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TIGER TRUCK



Star

Utility Vehicle

SERVICE MANUAL

100 Tiger Drive ~ Poteau, Oklahoma 74953 ~ Tel (866) 688-1778 ~ www.tigertruck.com

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TIGER TRUCK

INTRODUCTION

This manual covers all models of the Tiger Star. It is to be used for the maintenance, service, troubleshooting and repair of the Star series trucks manufactured by Tiger Truck, LLC.

The information and specifications included in this publication were in effect at the time of printing. Tiger Truck reserves the right to change specifications or design without notice and without incurring any obligation whatsoever.

Tiger manufactures vehicles with various options, including a flex-fuel system and automatic transmission. Please be aware of your unit's options prior to vehicle operation and maintenance. Maintaining your vehicle in accordance with the instructions in this manual will help to preserve your investment.

Unless otherwise negotiated during the purchase process, your new Tiger Star is covered by the following warranty:

Warranty Period (years / miles whichever occurs first)	
Bumper-to-Bumper (except friction parts)	1 year / 12,000 miles
Drive train	2 years / 24,000 miles
Automatic transmission (remanufactured)	3 years / 36,000 miles
Interior upholstery fabric	4 years / 48,000 miles
Exterior paint (rust-through)	7 years / unlimited miles

Restrictions and exclusions apply to these warranty periods. Please refer to the warranty information provided with your vehicle.

Tiger Truck maintains a dealership network in the United States. If questions arise that are not answered by this manual, please contact your local dealer or Tiger Truck in Poteau, Oklahoma, for assistance. When you write or call, please have the following information available:

- Vehicle Identification Number
- Mileage of the vehicle
- Your name, address and phone number
- A detailed description of the problem
- Name of the dealer (if any) you bought the vehicle from

Tiger Truck Manufacturing, LLC
100 Tiger Drive ~ Poteau, Oklahoma 74953
Tel: 866-688-1778

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SECTION 0A

GENERAL INFORMATION

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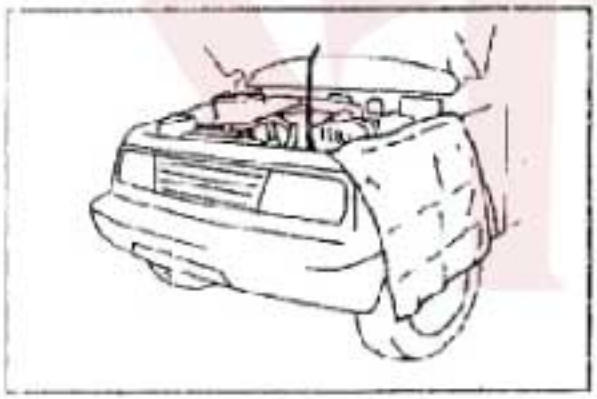
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GENERAL PRECAUTIONS

The WARNING and CAUTION below describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures described in this manual, and they will not necessarily be repeated with each procedure to which they apply.

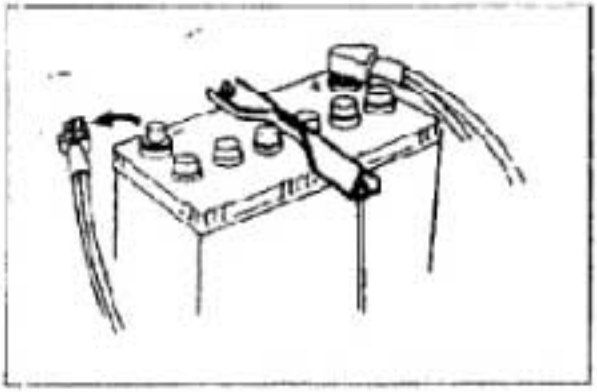
WARNING:

- **Whenever raising a vehicle for service, be sure to follow the instructions under "VEHICLE LIFTING POINTS" on SECTION 0A.**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles). Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tailpipe, muffler, etc.**
- **New and used engine oil can be hazardous. Children and pets may be harmed by swallowing new or used oil. Keep new and used oil and used engine oil filters away from children and pets. Continuous contact with used engine oil has been found to cause [skin] cancer in laboratory animals. Brief contact with used oil may irritate skin. To minimize your exposure to used engine oil, wear a long-sleeve shirt and moisture-proof gloves (such as dishwashing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil. Recycle or properly dispose of used oil and filters.**



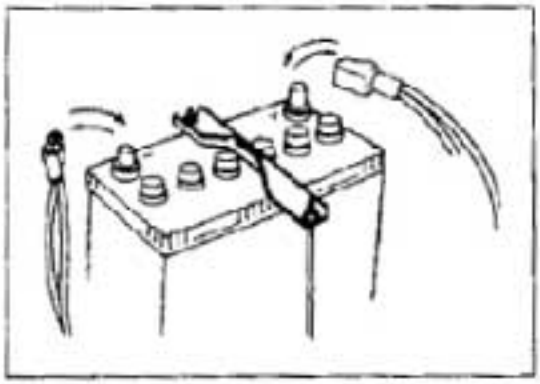
CAUTION:

- **Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle's finish.**



- **When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.**

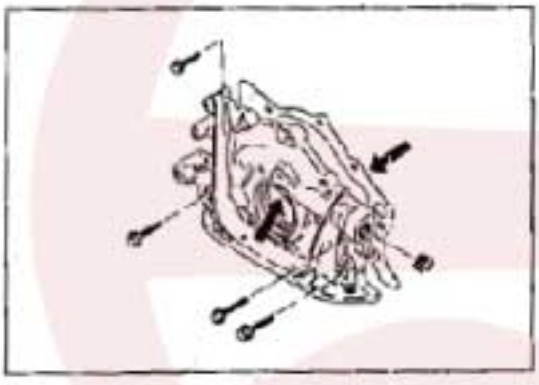
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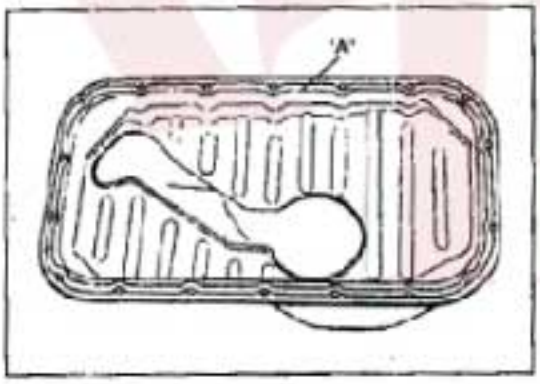
- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.

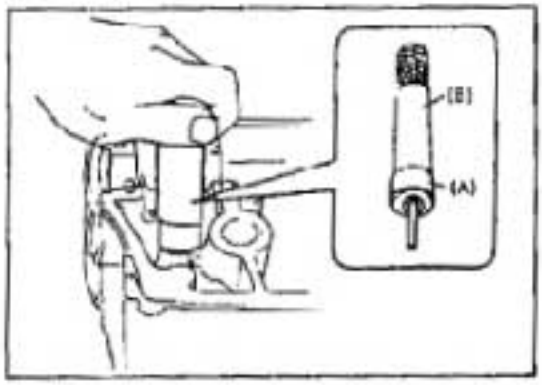


- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material form the mating surfaces.



- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

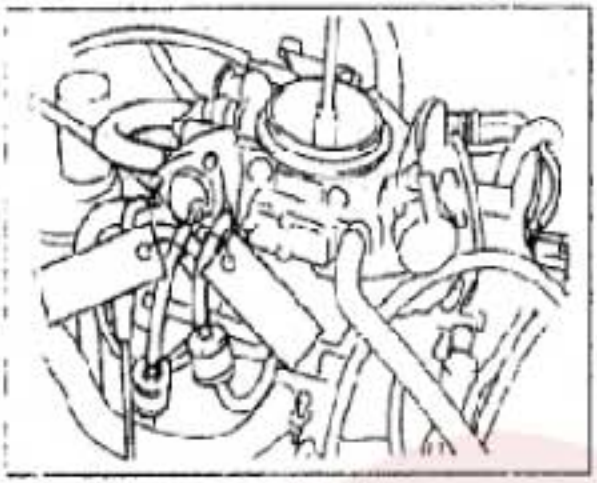
"A": Sealant 99000-31150



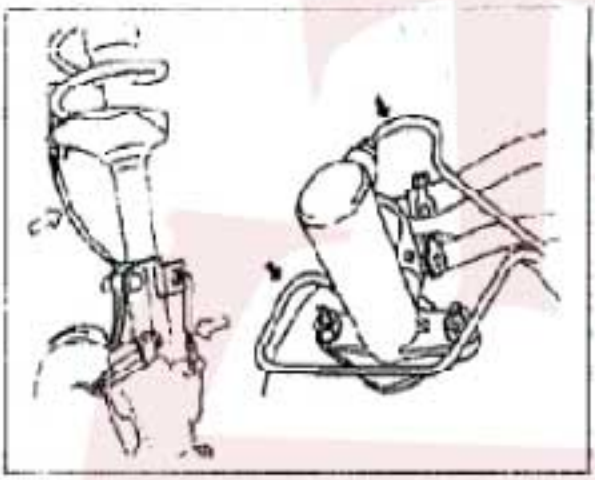
- Be sure to use special tools when instructed.

Special Tool
(A): 09917-98221
(B): 09916-58210

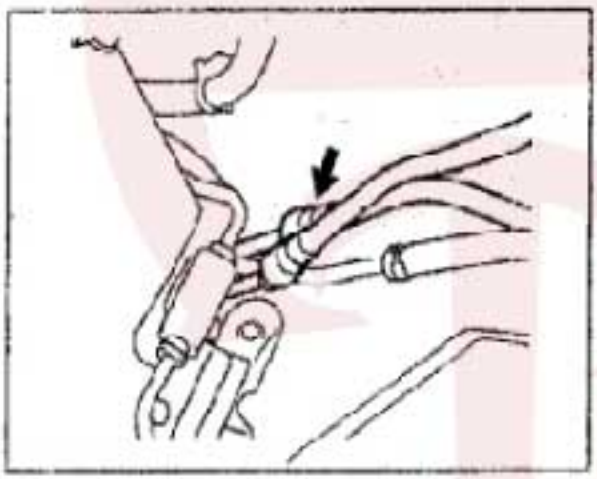
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- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.

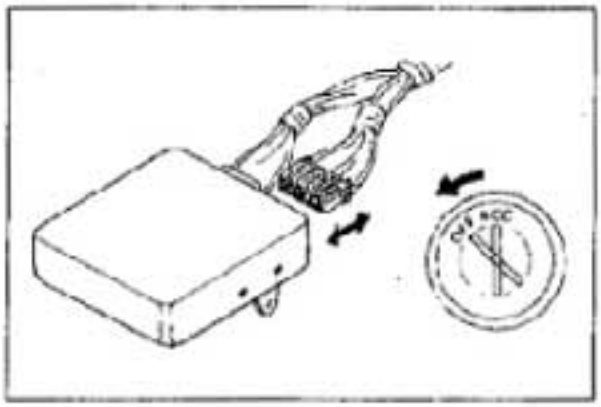


PRECAUTION FOR CATALYTIC CONVERTER

For vehicles equipped with a catalytic converter, use only unleaded gasoline and be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged.

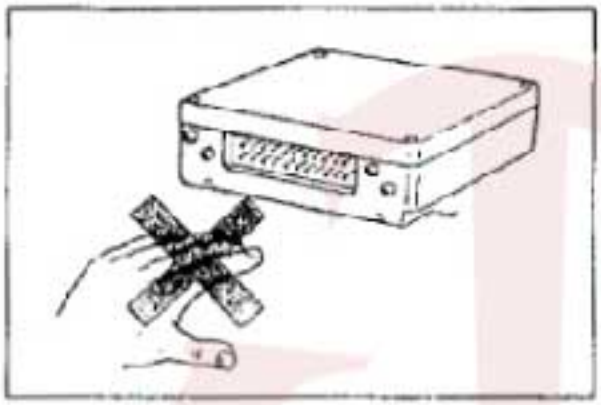
- Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
- Conduct engine compression checks within the shortest possible time.
- Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty).

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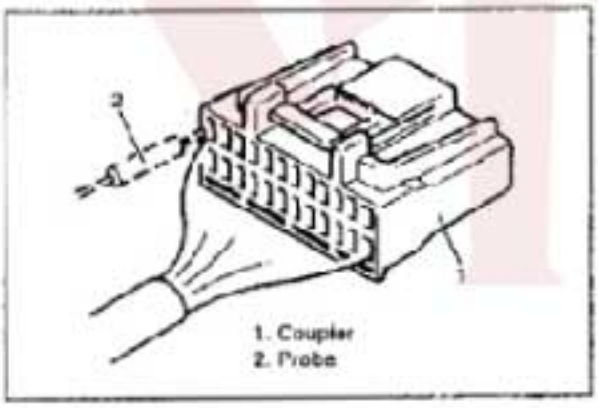
PRECAUTIONS FOR ELECTRICAL CIRCUIT SERVICE

- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or electronic parts may get damaged.



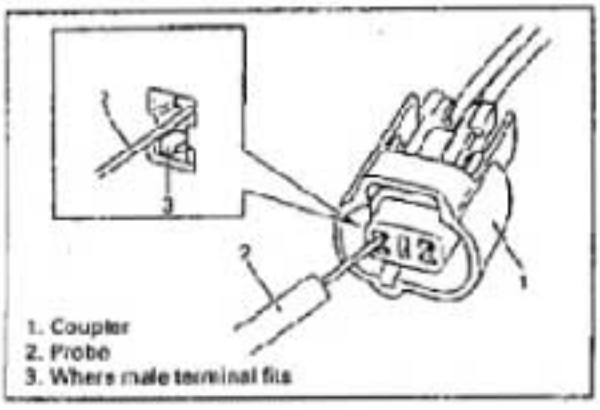
- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit). The static electricity from your body can damage these parts.

- Never connect any tester (voltmeter, ohmmeter or e.t.c.) to electronic control unit and sensor when its coupler is disconnected. Attempt to do it may cause damage to it.
- Never connect any tester to electronic control unit and sensor with its coupler connected to it. Attempt to do it may cause damage to it.
- Be sure to use a specified voltmeter/ohmmeter. Otherwise, accurate measurements may not be obtained or personal injury may result.



1. Coupler
2. Probe

- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.

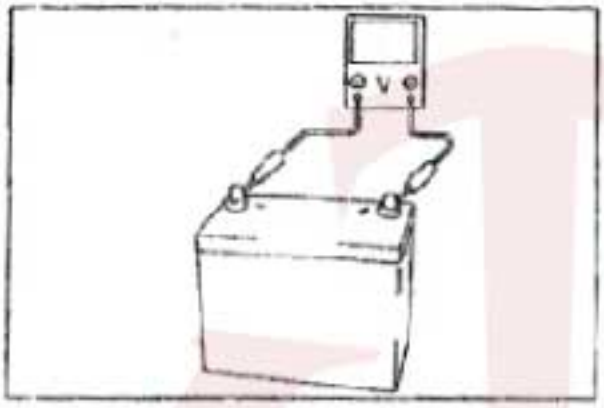


1. Coupler
2. Probe
3. Where male terminal fits

- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection. In case of such coupler as shown connect probe as shown to avoid opening female terminal. Never connect probe where male terminal is supposed to fit.

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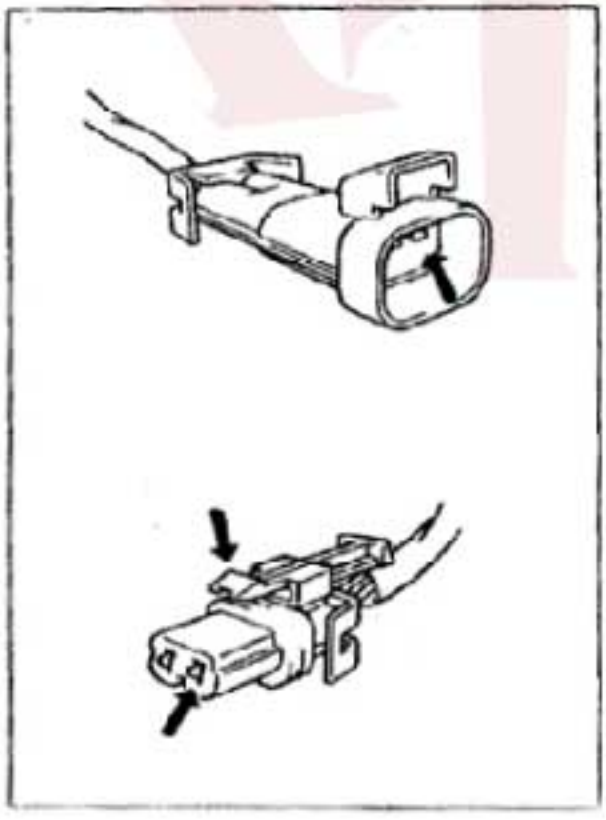
- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.



- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.

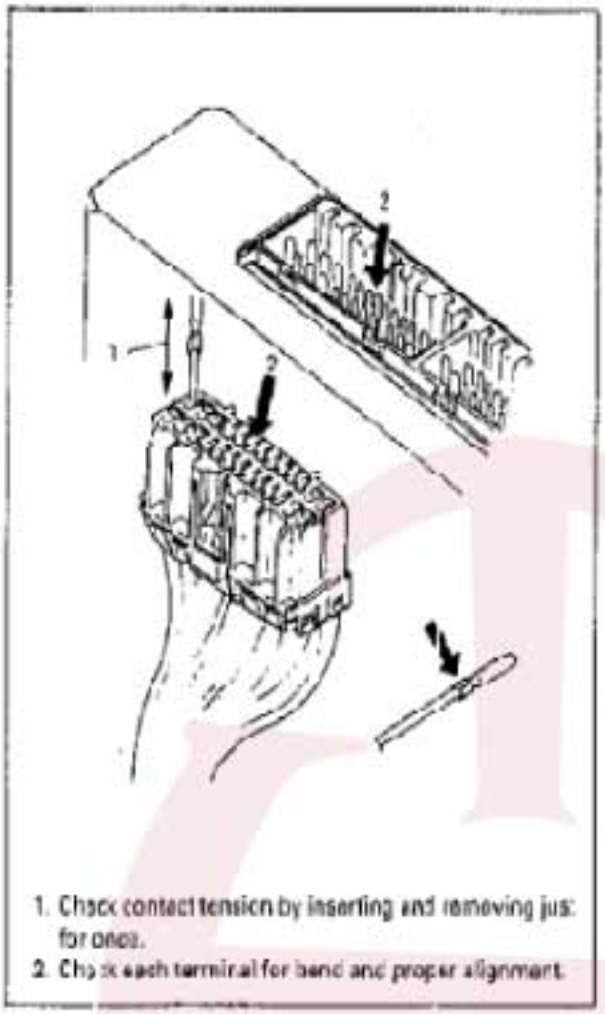
INTERMITTENTS AND POOR CONNECTION

Most intermittents are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. When checking it for proper connection, perform careful check of suspect circuits for:



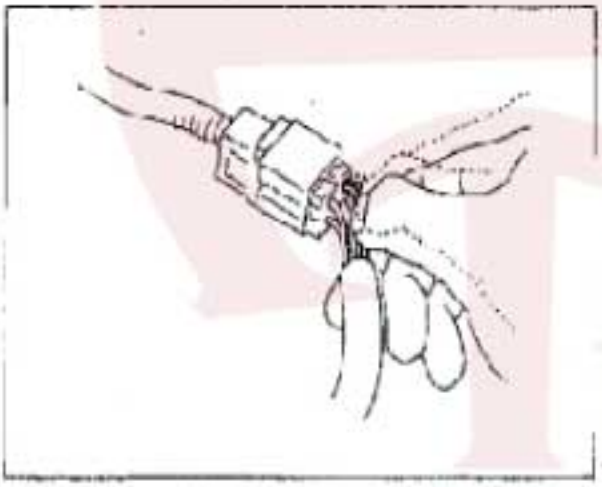
- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the like is prohibited.

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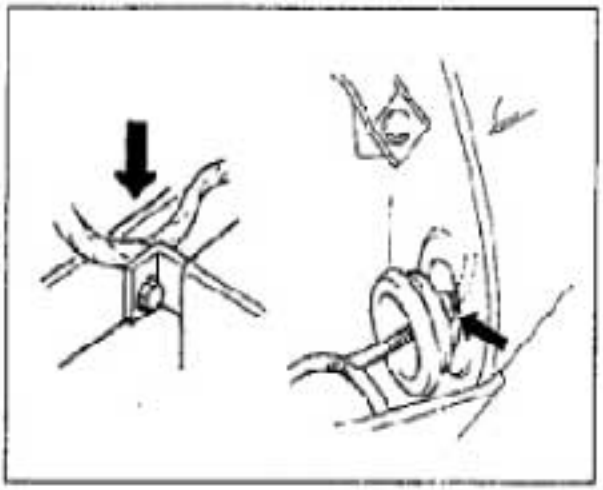


1. Check contact tension by inserting and removing just for once.
2. Check each terminal for bend and proper alignment.

- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal.
  If contact tension is not enough, reform it to increase contact tension or replace.

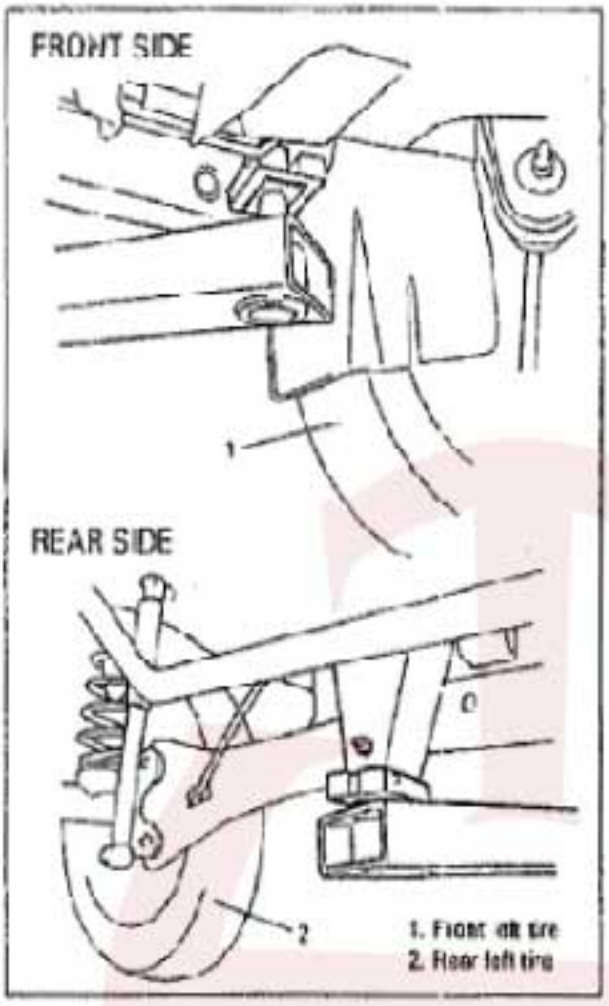


- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.



- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.
  If any abnormality is found, repair or replace.

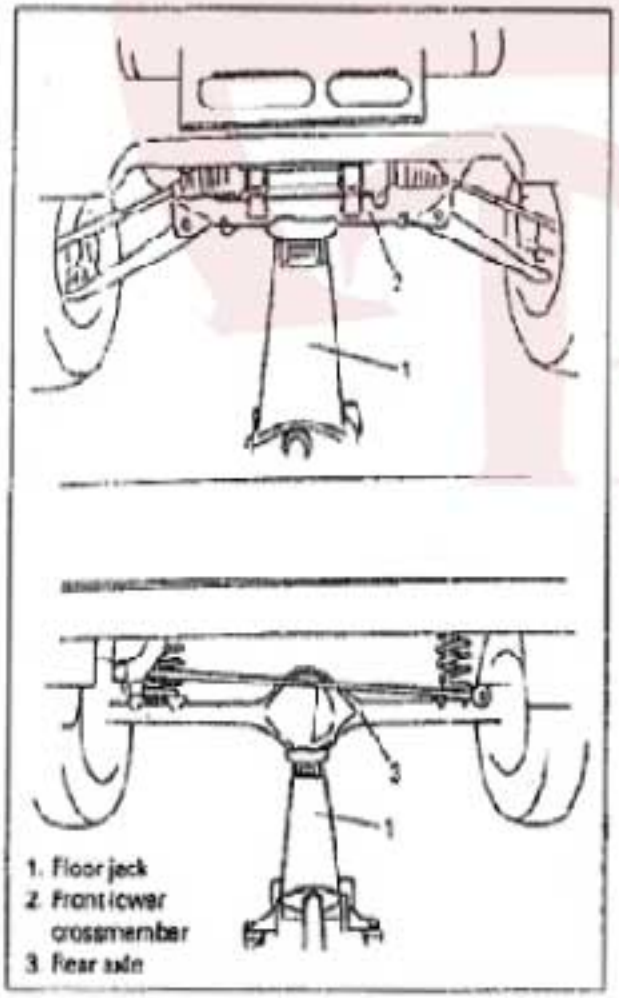
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VEHICLE LIFTING POINTS

WARNING:

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Before lifting up the vehicle, check to be sure that end of hoist arm is not in contact with brake pipe, fuel pipe, bracket or any other part.**
- **When using frame contact hoist, apply hoist as shown in figure (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**



When Using Floor Jack:

In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against the front end of the engine mounting member or rear axle.

To perform service with either front or rear vehicle end jacked up, be sure to place safety stands under body so that body is securely supported. And then check to ensure that body does not slide on safety stands and the vehicle is held stable for safety's sake.

WARNING:

- **Never apply jack against suspension parts (i.e., stabilizer, etc.) or vehicle floor, or it may get deformed.**
- **If the vehicle to be jacked up only at the front or rear end, be sure to block the wheels on ground in order to ensure safety. After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone.**

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ABBREVIATIONS MAY BE USED IN THIS MANUAL

A		
AC	:	Alternating Current
A/C	:	Air Conditioning
ABDC	:	After Bottom Dead Center
ABS	:	Antilock Brake System
A/F	:	Air Fuel Mixture Ratio
ATDC	:	After Top Dead Center
B		
B+	:	Battery Positive Voltage
BTDC	:	Before Top Dead Center
BBDC	:	Before Bottom Dead Center
C		
CO	:	Carbon Monoxide
CPU	:	Central Processing Unit
D		
DC	:	Direct Current
DTC	:	Diagnostic Trouble Code (Diagnostic Code)
E		
ECU	:	Electronic Control Unit
EVAP	:	Evaporative Emission
EVAP Canister	:	Evaporative Emission Canister (Charcoal Canister)
G		
GEN	:	Generator
GND	:	Ground
H		
HC	:	Hydrocarbons
I		
IG	:	Ignition
L		
LH	:	Left Hand
M		
Max	:	Maximum
Min	:	Minimum
M/T	:	Manual Transmission
N		
NOx	:	Nitrogen Oxides
O		
OHC	:	Over Head Camshaft
O2S	:	Oxygen Sensor
P		
P/S	:	Power Steering
PCV	:	Positive Crankcase Ventilation
R		
RH	:	Right Hand
S		
SOHC	:	Single Over Head Camshaft
T		
TWC		Three Way Catalytic Converter (Three Way Catalyst)
2WD		2 Wheel Drive
V		
VIN		Vehicle Identification Number
VSS		Vehicle Speed Sensor

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METRIC INFORMATION

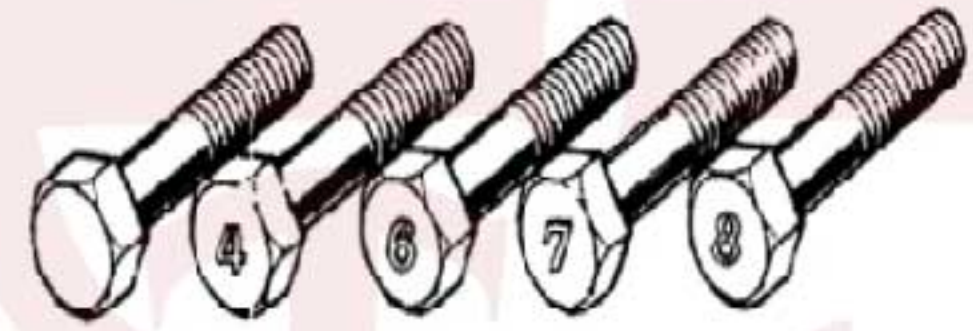
METRIC FASTENERS

Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Figure shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts division.





METRIC BOLTS-IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH-INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

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STANDARD TIGHTENING TORQUE

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- For the flanged bolt and nut, add 10% to the tightening torque given in the chart below.
- The chart below is applicable only where the fastened parts are made of steel or light alloy.

STRENGTH / THREAD DIAMETER (mm)	 "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1.5	0.15	1.0	2.3	0.23	2.0
5	3.0	0.30	2.5	4.5	0.45	3.5
6	5.5	0.55	4.0	10	1.0	7.5
8	13	1.3	9.5	23	2.3	17.0
10	29	2.9	21.0	50	5.0	36.5
12	45	4.5	32.5	85	8.5	61.5
14	65	6.5	47.0	135	13.5	98.0
16	105	10.5	76.0	210	21.0	152.0
18	160	16.0	116.0	240	24.0	174.0

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SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

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MAINTENANCE SCHEDULE (FOR FUEL INJECTED MODEL)

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (× 1,000)	10	20	30	40	50	60	70	80
	Miles (× 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
1. ENGINE									
1-1. Drive belt		—	—	—	I	—	—	—	R
1-2. Camshaft timing belt		Replace every 100,000 km (60,000 miles).							
1-3. Valve lash (clearance)		—	I	—	I	—	I	—	I
1-4. Engine oil and Engine oil filter (SE / SF / SG / SH / SJ)		R	R	R	R	R	R	R	R
1-5. Cooling system hoses and connections		—	—	—	I	—	—	—	I
1-6. Engine coolant		—	—	—	R	—	—	—	R
1-7. Exhaust pipes and mountings (except catalyst)		—	—	—	I	—	—	—	I&(R)
2. EMISSION CONTROL SYSTEM									
2-1. Crankcase ventilation hoses and connections		—	I	—	I	—	I	—	I
2-2. PCV valve		—	—	—	I	—	—	—	I
2-3. Fuel evaporative emission control system		—	I	—	I	—	I	—	I
3. ELECTRICAL SYSTEM									
3-1. Wiring harness and connections		—	—	—	I	—	—	—	I
4. IGNITION SYSTEM									
4-1. Spark plugs	When unleaded fuel is used	—	R	—	R	—	R	—	R
	When leaded fuel is used, refer to "Severe Driving Condition" schedule.								
4-2. Distributor cap and rotor		—	—	—	I	—	—	—	I
4-3. Ignition wiring		—	—	—	I	—	—	—	R
4-4. Ignition timing		—	—	—	I	—	—	—	I
5. FUEL									
5-3. Fuel tank cap		—	—	—	I	—	—	—	R
5-4. Air cleaner filter element		I	I	I	R	I	I	I	R
5-5. Fuel filler		Replace every 100,000 km (60,000 miles).							
5-6. Fuel lines and connections/Fuel tank		—	—	—	I	—	—	—	I

NOTE:

- "R" : Replace or change
- "I" : Inspect and correct or replace, if necessary
- Item 1-7 (R) is applicable to exhaust mounting rubber only.

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (× 1,000)	10	20	30	40	50	60	70	80
	miles (× 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
6. BRAKE									
6-1.	Brake discs and pads (front)	I	—	I	—	I	—	I	—
	Brake drums and shoes (rear)	I	—	I	—	I	—	I	—
6-2.	Brake hoses and pipes	I	—	I	—	I	—	I	—
6-3.	Brake fluid	—	I	—	R	—	I	—	R
6-4.	Brake pedal	—	I	—	I	—	I	—	I
6-5.	Brake lever and cable	I	—	I	—	I	—	I	—
7. CHASSIS AND BODY									
7-1.	Clutch	I	I	I	I	I	I	I	I
7-2.	Tires	I	I	I	I	I	I	I	I
7-3.	Wheel discs	I	I	I	I	I	I	I	I
7-4.	Suspension system	I	I	I	I	I	I	I	I
7-5.	Propeller shafts	—	I	—	I	—	I	—	I
7-6.	Manual transmission oil	I	I	I	R	I	I	I	R
7-7.	Differential oil	I	I	I	R	I	I	I	R
7-8.	Steering system	I	I	I	I	I	I	I	I
7-9.	All Latches, hinges and locks	I	I	I	I	I	I	I	I
7-10.	Gear shift control lever and shaft	I	I	I	I	I	I	I	I

NOTE:

- **"R" : Replace or change**
- **"I" : Inspect and correct or replace, if necessary**

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MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

- **A – Repeated short trips**
- **B – Driving on rough and/or muddy roads**
- **C – Driving on dusty roads**
- **D – Driving in extremely cold weather and/or salted roads**
- **E – Repeated short trips in extremely cold weather**
- **F – Leaded fuel use**

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
- B C - - -	Drive belt	I	Every 20,000 km (12,000 miles) or 12 months
		R	Every 40,000 km (24,000 miles) or 24 months
A - C D E -	Engine oil and oil filter	R	Every 5,000 km (3,000 miles) or 3 months
A B - D - -	Exhaust pipes and mountings	I	Every 10,000 km (6,000 miles) or 6 months
- - C - - -	Air cleaner filter element *1	I	Every 2,500 km (1,500 miles)
		R	Every 20,000 km (12,000 miles) or 12 months
A B C - E F	Spark plugs	R	Every 10,000 km (6,000 miles) or 6 months
A B - D - -	Propeller shafts	I	Every 10,000 km (6,000 miles) or 6 months
- B - - E -	Transmission (manual) and differential oil	R	Every 20,000 km (12,000 miles) or 12 months
- B - - - -	Bolts and nuts on chassis	T	Every 10,000 km (6,000 miles) or 6 months
A B C - - -	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 10,000 km (6,000 miles) or 6 months

NOTE:

- **"R" : Replace or change**
- **"I" : Inspect and correct or replace, if necessary**
- **"T" : Tighten to the specified torque**
- ***1 : Inspect or replace more frequently, if the vehicle is used under dusty conditions.**

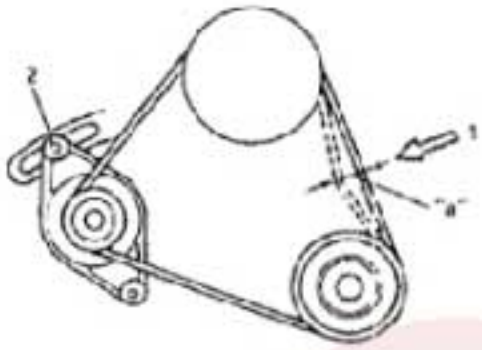
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MAINTENANCE SERVICE

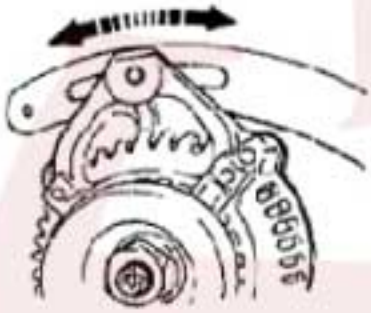
ENGINE

ITEM 1-1 Drive Belt

WARNING:
Disconnect negative cable at battery before checking and adjusting belt tension.



1. 10 kg (22 lbs)
2. Adjusting bolt



WATER PUMP BELT INSPECTION

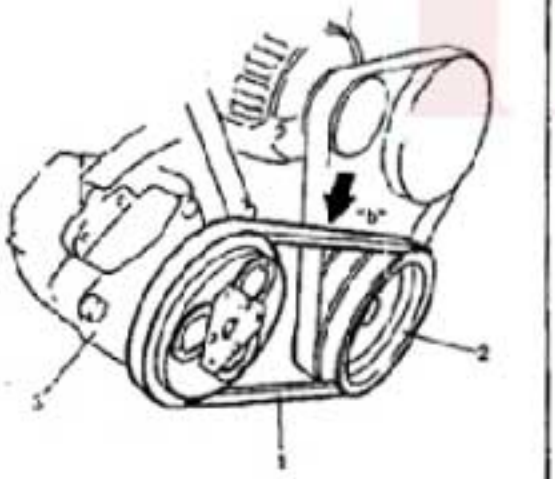
1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary, replace belt.
2) Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24 to 0.31 in.) under thumb pressure (about 10 kg (22 lbs)).

Belt tension "a": 6 – 8 mm (0.24 – 0.31 in.) as deflection

NOTE:
When replacing belt with a new one, adjust belt tension to 5 – 6 mm (0.20 – 0.24 in.).

WATER PUMP BELT REPLACEMENT

1) Disconnect negative cable from battery.
2) If equipped with A/C, remove A/C compressor drive belt (Refer to "A/C Compressor Drive Belt Replacement").
3) Replace water pump belt with new one.
4) Adjust belt tension to specification.
5) Connect negative cable to battery.



1. Drive belt
2. Crankshaft pulley
3. A/C compressor

A/C COMPRESSOR DRIVE BELT INSPECTION (IF EQUIPPED)

Inspect belt for wear, deterioration and tension.
Replace or adjust, if necessary.

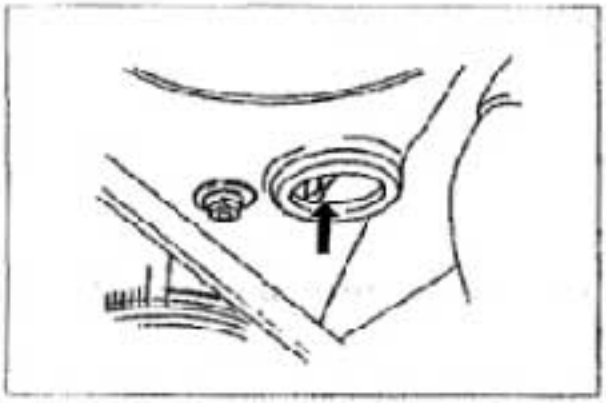
A/C compressor drive belt tension "b":
8 – 11 mm (0.31 – 0.43 in.) deflection under 10 kg (22 lbs) pressure

A/C COMPRESSOR DRIVE BELT REPLACEMENT (IF EQUIPPED)

1) Disconnect negative cable from battery.
2) Loosen belt tension and replace belt with new one.
3) Adjust belt tension to specification.
4) Connect negative cable to battery.

NOTE:
When replacing belt with a new one, adjust belt tension to 8 – 9 mm (0.31 – 0.35 in.).

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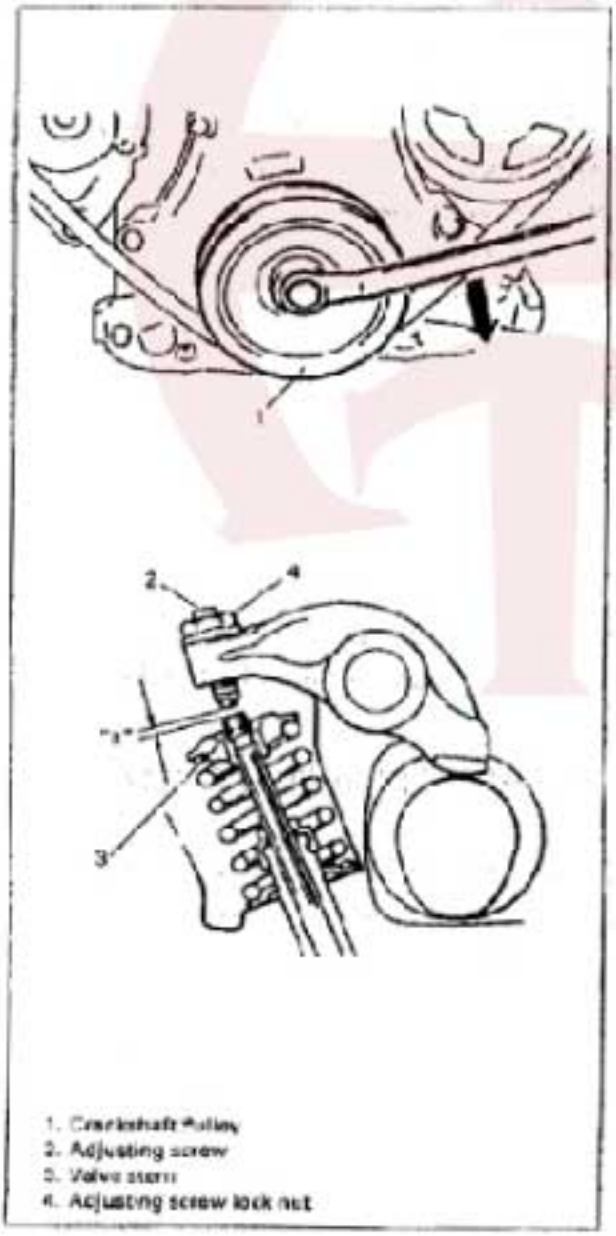
ITEM 1-2 Camshaft Timing Belt

INSPECTION

1) Remove check hole plug from timing belt outside cover.
2) Inspect timing belt for wear, crack, deterioration, oil stains and fluid stains using a light and mirror as required. Replace it as necessary.
3) Install plug to timing belt outside cover.

REPLACEMENT

Replace timing belt with new one referring to SECTION 6A.



ITEM 1-3 Valve Lash

INSPECTION

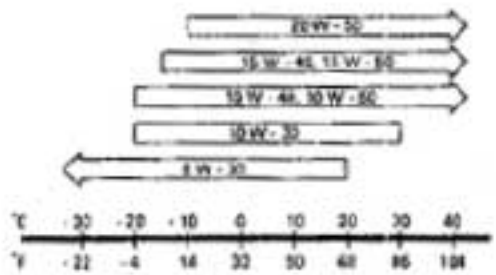
1) Disconnect cables at battery, then remove battery.
2) Disconnect PCV hose from cylinder head cover and remove warm air hose.
3) Remove cylinder head cover.
4) Inspect intake and exhaust valve lash and adjust as necessary.
   Refer to SECTION 6A for valve lash inspection and adjustment procedure.

		When cold (Coolant temperature is 15 – 25°C (59 – 77°F)	When hot (Coolant temperature is 60 – 68°C (140 – 154°F)
Valve lash (gap "a") specification	Intake	0.13 – 0.17 mm (0.005 – 0.007 in.)	0.23 – 0.27 mm (0.009 – 0.011 in.)
	Exhaust	0.15 – 0.19 mm (0.006 – 0.008 in.)	0.25 – 0.29 mm (0.010 – 0.011 in.)

5) Install cylinder head cover and tighten bolts to specification.
6) Connect PCV hose.
7) Install battery.
8) Connect battery cables at battery.

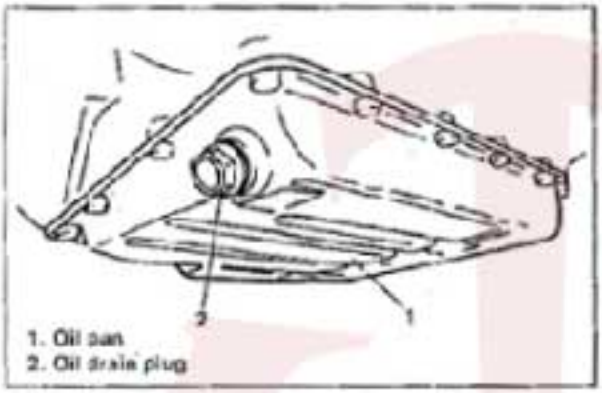
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Proper Engine Oil Viscosity Chart



ITEM 1-4 Engine Oil And Engine Oil Filter CHANGE

It is recommended to use engine oil of SE, SF, SG, SH or SJ class.
Select the appropriate oil viscosity according to the left chart.
Always change oil and oil filter as soon as possible after driving in a dust storm.
See Owner's Manual for further details.

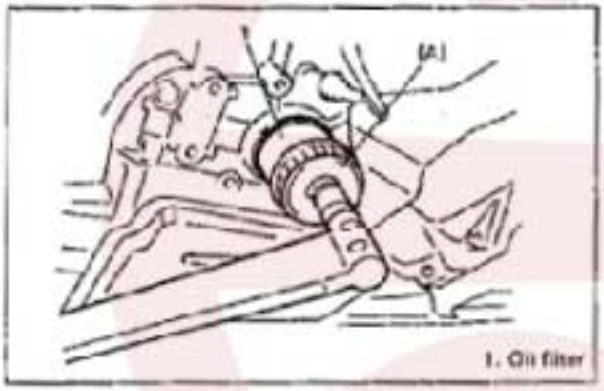


1. Oil pan
2. Oil drain plug

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to following work.

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

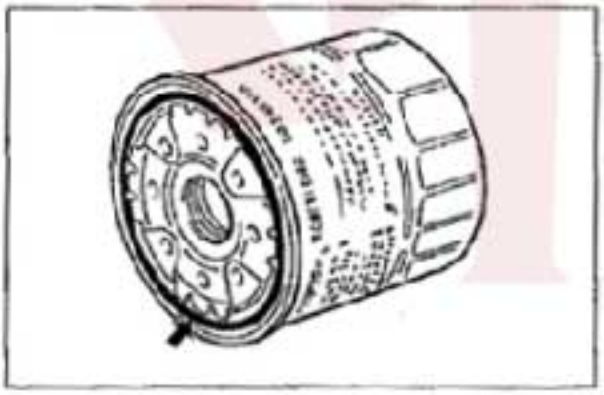
Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



1. Oil filter

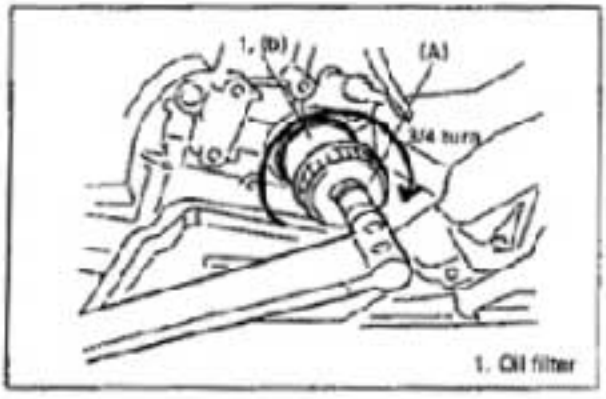
3) Loosen oil filter by using oil filter wrench (Special tool).

Special Tool
(A): 09915-47340



4) Apply engine oil to new oil filter O ring.
5) Screw new filter on oil filter stand by hand until filter O ring contacts mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position at which filter O ring first contacts mounting surface.



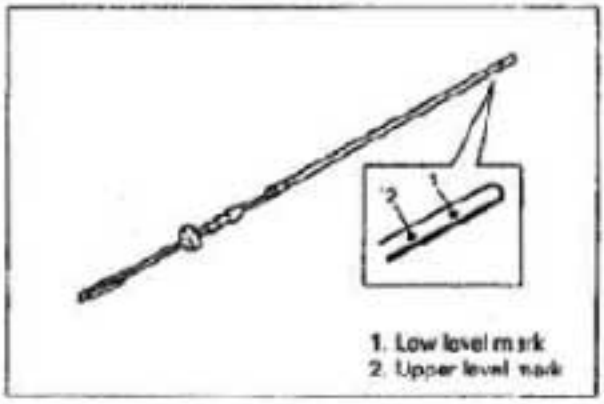
1. Oil filter

6) Tighten filter 3/4 turn from the point of contact with mounting surface using an oil filter wrench.

Special Tool
(A): 09915-47340

Tightening Torque
(b): 14 N·m (1.4 kg-m, 10.5 lb-ft)

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1. Low level mark
2. Upper level mark

7) Replenish oil until oil level is brought to FULL level mark on oil level gauge (dipstick). (about 4.0 liters (8.5/7.0 US/Imp pt). Filler inlet is at the top of cylinder head cover.
8) Start engine and run it for three minutes. Stop it and wait another 3 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dipstick.

Engine oil capacity

Oil pan capacity	About 3 qts.
Oil filter capacity	About .2 qts.
Others	About .3 qts.
Total	About 3.5 qts.

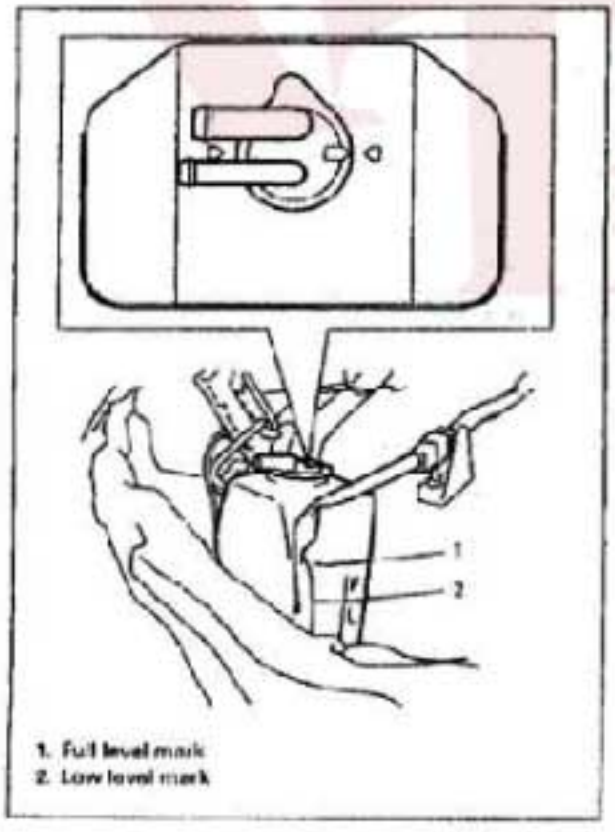
NOTE:
Engine oil capacity is specified as left table.
However, note that amount of oil required when actually changing oil may somewhat differ from data in left table depending on various conditions (temperature, viscosity, etc.).

9) Check oil filter and drain plug for oil leakage.

ITEM 1-5 Cooling System Hoses and Connections

INSPECTION

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.
2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.



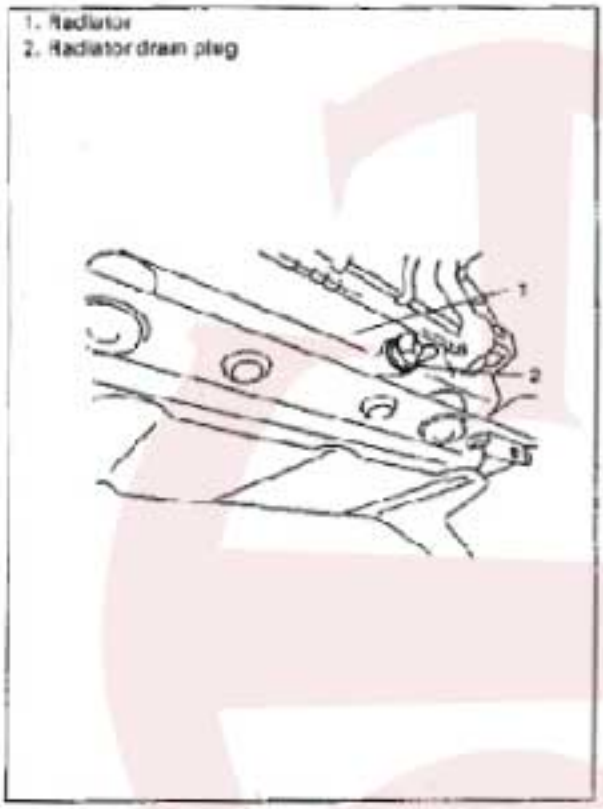
1. Full level mark
2. Low level mark

3) Clean frontal area of radiator core.
4) Test system and radiator cap for proper pressure holding capacity, 110 kPa (1.1 kg/cm^2, 15.6 psi).
If replacement cap is needed, use a cap designed for cooling system of this vehicle.
5) Check coolant level and concentration.
Add if necessary.
Refer to "Coolant Level" of SECTION 6B for procedure of level check.

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ITEM 1-6 Engine Coolant

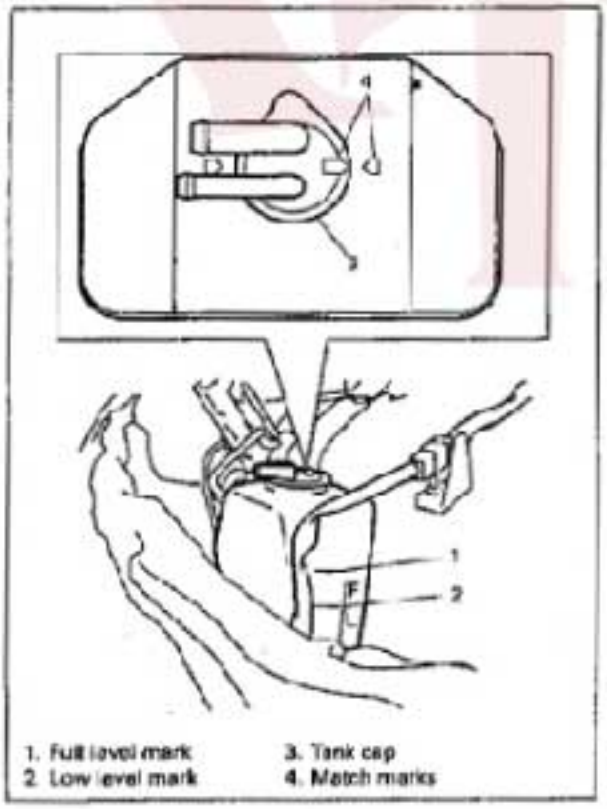
WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.



CHANGE

CAUTION:
The cap of thermostat cap must not be removed.

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir tank and drain.
4) Tighten drain plug securely. Also install reservoir tank.
5) Fill radiator with specified amount of coolant, bleed air from cooling system (refer to SECTION 6B) and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches filler throat of radiator. Reinstall radiator cap.



6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap to reservoir tank aligning match marks on the tank and cap.

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% ethylene-glycol base coolant (Anti-Freeze/Anti-corrosion coolant) for the market where ambient temperature falls lower than – 16°C (3°F) in winter and mixture of 70% water and 30% ethylene-glycol base coolant for the market where ambient temperature doesn't fall lower than –16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene-glycol base coolant should be used for the purpose of corrosion protection and lubrication.

Refer to SECTION 6B for COOLANT CAPACITY.

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ITEM 1-7 Exhaust Pipe And Mountings

WARNING:
To avoid danger of being burned, do not touch exhaust system when it is still hot.
Any service on exhaust system should be performed when it is cool.



INSPECTION

When carrying out periodic maintenance or vehicle is raised for other service, check exhaust system as follows:

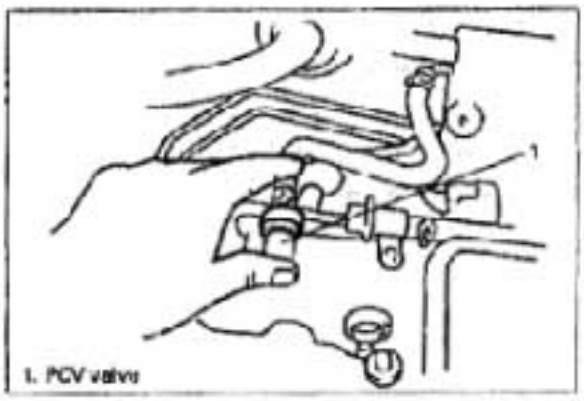
- Check rubber mountings for damage and deterioration.
- Check exhaust system for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification.
  Refer to SECTION 6K for torque specification of bolts and nuts.
- Check nearby body areas for damaged, missing or misposi-tioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into ve-hicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and pos-sible damage to floor carpet.
- Any defects should be fixed at once.

EMISSION CONTROL SYSTEM

ITEM 2-1 Crankcase Ventilation Hoses And CONNECTIONS

INSPECTION

Check crankcase ventilation hoses for leaks and cracks, if any of these is defective, repair or replace. Check to be sure that the hose connection is tight.



1. PCV valve

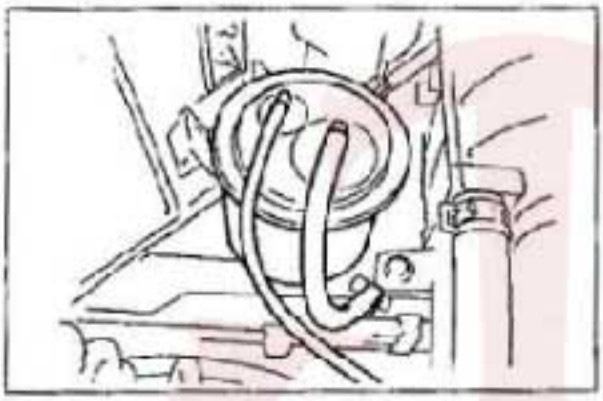
ITEM 2-2 PCV Valve

INSPECTION

1) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
2) Run engine at idle.
3) Place your finger over end of PCV valve to check for vacu-um. If there is no vacuum, check for clogged valve. Replace as necessary.

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4) After checking vacuum, stop engine and remove PCV valve. Shake valve and listen for the rattle of check needle inside the valve. If valve does not the rattle, replace valve.
5) After checking, remove plug and install PCV valve.



ITEM 2-3 Fuel Evaporative Emission Control System

INSPECTION

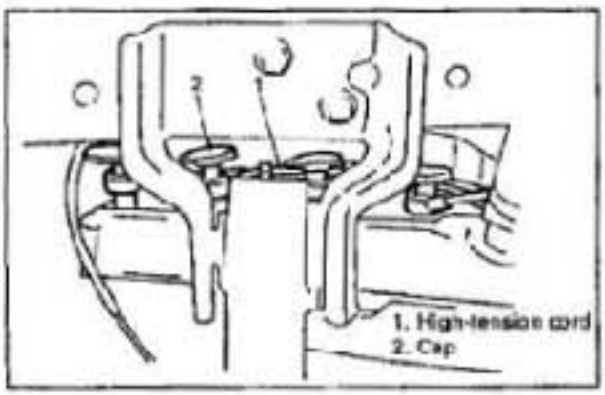
1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) If any of these is defective, repair or replace.
3) Check EVAP canister. Refer to "On-vehicle Service" of SECTION 6J for procedures to check EVAP canister.

ELECTRICAL SYSTEM

ITEM 3-1 Wiring Harness And Connections

INSPECTION

1) Visually inspect all wires in engine compartment for evidence of breakage.
   Inspect condition of insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.



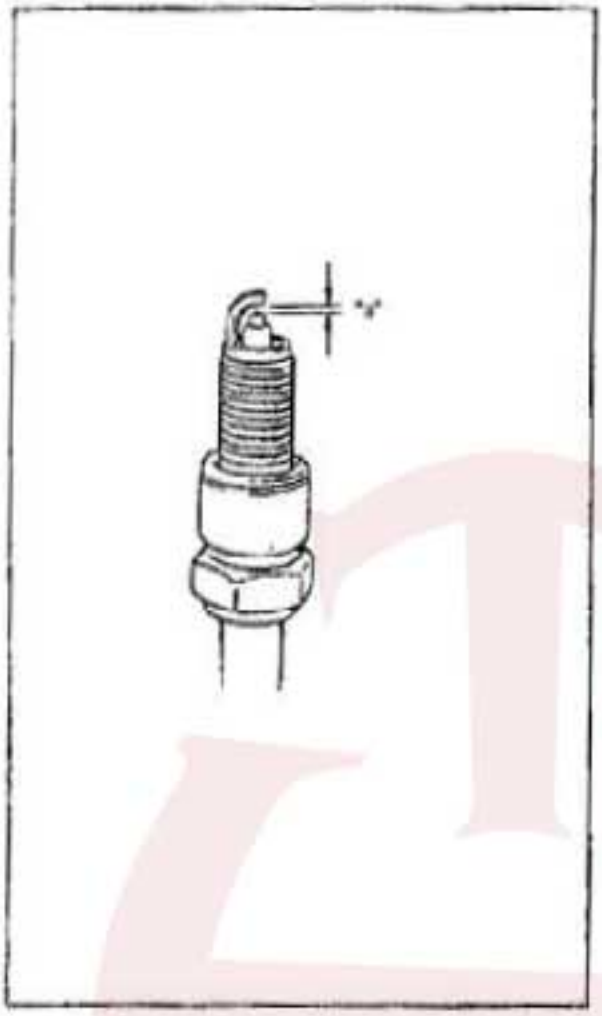
IGNITION SYSTEM

ITEM 4-1 Spark Plugs

REPLACEMENT

1) Hoist vehicle.
2) Dust off cylinder head around spark plugs.
3) Disconnect high-tension cords from spark plugs. Make sure to pull only on spark plug caps.
4) Using a spark plug wrench, loosen and remove plugs.

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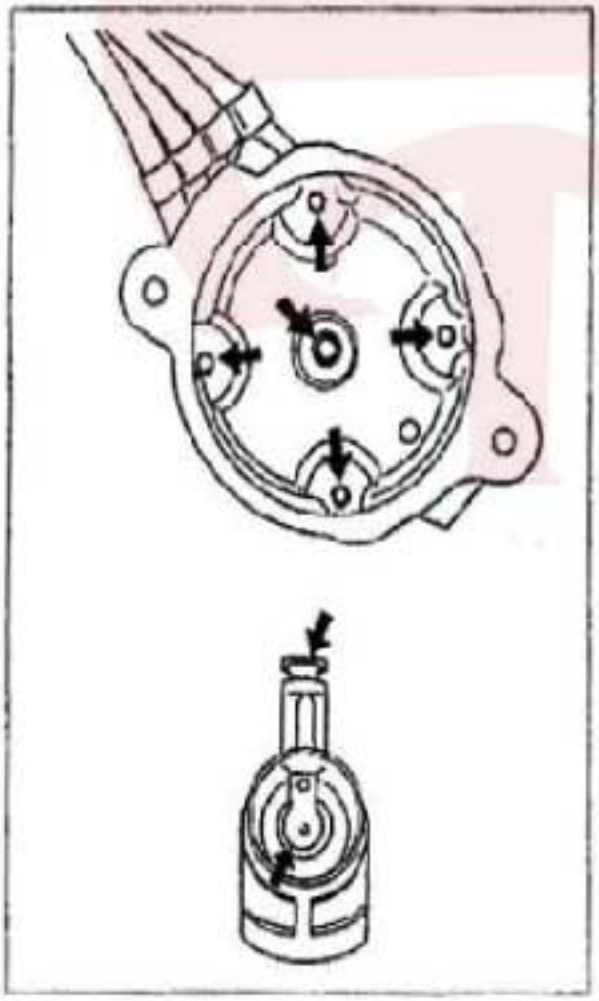
5) Install new spark plugs.

NOTE:
Make sure to use new plugs of specified heat range and size.
PLUG SPECIFICATION : AC Delco R45XLS
Clearance "a" : 0.7 – 0.8 mm (0.028 – 0.031 in.)

6) Tighten spark plugs to specified torque.

Tightening torque for spark plug:
15 N·m (1.5 kg-m, 10.5 lb-ft)

7) Connect high-tension cords to spark plugs. DO NOT push cords for connection. Push boots.



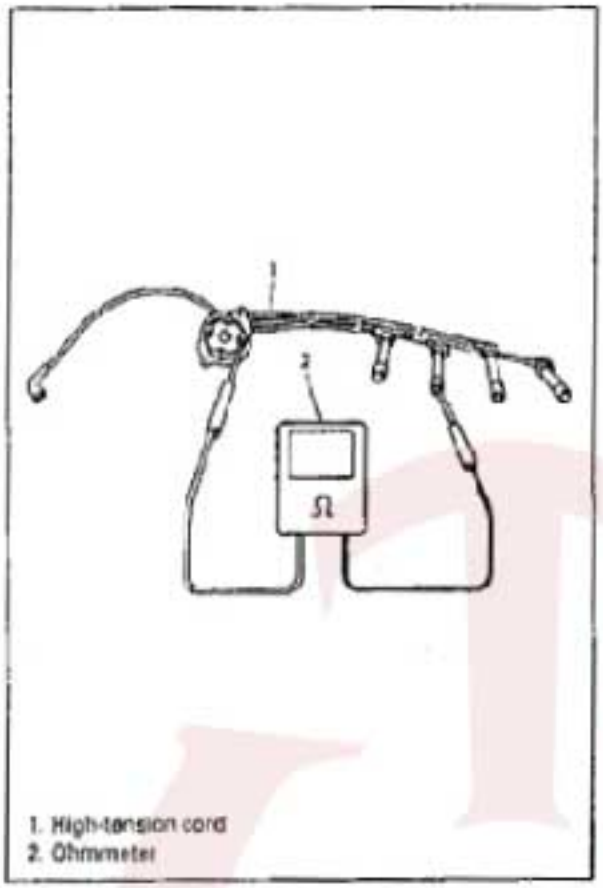
ITEM 4-2 Distributor Cap And Rotor

INSPECTION

1) Remove distributor service lid.
2) Inspect distributor cap and rubber caps for cracks.
3) Inspect center electrode and terminals for wear.
4) Inspect rotor for cracks, and its electrode for wear.
5) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

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1. High-tension cord
2. Ohmmeter

ITEM 4-3 Ignition Wiring (High-tension Cord)

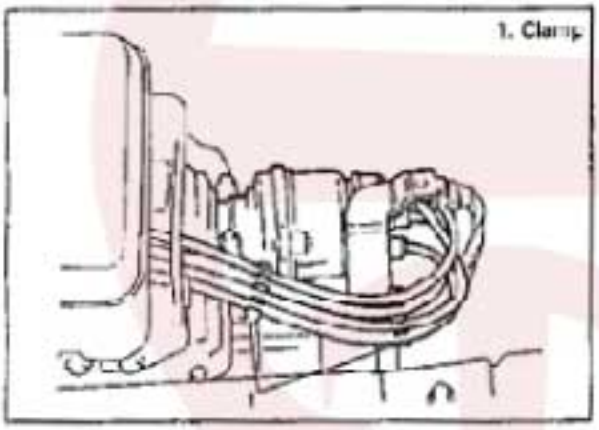
INSPECTION

Check high-tension cords for cracks, connections and resistance. Refer to SECTION 6F for resistance data and measuring procedure.

Replace high-tension cords that show evidence of deterioration.

NOTE:

Check to make sure that each of the high-tension cord terminals and connections is secure and fully inserted into its mating component. Any burnt fitting must be replaced.


1. Clamp

REPLACEMENT

1) Disconnect high-tension cords from spark plugs, ignition coil and distributor.
2) Connect new high-tension cords and clamp them securely. DO NOT push cords for connection. Push caps.

ITEM 4-4 Ignition Timing

INSPECTION

Check to make sure that ignition timing is set properly. If out of specification, adjust it.

Refer to SECTION 6F for inspection and adjustment procedure.

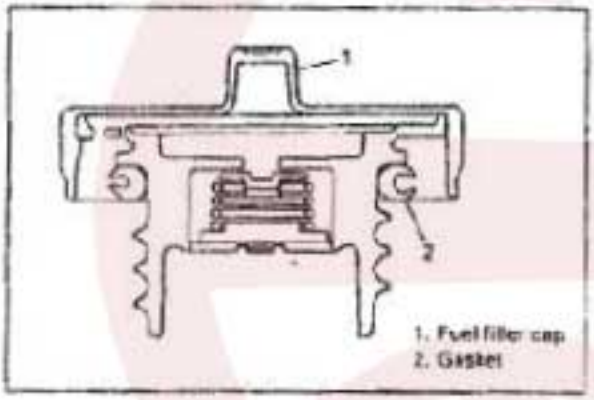
ITEM 4-5 Distributor Advancer

INSPECTION

Check centrifugal and vacuum advancers for proper operation.

Refer to SECTION 6F for checking procedure.

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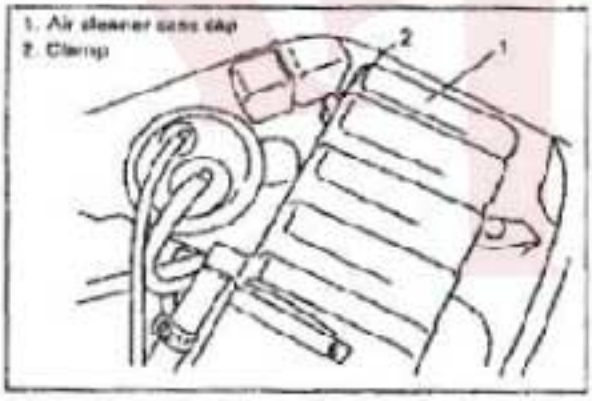


ITEM 5-3 Fuel Tank Cap

INSPECTION

Visually inspect gasket of fuel tank cap. If it is changed or deteriorated, replace it with new one.

CAUTION:
Be sure to use a new specified cap. Failure to use correct cap can result in critical malfunction of system.

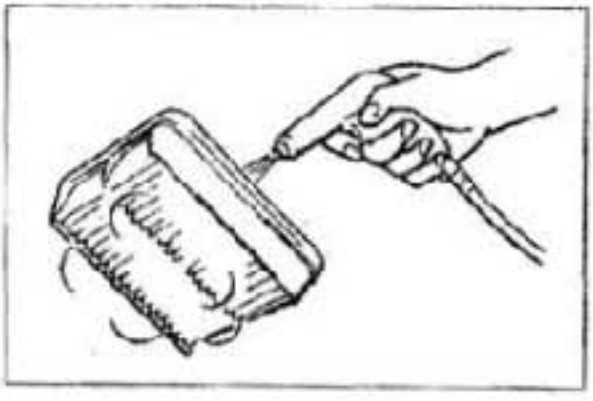


ITEM 5-4 Air Cleaner Filter Element

REPLACEMENT

NOTE:
Replace more often under dusty conditions. Ask your dealer for proper replacement interval for your driving conditions.

Replace air cleaner element with new one according to procedure described in SECTION 6A.

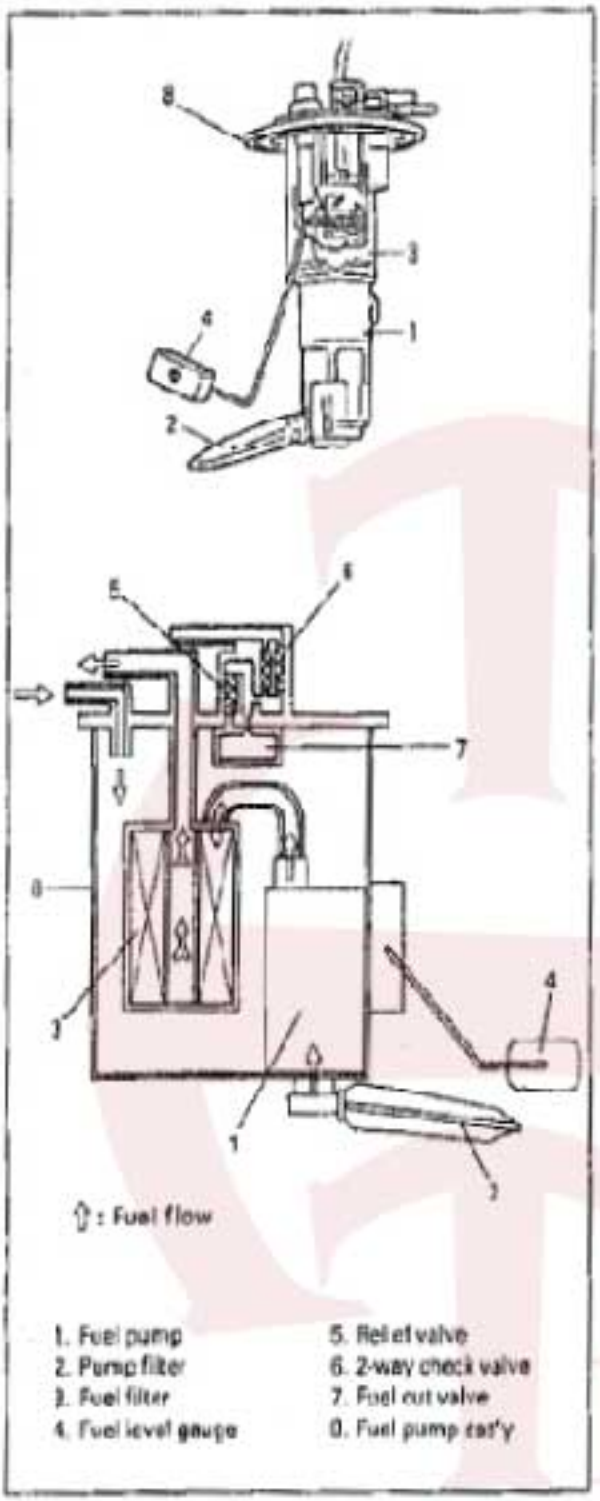


INSPECTION AND CLEANING

1) Visually check that air cleaner element is not excessively dirty, damaged or oily.
2) Clean element with compressed air from air outlet side of element.

NOTE:
If vehicle is used in dusty area, clean every 2,500 km (1,500 miles) or more frequently.

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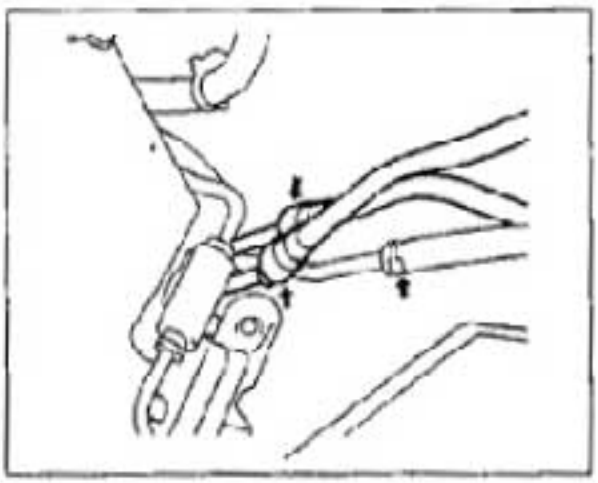
ITEM 5-5 Fuel Filter

REPLACEMENT

WARNING:
This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Fuel filter is located in the fuel tank, included in fuel pump assembly.

Replace fuel filter with new one periodically, referring to SECTION 6C for removal and installation.

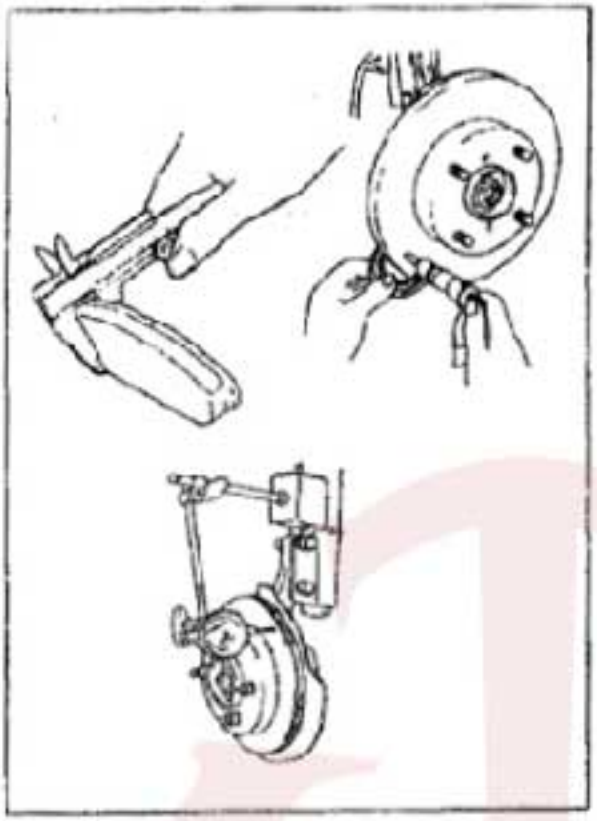


ITEM 5-6 Fuel Lines And Connections/Fuel Tank

INSPECTION

- Check fuel tank, fuel lines and connections for evidence of fuel leakage, hose cracking, deterioration and damage. Make sure all clamps are secure.
  Repair leaky joints, if any.
  Replace hoses that are suspected of being cracked.

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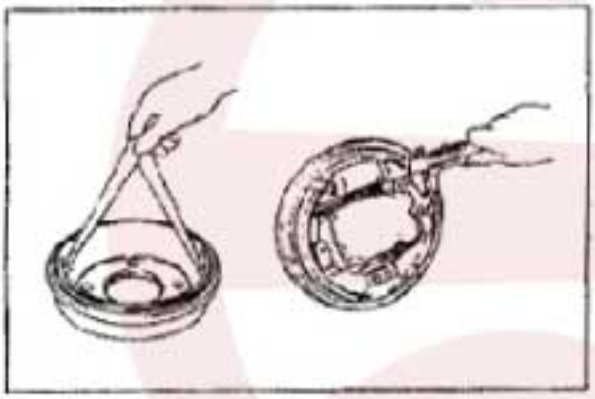
BRAKE

ITEM 6-1 Brake Discs And Pads (Front)

INSPECTION

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to SECTION 5.
   Be sure to torque caliper pin bolts to specification.

NOTE:
If noise is heard from front brake when brake pedal is depressed, check brake pad lining for wear. If it is worn, both right and left brake pads should be replaced with new ones.



Brake Drums And Shoes (Rear)

INSPECTION

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leakage. Replace as necessary.
   For the details, refer to SECTION 5.



ITEM 6-2 Brake Hoses And Pipes

INSPECTION

Perform this inspection where there is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing, wear, corrosion, bends, twists and other damage.
  Replace any of these parts as necessary.
- Check all clamps for tightness and connections for leakage.
- Check that hoses and pipes are clear of sharp edges, moving parts.

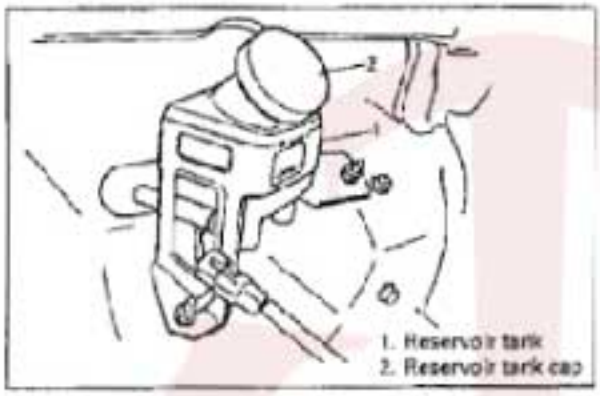
CAUTION:
After replacing any brake pipe or hose, be sure to carry out air purge operation.

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ITEM 6-3 Brake Fluid

INSPECTION

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.



2) Check fluid level.
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

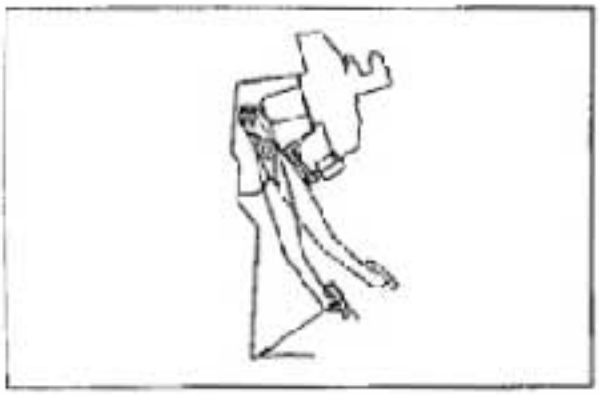
   Brake fluid: Refer to reservoir tank cap.

   For the details, refer to "On-vehicle Service" of SECTION 5.

CAUTION:
Since brake system of this vehicle is factory-filled with brake fluid indicated on reservoir tank cap, do not use or mix different type of fluid when refilling; otherwise serious damage will occur.
Do not use old or used brake fluid, or any fluid from a unsealed container.

CHANGE

Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with above recommended fluid and carry out air purge operation.
For air purging procedure, refer to SECTION 5.

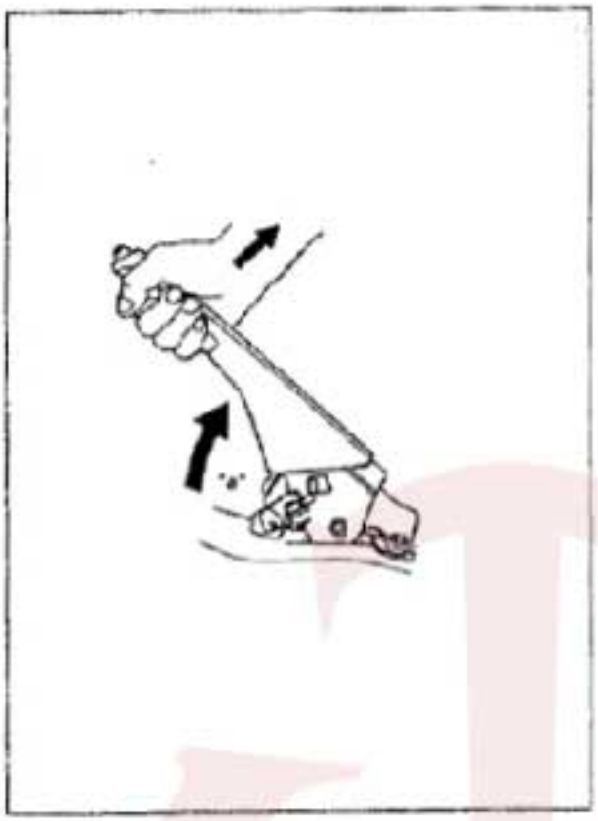


ITEM 6-4 Brake Pedal

INSPECTION

Check brake pedal travel.
For checking procedure, refer to "Pedal Travel Check" of SECTION 5.

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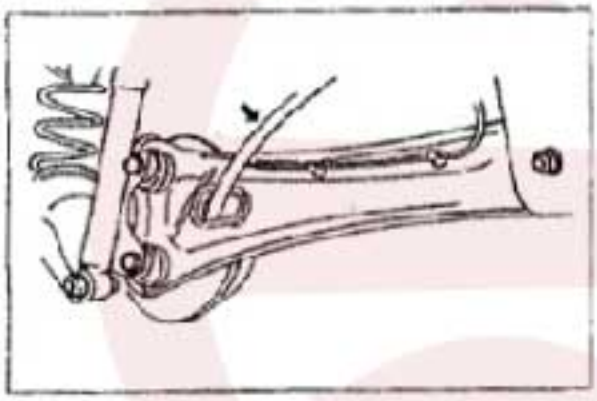


ITEM 6-5 Brake Lever And Cable

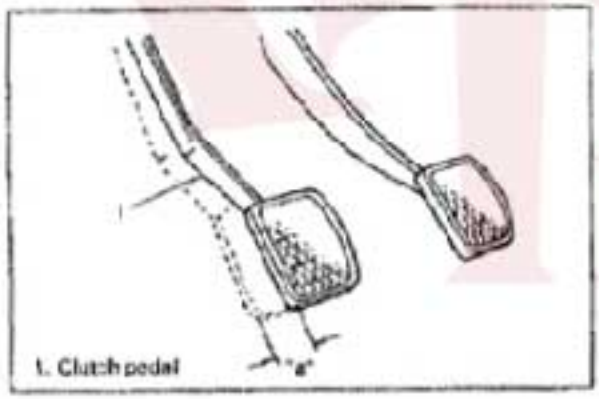
INSPECTION

- Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
- Check parking brake lever for proper operation and stroke, and adjust it if necessary.
  For checking and adjusting procedures, refer to "Parking Brake Inspection And Adjustment" of SECTION 5.

"a": Parking brake lever stroke
4 – 7 notches (With 20 kg (44 lbs) of pull pressure)



- Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.



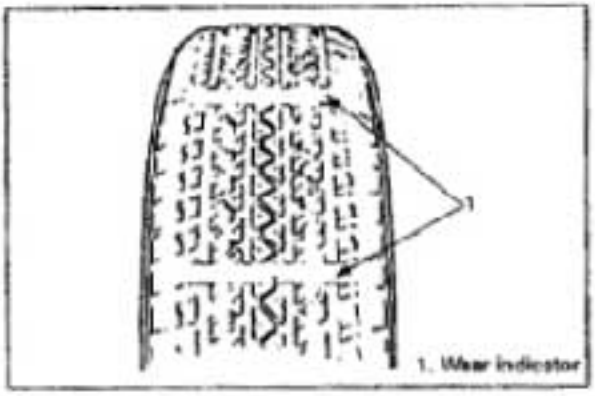
CHASSIS AND BODY

ITEM 7-1 Clutch

INSPECTION

Check clutch pedal free travel. Refer to SECTION 7C for procedure to check and adjust it.

"a" : Pedal free travel
10 – 15 mm (0.6 – 0.8 in.)



ITEM 7-2 Tires

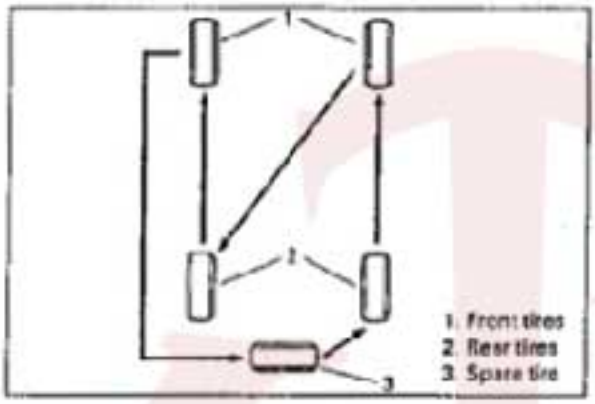
INSPECTION

1) Check tire for uneven or excessive wear, or damage. If defective, replace.

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2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:
- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with vehicle.**



TIRE ROTATION

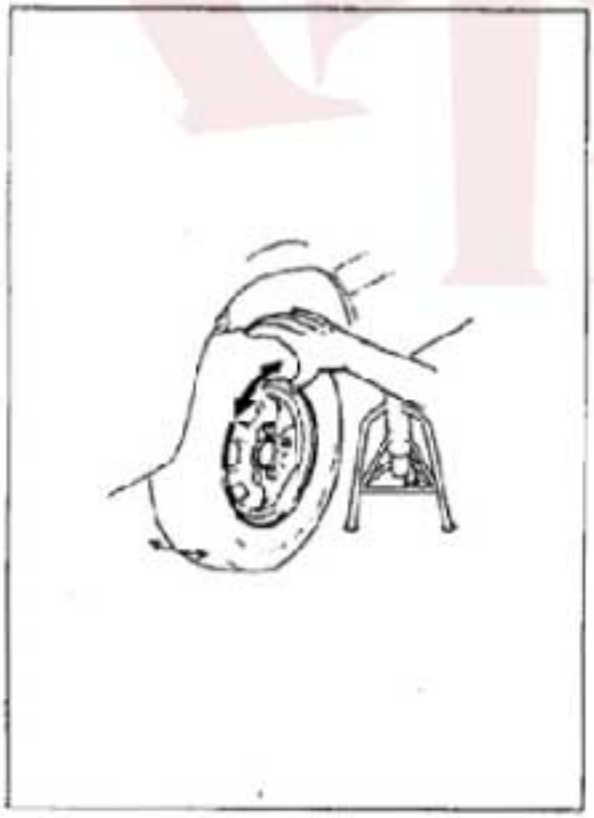
Rotate tires.

For details of the steps, refer to SECTION 3F.

ITEM 7-3 Wheel Discs

WHEEL DISC INSPECTION

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.



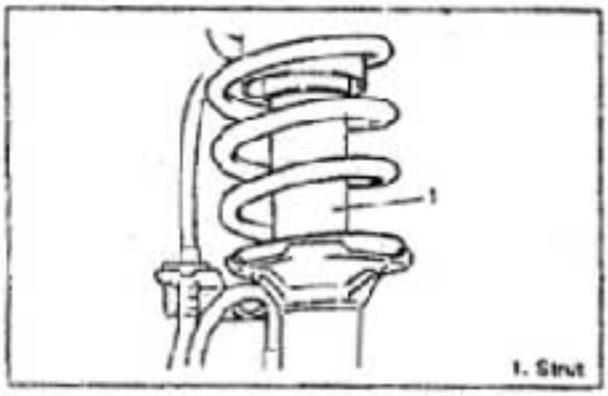
WHEEL BEARING INSPECTION

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to "Front Suspension Inspection" of SECTION 3D.
2) Check rear wheel bearing for wear, damage abnormal noise or rattle. For details, refer to "Rear Suspension Inspection" of SECTION 3E.

WHEEL NUTS

Check wheel nuts for tightness and, retighten them to specified torque.

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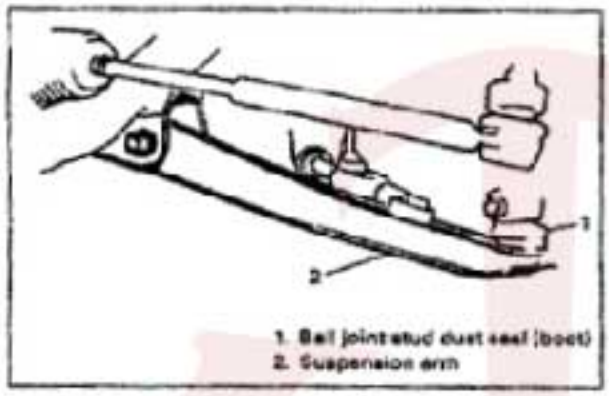


1. Strut

ITEM 7-4 Suspension System

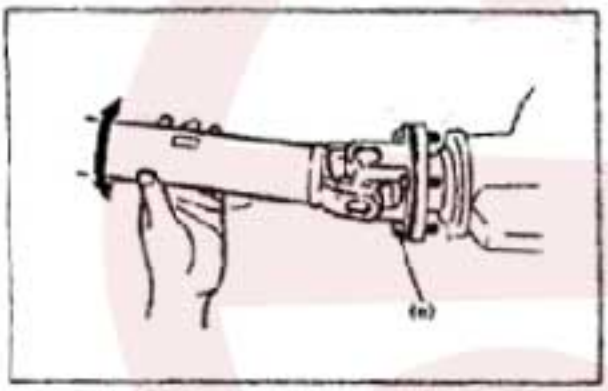
INSPECTION

- Inspect front & rear shock absorber for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
  Replace defective parts, if any.



1. Ball joint stud dust seal (boot)
2. Suspension arm

- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
  Repair or replace defective parts, if any.
- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage.
  Replace defective boot, if any.
- Check suspension bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.

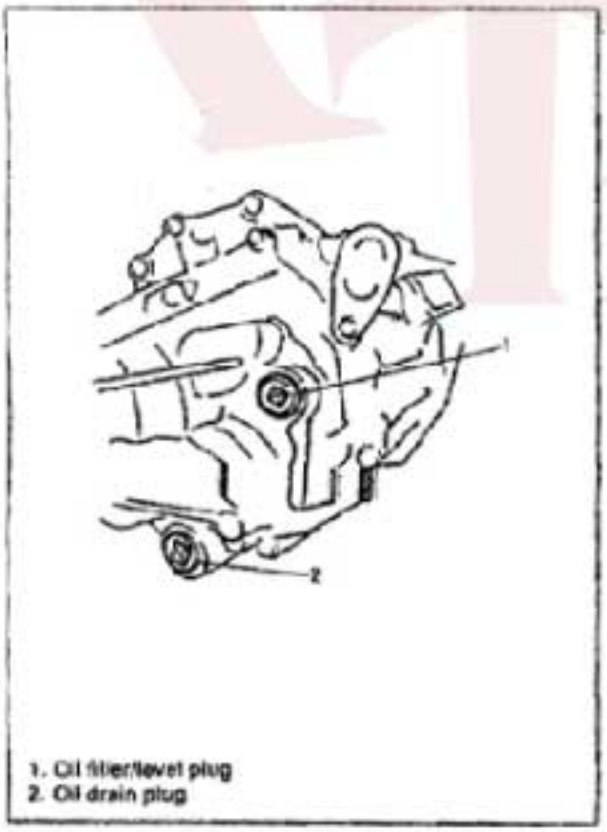


ITEM 7-5 Propeller Shafts

INSPECTION

1) Check universal joint and spline of propeller shaft for rattle.
   If rattle is found, replace defective part with a new one.
2) Check propeller shaft flange yoke bolts & nuts for tightness, and retighten them as necessary:

   Tightening Torque
   (a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)



1. Oil filler/level plug
2. Oil drain plug

ITEM 7-6 Manual Transmission Oil

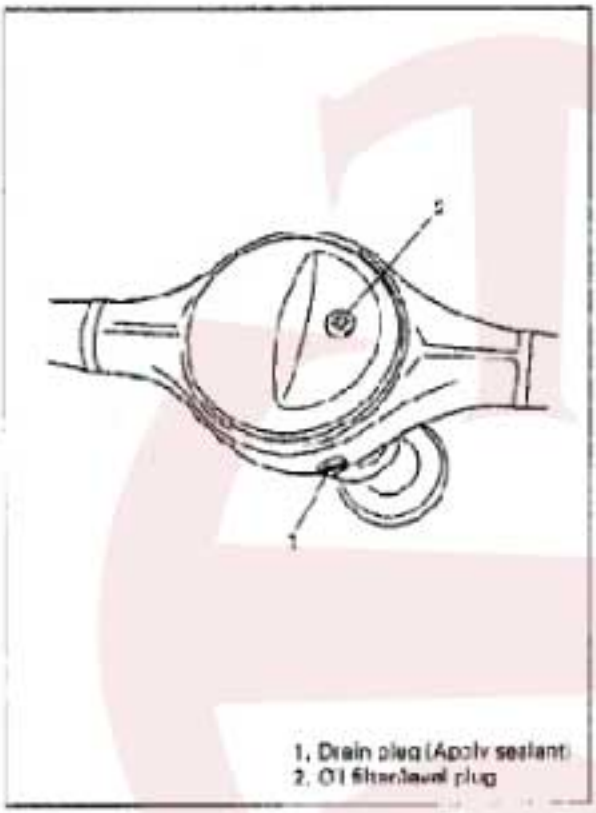
INSPECTION

1) Inspect transmission case for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level plug of transmission. Oil level can be checked roughly by means of filler/level plug hole.
   That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole.
   For specified oil, refer to description of oil change under "On-vehicle Service" in SECTION 7A.
4) Tighten level plug to specified torque.

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CHANGE

1) Place the vehicle level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to "On-vehicle Service" of SECTION 7A.



1. Drain plug (Apply sealant)
2. Oil filler/level plug

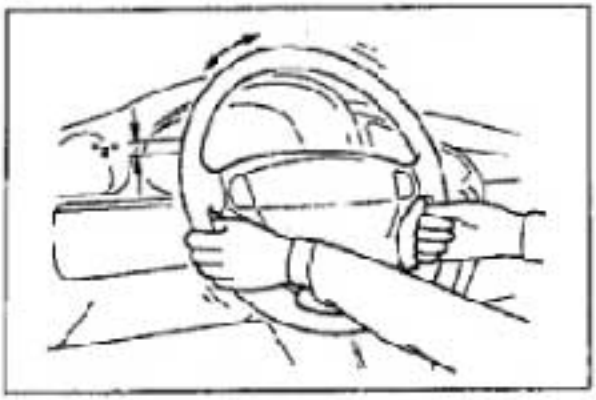
ITEM 7-7 Differential Oil

INSPECTION

1) Inspect differential housings for evidence of oil leakage. Repair leaky point, if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove level plug of differential. Oil level can be checked roughly by means of level plug hole.
   That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled. If oil is found insufficient, pour specified oil up to level hole.
   For specified oil, refer to description of oil change under "On-vehicle Service" in SECTION 7F.
4) Tighten level plug to specified torque.

CHANGE

1) Place the vehicle level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to "On-vehicle Service" of SECTION 7F.



ITEM 7-8 Steering System

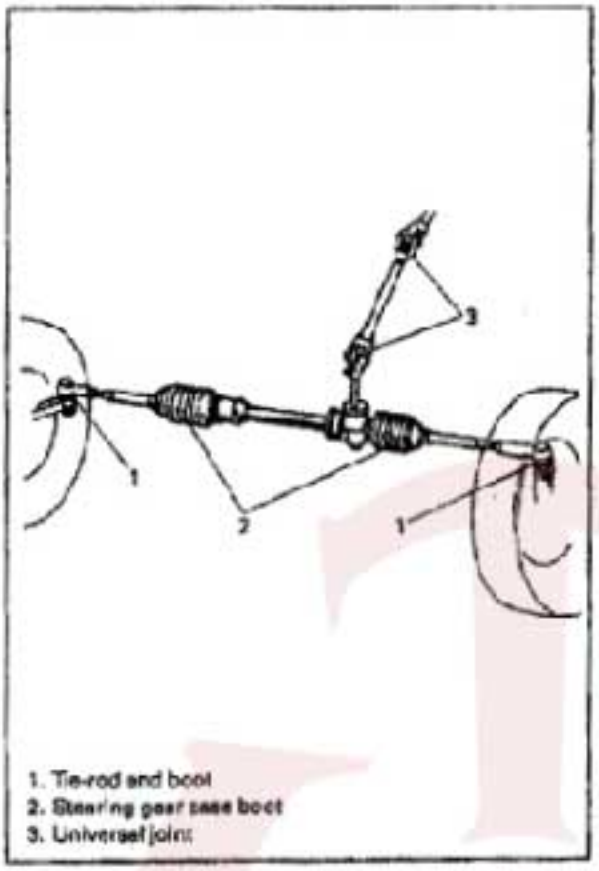
INSPECTION

1) Check steering wheel for play and rattle, holding vehicle straight on ground.

   Steering wheel play "a" : 0 – 30 mm (0.0 – 1.2 in.)

2) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.

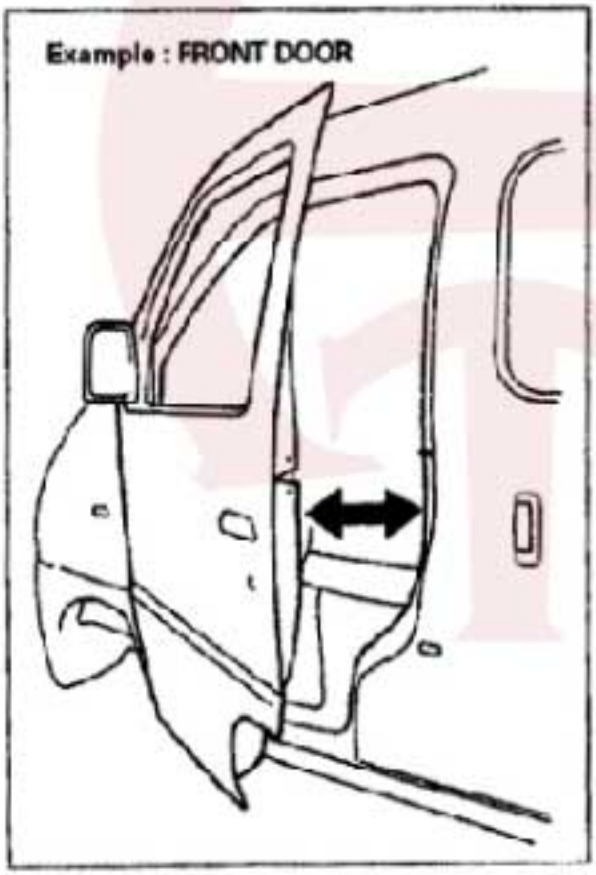
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1. Tie-rod end boot
2. Steering gear case boot
3. Universal joint

3) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
4) Check boots of steering linkage and steering gear case for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
5) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
6) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.
7) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
   Refer to "Tightening Torque Specification" of SECTION 3B and 3C (or 3C1) for particular check points.
8) Check wheel alignment.

NOTE:
For the details of wheel alignment, refer to "Wheel Alignment" of SECTION 3A.



ITEM 7-9 All Latches, Hinges And Locks

INSPECTION

Check that each door of front food, front, rear and back doors opens and closes smoothly and locks securely when closed.
If any malfunction is found, lubricate hinge and latch or repair door lock system.
Refer to SECTION 9 for lubrication to rear sliding door.

ITEM 7-10 Gear Shift Control Lever And Shaft

INSPECTION

Check that gear shift control lever move smoothly without abnormal noise.
If defective, lubricate as follows.
Lubricate lever seat and shaft bushings with water resistant chassis grease.

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FINAL INSPECTION

WARNING:
When carrying out road tests, select a safe place where no man or no running vehicle is seen so as to prevent any accident.

Engine Hood Latch
Check that hood opens and closes smoothly and properly. Lubricate if necessary. Also check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way.) and hood locks securely when closed.

Doors
Check that each door opens and closes smoothly and locks securely when closed.

Seats
Check that reclining mechanism of front seat back allows it to be locked at any angle.

Seat Belt
Inspect belt system including webbing, buckles, latch plates, retractors and anchors for camage or wear.
Check that seat belt is securely locked.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If battery is equipped with built-in indicator, check battery condition by the indicator.

Accelerator Pedal Operation
Check that pedal operates smoothly without getting caught or interfered by and other part.

Engine Start
Check engine start for readiness.

WARNING:
Before performing the following check, be sure to have enough room around the vehicle. Then, firmly apply both the parking brake and the regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the vehicle could move without warning and possibly cause personal injury or property damage.

Place the shift lever in "Neutral," push the clutch halfway and try to start. The starter should crank only when the clutch is fully depressed.

Exhaust System Check
Check for leakage, cracks or loose supports.

Clutch
Check for the following.
- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating,
- Clutch itself is free from any abnormal condition.

Gearshift or Selector Lever (Transmission)
Check gear shift or selector lever for smooth shifting to all positions and for good performance of transmission in any position.

Brake
[Foot brake]
Check the following:
- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that braking force is applied equally on all wheels,
- and that brake do not drag.

[Parking brake]
Check that lever has proper travel.

WARNING:
With vehicle parked on a fairly steep slope, make sure nothing is in the way downhill to avoid any personal injury or property damage. Be prepared to apply regular brake quickly even if vehicle should start to move.

Check to ensure that parking brake is fully effective when the vehicle is stopped on the safe slope and brake lever is pulled all the way.

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Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling.
- Check that the vehicle does not wander or pull to one side.

Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheels and Power Transmitting System

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

Meters and Gauge

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights

Check that all lights operate properly.

Windshield Defroster

Periodically check that air comes out from defroster outlet when operating heater or air conditioning.

Set fan switch lever to "HI" position for this check.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil recommendation	SE, SF, SG, SH or SJ (Refer to engine oil viscosity chart in Item 1-4.)
Engine coolant (long life coolant)	Ethylene-glycol base coolant ("Antifreeze/Anticorrosion coolant")
Brake fluid	Refer to reservoir tank cap or owner's manual
Manual transmission oil	See oil chart on SECTION 7A
Gear shift control lever and shaft/cables	Water resistance chassis grease
Door hinges	Engine oil
Engine hood latch	Engine oil
Key lock cylinder	Spray lubricant

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SECTION 1A

HEATER AND VENTILATION

CONTENTS

DIAGNOSIS 1A-2

ON-VEHICLE SERVICE 1A-2

Wiring Circuit 1A-2

Heater Unit 1A-3

Heater Blower Motor Resistor 1A-5

Heater Blower Motor Switch 1A-6

Heater Control Cables 1A-6

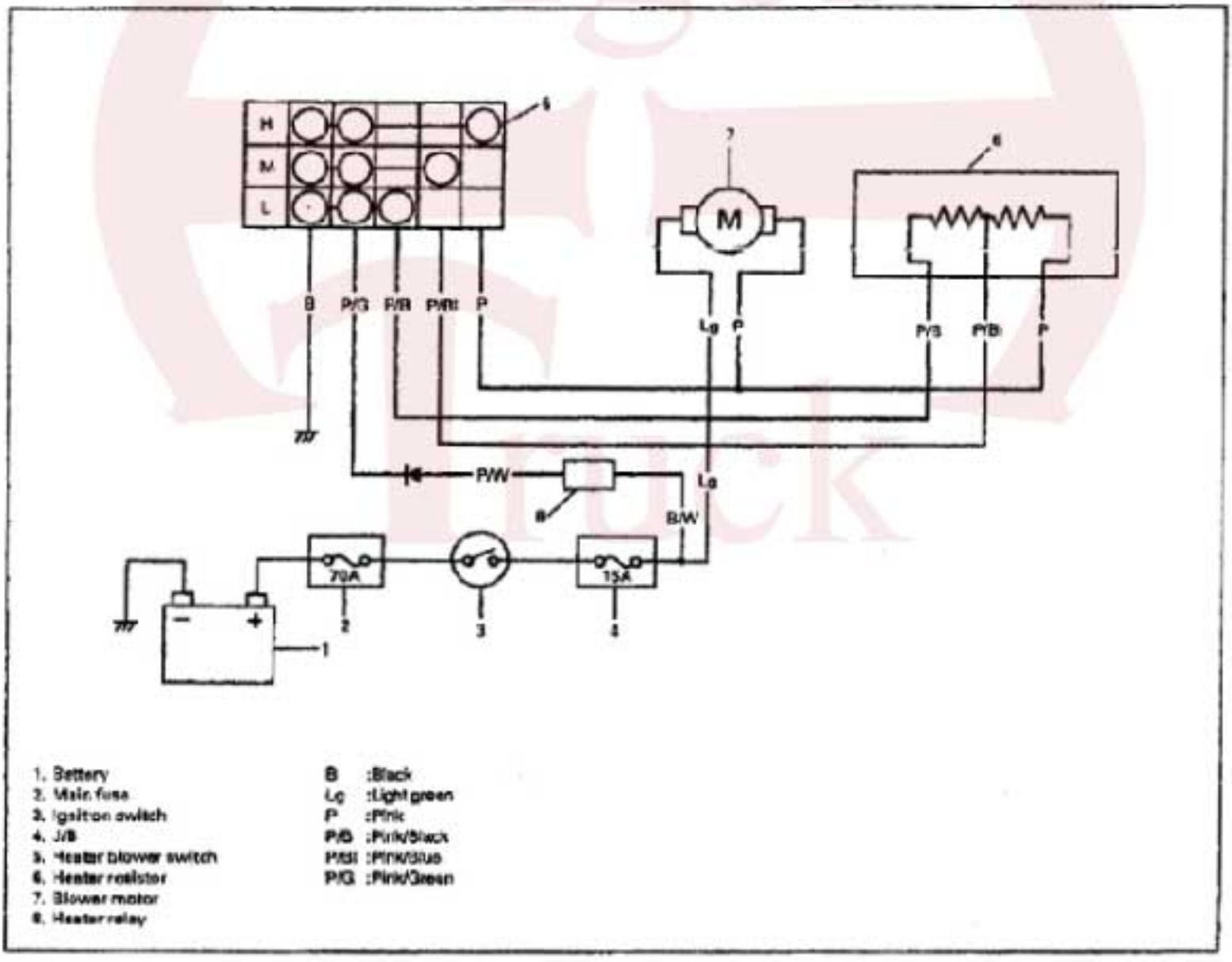
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DIAGNOSIS

Trouble	Possible Cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower resistor faulty	Check continuity.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output	Control cables broken or binding	Check cables.
	Air damper broken	Repair damper.
	Air ducts clogged	Repair air ducts.
	Heater core leaking or clogged	Replace heater core.
	Heater hoses leaking or clogged	Replace hoses.

ON-VEHICLE SERVICE

WIRING CIRCUIT

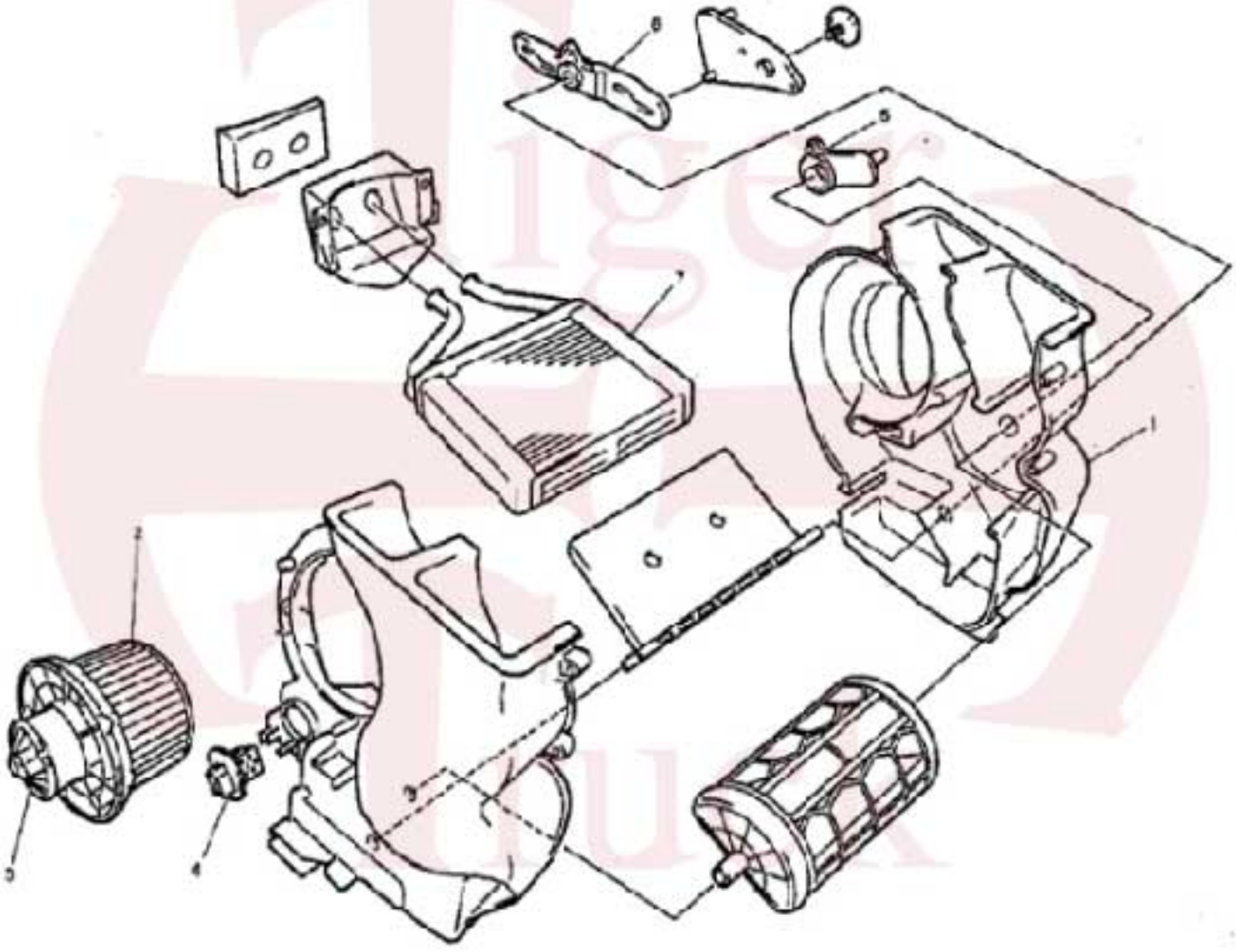


1. Battery
2. Main fuse
3. Ignition switch
4. J/B
5. Heater blower switch
6. Heater resistor
7. Blower motor
8. Heater relay

B :Black
Lg :Light green
P :Pink
P/B :Pink/Black
P/Bl :Pink/Blue
P/G :Pink/Green

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HEATER UNIT



1. Heater unit assembly
2. Blower fan
3. Fan motor
4. Resistor
5. Mode lever
6. Air mix link
7. Heater core

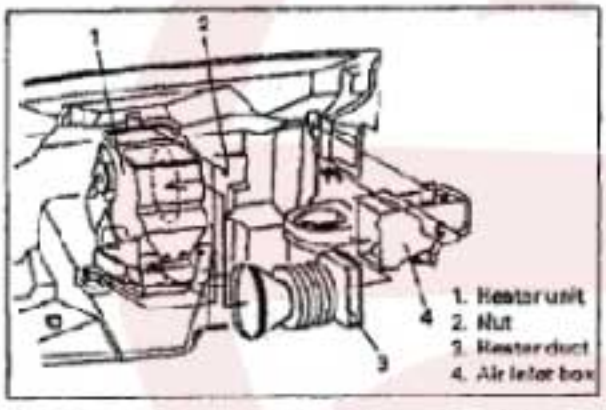
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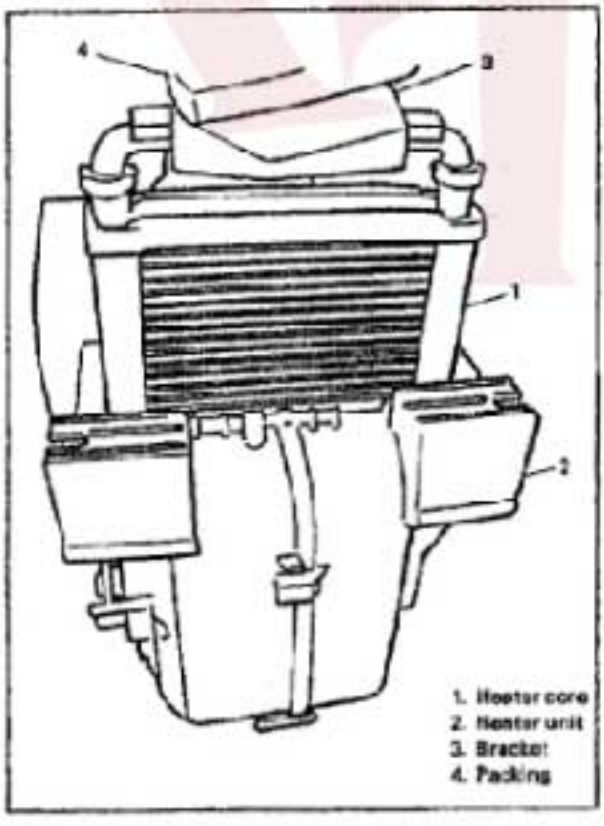
REMOVAL

WARNING:
Please observe all WARNINGS, CAUTIONS, "Service Precautions" under "On Vehicle Service" before performing service on Air Bag System Component. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.

1) Disconnect negative (–) cable at battery.
2) Drain engine coolant and disconnect heater hoses from heater unit.
3) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 3C1.
4) Remove instrument panel, refer to "Instrument Panel" in Section 9. Disconnect instrument wire harness clamps from steering support member, and remove steering support member.
5) Disconnect blower motor and resistor lead wires at coupler.

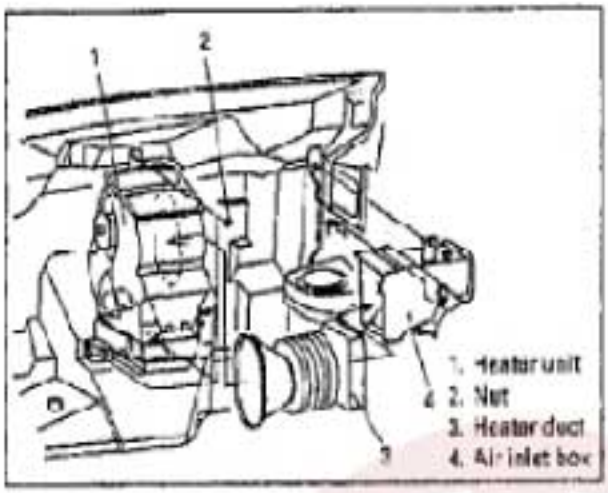


6) Remove heater duct.
7) Remove heater unit.



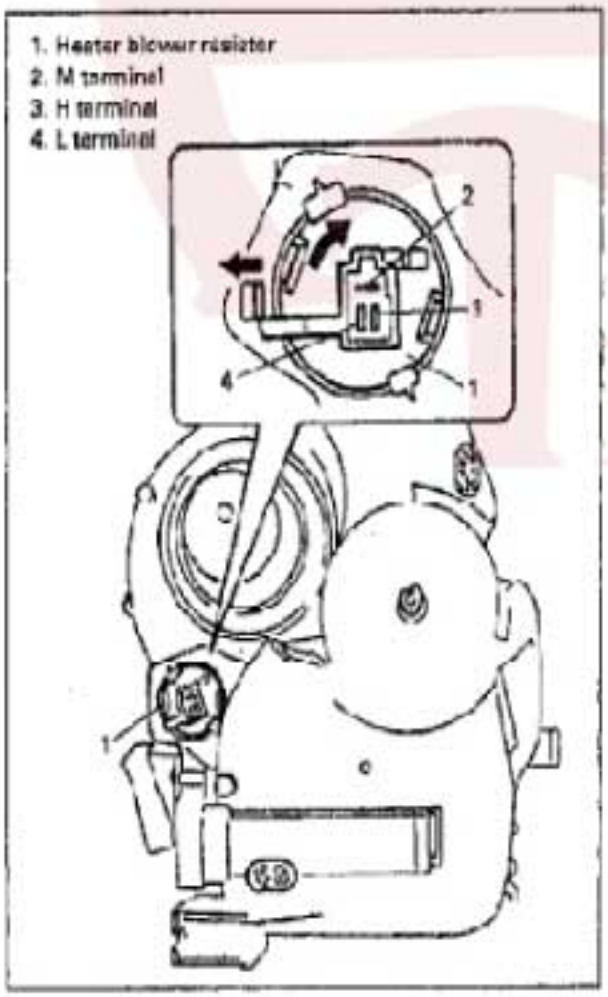
8) Pull out heater core from unit.

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INSTALLATION

1) Install heater unit by reversing removal procedure, noting the following items.
   - When installing each part, be careful not to catch any cable or wiring harness.
   - When installing steering column assembly, refer to Section 3C1 "Steering Column".
2) Adjust control cables. (Refer to "Heater Control Cables" in this section.)
3) Fill engine coolant to radiator and bleed air from cooling system, refer to Section 6B.
4) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 3C1.



HEATER BLOWER RESISTOR

REMOVAL

1) Disconnect battery (–) cable at battery.
2) Disconnect blower resistor lead wire at coupler.
3) Remove heater blower resistor.

INSPECTION

Measure the resistor for each terminal-to-terminal resistance.

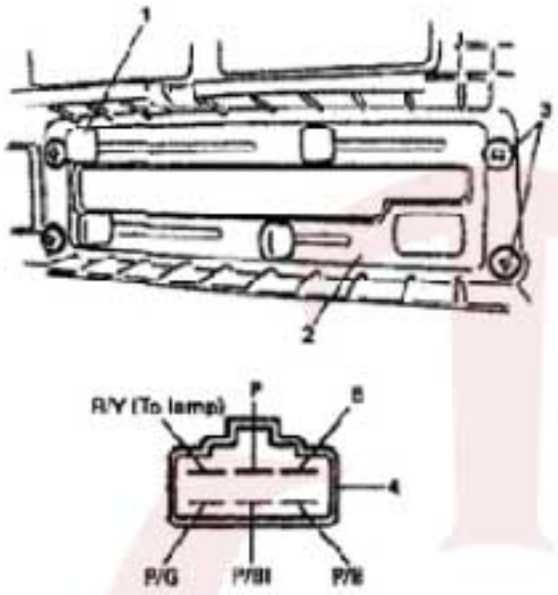
Terminal-to-terminal	Resistance (Ω)
H–M	1.2
H–L	2.9
M–L	1.7

If the measured resistor is incorrect, replace the heater blower resistor.

INSTALLATION

Reverse removal procedure for installation.

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1. Control lever knob
2. Control panel
3. Screw
4. Heater blower motor switch connector

HEATER BLOWER MOTOR SWITCH

REMOVAL

1) Remove meter cluster and glove box.
2) Remove control cable from link.
3) Disconnect blower motor switch lead wires at coupler.
4) Disconnect instrument harness clamps from stay.
5) Remove control lever assembly.

INSPECTION

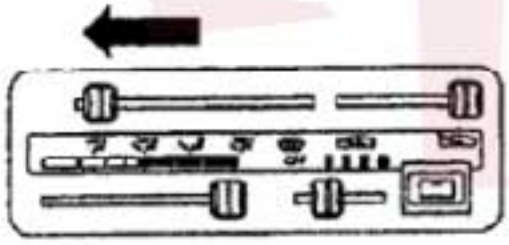
Check switch for each terminal-to-terminal continuity. If there is no continuity, replace control lever assembly.

	B	P/G	P/B	P/Bl	P
H	○	○			○
M	○	○		○	
L	○	○	○		

B : Black
P : Pink
P/B : Pink/Black
P/Bl : Pink/Blue
P/G : Pink/Green

INSTALLATION

Reverse removal procedure for installation.

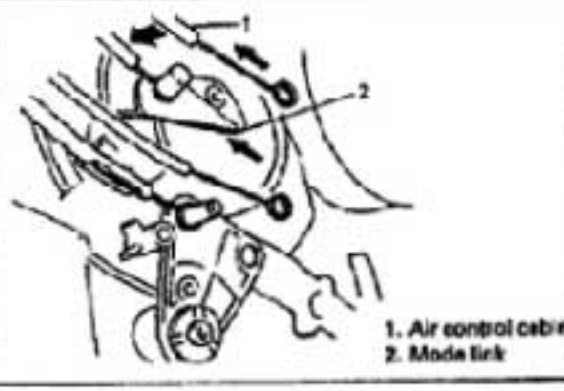


HEATER CONTROL CABLES

ADJUSTMENT

Air control cable

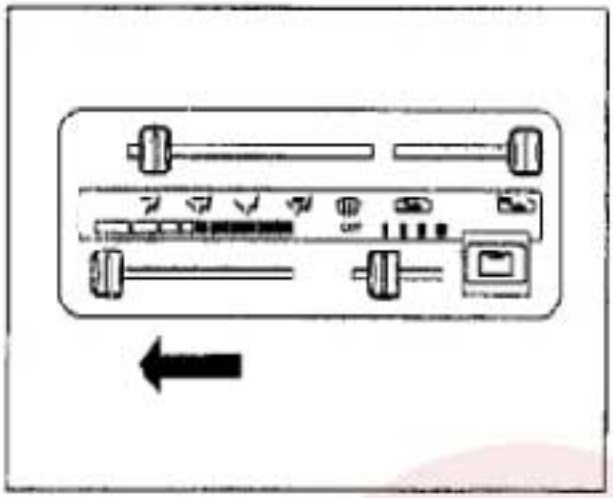
1) Set control lever to ventilation position.



1. Air control cable
2. Mode link

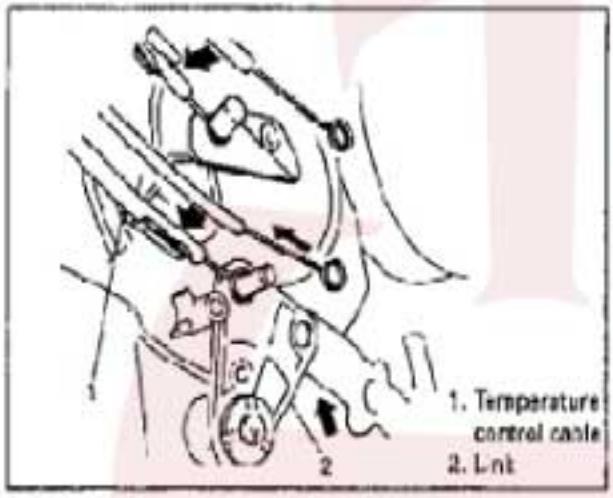
2) Pull lever and link in arrow directions fully as shown in figure and fix cable there.

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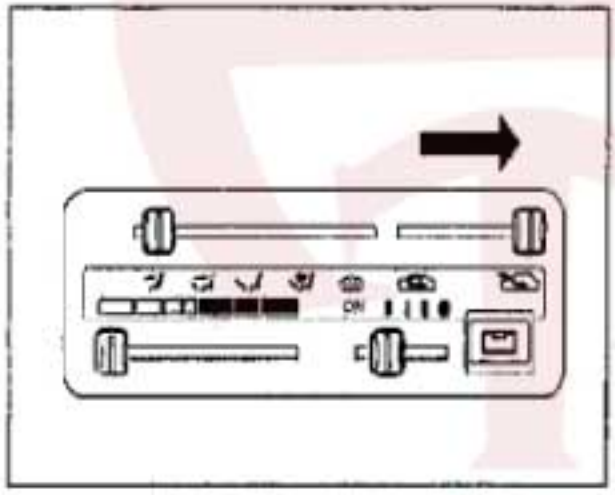


Temperature control cable

1) Set control lever to "COOL" position.

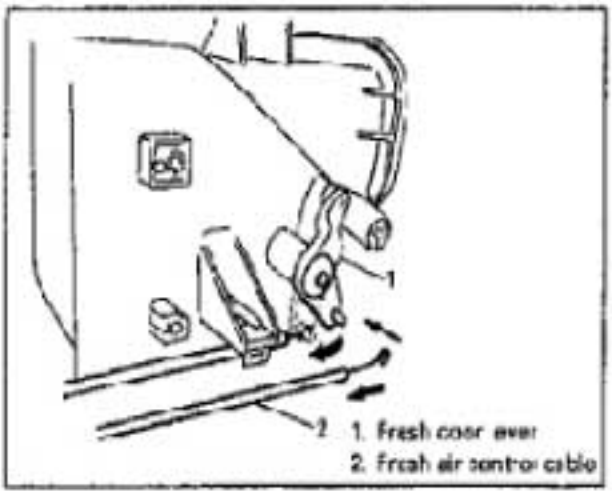


2) Pull lever and link in arrow direction fully as shown in left figure and fix cable there.



Fresh air control cable

1) Set control lever to "FRESH AIR" position.



2) Pull lever in arrow direction fully as shown in left figure and fix cable there.

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SECTION 1B

AIR CONDITIONING (OPTIONAL)

CAUTION:
The air conditioning system of this model uses refrigerant HFC-134a (R-134a).
None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C:
one using refrigerant CFC-12 (R-12) and the other using refrigerant HFC-134a (R-134a).
Be sure to check which refrigerant is used before any service work including inspection and maintenance.
When replenishing or changing refrigerant and compressor oil and when replacing parts, make sure that the material or the part to be used is appropriate to the A/C installed in the vehicle being serviced.
Use of wrong one will result in leakage of refrigerant, damage in parts or other faulty condition.

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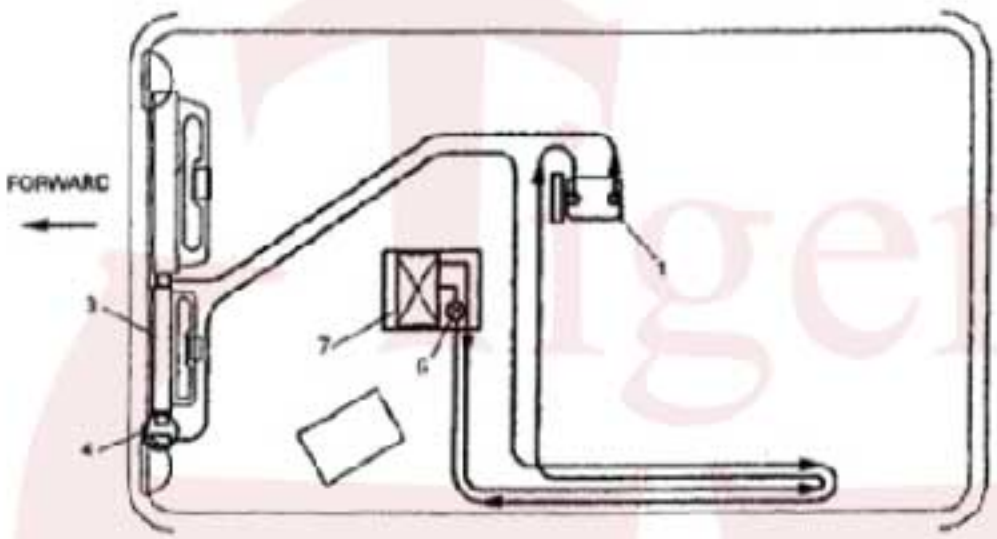
PERFORMANCE TEST 1B-29

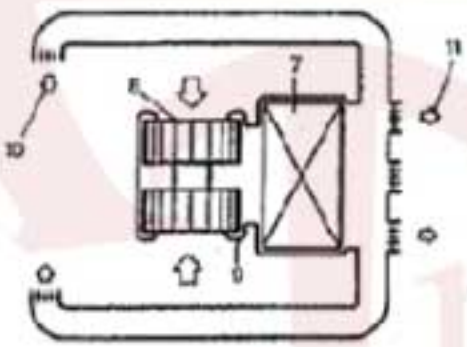
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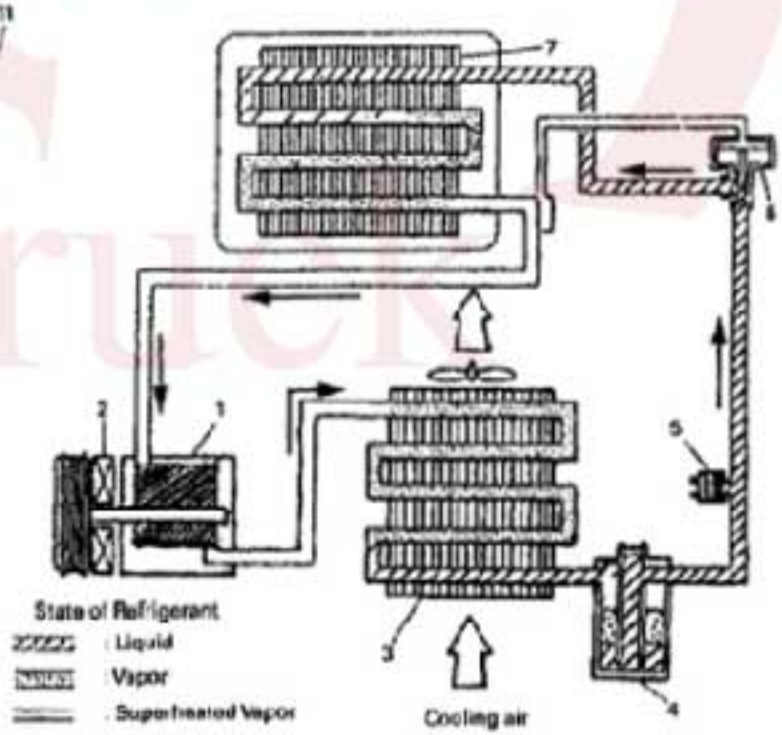
GENERAL DESCRIPTION

Air conditioning for this vehicle is available as an optional equipment. This section describes function of its main components, installation, servicing etc.

MAJOR COMPONENTS AND REFRIGERANT FLOW OF AIR CONDITIONING SYSTEM





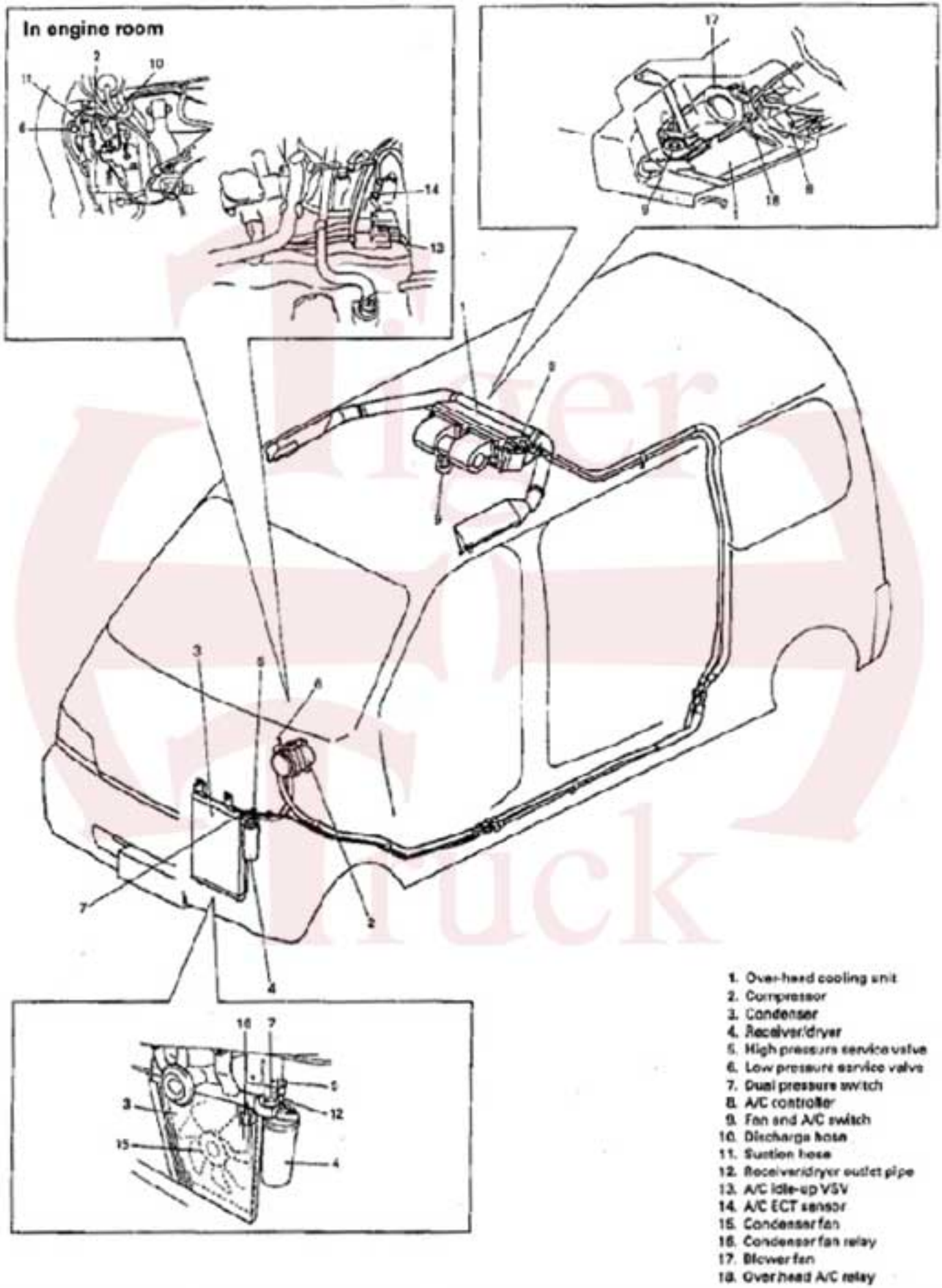


1. Compressor
2. Magnet clutch
3. Condenser
4. Receiver/dryer
5. Dual pressure switch
6. Expansion valve
7. Evaporator
8. Blower motor
9. Over-head cooling unit
10. To front seat
11. To rear seat

State of Refrigerant
- Liquid
- Vapor
- Superheated Vapor

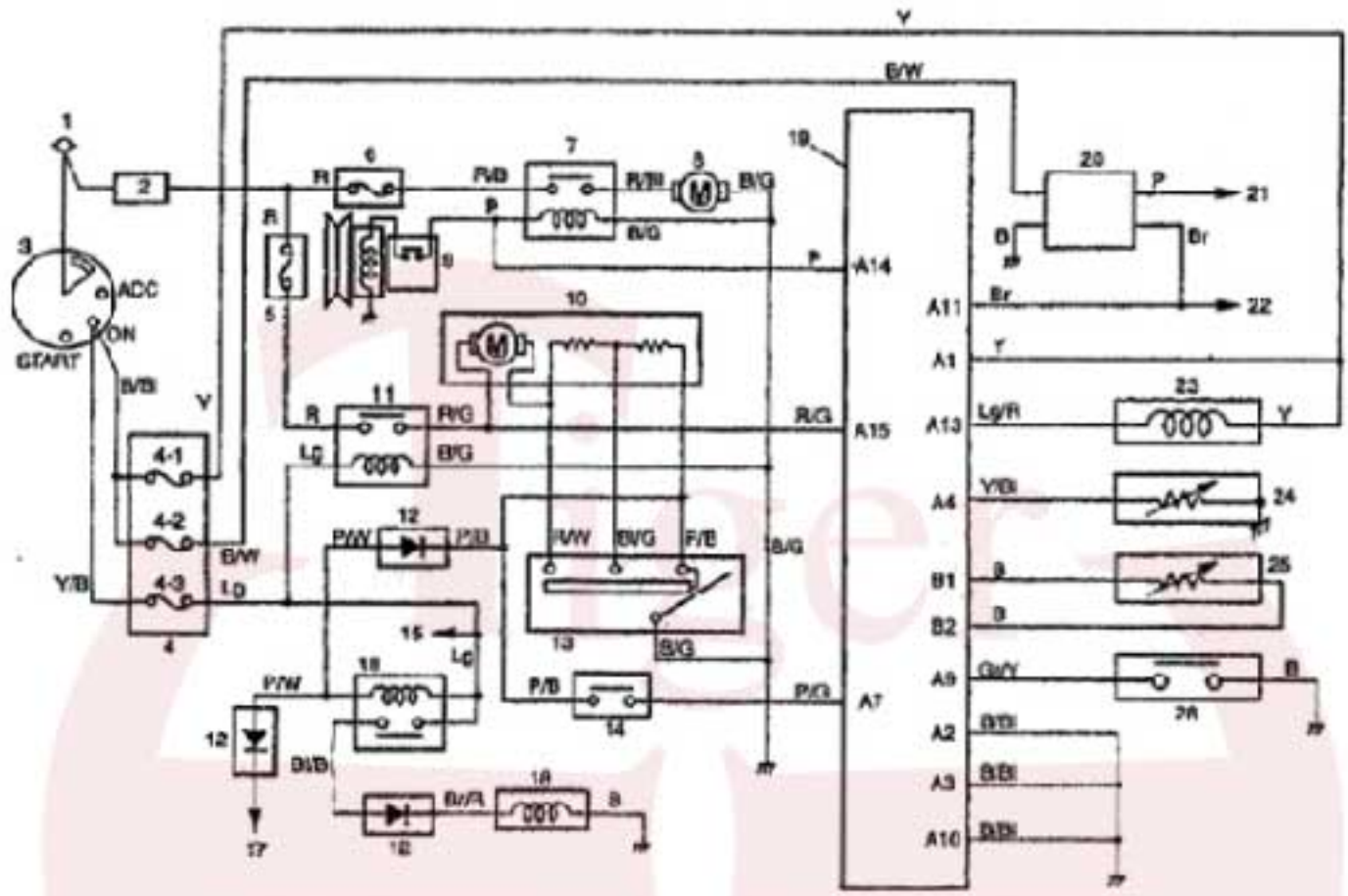
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SYSTEM COMPONENTS

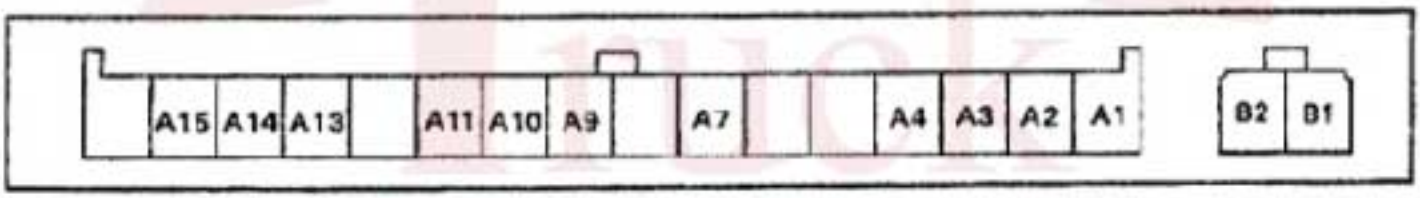


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SYSTEM CIRCUIT



Terminal arrangement of A/C controller coupler (viewed from harness side)



1. Battery positive terminal
2. Fusible link
3. Ignition switch
4. Fuse box
4-1. "TURN BACK" fuse (15A)
4-2. "IG-COIL-METER" fuse (15A)
4-3. "Heater" (20A)
5. "A/C" fuse
6. "A/C" condenser fan motor fuse
7. A/C condenser fan relay
8. A/C condenser fan motor
9. A/C compressor
10. Blower fan motor and resistor
11. Over-head A/C relay
12. Diode
13. A/C and fan switch
14. Dual pressure switch
15. Heater fan motor
16. Idle-up relay
17. Heater fan switch
18. Idle-up VSV
19. A/C controller
20. Fuel pump relay
21. Fuel pump and gauge
22. Noise suppressor
23. A/C idle-up VSV
24. A/C ECT sensor
25. A/C evapo. thermistor
26. Accelerator pedal OFF switch

INSTALLATION OF AIR CONDITIONING COMPONENTS

PREPARATION PRIOR TO INSTALLATION

INSPECTION AND ADJUSTMENT OF VEHICLE

Before installing air conditioning, check and adjustment following items.

- Engine ignition timing
- Engine cooling system
- Battery electrolyte and charging system
- Passenger compartment sealing
- Fuel system
- General vehicle conditions

PREPARATION OF AIR CONDITIONING COMPONENTS

When unpacking parts kit, arrange unpacked parts in the order of installation.
At this time, you have to make sure the kit has no missing or defective parts. And when installing air conditioner, you have to use covers for protection of fender and seat.

PRECAUTION FOR INSTALLATION

1) Negative (-) cable should be disconnected from battery.
2) Engine-installed air conditioning components should be tightened by specified torque using bolts supplied in the kit.
3) Air conditioning lines and wire harness should, when installed, be routed correctly so as not to interfere with peripheral parts.
4) Hoses and tubes should be connected with each other respectively after applying two to three drops of refrigerant oil to seat of flared nuts.
5) Line fittings should be tightened or loosened using two wrenches so that they are supported evenly during such tightening or loosening.
6) Flared nuts should be tightened by specified torque.
7) Until it becomes possible to connect each components into position, blind plugs of attaching portions should not be removed.

   NOTE:
   Remove plugs from compressor carefully to allow refrigerant to escape slowly. This is necessary because compressor is shipped out from factory with a slight charge of refrigerant to prevent its seals from corroding.

8) When handling refrigerant HFC-134a (R-134a), you should always wear safety goggles and also use care that it will not get on your skin.
9) Refrigerant HFC-134a (R-134a) can should be kept at about 40°C (100°F) by putting it in hot water.

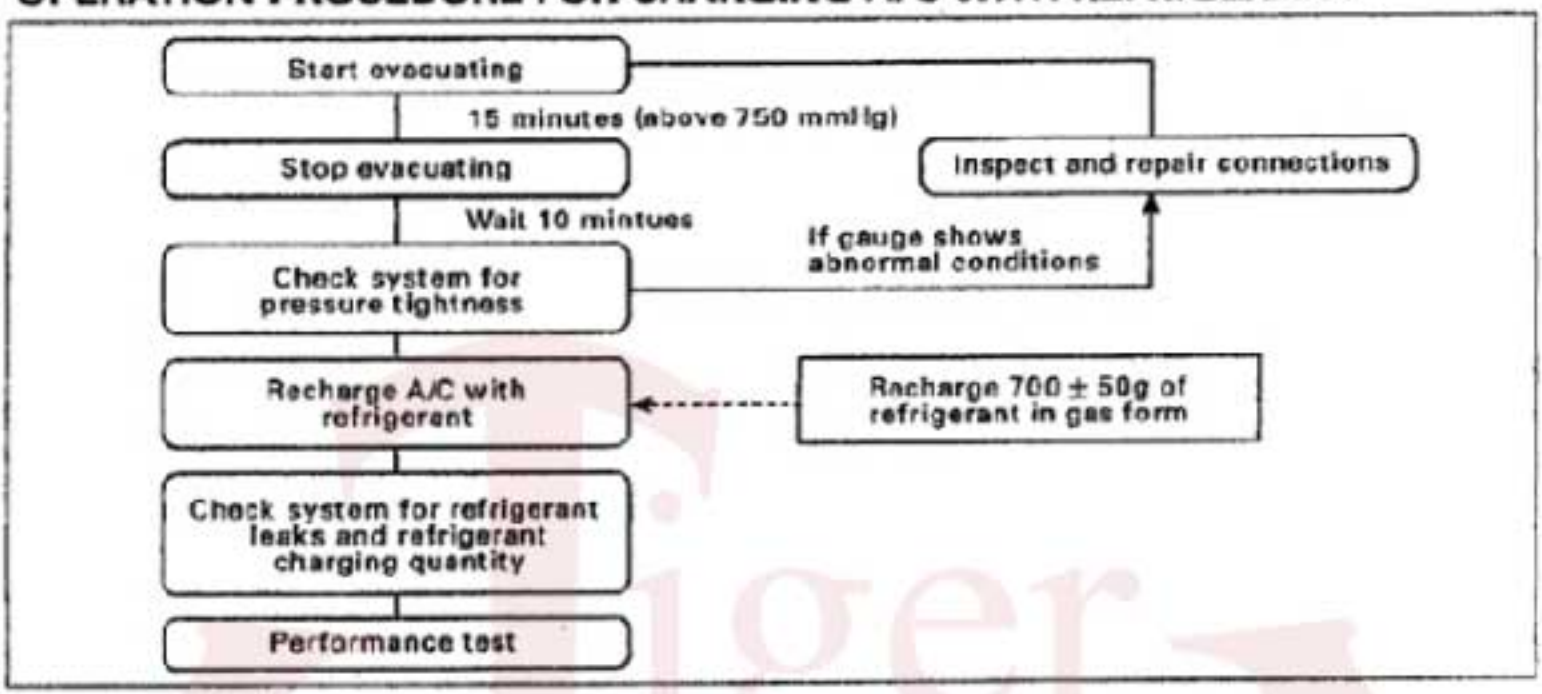
PROCEDURE FOR INSTALLATION

When installing air conditioning, refer to instruction manual which is packed with A/C parts.

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RECOVERY, EVACUATION AND CHARGING

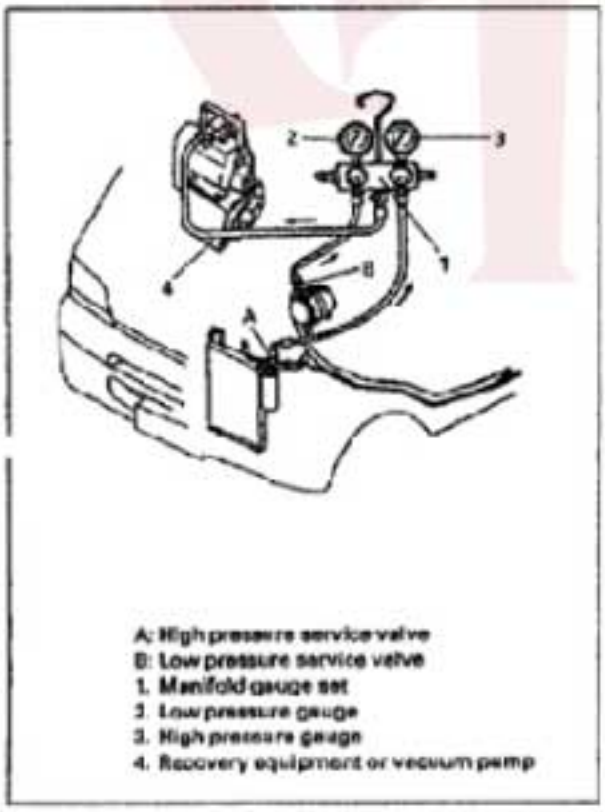
OPERATION PROCEDURE FOR CHARGING A/C WITH REFRIGERANT



REFRIGERANT RECOVERY

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment.
Discharging it into atmosphere would cause adverse effect to environments.

NOTE:
When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.



A: High pressure service valve
B: Low pressure service valve
1. Manifold gauge set
2. Low pressure gauge
3. High pressure gauge
4. Recovery equipment or vacuum pump

EVACUATING SYSTEM

NOTE:
Whenever opened (exposed to atmospheric air), air conditioning system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approx. 15 minutes.

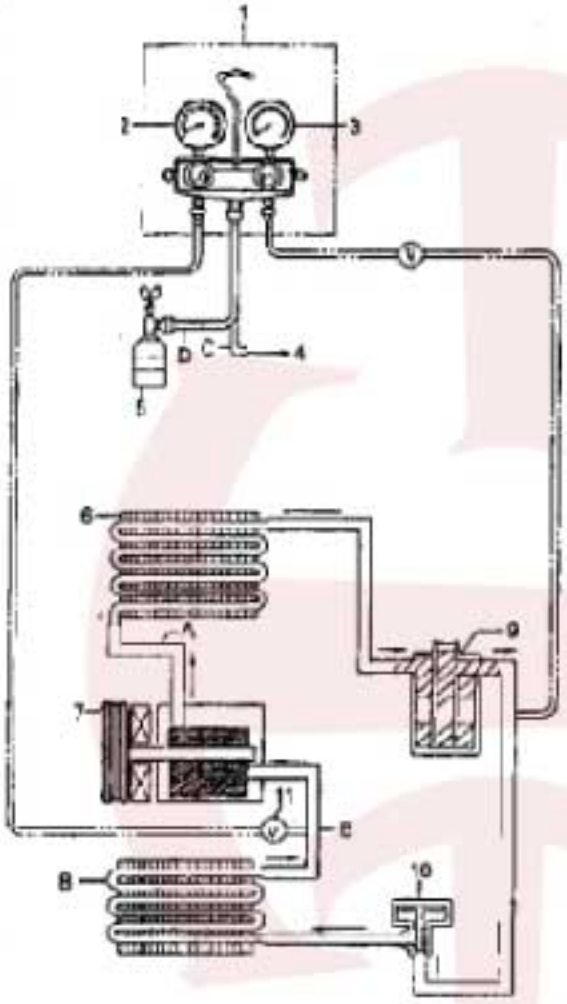
CAUTION:
Do not evacuate before recovering refrigerant in system.

1) Connect high and low charging hoses of manifold gauge set respectively as follows:

   High charging hose : High pressure service valve
   Low charging hose : Low pressure service valve

2) Attach center charging hose of manifold gauge set to vacuum pump.

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A : Compressor delivery hose
B : Suction hose
C : Recovery or evacuating
D : Charging

1. Gauge manifold set
2. Low pressure gauge
3. High pressure gauge
4. Recovery equipment or vacuum pump
5. Refrigerant container
6. Condenser
7. Compressor
8. Evaporator
9. Receiver/dryer
10. Expansion valve
11. Service valve

3) Operate vacuum pump, and then open suction-side valve (Lo) of manifold gauge set. If there is no blockage in system, there will be an indication on high pressure gauge. When this occurs, open the other-side valve (Hi) of the set.
4) Approx. 10 minutes later, low pressure gauge should show a vacuum lower than 760 mmHg providing no leakage exists.

NOTE:
If the system does not show a vacuum below 760 mmHg, close both valves, stop vacuum pump and watch movement of low pressure gauge. Increase in the gauge reading suggests existence of leakage. In this case, repair the system before continuing its evacuation.
If the gauge shows a stable reading (suggesting no leakage), continue evacuation.

5) Evacuation should be carried out for a total of at least 15 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum less than 760 mmHg, and then close both valves.
7) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.

CHECKING SYSTEM FOR PRESSURE LEAKS

After completing the evacuation, close manifold gauge high-pressure valve (HI) and low-pressure valve (LO) and wait 10 minutes. Verify that low-pressure gauge reading has not changed.

CAUTION:
If the gauge reading moves closer to "0", there is a leak somewhere. Inspect the tubing connections, make necessary corrections, and evacuate system once again, making sure that there are no leaks.

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CHARGING SYSTEM WITH REFRIGERANT

The air conditioning system contains HFC-134a (R-134a).

Described here is a method to charge the air conditioning system with refrigerant from the refrigerant service container.

When charging refrigerant recovered by using the refrigerant recovery and recycling equipment (when recycling refrigerant), follow the procedure described in the equipment manufacturer's instruction manual.

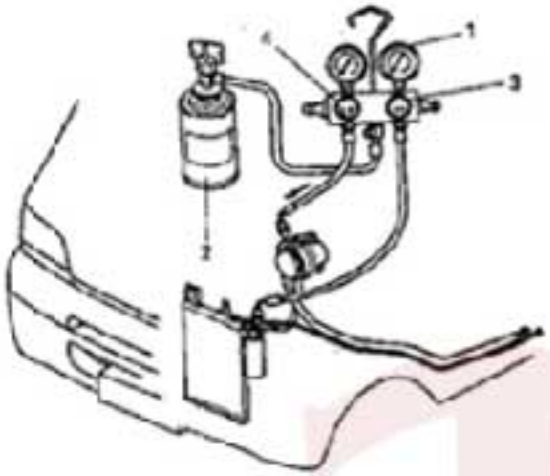
WARNING:

- **Your eyes should not be exposed to refrigerant (liquid).**
  Any liquid Refrigerant HFC-134a (R-134a) escaping by accident shows a temperature below freezing point. Should liquid HFC-134a (R-134a) get into your eyes, it may cause a serious injury. To protect your eyes against such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) strikes your eye(s), consult a doctor immediately.
  a. Do not use your hand to rub the affected eye(s). Instead, use quantities of fresh cold water to splash it over the affected area to gradually raise temperature of such area above freezing point.
  b. Obtain proper treatment as soon as possible from a doctor or eye specialist.
- **Should the HFC-134a (R-134a) liquid come into contact with your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.**
- **Refrigerant must not be handled near where welding or steam cleaning is performed.**
- **Refrigerant should be kept at a cold and dark place. It should never be stored where a high temperature is anticipated, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).**
- **Avoid breathing fumes produced when HFC-134a (R-134a) is burned. Such fumes may be hazardous to health.**

CAUTION:

- **ALWAYS CHARGE THROUGH LOW PRESSURE-SIDE of A/C system.**
- **NEVER CHARGE ON HIGH PRESSURE-SIDE of A/C system.**
- **Do not charge while compressor is hot.**
- **When installing tap valve to refrigerant container to make a hole there through, carefully follow directions given by manufacturer.**
- **A pressure gauge should always be used before and during charging.**
- **The refrigerant container should be emptied of refrigerant when discarding it.**
- **The refrigerant container should not be heated up to 40°C (100°F) or over.**
- **Refrigerant container should not be reversed in direction during charging. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.**

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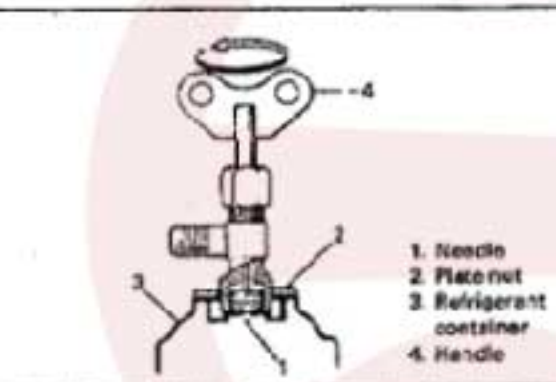
1. Manifold gauge set
2. Refrigerant container
3. High pressure side (High pressure service valve side)
4. Low pressure side (Low pressure service valve side)

PROCEDURE OF CHARGING

1) Make sure that hoses are routed properly after evacuating the system (see evacuation circuit is correctly routed.)
2) Connect manifold gauge set in position. Thus open refrigerant container valve to purge the charging line. Then open the low pressure-side valve.

> **WARNING:**
> **Make sure that high pressure-side valve is closed securely.**

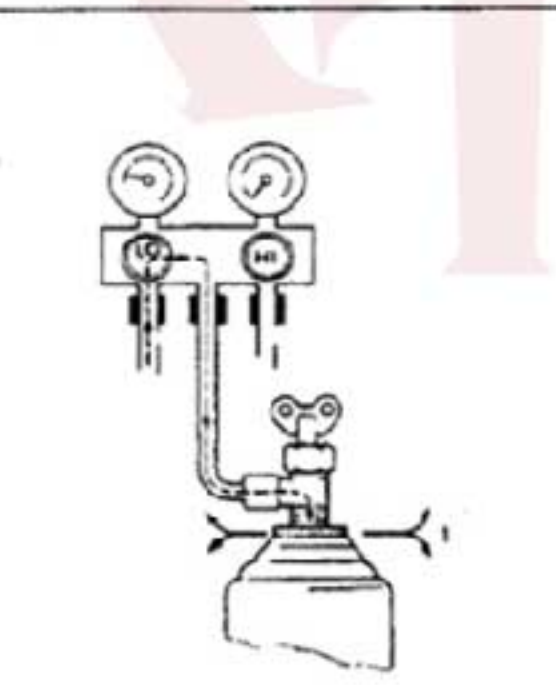
3) Start engine and keep engine speed at 1500 rpm. Then operate air conditioning.
4) Charge A/C system with refrigerant at vapor state. At this time refrigerant container should be held upright.
5) When a refrigerant container is emptied, use following procedure to replace it with a new refrigerant container.



1. Needle
2. Plate nut
3. Refrigerant container
4. Handle

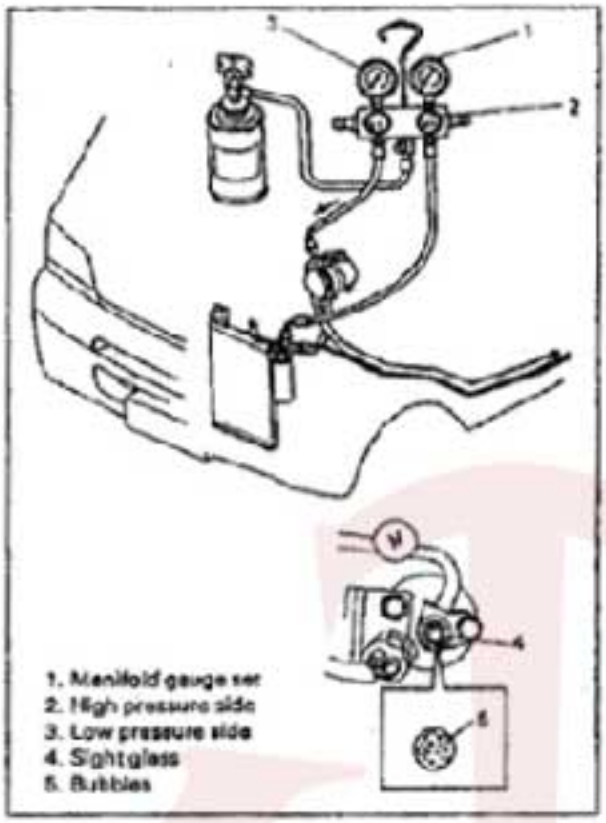
i) Close low pressure valve.
ii) Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve, use following procedure for replacement.
   (1) Retract needle and remove refrigerant container tap valve by loosening its plate nut.
   (2) Reinstall previously removed refrigerant container tap valve to a new refrigerant container.

iii) Purge any air existing in center charging hose.
When using refrigerant container tap valve, use following procedure to purge air.
   (1) Once fully tighten refrigerant container tap valve and then slightly loosen plate nut (open it a little).
   (2) Open low pressure valve of manifold gauge set a little.
   (3) As soon as refrigerant comes out with a "hiss" through a clearance between refrigerant container and tap valve, tighten plate nut as well as manifold gauge set low pressure valve.
   (4) Turn handle of tap valve clockwise so that its needle is screwed into the new container to make a hole for refrigerant flow.



1. "Hiss"

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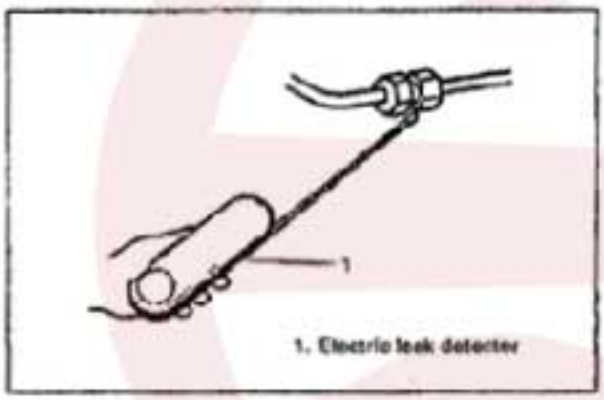


1. Manifold gauge set
2. High pressure side
3. Low pressure side
4. Sight glass
5. Bubbles

6) After the system has been charged with specified amount (650 – 750g (22.8 – 26.3 Imp oz.)) of refrigerant or when low and high pressure gauges have indicated specified value below respectively, close low pressure side valve of manifold gauge set. At this time, look into the sight glass and check that there are no bubbles in it, which means that the system is fully charged.

Low pressure gauge
when charged with specified amount :
About 200 – 300 kPa (2 – 3 kg/cm^2, 29 – 43 psi)
(at air temperature 25 – 35°C (77 – 95°F))

High pressure gauge
when charged with specified amount:
About 1370 – 1670 kPa (13.7 – 16.7 kg/cm^2, 200 – 244 psi)
(at air temperature 25 – 35°C (77 – 95°F))

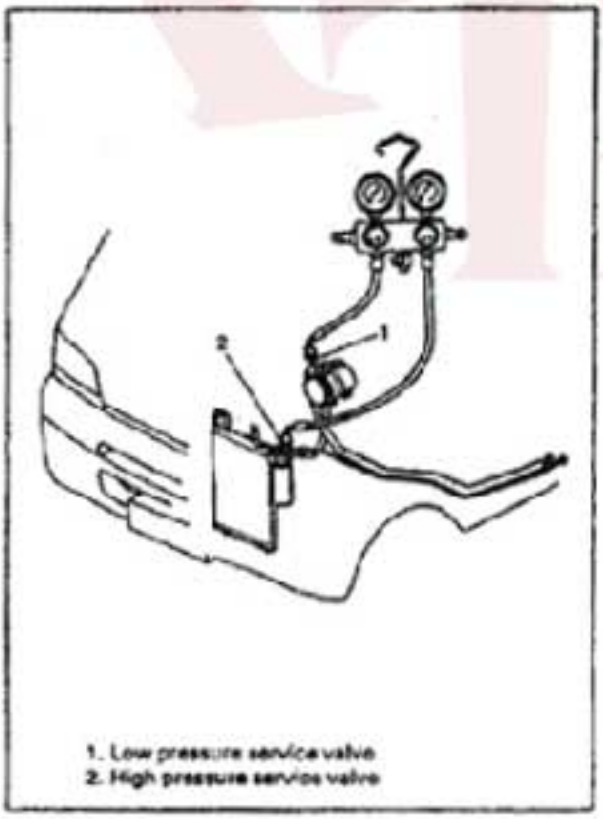


1. Electric leak detector

INSPECTING A/C SYSTEM FOR LEAKS

Using an electric leak detector, carefully check the system for leakage.

WARNING:
- **To prevent explosions or fires, make sure that there are no flammables in the vicinity.**
- **When exposed to fire, the refrigerant turns into a poisonous gas (phosgene). Do not inhale this gas.**



1. Low pressure service valve
2. High pressure service valve

DETACHING MANIFOLD GAUGE SET

WARNING:
High pressure-side is naturally under high pressure. Care should be taken to protect eyes and skin.

1) Close low pressure-side valve of manifold gauge set. (High pressure-side valve is closed continuously during the process of charging.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using a shop rag, remove charging hoses from compressor service valves. This operation must be performed rapidly.
5) Put caps on service valves.

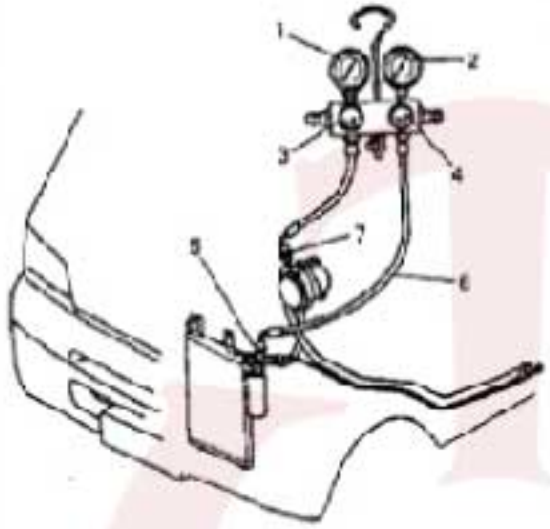
DIAGNOSIS

Condition	Possible Cause	Correction
Cool air does not come out (A/C system improper operative)	• A/C system inoperative	
	1) No refrigerant	Recovery, evacuation and charging.
	2) Fuse blown	Check "TURN BACK" fuse, "Heater" fuse "A/C" fuse and check for short circuit.
	3) A/C and fan switch faulty	Check A/C and fan switch.
	4) Slow idle speed	Idle speed with A/C ON check and adjustment.
	5) A/C thermistor faulty	Check A/C thermistor.
	6) A/C ECT sensor faulty	Check A/C ECT sensor.
	7) Dual pressure switch faulty	Check dual pressure switch.
	8) Over head A/C relay faulty	Check over-head A/C relay.
	9) Accel OFF switch faulty	Check accel OFF switch.
	10) Wiring or grounding faulty	Repair as necessary.
	11) A/C controller faulty	Check A/C controller.
	• Compressor inoperative (dose not rotation)	
	1) Compressor thermal protector faulty	Check compressor thermal protector.
	2) Magnet clutch faulty	Check magnet clutch.
	3) Drive belt loose or broken	Tighten or replace drive belt.
	4) Compressor faulty	Check compressor.
	• Condenser fan inoperative	
	1) Fuse blown	Check "A/C condenser fan motor" fuse and check for short circuit.
	2) A/C condenser fan relay faulty	Check A/C condenser fan relay.
	3) Wiring or grounding faulty	Repair as necessary.
	4) A/C condenser fan motor faulty	Check A/C condenser fan motor.
	• Blower motor inoperative	
	1) Blower motor resistor faulty	Check blower motor resistor.
	2) A/C and fan switch faulty	Check A/C and fan switch.
	3) Wiring or grounding faulty	Repair as necessary.
	4) Blower motor faulty	Check blower motor.
Cool air does not come out or insufficient cooling (A/C system normal operative)	• Insufficient or excessive charge of refrigerant	Check charge of refrigerant. Check system for leaks.
	• Condenser clogged	Check condonser.
	• Evaporator clogged or frosted	Check evaporator Check A/C thermistor. Check A/C controller.
	• A/C thermistor faulty	Check A/C thermistor.
	• A/C controller faulty	Check A/C controller.
	• Expansion valve faulty	Check expansion valve.
	• Receiver/dryer clogged	Check receiver/dryer.
	• Drive belt slipping	Check or replace drive belt.
	• Magnetic clutch faulty	Check magnetic clutch.

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Condition	Possible Cause	Correction
Cool air does not come out or insufficient cooling (A/C system normal operative)	• Compressor faulty	Check compressor.
	• Air in A/C system	Replace receiver/dryer, and evacuation and charging.
	• Air leaking from cooling unit or air duct	Repair as necessary.
	• Heater and ventilation system faulty	Check air inlet box Assy. Check heater control lever Assy. Check heater Assy
	• Blower motor faulty	Check blower motor.
	• Excessive compressor oil existing in A/C system	Pull out compressor oil in A/C system circuit, and replace compressor.
Cool air comes out or does not comes out only intermittently	• Wiring connection faulty	Repair as necessary.
	• Expansion valve faulty	Check expansion valve.
	• Excessive moisture in A/C system	Replace receiver/dryer, and evacuation and charging.
	• Accel off switch faulty	Check accel off switch faulty.
	• A/C controller faulty	Check A/C controller
	• Magnetic clutch faulty	Check magnetic clutch.
	• Compressor thermal protector faulty	Check compressor thermal protector
	• Excessive charge of refrigerant	Check charge of refrigerant.
Cool air comes out only at high speeds	• Condenser clogged	Check condenser.
	• Insufficient charge of refrigerant	Check charge of refrigerant.
	• Air in A/C system	Replace receiver/dryer, and evacuation and charging.
	• Drive belt slipping	Check or replace drive belt.
	• Compressor faulty	Check compressor.
Cool air does not comes out only at high speeds	• Accel off switch faulty	Check accel off switch.
	• Excessive charge of refrigerant	Check charge refrigerant.
	• Evaporator frosted	Check evaporator. Check A/C thermistor.
Insufficient velocity of cooled air	• Evaporator clogged or frosted	Check evaporator. Check A/C thermistor.
	• Air leaking from cooling unit or air duct	Repair as necessary.
	• Blower motor faulty	Check blower motor.
	• Wiring or grounding faulty	Repair as necessary.

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1. Low-pressure gauge
2. High-pressure gauge
3. Low-pressure valve
4. High-pressure valve
5. High-pressure service valve
6. Charging hoses
7. Low-pressure service valve

TROUBLESHOOTING PROCEDURE USING MANIFOLD GAUGE SET

This procedure enables the technician to discover and repair cooling problems by having the pressures of both the high and low-pressure sides indicated on the respective gauges of the manifold gauge set.

ATTACHING MANIFOLD GAUGE SET

1) Make sure that high-pressure and low-pressure valves of manifold gauge are firmly closed.
2) Connect high-pressure charging hose to high-pressure service valve on vehicle, and connect low-pressure charging hose to low-pressure service valve on vehicle.
3) Bleed the air in charging hoses by loosening their respective nuts on manifold gauge, utilizing the refrigerant pressure. When a hiss is heard, immediately tighten nut.

CAUTION:
Do not interchange high and low-pressure charging hoses by mistake.
If the compressor is equipped with service valves with different thread diameters, the smaller is the high-pressure side, and the larger the low-pressure side.

TROUBLESHOOTING INFORMATION

1) Beginning on the next page, the manifold gauge pressure values shown have been obtained under conditions listed below. However, keep in mind that the actual on-the-vehicle readings are somewhat affected by the ambient temperature.

A/C inlet air temperature:	**30 – 35°C (86 – 95°F)**
Engine speed:	**1500 rpm**
A/C and fan switch:	**High position**
Doors:	**All open**

2) Since the operating pressure for the HFC-134a (R-134a) refrigerant at high temperatures is higher than that of the R12, the gauge readings will be slightly higher.

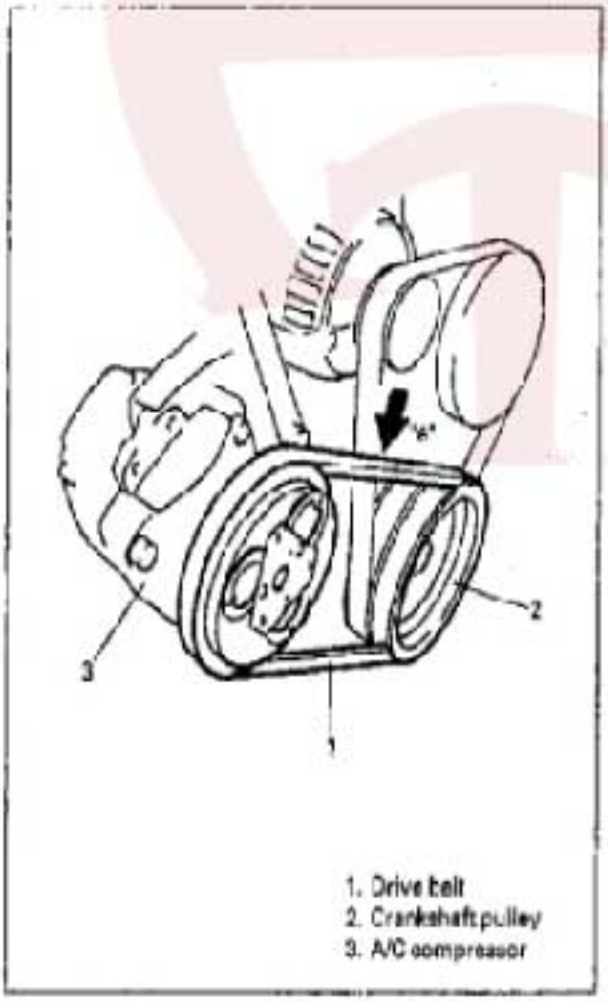
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CORRECTIVE MEASURES FOR MALFUNCTION SYMPTOMS

Starting on the next page, gauge readings, conditions, causes, and measures (classified according to malfunction symptoms) will be discussed

MANIFOLD GAUGE MPa (kg/cm², psi)		CONDITION	CAUSE	CORRECTION
Lo	Hi			
0.15 – 0.25 (1.5 – 2.5, 21.3 – 35.5)	1.37 – 1.57 (14 – 16, 200 – 227)	Normal condition.	———	———
Negative pressure	0.5 – 0.6 (5 – 6, 71.2 – 85.3)	• The low pressure side reads a negative pressure, and the high pressure side reads an extremely low pressure. • Presence of frost around tubing to and from receiver/dryer and expansion valve.	• Dust particles or water droplets are either stuck or frozen inside expansion valve, preventing the refrigerant from flowing. • Gas leak from heat-sensitizing tube is preventing refrigerent flow.	• Clean expansion valve. Replace it if it can not be cleaned. • Replace receiver/dryer. Evacuate the A/C system and recharge with fresh refrigerant. • If heat-sensitizing tube is defective, replace expansion valve.
Normal: 0.15 – 0.25 (1.5 – 2.5, 21.4 – 35.5) Abnormal: Negative pressure	Normal: 1.37 – 1.57 (14 – 16, 200 – 227) Abnormal: 0.69 – 0.98 (7 – 10, 100 – 142)	During A/C operation, the low pressure side sometimes indicates negative pressure, and sometimes normal pressure. Also high pressure side repeats indication of the abnormal and normal pressure	Expansion valve is frozen due to moisture found in the system,and temporarily shuts off the refrigeration cycle.	• Replace expansion valve. • Replace receiver/dryer. • Evacuate A/C system and recharge with fresh refrigerant.
0.05 – 0.1 (0.5 – 1.0, 4.2 – 14.2)	0.69 – 0.98 (7 – 10, 100 – 142)	• Both low and high pressure sides indicate low readings. • Continuous air bubbles are visible through sight glass. • Output air is slightly cold.	Insufficient refrigerant in system. (Refrigerant leaking.)	• Using a gas leak detector, check for leaks and repair as neoecsary. • Recharge refrigerant to a specified amount. If the pressure reading is almost 0 when the manifold gauges are attached, check for any leaks, repair them, and evacuate the system.
0.4 – 0.6 (4 – 6, 56.9 – 85.3)	0.69 – 0.98 (7 – 10, 100 – 142)	• Pressure on low pressure side is high. • Pressure on high pressure side is low.	Internal leak in compressor.	Inspect compressor and repair or replace as necessary.
0.25 – 0.3 (2.5 – 3.0, 35.6 – 42.6)	1.96–2.45 (20 – 25, 285 – 355)	• High pressure reading on both low and high pressure sides. • Air bubbles are not visible even when engine revolution is lowered.	• Overcharged A/C system. • Faulty condenser cooling operation. • Faulty condenser fan operation	• Adjust refrigerant to specified amount. • Clean condenser. • Inspect and repair condenser fan.

MANIFOLD GAUGE MPa (kg/cm²)		CONDITION	CAUSE	CORRECTION
Lo	HI			
0.25 – 0.3 (2.5 – 3.0, 35.6 – 42.6)	1.96–2.45 (20 – 25, 285 – 355)	• High pressure reading on both low and high pressure sides. • Low pressure side tubing is not cold to touch. • Air bubbles are visible through sight glass	• Presence of air in A/C system. (Improperly evacuated.)	• Replace receiver/dryer. • Inspect quantity of compressor oil and presence of contaminants in oil. • Evacuate system and recharge with fresh refrigerant.
0.3 – 0.4 (3.0 – 4.0, 42.7 – 56.8)		• High pressure reading on both low and high pressure sides. • Large amount of frost or dew on the low pressure side tubing.	• Faulty expansion valve or improper attachment of heat-sensitizing tube. • Refrigerant flow is not regulated properly.	• Inspect if heat-sensitizing tube is properly attached. • Replace expansion valve.



1. Drive belt
2. Crankshaft pulley
3. A/C compressor

A/C COMPRESSOR DRIVE BELT INSPECTION

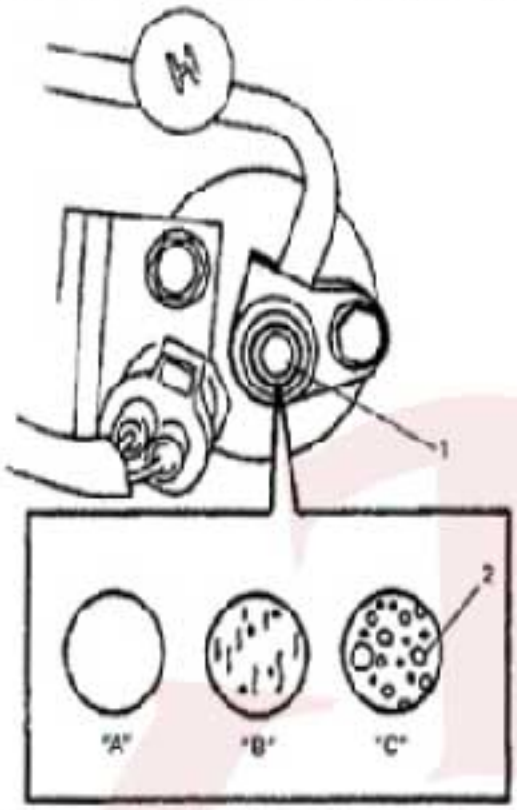
1) Check belt tension by measuring how much it deflects when pushed at intermediate point between compressor pulley and crank pulley with about 100 N (10 kg, 22 lbs) force.

"a" : 8 – 11 mm (0.31 – 0.43 in.) as deflection/100N (10 kg, 22 lbs)

NOTE:
When replacing belt with a new one, adjust belt tension to 8 – 9 mm (0.31 – 0.35 in.).

2) Check belt for wear and cracks, and replace as required.

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"A" :Overcharged or no refrigerant present
"B" :Appropriate
"C" :Undercharged
1. Sight glass
2. Bubbles

REFRIGERANT QUANTITY INSPECTION THROUGH SIGHT GLASS

The following procedure can be used for quickly checking whether the A/C system has a proper charge of refrigerant or not.

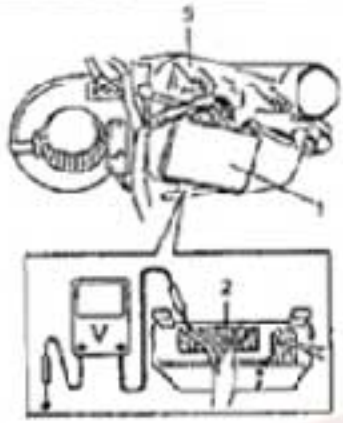
1) Operate A/C with following settings for a few minutes.

A/C and Fan Switch:	**High position**
Engine Speed:	**1100 rpm (at fast idle)**
Doors:	**All open**

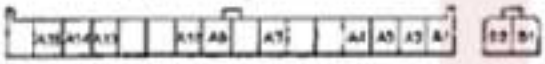
2) Look at the sight glass to inspect the condition of the refrigerant in A/C system, and compare what is observed with the symptoms listed in the table given below.

Item No.	Condition	Cause	Correction
1	Bubbles observed in sight glass.	Insufficient charge of refrigerant in system	Check system for leaks with a leak tester.
2	No bubbles observed in sight glass.	No or insufficient charge of refrigerant in system	Refer to items 3 and 4.
3	No temperature difference between compressor inlet and outlet.	Empty or nearly empty system	Evacuate and charge system and then check it for leaks with a leak tester.
4	Noticeable temperature difference between compressor inlet and outlet.	Proper or too much charge of refrigerant in system	Refer to items 5 and 6.
5	When A/C is turned OFF, refrigerant in sight glass clears immediately and remains clear.	Too much charge of refrigerant in system	Discharge excess charge of refrigerant to adjust it to a specified charge.
6	When A/C is turned OFF, refrigerant in sight glass once produces bubbles and then clears.	Proper charge of refrigerant in system	No correction needed because charge of refrigerant is normal.

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Terminal arrangement of A/C controller coupler (viewed from harness side)



1. A/C controller
2. A/C controller connector
3. C-or-head cooling unit

A/C CONTROLLER AND ITS CIRCUITS INSPECTION

A/C controller and its circuits can be checked at A/C controller wiring couplers by measuring voltage.

CAUTION:
A/C controller cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to A/C controller with couplers disconnected from it.

VOLTAGE CHECK

1) Remove A/C controller from body.
2) Connect A/C controller couplers to A/C controller.
3) Check voltage at each terminal of couplers connected and ignition switch is on.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.

Terminals	Circuit	Normal voltage (V)	Condition
A1	Power circuit	10 – 14	
A2	Ground	0	
A3	Ground	0	
A4	ECT sensor	2.3 – 2.5	When engine coolant temperature is at 80°C (176°F)
		1.5 – 1.7	When engine coolant temperature is at 100°C (212°F)
A7	Dual pressure sw	0 – 1	When A/C and fan switch is ON
		10 – 14	When A/C and fan switch is OFF
A9	Accel OFF sw	0 – 1	When accelerator pedal OFF switch is ON
		5	When accelerator pedal OFF switch is OFF
A10	Ground	0	
A11	Noise suppressor	0 –12 pulse signal	When engine is running
A13	A/C idle-up VSV	0 – 1	When A/C and fan switch is ON at engine running
		10 –14	When A/C and fan switch is OFF at engine running
A14	A/C compressor and condenser fan motor	0 – 1	When A/C and fan switch is ON at engine running
		10 –14	When A/C and fan switch is OFF at engine running
A15	Blower fan motor relay	10 –14	
B1	A/C evapo. thermistor	0	
B2	A/C evapo. thermistor	1.1 – 1.4	When A/C evapo. temperature is at 25°C (77°F)
		2.6 – 2.7	When A/C evapo. temperature is at 0°C (32°F)

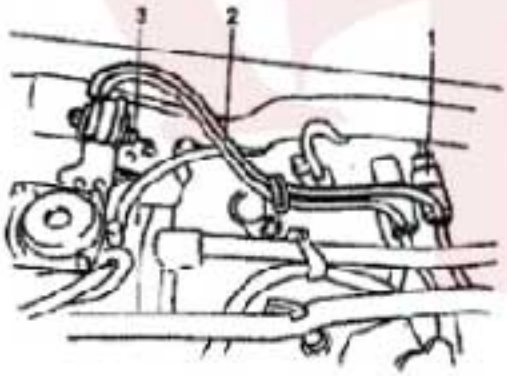
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ON-VEHICLE SERVICE

CAUTION:
When refrigerant line must be disconnected and connected to remove and reinstall any component of A/C system, be sure to observe following instructions.

- **When disconnecting any line from system, install a bling plug or cap to fitting of such line immediately.**
- **When connecting hoses and pipes to each other respectively, previously apply a few drops of refrigerating oil to seats of coupling nuts and O-ring.**
- **When tightening or loosening a fitting, use two wrenches, one for turn and the other for support.**
- **Tighten flared nuts according to following specifications. Tightening torque for coupling nut**

8 mm pipe: 13 N·m (1.3 kg-m, 9.5 lb-ft)
14.5mm pipe: 32 N·m (3.2 kg-m, 23.0 lb-ft)



1. A/C-VSV
2. Hose
3. Actuator

IDLE SPEED WITH A/C ON CHECK AND ADJUSTMENT

Before idle speed check and adjustment, make sure to the following.

- Lead wires and hoses of fuel, ignition and emission control systems are connected securely.
- Accelerator cable has some play, that is, it is no tight.
- Ignition timing is within specification.
- All of electrical loads except ignition are switched OFF.

NOTE:
Before starting engine, place transmission gear shift lever in "Neutral" and set parking brake and block drive wheels.

1) Warm up engine to normal operating temperature.
2) Set tachometer.
3) Check to ensure that idle speed is as specified.

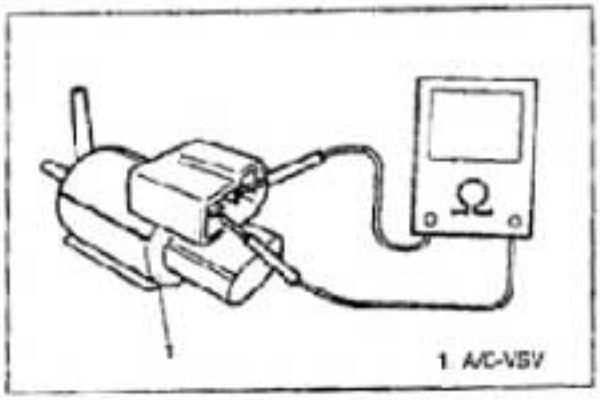
Engine idle speed (A/C OFF)
1000 ± 50 rpm

If engine idle speed is out of specified value, Repair faulty condition referring to SECTION 6D.

4) Turn ON A/C and fan switch.
5) Check to ensure that idle speed is as specified.

Engine idle speed (A/C ON)
1100 ± 50 rpm

If engine idle speed is out of specified value, Check A/C-VSV and its related pipes and hoses.



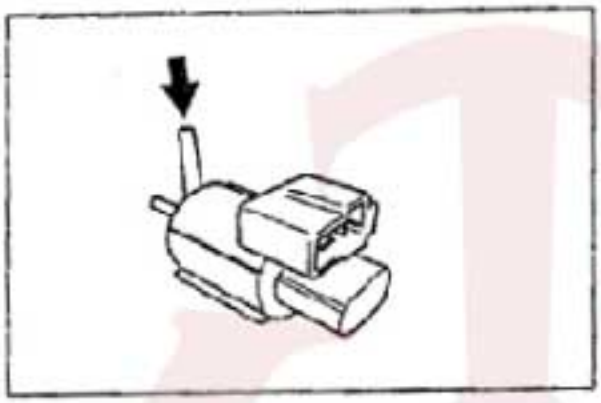
A/C-VSV (VACUUM SWITCHING VALVE)

INSPECTION

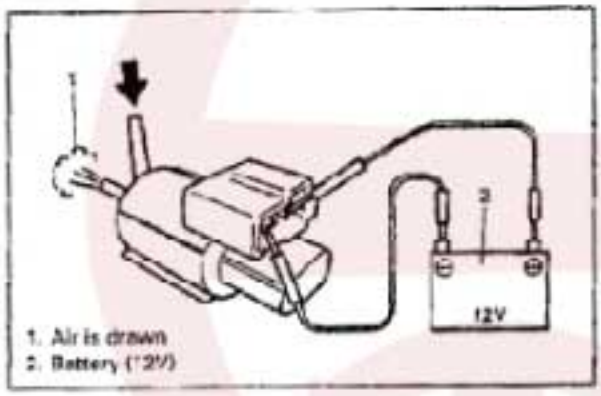
1) With ignition switch OFF, disconnect A/C-VSV coupler.
2) Check resistance between each two terminals of A/C-VSV.

Resistance: 36 – 40 Ω

If it is within specification, proceed to next operation check.
If not, replace.

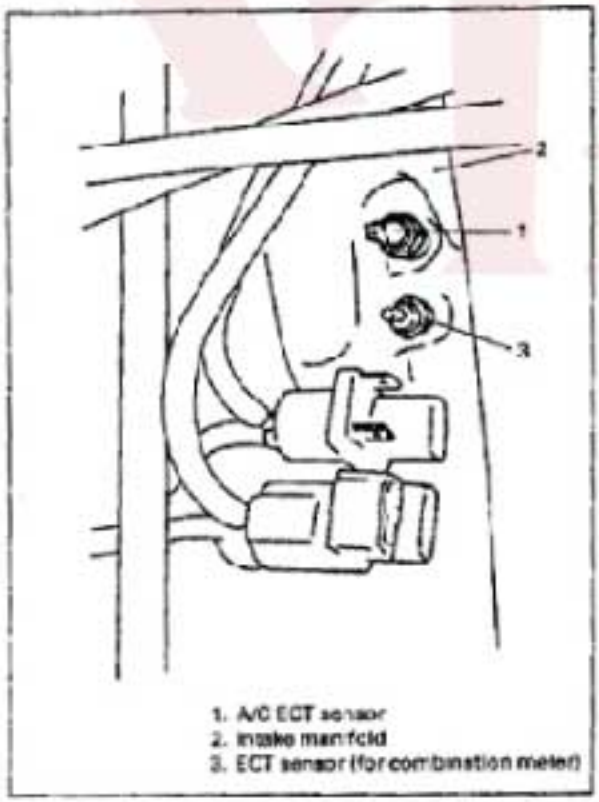


3) Warm up engine to normal operating temperature.
4) With engine running and A/C-VSV coupler disconnected, disconnect A/C-VSV hose of underside as shown.
In this state, check that air is not drawn into the A/C-VSV.



5) Under above condition, connect 12V-battery to A/C-VSV terminals and check that air is drawn into the A/C-VSV.
If check result is not satisfactory, replace A/C-VSV.

CAUTION:
Do not apply battery voltage to A/C-VSV for longer than 1 second. Applying battery for longer than 1 second may cause solenoid to burn.



A/C ECT SENSOR

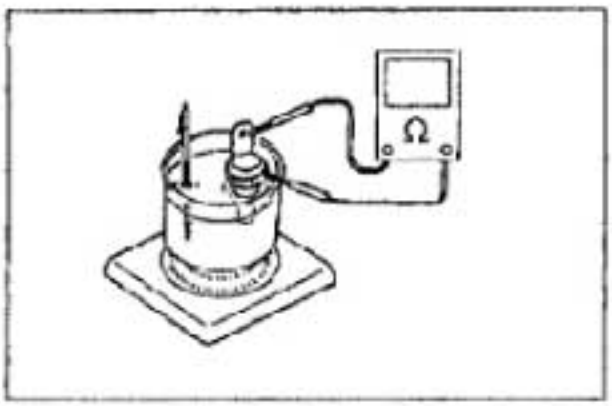
REMOVAL

1) Disconnect negative (–) cable from battery.
2) Drain coolant, referring SECTION 6B.

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

3) Disconnect connector from A/C ECT sensor.
4) Remove A/C ECT sensor from intake manifold.

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INSPECTION

Put temperature sensing part of sensor in water and measure resistance value of sensor while heating water gradually. If relation between resistance and temperature is as shown below, it is acceptable. If there is any faulty condition, replace sensor with new one.

Temperature (°C (°F))	50 (122)	80 (176)	100 (212)
Resistance (Ω)	154	52	27.5

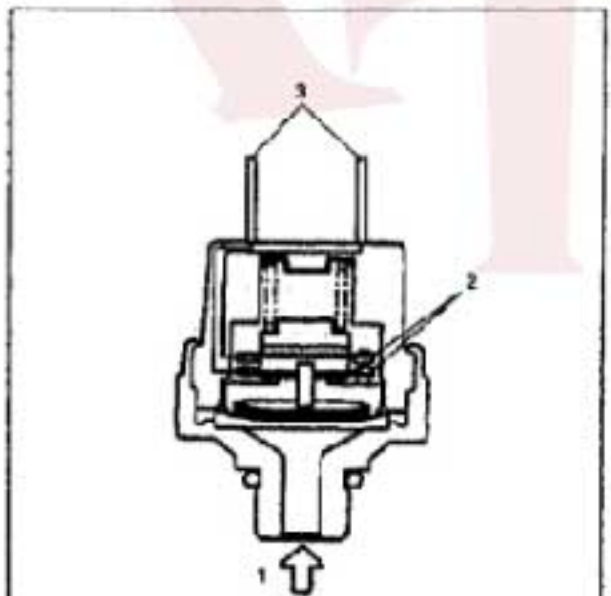
INSTALLATION

Reverse removal procedure observing following instructions.

- Clean mating surface of A/C ECT sensor and intake manifold.
- Apply sealant to A/C ECT sensor mating surface.
- Tighten A/C ECT sensor to specified torque.

Tightening torque for A/C ECT sensor
8 N·m (0.8 kg-m, 6.0 lb-ft)

- Connect connector to A/C ECT sensor securely.
- Refill coolant.



1. Pressure
2. Movable contact
3. Pressure switch terminal

DUAL PRESSURE SWITCH

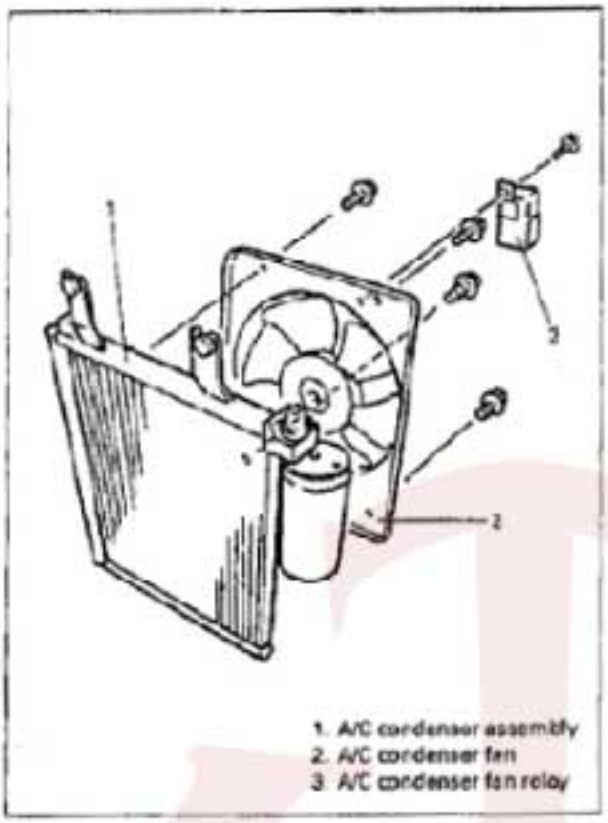
INSPECTION

1) Check switches for continuity at normal temperature (approx. 25°C (77°F)) when A/C system has a proper charge of refrigerant and when A/C system (compressor) is under operation. In each of these cases, switches should show proper continuity.
2) When pressure is following specified pressure, switch should show no continuity.

High side pressure	Dual pressure switch
200 kPa (2.0 kg/cm^2) or below	No continuity
3200 kPa (32 kg/cm^2) or above	No continuity

Tightening torque for dual pressure switch
11 N·m (1.1 kg-m, 8.0 lb-ft)

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1. A/C condenser assembly
2. A/C condenser fan
3. A/C condenser fan relay

A/C CONDENSER ASSEMBLY

INSPECTION

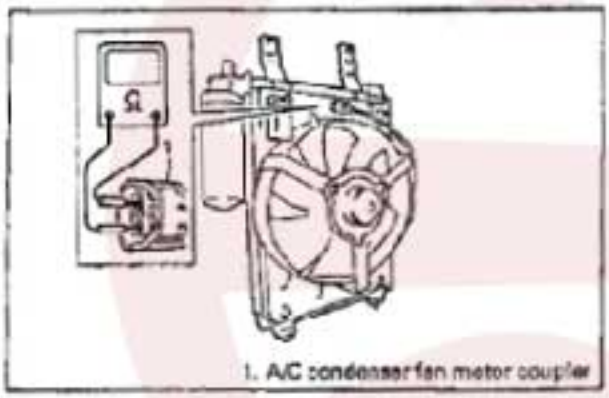
Check the following.

- Condenser fins for leakage, blockage and damage
- Condenser fittings for leakage

Clogged condenser fins should be washed with water, and should be dried with compressed air.

NOTE:

Be careful not to damage condenser fins. If condenser fin is bent, straighten it by using a screwdriver or pair of pliers. If any leakage is found from fitting or tube, repair or replace condenser.



1. A/C condenser fan motor coupler

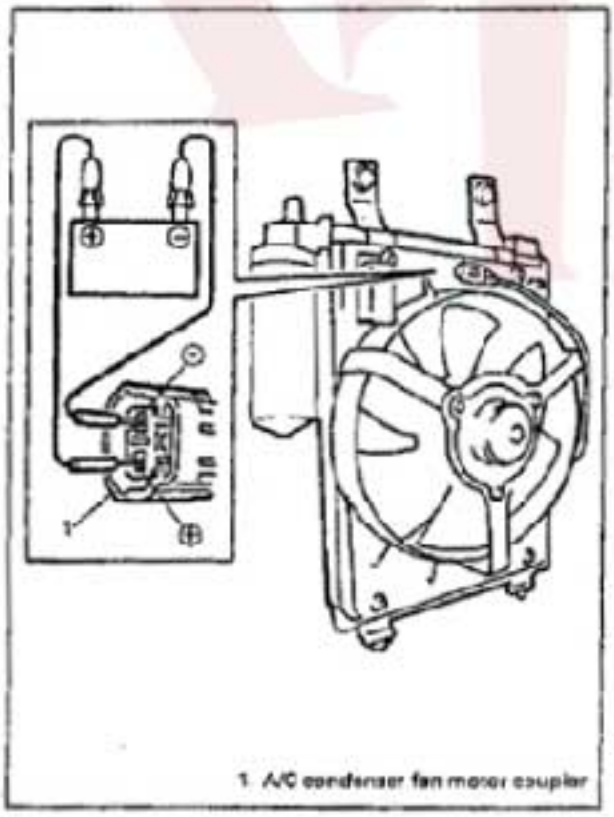
A/C CONDENSER FAN MOTOR

INSPECTION

Check continuity between each two terminals.

If check results are continuity, proceed to next operation check.

If not , replace.

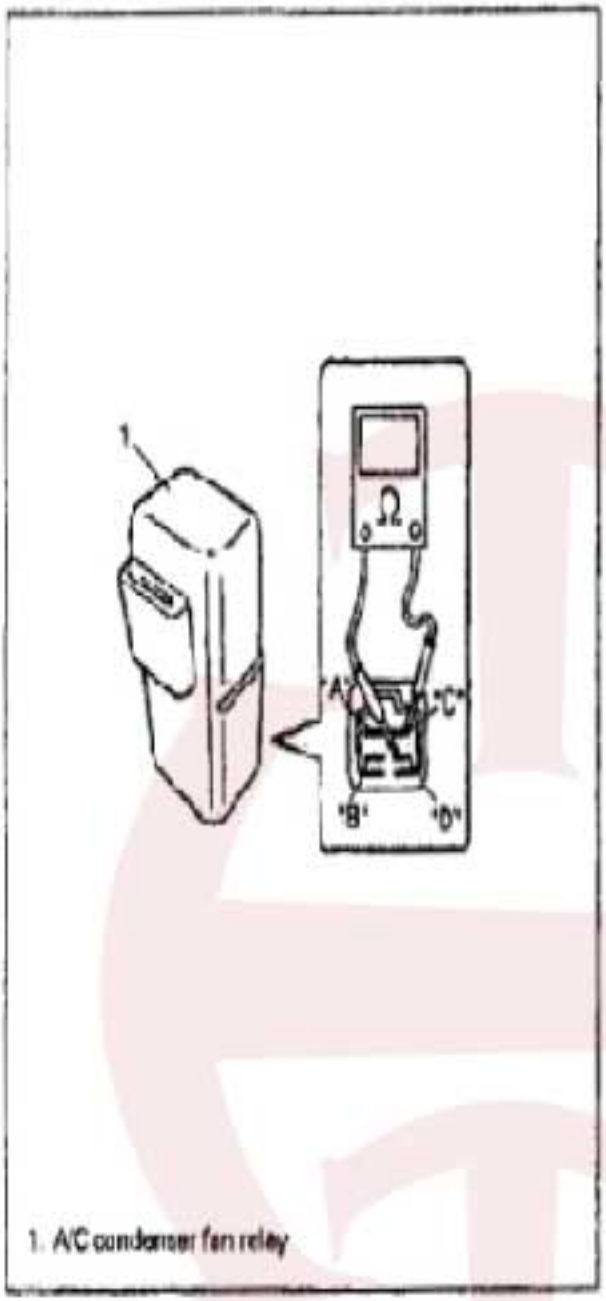


1. A/C condenser fan motor coupler

Connect battery to A/C condenser fan motor as shown, then check that the condenser fan motor operates smoothly.

Reference current : 5.8 – 7.2 A at 12V

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1. A/C condenser fan relay

A/C CONDENSER FAN RELAY

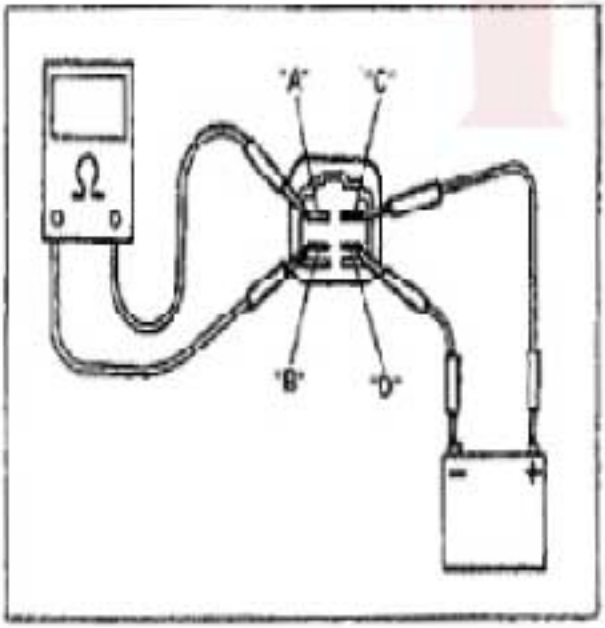
INSPECTION

Check resistance between each two terminals as in table below.

Resistance between "A" and "B" terminals:
∞ (infinity)

Resistance between "C" and "D" terminals:
80 – 100 Ω at 20°C (68°F)

If check results are as specified, proceed to next operation check.
If not, replace.



Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".
If found defective, replace.

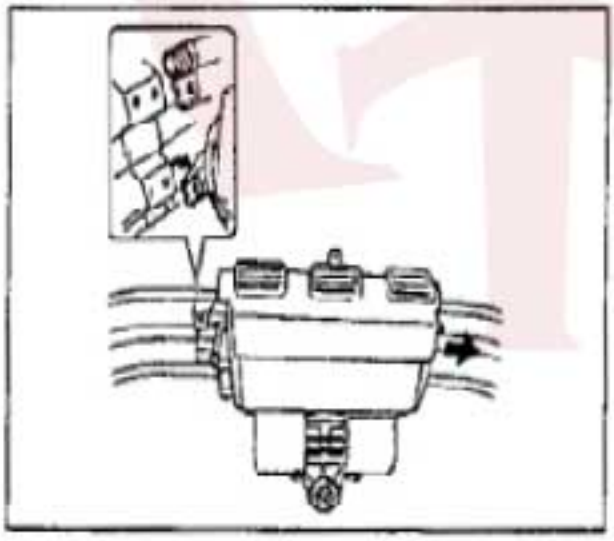
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OVER-HEAD COOLING UNIT

REMOVAL

1) Disconnect negative (–) cable at battery.
2) Recover refrigerant by using recovery and recycling equipment. Be sure to follow the instruction manual for the equipment.
   The amount of compressor oil removed must be measured and the same amount added to the system.
3) Remove over-head cooling unit cover.
4) Disconnect to over-head cooling unit connectors.
5) Disconnect compressor suction pipe, receiver/dryer outlet pipe from over-head cooling unit.

   NOTE:
   As soon as above pipe are disconnected, cap opened fittings so that moisture and dust may not enter cooling unit.



6) Remove mounting bolts and screw and then remove over-head cooling unit as shown in the figure.

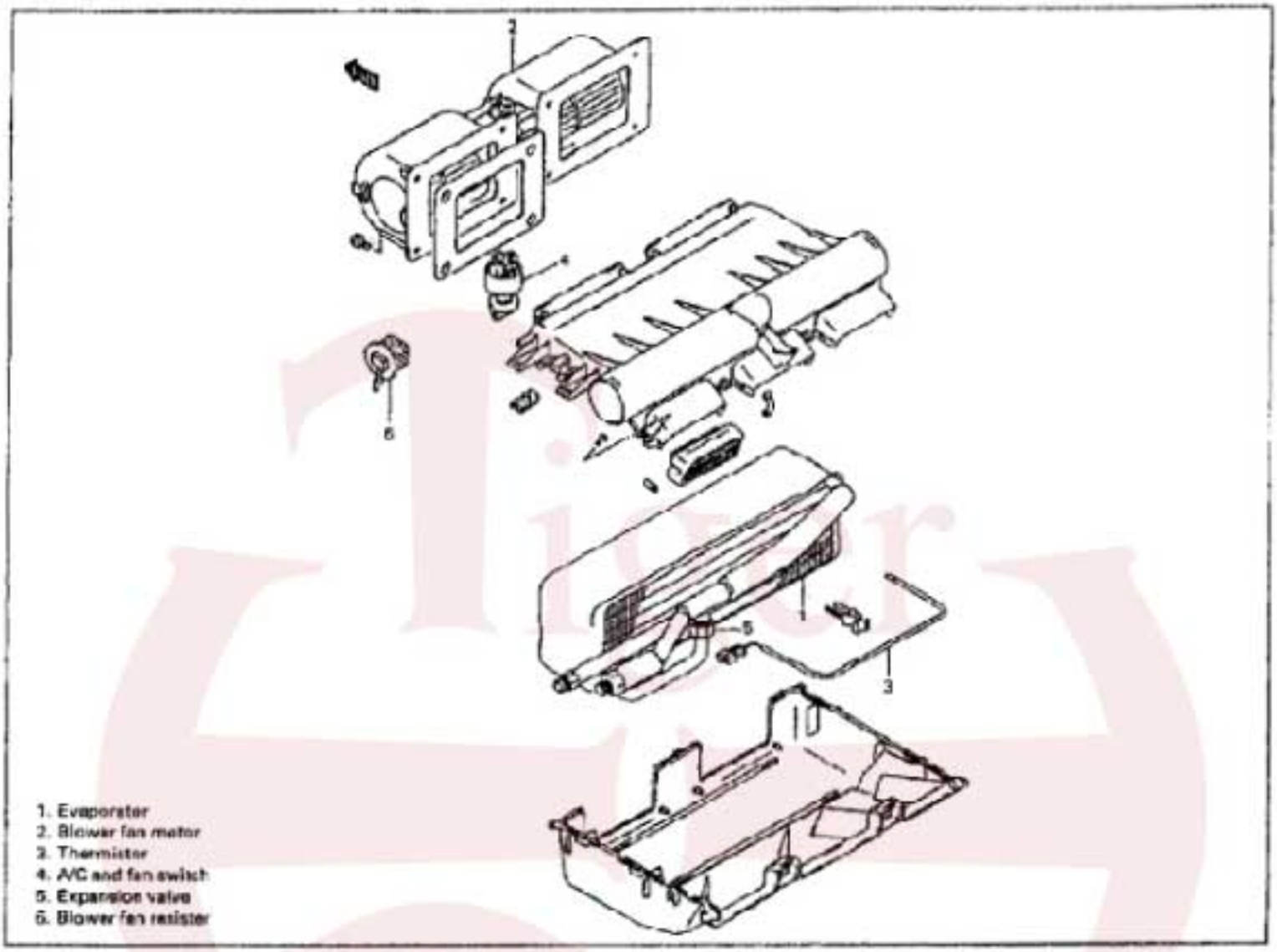
INSTALLATION

1) Install over-head cooling unit by reversing removal procedure.
2) Evacuate and charge system according to previously described procedure.

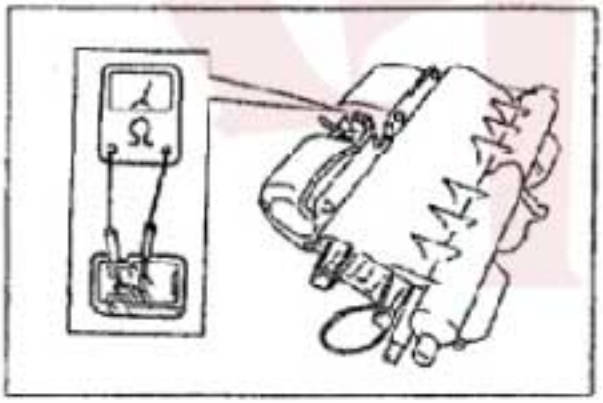
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DISASSEMBLY AND REASSEMBLY

Refer to the figure as given below when disassembling and reassembling overhead cooling unit.



1. Evaporator
2. Blower fan motor
3. Thermister
4. A/C and fan switch
5. Expansion valve
6. Blower fan resister



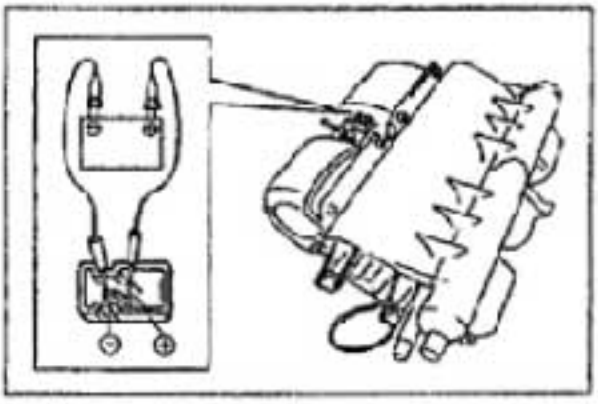
INSPECTION

Blower fan motor

Check continuity between each two terminals.

If check results are continuity, proceed to next operation check.

