MAZDA 1971-72 ROTARY ENGINE MODIFICATION

Mazda R-100 (1971)
Mazda RX-2 (1971-72)

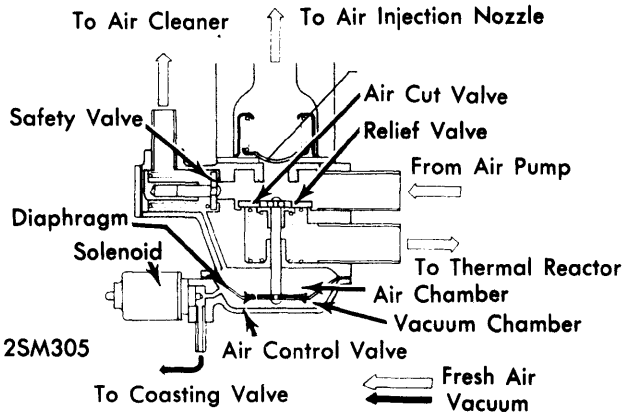
DESCRIPTION

The exhaust emission control system consists of an air injection system, an ignition and air flow control system, and a deceleration control system.

Air Injection System – Consists of an air pump, a check valve, an air injection nozzle, and a thermal reactor. In addition, RX-2 models have an air control valve.

Ignition and Air Flow Control System – Consists of a thermosensor, a thermodetector, a vacuum switch, and a control box.

Deceleration Control System – Consists of an anti-afterburn valve, a coasting valve, a relief valve on R-100 models or an air supply valve on RX-2 models, and a control box. In addition, RX-2 models also use a throttle positioner.



AIR CONTROL VALVE

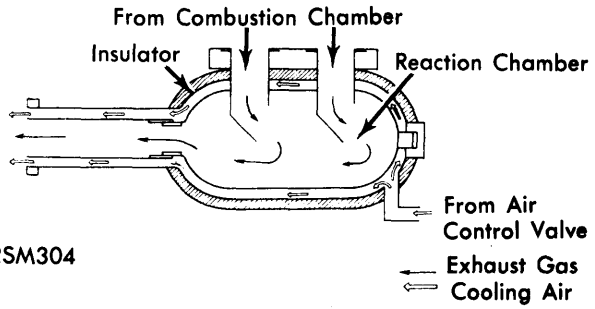
OPERATION

AIR INJECTION SYSTEM

Air Pump – A two-vane type driven by a "V" belt mounted on the eccentric shaft pulley.

