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State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-70-5
Relating to Exemptions under Section 27156
of the Vehicle Code

MALLORY ELECTRIC COMPANY
MALLORY POWER CELL #611 IGNITION AMPLIFIER

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 "Mallory Power Cell #611 Ignition Amplifier" unidirectional current flow device 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 1978 and older General Motors, Ford and Chrysler breakerless electronic ignition systems.

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 "MALLORY POWER CELL #611 IGNITION AMPLIFIER."

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 13th day of June, 1978.

original signed by
Thomas C. Austin
Deputy Executive Officer

State of California
AIR RESOURCES BOARD

May 5, 1978

Staff Report

Evaluation of the Mallory Power Cell #611 Ignition
Amplifier in Accordance with Section 2222, Title
13 of the California Administrative Code

I. Introduction

W. R. Grace & Co. of 7091 Belgrave Ave., Garden Grove, California 92641 has applied for an exemption from the prohibitions of Section 27156 of the Motor Vehicle Code for the Mallory Power Cell #611 Ignition Amplifier. This device is designed to be installed on 1978 and older model year Ford, GM and Chrysler inductive breaker-less electronic ignition systems. (Exhibit A)

II. System Description

The Mallory Power Cell #611 Ignition Amplifier is to be used in conjunction with a vehicle's OEM electronic ignition system. The Mallory Power Cell consists of a Zener diode which is encapsulated in an environmentally protective epoxy resin. The installation of the device consists of splicing the wire on the electronic ignition module and placing the Mallory Power Cell in-series with the electronic ignition module and the ignition coil primary ground terminal (this increases the possibility of poor electrical conductivity.) The applicant claims that the Zener diode restricts the back flow of resonating current into the electronic ignition module protecting the module from possible damage.

III. System Evaluation

A. Manufacturer's Test Data

The applicant submitted back-to-back ignition data for a Delco High Energy Distributor. An examination of the data reveals questionable results for both the baseline and device tests. An initial indication of these results is revealed for the system primary voltage which should be at 12 volts. The applicant recorded a value of 9 volts d-c at start. The coil primary voltage is then shown to increase to 24 volts d-c during normal operation which is impossible for commonly used 12VDC systems.

Another discrepancy can be found in the average spark voltage. The applicant recorded the average spark voltage at 1.5 kilovolts during the cruise mode. This is contradictory to the ARB baseline tests which have recorded the average spark voltage at 11 kilovolts.

The Delco High Energy Ignition produces approximately 60 to 80 millijoules of spark energy at low engine speeds and decreases to 30 at higher speeds. The applicants baseline values of spark energy remained at 30 millijoules for start, idle, and cruise conditions. This constant energy characteristic was not experienced in previous ARB tests of a similar device.

The ARB engineering staff considered the applicant's data highly unusual and significantly different from O.E. performance characteristics. Therefore the ARB Laboratory conducted confirmatory testing to evaluate the effects of this device on breakerless electronic ignition systems.

B. ARB Tests

The ARB Laboratory conducted back-to-back bench tests on the following vehicle distributors:

- 1) 1975 Chevrolet V-8 HEI distributor.
- 2) 1975 Ford distributor equipped with an electronic ignition system.
- 3) 1974 Chrysler distributor equipped with an electronic ignition system.

All of the above tests were performed on an ignition simulator in accordance with the ARB "Criteria for Aftermarket Ignition System Modifications" adopted November 4, 1977. The Mallory Power Cell #611 Ignition Amplifier was installed according to the manufacturers installation instructions (see Exhibit B). Tables I through IV summarize the results of the test data.

~~The ARB's staff engineering evaluation of the Mallory Power Cell~~
#611 Ignition Amplifier indicates that the use of the device has the potential of increasing the Available Secondary Voltage by reducing the reverse EMF generated by the coil. The increase in the Available Secondary Voltage is relatively insignificant, since all OEM electronic ignition systems offer substantial voltage increases (80% is typical) above the required 12 KV needed to produce an arc across the spark plug gap. The Mallory device also

offers the opportunity of increasing the longevity of the electronic ignition module since less oscillating voltage is transmitted through the module components.

The ARB (Pass/Fail) criteria has set the maximum variation of the Available Secondary Voltage at $\pm 10\%$ from the baseline tests. The Mallory Power Cell indicates an increase as high as 25% over the baseline when used in conjunction with the Chevrolet HEI ignition system. Normally this would cause a strain on the conventional ignition system, but since modern electronic ignition systems use improved ignition wires and better insulation techniques this voltage increase should not result in any leaks within the ignition system.