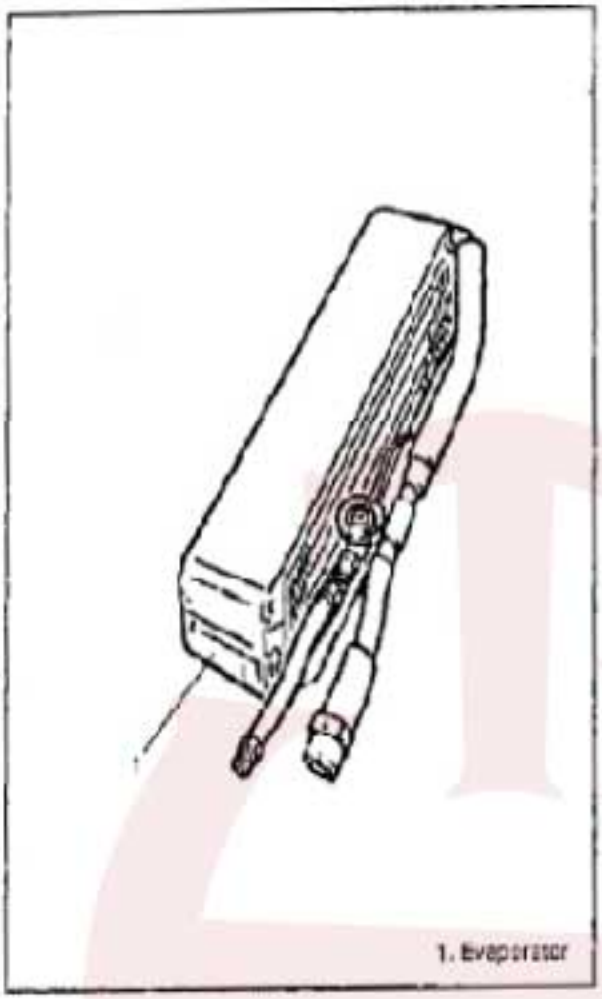
If not, replace.



Connect battery to blower fan motor as shown, then check that the blower fan motor operates smoothly.

Reference current : 4.8 – 6.0 A at 12V

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1. Evaporator

Evaporator

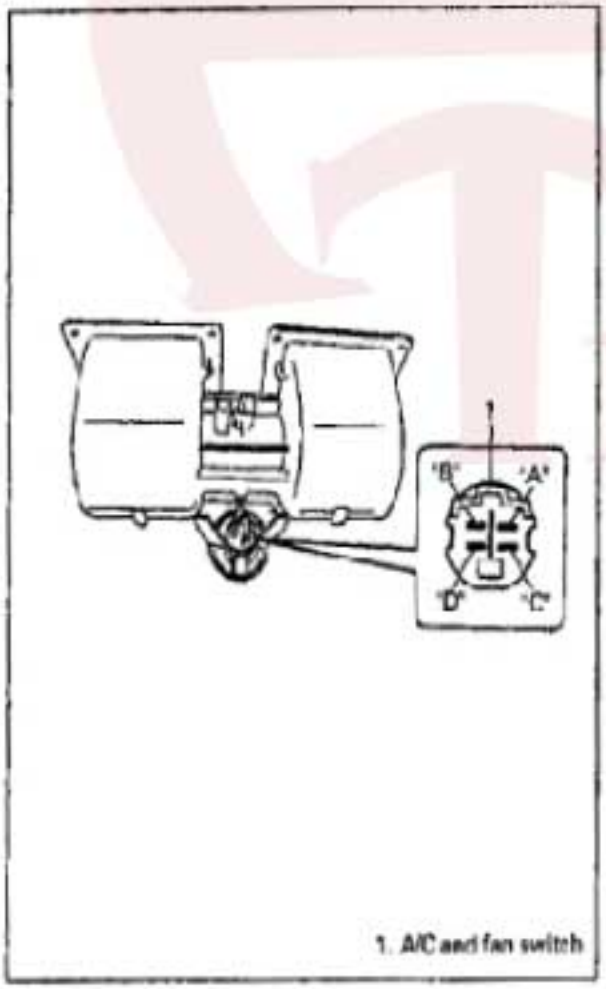
Check the following

- Evaporator fins for leakage, blockage and damage.
- Evaporator fitting for leakage.

Clogged evaporator fins should be washed with water, and should be dried with compressor air.

NOTE:

- **Be careful not to damage evaporator fins. If evaporator fin is bent, straighten it by using a screwdriver or pair of pliers, If any leakage is found from fitting or tube, repair or replace evaporator.**
- **When the thermistor removed, its should be reinstalled in original position.**



1. A/C and fan switch

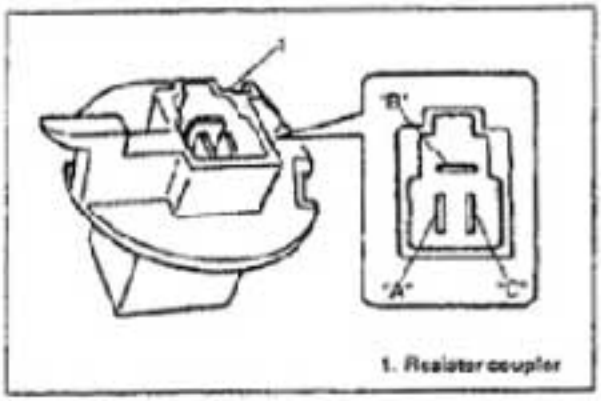
A/C and fan switch

1) Disconnect negative (–) cable at battery.
2) Remove over head cooling unit cover.
3) Disconnect A/C and fan switch connector to remove A/C and fan switch.
4) Use an ohmmeter to check A/C and fan switch for proper continuity between each terminal.

Position	"A"	"B"	"C"	"D"
OFF	○			
Low	○	○		
Middle	○	○	○	
High	○	○		○

If A/C and fan switch shows no continuity, replace it.

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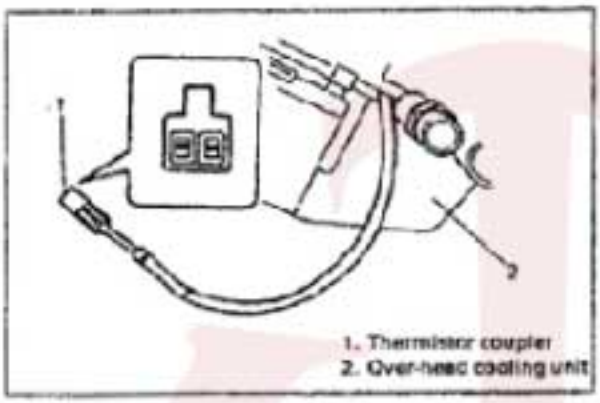
1. Resistor coupler

Blower fan resister

Check resistance for each terminal-to-terminal as given below.

Terminal-to-terminal	Resistance (Ω)
"A"-"B"	1.6 – 1.8
"A"-"C"	2.8 – 3.0
"B"-"C"	1.1 – 1.3

If check results are as specified, replace blower fan motor and resister.


1. Thermistor coupler
2. Over-head cooling unit

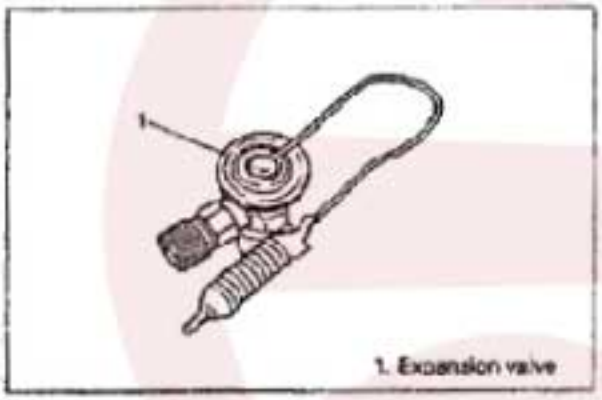
A/C evapo. thermistor

Check resistance between terminals.

Sensor Temperature (°C (°F))	Resistance (kΩ)
0 (32)	6.3 – 7.0
25 (77)	1.8 – 2.2

If check results are as specified, replace thermistor.

NOTE:
When the thermistor removed, it should be reinstalled in original position.


1. Expansion valve

Expansion valve

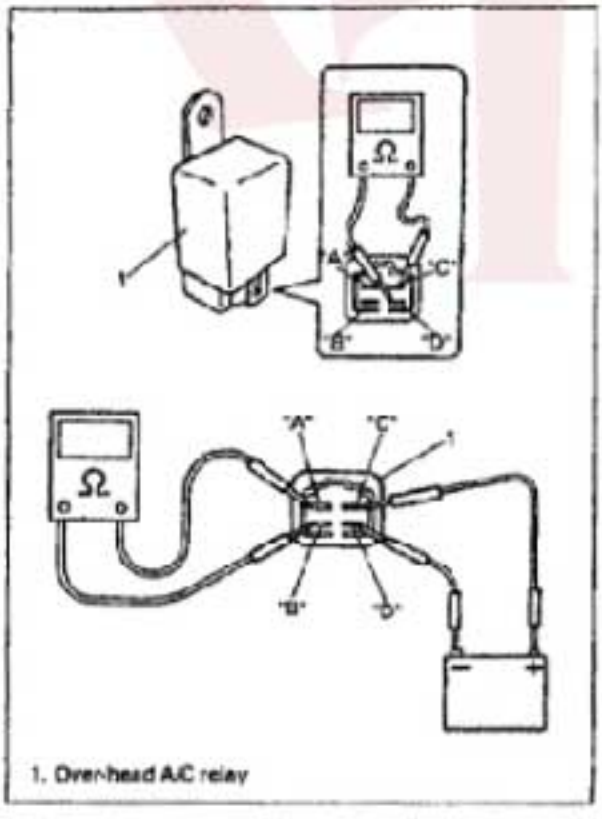
Refer to "Troubleshooting Procedure Using Manifold Gauge Set" earlier in this section.

OVER-HEAD A/C RELAY

INSPECTION

Check resistance between each two terminals as in table below.

Resistance between "A" and "B" terminals:
∞ (infinity)
Resistance between "C" and "D" terminals:
80 – 100 Ω at 20°C (68°F)



1. Over-head A/C relay

If check results are as specified, proceed to next operation check.
If not, replace.
Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D". If found defective, replace.

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A/C COMPRESSOR

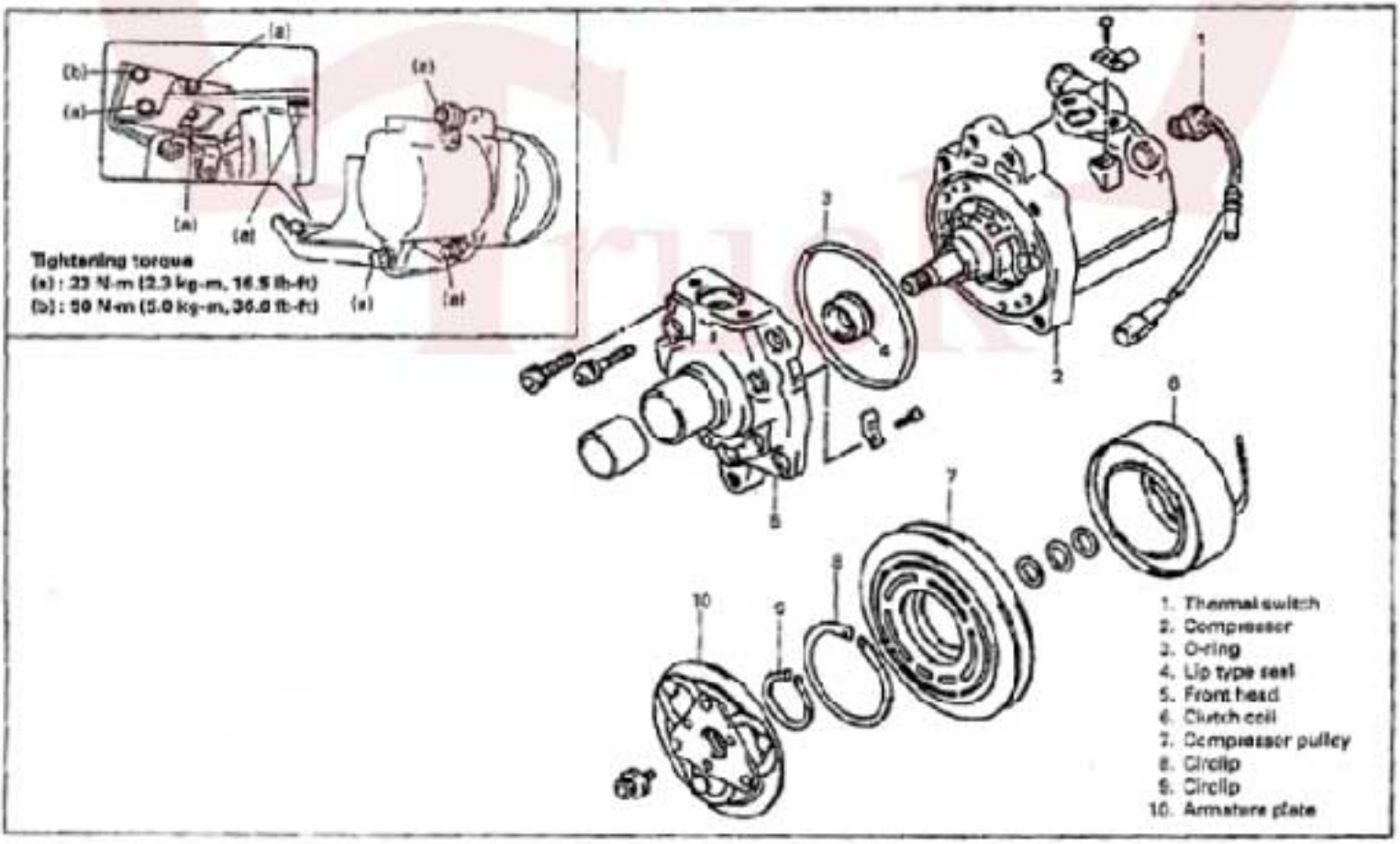
ON-VEHICLE INSPECTION

Compressor troubles are mainly following three types : gas leakage, noise and insufficient pressure. Compressor gas leakages in most cases develop from the shaft seal. When detecting gas leakage, always use a leak tester. If a small amount of oil seeps out from the shaft seal, there is no necessity of replacing the seal. The shaft seal has been designed to allow a small amount of oil to leak out for lubricating purpose. Thus, the shaft seal should be replaced only when a large amount of compressor oil is leaking out or when gas leakage id discovered by using gas tester.

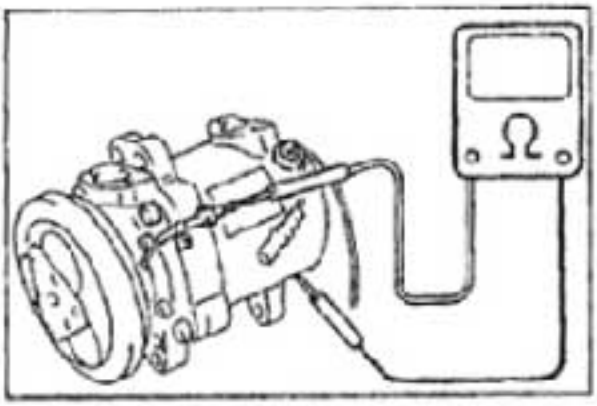
PROBLEM	POSSIBLE CAUSE	CORRECTION
Noise from compressor	• Defective rotary valve • Defective bearing • Defective cylinder and/or shaft	Replace Replace Replace
Noise from magnetic clutch	• Defective bearing • Defective clutch face	Replace Replace
Insufficient cooling	• Defective gasket • Defective reed valve	Replace Replace
Not rotating	• Locked by rotary valve to cylinder and/or shaft and reed valve • Seized magnetic clutch • Rotating parts seized by insufficient oil amount	Replace Replace Replace
Oil and/or gas leakage	• Defective shaft seal • Defective O-ring	Replace Replace

REMOVAL AND INSTALLATION

Refer to the figure as given below when removing and installing A/C compressor.
After installing, be sure to check and adjust drive belt tension, referring to "A/C Compressor Drive Belt Inspection" under "Diagnosis".



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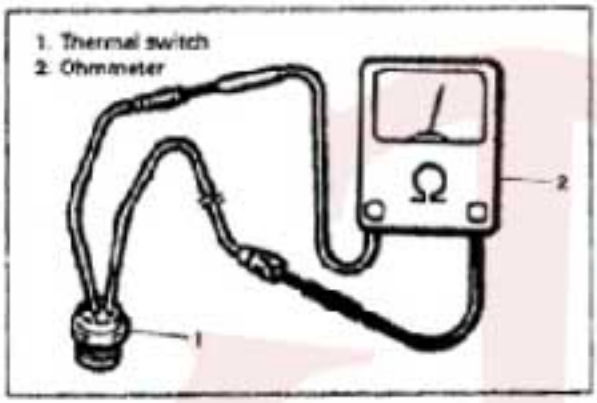


INSPECTION

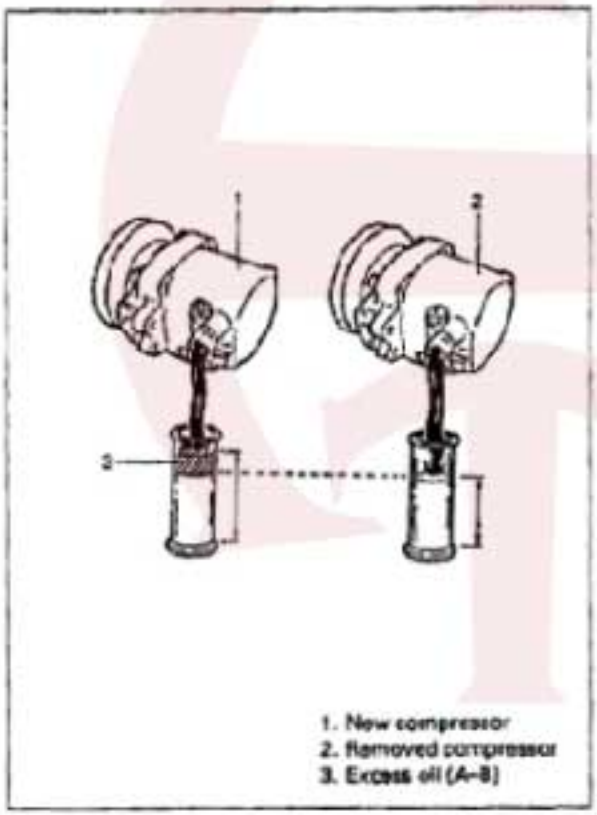
- Check pressure plate and rotor for wear and oil soaked conditions respectively.
- Check clutch bearing for noise, wear and grease leakage.
- Measure stator coil for resistance at 20°C.

Standard Resistance: 2.9 – 3.8 Ω

If the measured resistance does not remain within above tolerance, replace coil.



- Use an ohmmeter to check thermal switch for continuity. If it is no continuity, replace it.



REPLENISHING COMPRESSOR OIL

When replacing air conditioning parts with new ones, it is necessary to replenish oil by the amount supposedly remaining in each part.

When charging gas only

When it is unavoidable to change gas without replacing any component part for engine removal and installation or for some other reason, replenish 100cc oil. When replenishing gas only, oil replenishment is not necessary.

When replacing compressor

Compressor oil is sealed in each new compressor by the amount required for air conditioner cycle. Therefore, when using a new compressor for replacement, drain oil from it by the amount calculated as follows.

"C" = "D" – "E"
"C": Amount of oil to be drained
"D": Amount of oil sealed in a new compressor "A"
"E": Amount of oil remaining in removed compressor "B"

When replacing other part

Part replaced	Amount of compressor oil to be replenished
Evaporator	25 cc
Condenser	15 cc
Receiver/dryer	20 cc
Hoses	10 cc each
Pipes	10 cc each

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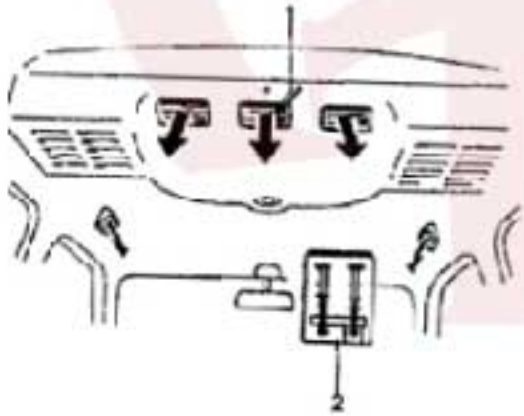
1. Accelerator pedal OFF switch
2. Accelerator pedal

ACCELERATOR PEDAL OFF SWITCH

INSPECTION

With accelerator pedal set in following state, check continuity of 2 terminals included in connector of accelerator pedal OFF switch.

OFF position (accelerator pedal is depressed fully):
Continuity
ON position (accelerator pedal is not depressed fully):
No continuity
If the above conditions are not satisfied, replace accelerator pedal OFF switch.



1. Thermometer
2. Psychrometer

PERFORMANCE TEST

After finishing all repairs, make sure to carry out performance test of A/C system as follows.

PROCEDURE

1) Connect high and low side charging hose of manifold gauge set to hose fittings of compressor.
2) Run engine, and keep speed at 1500 rpm.
3) Set A/C and fan switch at high position.
4) Keep all windows and doors open.
5) Insert a dry bulb thermometer in cool air outlet, and place psychrometer (dry and wet bulb thermometer) close to inlet of cooling unit.
6) The high pressure gauge reading should be within specified pressure range.

   High pressure gauge reading:
   1.4 – 1.6 Mpa (14 – 16 kg/cm^2, 200 – 228 psi)
   NOTE:
   If the gauge indicates too high, pour water on condenser or if it is too low, cover front surface of condenser.

7) The dry bulb thermometer at air inlet should be within 25 to 35°C (77 to 95°F).

Under above conditions, operate A/C system until a stabilized condition on high and low pressure gauges and thermometers has been established.

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HOW TO READ THE STANDARD PERFORMANCE CURVE

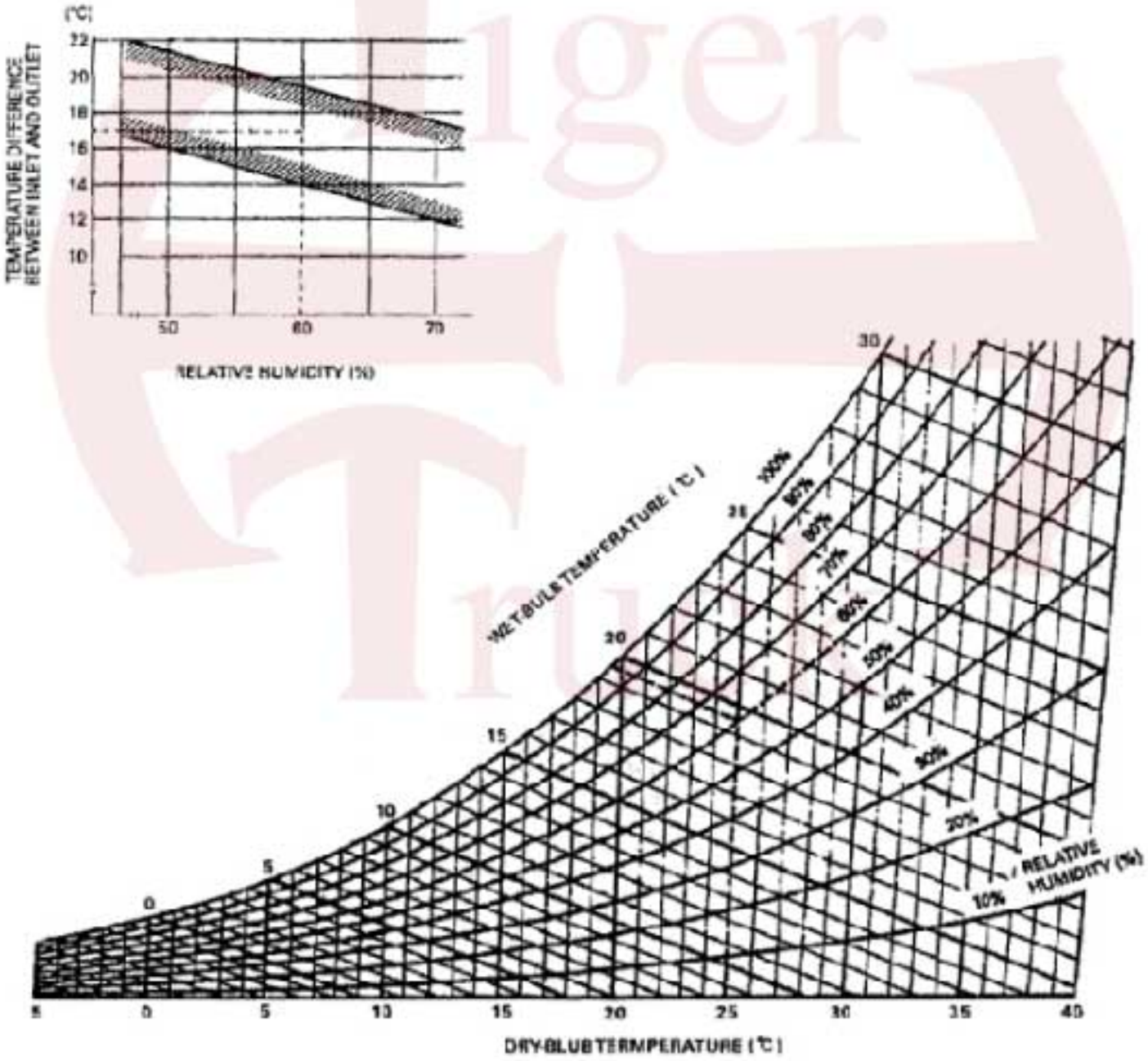
1) Read psychrometer reading at the inlet, and get relative humidity from psychrometric chart. (See following figures.)
2) Measure dry bulb temperature at cool air outlet, then find out the difference between inlet and outlet temperatures.
3) Check the relative humidity-to-temperature difference relationship using the graph.
   As an example of 17°C (62.5°F) temperature difference and 60% relative humidity shown in it, if their crossing point falls within the area between two lines, cooling performance then is satisfactory and proper.

HOW TO READ RELATIVE HUMIDITY (°C)

Measure wet-bulb temperature and dry-bulb temperature on the psychrometer at the evaporator air inlet, follow lines at those temperatures and read the relative humidity curve at their intersection.

Example:

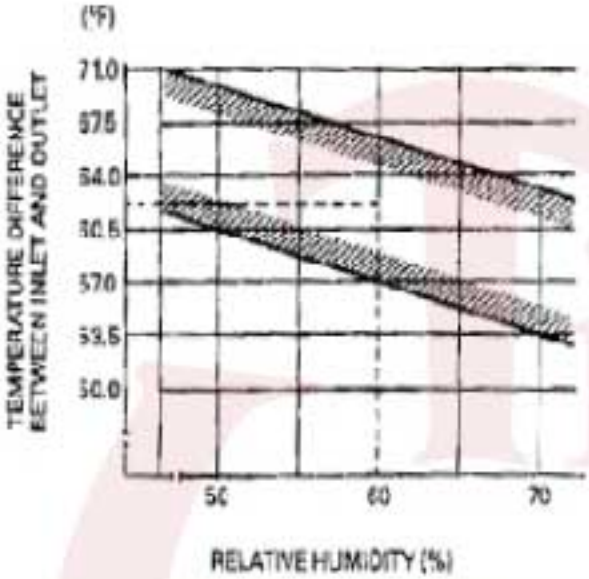
If dry-bulb temperature is 25°C and wet-bulb temperature is 19.5°C, the relative humidity is 60%.

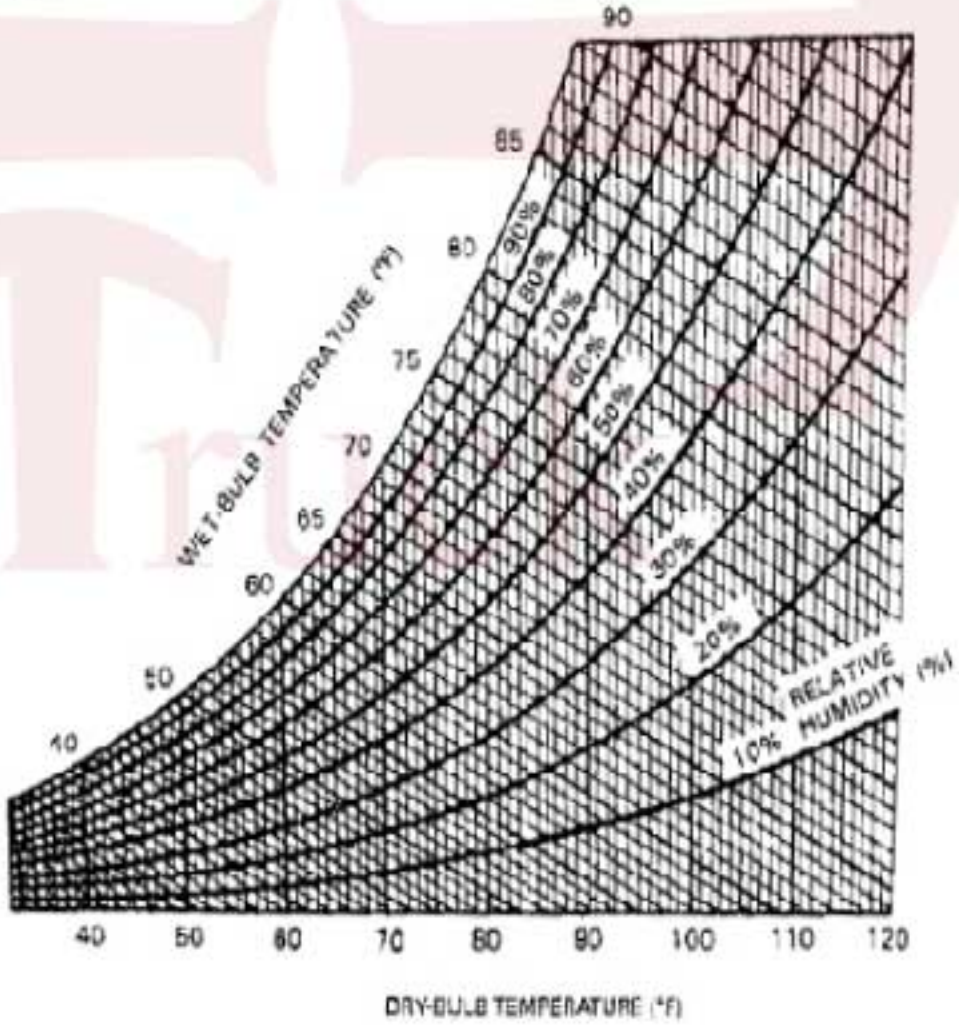


HOW TO READ RELATIVE HUMIDITY (°F)

Measure wet-bulb temperature and dry-bulb temperature on the psychrometer at the evaporator air inlet, follow lines at those temperatures and read the relative humidity curve at their intersection.

Example:
If dry-bulb temperature is 90°F and wet-bulb temperature is 78°F, the relative humidity is 60%.





SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

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GENERAL DIAGNOSIS

Since the problems in steering, suspension, wheels and tires involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect front and rear suspension and rack and pinion for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loosen and/or rough wheel bearings.

Condition	Possible Cause	Correction
Vehicle Pulls (Leads)	• Mismatched or uneven tires	Replace tire.
	• Tires not adequately inflated	Adjust tire pressure.
	• Broken or sagging springs	Replace spring.
	• Radial tire lateral force	Replace tire.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Brake dragging in one road wheel	Repair front brake.
	• Loose, bent or broken front or rear suspension parts	Tighten or replace suspension parts.
Abnormal or Excessive Tire Wear	• Sagging or broken spring	Replace spring.
	• Tire out of balance	Adjust balance or replace tire.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Faulty strut (shock absorber)	Replace strut.
	• Hard driving	Replace tire.
	• Overloaded vehicle	Replace tire.
	• Not rotating tire	Replace or rotate tire.
	• Worn or loose road wheel bearing	Replace wheel bearing.
	• Wobbly wheel or tire	Replace wheel or tire.
	• Tires not adequately inflated	Adjust tire pressure.
Wheel Tramp	• Blister or bump on tire	Replace tire.
	• Improper strut (shock absorber) action	Replace strut.
Shimmy, Shake or Vibration	• Tire or wheel out of balance	Balance wheels or replace tire and/or wheel.
	• Damaged or worn wheel bearings	Replace wheel bearing.
	• Worn tie rod ends	Replace tie rod end.
	• Worn lower ball joints	Replace front suspension arm.
	• Excessive wheel runout	Repair or replace wheel and/or tire.
	• Blister or bump on tire	Replace tire.
	• Excessively loaded radial runout of tire/wheel assembly	Replace tire or wheel.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Loose or worn steering linkage	Tighten or replace steering linkage.
	• Loose steering gear case mounting bolts	Tighten case bolts.

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Condition	Possible Cause	Correction
Hard Steering	• Tire not adequately inflated	Inflate tires to proper pressure.
	• Bind in tie rod end ball studs or lower ball joints	Replace tie rod end or front suspension arm.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Rack and pinion not properly adjusted	Check and adjust rack and pinion torque.
	• Bind in steering column	Repair or replace.
Too Much Play in Steering	• Wheel bearings worn	Replace wheel bearing.
	• Loose steering gear case bolts	Tighten.
	• Rack and pinion not properly adjusted	Check and adjust rack and pinion torque.
	• Worn steering shaft joints	Replace joint.
	• Worn tie rod ends or tie rod inside ball joints	Replace tie rod end or tie rod.
	• Worn lower ball joints	Replace front suspension arm.
Poor Return ability	• Bind in tie rod end ball studs	Replace tie rod end.
	• Bind in ball joints	Replace front suspension arm.
	• Bind in steering column	Repair or replace.
	• Poorly lubricated rack and pinion	Check, repair or lubricate rack and pinion.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Rack and pinion not properly adjusted	Check and adjust rack and pinion torque.
	• Tires not adequately inflated	Adjust tire pressure.
Steering Noise (Rattle or Chuckle)	• Loose steering gear case bolts	Tighten.
	• Broken or otherwise damaged wheel bearings	Replace.
	• Worn or sticky tie rod ends	Replace.
	• Rack and pinion not properly adjusted	Check and adjust rack and pinion torque.
Abnormal Noise in Front End	• Worn, sticky or loose tie rod ends, lower ball joints, tie rod inside ball joints or drive shaft joints	Replace tie rod end, suspension arm, tie rod or drive shaft joint.
	• Damaged struts or mounting	Repair or replace.
	• Worn suspension arm bushings	Replace.
	• Loose stabilizer bar.	Tighten bolts, replace bushes.
	• Loose wheel nuts	Tighten wheel nuts.
	• Loose suspension bolts or nuts	Tighten suspension bolts or nuts.
	• Broken or otherwise damaged wheel bearings	Replace wheel bearing.
	• Broken suspension springs	Replace spring.
	• Poorly lubricated or worn strut bearings	Lubricate or replace strut bearing.
	• Worn or sticky stabilizer joints	Replace.

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Condition	Possible Cause	Correction
Wander or Poor Steering Stability	• Mismatched or uneven tires	Replace tires or inflate tires to proper pressure.
	• Loosen ball joints and tie rod ends.	Replace suspension arm or tie rod end.
	• Faulty shock absorbers/struts or mounting	Replace strut or repair mounting.
	• Loose stabilizer bar	Tighten or replace stabilizer bar or bushes.
	• Broken or sagging springs	Replace spring.
	• Rack and pinion not properly adjusted	Check and adjust rack and pinion torque.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Loose stabilizer joints	Replace joint.
Erratic Steering When Braking	• Worn wheel bearings	Replace wheel bearings.
	• Broken or sagging springs	Replace spring.
	• Wheel tires are inflated unequally	Inflate tires to proper pressure.
	• Disturbed front end alignment	Check and adjust front end alignment.
	• Brakes not working in unison	Refer to SECTION 5.
Low or Uneven Trim Height	• Broken or sagging springs	Replace spring.
	• Over loaded	Check loading.
	• Incorrect springs	Replace spring.
Ride Too Soft	• Faulty shock absorbers or struts	Replace shock absorber or strut.
Suspension Bottoms	• Overloaded	Check loading.
	• Faulty shock absorbers or struts	Replace shock absorber or strut.
	• Incorrect broken or sagging springs	Replace spring.
Body Leans or Sways in Corners	• Loose stabilizer bar	Tighten stabilizer bar bolts or nuts, or replace bushes or joint.
	• Faulty shock absorbers, struts or mounting	Replace strut or tighten mounting.
	• Broken or sagging springs	Replace spring.
	• Overloaded	Check loading.
Cupped Tires	• Front struts defective	Replace.
	• Worn wheel bearings	Replace wheel bearings.
	• Excessive tire or wheel run-out	Replace tire or wheel disc.
	• Worn ball joints	Replace front suspension arm.
	• Tire out of balance	Adjust tire balance.

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Hard cornering, under inflation or lack of rotation



Incorrect wheel alignment, tire construction not uniform or wheel heavy acceleration



TIRE DIAGNOSIS

IRREGULAR AND/OR PREMATURE WEAR

Irregular and premature wear has many causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.

If the following conditions are noted, rotation is necessary:

1) Front tire wear is different from rear.
2) Uneven wear exists across the tread of any tire.
3) Front tire wear is unequal between the right and left.
4) Rear tire wear is unequal between the right and left.
5) There is cupping, flat spotting, etc.

A wheel alignment check is necessary, if following conditions are noted:

1) Front tire wear is unequal between the right and left.
2) Wear is uneven across the tread of any front tire.
3) Front tire treads have scuffed appearance with "feather" edges on one side of tread ribs or blocks.



1. Indicator

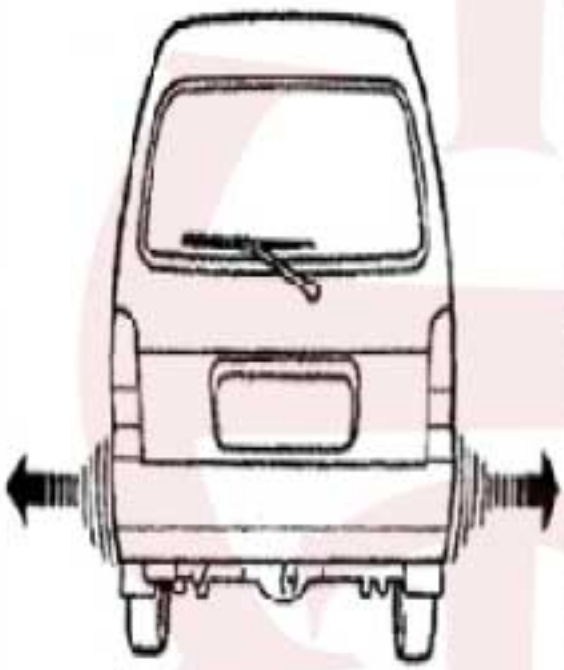
WEAR INDICATORS

Original equipment tires have built-in tread wear indicators to show when they need replacement.

These indicators will appear as 12 mm (0.47 in.) wide bands when the tire tread depth becomes 1.6 mm (0.063 in.).

When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.

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RADIAL TIRE WADDLE

Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 48 km/h (5 to 30 mph).

It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or "waddles". To the driver in his seat, it feels as though someone is pushing on the side of vehicle.

If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in vehicle.

Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture's recommendations.

If TPD is not available, the more time consuming method of substituting known good tire/wheel assemblies can be used as follows:

1) Ride vehicle to determine whether the front or rear waddles.
2) Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3) Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known good tires in place of all four. Then reinstall originals in the same manner as above.

RADIAL TIRE LEAD

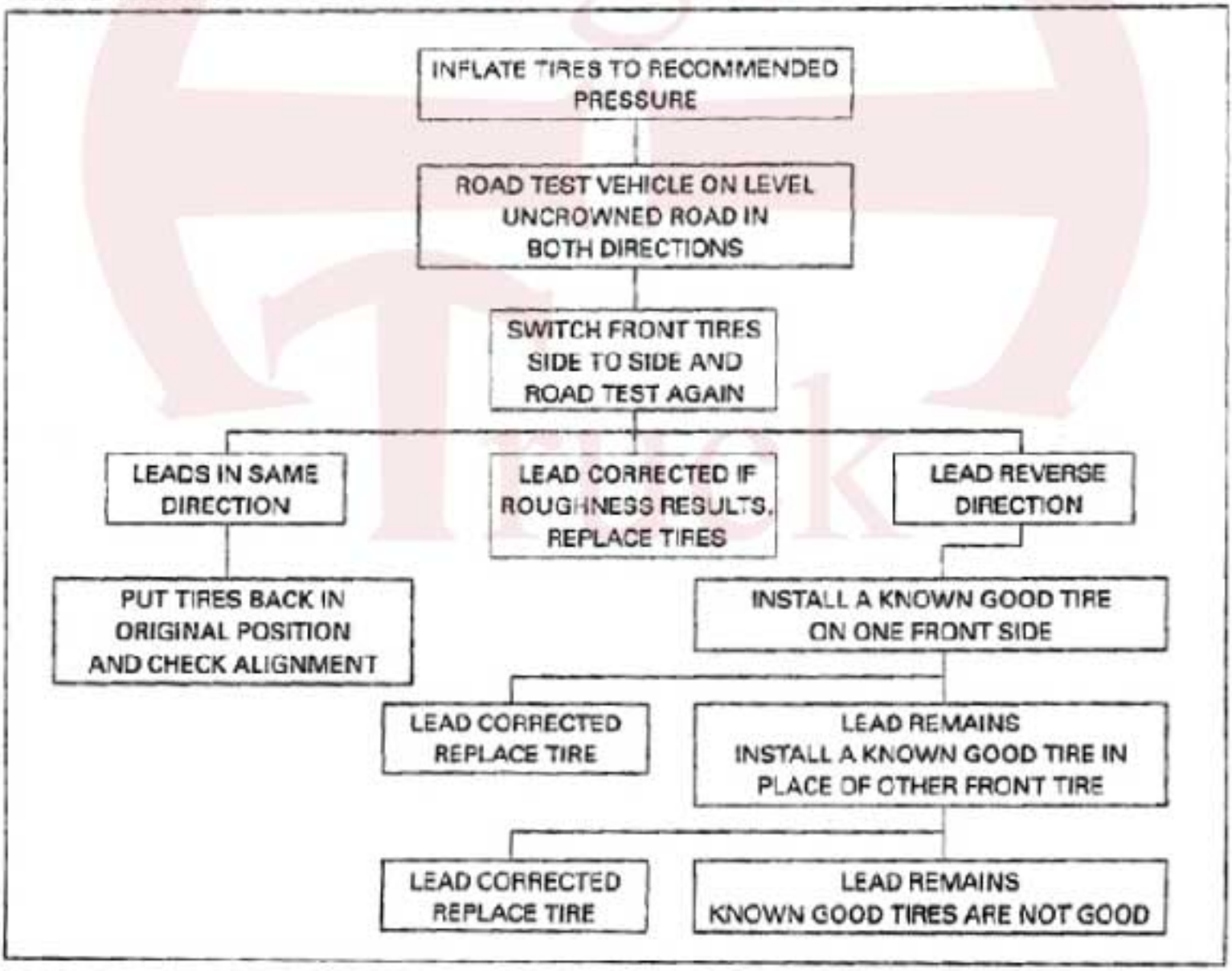
"Lead" is the deviation of the vehicle from a straight path on a level road even with no pressure on the steering wheel.
Lead is usually caused by:

- Incorrect alignment
- Uneven brake adjustment
- Tire construction

The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.
The procedure in the figure (Lead diagnosis flow chart) should be used to make sure that front alignment is not mistaken for tire lead.

1) Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed.
2) Rear tires will not cause lead.

LEAD DIAGNOSIS FLOW CHART



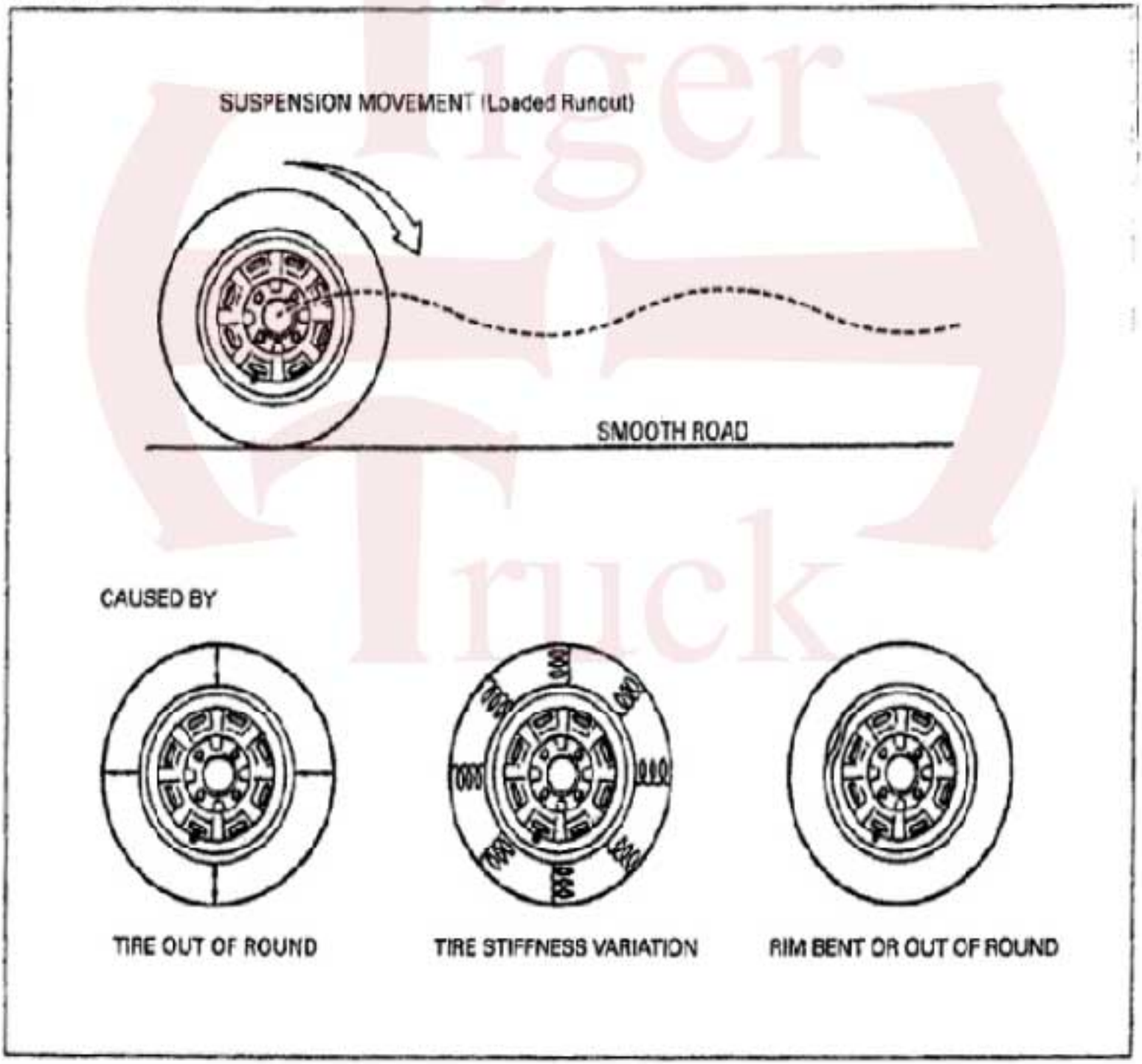
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VIBRATION DIAGNOSIS

Wheel unbalance causes most of the highway speed vibration problems. If a vibration remains after dynamic balancing, its possible causes are as follows.

- Tire runout
- Wheel runout
- Tire stiffness variation

Measuring tire and/or wheel free runout will uncover only part of the problem. All three causes, known as loaded radial runout, must be checked by using a Tire Problem Detector (TPD). If TPD is not available, the more time consuming method of substituting known good tire and wheel assemblies on the problem vehicle can be used.



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SECTION 3A

FRONT END ALIGNMENT

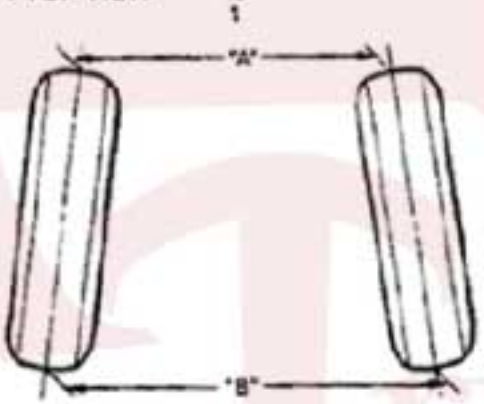
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- Preliminary checks prior to adjusting front alignment 3A-2
- Toe adjustment 3A-3
- Camber and caster adjustment 3A-3
- Steering angle 3A-4

TIGHTENING TORQUE SPECIFICATION 3A-4

GENERAL DESCRIPTION

WHEEL TOE-IN TOP VIEW



POSITIVE CAMBER



ALIGNMENT SERVICE DATA

Toe-in ("B" – "A")	:	0.0 ± 1.5 mm (0.00 ± 0.06 in.)
Camber	:	1° 20′ ± 45′
Caster	:	3° 00′ ± 1°
Kingpin inclination	:	9° 50′ ± 2°

1. Forward
2. Body center side
3. Center line of wheel
4. Camber angle

NOTE:

Toe-in value given above was measured by using a toe-in gauge.

Front alignment refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. Generally, the only adjustment required for front alignment is toe setting. Camber and caster can't be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If the body is damaged, it should be repaired and if suspension is damaged, it should be replaced.

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TOE SETTING

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (excessive toe-in or toe-out may increase tire wear). Amount of toe can be obtained by subtracting "A" from "B" as shown in previous page and therefore is given in mm.

CAMBER

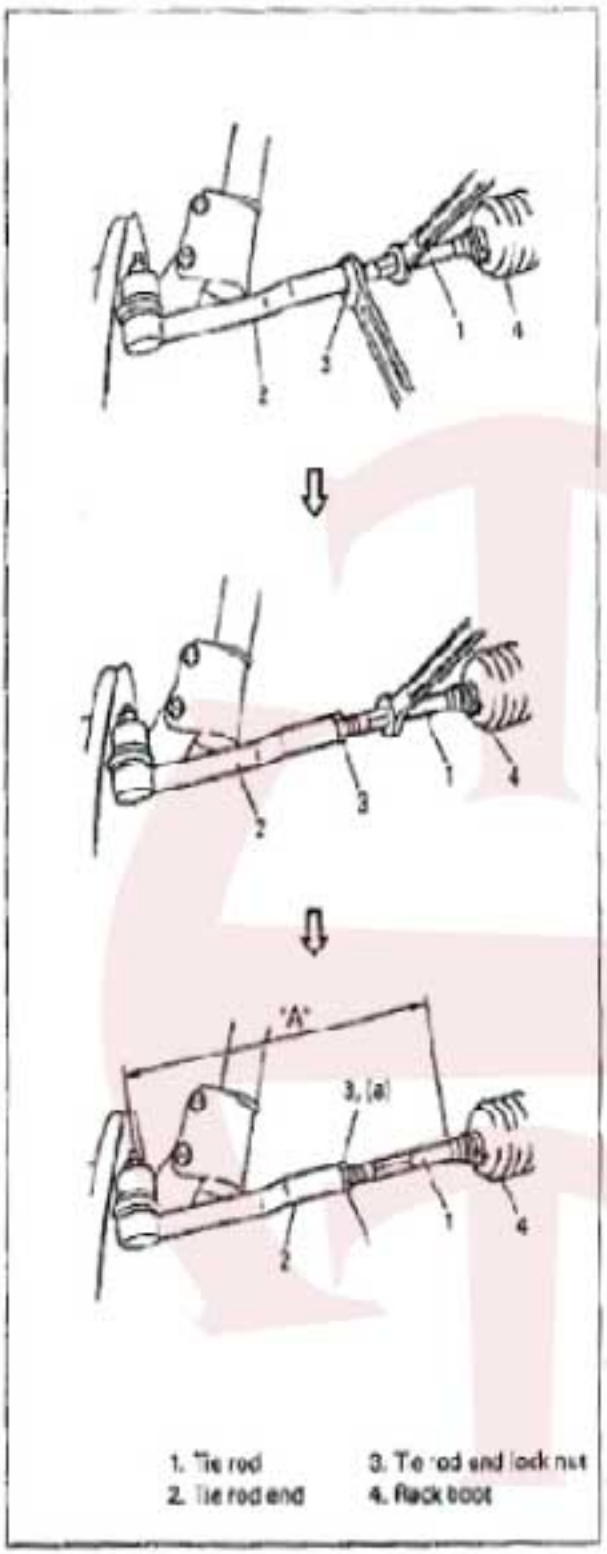
Camber is the tilting of the front wheels from the vertical, as viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive. When the wheels tilt inward at the top, the camber is negative. The amount of tilt is measured in degrees.

PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. "Lead" is the deviation of the vehicle from a straight path on a level road without hand pressure on the steering wheel. SECTION 3 of this manuel contains a procedure for determining the presence of a tire lead problem. Before making any adjustment affecting toe setting, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check for loose of ball joints. Check tie rod ends; if excessive looseness is noted, it must be corrected before adjusting.
3) Check for runout of wheels and tires.
4) Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
5) Check for loose of suspension arms.
6) Check for loose or missing stabilizer bar attachments.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
8) Consider condition of equipment being used to check alignment and follow manufacturer's instructions.
9) Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

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TOE ADJUSTMENT

Toe is adjusted by changing the tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length ("A" in the figure).

Before rotating tie rods, apply grease between tie rods and rack boots so that boots won't be twisted.

After adjustment, tighten lock nuts to specified torque and make sure that rack boots are not twisted.

Tightening Torque

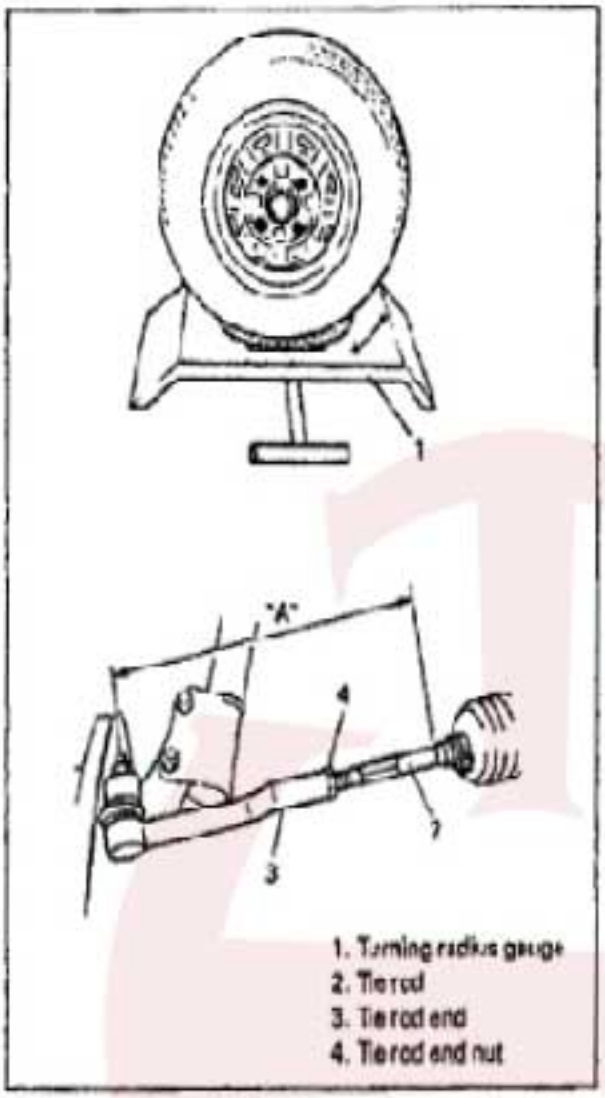
(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in vehicle body, repair it so as to attain specifications.

To prevent possible incorrect reading of camber or caster, vehicle front end must be moved up and down a few times before inspection.

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1. Turning radius gauge
2. Tie rod
3. Tie rod end
4. Tie rod end nut

STEERING ANGLE

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauge.
If steering angle is not correct, check if right and left tie rods are equal in length "A".

NOTE:
If tie rod lengths were changed to adjust steering angle, reinspect toe-in.

Steering angle Inside : 40.1°
outside : 36.7°

Reference Information:
Side slip:
For inspecting front wheel side slip with side slip tester.

Side slip limit: 0 – OUT 3

If side slip exceeds above limit, toe-in or front wheel alignment may not be correct.

TIGHTENING TORQUE SPECIFICATION

Fastening Part	Tightening Torque		
	N·m	kg-m	lb-ft
Tie rod end lock nut	45	4.5	32.5

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SECTION 3B

MANUAL RACK AND PINION

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, end/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

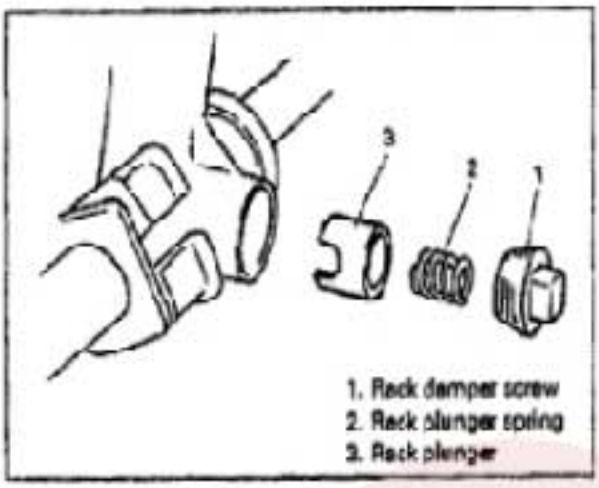
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Steering gear case 3B- 3
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GENERAL DESCRIPTION

The rack and pinion steering system consists of two main components, the rack and the pinion. When the steering wheel is turned, the motion is transmitted to the steering shaft, shaft joint and then to the pinion. Since the pinion teeth mesh with teeth on rack, the motion is further transferred to the rack and changed to linear motion. The force is then transmitted through the tie rods to the steering knuckles which turn wheels.

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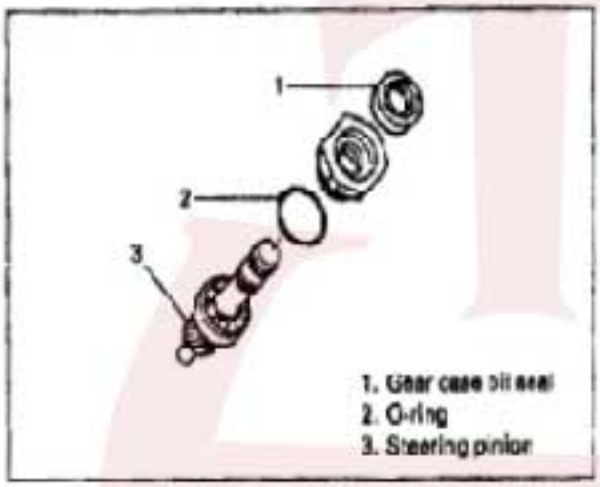
1. Rack damper screw
2. Rack plunger spring
3. Rack plunger

INSPECTION

Rack Plunger

- Inspect rack plunger for wear or damage.
- Inspect rack plunger spring for deterioration.

In either case, if found defective, replace.



1. Gear case oil seal
2. O-ring
3. Steering pinion

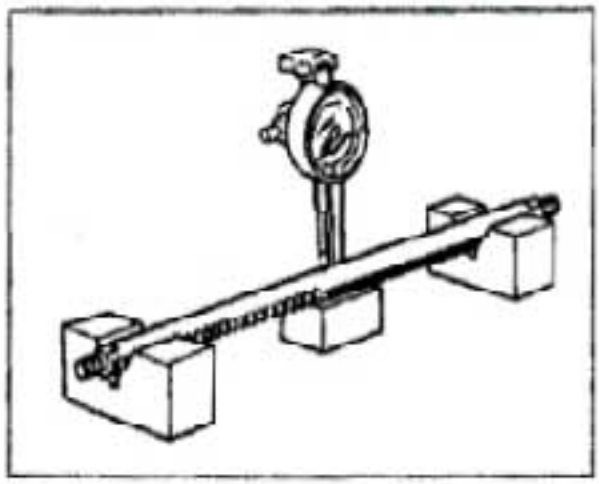
Steering Pinion

- Inspect pinion teeth surface for wear or damage.
- Inspect oil seal for damage.
- Inspect gear case packing for damage.

Replace any part found defective.

Steering Pinion Bearing

Check rotation condition of bearing and inspect for wear.
If found defective, replace as gear case assembly.



Steering Rack

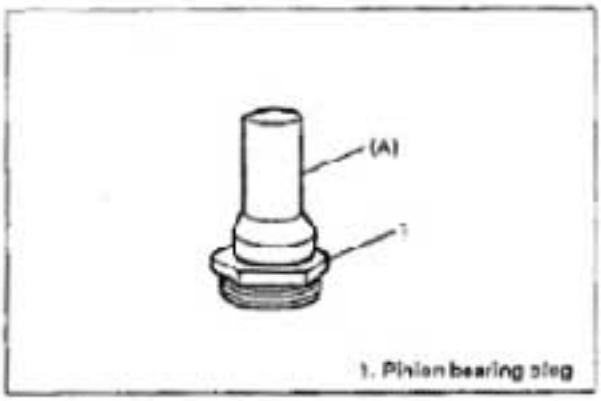
Inspect for deflection, teeth wear, or damage, back surface wear or damage.

Limit of rack deflection: 0.1 mm (0.004 in.)

If deflection exceeds limit, replace rack.

CAUTION:
Do not use a wire brush when cleaning.

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1. Pinion bearing plug

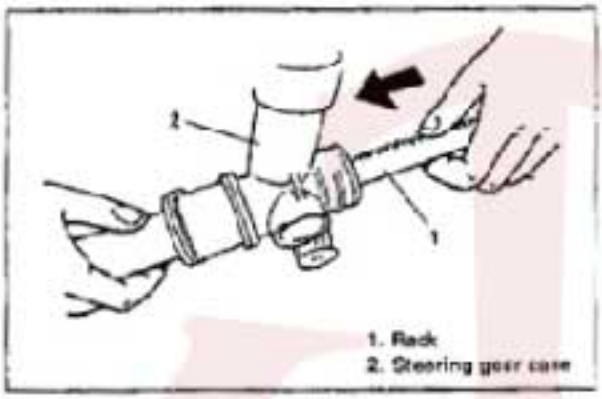
REASSEMBLY

Install in reverse order of removal, nothing following points.

1) Install pinion bearing oil seal to pinion bearing plug with special tool.

Special Tool
(A): 09925-98210

2) Apply grease to oil seal lip.

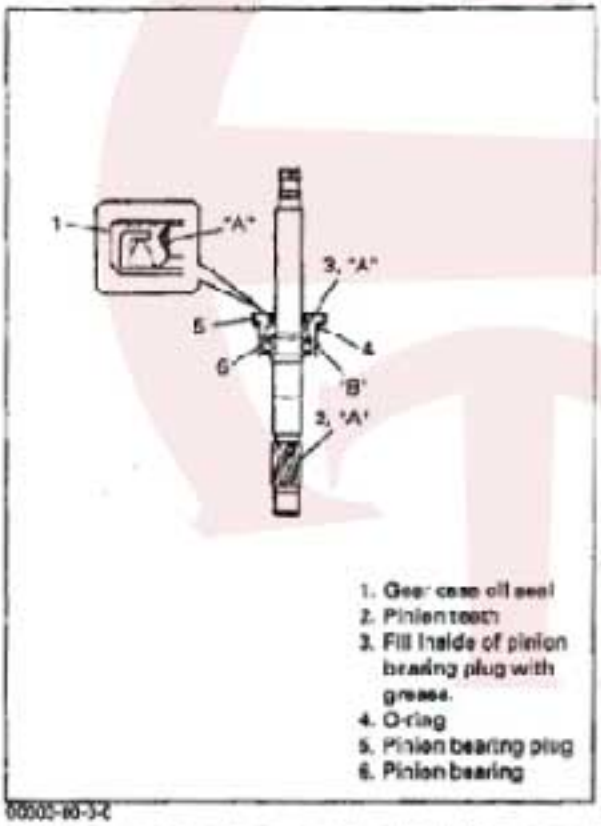


1. Rack
2. Steering gear case

3) Apply grease to entire teeth surface of rack and its periphery.

4) Slide rack into steering gear case in the direction as shown.

CAUTION:
Inside of steering rack bushing is coated with special coating. As it is damageable, be very careful not to cause damage to it when inserting rack into steering gear case.



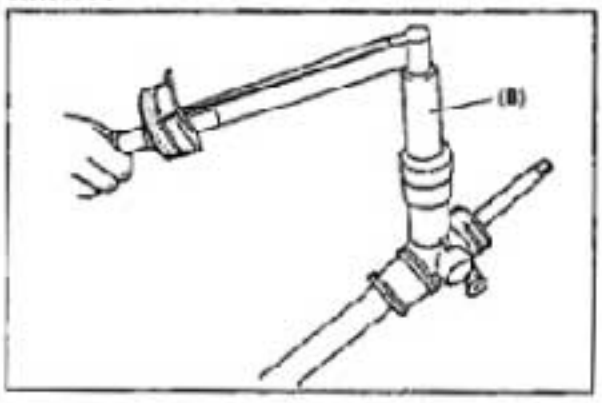
1. Gear case oil seal
2. Pinion teeth
3. Fill inside of pinion bearing plug with grease.
4. O-ring
5. Pinion bearing plug
6. Pinion bearing

5) Apply grease to all around pinion teeth, pinion bearing and gear case oil seal lip.

"A": Grease

6) Apply lock cement to pinion bearing plug thread.

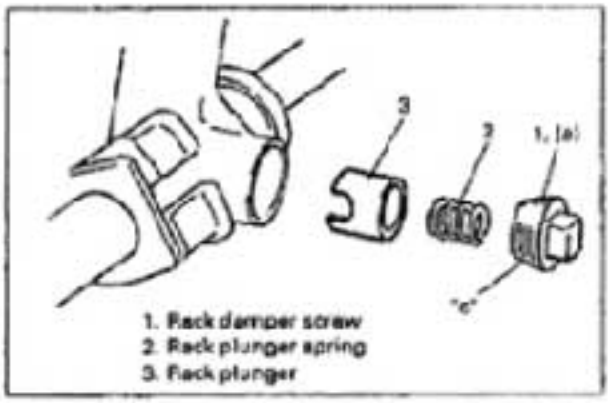
"B": Lock Cement



7) Install pinion assembly and tighten pinion bearing plug to specified torque.

Special Tool (43 mm socket)
(B): 09944-25011
Tightening torque for bearing plug
95 N·m (9.5 kg-m, 69.0 lb-ft)

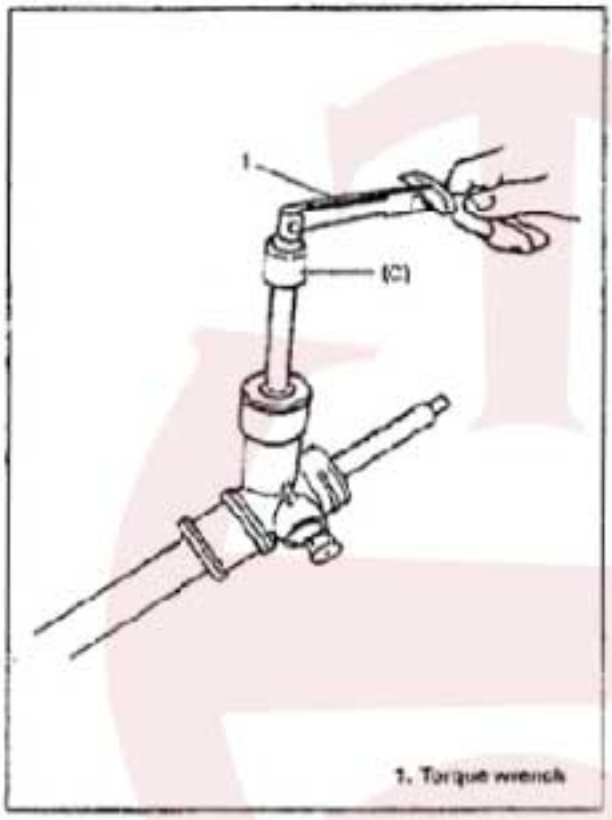
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1. Rack damper screw
2. Rack plunger spring
3. Rack plunger

8) Apply grease lightly to sliding part of plunger against rack

9) Install parts as shown.
10) Apply sealant to all around thread part of rack damper screw and tighten to specified torque.
"C" : Sealant
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

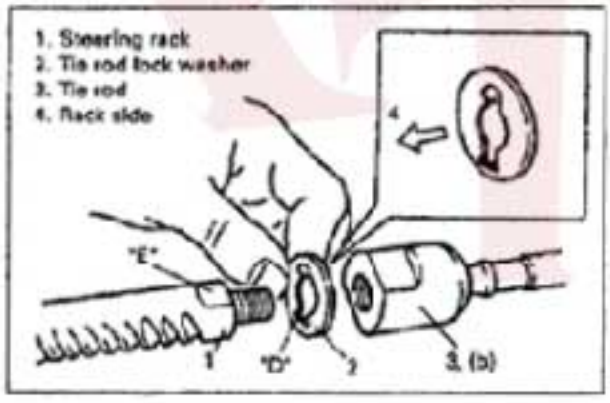


1. Torque wrench

11) After tightening rack damper screw to above specified torque, turn it back by 0° – 90° and check for rotation torque of pinion. If it is not as specified below, adjust so that it will be within specified torque range.

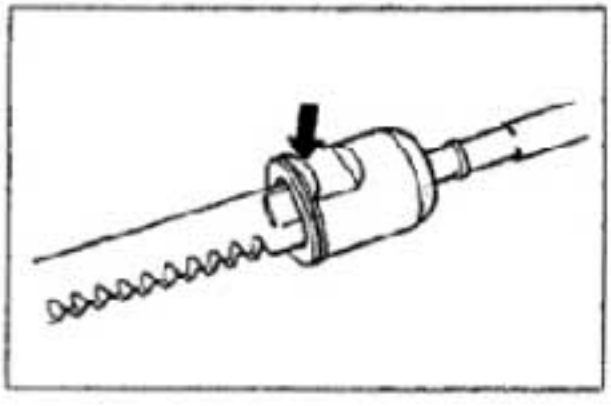
Special Tool
(C): 09944-18211
Rotation torque of pinion
0.8 – 1.3 N·m (0.08 – 0.13 kg-m (0.58 – 0.94 lb-ft))

Also, check if rack as a whole moves smoothly.
12) Install steering gear case cover.



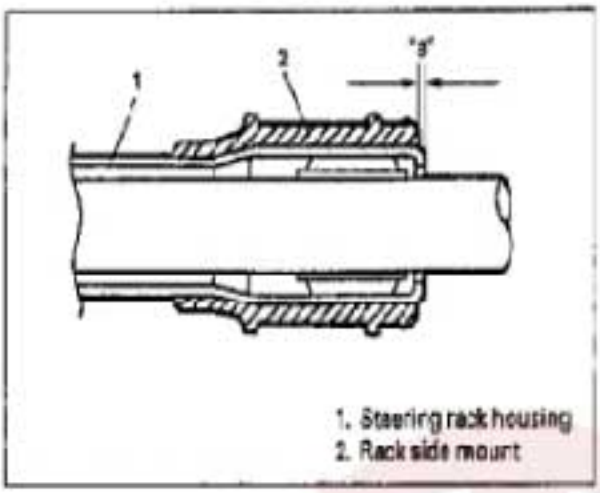
13) Install new tie rod lock washer as shown and tie rod to rack. Align straight part "D" of washer with flat part "E" of rack.
14) Tighten tie rod inside ball nut to specified torque.

Tightening Torque
(b): 85 N·m (8.5 kg-m, 61.5 lb-ft)



15) Bend lock washer to tie rod side as shown.

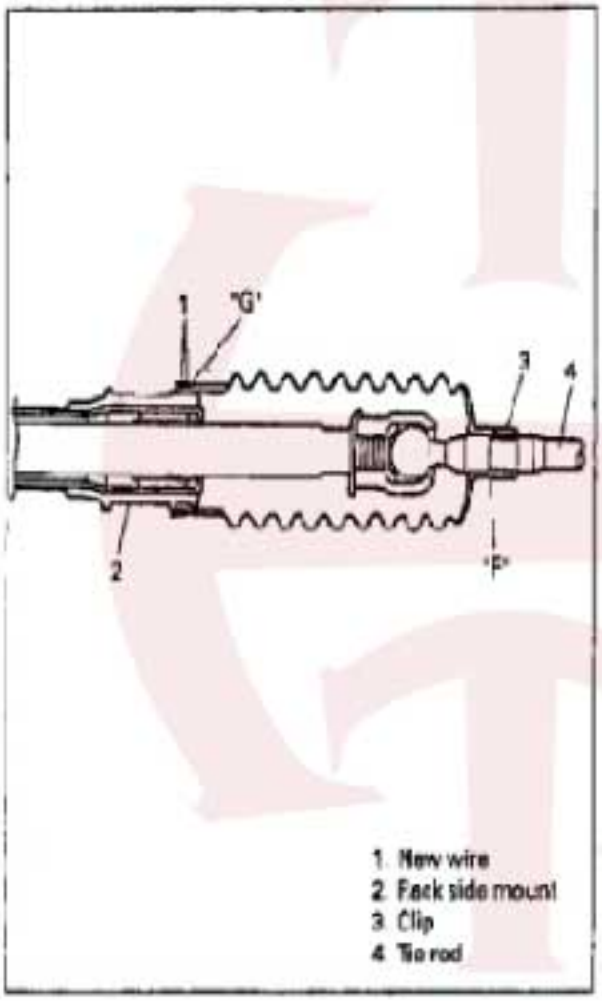
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1. Steering rack housing
2. Rack side mount

16) Before installing boot to steering rack housing, make sure that rack side mount is positioned as shown.

"a": 0.3 – 1.3 mm (0.01 – 0.05 in.)

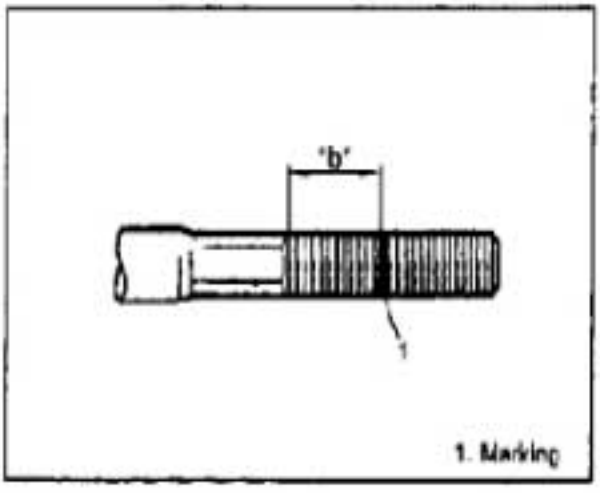


1. New wire
2. Rack side mount
3. Clip
4. Tie rod

17) Apply grease to part which tie rod side "F" of boot.

CAUTION:
Never apply grease to part which contacts steering gear case side "G" of boot.

18) Position boot properly in grooves of gear case and tie rod and clamp it with new wire and clip.
Wire should be new and should go around twice and be tightened with its both ends twisted together. The twisted ends should be bent in the circumferential direction. After this, check to ensure that boot is free from twist and bent.



1. Marking

19) Install tie rod end lock nut and tie rod end to tie rod. Position lock nut to marking made in removal.

NOTE:
When tie rod was replaced, measure length "b" on removed tie rod and use it on new replacement tie rod so as to position lock nut properly.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening Parts	Tightening Torque		
	N·m	Kg-m	lb-ft
Steering shaft joint bolt	25	2.5	18.0
Steering gear case bolt	25	2.5	18.0
Tie rod end nut	43	4.3	31.5
Tie rod end lock nut	45	4.5	32.5
Steering pinion bearing plug	95	9.5	69.0
Tie rod inside ball nut	85	8.5	61.5
Wheel nut	85	8.5	61.5

REQUIRED SERVICE MATERIALS

MATERIAL	USE
Lithium grease (should be applicable for -40°C - 130°C)	• Sliding part of rack against steering housing (All around rack plunger, rack bushing and rack) • Sliding part against steering pinion (Oil seal lip, needle bearing) • Steering rack and pinion gear teeth • Contacting parts of tie rod and rack side boots • Rack end ball joint
Lock cement	• Pinion gear case
Sealant	• Thread part of rack damper screw

SPECIAL TOOLS

			
09913-50121 Oil seal remover	09925-98210 Bearing installer	09944-18211 Pinion torque checking socket	09944-20011 Pinion bearing plug socket (43 mm)

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SECTION 3C

STEERING WHEEL AND COLUMN (NOT EQUIPPED WITH AIR BAG)

NOTE:
All steering wheel and column fasteners are important parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality of substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

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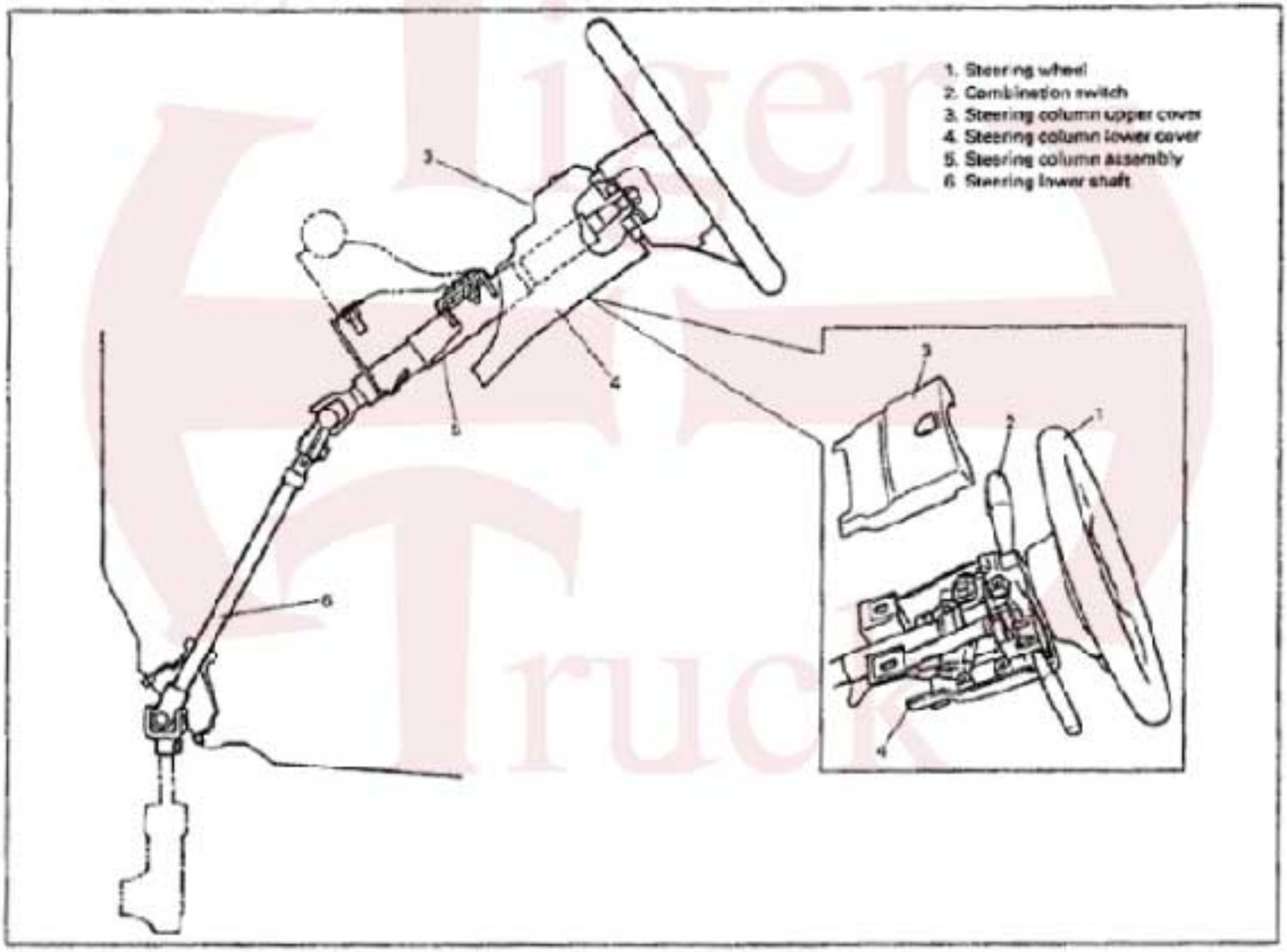
GENERAL DESCRIPTION

This double tube type steering column has following three important features in addition to the steering function:

- The column is energy absorbing, designed to compress in a front-end collision.
- The ignition switch and lock are mounted conveniently on this column.
- With the column mounted lock, the ignition and steering operations can be locked to inhibit theft of the vehicle.

To insure the energy absorbing action, it is important that only the specified screws, bolts, and nuts be used as designated and that they are tightened to the specified torque.

When the column assembly is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller other than the one recommended in this manual or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length.



DIAGNOSIS

For diagnosis of the steering wheel and column, referring to SECTION 3.

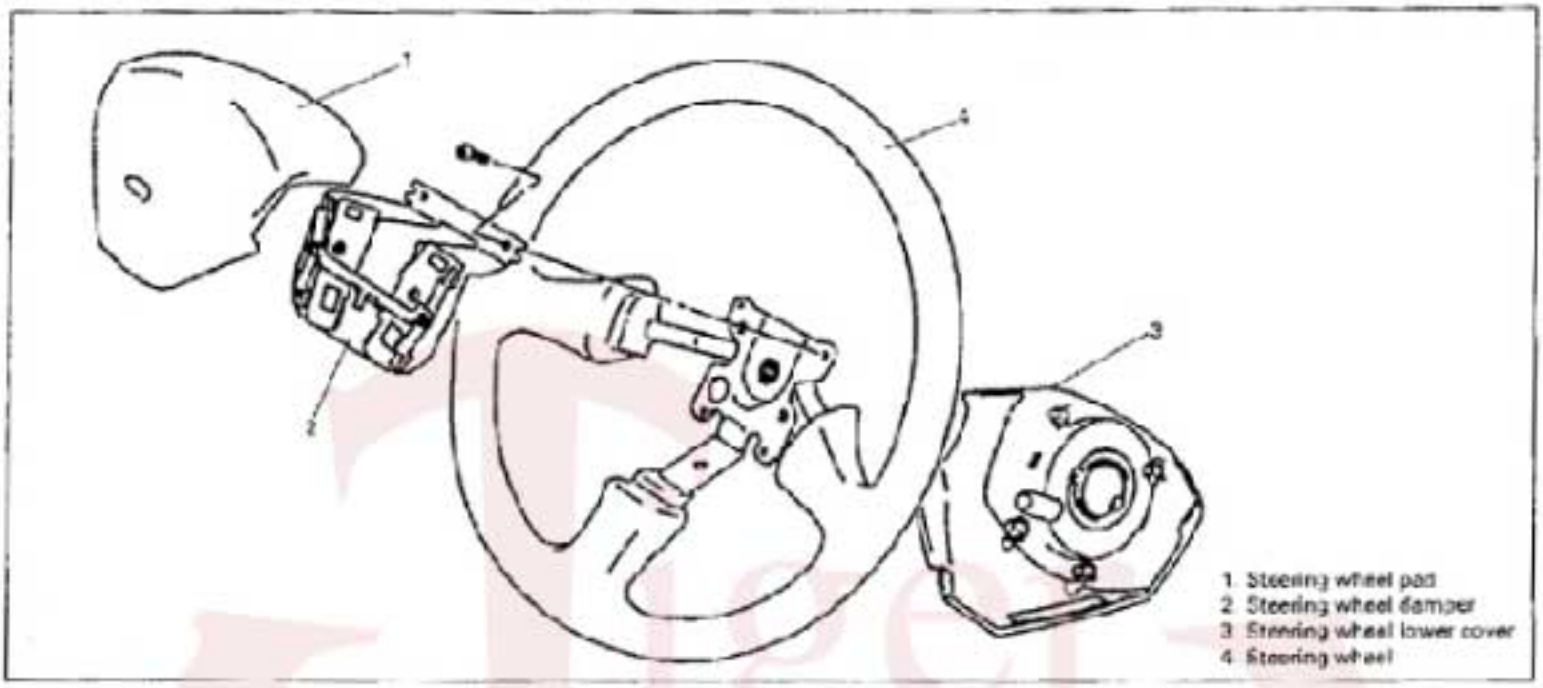
INSPECTION AND REPAIR REQUIRED AFTER ACCIDENT

After an accident, be sure to perform checks, inspections and repairs described under "Checking Steering Column For Accident Damage" in this section.

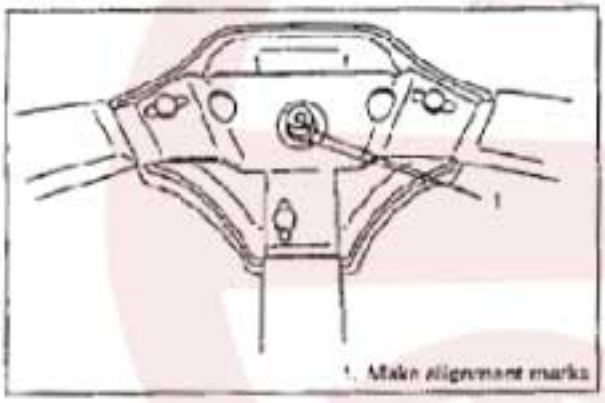
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ON-VEHICLE SERVICE

STEERING WHEEL



1. Steering wheel pad
2. Steering wheel damper
3. Steering wheel lower cover
4. Steering wheel



1. Make alignment marks

REMOVAL

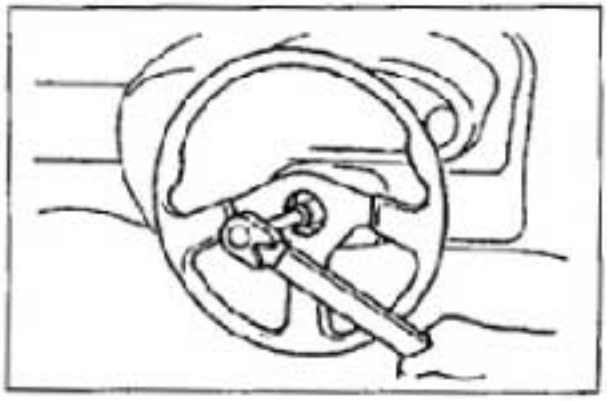
1) Disconnect negative battery cable.
2) Remove steering wheel pad.
3) Remove steering wheel damper.
4) Remove steering shaft nut.
5) Make alignment marks on steering wheel and shaft for a guide during reinstallation.



6) Remove steering wheel with special tool.

Special Tool
(A): 09944-36011

CAUTION:
Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.



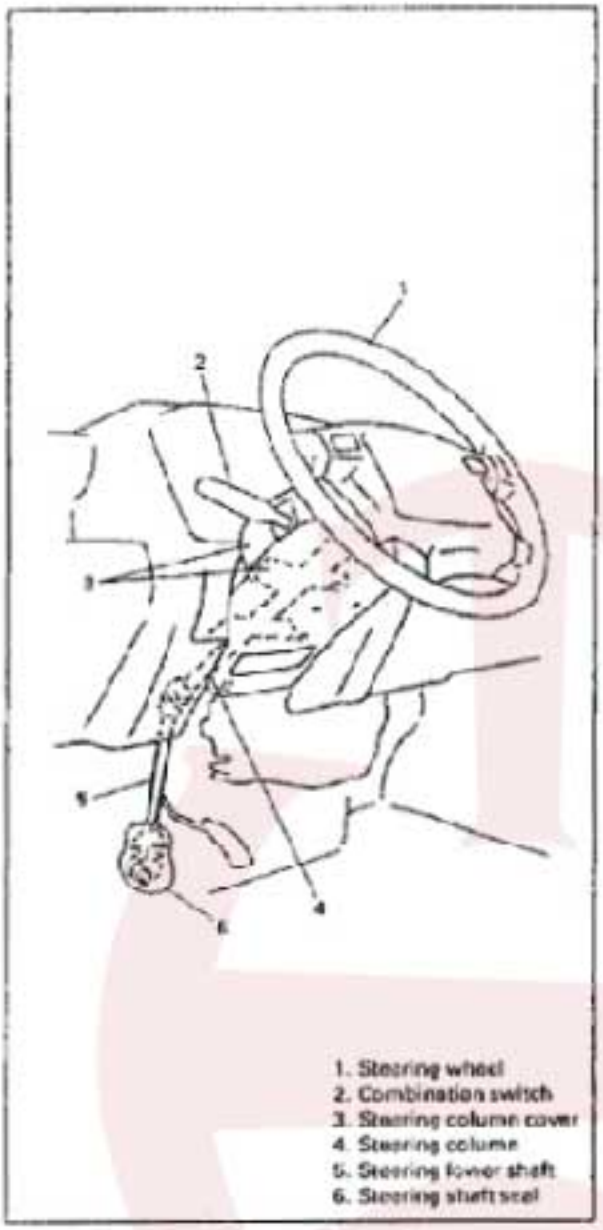
INSTALLATION

1) Install steering wheel onto shaft, aligning alignment marks on them.
2) Tighten steering shaft nut to specified torque.

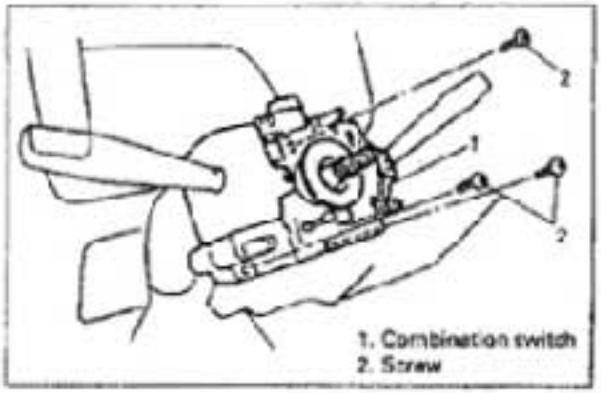
Tightening Torque for steering shaft nut
33 N·m (3.3 kg-m, 24.0 lb-ft)

3) Install damper and pad.
4) Connect battery negative cable.

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COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT

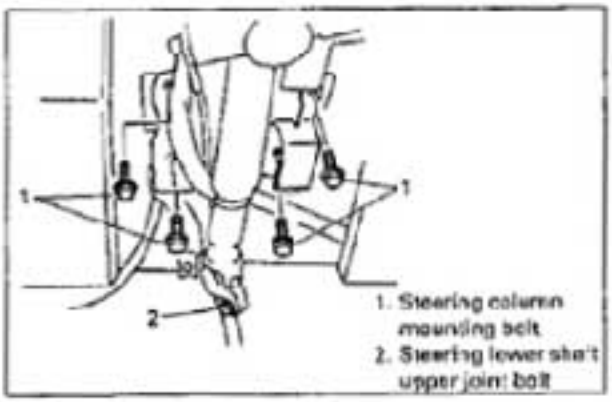
CAUTION:
Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.
Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length. Leaning on the column assembly could cause it to bend or deform.
Any of the above damage could impair the column's collapsible design.
Steering column mounting bolts should not be loosened with steering lower shaft upper joint bolt tightened as this could cause damage to shaft joint bearing.

NOTE:
When servicing steering column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

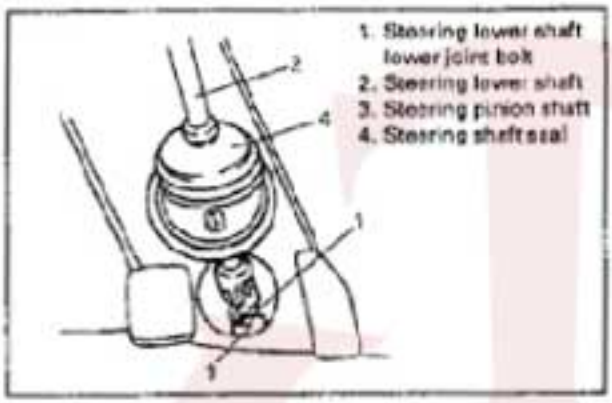
REMOVAL

1) Turn steering wheel so that vehicle's front tires are at straight-ahead position.
2) Disconnect negative battery cable.
3) Remove steering wheel, if necessary. Refer to "Steering Wheel" earlier in this section.
4) Remove steering column upper and lower cover.
5) Disconnect connectors for combination switch and ignition switch wire harness.
6) Remove combination switch, if necessary.

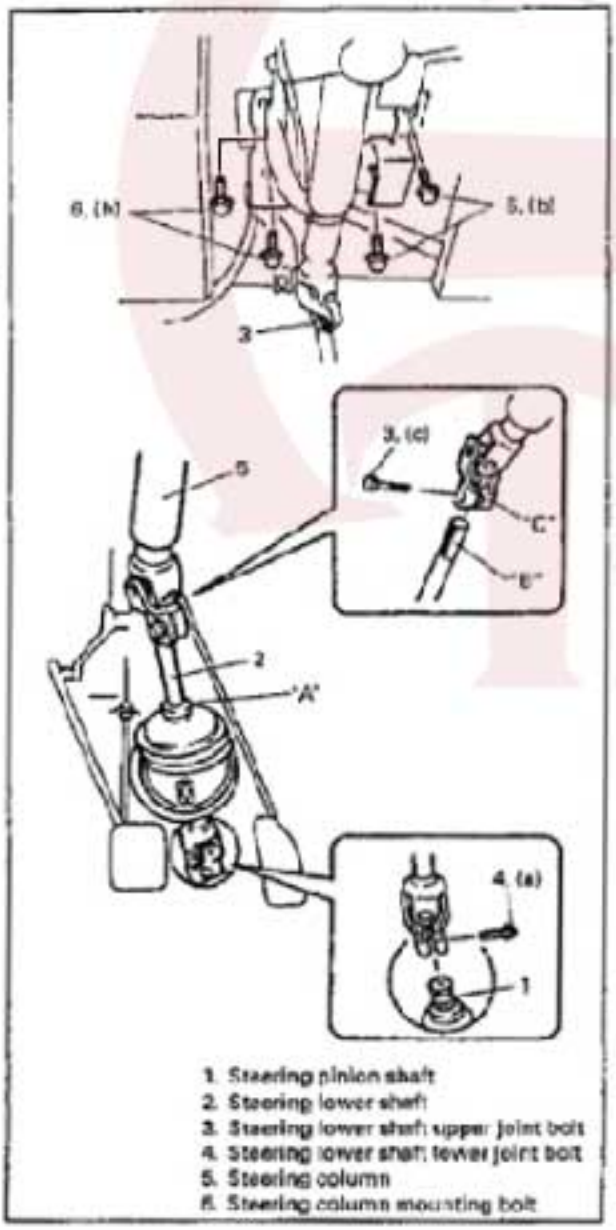
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7) Remove steering lower shaft upper joint bolt.
8) Remove steering column mounting bolts. Then remove steering column.



9) Remove steering shaft seal from dash panel.
10) Remove steering lower shaft lower joint bolt. Then remove steering shaft lower joint, if necessary.



INSTALLATION

1) Be sure that front wheels and steering wheel are in straightforward state and insert lower joint into steering pinion shaft.
2) Tighten steering lower shaft lower joint bolt to specified torque.

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

3) Apply grease to "A" of steering shaft seal and then install steering shaft seal to dash panel as shown.
4) Align flat part "B" of steering lower shaft with joint bolt hole "C" of steering column as shown. Then insert steering lower shaft into joint of steering column.
5) Torque steering column mounting bolts to specified torque.

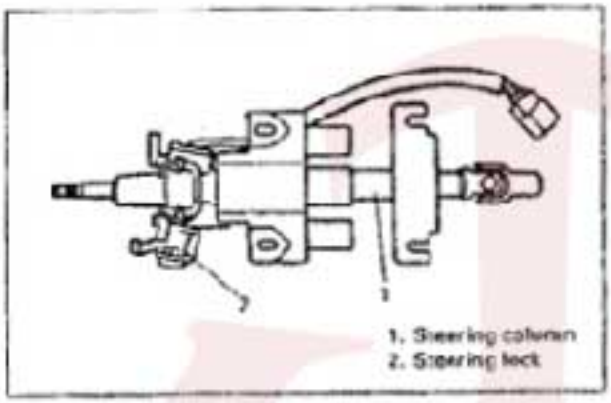
Tightening Torque
(b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

6) Tighten steering lower shaft upper joint bolt to specified torque.

Tightening Torque
(c): 25 N·m (2.5 kg-m, 18.0 lb-ft)

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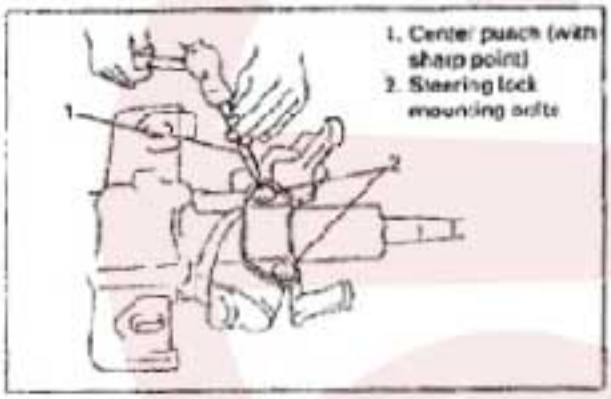
7) Install combination switch, if necessary.
8) Connect connectors for ignition switch and combination switch wire harness.
9) Install steering column upper and lower cover, if necessary.
10) Install steering wheel, if necessary. Refer to "Steering Wheel" earlier in this section.
11) Connect negative battery cable.



STEERING LOCK (IGNITION SWITCH)

REMOVAL

1) Disconnect negative battery cable.
2) Remove steering column. Refer to "Combination Switch, Steering Column And Steering Lower Shaft" earlier in this section.



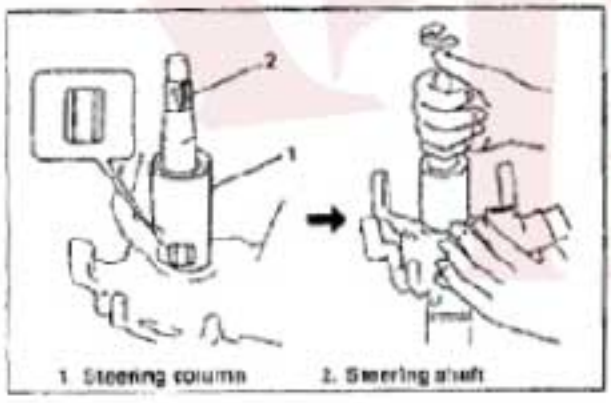
3) Using center punch as shown, loosen and remove steering lock mounting bolts.

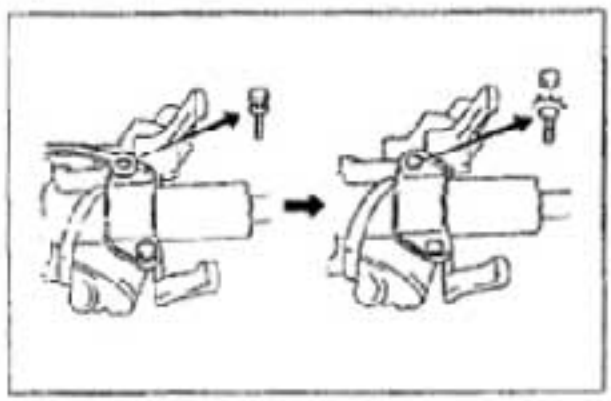
NOTE:
Use care not to damage aluminum part of steering lock body with center punch.

4) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.

INSTALLATION

1) Position oblong hole of steering shaft in the center of hole in column.
2) Turn ignition key to "ACC" or "ON" position and install steering lock assembly onto column.
3) Now turn ignition key to "LOCK" position and pull it out.
4) Align hub on lock with oblong hole of steering shaft and rotate shaft to assure that steering shaft is locked.





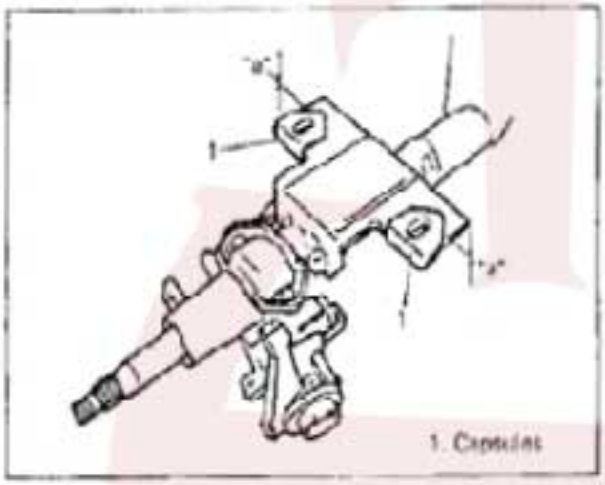
5) Tighten 2 new bolts until head of each bolt is broken off.
6) Turn ignition key to "ACC" or "ON" position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.
7) Install steering column. Refer to "Combination Switch, Steering Column And Steering Lower Shaft" earlier in this section.
8) Connect negative battery cable.

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CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

NOTE:

Vehicles involved in accidents resulting in body damage, where steering column has been impacted may have a damaged or misaligned steering column.

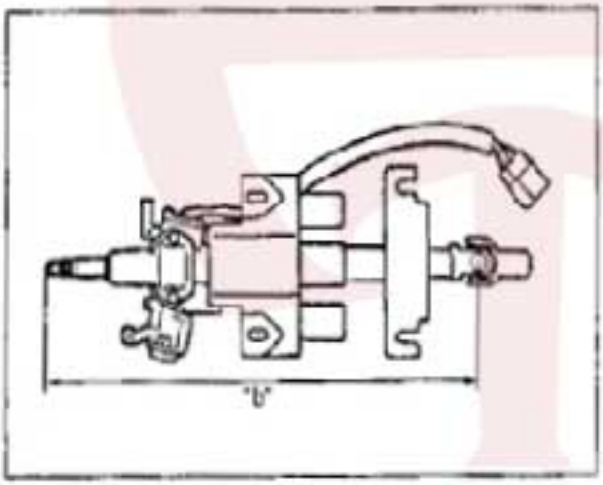


CHECKING PROCEDURE

1) Check that two capsules are attached to steering column bracket securely.
   Check clearance between capsules and steering column bracket as shown. Clearance should be 0.0 mm (0.0 in.) on both sides.

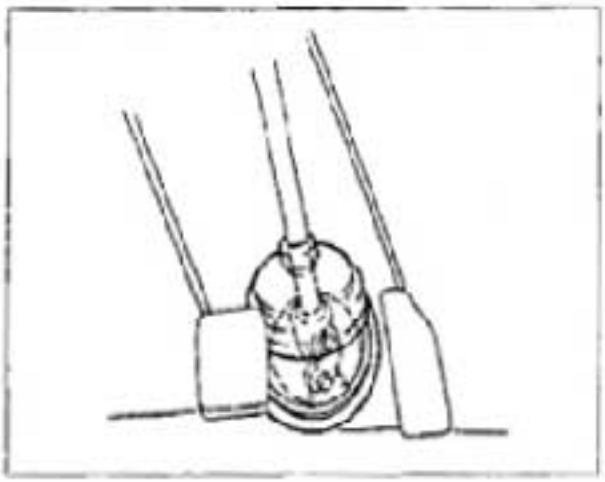
   Clearance "a" : 0.0 mm (0.0 in.)

   Check capsules for crack. If found defective, replace.



2) Take measurement "b" as shown.
   If it is shorter than specified length, replace column assembly with new one.

   Length "b": 432.5 ± 1 mm (17.03 ± 0.04 in.)



3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
   If anything is found faulty, replace as column assembly.
4) Check steering shaft for smooth rotation.
   If found defective, replace as column assembly.
5) Check steering shaft and column for bend, cracks or deformation.
   If found defective, replace as column assembly.

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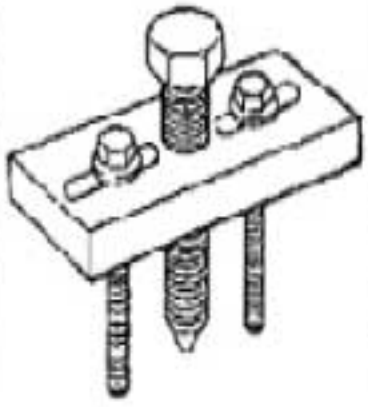
TIGHTENING TORQUE SPECIFICATIONS

Fastening Parts	Tightening Torque		
	N·m	kg-m	lb-ft
Steering shaft nut	33	3.3	24.0
Steering shaft joint bolt	25	2.5	18.0
Steering column mounting bolt	25	2.5	18.0

REQUIRED SERVICE MATERIAL

MATERIAL	USE
Lithium grease	Steering shaft seal

SPECIAL TOOL



09944-36011
Steering wheel remover

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SECTION 3D

FRONT SUSPENSION

NOTE:

- All front suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any front suspension part. Replace it with a new part or damage to the part may result.

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- Stabilizer Bar and/or Bushing Check 3D- 4
- Compression Rod and/or Bushing Check 3D- 4
- Strut Damper Check 3D- 5
- Suspension Control Arm/Knuckle Check 3D- 5
- Suspension Control Arm Bushing Check 3D- 5
- Suspension Control Arm Joint Check 3D- 5
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ON-VEHICLE SERVICE 3D- 7
- Stabilizer Bar and/or Bushings 3D- 7
- Compression Rod and/or Bushings 3D- 8
- Strut Damper Assembly 3D- 9
- Wheel Hub/Wheel Stud 3D-13
- Suspension Control Arm/Bushing 3D-15
- Knuckle 3D-17
- Suspension Frame 3D-18

TIGHTENING TORQUE SPECIFICATIONS 3D-19

SPECIAL TOOLS 3D-19

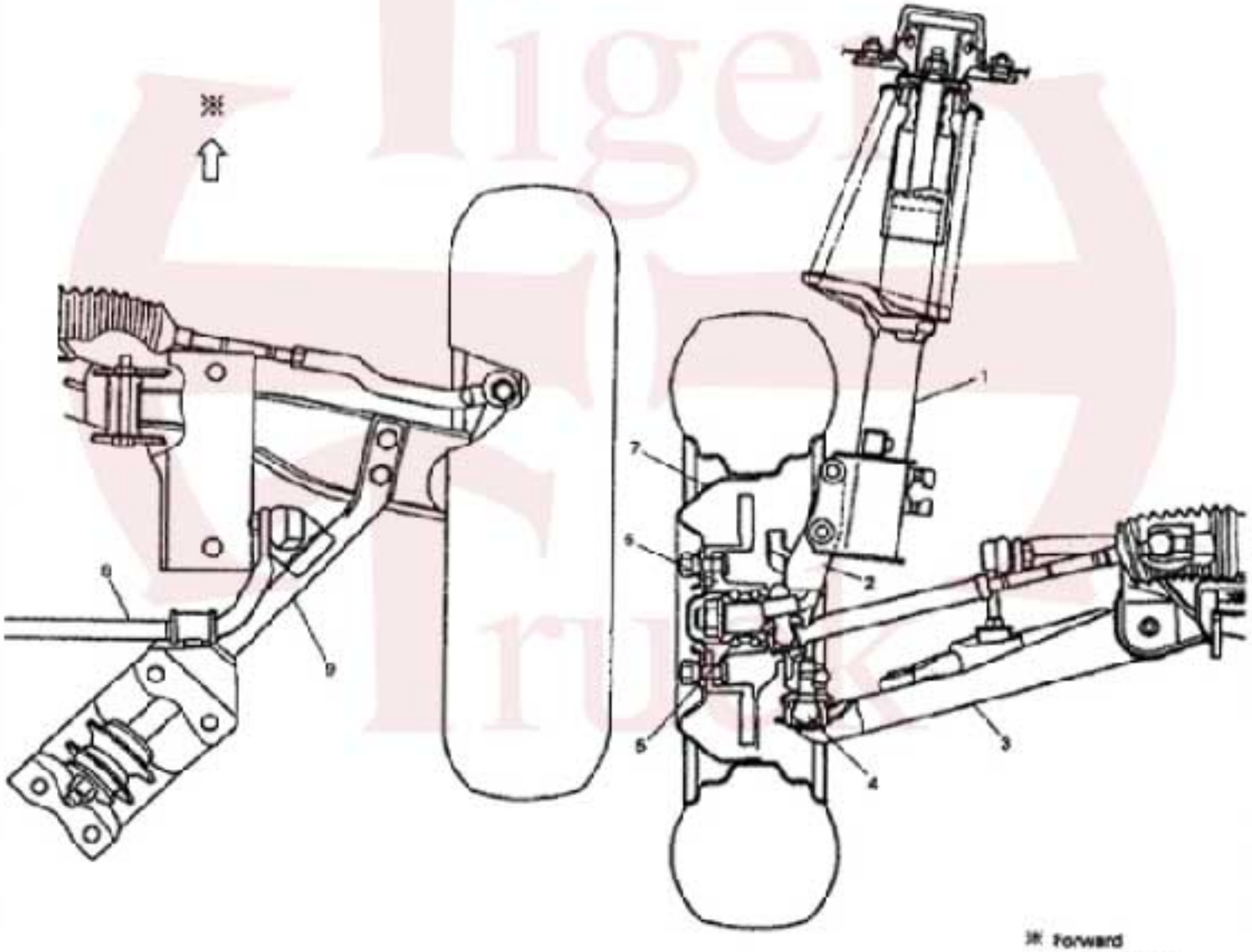
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GENERAL DESCRIPTION

The front suspension is the strut type independent suspension. The upper end of a strut is anchored to the vehicle body by a strut support. The strut and strut support are isolated by a rubber mount. A strut bearing is also installed a little lower to the rubber mount.

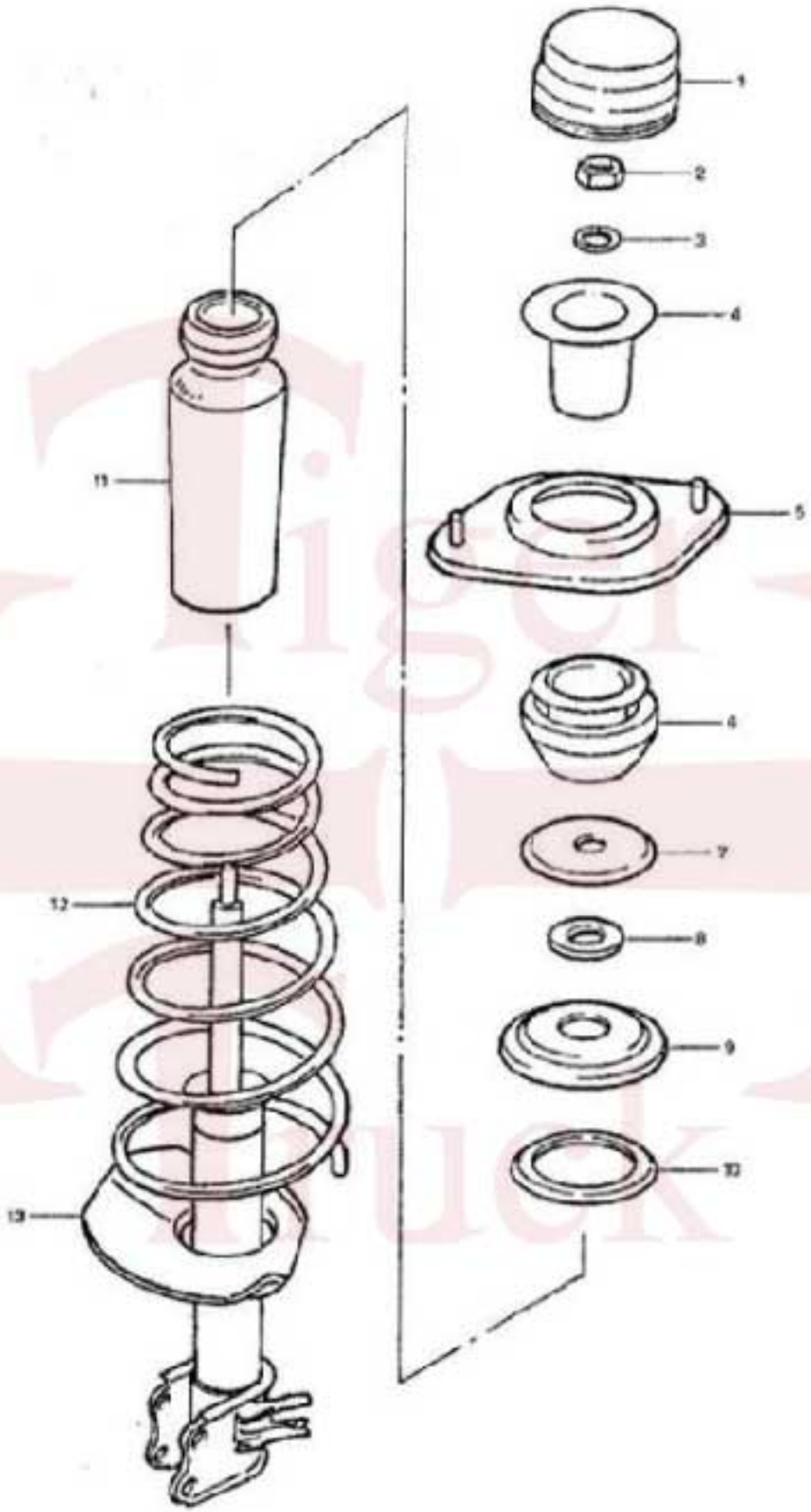
The lower end of the strut is connected to the upper end of a steering knuckle and lower end of knuckle is attached to the stud of a ball joint which is incorporated in a unit with a suspension control arm. And connected to this steering knuckle is the tie-rod end.

Thus, movement of the steering wheel is transmitted to the tie-rod end and then to the knuckle, eventually causing the wheel and tire to move. In this operation, with the movement of the knuckle, the strut also rotates by means of the strut bearing and lower ball joint.



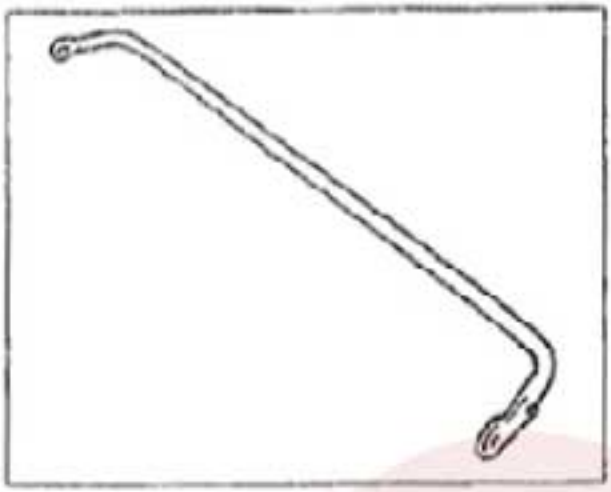
※ Forward
1. Strut assembly
2. Steering knuckle
3. Suspension control arm
4. Ball stud
5. Wheel bearing
6. Front wheel hub
7. Wheel
8. Stabilizer bar
9. Compression rod

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1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut inner support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Strut spring rubber seat
11. Bump stopper
12. Coil spring
13. Strut assembly

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DIAGNOSIS

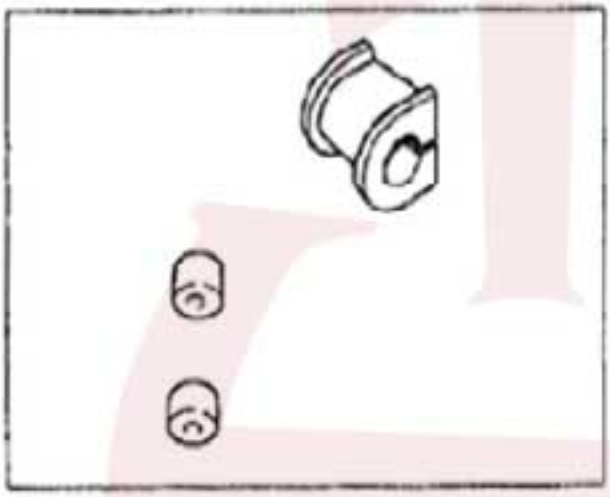
Refer to Section 3.

CHECK AND ADJUSTMENT

STABILIZER BAR AND/OR BUSHING CHECK

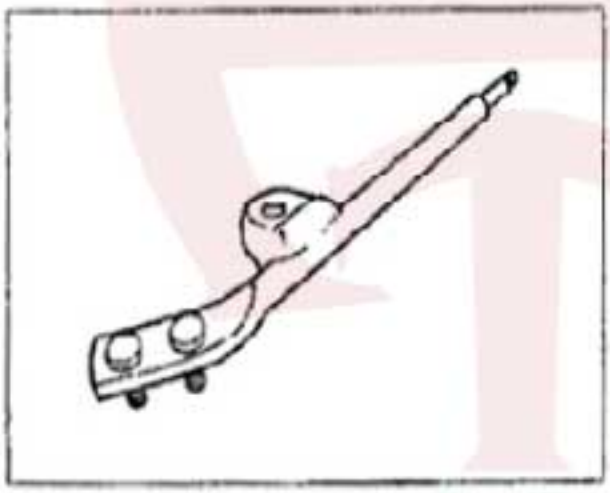
Bar

Inspect for damage or deformation. If defective, replace.



Bushing

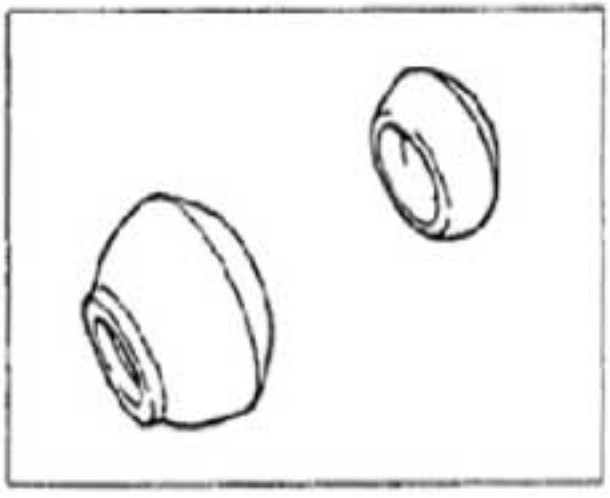
Inspect for damage, wear or deterioration. If defective, replace.



COMPRESSION ROD AND/OR BUSHING CHECK

Rod

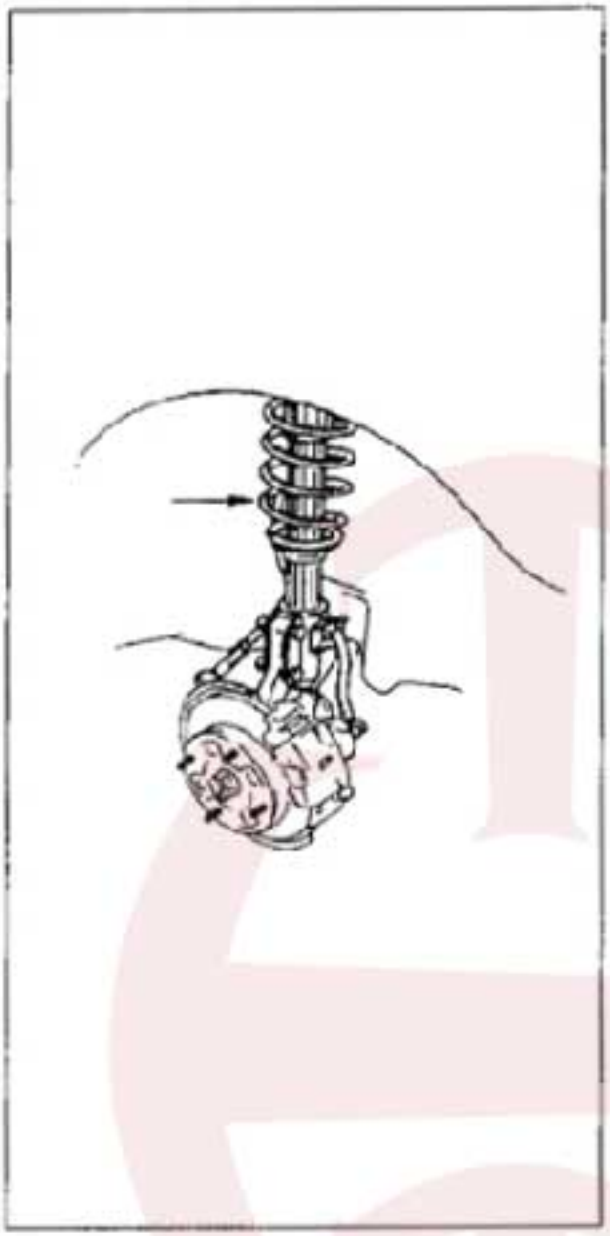
Inspect for damage or deformation. If defective, replace.



Bushing

Inspect for damage, wear or deterioration. If defective, replace.

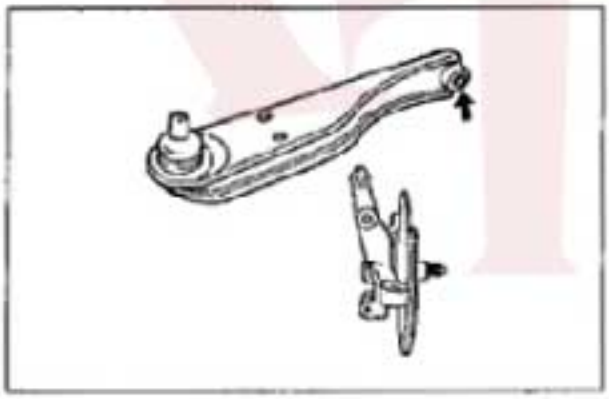
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STRUT DAMPER CHECK

1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.
2) Strut function check
   Check and adjust tire pressures as specified. Bounce vehicle body three or four times continuously by pushing front end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
   Also, note how many times vehicle body rebounds before coming to stop after hands are off. Do the same for strut on the other side.
   Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, vehicle body should come to stop the moment hands are off or after only one or two small rebounds if struts are suspected, compare them with known good vehicle or strut.
3) Inspect for damage or deformation.
4) Inspect bearing for wear, abnormal noise or gripping.
5) Inspect for cracks or deformation in the spring seat.
6) Inspect for deterioration of the bump stopper.
7) Inspect rebound stopper and strut mount for wear, cracks or deformation.

Replace any parts found defective in steps 2) – 7).

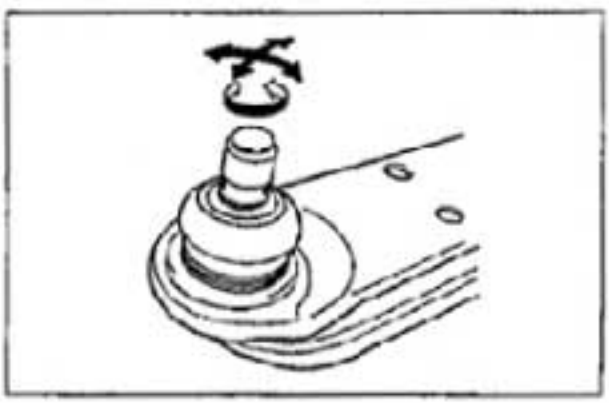


SUSPENSION CONTROL ARM/KNUCKLE CHECK

Inspect for cracks, deformation or damage.

SUSPENSION CONTROL ARM BUSHING CHECK

Inspect for damage, wear or deterioration.

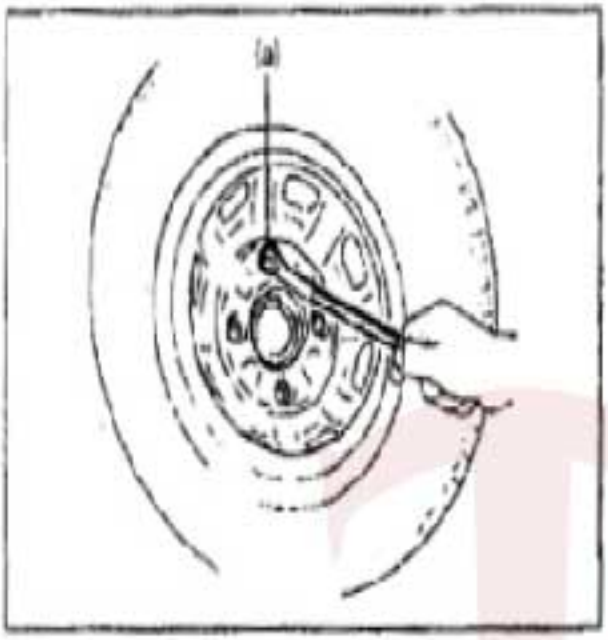


SUSPENSION CONTROL ARM JOINT CHECK

1) Check for smooth rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.
4) Inspect for play in ball joint. If found defective, replace.

NOTE:
Suspension arm and arm joint cannot be separated.
If there is any damage to either, control arm assembly must be replaced as a complete unit.

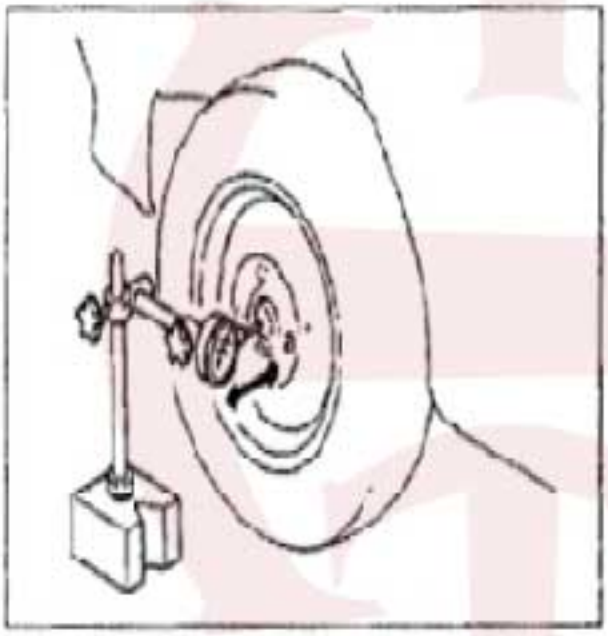
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WHEEL DISC, NUT & BEARING CHECK

1) Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
2) Check wheel nuts for tightness and, as necessary retighten them to specification.

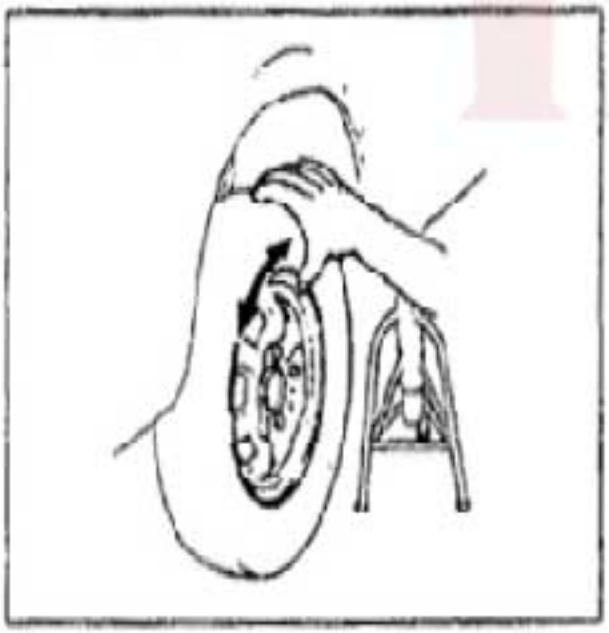
Tightening Torque
(a): 85 N·m (8.5 kg·m, 61.5 lb·ft)



3) Check wheel bearing for wear. When measuring thrust play, apply a dial gauge to wheel hub center after removing wheel center cap from wheel disc.

Thrust play limit "a": 0.1 mm (0.004 in.)

When measurement exceeds limit, replace wheel hub assembly.



4) By rotating wheel actually, check wheel bearing for noise and smooth rotation. If defective, replace wheel hub assembly.

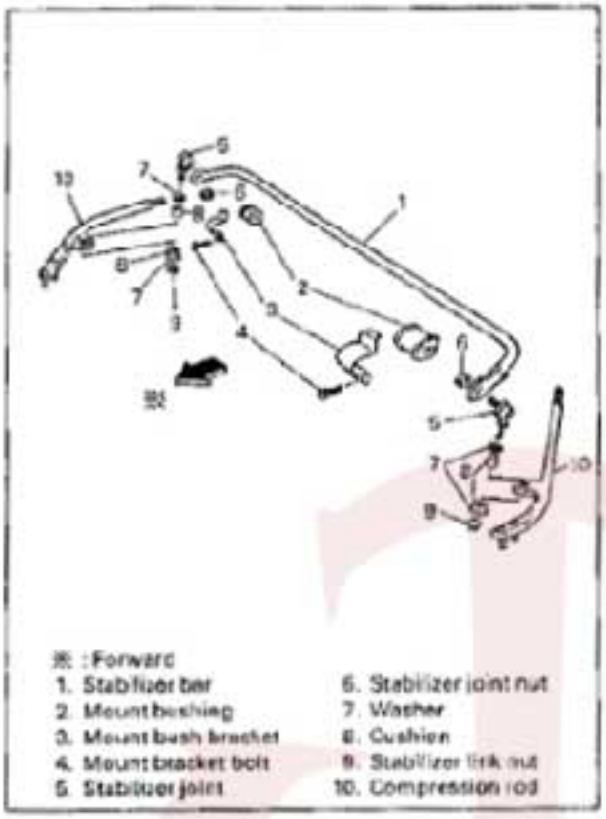
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ON-VEHICLE SERVICE

STABILIZER BAR AND/OR BUSHINGS

REMOVAL

1) Hoist vehicle and allow the front suspension control arms to hang free.
2) Remove stabilizer link nuts, washers and cushions.
   When loosening link nut, hold stud with wrench.
3) Remove stabilizer bar mount bushing bracket bolts
4) Remove stabilizer bar and its joints.
5) Remove stabilizer joints from stabilizer bar.
   When loosening joint nut, hold stud with wrench.



※ : Forward
1. Stabilizer bar
2. Mount bushing
3. Mount bush bracket
4. Mount bracket bolt
5. Stabilizer joint
6. Stabilizer joint nut
7. Washer
8. Cushion
9. Stabilizer link nut
10. Compression rod

INSTALLATION

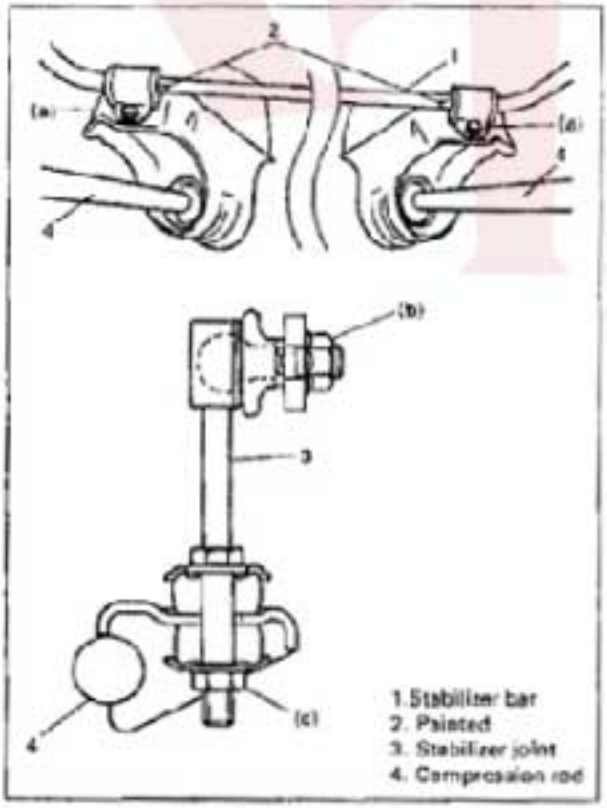
Install in reverse order of removal procedure, noting following points.

- When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.

NOTE:
For correct installation of stabilizer bar, side-to-side, be sure that color paint on stabilizer bar aligns with mount bushing, both right and left, as shown in figure.

- Tighten bolts and nuts to specified torque.

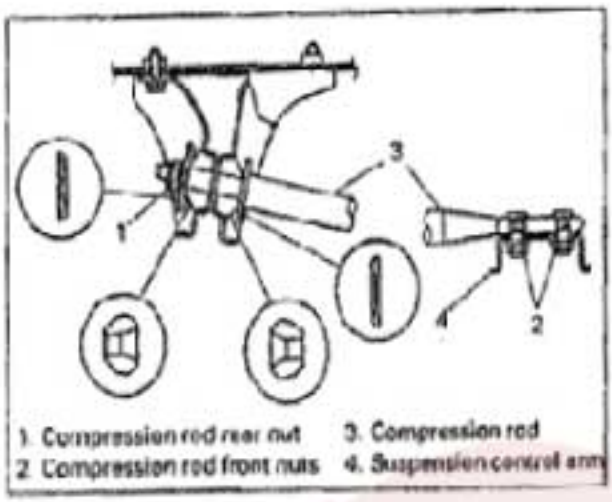
CAUTION:
When tightening stabilizer link nut, use care so that cushion is fitted to washer.



1. Stabilizer bar
2. Painted
3. Stabilizer joint
4. Compression rod

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(c): 23 N·m (2.3 kg-m, 17.0 lb-ft)

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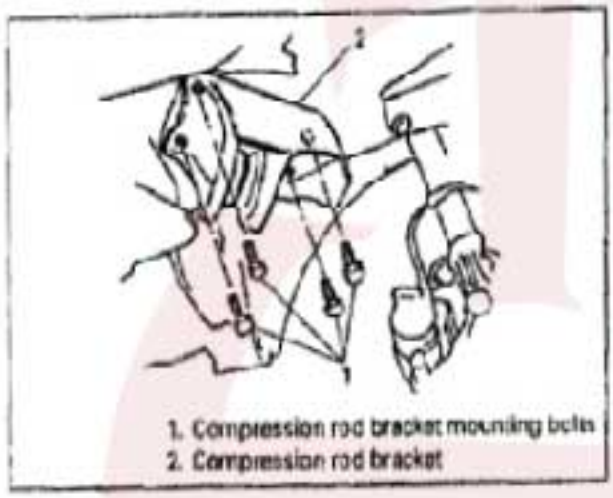


1. Compression rod rear nut
2. Compression rod front nuts
3. Compression rod
4. Suspension control arm

COMPRESSION ROD AND/OR BUSHINGS

REMOVAL

1) Hoist vehicle, allow the front suspension to hang free.
2) Remove stabilizer bar, refer to steps 2) to 4) of "STABILIZER BAR AND/OR BUSHINGS REMOVAL".
3) Remove compression rod front and rear nuts.
4) Remove compression rod.



1. Compression rod bracket mounting bolts
2. Compression rod bracket

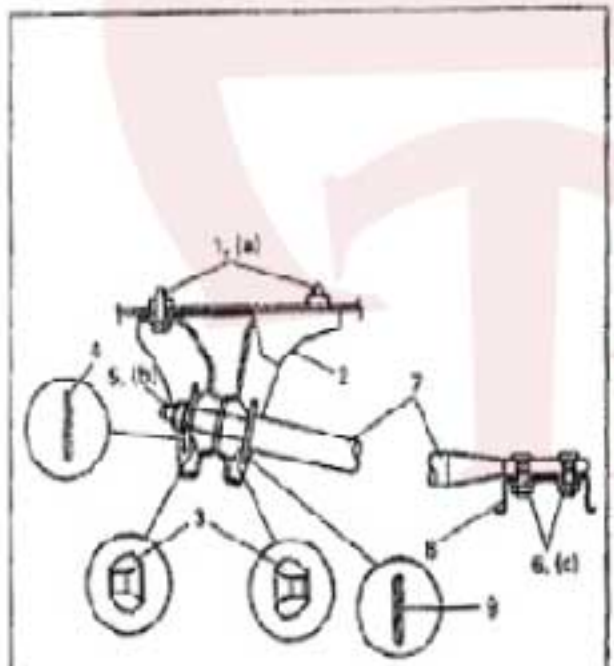
5) Remove compression rod bracket from vehicle body.

INSTALLATION

Install in reverse order of removal procedure, noting following points.

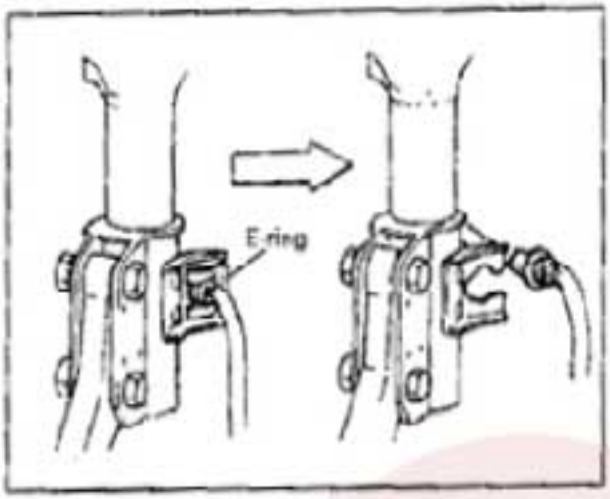
- For correct installation of compression rod bushing and compression rod rear washer, refer to left figure.
- Use new compression rod rear nut.
- Tighten each bolts and nuts to specified torque.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
(b): 65 N·m (6.5 kg-m, 47.0 lb-ft)
(c): 95 N·m (9.5 kg-m, 69.0 lb-ft)



1. Compression rod bracket mounting bolts
2. Compression rod bracket
3. Compression rod bushings
4. Compression rod rear washer
5. Compression rod rear nut
6. Compression rod front nuts
7. Compression rod
8. Suspension control arm
9. Compression rod front washer

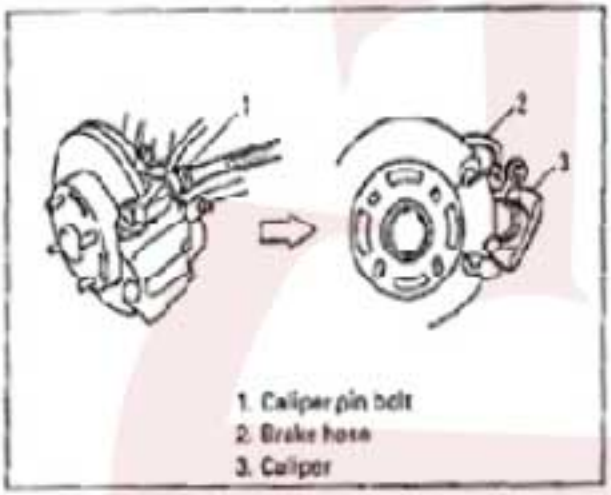
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STRUT DAMPER ASSEMBLY

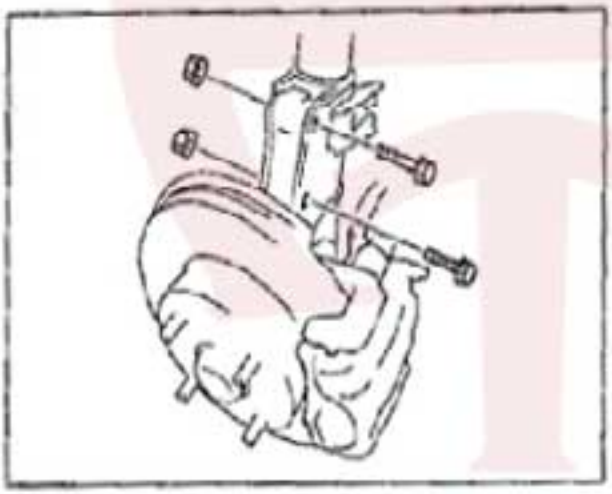
REMOVAL

1) Disconnect negative cable at battery.
2) Hoist vehicle, allowing front suspension to hang free.
3) Remove wheel.
4) Remove E ring securing brake flexible hose and take brake flexible hose off strut bracket as shown.

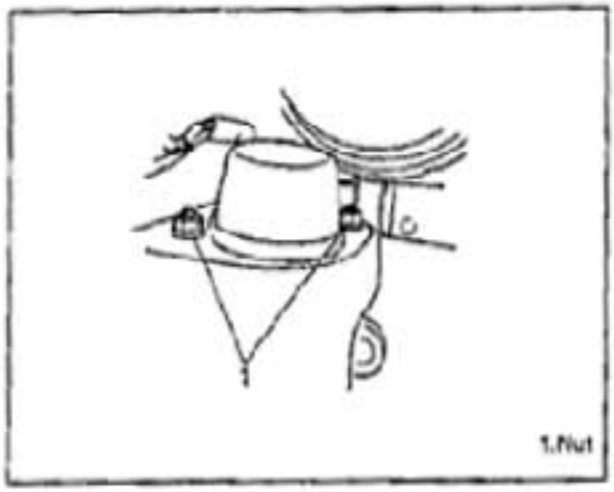


5) Remove caliper pin bolt and tilt caliper as shown in figure.

CAUTION:
When tilting caliper, be careful not to pull brake hose so much as to cause damage to it.

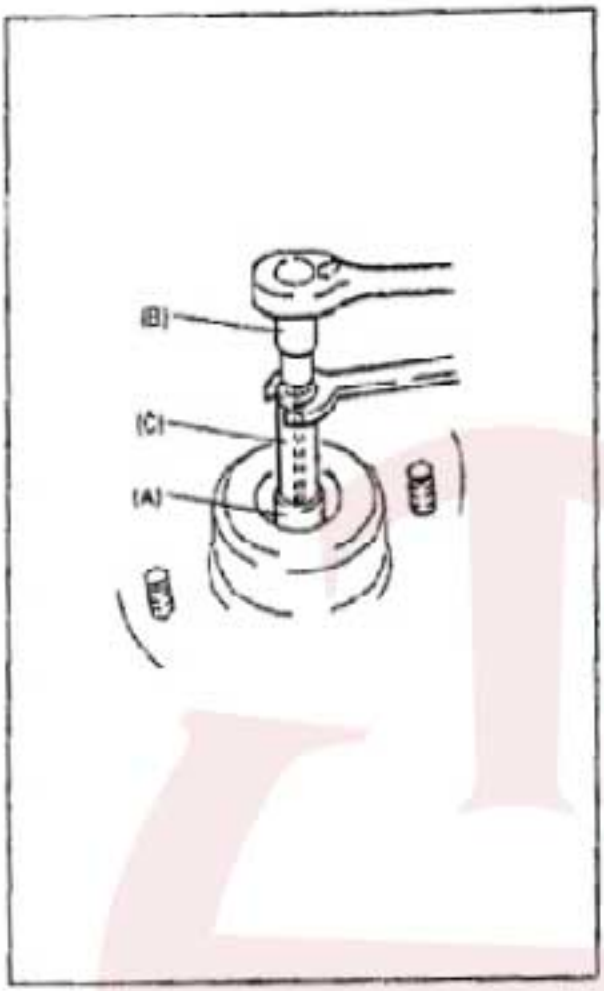


6) Remove wheel speed sensor harness clamp bolt from strut (if equipped).
7) Remove strut bracket bolts.



8) Remove strut support nuts.
   Hold strut by hand so that it will not fall off.
9) Remove strut assembly.

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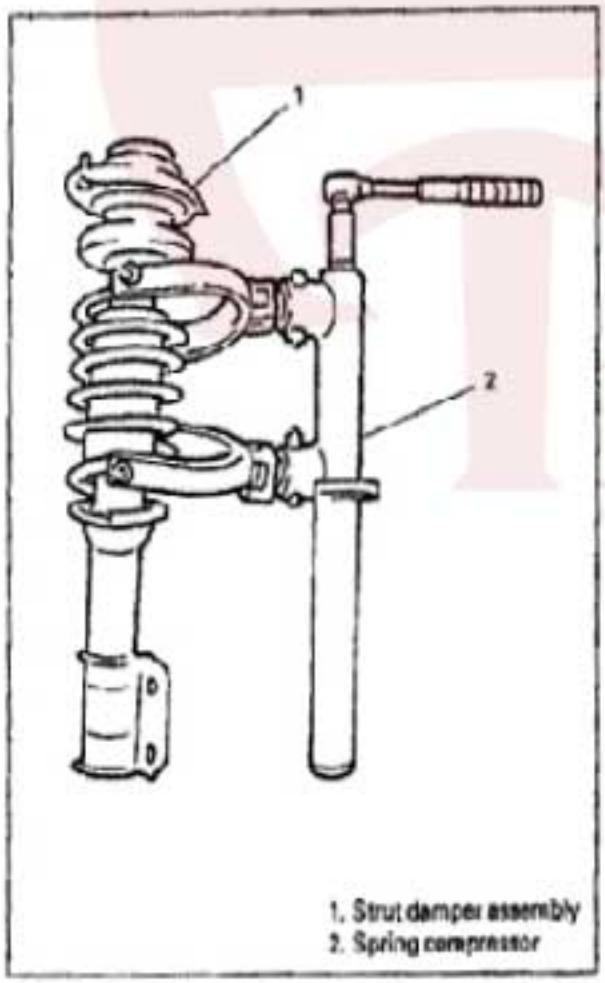


DISASSEMBLY

1) Remove strut support cap and loosen strut nut a little by using special tools.

Special Tool
(A): 09945-26010 (17 mm socket)
(B): 09900-00411 (Socket)
(C): 09900-00414 (5 mm)

NOTE:
When disassembling strut assembly, loosen strut nut a little before compress strut spring. This will make disassembly easier. Note, however, nut must not be removed at this point.



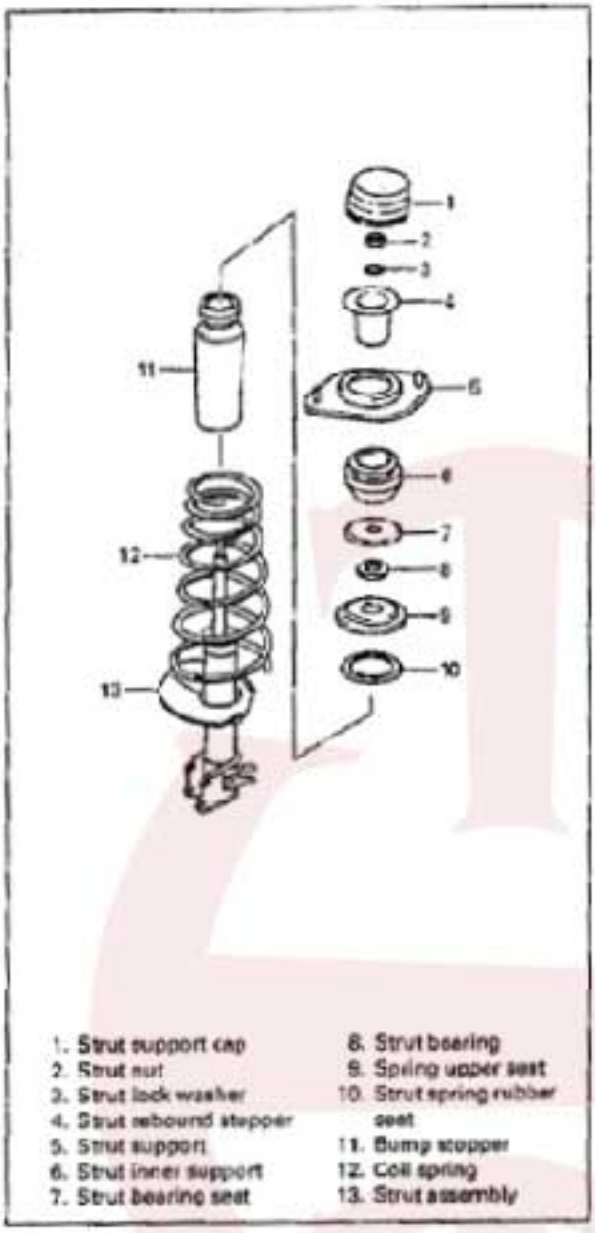
1. Strut damper assembly
2. Spring compressor

2) Using a spring compressor, compress the strut spring till its force pressing the spring seat is released.

CAUTION:
Use a commercially available spring compressor and follow the operation procedure described in the Instruction Manual supplied with that spring compressor.

3) While keeping spring compressed with spring compressor, remove strut nut and then disassemble parts.

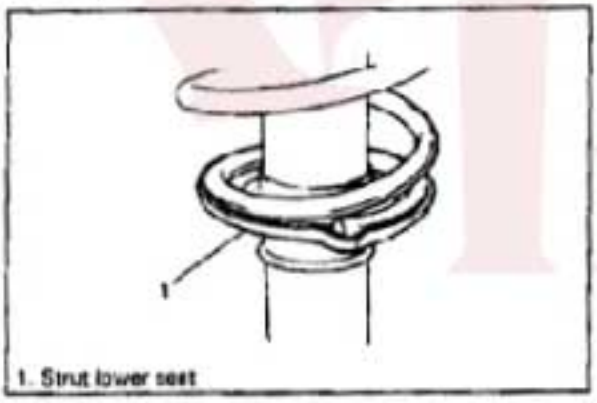
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1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut inner support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Strut spring rubber seat
11. Bump stopper
12. Coil spring
13. Strut assembly

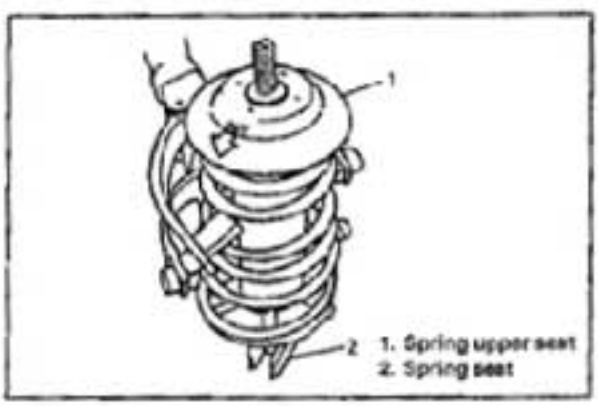
ASSEMBLY

For assembly, reverse disassembly procedure, observing following instruction.



1. Strut lower seat

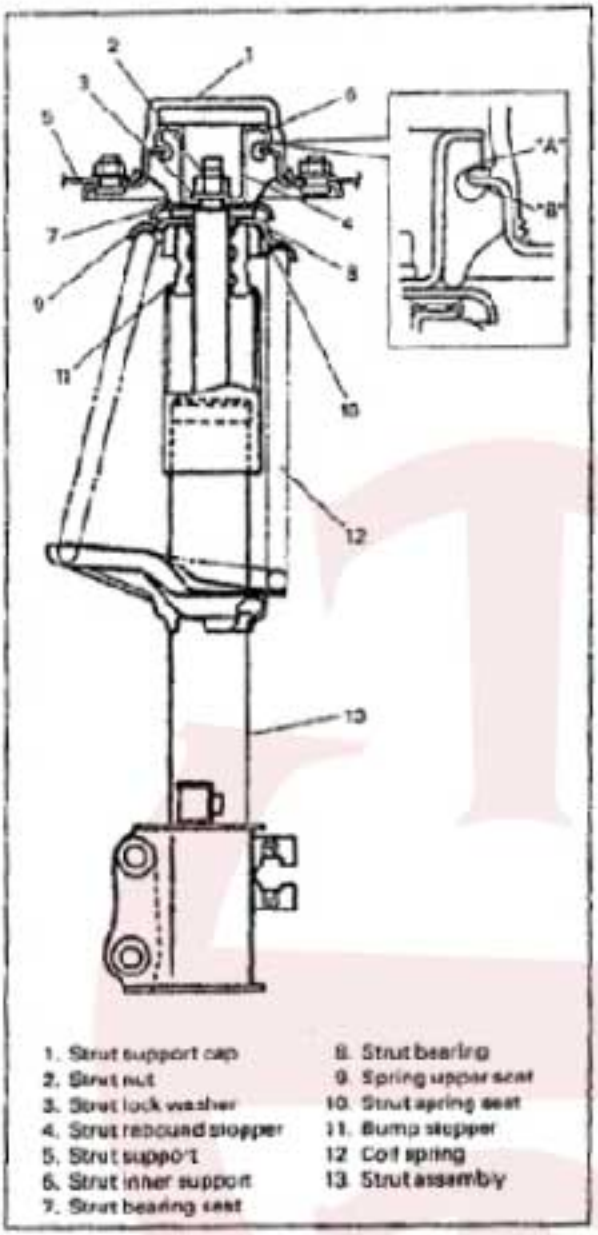
- Mate spring end with stepped part of lower seat as shown.



1. Spring upper seat
2. Spring seat

- With "CUT" mark on spring upper seat and the center of strut bracket aligned, place spring upper seat together with spring (rubber) seat on coil spring.

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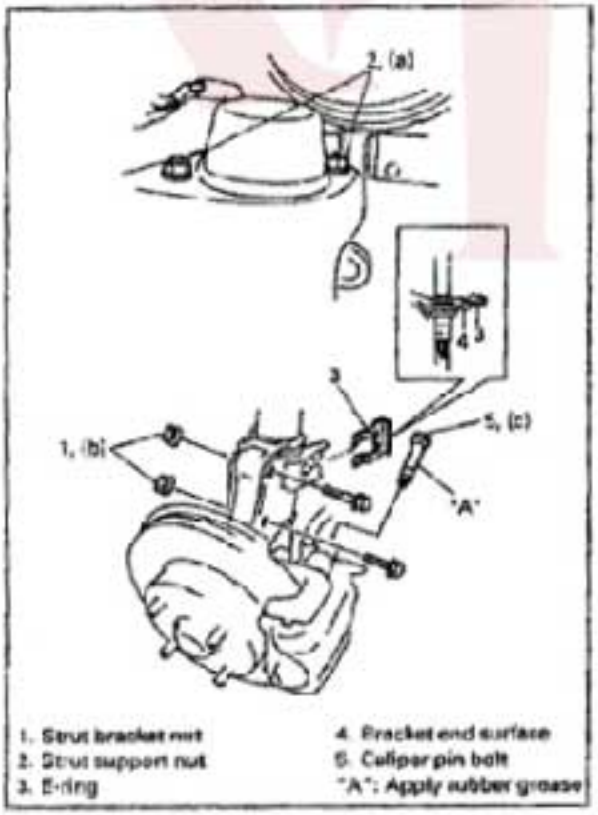
1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut inner support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Strut spring seat
11. Bump stopper
12. Coil spring
13. Strut assembly

- Install bump stopper onto strut rod. For installing direction, refer to left figure.
- Clean strut bearing and install it on spring upper seat. For installing direction, refer to figure at left.
- Wash bearing seat and install it as shown.
- On bearing seat, install rebound stopper, strut support and inner support in this sequence. Be careful for installing directions. Tighten strut nut to specified torque and then apply water-proof coating (paint or lacquer) all around nut and strut rod screw part.

NOTE:
As shown at the left, have sections "A" and "B" of strut inner support caught by strut support securely.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

- Recheck that stepped part of spring seat and spring end are in place to each other as described.



1. Strut bracket nut
2. Strut support nut
3. E-ring
4. Bracket end surface
5. Caliper pin bolt
"A": Apply rubber grease

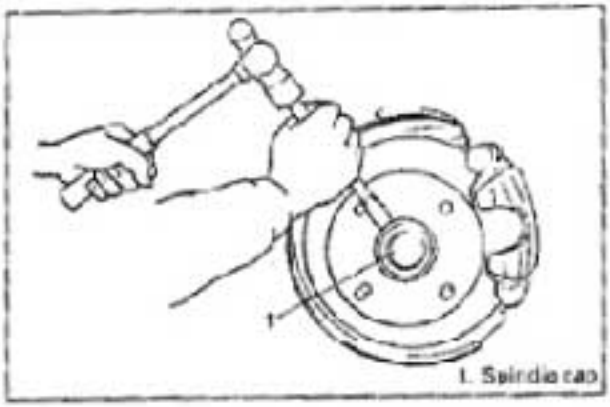
INSTALLATION

1) Install strut by reversing REMOVAL Steps 1) – 9). Insert bolts in such a direction as shown.
2) Torque all fasteners to specification.

Tightening Torque
(a): 73 N·m (7.3 kg-m, 53.0 lb-ft)
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)
(c): 35 N·m (3.5 kg-m, 25.5 lb-ft)

NOTE:
Don't twist brake hose when installing it.
Install E ring as far as it fits to bracket as shown.

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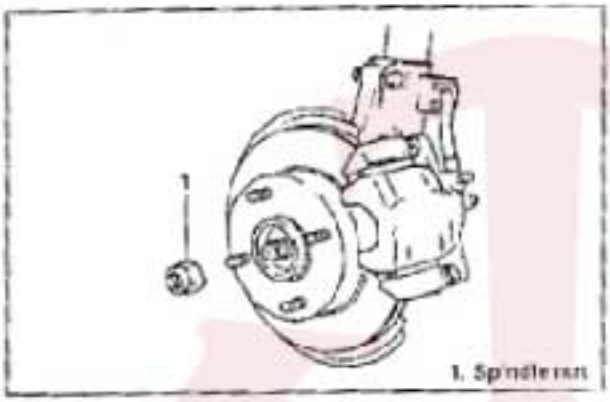


1. Spindle cap

WHEEL HUB/WHEEL STUD

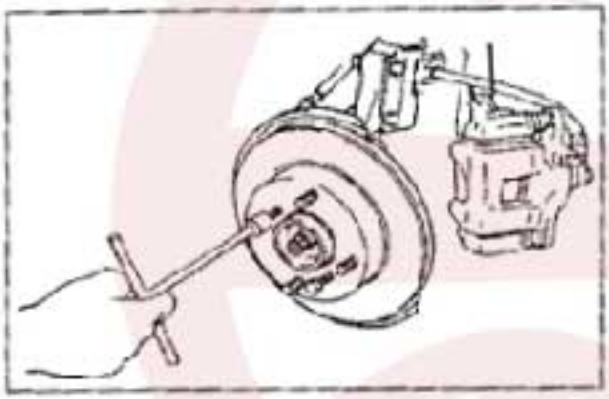
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove spindle cap as shown (by hammering lightly at 3 locations around it using care not to deform or cause damage to seating part of cap).



1. Spindle nut

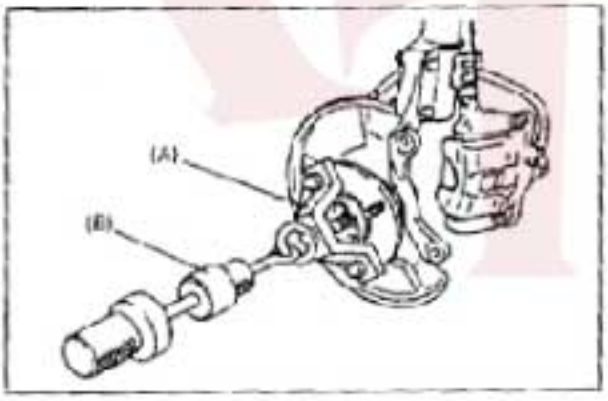
3) Uncalk spindle nut.
4) Remove spindle nut.



5) Remove caliper carrier bolts.
6) Remove caliper with carrier.

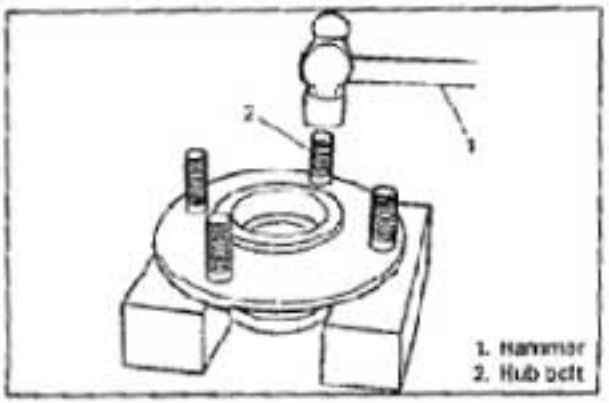
NOTE:
Hang removed caliper with a wire hook of the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

7) Pull brake disc off by using two 8 mm bolts.



8) Pull out wheel hub with special tools.

Special Tool
(A): 09943-17912
(B): 09942-15510

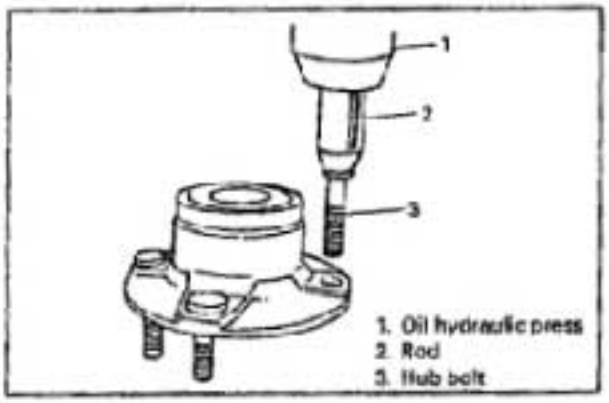


1. Hammer
2. Hub bolt

9) Remove hub bolts.

CAUTION:
Never remove bolt unless replacement is necessary.
Be sure to use a new bolt for replacement.

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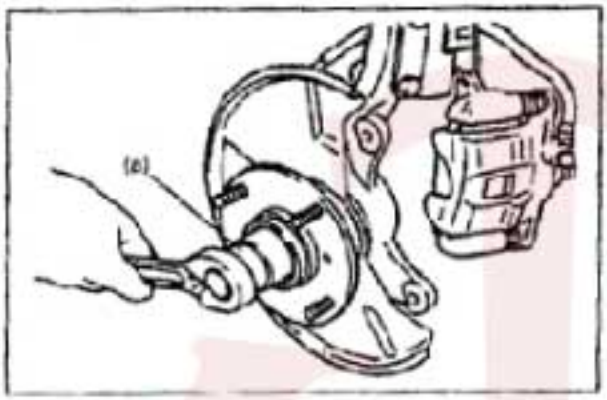


1. Oil hydraulic press
2. Rod
3. Hub bolt

INSTALLATION

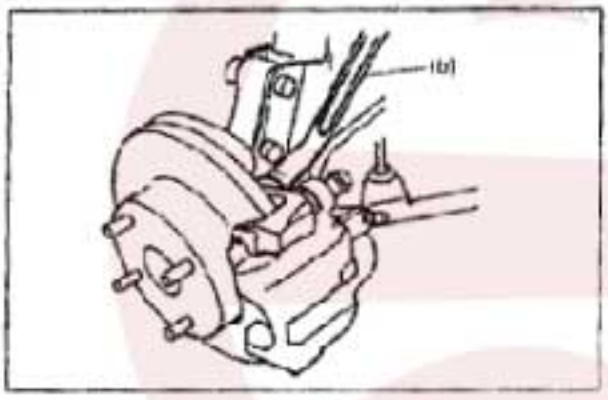
Install Hub Bolts

Insert new stud in hub hole. Rotate stud slowly to assure serrations are aligned with those made by original bolt.



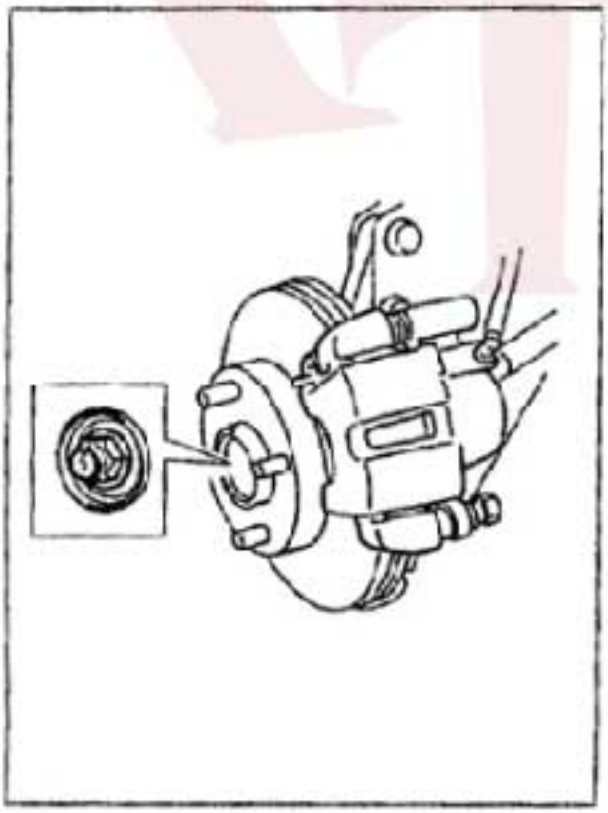
1) Install wheel hub to spindle, tighten new spindle nut to specified torque.

Tightening Torque
(a): 175 N·m (17.5 kg-m, 126.5 lb-ft)



2) Install brake disc.
3) Install brake caliper/caliper carrier.
4) Tighten caliper carrier bolts to specified torque.

Tightening Torque
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)

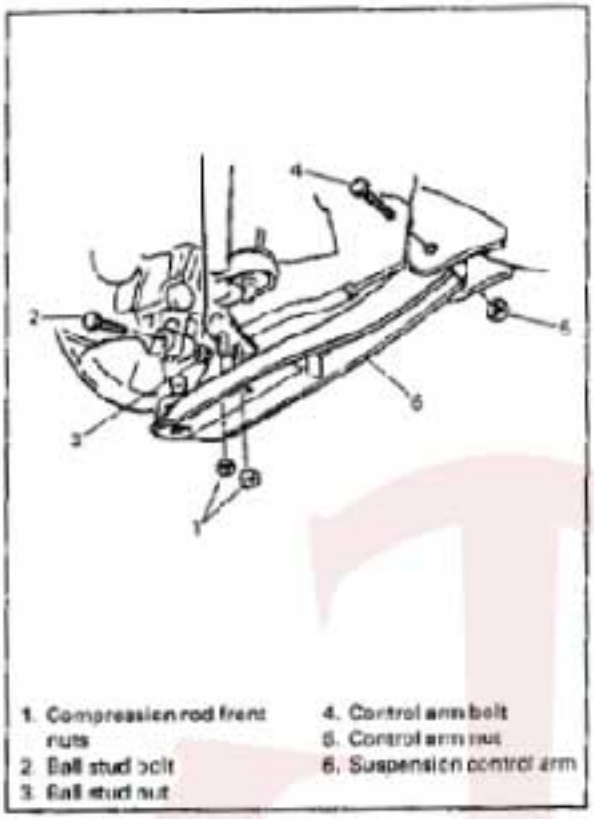


5) Calk spindle nut as shown.

> **WARNING:**
> **Be careful while calking nut so that no crack will occur in calked part of nut. Cracked nut must be replaced with new one.**

6) Install spindle cap to wheel hub.
7) Install wheel and lower hoist.

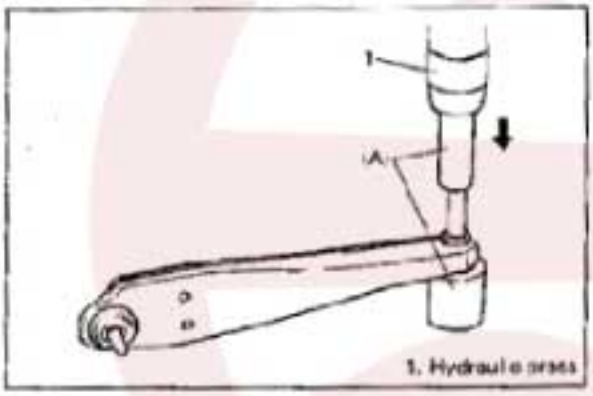
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SUSPENSION CONTROL ARM/BUSHING

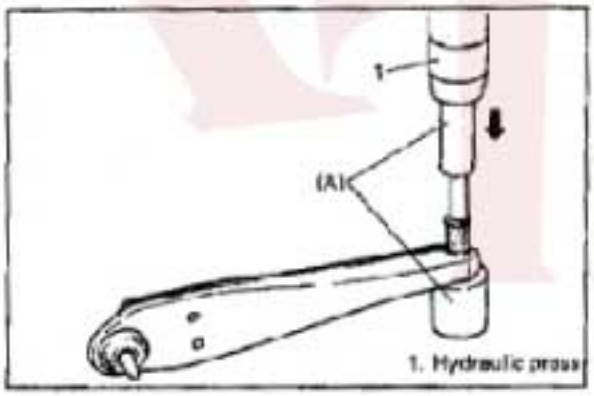
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove compression rod front nuts from suspension control arm.
3) Remove ball stud bolt and nut.
4) Remove suspension control arm bolt and nut.
5) Remove suspension control arm.



6) Remove bushing.
Pull out bushing with special tool and oil hydraulic press as shown.

Special Tool
(A): 09943-77910



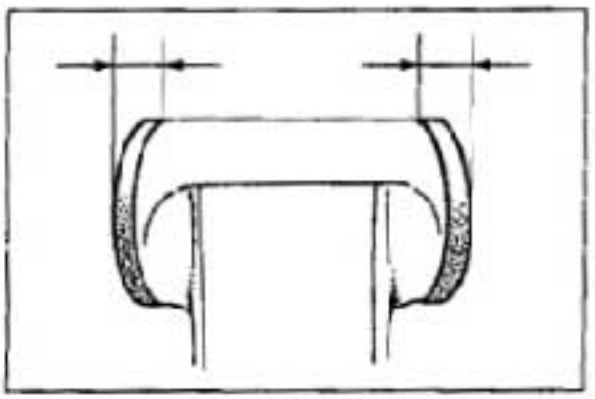
INSTALLATION

1) Install bushing.

Special Tool
(A): 09943-77910

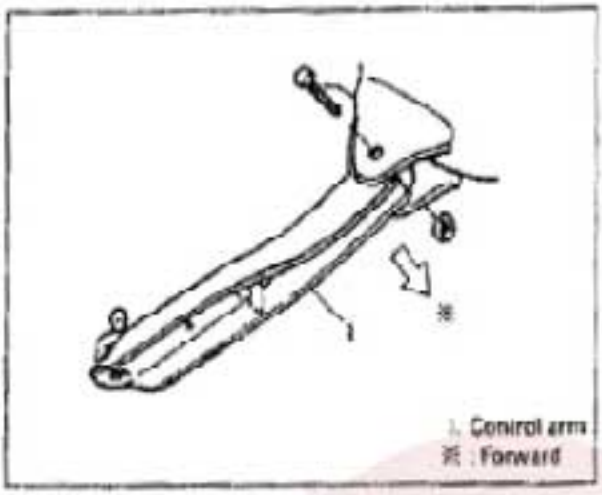
NOTE:

- **Before installing bushing, apply soap water on its circumference to facilitate installation.**



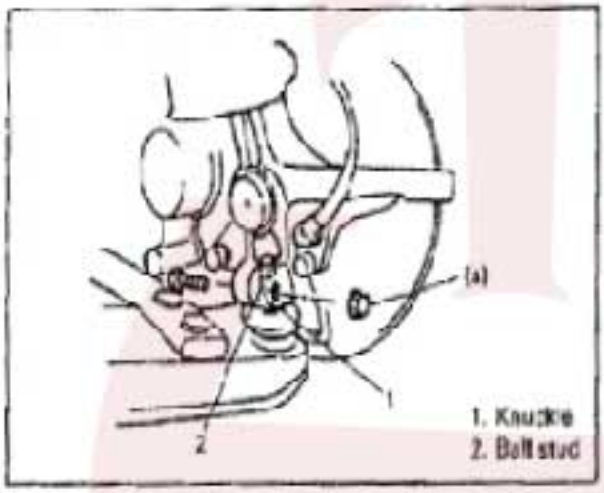
- **When installed, bush should be equal on the right and left of arm as shown.**

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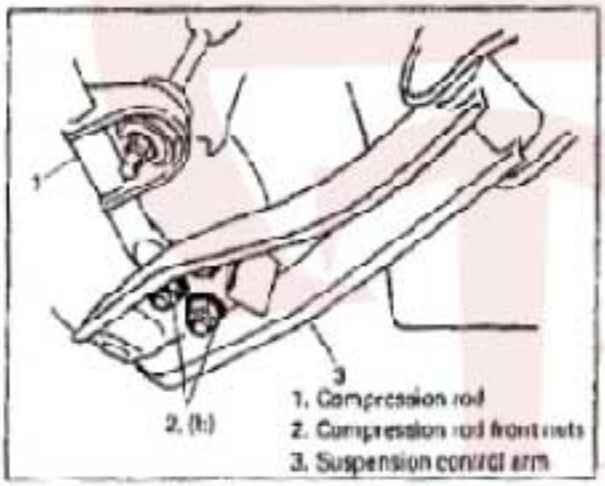
2) Install suspension control arm to suspension frame, referring to figure for proper installing direction of bolt and nut.

NOTE:
Nut should not be tightened.



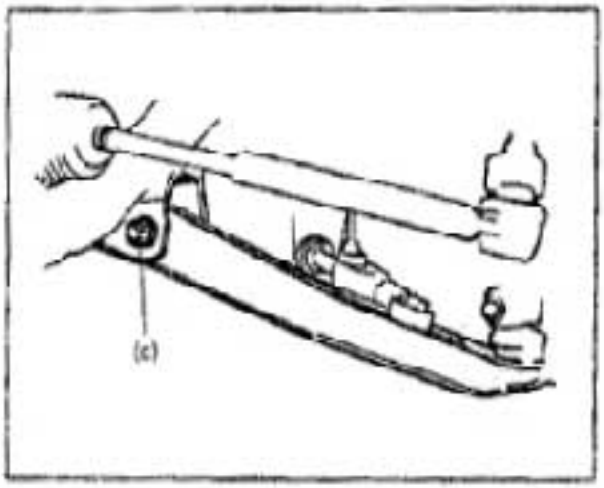
3) Install ball stud to knuckle. Align ball stud groove with knuckle bolt hole as shown.
Then drive in ball stud bolt from the direction as shown.
Tighten ball stud bolt to specified torque.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



4) Tighten compression rod front nuts to specified torque.

Tightening Torque
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)

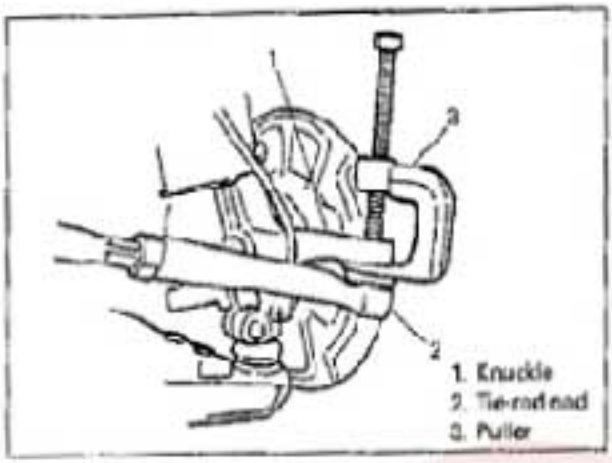


5) Install wheel and tighten wheel nuts to specified torque, refer to "TIGHTENING TORQUE SPECIFICATIONS" of this section.
6) Lower hoist and with in non-loaded condition, tighten suspension control arm nut to specified torque.

Tightening Torque
(c): 73 N·m (7.3 kg-m, 53.0 lb-ft)

7) Check toe setting, adjust as required.

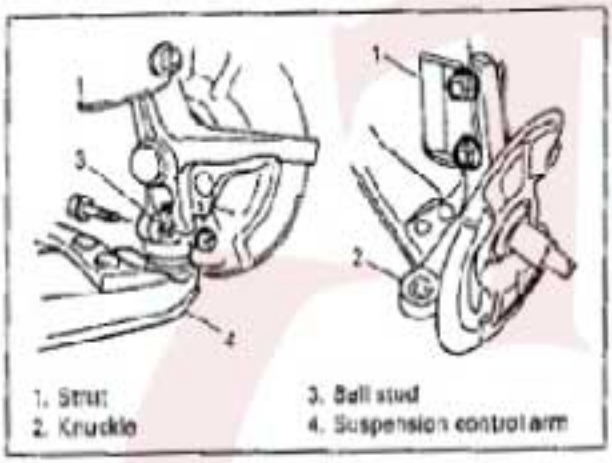
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KNUCKLE

REMOVAL

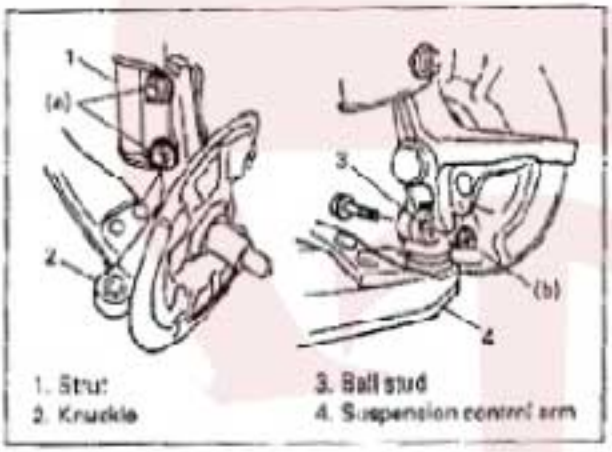
1) Hoist vehicle and remove wheel.
2) Remove wheel hub. Refer to Steps 2) – 8) in WHEEL HUB/WHEEL STUD REMOVAL of this section.
3) Disconnect tie-rod end from knuckle with puller.
4) Remove wheel speed sensor from knuckle (if equipped).



5) Remove ball stud bolt from knuckle and then strut bracket bolts from strut bracket.
6) Remove knuckle.

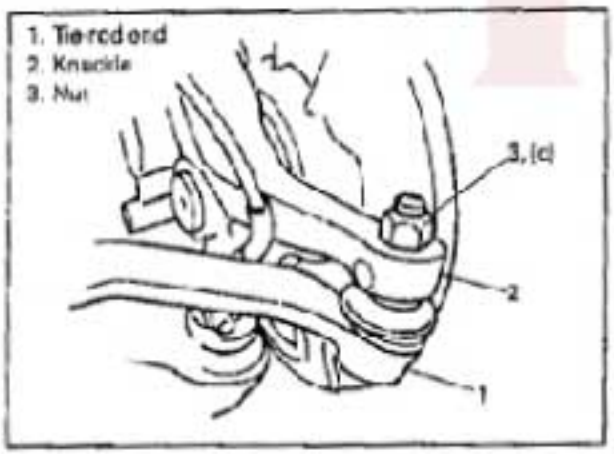
INSTALLATION

1) Install knuckle to ball stud on suspension arm and strut bracket. Installing direction of each bolt is as shown. Align knuckle bolt hole with ball stud groove as shown and install ball stud bolt. Tighten each bolt and nuts to specified torque.



Tightening Torque
(a): 95 N·m (9.5 kg-m, 69.0 lb-ft)
(b): 55 N·m (5.5 kg-m, 40.0 lb-ft)

2) Install wheel speed sensor (if equipped).
3) Connect tie-rod end to knuckle and tighten tie-rod end new nut to specified torque.

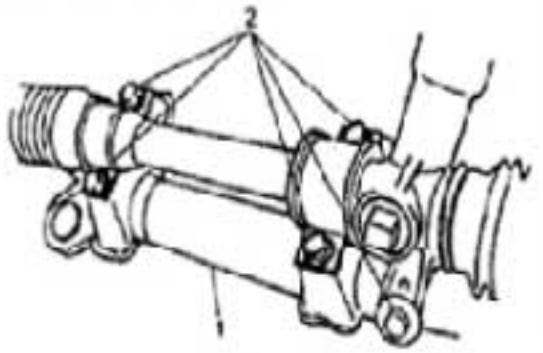


Tightening Torque
(c): 43 N·m (4.3 kg-m, 31.5 lb-ft)

NOTE:
When tightening tie-rod end nut, push tie-rod end to upper side with jack so as ball stud not to be rotated.

4) For installation procedures following the above, refer to Steps 1) – 7), WHEEL HUB/WHEEL STUD INSTALLATION on this section.

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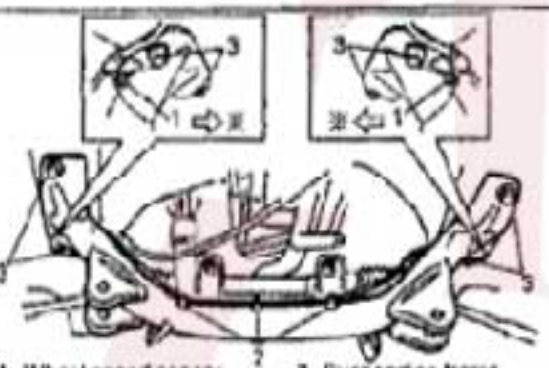


1. Suspension frame
2. Steering gear case mount bolts

SUSPENSION FRAME

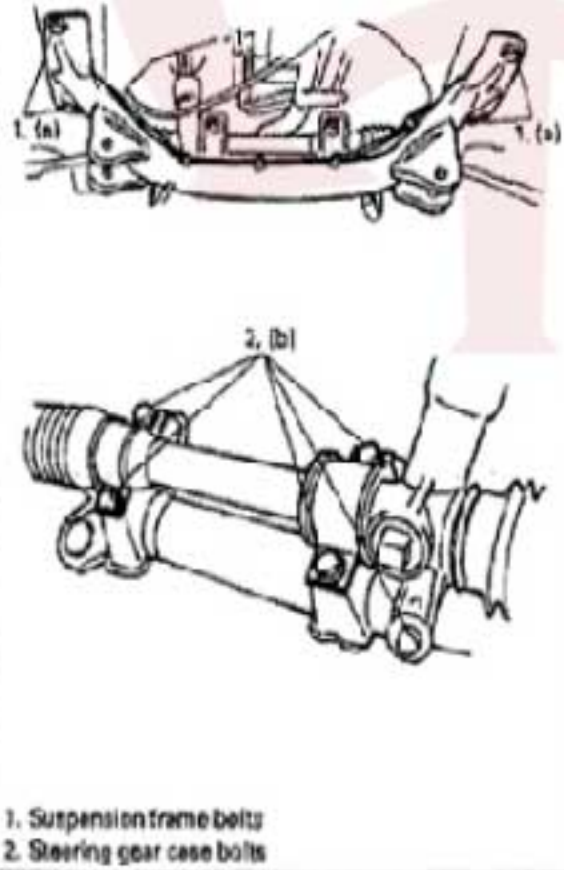
REMOVAL

1) Hoist vehicle and remove wheels.
2) Remove suspension control arms (right & left), refer to steps 2) to 5) of "SUSPENSION CONTROL ARM REMOVAL" in this section.
3) Remove steering gear case mount bolts.



1. Wheel speed sensor harness clamp bolt
2. Wheel speed sensor harness clamps
3. Suspension frame bolts
↑: Wheel side

4) Remove wheel speed sensor harness clamp bolts and clamps from suspension frame (if equipped).
5) Remove suspension frame bolts and suspension frame.



1. Suspension frame bolts
2. Steering gear case bolts

INSTALLATION

1) Install suspension frame and tighten suspension frame bolts to specified torque.

Tightening Torque
(a): 95 N·m (9.5 kg-m, 69.0 lb-ft)

2) Install wheel speed sensor harness clamp bolts and clamps to suspension frame (if equipped).
3) Install steering gear case mount bolts and tighten bolts to specified torque.

Tightening Torque
(b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

4) Install suspension control arms (right & left), refer to steps 2) to to 6) of "SUSPENSION CONTROL ARM INSTALLATION" in this section.
5) Confirm front end (wheel) alignment, refer to Section 3A.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Compression rod bracket bolt	55	5.5	40.0
Compression rod front nut	95	9.5	69.0
Compression rod rear nut	65	6.5	47.0
Strut bracket nut	95	9.5	69.0
Strut nut	50	5.0	36.5
Strut support nut	73	7.3	53.0
Brake caliper pin bolt	35	3.5	25.5
Ball stud bolt	55	5.5	40.0
Suspension control arm nut	73	7.3	53.0
Stab lizer bar mount bracket bolt	25	2.5	18.0
Stabilizer link nut	23	2.3	17.0
Stabilizer joint nut	50	5.0	36.5
Spindle nut	175	17.5	126.5
Brake caliper carrier bolt	95	9.5	69.0
Tie rod end nut	43	4.3	31.5
Wheel nut	85	8.5	61.5
Suspension frame bolt	95	9.5	69.0
Steering geer case mount bolt	25	2.5	18.0

SPECIAL TOOLS



1. 09900-00411
   Hexagon wrench socket
2. 09900-00414
   Hexagon wrench bit 6 mm



09945-26010
Socket wrench 17 mm



09942-15510
Sliding hammer



09943-17912
Front wheel hub remover
(Brake drum remover)



09943-77910
Control bush remover

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SECTION 3E

REAR SUSPENSION

NOTE:

- All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any suspension part. Replace it with a new part, or damage to the part may result.

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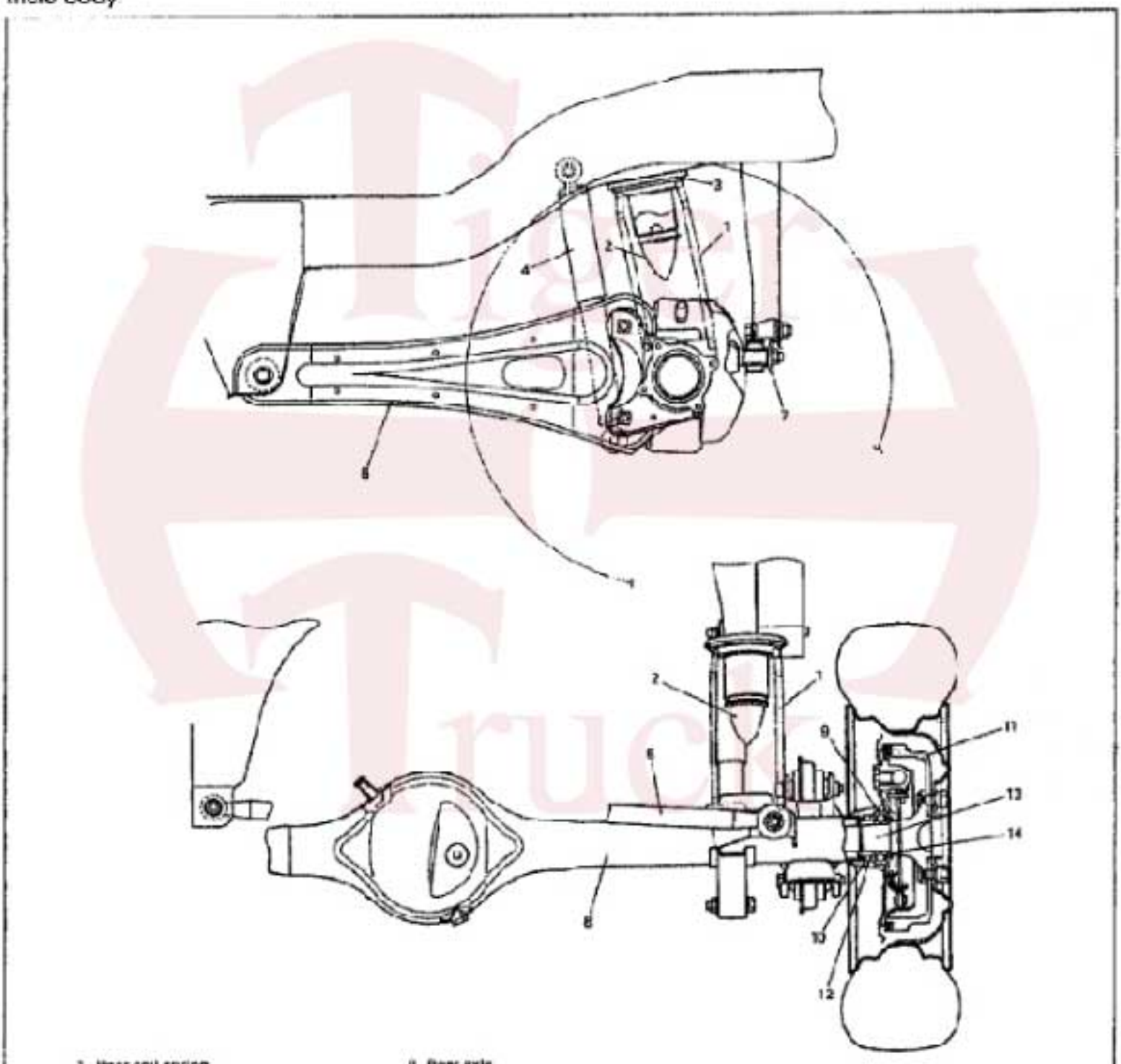
GENERAL DESCRIPTION

Rear suspension is a type which consists of coil springs, rear axle, shock absorbers, lateral rod and trailing arms.

The lateral rod is installed to the body and axle by using bushes so as to prevent axle movement in the lateral direction.

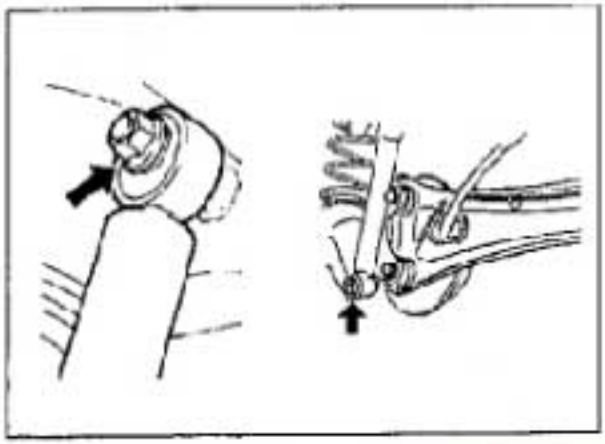
The trailing arms which are connected with the axle are installed to the body by using a bush so that axle moves up and down with the bush as its supporting point.

The shock absorber is installed between the body and axle to absorb up-and-down movement of the vehicle body.



1. Rear coil spring
2. Rear bump stopper
3. Rear spring upper seat
4. Rear shock absorber
5. Lateral rod
6. Trailing arm
7. Lateral rod outer washer
8. Rear axle
9. Bearing
10. Rear shaft oil seal
11. Brake drum
12. Bearing retainer ring
13. Rear axle shaft
14. Wheel bearing spacer

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DIAGNOSIS

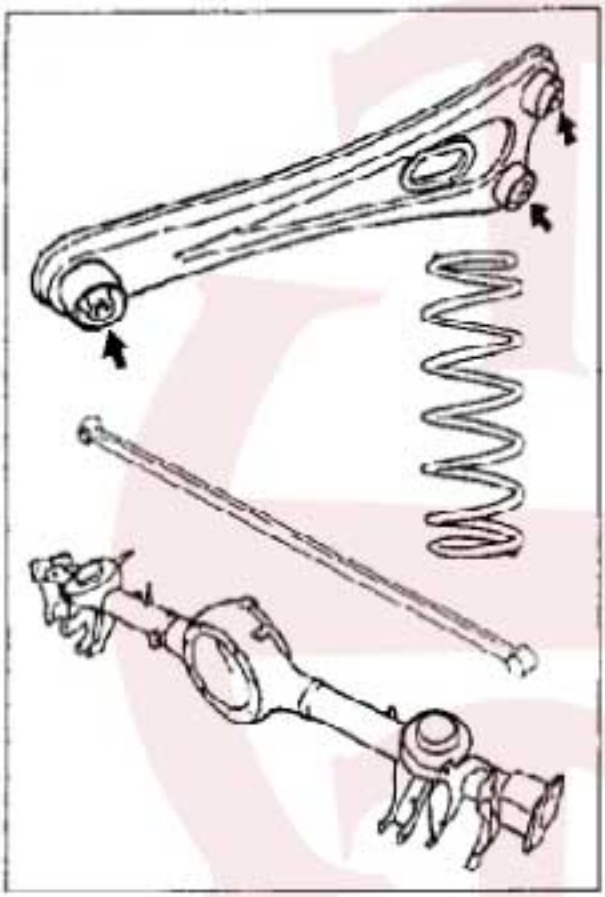
Refer to Section 3.

CHECK AND ADJUSTMENT

REAR SHOCK ABSORBER CHECK

- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

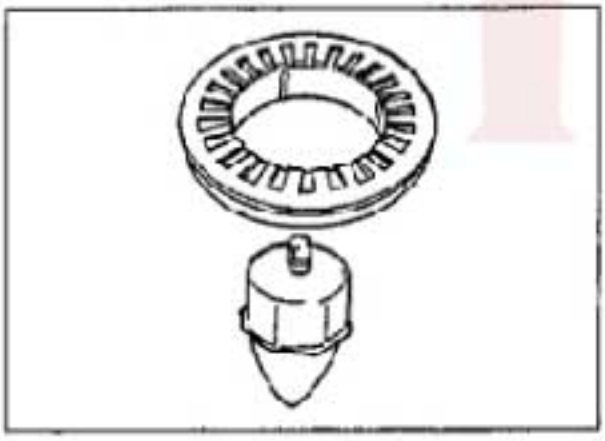
Replace any defective part.



TRAILING ARM, LATERAL ROD, REAR AXLE AND COIL SPRING CHECK

- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.
  Replace any defective part.

NOTE:
Bushing can not be replaced. Replace lateral rod or trailing arm assembly.



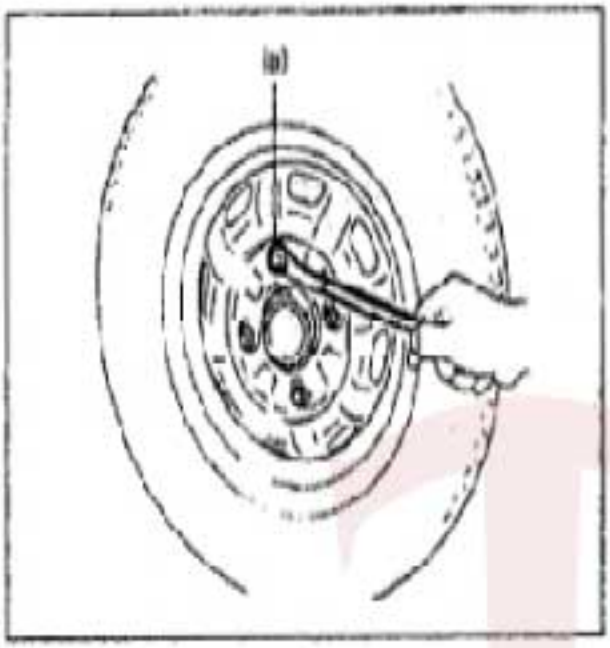
BUMP STOPPER/SPRING UPPER SEAT CHECK

- Inspect for cracks, deformation or damage.
  Replace any defective part.

REAR SUSPENSION FASTENERS CHECK

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to page 3E-17 of this section.

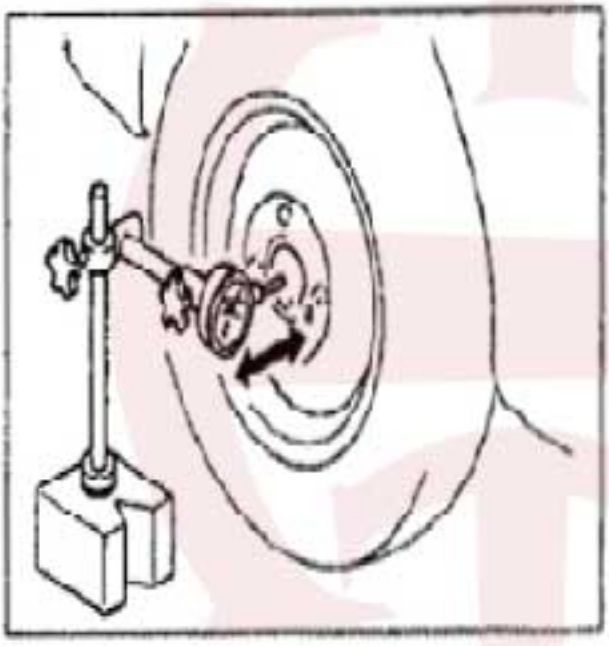
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WHEEL DISC, NUT & BEARING CHECK

- Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
- Check wheel nuts for tightness and, as necessary, retighten to specification.

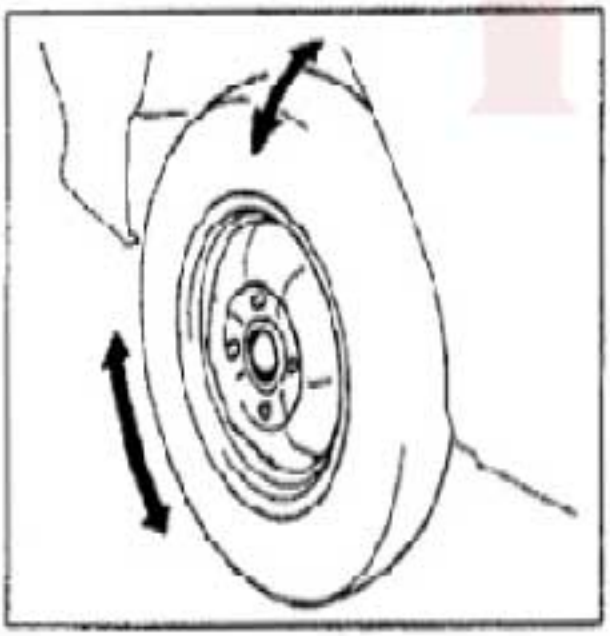
Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center.

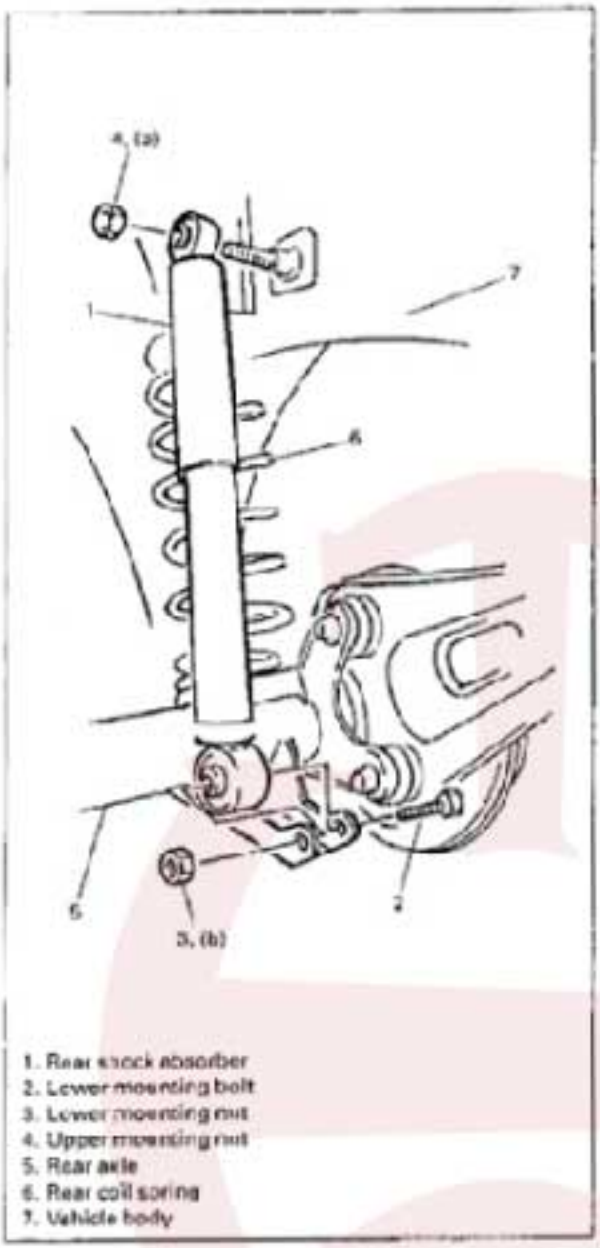
Thrust play limit "a": 0.8 mm (0.03 in.)

When measurement exceeds limit, replace bearing.



- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.

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1. Rear shock absorber
2. Lower mounting bolt
3. Lower mounting nut
4. Upper mounting nut
5. Rear axle
6. Rear coil spring
7. Vehicle body

ON-VEHICLE SERVICE

REAR SHOCK ABSORBER

REMOVAL

1) Hoist vehicle.
2) Support rear axle housing by using floor jack to prevent it from lowering.
3) Remove lower mounting bolt and nut.
4) Remove upper mounting nut. Then remove shock absorber.

INSTALLATION

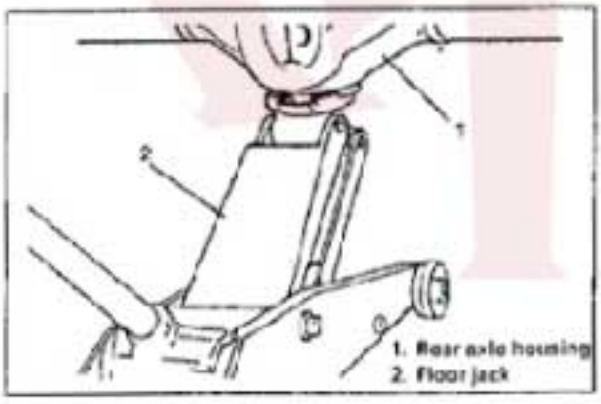
1) Install shock absorber, referring to left figure for proper installing direction of bolt.

NOTE:
Nut and bolt should not be tightened.

2) Remove floor jack from rear axle housing and lower hoist.
3) Tighten bolts and nuts to specified torque.

NOTE:
Tighten bolts and nuts with vehicle off hoist and in non-loaded condition.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
(b): 80 N·m (8.0 kg-m, 58.0 lb-ft)

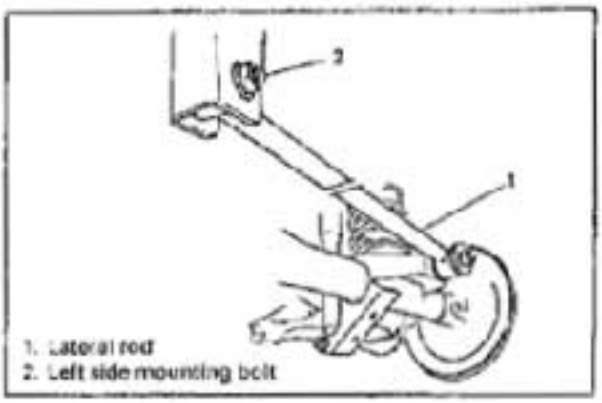


1. Rear axle housing
2. Floor jack

COIL SPRING

REMOVAL

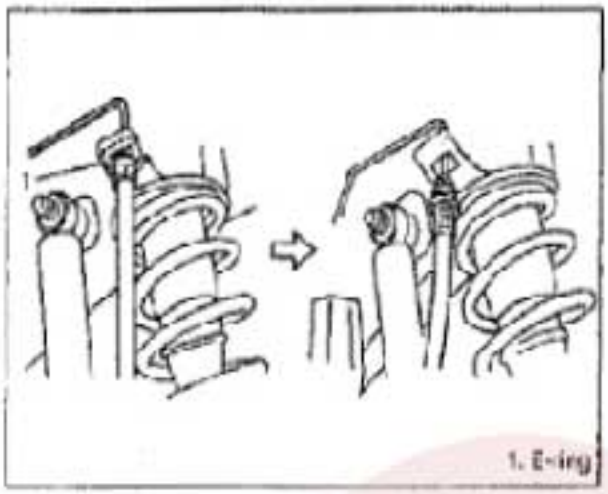
1) Hoist vehicle and remove rear wheel (s).
2) Support rear axle housing by using floor jack to prevent it from lowering.



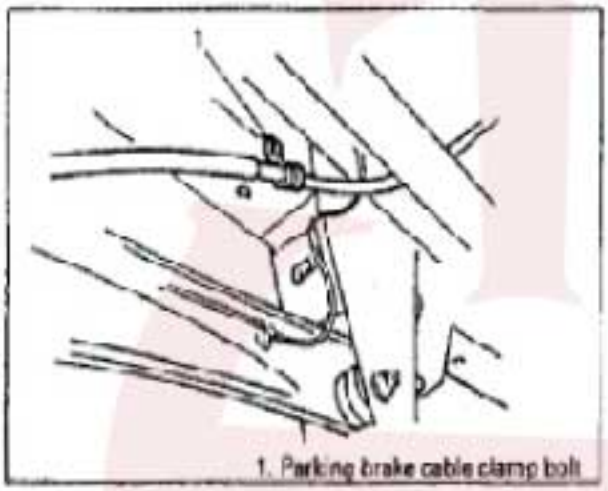
1. Lateral rod
2. Left side mounting bolt

3) Remove lateral rod left side mounting bolt and nut.

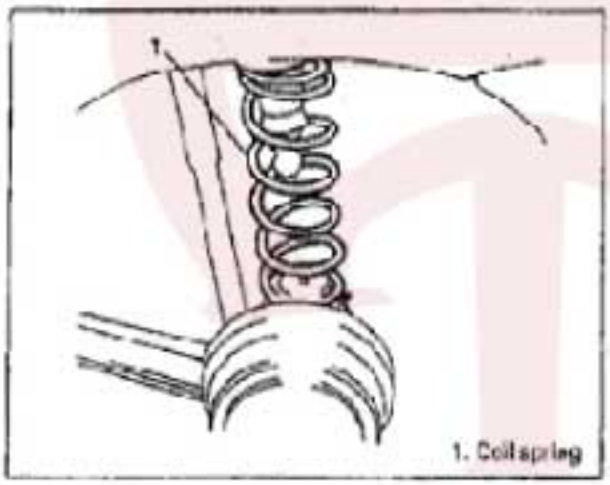
https://truckmanualshub.com/



4) Remove brake flexible hose E-ring.



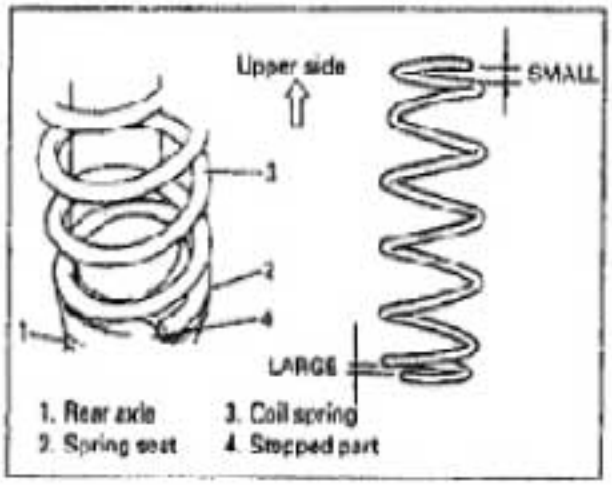
5) Remove parking brake cable clamp bolt.



6) Remove shock absorber lower mounting bolt and nut.
7) Lower rear axle housing gradually as far down as where coil spring can be removed.

CAUTION:
Be careful not to let rear axle down too much. It may cause damage to brake flexible hose.

8) Remove coil spring.

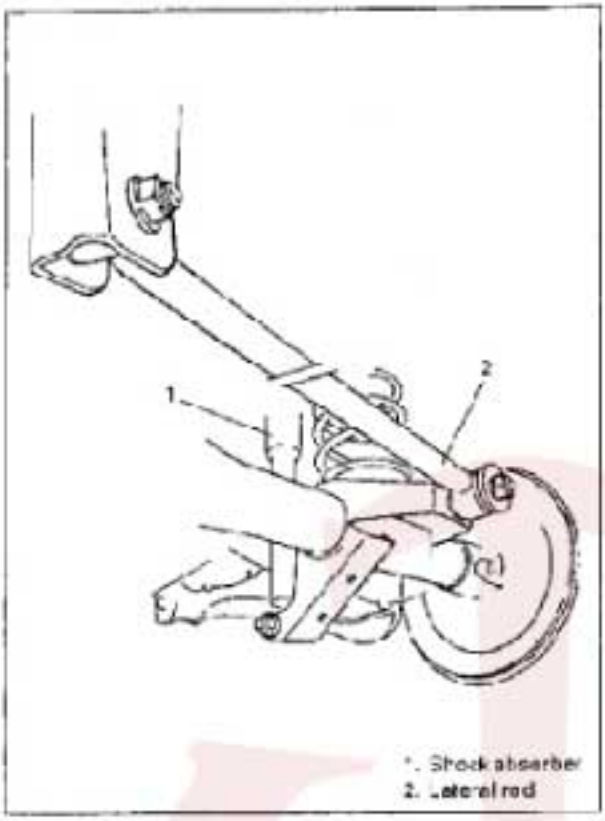


INSTALLATION

1) Install coil spring with its closed end facing up and open end (with paint marking) down and make sure that its bottom fits in spring seat securely. Then raise axle housing.

