

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-213-2
Relating to Exemptions Under Section 27156
of the Vehicle Code

VORTECH ENGINEERING, INC.
MODEL V-1 460 CID SUPERCHARGER

Pursuant to the authority vested in the Air Resources Board 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-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the add-on supercharger kit model number V-1 460 CID, manufactured by Vortech Engineering Inc., of 5351 Bonsai Ave., Moorpark, CA 93021, has been found not to reduce the effectiveness of the applicable vehicle pollution control system and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1987-1990 model-year Ford Motor Company vehicles powered by a 460 CID (7.5L) electronic fuel injection engine.

This Executive Order is valid provided that installation instructions for this supercharger kit will not recommend tuning the vehicle to specifications different from those submitted by Vortech Engineering, Inc.

Changes made to the design or operating conditions of the supercharger kit, as exempt by the Air Resources Board, which adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this supercharger kit using any identification other than that shown in this Executive Order or marketing of this supercharger kit for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of the supercharger kit shall not be construed as exemption to sell, offer for sale, or advertise any component of the kit as an individual device.

This Executive Order does not constitute any opinion as to the effect the use of this supercharger 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 THE VORTECH ENGINEERING, INC. 460 CID SUPERCHARGER KIT MODEL NO. V-1.

VORTECH ENGINEERING, INC.
V-1 460 CID SUPERCHARGER

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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 order. The order may be revoked only after ten day written notice of intention to revoke the order, in which period the holder of the 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 order may not be revoked until a determination after hearing that grounds for revocation exist.

Executed at El Monte, California, this 4th day of April, 1991.

R. B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF VORTECH ENGINEERING, INC. MODEL V-1 460 CID SUPERCHARGER
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE
CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE
CALIFORNIA CODE OF REGULATIONS

April 1991

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AIR RESOURCES BOARD

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CALIFORNIA CODE OF REGULATIONS

by

Mobile Source Division
State of California
Air Resources Board
9528 Telstar Avenue
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(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 mention of trade names or commercial products constitute endorsement or recommendation for use.)

SUMMARY

Vortech Engineering, Inc., of 5351 Bonsai Ave., Moorpark, CA. 93021 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code (VC) for the Vortech V-1 460 CID Supercharger. The V-1 Supercharger is designed for installation on 1987-90 Ford Motor Company vehicles powered by a 7.5 liter (460 CID) fuel-injected engine.

Based on the results from comparative exhaust emission tests performed at an independent laboratory on a 1990 Ford F-350 pick-up truck, and from the confirmatory tests performed by the ARB, the staff concludes that Vortech Engineering, Inc.'s V-1 supercharger kit will not adversely affect exhaust emission from vehicles for which an exemption is requested.

The staff recommends that Vortech Engineering, Inc. be granted an exemption as requested and that Executive Order D-213-2 be issued.

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I. INTRODUCTION

Vortech Engineering, Inc., of 5351 Bonsai Ave., Moorpark, CA. 93021 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code for the Vortech V-1 Supercharger. The V-1 Supercharger is designed for installation on 1987-90 Ford Motor Company vehicles powered by a 7.5 liter (460 CID) fuel-injected engine.

Vortech Engineering, Inc. has submitted data from comparative emission tests conducted on a 1990 Ford F-350 pick-up truck at Milton Roy Company, Orange, California. Confirmatory tests were conducted on the same vehicle at the Air Resources Board (ARB) laboratory in El Monte, California.

II. CONCLUSIONS

Based on the results from comparative exhaust emission tests performed at Milton Roy Company on a 1990 Ford F-350 pick-up truck, and from the confirmatory tests performed by the ARB on the same vehicle, the staff concludes that Vortech Engineering, Inc.'s V-1 supercharger kit will not adversely affect exhaust emissions from vehicles for which an exemption is requested.

III. RECOMMENDATION

The staff recommends that Vortech Engineering, Inc. be granted an exemption for their add-on V-1 supercharger kit for installation on 1987-1990

model-year Ford vehicles powered by a fuel-injected 7.5 liter (460 CID) engine. The staff also recommends that Executive Order D-213-2 be issued.

