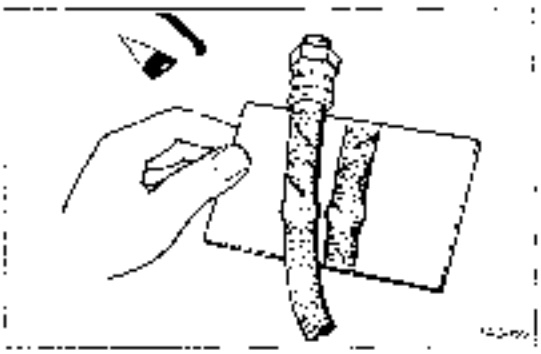
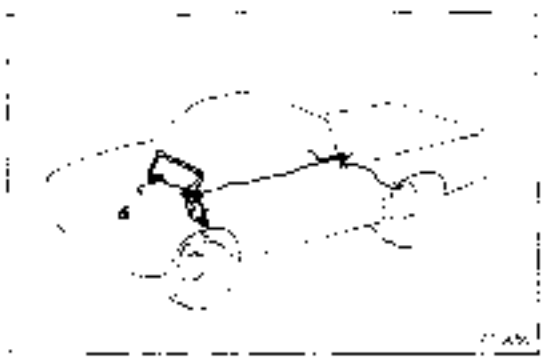
1985 TOYOTA TRUCK & 4-RUNNER Gasoline REPAIR MANUAL

MAINTENANCE

GENERAL NOTES:

- Every service item in the periodic maintenance list must be performed.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions





BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

NOTE: Inspect in a well lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

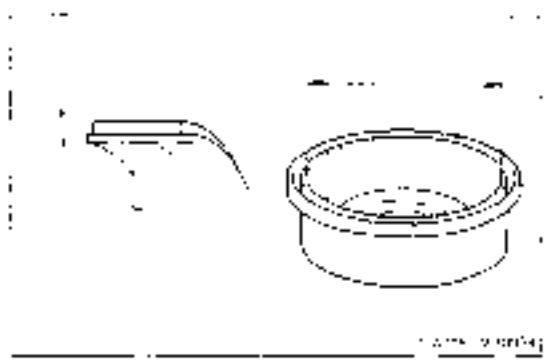
(a) Check all brake lines and hoses for:

- Damage
- Corrosion
- Wear
- Leaks
- Deformation
- Bends
- Cracks
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.



17. INSPECT REAR BRAKE LININGS AND DRUMS

(2WD: See page BR-30 or BR-37, 4WD: See page BR-43)

(a) Check the linings for wear.

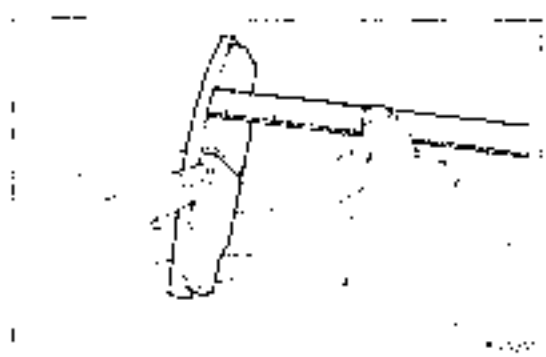
Minimum lining thickness: 1.0 mm (0.039 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter: 256.0 mm (10.079 in.)

(c) Clean the brake parts with a damp cloth.

NOTE: Do not use compressed air to clean the brake parts.



18. INSPECT FRONT BRAKE PADS AND DISCS

(2WD: See page BR-13 or BR-19, 4WD: See page BR-25)

(a) Check the thickness of the disc brake pads and check for irregular wear.

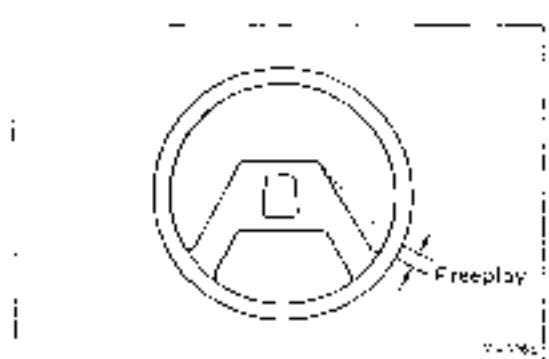
Minimum pad thickness: 1.0 mm (0.039 in.)

(b) Check the disc for wear or runout.

Minimum disc thickness:

RN 2WD	1/2 ton	21.0 mm (0.827 in.)
	1 ton and C&C	24.0 mm (0.945 in.)
RN 4WD		11.5 mm (0.453 in.)

Maximum disc runout: 0.15 mm (0.0059 in.)



CHASSIS

19. INSPECT STEERING LINKAGE

(a) Check that the steering wheel freeplay is:

Maximum: 30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

TROUBLESHOOTING (22R-E)

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	CO-2
	Incorrect ignition timing	Reset timing	IG-10

HARD STARTING

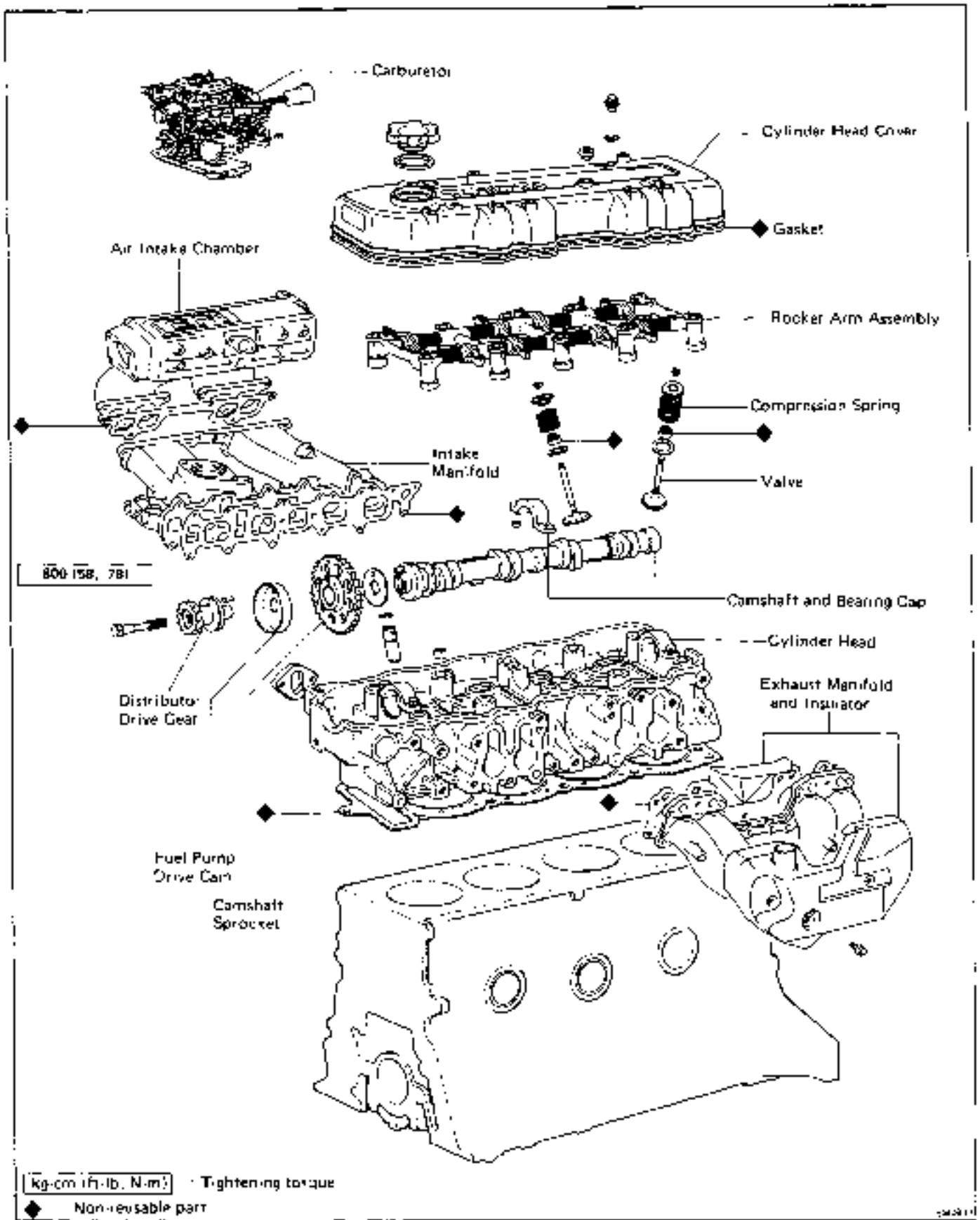
Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to injector	Troubleshoot EFI system	FI-9
	• No fuel in tank		
	• Fuel pump not working		
	• Fuel filter clogged		
	• Fuel line clogged or leaking		
	EFI system problems	Repair as necessary	
	Ignition problems	Perform spark test	
	• Ignition coil	Inspect coil	IG-5,7
	• Igniter	Inspect igniter	IG-6,8
	• Distributor	Inspect distributor	IG-9
	Spark plugs faulty	Inspect plugs	IG-4
	High tension wires disconnected or broken	Inspect wires	IG-4
	Vacuum leaks	Repair as necessary	
	• PCV hoses		
	• EGR valve		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Compression low	Check compression	EM-11

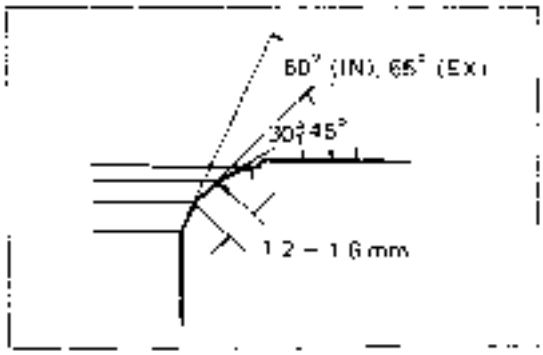
ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plugs faulty	Inspect plugs	IG-4
	High tension wires faulty	Inspect wires	IG-4
	Ignition problems		
	• Ignition coil	Inspect coil	IG-5,7
	• Igniter	Inspect igniter	IG-6,8
	• Distributor	Inspect distributor	IG-9,10
	Incorrect ignition timing	Reset timing	IG-10
	Vacuum leaks	Repair as necessary	
	• PCV hoses		
	• EGR valve		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect idle speed	Adjust idle	MA-8
	EFI system problems	Repair as necessary	

CYLINDER HEAD

COMPONENTS





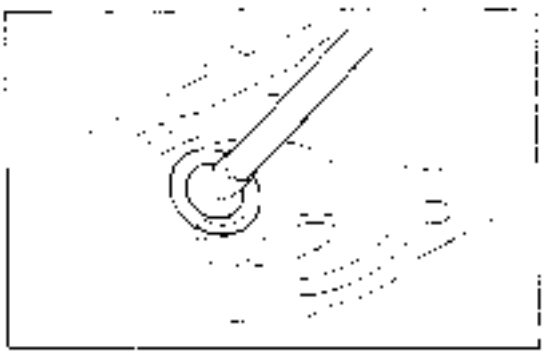
- Check that the seat contact is on the middle of the valve face with the following width:

  1.2 – 1.6 mm (0.047 – 0.063 in.)

  If not, correct the valve seat as follows:

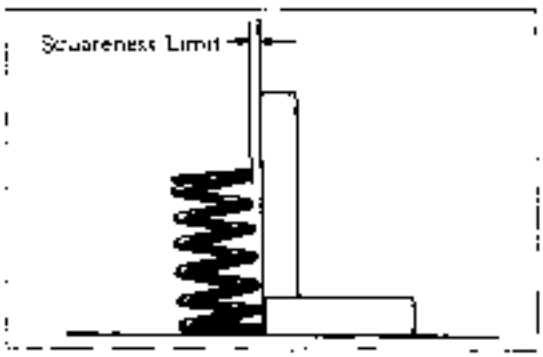
  If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

  If seating is too low on the valve face, use 60° (IN) or 65° (EX) and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat together with abrasive compound.

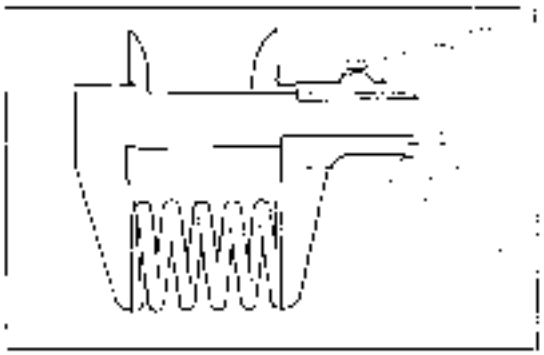
(e) Clean the valve and valve seat after hand-lapping.



13. INSPECT VALVE SPRINGS

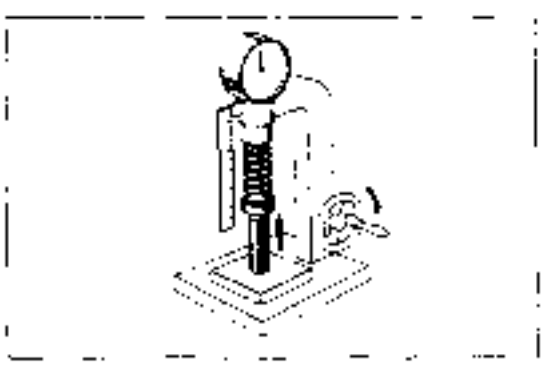
(a) Using a steel square, check the squareness of the valve springs. If a spring is out of square more than the maximum allowable, replace the spring.

Maximum allowable: 1.6 mm (0.063 in.)



(b) Measure the free height of all springs. Replace any spring that is not correct.

Free height: 48.5 mm (1.909 in.)



(c) Using a spring tester, check the tension of each spring at the specified installed height.

If the installed tension is less than the minimum, replace the spring.

Installed height: 40.5 mm (1.594 in.)
Minimum installed tension: 28.5 kg (62.8 lb, 279 N)

18. **FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill with coolant.

Total capacity: w/Heater 8.4 liters
(8.9 US qts, 7.4 Imp. qts)

19. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

20. **START ENGINE**

Warm up the engine and inspect for leaks.

21. **PERFORM ENGINE ADJUSTMENT**

(a) Retighten the cylinder head bolts.
(See step 3 on page EM-27)

(b) Readjust the valve clearance.
(See page MA-13)

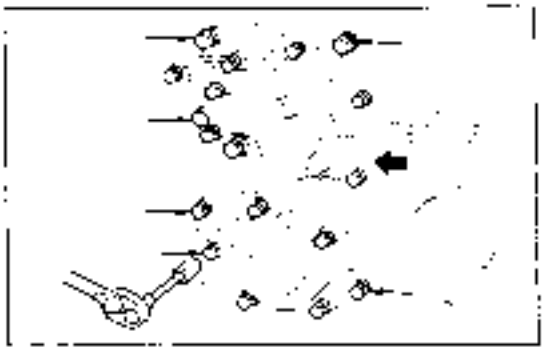
(c) Recheck ignition timing. (See step 1 on page IG-10)

(d) Adjust idle speed. (See step 14 on page MA-14)

22. **RECHECK COOLANT AND ENGINE OIL LEVEL**

23. **ROAD TEST**

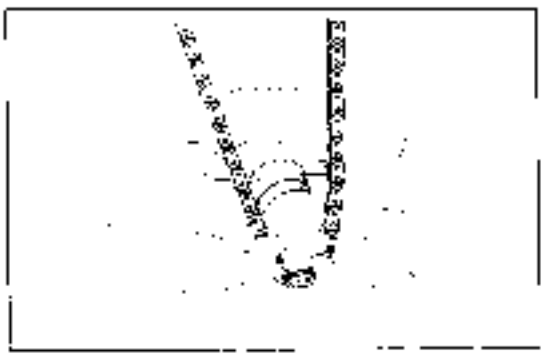
Perform a road test



6. **REMOVE CHAIN COVER ASSEMBLY**

(a) Remove six timing chain cover bolts shown by the arrows.

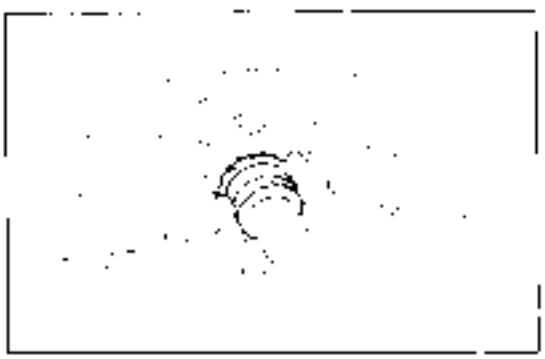
(b) Using a plastic faced hammer, loosen the chain cover and remove it.



7. **REMOVE CHAIN AND CAMSHAFT SPROCKET**

(a) Remove the chain from the damper.

(b) Remove the cam sprocket and chain together.



8. **REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET**

If the pump drive and sprocket cannot be removed by hand, use SST to remove them together.

SST 09213 36020

9. **REMOVE GASKET MATERIAL ON CYLINDER BLOCK**

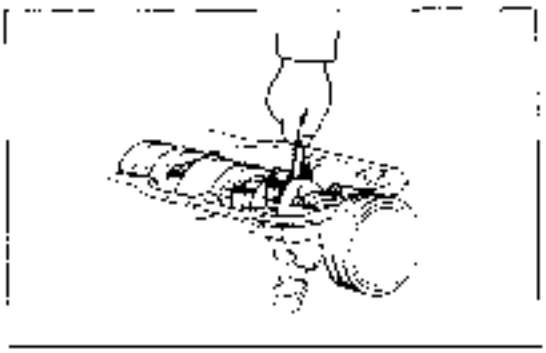
DISASSEMBLY OF CYLINDER BLOCK

1. **REMOVE OIL STRAINER**

   Remove the four bolts holding the oil strainer.

2. **REMOVE REAR OIL SEAL RETAINER**

   Remove the five bolts, rear oil seal retainer and gasket.

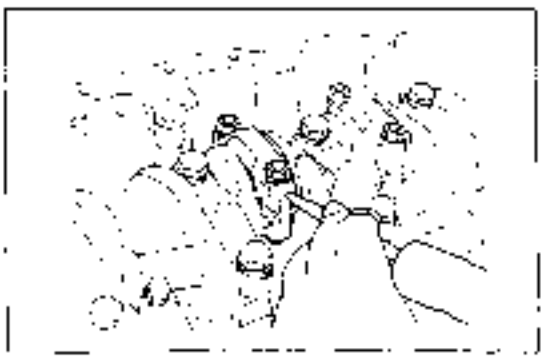


3. **MEASURE CONNECTING ROD THRUST CLEARANCE**

   Using a feeler gauge, measure the rod thrust clearance.

   If clearance is greater than the maximum, replace the connecting rod.

   Rod thrust maximum clearance: 0.30 mm (0.0118 in.)

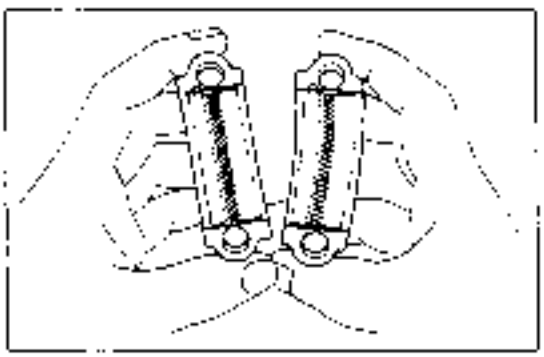


4. **REMOVE CONNECTING ROD CAPS AND MEASURE OIL CLEARANCE**

   (a) Using a punch or numbering stamp, mark the connecting rods and caps to ensure correct reassembly.

   (b) Remove the rod caps.

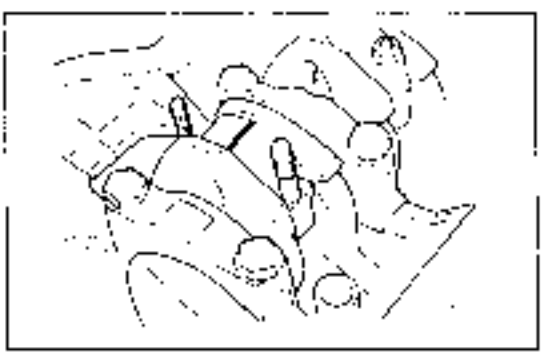
   Remove the rod cap nuts. Using a plastic hammer, tap the rod bolts lightly and lift off the rod caps. Keep the bearing inserted with the cap.



   (c) Clean the bearings and crankshaft pins.

   (d) Inspect each bearing for pitting and radial scratches.

   If bearings are damaged, replace them.



   (e) Lay a strip of Plastigage across the crankshaft pin.

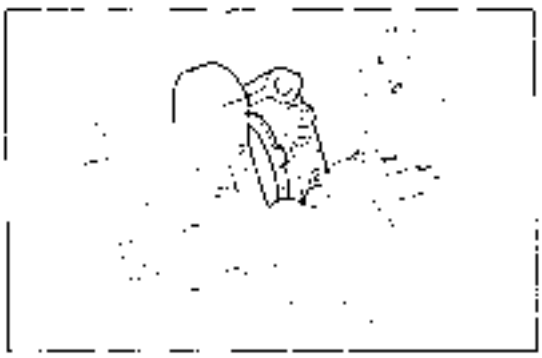
INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

1. INSTALL UPPER MAIN BEARING IN CYLINDER BLOC..

(a) Place the upper main bearing in the block.

(b) Install the upper thrust washers on the center main bearing with the oil grooves facing outward.

(c) Lubricate the faces of the bearings with engine oil.

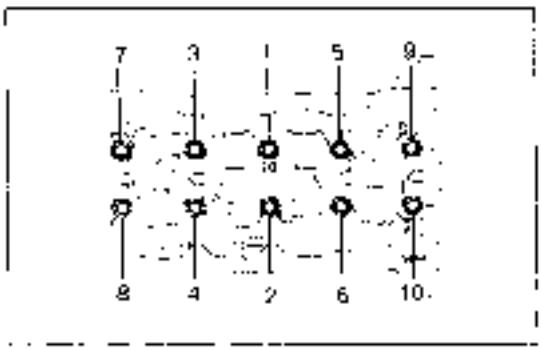


2. PLACE CRANKSHAFT IN CYLINDER BLOCK

3. INSTALL MAIN BEARING CAPS

NOTE: Each bearing cap is numbered.

(a) Install thrust washers on bearing cap No.3 with the oil grooves facing out ward.



(b) Install the bearing caps in numbered order with the arrows facing forward. Tighten the bolts to the specified torque in the sequence shown in two or three passes.

Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

(c) Measure the crankshaft thrust. (See step 6 on page EM-53)

Using a feeler gauge, measure the clearance at the center bearing.

If the clearance is greater than the maximum, replace the thrust washer.

Maximum clearance: 0.30 mm (0.0118 in.)

Select a thrust washer to obtain the standard clearance.

Standard clearance: 0.02 — 0.22 mm (0.0008 — 0.0087 in.)

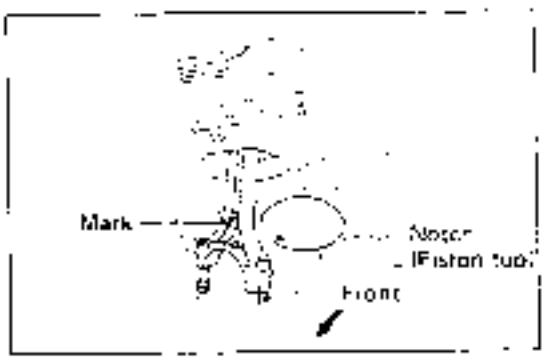
Size	Thickness mm (in.)
STD	2.00 (0.0787)
O/S 0.125	2.06 (0.0811)
O/S 0.250	2.13 (0.0839)

(d) Check that the crankshaft turns

4. INSTALL PISTON AND CONNECTING ROD ASSEMBLY

(a) Lubricate the cylinder bore and rod journal with clean engine oil.

(b) Using a ring compressor, push the correctly numbered piston and rod assembly into each cylinder. Make sure the notch and mark are facing forward.



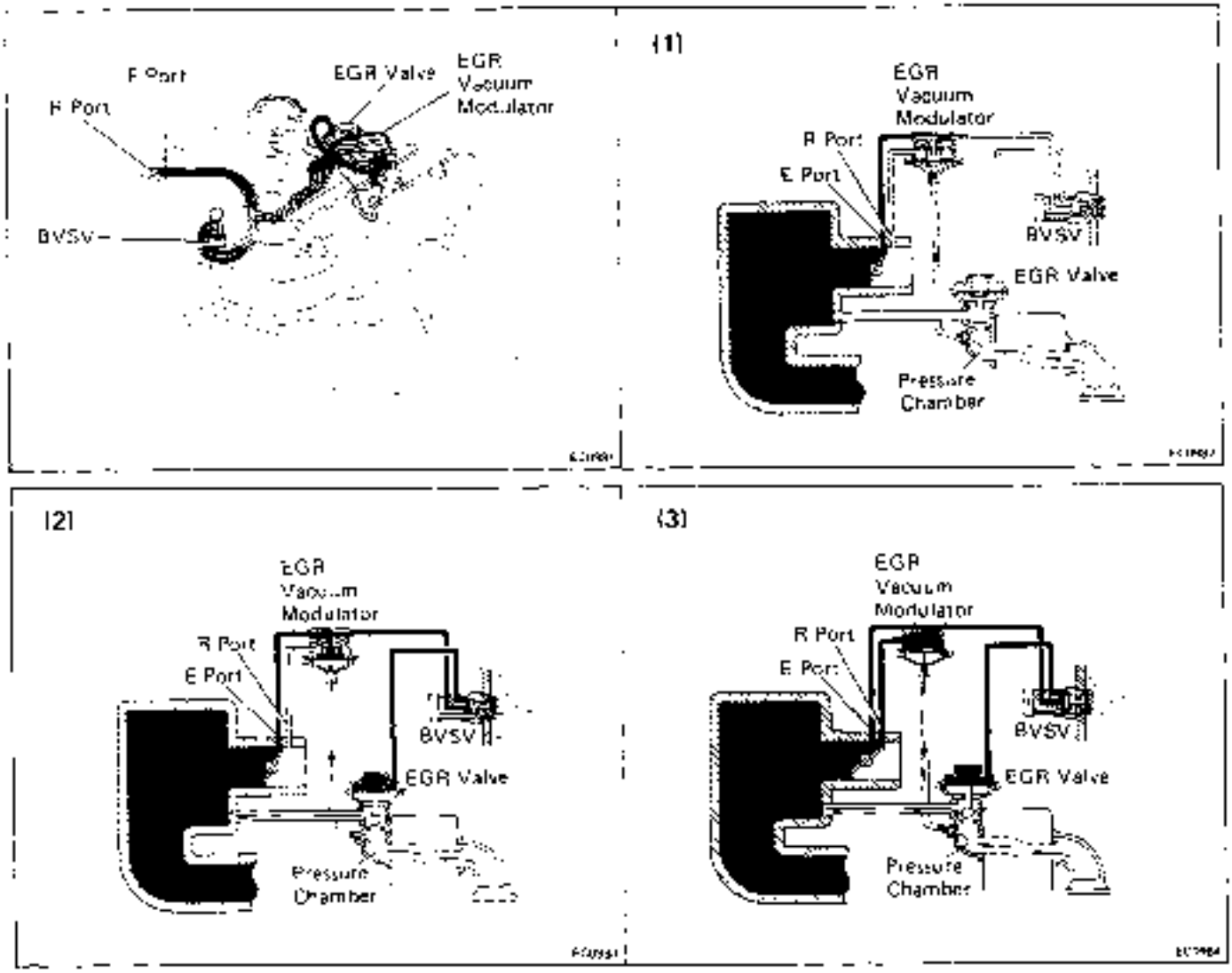
EMISSION CONTROL SYSTEMS

NOTE: TROUBLESHOOTING

See page EM-2 (for EFI Engine)
See page EM-5 (for Carb. Engine)

EC

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



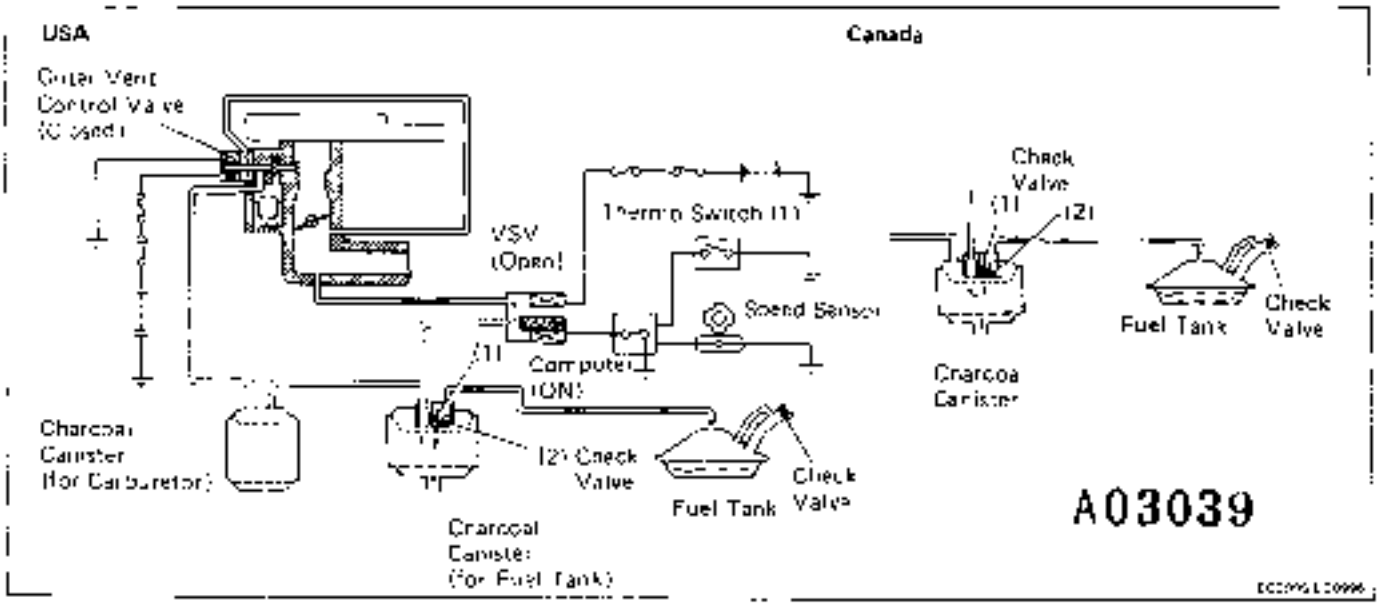
To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED	–				CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below E port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
		Positioned between E port & R port	(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated (Increased)

Remarks: *Pressure increase→Modulator closes→EGR valve opens→Pressure drops
→EGR valve closes→Modulator opens

**When the throttle valve is positioned above the R port, 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.

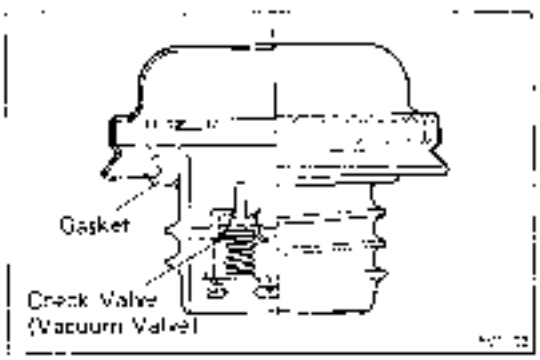
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emissions, evaporated fuel from the fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

IG S/W	Engine	*Outer Vent Control Valve	Coolant Temp.	Thermo S/W (1)	Vehicle Speed	Computer	VSV	Check Valve (1)	Check Valve (2)	Check Valve in Cap	Evaporated Fuel (HC)
OFF	Not running	OPEN	–				–			–	HC from tank and float chamber is absorbed into the canister
ON	Running	CLOSED	Below 122°F (50°C)	ON	–	OFF	CLOSED	–			HC from tank is absorbed into the canister
			Above 122°F (50°C)	OFF	Below 7 mph (11 km/h)	OFF	CLOSED				
					Above 10 mph (25 km/h)	ON	OPEN				HC from canister is fed into the intake manifold
High pressure in tank								OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister
High vacuum in tank							–	CLOSED	OPEN	OPEN	Air is fed into the tank

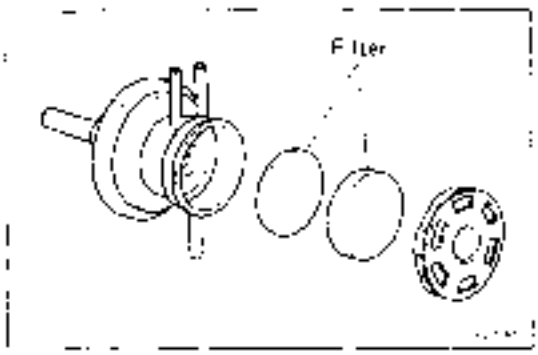
Remarks *The outer vent control valve is pulled by intake manifold vacuum and held by the solenoid. The solenoid itself cannot pull the valve.



INSPECTION OF FUEL FILLER CAP, FUEL VAPOR LINES AND FUEL TANK

1. VISUALLY INSPECT FUEL FILLER CAP

Look for damaged or deformed gasket and cap.
If a problem is found, repair or replace the cap.



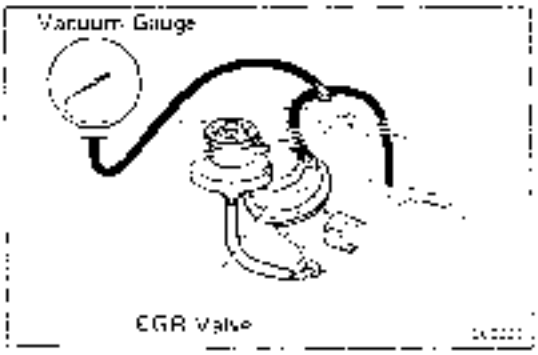
INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

A03049

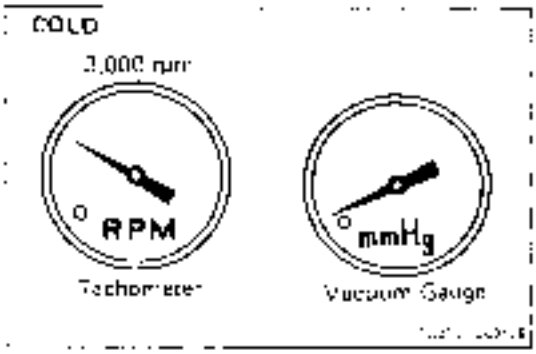


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

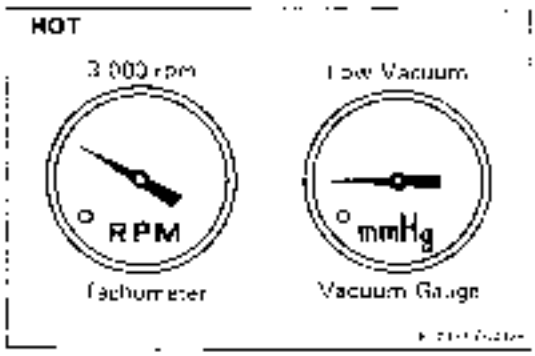
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

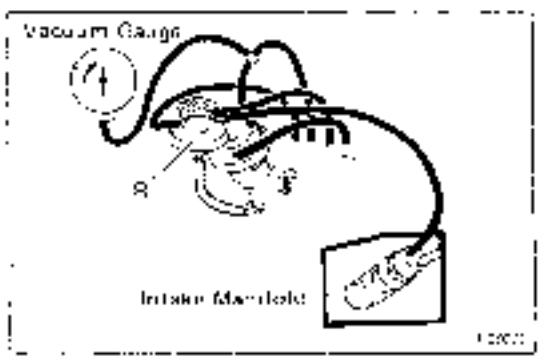
(b) Check that the vacuum gauge indicates zero at 3,000 rpm.



5. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,000 rpm.

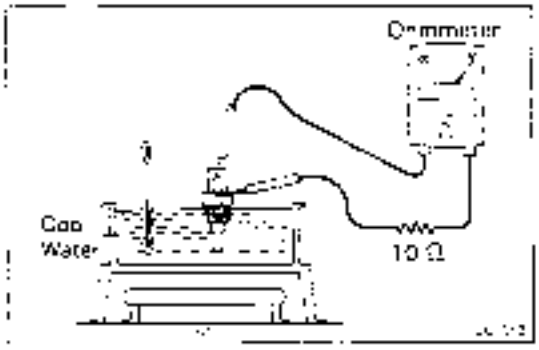


(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



INSPECTION OF THERMO SWITCH (2)

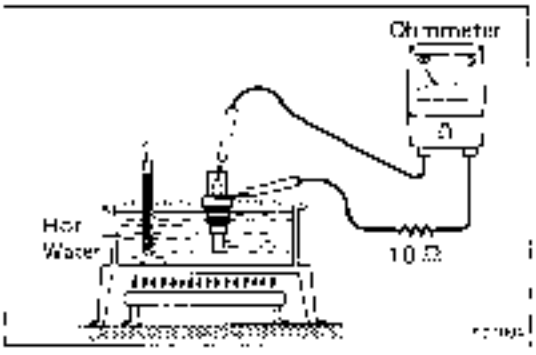
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 6°C (43°F).

(d) Using an ohmmeter, check that there is continuity.



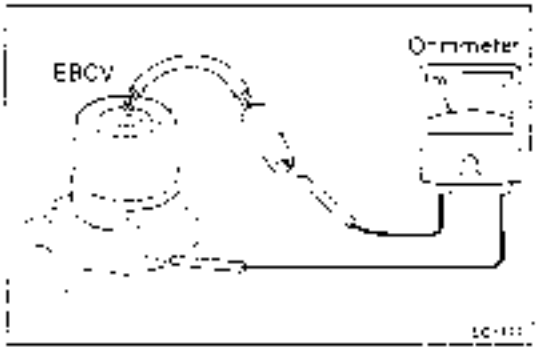
(e) Heat the switch to above 18°C (64°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

(h) Fill the radiator with coolant.

A03059

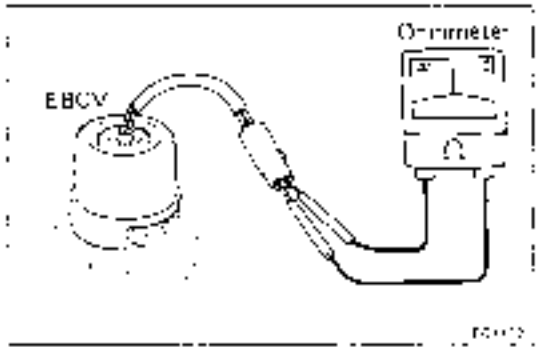


INSPECTION OF EBCV

1. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the EBCV body.

If there is continuity, replace the EBCV.



2. CHECK FOR OPEN CIRCUIT

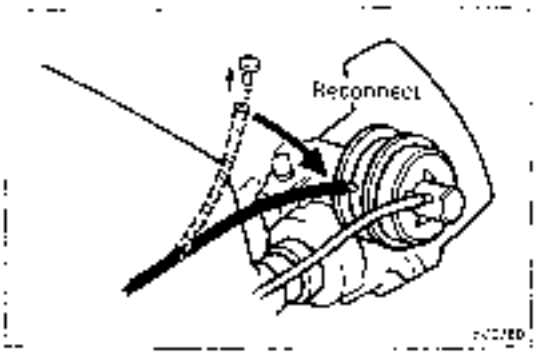
Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.

