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CONTENTS

	Page		Page
Servicing the Breakerless Ignition System	1	1964 Fuel Injection Specifications Corrected	6
Chevy II Air Conditioner Blower Switch Relay Replacement	6	Chevelle Front End Alignment Specifications Revised	6

SERVICING THE BREAKERLESS IGNITION SYSTEM

A Breakerless Ignition System of the magnetic pulse type was introduced in December 1963 as an Option for certain 1964 high performance versions of Chevrolet V-8 engines. Ordered as RPO K66, this transistor controlled breakerless ignition system is currently available, factory installed, on Corvette 327 cu. in. V-8 engines of 365 and 375 hp. or on the 409 cu. in. V-8 engines of 340, 400, and 425 hp. that are offered for 1964 Chevrolet series passenger cars.

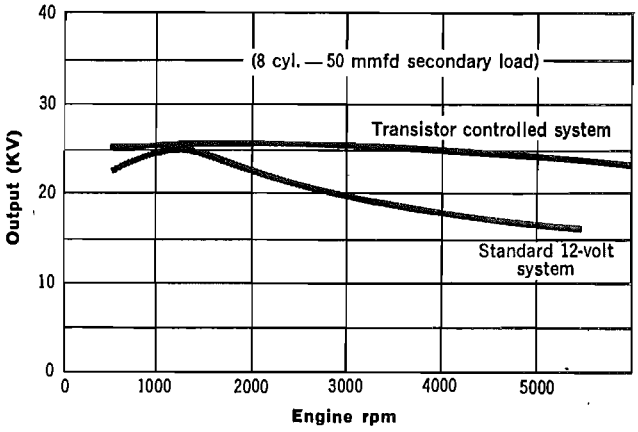
Recent advances in electronics have been put to work in the breakerless ignition system to provide faster engine starts, greater ignition system durability, and increased secondary voltage output at high engine speeds.

The three major units used in the breakerless ignition system are a magnetic pulse distributor, an ignition pulse amplifier, and a special ignition coil. Two resistance wires also are used in the circuit, one as ballast between the coil negative terminal and ground; while the other resistance wire provides a voltage drop for the "engine run" circuit and is by-passed at cranking. The other units in the system—the spark plugs, battery, and ignition switch—are all of standard design.

The elimination of the familiar contact point set is made possible by use of the magnetic pulse distributor with its static design triggering signal "pickoff." This provides the breakerless ignition system with an important advantage of maintaining its high output as vehicle operating mileage accrues. In comparison, the efficiency of standard ignition systems gradually decreases due to pitting and oxidation of the contact points.

Other advantages of the breakerless ignition system are the elimination of system efficiency loss due to point bounce and excessive rubbing block wear, two troubles that often plague standard ignition systems in high speed applications. Even spark plug life is lengthened by the higher secondary voltage output provided by this new type ignition system.

SECONDARY OUTPUT—COMPARISON



The accompanying chart of ignition system performance curves shows that the transistor controlled breakerless ignition system has greater output than the standard 12-volt system at all speeds, particularly at high speeds. While contact point deterioration problems limit primary current in the conventional system to about 4.5 amperes, the breakerless type could operate at as high as 7.0 amperes without damage to electric components.

The external appearance of the Delco-Remy magnetic pulse distributor resembles a standard ignition distributor; however, when the cap is removed it is obvious that the internal construc-