CAUTION:
Make spring end meet with stepped part of lower seat as shown.

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1. Shock absorber
2. Lateral rod

2) Install shock absorber lower mounting bolt, refer to step 1) of "REAR SHOCK ABSORBER INSTALLATION" in this section.
3) Remove floor jack from rear axle housing.
4) Install parking brake cable clamp bolt and brake flexible hose E-ring.
5) Install lateral rod to vehicle body, refer to step 1) of "LATERAL ROD INSTALLATION" in this section.

NOTE:
Nut should not be tightened.

6) Install wheel and tighten wheel nuts to specified torque.

Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non-loaded condition, tighten absorber lower mounting nut and lateral rod left mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)

BUMP STOPPER AND SPRING UPPER SEAT

REMOVAL

1) Remove coil spring. For details, refer to steps 1) to 8) of "COIL SPRING REMOVAL".
2) Remove spring upper seat.
3) Remove bump stopper by using special tool.

Special Tool
(A): 09941-66010



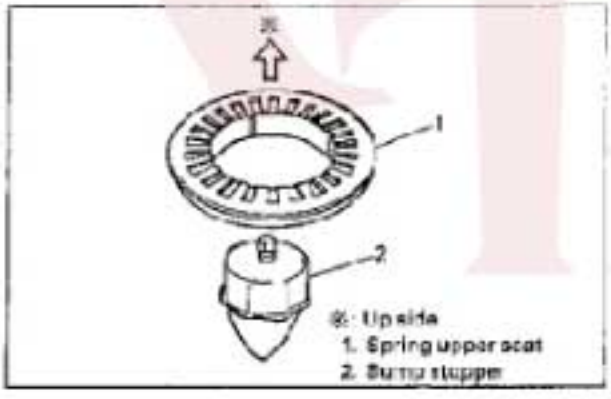
1. Spring upper seat
2. Bump stopper

INSTALLATION

1) Install bump stopper.

NOTE:
- **Before installing bushing, apply soap water on it.**
- **For proper installing direction of spring upper seat, refer to figure at left.**

2) Install spring upper seat.
3) Install coil spring. For details, refer to steps 1) to 7) of "COIL SPRING INSTALLATION".

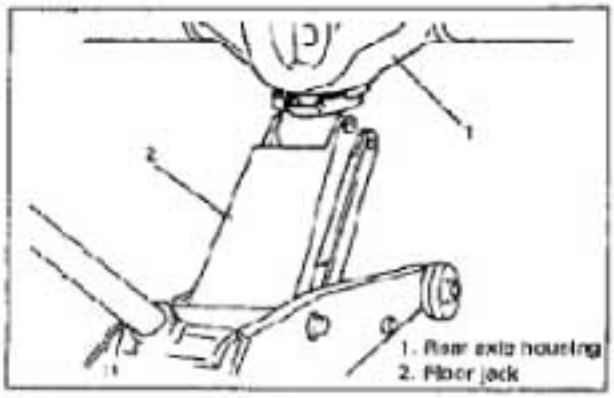


※: Up side
1. Spring upper seat
2. Bump stopper

TRAILING ARM

REMOVAL

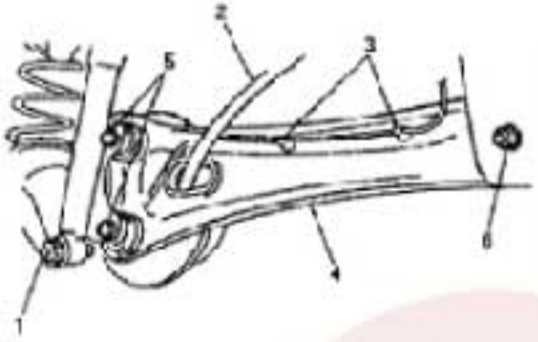
1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack.



1. Rear axle housing
2. Floor jack

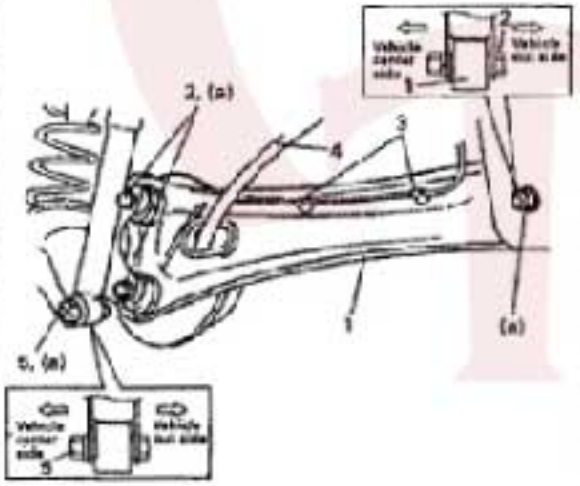
CAUTION:
Never apply floor jack against lateral rod as it may get deformed.

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1. Shock absorber lower mounting bolt and nut
2. Parking brake cable
3. Wheel speed sensor lead wire clamps
4. Trailing arm
5. Trailing arm mounting bolts
6. Trailing arm mounting bolt and nut

3) Remove shock absorber lower mounting bolt and nut.
4) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to "PARKING BRAKE CABLE REMOVAL" of Section 5.
5) For ABS equipped vehicle, disconnect wheel speed sensor lead wire clamp from trailing arm.
6) Remove trailing arm mounting bolts and nut.



1. Trailing arm
2. Trailing arm mounting bolts
3. Wheel speed sensor lead wire clamps
4. Parking brake cable
5. Shock absorber lower mounting nut

INSTALLATION

1) Install trailing arm to vehicle body and rear axle housing, referring to figure for proper installing direction of bolts.

NOTE:
Nut and bolts should not be tightened.

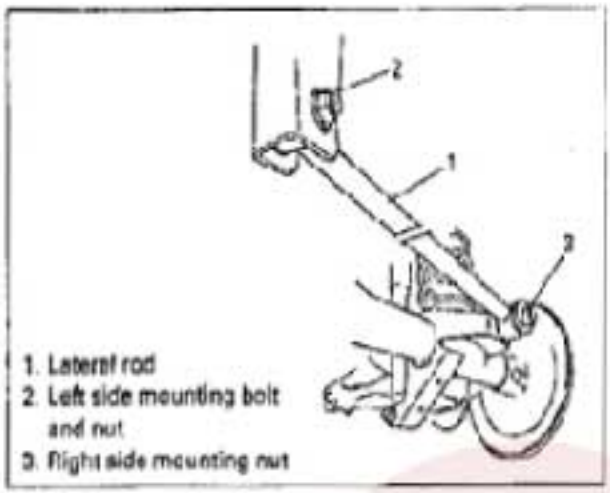
2) Install wheel speed sensor lead wire clamp, if equipped.
3) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to "PARKING BRAKE CABLE INSTALLATION" of Section 5.
4) Install shock absorber to rear axle housing.
5) Remove floor jack from rear axle housing.
6) Install wheel and tighten wheel nuts to specified torque.

Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non loaded condition, tighten trailing arm mounting bolts and nuts and shock absorber lower mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)

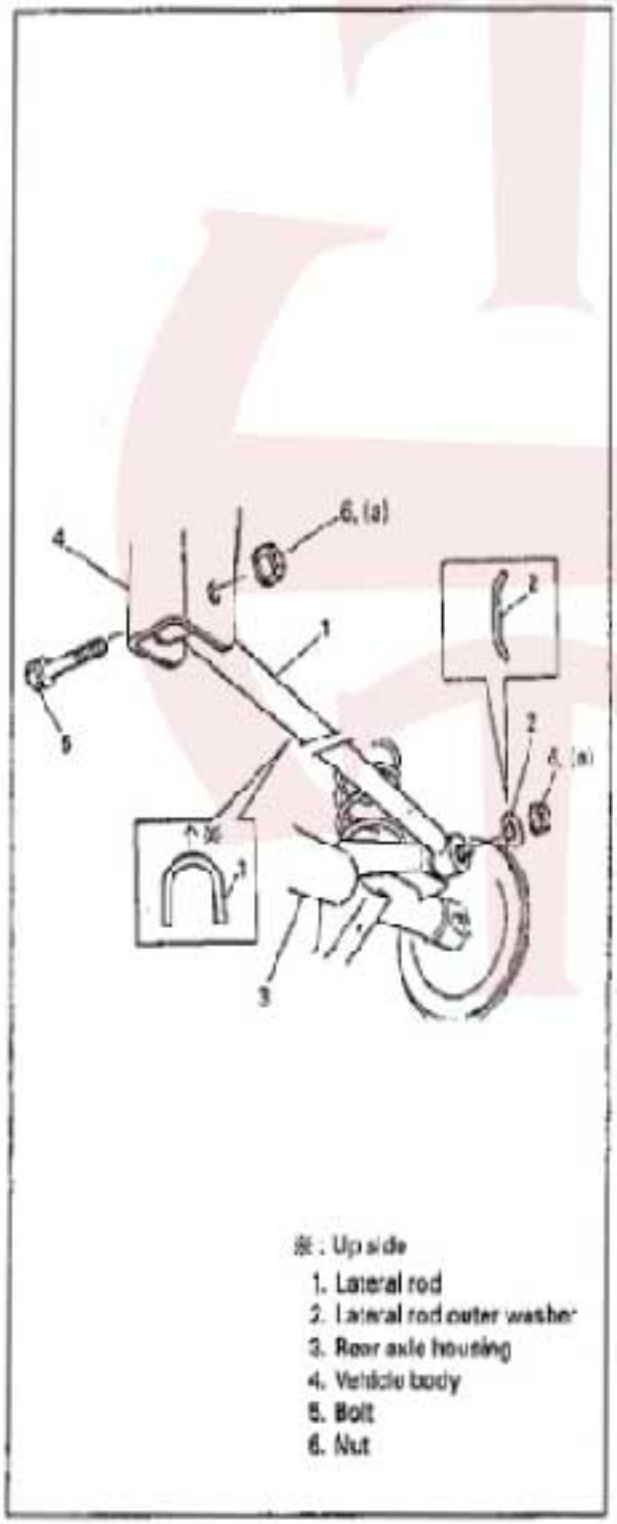
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LATERAL ROD

REMOVAL

1) Hoist vehicle.
2) Remove lateral rod mounting bolt and nuts.
3) Remove lateral rod.



INSTALLATION

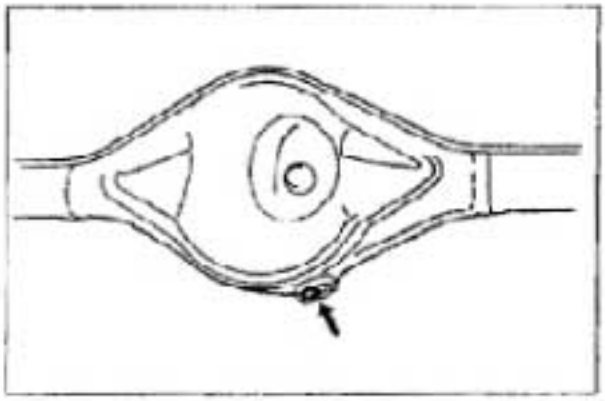
1) Install lateral rod to vehicle body and rear axle housing, referring to figure for proper installing direction.

NOTE:
Nut should not be tightened.

2) Lower hoist and with vehicle in non-loaded condition, tighten lateral rod bolt and nuts to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)

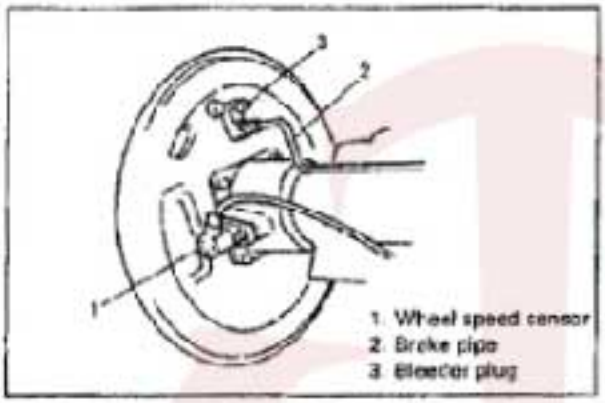
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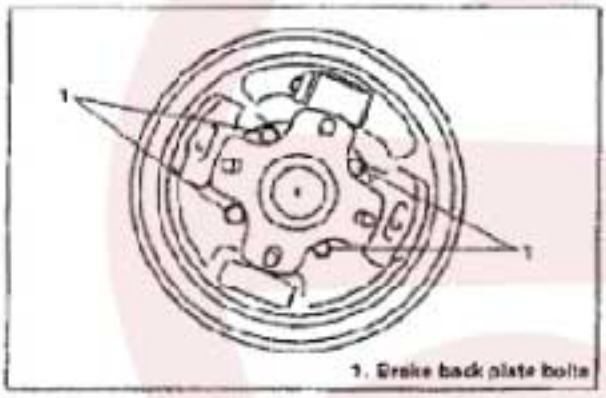
REAR AXLE SHAFT AND WHEEL BEARING

REMOVAL

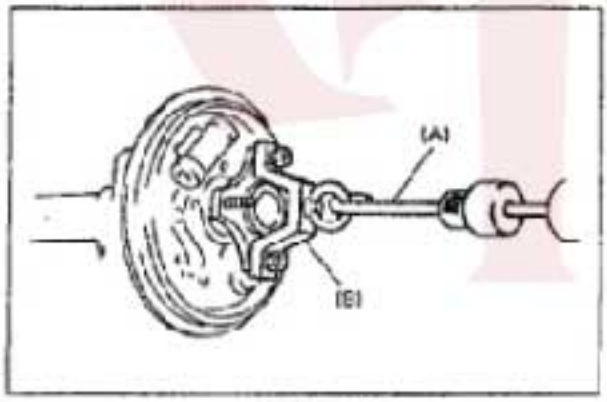
1) Hoist vehicle and remove rear wheel.
2) Drain gear oil from rear axle housing by loosening drain plug.
3) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to "PARKING BRAKE CABLE REMOVAL" of Section 5.



4) Remove wheel speed sensor (if equipped with ABS).
5) Disconnect brake pipe(s) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.

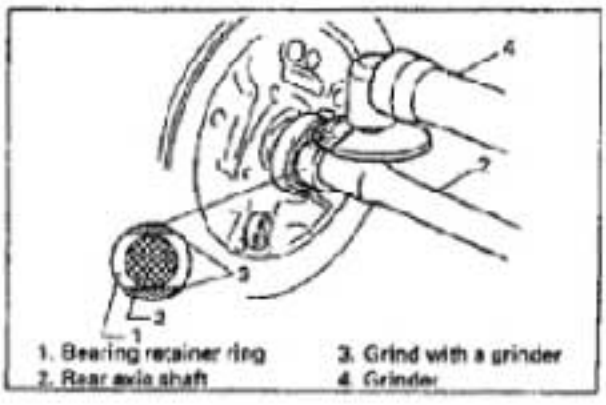


6) Remove brake back plate bolts.



7) Using special tools indicated, draw out axle shaft with brake back plate.

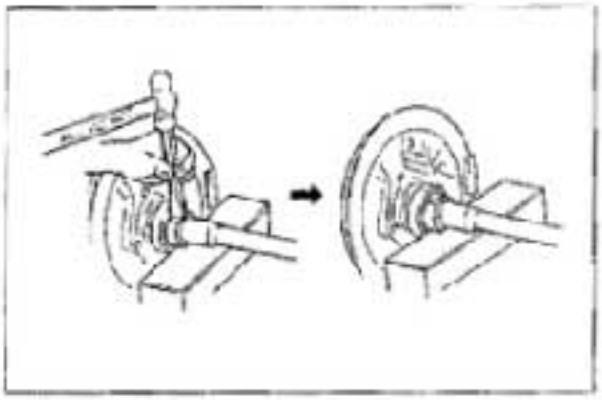
Special Tool
(A): 09942-15510
(B): 09943-17912



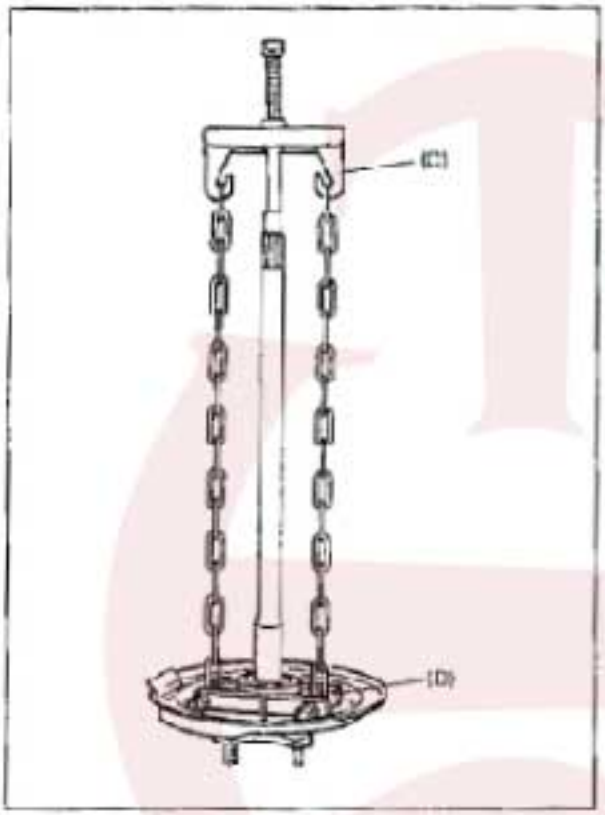
8) Remove wheel sensor ring (if equipped with ABS). Refer to "REAR WHEEL SENSOR RING REMOVAL" of Section 5E.
9) In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

CAUTION:
Be careful not to go so far as to grind the shaft.

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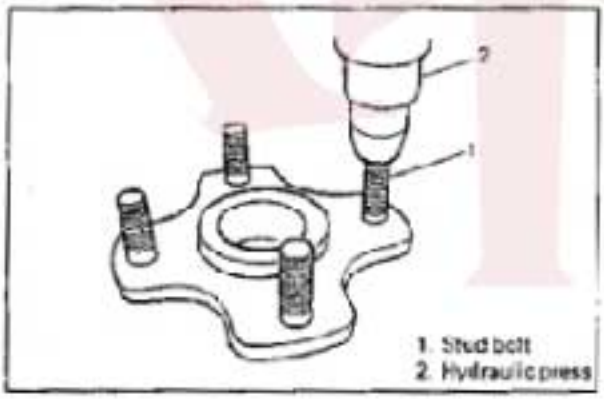


10) Break with a chisel the thin ground retainer ring, and it can be removed.

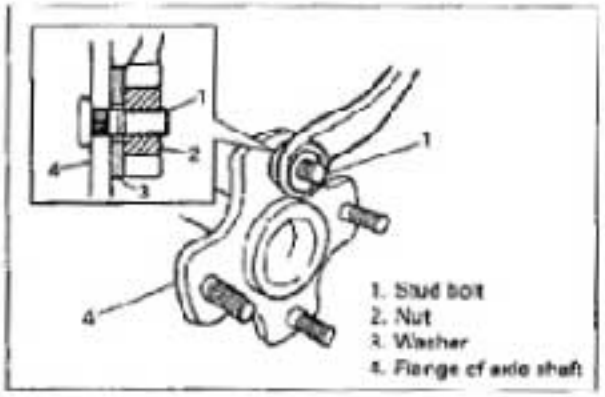


11) Using special tools, remove bearing from shaft and then remove brake back plate.

Special Tool
(C): 09927-16411
(D): 09921-57810



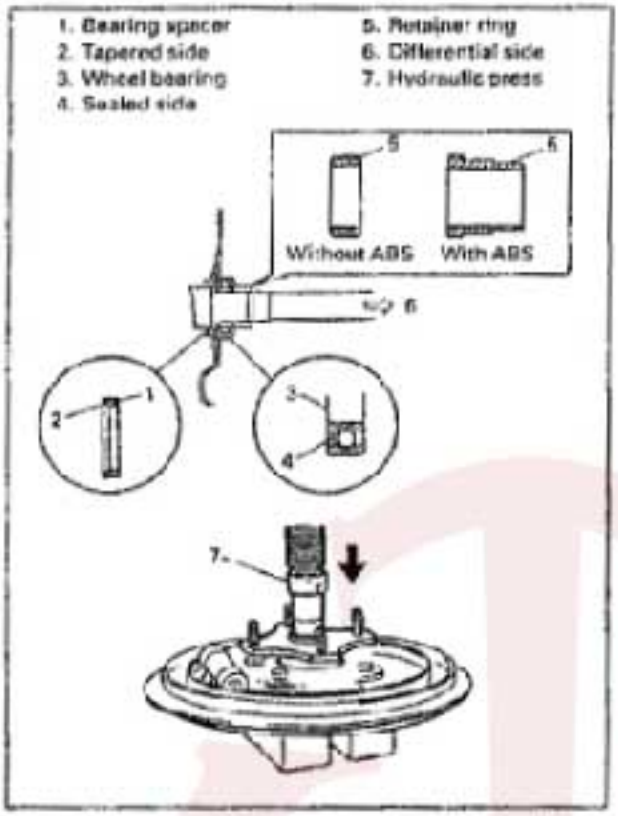
12) Remove stud bolts by using hydraulic press.



INSTALLATION

1) Aligning serrations between new stud bolt(s) and flange, install new stud bolt(s) by tightening nut as shown.

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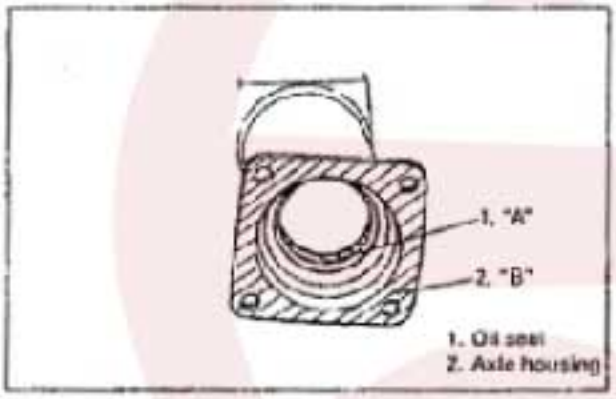


2) Press in a new bearing and retainer ring in order by using an oil hydraulic press.

NOTE:

- **Install wheel bearing spacer with the tapered side of its inner diameter directed toward outside, or brake drum side.**
- **Install wheel bearing with its sealed side directed toward brake drum side.**
- **Use care not to cause any damage to outside of retainer ring.**

3) Install wheel sensor ring (if equipped with ABS).
Refer to "REAR WHEEL SENSOR RING INSTALLATION" of Section 5E.



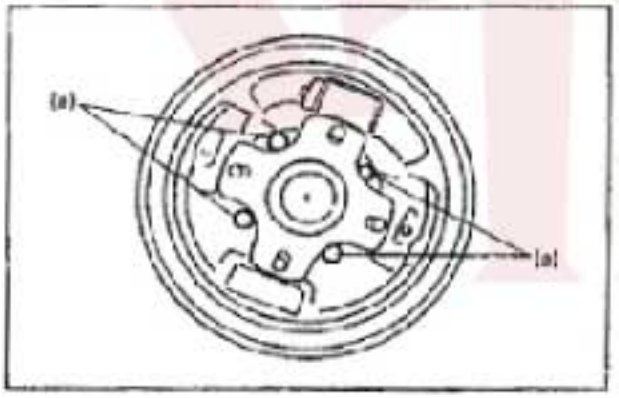
4) Apply grease to axle shaft oil seal lip as shown.

"A": Grease

5) Apply sealant to mating surface of axle housing with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

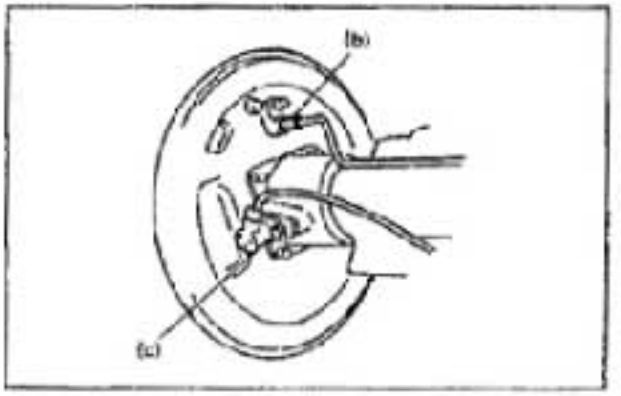
"B": Sealant 99000-31090



6) Install rear axle shaft to rear axle housing and tighten brake back plate bolts to specified torque.

NOTE:
When installing rear axle shaft, be careful not to cause damage to oil seal lip in axle housing.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



7) Connect brake pipe to wheel cylinder and tighten brake pipe flare nut to specified torque.

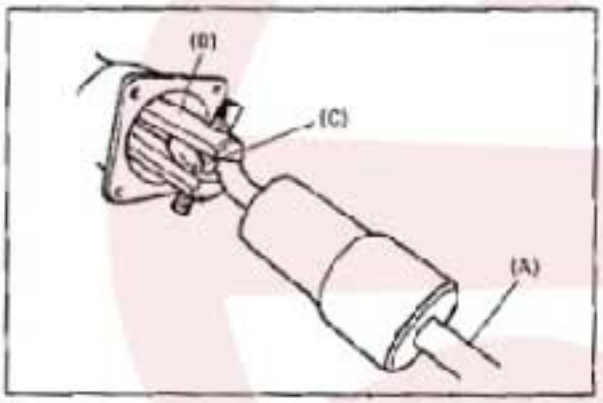
Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

8) Install wheel speed sensor (if equipped with ABS).

Tightening Torque
(c): 10 N·m (1.0 kg-m, 7.5 lb-ft)

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9) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to "PARKING BRAKE CABLE INSTALLATION" of Section 5.
10) Refill rear axle (differential) housing with new specified gear oil. Refer to Section 7E for refill.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see Section 5.)
12) Install wheel and tighten wheel nuts to specified torque.
13) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable (for adjustment, see Section 5 of this manual).
14) Check to ensure that brake drum is free from dragging and proper braking is obtained.
15) Perform brake test (foot brake and parking brake). (For brake test, see Section 5).
16) Check each installed part for oil leakage.



REAR AXLE SHAFT INNER OIL SEAL

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 7) of "REAR AXLE SHAFT REMOVAL" in this section.
2) Remove rear axle shaft inner oil seal, by using special tools.

Special Tool
(A): 09942-15510
(B): 09944-96010 (remover)
(C): 09921-26010 (collar)

INSTALLATION

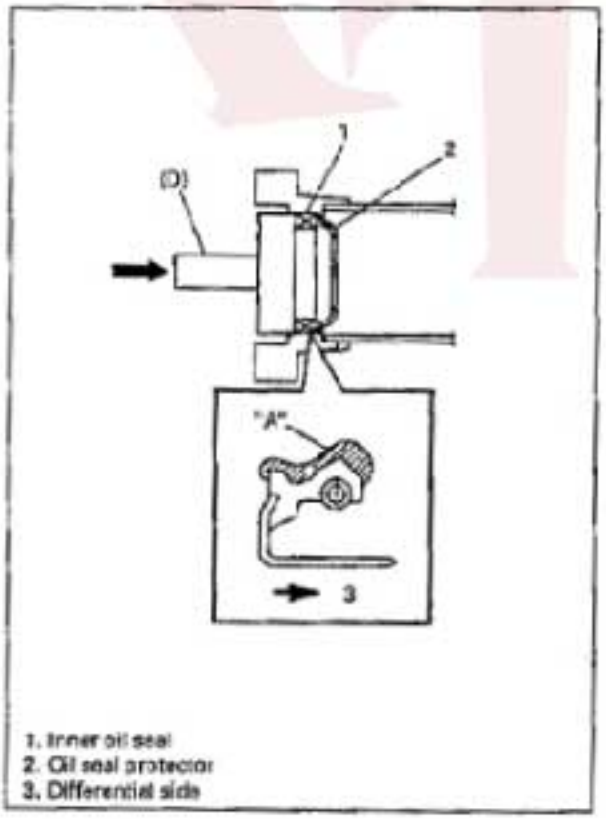
1) Using special tools drive in oil seal until it contacts oil seal protector in axle housing.

NOTE:
- **Make sure that oil seal is free from inclination as it is installed.**
- **Refer to figure so that oil seal is installed in proper direction.**

Special Tool
(D): 09913-75520

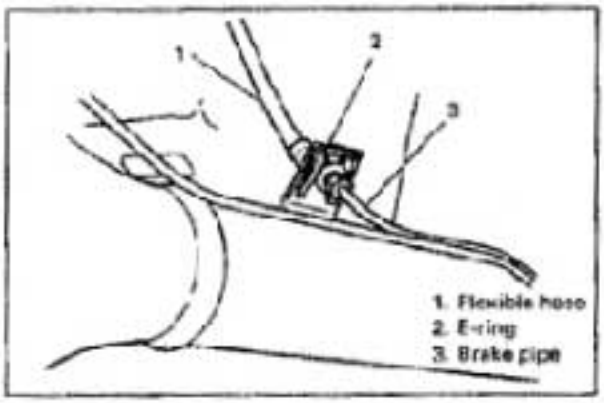
"A": Grease 99000-25010

2) For procedure hereafter, refer to steps 4) to 16) of "REAR AXLE SHAFT INSTALLATION" in this section.



1. Inner oil seal
2. Oil seal protector
3. Differential side

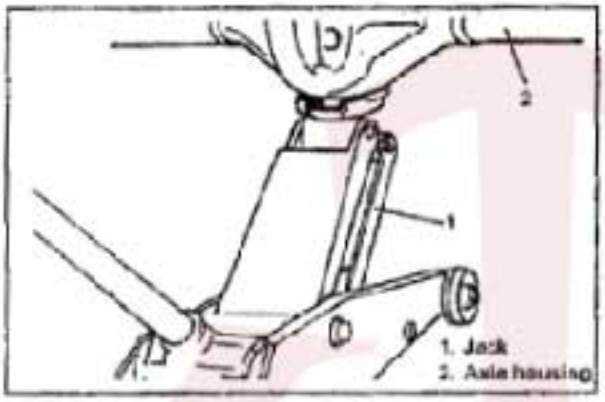
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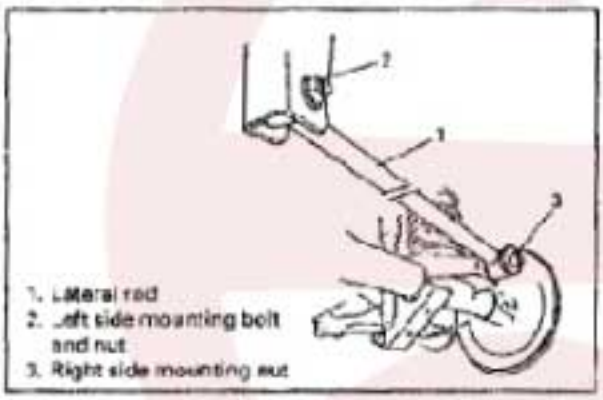
REAR AXLE HOUSING

REMOVAL

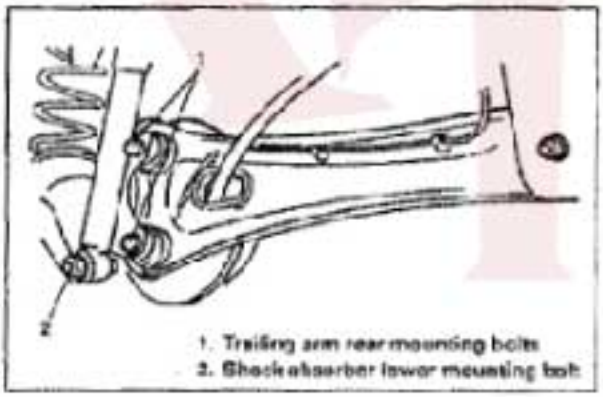
1) Hoist vehicle and remove rear wheels (right & left).
2) Remove rear axle shafts, refer to steps 2) to 7) of "REAR AXLE SHAFT REMOVAL" in this section.
3) Disconnect brake pipe from flexible hose and remove E-ring.
4) Remove brake pipe clamps and pipes from axle housing.
5) Remove wheel speed sensor harness clamps from axle housing (if equipped with ABS).



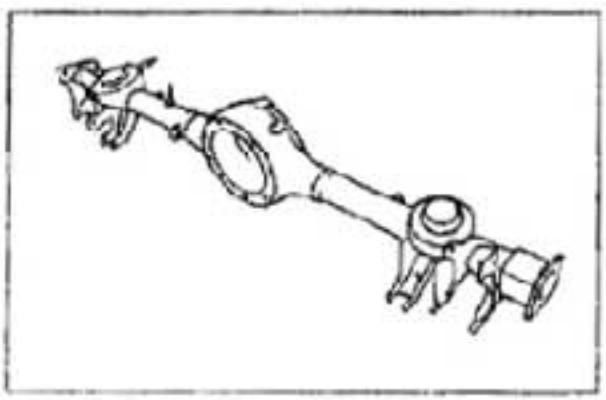
6) Remove differential carrier assembly, refer to Section 7F.
7) Disconnect LSPV spring from axle housing, refer to "LSPV REMOVAL" of Section 5 (if equipped with LSPV).
8) For jobs hereafter, support rear axle housing by using floor jack under axle housing.



9) Remove lateral rod.

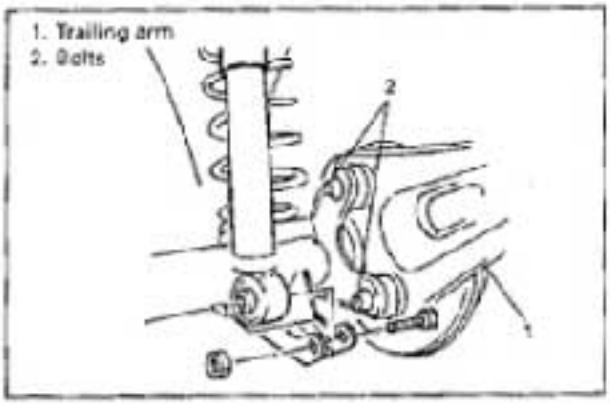


10) Loosen front and rear mounting bolts and nuts of trailing arm but don't remove bolts.
11) Remove shock absorber lower mounting nut and bolt.



12) Lower floor jack until tension of suspension coil spring becomes a little loose and remove rear mount bolts of trailing arm.
13) Lower rear axle housing gradually.
14) Remove axle housing.

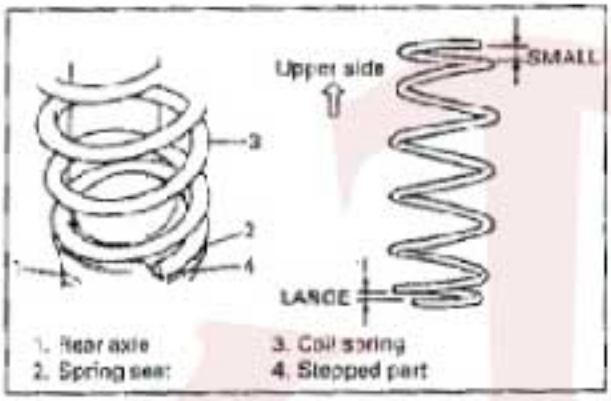
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INSTALLATION

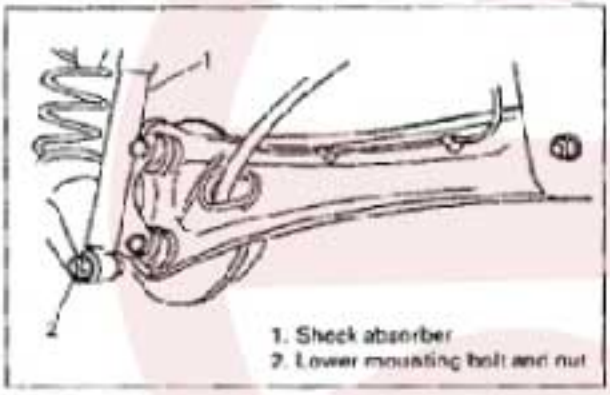
Install removed parts in reverse order of removal, noting the following points.

1) Place rear axle on floor jack. Then install trailing arm rear mounting bolts (right & left). At this time, mount bolts but don't tighten them.

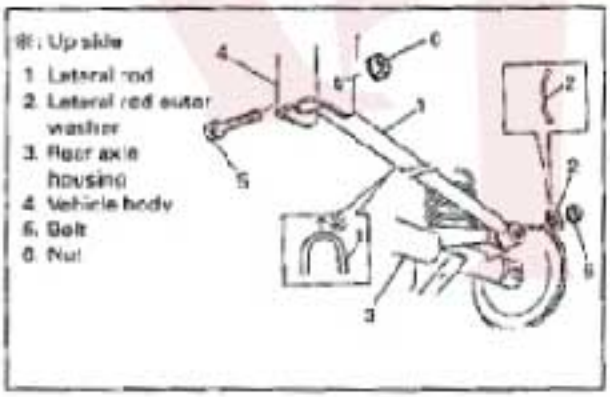


2) Install coil springs (right & left) on spring seat of rear axle as shown in figure and then raise rear axle.

NOTE:
When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

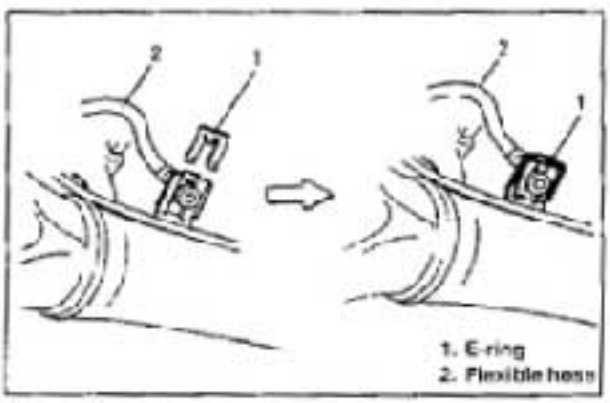


3) Install shock absorber lower mounting bolts and nuts (right & left).
4) Remove floor jack from rear axle housing.



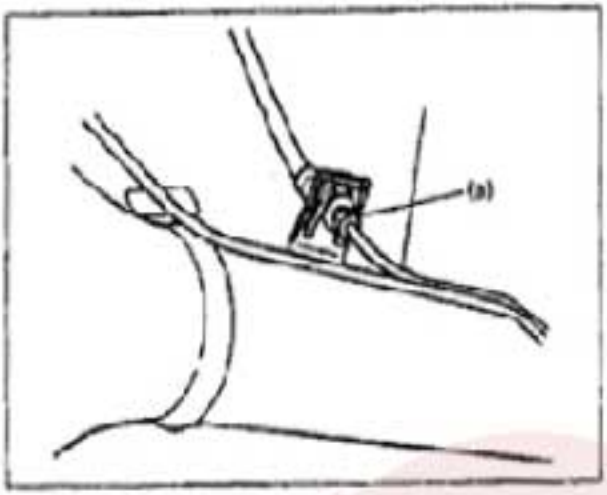
5) Install lateral rod to rear axle housing and vehicle body.

NOTE:
Nut should not be tightened.



6) Install differential carrier assembly, refer to Section 7F.
7) Install wheel speed sensor harness clamps (if equipped with ABS).
8) Connect brake pipes onto axle housing and clamp them securely.
   For clamping positions, refer to Section 5 of this manual.
9) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.

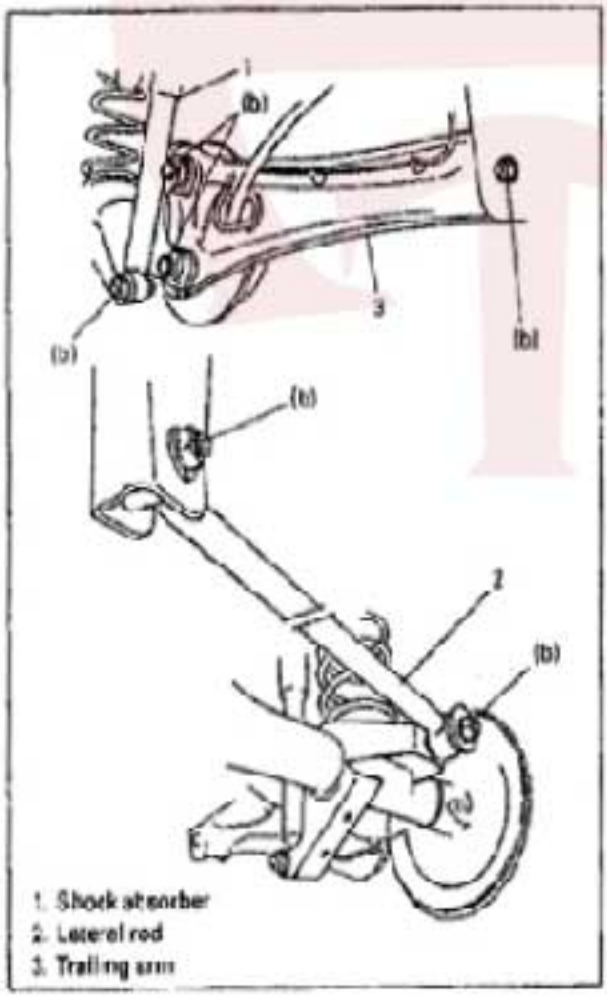
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10) Connect brake pipe to brake flexible hose and tighten brake pipe flare nut to specified torque.

Tightening Torque
(a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

11) Install rear axle shafts to rear axle housing, refer to steps 4) to 13) of "REAR AXLE SHAFT INSTALLATION" in this section.
12) Connect LSPV spring to axle housing, refer to "LSPV INSTALLATION and ADJUSTMENT" of Section 5.



13) Lower hoist.
14) Tighten trailing arm front and rear mounting bolts and nuts, shock absorber lower mounting bolts and nuts to specified torque. Tighten lateral rod right and left mounting nuts to specified torque.

NOTE:
When tightening these nuts and bolts, be sure that vehicle is off hoist and in non loaded condition.

Tightening Torque
(b): 80 N·m (8.0 kg-m, 58.0 lb-ft)

15) Check to ensure that brake drum is free from dragging and proper braking is obtained.
16) Perform brake test (foot brake and parking brake). (For brake test, see Section 5.)
17) Check each installed part for oil leakage.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Lateral rod right side mounting nut	80	8.0	58.0
Lateral rod left side mounting nut	80	8.0	58.0
Shock absorber upper mounting nut	55	5.5	40.0
Shock absorber lower mounting nut	80	8.0	58.0
Trailing arm front mounting nut	80	8.0	58.0
Trailing arm rear mounting bolt	80	8.0	58.0
Brake back plate bolt	23	2.3	17.0
Brake flare nut	16	1.6	12.0
Wheel nut	85	8.5	61.5

REQUIRED SERVICE MATERIALS

MATERIALS	USE
Brake fluid	Brake reservoir tank
Water tight sealant	Join seam of rear axle housing and brake back plate
Lithic wheel bearing grease	Oil seal lip

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SPECIAL TOOLS

 09041-66010 Bump stopper wrench	 09942-15510 Sliding hammer	 09943-17912 Brake drum remover	 09913-75520 Bearing installer
 1. 09927-18411 Universal puller 2. 09921-57810 Bearing remover	 09944-96010 Bearing outer race remover 09921-26010 Bearing outer race remover collar		

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SECTION 3F

WHEELS AND TIRES

NOTE:
All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

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TIGHTENING TORQUE SPECIFICATIONS 3F-7

GENERAL DESCRIPTION

TIRES

This vehicle is equipped with following tire.
155R13
The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

WHEELS

Standard equipment wheels are the following steel wheel.
13 x 4 1/2 J

REPLACEMENT TIRES

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard. Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.

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kPa	kgf/cm^2	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44

WARNING:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

The metric term for tire inflation pressure is the kilopascal (kPa). Tire pressures is usually printed in both kPa and psi on the Tire Placard.

Metric tire gauges are available from tool suppliers.

The chart, shown left table, converts commonly used inflation pressures from kPa to psi.



* TOTAL INDICATOR READING IGNORE INDICATOR "JUMP" DUE TO WELD SEAMS, PAINT RUNS, SCRATCHES, ETC.

1. Radial runout
2. Lateral runout

WHEELS REPLACEMENT

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in figure below may cause objectional vibrations.

Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, vehicle ground clearance and tire clearance to body and chassis.

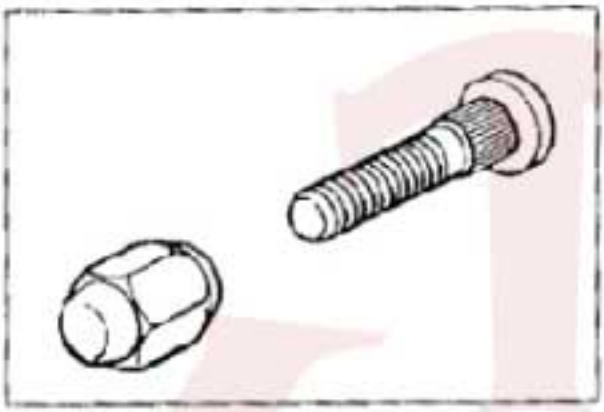
To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.

Take measurements of both lateral runout and radial runout at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.

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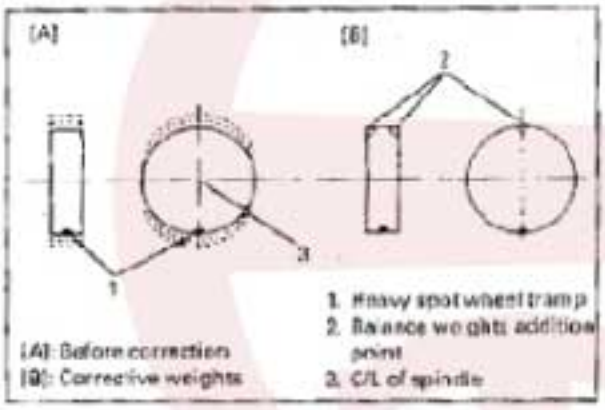
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

	Radial runout limit	Lateral runout limit
Steel wheel	1.14 mm (0.045 in.)	1.40 mm (0.055 in.)



METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs (size: M12 × 1.25).



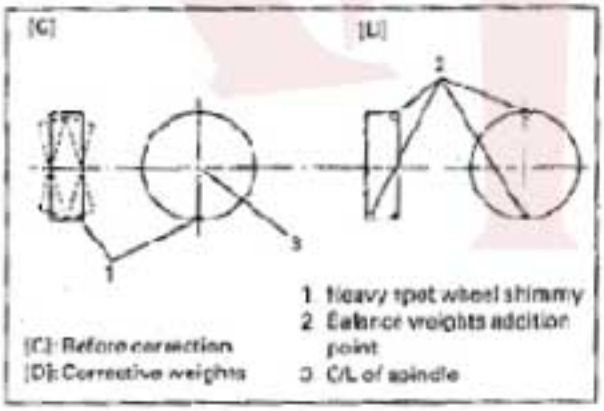
DIAGNOSIS

DIAGNOSIS TABLE

Refer to SECTION 3.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in left figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



Dynamic balance, as shown in left figure, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

GENERAL BALANCE PROCEDURES

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:
Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

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OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-VEHICLE BALANCING

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

WARNING:
Wheel spin should be limited to 35 mph (55 km/h) as indicated on speedometer.
This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped.
Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

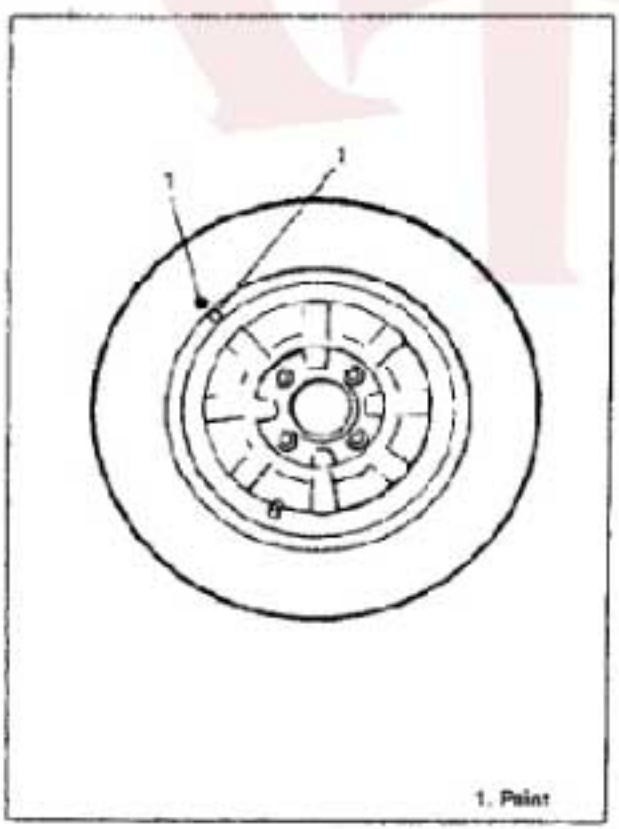
MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL AND TIRE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.



1. Paint

MATCHED TIRES AND WHEELS

Tires and wheels are matchmounted at the assembly plant. This means that the radially stiffest part of the tire, or "high spot", is matched to the smallest radius or "low spot" of the wheel.
This is done to provide the smoothest possible ride.
The "high spot" of the tire is originally marked by paint dot on the outboard sidewall. This paint dot will eventually wash off the tire.
The "low spot" of the wheel is originally marked by paint dot on the wheel rim-flange. Properly assembled, the wheel rims' paint dot should be aligned with the tires' paint dot as shown in left figure.
Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire's paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

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INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.

Tire pressure, with tires cold, (after vehicle has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire placard located on the left door (right door for right-hand side steering vehicle) lock pillar.

It is normal for tire pressure to increase to 28 kPa (4 psi) when the tires become hot during driving.

Do not bleed or reduce tire pressure after driving. Bleeding reduces the "Cold Inflation Pressure".

Higher than recommended pressure can cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Unequal pressure on same axle can cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be on the valves to keep dust and water out.

Lower than recommended pressure can cause:

1. Tire squeal on turns
2. Hard Steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperature
7. Reduced handling
8. High fuel consumption

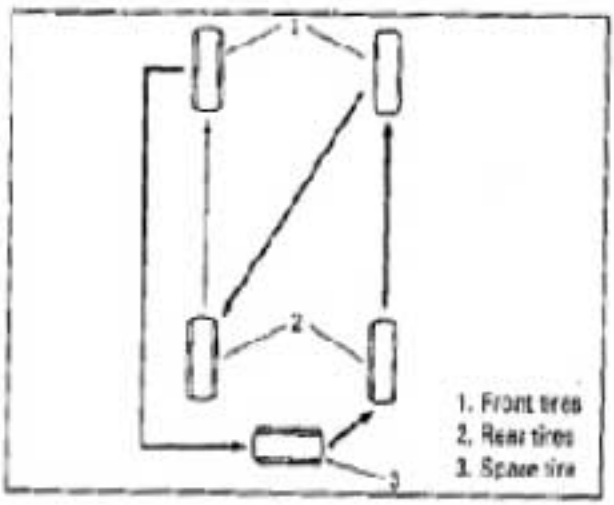
TIRE PLACARD

The tire placard is located on the left door (right door for right-hand side steering vehicle) lock pillar and should be referred to for tire information.

The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE:

Whether rim size and/or maximum load are listed or not depends on regulations of each country.



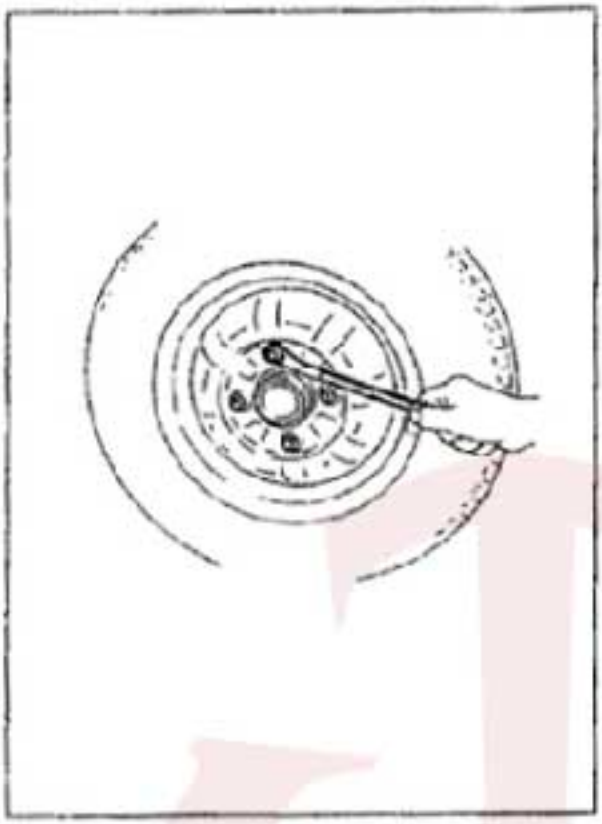
TIRE ROTATION

To equalize wear, rotate tires according to left figure. Radial tires should be rotated at the first 10,000 km (6,000 miles) and after that, tire rotation at least every 6,000 miles is recommended. Set tire pressure.

NOTE:

Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.

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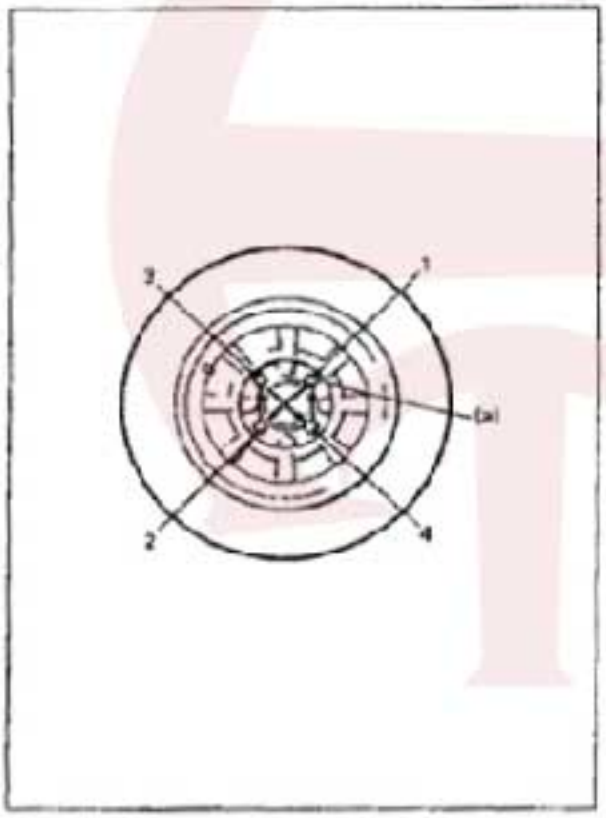
ON-VEHICLE SERVICE

WHEEL

REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

CAUTION:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.



INSTALLATION

Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc, left figure.

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow a wheel to come off while vehicle is moving.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

TIRE

MOUNTING AND DEMOUNTING

Use a tire changing machine to mount or demount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.
Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting a tire, bead area should be well lubricated with approved tire lubricant.

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After mounting, inflate to specified pressure shown on tire placard so that beads are completely seated.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and re-inflate.
Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate to proper pressure.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

TIGHTENING TORQUE SPECIFICATIONS

Fastening	Tightening torque		
	N·m	kg-m	lb-ft
Wheel nuts	85	8.5	61.5

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SECTION 4

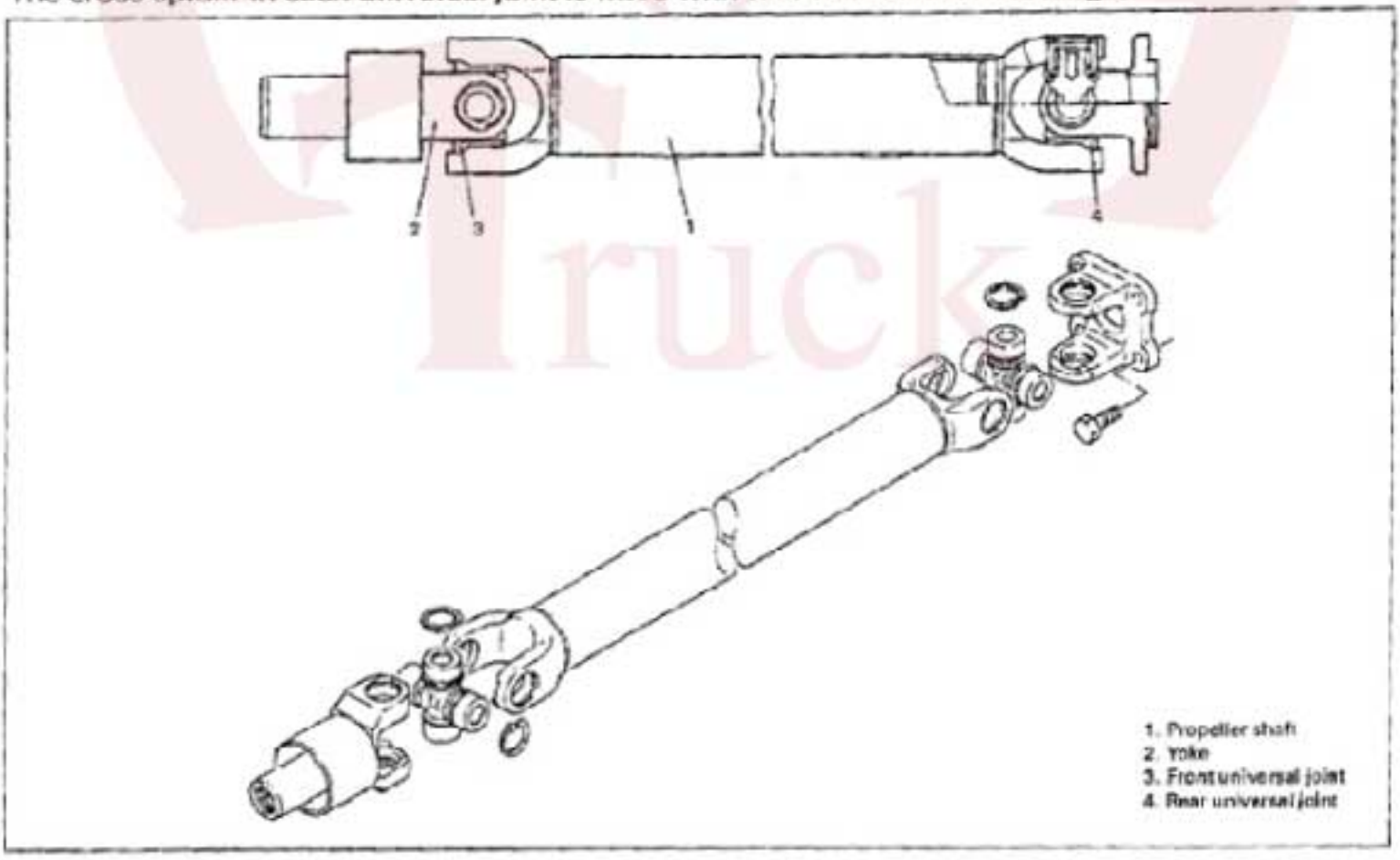
PROPELLER SHAFT

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SPECIAL TOOLS ..... 4 - 6

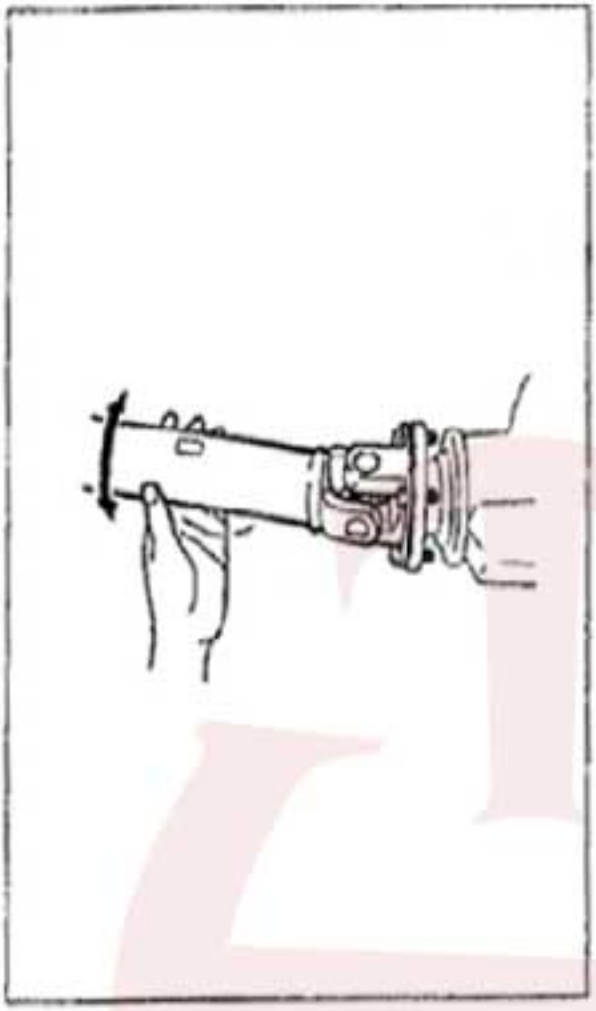
GENERAL DESCRIPTION

The propeller shaft is a three-part combination consisting of a shaft two universal joints. It is connected to the differential pinion through flanged connection and to the transmission output (main) shaft through a sliding spline joint.
The yoke of the front universal joint has its shank internally splined. The splined end of transmission shaft fits into the shank. The outer yoke of the rear joint is flanged; this flange is bolted to the flange, which is splined onto the forward end of the differential pinion.
The cross spider in each universal joint is fitted with four needle roller bearings.



1. Propeller shaft
2. Yoke
3. Front universal joint
4. Rear universal joint

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ON-VEHICLE SERVICE

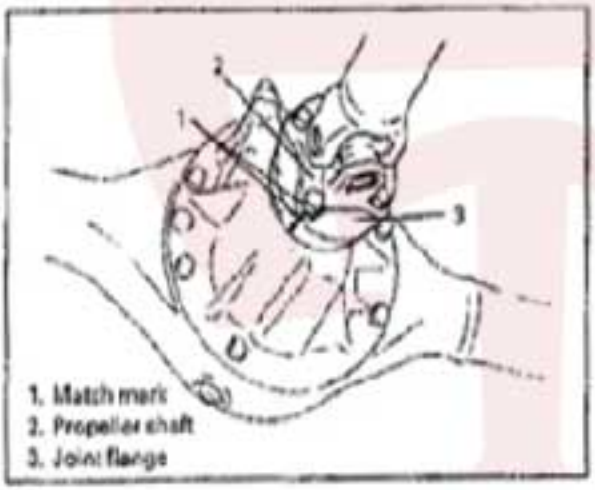
PROPELLER SHAFT

MAINTENANCE

Universal joint noise

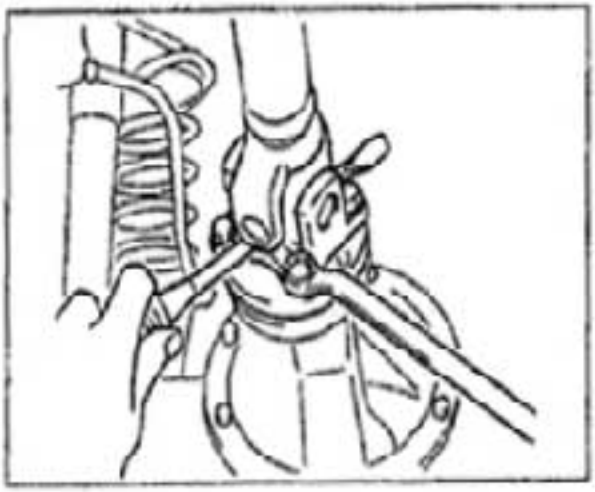
If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider ratties in yokes or if splines are worn down and replace defective propeller shaft with new one.

Noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).



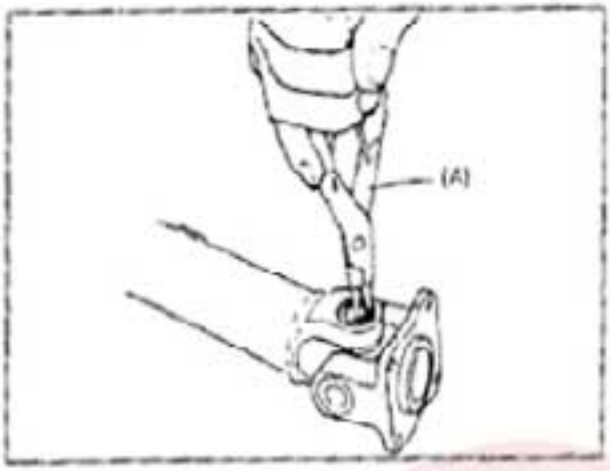
REMOVAL

1) Hoist vehicle.
2) Drain transmission oil.
3) Before removing propeller shaft, give match marks on each joint flange and propeller shaft as shown.



4) Loosen propeller shaft bolts.
5) Remove propeller shaft.

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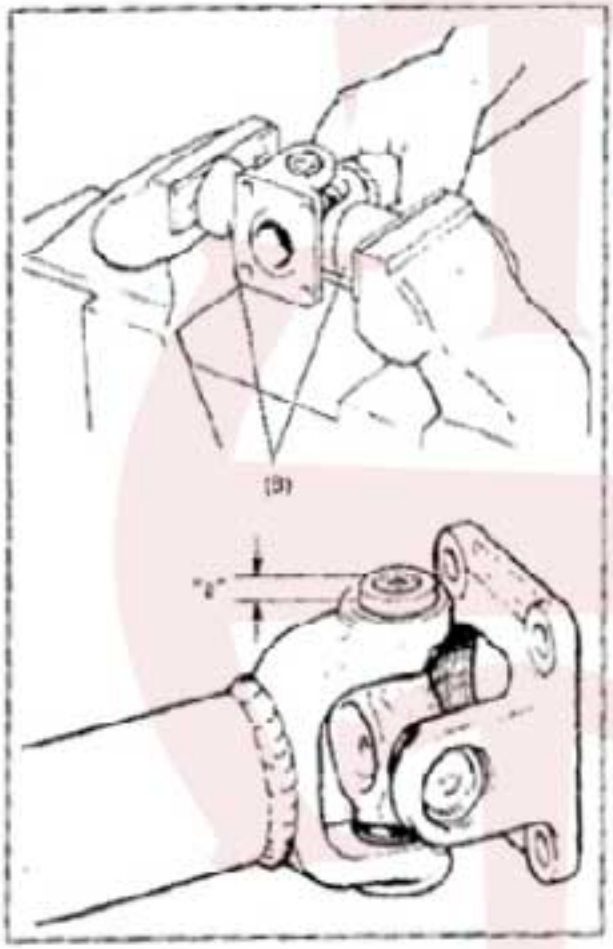


DISASSEMBLY

Disassembling on propeller shaft yoke side

1) Using special tool(A), remove 2 circlips.

Special Tool
(A): 09900-06108

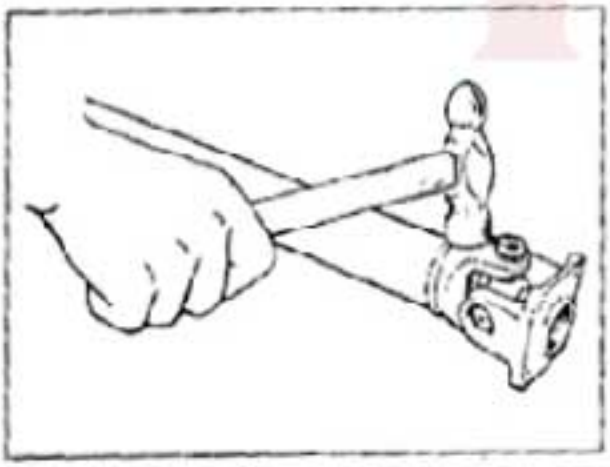


2) Using special tool(B), push spider bearing race out 3 – 4 mm (0.12 – 0.16 in.) from shaft yoke race.

NOTE:
Before pushing it out, apply penetrate lubricant between bearing race and yoke race.

Special Tool
(B): 09926-48010

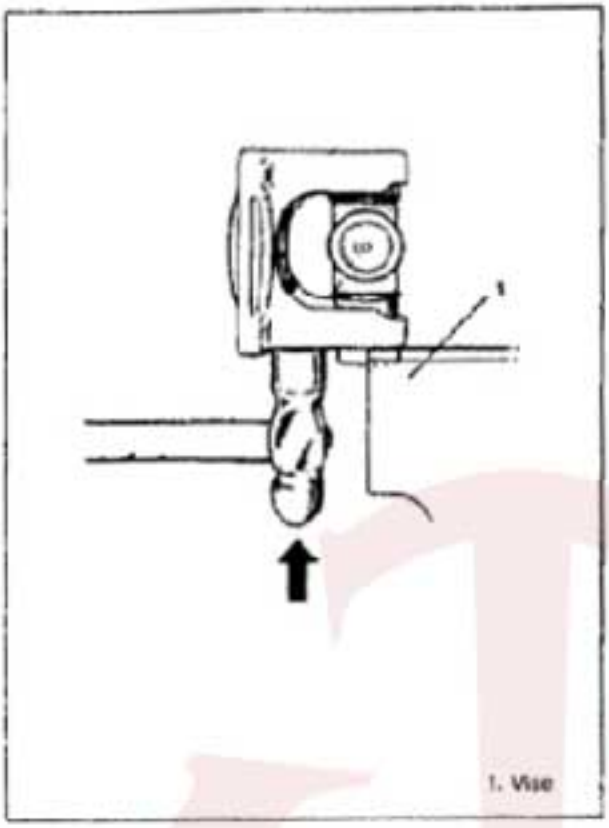
Length "a": 3 – 4 mm (0.12 – 0.16 in.)



3) Tapping yoke with a hammer, completely remove bearing race.

4) Take out bearing race on the other side in the same way as in 2) and 3).

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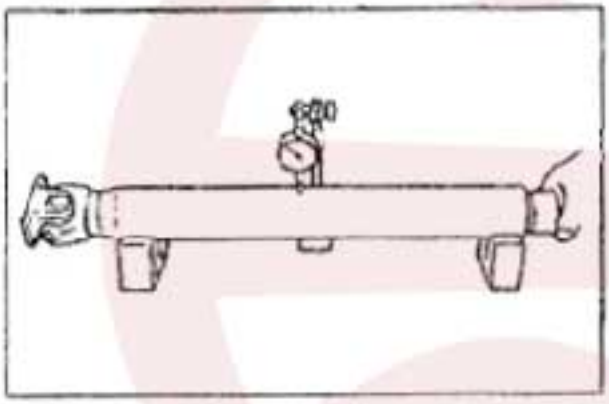
1. Vise

Disassembling on flange yoke side

Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vise, tap flange yoke and take out race. (Refer to the figure.)
Remove bearing race on the opposite side in the same way.

NOTE:

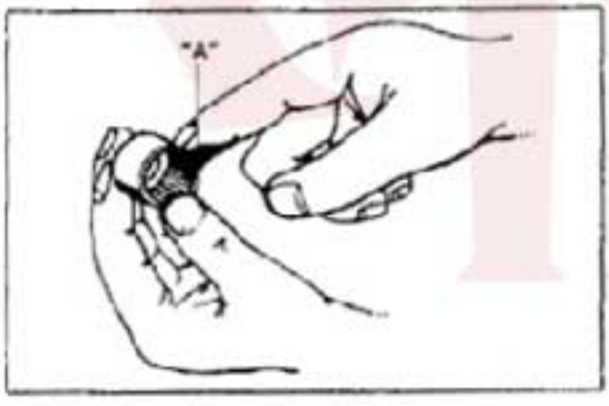
- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**



INSPECTION

Inspect propeller shaft and flange yoke for damage, and propeller shaft for runout.
If damage is found or shaft runout exceeds its limit, replace.

Runout limit: 0.7 mm (0.028 in.)

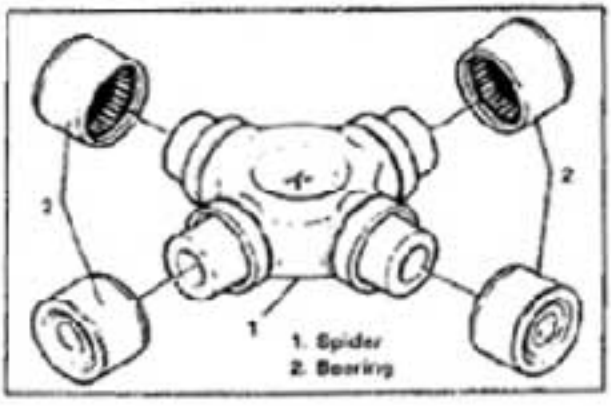


ASSEMBLY

NOTE:

- **Make sure that rollers inside spider bearing race are all in place.**
- **Make sure to apply grease to spider bearing race.**

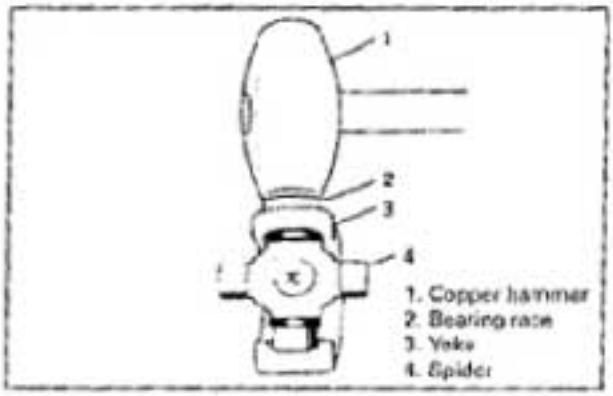
"A": Grease 99000-25030



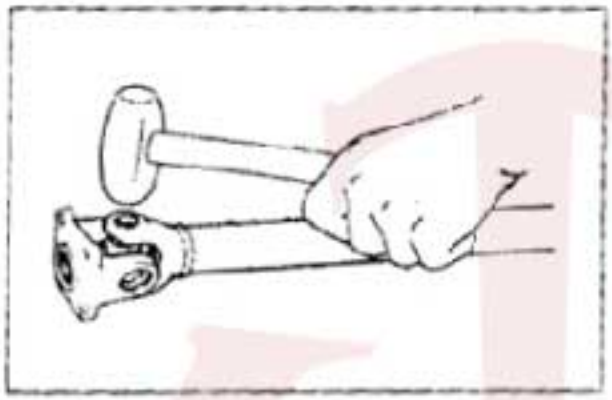
1. Spider
2. Bearing

CAUTION:
In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once disassembled is prohibited.

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1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.



2) Insert the other bearing race on the opposite side into yoke, tapping with a hammer until it is flush with yoke face.
3) Insert bearing races on the flange yoke side in the same way as described in 1) and 2) above.

4) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
5) Securely fit 4 circlips to shaft and flange yoke.

NOTE:
- **After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.**
- **Make sure that each circlip is fitted in groove securely.**



INSTALLATION

Install propeller shaft reversing removal procedure noting following points :

- When installing propeller shaft, align the match marks. Otherwise, vibration may occur during driving.
- Use following specification to torque universal joint flange.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

NOTE:
If transmission oil was drained for propeller shaft removal, pour specified gear oil into transmission case to specified level.

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REQUIRED SERVICE MATERIAL

MATERIAL	USE
Lithium grease	To apply to spider bearing race.

SPECIAL TOOLS

	
09900-06108 Snap ring pliers (Closing type)	09923-48010 Universal joint disassembling tool set

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SECTION 5

BRAKES

NOTE:

- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.**
- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to Section 5E first.**

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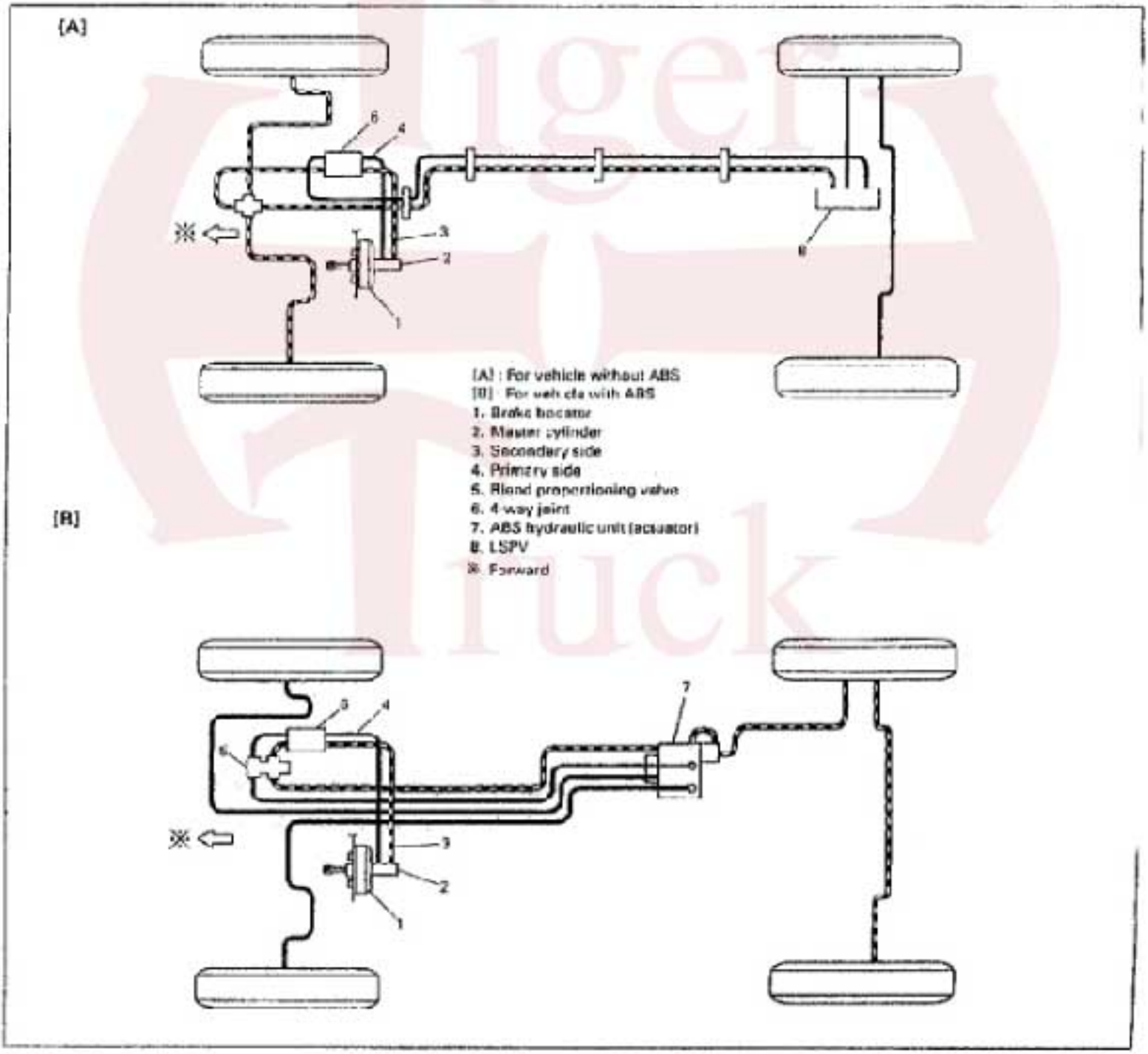
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GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and two in rear).
The master cylinder is a tandem master cylinder. The brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).
The blend proportioning valve (B.P. valve) or the load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear wheels. In brake system of this model, the disc brake type is used of the front wheel brake and a drum brake type (leading/trailing shoes) for the rear wheel brakes.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

NOTE:
"B.P." valve in circuit diagram is installed on vehicle which is equipped with ABS and "LSPV" is installed on vehicle not equipped with ABS.



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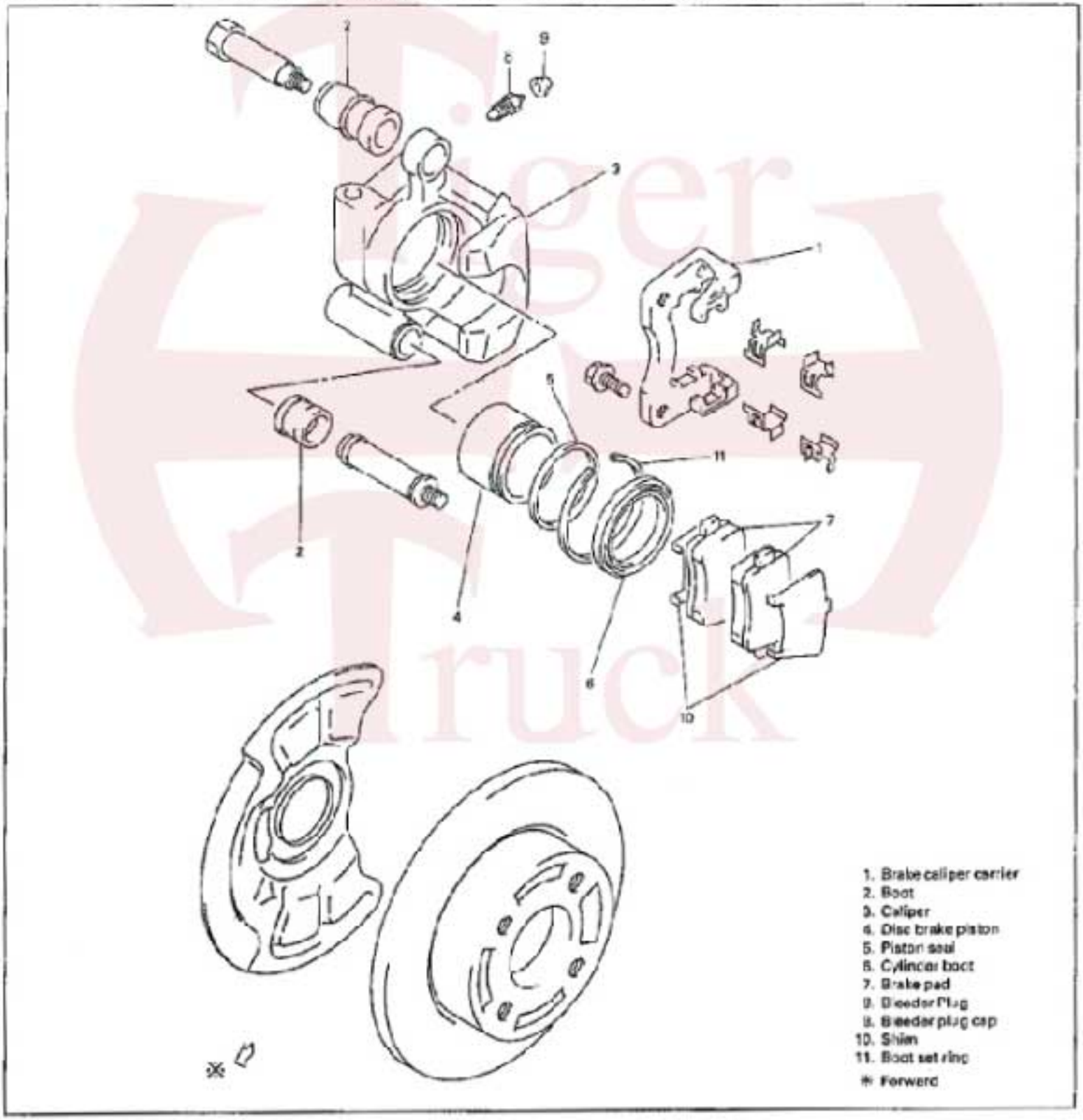
FRONT DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

This caliper has a single bore. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle.

NOTE:

Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



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REAR DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

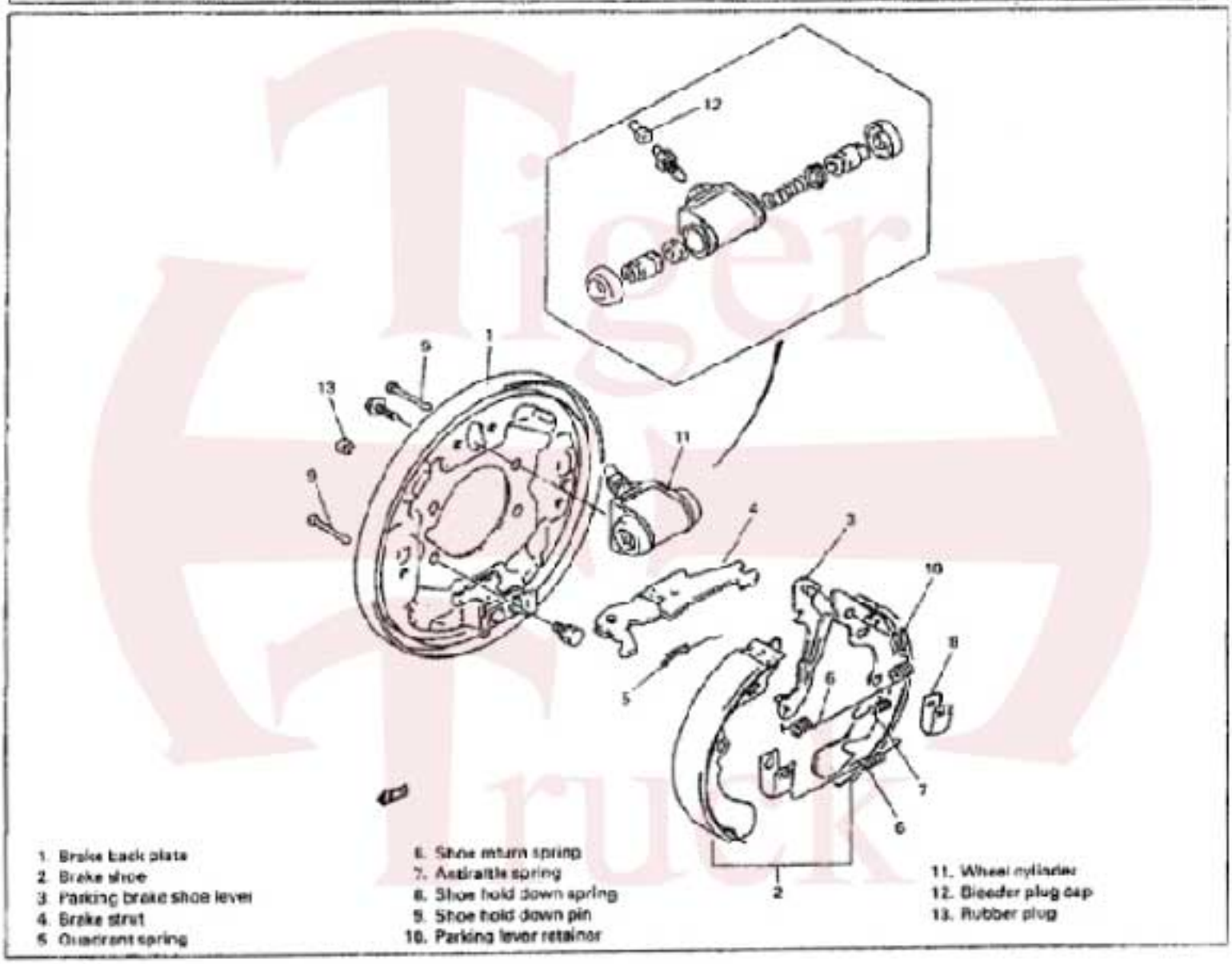
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times.

NOTE:

Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.

WARNING:

If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.



1. Brake back plate
2. Brake shoe
3. Parking brake shoe lever
4. Brake strut
5. Quadrant spring
6. Shoe return spring
7. Antirattle spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Parking lever retainer
11. Wheel cylinder
12. Bleeder plug cap
13. Rubber plug

OPERATION

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side. As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever of brake strut at the time of such a contact becomes larger. When it exceeds specified value, the hole of the brake shoe web moves the lever of brake strut as much as the amount of the brake shoe lining wear toward the brake drum side.

Thus the shoe is forced against the drum and the brake force is produced.

The distance the lever moves corresponds to the amount of wear. In accordance with the lever movement, the fan-shaped ratchet also moves, for they are assembled as a unit. The lever and ratchet remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.

In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

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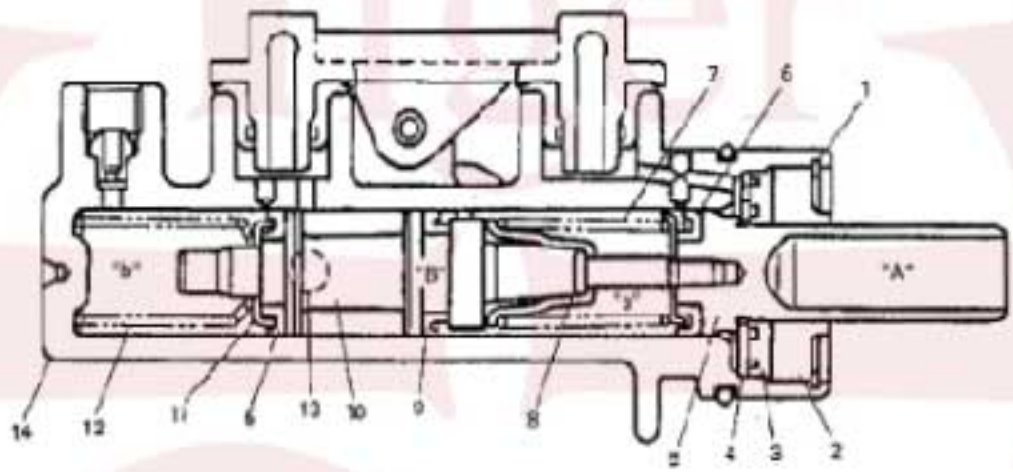
MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

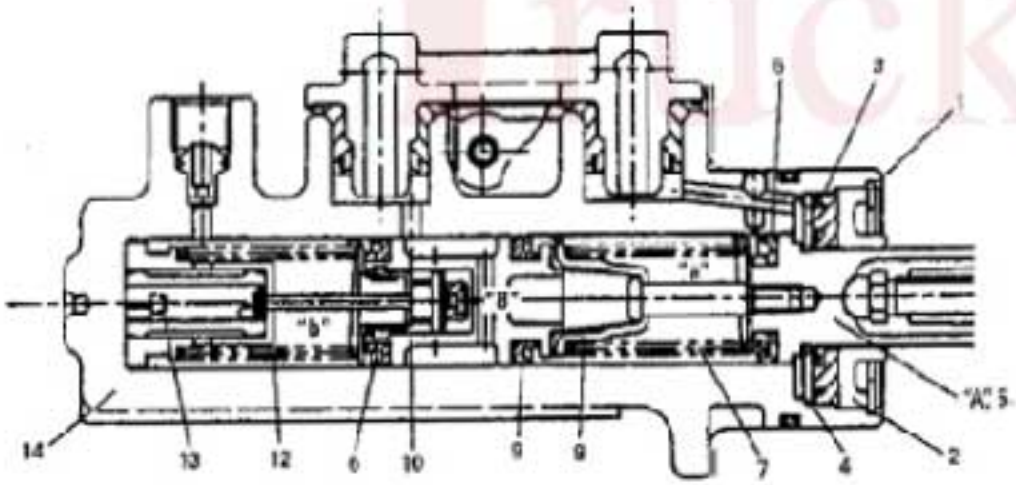
The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the figure below) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (front wheel brakes for vehicle with ABS).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (rear wheel brakes for vehicle with ABS).

CAUTION:
Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do no use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.

[A]



[B]



[A] : For vehicle without ABS
[B] : For vehicle with ABS
1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup
4. Plate
5. Primary piston
6. Piston cup
7. Primary piston return spring
8. Primary spring retainer
9. Secondary piston pressure cup
10. Secondary piston
11. Return spring secondary seat
12. Secondary piston return spring
13. Secondary piston stopper bolt
14. Master cylinder body
"A" : Primary piston
"B" : Secondary piston

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BOOSTER ASSEMBLY

GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum. Its operation is as follows.

CAUTION:
When and after removing booster, never drop or deform it.

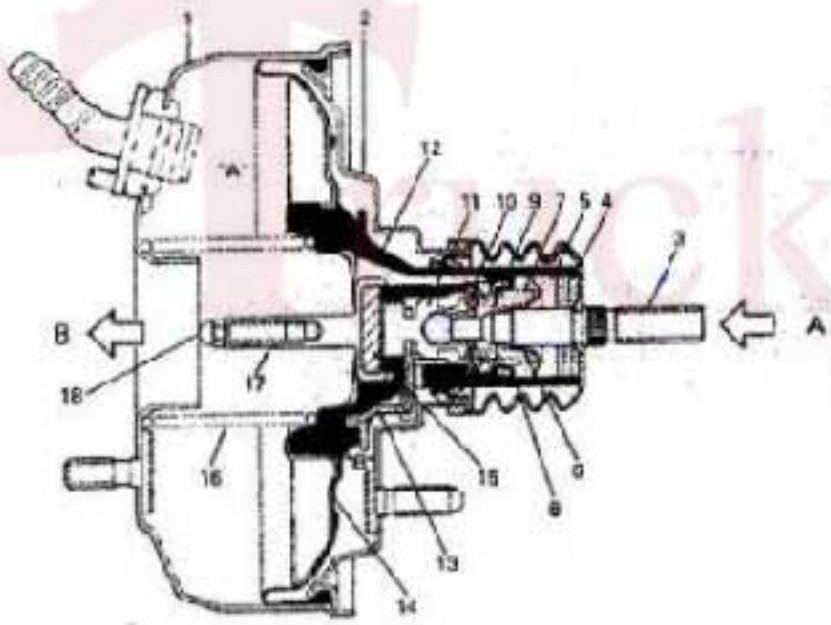
WARNING:
Never disassemble brake booster assembly. If it is found faulty, replace it with new assembly.

CAUTION:
The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.

OPERATION

When the brake pedal is depressed, the force is transmitted to the piston of the master cylinder through the valve operating rod, booster air valve, reaction disc and piston rod. At the same time, the force of the booster piston developed due to the pressure difference between the two chambers "A" and "B" in the figure below is added to it. Therefore, a small brake pedal depressing force is made into a strong push to the master cylinder push rod to produce high hydraulic pressure.

Should any of the vacuum related parts in the booster be faulty, the brake force is not increased. Even then, however, the brake depressing force is transmitted to the valve operating rod, booster air valve, valve stopper key and booster piston in that order, to push the master cylinder push rod. Thus, the braking operation itself will not fail.



A. Brake pedal
B. Master cylinder
1. Booster No.1 body
2. Booster No.2 body
3. Valve operating rod
4. Air cleaner element
5. Air cleaner separator
6. Air valve spring retainer
7. Air valve return spring
8. Control valve spring retainer
9. Control valve spring
10. Booster control valve
11. Booster air valve
12. Booster piston
13. Valve stopper key
14. Booster diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjust screw

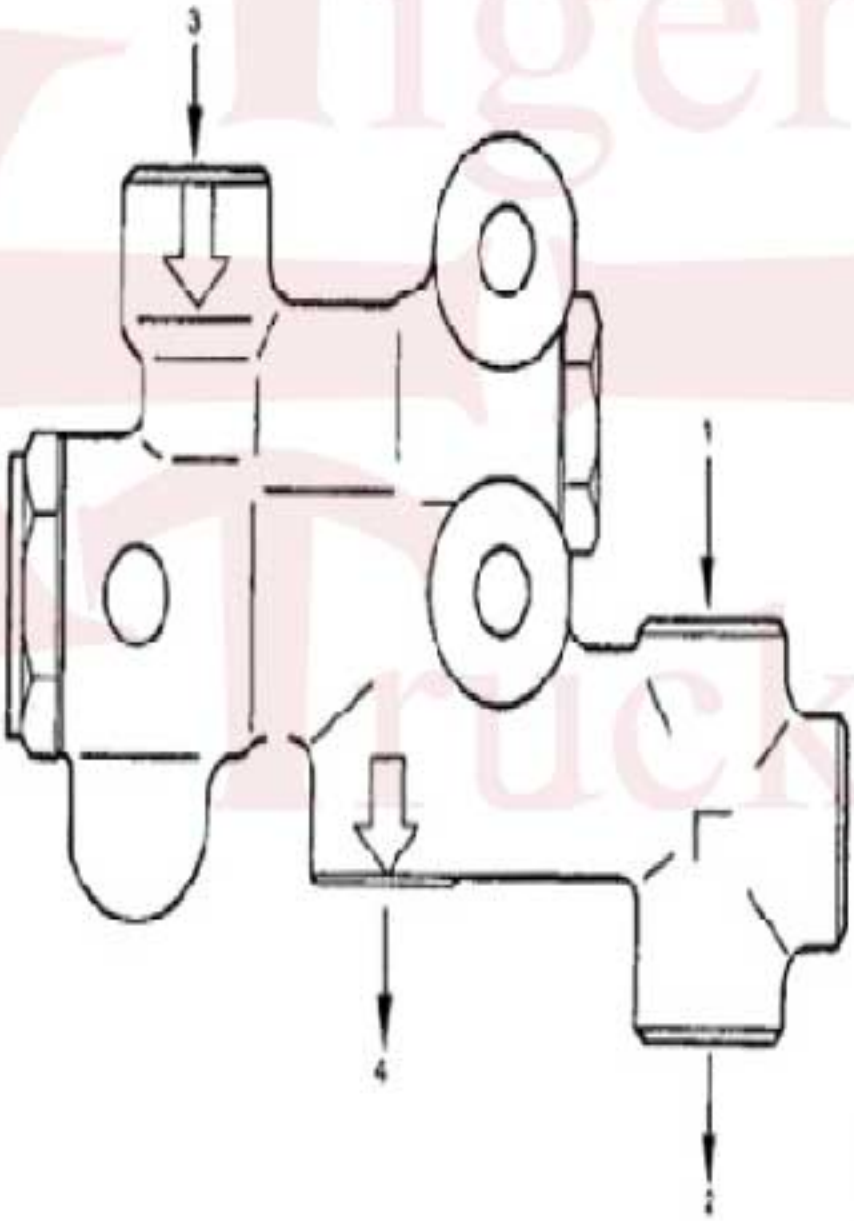
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BLEND PROPORTIONING (B.P.) VALVE (If equipped with ABS)

The blend proportioning valve is included within the brake circuit which connects the master cylinder and the wheel brakes. It is installed on floor panel and controls the hydraulic pressure applied to the rear wheel brakes after predetermined pressure has been reached.

CAUTION:

Never disassemble proportioning valve. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. From master cylinder (Primary)
2. To ABS hydraulic unit
3. From master cylinder (Secondary)
4. To ABS hydraulic unit and rear wheel cylinders (right & left)

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LSPV (Load Sensing Proportioning Valve) ASSEMBLY (If equipped)

As shown below, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely. Also, it releases the above described control over the hydraulic pressure applied to the rear wheel brake, should any failure occur in the hydraulic circuit of the front wheel brake so that the hydraulic pressure produced in the master cylinder is applied to the rear wheel brake directly to operate it.

CAUTION:
Never disassemble LSPV. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. LSPV spring bracket (Rear axle housing)
2. LSPV assembly
3. From master cylinder
4. To rear wheel brakes (Right and Left)
5. From master cylinder

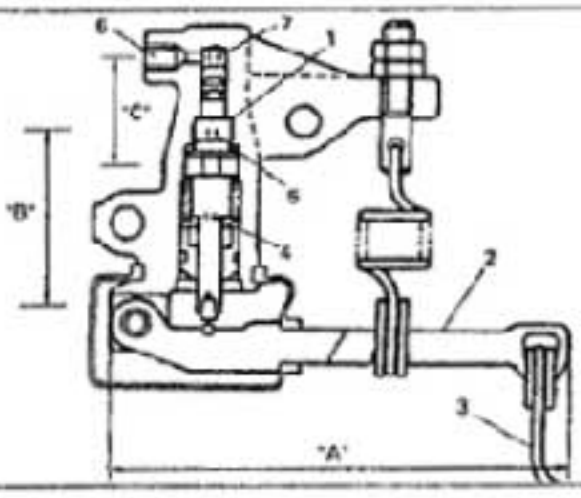
CONSTRUCTION

The LSPV components are grounded into 2 sections as follows.

"A": Sensor section
The main parts in this section are a lever and a spring which senses variation in the vehicle height as affected by the loaded condition and convert it into the load.

"B": Hydraulic pressure control section
Included in this section are a plunger and valve mechanism to execute proportional control.

"C": Fail-safe section
The main parts in this section are a chamber which draws in the hydraulic pressure from the front wheel brake system and a fail-safe piston which releases the valve mechanism in the control section connected to the rear wheel brake, should any failure occur in the front wheel brake system.



1. Plunger
2. LSPV lever
3. Sensor spring
4. From master cylinder primary chamber (Rear wheel brake)
5. To rear wheel brake
6. From master cylinder secondary chamber (Front wheel brake)
7. Bleeder plug

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DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively.

Also drive vehicle to see if it leads to one side or the other without brake application. if it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis chart for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excess ve fluid is found, replace the pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If condition is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

BRAKE DIAGNOSIS TABLE

Condition	Possible Cause	Correction
Not enough braking force	• Brake oil leakage from brake lines.	Locate leaking point and repair.
	• Brake disc or pads stained with oil.	Clean or replace.
	• Overheated brakes.	Determine cause and repair.
	• Poor contact of shoes on brake drum.	Repair for proper contact.
	• Brake shoes linings stained with oil or wet with water.	Replace.
	• Badly worn brake pad linings.	Replace.
	• Defective wheel cylinders.	Repair or replace.
	• Malfunctioning caliper assembly.	Repair or replace.
	• Air in system.	Bleed system.
	• Maladjusted sensor spring length of LSPV (If equipped).	Check or adjust.
	• Broken sensor spring of LSPV (If equipped).	Replace.
	• Defective collar of LSPV (If equipped)	Replace.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5E.

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Condition	Possible Cause	Correction
Brake pull (Brakes not working in unison)	• Pad linings and/or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	• Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism)	Check for inoperative auto adjusting mechanism.
	• Disc and/or drum is out of round in some brakes.	Replace.
	• Wheel tires are inflated unequally.	Inflate equally.
	• Malfunctioning wheel cylinders.	Repair or replace.
	• Disturbed front end alignment.	Adjust as prescribed.
	• Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	• Restricted brake pipes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	• Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	• Loose suspension parts.	Check all suspension mountings.
	• Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	• Front lining worn out.	Replace linings.
Rear brake locked prematurely (For vehicle equipped with LSPV)	• Maladjusted sensor spring length of LSPV.	Check or adjust.
	• Malfunctioning LSPV assembly.	Replace assembly.
Brake locked (For vehicle equipped with ABS)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.

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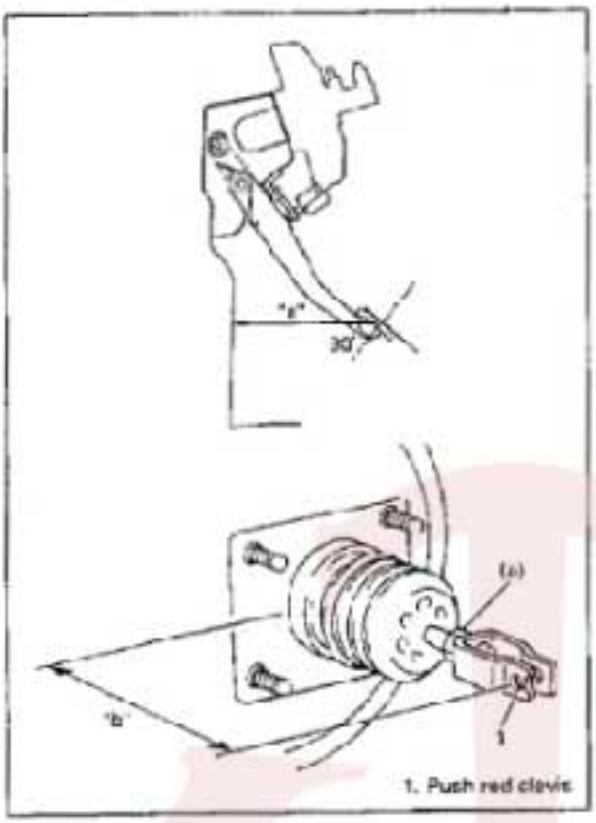
Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	• Partial brake system failure.	Check brake systems and repair as necessary.
	• Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	• Air in system (pedal soft/spongy).	Bleed system.
	• Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	• Bent brake shoes.	Replace brake shoes
	• Worn rear brake shoes.	Replace brake shoes
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	• Master cylinder pistons not returning correctly.	Repair master cylinder.
	• Restricted brake pipes or hoses.	Check for soft hoses or damaged pipes and replace with new hoses and/or new double-walled steel brake piping.
	• Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	• Weakened or broken return springs in the brake.	Replace.
	• Sluggish parking-brake cables or linkage.	Repair or replace.
	• Wheel cylinder or caliper piston sticking.	Repair as necessary.
	• Badly worn piston seal in the caliper.	Replace piston seal.
	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
Pedal pulsation (Pedal pulsates when depressed for braking.)	• Damaged or loose wheel bearings.	Replace wheel bearings.
	• Distorted steering knuckle or rear wheel spindle.	Replace knuckle or rear wheel spindle.
	• Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	• Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine the disc.
	• Rear drums out of round.	Check runout Repair or replace drum as necessary.

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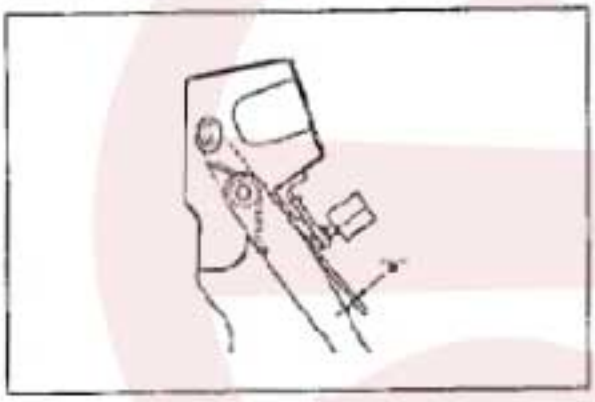
Condition	Possible Cause	Correction
Braking noise	• Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe linings.
	• Worn or distorted shoe linings.	Replace shoe linings (or pads).
	• Loose front wheel bearings.	Replace wheel bearing.
	• Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.
Brake warning lamp turns on after engine start	• Parking brake applied.	Release parking brake and check that brake warning lamp turns off.
	• Insufficient amount of brake fluid.	Add brake fluid.
	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Brake warning lamp circuit faulty.	Repair circuit.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5E.
Brake warning lamp turns on when brake is applied	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Insufficient amount of brake fluid.	Add brake fluid.
Brake warning lamp fails to turn on even when parking brake is applied	• Brake warning light circuit faulty.	Replace bulb or repair circuit.
ABS warning lamp turns on after engine start (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
ABS warning lamp turns on when brake is applied (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.

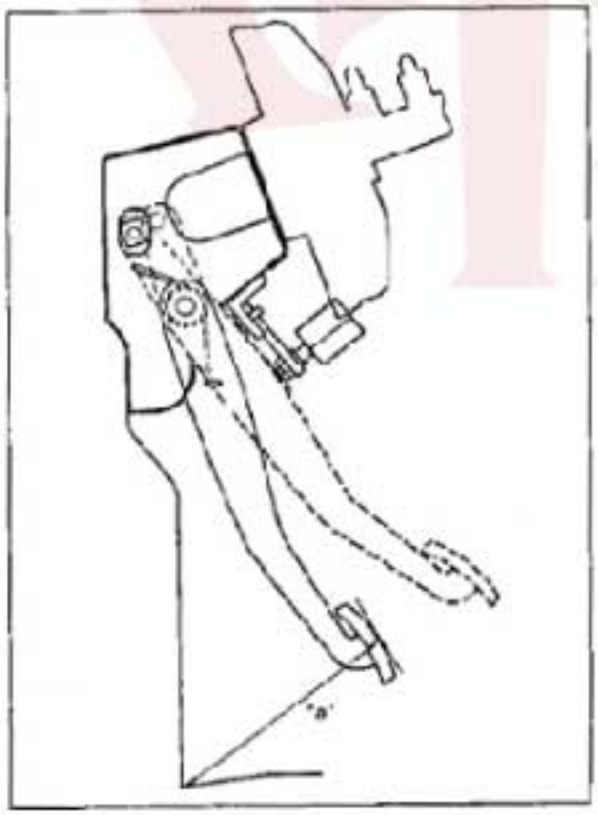
NOTE:
When ABS warning lamp is flashing, investigate faulty point and repair it, referring to "Diagnosis" in Section 5E.

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1. Push rod clevis





CHECK AND ADJUSTMENT

BRAKE PEDAL FREE HEIGHT ADJUSTMENT

Check brake pedal free height (distance).
If it is not within specification, check and adjust following item 1) and 2).

Brake pedal free distance "a"
from dash panel : 210 – 216 mm (8.27 – 8.50 in.)

1) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted.

   Length "b": 99.5 – 100.5 mm (3.92 – 3.96 in.)

   Tightening Torque
   (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Check stop light switch position. Adjust it if it is out of specification.

STOP LIGHT SWITCH ADJUSTMENT

Adjustment should be made as follows when installing switch. Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of threac and brake pedal is specified. Then tighten lock nut to specified torque.

Clearance "a": 1.5 – 2.0 mm (0.06 – 0.08 in.)

Tightening Torque
(a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

EXCESSIVE PEDAL TRAVEL CHECK

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30kg (66 lbs) load, measure brake pedal to wall clearance "a".

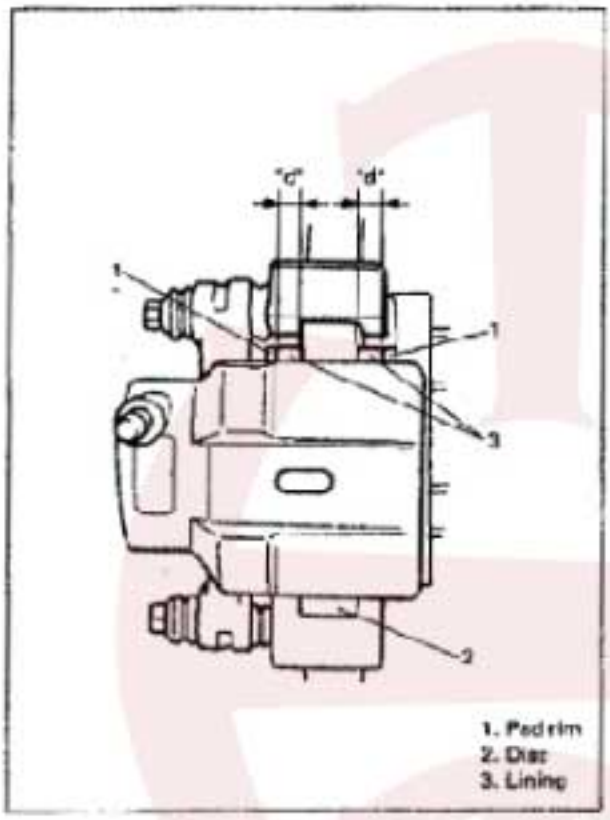
   Clearance "a": Over 155 mm (6.10 in.)

4) If clearance "a" is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "a" remain less than specification even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment.
   - Refer to BLEEDING BRAKES for bleeding brake system.
   - Remove brake drums for adjuster inspection, (refer to BRAKE DRUM INSPECTION.) If defective, correct or replace.

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FRONT BRAKE DISC CHECK

Refer to BRAKE PAD INSPECTION of this section for inspection point and procedure.



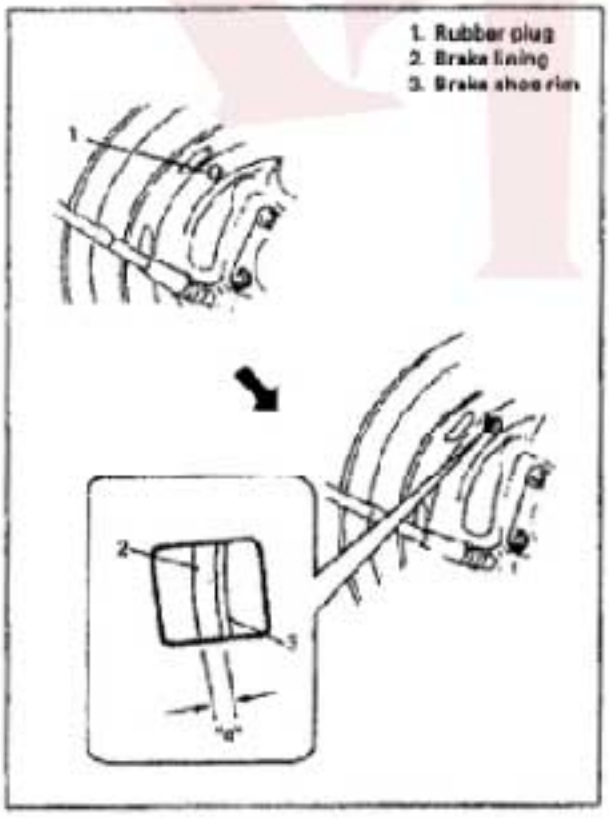
1. Pad rim
2. Disc
3. Lining

FRONT BRAKE PAD LINING CHECK

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness ("d" in figure) is less than limit, all pads must be replaced at the same time.

Thickness "d"

Service limit: 1.0 mm (0.04 in.)



1. Rubber plug
2. Brake lining
3. Brake shoe rim

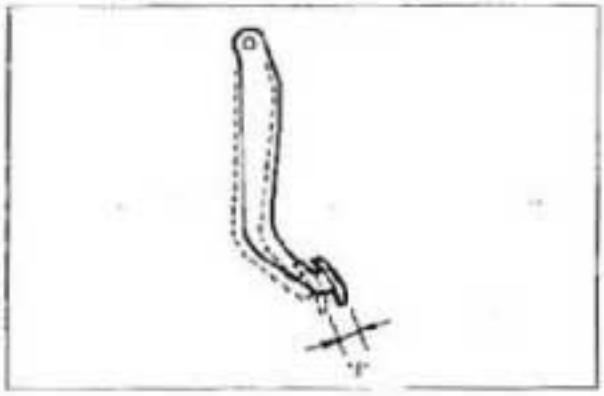
REAR BRAKE SHOE CHECK

Inspection should be carried out on following points after brake pedal travel (pedal to wall clearance) check, even when pedal travel is normal.
Amount of brake shoe wear can be checked as follows.

1) Hoist vehicle.
2) Remove rubber plug from brake back plate.
3) Through hole of back plate, visually check for thickness of brake shoe lining. If lining thickness "e" is found less than limit, replace all shoes with new ones at the same time.

Thickness "e"
Service limit: 1.0 mm (0.04 in.)

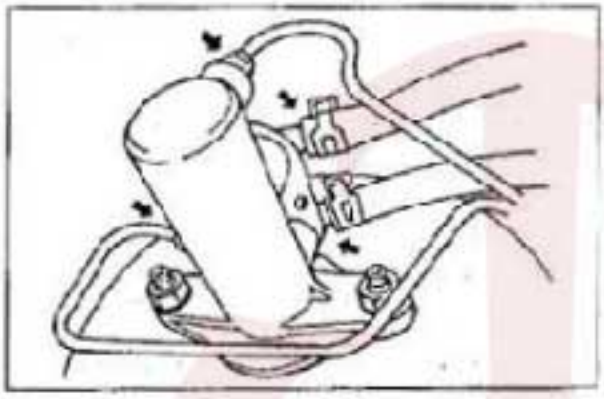
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BRAKE PEDAL PLAY CHECK

Pedal play should be within specification below.
If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and master cylinder pin installation for looseness and replace if defective.

Pedal play "f": 1 – 6 mm (0.04 – 0.31 in.)

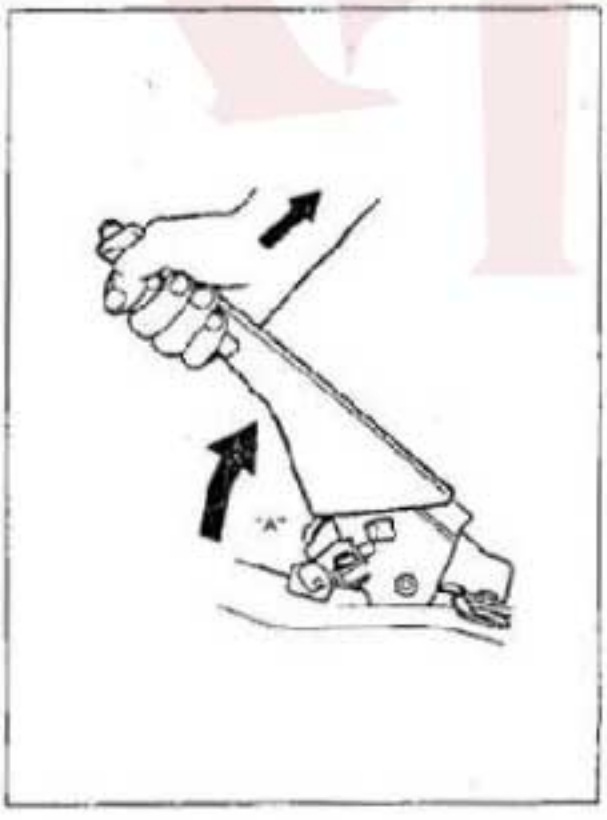


MASTER CYLINDER CHECK

Check for cracked master cylinder casting or brake fluid around the master cylinder. Leaks are indicated only if there is at least a drop of fluid. A damp condition is not normal.

REAR DRUM BRAKE SHOE ADJUSTMENT

Rear brake has self-adjusting mechanism but it does require adjustment for proper drum to shoe clearance when brake shoe has been replaced or brake drum has been removed for some other service.
Adjustment is automatically accomplished by depressing brake pedal 3 to 6 times with approximately 30kg (66 lbs) load after all parts are installed.
Then check brake drum for dragging and brake system for proper performance. After lowering vehicle from hoist, brake test should be performed.



PARKING BRAKE CHECK AND ADJUSTMENT

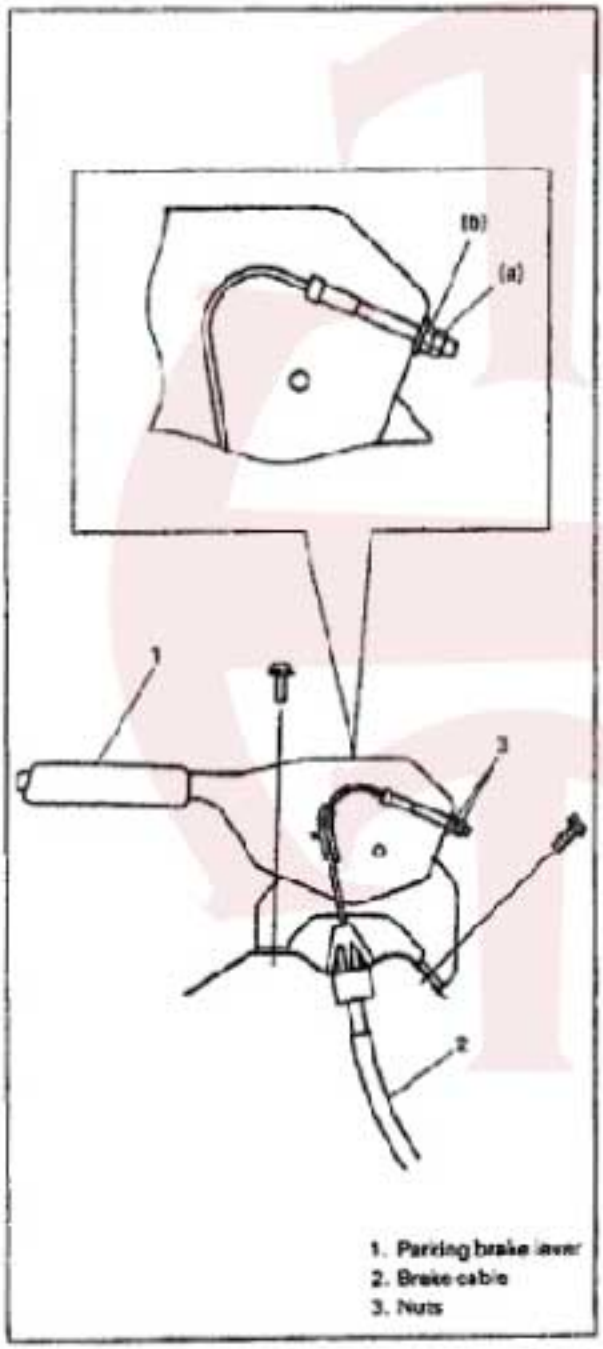
CHECK

Hold center of parking brake lever grip and pull it up with 20 kg (44 lbs) force.
With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure.
There should be 4 to 7 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake level without pressing its button.
One click sound corresponds to one notch.

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If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) so as to obtain specified parking brake stroke.

NOTE:
Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.



1. Parking brake lever
2. Brake cable
3. Nuts

ADJUSTMENT

NOTE:
Make sure for following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 30 kg (66 lbs) load.**
- **Parking brake lever has been pulled up a few times with about 20 kg force.**
- **Rear brake shoes are not worn beyond limit.**

After confirming that above 5 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening parking brake nuts (3 in left figure).

Tightening Torque
(a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)
(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

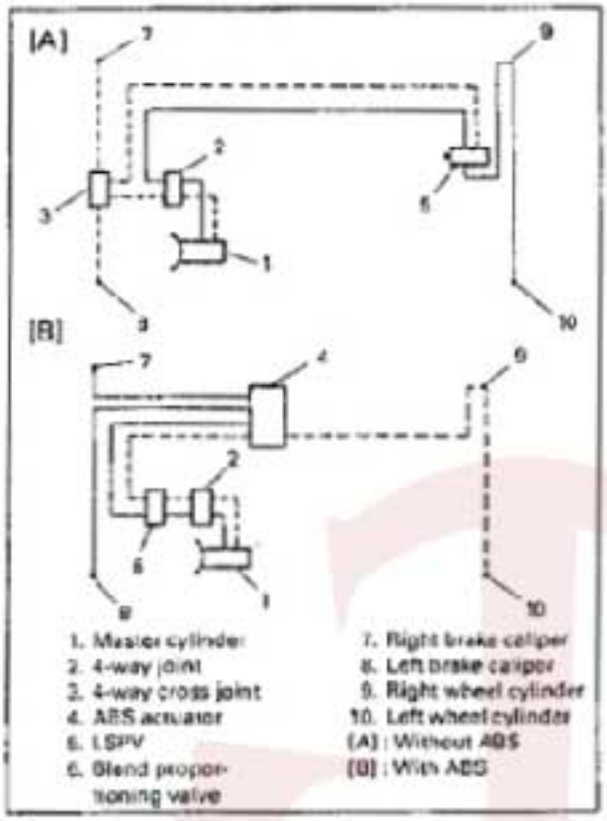
NOTE:
Check brake drum for dragging after adjustment.

Parking brake stroke: when lever is pulled up at 20 kg (44 lbs)	Within 4 – 7 notches

FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.

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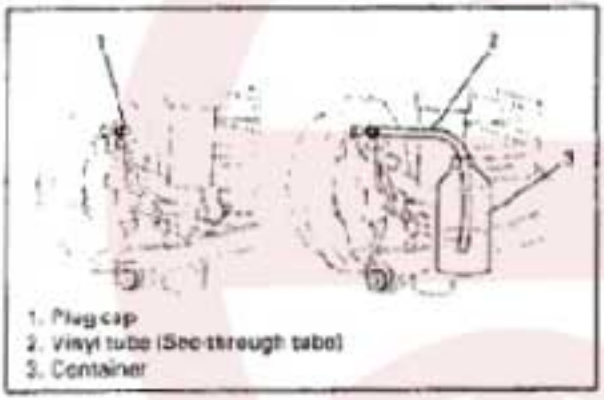
1. Master cylinder
2. 4-way joint
3. 4-way cross joint
4. ABS actuator
5. LSPV
6. Blend proportioning valve
7. Right brake caliper
8. Left brake caliper
9. Right wheel cylinder
10. Left wheel cylinder

[A] : Without ABS
[B] : With ABS

BLEEDING BRAKES

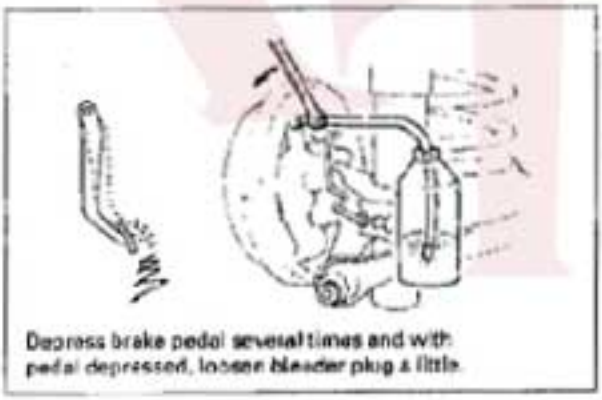
CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

NOTE:
Before performing bleeding operation, make sure that ABS warning light turns off after ignition switch has turned on (for vehicle equipped with ABS).
Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at right and left brake caliper, left wheel cylinder and LSPV (if equipped).



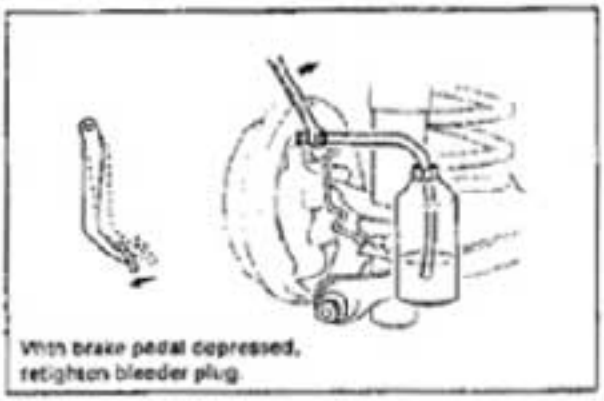
1. Plug cap
2. Vinyl tube (See-through tube)
3. Container

1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
Attach a vinyl tube to bleeder plug, and insert the other end into container.



Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

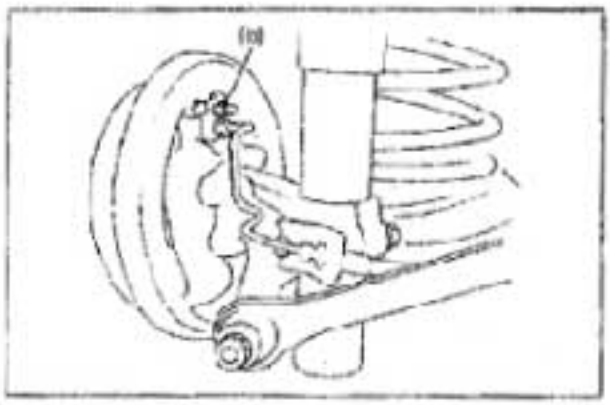
3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.



With brake pedal depressed, retighten bleeder plug.

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.

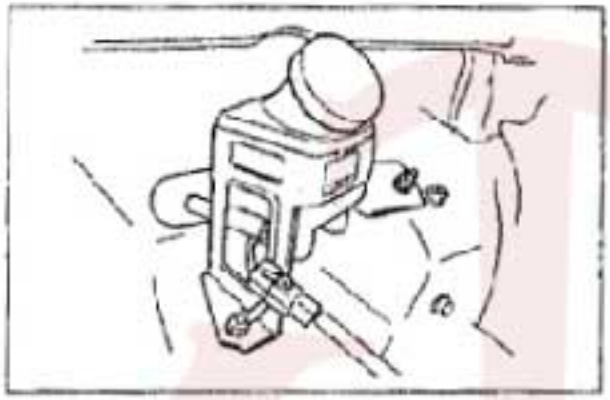
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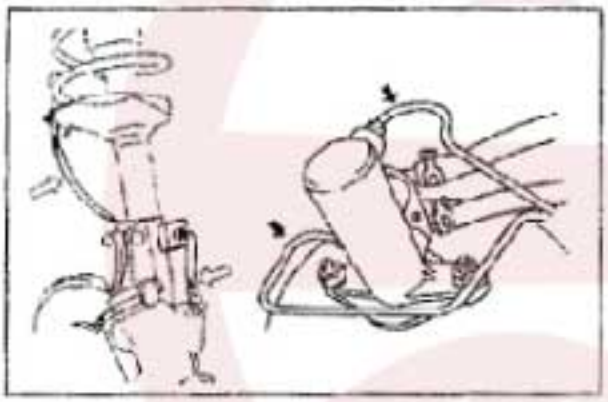
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening Torque
(b): 8 N-m (0.8 kg-m, 6.0 lb-ft) .. For Rear brake, LSPV
11 N-m (1.1 kg-m, 8.0 lb-ft) .. For Front brake

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



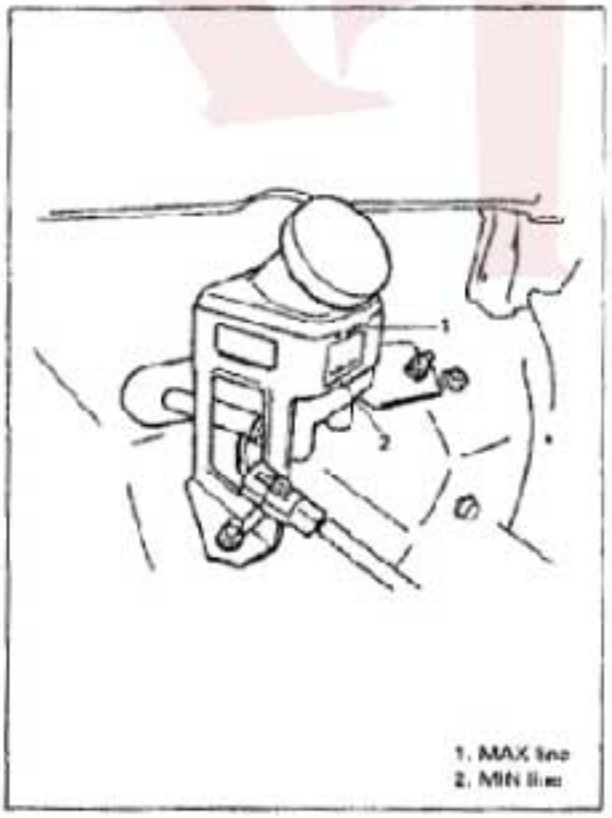
9) Replenish fluid into reservoir up to specified level.
10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.



BRAKE HOSE AND PIPE CHECK

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of the outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, it is necessary to replace it.

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.



BRAKE FLUID LEVEL CHECK

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning light lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

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BOOSTER OPERATION CHECK

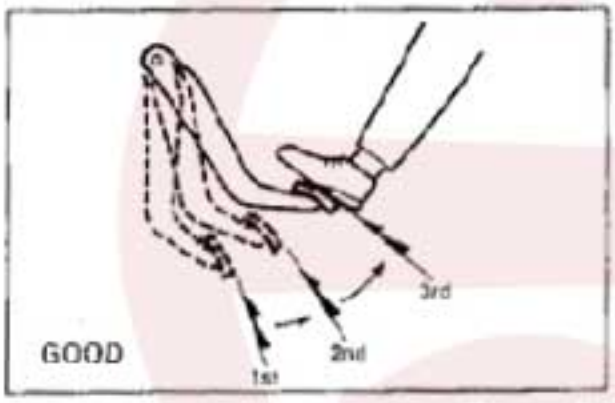
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:
For this check, make sure that no air is in hydraulic line.

INSPECTION (WITHOUT TESTER)

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.

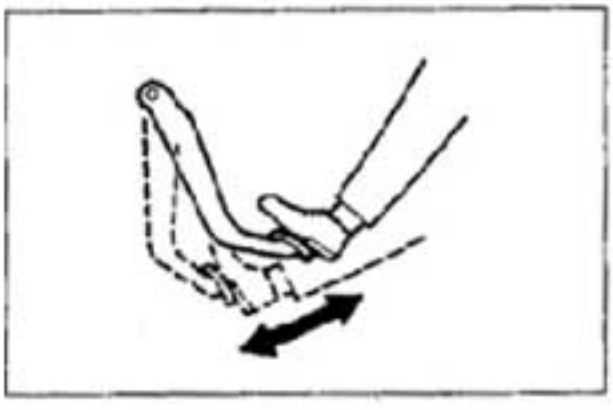


3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



4) If pedal travel doesn't change, air tightness isn't obtained.

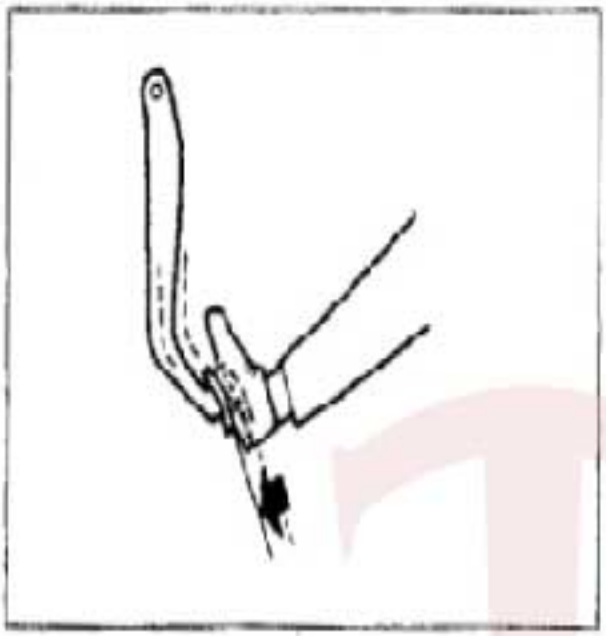
NOTE:
If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test.



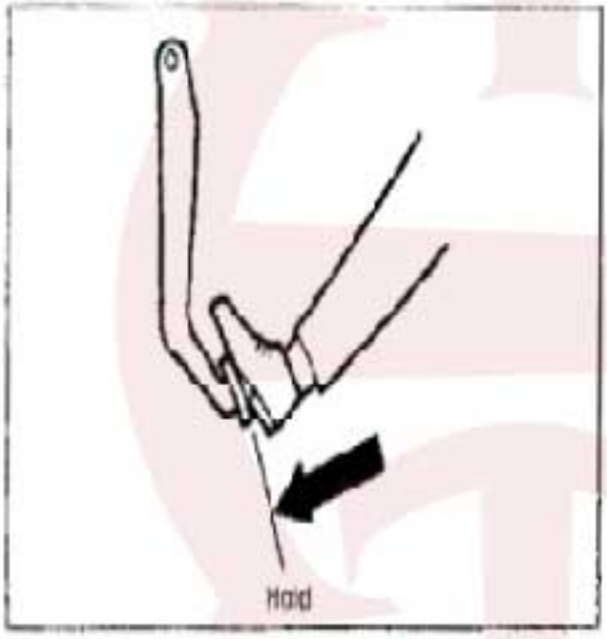
Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

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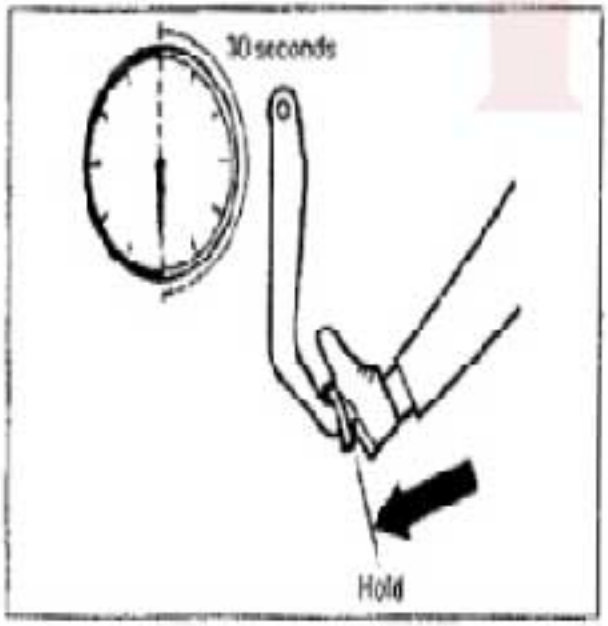


2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



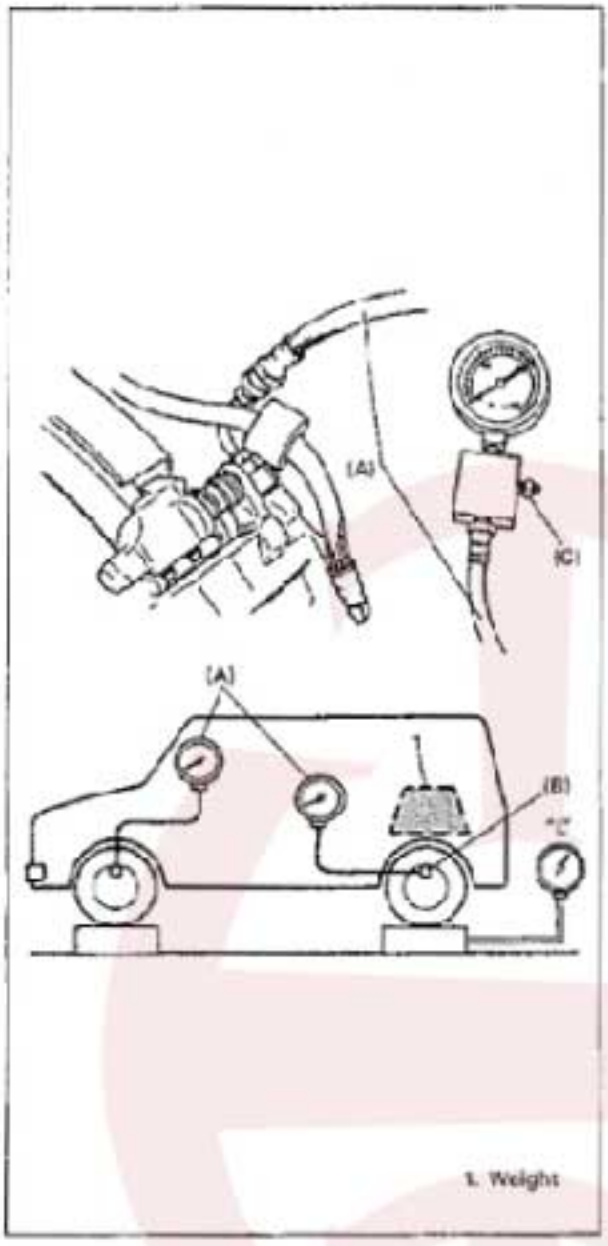
Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

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FLUID PRESSURE TEST (if equipped with LSPV)

Test procedure for LSPV assembly is as follows.
Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

1) Place vehicle on and set weight slowly on axle housing center so that rear axle weights 660 kg (1455 lb).

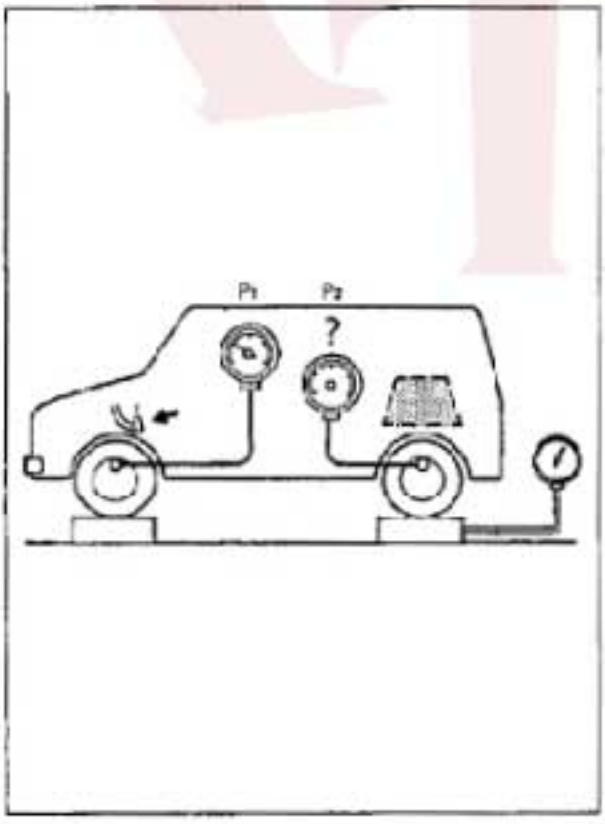
   Rear axle weight "L": 660 kg (1455 lb)

2) Install pressure gauge to front and rear brake.

   NOTE:
   Pressure gauge should be connected to bleeder of front (left side brake) and rear brakes.

   Special Tool
   Front brake
   (A) : 09956-02310
   Rear brake
   (A) : 09956-02310
   (B) : 09952-36310 (Fluid pressure gauge attachment)
   (C) : 55473-82030 (Bleeder plug (10 mm) as a spare part)

   NOTE:
   Special tool (B) is used instead of thread diameter 10mm attachment of special tool (A). So remove the attachment from (A) and install (B).



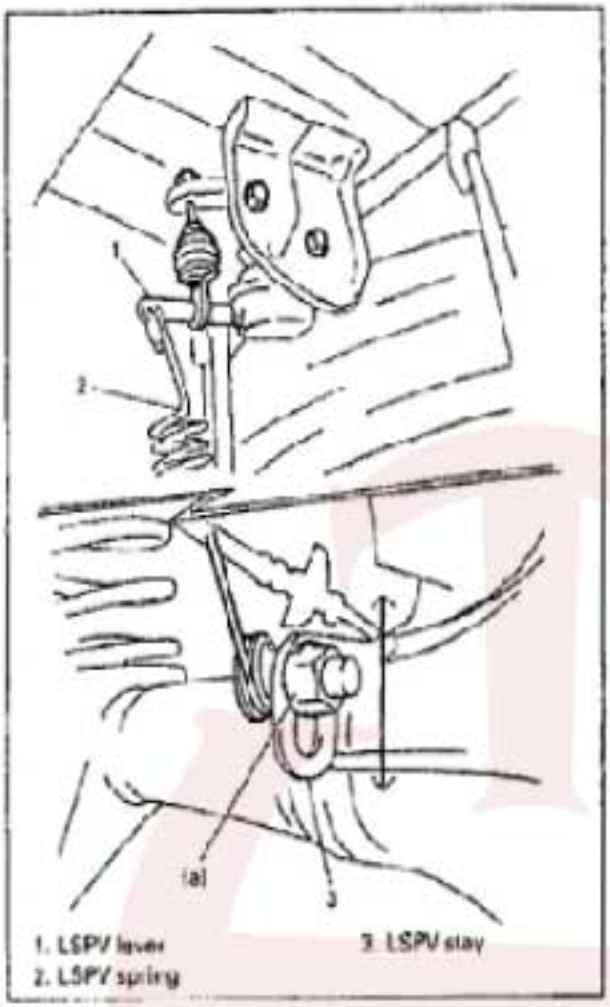
3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake "P_1"	Rear brake "P_2"
8000 kPa 80 kg/cm^2 1138 psi	4200 – 5600 kPa 42 – 56 kg/cm^2 597 – 797 psi

As done above, apply 100 kg/cm^2 prassure to front brake and check that rear brake pressure then is within specification as given below.

Front brake "P_1"	Rear brake "P_2"
10000 kPa 100 kg/cm^2 1422 psi	4800 – 6200 kPa 48 – 62 kg/cm^2 682 – 882 psi

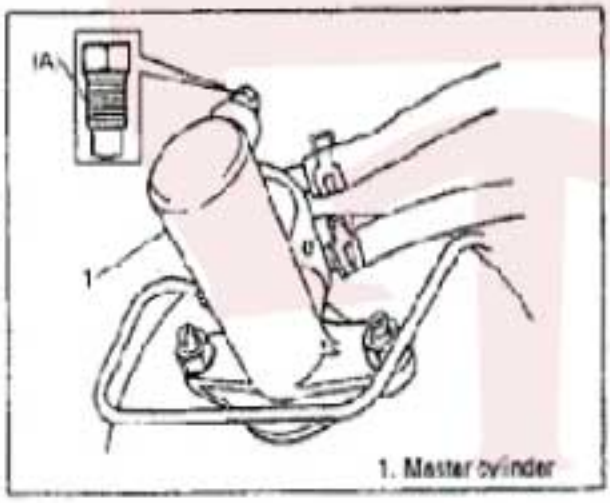
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1. LSPV lever
2. LSPV spring
3. LSPV stay

4) If rear brake pressure is not within specification, adjust it by changing bolt (a) tightening position as follows.
- If rear brake pressure is higher than specification, move bolt (a) downward and if it is lower, upward.
- Repeat steps 3) and 4) until rear brake pressure is within specification.
- After adjustment, be sure to torque nut to specification.

Tightening Torque
(a) : 23 N·m (2.3 kg-m, 17 lb-ft)



1. Master cylinder

5) Disconnect brake pipe (connecting between master cylinder and 4-way cross joint) from master cylinder.
Tighten plug (special tool) to master cylinder as shown below.

Special Tool
(A) : 09956-02210

Depress brake pedal. If rear brake pressure is 95 – 100 kg/cm^2 when front brake pressure is 100 kg/cm^2, it means that front fail-safe system functions properly.

Front brake	Rear brake
10000 kPa	9500 – 10000 kPa
100 kg/cm^2	95 – 100 kg/cm^2
1422 psi	1350 – 1422 psi

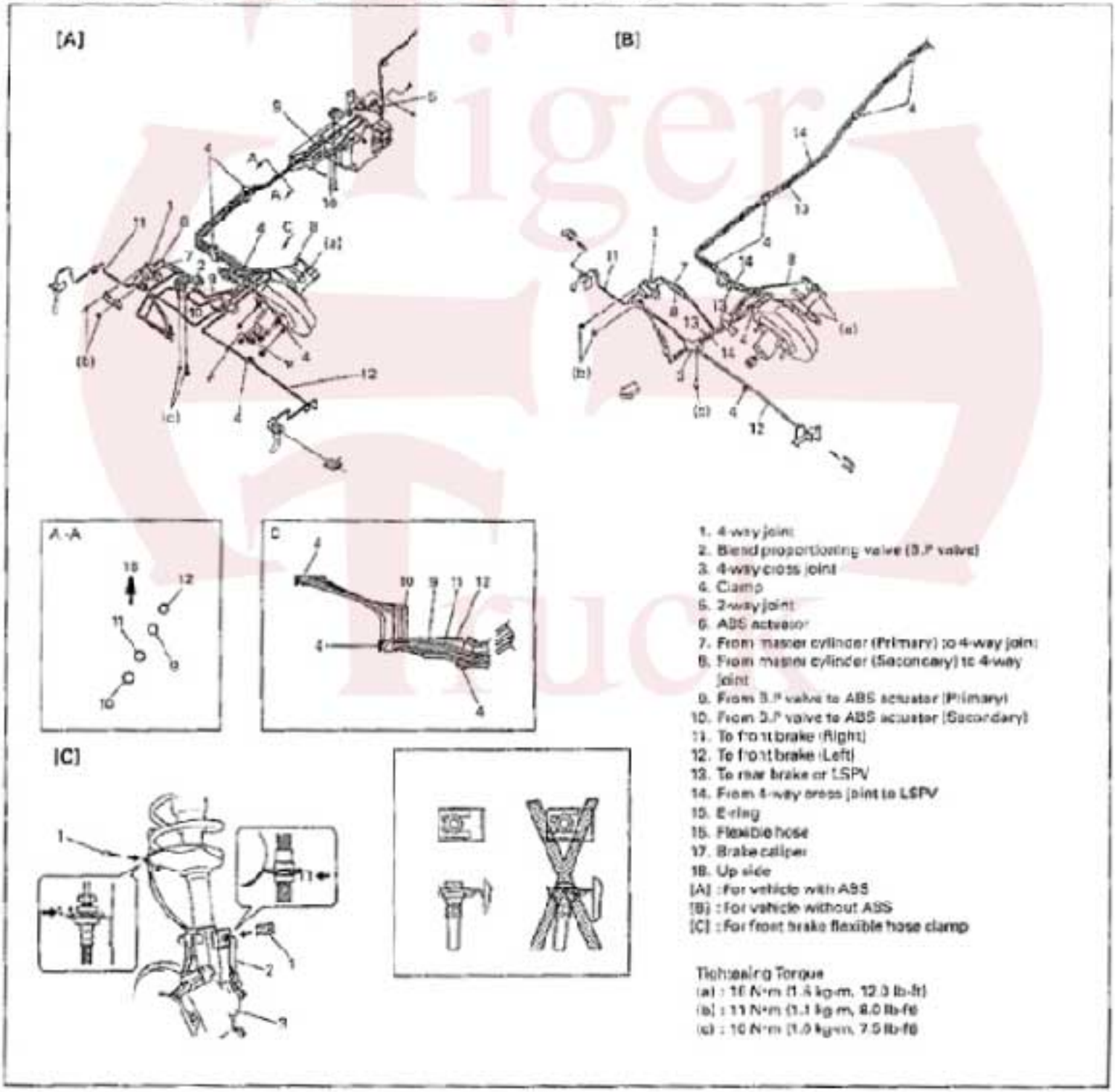
6) Upon completion of fluid pressure test, bleed brake system and perform brake test.

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ON-VEHICLE SERVICE

FRONT BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and P valve.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure.
   For installation, make sure that steering wheel is in straightforward position and flexible hose has not twist or kink. Check to make sure that flexible hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check installed part for fluid leakage.



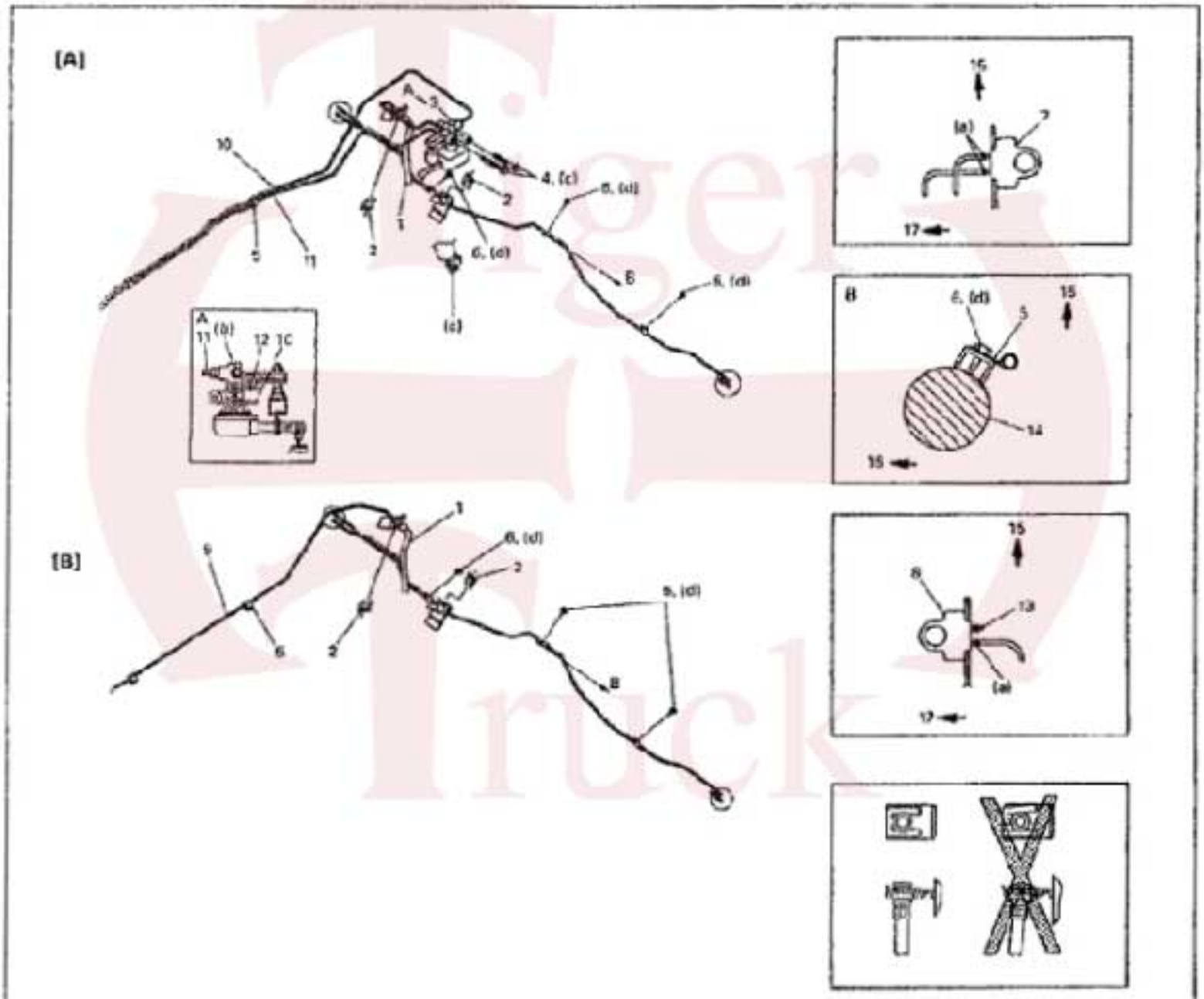
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REAR BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

PRECAUTION FOR INSTALLATION

- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.

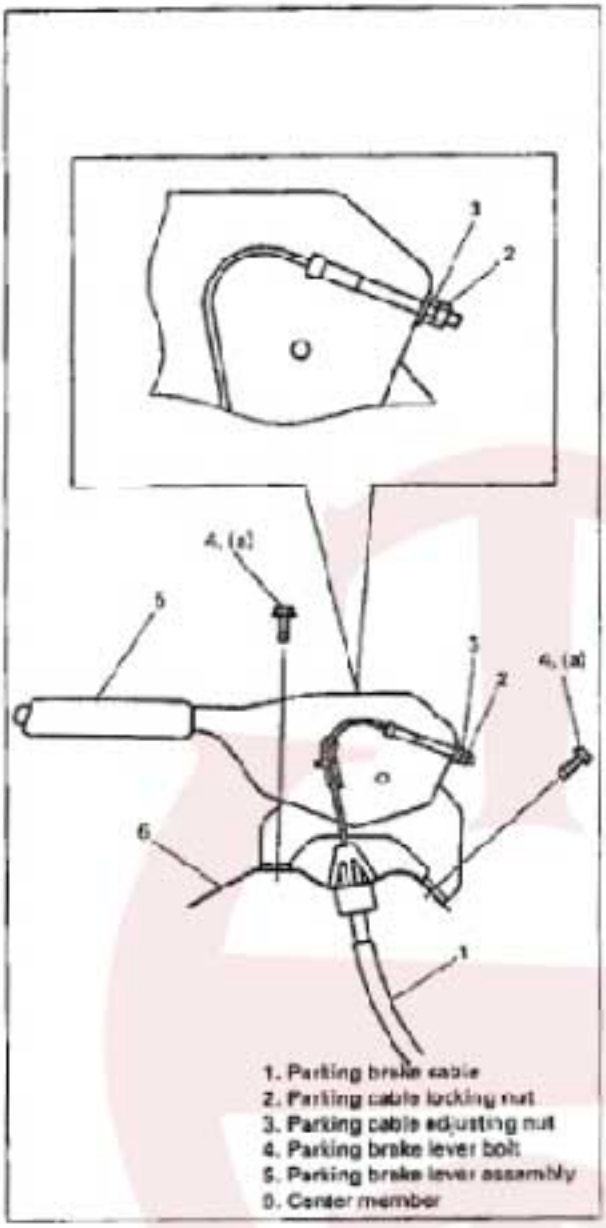


1. Flexible hose
2. E ring
3. LSPV
4. LSPV bolt
5. Clamp
6. Tapping screw
7. Wheel cylinder (Right)
8. Wheel cylinder (Left)
9. From ABS actuator
10. From master cylinder (Primary)
11. From master cylinder (Secondary)
12. To wheel cylinder
13. Bleeder plug
14. Rear axle
15. Up side
16. Front side
17. Left side

[A] : For vehicle without ABS
[B] : For vehicle with ABS

Tightening Torque
(a) : 16 N·m (1.6 kg-m, 12.0 lb-ft)
(b) : 8 N·m (0.8 kg-m, 6.0 lb-ft)
(c) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
(d) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

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PARKING BRAKE LEVER

REMOVAL

1) Remove console box.
2) Disconnect lead wire of parking brake switch at coupler.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

3) Remove parking brake cable nuts.
4) Remove parking brake lever bolts.

INSTALLATION

1) Install in reverse order of steps 2) to 4) of REMOVAL.

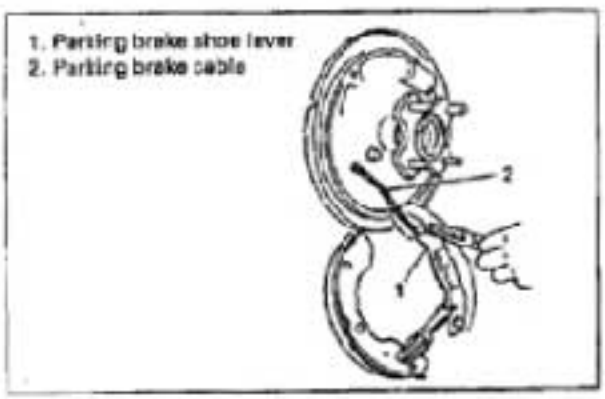
Tightening Torque
(a): 20 N·m (2.0 kg-m, 14.5 lb-ft)

2) Adjust parking brake lever. Refer to PARKING BRAKE CHECK AND ADJUSTMENT in this section.
3) Check rear brakes for dragging and brake system for proper performance.
4) Install console box.

PARKING BRAKE CABLE

REMOVAL

1) Remove cable from parking brake lever. (Refer to steps 1) to 3) of PARKING BRAKE LEVER REMOVAL.)
2) Remove brake drum. (Refer to steps 1) to 5) of BRAKE DRUM REMOVAL of this section.)

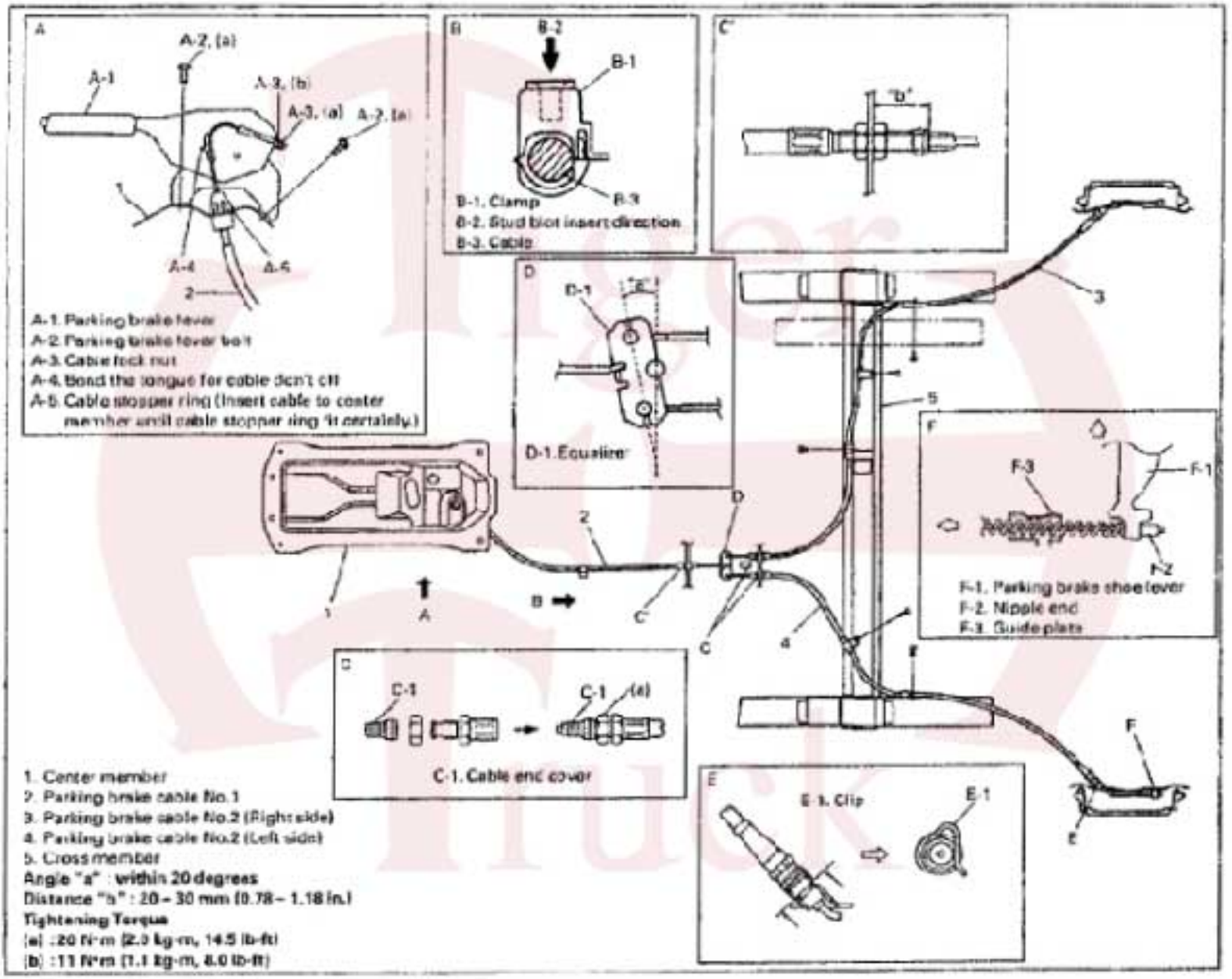


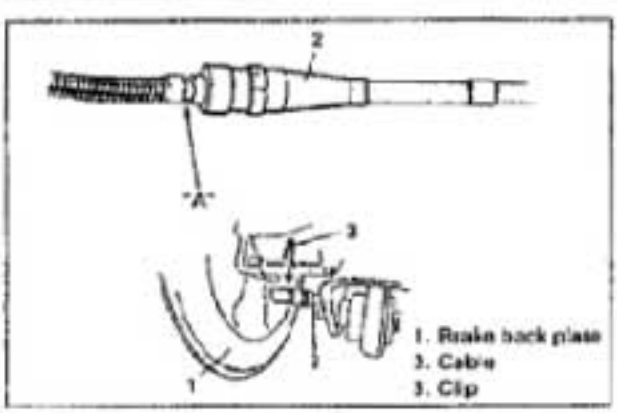
3) Disconnect parking brake cable from brake shoe lever. (Refer to step 2) & 4) of BRAKE SHOE REMOVAL of this section.)
4) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL.)

NOTE:
When it is necessary to remove both right and left parking brake cable, repeat above steps 2) to 4) on right and left wheels.

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5) Remove cable from vehicle body.





INSTALLATION

1) Apply water tight sealant "A" around cable at indicated position in figure and connect it to back plate with clip.

"A" : Sealant 99000-31090

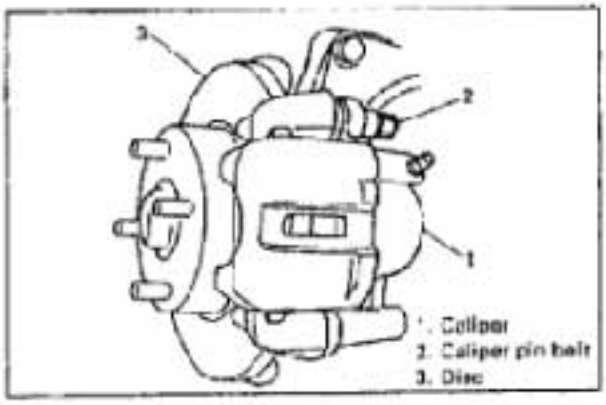
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2) Connect cable to brake shoe lever and install brake shoes to back plate. (Refer to steps 1) to 2) of BRAKE SHOE INSTALLATION of this section.)
3) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION of this section.)
4) Connect cable to parking brake lever (Refer to step 1) of BRAKE LEVER INSTALLATION of this section.
Don't make lever adjustment at this point yet.

NOTE:
Above steps 1) to 3) must be performed on both right and left wheels.

5) Clamp cable securely referring to figure.
6) Upon completion of installation, adjust cable.
(Refer to PARKING BRAKE CHECK AND ADJUSTMENT of this section.)
Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

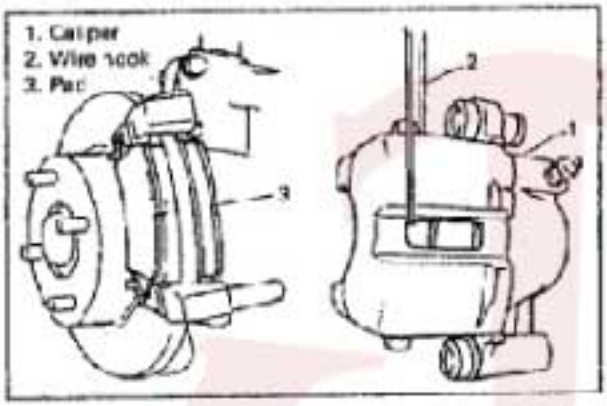
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BRAKE PAD

REMOVAL

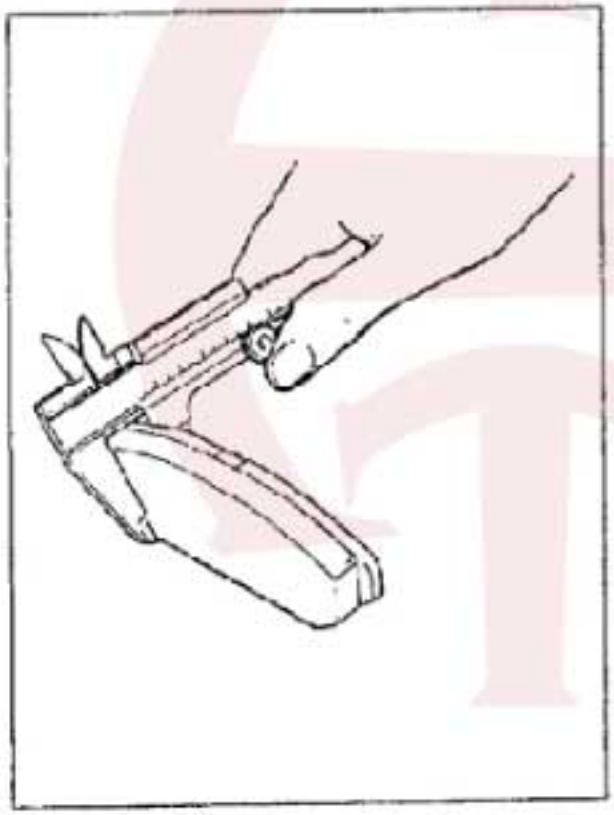
1) Hoist vehicle and remove wheel.
2) Remove E-ring securing brake hose and take brake hose off from strut bracket.
3) Remove caliper pin bolt.



4) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake flexible hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

5) Remove pads.



INSPECTION

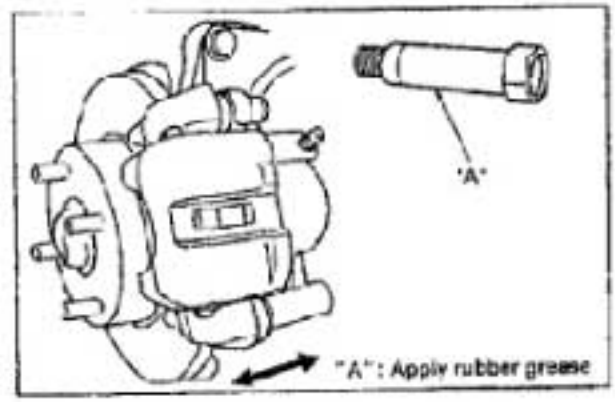
Brake Pad

Check pad lining for wear. When wear exceeds limit, replace with new one.

CAUTION:
Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Pad thickness (lining + pad rim)
Standard : 15 mm (0.59 in.)
Limit : 6 mm (0.24 in.)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



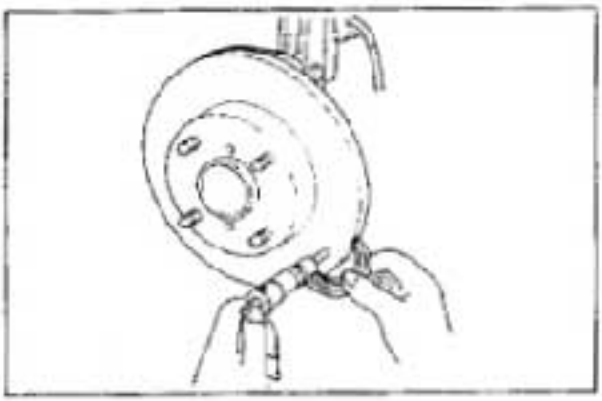
Cylinder Slide Pin/Caliper pin bolt

Check slide pin for smooth movement as shown.
If it is found faulty, correct or replace. Apply rubber grease to slide pin and caliper pin bolt outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as −40°C (−40°F).

Bush Dust Boot and Pin Slide Bush

Check boot and bush for breakage, crack and damage. If defective, replace

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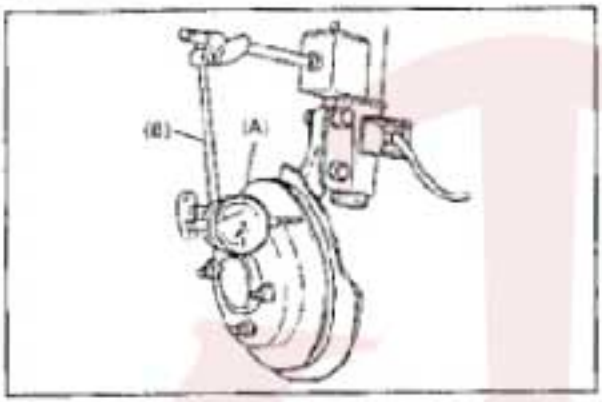


Brake Disc

Check disc surface for scratches in wearing parts.
Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious.
But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, polish and correct that side

Disc thickness

Standard : 12.0 mm (0.472 in.)
Limit : 10.0 mm (0.394 in.)

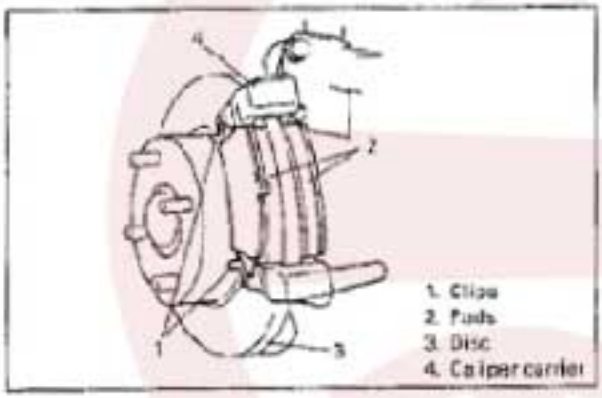


Use wheel nuts to hold the disc securely against the hub, then mount a dial indicator as shown.
To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection: 0.15 mm (0.006 in.)

Special Tool
(A): 09900-20606
(B): 09900-20701

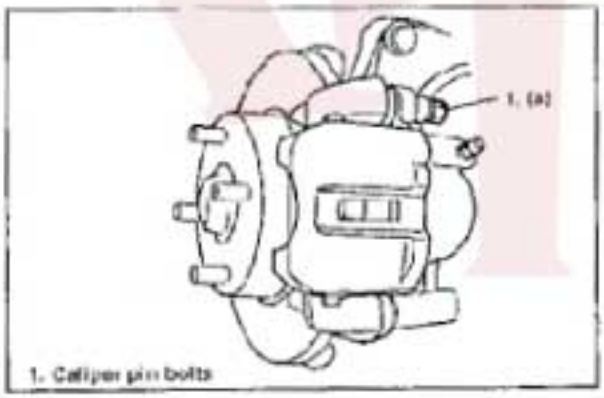
NOTE:
Check front wheel bearing for looseness before measurement.



INSTALLATION

NOTE:
See NOTE at the beginning of this section.

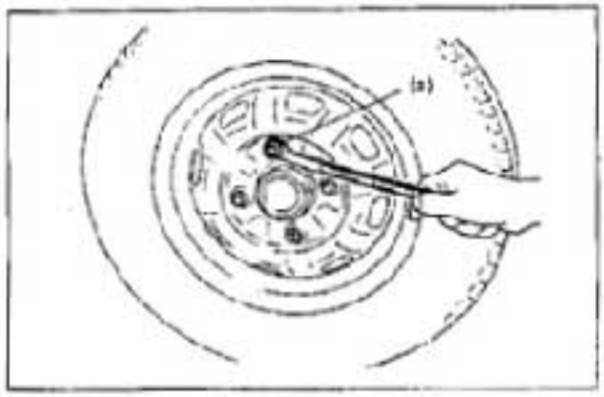
1) Install shims to pads, then pad clips and pads to caliper carrier.



2) Install caliper and torque caliper pin bolt to specification.

NOTE:
Make sure that boots are fit into groove securely.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

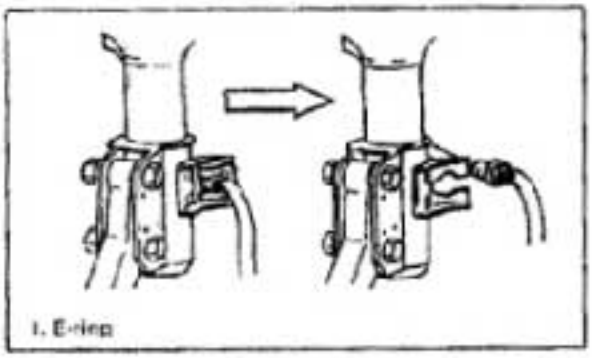


3) Install E-ring to strut securely.
4) Tighten front wheel nuts to specified torque.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

5) Upon completion of installation, perform brake test.

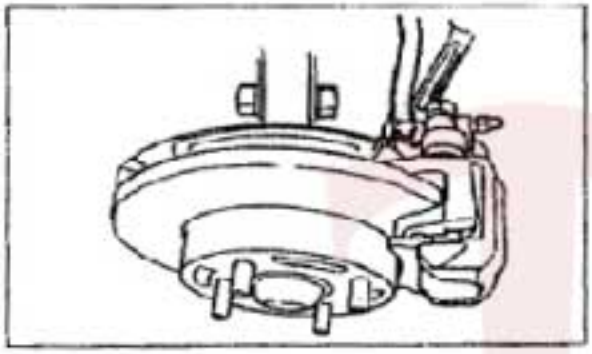
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1. E-ring

CALIPER ASSEMBLY

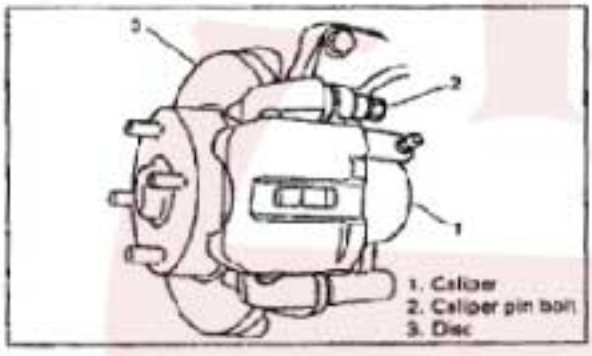
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove E-ring.



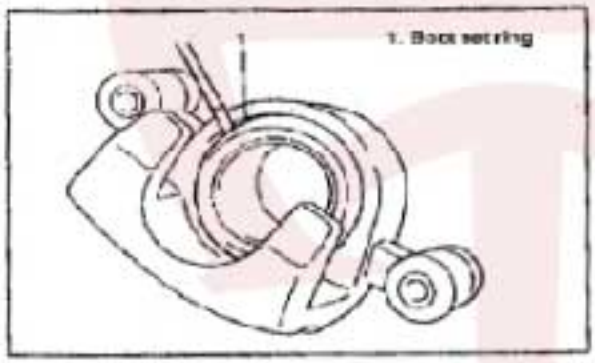
3) Loosen flexible hose joint bolt a little at caliper.

> **CAUTION:**
> **Be careful not to twist flexible hose while loosening the bolt.**



1. Caliper
2. Caliper pin bolt
3. Disc

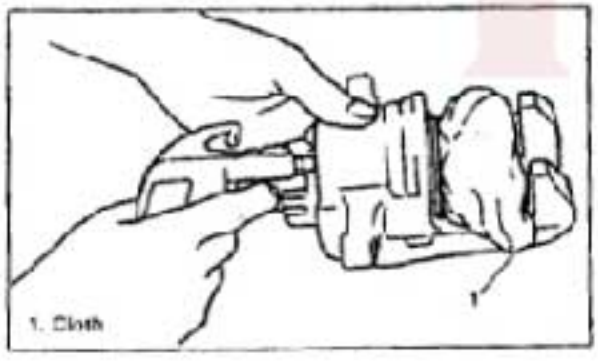
4) Remove caliper pin bolt.
5) Remove caliper from carrier.
6) Disconnect flexible hose from caliper using care not to twist it. As this will allow fluid to flow out of flexible hose, have a container ready beforehand.



DISASSEMBLY

Before disassembly, clean all around caliper with brake fluid.

1) Remove piston boot set ring and boot from caliper, pry off with a flat-bladed tool. Be careful not to damage boot.



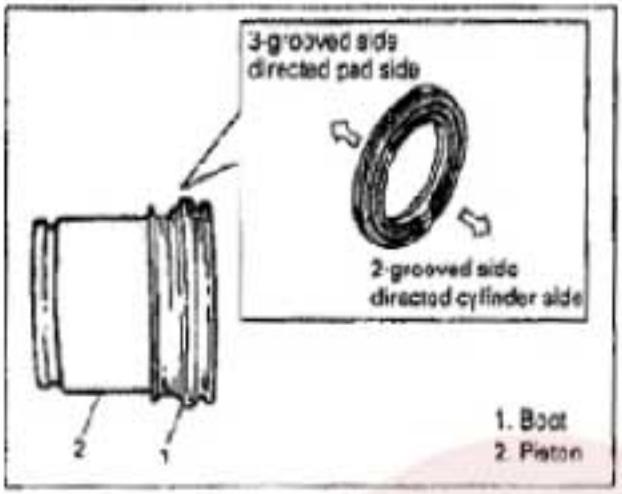
1. Cloth

2) Blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

> **WARNING:**
> **Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.**

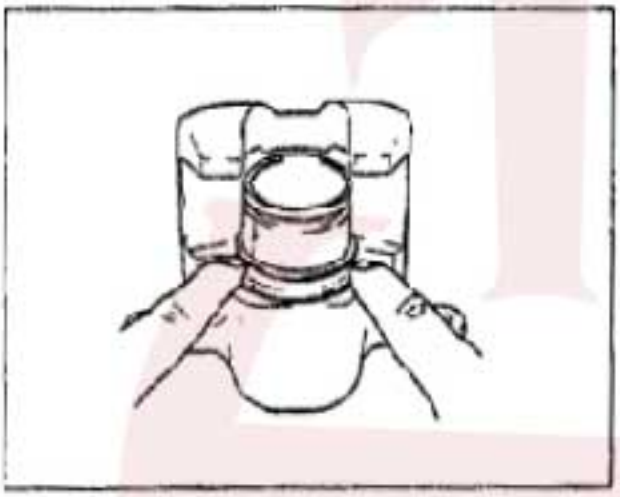
Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

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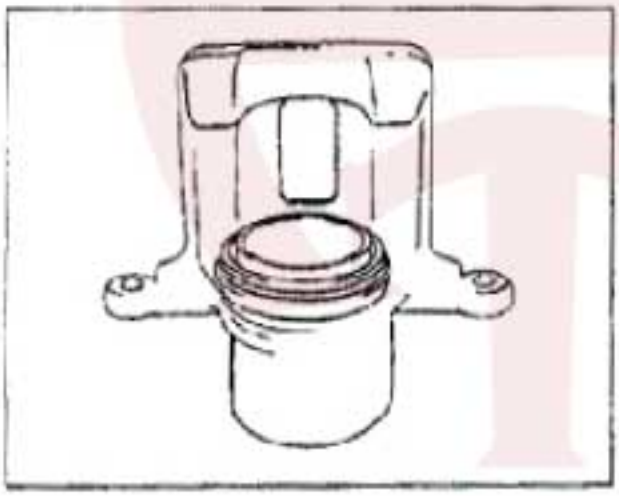


Piston and Boot

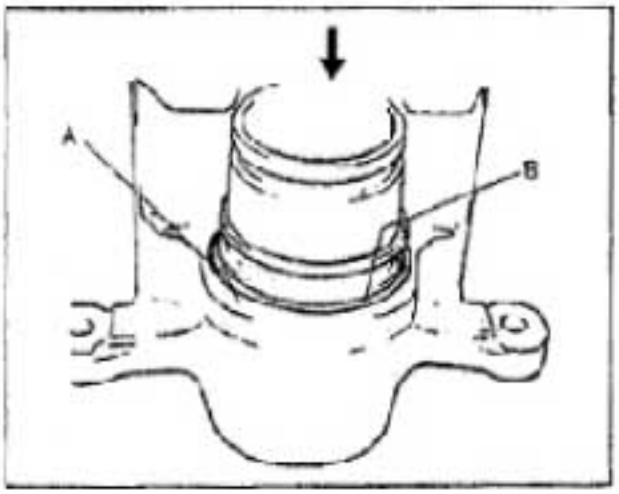
1) Before inserting piston into cylinder, install boot onto piston as shown.



2) Fit boot as it is in figure into boot groove in cylinder with fingers.



3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

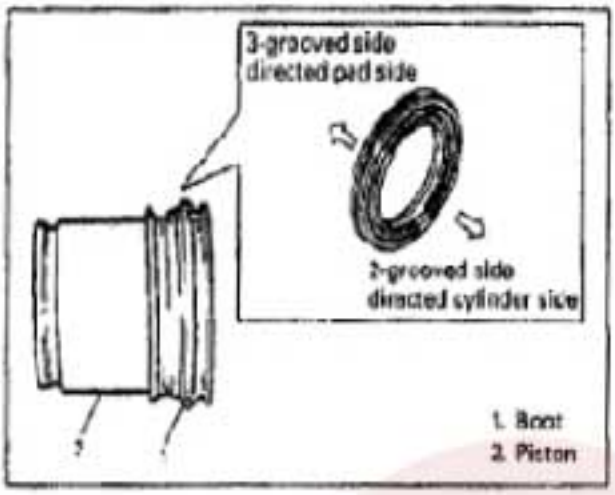


4) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

NOTE:
Boot's face B should be at the same level from cylinder's face A all around.

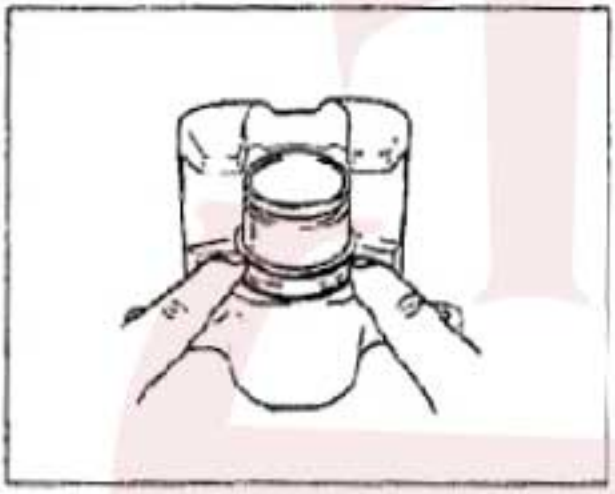
5) Insert piston into cylinder by hand.
6) Install boot set ring securely.

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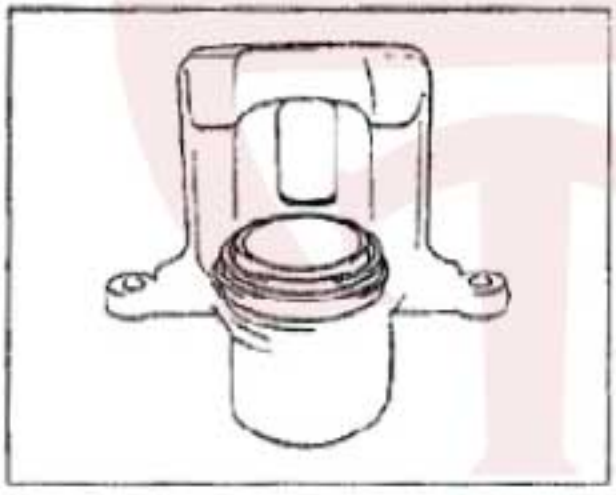


Piston and Boot

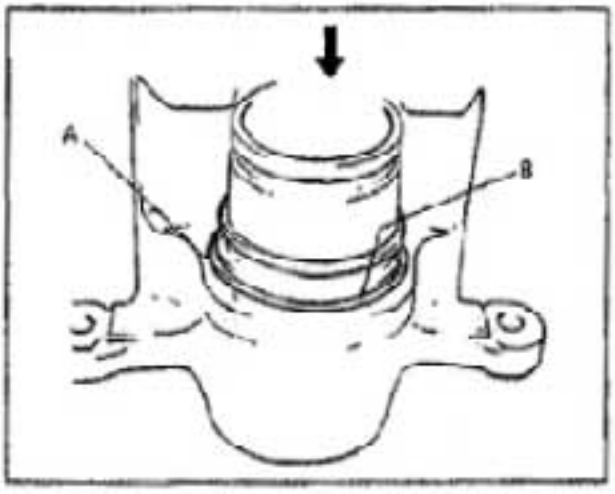
1) Before inserting piston into cylinder, install boot onto piston as shown.



2) Fit boot as it is in figure into boot groove in cylinder with fingers.



3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

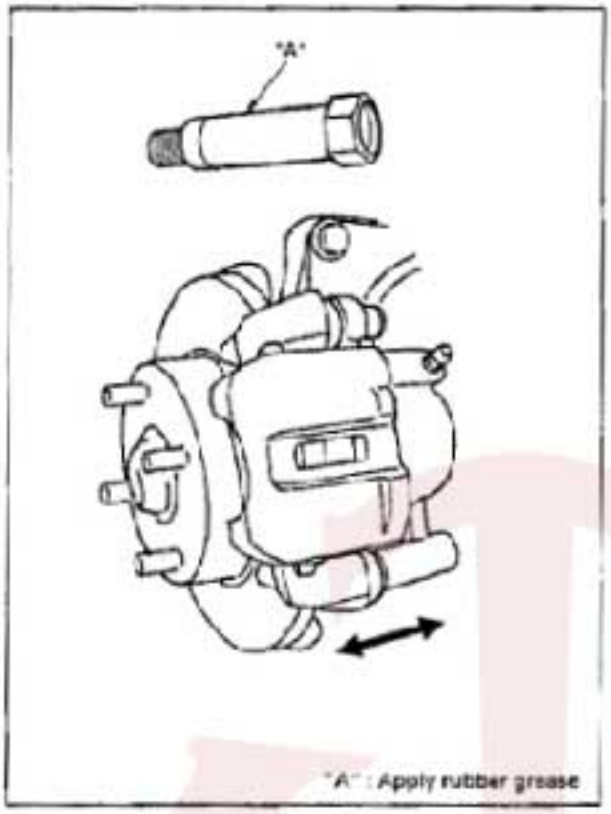


4) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

NOTE:
Boot's face B should be at the same level from cylinder's face A all around.

5) Insert piston into cylinder by hand.
6) Install boot set ring securely.

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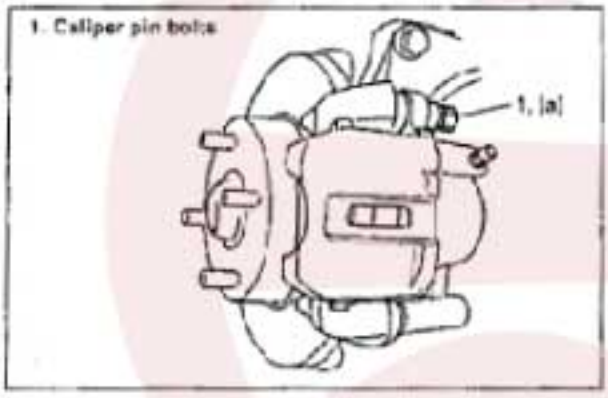


Caliper

Before installing caliper (cylinder body) to carrier, check to ensure that caliper can be moved smoothly in thrust direction.

NOTE:

Where temperature gets as low as – 30°C (– 22°F) in cold weather, use rubber grease whose viscosity varies very little even at – 40°C (– 40°F).



INSTALLATION

1) Connect caliper to flexible hose.
2) Apply grease to caliper pin bolt and slide pin, then install caliper to caliper carrier.
3) Tighten caliper pin bolt to specified torque.

   NOTE:

   Make sure that boots are fit into groove securely.

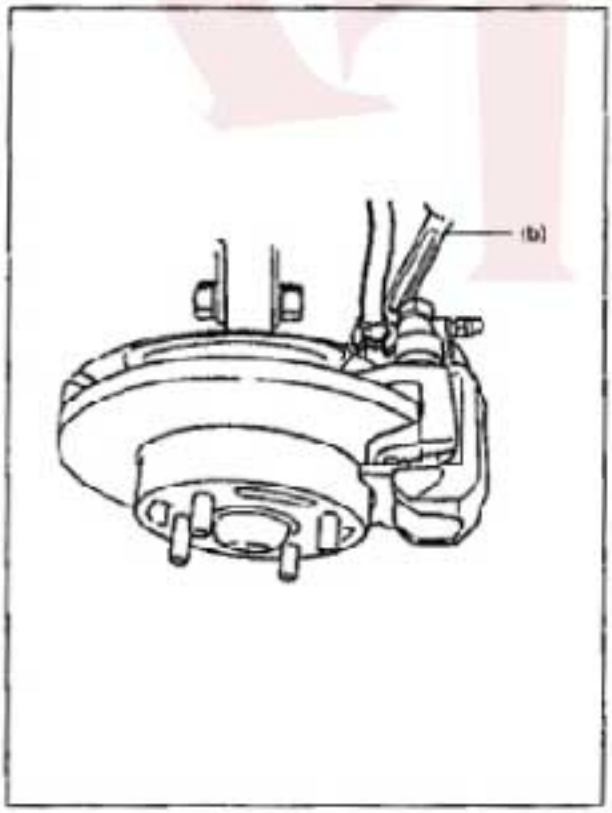
   Tightening Torque

   (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

4) Tighten flexible hose joint bolt to specified torque.

   Tightening Torque

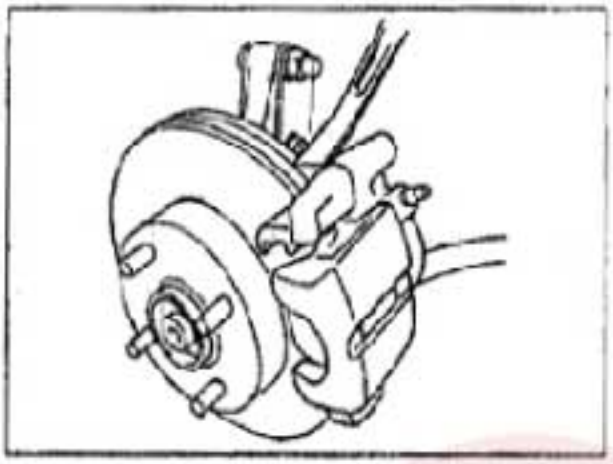
   (b): 16 N·m (1.6 kg-m, 12.0 lb-ft)



> **WARNING:**
> **Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.**

5) Install E-ring to strut securely.
6) Lower hoist.
7) Tighten wheel nuts to specified torque.
8) After completing installation, fill reservoir with brake fluid and bleed air from brake system. Perform brake test and check each installed part for oil leakage.

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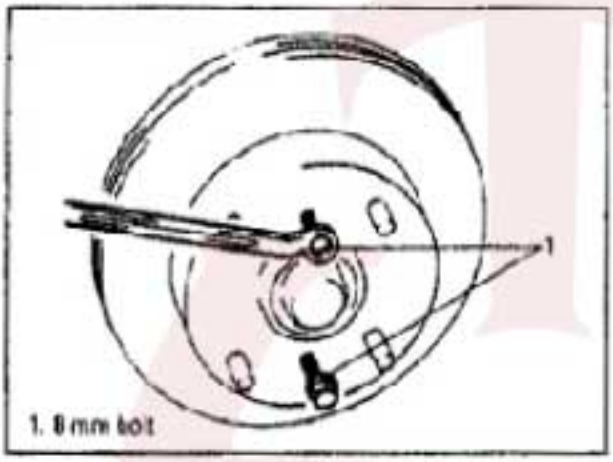


BRAKE DISC

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by loosening carrier bolts (2 pcs).

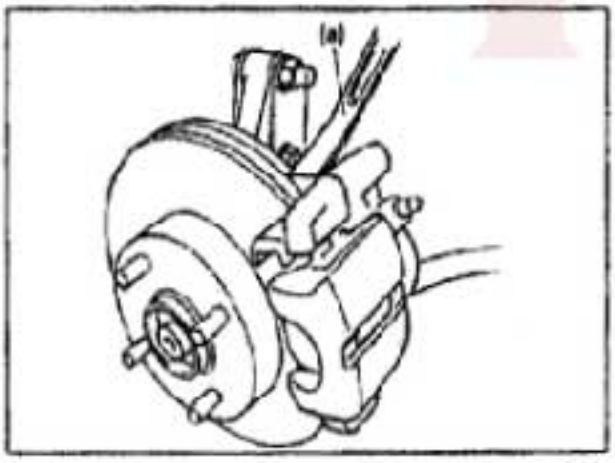
CAUTION:
During removal, be careful not to damage brake flexible hose and not to depress brake pedal.



3) Pull brake disc off by using 8 mm bolts (2 pcs).

INSPECTION

Refer to BRAKE PAD INSPECTION



INSTALLATION

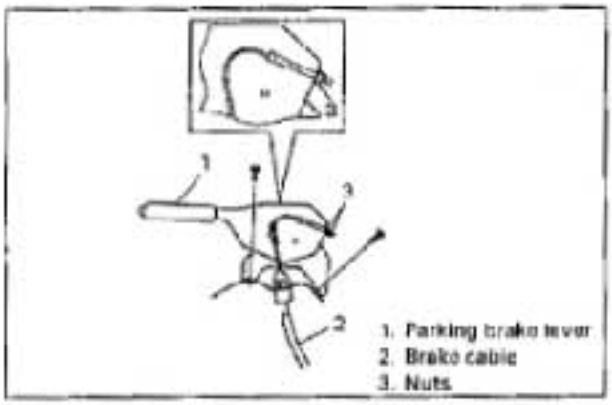
NOTE:
See NOTE at the beginning of this section.

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Tighten caliper carrier bolts to specified torque.

Tightening Torque
(a): 95 N·m (9.5 kg-m, 69.0 lb-ft)

4) Tighten front wheel nuts to specified torque.
5) Upon completion of installation, perform brake test.

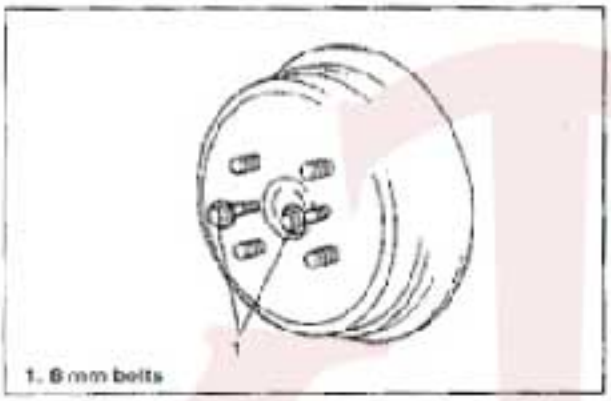
https://truckmanualshub.com/



BRAKE DRUM

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove console box.
3) Release parking brake lever.
4) Loosen parking brake cable nuts.



5) Pull brake drum off by using 8 mm bolts.



INSPECTION

Brake Drum

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Brake drum ID

Standard : 220 mm (8.66 in.)
Service limit : 222 mm (8.74 in.)

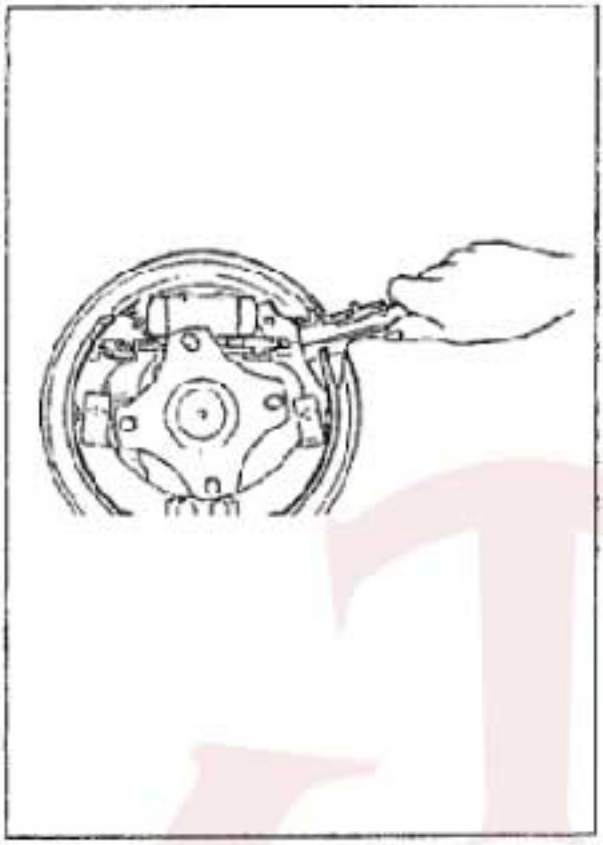
Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

Cracked, Scored, or Grooved Drum

A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.
Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.
If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:
When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

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Brake Shoe

Where lining is worn out beyond service limit, replace shoe.

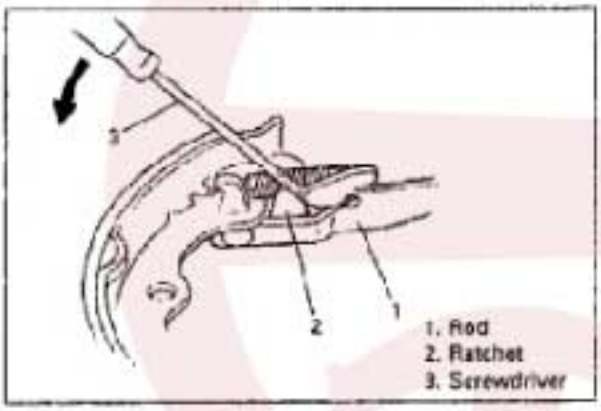
Brake lining thickness (lining + shoe rim)

Standard : 6.9 mm (0.27 in.)

Service limit : 3.6 mm (0.14 in.)

If one of brake linings is worn to service limit, all linings must be replaced at the same time.

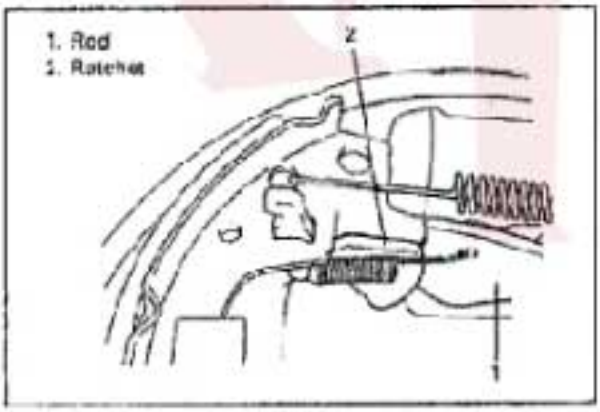
CAUTION:
Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



INSTALLATION

NOTE:
See NOTE at the beginning of this section.

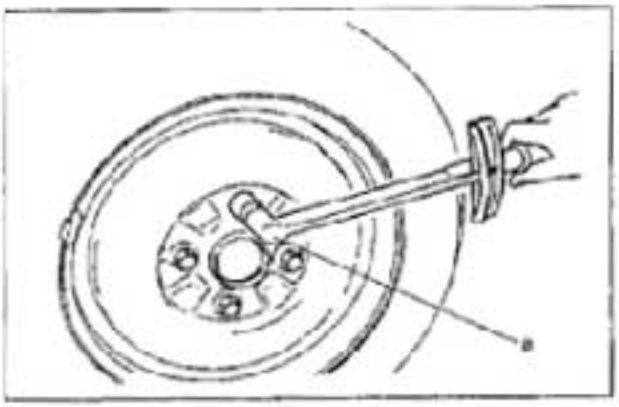
1) Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod and ratchet and push down ratchet as shown in figure.



NOTE:
Left figure shows ratchet position where brake shoe-to-drum clearance is maximum.

2) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
3) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
4) Install console box.

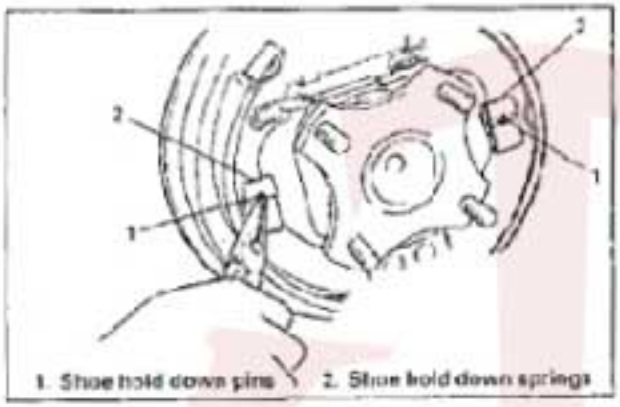
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5) Install wheel and tighten wheel nuts so specified torque.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

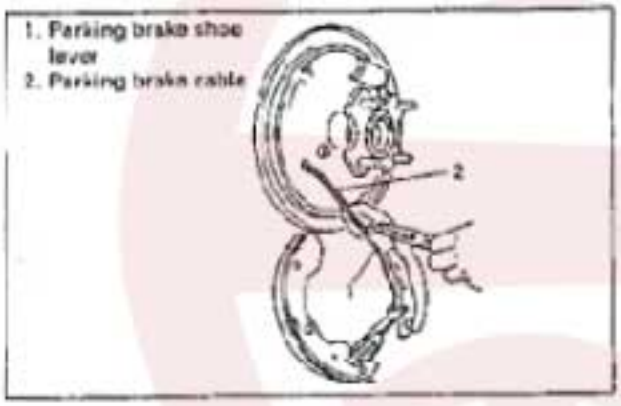
6) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and preform brake test (foot brake and parking brake).



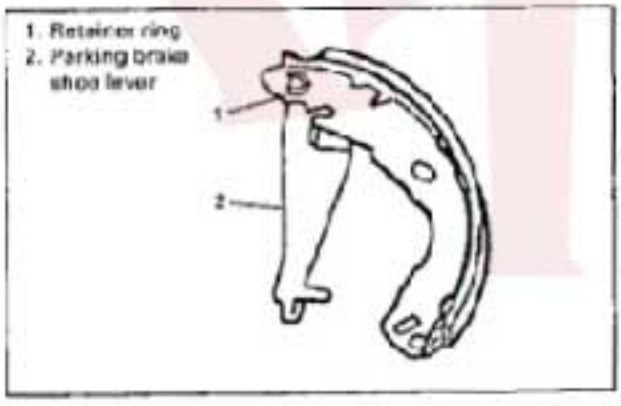
BRAKE SHOE

REMOVAL

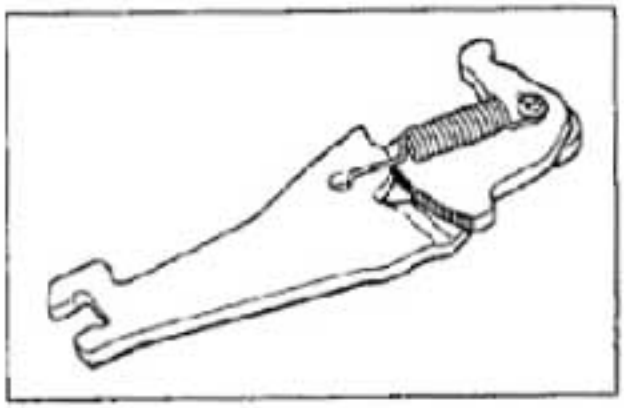
1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.
3) Remove brake shoes.



4) Disconnect parking brake shoe lever from parking brake cable.
5) Remove strut and springs.



6) Remove retainer ring and disconnect parking brake shoe lever from shoe rim.

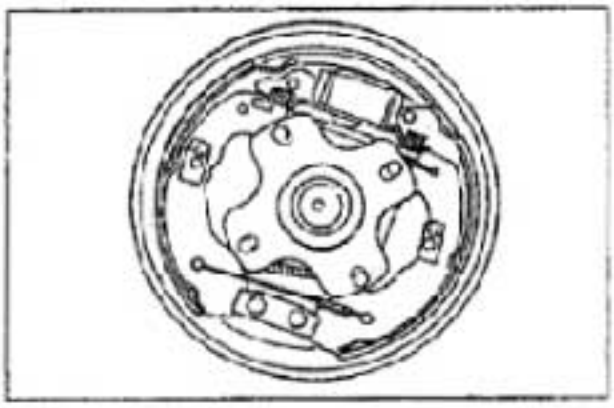


INSPECTION

Brake Strut

Inspect ratchet of strut for wear or damage.

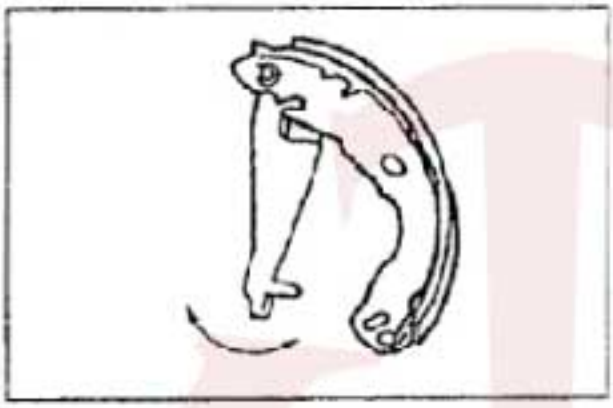
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Springs

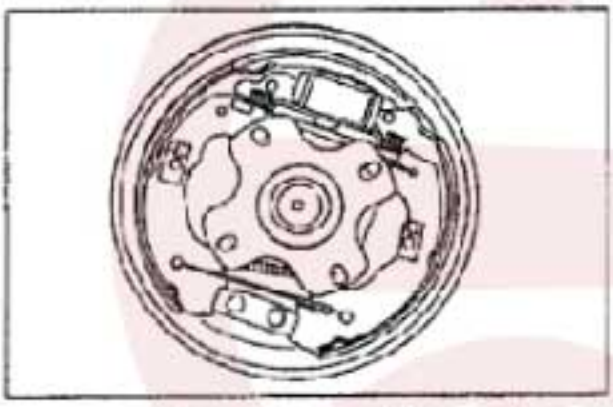
Inspect for damage, corrosion or weakening.

Inspect each part with arrow for rust. If found defective, replace.



Parking Shoe Lever

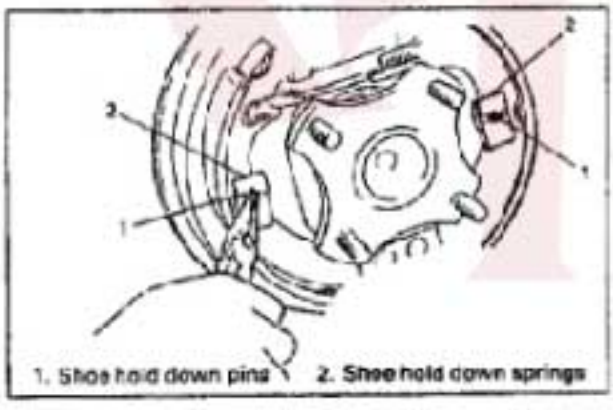
Inspect brake shoe lever for smooth movement along shoe rim. If defective, correct or replace.



