

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-44-2
Relating to Exemptions under Section 27156
of the Vehicle Code

FAIRCHILD SEMICONDUCTOR
"BREAKERLESS IGNITION SYSTEM KV-E300"

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 the "Breakerless Ignition System KV-E300" manufactured by Fairchild Semiconductor, a division of Fairchild Camera and Instrument Corporation, 464 Ellis Street, Mountain View, California 94040 has been found not 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 all domestic (except Chrysler Corporation) 1974 and older model year vehicles equipped with 6 or 8 cylinder engines and 12 volt negative ground ignition systems except vehicles originally equipped with breakerless, C-D (OEM or aftermarket), electronic ignition systems or dual point distributors where one of the points are used for emission control and 1966-1970 vehicles with NOx retrofit devices and 4° spark retard (i.e., Carter-CER, Echlin, STP-Air Computer and AQP-Electro-NOx).

The device consists of a magnetic pickup unit operating on the original distributor cam, mounting bracket, solderless connectors, feeler gauge, and an amplifier module for transistor switching of the primary current to the standard ignition coil.

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 "BREAKERLESS IGNITION SYSTEM KV-E300" 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.

Executed at Sacramento, California, this 30th day of October, 1975.

WILLIAM H. LEWIS, JR.
Executive Officer

State of California

AIR RESOURCES BOARD

October 7, 1975

Staff Report

Evaluation of the Fairchild Semiconductor
"Breakerless Ignition System KV-E300"

I. Introduction

Fairchild Semiconductor, a division of Fairchild Camera and Instrument Corporation, 464 Ellis Street, Mountain View, California 94040 has applied (Exhibit A) for an exemption from the prohibitions of Section 27156 of the California Motor Vehicle Code for the "Breakerless Ignition System KV-E300" for all domestic (except Chrysler Corp.) 1974 and older model year vehicles equipped with 6 or 8 cylinder engines and 12 volt negative ground ignition systems except those vehicles originally equipped with breakerless, C-D (OEM or aftermarket), electronic ignition systems or dual point distributors where one of the points are used for emission control and 1966-1970 vehicles with NOx devices and 4° spark retard (i.e., Carter-CER, Echlin, STP - Air Computer and AQP - Electro - NOx).

Section 27156 of the Motor Vehicle Code prohibits the installation of any device or mechanism which reduces the effectiveness of the required emission control devices. This vehicle code section also authorizes the Air Resources Board to exempt devices from this prohibition if a finding shows that the device will not adversely effect the performance of the emission control system.

II. System Description

The Fairchild "Breakerless Ignition System KV-E300" is a kit designed to replace the breaker points within a distributor. This kit consists of an amplifier, magnetic pick-up unit, mounting bracket, solderless connectors, feeler gauge and installation instructions (Exhibit B).

The magnetic pick-up is placed on a mounting bracket supplied with the kit. This bracket is custom made for each specific distributor application. The air gap between the pick-up and the distributor cam lobe is determined by a feeler gauge. When the high points of the cam moves past the magnetic pick-up, an induced voltage signal is generated. This signal is transferred to the amplifier which triggers an electronic switch controlling the current flow to the primary side of the ignition coil. This signal stops the current flow to the primary side of the coil which causes the magnetic field of the coil primary to collapse. The collapse of the magnetic field builds up the voltage in the coil secondary and causes the spark plug to fire. The electrical schematic is presented in Exhibit C.

III. System Evaluation

The applicant did not submit any emission data indicating the device will not have any adverse effect on the emission control system. The applicant did submit data for characterizing the ignition system performance in order to evaluate the device, by comparing the output characteristics of an ignition system with and without the device.

The tests were accomplished on an ignition system simulator according to the "Ignition System Measurements Procedure" SAE J973a. The comparisons are shown in Table I and II. The electronic circuit has a time lag between the magnetic pick-up signal and the signal from the electronic switch. This has the effect of causing the spark to retard at the higher engine rpm range.

It was noticed that the applicant chose distributors (eccentric breakerplate timing advance design) that had calibrations considerably less than the maximum possible 22-24 degrees crankshaft. This would mitigate the effects caused by the eccentric breakerplate. This was discussed with the applicant and as a result the applicant then submitted additional data on distributors with greater angular vacuum spark advance and also different breakerplate designs to confirm the performance of his device. The following summary shows a comparison of the distributors tested by the applicant.

