

F.O. 2504

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-49-1  
Relating to Exemptions under Section 27156  
of the Vehicle Code

SEARS ROEBUCK AND CO.  
"SEARS CAPACITIVE DISCHARGE  
IGNITION SYSTEM MODEL 8204"

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 Section 39515 of the Health and Safety Code and Executive Order G-30A;

IT IS ORDERED AND RESOLVED: That the installation of the Sears Capacitive Discharge Ignition System Model 8204 manufactured by Auto Start/Systematics, Inc., 547 North Wheeler Street, Saint Paul, Minnesota 55014 and marketed by Sears, Roebuck and Co., Pacific Coast Buying Office, 900 South Fremont Avenue, Alhambra, California 91802, has been found to not 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 1974 and older model year vehicles equipped with a standard Kettering ignition system.

The Model 8204 is an electronic control module which consists of energy transfer, storage, and triggering circuits.

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.

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 "SEARS CAPACITIVE DISCHARGE IGNITION SYSTEM MODEL 8204" DEVICE.

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 Sacramento, California, this 19 day of <sup>Sept.</sup>~~August~~, 1976.

*Original signed by*  
Thomas C. Austin  
Deputy Executive Officer-Technical

State of California

AIR RESOURCES BOARD

August 9, 1976

Staff Report

Evaluation of Sears Capacitive Discharge  
Ignition System Model 8204  
for Exemption from the Provisions  
of Section 27156 of the Vehicle Code

I. Introduction

Sears, Roebuck and Co., Pacific Coast Buying Office, 900 South Fremont Avenue, Alhambra, California, 91802, has applied for an exemption for the "Sears Capacitive Discharge Ignition System Model 8204" from the prohibitions of Section 27156 of California Motor Vehicle Code (see Exhibit A). The applicant intends to market the device for installation on 1974 and older model year vehicles equipped with a standard Kettering ignition system.

The applicant has been previously granted an exemption by Executive Order D-49 on January 28, 1976 for "Sears Penske Capacitive Discharge System Model. No. 8205". The applicant claims the model 8204 unit in which an exemption from V.C. 27156 is requested is essentially the same in design and operational characteristics as the Model 8205 except for the modifications in packaging and wire harness.

II. System Description

The Sears Capacitive Discharge Ignition System Model 8204 is an electronic control module which consists of energy transfer, storage

and triggering circuits. Exhibit B is the detailed wiring schematic of the device and also shows how it is connected in the vehicle ignition system. The device is manufactured for Sears, Roebuck and Co. by Auto Start/Systematics, Inc. 547 North Wheeler Street, Saint Paul, Minnesota 55104.

In operation when the distributor contact points close the transformer within the CD unit is saturated with the current supplied by the battery. This energy is then transferred from the transformer secondary through two rectifiers to a storage capacitor. When the distributor points open, the triggering circuit causes the storage capacitor to discharge causing the spark plug to fire.

### III. System Evaluation

A comparison of the circuit diagram of previously approved Model 8205 unit and the modified Model 8204 indicates significant component variations. Also the comparative ignition data of the two models submitted by the applicant shows that Model 8204 employs single spark discharge and 0.3 ampere point current compared to multiple spark discharge and 1.2 amperes point current for Model 8205. Since the two devices are different an engineering evaluation of the new model for compliance with Section 27156 criteria is considered necessary.

"ARB Guidelines for Testing and Criteria for Emission Compliance of Ignition System Modifications", dated May 25, 1976 details the test procedures used in the evaluation of the device by a bench test method in-lieu of an emission test.

A. Applicant's Test Data

The applicant was requested to submit back to back ignition system test data for a 1972 Chrysler 8 cylinder distributor and a 1973 VW 4 cylinder distributor.

The initial set of test data submitted by the applicant showed unusually low spark energies for OEM and device tests on both distributors. The applicant retested the two distributors and submitted a new set of test data as summarized in Table I and II.

The test data showed no significant degradation of OEM ignition system characteristics as a result of the device installation for both Chrysler and VW distributors. However the problem associated with low output energies for both OEM and device tests still persisted. The applicant attributed the cause of this problem to either high tension leakage or excessive loading in the test circuit.

B. ARB Confirmatory Test

The ARB Laboratory conducted confirmatory tests on a 1973 Chrysler 8 cylinder distributor and a 1973 VW 4 cylinder distributor. Table III and IV are the summaries of the test data. The following are pertinent observations.

1. As expected on any capacitive discharge system the spark duration decreased considerably when Sears CD system was installed on the above distributors. However the duration was well above the minimum requirement of 100 u sec per the ARB criterion.
2. The secondary voltage rise time decreased considerably on the VW distributor from 120 to 45 u sec when Sears CD system was installed. The reduction to a 45 u sec duration in rise time is not considered to have an adverse effect on the ignition system as a shorter rise time tends to improve ignition system performance by reducing energy leakage during the secondary voltage built-up.
3. The available secondary voltage increased by an average of 20% for both ignition systems. Since the resultant available secondary voltage did not exceed 30 KV, the substantial increase in the voltage from OEM would not put an undue stress on the ignition harness, distributor or coil.

4. The test data did not show a significant degradation of other critical ignition parameters such as spark energy and centrifugal advance.

IV. Applicant's Claims

The applicant stated that the use of the Sears CD system will improve spark plug life and reduce breaker point wear. It is the staff's judgement that the device offers potential for reducing maintenance when properly installed because of reduced contact points current loading. The electrical characteristics of this system do not indicate that there would be any greater benefits on performance, economy, or emission reduction when installed on vehicles than would be obtained from a properly tuned engine.