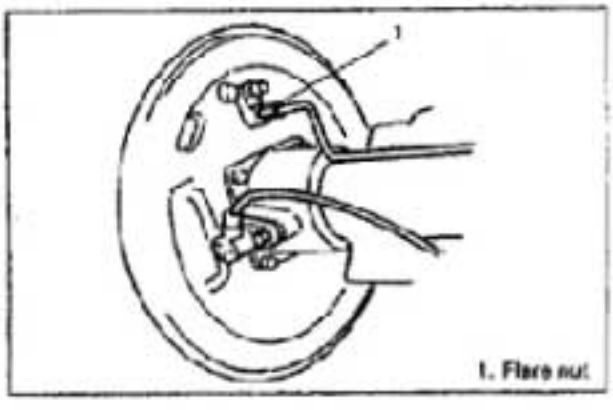
INSTALLATION

1) Assemble parts as shown in reverse order of removal.

NOTE:
Removed retainer ring should be replaced with new one.



2) Install shoe hold down springs by pushing them down in place and turning hold down pins.
3) For procedure hereafter, refer to steps 1) to 6) of BRAKE DRUM INSTALLATION.

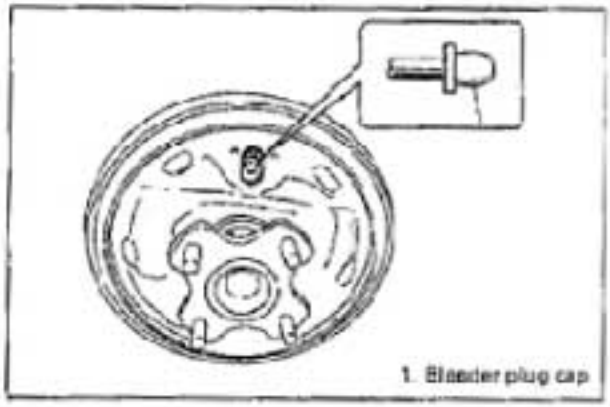


WHEEL CYLINDER

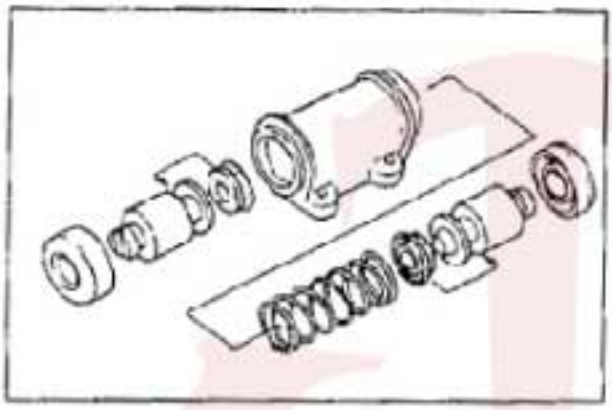
REMOVAL

1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Loosen brake pipe flare nut but only within the extent that fluid does not leak.

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1. Bleeder plug cap

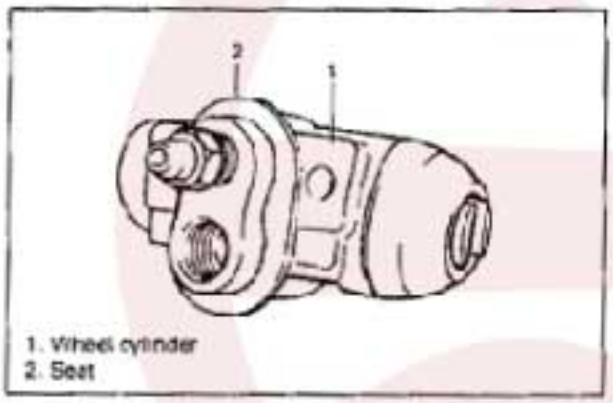
4) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap onto pipe to prevent fluid from spilling.



INSPECTION

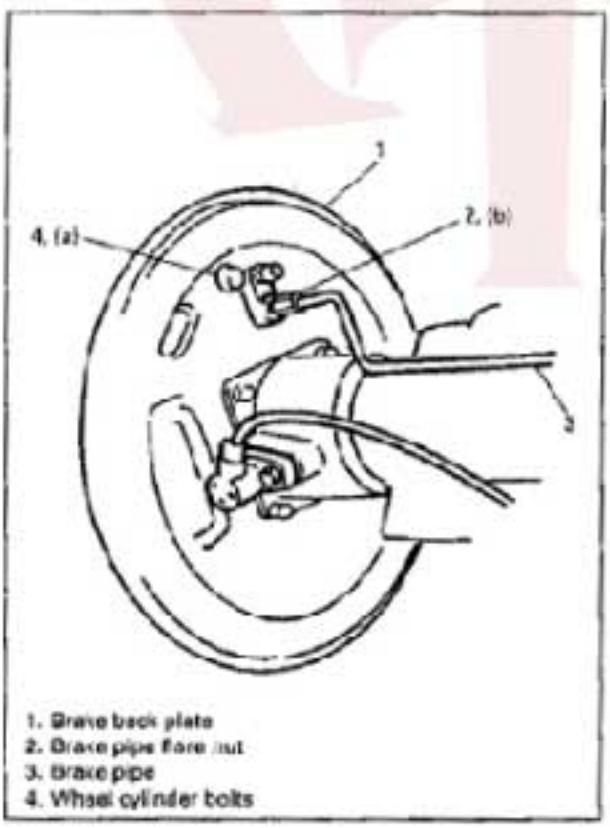
Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:
Clean wheel cylinder components with brake fluid.


1. Wheel cylinder
2. Seat

INSTALLATION

1) Install seat to wheel cylinder. Then take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder just enough to prevent fluid from leaking.



1. Brake back plate
2. Brake pipe flare nut
3. Brake pipe
4. Wheel cylinder bolts

2) Tighten wheel cylinder to brake back plate to specified torque.

Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

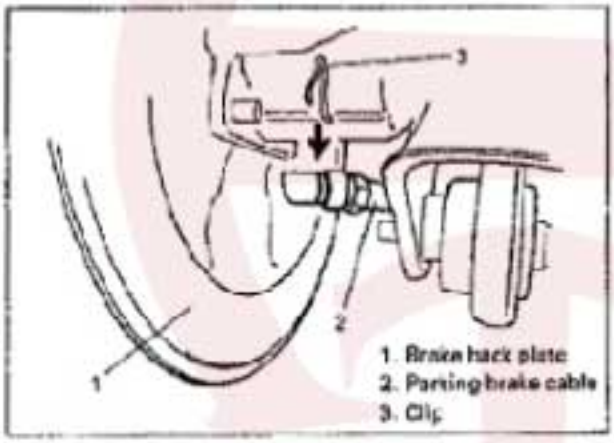
3) Torque flare nut of brake pipe which was connected in step 1) to specification.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

4) Install bleeder plug cap taken off from pipe back to bleeder plug.

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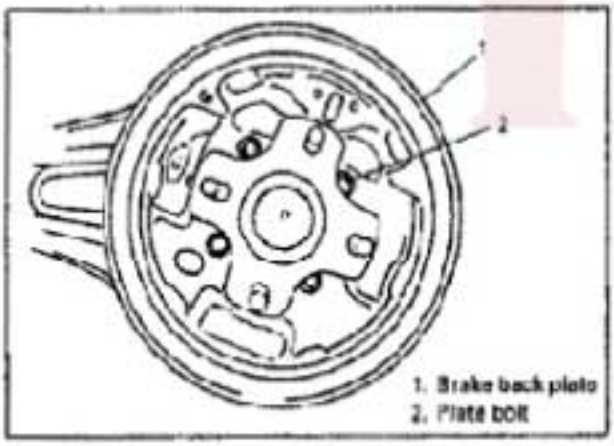
5) Install brake shoes, referring to steps 1) and 2) of BRAKE SHOE INSTALLATION.
6) Install brake drum. (Refer to steps 1) and 2) of BRAKE DRUM INSTALLATION of this section.
7) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
8) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
9) Install console box.
10) Install wheel and tighten wheel nuts to specified torque. (Refer to TIGHTENING TORQUE SPECIFICATIONS.)
11) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
12) Check each installed part for oil leakage.



BRAKE BACK PLATE

REMOVAL

1) Perform steps 1) to 5) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Perform steps 3) to 4) of WHEEL CYLINDER REMOVAL.
4) Remove parking brake cable clip and disconnect parking brake cable from brake back plate.

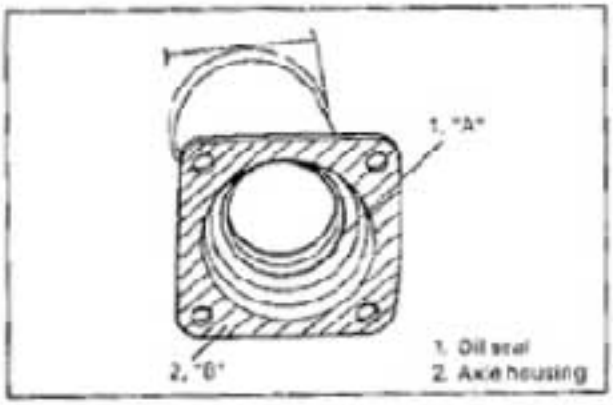


5) Drain rear differential gear oil.
6) Remove brake back plate bolts.
7) Draw out rear axle shaft with brake back plate, refer to step 7) of REAR AXLE SHAFT REMOVAL in Section 3E.
8) Remove wheel bearing, refer to steps 8) to 11) of WHEEL BEARING REMOVAL in Section 3E.
9) Remove brake back plate from axle shaft.

INSTALLATION

1) Install brake back plate to axle shaft.
2) Press-fit wheel bearing and retainer ring, refer to steps 2) to 3) of WHEEL BEARING INSTALLATION in Section 3E.

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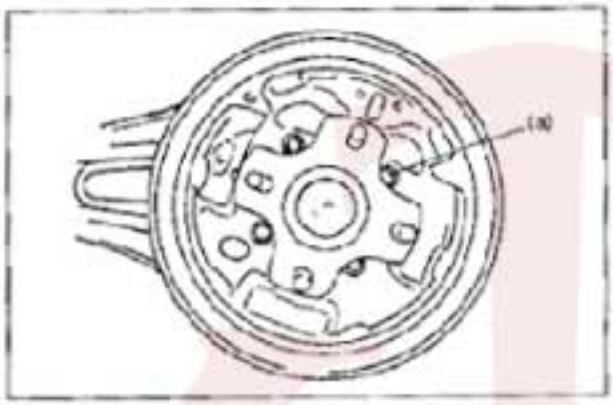
3) Apply grease to axle shaft oil seal lip as shown.

"A": Grease 99000-25010

4) Apply sealant to mating surface of axle housing with brake back plate.

NOTE:
Make sure to removed old sealant before applying it new.

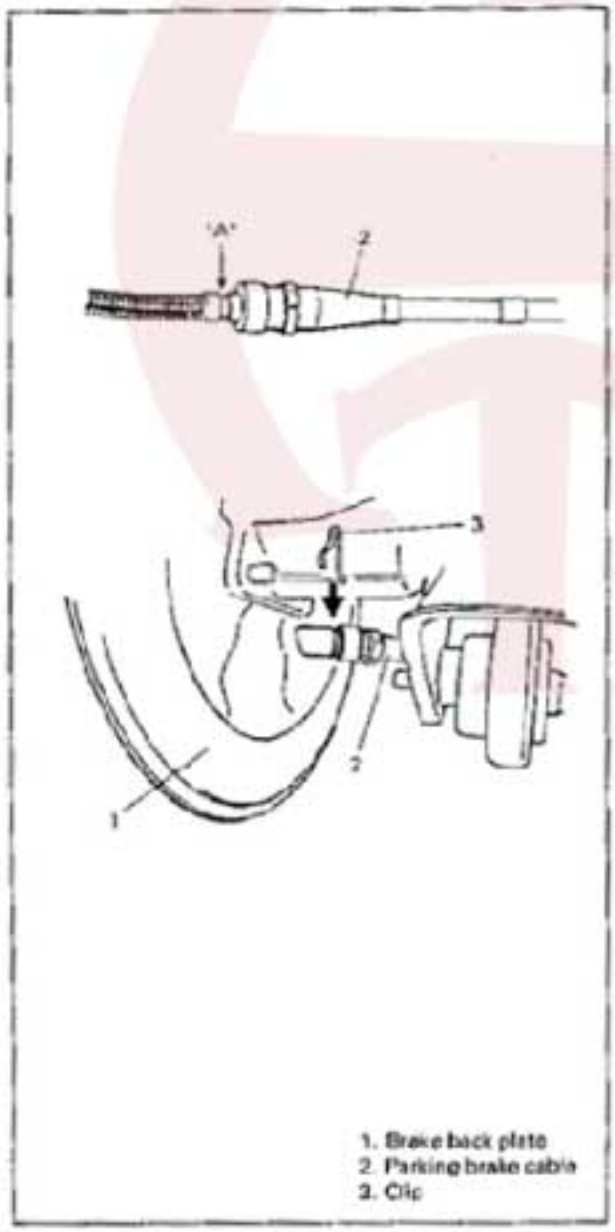
"B": Sealant 99000-31110 or 99000-31090



5) Install rear axle shaft to rear axle housing.
6) Tighten brake back plate bolts to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m,17.0 lb-ft)

7) Install wheel cylinder, and tighten wheel cylinder bolts and brake pipe flare nut (or nuts) to specified torque. (Refer to steps 1) to 4) of WHEEL CYLINDER INSTALLATION).



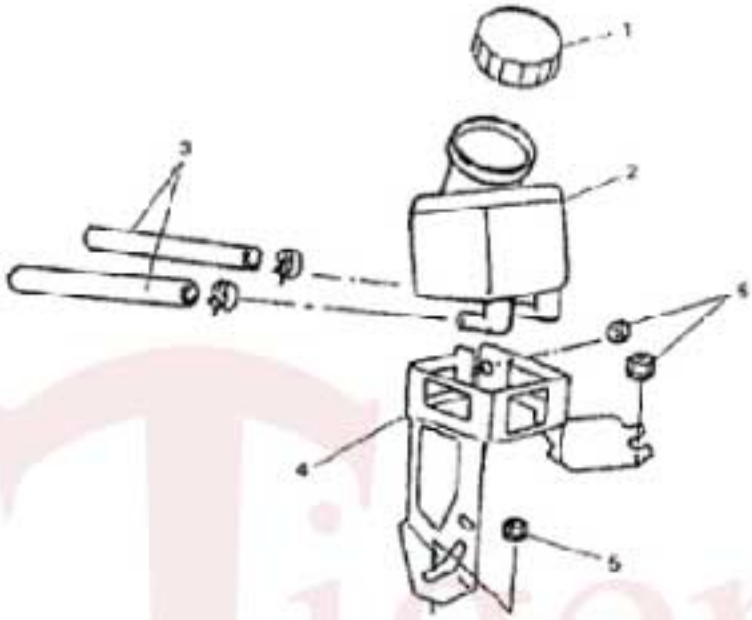
8) Apply water tight sealant where plate and cable contact, and run parking brake cable through brake back plate and secure it with clip.

"A": Sealant 99000-31090

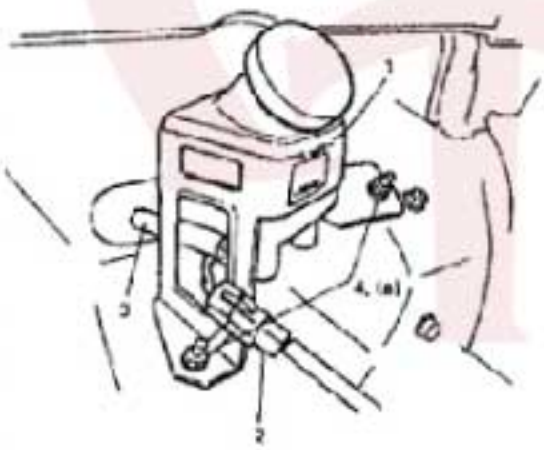
9) Install brake shoes, referring to steps 1) and 2) of BRAKE SHOE INSTALLATION.
10) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION.
11) Refill differential housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refill.
12) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
13) Install wheel and tighten wheel nuts to specified torque.
14) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
15) Install console box.
16) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
17) Check each installed part for oil leakage.

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MASTER CYLINDER RESERVOIR



1. Reservoir cap
2. Reservoir
3. Reservoir hose
4. Reservoir bracket
5. Nuts



1. Reservoir
2. Wire coupler
3. Brake master hose
4. Nuts

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.
4) Disconnect brake master hose from reservoir.
5) Remove reservoir bracket nuts.
6) Remove reservoir.

INSTALLATION

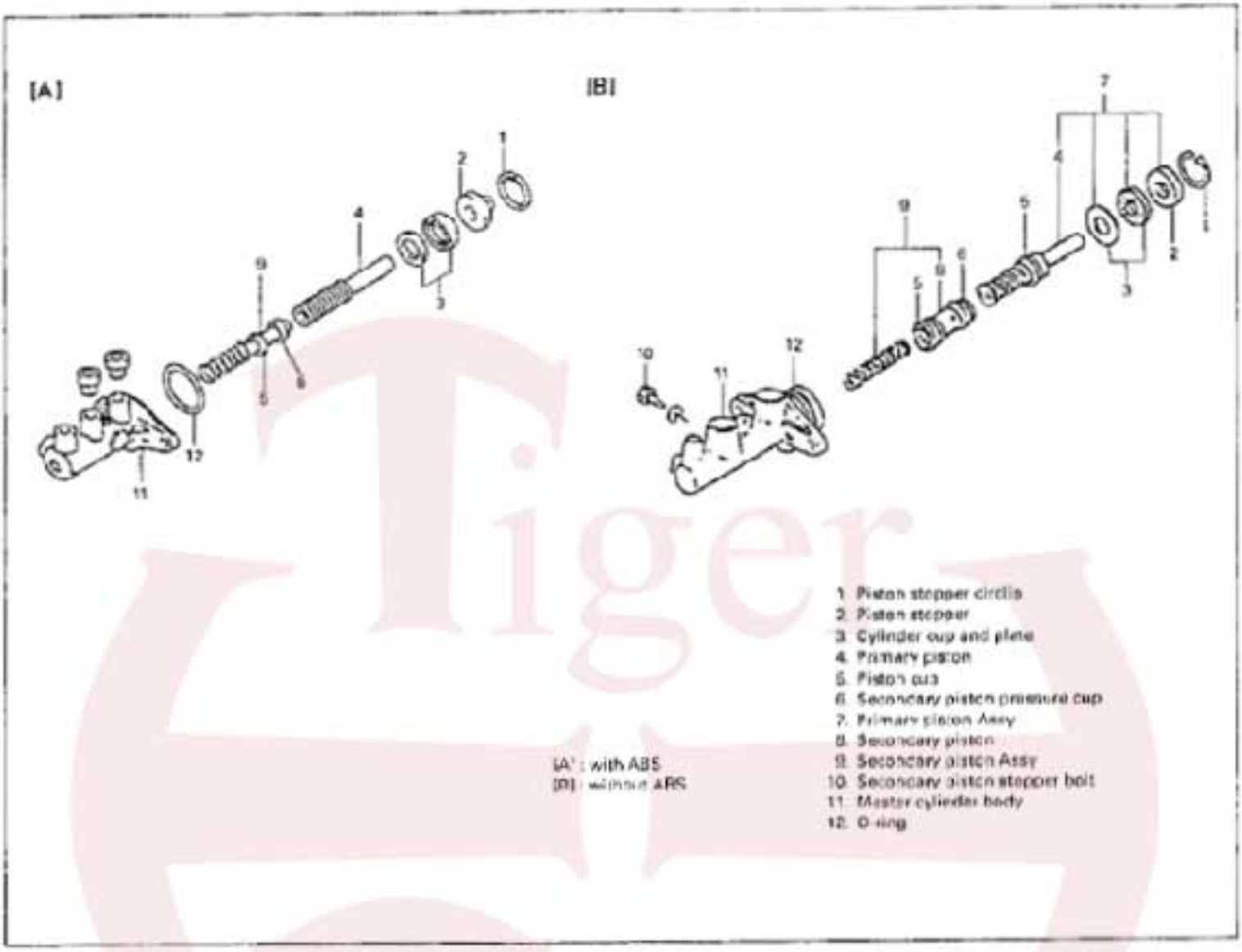
1) Install reservoir and tighten nuts to specified torque.

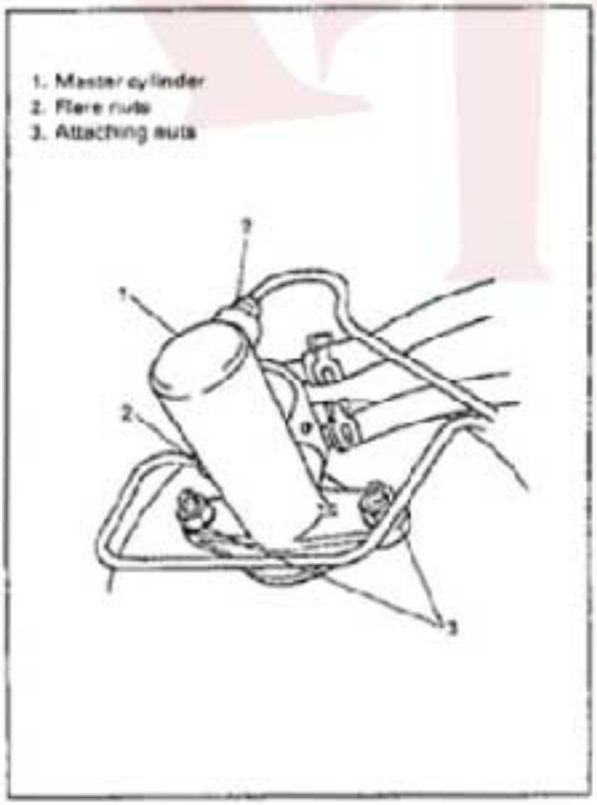
   Tightening Torque
   (a) : 11N-m (1.1 kg-m, 8.0 lb-ft)

2) Connect reservoir hose to reservoir.
3) Install clamp to reservoir lead wire.
4) Fill brake fluid up to MAX line.
5) Perform air bleeding, referring to BLEEDING BRAKES, and check for fluid leakage.

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MASTER CYLINDER ASSEMBLY





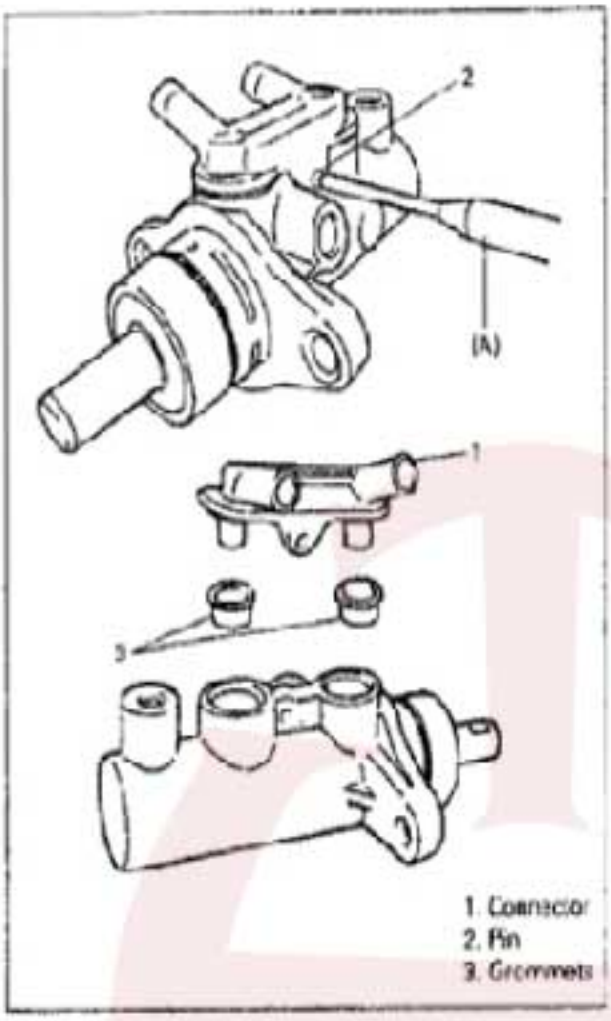
REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Disconnect reservoir hose.
3) Disconnect brake pipes from master cylinder.

> **CAUTION:**
> **Do not allow brake fluid to get on painted surfaces.**

4) Remove two attaching nuts.
5) Remove master cylinder.

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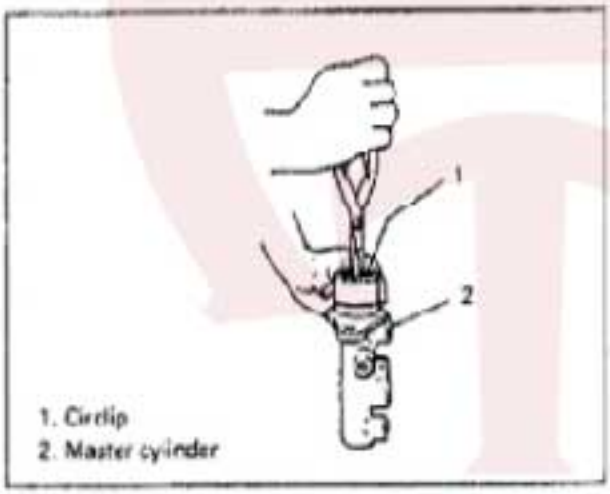
1. Connector
2. Pin
3. Grommets

DISASSEMBLY

1) Remove the pin that fixes cylincer body and connector by using special tool.

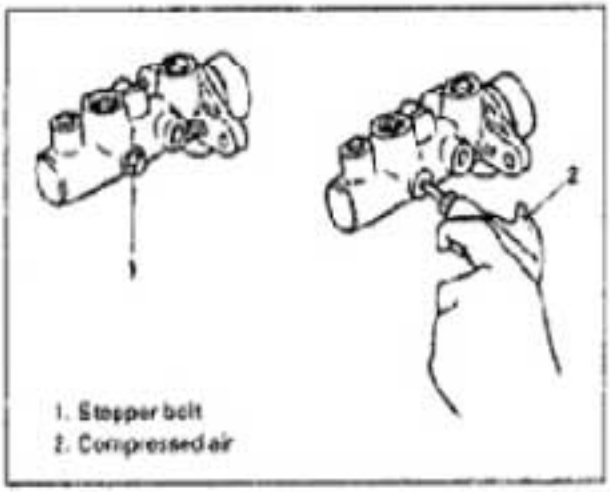
Special Tool
(A): 09922-85811

2) Remove connector and 2 grommets.



1. Circlip
2. Master cylinder

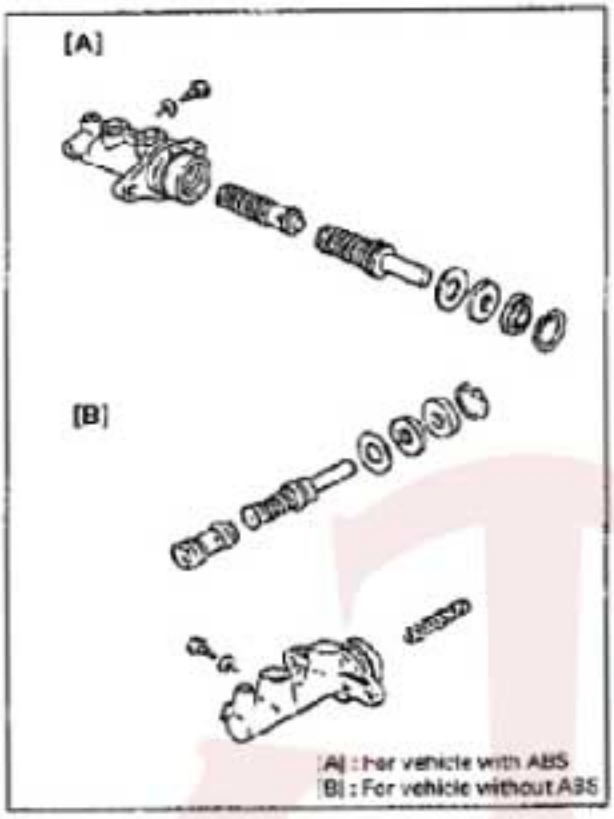
3) Remove circlip.



1. Stopper bolt
2. Compressed air

4) Remove primary piston.
Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
Be cautions during removal as secondary piston jumps out.

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INSPECTION

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston assembly.**

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

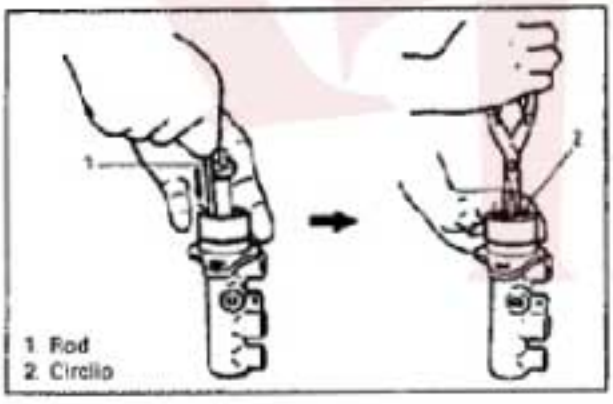
Polishing bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

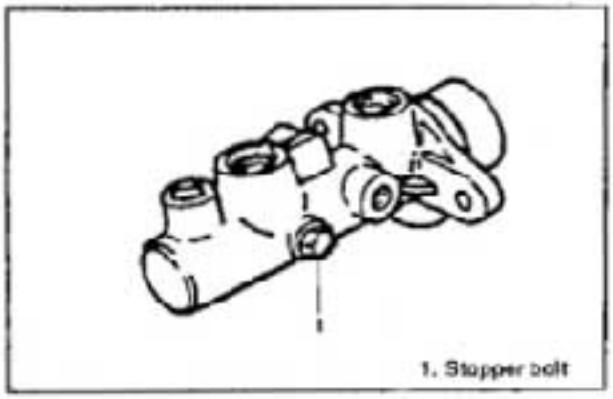
ASSEMBLY

CAUTION:

- **Never use any mineral oil such as kerosene oil and gasoline when washing and assembling parts.**
- **Check inside of cylinder wall, pistons and cup seals are free from any foreign objects such as dust and dirt and use care not to cause any damage with a tool during assembly.**
- **Do not drop parts. Do not use any part which has been dropped.**



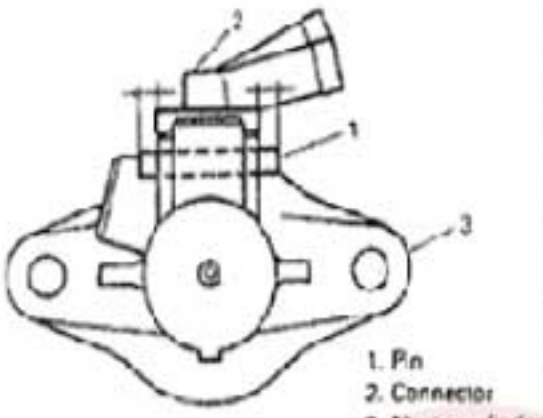
1) Apply brake fluid to inside of cylinder and contact surface of piston ass'y and insert secondary piston ass'y into cylinder body.
   Be sure to install piston cup in correct installation direction and straight into cylinder so that it is not caught.
   Install secondary piston assembly into cylinder.
2) Install primary piston in cylinder.
3) Depress, and install circlip.



4) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.

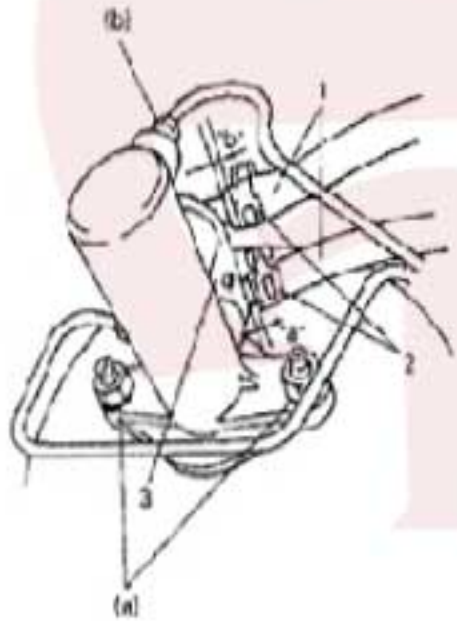
   Tightening Torque
   (a) : 10N·m (1.0 kg-m, 7.5 lb-ft)

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1. Pin
2. Connector
3. Master cylinder

5) Apply thin coat of brake fluid to all around new grommets (2pcs.) and install them to cylinder body, then install reservoir.
6) Set a new pin in connector hole and drive it in. At this time, make end of pin and end face margin of connector equal.



1. Reservoir hose
2. Clamp
3. Connector

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Check clearance between booster piston rod and master cylinder piston (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**
- **Adjust booster piston rod length with special tool (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**

1) Install master cylinder as shown and torque attaching nuts to specification.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

2) Attach hydraulic lines and torque flare nuts to specification.

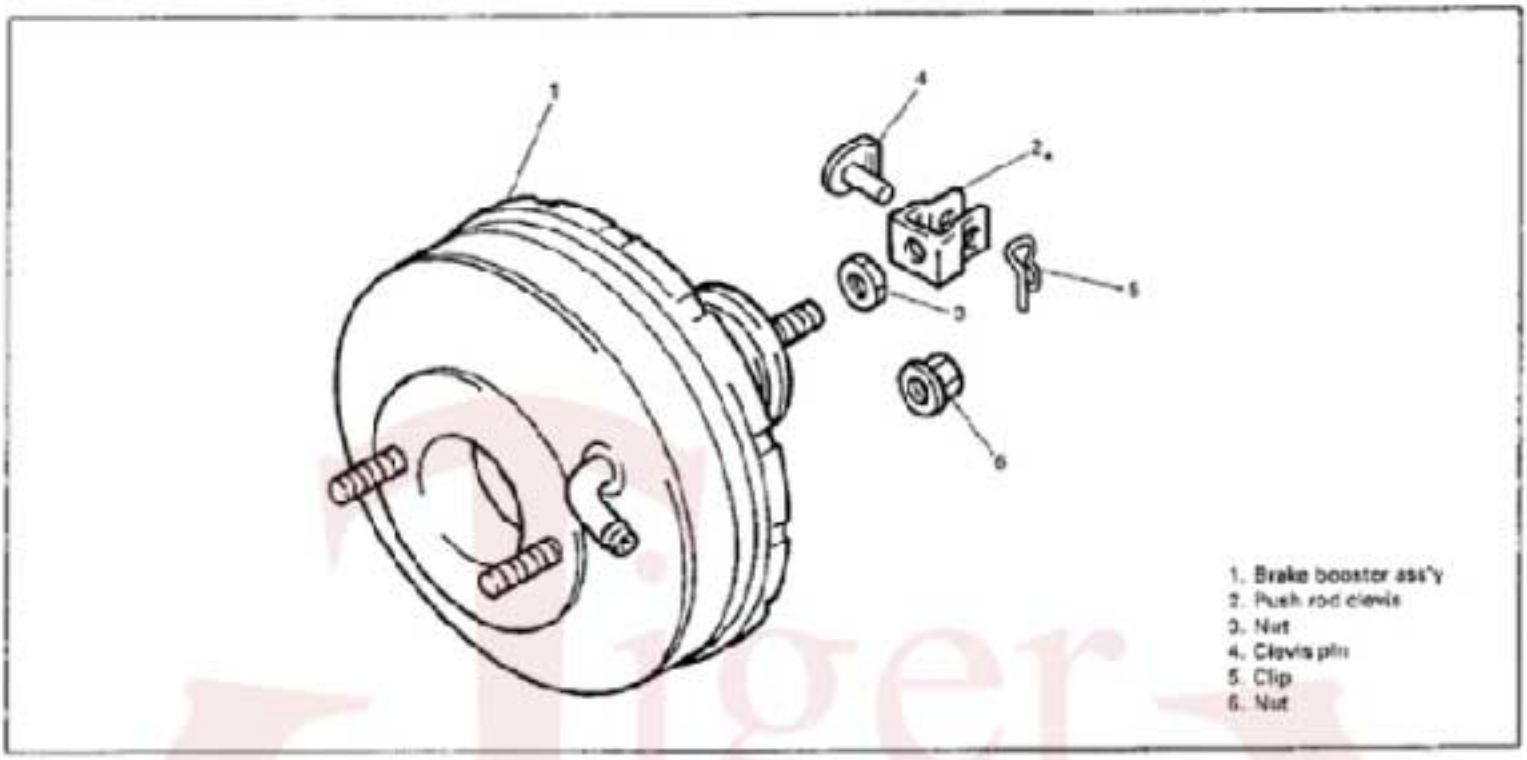
   Tightening Torque
   (b): 16 N·m 1.6 kg-m, 12.0 lb-ft)

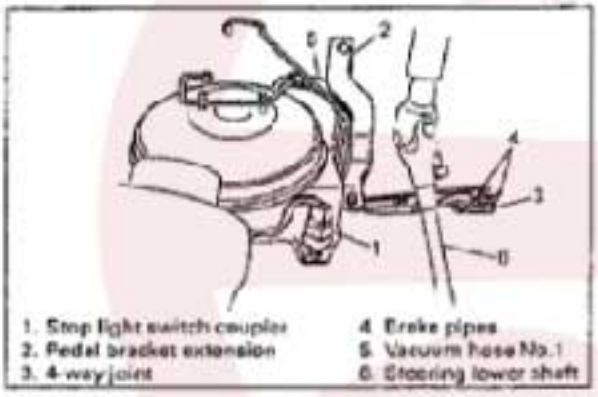
3) Connect reservoir hose.
   Distance
   "a" : less than 5 mm (0.20 in.)
   "b" : 4 - 10 mm (0.16 - 0.39 in.)

4) Fill reservoir with specified brake fluid.
5) After installing, check brake pedal play and bleed air from system (refer to BRAKE PEDAL PLAY CHECK and BLEEDING BRAKES).
6) Perform brake test and check each installed part for fluid leakage.

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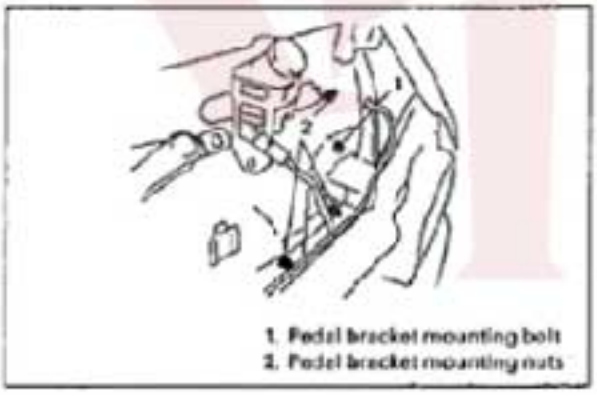
BRAKE BOOSTER



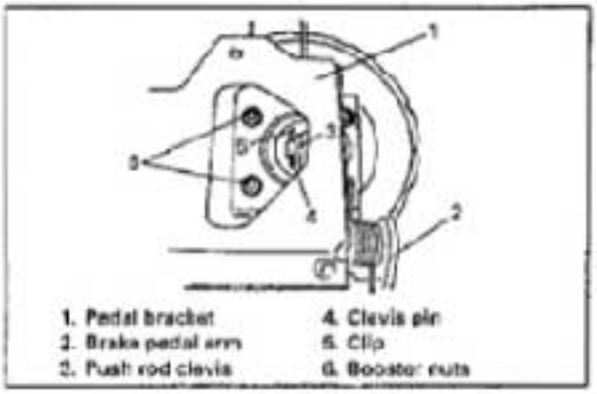


REMOVAL

1) Remove master cylinder assembly, referring to step 1) to 5) of MASTER CYLINDER REMOVAL.
2) Disconnect stop light switch lead wire at coupler.
3) Remove pedal bracket extension (For vehicle with ABS).
4) Disconnect flare nuts from 4-way joint and remove brake pipes.
5) Disconnect vacuum hose No.1 from booster and vacuum hose No.2 at dash panel and remove pipe with hose.
6) Disconnect clutch cable from clutch pedal arm.



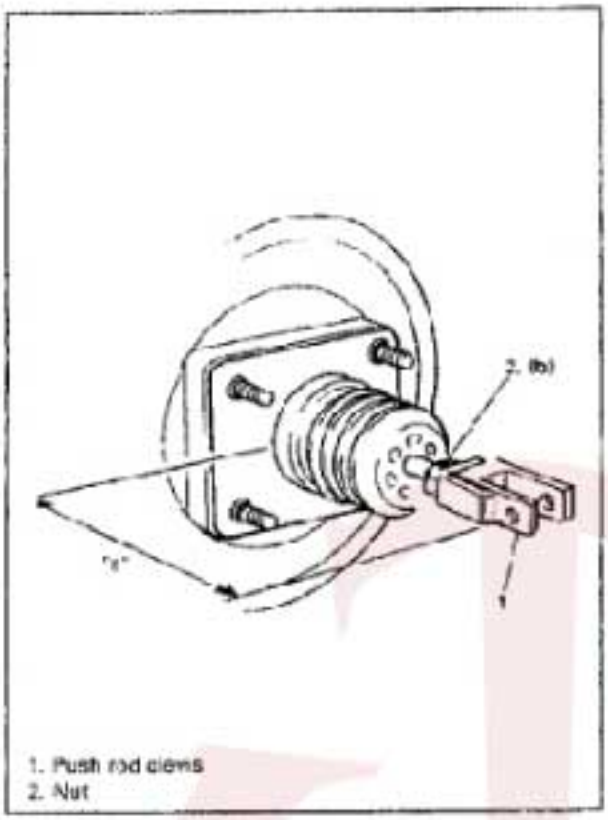
6') Remove steering lower shaft.
7) Remove pedal bracket mounting bolt and nuts at dash panel.
8) Remove pedal bracket with brake booster.



9) Disconnect push rod clevis from brake pedal arm.
10) Remove brake booster attaching nuts and disconnect brake booster from pedal bracket.

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

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1. Push rod clevis
2. Nut

INSPECTION AND ADJUSTMENT

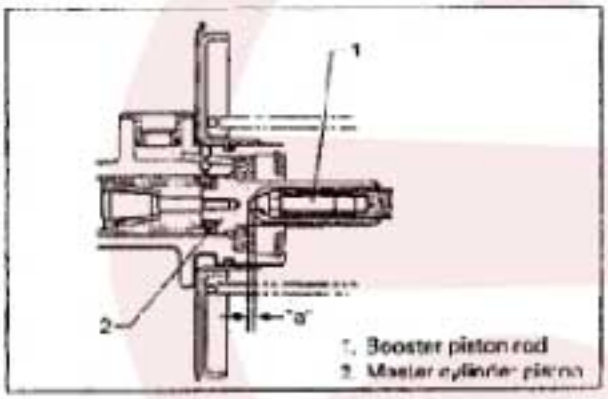
Push Rod Clevis Length

Check that dimension "a" as shown is within 99.5 – 100.5 mm (3.92 – 3.99 in.) and torque nut to specification.

Dimension "a": 99.5 – 100.5 mm (3.92 – 3.99 in.)

Tightening Torque
(b): 25 N·m 2.5 kg-m, 18.0 lb-ft)

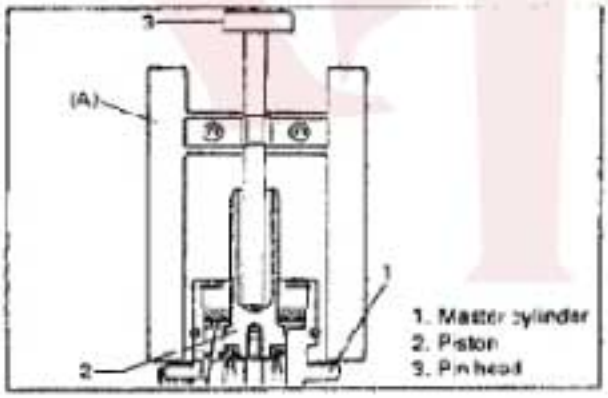
NOTE:
Whenever booster was removed, make sure to check clearance between piston rod and master cylinder piston (For details, refer to following procedure.)



1. Booster piston rod
2. Master cylinder piston

Booster Piston Rod and Master Cylinder Piston Clearance

The length of booster piston rod is adjusted to provide specified clearance "a" between piston rod end and master cylinder piston.

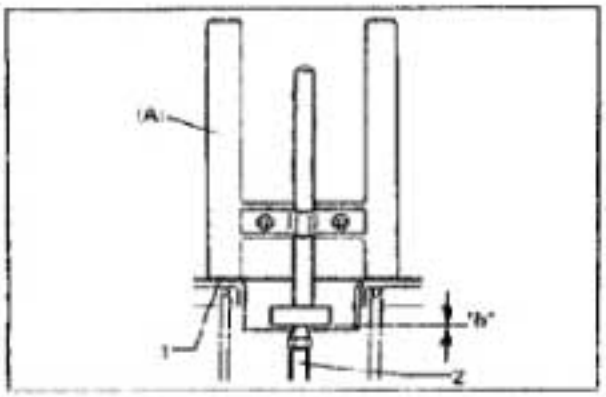


1. Master cylinder
2. Piston
3. Pin head

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Keep inside of booster at atmospheric pressure for measurement.

1) Set special tool (A) on master cylinder and push pin until contacts piston.

Special Tool
(A) : 09950-96010



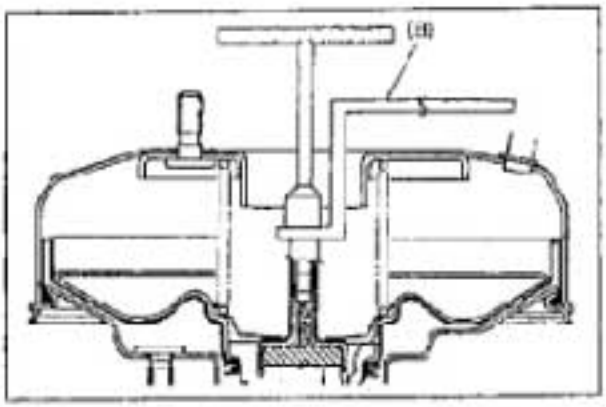
2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod and contacts pin head.

Special Tool
(A) : 09950-96010

Clearance "b" : 0 mm (0 in.)

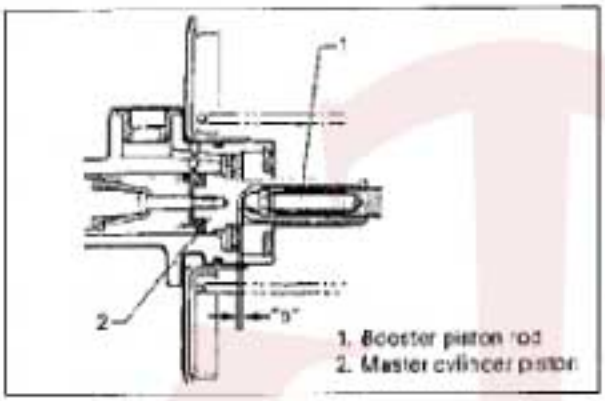
NOTE:
Take measurement with booster set vertically and rod at the center, or with piston rod fixed by screw driver.

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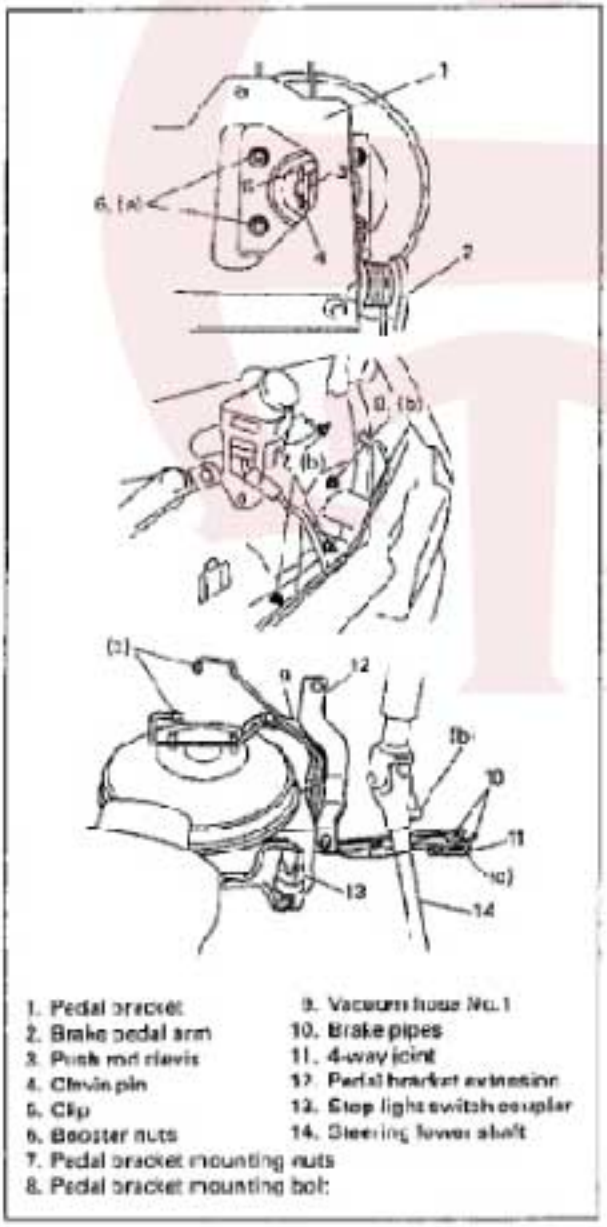
3) Adjust clearance by turning adjusting screw of piston rod.

Special Tool
(B) : 09952-16010



Reference
When adjusted as above, its negative pressure is applied to booster with engine at idle, piston to piston rod clearance "a" should become below.

Clearance "a" : 0.25 - 0.5 mm (0.010 - 0.020 in.)



INSTALLATION
NOTE:
- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (Refer to INSPECTION AND ADJUSTMENT.)**
- **Check length of push rod clevis. (Refer to INSPECTION AND ADJUSTMENT.)**

1) Install booster to pedal bracket. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Tighten booster attaching nuts to specified torque.

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Install pedal bracket to dash panel.
Tighten pedal bracket bolt and nuts to specified torque.

Tightening Torque
(b): 25 N·m (2.5 kg-m, 18.5 lb-ft)

4) Connect clutch cable to clutch pedal arm, refer to CLUTCH CABLE INSTALLATION of Section 7C.
5) Connect vacuum hose No.1 to booster and vacuum hose to vacuum hose No.2.
6) Connect brake pipes to 4 way joint. Flare nuts should not be tightened.
7) Install steering lower shaft.
For detail, refer to Section 3C COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT INSTALLATION.
7) Install pedal bracket extension (For vehicle with ABS).
8) Connect stop light switch lead wire at coupler.
9) Install master cylinder to booster. (Refer to MASTER CYLINDER ASSEMBLY INSTALLATION of this section.)
10) Tighten brake pipes flare nuts to specified torque.

Tightening Torque
(c) : 16 N·m (1.6 kg-m 12.0 lb-ft)

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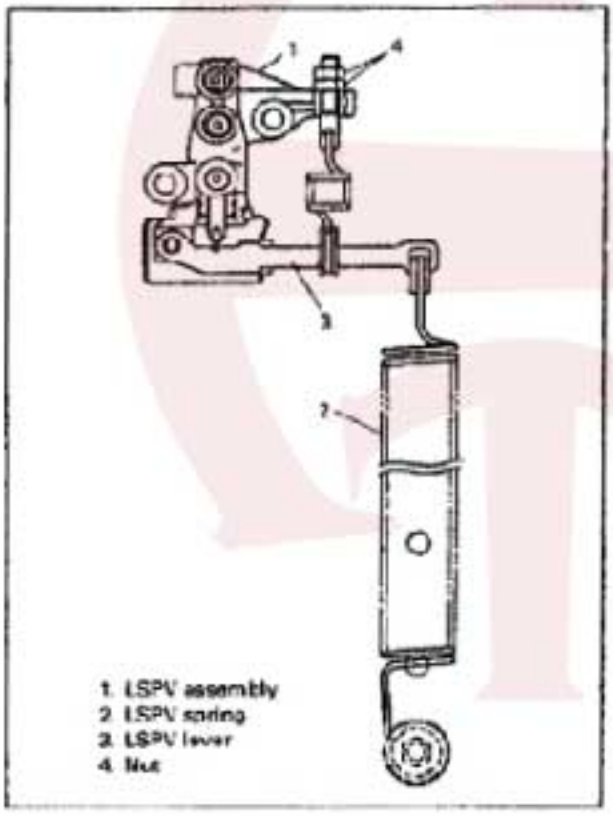
11) Fill reservoir with specified fluid.
12) Bleed air from brake system (refer to BLEEDING BRAKES).
13) After installing, check pedal height and play, refer to EXCESSIVE PEDAL TRAVEL CHECK and BRAKE PEDAL PLAY CHECK.
14) Perform brake test and check each installed part for fluid leakage.



LSPV (Load Sensing Proportioning Valve)

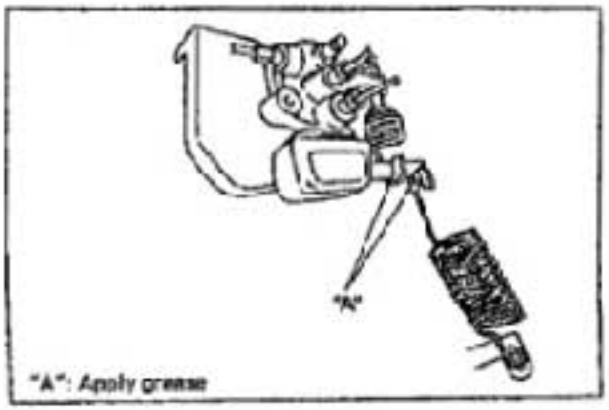
REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.



4) Remove LSPV assembly from LSPV bracket.
5) Remove spring from LSPV lever.

CAUTION:
- **Nuts of LSPV assembly should not be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

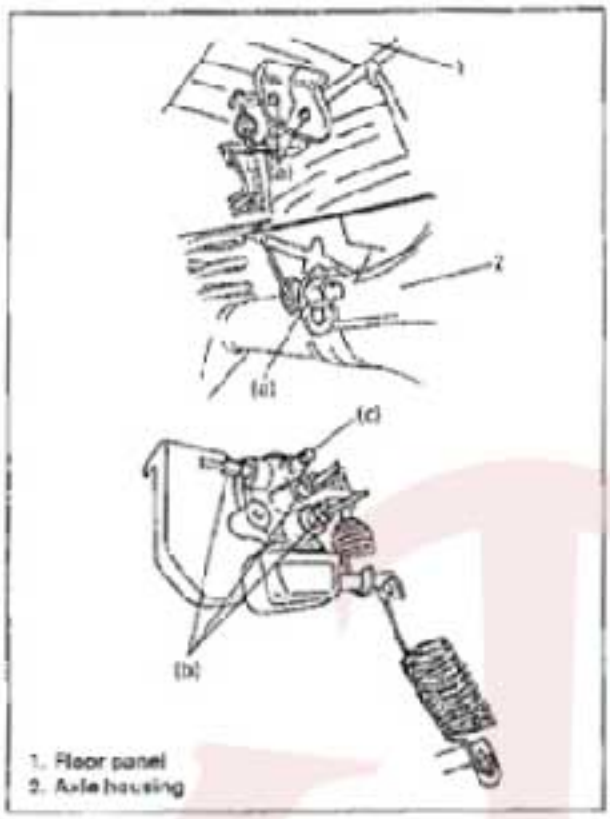


INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, noting the following.
1) Apply multi-purpose grease to upper and lower joint of coil spring.

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1. Floor panel
2. Axle housing

2) Torque each bolt and nut to specification as indicated respectively in figure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)
(c): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

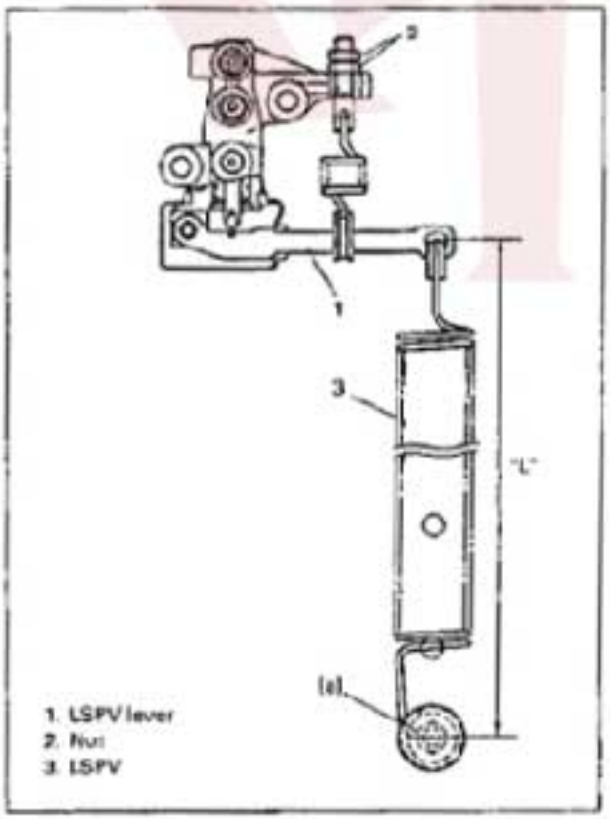
NOTE:
Make sure to bleed air from LSPV bleeder without fail.

4) After bleeding air, check that LSPV in installed properly, referring to following INSPECTION & ADJUSTMENT section.

INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.
- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

With vehicle in above conditions;
1) Place it on level floor.
2) Push up LSPV lever with finger till it stops and measure length of coil spring ("L" in figure) as it is pulled.



1. LSPV lever
2. Nut
3. LSPV

3) Spring length "L" should be as specified below.

Spring length "L" : 312 mm (12.28 in.)

NOTE:
Don't depress brake pedal, when measuring spring length.

4) If it isn't, adjust it to specification by changing bolt (a) tightening positions as shown in left figure. After adjustment, tighten nut to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N-m	kg-m	lb-ft
Brake caliper pin bolt		85	8.5	61.5
Brake caliper carrier bolt		95	9.5	69.0
Front brake flexible hose joint bolt		16	1.6	12.0
Rear brake bolt (Brake back plate bolt)		23	2.3	17.0
Master cylinder nut or booster nut		13	1.3	9.5
Brake booster push rod nut		25	2.5	18.5
Brake pipe 4-way joint nut		11	1.1	8.0
Blend proportioning valve bolt/4-way cross joint bolt		10	1.0	7.5
Brake pipe flare nut		16	1.6	12.0
Brake pedal bracket bolt and nut		25	2.5	18.5
Brake bleeder plug	(Front caliper)	11	1.1	8.0
	(Rear cylinder/LSPV)	8	0.8	6.0
Wheel nut		85	8.5	61.5
Wheel cylinder bolt		12	1.2	9.0
Parking brake lever bolt		20	2.0	14.5
LSPV bolt		23	2.3	17.0
LSPV nut				

REQUIRED SERVICE MATERIALS

MATERIALS	USE
Brake fluid	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Water tight sealant	• To apply to mating surfaces of brake back plate and rear axle housing. • To apply to mating surfaces of brake back plate and parking brake cable
Sealant	• To apply to mating surfeces of brake back plate and rear axle housing.

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SPECIAL TOOLS



09922-85811
Pin remover



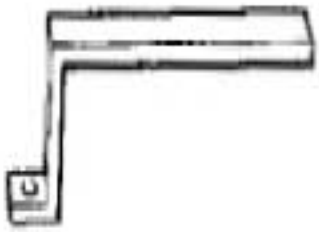
09950-C2210
Brake circuit plug



09950-78210
Flare nut wrench (10 mm)



09956-02310
Fluic pressure gauge



09952-16010
Booster piston rod adjuster



09900-20606
Dial gauge



09900-20701
Magnetic stand



09952-36310
Fluid pressure gauge

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SECTION 6

ENGINE

ENGINE.....6A-1

CARBURETOR **(if equipped)** 6B-1-1

ELECTRONIC INJECTION SYSTEM 6B-2-1

AIR CLEANER, ROUGH FILTER **FUEL PUMP AND FILTER.** ..6C-1

ENGINE COOLING SYSTEM.....6D-1

HEATER 6E-1

IGNITION SYSTEM.....6F-1

STARTER MOTOR.....6G-1

CHARGING SYSTEM.....6H-1

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Engine Disassembly..... 6A-8

Engine Maintenance Service..... 6A-16

Engine reassembly.....6A-34

Engine Inspection and Adjustments.....6A-46

Engine Lubrication.....6A-50

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Description

1) **The engine is a water-cooled, in-line 4 cylinders, 4-stroke cycle gasoline unit with its S. O. H. C. (single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.**

The single overhead camshaft (S. O. H. C.) is mounted over the cylinder head; it is driven from crankshaft through timing belt. Unlike conventional overhead valve (O. H. V.) engine, this engine has no pushrods. Thus, drive for valves is more direct and enables the valves to follow the crankshaft without any delay.

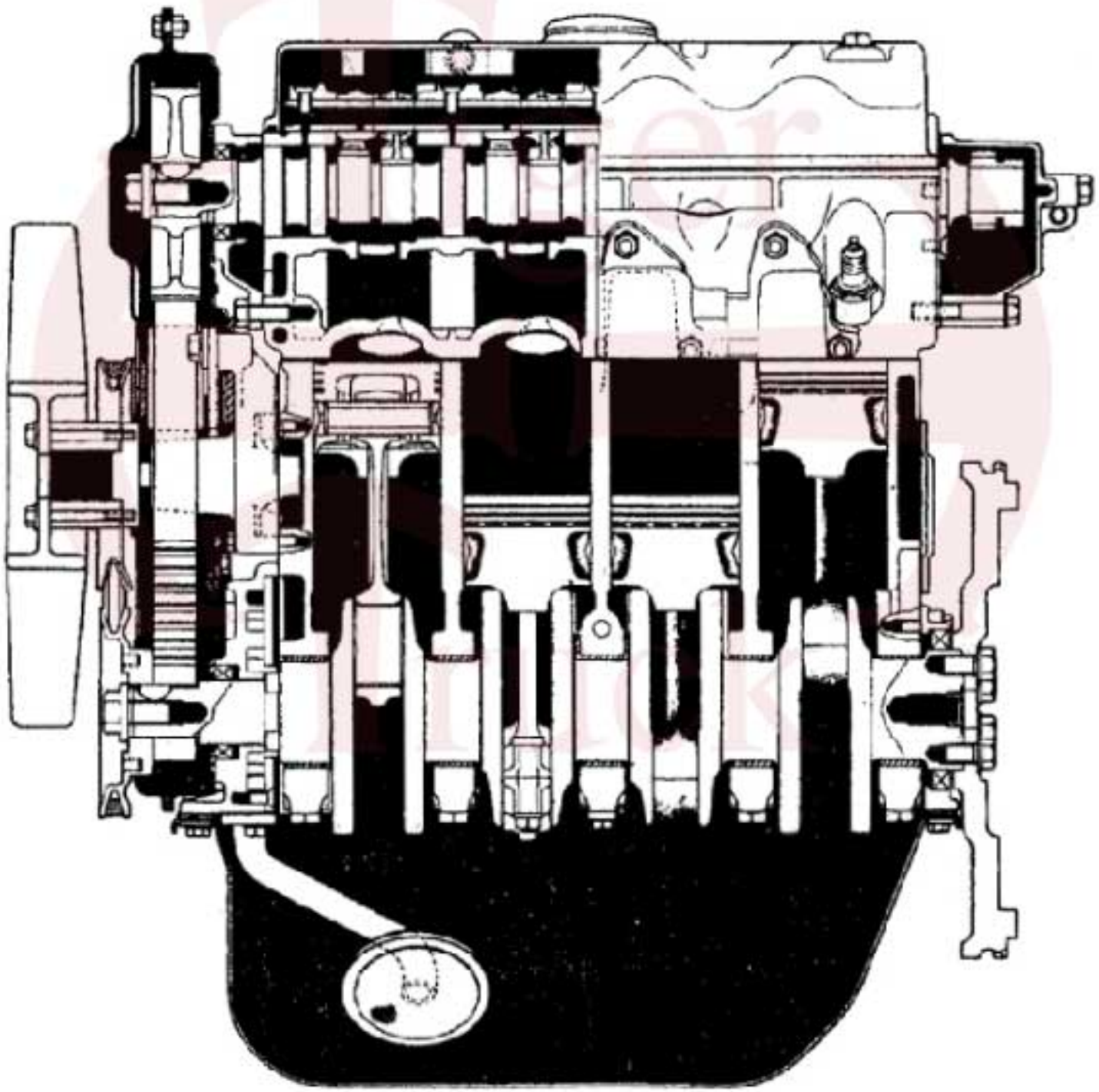


Fig. 3-1

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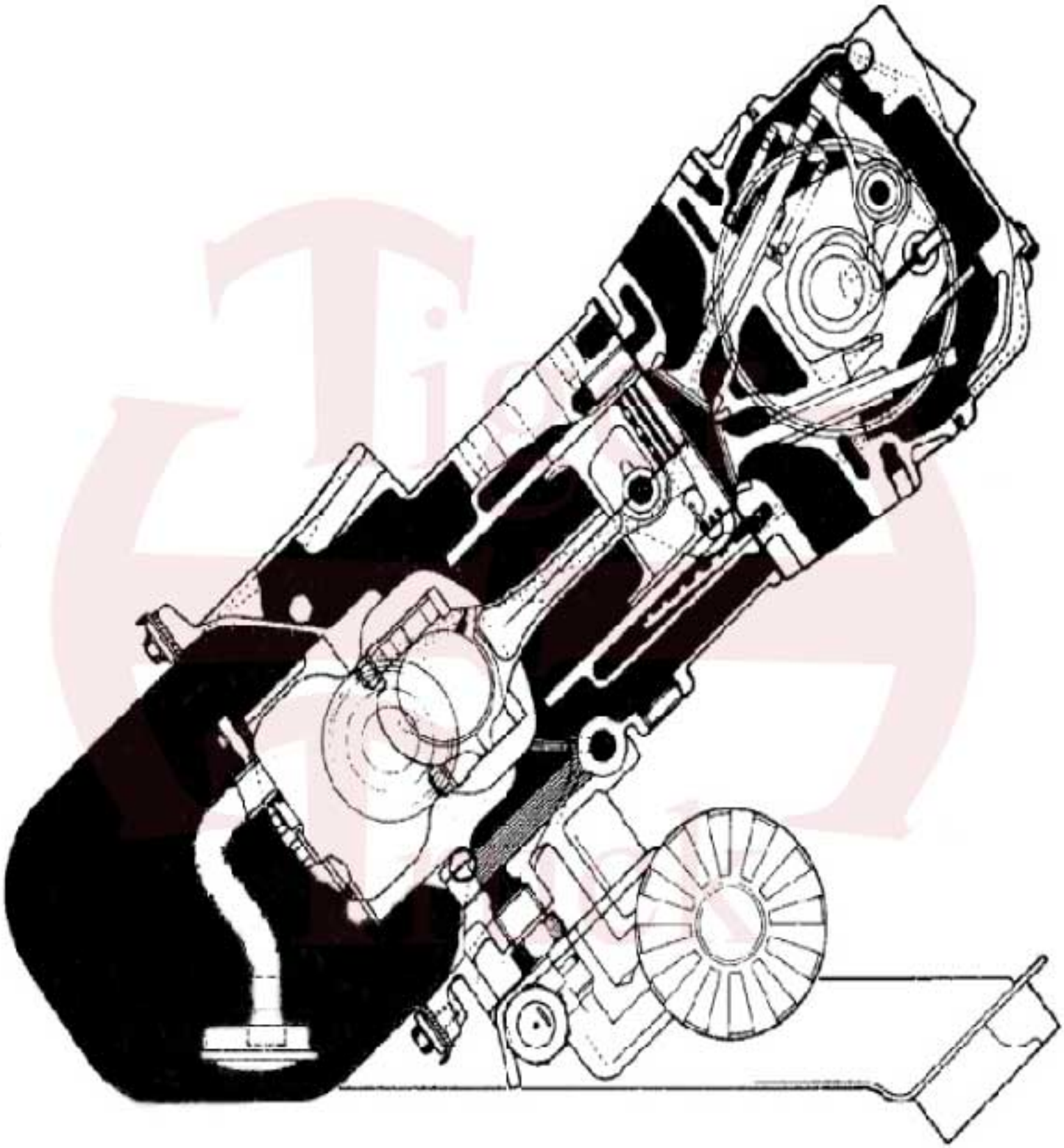


Fig. 3-1-1

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2) The distinctive features of this engine may be summarized as follows:

1. Because of inlet and exhaust ports arranged for cross-flow pattern, with valves located in "V"-type configuration, both volumetric and scavenging efficiencies are very high.

2. The combustion chamber formed between piston crown and cylinder head is of a multi-spherical type shaped to provide squish. This feature is calculated to make available greater horsepower from a lesser amount of fuel.

3. The supports for camshaft and rocker shafts are integral with the cylinder head, so that the valve mechanism noise is markedly reduced by the structural rigidity and, moreover, that the number of valve mechanism parts is reduced, let alone a more compact size of the engine.

4. The timing belt for driving the camshaft runs quiet and is light in weight.

5. A high-grade cast iron is used for the material of the cylinder block. The block is shaped to present deep skirts and retain greater rigidity.

6. The crankshaft is a one-piece forging, and is supported by five bearings for vibration-free running.

7. Heating by hot water is employed for the inlet manifold in order to facilitate fuel carburetion and ensure that uniform distribution of the mixture. The higher combustion efficiency of this engine is largely explained by this inlet manifold feature.

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3) Blowby gas recycling system

Blowby gas passage is provided in the cylinder block to pass the blowby gases from crankcase to cylinder head. In the head cover, an oil separator removes oil particles from the gases before the gases are drawn into the air cleaner.

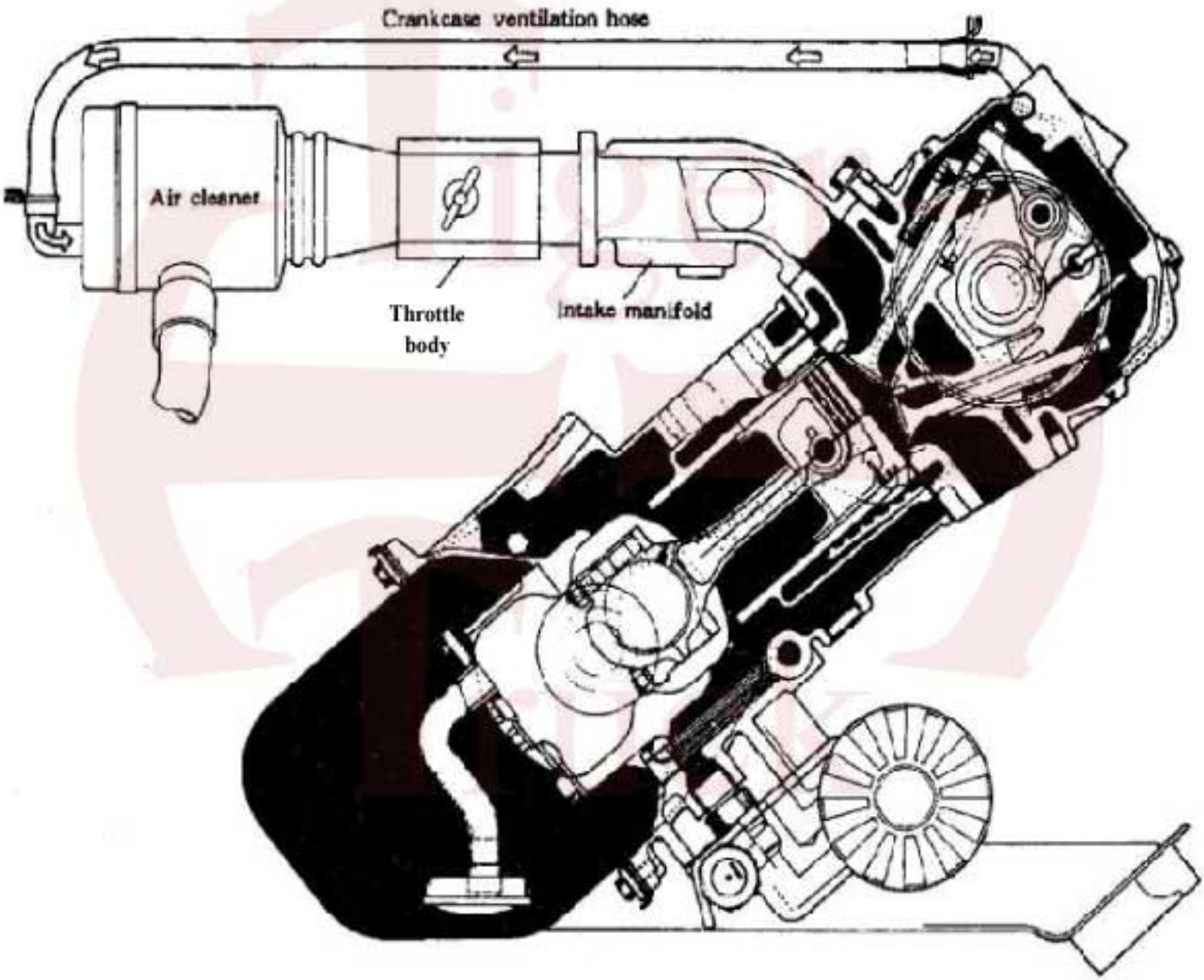


Fig. 3-2

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Engine Services Not Requiring Engine Removal

The following parts or components do not require engine removal to receive services (replacement, inspection or adjustment):

Part or Component	Nature of Service
1. Spark plug	Replacement or inspection
2. Distributor	Replacement, inspection or adjustment
3. Exhaust manifold	Replacement or inspection
4. Oil filter	Replacement
5. Oil pressure sensor unit	Replacement
6. Cylinder head cover	Replacement
7. Rocker shaft	Replacement or inspection
8. Rocker-arm	Replacement or inspection
9. Rocker-arm spring	Replacement or inspection
10. Camshaft (needing cylinder head removal)	Replacement or inspection
11. Cylinder head	Replacement or inspection
12. Radiator	Replacement or inspection
13. Cooling fan	Replacement
14. Camshaft timing belt pulley	Replacement or inspection
15. Cranshaft timing belt pulley	Replacement or inspection
16. Timing belt	Replacement or inspection
17. Fuel pump	Replacement
18. Carburetor (if equipped)	Replacement, inspection or adjustment
19. Intake manifold	Replacement
20. Alternator	Replacement or inspection
21. Starter motor	Replacement or inspection
22. Fan belt	Replacement, inspection or tension adjustment
23. Water pump	Replacement
24. Pulleys (crank, generator, fan)	Replacement
25. Timing belt cover	Replacement
26. Water hose	Replacement or inspection
27. Oil pump, piston, piston ring and connecting rod	Replacement or inspection

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Dismounting the Engine

1. Remove the engine service cover panel on the bed floor.
2. Remove the engine under cover.
3. Loosen two drain plugs, one on the bottom of radiator and one on the cylinder block, to drain the cooling water.
4. Disconnect negative (—) and positive (+) cords from the battery terminals.
5. Disconnect the lead wire from the water temperature gauge.
6. Disconnect the harness coupler from the alternator terminals.
7. Disconnect the primary wire (white/black) from the distributor terminal.
8. Remove the distributor cap and rotor from the distributor.
9. Disconnect the fuel hoses from the fuel pump body.
10. Disconnect the warm air hose (optional), if one is attached.
11. Disconnect the accelator cable from the carburetor body.
12. Disconnect the choke cable from the carburetor body.
13. Take out the crankcase ventilation hose from the cylinder head cover.
14. In case of machine equipped with optional car-heater, disconnect the inlet and outlet heater hoses at the joining part.
15. Disconnect the radiator inlet hose from the thermostat cap.
16. Remove the air cleaner case ass' y.
17. Disconnect the fuel return hose from the carburetor body.
18. Disconnect the radiator outlet hose from the water inlet pipe.
19. Disconnect the lead wire (brown/green) from the oil pressure unit, and remove the lead wire clamps.
20. Disconnect the clutch cable from the engine mounting member and clutch lever.
21. Remove the muffler from the exhaust pipe and then from the chassis.
22. Remove the propeller shaft.
23. Disconnect the speedometer cable from the transmission case (extension case).
24. Disconnect the back up lamp switch lead wire at the coupler.
25. Disconnect the gear shift and select control rods from the joints on the extension case.
26. Disconnect the lead wire (white /brown) and (+) cord from the starter motor.
27. Disconnect the battery ground (—) cord from the transmission case.
28. Remove the radiator lower shroud.
29. Jack up the body placing the jack between the engine and tranamission.
30. Remove the transmission mounting bracket from the chassis frame.
31. Remove the engine mounting brackets from the chasssis frame.

CAUTION:
Before starting to take down the engine check around once again to be sure that there is no connection left undone.

33. Take down the engine.

CAUTION:
Make sure to avoid the engine cooling fan from touching against the shroud panel in removing the engine.

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Throughout this MANUAL, the four cylinders of the engine are identifie.. y numbers; No. 1, No. 2, No. 3 and No. 4 as counted from front end.

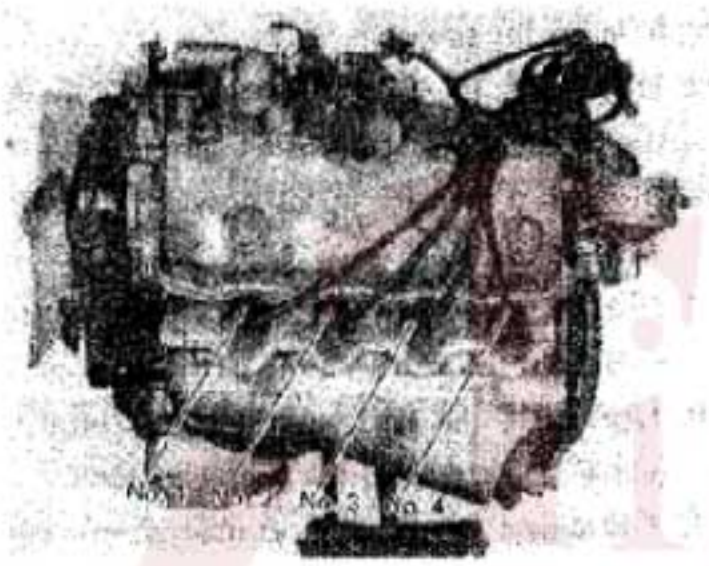


Fig. 3-3

Engine Disassembly

NOTES;

- **Observe critically before starting to remove a component or part by loosening bolts, nuts and the like. What you may find before and during disassembly is valuable information necessary for successful reassembly.**
- **Be careful in handling aluminum-alloy parts. They are softer than steel or cast-iron parts and their finished surfaces more easily take scratch marks.**
- **Have trays and pans ready for setting aside the disassembled parts in an orderly manner. place the parts in the trays and pans in such a way that they can be readily identified. Put match marks or tags on them, as necessary, so that they will go back to where they came from.**

Carry out engine disassembly in the following sequence;

Loosen drain plug and drain out engine oil.



Fig. 3-4

Remove clutch cover.

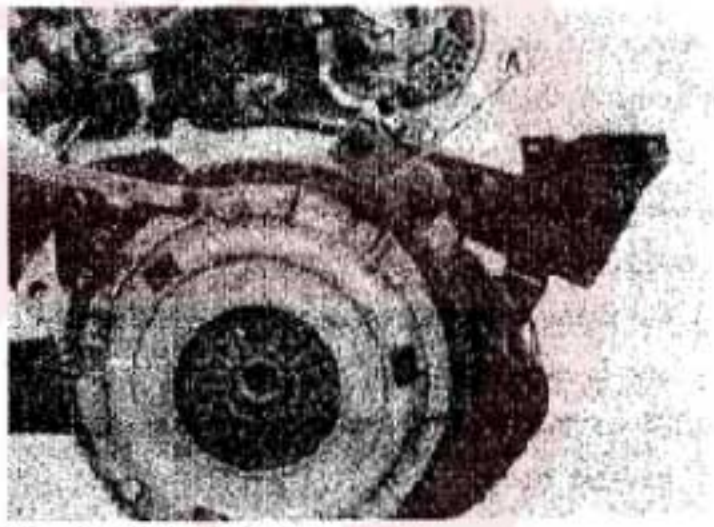


Fig. 3-5 Ⓐ Flywheel stopper

Remove distributor assembly.

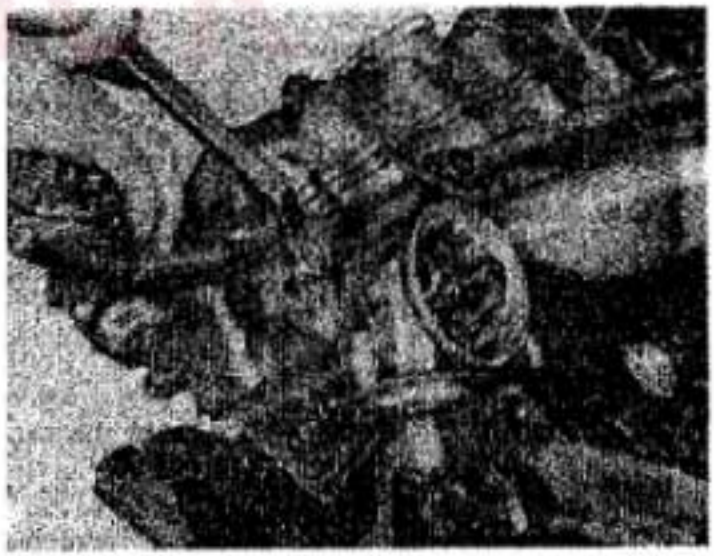


Fig. 3-6

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Remove fuel pump.

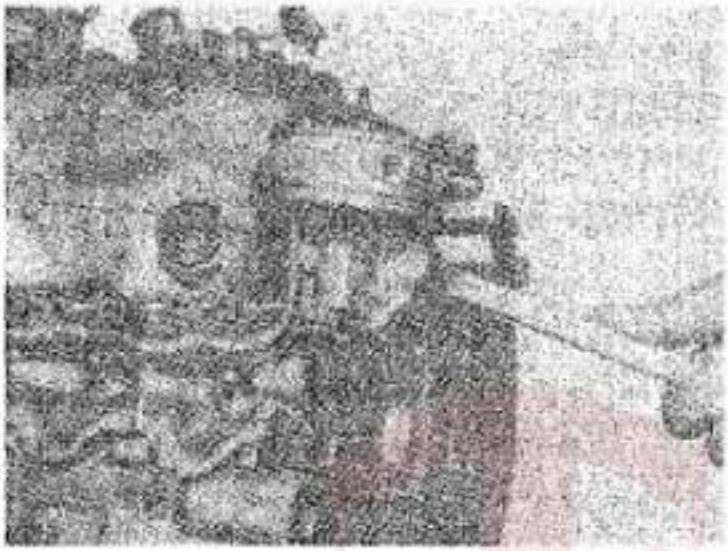


Fig. 3-7

Take down distributor case.



Fig. 3-8

Remove cooling fan.

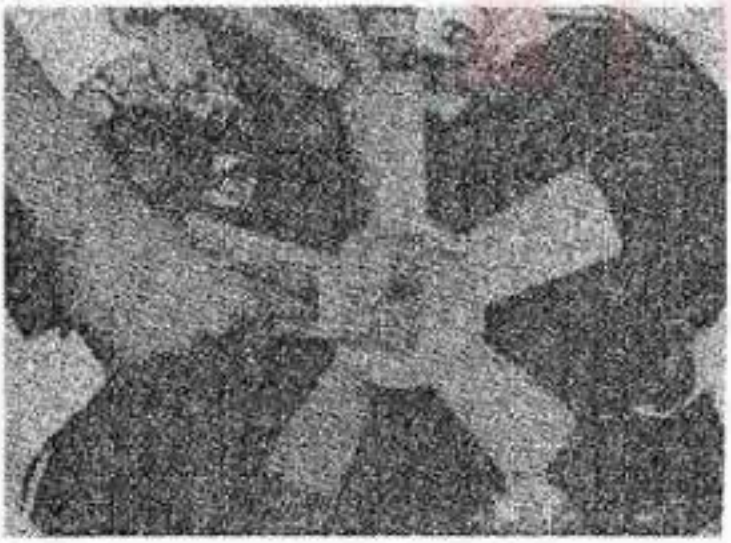


Fig. 3-9

Take down alternator.



Fig. 3-10

Remove alternator mounting stay.

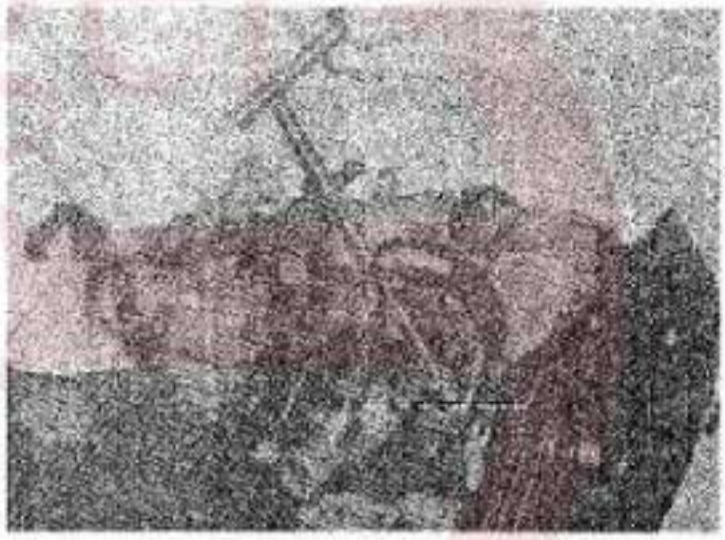


Fig. 3-11

Remove thermostat cap.



Fig. 3-12

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Remove crank pulley similarly, with special tool (A) (flywheel stopper) hitched to flywheel so that crankshaft will not turn.

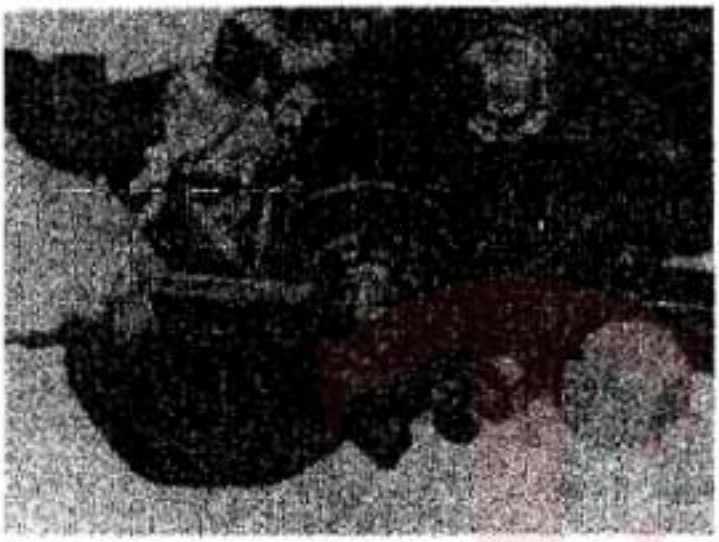


Fig. 3-13

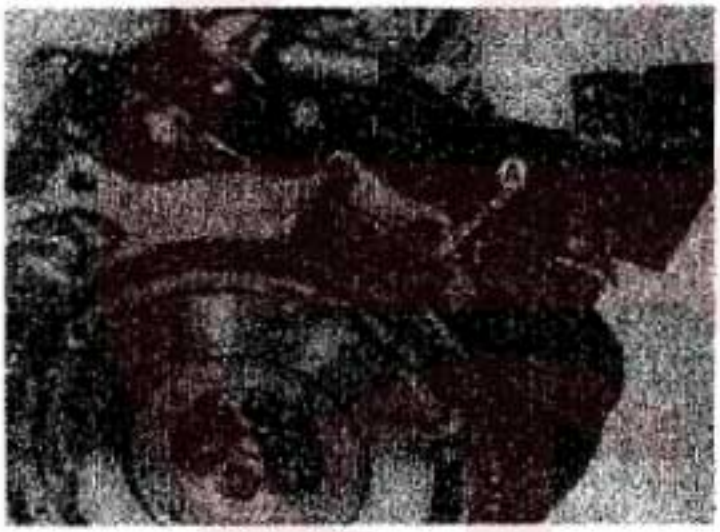


Fig. 3-14

Remove outside cover on timing belt.



Fig. 3-15

Remove timing belt tensioner.

CAUTION:

Before removing the tensioner, turn over the crankshaft to bring its keyway ① to a point between 80° and 100° on the left side of mark ② provided on the timing belt inside cover. See Fig. 3-16. This positioning is necessary in order to prevent the piston crown from coming into contact with the valve. The valve could be damaged if this contact should occur. Never rotate camshaft or crankshaft before the cylinder head or rocker arms are removed.



Fig. 3-16

Remove timing belt.



Fig. 3-17

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Remove the camshaft timing belt pulley, with special tool (camshaft lock holder) attached, as shown, to lock the camshaft.

CAUTION:
Do not rotate camshaft when removing the pulley.



Fig. 3-18

Similarly remove the crankshaft timing belt pulley.



Fig. 3-19

After removing the pulley key, take out timing belt guide.



Fig. 3-20

Take down timing belt inside cover.



Fig. 3-21

Remove cylinder head front side case.



Fig. 3-22

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Remove water pump case.

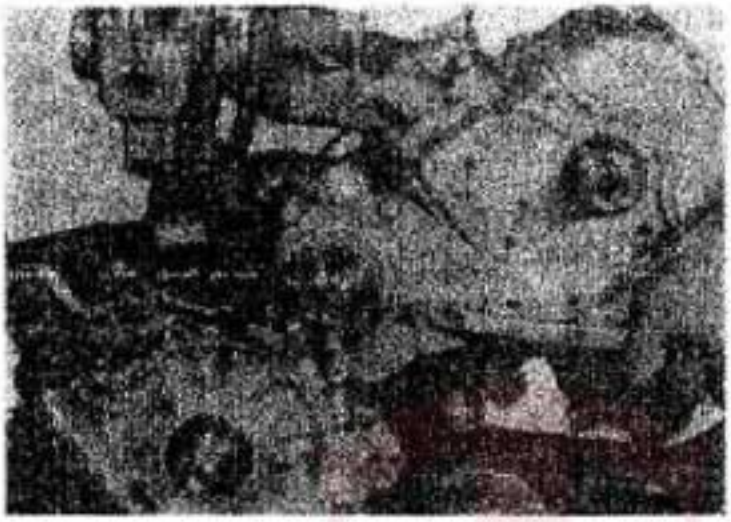


Fig. 3-23

Remove exhaust manifold cover.

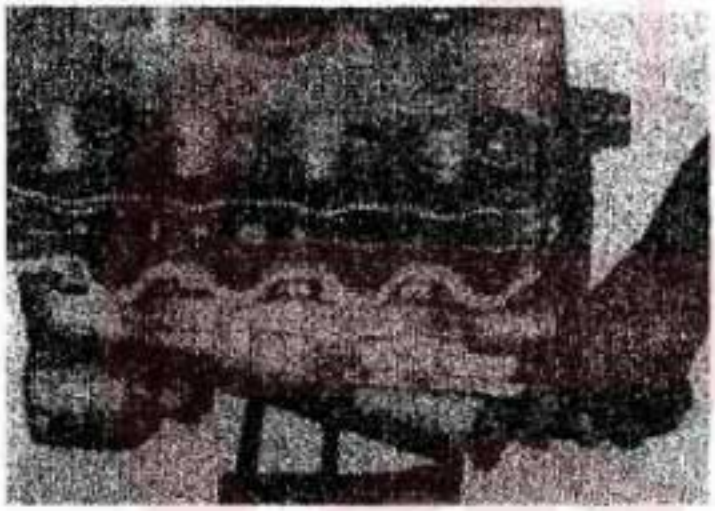


Fig. 3-24

Take off exhaust manifold and its gasket.

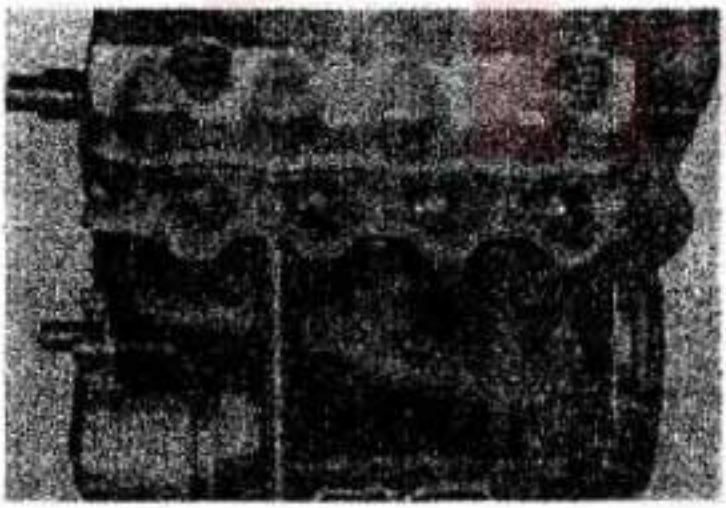


Fig. 3-25

Using special tool (oil filter wrench Ⓐ), to remove oil filter.

NOTE:

Be careful not to spill the oil when removing the filter.

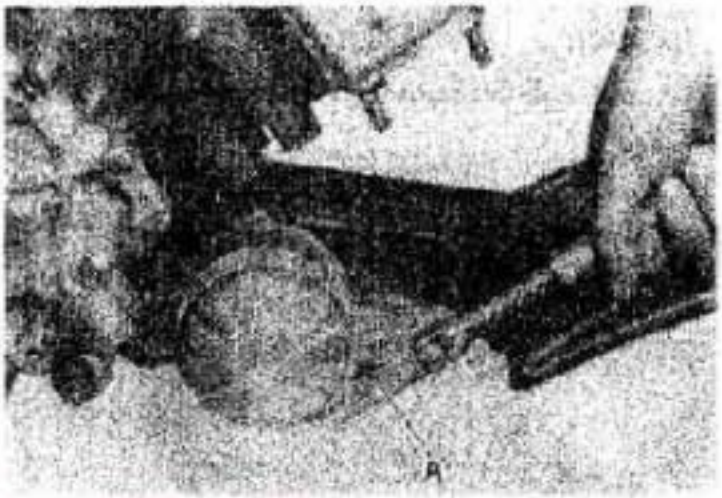


Fig. 3-26

Draw bypass hose off inlet manifold.

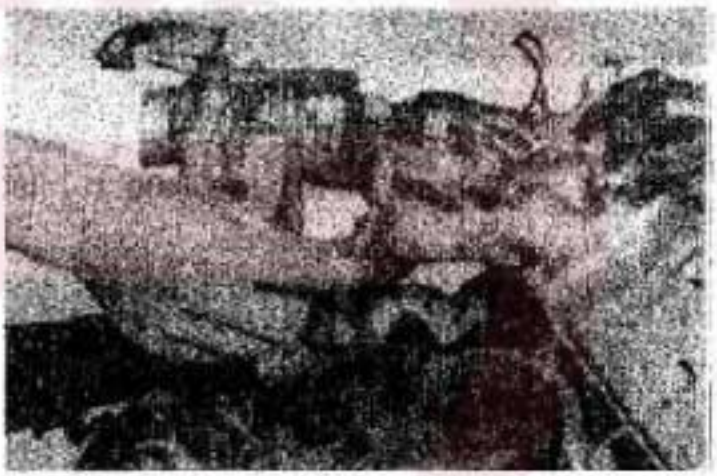


Fig. 3-27

Take down inlet manifold.



Fig. 3-28

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Remove water inlet pipe.



Fig. 3-29

Take off cylinder head cover.

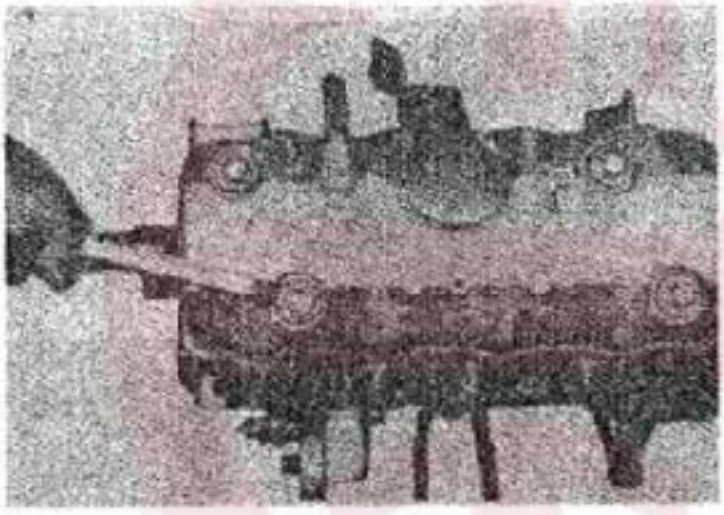


Fig. 3-30

Loosen the 8 valve adjusting screws fully. Leave the screws in place.

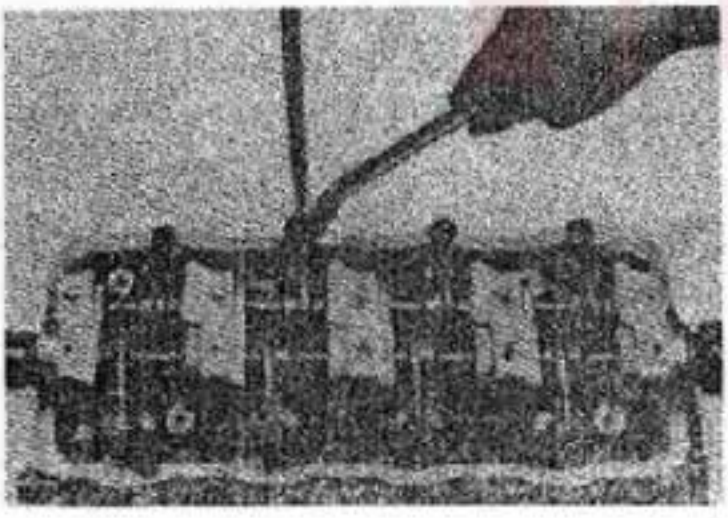


Fig. 3-31

Loosen rocker arm shaft securing screws : there are 10 screws.



Fig. 3-32

While drawing out rocker arm shaft, separate valve rocker arms and rocker arm springs.

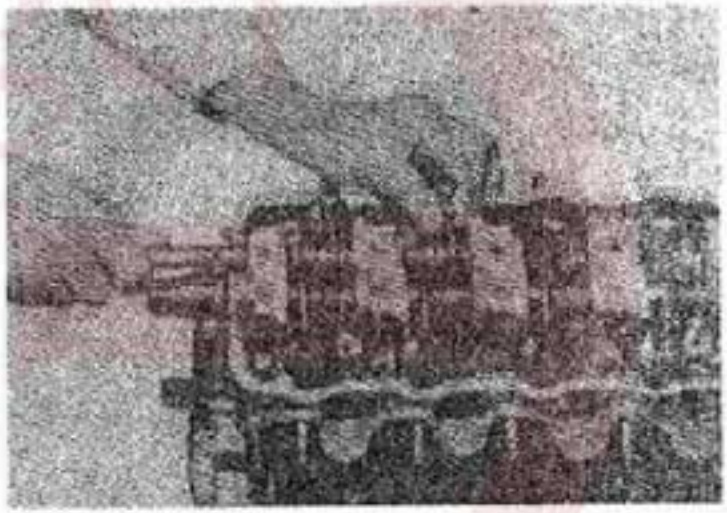


Fig. 3-33

Remove camshaft thrust plate, and draw camshaft out toward front end.

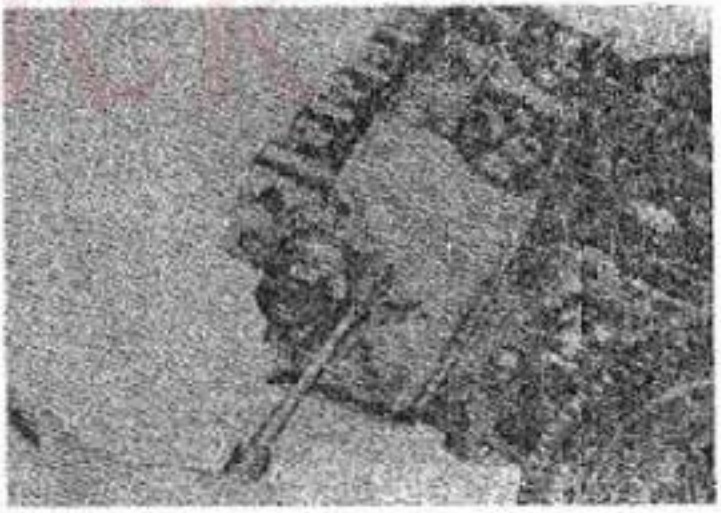


Fig. 3-34

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Remove cylinder head.



Fig. 3-35

Use valve lifter Ⓐ (*09916-14510*) to compress the valve spring in order to free valve cotter pieces for removal. In this way, remove valve spring and valves.

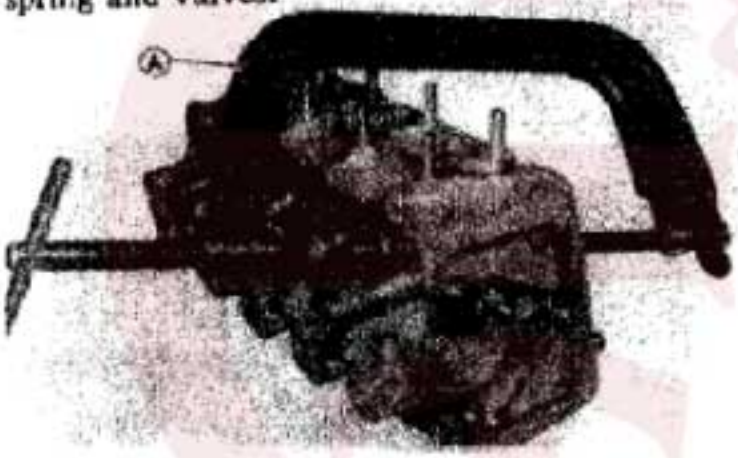


Fig. 3-36

Remove flywheel, using special tool Ⓐ (*09916-97910*) as shown.

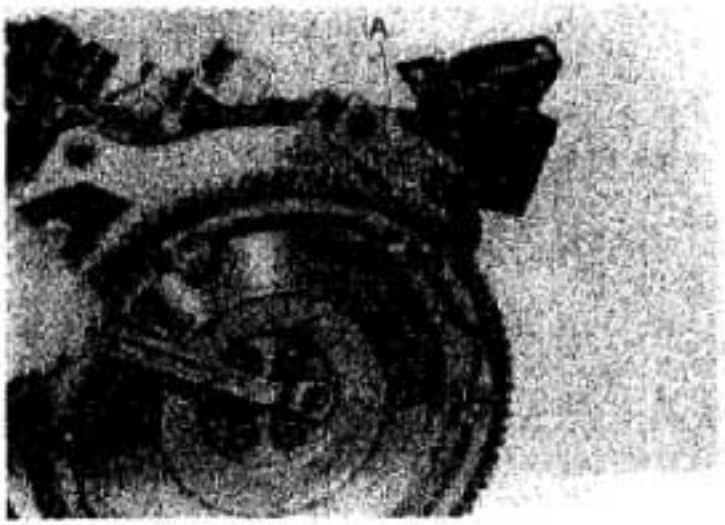


Fig. 3-37

Remove alternator bracket.

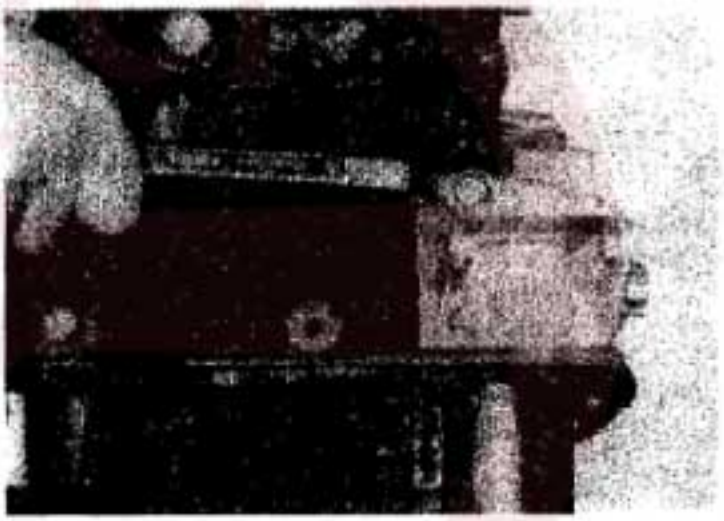


Fig. 3-38

Remove engine mounting bracket from cylinder block. (R, L)

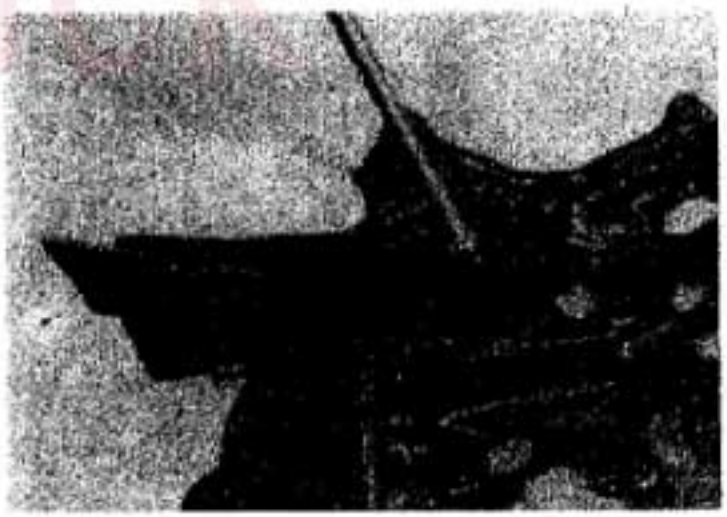


Fig. 3-39

Take down oil pan.

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Fig. 3-40

Remove oil pump strainer.

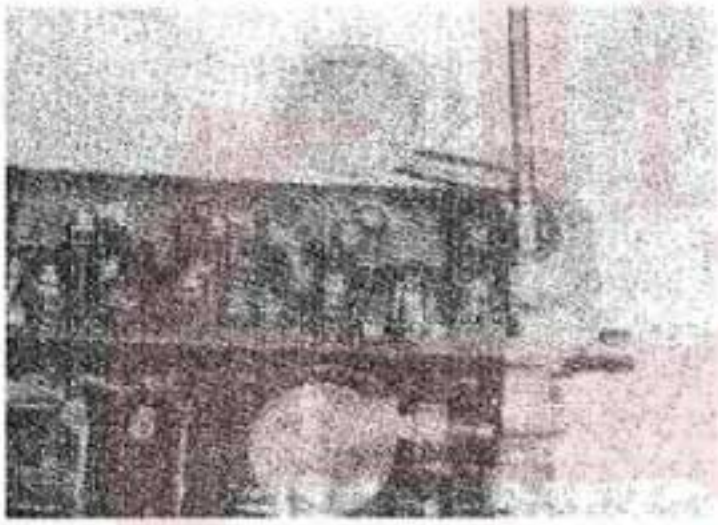


Fig. 3-41

As the first step of crankshaft removal, remove the connecting rod caps for No. 2 and No. 3 cylinders, and take out pistons, each complete with its connecting rod, from cylinder head side.

CAUTIONS;

- Before pulling the piston out, scribe the cylinder number on its crown.
- Never drive on the big end in an attempt to force the piston out. If driving is necessary to ease the big end off crankpin, run stud bolts into the big end and drive on the bolts with a mallet handle.
- Be sure to identify each bearing cap for its connecting rod by using the cylinder number. Set the cap and rod aside in combination.

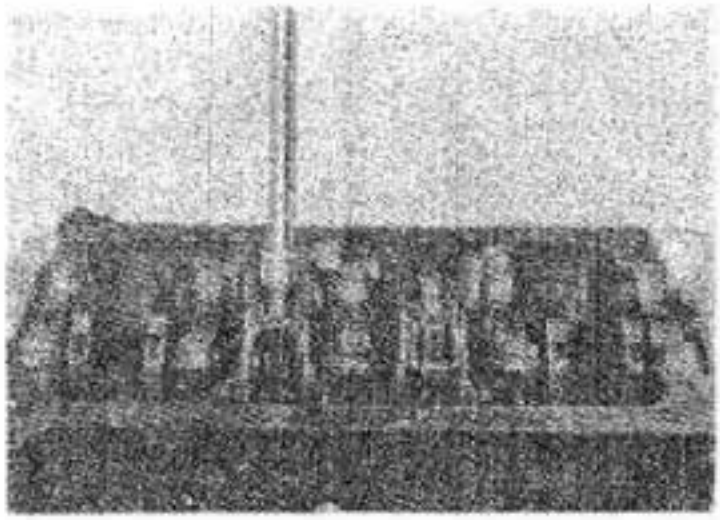


Fig. 3-42

Remove the connecting rod caps for No. 1 and No. 4 cylinders and, as mentioned above, take out the pistons and connecting rods.

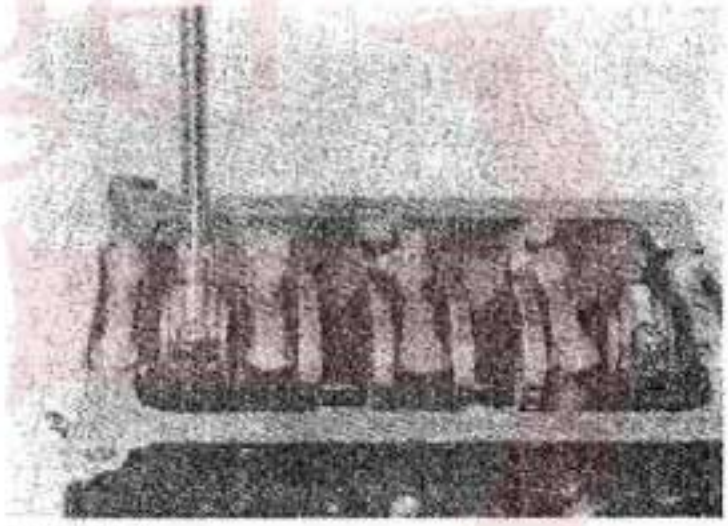


Fig. 3-43

Remove crankshaft rear oil seal assy.

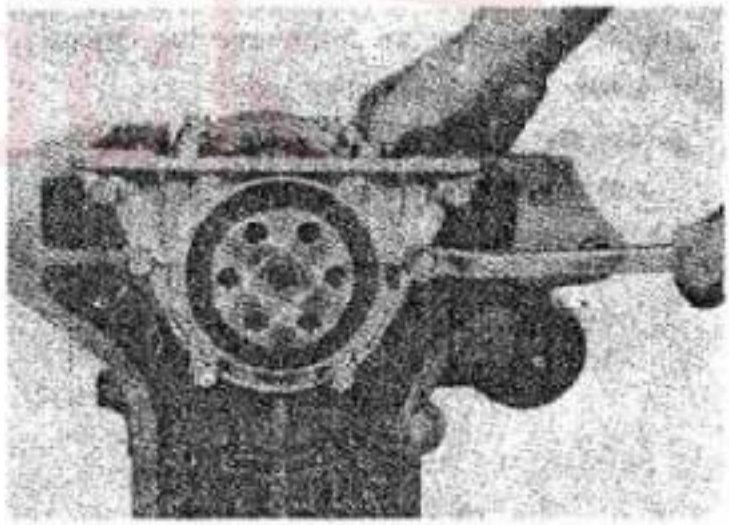


Fig 3-44

Remove crankshaft bearing caps, and take out crankshaft.

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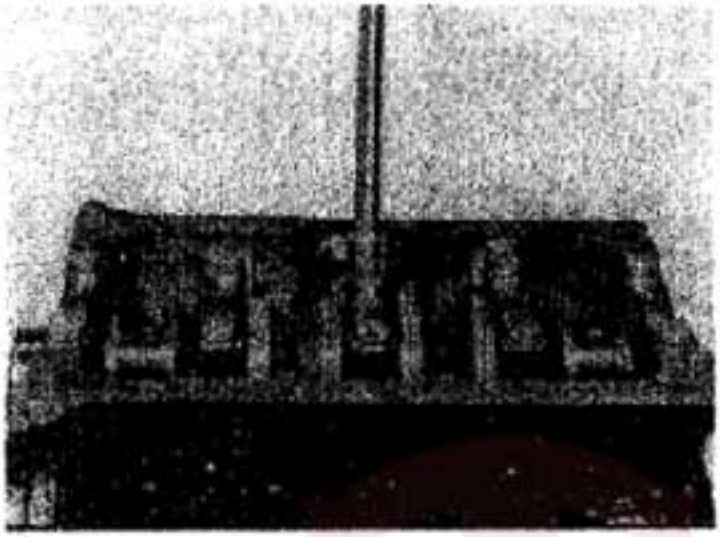


Fig. 3-45

From each piston, ease out piston pin circlips, as shown.



Fig. 3-46

Force piston pin out.

CAUTIONS:

- Before removing the pin, scribe the cylinder number on the connecting rod.
- Set the piston, piston pin and connecting rod, together with cap, in the tray or pan as a combination.

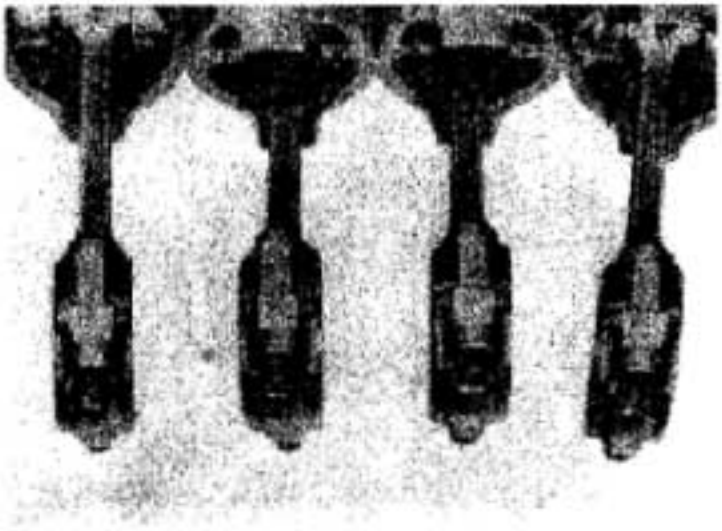


Fig. 3-47

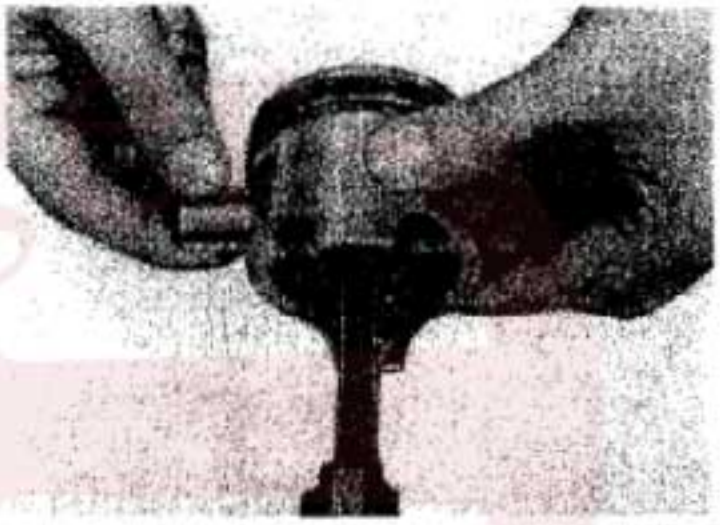


Fig. 3-48

Engine Maintenance Service

NOTES:

- During and immediately after disassembly, inspect the cylinder block and head for evidence of water leakage or damage and, after washing them clean, inspect more closely.
- Wash all disassembled parts clean, removing grease, slime, carbon and scales, before inspecting them to determine whether repair is necessary or not.
  Be sure to de-scale the water jackets.
- Use compressed air to clear internal oil holes and passages.
- Do not disturb the set combinations of valves, bearings and bearing caps, etc. Have the sets segregated and identified.

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Cylinder head

●De-carbon the cylinder head:

Deposits of carbon will be found on its combustion chamber surfaces and exhaust ports. Remember, overheating tendency and loss of output are often due to excessive carbon accumulation. De-carbon the valves, too.

NOTE:
Do not use any sharp-edged tool to scrape off the carbon. Be careful not to scuff or nick the metal surfaces when de-carboning.

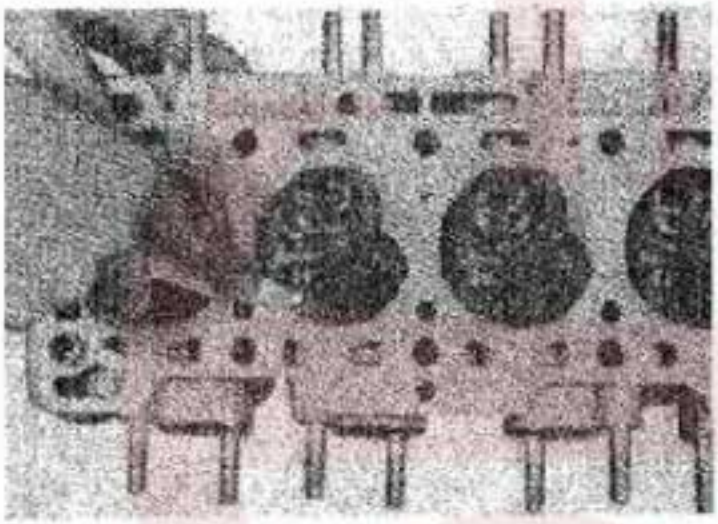


Fig. 3-49

●Flatness of gasketed surface:

Using a straightedge and thickness gauge, check the flatness at a total of 6 locations. If the limit, stated below, is exceeded, correct the gasketed surface with a surface plate and sandpaper of about # 400; place the sandpaper on and over the surface plate and rub the gasketed surface against the sandpaper to grind off high spots. Should this fail to reduce the thickness gauge readings to within the limit, replace the cylinder head.

Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface; such leakage results in reduced power output and hence a higer cost of fuel per kilometer.

Limit on flatness	under 0. 05mm (0. 002in.)

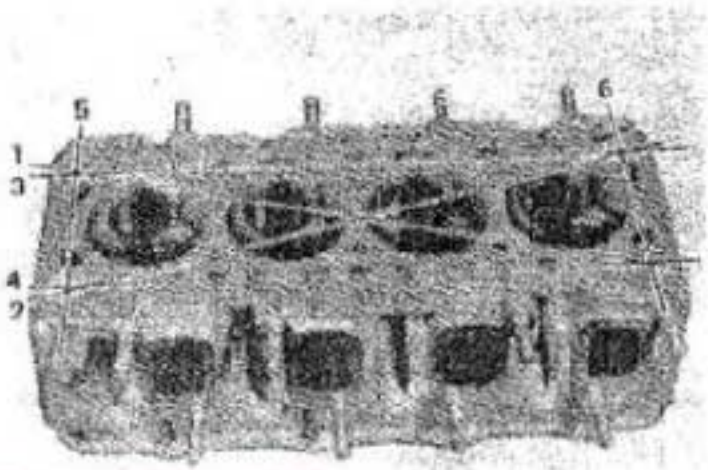


Fig. 3-50



Fig. 3-51

●Flatness of manifold seating faces:

Check the seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or the cylinder head replaced.

Limit on flatness	under 0. 10mm (0. 004in.)

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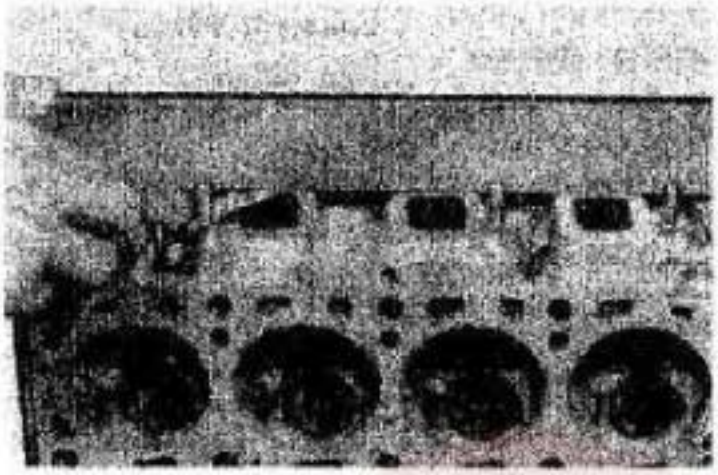


Fig. 3-52 Checking exhaust manifold seating face for flatness

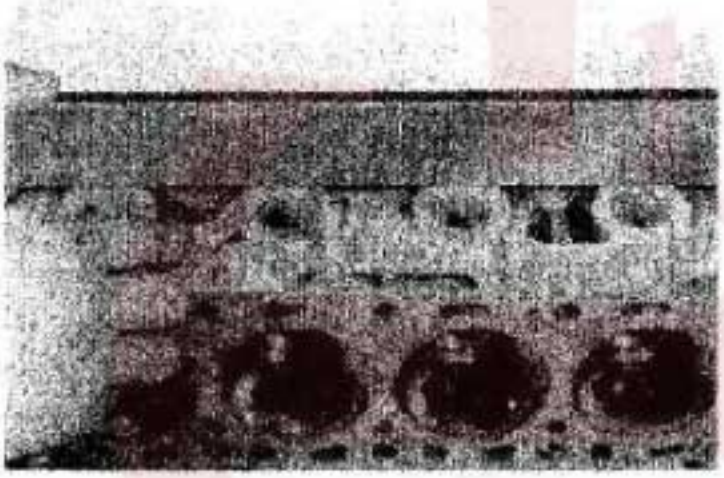


Fig. 5-53 Checking inlet manifold seating face for flatness

(The checking method of the flatness of exhaust manifold seating faces is the same above.)

Rocker-arm shaft and rocker arms

●Wear:

Check these parts for wear and, as necessary, replace them. The extent of wear is determined on the basis of two readings, one on rocker arm I. D. and the other on shaft diameter.

NOTE:
Use a micrometer on rocker-arm shaft and a caliper on rocker arm. The difference between the two readings is the arm-to-shaft clearance on which a limit is specified. If the limit is exceeded, replace shaft or arm, or both.

Item		Standard	Limit
Rocker arm I. D.		14. 985-15. 005mm (0. 590-0. 591in.)	
Rocker-arm shaft dia.		14. 965-14. 980mm (0. 589-0. 590in.)	
Arm-to-shaft clearance	Inlet	0. 005-0. 040mm (0. 0002-0. 0016in.)	0. 07mm (0. 0027in.)
	Exhaust	0. 005-0. 040mm (0. 0002-0. 0016in.)	0. 07mm (0. 0027in.)

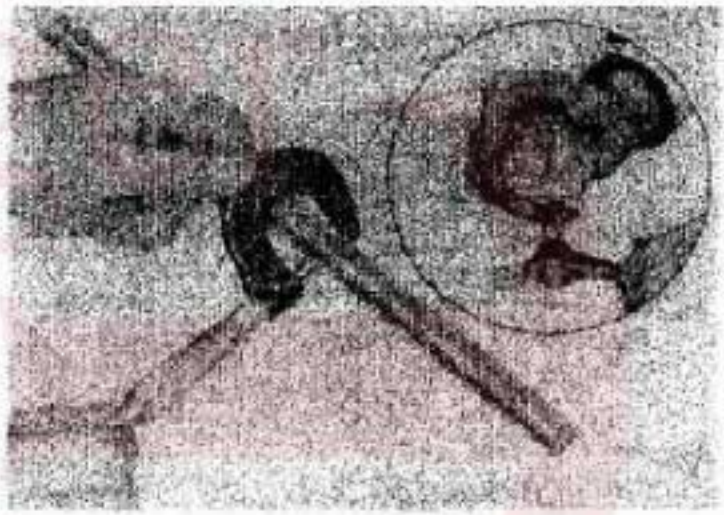


Fig. 3-54

●Rocker-arm shaft deflection:

Using "V" blocks and a dial gauge as shown in Fig. 3-55 , check the shaft for straightness in terms of deflection. If the limit is exceeded, correct it by cold-working with a wooden mallet or replace it.

Deflection limit	under 0. 06mm (0. 0023in.)

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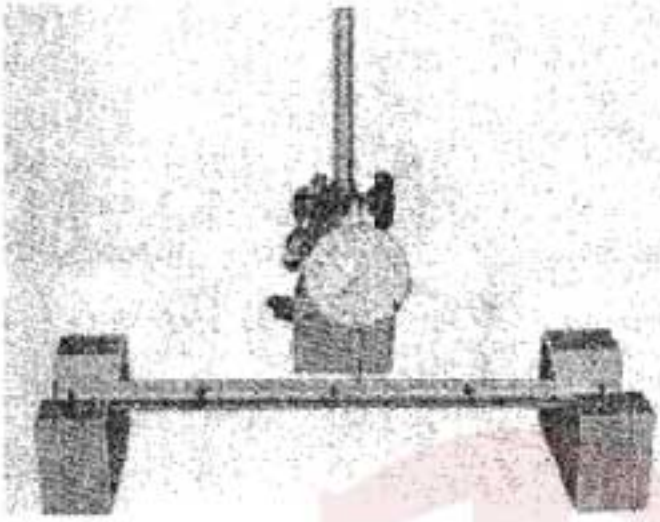


Fig. 3-55

● If the tip ① of adjusting screw ② is badly worn, replace the screw. The arm must be replaced if its cam-riding face ③ is badly worn.



Fig. 3-56

● Visually examine each rocker-arm spring for evidence of breakage or weakening. Be sure to replace springs found in bad condition.

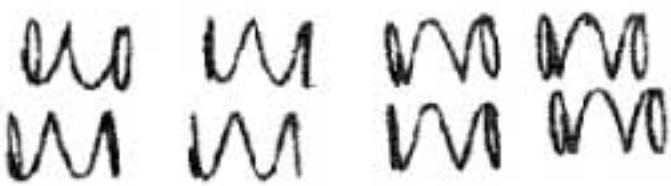


Fig. 3-57
Valve guides

● Using a micrometer and caliper, take diameter readings on valve stems and guides to determine the stem clearance in the guide. Be sure to take a reading at three places along the length of each stem and guide, as shown in Fig. 3-58.

Item		Standard	Limit
Valve stem diameter	Inlet	6.965-6.980mm (0.2742-0.2748in.)	-
	Exhaust	6.955-6.970mm (0.2738-0.2744in.)	
Valve guide I.D.	Inlet	7.000-7.015mm (0.2755-0.2761in.)	-
	Exhaust	7.000-7.015mm (0.2755-0.2761in.)	-
Stem-to-guide clearance	Inlet	0.020-0.050mm (0.0008-0.0019in.)	0.07mm (0.0027in)
	Exhaust	0.030-0.060mm (0.0012-0.0023in.)	0.09mm (0.0035in.)

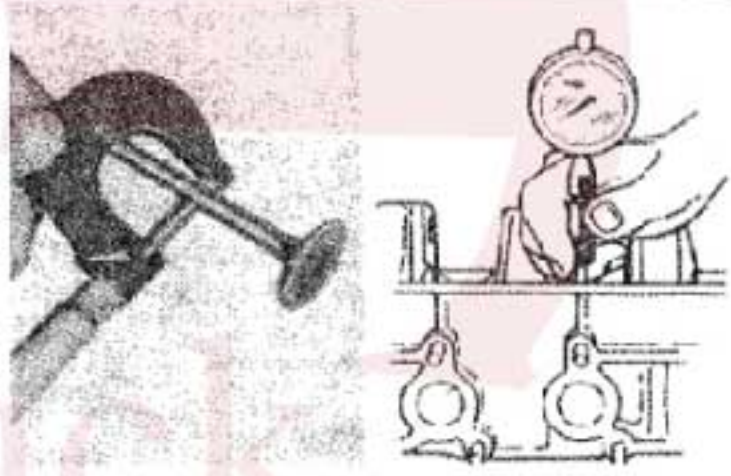


Fig. 3-58

If the caliper like the one shown in Fig. 3-58 is not available, check the end deflection of the valve stem in place with a dial gauge rigged as shown in Fig. 3-59. Move the stem end in the directions ④ ⑤ and determine whether replacement is necessary or not, by referring to these limiting values.

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Valve stem end deflection	Inlet	0. 12mm (0. 0047in.)
	Exhaust	0. 16mm (0. 0063in.)

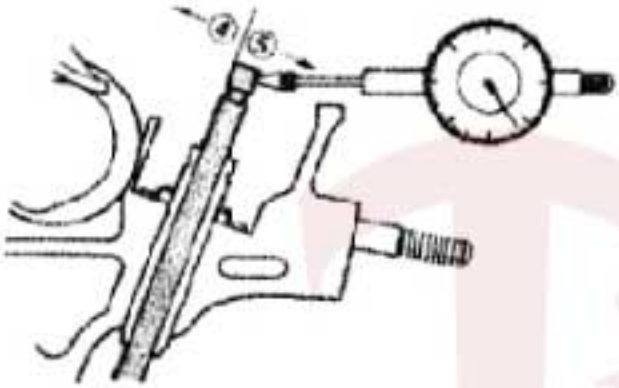


Fig. 3-59

●Valve guide replacement;

Valve guides are shrink-fitted. The method of removal and installation is as follows;

1) Using the guide remover (valve guide remover)drive the valve guide out to remove it from the top side of cylinderhead. After driving the guide out, ream the guide hole with a 12 mm (0. 472 in.)reamer (Special tool -valve guide reamer) to remove burrs, making sure that the hole diameter after reaming comes within this range;

Valve guide hole diameter	Inlet	12. 030-12. 048mm (0. 4736-0. 4743in.)
	Exhaust	



Fig. 3-60

2) Heat the cylinder head uniformly to anywhere between 80℃ and 100℃ (176°F-212°F) so that the head will not distort, and drive the oversize guide into the hole with the valve guide installer set Ⓑ . See Fig. 3-61. Be sure to carry out this step speedily so that all guides will go into the cylinder head in steady temperature state.

Valve guide oversize	0. 03mm(0. 0012in.)
Valve guide protrusion l	16. 5mm(0. 649in.)



Fig. 3-61

NOTE;
Valve guide length both for INLET and EXHAUST is the same. It is 48 mm.

3)Check all valve guides and, stems in place for I. D. and, if the clearance reading indicates too small, ream the guide I. D. with the reamer Ⓒ as shown in Fig. 3-62.

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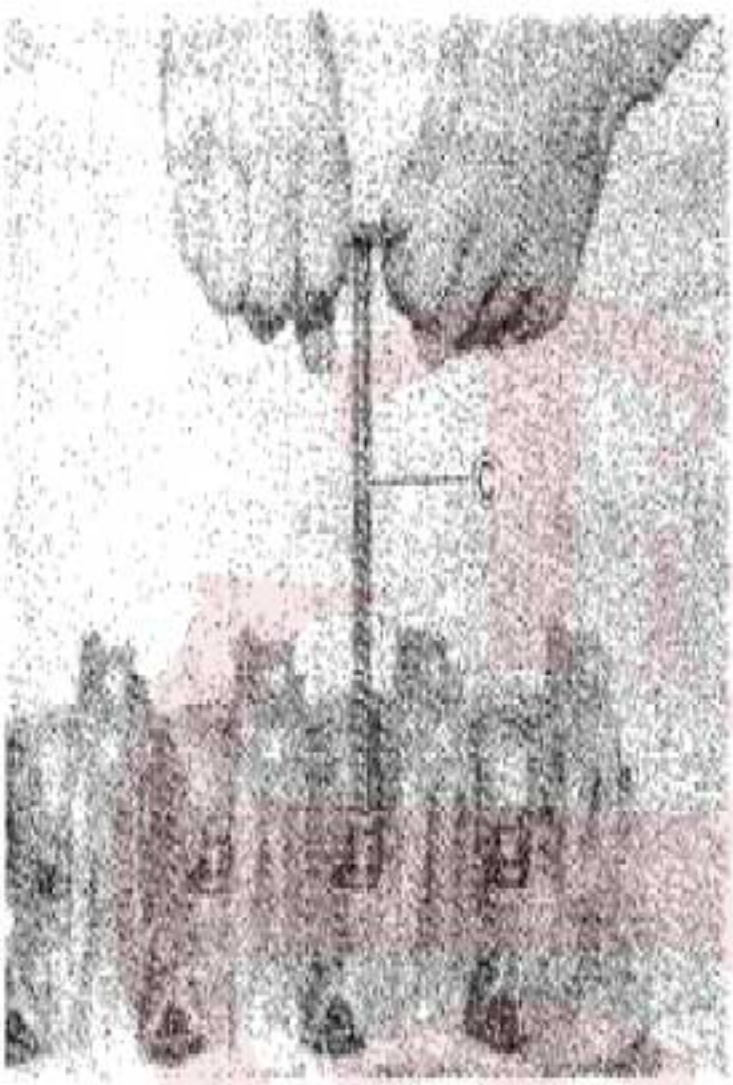


Fig. 3-62

Valves

- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure the thickness ② of valve head. If the limit given to this thickness is exceeded, the valve must be replaced.

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Valve head thickness ②

Standard	Limit	
0. 8-1. 2mm (0. 031-0. 047in.)	Inlet	0. 6mm(0. 0236in.)
	Exhaust	0. 7mm(0. 0275in.)

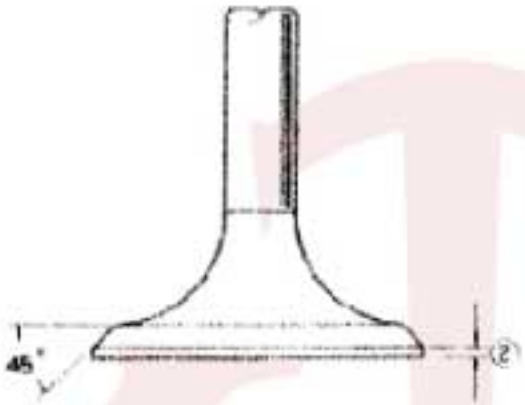


Fig. 3-63

● Check the end face of each valve stem for wear. This face meets the rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen the end face with an oil stone and, if this grinding removes the end stock by as much as 0. 5 mm (0. 0196 in.)(as measured from the original face), replace the valve.
Replacement valves have their stems machined to the follwowing diameter ranges.

Standard valve stem diameter	Inlet	6. 965-6. 980 mm (0. 2742-0. 2748in.)
	Exhaust	6. 955-6. 970mm (0. 2738-0. 2744in.)

●Check each valve for radial runout with a dial gauge and "V" block, as shown in Fig. 3-64. The object of this check is to determine whether the valve stem is concentric relative to the head.

Limit on valve head radial runout	0. 03mm(0. 0012in.)

If the limit is exceeded, do not attempt to correct the stem; replace the valve, instead.

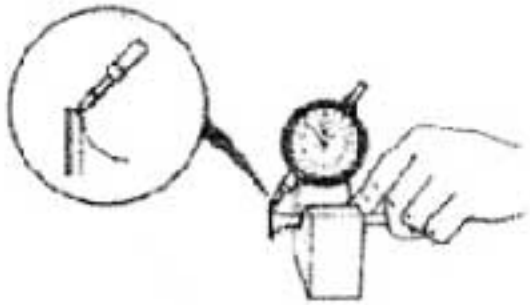


Fig. 3-64

Valve seats

CAUTION;
The valves to be checked and serviced for seating width and contact pattern must be those found satisfactory in regard to stem clearance in the guide and also the requirements stated in the preceding part titled VALVES.

●Seating contact width;
Produce a contact pattern on each valve in the usual manner, namely, by giving a uniform coat of red-lead paste to the valve seat and by rotatingly tapping the seat with the valve head. The valve lapper (the tool used in valve lapping) must be used.
The pattern produced on the seating face of the valve must be a continuous ring without any break, and the width ⓦ of the pattern must be within the stated range.

Standard seating width revealed by contact pattern on valve face; ⓦ	Intake	1. 3-1. 5mm (0. 0512-0. 0590in.)
	Exhaust	

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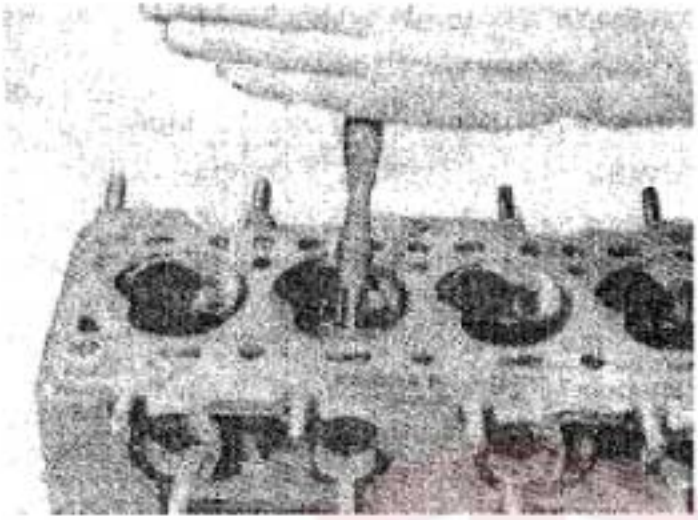


Fig. 3-65

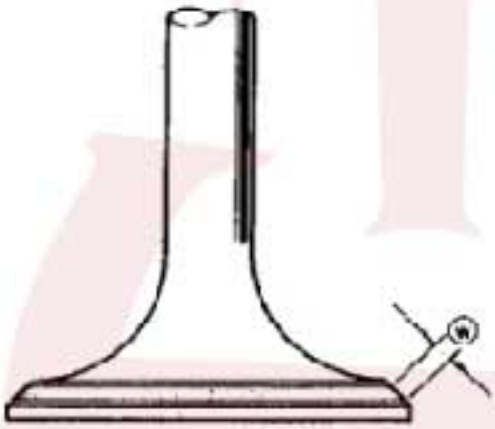


Fig. 3-66

●Valve seat repair;

A valve seat not producing a uniform contact with its valve or showing a width Ⓦ of the seating contact that is off the specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

1) EXHAUST VALVE SEAT; Use a special valve seat cutter to make three cuts in the order illustrated in Fig. 3-68. Three cutters must be used; the first for making the 15° angle, the second for making the 75° angle and the last for making the 45° seat angle. The third cut Ⓑ must be made to produce the desired seat width Ⓦ.

Seat width Ⓦ for exhaust valve seat	1.3-1.5mm (0.0512-0.0590in.)

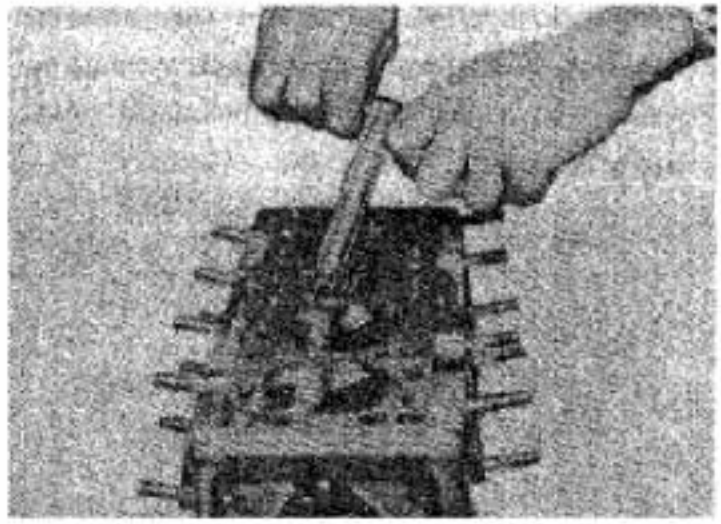


Fig. 3-67 Valve seat cutting

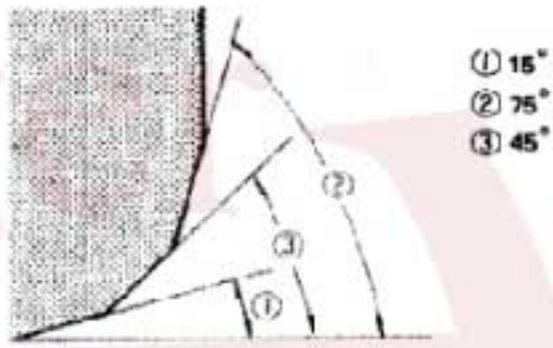


Fig. 3-68 Valve seat angles for exhaust valve seat

2) INLET VALVE SEAT;

The cutting sequence is the same as for exhaust valve seats but the second angle differs, as will be noted in Fig. 3-69.

Seat width Ⓦ for inlet valve seat	1.3-1.5mm (0.0512-0.0590in.)

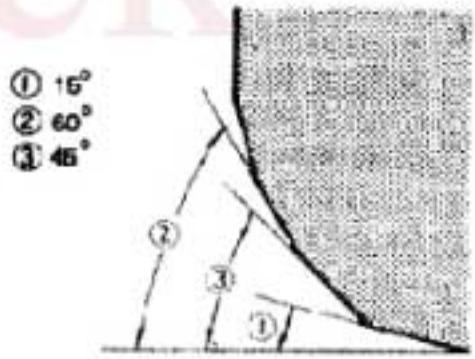


Fig. 3-69 Valve seat angles for inlet valve seat

3) VALVE LAPPING; Lap the valve on the seat in two steps, first with a coarsesize lapping

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compound applied to the face and the second with a fine-size compound, each time using a valve lapper according to the usual lapping method.

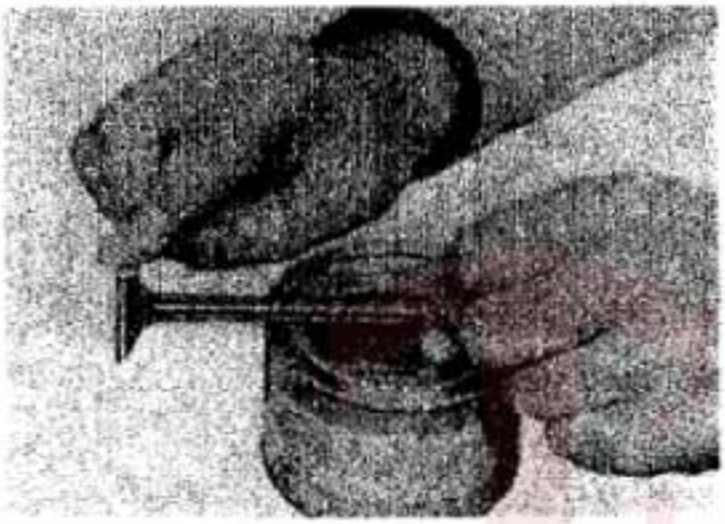


Fig. 3-70 Applying lapping compound to valve face

NOTES:

- After lapping, wipe the compound off the valve face and seat, and produce a contact pattern with a red-lead paste. Check to be sure contact width and specified pattern area must be reached.

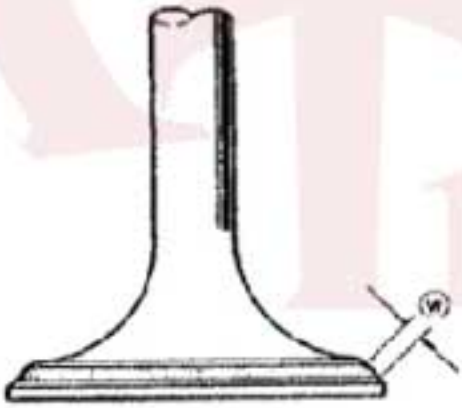


Fig 3-71 Contact pattern (W) uniform in width

Valve springs

- Referring to the criteriondata given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can be the cause of chatter, not to mention the possibility of reducing the power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	47.7mm (1.8779in.)	46.5mm (1.8307in.)
Valve spring preload	26-30kg for 40mm (57.3-66.1lb/1.57in.)	24kg for 40mm (52.9lb/1.57in.)

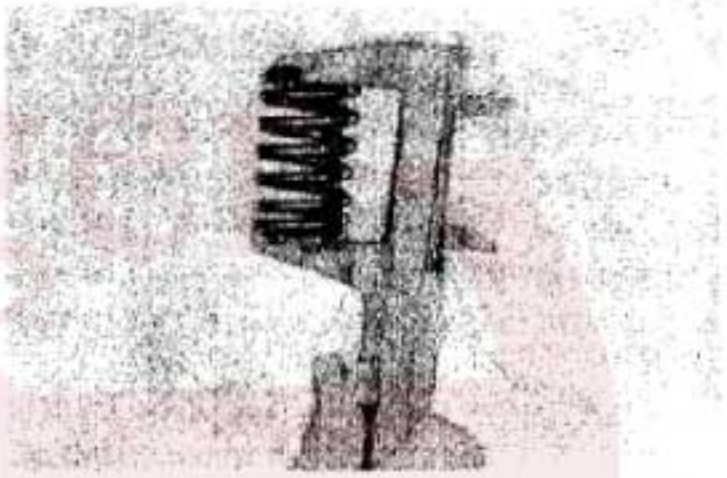


Fig. 3-72 Measuring free length of spring



Fig. 3-73 Checking the spring for preload

- Spring squareness;

Use a square and surface plate to check each spring for squareness in terms of the clearance ①, Fig. 3-74, between the end of valve spring and the square. Valve springs found to exhibit a larger clearance than the limit must be replaced.

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Valve spring squareness ① limit	2.0mm (0.079in.)

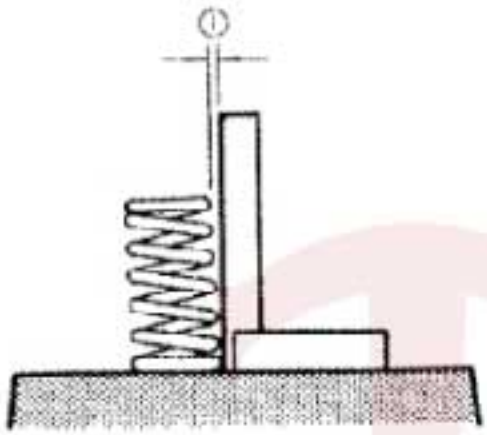


Fig. 3-74

Camshaft

A noisy engine or an engine producing not enough power is frequently due to its camshaft excessively worn or bent or bowed. The wear could occur on its cams and journals.

●Camshaft deflection:

Hold the camshaft between two center points, as shown in Fig. 3-75, with a dial gauge rigged up to measure its deflection. Replace the camshaft if the amount of deflection so measured exceeds the limit.

Camshaft deflection limit	0.10mm (0.0039in.)

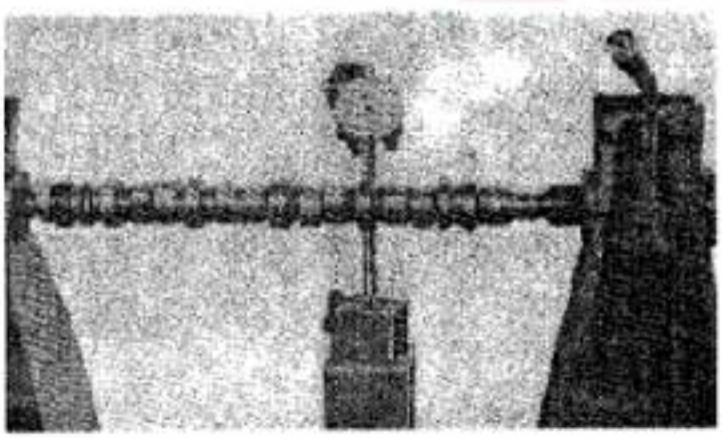


Fig. 3-75

●Cam wear:

Measure the height Ⓗ of each cam. If any of the micrometer readings taken is down to or less than the limit, replace the camshaft.

Cam height Ⓗ	Standard	Limit
Inlet cam	36.152mm (1.4233in.)	36.100mm (1.4212in.)
Exhaust cam	36.152mm (1.4233in.)	36.100mm (1.4212in.)
Pump drive cam	33.300mm (1.3110in.)	33.000mm (1.2992in.)

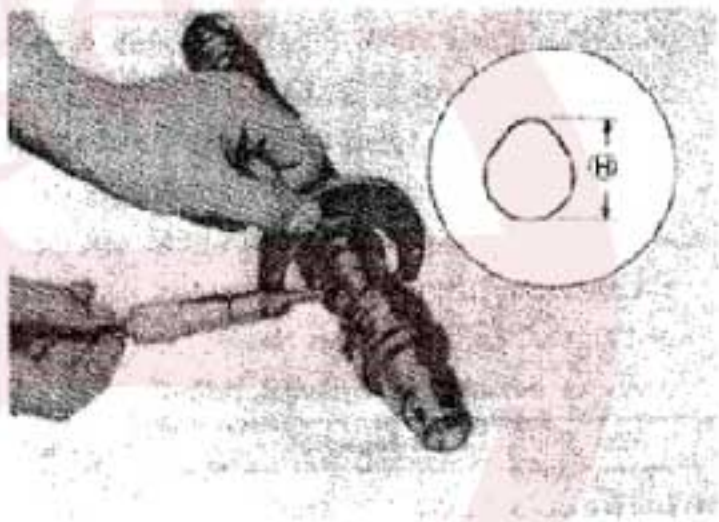


Fig. 3-76

● Thrust clearance:

Using a thickness gauge, measure this clearance as shown in Fig. 3-77, at the thrust plate. If the limit is exceeded, replace thrust plate of camshaft.

Item	Standard	Limit
Thrust clearance	0.050-0.150mm (0.0019-0.0059in.)	0.200mm (0.0118in.)

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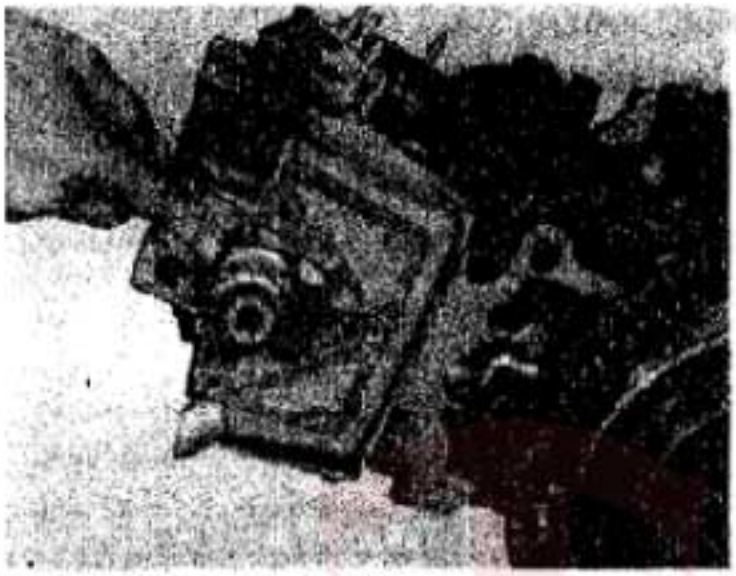


Fig. 3-77

●Journal wear:

Measure the journal diameter in two directions at two places to obtain four readings on each journal (as shown in Fig. 80); and check the journal bores with a I. D. dial gauge , as shown in Fig. 3-79, producing four readings on each. From these readings, compute the radial clearance (camshaft journal clearance). If the service limit is exceeded by any of the computed radial clearances, replace the camshaft and, as necessary, cylinder head, too.

Item	Standard	Limit
Journal clearance	0.050-0.091mm (0.0020-0.0036in.)	0.15mm (0.0059in.)

Camshaft journal dia.	Journal bore dia.
ⓐ 44.225 ~ 44.250mm (1.7411~1.7421 in)	44.300~44.316 mm (1.7441~1.7447 in)
ⓑ 44.225 ~ 44.250mm (1.7411~1.7421 in)	44.300~44.316mm (1.7441~1.7447in)
ⓒ 44.025 ~ 44.050mm (1.7332~1.7342in)	44.100~44.116mm (1.7362~1.7368 in)
ⓓ 43.825 ~ 43.850mm (1.7254~1.7264 in)	43.900~43.916mm (1.7283~1.7289in)
ⓔ 43.625 ~ 43.650mm (1.7175~1.7185in)	43.700~43.716mm (1.7205~1.7210in)
ⓕ 43.425~43.450mm (1.7096~1.7106in)	43.500~43.516mm (1.7126~1.7132in)

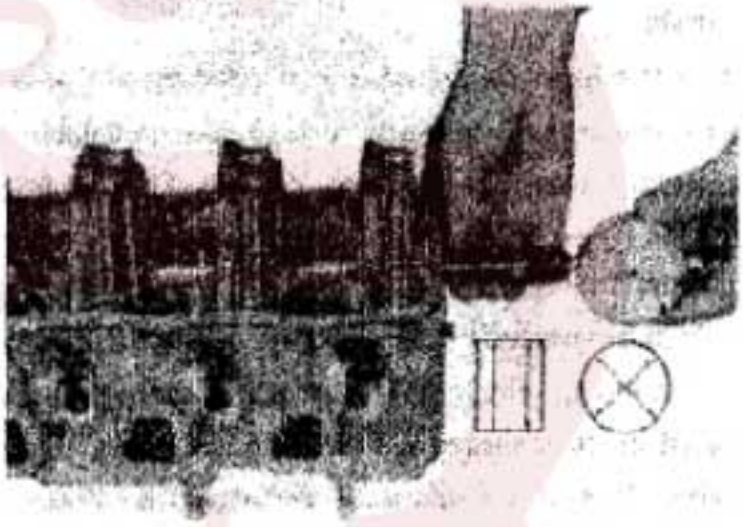


Fig. 3-79

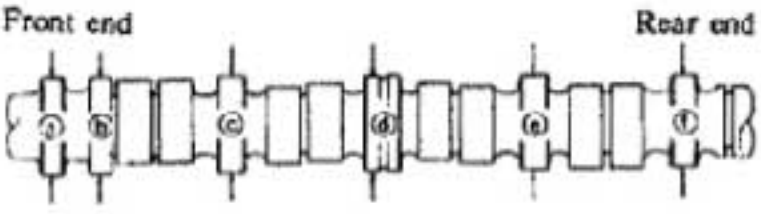


Fig. 3-78

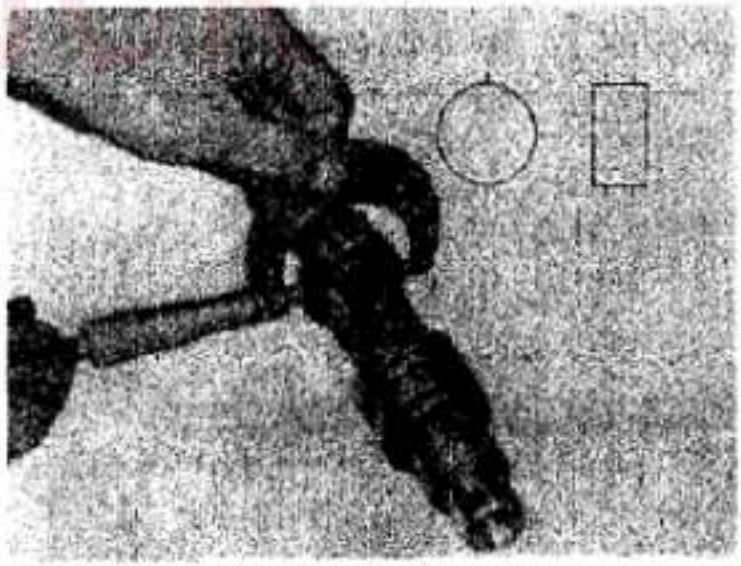


Fig. 3-80

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Cylinder block

●Flatness of gasketed surface:

By the same method that is prescribed for checking the flatness of the gasketed surface of the cylinder head, check the top face of the cylinder block for flatness and, if the flatness is found to exceed the limit, machine the face with a surface grinder.

Limit on flatness	0.05mm (0.0020in.)

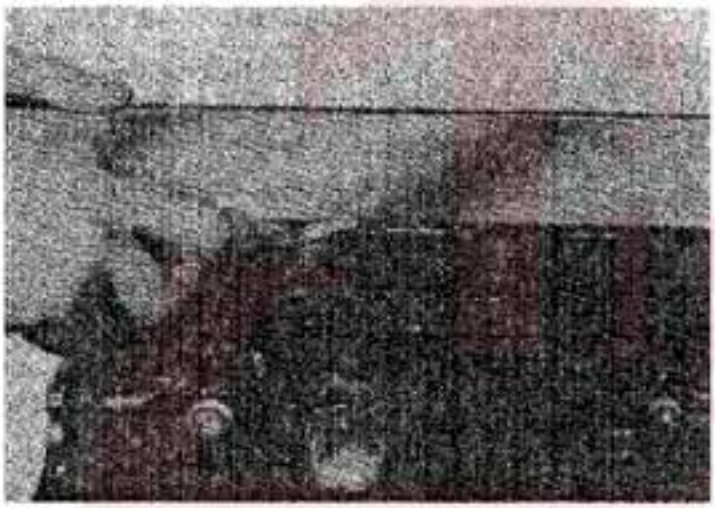


Fig. 3-81

●Cylinder bore:

Using a dial measure the diameter of each bore in two directions, longitudinal and transverse, at three places, top, middle and bottom, as indicated in Fig. 3-82, to obtain a total of 6 readings. On the basis of these readings taken on each bore, determine whether the maximum difference in diameter between any two bores exceeds the limit. If the limit, stated below, is exceeded or if the bore wall is badly scored or burned, re-bore all cylinders to the next oversize and use oversize pistons in engine reassembly.

Piston oversize	0.25mm (0.0098in.)
	0.50mm (0.0196in.)

CAUTION:
If any one of the four cylinders has to be re-bored, re-bore the four to the same next oversize. This is necessary for the sake of uniformity.

When replacing the pistons or installing oversize pistons, be sure that the piston-to-cylinder clearance comes within the stated range:

Limit on difference in diameter between any two cylinders	0.05mm (0.0020in.)
Piston-to-cylinder clearance	0.040-0.050mm (0.0016-0.0020 in.)

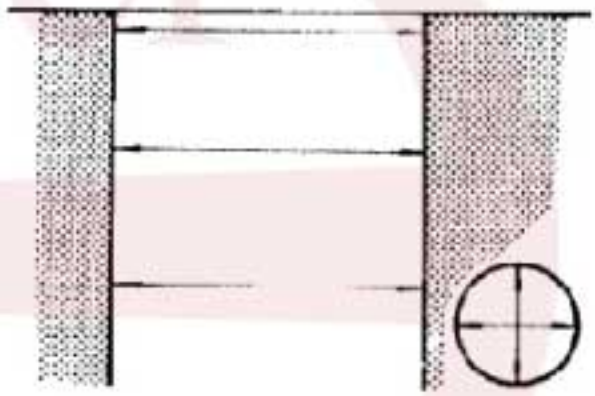


Fig. 3-82

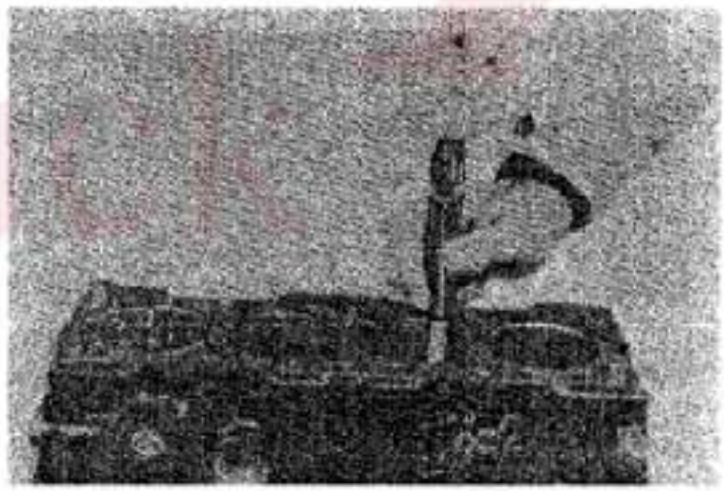


Fig. 3-83

Piston and piston rings

●Piston diameter:

Piston-to-cylinder clearance, mentioned above, is equal to the bore diameter minus the piston diameter, which is to be measured by

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measuring at the level of the piston in the direction transverse to piston pin axis, as shown in Fig. 3-84. This Level Ⓗ from the skirt end is 30 mm (1. 18in.) high.

Piston diameter	Standard	61. 960-61. 975mm (2. 4393-2. 4399in.)
	Oversize	62. 460-62. 475mm (2. 4590-2. 4596in.)

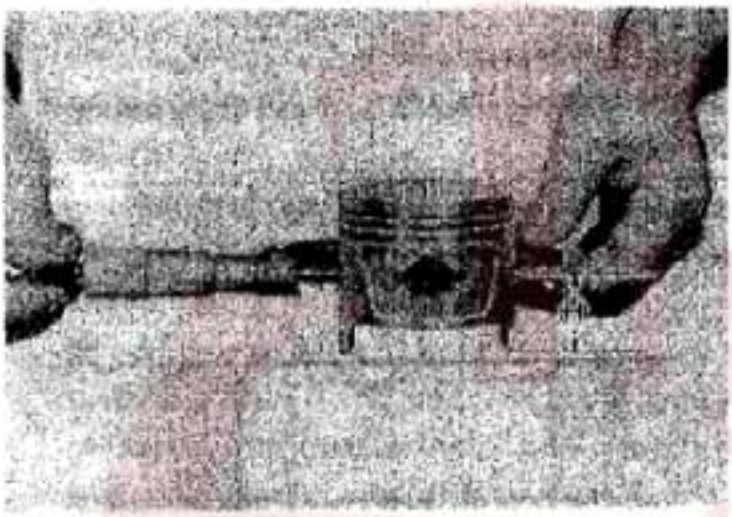


Fig. 3-84

- Inspect the outer surface of each cylinder for evidence of burn and for scratch or groove marks. Minor flaws can be removed by grinding with fine-grain sandpaper.
- De-carbon the piston crown and ring grooves, using a soft-metal scraping tool.



Fig. 3-85

- Ring clearance in the groove:

Using a thickness gauge, check each piston ring in its groove for side clearance and ,if the limit stated below is exceeded, measure the groove width and ring width to determine whether the piston or the ring or both have to be replaced.

Item		standard	Limit
Ring clearance in the groove	Top ring	0. 03-0. 07mm (0. 0012-0. 0027in.)	0. 12mm (0. 0047in.)
	2nd ring	0. 02-0. 06mm (0. 0008-0. 0023in.)	0. 10mm (0. 0039in.)

Piston ring thickness	Top ring	1. 47-1. 49mm (0. 0578-0. 0586in.)
	2nd ring	1. 47-1. 49mm (0. 0578-0. 0586in.)
	Oil ring	0. 45mm (0. 0177in.)
Ring groove width	Top ring	1. 52-1. 54mm (0. 0598-0. 0606in.)
	2nd ring	1. 51-1. 53mm (0. 0594-0. 0602in.)
	Oil ring	2. 81-2. 83mm (0. 1106-0. 1114in.)

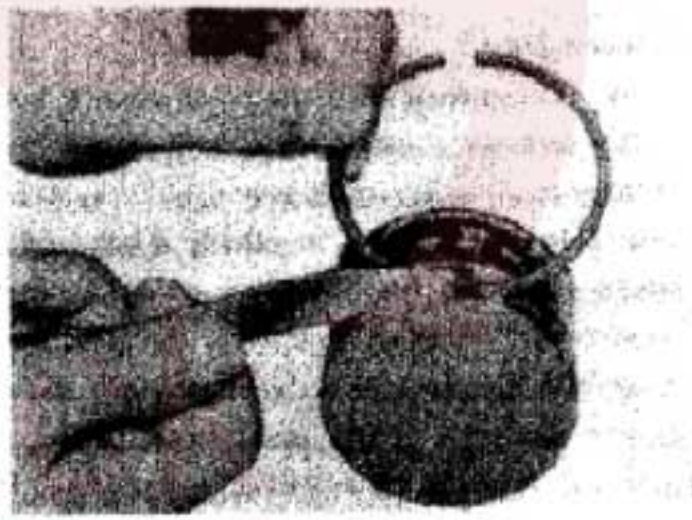


Fig. 3-86

- Piston ring end gap:

To measure the end gap, insert the piston ring into the cylinder bore, locating it at the lowest part of the bore and holding it true and square; then use a thickness gauge to measure the gap. If the gap measured exceeds the limit, replace the ring.

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Item		Standard	Limit
Piston ring end gap	Top & 2nd rings	0.15-0.35mm (0.059-0.0137in.)	0.7mm (0.0275in.)
	Oil ring	0.30-0.90mm (0.0118-0.0354in.)	1.8mm (0.0708in.)



Fig. 3-87

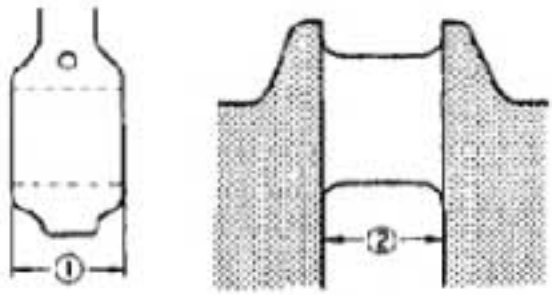




Fig. 3-88

Connecting rods

●Big-end thrust clearance;

Check the big end of each connecting rod for thrust clearance, with the rod fitted and connected to its crank pin in the normal manner. If the clearance measured is found to exceed the limit, the connecting rod of the crankshaft, whichever is responsible for the excessive clearance, must be replaced.

Item	Standard	Limit
Big-end thrust clearance	0.10-0.20mm (0.0039-0.0078in.)	0.30mm (0.0118in.)

① Width of big end	21.95-22.00mm (0.864-0.866in.)
② Width of crank pin	22.10-22.15mm (0.870-0.872in.)

●Connecting rod alignment;

Mount the connecting rod on the aligner to check it for bow and twist and, if the limit is exceeded, replace it.

Limit on bow	0.05mm(0.0020in.)
Limit on twist	0.10mm (0.0039in.)

●Inspect the small end of each connecting rod for wear and evidence of crack or any other damage, paying particular attention to the condition of its bush. Check the piston pin clearance in the small end. Replace the connecting rod if its small end is badly worn or damaged or if the clearance checked exceeds the limit.

Item	Standard	Limit
Pin clearance in small end	0.003-0.016mm (0.0001-0.0006in.)	0.05mm (0.0020in.)

Small-end I.D.	16.003-16.011mm (0.6300-0.6303in.)

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Piston Pin dia.	15.995-16.000mm (0.6297-0.6299in.)

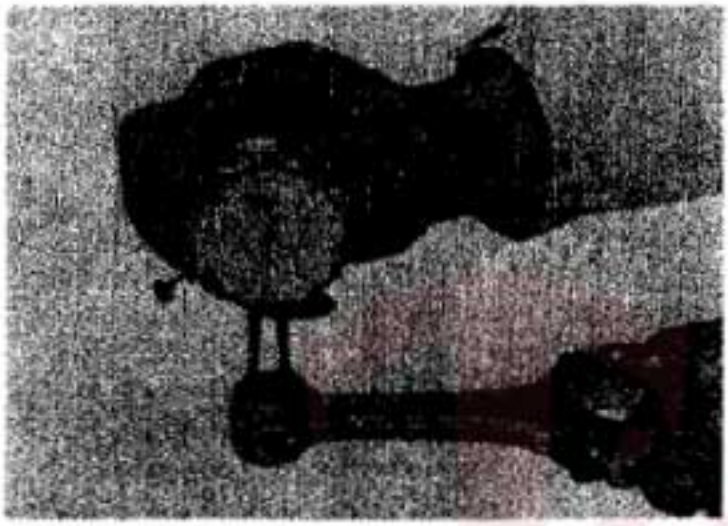


Fig. 3-89



Fig. 3-90

Connecting-rod big end bearings

- Inspect the bearing shells for signs of fusion, pitting, burn or flaking and observe the contact pattern. Bearings found in defective codition through this inspection must be replaced.

CAUTION:
Bearing shells are not meant to be repaired by scraping or grinding with sandpaper or by any machining. The remedy is to replace them.

- Crankpin-to-bearing clearance:

Check this clearance by using fuse stock or, preferably, PLASTIGAGE. Here's how to use PLASTIGAGE:

1) Prepare, by cutting, a length of PLASTIGAGE roughly equal to bearing width and place it axially on crankpin, avoiding the oil hole.
2) Make up the big end in the normal manner, with bearing shells in place and by tightening the cap to the specification.

NOTE:
Never rotate crankshaft or turn connecting rod when a piece of PLASTIGAGE is in the radial clearance.

Bearing cap tightening torque	27.4-31.4N·M

NOTE:
When fitting bearing cap to crankpin, be sure to discriminate between its two ends, front and rear.

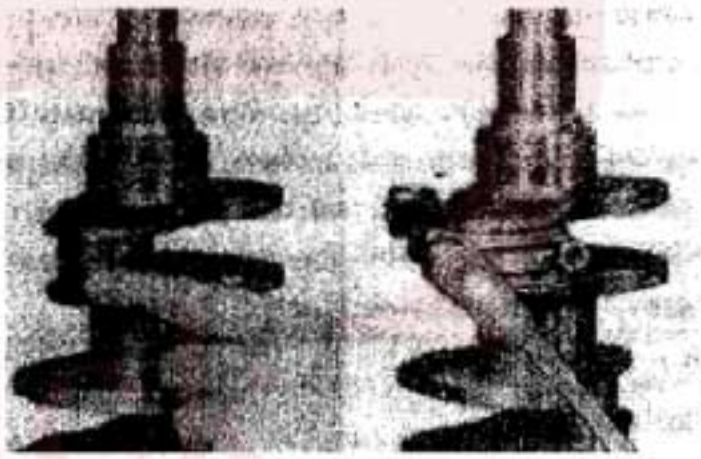


Fig. 3-91

3) Remove the cap, and measure the width of flattened PLASTIGAGE piece with the PLASTLGAGE envelope scale. This measurement must be taken at the widest part.

Item	Standard	Limit
Crankpin-to-bearing clearance	0.020-0.040mm (0.0008-0.0016in)	0.080mm (0.003in.)

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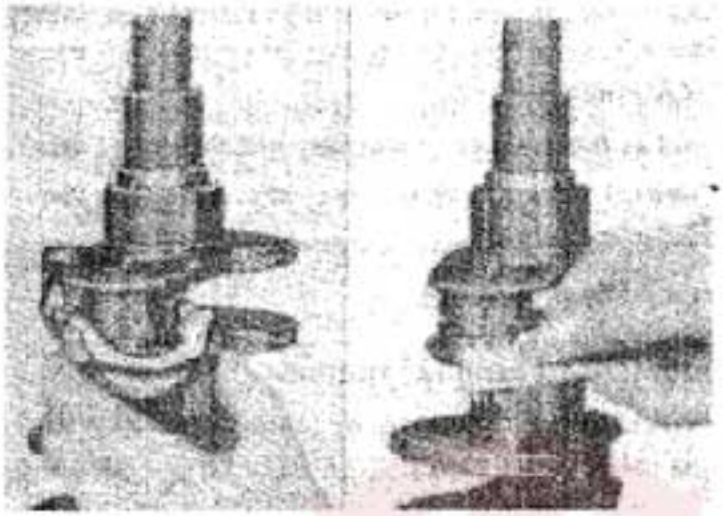


Fig. 3-92

4) If the limit, indicated above is exceeded, replace the bearing. Re-grind the crankpin if still exceeded.

Bearing size	Crankpin diameter
Standard	37.985-38.000mm (1.4954-1.4960in.)
0.25-mm undersize	37.735-37.750mm (1.4856-1.4862in.)
0.50-mm undersize	37.485-37.500mm (1.4760-1.4763in.)

Where undersize bearings are used, the clearance specification is slightly lenient;

Radial clearance for undersize bearing	0.020-0.070mm (0.0008-0.0027in.)

Crankshaft

●Deflection;

Check the crankshaft for deflection, as shown in Fig. 3-93, and if the dial gauge reading exceeds the limit, repair or replace the crankshaft.

Limit on crankshaft deflection	0.06mm (0.0023in.)

NOTE;
Measure the deflection at the center journal.
Rotate the crankshaft slowly.

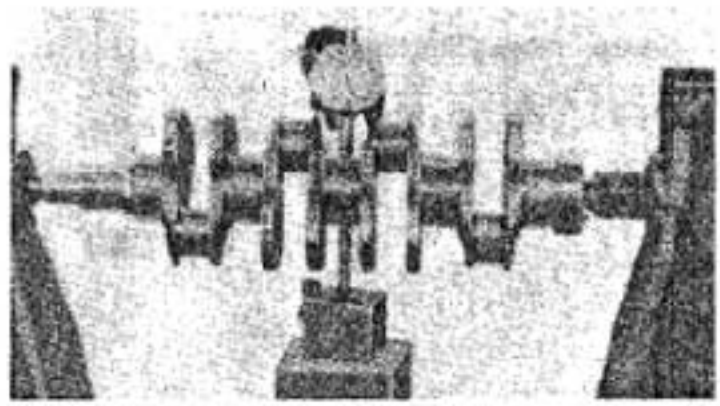


Fig. 3-93

●Crankshaft thrust play;

Measure this play with crankshaft set in the cylinder block in the normal manner, that is, with the thrust bearing fitted and the bearing caps installed. Use a dial gauge to read the displacement in axial (thrust) direction of the crankshaft. If the limit is exceeded, replace the existing thrust bearing by the oversize one.

Item	Standard	Limit
Crankshaft thrust play	0.13-0.28mm (0.0051-0.0110in.)	0.35mm 0.0138in.)

Thickness of crank-shaft thrust bearing	Standard	2.500mm (0.0984in.)
	Oversize 0.125mm (0.0049in.)	2.563mm (0.1009in.)
	Oversize 0.250mm (0.0098in.)	2.625mm (0.1033in.)

Tightening torque for cap bolts	42.1~47N・M

Tighten torque for the bolts securing the bearing caps is specified.

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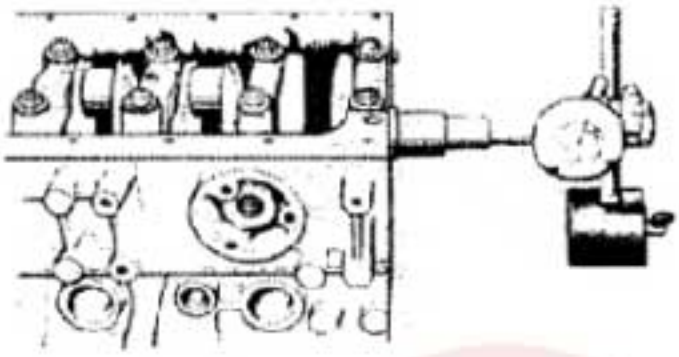


Fig. 3-94

●Out-of round and taper (uneven wear):

An unevenly worn crankshaft journal or crankpin shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is to be determined from micrometer readings taken as shown in Fig. 3-95.

If any of the journals or crankpins is badly damaged or if the amount of uneven wear in the sense explained above exceeds the limit, repair (by re-grinding) or replace the crankshaft.

Limit on uneven wear	0.01mm (0.0004in.)

NOTE:
Where journal or crankpin re-grinding is necessary, finish the diameter to the size necessary for the undersize bearing.

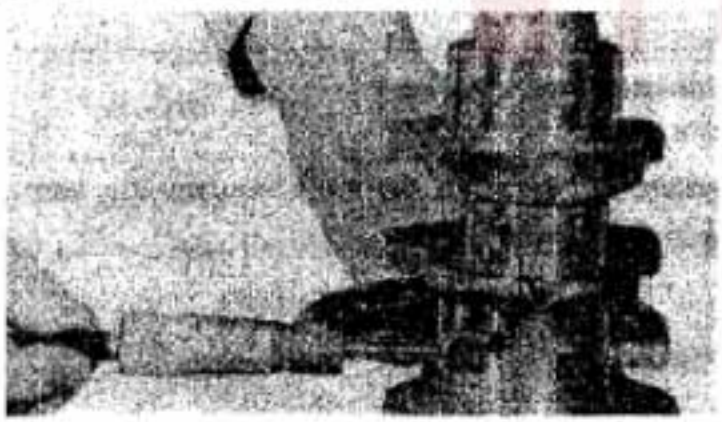


Fig. 3-95

Crankshaft journal bearings

●Inspect the bearing shells for signs of fusion, pitting, burn or flaking and observe the contact pattern. Defective shells must be replaced.

CAUTION:
As in the case of connecting-rod bearings, the journal bearing shells are not meant to be repaired by scraping or grinding with sandpaper or by any machining.

●Journal-to-bearing clearance:

Check this clearance by using fuse stock or, preferably, PLASTIGAGE. The following method is based on the use of PLASTIGAGE:

1)Cut the PLASTIGAGE stock to the required length (equal to the width of the bearing), and place it axially on the journal, avoiding the oil hole.

2) Mount the crankshaft in the usual manner, tightening the bearing caps to the specified torque value. (It is assumed that a PLASTIGAGE piece is pinched at each journal.) Do not rotate the crankshaft when PLASTIGAGE is in.

Tightening torque for cap bolts	42~47N·M

CAUTION:
Each of the five bearing caps has an arrow marked on it. Be sure to position each cap with its arrow pointing to front end and to match it to its journal. Remember, the four cylinders are numbered, 1, 2, 3, and 4, as counted from front end. See Fig. 3-96.



Fig. 3-96

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3) Remove the caps and take out the PLASTIGAGE pieces, which are now flattened. By a dial, measure the width of the widest part of the piece, and determine whether the radial clearance checked (obtained from the PLASTIGAGE piece) is within the limit.

Item	Standard	limit
Journal-to-bearing clearance	0.020-0.040mm (0.0008-0.0016in.)	0.08mm (0.0032in.)

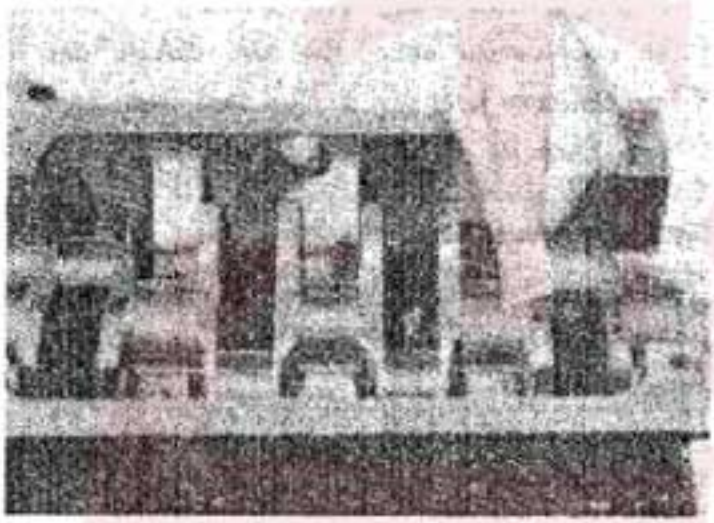


Fig. 3-97

4) If the limit is exceeded, re-grind the journals to the undersize and use the undersize bearing, or replace the bearing to contract the play.

Bearing size	Journal diameter
Standard	49.985-50.000mm (1.9679-1.9685in.)
0.25mm undersize	49.735-49.750mm (1.9580-1.9586in.)
0.50mm undersize	49.485-49.500mm (1.9482-1.9488in.)

Radial clearance for undersize bearing	0.020-0.070mm (0.0008-0.0027in.)

Flywheel

● Inspect the friction surface — the surface in contact with clutch disc — for wear and damage. Most of surface flaws, if any, can be removed by simple machining. A badly damaged flywheel must be replaced.

●Face runout:

Check the flywheel for face runout with a dial gauge, as shown in Fig. 3-98. Be sure that the runout is within the limit.

Limit on runout	0.2mm (0.0078in.)

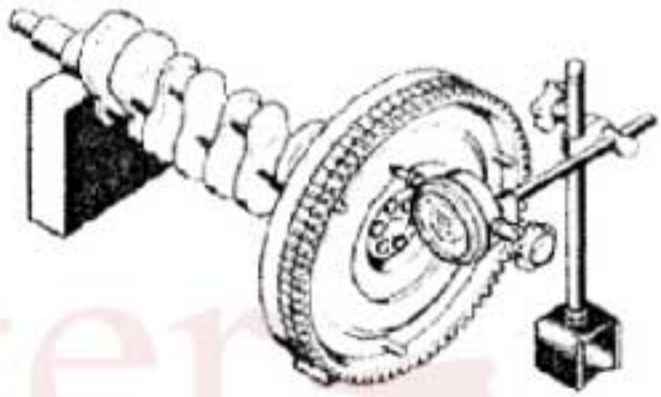


Fig. 3-98

●Ring gear tooth wear:

Inspect the teeth for wear and for evidence of crack, chipping or any other damage. Replace the ring gear if its teeth are found in bad condition.

Oil seals

Carefully inspect the oil seals removed in disassembly, examining the lip portion ① of each oil seal for wear and damage. Use of new oil seals in reassembly is recommended.



Fig. 3-99

Timing belt and timing pulleys

Inspect the belt and pulleys for wear, cracks and signs of failure. Replace them as necessary.

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CAUTION;
- Do not bend the belt. Keep away oil and water from the belt. The belt must be kept clean.
- The pulleys and belt tensioner, too, must be kept clean and free of oil and water.



Fig. 3-100

Engine Reassembly

NOTE;
- All parts to be used in reassembly must be perfectly clean.
- Oil the sliding and rubbing surfaces of engine parts just before using them in reassembly. For the oil, use SAE 20W/40 grade, engine oil.
- Have the liquid packing ready for use. Anaerobic bond QY168/GY230 specified for the liquid. Use it wherever its use is specified in order to ensure leak-free (oil and water) workmanship of reassembly.
- There are many running clearances. During the course of engine reassembly, be sure to check these clearances, one after another, as they form.
- Gaskets, "O" rings and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.
- Tightening torque is specified for important fasteners — bolts and nuts in the main — of the engine and other components. Use torque wrenches and constantly refer to the specified values.
- Do not disregard the match marks provided on parts. Some of them are those given at the time of disassembly.
- There are many sets of parts. Crankshaft bearings, connecting rods, pistons, etc, are in combination sets. Do not disturb the combinations and try to see that each part goes back to where it came from.

Tightening torque data

This is a list-up of bolts and nuts tightening jobs identified by parts to be secured;

What to tighten	N • M
Crankshaft bearing cap bolt	42.1-47
Connecting-rod bearing nut	27.4-31.4
Crankshaft pulley bolt	49-58.8
Flywheel bolt	39.2-44.1
Cylinder head bolt	53.9-58.8
Spark plug	19.6-29.4
Camshaft pulley bolt	49-58.8
Valve adjusting nut	14.7-19.6
Oil drain plug	19.6-24.5
Oil pan securing bolt	3.92-4.9
Oil filter	9.8-14.7
Oil filter stand	19.6-24.5
Oil pressure unit	11.76-14.7
Timing belt cover bolt	2.94-3.92

Engine reassembly is the reverse of engine disassembly as far as sequence is concerned, but there are many reassembling steps that involve measures necessary for restoring the engine as close to the factory-assembled condition as possible. Only those steps will be dealt with.

Crankshaft

Be sure to oil crankshaft journal bearings as shown.

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Fig. 3-101

Thrust bearings for the crankshaft are an item prone to escape the serviceman' s attention; be careful not to leave them out. These bearings go into place with their oil groove side facing the crank web.



Fig. 3-102

Be sure to oil crankshaft journals as shown.

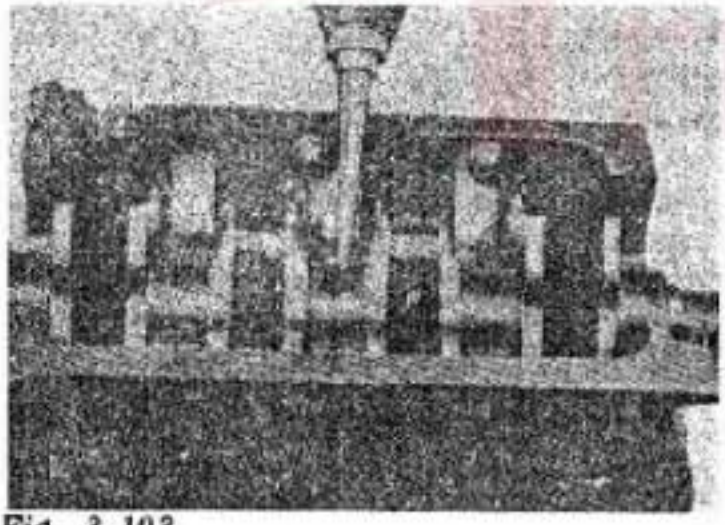


Fig. 3-103

When fitting crankshaft bearing caps to journals after setting the crankshaft in place, be sure to point the arrow mark (on each cap) to front side. Fit them sequentially in the ascending order, 1, 2, 3, 4 and 5, starting from front (pulley) side.

Tightening torque for bearing cap bolts	42.1-47N·M; 4.3-4.8kg-m (31.5-34.5lb-ft)

Gradual and uniform tightening is important for bearing cap bolts. Make sure that the five caps become tight equally and uniformly progressively to the stated torque value.

NOTE:
After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned over by hand.

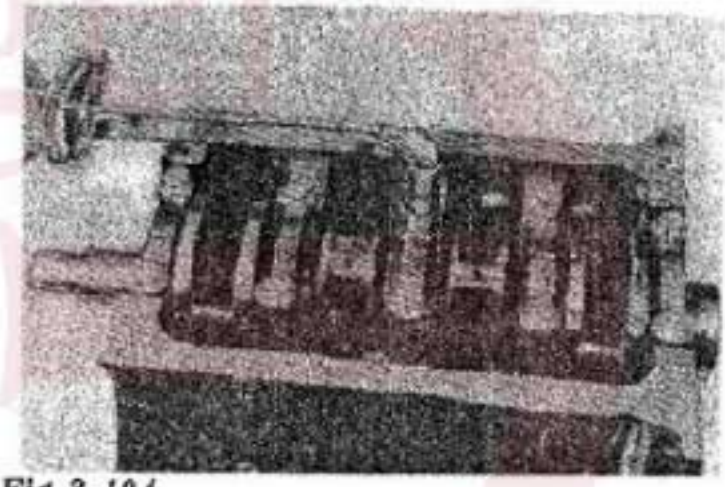


Fig 3-104

Oil seal housing

This housing demands new gasket; do not reuse the gasket removed in disassembly. After bolting the housing to the block, the gasket edges might bulge out; if so, cut off the edges to make the joint seam flat and smooth, use a sharp knife. After cutting, apply GY168 bond as shown.

NOTE:
Just before mounting the housing, oil the lip portion of the oil seal.

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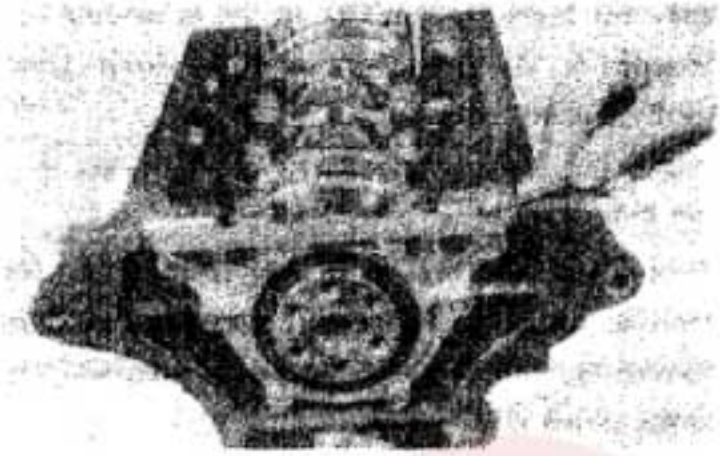


Fig. 3-105

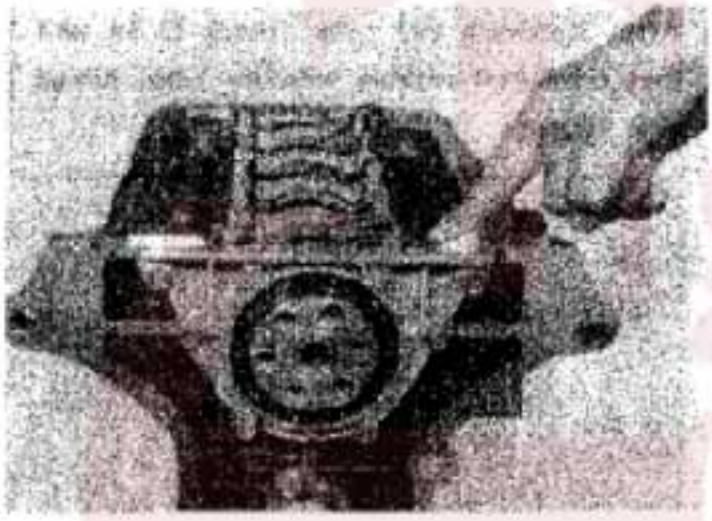


Fig. 3-106

Oil pump

The gasket for oil pump case must be new. As in the case of oil seal housing, cut off the gasket edges with a knife to smoothen the joint seam.

NOTE:
Before fitting the pump case, oil the oil seal lip.

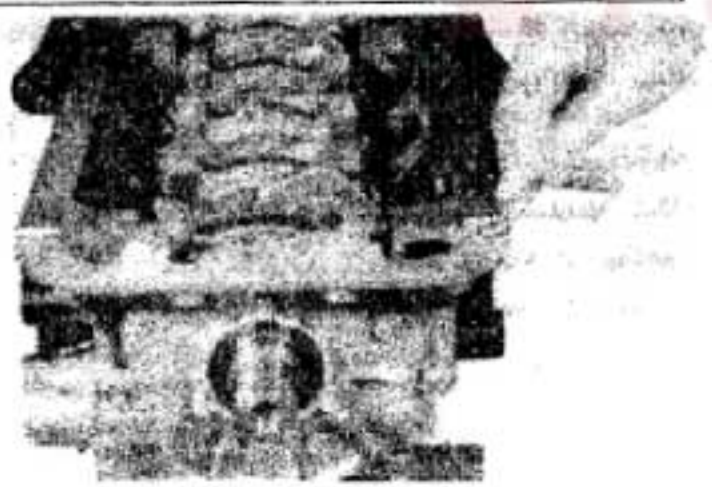


Fig. 3-107

After cutting the gasket edges, apply GY168 Anaerobic bond.

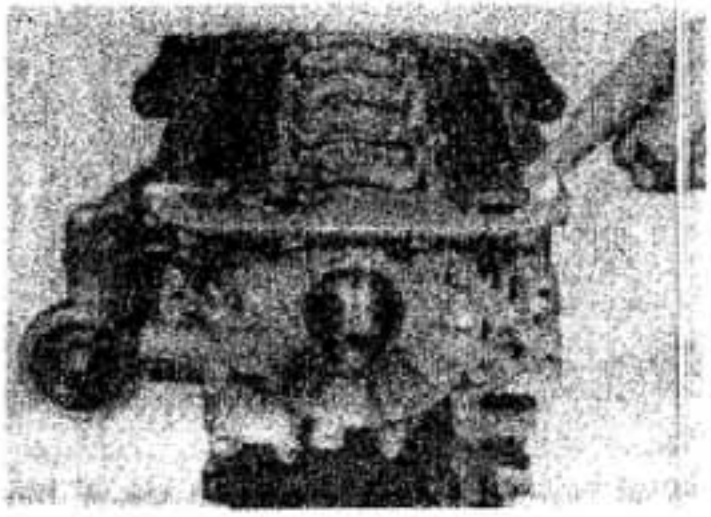


Fig. 3-108

POSITION OF PISTON RELATIVE TO CONNECTING ROD: The arrow ① on the crown points to front (pulley) side, and the oil hole ② comes on inlet port side. See Fig. 3-109.

NOTE:
Before pinning piston to connecting rod, oil the small end and pin holes.



Fig. 3-109

Before fitting rings to piston, check to be sure that first ring has RN mark and second ring R mark. After mounting the three rings, distribute their end gaps as illustrated in Fig. 3-110. Remember, the marked side of each ring (1st and 2nd) comes on top side.

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NOTE;
After fitting the rings, oil them in the grooves.

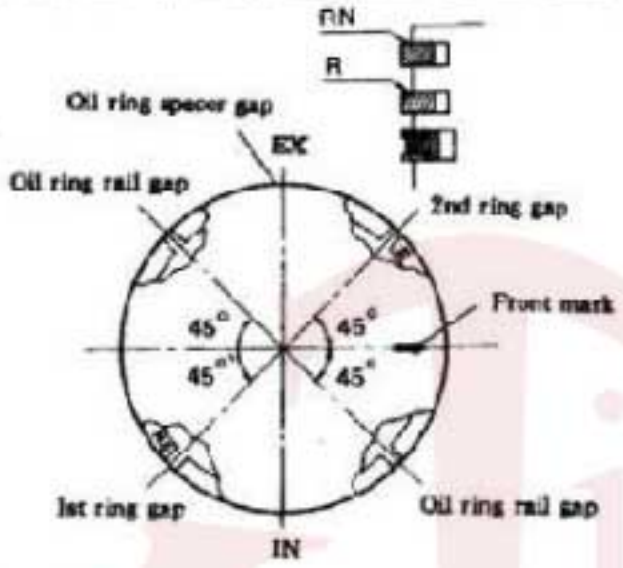


Fig. 3-110

Use of the piston ring compressor Ⓐ, Fig. 3-111, is mandatory in inserting pistons into cylinder block. Using this compressor Ⓐ, feed the piston and connecting rod combination into the bore from the upper side of cylinder block.

Pay attention to these reminders;

- Point the piston crown arrow to front side.
- Be sure that the number (marked on the crown at the tme of disassembly) tailies with the cylinder number.
- Liberally oil the big-end bearings before fitting them to crankpins.
- Oil the bore just before feeding in the piston.

CAUTION;
As the piston and connecting rod combination goes into the bore, the rod might hitch onto the cylinder wall or crank journal. In such a case, do not attempt to force piston in. If any hitch is felt, look into under crankshaft to clear the wall for the rod.

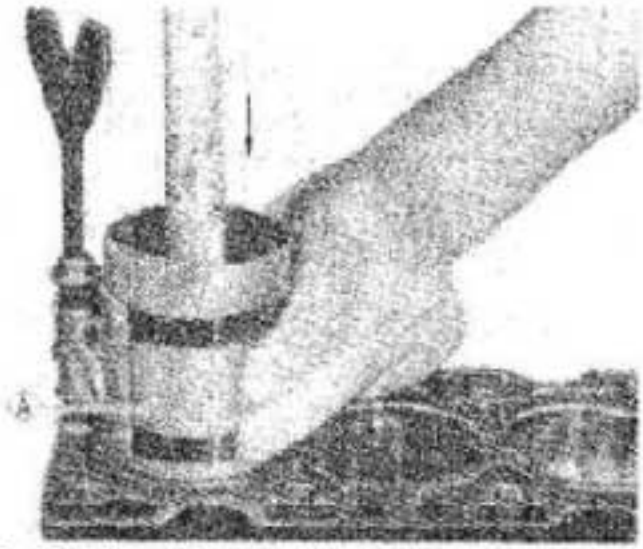


Fig. 3-111



Fig. 3-112

Connecting rods

Two stoppers ① ②, Fig. 3-113 and 114, determine the position of bearing. At the time of installing these caps, be sure to locate stopper ① of cap in the direction of stopper ②.

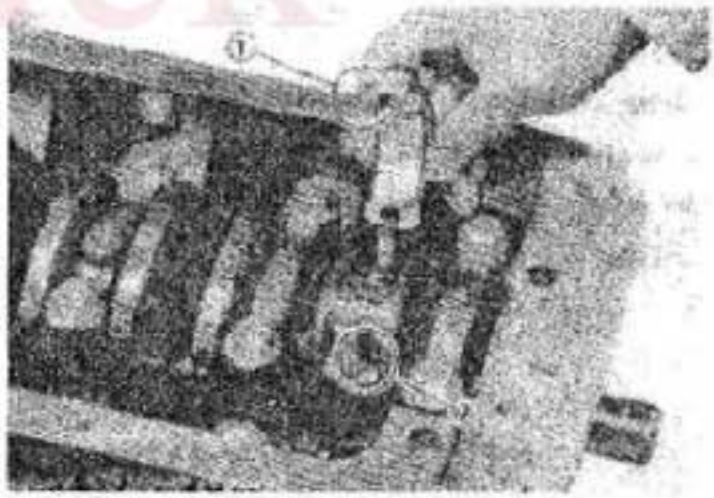


Fig. 3-113

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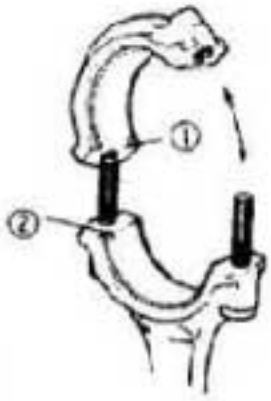


Fig. 3-114

After fitting all four big-end bearing caps, start tightening them uniformly, being sure to equalize tightness between right and left on each cap. The sequence here is similar to that for crankshaft bearing caps.

Tightening torque for big-end caps	27.4-31.3N · M



Fig. 3-115

NOTE:
After installing crankshaft and pistons, connecting rod assy as above, double-check to be sure that the arrows on piston crowns are all pointing to pulley (front) side.

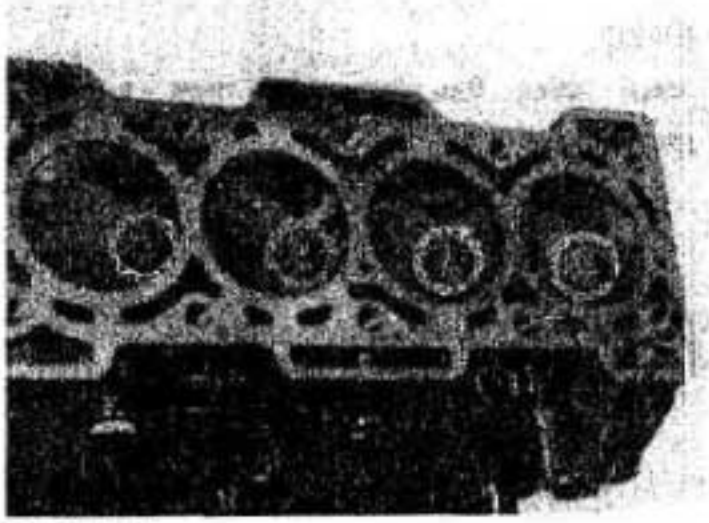


Fig. 3-116

Oil pump strainer

Bear in mind that "O" ring ① is often forgotten and left out in reassembly. Absence of this ring defeats the purpose served by the strainer.

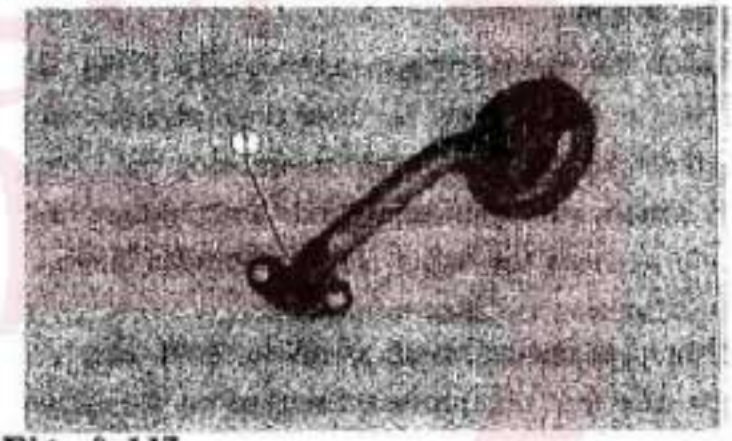
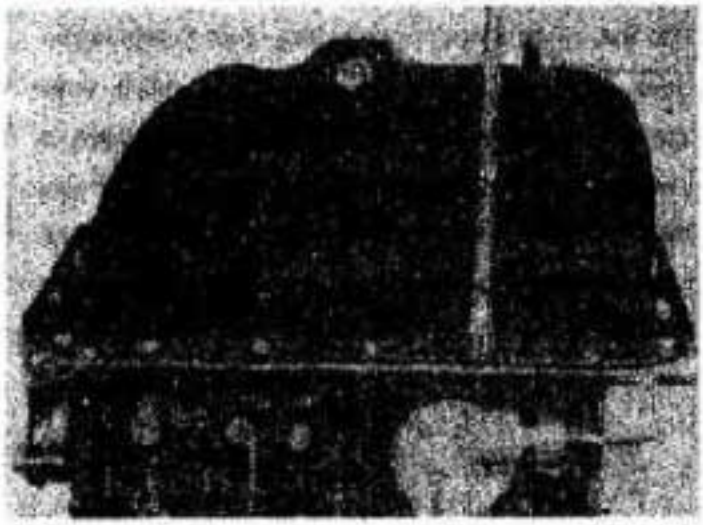


Fig. 3-117

Oil pan

After fitting the oil pan to the block, run in securing bolts and start tightening at the center, move wrench outward, tightening one bolt at a time.



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Fig. 3-118

Flywheel

The first step of flywheel installation is to check to be sure that locating pin ① is studded in the crankshaft. The next step is to fill up the pocket between input shaft bearing and oil seal ② with grease. Make this pocket 60% full.

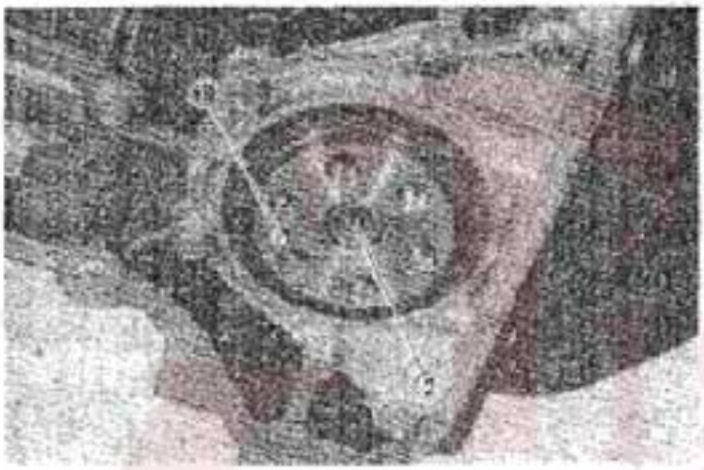


Fig. 3-119

Cylinder head

Oil valve stems before inserting them into guides.

CAUTION:
Be sure to distinguish between inlet valves and exhaust valves. The difference is in diameter and marking. Refer to the embossed marks, shown in Fig. 3-120.

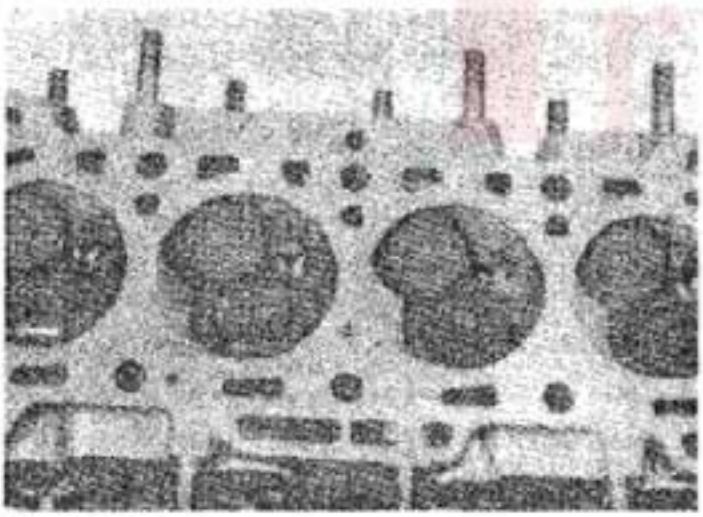


Fig. 3-120

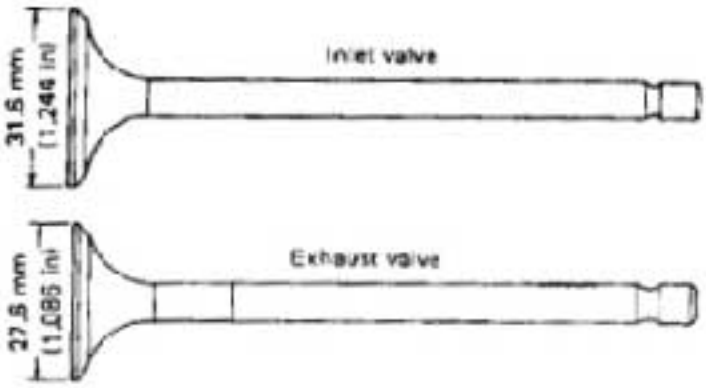


Fig. 3-121

Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position the springs in place so that their bottom ends come on bottom side.

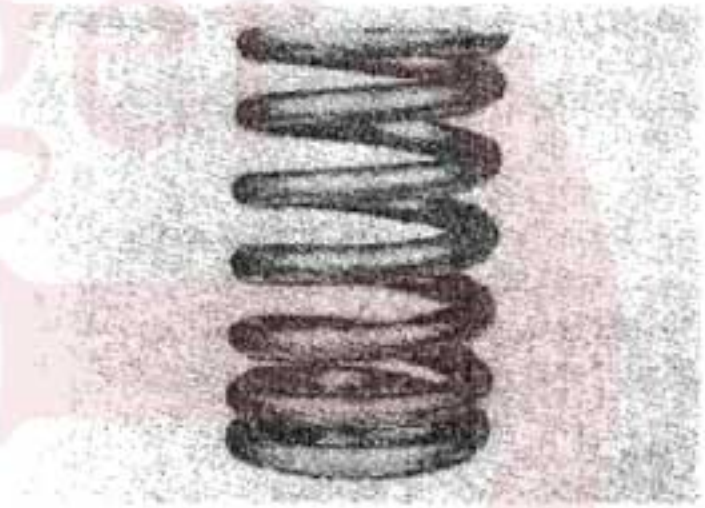


Fig. 3-122

To fit valve cotters to the groove provided on the end portion of each valve stem, be sure to use the valve lifter compress the valve spring with this lifter and mount the cotter pieces, as shown in Fig. 3-123.

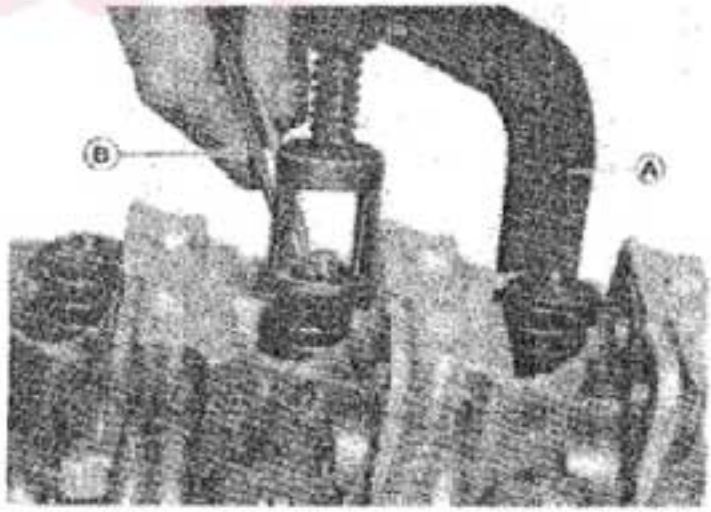


Fig. 3-123 Ⓑ Forceps

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At the time of installing the cylinder head, be sure to position the head gasket correctly on the cylinder block. "TOP" mark ①, provided on the gasket, comes on top side; "IN" mark ② comes on inlet manifold side and "EX" mark ② comes on exhaust side.

