State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-137-1
Relating to Exemptions under Section 27156
of the Vehicle Code

CARTER AUTOMOTIVE DIVISION
ACF INDUSTRIES INCORPORATED
"ENGINE KNOCK ELIMINATOR"

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 "Engine Knock Eliminator" manufactured by Carter Automotive Division, ACF Industries Incorporated, of 9666 Olive Boulevard, St. Louis, Missouri 63132, 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 1984 and older model-year gasoline-powered motor vehicles, excluding the following:

1. General Motors Corporation vehicles with an "odd-firing" V6 231 CID engine;

2. Vehicles powered by a rotary engine; and

3. Vehicles equipped with more than one ignition coil.

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 "ENGINE KNOCK ELIMINATOR".

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 6th day of ~~June~~, 1984.

K. D. Drachand, Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF CARTER AUTOMOTIVE DIVISION'S "ENGINE KNOCK ELIMINATOR" FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

June 4, 1984

Date of Issue: June 4, 1984

EVALUATION OF CARTER AUTOMOTIVE DIVISION'S "ENGINE KNOCK ELIMINATOR" FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

by

Mobile Source Division

State of California
Air Resources Board
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(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

Carter Automotive Division (CAD) requested an update to the existing Air Resources Board's Executive Order No. D-137. Request made is to include the vehicles equipped with a closed-loop (computer controlled) carburetion system in the exemption of the "Engine Knock Eliminator" (EKE) add-on device.

CAD has submitted data of comparative cold-start CVS-75 emission test data generated from a 1984 Chevrolet Chevette powered by a 1.6 liter engine using closed-loop carburetion system.

Based on the comparative exhaust emission tests performed on the late model vehicle, the staff concludes that the EKE will not have an adverse effect on exhaust emission from vehicles equipped with closed-loop carburetion system.

The staff recommends that CAD be granted an updated exemption from the prohibitions in Vehicle Code Section 27156 for their EKE device for installation on 1984 and older model-year gasoline-powered motor vehicles, excluding the following:

1. General Motors Corporation vehicles with an "odd-firing" V6 231 CID engine;
2. Vehicles powered by a rotary engine; and
3. Vehicles equipped with more than one ignition coil.

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EVALUATION OF CARTER AUTOMOTIVE DIVISION'S "ENGINE KNOCK ELIMINATOR" FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE.

I. INTRODUCTION

Carter Automotive Division (CAD) of ACF Industries, Incorporated, 9666 Olive Boulevard, St. Louis, Missouri 63132, requested an update to the existing Air Resources Board's Executive Order (E.O.) No. D-137. Request made is to include the vehicles equipped with a closed-loop (computer controlled) carburetion system in the exemption of the "Engine Knock Eliminator" (EKE) add-on device.

CAD has submitted data of comparative cold-start CVS-75 emission test data generated from a 1984 Chevrolet Chevette powered by a 1.6 liter engine using closed-loop carburetion system. Tests were performed under contract by the Olson Engineering, Inc. laboratory in Huntington Beach, California.

II. CONCLUSION

Based on the comparative exhaust emission tests performed on the late model vehicle, the staff concludes that the EKE will not have an adverse effect on exhaust emission from vehicles equipped with closed-loop carburetion system.

III. RECOMMENDATIONS

Based on the above conclusion, the staff recommends that CAD be granted an updated exemption from the prohibitions in Vehicle Code Section 27156 for their EKE device. Update is to include the vehicles equipped with a closed-loop carburetion system.

The staff also recommends that Executive Order No. D-137-1 be issued, exempting the EKE device for installation on 1984 and older model-year gasoline-powered motor vehicles, excluding the following:

1. General Motors Corporation vehicles with an "odd-firing" V6 231 CID engine;
2. Vehicles powered by a rotary engine; and
3. Vehicles equipped with more than one ignition coil.

IV. DEVICE DESCRIPTION AND OPERATION

The EKE is an add-on device which senses engine detonation and electronically retards ignition timing to eliminate detonation. The major components of the EKE are a detonation sensor and an electronic control unit. The components are packaged with installation hardware and instructions and sold as a kit.

The detonation sensor has a 3/8" standard threaded stud designed to be bolted directly to any existing vacant 3/8"-16 threaded hole in the intake manifold or cylinder head where there is no interference with throttle or choke mechanism. The sensor senses engine vibration and generates an electrical signal to the electronic control unit. The knock sensor consists of an amplifier and a discriminator. The amplifier amplifies the intensity of the vibration for signal generation; whereas, the discriminator will discrete engine noise/vibration interference from engine detonation, thus, generating a voltage signal only under engine detonation conditions.

The electronic control unit is a transistorized module which interprets voltage signals from the knock sensor (during detonation) to retard ignition timing until detonation is eliminated. Once detonation is ceased, the ignition timing is slowly returned to OEM specification. The amount of retard is proportional to the strength and frequency of the engine knock. Although the maximum retard is about 15 degrees, the actual amount of retard is only enough to eliminate engine knock. CAD technicians claim that the retard

control response (time required to retard timing by 15 degrees) is 0.5 seconds, and advance control response (time required to forward ignition timing to OEM specification, up to 15 degrees) is 3.8 seconds. Ignition retardation is accomplished through the control unit by delaying the termination of current to the ignition coil and, thus, the ignition timing.

The control unit contains a four-, six-, and eight-cylinder rotating selector to accommodate all engine sizes.

V. EVALUATION

CAD submitted data of comparative (without and with the device installed on a test vehicle) cold-start CVS-75 emission tests. The tests were performed on a 1984 Chevrolet Chevette powered by a 1.6 liter engine using a closed-loop carburetion system. A summary of the test results is shown in the Appendix.

VI. DISCUSSION

CAD's comparative data (shown in the Appendix) indicate that their EKE device did not have an adverse effect on exhaust emissions from the vehicle tested.

APPENDIX

CAD's Emission Test Data

Evaluation of CAD's "Engine Knock Eliminator"

1984 Chevrolet Chevette
Cold-Start CVS-75

Test Mode	Exhaust Emissions (g/mi) HC	CO	NOx	Fuel Economy (mpg)
Baseline	0.24	1.8	0.7	26.47
Baseline	0.23	2.3	0.6	26.01
Average	0.24	2.0	0.6	26.24
Device	0.18	1.7	0.6	26.09
Device	0.22	2.3	0.5	25.90
Average	0.20	2.0	0.6	26.00