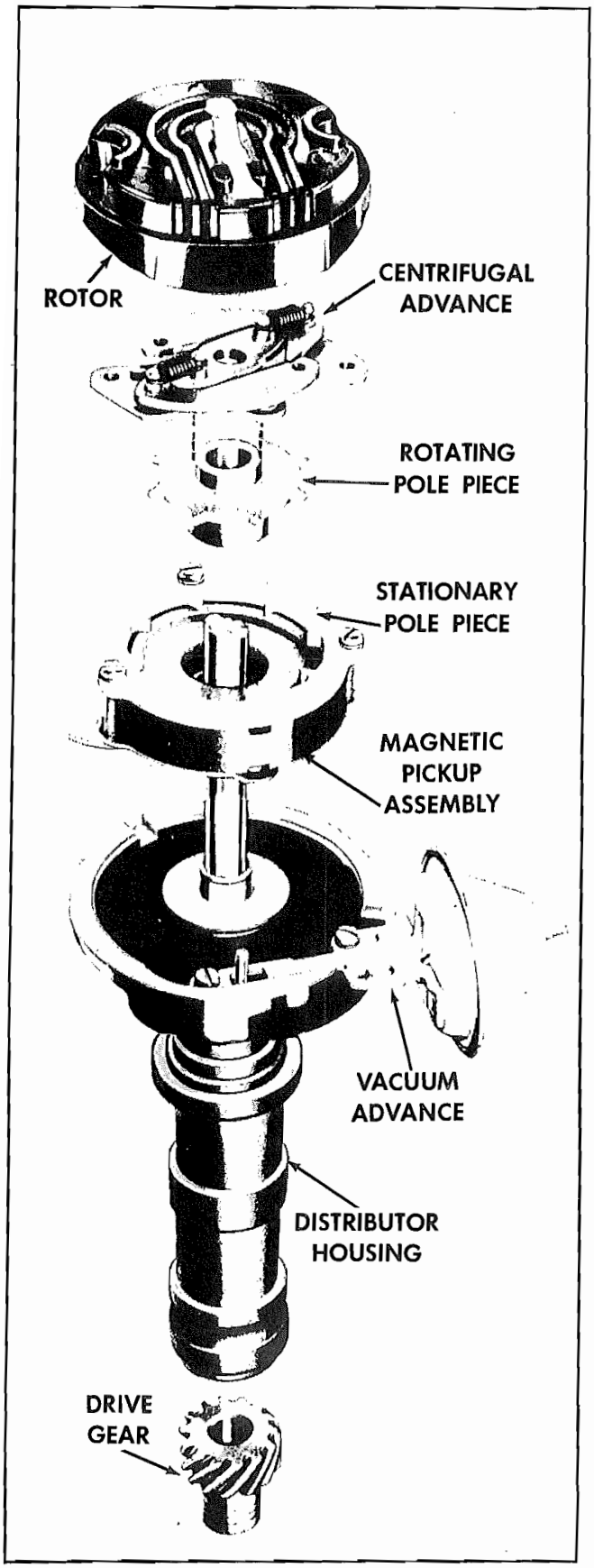


Fig. 1—Magnetic Pulse Distributor Components

tion is radically different, as shown in Figure 1. Note that familiar breaker cam has been replaced by a timer core (rotating iron pole piece), and the conventional breaker plate, contact point set, and condenser assembly have been supplanted by a stationary magnetic pick-up assembly. The timer core assembly (rotating pole piece) is attached to the distributor shaft by means of a conventional centrifugal advance mechanism and is positioned so that it will be rotated within the center of the stationary pole piece on the magnetic pickup assembly. The timer core pole piece has the same number of equally spaced external teeth (poles) as there are cylinders in the engine for which the distributor was designed. The multiple magnetic paths, provided by these poles, induce a voltage pulse in the pickup coil that is much stronger than would be obtained if a single pole were rotated in the same strength magnetic field.

The magnetic pickup assembly, within which the timer core rotates, is piloted on the O.D. of the distributor shaft bushing and rests on a bearing plate in the distributor housing. The pickup assembly is stationary except when rotated slightly by the vacuum control unit to provide timing advance. The components of the magnetic pickup assembly are a permanent magnet, a pole piece, and a pickup coil. The pole piece is a metal plate having equally spaced internal teeth, each tooth actually representing a specific cylinder of the engine when the distributor is installed.

