

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-180-8
Relating to Exemptions Under Section 27156
of the Vehicle Code

THE TURBO SHOP, INC.
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, Inc. 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 1983-1987 model year Ford Motor Company Vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988-1991 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 turbocharger kit 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 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, INC.'S AIR-TO-AIR INTERCOOLER 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.

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

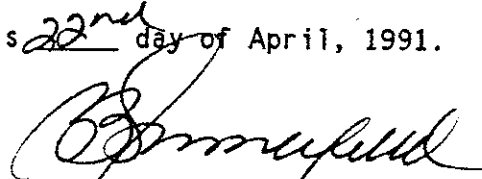
Section 43644 of the Health and Safety Code provides as follows:

"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.

Executive Order D-180-4 is superseded and of no further force and effect.

Executed at El Monte, California, this 22nd day of April, 1991.



R. B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF THE TURBO SHOP, INC.'S ADD-ON AIR-TO-AIR INTERCOOLER KIT
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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EVALUATION OF THE TURBO SHOP, INC.'S ADD-ON AIR-TO-AIR INTERCOOLER KIT
FOR EXEMPTION FROM THE PROHIBITIONS IN 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
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 mention of trade names or commercial products constitute endorsement or recommendation for use.)

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SUMMARY

The Turbo Shop, Inc. (Turbo Shop) has applied for an update to Executive Order D-180-4 which exempts their air-to-air intercooler Kit from the prohibitions of Vehicle Code Section 27156. The existing exemption applies to 1983-1987 model year Ford Motor Company vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988-1990 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. The update is requested to include the 1991 model-year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

Because Turbo Shop, Inc. was granted an exemption for 1988-1990 model year 7.3L Navistar International heavy-duty diesel vehicles and the 1991 model year 7.3L heavy-duty diesel engine is a carry-over from the previous model years, the staff concludes that Turbo Shop, Inc.'s add-on air-to-air intercooler kit will not have an adverse effect on exhaust emissions from vehicles for which the exemption update has been requested.

The staff recommends The Turbo Shop, Inc. be granted an update as requested and that Executive Order D-180-8 be issued.

EVALUATION OF THE TURBO SHOP, INC.'S ADD-ON AIR-TO-AIR INTERCOOLER KIT FOR
EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE
WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA CODE OF REGULATIONS.

I. INTRODUCTION

The Turbo Shop, Inc. (Turbo Shop) of 940 West Manchester, Inglewood, CA 90301, has applied for an update to Executive Order D-180-4, which exempts their air-to-air intercooler kit model from the prohibitions in Vehicle Code Section 27156. The exemption applies to 1983-1987 model year Ford Motor Company vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988-1990 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. The update is requested to include the 1991 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

II. CONCLUSION

Based on the following: (1) an exemption has been granted for the installation of the Turbo Shop's air-to-air intercooler system on 1988-1990 model year 7.3L Navistar International heavy-duty diesel vehicles; (2) the 1991 model year 7.3L heavy-duty diesel engine is a carry-over from previous model years; (3) previous comparative tests evaluating emission effects of several add-on intercooler systems and the staff's technical evaluation of the intercooler's impact on exhaust emissions, the staff concludes that Turbo Shop's add-on air-to-air intercooler kit will not adversely affect exhaust emissions from vehicles for which the exemption update is requested.

III. RECOMMENDATIONS

The staff recommends that The Turbo Shop be granted an update as requested and that Executive Order D-180-8 be issued.

IV. INTERCOOLER KIT DESCRIPTION

The purpose of the Turbo Shop intercooler system is to reduce the temperature of the intake air that is charged into the turbocharged engine. A reduction in the intake air temperature allows a greater charge density (more mass of air flowing through the engine) to enter the combustion chamber. This means more fuel into the engine at any given manifold pressure and, therefore, more power output from the engine. Also, the reduction in the intake charge temperature results in lower combustion/exhaust temperature.

The major components of the system include an air-to-air heat exchanger and inter-connecting bent tubes. The compressed air from the turbocharger enters through one section of the heat exchanger and ambient air, as a cooling medium, flows through the other section, cooling the heated compressed charge air. The cooled compressed air then passes out of the heat exchanger to the throttle(s) for induction to the engine. A pressure drop occurs when the compressed 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, respectfully. The length of the tubing varies according to the model-year of the engine. No emission control components are removed, disconnected or relocated when the air-to-air intercooler kit is installed.

V. DISCUSSION

Turbo Shop's add-on air-to-air intercooler kit model 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 1988-1991 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. The applicant claims that no modifications to the kit is necessary for the installation on 1991 model year applicable vehicles. According to performance analysis previously submitted by other manufacturers seeking exemption, the thermal efficiency of the intercooler system ranges between 40 percent to 84 percent.

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.

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-180-9
Relating to Exemptions Under Section 27156
of the Vehicle Code

THE TURBO SHOP, INC.
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, Inc. 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 1989-1991 model year Dodge vehicles powered by a 5.9L Cummins 6BT heavy-duty diesel engine.

This Executive Order is valid only for those Dodge vehicles powered by a 5.9L Cummins 6BT heavy-duty diesel engine with a manufacturer production date of February 1, 1991 or earlier.

