

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-62
Relating to Exemptions under Section 27156
of the Vehicle Code

TRW AUTOMOTIVE ELECTRONICS
"LUMENITION BREAKERLESS 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 39023 of the Health and Safety Code;

IT IS ORDERED AND RESOLVED: That the installation of "Lumenition Breakerless Ignition System" manufactured and marketed by TRW Automotive Electronics, Davis and Capewood Streets, Camden, New Jersey 08103 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 the following 1974 and older model-year vehicles with concentric distributor breaker plates:

1. Model 626-021 (4 cylinder engines with Bosch distributors)
Volkswagen, Audi, BMW, Opel, Porsche, Ford Capri, Mercedes Benz
2. Model 626-023 (6 cylinder engines with Bosch distributors)
BMW, Opel, Porsche, Ford Capri, Mercedes Benz
3. Model 626-028 (8 cylinder engines with Bosch distributors)
Mercedes Benz
4. Model 626-006 (8 cylinder engines with Delco distributors)
General Motors and American Motors

This system may not be used on vehicles with C-D ignition systems or dual point distributors where one of the points is used for emission control.

This breakerless ignition system consists of a control rotor (chopper), position sensor (light emitting diode), infrared detector and a transistor switching unit.

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 exempted by the Air Resources Board, that adversely affect the performance of the 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 "TRW LUMENITION ELECTRONIC 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 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.

Executed at Sacramento, California, this 29th day of October, 1975.

WILLIAM H. LEWIS, JR.
Executive Officer

State of California

AIR RESOURCES BOARD

October 8, 1975

Staff Report

Evaluation of TRW Automotive Electronics'
"TRW Lumenition Electronic Ignition System Conversion Kit"
for Compliance with the Requirements of Section 27156 of the
California Motor Vehicle Code.

I. Introduction

TRW Automotive Electronics, Davis and Copewood Streets, Camden, New Jersey 08103 has submitted a revised application requesting an exemption from Section 27156 of the California Motor Vehicle Code for the "TRW Lumenition Electronic Ignition System Conversion Kit". A previous application was denied (Staff report dated July 10, 1975) because of excessive retard on certain vehicle applications.

Vehicle Code Section 27156 prohibits the installation of any device or mechanism which reduces the effectiveness of the emission control system. The Air Resources Board has been granted the authority to exempt the devices or mechanisms from this prohibition if a finding shows the device or mechanism will not adversely affect the performance of the emission control system.

TRW is requesting an exemption for installation of the device on certain 1974 and older model year foreign and domestic make vehicles having four, six or eight cylinder engines with conventional breaker-point distributors and concentric breaker plates except those vehicles equipped with dual point distributors where one set is used to retard timing for emission controls or those vehicles equipped with either O.E.M. or aftermarket C-D ignition systems.

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II. System Description

The TRW/Lumenition Electronic Ignition System is a breakerless ignition system kit intended to replace the breaker points within the distributor. It consists of a control rotor, a position sensor, and a transistor switching unit. This device utilizes the ignition coil supplied with the vehicle. The control rotor (chopper) is placed over the cam of the distributor and has windows cut for four, six or eight cylinder engine applications. The position sensor operates in conjunction with the control rotor and consists of a light emitting diode and an infrared detector. The signals derived by the position sensor are fed to a power unit which amplifies the signal and accomplishes transistor switching of the primary voltage to the ignition coil. (Reference Appendix A and B)

III. System Evaluation

The applicant has submitted data comparing the ignition system characteristics with and without the device. A brief summary of their data is shown below:

1) Bosch Distributor - 4 cylinder 1965 and later models

(Volkswagen, Audi, BMW, Mercedes Benz, Opel, Porsche, Ford Capri)

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	10	10
2000	20	18
2600	26	26
3200	33	31

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B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
3	0	0
6	4	0
9	13	13
15	13	13
20	13	13

C. Secondary Voltage Available KV (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	35 (17)	36 (15)
4000	27 (14)	37 (14)

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	25	24
4000	25	26

E. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1800	1700
4000	1600	1550

F. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	14.0	13.7
4000	9.9	10.6

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- 2) Bosch Distributor - 6 cylinder - 1968 and later models (Mercedes Benz, BMW, Opel, Porsche, Ford- Capri)

