State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-54-4
Relating to Exemptions under Section 27156
of the Vehicle Code

PRESTOLITE ELECTRICAL DIVISION
IHC "FLEETRITE" BREAKERLESS
INDUCTIVE 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 the IHC "Fleetrite" breakerless inductive ignition system manufactured by the Prestolite Electrical Division, 511 Hamilton Street, Toledo, Ohio 43694, has been found not to reduce the effectiveness of required motor vehicles pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1975 and older model year vehicles except as follows:

1) Those vehicles originally equipped with breakerless ignition systems or dual point ignition systems where one of the points is used to retard timing for emission control.

2) Those 1966 through 1970 vehicles equipped with "NOx retrofit devices" with a 4° retard in basic ignition timing (i.e., Carter, Echlin, STP Air Computer, Pure Power - Electro-NOx).

IHC "Fleetrite" consists of an electronic pack, trigger wheel and pick up assembly, and wiring harness. This device is marketed for the following applications:

Engine	Model
AMC and GMC 8 cylinder	549621-C19
AMC and GMC 6 cylinder (except V-6)	549622-C19
Ford 6 cylinder (except V-6)	549623-C19
Ford 8 cylinder	549624-C19
Chrysler 6 cylinder	549625-C19
Chrysler 8 cylinder (361, 383, 400, 413, 426, 400 CID)	549626-C19
Chrysler 8 cylinder (273, 318, 340, 360 CID)	549627-C19

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 BY ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE IHC FLEETRITE BREAKERLESS INDUCTIVE IGNITION SYSTEM 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 43644 of the Health and Safety Code provide 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.

Executive Order D-54-3, dated November 26, 1975 is still valid.

Executed at Sacramento, California, this 11 day of ~~February~~ March, 1976.

original signed by
WILLIAM H. LEWIS, JR.
Executive Officer

State of California

AIR RESOURCES BOARD

March 6, 1975

Staff Report

Evaluation of Prestolite Electrical Division "BID" Breakerless Inductive Ignition System for Exemption from the Provisions of Section 27156 of the Vehicle Code

I. Introduction

Prestolite Electrical Division, 511 Hamilton Street, Toledo, Ohio 43694, has applied for an exemption for its "BID" breakerless inductive ignition system. Prestolite Electrical Division intends to market this device for 1974 (1972 for Chrysler products) and older model-year domestic vehicles equipped with a standard Kettering ignition system. Vehicles equipped with dual point distributors, where one of the points are used to retard timing for emissions control, are specifically excepted.

II. Device Description and Function

The "BID" is a breakerless, retrofit ignition system utilizing a resonant, magnetic pick-up coil and a metallic "toothed" trigger wheel that lowers the magnetic field strength in the pick-up coil. This voltage reduction triggers a change in a unistable switch which controls a power switching transistor. This power transistor controls current flow to the primary of the OEM ignition coil and the remainder of the standard Kettering ignition system. The system is pictured in Exhibit I. This type of system is described in the February 14, 1973

staff report entitled "Evaluation of Capacitive Discharge and Transistorized Ignition Systems for Compliance with the Requirements of Section 27156 of the Vehicle Code". The major effect of the installation of this device is the replacement of the OEM point system with a metal detecting switching system similar to Chrysler's OEM breakerless ignition system.

III. Device Evaluation

The applicant submitted electrical characteristics data and emission data on a 1972 International Harvester, Model 1010, with a 392-4V V-8 engine. Tests were run according to the CVS-2 procedure with the vehicle in three conditions:

1) As received.

2) Tuned to vehicle manufacturers specifications and

3) As in 2) but with Prestolite "BID" system installed.

The results in Table I are the averages of two tests for each condition.

Table I

Prestolite CVS-2 Data on IH Model 1010

Test Condition	Emissions in gms/mi. HC	CO	NOx
As Received	1.87	48.52	4.08
Tuned to Manufacturer's Specifications	1.74	55.29	4.42
"BID" System Installed	1.53	48.74	3.89

During the third phase of the Prestolite tests the idle rpm increased 30-40 rpm, thus it is not clear that all of the HC and CO reductions may be attributed to the "BID" system. No increases from the OEM system baseline were caused by the installation of the "BID" system.