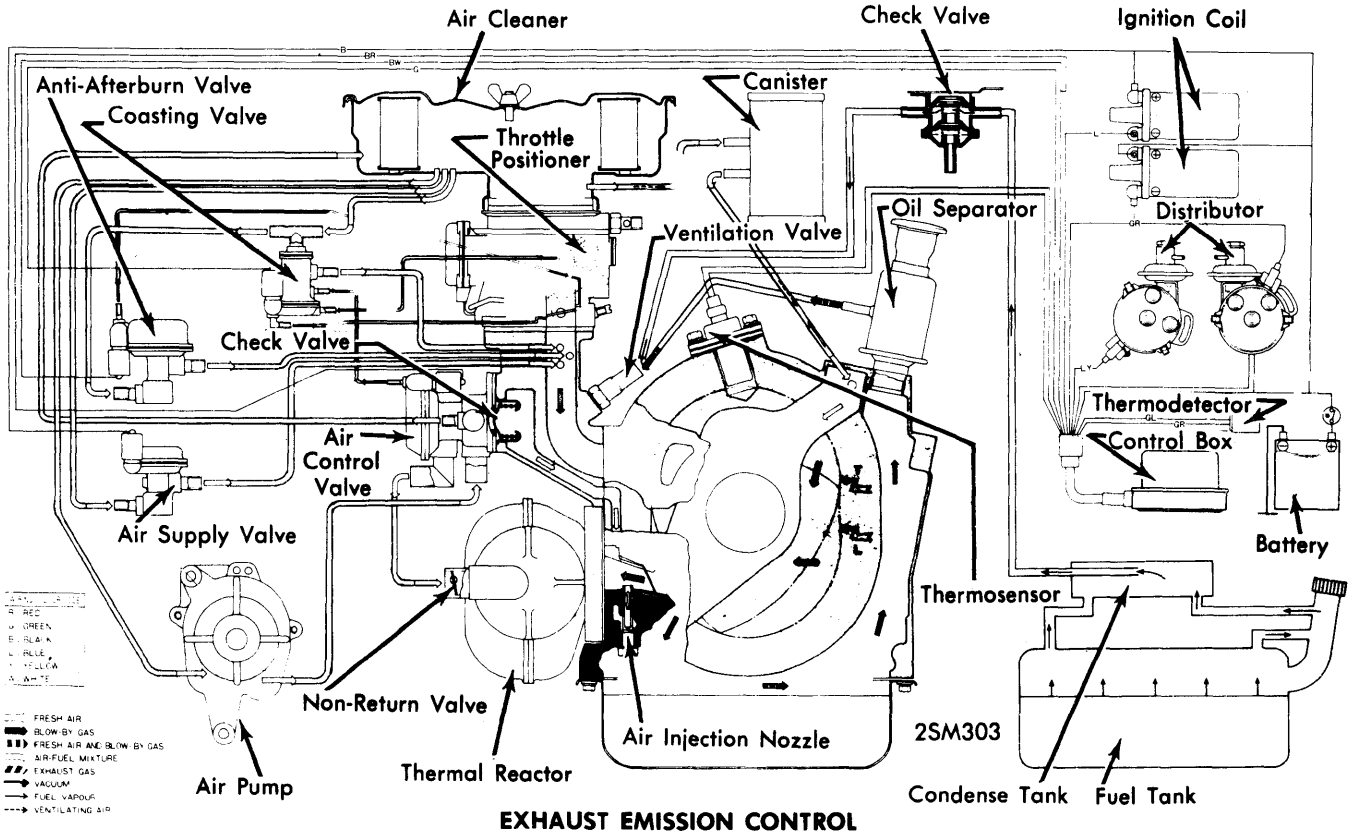
Check Valve – On R-100 models, check valve is located on intake manifold below carburetor. On RX-2 models, check valve is incorporated in air control valve. Should exhaust gas pressure exceed air pump pressure, valve closes to prevent backflow of exhaust gas which could damage air pump.

Air Injection Nozzle – Nozzles are attached to each of the front and rear rotor housings. Air from the air pump passes through the check valve and is injected through the nozzle into the exhaust port adjacent to the thermal reactor.



THERMAL REACTOR COOLING AIR CIRCUIT

Air Control Valve – Air control valve contains three valves which, depending upon engine operation, directs air from air pump to either air injection nozzles or thermal reactor. In addition, should air become trapped due to a malfunction, a safety valve opens and directs air pump air to the air cleaner to prevent damage to the system. Operational conditions of air control valve are as follows:



