

IGNITION SYSTEM

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DESCRIPTION AND OPERATION

The ignition system consists of an ignition switch, neutral start switch, spark plugs, low and high tension wiring, ignition distributor, vacuum advance, contact points, condenser, ignition coil, battery cables and a source of electrical energy, the battery.

The ignition system has two separate circuits. The primary circuit includes the ignition switch, neutral start switch, primary winding of the ignition coil, distributor contact points and condenser. The secondary or high tension circuit includes the secondary winding of the ignition coil, the high tension wire from the center of the coil to the center of the distributor cap, the distributor cap, rotor, spark plug wires and spark plugs.

The function of the ignition systems is to produce high voltage surges and direct them to the spark

plugs. When the ignition switch is closed, battery current flows through the primary winding of the ignition coil, closed contact points to ground and back to the battery. As the distributor cam opens the points, current decreases rapidly in the coil primary winding and a high voltage is induced in the coil secondary winding. This high voltage is transmitted by the rotor, through the plug wires to the spark plugs where it creates an arc across the electrodes to ignite the air-fuel mixture in the engine cylinders to provide the power stroke of the engine. To bring the primary current to a quick controlled stop and in order to greatly reduce the size of the arc for prolonged contact point life, a capacitor (condenser) is connected across the contact points.

The ignition switch is located under the instrument panel on the top left side of the steering column. It is operated through mechanical linkage by the ignition and steering lock assembly.