IV. DEVICE DESCRIPTION

The Vortech supercharger kit is designed for installation on 1987-90 Ford Motor Company vehicles powered by a 7.5 liter (460 CID) fuel-injected engine. The kit operates in conjunction with the original equipment manufacturer (OEM) computer controlled electronic port fuel injection and emission control systems already certified with the stock engine. The purpose of supercharging an engine is to increase its volumetric efficiency by forcing more air into the engine than it would consume in normal aspirated, non-supercharged condition. This is accomplished by the addition of a centrifugal blower, Vortech Model No. V-1, which delivers an overall impeller-to-crankshaft ratio of 6.734:1. Intake air is delivered from the OEM air filtering system to the centrifugal blower. It is then compressed by the supercharger and routed to the throttle body of the electronic fuel injection system. Maximum positive manifold pressure or boost is limited to 5 psi by the blower scroll housing and the impeller design. No wastegate or other active boost limiting device is used.

To provide additional fuel to maintain the proper air/fuel ratio during boost conditions a fuel control unit is added. At boost, a positive pressure of about 1 psi induced by the supercharger causes an increase in the static pressure in the fuel return line beyond the maximum 34 psi of the OEM fuel pressure regulator. The fuel control unit has a set static pressure limit of

70 psi. This condition causes an increase in air and fuel charge, while maintaining the proper air/fuel ratio.

The blower is lubricated by feed lines in engine block and oil pan. All OEM emission controls are left intact.

V. SUPERCHARGER KIT EVALUATION AND DISCUSSION

A 1990 Ford F-350 heavy-duty pick-up truck with a 7.5 liter (460 CID) fuel-injected gasoline engine was used for the evaluation of the supercharger kit. The dynamometer inertia weight and loading used were 7500-lbs and 18.2-hp respectively.

Comparative emissions tests conducted by Milton Roy for Vortech Engineering, Inc. consisted of one Cold-Start CVS-75 emission test in the unmodified (baseline) configuration, followed by one Cold-Start CVS-75 emission test in the supercharged (device installed) configuration. Confirmatory tests were performed at the ARB following the same test sequence. A summary of the test results is shown below:

Exhaust Emissions Test Results
On A 1990 Ford F-350 Pick-Up Truck

A. Applicant Test Results

<u>Test Mode</u>	<u>Exhaust Emissions (gm/mi)</u>		<u>NOx</u>
	<u>HC</u>	<u>CO</u>	
Baseline	.791	10.703	6.399
Device	.755	9.896	6.857
% Difference	-4.6%	-1.3%	+7.2%

B. ARB's Confirmatory Test Results

Baseline	.850	11.568	8.453
Device	.857	10.438	8.952
% Difference	+0.8%	-9.8%	+5.9%

The test data submitted by the applicant and the confirmatory tests conducted by the ARB show that the installation of the V-1 supercharger kit did not have an adverse effect on exhaust emissions on the test vehicle. Vortech Engineering submitted all the required information and fulfilled the requirement for exemption.

APPENDIX

APPENDIX A:

