State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-231-2
Relating to Exemptions Under Section 27156
of the Vehicle Code

WHIPPLE INDUSTRIES, INC.
SUPERCHARGER KIT
(P/N'S WI-TEC 3133-89-5, WI-TEC 3133-91-5 AND WI-TEC 3133-92-5)

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 Whipple supercharger kit, part numbers WI-TEC 3133-89-5, WI-TEC 3133-91-5 and WI-TEC 3133-92-5, manufactured by Whipple Industries, Inc. of 3292 North Weber Avenue, Fresno, CA 93722, 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 the following vehicle applications equipped with automatic transmission:

Whipple part number	Vehicle application
WI-TEC 3133-89-5	1989 General Motors 5.0/5.7 liter trucks
WI-TEC 3133-91-5	1990-91 General Motors 5.0/5.7 liter trucks
WI-TEC 3133-92-5	1992 General Motors 5.0/5.7 liter trucks

The following modifications to the original equipment emission controls are allowed:

1. The original equipment electronic control unit in the 1989-1991 model-year vehicles is replaced with the 1992 General Motors electronic control unit, part number 1616299.

2. The original heated air intake system is removed and cold-start emission problems are avoided by heated coolant water flowing through the throttle-body adapter.

3. The original air cleaner is replaced by the air cleaner assembly supplied with the supercharger kit.

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

Changes made to the design or operating conditions of the supercharger, 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 using any identification other than that shown in this Executive Order or marketing of this supercharger 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 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 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 WHIPPLE INDUSTRIES, INC.'S SUPERCHARGER KITS.

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 9th day of September, 1992.

R. B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF WHIPPLE INDUSTRIES, INC.'S 5.0/5.7 SUPERCHARGER KIT FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA CODE OF REGULATIONS

September 1992

State of California
AIR RESOURCES BOARD

EVALUATION OF WHIPPLE INDUSTRIES, INC.'S 5.0/5.7 SUPERCHARGER KIT FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA CODE OF REGULATIONS

by

Mobile Source Division
State of California
Air Resources Board
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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

Whipple Industries, Inc., of 3292 North Weber Avenue, Fresno, California 92722 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code (VC) for the Whipple Industries, Inc.'s 5.0/5.7 supercharger kit. The supercharger kit is designed for installation on 1989-1992 model-year General Motors trucks equipped with automatic transmission and a 5.0 liter or 5.7 liter engine.

Based on the results from emission tests performed at an independent laboratory and confirmatory tests at the Haagen-Smit laboratory on a 1992 Chevrolet pick-up truck, the staff concludes that Whipple Industries, Inc.'s 5.0/5.7 supercharger kit will not adversely affect exhaust emission from vehicles for which an exemption is requested.

The staff recommends that Whipple Industries, Inc. be granted an exemption as requested and that Executive Order D-231-2 be issued.

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I. INTRODUCTION

Whipple Industries, Inc. of 3292 North Weber Avenue, Fresno, California 92722 has applied for an exemption from the prohibitions in Section 27156 of the California Vehicle Code for the Whipple Industries, Inc.'s 5.0/5.7 supercharger kit. The supercharger kit is designed for installation on 1989-1992 model-year General Motors pick-up trucks equipped with automatic transmission and a 5.0 liter or a 5.7 liter engine.

Whipple Industries, Inc. has submitted data from testing on a 1992 Chevrolet pick-up truck at NGV Development Company, Long Beach, California. In addition, the Air Resources Board (ARB) conducted a confirmatory test at the Haagen-Smit Laboratory.

II. CONCLUSIONS

Based on the results from emission test performed at NGV Development Company and the confirmatory test by the ARB on a Chevrolet pick-up truck, the staff concludes that Whipple Industries, Inc.'s 5.0/5.7 supercharger kit will not adversely affect exhaust emissions from vehicles for which an exemption is requested.

III. RECOMMENDATION

The staff recommends that Whipple Industries, Inc. be granted an exemption for their 5.0/5.7 supercharger kit for installation on 1989-1992

model-year General Motors trucks equipped with automatic transmission and a 5.0 liter or a 5.7 liter engine. The staff also recommends that Executive Order D-231-2 be issued.

IV. DEVICE DESCRIPTION

The Whipple Industries, Inc.'s 5.0/5.7 supercharger kit is designed for installation on 1989-1992 model-year General Motors pick-up trucks equipped with automatic transmission and a 5.0 liter or a 5.7 liter engine. The supercharger kit is comprised of a WI-TEC 3133 supercharger, an air cleaner system, boost control solenoid, fuel pump, computer prom, General Motors computer and other plumbing necessary to install the kit. The supercharger kit operates in conjunction with the original equipment manufacturer (OEM) computer controlled fuel injection and the emission control system already certified with the stock engine.