Since the Mallory Power Cell is a unidirectional current flow device, the induced primary voltage decreased as indicated in Tables I, II, III. The reserve secondary voltage however, showed a 25% gain due to the "clipping" characteristic of the resonating current generated by the coil which apparently delays the collapse of the magnetic flux field within the primary circuit. The peak primary current was reduced during cruise conditions on both the Chrysler and Chevrolet HEI ignition systems. This lower input current resulted in less energy lost from the coil due to the Zener's operation.

The degradation of spark energy over the baseline tests show decreases from 16-12 millijoules for the Chrysler electronic ignition system due to the reduced current flow. Although

this reduction is significantly high in terms of a percentage decrease (25%), the ARB staff believes that the reduction will not have any adverse effects on the ignition system. This reduced energy output was not experienced with the Chevrolet system possibly due to the coils unique turns ratio.

IV. Manufacturer's Claims

W. R. Grace & Co. claims the installation of their Mallory Power Cell Ignition Amplifier will provide the user with improved ignition performance when used in conjunction with all Ford, GM and Chrysler Electronic ignition systems. This improvement is based on the ability of the device to prevent resonating current flow back into the electronic ignition module.

V. Conclusion and Recommendation

A brief review of the system evaluation indicates that the Mallory Power Cell #611 Ignition Amplifier has the potential to:

- 1) Increase the Available Secondary Voltage.
- 2) Reduce the fly-back (oscillating) current back into the electronic ignition module, thereby protecting it from possible damage.

In addition to these traits, the ARB engineering staff believes that ~~the Mallory Power Cell will not have any adverse effects on the ignition~~ system or emission characteristics of all GM, Ford or Chrysler vehicles equipped with breakerless Electronic Ignition Systems.

The ARB engineering staff therefore recommends that the Mallory Power Cell #611 Ignition Amplifier be granted an exemption from the prohibitions of Section 27156 of the California Motor Vehicle Code for use on 1978 and older GM, Ford and Chrysler breakerless electronic ignition systems.

Table I Mallory Power Cell #611 Ignition Amplifier System Data Summary
for 1975 Chevrolet V-8 HEI Distributor (ARB Test)

A. Coil Induced primary voltage in Peak Volts.

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	380	385
3000	275	250

B. Peak Coil primary input current in Peak Amperes

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	6.0	6.0
3000	6.5	6.0

C. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	2800	2800
3000	1300	1300

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	100	100
3000	100	100

E. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	77.0	77.0
3000	34.3	32.5

F. Available Secondary Voltage in Kilovolts (simulating fouled spark plug)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	24	24
3000	21	21

G. Available Secondary Voltage in Kilovolts (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	38.0	37.5
3000	26.0	32.5

Table II Mallory Power Cell 3611 Ignition Amplifier System Data
Summary for 1974 Chrysler V-8 with electronic ignition
distributor (ARB Test)

A. Coil Induced Primary Voltage on Peak Volts

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	175	180
3000	220	225

B. Peak Coil primary input current in Peak Amperes

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	3.5	3.0
3000	4.0	6.0

C. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1250	1250
3000	900	850

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	100	100
3000	100	100

E. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	22.0	22.0
3000	16.2	12.2

F. Available Secondary Voltage in Kilovolts (simulating fouled spark plug)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	15.5	16.5
3000	15.5	14.5

G. Available Secondary Voltage in Kilovolts (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	23.5	25.0
3000	21.5	24.5

Table III Mallory Power Cell #611 Ignition Amplifier System Data
Summary for 1975 Ford V-8 distributor with electronic
ignition.

A. Coil Induced Primary Voltage in Peak Volts

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	220	200
3000	175	160

B. Peak Coil primary input current in Peak Amperes

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	4.0	4.0
3000	4.0	3.0

C. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	1200	1800
3000	1500	1450

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	90	90
3000	90	90

E. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	38.4	34.6
3000	27.0	22.6

F. Available Secondary Voltage in Kilovolts (simulating fouled spark plug)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	20.5	16.5
3000	15.5	13.0

G. Available Secondary Voltage in Kilovolts (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>
600	27.0	25.5
3000	20.5	20.5

Table IV Mallory Power Cell #611 Ignition Amplifier System Data Summary
(ARB Test)