Specified resistance: 11 — 13 Ω at 20°C (68°F)

If the resistance is not within specification:
Replace the EBCV.

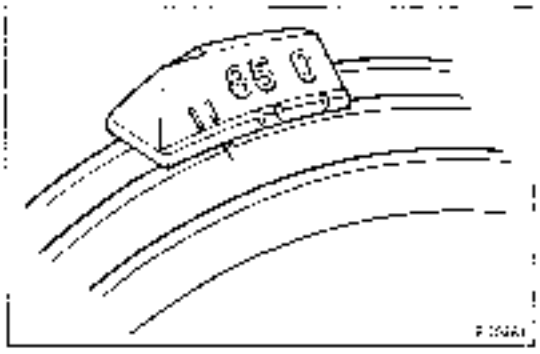
INSPECTION OF SPEED SENSOR

(See Page EC-25)



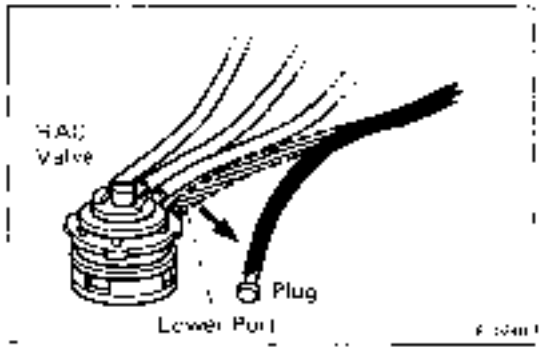
(d) Reconnect the hose to the sub-diaphragm.

A03069



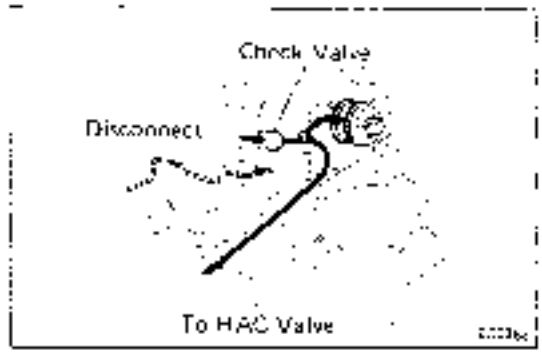
(e) Check that the ignition timing advances.

Ignition timing: **About 12° BTDC @ Max. 950 rpm**



2. CHECK THE CHECK VALVE

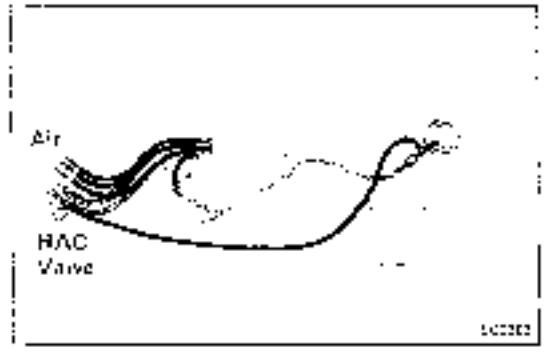
(a) Disconnect the vacuum hose from lowest port of the HAC valve, and plug the hose end.



(b) Disconnect the vacuum hose between the check valve and vacuum pipe at the pipe side, and plug the pipe end.

(c) Check that the ignition timing remains stationary for more than one minute.

(d) Stop the engine and reconnect the hoses to the vacuum pipe and HAC valve.



3. CHECK CARBURETOR

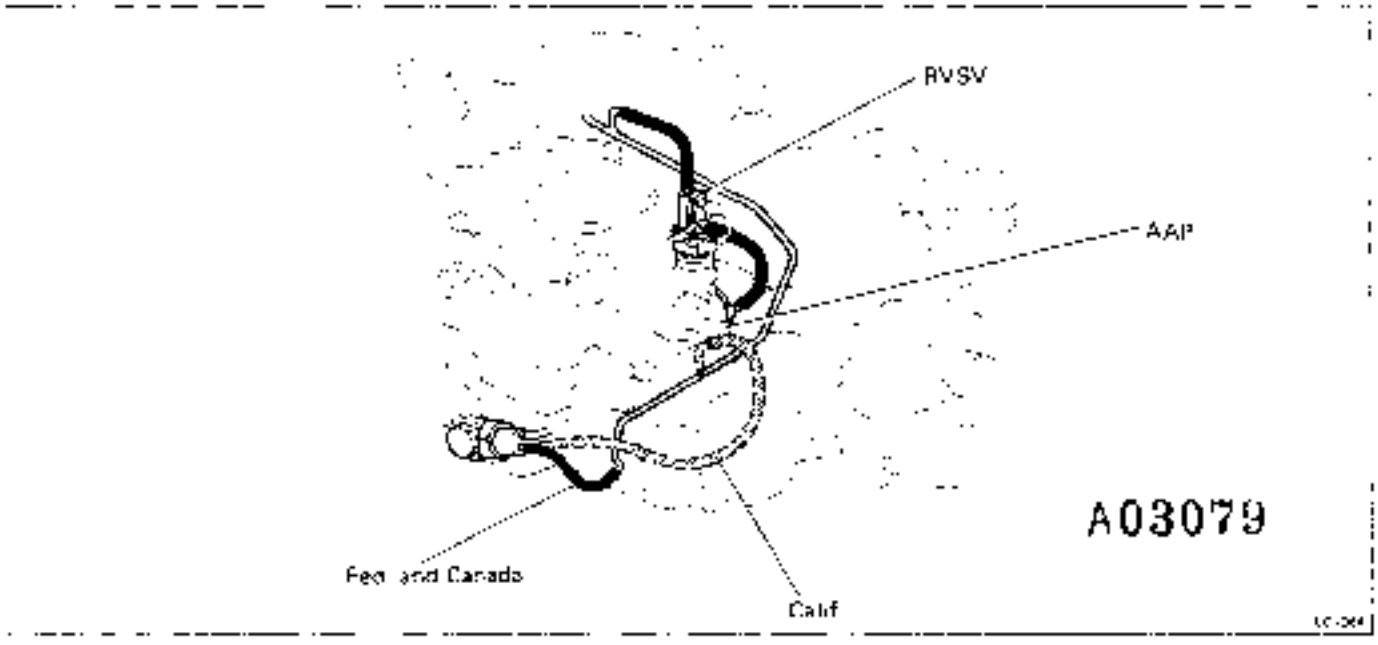
(a) Disconnect three hoses from the pipes on top of the HAC valve.

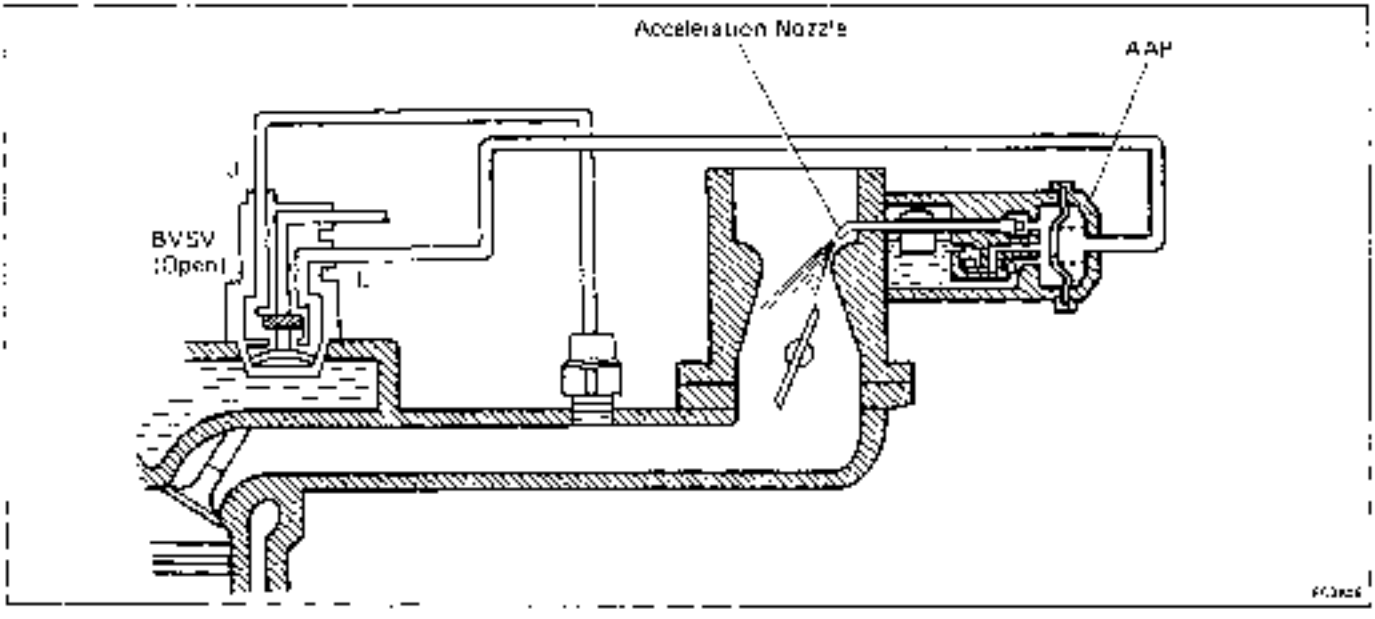
(b) Blow air into each hose and check that air flows into the carburetor.

(c) Reconnect the hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY. OTHERWISE INSPECT EACH PART.

5. Auxiliary Acceleration Pump (AAP) System

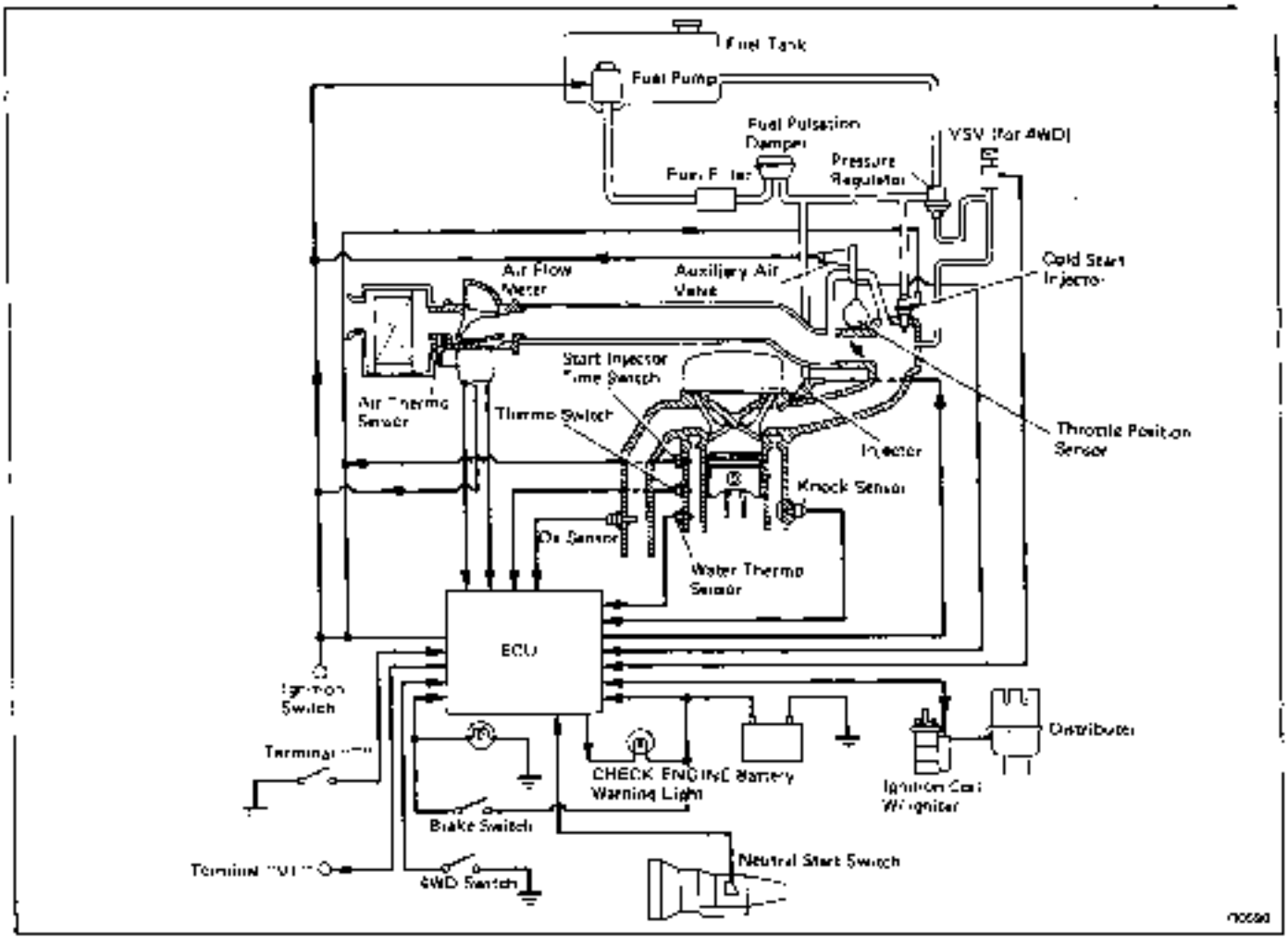




The carburetor air-fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the accelerator nozzle to obtain better cold engine performance.

Coolant Temp.	BVSV	Engine	Intake Vacuum	Diaphragm in AAP	Fuel
Below 55°C (131°F)	OPEN (J-L)	Constant RPM	HIGH	Pulled by vacuum	Drawn into AAP Chamber
		Acceleration	LOW	Returned by spring tension	Forced into acceleration Nozzle
Above 74°C (165°F)	CLOSED (J-L)	—	—	No operation	—

SYSTEM DESCRIPTION



The EFI used on Toyotas has three basic systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the EFI injectors. These injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU. Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 22R-EC engine is equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, Diagnosis systems, etc. by means of an Electronic Control Unit (ECU – formerly EFI computer) employing a microcomputer.

OK CONTINUED FROM PAGE FI-11

CHECK AIR VALVE
1. Disconnect air hose from air valve.
2. Check that the air valve opens when cold.
Room temp.: Below 20°C (68°F)

NO →
1. Air valve (See page FI-58)
2. Water hoses
3. Air hoses

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

NO →
1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Fuse (EFI 15A)
   (3) Main relay
3. Air flow meter
4. Water thermo sensor
5. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU

DIAGNOSIS SYSTEM

DESCRIPTION

By analyzing various signals as shown in the later table (page FI-25) the ECU detects system malfunctions which are related to the various operating parameter sensors or to the actuator. The ECU stores the failure code associated with the detected failure until the diagnostic system is cleared by removing the EFI fuse with ignition switch off.

A "CHECK ENGINE" warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been cleared.

CHECK ENGINE

"CHECK ENGINE" LIGHT CHECK

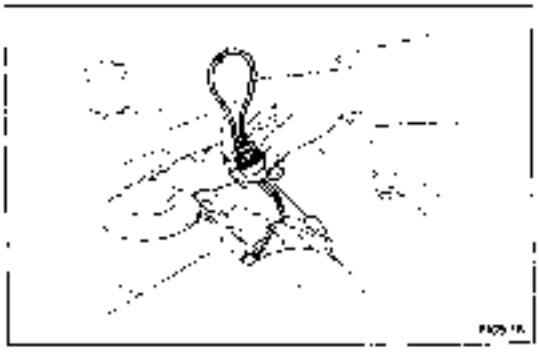
1. The "CHECK ENGINE" warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the "CHECK ENGINE" warning light should go out

   If the light remains on, the diagnosis system has detected a malfunction in or abnormality in the system.

OUTPUT OF DIAGNOSTIC CODES

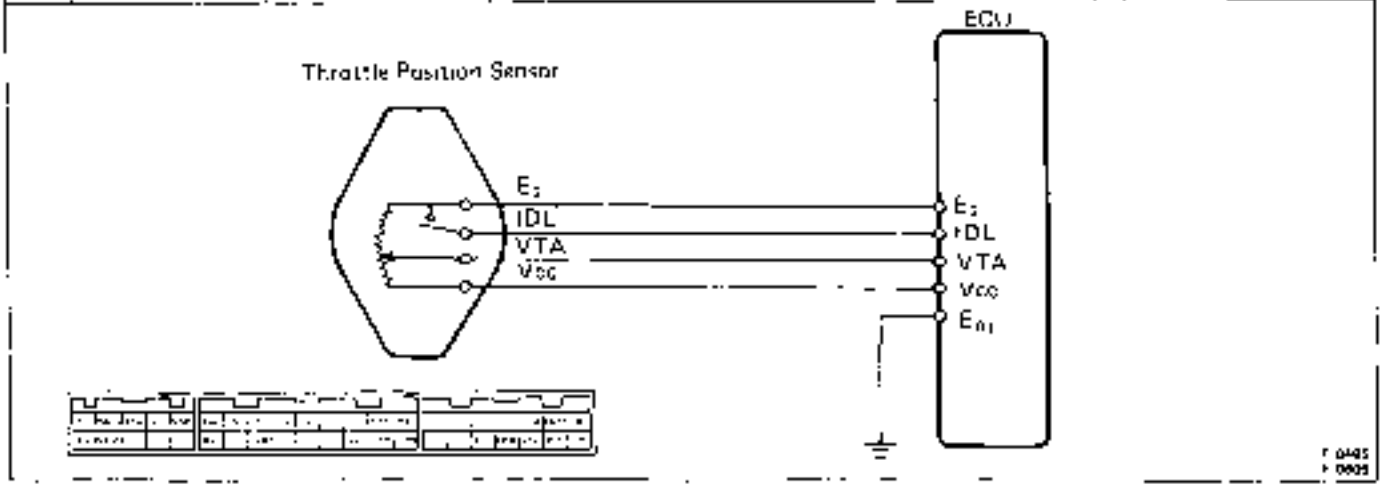
To obtain an output of diagnostic codes, proceed as follows:

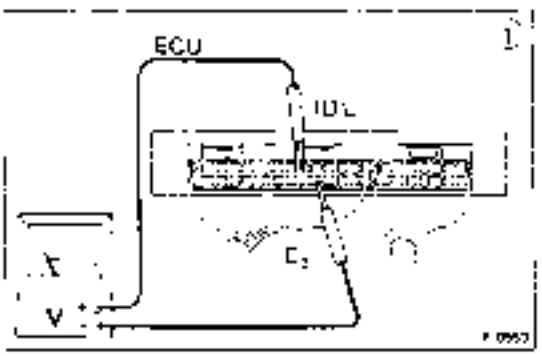
1. Initial conditions
   (a) Battery voltage above 11 volts.
   (b) Throttle valve fully closed (throttle position sensor IDL points closed).
   (c) Transmission in neutral postion.
   (d) Accessory switches OFF.
   (e) Engine at normal operating temperature.
2. Turn the ignition switch to ON. Do not start the engine.
3. Using a sub wire short terminals $T-E_1$ of the Check Engine Connector located near the ignition coil

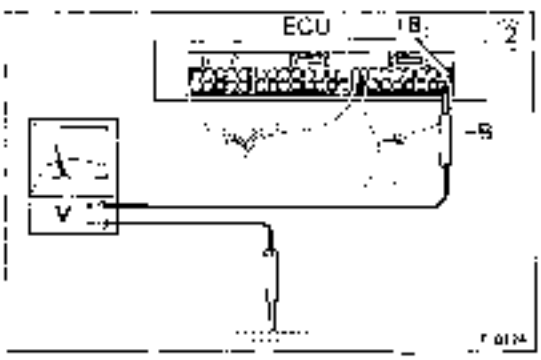


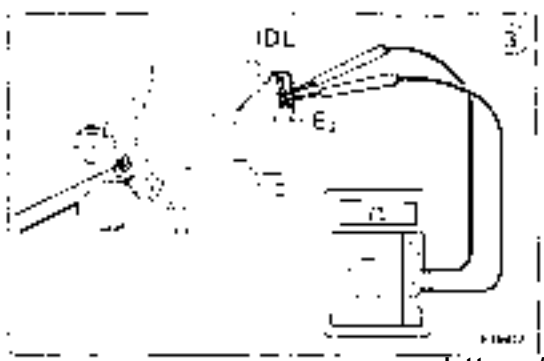
A03835

No.	Terminals	Trouble	Condition	STD Voltage
3	IDL – E_2	No voltage	Ignition switch ON	Throttle valve open: 4 – 10 V
	VTA – E_2			Throttle valve fully closed: 0.1 – 1.0 V
				Throttle valve fully open: 4 – 5 V
	Vcc – E_2			– : 4 – 6 V









◆ IDL – E_2

1. There is no voltage between ECU terminals IDL and E_2. (IG S/W ON) (Throttle valve open)

2. Check that there is voltage between ECU terminal $+B_1$ or +B and body ground. (IG S/W ON)

NO → Check wiring between ECU terminal E_2 and body ground.
- BAD → Replace or repair.

OK →

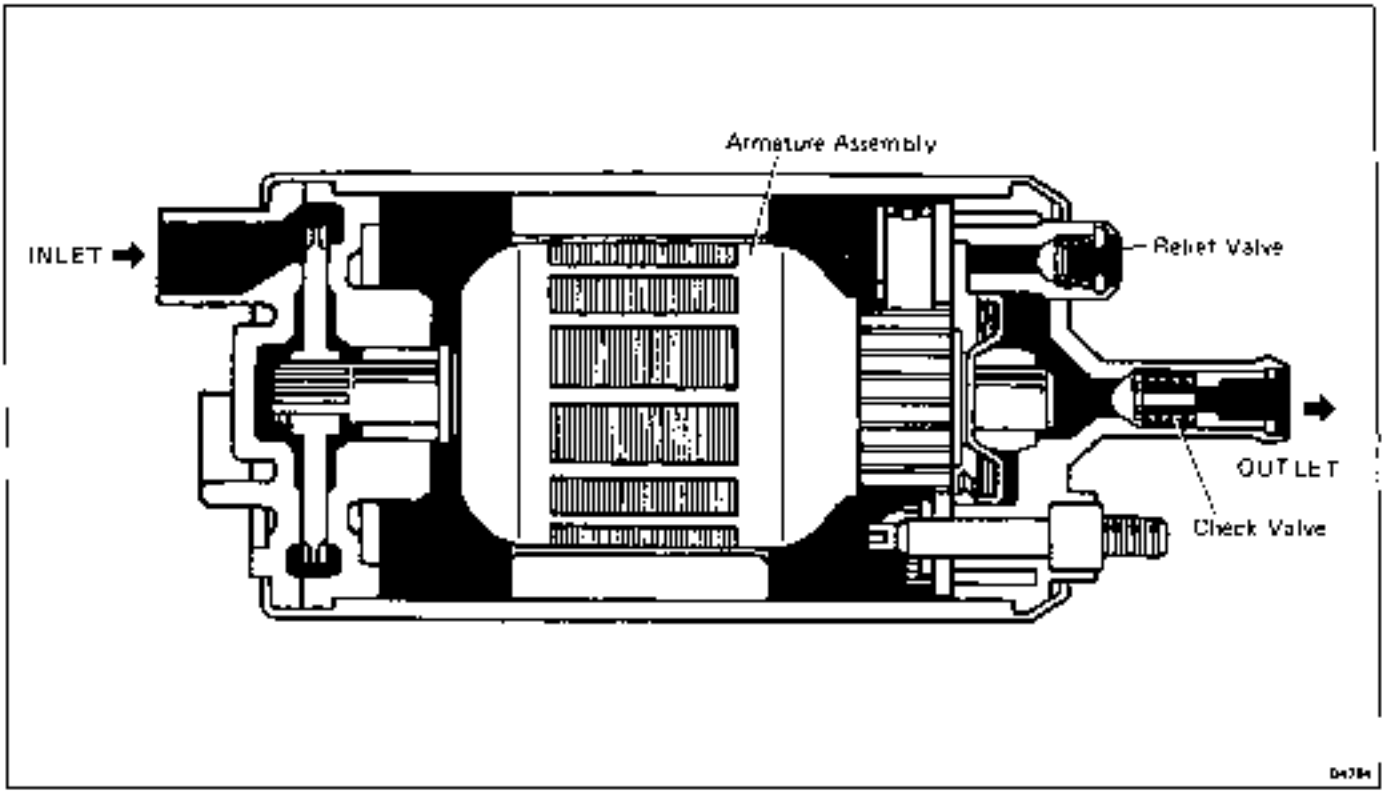
Refer to No. 1
- BAD → Replace or repair.

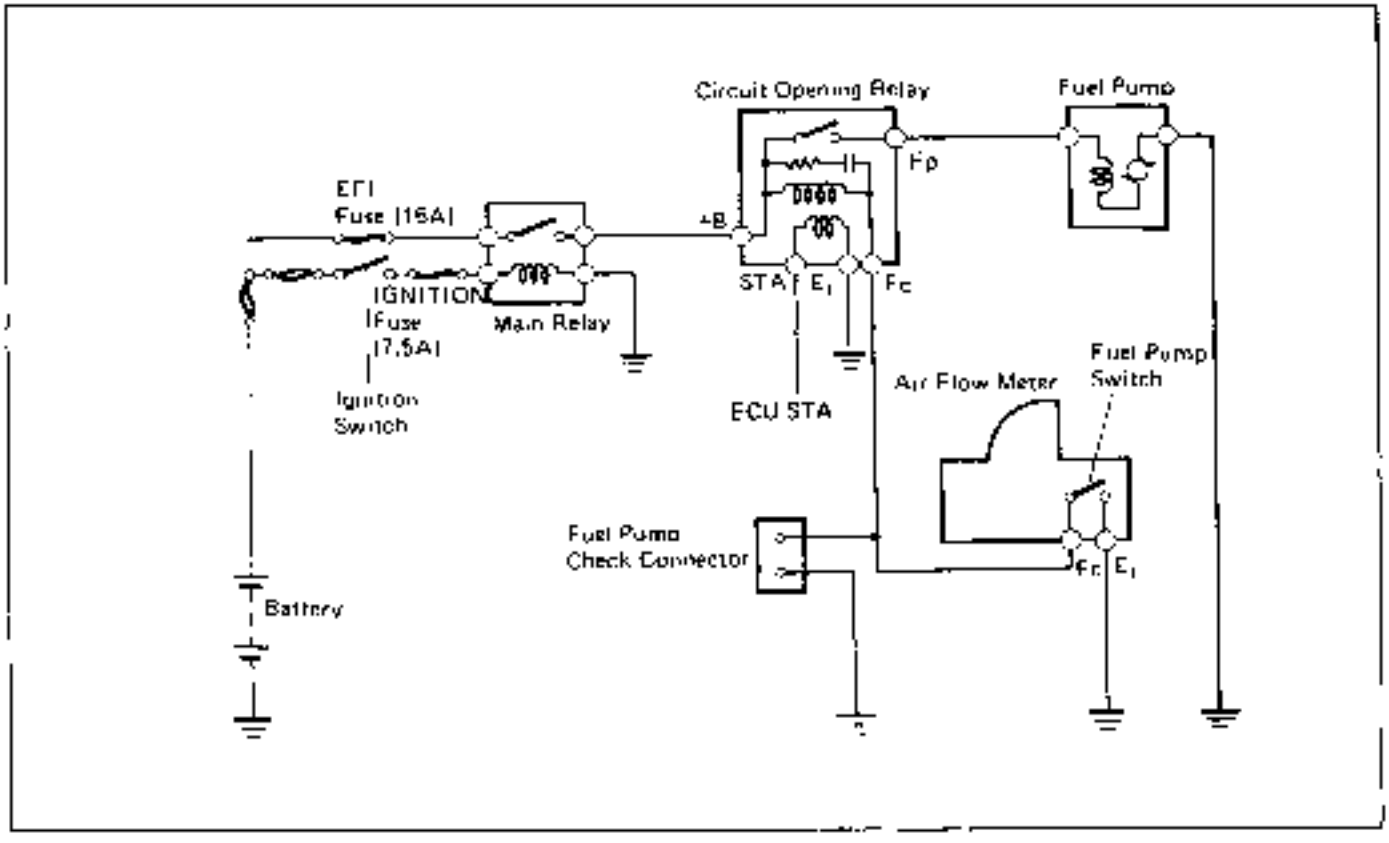
OK →

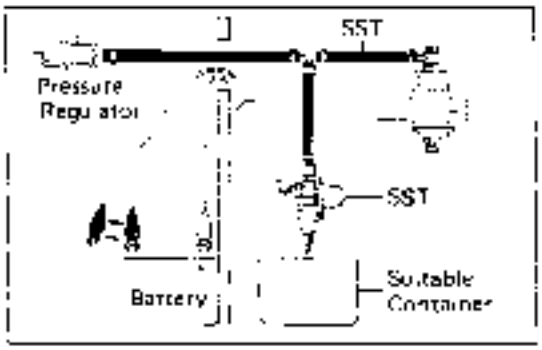
3. Check throttle position sensor.
- BAD → Replace or repair throttle position sensor.
- OK → Check wiring between ECU and throttle position sensor.
  - BAD → Replace or repair.
  - OK → Try another ECU

FUEL SYSTEM

Fuel Pump







NOTE: If not within specified volume, clean or replace the injector.

(h) Remove the vinyl hose.

(i) Connect the SST to the battery, and test the injection spray pattern in a suitable container.

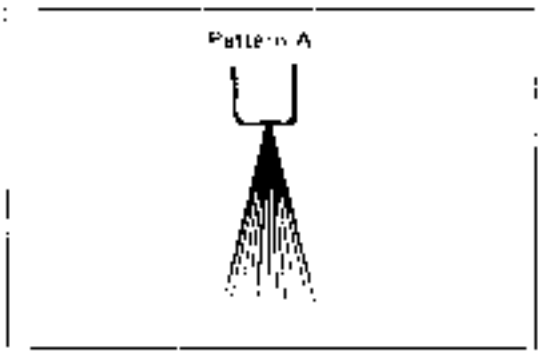
WARNING: Be careful to keep clear of sparks during the test.

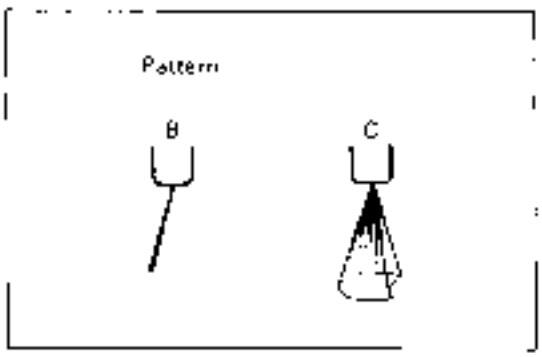
Proper injection spray pattern:

- A fine mist spreading out into a conical shape (pattern A).

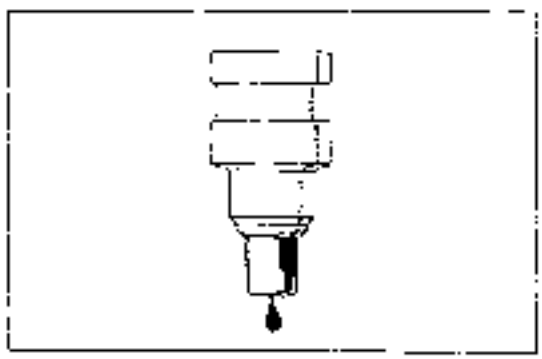
Faulty injection spray pattern:

- Injection is in 1 or more streams, not forming into a conical shape (pattern B).
- Imperfect conical shape (pattern C).





NOTE: If injection spray pattern is not within specification, clean or replace the injector.



2. TEST LEAKAGE

(a) From the previous condition, disconnect the SST from the battery and check the fuel leakage from the injection nozzle.

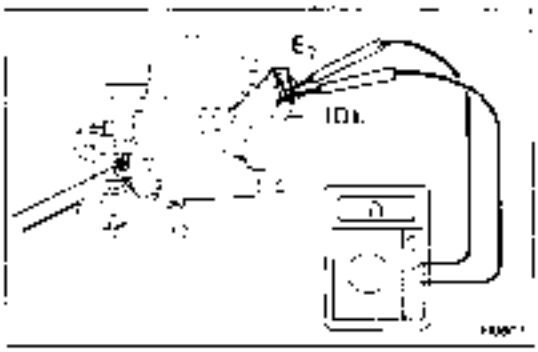
SST 09842-30020

Fuel drop: Less than one fuel drop of fuel per minute

(b) Disconnect the battery ground cable.

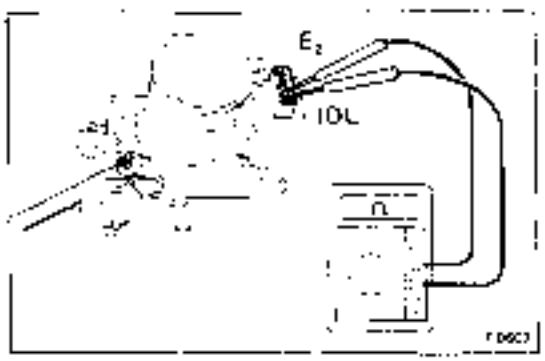
Remove the SST and disconnect the service wire from the fuel pump service connector.

SST 09266-41045



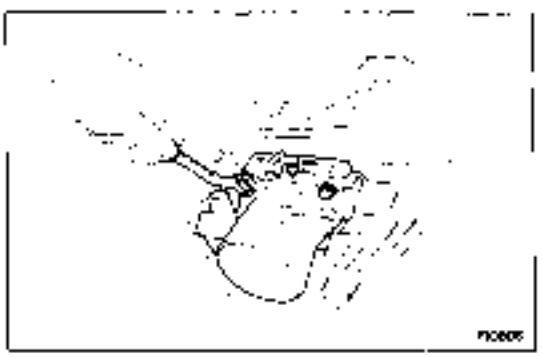
(b) Insert a thickness gauge (0.47 mm or 0.0185 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E_2.

Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with two screws.



(c) Using a thickness gauge, recheck the continuity between terminals IDL and E_2.

Clearance between lever and stop screw	Continuity (IDL – E_2)
0.57 mm (0.0224 in.)	Continuity
0.85 mm (0.0335 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

Using new gaskets, install the throttle body and four bolts.

2. CONNECT THROTTLE SENSOR CONNECTOR

3. CONNECT FOLLOWING HOSES:

(a) Emission control hoses

(b) PCV hose to throttle body

(c) No. 1 and No. 2 water by-pass hoses.

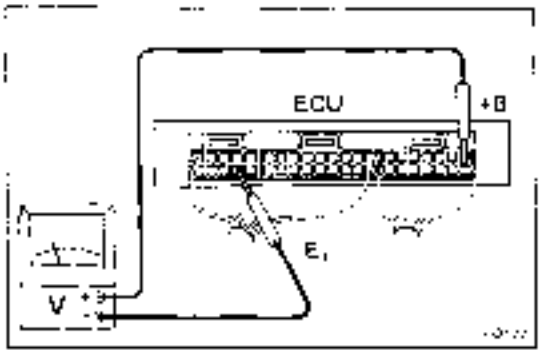
4. INSTALL AIR INTAKE CONNECTOR

ECU

INSPECTION OF ECU

1. MEASURE VOLTAGE OF ECU

NOTE:
1. The ECU itself cannot be checked directly.
2. The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.



Check the voltages at the wiring connectors.

- Remove the right kick panel.
- Turn the ignition switch ON.
- Measure the voltage at each terminal.

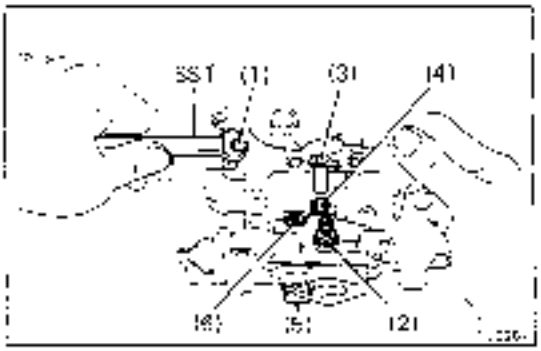
NOTE: 1. Perform all voltage measurements with the connectors connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.

Voltage at ECU Wiring Connectors

Terminals	Condition		STD voltage
+B – E_1	Ignition switch ON		10 – 14
BATT – E_1			10 – 14
IDL – E_2	Ignition switch ON	Throttle valve open	4 – 10
VTA – E_2		Throttle valve fully closed	0.1 – 1.0
		Throttle valve fully open	4 – 5
V_{cc} – E_2		–	4 – 6
IGt – E_1		Idling	0.7 – 1.0
STA – E_1		Ignition switch ST position	6 – 12
No. 10 – E_1 No. 20 – E_1		Ignition switch ON	9 – 14
W – E_1	No trouble (CHECK ENGINE light off) and engine running		8 – 14
V_c – E_2	Ignition switch ON	–	4 – 9
V_s – E_2		Measuring plate fully closed	0.5 – 2.5
		Measuring plate fully open	5 – 8
		Idling	2.5 – 7.5
THA – E_2	Ignition switch ON	Intake air temperature 20°C (68°F)	2 – 3
THW – E_2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.5 – 2.5
B/K – E_1		Stop light switch ON	8 – 14

ECU Connectors

F1405



Disassembly of Carburetor Body

1. **REMOVE DASH POT WITH BRACKET (FOR A/T)**

2. **REMOVE JETS AND POWER VALVE**

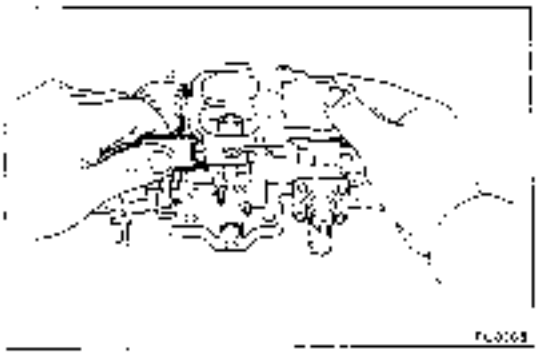
   (a) Using SST, remove the slow jet (1).

   SST 09522-00010

   (b) Remove the power valve with jet (2).

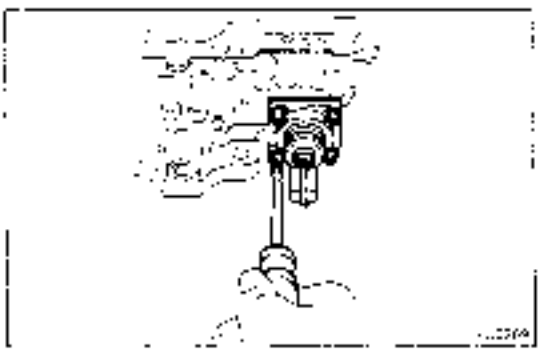
   (c) Remove the metering needle guide (3) and secondary main jet (4).

   (d) Remove the plug (5) and primary main jet (6).



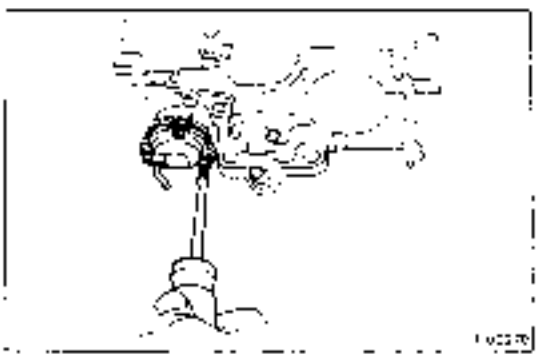
3. **REMOVE FUEL CUT SOLENOID VALVE**

   Remove the solenoid valve from the carburetor body.