The "BID" system on the IH truck was installed on a distributor with its vacuum advance system pivoted concentrically with the distributor shaft. However, several problems with decreased vacuum advance have been encountered on similar breakerless systems installed with eccentrically (off-center) pivoted vacuum advance units (see February 24, 1975 staff report on Essex International, Inc.'s "Elightronic" system). In order to evaluate this effect and to confirm the reported electrical characteristics data from Prestolite on a back-to-back basis with an OEM system, vehicle tests were performed by the ARB laboratory on both a concentrically and an eccentrically pivoted vacuum advance equipped distributor. The tests were performed on a Delco V-8 distributor with concentric advance installed in a 1974 AMC station wagon and on a Chrysler 6 distributor with eccentric advance installed in a 1972 Dodge pick-up truck. The Dodge truck also received a back-to-back CVS-1 hot-start test to determine any adverse emission effects due to the shortened dwell period of the "BID" system vs. the OEM system. These results are shown in Table II.

Table II

Bench Test Results

Centrifugal Spark Advance in Crankshaft Degrees from TDC

RPM	Baseline		Device	
	AMC-V8	Chrysler-6	AMC-V8	Chrysler-6
700	0	0	0	0
1000	6	1.5	5	0
1500	13	9.5	12	3.5
2000	15	17.5	15	14.0
2500	18	22.5	17	21.0
3000	21	24.5	20	22.5

Vacuum Spark Advance in Crankshaft Degrees from TDC

Vacuum (in. Hg)	Baseline		Device	
	AMC-V8	Chrysler-6	AMC-V8	Chrysler-6
0	0	0	0	0
5	2	0	2	0
10	12	9	12	6
15	15	13.5	15	7
20	15	13.5	15	7

Spark Duration in Microseconds

RPM	Baseline		Device	
	AMC-V8	Chrysler-6	AMC-V8	Chrysler-6
700	1300	1200	1300	1200
1200	1200	1000	1100	1100
2000	1200	900	800	800
3000	800	800	700	600

Secondary Voltage Rise Time in Microseconds

RPM	Baseline	Device
	AMC-V8	AMC-V8
700	50	45
1200	50	45
2000	50	50

Available Secondary Voltage in Kilovolts

RPM	Baseline		Device	
	AMC	Chrysler	AMC	Chrysler
700	29	32	30	30
1200	30	32	30	30
2000	31	32	29	30
3000	29	32	26	28

Required Secondary Voltage in Kilovolts

	Baseline		Device	
RPM	AMC	Chrysler	AMC	Chrysler
700	14	11	13	10
1200	14	9	15	9
2000	13	6	14	7
3000	11	5	13	6

Back-to-Back CVS-1 Hot Start Test on Chrysler Truck

	Emissions (gms/mi)		
Configuration	HC	CO	NOx
OEM	1.77	66.93	2.91
Device	1.30	54.01	2.48

Significant changes from baseline values occur in both centrifugal and vacuum advance. No emission increases in HC were seen due to the shortened dwell period; emission decreases are probably due to the retardation in ignition timing as noted above. The large change in centrifugal timing in the Chrysler at low rpm is attributed to the very steep timing curve and variations in vehicle speed during measurement. The timing differences at higher speed is judged to be more representative of the true retardation effect.

The retardation of vacuum advance is brought about by a change in geometry due to the installation of the "BID" system. The retardation of centrifugal advance stems from electronic delay in the circuitry and is from 1 to 3 engine degrees, predominently at speeds higher than 2000 rpm. Prestolite was informed of these findings and developed a fix for the vacuum advance retardation by various changes in the

attachment point of trigger wheel/pick-up coil assembly with the vacuum advance arm. The effect of these changes are shown in Table III.