	Engine RPM	<u>Centrifugal Advance</u>		Engine RPM	Baseline	Device
		<u>Baseline</u>	<u>Device</u>			
1975 Chevrolet V-8 HEI Distributor	600	0	0	3000	6.5	6.5
	1000	0	0	2600	8.5	8.0
	1600	4.5	4.5	3000	9.0	8.5

in. Hg	<u>Vacuum Advance</u>		in. Hg	Baseline	Device
	<u>Baseline</u>	<u>Device</u>			
0	0	0	12	8.0	8.0
3	0	0	15	9.0	9.0
6	1.5	1.5	18	9.0	9.0
9	5.0	5.0	20	9.0	9.0

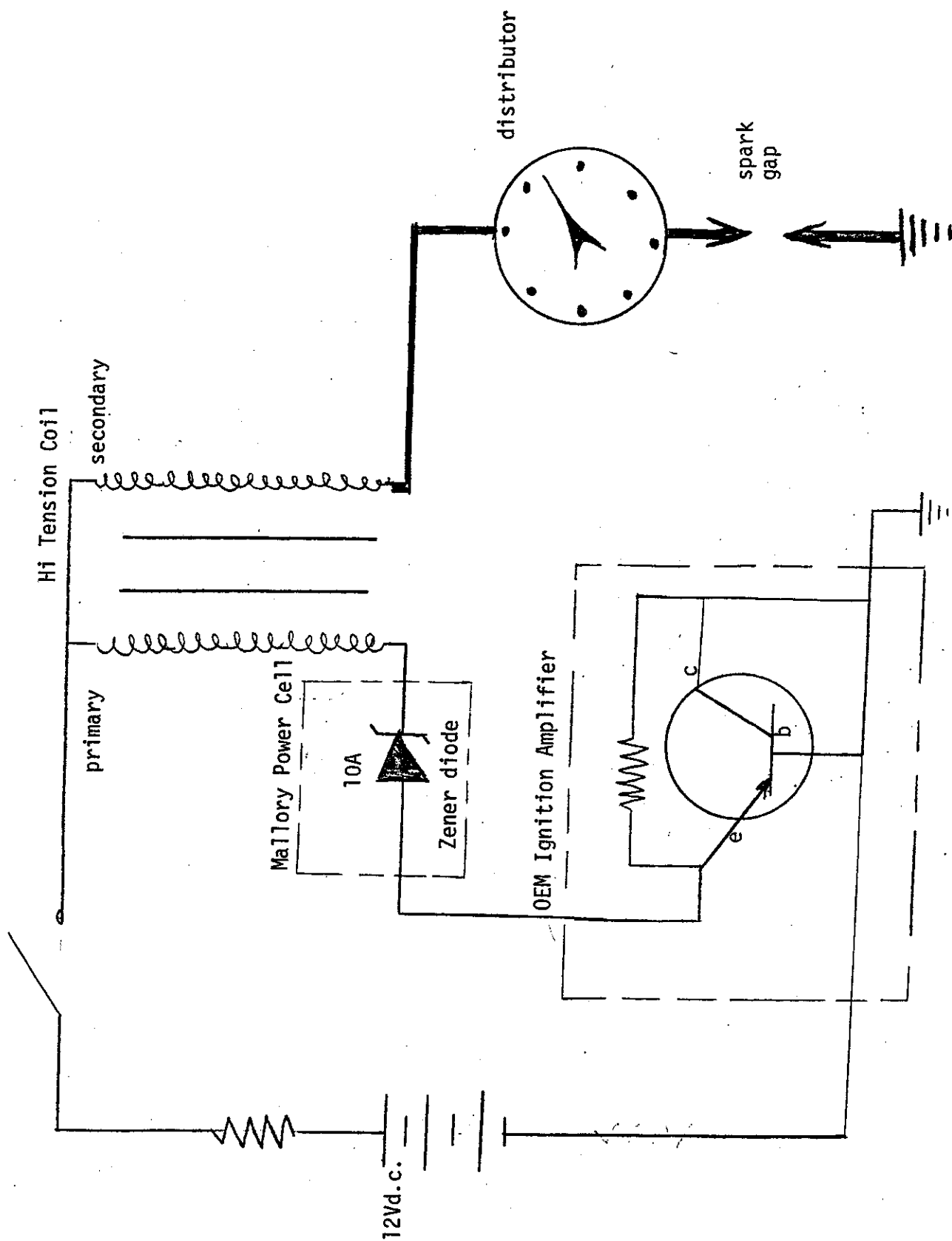
	Engine RPM	<u>Centrifugal Advance</u>		Engine RPM	Baseline	Device
		<u>Baseline</u>	<u>Device</u>			
1974 Chrysler V-8 distributor with electronic ignition	600	0	0	2000	8.0	8.0
	1000	3.0	3.0	2600	9.5	9.5
	1600	7.5	7.0	3000	10.5	10.5

