

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-202-1  
Relating to Exemptions Under Section 27156  
of the Vehicle Code

DETROIT DIESEL CORPORATION  
DDEC ENGINE UPGRADE KIT

Pursuant to the authority vested in the Air Resources Board (ARB) by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-9;

IT IS ORDERED AND RESOLVED: That installation of the DDEC Engine Upgrade Kit, manufactured by Detroit Diesel Corporation of 13400 Outer Drive, West, Detroit, Michigan 48239-4001, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore, the DDEC Engine Upgrade Kit is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on diesel-powered 1985-1990 model-year Detroit Diesel Corporation (DDC) 6V92TA DDEC urban bus engines with power ratings of 253 and 277 horsepower.

The DDEC Engine Upgrade Kit rebuilds diesel-powered 1985-1990 model-year 6V92TA DDEC urban bus engines to meet California's 1991 model-year heavy-duty diesel urban bus engine emission standards of 0.10 grams per brake-horsepower-hour (g/bhp-hr) particulate matter (PM) and 5.0 g/bhp-hr oxides of nitrogen (NOx).

The required DDEC Engine Upgrade Kit parts are listed in the parts lists which are attached hereto and incorporated herein.

The DDEC Engine Upgrade Kit consists of three kits: 1) engine rebuild kit - newly manufactured parts, 2) engine rebuild kit - rebuilt parts, and 3) converter/muffler kit. The newly manufactured parts kit consists of a gasket kit, air inlet hose, blower drive gear (2.05 to 1), blower by-pass valve assembly, cylinder kits (piston assemblies and cylinder liners), new electronic-unit fuel injectors, and DDEC II to DDEC III conversion kits. The rebuilt parts kit consists of remanufactured camshafts, blower assembly, turbocharger, and head assemblies. The converter/muffler kit consists of a direct-replacement oxidation catalyst supplied by Nelson, Engine Control Systems, or Engelhard. One of each type kit is required for the rebuild of an engine.

The DDEC Engine Upgrade Kit incorporates the revised certification word codes as required by the United States Environmental Protection Agency as resolution of the NOx defeat device issue.

This exemption is based on emission tests conducted by DDC on a federal 1993 model-year 6V92TA DDEC engine. DDC submitted the following federal transient heavy-duty diesel engine test results for a 552 cubic-inch 6V92TA DDEC engine with a 277 horsepower rating:

Converter/ Muffler	HC	CO	NO	PM
	<u>(grams per brake horsepower-hour)</u>			
A*	0.3	1.0	4.8	0.08
B*	0.1	0.2	4.7	0.08
C*	0.2	0.5	4.9	0.10
<i>Emission Standard</i>	<i>1.3</i>	<i>15.5</i>	<i>5.0</i>	<i>0.10</i>

\* The upgrade kit is available with converter/muffler kits from three suppliers: Nelson, Engine Control Systems, and Engelhard.

The test data show that the DDEC Engine Upgrade Kit did not adversely affect the exhaust emissions of the DDEC 6V92TA engine. The same emissions impact is expected when the DDEC Engine Upgrade Kit is installed on the engines for which the exemption is requested.

This Executive Order is valid provided that installation instructions for the DDEC Engine Upgrade Kit not recommend tuning the vehicle to specifications different from those submitted by the vehicle manufacturer.

Changes made to the design or operating conditions of the DDEC Engine Upgrade Kit, as exempt by the ARB, which adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of the DDEC Engine Upgrade Kit using an identification other than that shown in this Executive Order or for an application other than those listed in the attachments shall be prohibited unless prior approval is obtained from the ARB.

In addition to the foregoing, the ARB reserves the right in the future to review this Executive Order and the exemption provided herein to assure that the exempted DDEC Engine Upgrade Kit continues to meet the standards and procedures of Title 13, California Code of Regulations, Section 2222 et seq.

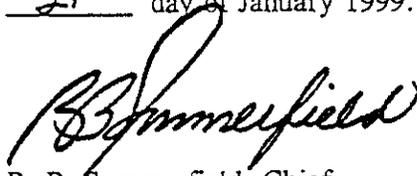
This Executive Order does not constitute any opinion as to the effect the use of the DDEC Engine Upgrade Kit may have on any warranty either expressed or implied by the vehicle manufacturer.

**THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF DETROIT DIESEL CORPORATION'S DDEC ENGINE UPGRADE KIT.**

No claim of any kind, such as "Approved by the Air Resources Board," may be made with respect to the action taken herein in any advertising or other oral or written communication.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order. The Executive Order may be revoked only after a ten-day written notice of intention to revoke the Executive Order, in which period the holder of the Executive Order may request in writing a hearing to contest the proposed revocation. If a hearing is requested, it shall be held within ten days of receipt of the request and the Executive Order may not be revoked until a determination after the hearing that grounds for revocation exist.

Executed at El Monte, California, this 21<sup>st</sup> day of January 1999.



R. B. Summerfield, Chief  
Mobile Source Operations Division

DETROIT DIESEL CORPORATION

PARTS LISTS FOR BASE ENGINE COMPONENTS

USED FOR REBUILDING OF 6V-92TA DDEC COACH ENGINES

TO ACHIEVE 0.10 G/HP-HR PARTICULATE EMISSIONS

ENGINE ORIENTATION: UPRIGHT

ENGINE MODELS: 8067 7B27, 8067 7B28

ROTATION: RH

NEW PART KIT: R23523096

GASKET OVERHAUL KIT: 23512684

CYLINDER KITS (6): 23522054

AIR INLET HOSE: 23505560

BY-PASS VALVE ASM: 8927187

ELECTRONIC FUEL INJECTOR (6): R5236962

BLOWER DRIVE GEAR: 8928595

DDEC II TO DDEC III: 23523099

RELIABILT® KIT: R23523102

RB CAM & PLUG ASM: R3507995

LB CAM & PLUG ASM: R3507993

BLOWER ASM: R8927039

TURBOCHARGER: R3508799

CYLINDER HEAD ASM (2): R3519195

DETROIT DIESEL CORPORATION

PARTS LISTS FOR BASE ENGINE COMPONENTS

USED FOR REBUILDING OF 6V-92TA DDEC COACH ENGINES

TO ACHIEVE 0.10 G/HP-HR PARTICULATE EMISSIONS

ENGINE ORIENTATION: 15 DEG. TILT

NEW PART KIT: R23523096

GASKET OVERHAUL KIT: 23512684

CYLINDER KITS (6): 23522054

AIR INLET HOSE: 23505560

BY-PASS VALVE ASM: 8927187

ELECTRONIC FUEL INJECTOR (6): R5236962

BLOWER DRIVE GEAR: 8928595

DDEC II TO DDEC III: 23523099

ROTATION: RH

ENGINE MODELS: 8067 7B21, 8067 7B22

RELIABILT@ KIT: R23523102

RB CAM & PLUG ASM: R3507995

LB CAM & PLUG ASM: R3507993

BLOWER ASM: R8927039

TURBOCHARGER: R3508799

CYLINDER HEAD ASM (2): R3519195

ROTATION: LH

ENGINE MODELS: 8067 3B21, 8067 3B22

RELIABILT@ KIT: R23523101

RB CAM & PLUG ASM: R3507992

LB CAM & PLUG ASM: R3507991

BLOWER ASM: R8927039

TURBOCHARGER: R3508799

CYLINDER HEAD ASM (2): R3519195

DETROIT DIESEL CORPORATION

PARTS LISTS FOR BASE ENGINE COMPONENTS

USED FOR REBUILDING OF 6V-92TA DDEC COACH ENGINES

TO ACHIEVE 0.10 G/HP-HR PARTICULATE EMISSIONS

ENGINE ORIENTATION: 43 DEG. TILT

NEW PART KIT: R23523098

