A.O. Box

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-71
Relating to Exemptions Under Section 27156
of the Vehicle Code

STEVENS ASSOCIATES
SIG-101 CAPACITIVE DISCHARGE IGNITION SYSTEM

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 "Steven's Capacitive Discharge Ignition System (SIG-101)", manufactured by Stevens Associates, P.O. Box 620, Alamo, CA 94507 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 1976 and older model year vehicles except as follows:

1. Vehicles originally equipped with breakerless capacitive discharge or Delco high energy electronic ignition systems.

2. Those 1966-70 vehicles equipped with a "AQP Pure Power" NO_x retrofit device employing a capacitive discharge circuit combined with spark advance control.

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 "STEVENS CAPACITIVE DISCHARGE IGNITION SYSTEM".

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 28th day of October, 1976.

Original Signed By

Thomas C. Austin
Deputy Executive Officer-Technical

State of California

AIR RESOURCES BOARD

Staff Report

August 30, 1976

Evaluation of the Stevens Associates "SIG-101 Capacitive Discharge Ignition System" for Compliance with the Requirements of Section 27156 of the California Motor Vehicle Code

I. Introduction

Stevens Associates, P.O. Box 620, Alamo, California 94507 has submitted an application (see Appendix I) requesting an exemption from Section 27156 of the California Vehicle Code for its capacitive discharge electronic ignition system Model NO. SIG-101.

Section 27156 of the Vehicle Code prohibits the installation, sale or advertisement of any device or mechanisms which alters the performance or design of the vehicle's emission control system. The Air Resources Board is empowered to exempt any device from this prohibition if a finding shows the device will not reduce the effectiveness of the emission control system.

II. System Description and Function

The "Stevens Capacitive Discharge Ignition System" consists basically of electrical circuits for a d-c to d-c converter, a storage capacitor and a silicon controlled rectifier which serves as an electronic switch. Other circuits act as point bounce eliminator, transfer relay to return the ignition system to normal operation in case of failure of the Stevens system, point cleaner which increases the primary current during starting, and power filters to eliminate noise.

Exhibit A is a detailed wiring diagram of the device and Exhibit B shows how it is connected to the vehicle ignition system.

III. Device Evaluation

The applicant submitted back-to-back bench test ignition system performance data (ARB guidelines dated May 25, 1976) for the following ignition systems:

1. 1966 Mercury - 8 cylinders
2. 1973 Buick - 8 cylinders
3. 1973 Ford - 8 cylinders

A summary of the data for these tests is shown in Table I.

The ARB laboratory performed similar confirmatory back-to-back bench tests (ref. Lab Reports Project B-76-15) on the following ignition systems:

1. 1967 Ford - 8 cylinders
2. 1973 Volkswagen - 4 cylinders
3. 1974 Chrysler - 8 cylinders - Electronic breakerless ignition system.

A summary of the data for these tests is shown in Table II.

The applicant did not submit centrifugal or vacuum advance data and the submitted OEM spark duration data (Table IA) was too high when compared to manufacturers specifications. The ARB laboratory performed confirmatory tests to determine OEM spark advance characteristics and all other ignition criteria critical to emission control. This information is included in Table II.

An evaluation of the test data showed that the device met the ARB criteria as given in the Guidelines dated May 25, 1976. The results indicated a decrease in secondary voltage rise time which minimizes leakage and an increase in spark energy and available voltage. This improves the ability of the spark plug to fire under adverse conditions. Although the spark duration was substantially decreased from the O.E.M. values, it still exceeded the minimum of 100 microseconds as given in the above criteria.

IV. Applicant's Claims

The applicant claims improved performance and gas mileage, lower fuel octane requirements, reduced exhaust pollutants, and less maintenance. The electrical characteristic of this system do not indicate any marked increase in performance or gas mileage or decrease in octane requirements or exhaust pollutants from a normal properly tuned engine. However, the points and spark plugs should require less maintenance.

V. Conclusion and Recommendations

The staff concludes that the installation of this device on 1976 and older model engines will not result in increased emissions.