This test series of the modified "BID" system shows a retardation of 1-2 degrees in the centrifugal advance at speeds of 2000 rpm or higher and a 1-3 degree retard in the vacuum advance at vacuums higher than 10 in. Hg. This amount of retardation should not exceed 4 degrees at cruising speeds of 60 mph or higher except on vehicles which have had their initial timing retarded 4 degrees due to the installation of certain NOx retrofit devices. A sustained retard in excess of 4 degrees has been judged to adversely affect emissions due to accelerated exhaust valve deterioration..

IV. Conclusions and Recommendations

It is the opinion of the staff that Prestolite Electrical Division's "BID" breakerless inductive ignition system will not reduce the effectiveness of required emission control systems except for certain 1966-1970 vehicles retrofitted with a NOx control device utilizing a sustained retardation of 4 degrees or more.

Therefore, it is recommended that Prestolite Electrical Division be granted an exemption from the prohibitions of Vehicle Code Section 27156 for its "BID" breakerless ignition system for 1974 and older model-year domestic vehicles originally equipped with the standard Kettering ignition system except for the following:

1. Vehicles equipped with a 1966-1970 NOx retrofit system utilizing a sustained ignition retardation of 4 engine degrees or more at a speed of 60 miles per hour or greater.

2. Vehicles originally equipped with a dual-point ignition system where one of the points are used to retard timing for emissions control.

Table III

Bench Test Results

Centrifugal Spark Advance in Crankshaft Degrees from TDC

RPM	Distributor Type (Baseline/Device)					
	Chrysler 6 (used)	Chrysler 6 (new)	Chrysler 8	Delco 6	Ford 6	Ford 8
600	0/0	0/0	0/0	0/0	0/0	0/0
1000	6/5	4/4	4/4	0/0	7/7	4/5
1500	12/9	15/15	20/19	5/5	17/16	15/14
2000	14/11	18/17	22/21	11/12.5	22/22	16/15
2500	17/15	19/19	24/23	15/14.5	24/22	18/17
3000	20/17	21/20	26/24.5	19/18	24/23	20/19

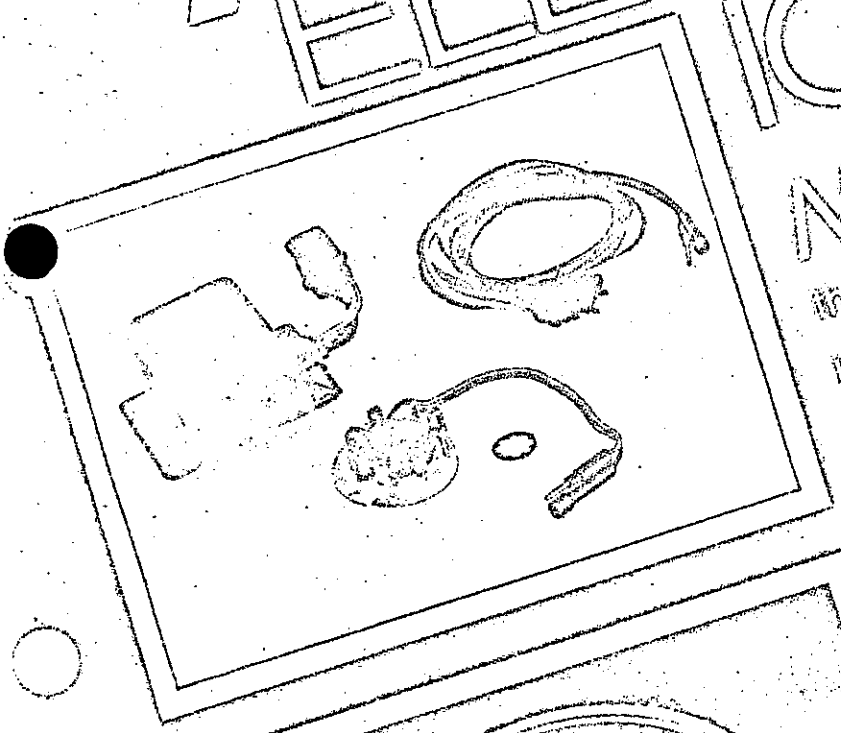
Vacuum Advance in Crankshaft Degrees from TDC