GASKET OVERHAUL KIT: 23512683

CYLINDER KITS (6): 23522054

AIR INLET HOSE: 23505560

BY-PASS VALVE ASM: 8927187

ELECTRONIC FUEL INJECTOR (6): R5236962

BLOWER DRIVE GEAR: 8928595

DDEC II TO DDEC III KIT: 23523100

ROTATION: RH

ENGINE MODELS: 8067 7B23, 8067 7B24

RELIABILT® KIT: R23523102

RB CAM & PLUG ASM: R3507995

LB CAM & PLUG ASM: R3507993

BLOWER ASM: R8927039

TURBOCHARGER: R3508799

CYLINDER HEAD ASM (2): R3519195

ROTATION: LH

ENGINE MODELS: 8067 4B23, 8067 4B25

RELIABILT® KIT: R23523101

RB CAM & PLUG ASM: R3507992

LB CAM & PLUG ASM: R3507991

BLOWER ASM: R8927039

TURBOCHARGER: R3508799

CYLINDER HEAD ASM (2): R3519195

DETROIT DIESEL CORPORATION

MAJOR COMPONENTS FOR DDEC II TO DDEC III  
CONVERSION KIT FOR UPRIGHT ENGINES

PART NO.	QTY.	DESCRIPTION
23518743	1	ELECTRONIC CONTROL MODULE
23513858	1	ECM HEAT SHIELD
23513868	1	ECM MOUNTING BRACKET, T-DRIVE
23516935	1	ECM COLD PLATE
23513866	1	WIRING HARNESS, SENSOR, T-DRIVE
23513861	1	WIRING HARNESS, INJECTOR, LB
23513863	1	WIRING HARNESS, INJECTOR, RB, T-DRIVE
23513010	1	WHEEL, SPEED SENSOR

Parts List No. 5

CONVERTER/MUFFLER PART NUMBERS FOR DIFFERENT BUS OEMs

MANUFACTURER: ENGINE CONTROL SYSTEMS

ECS PART NUMBER	BUS OEM	CONFIGURATION
5700-003D	FLXIBLE	COWL - VERTICAL
5700-004D	FLXIBLE	COWL - STREET
5700-006D	FLXIBLE	COWL - STREET
5700-014D	FLXIBLE	COWL - STREET
5700-015D	FLXIBLE	COWL - VERTICAL
5700-016D	FLXIBLE	COWL - VERTICAL
5700-019D	FLXIBLE	COWL
5700-020D	FLXIBLE	COWL - ROOF
5700-021D	FLXIBLE	COWL
5700-022D	FLXIBLE	COWL
5700-023D	FLXIBLE	COWL - ROOF
5700-024D	FLXIBLE	COWL
5700-025D	FLXIBLE	COWL
5800-001D	GMC	ROUND
5800-002D	MCI CLASSIC	ROUND
5900-003D	IKARUS	OVAL
6000-001D	RTS	OVAL
6000-002D	TMC	OVAL
6000-005D	TMC	OVAL
6000-006D	RTS	OVAL
6400-004D	ORION	OVAL
6400-005D	ORION	OVAL
6500-001D	GILLIG	OVAL
6500-002D	GILLIG	OVAL
6500-003D	GILLIG	OVAL
6700-001D	EAGLE	OVAL
6800-001D	NEOPLAN	OVAL
6800-002D	NEOPLAN	OVAL

Parts List No. 6

CONVERTER/MUFFLER PART NUMBERS FOR DIFFERENT BUS OEMs

MANUFACTURER: ENGELHARD

ENGELHARD PART NUMBER	BUS OEM	CONFIGURATION
CMX-0044	FLXIBLE	ROAD
CMX-0047	FLXIBLE	ROAD
CMX-0059	FLXIBLE	ROOF
CMX-0060	FLXIBLE	ROOF
CMX-0072	FLXIBLE	ROAD
CMX-0073	FLXIBLE	ROOF
CMX-0005	GMC/TMC/RTS	ROAD/ROOF
CMX-0040	GMC/TMC/RTS	ROAD
CMX-0065	IKARUS	ROOF
CMX-0082	IKARUS	ROOF
CMX-0010	MCI	ROOF
CMX-0011	MCI	ROAD/ROOF
CMX-0074	MCI	ROOF
CMX-0063	MCI	ROAD
CMX-0013	BIA - ORION	ROOF
CMX-0085	BIA - ORION	ROOF
CMX-0051	BIA - ORION	ROAD
CMX-0075	BIA - ORION	ROOF
CMX-0081	BIA - ORION	ROOF
CMX-0036	GILLIG	ROOF
CMX-0078	EAGLE	ROAD
CMX-0009	NEOPLAN	ROOF
CMX-0029	NEOPLAN	ROAD
CMX-0056	NEOPLAN	ROAD
CMX-0089	BRADA	ROOF
CMX-0042	NEW FLYER	ROOF
CMX-0083	NEW FLYER	ROAD
CMX-0084	NEW FLYER	ROOF