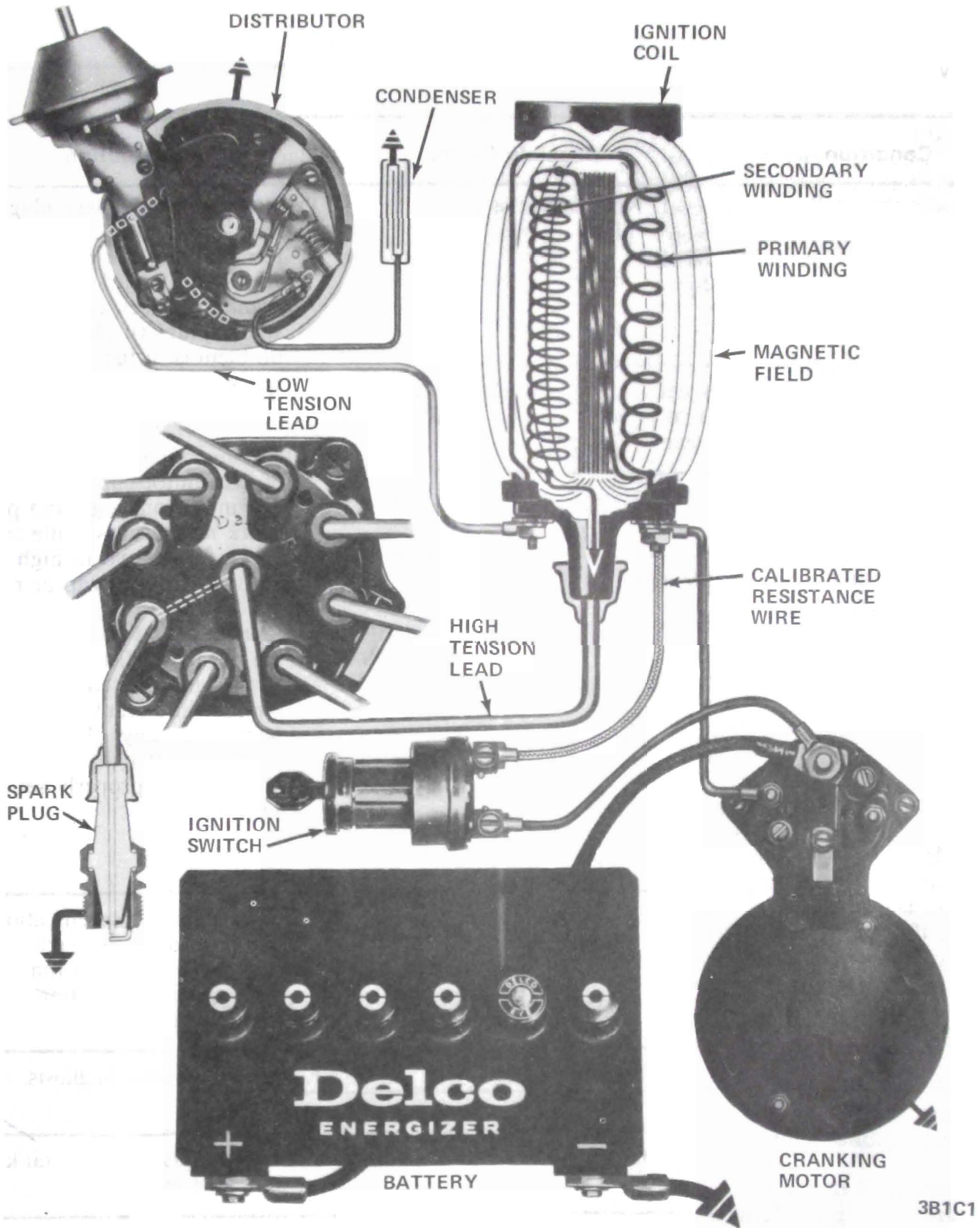


Figure 1C-1 Ignition System

DIAGNOSIS

Ignition System Diagnosis

Condition	Possible Cause	Correction
Engine cranks but will not start	1. No spark at spark plugs	<p>1. Disconnect any spark plug wire from distributor cap and hold terminal end horizontally at cap hole. If spark occurs while cranking, check condition of spark plugs (if plugs are okay, problem is in fuel system). If no spark occurs:</p> <p>a. Disconnect coil wire from center of distributor cap and hold 3/8 inch from a ground point. If spark now occurs while cranking, check for ground in high voltage path (distributor cap or rotor).</p> <p>b. Connect a 12 volt test light to the negative (distributor side) of the ignition coil. If light blinks while cranking, the contact points are okay, check coil and condenser. If light does not blink, points are improperly set or defective.</p>
	2. Engine timing out of adjustment	1. Reset timing to specifications. For procedure to rough-set timing on an engine that won't run, see setting ignition timing in this Section.
	3. Internal engine problems	1. Refer to engine diagnosis.
	4. Out of gas	1. Put a supply of gas in tank and start engine.
	5. Defective carburetor	1. Refer to Carburetor Diagnosis.
	6. Defective fuel pump	1. Refer to Fuel System Diagnosis
Engine starts but stops when ignition switch is released to "RUN POSITION"	1. An "OPEN" in the ignition circuit or a defective ignition switch	<p>1. Use a 12 volt test lamp and check IGN-1 terminal of ignition switch in "RUN POSITION".</p> <p>a. If lamp lights, locate and repair "OPEN" in circuit to coil positive terminal. This includes pink</p>

		<p>wire from switch connector to cowl connector, white with orange and purple cross tracer resistance wire from cowl connector to splice and pink wire in engine harness to coil positive terminal.</p> <p>b. If lamp does not light, replace ignition switch.</p>
Engine will not crank	1. Loose or corroded wire or cable connections.	1. Inspect for and clean and or tighten connections as necessary.
	2. Discharged battery	1. Refer to diagnosis in battery section.
	3. Neutral start switch defective, out of adjustment or poor connection	<p>1. Make certain connector terminals are clean and connector is properly installed.</p> <p>2. Connect 12 volt test lamp to solid purple wire and ground. Lamp should light in start position with shift in neutral or park. If lamp lights, ignition and neutral start switch are okay.</p> <p>3. If lamp did not light on solid purple wire, connect it to purple with white stripe wire. If lamp now lights in start position in neutral or park, adjust or replace neutral safety switch. If lamp did not light, see following ignition switch test.</p>
	4. Loose connection at or defective ignition switch.	<p>1. Inspect connector to assure clean terminals and proper connection.</p> <p>2. Using 12 volt test lamp check both purple wires at neutral start switch. If lamp does not light at either wire, repair "OPEN" circuit in purple wire to the ignition switch and or replace ignition switch as required.</p>
	5. "OPEN" circuit in wiring to solenoid or defective solenoid.	1. Using 12 volt test lamp between purple wire at solenoid and ground lamps should light in start position in neutral or park.

		<ol style="list-style-type: none"> a. If lamp does not light, locate and correct "OPEN" in circuit. b. If lamp lights replace solenoid.
	6. Burned out fusible link.	<ol style="list-style-type: none"> 1. Using 12 volt test lamp between No. 10 red wire at cowl connector and ground, lamp should light. <ol style="list-style-type: none"> a. If lamp does not light, replace fusible link.
Engine runs rough, poor power and mileage	1. Burned contact points and or wrong dwell setting	1. Inspect points, replace if necessary and reset dwell.
	2. Defective spark plugs	1. Inspect, clean and adjust or adjust and install new plugs.
	3. Misadjusted timing	1. Adjust timing to specifications.
	4. Inoperative vacuum advance	1. With engine running at part throttle, hold finger on vacuum advance rod and remove vacuum hose. Rod should move toward distributor. If rod does not move, replace vacuum advance unit.
	5. Defective centrifugal advance mechanism	1. Inspect for excessive wear. Turn base plate until weights are fully extended and release. Springs should return weights to stop without sticking or excess free movement in retard position. Replace if necessary.
	6. Defective plug wires	1. Clean and inspect wires for a brittle, cracked or loose insulation condition. Resistance valve of each wire should not exceed 20,000 ohms. Also inspect for burned, corroded terminals. Clean or replace wire assemblies as necessary including deteriorated nipples or boots.
	7. Faulty carburetion	1. Refer to carburetion diagnosis.
	8. Faulty engine components such as valves, rings, etc.	1. Refer to engine diagnosis.

MAINTENANCE AND ADJUSTMENTS

Unless an operational problem occurs, only an occasional visual inspection may be performed between regular tune-up intervals.