INSTALLATION INSTRUCTIONS
1987-1990
460ci. EFI ENGINES

1. Remove rubber air ducts (2) between the throttle body and plastic air resonator.
2. Remove the rubber molded air bypass tube between the Idle Air Bypass valve and the plastic air resonator.
3. Remove the plastic resonator.
4. Remove the stock alternator bracket and loosen the alternator pivot bolt. Remove alternator belt.
5. Loosen all bolts holding the main (cast) alternator bracket and remove the engine hoisting bracket.
6. Remove the radiator hose (make sure to drain a little fluid first).
7. Remove the passenger side valve cover.
8. Drill a 7/16" hole in the front of the valve cover using the supplied template to properly locate the hole.
9. Tap the 7/16" drain hole using a 1/4 npt tap.
10. Install the supplied 90° oil drain fitting into the valve cover.
11. Re-install the valve cover.
12. Install the Vortech Supercharger mounting bracket to the two top water pump studs using the bolts provided.
13. Install the Vortech alternator adjusting bracket to the studs on the supercharger mounting bracket and the holes in the block using the spacer provided between the bracket and the block.
14. Install the mounting bracket brace between the upper right hand hole on the supercharger mounting bracket and the front intake manifold stud. Tighten all bolts and nuts securely.
15. Using a 1 1/16" socket, remove the oil pressure sender from the rear of the engine.
16. Place the oil pressure sender in the provided brass tee.
17. Screw the brass tee into the pressure sender hole.
18. Screw the Vortech oil fitting into the tee.
19. Remove thermostat housing and replace with the provided housing.
20. Re-install the radiator hose and replenish fluid.
21. Route the oil drain line (1/2" I.D.) from the oil drain fitting on the supercharger to the oil drain fitting on the valve cover. Make sure there

are no crimps in the oil drain line.

22. Install the Vortech V-1 Supercharger to the bracket.
23. Route the oil feed line (1/4" oil hose) from the pressure sender oil fitting to the oil spray fitting on the side of the V-1 Supercharger. Make sure this line is not routed near any exhaust or other heat source and is not restricted or crimped in any way. Tighten fittings and lines securely.
24. Route the supercharger drive belt over the front crankshaft pulley, around the smog pump and alternator and the supercharger drive pulley.
25. With the alternator in the fully retracted position, place the provided supercharger idler pulley against the back side of the belt (passenger side) and while pushing the belt back, screw the 12mm bolt on the idler pulley into the middle boss on the V-1 Supercharger. Tighten securely.
26. Tension the belt using the alternator. Tighten the alternator pivot bolt and tensioning bolt securely.
27. Connect the plastic discharge "Y" between the stock throttle body and the discharge side of the V-1 Supercharger using the sleeves and clamps provided.
28. Connect the intake plenum to the intake opening on the V-1 Supercharger using the sleeve and clamp provided.
29. Connect the stock rubber air cleaner tubes to the two nipples on the intake plenum using the stock clamps.
30. Install the Vortech Fuel Management System as per the instructions provided with the system.
31. Make sure all bolts, nuts, belts and fittings are secure.
32. Start engine and check for leaks and belt alignment.

APPENDIX B:

VORTECH FUEL MANAGEMENT UNIT

1. Determine which fuel line on your vehicle is the return line to the fuel tank.
2. Install the Vortech FMU in the return line, downstream of the stock pressure regulator as shown in fig. 1 and per the directions below for your vehicle:
 - 2A. For Ford EFI vehicles, use a Ford 3/8" spring-lock disconnecter tool to disconnect the Ford fittings and snap the Vortech lines into the stock spring-lock fittings.
 - 2B. Route the line that comes from the fuel rail into the side (90°) fitting on the FMU. Tighten securely.
 - 2C. Route the line that connects to the stock fuel return line (line going to the fuel tank) to the straight fitting at the bottom of the FMU. Tighten securely.
3. Route the 5/32 vacuum line from the 90° vacuum fitting on top of the FMU to the vacuum tree on the firewall or intake manifold. If no empty spot is available, it may be necessary to "Tee" off an existing vacuum line. Make sure it is a manifold vacuum source only.
4. It is recommended that the fuel lines be checked every 3,000 miles or every few months to insure that they are not hardening. Replace the FMU fuel lines every year (or if hardening begins before one year) with Vortech FMU Fuel Lines. Failure to comply could lead to serious damage and/or a fuel fire in your engine compartment.
5. Make sure that the fuel lines are not crimped or rubbing against any moving parts and will not chafe during engine vibration or torque. Some tie wraps are provided with your Vortech FMU to insure this.
6. Recheck all fittings and brackets.
7. Energize the fuel pump by turning on the key and check for leaks. If there are no leaks, continue on with step 8.
8. Start engine and re-check for leaks.