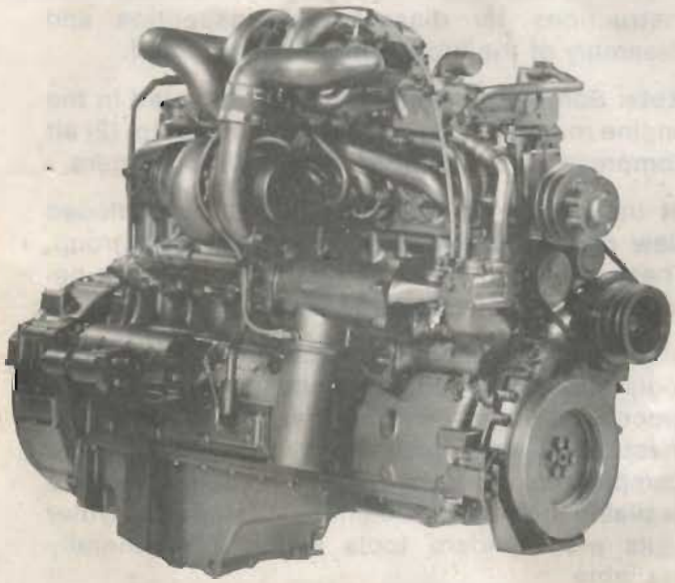
Shop Manual

Cummins Diesel NH/NT/NTA 855 C.I.D. Engines



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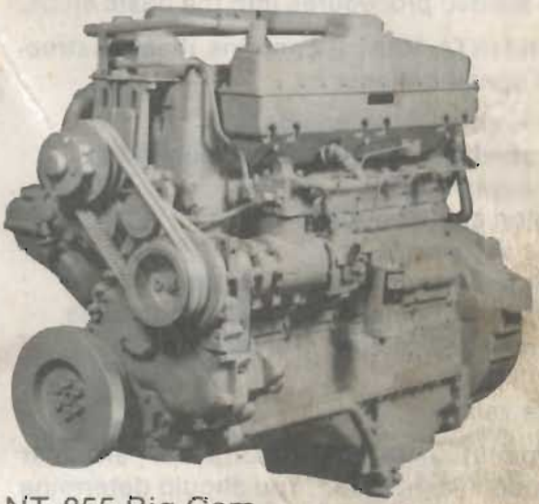
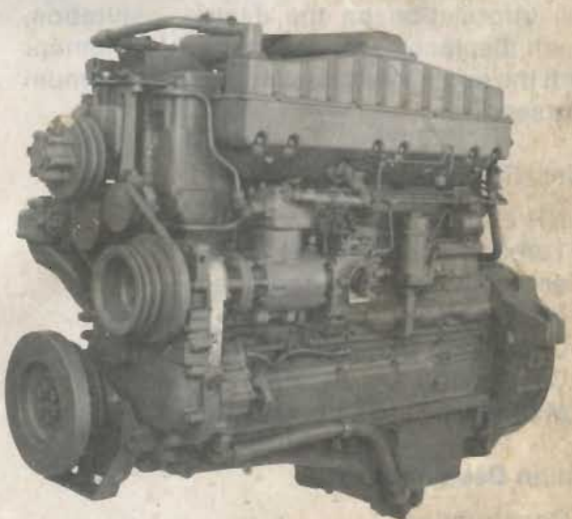


NT-855 Big Cam



NTA-855 Big Cam II (MVT)

Bulletin No. 3379076-05, Printed 9-81

Foreword

This NH/NT/NTA-855 C.I.D. Engine Rebuild Manual is written and organized in a way which allows a user, no matter his familiarity with Cummins engines, to follow the procedures necessary to rebuild that engine. For this reason, we have attempted to use as few technical terms as possible and have divided procedures into the basic steps.

This NH/NT/NTA Manual contains these instructions and specifications:

- Disassembly of the engine
- Disassembly of some components and most assemblies
- Cleaning and inspection of the engine and parts
- Repair and/or replacement of parts
- Assembly of components and assemblies
- Assembly and testing of the engine
- Worn limits
- Torque values

Some information that is specific to particular engine models is included. You should determine what engine model an engine is before doing any work on that engine. The dataplate on the engine will identify the engine model. This model number provides information on the design, aspiration, cubic inch displacement, application (equipment for which the engine was designed) and maximum rated horsepower.

Example: NTA-855-C360

N = NH Engine Series
T = Turbocharged (If there is no "T", the engine is naturally aspirated)
A = Aftercooled
855 = Cubic Inch Displacement
C = Construction Application
360 = Maximum Rated Horsepower

Application Designations

C = Construction
G = Generator (GS = Standby, GC = Continuous Duty)
P = Power Unit
M = Marine
L = Locomotive
R = Railcar

How to use this Manual

The manual is divided into 22 groups. These groups are listed in the Table of Contents.

The disassembly of the engine is covered in Group 0. The disassembly, inspection and assembly of components are covered in the appropriate group. For example, Group 0 contains the instructions for removing the lubricating oil pump from the engine. Group 7, Lubricating System, contains the instructions for disassembly, inspection and assembly of the lubricating oil pump itself.

Note: Some components are not included in the engine manual. They are: (1) the fuel pump, (2) air compressor, (3) injectors and (4) turbochargers.

At the beginning of each group is an exploded view of the components covered in that group. These exploded views show the relationship between all parts in a component.

Also at the beginning of each group is a list of tools either required or recommended to do the procedures described in that group. Many of these tools were designed by Cummins Engine Company to perform a specific procedure and are available from your Cummins Distributor. Other tools are standard tools which are generally available.

At the end of each group is a table which includes the worn limits, and dimensions of the parts contained in that group. (Worn limits indicate that a part can be used if its dimensions are within the dimensions given and if it is not damaged.) Torque values are also included in this table.

