MITSUBISHI ELECTRONIC IGNITION SYSTEMS – ROTARY ENGINE

Mazda
RX7

DESCRIPTION

The Mitsubishi electronic ignition system used on the Mazda RX7 rotary engine is unique in that it has 2 sets of spark plugs (leading and trailing) with one set in the front rotor housing and one in the rear rotor housing. See *Fig. 1*. There are also 2 ignition coils, 2 pick-up coils in the distributor, and 2 coil-to-distributor high tension wires.

There are 2 separate ignitors, mounted on a common base, one for leading side and one for the trailing side. Other system components include a battery, ignition switch, ignition control switches (water temperature, altitude, etc.), and various relays.

All models are equipped with an ignition control system and centrifugal advance mechanisms. All models have vacuum control units on both trailing and leading sides, except automatic transmission models which have no trailing vacuum control unit.

OPERATION

A reluctor (signal rotor) is mounted on the rotor shaft and turns inside 2 magnetic pick-up coils, one for the leading side and one for the trailing side. See *Fig. 2*. As each tooth of the reluctor approaches and then passes the leading pick-up coil, a signal is generated that is sent to the leading ignitor, which breaks the primary circuit in the leading ignition coil. As each tooth passes the leading pick-up coil, the previous passing tooth approaches and becomes aligned with the trailing pick-up coil. This triggers a signal to the trailing ignitor, which breaks the primary circuit in the trailing ignition coil.

Therefore, immediately after the leading spark plug fires, the trailing spark plug also fires, providing more complete and efficient combustion and reducing HC and CO emissions.

As the primary circuit is broken in the leading and trailing ignition coils, a voltage surge occurs in the secondary circuit of the ignition coils. This high voltage is transmitted through the leading and trailing high tension wires to the distributor, rotor and spark plugs.

An emission control unit is also included in the ignition control system along with different sensing switches to provide proper timing under varying engine operating conditions.

SPECIFICATIONS

Centrifugal & Vacuum Advance (or Retard) – See *Specifications Tables in this section.*

ADJUSTMENTS

Reluctor-to-Pick-Up Coil Air Gap – **1)** Remove distributor cap and rotor. Turn distributor shaft until the extended tooth of the reluctor (signal rotor) aligns with core of pick-up coil. See *Fig. 2*.

2) Using a feeler gauge, check for .008-.024" (.2-.6 mm) air gap. If gap is incorrect, replace pick-up coil and bearing assembly or distributor drive shaft, if necessary.