The ignition pulse amplifier (Fig. 2), control center of the system, is housed in a cast aluminum case and contains transistors, capacitors, resistors and a zener diode, all of which are mounted on a printed circuit board. The zener diode is a circuit protection device and its case acts as a heat sink. The remaining components control and switch

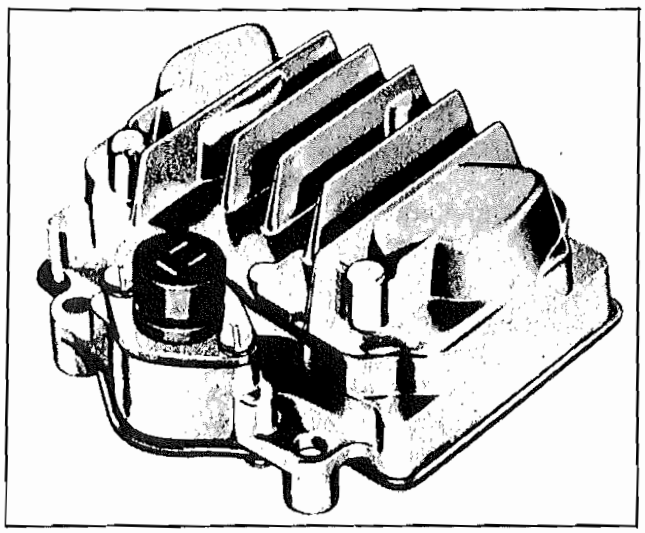


Fig. 2—Ignition Pulse Amplifier Unit

ignition coil current electronically—there are no moving parts in the amplifier unit.

The ignition coil is of heavy-duty construction and incorporates special windings. This coil will not provide satisfactory operation if installed in a standard ignition system, nor will the coil from a standard ignition system perform satisfactorily in a breakerless ignition system.

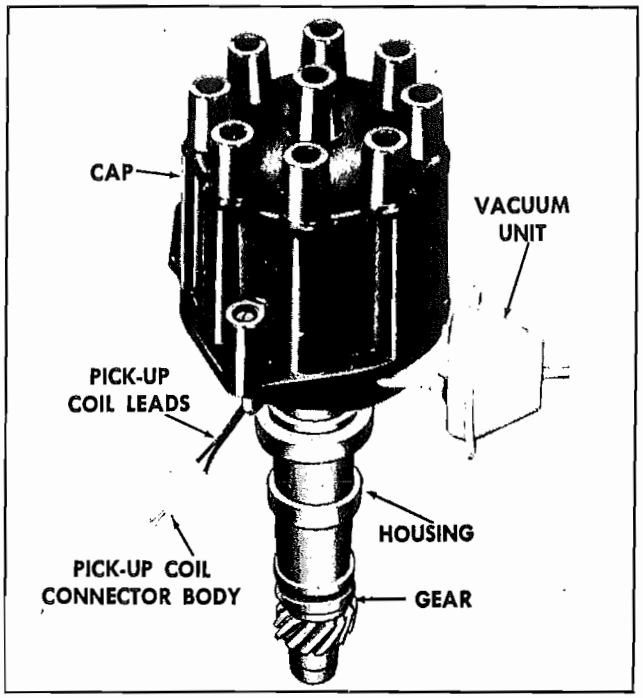


Fig. 3—Magnetic Pulse Distributor

Operating Principles of Breakerless System

In order to fire each spark plug, it is necessary to induce a high voltage in the ignition coil secondary winding by opening the circuit to the coil primary winding. In standard systems, this is accomplished by opening the distributor contact points. In the breakerless ignition system, this is accomplished as follows:

The magnetic pulse distributor is utilized to provide a "triggering" pulse or signal for the ignition pulse amplifier. Within the distributor, the permanent magnet provides a strong magnetic field at the internal teeth of the pole piece. As the distributor shaft rotates and the projections of the rotating pole piece pass the stationary pole teeth, the magnetic field alternately builds up and collapses. Thus, a voltage pulse is induced in the pickup coil each time the rotating projections pass the teeth of the pole piece.

Each voltage pulse from the distributor pickup coil is conducted to the pulse amplifier where it signals the "triggering" transistor to turn off a "switching" transistor. This action interrupts ignition primary current flow, inducing high voltage in a conventional secondary ignition circuit. The switching transistor then automatically returns the primary circuit to an "On" condition for the next plug firing. The above description of amplifier operation is intentionally simplified, since the component parts are not serviced separately.

