State of California
AIR RESOURCES BOARD

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

M. W. RAYBIN
"RAYBIN MAGNETIC DISCHARGE"

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 39023 of the Health and Safety Code;

IT IS ORDERED AND RESOLVED: That the installation of "Raybin Magnetic Discharge" transistorized ignition system as a replacement part manufactured by M. W. Raybin has been found to not reduce the effectiveness of required emission control devices in vehicles and therefore is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1966-1973 model-year vehicles. The device consists of a transistor, ballast resistor and an auto-transformer.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different than those listed 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 "RAYBIN MAGNETIC DISCHARGE" 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 unlawful, untrue or misleading advertising and Section 17534 makes violation punishable as a misdemeanor.

Section 39130 and 39184 of the Health and Safety Code provide as follows:

> "39130. No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for certification of a device, represent, any device as a motor vehicle pollution control device unless that device has been certified by the 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 section is a misdemeanor."

"39184. No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for accreditation 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 accredited by the board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as an accredited device. Any violation of this section is a misdemeanor."

Any apparent violation of the policy or laws will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at Sacramento, California, this 30 day of March, 1973.

JOHN A. MAGA
Executive Officer

State of California

AIR RESOURCES BOARD

March 16, 1973

Staff Report

Evaluation of M. W. Raybin "Raybin Magnetic Discharge" Transistorized Ignition System for Exemption to the Prohibitions of Section 27156 of the Motor Vehicle Code

I. Introduction

M. W. Raybin, Lawndale, California, has applied for exemption to the prohibitions of Section 27156 of the Motor Vehicle Code for the "Raybin Magnetic Discharge" transistorized ignition system. Section 27156 prohibits the installation of any device which reduces the effectiveness of motor vehicle emission control systems. The applicant intends to sell the device as an "after-market" part to replace the standard ignition system.

The Air Resources Board has adopted criteria for the evaluation of "after-market" devices for compliance with Section 27156. The basis for evaluation is defined in the "Air Resources Board Criteria for Determining Compliance with Section 27156 of the Motor Vehicle Code".

II. System Description

For a general description of transistorized ignition systems, see staff report "Evaluation of Capacitive Discharge and Transistorized Ignition Systems for Compliance with the Requirements of Section 27156 of the Motor Vehicle Code", dated February 14, 1973.

The "Raybin Magnetic Discharge" device consists of a transistor, ballast resistor and an auto-transformer to impact an electrical pulse (200 volts) across the primary of the ignition coil. The system has a spark energy capability of 60 millijoules.

III. Emission Testing

Because of the number of applications received from manufacturers of transistorized ignition systems, it was decided to test one transistorized device with ignition design characteristics representative of this group. A Solid State Products, Inc. "SSP Stage II" system was selected for testing. The results of these tests are shown in the staff report "Evaluation of Capacitive Discharge and Transistorized Ignition Systems for Compliance with the Requirements of Section 27156 of the Motor Vehicle Code". These tests verify that a transistorized ignition system does not adversely effect the exhaust emissions of a "tuned" engine.

IV. Conclusions and Recommendations

It is the staff's opinion that the M. W. Raybin "Raybin Magnetic Discharge" transistorized ignition system will not adversely effect motor vehicle exhaust emissions when evaluated with respect to the exhaust emissions obtained with a conventional ignition system of a "tuned" engine. This device may also have a beneficial effect in the control of exhaust emissions in that it maintains the "tuned" condition of the engine for a longer period of time. Therefore, "Raybin

Magnetic Discharge" transistorized ignition system should be exempt from the prohibitions of Section 27156 of the Motor Vehicle Code.

State of California

AIR RESOURCES BOARD

February 14, 1973

Staff Report

Evaluation of Capacitive Discharge and Transistorized Ignition Systems for Compliance with the Requirements of Section 27156 of the Motor Vehicle Code

I. Introduction

Section 27156 of the California Motor Vehicle Code prohibits the installation of a device, apparatus or mechanism which, when used with a required motor vehicle emission control system, alters or modifies the emission control system in such a manner that it reduces the effectiveness of the emission control system.

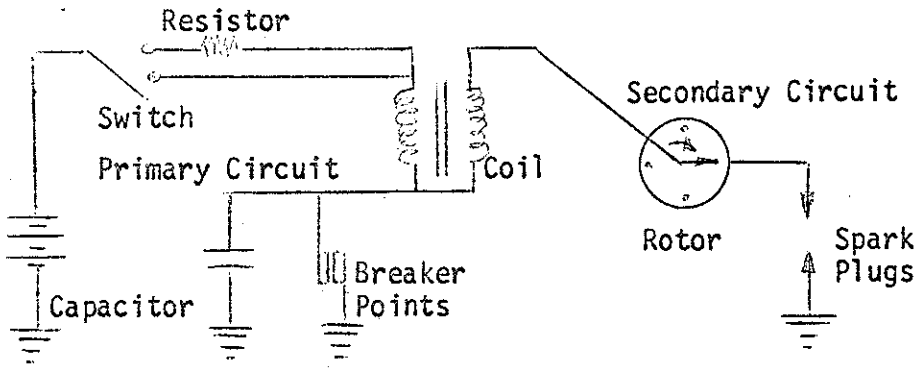
In order to determine whether a device constitutes a violation of Section 27156, the device manufacturer shall submit an application requesting that the Air Resources Board make an evaluation of the device's effect on emissions. By established policy, the evaluation is limited to the emission effects and does not include evaluations of vehicle driveability and performance and device durability.

