

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-173  
Relating to Exemptions under Section 27156  
of the Vehicle Code

ALLIED SIGNAL  
GARRETT AFTERMARKET DIVISION  
AIR-TO-AIR INTERCOOLER KITS

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 air-to-air intercooler kits manufactured by Allied Signal, Garrett Aftermarket Division has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for the following OEM turbocharged vehicles:

1985-1987 2.4L Toyota trucks  
1987 2.0L Pontiac Grand AM

This exemption shall not apply to any device, apparatus, or mechanism advertised, offered for sale or sold with, or installed on, a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

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

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device 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 a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device 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 ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE ALLIED SIGNAL, GARRETT AFTERMARKET DIVISION'S AIR-TO-AIR INTERCOOLER KITS.

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

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 16<sup>th</sup> day of October, 1987.

*A. F. Donnelly (for KDD)*  
K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF ALLIED SIGNAL, GARRETT AFTERMARKET DIVISION'S  
AIR-TO-AIR INTERCOOLER KITS FOR EXEMPTION FROM THE  
PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH  
SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

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by

Mobile Source Division

State of California  
AIR RESOURCES BOARD  
9528 Telstar Avenue  
El Monte, CA 91731

(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

Allied Signal, Garrett Aftermarket Division (Garrett), has requested an exemption from the prohibitions in Vehicle Code Section 27156 for their air-to-air intercooler kits. The kits are intended for installation on 1985-1987 2.4 liter Toyota trucks and 1987 2.0 liter Pontiac Grand AM vehicles.

Based on: (1) previous comparative (turbocharged vehicle without and with an air-to-air intercooler kit) tests evaluating the exhaust emission effects of previously exempt intercooler kits; and (2) the staff's engineering evaluation of the intercooler's impact on exhaust emissions from vehicles, the staff concludes that Garrett's air-to-air intercooler kits will not adversely affect exhaust emissions from vehicles for which exemption is requested.

The staff recommends that Garrett be granted an exemption for their intercooler kits as requested and that Executive Order D-173 be issued.

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EVALUATION OF ALLIED SIGNAL, GARRETT AFTERMARKET DIVISION'S AIR-TO-AIR INTERCOOLER KITS FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

I. INTRODUCTION

Allied Signal, Garrett Aftermarket Division (Garrett), of 2511 Edison Way, Compton, California 90220, has requested an exemption from the prohibitions in Vehicle Code Section 27156 for their air-to-air intercooler kits. The kits are intended for installation on 1985-1987 2.4 liter Toyota trucks and 1987 2.0 liter Pontiac Grand AM vehicles.

II. CONCLUSION

Based on: (1) previous comparative (turbocharged vehicle without and with an air-to-air intercooler kit) tests evaluating the exhaust emission effects of previously exempt intercooler kits; and (2) the staff's engineering evaluation of the intercooler's impact on exhaust emissions from vehicles, the staff concludes that Garrett's air-to-air intercooler kits will not adversely affect exhaust emissions from vehicles for which exemption is requested.

III. RECOMMENDATIONS

The staff recommends that Garrett be granted an exemption for their intercooler kits as requested and that Executive Order D-173 be issued.

IV. INTERCOOLER KIT DESCRIPTION AND OPERATION

The purpose of the intercooler is to reduce the temperature of the intake air/fuel charge going into the turbocharged engine. This reduction in the intake charge temperature allows a higher charge density (more amount of air per minute flowing through the engine) which means more fuel into the engine at a given intake manifold vacuum/pressure.

The major component of the Garrett air-to-air intercooler kit is the heat exchanger. It is packaged with installation hardware and instructions and sold as a kit. The kit is designed using different design concepts, including tubing lengths, diameter and bends, to suit the requirements of the individual vehicle.

The air-to-air heat exchanger is located in such a way that the heated charge air flow goes through one section and ambient air flows through the other section, cooling the heated, compressed charge air. The cooled compressed air is then passed out of the heat exchanger to the intake manifold. The location for the installation of the heat exchanger varies with each vehicle model.

#### V. DISCUSSION

According to the performance analysis submitted by Garrett and of other companies, the staff have found that the thermal efficiency of an intercooler kit ranges between 40% and 84% and that the reduction in the combustion temperature, resulted from the cooler intake charge due to the installation of the intercooler kit, will reduce the formation of NOx gases in the combustion chamber and, therefore, through the exhaust system.