Based on test data and other information submitted by the applicant, the staff recommends Stevens Associates be granted an exemption from the prohibitions of Vehicle Code Section 27156 for the "Stevens SIG-101 Capacitive Discharge Ignition System" installed on 1976 and older model vehicles except for the following:

1. Vehicles originally equipped with breakerless capacitive discharge or Delco high energy electronic ignition systems.
2. Those 1966-1970 vehicles equipped with the AQP-Pure Power NOx retrofit device employing a capacitive discharge circuit combined with spark advance control.

This recommendation is contingent on the applicant deleting from all published materials any reference to tuning the engine to specifications other than those in the original vehicle manufacturers instructions. (See Appendix I page 3).

Table I

Ignition System Data Submitted by Applicant

Engine RPM	1966 Mercury - V8 Baseline	1966 Mercury - V8 Device	1973 Buick - 4 Cyl Baseline	1973 Buick - 4 Cyl Device	1973 Ford - V8 Baseline	1973 Ford - V8 Device
A. Spark Duration in Microseconds						
200	3,500	370	3,600	350	3,000	390
600	2,500	370	3,000	350	3,000	390
3000	1,500	370	1,750	350	2,000	390
B. Secondary Voltage Rise Time in Microseconds						
200	150	80	100	80	150	80
600	150	80	120	75	150	80
3000	150	80	130	80	170	80
C. Spark Energy in Millijoules						
200	19.0	22.8	22.9	23.3	16.8	24.0
600	13.6	22.8	19.1	23.3	16.3	24.0
3000	5.4	22.8	10.9	23.3	8.2	23.4
D. Available Voltage With Load (KV)						
200	25	35	23	34	25	32
600	22	32	25	34	25	32
3000	18	32	22	34	22	31
E. Available Voltage With Simulated Fouled Spark Plug (KV)						
200	16	25	15	25	14	24
600	16	23	16	25	14	24
3000	12	22	12	24	13	22

Table II

Ignition System Data From ARB Laboratory

Engine RPM	1967 Ford- V8 Baseline	1967 Ford- V8 Device	1973 Volkswagen 4 Cyl Baseline	1973 Volkswagen 4 Cyl Device	1974 Chrysler V8* Baseline	1974 Chrysler V8* Device
A. Centrifugal Spark Advance in Crankshaft Degrees						
600	0	0	0	0	0	0
1400	9.0	9.5	8.0	8.0	16.0	16.0
2000	16.5	16.0	12.5	12.5	18.5	18.5
2600	18.5	18.5	16.5	16.5	21.5	21.0
3200			20.5	21.0		
B. Vacuum Spark Advance in Crankshaft Degrees						
In. Hg						
3	0	0	0	0	0	0
6	2.5	2.0	0.5	0.5	0	0
9	10.0	10.0	5.0	5.0	3.5	4.0
12	16.0	16.0	5.0	5.0	12.5	12.0
15	20.0	20.0	5.0	5.0	20.0	20.0
20	24.0	24.0	5.0	5.0	20.0	20.0
C. Spark Duration in Microseconds						
200	1900	440	800	500	2200	800
600	1400	440	1000	500	1200	400
3000	1100	440			900	400
4000			800	500		
D. Secondary Voltage Rise Time in Microseconds						
200	100	60	50	40	120	60
600	120	60	50	40	120	60
3000	120	60			120	60
4000			50	40		

*Electronic Ignition

Engine RPM	1967 Ford V-8 Baseline	1967 Ford V-8 Device	1973 Volkswagen 4 Cyl. Baseline	1973 Volkswagen 4 Cyl. Device	1974 Chrysler V-8 Baseline	1974 Chrysler V-8 Device
E. Spark Energy in Millijoules						
200	34.2	22.7	14.0	24.5	54.3	45.3
600	24.5	23.2	22.0	24.5	21.1	30.0
3000	15.7	23.2			22.8	30.0
4000			15.1	27.6		
F. Available Voltage With Load (KV)						
200	26.0	31.0	15.5	20.0	22.5	31.0
600	23.5	29.5	19.5	20.0	22.0	32.0
3000	19.0	29.5			20.0	32.0
4000			16.5	20.0		
G. Available Voltage With Simulated Fouled Spark Plug (KV)						
200	17.0	24.0	12.5	12.0	15.0	24.5
600	16.0	23.0	15.0	17.0	14.0	25.0
3000	12.5	22.0			13.5	25.0
4000			13.5	17.0		