Contact Point Replacement

1. Release distributor cap retainers and remove cap.
2. Remove rotor.
3. Remove ignition point shield. See Figure 1C-2.

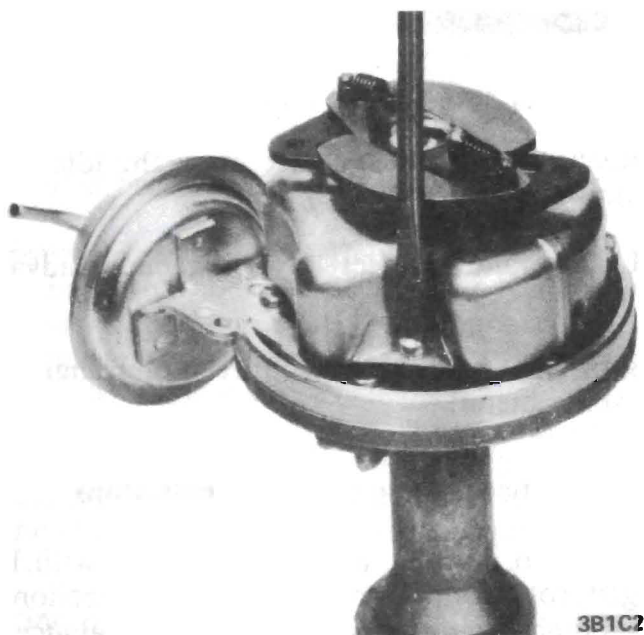


Figure 1C-2 Removing Shield Screws

4. Disconnect primary and condenser leads from points.
5. Loosen two retaining screws and lift out points.
6. Wipe breaker plate clean and rotate lubrication wick. See Figure 1C-3.

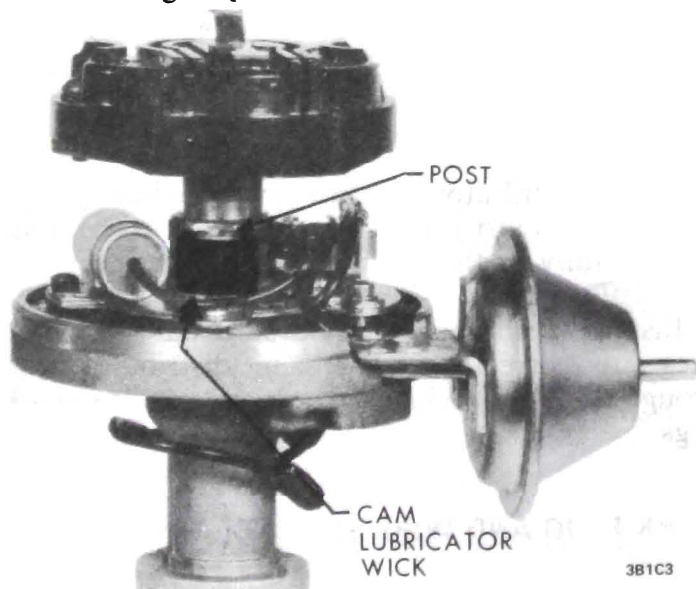


Figure 1C-3 Cam Lubricator Wick

7. Insert new points under screws on breaker plate and tighten screws.
8. Connect primary and condenser leads to points.
9. Install ignition point shield.
10. Install rotor.
11. Position distributor cap in place and secure the retainers.

Condenser Replacement

1. Release distributor cap retainers and remove cap.
2. Remove rotor.
3. Remove ignition point shield.
4. Disconnect condenser lead from points.
5. Remove condenser clamp screw, clamp and condenser.
6. Wipe breaker plate clean.
7. Attach clamp to new condenser and secure to breaker plate.
8. Connect condenser lead to points.
9. Install ignition point shield.
10. Install rotor.
11. Position distributor cap in place and secure the retainers.

Adjusting Contact Points (Dwell Angle)

1. Calibrate and connect dwell-tach meter between distributor side of coil and ground following manufacturers instructions.
2. Start engine and turn meter selector switch to position 8 representing an eight cylinder engine.
3. Lift distributor cap window, insert 1/8" allen wrench or equivalent in adjusting screw and set dwell angle at 30 degrees. See Figure 1C-4.
4. Always check and reset timing if necessary after adjusting dwell angle.

Setting Ignition Timing (Engine Running)

Always check dwell angle and adjust if necessary before attempting to set timing.