Group 18 includes the specifications contained in all other groups and the following additional specifications:

1. Oil Recommendations
2. Fuel Recommendations
3. Coolant Recommendations

There is an alphabetical index at the end of the manual to allow you to find the page number for specific information without having to read through an entire group. This index is intended to match the headings used in the text. For example, if you are looking for disassembly of the lubricat-

ing oil pump, look up "Lubricating Oil Pump" in the index, The entry would appear as follows:

Lubricating Oil Pump
Assembly 7-4
Disassembly 7-2
Inspection 7-2
Repair 7-2
Replacement 7-2

Note: The pages in this manual are numbered in sequence within the group. That is, the first page in Group 0 is 0-1; the first page in Group 1 is 1-1.

The last page in this manual is a list of other Cummins Engine service publications on related subjects.

The pages of the manual can be removed by bending the manual back at the beginning and end of each group. The pages can then be easily pulled out and put in a three-ring binder.

This manual includes Service/Parts Topic information concerning the NH/NT/NTA-855 from February, 1979 to September, 1981 and supersedes Bulletin Number 3379076-04. As it is the policy of Cummins Engine Company, Inc. to improve its products, design changes will occur after publication of this manual which can affect the procedures described in this manual. If you have any questions about your engine, check with your local Cummins Distributor or Dealer.

To make sure that this manual provides the information you need in a way that allows you to make the best use possible of that information, we need to hear from you about any problems you encounter. Please send your comments to:

NH Technical Writer -- 80203
Service Operations
Cummins Engine Company, Inc.
Box 3005
Columbus, IN 47201

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The Contents of this manual are based on information in effect at time of printing and are subject to change without notice.

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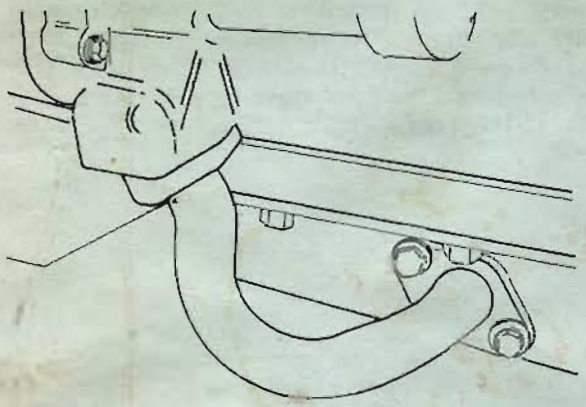


Fig. 9, Oil pan transfer tube installation

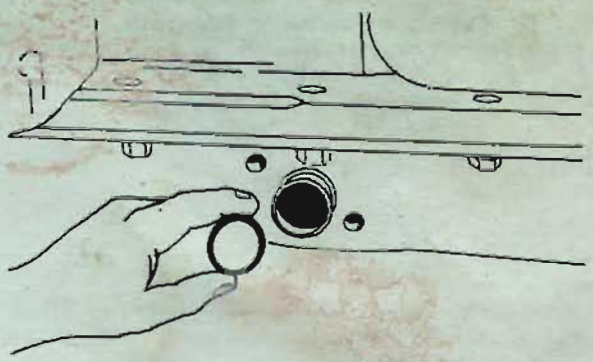
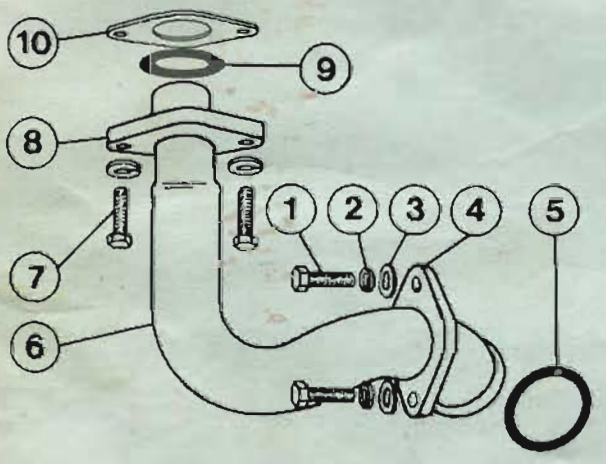


Fig. 10, Installing O-ring on oil pan



Lubricating Oil Transfer Tube Assembly

1. Capscrew 3/8-16 x 1 (2 required)
2. Lockwasher 3/8 (4 required)
3. Plain Washer 3/8 (2 required)
4. Flange Retainer
5. O-ring
6. Oil Transfer Tube
7. Capscrew 3/8-16 x 1 3/8 (2 required)
8. Flange Retainer
9. O-ring
10. Gasket, Oil Pump

Fig. 11, Exploded view of oil transfer tube assembly

T46-B TURBOCHARGER

The turbocharger has been changed for greater efficiency. The only external changes are the oil inlet line and the vee bands. The oil inlet line has been rotated approximatedly 140° from the top. Many of the internal components have also been changed. They include the following:

Compresssor Wheel
Compressor Housing
Turbine Wheel and Shaft
Bearing Housing Assembly

Tighten the V-band clamp carriage bolts to 6.5 to 7.01 N•m [58 to 68 in-lb] torque.

EXHAUST SYSTEM

All Big Cam III engines use pulse exhaust manifolds. They improve fuel economy and give faster turbocharger response. The manifold capscrews have been changed and do not require lockplates or washers. Use an antisieze compound which prevents the manifold capscrews from seizing inside the cylinder head. The new style capscrew must be tightened between 75 to 85 N•m [55 to 65 ft-lb] torque.

COOLING SYSTEM

Water Pump Impeller

The diameter of the water pump impeller has been reduced from 114.3 mm [4.5 inches] to 101.6 mm [4.0 inches] on automotive engines. The coolant flow rate has been reduced from 530 L [140] to 359.6 L [95 GPM] at 2100 RPM. These changes reduce the engine's parasitic load and add to its performance. Industrial and construction engines continue to use the 4.5 inch impeller which provides a flow rate of 530 L [140 GPM].

Water Transfer Tube

The water inlet housing now is made of stamped welded steel rather than cast iron.

