prevent damage and keep the engine operating at its optimum capacity. Fleetguard, a wholly owned subsidiary of Cummins Engine Company, offers a full line of quality filters and cooling system corrosion inhibitors.

The addition of a water separator into a fuel system prevents water and other contaminants from reaching the fuel pump and injectors. The water separator must be emptied at periodic intervals to remove any accumulated water.

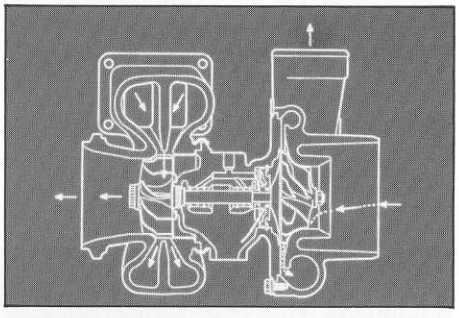
The Fleetguard SUPERFILTER combines the water separator and fuel filter into one high performance unit. Superfilters are 99% efficient in removing "free" water and 94% to 99% efficient in removing emulsified water from fuel. A patented self-venting valve makes draining quick and easy.

The Cummins Fleetguard superfilter will save money over the FF105 and brand X filters. It's the most cost effective method to ensure water removal, compared to the aftermarket filters currently offered.

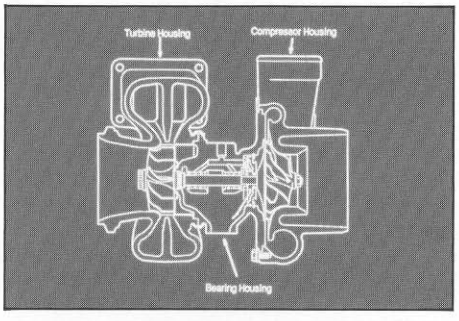
Turbochargers



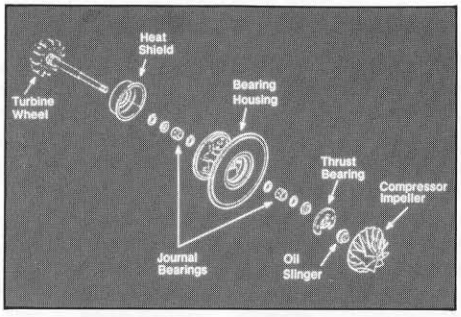
Most Cummins engines are equipped with turbochargers. A turbocharger is used to force more air into the cylinder so that a larger amount of fuel can enter the combustion chamber and be burned efficiently. This not only increases the engine's power and fuel economy, it also helps to compensate for thinner air at high altitudes.



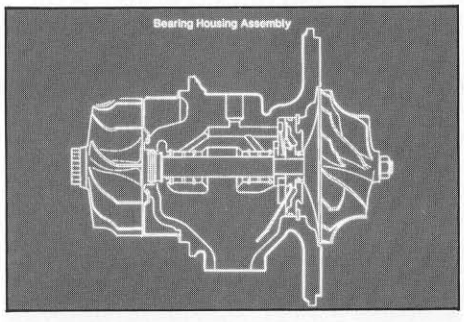
The turbocharger is driven by exhaust gas. As the hot exhaust gas passes through the turbine chamber, it forces the turbine wheel to rotate. The turbine wheel is connected by a shaft to the compressor wheel. The compressor wheel compresses the air into the intake manifold.



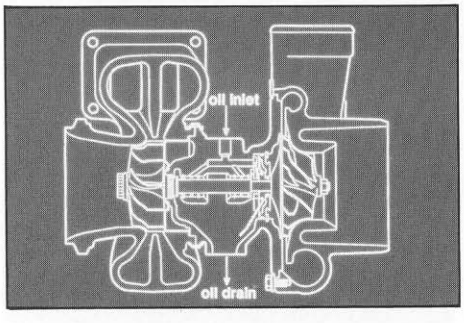
The turbocharger consists of three basic systems, as shown in the cutaway: a turbine, a compressor, and a mechanical system consisting of a bearing housing, bearings, seals, etc.



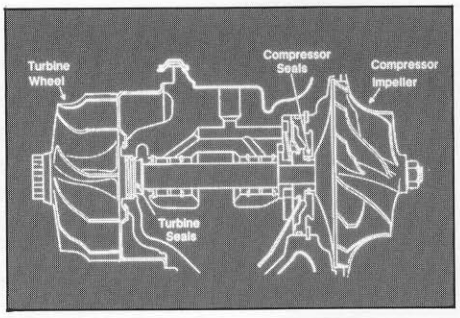
The turbine wheel is connected to the compressor impeller by a shaft which rotates in a bearing housing.



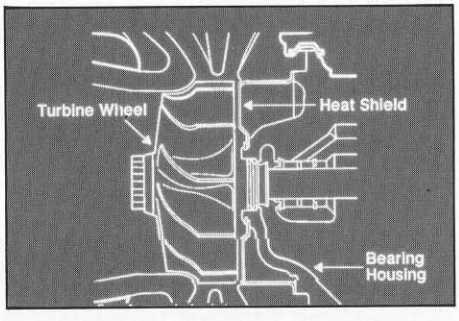
The bearing housing assembly is common to both the turbine and compressor. Although turbo designs may vary somewhat, the function is the same.



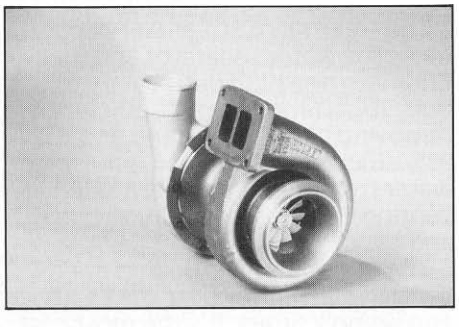
Turbochargers receive their lubrication and are cooled by the engine's lube system. Pressurized oil enters the oil inlet. It travels through cross drillings to lubricate and cool the bearing and shaft. Oil then flows by gravity into the lower bearing housing and is returned through a drain line to the oil pan.



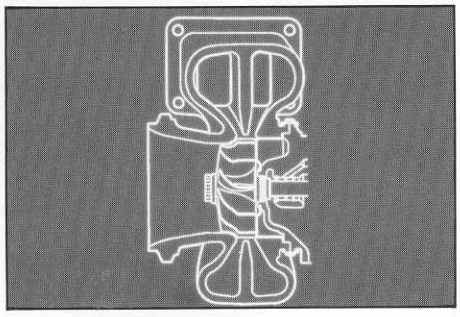
When the turbocharger is operating, the exhaust pressure behind the turbine wheel, and the air pressure behind the compressor impeller is greater than the pressure inside the bearing housing. To prevent oil from escaping at idle and pressurized exhaust gas and air from entering the bearing housing during operation, sealing rings are used. These non-rotating seals are a precise fit between the bearing housing and the shaft.



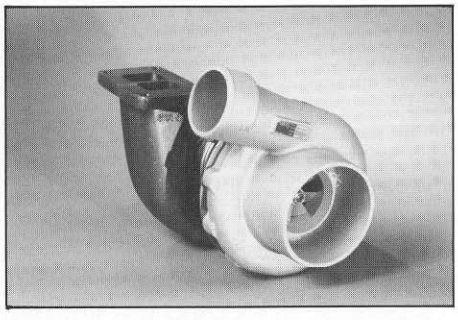
A heat shield is necessary in the turbine end of the housing to prevent the turbine exhaust gas temperatures from transferring to the bearing housing. The HT3B Turbo models use an air space to insulate the bearing housing. Turbo models like the VT-50 T-46 and T-46B actually use an insulation pad and a cast iron heat shield to insulate the bearing housing from the high exhaust temperatures.



The turbocharger compressor is driven by a radial-flow turbine consisting of a turbine housing and wheel. The turbine housing design is a scroll or snail shape which directs the exhaust gas to drive the turbine wheel.

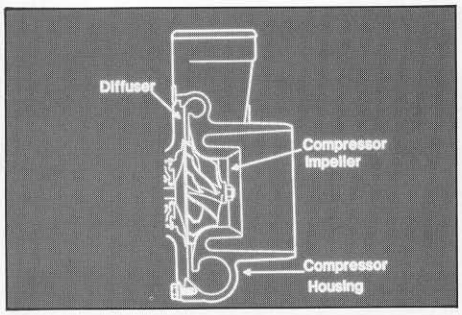


The spiraling passageway goes from a large area (exhaust entry) to a smaller area. This design produces the correct exhaust velocity and pressure distribution throughout the turbine housing.



Dual entry HT3B turbochargers were introduced on Big Cam III engines and are sold as an Uprate component for Small Cam, Big Cam I, II and III engine models. The dual entry provides better engine performance and lower exhaust temperatures at lower engine speeds because of improved exhaust pulse separation from the front to the rear of the engine.

Special considerations must be given when changing from a single entry turbo to a dual entry, when a Jacobs brake is on the engine. When an HT3B is used in conjunction with a Jacobs brake, the housing will require a specific "TT" auto lash screw and could possibly require a slight housing modification. The new auto lash screw, Jacobs part number 13369, provides the correct adjustment which is required to keep the exhaust valves slightly open during braking. This prevents injector push tube overloading from the higher cylinder pressures which are generated by the dual entry turbo. See Service Parts Topic 85T 20-1 for additional information.