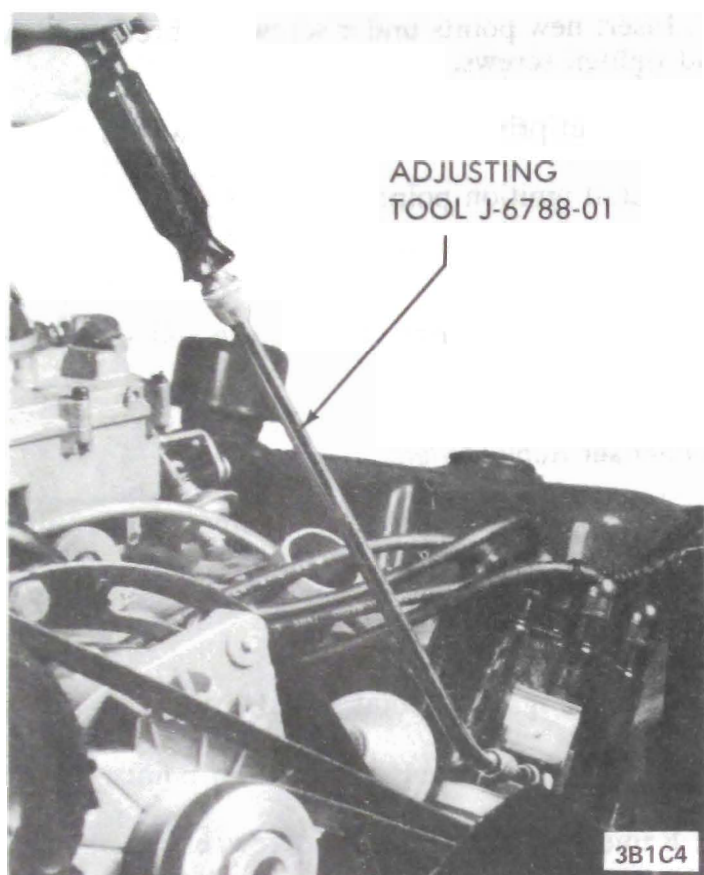


Figure 1C-4 Adjusting Dwell Angle

1. Connect 12 volt power timing light to No. 1 cylinder following instrument manufacturers instructions.

2. Calibrate and connect dwell-tach meter between distributor side of coil and ground following manufacturers instructions.

3. Make certain plug wires, boots and nipples are in good condition and properly installed. Loosen distributor clamp bolt.

4. Set parking brake and block a drive wheel front and rear.

5. Start engine and allow to warm up until upper radiator hose is hot, choke valve fully open and air-conditioner turned off if so equipped.

6. With engine at specified idle speed, use 1/8" allen wrench or adjusting tool J-6788-01 and set dwell angle at 30 degrees if necessary.

7. Disconnect and plug hose at distributor vacuum advance.

8. Direct timing light beam on engine timing indicator and yellow mark on harmonic balancer. Slowly rotate distributor until yellow mark on harmonic balancer is aligned with specified degree mark on timing indicator. See Figure 1C-5.

9. Tighten distributor to engine clamp bolt.

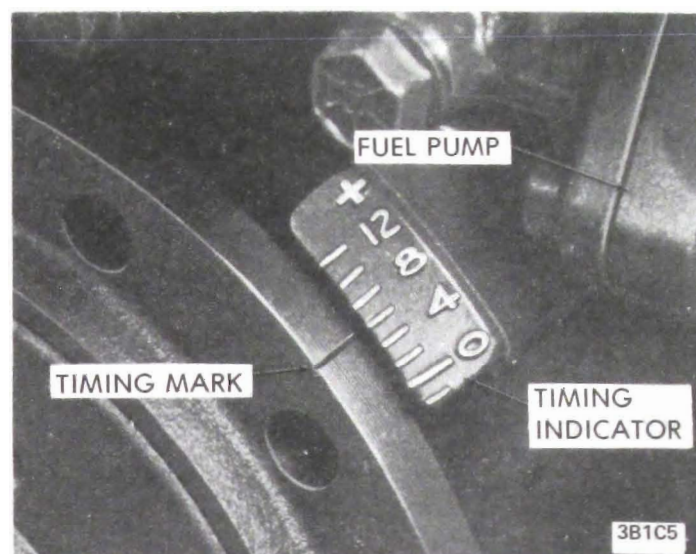


Figure 1C-5 Timing Mark and Indicator

10. Recheck and adjust if necessary the idle speed and timing.

11. Unplug and connect hose to vacuum advance unit.

12. Shut engine off and disconnect timing light and dwell-tach meter.

Setting Ignition Timing (Engine Won't. Run)

1. With No. 1 spark plug removed and with hole plugged, rotate crankshaft in a forward direction using a suitable wrench on the harmonic balancer to crankshaft bolt. When plug blows from No. 1 cylinder, continue rotation until timing mark on balancer is aligned with proper mark on timing indicator. No. 1 cylinder is now in position to fire.

2. If removed, install distributor in engine with rotor in position to fire No. 1 cylinder and with vacuum control in position to connect vacuum hose. Install distributor clamp and bolt with lock washer, leaving bolt just loose enough to allow movement of distributor with hand pressure.

3. Connect primary wire to coil.

4. Rotate distributor counterclockwise slightly until contact points just start to open. This must be done very carefully or the engine will not start.

5. Install distributor cap. Make sure that spark plug wires are correctly installed in distributor cap, through clips on rocker arm covers, and on spark plugs.

SPARK PLUG AND WIRE SERVICE

Spark plug wire is of special resistance type construction with a carbon impregnated linen core. It is de-

signed to eliminate radio and television interference radiation and is superior in resistance to crossfire. Care must be used when removing spark plug wires to prevent pulling terminals off and or breaking the core.