Ignition System Periodic Maintenance

Since there are no moving parts in the ignition pulse amplifier unit mounted forward of the radiator bulkhead, and the distributor shaft and bushings have permanent type lubrication, no periodic maintenance is therefor required for the breakerless ignition system. The distributor lower bushing is lubricated by engine oil through a splash hole in the distributor housing, and a housing cavity next to the upper bushing contains a supply of lubricant which will last between overhaul periods. At time of overhaul, the upper bushing may be lubricated by removing the plastic seal and then adding SAE 20 oil to the packing in the cavity. A new plastic seal will be required since the old one will be damaged during removal.

Servicing The Engine

When the breakerless ignition system (RPO K66) is factory installed on any of the 1964 optional engines listed in the accompanying chart, except for the ignition system, specifications for the engine with breakerless ignition will be identical to those of its counterpart with the standard production ignition system installed.

Engines Available With RPO K66 Breakerless Ignition Installed	Magnetic Pulse Ignition Distributor (Prod. Part No.)	Centrifugal Advance (Crank Degrees @ Engine RPM)	Vacuum Advance (In Crank Degrees)	Ignition Timing BTDC Setting At Engine Idle	Engine Idle Setting (RPM)	Orig. Equip. Spark Plug
327 Cu. In. V-8 RPO L76 (w/Holley 4-Bbl.) RPO L84 (Fuel Injection) Corvette	1111060—w/RPO L76 1111064—w/RPO L84	0° @ 800 26° @ 2500	0° @ 4" Hg. 16.5° @ 8.2" Hg.	12°	RPO L76 750 RPM RPO L84 850 RPM	AC 44
409 Cu. In. V-8 RPO L33 (340 H.P. w/Hyd. Lifters) RPO L31 (400 H.P. w/Solid Lifters) RPO L80 (425 H.P. w/Solid Lifters) Chevrolet (1000 Series)	1111059	0° @ 700 11° @ 1600 24° @ 4600	0° @ 8" Hg. 15° @ 15.5" Hg.	RPO L33..... 6° RPO L31.....12° RPO L80.....12°	L33.....450-500 L31.....750 L80.....750	AC 43N

Tachometer readings for test purposes can be made on the secondary circuit of the breakerless ignition system in the same manner as on the conventional ignition system, however before attempting to connect a test tachometer into the primary circuit check with your instrument supplier to insure that satisfactory readings can be obtained and the breakerless system will not be damaged by the tachometer that is to be used.

CAUTION: *Never install a condenser of any rating between the coil positive and ground. The use of a condenser at this location for radio noise suppression can damage the power transistor in the ignition amplifier unit.*

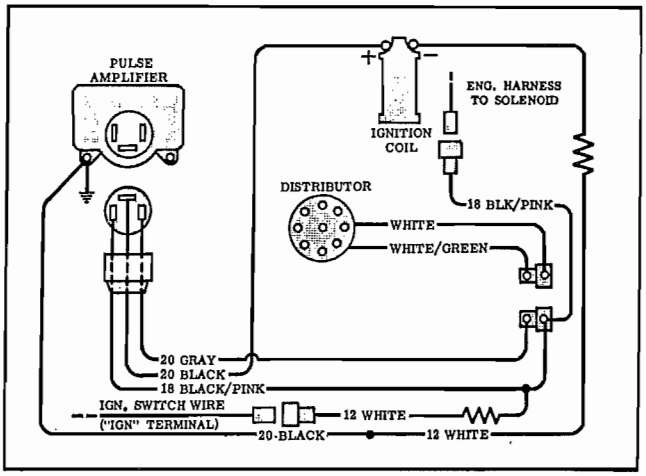


Fig. 4—Corvette Breakerless Ignition System

Ignition Coil Check

The ignition coil primary can be checked for an open condition by connecting an ohmmeter across the two primary terminals. Primary resistance at 75°F. should be between .35 and .55 ohm. An infinite reading indicates the primary is open. For the engine to run but miss at times, the primary open may be of the intermittent type.

The coil secondary can be checked for an open by connecting an ohmmeter from the high tension center tower to either primary terminal. To obtain a reliable reading, a scale on the ohmmeter having the 20,000 ohm value within, or nearly within, the middle third of the scale should be used. Secondary resistance at 75°F. should be between 8,000 and 12,500 ohms. If the reading is infinite, the coil secondary winding is open.

