

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-171-2
Relating to Exemptions under Section 27156
of the Vehicle Code

ADVANCED TURBO SYSTEMS, INC.
TURBOCHARGER KIT MODEL NO. ATS 6.9L/7.3L

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 turbocharger kit Model No. ATS 6.9L/7.3L manufactured by Advanced Turbo Systems, Inc. of 5919 South 350 West, Murray, Utah 84107, 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 heavy-duty vehicles powered by a 6.9L Navistar International heavy-duty diesel engine and 1988 model-year Ford Motor Company heavy-duty vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

Modifications to the OEM emission-related parts due to the installation of the turbocharger include replacement of air cleaner assembly, replacement of the OEM exhaust system with a 3" diameter exhaust system, and replacement of the OEM crankcase depression regulator with parts included in the kit.

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 ADVANCED TURBO SYSTEMS, INC. TURBOCHARGER KIT MODEL NO. ATS 6.9L/7.3L.

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.

Executive Order D-171-1, dated December 17, 1988, is superseded and of no further force and effect.

Executed at El Monte, California, this 31st day of March, 1988.


K. D. Drachand, Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF ADVANCED TURBO SYSTEMS, INC. ADD-ON TURBOCHARGER KIT
MODEL NO. ATS 6.9L/7.3L FOR INSTALLATION IN 1983-1987 MODEL-YEAR
FORD MOTOR COMPANY HEAVY-DUTY VEHICLES POWERED BY A 6.9 LITER
NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE AND
1988 MODEL-YEAR FORD MOTOR COMPANY HEAVY-DUTY VEHICLES POWERED BY
A 7.3 LITER NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE
FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE
SECTION 27156 IN ACCORDANCE WITH SECTION 2222,
TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

March 1988

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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.)

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SUMMARY

Advanced Turbo Systems, Inc. (ATS) has requested an update to Executive Order D-171-1, which exempts their turbocharger kit model No. ATS 6.9L for 1983-1987 model-year Ford Motor Company heavy-duty vehicles powered by a 6.9 liter Navistar International heavy-duty diesel engine. They have requested that the exemption be updated to include the 1988 model-year Ford Motor Company heavy-duty vehicles powered by a 7.3 liter Navistar International heavy-duty diesel engine.

Based on the following: (1) the fact that the kit applicable to 1988 model-year 7.3 liter Navistar International heavy-duty diesel engine is identical to the exempted kit; (2) the fact that the 1988 7.3 liter Navistar International heavy-duty diesel engine is a replacement engine for the 1987 6.9 liter Navistar International heavy-duty diesel engine and that both engines have similar designs; (3) the test data from previous comparative exhaust emission tests and back-to-back crankcase pressure tests performed for exempting the kit; and (4) that the engine design complies with the carryover criteria as outlined in EPA's Advisory Circulars 17F and 20B, the staff believes that the add-on turbocharger kit will have no adverse effect on the engines for which ^{the} exemption update is requested.

The staff recommends that ATS be granted an update as requested, and ^{at} the Executive Order D-171-2 be issued.

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EVALUATION OF ADVANCED TURBO SYSTEMS, INC. ADD-ON TURBOCHARGER KIT MODEL NO. ATS 6.9L/7.3L FOR INSTALLATION IN 1983-1987 MODEL-YEAR FORD MOTOR COMPANY HEAVY-DUTY VEHICLES POWERED BY A 6.9 LITER NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE AND 1988 MODEL-YEAR FORD MOTOR COMPANY HEAVY-DUTY VEHICLES POWERED BY A 7.3 LITER NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

I. INTRODUCTION

Advanced Turbo Systems, Inc. of 5919 South 350 West, Murray, UT 84107, has requested an update to the existing Air Resources Board Executive Order (E.O.) D-171-1 dated December 17, 1988. E.O. D-171-1 exempted the ATS turbocharger kit model No. ATS 6.9L from the prohibitions in Vehicle Code Section 27156 for 1983-1987 model-year Ford Motor Company heavy-duty vehicles powered by a 6.9 liter Navistar International heavy-duty diesel engine. The applicant has requested that the exemption be updated to include the 1988 model-year Ford Motor Company heavy-duty vehicles powered by a 7.3 liter Navistar International heavy-duty diesel engine.

II. CONCLUSION

Based on the following: (1) the fact that the kit applicable to 1988 model-year 7.3 liter Navistar International heavy-duty diesel engine is identical to the exempted kit; (2) the fact that the 1988 7.3 liter Navistar International heavy-duty diesel engine is a replacement engine for the 1987 6.9 liter Navistar International heavy-duty diesel engine and that both engines have similar designs; (3) the test data from previous comparative exhaust emission tests and back-to-back crankcase pressure tests performed for exempting the kit; and (4) that the engine design complies with the carryover criteria as outlined in EPA's Advisory Circulars 17F and 20B, the staff believes that the add-on turbocharger kit will have no adverse effect on the engines for which ^{the} exemption update is requested.