A. Original Data

<u>Distributor</u>	<u>Type Design</u>	<u>Maximum Vacuum Advance (degrees crankshaft)</u>
1971 Ford - 8 cyl.	Eccentric	8.2
1971 Ford - 6 cyl.	Eccentric	17.4
1971 American Motors - 6 cyl.	Eccentric	14.0

B. Additional Data

<u>Distributor</u>	<u>Type Design</u>	<u>Maximum Vacuum Advance (degrees crankshaft)</u>
1973 Ford - 8 cyl.	Pivotal Concentric	24.4
1967 Ford - 8 cyl.	Eccentric	21.8
1968 Chevrolet- 6 cyl.	Eccentric	22.0

The comparison data for spark advance characteristics of the additional distributors are shown in Tables III and IV.

This series of tests show that the device caused a spark timing retardation, however the device does not exceed the Air Resources Board limit of 4° (crankshaft) spark retard. The difference between baseline and device results of the balance of the test data shows the results to be within experimental and test variability and, therefore, the installation of the device will not change the ignition performance characteristics.

IV. Conclusion and Recommendations

Based on the evaluation of the application the installation of the Fairchild "Breakerless Ignition System KV-E300" would not adversely affect the performance or operation of the OEM pollution control system. The staff recommends that Fairchild Semiconductor be issued an exemption from the prohibitions of Section 27156 of the Vehicle Code for the "Breakerless Ignition System KV-E300" for usage as noted in the introduction.

Table I - Fairchild Ignition System Data Summary for 1971 Ford 6 and 8 cylinder engines.

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>1971 Ford - 8 cylinder</u>		<u>1971 Ford - 6 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0	-0.4	0	0
1400	6.4	3.8	4.8	3.8
2000	18.0	14.3	10.2	9.0
2600	19.6	17.2	13.8	12.0
3200	20.8	18.6	15.4	13.8

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
6	0	0	4.4	4.0
9	2.0	2.0	15.6	14.0
15	8.2	8.0	17.4	16.0
20	8.2	8.0	17.4	16.0

C. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
1000	1100	1100	1100	1000
3500	700	900	800	1000

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
1000	50	23	24	24
3500	25	25	24	24

E. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
1000	35	34	37	35
3500	17	21	21	39

F. Available Voltage in Kilovolts

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
1000	25	26	25	26
3500	20	21	24	25

Table II - Fairchild Ignition Systems Data Summary for 1971 AMC 6 and 8 cylinder engines.

A. Centrifugal Spark Advance in Crankshaft Degrees

Engine RPM	1971 American Motors - 8 cylinder		1971 American Motors - 6 cyl.	
	Baseline	Device	Baseline	Device
600	0	0	0	0
1400	5.2	4.2	4.0	2.0
2000	13.2	12.0	12.6	11.4
2600	20.0	18.2	17.0	13.6
3200	22.4	20.0	19.0	15.6

B. Vacuum Spark Advance in Crankshaft Degrees

Vacuum in. Hg.	Baseline	Device	Baseline	Device
3	0	0	0	0
6	0	0	0	0
9	6.0	6.0	10.0	10.0
15	14.4	14.4	14.0	14.0
20	14.6	14.4	14.0	14.0

C. Spark Duration in Microseconds

Engine RPM	Baseline	Device	Baseline	Device
1000	1700	1600	2000	2000
3500	1000	950	900	1200

D. Secondary Voltage Rise Time in Microseconds

Engine RPM	Baseline	Device	Baseline	Device
1000	50	21	40	20
3500	25	22	22	22

E. Spark Energy in Millijoules

Engine RPM	Baseline	Device	Baseline	Device
1000	53	55	56	56
3500	29	37	21	50

F. Available Voltage in Kilovolts

Engine RPM	Baseline	Device	Baseline	Device
1000	28	35	27	37
3500	22	24	24	29

Table III - Fairchild Ignition System Data Summary for 1973 Ford 8 cylinder engines.