EXHAUST EMISSION CONTROL

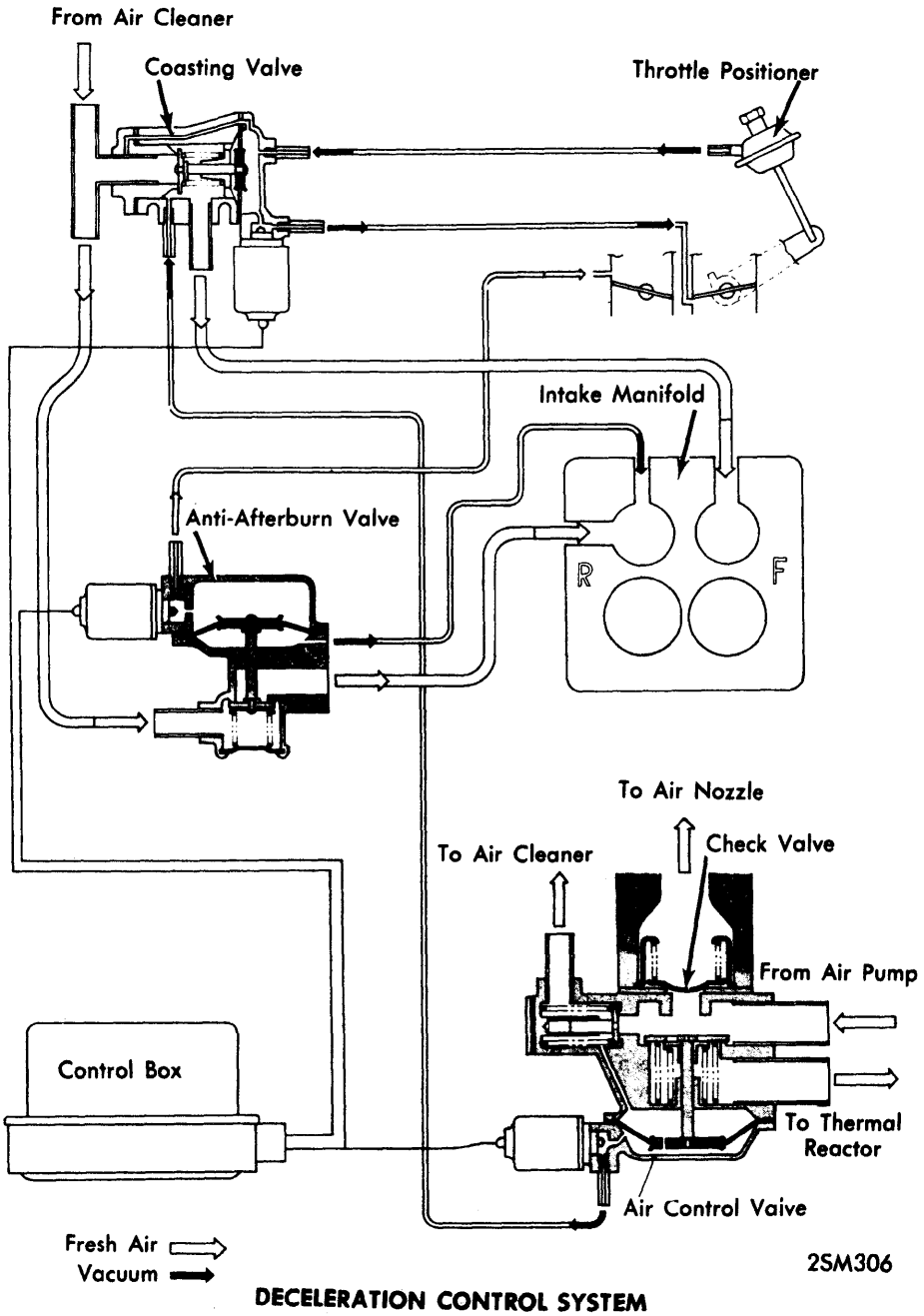
MAZDA 1971-72 ROTARY ENGINE MODIFICATION (Cont.)

1) During normal engine operation air from the air pump flows into the air control valve and passes through the check valve to the air injection nozzles. When engine speed exceeds 4000±200 RPM, an electronic control box actuates the solenoid which shuts off vacuum to air control valve vacuum chamber. Spring pressure opens the air cut valve which shuts off air to air injection nozzles and allows the air from the air pump to pass to the thermal reactor cooling circuit.

2) During periods of deceleration when engine speed is below 4000±200 RPM, the coasting valve of the deceleration control system shuts off vacuum to the air control valve vacuum chamber. This causes spring pressure to open air cut valve, which in turn shuts off air to air injection nozzles and allows the air from the air pump to pass to the thermal reactor cooling circuit.

3) The relief valve is controlled by air pressure in the air injection system. When air pressure exceeds 1.3-2.0 lbs./sq.in. (0.11-0.14 Kg./sq. cm) valve opens and directs a quantity of air through the thermal reactor cooling system. This action maintains a constant pressure of air flowing to the air injection nozzles.

Thermal Reactor – Thermal reactor is mounted just outside the exhaust port. It oxidizes unburned exhaust gas expelled from the engine. When engine speed is approximately 4000 RPM, or during deceleration, the air control valve supplies fresh air from the air pump to the thermal reactor to maintain the necessary temperature for oxidation of exhaust gas.



DECELERATION CONTROL SYSTEM

MAZDA 1971-72 ROTARY ENGINE MODIFICATION (Cont.)

IGNITION & AIR FLOW CONTROL SYSTEM

Thermosensor – Located in engine cooling system, it reacts to engine temperature and sends a signal to the control box, thereby controlling ignition of trailing spark plug.