Parts List No. 7

CONVERTER/MUFFLER PART NUMBERS FOR DIFFERENT BUS OEMs

MANUFACTURER: NELSON

NELSON PART NUMBER	BUS OEM	CONFIGURATION
861000A	TMC RTS	
861001A 861002A 861003A	FLYER D901-10240 FLYER D901-10240 FLYER D40	
861004A	GMC TRS	
861005A	ORION 01	
861006A	GILLIG PHANTOM	
861008A	FLYER D901	
861009A	FLXIBLE METRO	

Note: Additional designs will be offered by Nelson in the future based on the OEM mufflers being replaced.

Rated Power HP	Rated Torque FT-LB	Fuel Type	Rotation	Existing CWC	Revised CWC*
277	880	DF2	RH	316	1116
277	880	DF2	RH	483	1126
277	880	DF2	LH	317	1117
277	880	DF2	LH	480	1123
253	880	DF2	RH	318	1118
253	880	DF2	RH	484	1127
253	880	DF2	LH	319	1119
253	880	DF2	LH	481	1124
253	775	DF2	RH	320	1120
253	775	DF2	RH	485	1128
253	775	DF2	LH	321	1121
253	775	DF2	LH	483.2	1126.1125
277	880	DF1	RH	259	1110
277	880	DF1	LH	262	1115
253	880	DF1	RH	260	1111
253	880	DF1	LH	263	1114
253	775	DF1	RH	261	1112
253	775	DF1	LH	264	1115

\* Revised CWC's will supersede existing CWC's effective January 1, 9999.

TABLE 1

State of California  
AIR RESOURCES BOARD

EVALUATION OF DETROIT DIESEL CORPORATION'S  
DDEC ENGINE UPGRADE KIT  
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE  
SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE  
CALIFORNIA CODE OF REGULATIONS

January 1999

by

Mobile Source Operations Division  
Aftermarket Parts Section  
9528 Telstar Avenue  
El Monte, CA 91731-2990

(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.)

## SUMMARY

Detroit Diesel Corporation (DDC) of 13400 Outer Drive, West, Detroit, Michigan 48239-4001 has applied for an exemption from the prohibitions of Section 27156 of the California Vehicle Code for their DDEC Engine Upgrade Kit. DDC's upgrade kit is designed to rebuild diesel-powered 1985-1990 model-year 6V92TA DDEC urban bus engines. With the upgrade kit, the engines meet California's 1991 model-year heavy-duty diesel urban bus engine emission standards of 0.10 grams per brake-horsepower-hour (g/bhp-hr) particulate matter (PM) and 5.0 g/bhp-hr oxides of nitrogen (NOx).

Based on the test data submitted by DDC, staff concludes that the DDEC Engine Upgrade Kit will not adversely affect the exhaust emissions of the engines for which the exemption is requested. Therefore, staff recommends that DDC be granted an exemption for their upgrade kit as requested and that Executive Order No. D-202-1 be issued.

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State of California  
AIR RESOURCES BOARD

EVALUATION OF DETROIT DIESEL CORPORATION'S  
DDEC ENGINE UPGRADE KIT  
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE  
SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE  
CALIFORNIA CODE OF REGULATIONS

I. INTRODUCTION

Detroit Diesel Corporation (DDC) of 13400 Outer Drive, West, Detroit, Michigan 48239-4001 has applied for an exemption from the prohibitions of Section 27156 of the California Vehicle Code for their DDEC Engine Upgrade Kit. The upgrade kit is designed for use on diesel-powered 1985-1990 model-year 6V92TA DDEC urban bus engines. DDC has submitted all the required information including engine upgrade parts list and emission test data.