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>1973 Ford - 8 cylinder</u>		<u>1973 Ford - 8 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0.4	0	1.0	0.8
1400	10.0	8.2	15.4	13.6
2000	14.8	12.4	16.0	14.2
2600	20.0	17.2	17.2	15.0
3200	25.0	22.8	18.0	15.6

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
6	4.6	4.0	0.6	0.6
9	14.0	13.4	8.2	7.8
15	24.0	24.0	17.6	16.8
20	24.4	24.4	21.8	21.8

Table IV - Fairchild Ignition System Data Summary for 1968 Chevrolet 6 cylinder engines.

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>1968 Chevrolet - 6 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>
600	0	0
1400	4.0	2.2
2000	12.6	11.2
2600	17.0	13.6
3200	19.2	15.8

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
3	0	0
6	0	0
9	5.0	4.6
15	19.0	19.0
20	22.0	22.0

Exhibit A

18 September 1975

Mr. Richard Kenny
California Air Resources Board
9528 Telstar Ave.
El Monte, California 91373

Dear Mr. Kenny:

In telephone conversations with our Mr. Len Arguello regarding the exemption of our Breakerless Retrofit Ignition System (Model K.V. E300), the question of performance on automobiles fitted with California retrofit emission control systems (N.O.X.) has been raised.

I would draw your attention to the letter of November 5, 1974, from Robert B. Hood to Mr. George Lew of the California Air Resources Board. The subject of this letter is the performance of the aforementioned emission devices in conjunction with our K.V. E100 retrofit ignition system. Since the output device and circuitry used for the output stage is identical in the KV E100 and KV E300, the signal available at the coil negative terminal should be unchanged.

The retrofit emission systems (N.O.X.) should therefore be unaffected by the installation of either the K.V. E100 or E300 ignition systems.

I hope this letter meets with your requirements; if you have any questions or suggestions, please feel free to call me at (415) 962-3511.

Yours truly,



Rodney Smith
Engineering Manager
AUTOMOTIVE PRODUCTS

/tmg

Attachment

Exhibit A

15 August 1975

Mr. Richard Kenny
California Air Resources Board
9528 Telstar Avenue
El Monte, Calif. 91371

Subject: REQUEST FOR EXEMPTION FROM VC27156 PROHIBITION

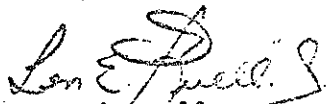
Dear Mr. Kenny:

Fairchild Semiconductor is planning to market a retrofit Breakerless Ignition System under the trademark "KV", Model E300. This letter will become our Company's (Fairchild) official request to be granted exemption from the prohibition of Section 27156 of the California Vehicle Code for all domestic vehicles (with the exception of Chrysler Corporation's) models 1974 or older, equipped with an eight or six cylinder engine. We feel that the addition of this device to the ignition system of the above mentioned vehicles will not adversely affect emissions beyond the levels as specified by State regulations. In order to assist in establishing the KV-E300's insignificant effect on vehicle emissions output, the following material is included:

- A) Ignition System test data as specified by California A.R.B. using standard ignition components. (Attachment 2)
- B) Description of device's construction and circuit schematic. (Attachment 1)
- C) Installation instructions. (Attachment 3)
- D) A representative device for evaluation.

I will be glad to do anything possible to help expedite approval of this exemption. In case there are any questions, please call me (415: 962-3504).

Very truly yours,


Len Arguella

/tmg

Attachments

Exhibit A

Mr. George Lew
California Air Resources Board
9528 Telstar Avenue
El Monte, California 91373

November 5, 1974

Dear Mr. Lew:

As promised during our recent telephone conversation, I am offering the following comments on performance of the previously approved California Retrofit Emissions Systems when used in conjunction with the KV Electronic Ignition System:

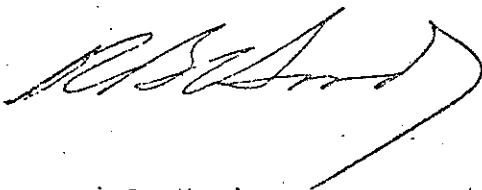
"Both of the systems you mention (manufactured by Carter and Dana) use the signal from the coil negative terminal as the primary engine speed input for their ignition advance control operation. Additionally, the Dana System derives its power from the same terminal."