Service Parts Topics

Date: February, 1983
No: 83T7-5
File Group: B
Engine Family: Big Cam III (Big Cam III Look Alikes)

Subject: Trouble-Shooting the Demand Flow Cooling (DFC) Lubricating Oil System

Ref.	Engine Shop Manual	O/M Manual	Film Card	Other
B		3379137-03	07.01	81T7-

The DFC lubricating oil system is designed to maintain 241 to 310 kPa [35 to 45 psi] oil pressure with a flow rate of 151.4 litres per minute [40 gallons per minute (GPM)] the main oil supply passage.

Note: All trouble-shooting procedures listed in this topic must be performed with th engine at operating temperature.

Complaint: Excessive Oil Pressure

Oil pressure over 310 kPa [45 psi] with the engine operating at rated speed and normal operating temperature indicates an abnormality.

Oil pressure ranging from 414 kPa [60 psi] at idle and increasing with engine spe until the high pressure regulator opens at approximately 965 kPa [140 psi] al indicates an abnormality.

Possible Causes:

1. Oil pressure gauge not accurate. Connect a new or calibrated gauge so that bo the new and old gauge can be read at the same time. If the new gauge reads 241 310 kPa [35 to 45 psi], replace the old gauge. No further trouble-shooting required.

2. The DFC plunger is not moving from the closed position. This is usually caused b dirt or foreign material in the plunger barrel. Remove, disassemble and clean th lubricating oil pump. Inspect all parts of the pump for wear or damage. Repla all excessively worn parts. (See parts reference.)

Complaint: Irregular Oil Pressure

Oil pressure increases with engine speed to 414 kPa [60 psi] or more at rated spee and then drops slowly to 172 to 193 kPa [25 to 28 psi]. On rapid deceleration, the pressure will drop rapidly until it is almost at zero and then increase to 172 to 193 k [25 to 28 psi].

Possible Cause:

1. Restricted signal orifice. Remove, disassemble and clean the lubricating oil pum Inspect all parts for wear or damage. Replace all parts not within specification (See parts reference). Clean the signal orifice. Use an acetylene torch tip clean to clean the orifice. Compressed air and solvent can be used to clean the inter oil passages of the pump. When using compressed air, be sure all of the dirt blown completely out of the pump. If the dirt is not removed, it will plug t orifice again. Any metal fragments found in the lubricating oil pump indicat internal engine problems. If metal fragments are found in the pump, remove the pan and inspect it for metal fragments. If fragments are found, inspect the ma and rod bearings.

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Registered Office: 4660 Coombe Road, New Malden, Surrey KT3 4QL
Registered No. 573951 England

Complaint: Low Oil Pressure

Oil pressure less than 241 kPa [35 psi] with the engine at operating temperature and at rated speed indicates a problem.

Possible Causes:

1. Low oil level.

2. Oil pressure gauge not accurate. Connect a new or calibrated gauge so both the new and old gauge can be read at the same time. If the new gauge reads 241 to 310 kPa [35 5to 45 psi], replace the old gauge. . No further trouble-shooting is required.

3. Air entering the lubricating oil system can also cause low oil pressure. To check for air in the lubricating oil, remove the valve covers and check for air bubbles between the rocker levers. Weak Jacobs Brakes™ can also indicate air in the oil. Air in the lubricating oil is usually caused by a loose or defective oil suction hose or fitting.

4. If the engine oil level is correct, the oil pressure gauge is accurate, the engine is not excessively worn, and there are no air bubbles in the lubricating oil, then check the DFC plunger to see that it is not remaining open when it shoud be closed. A plunger which does not operate freely can be caused by dirt in the barrel or a defective plunger spring. When servicing springs, check both the overall length and the spring rate. The springs must not have any scratches, grooves or other damage. Check both the plunger diameter and the inside diameter of the bore in the oil pump body for excessive wear. (See parts reference.)

5. If all of the previously mentioned low oil pressure trouble-shooting procedures in this topic have been completed and the oil pressure is still low, check for wear on the main and rod bearings and the camshaft bushings. The main and rod bearing can be inspected by removing the bearing caps. If main bearing shell thickness in the loaded area is less then 3.086 mm [0.1215 inch] the bearing should be replaced. If rod bearing shell thickness is less than 1.80 mm [0.071 inch] the bearings should be replaced.