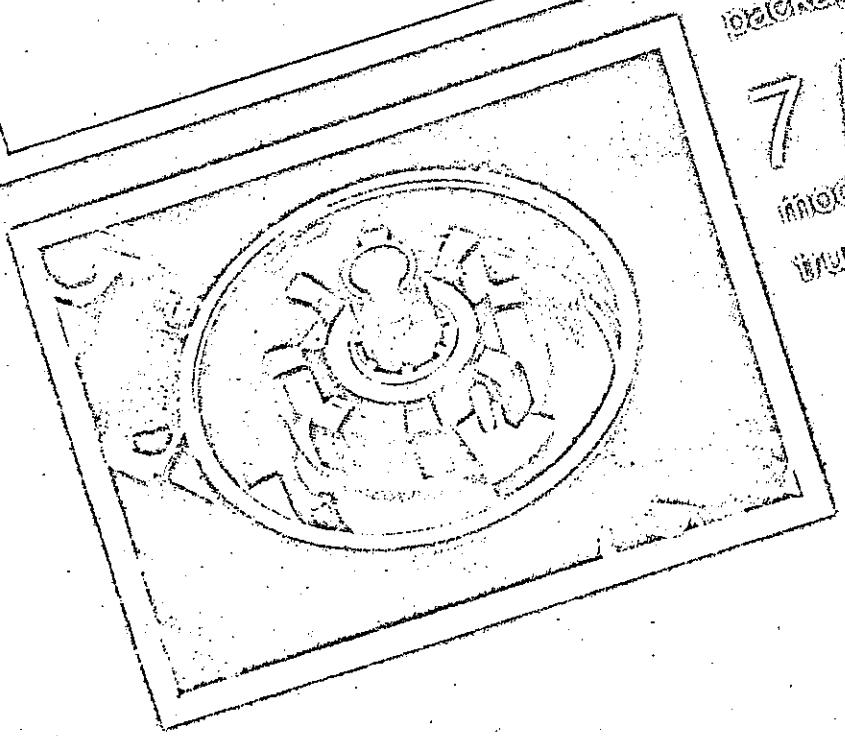
Vacuum (in. Hg)	Distributor Type (Baseline/Device)					
	Chrysler 6 (old)	Chrysler 6 (new)	Chrysler 8	Delco 6	Ford 6	Ford 8
0	0/0	0/0	0/0	0/0	0/0	0/0
5	0/0	0/0	0/0	0/0	0/0	0/0
10	5/4	14/13	2/2	5.5/5	11/13	9/9
15	14/11	14/13	21/16*	10/11	13/13	16/17
20	14/11	14/13	21/18	12/11	13/13	21/22

*vacuum advance arm adapter binding

EXHIBIT I-1

prestolite ELECTRONIC IGNITION





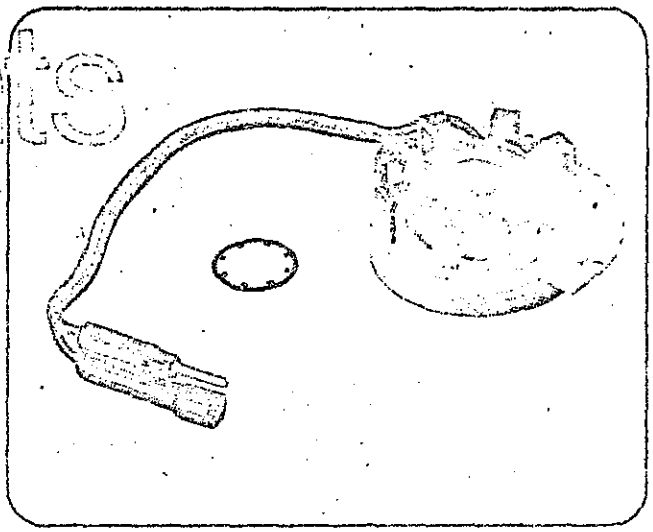
NOW!... From Prestolite the world leader in development of ignition systems for all types of vehicles, comes the most advanced electronic ignition package available today.