III. RECOMMENDATIONS

The staff recommends that ATS be granted an update as requested, and that Executive Order D-171-2 be issued.

IV. TURBOCHARGER KIT DESCRIPTION AND OPERATION

The purpose of the ATS turbocharger kit is to increase the power output of the engine by increasing its volumetric efficiency. This is accomplished by compressing the intake charge to pressures above that of the atmosphere. The increased pressure allows a greater charge density to enter the combustion chamber providing more oxygen for combustion. The maximum fuel delivery is slightly increased in order to maintain proper air-fuel ratios with the increased air flow from the turbocharger when it is providing positive manifold pressure (boost).

The major components of the kit include a 0.96 A/R ratio Rotomaster (AirResearch) model No. T04B, custom intake and exhaust tubing, air cleaner assembly, brackets, hoses and the hardware necessary to complete the installation. The OEM crankcase depression regulator is removed and replaced with tubing, fittings with a 0.375" orifice supplied in the kit. A complete air cleaner assembly is supplied with the system to replace the stock air cleaner assembly. No other emission-related components are removed or disconnected when the turbocharger kit is installed.

Maximum positive manifold pressure is limited to 12 psi by the size of the turbine and the compressor. The maximum engine speed is regulated by the OEM fuel injection governor which is not modified by the installation of the kit. Therefore, by controlling maximum engine speed, maximum turbine speed and corresponding boost pressures are also controlled.

DISCUSSION

ATS add-on turbocharger kit model No. ATS 6.9L is designed for

Installation on 1983-1987 model-year Ford Motor Company vehicles powered by a 6.9 liter Navistar International heavy-duty diesel engine. The exemption was granted on the basis that the effectiveness of the vehicle's pollution control system was not reduced. Evaluation consisted of comparative (baseline versus turbocharged) steady state tests and back-to-back crankcase pressure tests.

The applicant is making available the add-on turbocharger kit model No. ATS 6.9L/7.3L for the 1988 model-year Ford Motor Company vehicles powered by a 7.3 liter Navistar International heavy-duty diesel engine. The applicant claims that no modifications to the kit are needed in order to be compatible with the 1988 models. They have requested that the exemption be updated to include these 1988 model-year vehicles.

In response to the applicant's request, the staff compared the engine design of 1987 and 1988 model-year Ford Motor Company vehicles powered by a 6.9 or a 7.3 liter Navistar International heavy-duty diesel engine. Certification documents and correspondence from Navistar International to the ARB indicated that the 1988 model-year 7.3 liter engine is the replacement engine for the 1987 model-year 6.9 liter engine. The staff also noted that the engine designs of both 1987 and 1988 engines are similar.

Because the data on a 1986 6.9L ¹⁹⁸⁶ test vehicle showed that the emissions were not adversely affected when the turbocharger kit was installed, ^{See memo to} and back-to-back crankcase pressure tests on five vehicles did not show significant effect on crankcase pressure and that the engine design complies with the carry-over criteria as outlined in EPA's Advisory circulars 17F and 20B, the add-on turbocharger kit will have no adverse effect on the 1988 model-year Ford Motor Company heavy-duty vehicles powered by a 7.3L ¹⁹⁸⁶ Navistar International heavy-duty diesel engine. No additional testing was required or performed for updating the exemption as requested.

ADVANCED TURBO SYSTEMS

6.9/7.3 LITER DIESEL

INSTALLATION PROCEDURE

CONGRATULATIONS! You have just purchased the finest turbo system available for the 6.9 and 7.3 liter diesel engine. The following information will assist you, in the installation of your ATS turbo system.

IMPORTANT: It is very important to read all the instructions carefully prior to any installation of your turbo system! Normal mechanical and safety procedures should be followed.