Control Box & Thermodetector – The thermodetector is a circuit in the control box which prevents the thermosensor from being influenced by ambient temperature. The control box receives various signals from; leading spark plug ignition coil (indicates engine RPM), the thermosensor (indicates engine temperature), and the vacuum switch (indicates engine load). After receiving a signal, the control box either allows the trailing spark plug to fire or prevents it from firing.

Vacuum Switch – Switch is connected to vacuum advance control rod and is mounted inside the leading plug distributor. When energized, the vacuum switch sends a signal to the control box which in turn ignites the trailing spark plug.

DECELERATION CONTROL SYSTEM

Anti-Afterburn Valve – During periods of deceleration and when shifting gears, intake manifold vacuum causes valve to open. With valve open, fresh air from carburetor air cleaner passes through valve and enters the intake manifold to correct the overrich mixture caused by sudden throttle closure. During normal running conditions, solenoid is de-energized and valve is closed. When engine speed exceeds 4000±200 RPM, control box energizes solenoid and valve is opened allowing fresh air to enter intake manifold to prevent afterburning during deceleration at high engine speeds. When the engine is switched off, solenoid opens vacuum line and due to the resulting pressure difference between air and vacuum chambers, valve opens and directs air into intake manifold to prevent afterburn. A metering orifice in valve diaphragm controls duration of valve opening.

Coasting Valve – Connected to intake manifold, valve supplies fresh air from air cleaner to intake manifold to correct overrich mixture during deceleration. When coasting valve opens, intake manifold vacuum connected to vacuum chamber of air control valve is released to atmosphere. This shuts off air to air injection nozzles and directs it to the thermal reactor cooling circuit. The rise of intake manifold vacuum during deceleration and gear shifting causes valve to open, and air from air cleaner is directed to intake manifold to prevent afterburn. When engine speed exceeds 1400±50 RPM, control box energizes solenoid which opens vacuum line leading to vacuum chamber. Pressures in vacuum and air chambers are equalized and air from air cleaner overcomes spring force and flows into intake manifold. In addition, when coasting valve opens, vacuum chamber of air control valve is subjected to atmosphere and pressures in vacuum and air chambers are equalized allowing spring force to operate air cut valve.

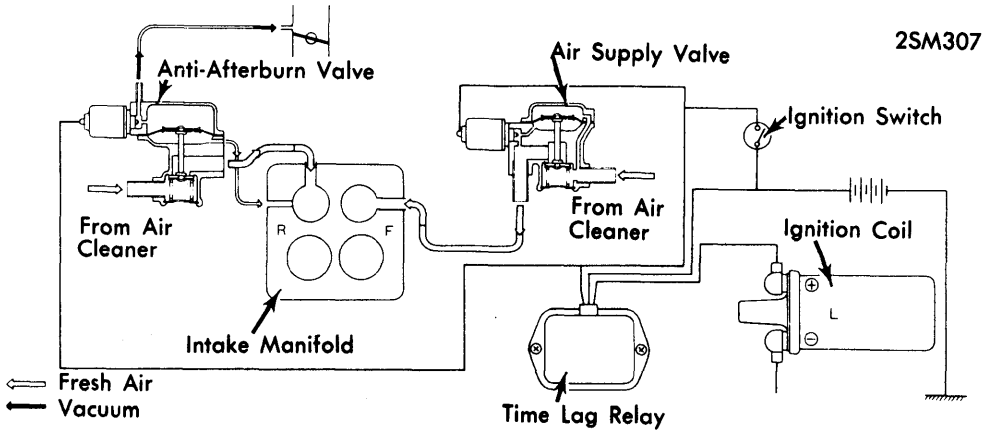
Throttle Positioner – Connected to carburetor throttle lever, it prevents throttle from fully closing during deceleration. Diaphragm of throttle positioner is controlled by vacuum from the vacuum chamber of the coasting valve. When engine speed decreases to 1200±50 RPM, control box de-energizes coasting valve solenoid. This shuts off vacuum to throttle positioner diaphragm and allows carburetor throttle lever to return to normal idling position.

Air Supply Valve & Time Lag Relay – When the ignition is switched off, the air supply valve directs fresh air from the carburetor air cleaner into the intake manifold. At the same time, the time lag relay ignites the leading spark plug for a short period in order to burn the unburned components.

TESTING

Air Pump – Make sure hoses are free of air leaks. Connect a pressure gauge between air pump and air control valve. With engine idling, gauge pressure should be .47-.65 lb./sq.in. (.033-.046 Kg./sq. cm).

