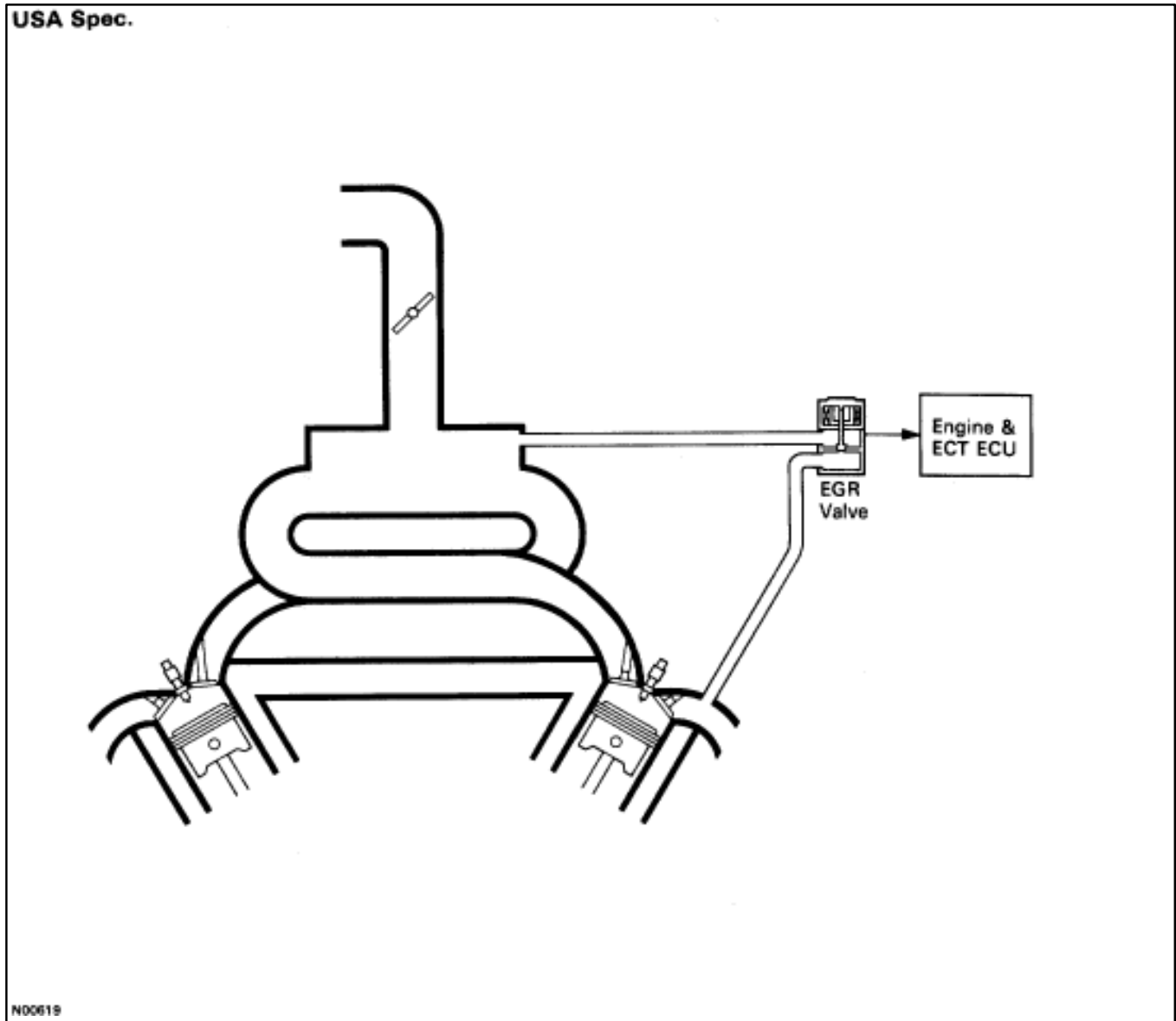


EXHAUST GAS RECIRCULATION (EGR) SYSTEM

DESCRIPTION

To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

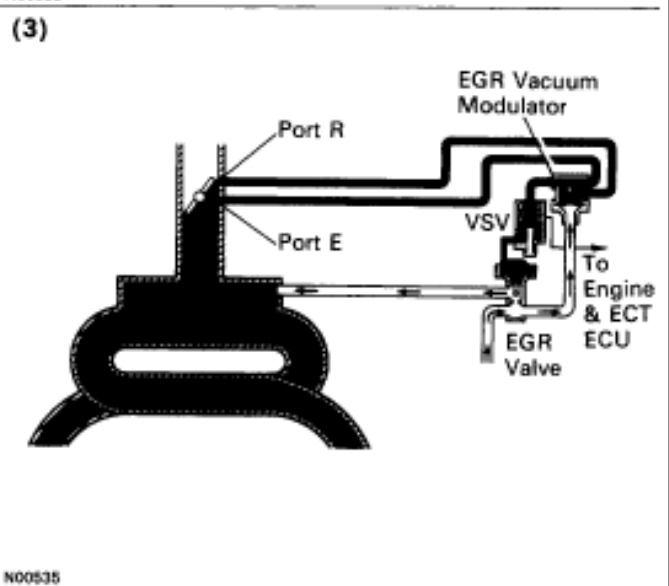
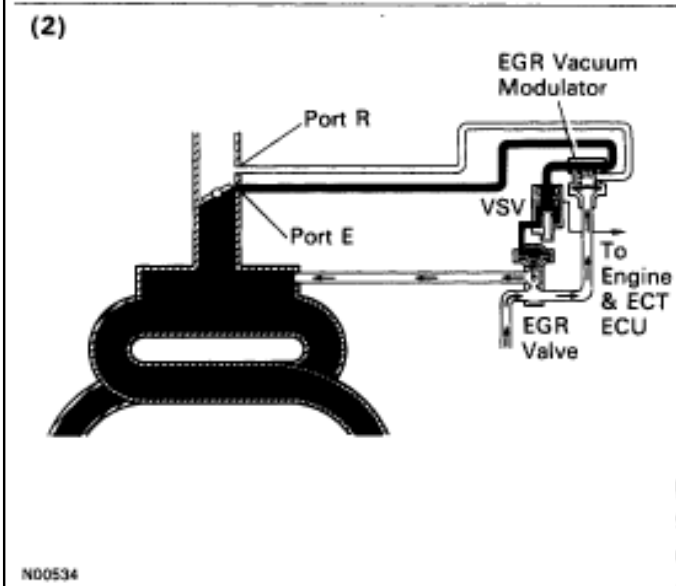
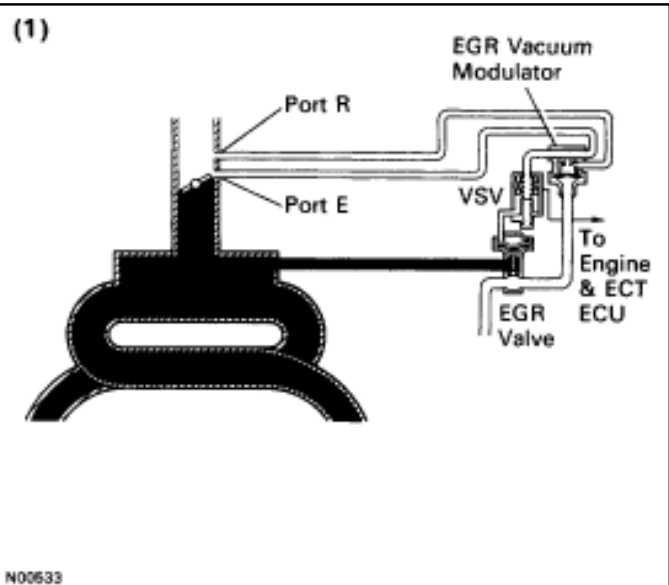
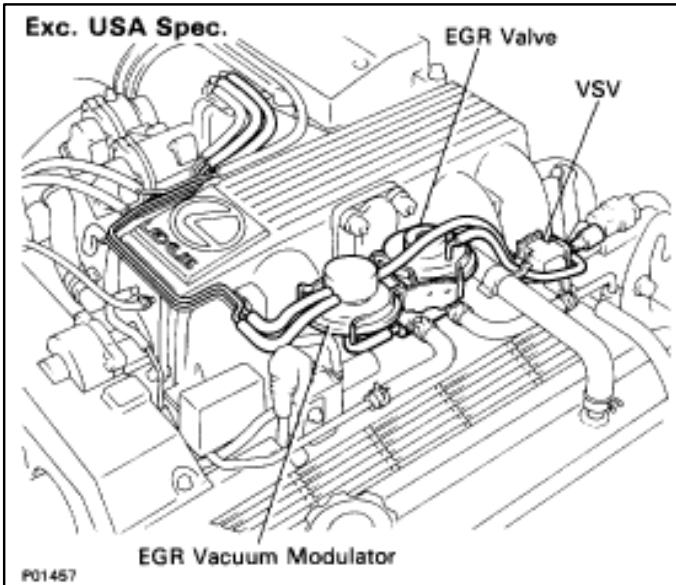
OPERATION



Coolant Temp.	Condition	EGR Valve	Exhaust Gas
Below 53°C (127°F)	–	CLOSED	Not recirculated
Above 55°C (131°F)	(a) Idling, Deceleration, Neutral, Low air volume, High Engine speed	CLOSED	Not recirculated
	Except (a)	OPEN	*Recirculated

* The ECU calculates the appropriate number of steps according to the intake air volume and the engine speed, then drives the stepping motor to maintain the EGR volume at a level appropriate to the driving conditions.