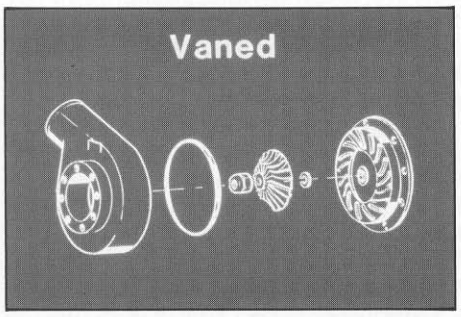


The compressor consists of three elements that must be matched to each other for optimum efficiency: the diffuser, compressor impeller, and collector housing.

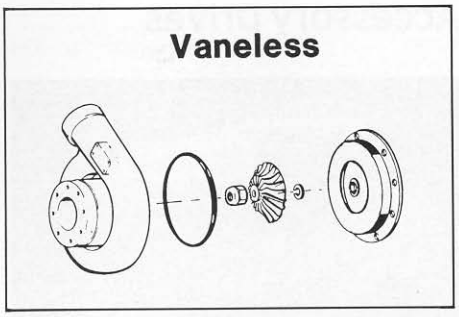
Diffusers

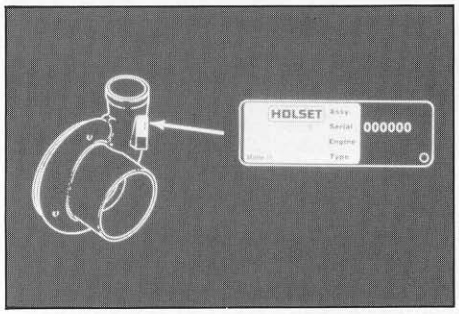
There are two types of diffusers **vaned** and **vaneless**. There are also two types of collector housings, **plenum** and **scroll**. The diffuser converts high velocity low pressure air from the compressor impeller to low velocity high pressure air.

The T-590 and VT-50 turbochargers use a vaned type diffuser with stationary vanes to convert velocity into pressure. Its' plenum type housing is used to collect the air and routes it to the air crossover.



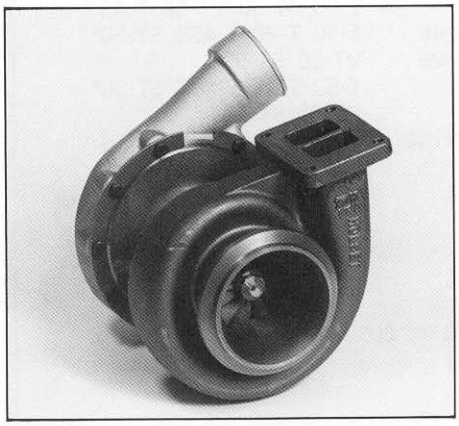
The vaneless diffuser scroll type turbochargers include models such as, T-50, T-46, T-46B, HT3B and HT4B. The vaneless design has a parallel wall diffuser section to convert velocity into pressure. The scroll type housing collects the air and further reduces the velocity in its' spiral, area increasing passageway.





You can determine exactly which turbocharger is on an engine by examining the data plate mounted to the turbocharger. You should always refer to this when determining what parts you will issue. Improvements and uprates could change which turbocharger is on a particular engine so make sure by checking the CPL (Control Parts List) Manual. In addition to the model number, a part number is also located there. Use the part number in helping to determine field fixes and the correct rebuild kit.

HT3B and HT4B Turbochargers and Uprate Information



NT engines were originally manufactured using the T-590, T-50, VT-50, ST-50 and were Uprated with T-46 and T-46B turbochargers. Currently the HT3B and HT4B turbochargers represent the state of the art in Cummins turbocharger technology. The dual entry HT3B was designed to improve the responsiveness and durability of NT engine models. The dual entry HT3B was introduced on Big Cam III engines produced after March 20, 1984. Previously built Big Cam III engines along with Small Cam and Big Cam I and II engines may (in most cases) be Uprated with the dual entry HT3B turbocharger which offers a fuel economy improvement of up to 2.5% over earlier designs.

A complete listing of the allowable Uprates is included in Service Parts Topic 85T10-4 which is reprinted in the Uprate Manual, Bulletin No. 3387319-R.

Turbocharger Uprating on all engines requires a field fix and additional parts such as plumbing kits. See Service Parts Topic 85T10-4 and your latest CPL (Control Parts List) Manual Bulletin No. 3379133-11 to obtain the correct turbo match for your customer's engine CPL. Whenever you are supplying an uprate kit, make sure you obtain the engine's CPL.

Turbo Matching

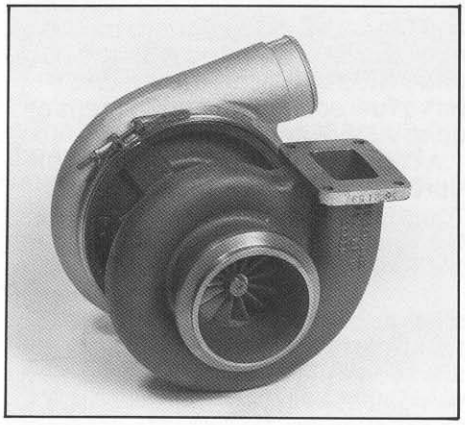
The air output of a turbo and the air requirements of an engine need to be carefully matched. Cummins researches the air handling capabilities of both the turbo and its' engines to ensure the optimum amount of air is available to the engine throughout its operating speed range, at all power output levels and altitudes.

The Effects of Inadequate Turbo Matching

If the turbo compressor is too small, the rotor speed will be too high, and turbo efficiency too low to permit effective engine operation at rated speed and high altitudes. If the compressor is too large, turbo damaging low speed surge may occur, especially at higher altitudes. The engine acceleration response will be penalized if the boost is too low, cylinder and exhaust temperatures will be too hot - more so at high altitudes. If the boost is too high, cylinder pressures will go up, shortening the life of pistons and bearings. The chances of damaging turbo surge increases - especially at higher altitudes.

HT3B and HT4B Single Entries

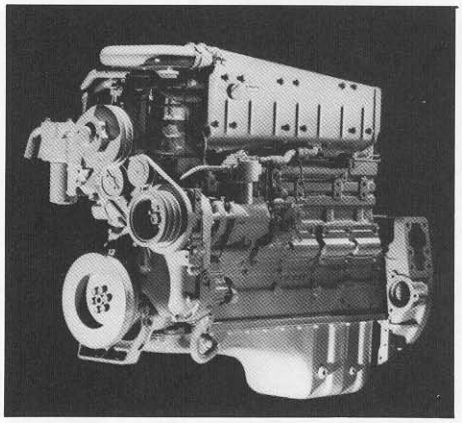
A single entry HT3B turbo was introduced with the Big Cam IV engines for 350 horsepower and below, other than the turbine casing the HT3B single entry is quite similar to the HT3B dual entry design.



The HT4B single entry turbocharger is currently being used on the Big Cam IV NTC and Formula 400 engines. This turbocharger does not contain the same parts as the HT3B so do not think of them as being the same.

The HT4B has a larger frame size to handle the higher air flow of the NTC 400 horsepower, optimized aftercooled engines (LFC). The differences in part numbers are shown in the Big Cam IV parts catalog.

Accessory Drives



The accessory drive transfers power to the accessories to operate them. This is primarily accomplished by a series of pulleys and belts mounted at the front of the engine.

Proper operation of the accessories is dependent on the condition of the pulleys, fan hub and belts. Cracks, wear, burrs or breakage can cause improper operation or component damage. There is generally no fix for a damaged accessory drive component aside from replacement.

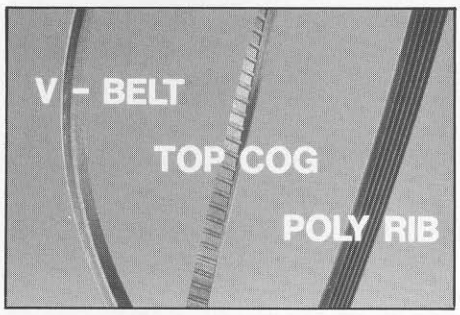
Cummins recommends inspecting the pulley and belt grooves of the Cummins fan hubs. The fan hub should be rebuilt if it is leaking.

CUMMINS TURBOCHARGER REPAIR KITS

Part Number	Description	Turbo Style
AR-07956	Seal Kit	T-35
3801096	Seal Kit	T-50, ST-50, VT-50, T-46
3801097	Seal Kit, Bearing, Sleeve	T-50, T-46, T-46B, ST-50*
3801098	Seal Kit, Bearing, Sleeve	VT-50, ST-50**
3801099	Seal Kit, Sleeve	T-50, T-46, T-46B, ST-50*
3801100	Seal Kit, Sleeve	VT-50, ST-50*
3801101	Seal Kit, Bearing, Bearing Housing, Sleeve	T-50, ST-50, VT-50, T-46, T-46B with top oil feed only.
3801522	Seal Kit	HT3B
3801523	Seal Kit, Bearing	HT3B
3801638	Seal Kit, Bearing	HT4B
3801639	Seal Kit	HT4B

ST-50's were built with two compressor casings:
* Single Piece compressor casing
** Two piece compressor casing

Drive Belts



There are three main types of drive belts used on heavy duty diesel engines. They are:

- Conventional heavy duty V-belt
- Top Cog heavy duty V-belt
- Poly-Rib belt.

The conventional V-belt receives its name from its shape. A typical heavy duty diesel V-belt may transfer as much as 20 horsepower under rapid acceleration and load.