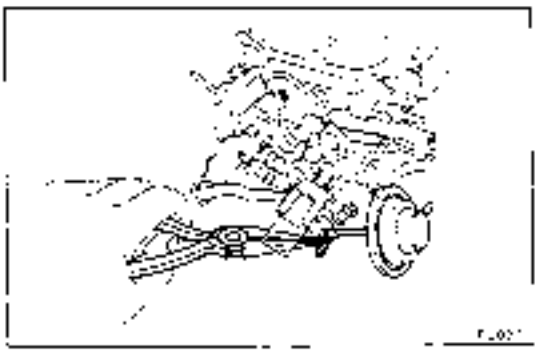
4. **REMOVE ACCELERATION PUMP**

   Remove the four screws, pump housing, diaphragm and spring.



5. **REMOVE AUXILIARY ACCELERATION PUMP**

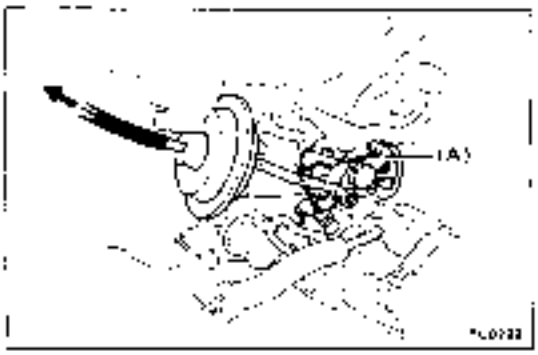
   Remove the three screws, pump housing, spring and diaphragm.



6. **REMOVE IDLE-UP DIAPHRAGM**

   (a) Disconnect the idle up diaphragm link.

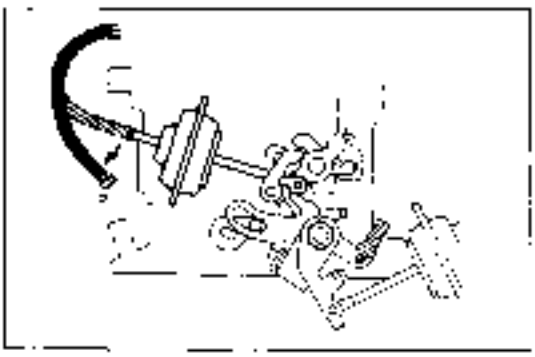
   (b) Remove the idle up diaphragm.



5. **CHECK AND ADJUST CHOKE OPENER**

(a) Apply vacuum to the choke opener diaphragm.

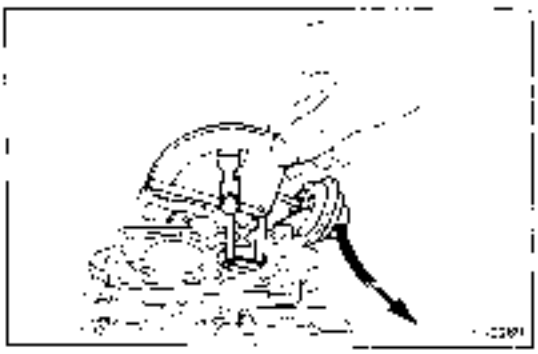
(b) Check that the fast idle cam is released to the four, step. Adjust by bending choke opener lever A.



(c) Disconnect the vacuum hose.

(d) Close the choke valve and set the fast idle lever to the first step.

(e) Check that there is clearance between the choke opener lever and fast idle cam.

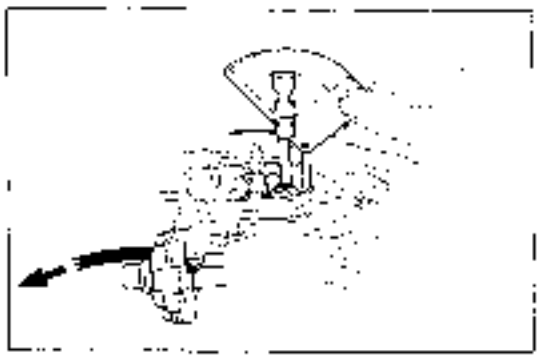


6. **CHECK AND ADJUST IDLE-UP**

(a) Apply vacuum to the idle-up diaphragm.

(b) Check the throttle valve opening angle. Adjust by turning the adjusting screw.

Standard angle: 16.5° from horizontal plane



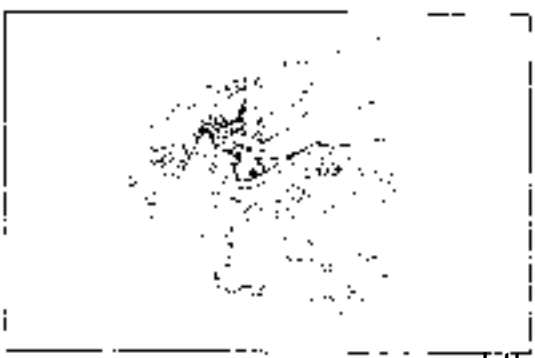
7. **CHECK CHOKE BREAKER**

(a) Apply vacuum to the choke breaker diaphragm.

(b) Close the choke valve by hand.

(c) Check the choke valve opening angle.

Standard angle: 42° from horizontal plane



8. **CHECK AIR VALVE AND METERING NEEDLE**

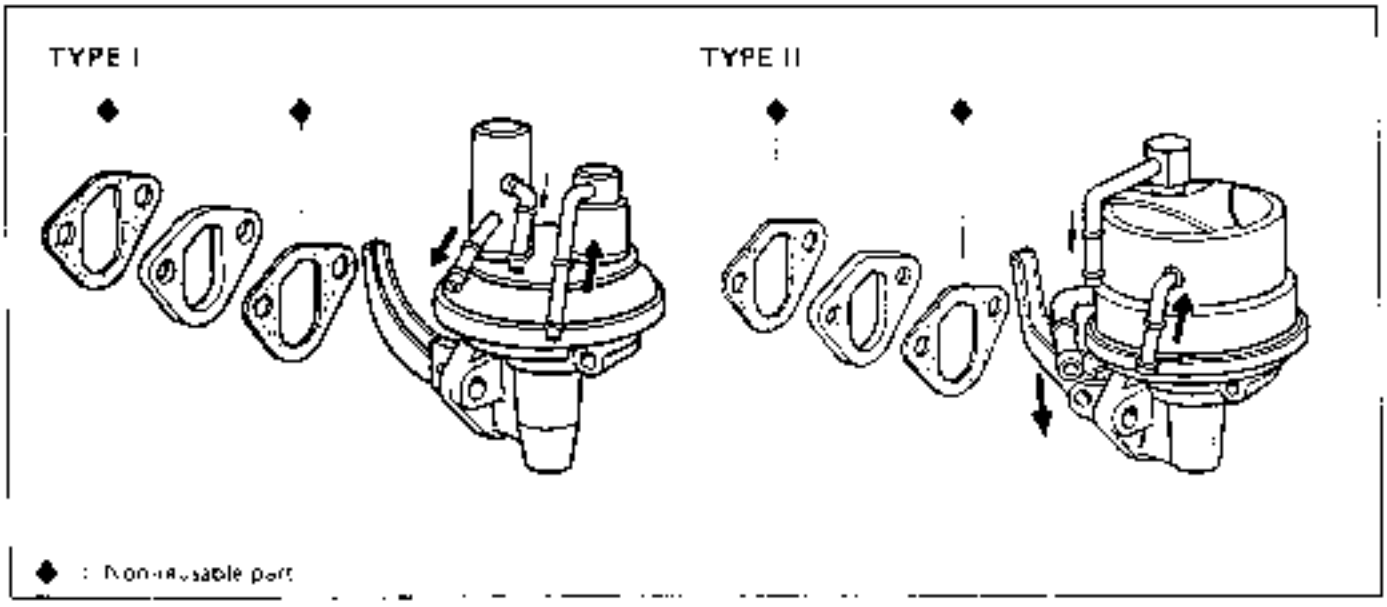
(a) Check that the air valve and metering needle move smoothly together.

(b) While the primary throttle valve angle is idle position, check the air valve opening angle.

(c) While the primary throttle valve is full opening ang check that there is clearance between the connecting rod and stopper

FUEL PUMP

COMPONENTS



REMOVAL OF FUEL PUMP

1. **DRAIN COOLANT**

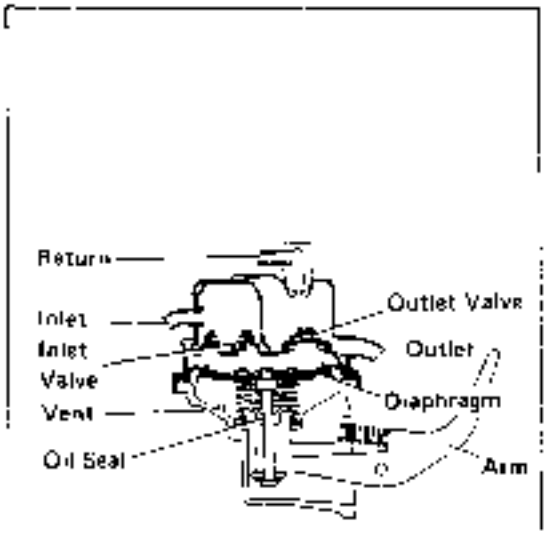
   Open the radiator drain cock and allow the coolant to dr into a suitable container.

2. **DISCONNECT UPPER RADIATOR HOSE**

3. **DISCONNECT THREE FUEL HOSES FROM FUEL PUMP**

4. **REMOVE FUEL PUMP**

   Remove the two bolts, fuel pump and gasket.



INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

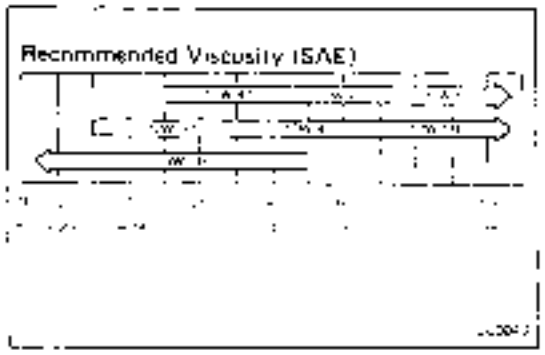
Before preforming the following checks on the fuel pump:

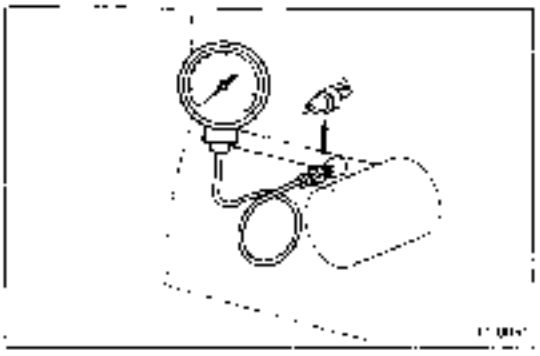
(a) Run some fuel through the pump to insure that the check valves seal tightly (a dry check valve may not seal properly).

(b) Without blocking off any pipe, operate the pump lever and check the amount of force necessary for operation and the amount of arm play. This same amount of force should be used in the checks.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Replace as necessary	
	Oil seal faulty	Replace oil seal	LU-4
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Replace as necessary	
	Relief valve faulty	Replace relief valve	LU-4
	Oil pump faulty	Replace oil pump	LU-4
	Engine oil poor quality	Replace engine oil	LU-3
	Crankshaft bearing faulty	Replace bearing	
	Connecting rod bearing faulty	Replace bearing	
High oil pressure	Oil filter clogged	Replace oil filter	LU-3
	Relief valve faulty	Replace relief valve	LU-4





OIL PRESSURE CHECK

1. **CHECK OIL QUALITY**

   Check the oil for deterioration, entry of water, discolori or thinning.

   If the quality is poor, change the oil.

   Use API grade SF or SF/CC multigrade, fuel-efficient and recommended viscosity oil.

2. **CHECK OIL LEVEL**

   The oil level should be between the L and F marks on the level gauge. If low, check for leakage and add oil up to the F mark.

3. **REMOVE OIL PRESSURE SWITCH OR SENDER GAUGE**

4. **INSTALL OIL PRESSURE GAUGE**

5. **START ENGINE**

   Start engine and warm it up to normal operating temperature.

6. **MEASURE OIL PRESSURE**

   Oil pressure:

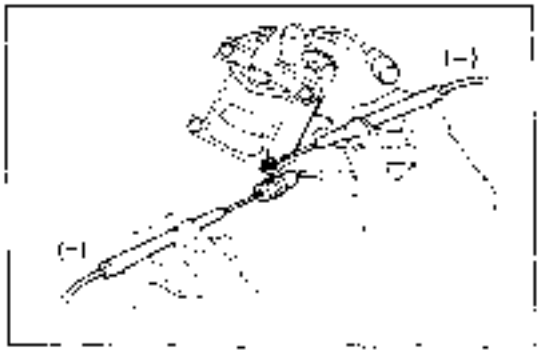
   At idle speed **More than 0.3 kg/cm² (4.3 psi, 29 kPa)**

   At 3,000 rpm **2.5 — 5.0 kg/cm² (36 — 71 psi, 245 — 490 kPa)**

   NOTE: Check for oil leakage after reinstalling the oil pressure switch or sender guage.

INSPECTION OF IGNITER

1. TURN IGNITION SWITCH ON

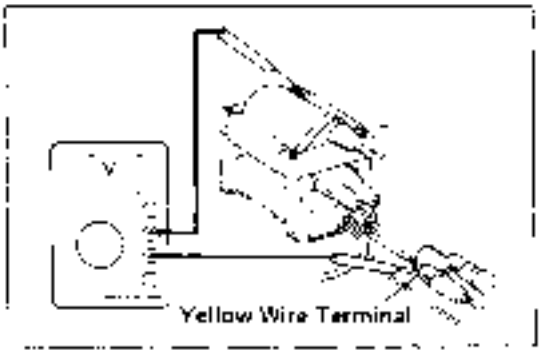


2. CHECK POWER SOURCE LINE VOLTAGE

(a) Disconnect the wiring connector for brown wire and yellow wire.

(b) Using a voltmeter, connect the positive (+) probe to the brown wire for the wire harness side and the negative (−) probe to body ground.

Voltage: Approx. 12 V

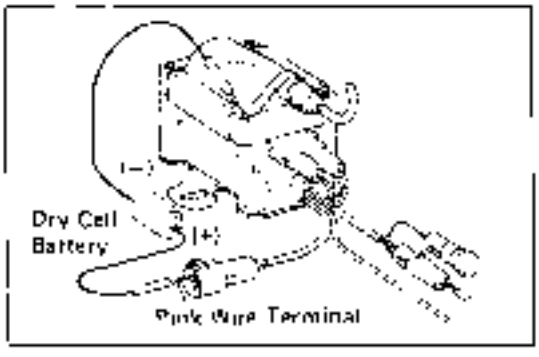


3. CHECK POWER TRANSISTOR IN IGNITER

(a) Connect the wiring connector for brown wire and yellow wire.

(b) Using a voltmeter, connect the positive (+) probe the yellow wire for the igniter side and the negative (−) probe to body ground.

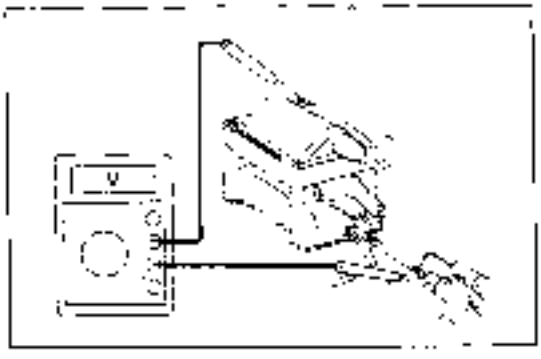
Voltage: Approx. 12 V



(c) Unplug the wiring connector from the distributor.

(d) Using a dry cell battery (1.5 V), connect the positive (+) pole of the battery to the pink wire terminal and the negative (−) pole to the white wire terminal.

CAUTION: Do not apply voltage more than 5 seconds to avoid destroying the power transistor in the igniter.



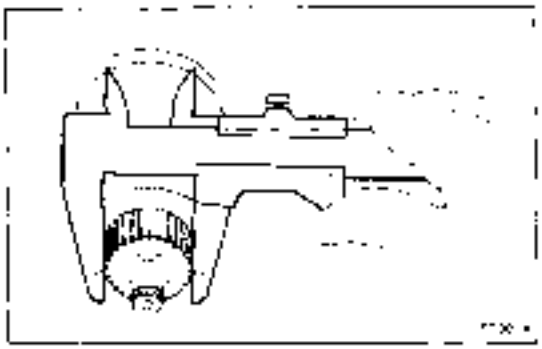
(e) Using a voltmeter, connect the positive (+) probe to the yellow connector for the igniter side and the negative (−) probe to body ground.

Voltage: 8 — 10 V

If a problem is found, replace the igniter.

4. TURN IGNITION SWITCH OFF

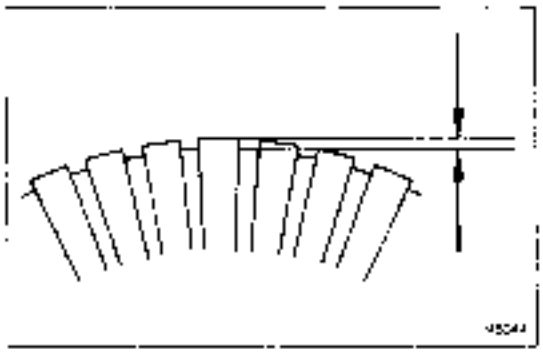
5. REMOVE TEST EQUIPMENT AND RECONNECT WIRING



3. MEASURE DIAMETER OF COMMUTATOR

If the diameter of the commutator is less than the minimum, replace the armature.

Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)

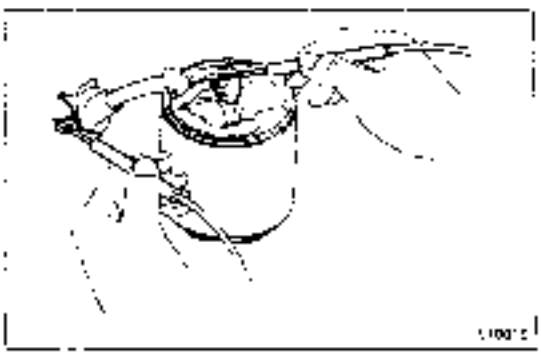


4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign particles. Smooth out the edge

If the undercut depth is less than the minimum, correct it with a hacksaw blade.

Standard undercut depth: 0.5 — 0.8 mm (0.020 - 0.031 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

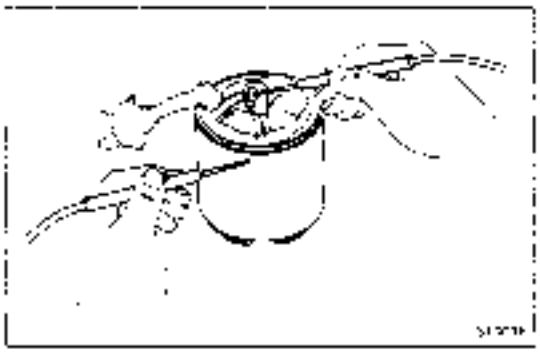


Field Coil

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the le wire and field coil brush lead.

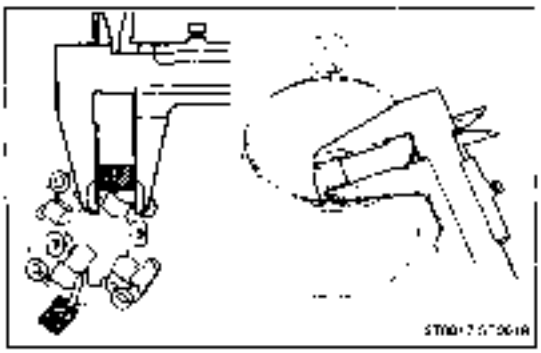
If there is no continuity, replace the field frame.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, replace the field frame.



Brushes

MEASURE BRUSH LENGTH

If length is less than the minimum, replace the brush and dress with an emery cloth.

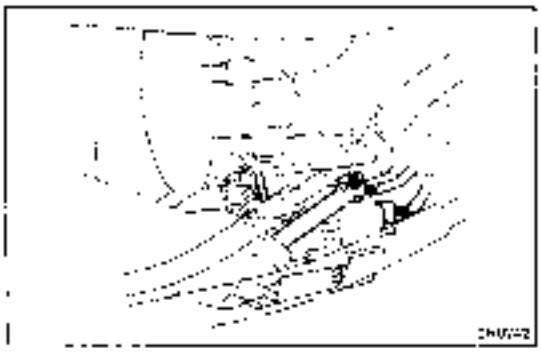
Standard length: 1.0 kW 13.0 mm (0.512 in.)
1.4 kW 15.0 mm (0.591 in.)
Minimum length: 1.0 kW 8.5 mm (0.335 in.)
1.4 kW 10.0 mm (0.394 in.)

ALTERNATOR

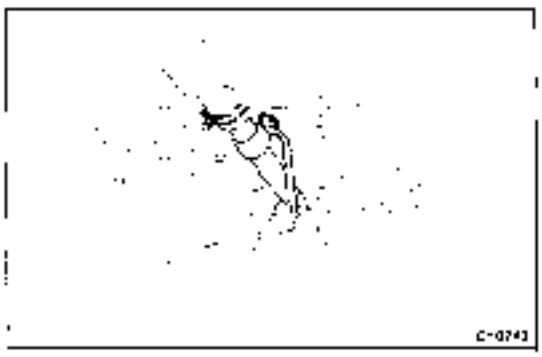
REMOVAL OF ALTERNATOR

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

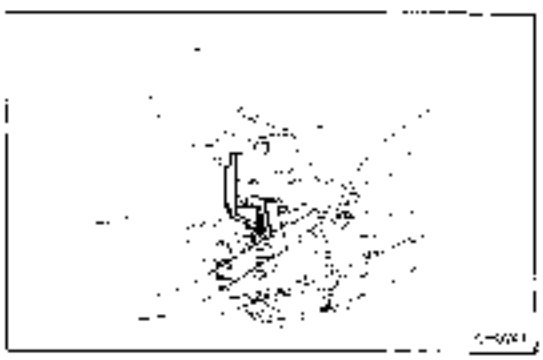
2. **DRAIN COOLANT**



3. **DISCONNECT WIRING FROM ALTERNATOR**
   (a) Disconnect the connector from the alternator.
   (b) Remove the nut and wire from the alternator.



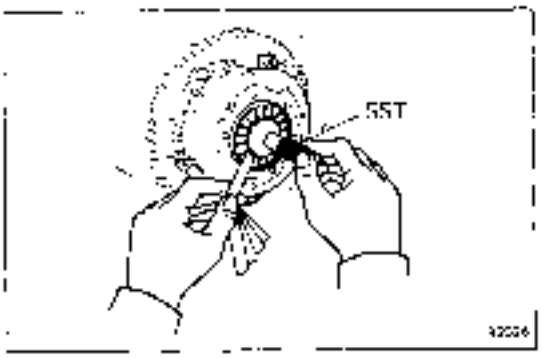
4. **DISCONNECT WATER INLET HOSE**
   (a) Remove the engine under cover.
   (b) Remove the two water inlet pipe bolts.
   (c) Disconnect the water inlet hose from the engine.



5. **REMOVE FAN BELT**
   (a) Loosen the alternator pivot and remove the adjust bolt.
   (b) Remove the fan belt.

6. **REMOVE ALTERNATOR**
   (a) Hold the alternator and remove the pivot.
   (b) Remove the alternator.

CLUTCH



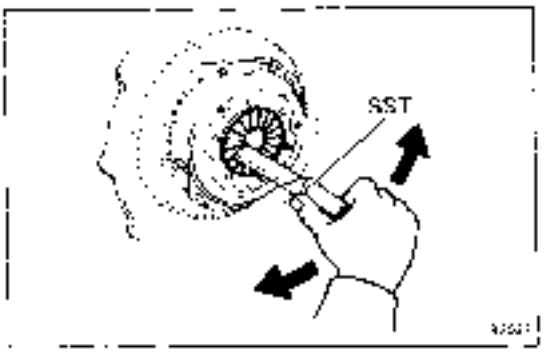
3. **CHECK DIAPHRAGM SPRING TIP ALIGNMENT**

Using a feeler gauge and SST, measure the gap between the spring tips and the tool.

SST 09302-30031

Maximum gap: 0.5 mm (0.020 in.)

If the gap is excessive, adjust as follows.



4. **IF NECESSARY, ADJUST SPRINGS**

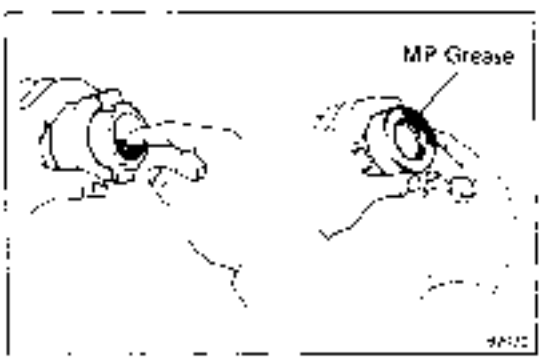
Using SST, bend the springs to correct alignment

SST 09333-00012

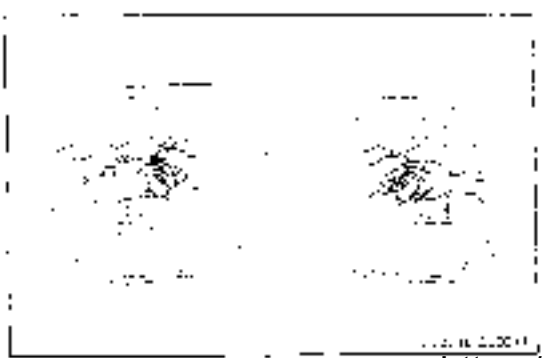
5. **APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) OR MP GREASE**

(a) Apply molybdenum disulphide lithium base grease to the following parts:

- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point
- Clutch disc spline
- Release bearing hub inside groove

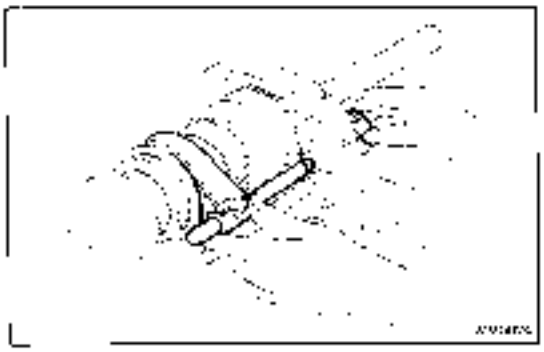


(b) Apply MP grease to release bearing.

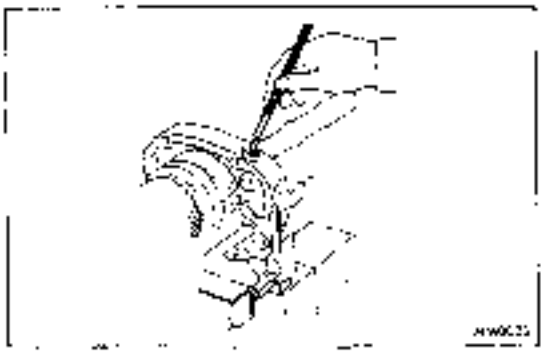


6. **INSTALL BOOT, FORK, HUB AND BEARING ON TRANSMISSION**

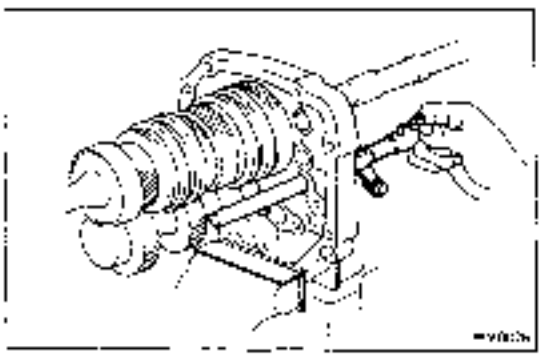
7. **INSTALL TRANSMISSION**



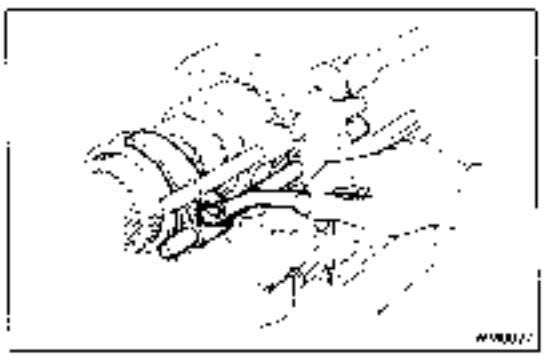
(g) Remove the shift fork and shaft No. 2.



(h) Using a magnetic finger, remove interlock pin No. 3.



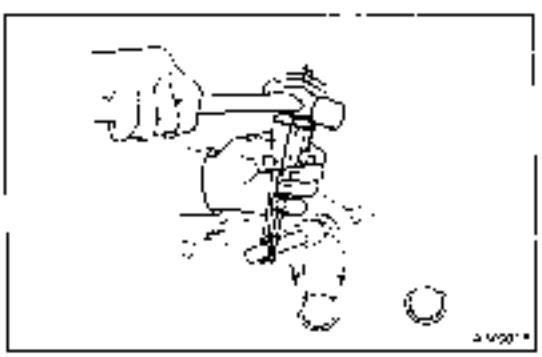
(i) Remove fork shaft No. 3 with reverse shift arm.



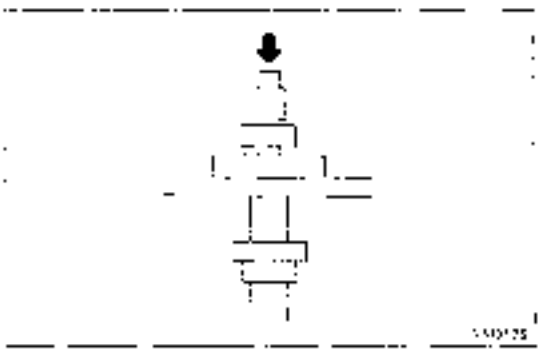
8.-2 (5-Speed)

REMOVE SHIFT FORKS SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

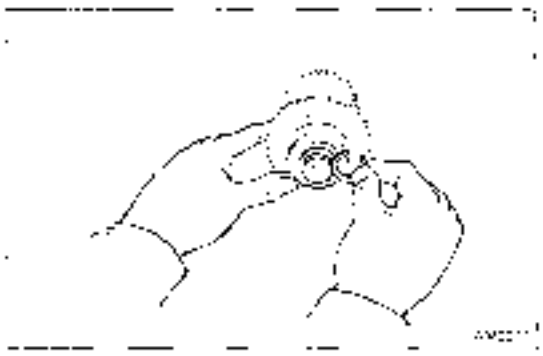
(a) Pry out the lock washers of shift fork No. 1 and No. 2, and remove two set bolts.



(b) Using two screwdrivers and a hammer, tap out the two snap rings of the No. 1 and No. 2 fork shafts.

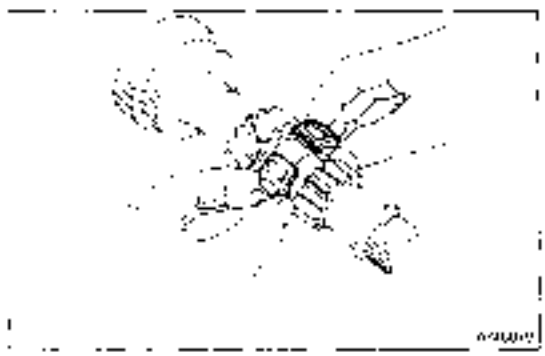


(e) Using a socket wrench, press in the bearing, side race and inner race.



(f) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness		Axial play
1	2.05 — 2.10		0.0807 — 0.0927
2	2.10 — 2.15		0.0827 — 0.0846
3	2.15 — 2.20		0.0846 — 0.0866
4	2.20 — 2.25		0.0866 — 0.0886
5	2.25 — 2.30		0.0886 — 0.0906
6	2.30 — 2.35		0.0906 — 0.0925
7	2.35 — 2.40		0.0925 — 0.0945

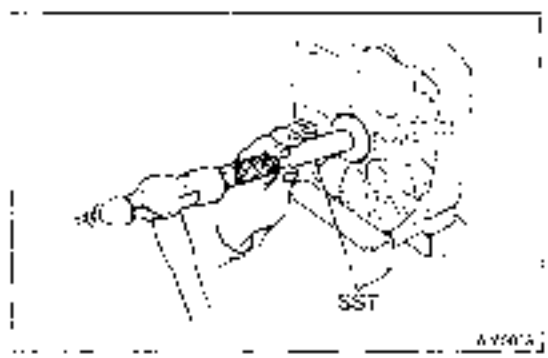


10. IF NECESSARY, REPLACE COUNTER GEAR CENTER BEARING

(a) Remove the bearing from the counter gear.

(b) Install the new bearing on the counter gear.

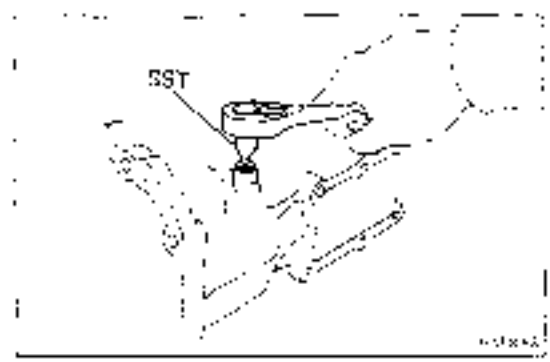
NOTE: Engage the roller cages.



(c) Using SST, tap out the bearing outer race.

SST 09608-35013

NOTE: The outer race will be installed later, as the transmission is assembled.

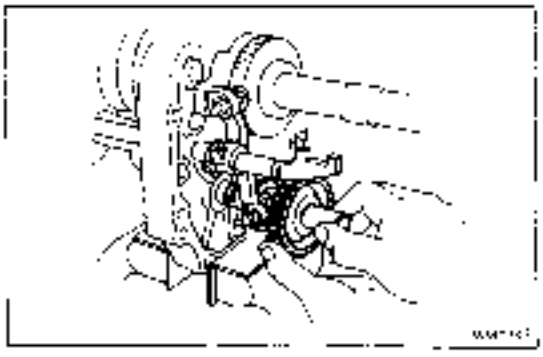


11. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

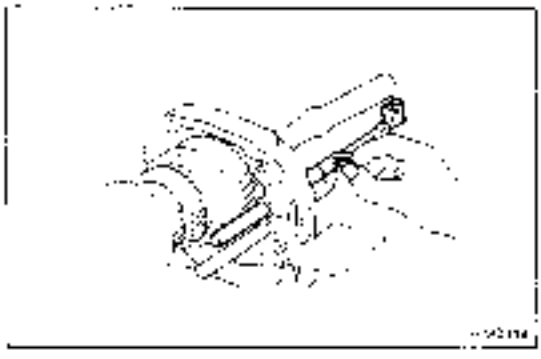
(a) Using SST, remove the screw plug.

SST 09313-30021

(2) Apply MP grease to interlock pin No. 3 and install the pin into the intermediate plate hole.



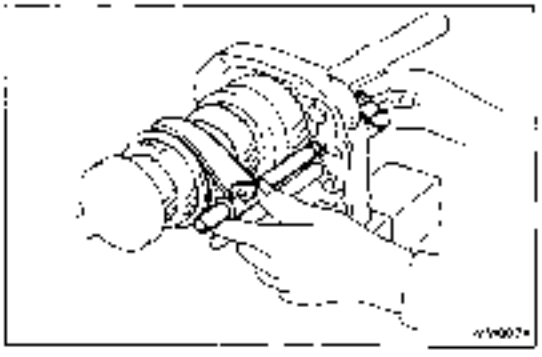
(b) Install the reverse idler gear and shaft.
Align the reverse idler gear groove to the reverse shift arm shoe and install the reverse idler gear shaft to the intermediate plate.



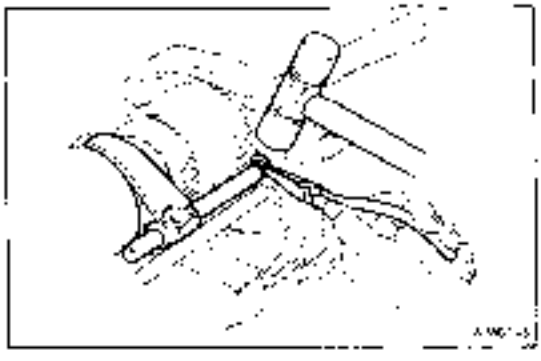
(c) Install shift fork No. 2 and shaft No. 2.

(1) Apply MP grease to interlock pin No. 2 and install the pin into the shaft hole.

(2) Place shift fork No. 2 into the groove of H sleeve No. 2.

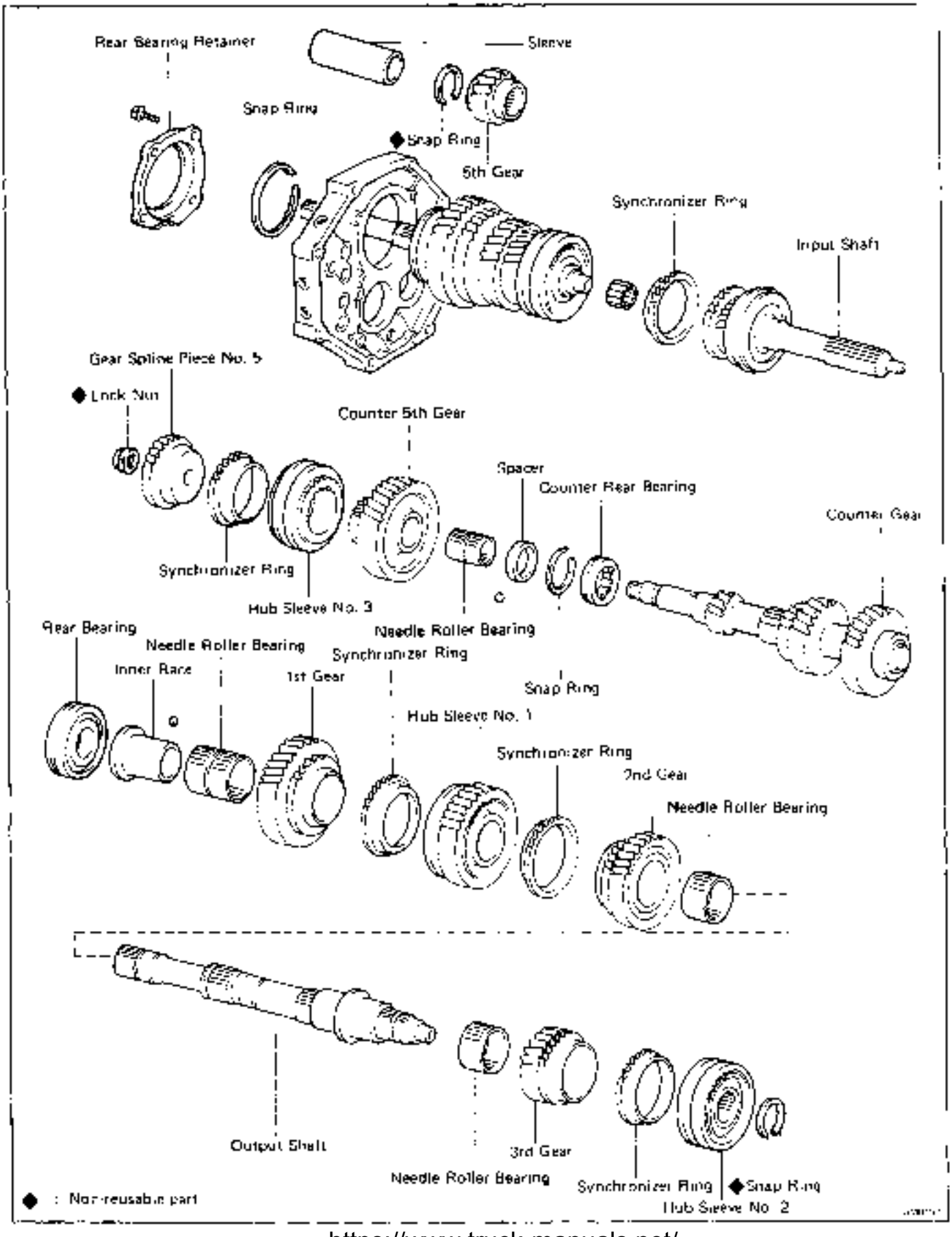


(3) Install fork shaft No. 2 to the shift fork through the intermediate plate



(d) Install the snap ring of fork shaft No. 2.