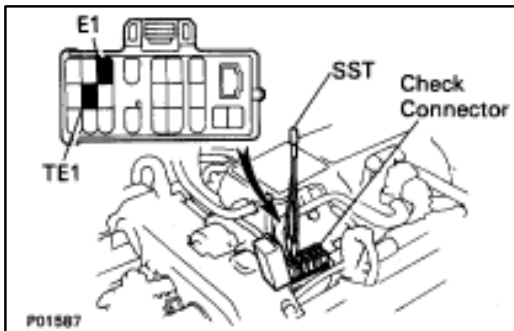
OPERATION (Cont'd)



Coolant Temp.	Engine RPM	VSV	Throttle Valve Opening Angle	Pressure in EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 53°C (127°F)	-	CLOSED	-	-	-	CLOSED	Not recirculated
Above 55°C (131°F)	Below 3,800 rpm	CLOSED	-	(1)	-	CLOSED	Not recirculated
		OPEN	Positioned between Ports E and R	(2) HIGH	*	CLOSED passage to atmosphere	OPEN
	Positioned above Port R		(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)
	Above 4,000 rpm	CLOSED	-	-	-	CLOSED	NOT Recirculated

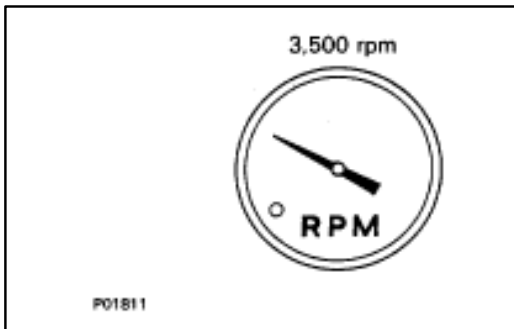
* Pressure increase → Modulator closes → EGR valve opens → Pressure drops
 ← EGR valve close ← Modulator opens ←

** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

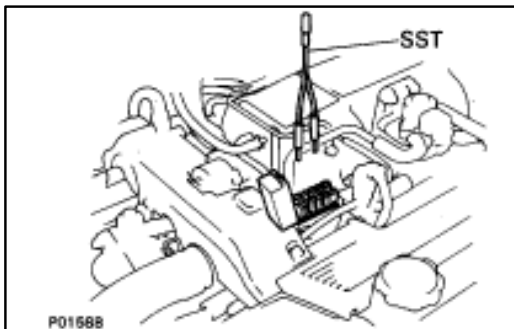


INSPECTION OF EGR SYSTEM (USA Spec.) INSPECT SYSTEM OPERATION

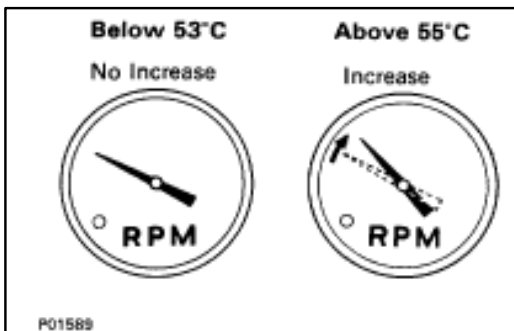
- (a) Using SST, connect terminals TE1 and E1 of the check ("DIAGNOSIS") connector.
SST 09843-18020



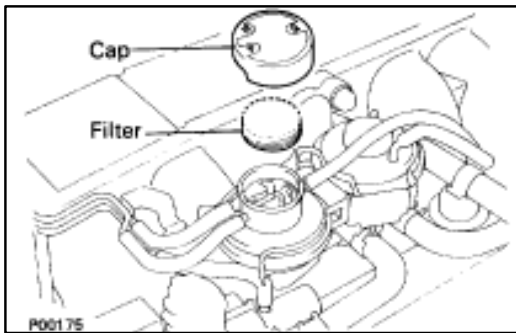
- (b) Keep the engine at 3,500 rpm.



- (c) Set the transmission shift lever to the "N" position.
(d) Remove the SST from the check connector.
SST 09843-18020



- (e) Check whether the engine rpm increases 100–300 rpm under the following conditions.
Coolant temp.
Below 53°C (127°F) No increase
Above 55°C (131°F) Increases

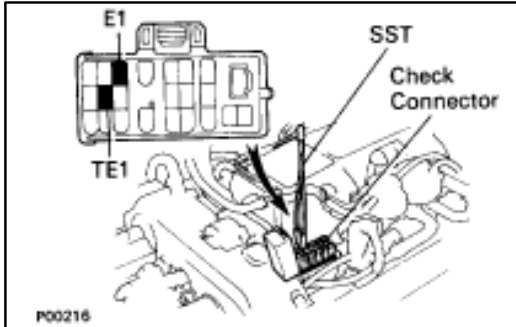


INSPECTION OF EGR SYSTEM (Exc. USA Spec.)

1. CHECK AND CLEAN FILTERS IN EGR VACUUM MODULATOR

- (a) Remove the cap and filter.
- (b) Check the filter for contamination or damage.
- (c) Using compressed air, clean the filters.
- (d) Reinstall the filter and cap.

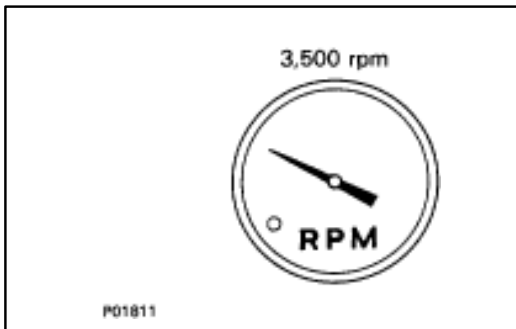
HINT: Install the filter with the coarser surface facing the atmospheric side (outward).



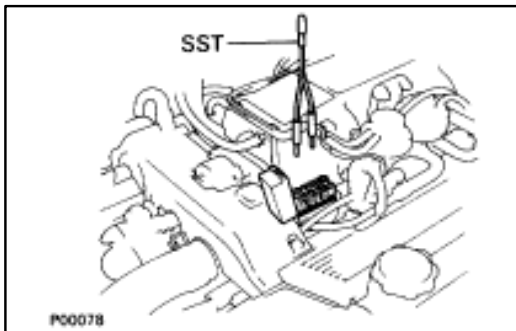
2. INSPECT SYSTEM OPERATION

- (a) Using SST, connect terminals TE1 and E1 of the check ("DIAGNOSIS") connector.

SST 09843-18020

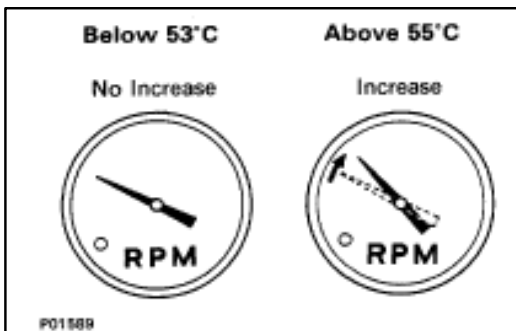


- (b) Keep the engine at 3,500 rpm.



- (c) Set the transmission shift lever to the "N" position.
- (d) Remove the SST from the check connector.