A number of different types of coil testers are available from various test equipment manufacturers. When using these testers, follow the procedure recommended by the tester manufacturer.

NOTE: *Make sure the tester will properly check this special coil.*

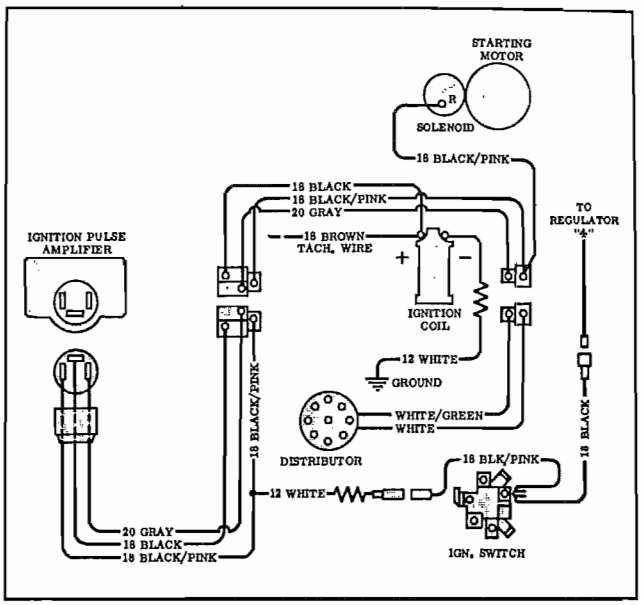


Fig. 5—Breakerless Ignition for Chevrolet Series 1000

Magnetic Pulse Distributor Overhaul

Removal

1. Disconnect pick-up coil leads at connector.
2. Remove distributor cap.
3. Crank engine so rotor is in position to fire No. 1 cylinder and timing mark on harmonic balancer is indexed with pointer.
4. Remove vacuum line from distributor.
5. Remove distributor clamping screw and hold-down clamp.
6. Remove distributor and distributor-to-block gasket. It will be noted that the rotor will rotate as the distributor is pulled out of the block. Mark the relationship of the rotor and the distributor housing after removal so that the rotor can be set in the same position when the distributor is being installed.

Disassembly

NOTE: *If a distributor is being disassembled for replacement of the stationary magnetic pickup assembly only, it will be necessary to perform only steps 3, 4, 5, 7, 8, 9, and 12 of the service procedure listed below.*

1. Remove screws securing rotor and remove rotor.
2. Remove centrifugal weight springs and weights.
3. On Corvettes, remove the tachometer drive gear from the distributor.
4. Remove roll pin, then remove distributor drive gear and washer.

(Continued on Page 6)

BREAKERLESS IGNITION SYSTEM TROUBLE DIAGNOSIS PROCEDURE

ENGINE SURGE OR ERRATIC MISS CONDITION

When the above condition exists, unless the following checks are performed first, it is likely that major components will be replaced unnecessarily, and the problem will not be remedied.

All the wiring should be visually inspected for brittle or cracked insulation, broken strands, and loose or corroded connections. The secondary leads in the coil and distributor cap should be checked to make sure they are pressed all the way down in their inserts. Rubber boots should be tight in place over connections. The outside of the distributor cap and the coil tower should be inspected for carbonized paths which would allow leakage of high voltage to ground. Also, remove the distributor cap so the rotor and inside of the cap can be checked for cracks and carbonized paths.

An engine surge condition much more severe than produced by lean carburetion may be due to the two distributor pickup coil leads being reversed in the connector body, or may be due to an intermittent open in the distributor pickup coil.

ENGINE HARD START OR WILL NOT RUN CONDITION

Disconnect any one spark plug lead and crank engine while holding end of lead approximately ¼" from ground. CAUTION: Do not perform this test by disconnecting the coil to distributor secondary lead or damage to the amplifier may occur.

SPARK OCCURS

Reconnect spark plug lead. The problem is not in the primary circuits. Check fuel system, starting circuit, carburetion, also check secondary circuit as described under "Engine Surge or Erratic Miss."