Electronic Circuit Diagram

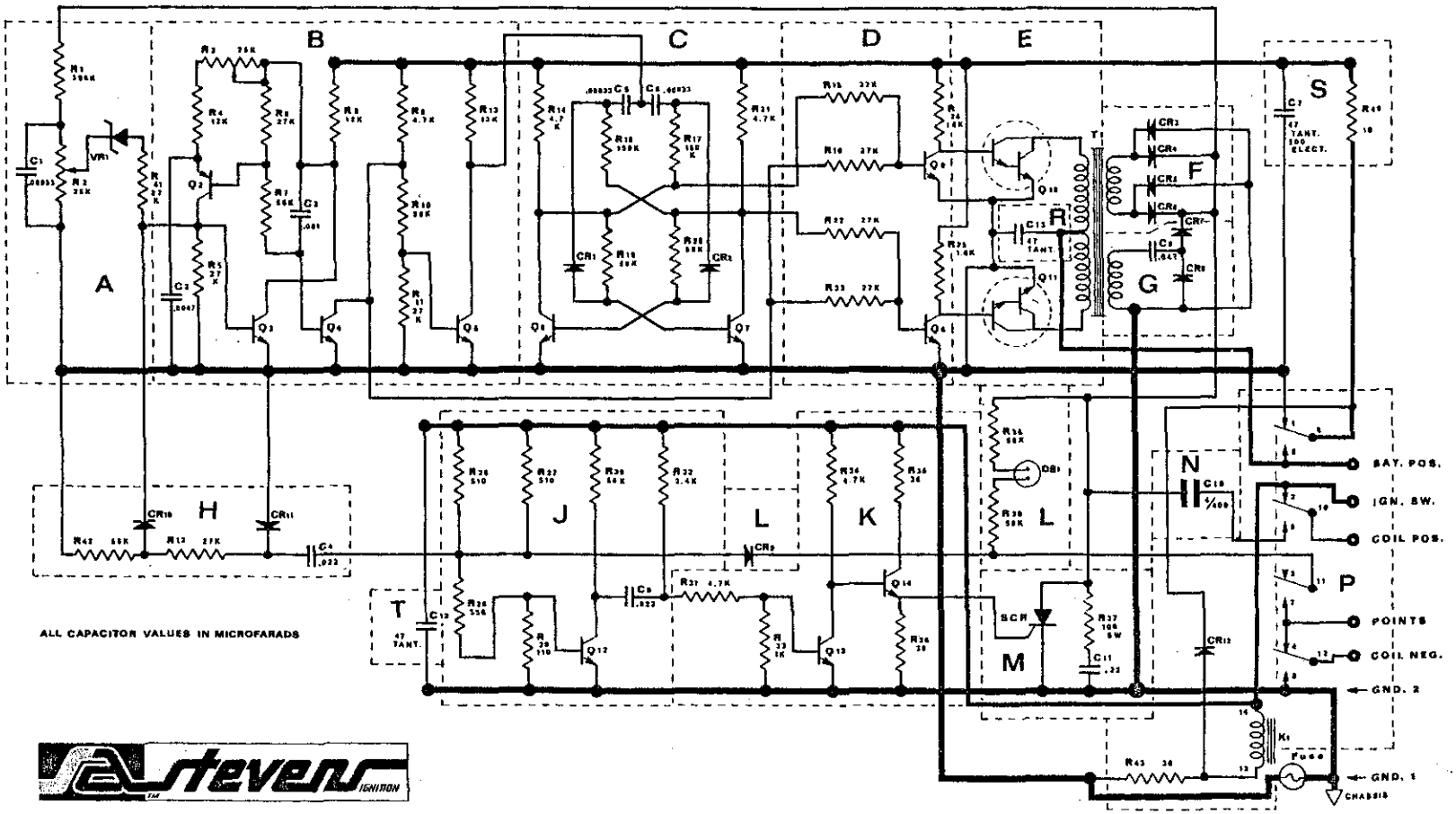