Several applications have been received from manufacturers of capacitive discharge and transistorized ignition systems requesting an evaluation of their devices.

II. System Description

A. Standard Inductive System

The conventional ignition system is of the magnetic inductance type. The basic components of the system are a battery, ignition coil, breaker points, condenser, rotor and spark plugs. The schematic of a typical system is shown below:



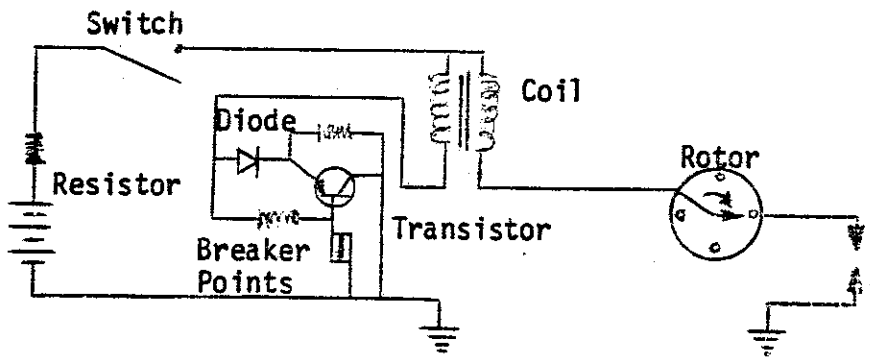
The system has two circuits, primary and secondary. When continuity is established by closing of the switch and breaker points, current will flow in the primary circuit building up a magnetic field around the coil. When the breaker points are opened, the magnetic field slowly collapses and induces a current flowing in the same direction in the primary circuit. The current charges a capacitor until the capacitor builds a potential opposing flow and discharges back through the primary circuit. This causes a sudden collapse of the remaining magnetic field and induces a high voltage in the secondary coil winding. The secondary coil voltage is also cut by the collapsing magnetic field.

The secondary circuit consists of the high tension coil, wires, and a mechanical device for the proper timing of the voltage to the spark plugs.

The external resistor in the primary circuit is to reduce the current at low speeds while not appreciably restricting the current flow at high speeds. The resistor is bypassed during starting of the engine.

B. Transistorized Inductive Ignition Systems with Breaker Points

A typical transistorized system maintains the same basic components as the standard system except the condenser is replaced with a transistor and the coil is replaced by a coil of a special design. A typical transistorized system is shown below:



The transistor acts as a switch in the primary circuit, replacing the breaker points of the standard system in this function. The breaker points now serve as a switch for the triggering current to the transistor. With the points closed, the current flow from

the emitter to ground (triggering) circuit through the points is considerably reduced, thereby improving the life of the points. Opening of the points stops the flow of triggering current and cuts off the transistor current.

The transistor also acts as a current amplifier. The primary current flowing through the emitter-collector circuit in series with the low-tension coil and battery is greatly amplified over the triggering current. The inductance of the coil and the ballast resistor limit the current flow through the coil.

Zener diodes are used to protect the transistor by clipping or eliminating the primary voltage pulse below the minimum voltage rating for the emitter to collector.

The coil used in the transistorized system has a higher ratio of turns in the secondary/primary coils. The increased number of turns in the secondary coil reduces the reverse voltage in the primary circuit without reducing the high voltage output of the coil. The high reverse voltage and current of the conventional system sometimes cause arcing across the breaker points of the conventional system.

The advantages of the transistorized ignition system are:

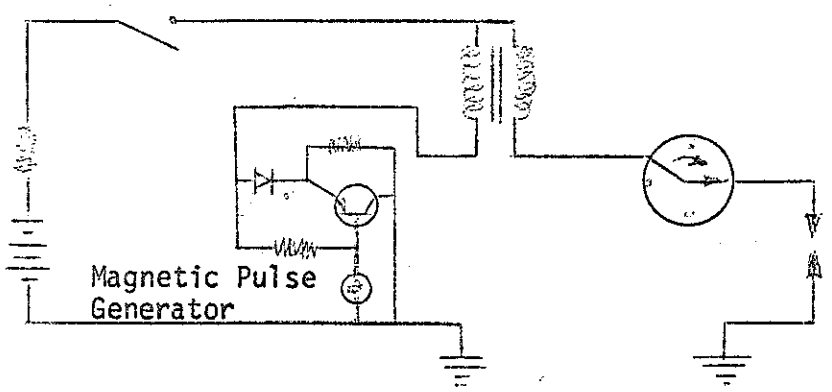
1. Increased point life due to reduction in current flow

through the breaker points. Other distributor maintenance is required.