1. Disconnect both batteries at the negative terminals.
2. Remove air cleaner and air cleaner canister.
3. Remove 1/2" nut holding wire lube clamp to rear engine lifting bracket.
4. Remove rear engine lifting bracket. Install shorter cap screws (item #30) provided in kit.
Note: Steps 5-7 only need to be followed, if your vehicle is a 1983 or 1984 model.
5. Remove the fuel return line which was previously held in position with the rear engine lifting bracket bolt. Remove this line only from the passenger side rear injector.
6. Cut an 1/8" out of the return line, between the third and fourth injector on the right bank (passenger side). Install the "T" fitting (item #27) supplied in the kit. Connect the fuel return line which was removed from the rear injector to this "T" fitting in such a manner that the fuel line will lie on the intake manifold directly behind the air intake.
7. Install fuel return cap (item #28) supplied in the kit, on the rear injector where the fuel return line was previously located.
8. Vehicles with a sound insulating blanket covering the firewall, must cut and remove one half or approximately 14" of the passenger side sound insulating blanket.
9. Using an 1/8" drill bit, relocate the vacuum block on the firewall above the right bank valve cover (passenger side), three inches more to the passenger side and three inches higher than the original location.
10. Using a prybar or a piece of 2" pipe, bend the lip on the firewall rearward directly behind the right bank (passenger side) head, where the heat shield is riveted to the body.

11. On vehicles with automatic transmission, remove the 1/2" cap screw holding dipstick tube and vacuum line to bell housing. Remove dipstick tube. Move vacuum line to drivers side and secure with 1/2" cap screw on drivers side. Reinstall 1/2" cap screw on passenger side.
12. Remove the anti-depression valve from the rear of the intake manifold.
13. On 1987 and newer model vehicles, tie wrap wire lme near passenger side rear injector to large yellow wires on sensor located behind intake manifold.
14. Lubricate and install O-ring seals (item #19 & 23 in oil drain casting (item #10)
15. Using 5/16" X 1 1/4" USS cap screws (item #30) and lock washers (item #40) supplied in kit. Install oil drain casting in valley pan grommet and bolt to back of intake manifold, where the anti-depression valve was previously located.
16. Route throttle and cruise control cables under automatic transmission kick-down linkage and route cables behind oil drain casting and in front of control relay box bolted to rear of intake manifold.
17. Remove drivers side valve cover. Using an 1 1/4" hole saw, cut a hole in the center of the rear most flat round portion of the valve cover.
18. Install molded vent hose (item #14) into valve cover and reinstall valve cover on engine.
19. Install heat shield (item #9), using 5/16" X 1/2" USS cap screw (item #32) and washer (item #40).
20. At this time, check to make sure a 1/8" pipe plug (item #29) or a manifold pressure adapter is tightened into the pressure chamber (item #4).
21. Install 90 degree adapter fitting (item #25) in the female pipe threaded portion of the turbo bearing housing (item #1). When tight, fitting should be facing the radiator.
22. Lubricate and install the 2" I.D. O-ring seal (item #21) and install into pressure chamber. With O-ring seal lubricated, push pressure chamber over turbo compressor housing discharge.
23. Lubricate and install large O-ring seal (item #22) over cleaned intake manifold.
24. Install turbo assembly onto oil drain casting , using 3/8" SAE nuts (item #37) and lock washers (item #39). With turbo assembly tightened into position, install 3/8" X 2 1/2" USS cap screw with seal washer (item #30,42) into pressure chamber and tighten into intake manifold.

25. Install oil supply line (item #13) to turbo oil fitting (item #25) and tighten. Route oil supply line through the clearance area between the compressor discharge and the oil drain casting and route oil line down back side of engine on drivers side.
26. Remove and save 5/16" X 1/2" cap screws which secure the throttle linkage bracket to the front of intake manifold. Install 5/16" X 1 1/4" studs (item #34) into manifold where cap screws were just removed.
27. Install air filter support bracket (item #11) in front of throttle linkage bracket with long portion of filter support bracket running horizontal from front of intake manifold towards radiator.
28. Remove stock hose from anti-depression valve and secure valve to air filter base casting (item #4), using 5/16" X 1/2" cap screws which previously held throttle bracket to intake manifold.
Note: Be sure to use original rubber sealing gasket between valve and air filter base casting.
29. Install 5/16" X 1" studs (item #35) in air filter base casting.
30. Install air filter restriction indicator (item #18) in air filter base casting using 1/8" NPT coupler (item #34) supplied in kit.
31. Lubricate and install O-ring seal (item #20) in air filter base casting. With O-ring seal lubricated, push air filter base casting assembly over turbo compressor inlet and locate air filter base against angle support bracket. Secure air filter base to angle support bracket, using 5/16" SAE hex lock nuts (item #41) supplied in kit.
32. Install air filter element (item #17) into air filter cover casting (item #6) and clip onto air filter base casting.
33. Install fresh air inlet hose to air filter cover and grill fixture.
Note: 1988 $\frac{1}{2}$ and newer year models have the fresh air inlet fixture located above the grill, just under the hood. Vehicles having this arrangement should remove the fresh air inlet fixture and hose and install the older type, part number E3TA-9C675-BE and hose E3TA-9B676-BB. This will prevent drawing the hood insulation into the air filter element.
34. Remove entire exhaust system, retaining stock exhaust hangers.
35. Remove 1/8" pipe plug from engine block (oil galley). Location is directly behind drivers side exhaust manifold flange and in line with transmission mounting bolt.
36. Install 1/8" oil adapter elbow (item #26) into oil galley where plug was removed and tighten elbow to 1:00 O'clock position.
37. Connect turbo oil supply line to elbow and tighten.