NO SPARK OCCURS

1. Reconnect spark plug lead.
2. Connect a tachometer between coil positive (+) terminal and the black/pink wire at the 3-wire connector on left side of firewall.
3. Place selector on 1000 R.P.M. scale, then crank the engine and look for tachometer deflection.

NO DEFLECTION

Make the following tests to determine location of open, short, or abnormally high resistance in circuit.

DEFLECTION

Pinpoint the system trouble by performing "Ignition Distributor Check" detailed below.

CIRCUIT RESISTANCE TEST
(Using Voltmeter)

1. Connect voltmeter between the ignition coil positive (+) terminal and a good ground location.
2. Turn ignition switch to "ON" position and observe voltmeter reading.

0 VOLTS

Indicates an open in ignition circuit between the battery positive terminal and the coil positive terminal. If connections are good, insert a jumper lead between the black/pink and the black lead at amplifier connector.

- **READS 0 VOLTS** — Indicates an open in the harness to amplifier unit. Repair or replace the harness.
- **READS 5-7 VOLTS** — Indicates open in amplifier unit. Replace amplifier.

0-5 VOLTS

Indicates high starting by-pass resistance or high amplifier resistance. Move voltmeter lead from coil positive to black/pink wire at 3-terminal connector at firewall (use test prod).

- **METER READS OVER 7 VOLTS** — Resistance in amplifier too high—replace amplifier.
- **READS LESS THAN 6 VOLTS** — Resistance too high in starting by-pass wire. (Spec.: approx. .7 ohm)

5-7 VOLTS

This is the correct reading, however, when obtained at this stage of the check on a system that has not been functioning properly it would indicate improper triggering action of the distributor pickup coil or amplifier unit. Perform DISTRIBUTOR CHECK.

7-11 VOLTS

Indicates high resistance through coil and ground resistance wire. Move the voltmeter lead from the coil positive to the coil negative (—) terminal.

- **METER DROPS TO 3 VOLTS** — Ignition coil resistance high—replace.
- **DROPS TO 4 TO 8 VOLTS** — Resistance wire has too high a value—replace. (Spec.: approx. .45 ohm)

BATTERY VOLTAGE (11-12 VOLTS)

Indicates open in primary circuit. Move voltmeter lead to negative coil terminal.

- **METER DROPS TO 0 VOLTS** — Indicates an open primary circuit in ignition coil. Replace coil.
- **STAYS AT 11-12 VOLTS** — Indicates open in ground resistor wire or connections. Repair or replace harness.

IGNITION DISTRIBUTOR CHECK

Check performance of the distributor pickup coil and the amplifier unit by employing either of the test methods described below.

OHMMETER METHOD

1. Detach distributor connector body from harness connector, and connect an ohmmeter to the distributor leads.
2. Slowly rotate magnetic pickup assembly through full advance travel and read ohmmeter. If reading is not within 500-700 ohms replace pickup assembly.
3. If the reading is within the 500-700 ohm range, disconnect one ohmmeter lead and connect to ground.
4. If reading is less than infinity, replace magnetic pickup assembly.
5. If reading is infinite, replace the installed amplifier unit.

DISTRIBUTOR SUBSTITUTION METHOD

1. Detach distributor connector body from harness connector and connect a spare distributor to the harness connector.
2. Connect a tachometer between coil positive terminal and the black/pink wire at the 3-wire connector on left side of firewall.
3. With the ignition switch "ON," turn distributor shaft by hand and observe tachometer.
4. If tachometer needle deflects, replace magnetic pickup assembly in distributor installed in engine.
5. If there is no needle deflection, replace the installed amplifier unit.

NOTE: Components of the ignition pulse amplifier unit are not serviced separately—only the complete amplifier unit is available for service replacement.

CAUTION: *To prevent damage to the permanent magnet, support drive gear when driving out roll pin.*

5. Remove drive shaft assembly.
6. Remove centrifugal weight support and timer core from drive shaft.
7. Remove connector from pickup coil leads.
8. Remove retaining ring which secures magnetic core support plate to distributor shaft bushing in housing.
9. As a unit, remove the entire magnetic pickup assembly from the distributor housing.
10. Remove brass washer and felt pad.