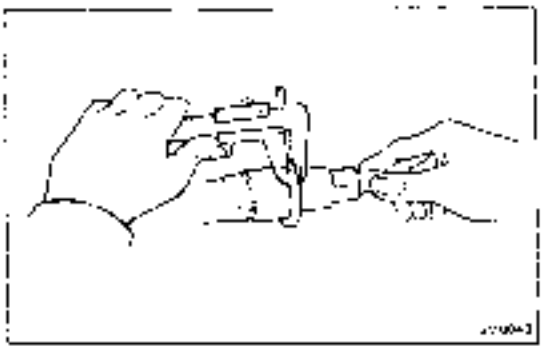
COMPONENTS (Cont'd)



INSPECTION OF TRANSMISSION COMPONENTS

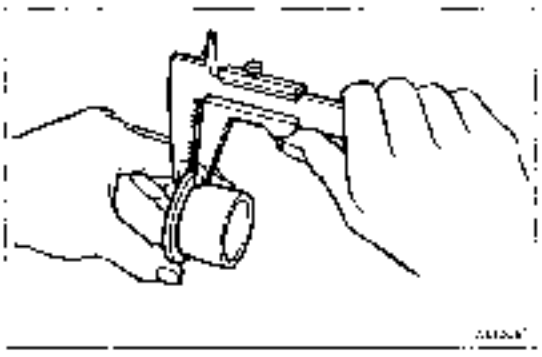
1. INSPECT OUTPUT SHAFT AND INNER RACE

(a) Using calipers, measure the output shaft flange thickness.



Minimum thickness: 4.80 mm (0.1890 in.)

(b) Using calipers, measure the inner race flange thickness.



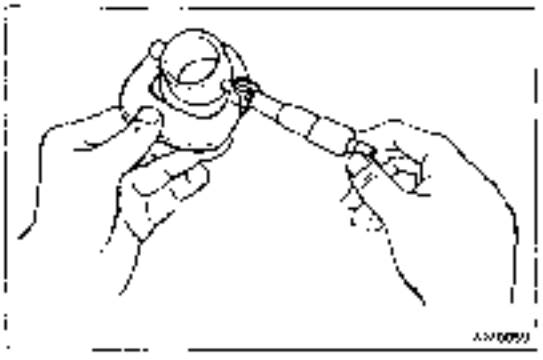
Minimum thickness: 3.99 mm (0.1571 in.)

(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum diameter:

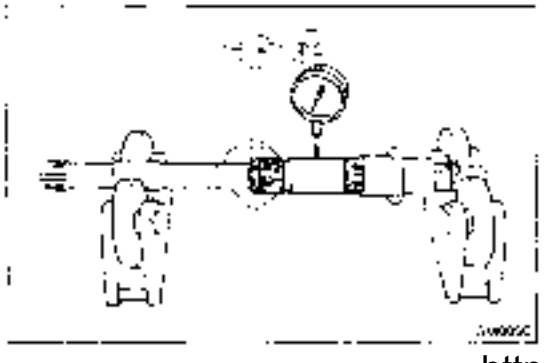
2nd gear	37.984 mm (1.4954 in.)
3rd gear	34.984 mm (1.3773 in.)

(d) Using a micrometer, measure the outer diameter of the inner race.

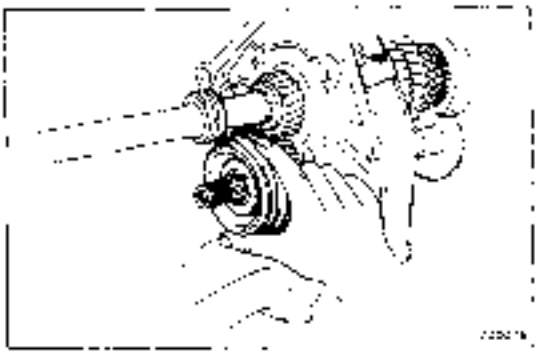


Minimum diameter: 38.985 mm (1.5348 in.)

(e) Using a dial indicator, check the shaft runout.



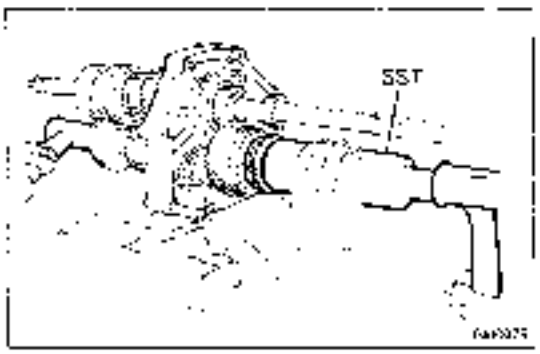
Maximum runout: 0.05 mm (0.0020 in.)



20 INSTALL COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3 ASSEMBLY AND NEEDLE ROLLER BEARINGS

(a) Apply gear oil to the needle roller bearings.

(b) Install the counter 5th gear with hub sleeve No.3 and needle roller bearings.



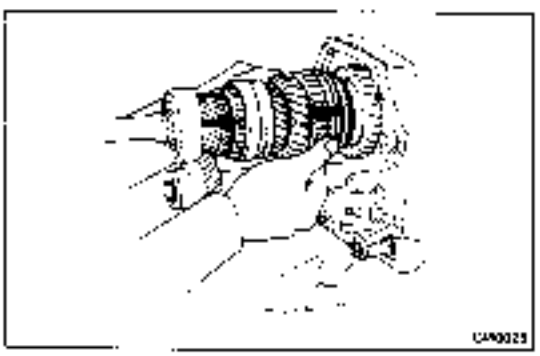
21. INSTALL SYNCHRONIZER RING AND GEAR SPLINE PIECE NO.5

(a) Install the synchronizer ring on gear spline piece No.5.

(b) Using SST, drive in gear spline piece No.5 with the synchronizer ring slots aligned with the shifting keys.

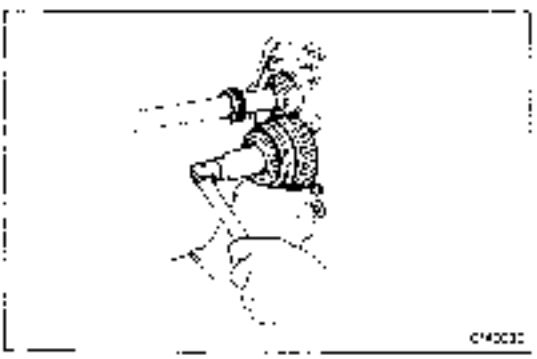
SST 09316-60010

NOTE: When installing gear spline piece No.5, support the counter gear in front with a 3-5 lb hammer or equivalent.



22. INSTALL LOCK NUT

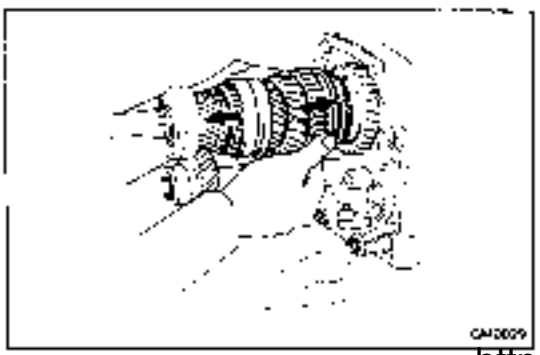
(a) Engage the gear double meshing.



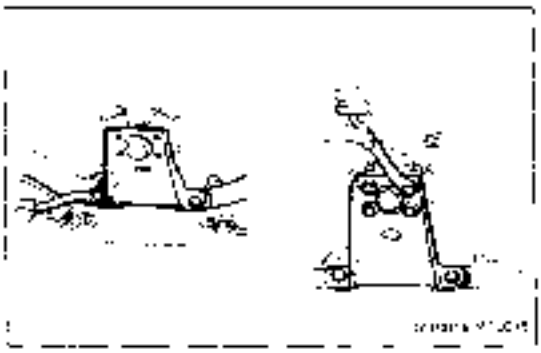
(b) Install and torque the lock nut.

Torque: 1,200 kg-cm (87 ft-lb, 118 N·m)

(c) Stake the lock nut.



(d) Disengage the gear double meshing.



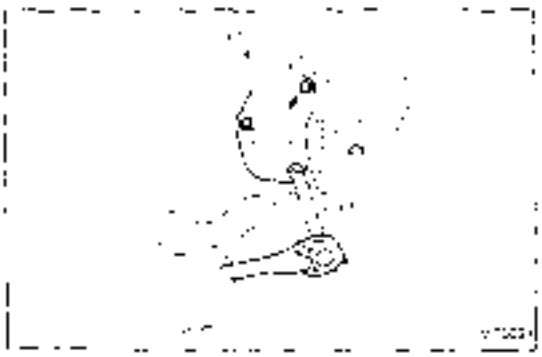
(c) Install the engine rear mounting bracket to the support member. Torque the bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(d) Lower the transmission and rest it on the extension housing.

(e) Install the bracket to the mounting. Torque the bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

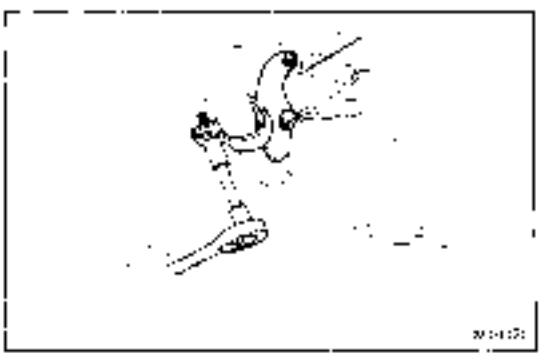


4. REMOVE PIECE OF WOOD FROM FRONT CROSSMEMBER

5. INSTALL EXHAUST PIPE, BRACKET AND PIPE

(a) Install the exhaust pipe to the manifold.

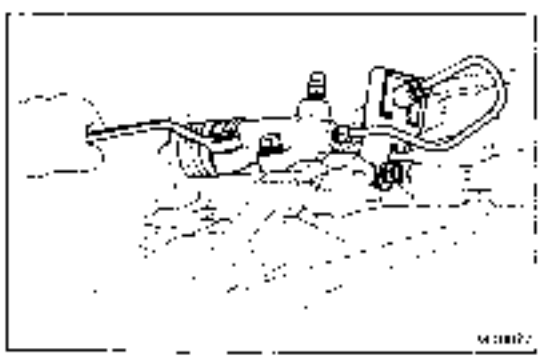
Torque: 400 kg-cm (29 ft-lb, 39 N·m)



(b) Install the pipe bracket to the clutch housing.

Torque: Upper 380 kg-cm (27 ft-lb, 37 N·m)
Lower 700 kg-cm (51 ft-lb, 69 N·m)

(c) Install the exhaust pipe clamp.



6. INSTALL STARTER LOWER MOUNTING BOLT AND RELEASE CYLINDER TUBE BRACKET

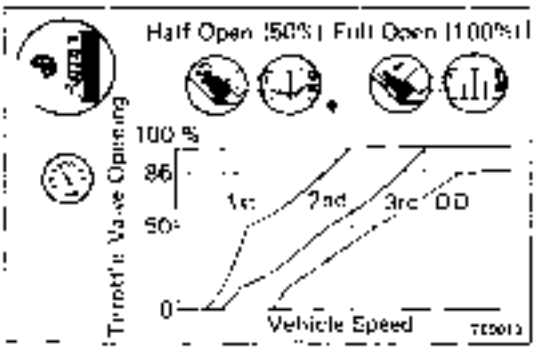
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

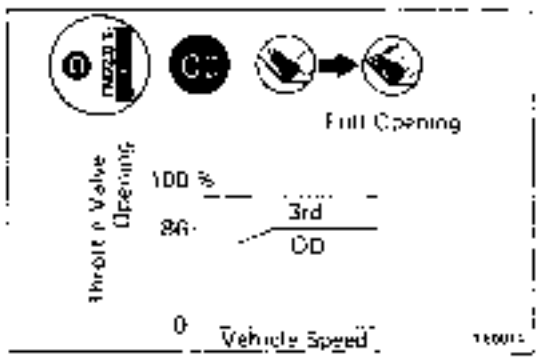
7. INSTALL CLUTCH RELEASE CYLINDER

Torque: 120 kg-cm (9 ft-lb, 12 N·m)

8. CONNECT SPEEDOMETER CABLE AND BACK-UP LIGHT SWITCH

9. CONNECT PROPELLER SHAFT
(See page PR-2)





ROAD TEST

CAUTION: Perform the test at normal operation fluid temperature(50 — 80°C or 122 - 176°F).

1. **"D" RANGE TEST**

Shift into "D" range and while driving with the accelerator pedal held constant at a specified point(throttle valve opening 50 % and 100 %)and the OD swith "ON", check the following points.

(a) At each of the above throttle openings, check to see that 1→2, 2→3 and 3→OD up-shift take place and also that the shift points conform to those shown in the automatic shift diagram.

NOTE. 3→OD up shift does not take place with a throttle valve opening of more than 86 % or coolant temperature below 50°C (122°F).

EVALUATION

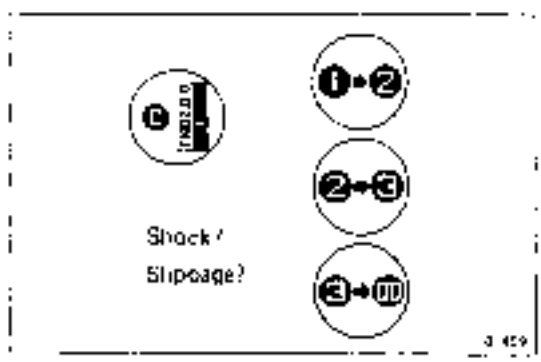
(1) If there is no 1→2 up-shift:
- Governor valve is defective
- 1-2 shift valve is stuck

(2) If there is no 2→3 up-shift:
- 2-3 shift valve is stuck

(3) If there is no 3→OD up-shift (throttle valve opening of less than 86 %):
- 3-OD shift valve is stuck

(4) If the shift point is defective:
- Throttle cable is out-of-adjustment
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-OD shift valve etc., are defective

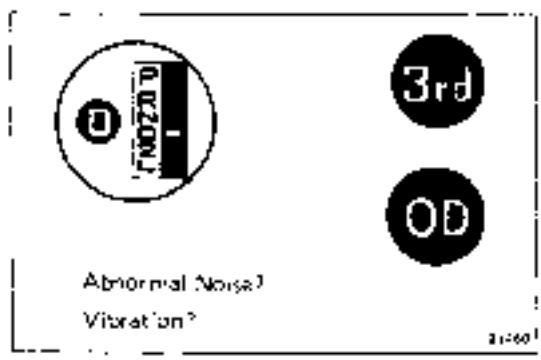
(b) In the same manner, check the shock and the slip at 1→2, 2→3 and 3→OD shifts.



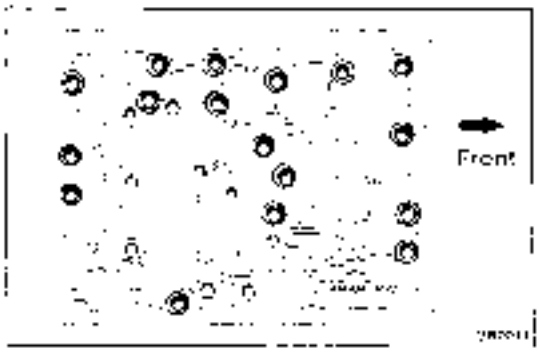
EVALUATION

If the shock is servere,
- Line pressure is too high
- Accumulator is defective
- Check ball is defective

(c) In "D" range 3rd gear or OD, check for abnormal noise and vibration.



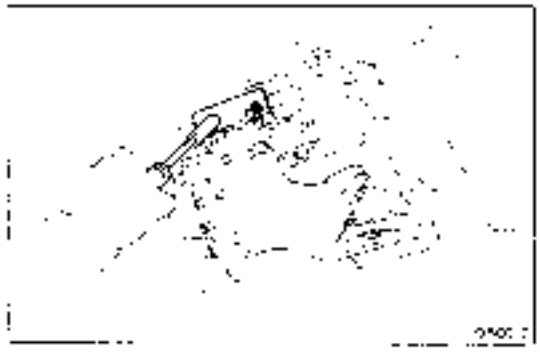
NOTE: Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in propeller shaft, differential, tire, torque converter, etc. or insufficient bending rigidity, etc., in the power train.



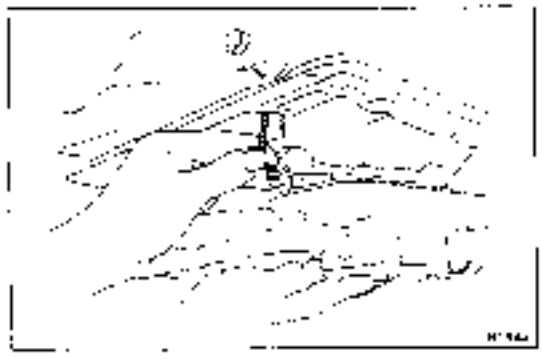
7. **REMOVE VALVE BODY**

(a) Remove the seventeen bolts.

NOTE: Bolt lengths will be shown for installation, so there is no need to mark them now.



(b) Lower the valve body slightly, and install the accumulator piston retaining plate. Hold it in place with two pan bolts. Hand tighten the bolts with a socket driver.



(c) Disconnect the throttle cable from the cam and remove the valve body.

DISASSEMBLY, INSPECTION AND ASSEMBLY OF VALVE BODY

(See page AT-29)

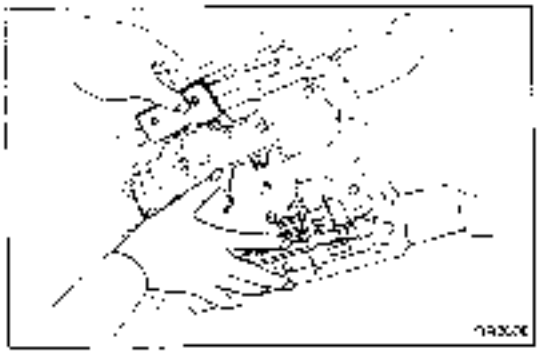
INSTALLATION OF VALVE BODY

1. **CONNECT THROTTLE CABLE TO CAM**

Push the cable fitting into the cam.

2. **ALIGH MANUAL VALVE LEVER WITH MANUAL VALVE AND LOOSELY INSTALL SEVERAL BOLTS IN VALVE BODY**

Leave the bolts loose so that the accumulator retaining plate can be removed.



3. **REMOVE ACCUMULATOR RETAINING PLATE**

Remove the two pan bolts, and slide out the plate.

DISASSEMBLY OF TRANSMISSION

SEPARATE BASIC SUBASSEMBLY

1. REMOVE CLAMP FOR WIRING AND THROTTLE CABLE
2. REMOVE SOLENOID AND O-RINGS
3. REMOVE SHIFT HANDLE

4. REMOVE NEUTRAL START SWITCH

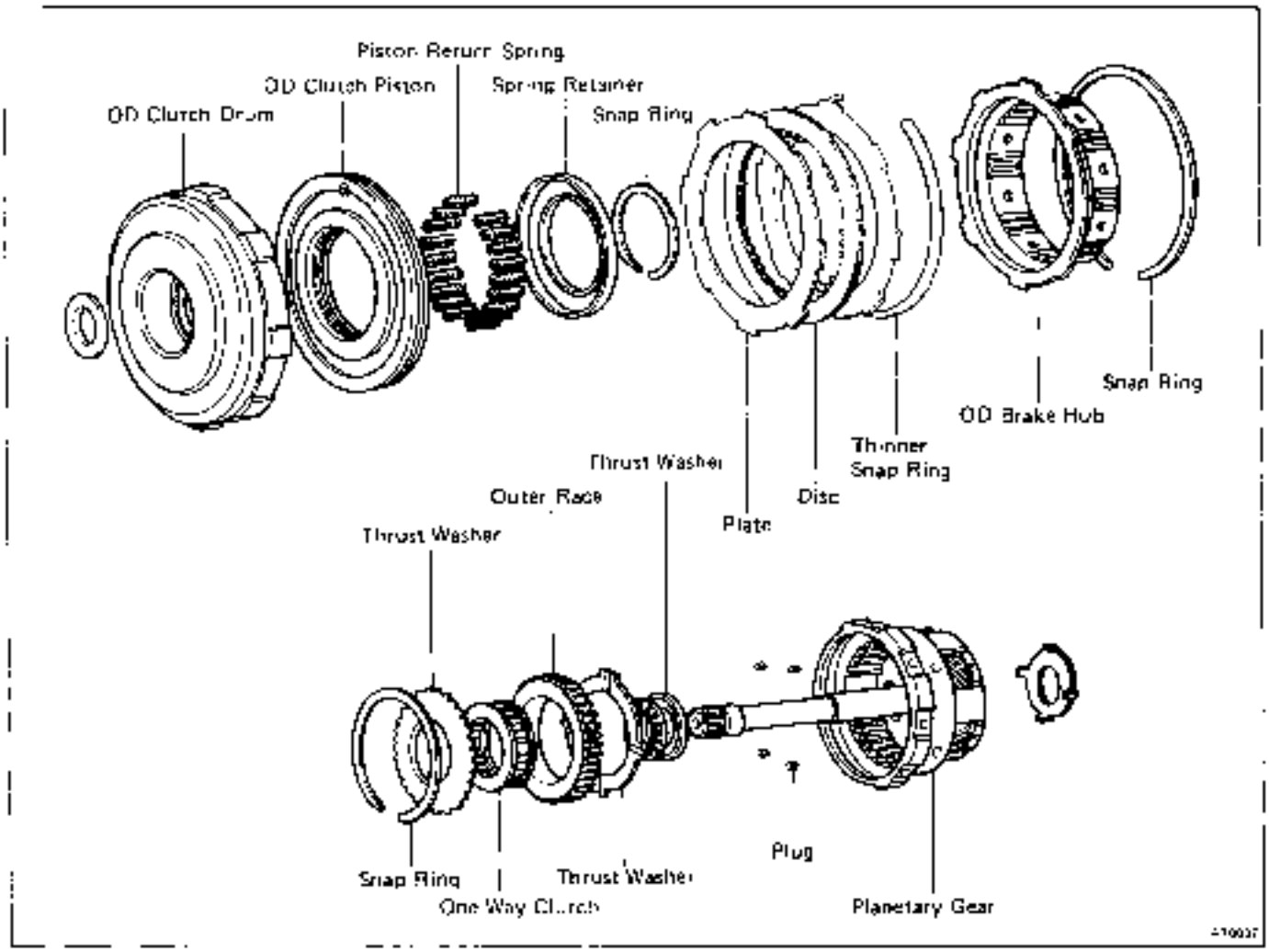
5. REMOVE SPEEDOMETER DRIVEN GEAR

6. REMOVE OIL PUMP
   (a) Remove the seven bolts.
   (b) Position SST on the shaft in back of the spline.
   SST 09610-20012
   CAUTION: Do not damage the shaft bushing surface. Turn the end bolt of SST to free the pump.

   (c) Grasp the front pump stator shaft and pull the pump from the case.

7. WATCH FOR RACE BEHIND OIL PUMP

Overdrive Input Shaft and Clutch



DISASSEMBLY OF OVERDRIVE INPUT SHAFT AND CLUTCH

1. **REMOVE THRUST BEARINGS AND RACES FROM OVERDRIVE INPUT SHAFT**
   (a) Slide off the thrust bearing and race from the clutch side by hand. Note the position of the races.
   (b) Using a screwdriver, pry off the thrust washer from the planetary gear side.

2. **PULL OVERDRIVE CLUTCH ASSEMBLY FROM INPUT SHAFT**
   CAUTION: Be careful that the thrust bearing and race do not fall out.

3. **REMOVE THRUST BEARING AND RACE**
   Note the position of the race.

INSPECTION OF FRONT CLUTCH

INSPECT FRONT CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

NOTE: Do not allow the discs to dry out. Prepare new discs by soaking them at least two hours in ATF.

ASSEMBLY OF FRONT CLUTCH

(See page AT-47)

1. INSTALL NEW O-RINGS ON PISTON

2. INSTALL PISTON IN FRONT CLUTCH DRUM

Press the piston into the housing with the cup side up (check ball down).

Be careful not to damage the O-rings.

3. INSTALL EIGHTEEN PISTON RETURN SPRINGS, SPRING RETAINER AND SNAP RING IN PLACE

4. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place SST on the spring retainer, and compress the spring on a shop press.

SST 09350-20013

(b) Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

5. INSTALL DISCS AND PLATES WITHOUT ASSEMBLING THINNER SNAP RING

(a) Do not assemble the thinner snap ring yet.

(b) Using low-pressure compressed air, blow all excess ATF from the discs. For measurement of the clutch pack, install all plates and discs (temporarily without thinner snap ring):

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-plate-disc-plate-disc-plate (no snap ring)-disc

6. CHECK PISTON STROKE OF FRONT CLUTCH

(a) Install the rear clutch hub and outer snap ring.

(b) Install the front clutch drum onto the overdrive case. Using a dial indicator, measure the stroke applying and releasing the compressed air (4 — 8 Kg/cm², 57 — 114 psi or 392 — 785 kPa).

Standard piston stroke: 1.32—2.66 mm (0.0520 — 0.1047 in.)

If the stroke exceeds the limit, the clutch pack is probably worn. If stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.

14. TURN CENTER SUPPORT OVER AND INSTALL NO. 2 BRAKE PLATES, DISCS AND FLANGE

Using the low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-plate-disc-plate-disc-flange

15. INSTALL SNAP RING IN CENTER SUPPORT

Check that the snap ring ends are not aligned with one of the cutouts.

16. CHECK PISTON STROKE OF NO. 2 BRAKE

Using a dial indicator, measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 KPa) as shown.

Standard piston stroke: 1.01 — 2.25 mm (0.0398 — 0.0886 in.)

If the stroke exceeds the limit, the clutch pack is probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.

17. ASSEMBLE CENTER SUPPORT AND SUN GEAR

(a) Align the brake No. 2 disc flukes.

(b) Mesh the brake hub with the discs, twisting and jiggling the hub as required.

18. INSTALL SNAP RING ON END OF SUN GEAR

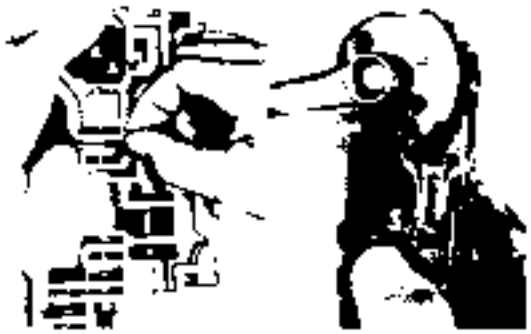
3. **REMOVE SMALL COVER**

4. **TURN ASSEMBLY OVER AND REMOVE TEN BOLTS FROM UPPER FRONT VALVE BODY AND UPPER REAR VALVE BODY**

5. **TURN ASSEMBLY OVER AND REMOVE SET BOLTS FROM LOWER VALVE BODY**

6. **LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT**

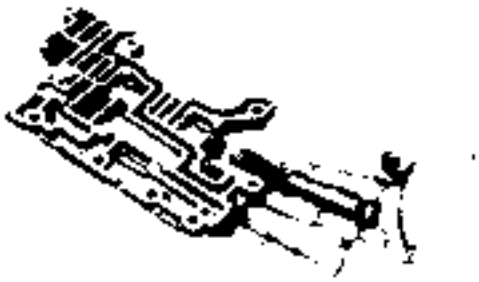
   NOTE: Be careful that the check valve and balls do not fall out.



4. **PUSH DOWN-SHIFT PLUG INTO VALVE BODY AND TEMPORARILY HOLD IN THROTTLE VALVE**

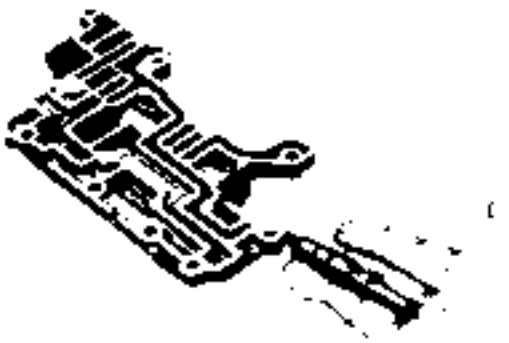
   Temporarily hold the throttle valve in position with the cut back valve plug retainer.

5. **REMOVE THROTTLE CAM**



6. **REMOVE DOWN-SHIFT PLUG AND SPRING**

   Press on the down-shift plug so that the temporary retainer falls out.



7. **REMOVE THROTTLE VALVE**

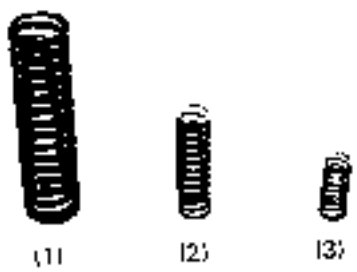
8. **REMOVE SPRING AND ADJUSTING RINGS**

   Note the number of adjusting rings installed.

INSPECTION OF UPPER FRONT VALVE BODY

INSPECT VALVE SPRING

Check for damage, squareness, rust and collapsed coils. Measure the spring free height and replace it if less than that shown below.



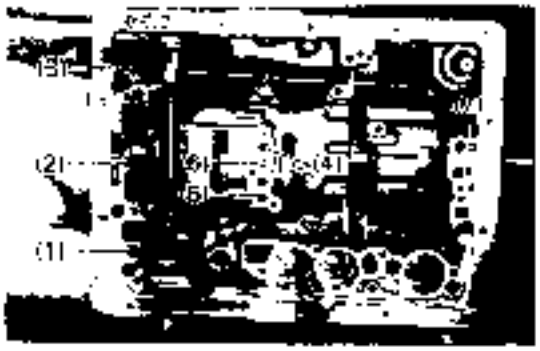
	Free length mm (in.)
(1) Secondary regulator valve	71.27 (2.8059)
(2) Down-shift plug	39.71 (1.5634)
(3) Throttle valve	21.94 (0.8638)

12. **INSERT MANUAL VALVE**

13. **INSTALL DETENT SPRING**

Tighten the bolts.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



29. CHECK OPERATION OF PISTONS

Blow low-pressure compressed air into the passages indicated in the photo and listen for noise from piston movement.

(1) Overdrive clutch
(2) Overdrive brake
(3) Front clutch
(4) Rear clutch
(5) Brake No. 1
(6) Brake No. 2
(7) Brake No. 3

If the pistons do not move, disassemble and inspect them.

30. CHECK INPUT SHAFT AND OUTPUT SHAFT

(a) Make sure that the input shaft has play in axial direction and that it turns.

(b) Make sure that the output shaft has thrust play in axial direction.

Thrust play: 0.3 — 0.9 mm (0.012 — 0.035 in.)

31. IF NECESSARY, INSTALL MANUAL VALVE LEVER SHAFT INTO CASE

(a) Assemble the new collar to the manual valve lever.

NOTE: Always replace the collar and roll pin with a new one. Never reuse a pin after it has been removed.

(b) Install the manual valve lever shaft to the transmission case through the manual valve lever.

(c) Drive in a new roll pin with the slot at a right angle to the shaft.

(d) Match the collar hole to the lever caking hollow and calk the collar to the lever.

32. INSTALL PARKING LOCK PAWL, PIVOT PIN AND SPRING IN CASE

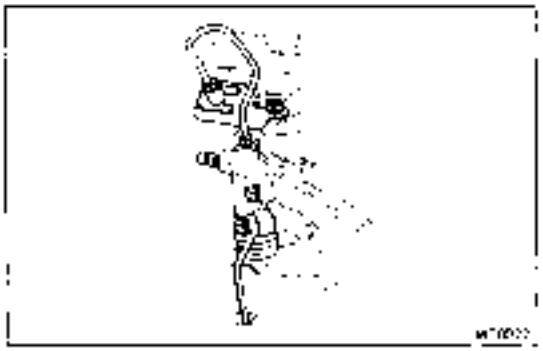
33. INSTALL PARKING LOCK PAWL BRACKET ON CASE

Make sure the collar on the control rod is toward the front of the transmission.

Tighten the two bolts. Make sure the pawl moves freely

NOTE: Be careful, as it is possible for bracket to be installed too far forward, where it will bind the pawl.

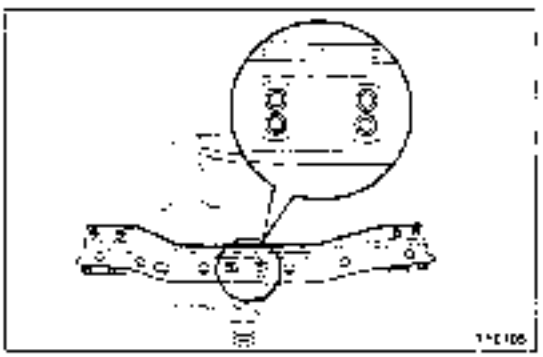
Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)



9. **REMOVE CLUTCH RELEASE CYLINDER, TUBE BRACKET AND STARTER LOWER MOUNTING BOLT**

Remove the mounting bolts and lay the starter and relea cylinder alongside the engine.

NOTE: Do not disconnect the clutch line



10. **REMOVE FRAME CROSSMEMBER NO.2 FROM SIDE FRAME**

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly with a jack.

(c) Remove the four bolts from the side frame and remove the frame crossmember No.2.

11. **PLACE PIECE OF WOOD BETWEEN ENGINE OIL PAN AND FRONT AXLE**

12. **LOWER TRANSMISSION WITH TRANSFER**

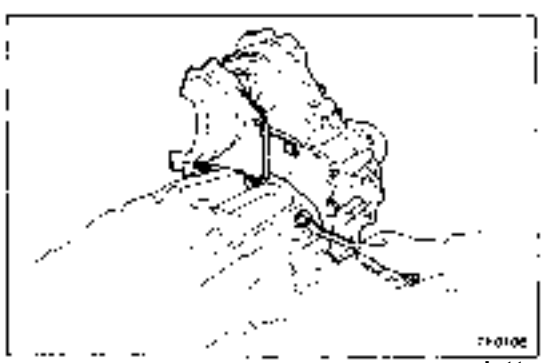
13. **REMOVE EXHAUST PIPE BRACKET AND STIFFENER PLATE BOLTS**

14. **REMOVE REMAINING TRANSMISSION BOLTS**

15. **REMOVE TRANSMISSION WITH TRANSFER**

(a) Draw out the transmission with the transfer toward the rear.

(b) Lower the transmission with the transfer front and remove it from the vehicle.



16. **REMOVE ENGINE REAR MOUNTING**

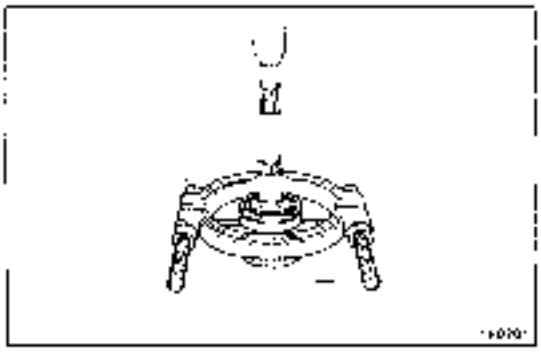
17. **REMOVE PROPELLER SHAFT UPPER DUST COVER AND TRANSFER FROM TRANSMISSION**

(a) Remove the dust cover bolt from the bracket.

(b) Remove the transfer adapter rear mounting bolts

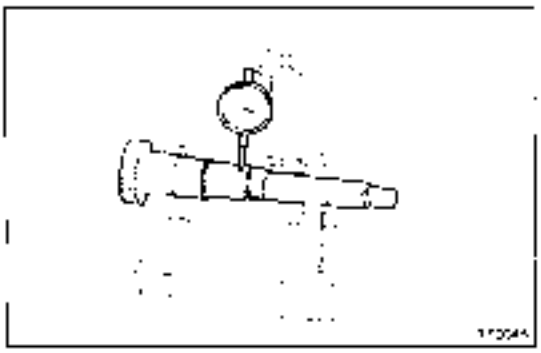
(c) Pull the transfer straight up and remove it from the transmission.

NOTE: Take care not to damage the adapter rear oil seal with the transfer input gear spline.



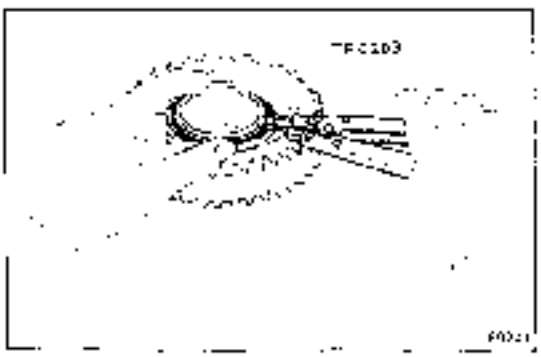
(b) Using a press, remove the bearing, No. 1 spacer and low gear.

(c) Remove the steel ball and needle roller bearing.



(d) Using a dial indicator, measure the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

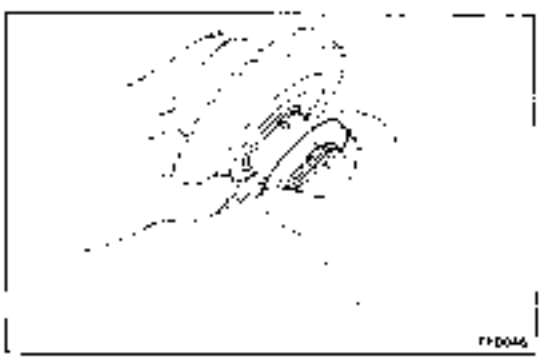


(e) Using snap ring pliers, remove the snap ring from the low gear.

(f) Remove the spacer, thrust spring and sub gear.

(g) Install the sub gear, thrust spring and spacer.

(h) Using snap ring pliers, install the snap ring.

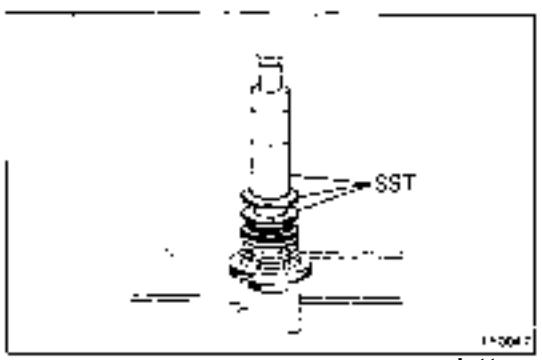


(i) Apply MP grease to the needle roller bearing.

(j) Install the low gear with needle roller bearing to the output shaft.