The purpose of supercharging an engine is to increase its volumetric efficiency and power output at particular engine loads and throttle openings. At light engine loads and small throttle openings, the engine manifold pressure and power output is the same as a normally aspirated engine. At heavy engine loads and increased throttle openings, the manifold pressure is increased by the supercharger allowing more air and fuel to enter the engine, resulting in higher power output.

The WI-TEC 3133 supercharger is a positive displacement (1.33L/rev) twin crew rotor, compressor powered by a crankshaft driven serpentine belt. The maximum volume of air is determined by selecting the proper ratio between the

supercharger pulley and the crankshaft pulley. The supercharger is driven utilizing the engine's standard serpentine belt loop system at a ratio of 2.75 to 1 from the crankshaft pulley. The air needed to operate the supercharger enters the engine compartment through the stock fender location and into the supplied air cleaner. This air enters the stock throttle body injection, mounted at the rear of the supercharger. The fuel injected is controlled by the OEM electronic control module. The total engine air flow amount is controlled in the same manner as the OEM, by the throttle plate in the throttle body injection. The air/fuel mixture is compressed within the supercharger inlet and outlet ports by the design of the twin screw rotors. When the inlet throttle plates are opened to allow for more flow, the mixture exits the outlet port at higher pressure into the stock intake manifold. Maximum positive manifold pressure is limited to 6.5 psi by the built in pressure ratio and driven ratio.

To maintain the correct air/fuel ratio during boost conditions, additional fuel is supplied by increasing the fuel pressure. This is performed by installing a new throttle body pressure regulator cover and a new housing which biases the throttle body fuel pressure regulator with manifold pressure during boost. A hose, which routes above-atmosphere manifold pressure to the fuel pressure regulator during boost, is connected from the regulator housing to a solenoid valve. The solenoid valve is electrically controlled by a vacuum switch, triggered only when in boost. To provide the correct air/fuel ratio and spark timing, an engine calibration PROM has been optimized for the parameters of the supercharger. In addition to the PROM, the OEM computer is replaced on the 1989-1991 vehicle with the stock 1992 computer. Whipple has

concluded that the 1992 computer compensates for drivebility problems experienced in the earlier model-year vehicles.

The fuel delivery and spark timing are calculated and determined by measuring manifold pressure, engine RPM, throttle position, and coolant temperature. Fuel delivery is increased by the amount required during acceleration enrichment and wide open throttle conditions. During normal engine operation, the stock spark timing map is retained. When in a wide open throttle boost condition, the spark timing is increased by a few degrees.

When the supercharger kit is installed, the heated-air intake system is removed. Instead, engine coolant is routed through the throttle body mounting adaptor on the supercharger which increases fuel atomization during cold engine operation. Installation of Whipple Industries, Inc.'s 5.0/5.7 supercharger kit does not alter the OEM location of the oxygen sensor and the catalyst. The tune-up specifications also remain the same.

V. SUPERCHARGER KIT SYSTEM EVALUATION AND DISCUSSION

A 1992 Chevrolet pick-up truck equipped with a 5.7 liter (350 CID) fuel injected gasoline engine was used for the evaluation of the 5.0/5.7 supercharger kit. The dynamometer inertia weight and loading were 5500-lbs and 19.9-hp respectively.

Emission tests conducted by NGV Development Company for Whipple Industries, Inc. consisted of one Cold-Start CVS-75 emission test in the modified (supercharger kit system installed) configuration. Confirmatory tests

were performed by the ARB following the same test sequence. A summary of the test results is shown below:

Exhaust Emissions Test Results
On A 1992 Chevrolet pick-up
(NGV Development Company)

Test Mode	Exhaust Emissions (gm/mi) NMHC	CO	NOx
Device	.441	5.787	.728
Device w/DF	.456	5.927	.728
Standard	.50	9.0	1.0
Confirmatory Test (Haagen-Smit Laboratory)			
Device	.475	6.075	.685
Device w/DF	.492	6.233	.685
Standard	.50	9.0	1.0

Results from the emission tests conducted at NGV Development Company and the Haagen-Smit Laboratory show the vehicle emissions with the Whipple Industries, Inc.'s 5.0/5.7 supercharger kit installed to be lower than the emission standards. Based on the test results, the staff concludes that the installation of the Whipple Industries, Inc.'s 5.0/5.7 supercharger kit did not have an adverse effect on exhaust emissions of the affected vehicles. Whipple Industries, Inc. submitted all the required information and fulfilled the requirements for exemption.