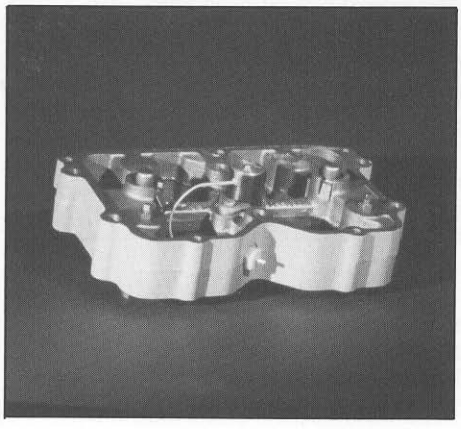
The Dayco Top Cog heavy duty V-belt design allows greater flexibility around the pulleys, thereby reducing the internal friction that causes heat buildup. The Dayco Top Cog V-belt runs cooler and lasts up to 40% longer than a conventional V-belt.

The Poly-Rib or Poly-Vee belt design, offers a number of advantages. Its thin profile produces less surface wear, reduces heat build-up and allows for easier flexing over smaller diameter pulleys without sacrificing belt life. It can handle smaller high speed drives due to its superior tensile strength, thereby enabling it to hold tension longer and to transmit more power.

You'll find the poly-ribbed belt used more and more on both gasoline and diesel engine applications. For example, the Cummins L10, K19, K38 and K50 series engines use Poly-Rib belts on the cooling fan, alternator and water pump drives.

Using the correct belt is very important for proper accessory operation. Make sure you recommend Cummins/Dayco belts to your customers. Dayco belts are specifically designed for Cummins engine applications.

C Brake



The C BRAKE is a highly efficient engine retarder for reducing vehicle speed during downhill operation and stop-and-go driving. Installing the new Cummins C BRAKE is a big plus, in that it prolongs vehicle brake life.

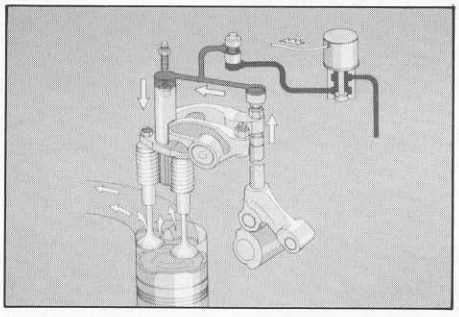
The long awaited Cummins Retarder, known as the C BRAKE, was released for sale to distributors and dealers in September of 1985 to serve Aftermarket Customers.

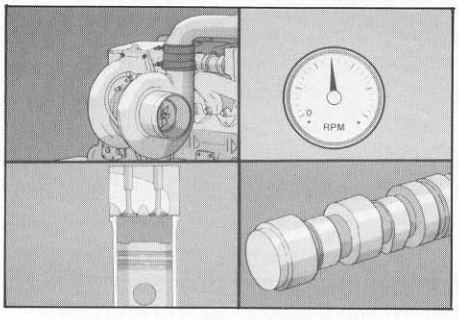
Cummins entered the compression brake market due to an expected market growth for engine brakes. As Cummins diesel engines and truck designs become more efficient, the natural retarding horsepower decreases. This means that brake linings wear quicker. The C BRAKE will extend brake life over 100% in most applications.

The C BRAKE provides the latest in compression brake technology and has been developed and tuned by Cummins engineers to provide the highest braking horsepower with improved reliability and durability over competitive engine brakes. Plus, the C BRAKE is backed by the Genuine Cummins Warranty, 1 year/ 100,000 miles. Let your customers know that they'll benefit from installing the engine brake designed by the #1 diesel engine manufacturer in the world — Cummins.

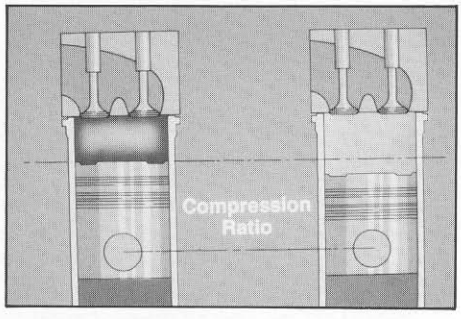
C Brake Operation

The C BRAKE converts the engine to an energy absorbing device to reduce vehicle speed. This is accomplished by a hydraulic circuit that opens the exhaust valves near the end of the compression stroke.



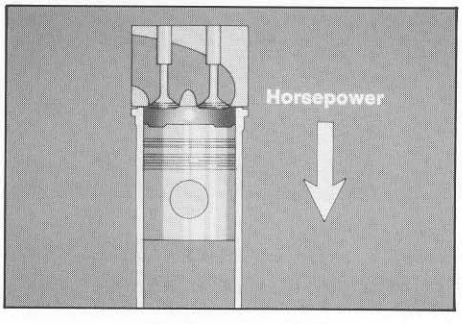


The amount of braking power realized in a given engine series varies. Braking power depends on turbo boost pressure, engine rpm, compression ratio, injector timing, and "when" the brake opens the exhaust valves.

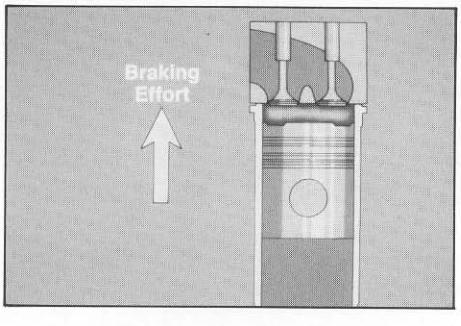


Engines in the lower horsepower range traditionally have higher compression ratios, whereas higher horsepower engines have lower compression ratios. This results in different amounts of potential engine braking efficiency.

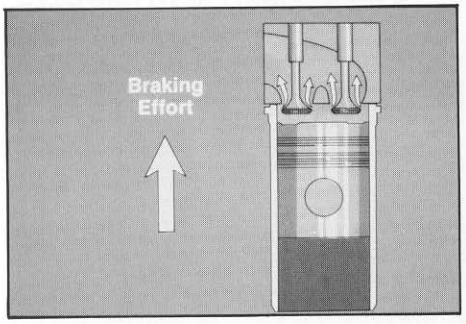
Another prominent factor to consider is cylinder pressure. High-efficiency turbo's (normally used on high horsepower engines) produce increased cylinder pressure, resulting in a higher degree of potential engine braking efficiency.



During normal engine operation, with the C BRAKE turned "OFF", the engine is producing horsepower.

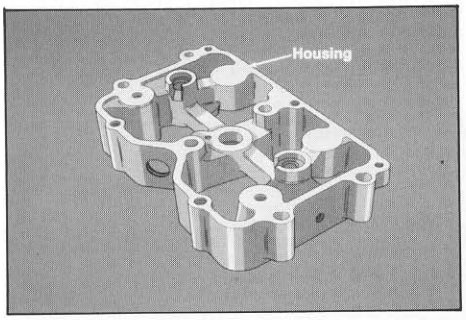


With the C BRAKE activated and the vehicle moving, the engine produces a compression braking effect. This is accomplished by compressing air in the cylinder during the compression stroke.

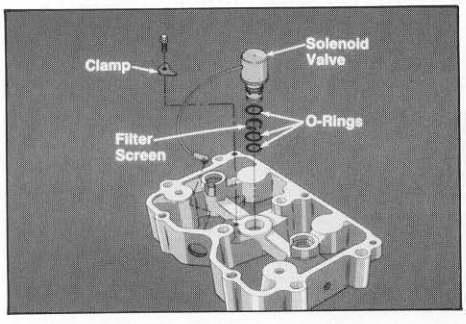


When the piston is near TDC (top dead center), on the compression stroke, the exhaust valves open and the compressed air escapes from the cylinder. The power stroke is negated; no positive horsepower is produced. The compressed air that normally pushes the piston downward has escaped from the cylinder, creating the braking effect.

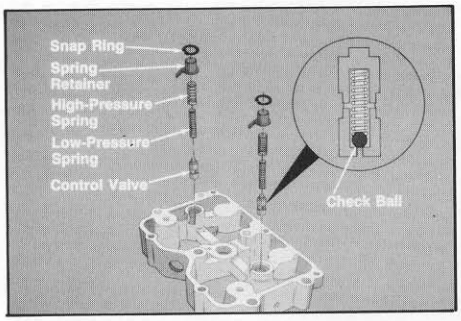
Now let's take a look at the C BRAKE hardware.



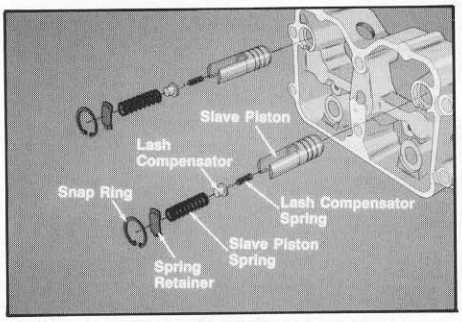
The C BRAKE consists of a cast-iron housing — one for each cylinder head...



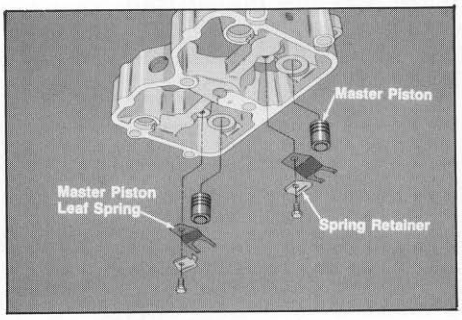
with a solenoid valve, which includes o-rings, filter screen and clamp...



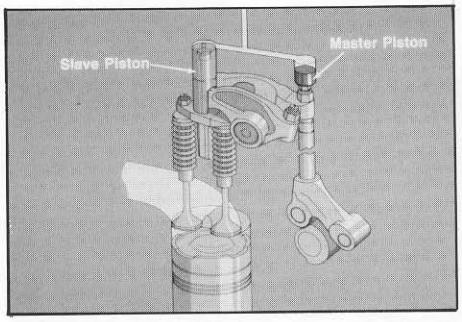
two Control Valves, each with a snap ring, spring retainer, high and low pressure springs, and a check ball (one for each cylinder)...