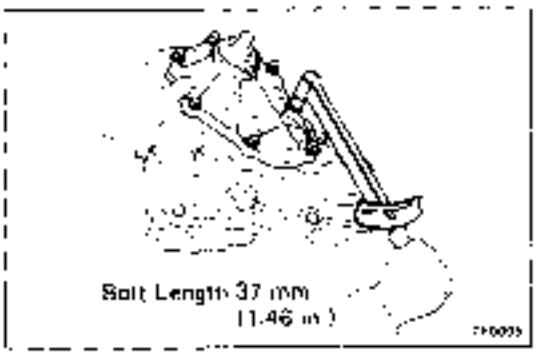
(k) Install the steel ball on the output shaft.

(l) Install the No.1 spacer.



(m) Using a press and SST, install the new bearing.

SST 09316-60010



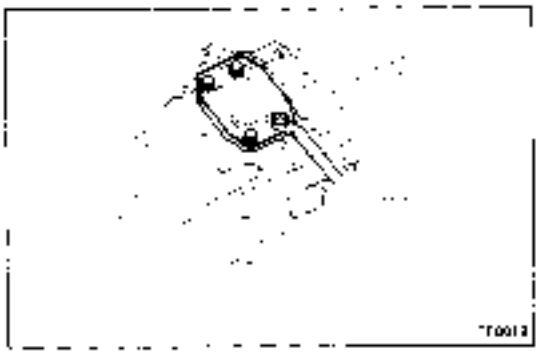
20. **INSTALL EXTENSION HOUSING WITH NEW GASKET**

(a) Place a new gasket to the rear case.

(b) Apply MP grease to the two oil seals.

(c) Install the extension housing with seven bolts. Torque the bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N-m)

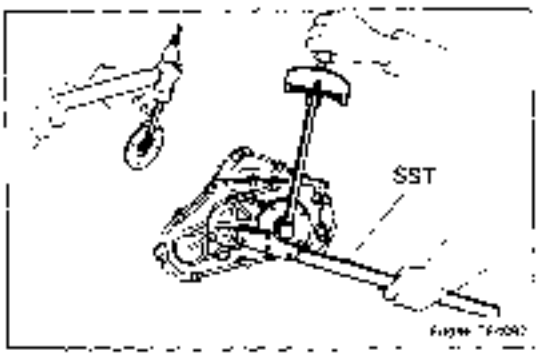


21.-1 (22R Engine Vehicle)
INSTALL TRANSFER CASE COVER

Torque: 90 kg-cm (78 in.-lb, 8.8 N-m)

21.-2 (22R-EC Engine Vehicle)
INSTALL SHIFT LEVER RETAINER

Torque: 130 kg-cm (9 ft-lb, 13 N-m)



22. **INSTALL REAR COMPANION FLANGE**

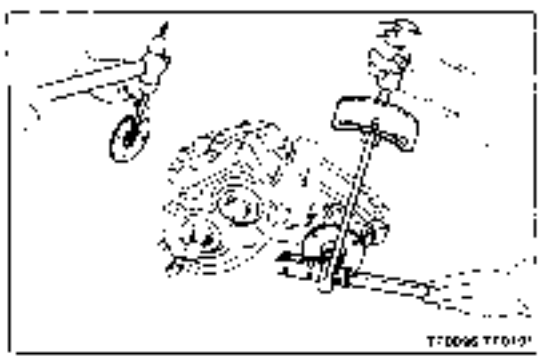
(a) Install the companion flange to the output shaft.

(b) Using SST to hold the flange, install the washer and nut. Torque the nut.

SST 09330-00020

Torque: 1,250 kg-cm (90 ft-lb, 123 N-m)

(c) Stake the nut.



23. **INSTALL FRONT COMPANION FLANGE**

(a) Install the companion flange to the front drive gear.

(b) Using SST to hold the flange, install the washer and nut. Torque the nut.

SST 09330-00020

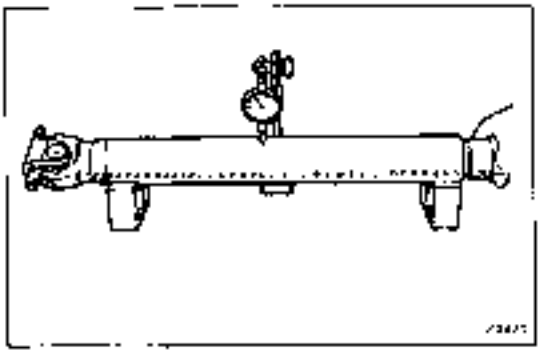
Torque: 1,250 kg-cm (90 ft-lb, 123 N-m)

(c) Stake the nut.

24. **INSTALL TRANSFER INDICATOR SWITCH WITH WASHER**

25. **INSTALL SPEEDOMETER DRIVEN GEAR**

Secure the gear with the lock plate and bolt.

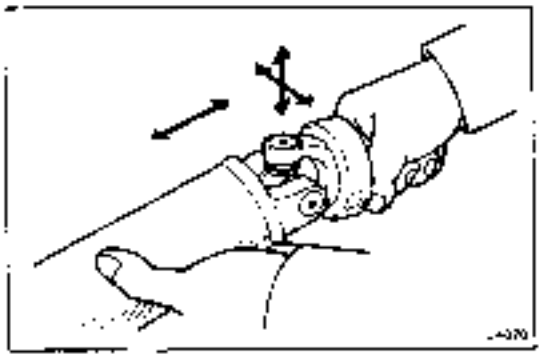


INSPECTION OF PROPELLER SHAFT COMPONENTS

1. **INSPECT PROPELLER AND INTERMEDIATE SHAFTS FO... DAMAGE OR RUNOUT**

If shaft runout is greater than maximum, replace the shaft.

Maximum runout: 0.8 mm (0.031 in.)



2. **INSPECT SPIDER BEARINGS**

(a) Inspect the spider bearings for wear or damage.

(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

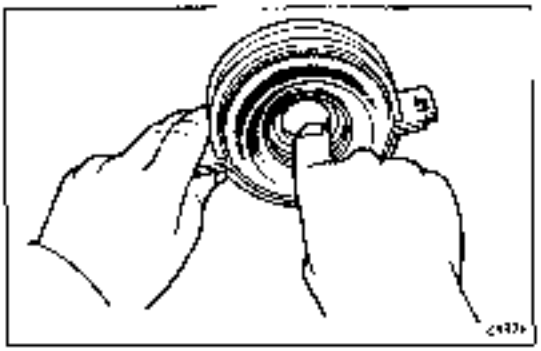
Bearing axial play:

2-Joint type Less than 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing.

3-Joint type Less than 0.05 mm (0.0020 in.)

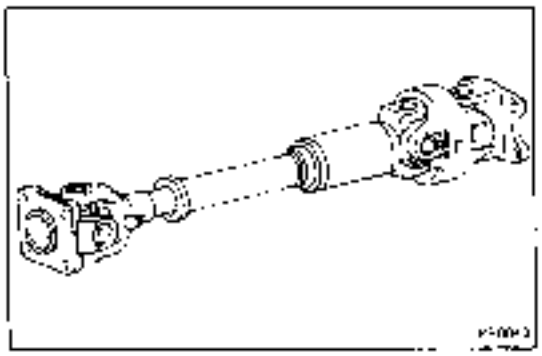
If necessary, replace the propeller shaft.



3. **INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE**

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn free replace it.

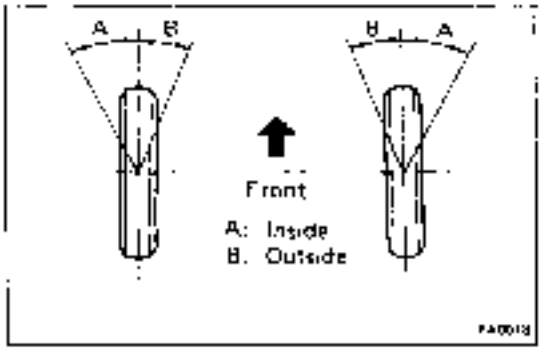


4. **INSPECT FRONT PROPELLER SHAFT**

(a) Inspect the shaft for wear or damage.

(b) Inspect the double cardan joint for wear or damage.

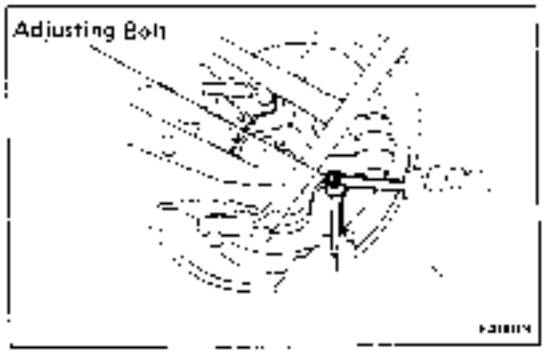
NOTE: If any problem is found, replace the front propeller shaft assembly.



3. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	34° +1° −2°
	Outside wheel	30°
at 20°	Inside wheel	22°15'
	Outside wheel	20°

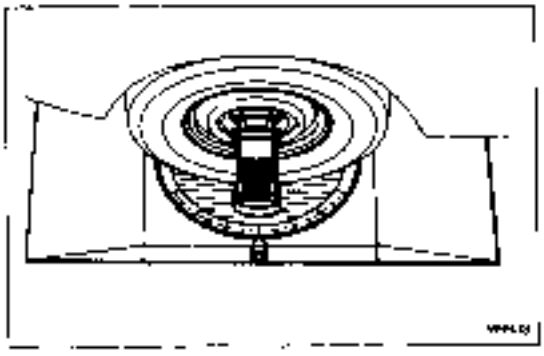


NOTE: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

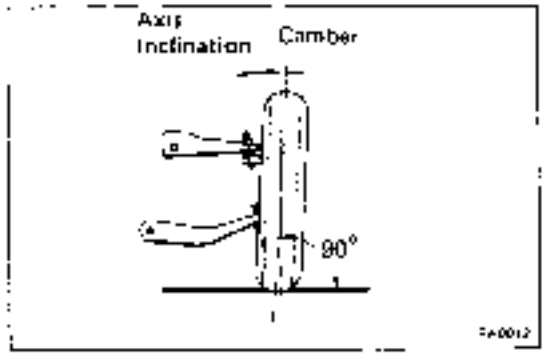
Torque: 350 kg-cm (25 ft-lb, 34 N·m)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



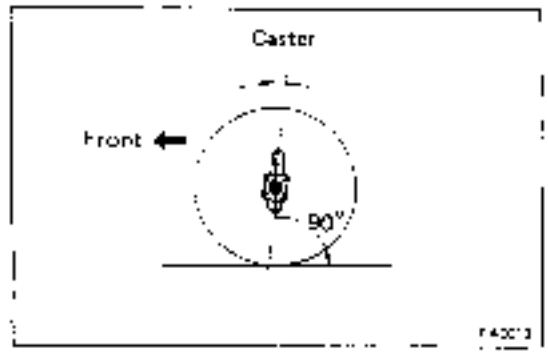
4. INSTALL WHEEL ALIGNMENT EQUIPMENT

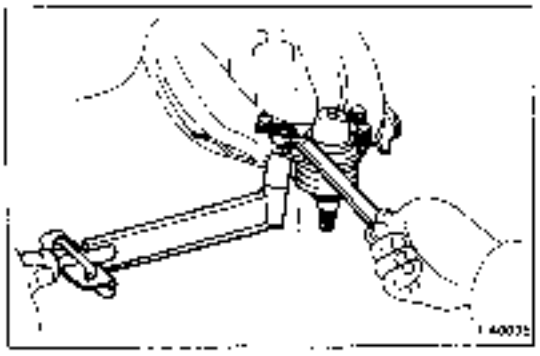
Follow the specific instructions of the equipment manufacturer.



5. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

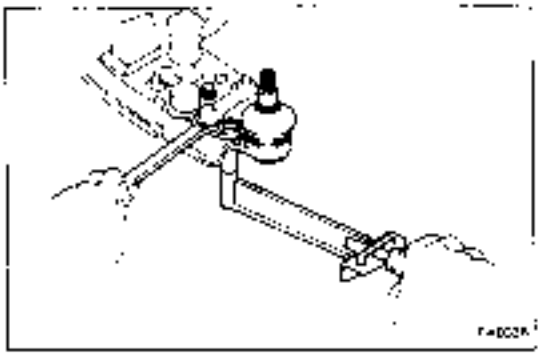
	Inspection STD	Adjustment STD
Camber	0°30' ± 45'	0°30' ± 30'
Left-right error	30'	30'
Steering axis inclination	10°	
Caster		
1/2 ton short	0°40' ± 45'	0°40' ± 30'
1/2 ton Long	1°10' ± 45'	1°10' ± 30'
1 ton	0°35' ± 45'	0°35' ± 30'
C & C	0°05' ± 45'	0°05' ± 30'
Left-right error	30'	30'



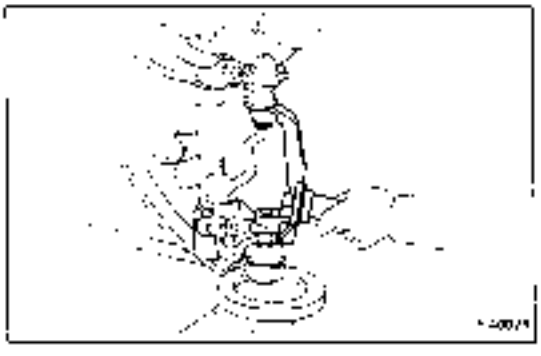


INSTALLATION OF BALL JOINTS

1. **INSTALL UPPER BALL JOINT TO UPPER ARM**
   Torque: 270 kg-cm (20 ft-lb, 26 N·m)



2. **INSTALL LOWER BALL JOINT TO LOWER ARM**
   Torque: 700 kg-cm (51 ft-lb, 69 N·m)



3. **INSTALL STEERING KNUCKLE**
   (See page FA-10)

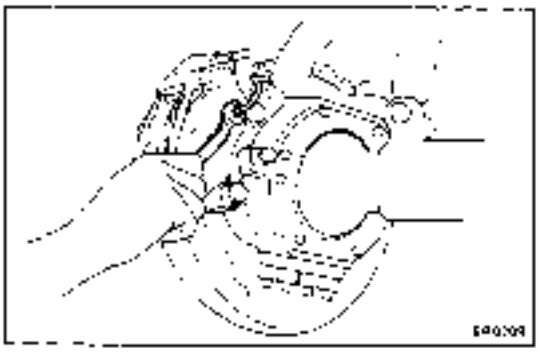
TROUBLESHOOTING (4WD)

Problem	Possible cause	Remedy	Page
Oil leak at front axle	Oil seals damaged or worn	Replace oil seal	FA-49
	Front axle housing cracked	Repair as necessary	
Oil leak at pinion shaft	Oil level too high or wrong grade	Drain and replace oil	A-34
	Oil seal worn or damaged	Replace oil seal	RA-6
	Companion flange loose or damaged	Tighten or replace flange	RA-9
Noises in front axle	Oil level low or wrong grade	Drain and replace oil	A-34
	Excessive backlash between pinion and ring or side gear	Check backlash	RA-8
	Ring, pinion or side gears worn or chipped	Inspect gears	RA-10
	Pinion shaft bearing worn	Replace bearing	RA-10
	Wheel bearing worn	Replace bearing	FA-45
	Differential bearing loose or worn	Tighten or replace bearings	RA-10
Wanders/pulls	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	FA-25
	Alignment incorrect	Check front end alignment	FA-25
	Wheel bearing adjusted too tight	Adjust wheel bearing	FA-46
	Front or rear suspension parts loose or broken	Tighten or replace suspension part	FA-60
	Steering linkage loosen or worn	Tighten or replace steering linkage	SR-75
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-3
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	FA-60
	Springs weak	Replace spring	FA-61
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	FA-25
	Stabilizer bar bent or broken	Inspect stabilizer bar	FA-65
	Shock absorber worn out	Replace shock absorber	FA-60
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	FA-25
	Wheels out of balance	Balance wheels	
	Steering damper worn out	Replace steering damper	SR-77
	Shock absorber worn out	Replace shock absorber	FA-60
	Alignment incorrect	Check front end alignment	FA-25
	Wheel bearings worn or improperly adjusted	Replace or adjust wheel bearings	FA-45
	Steering knuckle bearing worn	Replace bearing	FA-45
	Steering linkage loosen or worn	Tighten or replace steering linkage	SR-75
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-3
Abnormal tire wear	Tires improperly inflated	Inflate tire to proper pressure	FA-25
	Shock absorbers worn out	Replace shock absorber	FA-60
	Alignment incorrect	Check toe-in	FA-26

AUTOMATIC LOCKING HUB (4WD)

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Will not lock	Brake shoe worn or damaged	Replace brake assembly	FA-36
Will not unlock	Brake spring weak	Replace brake assembly	FA-36
	Bad rubbing between the inner hub and clutch	Replace hub assembly	FA-36
	Engage and disengage between the clutch and hub body did not go smoothly	Replace hub assembly	FA-36
Abnormal noise	Body and clutch looseness or damage	Replace hub assembly	FA-36
	Looseness of set bolt for axle shaft and inner hub	Tighten or replace hub assembly	FA-36
	Looseness of brake assembly set screw	Replace brake assembly	FA-36
	Needs grease	Apply grease or replace hub assembly	FA-36
Brake drag (A/T,H)	Outer cam worn or damaged	Replace hub assembly	FA-36
	Front brake dragged	Replace hub assembly	FA-36



Front Axle Hub

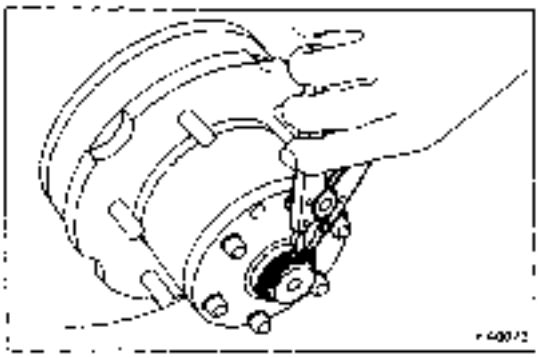
DISASSEMBLY OF FRONT AXLE HUB

1. REMOVE DISC BRAKE CYLINDER

(a) Using SST, disconnect the brake tube.

SST 09751-36011

(b) Remove the disc brake cylinder.



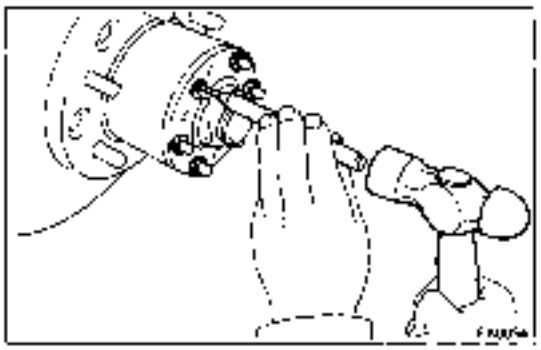
2. REMOVE FLANGE, FREE WHEELING HUB OR AUTOMATIC LOCKING HUB

NOTE: For the free wheeling hub. (See page FA-29)
For the automatic locking hub. (See page FA-36)

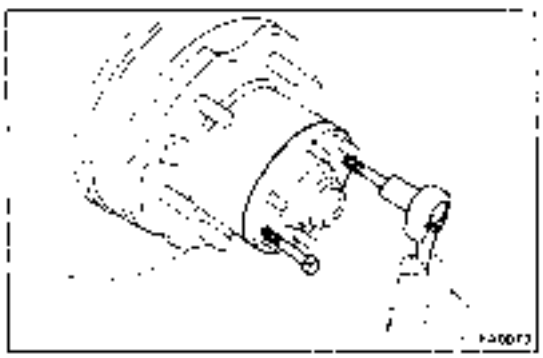
(a) Remove the cap from the flange.

(b) Using snap ring pliers, remove the snap ring.

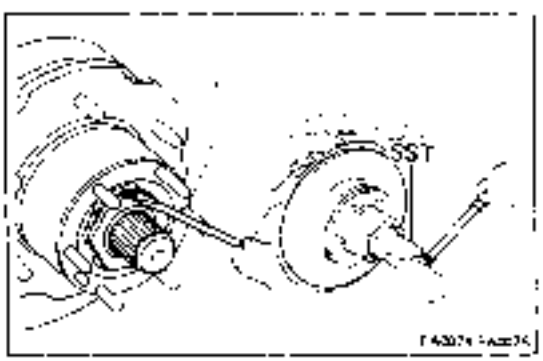
(c) Remove the mounting nuts.



(d) Using a tapered punch, tap the slits of the cone washers and remove them.



(e) Install and tighten the two bolts, and remove the flange.



3. REMOVE AXLE HUB WITH DISC

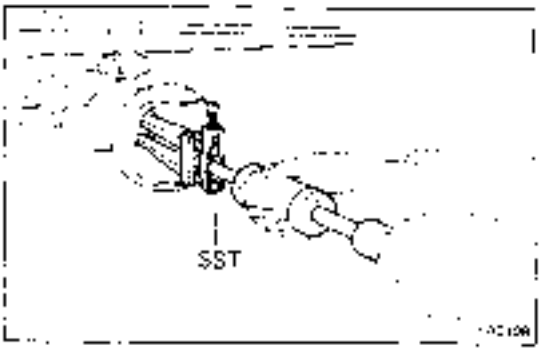
(a) Using a screwdriver, release the lock washer.

(b) Using SST, remove the lock nut.

SST 09607-60020

(c) Remove the lock washer and adjusting nut.

(d) Remove the axle hub with the disc.



ADJUSTMENT OF STEERING KNUCKLE ALIGNMENT AND BEARING PRELOAD

NOTE: Whenever the axle housing or the steering knuckle is replaced, the steering knuckle alignment and knuckle bearing preload are to be adjusted with the SST.

SST 09634-60013

1. ADJUST BEARING PRELOAD

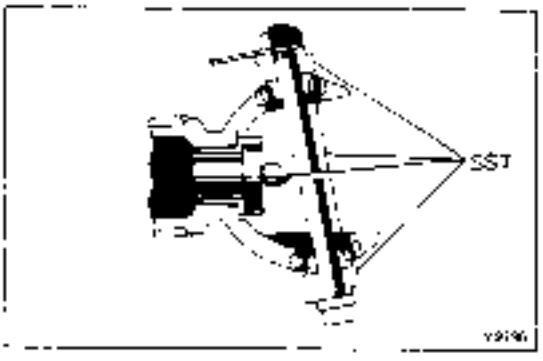
(a) Using SST, remove the oil seal.

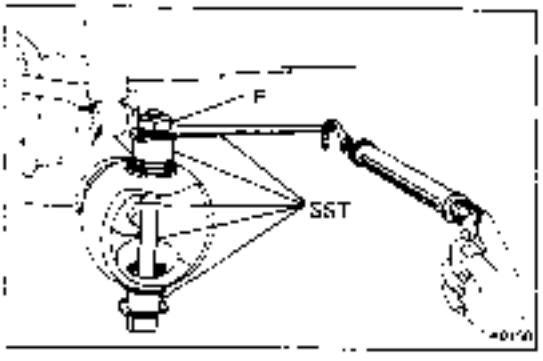
SST 09308-00010

(b) Coat the knuckle bearings lightly with MP grease.

(c) Mount the SST on the housing with the bearings.

SST 09634-60013

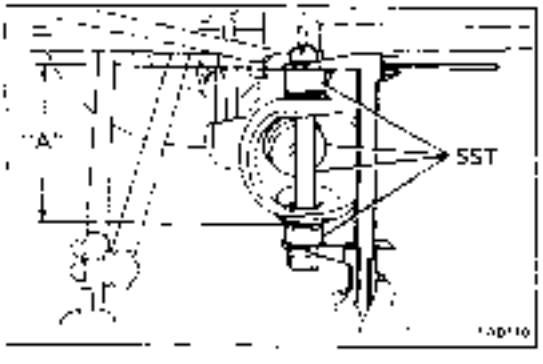




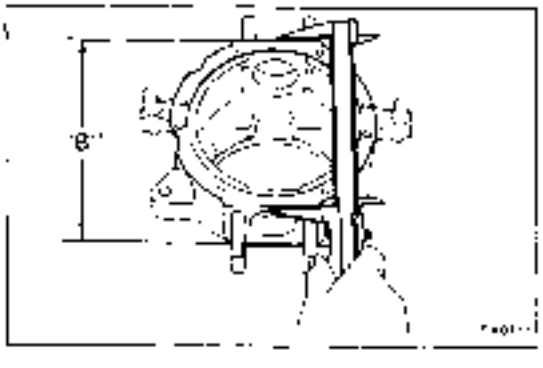
(d) Add preload to the bearings by tightening nut F.

Using a spring tension gauge, measure the preload.

Preload (rotating): 3.0 — 6.0 kg (6.6 — 13.2 lb, 29 - 59 N)



(e) Measure distance "A".

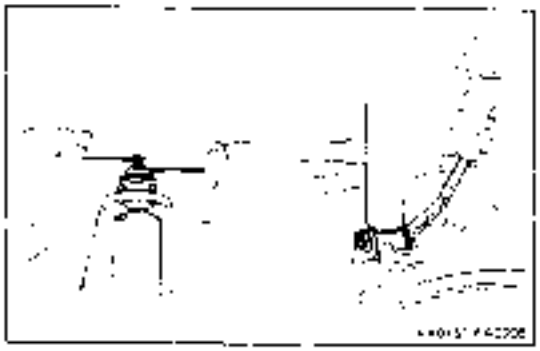


(f) Measure distance "B".

The difference between "A" and "B" is the total adjusting shim thickness that is required to maintain the correct bearing preload.

TOTAL SHIM THICKNESS "C"
"C" = "A" — "B"

B02220



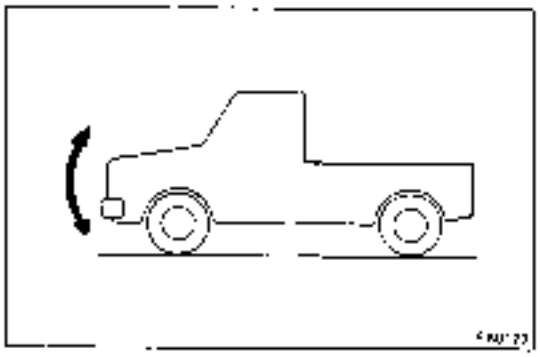
5. **INSTALL SHOCK ABSORBER**

(a) Position the shock absorber and install the bushings, retainers and nut.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

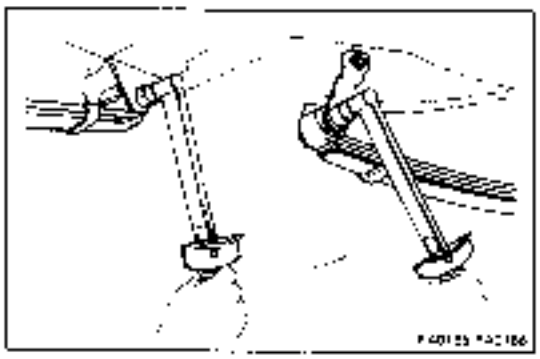
(b) Install the lower mounting bolt.

Torque: 970 kg-cm (70 ft-lb, 95 N·m)



6. **STABILIZE SUSPENSION**

Remove the stands and bounce the car to stabilize the suspension.



7. **TIGHTEN HANGER PIN AND SHACKLE PIN**

Tighten the hanger pin nut.

Torque: 930 kg-cm (67 ft-lb, 91 N·m)

Tighten the shackle pin nut.

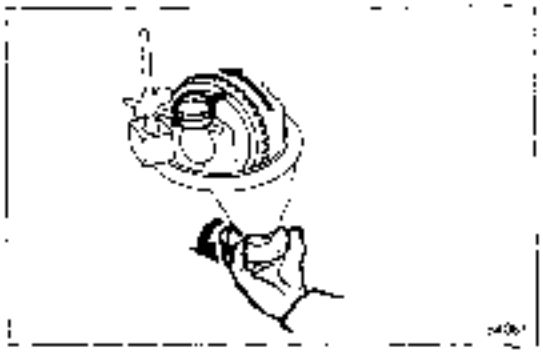
Torque: 930 kg-cm (67 ft-lb, 91 N·m)

DISASSEMBLY OF DIFFERENTIAL

(See page RA-6)

NOTE: If the differential is noisy, perform the following pre-inspection before disassembly to determine the cause of the noise.

If the differential has severe problems, disassemble and repair it as necessary.

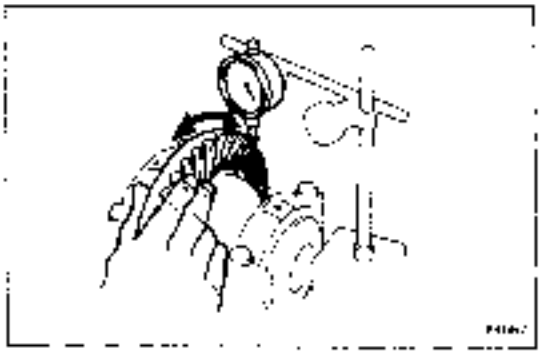


1. **CHECK RING GEAR RUNOUT**

If the runout is greater than maximum, install a new ring gear.

Maximum runout:

1/2 ton	0.07 mm (0.0028 in.)
1 ton, C&C and 4WD	0.10 mm (0.0039 in.)



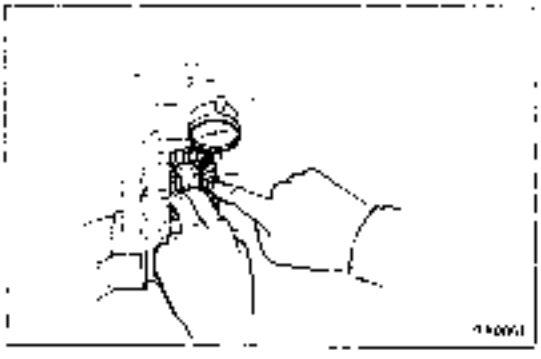
2. **CHECK RING GEAR BACKLASH**

If the backlash is not within specifications, adjust the side bearing preload or repair as necessary. (See step 5 on page RA-14)

Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

3. **INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 6 on page RA-16)**

Note the tooth contacting position.

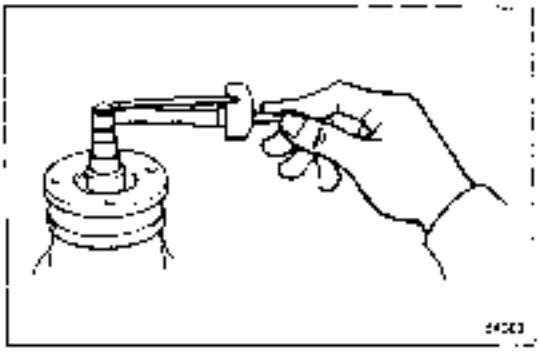


4. **CHECK SIDE GEAR BACKLASH**

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:
0.05 — 0.20 mm (0.0020 — 0.0079 in.)

If the backlash is not within specification, install the proper thrust washers.



5. **MEASURE DRIVE PINION PRELOAD**

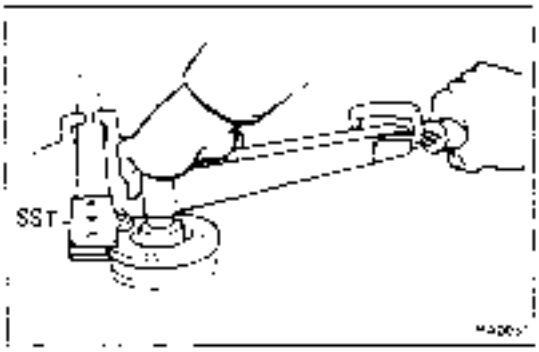
Using a torque meter, measure the preload of backlash between the drive pinion and ring gear.

Preload:
1/2 ton
6 — 10 kg-cm (5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)
1 ton, C&C and 4WD
9 — 13 kg-cm (7.8 — 11.3 in.-lb, 0.9 — 1.3 N·m)

6. **CHECK TOTAL PRELOAD**

Using a torque meter, measure the total preload.

Total preload: In addition to drive pinion preload
4 — 6 kg-cm
(3.5 — 5.2 in.-lb, 0.4 — 0.6 N·m)

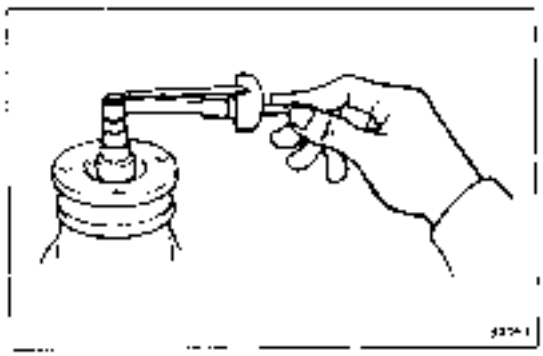


(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

SST 09330-00020

Torque:
1/2 ton
1,100 – 2,400 kg-cm (80 – 173 ft-lb, 108 – 235 N·m)
1 ton, C&C and 4WD
2,000 – 3,500 kg-cm (145 – 253 ft-lb, 197 – 343 N·m)



12. ADJUST DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

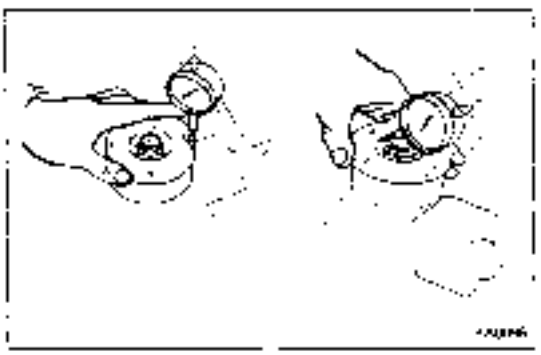
Preload:
New bearing
1/2 ton
12 – 19 kg-cm (10.4 – 16.5 in.-lb, 1.2 – 1.9 N·m)
1 ton, C&C and 4WD
19 – 26 kg-cm (16.5 – 22.6 in.-lb, 1.9 – 2.5 N·m)
Reused bearing
1/2 ton
6 – 10 kg-cm (5.2 – 8.7 in.-lb, 0.6 – 1.0 N·m)
1 ton, C&C and 4WD
9 – 13 kg-cm (7.8 – 11.3 in.-lb, 0.9 – 1.3 N·m)

(a) If preload is greater than specification, replace the bearing spacer.

(b) If preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) at a time until the specified preload is reached.

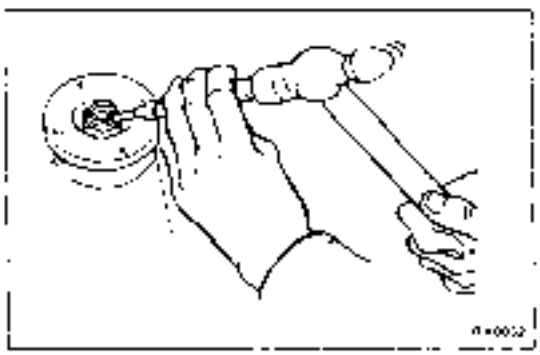
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque:
1/2 ton
2,400 kg-cm (174 ft-lb, 235 N·m)
1 ton, C&C and 4WD
3,500 kg-cm (253 ft-lb, 343 N·m)

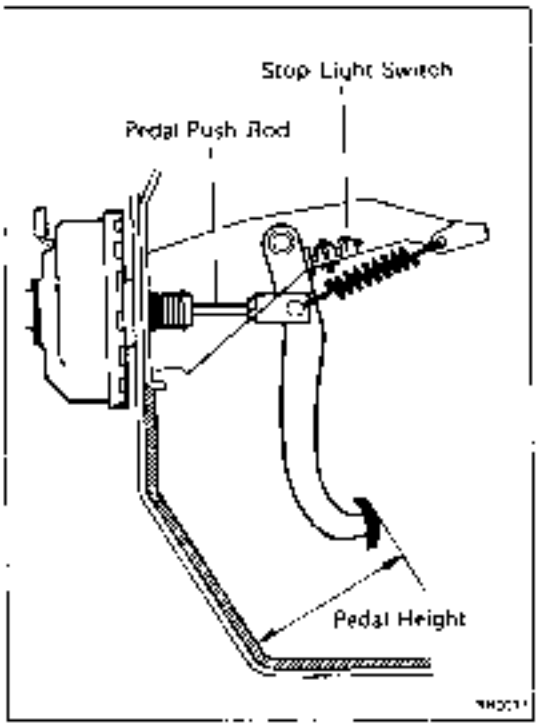


13. CHECK DEVIATION OF COMPANION FLANGE

Maximum longitudinal deviation:
0.10 mm (0.0039 in.)
Maximum latitudinal deviation:
0.10 mm (0.0039 in.)



14. STAKE DRIVE PINION NUT



CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height: 144 – 149 mm (5.67 – 5.87 in.)

If incorrect, adjust the pedal height.

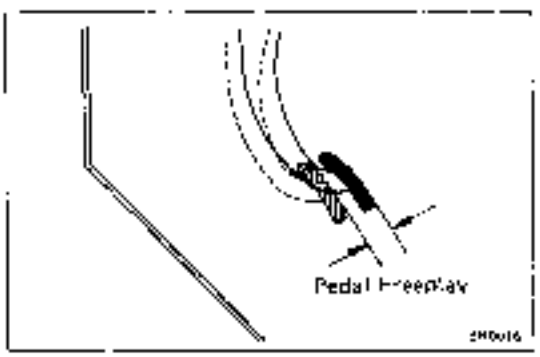
2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Sufficiently loosen the stop light switch.

(b) Adjust the pedal height by turning the pedal push rod.

(c) Return the stop light switch until its body tightly contacts the pedal stopper.

NOTE: After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK AND ADJUST PEDAL FREEPLAY

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

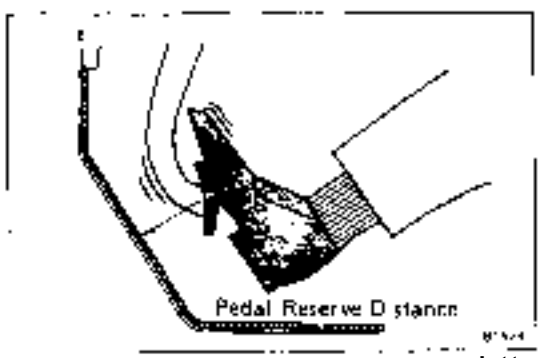
Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)

NOTE: The pedal freeplay is the amount of the stroke until the booster air valve is moved by the pedal push rod.

(c) If incorrect, adjust the pedal freeplay by turning the pedal push rod.

(d) Start the engine and confirm that the pedal freeplay exists.

NOTE: After adjusting the pedal freeplay, check the pedal height.



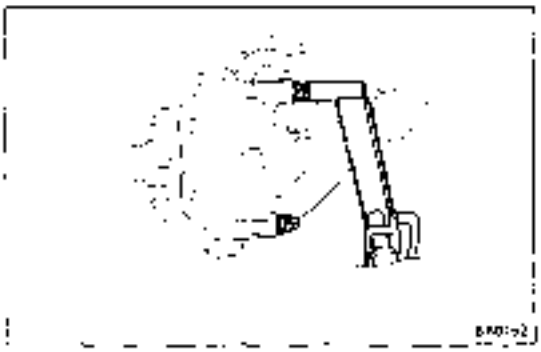
4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 50 kg (110.2 lb, 490 N):

2WD 1/2 ton	More than 66 mm (2.58 in.)
1 ton, C&C	More than 55 mm (2.17 in.)
4WD	More than 60 mm (2.36 in.)

If incorrect, troubleshoot the brake system.

