

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-20-1  
Relating to Exemptions under Section 27156  
of the Vehicle Code

TRI-STAR CORPORATION  
"TIGER 500" and "TIGER PULSAR"

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 neither the "Tiger 500" nor the "Tiger Pulsar" electronic ignition system manufactured by Tri-Star Corporation has been found 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 1974 and older model-year vehicles equipped with 12-volt negative ground batteries except for the following:

1. 1973-74 Mercedes Benz, Mazda, Audi and Porsche vehicles.
2. All General Motors Corporation vehicles equipped with an ignition coil integrated into the distributor.
3. All 1966-70 model-year vehicles equipped with a Dana or Carter NOx retrofit device using an electronic speed sensor.

The "Tiger 500" and the "Tiger Pulsar" are solid-state electronic devices which consist of a d-c to d-c converter, capacitors, diodes, resistors, and silicon controlled rectifier electronic switch.

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.

Changes made to the design or operating conditions of the device as originally submitted to the Air Resources Board for evaluation that adversely affect the performance of the vehicle's pollution control devices 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 either 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 "TIGER 500" OR THE "TIGER PULSAR" 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.

Sections 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. (a) 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 which, in fact, is not an accredited 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-20, dated February 28, 1974 is superseded and of no further force and effect.

Executed at Sacramento, California, this 20 day of June, 1974.

Original signed by  
William Simmons

WILLIAM SIMMONS  
Executive Officer

State of California

AIR RESOURCES BOARD

June 12, 1974

Staff Report

Evaluation of Tri-Star Corporation  
"Tiger SST"  
Electronic Capacitive Discharge Ignition System  
For Exemption from the Prohibitions of  
Section 27156 of the Motor Vehicle Code

I. Introduction

Tri-Star Corporation, Grand Junction, Colorado, has applied for exemption from the prohibitions of Section 27156 of the Motor Vehicle Code for the "Tiger SST" electronic capacitive discharge 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 augment the existing standard ignition system for 1974 and older model year vehicles equipped with a 12-volt negative ground battery, except the following:

- A. 1973-74 Mercedes Benz, Mazda, Audi and Porsche vehicles.
- B. All General Motors vehicles equipped with an ignition coil integrated into the distributor.

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", dated February 17, 1971.

## II. System Description

For a general description of electronic capacitive discharge 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 "Tiger SST" is a solid-state printed-circuit ignition system which consists of a d-c to d-c converter, a rectifier bridge, a storage capacitor, a coil, resistors, diodes, a silicon control rectifier and a switch. The switch is to allow converting back to the conventional ignition system (see Figure 1 below). The manufacturer claims that the "Tiger SST" device can deliver up to 45 KV at all speeds with a rise time of 0.5 microseconds, keeps the engine in a "just tuned" condition up to 70,000 miles, and improves gas mileage and performance in general.

An early model of the Tiger series, "Tiger 500", was previously tested by the ARB staff; see staff report entitled "Evaluation of the Tri-Star Corporation 'Tiger 500'", dated February 8, 1974. The "Tiger SST" device is technically the same as the previously evaluated "Tiger 500" device. The "Tiger SST" is equipped with an extra R.F. choke to protect the silicon control rectifier by reducing the peak output current. Aside from the R.F. choke, there is no significant circuit difference between the "Tiger 500" and the "Tiger SST" devices.