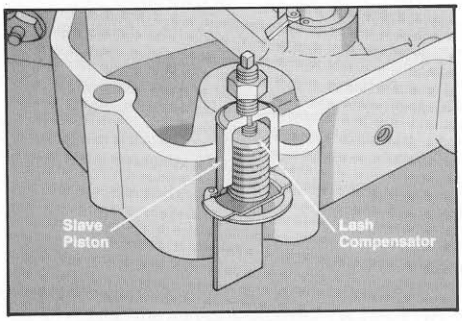
. . . two slave pistons, each with a lash compensator, snap ring, spring retainer, slave piston spring and lash compensator spring (one for each engine cylinder)...



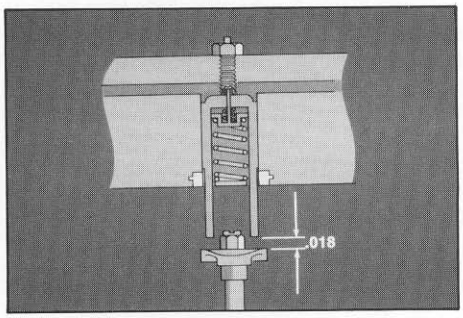
. . . and two master pistons, each with a leaf spring and spring retainer (one for each engine cylinder).



The slave pistons are located above the exhaust valve crossheads. The master pistons are located above the injector rocker lever adjusting screws.



The most important feature of the Cummins C BRAKE is the **lash compensator**. Located in the top of each slave piston, the lash compensator controls the timing of exhaust valve opening.



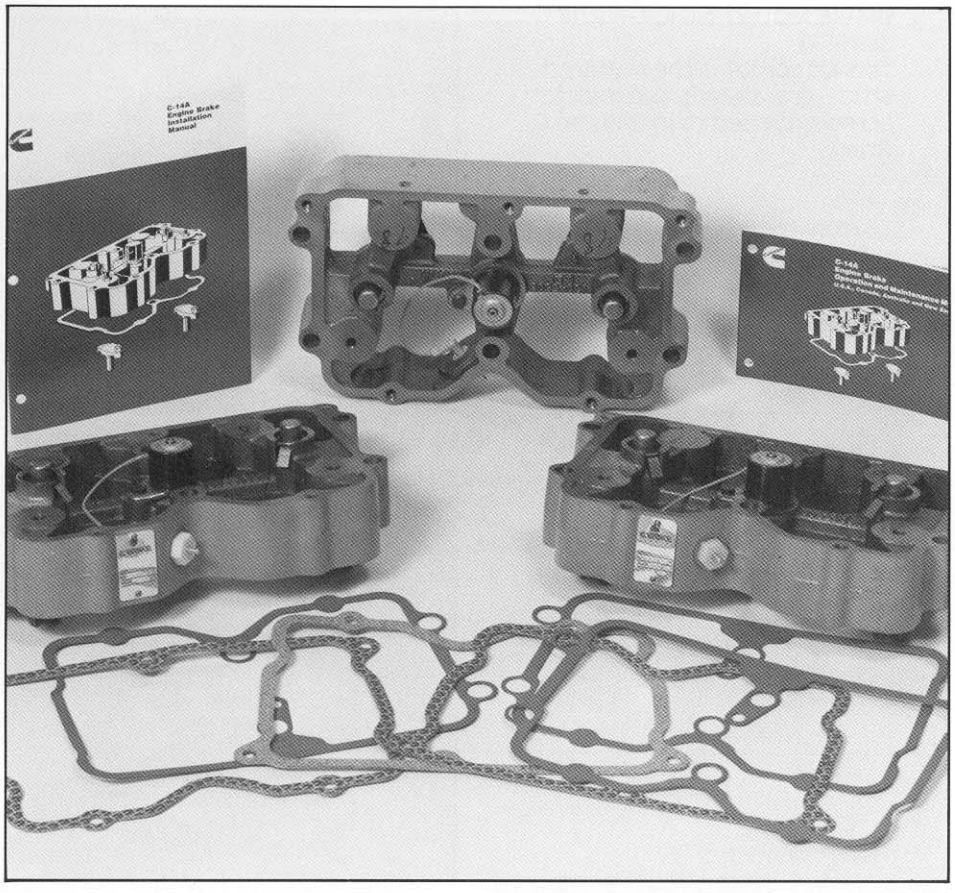
The lash compensator holds the slave piston spring away from the slave piston a specific distance when the brake is deactivated.

C Brake Availability

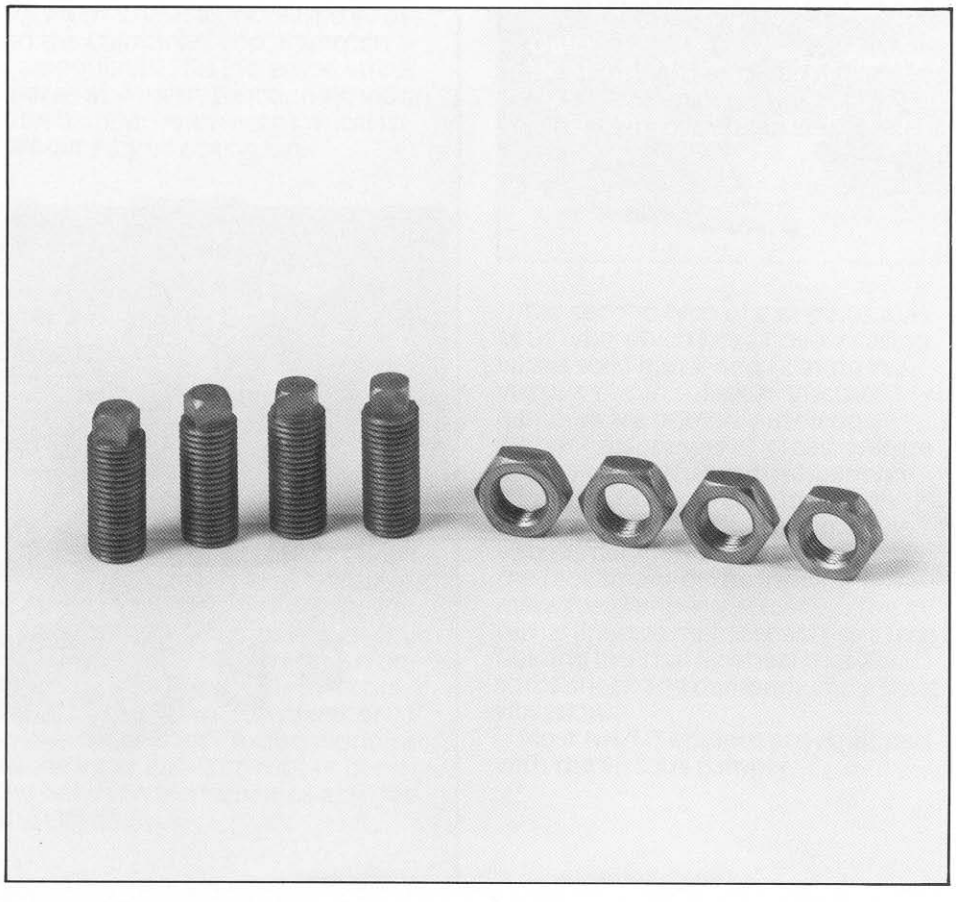
Currently the C BRAKE is available for a limited number of Big Cam IV CPL's. The CPL's are 674, 675, 676, 718 and 749. C Brake applications will be made available in 1986 for Big Cam I, II and III CPL's. Keep an eye on upcoming Parts Professional Booklets for more C BRAKE introductions.

Cummins has divided the C BRAKE into 5 kits for Service. By popular request Cummins has released a higher level kit P/N 3801687 for Big Cam IV CPL's only. This number includes all 5 kits.

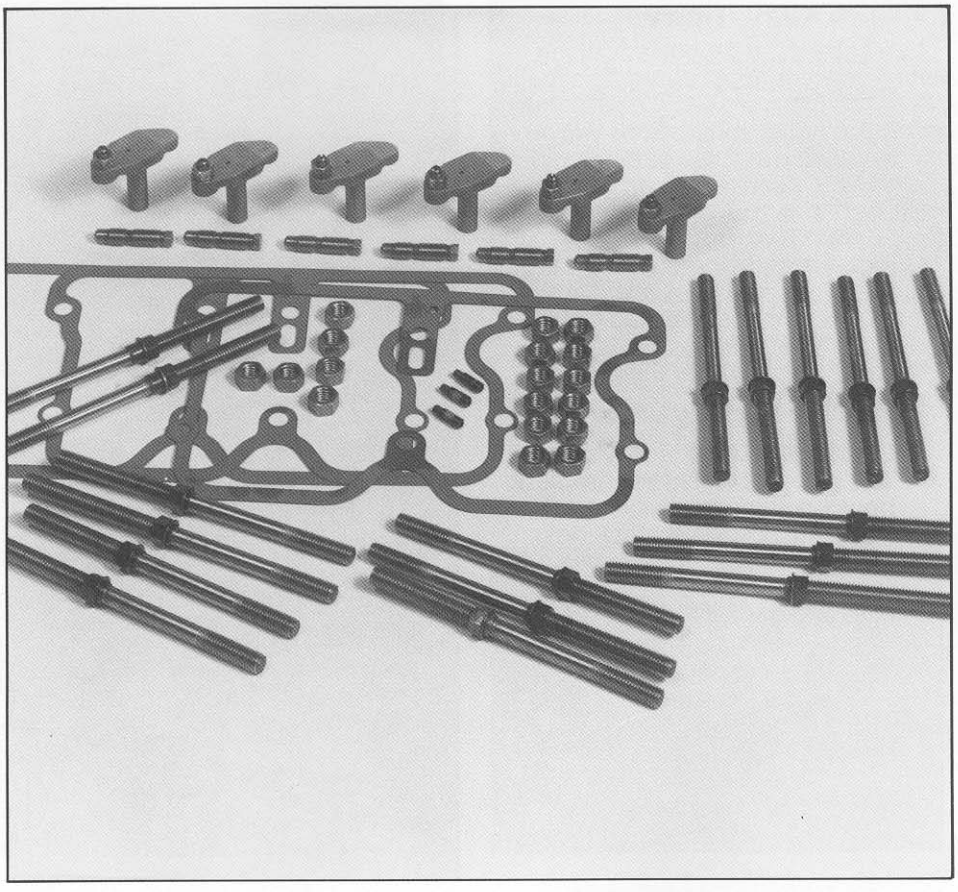
1. ENGINE BRAKE KIT — P/N 3801601
   This kit contains three complete housing assemblies, except the adjusting screws. Kit includes: solenoid valve, control valve, slave and master piston assemblies and gaskets.