Service Parts Topics

Date
December, 1984

No.
84T0-5

File Group
0

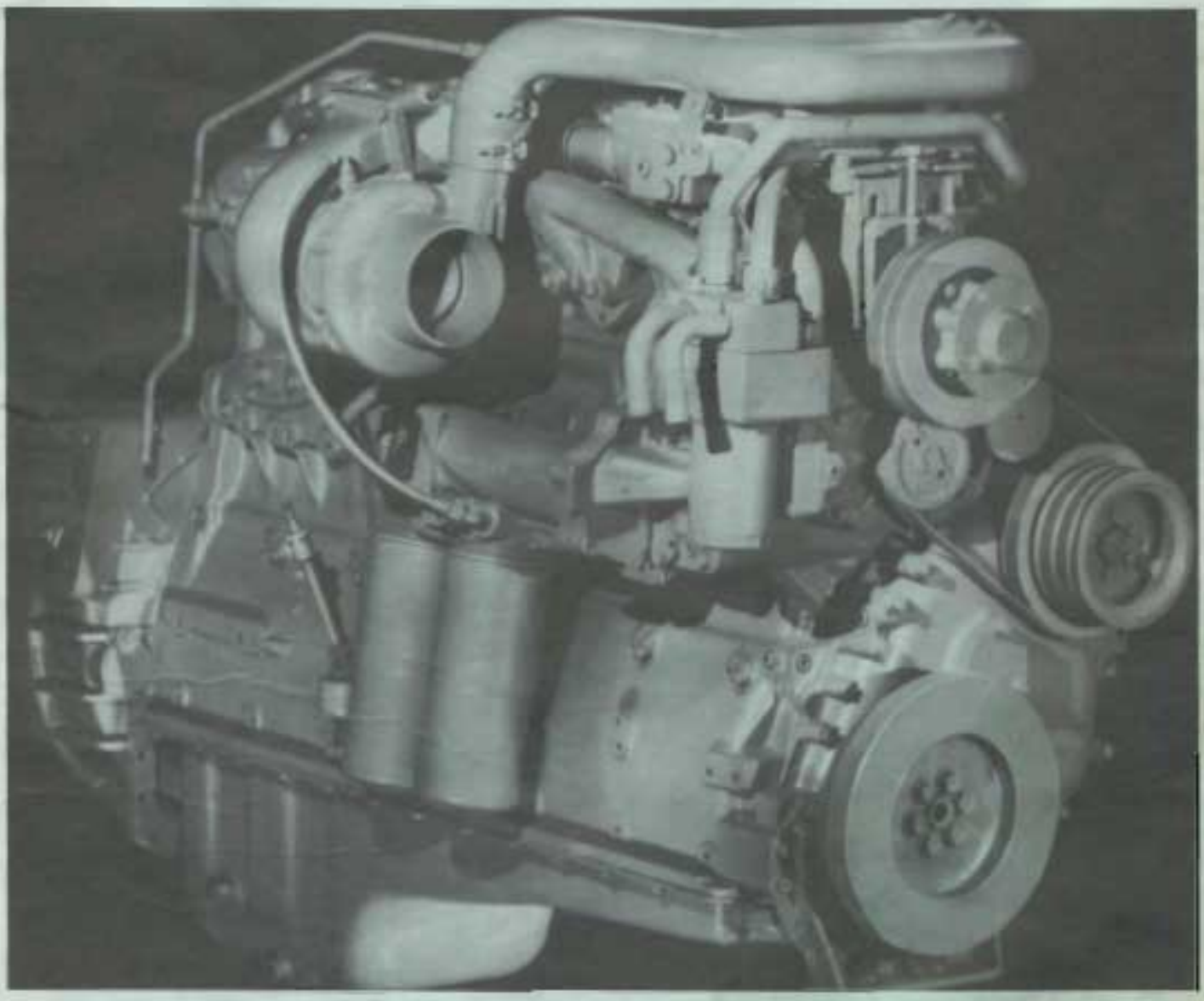
Engine Family
NH/NT

Subject
Big Cam IV Optimized Aftercooling

Ref.: Engine Shop Manual | O.M. Manual | Film Card | Other

B

Full production release of the Big Cam IV with Optimized Aftercooling will start in December, 1984. This topic explains the components that are released for the engine.



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Registered No. 573961 England

CYLINDER BLOCK

A new cylinder block vent has been added to all Big Cam IV engines. This vent is only needed for the Big Cam IV tilt applications, but is being standardized for all Big Cam III and Big Cam IV engines. This hole vents the water pump cavity with the water jacket around the cylinder liners. There is no change in cylinder block part numbers. See Fig. 1.

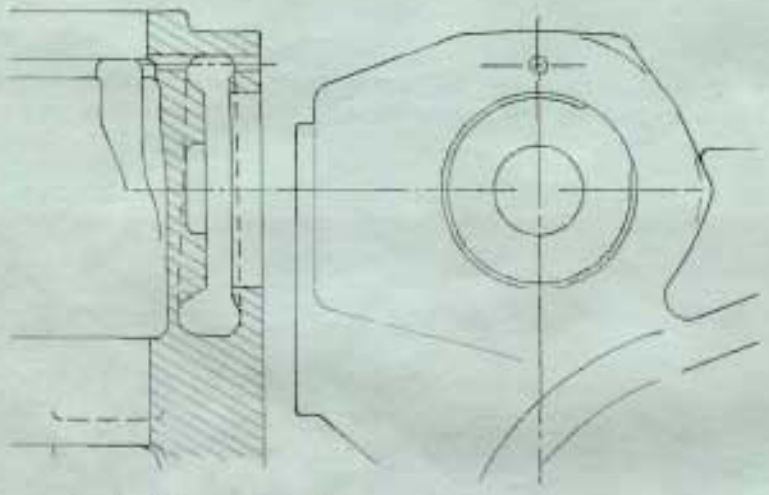

Fig. 1, New vent drilling in cylinder block

PISTON

The 400 horsepower rating will use the standard piston ring location. The 300 and 350 horsepower ratings will use the raised top ring piston. The top ring is 0.350 inch [8.89mm] higher on the raised ring piston. The Fleet 300 engine will use a dual ni-resist piston. Refer to Table 1 for exact part numbers. All full production Big Cam IV pistons will use the solid piston pin.

CAMSHAFT

The 400 horsepower engine will utilize the high lift camshaft. All other engine ratings will use the same camshaft used in Big Cam II and III engines.

Table 1:- Full Production Big Cam IV Components by Model

	Fleet 300	NTC-300	NTC-350	NTC-400
CPL	718	674	675	676
Piston	3801534 (3045948)	3801535 (3042320)	3801533 (3042318)	3801233 (3028685)
Turbocharger	3801588 (3522674)	3801589 (3522676)	3801591 (3513417)	3801590 (3523591)
Camshaft	3026975 (3025518)	3026975 (3025518)	3026975 (3025518)	3801448 (3036697)
Injector	3018353	3018353	3034619	3030445
Cylinder Head	3041993	3041993	3041993	3037989
Timing	BY (.070)	AX (.055)	BU (.065)	FI (.070)

Note: Numbers in parenthesis are the numbers which will be in the CPL book. These are production only part numbers and cannot be ordered from Part Distribution Center PDC).

TURBOCHARGER

The 400 horsepower engine will utilize the HT4B turbocharger. All other ratings will use the HT3B. All of the turbochargers on Big Cam IV use a single entry turbine housing. Make sure the correct turbocharger part number is specified, individual ratings have different turbocharger assemblies. The turbocharger drain has now been simplified, the bypass oil filter drain is no longer connected to the turbocharger drain. Refer to Fig. 2.