This Executive Order is valid provided that installation instructions for this turbocharger kit 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 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, INC.'S AIR-TO-AIR INTERCOOLER 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.

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

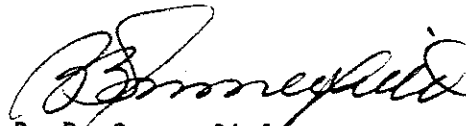
Section 43644 of the Health and Safety Code provides as follows:

"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.

Executive Order D-180-5 dated July 16, 1990 is superseded and of no further force and effect.

Executed at El Monte, California, this 22nd day of April, 1991.



R. B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF THE TURBO SHOP, INC.'S ADD-ON AIR-TO-AIR INTERCOOLER KIT
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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EVALUATION OF THE TURBO SHOP, INC.'S ADD-ON AIR-TO-AIR INTERCOOLER KIT
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SUMMARY

The Turbo Shop, Inc. (Turbo Shop) has applied for an update to Executive Order D-180-5 which exempts their air-to-air intercooler kit from the prohibitions of Vehicle Code Section 27156. The existing exemption applies to 1989-1990 model year Dodge vehicles powered by a 5.9L Cummins 6BT heavy-duty diesel engine. The update is requested to include the 1991 model-year Dodge vehicles powered by a 1990 5.9L Cummins 6BT heavy-duty diesel engine with a manufacturer production date of February 1, 1991 or earlier.

Because Turbo Shop, Inc. was granted an exemption for 1989-1990 model year 5.9L Cummins 6BT heavy-duty diesel engine and the 1991 model year Dodge vehicles with a manufacturer production date of February 1, 1991 or earlier are equipped with the 1990 5.9L Cummins 6BT heavy-duty diesel engine which is a carry-over from the previous model years, the staff concludes that Turbo Shop, Inc.'s add-on air-to-air intercooler kit will not have an adverse effect on exhaust emissions from vehicles for which the exemption update has been requested.

The staff recommends The Turbo Shop, Inc. be granted an update as requested and that Executive Order D-180-9 be issued.

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EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE
WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA CODE OF REGULATIONS.

I. INTRODUCTION

The Turbo Shop, Inc. (Turbo Shop) of 940 West Manchester, Inglewood, CA 90301, has applied for an update to Executive Order D-180-5, which exempts their air-to-air intercooler kit model from the prohibitions in Vehicle Code Section 27156. The exemption applies to 1989-1990 model year Dodge vehicles powered by a 5.9L Cummins 6BT heavy-duty diesel engine. The update is requested to include the 1991 model year Dodge vehicles powered by a 1990 5.9L Cummins 6BT heavy-duty diesel engine with a manufacturer production date of February 1, 1991 or earlier.

II. CONCLUSION

Based on the following: (1) an exemption has been granted for the installation of the Turbo Shop's air-to-air intercooler system on 1989-1990 model year 5.9L 6BT Cummins heavy-duty diesel vehicles; (2) the 1991 model year Dodge vehicles equipped with the 1990 5.9L Cummins 6BT heavy-duty diesel engine with a manufacturer production date of February 1, 1991 or earlier are a carry-over from previous model years; (3) previous comparative tests evaluating emission effects of several add-on intercooler systems and the staff's technical evaluation of the intercooler's impact on exhaust emissions, the staff concludes that Turbo Shop's add-on air-to-air intercooler kit will not adversely affect exhaust emissions from vehicles for which the exemption update is requested.

III. RECOMMENDATIONS

The staff recommends that The Turbo Shop be granted an update as requested and that Executive Order D-180-9 be issued.

IV. INTERCOOLER KIT DESCRIPTION

The purpose of the Turbo Shop intercooler system is to reduce the temperature of the intake air that is charged into the turbocharged engine. A reduction in the intake air temperature allows a greater charge density (more mass of air flowing through the engine) to enter the combustion chamber. This means more fuel into the engine at any given manifold pressure and, therefore, more power output from the engine. Also, the reduction in the intake charge temperature results in lower combustion/exhaust temperature.

The major components of the system include an air-to-air heat exchanger and inter-connecting bent tubes. The compressed air from the turbocharger enters through one section of the heat exchanger and ambient air, as a cooling medium, flows through the other section, cooling the heated compressed charge air. The cooled compressed air then passes out of the heat exchanger to the throttle(s) for induction to the engine. A pressure drop occurs when the compressed 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 steel tubing. The length of the tubing varies according to the model-year of the engine. No emission control components are removed, disconnected or relocated when the air-to-air intercooler kit is installed.

V. DISCUSSION

Turbo Shop's add-on air-to-air intercooler kit model is designed for installation on 1989-1991 model year Dodge vehicles powered by a 1990 5.9L Cummins 6BT heavy-duty diesel engine with a manufacturer production date of February 1, 1991 or earlier. The applicant claims that no modifications to the kit are necessary for the installation on 1991 model year applicable vehicles. Dodge vehicles manufactured after February 1, 1991 will not be equipped with the Cummins 6BT engine. The 1991 model year Cummins heavy-duty diesel engine has a new model number and comes equipped with an intercooler system.

According to performance analysis previously submitted by other manufacturers seeking exemption, the thermal efficiency of the intercooler system ranges between 40 percent to 84 percent. 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.