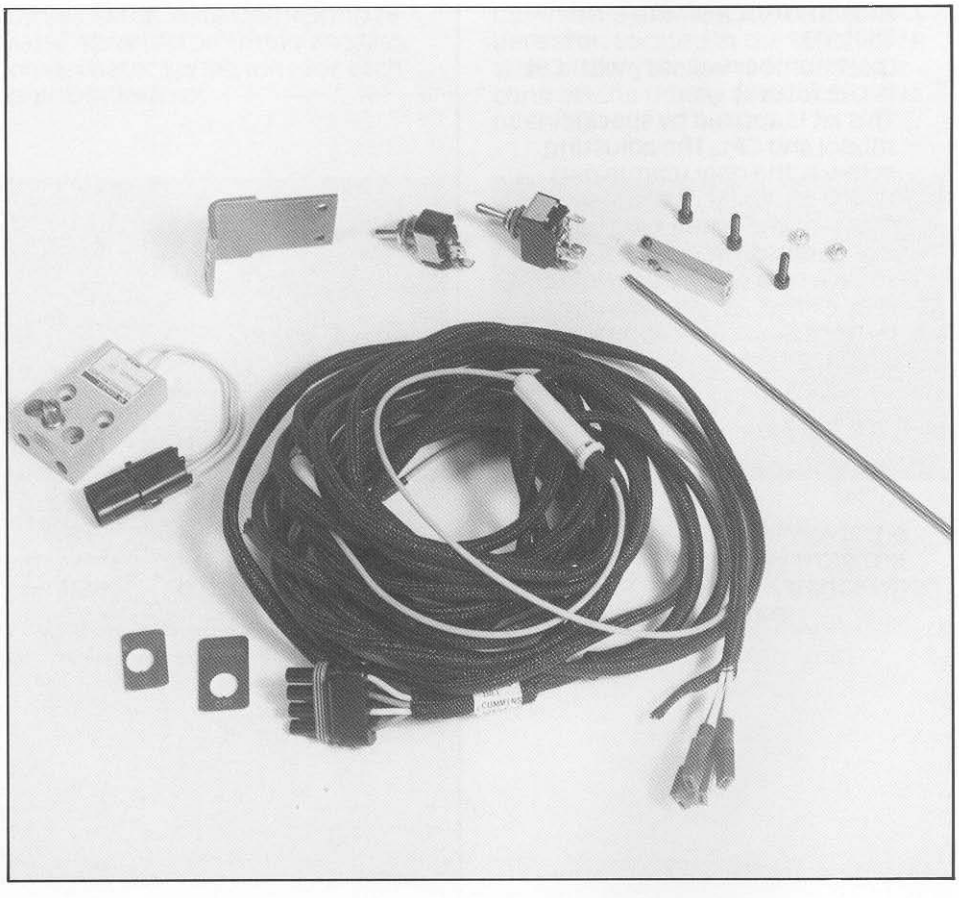
2. ADJUSTING SCREW KIT — P/N 3801603
   (part number will vary with CPL in the future)
   This kit is applied by specific model and CPL. The adjusting screw is the only unique part which differs per engine model. It is very important that the right adjusting screw be applied for use on a particular engine model (they are all the same for current Big Cam IV approved CPL's).



3. BRAKE MOUNTING KIT — P/N 3801600
This kit contains the required studs, crossheads and injector screws needed to install the C Brake.

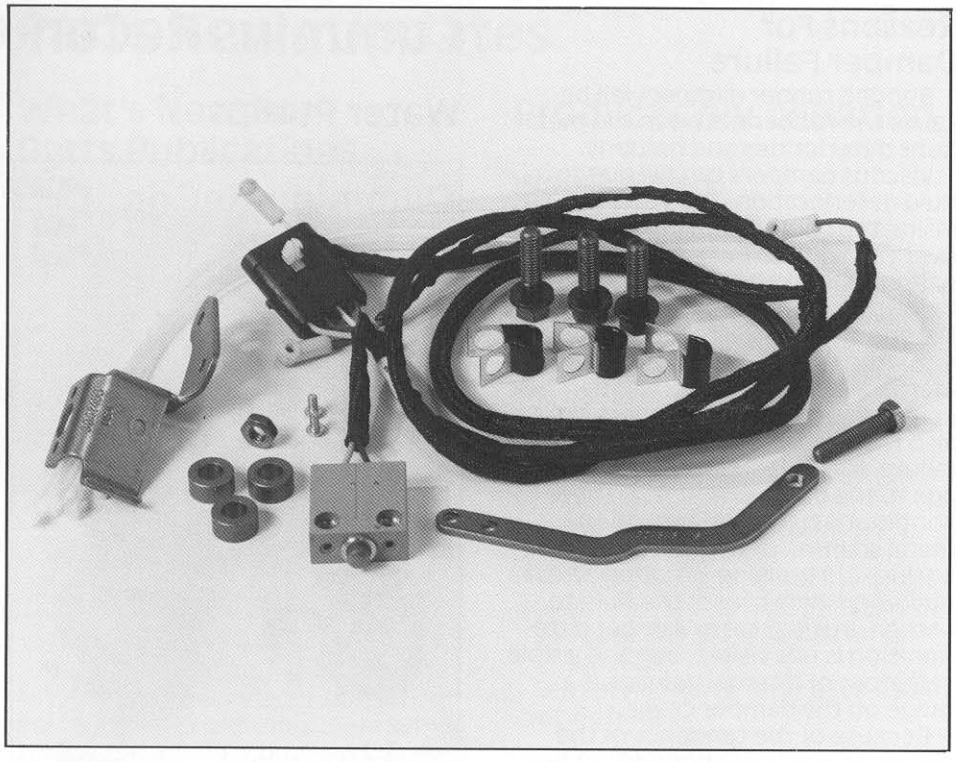


4. ENGINE CONTROL KIT — P/N 3801602
This kit contains the throttle switch, wiring harness and brackets needed to install the C BRAKE.

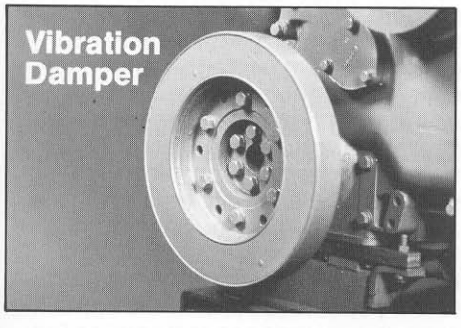


5. CAB CONTROL KIT — P/N 3801612
   This kit contains panel switches, wiring harness adaptable to any truck, clutch switch and required mounting hardware.

Again, when ordering a complete C BRAKE kit, order all 5 kits with kit P/N 3801687. Remember, when ordering the Adjusting Screw Kit, the Part Number is determined by the Engine Model and CPL. At this time the C Brake is available only for Big Cam IV CPL's, so the Adjusting Screw Kit Part Numbers are all the same. **Once other engines and CPL's are offered, there will be different part numbers which you must be aware of!**



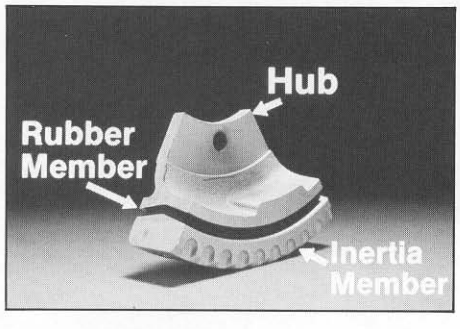
Vibration Dampers



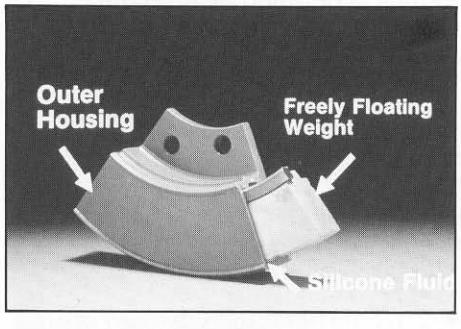
Vibration dampers are available new and carry a 1 year, 100,000 mile warranty. It is mounted on the nose of the crankshaft and is designed to reduce torsional vibrations.