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	4	2
2000	14	13.6
2600	18	16
3200	21	18

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
3	0	0
6	10	8
9	10	10
15	10	10
20	10	10

C. Secondary Voltage Available KV (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	35 (17)	36 (15)
3500	27 (13)	31 (15)

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	23	23
3500	26	25

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E. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1800	1600
3500	1600	1400

F. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	14.2	12.3
3500	9.8	9.4

3) Mercedes Benz - 8 cylinder - 1975 model year

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	5	4
2000	12	10
2600	13	13
3200	13	13

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
6	0	0
9	6	4
15	15	13
20	15	13

C. Secondary Voltage Available KV (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	34 (20)	36 (16)
3000	28 (14)	31 (13)

D. Secondary Voltage Rise Time in Microseconds

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
600	35	25
3000	32	27

E. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1800	1650
3000	1650	1500

F. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	13.4	13.7
3000	9.0	9.9

4) Buick - 8 cylinder - 1967-1971

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	5	4
2000	14	14
2600	18	18
3200	20	20

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
6	0	0
9	3	3
15	15	15
20	17	17

C. Secondary Voltage Available KV (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	32 (18)	32 (17)
3000	28 (17)	30 (15)

D. Secondary Voltage Rise Time in Microseconds

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
600	30	26
3000	28	25

E. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1400	1400
3000	1100	1200

F. Spark Energy in Millijoules

<u>RPM</u>	<u>Baseline</u>	<u>Device</u>
600	13.4	13.7
3000	9.0	9.9

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The following tests were conducted at the Air Resources Board
Laboratory.

5) Bosch Distributor - 4 cylinder - 1973

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	8	8
2000	13	11
2600	18	16
3200	20.5	21

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
3	0	0
6	1	1
9	5	5
15	5	5
20	5	5

C. Secondary Voltage Available (with load) KV

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
200	11	12
800	16	14
4000	14	14

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D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
200	50	45
800	40	40
4000	40	35

E. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
200	700	700
800	1000	850
4000	750	800

F. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
200	10.9	9.1
800	19.0	14.7
4000	12.0	12.4

The data submitted by the manufacturer and tests made by the Air Resources Board Laboratory Showed that the device will not result in any modification of the spark ignition characteristics which would tend to increase emissions in the above vehicles.

IV. Recommendation

The staff recommends granting an exemption from the prohibitions of Section 27156 of the Vehicle Code for the following vehicles:

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- 1) Model 626-021 (4 cylinder engines with Bosch distributors)
Volkswagen, Audi, BMW, Opel, Porsche, Ford Capri,
Mercedes Benz
- 2) Model 626-032²³ (6 cylinder engines with Bosch distributors)
BMW, Opel, Porsche, Ford Capri, Mercedes Benz.
- 3) Model 626-028 (8 cylinder engines with Bosch distributors)
Mercedes Benz
- 4) Model 626-006 (8 cylinder engines with Delco distributors)
General Motors and American Motors

TRW

September 30, 1975

Mr. K.D. Drachand, Chief
Vehicle Compliance
Air Resources Board Laboratory
9528 Telstar Avenue
El Monte, California 91713

RE: TRW/Lumenition Breakerless Ignition System Conversion Kit

Dear Mr. Drachand:

On September 26, 1975, Mr. R.J. Kenny pointed out to our Mr. Mc Cue that our kit no. 626-036 (Ford 6-cyl.) exceeded the ARB criteria for timing variation when centrifugal advance data is added to the vacuum advance data. We are presently analyzing this situation to determine the problem, if there is a problem. Meanwhile, in order not to hold up approval on the other models, we will temporarily withdraw our application for kit no. 626-036.

We will resubmit 626-036 along with other kits at a later date.

This leaves under application, per my letter of August 15, 1975, and my letter of September 12, 1975, to Mr. Kenny with corrected data, the following kits:

626-021 4-Cylinder Bosch
626-023 6-Cylinder Bosch
626-028 V8 Bosch
626-027 4-Cylinder VW (Bosch) Industrial
626-006 V8 Delco (GM and AMC)

Can I assume that when our application is approved, it will allow an O.E.M. (e.g. BMW) to sell vehicles in California equipped with the appropriate Lumenition installation?

I look forward to hearing from you on our application.