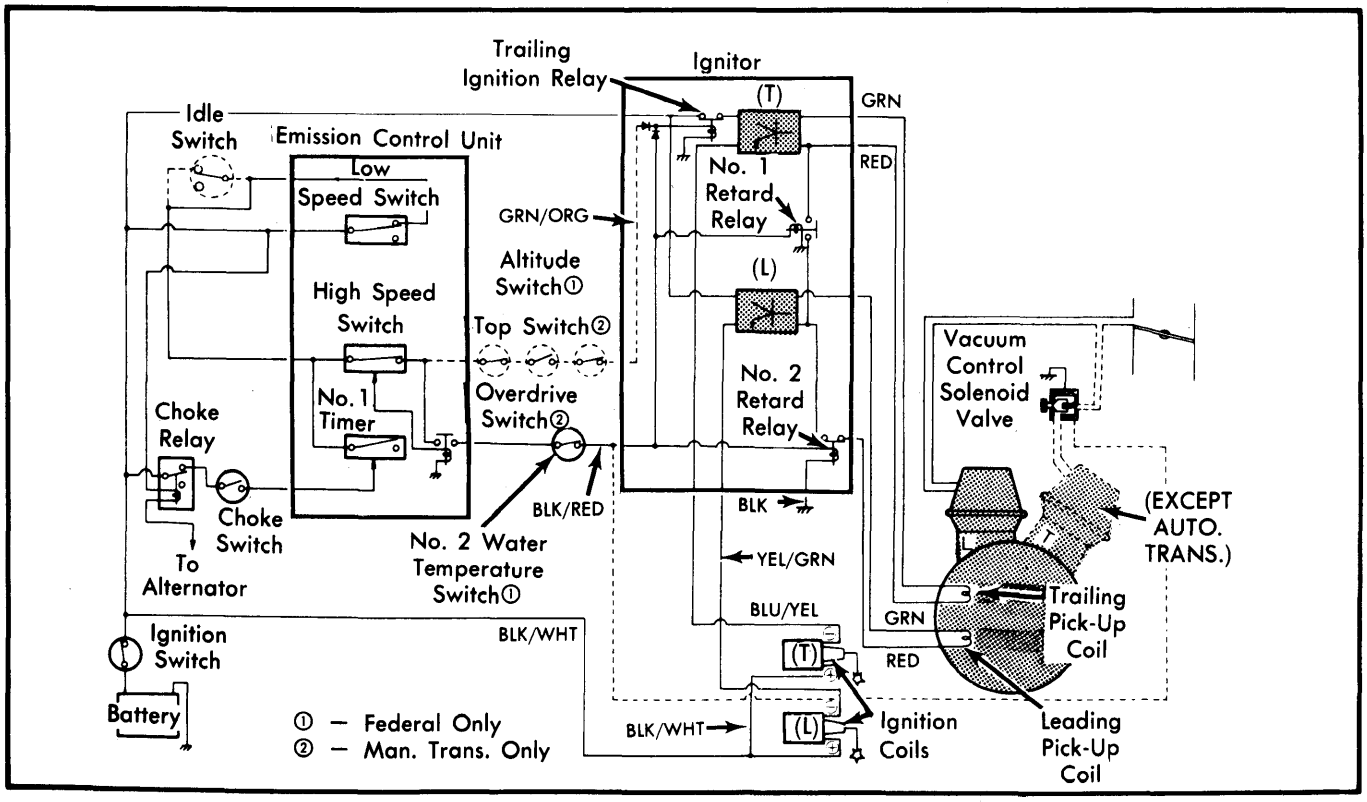

Fig. 1 Schematic of RX7 Ignition System

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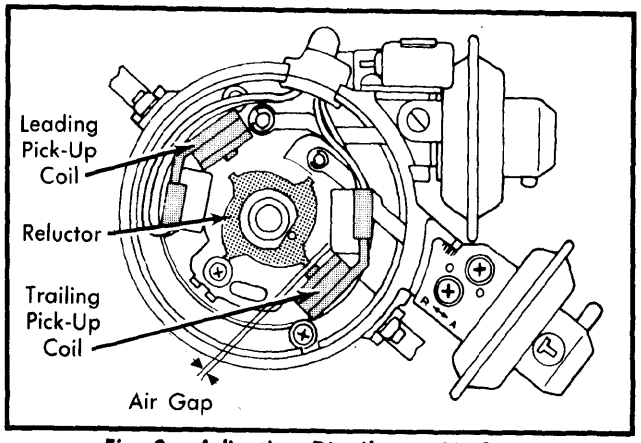

Fig. 2 Adjusting Distributor Air Gap

Ignition Timing – 1) Leading timing is adjusted by loosening distributor lock nut and rotating distributor housing until correct timing is obtained. See *Fig. 3*.

2) Trailing timing is changed by loosening the screws securing the vacuum unit and moving the vacuum unit outward (to advance) or inward (to retard). Retighten screws when correct timing is obtained.