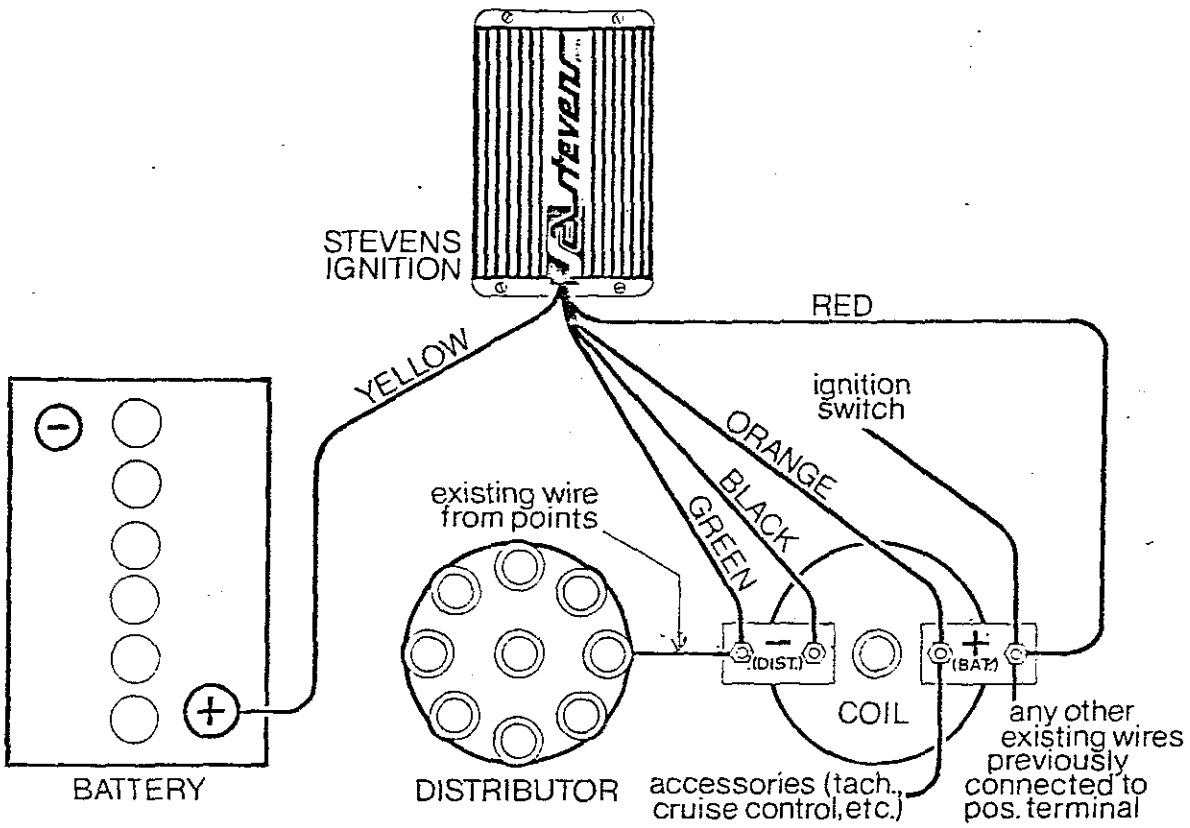
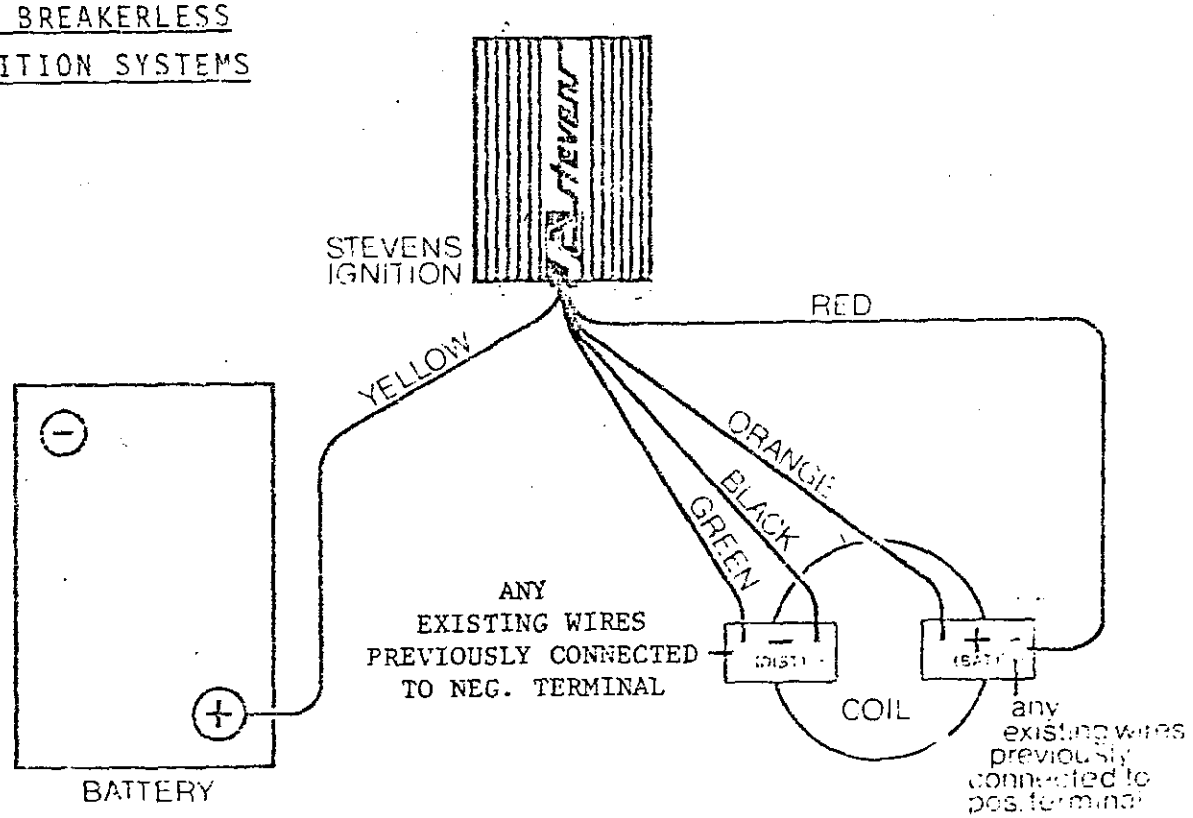