7 KITS... fit all late model U.S. cars and light trucks!

EXHIBIT I-2

ELECTRONIC IGNITION

components



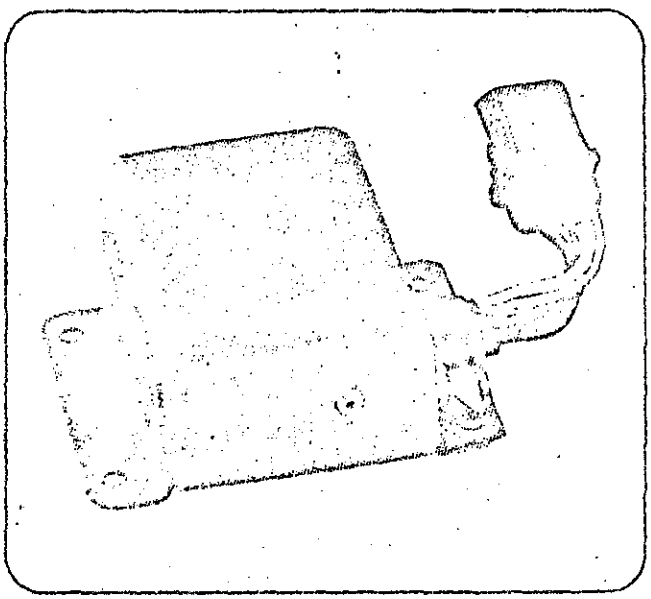
TRIGGER WHEEL AND SENSOR ASSEMBLIES

On all but the GM and AMC eight cylinder applications, the Prestolite sensor and trigger wheel is a unitized assembly.

It fits down easily over the distributor cam, replacing the points, condenser and breaker plate assembly. It is held in place by a simple retainer ring.

In the GM and AMC eight cylinder kits, the trigger wheel is attached to the rotor itself. The sensor is mounted on the breaker plate in place of the contact set.

With the unique Prestolite "F" wheel design, a pair of trigger wheel teeth pass by on each side of the sensor. This eliminates the variables of timing and dwell still present in other systems and makes any sensor adjustments completely unnecessary.



ELECTRONIC CONTROL

The electronic control is a sophisticated solid state unit that takes over the job of the contact set. Acting on signals from the sensor, the control releases the stepped up electrical charge in the coil to the spark plugs.

This unit is completely maintenance free due to a unique electronic design and a special potting compound which seals out dirt and moisture while protecting against damage from shock and vibration.

how it operates

The Prestolite Electronic Ignition utilizes a sensor, trigger wheel and electronic control. The sensor is a proximity switch, or more simply, a metal detector. The metal it detects is each pair of teeth on the trigger wheel.

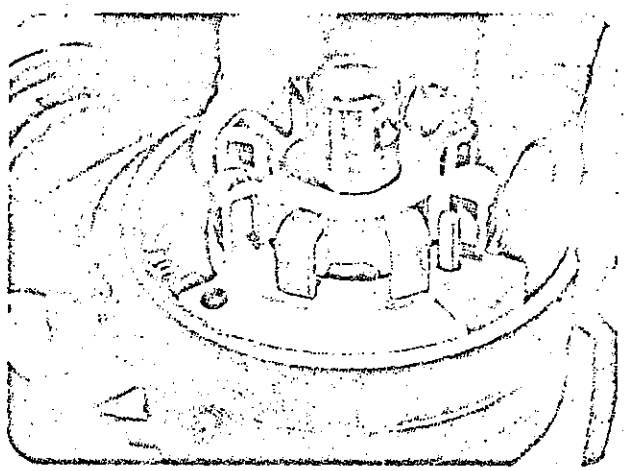
As the trigger wheel turns with the distributor shaft, the teeth pass by on each side of the sensor. Each time the sensor detects the passing teeth, it signals the electronic control to open the ignition coil primary circuit. This is equivalent to opening the contacts in a conventional ignition system. From here, high voltage from the coil travels through the distributor cap, rotor and wires to fire the spark plugs and ignite the fuel mixture in the cylinders.

easy installation

Each Prestolite kit contains all the components and wiring needed to complete the conversion, along with fully illustrated instructions.