SST 09843-18020

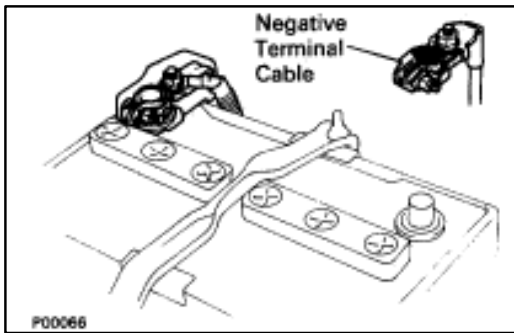


- (e) Check whether the engine rpm increases 100-300 rpm under the following conditions:

Coolant temp.

Below 53°C (127°F) No increase

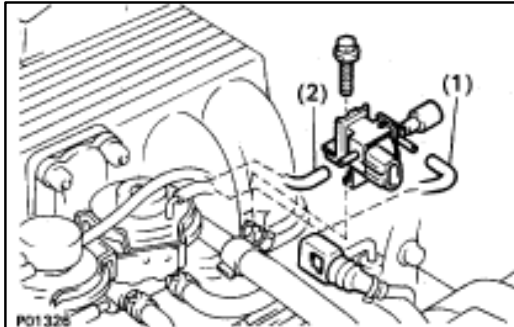
Above 55°C (131°F) Increases



INSPECTION OF VSV (Exc. USA Spec.)

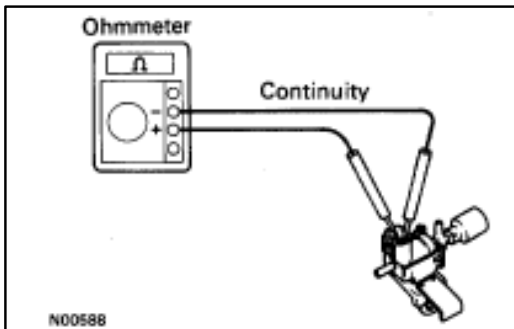
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.



2. REMOVE VSV

- (a) Disconnect the VSV connector.
- (b) Disconnect the following hoses:
 - (1) Vacuum hose (from EGR valve) from VSV
 - (2) Vacuum hose (from EGR vacuum modulator) from VSV
- (c) Remove the bolt and VSV.



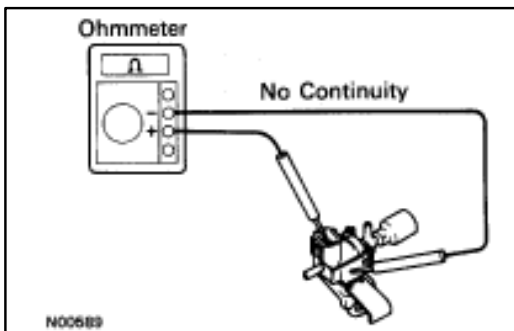
3. INSPECT VSV

A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold): 33–39 ?

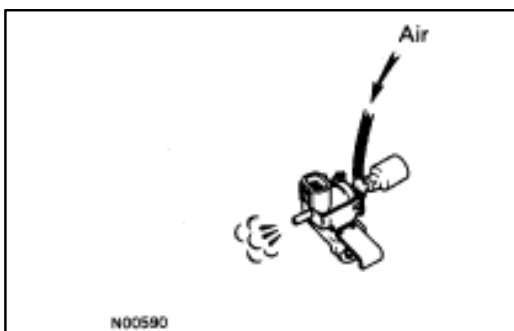
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

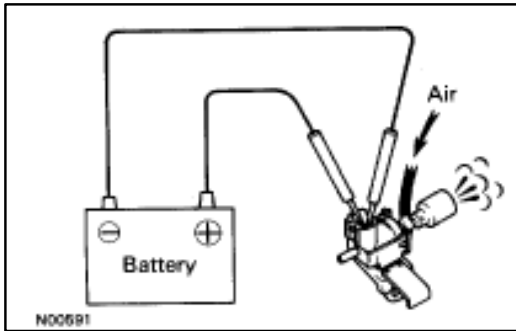
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.

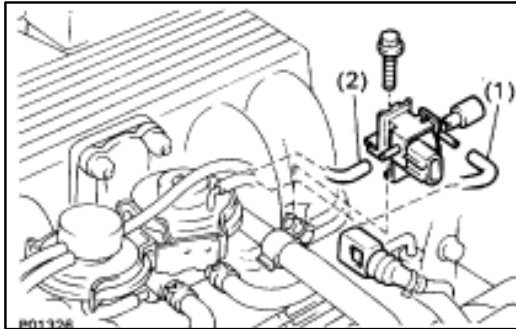


C. Inspect VSV operation

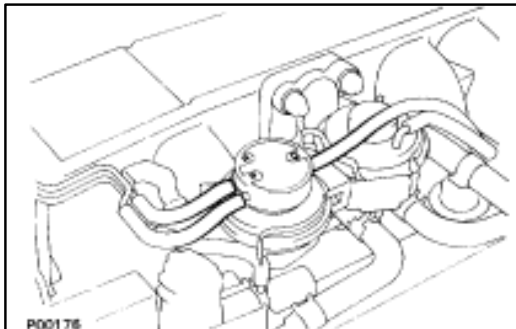
- (a) Check that the air flows from ports E to G.



- (b) Apply battery voltage across the terminals.
- (c) Check that the air flows from port E to the filter. If operation is not as specified, replace the VSV.