Exhibit A

Wire Connection Diagram



FOR BREAKERLESS IGNITION SYSTEMS



Installing Your Stevens Ignition

You can install your Stevens Ignition quickly using a few hand tools. Simply mount the unit and make the necessary wire connections as shown and described. Be sure to read the instructions all the way through before you start. You may shorten any wire from the unit. (Cut and strip the wire, then crimp or solder a spare ring-tongue terminal to its end.)

Mounting and Connecting the Unit

1. Pick a suitable location under the hood. Make sure that:
   a. Air will flow freely over the unit during use.
   b. The four thinner wires from the unit reach the ignition coil without touching hot or moving parts.
   c. The heavy yellow wire from the unit reaches the positive (+) terminal of the battery (or some other suitable point as described in step 5).

   NOTE: If your vehicle has wood around the engine (common in motor homes and boats), try to mount the unit on a metal part of the vehicle frame. If this cannot be done, you must ground the unit to the vehicle frame through a 1/4 inch braided grounding strap less than 1 ft. long. Attach the strap under one of the unit mounting screws near the end where the wires emerge.
2. Using the unit as a guide, mark the four mounting holes on the mounting surface. Center-punch. Drill the holes, using the drill bit supplied. Mount the unit with the sheet-metal screws and star washers.
3. Remove the nut and lockwasher from the negative (− or DIST) terminal post on the ignition coil. Take off the existing wires.

   Over the negative post, slip the insulating strip attached to the green wire from the ignition unit. Connect the black wire from the unit to this same post. Replace the lockwasher and nut, then tighten. Connect the wire from the distributor points to the screw that holds the green wire on the insulating strip. Remaining accessory wires, if any, will be connected in Step 4.
4. Remove the nut and lockwasher from the positive (+ or BAT) post on the coil. Take off the existing wires.

   Over the positive post, slip the insulating strip attached to the red wire from the ignition unit. Connect the orange wire from the unit—and all other wires from any accessory that had been connected to the negative coil post (tachometer, cruise control, etc.)—to the positive coil post.