2. Increased output voltage available for higher engine speeds.
3. Increase in spark energy.

C. Breakerless Transistorized Induction Ignition Systems

In the breakerless ignition system, the transistor base current is controlled by a triggering circuit and a breakerless pick-up used in place of the distributor points. The trigger unit is activated by a magnetic pulse generator or photocell mounted in the distributor. A typical circuit is shown below. The remaining circuit is as previously described.

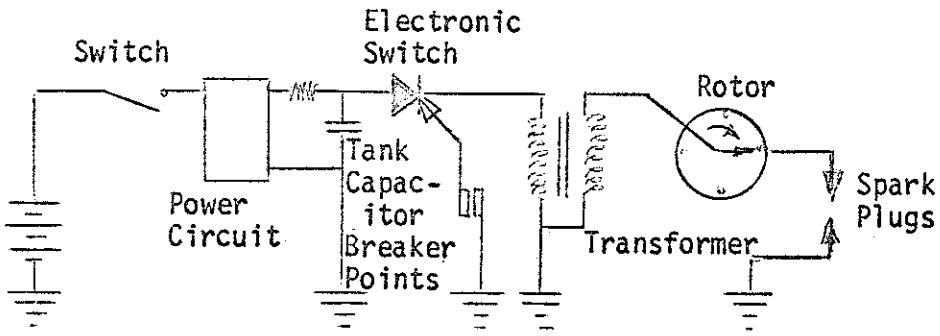


The advantage of this system are:

1. Periodic maintenance of the distributor is eliminated.
2. Increased output voltage available for higher engine speeds.
3. Increase in spark energy.

D. Capacitor Discharge Ignition Systems with Breaker Points

A capacitor discharge system consists of three basic circuits. A power circuit which converts battery voltage to a higher voltage. A tank capacitor which stores and discharges the high voltage current supplied by the power circuit. A switching circuit which accepts signals from the engine and discharges the tank capacitor into the primary windings of the transformer. A typical schematic is shown below:



The advantages of a capacitor discharge ignition system are:

1. Increase distributor point life due to reduction in current flow through the breaker points. Other distributor maintenance remains the same.
2. Increase spark plug life due to faster output voltage rise time.
3. Increased output voltage at higher engine speeds.
4. Improved engine startability at low temperatures.

E. Breakerless Capacitor Discharge Ignition System

The breakerless C-D system contains the same basic elements as the contact-triggered system except the triggering circuit is controlled by a breakerless pick-up in place of the distributor points. As in the breakerless transistor system, the pick-up may be a magnetic pulse or optical trigger source. In addition to the advantages previously described for C-D systems, breakerless systems have the following advantages:

1. Eliminates periodic maintenance of the distributor.

III. Emission Testing

To determine the effect of transistorized and capacitor discharge ignition systems on exhaust emissions, hot CVS tests were performed on devices considered to be typical of each type. The systems selected were Delta Products, Inc., Mark Ten B Capacitor Discharge Ignition System and a Solid State Products, Inc., model 200-IZN transistorized ignition system. Each system was used with the vehicle distributor breaker points.

The vehicle used in these tests was a 1968 Plymouth, 318 CID. The vehicle's ignition system was put into a "tuned" condition and the tests were run with the timing, dwell, idle CO, and idle RPM set to the vehicle manufacturer's specifications. Baseline tests were then performed. The devices were installed per the device manufacturer's instructions and the tests were repeated. The following are

the results of the ARB emission and ignition coil output tests:

	Emissions - grams/mile			Change in Emissions-%		
	HC	CO	NOx	HC	CO	NOx
Baseline	1.68	11.33	5.54	-	-	-
Mark 10B	1.23	11.18	5.76	26.8	1.3	-4.0
SSP	1.58	11.65	5.52	6.0	-2.0	0

(-) Indicates an increase.

	Open Circuit Voltage - Volts	
	Idle	3,000 RPM
Baseline	24,000	20,000
Mark 10B	24,000	24,000
SSP	23,000	23,000

The emission test data indicate that both devices produce slight reductions in hydrocarbons and very slight increases in oxides of nitrogen. Carbon monoxide emissions remained basically constant. All changes in emissions were considered insignificant and in the range of test repeatability.

The coil voltage output was lower than what would be obtained with the vehicle in a fully "tuned" condition. This was attributed to a degradation of the ignition wiring. However, the diagnosis checks indicated there was adequate voltage available to meet engine demand requirements for each of the three systems. The voltages measured

at the higher engine RPM reflect the increases in voltage output at the higher engine speeds that are obtained with the capacitive discharge and transistorized systems.

IV. Conclusions and Recommendations

It is the staff's opinion that capacitive discharge and transistorized ignition systems will not adversely effect motor vehicle exhaust emissions when evaluated with respect to the exhaust emissions obtained with a conventional ignition system of a "tuned" engine. These devices may also have a beneficial effect in the control of exhaust emissions in that they maintain the "tuned" condition of the engine for a longer period of time. Therefore, capacitive discharge and transistorized ignition systems should be exempt from the prohibitions of Section 27156 of the Motor Vehicle Code.