in. Hg	<u>Vacuum Advance</u>		in. Hg	Baseline	Device
	<u>Baseline</u>	<u>Device</u>			
0	0	0	12	7.0	6.5
3	0	0	15	10.0	10.5
6	0	0	18	10.5	10.5
9	2.0	2.0	20	10.5	10.5

	Engine RPM	<u>Centrifugal Advance</u>		Engine RPM	Baseline	Device
		<u>Baseline</u>	<u>Device</u>			
1975 Ford V-8 distributor with electronic ignition	600	0	0	2000	2.5	2.5
	1000	0	0	2600	3.5	4.0
	1600	1.0	1.0	3000	5.0	4.5

in. Hg	<u>Vacuum Advance</u>		in. Hg	Baseline	Device
	<u>Baseline</u>	<u>Device</u>			
0	0	0	12	11.0	11.0
3	0	0	15	12.0	12.0
6	0	0	18	12.0	12.0
9	8.0	8.0	20	12.0	12.0

Figure 1. Typical Installation of the Mallory Power Cell on a breakerless electronic ignition



GRACE

Automotive Specialties Division

W. R. Grace & Co.
7091 Belgrave Ave.
Garden Grove, Calif. 92641

January 19, 1978

(714) 893-0595

Mr. G. C. Hass, Chief
Vehicle Emissions Control Program
Air Resources Board
9528 Telstar Ave.
El Monte, Calif.

RE: Application for an ARB
Resolution of Compliance
with section 27156 of the
California Vehicle Code

Dear Mr. Hass:

This letter is an application for an ARB resolution of compliance with section 27156 of the California Vehicle Code for the Mallory "Power Cell" number 611 ignition amplifier.

Description of Device:

The device is a unique electronic module that is completely encapsulated and features easy installation with O.E. electronic ignition systems.

Purpose of Device:

The device is intended to offer improved ignition performance of all Delco and Ford and Chrysler electronic ignitions by allowing increased coil ring down oscillation similar to the older breaker point magnetic storage ignition system.

This module allows all of the available coil energy to be used rather than allowing it to be absorbed into the electronics of the current O.E. pointless ignition.

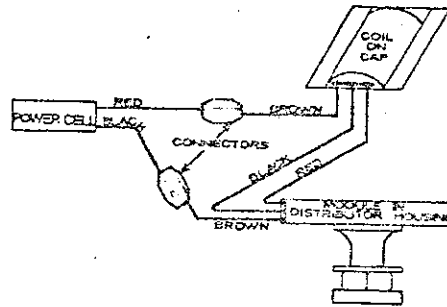
Installation:

The unit is simple to install and is a matter of a cut and splice installation. Detailed instructions are included with each unit.

Applications:

The Power Cell will operate with all Ford, Delco and Chrysler pointless ignition systems.

INSTALLATION INSTRUCTIONS



INSTRUCTIONS FOR INSTALLING MALLORY POWER CELL CONNECTING THE MALLORY POWER CELL TO A DELCO H.E.I. IGNITION SYSTEM

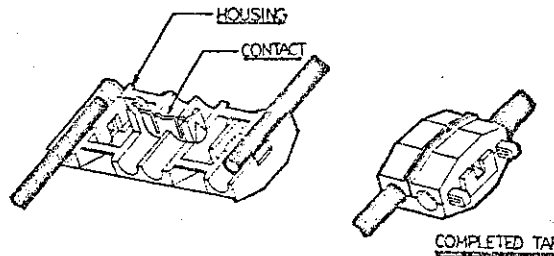
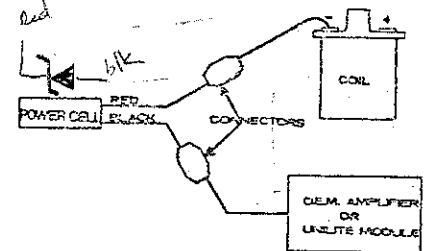
1. Mount the Power cell on the fender wall or fire wall as near the distributor as possible, using the metal screws supplied.
2. Cut the brown wire connected between the H.E.I. distributor and coil in distributor cap.
3. Using blue connectors supplied, connect the Power Cell in the circuit as shown in the diagram at left. The Power Cell wires can be shortened for a neat installation.