Torsional vibrations are generated each time a cylinder fires, the piston and connecting rod travel downward putting a torque on the crankshaft, trying to twist it. The crankshaft gives slightly and then corrects itself. This alternating pattern of torque is torsional vibration, and travels in a wave pattern the length of the crankshaft.

A properly functioning damper reduces the vibration that is generated. A damaged or malfunctioning vibration damper can cause damage (cracking and/or breakage) to the crankshaft and/or related components. In addition, the trend to higher horsepower engines, turbocharging, and greater use of accessory items have all increased stress on the crankshaft and drivetrain components. This increased stress makes a properly functioning vibration damper even more critical to proper engine operation.



There are two types of vibration dampers commonly in use, the type used is determined by horsepower rating. The first is a rubber type. Rubber dampers are primarily used on lower horsepower models. It consists of an outer inertia member joined by an elastic rubber bonding to the inner hub. The rubber bonding between the two hubs absorbs the vibration.



The second type of damper is a viscous type which has a hollow casing with a solid metal ring floating in a viscous silicon solution. Viscous dampers are primarily used on higher horsepower engines, and are usually larger than the rubber type dampers. Extreme care must be taken not to dent the casing of the viscous damper. Dents which restrict the movement of the inner ring will make the damper ineffective. The internal (inertia) member acts as a free floating internal flywheel that absorbs shock and dampens crankshaft vibration.

Most NH/NT engines are equipped with the viscous damper.

Reasons For Damper Failure

Bonded rubber dampers fail because the rubber between the metal hubs deteriorates and hardens.

Viscous dampers can fail due to fluid deterioration. The viscous fluid inside the damper can deteriorate over time due to heat, fluid contamination (due to wear of mating surfaces), or simply extended service. Deterioration leads to fluid hardening, which restricts movement of the inertia member and reduces dampening capacity. Fluid dampers can also fail prematurely due to bearing failure, leaking fluid, or physical damage to the damper housing. These conditions can cause a metal to metal scuffing of the inertia member against the housing, creating a heat build-up which causes the fluid to harden. In most cases damper deterioration is not visible, but one visible symptom of internal damage is a bulge on the damper cover.

Because of the tendency of the rubber to harden in bonded rubber dampers and the deterioration of viscous fluid over time in viscous dampers, Cummins recommends regular scheduled maintenance checks, as a worn or damaged damper can cause crankshaft failure.

Normally a driver cannot feel or hear the destructive vibrations caused by a failing damper. There may be some minor symptoms such as:

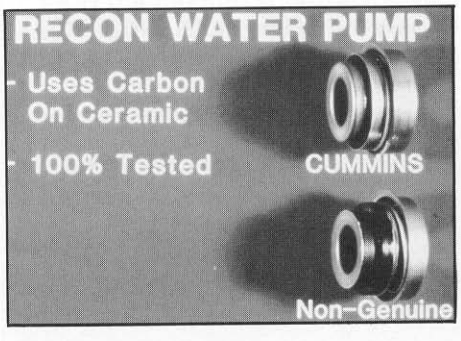
- slapping belts
- gear train rattle
- noisy driveline anti-friction bearings
- extreme heating of damper after short periods of operation
- broken accessory drive shaft

Sell your customers on preventive maintenance of their vibration dampers. Doing so will prevent them from expensive crankshaft and driveline related repairs later on.

Cummins ReCon Components

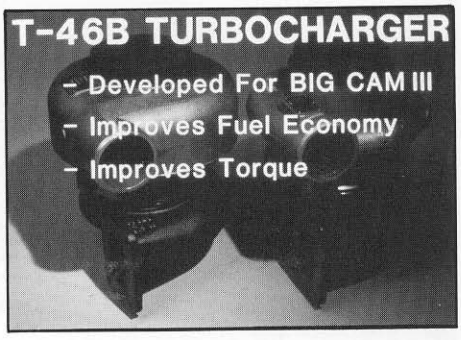
Water Pumps

Cummins ReCon water pumps are built to last longer than the competition. The construction of the Cummins water pump seals is one of the main reasons for this.



Diesel ReCon uses a unitized carbon on ceramic version of the Cummins design in its remanufactured water pumps. The top hardness grade of carbon is used to maximize the durability of this seal. The unitized design reduces the danger of contamination and handling damage during installation. In addition Cummins improvements in spring tension and seat design have combined to make this seal more reliable and longer lasting than any in its class.

ReCon Turbochargers



Cummins ReCon offers remanufactured HT3B and T-46B turbochargers at a very low cost compared to the price of a new unit. Core acceptance is non-style for style, so customers can trade in their T-50, VT-50, ST-50 and T-46 series turbos and update their inventory. There may be a slight conversion charge for certain models, consult your Cummins Distributor for the most current information. Cummins ReCon offers full core acceptance — even damaged or non-genuine brand turbos are acceptable for no extra charge. ReCon turbochargers are completely inspected by electronic equipment to assure precise contour and fit. Also, the entire wheel and shaft assemblies are balanced to new Cummins factory specifications. The original case dimensions are restored to factory specifications through the use of computer numerically controlled (CNC) machining.

ReCon turbos are 100% functionally tested under simulated operating conditions to assure optimum performance and reliability. This is the final inspection in the ReCon remanufacturing process, and ensures that ReCon turbos meet every Cummins factory standard for durable, dependable performance.

ReCon Dampers

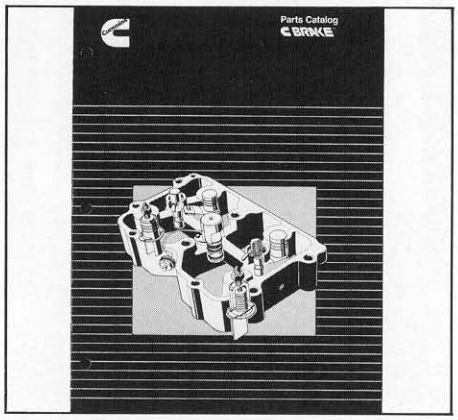
Cummins ReCon supplies viscous vibration dampers that are fully remanufactured to Cummins factory specifications. All units are completely disassembled and cleaned. Damper housings are machined and gaged to assure critical dimensions meet new factory specifications.

ReCon vibration dampers are remanufactured using premium grade silicon fluid to ensure long life. New full floating teflon bearings are installed in place of older style cadmium and brass bearings. The full floating design distributes fluid on both sides of the bearing, providing a "double" cushion to increase dampening capacity. Resiliency of the teflon material allows the damper to absorb shock loads while protecting the intertia member from contact with the housing. This prevents metal to metal scuffing which results in premature failure. The finished product is 100% torsional tested to ensure dampening capacity. Also your customers get the low ReCon price, great warranty (6 months unlimited mileage) and full core acceptance.

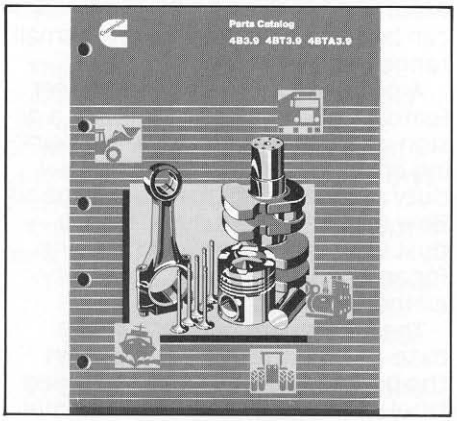
NOTE: Cores must be complete by the same part number ordered, and must not be damaged by non-operational causes such as rust, rough handling, or fire. The ReCon pocket reference core handbook contains complete details on damper core acceptance.

Parts News Updates

What's New For Parts Publications



The C Brake Catalog, Bulletin No. 3822028-00, is designed to assist field personnel with ordering, identifying and rebuilding the Cummins C Brake.



Parts Catalog 4B3.9 Bulletin No. 3822007-03 printed February 1986 will be available in late March. Order this publication from your local distributor.

Product Consolidation

Water pump Consolidation/ Standardization

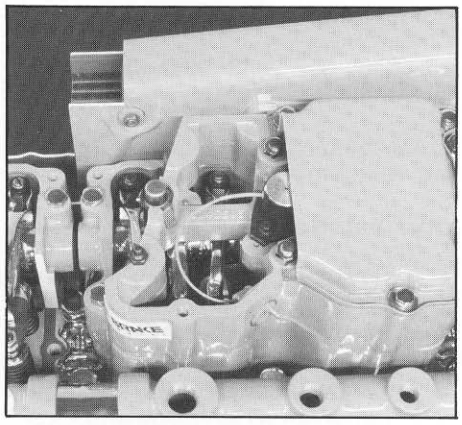
The water pumps for the Big Cam NH/NT engines have been standardized to simplify service requirements. This standardization requires one pump body, one impeller and two pump pulleys for most applications.

- — Body P/N 3045163 (Has internal vent drilling)
- — Impeller P/N 3000888 (4 1/2" diameter, 6 vanes)
- — Pulley P/N 3025935 (4 11/16" diameter) B.C. III GMC applications
- — Pulley P/N 3025861 (4 5/16" diameter)

See Service Parts Topic 85T8-9 for specific details.

New Products

C BRAKE



The Cummins C BRAKE means added safety, resale value, and the extended life of your vehicle brakes. The C BRAKE is a compression type brake that uses a hydraulic circuit that's actuated by the injector push tube to open the exhaust valves at a predetermined time. The C BRAKE is a standard option on Big Cam IV and will be retrofittable on most Big Cam engines as kits become available.