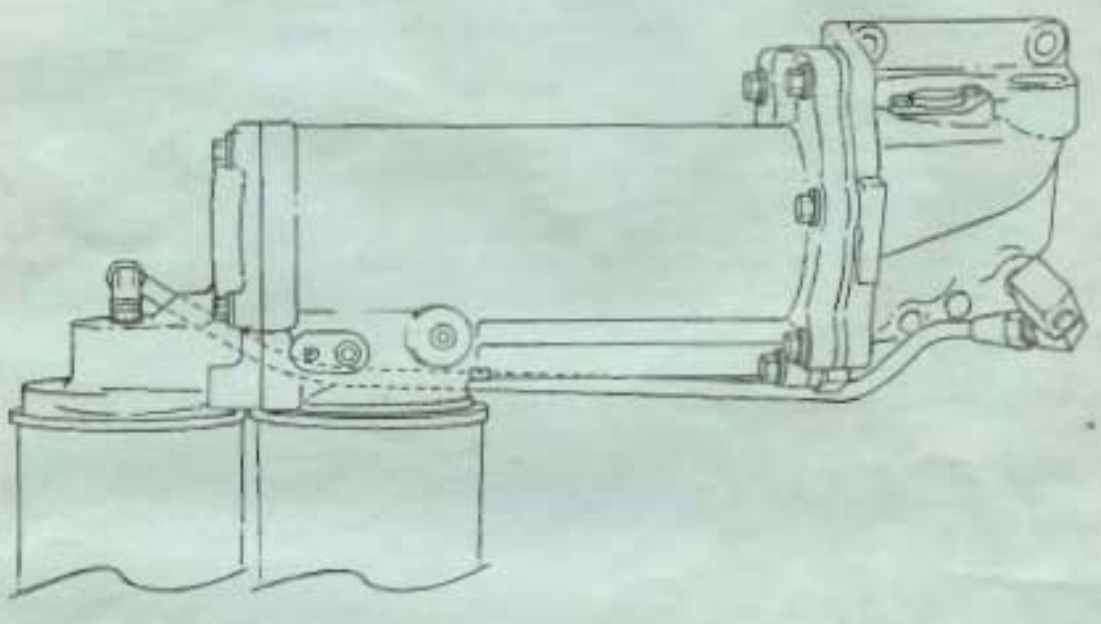

Fig. 2, New turbocharger and bypass filter oil drain lines

CYLINDER HEAD

The heavier valve spring, retainer and wear plate associated with the high lift camshaft are used on the 400 horsepower engine. All other ratings remain the same as the Big Cam III.

OIL COOLER AND HOUSING

A new oil cooler core, Part No. 3045483, has been released which has a more tightly controlled coolant side pressure drop. This oil cooler can be used on either the Big Cam III or the Big Cam IV. The bypass oil filter drain is now routed to the front oil cooler support. This eliminates the hose connection that was previously use to connect the bypass drain to the turbocharger drain line. Refer to Fig. 2.

WATER PUMP

A new water pump is being used on the Big Cam IV engine. This water pump includes a new casting with a refined water pump inlet and a special impeller set to 0.015 inch [0.38mm] end clearance. The body on this pump is also internally vented to match with the block vent shown in Fig. 1. The speed of the pump has been increased with a smaller diameter water pump pulley assembly, Part No. 3026013. The water pump assembly (less idler) is Part No. 3045943.

COMPUCHEK®

Big Cam IV will have all Compuchek fittings standard. Fittings have been added to the oil cooler, thermostat housing, front upper water manifold, and the lubricating pump. These fittings use a straight thread with an O-ring seal for seating.

AFTERCOOLER AND MOUNTING

The unitized aftercooler is being used on all full production Big Cam IV engines. A new venting arrangement is also released which will simplify the connections to the radiator in all installations. Service Parts Topic 84T10-8 will cover the special features and removal/installation procedures with the new aftercooler.

FAN HUB BRACKET

The fan hub brace support has been changed. The new brace, Part No. 3044986, is also used for supporting the aftercooler coolant supply and return lines. The fan hub adjusting screw no longer travels through the bracket. This does not change the fan hub adjusting procedure in any way. The tension on the fan hub should be set with the adjusting screw and the mounting bolts then tightened. Finally the adjusting screw is backed off 1/2 turn to unload the screw.

ENGINE BRAKE

Only the 401C Jacobs Brake should be used with the Big Cam IV.

Service Parts Topics

Date
December, 1984
No.
84T10-8
File Group:
10
Engine Family:
NT

Subject
Unitized Aftercooler and Mounting

Ref.:	Engine Shop Manual	O/M Manual	Film Card	Other
B			10	

A new unitized aftercooler has been released for the Big Cam IV engine. This hig efficiency aftercooler also offers a front air crossover which allows easier valve cove removal. Part numbers are included in the Big Cam IV parts book (available throug Literature Control Service as 3822017).

AFTERCOOLER ASSEMBLY

The aftercooler is constructed of a heat exchanger element wrapped in a stamped stee wrapper. Refer to Fig. 1. Nine 5/16 inch bolts/studs hold the core in place, thes bolts are torqued to 25 to 30 ft-lbs [34 to 41 N•m]. There are also six 5/16 inch socke head capscrews located along the bottom of the aftercooler. These socket hea capscrews should be torqued to 15 to 20 ft-lbs [20 to 27 N•m].

All of the capscrews highlighted in Fig. 1 should not be removed or replaced. Remova of these capscrews could release the clamping load on the aftercooler core. Use o anything other than the proper capscrew or stud could cause an interference proble or improper clamping load.