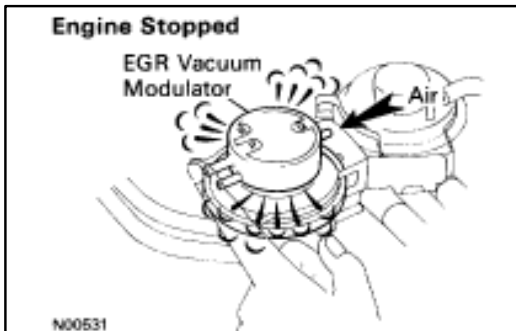


4. **REINSTALL VSV**
 - (a) Install the VSV with the bolt.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
 - (b) Connect the following hoses:
 - (1) Vacuum hose (from EGR valve) to VSV
 - (2) Vacuum hose (from EGR vacuum modulator) to VSV
 - (c) Connect the VSV connector.
5. **RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

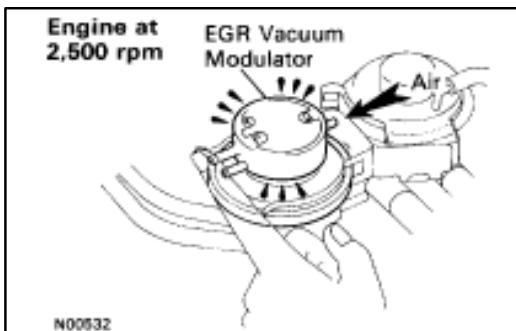


INSPECTION OF EGR VACUUM MODULATOR (Exc. USA Spec.)

1. **DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR**
Disconnect the three vacuum hoses from ports P, Q and R of the EGR vacuum modulator.



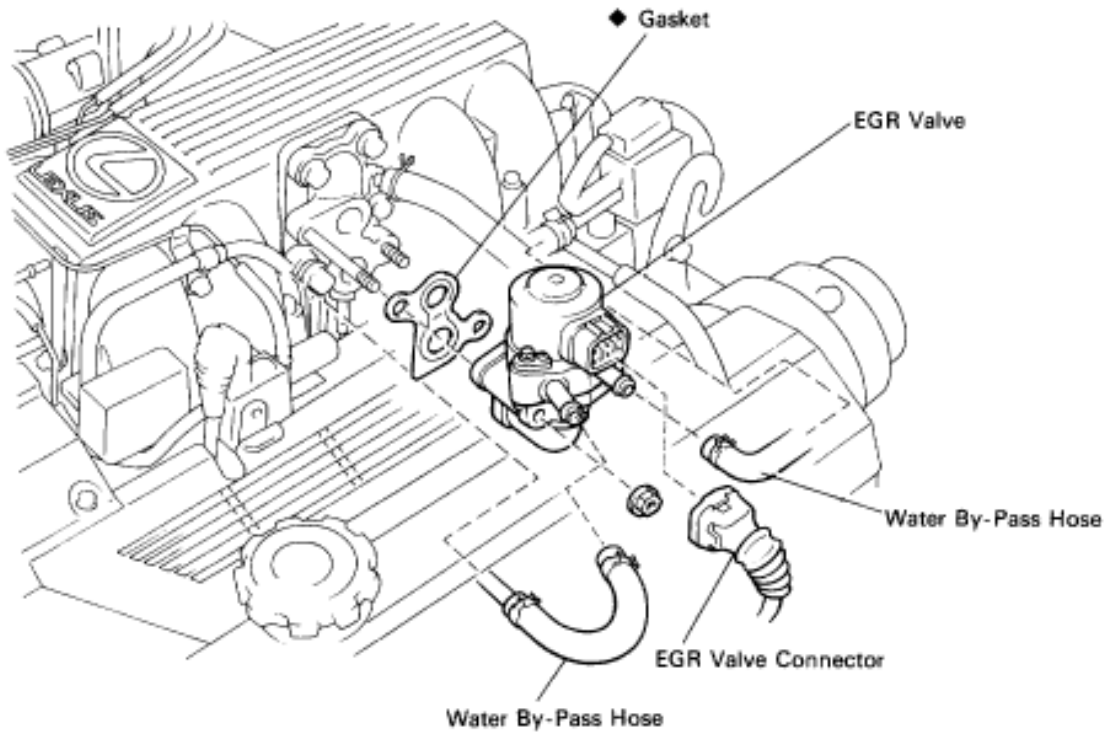
2. **INSPECT EGR VACUUM MODULATOR OPERATION**
 - (a) Block ports P and R with your finger.
 - (b) Blow air into port Q, and check that the air passes through to the air filter side freely.



- (c) Start the engine, and maintain speed at 2,500 rpm.
 - (d) Repeat the above test. Check that there is a strong resistance to air flow.
3. **RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR**
Connect the three vacuum hoses to the proper locations.