New Product

Cummins Overhead Gasket Set For Use With Jacobs Compression Brakes

Cummins is pleased to announce the availability of a new overhead gasket set to service Cummins engines that are equipped with Jacobs Brakes. The new overhead gasket set is P/N 3801640. Cummins is now accepting orders for this set. The gasket set will service the following Jacobs Brake Models:

Model Numbers Serviced

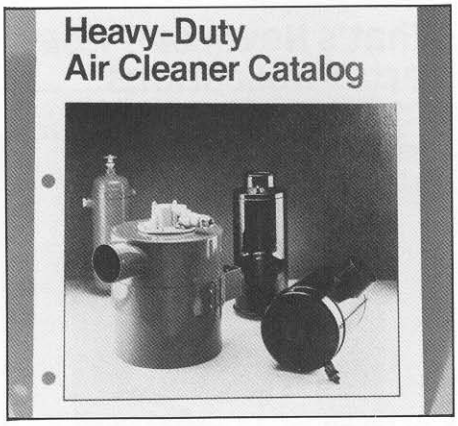
25B 30 30E 44B 400 400H
401A 401B 401C

Gasket Set P/N 3801640 contains the following:

Qty.	Part No.	Description
1	216487	Crossover Gasket
1	3012972	Crossover Gasket
3	3044514	Rocker Cover gasket
3	3045533	Brake Housing Gasket
3	3045534	Rectangular Seal Ring

The gaskets and seals are made of premium materials for long life. The rocker cover and brake housing gaskets are of the laminated steel center design for strength and durability.

Fleetguard Air Cleaners



For the first time, Cummins distributors now have access to a Fleetguard brand air cleaner line. The cleaners cover sizes from 5.6" in diameter up to 16", and can accomodate CFM requirements of 125 to 1200 with low initial restrictions.

The line is sourced from Coopers, which, at one time, was a Donaldson Licensee. in addition, Fleetguard is featuring a "hat" type cleaner which can be specified at low cost for small range engines.

Among the applications and user features of the air cleaner line is a design which allows for flexible mounting arrangements. All of the heavy duty air cleaners feature a 2-stage air flow system, have a dust cover, a dust valve, and an optional mount for an air restriction gauge. Safety elements are available.

The Fleetguard product will be base-coat painted and will have in the package a Fleetguard identified label which will notify the customer of the correct replacement filter part numbers.

In addition to the cleaners, all applicable hoses, piping, raincaps, elbows and reducers will be available from Fleetguard. The buyer will be able to call out the selected air cleaner, and have boxed with it their choice of accessories.

Premium Blue

Cummins Premium Blue is a revolutionary new oil developed specifically for todays efficient, low oil consumption engines. Premium Blue is designed to meet or exceed the specifications of all diesel engine manufacturers. It is a 15W-40 oil that meets API CD, CC/SF performance requirements and can be used where MIL-L-46152 and MIL-L-2104 oils are recommended. Take a look at the many advantages that Premium Blue offers your customers:

- Specifically formulated to prevent carbon build-up so critical to low oil consumption.
- Up to 30% more miles between overhauls for excessive oil consumption, when comparing good performing premium oils* and Cummins Premium Blue.
- Up to 20% less oil consumption until overhaul as compared to good performing premium oils*.
- Superior detergent and dispersant additives that work to keep the engine clean and oil contamination suspended to the end of the oil drain interval.
- An effective anti-oxidant, anti-rust and corrosion inhibitor package to fight acids and water generated during combustion; helps keep Cummins Premium Blue stable throughout its performance cycle.
- Designed for cold starts at -13°F (-25°C), with a formulation that gets the oil flowing to the vital areas quickly.

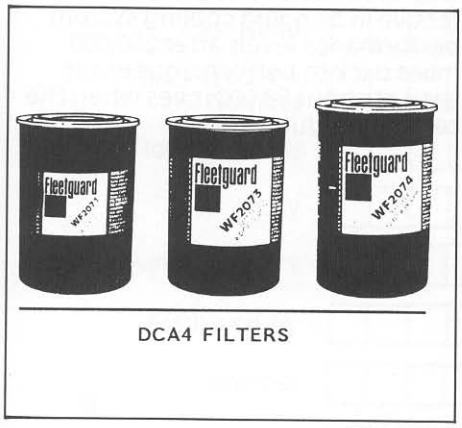
Let your customers know that Cummins uses high quality base oils along with a specially formulated additive package to provide the extra performance available from Premium Blue. Using this oil can provide plenty of advantages, so get the word out and let the customer know that their next oil change should include Premium Blue, the customized diesel oil formulated by Cummins.

* 1980 - 1982 premium quality commercial CD oils.

Fleetguard

Beginning with production in January, all Cummins Engines equipped with a coolant filter corrsion resistor will use the new corrosion protecting chemical, DCA4.

DCA4 has been utilized since December 1984 on Big Cam IV engines, and the formula has proved so successful in further field and laboratory testing that it will now be the Cummins standard.



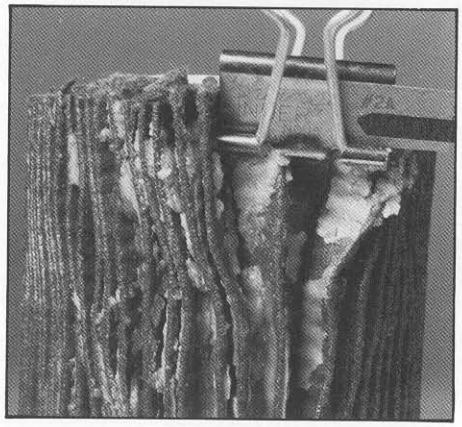
DCA4 FILTERS

New engines will be equipped with the "WF2073" and "WF2074," which contain proper amounts of chemical for initial protection levels. The standard replacement water filters will be the "WF2071" and "WF2070" for small engines. The one pint liquid is DCA60L.

The DCA4 formula represents the "next generation" in cooling system protection. It uses a phosphate/molybdate/nitrite base to protect against corrosion, solder bloom, liner pitting, foaming and other cooling system problems. The protection levels are improved in every category over the more familiar borate/nitrite formulas. DCA4 is unique in that it protects aluminum against corrosion very effectively. In addition, it offers protection against oil fouling, which has never before been a feature in a supplemental coolant additive.

Avoiding Silica Gel

Another significant advantage of DCA4 is that it is far less likely to react with antifreeze to form "silica gel," a problem seen in about 5% of today's over-the-road trucks and often occurs in off-road as well. Silica gel is a gritty, gooey substance which forms when too many silicates are put into solution. The silicates cannot stay soluble and begin to polymerize and stick to cold metal surfaces.



The ultimate result of silica gel buildup is plugged heat exchanger passages and lack of cab air heat. Sometimes the buildup causes engine overheating and even, at worst, total system blockage.

Cummins recommends four major methods of avoiding silica gel:

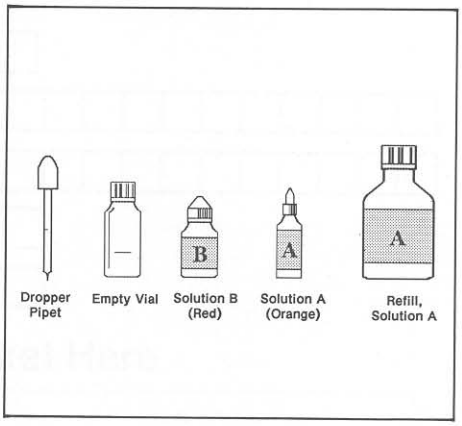
1. Use a specially formulated, low silicate heavy duty antifreeze which corresponds to GM 6038 formula.
2. Use antifreeze concentrations of no more than 65% antifreeze to 35% water; preferably, never exceed 50/50% mix.
3. Do not overconcentrate supplemental coolant additives. Stick with recommended replenishment guidelines.
4. Use DCA4.
   Borate/Nitrite formulas (including DCA and Nalcool) are high in silicates whereas DCA4 contains few silicates; thus, DCA4 is less likely to cause a silica gel problem.

It should be noted that the major reason for the silica gel problem is the high silicate levels in today's modern antifreezes. The formulas are high in silicates because they are designed for use in passenger cars which have aluminum blocks. Since DCA4 is an excellent protector of aluminum, the low silicate formula is ideal for the fleet which wants to protect passenger cars and mid-range diesels along with heavy duty diesels. A Pre-mix of low silicate antifreeze, water, and proper amounts of DCA4 will protect every engine properly.

Customer Recommendations

When recommending DCA4 to customers, you should know the following points:

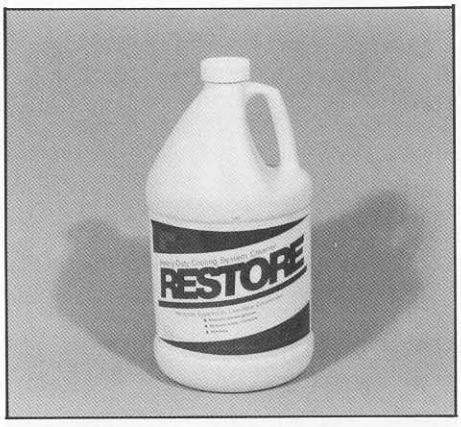
- DCA4 and DCA are compatible. In fact, DCA4 is compatible with every supplemental additive formula on the market. While the preferable way to utilize DCA4 is to drain the system, clean it, and start over with a fresh charge of DCA4, customers may simply start to use the new formula.



- DCA test kits (3300846S) can test concentrations of DCA4 (when DCA4 is the only chemical in use in the system). The testing procedure is similar to that of DCA. The only difference is the way the coolant sample must be diluted in order to get proper results, see SPT 85T8-10. Fleetguard's Bulletin SB-49 features complete "how to" instructions.