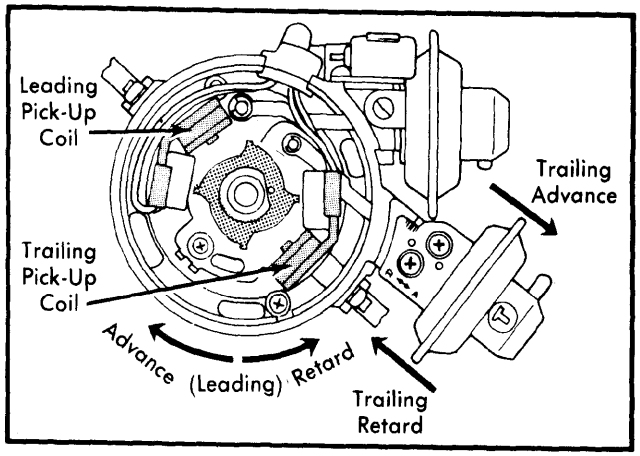

Fig. 3 Adjusting Ignition Timing

TESTING

HIGH TENSION WIRE RESISTANCE CHECK

Turn ignition switch "OFF". Connect ohmmeter leads to each end of coil-to-distributor high tension wire. Resistance should be 16,000 ohms (±6,400 ohms) per 39.37" (1 m).

IGNITION COIL RESISTANCE CHECK

Set an ohmmeter in the low scale. With ignition switch turned "OFF", and coil wires disconnected, attach ohmmeter leads to primary terminals of leading coil and then trailing coil. Primary resistance should be 1.22-1.48 ohms for each ignition coil.

PICK-UP COIL RESISTANCE CHECK

1) Set an ohmmeter in the x100 scale. Turn ignition switch "OFF". Disconnect connector between ignitor and distributor. See *Fig. 4*.

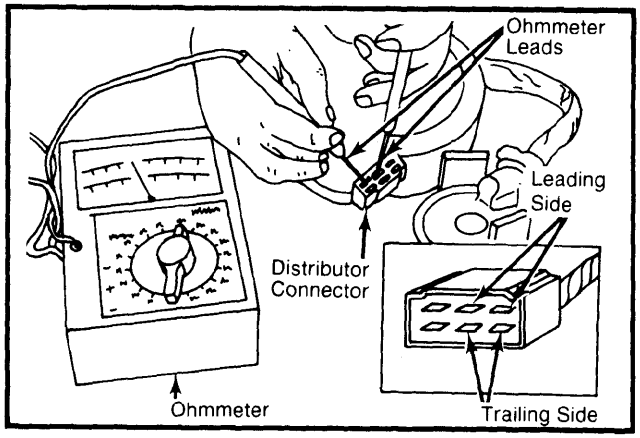

Fig. 4 Ohmmeter Hookup for Pick-Up Coil Resistance Check

2) Connect ohmmeter leads to leading terminals and then to trailing terminals. Resistance should be 600-700 ohms at 68° F (20° C) for each set of pick-up coils. If not, replace pick-up coil and bearing assembly.

PICK-UP COIL OPERATION CHECK

1) With distributor connector still disconnected, touch ammeter leads to leading terminals and then to trailing terminals.

2) Place a screwdriver against core of pick-up coil being tested. Indicator of meter should move each time screwdriver is taken quickly away from core. If not, replace pick-up coil and bearing assembly.

IGNITOR CHECK

1) Disconnect connectors from pick-up coil lead and from ignition coils. See *Fig. 5*. Disconnect 2-pin connector from between switches and ignitor.