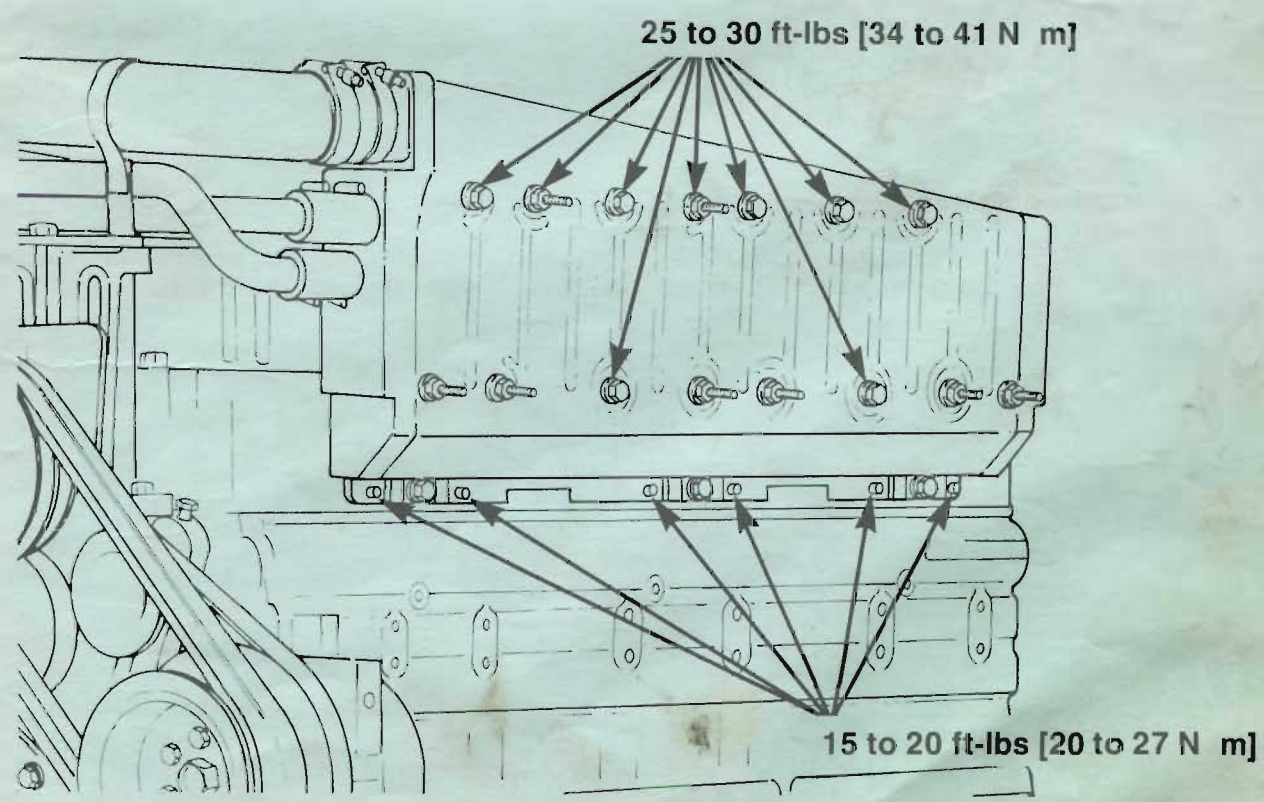

Fig. 1, Unitized Aftercooler

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AFTERCOOLER MOUNTING

Nine grade eight 3/8 inch capscrews/studs are used to attach the aftercooler to the cylinder heads (refer to Fig. 2). These should be torqued to 45 to 50 ft-lbs [61 to 68 N•m]. Full thread engagement is required, do not substitute other capscrews or add any brackets or clips between the aftercooler and the mounting bolts. The six upper studs used will allow attachment of any additional items.