Removal

1. Remove spark plug wires by grasping the boots and not the wire.
2. Remove spark plugs avoiding insulator damage.

Inspection

1. Clean spark plug wires with a kerosene moistened cloth and wipe dry. Inspect for broken, brittle or loose insulation and corroded, broken or distorted terminals. Replace as may be required including deteriorated boots.

2. Inspect spark plugs carefully for cracked or broken insulators and worn or burned electrodes. Replace as required. If spark plugs appear to be in good condition except for carbon or oxide deposits, they should be cleaned with a blast type cleaner, adjusted and reinstalled. Plugs with a wet or oily deposit should be cleaned first with a degreasing solvent and thoroughly dried. Manufacturers instructions must be followed when cleaning plugs.

Adjusting Spark Plug Gap

To accurately adjust spark plug gap use round wire feeler gauge. Adjust gap by binding side electrode only. The specified gap is .040". Check gap by sliding correct round wire feeler gauge between end of center electrode and side electrode.

Spark Plug and Wire Installation

1. Install properly gapped spark plugs and tighten to 15 ft.lbs. torque. Do not overtighten as they will be difficult to remove the next time.
2. Install plug wires making sure each spark plug is connected to its respective distributor cap tower. Insure that all boots are properly seated.

NEUTRAL START AND BACK-UP LAMP SWITCH

Removal

1. Disconnect wiring connectors from switch.
2. Remove the two attaching screws and lift switch off column.

Installation

WITH MANUAL TRANSMISSION

1. Position shift lever in REVERSE.
2. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.
3. Move shift lever out of reverse to shear switch pin and then check operation.
4. If switch needs to be reset, position shift lever in REVERSE, loosen retaining screws, rotate switch slightly on column until gauge hole in back of switch freely admits a No. 41 size drill to depth of 3/8 inch and then secure retaining screws.

WITH AUTOMATIC TRANSMISSION (COLUMN SHIFT)

1. Position shift lever in NEUTRAL.
2. Insert a No. 41 size drill to depth of 3/8 inch in gauge hole in back of switch.
3. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.
4. Move shift lever out of NEUTRAL to extreme position to shear switch pin and then check operation.
5. If switch needs to be reset, position shift lever in NEUTRAL, loosen retaining screws, rotate switch slightly on column until gauge hole in back of switch freely admits a No. 41 size drill to a depth of 3/8 inch and then secure retaining screws.

WITH AUTOMATIC TRANSMISSION (CONSOLE SHIFT)

1. Since this switch is fixed in PARK position with an internal plastic shear pin, position steering column in LOCK position.
2. Rotate shift bowl clockwise (as viewed from upper end of column) and lightly hold against lock stop.
3. Assemble switch to column by inserting switch carrier tang into shift tube slot and installing the retaining screws.
4. Unlock shift column, move shift lever out of PARK to shear switch pin and check operation.
5. If switch needs to be reset, position shift lever in NEUTRAL, loosen retaining screws, rotate switch on column slightly until gauge hole in back of switch

freely admits a No. 41 size drill to a depth of 3/8 inch and then secure retaining screws.

IGNITION SWITCH

Removal

1. Disconnect battery ground cable.
2. Loosen and lower steering column. Refer to Group 3 Section F for procedure.
3. Disconnect electrical connectors from ignition switch.
4. Remove the two ignition switch attaching screws and lift switch off actuating rod.

Installation

1. Place shift bowl in any position except "PARK" and rotate lock cylinder counterclockwise until the rack bottoms against the lower surface of the cast in bowl plate.
2. Move the ignition switch slider first to accessory position then two positions in the opposite direction (off unlock position).
3. Fit the slider hole onto the actuator rod and assemble the ignition switch to the steering column being careful not to move the switch out of detent. Use correct screws and tighten to 35 in. lbs.
4. Attach electrical connectors.
5. Assemble steering column to instrument panel following the procedures in Group 3, Section F.

MAJOR REPAIR

DISTRIBUTOR OVERHAUL

Removal

1. Remove plug wires from distributor cap and disconnect distributor primary wire from coil.
2. Depress, release distributor cap retainers and remove distributor cap.
3. Holding a straight edge firmly against distributor housing and water pump housing, make a chalk or crayon mark on rotor, distributor housing and water pump housing to assure proper installation after removal.
4. Remove distributor clamp bolt and clamp and lift distributor out of timing gear housing.