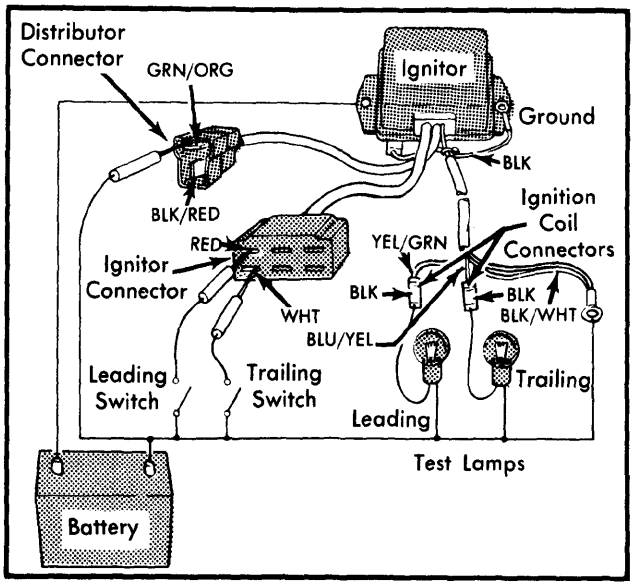

Fig. 5 Test Lamp Hookup for Checking Ignitor Operation

2) Make a circuit as shown in *Fig. 5*. Use two 12 volt lamps with less than 10 watt rating. Operate switch "ON" and "OFF" to be sure test lamps work. Apply battery power to green/orange wire in 2-pin connector. Operate trailing side switch "ON" and "OFF". Trailing side lamp should not flash.

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3) Now apply battery power to black/red wire in same connector. Operate trailing side switch "ON" and "OFF". Test lamp of leading lamp should flash. If test results differ, replace ignitors.

4) To replace ignitors, disconnect couplers from ignitor leads and remove ignitor assembly. See *Fig. 6*. Grip coupler (not wires) and remove from each ignitor. Loosen ignitor attaching screws. Insert thin screwdriver between ignitor and aluminum base plate (on end of ignitor opposite coupler connections), and pry upward on ignitor a little at a time. Remove from plate. Clean ignitor and plate mounting surfaces and install new ignitor. Tighten attaching screws to 10-17 INCH lbs. (12-20 cmkg). Reinstall ignitor assembly on front of shock absorber housing and connect couplers to ignitor leads.

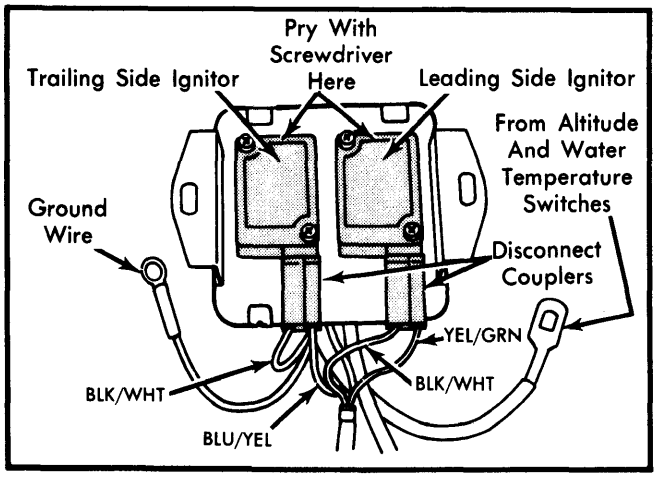

Fig. 6 Removing Ignitors from Base

OVERHAUL

Disassembly – **1)** Remove distributor cap, rotor and seal cover. See *Fig. 7*. Remove clips holding vacuum diaphragm links. Remove screws attaching vacuum control units to distributor housing. Remove vacuum control units and condenser.

2) Remove reluctor (signal rotor) shaft attaching screw from end of shaft. Remove pick-up coil base bearing attaching screws. Remove reluctor, reluctor shaft, pick-up coils and coil base bearing assembly from top of distributor drive shaft.

3) Remove reluctor from reluctor shaft, using suitable puller. Remove spring pin. Remove governors by removing springs. Drive lock pin out of driven gear, using a small drift. Remove gear and washers. Remove drive shaft through top of distributor housing.

Reassembly – Inspect distributor cap and rotor for cracks, carbon tracks, and burned or corroded terminals. Assemble distributor in reverse order of disassembly, noting the following: Install reluctor shaft onto distributor drive shaft, engaging slots of reluctor shaft and governor pins. Install pick-up coil and coil base bearing assembly and tighten attaching screws. Install reluctor on shaft, driving spring pin in with a suitable punch.