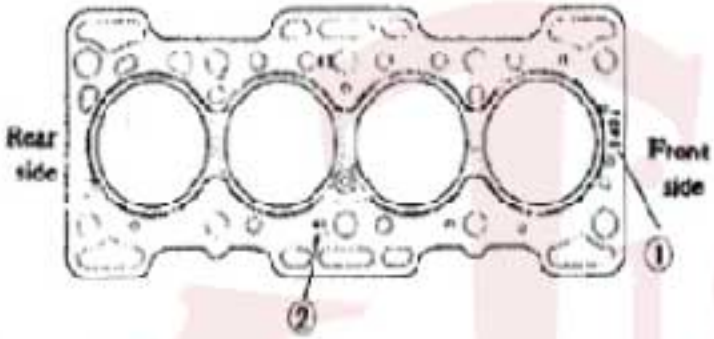


Fig. 3-124

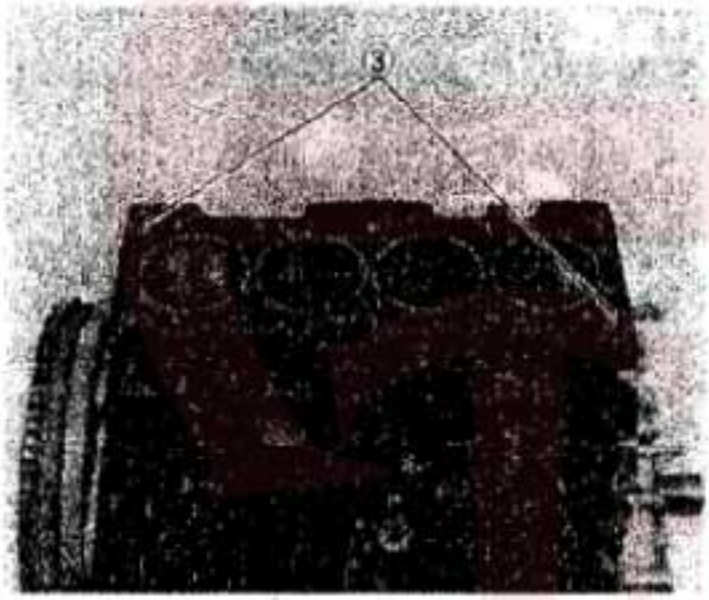


Fig. 3-125 ③ Locating pins

The position the cylinder head takes on the block is but one, which is shown in Fig. 3-126. When placing the head on the block, be sure that it is correctly oriented; It is the clue that the inlet ports ④ should be at the same side of the gasket marked "IN".

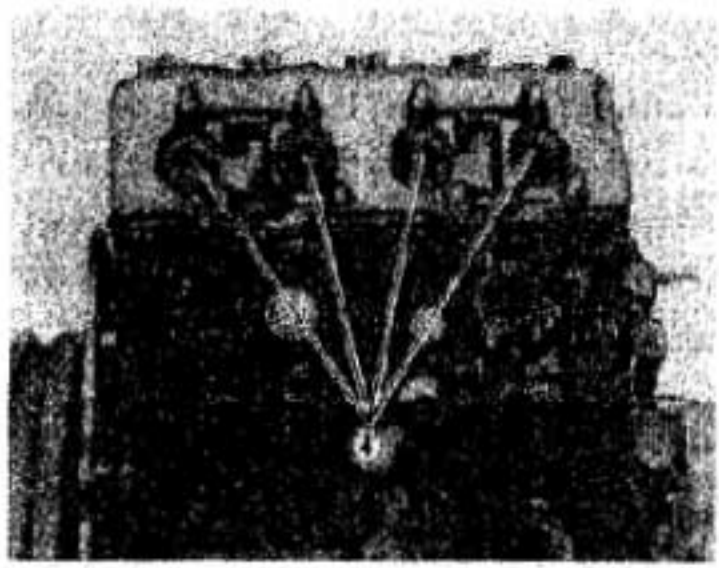


Fig. 3-126

The tightening sequence for cylinder head bolts is indicated in the photo. Tighten the bolts in that sequence to the specified torque value;

Tightening torque for cylinder head bolts	53.9-58.8N · M

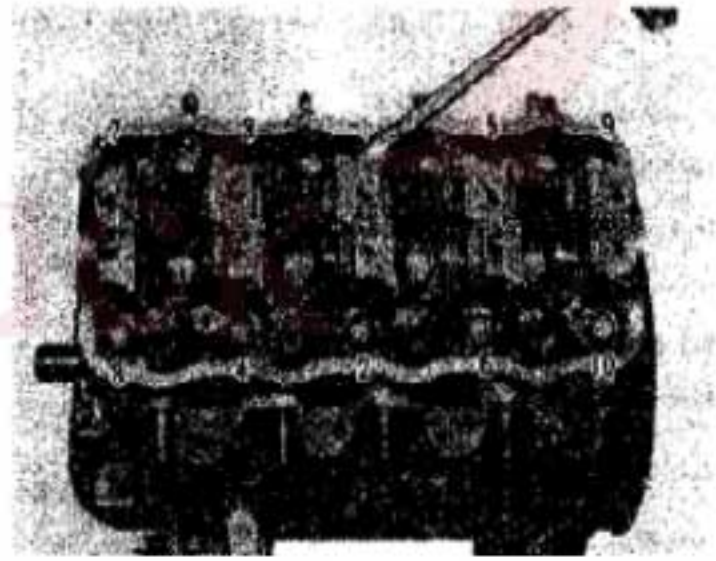


Fig. 3-127

Camshaft

The camshaft goes into cylinder head from front side. Before inserting it, be sure to oil its journals.

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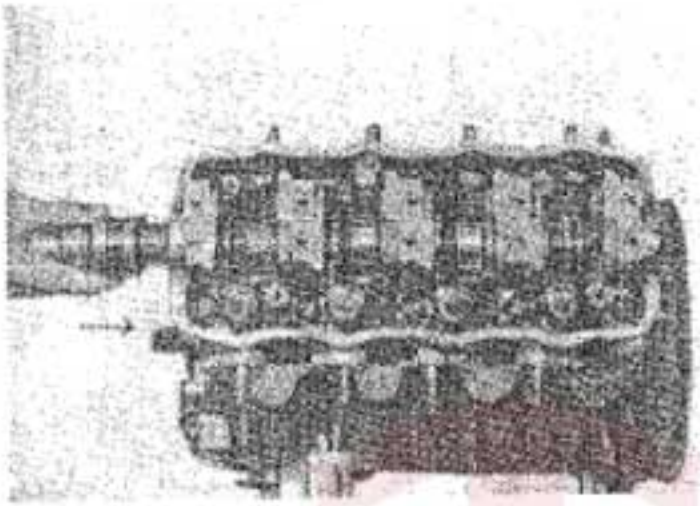


Fig. 3-128

Be careful not to leave out the thrust plate ① and turn the shaft by hand to be sure it rotates smoothly.

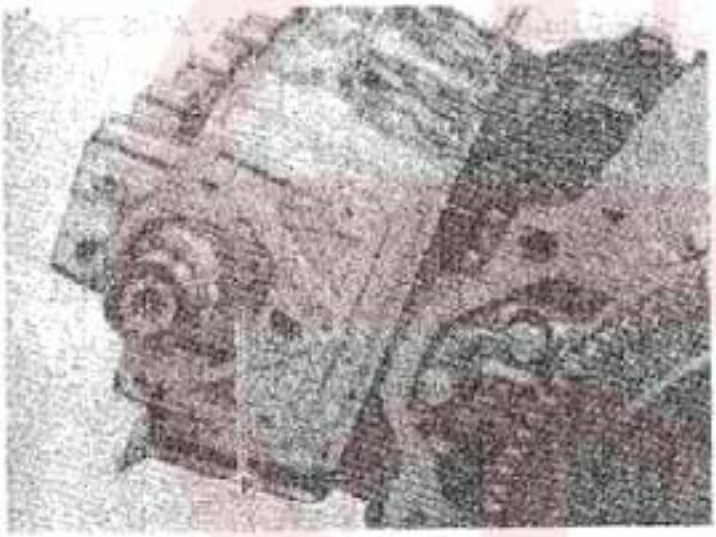


Fig. 3-129

Rocker-arm shafts

CAUTION:
Before installing the rocker-arm shaft on the head, be sure to locate the crankshaft keyway ② in the 80°-100° angular range, as shown in Fig. 3-130.
This crankshaft position is necessary because, if its keyway is in any other angular position, some valves will touch piston crowns, possibly resulting in damaged valves of piston crowns. Keep crankshaft in that angular position until the job of adjusting the timing belt tension is completed.

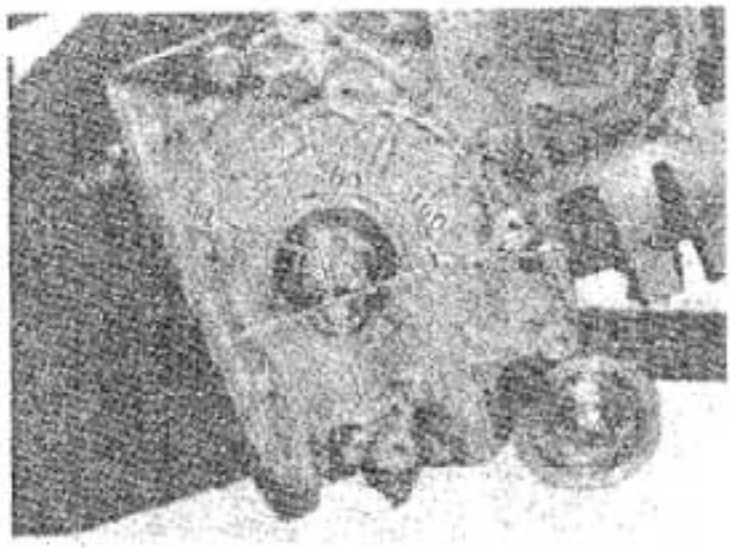


Fig. 3-130

The two rocker-arm shafts are identical, there being no need to distinguish between the two. However, each shaft takes but one position in place. See Fig. 3-131.

- On the inlet side, the stepped end ③ comes on front side.
- On the exhaust side, the stepped end ④ comes on rear side.

NOTE:
Oil rocker-arm shafts just before installing them.

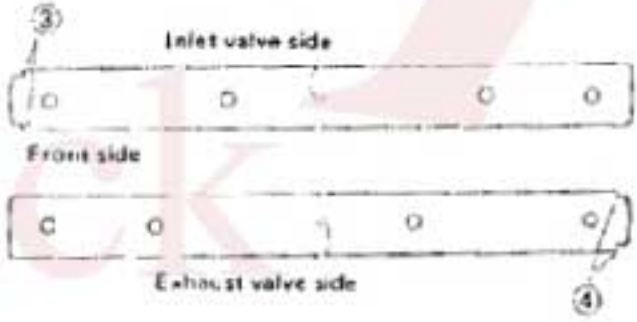


Fig. 3-131

https://truckmanualshub.com/

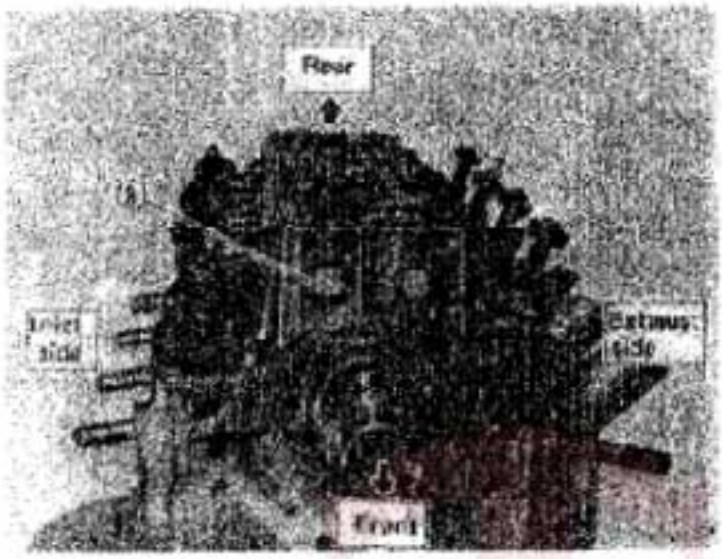


Fig. 3-132

As to the positions of rocker arms and springs on each rocker-arm shaft on INLET, rocker-arm spring is in front side, rocker-arm is in rear side on EXHAUST, it is in reverse, refer to Fig. 3-133. "Front side" is meant by "1"; "rear side" by "2".

NOTE:
When installing rocker-arm shafts, be sure to have valve adjusting screws loosened fully but do not remove them.

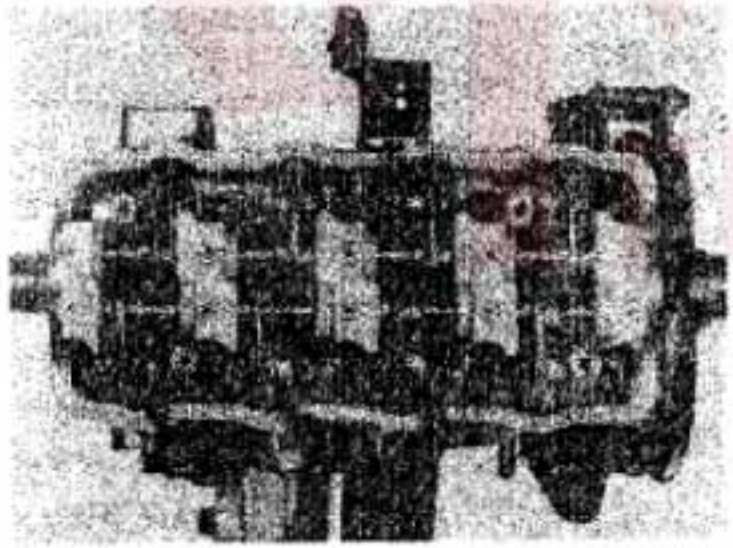


Fig. 3-133

Water inlet pipe

The angle that this pipe takes in place is important. When installing it, be sure to angle it as shown in Fig. 3-134.

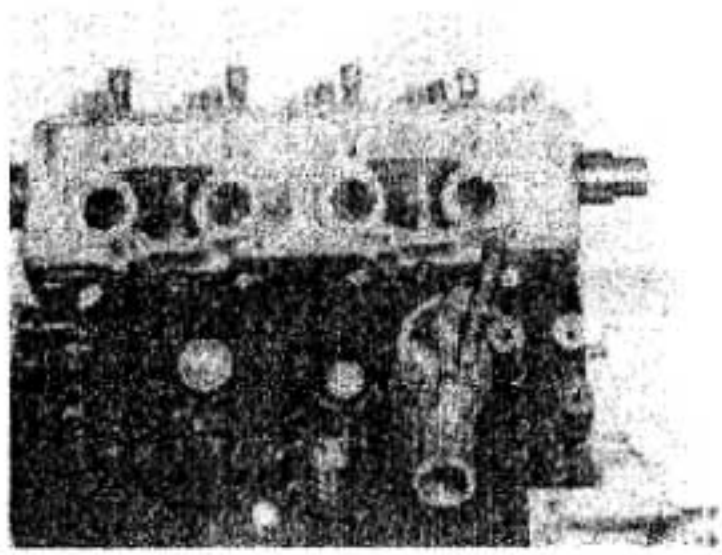


Fig. 3-134

Cylinder head front side case

Two bolts ① for securing the front side case to cylinder head, Fig. 3-135, need to apply GY230, because the bolt holes for the two extend into the interior of cylinder head.

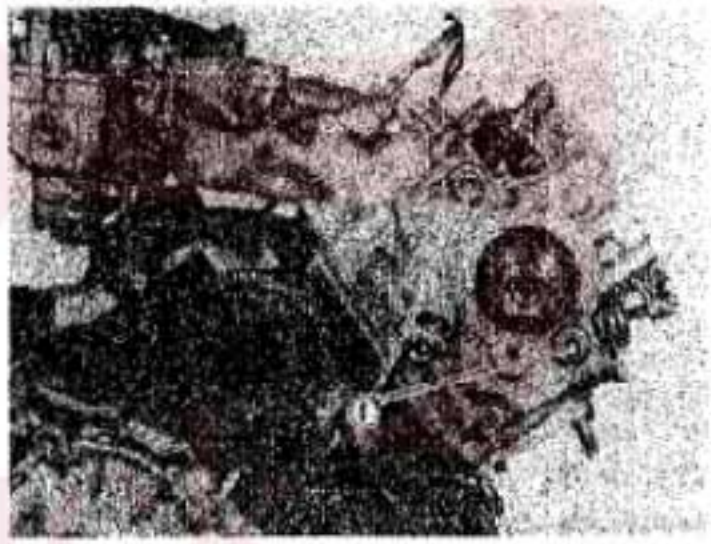


Fig. 3-135

Crankshaft timing belt guide

This guide takes its position on crankshaft as shown in Fig. 3-136. Remember, one side of this guide faces the cylinder block and the other side faces the timing belt pulley.

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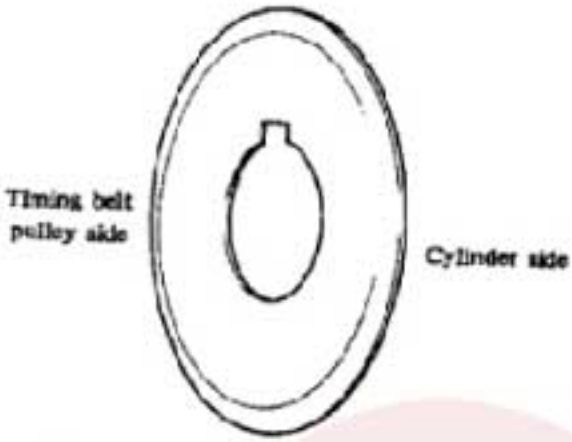


Fig. 3-136

Camshaft timing belt pulley

One side of this pulley has a punch mark ① as the reference for correctly positioning it on the camshaft. Fit the pulley to camshaft, bringing the punch-marked-side to fan side and locating the mark ① at the keyway ② provided in camshaft.

CAUTION:
Before installing the pulley as above, check to be sure that crankshaft keyway ③ is in the 80°—100° range, as shown in Fig. 3-137.

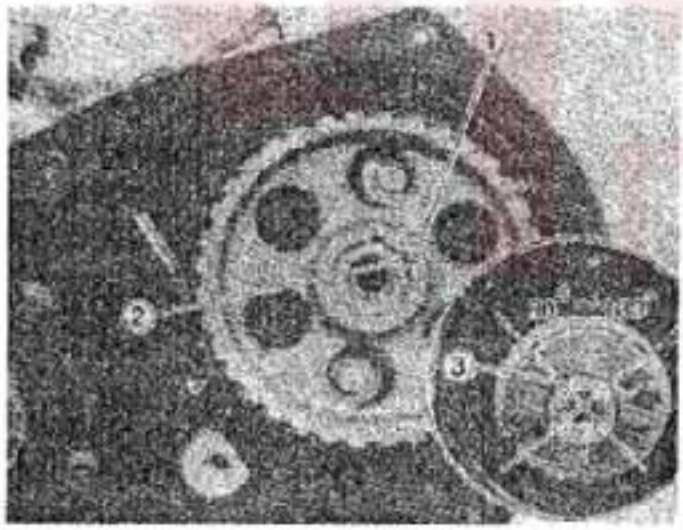


Fig. 3-137

Timing belt (valve timing adjustment)

A certain sequence must be followed installing the timing belt. Here's the sequence;

1) Put the tensioner and the spring together before installing them as one to the timing belt cover. Tighten the bolt and the nut to the extent that the tensioner can be moved by hand easily.

NOTE:
When carrying out the above job, make sure to loosen each lock nut and then each valve clearance adjusting screw so that the camshaft and the pulley can rotate freely.

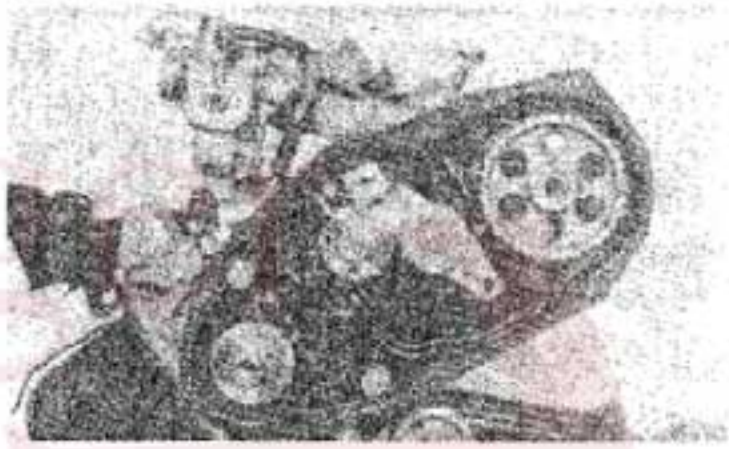


Fig. 3-138

2) Camshaft timing belt pulley has another punch-mark ④, which is located on the radial line passing through the punch-mark ① mentioned above. Now, timing belt inside cover has an embossed mark ⑤. Turn camshaft timing belt pulley to the position where mark ④ meets mark ⑤.

3) The inside cover has another embossed mark ⑥. Turn crankshaft to match keyway ③ of crankshaft timing belt pulley to mark ⑥.

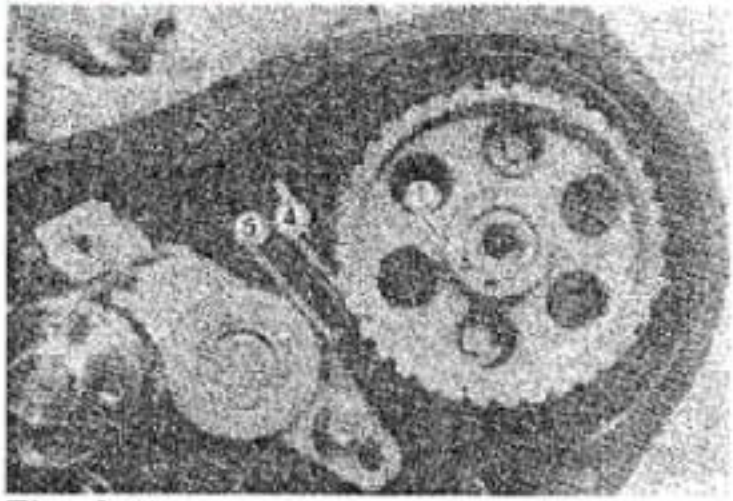


Fig. 3-139

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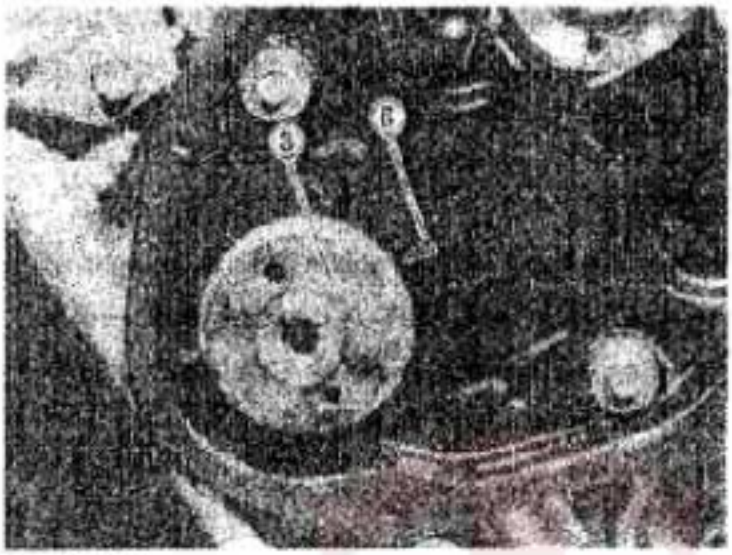


Fig. 3-140

4) You now have the two pulleys correctly related to each other in angular sense. Under this condition, put on the timing belt in such a way that portion of belt indicated as ⑦ is free of any slack.

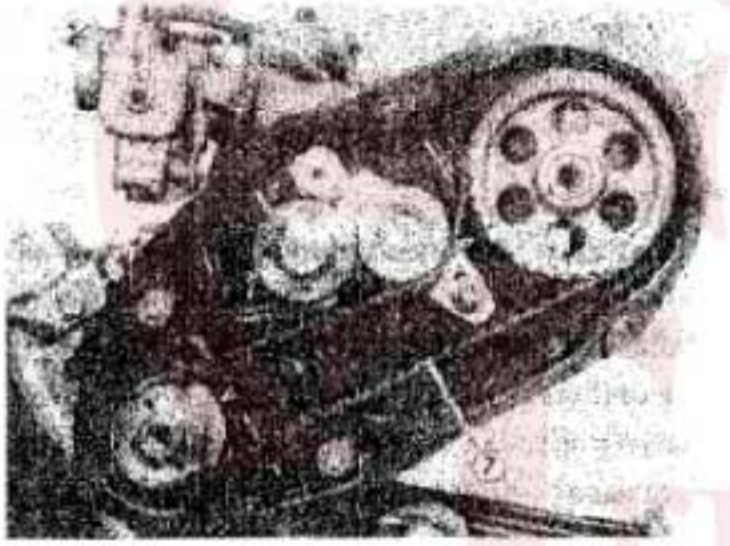


Fig. 3-141

5) After putting the belt, hook the spring on the bracket as shown in Fig. 3-142. The spring, with its own tension, adjusts the belt tension to the specified value.

Rotate the crankshaft clockwise fully twice and tighten the bolt and the nut to the specified torque, after being sure the two pulleys are synchronous.

NOTE:

- **Apply THREAD LOCKCEMENT SUPER GY230 Anaerobic bond to the screw part of the tensioner bolt.**
- **Make sure to tighten the bolt first and then the nut.**

Tightening torque for tensioner bolt and nut	N • M	kg-m	lb-ft
	15~23	1.5~2.3	11.0~16.5

CAUTION:

After setting the belt tensioner, turn crankshaft 2 rotations in clockwise direction to see if marks ① ④ ⑤ ⑥ and crankshaft keyway ③ locate themselves on the same straight line. If they do not line up straight, the foregoing procedure must be repeated to satisfy this requirement.

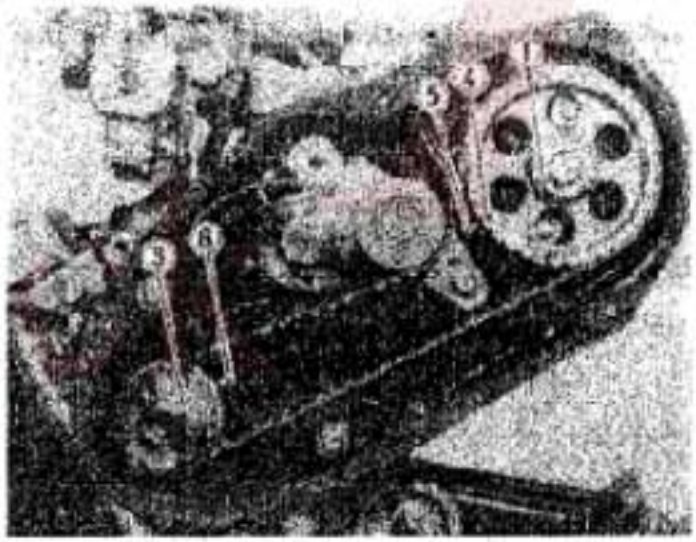


Fig. 3-142

6) Check to be sure that the tension is within the specified range when pushing the belt at the mid point between camshaft and crankshaft.

Timing belt tension "L"	5.5-6.5mm (0.22-0.26in.)

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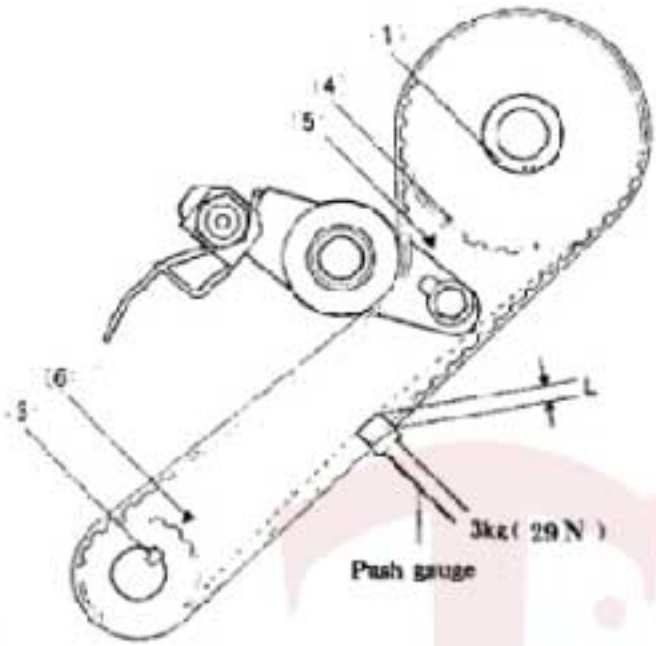


Fig. 3-142-1

7) After adjusting the belt tension within the specified range, adjust each valve clearance to the specified value.

Valve clearance adjustment

The method of valve clearance adjustment is accomplished by means of adjusting screw ⑧. Nut ⑨is for locking the screw. Use a feeler (thickness) gauge to measure the clearance between screw ⑧ and stem ⑩ when the rocker arm arc contacts the base circle of the cam.

Valve clearance specification (when cold)	Intake	0.13-0.18mm (0.005-0.007in.)
	Exhaust	

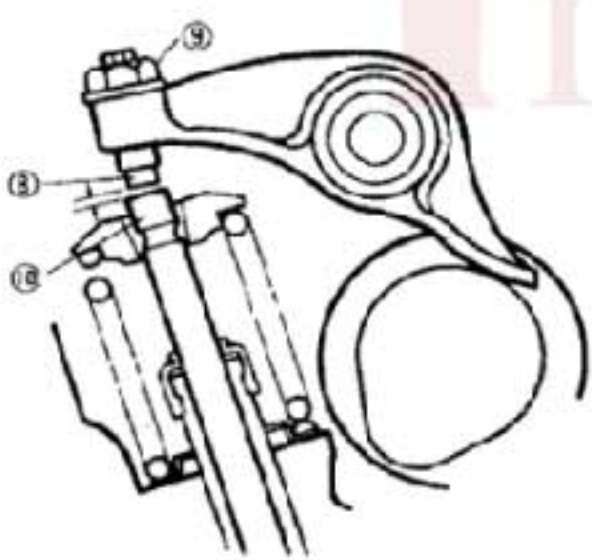


Fig. 3-143

If the engine has been disassembled, it is absolutely necessary to check each valve clearance and set it to the specification, as explained above, upon engine reassembly.

CAUTION:
When checking the valve clearance, be sure that the rocker arm arc is off the camshaft cam (end contacts the base circle of the cam.) The clearance reading is meaningless if the arm is riding on the cam. Stick to this rule for each valve.

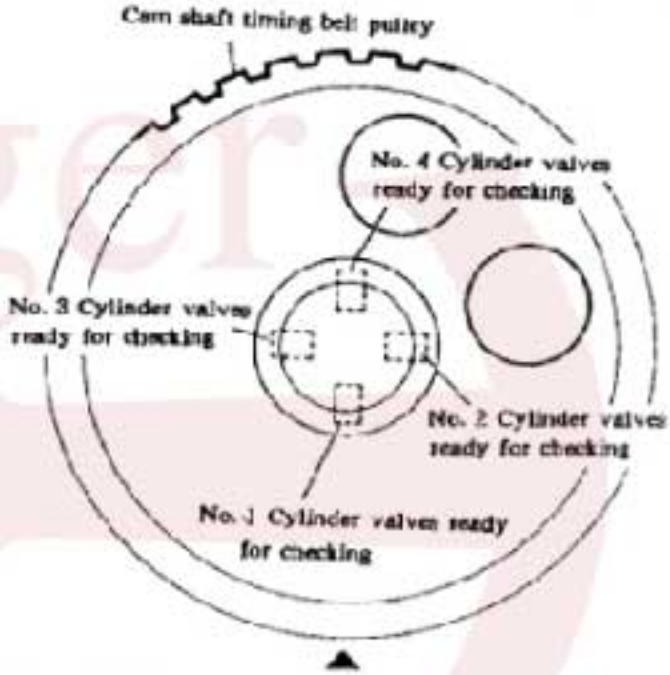


Fig. 3-144

Distributor gear case

Bolts ① are for securing this distributor seat to the cylinder block. When installing the case, be sure to apply Anaerobic bond QY168 to the threads of these bolts.

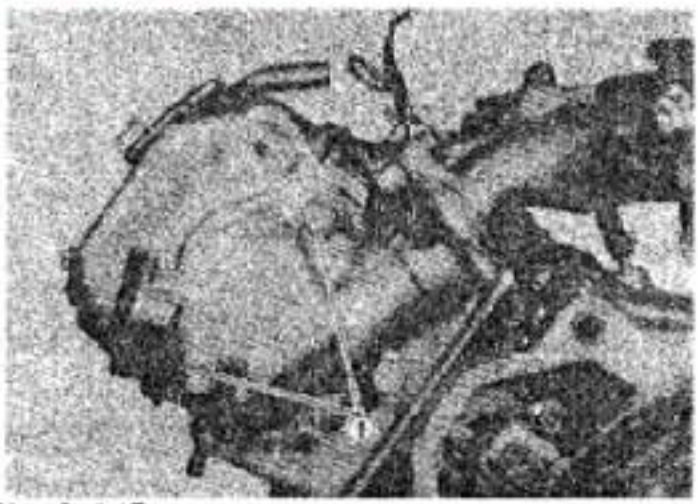


Fig. 3-145

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Distributor

The distributor takes its mounted position correctly only when it is inserted into the distributor seat under a specific condition. The condition is this: Turn over crankshaft to locate the piston at B. T. D. C. 10° (No. 1 Piston being compression stroke), and insert the distributor into the distributor seat, with center ② of distributor rotor lined up with embossed mark ③ of distributor housing, as shown in Fig. 3-146.

NOTE:
For the checking and adjusting steps on ignition timing, refer to the section dealing with the ignition system.

CAUTION:
Where the distributor seat has been removed, it is necessary to fill in 60 cc (2. 03/2. 11 US/Imp oz) of engine oil after re-installing the gear case.
Pour this much oil in through the distributor mounting hole. The gear could develop trouble if this step is ignored.



Fig. 3-146

Alternator

The water pump drive belt, by which the alternator too is driven, must be tensioned to the specification after the alternator is installed. Check the tension at the middle point of the belt between water pump pulley and alternator pulley. To vary the tention for adjustment, displace the alternator in place.

Drive belt tension (in terms of belt deflection as shown)	10-15mm (0. 4-0. 6in.) under 10kg (22. 0lb) thumb pressure



Fig. 3-147

Clutch

At the time of bolting the clutch cover after mounting the clutch disc, the disc must be turned up and centered. Carry out this centering job with the use of the special tool Ⓐ.

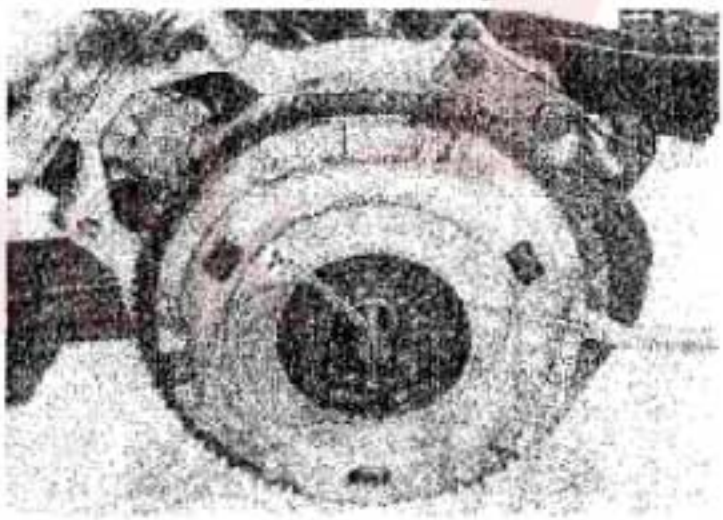


Fig. 3-148

Engine Inspection and Adjustments

Fan belt

Adjust the belt tension as outlined in the section for ENGINE COOLING SYSTEM.

Distributor point gap

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The method of adjusting the contact point gap is described in the section for IGNITION SYSTEM.

Ignition timing

Refer to IGNITION TIMING.

Carburetor

Adjustments to be made are detailed in CARBURETOR.

Valve clearance

Valve clearance specification (COLD)	Intake	0.13-0.18mm (0.005-0.007in.)
	Exhaust	

To check and adjust valve clearance with the engine mounted in place, that is, secured to the chassis, be sure to remove the cylinder head cover, so that you can take a good look at rocker arms and camshaft. Remember, a clearance reading is meaningful only when it is taken with the rocker arm clear of and not riding on the cam.

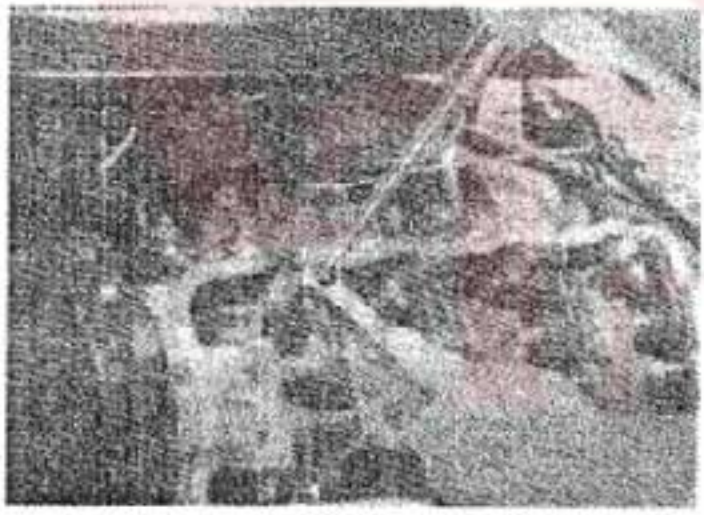


Fig. 3-149 Adjusting valve clearance



Fig. 3-150 Measuring valve clearance

Timing belt

This belt is an expendable item. Periodically, inspect it for breakage, cracks, wear and cleanliness. If it is badly dirtied with greasy matter or otherwise damaged, replace it.

> **NOTE:**
> **Inspect the belt for any damage or wear while moving it by turning the crankshaft clockwise.**

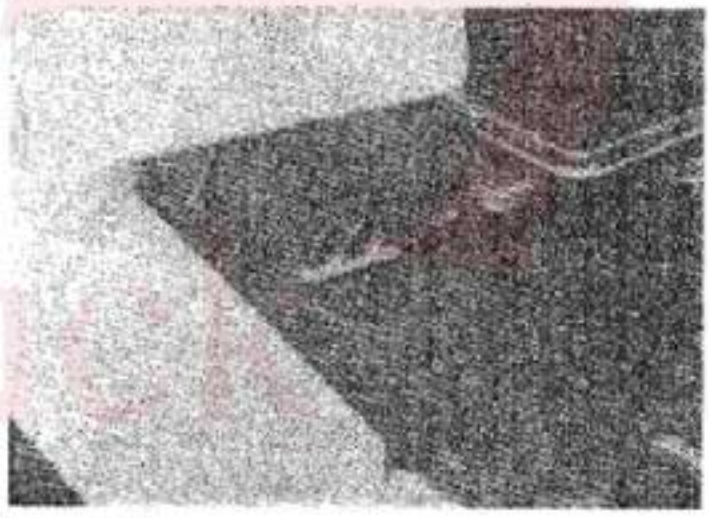


Fig. 3-151

Oil pump discharge pressure measurement

The method of pressure measurement is outlined in the section for ENGINE LUBRICATION.

Compression pressure measurement

Check the compression pressure on all four cylinders, as follows:

1) Remove all spark plugs.

2) Install the compression gauge Ⓐ (09915-

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64510) on one of the cylinders, making the connection perfectly air-tight.

3) Disengage the clutch (to lighten starting load on engine), and depress the accelerator all the way to make the throttle full-open.

4) Crank the engine with the starter motor, and read the highest pressure on the compression gauge.

5) Carry out the steps 2) through 4) on each cylinder to obtain four readings.

Compression pressure

Standard	Limit	Difference
11.5kg/cm² (163.5psi) /300r/min	(10.0kg/cm² (128.0psi)/300r/min	1.0kg/cm² (14.2psi)/300r/min between any two cylinders

NOTE:
There is some trouble in the engine when the compression pressure is not higher than the limit. Refer to TROUBLE-SHOOTING GUIDE for possible causes.

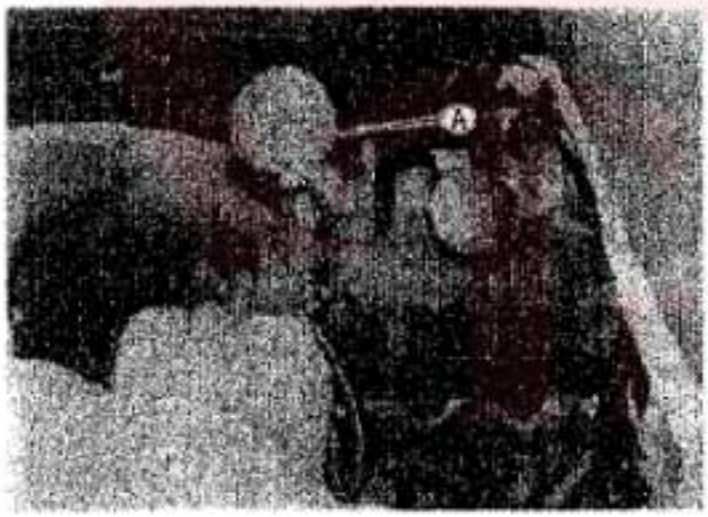


Fig. 3-152

Vacuum measurement

The vacuum that develops in the intake line is a good indicator of the condition of the engine. It is for this reason that the vacuum is measured. The measuring procedure is as follows:

1) Run the engine until its coolant temperature rises to a level between 75℃ and 85℃ (167°F-185°F).

2) Install the vacuum gauge Ⓑ on the manifold as shown in Fig. 3-153. Install an engine tachometer.

3) Run the engine at the specified idling speed and, under this running condition, read the vacuum gauge. The vacuum should be not lower than 40 cm Hg (15.7in. Hg).

A low vacuum reading means that any combination of the following malconditions is the cause, which must be corrected before releasing the machine to the customer:

(a) Leaky cylinder head gasket
(b) Leaky inlet manifold gasket
(c) Leaky valves
(d) Weakened valve springs
(e) Maladjusted valve clearance
(f) Valve timing out of adjustment
(g) Ignition mistimed
(h) Carburetor improperly adjusted

NOTE:
Should the indicating hand of the vacuum gauge oscillate violently, turn the adjusting nut Ⓒ to steady it.

Standard vacuum	45cm Hg Over (17.7in. Hg)
Idling speed specification	900r/min (Take vacuum reading at this speed.)



Fig. 3-153

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Engine oil

Refer to the section for ENGINE LUBRICATION.

Engine oil filter

The methods of checking and servicing the oil filter are outlined under ENGINE LUBRICATION.

Engine coolant

This subject is covered in the section for ENGINE COOLING SYSTEM.

Exhaust line and muffler

Inspect each exhaust line connection for tightness, and examine the muffler and other parts for evidence of breakage and leakage of gases. Repair or replace defective parts, if any.

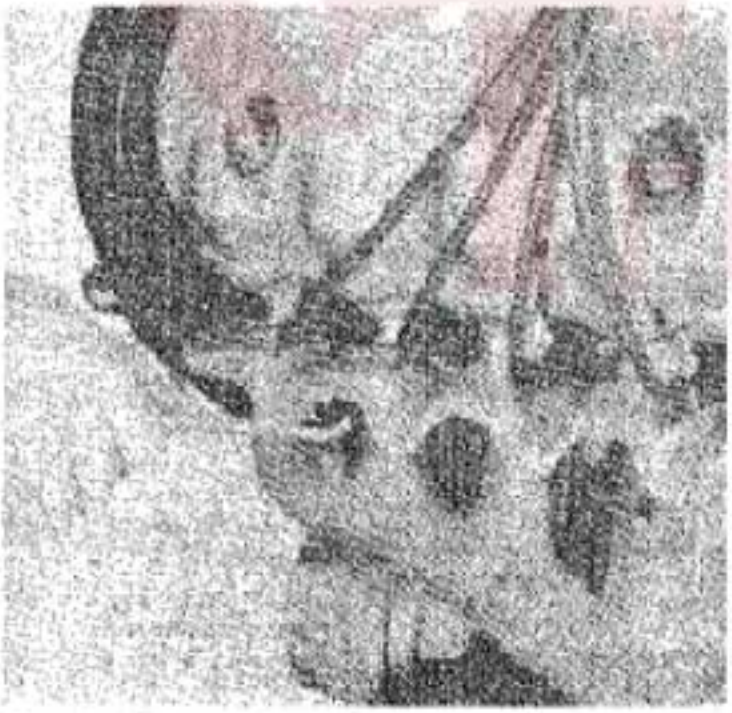


Fig. 3-154

Crankcase ventilation hose

Inspect this hose for cracks and evidence of breakage and, as necessary, replace it. Check to be sure that the hose connection is tight.



Fig. 3-155

Oil filler cap

The cap has a packing. Be sure that the packing is in good condition, free of any damage and signs of deterioration, and is tight in place; it is replaceable.

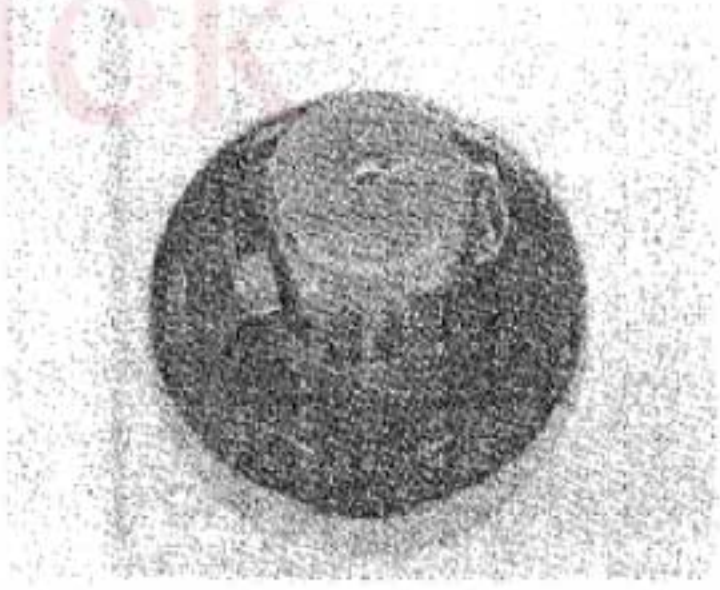


Fig. 3-156

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Engine Lubrication

Description

The oil pump for pressure-feeding lubrication oil to the running parts of the engine is of an internal gear type, in which an outer ring-like gear is internally meshed with an inner gear, there being a separating crescent-like stator between the two. The pump is mounted on the front end of the engine, and is driven by the crankshaft.

Oil Circuit

The oil pump lifts oil through the strainer and discharges it under pressure, forcing the oil through the oil filter. The filtered oil flows into two paths inside the cylinder block. In one path, oil reaches the crankshaft journal bearings and big-end bearings on crankpins. Some of this oil goes to the connecting-rod small ends and lubricates piston pins there and also the walls of cylinder bores.

In the other path, oil goes up to the cylinder head through the camshaft center journal and enters the internal oilways of rocker arm shafts to lubricate the sliding parts of these shafts and also other four journals of the camshaft.

An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.5kg/cm (64.0psi). Relieved oil flows back to the oil pan.

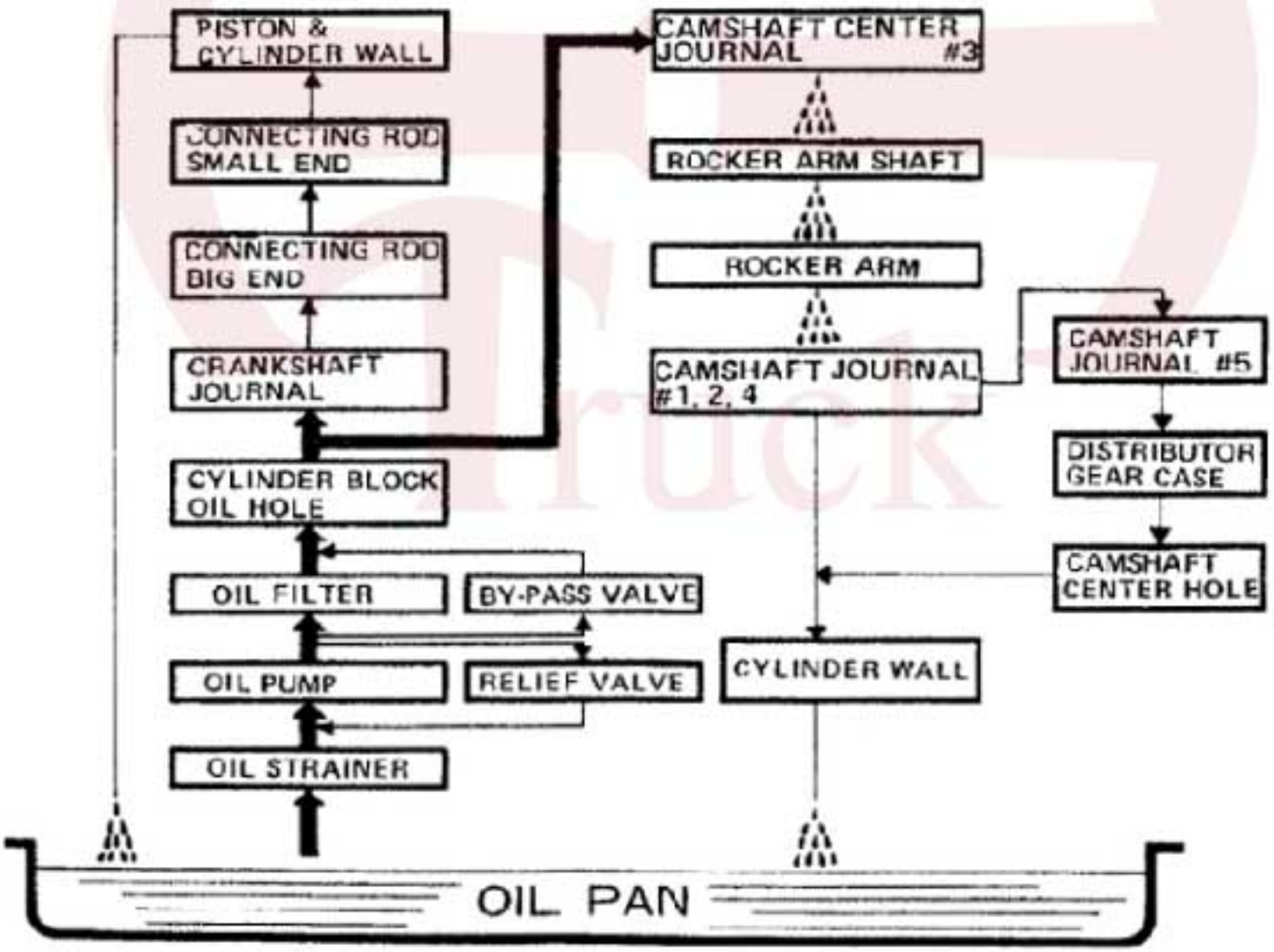


Fig. 3-157

https://truckmanualshub.com/

Oil pump disassembly

Remove oil pump gear plate.

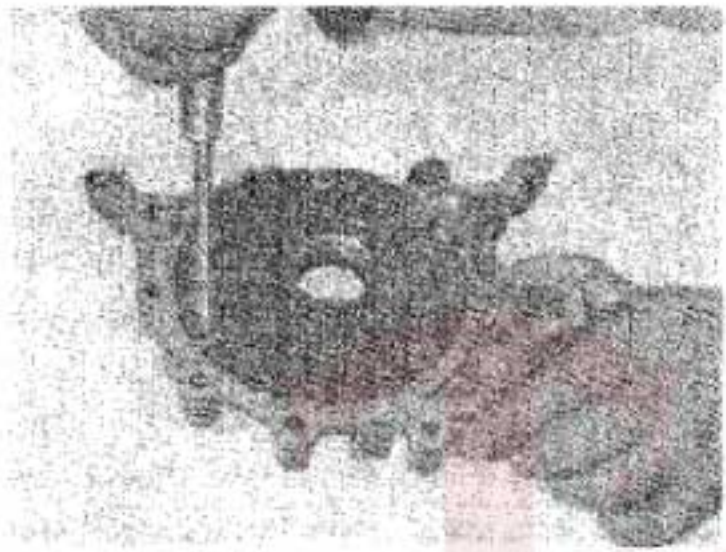


Fig. 3-158

Take out inner gear.



Fig. 3-159

Take out outer gear.

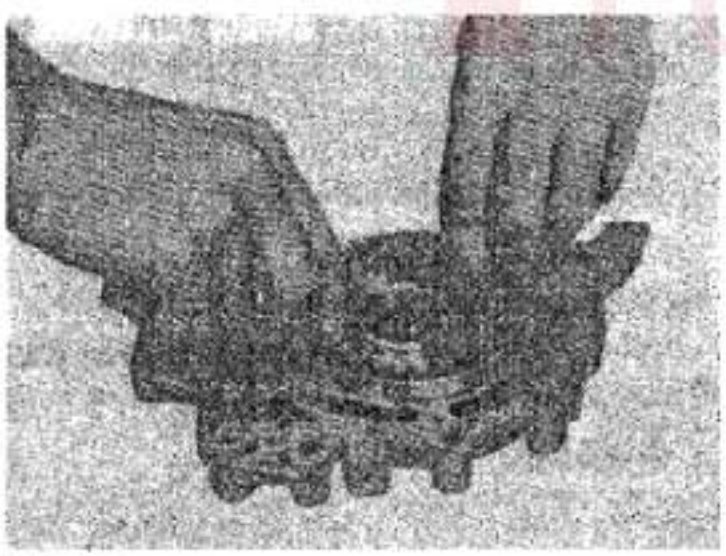


Fig 3-160

Oil pump inspection

Radial clearance between inner gear and crescent.

Standard	0.60-0.80mm (0.0236-0.0315in.)

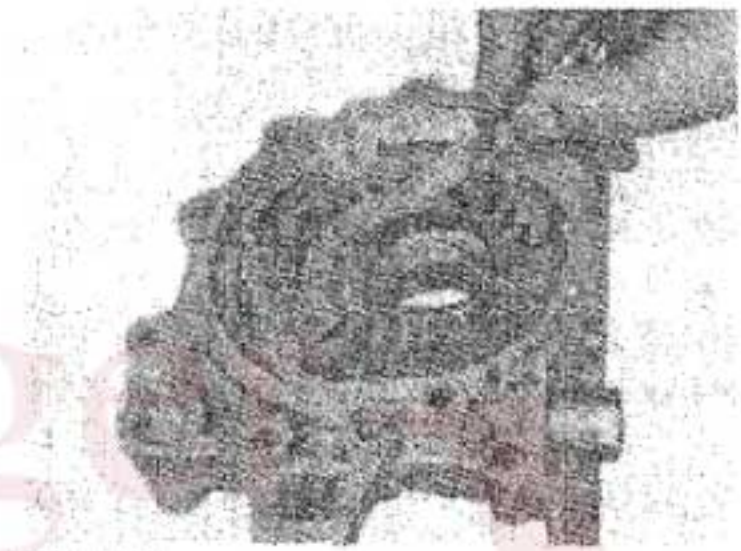


Fig 3-161

Radial clearance between outer gear and crescent.

Standard	0.25-0.40mm (0.0098-0.0157in.)



Fig. 3-162

Radial clearance between outer gear and pump case.

Limit	0.3mm(0.0118in.)

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Fig. 3-163

Side clearance;

Using a straightedge, determine the side clearance in terms of the thickness gauge reading taken between straight edge and gear, as shown in Fig. 3-164.

Limit on side clearance	0.17mm (0.0067in.)

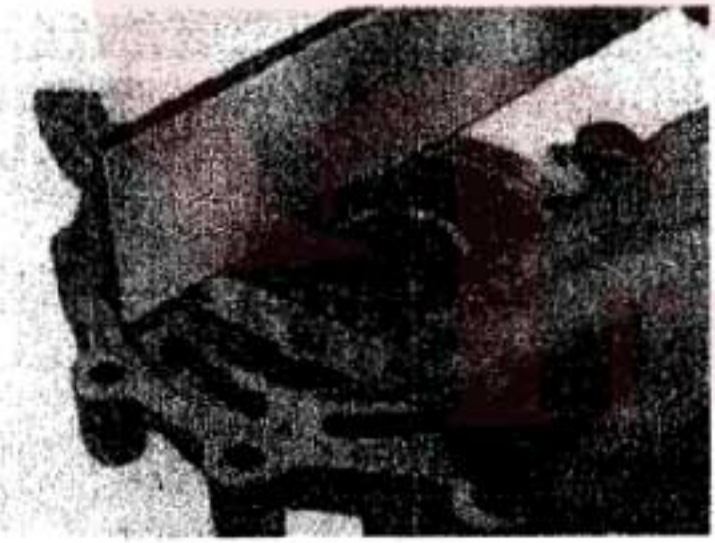


Fig. 3-164

Oil pump reassembly

Have all disassembled parts washed clean, and rebuild the pump to meet each of the following requirements;

- Outer gear has a punch mark ①. Fit outer gear into the pump case, with this punch-marked side coming on plate side.

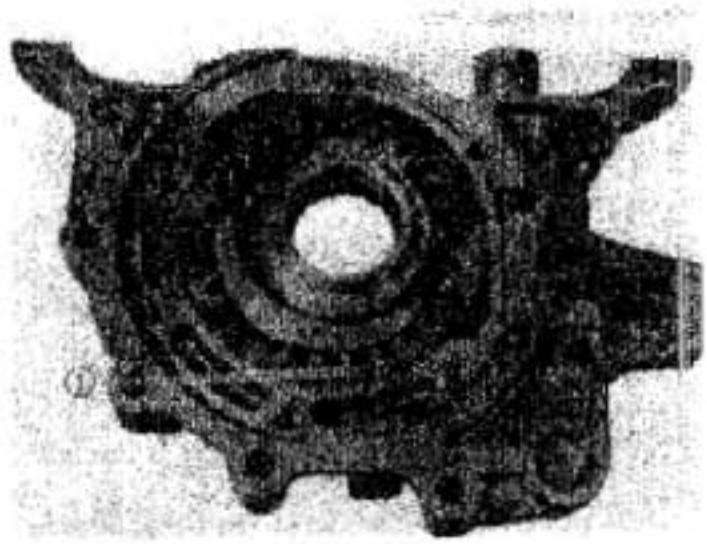


Fig. 3-165

- Use a new gasket when fitting the oil pump case to the cylinder block. The edge of the gasket might bulge out; if it does, cut the bulge off with a sharp knife, making the edge smooth and flush with the end face of the pump case, and apply Anaerobic bond QY168 to the cut edge.

NOTE;
Before fitting the pump case, oil the oil seal lip.

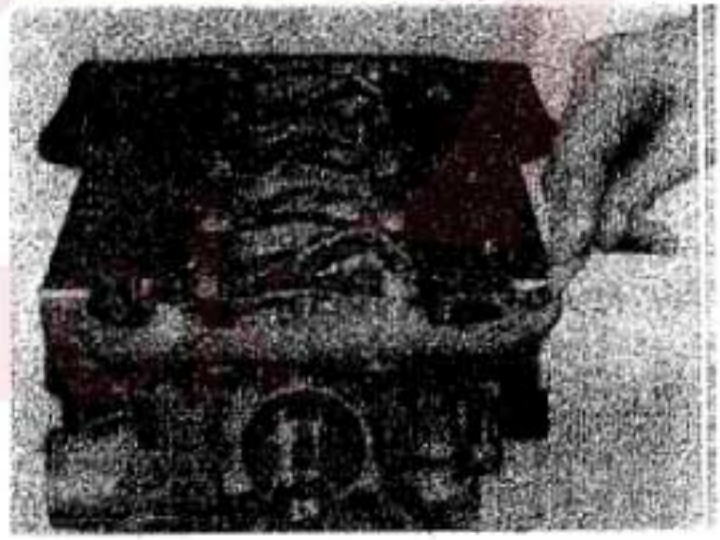


Fig. 3-166

- Installation of crankshaft timing belt pulley and timing belt must be carried out in strict conformity to the special instructions given for engine reassembly.

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CAUTION:
Strict adherence to the special instructions is essential, for an improperly installed pulley and timing belt prevents the engine from operating as designed.

Oil filter servicing

At intervals stated below, replace the oil filter element. The element must be replaced not only periodically but also whenever it is found dirty.

Initial replacement to be made:	After 1,000km 62.2miles
Replace at intervals of:	Every 10,000km (6215miles)

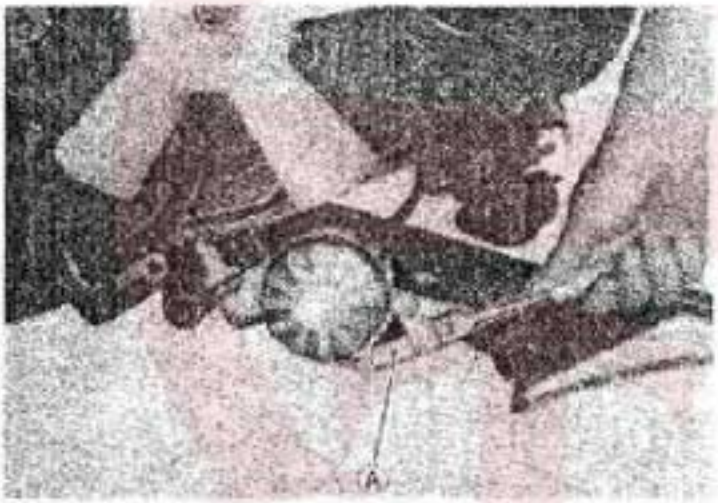


Fig. 3-167 Oil filter wrench (A) (09915-47310)

Oil pump strainer servicing

Inspect the strainer periodically and, as necessary, clean it by washing to remove dirty matters clogging its screen.

Checking the oil pressure

When the engine is idling, not to mention fast running, the oil pressure light should remain completely off; if not, it is a cause for checking the oil pressure in the following manner:

1) Be sure that engine oil is up to level in the oil pan. Refill the oil pan, as necessary, to raise the oil to and above "LOW" line on the level gauge. Be sure, too, that the oil filter is clean and that the oil pump strainer is not clogged. Check to be sure that there is no oil leakage from any part of the engine.

2) Remove the oil pressure unit, which is mounted on that side of the cylinder block where the oil filter is located. Into the vacated threaded hole, screw the pressure gauge connection to install the gauge.



Fig. 3-168

3) Start up the engine and idle it until the coolant temperature rises to a level between 75° and 85°C (167°-185°F). At this temperature, raise engine speed to 3,000 r/min and read the pressure gauge indication.

Oil pressure specification	3.0-4.5kg/cm²(42.66-63.99psi) At 3,000r/min (rpm)

if the pressure read is not up to the specification, the oil pump must be checked.

CAUTION:
When re-installing the oil pressure unit, be sure to wrap its screw threads with a sealing tape. Tighten the unit to a torque value of 1.2 to 1.5kg-m (9.0-10.5lb-ft).

Engine oil servicing

For the engine oil, use API QE Grade

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SAE10W40 engine oil. Each oil change requires the following amount of oil:

Periodical oil change	3L
Filling up after engine overhauling	3. 5L

Oil level,

Refill the engine oil whenever necessary, in order to maintain the oil surface between "LOW" and "FULL" lines on the oil level gauge.

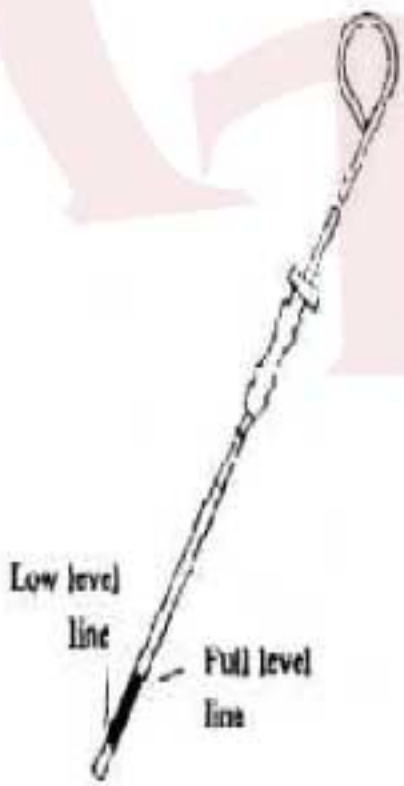


Fig. 3-169 Oil level gauge

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SECTION 6B-1

CARBURETOR

(if equipped)

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Carburetor Specifications.....6B-1-2

Carburetor Operation.....6B-1-2

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Description

The carburetor, serving all four cylinders, is of a horizontal-draft Solex type, composed of the following component parts;

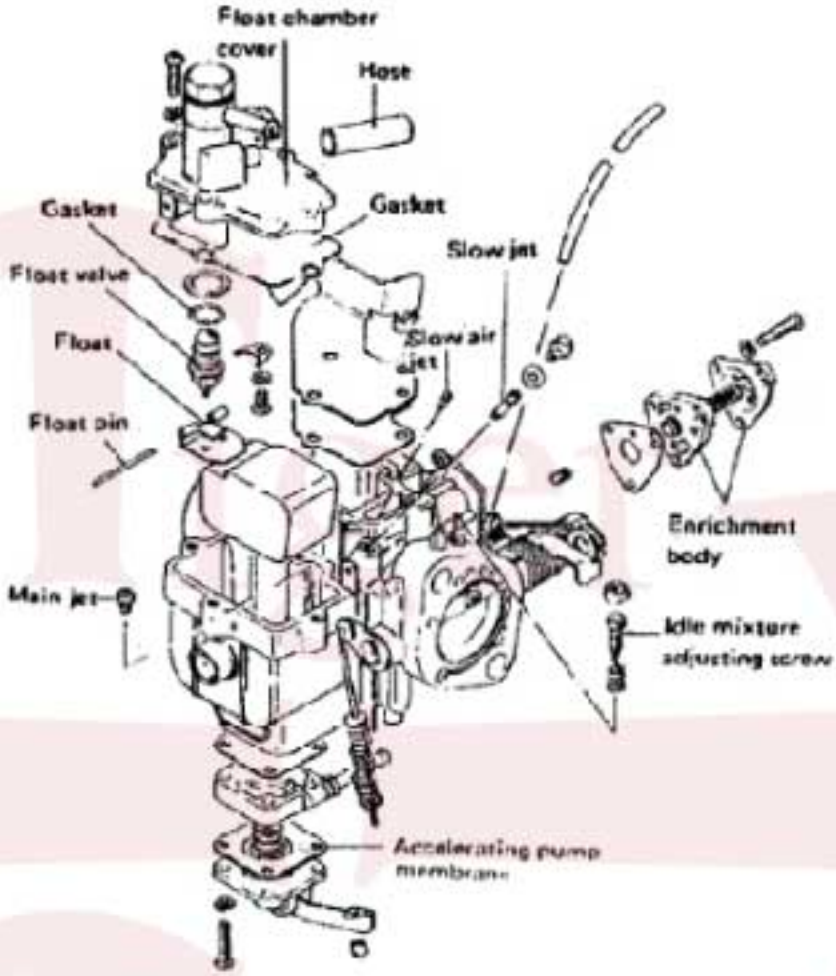


Fig. 4-1

Carburetor Specifications

Item	Specification
Venturi diameter	25mm (0.984in.)
Main jet	#100
Main air hole	1.1
Slow jet	#52.5
Slow air jet	1.8

Carburetor Operation

Float chamber

The float chamber with its needle valve is a vessel receiving the fuel from the fuel pump and holding it up to a certain constant level. The float responds to the up-and-down movement of fuel surface and actuates the needle valve.

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Slow speed mixture

Referring to Fig. 4-2, fuel flows out of the float chamber through main jet and reaches slow jet. Slow air jet admits air, metering this air and sends it to the inlet side of slow jet, which meters this mixture of fuel and air into the slow circuit terminating at idle port and bypass port.

During idling, the slow speed mixture (coming from slow jet) is sprayed out mainly from idle port and becomes mixed with the air flowing into the main bore. Thus, the air-fuel mixture can be made richer or leaner by re-setting idle adjusting screw in loosening or tightening direction, respectively, in that order.

High speed mixture

Two circuits come into operation for producing the high speed mixture. One circuit begins with main jet, which meters out fuel from the float chamber. This fuel is mixed with the air meteringly admitted by main air hole; this mixing is effected in emulsion tube. The emulsified mixture is then sprayed out into the venturi from main bleed pipe.

The other circuit goes into service when the manifold vacuum falls to move the diaphragm in the enrichment device on the carburetor body. As the diaphragm so moves, the valve above it opens to let out fuel through the hole provided in the chamber. Enrichment jet meters out this fuel and sends it to emulsion tube, from which it flows into main bleed pipe and is sprayed into the venturi.

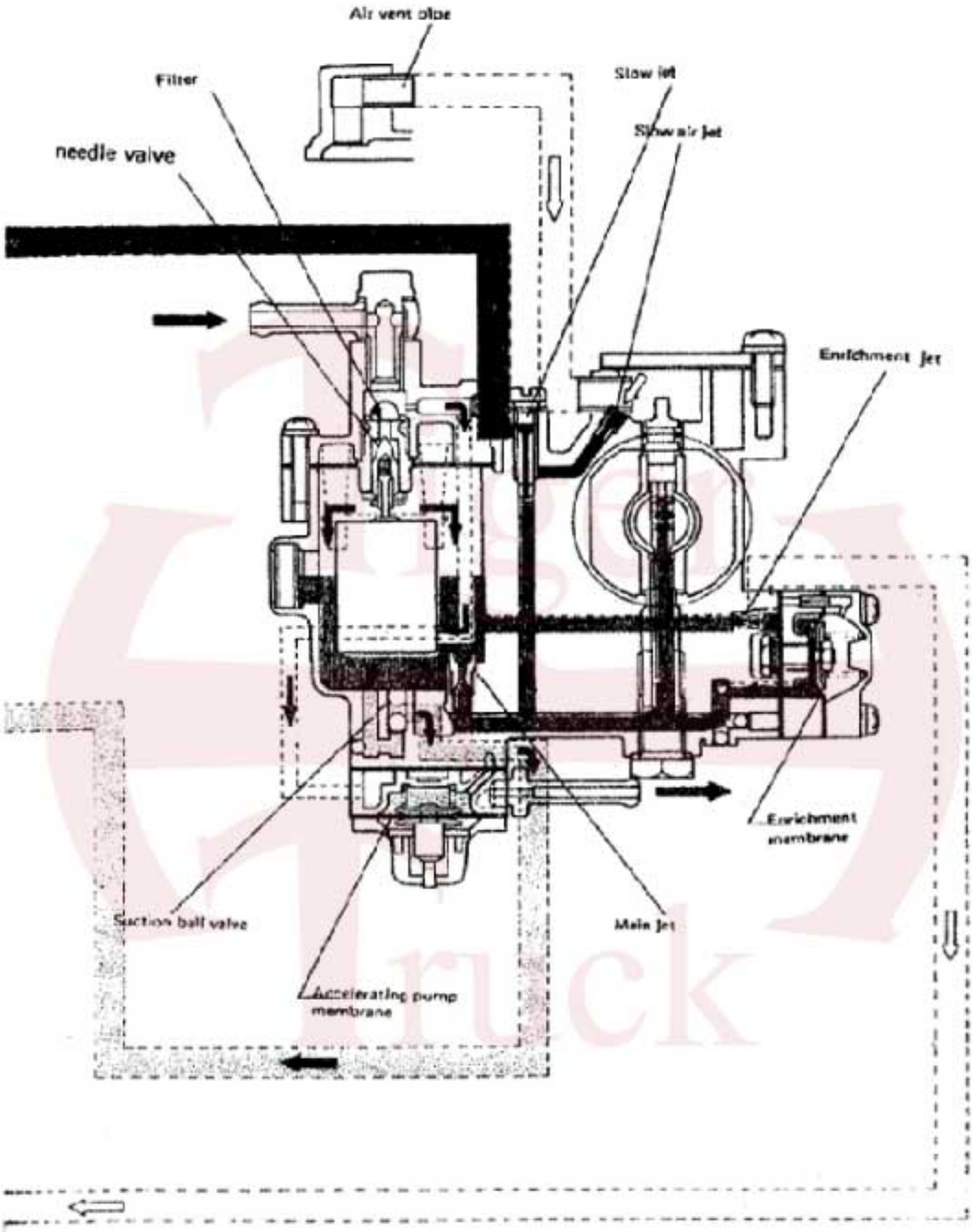
Acceleration power system

The main device of this system is an accelerating pump for making the carburetor respond without delay to the accelerator pedal depressed abruptly while the engine is running in its low speed range or is idling. The actuating lever of this pump is linked to the throttle shaft so that, as throttle valve opens quickly, the pump lever pushes up the diaphragm, thereby closing suction ball valve and opening discharge ball valve. Consequently, the fuel in the pump is forced out of pump nozzle into the venturi.

Others

A fuel return circuit is provided in this carburetor in order to avoid "vapor locking" of fuel. How "vapor locking" is avoided will be explained. When the fuel level rises in the float chamber, its float valve closes; and, as the level falls, the valve opens. With the valve closed, the incoming fuel (delivered under pressure by the pump) finds its way through the sidewise hole provided in the top part of the float valve anchoring point and flows throuth the passage drilled out through the float chamber wall and provided in the section under the acceleration pump to the fuel tank filler. This arrangement allows the fuel pump to keep on delivering fuel. For this reason, the incoming fuel for the float chamber is always "cold" and cools the float chamber and acceleration-pump chamber by flowing past its chamber, thereby suppressing the conditions leading to vapor locking.

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Inspecting and Adjusting

Jets

Wash the jets clean. Wash the holes in which jets are located ,and clear each hole by directing compressed air to it.

A clogged slow jet is usually responsible for erratic engine idling. Erratic engine operation in the medium and high-speed ranges and during acceleration is often accounted for by a clogged

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condition of main jet, main air hole or hole constrictions in the carburetor body.



Fig. 4-3

Needle valve

The conical tip of needle valve is subject to wear as this tip seats and unseats in the normal operation of the needle valve. When the needle valve is in closed condition, this tip is pushed against the seat by the float.

Inspect the conical tip and seat for evidence of clogging. As necessary, remove the seat and wash it clean. A worn needle, illustrated in Fig. 4-4, must be replaced. Remember, a clogged or poorly seating needle valve is usually accountable for "overflow".

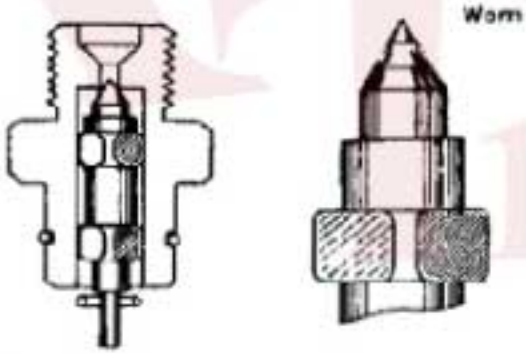


Fig. 4-4

Choke valve

Check to be sure that, when the choke knob is pulled out all the way, the shaft of choke valve in the carburetor will rotate, and that, when the knob is pushed in , the shaft will rotate back to original position.

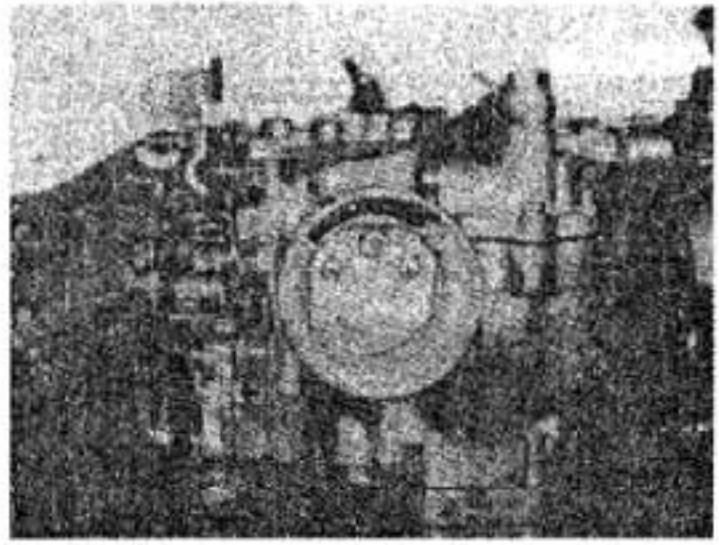


Fig. 4-5 Choke valve (with knob pulled out fully)

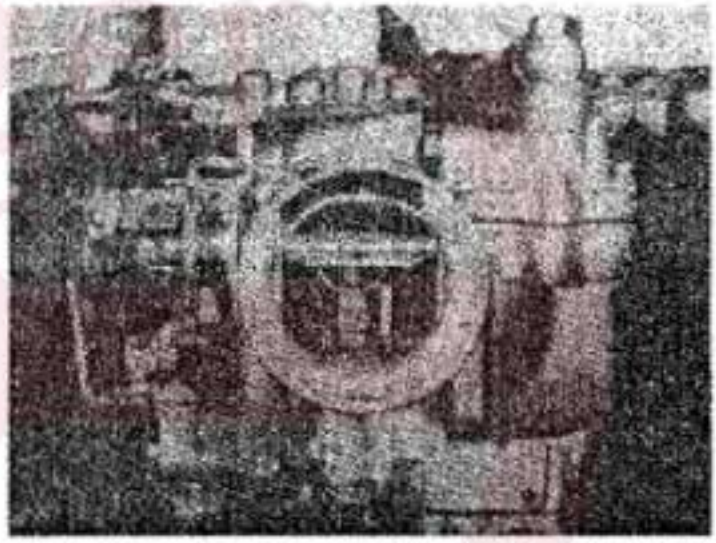


Fig. 4-6Choke valve (with knob pushed in fully)

Accelerator and choke cables

Inspect these cables for wear and tear, and check to be sure that each cable connection is in sound condition. Do not hesitate to replace a defective cable or other part; when installing a replacement cable, tighten the connections good and hard.

NOTE:
Install the choke cable to the carburetor body with the choke knob pulled out about 7 mm(0. 27in). If this is not done, the choke valve may not return completely to the original position.

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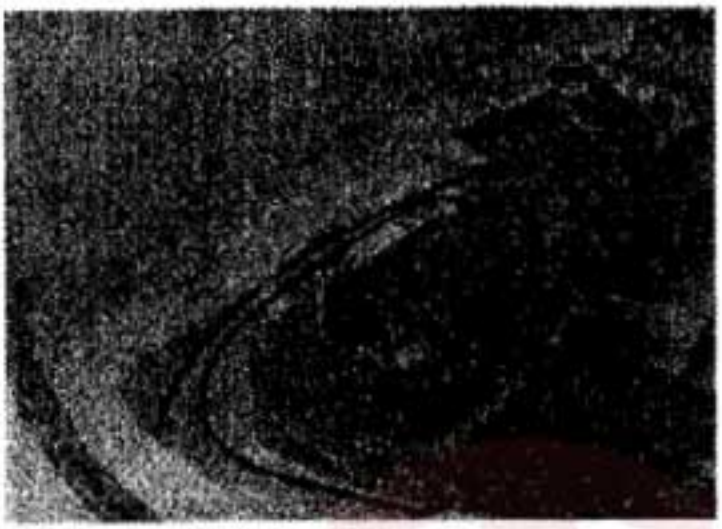


Fig. 4-7

Fuel hose

Inspect the hose for cracks and signs of breakage, and replace it as necessary. Examine it for signs of leakage, too. Be sure that the hose is free of any leak and that its connections are tight.



Fig. 4-8

Fuel tank cap

This cap is fitted with a rubber packing. Be sure that the packing is in good condition and that the cap in place is tight and leak-free.

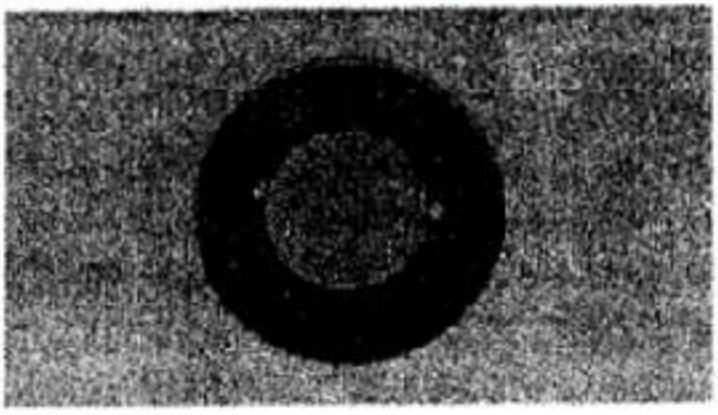


Fig. 4-9

Idle speed and idle mixture adjustment

NOTE:
Requires external tachometer.

As preliminary steps, check to be sure that:

- Coolant temperature is approximately 82℃ (180℉).
- Choke valve is in the full-open position.
- All accessories (wipers, heater, lights, etc.) are out of service.
- The ignition timing is within specification.
- The air cleaner has been properly installed and is in good condition.

[Idle speed and idle mixture adjustment]

Adjust idle speed by repositioning the idle speed adjusting screw①, making sure the engine idles steady at 900 r/min (rpm) ± 50r/min(rpm).

Idle mixture adjusting screw② generally needs no adjustment. However, when the adjusting screw is removed to overhaul the carbutetor, adjustment is necessary as follows:

Tighten idle mixture adjusting screw ② fully and, gradually untightening it, set the screw at a position where the engine speed is the highest (best idle). Then, readjust the engine idling speed to 900 r/min (rpm) with idle speed adjusting screw ①.

CAUTION:
- **When cars are used in countries where exhaust gas regulations are in force, check the exhaust gas with an exhaust gas tester. If gas exceeds the value specified in the regulations, adjust the idle mixture adjusting screw②.**

For European market, adjust the screw② with special tool.

For other market, adjust the screw ② with plain screwdriver.

Engine idling speed specification	900 ± 50r/min (rpm)

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SECTION 6B–2

ELECTRONIC INJECTION SYSTEM

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1. Precaution

It is important to observe the follows during use, check, diagnosis and maintenance of the engine, F series.

(1)When checking the electric elements without need of power, disconnect the cathode of battery.

(2)When disconnecting the electrodes of battery, disconnect the cathode first, then the anode, when connecting the battery, do it in reverse order.

(3)Whenever using seal parts, new gasket and "O" ring should be chosen as far as possible, and the surface should be cleaned up to keep the tightness.

(4)After repairing any line, check all related pipes and joints for leakage or chokage.

(5)Never disconnect the fuel delivery pipe between pump and nozzle, before the fuel pressure drops down, or the pressurized fuel will spray out.

(6)Since the engine is equipped with a catalytic converter, unleaded gasoline can be used only.

(7)It must be prohibited to introduce the unburned fuel into the exhaust pipe, or the catalytic converter will be damaged.

(8)Ignition spark test may only be performed as actual demand is required, but the experiment duration is as short as possible with the throttle being closed.

(9)Never unplug the high tension lead of spark plug while the engine is running.

(10)Prevent the engine from flameout.

(11)When connecting or disconnecting the electric elements, turn the ignition switch to "Off" position, otherwise the element will be damaged.

(12)Do not touch the element pins with finger, or the static electricity from body may burn out the element.

(13)When measuring the circuits, a multitester with high input impedance is required to use.

(14)When measuring the circuits, it is prohibited to pierce the isolating layer of the wire , if in this way, the insulatibity will be affected.

(15)When measuring the connectors, pay more attention not to bend the pins.

(16)Observe the connection (connecter) conditions and check if any bent male pins and expanded sockets, in addition, check if any unlocked connectors, any dirt and corrosion.

(17)Measure if the voltage of battery is equal to or over 11V, before check the electric system and measure circuit voltage.

(18)When installing the electronic devices, such as antitheft device, wireless or mobile telephone, the following points will be observed:

1) The antenna will be placed to the Electronic Control (engine management) System as far as possible.

2) Do not connect any other wire onto the harness of Electronic Control (engine management) System.

(19) When the vehicle is in demand of weld or bake, remove the ECU before doing so.

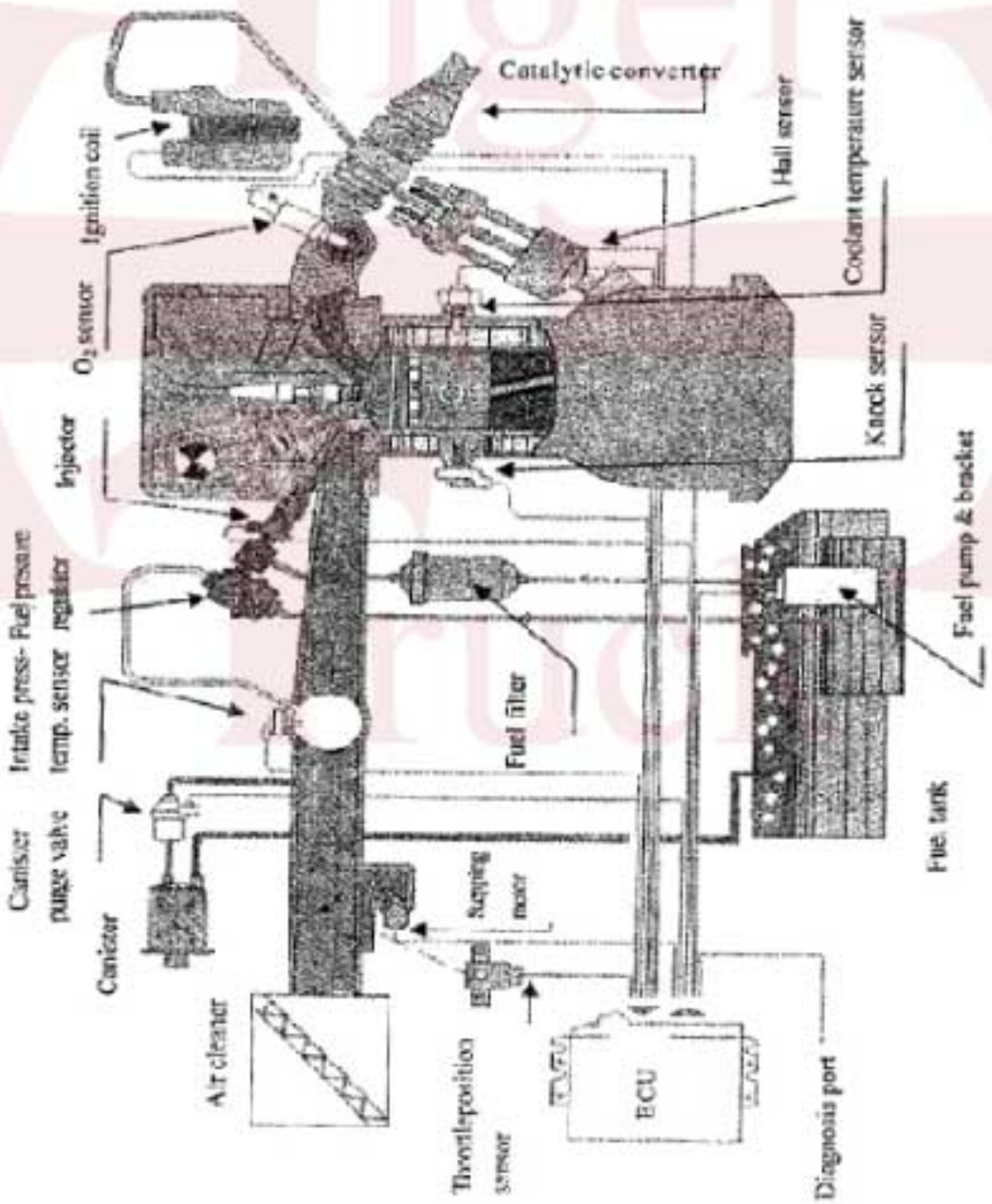
(20) This manual is suitable for the electronic control engine (MPI engine), F series, Jialing brand and the relevant vehicle, Chang'an brand.

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Engine model	Vehicle model
JL465Q5	SC6350 FHA , SC6331E ECA , SC1020A
JL465Q7	SC6350C FAA, SC6331 EYA, SC6330C FAA , SC6330DA
JL462Q3	SC1011D, SC6320A, SC633DB
JL368Q3(Horizontal)	SC7060A
JL368Q3(longitudinal)	SC6331D, SC1012C

2. Summary

The Electronic Control (engine management) System of the engine, F series is composed of 6 subsystems, such as intake system, fuel delivery system, control system, ignition system, emission system and air conditioner system



Sketch of Electronic control engine (MPI engine)

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2.1 Intake system

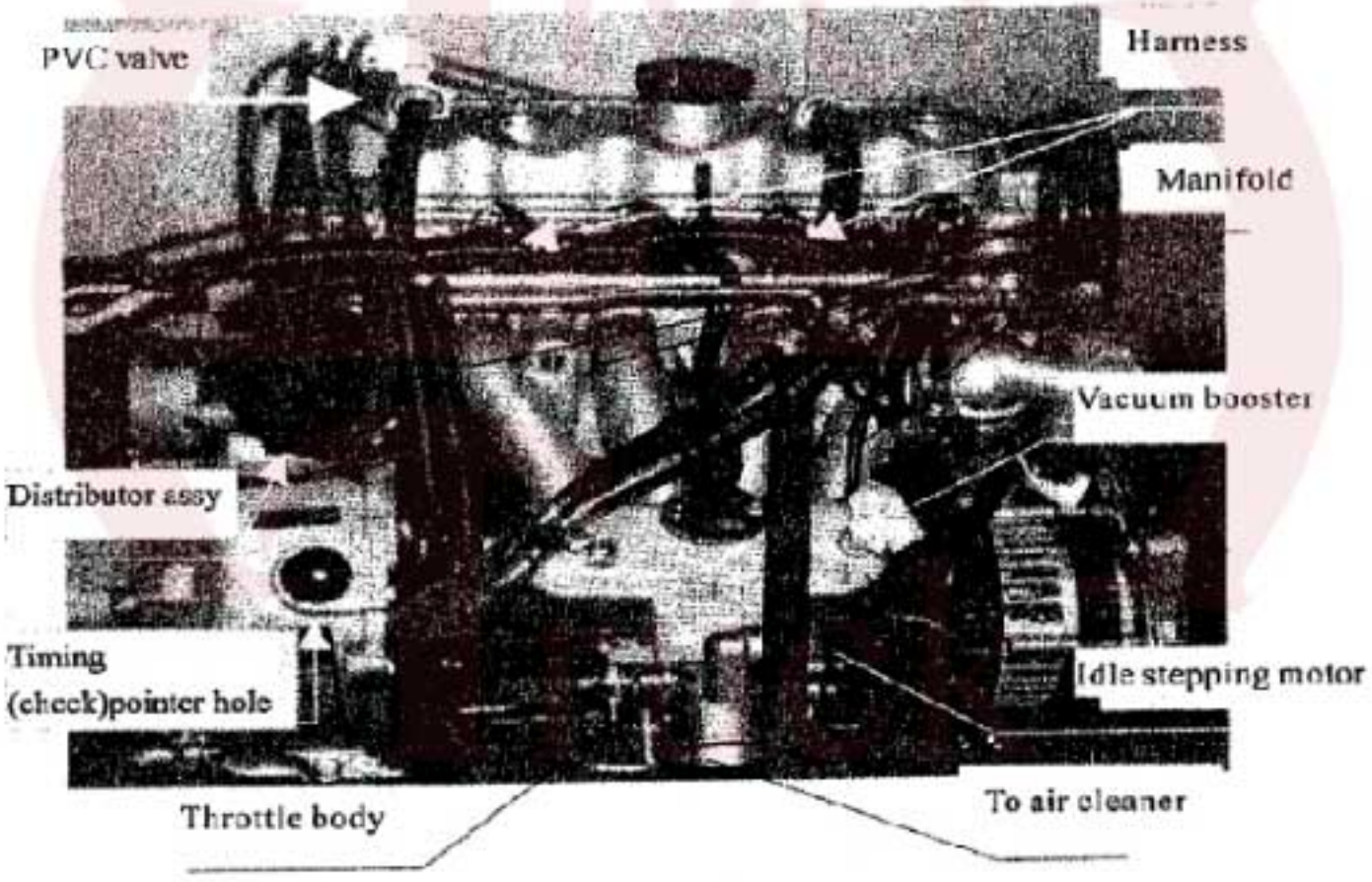
It is composed of air cleaner, throttle body, idle stepping motor and manifold etc.

Function expression(Function description):

Fresh air is filtered by air cleaner, then it is distributed into the combusting chamber through the manifold at a certain air flow rate controlled by throttle body. When the engine running at idle speed the idle stepping motor actuates according to the command from ECU to control the air intake rate. The intake manifold will generate vacuum pressure to supply the whole vehicle as a negative pressure source.

General requirement:

The air cleaner must have the function to filter the impurity (dust) from the atmosphere and have the intake resistance as small as possible. The throttle can operate smoothly and its internal face (surface) keeps clear. The air valve operated by the idle stepping motor must be clear without any obstruction. There is not any crack, air and water leakage on the manifold.



Sketch of Electronic Injection Engine

2.2 Fuel delivery system

It is composed of fuel tank, fuel pump, fuel filter, fuel rail, fuel pressure regulator, fuel injector and fuel pipe etc.

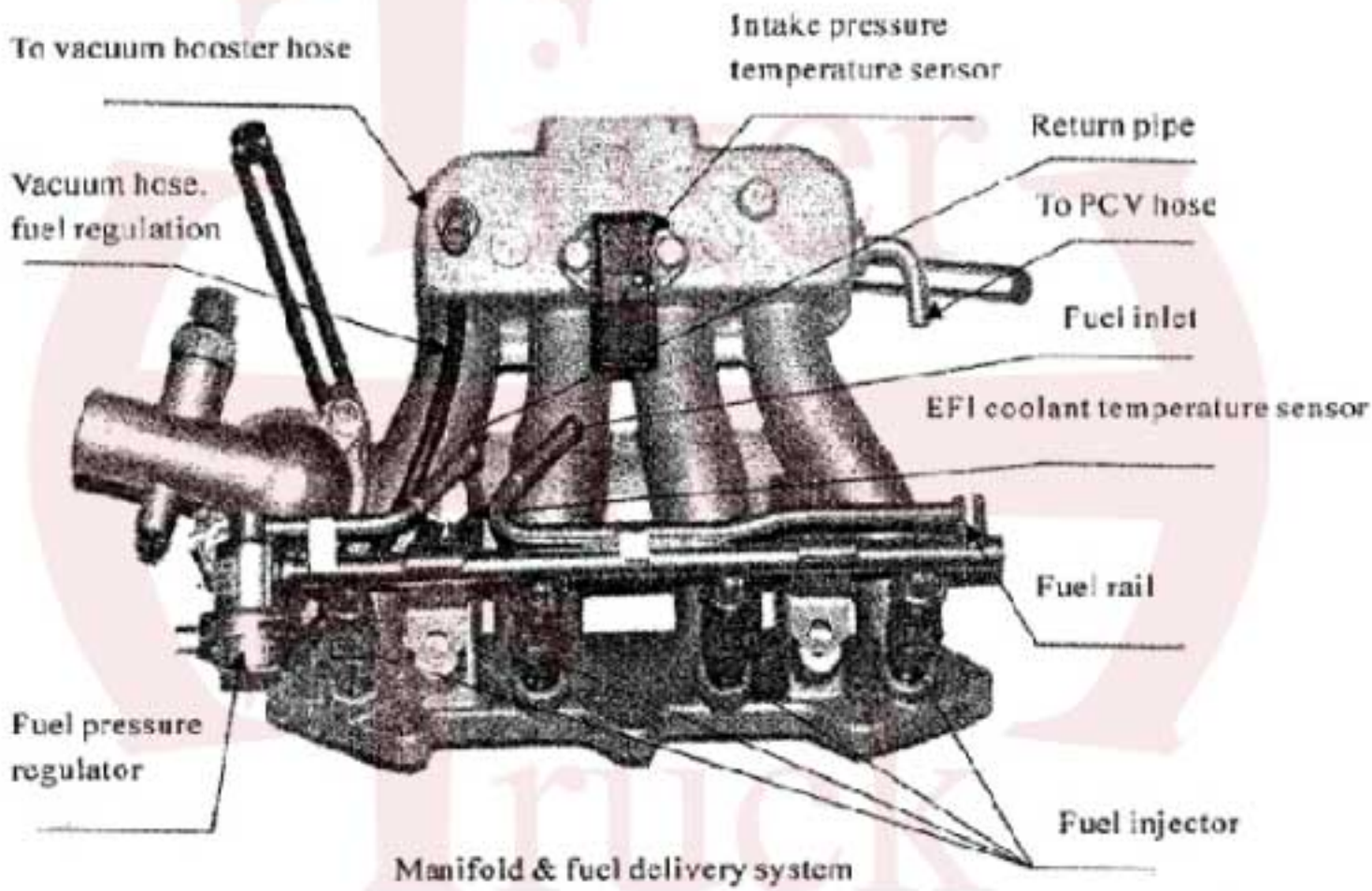
Function expression(Function description):

Fuel in the tank is pumped out to each injector through the fuel pipe, filter and fuel rail, the

pressure regulator integrated with the fuel rail has the function to keep the fuel pressure in the injector 300Kpa higher than that in the intake manifold, and to let most fuel come back to the fuel tank through the return pipe. The injector is controlled by ECU, thus, appropriate pressurized fuel injects into the combustion chamber close to the valve on the cylinder head.

General requirement:

The fuel filter is able to filter the impurity (dust) in the fuel with small pressure loss so as not to block the fuel injector. The fuel pressure regulator is able to adjust the fuel pressure to a correct level subject to the pressure in intake manifold, therefore the fuel can properly atomize in a good pattern.



Manifold & fuel delivery system

2.3 Electronic Control(engine management) System

It is composed of the follows:

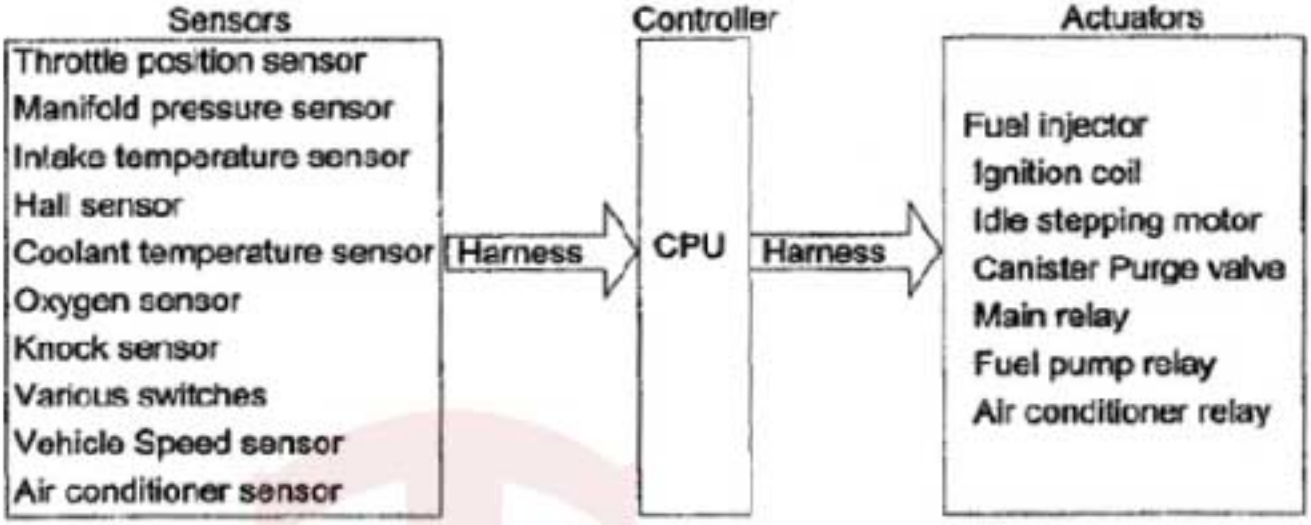
1) Various sensors that are used to probe the running status of engine and other information demanded for proper work.

2) ECU, which is used to analyze and process the output signals from the sensors and control the actuators.

3) Various actuators that are controlled by ECU.

4) Harness, which is used to connect sensors, ECU and actuators.

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Sensors and actuators for electronic control engine (MPI engine), F series

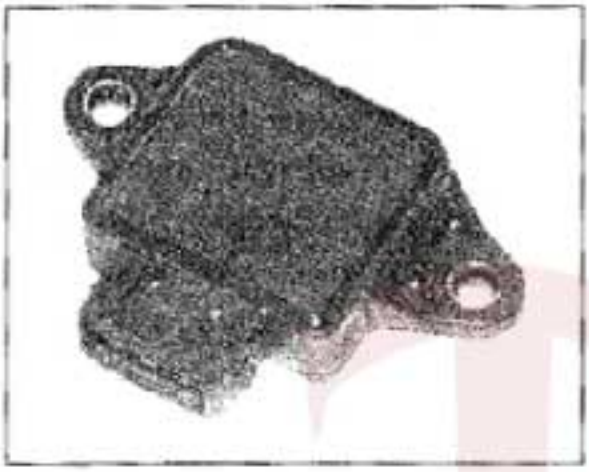
Relational table of input and output signals of electronic control engine (MPI engine), F series

Input signals \ Output signals	Actuators						
	Fuel injector	Ignition coil	Idle stepping motor	Canister purge control valve	Main relay	Fuel pump relay	A/C relay
Throttle position sensor	O	O	O	O			O
Manifold pressure sensor	O	O	O	O			
Intake temperature sensor	O	O	O				
Hall sensor	O	O	O	O		O	
Coolant temperature sensor	O	O	O	O			O
Oxygen sensor	O						
Knock sensor	O	O					
Speed sensor		O					
A/C evaporator sensor		O					O
Air conditioner switches		O					O
Fuel Enriching(enrich) ground wire, No 1	O						
Fuel Enriching(enrich) ground wire, No 2	O						
Ground wire, ignition timing		O					
Ignition switch	O	O	O	O	O	O	O

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The function and general requirement are described as follows:

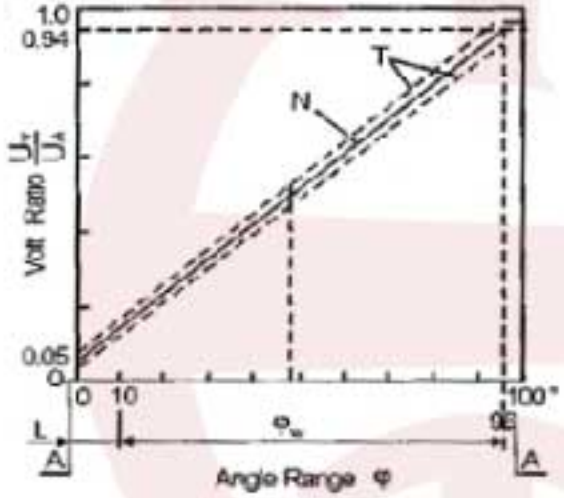
1) Throttle position sensor:



Function: it supplies information about the engine load and operating condition.

Principle: In fact, this sensor is a swivel arm potentiometer with linear output characteristics. The swivel arm is coaxially mounted with the throttle. When the throttle turning, the swivel arm goes along with the throttle to indicate a certain resistance, therefore the voltage signal output of the potentiometer is proportional to the position of throttle

Characteristics curve



U_A: Output signal voltage

U_V: Operating voltage

N: Theoretical characteristics curve

T: Characteristics curve deviation

Technical specifications

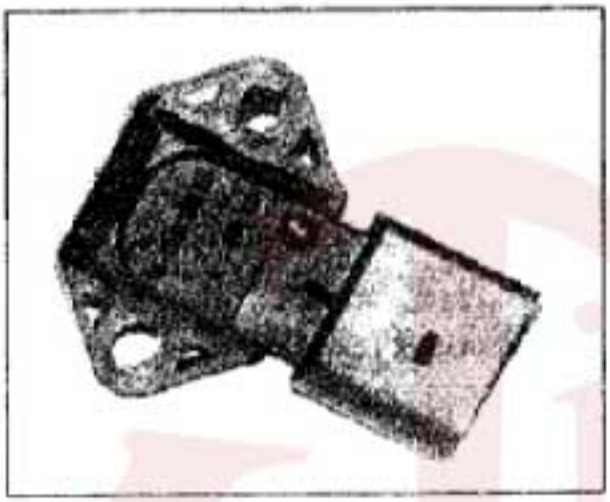
Electronic angle range	≤96°
Rotation direction	Arbitrary
Resistance	2KΩ ±20%
Operating voltage	5V
Operating temperature	-30℃~+110℃,-40℃~120℃(in short term)
Protection resistance for swivel arm	710Ω~1380Ω
Permitted current for swivel arm	≤18μA
Service life	2,000,000 cycles

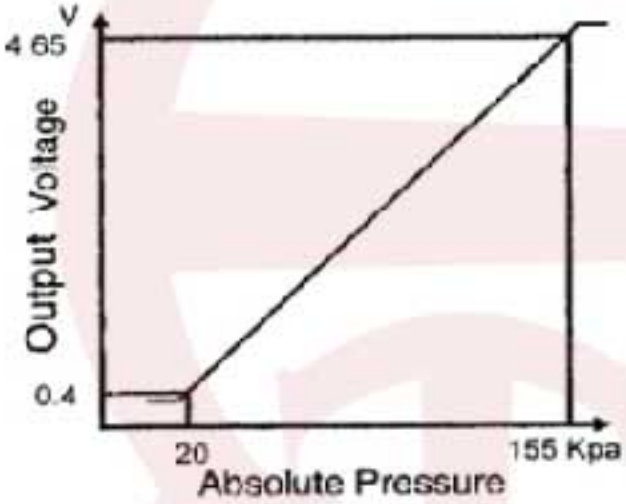
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General requirement:

The output signal value should be in conformity with the aperture width of the throttle, prevent the sensor from showering, impacting and shocking, keep the connector in good appearance without dirt, deformation and corrosion.

2) Intake pressure temperature sensor





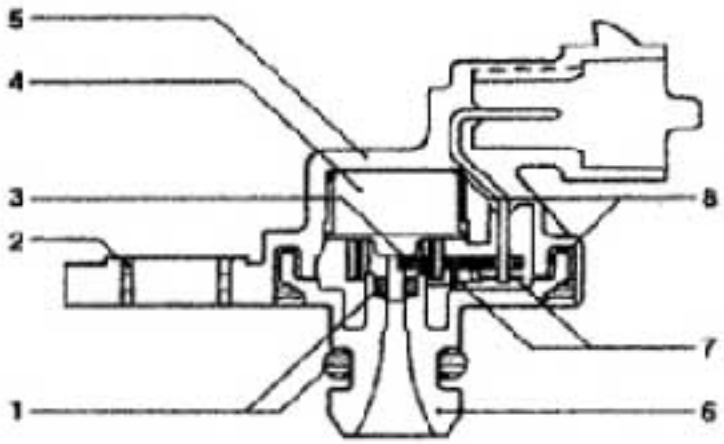
Function: It is used to gauge the absolute pressure in the intake manifold and supply the information on engine load

Principle: This sensor is composed of a Si chip. The pressure diaphragm is etched on the chip, the fixed-value and rectifying circuits are also integrated on the chip. Variation of air pressure will deform the diaphragm by force, and its resistance changes on the effect of piezoresistance. After processing by the chip, the voltage signal is generated in linear relation with the pressure. This sensor is direct mounted on the manifold. To the sensor, model DS-S/TF, the air pressure and temperature sensors are integrated in one.

Features: It adopts the advanced sensing technique, and has the advantages of light body, compact structure and small occupation in the manifold.

Characteristics curve

Section of pressure sensor, model DS-S



1. Seal ring
2. Stainless steel bush
3. PCB base
4. Sensing element
5. Case
6. Pressure bracket
7. Welded connection
8. Bonded connection

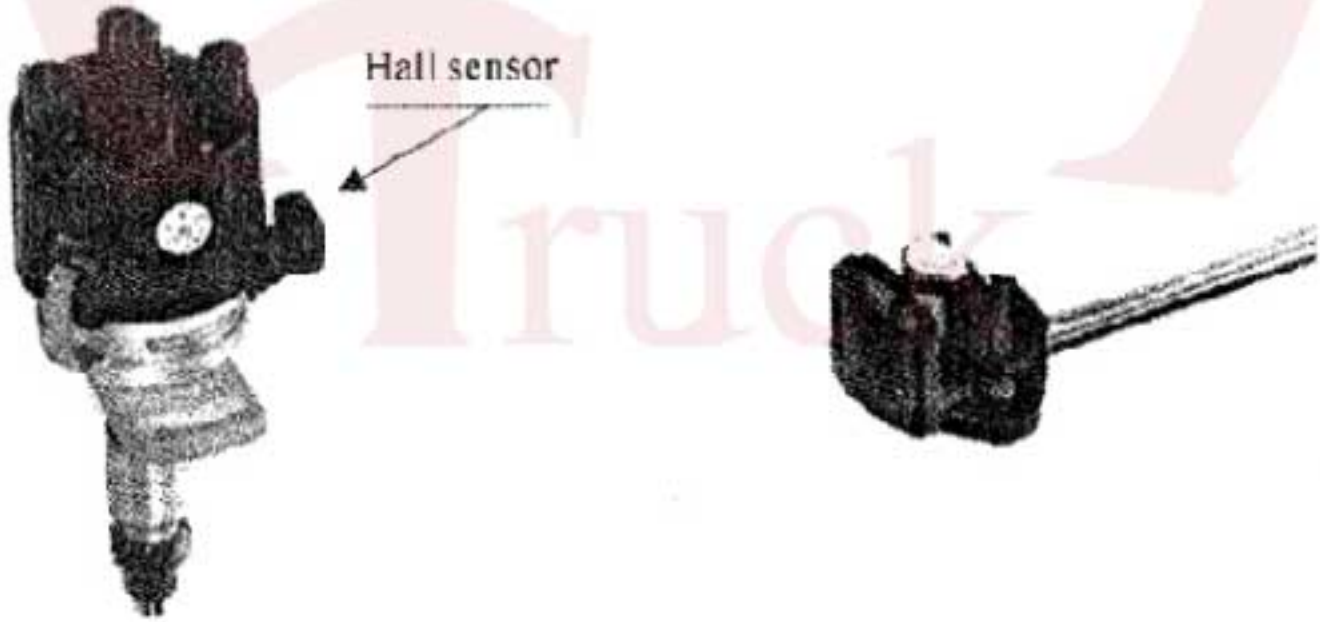
Technical specification:

Pressure range (To turbine engine)	25kpa~115kpa (Max. 250kpa)
Input voltage	5.0±0.5V
Weight	Approx. 18g~27g
Vibration resistance (withstand)	Harmonic wave: 250m/s² Peak: 600m/s²
Current	9mA
Temperature sensor resistance at 20℃	2.5KΩ ±5%
Operating temperature range	-40℃~+125℃
Trigger time	0.2ms
Measuring error(Measuring tolerance), pressure	±1.5%

General requirement:

Keep the connectors in good appearance without dirt, deformation and corrosion.

3) Hall sensor (in the distributor):



Function expression(Function description):

It supplies ECU with engine speed signal and crankshaft phase signal, these signals will be taken as a reference time for injection and ignition.

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Technical specification:

Power voltage (Power Supply voltage) within the following temperature: -40℃~+80℃ -40℃~+150℃	 4.5V~30V 4.5V~24V
Supply current, when Uv=16V	≤21mA
Output voltage, when Uv=20V	0~Uv
Output current	0~20mA
Saturated output voltage	≤0.4 V
On-off time at the point of 10% or 90% output voltage	9μs
Operating ambient temperature	-40℃~+130℃
Limiting temperature in short term	-40℃~+150℃

General requirement

Keep the connectors in good appearance without dirt, deformation and corrosion.

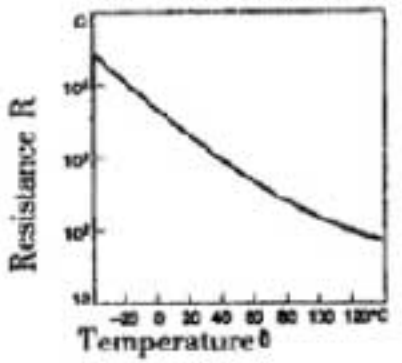
4) Coolant temperature sensor



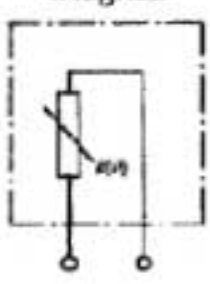
Function: It is used to measure the coolant temperature and intake air temperature.

Principle: In the sensor, there is a NTC thermistor, its resistance will drop, when the temperature rises. The variation of coolant temperature or intake air temperature will result in the change of resistance, then, the varied resistance will be transduced into a voltage signal with a divider circuit and send to the controller.

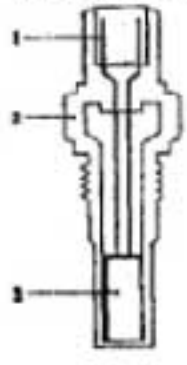
Characteristics curve



Diagram



Structure chart



1.Connector
2.Case
3.NTC resistor

Technical specification

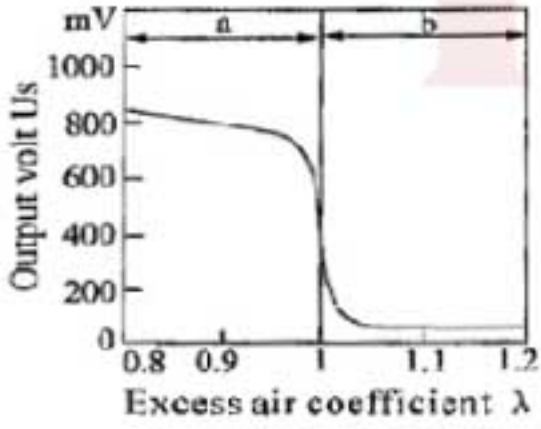
Measuring range	-30℃~+130℃
Max measuring current passed through sensor	5mA
Nominal resistance at 20℃	2.5KΩ±5%
Max energy loss, at 23℃ (static water), Δ T=1K	15mW
Nominal voltage	5V
Vibration resistance (withstand)	600m/s²
Response time in water	Approx15s

General requirement

Keep the connectors it in good appearance without dirt, deformation and corrosion.

5) Oxygen sensor:





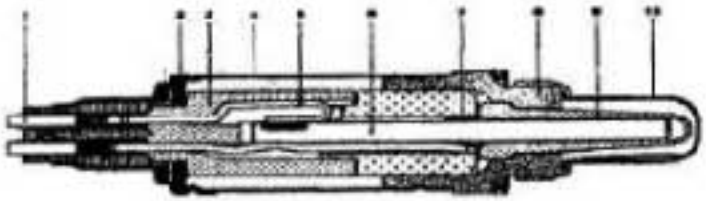
The voltage characteristics of oxygen sensor at 600℃ of exhausted gas
a: thicker mixed gas (lack of O_2)
b: thinner mixed gas (exceeded O_2)

Function: It is used to determine if the mixture gas (mixture) is in the state of complete combustion by means of measuring the content of oxygen. The electronic controller executes a closed loop control to realize the purpose of the excess air coefficient $\lambda = 1$, according to the information from the sensor, so as to ensure the catalytic converter has got the maximum conversion ratio for the emissions of HC, CO, and NOx.

Principle: The element of oxygen sensor is composed of a ceramic tube, the atmosphere goes through inside of the tube and the exhausted gas vents from the outside. This ceramic tube is a solid electrolyte, after heating, the catalyzer on the external wall activates various compositions in the gas to produce chemical reactions, the diffuse of oxygen ion on the tube generates a potential difference between the internal wall and external wall, i.e. a signal voltage which is proportional to the content of oxygen in the exhausted gas.

Features: It has the advantages of leadproof, little dependence on exhaust temperature, rapid entrance into closed loop control after starting.

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1)Cable 2) Disc spacer3) Lower insulating bush4) Protective sheath 5) Contacting wire 6) Heating rod 7) Contacting shim 8) sensor seat 9) Ceramic probe 10) Protective tube

Technical specification

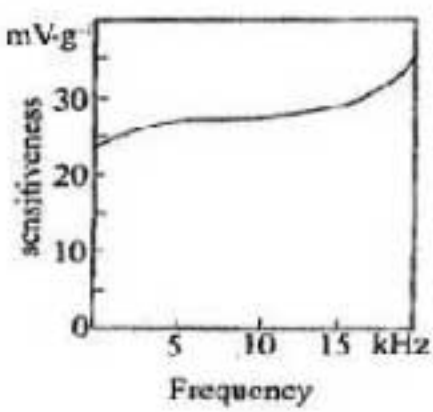
Tightening torque	40Nm-60Nm
Protective tube	3 slots
Operating temperature: Ceramic probe (exhaust) Hexagon nut Cable outlet Connectors	 200℃-850℃ ~570℃ ~250℃ ~150℃
Temperature gradient in Ceramic probe	Max 100k/s
Lifetime	>160,000km

General requirement

Keep connectors in good appearance without dirt, deformation and corrosion. It is required to exist no breakage to the lead, no abnormal noise when shaking the sensor and no oil stain at the end of the oxygen

6) Knock sensor





Function: It is used to check knocks from cylinder block, so that the operation condition of the engine is able to be identified by the electronic controller.

Principle: The knock sensor is a vibration acceleration sensor. One or more are mounted on the cylinder block. The pressure sensitive element of the sensor is a piezoquartz。When the engine is knocking, the vibration delivers to the piezoquartz from a probing piece in the sensor. A voltage is produced at the electrodes of the piezoquartz under the action of the vibration, thus the mechanical vibration transduces into the output voltage signal.

Features: It has the advantages of compact and secured structure, high sensitiveness.

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Technical specification

Frequency range	1kHz~20kHz
Measuring range	0.1g~400g
Sensitiveness at 5kHz	26±8mV/g
Linearity between 3kHz and 15kHz	±15% comparable to 5kHz
Primary harmonic frequency	>20kHz
Impedance	>1MΩ
Capacitance	800~1600pF
Temperature coefficient of sensitiveness	≤0.06mV/(g. ℃)
Operating temperature	40℃~+130℃

General requirement:

Keep connectors in good appearance without dirt, deformation and corrosion. It is required to exist no breakage to the lead.

7) Speed sensor:

Function expression(Function description):

It is mounted in the speedometer to supply the ECU with the speed signal for accurate determination of the engine operation condition running at idle speed.

General requirement:

Keep the connectors in good appearance without deformation and corrosion. It is required to exist no breakage to the lead.

8) Air conditioner sensor

Function expression(Function description):

It is used to supply the ECU with the evaporator temperature signal for control of air conditioner relay, and indirect control of the a/c compressor.

General requirement:

The sensor must be placed in correct position to reflect the evaporator temperature. It is required to exist firm connection and no breakage to the lead.

9) Enriching(enrich) ground wires, No1, No 2 i.e. pin No 8 of ECU (white with blue tracer wire) and pin No 52 (green wire):

Function expression(Function description):

Two round plugs are placed in front of battery under the driver seat (for vehicle SC6350C) or near the girder (for other models). If they are manually connected to the ground, ECU will thicken the mixed gas automatically to obtain sufficient power in the plateau region with thinner atmosphere.

General requirement:

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Never connect them to the ground if not necessary, or it will make higher fuel consumption, and deteriorate emissions.

Special precautions:

For the vehicles with JL465Q5 engines (e.g. SC6350C THA, SC6331E ECA), the pin No 8 (white with blue tracer wire) should connect the ground at any time, but the pin No 52 (green wire) hangs up as a rule.

10) Ignition timing wire to the ground:

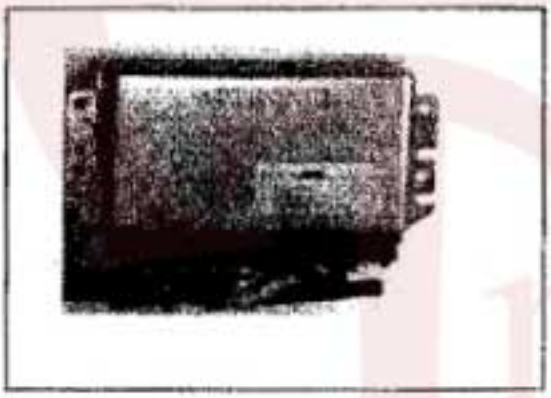
Function expression(Function description):

The square plug close to the Enriching (enrich) ground wire must connect to the ground when ignition timing adjustment is performed with a timing lamp. Do not adjust the ignition timing, before ECU determines the ignition advance angle.

General requirement:

After complete adjustment of ignition advance angle, do not forget to disconnect the plug, or serious problems will occur, such as insufficient power and catalytic converter overheat.

11) ECU controller:



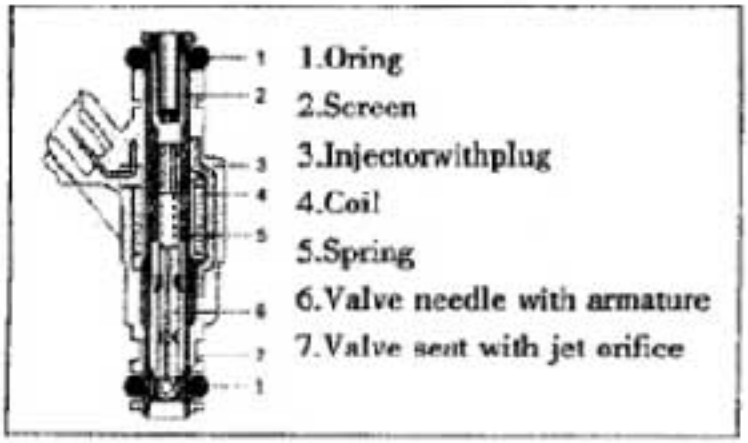
Function expression (Function description):

It is used to analyze and process the signals from various sensors, and deliver the related commands to the actuators.

General requirement:

Prevent the controller from showering, impacting, shocking and overheating, and avoid touching the ECU pins with finger, keep the connectors in good appearance without dirt and corrosion.

12)Fuel injector



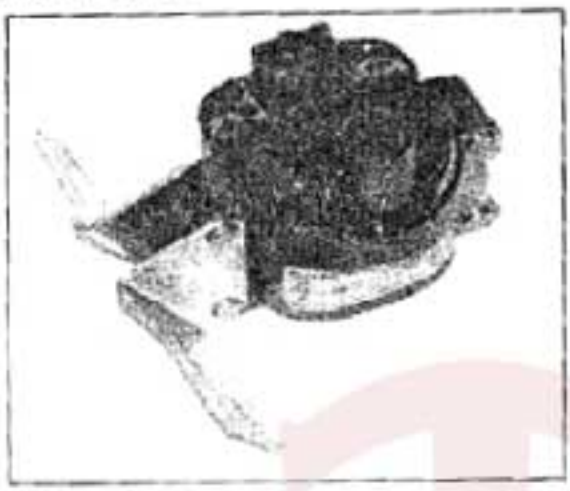
Function expression (Function description):

It injects an appropriate mixed fuel close to the intake valve.

General requirement:

It is required to atomize fuel in proper spray pattern and to keep the connector in good contact without dirt and corrosion.

13) Ignition coil



Function expression(Function description):

It generates high tension to the spark plug, which can ignite the mixed gas in the combustion chamber at appropriate intervals.

General requirement:

The ignition coil is able to produce sufficient high tension. Prevent the coil from showering and keep the connector in good contact without dirt and corrosion.

14) Idle stepping motor



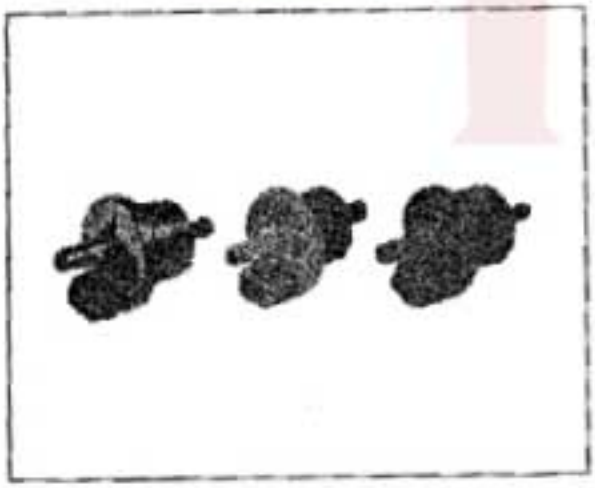
Function expression(Function description):

It is used to control the intake rate of bypass air according to the commanded current from ECU, as a result, the idle speed of the engine is regulated to run steadily.

General requirement:

Keep the stepping motor turning smoothly and prevent it from showering and oil stain, and keep the connector in good contact without dirt.

15) Canister(Canister Purge) control valve:



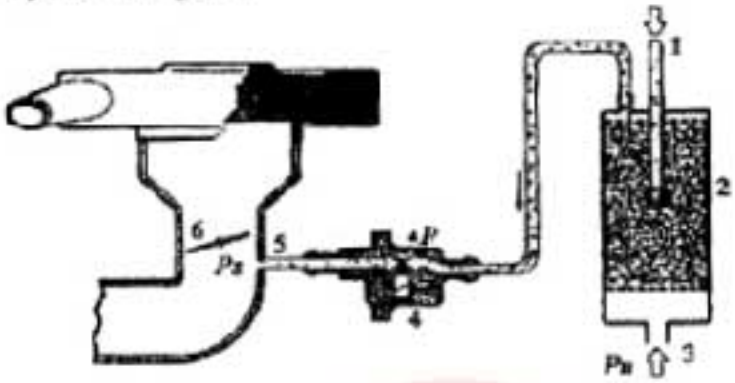
Function: It is used to control the flow rate of reproduced gas in the evaporation emission system.

Principle: The Canister (Canister Purge) in the evaporation emission control system absorbs the fuel vapor from the tank till the fuel vapor has saturated. The electronic controller opens the Canister(Canister Purge) control valve to mix the fresh air and saturated fuel vapor and form reproduced gas flow, which is introduced into the engine intake pipe. Depending on the engine running conditions, the solenoid coil in the valve controls the aperture width of the valve by means of the duty ratio of impulse signal delivered from the electronic controller. In addition, the aperture width is also effected by the pressure difference between two ends of the valve.

Features: It has the advantages of wide operating range, accurate control to flow rate and good tightness.

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System diagram



1. From tank
2. Canister
3. Atmosphere
4. Canister control valve
5. To intake manifold
6. Throttle

ΔP is a pressure difference between ambient pressure Pu and intake manifold pressure Ps

Technical specification

Flow rate	2 or 3 m2/h, at 200mbar
Air tightness	<2000cm2/h
Control frequency	30Hz
Min control pulse	7ms
Current consumption	0.5V at 13.5V
Resistance	26Ω
Operating voltage	9V~16V
Inductance	48mH, f=1kHz
Operating temperature	-30℃~+120℃

General requirement:

Keep the connectors in good contact without dirt, chokage and leakage.

16) Main relay, fuel pump relay, A/C relay



Function expression (Function description):

They are used to turn on or off the related apparatus according to the commands from ECU.

General requirement:

Prevent the relays from showoring, maintain the switches with smooth and reliable operation and keep the connectors in good contact without dirt.

2.4 Ignition control system

It is composed of distributor assembly, knock sensor, ECU, ignition coil, high tension wire and

spark plug.

Function expression (Function description):

ECU is used to estimate the relevant operation conditions of the engine depending on the input signals from various sensors, and deliver the relevant ignition signals to fire the mixed gas in the combustion chambers of the engine for a normal run.

General requirement:

Keep the elements and spark plug in good condition and reliable contact. Adjust the timing reference of ignition properly, remain clear in the distributor assembly and no looseness for the signal panel.

2.5 Emission control system

It is composed of activated carbon canister, Canister (Canister Purge) control valve, PCV, catalytic converter and related pipes.

Function expression (Function description):

It is used to lessen the fuel vapor, the emission from crankshaft and tail gas pollutant.

General requirement:

Keep the all components in good condition, and keep the line in air tightness without any chokage and leakage.

2.6 Air conditioner control system

It is composed of A/C switch, fan motor switch, temperature sensor of evaporator, ECU, A/C relay, compressor and related harness.

Function expression(Function description):

ECU controls the A/C relay, i.e. switches indirectly on or off the compressor subject to various input signals and operation condition of the engine.

General requirement:

Keep all switches and harness in good contact and perfect condition. The other requirements refer to the chapter about air conditioner.

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3. Fault diagnosis

Summary:

To the engine, F series, ECU of the Electronic Control (engine management) System has equipped with a memory for storing faults information. During operation, ECU continues to perform the self diagnosis on the relevant parts and their work conditions of the system, it will record the faults or error codes into the memory as soon as any abnormal cases are found. This stored information can be read out and gives the service persons some prompts on faults for easy and rapid elimination.

If the faults are caused by temporary cable breakage or poor contact, such sort of faults will be recorded as an occasional fault. The occasional fault recorded in the memory will be cleaned out automatically by ECU, if it does not occur again within 40 times of engine starts.

If a setup error of air-fuel ratio occurs, the error will not be recorded within 4 minutes.

The fault information in ECU will be cleaned out if the power supply is cut off, e.g. unplug the controller or disconnect the lead on the terminal of the battery.

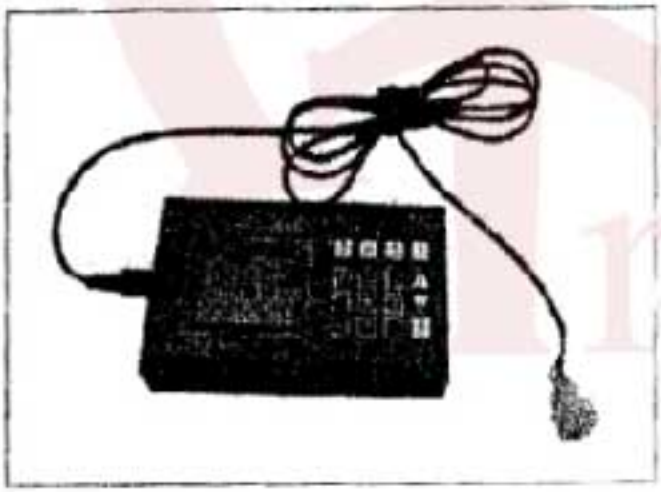
Notice:

1) If it is necessary to cut off the power of ECU during repair, at first, read out and record various fault information in the memory of ECU.

2) Clean out the fault information in the memory, and read out the fault information again after trial drive, pay more attention to the repeated faults and check them carefully.

3) The fault diagnosis instrument can only clean out the fault information in ECU, instead of fault elimination.

3.1 Read out and clean the self diagnosis information in ECU



To read out or clean the self diagnosis information in ECU, please use the fault diagnosis instrument for electronic injection system recommended by Chang'an Co. do not operate it before reading its instruction manual carefully. The diagnosis interface is placed under the driver seat or near the girder, it bands together with the Enriching (enrich) ground wire and ignition timing wire. The fault information in ECU can easily be read out and cleaned just connect the interface with that of the fault diagnosis instrument and turn on the ignition switch.

Notice: To read out the fault information in ECU correctly, it is best to take a trial run

1) Trial run

* The trial time must be longer than 4 minutes.
* Trial run must be taken for 3 minutes at the coolant temperature above 70℃
* Trial run must be taken for 10s in the condition of throttle aperture width above 75°
* The engine must keep running at idle speed for 30s before it flameouts.

3.2 Read out status parameter of the engine

By means of the fault diagnosis instrument for electronic injection system recommended by Chang'an Co, the status parameters of the engine can be read out during the engine running, e.g. speed, coolant temperature etc, these parameters is in aid of the service men to determine where the fault takes place and repair the vehicle. The operation of the instrument refers to the instruction manual.

Notice:

Do not turn on the ignition switch before the diagnosis instrument connects with the Electronic Control(engine management) System. If the diagnosis instrument has no response for a long time, press the reset key.

3.3 Diagnosis on connectors and harness

The fault of connectors and harness may have 4 sorts as follows:

1) Broken circuit: The poor contact or broken wire has happened in this circuit.

2) Short circuit to the anode: A part of the circuit connects to the anode, where it is not allowed to do so.

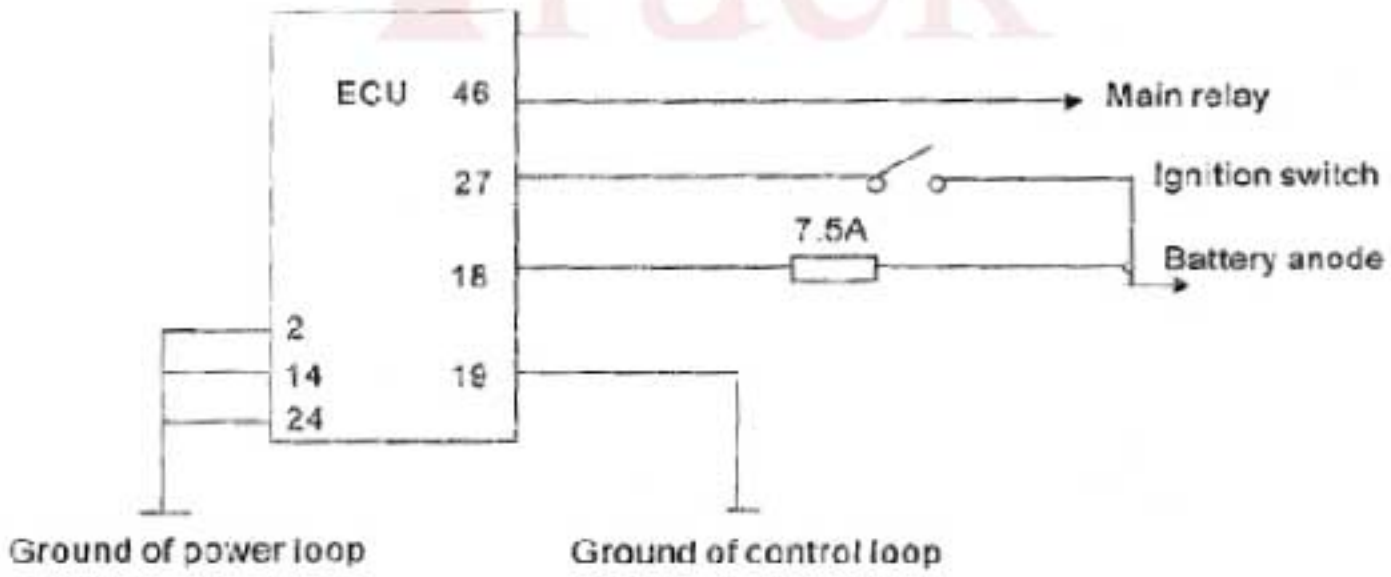
3) Short circuit to the cathode: A part of the circuit connects to the cathode, where it is not allowed to do so.

4) Short circuit to each other: the independent circuit connects to another one or electric leakage takes place.

If the faults stated above have been found during diagnosis, eliminate the faults according to the requirement for circuit repair, the circuit must be in good contact and isolation to the other circuit nearby after repair, then handle this circuit with moistureproof treatment.

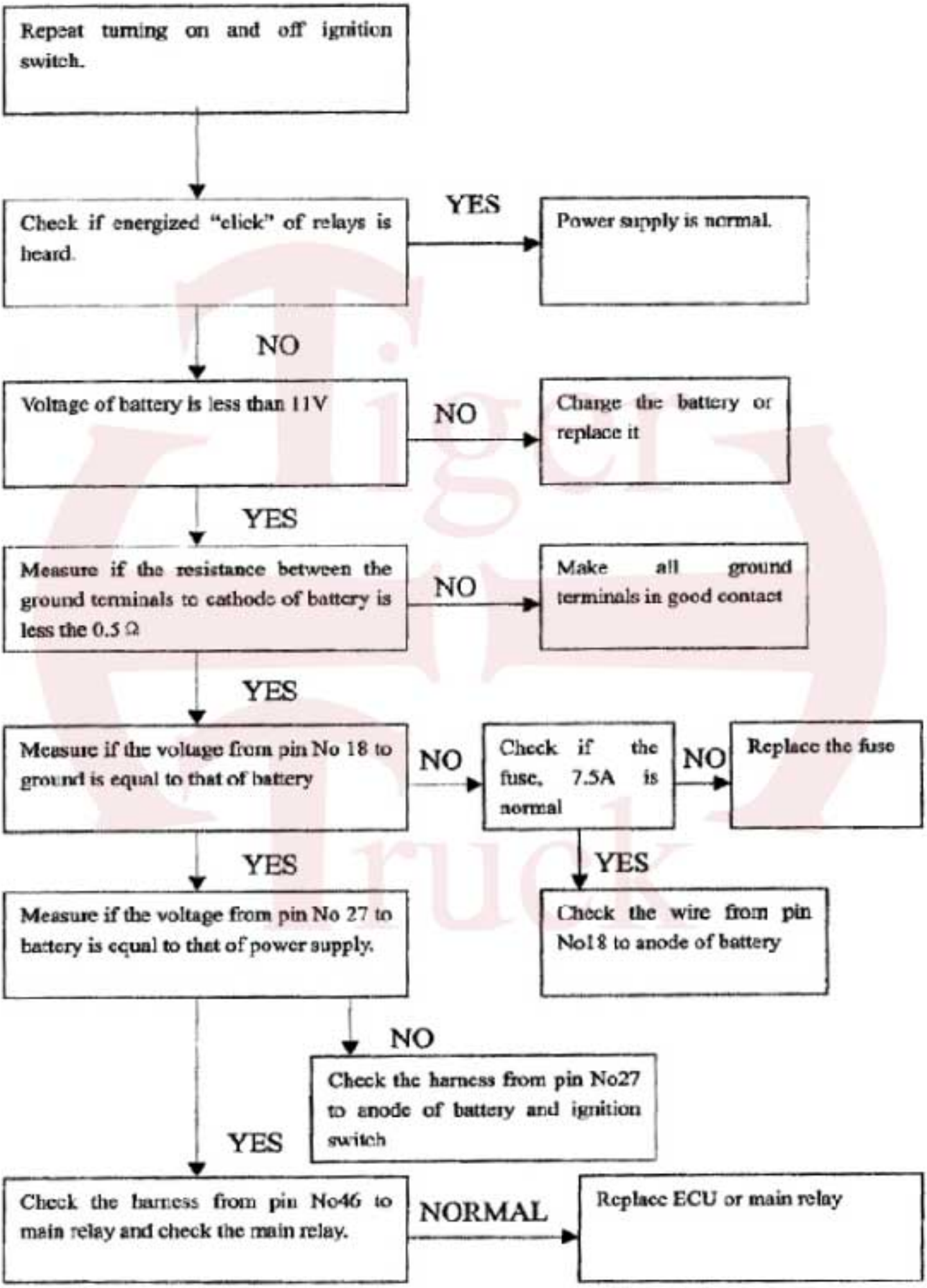
3.4 Power of Electronic Control(engine management) System and ignition switch circuit

Circuit diagram



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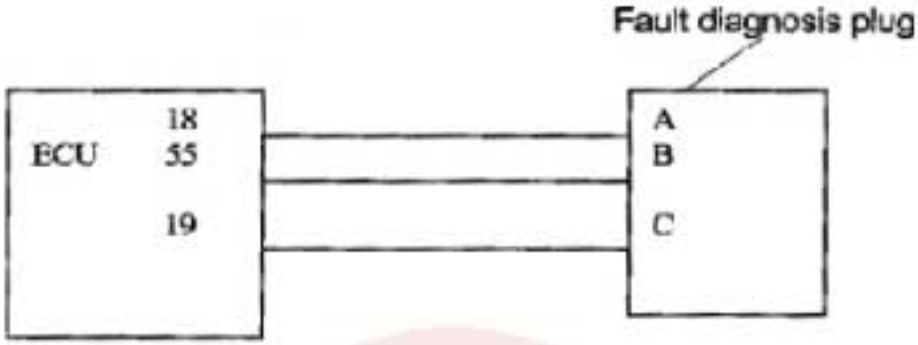
Fault diagnosis



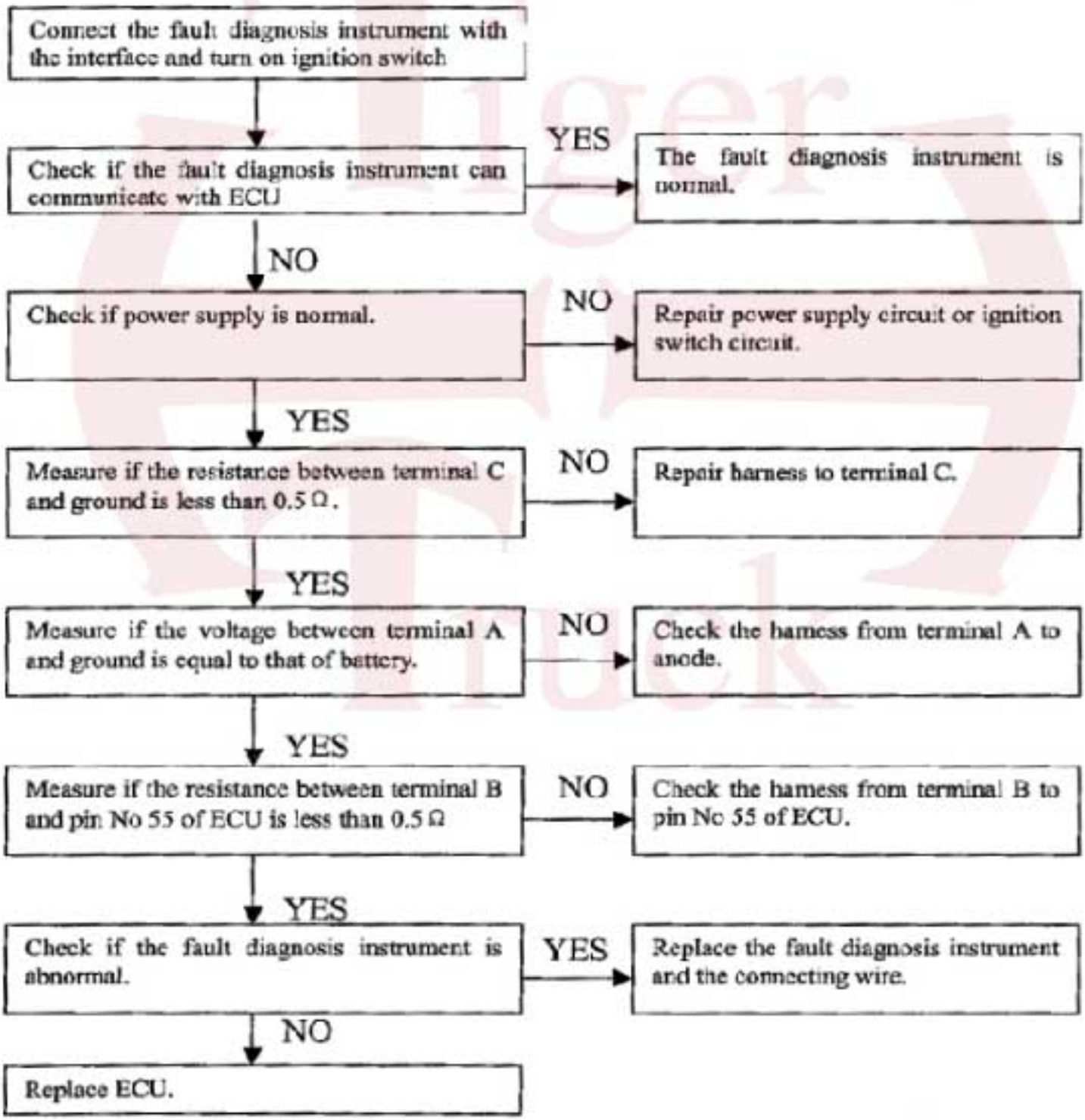
https://truckmanualshub.com/

3.5 Self-diagnosis circuit

Circuit diagram



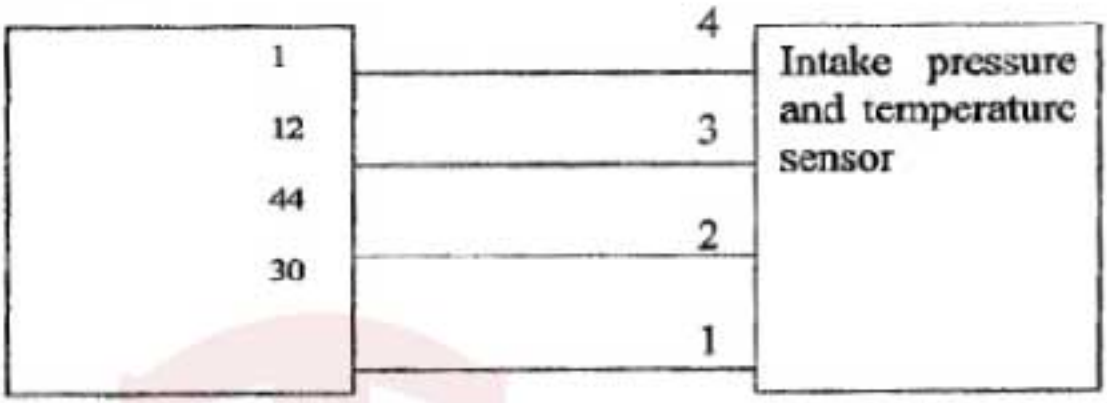
Fault diagnosis



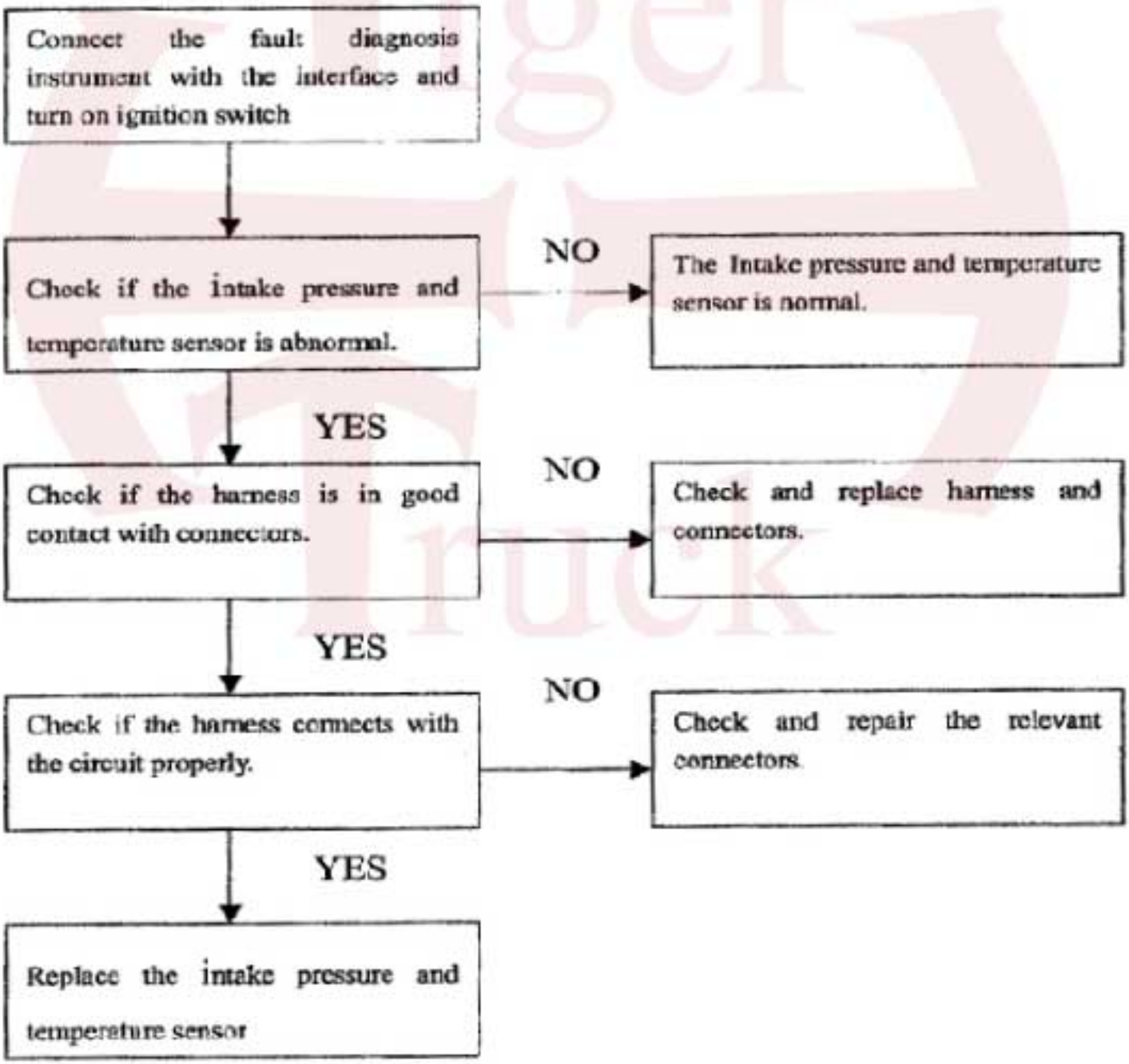
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3.6 Intake pressure and temperature sensor circuit

Circuit diagram



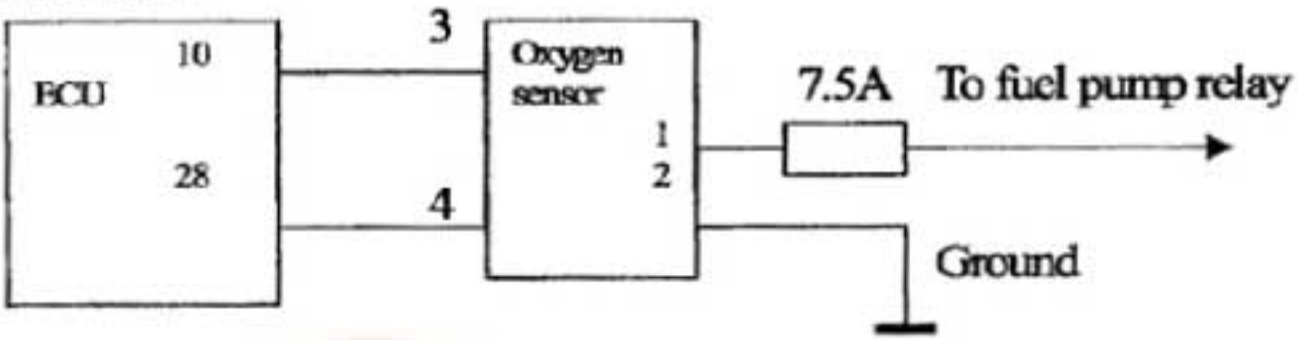
Fault diagnosis



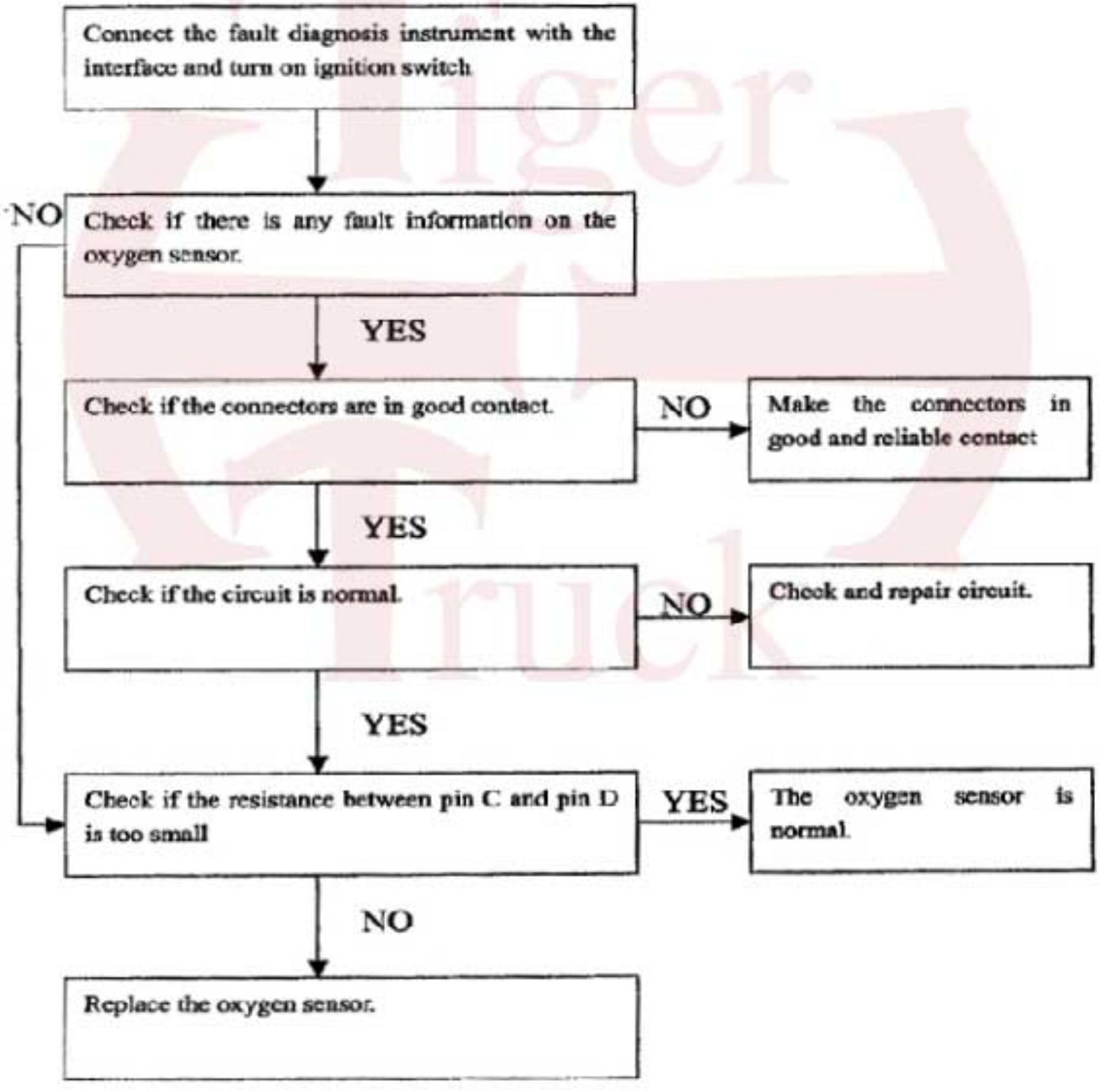
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3.8 Oxygen sensor circuit

Circuit diagram



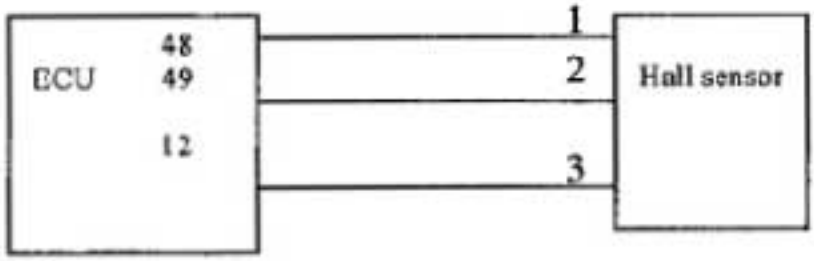
Fault diagnosis



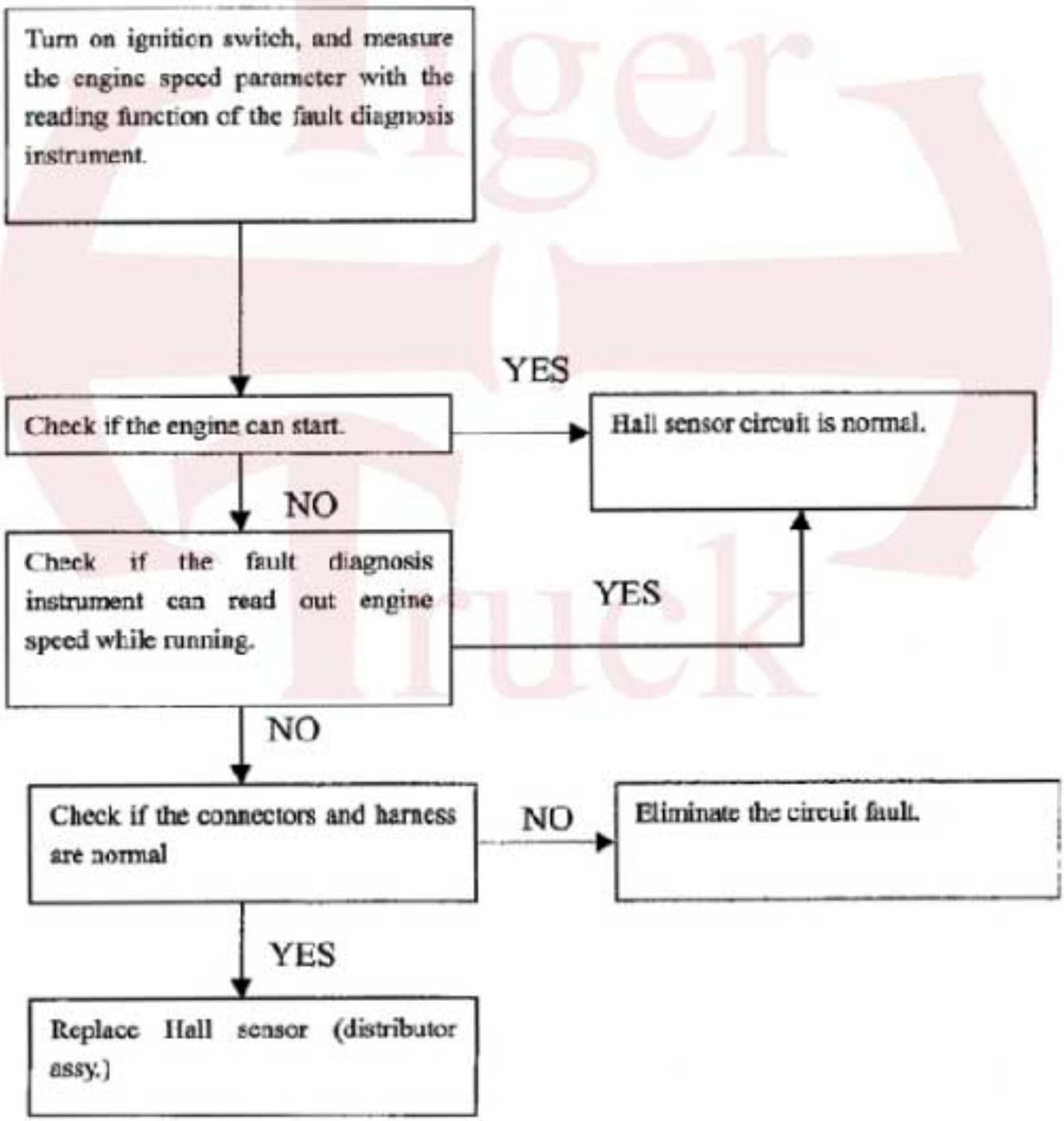
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3.9 Hall sensor circuit

Circuit diagram



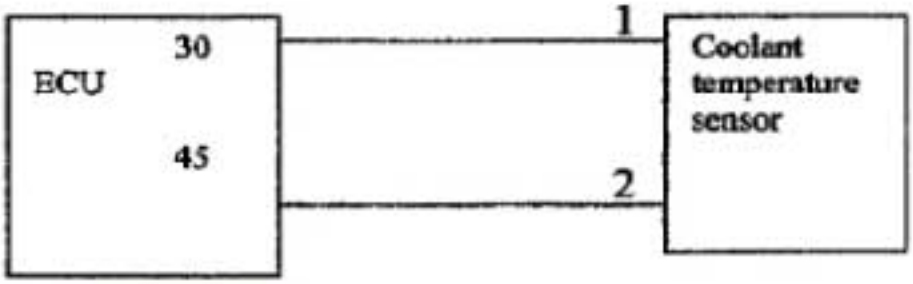
Fault diagnosis



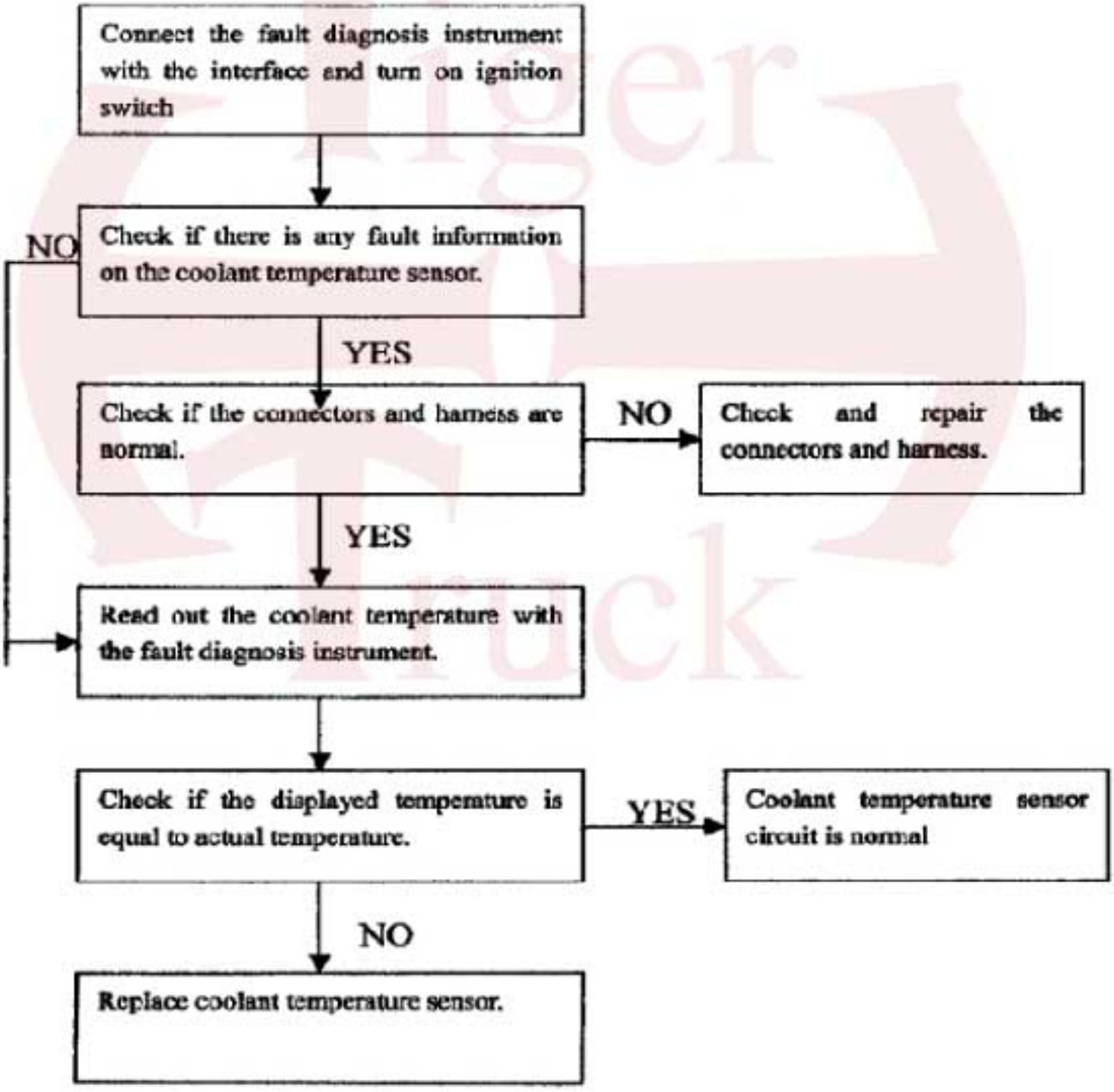
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3.10 Coolant temperature sensor circuit

Circuit diagram



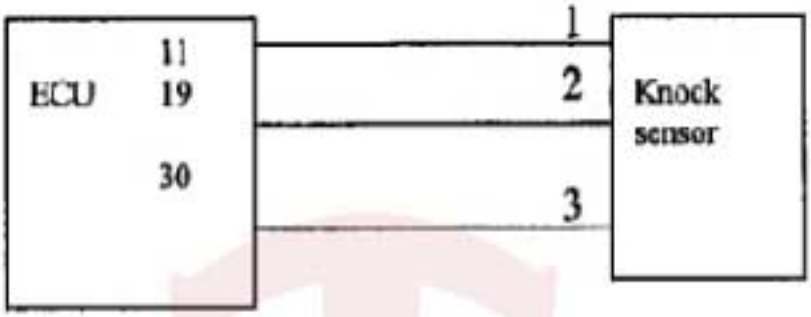
Fault diagnosis



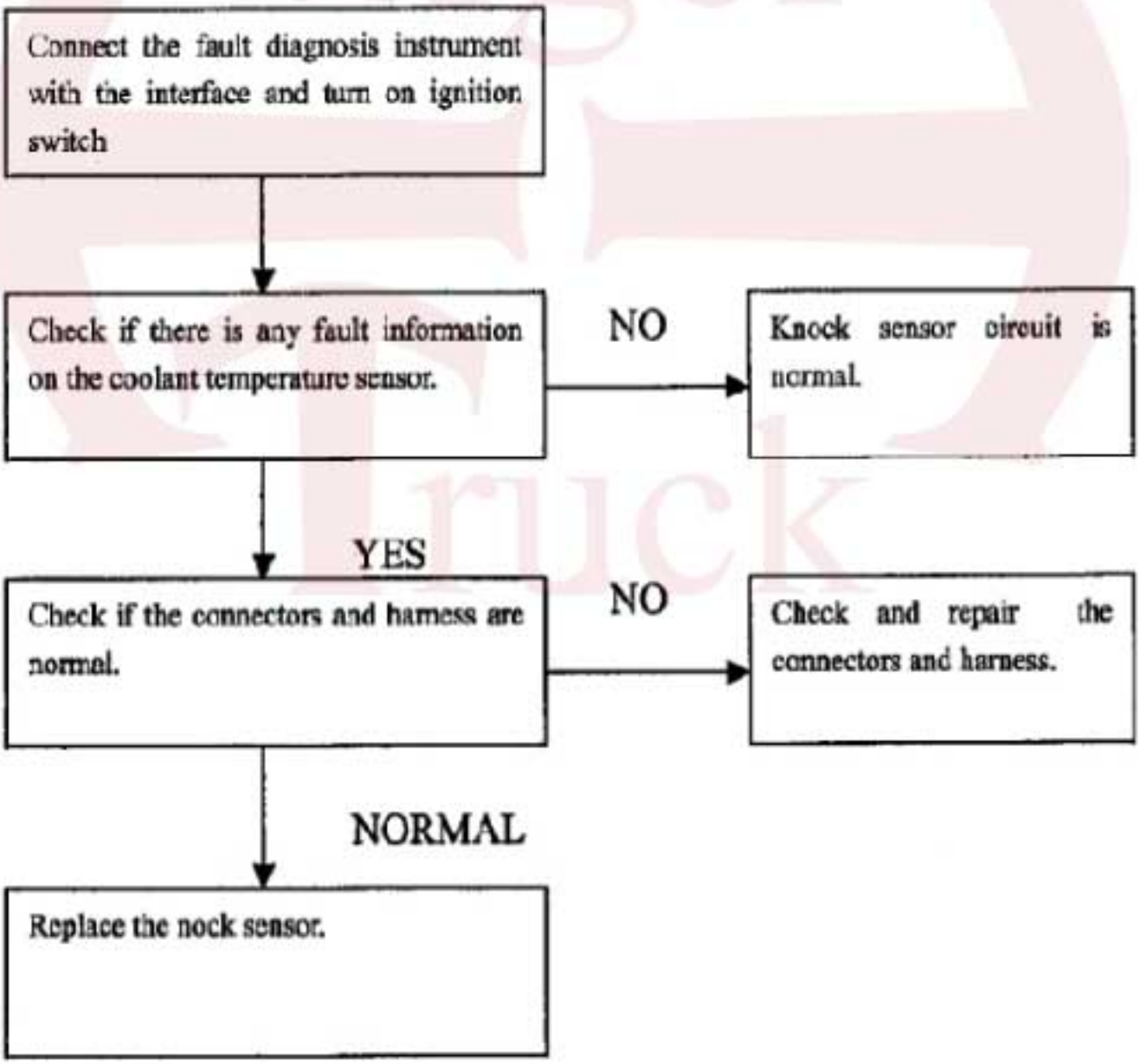
https://truckmanualshub.com/

3.11 Knock sensor circuit

Circuit diagram



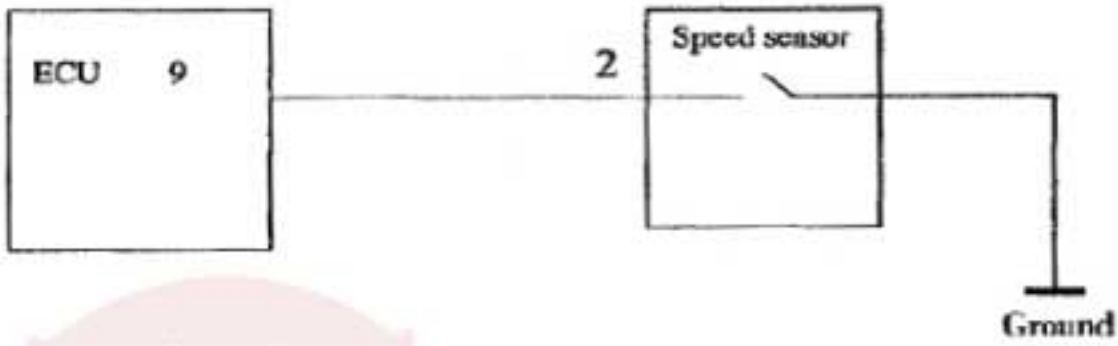
Fault diagnosis



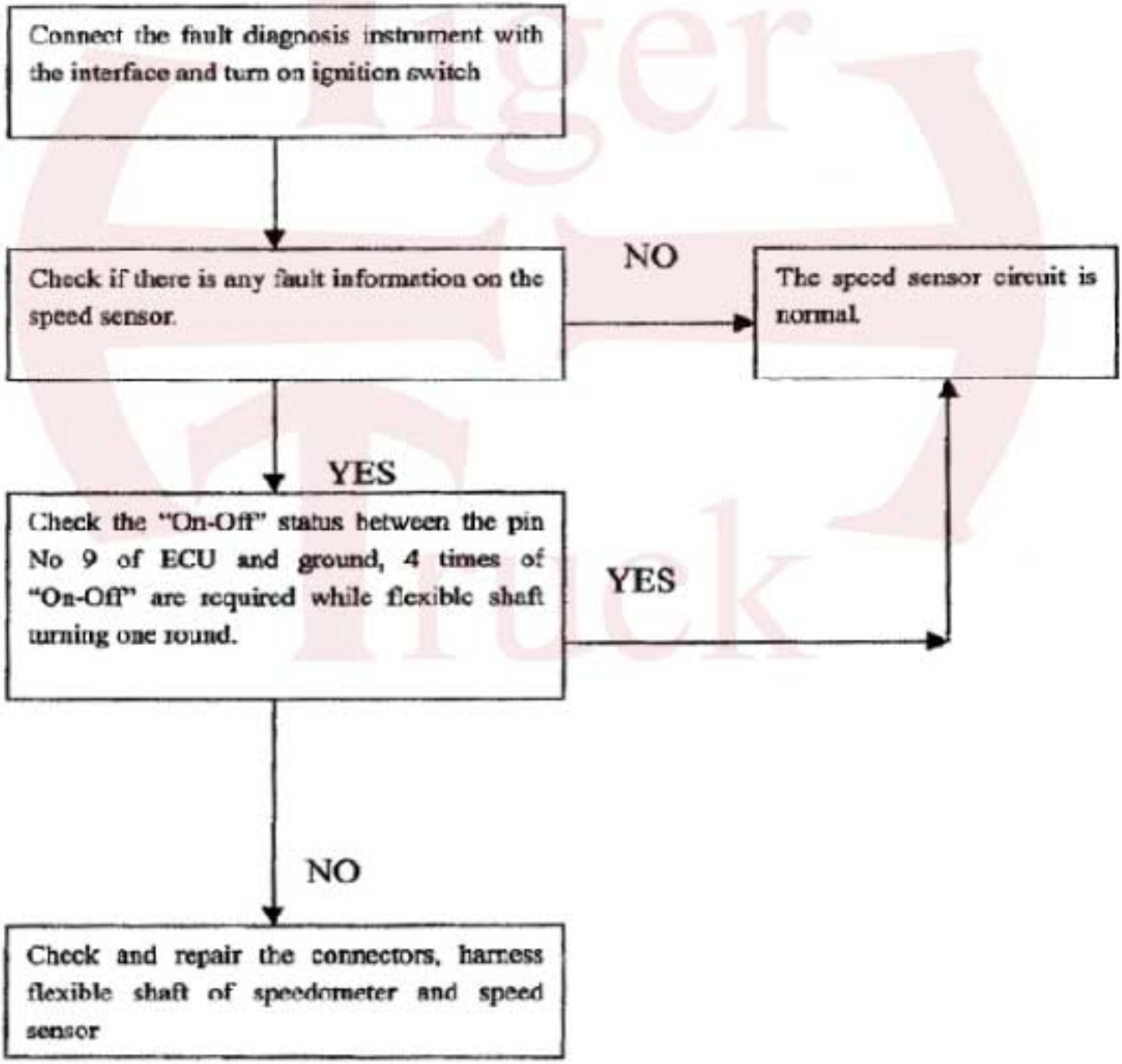
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3.12 Speed sensor circuit

Circuit diagram



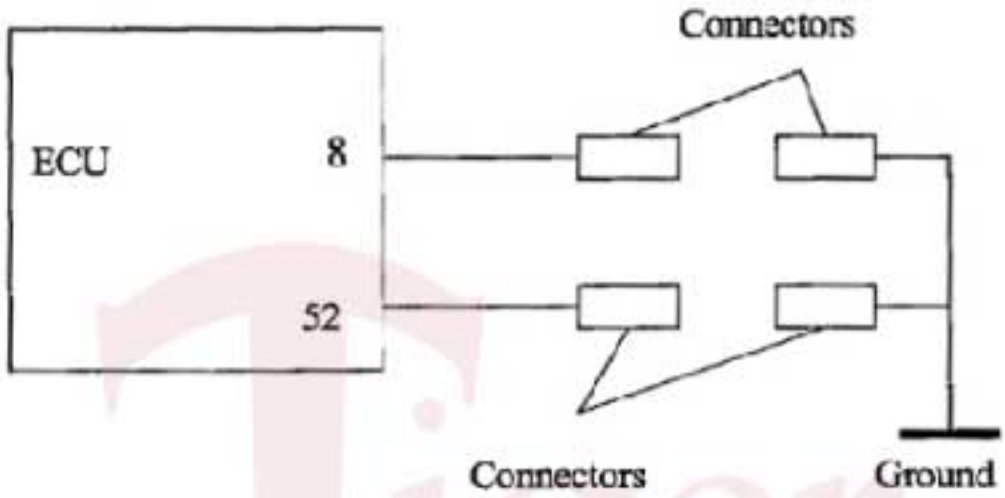
Fault diagnosis



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3.13 Plateau fuel Enriching(enrich) circuit

Circuit diagram



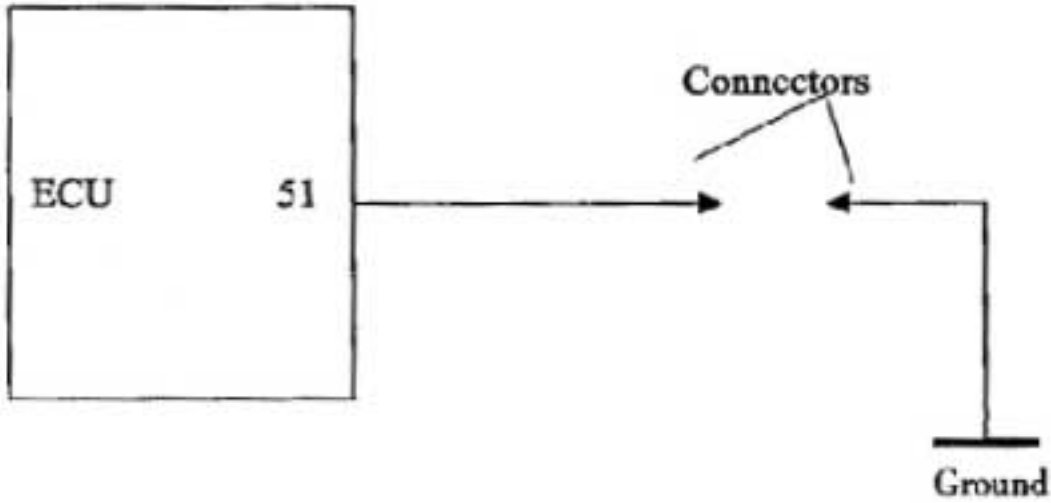
Special precaution: To the vehicles (e.g. SC6350C, SC6331EAC) equipped with the engines JL465Q5 (displacement is 1.012L), the pin No8 of ECU (white with blue tracer) should be connected to the ground permanently.

Fault diagnosis

Disconnect the fuel Enriching (enrich) wire from the ground as a usual, measure the voltage between the Enriching(enrich) wire and the ground, the voltage should be less than 4 V, if not, check the harness for electric leakage. Connect the Enriching(enrich) wire to the ground only if the power is insufficient on the plateau or the engine degraded.

3.14 Ignition advance angle correcting circuit

Circuit diagram:

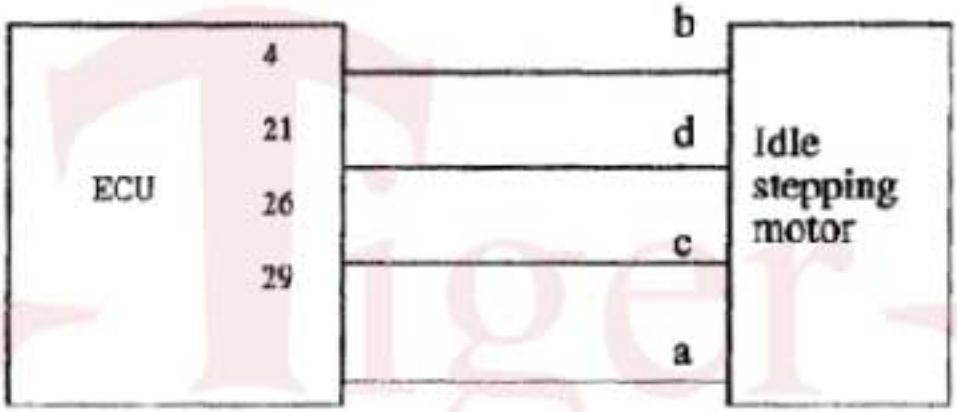


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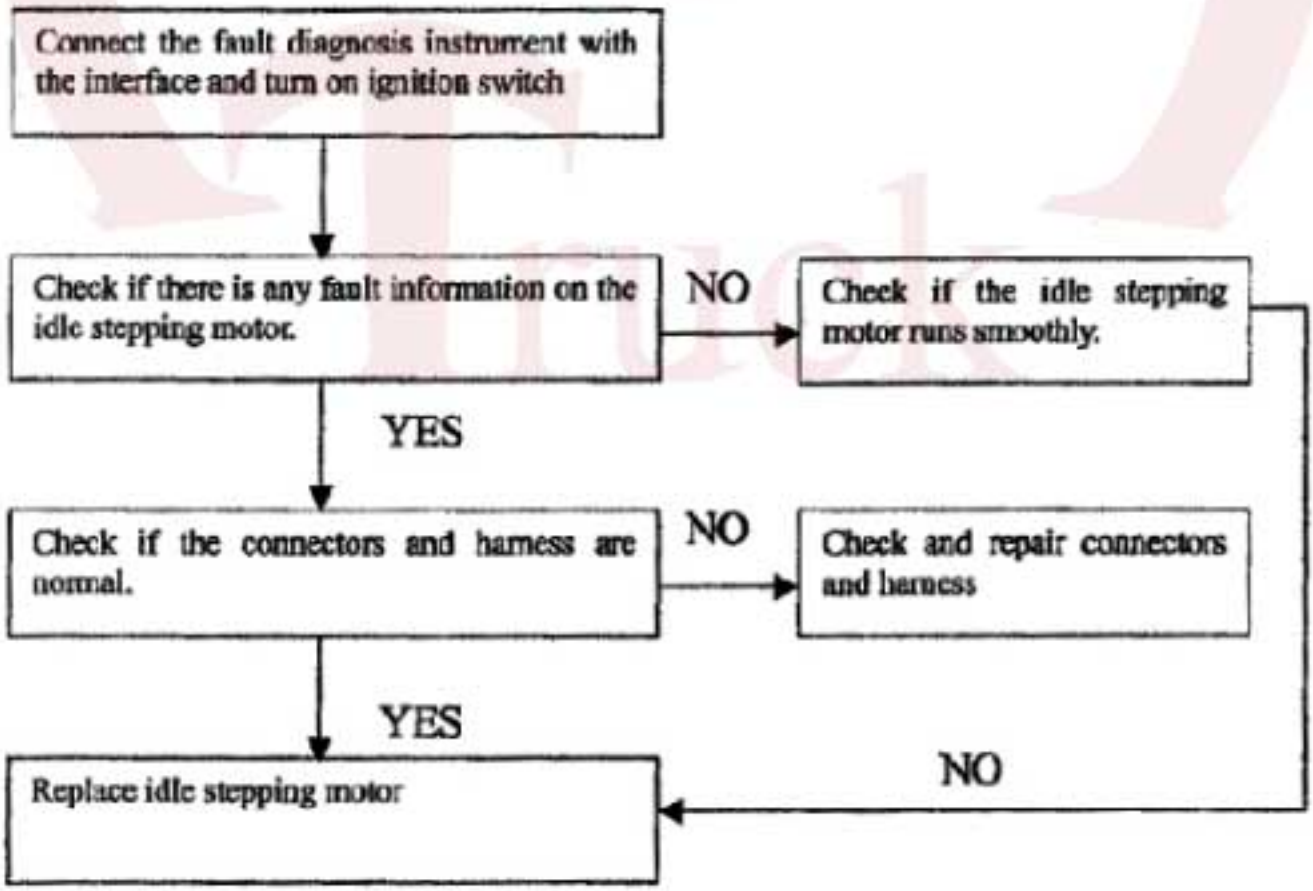
Fault diagnosis:

When the engine runs properly, disconnect the connector, check the ignition advance angle with ignition timing lamp at various running speeds, in this case, the angle should have a greater change, otherwise, check if the lead of pin No51 connects to the ground or has some leakage to the ground.

3.15 Idle stepping motor circuit

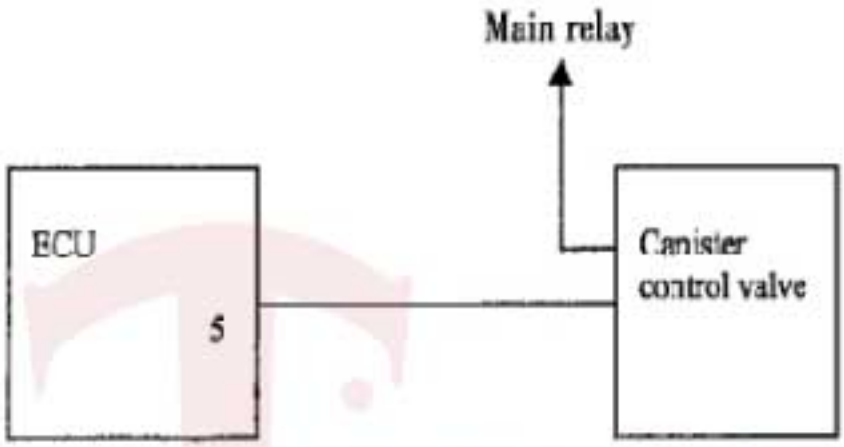


Fault diagnosis

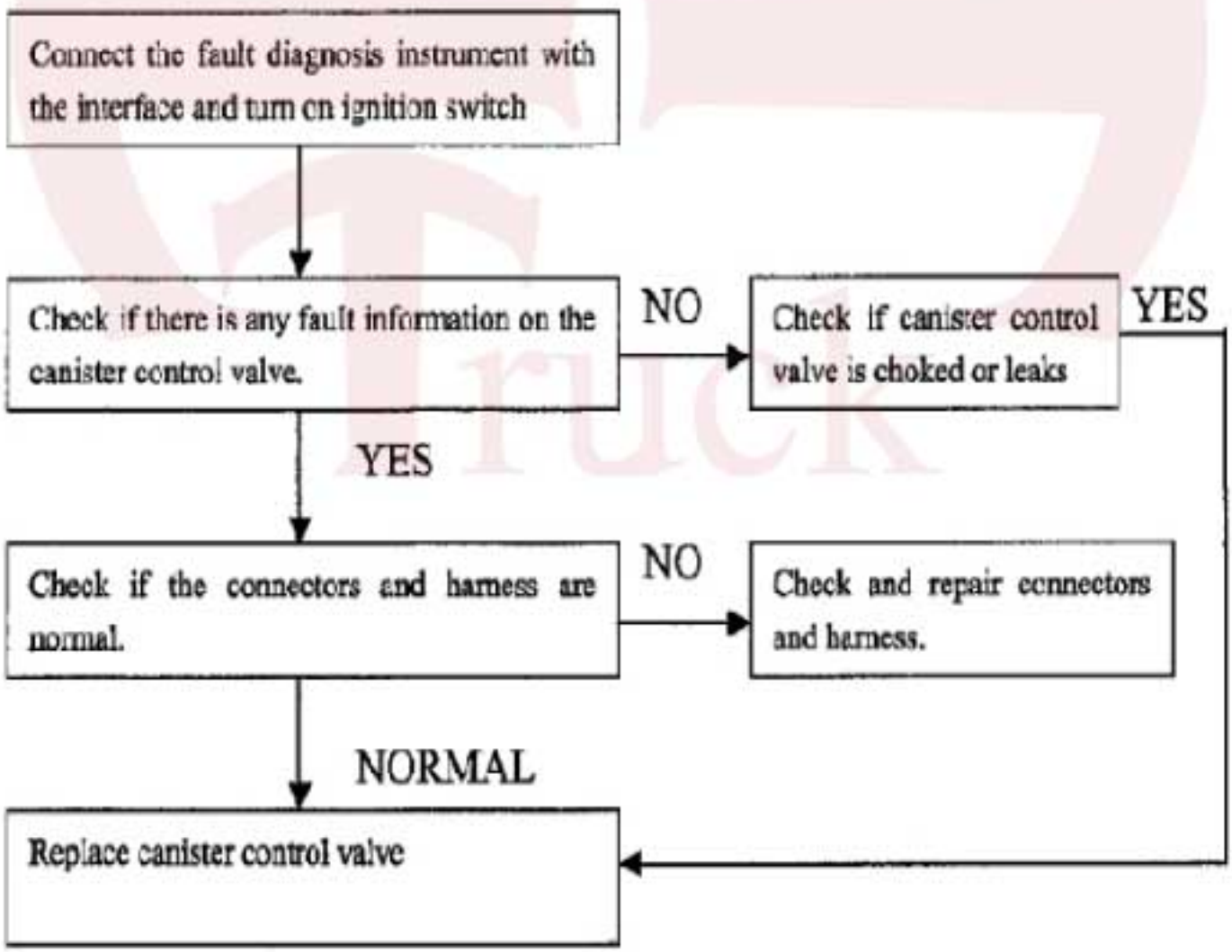


3.16 Canister(Canister Purge) control valve circuit

Circuit diagram



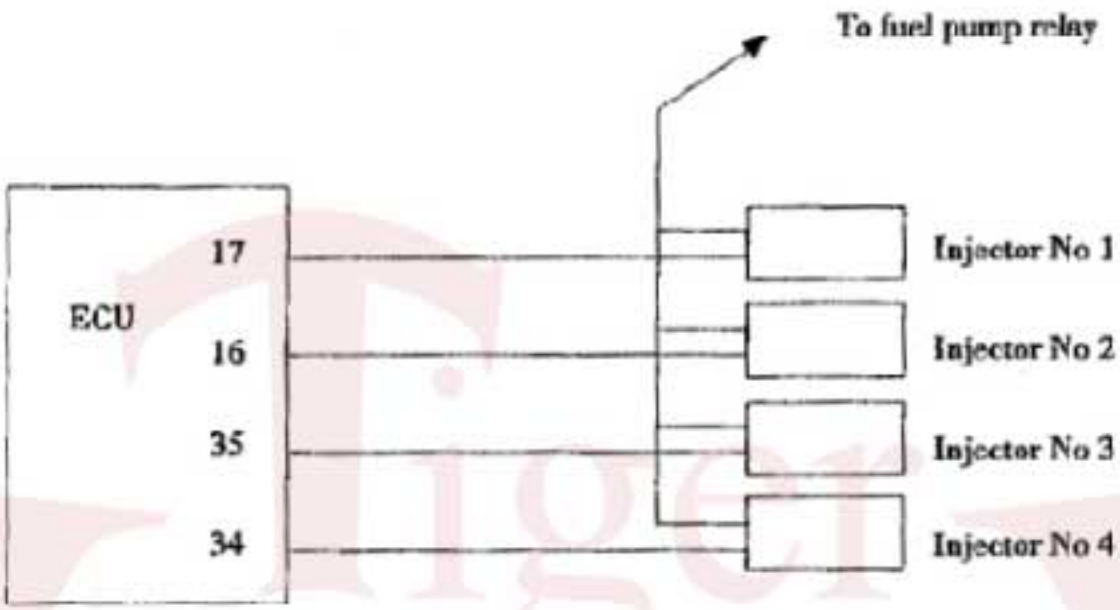
Fault diagnosis



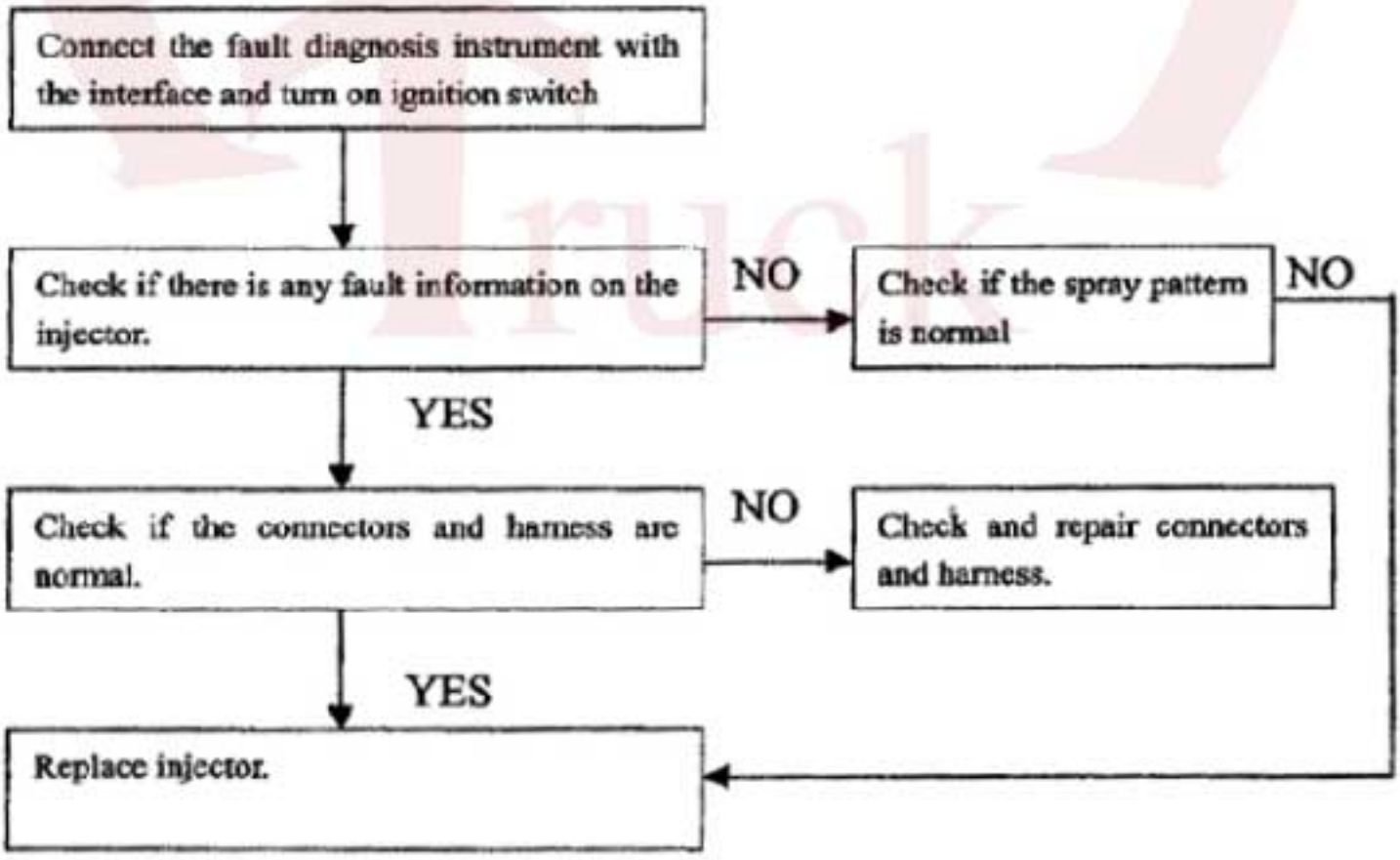
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3.17 Injector circuit

Circuit diagram



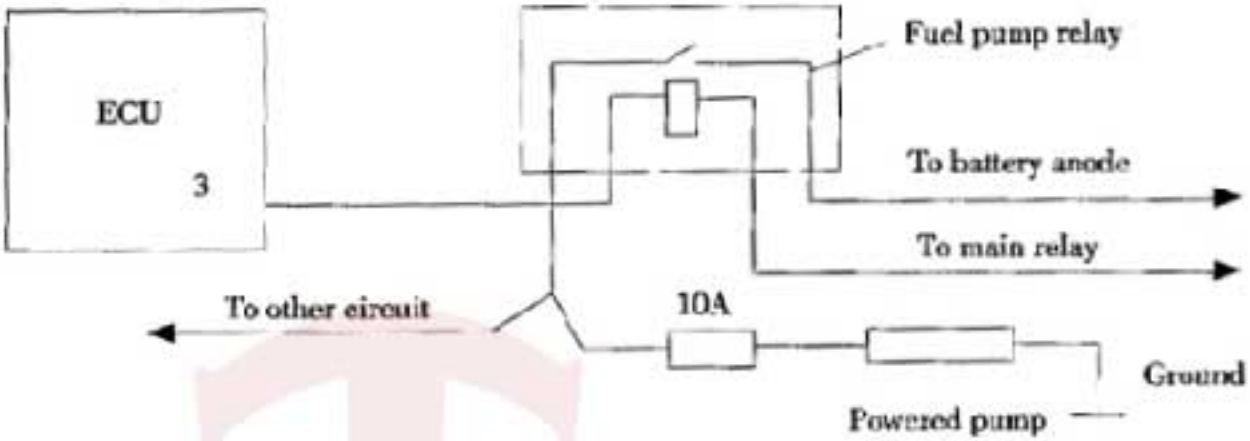
Fault diagnosis



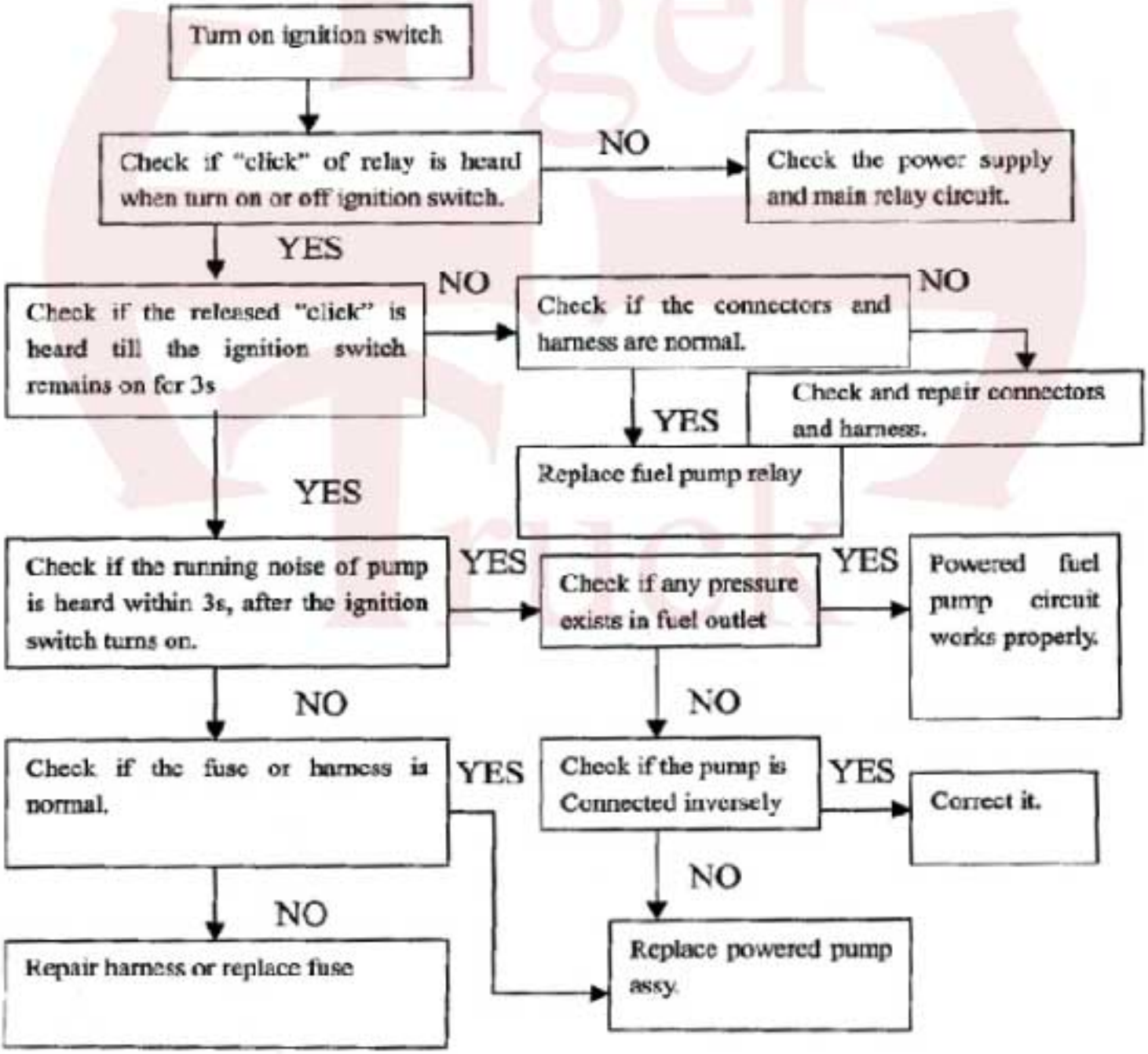
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3.18 Powered fuel pump circuit

Circuit diagram



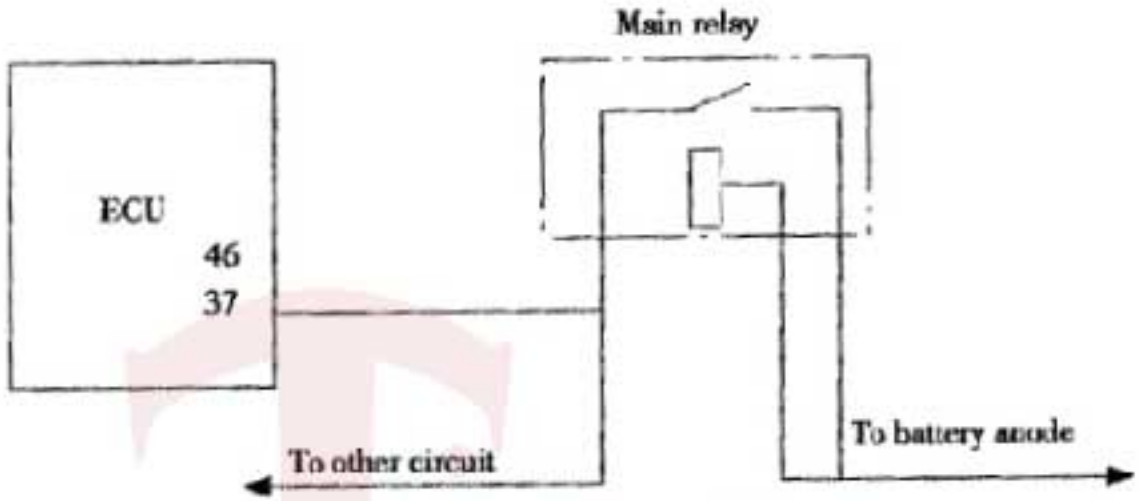
Fault diagnosis



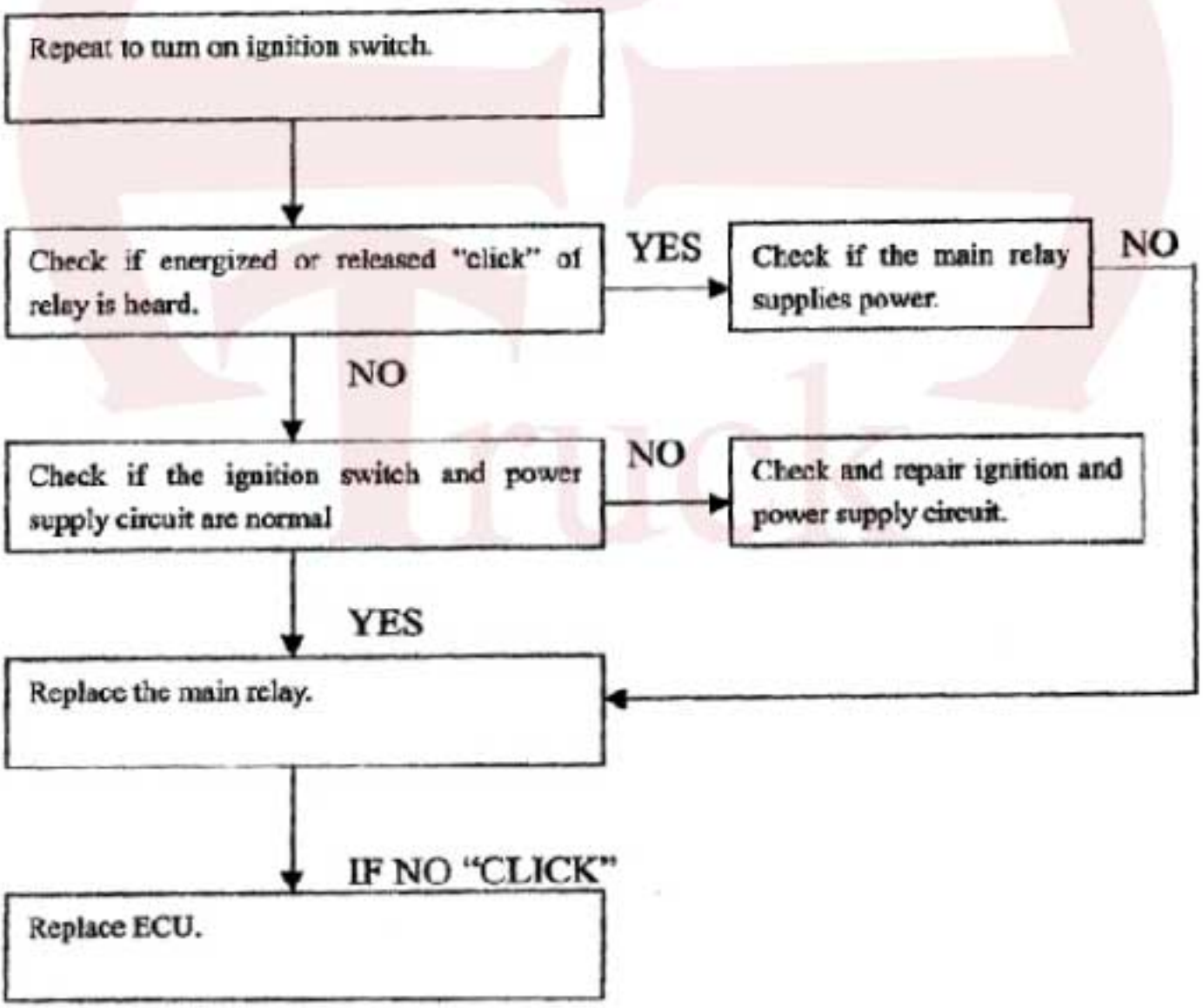
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3.19 Main relay circuit

Circuit diagram



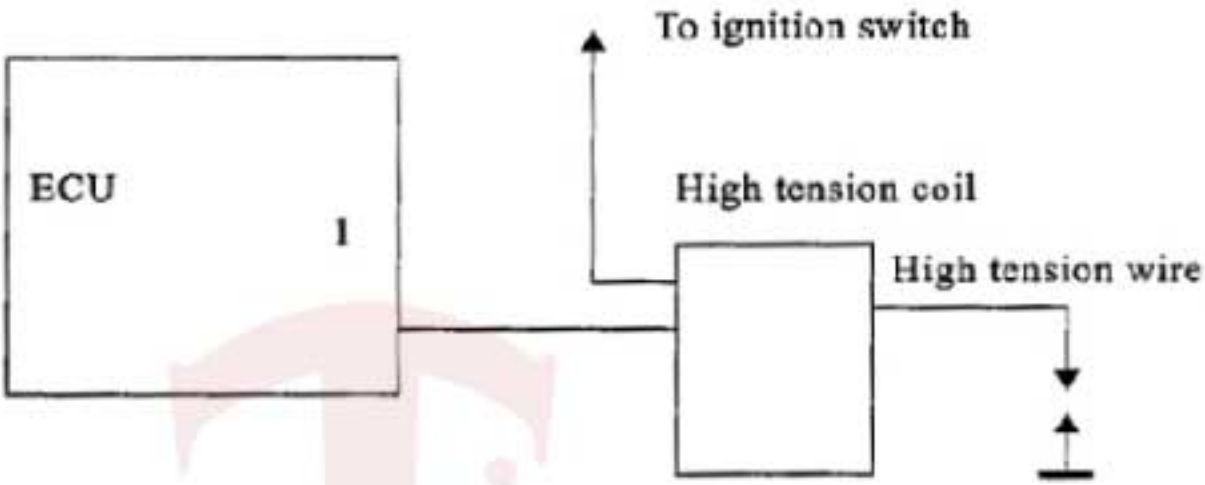
Fault diagnosis



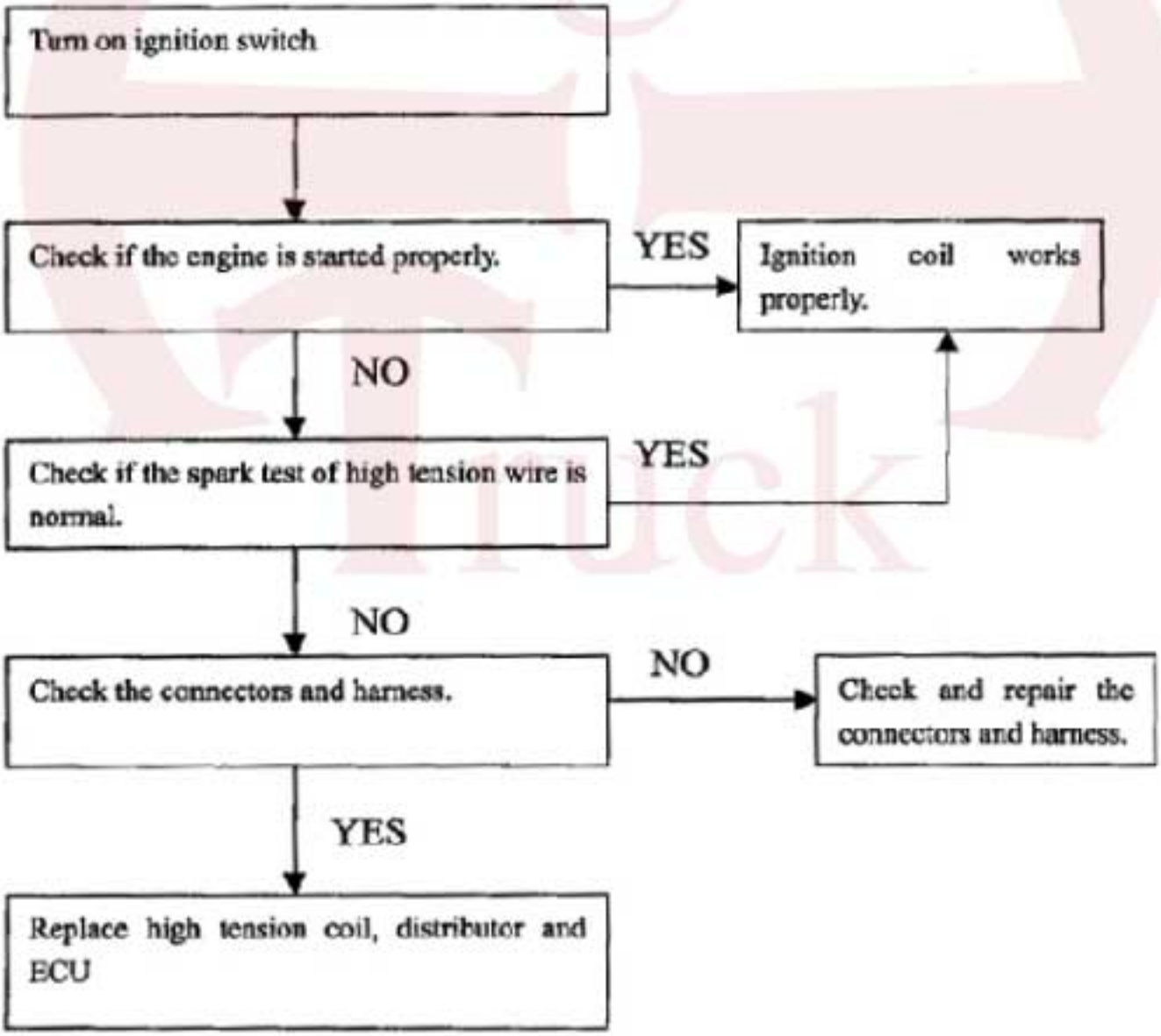
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3.20 Ignition coil circuit

Circuit diagram



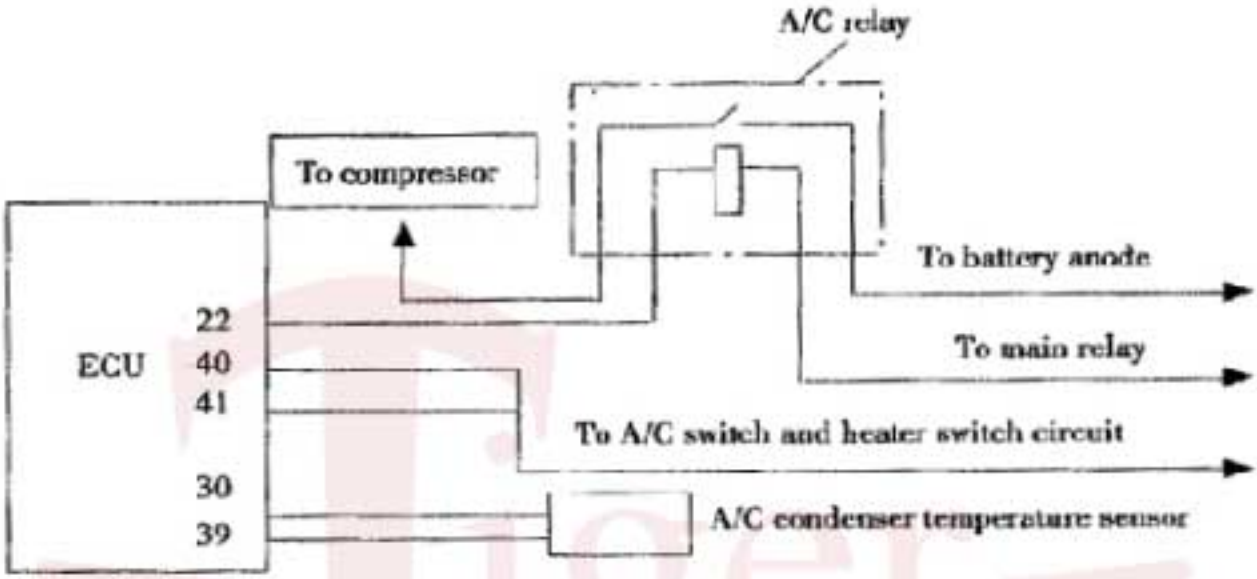
Fault diagnosis



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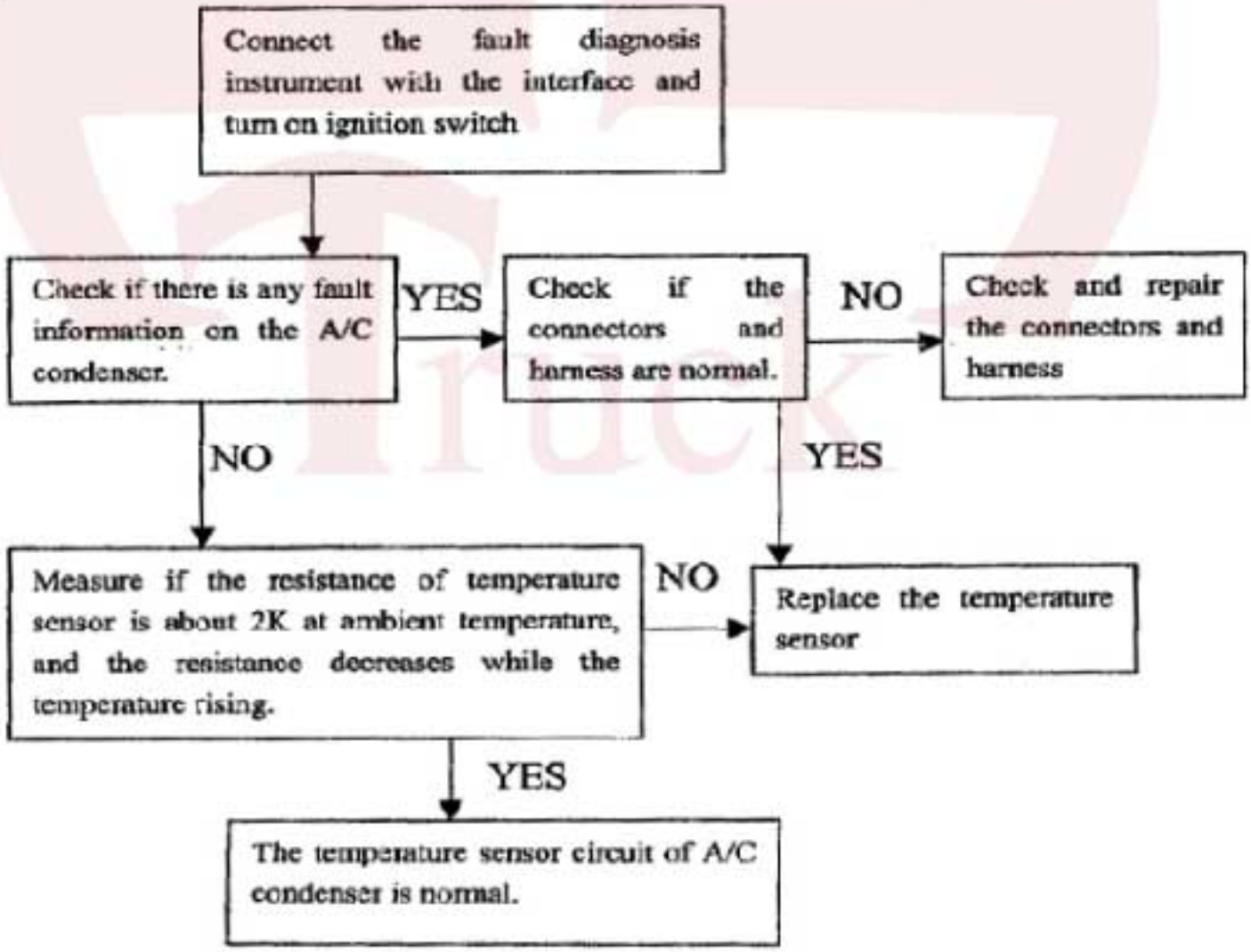
3.21 Air conditioner control system circuit

Circuit diagram



Fault diagnosis

1. Diagnosis on A/C condenser temperature sensor

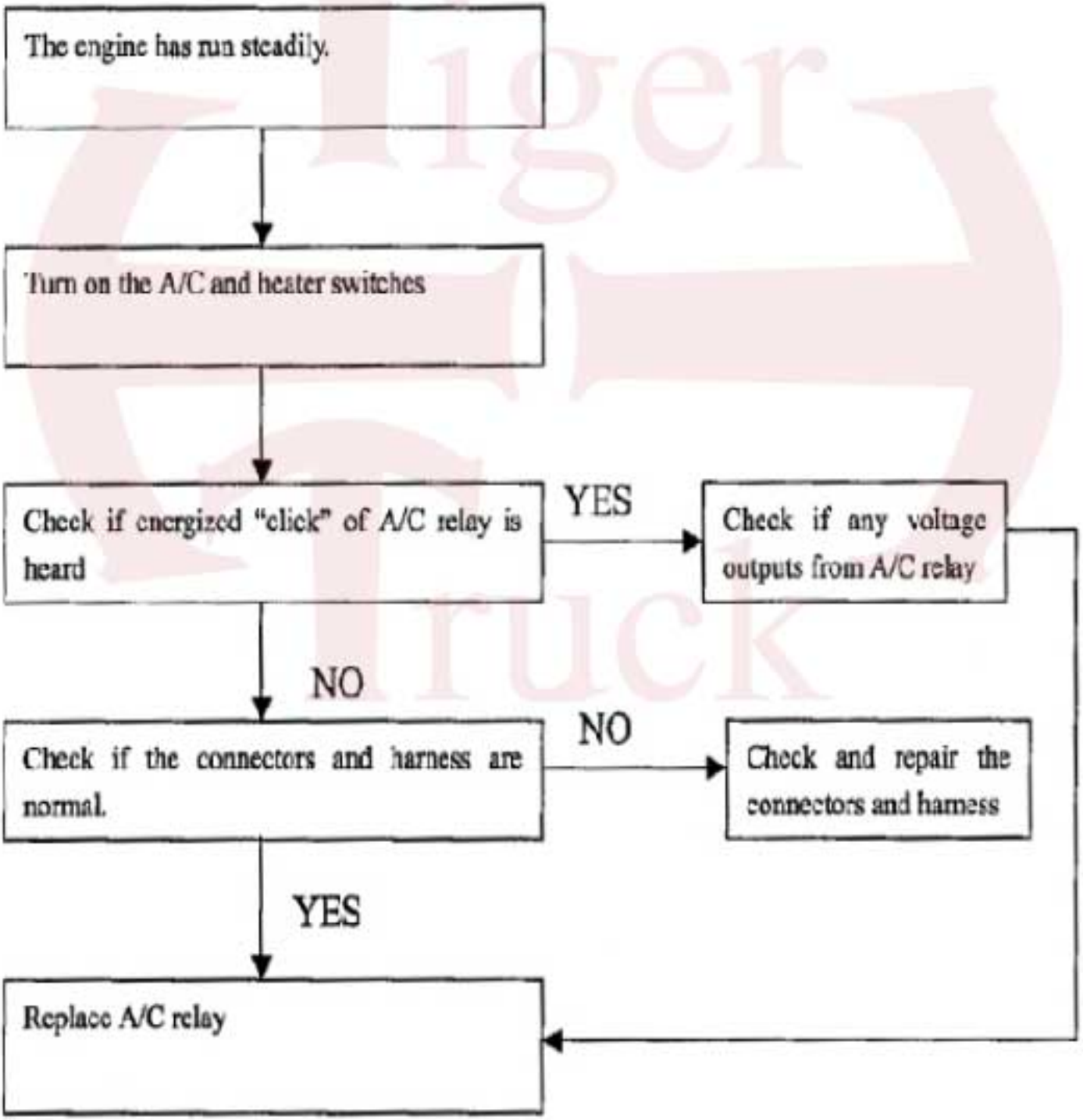


2. Diagnosis on the voltage between the pinNo40 and pin No41 of ECU:

When the A/C switch and heater switch are turned off simultaneously, The engine will increase 100 rounds at the idle speed, the voltage should be less than 0.5V from the pin No41 and Pin No40 to the ground, in other case, such voltage is equal to power supply. otherwise, check the relevant circuits

3. Diagnosis on A/C relay

After finishing steps 1 and 2 above, perform the following diagnosis:



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4. Fault elimination

Special precaution:

1) When measuring the cylinder pressure, The Hall sensor plug must be disconnected from the distributor.