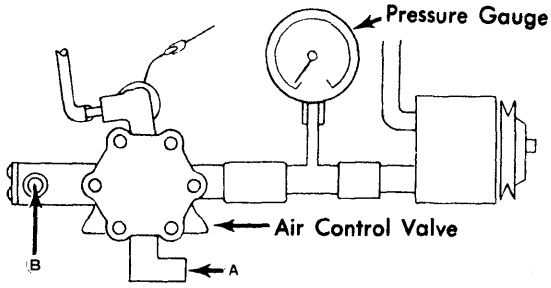
Check Valve – Remove air control valve. Remove check valve seat, valve, and spring from air control valve. Check seating of valve and seat. Inspect spring, free length of spring should be 1.22 in. (31 mm).



AIR SUPPLY VALVE, ANTI-AFTERBURN VALVE,

MAZDA 1971-72 ROTARY ENGINE MODIFICATION (Cont.)

Thermal Reactor – Check for damage or cracks. Remove air hose leading to air control valve, insert finger into valve and make sure non-return valve works smoothly. Start engine and make sure that there are no major exhaust gas leaks from the cooling air injection pipe of the thermal reactor.



2SM308

TESTING AIR CONTROL VALVE

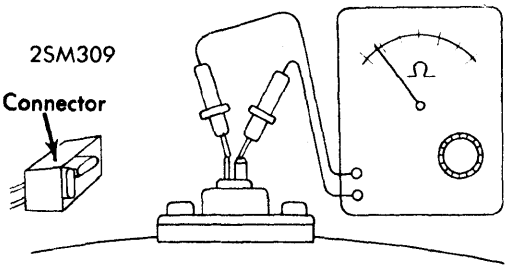
Air Control Valve – With ignition turned off, check solenoid by connecting it directly to battery. If clicking sound is heard, solenoid is normal. Attach pressure gauge as shown in illustration and proceed as follows:

1) Remove hoses from outlets "A" and "B". Start engine and run at idle. Check to see that pressure gauge reads .47-.65 lb./sq.in. (.033-.046 Kg./sq. cm.) and there are no air leaks from outlets "A" and "B".

2) Increase engine speed to 3000 RPM. Pressure gauge should now read 1.3-2.0 lb./sq.in. (.11-.14 Kg./sq. cm), and air should be coming from outlets "A" and "B".

3) Remove solenoid terminal. Pressure gauge should now read 0-.36 lb./sq.in. (0-.025 Kg./sq. cm), and air should flow from outlet "A" but it should not flow from outlet "B". Remove pressure gauge and connect hoses.

Thermosensor – Disconnect wire connector and attach an ohm meter. A reading of under 200,000 ohms indicates that thermosensor is normal.



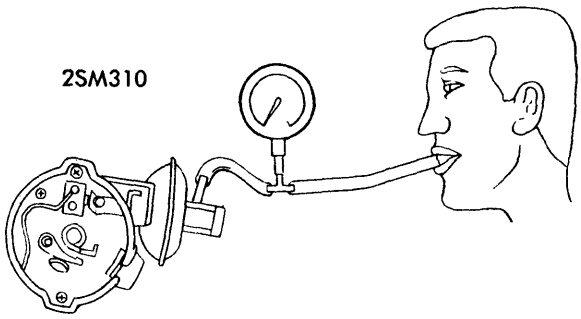
TESTING THERMOSENSOR

Vacuum Switch – With the cap of the leading ignition distributor removed, remove vacuum sensing tube from the vacuum advance tube of the distributor and attach a vacuum gauge in its place. Proceed as follows:

1) Hold mouth to tube of vacuum gauge and suck in. Watch vacuum gauge and listen for the vacuum switch to change from ON to OFF at approximately 7.09 in. (180 mm) Hg. Vacuum switch should then change from OFF to ON when vacuum is reduced to approximately 4.72 in. (120 mm) Hg.