Very truly yours,

TRW AUTOMOTIVE SUBSYSTEMS



William P. Donohue
Division Manager

WPD/rk

cc: Mr. W.C. Mc Cue

July 3, 1975

Mr. K.D. Drachand, Chief
Vehicle Compliance
Air Resources Board Laboratory
9528 Telstar Avenue
El Monte, California 91713

RE: YOUR LETTER OF JUNE 5, 1975---TRW LUMENITION BREAKERLESS IGNITION
SYSTEM CONVERSION KIT

Dear Mr. Drachand:

The answers to your questions are as follows:

- (1) Test data requested is shown on the attached data sheets 1 - 16.
- (2) Attached is revised Exhibit III, Part 1, showing part numbers as requested.
- (3) The Lumenition system is not compatible with after-market or O.E.M. C-D ignition systems, and we do not recommend interfacing the two kinds of devices. The Lumenition system is designed to replace the breaker points with a permanent, non-adjustable photo-optic trigger, which still uses the Kettering principle for energy storage. This means that the O.E.M. coil sees the same kind of signal it would receive if the points were still in place. If a vehicle has an existing C-D system, we recommend replacing it with the Lumenition system and a standard coil and standard spark plugs.
- (4) The Lumenition system is not compatible with dual point distributors where one set of points is used to retard timing for emission control. As a result, we do not have kits for such vehicles.
- (5) To our knowledge, the only vehicles we retrofit with unequal cam angles are pre-1968 Type 1, 2 and 3 Volkswagens. According to Volkswagen of America, the number 3 spark plug firing was retarded 3° to overcome an overheating problem with that cylinder. VW of America recommends to its dealers to replace worn pre-1968 distributors with new distributors which have equal cam angles. To overcome the overheating problem, they recommend retarding the spark 3° from original manufacturer's specifications.

Mr. K.D. Drachand

July 3, 1975

Henceforth, our instruction sheets for Volkswagen vehicles will carry the statement: "On Type 1, 2 and 3 vehicles prior to 1968 Model Year, timing should be retarded 30° from manufacturer's specifications."

- (6) The Lumenition system is fully compatible with electronic speed sensors which are capable of utilizing a positive square wave signal as an input, such as the Dana, Carter and AQP-Electro-NOx speed sensors.
- (7) The 8 cylinder Ford unit was delivered to your office by Mr. W.C. McCue.

We trust this information satisfies your requirements and paves the way to certification. If you have any further questions, please call me at the number listed at the bottom of the first page of this letter.

Very truly yours,

TRW AUTOMOTIVE SUBSYSTEMS



W.P. Donohue
Division Manager

WPD/cmr

Attachment

cc: Mr. W.C. McCue

GENERAL DESCRIPTION OF THE LUMENITION® SYSTEM

Lumenition® is a breakerless, optically triggered electronic subsystem for controlling the ignition of a spark ignited internal combustion engine. As presently manufactured it is a retrofit package, making use of the OEM distributor by direct substitution for the breaker points. It is designed to use the OEM coil, but high performance requirements are met by the use of a special coil in conjunction with the electronic package.

It operates as follows: Infrared radiation from a light emitting diode is focused on the junction of a phototransistor; a slotted sheet metal or plastic disc affixed to the distributor shaft interrupts the beam, producing an on-off signal for spark control.

The opto-electronic trigger signal (basically a measure of crankshaft position) is amplified and used to control a power semiconductor which actually switches the coil primary current and so controls the spark energy. Since both the initiation and interruption of the coil current are controlled by the optically generated signal, spark timing is only a function of crankshaft position. The performance, then, is very much the same as a properly adjusted breaker point system, but the absence of any moving parts in rubbing contact makes the initial timing adjustments permanent.