NOTE: *Before removing plastic seal, refer to instructions provided earlier in this article, under the heading, "Periodic Maintenance."*

11. Remove vacuum advance unit.
12. To reassemble distributor, performing the above steps in reverse order.

Installation

1. Check to see that the engine is at firing position for No. 1 cylinder (timing mark on harmonic balancer indexed with pointer).
2. Position a new distributor-to-block gasket on the block.
3. Before installing distributor, index rotor with housing as noted when distributor was removed. Install distributor in block so that vacuum diaphragm faces approximately 45° forward on the right side of the engine and the rotor points toward contact in cap for No. 1 cylinder.
4. Replace distributor clamp leaving screw loose enough to allow distributor to be turned for timing adjustment.
5. Install spark plug wires in distributor cap. Place wire for No. 1 cylinder in tower (marked on old cap during disassembly) then install remaining wires clockwise around the cap according to the firing order (1-8-4-3-6-5-7-2).
6. Attach distributor to coil primary wires.
7. Replace distributor cap.
8. Adjust timing and then fully tighten distributor clamp screw.
9. Attach vacuum line to distributor.

Distributor Off-Engine Test

The distributor's centrifugal and vacuum advance can be checked in a distributor testing machine or synchroscope specially adapted or designed to accommodate this type distributor. However, since this envolves removing the distributor from the engine, this test may be postponed until other system checks have been made. A dwell reading cannot be obtained on this distributor and it is not likely that the centrifugal or vacuum advance will be a cause of trouble.

Chevy II Air Conditioner Blower Switch Relay

The air conditioner blower switch relay on 1963-64 Chevy II vehicles is located on top of the evaporator assembly and directly behind the ash tray opening. This relay is used to direct current through a double resistor unit for varying the blower motor speed from low to medium. When the blower switch is turned to the high position, the relay directs current from the battery directly to the blower motor.

The service procedure for removing and reinstalling this relay has been revised and is as follows:

1. Remove the glove box.
2. Remove the ash tray and support.
3. Disconnect the defroster hose and the electrical connections to the relay.
4. Remove the relay by placing left hand through the ash tray opening to hold relay while the two hex-head mounting screws are removed by working through the glove box opening with a ratchet drive in the right hand.
5. To install the relay perform the above steps in reverse order. Check blower performance.

1964 Fuel Injection Specifications Corrected

The correct service specifications for fuel injection units used on 1964 Corvettes are provided in the following chart. All previously published specifications for these units that may conflict with information in this chart are hereby superseded.

		Early Prod. Unit 7017375-R	Late Prod. Unit 7017380
Fuel Pressure @ .5" H_2O	*At Power Stop	1.9" Hg. (± .1)	1.9" Hg. (± .1)
	*At Economy Stop	1.0" Hg. (± .1)	1.0" Hg. (± .1)
Enrichment Diaphragm —Vacuum to Apply	At Economy Stop	6" Hg.	6" Hg.
	At Travel Center	4" Hg.	4" Hg.
	At Power Stop	2" Hg.	2" Hg.
Enrichment Diaphragm Clearance (Min.)		.010"	.010"
Cold Enrichment Housing Cover Setting		3 Notches Lean	3 Notches Lean
Cranking Signal Valve—Vacuum to Apply		1" Hg. (Max.)	Not Used
Main Control Diaphragm—Vacuum to Apply*		½" H_2O	½" H_2O
Float Level		29/32"	29/32"
Float Drop		227/32"	227/32"
Engine Fast Idle Speed. (Engine Hot)		2200 RPM	2200 RPM

*Checked with Fuel Injector Calibrator J-7090

Chevelle Front End Alignment Specifications

Revised front wheel alignment specifications for all Chevelle vehicles are provided below. It will be noted that caster and toe-in recommendations have been changed.

Caster	Negative 1° ± ½°
Camber	Positive ¾° ± ½°
Steering Axis Inclination	8¼° ± ½°
Toe-in	⅛" ± 1/16" Total