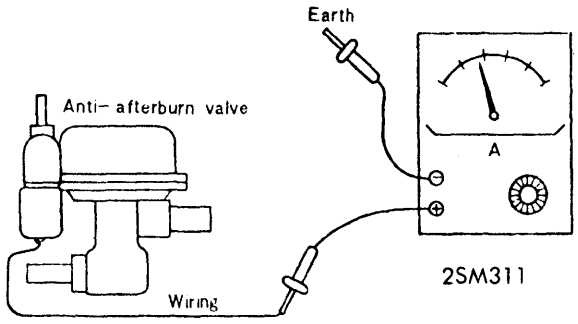
2) Replace distributor cap and replace vacuum sensing tube to the vacuum advance of the distributor. Remove thermosensor connector and connect timing light to the high tension lead of the trailing distributor.

3) Run engine at idle speed and then raise RPM. Timing light should stop flashing when speed is raised to between 1600-4200 RPM.



TESTING VACUUM SWITCH

Control Box – With thermosensor connector removed and a timing light attached to the high tension lead of the trailing distributor, proceed as follows:



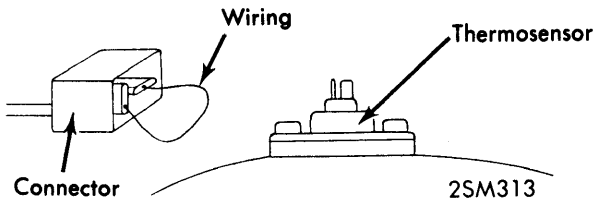
TESTING CONTROL BOX

1) Make sure that timing light does not flash when engine speed is between 1600-4200 RPM, and that it starts to flash again at speeds in excess of 4200 RPM.

2) Connect an ammeter to the air control valve solenoid and to the anti-afterburn valve solenoid. Make sure that current flow to both solenoids when engine speed is 800-4200 RPM and that current does not flow to either solenoid when engine speed is in excess of 4200 RPM.

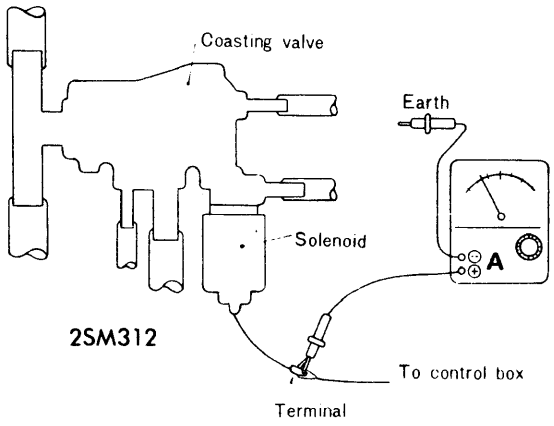
MAZDA 1971-72 ROTARY ENGINE MODIFICATION (Cont.)

3) Using a short piece of wire, connect both terminals of the thermosensor connector to each other in order to short circuit the connector. Make sure that timing light flashes at engine speeds between 1600-4200 RPM.



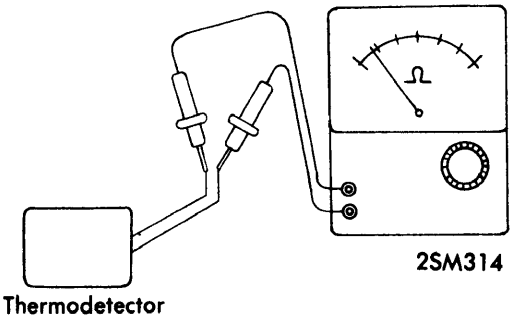
CONNECTOR SHORT-CIRCUIT

4) Remove wiring used to short circuit connector and connect thermosensor connector to the thermosensor. Attach an ammeter to the coasting valve solenoid and make sure there is no current flow to the ammeter at idle speed. At speeds of 1250-1550 RPM and above current should flow. When engine speed is gradually lowered to 1100-1300 RPM, current flow should stop.