POWER AMPLIFIER

TRIGGER

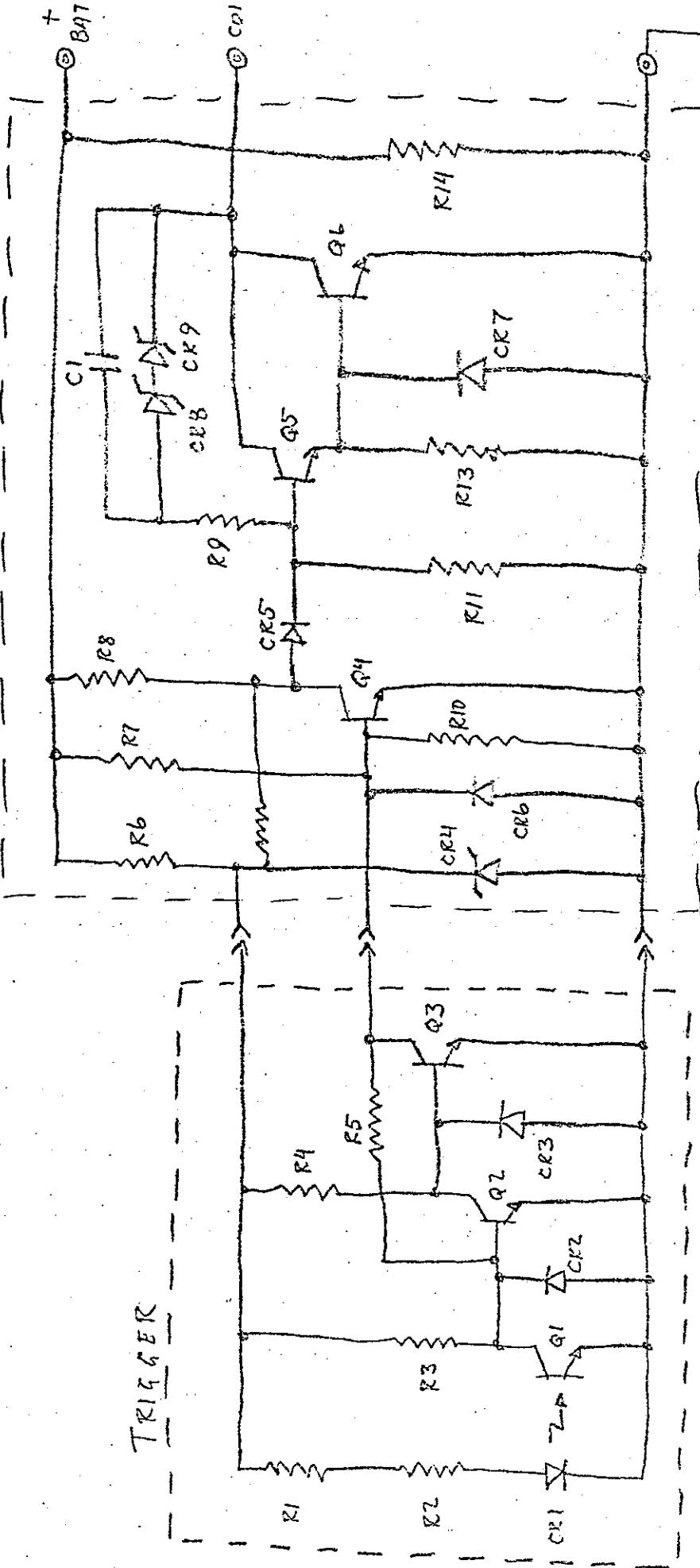


FIGURE 2 - CIRCUIT DIAGRAM

EXHIBIT A

TW3 73 Apr 75

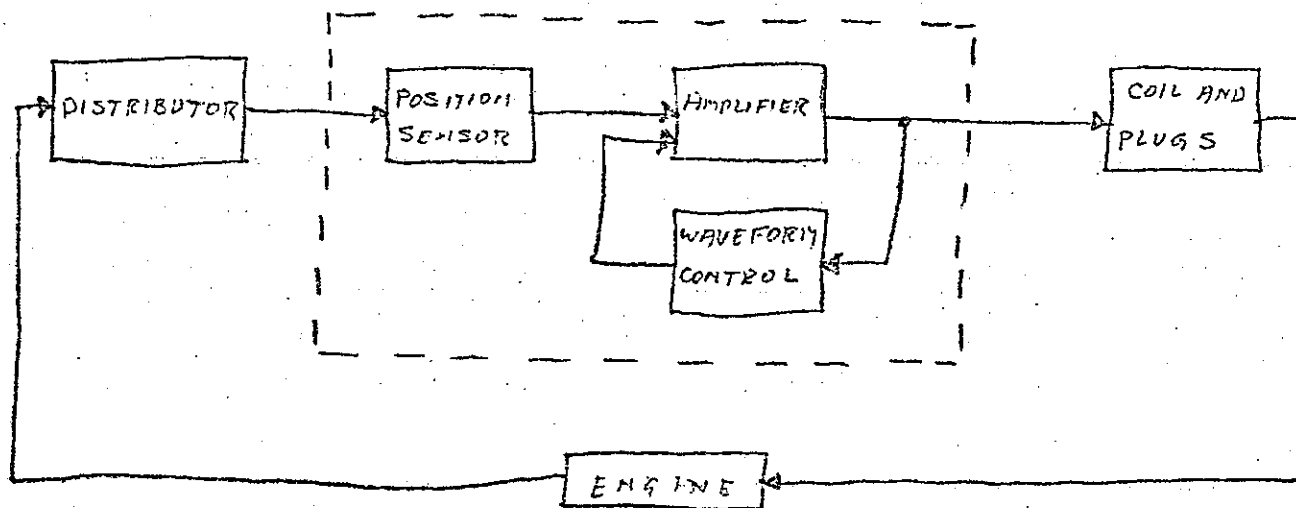


FIGURE 3 - SYSTEM BLOCK DIAGRAM

FOR BOSCH 4 CYLINDER CLOCKWISE ROTATION (626-021)

BOSCH 4 CYLINDER COUNTER CLOCKWISE ROTATION (626-022)

Appendix B