NOTE: Refer to connector instructions for installation of the connector.

INSTALLATION INSTRUCTIONS FOR ELECTRONIC IGNITION SYSTEMS WITH A REMOTE MOUNTED IGNITION COIL

1. Mount the Power Cell on the fire wall or fender wall as near the ignition coil as possible, using the metal screws supplied.
2. Cut wire connected to the negative (-) terminal of coil (on some Ford electronic ignition systems, this terminal is marked "D.E.C." Usually this wire is a green color).
3. Using blue connectors supplied, connect the Power Cell in the circuit as shown in the diagram at right. Connect the red wire from the Power Cell to the wire still connected to the negative terminal of the coil. Connect the black wire from the Power Cell to the other end of the cut wire. The Power Cell wires can be shortened for a neat installation.

NOTE: Refer to connector instructions for installation of the connector.



CONNECTOR INSTRUCTIONS

Install wire from Power Cell and wire from ignition coil into open connector as shown. Fold over connector and push connector together with pliers as shown in "Completed Tap."

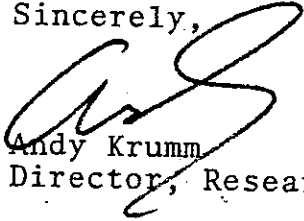
Air Resources Board
January 19, 1978

- 2 -

Test Data:

Bench test data is attached following the recommended guidelines for the use of the Power Cell with the Delco HEI ignition system. A sample unit is being forwarded under separate cover.

Sincerely,


Andy Krumm
Director, Research & Development

AK:kh
Enclosure: Ignition System Test Data
Mallory # 611

CC: Mr. M. Mallory

PART NO.

DWG NO.

REV

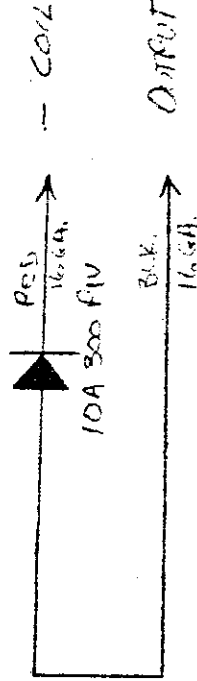
60327

REFERENCE PRINT

FEB 27 1978

DATE

Part # 40675



OUTPUT TRANSISTOR COLLECTOR

LTR	DESCRIPTION	DATE	REV
REVISIONS			
TITLE: SCHEMATIC, Part 40675			
Mallory ELECTRIC DIV OF W R GRACE & CO 1801 Oregon St. Carson City, Nev.		TOLERANCE UNLESS OTHERWISE SPECIFIED MACH. FINISH ☒ ☐ CNTRC WITHIN _____ TOTAL ANGULAR $\pm$ _____ SYMM. WITHIN _____ TOTAL DECIMAL $\pm$ _____ STRTNESS WITHIN _____ TOTAL .XX $\pm$ _____ PERP. WITHIN _____ TOTAL .XXX $\pm$ _____	
SCALE NONE		MATERIAL:	
DATE 2 JAN '78			
DRAWN GM			
CHECKED			
APPD <i>efm</i>			
PART NO. 60327	ASSY NO. 611	DWG NO.	REV

NOTES: UNLESS OTHERWISE SPECIFIED

AIR RESOURCES BOARD REFERRAL SLIP

Correspondence From: W. R. Grace & CO.

Date In : 1/23/78

Date Referred : 1/27/78

Subject:

Application for compliance -
Mallory Power Cell Number 611 ignition
amplifier

Date Due : ☐ ASAP/ 2/10/78

☒ As Noted

☐ Routine

Date Pending : _____



REFERRAL TO:

KENNY / *6111*

REFERRAL FROM: DRACHAND

- ☐ Reply—my signature
- ☐ Reply direct—copy to me
- ☒ Investigate and recommend

- ☐ Action as noted—return original
- ☐ Information and return
- ☐ Note and forward

- ☐ Note and return
- ☐ File
- ☐ Please see me

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U.S. AIR RESOURCES BOARD (U.S. ARB)