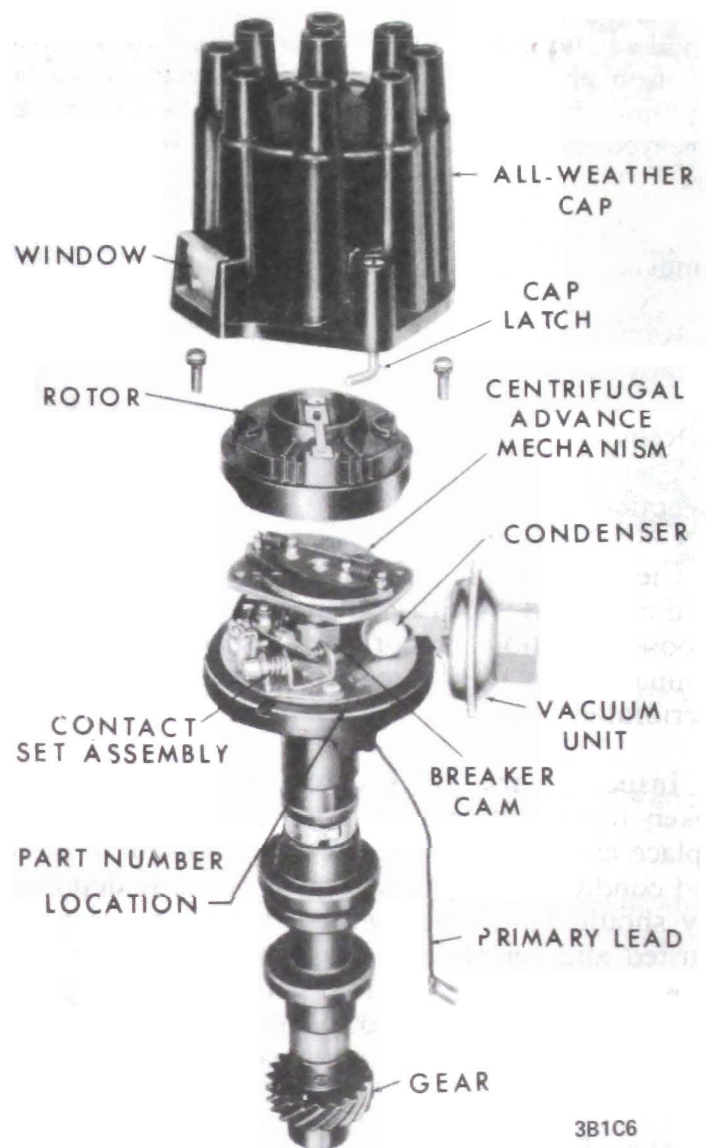


Figure 1C-6 Distributor Assembly

Disassembly and Inspection

1. *Distributor Cap* Thoroughly wipe cap with clean cloth and inspect for chips, cracks, carbon paths and or corroded terminal segments and sockets. Light corrosion may be removed using a stiff wire brush. If there are carbon paths, cracks or deeply grooved terminal segments, the distributor cap requires replacement.
2. *Rotor* Remove rotor and wipe off with clean cloth. If upon inspection, the rotor is found to be cracked, the spring contact badly worn or the rotor tip excessively burned, replace the rotor.
3. *Contact Points and Condenser* Remove contact points, condenser and disconnect primary lead. Inspect primary lead for loose terminals, cracked or deteriorated insulation and replace if necessary. Check condenser on reliable tester. If faulty, replace condenser. Inspect point contacts and rubbing block. If contacts are only slightly burned or pitted, the high spots may be removed with a clean fine point file. If points are excessively blackened, pitted or burned, or the rubbing block is excessively worn, the contact point must be replaced.

4. *Centrifugal Advance* Inspect for excessive wear between centrifugal weights and advance cam or pivot pins by turning and releasing base plate several times allowing weights to fully extend and return to retard position. Weights should operate freely without excess movement in retard position. Also, inspect cam lobes for scoring or excessive wear and weight base plate for bind or excessive looseness on distributor shaft.

5. *Distributor Shaft* Check for excessive wear between shaft and bearings in distributor housing. Using a 1/8" pin punch, remove driven gear roll pin, driven gear, washer and lift distributor shaft out of housing. See Figure 1C-7.

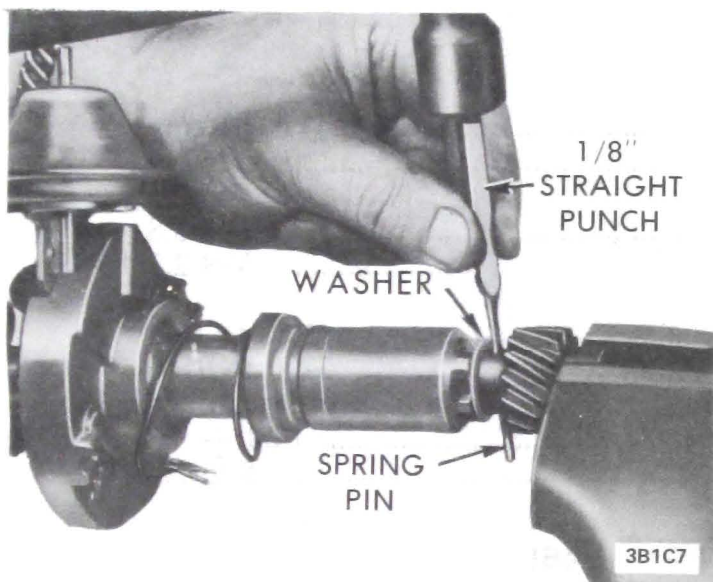


Figure 1C-7 Removing Spring Pin

Check condition of shaft and distributor bushings. If necessary remove advance springs, weights and slide weight base plate and cam assembly off distributor shaft.