II. CONCLUSION

Based on the test data submitted by DDC, staff concludes that the engines rebuilt with the upgrade kit meet California's 1991 model-year heavy-duty diesel urban bus engine emission standards and will not adversely affect the emissions of the applicable engines.

III. RECOMMENDATION

Staff recommends that DDC be granted an exemption as requested, permitting advertisement, sale and installation of their upgrade kit on diesel-powered 1985-1990 model-year 6V92TA DDEC urban bus engines.

IV. DEVICE DESCRIPTION AND OPERATION

DDC has designed their kit to allow upgrade of diesel-powered 1985-1990 model-year 6V92TA DDEC urban bus engines to meet the 1991 model-year heavy-duty diesel urban bus engine

emission standards. The upgrade kit consists of three kits: 1) engine rebuild kit - newly manufactured parts, 2) engine rebuild kit - reliabilt parts, and 3) converter/muffler kit. The newly manufactured parts kit consists of a gasket kit, air inlet hose, blower drive gear (2.05 to 1), blower by-pass valve assembly, cylinder kits (piston assemblies and cylinder liners), new electronic-unit fuel injectors, and DDEC II to DDEC III conversion kits. The reliabilt parts kit consists of remanufactured camshafts, blower assembly, turbocharger, and head assemblies. The converter/muffler kit consists of a direct-replacement oxidation catalyst supplied by Nelson, Engine Control Systems, or Engelhard. One of each type kit is required for the rebuild of an engine. The upgrade kit incorporates the revised certification word codes as required by the United States Environmental Protection Agency (U.S. EPA) as resolution of the NOx defeat device issue.

V. DEVICE EVALUATION AND DISCUSSION

To demonstrate that their upgrade kit does not adversely affect the engines' exhaust emissions, DDC tested a federal 1993 model-year 6V92TA DDEC engine. DDC submitted the following federal transient heavy-duty diesel engine test results for a 552 cubic-inch 6V92TA DDEC engine with a 277 horsepower rating:

<u>Converter/ Muffler</u>	<u>HC</u>	<u>CO</u>	<u>NO</u>	<u>PM</u>
	<u>(grams per brake horsepower-hour)</u>			
A*	0.3	1.0	4.8	0.08
B*	0.1	0.2	4.7	0.08
C*	0.2	0.5	4.9	0.10
<i>Emission Standard</i>	<i>1.3</i>	<i>15.5</i>	<i>5.0</i>	<i>0.10</i>

\* The upgrade kit is available with converter/muffler kits from three suppliers: Nelson, Engine Control Systems, and Engelhard.

The test data show that the exhaust emissions of the modified engine were below the California emission standards for 1991 model-year urban bus engines. Staff concludes that the upgrade kit does not adversely affect the exhaust emissions of the DDEC 6V92TA engine, and the same emissions impact is expected when the upgrade kit is installed on California-certified 1985-1990 model-year 6V92TA DDEC engines.

DDC also submitted emission data with the revised calibrations which were incorporated in the upgrade kit as required by the U.S. EPA as resolution of the NOx defeat device issue. (The emission data are contained in DDC's exemption application file.) The revised calibrations are only applicable to the steady-state or off-cycle engine operation. The test data show that with the revised calibrations, during FTP engine operation, the emission levels are below the applicable 1991 model-year emission standards (0.10 g/bhp-hr PM and 5.0 g/bhp-hr NOx). Under forced, steady-state engine operation, the PM emission levels are below 0.10 g/bhp-hr, and the NOx emission levels are below the 1990 model-year emission standard of 6.0 g/bhp-hr.

Based on the above, staff concludes that the exhaust emissions of the engines for which the exemption is requested will not be adversely affected by the DDEC Engine Upgrade Kit and recommends that DDC be granted an exemption for their upgrade kit as requested.