   NOTE: To avoid interfering with the point-cleaning function of the Stevens Ignition, do not connect the accessory wire to any terminals at the negative side of the coil.

   Replace the lockwasher and nut, then tighten.

   Locate the wires previously attached to the positive coil post. Connect *all of them* to the screw that holds the red wire on the insulating strip.
5. Finally, connect the heavy yellow wire from the ignition unit to the positive battery voltage—at the battery, alternator, or starter solenoid.

   If you connect the wire at the battery, use the drill bit supplied to drill a hole 1/2 inch deep in the top of the positive battery terminal or its clamp. Then use the remaining sheet-metal screw and star washer to fasten the ring-tongue lug to the terminal or clamp. Be sure to cover the connection with grease to prevent corrosion.

Checking Your Installation

Your Stevens Ignition is now completely installed and ready to operate. Start the engine and check to see that the red indicator lamp on the ignition unit is lit. This shows that the system is working properly and will give you outstanding engine performance.

If the indicator on the unit is not lit with the engine running, it means the system is operating in the conventional mode (as if the ignition unit had not been installed). Check to make sure the unit's fuse fits properly in its holder and is not blown. The unit uses a standard 10-amp automotive fuse available at any service station.

If the fuse is not the problem, check carefully to make sure the unit is properly grounded to the metal frame of the vehicle as noted in Step 1.

If the engine fails to start, go over these instructions again. Check the wiring and correct all improper connections. If the engine still won't start, remove the fuse from the ignition unit. This will put the system in the conventional operating mode and the engine should start. If it does not, you have made an error in connecting the wires.

Operation Notes

Once installed, your Stevens Ignition will continue to perform indefinitely without further attention.

Indicator Lamp You can always check to see that the unit is working properly by simply noting that the indicator lamp on the end panel is lit.

Safety Function (or, Operating Safeguard) The unit uses a standard 10-amp automotive fuse available at any service station. If for any reason the fuse is blown, the unit will automatically transfer engine operation to the conventional mode.

Engine Performance As stated previously, your Stevens Ignition is designed to give you many years of greatly improved engine performance. To get the full benefits from your unit, however, you should see that any existing conditions in your engine or transmission system that may contribute to poor performance are taken care of. While your Stevens Ignition may seem to compensate for such things as burned valves, worn piston rings, or poor carburetion, eliminating these problems will further enhance your vehicle's performance.

Initial Tuneup We recommend that after your unit is installed, you have your engine tuned and new points put in. These points should never need replacement as long as they operate with the Stevens Ignition. Spark plug gaps should be set at 0.050 in. (see discussion on plugs under "Fuel Economy"). Timing should be adjusted as specified by the auto manufacturer.

Since many ignition test instruments will not work properly with this type of electronic ignition, the system should be put in conventional mode for tuning. This can be done readily by pulling the fuse on the unit.

After the initial tuneup, you will be able to drive 40,000 to 50,000 miles before your next tuneup.

el Economy Your Stevens Ignition will bring you substantial savings by improving gas mileage. It will also, in some cases, further reduce fuel costs by lowering the octane rating requirements. This will depend on the compression ratio of the engine and the temperature rating of the spark plugs.

NOTE: With your Stevens Ignition you can install plugs that are one or two grades colder and thereby use a more economical, lower-octane gasoline. Surface-gap plugs, which cannot be used with standard and most electronic ignition systems (because these plugs tend to foul), work very well with the Stevens Ignition, improving performance still further and reducing octane requirements.

If your engine has a very high compression ratio, it will still require the use of premium gasoline.

Beyond this, you can periodically check the dwell for fine adjustment.

Technical Description

The Stevens Ignition is an electronic ignition unit of the type known as capacitive-discharge (C-D). The Stevens Ignition is also unique in that it is carefully engineered to provide the following:

1. Maximum spark energy with optimum voltage and current.
2. Maximum reliability and durability.
3. Simple installation in any 12-volt, negative-ground system.

Some of the more important design features used to accomplish the above are discussed in the following paragraphs with reference to the electronic circuit diagram.

Basic Operation The unit's energy storage capacitor C10 (section P on the diagram) is charged to the proper energy level and then discharged through the ignition coil every time the points in the distributor open. The coil in turn transfers the accumulated energy through the distributor to the spark plugs.