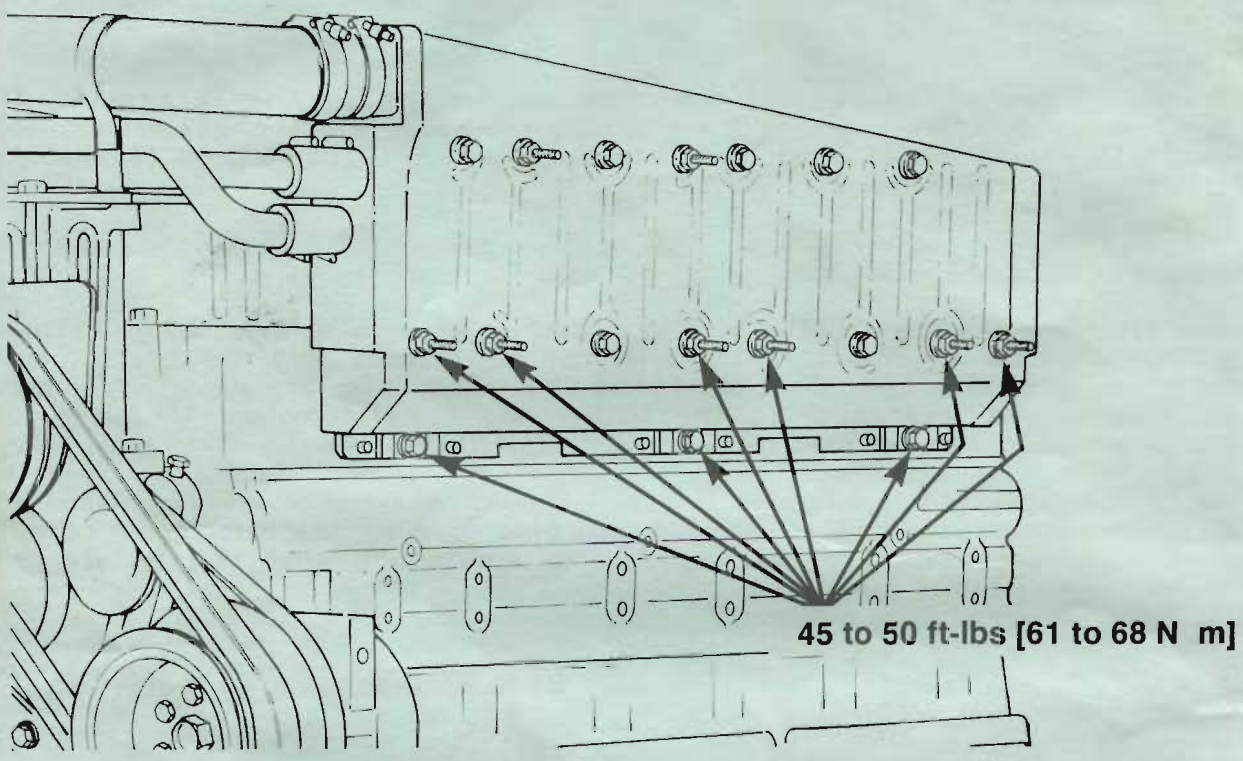

Fig. 2, Unitized Aftercooler Mounting

A special clamp, Part No. 3043643, is used on the lower aftercooler mounting capscrews. The part number stamped on this clamp should facing outward. Fig. 3 shows the clamp.

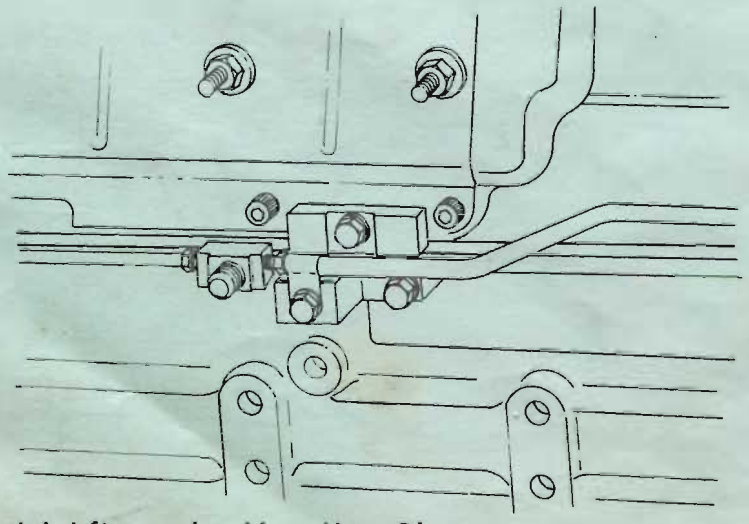

Fig. 3, Special Aftercooler Mounting Clamp.

NEW VENTING ARRANGEMENT

A new standard venting arrangement has been released for all applications. Hose from the aftercooler coolant return line connects with a new fitting that screws into the front water manifold section. A single line is then used to connect the fitting to the radiator fill/auxilary tank.

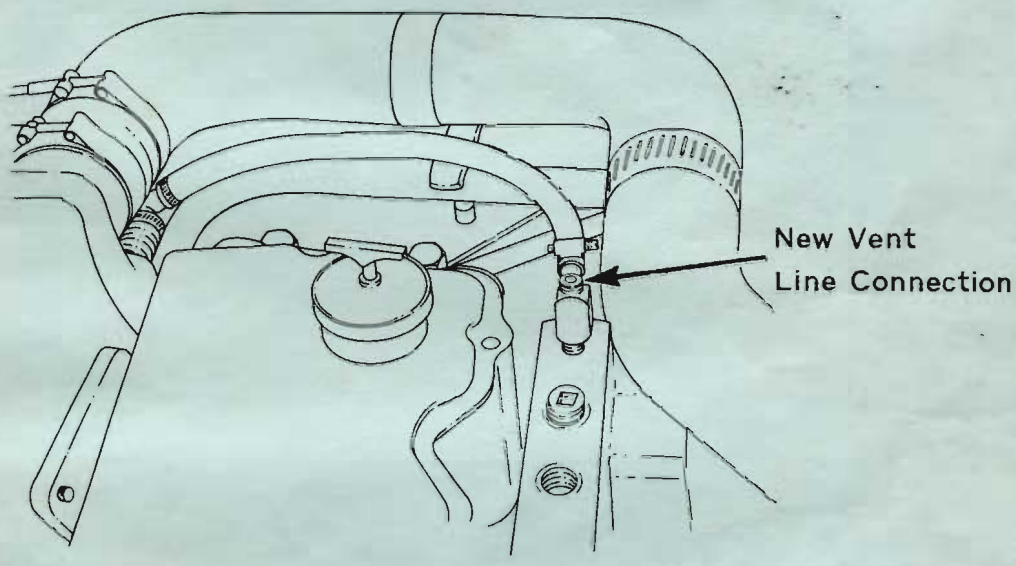

Fig. 4, New Venting Arrangement.

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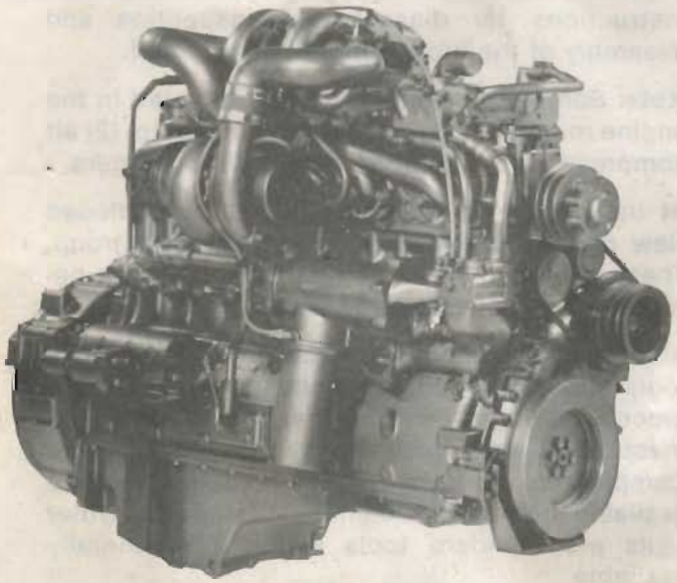