- Cummins/Fleetguard testing shows that stabilizers postpone the formation of silica gel, but after a relatively short time, the rate of polymerization and drop out is equal between the stabilized and unstabilized formulas. DCA4 is significantly lower in cost than its competitors which use Stabil-Aid.

Cleaner Complement Line



Fleetguard has a new complement to the cooling system product line, a cleaner called RESTORE. It is available in three sizes, 1 gallon, 5 gallon, and 55 gallon drums. Fleetguard RESTORE heavy duty cooling system cleaner will clean a cooling system in 45 to 90 minutes, and will remove silica gel, scale, oil and other contaminants. The product requires no neutralization and is a "one step" cleaner, which uses a water rinse.

The RESTORE cleaner, which will cost the end user about $17.50 per cleaning, is being advertised as the treatment to try first when overheating problems occur. In addition, leaking water pumps may be cured by a good cleaning with RESTORE since it has been found that over half of water pump leakage problems are a direct result of overcharging of coolant additives in the cooling system.

The cleaner has been tested at Cummins, with results that conclude that the cleaner was extremely effective in bringing cooling system performance levels after 250,000 miles back to performance levels seen at about 80,000 miles when the test was begun.

Parts Professional Accreditation Exam Instructions

1. Complete the examination, make sure to check only one answer PER Question in the ( ) provided.
2. If you are already enrolled in the Cummins Parts Professional Program please fill out only your name and address in the boxes below and check the information at the bottom of this page.
3. If you are not currently enrolled please fill in the enrollment information below. Print clearly, and make sure to provide your place of employment and your social security/insurance number.
4. Score an average of 90% or better on the first 4 exams and earn a Cummins Parts Professional jacket.

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Parts Professional Exam

( ) I did not receive Booklets #1 or #2. Please send me a copy (specify which one). Please allow 4-6 weeks for verifications and handling.

☐ Parts Professional #1
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Check who you are employed by:

( ) Cummins Engine Company
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( ) OEM (specify) _____
( ) Other (specify) _____

_____
Your Signature Date

Turn Page, Begin Test

Name _____

Parts Professional Test #3

1. The introduction of the new design water pump seal in 1982 resulted in:
   A. ( ) The restructuring of water pump repair kits
   B. ( ) A water pump recall
   C. ( ) Recalling all unitized carbon on ceramic seals
   D. ( ) The deletion of impellers from major repair kits

2. Cummins ReCon vibration dampers are fitted with _____bearings.
   A. ( ) Full floating teflon
   B. ( ) Cadmium brass
   C. ( ) Bronze/Lead babbit
   D. ( ) Roller

3. The core turned in for a Cummins ReCon vibration damper must be complete by the same part number as the part number ordered.
   A. ( ) True
   B. ( ) False

4. Big Cam III oil coolers feature filter head mounting for both the full-flow and bypass oil filters.
   A. ( ) True
   B. ( ) False

5. The amount of braking power realized (from a C BRAKE) in a given engine series varies according to which of the following factors?
   A. ( ) Turbo boost pressure
   B. ( ) Tire pressure
   C. ( ) Compression ratio
   D. ( ) A & C

6. Off brand water pump seals often rely on high friction levels and/or have significantly different spring pressures for sealing. What does this result in?
   A. ( ) No significant difference
   B. ( ) Initial water pump leakage which goes away after seal wear-in
   C. ( ) Increases seal life
   D. ( ) Rapid seal wear and shorter water pump seal life

7. The Big Cam III full-flow oil filter is:
   A. ( ) Mounted above the oil cooler
   B. ( ) Mounted on the same side of the lube pump
   C. ( ) Mounted below the oil cooler
   D. ( ) Mounted directly to the lube pump

8. The turbocharger is driven by:
   A. ( ) Water
   B. ( ) Air
   C. ( ) Exhaust gas
   D. ( ) Lube oil

9. The dual entry HT3B turbocharger was initially introduced on:
   A. ( ) Big Cam I
   B. ( ) Small Cam Magnum 350
   C. ( ) Big Cam III
   D. ( ) L10

10. When Uprating early NT engines (equipped with a Jacobs brake) with a DFC lube system what parts are required.
    A. ( ) Brake adjusting screws
    B. ( ) Jacobs master piston return spring and inner control valve spring
    C. ( ) Rocker arm adjusting screw and master piston return spring
    D. ( ) This Uprate cannot be performed with a Jacobs brake equipped engine

11. Special considerations must be given when an HT3B dual entry turbocharger is used in conjunction with a Jacobs brake. The brake housing will require:
    A. ( ) New injectors
    B. ( ) A change to camshaft timing
    C. ( ) New push tubes
    D. ( ) A specific "TT" auto lash adjusting screw

12. The HT4B is a dual entry turbocharger.
    A. ( ) True
    B. ( ) False

13. Which of the following turbochargers has a vaned type diffuser.
    A. ( ) T-50
    B. ( ) T-46
    C. ( ) T-46B
    D. ( ) VT-50

14. Installing a turbocharger with too small a compressor for a particular engine application will result in:
    A. ( ) Excessive rotor speed and low turbo efficiency
    B. ( ) Low speed surge
    C. ( ) Poor engine acceleration response
    D. ( ) Improved high altitude performance

15. The HT3B single entry turbocharger was introduced on the Big Cam IV engine for 350 horsepower and below.
    A. ( ) True
    B. ( ) False

16. The primary result of using the C BRAKE is:
    A. ( ) Extended engine life by canceling power strokes when they are not needed
    B. ( ) Improved engine performance at cruising speed
    C. ( ) Extended vehicle brake life
    D. ( ) Improved air compressor performance

17. The Top Cog V-belt:
    A. ( ) Handles small speed drives
    B. ( ) Has a thin profile
    C. ( ) Runs cooler and lasts longer than a conventional V-belt
    D. ( ) Will not work on a Cummins engine

18. Premium Blue oil is a 15W-40 oil that meets API CD,CC/SF performance requirements.
    A. ( ) True
    B. ( ) False

19. Which type of vibration damper do high horsepower Cummins engines normally use?
    A. ( ) Solid Steel
    B. ( ) Rubber
    C. ( ) Viscous
    D. ( ) Rubber/Brass

20. How are Cummins ReCon water pumps containing a cast iron impeller identified?
    A. ( ) A special prefix to the ReCon part number
    B. ( ) A -1 suffix on their ReCon part number
    C. ( ) By outside appearance
    D. ( ) All ReCon water pumps have phenolic impellers

21. What is the distinguishing design feature of the DFC lube pump.
    A. ( ) Reduced main oil rifle pressure
    B. ( ) Maintains more constant oil pressure
    C. ( ) Maintains proper oil temperature
    D. ( ) All of the above

22. The DFC lube system reduced the horsepower required by the lube pump by approximately _ horsepower at rated speed and load conditions.
    A. ( ) 4
    B. ( ) 6
    C. ( ) 2
    D. ( ) 0

23. The Fleetguard SUPERFILTER combines:
    A. ( ) The fuel filter and coolant filter into one unit
    B. ( ) The bypass and full-flow oil filters into one unit
    C. ( ) The water separator and fuel filter into one unit
    D. ( ) The coolant filter and coolant conditioner into one unit

24. C BRAKE kits can be ordered together under a single part number.
    A. ( ) True
    B. ( ) False

25. The Big Cam IV engine uses a single loop cooling system.
    A. ( ) True
    B. ( ) False

26. The DFC Lube system is not available as an UPRATE kit.
    A. ( ) True
    B. ( ) False

27. The purpose of the oil bypass filter is to:
    A. ( ) Filter large particles from oil prior to going through full-flow filter
    B. ( ) Filter particles 4 microns and smaller
    C. ( ) Filter particles 5 microns and larger
    D. ( ) Filter oil when full-flow filter is clogged

28. DCA and DCA4 coolant conditioners are
    A. ( ) Compatible
    B. ( ) Not Compatible

29. DCA test kits can test DCA4 when:
    A. ( ) DCA4 is mixed with DCA
    B. ( ) DCA4 is used with Nalcool 3000
    C. ( ) DCA4 is the only chemical in the system
    D. ( ) None of the above, DCA test kit cannot detect DCA4

30. The air output of a turbocharger and the air requirements of an engine need to be carefully matched.
    A. ( ) True
    B. ( ) False

Recent Accessory Group Changes to Review

Service Parts

Number	Topic	Engine Series
83T10-4	T-46B Turbocharger Application Information	NT
84T7-4	DFC Signal Hose	NH/NT
84T7-7	DFC Signal Line	NH/NT
84T8-4	New Jacobs Water Pump Service Kit	NT
84T10-1	Turbine Seal Leakage Trouble-shooting Procedure	All
84T10-5	HT3B Turbocharger Noise	NH/NT
84T10-6	HT3B Turbocharger for Big Cam III Engines	NH/NT
84T10-7	HT3B Turbocharger Application on Small Cam NT Engines	NT
84T22-1	Water Pump Seal Drivers	NT/L10/SV/ V903/K19
85T8-9	NH/NT Standardized Water Pump	NT
85T8-10	Testing Coolant with DCA4	NH/NT L10
85T10-2	Turbocharger Soft Surge	NH
85T10-3	HT3B Turbocharger Oil Supply Connection	NH
85T10-4	HT3B Turbocharger for Earlier Engines	NT
85T20-1	Jacobs Engine Brake TT Auto-Lash™ Adjusting Screw	NT

Reference

3379133-11	CPL Manual
3387316-R	C Brake Familiarization
3387319-R	Uprate Manual
3379682	Big Cam III Parts Catalog
3822017	Big Cam IV Parts Catalog

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