2) When determining the operating condition to each cylinder, just unplug the relevant fuel injector, instead of disconnecting the high tension wire of spark plug.

3) If it is necessary to dismantle the pipe joint. the oil stain around the joint must be cleaned out carefully.

4) The fuel delivery system is under pressure, so when loosening the joint, wrap the joint with a dry cloth to suck the fuel exuded from the pipe and remove the pipe carefully.

5) The hose for fuel delivery system is a specific high-pressure hose, never use general-purpose hose instead of the specific one. As well, the similar clamp is required to use.

6) ECU self teaching function: When first start of the engine is done after disconnection of the plug of ECU or the terminal of battery, turn the ignition key to the ignition position and remain in this place over 10s, then, restart the engine. If not, the idle speed of the engine may be unsteady.

7) Since the reliability of the Electronic Control(engine management) System elements is very high, the possibility of fault is very small to the system elements. In general, do not repair or replace the elements before complete elimination of the mechanical faults.

8) When a fault happens to the Electronic Control (engine management) System, the most possible cause may come from the connectors or harness, so lay stress on examination of connectors and harness.

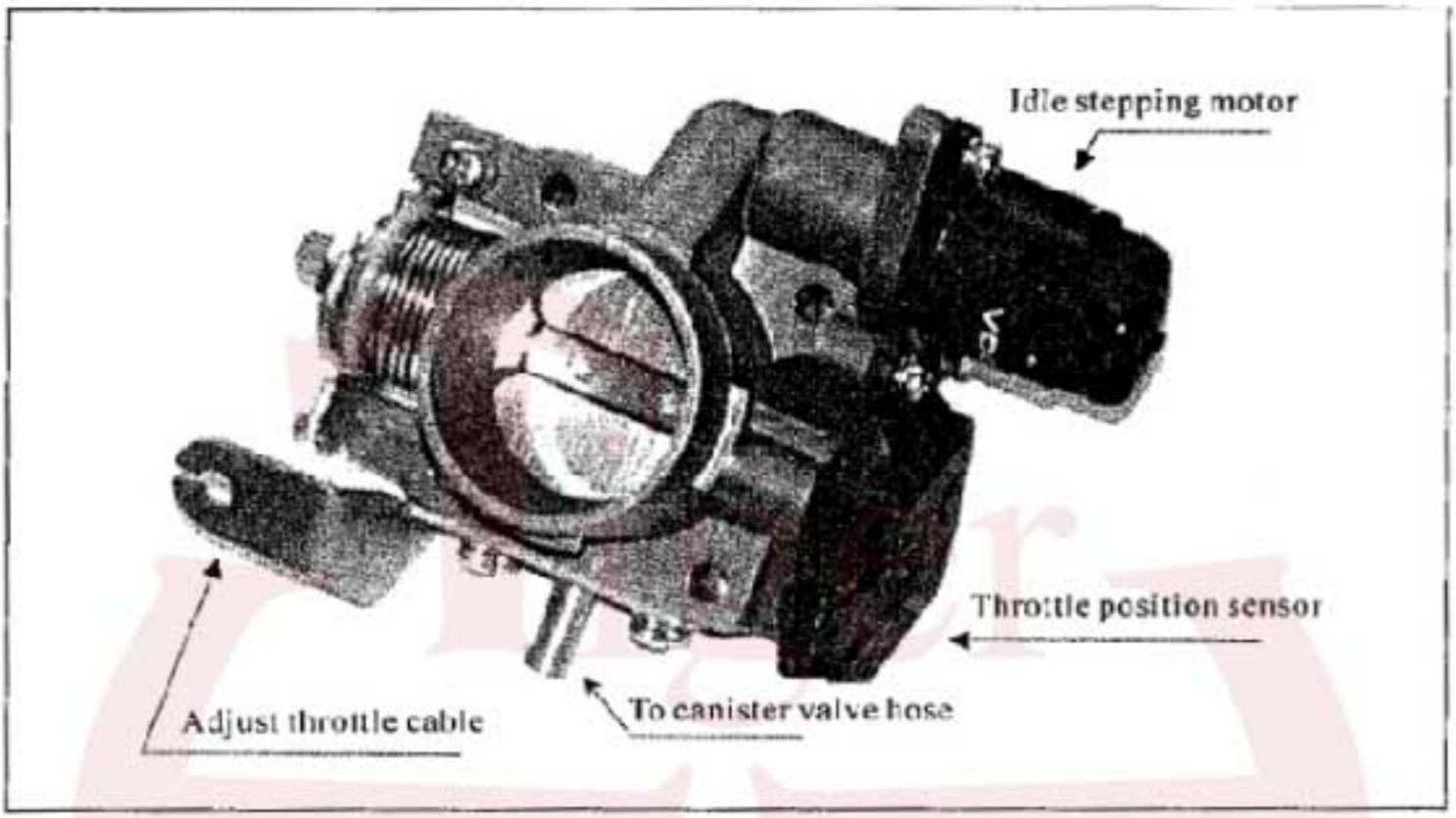
9) When it is necessary to disassemble the intake manifold, the coolant must be drained out completely, or the oxygen sensor and cleaner may be damaged.

10) In general, the wires and connectors are fastened with lock, unlock the connectors before disconnect them, otherwise, the connectors may be damaged. When reinstall the connector, ensure the connectors are in position by hearing a "click".

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4.1 Intake system service

4.1.1 Throttle body



1) Adjust throttle cable

Adjust the cable nut so that the throttle can be opened or closed completely. Read out the aperture width with the fault diagnosis instrument, the reading is 0° when the throttle is fully closed, and the reading is more than 80° , when it is fully opened.

2) Dismantle the throttle

① Dismantle the cable from the throttle body.

② Disconnect the connectors of throttle position sensor and idle stepping motor.

③ Dismantle the hoses of the air cleaner and canister

④ Dismantle the throttle body from the intake manifold.

3) Check if the throttle rotates smoothly.

4) Assemble the throttle body

Assemble the throttle body in inverse order of disassembly, pay attention to use of a good gasket for the throttle body.

4.1.2 Idle stepping motor

1) Dismantle

① Dismantle the throttle body.

② Dismantle the idle stepping motor.

2) Check

① if it is clear.

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② if it rotates smoothly

③ if the "O" ring is in good condition.

④ if the re is any deformation and corrosion to the connectors.

3) Assemble:

Assemble the idle stepping motor in the original position, and replace the old "O" rings with good ones, tightening torque: 4±0.5Nm.

4.1.3 Throttle position sensor

1) Dismantle

① Dismantle the throttle body.

② Dismantle the throttle position sensor.

2) Check

① if the "O" ring is in good condition.

② if the re is any deformation and corrosion to the connectors.

③ if the throttle shaft is assembled with tight fit.

3) Assemble:

Assemble the throttle position sensor into the original position, tightening torque: 2±0.5Nm.

4.1.4 Intake manifold

Check

① if there is any crack.

② if there is any leakage or chokage to the pipes which connect with the intake manifold.

4.2 Fuel delivery system

4.2.1 Check fuel pressure

① Connect a pressure gauge to the fuel delivery pipe with a 3-way.

② The pressure should be 2.5 bar at idle speed, and the pressure is about 3 bar when the vacuum hose of the pressure regulator is removed.

4.2.2 Check fuel pump

① if the fuel pump operates normally

② if the fuel pressure meets the requirement.

③ if the fuel filter is clear.

4.2.3 Check fuel pressure regulator

① Check the fuel pressure.

② Check the vacuum hose of the pressure regulator.

4.2.4 Fuel injector

1) Dismantle

① Disconnect the connectors

② Dismantle the vacuum hose

③ Unscrew the mounting screws of the fuel distribution pipe.

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④ Dismantle the fuel injector with the fuel distribution pipe.

2) Check

① if the spray orifice is clear without chokage.

② if the "O" ring is in good condition.

③ if there is any deformation or corrosion to the connectors.

④ The fuel dripping rate is less than 2 drip/min. when the fuel pressure is 3 bar,

⑤ Start the engine after connection(connecter) of plugs, check if the spray pattern of atomized fuel is uniform to each injector and in good shape.

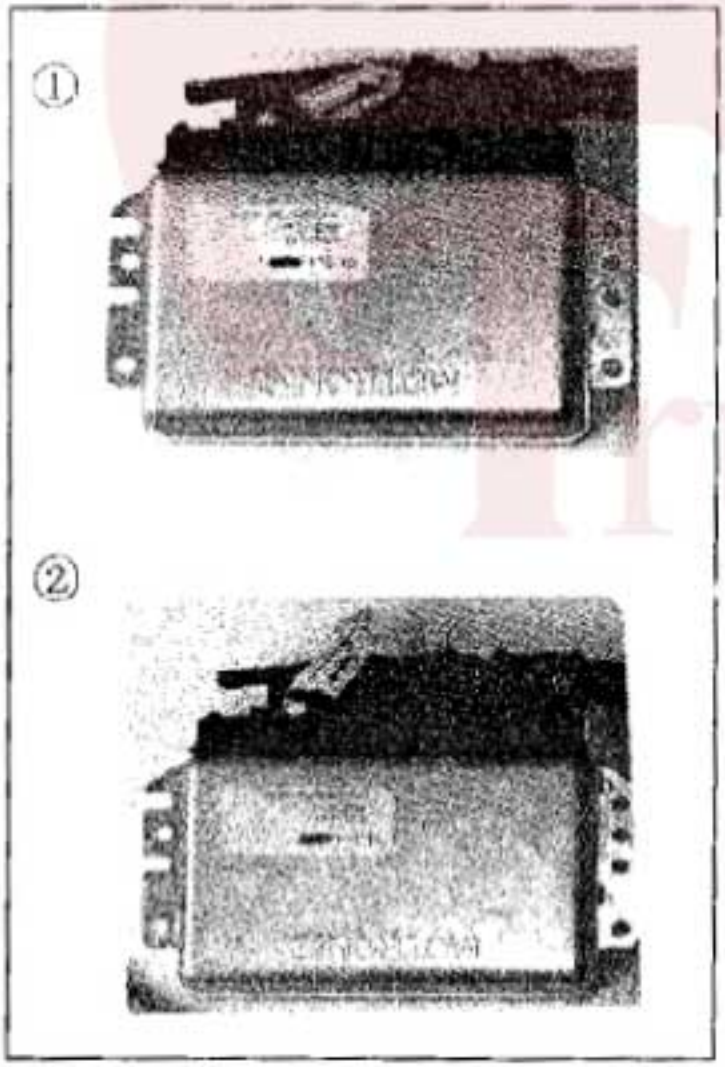
3) Assemble

① Apply little grease on the "O" ring to the spray nozzle.

② Assemble it in inverse order of disassembly.

4.3 Electronic Control (engine management) System

4.3.1 Dismantle and assemble the connectors of ECU



1) Dismantle:

① Unlock the connectors

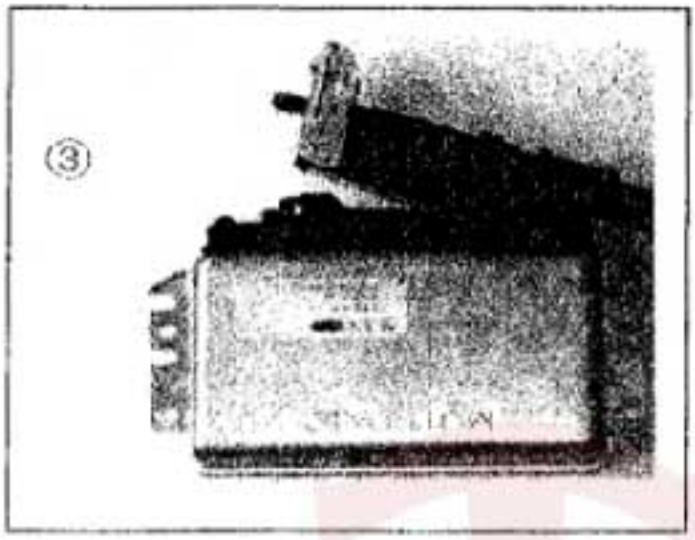
② Rotate the plug

③ Pull out the plug

2) Check:

① if there is any deformation or corrosion to the connectors.

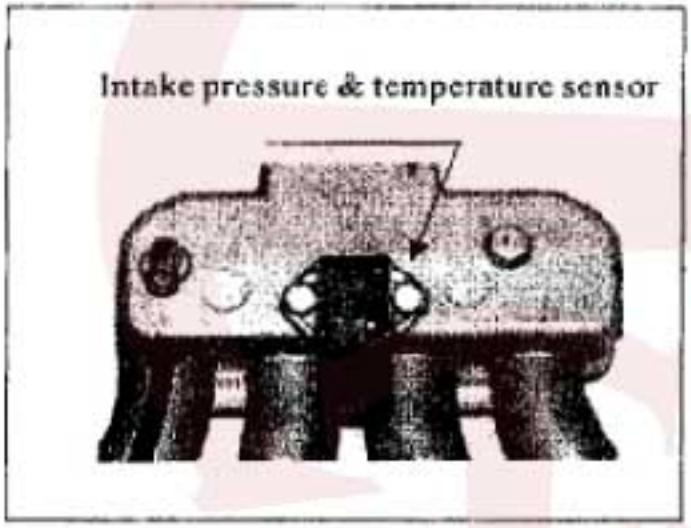
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3) Assemble:

Assemble it in inverse order of disassembly, and lock the plug in position

4.3.2 Intake pressure and temperature sensor



1) Dismantle:

① Disconnect the connectors.

② Dismantle the mounting screws

③ Remove the sensor.

2) Check:

① if the "O" ring is in good condition.

② if there is any deformation or corrosion to the connectors.

③ if the sensor is clear.

3) Assemble:

① Apply little grease on the "O" ring.

② Assemble it in inverse order of disassembly.

③ Tightening torque: 7±1Nm

4.3.3 Engine coolant temperature sensor:

1) Dismantle:

① Drain the coolant from the engine.

② Disconnect the connectors

③ Dismantle the coolant temperature sensor.

2) Check:

① If the appearance is in good condition.

② if there is any corrosion to the connectors

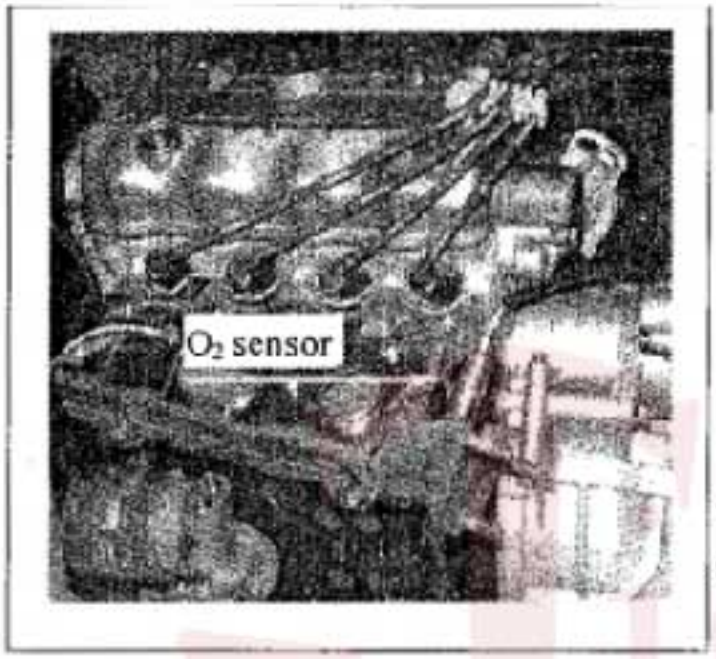
3) Assemble:

① Assemble it in inverse order of disassembly.

② Tightening torque: 20Nm.

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4.3.4 Oxygen sensor



1) Dismantle:

① Disconnect the connectors

② Dismantle the oxygen sensor

2) Check:

① if the appearance is in good condition.

② if there is any chokage in the sensing hole

③ if there is any abnormal noise in the sensor.

3) Assemble:

① Apply little high-temperature grease on the thread part, but it is not allowed to penetrate the grease into the sensing hole.

② Assemble it in inverse order of disassembly.

③ Tightening torque: 50Nm

4.3.5 Knock sensor

1) Dismantle:

① Dismantle the knock sensor from the cylinder block.

2) Check:

① If the appearance is in good condition.

② If there is any dirt or corrosion to the connectors.

3) Assemble:

① Assemble the knock sensor direct on the cylinder block without any washer.

② Tightening torque: 20Nm

③ It must tightened to the specified torque.

4.3.6 Main relay, fuel pump relay and A/C relay

1) Dismantle:

① Dismantle the relays from the holders.

2) Check:

① if there is any corrosion to the connectors.

② if there is any oil stain.

③ if the pins No85,86 of the relay are in open circuit.

3) Assemble:

① Assemble the relays in the original direction.

② It is allowed to alternate the three relays.

4.4 Emission control system

4.4.1 Canister(Canister Purge) control valve

1) Dismantle:

① Disconnect the connectors

② Dismantle the inlet and outlet hoses

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③ Dismantle the Canister(Canister Purge) control valve

2) Check:

① if the appearance is in good condition.

② if there is any air leakage and chokage.

3) Assemble:

① Assemble the Canister(Canister Purge) control valve in inverse order of disassembly.

② Connect the inlet and outlet hoses to the manifold.

4.5 Ignition system

4.5.1 Distributor assy.

Check if there is any looseness or play to the distributor disc, or any high tension leakage from the distributor, and check if the distributor cap is tightened in position, and the distributor track is in good condition.

4.5.2 Spark test

1) Disconnect the connectors of the injector.

2) Connect the spark plug to the high tension damping wire or ignition coil, connect the spark plug shell to the ground.

3) Start the engine to check the spark generated by the spark plug.

4.5.3 Ignition timing adjustment

1) Start the engine, and keep the engine running at idle speed.

2) Connect the pin No 51 of ECU to the ground with an ignition timing adjustment wire.

3) Observe the ignition timing signal from the cylinder No1 in aid of ignition timing lamp, adjust the distributor to obtain that the ignition advance angle is $7\pm1^{\circ}$.

4) Disconnect the ignition timing wire from the pin No51 of ECU, hang it up.

Notice:

It will make a serious problem, if the ignition timing wire is not disconnected from the pin No 51 of ECU.

4.6 Air conditioner control system

Refer to the fault diagnosis.

4.7 Check procedure of primary fault

Notice: Check coolant, machine oil, fuel and voltage before repair the engine.

1) It is difficult to start up the engine or not able to start it. (The starting motor works normally.)

The causes may be:

(1)There is no fuel in the tank.

(2)The fuel pump or other circuits are abnormal.

(3)The fuel pressure regulator is out of work..

(4)The fuel delivery line or spray nozzle is choked.

(5)The idle stepping motor does not operate properly.

(6)The intake pressure temperature sensor and coolant temperature sensor does not work

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properly.

(7)Ignition time and ignition order are not right.

(8)There is something wrong with distributor, ignition coil, high tension wire or spark plug.

(9)The main relay and fuel pump relay have got fault.

(10)ECU has broken.

(11)The intake line is choked.

(12)The other mechanical faults.

Repairing procedure

(1)Make sure sufficient fuel in the tank.

(2)Eliminate all faults determined by the fault diagnosis instrument.

(3)Check and eliminate the ignition circuit fault.

(4)Check and eliminate the fuel pressure fault.

(5)Check and eliminate the spray nozzle fault.

(6)Check the pressure in the cylinder.

(7)Check and eliminate the mechanical fault, such as improper throttle gap.

2) The idle speed of the engine is not steady or in poor performance

The causes may be:

(1)Ignition time and ignition order are not right.

(2)There is something wrong with distributor, ignition coil, high tension wire or spark plug.

(3)The fuel or pressure is insufficient.

(4)The idle stepping motor does not operate properly.

(5)The throttle position sensor or coolant temperature sensor is out of work.

(6)The throttle cable has fault.

(7)There are some air leakage from various pipes mounted with intake manifold.

(8)The Canister(Canister Purge) control valve does not work properly.

(9)A self-adaptive teaching is not performed by the controller.

(10)A/C signal is not normal.

(11)Abnormal voltage.

(12)Mechanical faults such as lower pressure in the cylinder.

Repairing procedure

(1)Make sure sufficient fuel in the tank.

(2)Eliminate all faults determined by the fault diagnosis instrument.

(3)Check and adjust the throttle cable.

(4)Check and eliminate the leakage fault to various vacuum hoses.

(5)Check and eliminate the ignition system fault.

(6)Check the chokage in the pipe for idle speed.

(7)Check and eliminate the fuel delivery system fault.

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(8)Check and eliminate the A/C signal circuit fault.

(9)Replace the distributor.

(10)Check and eliminate the mechanical fault, such as improper cylinder pressure or valve lash.

3)Insufficient power from the engine.

The causes may be:

(1)The throttle cable is not adjusted properly.

(2)The fuel pressure is insufficient..

(3)The spray nozzle has fault.

(4)The intake pressure temperature sensor and coolant temperature sensor does not work properly.

(5)The idle stopping motor does not operate properly.

(6)The ignition timing wire connects to the ground.

(7)There is something wrong with distributor, ignition coil, high tension wire or spark plug.

(8)Ignition timing adjustment is improper.

(9)Intake and exhaust are not smooth.

(10)Mechanical faults such as incorrect pressure in the cylinder, clutch fault etc.

Repairing procedure

(1)Adjust the throttle cable.

(2)Check the ignition timing correcting circuit.

(3)Eliminate all faults determined by the fault diagnosis instrument.

(4)Check and eliminate the fuel delivery system fault.

(5)Check and eliminate the ignition system fault.

(6)Check the intake and exhaust system.

(7)Check and eliminate incorrect pressure in the cylinder, clutch fault

4)The engine operates in dull response.

The causes may be:

(1)The throttle position sensor or intake pressure and temperature sensor is out of work.

(2)There are something wrong with distributor, ignition coil, high tension wire and spark plug.

(3)The fuel delivery system has fault.

(4)The idle stepping motor does not operate properly.

(5)Ignition timing adjustment is improper.

(6)Mechanical faults such as insufficient pressure in the cylinder.

Repairing procedure

(1)Eliminate all faults determined by the fault diagnosis instrument.

(2)Check the ignition advance angle at idle speed.

(3)Check and eliminate the ignition system fault

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(4)Check and eliminate the fuel delivery fault.
(5)Check and eliminate the other mechanical faults.

5)The engine operates unsteadily.
The causes may be:
(1)There is something wrong with distributor, ignition coil, high tension wire or spark plug.
(2)The throttle position sensor or coolant temperature sensor is cut of work.
(3)The fuel pressure is not steady.
(4)The spray nozzle has fault.
(5)The idle stepping motor does not operate properly.
(6)The voltage is too low (e.g. the generator is damaged).
(7)There is a fault on ECU.
(8)Mechanical faults such as insufficient pressure in the cylinder
Repairing procedure
(1)Eliminate all faults determined by the fault diagnosis instrument.
(2)Check and eliminate the ignition system fault
(3)Check and eliminate the fuel delivery fault.
(4)Check and eliminate the other mechanical faults.

6)Fuel consumption is too high.
The causes may be:
(1)There is something wrong with distributor, ignition coil, high tension wire or spark plug.
(2)Ignition timing adjustment is improper.
(3)The fuel pressure regulator, spray nozzle do not work properly.
(4)The throttle position sensor or coolant temperature sensor does not work properly.
(5)There is a fault on ECU.
(6)Intake and exhaust are not smooth.
(7)The fuel Enriching(enrich) wire connects to the ground.
(8)Intake pressure and temperature sensor is choked.
(9)There is air leakage in front of or near the oxygen sensor
(10)Other mechanical faults.
Repairing procedure
(1)Eliminate all faults determined by the fault diagnosis instrument.
(2)Check and eliminate the ignition system fault.
(3)Check and eliminate the fuel delivery system fault.
(4)Check and eliminate the intake and exhaust system faults.
(5)Check and eliminate mechanical faults, such as insufficient pressure in the cylinder.

7)The emission exceeds limits.
The causes may be:

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(1) There is something wrong with distributor, ignition coil, high tension wire and spark plug.
(2) The fuel delivery system has fault on fuel pressure regulator or spray nozzle
(3)The catalytic converter is not fully preheated.
(4)The catalytic converter has degraded.
(5)The engine does not run at a normal temperature.
(6)The oxygen sensor has fault.
(7)There are some air leakage from exhaust system.
(8)The throttle position sensor or coolant temperature sensor does not work properly.
(9)Ignition time is not right.
(10)Intake and exhaust are not smooth.
(11)There is a fault on ECU.
(12)Other mechanical faults.

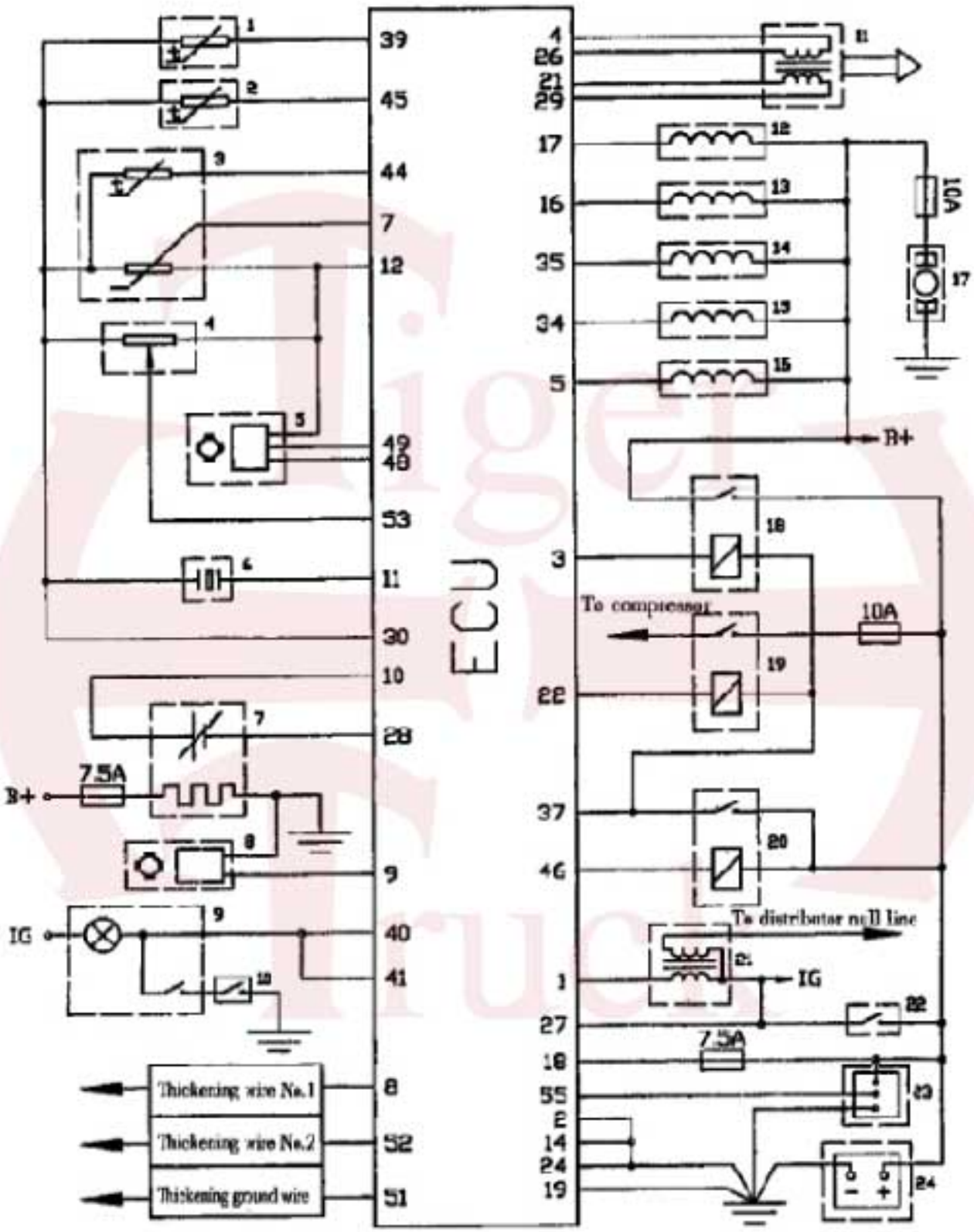
Repairing procedure
(1)Eliminate all faults determined by the fault diagnosis instrument.
(2)Check and eliminate the ignition system fault.
(3) Make the engine and catalytic converter to reach the normal temperature.
(4) Check and eliminate chokage and leakage faults in intake or exhaust system
(5) Replace the catalytic converter or oxygen sensor.
(6)Check and eliminate the fuel delivery system fault.
(7)Check and eliminate the mechanical fault, such as insufficient cylinder pressure.

8)Self adaptive value λ exceeds lower and upper limits.
The causes may be:
(1)Intake and exhaust system are not smooth or they are leak.
(2)The fuel pressure regulator, spray nozzle do not work properly.(3)There is something wrong with distributor, ignition coil, high tension wire and spark plug.
(4)The oxygen sensor has fault.
(5)There are mechanical faults, such as improper cylinder pressure or valve lash.
(6) The intake pressure sensor works improperly.
(7) There is a fault on ECU.

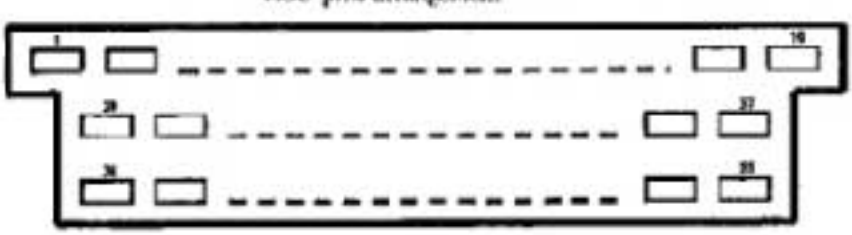
Repairing procedure
(1)Eliminate all faults determined by the fault diagnosis instrument.
(2)Check and eliminate the ignition system fault.
(3)Check and eliminate the fuel delivery system fault.
(4)Check and eliminate the intake and exhaust system.
(5)Check and eliminate the mechanical fault, such as insufficient cylinder pressure.
(6)Replace the intake pressure sensor.
(7)Replace ECU.

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4.8 Circuit diagram of engine electronic control system



ECU pins arrangement



1. A/C evaporator temperature sensor 9
2. Coolant temperature sensor
3. Intake pressure and temperature sensor
4. Throttle position sensor
5. Hall sensor
6. Knock sensor
7. Oxygen sensor
8. Speed sensor
9. Air conditioner switch
10. Heater switch
11. Idle stepping motor
12. Spray nozzle in cylinder No 1
13. Spray nozzle in cylinder No 2
14. Spray nozzle in cylinder No 3
15. Spray nozzle in cylinder No 4 (4-cylinder engine); Canister (Canister Purge) control valve (3-cylinder engine)
16. Canister(Canister Purge) control valve (4-cylinder engine)
17. Powered fuel pump
18. Fuel pump relay
19. A/C relay
20. Main relay
21. High tension coil
22. Ignition switch
23. Faults diagnosis interface
24. Battery

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SECTION 6C

AIR CLEANER, CYCLONE, FUEL PUMP AND FUEL FILTER

CONTENT

Air Cleaner.....6C-2

Cyclone System.....6C-3

Fuel Pump..... 6C-4

Fuel Filter..... 6C-5

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Air Cleaner

Description

This air cleaner element is of dry type. Remember that it needs cleaning according to the following method and interval.

1) Take out the cleaner element ① off the air cleaner case.

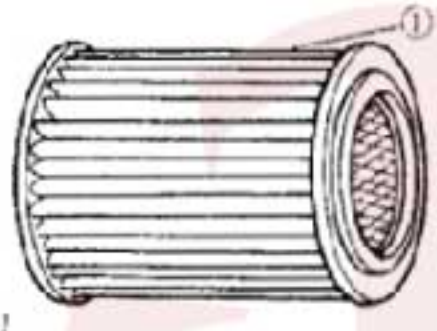


Fig. 5-1

2) Blow off dust by compressed air from inside of element.

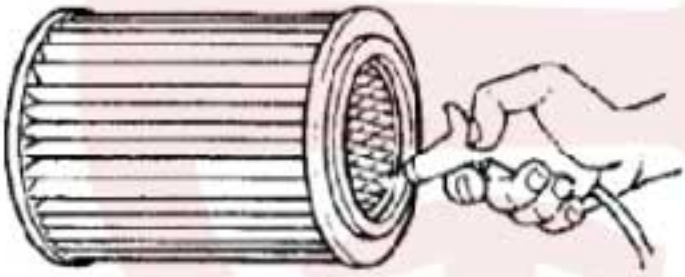


Fig. 5-2

NOTE:
If the element are heavily dirtied, wash it in household type detergent. After washing, rinse the detergent out of element, and dry it completely.

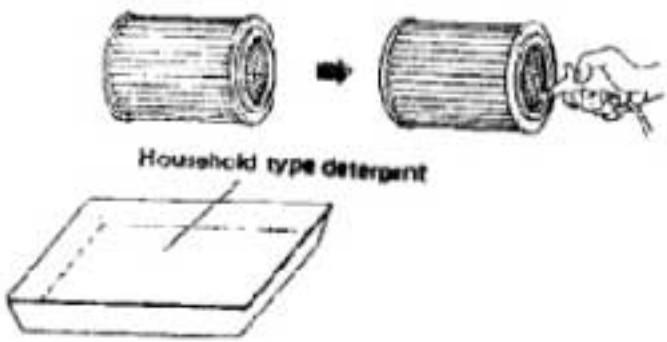


Fig. 5-3

Clean	Paved-road, Every 10,000km (6215 miles)
	Dusty condition, Every 2,500 km (1,553 miles) or as required
Replace	Every 40,000km (24,855 miles) NOTE: More frequent replacement if under dusty driving conditions.

Use of the selector lever (Option)

A mispositioned selector lever can cause the carburetor to get "iced" in freezing weather or the engine to overheat in hot weather. Position this lever according to the atmospheric temperature, i. e, in WINTER position when outside temperature is 15℃ (59℉) or below, or in SUMMER position when the temperature is above that level.

Warm-air selector lever position	
Atmospheric temperature	Lever position
15℃ (59℉) or below	WINTER
Above 15℃ (59℉)	SUMMER



Fig. 5-4

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Cyclone System

(This system device is installed in the vehicles used in certain dusty areas.)

Description

Cyclone is installed in front of the air cleaner inlet hose. Its purpose is to clean the air to be drawn into the air cleaner and the carburetor. It whirls the ingoing air and separates dust out of air with an effect of the centrifugal force produced in it.



Fig. 5-5

Construction

The air is drawn into No. 1 chamber of Cyclone due to the suction negative pressure of the engine and enters No. 2 chamber through the holes of Plates① which are shaped like the fliers of a windmill. As the air passes, Plates ① give whirling motion to it. The centrifugal force which is produced by the whirling air current presses dust in the air against the inside wall of No. 2 chamber. Dust then drops down into cup ②along the wall. The air free from dust now is drawn into the air cleaner through No. 3 chamber.

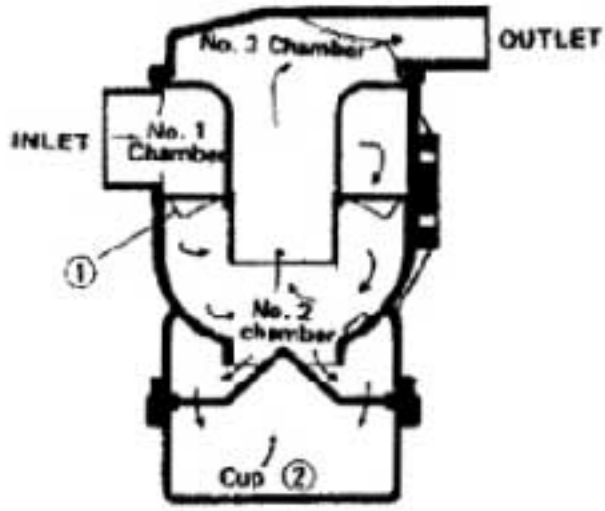
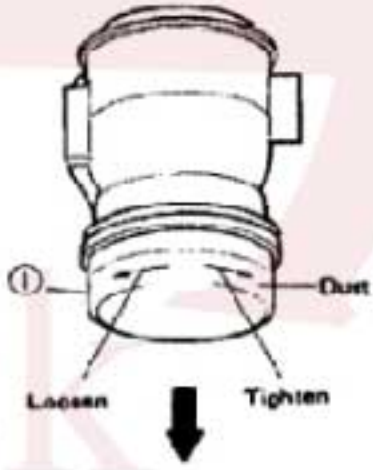


Fig. 5-6

Inspection and cleaning

Check the inside of cup① for dust every month. If dust collects up to the middle of the cup, remove the cup from cyclone, and clean the inside of cup.

Clean	Every month





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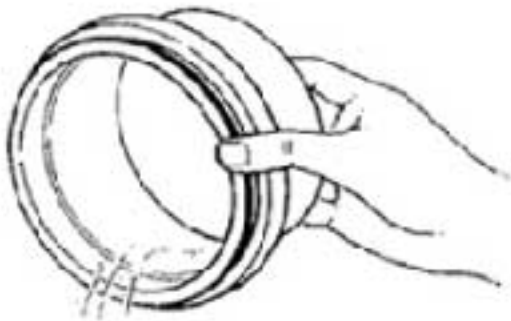


Fig. 5-7

Fuel Pump

Description

A pneumatic diaphragm pump is used to deliver gasoline to the float chamber in the carburetor. Its diaphragm is actuated from one of the cams formed of engine camshaft. A rocker arm rides on this cam and moves the pump diaphragm up and down.

Fuel pump specifications	
Discharge pressure	0.25-0.35 kg/cm² (3.55-4.97psi)
Pump capacity	1.3litres/minute or better at 2,000 r/min

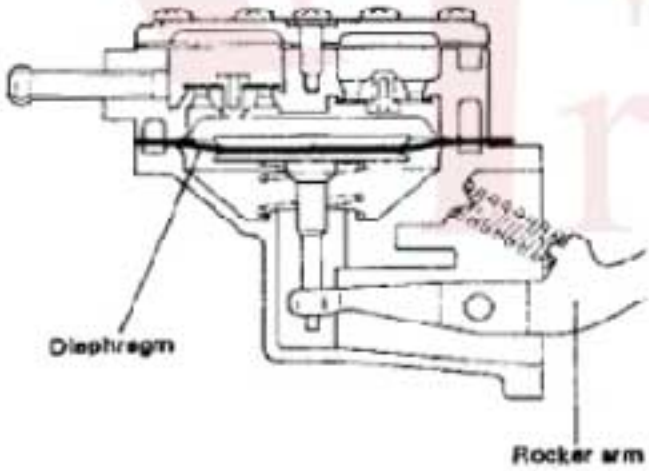


Fig. 5-8

Important pump disassembling step

Scribe match marks ① across the joint seams to establish and identify the angular positions of upper half ② and lower half ③ as shown in Fig. 5-8. This provision is necessary because the screw holes are so located as to permit the two halves to be angularly positioned in more than one way, whereas the pump can be piped only when the pump is assembled as shown.



Fig. 5-9

Inspection

- Inspect the fuel pump in place for leakage.
- Be sure that the fuel hose is free of any sign of cracking.
- Be sure that the nuts securing the pump in place are tight.
- After disassembling the pump, examine the diaphragm to be sure it is in good condition, free of any evidence or rupture or breakage.

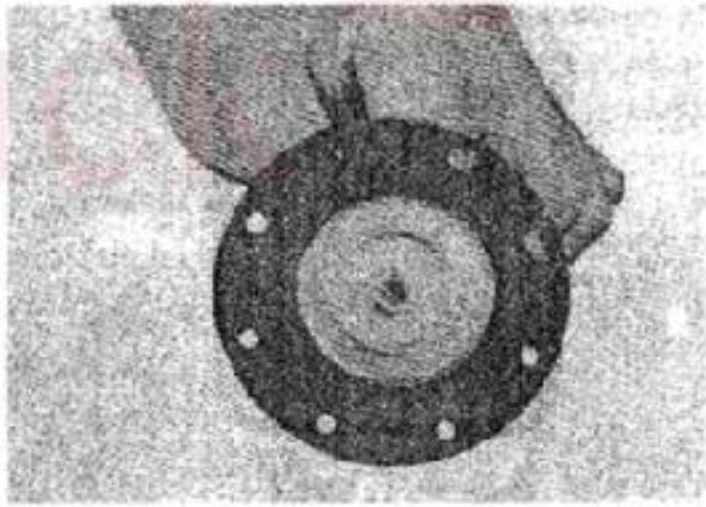


Fig. 5-10

Important pump reassembling

Be sure to fit the upper half and lower half as

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guided by the match marks① given at the time of disassembly. With two halves②③ correctly positioned, run in the screws and tighten them equally.

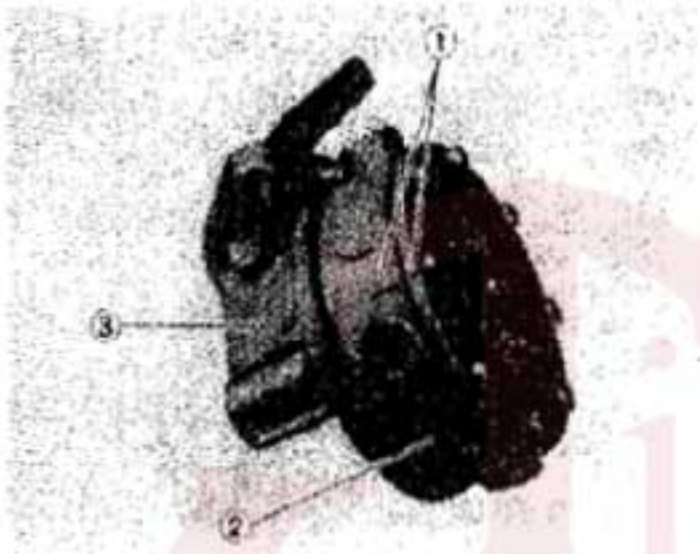


Fig. 5-10

Fuel Filter

Description

Fuel enters the filter through its inlet hole and, after passing through the filtering element, comes out of its outlet hole communicated to the fuel pump. This filter is not meant to be disassembled. It is of cartridge type, consisting of a filtering element in a plastic case.

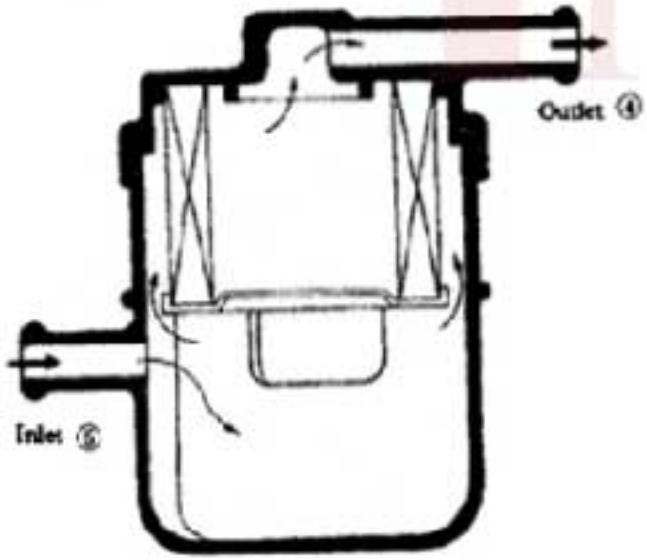


Fig. 5-11

Servicing and installation

As said before, this filter does not permit disassembly, it is to be replaced by a new one periodically. It is one of the expendable items.

Interval of fuel filter replacement	Every 40,000km (24855 miles)

CAUTION:

Fig. 5-11, Left, shows the fuel filter in its correct posture, with outlet④ coming on top side and inlet⑤ on bottom side.

Remember the relative positions of inlet and outlet when piping the filter.

SECTION 6D

ENGINE COOLING SYSTEM

CONTENT

Description.....6D-2

Cooling Water circuit.....6D-2

Removal 6D-3

Functional Description of Major Components.....6D-4

Cooling System Services.....6D-7

Important Re-installing Steps.....6D-10

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Description

The engine is cooled by coolant set in forced recirculation through jackets formed in the engine body and through the radiator. For the water pump, a high-capacity centrifugal pump is used. For the radiator, a tube-and-fin type, large in heat dissipating capacity, is used.

The thermostat is of wax pellet type, accurately responsive to temperature changes and durable in construction. It maintains the coolant temperature within a narrow range during operation.

Cooling Water Circuit

The thermostat remains in closed condition-its valve is closed-when the coolant is cold. Under this condition, the coolant being pumped flows through the circuit comprising cylinder block, cylinder head, inlet manifold, bypass hose and water pump, in that order.

As the temperature rises to 82℃ (179℉) or thereabout, the thermostat begins to open, thereby allowing some of the coolant in recirculation to flow through the radiator. At about 95℃ (203℉) of rising coolant temperature, the thermostat becomes completely open so that little or no flow occurs through the bypass hose; the coolant now flow through the radiator and back to the pump, releasing the most of heat to the atmosphere through the radiator core.

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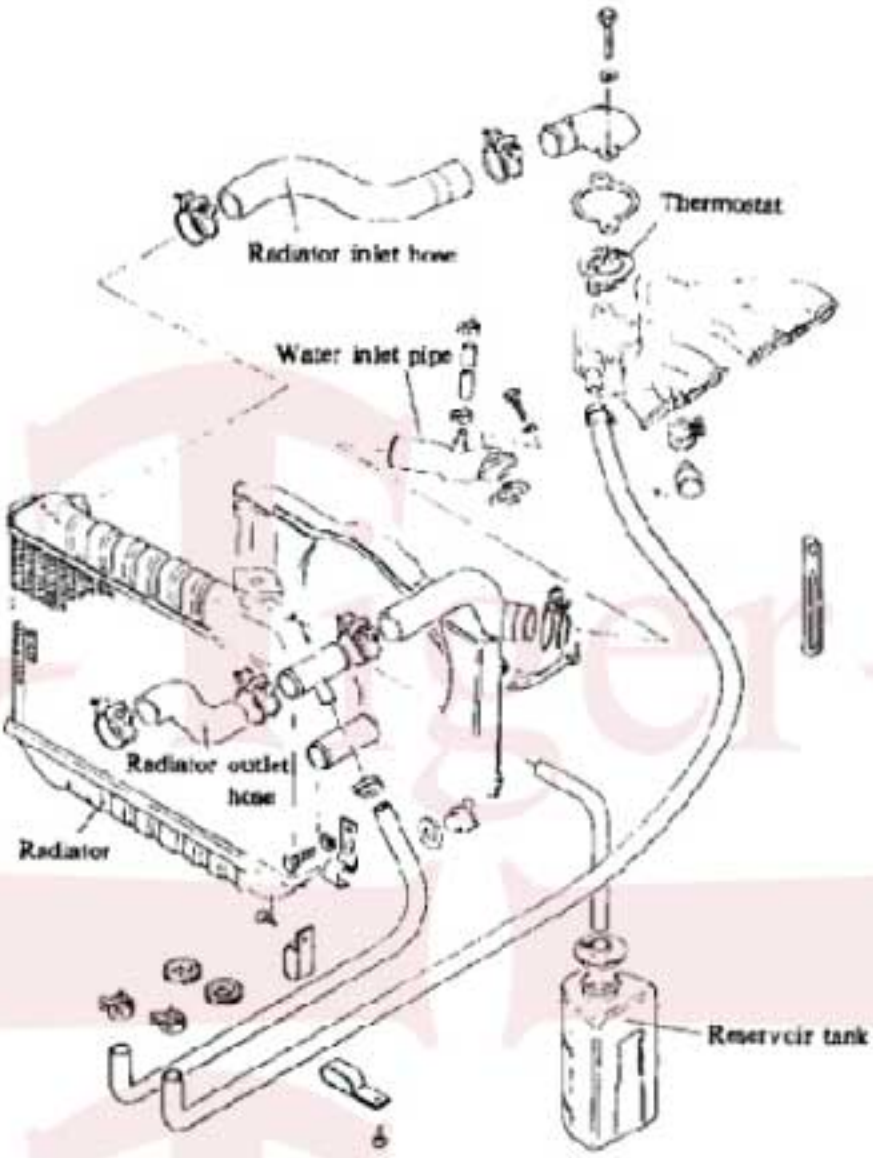


Fig. 6-1

Removal

1. Coolant draining

1) Loosen the drain plug ① on the radiator to empty its water side.

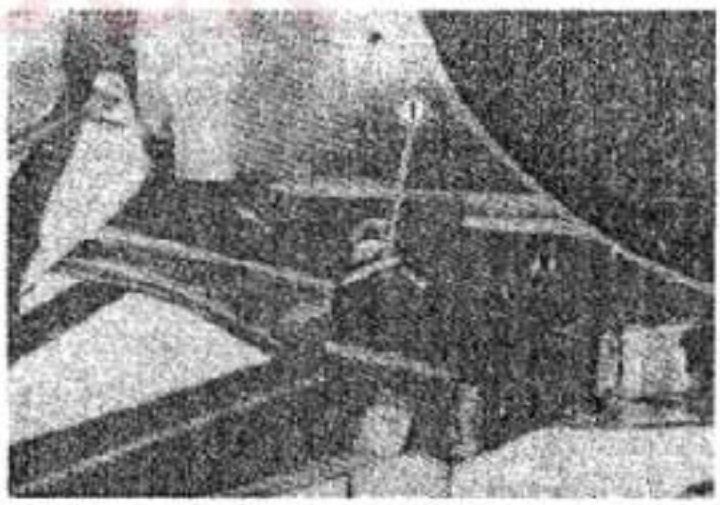


Fig. 6-2

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2)The drain plug②for engine water jackets is located below the exhaust manifold. To change the coolant, or to drain the jackets for one reason or another, loosen this plug, too.



Fig. 6-3

2. Removal of cooling water hoses

To remove these hoses, loosen the screw on each hose clip and pull the hoses end off.

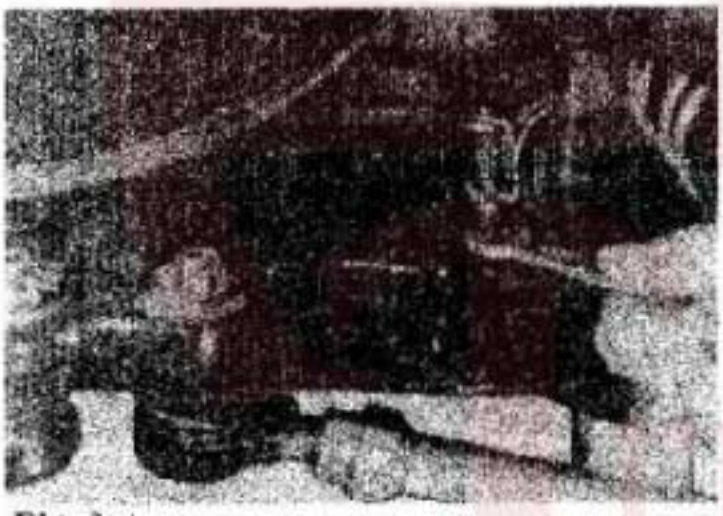


Fig. 6-4

3. Radiator removal

Loosen the bolts securing the radiator in place. Take down the radiator.

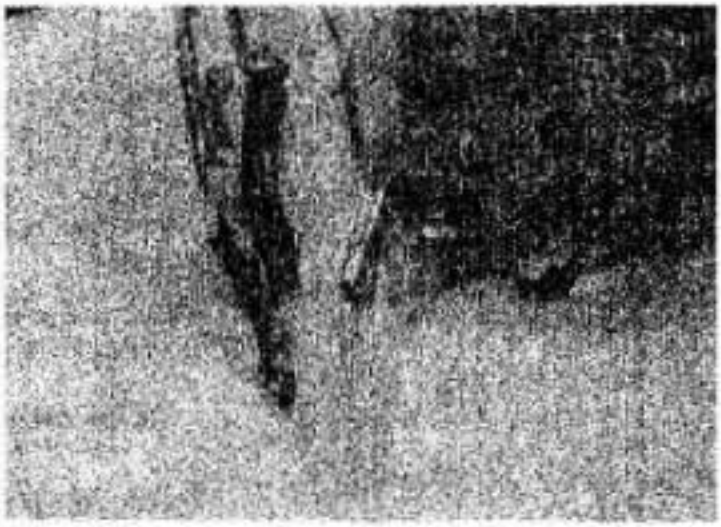


Fig. 6-5

4. Cooling fan removal

Removing the bolts securing the fan to the hub allows the fan to be detached.

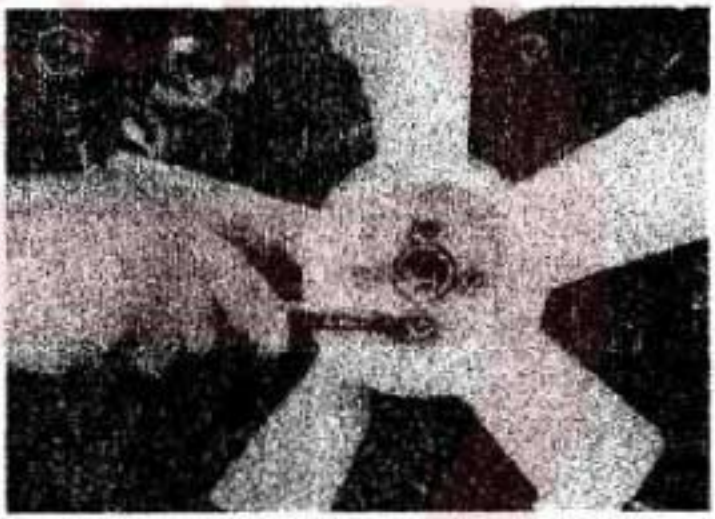


Fig. 6-6

5. Water pump removal

In order to remove the water pump, it is not necessary to take down the engine. The method of removal is sequentially illustrated in Figs. 3-12 3-13, 3-15, 3-16, 3-17, 3-18, 3-19, 3-20, 3-2 and 3-23.

In these figures, cautioning reminders are given. Be sure to pay attention to those reminders when removing the pump.

The method of re-installing the pump is sequentially illustrated in Figs. 3-136, 3-137, 3-139, 3 140, 3-141, 3-142 and 3-143.

Functional Description of Major Components

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Water reservoir tank

This reservoir, a small plastic tank, is so located relative to, and so associated with the radiator that it receives the excess coolant that would otherwise spill out by overflowing. The excess is due to coolant expansion caused by temperature rise. When the coolant cools down, its volume contracts, and the coolant in the reservoir returns to the radiator.

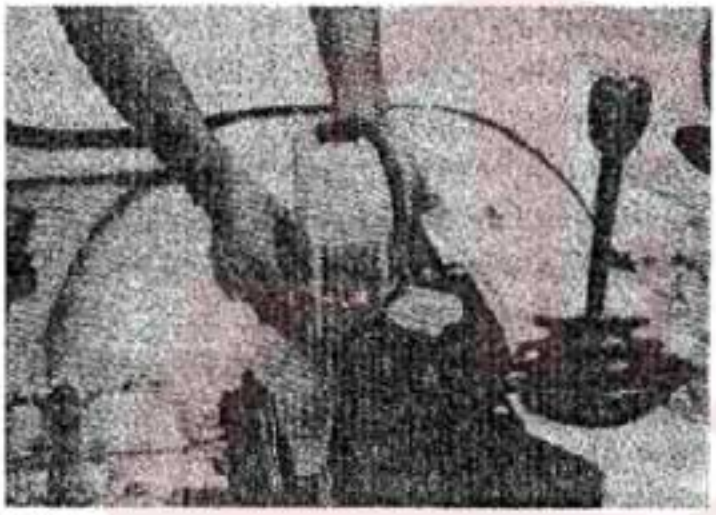


Fig. 6-7

Thermostat

The temperature-sensitive material in the thermostat is a wax pellet. It is hermetically contained in a metal case, and expands and contracts according as the coolant temperature rises and falls. When it expands, the case pushes down the valve to open it.

If, during operation, the valve is suspected of remaining closed while it is expected to open increasingly, the cause is most likely a ruptured wax case.

In the top portion of the thermostat, an air bleed hole is provided; this hole is for venting out the gas or air, if any, that has accumulated in the coolant circuit.

Thermostat functional specifications	
Temperature at which valve begins to open	82℃(179℉)
Temperature at which valve becomes full open	95℃(203℉)

Thermostat functional specifications	
Valve lift	8mm(0.31in.)

Thermostat

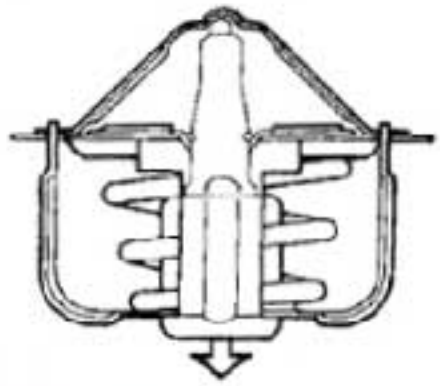


Fig. 6-8

Radiator filler cap

This cap has two built-in valves and, by these valves, allows the internal pressure of coolant circuit to rise to a certain level slightly above that of the atmosphere.

Of the two built-in valves, one is an adjusting valve and the other is a negative-pressure valve. The former opens only when the internal pressure rises by 0.9kg/cm². This means that the coolant's boiling temperature is substantially above 100℃(212℉)-if the coolant is straight water — and that, under normal running condition, no boiling occurs.

Following a shutting down of the engine, the coolant will cool off and the internal pressure will drop. If the pressure should be allowed to keep on falling, there happens the danger of coolant pipes and radiator cores becoming subjected to a large collapsing pressure; the pipes or radiator cores or any weakest point might give in. The negative-pressure valve opens in such a case to admit atmospheric pressure into the coolant circuit, thereby avoiding a build-up of negative pressure.

The cap has its face marked "0.9", which means that its pressure adjusting valve opens at 0.9km/cm².

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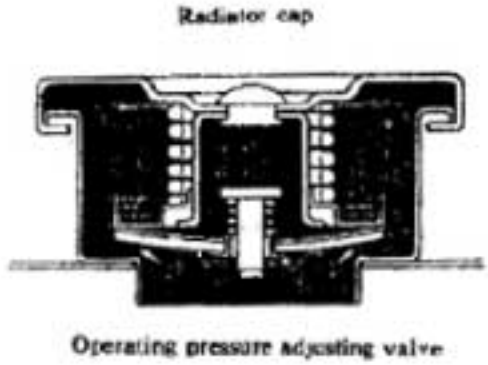


Fig. 6-9

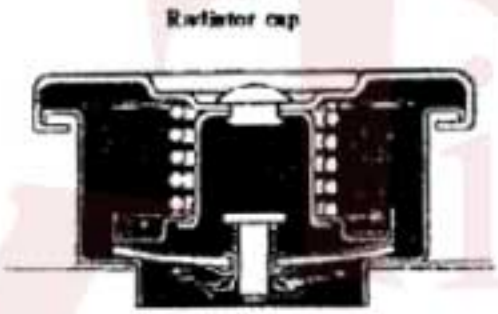


Fig. 6-10

Water pump

The pump rotor is supported by a totally sealed bearing and do not permit disassembly. For this reason, the pump must be replaced by a new one when any part of it has developed a malcondition.



Fig. 6-11

Requirements on coolant

The long-term reliability and cooling capacity of the engine cooling system depends much on the quality of cooling water used. "Hard water", if used, will foul up the cooling circuit by scale formation, for such water is usually high in silicate and mineral contents. Scales are poor heat conductors.

Use of water high in acid concentration is just as bad; such water promotes rusting. For similar reasons, river water, well water, not to mention sea water, are not fit as engine cooling water.

Tap water available from city water supply is the best available water. Distilled water is ideal but is a luxury in most cases.

For protection of the cooling circuit, it is recommended that glycol be added to the cooling water in a proportion determined by the lowest atmospheric temperature expected.

Standard SC1010, SC1010X is shipped from the factory with its cooling circuit filled with a 50% solution of glycol, this solution does not freeze down to -36℃.

Many brands of ANTI-FREEZE compounds are sold in the market. In no case, allow two or more different brands to be mixed in the cooling circuit of the engine.

"GLYCOL Coolant" — "Anti-freeze and Summer Coolant" — its effects and use

(1) Effects of glycol coolant

(a) Its freezing temperature is much lower and depends on the concentration of glycol. It is an anti-freeze coolant.

(b) It does not corrode the metal surfaces of the cooling circuit. It is an anti-corrosion coolant.

(c) It does not develop foam or bubbles. It is a foam-inhibited coolant.

(d) It stands long usage. The renewal interval is much longer.

(2) How to proportion Anti-freeze coolant to cooling water

Anti-freeze coolant is a multi-purpose anti-freeze compound. Its aqueous solution as engine coolant can be kept in service as long as two years in a single stretch, regardless of changes of season.

To prepare an anti-freeze coolant with Anti-freeze coolant, proportion this compound to

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water according to the following chart, in which the proportions are indicated for seven levels of temperature as the lowest expected levels;

ANTI-FREEZE PROPORTIONING CHART

Freezing temperature	℃	−9	−12	−16	−20	−25	−30	−36
	℉	16	10	3	−4	−13	−22	−33
Glycol concentration	%	20	25	30	35	40	45	50
Ratio of compound to cooling water	ltr.	0.90/3.60	1.13/3.37	1.35/3.15	1.57/2.93	1.80/2.70	2.05/2.45	2.25/2.25
	US pt.	1.90/7.60	2.38/7.12	2.85/6.65	3.33/6.17	3.80/5.70	4.28/5.22	4.75/4.75
	Imp. pt.	1.58/6.32	1.98/5.92	2.37/5.53	2.77/5.13	3.16/4.74	3.66/4.34	3.95/3.95

NOTE;
Remember, the radiator capacity is 4.5 litres which includes the reservoir tank capacity of 0.6 litre (1.3lb).

Water temperature gauge

This gauge constitutes a system of its own, with an indicator mounted in the instrument panel, an engine unit or sensor of thermistor type and a regulator for passing a constant current. These three are connected as shown in the diagram below;

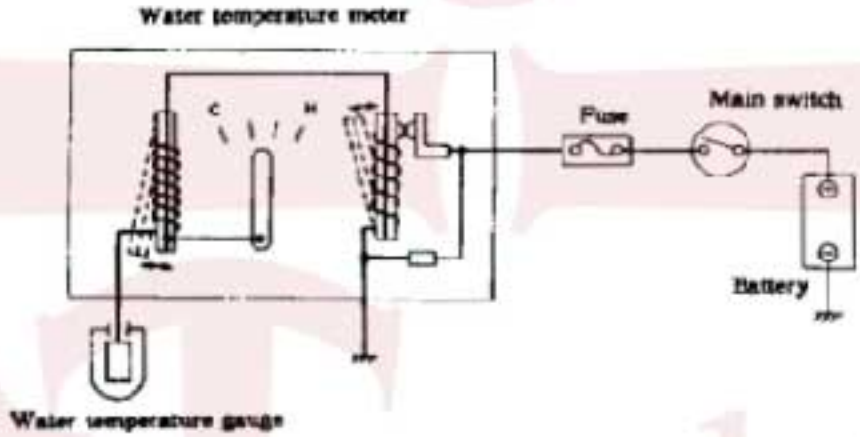


Fig. 6-13

The indicator is of bimetal type; its bimetal element is wrapped with a heater coil and becomes heated by the current flowing in the coil. By deflecting, the element actuates the indicating hand, making the hand move along the temperature scale.

The magnitude of the current is determined by the state of the thermistor in the engine unit. This unit is installed on the intake manifold. Speaking generally, a thermistor is a semiconductor resistive element whose ohmic resistance decreases as its temperature rises; its resistance has a negative temperature coefficient. When the coolant temperature rises, the thermistor offers a decreasing resistance, so that the current increases, thereby deflecting the indicating hand wider.

The regulator is a means of maintaining a constant current in the circuit for each ohmic resistance state of the thermistor, and does so function under the varying voltage condition of the battery.

Cooling System Services

Thermostat

If the thermostat valve is suspected of malfunctioning, check first the possibility of some foreign

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matters being stuck on the valve seat to prevent the valve from seating tight. Next, check the thermostatic movement of the wax element in the following manner:

Heat water in a pan by placing the pan on a stove, as shown in Fig. 6-14. Grip the end of a thread or small string by pinching it in the valve and suspend the thermostat unit by holding the other end of the thread or string. Immerse it in the water, holding it about 20 mm (0.78in) above the bottom, and read the water temperature on the column thermometer.

If the suspended unit falls to the bottom just when the temperature rises to 82℃ (179℉) or thereabout (which is the temperature at which the valve should begin to open), the thermostat unit may be deemed to be in sound condition.

If the valve begins to open at a temperature substantially below or above, the thermostat unit should be replaced by a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.



Fig. 6-14

Make sure that the air bleed hole of the thermostat is clear, no clogged.



Fig. 6-15

Fan belt

This belt drives both alternator and water pump. Check the belt for tension. The belt is in proper tension when a thumb pressure (10kg) applied to the middle point of its span deflects it about 10-15mm (0.4-0.6in.). Inspect the belt for signs of deterioration and replace it as necessary.

Belt tension specification	10-15mm (0.4-0.6in.) as deflection

NOTE:
When replacing the belt with a new one, adjust belt tension to 8-10mm (0.3-0.4 in.)

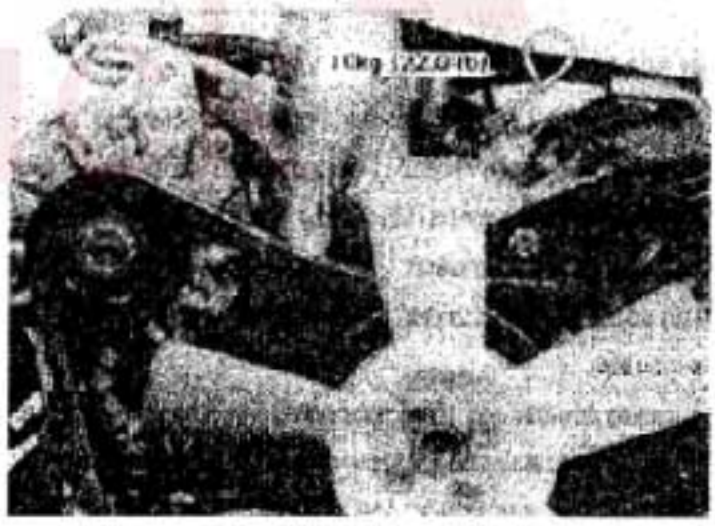


Fig. 6-16

To adjust the belt for proper tension, loosen the 3 bolts securing the generator in place, and displace it to slacken or tighten the belt.

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A loose belt, or a belt tending to break off or otherwise defective, is often the cause of engine overheating. Because of the importance of this belt, it is strongly recommended that the belt be replaced at regular intervals even when the belt looks satisfactory in appearance.

Belt replacement interval	Two years (recommended)



Fig. 6-17

Radiator

If the water side of the radiator is found excessively rusted or covered with scales, clean it by flushing with the radiator cleaner compound. This flushing should be carried out at regular intervals for scale or rust formation advances with time even where a recommended type of coolant is used. Periodical flushing will prove more economical. Excessive rust or scale will lower the cooling efficiency

Inspect the radiator cores and straighten the flattened or bent fins, if any. Clean the cores, removing road grimes and trashes.

Flattened or bent fins obstruct the flow of air through the core to impede heat dissipation.

Radiator flushing interval	Two years (recommended)

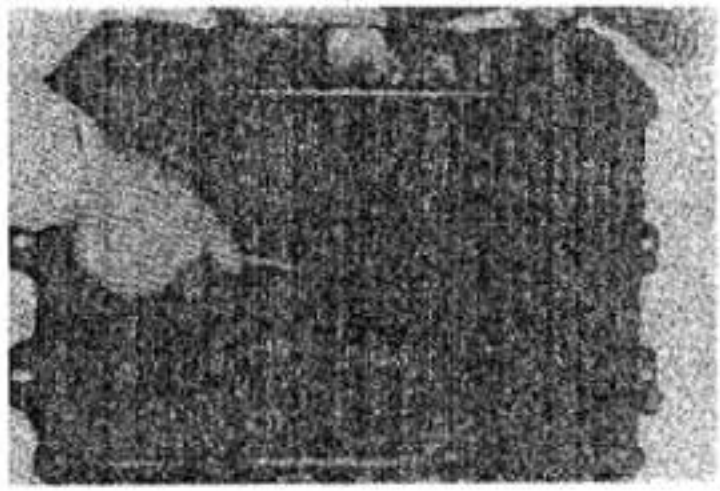


Fig. 6-18

Coolant level

Cooling water in service decreases its volume gradually on account of progressive loss due to water evaporation. Check to be sure that the water surface is up to anywhere between FULL and LOW marks on the reservoir tank. The user should be reminded of the need to daily check the water level.



Fig. 6-19

Water hoses

Inspect each water hose for evidence of cracking or breakage, and be sure that its connection is tight. A defective hose or a hose showing signs of malcondition must be replaced. Tighten the hose connections as necessary.

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Fig. 6-21

Cooling fan

The cooling fan takes its position with two engraved cylinders facing outward (toward front side). Be sure to mount the fan as shown in Fig. 6-22.

Fig. 6-20

Important Reinstalling Steps

Filling up the cooling system

Park the machine on a flat level floor, and fill in until you see the coolant come up to the well part of the radiator filler. Then, run the engine two or three minutes to recirculate the coolant. This recirculation will drive out air, if any, trapped inside, and will lower the coolant surface at the filler. Add coolant until its surface shows up again in the filler, and fill up the reservoir tank, raising the surface to FULL mark.

NOTE:
Check to ensure that there is a clearance of 10mm (0. 4in.) between the end of the rubber hose in the reservoir tank and the bottom of the tank.

Fig. 6-22

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SECTION 6E

HEATER

CONTENT

Description.....6E-2

Electrical Circuit.....6E-3

Heater Services.....6E-4

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Description

The optional heater is of hot water type. Its operation is quiet. It takes engine heat through the medium of water and sends warm air into the cabin by means of a blower.

Since the blower drive is electrical, independent of engine speed, the heater is just as effective even when the engine is running slowly. In summer, the blower doubles as a fan for room ventilation, with the heater valve kept closed.

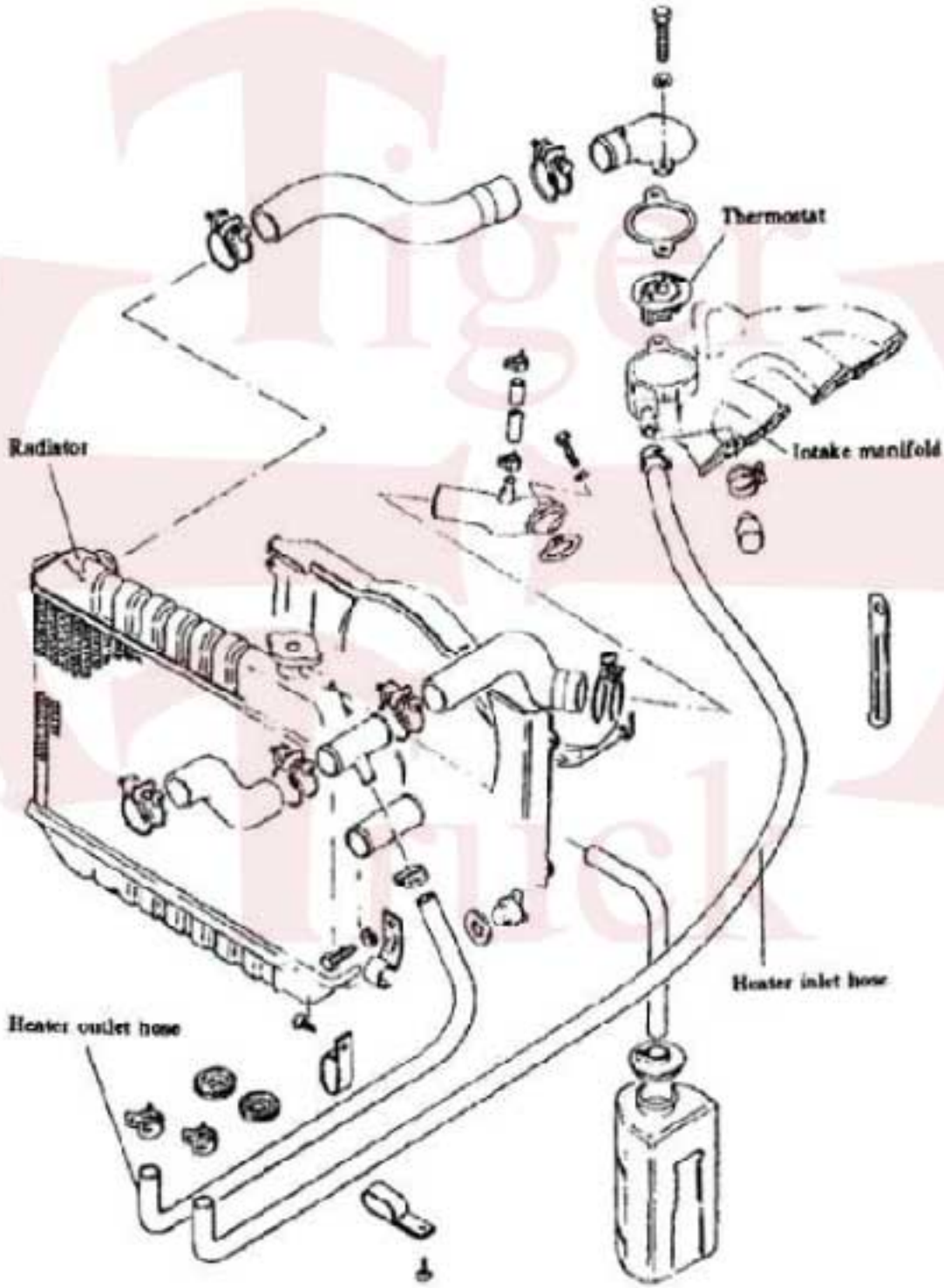


Fig. 7-1

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Electrical Circuit

The circuit diagram shown in Fig. 7-2 illustrates how the blower motor is controlled. With the main switch closed, pulling the button of the fan switch to the first position passes a current through the motor. This current is small because the circuit has a resistor (indicated as "fan resistance" in the diagram), and the blower runs slow under this condition.

Pulling the switch button all the way (to the second position) throws the full battery voltage across the blower motor. A large current flows, and the blower runs with full speed.

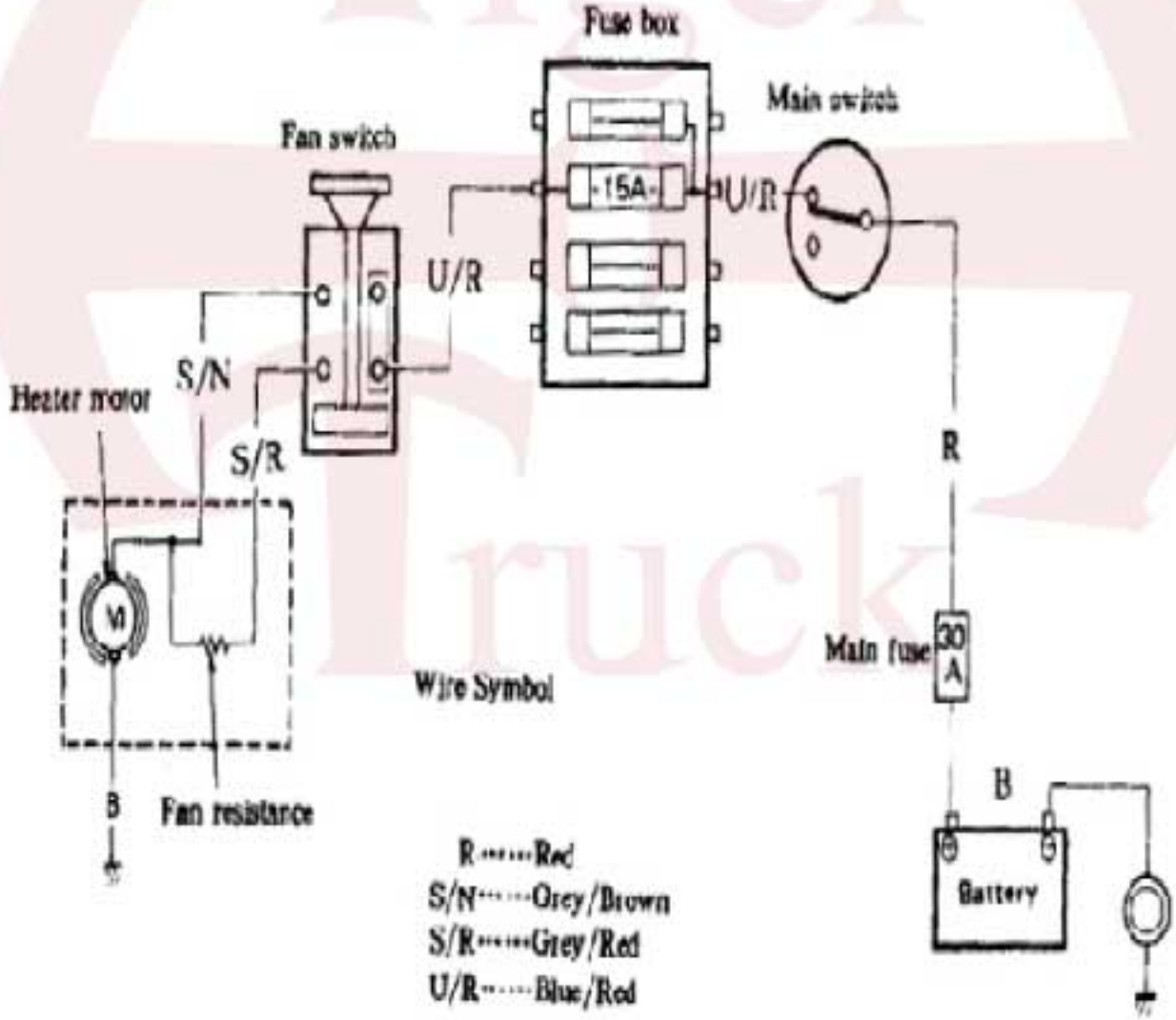


Fig. 7-2

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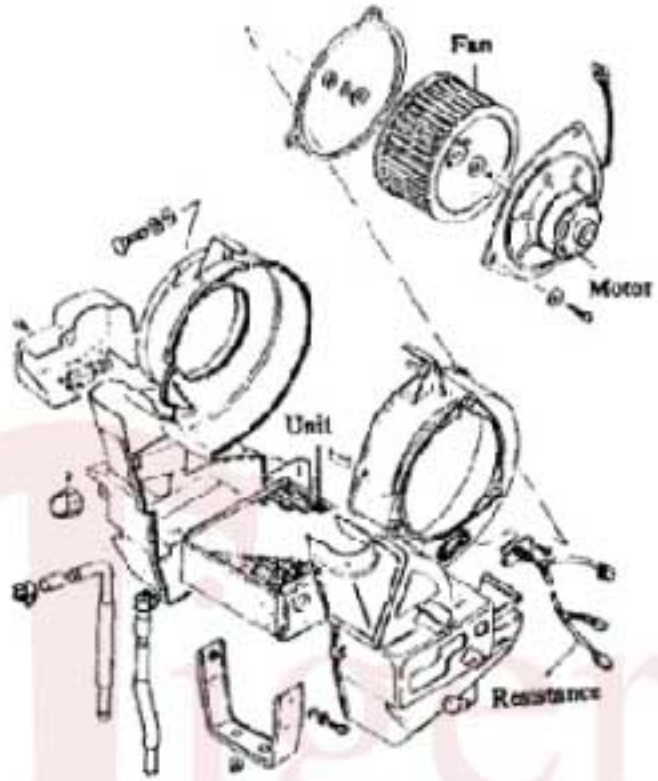


Fig. 7-2-1

Heater Services

Fan resistor

This resistor is in the heater case. Inspect it for signs of cracking or breakage and replace it as necessary. If the blower motor will not run or when you replace the existing resistor, check to be sure the resistor has an ohmic resistance of 4. 3 ohms. Use a circuit tester for this purpose.

Fan resistor specification	4. 3 ohms



Fig. 7-3

Fan switch

Using a circuit tester, check this switch for circuit continuity:

(1)Switch button in first position
Continuity should be verified betweenS/R and U/R.

(2)Switch button in second position
Continuity should be verified between S/N and U/R.

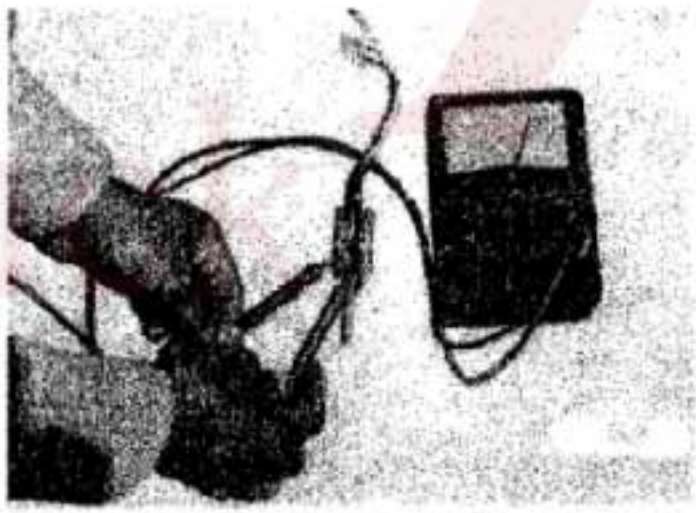


Fig. 7-4

Heater valve

This valve is installed in the heater box. When warm air is wanted in the room, open the valve During the season not requiring the use of the heater, keep the valve closed.

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The rough standard for opening and closing of the heater valve is about 20℃ (68℉)of the outside temperature.

NOTE;

Make sure not to leave the heater hose removed even when the heater is not used. This is important to prevent rust.

Rule of thumb on heater valve		
When outside temperature is;	Above 20℃ (68℉)	Keep the valve tight(closed)
	Below 20℃ (68℉)	Keep the valve loose(opened)



Fig. 7-5

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SECTION 6F

IGNITION SYSTEM

CONTENT

Description.....6F-2

Description of Components.....6F-3

Maintenance Services.....6F-5

Important Reminders for Reassembly and installation..... 6F-8

Ignition Timing.....6F-9

Replacement of Distributor Drive Gear..... 6F-11

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Description

The principal components of the ignition system are, as shown in the circuit diagram of Fig. 8-1, the spark plugs, distributor, contact-breaker, ignition coil and, as the source of igniting energy, the battery. Note that the ignition coil has two windings, primary and secondary.

Current from the battery flows through the primary winding and then the contact-breaker; the contact point in the breaker opens and closes to interrupt this current intermittently.

Each time the primary current is interrupted, a very high voltage develops in secondary winding. It is this intermittent high voltage that the distributor passes sequentially to the four spark plugs to fly a spark across the gap in each, one plug a time.

The distributor is sort of rotary switch, whose rotor connects the four plugs, one at a time, to secondary winding of the ignition coil through the wires called "high-tension" cords. Note that there are one high-tension cord, from secondary winding to the center of the distributor cap, and four more high-tension cords between the spark plugs and the four terminals on the cap.

The resistor, connected in series to primary winding, serves to reduce the inductance of primary winding so that the high voltage generation in secondary winding will be stabilized.

NOTE:
Whereabouts of terminal connections are clearly indicated in the diagram below. When inspecting the electrical wiring, refer to this diagram and check to be sure that each connection is tight. Examine the cords for torn insulation and for evidence of grounding.

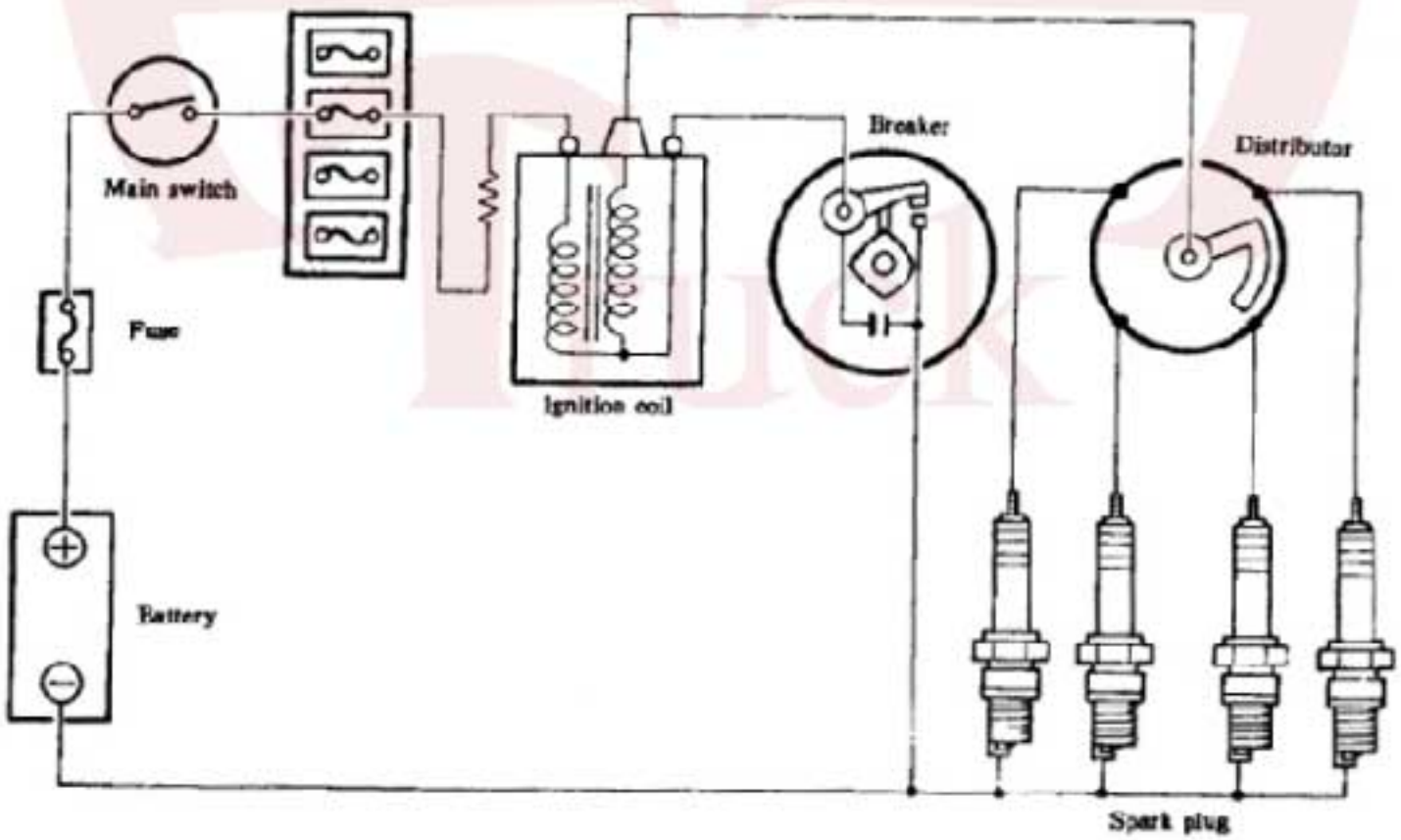


Fig. 8-1

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Description of Components

Distributor

Fig. 8-2 shows the distributor unit in section to expose its internal mechanisms to easy viewing. The shaft is driven from engine crankshaft through worm gearing, and rotates once for every two revolutions of the crankshaft.

Inside the cap are four side electrodes (for spark plugs) and one center electrode (to which the secondary side of the ignition coil is connected). The arm of the rotor, mounted on the shaft, touches the side electrodes one by one "distribute" the high voltage to the spark plugs.

Immediately below the distributing mechanism is the contact-breaker, whose cam, mounted on the shaft, actuates the breaker arm to make and break the primary current circuit for the purpose already mentioned. The condenser (capacitor) secured to the distributor body is for absorbing the current surge, which would otherwise result in a sparking across the contact point gap. The surge occurs every time the contact point is opened, and is due to, so to say, the inertia of electric current. The object served by the condenser is obvious; it is to prevent the point faces from getting burnt by sparking.

The ignition is advanced automatically by centrifugal action and by the difference between inlet manifold vacuum and atmospheric pressure. How the advancer operates will be described in reference to Figs. 8-4, 8-5, 8-6 and 8-7.

Distributor data	
Cam dwell angle	52°
Condenser capacitance	0.25 microfarad
Ignition timing	10° B. T. D. C. /900r/min (rpm)
Number of gear teeth	13
Direction of rotation	Clockwise, as viewed from top

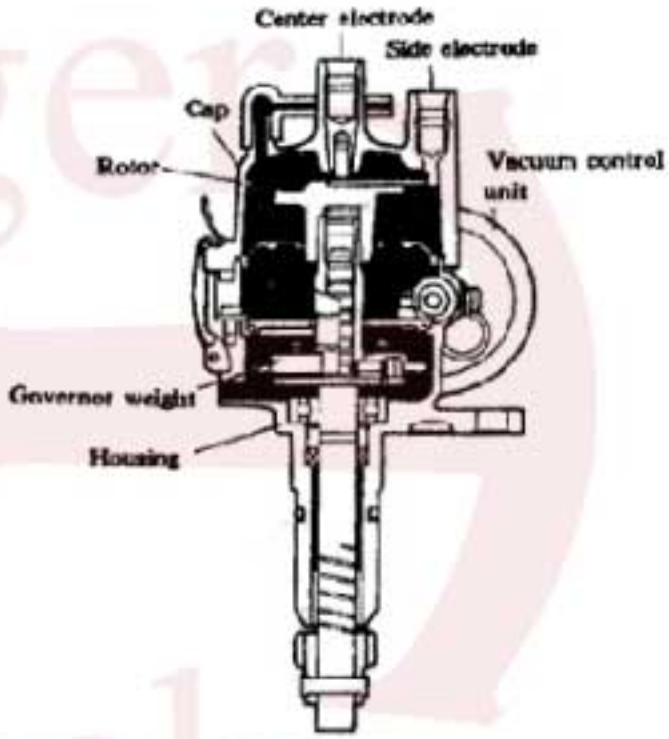


Fig. 8-2

Ignition coil

The ignition coil is a sort of minature transformer and, as such, has an iron core around which two coils are wound — primary and secondary windings mentioned above. The two are so close to each other that a sudden change in the magnetic flux produced by "primary current" flowing in primary winding (in a less number of coil turns) induces a very large electromotive force (voltage) in secondary winding (in a greater number of coil turns). These live parts are housed in a tight, insulator case topped by the cap

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mentioned above. Note that the cap has three terminals, one high-tension terminal and two low-tension terminals.

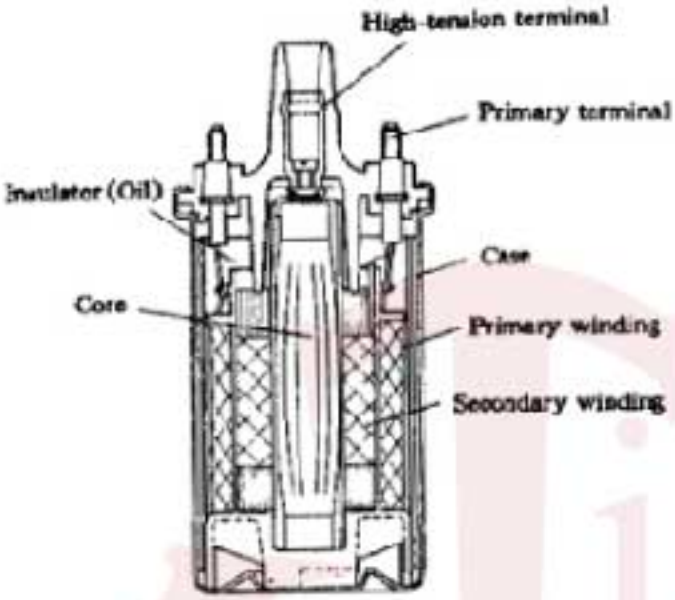


Fig. 3-3

Timing advancer

The distributor shaft, from its driven-gear end to the rotor-carrying end, is not a single solid piece; actually this shaft is in two pieces connected together through the timing advancer. The advancer is essentially a flyweight mechanism. Timing advancing action is accomplished by twisting the top shaft piece relative to the bottom one in the direction of shaft rotation.

The contact-breaker cam, mentioned above, for actuating the breaker arm is mounted on the top piece. The twisting movement is produced by the speed-dependent radial (or spreading) movements of the two flyweights.

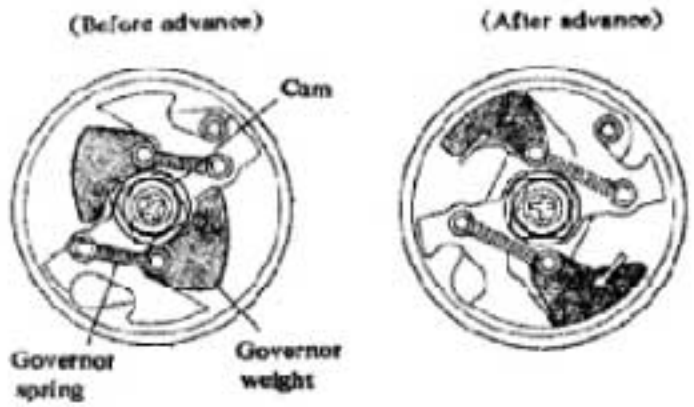
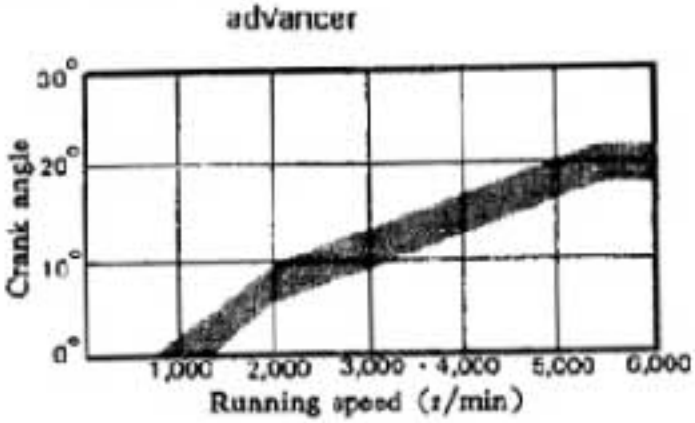


Fig. 3-4

Advancer feature



Vacuum advancer

When the engine is in lightly loaded condition, the amount of fuel being supplied to it is not much and, needless to say, throttle valve is open but a little, so that the vacuum in the inlet manifold side of the carburetor is high.

For fuel economy, it is desirable to advance the ignition when the engine is burning a small amount of fuel. The vacuum advancer utilizes the high vacuum to produce a force for actuating the advancer rod in order to angularly displace the breaker plate.

NOTE:
The vacuum advancer starts working to produce the advancing force when throttle valve is 4° to 5° open as measured from its fully closed position.

The diaphragm is spring-loaded. With a high vacuum, the differential pressure acting on the diaphragm causes to overcome the spring force and move in the direction for pulling the advancer rod. The rod so pulled turns the breaker plate counterclockwise (counter to the direction of distributor shaft rotation) to advance the ignition.

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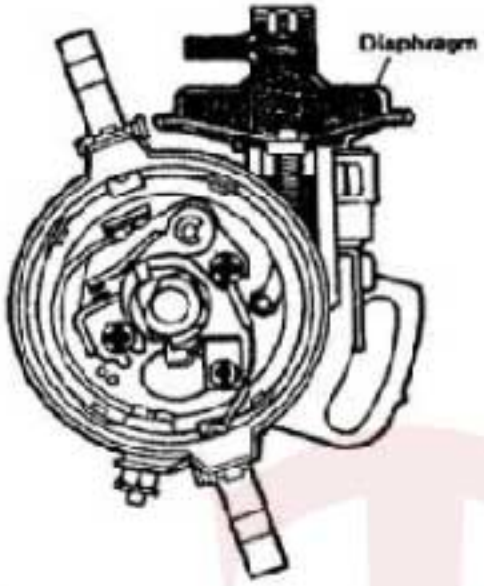
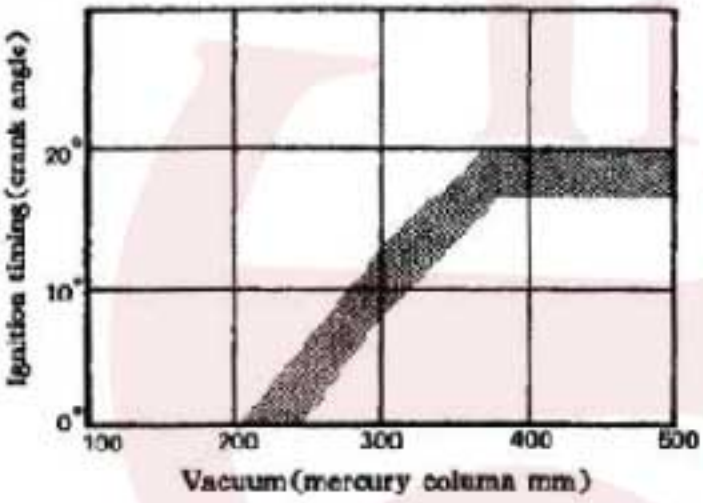


Fig. 8-6



Spark plugs

Each new machine shipped from the factory is fitted with standard plugs.

Brand	Standard type
AC Delco	R45XLS

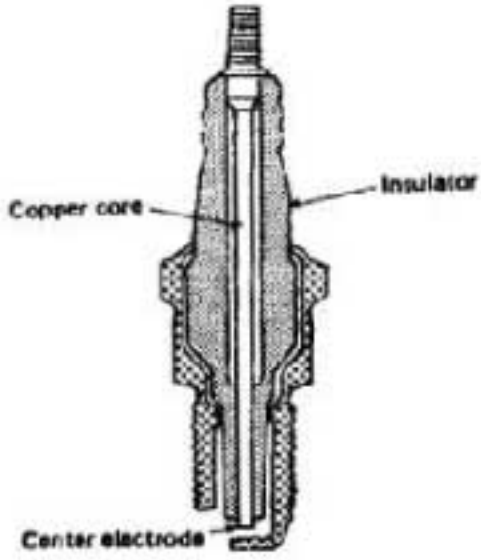


Fig. 8-8

Maintenance Services

Distributor cap

Leakage of high-tension energy for ignition shows up as misfiring in the engine. It occurs at any part of the high-tension line where insulation has failed or in a dirty distributor cap, that is, an internally dirty cap.

A wider spark gap in the plug, a conditin often found in poorly cared spark plugs, promotes the tendency of high-tension energy to find a short-cut to ground.

Cleanliness is very important for the distributor cap. With a clean dry cloth, wipe off dust or grime, if any, and inspect for any damaged (scarred, scratched or cracked) part or any part evidencing high-tension leakage inside the cap. Be sure to replace such parts.

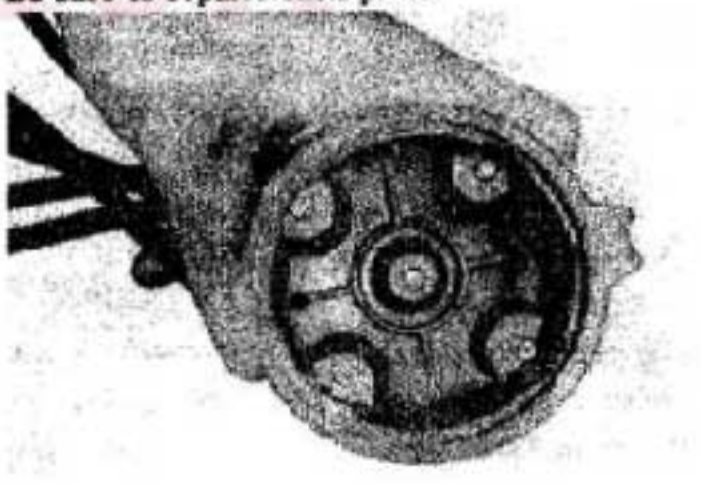


Fig. 8-9

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Distributor driven gear

Inspect the gear teeth for wear, and see if the backlash is normal or not. Excessive backlash can be told by turning the shaft back and forth, with its driven gear in mesh with driving gear. Maladjusted ignition timing is often due to excessive tooth wear in this gearing and, in such a case, can be corrected by replacing the driven gear.



Fig. 8-10

Spark plugs

The spark gap specification is 0. 7 ~ 0. 8mm (0. 027 ~ 0. 031in). Be sure to use a thickness gauge in checking the gap. A wide gap is just as bad as a narrow gap. The 0. 7 ~ 0. 8mm (0. 027 ~ 0. 031in) gap will produce the right kind of sparks needed by the air-fuel mixture in this engine.

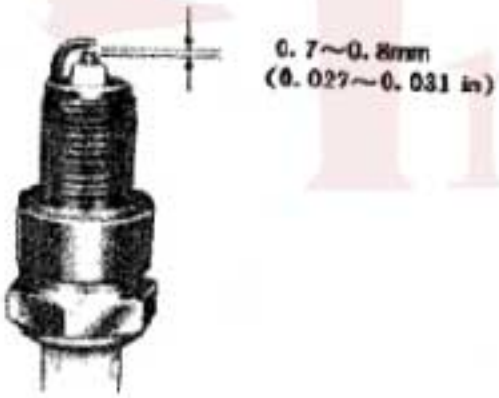


Fig. 8-11

Contact point faces

In the contact breaker, push the breaker arm with your fingertip just a little so that you can see the point faces. If the faces are oily, clean; if roughened, smoothen by grinding. In most cases, the point faces can be reconditioned by grinding with a file or oil stone. Points worn beyond repair must be replaced.

The illustration, below, tells what must be done in each case but the last one showing a pair of properly aligned, smooth faces. Wear or burning is hard to occur in the contact point whose point faces are in the condition labeled "good".

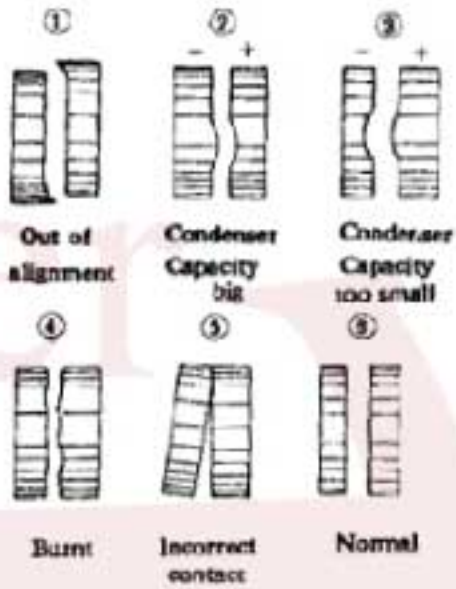


Fig. 8-12

Checking the primary circuit for fault

If the engine misfires or does not fire up at all where its spark plugs have just been checked to be in good condition, the first step of locating the cause is to check the primary circuit (between distributor and ground) for continuity by using a circuit tester as shown. Since the contact point is open, the tester should indicate discontinuity (infinitely large resistance); if continuity is noted, it means that there is a fault somewhere along the primary circuit, which could be in condenser or elsewhere.

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Fig. 8-13 ①*Open*

Condenser

Check the condenser for capacitance by using the electro-tester. You may do so with the condenser in place or removed. When checking it in place, that is ,as mounted on the distributor, be sure to have the contact point opened. A condenser not meeting the following capacitance specification must be replaced.

Condenser capacitance specification	0.25 microfarad

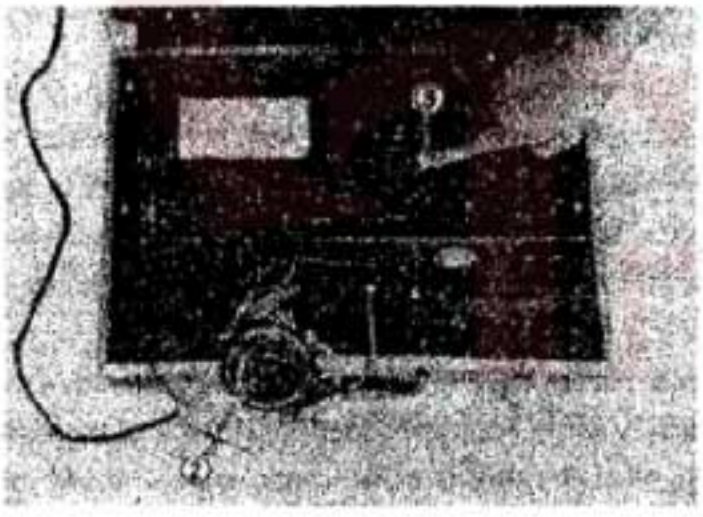


Fig. 8-14 ②*Open* ③*Push*

Ignition coil

(1)Sparking performance test

The purpose of this test is to see if the ignition coil is capable of producing high voltage surges forceful enough to fly good sparks at the ignition coils at all times, particularly when its temperature has risen to the normal operating level. Use of the electro tester is assumed for this test. With the ignition coil connected to the tester, as shown, let the spark fly across the three-needle gap. Continue this testing for about three minutes so that the coil will get warm to simulate the normal operating condition. The coil may be deemed to be in good condition if the sparking is stable, without any misses. In the use of the electro tester for this purpose, do not enlarge the three-needle gap wider than 7mm(0.27in.)

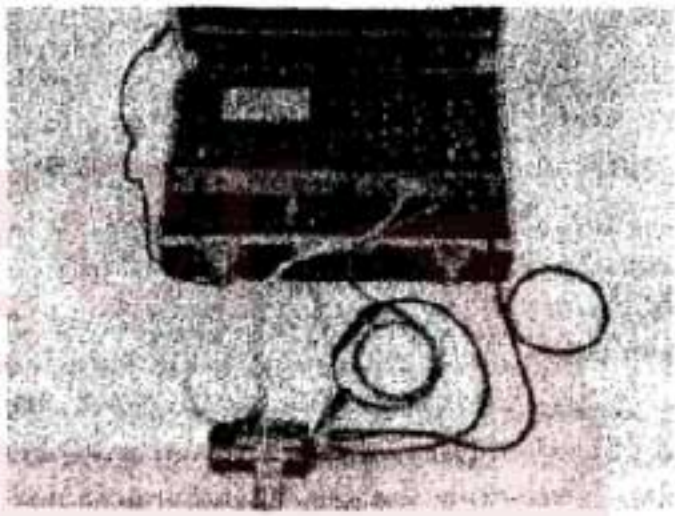


Fig. 8-15

(2)Resistance measurement

Measure the ohmic resistances of primary and secondary windings in the ignition coil. If the readings are in agreement with the prescribed values, indicated below, the coil may be judged to be in good condition. Take readings when the coil is hot, about 80℃(176℉); this is because we are interested in the performance of the coil at the normal operating temperature, not of a cold coil.

Primary winding resistance	About 3ohms(inclusive of the 1.5ohm resistor)
Secondary winding resistance	About 8kilohms

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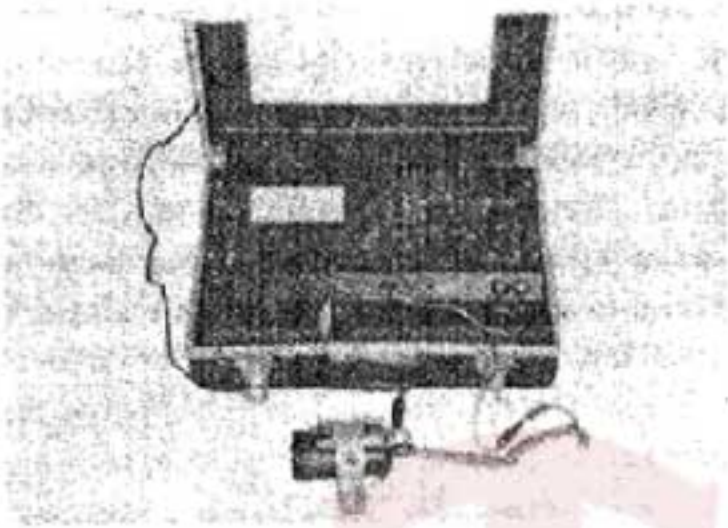


Fig. 8-16

Important Reminders for Reassembly and Installation

Distributor

When re-installing the distributor, be sure to insert it into the distributor gear case in the following sequence:

1) Turn over crankshaft in normal direction to index the (10° B. T. D. C.) timing mark ① to the timing match mark ②. The 10° mark is the one provided on flywheel. See Fig. 8-17. Normal direction of crankshaft is clockwise as viewed from front side.

CAUTION:
After aligning marks ① and ②, remove cylinder head cover to visually confirm that the rocker arms are not riding on the camshaft cams at No. 1 cylinder. If the arms are found to be riding on the cams, turn over crankshaft 360° to align the two marks anew.

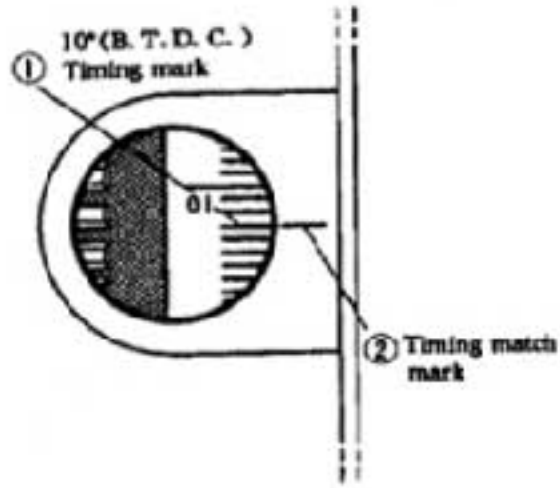


Fig. 8-17

2) Remove the distributor cap. Turn the rotor to make the center ③ of rotor flush with mark ④ embossed on the distributor housing, as shown in Fig. 8-18.



Fig. 8-18

3) Insert the distributor into the distributor gear case, indexing the embossed mark ⑤ of distributor flange to center ⑥ of the distributor mounting screw hole.

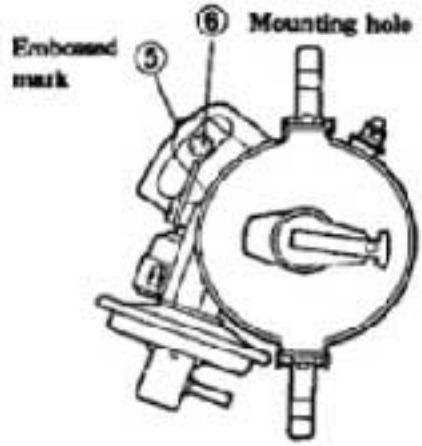
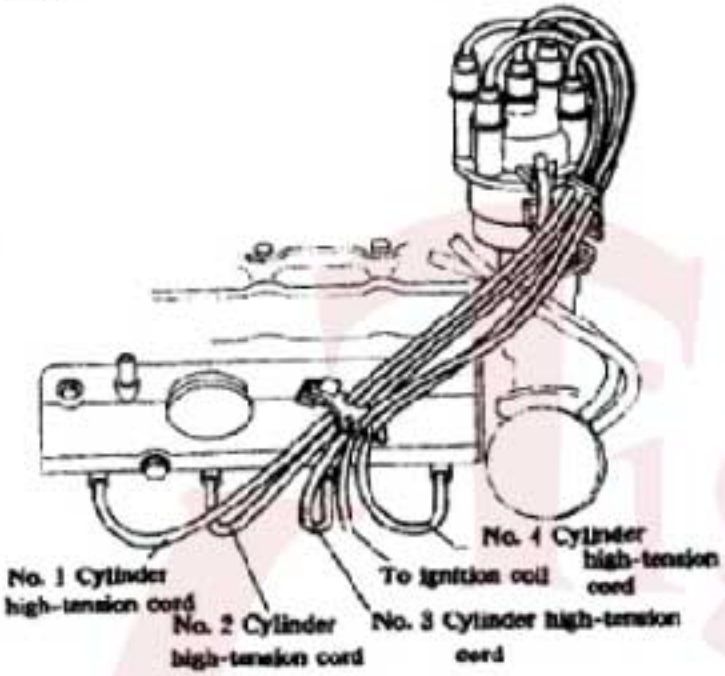


Fig. 8-18-1

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High-tension cords

Install the four high-tension cords by referring to Fig. *8-19*, making sure to identify the four cap terminals of the distributor for the four cylinders.



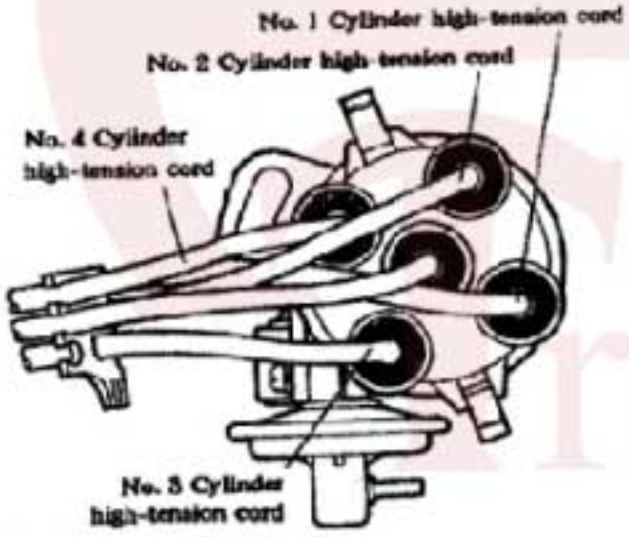


Fig. 8-19

Ignition Timing

Specifications

Ignition timing	10° B. T. D. C. at 900r/min (rpm)
Ignition order	1→3→4→2
Breaker point gap③	0.4~0.5mm (0.016~0.019in.)

Checking methods

Check to be sure that the point gap is within the specified range, from 0.40 to 0.50mm (0.016 ~0.019in.) and then check the ignition timing on No. 1 cylinder. To adjust the point gap, loosen screws ① and move the stationary point with plain screwdriver inserted into slit ②.

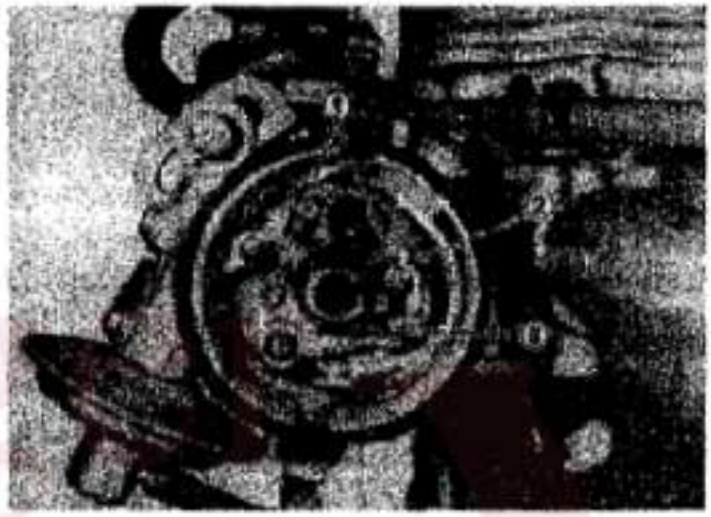


Fig. 8-20

(1) Checking and adjusting with timing light

CHECKING:

Tie the light to No. 1 high-tension cord. Start up the engine and run it at 900r/min. Under this condition, direct the light to the flywheel. If the 10° timing mark ④ appears aligned to the timing match mark ⑤, the ignition is properly timed. See Fig. 8-22.



Fig. 8-21

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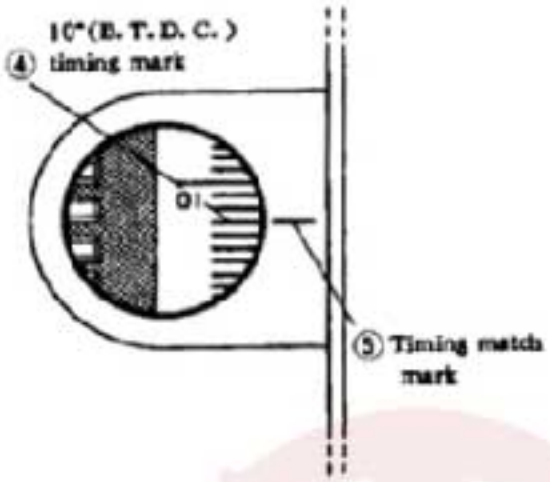


Fig. 8-22

ADJUSTING:

If the mark ④ is off the mark ⑤, adjust the timing as follows:

1) Check to be sure that breaker point gap is between 0.4 and 0.5mm (0.016 and 0.019in.).

2) Loosen the distributor clamp bolt and turn the distributor housing in place to advance or retard the timing.

NOTE:

- Turning the housing counterclockwise advances the timing, and vice versa.
- After repositioning the housing, check the timing with the timing light and, as necessary, repeat step 2).

(2) Checking and adjustment with the timing tester

The timing tester has a built-in buzzer. Connect one of its leads to the primary-circuit terminal of the distributor and the other lead to the distributor body. Slowly turn the crankshaft by rotating the cooling fan clockwise while watching the timing marks. (have the ignition switch turned off.)

The buzzer should start sounding off just when the marks come into register, indicatiog that the engine is set for the specified timing.

CAUTION:

With timing marks ⑥ ⑦ lined up as shown in Fig. 8-23, remove the cylinder head cover and check to be sure that No. 1 cylinder rocker arms are not riding on cam lobes. If the arms are up, turn over crankshaft by one rotation (360°) clockwise (as viewed from front side). This turning should cause the buzzer to sound off just when the marks come into alignment.

NOTE:

The two tester leads are given polarity signs, (+) to one and (−) to the other lead; connect the red lead to (+) cord, and the black lead to (−) cord, of the distributor.

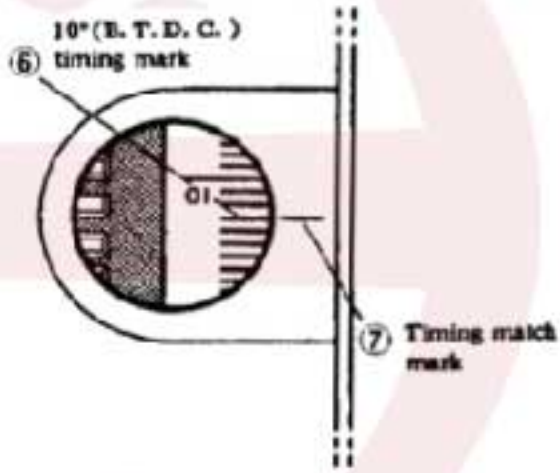


Fig. 8-23

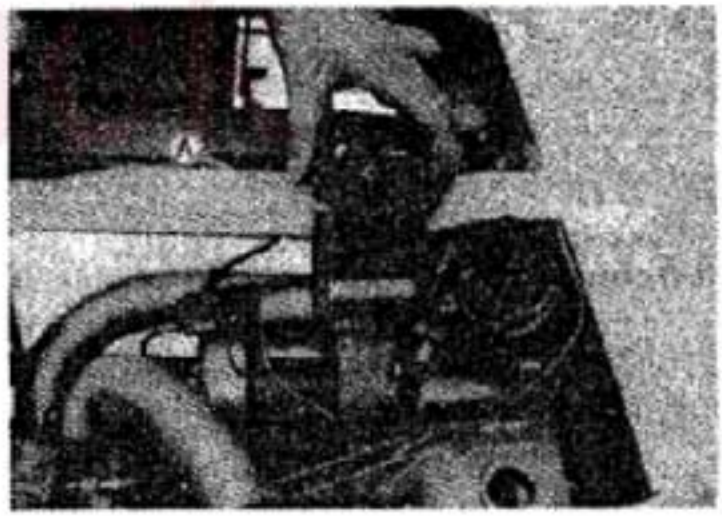


Fig. 8-24 Timing tester

ADJUSTING:

Upon noting that the ignition is not timed to the

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specification, proceed as follows:

1) Make sure that the breaker point gap is set right, that is, between 0. 4 and 0. 5mm (0. 016-0. 019in.).

2) Bring timing mark ⑥ into alignment with mark ⑦, as shown in Fig. 8-23. Mark ⑧ represents the 10° crank angle.

3) Loosen the distributor clamp bolt, and slowly rotate the distributor housing until the buzzer starts sounding off. Hold the distributor right there and tighten the clamp bolt.

NOTES:

1. **Turning the housing counterclockwise advances the timing and vice versa.**
2. **After tightening the clamp bolt, check the timing once again.**

Checking the timing advancer action

①CENTRIFUGAL ADVANCE:

Hook up the timing light, disconnect the vacuum hose from the vacuum advancer. Check that the ignition advancer increase up its speed as shown in Fig. 8-4. If not, that means something is wrong with the advancer. The controller return spring cracked or weekened or load bonded results in this problem.

Note:

When ignition timing is in conformity with the readings in Fig 8- 4, add 10° to the readings (in static ignition).

②VACUUM ADVANCE:

Connect the vacumm hose again, run the engine without load. Check the flywheel timing mark with the timing light.

a. When the engine runs at 3, 500r/m, read out the timing value according to the crank angle.

b. When the engine runs at the speed stated above, remove the vacuum hose from the carburetor, read out another reading. The difference between the first reading and the second one is the advance angle.

Note:

If the first reading is mostly the same as the second one, it means the vacuum advance is wrong.

Note:

Before checking the vacuum advance, be sure no leakage, crack, and damage of the vacuum hose.

Repalcement of Distributor Drive Gear

Replacing a worn-down driven gear (a part of the distributor assembly) is not enough. Inspect the drive gear, too, and replace it if it is badly worn down. The drive gear can be removed from the camshaft.

Worn gears in the distributor drive are likely to disturb the ignition timing and must be replaced.

When pressing the replacement drive gear onto camshaft, be sure to position the gear angularly as shown in Fig. 8-25. Note that the tooth root is radially centered on the center line through the keyway provided in camshaft.

NOTES:

1. **Before removing the drive gear from the camshaft, scribe a match mark on this shaft and, when mounting the replacement drive gear, refer to this mark.**
2. **There is no need to discriminate between the two end faces of the drive gear; the gear may be fitted with either end held foremost.**

CAUTION:

Distributor gear case

Where the distributor gear case has been removed in engine disassembly or at any other occasion, be sure to fill up the case with 60cc (2. 03/2. 11 US/Imp oz) of engine oil after re-installing the case. Never start up the engine with the gear case empty of oil.

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Front side view

Fig. 8-25

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SECTION 6G

STARTER MOTOR

CONTENT

Description.....6G-2

Specifications.....6G-3

Cranking Action.....6G-3

Removal..... 6G-5

Disassembly.....6G-5

Maintenance Services..... 6G-6

Important Reminders for Starter Motor Reassembly.....6G-9

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Description

A shift-lever type starter motor is used for cranking the engine. The motor is mounted on the crank case, with its drive pinion meshed with the ring gear of the flywheel. In the following illustration, note that the whole motor assembly inclusive of the magnetic switch and lever mechanism is enclosed.

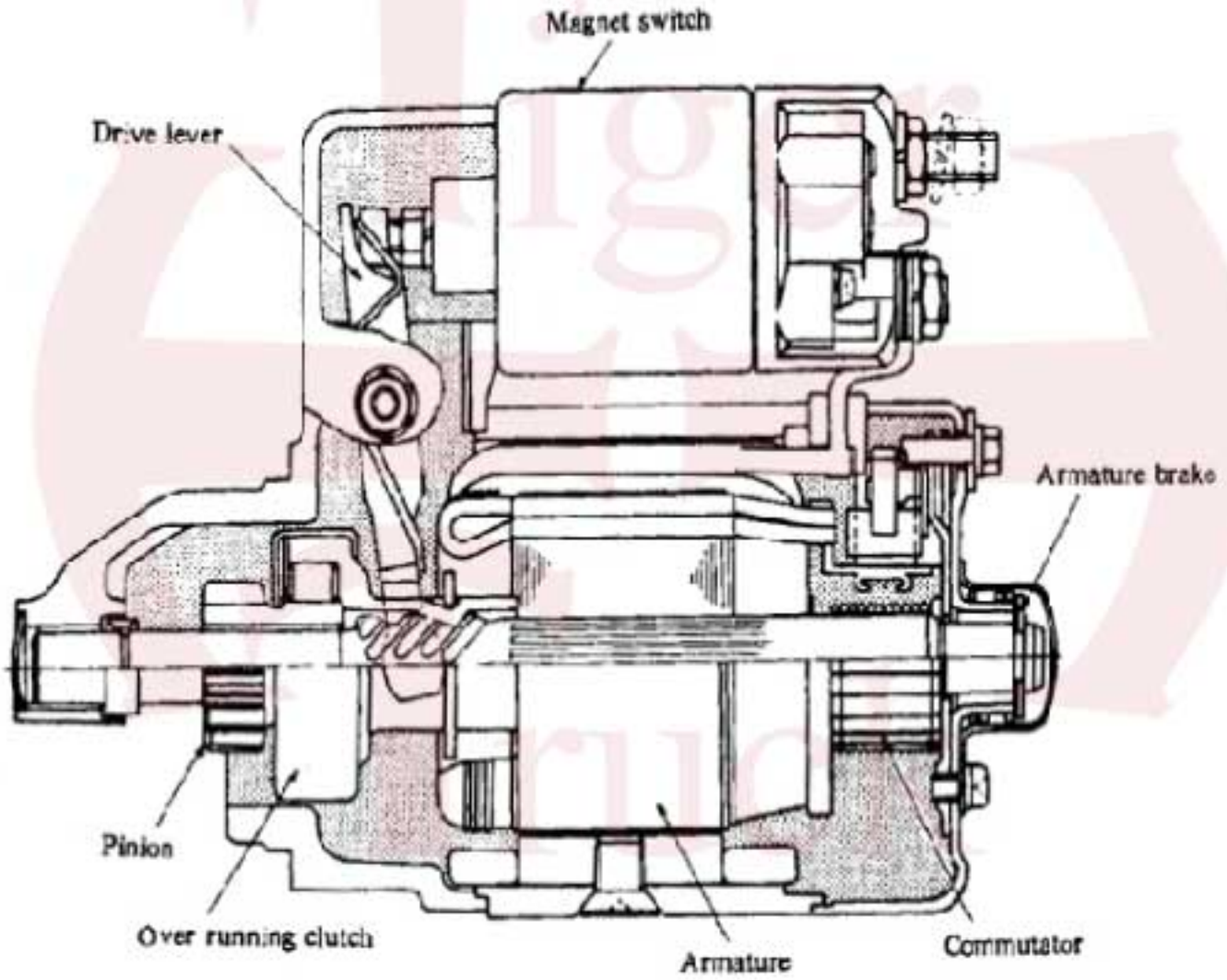


Fig. 3-1

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Specifications

Voltage	12volts
Output	0.8kw
Rating	30seconds
Direction of rotation	Counterclockwise as viewed from pinion side.
Brush length	19mm(0.75in.)
Number of pinion teeth	8
No-load characteristic	90A maximum at 11 volts, 5,000rpm minimum
Load characteristic	270A maximum at 9.5 volts and 0.7 kg-m torque, 1,200 rpm minimum
Locked rotor current	600A maximum at 7.7volts, 1.5kg-m minimum
Magnetic switch operating voltage	8volts maximum

Cranking Action

Starting up the motor

Turning on the starting switch results in a small current flowing through the holding coil and another through the pull-in coil, both in the magnetic switch. The former current flows direct into ground, but the latter flows through motor armature and field. In other words, motor begins to run. In the magnetic switch, the two coils energized—pull-in coil and holding coil—develop a combined magnetic pull, by which the moving core is pulled against the force of the spring and moves toward the right (in the illustration). At this time, the motor armature is running but slowly because of the small initial current. As the moving core is forced toward the right, its left end turns the shift lever around its pivot, so that the bottom end of the lever pushes the clutch toward the left. Since the clutch is splined to the motor shaft and because the motor shaft is rotating, the clutch advances toward the left as assisted by the helical splines.

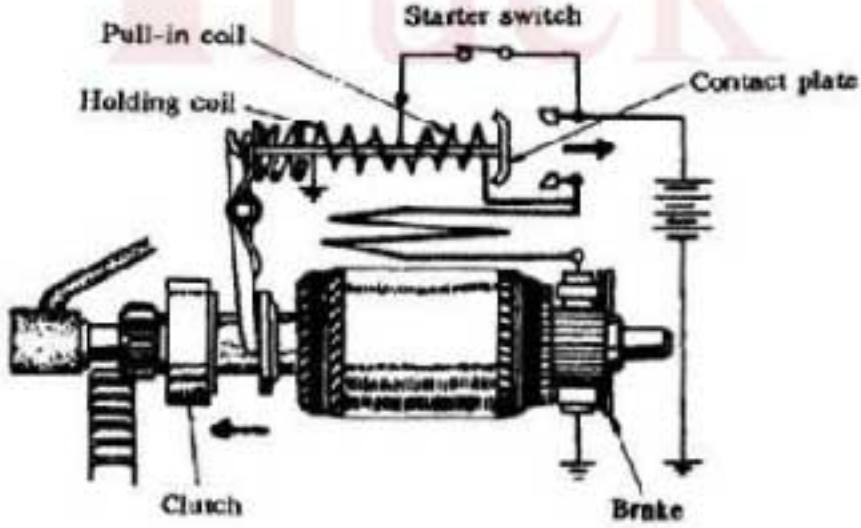


Fig. 9-2

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Pinion meshing with the ring gear

The pinion may mesh into the ring gear smoothly or may bounce on the ring gear , depending on the relative positions of their teeth. In the latter event, the springs mounted on the clutch absorb the shock and, since the pinion is rotating and being pushed, its teeth will eventually mesh into those of the ring gear. In either case, the shift lever is allowed to turn fully and permit the moving core to be kept pulled all the way toward the right. When this happens, the main contactor of the magnetic switch closes to connect the starter motor direct to the battery. Consequently, a very large current—load current—flows through the motor to develop a normal cranking torque for driving the engine crankshaft through the drive pinion and ring gear.

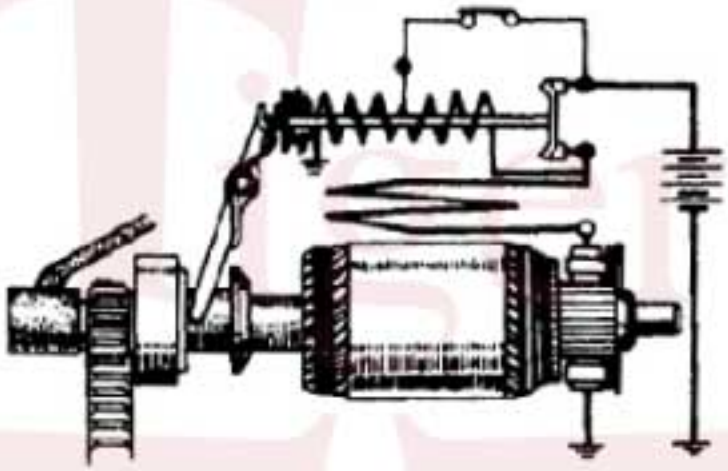


Fig. 9-3

Engine cranking

When the motor is cranking the engine with full force, the pull-in coil is bypassed or shunted but the holding coil remains energized to hold the moving core in its shifted position. Under this condition, the shift lever is pushing the pinion by overcoming the force of springs.

As the engine fires up and begins to run steadily and if the starting switch is kept closed, the ring gear starts driving the pinion. When this occurs, the pinion merely spins on the motor shaft without transmitting this reverse drive to the motor. This is because the clutch is of overrunning type.

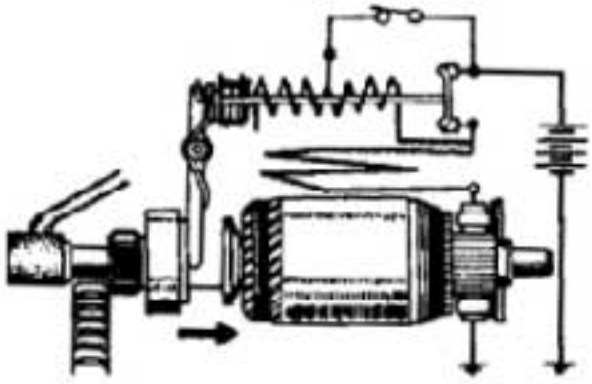


Fig. 9-4

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Terminating cranking operation

Turning off the starting switch de-energizes(shutting off the current)the holding coil so that the pull hitherto acting on the moving core disappears. By the force of the spring,then,the shift lever is turned back and the moving core is forced toward the left to open the main contactor. This shuts off the load current,and the drive pinion,shift lever and moving core go back to their original positions.

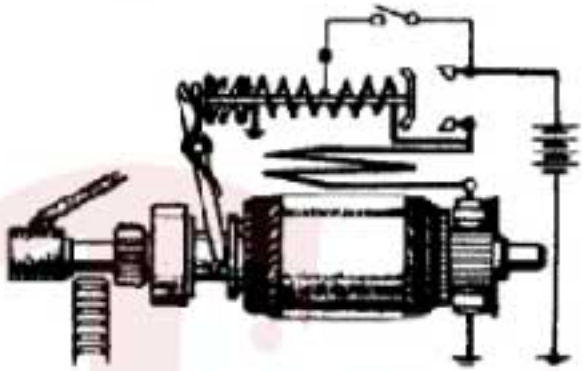


Fig. 9-5

Removal

1)Disconnect battery cable from the negative(-)terminal of the battery.

2)Disconnect the plus cord(+)and white/brown lead wire from the starter motor.

3)Remove the two bolts securing the starter motor assembly to the crank case,and take off the starter motor.

Disassembly

1)Remove the nut securing the end of the field coil lead to the terminal on the head of magnetic switch.

2)Take off the magnetic switch①from the starter motor body by removing the two mounting screws.

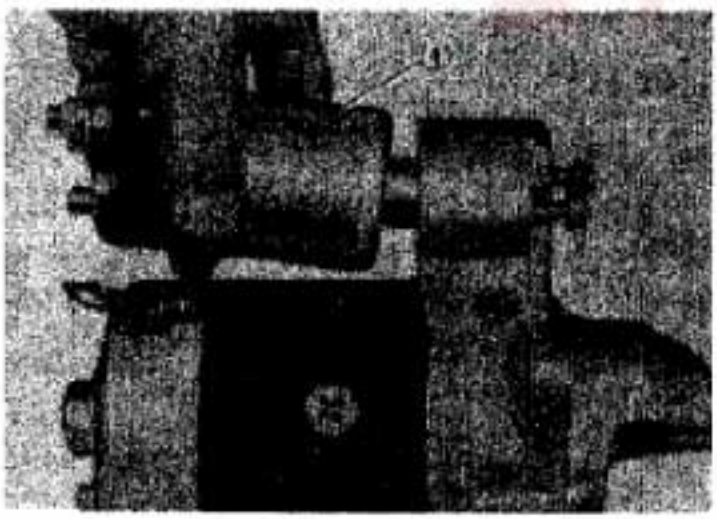


Fig. 9-6

3)Remove the bearing cover②and take out lock plate brake spring③and rubber④.

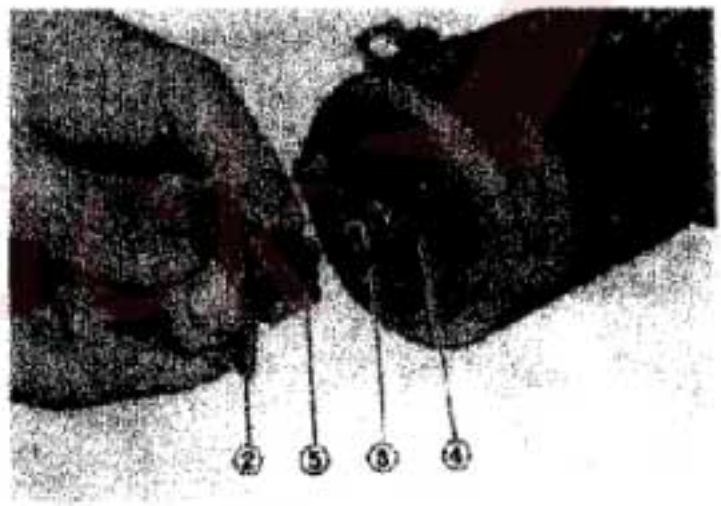


Fig. 9-7 ⑤Clip

4)Disassemble the brush holder section in the following sequence:

(1)Remove two through bolts.

(2)Detach commutator end frame.

(3)Draw brushes out of the holder.

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(4)Take out the brush holder.

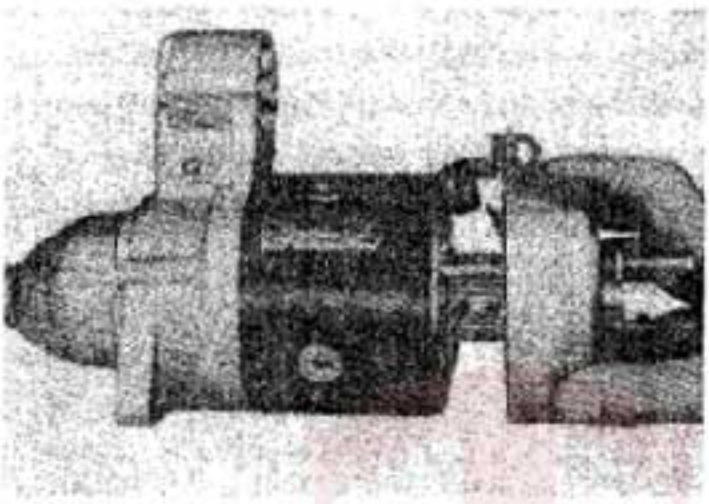


Fig. 9-8

5)Remove the case complete with field coils.
6)Pull off the set pin from shift lever, and take out the rubber and plate inside the housing.
7)From the housing, take out the armature, starter clutch and shift lever.

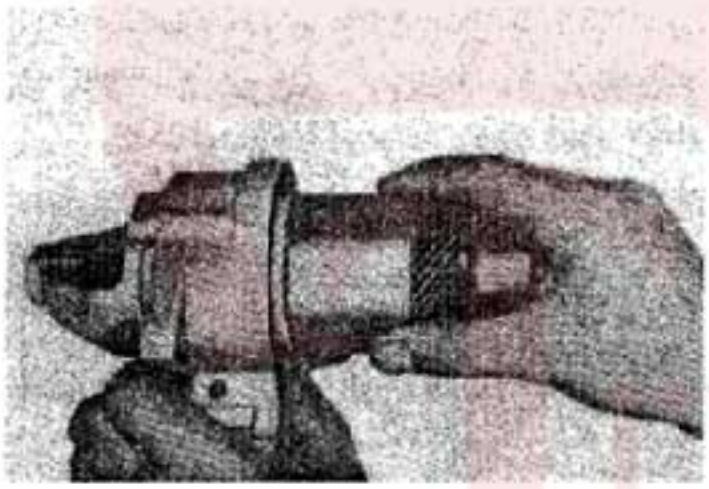


Fig. 9-9

8)Draw off the starter clutch, as follows;
(1)Draw stop nut toward the clutch side.
(2)Remove snap ring and slide off clutch.

Maintenance Services

In the event the starter motor is found unable to crank the engine, the first thing to be checked is whether the drive pinion plunges out. If the pinion does not plunge out, then the magnetic switch must be checked.

If the pinion plunges out satisfactorily, then the inability of the motor to crank the engine is likely to be due to some defective condition in the commutator or in the armature, provided that the battery is in good condition and that the circuit for applying the battery voltage to the motor is free from any open or fault. Having narrowed the scope of search for the cause of trouble to the motor proper, proceed as follows;

Checking the field coils

Check to be sure that the field circuit is neither grounded or open-circuited. This can be effected by using a circuit tester as shown. If continuity is indicated by the tester hooked to the housing or frame, it means that the insulation has failed, resulting in a grounded field coil. Such a fault can be corrected by repair in most cases.

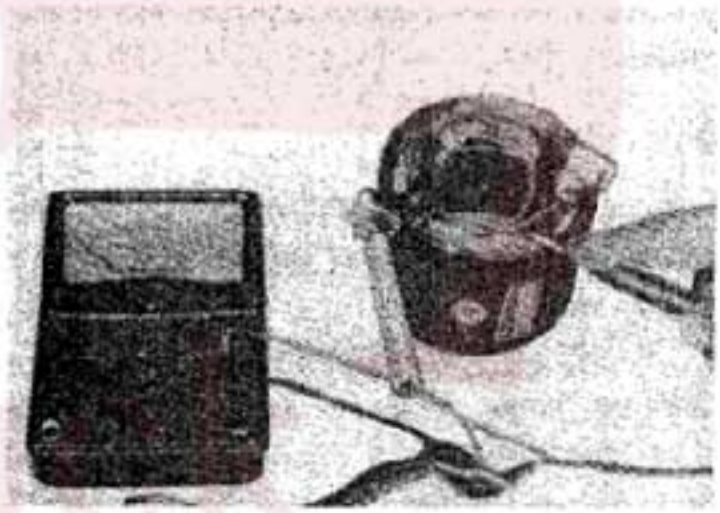


Fig. 9-10

Checking the armature

• Using the circuit tester, see if there is any continuity between commutator and armature core. The tester will indicate infinite resistance if the insulation is in sound condition.

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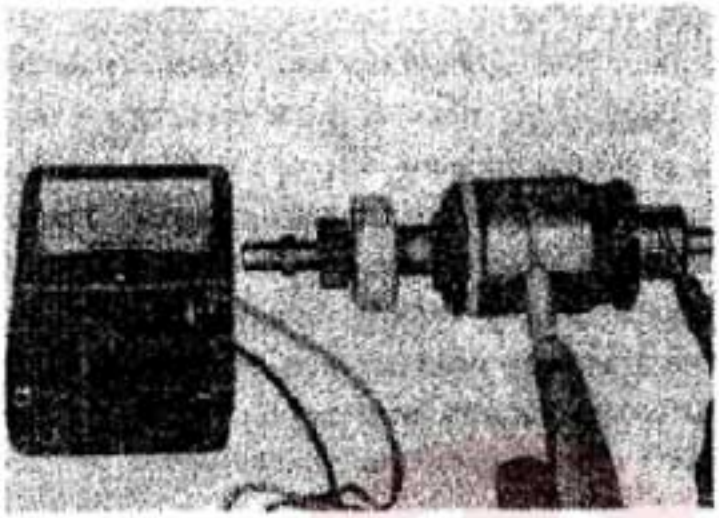


Fig. 9-11

- Again using the tester, check for continuity between each pair of adjacent commutator segments. If discontinuity is noted at any part of the commutator, replace the whole sub-assembly of the armature.



Fig. 9-12

Servicing the commutator

- If the surface of the commutator is gummy or otherwise dirty, wipe it off with a cloth dampened with gasoline. If the surface is coarsened or in burnt condition, smoothen it by grinding with sandpaper. If the surface is grooved deep, it may be necessary to remove the groove marks by turning the commutator in a lathe; such turning is often successful in reconditioning the commutator if the extra stock necessary for removal by cutting is available without reducing its diameter to the limit.

	Standard	Service limit
Commutator diameter	32.5mm (1.28in.)	30.5mm (1.20in.)



Fig. 9-13 ①Sand paper

- Make sure that the mica between each pair of adjacent segments is undercut to the prescribed depth. The conventional undercutting technique is to be used in repairing the commutator.

	Standard	Service limit
Mica undercut	0.5~0.8mm (0.02~0.03in.)	0.2mm (0.007in.)

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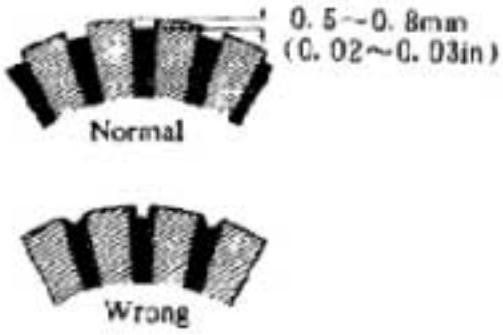


Fig. 9-14

Testing the magnetic switch

Before separating the magnetic switch from the motor proper just removed from the crankcase, test the switch by connecting the battery to the switch, as shown, to see if the drive pinion jumps out when the battery voltage is applied. (With the positive terminal of the battery cable end.) With the switch coils in sound condition, the drive pinion will jump out and, even when the main circuit is opened at "A", will remain in "jumped out" position. If undoing the connection at "A" causes the drive pinion to retract, it means that the holding coil is defective.

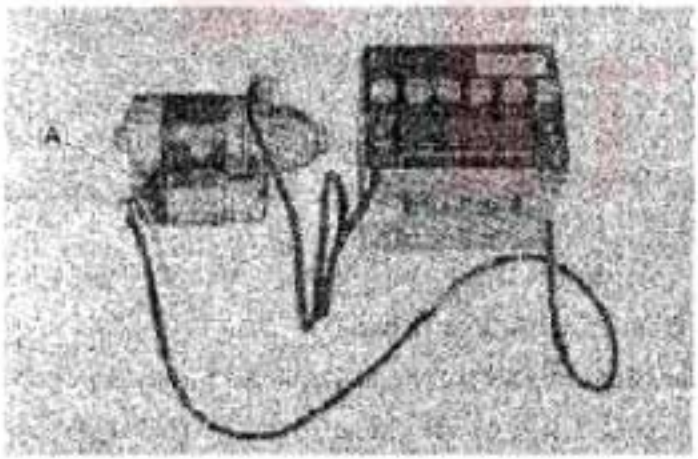


Fig. 9-15

Servicing the brushes

Check the length of each brush. If brushes are worn down to the service limit, replace them.

	Standard	Service limit
Brush length	19mm (0.75in.)	12mm (0.47in.)



Fig. 9-16

Servicing the brush holders

Make sure that the insulation between the two brush holders, positive and negative, is in good condition. This should be verified with the use of the circuit tester. If any continuity is noted, repair the insulation.

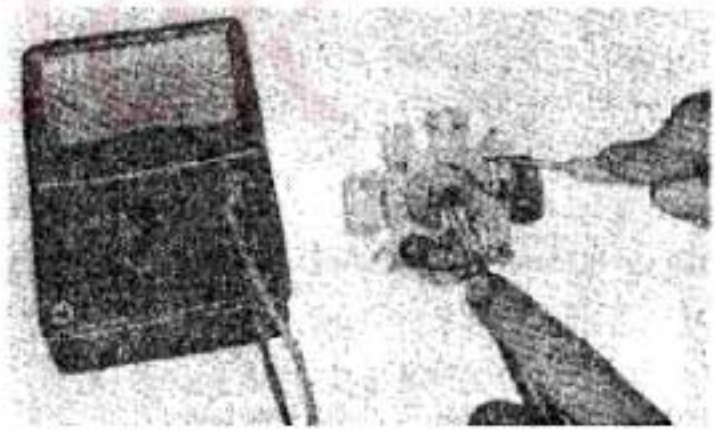


Fig. 9-17

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Important Reminders for Starter Motor Reassembly

Various parts of the starter motor assembly need lubrication at each overhaul. The lubrication points are illustrated below; (Also required is locking by punching.)

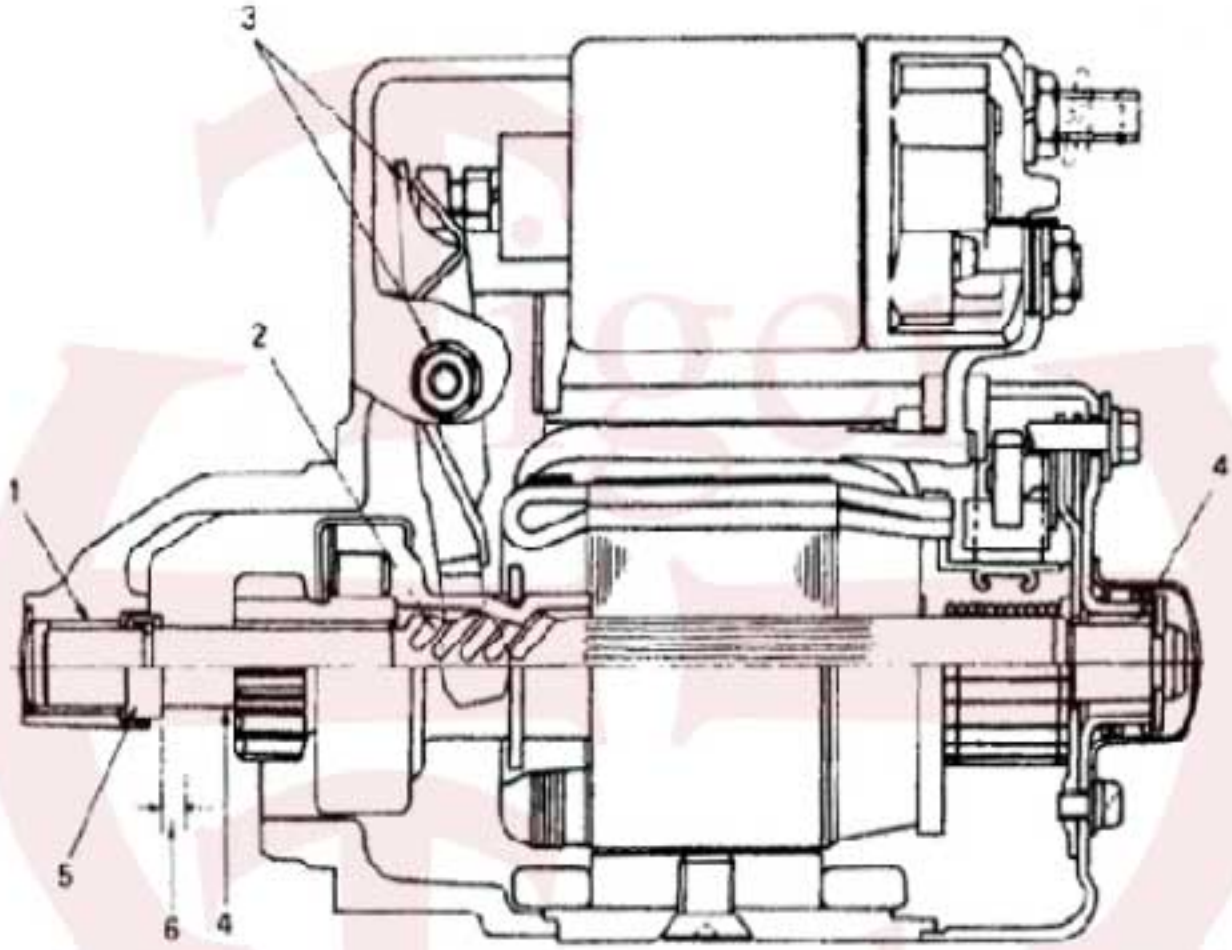


Fig. 9-18

1) Give grease to the bush in the drive housing.
2) Grease the helical splines before mounting the clutch sub-assembly.
3) Grease the sliding or contacting surfaces associated with shift lever.
4) Grease the bush fitted into the end frame and also the armature shaft end inserted into this bush.
5) After installing the stop nut, lock it by staking at two places with a punch.
6) Adjust the length of the moving stud so that the clearance between the stop nut and the pinion in plunged-out condition will be from 1 to 4 mm (0. 04 to 0. 16in.). To check, run the motor in no-load condition to plunge out the pinion and wait till the motor speed settles.

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SECTION 6H

CHARGING SYSTEM

CONTENT

Description.....6H-2

Charging Operation.....6H-2

Alternator.....6H-4

Alternator Regulator.....6H-9

Battery.....6H-12

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Description

The charging system consists of the alternator complete with a means of rectification for producing DC output power, and the two-element regulator unit for controlling the voltage.

In the alternator, the armature is stationary; it consists of three coils mounted-on the stator in such a way as to produce three-phase alternating voltage. This voltage applies to the rectifier for full-wave rectification. The rectifier delivers power in the form of direct current.

Against the stationary armature, revolving magnetic fields are produced by the field winding carried in the rotor. This feature of construction of the alternator strikes a distinct contrast to the dynamo (DC generator), in which the field is in the stator while the armature is in the rotor.

The magnitude of three-phase AC power available from the alternator to its rectifier is directly proportional to rotor speed and field(excitation)current. It is the function of the regulator unit to control the field current automatically in such a way that the output voltage unit to control the field current automatically in such a way that the output voltage remains constant; another function is to control the circuit of the charge warning lamp. Thus, the regulator unit has two element; one is voltage regulator for performing the first function and the other is voltage relay for the second function.

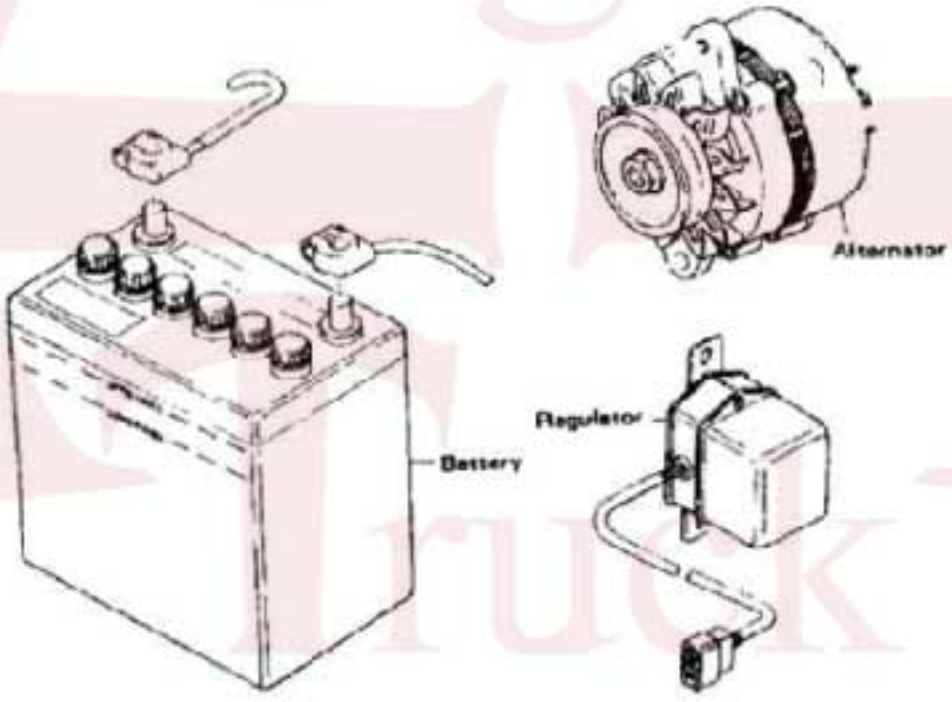


Fig. 10-1

Charging Operation

The following description of the system operation is referenced to the circuit diagram indicated in Fig 10-2. Closing the ignition switch connects the charge warning lamp to the battery; a small current flows through the lamp, lighting this lamp to signify that the alternator is not charging the battery, and through the contact point of voltage relay to ground. Another current flows from the battery through the contact point of voltage regulator into the field winding in the alternator rotor, thereby producing magnetic fields around the rotor. These fields, which are stationary at this time because the rotor is not

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running, link the armature coils and the rotor poles through the air gap between stator and rotor.

Under these conditions, suppose the engine is started up. The rotor begins to run, and its magnetic fields revolve to "cut" the three armature coils in succession. In each armature coil, an electromotive force is generated by electromagnetic induction. This force changes its direction alternately. Consequently, the three armature coils apply three alternating voltages to the rectifier. Viewed collectively, these voltages constitute the three-phase output voltage of the alternator.

The rectifier consists of three pairs of rectifying diodes, forming three one-way paths of current for full-wave rectification to convert the alternator output power into a direct current power, which is available from the "B" terminal of the alternator-rectifier unit, relative to "E" (ground) terminal.

As the engine picks up speed, the electromotive force induced in each armature coil increases, so that the output voltage appearing at terminal "B" (relative to terminal "E") becomes high enough to "push" electricity into the battery through its positive terminal. In other words, the battery begins to draw a charging current.

Let' s take a look at the pressure coil of the voltage relay. One end of this coil is connected to terminal "E" and the other end to the neutral point "N" of the three armature coils. Potential level of "E" (ground) is now so much lower than that of "N" that a current flows in the pressure coil to develop a magnetic pull. Consequently, point "P5" separates from point "P4" and touches point "P6"; the charge warning lamp thus becomes shunted and stops burning to signify that the battery is getting charged.

During the early stage of engine starting, the alternator output voltage may be lower than the battery voltage; even in such a case, no current flows from the battery into the alternator because of the rectifier diodes. The reason why a cutout relay is not used here is explained by the presence of the diode rectifier.

The function of the voltage regulator with its voltage coil is to alter the path of field (excitation) current for the field coil, in order to maintain the alternator output voltage at a relatively constant level. When this voltage rises owing to a rise in engine speed, the voltage coil pulls point "P2" away from point "P1", thereby introducing the control resistor "R1" into the field circuit. Field current falls slightly because of this resistance and, consequently, the output voltage falls to the normal level. If the engine picks up speed further, the magnetic pull developed by the voltage coil increases to bring point "P2" into contact with "P3", thereby shunting the field coil to reduce the field current to zero. Under this condition, voltage generation in the alternator is dependent on the residual magnetization of the rotor, which is small enough to keep down the output voltage to the normal level.

The foregoing description of the voltage regulator operation may be summarized as follows; the regulator controls the alternator output voltage by controlling the field current in three steps; first allowing a full field current to flow; secondly, by inserting a resistor into the circuit to reduce the field current; and thirdly, by shunting the field coil to reduce the current to zero.

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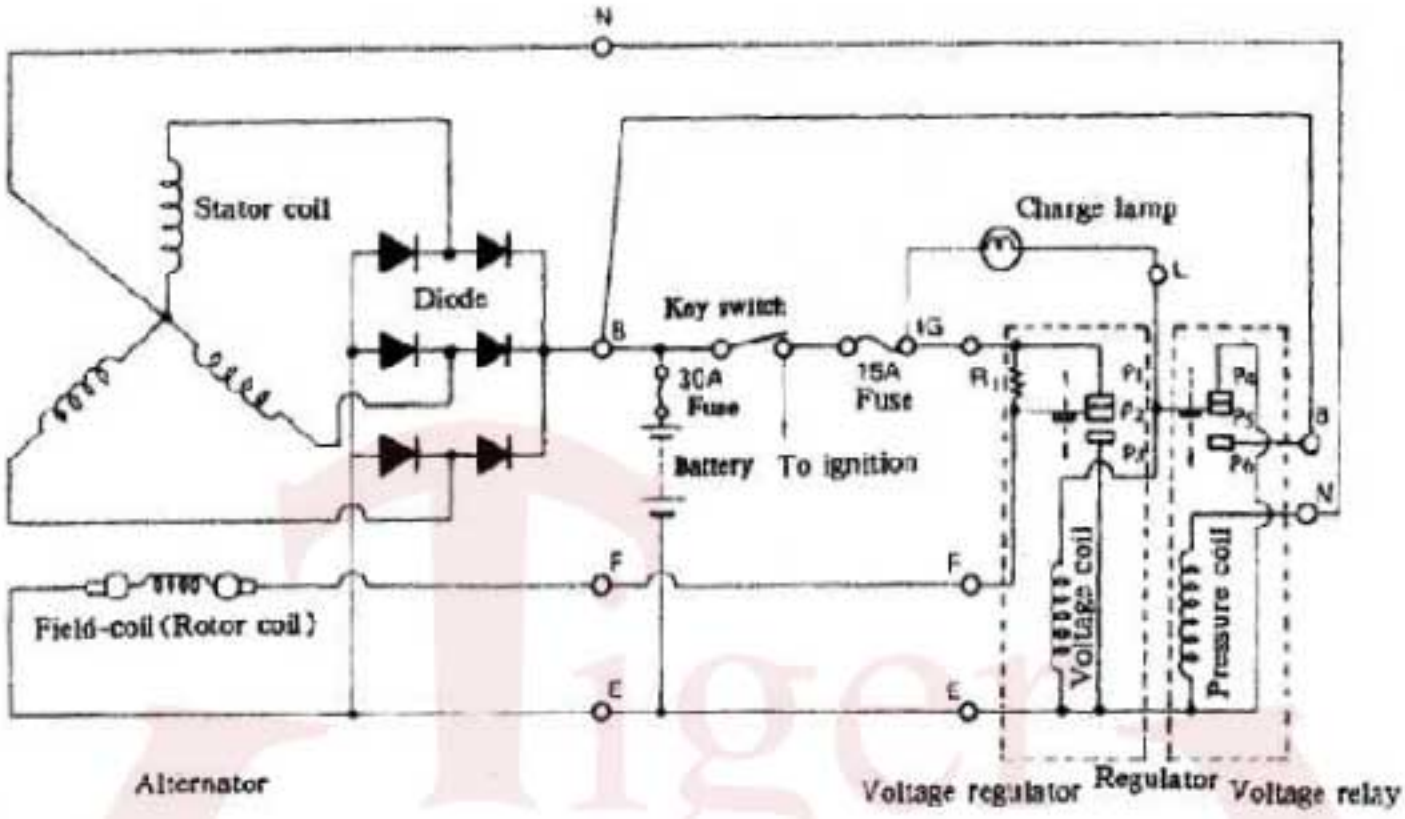


Fig. 10-2

Alternator

Description

In order to distinguish it from conventional automotive dynamos, the AC generating device is called an alternator for it produces a DC output from three alternating currents generated in its winding.

The alternator consists of; the rotor (which produces revolving magnetic fields), stator (which is a series of coils disposed and arranged to form three coil groups), two slip rings and two orushes (through which DC excitation current is fed into the field winding of the rotor), and the rectifier (which consists of six semiconductor diodes, and is built in the alternator).

In operation, the revolving magnetic fields "cut" the stator coils. In other words, the three groups of coils experience changes in magnetic flux. By the flux changes, an alternating electromotive force (emf) is induced in each coil group. Thus, three alternating voltages are available from the stator.

The six diodes are arranged so that they "rectify" or convert the three alternating outputs into a DC output. Three-phase full-wave rectification is effected by the built-in rectifier.

In terms of electric current, a diode is a circuit element that passes the current only in one direction. Of the six diodes, three are arranged to pass currents in the same direction, and the remaining three in the opposite direction. Since three alternating currents undergo full-wave rectification and are combined into one by superposition and are combined into one by superposition, the DC output of this alternator is much steadier and carries much less pulsating or ripple components than a DC output made available by full-wave rectification of a single-phase alternating current.

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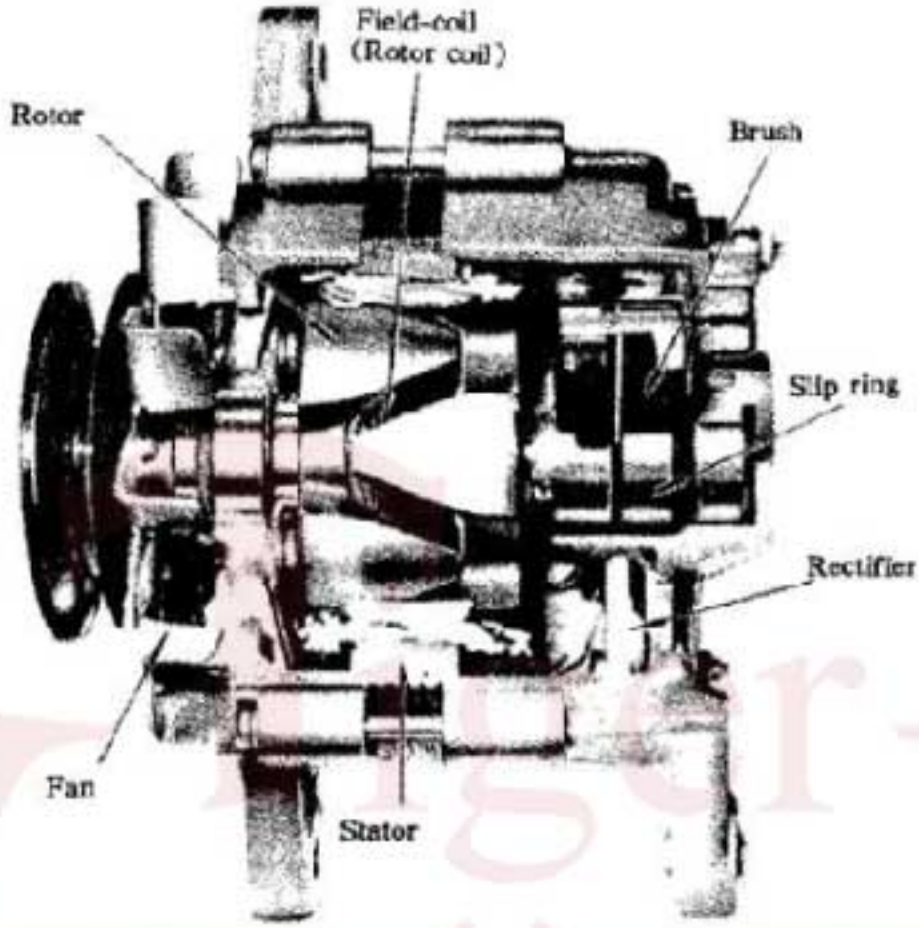


Fig. 10-3

Data and Specification

Nominal operating voltage	12Volts
Maximum alternator output	70A
Polarity	Negative ground
Effective pulley diameter	65mm(2.56in.)
No-load alternator speed	1,050~1,250rpm. 14 Volts at normal temperature
Full-load alternator speed	4,000rpm maximum, 35A,14 Volts at normal temperature
Direction of roation	Clockwise as viewed from pulley side
Maximum permissible alternator speed	13,000rpm
Working temperature range	-40℃~80℃ (-104℉~176℉)
Rectification	Full-wave rectification

Removal

(1) Disconnect the negative battery cable from the battery.

(2) Disconnect from the alternator the red cord and circuit coupler.

(3) Remove the bolts securing "V" belt adjusting arm and alternator and take down the alternator.

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Alternator Disassembly

Remove the nut securing the fan to the rotor shaft. To do so, the shaft must be held rigid and steady by using a special tool Ⓐ.

Hexagon wrench, 6mm

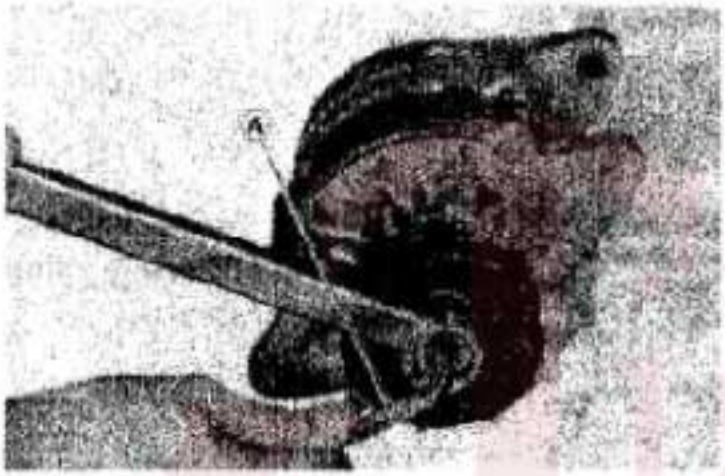


Fig. 10-4

Remove the 3 bolts fastening the end frame to the rotor housing; tap on the edges of the end frame with a wooden mallet to separate it from the housing, thereby severing the rotor from the stator.

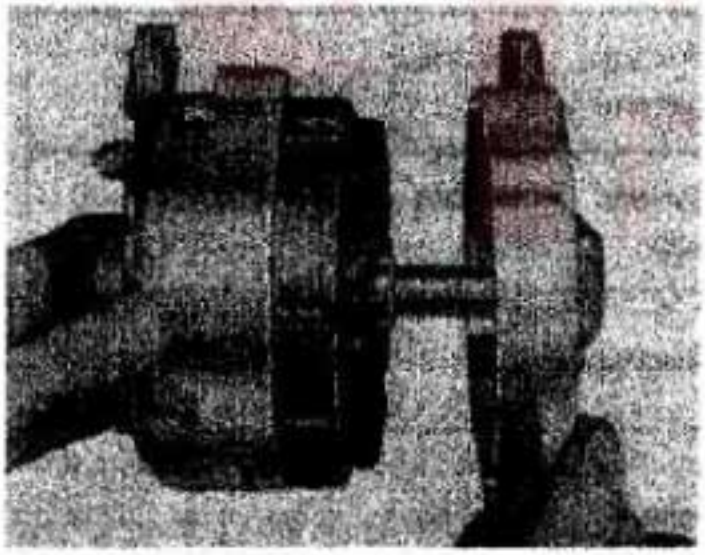


Fig. 10-5

Draw out the rotor. It may be necessary to lightly tap on the core and housing.



Fig. 10-6

Remove the 3 nuts securing the rectifier holder in place, and one other nut holding down the terminal insulator. Remove the rear end cover.

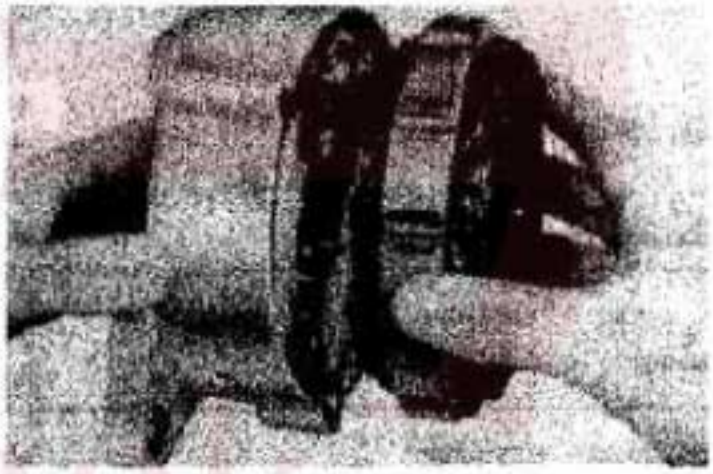


Fig. 10-7

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Remove the brush holder from the stator.

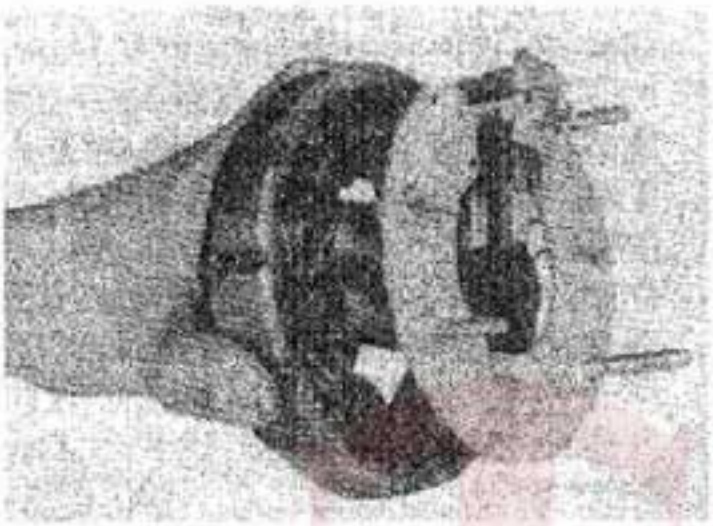


Fig. 10-8

NOTE:
The alternator is to be reassembled by reversing the foregoing sequence of steps. Before inserting the rotor into the housing, be sure to have the brushes installed in the holder. (Use a propersize rod Ⓐ, manipulating it from the rectifier side, to set the brush in the holder.)

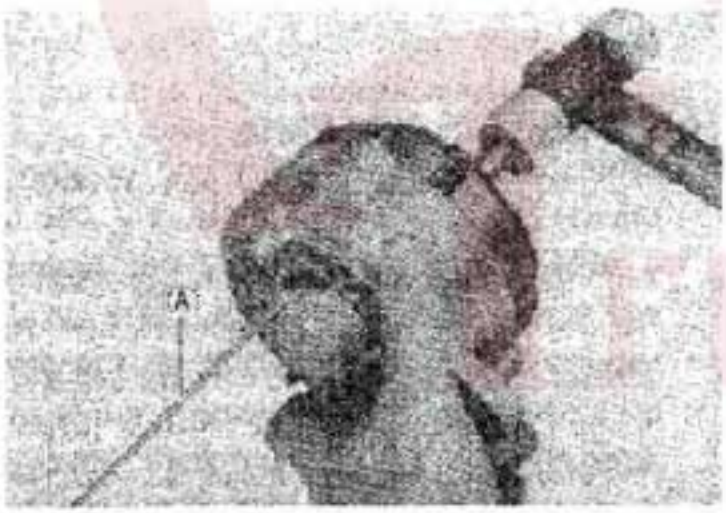


Fig. 10-9

Maintenance Services

(1)Rotor

• Testing the rotor for open-circuit

Check to be sure there is continuity between the two slip rings when tested as shown. Absence of continuity means that the field coil is open-circuited and must be replaced.

Ring-to-ring circuit resistance	4~5ohms

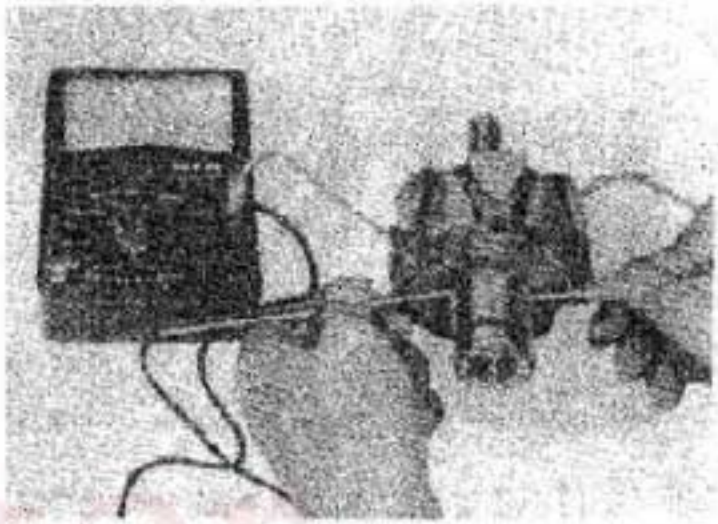


Fig. 10-10

• Testing the rotor for grounding

Check to be sure there is no continuity between the slip ring and the rotor shaft when tested as shown. Presence of any continuity means that the insulation on the field coil has failed, making it necessary for the rotor to be replaced.

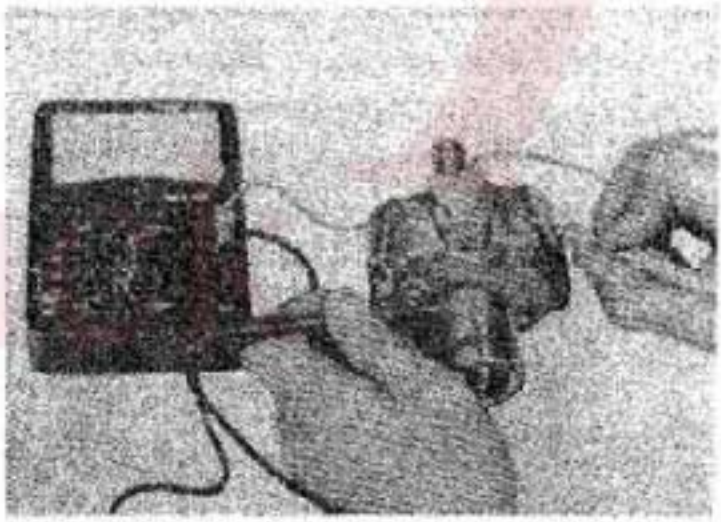


Fig. 10-11

(2)Stator

Check to be sure there is no continuity between the stator core and each armature coil; any continuity noted means that the coil is grounded. A grounded armature coil can be

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corrected by locating the faulted point and repairing the fault.

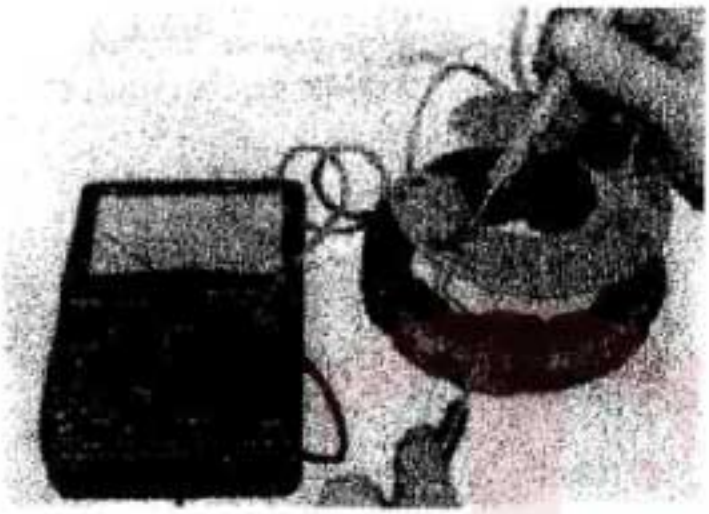


Fig. 10-12

(3) Brushes

Check each brush for wear by measuring it length, as shown. If the brush is found worn down to the service limit, replace the brush and holder altogether.

	Standard	Service limt
Brush length	16.5mm (0.65in.)	11.0mm (0.45in.)

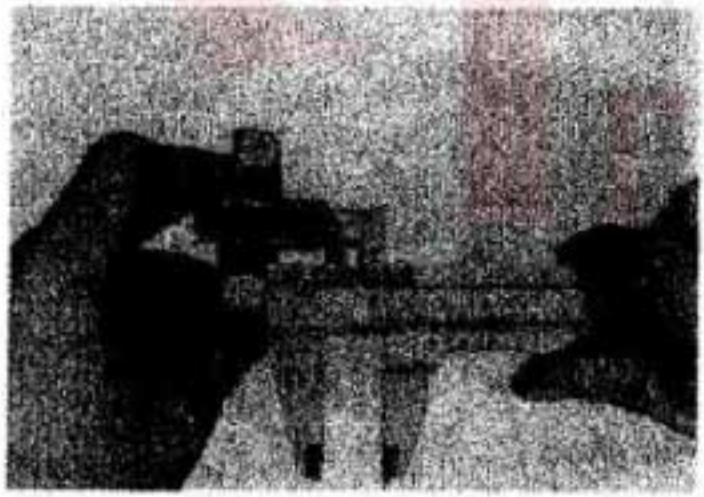


Fig. 10-13

(4) Rectifier

The rectifier is to be checked with the ohmmeter for continuity in one direction and non-continuity in the other direction.

Put ohmmeter lead to terminal "B" and the other lead to terminal "N", then swap the two leads. Of the 2 ohmmeter indications, one should be about 20 ohms, meaning continuity, and the other should be infinity (non-continuity).

Put ohmmeter lead to terminal "N" and the other lead to terminal "E", then swap the two leads. In this case, too, the two ohmmeter indications should be similar to those mentioned above.

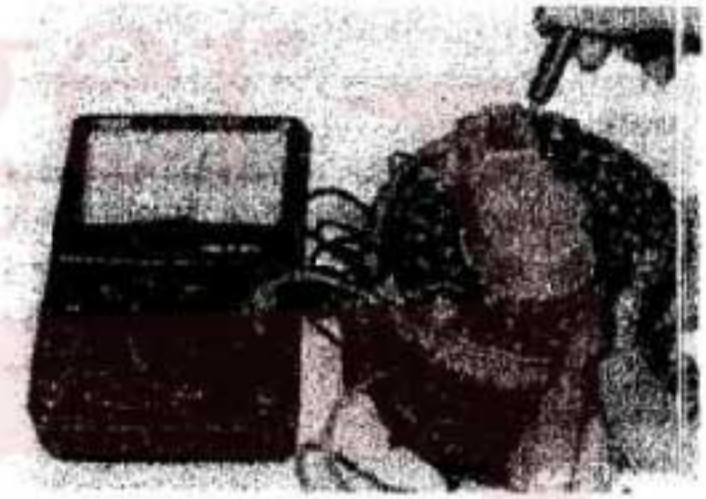


Fig. 10-14

(5) Alternator load performance

With the alternator-rectifier unit in place, run the engine in a speed range of 3,000 to 4,000rpm, with head lamps, 4-way flashers and wiper motor turned on, and check the alternator output voltage and current. Compare the readings against the prescribed values, indicated below. An output current which is small means the possibility of the rectifier being defective, any of the stator (armature, coil open-circuited, or an insulation failure resulting in a grounding fault).

Standard output voltage and current	13.8~14.8volts, 20A minimum

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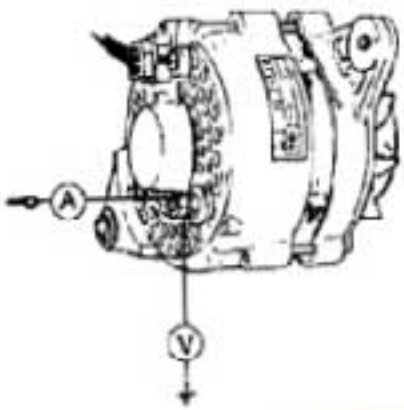


Fig. 10-15

Alternator Regulator

In the two-element regulator, one coil acts as voltage limiter or regulator and the other coil as relay for controlling the charge warning lamp. It should be noted in the circuit diagram that the magnetic pull developed by the voltage coil to move its moving point "P2" is roughly proportional to the alternator output voltage, whereas the magnetic pull developed by the pressure coil of the relay is dependent on the potential level of neutral point "N" of the armature with respect to the ground. A clear understanding of these relations is essential in checking, testing and servicing the regulator unit.

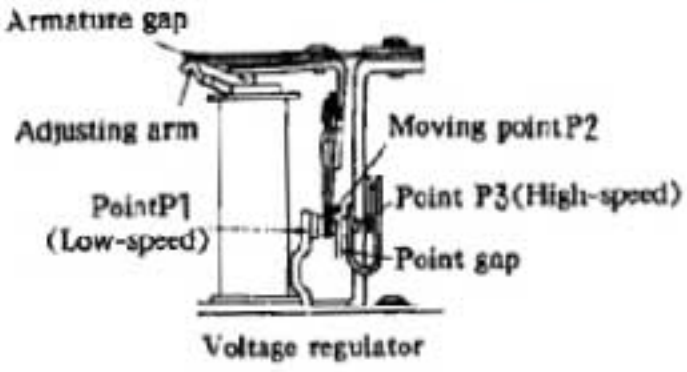


Fig. 10-16

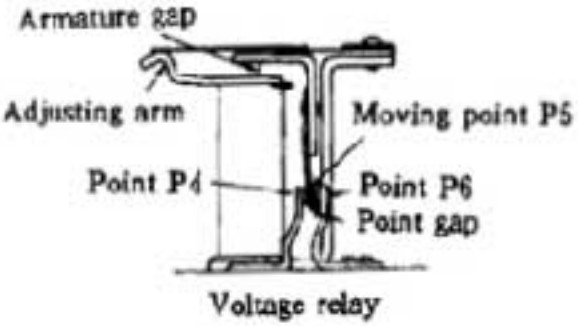


Fig. 10-17

Specifications

Regulated voltage	13.8~14.8volts
Voltage-relay cut in voltage	4~5.8volts

Maintenance services

(1) Voltage-regulator limiting action test

Hook up a voltmeter, inserting it between the alternator "B" terminal and ground, and run the engine within a range 2,000 to 3,000r/min, while reading the voltmeter indication. The voltage read is the charging voltage as limited by the action of the voltage regulator; the reading should be within the prescribed range, which is indicated below. If the charging voltage is found too high or too low, adjust it by bending the adjusting arm of the voltage regulator.

Prescribed range of charging voltage	13.8~14.8volts for 2,000~3,000 revolution(rpm)

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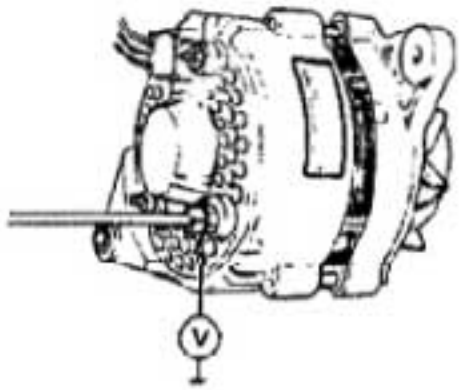


Fig. 10-18

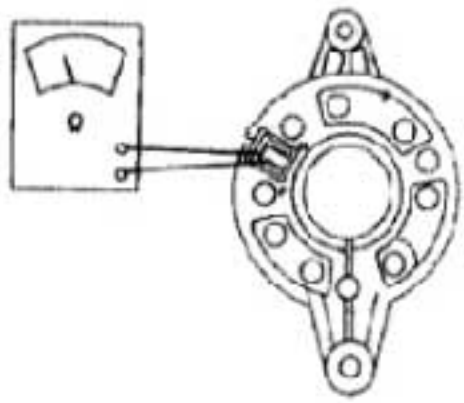


Fig. 10-19

(a) If the charging voltage is noted to oscillate or otherwise be unstable, it is most likely that the contact point faces in the voltage regulator are dirty or roughened. Cleaning and smoothening the faces will remedy this malcondition.

(b) If the charging voltage is too high, the possible causes are as follows;

- Armature gap is too wide on low-speed side or high-speed side in the voltage regulator.
- Contact resistance at high-speed side point is too large.
- The coil of voltage regulator or relay is open-circuited.
- Open circuit in the line to "N" or "B" terminal of the regulator unit. (Refer to Fig. 10-20)
- Contact pressure is too high on low-speed side point.
- Imperfect grounding of the regulator unit.

(2) Continuity test on field coil

Using the ohmmeter, check for continuity between the "E" and "F" terminals of the alternator, as shown. The meter should indicate continuity with a resistance value meeting the following specification;

Standard field circuit resistance	6~9 ohms

(a) If the resistance value noted is too small, it is likely that there is a short-circuit through insulation layers in the coil.

(b) If the resistance value noted is too large, the following possibilities must be considered;

- An open-circuit is developing in the field coil.
- The brushes are not seated properly on the slip rings.
- Brushes or slip rings are burnt.

(3) Checking terminal-to-terminal resistances

Pull off the connector from the regulator unit, remove the cover, and check the resistance between terminals. Refer the resistance readings to the following chart to diagnose the internal condition of the regulator unit,

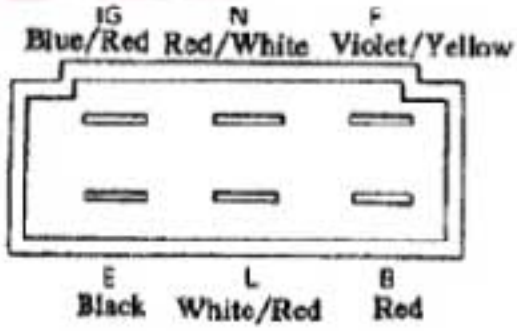


Fig. 10-20

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Guide on regulator diagnosis				
Terminal checked	State of vol. relay	State of vol. regulator	Normal resistance value (ohms)	Diagnosis
IG-F		Standstill	Zero	If not zero, point contact is detective on low-speed side.
		Operated	Approx. 11	If infinity is noted, control resistor is open-circuited.
L-E	Standstill		Zero	If not zero, relay contact point is not closing fully.
	Operated		Approx. 100	If zero, relay point faces are fused together. If infinity is noted, voltage coil is open-circuited.
N-E			Approx. 24	If zero, pressure coil is shorted. If infinity, pressure coil is open-circuited.
B-E	Standstill		Infinity	If not infinity, relay point faces are fused together.
	Operated		Approx. 100	If zero, voltage coil is shorted. If infinity, voltage coil is open-circuited or contact action of the point is defective.
B-L	Standstill		Infinity	If not infinity, relay point faces are fused together.
	Operated		Zero	If not zero, contact action of the point is defective.

NOTE:
In the above chart, "standstill" means that the regulator unit is in de-energized state; "operated" means that the armature is pulled in by the coil.

(4) Gap adjustment

(a) Voltage relay

Using a thickness gauge, check the two gaps, point gap and armature gap. Refer the gauge readings to the specification value, left, and adjust the gaps as necessary.

Gap specifications	
Armature gap	Approx. 0.6mm (0.023in.)
Point gap	Approx. 0.4mm (0.015in.)

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Fig. 10-21



Fig. 10-22

(b)Voltage regulator

Two gaps are to be checked, point gap, and armature gap. Use a thickness gauge, and compare the readings taken against the following specifications. Adjust the gaps as necessary.

Gap specifications	
Armature gap	Approx. 1.1mm(0.043in.)
Point gap	Approx. 0.5mm(0.019in.)

Battery

1)Battery specifications

Model	6-QA-36
Rated capacity	36AH, 12Volts
Electrolyte	2.2litres (5.3/4.4 US/Imp. Pt.)
Electrolyte S. G.	1.280 when fully charged at 25°C(68°F)

2)Care of the battery

The following information is basic in nature and is nothing new; it is merely a reiteration of what every service shop personnel knows about the automotive storage battery. The information is intended to serve as a reminder to the reader, with a hope that he will, in turn, remind each final user of the important basic facts about the battery whenever opportunity permits him to engage in a conversation with the final user in the shop or out of the shop.

(1)The battery is a vary reliable component, but needs periodical attentions.

Keep the battery container clean; prevent rust formation on the terminal posts; keep the electrolyte surface up to level in each cell-uniformly in all cells; and try to keep the battery fully charged at all times.

(2)Preserve the capacity of the battery.

There is a limit to the ability of the battery to hold electricity in store. This limit is called"capacity."

There are several ways for the battery to lower its capacity;

(a)Loss of electrolyte, or fall in electrolyte level.

When this happens, the battery cannot hold so much electricity as it originally could. Handle the battery with care when you take it down. Barring the loss of electrolyte by careless spilling or other-

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wise, the electrolyte level goes down gradually in the battery at work because the water content of it evaporates. Periodically refill distilled water to each cell, as necessary, so that the electrolyte is always up to the specified level. Never allow its surface to fall so much as to expose the cell plates.

(b) Overcharging the battery in place or off the machine.

In recharging the battery off the machine, caution must be exercised so as not to overcharge it. Overcharging gives rise to several complexities. For one thing, it heats up the battery to melt the pitch to result in a destroyed battery. Overcharging could occur in a battery in place if the voltage regulator is maladjusted to allow the alternator (or the dynamo in other machines) to develop too high an output voltage. For another thing, "gassing" occurs in a battery being overcharged to result in a loss of water content. One of the most serious consequences of overcharging is the swelling of positve-plate grids, causing the grids to crumble and the plates to buckle.

(c) Undercharging the battery in place.

Regulator malfunctioning is usually the cause of the battery remaining in a state of charge far below its capacity. This condition is very undesirable in freezing weather, for the electrolyte in such a battery can easily freeze up to result in a destroyed battery. Moreover, an undercharged battery is an easy prey to a greater evil-sulfation.

(d) Sulfation.

Let us recall the electrochemical reactions that take place in the battery during charging and discharging. As the battery gives out its energy (discharging), the active materials in its cell plates are converted into lead sulfate. During recharging, this lead sulfate is reconverted into active material. If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. "Sulfation" means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but it is a damaged battery and its capacity is lower than before.

(3) Keep the battery cable connections clean.

The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current. The inability of the starter motor to crank the engine is often due to the rust formation in the battery cable connection. Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

(4) Be always in the know as to the state of charge of the battery.

The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an inexpensive instrument for measuring the specific gravity (S. G.) of the battery electrolyte. Why measure the S. G. ? Because the S. G. of the electrolyte is indicative of the state of charge.

The direct method of checking the battery for state of charge is to carry out a high-discharge test, which involves a special low-reading voltmeter, an expensive instrument used generally in the service shops but no recommendable to the user of the machine.

At 20°C of battery temperature (electrolyte temperature):

The battery is in FULLY CHARGED STATE if the electrolyte S. G. is 1. 280.

The battery is in HALF CHARGED STATE if the S. G. is 1. 220.

The battdery is in NEARLY DISCHARGED STATE if the S. G. is 1. 150and is in danger of

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freezing.

What if the battery temperatures not 20°C(68°F)? Since the S. G. varies with temperature, you have to correct your S. G. reading (taken with your hydrometer) to the value at 20°C, and apply the corrected S. G. value to the three-point guide stated above. This manner of correction needs a chart showing the relation between S. G. and temperature. There is a simpler way, refer to the graph given below, which tells you the state of charge for a range of S. G. value and a range of temperature.

How to use the temperature-corrected state-of-charge graph.

Suppose your S. G. reading is 1. 28 and the battery temperature is -5°C(23°F). Locate the intersection of the -5°C line and the 1. 28 S. G. line. The intersection is "A". It is in the zone for CHARGED STATE. How much is the battery charged? To find out the answer, draw a line parallel to the zone demarcation line, extending it to the right, and see where this line crosses the percentage scale. In the present example, the line crosses at, say, 85% point. The battery is 85% fully charged.

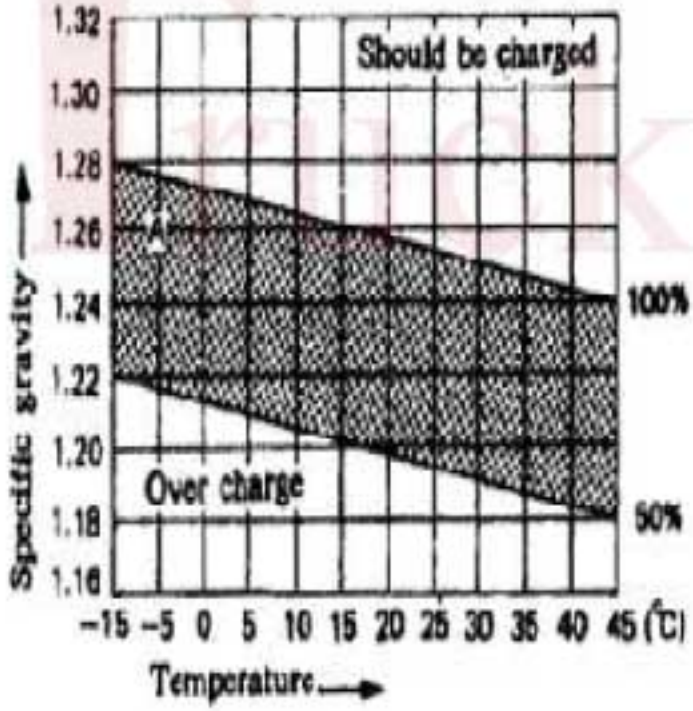


Fig. 10-24

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SECTION 7

AUTOMATIC TRANSMISSION

(if equipped)

Tiger Truck's automatic transmission is remanufactured to original specifications and is based Ford's C-5 transmission. The C-5 was chosen because it has an excellent operational history, was designed for trucks and is within Tiger's gross vehicle weight range.

The C-5 transmission is similar to the C-4 with a slight modification to the valve body and the addition of a centrifugal lock-up converter clutch. When diagnosing this unit, use the same trouble-shooting methods as the C-4.

We thank the Ford Motor Company and the Automatic Transmission Service Group for the illustrations and information that make this manual possible.