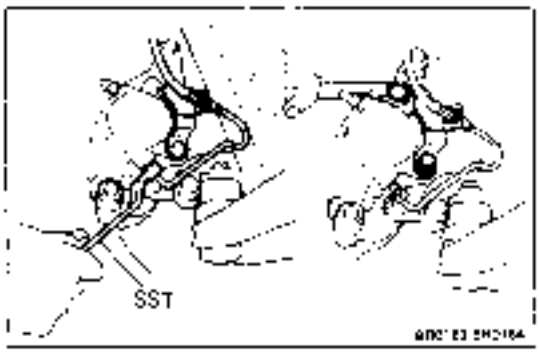


(d) Insert the brake cylinder carefully so the dust boot is not wedged.

(e) Install and torque the two mount bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N-m)

10. CHECK THAT FLUID LEVEL IS MAX AT LINE



REMOVAL OF CYLINDER

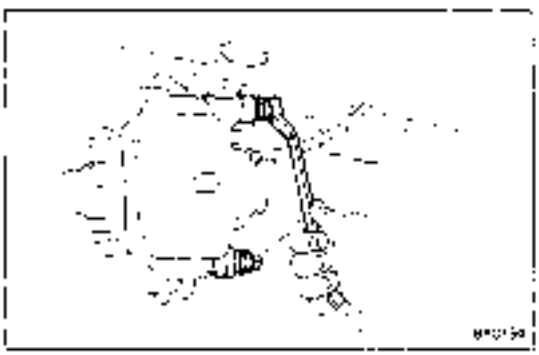
(See page BR-13)

1. DISCONNECT BRAKE LINE

(a) Using SST, disconnect the brake line.
Use a container to catch the brake fluid.

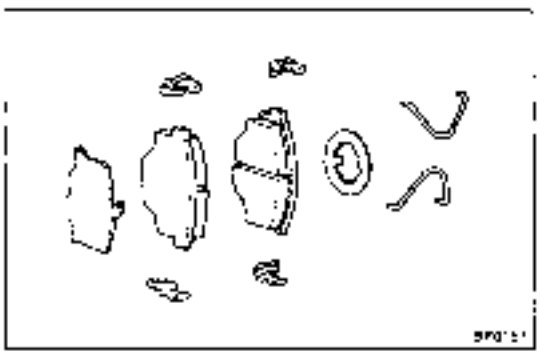
SST 09751-36011

(b) Remove the bracket from the cylinder.



2. REMOVE CYLINDER

Remove the two installation bolts and cylinder.

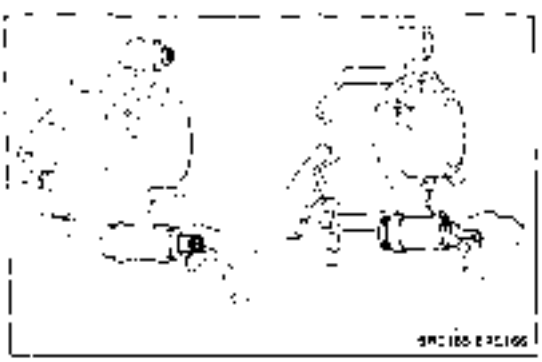


3. REMOVE ANTI-RATTLE SPRINGS

4. REMOVE BRAKE PADS

5. REMOVE ANTI-SQUEAL SHIMS

6. REMOVE SUPPORT PLATES



DISASSEMBLY OF CYLINDER

(See page BR-13)

1. REMOVE FOLLOWING PARTS:

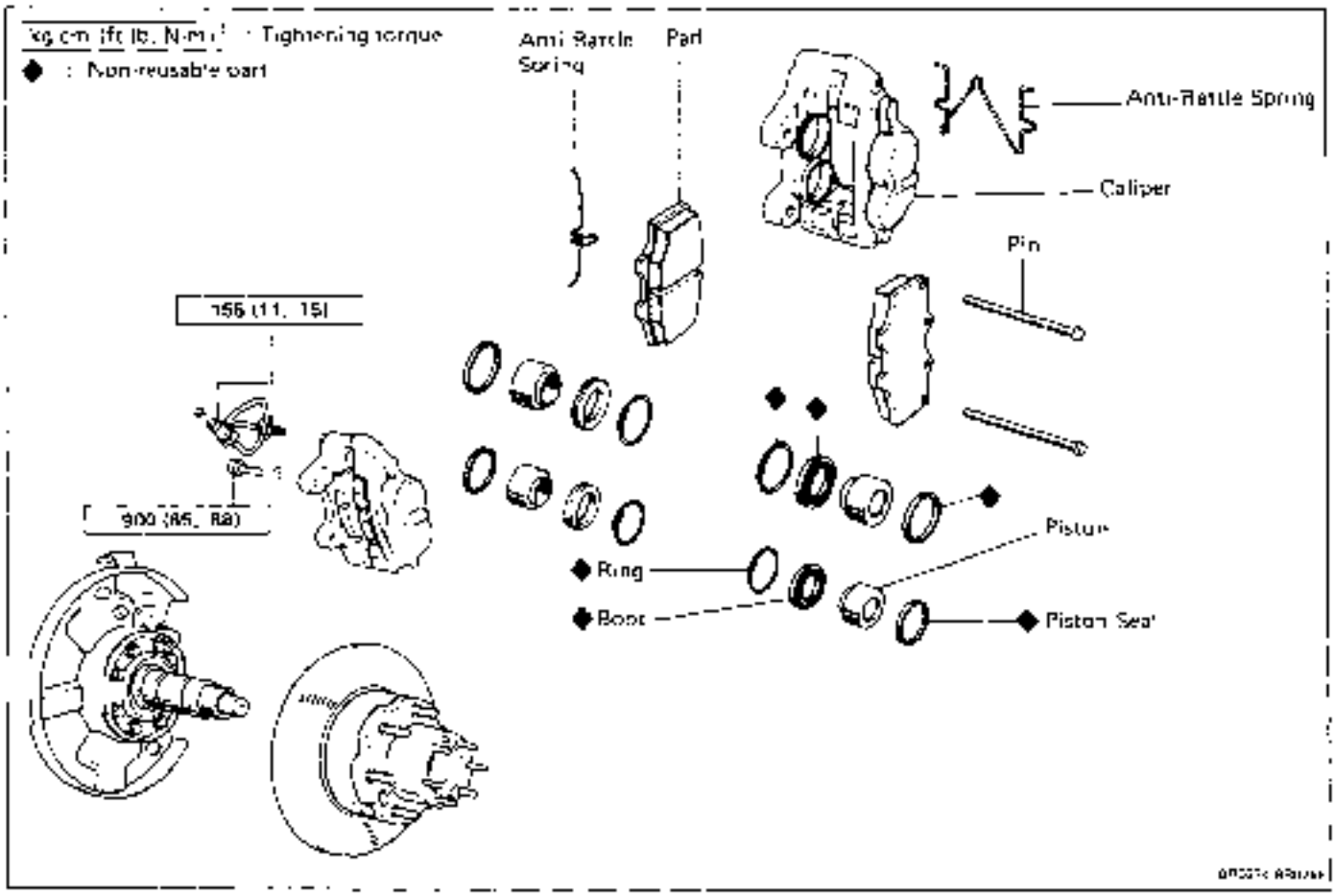
(a) Two cylinder slide bushings

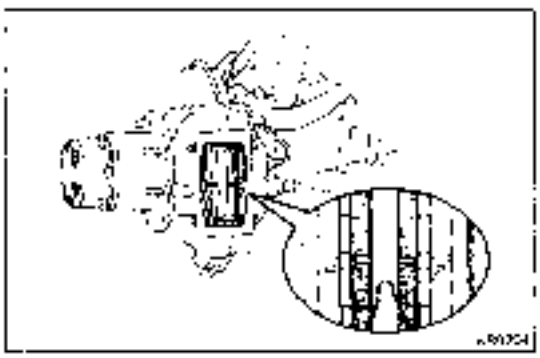
(b) Four dust boots

(c) Two collars

FRONT BRAKE – 4WD (S12 + 8 Type Disc)

COMPONENTS



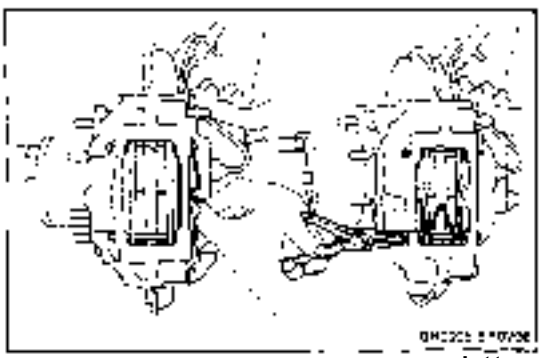


REPLACEMENT OF BRAKE PADS

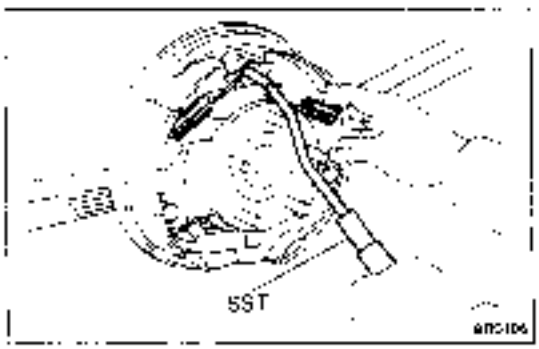
1. **INSPECT PAD LINING THICKNESS**

   Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

   Minimum thickness: 1.0 mm (0.039 in.)
   Standard thickness: 9.7 mm (0.382 in.)



2. **REMOVE FOLLOWING PARTS:**
   (a) Anti-rattle clip
   (b) Two anti-rattle pins
   (c) Anti-rattle spring
   (d) Two pads

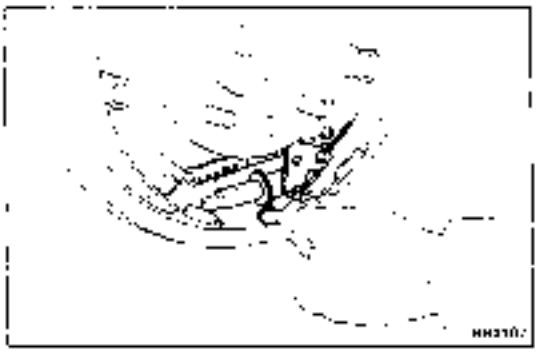


8. INSTALL SHOE GUIDE PLATE, CABLE GUIDE, ADJUSTING CABLE AND RETURN SPRINGS

(a) Install the shoe guide plate, cable guide and adjusting cable.

(b) Using SST, install the front return spring and then install the rear return spring.

SST 09718-20010

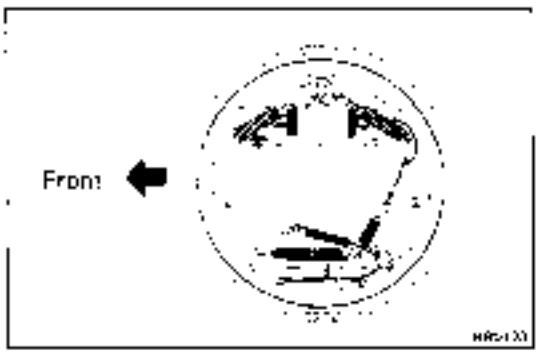


9. INSTALL ADJUSTING LEVER

(a) Install the tension spring to the rear shoe.

(b) Hook the adjusting lever with the cable and install the lever.

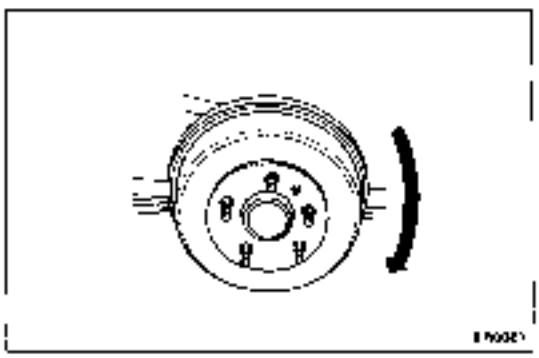
(c) Hold the adjusting lever with the tension spring.



10. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Pull the adjusting cable backward as shown, and release.
Check that the adjusting bolt turns

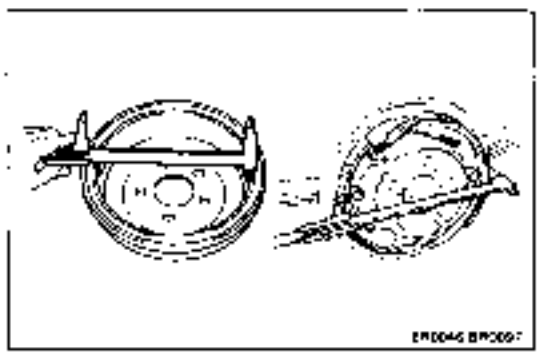
If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the strut to the shortest possible length

(c) Install the drum.

(d) Turn the brake drum in reverse direction and depress the brake pedal. Repeat this procedure several times.



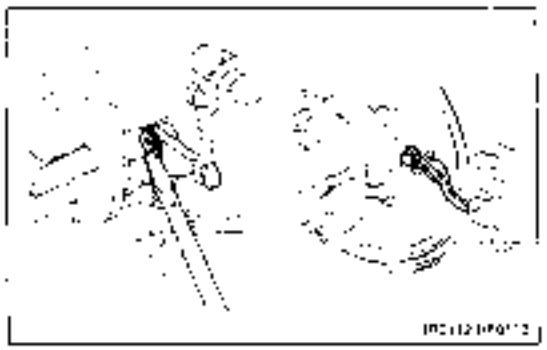
11. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

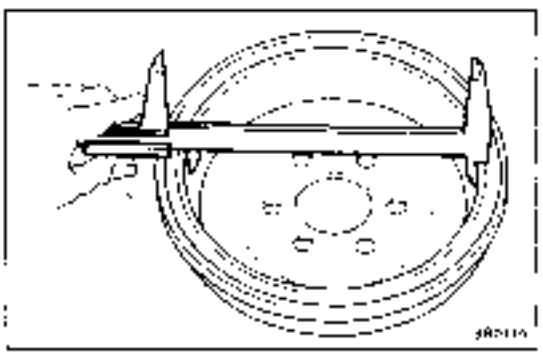
Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.



(c) Using a screwdriver, remove the small bellcrank from the backing plate with parking brake wire No.2.

(d) Remove the two mounting bolts and large bellcrank assembly.

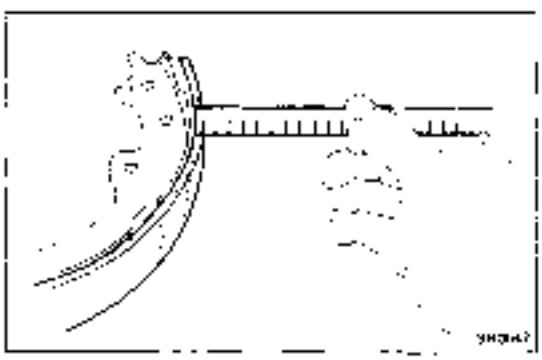


INSPECTION OF REAR BRAKE COMPONENTS

1. MEASURE BRAKE DRUM INSIDE DIAMETER

Maximum inside diameter: 256.0 mm (10.079 in.)
Standard inside diameter: 254.0 mm (10.000 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

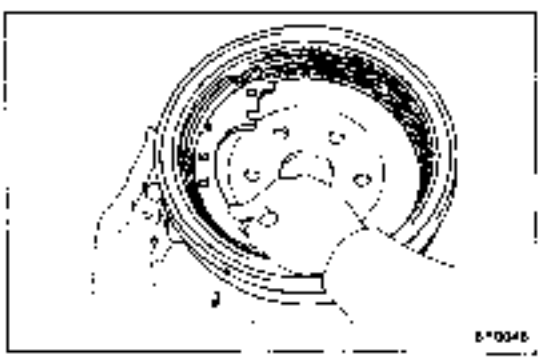


2. MEASURE BRAKE SHOE LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)
Standard thickness: 5.0 mm (0.197 in.)

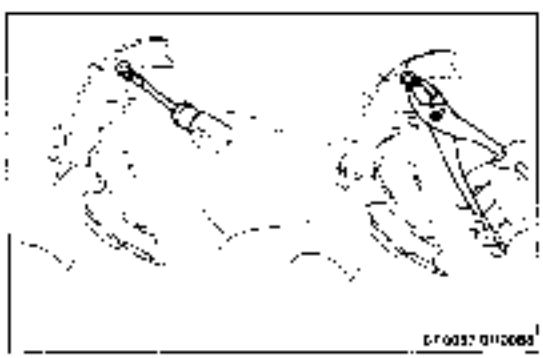
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

NOTE: If any brake shoe has to be replaced, replace all the rear brake shoes to maintain effective brakes.



3. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

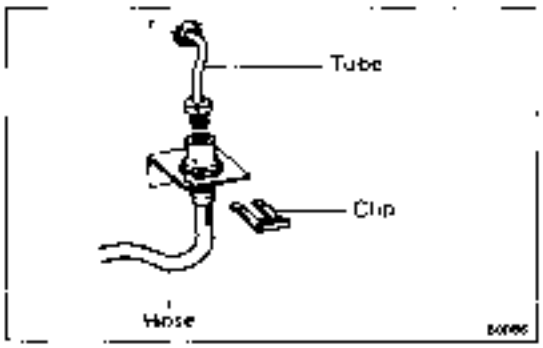
Replace the brake shoe or turn the brake drum, as necessary.



4. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever from the front shoe.

(b) Using pliers, install the parking brake lever with a new C-washer.



BRAKE HOSES AND TUBES

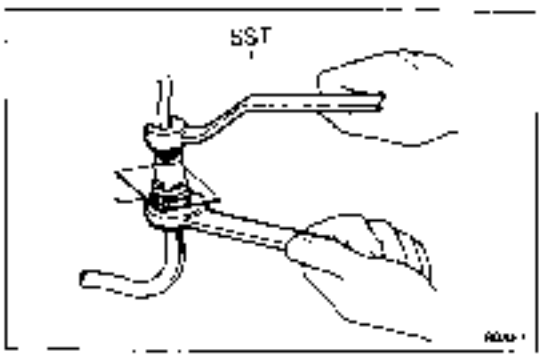
DISCONNECT AND CONNECT HOSE AND TUBE

1. DISCONNECT HOSE AND TUBE

(a) Disconnect the clip.

(b) Using a wrench to hold the hose and SST to hold the tube, disconnect the tube and hose.

SST 09751-36011



2. CONNECT HOSE AND TUBE

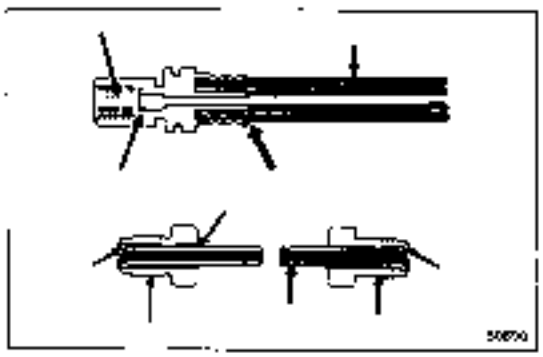
(a) Connect the hose and tube by hand.

(b) Using a wrench to hold the hose and SST to hold the tube, torque the connection.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

(c) Install a new hose clip.



INSPECTION OF BRAKE HOSES AND TUBES

1. INSPECT BRAKE HOSES

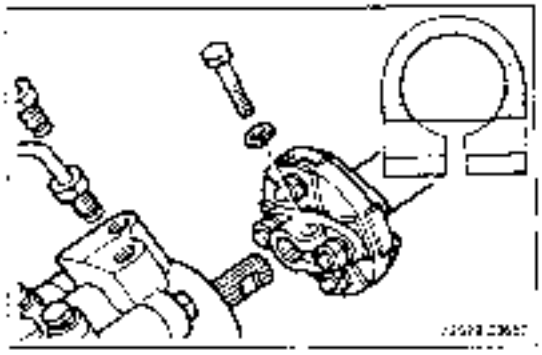
(a) Inspect the hose for damage, cracks or swelling.

(b) Inspect the threads for damage.

2. INSPECT BRAKE TUBES

(a) Inspect the tube for damage, cracks, dents or corrosion.

(b) Inspect the threads for damage.



INSTALLATION OF STEERING COLUMN ASSEMBLY

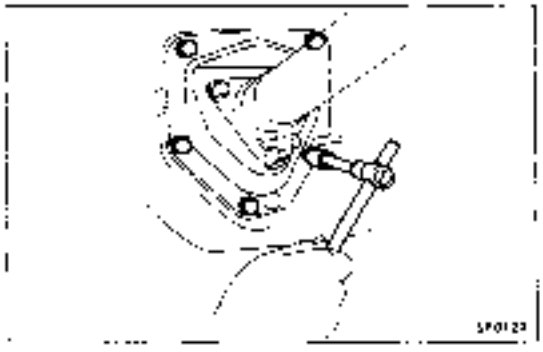
(See page SR-4)

1. **PLACE COLUMN AND MAIN SHAFT IN INSTALLED POSITION**

2 **INSTALL COUPLING ON WORM SHAFT**

Line up the marks on the coupling and worm shaft.

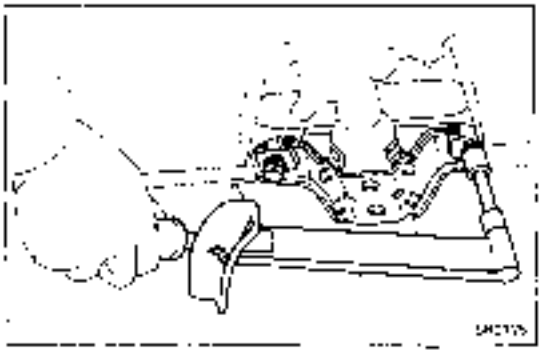
3. **INSTALL COLUMN BRACKET MOUNT BOLTS BY HAND**



4. **INSTALL STEERING COLUMN HOLE COVER**

Torque the five bolts.

Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)



5. **TORQUE TWO COLUMN BRACKET MOUNT BOLTS**

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

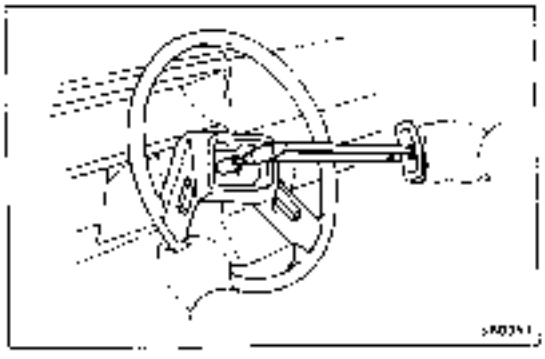
6. **INSTALL COUPLING MOUNT BOLT**

Install and torque the coupling mount bolt.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

7. **INSTALL COMBINATION SWITCH AND COLUMN COVER**

8. **INSTALL AIR DUCT AND INSTRUMENT LOWER FINISH PANEL**



9. **INSTALL STEERING WHEEL**

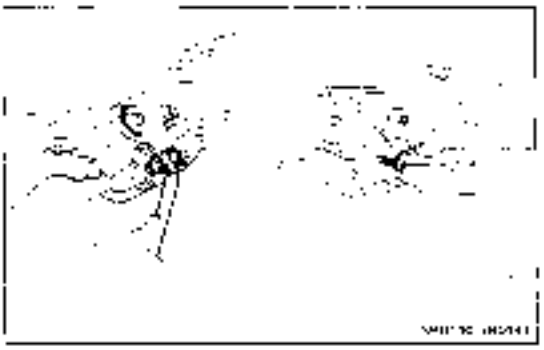
(a) Position the front wheels straight ahead and install the steering wheel in neutral position.

(b) Torque the nut.

Torque: 350 kg-cm (25 ft-lb, 34 N·m)

(c) Install the steering wheel pad.

10. **CONNECT NEGATIVE CABLE TO BATTERY**



9. REMOVE TILT LEVER RETAINER

(a) Remove the bolt, two nuts and two washers.

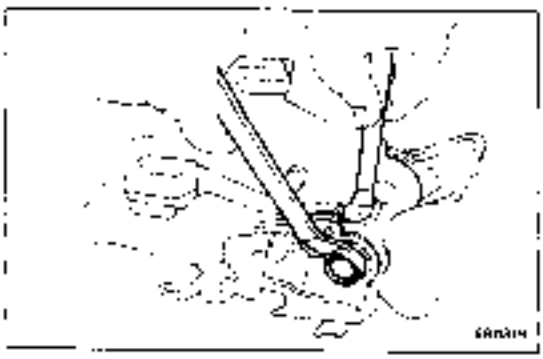
(b) Remove the lever retainer and collar.

10. REMOVE RELEASE PIN

11. REMOVE SERRATION BOLT

Temporarily install another nut flat with the end of the bolt and tap it in with a hammer.

12. REMOVE TILT PAWL



13. REMOVE COLUMN COVER SUPPORT

Remove the following parts:

(a) Nuts

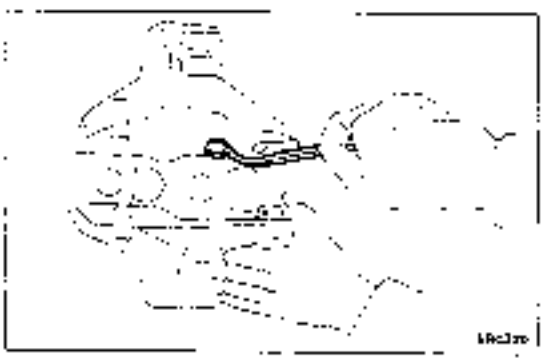
(b) Bolts

(c) Collars

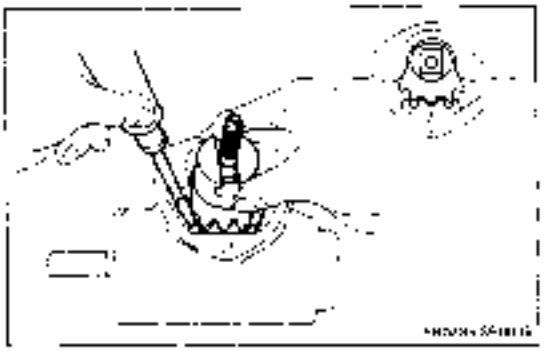
(d) Washers

(e) Shim

14. REMOVE TILT STEERING SUPPORT WITH TILT LEVER SUBASSEMBLY



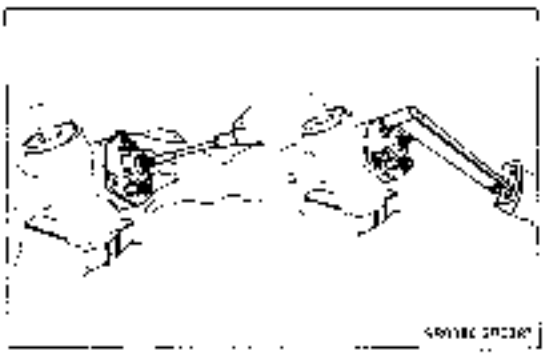
15. REMOVE PAWL SET BOLT



5. INSTALL SECTOR SHAFT

(a) Install the adjusting screw and thrust washer onto the sector shaft.

(b) Set the ball nut at the center of the worm shaft. Insert the sector shaft into the gear housing so that the center teeth mesh together.



6. INSTALL END COVER

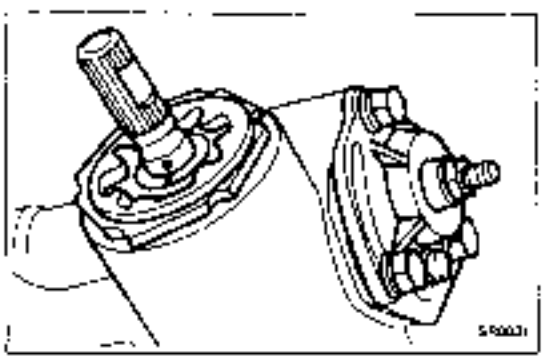
(a) Apply liquid sealer to the gasket and end cover.

(b) Install the end cover over the gasket.

(c) Loosen the adjusting screw as far as possible.

(d) Torque the four cover bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

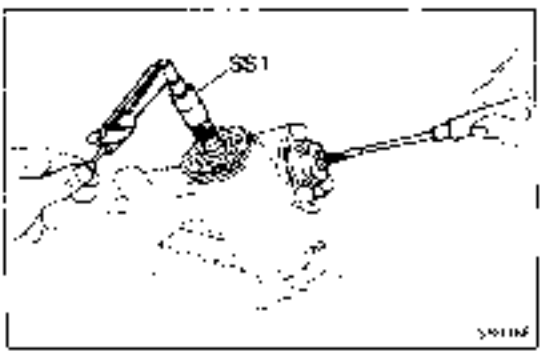


7. PLACE WORM SHAFT IN NEUTRAL POSITION

(a) Count the total shaft rotations and turn the shaft back half of that number.

(b) The worm shaft is now in neutral position.

(c) Place matchmarks on the worm shaft and housing to show neutral position.



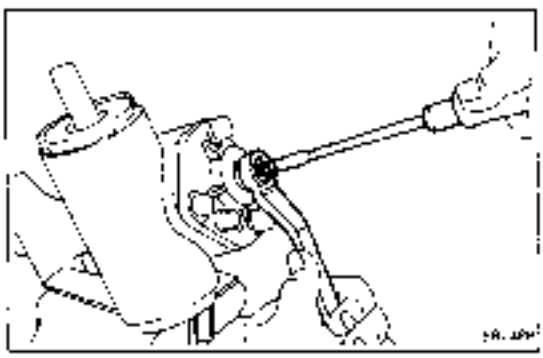
8. ADJUST TOTAL PRELOAD

Using a torque wrench and SST, turn the adjusting screw while measuring the preload until it is correct.

NOTE: Be sure that the worm shaft is in neutral position.

Preload (starting): 8.0 – 10.5 kg-cm (6.9 – 9.1 in.-lb, 0.8 – 1.0 N·m)

SST 09616-00010



9. TIGHTEN ADJUSTING SCREW LOCK NUT

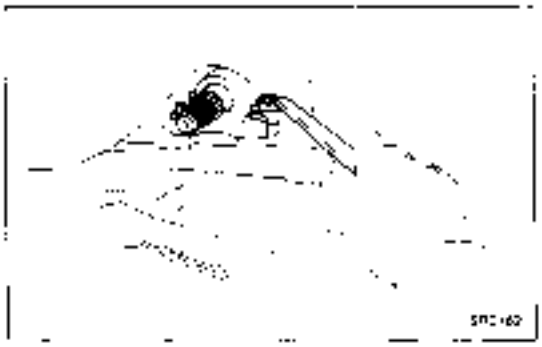
(a) Apply liquid sealer to the lock nut.

(b) Hold the screw with a screwdriver while tightening the lock nut.

(c) Torque the lock nut.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

NOTE: Check that the preload is still correct.



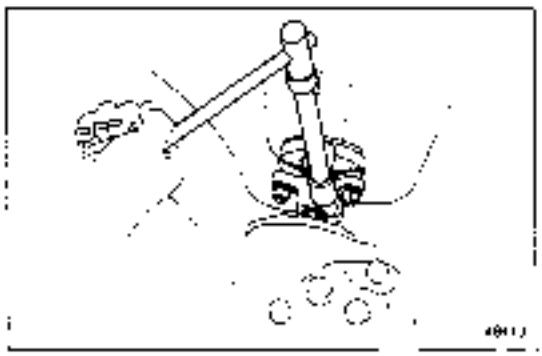
INSTALLATION OF GEAR HOUSING

(See page SR-33)

1. **INSTALL GEAR HOUSING**

Install the gear housing and torque the four mount bolts.

Torque: 575 kg-cm (42 ft-lb, 56 N·m)



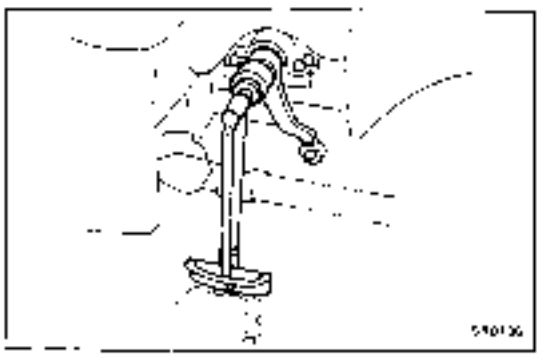
2. **CONNECT INTERMEDIATE SHAFT TO WORM SHAFT**

(a) Align matchmarks on the intermediate shaft and the worm shaft.

(b) Torque the coupling mount bolt.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(c) Install the stone shield to the gear housing.

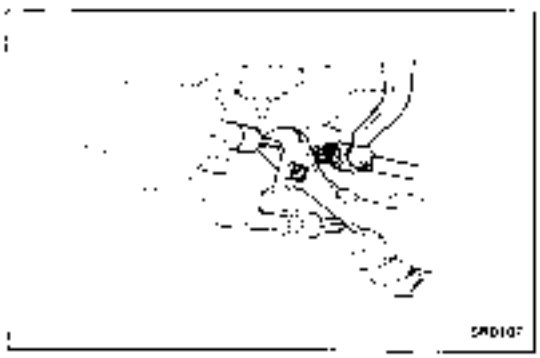


3. **INSTALL PITMAN ARM**

(a) Align marks on the sector shaft and the pitman arm.

(b) Torque the mount nut

Torque: 1,750 kg-cm (127 ft-lb, 172 N·m)

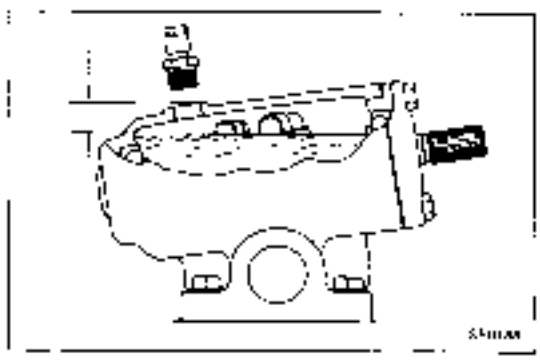


4. **CONNECT DRAG LINK**

(a) Insert the pitman arm in the drag link.

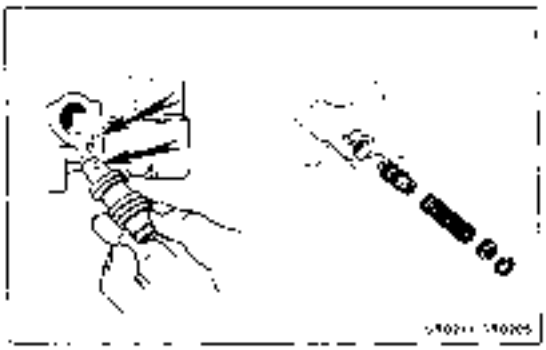
(b) Tighten the plug completely and then loosen 1-1/3 turns.

(c) Secure the plug by inserting a cotter pin.



5. **FILL GEAR HOUSING WITH GEAR OIL**

Oil type:	**API GL-4, SAE90**
Oil level:	**12 – 17 mm (0.47 – 0.67 in.) from top**
Capacity:	**580 cc (35.4 cu in.)**



ASSEMBLY OF PS PUMP

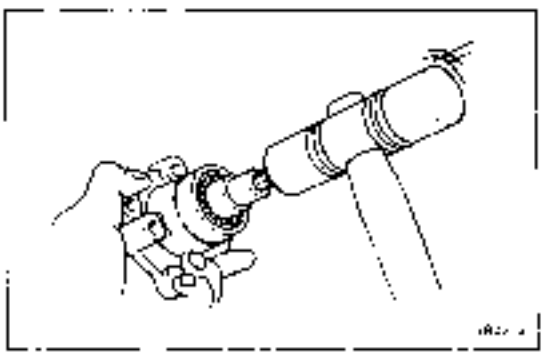
(See page SR-46)

1. **INSTALL FLOW CONTROL VALVE**

NOTE: Be sure the letter inscribed on the flow control valve matches the letter stamped on the rear of the pump body.

Inscribed mark: A, B, C, D, E or F

Install the flow control valve, spring, plug and snap ring.



2. **INSTALL PRESSURE PORT UNION**

Install and torque the union.

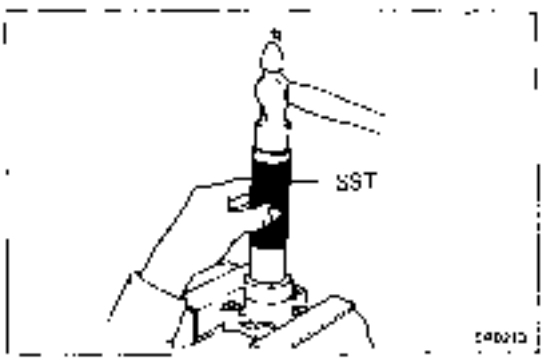
Torque: 700 kg-cm (51 ft-lb, 69 N·m)

3. **INSTALL ROTOR SHAFT TO FRONT HOUSING**

Install the rotor shaft into the front housing by tapping it in with a plastic hammer.

4. **INSTALL SNAP RING**

Using snap ring pliers, install the snap ring to the front housing.

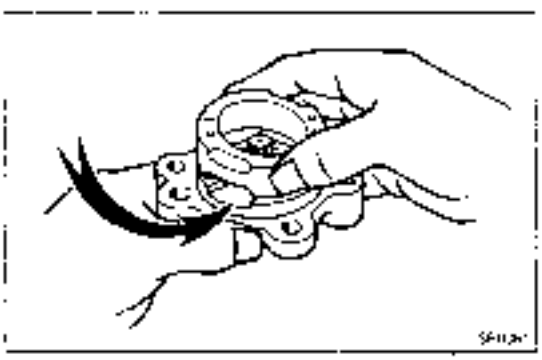


5. **INSTALL OIL SEAL**

(a) Apply a light coat of MP grease to the oil seal lip.

(b) Using SST and hammer, install the oil seal.

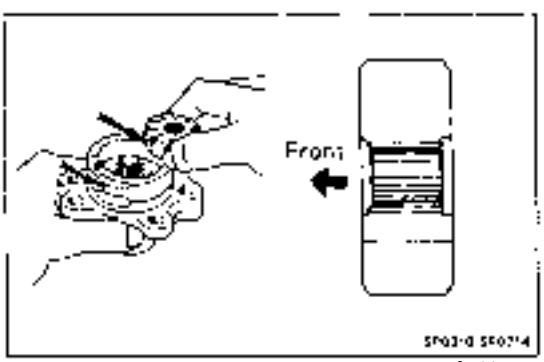
SST 09608-30011



6. **INSTALL O-RING**

7. **INSTALL CAM RING**

Align the fluid passages of the cam ring and front housing, and install the cam ring.

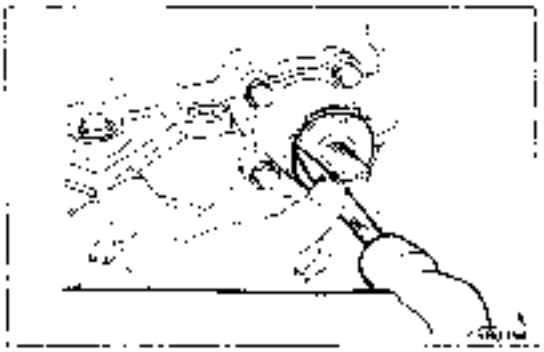


8. **INSTALL ROTOR**

Install the rotor with the chamfered end facing toward the front.