6. *Breaker Plate* Attempt rotating breaker plate against vacuum advance to check for excessive wear at vacuum advance linkage and looseness at distributor bushing. Remove breaker plate retainer, disengage breaker plate from vacuum advance, disconnect ground lead from housing and inspect for good ground lead connection to bottom of breaker plate. See Figure 1C-8.

7. *Vacuum Advance* Remove remaining screw and lift out vacuum advance unit. Attach vacuum unit to a vacuum source and observe its operation. Pinch off connecting hose to determine that a vacuum diaphragm is not leaking.

Assembly

Obtain any parts determined necessary during disassembly and inspection for rebuilding the distributor.

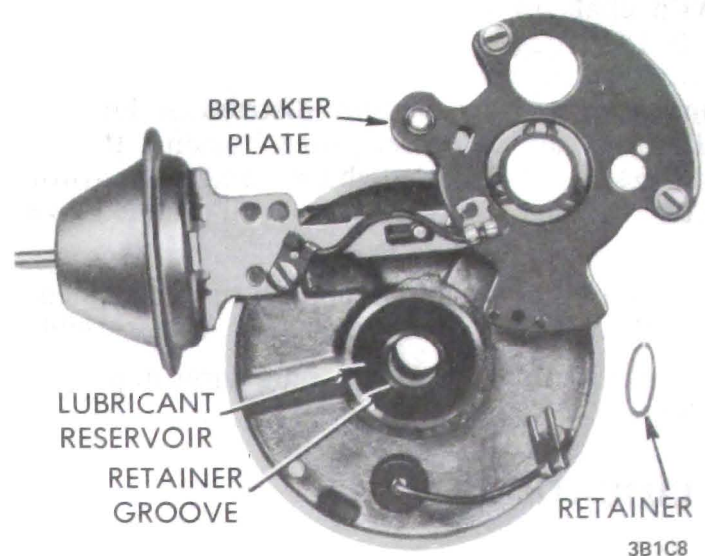


Figure 1C-8 Removing Breaker Plate and Retainer

1. Position vacuum advance in distributor and first secure with end screw, then attach breaker plate ground lead to other screw and secure in housing:

2. Position breaker plate on vacuum advance link and distributor bushing, then install breaker plate retainer.

3. If weight base plate and cam assembly was removed from distributor shaft, reinstall it and position shaft assembly into distributor housing. Place washer and driven gear on end of shaft and install roll pin.

4. Install balance weights and springs, if removed.

5. Install condenser and clamp assembly to breaker plate.

6. Locate and install contact points on breaker plate and connect the condenser and primary leads.

7. Check and adjust points if necessary to approximately .016".

8. Rotate cam lubricator approximately 90 degrees making sure of good contact with cam.

9. Install ignition point shield.

9. Install rotor.

11. If a reliable distributor tester is available, check to be certain the centrifugal and vacuum advance units are operating to specifications.

Installation

1. Install new "O" ring on distributor housing.

2. With chalk or crayon mark on rotor approximately 15-20 degrees counterclockwise from mark on distributor housing, position distributor in timing gear housing aligning distributor housing mark with mark on water pump housing. It may be necessary to lift distributor and turn rotor slightly to align the gears and oil pump drive shaft.

3. With all three chalk or crayon marks aligned, install distributor clamp and bolt finger tight.

4. Install distributor cap and plug wires in proper location.

5. Connect primary wire to coil.

6. Connect dwell-tach meter and timing light to engine.

7. Start engine and set dwell and timing to specifications.

8. Turn engine off, tighten distributor clamp bolt and disconnect dwell tach and timing light.

SPECIFICATIONS

IGNITION COIL AND RESISTOR

Make	Delco-Remy
Coil Number	1115247
Current Draw, Amperes at 12.6 Volts	
Engine Stopped	V-8 3.8
Engine Idling	V-8 2.3
Coil Resistance (Ohms) at 80° F.	
Primary	1.28 to 1.42
Secondary	7200 to 9500
Resistance Wire	Part of Wiring Harness
Resistance, Ohms at 80° F.	1.80 ± .05
Voltage at Coil (Ignition On and Points Closed)	5 to 5.5