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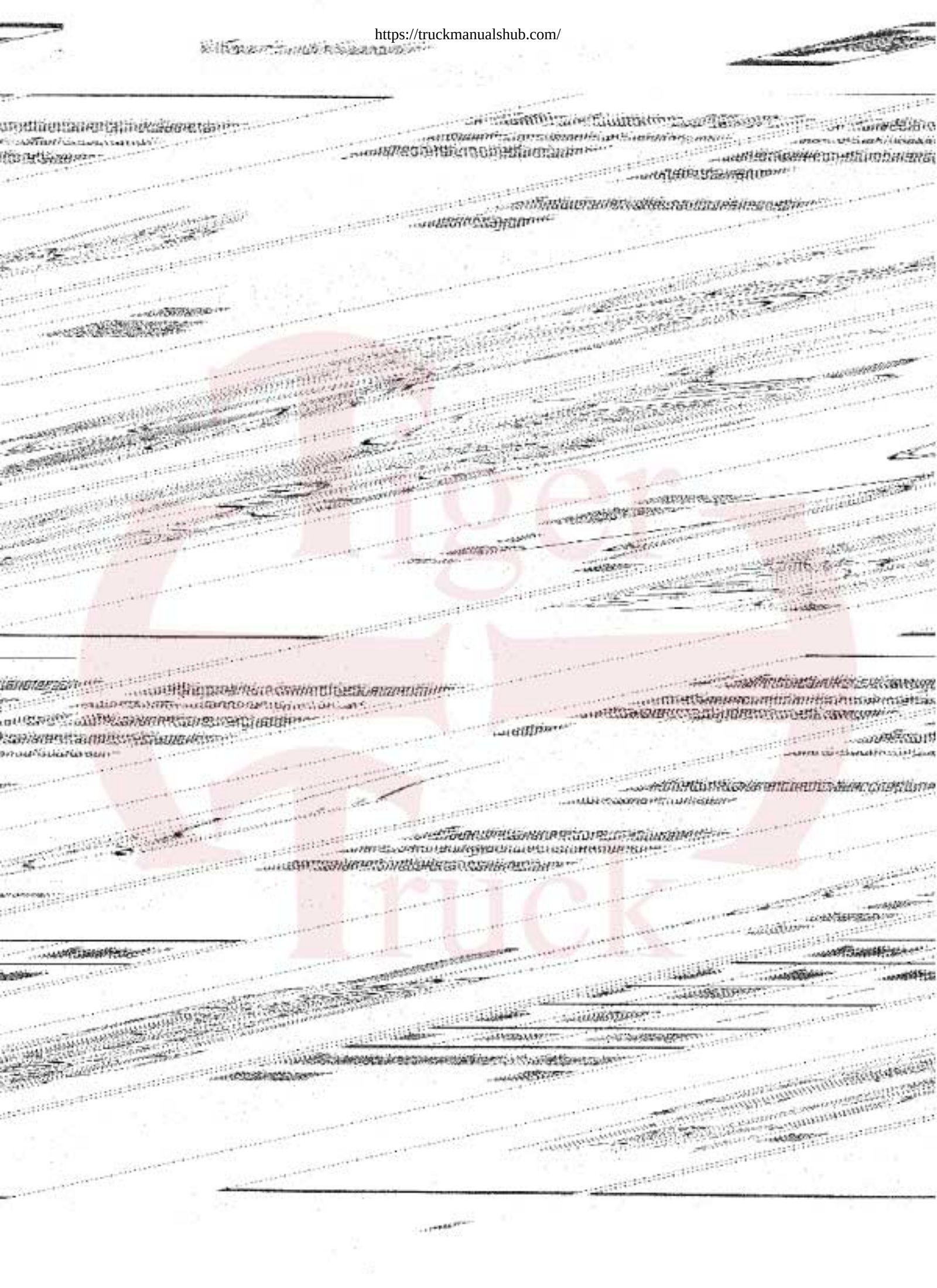
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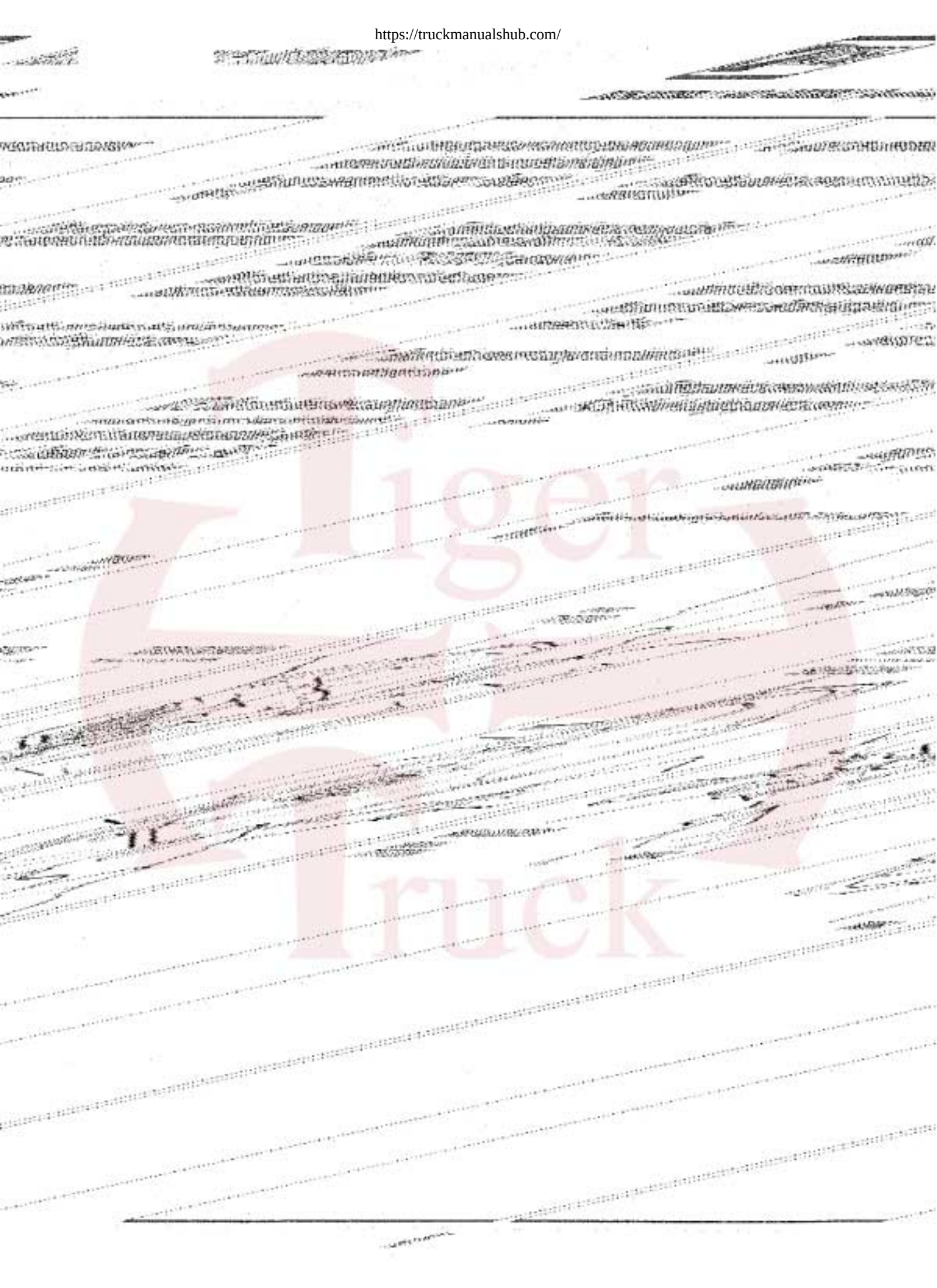
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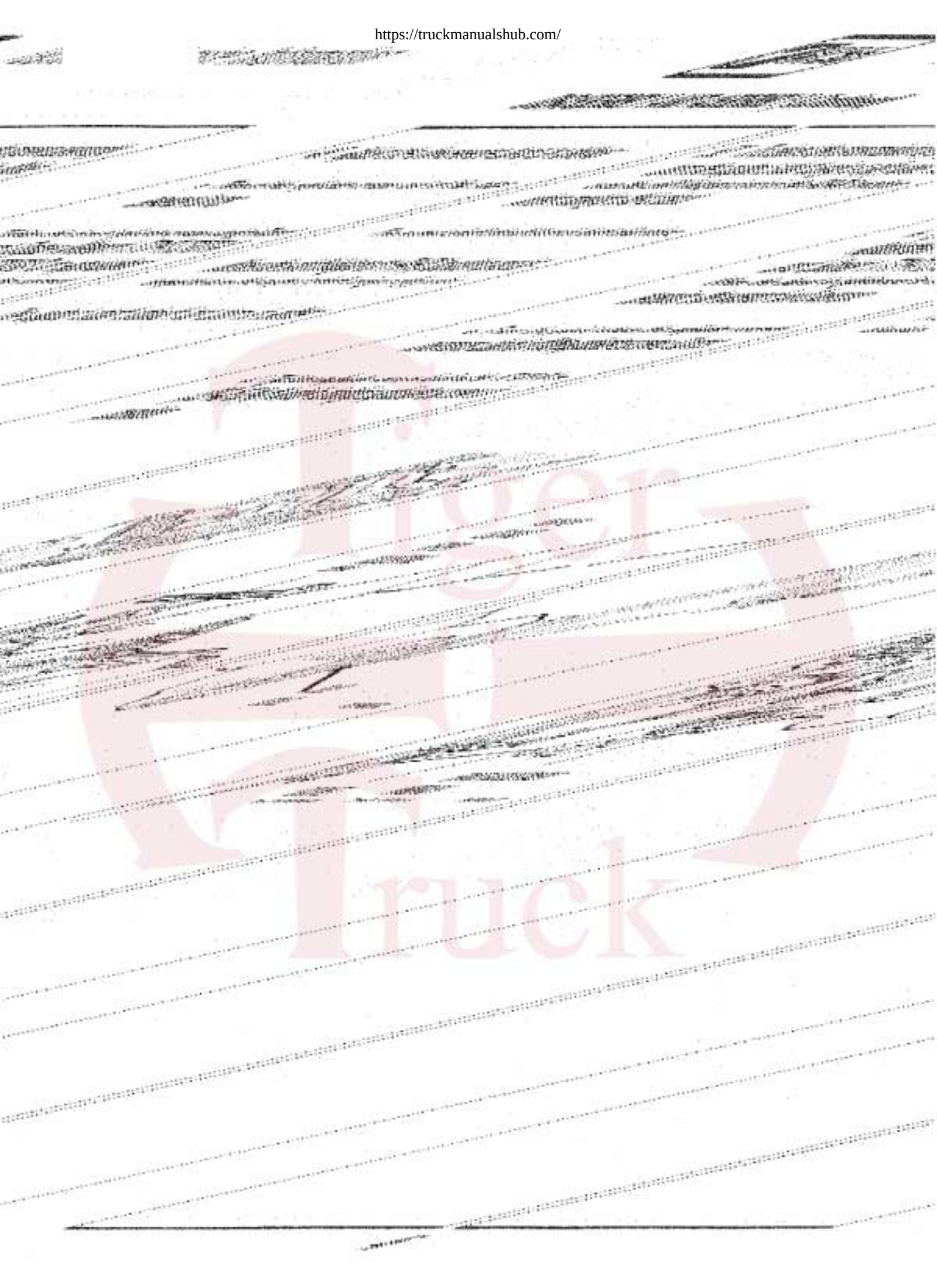
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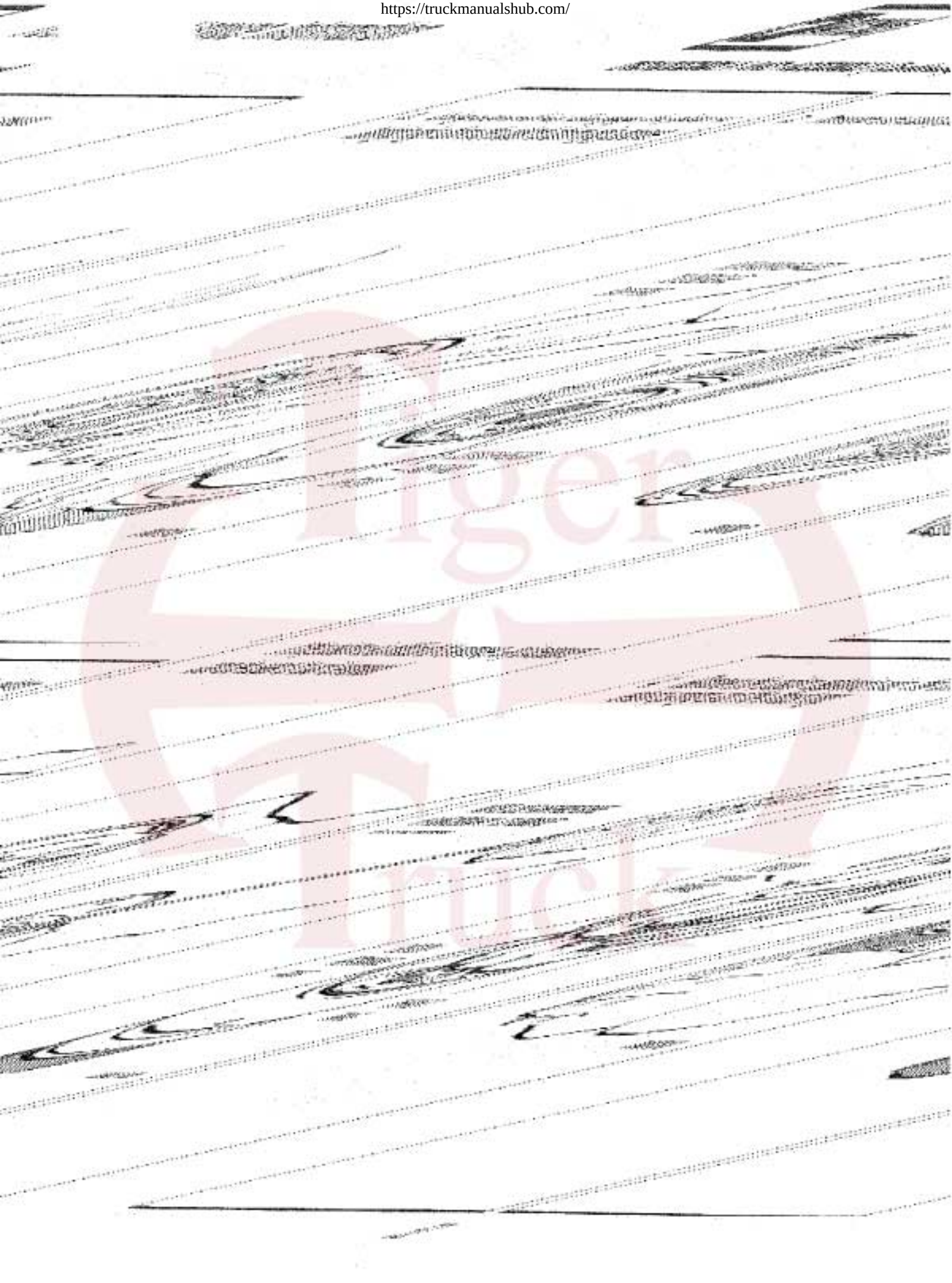
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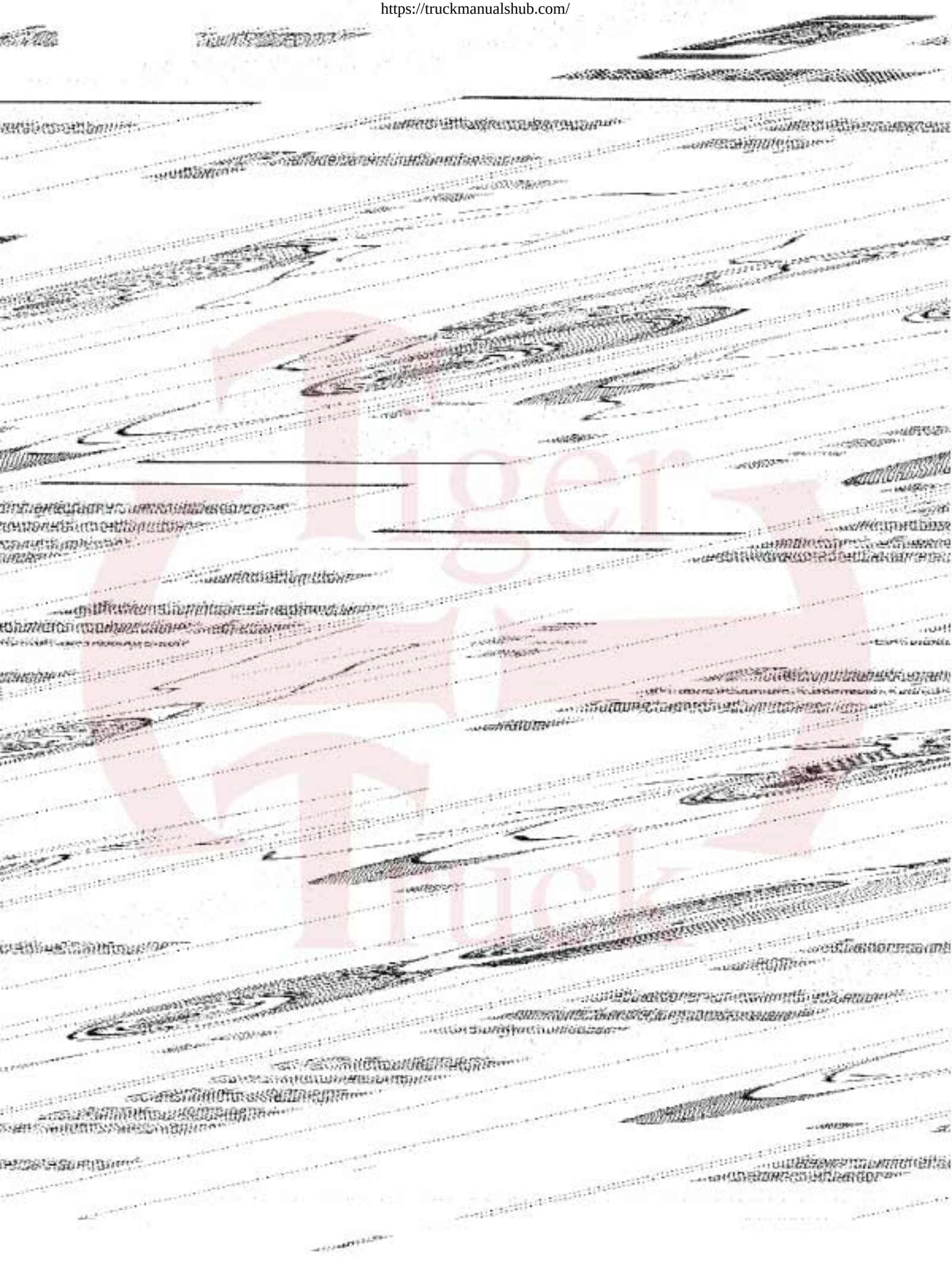
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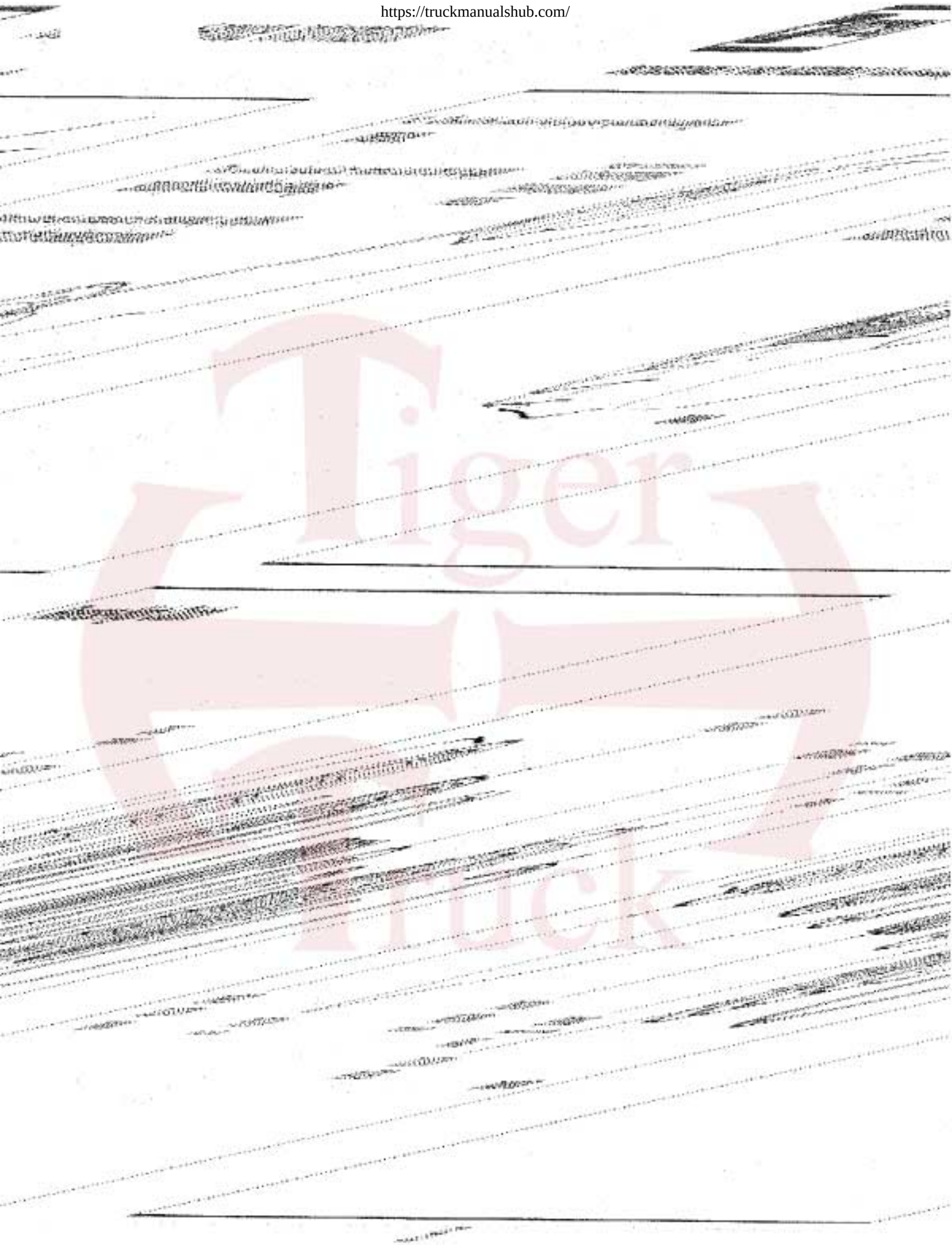
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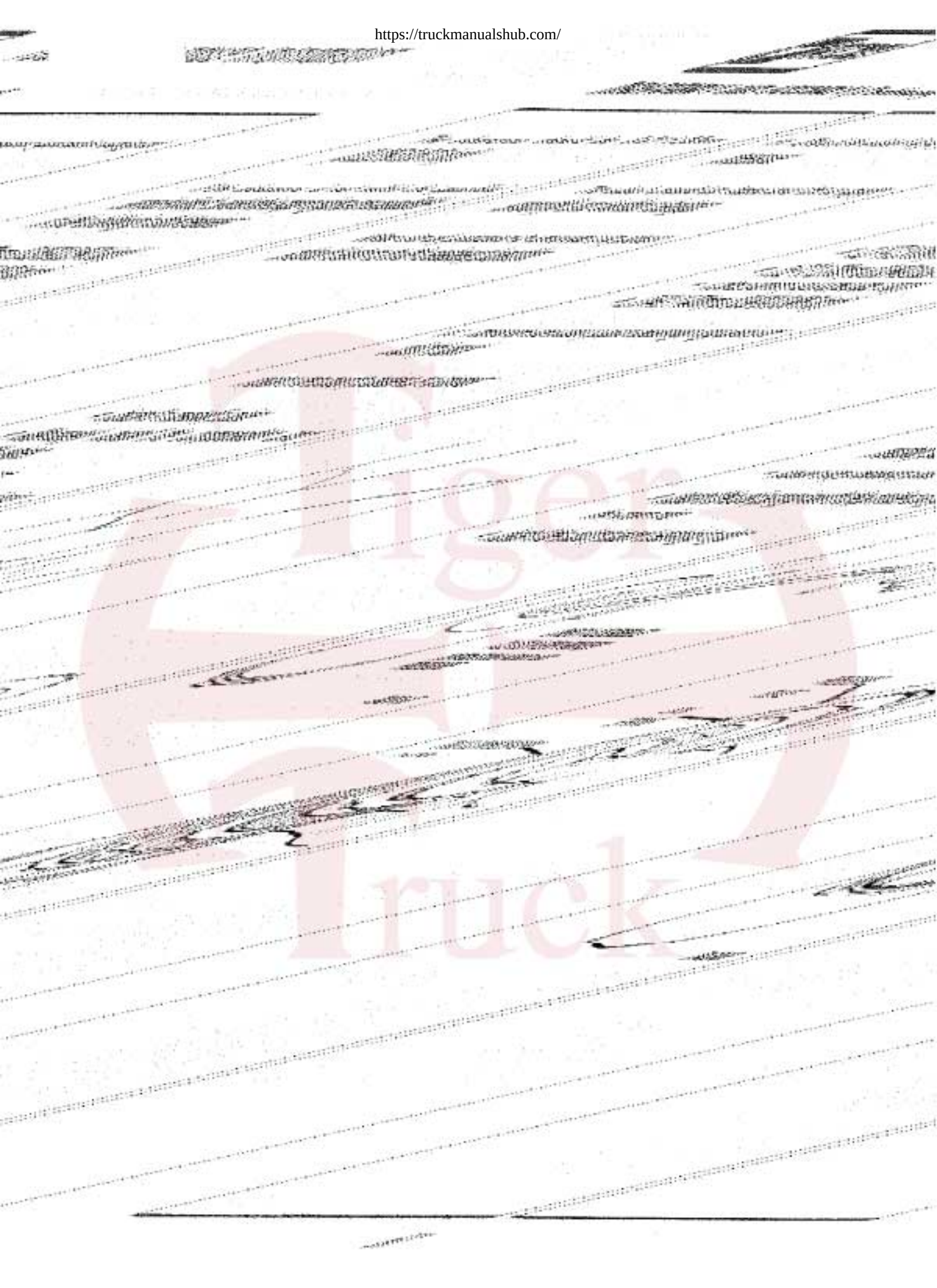
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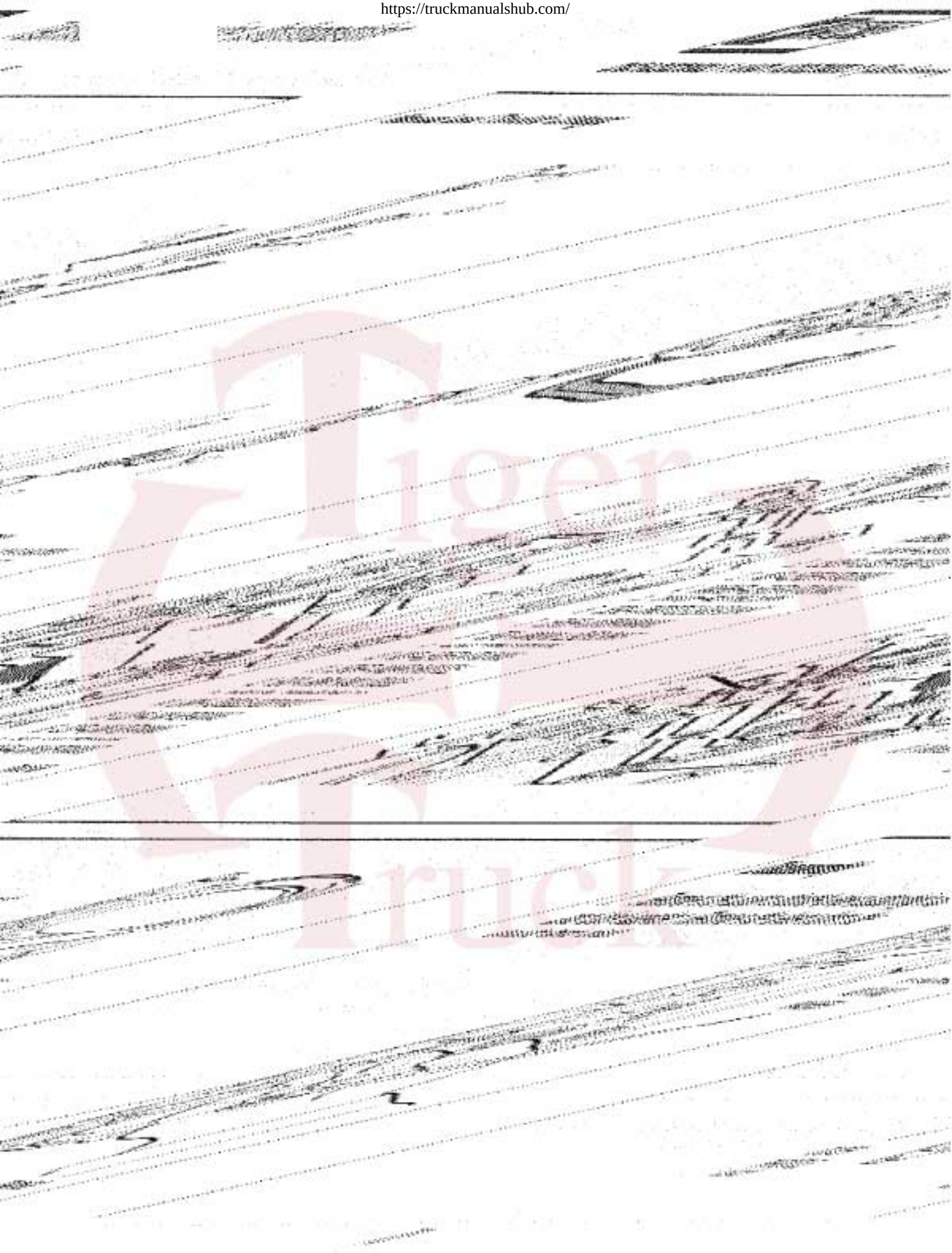


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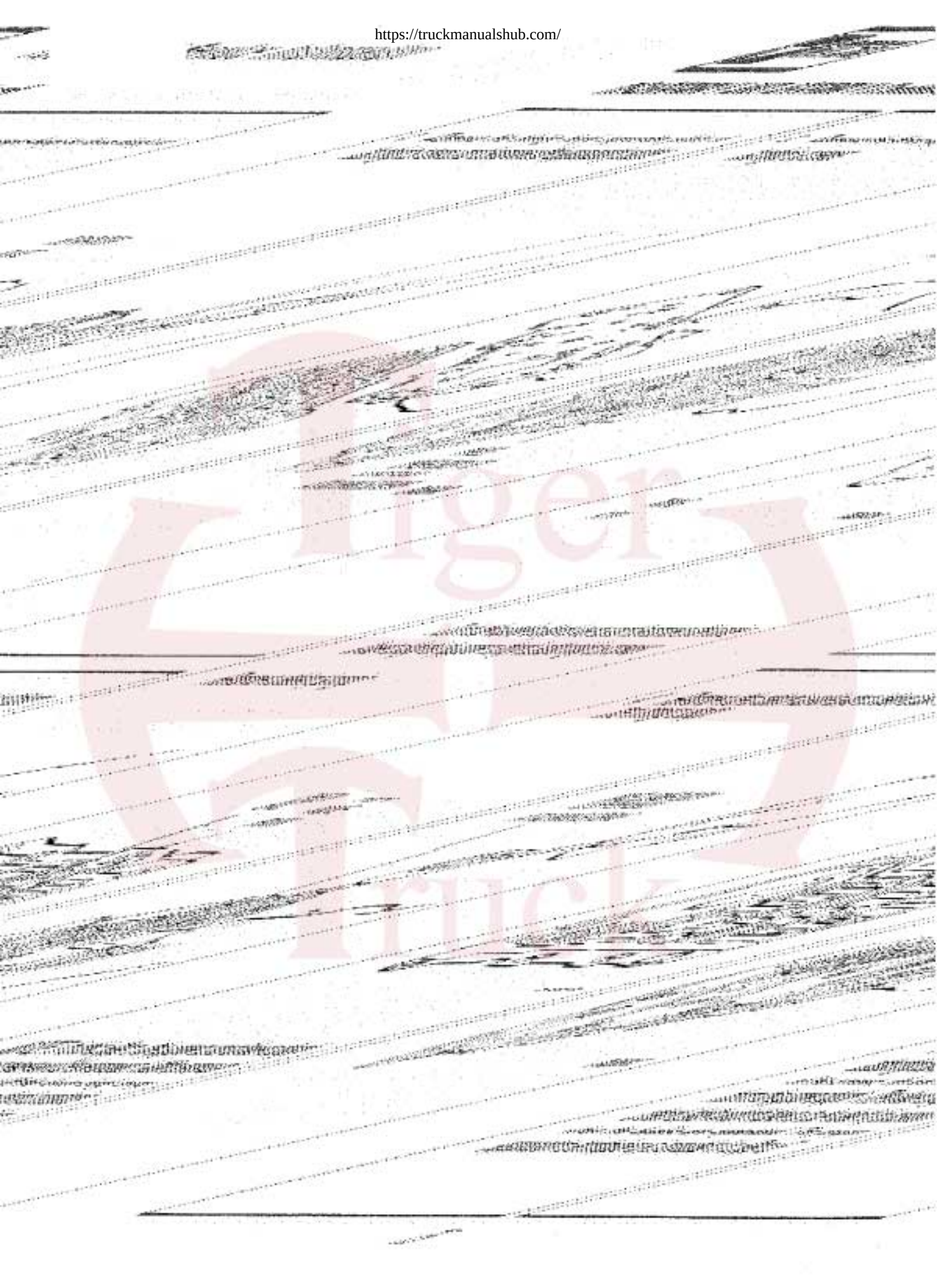
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SECTION 7A

MANUAL TRANSMISSION

(if equipped)

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GENERAL DESCRIPTION

CONSTRUCTION AND SERVICING

The transmission provides five forward speeds and one reverse speed by means of three synchronizers and four shafts – input shaft, main shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

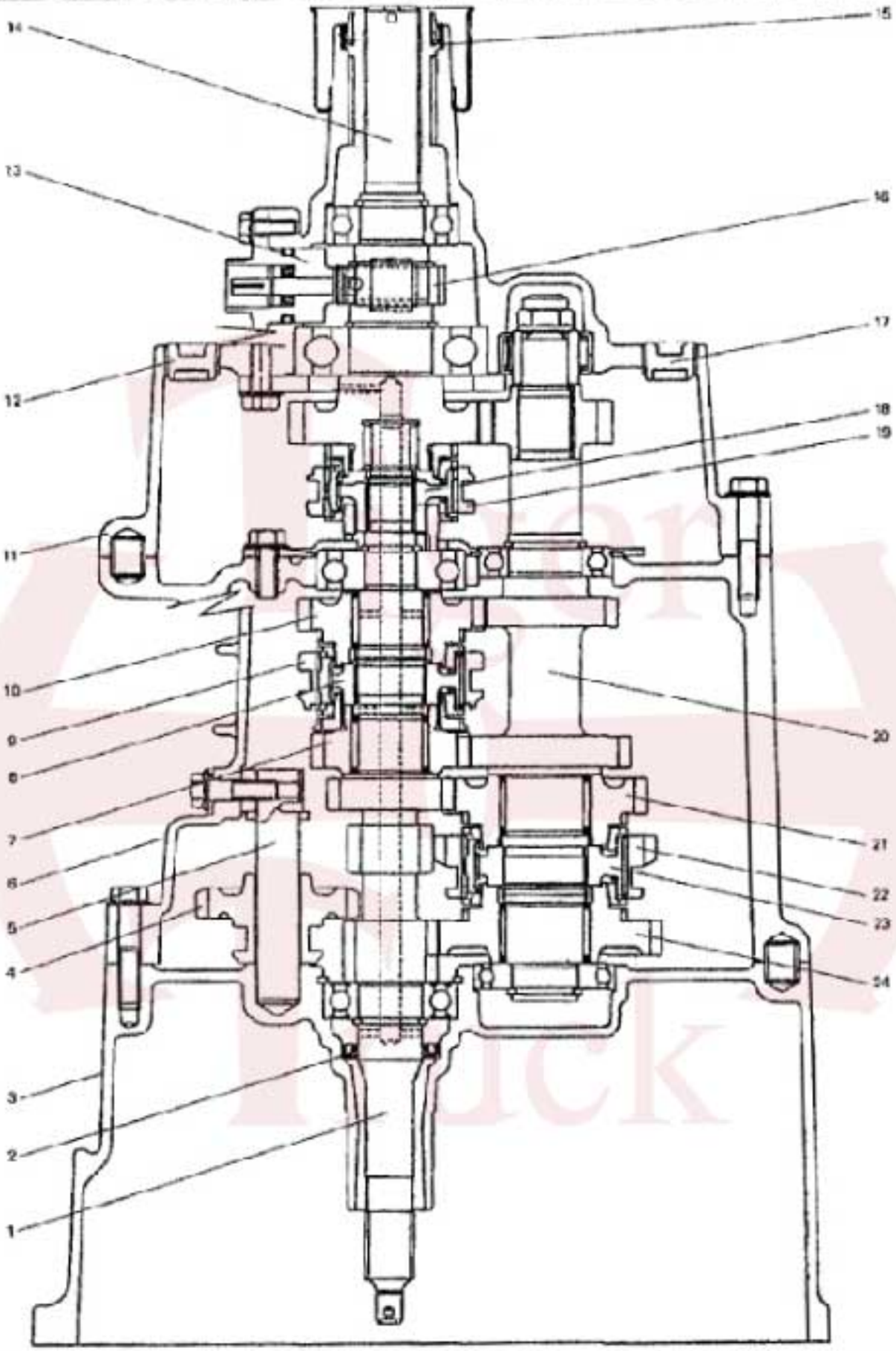
The low speed synchronizer is mounted on counter shaft and engaged with counter shaft first gear or second gear, while the high speed synchronizer is done on input shaft and engaged with input shaft third gear or fourth gear.

The fifth speed synchronizer on input shaft is engaged with fifth gear mounted on the main shaft.

The gear shift & select shaft is located at the upper of the transmission case and has a cam which prevents direct gear shift from the 5th speed gear to the reverse gear.

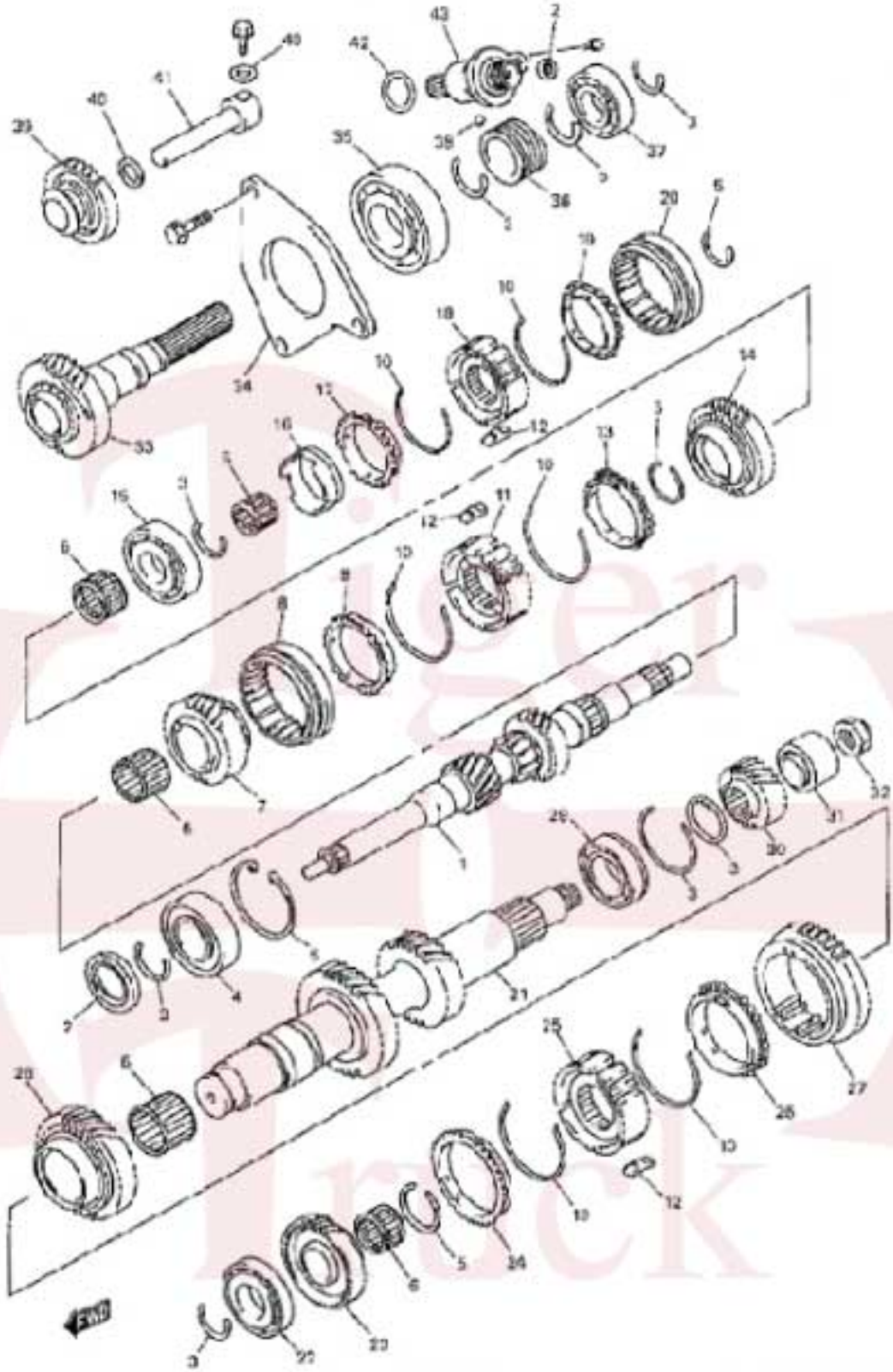
For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transmission case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

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1. Input shaft
2. Input shaft oil seal
3. Front case
4. Reverse idler gear
5. Reverse gear shaft
6. Rear case
7. Input shaft 3rd gear
8. High speed synchronizer hub
9. High speed synchronizer sleeve
10. Input shaft 4th gear
11. Extension case
12. Oil filler plug
13. Speedometer driven gear
14. Main shaft
15. Extension case oil seal
16. Speedometer drive gear
17. Oil drain plug
18. 5th speed synchronizer hub
19. 5th speed synchronizer sleeve
20. Countershaft
21. Countershaft 2nd gear
22. Low speed synchronizer sleeve
23. Low speed synchronizer hub
24. Countershaft 1st gear

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1. Input shaft
2. Oil seal
3. Snap ring
4. Input shaft front bearing
5. Circlip
6. Needle bearing
7. Input shaft 3rd gear
8. High speed sleeve
9. Synchronizer ring (3rd)
10. Synchronizer key spring
11. High speed synchronizer hub
12. Synchronizer key
13. Synchronizer ring
14. Input shaft 4th gear
15. Input shaft rear bearing
16. Reverse brake cone
17. Synchronizer ring (Reverse)
18. 5th speed synchronizer hub
19. Synchronizer ring (5th)
20. 5th/REV. sleeve
21. Countershaft
22. Countershaft front bearing
23. Countershaft 1st gear
24. Synchronizer ring (1st)
25. Low speed synchronizer hub
26. Synchronizer hub (2nd)
27. Low speed sleeve
28. Countershaft 2nd gear
29. Countershaft center bearing
30. Countershaft drive gear
31. Inner spacer
32. Countershaft nut
33. Main shaft
34. Bearing plate
35. Main shaft front bearing
36. Speedometer drive gear
37. Main shaft rear bearing
38. Ball
39. Reverse idler gear
40. Washer
41. Reverse gear shaft
42. O ring
43. Speedometer driven gear assembly

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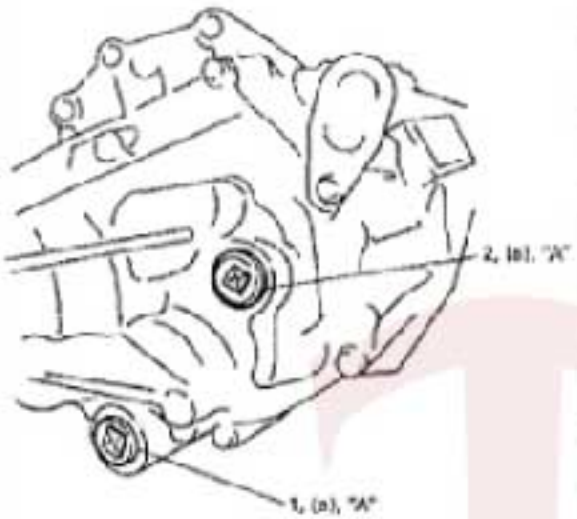
DIAGNOSIS

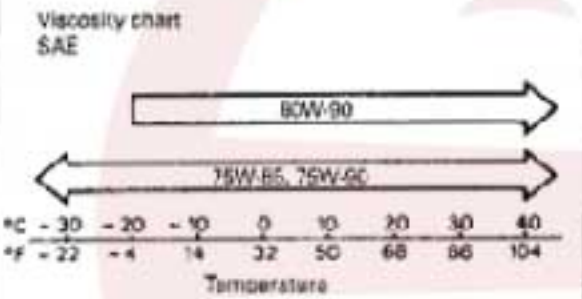
Condition	Possible Cause	Correction
Gear slipping out of mesh	• Worn shift fork shaft	Replace
	• Worn shift fork or synchronizer sleeve	Replace
	• Weak or damaged locating spring	Replace
	• Worn bearings on input shaft or mainshaft	Replace
	• Worn chamfered tooth on sleeve and gear	Replace sleeve and gear
	• Missing or disengagement of circlip(s)	Install
Gears refusing to disengage	• Weakened or broken synchronizer spring	Replace
	• Distorted shift shaft or shift fork	Replace
Hard shifting	• Improper clutch pedal free travel	Adjust
	• Distorted or broken clutch disc	Replace
	• Damaged clutch pressure plate	Replace clutch cover
	• Worn synchronizer ring	Replace
	• Worn chamfered tooth on sleeve or gear	Replace sleeve and gear
	• Distorted shift shaft	Replace
Noise	• Inadequate or insufficient lubricant	Replenish
	• Damaged or worn bearing(s)	Replace
	• Damaged or worn gear(s)	Replace
	• Damaged or worn synchronizer ring	Replace
	• Damaged or worn chamfered tooth on sleeve or gear	Replace

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ON-VEHICLE SERVICE

OIL CHANGE





1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.
3) Drain old oil and apply sealant to thread of drain plug and torque it as specified below.
4) Fill new specified oil by specified amount (up to level hole).
5) Torque level/filler plug as specified below.

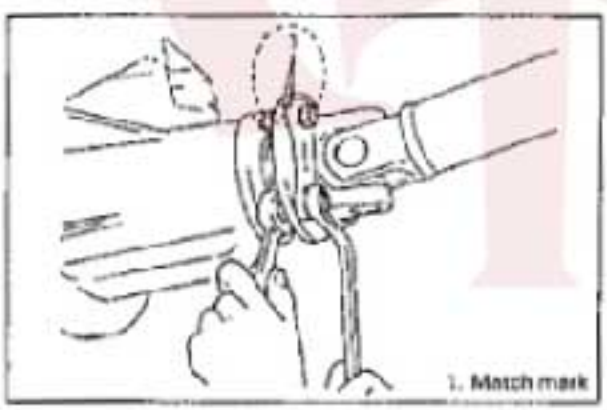
"A": Sealant 99000-31110

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

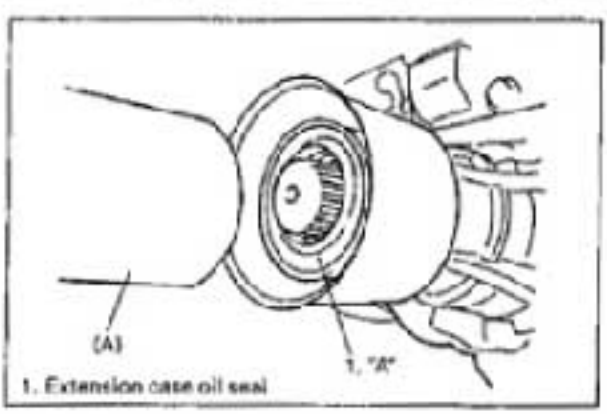
NOTE:
- **It is recommended to use API GL-4 75W-90 gear oil.**
- **Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.**

Oil specification: API GL-4
For SAE classification, refer to viscosity chart at the left.
Oil capacity: 1.2 liters (2.5/2.1 US/Imp. pt)

EXTENSION CASE OIL SEAL REPLACEMENT



1) Lift up vehicle horizontally.
2) Give match marks on joint flange and propeller shaft as shown in figure.
3) Remove 4 bolts from rear propeller shaft flange and remove propeller shaft.
4) Using screwdriver, remove oil seal.

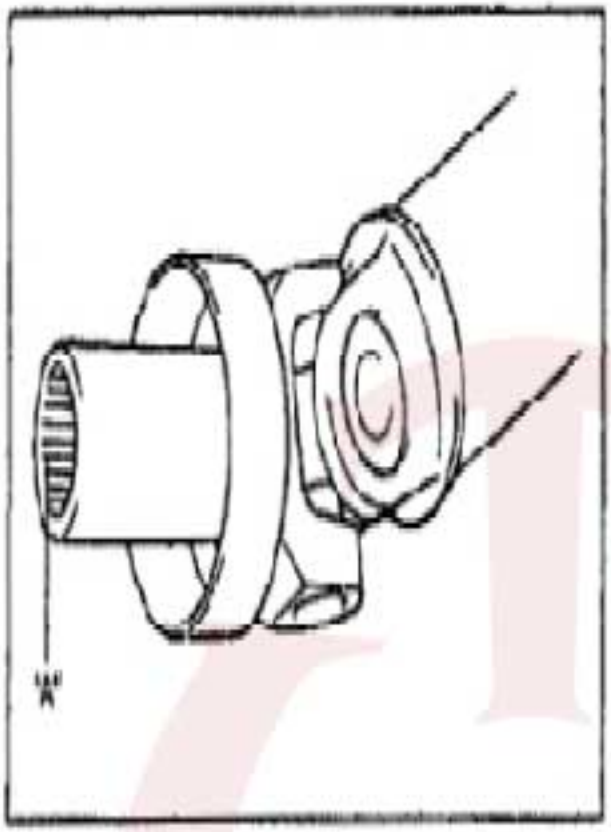


5) Using special tool and plastic hammer, press-fit new oil seal up to case surface. Be sure to apply grease to oil seal lip.

"A" : Grease 99000-25010

Special Tool
(A) : 09940-51710

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6) Clean and inspect sliding portion of propeller shaft front end (where oil seal contacts) before installation and if even small dent or scratch exists, correct and clean it again. Then apply grease inside splines of propeller shaft.

"A" : Grease 99000-25010



7) Install propeller shaft and torque universal joint flange bolts to specification.

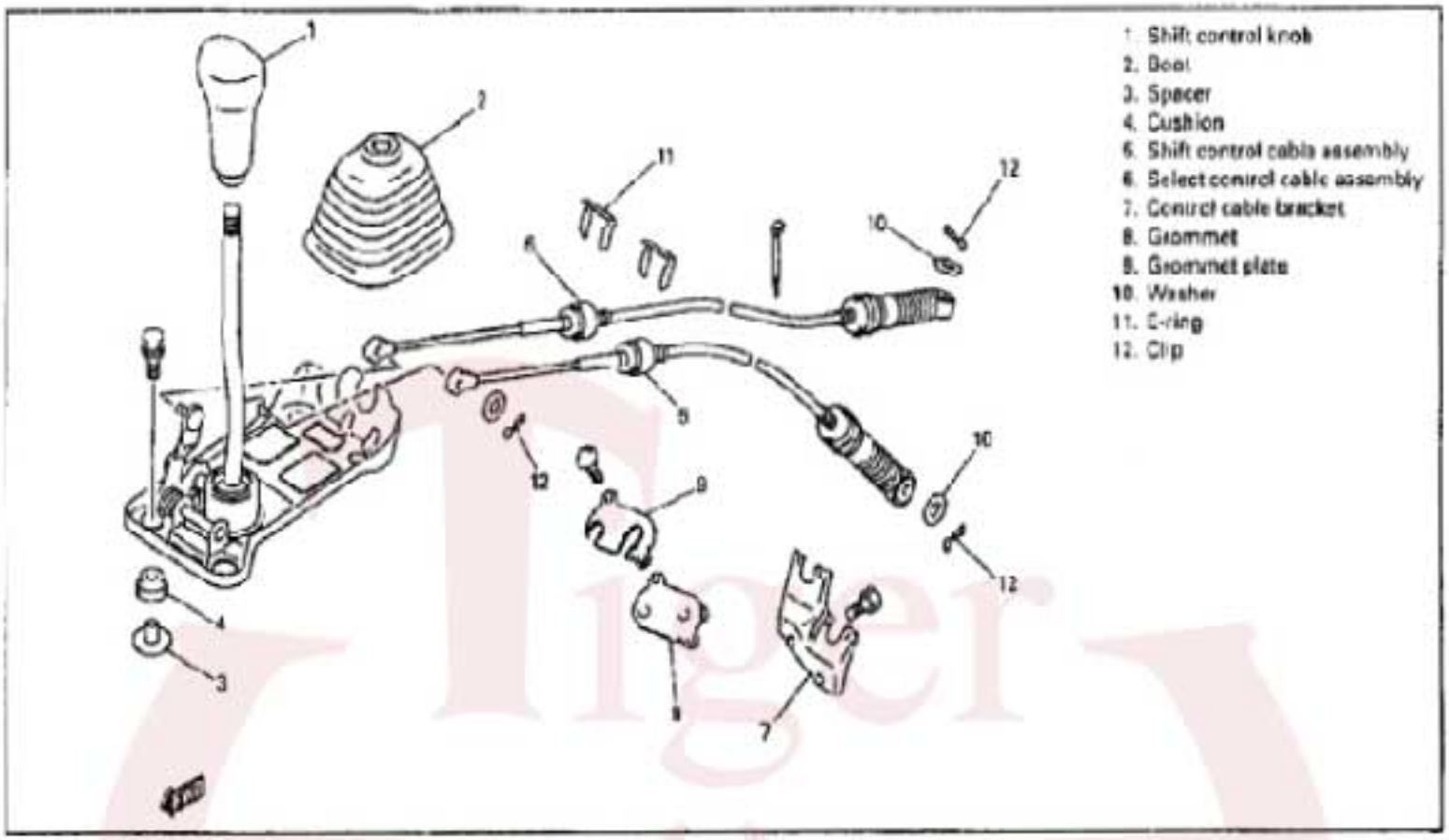
CAUTION:
Be sure to use only specified bolts, nuts and lock washers for universal joint flange.

Tightening Torque :
(a) : 55 N·m (5.5 kg-m, 40.0 lb-ft)

8) Check oil level and add new specified oil as necessary (roughly up to level hole).

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GEAR SHIFT CONTROL LEVER AND CABLE



REMOVAL

1) Remove T/M control cable end clips and washers.
2) Loosen 2 bolts and remove control cable bracket from T/M rear case.
3) Remove console box and then gear control cable grommet plate.
4) Disconnect gear shift & select control cables from gear shift control lever assembly.
5) Loosen 4 bolts and take out shift control lever assembly.

INSTALLATION

1) Apply grease to turning or sliding portions.
2) If knob has been removed from lever, apply thread lock cement and then install knob to control lever. Make sure that knob is aligned with lever.
3) Install control lever assembly and related parts as they were.

NOTE:

- **Make sure that boots are installed correctly.**
- **Check control lever for smooth movement after assembly.**

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SPEEDOMETER DRIVEN GEAR

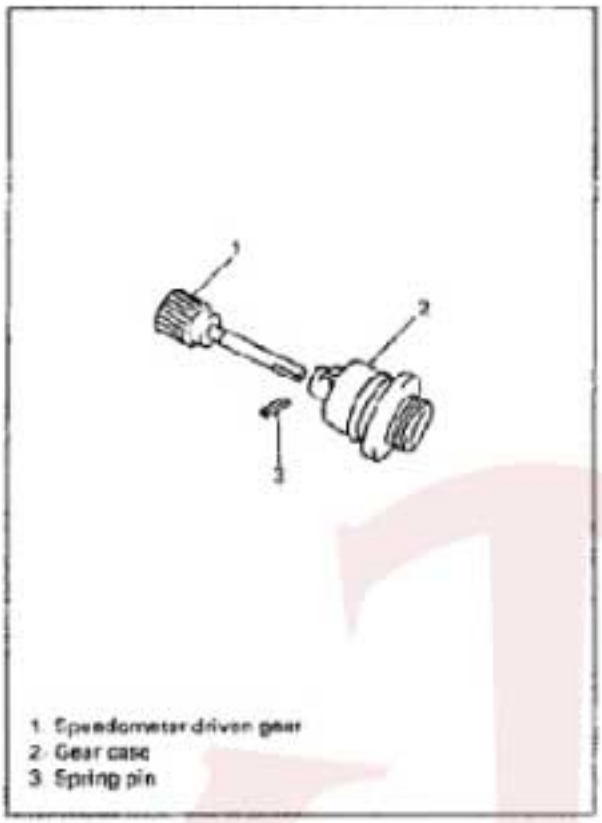
REMOVAL

1) Lift up vehicle horizontally or rear up.
2) Disconnect speedometer cable at transmission.
3) Remove bolt and take off gear case from transmission.

NOTE:
Transmission oil, although small amount, may be released then. Place oil container under speedometer driven gear case hole.

4) Drive out spring pin and remove speedometer driver gear.

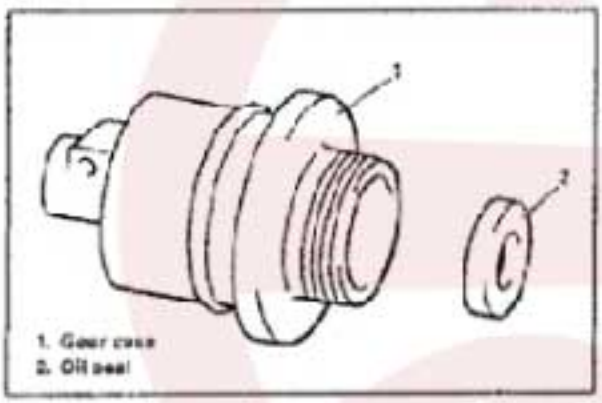
NOTE:
- **Use pin remover of 2.8 – 3.0 mm (0.11 in.) diameter for spring pin removal.**
- **Do not support or hit driven gear while removing spring pin.**



1. Speedometer driven gear
2. Gear case
3. Spring pin

5) Remove oil seal from case.

NOTE:
Use small L-type drive handle to remove oil seal.



1. Gear case
2. Oil seal

INSTALLATION

1) Make sure that O-ring and case have not been damaged and apply grease to O-ring.
2) Apply grease to driven gear as shown in figure.
3) Apply grease to lip portion of new oil seal and install it until bottom, directing lip side toward inside. Special tool may be used for installation.

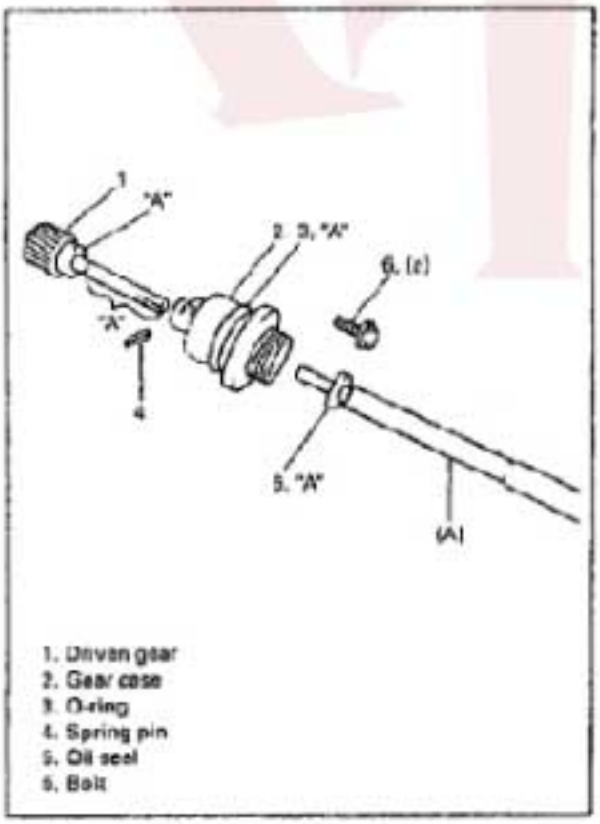
"A" : Grease 99000-25010

Special Tool
(A) : 09916-46010

4) Inspect speedometer driven gear for abnormal wear of gear teeth or bend of shaft portion and replace it if necessary.
5) Insert driven gear to case and fix it with spring pin, then make sure its smooth rotation.
6) Install case assembly to transmission and connect cable as it was.

Tightening Torque
(a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

7) Make sure that oil level is in specification.



1. Driven gear
2. Gear case
3. O-ring
4. Spring pin
5. Oil seal
6. Bolt

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1. Backup light switch coupler
2. Transmission mounting

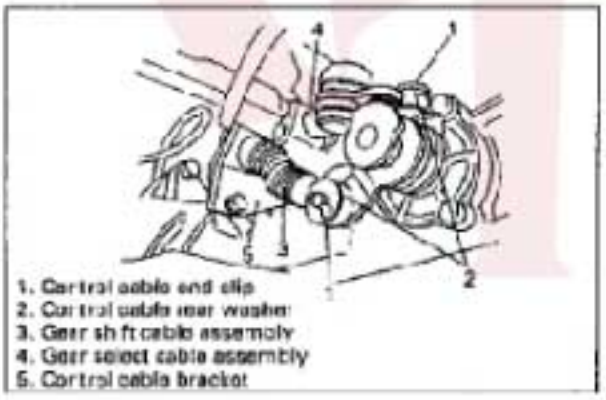
DISMOUNTING

1) Disconnect negative ( ) and positive (+) cords from battery terminals and hoist car.
2) Disconnect back up light switch lead wire at coupler.
3) Disconnect Black/yellow lead wire and positive (+) cord from starting motor.
4) Remove starting motor from transmission case and disconnect battery negative (–) cord from transmission case.
5) Free back up light switch lead wire from clamps.
6) Disconnect speedometer cable from transmission case.
7) Remove drain plug to drain oil in transmission.



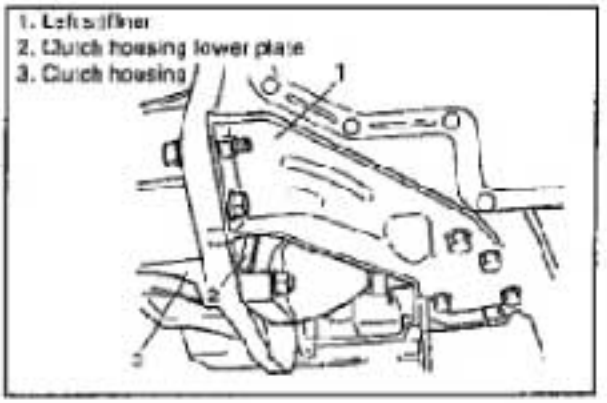
1. Clutch cable assembly
2. Clutch release fork
3. Transmission front case

8) Remove transmission front case cap and disconnect clutch cable from clutch release fork.



1. Control cable end clip
2. Control cable gear washer
3. Gear shift cable assembly
4. Gear select cable assembly
5. Control cable bracket

9) Remove control cable end clips and washers, and then disconnect gear shift cable and select cable from each lever.
10) Remove control cable bracket.



1. Left stiffner
2. Clutch housing lower plate
3. Clutch housing

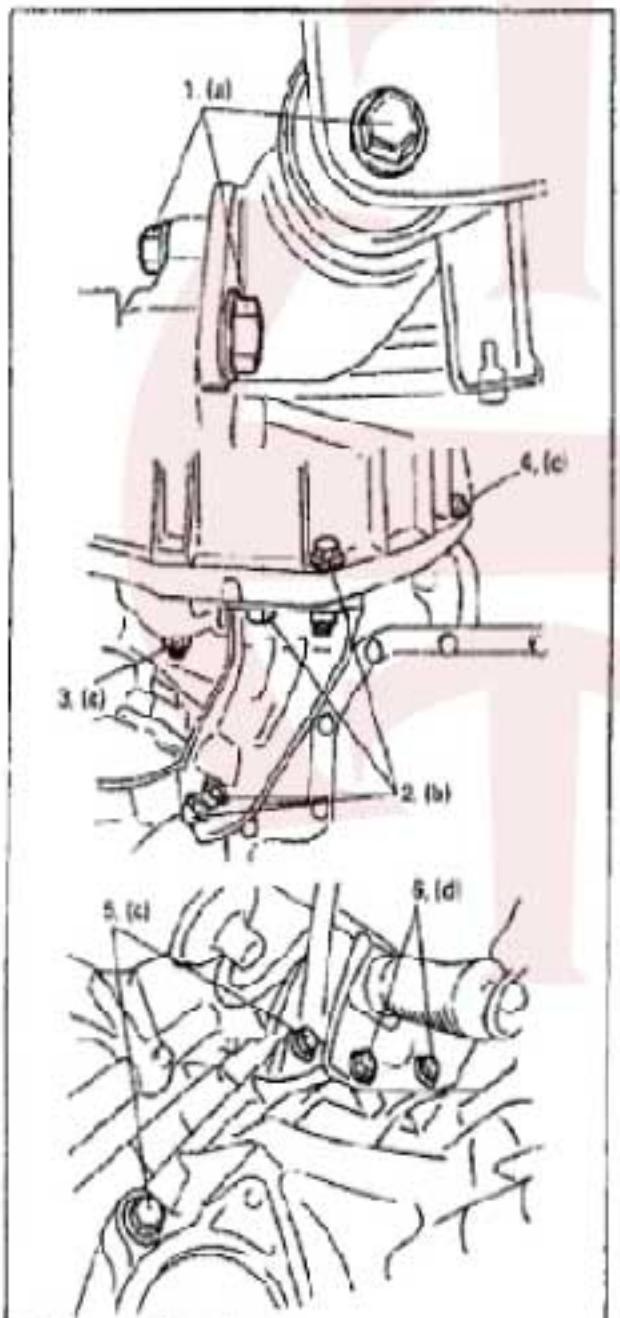
11) Remove propeller shaft.
12) Remove left stiffner, and then remove clutch housing lower plate from transmission case.

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13) Remove nuts fastening engine cylinder block and transmission case.

NOTE:
Before starting to remove transmission, check around once again to be sure that there is no connection left undone.

14) Remove transmission rear mounting bolt & nut from chassis.
15) Take down transmission.



1. Rear mounting bolt
2. Left stiffner bolt
3. Cylinder block & T/M case nut
4. Right stiffner bolt
5. Cylinder block & T/M case bolt
6. Control cable bracket bolt

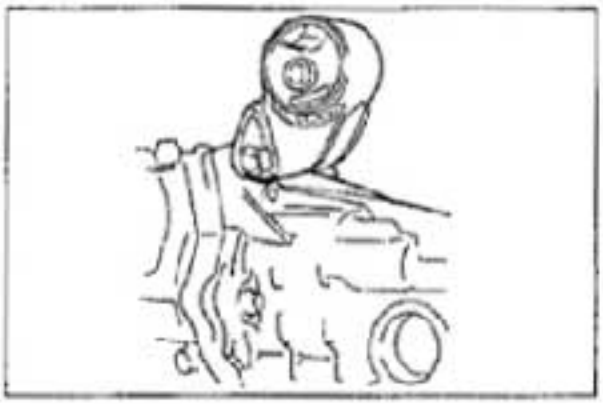
REMOUNTING

For remounting, reverse dismounting procedure.
Use specified torques as given below.

Tightening Torque
(a): 50 N·m (5.0kg-m, 36.0 lb-ft)
(b): 55 N·m (5.5kg-m, 40.0 lb-ft)
(c): 61 N·m (6.1kg-m, 44.0 lb-ft)
(d): 23 N·m (2.3kg-m, 17.0 lb-ft)

NOTE:
- **To facilitate remounting, install rear mounting to transmission after inserting input shaft into clutch disc.**
- **For tightening torque of starting motor bolts, refer to section 6G1.**
- **Refill specified amount of gear oil as previously outlined.**
- **After connecting clutch cable, be sure to adjust its play properly (refer to SECTION 7C).**

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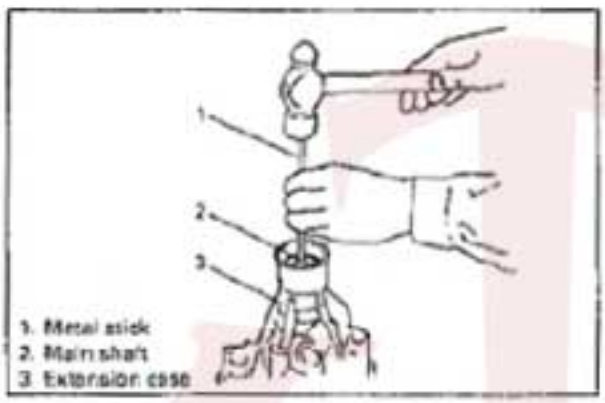


UNIT REPAIR

UNIT DISASSEMBLY

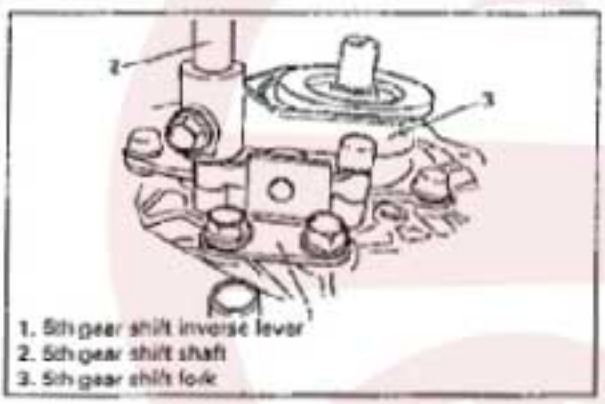
MAIN SHAFT

1) Remove 7 bolts and transmission mounting, and then take off extension case.

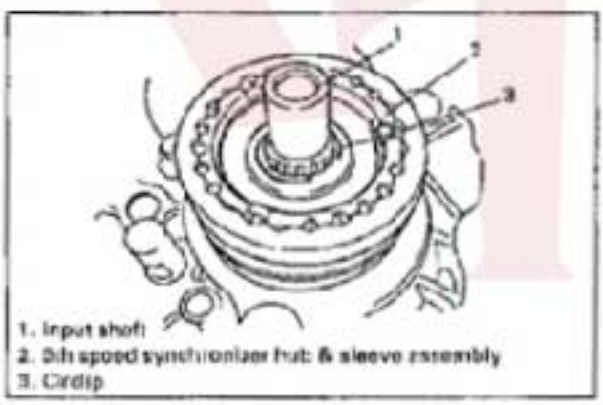


2) Remove main shaft front bearing plate and then drive out main shaft assembly by using metal stick and hammer.

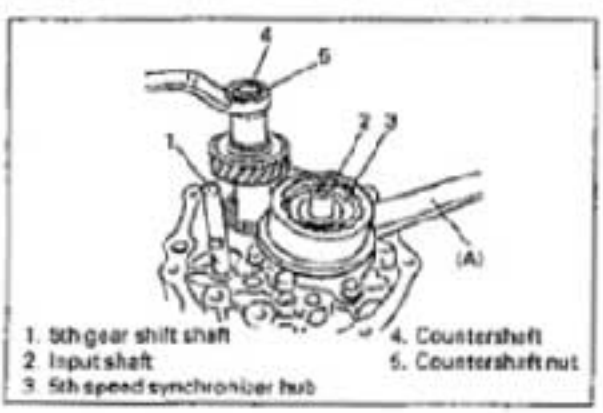
CAUTION:
Be careful not to damage oil seal.



3) Remove 5th gear shift inverse lever.
4) Remove bolt and then take out 5th gear shift shaft and shift fork.



5) Remove circlip and then take out 5th speed synchronizer sleeve & hub assembly, reverse shift brake ring and taper cone.
6) Disassemble sleeve & hub assembly.

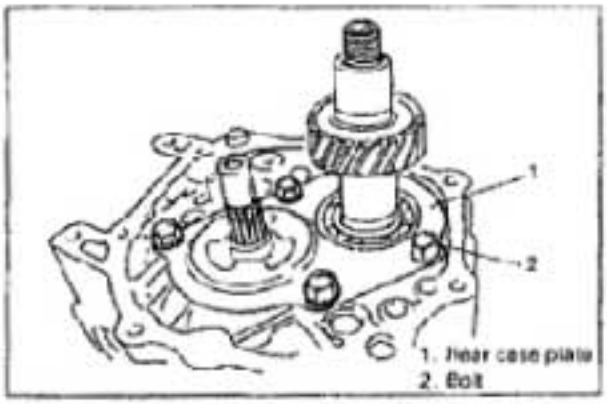


7) Push low speed gear shift shaft by using 5th gear shift shaft so that countershaft is engaged with input shaft.
8) Unfasten caulking of countershaft nut, install 5th speed synchronizer hub together with special tool, and then remove countershaft nut.

Special Tool
(A) : 09927-25411

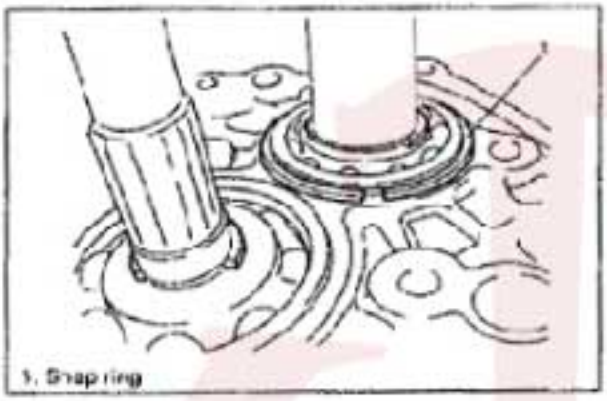
9) Remove 5th gear shift shaft, synchronizer hub and special tool.

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1. Rear case plate
2. Bolt

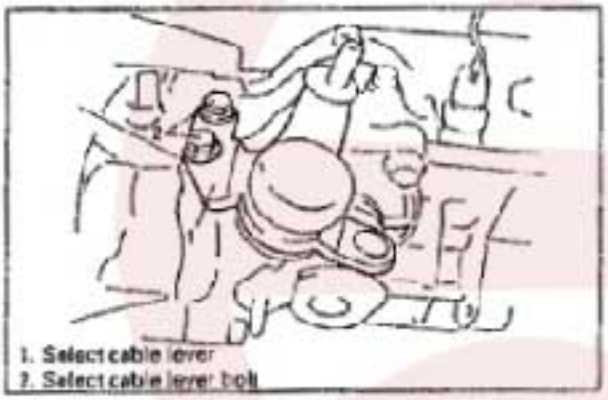
10) Remove 5 bolts and then take off rear case plate.



1. Snap ring

GEAR SHIFTER, INPUT SHAFT AND COUNTER-SHAFT

1) Remove countershaft center bearing snap ring.



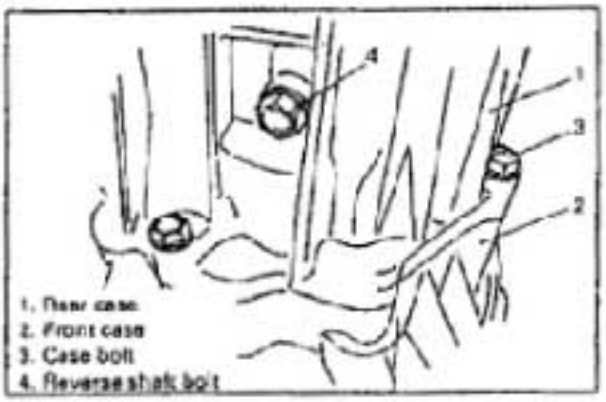
1. Select cable lever
2. Select cable lever bolt

2) Unfasten 2 bolts and then take out select cable lever.



1. Gear shift stop bolt
2. 5th to REV interlock guide bolt
3. Backup light switch
4. Gear shift & select shaft assembly
5. Gear shift guide case
6. Gear shift guide case bolt

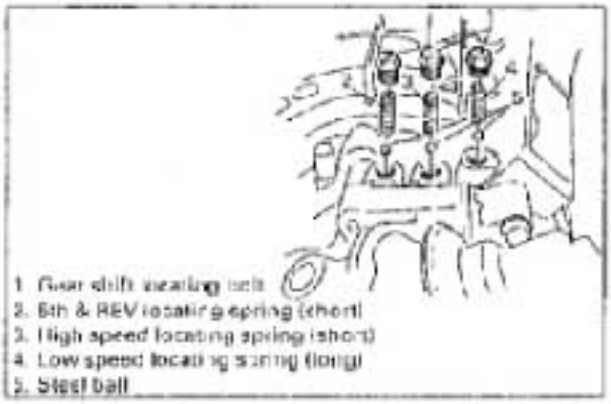
3) Remove gear shift stop bolt and 5th to reverse interlock guide bolt.
4) Remove back up light switch.
5) Remove 3 bolts from gear shift guide case and then pull out gear shift & select shaft assembly.



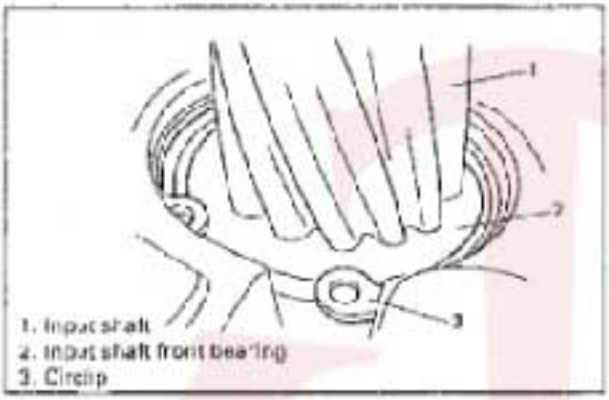
1. Rear case
2. Front case
3. Case bolt
4. Reverse shaft bolt

6) Remove reverse shaft bolt with washer.
7) Remove 5 case bolts from outside and another 3 from front case side.
8) Separate rear case from front case and remove it.

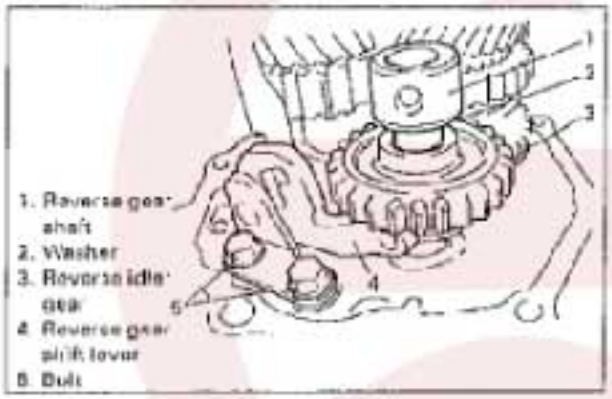
https://truckmanualshub.com/


1. Gear shift locating bolt
2. 5th & REV locating spring (short)
3. High speed locating spring (short)
4. Low speed locating spring (long)
5. Steel ball

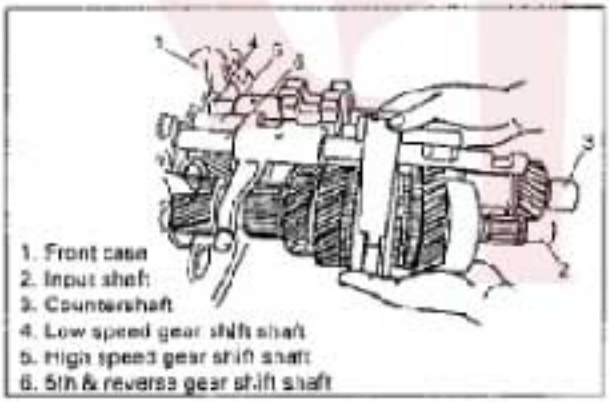
9) Remove gear shift locating bolts and take out low locating spring, high & 5th locating springs and 3 balls.


1. Input shaft
2. Input shaft front bearing
3. Circlip

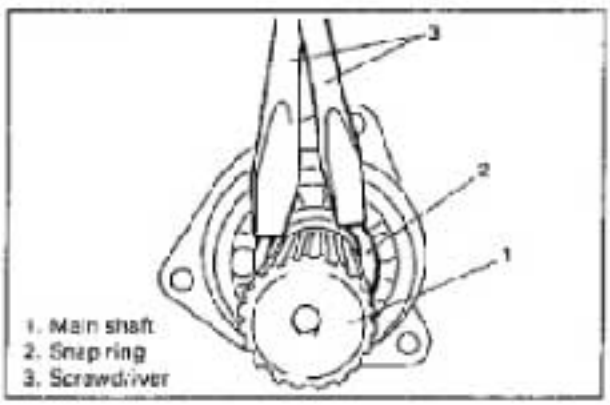
10) Remove input shaft front bearing circlip.


1. Reverse gear shaft
2. Washer
3. Reverse idler gear
4. Reverse gear shift lever
5. Bolt

11) Remove 2 bolts and reverse gear shift lever.
12) Pull out reverse gear shaft with washer, then take off reverse idler gear.


1. Front case
2. Input shaft
3. Countershaft
4. Low speed gear shift shaft
5. High speed gear shift shaft
6. 5th & reverse gear shift shaft

13) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly, counter shaft assembly, high speed gear shift shaft, low speed gear shift shaft and 5th & reverse gear shift shaft all at once.
14) Remove input shaft oil seal from front case as necessary.

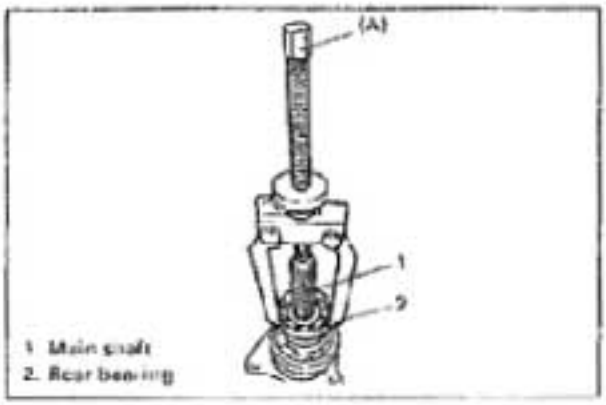

1. Main shaft
2. Snap ring
3. Screwdriver

MAIN SHAFT ASSEMBLY

DISASSEMBLY

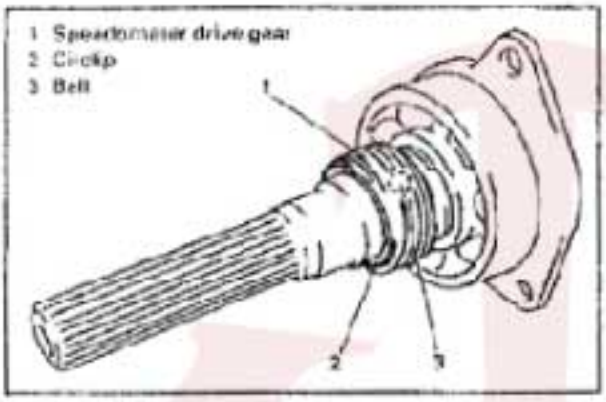
1) Remove snap ring as shown in figure.

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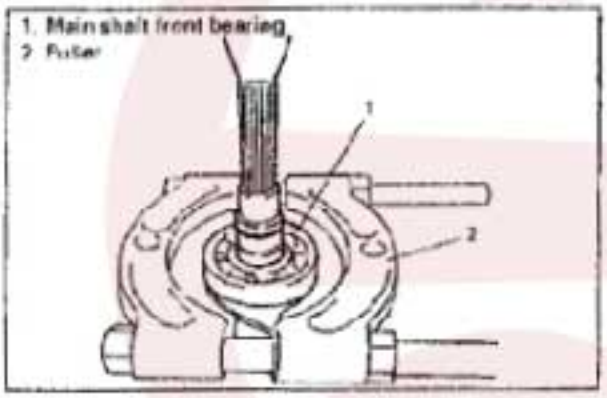


2) Drive out rear bearing by using special tool.

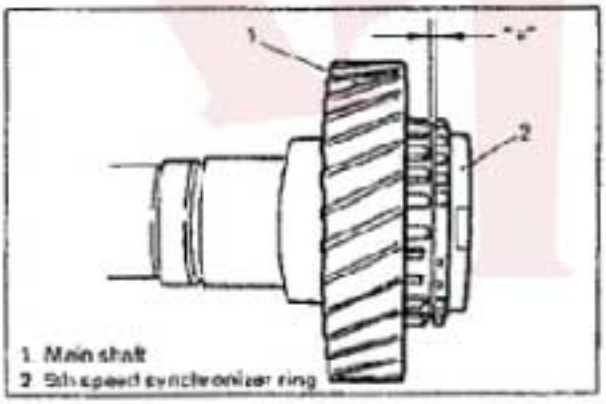
Special Tool
(A) : 09913-65135



3) Remove circlip, and then take out speedometer drive gear and ball.



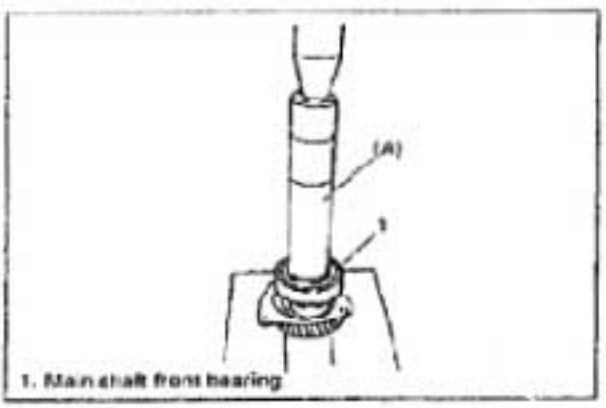
4) Remove snap ring, and then pull off front bearing by using puller and press.



INSPECTION AND REASSEMBLY

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) If synchronizer parts need to be repaired, check clearance "a" between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

Clearance "a" : Standard 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit 0.5 mm (0.019 in.)

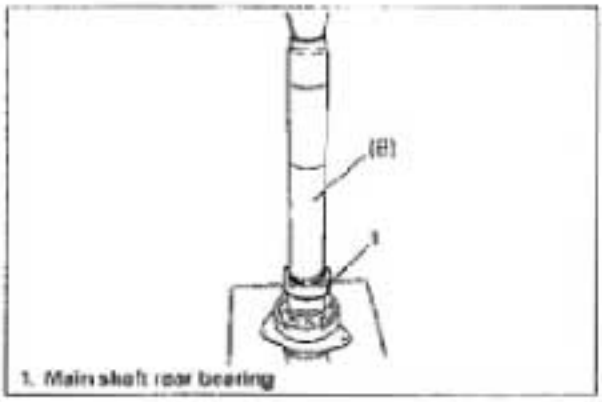


3) Apply gear oil to front bearing, press-fit it by using special tool and press, and then install snap ring.

Special Tool
(A) : 09940-51710

4) Install ball, speedometer drive gear and circlip.

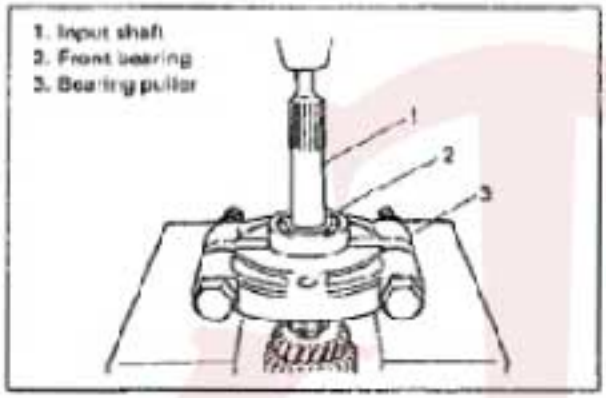
https://truckmanualshub.com/



1. Main shaft rear bearing

5) Apply gear oil to rear bearing, press-fit it by using special tool and press, and then install snap ring.

Special Tool
(B) : 09925-18010

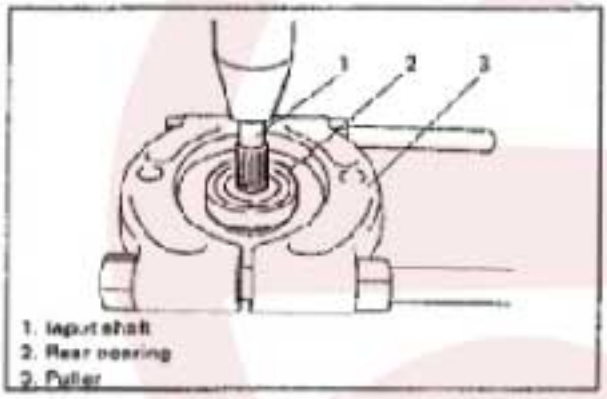


1. Input shaft
2. Front bearing
3. Bearing puller

INPUT SHAFT ASSEMBLY

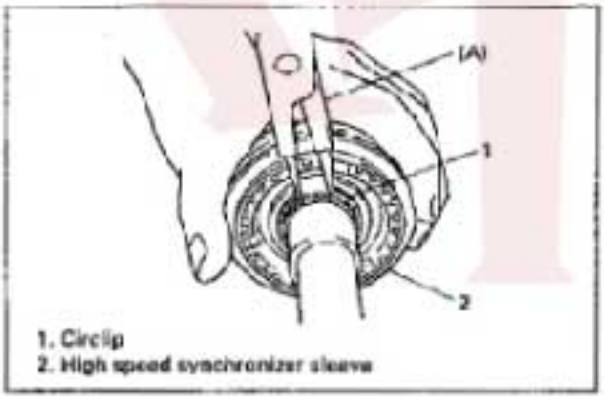
DISASSEMBLY

1) Remove snap ring and then remove input shaft front bearing by using bearing puller and press.



1. Input shaft
2. Rear bearing
3. Puller

2) Remove snap ring and pull off rear bearing by using puller and press.

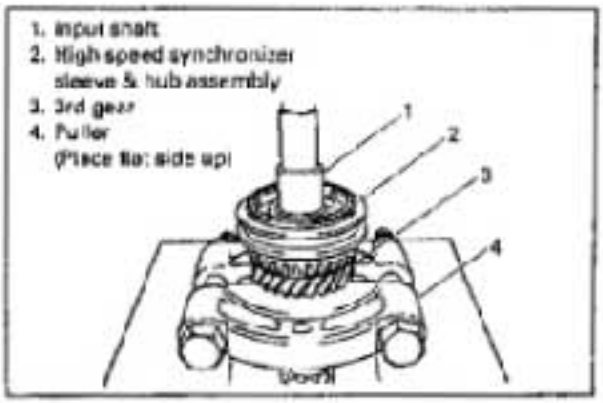


1. Circlip
2. High speed synchronizer sleeve

3) Take out 4th gear, needle bearing and high speed synchronizer ring.
4) Using special tool, remove circlip.

NOTE:
For smooth removal of circlip, it is recommended to correct tool tips to be flat.

Special Tool
(A) : 09900-06107



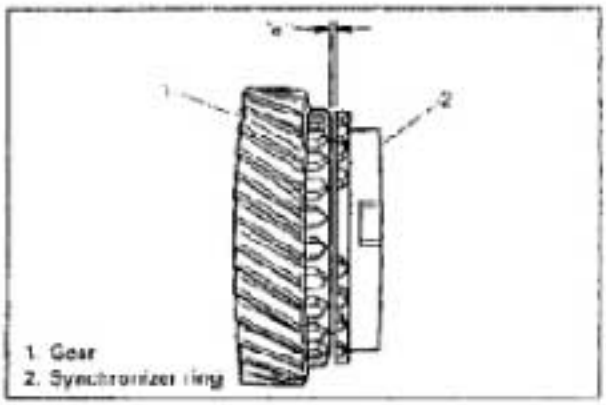
1. Input shaft
2. High speed synchronizer sleeve & hub assembly
3. 3rd gear
4. Puller
(Place flat side up)

5) Drive out high speed synchronizer sleeve & hub assembly together with 3rd gear by using puller and press.

> **CAUTION:**
> **Make sure to use flat side of puller to avoid causing damage to 3rd gear tooth.**

6) Take out 3rd gear needle bearing from shaft.
7) Disassemble synchronizer sleeve & hub assembly.

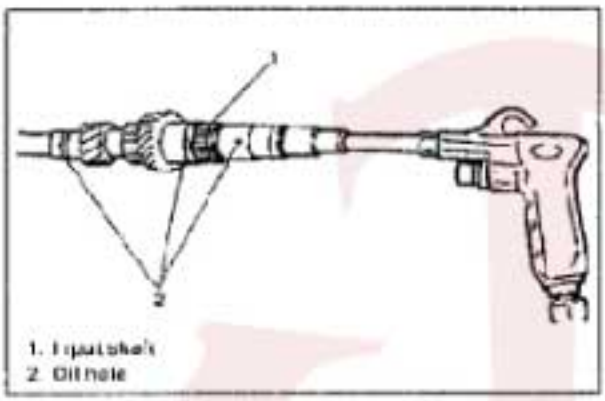
https://truckmanualshub.com/



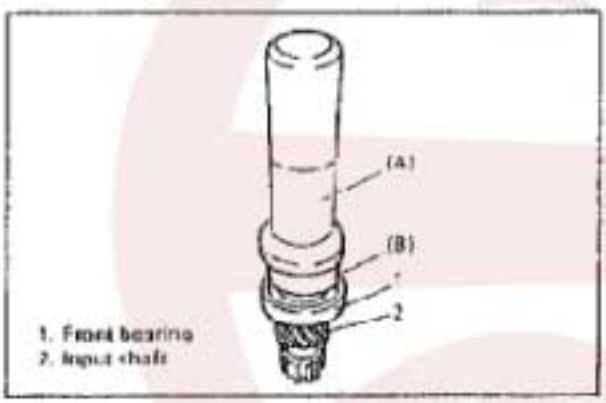
INSPECTION AND REASSEMBLY

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) If synchronizer parts need to be repaired, check clearance "a" between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

Clearance "a": Standard 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit 0.5 mm (0.019 in.)

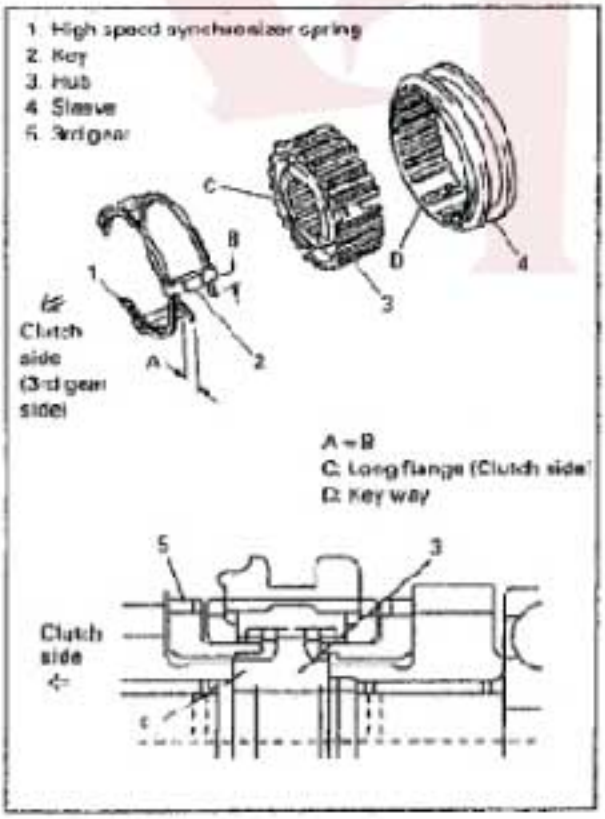


3) To ensure lubrication, air blow oil holes and make sure that they are free from any obstruction.



4) Apply gear oil to front bearing, press-fit it by using special tool and press, and then install snap ring.

Special Tool
(A) : 09951-16080
(B) : 09940-54950

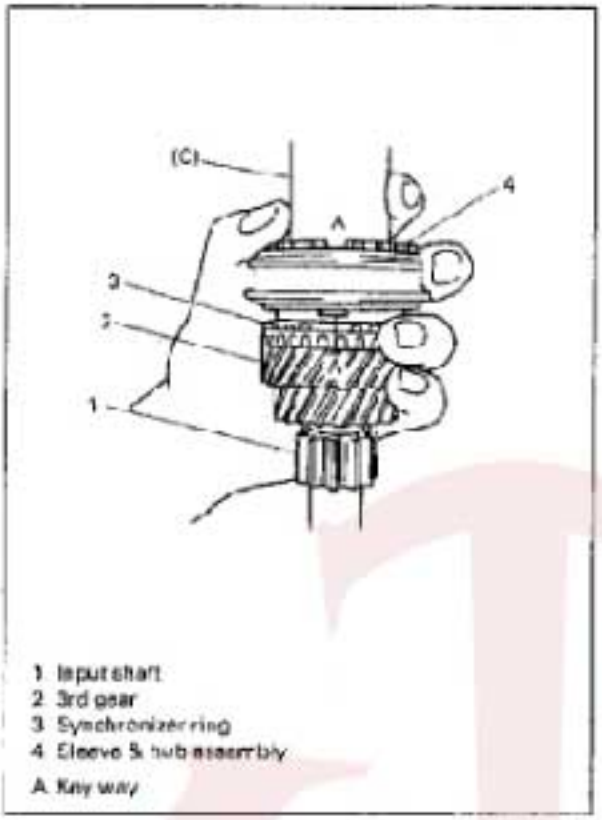


5) Fit high speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated left.

NOTE:

- **No specific direction is assigned to each key but it is assigned as assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

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1. Input shaft
2. 3rd gear
3. Synchronizer ring
4. Sleeve & hub assembly

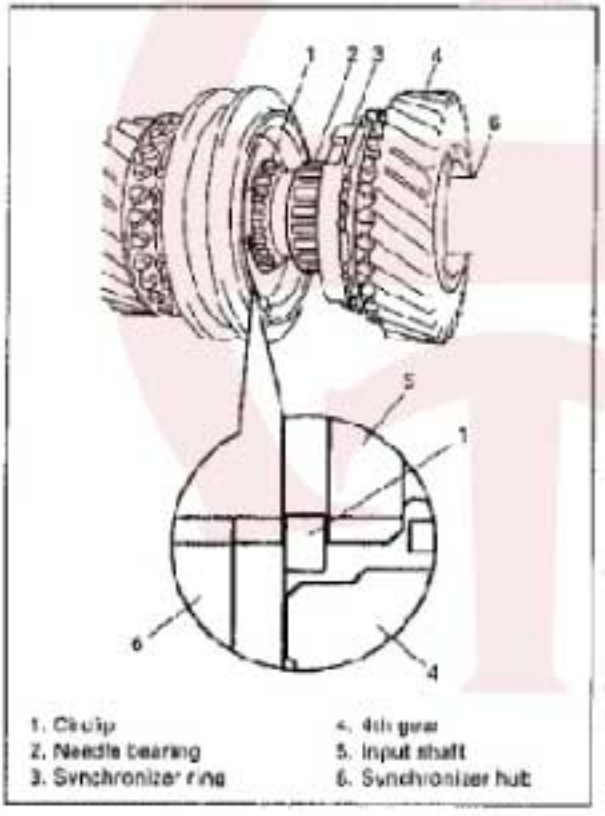
A. Key way

6) Install 3rd gear needle bearing and apply gear oil to it.
7) Install 3rd gear and synchronizer ring after applying gear oil to them.
8) Drive in high speed sleeve & hub assembly by using special tool and hammer.

NOTE:

- **High speed sleeve & hub assembly has specific installing direction. Refer to figure at step 5) in this item.**
- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Synchronizer rings for 3rd and 4th are identical.**

Special Tool
(C): 09913-84510

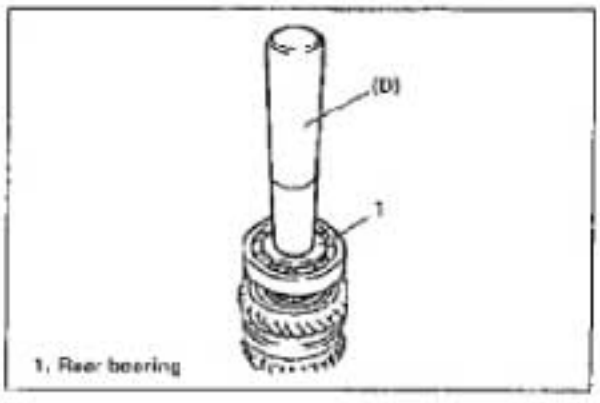


1. Circlip
2. Needle bearing
3. Synchronizer ring
4. 4th gear
5. Input shaft
6. Synchronizer hub

9) Install circlip in proper direction as shown in figure. Apply gear oil to needle bearing and install it.

CAUTION:
Confirm that circlip is installed in groove securely.

10) Install synchronizer ring. Apply gear oil to sliding portion of 4th gear and install it.

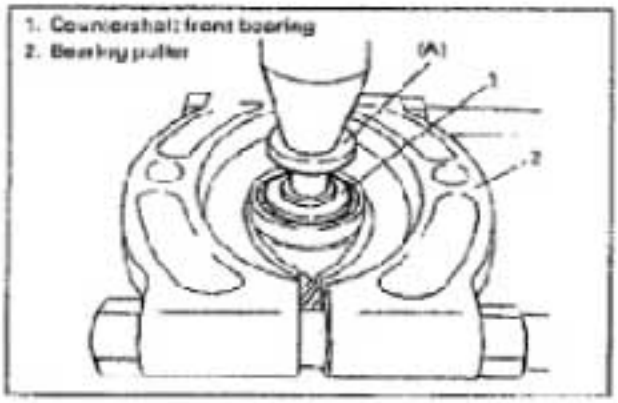


1. Rear bearing

11) Press-fit rear bearing by using special tool and hammer, and then install snap ring.

Special Tool
(D): 09925-98221

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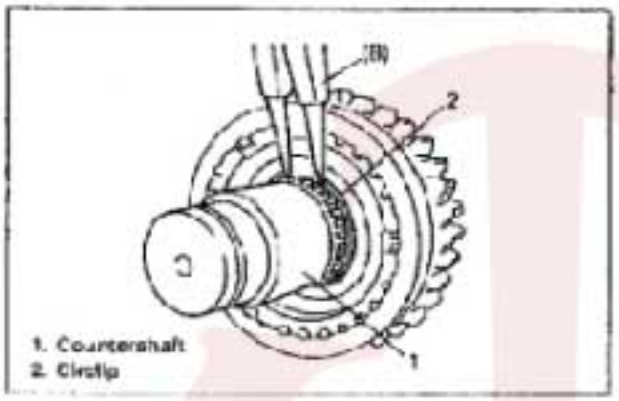
COUNTERSHAFT ASSEMBLY

DISASSEMBLY

1) Remove snap ring and then drive out front bearing by using special tool, puller and press.

Special Tool
(A): 09913-85230

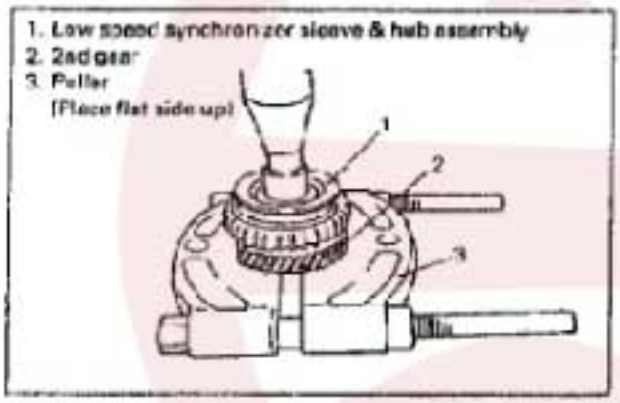
2) Take out 1st gear, 1st gear needle bearing and synchronizer ring.



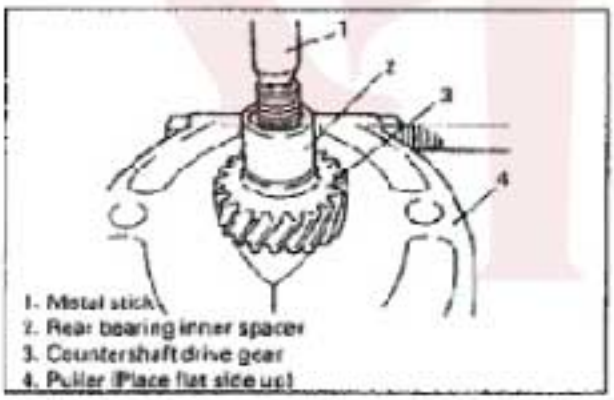
3) Using special tool, remove circlip.

NOTE:
Correct tool tips to be flat to facilitate removal of circlip.

Special Tool
(B): 09900-06107

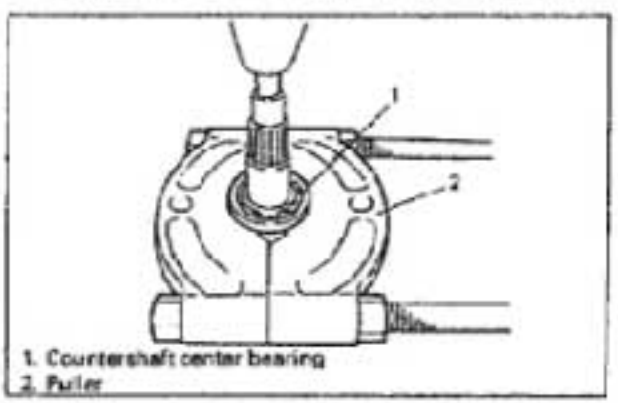


4) Apply puller to 2nd gear and pull off low speed synchronizer sleeve & hub assembly with gear by using press.
5) Disassemble synchronizer sleeve & hub assembly.
6) Take out needle bearing from shaft.



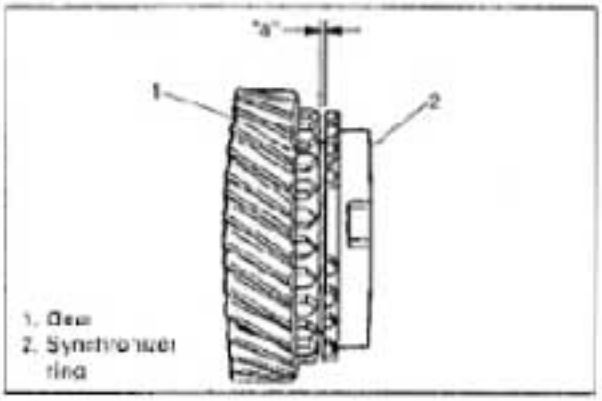
7) Apply puller to drive gear and pull off rear bearing inner spacer with gear by using puller, metal stick and press.

CAUTION:
Make sure to use flat side of puller so as not to damage drive gear tooth.



8) Remove snap ring and then drive out center bearing by using puller and press.

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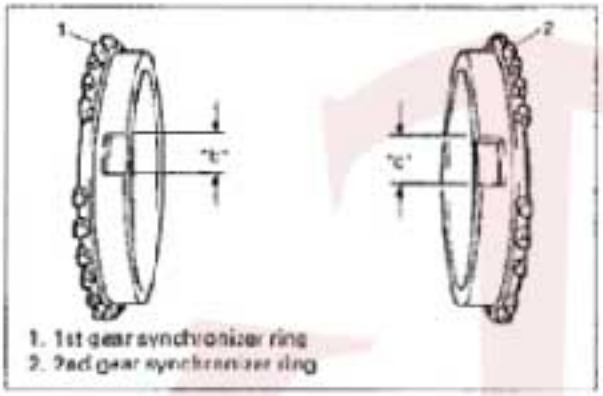


1. Gear
2. Synchronizer ring

INSPECTION AND REASSEMBLY

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) If synchronizer parts need to be repaired, check clearance "a" between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

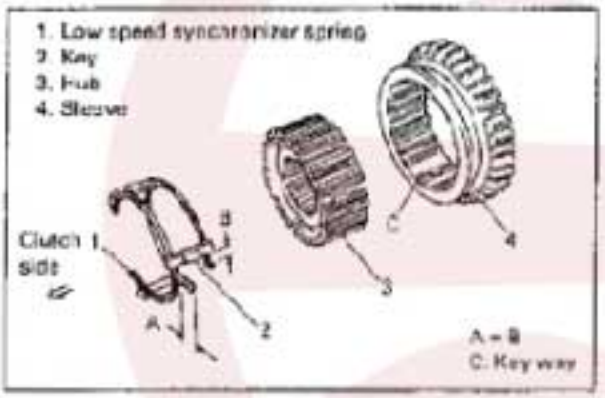
Clearance "a": Standard 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit 0.5 mm (0.019 in.)



1. 1st gear synchronizer ring
2. 2nd gear synchronizer ring

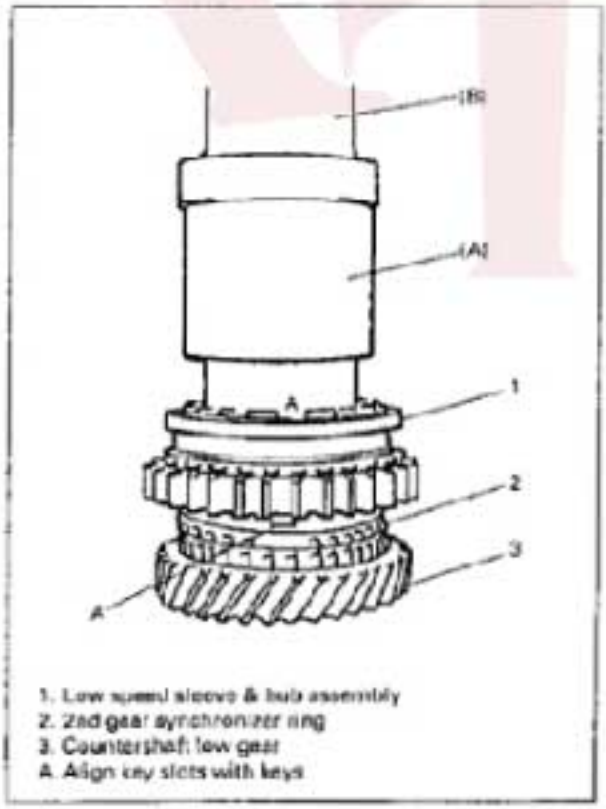
3) Install 2nd gear needle bearing and apply gear oil to it.
4) Apply gear oil to sliding portion of 2nd gear, and then install 2nd gear and 2nd gear synchronizer ring.

NOTE:
Key slot width of 1st synchronizer ring is smaller than that of 2nd synchronizer ring.
Distinguish the difference properly.
Width "b": 8.2 mm (0.32 in.)
"c": 8.8 mm (0.35 in.)



5) Fit low speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated left.

NOTE:
- **No specific direction is assigned to low speed synchronizer hub or each key but it is assigned as assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**



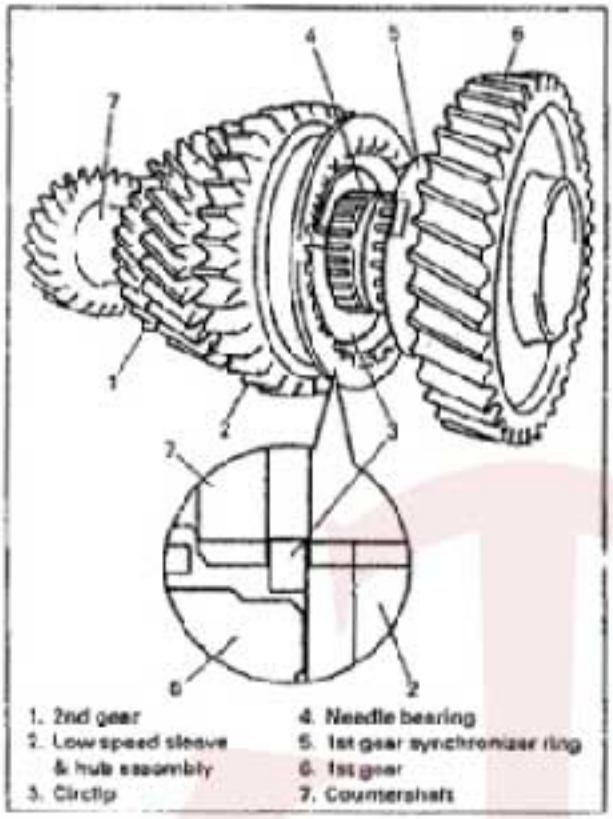
1. Low speed sleeve & hub assembly
2. 2nd gear synchronizer ring
3. Countershaft low gear
A. Align key slots with keys

6) Drive in low speed sleeve & hub assembly by using special tool and hammer.

NOTE:
- **Make sure that synchronizer ring key slots are aligned with keys while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st and 2nd gears after press-fitting sleeve & hub assembly.**

Special Tool
(A): 09940-53111
(B): 09913-85210

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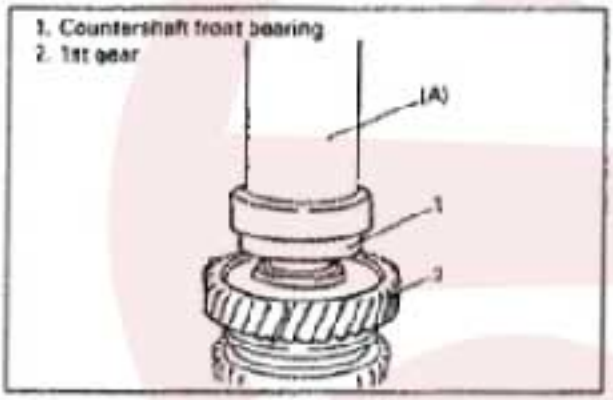


1. 2nd gear
2. Low speed sleeve & hub assembly
3. Circlip
4. Needle bearing
5. 1st gear synchronizer ring
6. 1st gear
7. Countershaft

7) Install circlip in proper direction as shown in figure.

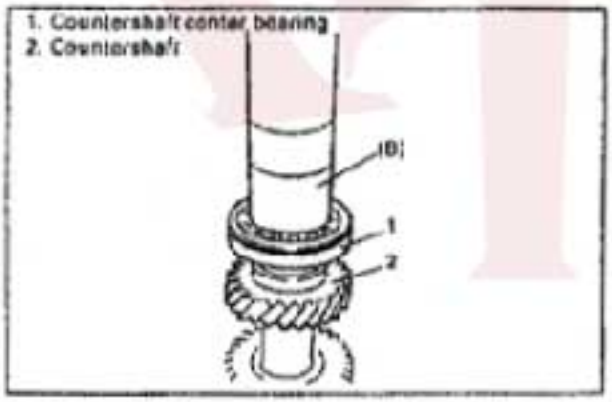
CAUTION:
Confirm that circlip is installed in groove securely.

8) Install needle bearing and apply gear oil to bearing. Then install 1st gear synchronizer ring.
Apply gear oil to sliding portion of 1st gear and install it.



9) Apply gear oil to front bearing, install it by using special tool and press and then install snap ring.

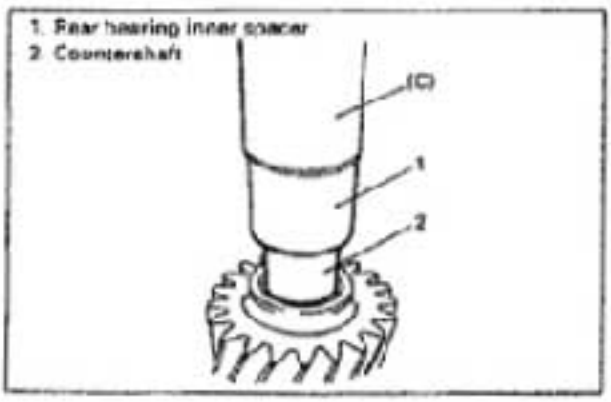
Special Tool
(A): 09913-85210



10) Apply gear oil to center bearing, install it by using special tool and hammer and then install snap ring.

Special Tool
(B): 09941-74910

11) Using the same special tool, drive in countershaft drive gear.



12) Press-fit rear bearing inner spacer by using special tool and hammer.

Special Tool
(C): 09925-98221

13) Apply gear oil to outer surface of spacer.

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GEAR SHIFTER

GEAR SHIFT & SELECT SHAFT ASSEMBLY

1) To disassembly component parts, use special tools and 2.8 – 3.0 mm (0.11 in.) pin remover in addition.

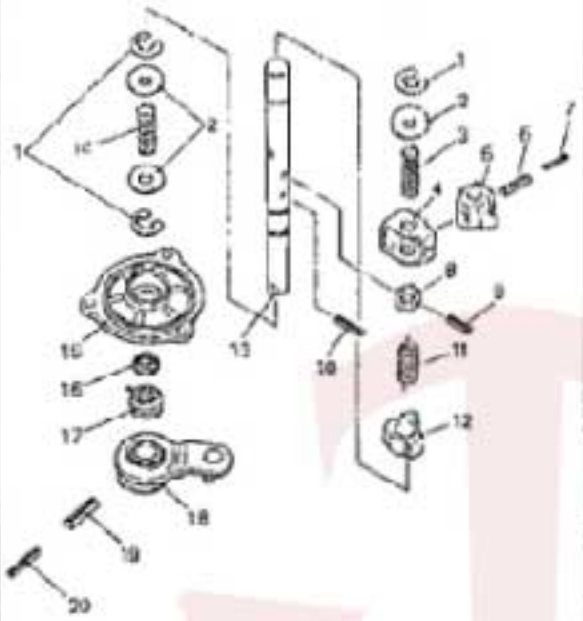
Special Tool
(A): 09922-85811 (4.5 mm)
(B): 09925-78210 (6.0 mm)

2) Clean all parts thoroughly, inspect them and replace with new ones as required.
3) Assemble component parts by reversing removal procedure.
4) If oil seal is replaced,apply grease to its lip.

"A" : Grease 99000-25010

NOTE:

- **When driving in spring pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & REV gear shift cam by winding cam guide return spring, and then drive in spring pin.**
- **Locate low speed select spring (Green) and reverse select spring (Yellow) correctly.**



1. E-ring
2. Washer
3. Low select spring
4. Interlock plate
5. Gear shift & select lever
6. Shift & select lever outer pin
7. Shift & select lever inner pin
8. 5th & REV gear shift cam guide
9. Cam guide pin
10. REV interlock shaft pin
11. Cam guide return spring
12. 5th & REV gear shift cam guide
13. Gear shift & select shaft
14. REV select spring
15. Guide cam
16. Oil seal
17. Oil boot
18. Shift cable lever
19. Shift cable lever outer pin
20. Shift cable lever inner pin

HIGH SPEED, LOW SPEED AND 5TH & REV GEAR SHIFT SHAFTS

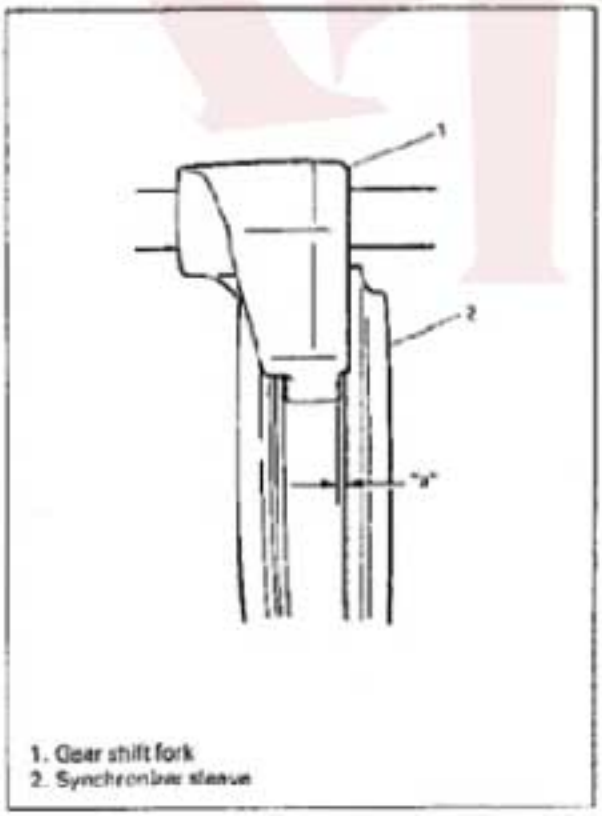
Inspection

1) Using feeler gauge, check clearance between fork and sleeve and replace those parts if it exceeds limit of 1.0 mm (0.039 in.).

NOTE:
For correct judgement of parts replacement, carefully inspect contact position of fork and sleeve.

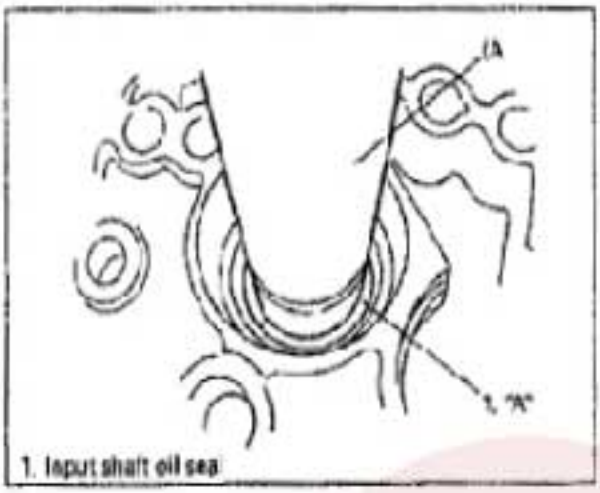
Clearance "a": Service limit 1.0 mm (0.039 in.)

2) Insert each gear shift shaft into case and check that it moves smoothly. If it doesn't, correct by using oilstone, reamer or the like.



1. Gear shift fork
2. Synchronizer sleeve

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1. Input shaft oil seal

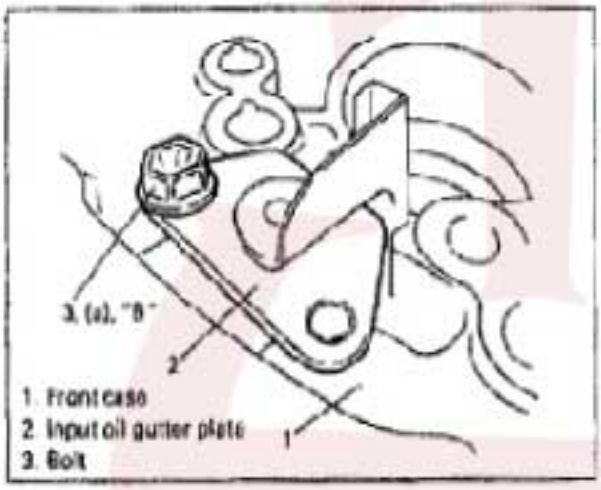
UNIT ASSEMBLY

FRONT AND REAR CASE

1) Install input shaft oil seal facing its spring side to clutch side. Use special tool and hammer for installation and apply grease to oil seal lip.

"A": GREASE, 99000-25010

Special Tool
(A): 09941-74910

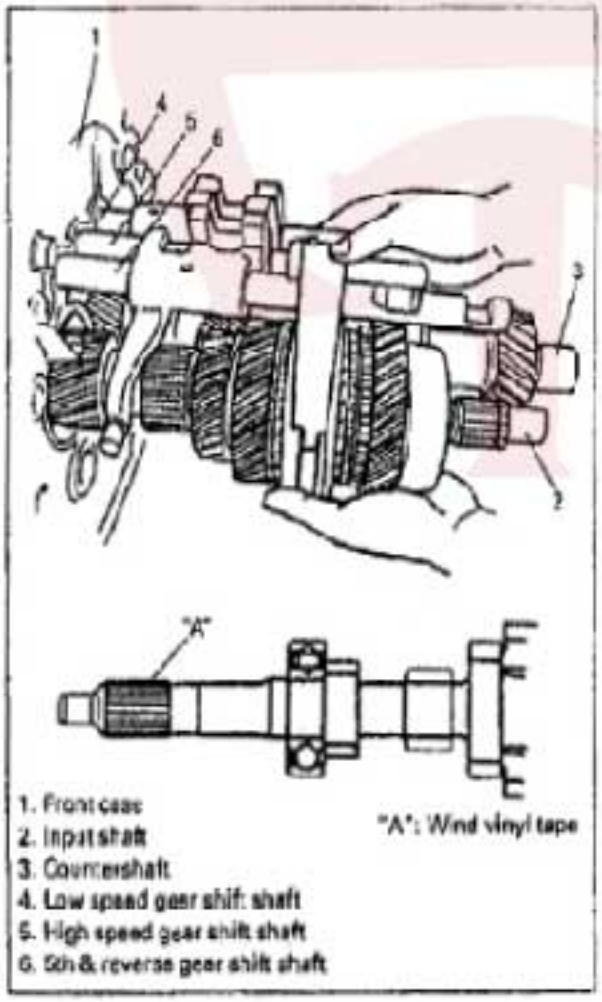


1. Front case
2. Input oil gutter plate
3. Bolt

2) If input oil gutter has been removed, install it with bolt applied with thread lock cement.

"B": Thread lock 1322, 99000-32110

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



1. Front case
2. Input shaft
3. Countershaft
4. Low speed gear shift shaft
5. High speed gear shift shaft
6. 5th & reverse gear shift shaft

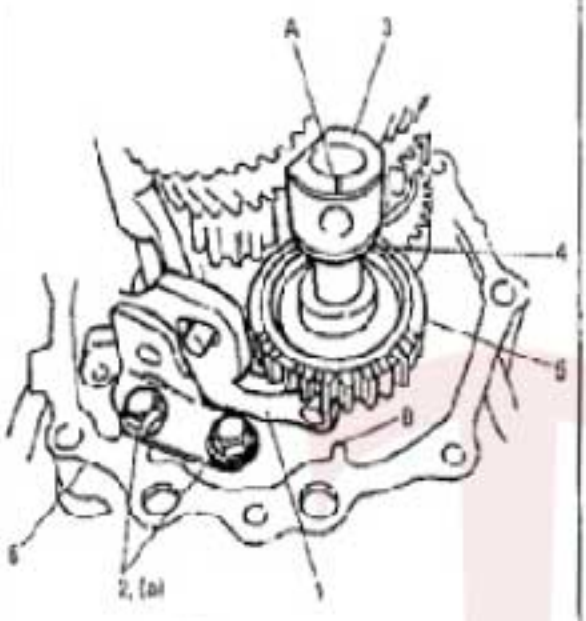
"A": Wind vinyl tape

3) Join input shaft, countershaft, low speed gear shift shaft, high speed gear shift shaft and 5th & reverse gear shift shaft assemblies all together, then install them into front case.

NOTE:
Input shaft front bearing on shaft can be installed into front case by tapping shaft with plastic hammer.

CAUTION:
To protect the oil seal from damage, wind vinyl tape to the spline section of the input shaft when installing it.

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1. Reverse gear shift lever
2. Reverse gear shift lever bolt
3. Reverse gear shaft
4. Washer
5. Reverse idler gear
6. Front case

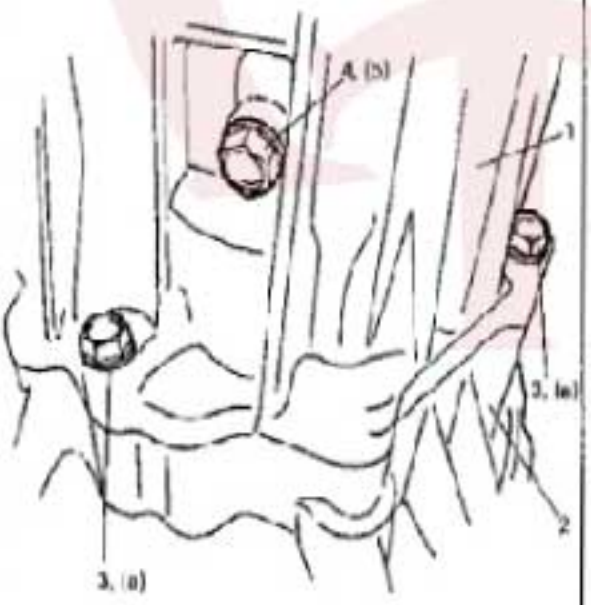
4) Place reverse gear shift lever, fasten it with 2 bolts applied with thread lock cement.

"B": Thread lock cement 1322, 99000-32110

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

5) Make reverse idler gear with reverse gear shift lever, insert reverse gear shaft applied with gear oil into case through idler gear and then align A in shaft with B in case.

NOTE:
Make sure that washer has been installed in shaft at above the gear.



1. Rear case
2. Front case
3. Case bolt
4. Reverse shaft bolt

6) Clean mating surfaces of both front and rear cases, coat mating surface of front case with sealant evenly then mate it with rear case.

7) Tighten case bolts from outside to specified torque.

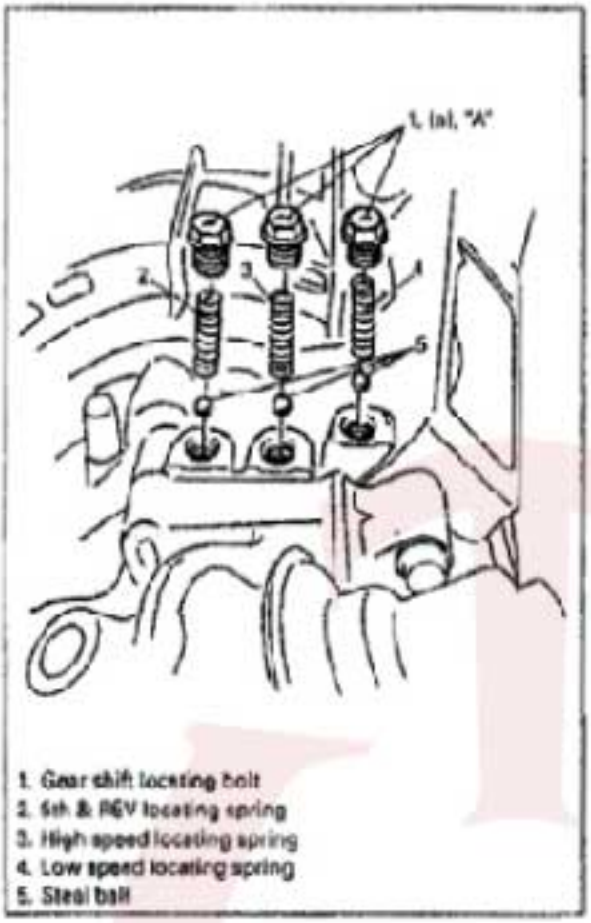
Tightening Torque
(a): 19 N·m (1.9 kg-m, 14.0 lb-ft)

8) Install reverse shaft bolt with aluminum washer and tighten it.

Tightening Torque
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

9) Install another 3 case bolts from front case side and tighten them to the same specification.
If vinyl tape has not been removed, remove it.

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1. Gear shift locating bolt
2. 5th & REV locating spring
3. High speed locating spring
4. Low speed locating spring
5. Steel ball

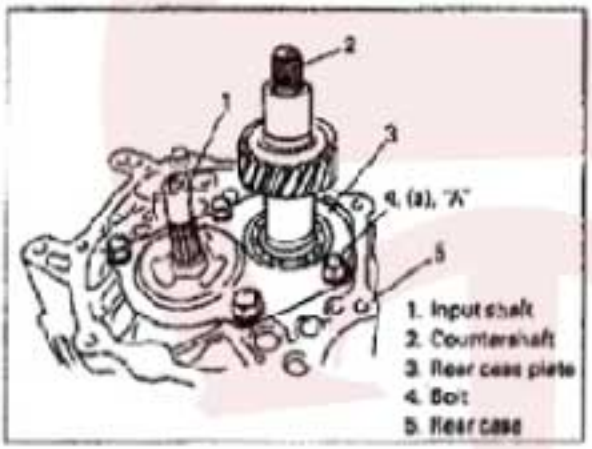
10) Check locating spring for deterioration and replace with new one as necessary.

Locating spring free length	Standard	Service Limit
High speed, 5th & REV	36.7 mm (1.445 in.)	35.6 mm (1.402 in.)
Low	46.7 mm (1.839 in.)	45.6 mm (1.795 in.)

11) Install steel ball and locating spring for respective gear shift shaft and tighten with bolt applied with thread lock cement.

"A" : Thread lock 1322, 99000-32110

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



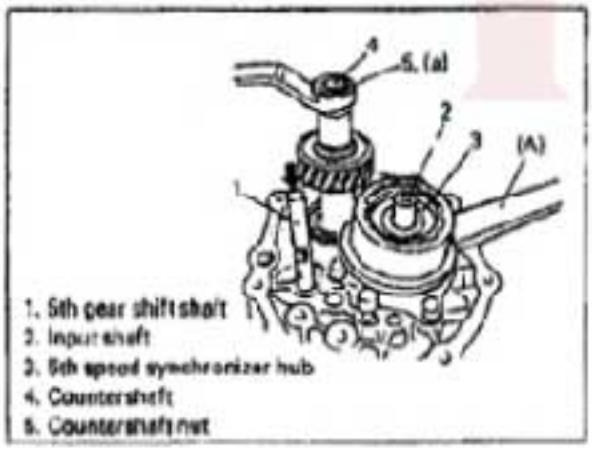
1. Input shaft
2. Countershaft
3. Rear case plate
4. Bolt
5. Rear case

MAIN SHAFT

1) Install countershaft center bearing snap ring, place rear case plate and fasten it with 5 bolts applied with thread lock cement.

"A" : Thread lock 1322, 99000-32110

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



1. 5th gear shift shaft
2. Input shaft
3. 5th speed synchronizer hub
4. Countershaft
5. Countershaft nut

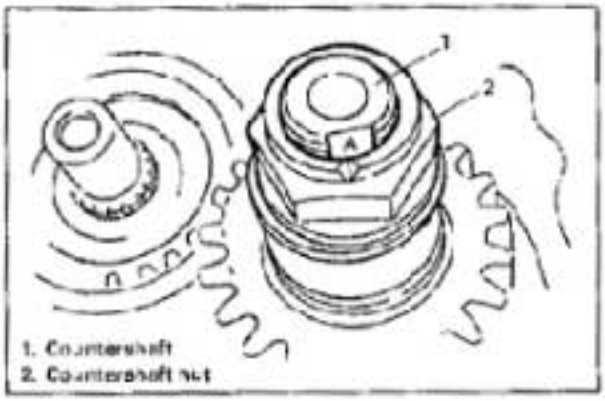
2) Push low speed gear shift shaft by using 5th gear shift shaft as shown in figure so that countershaft is engaged with input shaft.
3) Install 5th speed synchronizer hub together with special tool so as the shaft not to rotate.

Special Tool
(A): 09927-25411

4) Install countershaft nut and tighten it to specification.

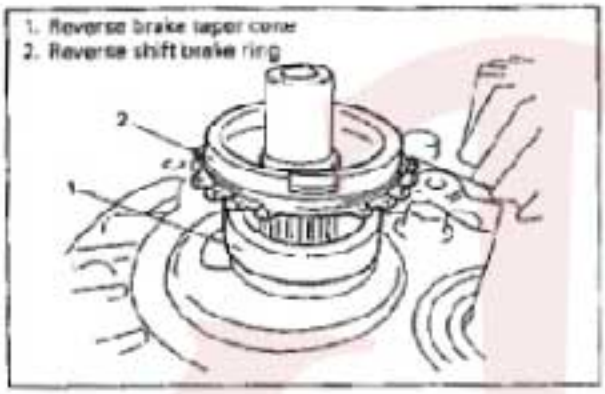
Tightening Torque
(a): 68 N·m (6.8 kg-m, 49.0 lb-ft)

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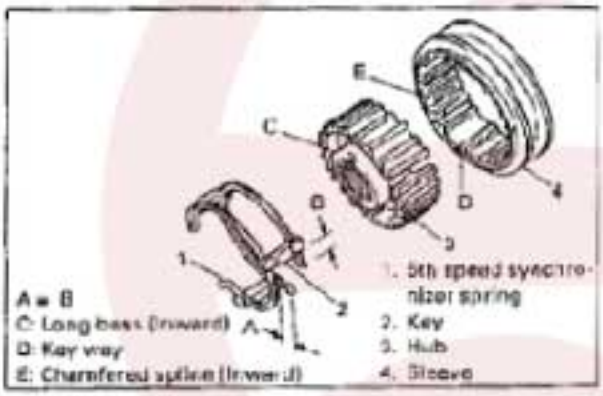
1. Countershaft
2. Countershaft nut

5) Remove special tool, then caulk nut at A with caulking tool and hammer.



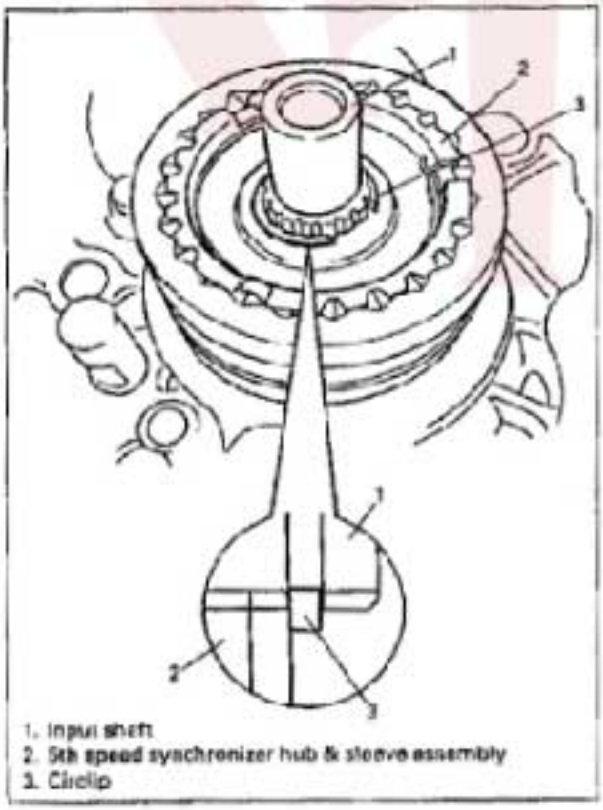
1. Reverse brake taper cone
2. Reverse shift brake ring

6) Place reverse brake taper cone, apply gear oil to its taper portion and then install reverse shift brake ring.



7) Assemble 5th speed synchronizer sleeve and hub with keys and springs.

NOTE:
Long boss C in hub and chamfered spline E in sleeve should face inward (rear case side).

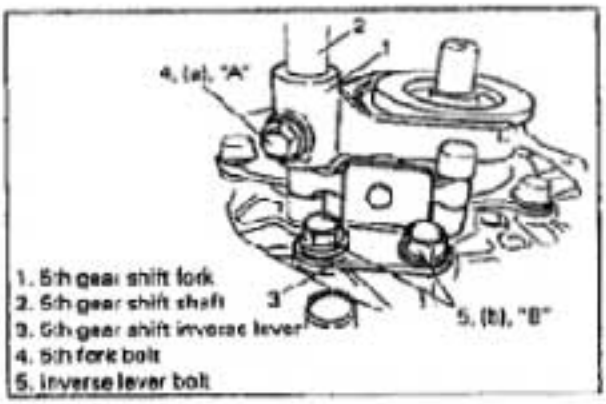


1. Input shaft
2. 5th speed synchronizer hub & sleeve assembly
3. Circlip

8) Install 5th gear synchronizer sleeve & hub assembly with long boss of hub facing rear case side.
9) Install circlip in correct direction as shown in figure.

CAUTION:
Confirm that circlip is installed in groove securely.

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10) Fit 5th speed shift fork sleeve & hub assembly, and then install 5th gear shift shaft.
11) Tighten 5th fork bolt applied with thread lock cement.

"A" : Thread lock 1322, 99000-32110

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

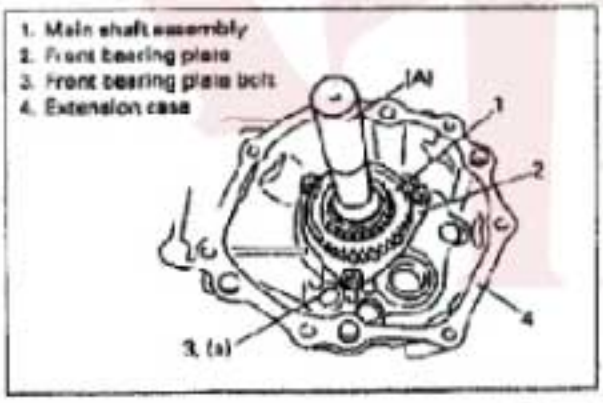
12) Install 5th gear shift inverse lever and tighten bolts applied with thread lock cement.

"B" : Thread lock 1322, 99000-32110

Tightening Torque
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

EXTENSION CASE

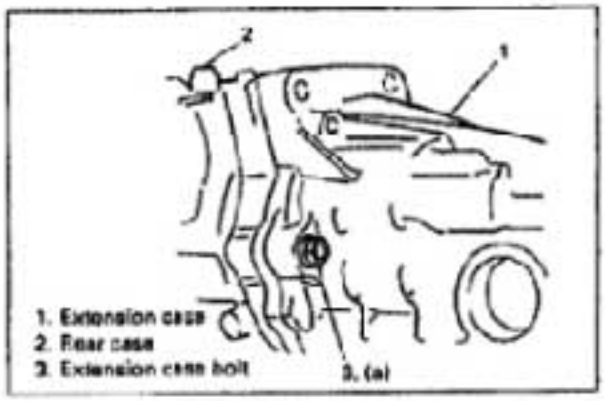
1) If oil seal has been removed, install it referring to 7A-5.



2) Install main shaft assembly into extension case by using special tool and hammer and then tighten front bearing plate bolts to specification.

Special Tool
(A) : 09925-98210

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

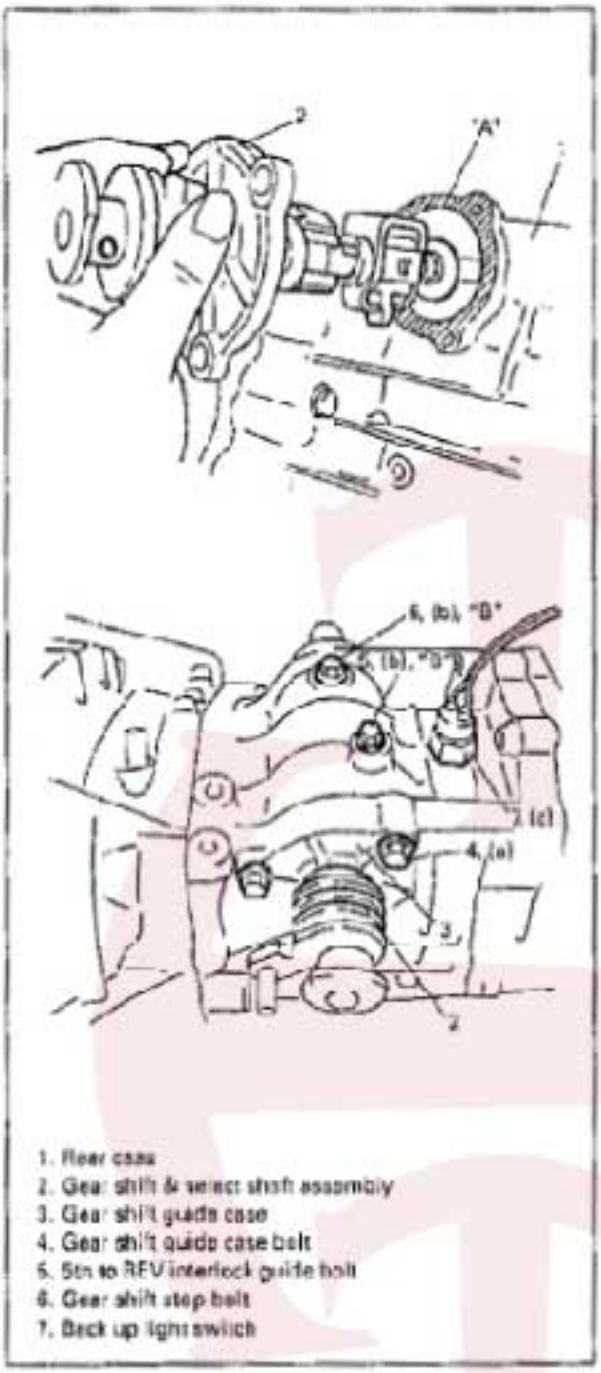


3) Clean mating surface of both extension case and rear case, coat mating surface of rear case with sealant evenly, mate it with extension case and then tighten with 7 bolts.

"A": Sealant 99000-31110

Tightening Torque:
(a): 19 N·m (1.9 kg-m, 14.0 lb-ft)

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1. Rear case
2. Gear shift & select shaft assembly
3. Gear shift guide case
4. Gear shift guide case bolt
5. 5th to REV interlock guide bolt
6. Gear shift stop bolt
7. Back up light switch

GEAR SHIFT & SELECT SHAFT ASSEMBLY

1) Clean mating surface of both rear case and gear shift guide case, coat mating surface of rear case with sealant evenly and install gear shift & select shaft assembly.

"A" : Sealant 99000-31110

NOTE:
When installing gear shift & select shaft assembly, position gear in neutral so that gear shift lever will go in smoothly.

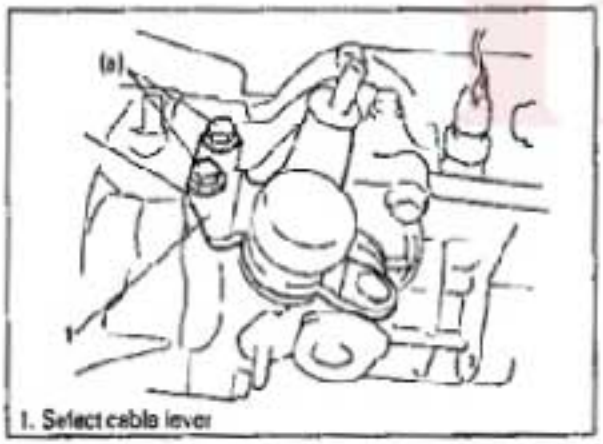
2) Tighten 3 bolts to specification

Tightening Torque
(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install 5th to REV interlock guide bolt applied with thread lock cement, gear shift stop bolt applied with thread lock cement and back up light switch.

"B" : Thread lock 1322, 99000-32110

Tightening Torque
(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
(c) : 20 N·m (2.0 kg-m, 14.5 lb-ft)



1. Select cable lever

4) Place select cable lever and fasten it with 2 bolts.

Tightening Torque
(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

5) Check input shaft for rotation in each gear position.
Also confirm function of back up light switch in reverse position by using ohmmeter. There should be continuity when gear is in reverse position.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
Drain & level/filler plugs	23	2.3	17.0
Propeller shaft universal joint flange bolts	55	5.5	40.0
Gear shift control lever bolts	13	1.3	9.5
Select cable lever bolts	23	2.3	17.0
Speedometer driven gear case bolt	10	1.0	7.5
Rear mounting bolts	50	5.0	36.0
Left stiffner bolts	55	5.5	40.0
Right stiffner bolts	61	6.1	44.0
Cylinder block & T/M case nuts	61	6.1	44.0
Cylinder block & T/M case bolts	61	6.1	44.0
Control cable bracket bolts	23	2.3	17.0
Oil gutter plate bolt	10	1.0	7.5
Reverse gear shift lever bolts	23	2.3	17.0
Front-rear case bolts	19	1.9	14.0
Reverse shaft bolt	23	2.3	17.0
Gear shift locating shaft bolt	13	1.3	9.5
Rear case plate bolts	23	2.3	17.0
Counter shaft nut	68	6.8	49.0
5th fork bolt	10	1.0	7.5
5th gear shift lever bolts	23	2.3	17.0
Main shaft front bearing plate bolts	23	2.3	17.0
Extension case bolts	19	1.9	14.0
Gear shift guide case bolts	23	2.3	17.0
5th to REV interlock guide bolt	23	2.3	17.0
Gear shift stop bolt	23	2.3	17.0
Back up light switch	20	2.0	14.5

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REQUIRED SERVICE MATERIALS

MATERIALS	USE
Lithium grease	• Control cable rear washers • Speedometer driven gear • Speedometer driven gear case O-ring • Speedometer driven gear case oil seal • Extension case oil seal • Propeller shaft front end • Gear shift shaft oil seal • Input shaft oil seal
Sealant	• Oil drain & level/filler plugs • Mating surface of transmission case • Mating surface of gear shift guide case
Thread lock cement	• Control lever knob • Reverse gear shift lever bolts • Oil gutter bolt • Rear case plate bolts • 5th gear shift fork bolt • 5th to REV interlock guide bolt • Gear shift stop bolt • Gear shift locating bolt

SPECIAL TOOLS



09900-06107
Snap ring pliers
(Opening type)



09940-51710
Bearing installer



09927-25411
Hub holder



09913-85135
Bearing puller



09925-18010
Bearing installer



09951-16060
Bearing installer



09940-54950
Bearing installer attachment



09913-84510
Bearing installer

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09925-98221
Bearing installer



09913-85230
Bearing puller attachment



09940-53111
Bearing installer



09913-85210
Bearing installer



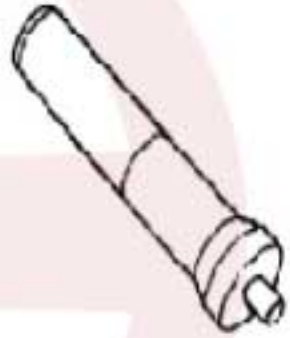
09922-85811
Spring pin remover 4.5 mm



09925-78210
Spring pin remover 6 mm



09941-74910
Bearing installer



09925-98210
Input shaft bearing installer



09916-46010
Valve guide remover

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SECTION 7C

CLUTCH

CONTENTS

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UNIT REPAIR 7C-6
Clutch Cover, Clutch Disc and Flywheel 7C-6
Clutch Release Fork 7C-9
TIGHTENING TORQUE SPECIFICATIONS 7C-11
REQUIRED SERVICE MATERIALS 7C-11
SPECIAL TOOLS 7C-12

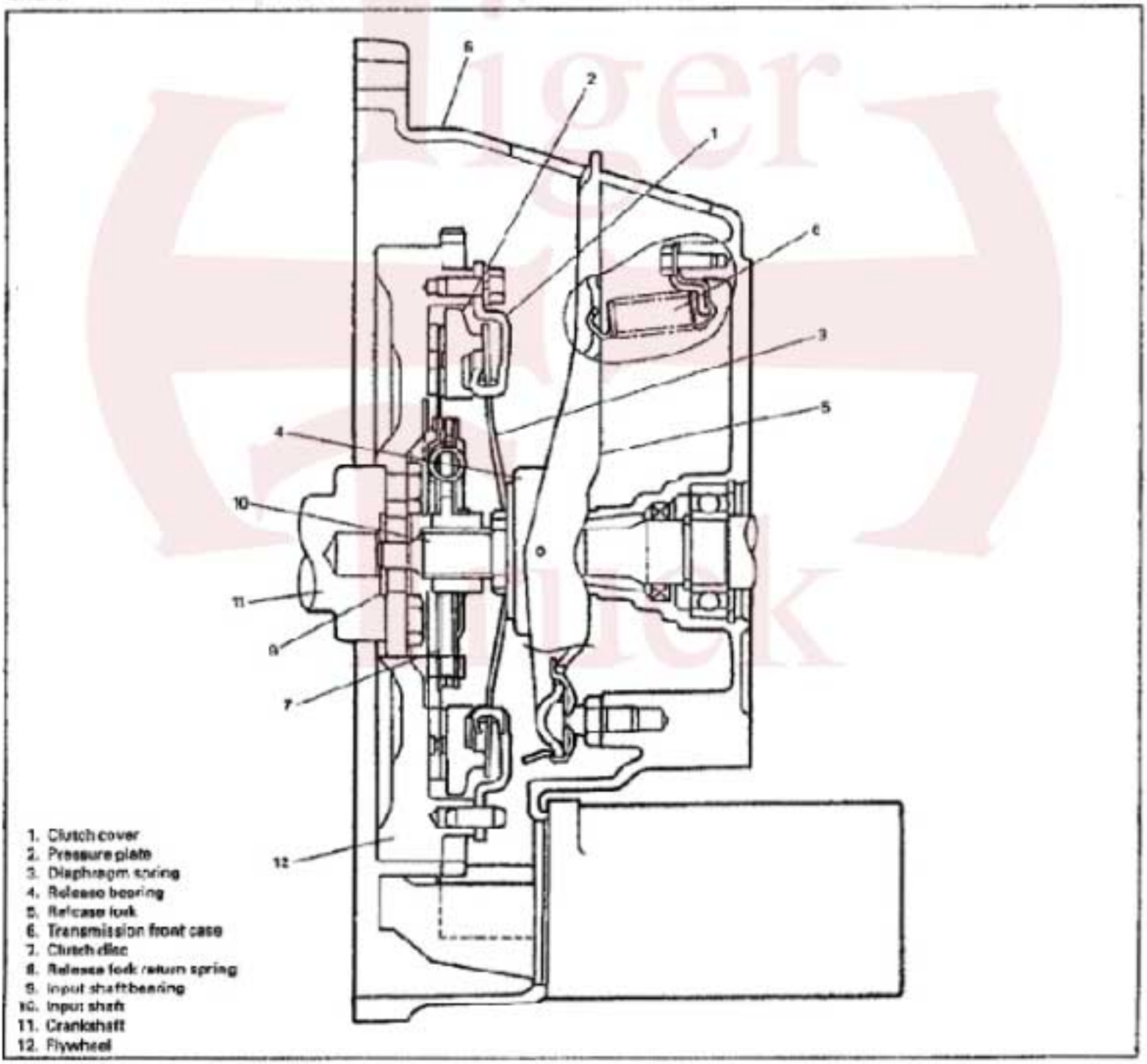
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GENERAL DESCRIPTION

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapering fingers pointing inward. The disc, carrying three torsional coil springs, is slidably mounted on the transmission input shaft with a serration fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back : This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and push on the tips of the tapering fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.

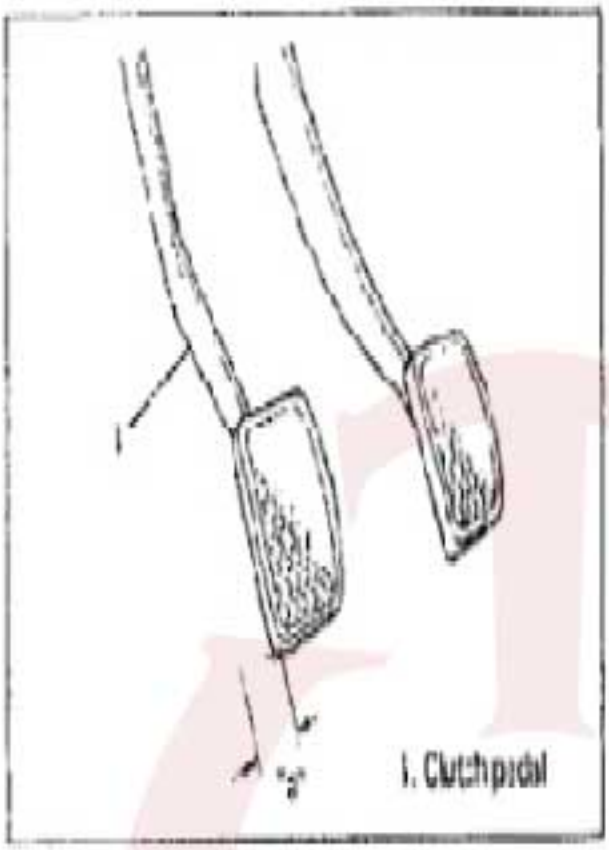


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DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	• Improper clutch pedal free travel.	Adjust free travel.
	• Worn or oily clutch disc facing.	Replace disc.
	• Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	• Weakened diaphragm spring.	Replace clutch cover.
	• Rusted clutch cable.	Replace cable.
Dragging clutch	• Improper clutch pedal free travel.	Adjust free travel.
	• Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	• Rusted input shaft splines.	Lubricate.
	• Damaged or worn splines of transmission input shaft.	Replace input shaft.
	• Excessively wobbly clutch disc.	Replace disc.
	• Clutch facings broken or dirty with oil.	Replace disc.
Clutch vibration	• Glazed (glass-like) clutch facings.	Repair or replace disc.
	• Clutch facings dirty with oil.	Replace disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	• Wobbly clutch disc, or poor facing contact.	Replace disc.
	• Weakened torsion springs in clutch disc.	Replace disc.
	• Clutch disc rivets loose.	Replace disc.
	• Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	• Weakened engine mounting or loosened mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	• Worn or broken release bearing.	Replace release bearing.
	• Input shaft front bearing worn down.	Replace input shaft bearing.
	• Excessive rattle of clutch disc hub.	Replace disc.
	• Cracked clutch disc.	Replace disc.
	• Pressure plate and diaphragm spring are rattling.	Replace clutch cover.
Grabbing clutch	• Clutch disc facings are soaked with oil.	Replace disc.
	• Clutch disc facings are excessively worn.	Replace disc.
	• Rivet heads are showing out of the facing.	Replace disc.
	• Torsion springs are weakened.	Replace disc.

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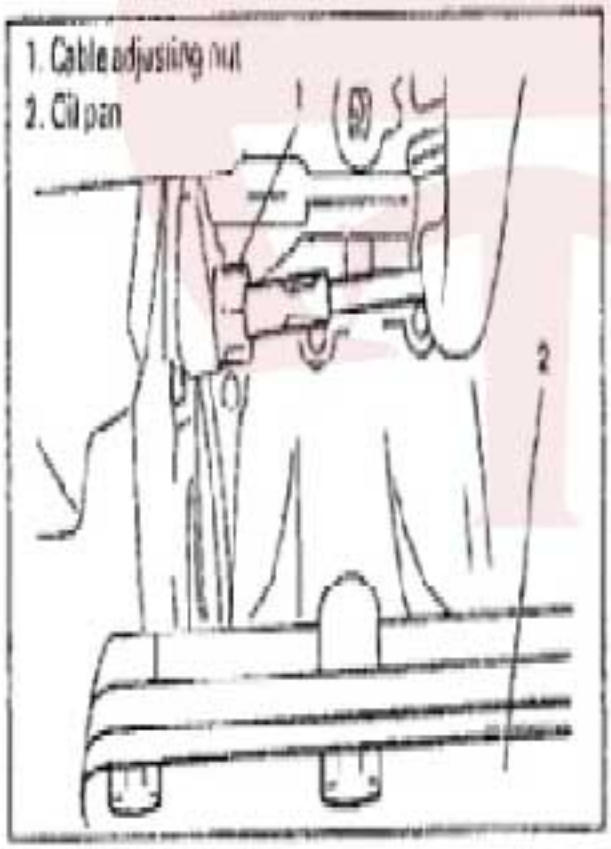


ON-VEHICLE SERVICE

CLUTCH PEDAL FREE TRAVEL

1) Depress clutch pedal, stop the moment clutch resistance is felt, and measure distance (clutch pedal free travel). Free travel should be within following specification.

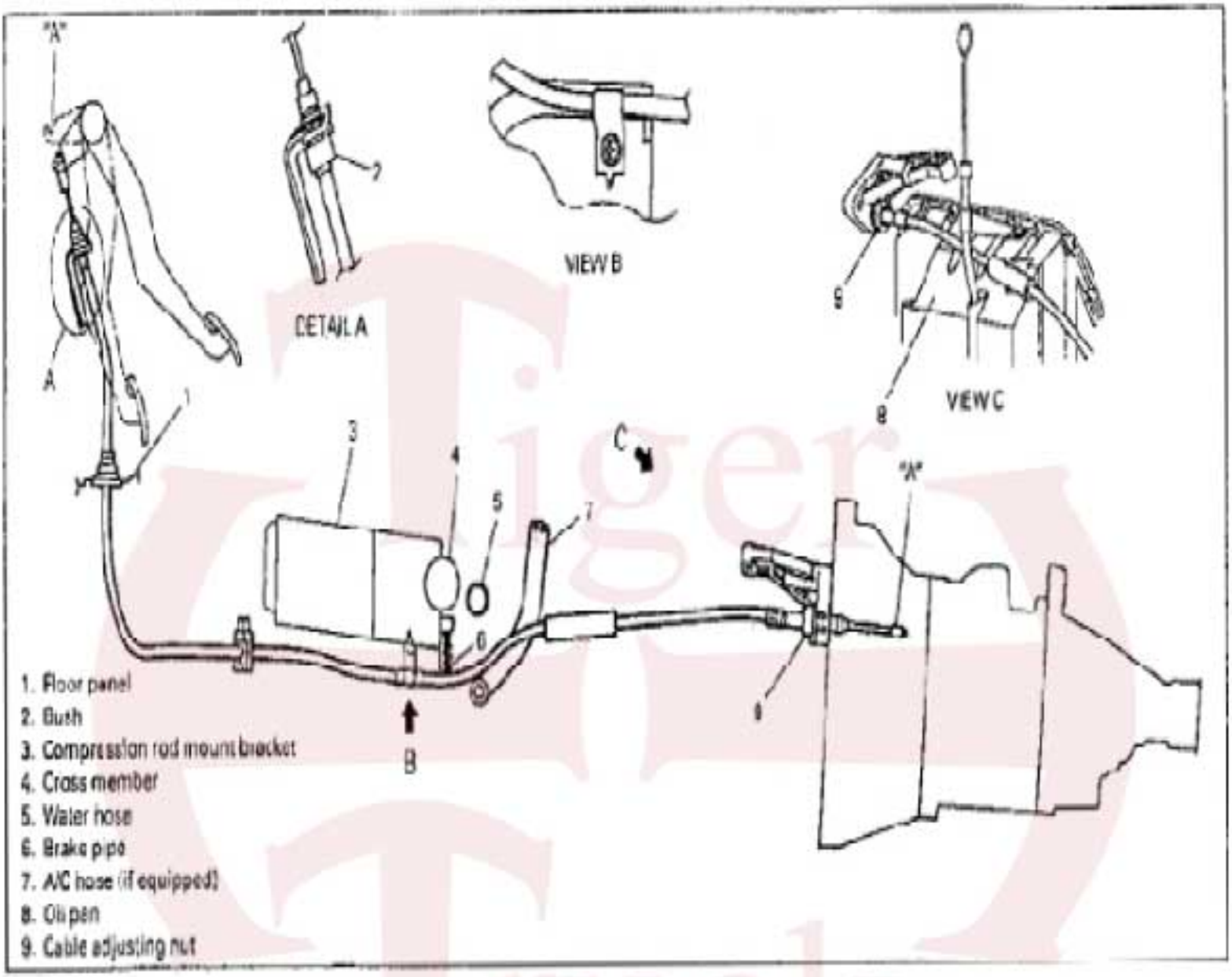
Pedal free travel "a": 10 - 15 mm (0.6 - 0.8 in.)

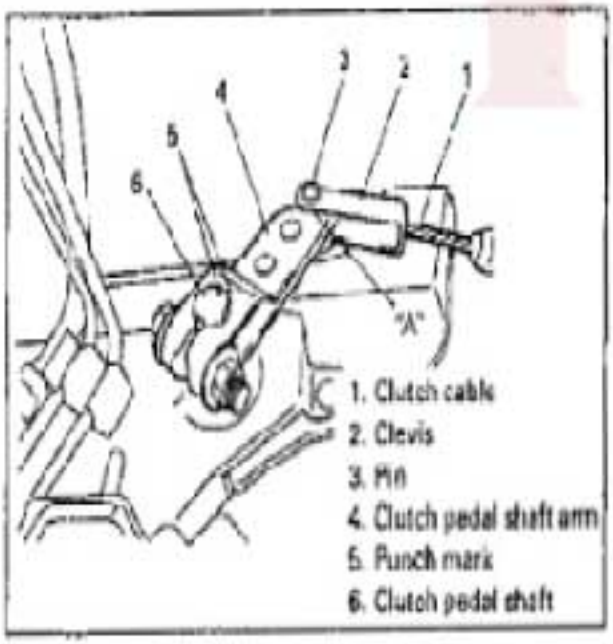


2) If free travel is out of specification, adjust it by turning cable adjusting nut.

3) After checking clutch pedal free travel, also check clutch for proper function with engine running.

CABLE ROUTING



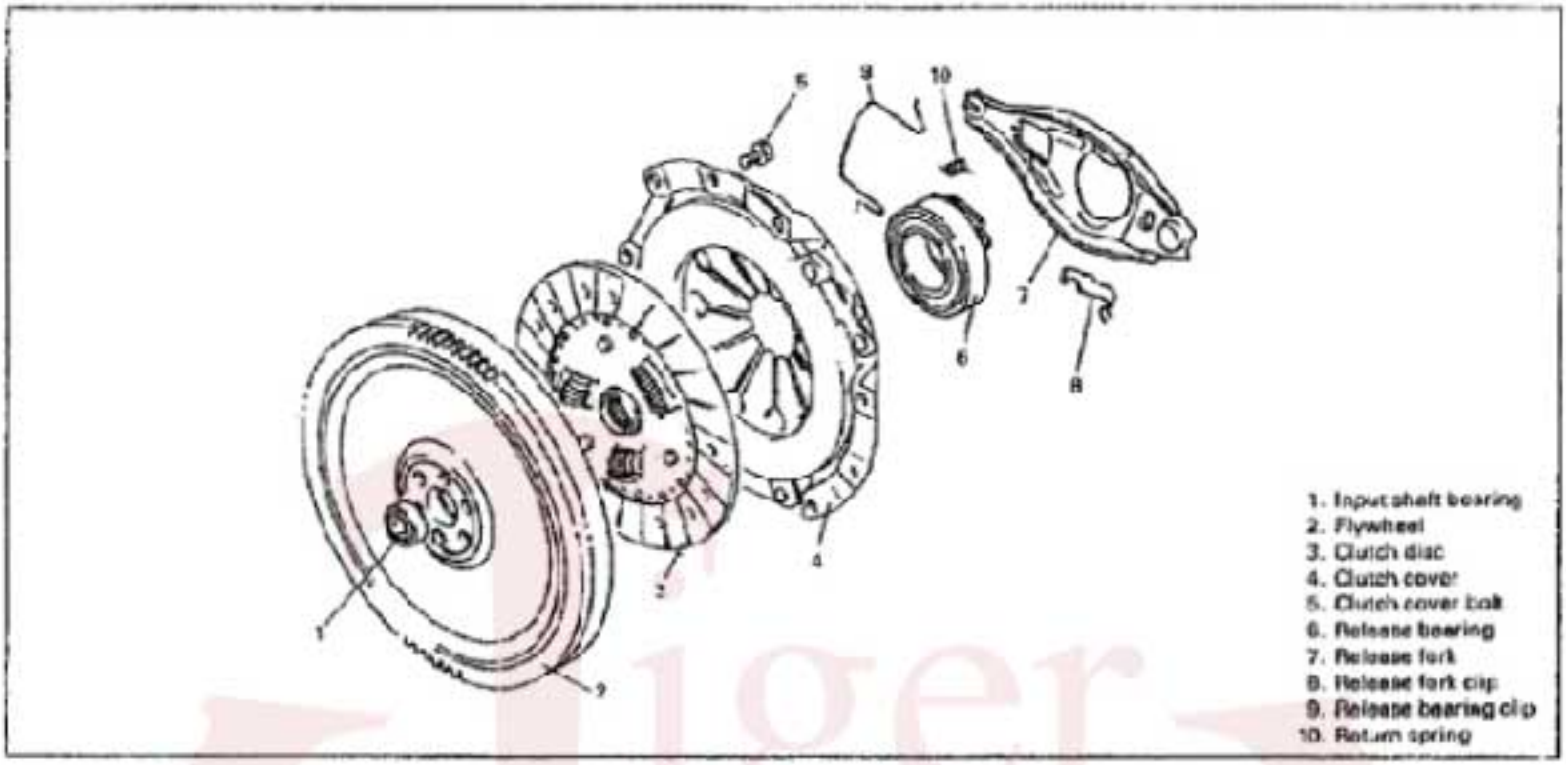


- When installing clutch pedal shaft arm to clutch pedal shaft, align punch marks as shown in figure.
- Apply grease to pin, clevis and arm before installing cable.

"A" : Grease 99000-25010

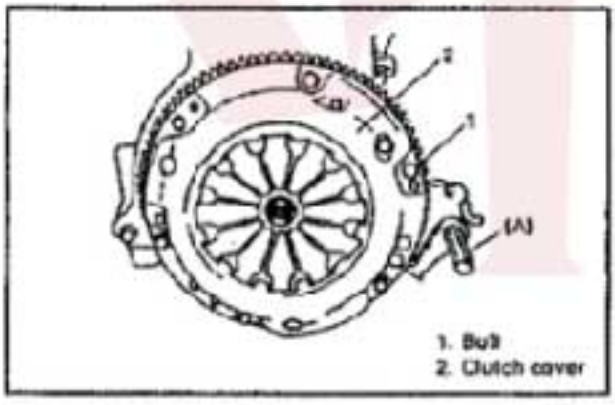
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UNIT REPAIR



DISMOUNTING / REMOUNTING

Refer to SECTION 7A for dismounting/remounting of manual transmission.

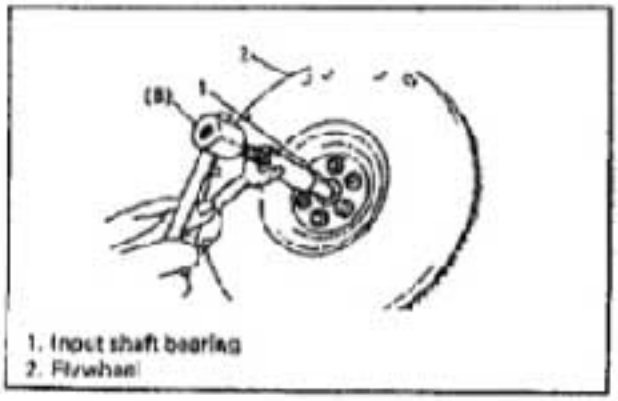


CLUTCH COVER, CLUTCH DISC AND FLY-WHEEL

REMOVAL

1) Hold flywheel stationary with special tool (A) and remove clutch cover bolts, clutch cover and clutch disc.

Special Tool
(A): 09924-17810



2) Pull out input shaft bearing by using special tool (B) and wrench.

Special Tool
(B): 09917-58010

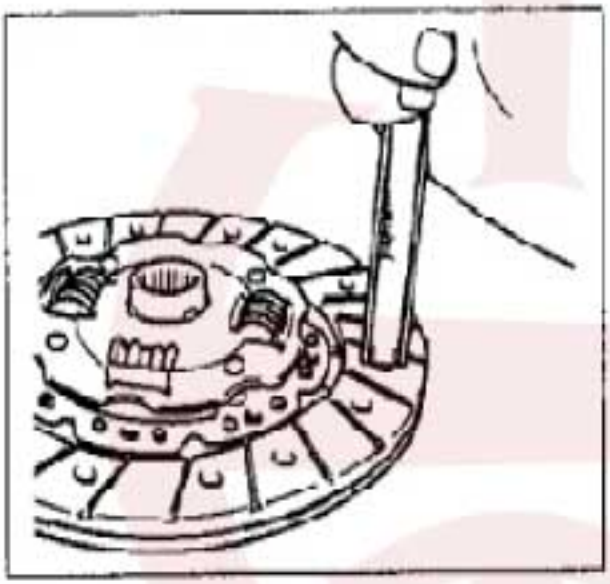
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1. Input shaft bearing

INSPECTION

Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.

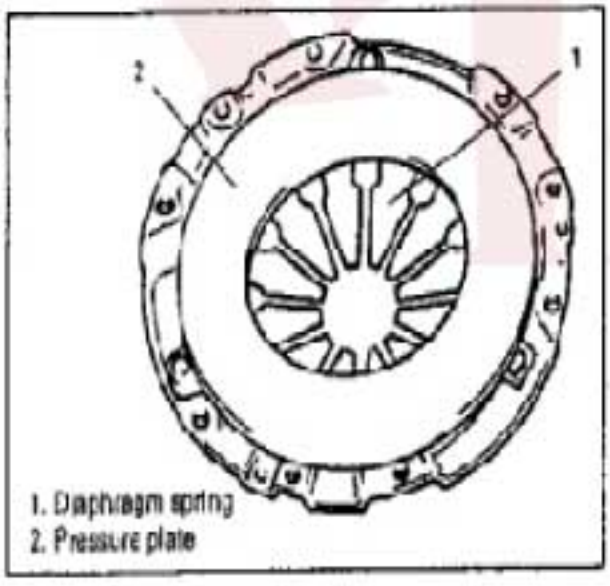


Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

Rivet head depth

Standard:	**1.2 mm (0.06 in.)**
Service limit:	**0.5 mm (0.02 in.)**



1. Diaphragm spring
2. Pressure plate

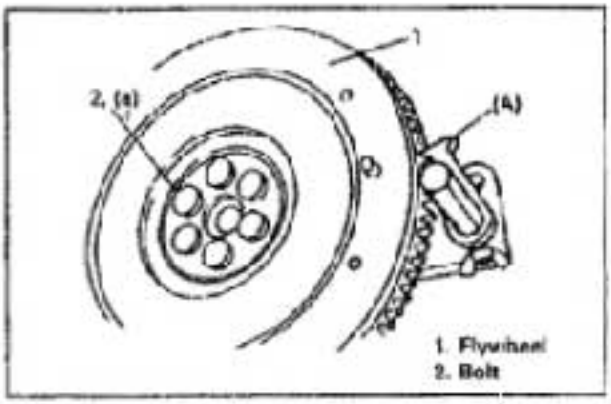
Clutch Cover

1) Check diaphragm spring for abnormal wear or damage.
2) Inspect pressure plate for wear or heat spots.
3) If abnormality is found, replace it as assembly. Do not disassemble it into diaphragm and pressure plate.

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

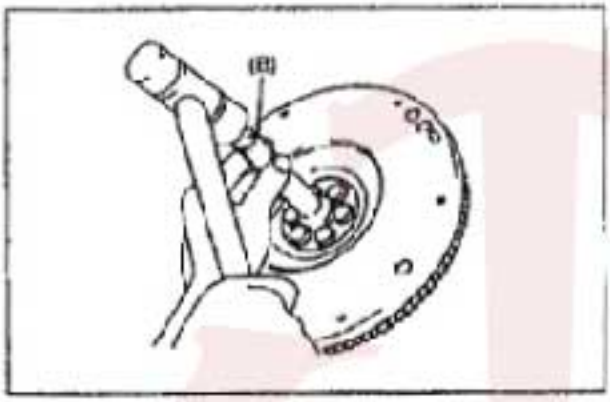
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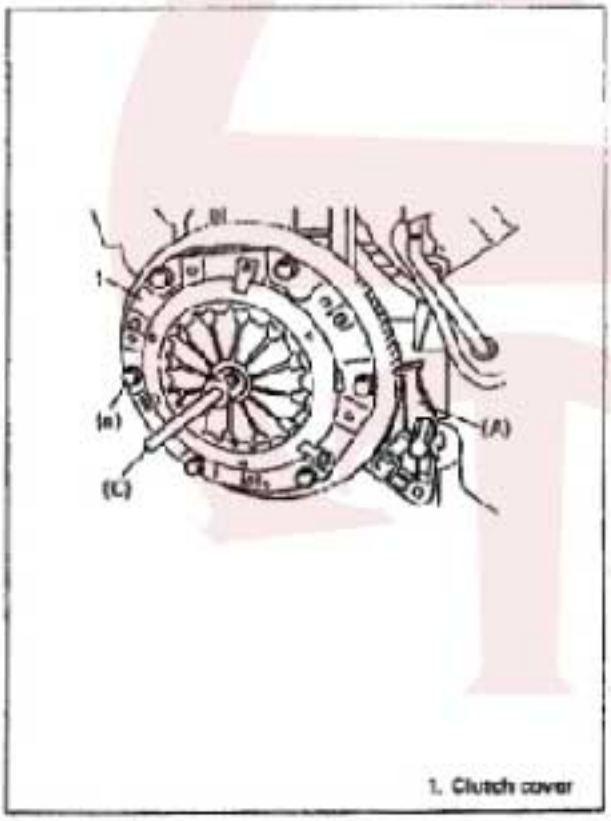
INSTALLATION

NOTE:
Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel to crankshaft and tighten bolts to specification.
Special Tool
(A): 09924-17810
Tightening Torque
(a): 78 N·m (7.8 kg-m, 56.5 lb-ft)



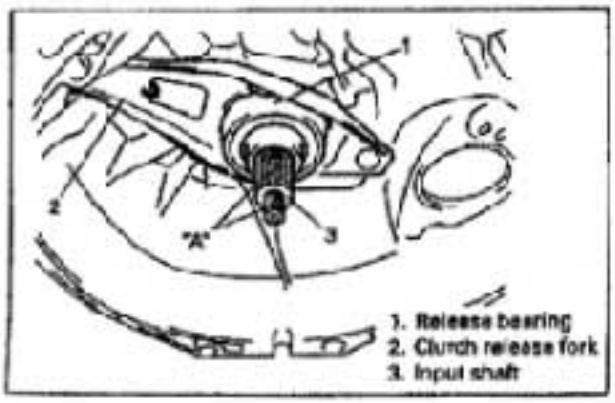
2) Using special tool, install input shaft bearing to flywheel.
Special Tool
(B): 09925-98210



3) Aligning clutch disc to flywheel center by using special tool install clutch cover and bolts. Then tighten bolts to specification.
NOTE:
- **While tightening clutch cover bolts, compress clutch disc with special tool (C) by hand so that disc centered**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special Tools
(A): 09924-17810
(C): 09923-36330

Tightening Torque
(a): 23 N·m (2.3 kg-m, 16.5 lb-ft)

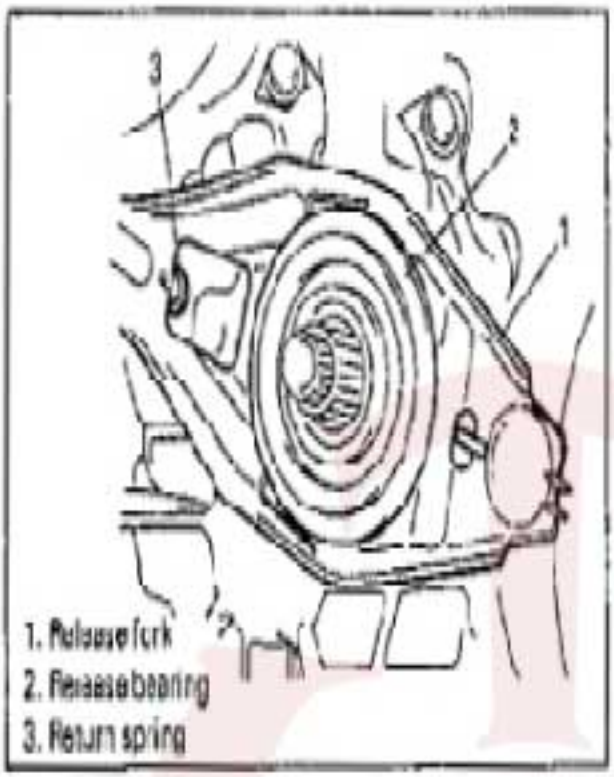


4) Slightly apply grease to input shaft, then join transmission assembly with engine. Refer to SECTION 7A for remounting procedure.

"A": Grease 99000-25210

NOTE:
Turn crankshaft with wrench from front while inserting transmission input shaft to clutch disc until splines mesh

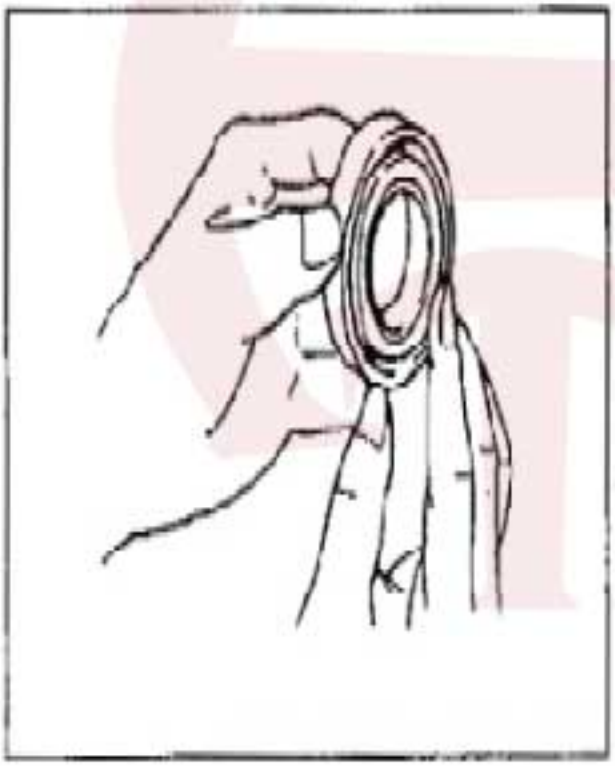
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CLUTCH RELEASE FORK

REMOVAL

1) Remove release fork return spring and release fork clip.
2) Remove release fork together with release bearing.



INSPECTION

Clutch release bearing

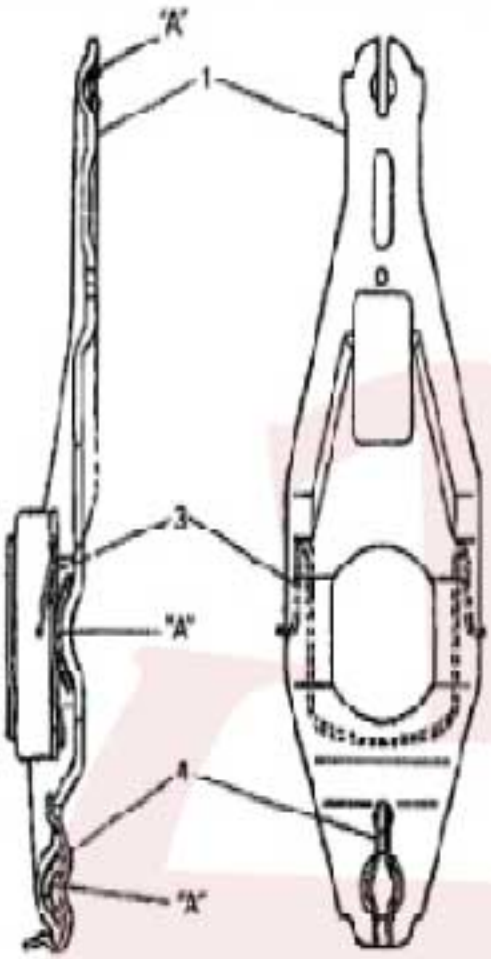
Check clutch release bearing for smooth rotation.
If abnormality is found, replace it.

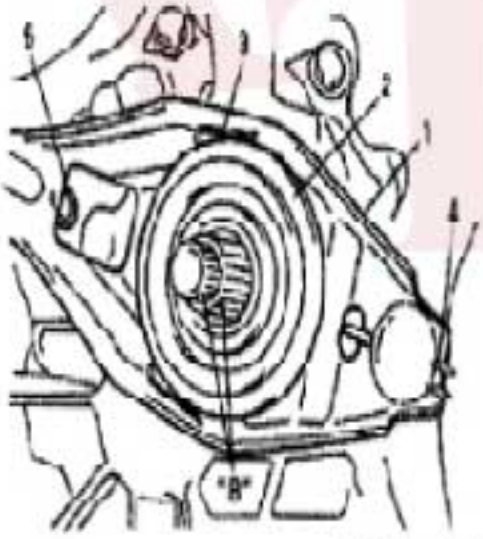
CAUTION:
Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

Clutch release fork

Check clutch release fork and its clip for deflection or damage.
Check also release fork return spring.
If abnormality is found, replace it.

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1. Release fork
2. Release bearing
3. Bearing clip
4. Fork clip
5. Return spring

INSTALLATION

Reverse removal procedure for installation noting following.

- Apply grease as shown in figure.

"A" : Grease 99000-25010
"B" : Grease 99000-25210

- Install release bearing, return spring and clips to release fork as shown in figure.

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TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Flywheel bolts	78	7.8	56.5
2. Clutch cover bolts	23	2.3	16.5

REQUIRED SERVICE MATERIALS

MATERIAL	USE
Lithium grease	• Clutch pedal shaft arm. • Clutch release fork.
	Input shaft spline front end.

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SPECIAL TOOLS



09917-68011
Bearing remover



09923-36330
Clutch center guide



09924-17810
Flywheel holder



09925-98210
Input shaft bearing installer

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SECTION 7F

DIFFERENTIAL

CONTENTS

GENERAL DESCRIPTION 7F- 2

ON-VEHICLE SERVICE 7F- 4

- OIL CHANGE 7F- 4
- REMOVAL 7F- 4
- INSTALLATION 7F- 5

UNIT REPAIR 7F- 6

- DISASSEMBLY 7F- 6
- ADJUSTMENT 7F- 8
- REASSEMBLY 7F-13

TIGHTENING TORQUE SPECIFICATIONS 7F-16

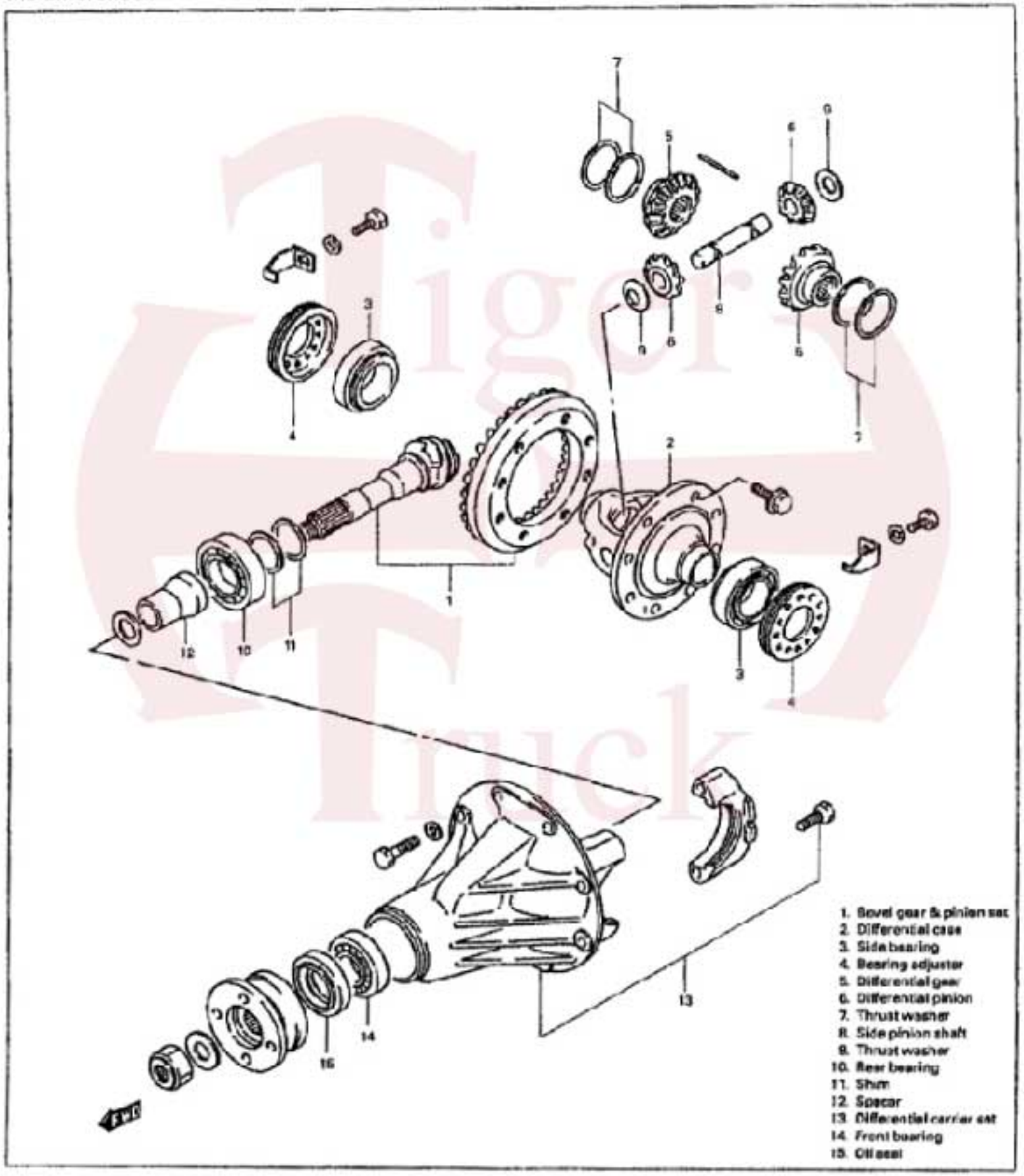
REQUIRED SERVICE MATERIALS 7F-16

SPECIAL TOOLS 7F-16

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GENERAL DESCRIPTION

The components of the differential are shown in figure below. The bevel gear drive is of hypoid design; pinion and gear have hypoid gear teeth. This means that the pinion is located slightly below the center of the bevel gear to permit the car body to be lowered in design, and that some wiping or sliding action occurs in tooth meshing between pinion and gear. Here lies the reason why use of hypoid gear oil is specified for the differential.



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DIAGNOSIS

Condition	Possible Cause	Correction
Gear noise	• Deteriorated or water mixed lubricant	Repair and replenish
	• Inadequate or insufficient lubricant	Repair and replenish
	• Maladjusted backlash between bevel pinion and gear	Adjust
	• Improper tooth contact in the mash between bevel pinion and gear	Adjust or replace
	• Loose bevel gear securing bolts	Replace or retighten
	• Damaged differential gear(s) or pinion(s)	Replace
Bearing noise	• (Constant noise) Deteriorated or water mixed lubricant	Repair and replenish
	• (Constant noise) Inadequate or insufficient lubricant	Repair and replenish
	• (Noise while coasting) Damaged bearing(s) of bevel pinion	Replace
	• (Noise while turning) Damaged diff. side bearing(s) or axle bearing(s)	Replace
Oil leakage	• Clogged breather plug	Clean
	• Worn or damaged oil seal	Replace
	• Excessive oil	Adjust oil level

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ON-VEHICLE SERVICE

OIL CHANGE

1) Remove oil drain plug and drain oil.
2) Reinstall drain plug and tighten it to specified tightening torque.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

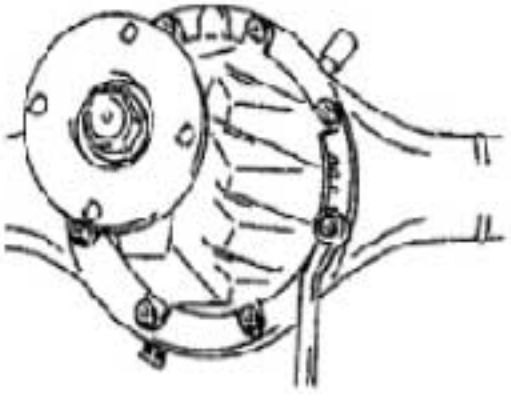
3) Remove oil level & filler plug and fill differential housing with new specified oil.
About 1.3 litre of gear oil is required to fill up differential housing.

Oil capacity	1.3 litre (2.8/2.3 US/Imp pt)
Gear oil	Hypoid gear oil, SAE 90 or Hypoid gear oil, SAE80W or 75W/80 – 85

NOTE:
For the vehicles used in areas where the ambient temperature becomes lower than –15°C (5°F) during the coldest season, it is recommended that oil be changed with SAE 80W or 75W/80 – 85 oil during the services such as a periodic maintenance.

4) Install level/filler plug and torque it to specification.

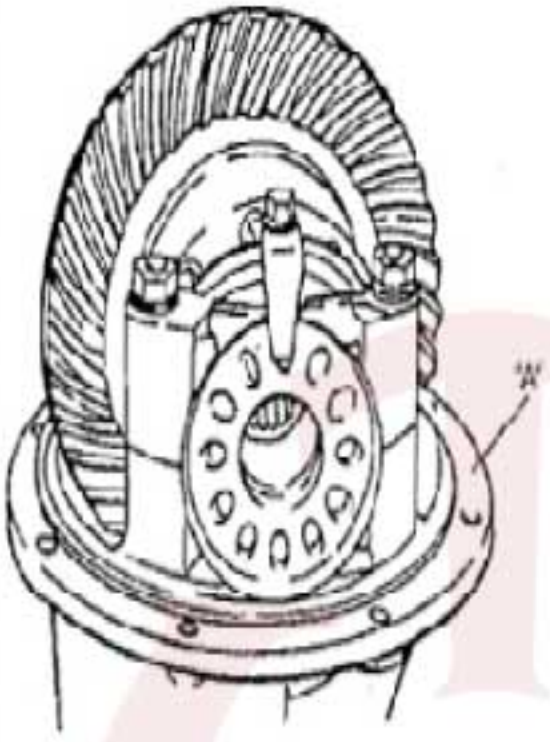
Tightening Torque
(b): 60 N·m (6.0 kg-m, 36.5 lb-ft)

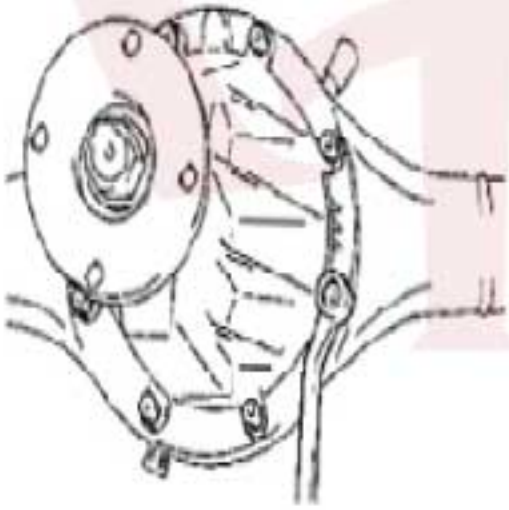


REMOVAL

1) With the vehicle rested steady on safety stands, draw out right and left rear axle shafts referring to "Rear axle shaft removal" in SECTION 3E REAR SUSPENSION of this manual.
2) At differential housing, disconnect propeller shaft by removing bolts securing flange yoke to companion flange. Remove 8 bolts holding fast differential carrier case to housing, and take down carrier assembly.

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INSTALLATION

Reverse removal procedure for installation, noting the following.

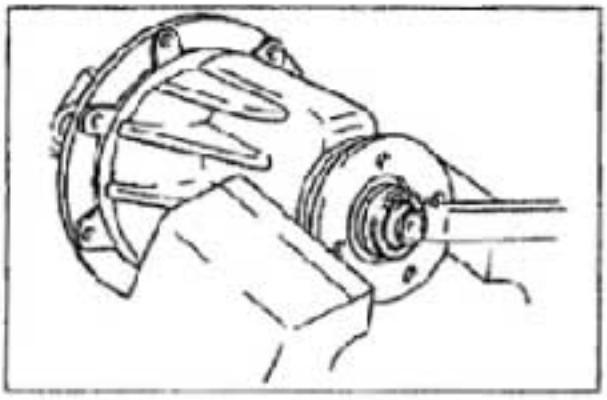
- Before installing differential ass'y to axle housing, clean mating surfaces of differential carrier and housing and apply sealant to them. After installing it, tighten carrier bolts to specified torque.

  "A": Sealant 99000-31110

  Tightening Torque
  (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

- For installation of rear suspension, refer to "Rear axle shaft installation" in SECTION 3E REAR SUSPENSION of this manual.
- Fill gear oil referring to "Oil Change".
- Make sure to purge air out of brake circuit.
  Refer to SECTION 5 BRAKES for "air purging" operation.
  Then check to ensure that joint seam of pipe is free from oil leak.

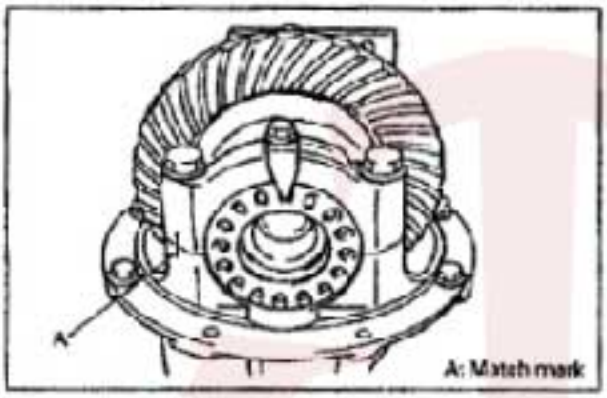
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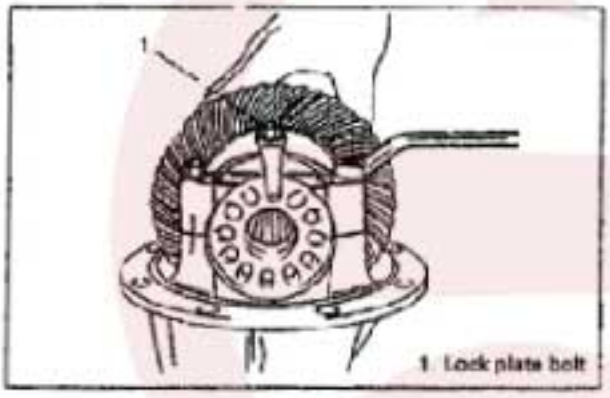
UNIT REPAIR

DISASSEMBLY

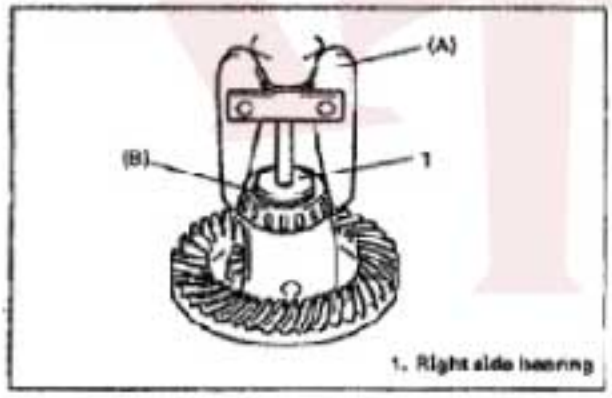
1) Lock the flange immovable, and remove the nut from the end of the bevel pinion shank.



2) Scribe marks on each cap bolted to the saddle portion of the carrier case and holding down the side bearing. The marks are to identify the cap. This means that there are right and left caps, so identified and so handled at the time of reassembly.

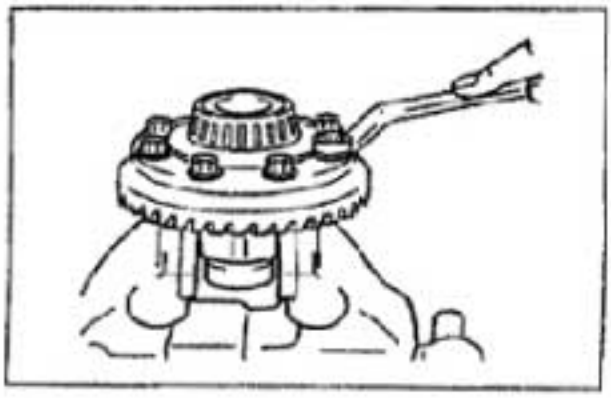


3) Remove the two bearing caps, right and left, and lift the differential case assembly off the carrier case, after loosening lock plate bolts and bearing cap bolts.



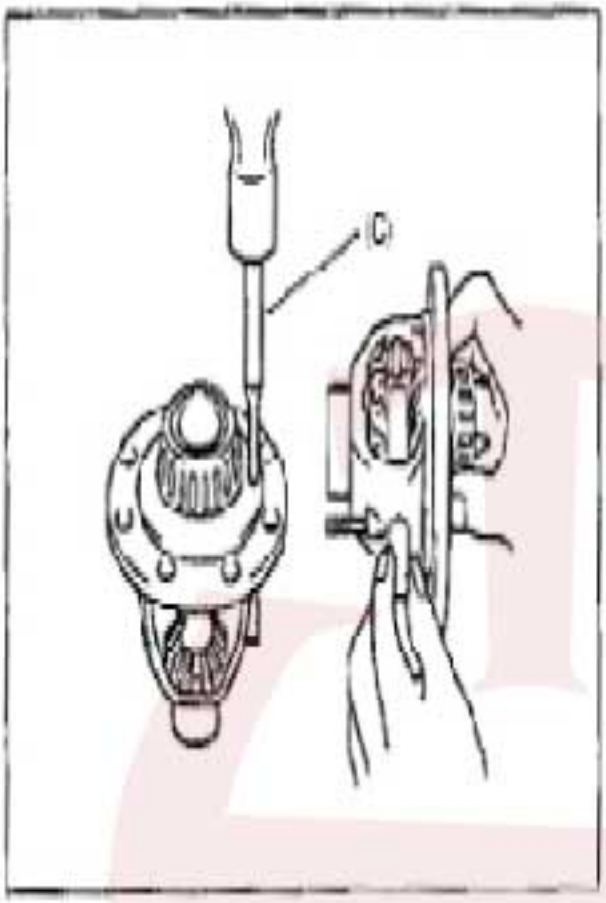
4) Using the special tools indicated below, extract the right side bearing from the differential case.

Special Tool
(A): 09913-60910
(B): 09913-85230



5) Remove the bolts fastening bevel gear to differential case, and take off bevel gear.

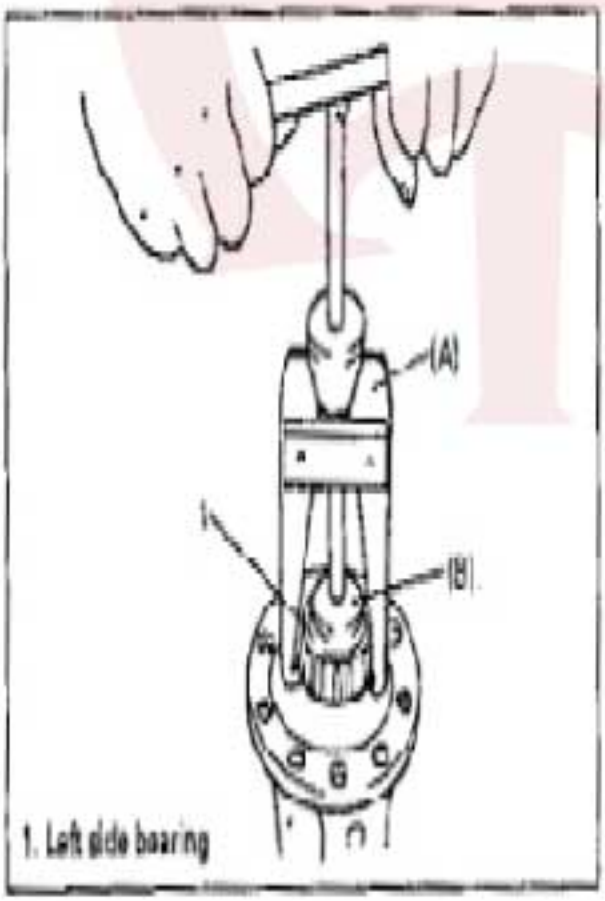
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6) Draw out side pinion shaft, as shown, and remove side pinions, side gears and thrust washers.

Special Tool

(C): 09922-85811



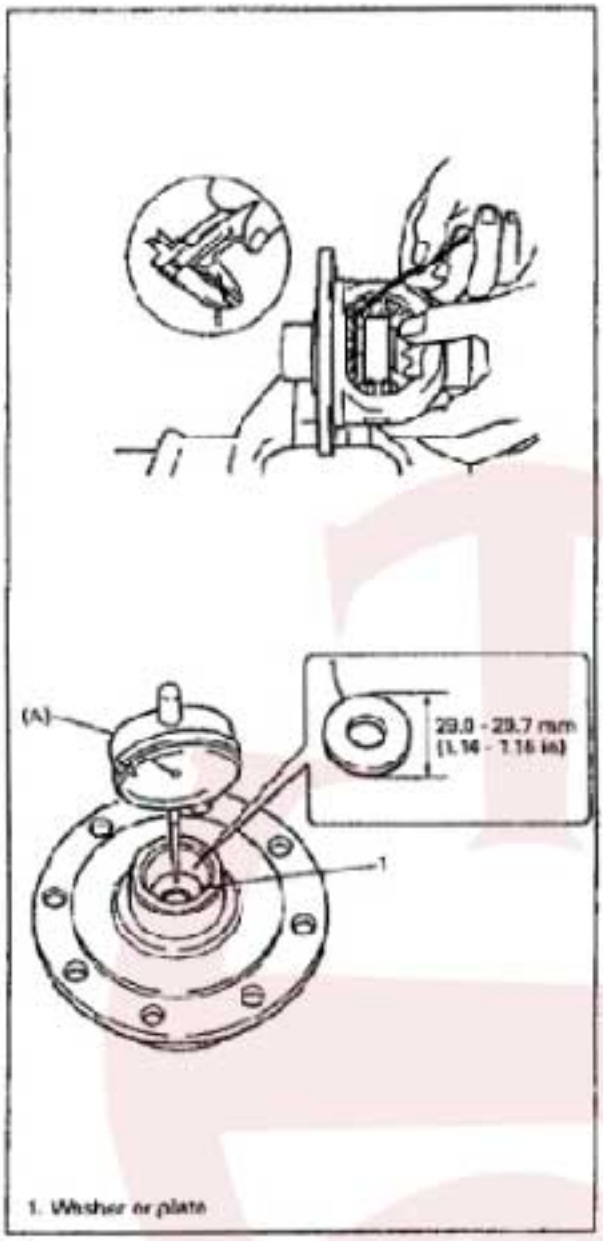
7) Using special tools indicated below, extract left side bearing from differential case.

Special Tool

(A): 09913-60910

(B): 09913-85230

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1. Washer or plate

ADJUSTMENT

Side gear backlash

Use soft fuse stock in checking the backlash.

After flattening fuse stock according to the standard practice of backlash checking, measure thickness of fuse stock, and compare the reading with backlash specification indicated below.

Adjust backlash, as necessary, by varying thickness of thrust washer.

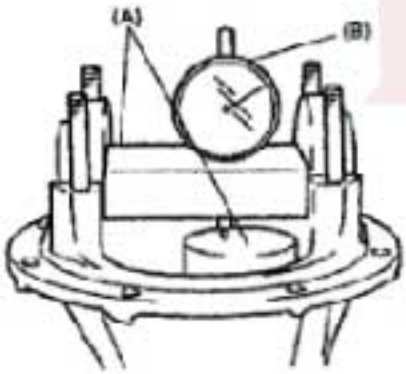
Side gear backlash specification	0.05 – 0.15 mm (0.002 – 0.006 in.)
Available thrust washer size (thickness)	0.9, 1.0, 1.1 & 1.2mm (0.035, 0.039, 0.043 & 0.047 in.)

NOTE:

When a fuse stock to measure differential side gear backlash is not available,measure side gear thrust play. If it is 0.37 mm (0.0145 in.) at the maximum, an acceptable backlash value is obtained. To measure thrust play, put an appropriate flat washer or plate on the side gear end as shown.

Special Tool

(A): 09900-20606



Determination of shim thickness of bevel pinion

The amount of shims to be used on the bevel pinion varies from one machine to another on account of a number of factors involved in machining and assembling. Thus, for each machine, the amount of shims necessary for locating the pinion in the correct position (for producing a proper backlash in the mesh between pinion and gear) must be determined anew at the time of reassembly.

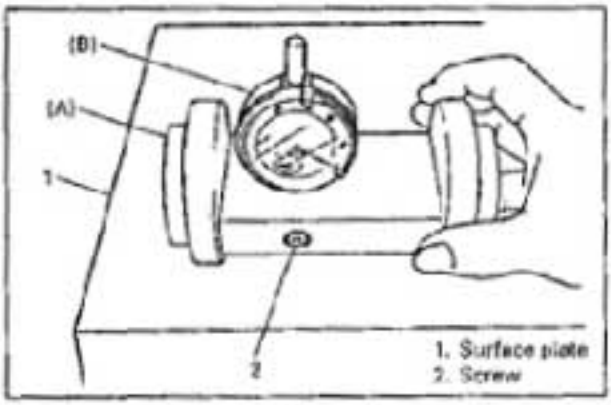
In order to facilitate this determination, a two-piece dummy tool (special tool) is made available. The following procedure is based on the use of this tool and supposes that the pinion dummy (one of the two pieces) is set in the carrier, without any shims, as shown in figure.