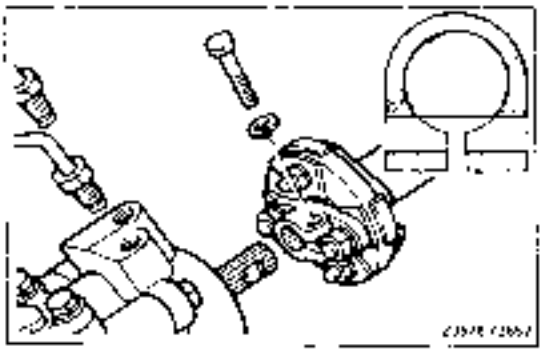
NOTE: Be sure the letters inscribed on the cam ring and rotor match.

Inscribed mark: 1, 2, 3, 4 or None



10. **STAKE LOCK NUT**

Using a punch and hammer, stake the lock nut at three places.



INSTALLATION OF GEAR HOUSING

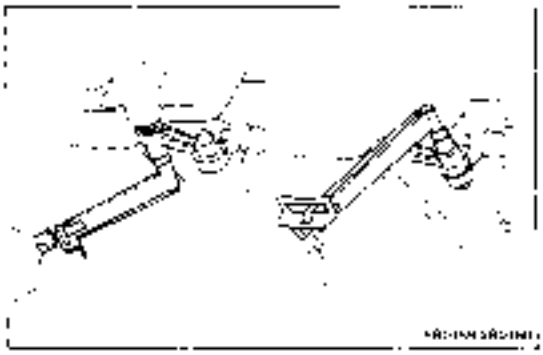
(See page SR-54)

1. **INSTALL GEAR HOUSING**

(a) Line up the marks on the coupling and worm shaft.

(b) Torque the three mounting bolts.

Torque: 660 kg-cm (48 ft-lb, 65 N·m)



2. **CONNECT PITMAN ARM TO GEAR HOUSING**

(a) Align the marks on the pitman arm and cross shaft.

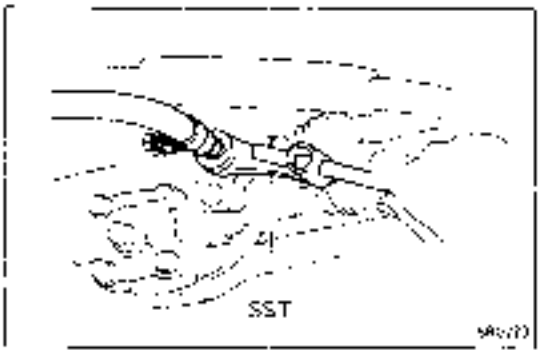
(b) Torque the pitman arm nut.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

3. **CONNECT PITMAN ARM TO RELAY ROD**

Connect the pitman arm to the relay rod and torque the mount nut.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)



4. **TORQUE COUPLING SET BOLT**

Torque the coupling mount bolt.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

5. **CONNECT PRESSURE LINE AND RETURN LINE**

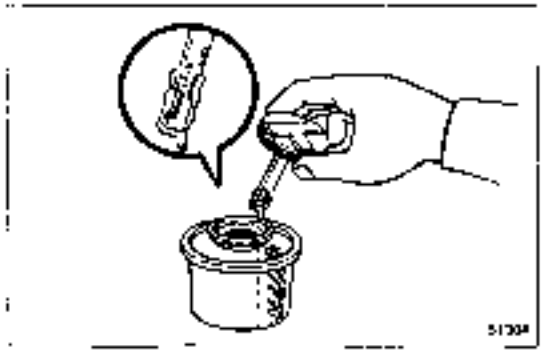
(a) Using SST, install and torque the union nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

SST 09631-22020

NOTE: Be sure the hose is not touching the fender.

(b) Install the pressure line clamp bolts.



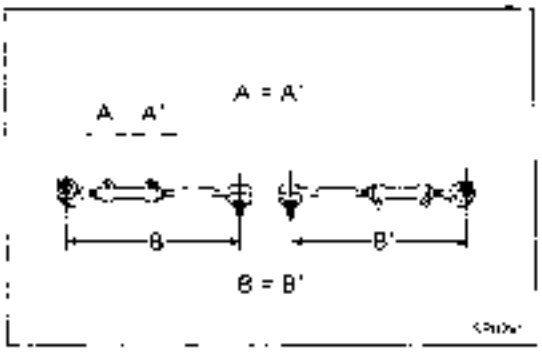
6. **FILL RESERVOIR TANK WITH FLUID**

Fluid: **ATF DEXRON or DEXRON II**

7. **BLEED SYSTEM AND PERFORM PRESSURE CHECK**

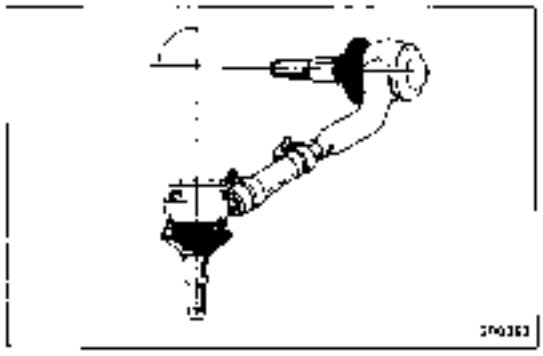
(See page SR-43)

2. **INSPECT TIE ROD FOR WEAR, DAMAGE OR CRACKS**
Check for cracks with flaw detecting penetrant.



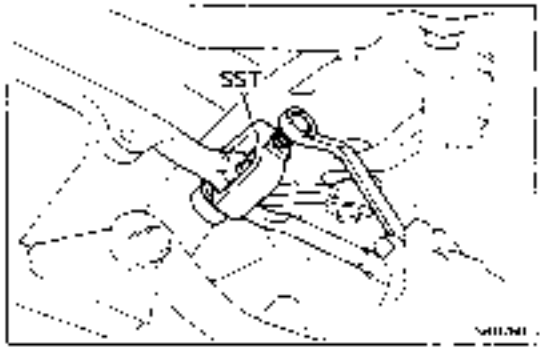
INSTALLATION OF TIE ROD

1. **ASSEMBLE TIE ROD**
Screw the tie rod ends into the tie rod.
The tie rod length should be approximately 314.5 mm (12.382 in.), and the remaining length of threads on both tie rod ends should be equal.



2. **ADJUST TIE ROD END ANGLE**
(a) Turn the tie rods so they cross at about 90 degrees.
(b) Tighten the tie rod clamps to lock the tie rod ends position.
Torque: 260 kg-cm (19 ft-lb, 25 N·m)

3. **CONNECT TIE ROD TO RELAY ROD AND KNUCKLE ARM**
Torque the mounting nuts.
Torque: 920 kg-cm (67 ft-lb, 90 N·m)

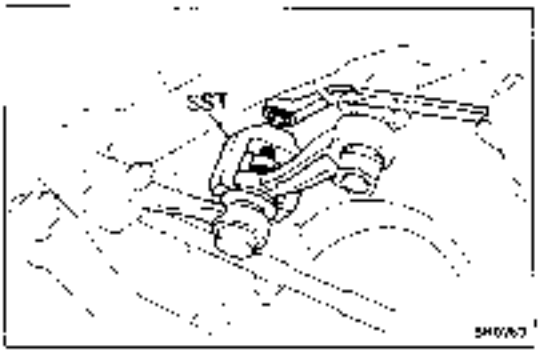


Relay Rod

REMOVAL AND INSPECTION OF RELAY ROD

(See page SR-68)

1. **DISCONNECT TIE ROD ENDS FROM RELAY ROD**
Using SST, disconnect the tie rod ends from the relay rod.
SST 09611-22012



2. **DISCONNECT RELAY ROD FROM PITMAN ARM AND IDLER ARM**
Using SST, disconnect and remove the relay rod.
SST 09611-22012

3. **INSPECT RELAY ROD FOR DAMAGE OR CRACKS**
Check for cracks with flaw detecting penetrant.

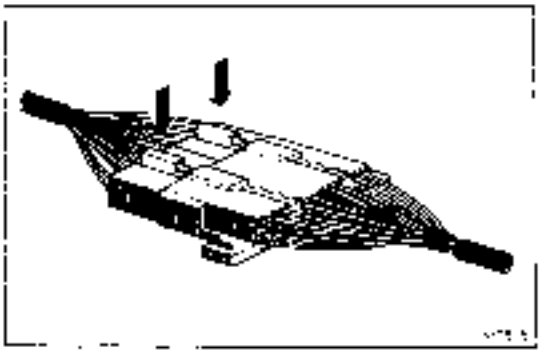
PRECAUTIONS

WIRING COLOR CODE

Wire colors are indicated by an alphabetical code. The 1st letter indicates the basic wire color and the 2nd indicates the stripe color.

B = Black	BR = Brown
G = Green	GR = Grey
L = Light Blue	LG = Light Green
O = Orange	P = Pink
R = Red	V = Violet
W = White	Y = Yellow

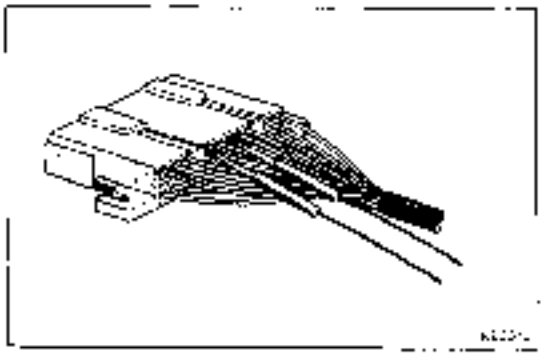
Example: R-G indicates a red wire with a green stripe.



HANDLING AND INSPECTION OF BULKHEAD TYPE CONNECTOR

DISCONNECT BULKHEAD TYPE CONNECTOR

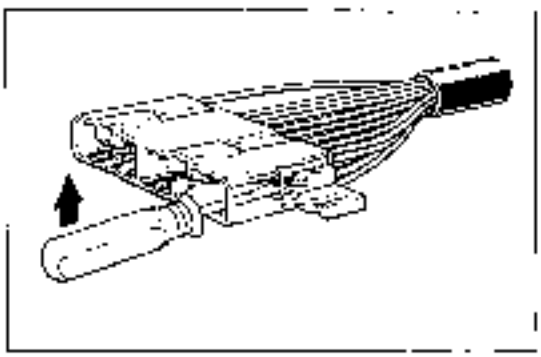
To remove the connector, push the lock levers, shown in the figure, and pull out.



INSPECT BULKHEAD TYPE CONNECTOR

When checking the continuity or voltage with a circuit tester, insertion of the test probe into the receptacle connector may open the fitting to the connector and result in poor contact.

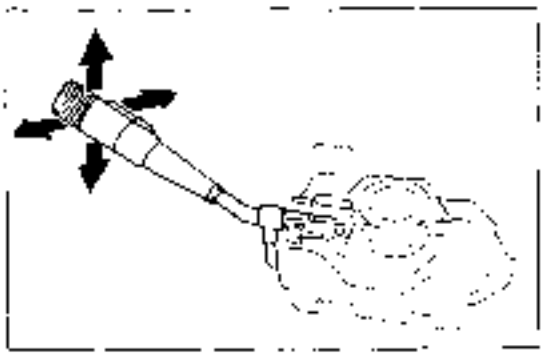
Therefore, ensure that the test probe is inserted only from the wire harness side as shown in the figure.



REPLACEMENT OF TERMINAL

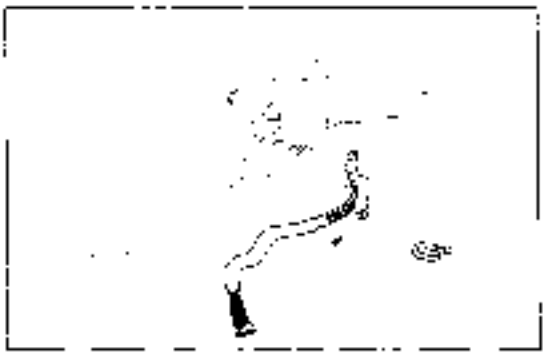
REMOVE TERMINALS FROM BULKHEAD CONNECTOR

(a) From the open end, insert a miniature screwdriver between the locking lug and terminal.



(g) Insure that the switch operates smoothly.

(h) Install the terminals to the connector.
(See page BE-3)



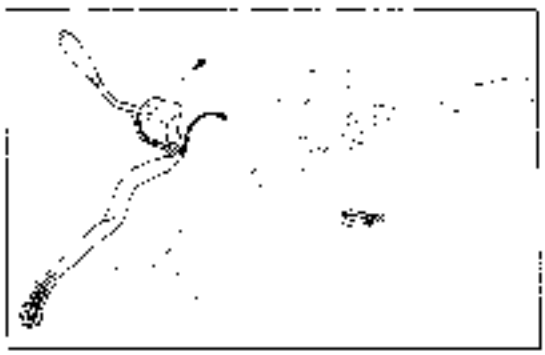
2. **REPLACE TURN SIGNAL AND HAZARD WARNING SWITCH**

(a) Remove the terminals from the connector.
(See page BE-2)

(b) Remove the turn signal and hazard warning switch.

(c) Install the turn signal and hazard warning switch.

(d) Install the terminals to the connector.
(See page BE-3)



3. **REPLACE WIPER AND WASHER SWITCH**

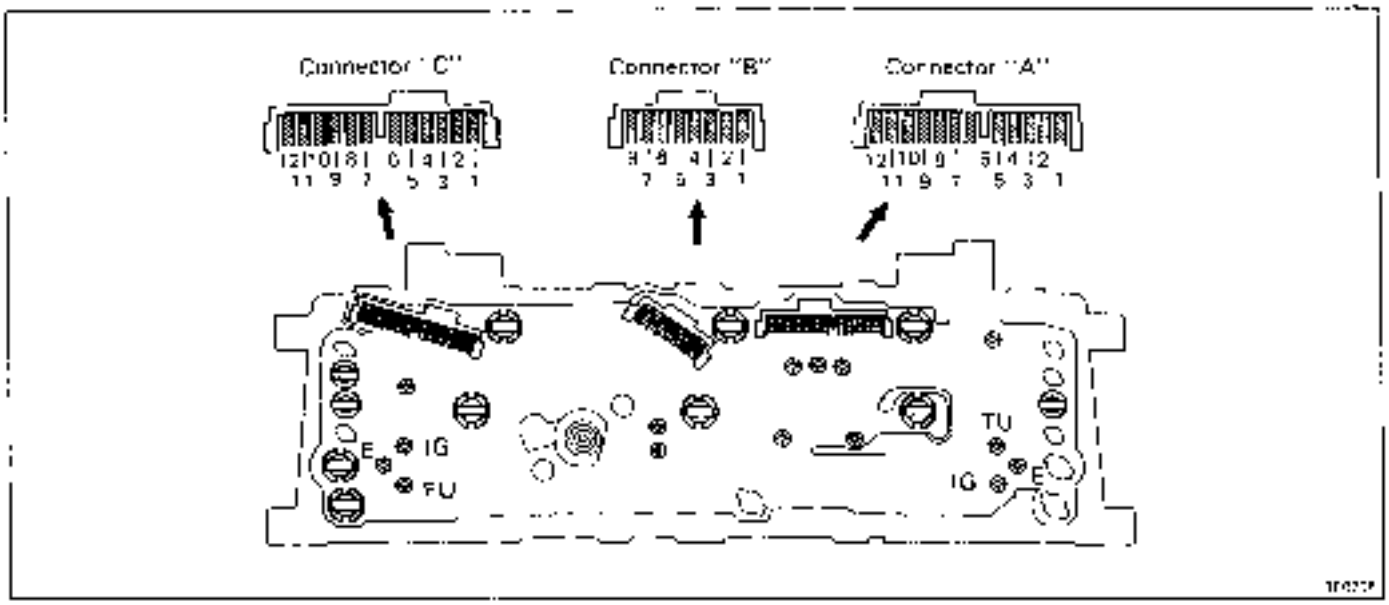
(a) Remove the terminals from the connector.
(See page BE-2)

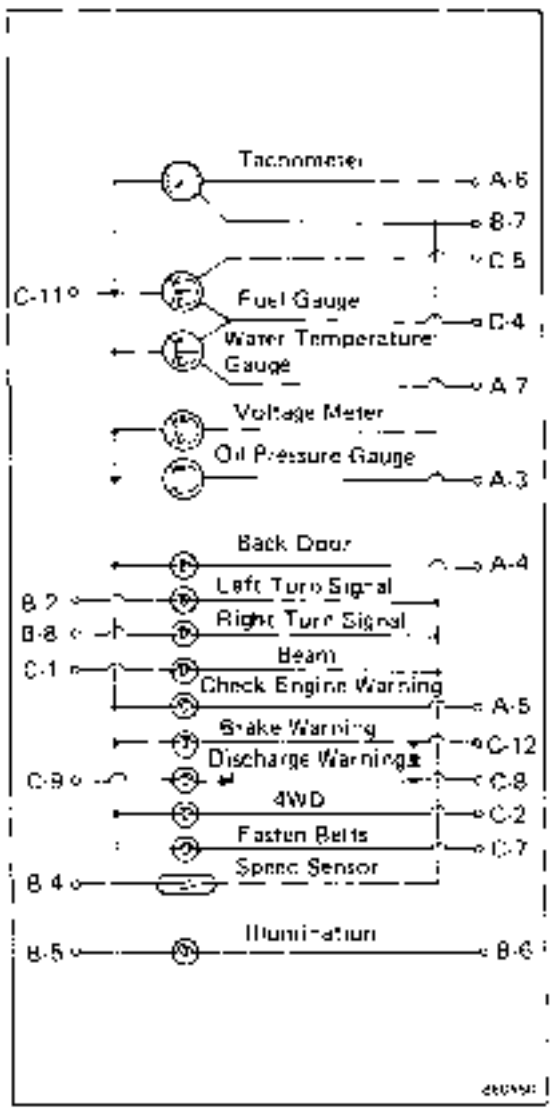
(b) Remove the wiper control switch and washer switch.

(c) Install the wiper control switch and washer switch.

(d) Install the terminals to the connector.
(See page BE-3)

Combination Meter and Gauge (w/Tachometer)





COMBINATION METER CIRCUIT

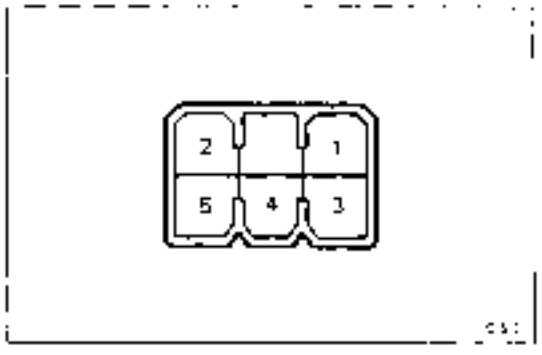
No.		Wiring connector side
A	3	Oil Pressure Sender Gauge or Oil Pressure Switch
	4	Back Door Unlock Warning Switch and Door Lock Detection Switch
	5	EFI Computer
	6	Ignition Coil
	7	Water Temperature Sender Gauge
B	2	Turn Signal Switch Terminal 8
	4	EFI Computer and Cruise Control Computer Terminal 7
	5	TAIL Fuse
	6	Light Control Rheostat Terminal 1
	7	Ground
	8	Turn Signal Switch Terminal 8
C	1	Headlight Dimmer Switch Terminal 6
	2	4WD Indicator Switch
	4	Ground
	5	Fuel Sender Gauge Terminal 1
	7	Seat Belt Warning Relay
	8	CHARGE Fuse
	9	IGN Fuse
	11	ENGINE Fuse
	12	Parking Brake Switch and Brake Fluid Level Warning Switch

B00021

HEATER

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Front	Rear
Blower does not work when fan switch is on	HEATER fuse blown	Replace fuse and check for short	BE-3	BE-3
	Heater relay faulty	Check relay	BE-32	BE-34
	Heater blower switch faulty	Check switch	BE-32	BE-34
	Heater blower resistor faulty	Check resistor	BE-33	BE-35
	Heater blower motor faulty	Replace motor		
	Wiring or ground faulty	Repair as necessary		
Incorrect temperature output	Control cables broken or binding	Check cables	BE-33	
	Heater hoses leaking or clogged	Replace hose		
	Water valve faulty	Replace valve		
	Air dampers broken	Repair dampers		
	Air ducts clogged	Repair ducts		
	Heater radiator leaking or clogged	Replace radiator		
	Heater control unit faulty	Repair control unit		



Heater Blower Switch

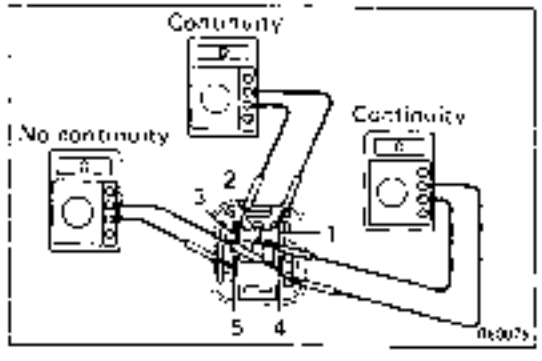
INSPECTION OF HEATER BLOWER SWITCH

INSPECT SWITCH CONTINUITY

Inspect heater blower switch continuity.

Switch position \ Terminal	4	5	1	2
OFF				
LO	○	○		
•	○	○	○	
HI	○	○		○

If continuity is not as specified, replace the switch.



Heater Relay

INSPECTION OF HEATER RELAY

1. **INSPECT RELAY CONTINUITY**

   (a) Check that there is continuity between terminals 1 and 3.

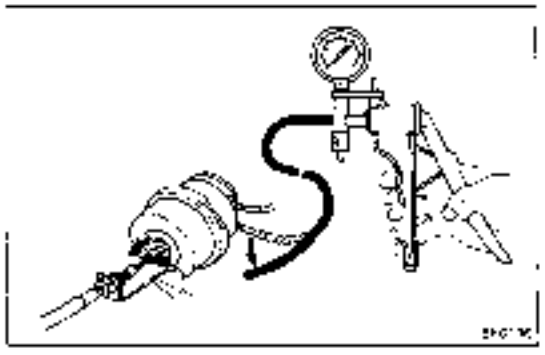
   (b) Check that there is continuity between terminals 2 a. 4.

   (c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay

TROUBLESHOOTING

Symptom	Inspection Area			Section
Cruise control cannot be set.	(a) Inspect type A code.	No. 1	NO	A
		No. 2	NO	B
		No. 3	NO	C
		No. 4	NO	D
		No. 5	NO	D
	(b) Inspect type B code	11		E
		21		D
		23		F
		31		B
		33		A and B
	(c) All codes are normal.			Replace Computer
Vehicle speed does not reduce when coast switch turned on	Inspect No. 1 of type A code	OK		F
		NO		A
Vehicle does not accelerate when accel switch turned on.	Inspect No. 2 of type A code.	OK		F
		NO		B
Vehicle speed does not return to memorized speed when resume switch turned on.	Inspect No. 2 of type A code.	OK		F
		NO		B
Set speed deviates on high side	Inspect No. 1 of type A code.	OK		F
Set speed deviates on low side.		NO		A
Vehicle speed fluctuates when set switch turned on.	Inspect No. 1 of type A code	OK		F
		NO		A
Setting speed does not cancel when brake pedal depressed.	Inspect No. 3 of type A code.	OK		F
		NO		C
Setting speed does not cancel when parking brake pulled.	Inspect No. 3 of type A code.	OK		F
		NO		C
Setting speed does not cancel when clutch pedal depressed (M/T only)	Inspect No. 3 of type A code	OK		F
		NO		C
Setting speed does not cancel when shifted to "N" range (A.T only)	Inspect No. 3 of type A code	OK		F
		NO		C
Speed can be set below 33 km/h (21 mph).	Inspect No. 4 of type A code	OK		F
		NO		D
Cruise control will not disengage even below 33 km/h (21 mph)	Inspect No. 5 of type A code.	OK		F
		NO		D



(c) Disconnect terminal 2 or 3 and check that the control cable returns to its original position and the vacuum returns to 0 mmHg (0 in.Hg, 0 kPa).

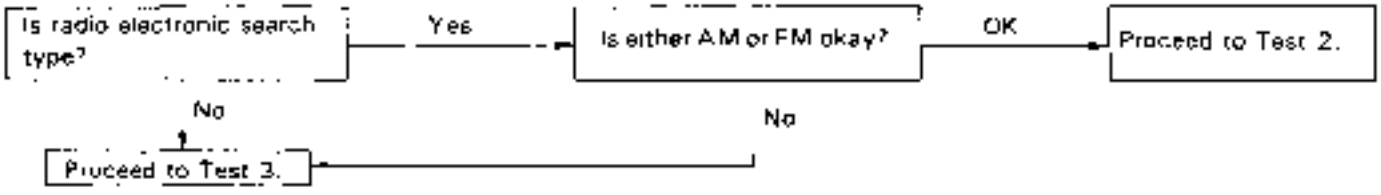
If operation is not as specified, replace the actuator.

(b) Tape player okay but no sound from AM and FM or either one.

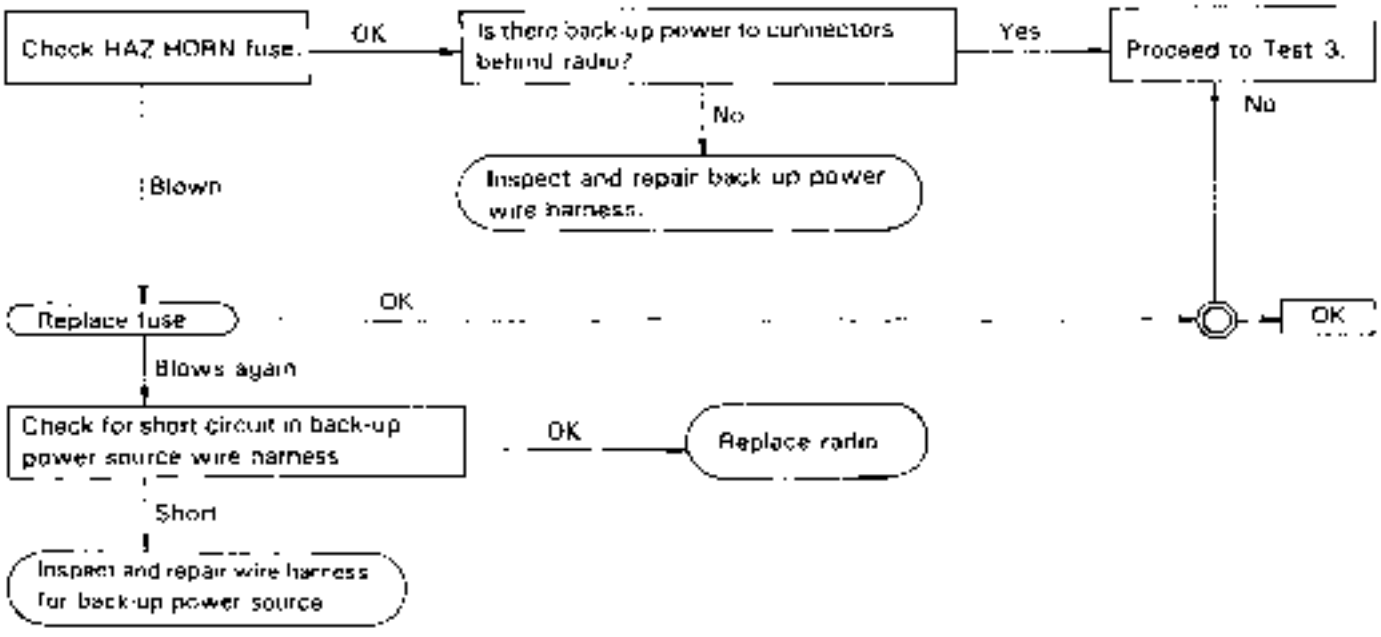
Possible causes:

- Antenna disconnected
- Antenna plug not properly connected
- Defective antenna
- Defective antenna cable
- Defective radio or tape player
- Blown HAZ-HORN fuse
- Short circuit or broken wire in wire harness for back up power source

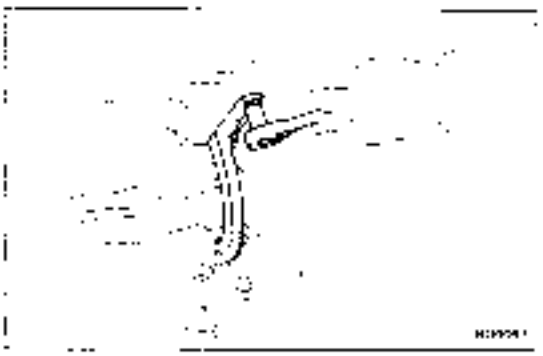
TEST 1



TEST 2



NOTE: Back up power refers to the storage voltage for preset tuning. This is applied even when the ignition switch is OFF.

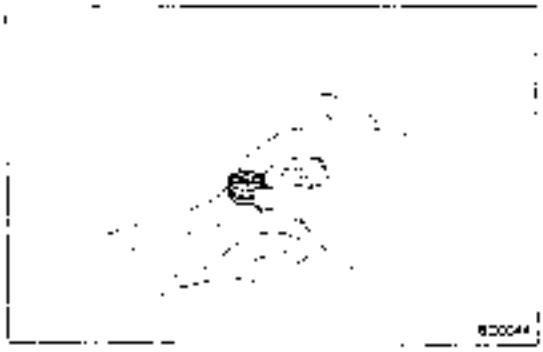


HOOD

ADJUSTMENT OF HOOD

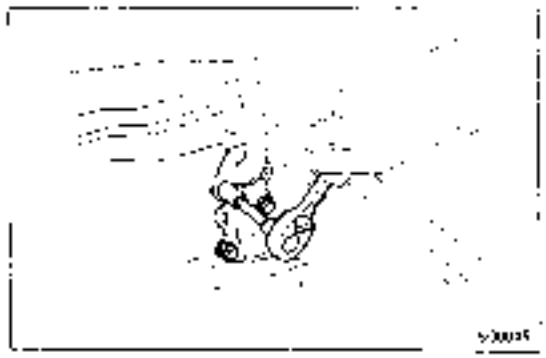
1. **ADJUST HOOD IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS**

   Loosen the hood side hinge bolts to adjust.



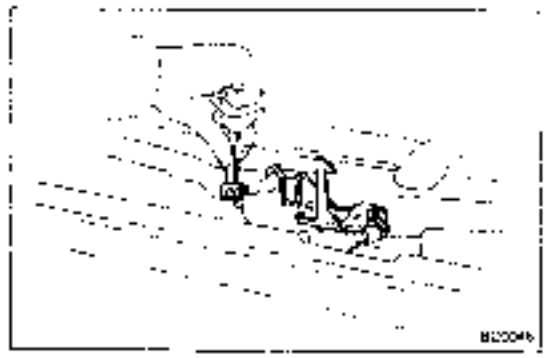
2. **ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION**

   Turn the hood cushions to adjust.



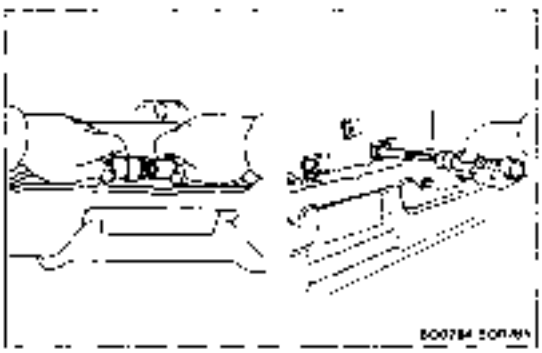
3. **ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION**

   Loosen the body side hinge bolts to adjust.



4. **ADJUST HOOD LOCK**

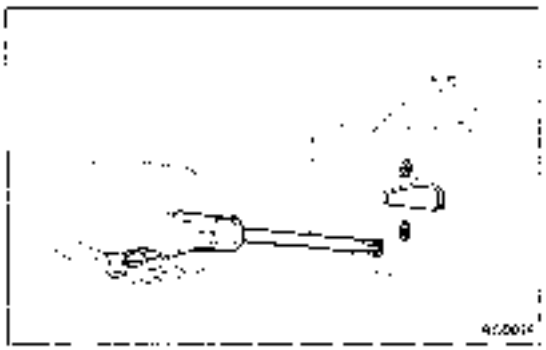
   Loosen the mounting bolts to adjust.



17. **DISCONNECT CONNECTOR FROM OUTER POWER WINDOW SWITCH**

18. **REMOVE LICENSE PLATE ASSEMBLY**

Remove the two nuts and a clip, and remove the license plate assembly.



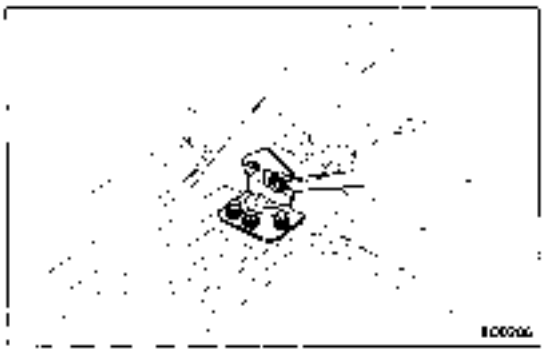
19. **REMOVE DOOR LOCK ASSEMBLY**

(a) Disconnect the connector from the door lock assembly. (LH side only)

(b) Remove the three screws.

(c) Pull out the door lock assembly from the cavity.

20. **PULL OUT WIRING FROM DOOR CAVITY**

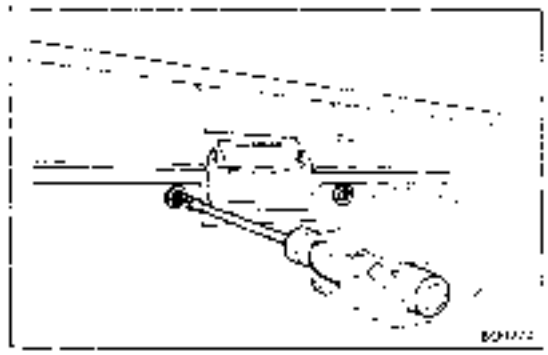


21. **REMOVE DOOR**

Remove the two bolts of the door hinge and remove the door.

NOTE: Place a shop cloth between the door and bumper so the door does not fall off and get damaged when the bolts are removed.

22. **REMOVE TORSION BAR FROM DOOR**



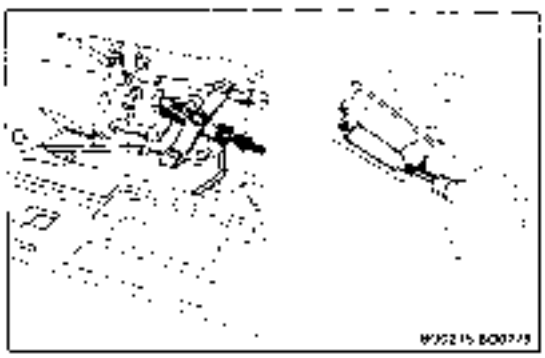
(POWER WINDOW NOT OPERATIVE)

If the power window is operative, see page BO-2.

1. **REMOVE DOOR TRIM**

2. **REMOVE PLATE**

3. **REMOVE SERVICE HOLE COVER**



4. **REMOVE INSIDE HANDLE**

(a) Disconnect the control link on the regulator side.

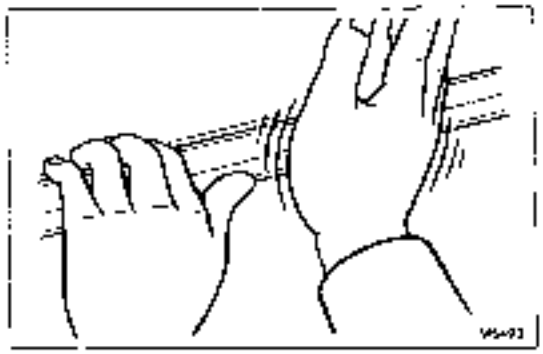
(b) Remove the two screws.

(c) Remove the inside handle assembly.

REMOVAL OF ROOF DRIP MOULDING

REMOVE ROOF DRIP MOULDING

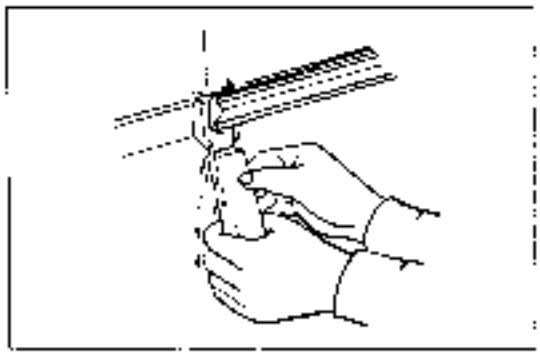
Remove the roof drip moulding by hand.



INSTALLATION OF ROOF DRIP MOULDING

INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange. Tap on the moulding by hand.

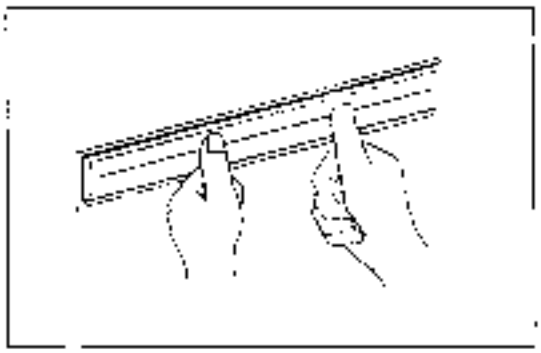


REMOVAL OF ROCKER PANEL MOULDING

REMOVE ROCKER PANEL MOULDING

(a) Remove the set screw.

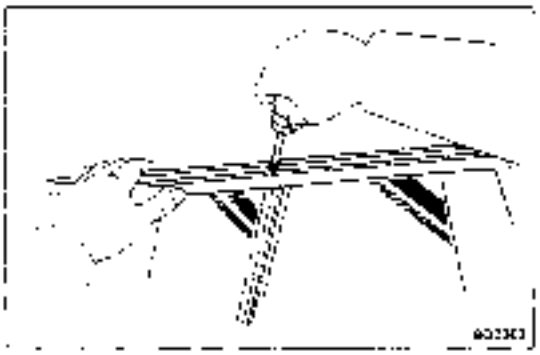
(b) Using a scraper, pry loose the clip and remove the moulding.



INSTALLATION OF ROCKER PANEL MOULDING

(a) Install the moulding by hand.

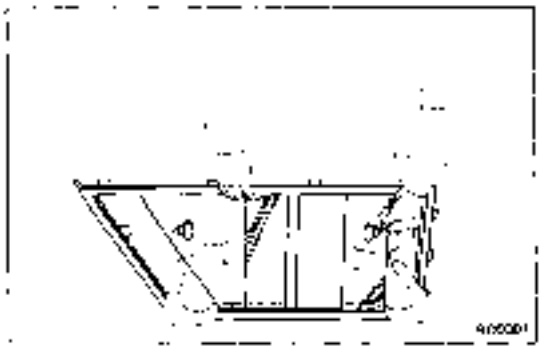
(b) Install the set screw.



5. DISASSEMBLE SIDE SLIDE WINDOW

(a) Remove the seven screws and window glass moulding.

(b) Remove the two screws of the center frame.



(c) Pull apart the channels and remove the front glass of the two slide glass panes at the center glass channel.

(d) Remove the center frame.

(e) Pull apart the channels and remove the rear glass of the two slide glass panes at the center glass channel.

(f) Remove the weatherstrip.

INSTALLATION OF SIDE SLIDE WINDOW

1. ASSEMBLE SIDE SLIDE WINDOW

(a) Install the weatherstrip to the frame.

(b) Pull apart the channels and install the rear glass of the two slide glass panes at the center glass channel.