38. On automatic transmissions, it is necessary to cut off machined locating boss, located above the starter well, between the two transmission bolts. Cut flush with transmission adapter plate.
Note: This is most easily done with a power hacksaw.
39. Install optional automatic transmission dipstick tube (item #12) using transmission mounting bolt to secure dipstick tube.
Note: Lubricate original O-ring seal before installing dipstick tube.
40. On vehicles with five speed manual transmission, it may be necessary to cut locating boss at an angle to give clearance for the final exhaust pipe (item #8).
41. Remove exhaust flange studs from right bank (passenger side) exhaust manifold. Install these studs into 'Y' collector casting (item #3).
42. Install 7/16" X 2 1/2" USS studs (item #33) in right bank (passenger side) exhaust manifold where original studs were removed.
43. Install 'Y' collector casting over studs in right bank (passenger side) exhaust manifold. Secure 'Y' collector casting using flat washers (item #38) and 7/16" nuts (item #36) supplied in kit.
Note: Tighten nuts evenly to maintain flange symmetry.
44. Install crossover feed pipe assembly (item #7) using original nuts, and 2 1/4" saddle clamp (item #44) supplied in kit.
45. Install 3" final exhaust pipe using spring (item #43) to secure pipe into position.
46. Install optional 3" mandrel bent exhaust system at this time.
Note: If the ATS optional exhaust system is not used, then a free flowing 3" exhaust with a Walker muffler part number 21468 or equivalent should be used.
47. To realize the full benefit from turbocharging your diesel engine, the injection pump maximum fuel delivery should be increased. This should be done at this time. For instructions as to increase the fuel delivery, read INJECTION PUMP FUEL SETTING PROCEDURE.
48. Reconnect both battery cables.
49. Start engine and check for any exhaust leaks, oil leaks, or air leaks.
CAUTION: Never rev engine until oil pressure is obtained at the turbo.
50. Install promoter kit (item #15) supplied in turbo kit.

INJECTION PUMP FUEL SETTING PROCEDURE

To realize the benefit from turbocharging your diesel engine, the injection pump maximum fuel delivery should be increased. This is done by removing the timing cover on the passenger side of the injection pump. Remove the top capscrew of the timing cover by using a $\frac{1}{4}$ " wrench. Loosen the bottom capscrew and let the timing cover plate rotate to the bottom with the rubber gasket. Now rotate the engine using a $\frac{15}{16}$ " socket and ratchet on the alternator belt pulley nut until the allen head leaf spring screw is centered in the opening. Using a $\frac{5}{32}$ " allen wrench, turn the allen head screw inward (clockwise) $\frac{1}{4}$ of a turn. The injection pump output will determine maximum exhaust temperature.

CAUTION: Never exceed 1150 degrees exhaust temperature.

MAINTENANCE

1. GIVE YOUR ENGINE A GOOD WARM-UP PERIOD BEFORE YOU WORK YOUR ENGINE HARD.
2. GIVE YOUR ENGINE A COOL-DOWN PERIOD AFTER WORKING THE ENGINE. LET IT COOL TO AT LEAST 300 DEGREES FAHRENHEIT.
3. CHANGE OIL AT INTERVALS OF NOT MORE THAN 2,500 MILES. CHANGE OIL FILTER WITH EACH OIL CHANGE.
4. KEEP AIR FILTER ELEMENTS CLEAN. WHEN THE ELEMENT GETS DIRTY, CHANGE IT! A DIRTY AIR CLEANER ELEMENT WILL CAUSE EXCESSIVE EXHAUST TEMPERATURE AND EXCESSIVE OIL CONSUMPTION.
5. KEEP FUEL FILTERS CLEAN. DRAIN WATER FROM FUEL REGULARLY. CLEAN DIESEL FUEL WILL ASSURE LONG TROUBLE-FREE INJECTION PUMP AND INJECTOR LIFE.
6. NEVER REV YOUR ENGINE UNTIL OIL PRESSURE IS OBTAINED!
7. NEVER SHUT OFF YOUR ENGINE AFTER WORKING IT HARD WITHOUT GIVING YOUR ENGINE A COOL-DOWN PERIOD!