TESTING CONTROL BOX

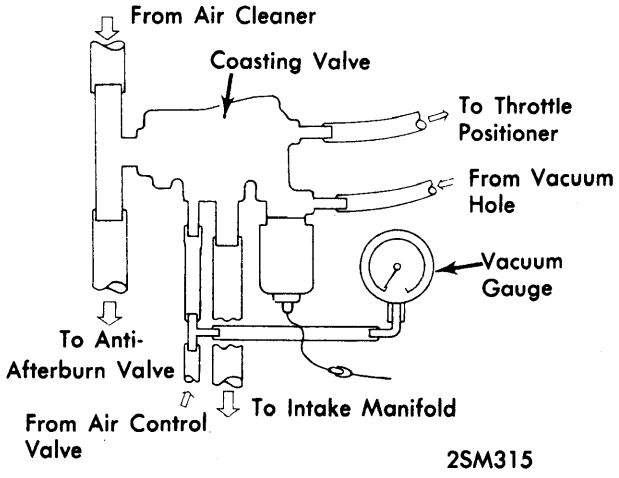
Thermodetector – Check resistance with an ohm meter. Thermodetector is normal if resistance is lower than 200,000 ohms.



TESTING THERMODETECTOR

Anti-Afterburn Valve – With suction hose remove from valve and engine running at idle, hold hand over opening of suction hose. If strong suction is felt, valve should be replaced. Run engine at 3500-3800 RPM and then close throttle suddenly. Air should be sucked into the hose for between .2-1.0 seconds. Run engine at idle and remove wire going to solenoid of anti-afterburn valve. Make sure that air continues to be sucked in through air suction hose while wire is disconnected from solenoid.

Coasting Valve – With vacuum gauge attached in tube from air control valve to coasting valve, start engine and check that vacuum is more than 15.7 in. (400 mm) Hg. when engine speed is 800 RPM. Raise speed to about 2500 RPM and close throttle suddenly. Vacuum reading at this time should be 0-1.18 in. (0-30 mm) Hg. When engine speed decreases to 1100-1300 RPM, the reading should rise to more than 15.7 in. (400 mm) Hg.

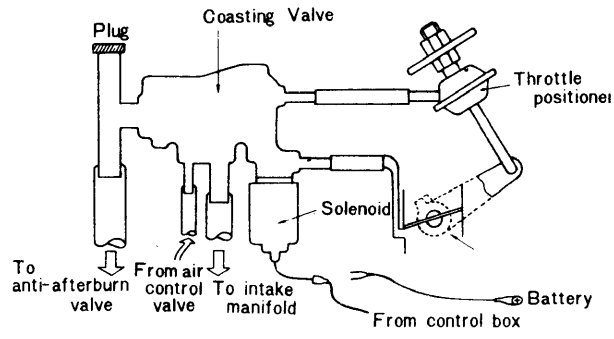


TESTING COASTING VALVE

Throttle Positioner – With air hose from coasting valve air inlet to air cleaner disconnected, plug air inlet. Start engine and run at 2000 RPM, proceed as follows:

1) Disconnect wire to coasting valve and connect a wire directly from battery to coasting valve solenoid. Release the throttle suddenly. RPM should drop to 950±50 RPM.

2SM316



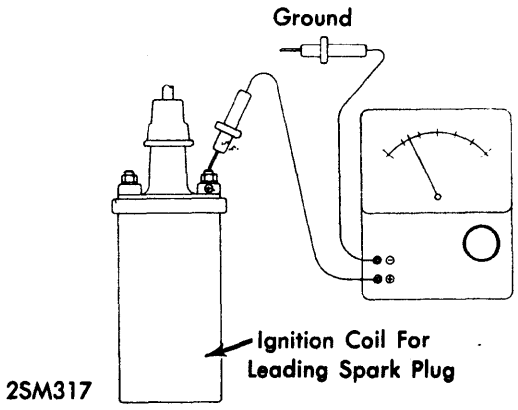
TESTING THROTTLE POSITIONER

MAZDA 1971-72 ROTARY ENGINE MODIFICATION (Cont.)

2) If engine speed does not stabilize at this speed, adjust throttle positioner. When direct lead from battery is disconnected from coasting valve solenoid, engine speed should drop to 800 RPM.

Air Supply Valve – Remove air hose from air suction pipe of the air supply valve. Start engine and run at idle speed. Close air suction pipe of the air supply valve. The engine speed will drop, but it should not drop over 30 RPM. Disconnect wire to the air supply valve solenoid and check the air supply to the intake manifold. A large amount of air should be supplied with the wire disconnected.

Time Lag Relay – Connect an ammeter to the positive side of the leading spark plug ignition coil. Start engine and run at idle. Turn ignition OFF. Current should continue to flow for about .7-1.0 seconds after ignition is turned OFF.



TESTING TIME LAG RELAY