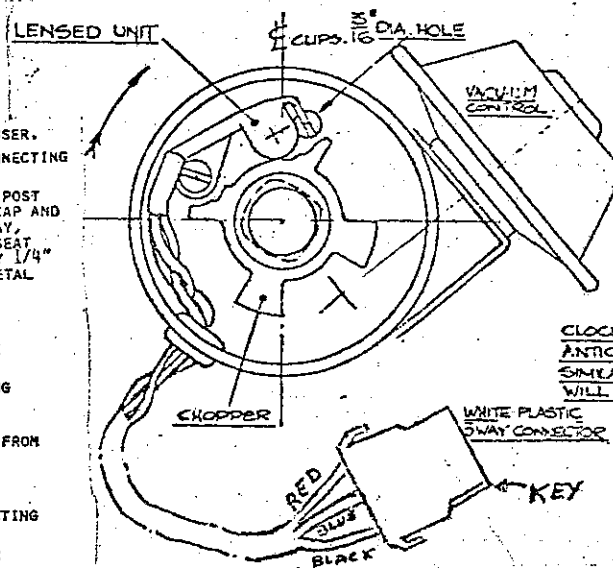
READ AND FAMILIARIZE YOURSELF WITH THE INSTRUCTIONS, DIAGRAMS, AND PARTS.

PREPARATION

1. THIS KIT IS FOR USE ON VEHICLES WITH NEGATIVE GROUND.
2. BE SURE YOUR KIT IS IDENTIFIED FOR THE DISTRIBUTOR IN YOUR VEHICLE.
3. TURN IGNITION SWITCH OFF.

DISTRIBUTOR (REFER TO FIGURE 1)