V. Conclusion and Recommendation

The evaluation of the ARB test data showed that the installation of the Sears CD Ignition System Model 8204 will not adversely affect the ignition characteristics of the OEM ignition system.

The staff therefore recommends that Sears, Roebuck and Co., be issued an exemption from the prohibitions of Section 27156 of the California Motor Vehicle Code for its "Sears Capacitive Discharge Ignition System Model 8204" for installation on 1974 and older model year vehicles equipped with a standard Kettering ignition system.

Table I - Sears Capacitive Discharge Ignition System Model 8204  
 Ignition System Data Summary for 1973 VW 4 Cylinder  
 Distributor (Applicant's Test Data)

A. Centrifugal Spark Advance in Crankshaft Degrees

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 0               | 0             |
| 1400                  | 6.0             | 6.0           |
| 2000                  | 14.0            | 14.0          |
| 2600                  | 17.0            | 17.0          |
| 3200                  | 20.0            | 20.0          |

B. Spark Duration in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 1000            | 300           |
| 4000                  | 500             | 250           |

C. Secondary Voltage Rise Time in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 50              | 40            |
| 4000                  | 50              | 40            |

D. Spark Energy in Millijoules

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 12              | 10            |
| 4000                  | 6               | 10            |

E. Available Voltage in Kilovolts (with load)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 27              | 26            |
| 4000                  | 18              | 26            |

F. Available Voltage in Kilovolts (simulating fouled spark plug)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 16              | 16            |
| 4000                  | 12              | 15            |

Table II - Sears Capacitive Discharge Ignition System Model 8204  
 Ignition System Data Summary for 1972 Chrysler 8 Cylinder  
 Distributor (Applicant's Test Data)

A. Centrifugal Spark Advance in Crankshaft Degrees

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 0               | 0             |
| 1400                  | 18              | 18            |
| 2000                  | 20              | 20            |
| 2600                  | 22              | 22            |
| 3200                  | 24              | 24            |

B. Spark Duration in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 1200            | 300           |
| 3000                  | 1000            | 300           |

C. Secondary Voltage Rise Time in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 45              | 30            |
| 3000                  | 75              | 30            |

D. Spark Energy in Millijoules

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 12              | 10.8          |
| 3000                  | 10              | 10.8          |

E. Available Voltage in Kilovolts (with load)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 24              | 29            |
| 3000                  | 21              | 30            |

F. Available Voltage in Kilovolts (simulating fouled spark plug)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 14              | 18            |
| 3000                  | 12              | 18            |

Table III - Sears Capacitive Discharge Ignition System Model 8204  
 Ignition System Data Summary for 1973 VW 4 cylinder  
 Distributor (ARB Confirmatory Test)

A. Centrifugal Spark Advance in Crankshaft Degrees

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 0               | 0             |
| 1400                  | 7.5             | 8.0           |
| 2000                  | 12.0            | 12.0          |
| 2600                  | 16.0            | 16.0          |
| 3200                  | 20.0            | 19.5          |

B. Spark Duration in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 1000            | 350           |
| 4000                  | 800             | 350           |

C. Secondary Voltage Rise Time in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 40              | 40            |
| 4000                  | 40              | 40            |

D. Spark Energy in Millijoules

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 20              | 17.5          |
| 4000                  | 16.0            | 18.45         |

E. Available Voltage in Kilovolts (with load)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 20              | 23            |
| 4000                  | 17              | 23            |

F. Available Voltage in Kilovolts (simulating fouled spark plug)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 16              | 17            |
| 4000                  | 14              | 16            |

Table IV - Sears Capacitive Discharge Ignition System Model 8204  
 Ignition System Data Summary for 1973 Chrysler 8  
 cylinder Distributor (ARB Confirmatory Test)

A. Centrifugal Spark Advance in Crankshaft Degrees

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 0               | 0             |
| 1400                  | 18.0            | 18.0          |
| 2000                  | 21.0            | 21.5          |
| 2600                  | 25.0            | 24.0          |
| 3200                  | -               | -             |

B. Spark Duration in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 2200            | 600           |
| 3000                  | 1600            | 600           |

C. Secondary Voltage Rise Time in Microseconds

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 120             | 45            |
| 3000                  | 120             | 45            |

D. Spark Energy in Millijoules

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 29.7            | 30.0          |
| 3000                  | 20.8            | 18.0          |

D. Available Voltage in Kilovolts (with load)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 24              | 30            |
| 3000                  | 23              | 29            |

F. Available Voltage in Kilovolts (simulating fouled spark plug)

| <u>Engine<br/>RPM</u> | <u>Baseline</u> | <u>Device</u> |
|-----------------------|-----------------|---------------|
| 600                   | 15              | 20            |
| 3000                  | 13              | 19            |

# Sears, Roebuck and Co.

PACIFIC COAST BUYING OFFICE

900 SOUTH FREMONT AVENUE

ALHAMBRA, CALIFORNIA 91802

April 5, 1976

Mr. George Lew  
California Air Resources Board  
9528 Telstar  
El Monte, California 91731

Dear George:

Enclosed are the forms and letters covering Sears new #8204 Capacitive Discharge Ignition System which we are submitting for approval. A sample of the unit is being sent you under separate cover and I am holding a second sample for you if you need it.

Please check this data to see if I have given you everything you need, but if not, give me a call and tell me what else you need. I am at 576-4186. Thank you for your help.

Sincerely,

  
C. M. Hattersley  
Department 733PCB

CMH:mrm

Attachment

cc: Mr. A. Kuehn  
Mr. R. Wheeler