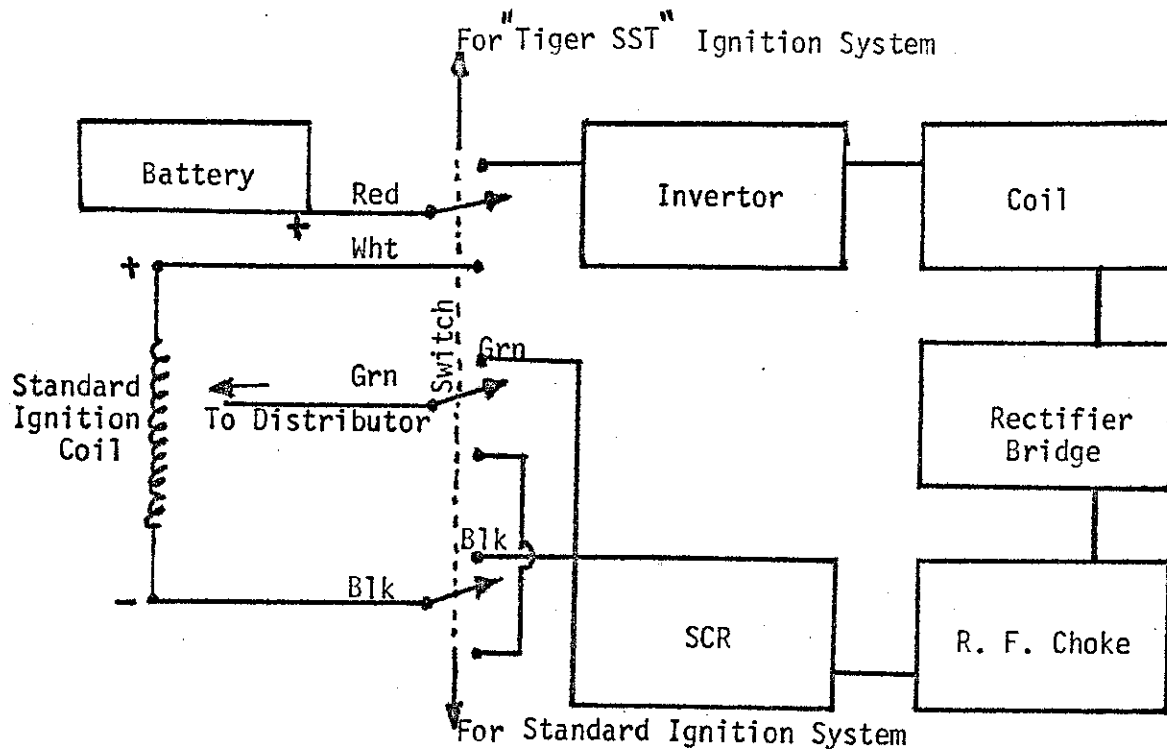


Figure I "Tiger SST" Electronic Ignition System Schematic

### III. Laboratory Test Data

The ARB performed calibration tests to investigate the effect of the "Tiger SST" device on the engine electrical system. A 1974 Ambassador (E 833605), 360 cubic inches displacement, two barrel carburetor, automatic transmission and conventional ignition system, vehicle was used. The following results were obtained:

#### 1. Centrifugal spark advance angle measured from TDC (degrees)

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
Idle (700)	5	5
1000	6	6
1500	16.5	17
2000	19.5	19
2500	21	21.5
3000	23	23

2. Secondary voltage rise time (microseconds)

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
Idle	20	20

3. Spark duration (microseconds)

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
Idle	1400 <sub>+200</sub>	130
2000	550 <sub>+250</sub>	130

4. Maximum available secondary voltage (KV)

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
Idle	<sup>26</sup> 25-27	<sup>26</sup> 24-28
2200	25-28	24-29

5. Required secondary voltage (KV)

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
Idle	9	10
2200	7	11

6. Idle exhaust emissions

<u>Baseline</u>		<u>Device</u>	
<u>HC</u>	<u>CO</u>	<u>HC</u>	<u>CO</u>
112 ppm	0.15%	112 ppm	0.15%

IV. Staff Evaluation

The ARB staff report entitled "Evaluation of the Tri-Star Corporation 'Tiger 500'", dated February 8, 1974 shows that the installation of the "Tiger 500" electronic capacitive discharge ignition system will not adversely affect the existing emission control devices in

a motor vehicle. Since the "Tiger 500" and the "Tiger SST" devices are very much alike with no significant electronic difference, the ARB staff believes that the "Tiger SST" should have no adverse effects on exhaust emissions.

The above ARB data show that the "Tiger SST" device has little or no effect on the centrifugal spark advance, the maximum available secondary voltage, the required secondary voltage, the secondary voltage rise time, or the idle exhaust emissions. Based on the ARB test data, the manufacturer's claims that the "Tiger SST" device is capable of delivering up to 45 kilo-volts and having 0.5 microsecond rise time were not substantiated since insignificant changes were observed with the device when compared with the baseline. However, it was observed that the "Tiger SST" device reduces the spark duration significantly to make the spark hotter since the output energy is unchanged. The spark duration, however, being significantly reduced is still far above the minimum limit required by auto manufacturers for combustion.

Vehicles equipped with NOx emission control devices using a speed sensor such as the Dana or Carter device cannot be equipped with the "Tiger SST" device. The speed sensor switch will interfere with the timing of the "Tiger SST" device and might cause excessive misfire. The device will not function properly for vehicles equipped with electronic ignition system whether it is a breakerless, capacitive

discharge, or transistorized type. The "Tiger SST" output voltage might overlap with the existing electronic system causing damage to the engine's electrical system by overloading the ignition wires or coil. It also could cause excessive misfiring due to erratic triggering from the points.

V. Conclusions and Recommendations

It is the staff opinion that Tri-Star Corp. "Tiger SST" electronic capacitive discharge ignition system will not adversely affect 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 the device may maintain the "tuned" condition for a longer period of time. Therefore, the "Tiger SST" electronic capacitive discharge ignition system should be exempt from the prohibitions of Section 27156 of the Motor Vehicle Code for 1974 and older model-year vehicles equipped with a 12-volt negative ground battery except the following:

- A. 1973-74 Mercedes Benz, Mazda, Audi, and Porsche.
- B. All vehicles equipped with an ignition coil integrated into the distributor or with an electronic ignition system whether it is a breakerless, capacitive discharge, or transistorized type.
- C. All 1966-70 model-year vehicles equipped with a Dana or Carter NOx retrofit device using an electronic speed sensor.