

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-97-3
Relating to Exemptions under Section 27156
of the Vehicle Code

BAE
TURBOCHARGER KIT NO. 32-0000-1

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 turbocharger kit No. 32-0000-1 manufactured by BAE of 3032 Kashiwa Street, Torrance, California 90505, 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 1981 model year Volkswagen Rabbit, Dasher, Jetta, and Pick Up Truck models having a 97 cubic inch displacement four-cylinder 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 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 BAE TURBOCHARGER, KIT NO. 32-0000-1.

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.

BAE
TURBOCHARGER KIT
MODEL NO. 32-0000-1

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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 27th day of July, 1981.


K. D. Drachand, Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

Staff Report

July 20, 1981

Evaluation of the BAE Turbocharger Kit No. 32-0000-1 for Compliance With the Requirements of Section 27156 of the Vehicle Code.

I. INTRODUCTION

BAE, of 3032 Kashiwa Street, Torrance, California 90505, has applied for exemption of a turbocharger kit from the prohibitions of Section 27156 of the Vehicle Code (V.C). The kit, turbocharger kit No. 32-0000-1, is intended for 1981 model-year Volkswagen Rabbit, Dasher, Jetta, and Pick Up Truck models having a 97 cubic inch displacement (CID) four-cylinder diesel engine.

BAE has submitted data from back-to-back emissions tests conducted on a 1981 Volkswagen Pick Up Truck at Olson Engineering, Inc. in Huntington Beach, California. Confirmatory tests were conducted on the same vehicle at the Air Resources Board (ARB) laboratory in El Monte, California.

II. TURBOCHARGER KIT DESCRIPTION

The purpose of the turbocharger kit is to increase the volumetric efficiency of an engine. The major components of the BAE kit are a RaJay turbocharger, a replacement intake/exhaust manifolds, and an air filter. The components are packaged with installation hardware and instructions and sold as a kit.

The original equipment manufacturer (OEM) exhaust manifold is replaced by a BAE exhaust manifold. The turbine inlet of the turbocharger mounts directly under the replacement exhaust manifold. The turbine, driven by exhaust gases, is linked to the compressor by a solid shaft. Intake air is drawn through the BAE canister-type air filter and compressed by the compressor. Compressed air is then routed to the BAE replacement intake manifold.

Maximum positive manifold pressure (boost) is limited to 7 psig by the size of (and exhaust flow through) the turbine housing. No wastegate or other active boost limiting device is used.

The cooling of the turbocharger is achieved by ram air, by forced air flow from a cooling fan, and by lubricating oil passing through the unit. The oil is delivered from a hole tapped at the oil filter adaptor to the turbocharger bearing housing through a stainless steel braided line and returned to the engine oil pan.

Optional accessories that can be connected to the kit include exhaust pyrometer to measure engine exhaust temperature at the turbine inlet and an intake manifold (boost) gauge.

No modifications to the OEM tune-up specifications are required when the turbocharger kit is installed.

III. TEST PROGRAM

A 1981 Volkswagen Pick Up truck with a 97 CID four-cylinder diesel engine and 4-speed manual transmission was used for testing. The road

load horsepower (RLHP) used in the testing was 8.9 hp at 50 mph. Testing consisted of cold start CVS-75 and hot start HFET at normal RLHP to determine exhaust emissions of the unmodified (baseline) and turbocharged (device) configurations for comparison. Confirmatory tests were also performed at the ARB laboratory.

IV. APPLICANT'S TEST DATA

The applicant's emissions test data in Table 1 was generated at Olson Engineering, Inc.

Table 1
Applicant's Emissions Test Data

<u>Test</u>	<u>Exhaust Emissions (g/mi)</u>			<u>Fuel Economy (mpg)</u>
	<u>HC</u>	<u>CO</u>	<u>NOx</u>	
Baseline CVS-75	0.18	1.08	1.34	32.5
Baseline CVS-75	<u>0.11</u>	<u>1.03</u>	<u>1.16</u>	<u>34.6</u>
Baseline Average	0.15	1.06	1.25	-
Device CVS-75	0.31	0.96	1.32	34.7
Applicable 1981 Std.	0.59	10.6	1.5	-
Baseline HFET	0.26	1.01	1.19	40.1
Device HFET	0.09	0.65	1.54	41.9
Applicable 1981 Std.	-	-	2.0	-

V. ARB'S TEST DATA

The ARB's emissions test data is shown in Table 2.

Table 2

ARB Emissions Test Data

<u>Test</u>	<u>Exhaust Emissions (g/mi)</u>		
	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Baseline CVS-75	0.25	0.96	1.22
Device CVS-75 ⁽¹⁾	0.24	0.89	1.54
Device CVS-75 ⁽²⁾	0.18	0.82	1.25
Device CVS-75 ⁽²⁾	<u>0.13</u>	<u>0.84</u>	<u>1.29</u>
Device CVS-75 ⁽²⁾ Avg.	0.16	0.83	1.27
Baseline HFET	0.17	0.64	1.05
Baseline HFET	<u>0.20</u>	<u>0.69</u>	<u>1.10</u>
Baseline HFET Avg.	0.18	0.67	1.07
Device HFET ⁽¹⁾	0.19	0.70	1.39
Device HFET ⁽²⁾	0.16	0.33	0.92
Device HFET ⁽²⁾	<u>0.14</u>	<u>0.33</u>	<u>0.95</u>
Device HFET ⁽²⁾ Avg.	0.15	0.33	0.93

(1) Invalid test data - "cold start knob" was not pushed back after engine warm up.

(2) Retest - "cold start knob" was pushed back as per VW manufacturer's recommendation.

VI. DISCUSSION

The first set of device test data generated at the ARB laboratory, denoted by (1), are invalid because the "cold start knob" was left pulled out throughout the whole testing period. The vehicle's manufacturer recommends that the "knob" be pushed in after two minutes of cold engine operation (see Appendix I).

The turbocharged vehicle was retested and the cold engine procedures recommended by VW were followed. The test data are shown in Table 2 and denoted by (2).

The two (2) sets of ARB comparative emissions test data in Table 2 show good test repeatability. The data also show that the emissions of the test vehicle are slightly changed due to the installation of the turbocharger kit. The changes, however, are within test variability and insignificant except the CO emissions from the HFET test showing a significant reduction.

VII. CONCLUSION AND RECOMMENDATION

Emission tests indicate that the BAE turbocharger kit No. 32-0000-1 will not have adverse effect on emissions when installed in accordance with the manufacturer's instructions. The Staff recommends that BAE be granted an exemption from the prohibitions of V.C. Section 27156 for this kit for 1981 model year Volkswagen Rabbit, Dasher, Jetta, and Pick Up Truck models having a 97 CID four-cylinder diesel engine with automatic or manual transmission. The Staff recommends that Executive Order D-97-3 be adopted.