1. DISTRIBUTOR PREPARATION
 - A. OPEN DISTRIBUTOR, LEAVING SPARK PLUG WIRES IN CAP.
 - B. REMOVE AND RETAIN ROTOR.
 - C. REMOVE AND DISCARD DUST COVER (IF SO EQUIPPED), POINTS, AND CONDENSER.
 - D. REMOVE AND DISCARD POINT WIRE AND GROMMET FROM DISTRIBUTOR, DISCONNECTING POINT WIRE FROM NEGATIVE COIL TERMINAL.
 - E. ON DISTRIBUTORS WHICH HAVE A NYLON OR FIBER POST WITH SPRING, THE POST MUST BE SHORTENED AS FOLLOWS: (1) REMOVE AND DISCARD RETAINING CAP AND SPRING, (2) PRESS FURNISHED REPLACEMENT CAP DOWN OVER POST HALF WAY, (3) GRASP POST WITH PLIERS AND PULL UP WHILE PUSHING CAP DOWN TO SEAT FIRMLY ON PLATE, AND (4) CUT OFF TOP PORTION OF POST APPROXIMATELY 1/4" ABOVE CAP FOR CHOPPER BLADE CLEARANCE. FOR DISTRIBUTORS WITH A METAL POST, THIS STEP IS UNNECESSARY.
2. TRIGGER INSTALLATION
 - A. FISH TRIGGER CABLE THROUGH THE DISTRIBUTOR POINT WIRE HOLE FROM THE INSIDE.
 - B. INSTALL TRIGGER UNIT ON MOUNTING PLATE USING EXISTING POINT MOUNTING SCREWS.
 - C. SLIDE GROMMET OVER TRIGGER LEADS AND INSTALL INTO DISTRIBUTOR HOLE FROM THE OUTSIDE. CHECK FOR FIT.
3. CHOPPER INSTALLATION
 - A. LOCATE CHOPPER OVER CAM. PRESS DOWN GENTLY ON CHOPPER WHILE ROTATING UNTIL ALIGNMENT IS ACHIEVED.
 - B. USING FAN BELT, MANUALLY ROTATE ENGINE UNTIL CHOPPER BLADES CLEAR TRIGGER.
 - C. PRESS CHOPPER FIRMLY DOWNWARD UNTIL IT IS FULLY SEATED ON CAM.
 - D. CHECK THAT THERE IS NO INTERFERENCE BETWEEN CHOPPER BLADES AND TRIGGER BY MANUALLY ROTATING ENGINE; BLADES SHOULD ROTATE APPROXIMATELY HALF-WAY BETWEEN OPTICS.



VIEW LOOKING DOWN INTO DISTRIBUTOR WITH CAP, DUST COVER, AND ROTOR REMOVED

FIGURE 1

ROUTE TRIGGER LEADS INSIDE DISTRIBUTOR TO ENSURE CLEARANCE OF THE CHOPPER. REPLACE ROTOR AND DISTRIBUTOR CAP. CHECK SPARK PLUG WIRES FOR TIGHTNESS.

6. INSERT THREE CONNECTOR PINS INTO CONNECTOR HOUSING AS SHOWN ORIENTING BLACK WIRE TOWARD TAPERED EDGE OF CONNECTOR. MAKE SURE TERMINALS LOCK INTO CONNECTOR HOUSING.

POWER MODULE (REFER TO FIGURE 2)

1. LOCATE SUITABLE MOUNTING AREA.
 - A. FLAT AREA 6 IN X 4 IN.
 - B. MUST HAVE FREE AIR MOVEMENT.
 - C. AWAY FROM RADIANT HEAT SOURCES SUCH AS EXHAUST MANIFOLD.
2. USE THE POWER MODULE AS A TEMPLATE AND MARK OFF MOUNTING HOLES ON THE MOUNTING SURFACE. MAKE SURE THERE IS CLEARANCE FOR CABLE.
3. DRILL 5/32 IN DIAMETER HOLES AT MARKED-OFF MOUNTING LOCATIONS.
4. ATTACH POWER MODULE WITH #10 SELF-TAPPING SCREWS SUPPLIED.
5. SECURE GROUND LEAD TO A WELL GROUNDED SURFACE. SCRAPE TO BARE METAL TO ASSURE A GOOD CONNECTION.

FINAL HOOK-UP

1. DRESS THE THREE-WIRE CABLE THROUGH THE ENGINE COMPARTMENT FROM THE POWER MODULE TO THE DISTRIBUTOR MAKING SURE IT CLEARS MOVING PARTS AND HOT SURFACES.
2. JOIN THE THREE-WIRE CONNECTOR FROM THE POWER MODULE TO THE PREVIOUSLY INSTALLED CONNECTOR FROM THE DISTRIBUTOR. (THE CONNECTOR IS KEYED AND WILL ONLY JOIN ONE WAY.) BE SURE RED IS TO RED, BLUE IS TO BLUE, BLACK IS TO BLACK.
3. ROUTE THE TWO-WIRE CABLE TO THE COIL AREA, MAKING SURE IT CLEARS MOVING PARTS AND HEAT SURFACES.
4. CONNECT BLUE TERMINAL TO NEGATIVE TERMINAL OF COIL (SOMETIMES LABELED DISTRIBUTOR). THIS IS THE TERMINAL FROM WHICH THE POINT WIRE WAS REMOVED.
5. CONNECT THE RED TERMINAL TO THE POSITIVE END OF THE COIL. (POSITIVE TERMINAL HAS LEAD WHICH CONNECTS TO IGNITION SWITCH.)
6. RESET ENGINE TIMING TO MANUFACTURER'S SPEC. THIS IS A FIXED DWELL ANGLE SYSTEM AND SHOULD REQUIRE NO PERIODIC TIMING ADJUSTMENTS.
7. ENGINE IS NOW READY TO RUN.