SPARK PLUGS

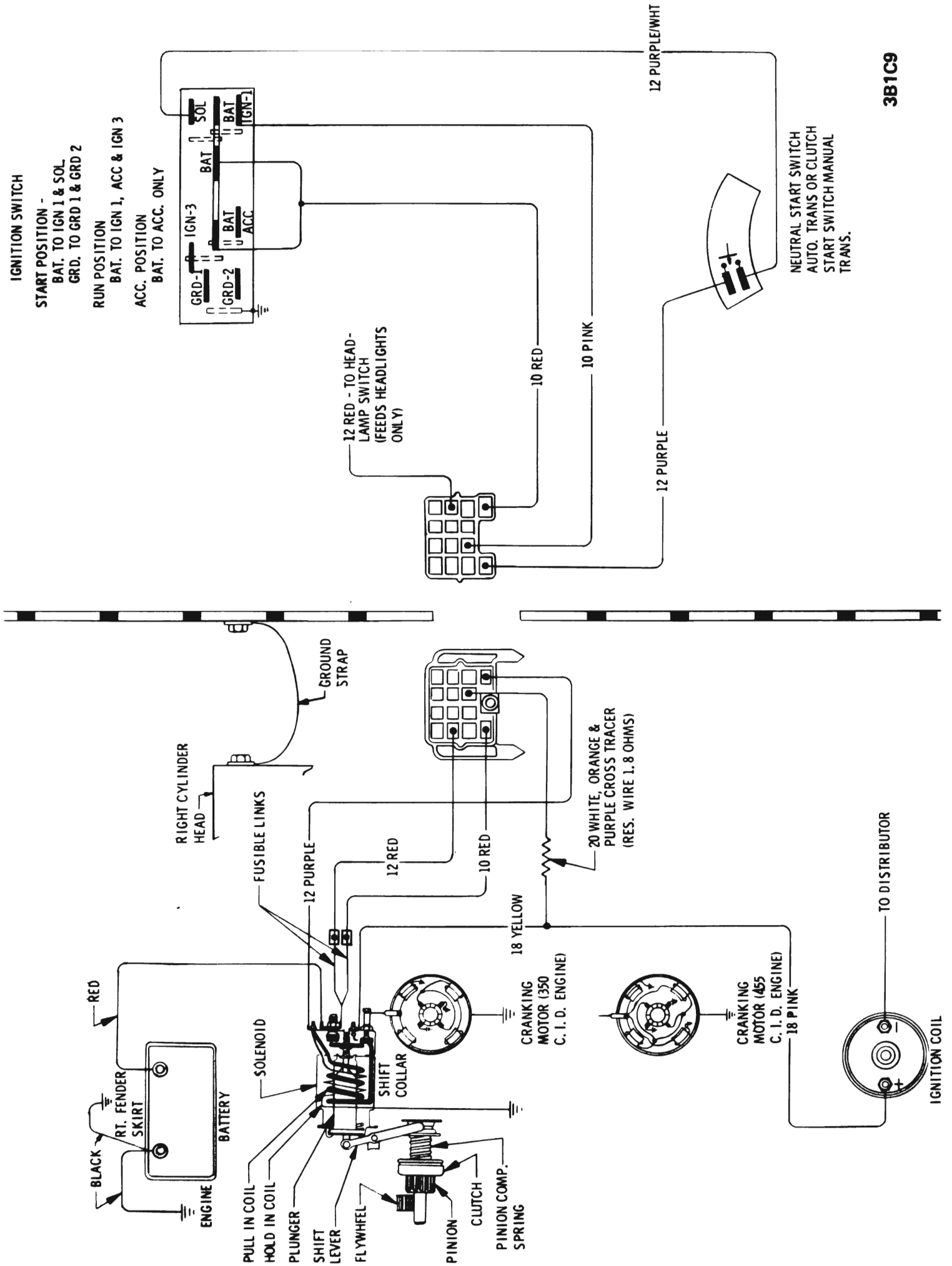
	350 Engine	455 Engine
Make and Model (Normal Operation)	ACR45TS	ACR45TS
Thread and Shell Hex. Sizes	14 MM, 5/8"	14MM, 5/8"
Terminal Nut Length	3/8"	3/8"
Gap at Points040"	.040"
Tightening Torque (Lb.Ft.)	15	15

DISTRIBUTOR

Make	Delco-Remy
Drive	From Camshaft
Rotation, Top View	Clockwise
Firing Order (All V-8 Engines)	1-8-4-3-6-5-7-2
Contact Point Opening and Dwell Angle V-8016", 30° ± 2°
Dwell Variation	3° Maximum
Breaker Arm Spring Tension, Ounces	19 to 23
Condenser Make and Capacity, Microfarads	Delco-Remy, .18 to .23

	350 Engine	455 Engine	455 Engine Stage I
Distributor Number (Less Cap)	1112109	1112110	1112016
Vacuum Control Number	1116210	1973440	1116210
Timing, Crankshaft Degrees (With Vacuum Disconnected and Engine Idling)	4° ± 1°	4° ± 1°	10° ± 2°
Centrifugal Advance, Crankshaft Degrees RPM			
Start Advance, at RPM	750-1050	750-1050	700-1050
Medium Advance, Degrees at RPM	11-15 at 1800	12-16 at 2100	9-13 at 1800
Max. Advance, Degrees at RPM	14-18 at 2900	16-20 at 3000	20-24 at 4600

Vacuum Advance, Crankshaft Degrees and Inches of Vac.			
Start Advance, at In. of Vacuum	6-8	6.5-8.5	6-8
Max. Advance, Degrees at In. of Vacuum	14-18 at 16	14-19 at 13	14-18 at 16



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Figure 1C-9 Ignition and Starting Schematic All Series