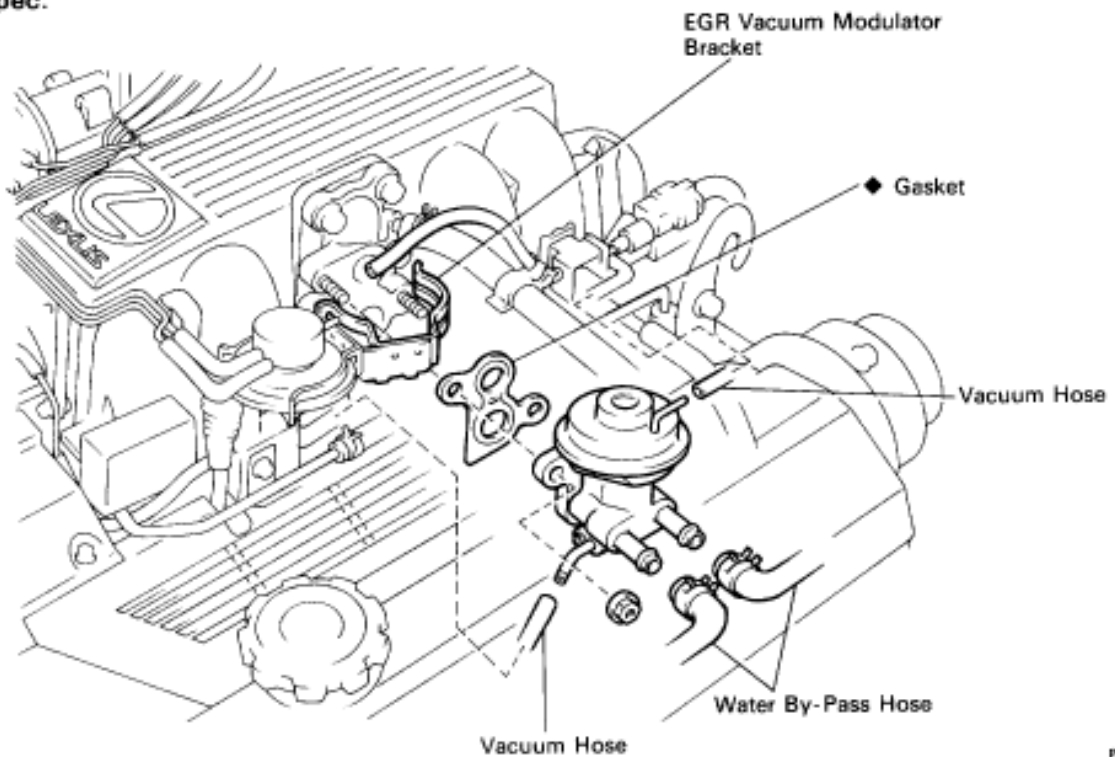
COMPONENTS FOR REMOVAL AND INSTALLATION OF EGR VALVE

USA Spec.

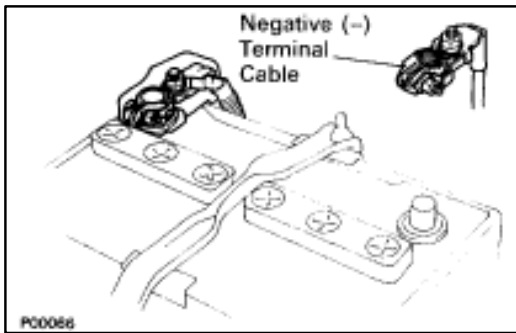


◆ Non-reusable part

Exc. USA Spec.



◆ Non-reusable part



INSPECTION OF EGR VALVE (USA Spec.)

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

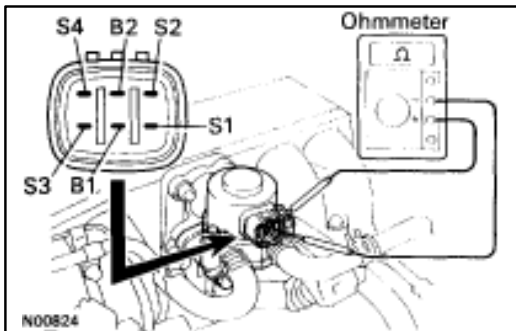
2. **DISCONNECT EGR VALVE CONNECTOR**

3. **INSPECT EGR VALVE RESISTANCE**

Using an ohmmeter, measure the resistance between terminal B1 (or B2) and other terminals (S1, S2, S3 and S4).

Resistance (Cold): 19.9–23.4 ?

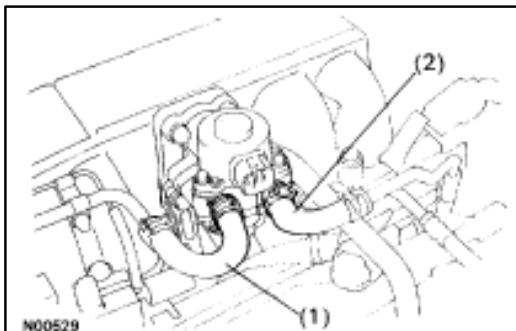
4. **DRAIN ENGINE COOLANT (See page CO-6)**



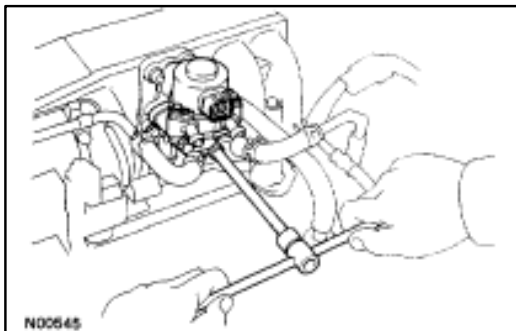
5. **REMOVE EGR VALVE**

(a) Disconnect the following hoses:

- (1) Water by-pass hose (from ISC valve) from the EGR valve
- (2) Water by-pass hose (from rear water by-pass joint) from the EGR valve



(b) Remove the two nuts, EGR valve and gasket.

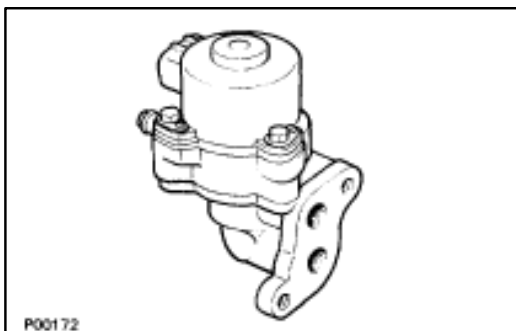


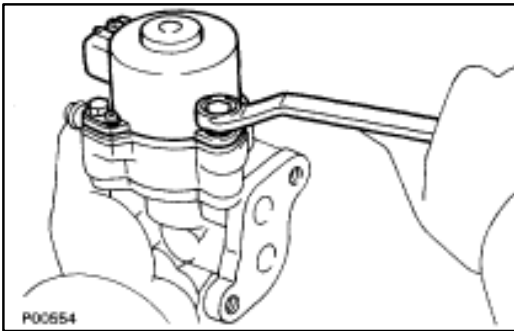
6. **INSPECT EGR VALVE**

- A. **Visually inspect EGR valve**

Check for sticking and heavy carbon deposits.