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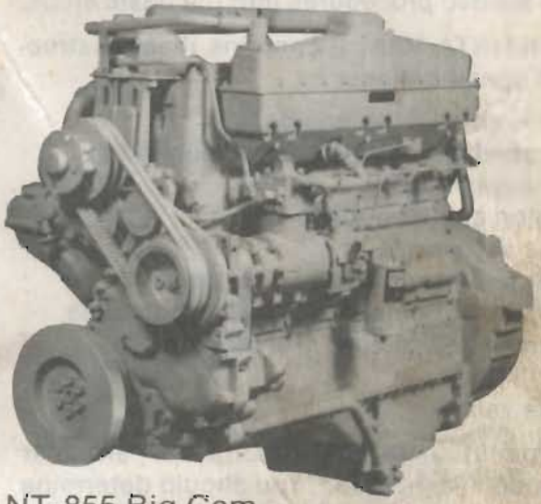
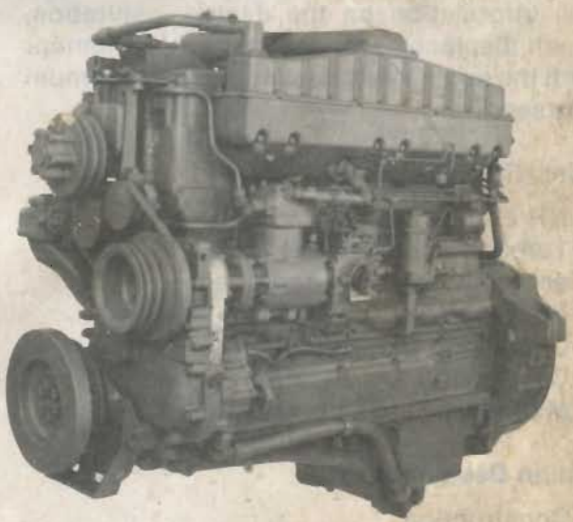


NT-855 Big Cam



NTA-855 Big Cam II (MVT)

Bulletin No. 3379076-05, Printed 9-81

Foreword

This NH/NT/NTA-855 C.I.D. Engine Rebuild Manual is written and organized in a way which allows a user, no matter his familiarity with Cummins engines, to follow the procedures necessary to rebuild that engine. For this reason, we have attempted to use as few technical terms as possible and have divided procedures into the basic steps.

This NH/NT/NTA Manual contains these instructions and specifications:

- Disassembly of the engine
- Disassembly of some components and most assemblies
- Cleaning and inspection of the engine and parts
- Repair and/or replacement of parts
- Assembly of components and assemblies
- Assembly and testing of the engine
- Worn limits
- Torque values

Some information that is specific to particular engine models is included. You should determine what engine model an engine is before doing any work on that engine. The dataplate on the engine will identify the engine model. This model number provides information on the design, aspiration, cubic inch displacement, application (equipment for which the engine was designed) and maximum rated horsepower.

Example: NTA-855-C360

N = NH Engine Series
T = Turbocharged (If there is no "T", the engine is naturally aspirated)
A = Aftercooled
855 = Cubic Inch Displacement
C = Construction Application
360 = Maximum Rated Horsepower

Application Designations

C = Construction
G = Generator (GS = Standby, GC = Continuous Duty)
P = Power Unit
M = Marine
L = Locomotive
R = Railcar

How to use this Manual

The manual is divided into 22 groups. These groups are listed in the Table of Contents.

The disassembly of the engine is covered in Group 0. The disassembly, inspection and assembly of components are covered in the appropriate group. For example, Group 0 contains the instructions for removing the lubricating oil pump from the engine. Group 7, Lubricating System, contains the instructions for disassembly, inspection and assembly of the lubricating oil pump itself.

Note: Some components are not included in the engine manual. They are: (1) the fuel pump, (2) air compressor, (3) injectors and (4) turbochargers.

At the beginning of each group is an exploded view of the components covered in that group. These exploded views show the relationship between all parts in a component.

Also at the beginning of each group is a list of tools either required or recommended to do the procedures described in that group. Many of these tools were designed by Cummins Engine Company to perform a specific procedure and are available from your Cummins Distributor. Other tools are standard tools which are generally available.

At the end of each group is a table which includes the worn limits, and dimensions of the parts contained in that group. (Worn limits indicate that a part can be used if its dimensions are within the dimensions given and if it is not damaged.) Torque values are also included in this table.

Group 18 includes the specifications contained in all other groups and the following additional specifications:

1. Oil Recommendations
2. Fuel Recommendations
3. Coolant Recommendations

There is an alphabetical index at the end of the manual to allow you to find the page number for specific information without having to read through an entire group. This index is intended to match the headings used in the text. For example, if you are looking for disassembly of the lubricat-

ing oil pump, look up "Lubricating Oil Pump" in the index, The entry would appear as follows:

Lubricating Oil Pump
Assembly 7-4
Disassembly 7-2
Inspection 7-2
Repair 7-2
Replacement 7-2

Note: The pages in this manual are numbered in sequence within the group. That is, the first page in Group 0 is 0-1; the first page in Group 1 is 1-1.

The last page in this manual is a list of other Cummins Engine service publications on related subjects.

The pages of the manual can be removed by bending the manual back at the beginning and end of each group. The pages can then be easily pulled out and put in a three-ring binder.

This manual includes Service/Parts Topic information concerning the NH/NT/NTA-855 from February, 1979 to September, 1981 and supersedes Bulletin Number 3379076-04. As it is the policy of Cummins Engine Company, Inc. to improve its products, design changes will occur after publication of this manual which can affect the procedures described in this manual. If you have any questions about your engine, check with your local Cummins Distributor or Dealer.

To make sure that this manual provides the information you need in a way that allows you to make the best use possible of that information, we need to hear from you about any problems you encounter. Please send your comments to:

NH Technical Writer -- 80203
Service Operations
Cummins Engine Company, Inc.
Box 3005
Columbus, IN 47201

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