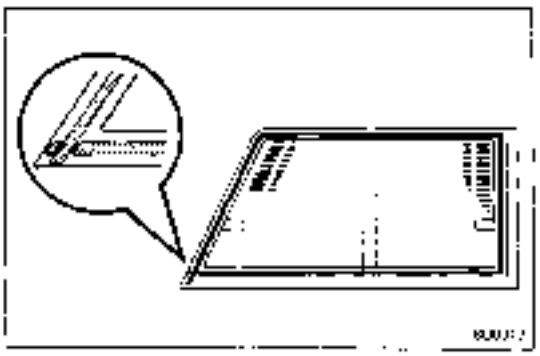
(c) Install the center frame.

(d) Pull apart the channels and install the front glass of the two slide glass panes at the center glass channel.

(e) Install the two screws of the center frame.

(f) Install the window glass moulding and the seven screws.

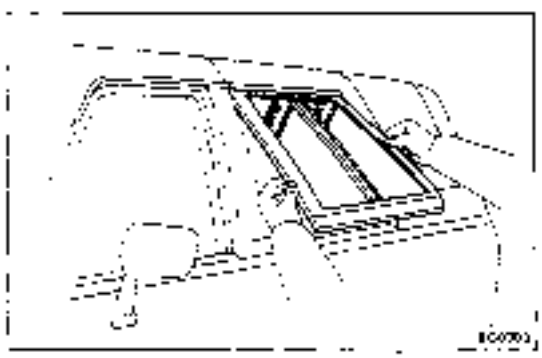
2. APPLY BUTYL TAPE TO WINDOW FRAME



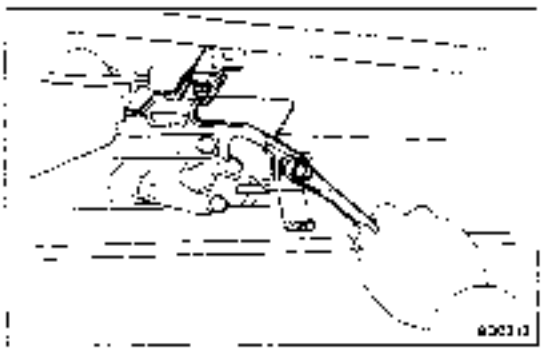
Apply butyl tape (6 mm or 0.24 in. width) to the slide window frame as shown in the figure.

NOTE: Firmly press down the overlapping portions of the tape so there are no open gaps.

3. INSTALL WINDOW ASSEMBLY



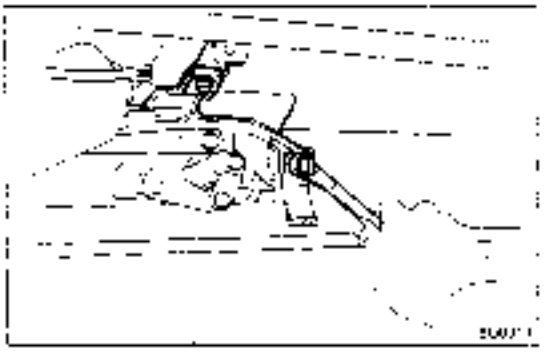
Install the side slide window assembly to the cover top.



5. **REMOVE WIPER MOTOR ASSEMBLY**

   Remove the three bolts, and then remove the wiper motor assembly.

6. **REMOVE WASHER NOZZLE**



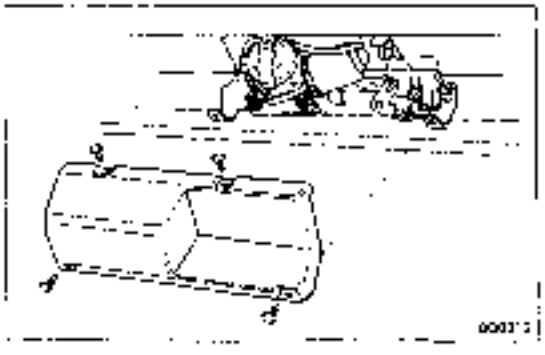
INSTALLATION OF REAR WIPER

1. **INSTALL WASHER NOZZLE**

   Torque: 15 kg-cm (13 in.-lb, 1.5 N·m)

2. **INSTALL WIPER MOTOR ASSEMBLY**

   Install the wiper motor assembly with the three mount bolts.

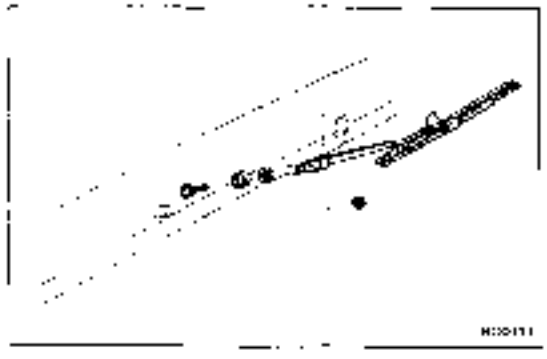


3. **CONNECT CONNECTORS AND WASHER HOSE**

   Connect the two connectors and washer hose.

4. **INSTALL WIPER MOTOR COVER**

   Install the wiper motor cover with the four clips.



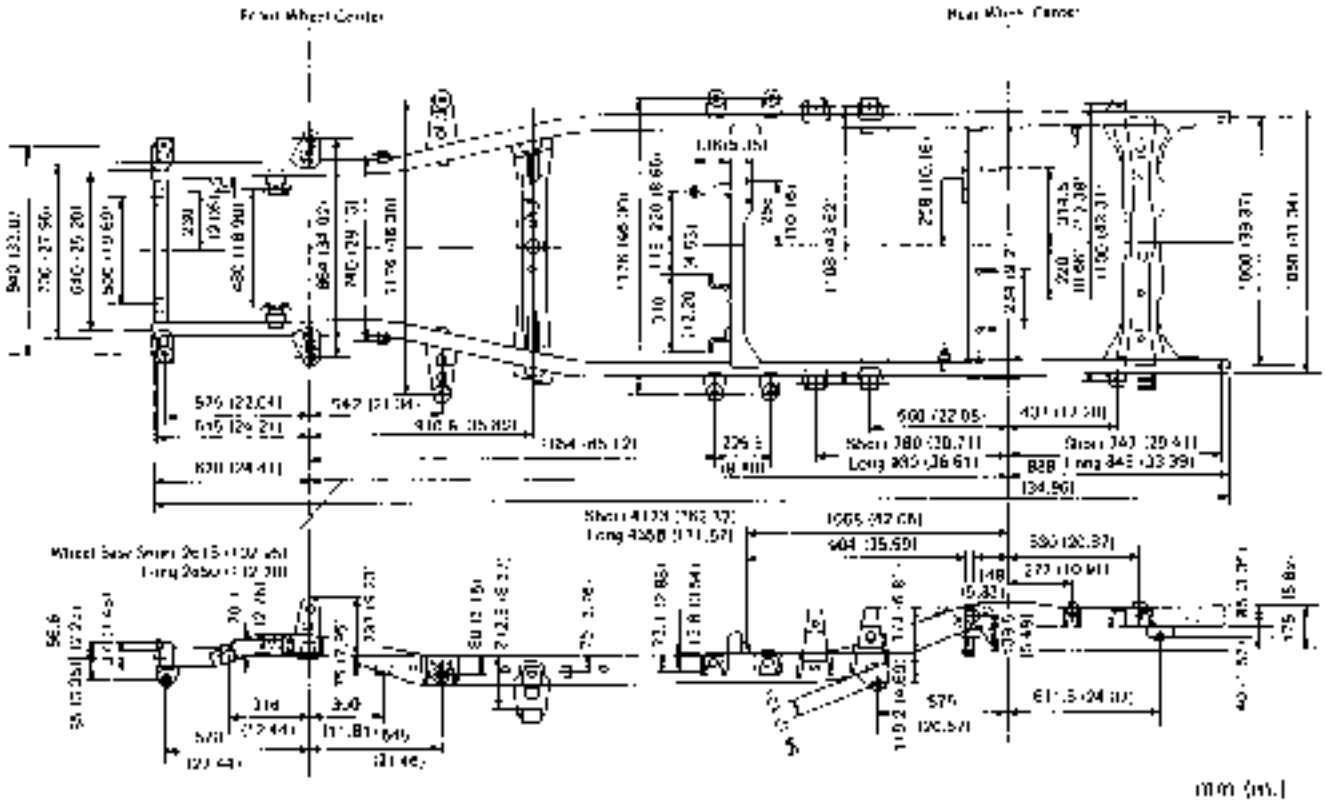
5. **INSTALL PIVOT NUT**

   Torque: 110 kg-cm (8 ft-lb, 11 N·m)

6. **INSTALL REAR WIPER ARM**

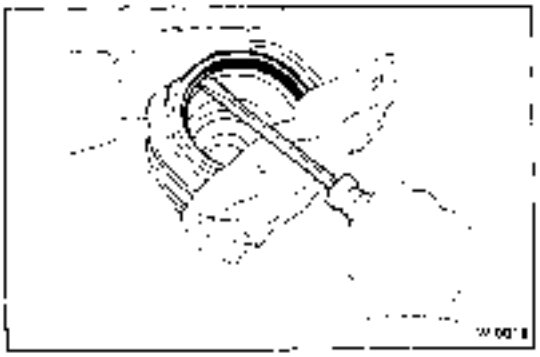
   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

BODY DIMENSIONS (4WD)



RN60 series	SHORT WHEEL BASE
RN65 series	LONG WHEEL BASE

Conversion table			
mm	In.	mm	in.
13.8	0.54	575	22.64
37	1.46	611.5	24.07
40	1.57	615	24.21
54	2.13	620	24.41
56.6	2.23	640	25.20
70	2.76	700	27.56
70.1	2.76	740	29.13
73.1	2.88	747	29.41
75	2.95	780	30.71
80	3.15	840	33.07
85	3.35	848	33.39
115	4.53	864	34.02
119.2	4.69	888	34.96
136	5.35	904	35.59
139.5	5.49	910.8	35.86
148	5.83	930	36.61
173	6.81	1,000	39.37
175	6.89	1,050	41.34
212.5	8.37	1,068	42.05
220	8.66	1,100	43.31
225.5	8.88	1,108	43.62
230	9.06	1,178	46.30
234	9.21	1,654	65.12
237	9.33	2,615	102.95
258	10.16	2,850	112.20
277	10.91	4,123	162.32
300	11.81	4,358	171.57
310	12.20		
314.5	12.38		
316	12.44		
437	17.20		
480	18.90		
500	19.69		
525	20.67		
530	20.87		
542	21.34		
545	21.46		
560	22.05		
570	22.44		



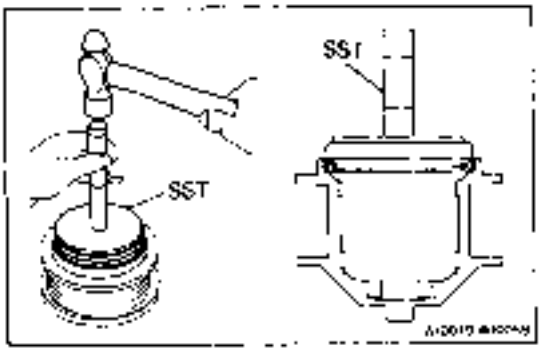
6. INSPECT WINCH DRUM OIL SEAL

(a) Check for damage.

(b) Check the oil seal lip for wear or damage.

7. IF NECESSARY, REPLACE OIL SEAL

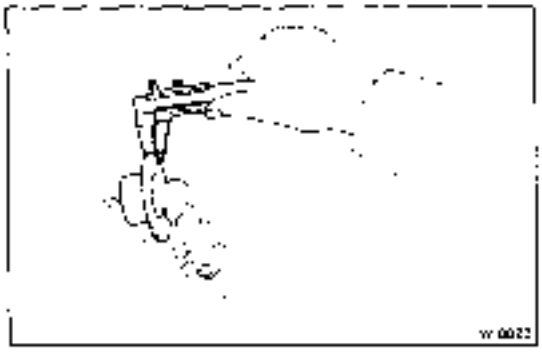
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, drive in a new winch drum oil seal to the winch drum as shown.

SST 09218-56030

Oil seal drive in depth: 0 – 1.0 mm (0 – 0.039 in.)

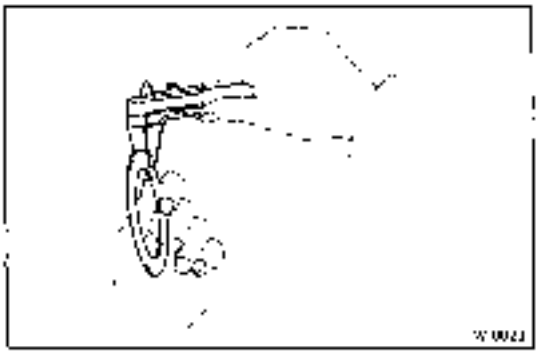


8. INSPECT WINCH DRUM THRUST BUSHING

Using calipers, measure the thrust bushing thickness.

Standard thickness: 1.5 mm (0.059 in.)
Minimum thickness: 1.0 mm (0.039 in.)

If the thrust bushing thickness is less than minimum, replace the thrust bushing.



9. INSPECT WINCH DRUM THRUST WASHER

Using calipers, measure the thrust washer thickness.

Standard thickness: 2.0 mm (0.079 in.)
Minimum thickness: 1.6 mm (0.063 in.)

If the thrust washer thickness is less than minimum, replace the thrust washer.

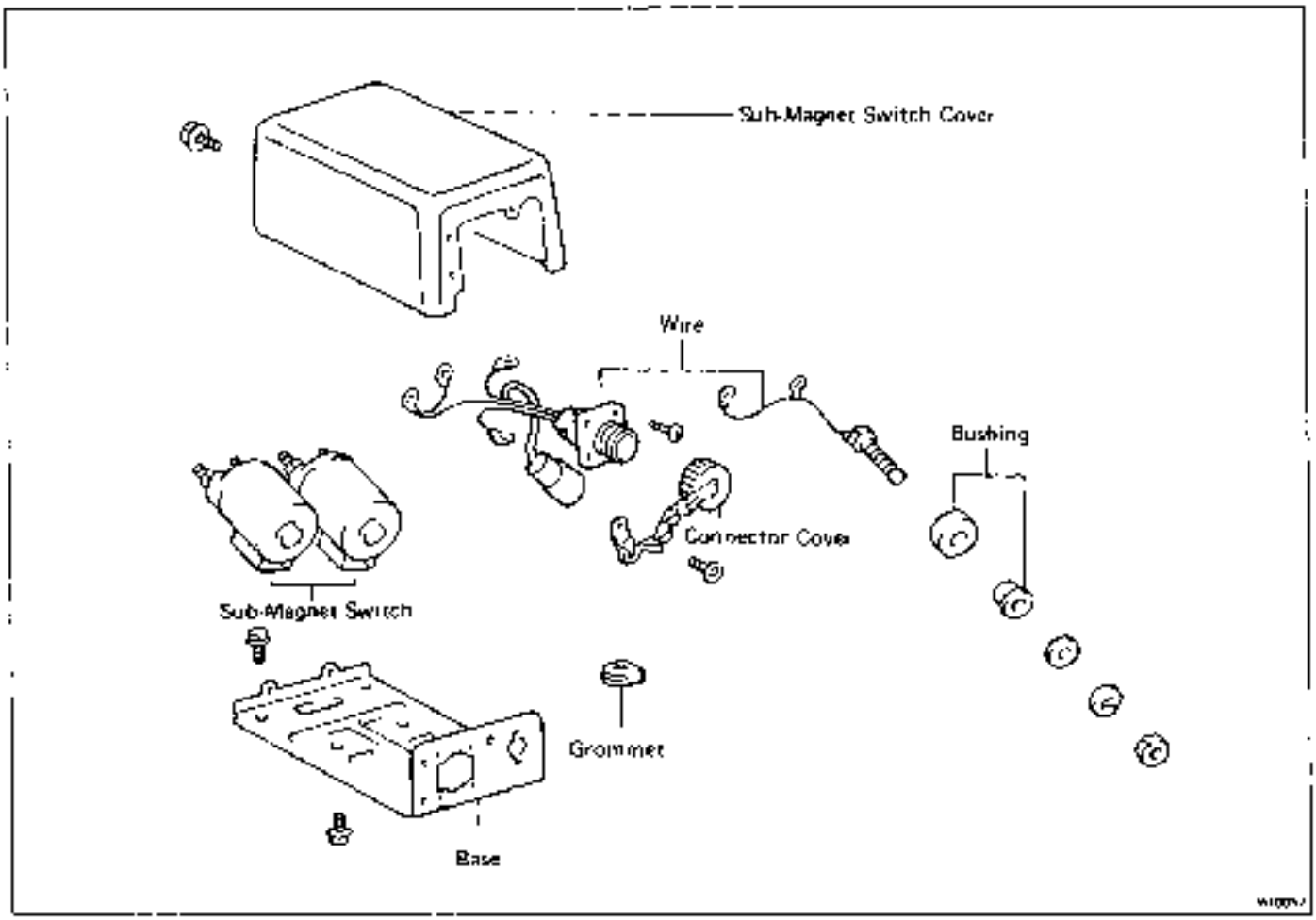
10. INSPECT PLANETARY GEAR UNIT NO.1, NO.2, NO.3 AND SUN GEAR

(a) Turn each bearing by hand while appling inward force.

If resistance is felt or if the bearing sticks, replace the planetary gear unit assembly.

SUB-MAGNET SWITCH

COMPONENTS



DISASSEMBLY OF SUB-MAGNET SWITCHES AND REMOTE CONTROL SWITCH

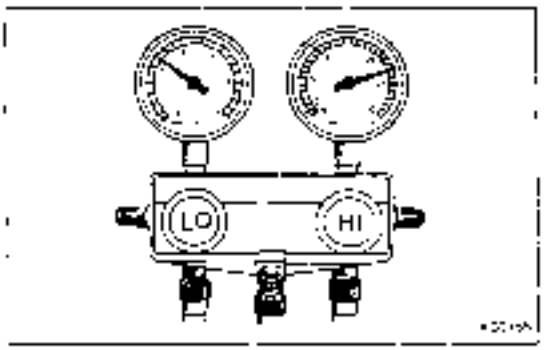
1. **DISCONNECT LEAD WIRE FROM SUB-MAGNET SWITCHES**

2. **REMOVE BASE**

   Remove the four bolts and two terminals.
   Then remove the base with the sub-magnet switches.

3. **REMOVE MAGNET SWITCHES**

   Remove the two bolts. Then remove the sub-magnet switches from the base.

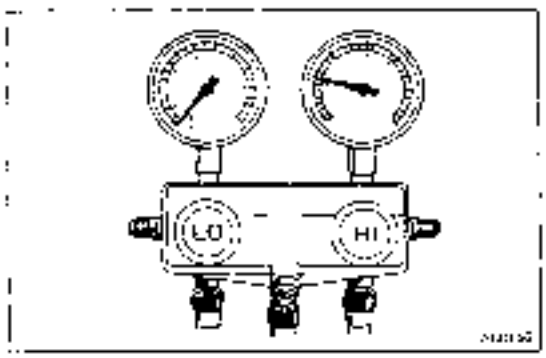


7. AIR PRESENT IN REFRIGERATION SYSTEM

Condition: Does not cool down sufficiently

NOTE: These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

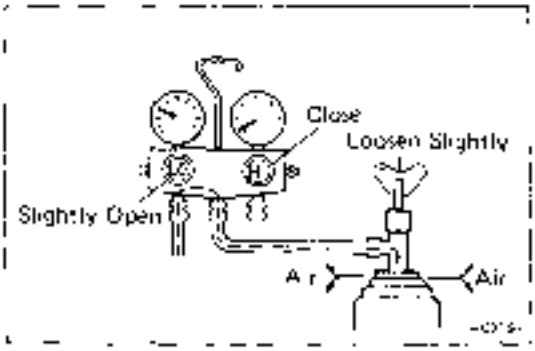
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
Pressures too nigh at both low and high pressure sides	Air entered refrigeration system	Air present in refrigeration system : Insufficient vacuum purging	(1) Replace receiver and drier (2) Check for dirty or insufficient compressor oil (3) Vacuum purge and charge new refrigerant



8. REFRIGERANT DOES NOT CIRCULATE

Condition: Does not cool (Cools from time to time in some cases)

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
Vacuum indicated at low pressure side, very low pressure indicated at high pressure side Frost or dew seen on piping before and after receiver and drier or expansion valve	Refrigerant flow obstructed by moisture or dirt refrigerant freezing or adhering to expansion valve orifice Refrigerant flow obstructed by gas leakage from expansion valve heat sensing tube	Expansion valve orifice clogged Refrigerant does not flow	Allow to stand for sometime and then restart operation to determine if trouble is caused by moisture or dirt. If caused by moisture refer to step 2 on page AC-4. If caused by dirt, remove expansion valve and clean off dirt by blowing with air. If unable to remove dirt, replace valve. Vacuum purge and charge refrigerant to proper amount. If gas leakage from heat sensing tube, replace expansion valve.



6. IF NECESSARY, CHARGE SYSTEM WITH ANOTHER REFRIGERANT CONTAINER

(a) When the refrigerant container is empty, close the pressure valves.

(b) Remove the container tap valve from the container.

(c) Attach the container tap valve to a new refrigerant container.

(d) Purge the air from the center hose by slightly opening the low pressure valve and loosening the valve disc.

(e) Make a hole in the sealed tap of the new container and charge the system.

CAUTION: Be careful not to overcharge the refrigerant as it could cause failure of the bearings and belt.

7. WHEN SYSTEM IS FULLY CHARGED, DISCONNECT MANIFOLD GAUGE SET

(a) Close both low and high pressure valves.

(b) Close the valve of the refrigerant container. If using one-pound containers of R-12, allow remaining refrigerant to escape by slowly removing the charge line.

(c) Turn off the engine.

(d) Using a shop rag, quickly remove both hoses from the compressor service valves.

WARNING: Care must be taken to protect eyes and skin when removing the high pressure hoses.

(e) Put the cap nuts on the service valve fittings.

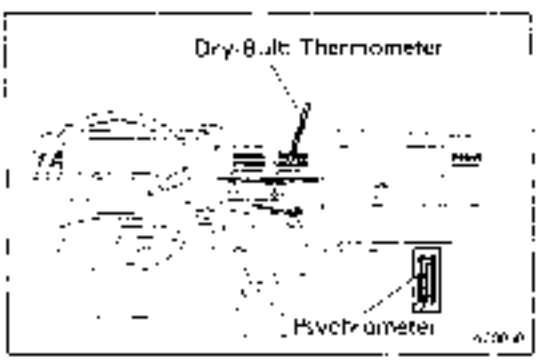
Performance Test

1. INSTALL MANIFOLD GAUGE SET

(a) Close the high pressure and low pressure hand valves.

(b) Connect the high pressure hose to the discharge service valve of the compressor.

(c) Connect the low pressure hose to the suction service valve of the compressor.



2. RUN ENGINE AND OPERATE AIR CONDITIONER

(a) Run the engine at 2,000 rpm.

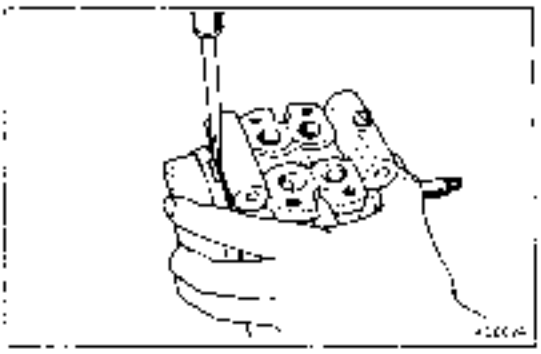
(b) Set the blower switch at HI, A/C switch ON temperature control at COOL, and air flow control at VENT.

(c) Keep all windows and doors open.

3. POSITION THERMOMETERS

(a) Place a dry-bulb thermometer in the cool air outlet.

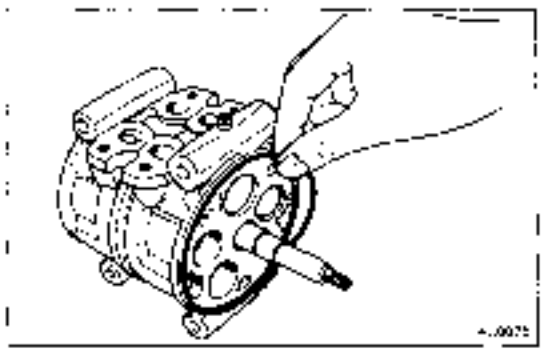
(b) Place a psychrometer close to the inlet of the cooling unit.



11. REMOVE REAR HOUSING

Using a hammer and punch, remove the rear housing by tapping on the protrusion.

CAUTION: Be careful not to scratch the sealing surface of the rear housing.

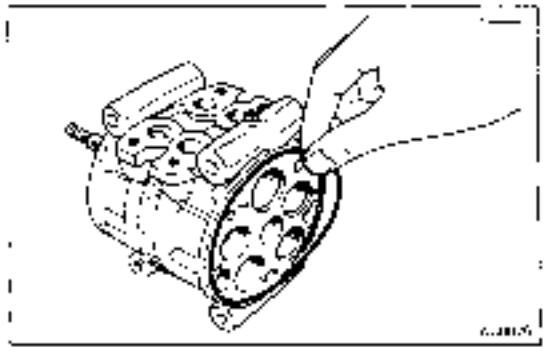


12. REMOVE FRONT AND REAR O-RINGS FROM CYLINDER BLOCK

Discard the O rings.

ASSEMBLY OF COMPRESSOR

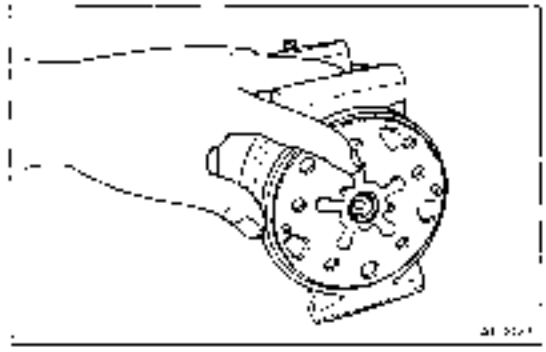
(See page AC-24)



1. INSTALL REAR VALVE PLATE ON REAR CYLINDER

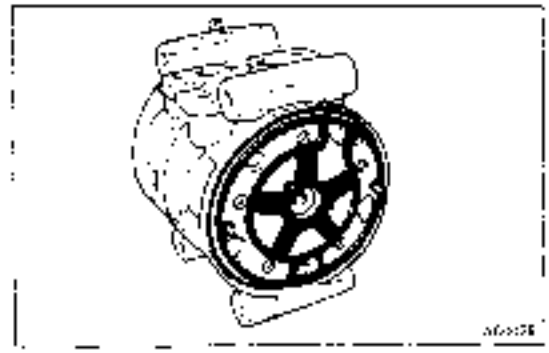
(a) Install the two pins in the rear cylinder.

(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear cylinder.



(c) Install the rear suction valve over the pins on the rear cylinder.

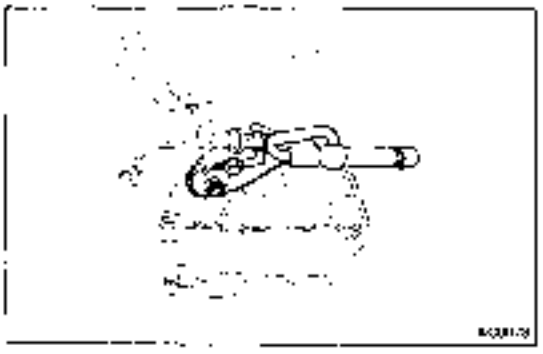
NOTE: The front and rear suction valves are identical.

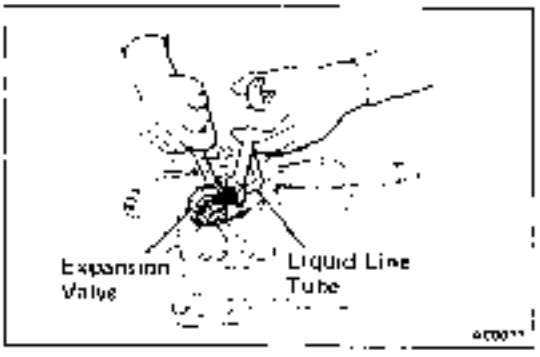


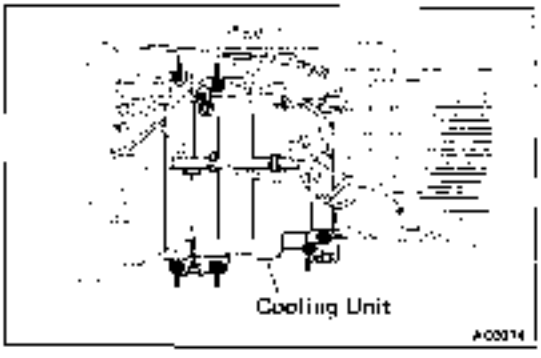
(d) Install the rear valve plate together with the discharge valve over the pins on rear cylinder.

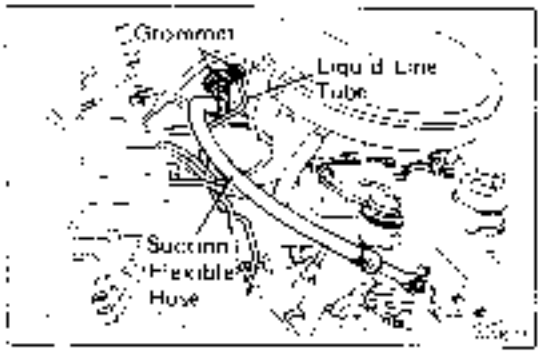
NOTE: The rear valve plate is marked with an "R".

(e) Lubricate the gasket with compressor oil. Install the gasket on the valve plate.









ASSEMBLY OF COOLING UNIT

(See page AC-19)

1. **INSTALL COMPONENTS ON EVAPORATOR**

   (a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.

   Torque: 235 kg-cm (17 ft-lb, 23 N-m)

   NOTE. Be sure that the O-ring is positioned on the tube fitting.

   (b) Connect the liquid line tube to the inlet fitting of the expansion valve. Torque the nut.

   Torque: 135 kg-cm (10 ft-lb, 13 N-m)

   (c) Install the pressure switch, if removed.

   Torque: 135 kg-cm (10 ft-lb, 13 N-m)

   (d) Install the clamp and heat insulator to the outlet tube.

2. **INSTALL THERMISTOR ON EVAPORATOR**

3. **INSTALL UPPER AND LOWER CASES ON EVAPORATOR**

INSTALLATION OF COOLING UNIT

1. **INSTALL A/C WIRE HARNESS TO COOLING UNIT**

2. **INSTALL COOLING UNIT**

   Install the cooling unit with the four tapping screws and the bolt.

   CAUTION: Be careful not to pinch the wire harness while installing the cooling unit.

3. **INSTALL GLOVE BOX**

4. **INSTALL GROMMETS ON INLET AND OUTLET FITTINGS**

5. **CONNECT LIQUID LINE TUBE TO COOLING UNIT INLET FITTINGS**

   Torque: 135 kg-cm (10 ft-lb, 13 N-m)

6. **CONNECT SUCTION FLEXIBLE HOSE TO COOLING UNIT OUTLET FITTING**

   Torque: 325 kg-cm (24 ft-lb, 32 N-m)

7. **IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**

   Add 40 – 50 cc (1.4 – 1.7 oz)

8. **CONNECT NEGATIVE CABLE TO BATTERY**

9. **EVACUATE, CHARGE AND TEST REFRIGERATION SYSTEM (See page AC-14)**

EFI SYSTEM (Cont'd)

Main relay	Resistance	1 – 2	60 – 80 Ω
		3 – 4	∞
Circuit opening relay	Resistance	STA – E_1	17 – 25 Ω
		+B – F_C	88 – 132 Ω
		+B – F_P	∞
Resistor	Resistance		2 – 3 Ω each
Start injector time switch	Resistance	STA – STJ	20 – 40 Ω (below 30°C, 86°F) 40 – 60 Ω (above 40°C, 104°F)
		STA – Ground	20 – 60 Ω
Temperature sensor	Resistance		10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F) 0.2 – 0.4 kΩ (80°C, 176°F)

ECU

NOTE: 1. Perform all voltage and resistance measurements with the ECU connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.
3. The testing probes must not make contact with the computer Ox and VF terminals.

+B – E_1	10 – 14	Ignition switch ON	
BATT – E_1	10 – 14	Ignition switch ON	
IDL – E_2	4 – 10	Ignition switch ON	Throttle valve open
VTA – E_2	0.1 – 1.0	Ignition switch ON	Throttle valve fully closed
	4 – 5	Ignition switch ON	Throttle valve fully open
Vcc – E_2	4 – 6	Ignition switch ON	
IGt – E_1	0.7 – 1.0	Idling	
STA – E_1	6 – 12	Ignition switch ST position	
No. 10 – E_1 No. 20 – E_1	9 – 14	Ignition switch ON	
W – E_1	8 – 14	No trouble (CHECK ENGINE light go off) and engine running	
V_C – E_2	4 – 9	Ignition switch ON	
V_S – E_2	0.5 – 2.5	Ignition switch ON	Measuring plate fully closed
	5 – 8	Ignition switch ON	Measuring plate fully open
	2.5 – 5.5	Idling	
THA – E_2	2 – 6	Ignition switch ON	Intake air temperature 20°C or 68°F
THW – E_2	0.5 – 2.5	Ignition switch ON	Coolant temperature 80°C or 176°F
B/K – E_2	8 – 14	Stop light switch ON	

Resistance	E_1 – E_2	0 Ω
	E_1 – BODY	0 Ω
	E_1 – E_{01}	0 Ω
	E_1 – E_{02}	0 Ω

Fuel cut rpm	Cut	M/T	2,130 rpm (Brake switch OFF)
		A/T	2,200 rpm
	Hysteresis		300 – 500 rpm (Brake switch ON)
			230 – 430 rpm (Brake switch OFF)

Specifications (Cont'd)

Shift point schedule (22R-E Engine C & C) km/h (mph)

"D" range (throttle valve fully open)						"L" range
1 → 2	2 → 3	3 → OD	OD → 3	3 → 2	2 → 1	2 → 1
51 — 69 (32 — 41)	95 — 111 (59 — 69)	No shift *1	*2	86 — 102 (53 — 63)	35 — 48 (22 — 30)	41 — 56 (25 — 35)

*1 3 → OD shift up point with closed throttle valve is at 34 — 47 km/h (21 — 29 mph).
*2 OD → 3 down-shift is possible up to maximum speed.

Valve body spring mm (in.)

Spring	Free length	Coil outer diameter	No. coils	Wire diameter
Lower valve body				
Primary regulator valve (22R)	73.32 (2.8866)	16.72 (0.6583)	15	1.59 (0.0626)
Primary regulator valve (22R-E)	61.20 (2.4094)	17.20 (0.6772)	13	1.80 (0.0709)
1-2 shift valve	34.62 (1.3630)	7.56 (0.2976)	13	0.56 (0.0220)
3-4 shift valve	33.65 (1.3248)	10.60 (0.4173)	14.5	1.10 (0.0433)
Oil cooler by-pass valve	33.32 (1.3118)	13.82 (0.5441)	7	1.32 (0.0520)
Pressure relief valve ball	32.14 (1.2654)	13.14 (0.5173)	9	2.03 (0.0799)
Damping check ball	20.00 (0.7874)	4.95 (0.1949)	15	0.38 (0.0150)
Upper rear valve body				
Low coast modulator valve	42.35 (1.6673)	9.24 (0.3638)	15	0.84 (0.0331)
Sequence valve	37.55 (1.4783)	9.17 (0.3610)	14.5	1.17 (0.0461)
Governor modulator valve	36.07 (1.4201)	9.09 (0.3579)	12	0.71 (0.0280)
2-3 shift timing valve	35.10 (1.3819)	8.96 (0.3528)	12.5	0.76 (0.0299)
Detent regulator valve	29.93 (1.1783)	8.85 (0.3484)	13.5	0.90 (0.0354)
Intermediate modulator valve	27.26 (1.0732)	9.04 (0.3559)	9.5	1.10 (0.0433)
Upper front valve body				
Secondary regulator valve	71.27 (2.8059)	17.43 (0.6862)	15	1.93 (0.0760)
Down shift plug	39.71 (1.5634)	10.89 (0.4287)	11.5	1.19 (0.0469)
Throttle valve	21.94 (0.8638)	8.58 (0.3378)	8	0.71 (0.0280)

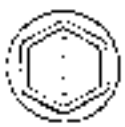
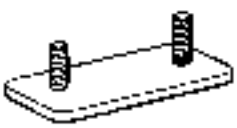
Clutch and brake return spring (C_0, C_1, C_2)	Free length	15.10 mm	0.5945 in.
	Coil outer diameter	8.0 mm	0.315 in.
	No. of coils	5.5	
Clutch and brake return spring (B_0, B_1, B_2, B_3)	Free length	16.12 mm	0.6346 in.
	Coil outer diameter	8.0 mm	0.315 in.
	No. of coils	6	
Oil pump	Side clearance STD	0.02 — 0.05 mm	0.0008 — 0.0020 in.
	Side clearance Limit	0.1 mm	0.004 in.
	Body clearance STD	0.07 — 0.15 mm	0.0028 — 0.0059 in.
	Body clearance Limit	0.3 mm	0.012 in.
	Tip clearance Driven gear STD	0.11 — 0.14 mm	0.0043 — 0.0055 in.
	Tip clearance Driven gear Limit	0.3 mm	0.012 in.

Specifications (Cont'd)

8.0 in. Differential 1 ton, C & C and 4WD	Drive pinion bearing preload	at Starting			
	New bearing		19 – 26 kg-cm	16.5 – 22.6 in. lb	1.9 – 2.5 N·m
	Reused bearing		9 – 13 kg-cm	7.8 – 11.3 in.-lb	0.9 – 1.3 N·m
	Total preload	at Starting	Add drive pinion bearing preload		
	New and reused bearing		4 – 6 kg-cm	3.5 – 5.2 in. lb	0.4 – 0.6 N·m
	Drive pinion to ring gear backlash		0.13 – 0.18 mm	0.0051 – 0.0071 in	
	Pinion gear to side gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.	
	Ring gear runout	Limit	0.10 mm	0.0039 in.	
	Companion flange runout	Limit			
		Radial	0.10 mm	0.0039 in.	
		Lateral	0.10 mm	0.0039 in.	
	Ring gear installing temperature		90 – 110°C	194 – 230°F	
	Side gear thrust washer thickness		1.6 mm	0.063 in.	
			1.7 mm	0.067 in.	
			1.8 mm	0.071 in.	
	Drive pinion adjusting plate washer thickness		1.70 mm	0.0669 in.	
			1.73 mm	0.0681 in.	
			1.76 mm	0.0693 in.	
			1.79 mm	0.0705 in.	
			1.82 mm	0.0717 in.	
			1.85 mm	0.0728 in.	
			1.88 mm	0.0740 in.	
			1.91 mm	0.0752 in.	
			1.94 mm	0.0764 in.	
			1.97 mm	0.0776 in.	
			2.00 mm	0.0787 in.	
			2.03 mm	0.0799 in.	
			2.06 mm	0.0811 in.	
			2.09 mm	0.0823 in.	
			2.12 mm	0.0835 in.	
			2.15 mm	0.0846 in.	
			2.18 mm	0.0858 in.	
			2.21 mm	0.0870 in.	
			2.24 mm	0.0882 in.	
			2.27 mm	0.0894 in.	
			2.30 mm	0.0906 in.	
			2.33 mm	0.0917 in.	

STANDARD BOLT TIGHTENING TORQUE

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 5 — 6 — 7 —	4T 5T 6T 7T	Stud bolt	 No mark	4T
	 No mark	4T			
Hexgon flange bolt w/washer hexagon bolt	 No mark	4T		 Grooved	6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			