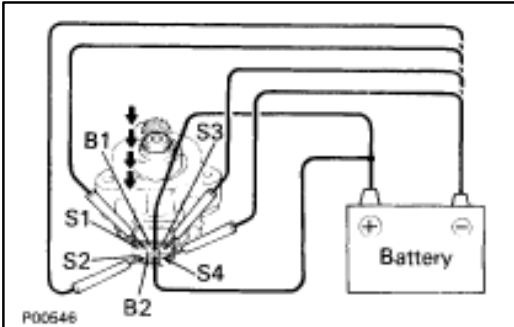
If a problem is found, replace the EGR valve assembly.





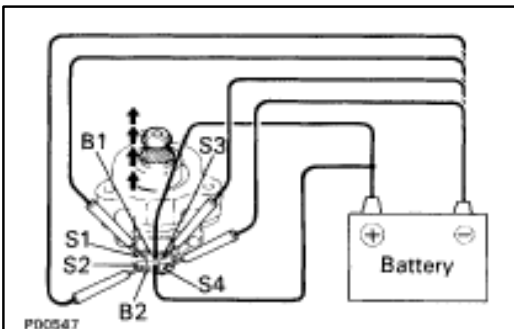
B. Inspect EGR valve operation

- (a) Remove the three bolts and stepping motor from the housing.



- (b) Apply battery voltage to terminal B1 (or B2), and while repeatedly grounding (*S4)–(S4 and *S3)–(S3 and *S2)–(S2 and *S1)–(S1 and *S4) in sequence, check that the valve moves toward the open position.

HINT: Keep the terminal marked with an asterisk (*) grounded while proceeding to the next grounding.

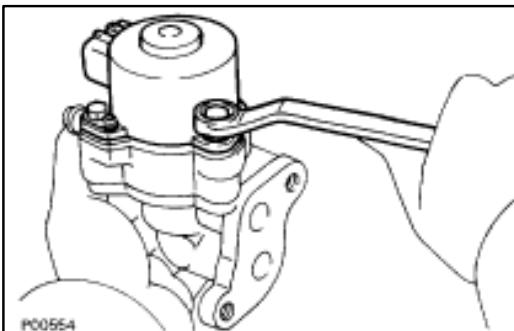


- (c) Apply battery voltage to terminal B1 (or B2), and while repeatedly grounding (*S1)–(S1 and *S2)–(S2 and *S3)–(S3 and *S4)–(S4 and *S1) in sequence, check that the valve moves toward the closed position.

HINT:

- Keep the terminal marked with an asterisk (*) grounded while proceeding to the next grounding.
- Perform this operation after opening the valve by performing step (b) above.

If operation is not as specified, replace the EGR valve assembly.



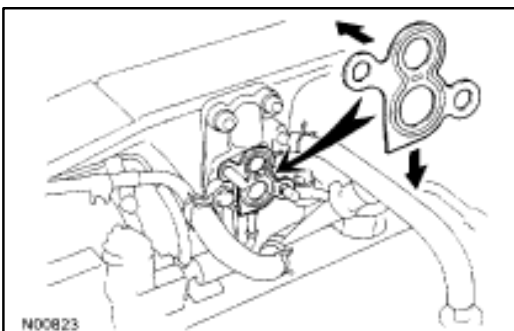
- (d) Reinstall the stepping motor to the housing with the three bolts.

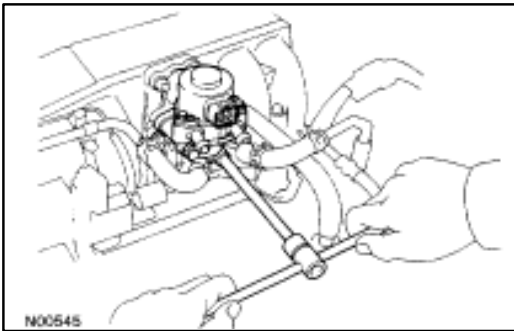
7. REINSTALL EGR VALVE

- (a) Place a new gasket on the EGR valve adaptor.

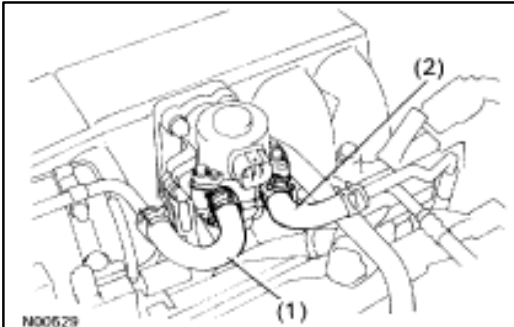
NOTICE:

- Do not touch the adaptor and EGR valve surfaces of the gasket with your hand.
- Align the port holes of the gasket and adaptor. Be careful of the installation direction.





- (b) Install the EGR valve with the two nuts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



- (c) Connect the following hoses:
 - (1) Water by-pass hose (from ISC valve) to the EGR valve
 - (2) Water by-pass hose (from rear water by-pass joint) to the EGR valve

8. RECONNECT EGR VALVE CONNECTOR

9. RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

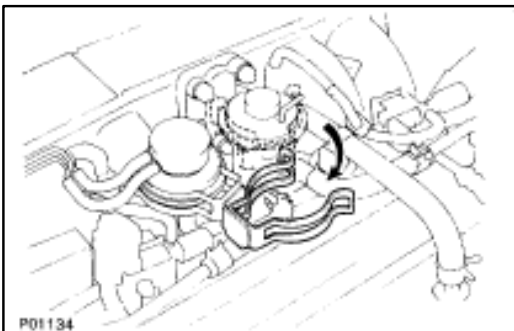
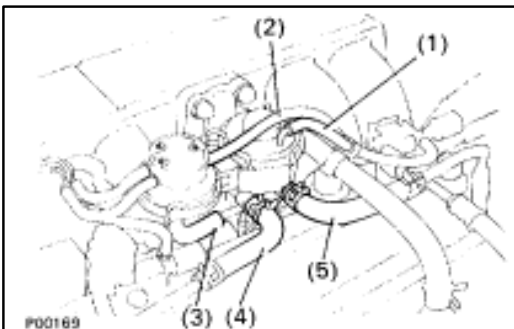
10. REFILL WITH ENGINE COOLANT (See page CO-7)

INSPECTION OF EGR VALVE (Exc. USA Spec.)