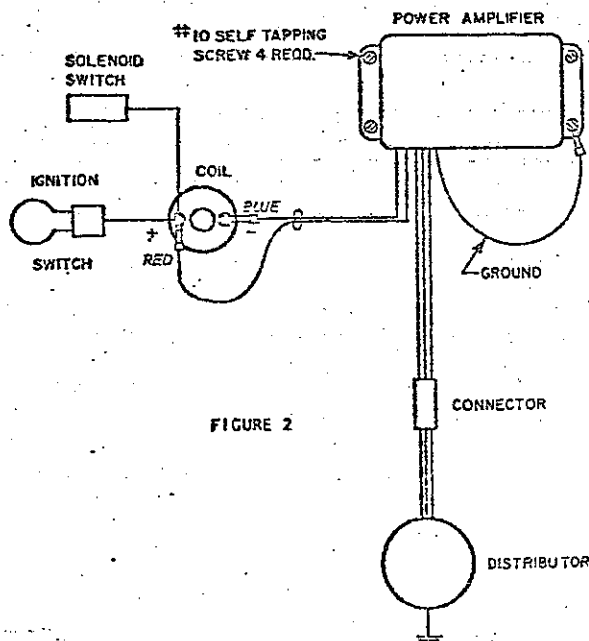


FIGURE 2

TESTING INSTRUCTIONS FOR TRW/LUMENITION IGNITION SYSTEM

(NEGATIVE GROUND ONLY)

If the system is operating we do not recommend routine testing.

Electronics do not deteriorate and therefore only the spark plugs, rotor arm, distributor and spark plug leads require checking, service, or replacement.

In the event that the system is not functioning first check all connections. In particular, verify that a good ground connection exists all the way to the battery. If in doubt, temporarily jumper battery negative terminal to ground terminal of power unit.

The system comprises three main components:

POWER AMPLIFIER ASSEMBLY

TRIGGER ASSEMBLY (LENSED UNIT)

CHOPPER

1) TO TEST COMPLETE SYSTEM

- 1) Remove the spark coil High Tension (H.T.) lead from the distributor and hold it 1/4" from grounded frame. On cranking the engine sparking should occur between the lead and frame.

2) TO TEST THE POWER AMPLIFIER ASSEMBLY

- 1) Unplug the distributor at the 3-pin connector.
- 2) Remove the H.T. Coil lead at the distributor and hold it 1/4" to 1/2" from a good ground.
- 3) Turn on the ignition switch.
- 4) By means of a small piece of wire shaped like a hair pin connect the blue wire to the black wire on the heat sink side of the 3-pin connector. When breaking this connection sparks should occur between the H.T. lead and ground.
- 5) If there is a very weak spark check the coil. If there is no spark suspect a power amplifier fault.
- 6) Before testing trigger, verify that correct voltages exist at power amplifier terminals. With connector disconnected, the following voltages should exist with ignition on:

3-pin connector between black (-) and red (+) leads $7V \pm 1V$

3-pin connector between black (-) and blue (+) leads $0.8V \pm 0.3V$

vehicle frame to battery ground: less than 0.1V

vehicle frame to blue ring terminal: $12 \pm 2V$

vehicle frame to red ring terminal: $12 \pm 2V$ (battery voltage)

vehicle frame to black ring terminal (ground) less than 0.1V

3) TESTING THE TRIGGER ASSEMBLY (LENSED UNIT)

This test is only valid with a good Power Amplifier Assembly. With the TRW/Lumenition system completely wired up, including the 3-pin connector, and the ignition switch on, connect the positive lead of Voltmeter carefully to the blue lead at the back of the 3-pin connector, and connect the negative lead of the Voltmeter to the black ring terminal. With an uninterrupted beam of light between lenses the meter should read 0.1 to 0.2 volts. With an interrupted beam of light the meter should read 0.6 to 0.9 volts (use finger to interrupt light beam). Before suspecting Lensed Unit ensure good Voltmeter connections.

NOTE: The light beam is invisible to the human eye!