A simple distributor conversion replaces the points and condenser with the sensor-trigger wheel assembly. The electronic control is installed on the firewall, fender well or radiator support. Connect the wiring and the car is ready to start. It's that simple. There is no dwell or point gap to set. It's all built into the electronics.

Prestolite's system utilizes standard plugs and all existing wires, rotor, distributor cap and coil. These parts should be inspected and replaced only if worn. Otherwise they will work fine with the new ignition system.



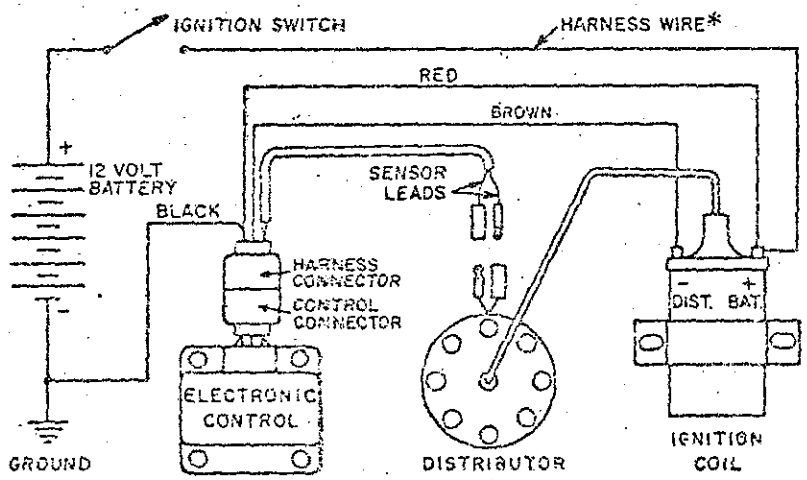
advantages

With Prestolite Electronic Ignition conventional tune-ups are virtually eliminated because there are no points and no condenser to wear out and be replaced. Since there are no mechanical wearing surfaces connected with the sensor and trigger wheel, timing and dwell remain constant for the life of the system.

In addition to this, the system:

- fits practically all American cars from 1968 to the present
- delivers an accurate spark with a long duration to more efficiently burn the fuel and produce few emissions
- will fire plugs at low cranking speeds and voltage levels for fast starts and smooth running under nearly all conditions
- is shock and moisture resistant and will operate reliably at temperatures from 20° below zero to 200° above
- allows spark plugs to burn clean and far outlast their normal service life
- is compatible with most all engine analysis equipment, timing lights and tachometers
- increases fuel economy and improves overall starting and operating performance

schematic



The Prestolite Electronic Ignition connects easily into the electrical system. The electronic control is connected by means of a wiring harness to the sensor leads coming from the distributor, to the ignition coil, and to ground. All wiring and special connectors are furnished with the kits.

*Resistance wire may be left in circuit.

The Prestolite Company
511 Hamilton Street
Toledo, Ohio 43601
Phone: 419-244-2811

March 28, 1975

Mr. Richard Kenny
Senior Engineer
California Air Research Board
9528 Telstar Avenue
El Monte, California 91731

Dear Mr. Kenny:

Enclosed are the following prints on Prestolite's seven electronic ignition systems. These prints reflect the systems which have been verbally approved by your office and incorporate modifications made on the original designs in order to meet your requirements.

Vehicle Application	Current Identification	Revised Identification
GMC 8-Cylinder	IDL-5001	IDL-5001
GMC 6-Cylinder	IDL-5002	IDL-5010
Ford 6-Cylinder	IDL-5003	IDL-5011
Ford 8-Cylinder	IDL-5004	IDL-5012
Chrysler 6-Cylinder	IDL-5005	IDL-5013
Chrysler 8-Cylinder (CCW)	IDL-5006	IDL-5014
Chrysler 8-Cylinder (CW)	IDL-5007	IDL-5015

There has been no change in the GM 8 since we agreed the original design met your standards.

We trust with this information you will issue a formal approval.

Please let me know immediately if you have any questions.

Yours very truly,

J. F. Carey, Director
Government & National Accounts Sales

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Encl.