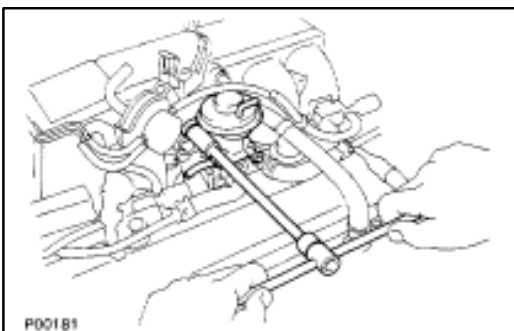
1. DRAIN ENGINE COOLANT (See page CO-6)

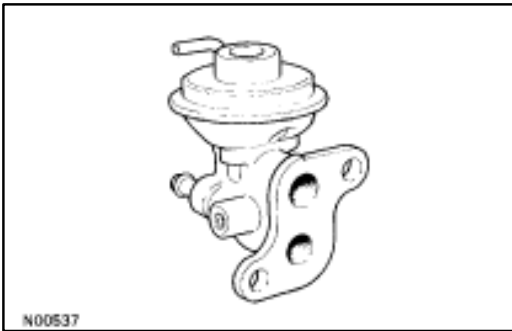
2. REMOVE EGR VALVE

- (a) Disconnect the following hoses:
 - (1) Vacuum hose (from VSV) from EGR valve
 - (2) Vacuum hose (from VSV) from EGR vacuum modulator
 - (3) Vacuum hose (from EGR vacuum modulator) from EGR valve
 - (4) Water by-pass hose (from ISC valve) from the EGR valve
 - (5) Water by-pass hose (from rear water by-pass joint) from the EGR valve
- (b) Disconnect the vacuum modulator bracket from the EGR valve.



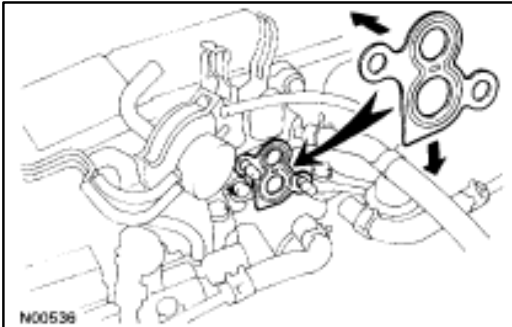
- (c) Remove the two nuts, EGR valve and gasket.





3. INSPECT EGR VALVE

Check for sticking and heavy carbon deposits.
If a problem is found, replace the EGR valve assembly.

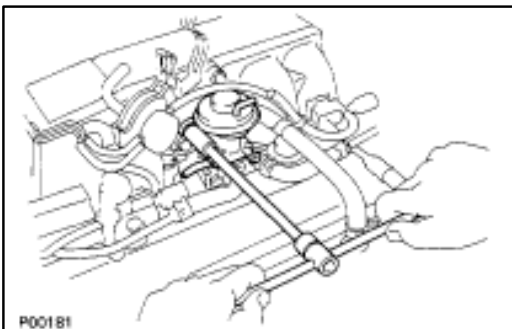


4. REINSTALL EGR VALVE

(a) Place a new gasket on the EGR valve adaptor.

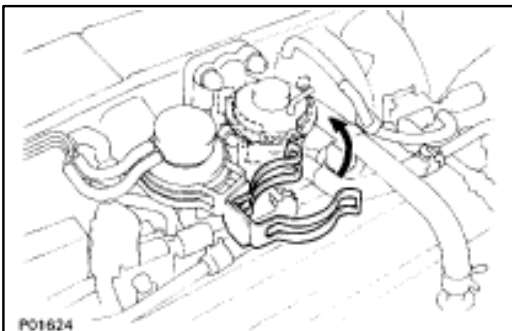
NOTICE:

- Do not touch the adaptor and EGR valve surfaces of the gasket with your hand.
- Align the port holes of the gasket and adaptor.
Be careful of the installation direction.

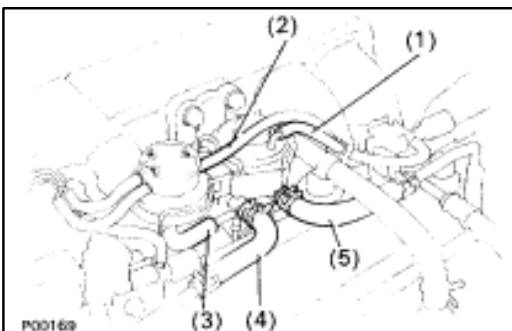


(b) Install the EGR valve with the two nuts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



(c) Install the vacuum modulator bracket to the EGR valve.



(d) Connect the following hoses:

- (1) Vacuum hose (from VSV) to EGR valve
- (2) Vacuum hose (from VSV) to EGR vacuum modulator
- (3) Vacuum hose (from EGR vacuum modulator) to EGR valve
- (4) Water by-pass hose (from ISC valve) to the EGR valve
- (5) Water by-pass hose (from rear water by-pass joint) to the EGR valve

5. REFILL WITH ENGINE COOLANT (See page [CO-7](#))