Energy Storage Capacitor (P) In the Stevens Ignition, the energy storage capacitor is 3 to 4 times larger than that found in other C-D units. As a result, it pumps much more energy into each spark discharge, as well as causing the coil to operate more efficiently. It also lengthens the duration of the spark to between 400 and 600 microseconds, which guarantees optimum ignition under all conditions.

Ten Year Warranty

The care exercised in the design, development, and production of this unit will provide years of trouble-free service and reliable performance. Before your ignition leaves our facility it is thoroughly tested and inspected.

Every Stevens Ignition manufactured by Stevens Associates is warranted to be free from defects in material and workmanship. We will, for a period of 10 years from date of purchase, at our option repair or replace—FREE OF CHARGE—any unit that proves defective.

The complete unit must be returned by the original owner, transportation prepaid, to Stevens Associates, P.O. Box 620, Alamo, CA 94507. This warranty is void if the unit has been tampered with or subjected to abuse or collision.

Please specify the Model and Serial Number found on the Identification Plate in all correspondence concerning your Stevens Ignition.

Appendix I

STEVENS ASSOCIATES

P.O. Box 620
Alamo, CA 94507
(415) 837-9164

July 29, 1976

Mr. Irv Ettinger
Air Resources Board
9528 Telstar Avenue
El Monte, California 91731

Dear Mr. Ettinger:

It was a pleasure speaking with you on the phone the other day and meeting with Mr. Luczynski several weeks ago. Since that time, we have been conducting a complete series of bench tests to assure the compliance of our ignition system with Section 27156 of the Vehicle Code. Base line tests and tests with our ignition have been run with three different vehicles. The test results are enclosed. Installation of the Stevens ignition requires no modification to the vehicle distributor and connections are all made directly at the coil and at a battery supply source.

When you examine the test results you will note that they are consistent over the full range of engine speed, battery voltage and vehicle type. The Stevens Ignition is the only ignition system on the market that we know of that has a regulated voltage supply. Also, it is the only one with a 4 microfared capacitor, allowing for the longer spark duration in excess of three hundred microseconds and considerably higher millijoules spark energy. The only slight change in energy is created by a change in the inductance of the coil, as can be noted from the test on the '73 Ford, an 8.4 millihenry coil inductance changed the spark energy only a few percent over the 5.0 millihenry coil inductance on the other vehicle.

Only the Delco HEI Ignition approaches the energy in the spark of the Stevens over the full operating range. We will apply for separate approval of a different model for use with the HEI at a later date.

Since the energy in the spark of all conventional units depends upon the coil inductance and the current flowing in the system, whether mechanical or solid state breaker points are used, we are applying for approval for installation of our system on all vehicles utilizing a Kettering Ignition System, mechanical, solid state or photoelectric points. We have researched the literature for Ford, Chrysler, General Motors and American Motors and determined through the specification for coil inductance and primary current that we will exceed the spark energy with our unit in all cases.

We feel confident that we can meet the Delco HEI criteria with our unit,

however, improvement in engine performance would not be as great, since the spark plug gap is already at .080. We feel it necessary to develop another system for this application.

It is noted that in Section 7.0 "Data should be presented in Test #2 for any device which alters parts of any distributor that controls spark advance timing."

The Stevens ignition does not alter any parts of the distributor and, therefore, should not alter spark advance timing and does not introduce any delay from the time the points open to the firing of the spark. This is evident from the evaluation of the data comparing the conventional ignition and Stevens ignition equiped 1973 Buick.

The above data was evaluated per Section 8.1 Ignition timing. The allowable spec is +0 - 2 degrees distributor timing. The data gathered on the tests show that the Stevens ignition introduces a delay of ½ degree at high RPM, which is well within the allowable specification.

In the light of the tests performed on timing delays, we find that the Stevens ignition will not introduce any delay regardless of the switching element used. used.

In accordance with your May 5, 1976 testing criteria, we submit the following:

9.1 The signature of C.R. Stevens appearing below is that of the President of Stevens Associates, the manufacturer of the device.