"Since the KV Electronic Ignition System presents a signal to the coil negative terminal that is almost identical to that produced at the same location by the breaker point OEM system, simply maintaining the connection prescribed in the installation manuals of the Carter and Dana systems should produce unchanged operation. This connection is identified as point "A" on the attached diagram (taken from my earlier letter to Mr. Dick Kenny.)

"Therefore, the retrofit emission systems should operate with no change in performance when used with the KV Electronic Ignition System."

I trust that this statement meets your present requirements. If you have any comments or suggestions, please call me at (415)962-2574. I will plan to be in touch in the next few days to see if further information is needed.

Yours truly,



Robert B. Hood
Manager/Advanced Automotive Products

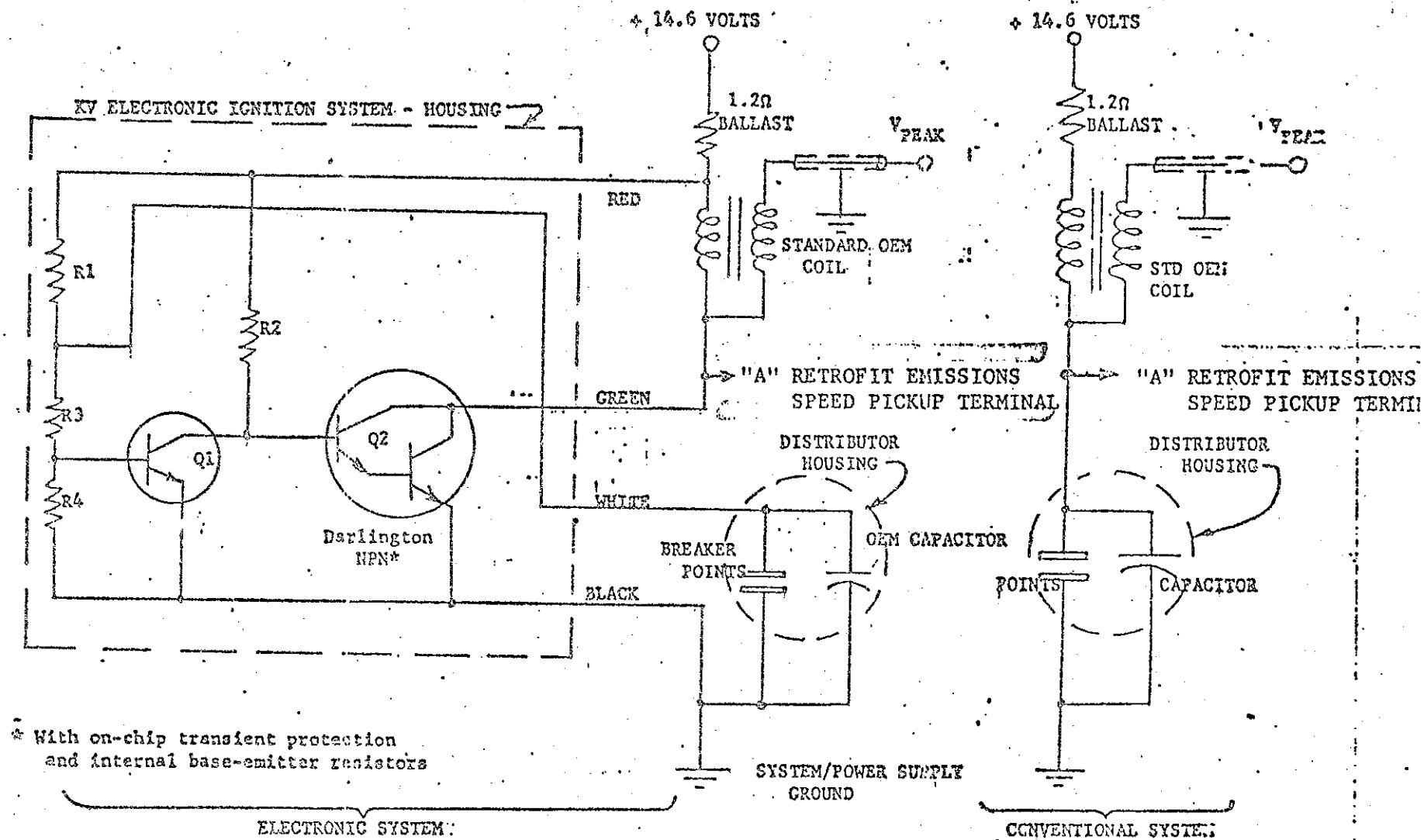


Figure 1 (a) SYSTEM TEST CONNECTION AND SCHEMATIC
DIAGRAM

FAIRCHILD MODEL E-300
BREAKERLESS ELECTRONIC IGNITION SYSTEM
INSTALLATION INSTRUCTIONS

This system has been designed for engines using 12 volt battery, negative ground and standard OEM coil and ballast resistor. Before installing the system, read through these instructions carefully. It is recommended that plugs, wire, rotor and cap be inspected for wear and dirt. If any of these ignition components are worn, deteriorated or fouled, the performance of your Breakerless Electronic Ignition will be less than optimum. When drilling mounting holes, care should be taken to wear eye protection and use a properly grounded drill.

Tools Required: Screwdriver
Center Punch (or Sharp Nail)
Pliers
Drill with 1/8" Bit

1. Turn off ignition. Remove distributor cap, rotor, points and condenser, and the wire from the points, with its rubber grommet.

For GM cars, also remove the radio interference shield as it is no longer required with this type of system.

2. Using attached list, select appropriate adapter plate and mount the magnetic pick-up to the plate using the #6-32 screw with the captive star lock-washer. Leave the screw just snug for later adjustment.
3. Mount adapter plate to distributor base plate using #8-32 round head/star lock washer, and/or countersunk #8-32 where applicable. (See list.)
Position the adapter plate to use the original point holes in the distri-

buter base plate. Tighten adapter plate screws. (For Ford cars equipped with dual points, see diagram.)

For all GM 8 cylinder adapter plates, special care is necessary to use the correct holes (A or B) depending on the model and corresponding adapter plate number/letter combination. (See list.)