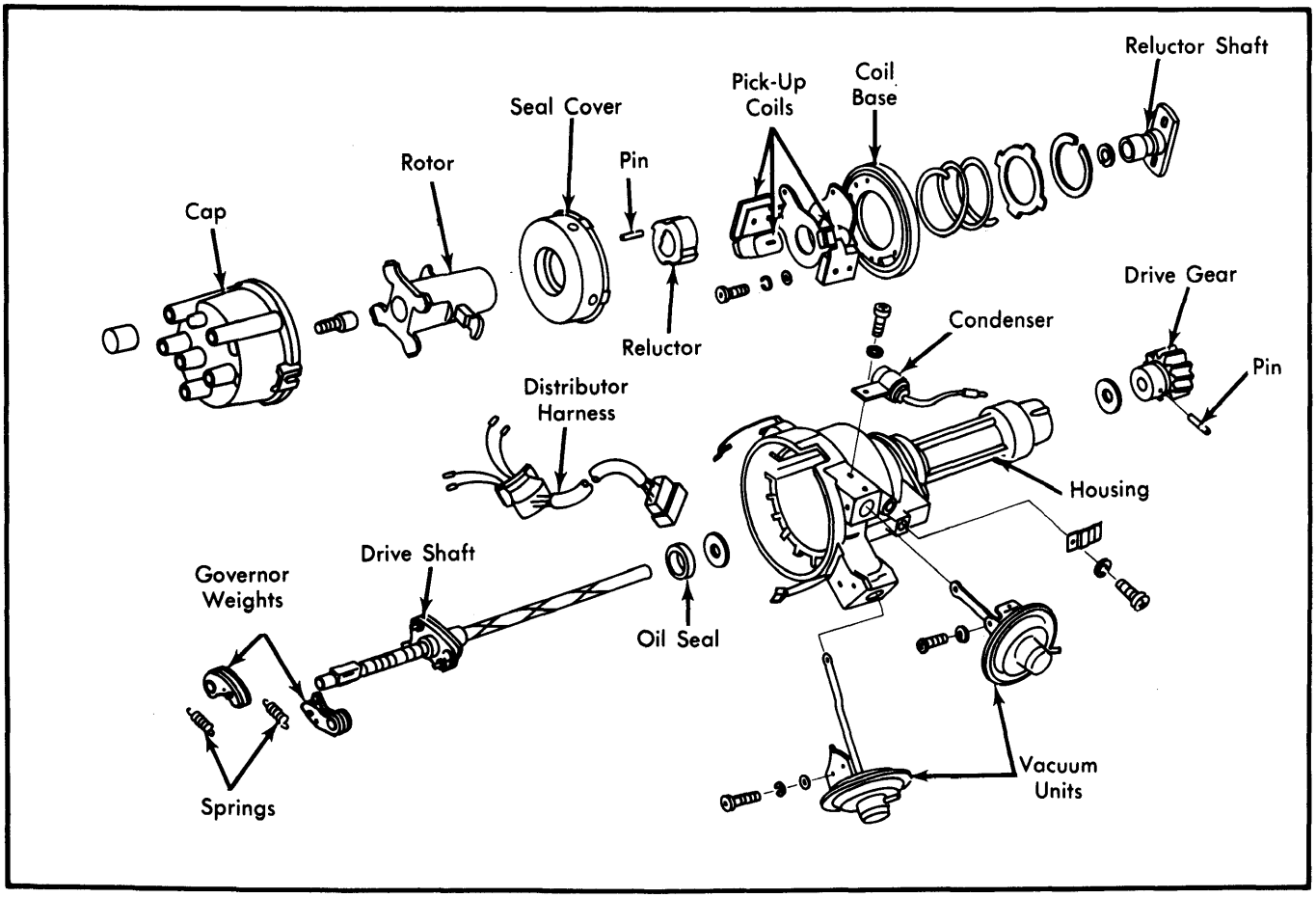

Fig. 7 Disassembled View of RX7 Distributor