

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-180-2  
Relating to Exemptions under Section 27156  
of the Vehicle Code

THE TURBO SHOP  
AIR-TO-AIR INTERCOOLER KIT

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 air-to-air intercooler kit manufactured by The Turbo Shop 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 installation on 1983-1987 model-year Ford Motor Company vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988-1989 model-year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle 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 TURBO SHOP'S AIR-TO-AIR INTERCOOLER KIT.

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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 17<sup>th</sup> day of March, 1989.



K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF THE TURBO SHOP ADD-ON AIR-TO-AIR  
INTERCOOLER KIT FOR INSTALLATION IN 1983-1987 MODEL-YEAR  
FORD MOTOR COMPANY VEHICLES POWERED BY A 6.9L NAVISTAR  
INTERNATIONAL HEAVY-DUTY DIESEL ENGINE AND 1988-1989  
MODEL-YEAR FORD MOTOR COMPANY VEHICLES POWERED BY  
A 7.3L NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE

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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

The Turbo Shop has applied for exemption from the prohibitions in Vehicle Code Section 27156 for their add-on intercooler kit for 1983-1987 Ford Motor Company vehicles powered by the Navistar International 6.9L heavy-duty diesel engine and 1988-1989 model-year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

The Turbo Shop has submitted a completed application and all the necessary information for exemption. Based on previous comparative tests evaluating the exhaust emissions effects of several add-on intercooler systems and the staff's evaluation of the intercooler's impact on exhaust emissions from turbocharged vehicles, the staff concludes that The Turbo Shop's intercooler system will not adversely affect exhaust emissions from vehicles for which exemption is requested.

The staff recommends that The Turbo Shop be granted an exemption for their add-on air-to-air intercooler system as requested and that Executive Order D-180-2 be issued.

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INTERCOOLER KIT FOR INSTALLATION IN 1983-1987 MODEL-YEAR  
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I. INTRODUCTION

The Turbo Shop of 940 West Manchester, Inglewood, California 90301, has applied for exemption from the prohibitions in Vehicle Code Section 27156 for their add-on air-to air intercooler kit for 1983-1987 Ford Motor Company vehicles powered by the Navistar International 6.9L heavy-duty diesel engine and 1988-1989 model-year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

II. CONCLUSION

Based on previous comparative tests evaluating the exhaust emissions effects of several add-on intercooler systems and the staff's evaluation of the intercooler's impact on exhaust emissions from turbocharged vehicles, the staff concludes that The Turbo Shop's intercooler system will not adversely affect exhaust emissions from vehicles for which exemption is requested.

III. RECOMMENDATIONS

The staff recommends that The Turbo Shop be granted an exemption for their add-on air-to-air intercooler system as requested and that Executive Order D-180-2 be issued.

IV. INTERCOOLER KIT DESCRIPTION

The purpose of The Turbo Shop intercoolr system is to reduce the temperature of the intake air charge into the turbocharged engine. This reduction in the intake charge temperature allows a greater charge density (more mass of air flowing through the engine) to enter the combustion

chamber which means more fuel into the engine at any given intake manifold pressure and, therefore, more power output of the engine. Also, the reduction in the intake charge temperature would result in lower combustion/exhaust temperature.

The major components of the air-to-air intercooler system include a heat exchanger and inter-connecting bent tubes. The compressed air from the turbocharger enters the heat exchanger which uses ambient air as a cooling medium. The air-to-air heat exchanger is located in such a way that the heated charge air flows 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 throttle(s) for induction into the engine. There will be a pressure drop when the air passes through the heat exchanger which varies depending on the size of the heat exchanger, the temperature of the cooling medium (ambient air) and the available flow rate of the cooling medium.

The inlet and outlet pipes of The Turbo Shop's air-to-air intercooler system are made from 2-1/4" and 2-1/2" steel tubing, respectively. The length of the tubing varies according to the model-year of the engine. Installation instructions, included in every kit, show how to properly install The Turbo Shop's air-to-air intercooler system (see Appendix).

#### IV. DISCUSSION

The Turbo Shop's add-on air-to-air intercooler is designed for installation on 1983-1987 model-year Ford Motor Company vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988-1989 model-



year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. According to the performance analysis previously submitted by other manufactures seeking exemption, the thermal efficiency of the intercooler system ranges between 40% and 84%.

Based on predicted efficiency of a heat exchanger and a review of the intercooler system, the staff believes that The Turbo Shop's add-on air-to-air intercooler kit will not adversely affect a turbocharged vehicle's emissions or degrade a vehicle's driveability.

## APPENDIX

THE TURBO SHOP, INC.  
940 W. Manchester  
Inglewood, CA 90301  
(213)215-0147

### 6.9/7.3L IC. Instructions

- 1: Remove the grille and the hood latch from the front of the vehicle. Once they are off you will see a support that goes from the top radiator core support to the bottom of the core support remove this support. There is a bracket that holds the front sheetmetal to this support, you must cut this bracket off flush with the edge of the sheetmetal.
- 2: There is two studs holding the headlight assembly on both sides of the vehicle. Remove the four nuts from the studs and pull the mounting tabs off the studs. Install the four spacers supplied with the intercooler kit on the four studs, the two long spacers on the bottom studs and the short spacers on the top studs. Reinstall mounting tabs and nuts.
- 3: Install intercooler into front of vehicle between front sheetmetal and radiator. If vehicle is equipped with optional transmission cooler it must be removed before intercooler is installed. Once intercooler is installed mark the openings for clearance around the inlet and exit tubes. Remove the intercooler and enlarge the openings.
- 4: Refit the intercooler into place and check the opens for size. Once the openings have enough clearance measure from the top of the intercooler to the mounting holes in the top radiator core support where support was removed in 1st step. Cut the support to fit from the top of the intercooler to it's original mounting holes and install. Transfer holes from intercooler top mount to the support, remove support and drill two 1/4" holes in locations marked. Install support with two 1/4" bolts, washers and nuts to intercooler and original mount bolts. Again check for clearance around inlet and exit tubes.
- 5: Measure from the bottom of intercooler to support mount on the lower radiator core support. Cut the remaining piece of the support to fit. Install support on mounting stud and transfer hole from mount on the intercooler to the support and drill a 1/4" hole in support. Install with original nut on the bottom of support and bolt, washers and nut on intercooler.
- 6: Reinstall the optional transmission cooler if so equipped by drilling a hole in the top radiator core support to the right of the intercooler, facing the hoses downward hang the core by the original clamp that was holding it in place to the center support.

APPENDIX (CONTINUED)

7. Reinstall grille and check for clearance. It may be necessary to trim some of the plastic off the inside edge of the grille.

8. Install the inlet tube from the turbocharger discharge to the inlet of the intercooler using 90 deg. fitting, hoses, clamps and inlet tube.

9. Install intercooler exit pipes to discharge hat with two pipes; hoses and clamps.

If vehicle was turbocharged prior to installation of this kit it will be necessary to remove old discharge hat, air cleaner and readjust the compressor outlet of the turbocharger to align with the pipes supplied with this kit. Once the turbocharger has been aligned install the new discharge hat and reinstall the old air cleaner.