4. Rotate distributor cam (if equipped with manual transmission, push car in high gear; if automatic transmission, use starter) until high part of cam is centered to the pick-up pole piece and adjust gap to .008" using feeler gauge provided. Use another screwdriver to wedge pole piece arm (using slot provided in adapter plate), while tightening pick-up holding screw. Recheck gap setting after tightening.
5. Feed pick-up wires through distributor hole and slide appropriate grommet over wires and into hole. Use either original grommet or one from kit supplied. Replace rotor in its normal position. Replace distributor cap, observing that in some cases the distributor cap acts to hold the grommet in place, and care should be taken to make sure the grommet is correctly positioned. Make sure that the pick-up wires are correctly dressed inside distributor as shown.

Slip wires into nylon male connector until snap action of tangs is felt. A needle-nosed pliers or tweezers would help here. This locks wires into connector. The black wire goes into connector hole #1 and the red wire into connector hole #2. (See diagram.)

6. Locate the Electronic Module on the firewall or flat portion of fender well. Measure the distance from module mounting location to coil and distributor. It should not extend further than the wiring harness.

7. Using the point of a nail or center punch, mark location of mounting holes of module.
8. Drill two 1/8" holes in the metal fender well. If you are locating the unit on the firewall, be careful not to drill through any existing wiring leading to instrument panel.
9. Mount the electronic module with the metal screws provided. Use a screwdriver or a 5/16" socket. Check to make sure it is flush and secure.
10. Route the wiring harness from the Electronic Ignition Module to the coil. Be careful that it does not interfere with linkages or exhaust manifolds.
11. Remove the spark plug wire center nipple to facilitate getting at terminal post of coil. Remember to replace before starting engine or damage to the electronic unit may result.
12. Remove the nut from the "Battery" (+) terminal post of the coil (marked on coil) using a 3/8" open end wrench or pliers. Connect the eyelet of red wire from the electronic module to this terminal post. Tighten nut with wrench or pliers.

(Ford): Remove the push-on connector from the positive ("Batt") terminal post of the coil. Connect the eyelet of the red wire from the electronic module to this terminal post and secure with the thin, sheet-metal nut provided (flange up). Tighten the nut with a wrench or pliers and replace the push-on connector firmly.
13. Remove the nut from the negative (-) terminal post of the coil. Remove existing wire. Connect the eyelet of green wire from electronic module to this terminal post. Tighten nut with wrench or pliers.