9.2 Detailed description is attached and titled "FACTS ABOUT THE STEVENS IGNITION SYSTEM".

9.3 The purpose of the device is to reduce exhaust pollutants, increase performance and improve gasoline mileage.

9.4 See enclosed Owners Manual.

9.5 Approval's requested for all vehicle makes and models other than those utilizing the Delco HEI system. The device part number, SIG 101, is the same for all vehicles.

9.6 Test data results are attached.

9.7 The device submitted for testing should be returned upon completion of the tests.

9.8 Identification of the device is Stevens Ignition Model No. SIG-101.

9.9 The device will be marketed in the State of California by the Stevens Associates Independent Distributor Organization under the name of STEVENS IGNITION.

9.10 The device is compatable with all retrofit emission control devices and speed sensors and retrofit devices with a 4 degree retard in timing. The device further has a tachometer output for connection to any device that requires electronic speed sensing.

9.11 The device is compatable with electronic fuel injector systems and, further, the same tachometer output may be used for synchronization with systems that require it.

9.12 It is recommended that spark plugs of up to two ranges colder gapped at .050 to .060 be installed and that the timing may be advanced up to 4 degrees beyond manufacturers specifications when using the colder plugs or to the point just before the engine starts to "ping".

We are pleased to enclose the bench test data you require and look forward to your approval of the Stevens Electronic Ignition System for sale in the State of California. We would most appreciate copies of the results of your tests. We also have enclosed the promised copy of a technical paper delivered to the IEEE.

If you require any additional information, please call us.

Very truly yours,

STEVENS ASSOCIATES

C. R. Stevens
President

Enclosures

distributor degrees
crankshaft = dist. D° x 2

Make	Yr.	Eng Size	Cyl.	Model No.	Por.	Type	Coil No.	Ω	Cent. Adv.	Vac. Adv.	D°	Remarks
Chrys.	74	318	8	3656763	C	Elec.	2444242		3100/13-16	15.5/9.5 to 12.5	NO	
Chrys.	72	318	8	3656 390	C	B.P.	2444242	0.6	2100/14-16	15"/8-10½	32°	
Chrys.	70	318	8	3438 225	C	B.P.	2444242	0.6	2100/12-14	16"/8¼-10¾	32°	
Chev.	75	350	8	1112880	C	HET	Built IN	NO	2100/11°	12"/9°	NO	1.0 primary Ω
Chev.	74	350	8	1112168	C	B.P.	IGV 202	1.35	1200/10°	7.5-8.5/7°	30°	
Chev.	68	850	6	1110399	C	B.P.	IGV 202	1.8	2100/14.0°	20"/10°-12.5°	32°	
FORD	76	2300 cc	4	D6EE12127 BA	C	Elec.	D5AE12029		N/A	N/A	NO	
FORD	75	2800 cc	V6	75TF42100 EA	C	Elec.	D5AE12029	1.4	2300/9.0°	6¾"/2½°	NO	
FORD	75	351	8	D5AE12127 BA	CC	Elec.	D5AE12029	1.4	2150/11¼	13"/13¾°	NO	
FORD	73	400	8	D3AF-BA	CC	B.P.	F500	1.4	2000/12°-14.5°	20"/10°-13.2°	27°	
FORD	67	390	8	C7AE12127-AA	CC	B.P.	F500	1.4	2000/10½-12°	20"/8.5-11.5°	28°	
Bosch VW	73	97	4	043905205C	C	B.P.	0221123007	NO	1900/11°-12.5°	4½6"/1°-2.5°	47°	3.1 primary Ω
HALLOPY VW	—	97	4	YL5418	C	B.P.	*	*	*	*	*	same as Bosch
TOYOTA	67	1900 cc	4	19100-40014	C	B.P.	90919-02015	NO	N/A	N/A	52°	3.7 primary Ω
Honda	75	90.8	4	30100-657-7710	C	BP.	N/A	N/A	2100/12.0°	Vac. Retard	51°	
FIAT	74	125.0	4	5147	C	B.P.	BZR202A	0.8	2000/12.5°	N/A	N/A	
Hal. chev.	—	—	8	YL482 HP	C	B.P.	*	*	*	*	*	see chart *
Hal. chev.	—	—	8	2C310F	C	B.P.	*	*	*	*	*	see chev *