(Ford): Remove the push-on connector from the negative ("Dist") terminal post of the coil. Connect the eyelet of the green wire from the electronic module to this terminal post and secure with the thin, sheet-metal nut provided (flange up). Tighten the nut with a wrench or pliers.

14. Connect the black wire to a suitable metal ground on engine, cross bolt or coil bracket. Scrape off any corrosion to insure a positive connection. If the module has been mounted on a metal surface, the ground (black) wire can be connected to one of the mounting screws.
15. Snap the male connector on the pick-up wires from the distributor into the female connector on the shielded cable from the Electronic Module.
16. Route wiring to avoid linkages, hot manifolds, etc. and secure neatly with tie-downs provided.
17. Before starting engine, check each of the following carefully:
 - are all connections clean and tight?
 - is module securely mounted?
 - are wires routed free of linkages, hot spots, etc.? Tied down?
 - have the rotor and cap been replaced correctly?
 - is the spark plug wire outer nipple reconnected to the coil?
 - are the pick-up wires connected to the correct holes on the male connector? (Black to #1, red to #2.)
18. Start engine. If engine will not start, or runs rough, check the following:
 - a. repeat step 17.
 - b. recheck gap between high point of cam and pick-up pole piece. (Should be 8 thousandths - .008 inches.)
 - c. set engine timing to manufacturer's specification.

19. Attach "Warning" sticker to air cleaner or radiator.

NOTES:

1. Dwell is electronically set by the module. Therefore, dwell setting or adjustment is neither necessary nor feasible.
2. For best results it is important to check the engine timing against the manufacturer's specification and reset if necessary.
3. Check spark plug wiring for cracks or other defects - the higher voltages generated by the system may cause deteriorated wiring to cross-fire or arc to ground.

ADAPTOR PLATE CROSS-REFERENCE LIST

(Applies only to cars not originally equipped with factory electronic ignitions.)

MAKE	YEAR	NO. OF CYL.	ADAPTOR PLATE #	MOUNTING HOLE USED	MOUNTING SCREWS USED		
					#6-32	#8-32 ROUND	#8-32 FLAT
PONTIAC ¹	'63 - '74	8	168	B	1	2	0
OLDSMOBILE	'64 - '74	8	168	B	1	2	0
CADILLAC	'71 & '72	8	168	B	1	2	0
ALL OTHER GM	'64 - '74	8	168	A	1	2	0
ALL OTHER GM	'64 - '74	6	173	-	1	0	1
FORD	'60 - '74	8	167	-	1	1	0
FORD (DUAL POINT)	'60 - '74	8	167	-	1	1	1
FORD	'60 - '74	6	172	-	1	1	1
AMERICAN MOTORS	'67 - '74	8	168	A	1	2	0
AMERICAN MOTORS	'67 - '74	6	173	-	1	0	1

1. Pontiac 307 CID engines use mounting hole A.

RED

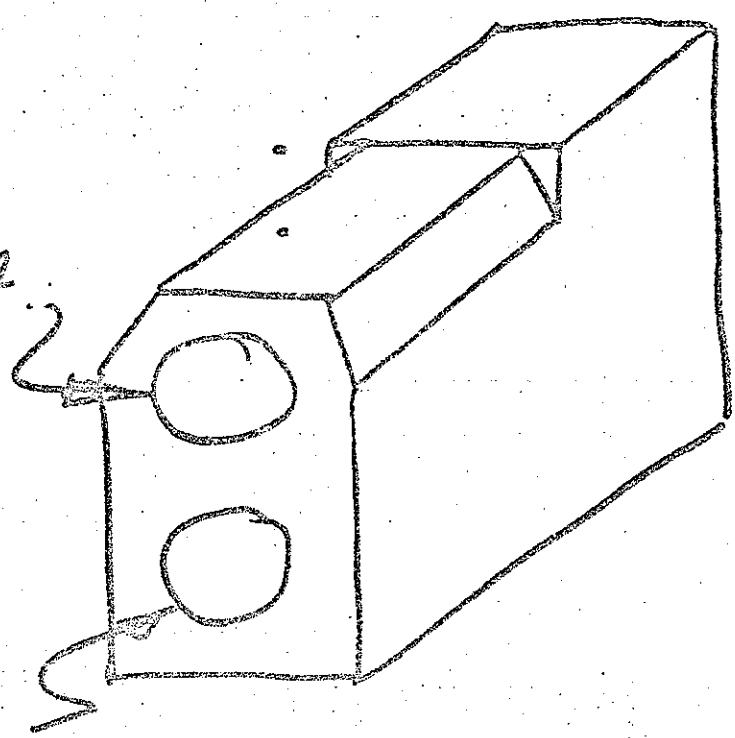
FROM
pick-up.

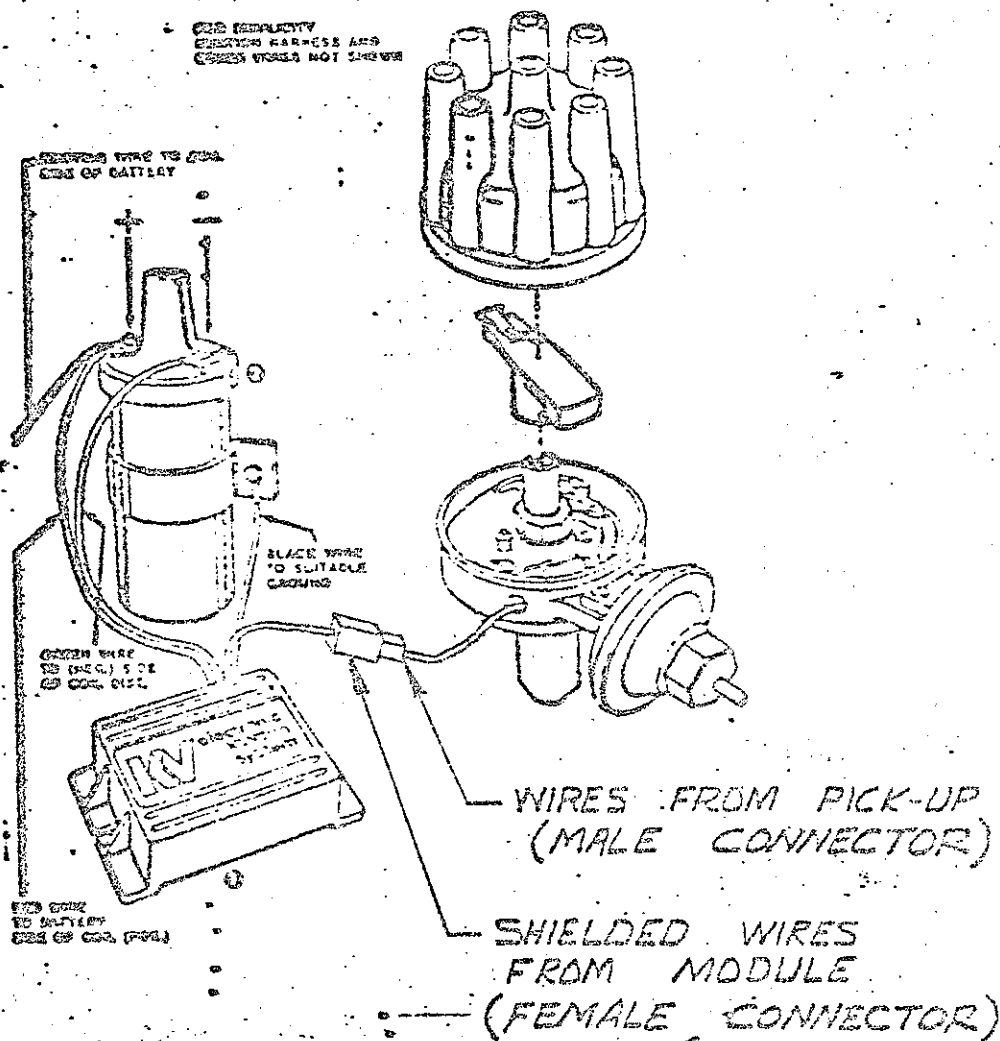
Black

HOLE #1

HOLE #2

MALE CONNECTOR



CONNECTION DIAGRAMFIGURE 3



1. ALL RESISTORS ARE IN OHMS (Ω); 1/4 W UNLESS OTHERWISE SPECIFIED.

EXHIBIT C