Special Tool

(A): 09924-36320

(B): 09900-20606

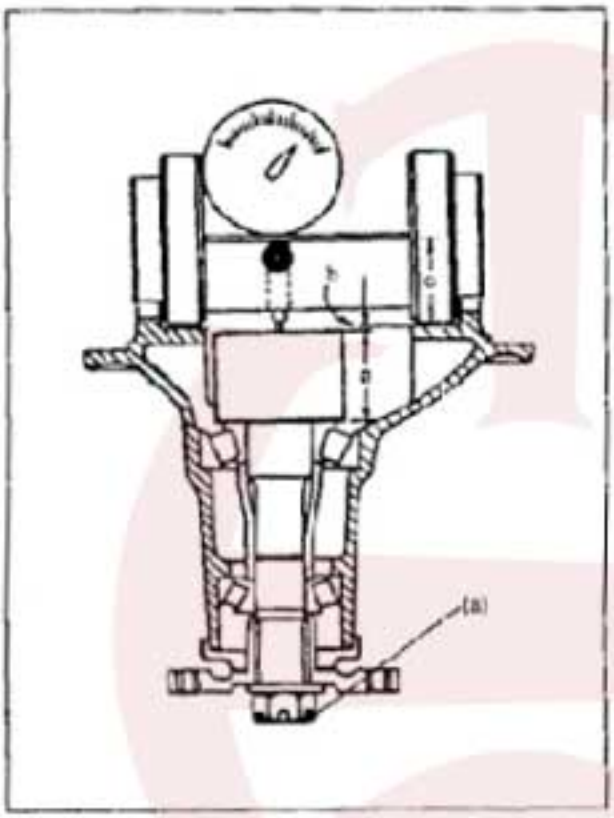
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1. Surface plate
2. Screw

1) Set dial indicator on dummy, letting indicator spindle protrude 5 to 6 mm from the bottom of dummy.
Rest dummy on the surface plate, and set dial indicator to zero.

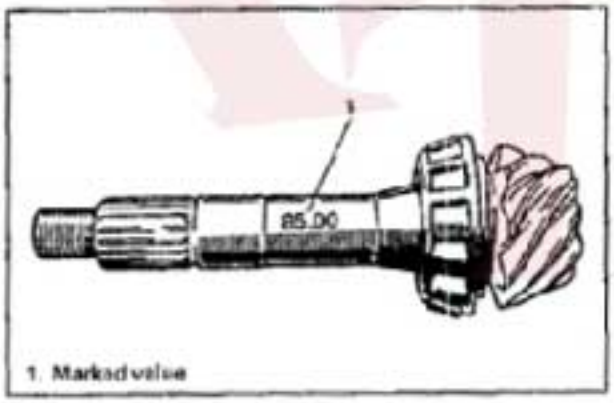
Special Tool
(A): 09924-36320
(B): 09900-20606



2) Feed dummy pinion into carrier, positioning it properly as shown in figure; and install joint flange. Secure joint flange in place by tightening its nut.

Tightening Torque
(a): 7 N·m (0.7 kg-m, 5.0 lb-ft)

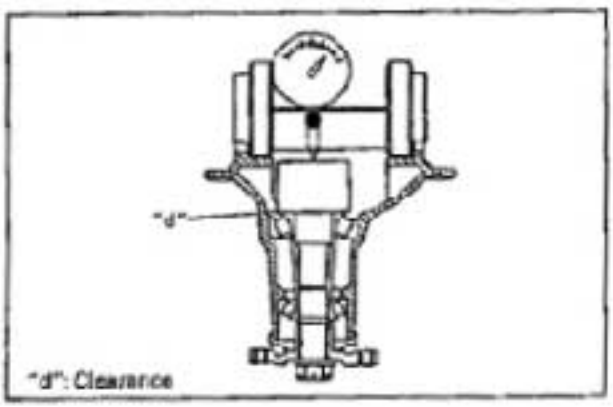
3) Referring to the figure, note that three dimensions are involved: "a", "b" and "c".
The value of "b" is unknown, and is to be determined now for calculating the required thickness of shims. The value of "a" + "c" is 85 mm (3.35 in).



1. Marked value

4) With dummy now secured, dial indicator hand may have deflected from the "0" mark to show a certain value; read this value, which is value "b". Add this reading to 85 mm (= "a" + "c") and, from the sum, subtract the value marked on the bevel pinion. The remainder is the required shim thickness:

(85 + "b") – marked value = required shim thickness



"d": Clearance

5) The shim stock is available in four selective thicknesses. Select and combine shim sizes to produce a total thickness as close to the required thickness as possible, and insert selected shim pieces into clearance "d" indicated in the figure.

Sizes of shims for bevel pinion	0.05, 0.1, 0.2, 0.3 & 0.5 mm (0.002, 0.004, 0.008, 0.012 & 0.02 in.)

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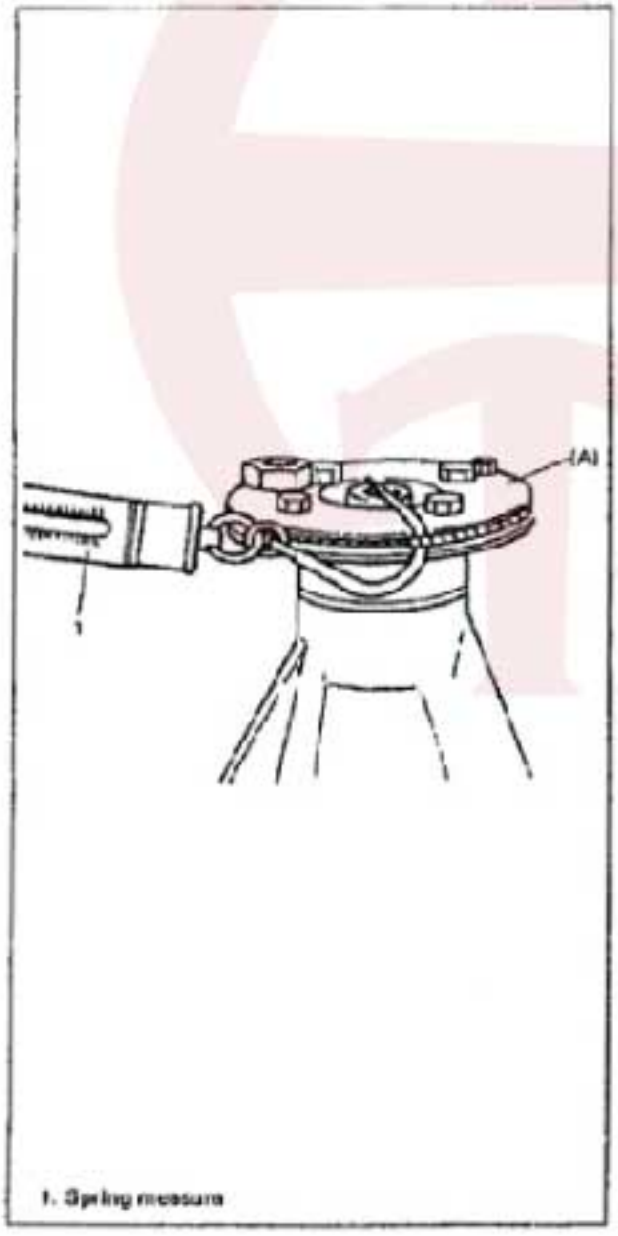
Bevel pinion bearing preload adjustment

The bevel pinion, as installed in the normal manner in the carrier, is required to offer a certain torque resistance when checked with the use of a prescribed torquing pulley (special tool) as shown in the following figure. This resistance is a "preload," which is due to the tightness of the two tapered roller bearings by which the pinion is held in the carrier. And this tightness is determined primarily by the thickness of the adjusting collar plus a shim.

Check the preload and, if the preload measurement is off the specified range indicated below, increase or decrease shim thickness. The method is as follows:

1) Tentatively install pinion in carrier, using adjusting collar and a 1 mm thick shim, and tighten the nut to secure splined yoke. Torque the nut to the following specification.

   Tightening torque for bevel pinion nut:
   200 N·m (20.0 kg-m, 144.5 lb-ft)



1. Spring measure

2) Put on torquing pulley (special tool) and give a pull, as shown in figure, and read spring balance indication just when the pulley begins to turn.
   The reading is a starting torque, and is required to be within the specified torque range.

   Special Tool
   (A): 09922-75222

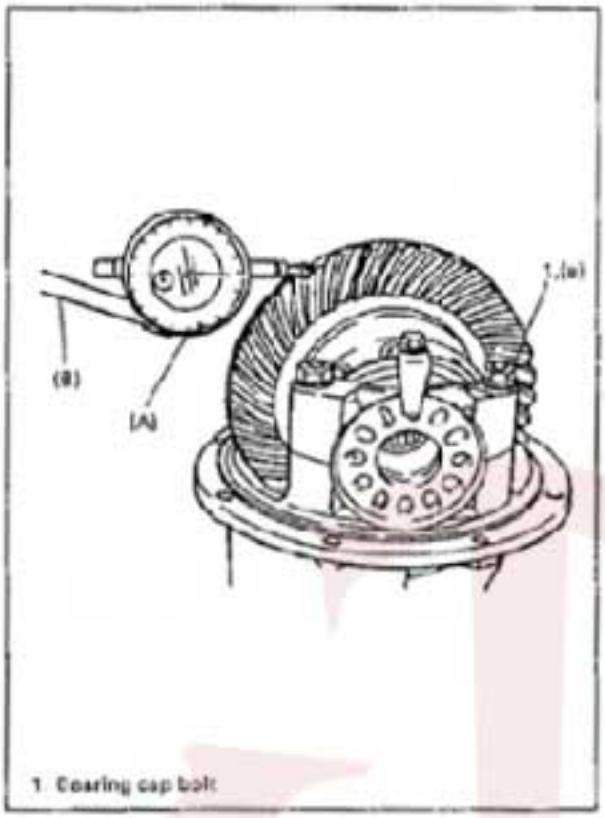
Pinion bearing preload	5.0 – 13.0kg-cm (4.3 – 11.3 lb-in.)
Spring measure reading (with special tool)	1.0 – 2.6kg (2.2 – 5.7 lb)

Increasing shim thickness decreases this preload, and vice versa. Five size shim stock available for "mounting distance" adjustment, mentioned above, is meant to be used in producing a proper shim thickness in this preload adjustment, too.

NOTE:

- **When tentatively installing pinion in carrier, be sure to oil bearings lightly with gear oil, and to leave out the oil seal.**
- **Make a note of the starting torque.**

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1. Bearing cap bolt

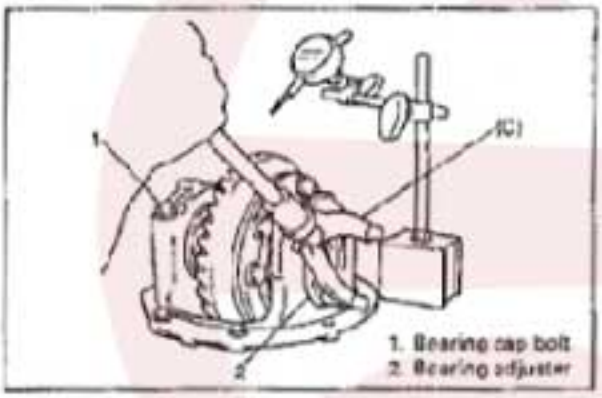
Bevel gear backlash adjustment

1) The backlash between bevel gear and pinion is checked in the manner shown in the figure. Note that the differential case assembly is mounted in the normal manner, and fastened down by tightening the side bearing cap bolts temporarily to the specified torque. The dial indicator spindle is pointed squarely to the "heel" on the drive side (convex side) of a gear tooth. Hold the bevel pinion rigidly, and turn the gear back and forth.
The dial indicator reading, which is a backlash value, is required to be within this range:

Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

Special Tool
(A): 09900-20606
(B): 09900-20701

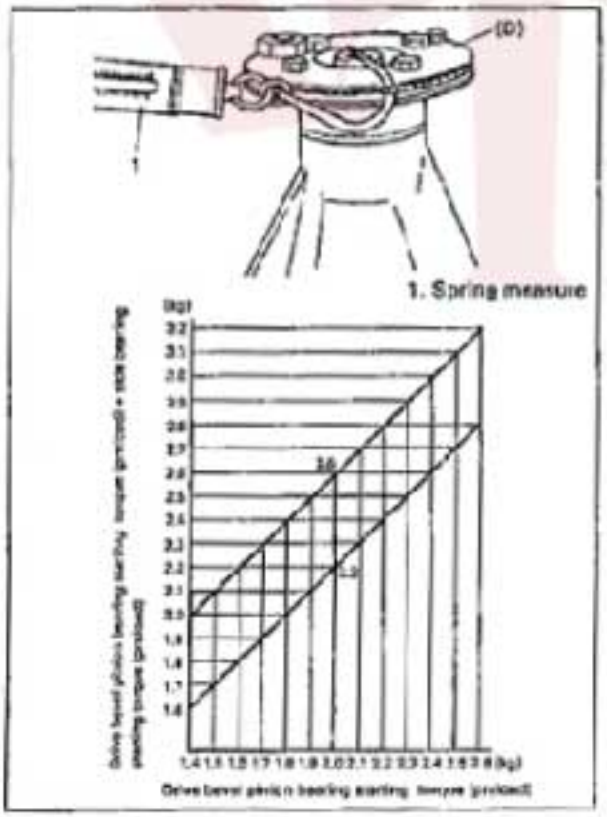
Bevel gear backlash: 0.10 – 0.20 mm (0.004 – 0.008 in.)



1. Bearing cap bolt
2. Bearing adjuster

2) To increase or decrease the backlash for adjustment, displace the bevel gear toward or away from the pinion by running in one adjuster and running out the other adjuster by an equal amount (with the side bearing cap nuts slightly loosened).
Turning the adjuster one notch changes the backlash by about 0.1 mm (0.004 in.).

Special Tool
(C): 09930-40113



1. Spring measure

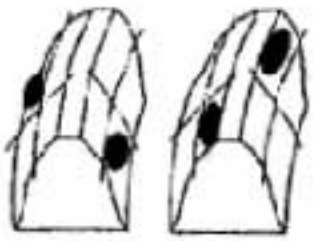
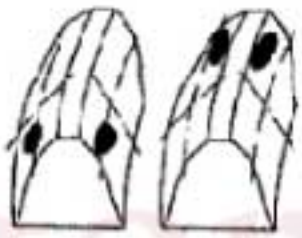
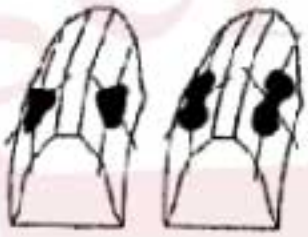
CAUTION:
Adjust preload on side bearing during backlash adjustment: mount preload check torquing pulley (special tool) on drive bevel pinion and measure using spring measure. When the reading at the instant side bevel gear starts moving is within the range as indicated in the below graph, the side bearing preload is acceptable. Referring to the graph, for example, when drive bevel pinion bearing preload measured as shown below is 2.0 kg (4.41 lb), drive bevel pinion bearing preload (kg) + side bevel gear bearing preload (kg) should be 2.2 – 2.6 kg (4.85 – 5.73 lb).
Upon completion of this adjustment, be sure to tighten bearing cap bolts to the specified torque.

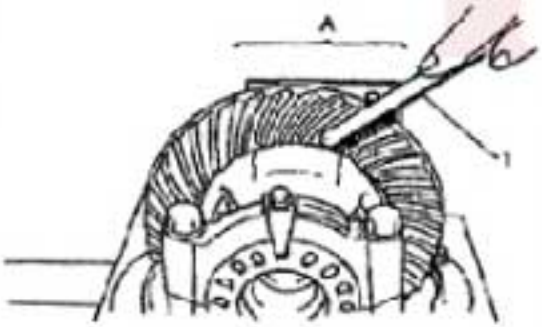
Special Tool
(D): 09922-75222

Tightening torque for bearing cap bolts after adjustment: 50 N·m (5.0 kg-m, 36.5 lb-ft)

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Pinion-to-gear Tooth Contact Pattern Check and Adjustment

Contact patterns	Diagnosis and remedy	Contact patterns	Diagnosis and remedy
	NORMAL		Replace differential carrier.
	HIGH CONTACT Pinion is too far back, therefore, increase bevel pinion adjusting shim.		1. Check seating of bevel gear or differential case. 2. Replace pinion and gear set. 3. Replace differential carrier.
	LOW CONTACT Pinion is too far out from differential carrier. Decrease bevel pinion adjusting shim.		1. Replace pinion and gear set. 2. Replace differential case.



1. Brush
A: Paint gear marking compound evenly

Check gear tooth contact as follows.

1) After cleaning tooth surface of 10 bevel gears, paint them with gear marking compound evenly by using brush or sponge etc.
2) Turn gear to bring its painted part in mesh with bevel pinion and turn it back and forth by hand to repeat their contact.
3) Bring painted part up and check contact pattern, referring to following chart. If contact pattern is not normal, readjust or replace as necessary according to instruction in chart.

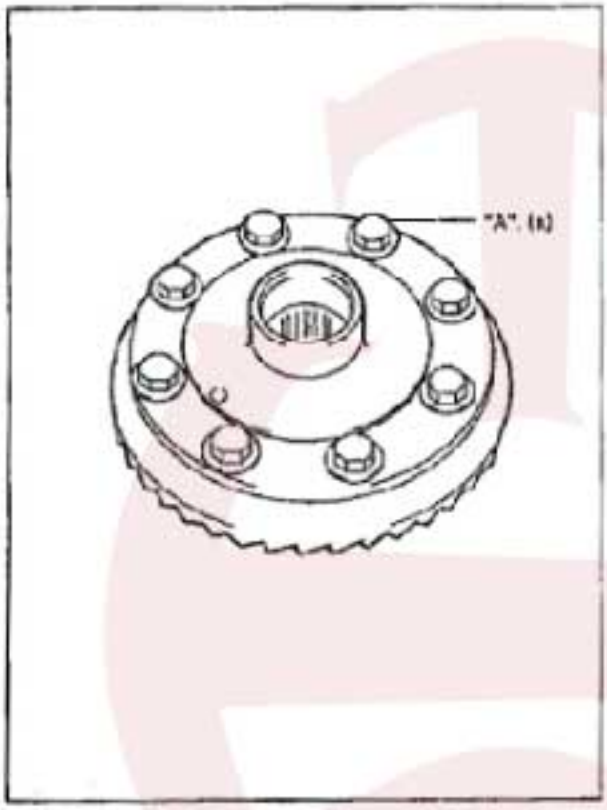
NOTE:
Be careful not to turn bevel gear more than one full revolution, for it will hinder accurate check.

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REASSEMBLY

Reverse disassembly procedure for reassembly, noting the following.

NOTE:
Bevel pinion and bevel gear are supplied as a set. Even when only bevel pinion or bevel gear replacement is necessary, be sure to replace both as a set.



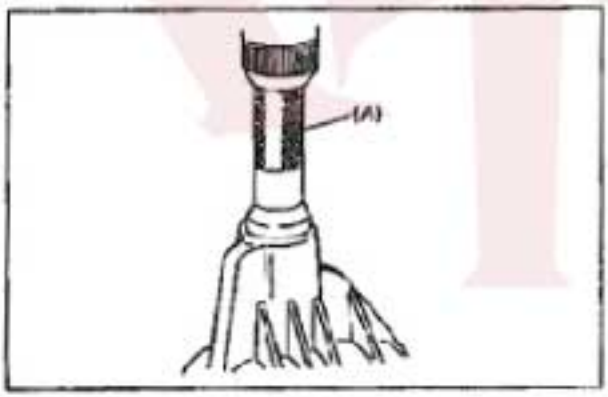
Drive bevel gear bolts

The bolts securing the bevel gear to the differential case are subject to shear stress since drive is transmitted by these bolts from the gear to the case. For this reason, they are special bolts made from chrome steel and must never be replaced with common bolts.

When mounting gear on case, be sure to apply thread lock cement to these bolts before running them in.

"A": Cement 99000-32020

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

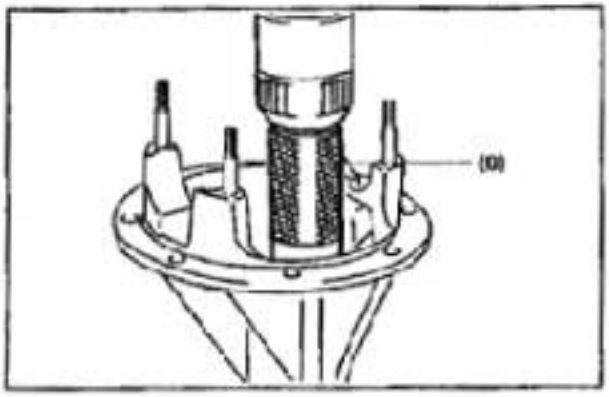


Bevel pinion bearings

A press must be used to install 2 tapered roller bearings on bevel pinion. Outer races are to be press-fitted into differential carrier and inner races onto pinion.

1] For outer race of front bearing (yoke side), special tool indicated here, must be used:

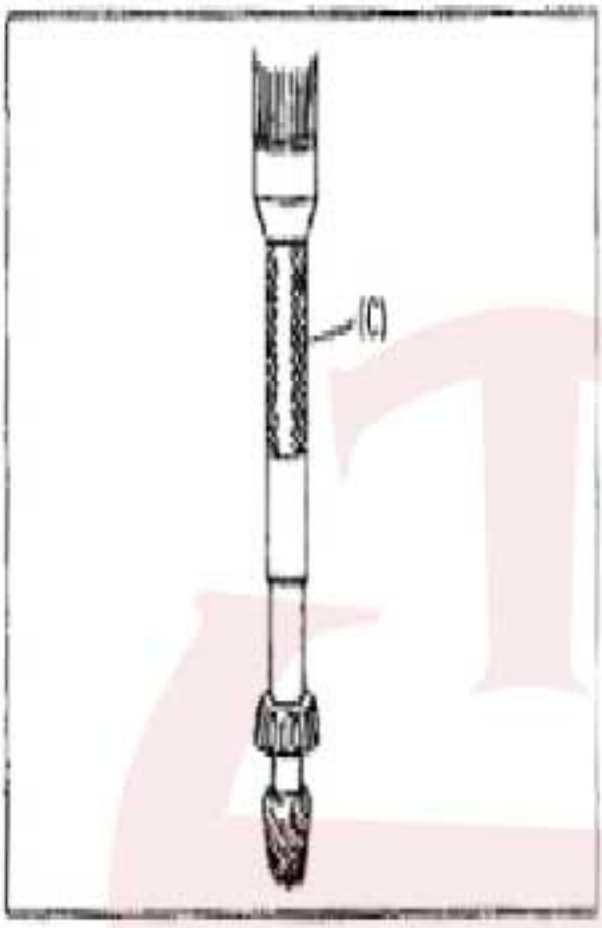
Special Tool
(A): 09913-75520



2] For outer race of rear bearing (gear side):

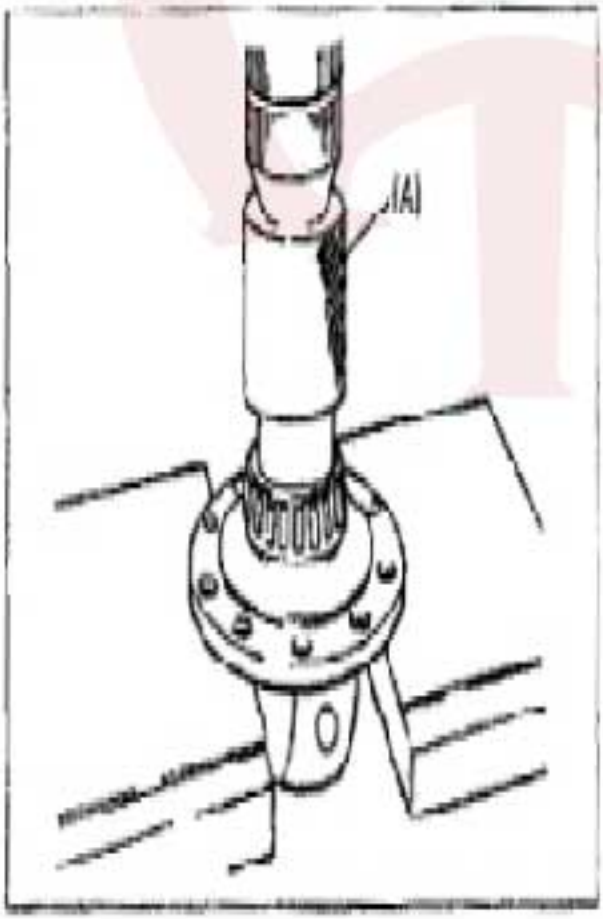
Special Tool
(B): 09913-75510

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3) For inner races, use this special tool.

Special Tool
(C): 09940-51710



Differential side bearings

Press-fit these bearings into differential case by using special tool. Driving bearing into the case is not permitted.

Special Tool
(A): 09940-53111

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TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
Differential oil filler/level plug	50	5.0	36.5
Differential oil drain plug	55	5.5	40.0
Propeller shaft flange bolts	50	5.0	36.5
Bevel gear bolts	85	8.5	61.5
Bearing cap bolts	50	5.0	36.5
Lock plate bolts	11.5	1.15	8.5
Rear differential carrier nuts	23	2.3	17.0
Bevel pinion nut	200	20.0	144.5

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REQUIRED SERVICE MATERIALS

MATERIALS	USE
Thread lock cement	Bevel gear bolts
Lithium grease	Oil seal lips
Sealant	• Rear differential drain plug • Mating surface of differential housing

SPECIAL TOOLS



09913-85230
Bearing removing jig



09922-85811
Spring pin remover



09913-75510 (O.D.70.5 mm)
09913-75520 (O.D.60.5 mm)
Bearing installer



09900-20701
Magnetic stand



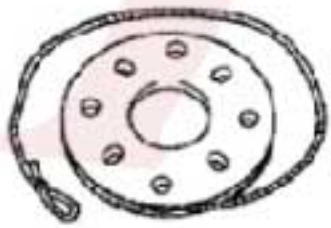
09900-20606
Dial gauge



09940-51710
Bearing installer



09924-36320 (For Front Diff)
Bevel pinion mounting dummy



09922-75222
Preload adjuster



09940-53111
Bearing installer



09530-40113
Rotor holder



09913-60910
Bearing/Gear puller

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SECTION 8

BODY ELECTRICAL SYSTEM

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Power Window Control System (If Equipped) B-37

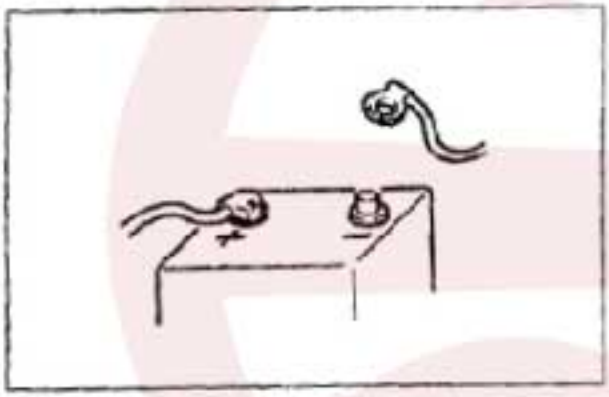
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GENERAL DESCRIPTION

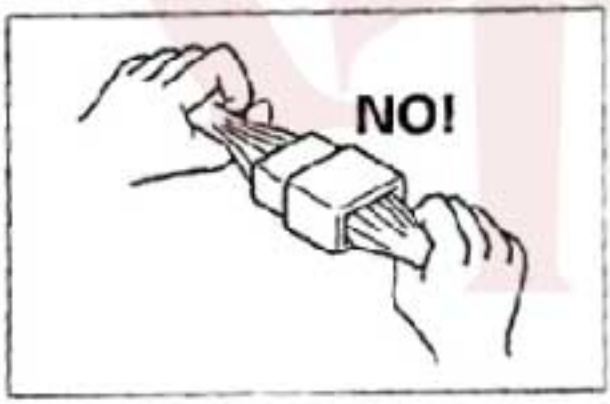
The body electrical components of this vehicle are designed to operate on 12 Volts power supplied by the battery. The electrical system utilizes negative ground polarity.

CAUTIONS IN SERVICING

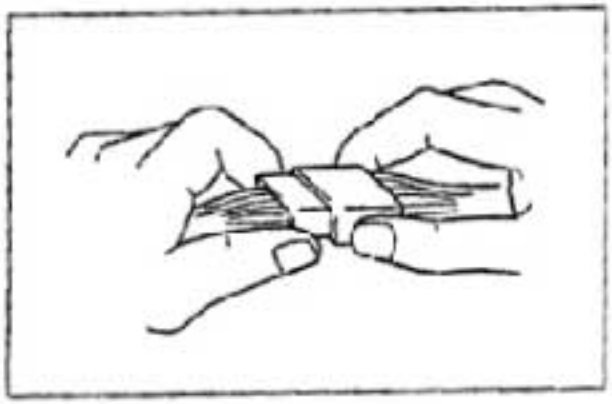
When performing works related to electric systems, observe following cautions for the purpose of protection of electrical parts and prevention of a fire from occurrence.



- When removing the battery from the vehicle or disconnecting the cable from the battery terminals for inspection or service works on the electric systems, always confirm first that the ignition switch and all the other switches have been turned OFF. Otherwise, the semi-conductor part may be damaged.
- When disconnecting cables from the battery, be sure to disconnect the one from the negative (–) terminal first and then the other from the positive (+) terminal.
- Reverse the above order when connecting the cables to the battery terminals.

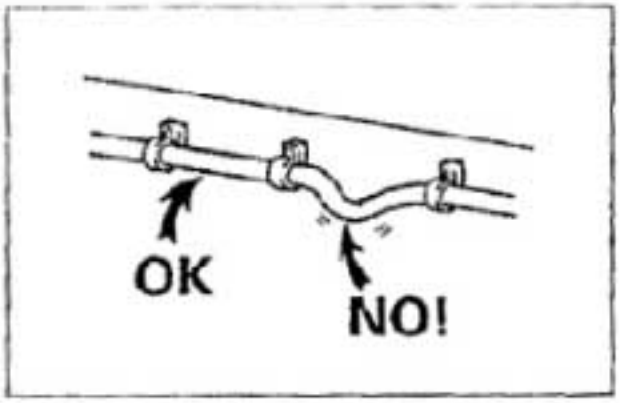


- When disconnecting connectors, never pull the wiring harnesses. Unlock the connector lock first and then pull them apart by holding connectors themselves.

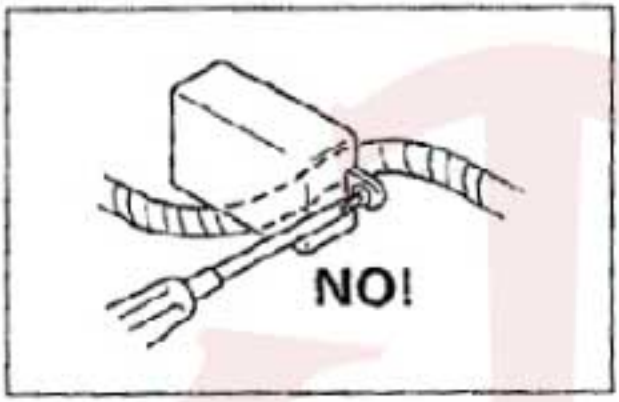


- When connecting connectors, also hold connectors and push them together until they lock securely (a click is heard).

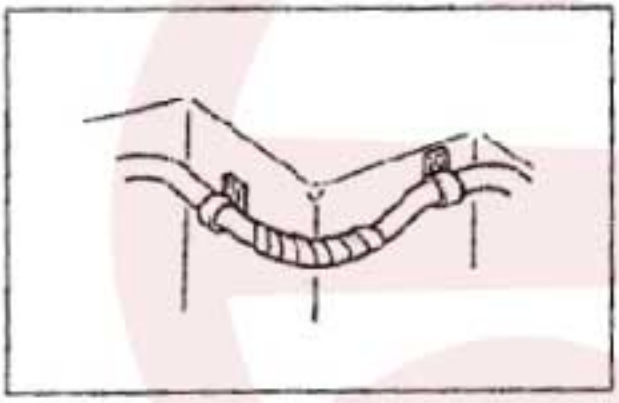
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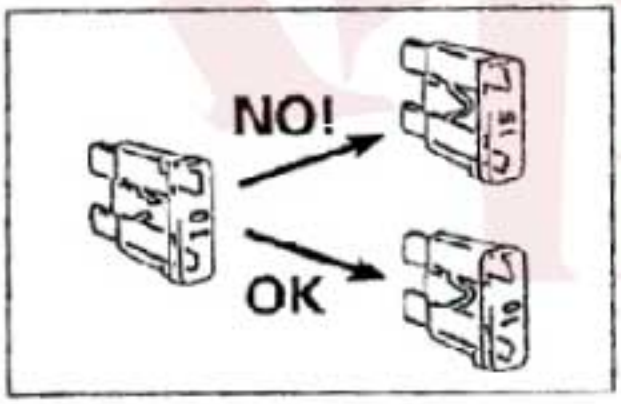
- When installing the wiring harness, fix it with clamps so that no slack is left.



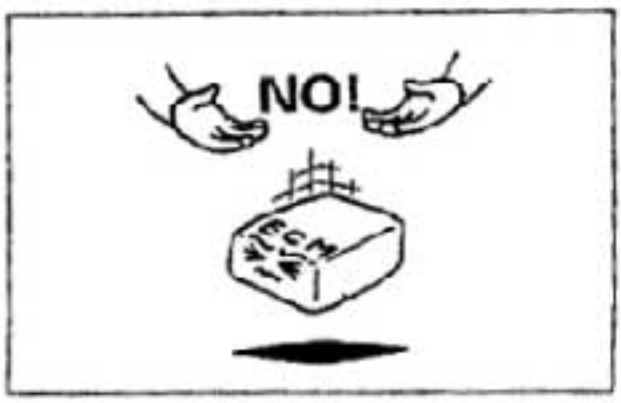
- When installing vehicle parts, be careful so that the wiring harness is not interfered with or caught by any other part.



- To avoid damage to the harness, protect its part which may contact against a part forming a sharp angle by winding tape or the like around it.

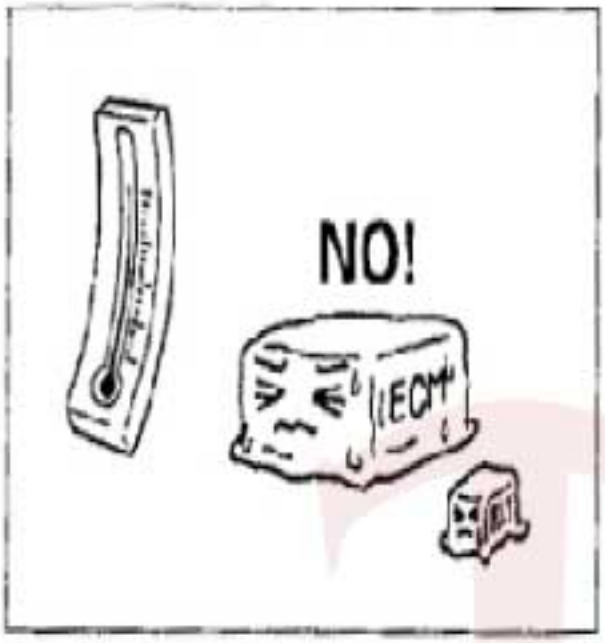


- When replacing a fuse, make sure to use a fuse of the specified capacity. Use of a fuse with a larger capacity will cause a damage to the electrical parts and a fire.



- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.

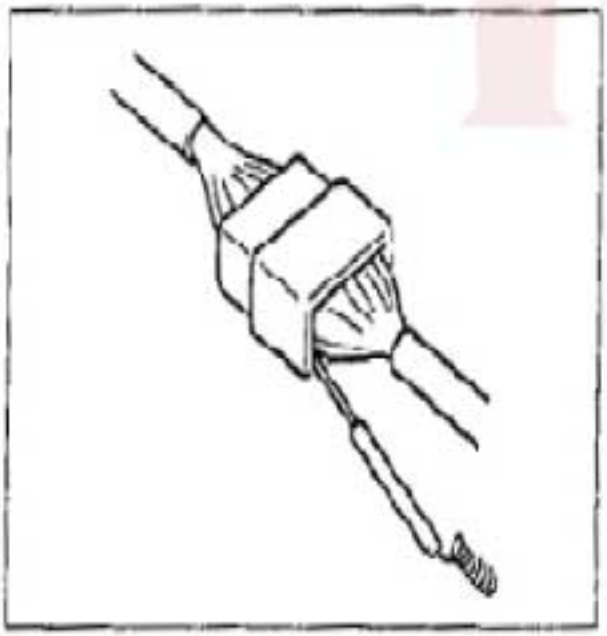
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- When performing a work that produces a heat exceeding 80°C in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.



- Use care not to expose connectors and electrical parts to water which will be a cause of a trouble.

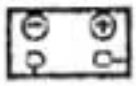
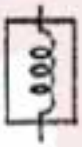
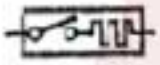
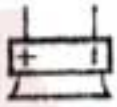
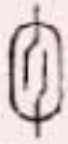
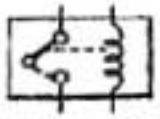
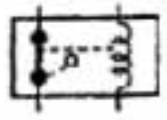


- When using a tester for checking continuity or measuring voltage, be sure to insert the tester probe from the wire harness side.

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SYMBOLS AND MARKS

In the diagrams of this manual, each equipments are represented by the symbols and marks as shown below.

Battery	Ground		Fuse	Main fuse
				
Circuit breaker	**Coil, Solenoid**	**Heater**	**Bulb**	
				
Cigarette lighter	**Motor**	**Pump**	**Horn**	**Speaker**
				
Buzzer	**Chime**	**Condenser**	**Thermistor**	**Reed switch**
				
Resistance	**Variable resistance**		**Transistor**	
			 NPN	 PNP
Photo transistor	**Diode**	**Reference (zener) diode**	**Light emitting diode**	**Photo diode**
				
Piezoelectric element	**Harness**		**Relay**	
	 (Connected)	 (Not connected)	 Normal open relay	 Normal closed relay
Connector	**Switch**		**"O" Type terminal**	
				

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ABBREVIATIONS

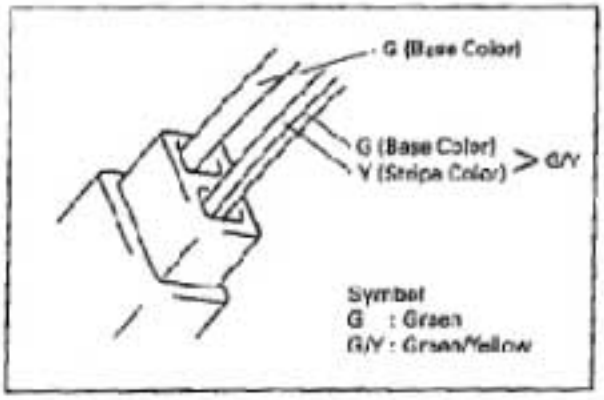
Listed below are the abbreviations as used in this manual and their full terms.

Abbreviation	Full term	Abbreviation	Full term
2WD	2 Wheel Drive vehicles	IG	Ignition
4WD	4 Wheel Drive vehicles	ILL	Illumination
A/C	Air Conditioning	IND	Indicator
ACC	Accessory	J/B	Junction/Fuse Block
CAMI	Vehicles assembled at CAMI plant in Canada	J/C	Joint Connector
CKP	Crankshaft Position	KOSAI	Vehicles assembled at KOSAI plant in Japan
CMP	Camshaft Position	LH	Left Hand
DLC	Data Link Connector	LO	Low
DRL	Daytime Running Light (if equipped)	MAP	Manifold Absolute Pressure
ECT	Engine Coolant Temperature	PSP	Power Steering Pressure
EFE	Early Fuel Evaporation	RH	Right Hand
EGR	Exhaust Gas Recirculation	SDM	Sensing and Diagnostic Module
F/L	Fusible Link	SEDAN	SEDAN model
HATCH-BACK	HATCH-BACK model	ST	Starter
HI	High	TCC	Torque Converter Clutch
IAC	Idle Air Control	VSS	Vehicle Speed Sensor
IAT	Intake Air Temperature		

WIRE COLOR SYMBOLS

The wire color is abbreviated to the first (or first two) alphabet(s) of each color.

Symbol	Wire Color	Symbol	Wire Color
B	Black	O	Orange
Bl	Blue	R	Red
Br	Brown	W	White
G	Green	Y	Yellow
Gr	Grey	P	Pink
Lbl	Light blue	V	Violet
Lg	Light green		



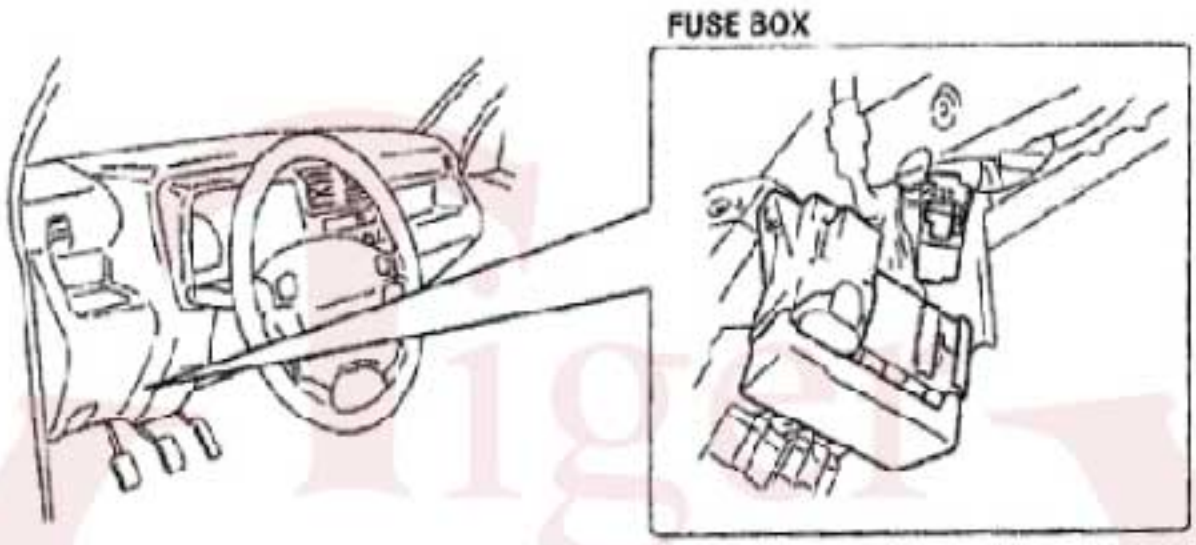
There are two kinds of colored wire used in this vehicle. One is single-colored wire and the other is dual-colored (striped) wire.

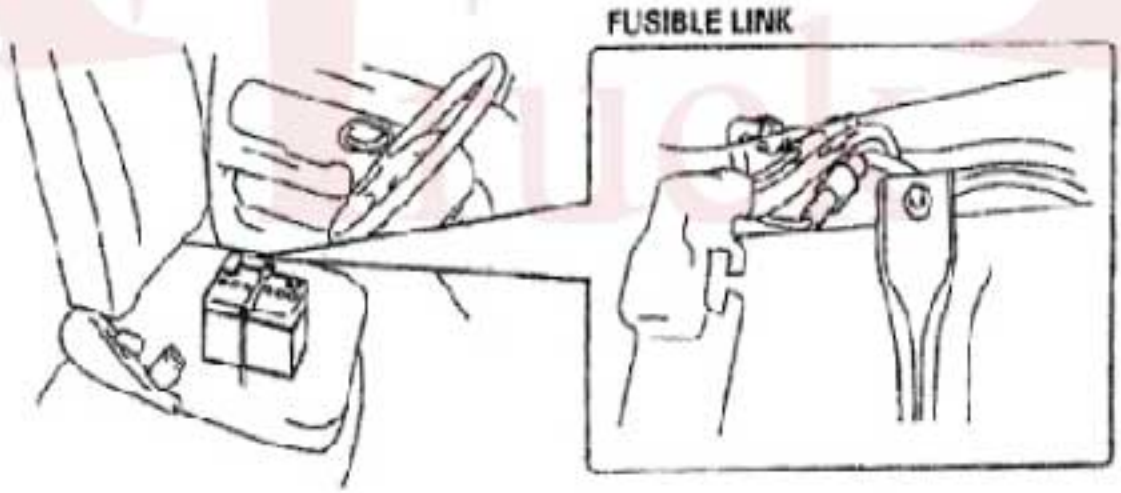
The single-colored wire uses only one color symbol (i.e. "G"). The dual-colored wire uses two color symbols (i.e. "G/Y"). The first symbol represents the base color of the wire ("G" in the figure) and the second symbol represents the color of the stripe ("Y" in the figure).

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FUSE BOX AND RELAY

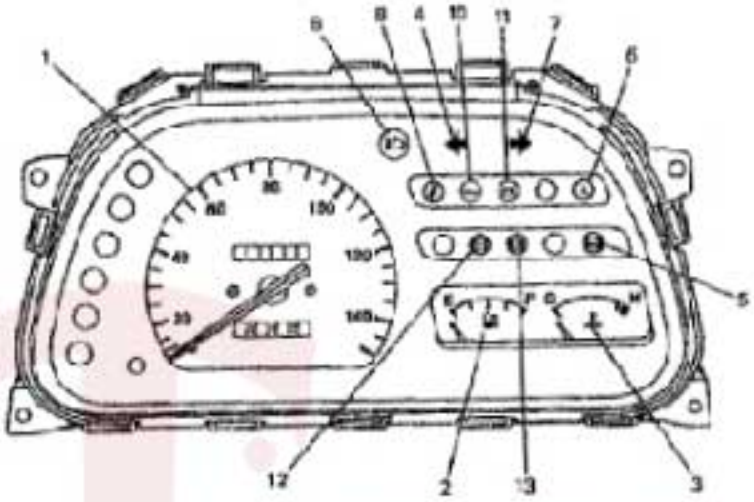
FUSE BOX

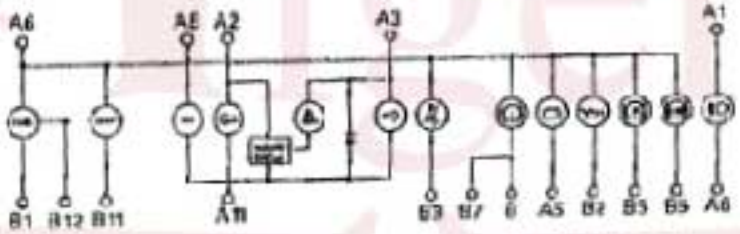




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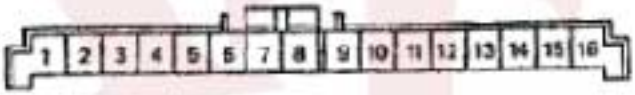
COMBINATION METER



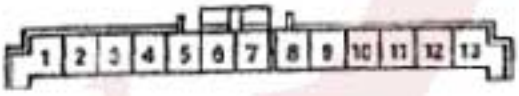


NOTE:
Terminal arrangement viewed from the harness side.

Coupler A



Coupler B



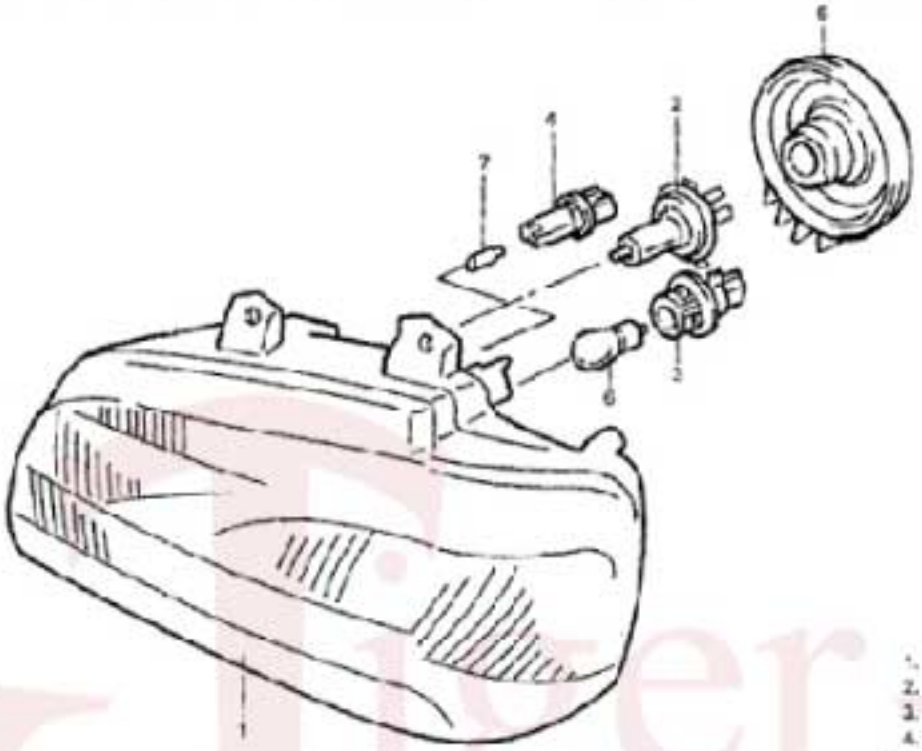
1. Speedometer
2. Fuel level meter
3. Water temperature meter
4. Turn signal pilot light (LH)
5. ABS warning light (if equipped)
6. Hazard pilot light (if equipped)
7. Turn signal pilot light (RH)
8. Fasten seat belt light (if equipped)
9. High beam light
10. Oil pressure warning light
11. Charge warning light
12. Parking brake warning light
13. Brake warning light
14. Illumination light

Coupler A		
1.	To fuse box	W/Bl
2.	To combination switch	G/R
3.	To combination switch	G/Y
4.	Blank	-
5.	To generator	W/R
6.	To fuse box	B/W
7.	Blank	-
8.	To combination switch	R/Y
9.	Blank	-
10.	Blank	-
11.	To ground	B
12.	Blank	-
13.	Blank	-
14.	Blank	-
15.	Blank	-
16.	To combination switch	R

Coupler B		
1.	To fuel level gauge	Y/R
2.	To oil pressure switch	Y/B
3.	To seat belt switch	Gr/B
4.	Blank	-
5.	To parking brake switch	V
6.	To brake fluid level switch	P/B
7.	To ignition switch	Br/B
8.	Blank	-
9.	To ABS controller	R/Bl
10.	Blank	-
11.	To ECT sensor	Y/W
12.	To ground	B/Y
13.	Blank	-

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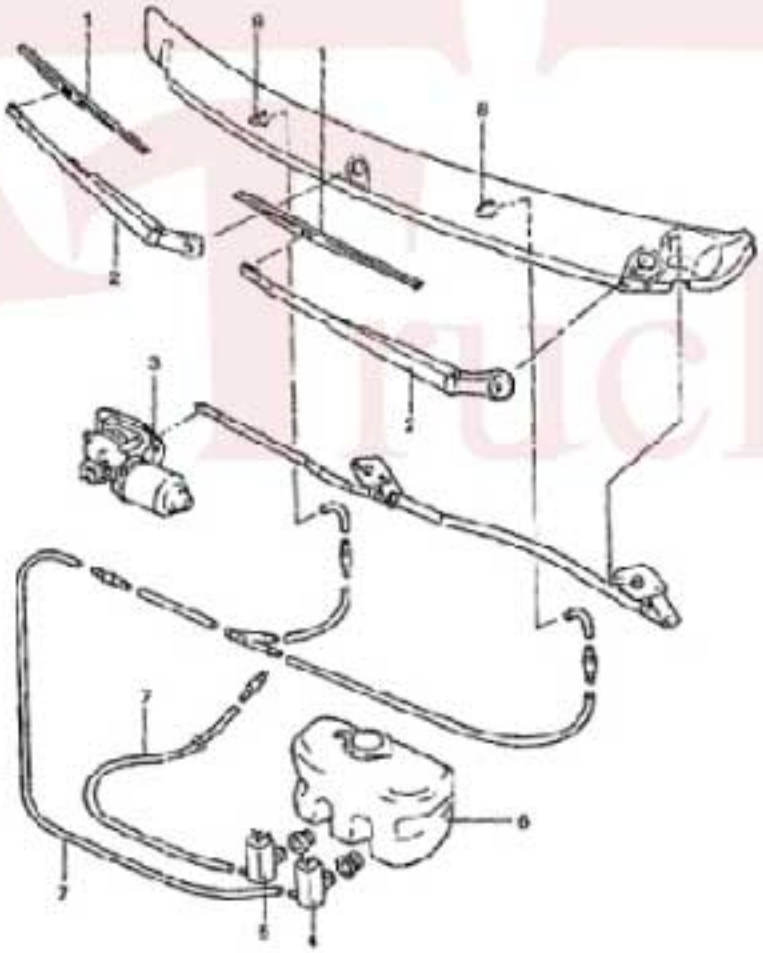
HEADLIGHT



1. Headlight assembly
2. Halogen bulb
3. Turn signal light socket
4. Position light socket
5. Socket cover
6. Turn signal light bulb
7. Position light bulb

WINDSHIELD WIPER

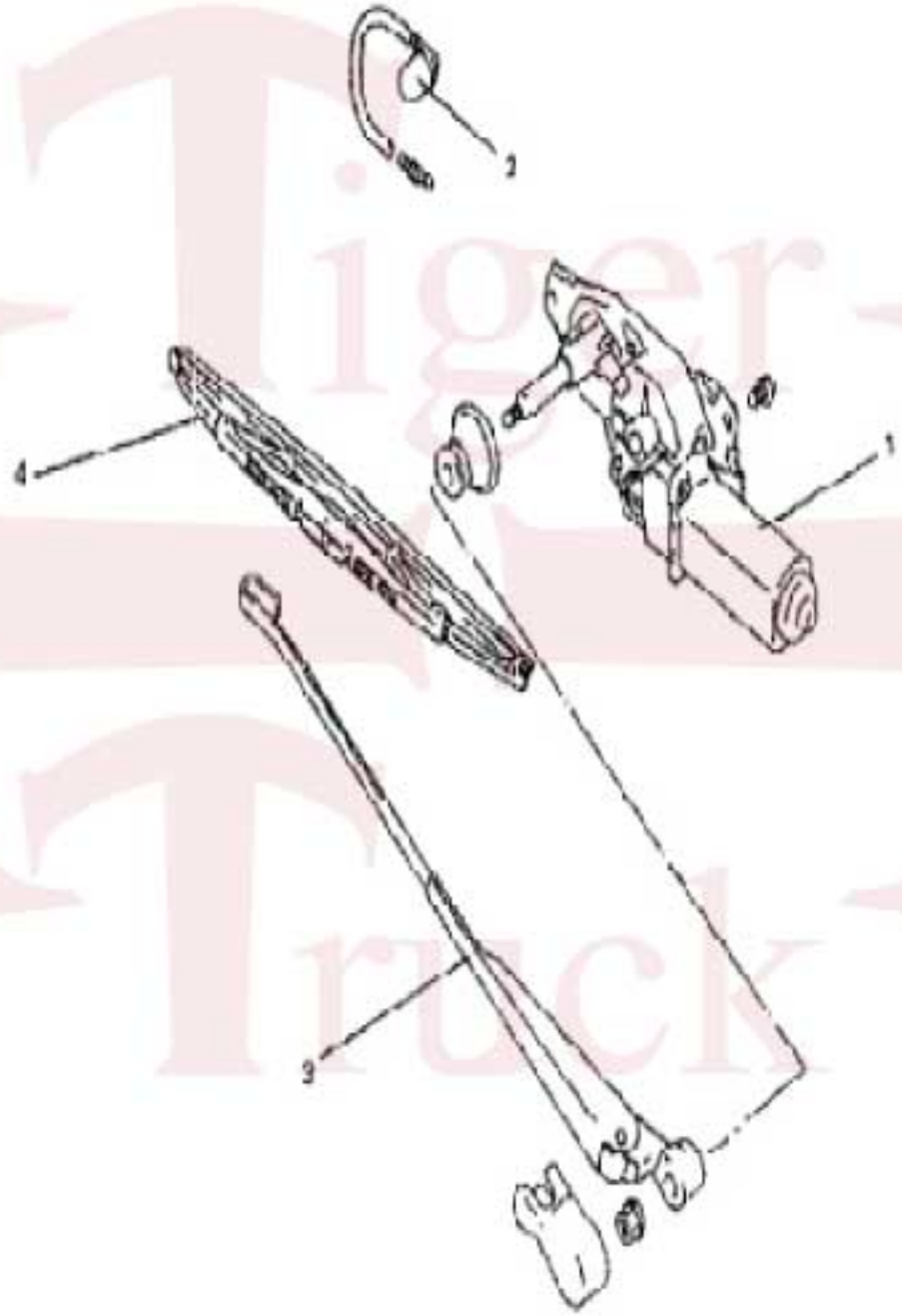
FRONT WIPER



1. Wiper blade
2. Wiper arm
3. Wiper motor
4. Washer pump (for front washer)
5. Washer pump (for rear washer)
6. Washer tank
7. Washer hose
8. Washer nozzle (front)

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REAR WIPER (IF EQUIPPED)



1. Wiper motor assembly
2. Washer nozzle
3. Wiper arm
4. Wiper blade

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DIAGNOSIS

HEADLIGHT

Trouble	Possible Cause	Correction
Headlights do not light up	Bulb blown	Check bulb
	Headlight switch faulty	Check headlight switch
	HEAD R and L fuses blown	Check fuses and replace as necessary (If replace, check short circuit)
	Wiring or grounding faulty	Repair circuit
Only one headlight does not light up	Bulb blown	Check bulb
	HEAD R or L fuse blown	Check fuse and replace as necessary
	Headlight switch faulty	Check headlight switch
	Wiring or grounding faulty	Repair circuit

FRONT FOG LIGHT (IF EQUIPPED)

Trouble	Possible Cause	Correction
Front fog lights do not light up	Bulb blown	Check bulb
	FOG fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Front fog light switch faulty	Check front fog light switch
	Front fog light relay faulty	Check relay
	Headlight switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit
Only one headlight does not light up	Bulb blown	Check bulb
	Wiring or grounding faulty	Repair circuit

TURN SIGNAL AND HAZARD WARNING LIGHTS

Trouble	Possible Cause	Correction
Flash rate high or one side only flashes	Bulb blown on "flash rate high"-side	Check bulb
	Incorrect bulb	Check bulb
	Turn signal/hazard warning relay faulty	Check relay
	Open circuit or high resistance existing between turn signal/hazard warning switch and light on one side	Repair circuit
	Wiring or grounding faulty	Repair circuit
No flashing	HAZARD HORN and/or	Check fuse and replace as necessary (If replace, check short circuit)
	TURN BACK fuse blown	
	Open circuit or high resistance existing between battery and switch	Check bulb and check circuit
	Turn signal/hazard relay faulty	Check relay
	Combination switch and/or hazard switch faulty	Check switch
Flash rate low	Supply voltage low	Check charging system
	Turn signal/hazard relay faulty	Check relay

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CLEARANCE, TAIL AND LICENSE PLATE LIGHTS

Trouble	Possible Cause	Correction
All lights do not light up	Bulb(s) blown	Check bulb
	TAIL•STOP fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Wiring or grounding faulty	Repair circuit
Some lights do not light up	Bulb(s) blown	Check bulb
	Wiring or grounding faulty	Repair circuit

BACK-UP LIGHT

Trouble	Possible Cause	Correction
Back-up lights do not light up	Bulb(s) blown	Check bulb
	TURN BACK fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Back-up light switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit
Back-up lights stay on	Back-up light switch faulty	Check or replace switch

BRAKE LIGHTS

Trouble	Possible Cause	Correction
Brake lights do not light up	Bulb(s) blown	Check bulb
	TAIL STOP fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Brake light switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit
Brake lights stay on	Brake light switch faulty	Check, adjust or replace switch

REAR FOG LIGHT (IF EQUIPPED)

Trouble	Possible Cause	Correction
Rear fog light does not light up	Bulb blown	Check bulb
	FOG fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Rear fog light switch faulty	Check rear fog light switch
	Headlight switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit

FUEL METER AND FUEL GAUGE UNIT

Trouble	Possible Cause	Correction
Fuel meter shows no operation	IG COIL METER fuse blown	Check fuse (If replace, check short circuit)
	Fuel gauge unit	Check fuel gauge unit
	Fuel meter	Check fuel meter
	Wiring or grounding	Repair circuit

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ENGINE COOLANT TEMP. (ECT) METER AND ECT SENSOR

Trouble	Possible Cause	Correction
Engine coolant temp. meter shows no operation	IG COIL METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	ECT meter faulty	Check ECT meter
	ECT sensor faulty	Check ECT sensor
	Wiring or grounding faulty	Repair circuit

OIL PRESSURE LIGHT

Trouble	Possible Cause	Correction
Oil pressure warning light does not light up when ignition switch is on at engine off	Bulb in combination meter blown	Check bulb
	IG COIL METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Combination meter wiring circuit faulty	Check combination meter wiring circuit
	Oil pressure switch faulty	Check oil pressure switch
	Wiring or grounding faulty	Repair circuit

BRAKE AND PARKING BRAKE WARNING LIGHT

Trouble	Possible Cause	Correction
Brake warning light does not light up when fluid low level	Bulb in combination meter blown	Check bulb
	IG COIL METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Combination meter wiring circuit faulty	Check combination meter wiring circuit
	Brake fluid level switch faulty	Check brake fluid level switch
	Wiring or grounding faulty	Repair circuit
Brake warning light does not light up when cranking (when ignition switch at ST position)	Ignition switch faulty	Check ignition switch
	Combination meter wiring circuit faulty	Check combination meter wiring circuit
	Wiring or grounding faulty	Repair circuit
Parking brake warning light does not light up	Bulb in combination meter blown	Check bulb
	IG COIL METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Combination meter wiring circuit faulty	Check combination meter wiring circuit
	Parking brake switch faulty	Check parking brake switch
	Wiring or grounding faulty	Repair circuit

SEAT BELT WARNING LIGHT

Trouble	Possible Cause	Correction
Seat belt warning light does not light up	Bulb in combination meter blown	Check bulb
	Seat belt switch faulty	Check seat belt switch
	IG COIL METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Wiring or grounding faulty	Repair circuit

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REAR WINDOW DEFOGGER (IF EQUIPPED)

Trouble	Possible Cause	Correction
Defogger does not operate	REAR DEFG fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Heat wire faulty	Check heat wire
	Rear window defogger switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit

WINDSHIELD WIPER AND WASHER
FRONT WIPER AND WASHER
REAR WIPER AND WASHER (IF EQUIPPED)

Trouble	Possible Cause	Correction
Wiper malfunctions or does not return to its original position	WIPER WASHER fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Wiper motor faulty	Check wiper motor
	Wiper switch (combination switch) faulty	Check wiper switch
	Wiring or grounding faulty	Repair circuit
Washer malfunctions	Washer hose or nozzle clogged	Clean or repair clogged hose or nozzle
	Washer motor faulty	Check washer motor
	Wiper switch (combination switch) faulty	Check wiper switch
	Wiring or grounding faulty	Repair circuit

POWER WINDOW CONTROL SYSTEM (IF EQUIPPED)

Trouble	Possible Cause	Correction
All power windows do not operate	Power window fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Ignition (main) switch faulty	Check ignition (main) switch
	Power window switch faulty	Check power window switch
	Wiring or grounding faulty	Repair circuit
Only one power window does not operate	Wiring and/or coupler faulty	Check wiring and/or coupler
	Power window switch (main or sub) faulty	Check power window switch
	Window actuator faulty	Check window actuator
	Window lock switch faulty	Check window lock switch
	Grounding faulty	Repair

CIGARETTE LIGHTER

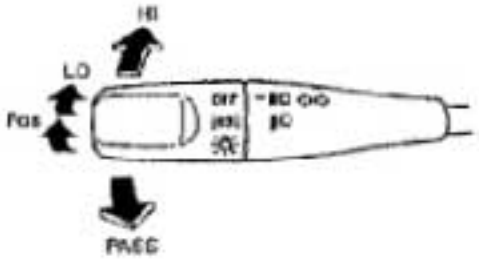
Trouble	Possible Cause	Correction
Cigarette lighter shows no operation	RADIO CIGAR fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Ignition switch faulty	Check ignition switch
	Cigarette lighter faulty	Check cigarette lighter
	Wiring or grounding faulty	Repair circuit

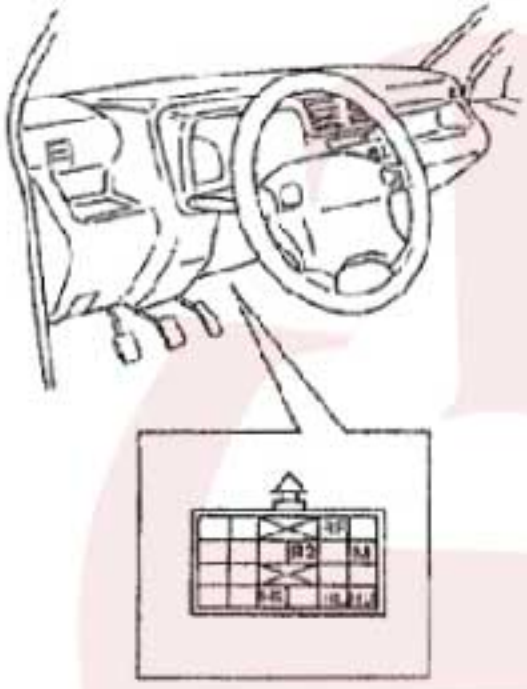
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INTERIOR LIGHTS

Trouble	Possible Cause	Correction
Interior lights do not light up	Bulbs blown	Replace
	TAIL STOP fuse blown	Check fuse and replace as necessary (If replace, check short circuit)
	Interior light switch faulty	Check switch
	Door switch faulty	Check switch
	Wiring or grounding	Repair
One of interior light does not light up	Bulb blown	Replace
	Interior light switch faulty	Check switch
	Door switch faulty	Check switch
	Wiring or grounding	Repair

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ON-VEHICLE SERVICE

HEADLIGHT

HEADLIGHT SWITCH

INSPECTION

1) Disconnect negative (-) cable at battery.
2) Disconnect combination switch lead wire couplers from junction/fuse block.
3) Use a circuit tester to check the continuity at each switch position shown below.

Switch Position \ Terminal / Wire Color	HE	HU	HL	RF
	B	R	R/W	G/B
Passing	○	○		
Low Beam			○	○
High Beam		○		○

Switch Position \ Terminal / Wire Color	HE	RF	B2	M
	B	G/B	W	R/Y
OFF				
			○	○
	○	○	○	○

REMOVAL AND INSTALLATION

Refer to COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT in Section 3C (for vehicle without air bag system) or Section 3C1 (for vehicle with air bag system) for details.



HEADLIGHT

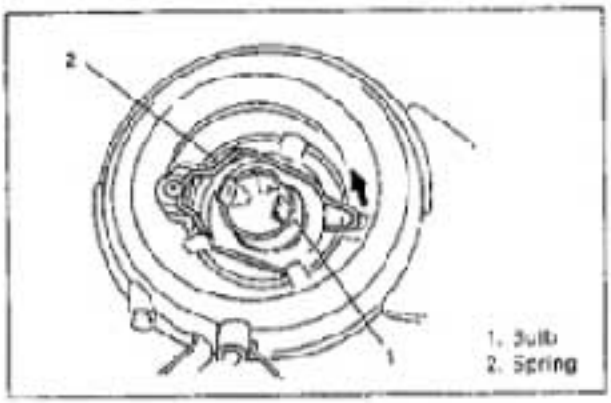
REMOVAL

1) Disconnect negative cable at battery.
2) Remove headlight mounting bolts.
3) Detach headlight assembly from vehicle.
4) Disconnect couplers from headlight assembly.
5) Remove headlight assembly.

INSTALLATION

Reverse removal procedure for installation.

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BULB REPLACEMENT

WARNING:
Don't touch when the bulb is hot.

1) Disconnect negative (–) cable at battery.
2) Disconnect harness from bulb.
3) Remove socket cover and bulb.
4) Replace bulb and assemble all removed parts.

HEADLIGHT AIMING WITH SCREEN

NOTE:

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to following procedure.**
- **After replacing headlight, be sure to adjust aiming.**

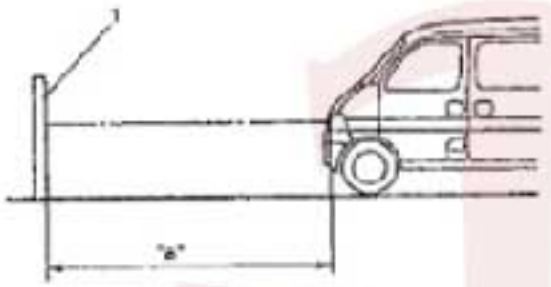
Before adjustment, make sure the following.

a) Place vehicle on a flat surface in front of blank wall (screen) ahead of headlight surface.

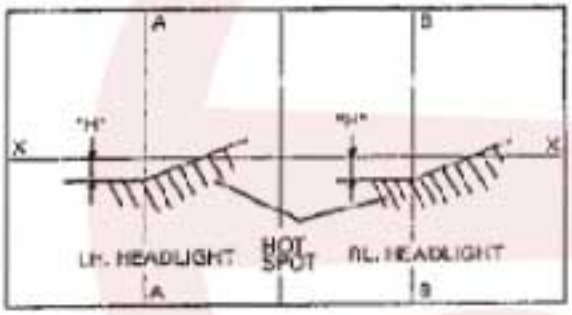
Clearance "a": 10 m (32.8 ft.)

b) Adjust air pressure of all tires to a specified value respectively.
c) Bounce vehicle body up and down by hand to stabilize suspension.
d) Carry out with one driver aboard.

Driver's weight: 75 kg (165 lb)



1. Screen



X - X: Horizontal center light of headlights
A - A: Vertical center line of left headlight
B - B: Vertical center line of right headlight

Adjustment

1) Check to see if hot spot (high intensity zone) of each main (low) beam axis falls as illustrated.

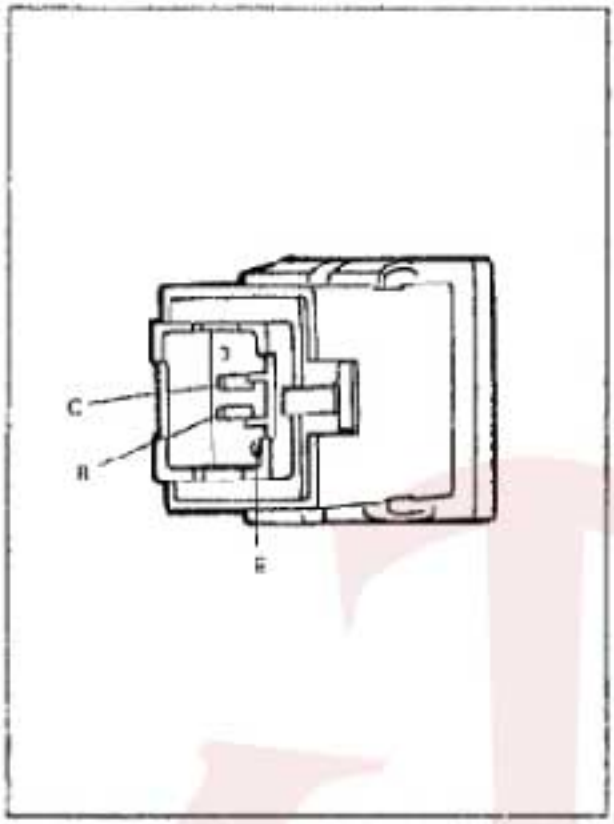
Clearance "H": Approx. 130 mm (5.15 in.)

2) If headlight aiming is not set properly, align it to specification by adjusting aiming screw and aiming gear.



1. Headlight assy
2. Aiming (for right/left adjustment)
3. Aiming (for up/down adjustment)

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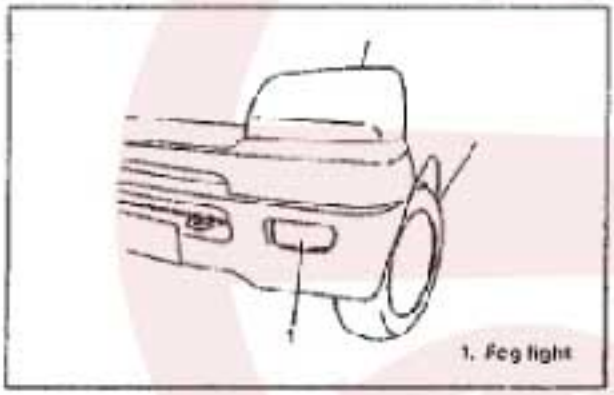
FRONT FOG LIGHT (IF EQUIPPED)

FRONT FOG LIGHT SWITCH

INSPECTION

Use a circuit tester to check switch for continuity between each terminals shown below.

Switch Position \ Terminal	C	B	E
OFF		○	○
ON	○	○	○



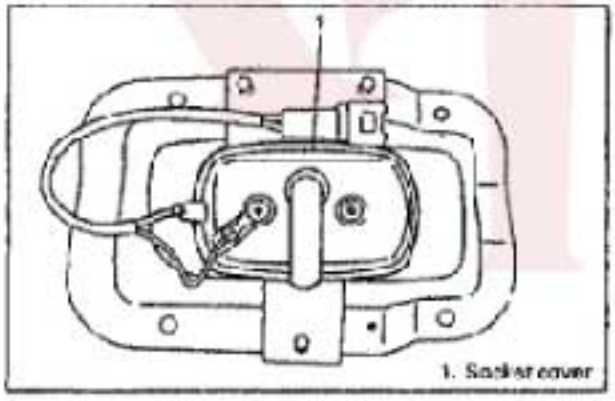
FRONT FOG LIGHT

REMOVAL

1) Remove head light.
2) Remove front bumper.
3) Disconnect fog light coupler.
4) Remove fog light assembly from bumper.

INSTALLATION

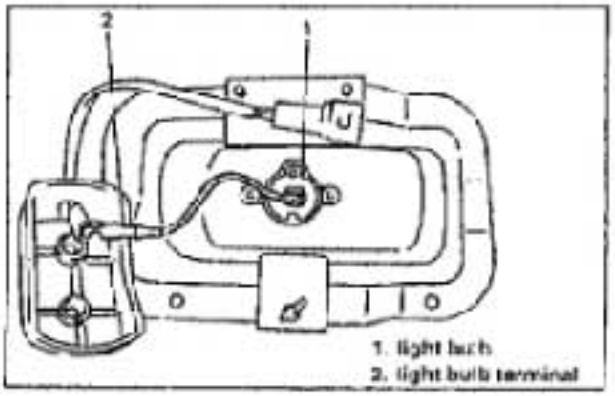
Reverse removal procedure for installation.



BULB REPLACEMENT

WARNING:
Don't touch when the bulb is hot.

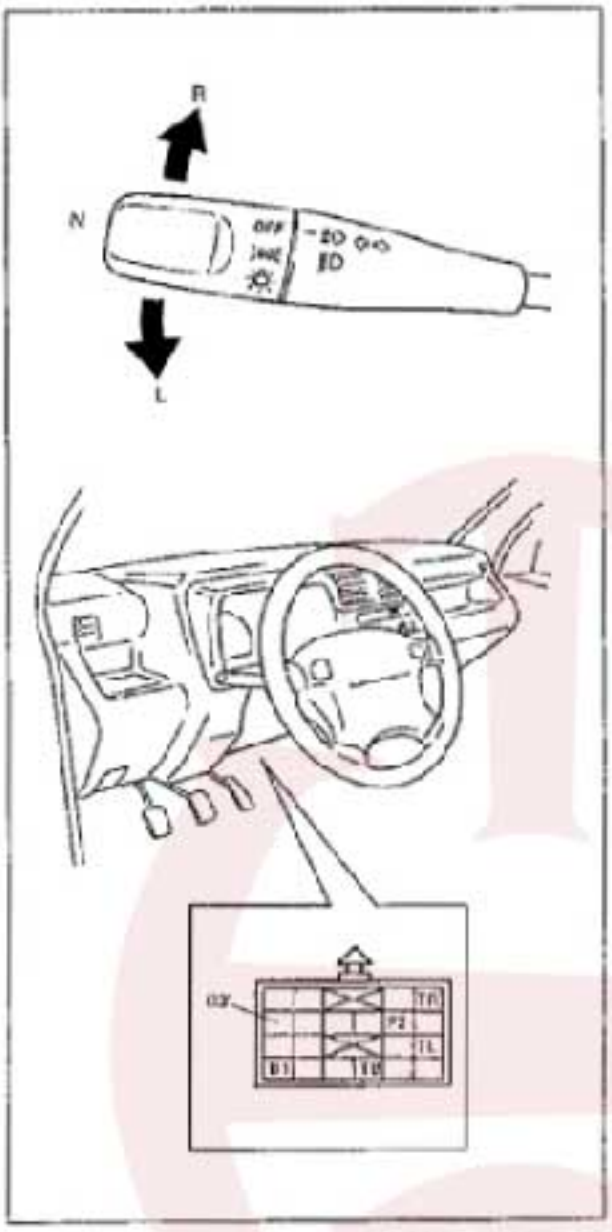
1) Disconnect negative (–) cable at battery.
2) Remove head light.
3) Remove front bumper.
4) Disconnect fog light coupler.
5) Remove socket cover and disconnect wire terminal.



4) Remove screw fixing light bulb, then remove light bulb from fog light assembly.
5) Replace light bulb and assemble all removed parts.

NOTE:
Make sure to cover light bulb terminal.

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TURN SIGNAL AND HAZARD WARNING LIGHT

TURN SIGNAL LIGHT SWITCH

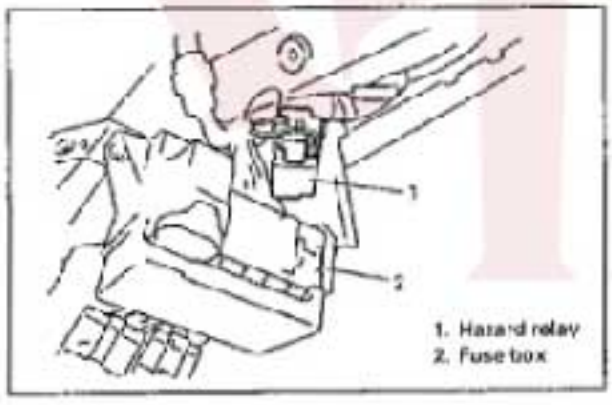
INSPECTION

1) Disconnect negative (–) cable at battery.
2) Disconnect combination switch lead wire coupler.
3) Use a circuit tester to check the continuity at each switch position shown below.

Terminal / Wire Color	TL	TB	TR	B3*	B1	F2
Hazard SW / Turn Signal SW	G/R	G	G/Y	Y	Y/B	W/G
OFF — L	○—○					
OFF — N				○—○		
OFF — R		○—○				
ON	○—○	○—○	○—○		○—○	○—○

REMOVAL AND INSTALLATION

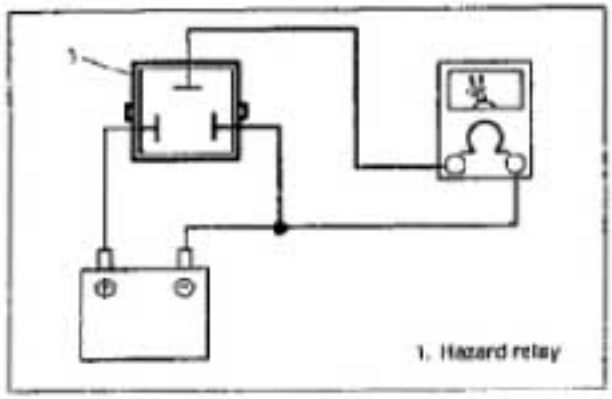
Refer to COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT in Section 3C (for vehicle without air bag system) or Section 3C1 (for vehicle with air bag system) for details.



1. Hazard relay
2. Fuse box

HAZARD RELAY

The turn signal/hazard relay is located near the fuse box.

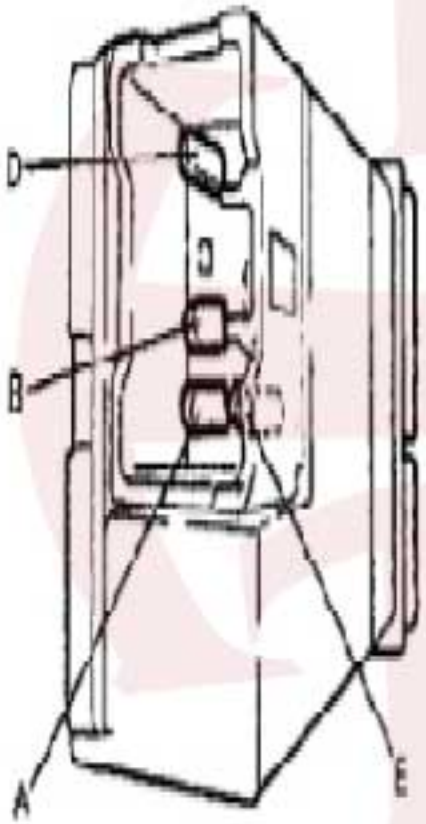


1. Hazard relay

INSPECTION

Connect battery and tester as shown left.
Unless a continued click sound is heard, replace relay.

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REAR FOG LIGHT (IF EQUIPPED)

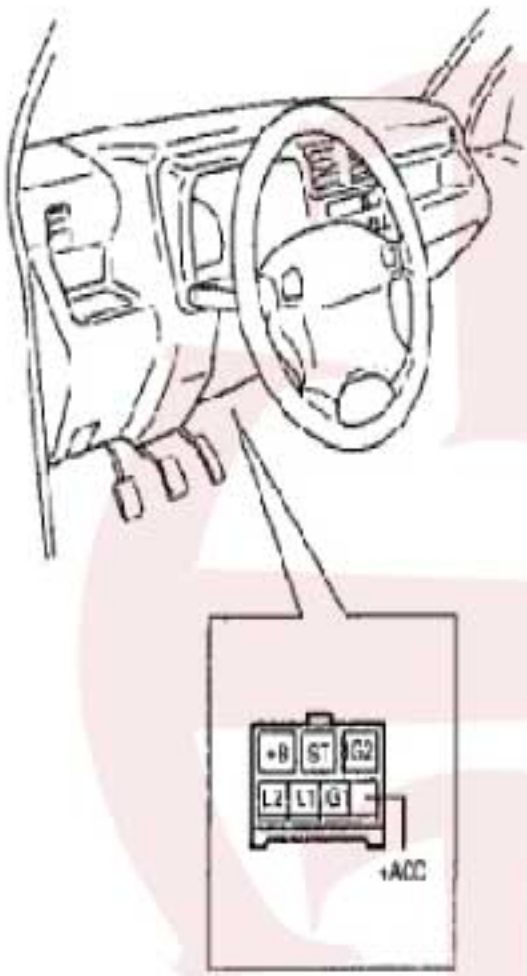
REAR FOG LIGHT SWITCH

INSPECTION

Use a circuit tester to check switch for continuity between terminals shown below.

RR FOG SW / TERMINAL / OFF SW		B	E	D	A
FREE	FREE				
	PUSH				
PUSH	FREE				
	PUSH				

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IGNITION SWITCH

INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect ignition switch lead wire coupler.
3) Use a circuit tester to check the continuity at each switch position. If any continuity is not obtained, replace main switch.

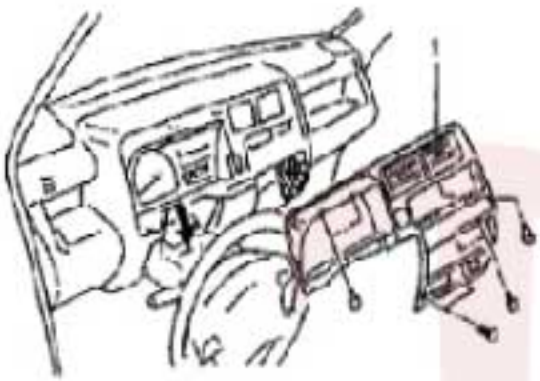
Terminal / Wire color / Key Position		+B	+ACC	IG1	IG2	ST	L1	L2
		W/G	Bl	B/Bl	Y/B	B/Y	Br/B	B
OUT	LOCK	○						
IN	ACC	○	○					
	ON	○	○	○	○			
	START	○		○		○	○	○

ACC : Accessory

REMOVAL AND INSTALLATION

Refer to STEERING LOCK (IGNITION SWITCH) in Section 3C (for vehicle without air bag system) or Section 3C1 (for vehicle with air bag system) for details.

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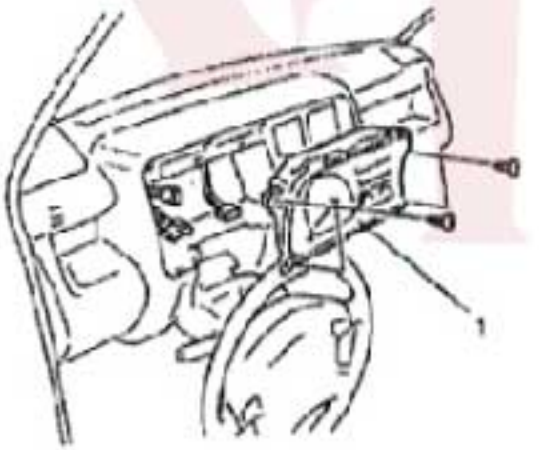


1. Meter cluster

COMBINATION METER

REMOVAL

1) Disconnect negative cable at battery.
2) Loosen steering column mounting bolts. (Refer to Section 3C, 3C1.)
3) Remove meter cluster panel. Make sure to disconnect all couplers of switches and wires of cigarette lighter on meter cluster.

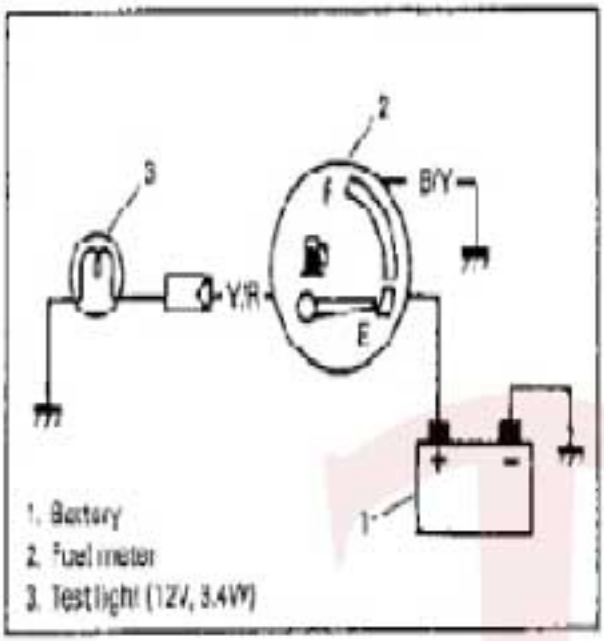


1. Combination meter

4) Detach speedometer cable and disconnect couplers from combination meter.
   Remove combination meter.

INSTALLATION

Reverse removal procedure for installation.



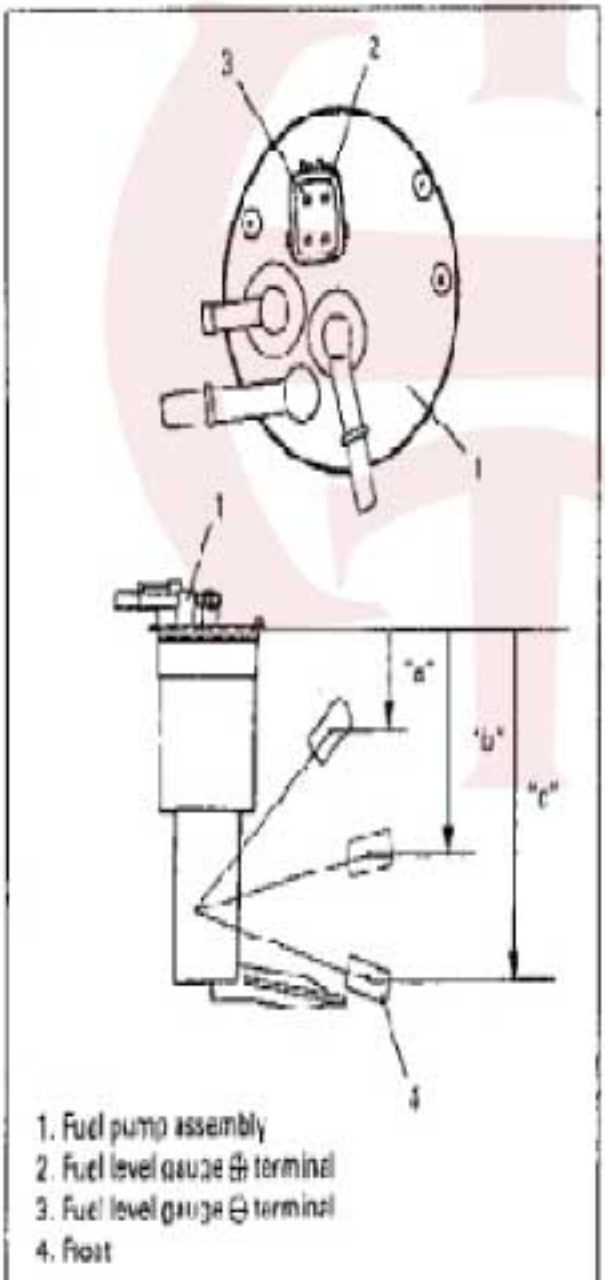
1. Battery
2. Fuel meter
3. Test light (12V, 3.4W)

FUEL METER/FUEL GAUGE UNIT

FUEL LEVEL METER

INSPECTION

1) Remove rear seat and peel rear end of the carpet.
2) Disconnect Y/R lead wire going to gauge unit.
3) Use a bulb (12V 3.4W) in position to ground lead wire as illustrated.
4) Turn ignition switch ON.
   Make sure that bulb is lighted with meter pointer fluctuating several seconds thereafter. If meter is faulty, replace.



1. Fuel pump assembly
2. Fuel level gauge ⊕ terminal
3. Fuel level gauge ⊖ terminal
4. Float

FUEL SENDER GAUGE

INSPECTION

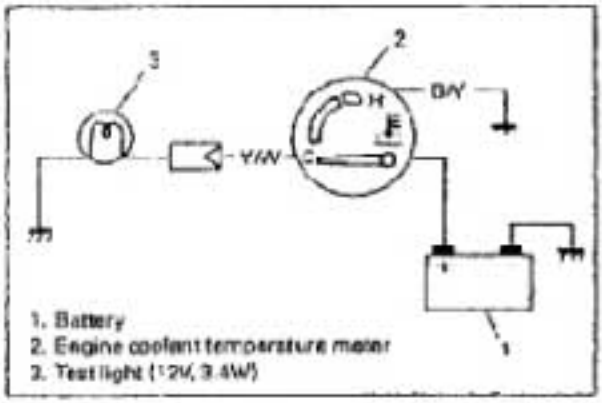
Remove fuel pump assembly referring to Section 6C of this manual.

Use an ohmmeter to confirm that resistance of sender gauge unit changes with change of float position.

Float Position		Resistance (Ω)	
"a"	102.3 mm (4.03 in.)	F	2 - 4
"b"	158.9 mm (6.20 in.)	1/2	28.6 - 36.6
"c"	218.5 mm (8.60 in.)	E	117 - 123

If the measured value is out of specification, replace.

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1. Battery
2. Engine coolant temperature meter
3. Test light (12V, 3.4W)

ENGINE COOLANT TEMPERATURE METER AND SENSOR UNIT

ENGINE COOLANT TEMPERATURE METER

INSPECTION

1) Disconnect Y/W lead wire going to sender gauge installed to thermostat case.
2) Use a bulb (12V 3.4W) in position to ground wire as illustrated.
3) Turn main switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter.
   If not, replace.

ENGINE COOLANT TEMPERATURE SENSOR

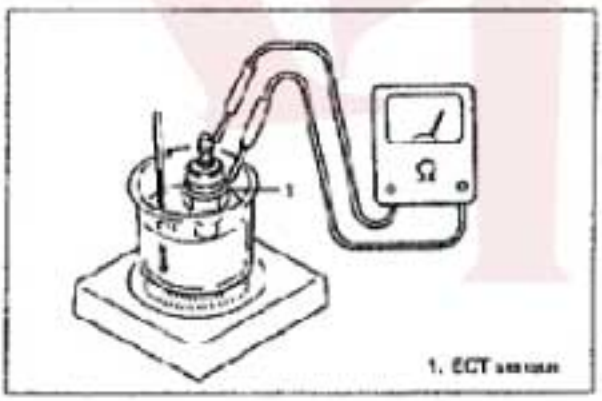
REMOVAL



1. ECT sensor
2. Radiator cap

WARNING:
- **Make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

1) Drain coolant.
2) Remove air cleaner ass'y.
3) Remove engine coolant temperature sensor.

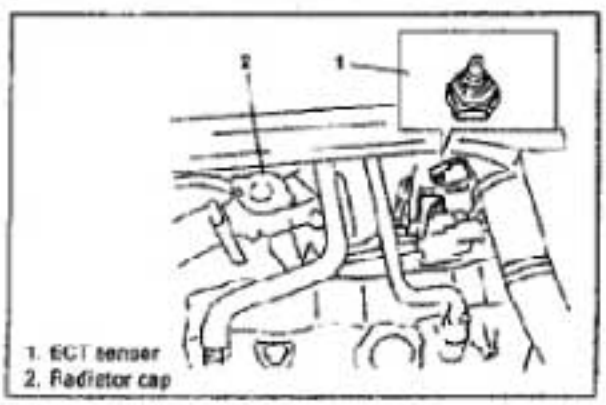


1. ECT sensor

INSPECTION

Warm up sender gauge. Thus make sure its resistance is decreased with increase of its temperature.

Temperature	Resistance
50°C (122°F)	190 - 260 Ω
115°C (239°F)	24.2 - 28.1 Ω



1. ECT sensor
2. Radiator cap

INSTALLATION

Reverse removal procedure for installation noting the following:

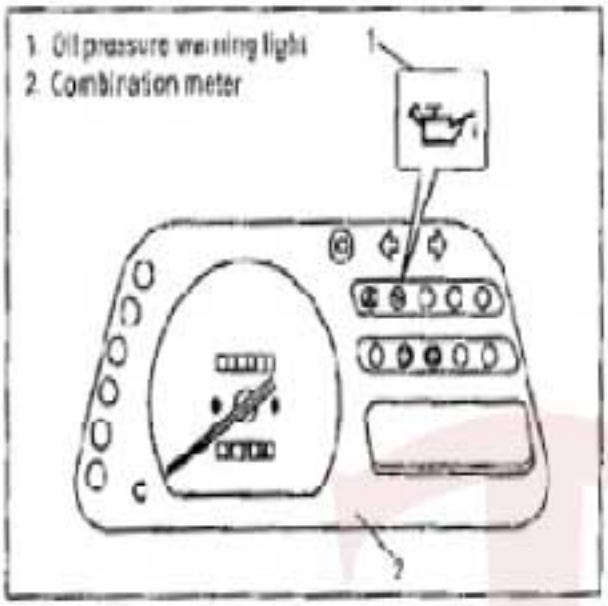
Apply sealant to the thread of ECT sensor.

(A) : Sealant 99000 - 31150

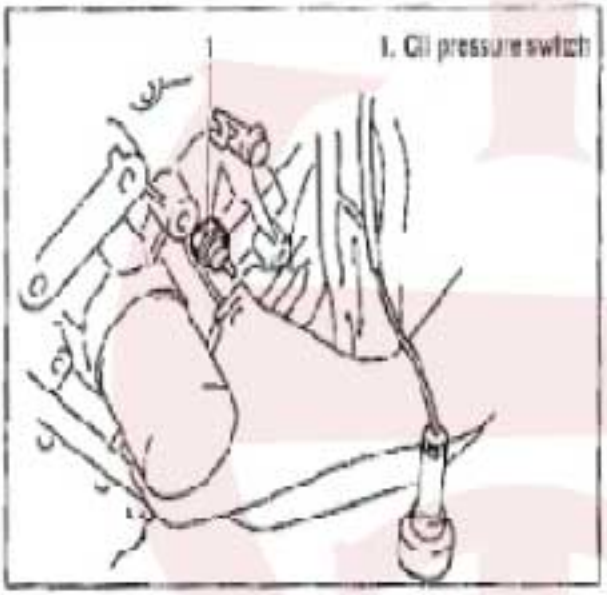
Tightening Torque

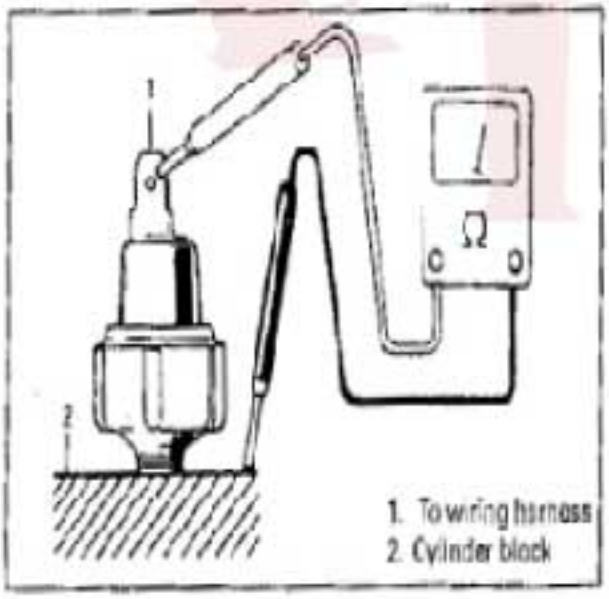
(a) : 8 N·m (0.8 kg-m, 6.0 lb-ft)

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OIL PRESSURE WARNING LIGHT





OIL PRESSURE SWITCH

INSPECTION

Use an ohmmeter to check switch continuity.

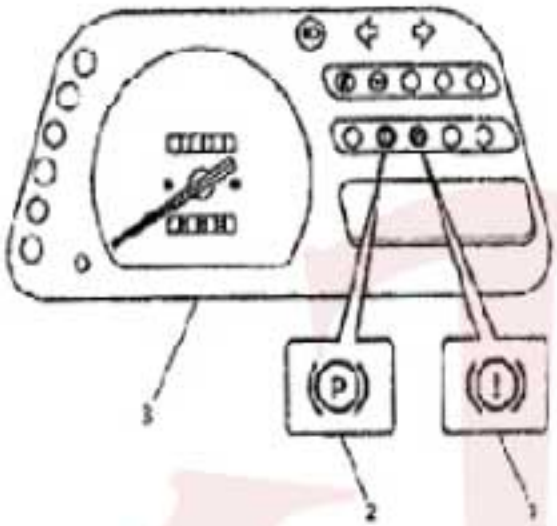
During Engine Running	No continuity (∞ Ω)
At Engine Stop	Continuity (0 Ω)

REMOVAL AND INSTALLATION

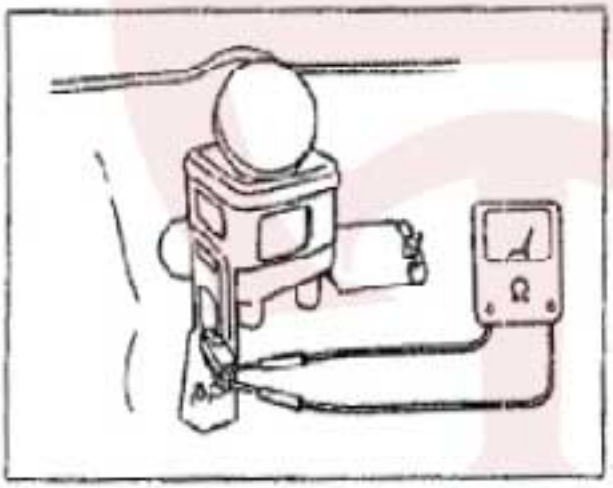
Refer to Section 0A OIL PRESSURE CHECK in this manual.

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BRAKE AND PARKING BRAKE WARNING LIGHT



1. Brake warning light
2. Parking brake warning light
3. Combination meter

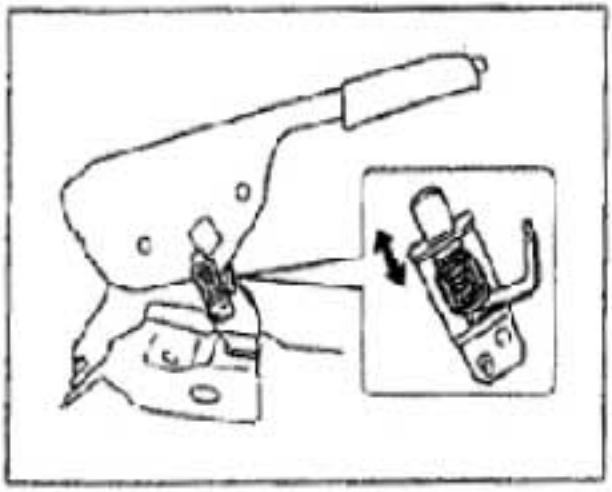


INSPECTION

- BRAKE FLUID LEVEL SWITCH

  Use an ohmmeter to check switch for continuity.
  If found defective, replace switch.

OFF position (float up)	No continuity
ON position (float down)	Continuity

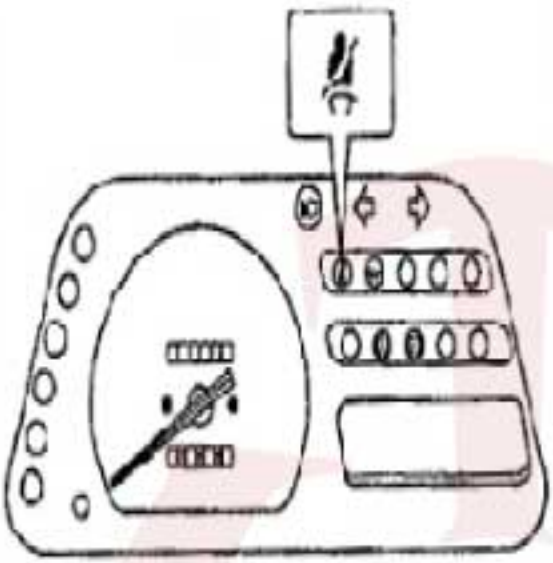


- PARKING BRAKE SWITCH

  Use an ohmmeter to check switch for continuity.
  If found defective, replace switch.

OFF position (parking brake released)	No continuity
ON position (parking brake lever pulled up)	Continuity

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SEAT BELT WARNING LIGHT

SEAT BELT SWITCH

INSPECTION

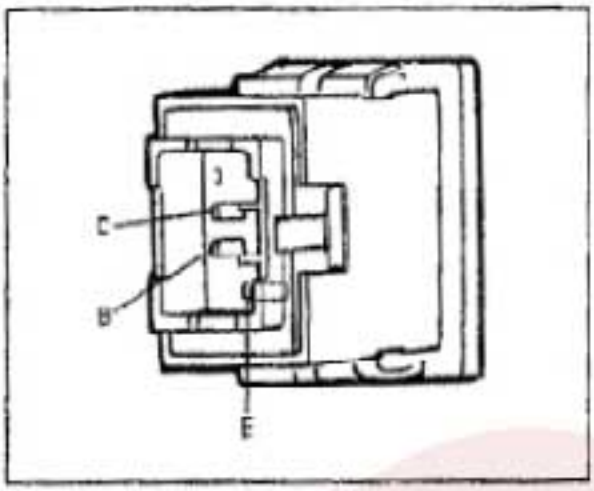
Use an ohmmeter to check switch for continuity.

If found defective, replace switch.

OFF position (seat belt fastened)	No continuity
ON position (seat belt not fastened)	Continuity



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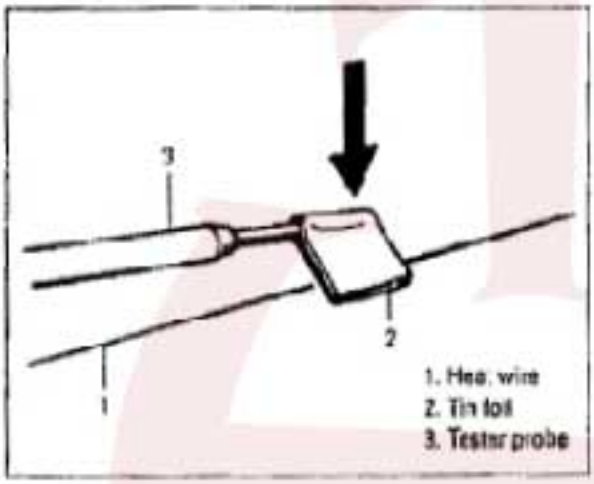
REAR WINDOW DEFOGGER (IF EQUIPPED)

DEFOGGER SWITCH

INSPECTION

Use a circuit tester to check defogger switch for continuity. If switch has no continuity between terminals, replace.

Defogger SW \ Terminal	B	C	E
OFF		○	○
ON	○	○	○



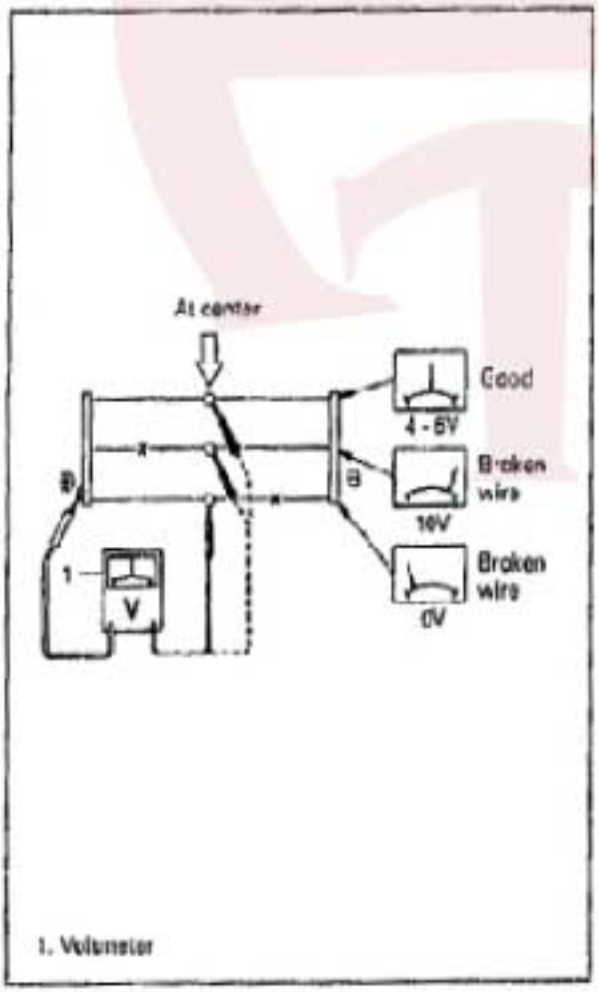
DEFOGGER WIRE

INSPECTION

NOTE:

- **When cleaning rear window glass, use a dry cloth to wipe it along wire direction.**
- **When cleaning glass, do not use detergent or abrassive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with negative probe wrapped with a tin foil which should be held down on wire by finger pressure.**

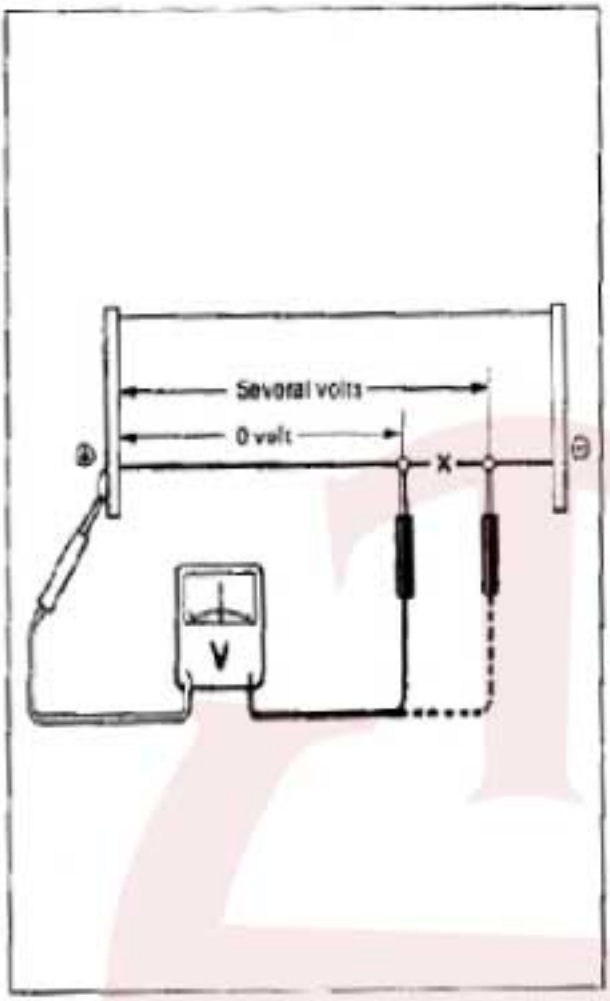
1) Checking wire damage
   a. Turn main switch ON.
   b. Turn defogger switch ON.
   c. Use a voltmeter to check voltage at the center of each heat wire, as shown.



Voltage	Criteria
Approx. 5V	Good (No break in wire)
Approx. 10V or 0V	Broken wire

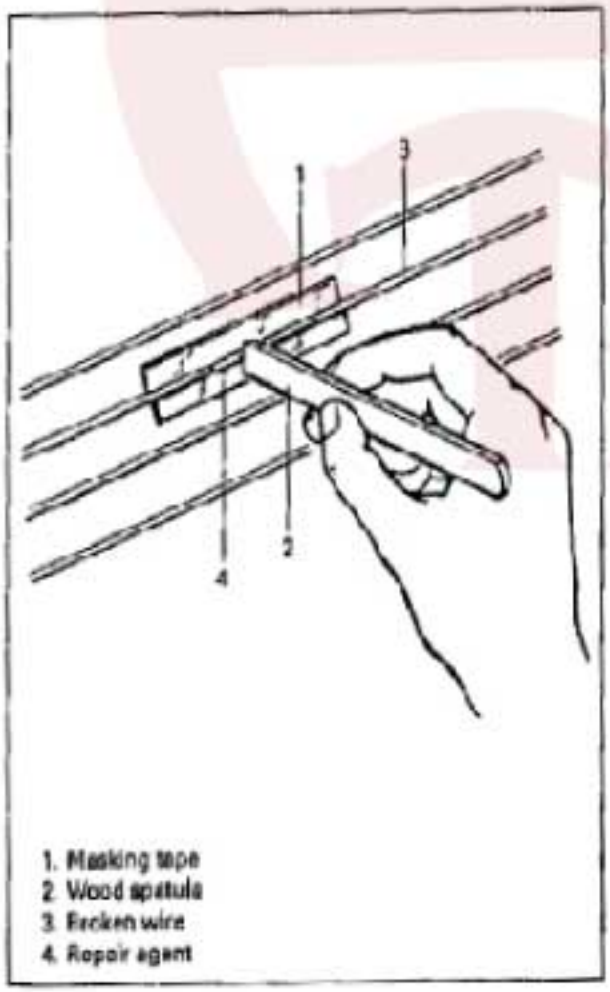
If measured voltage is 10V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.

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2) Locating damage in wire
   a. Touch voltmeter positive (+) lead to heat wire positive terminal end.
   b. Touch voltmeter negative (–) lead with a foil strip to heat wire positive terminal end, then move it along wire to the negative terminal end.
   c. The place where voltmeter fluctuates from zero to several volts is where there is damage.

NOTE:
If heat wire is free from damage, voltmeter should indicate 12V at heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).



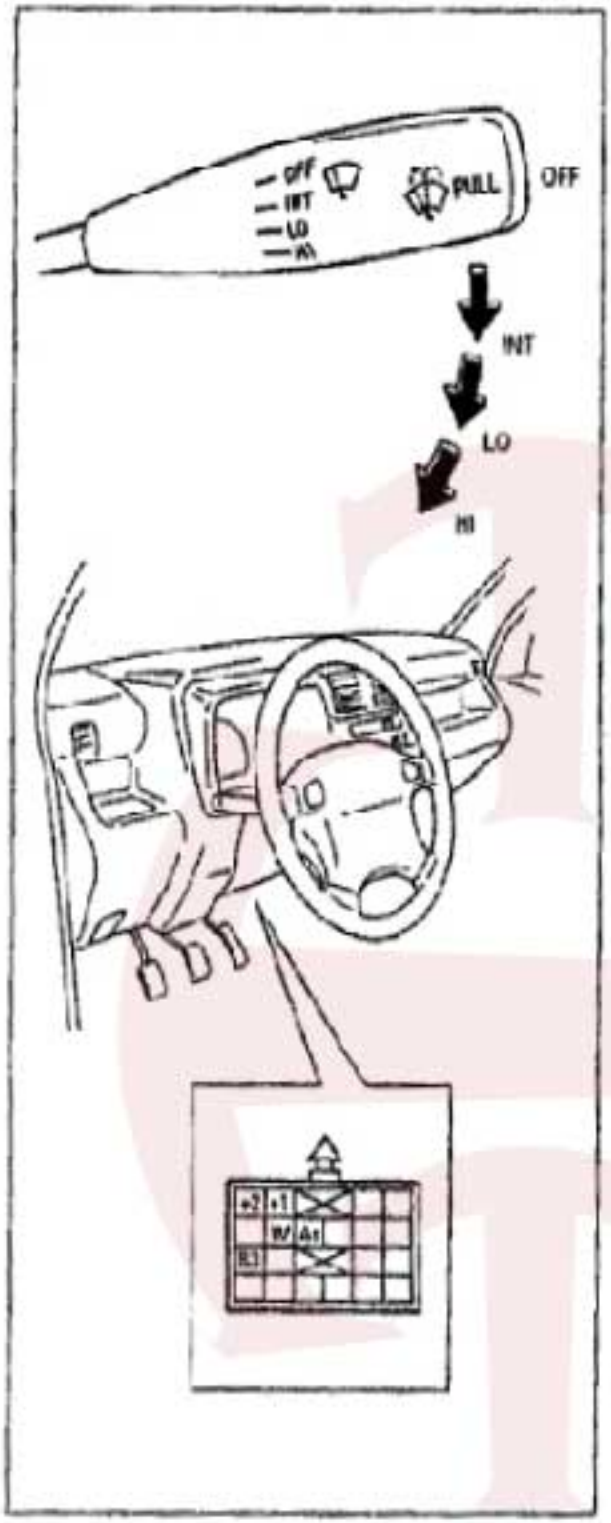
1. Masking tape
2. Wood spatula
3. Broken wire
4. Repair agent

DEFOGGER CIRCUIT

REPAIR

1) Use white gasoline for cleaning.
2) Apply masking tape at both upper and lower sides of heat wire to be repaired.
3) Apply commercially-available repair agent with a fine-tip brush.
4) Two to three minutes later, remove masking tapes previously applied.
5) Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

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WINDSHIELD WIPERS

FRONT WIPER AND WASHER

FRONT WIPER/WASHER SWITCH

Inspection

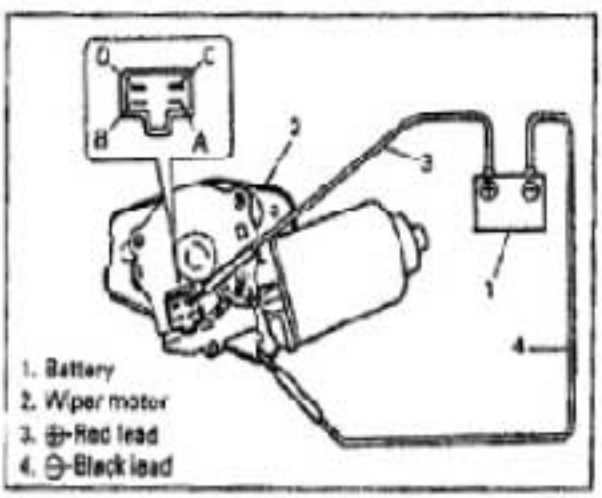
1) Disconnect negative cable at battery.
2) Disconnect combination switch lead wire coupler.
3) Use a circuit tester to check the continuity at each switch position as shown below.

Terminal / Wire Color / Wiper SW	B3	+2	+1	As
	Y/Bl	Bl/R	Bl	Bl/W
OFF			O—O	
INT			O—O	
LO	O——	——	—O	
HI	O—	—O		

Terminal / Wire Color / Washer SW	B3	W
	Y/Bl	B/Bl
OFF		
ON	O—	—O

Removal and Installation

Refer to COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT in Section 3C (for vehicle without air bag system) or Section 3C1 (for vehicle with air bag system) for details.

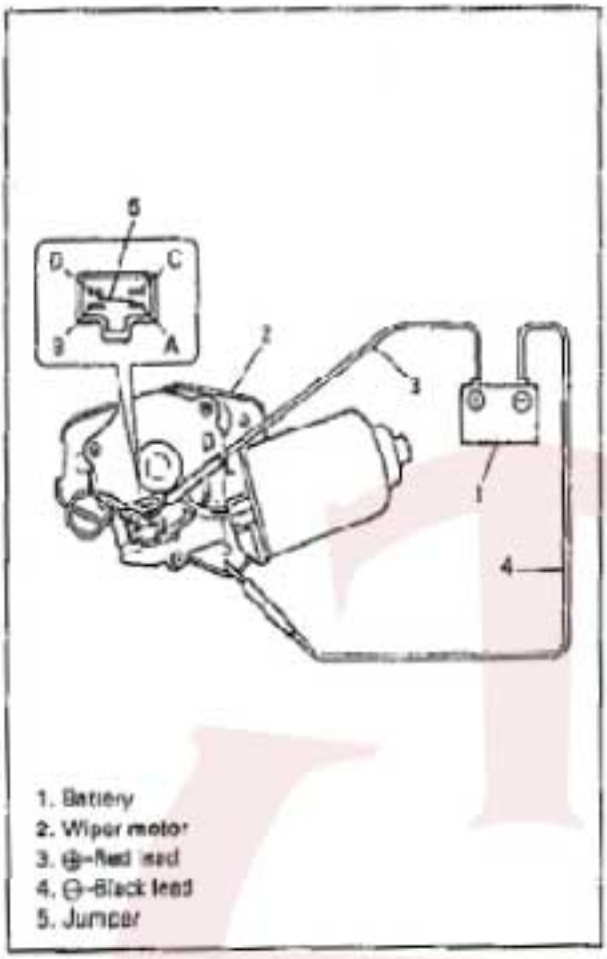


WIPER MOTOR

Inspection

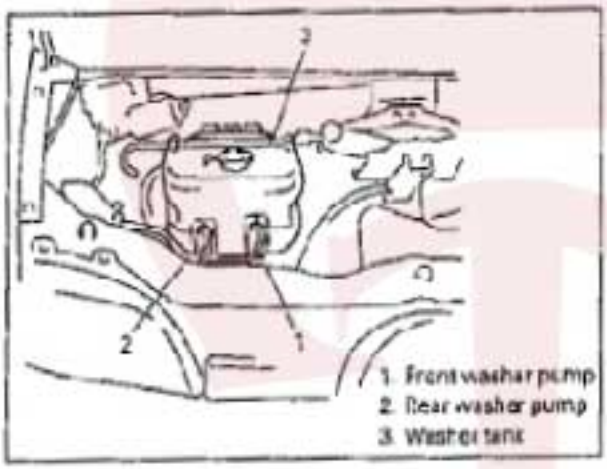
1) As illustrated left, have a 12V battery and connect its (+) terminal to terminal "A", and its (–) terminal to bracket (wiper ground). If motor rotates at a low revolution speed of 44 to 52 rpm, it is proper. As for high speed check, connect battery (+) terminal to terminal "B", and its (–) terminal to bracket (wiper ground). If motor rotates at a high revolution speed of 64 to 78 rpm, it is proper.

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1. Battery
2. Wiper motor
3. ⊕-Red lead
4. ⊖-Black lead
5. Jumper

2) Testing automatic stop action
   a) Connect 12V battery (+) terminal to terminal "A" of wiper motor and (–) terminal to bracket (wiper ground) and let the motor turn.
   b) Disconnect terminal "A" from battery, and let the motor stop.
   c) Connect terminal "A" and "D" with a jumper wire, and connect terminal "C" to battery (+) terminal. Observe the motor turns once again then stops at a given position.
   d) Repeat a) thru c) several times and inspect if the motor stops at the given position every time.

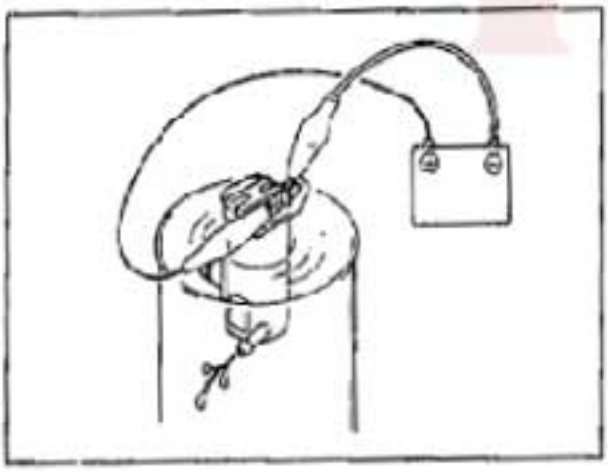


1. Front washer pump
2. Rear washer pump
3. Washer tank

WASHER PUMP

Removal

1) Disconnect battery (–) cable.
2) Remove washer tank fitting screws.
3) Disconnect pump lead wire coupler(s) and hose(s).
4) Remove washer tank.
5) Remove pump from tank.



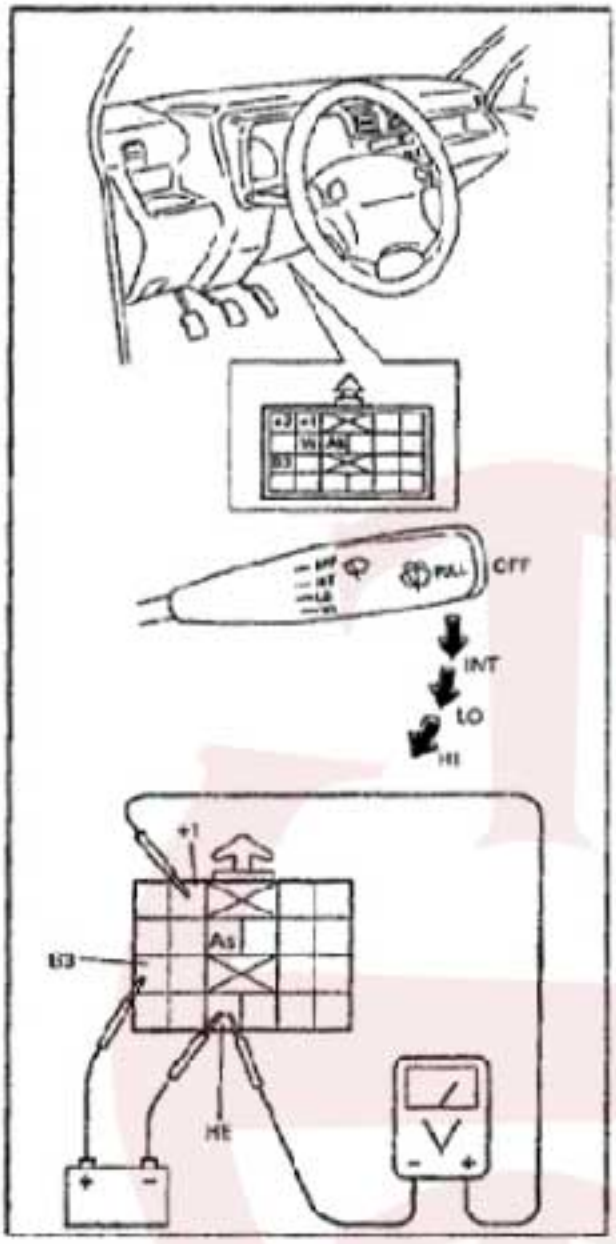
Inspection

Connect battery (+) and (–) terminals to pump (+) and (–) terminals respectively to check pumping rate.
Check for both front and rear washer pump.
Pumping Rate:
Front more than 1.0 l/min (2.1 US pt./min, 1.76 Imp pt./min)
Rear more than 0.72 l/min (1.5 US pt./min, 1.26 Imp pt./min)

Installation

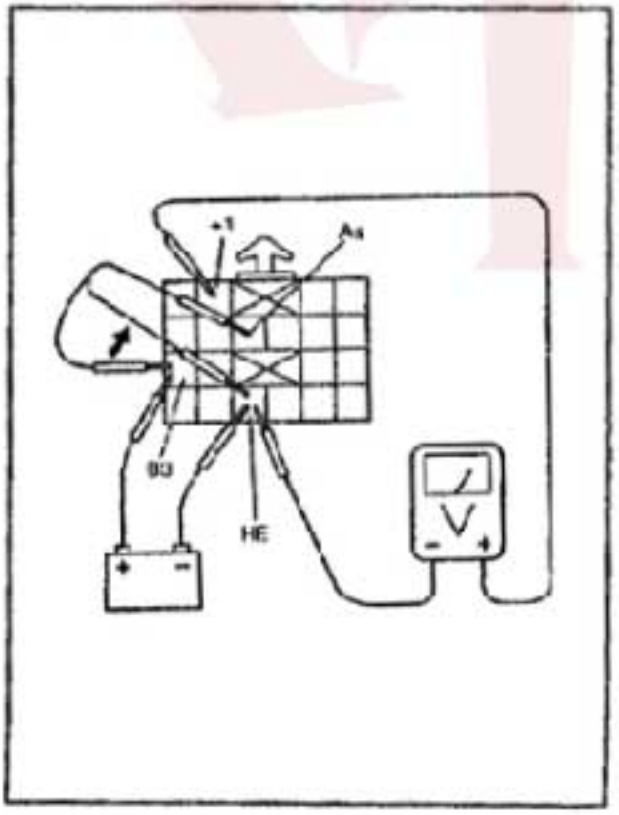
Reverse removal procedure for installation.

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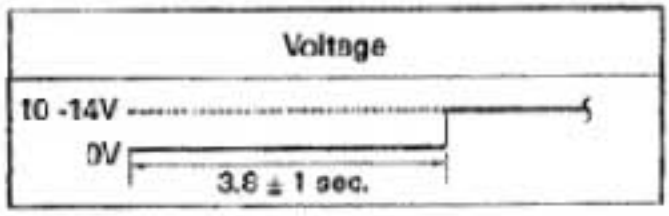


Intermittent Wiper Relay Circuit

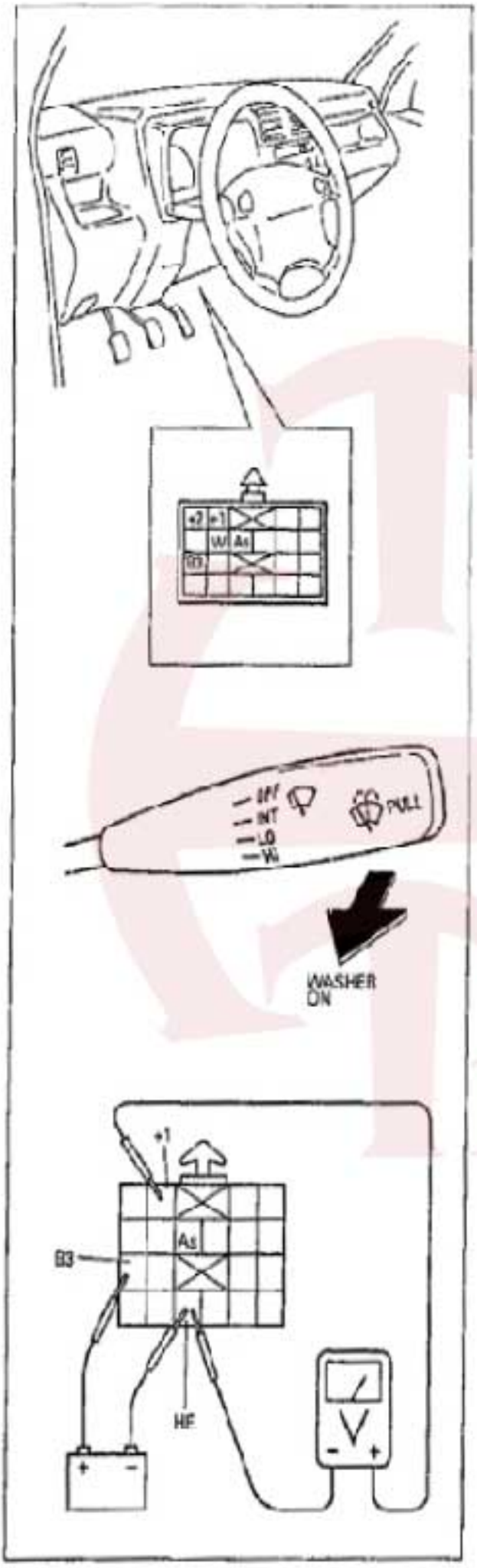
1) Disconnect negative cable at battery.
2) Disconnect combination switch lead wire coupler.
3) Turn the front wiper switch to INT position.
4) Connect battery positive terminal to terminal "B3" and battery negative terminal to terminal "HE".
5) Connect voltmeter positive lead to terminal "+1" and negative lead to terminal "HE"
   Check that the voltmeter indicates the battery voltage (10 – 14V).



6) Connect terminal "As" and terminal "B3" by a jumper wire. Then connect terminal "B3" end to terminal "HE". Observe the voltmeter voltage drops to 0V right after connecting the jumper wire from terminal "B3" to "HE". Then the voltage rises to battery voltage (10 – 14 V) within the time shown below.

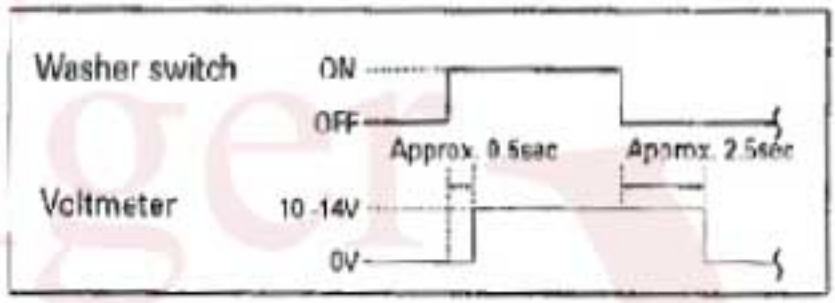


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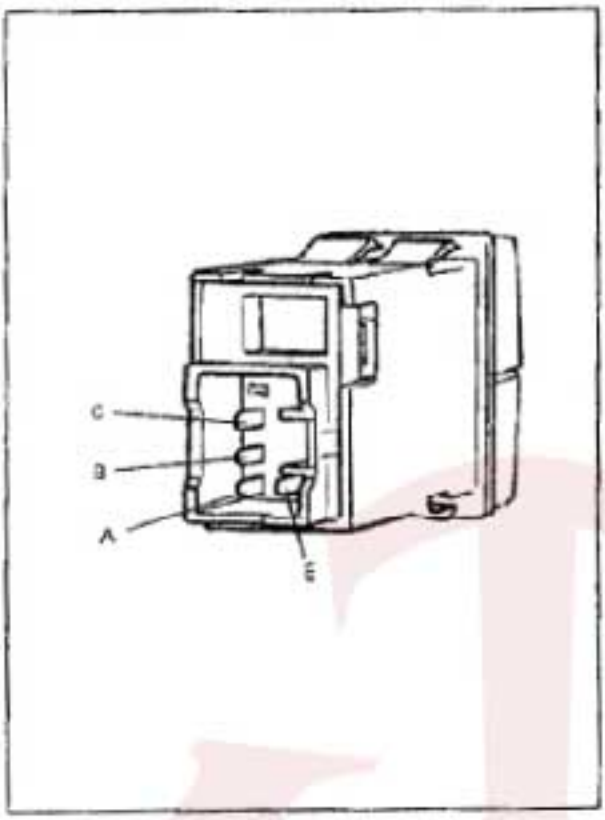


Washer Linked Operation

1) Disconnect negative cable at battery.
2) Disconnect combination switch lead wire coupler.
3) Make sure that front wiper switch is at OFF position.
4) Connect battery positive terminal to terminal "B3" and battery negative terminal to terminal "HE".
5) Connect voltmeter positive lead to terminal "+1" and negative lead to terminal "HE".
6) Push washer switch check that voltage changes as shown in the table.



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REAR WIPER AND WASHER (IF EQUIPPED)

INSPECTION

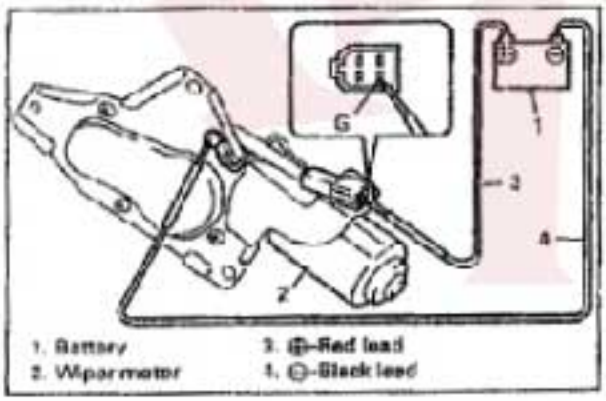
A. Wiper And Washer Switches

Use a circuit tester to check switches for continuity.

Wiper & Washer SW \ Terminal	Wiper SW	C	B	A	E
OFF	OFF		○—○		
	ON	○—○			
Washer ON	OFF	○			○
	ON	○	○		○
ON	OFF	○	○		○
	ON	○	○		○

B. Washer Pump

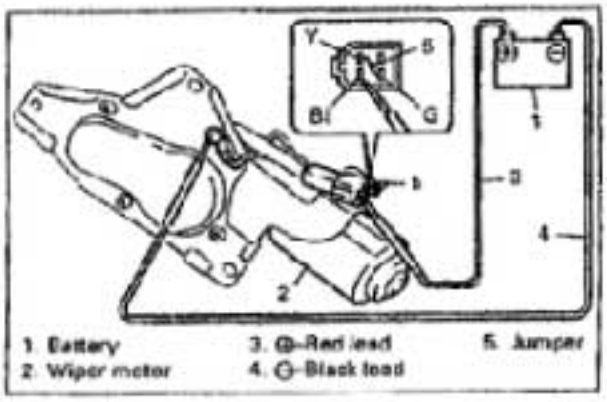
Refer to FRONT WIPER AND WASHER INSPECTION in this section.



C. Wiper Motor

1) TESTING WIPER MOTOR

As shown left, use a 12V battery to connect its (+) and (–) terminals to terminal "G" and Black lead wire respectively. Then motor should rotate at 33 to 43 rpm.



2) TESTING AUTOMATIC STOP ACTION

a) First, connect battery (+) terminal to terminal "G" and battery (–) terminal to black lead wire and let the motor turn.

b) Then disconnect terminal "G" from battery and let the motor stop.

c) Next connect terminal "G" and terminal "Y" with a jumper wire and connect terminal "BI" to battery (+) terminal. Observe the wiper motor turns once again, then stops at a given position.

d) Repeat these steps several times, and inspect if the motor stops at the given position every time.

SECTION 8A-1

POWER SUPPLY DIAGRAM

CONTENTS

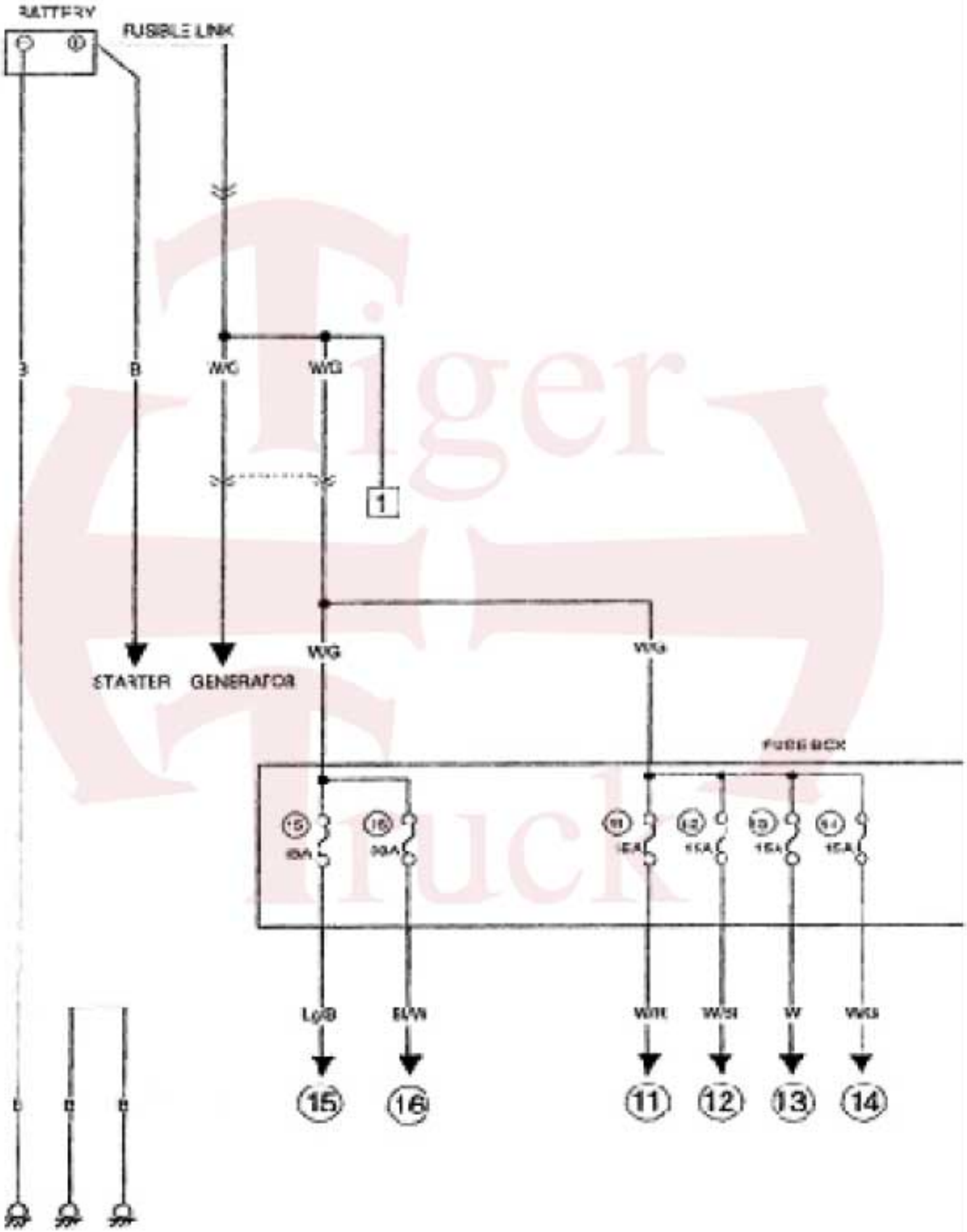
POWER SUPPLY DIAGRAM.....8A-1-2

POWER SUPPLY DIAGRAM.....8A-1-3

FUSE BOX.....8A-1-4

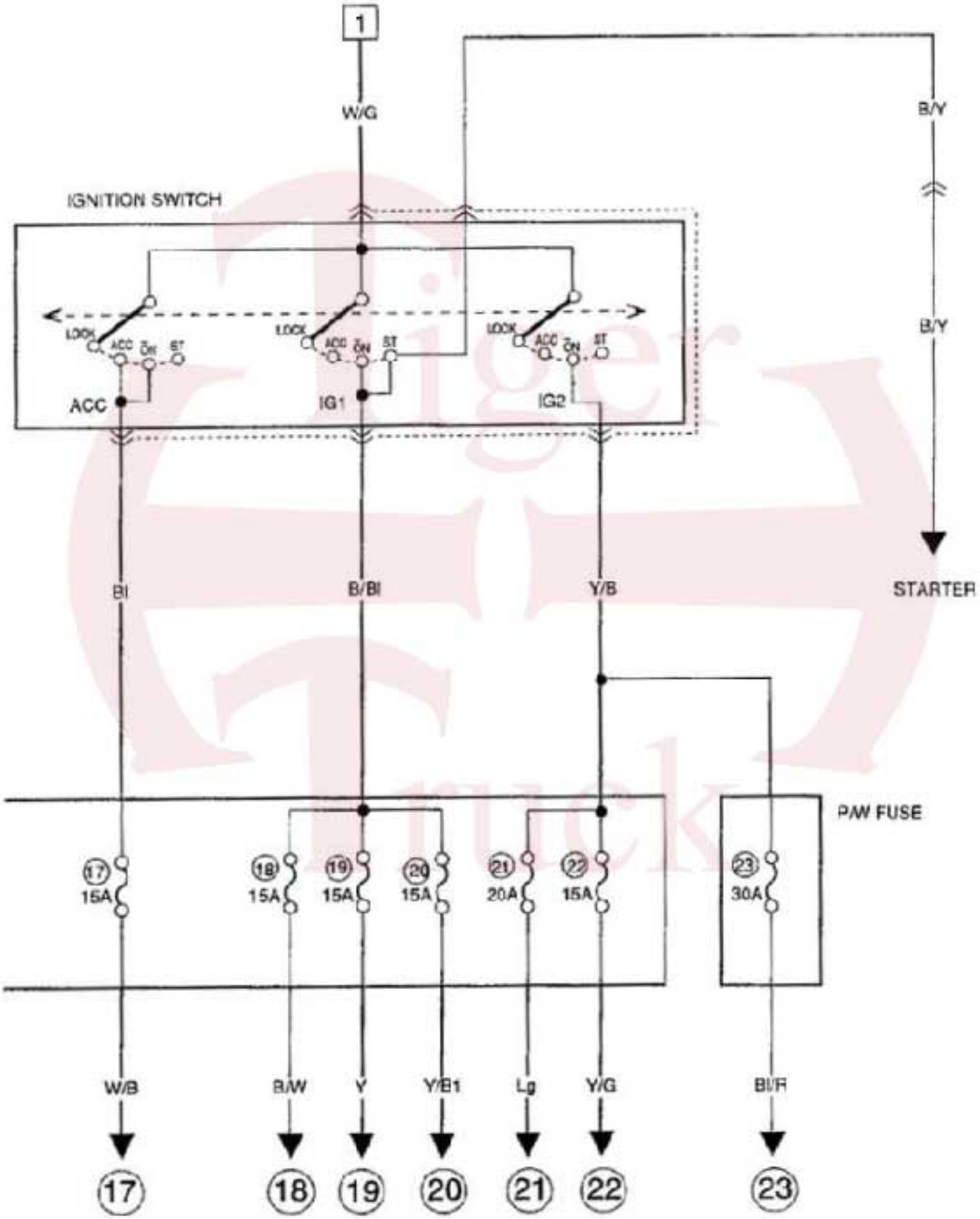
https://truckmanualshub.com/

POWER SUPPLY DIAGRAM



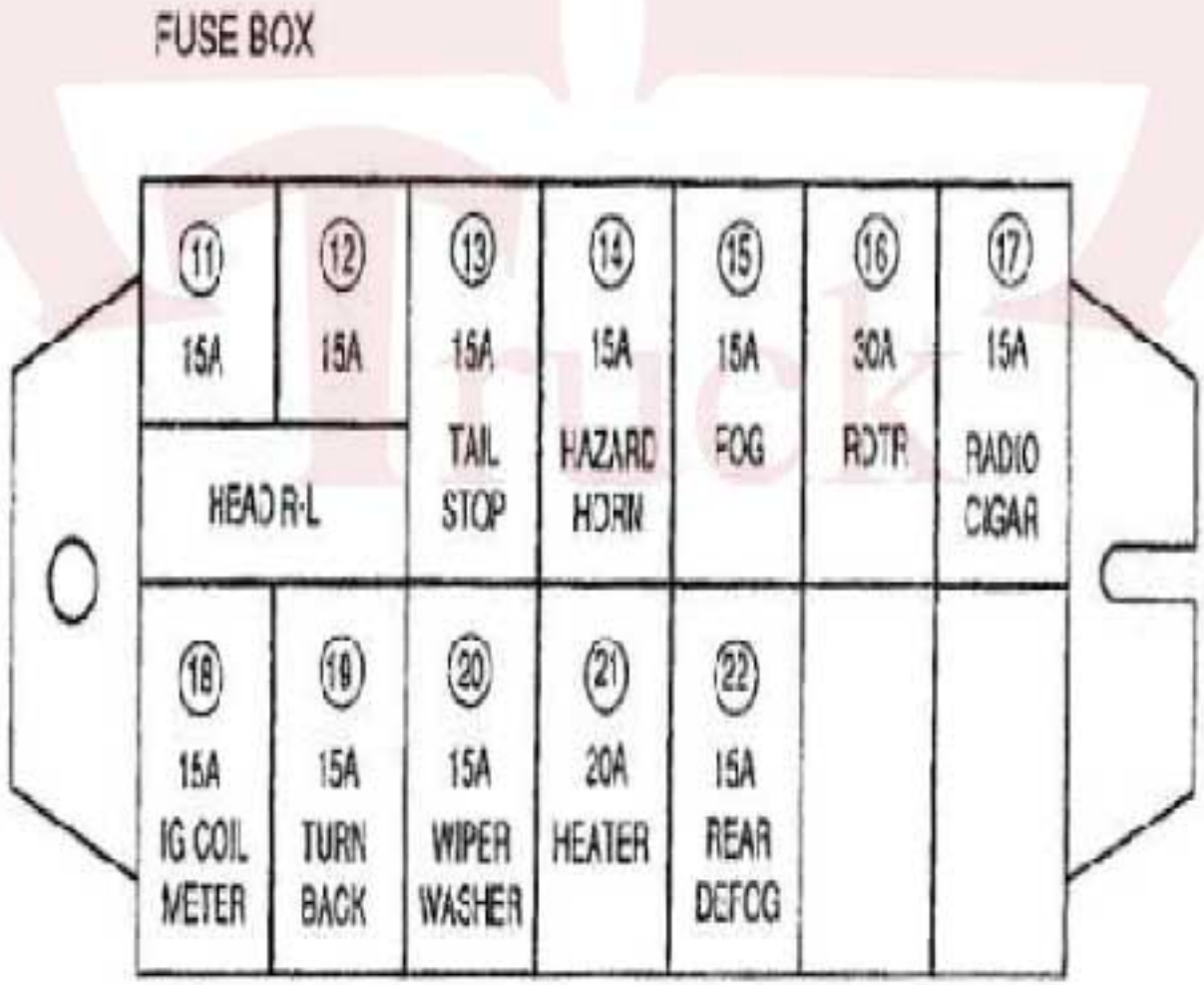
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POWER SUPPLY DIAGRAM



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FUSE BOX



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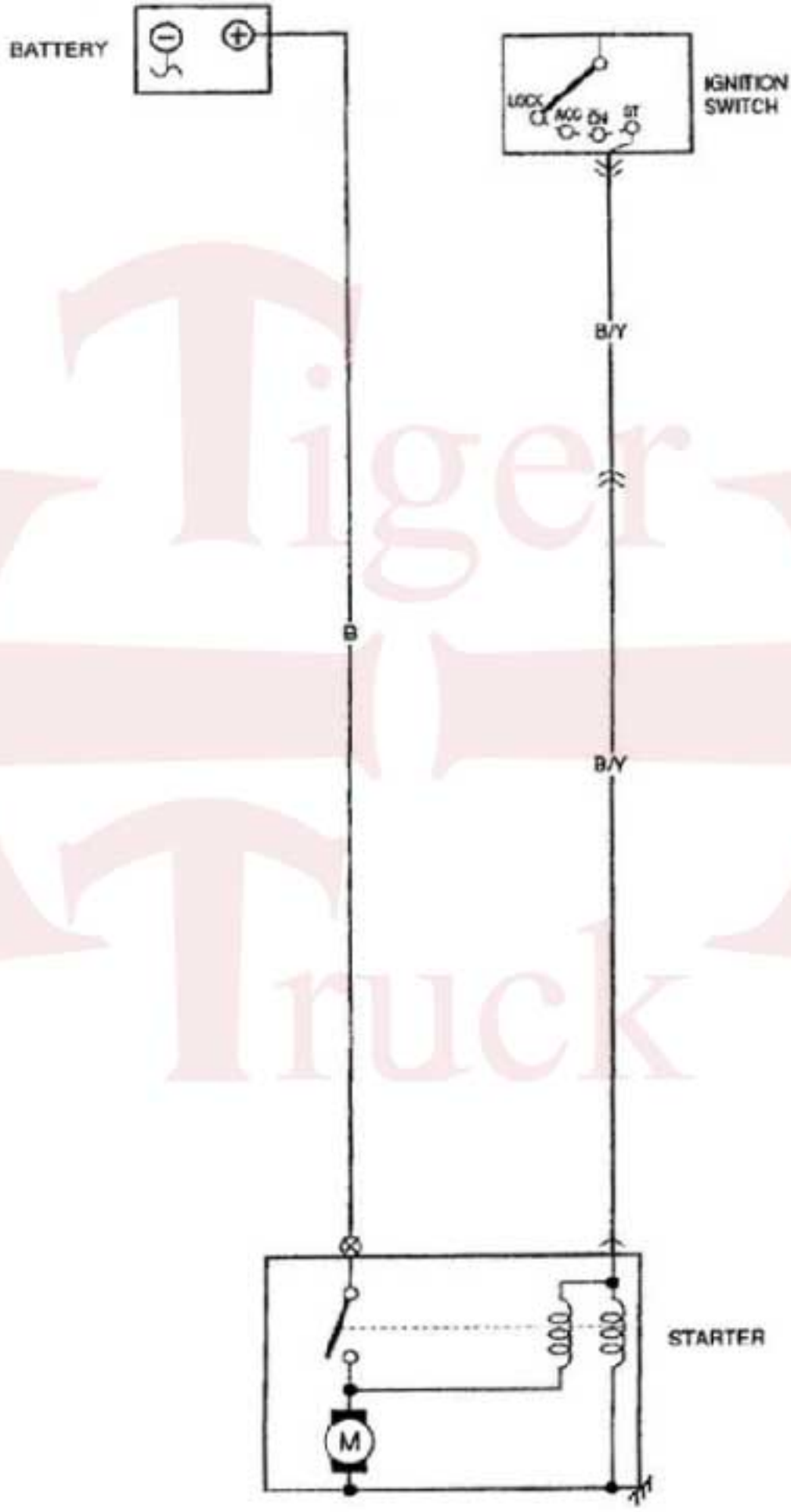
SECTION 8A-2
SYSTEM CIRCUIT DIAGRAM

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CRANKING SYSTEM.....8A-2-2
CHARGING SYSTEM.....8A-2-3
IGNITION SYSTEM.....8A-2-4
CARBURETOR CONTROL SYSTEM.....8A-2-5
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RADIO.....8A-2-21
CIGARETTE LIGHTER.....8A-2-22
FRONT FOG LIGHT.....8A-2-24
REAR FOG LIGHT.....8A-2-25

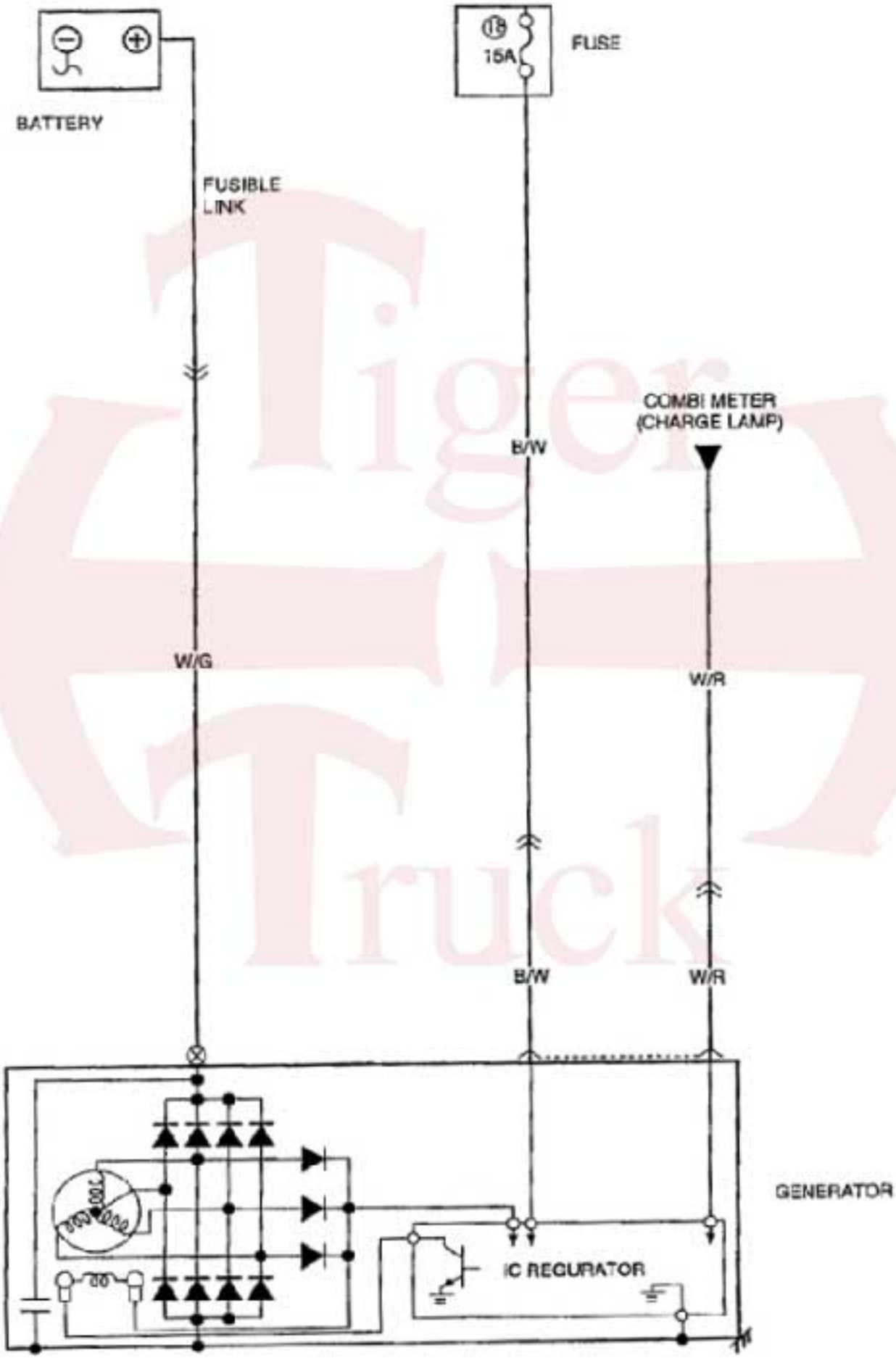
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CRANKING SYSTEM



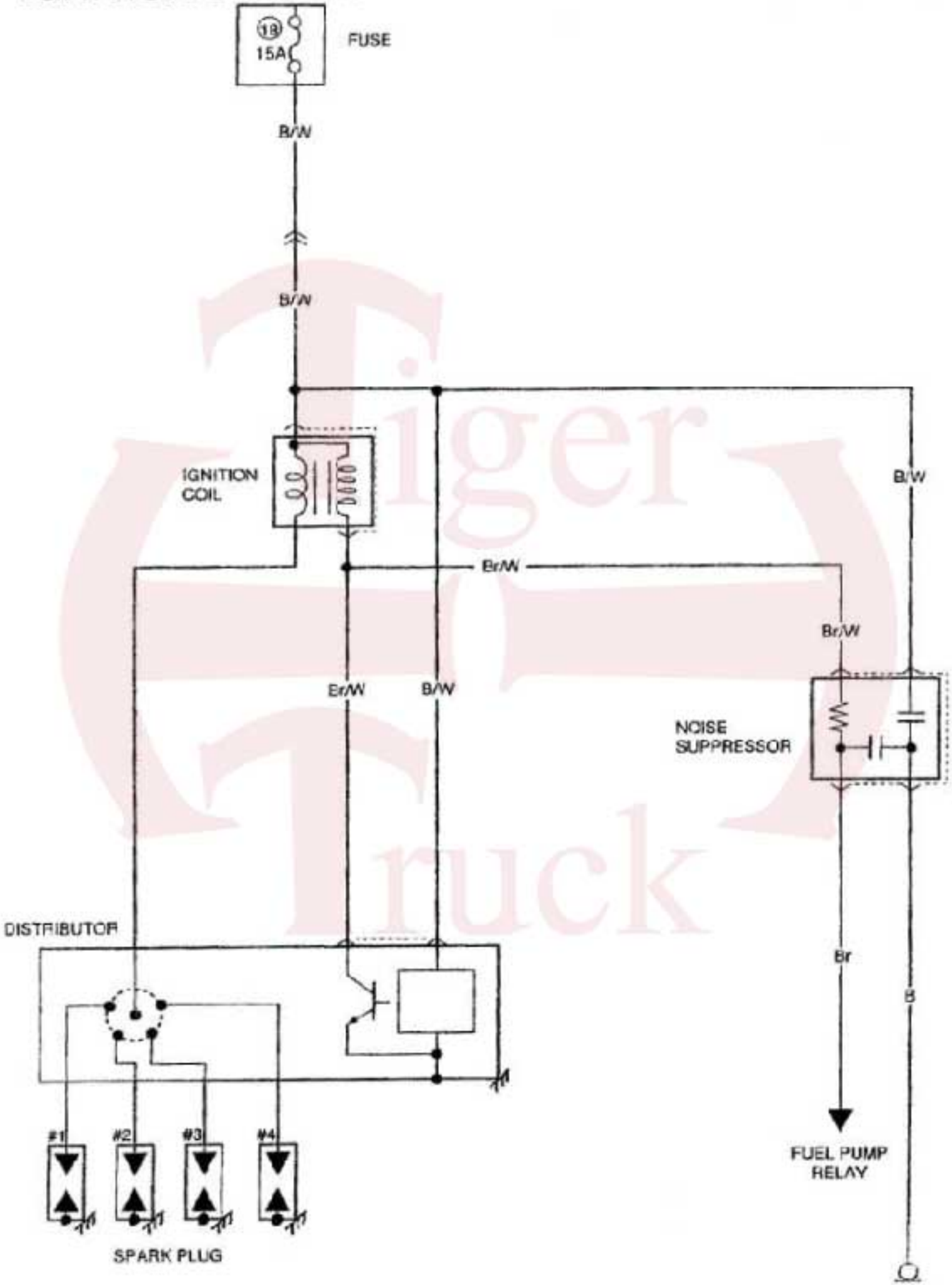
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CHARGING SYSTEM



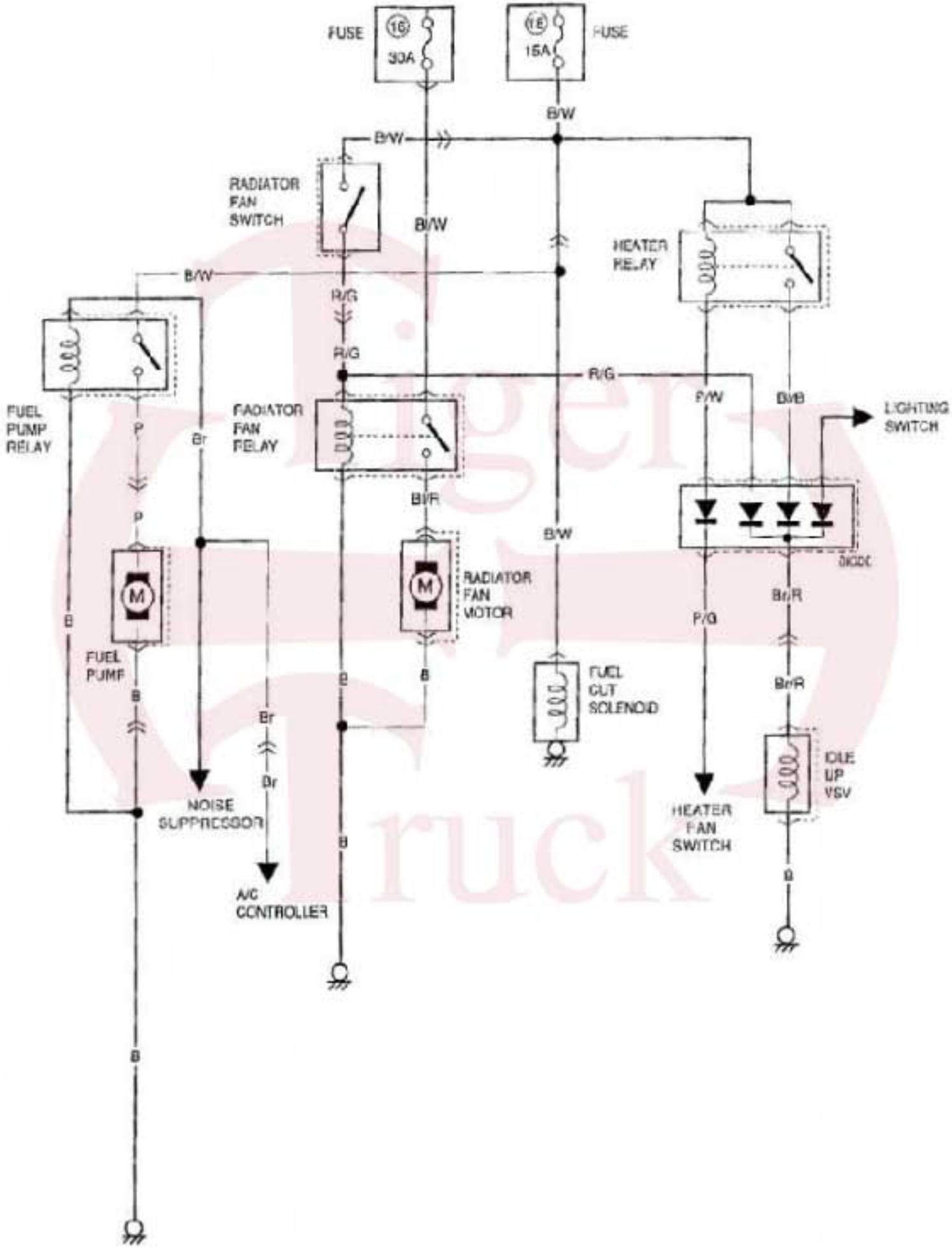
https://truckmanualshub.com/

IGNITION SYSTEM



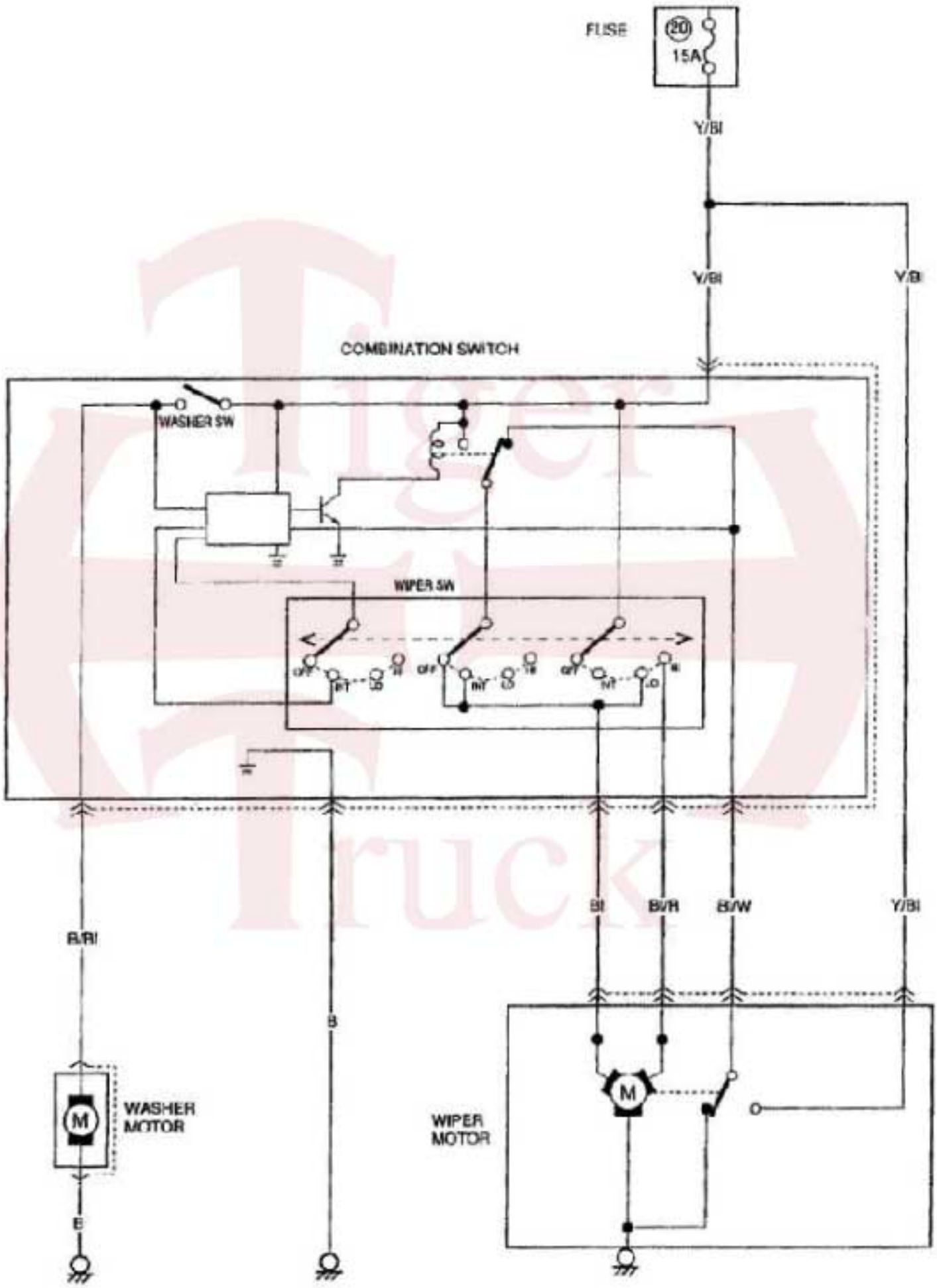
https://truckmanualshub.com/

INDUCTION CONTROL SYSTEM



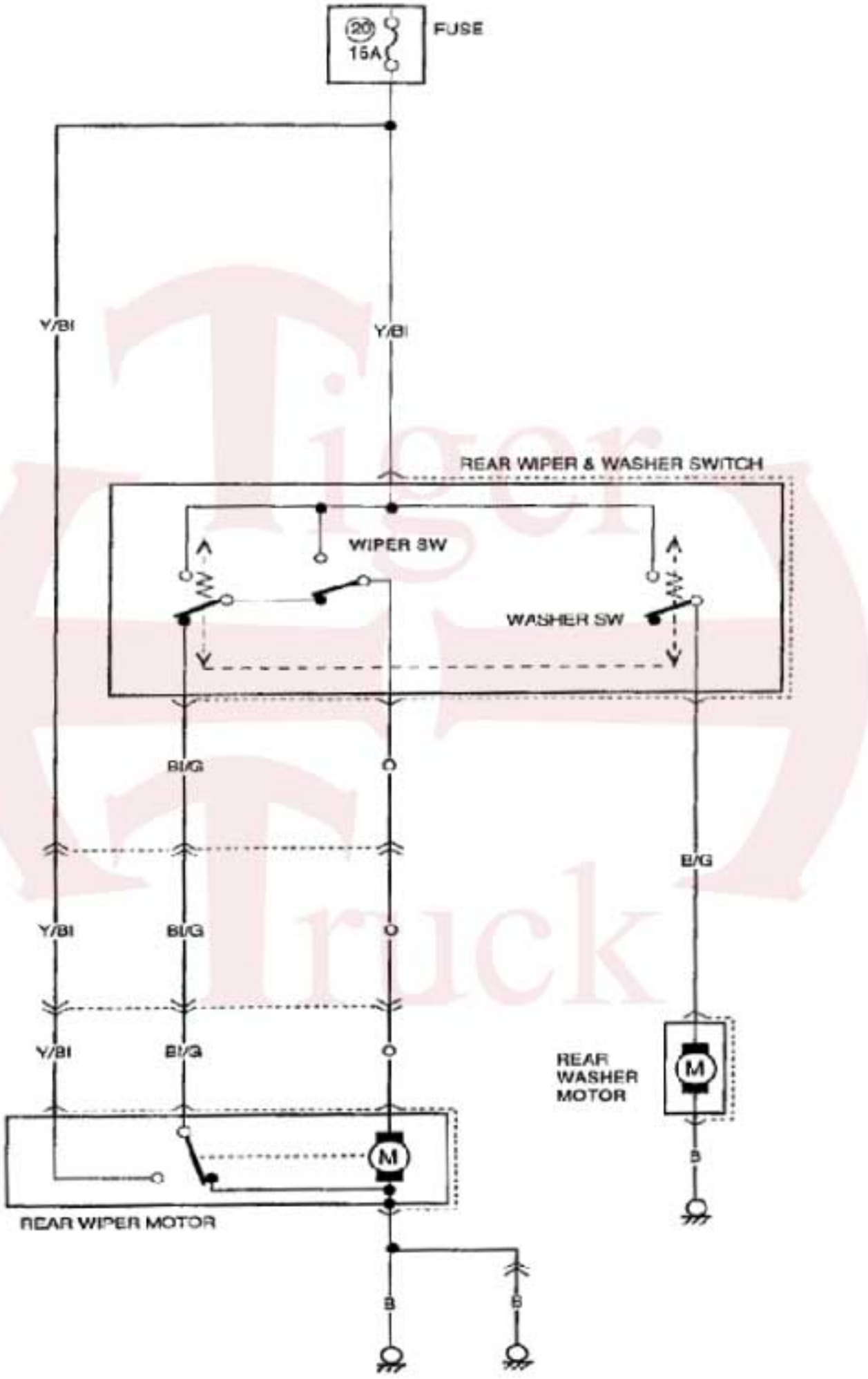
https://truckmanualshub.com/

FRONT WIPER & WASHER



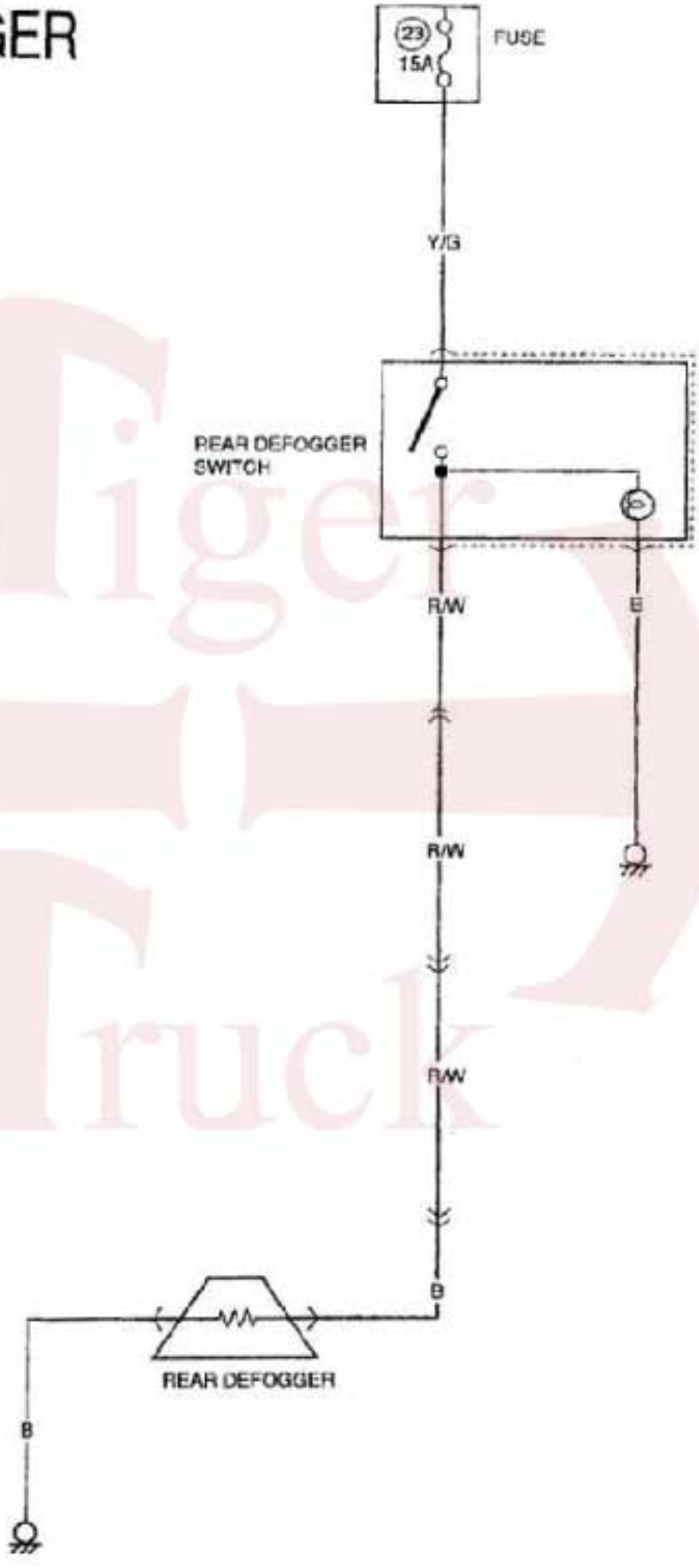
https://truckmanualshub.com/

REAR WIPER & WASHER



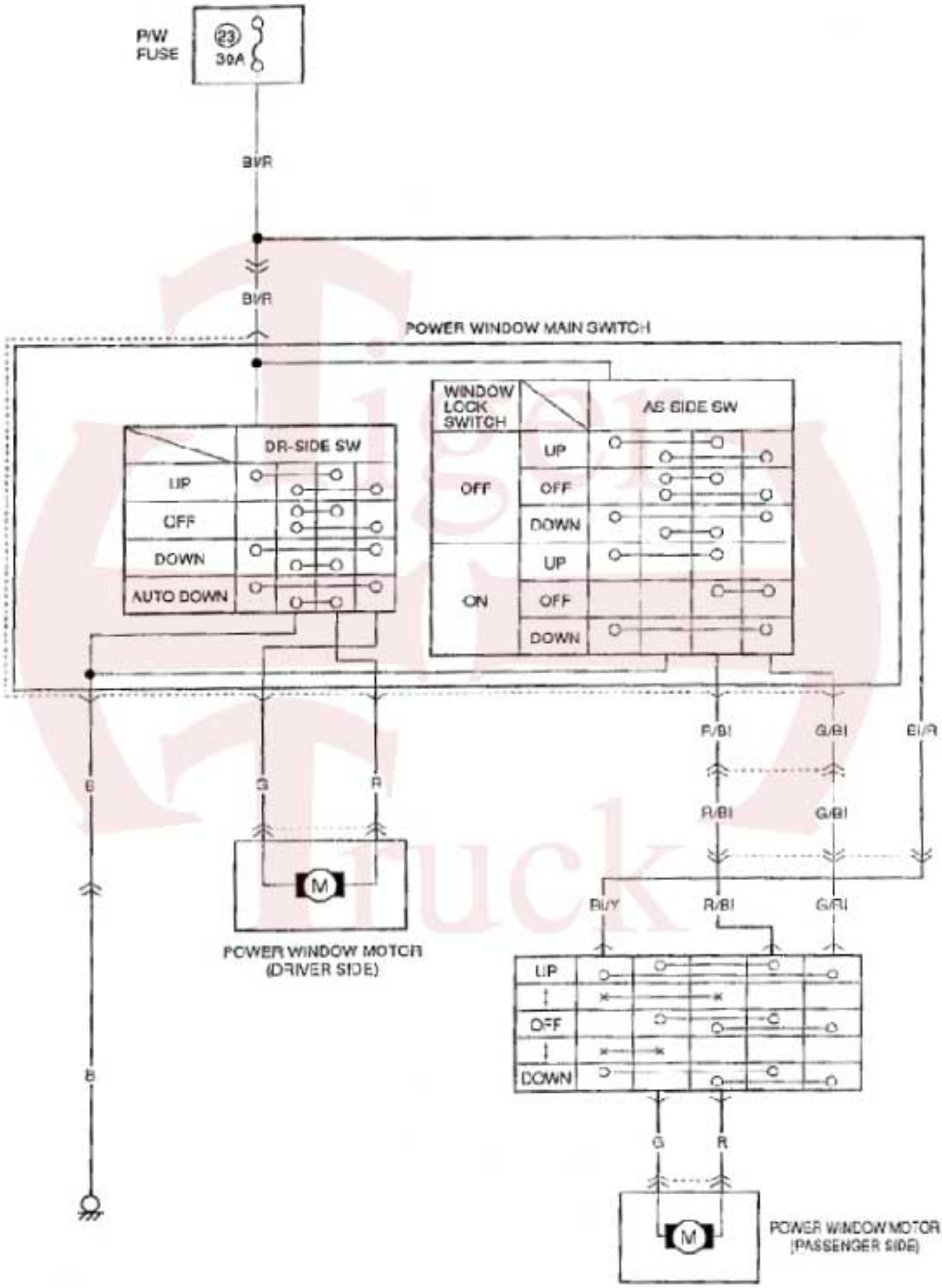
https://truckmanualshub.com/

REAR DEFOGGER



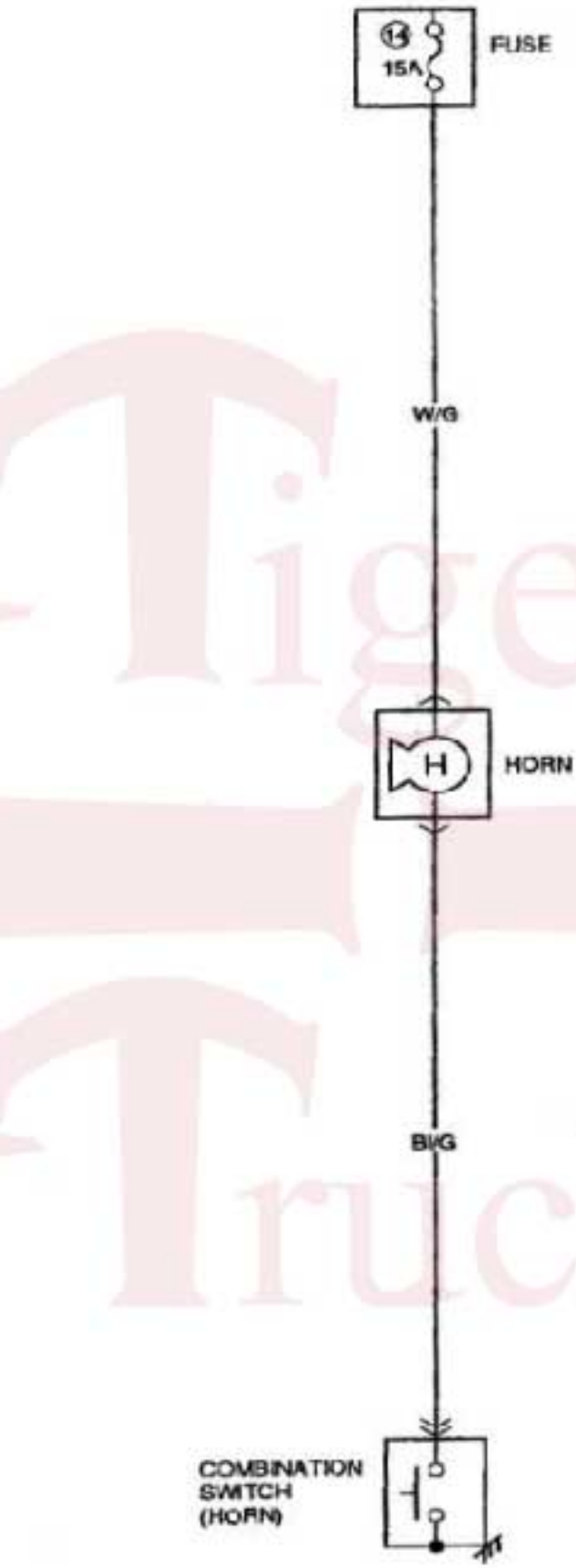
https://truckmanualshub.com/

POWER WINDOW



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HORN

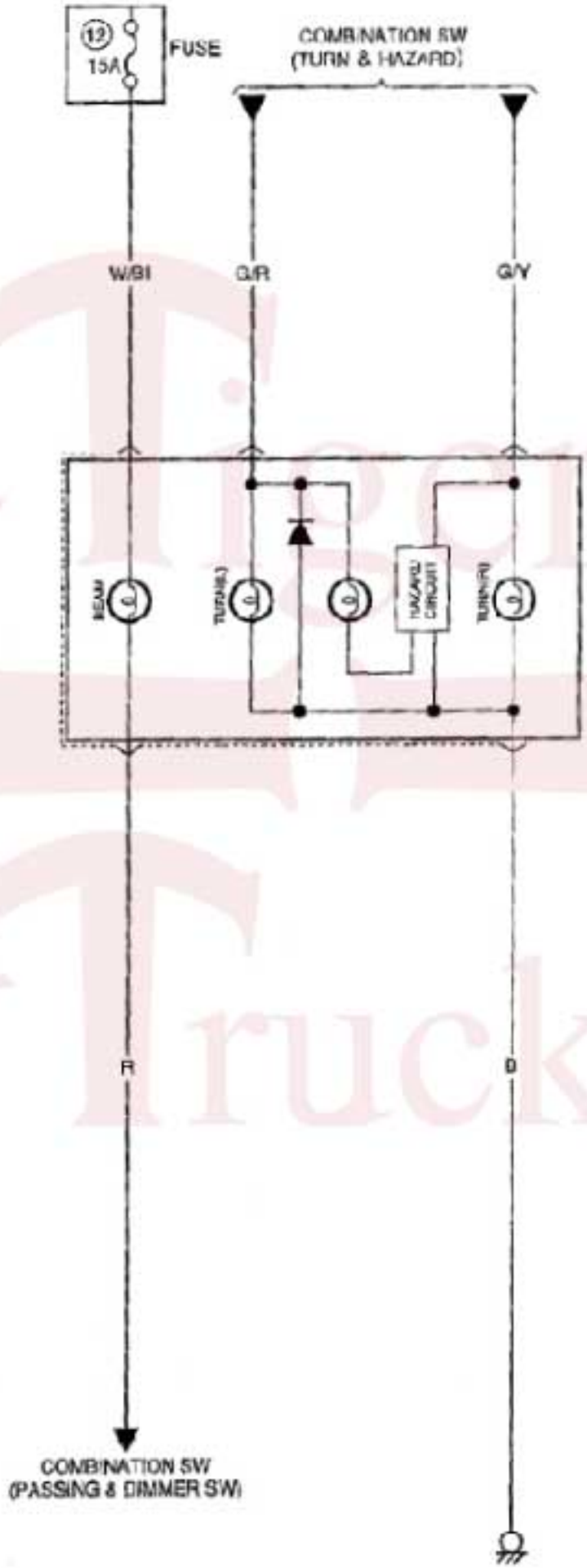




CLEARANCE, TAIL
LICENCE LIGHT

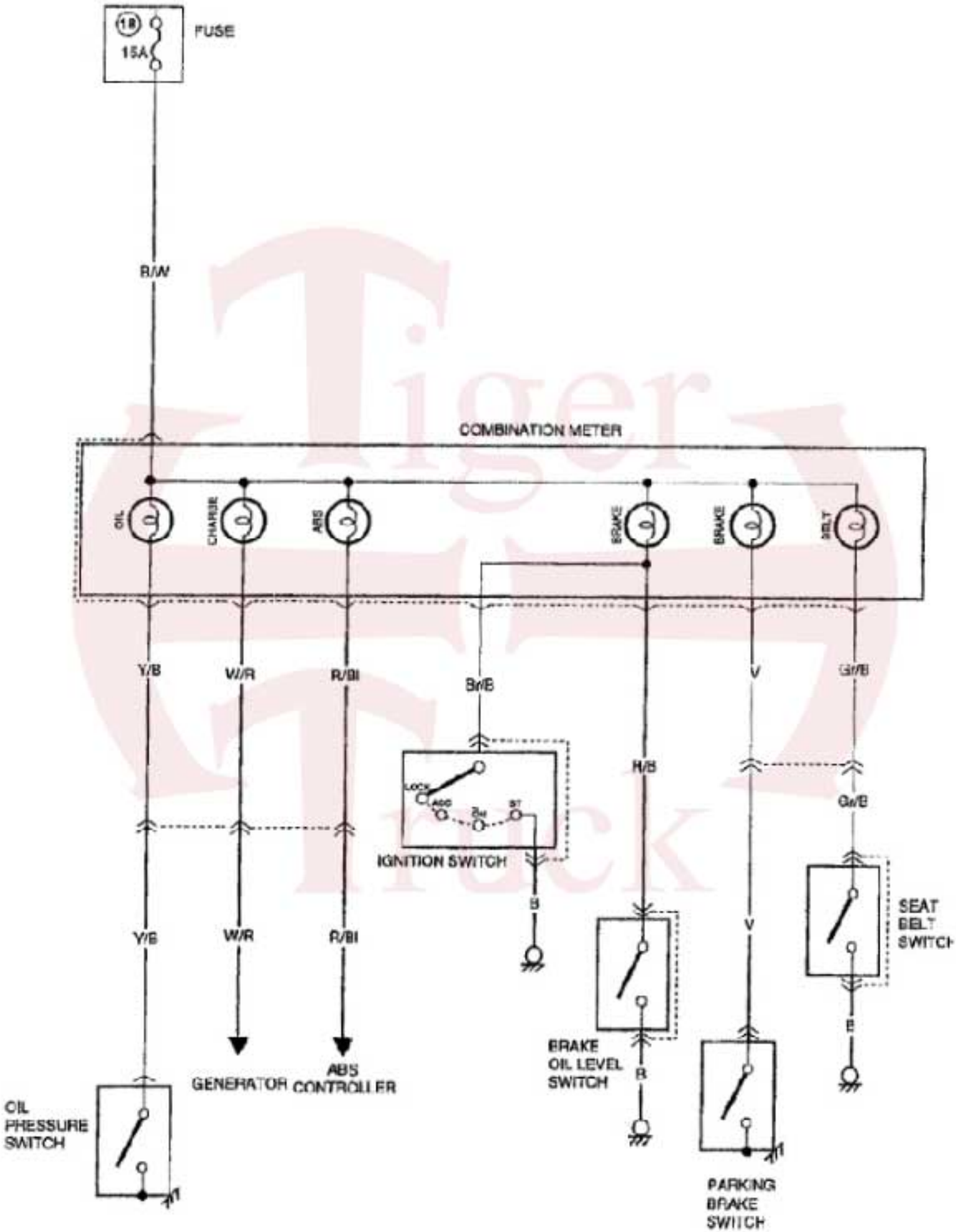
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COMBINATION METER



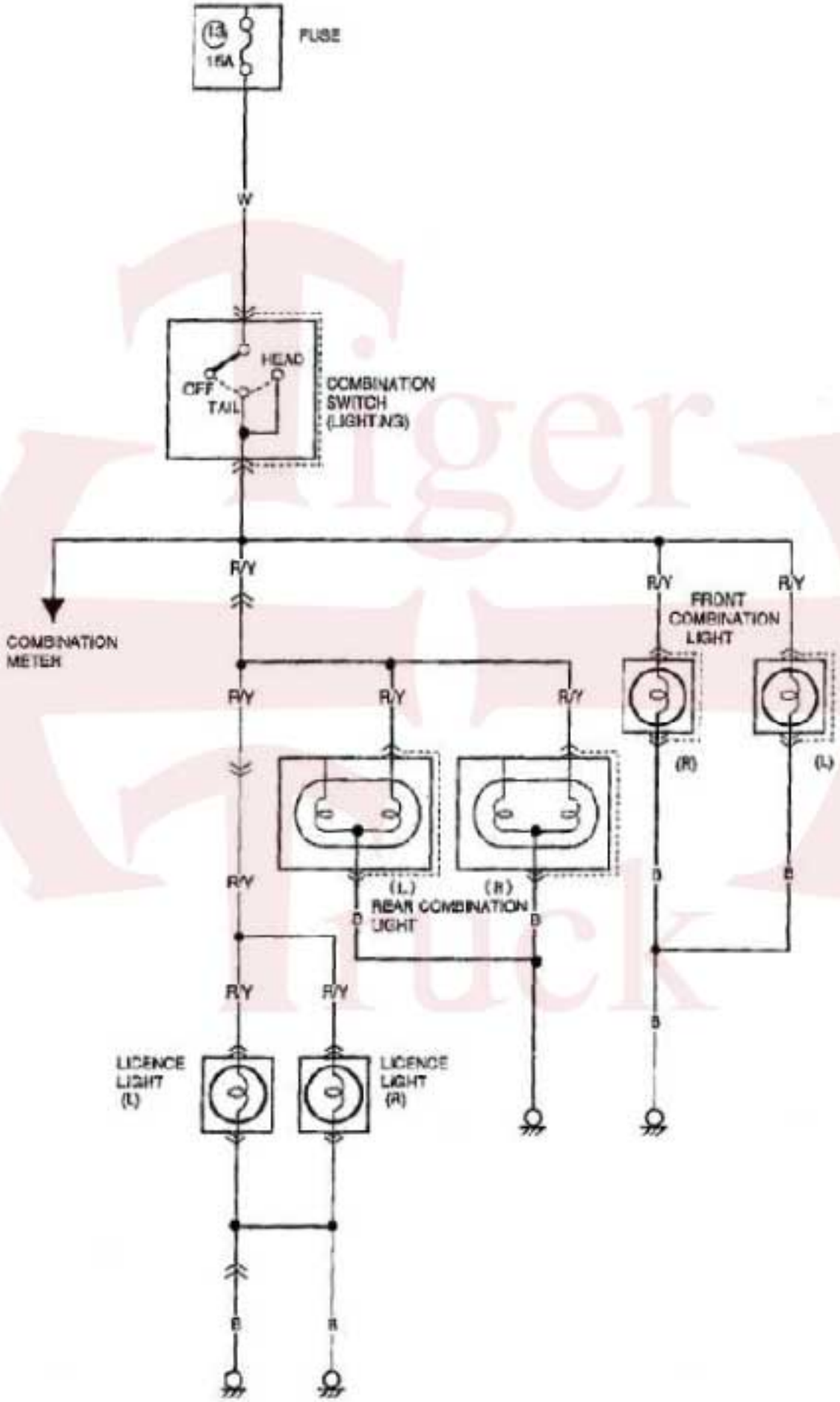
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COMBINATION METER



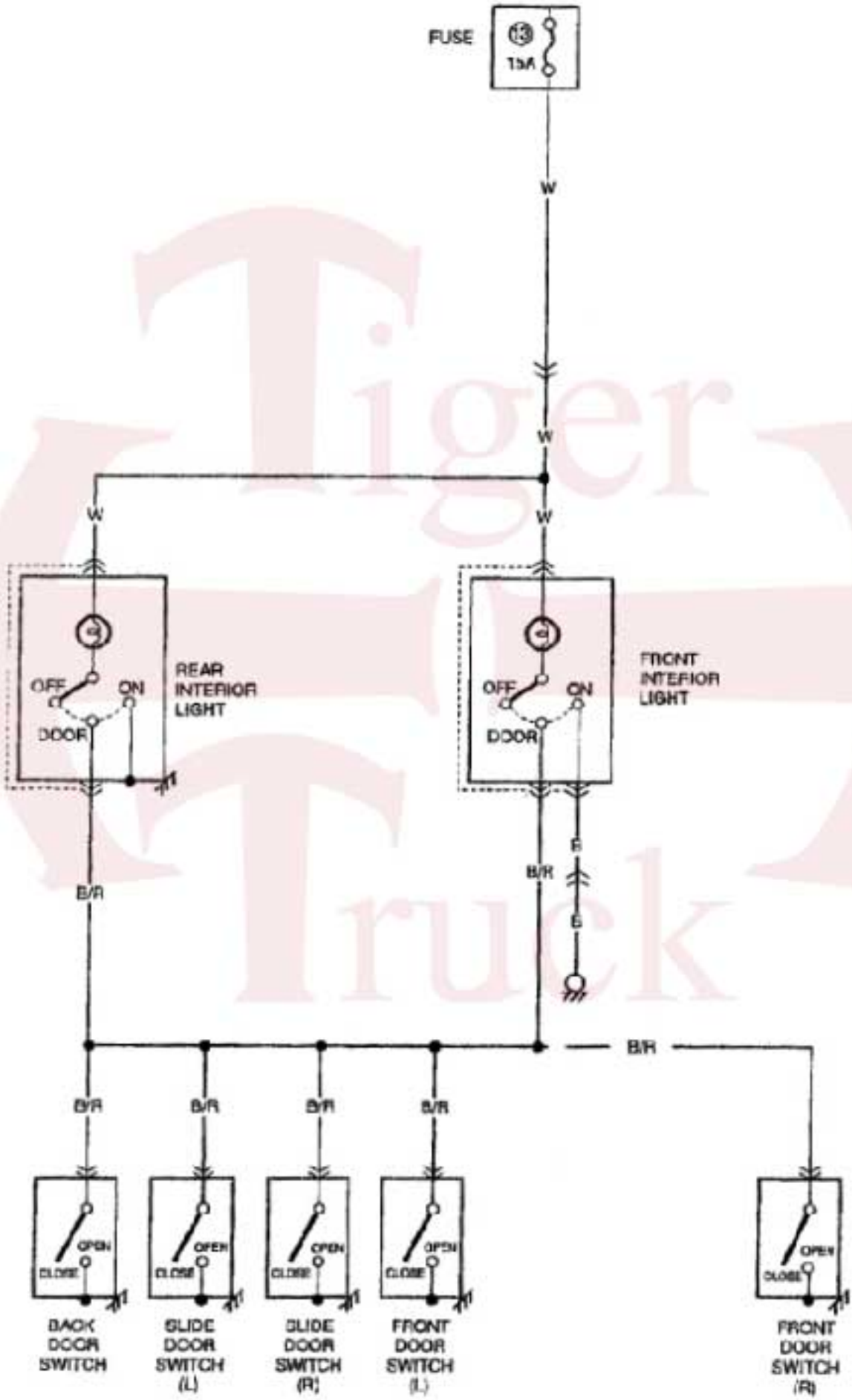
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POSITION / TAIL / LICENSE LIGHT LIGHT



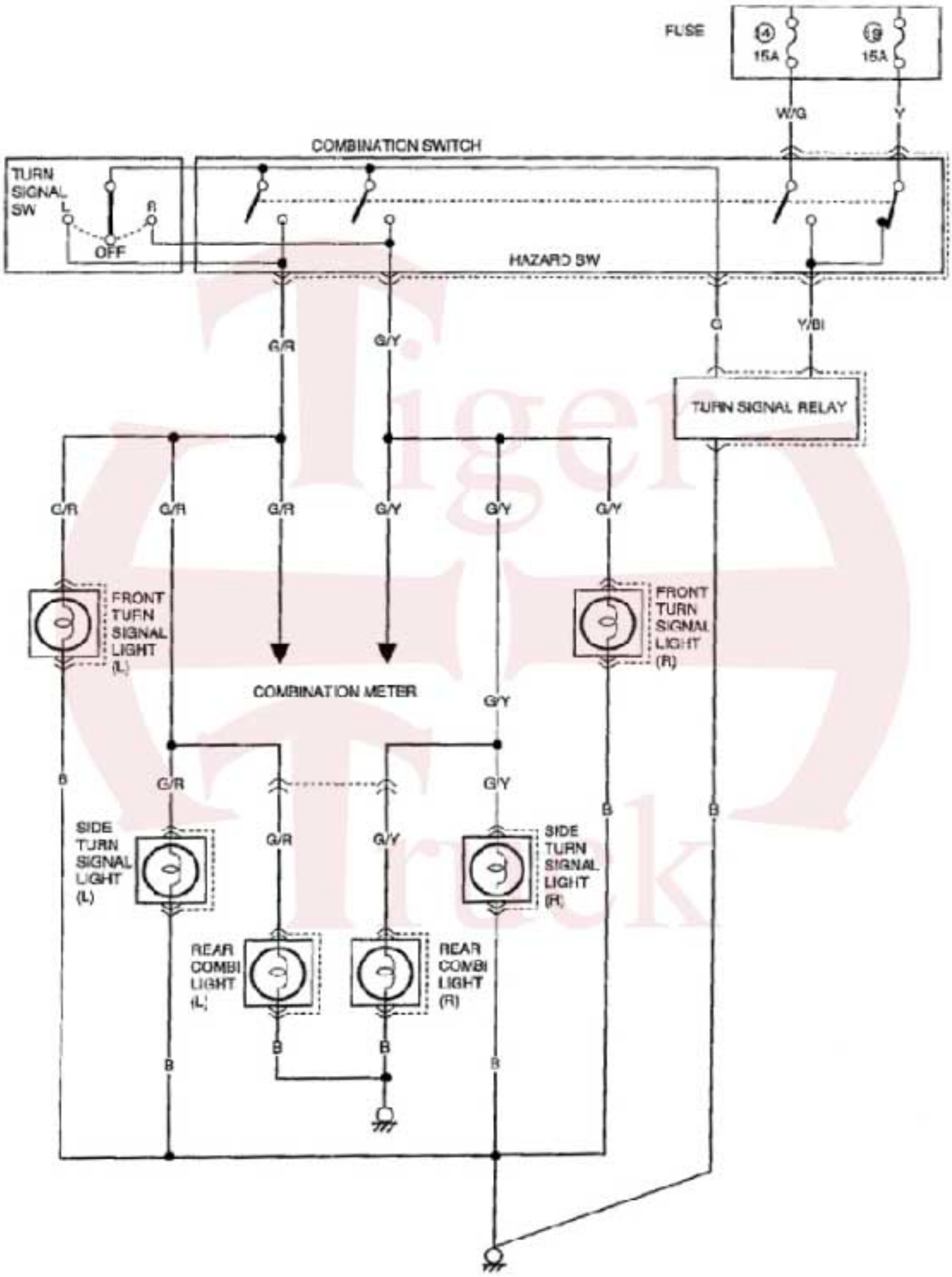
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INTERIOR LIGHT



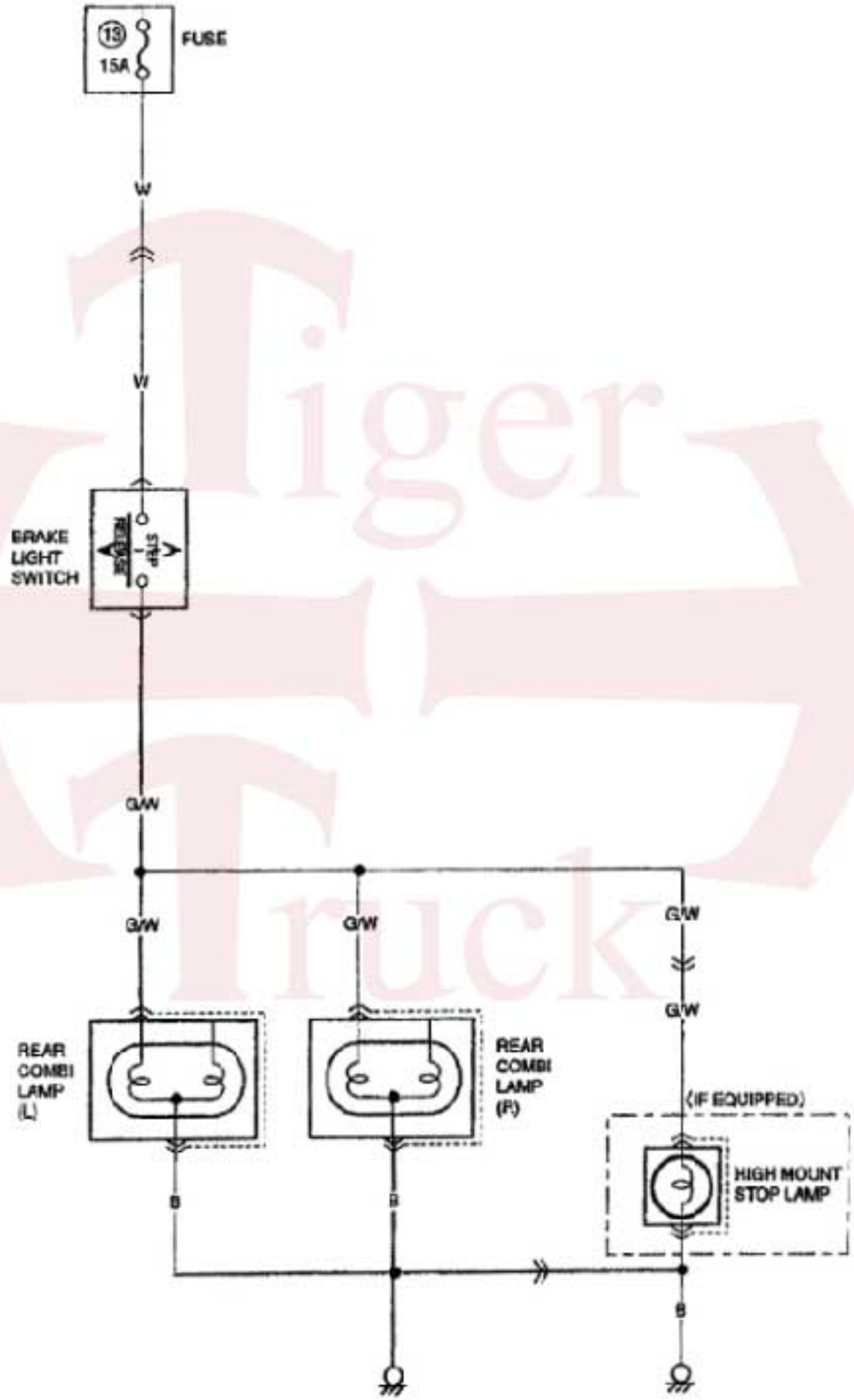
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TURN SIGNAL & HAZARD WARNING LIGHT



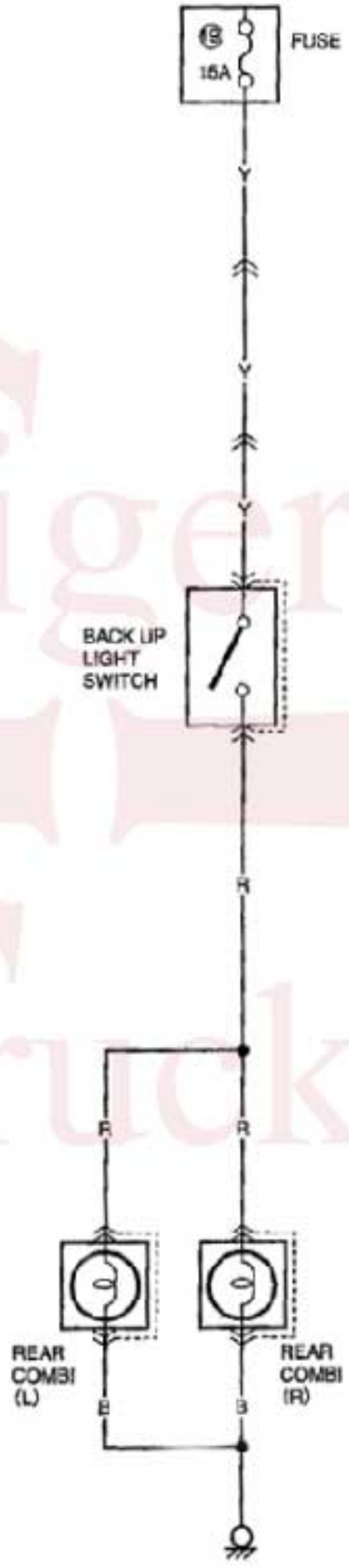
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BRAKE LIGHT



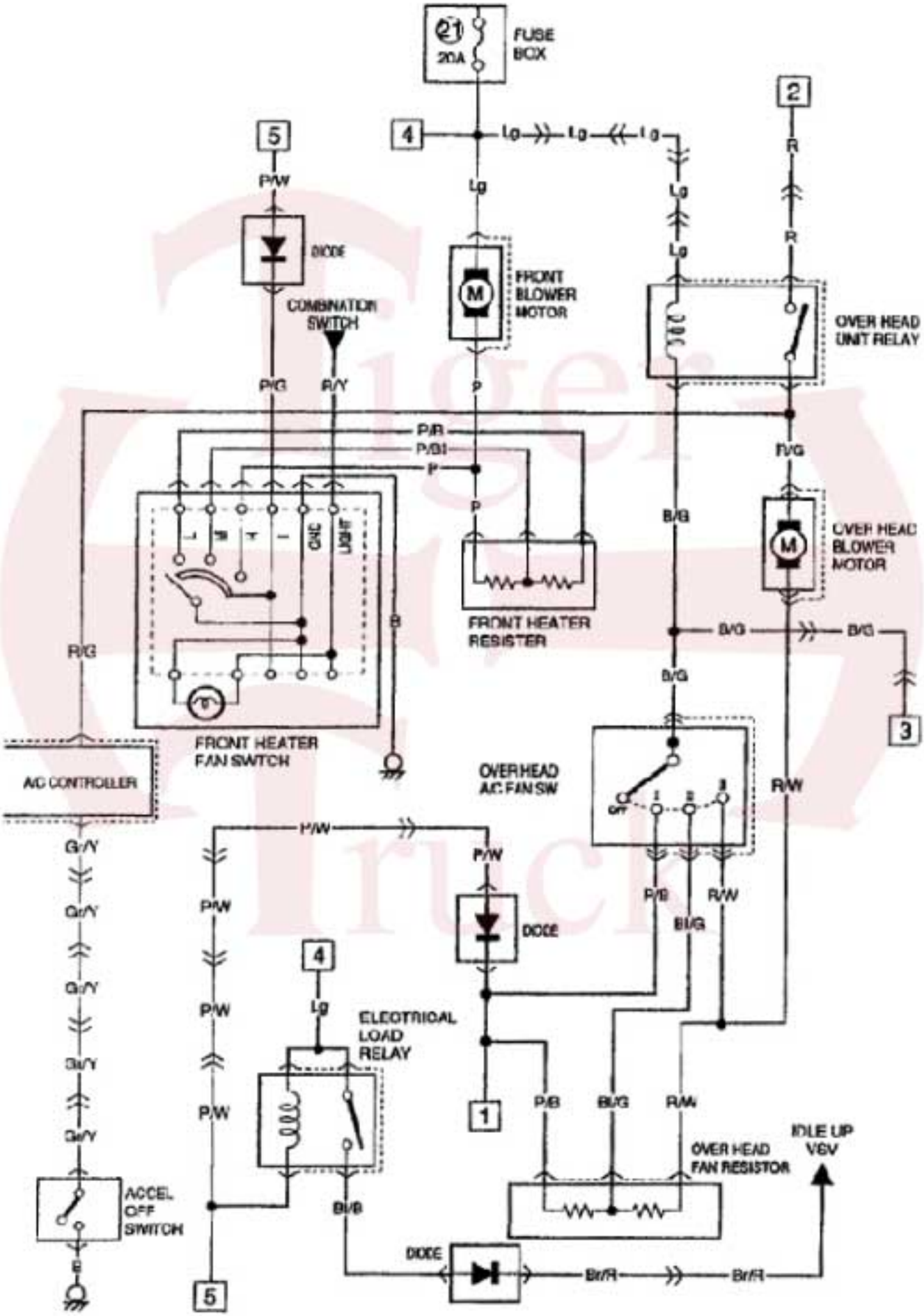
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BACK UP LIGHT



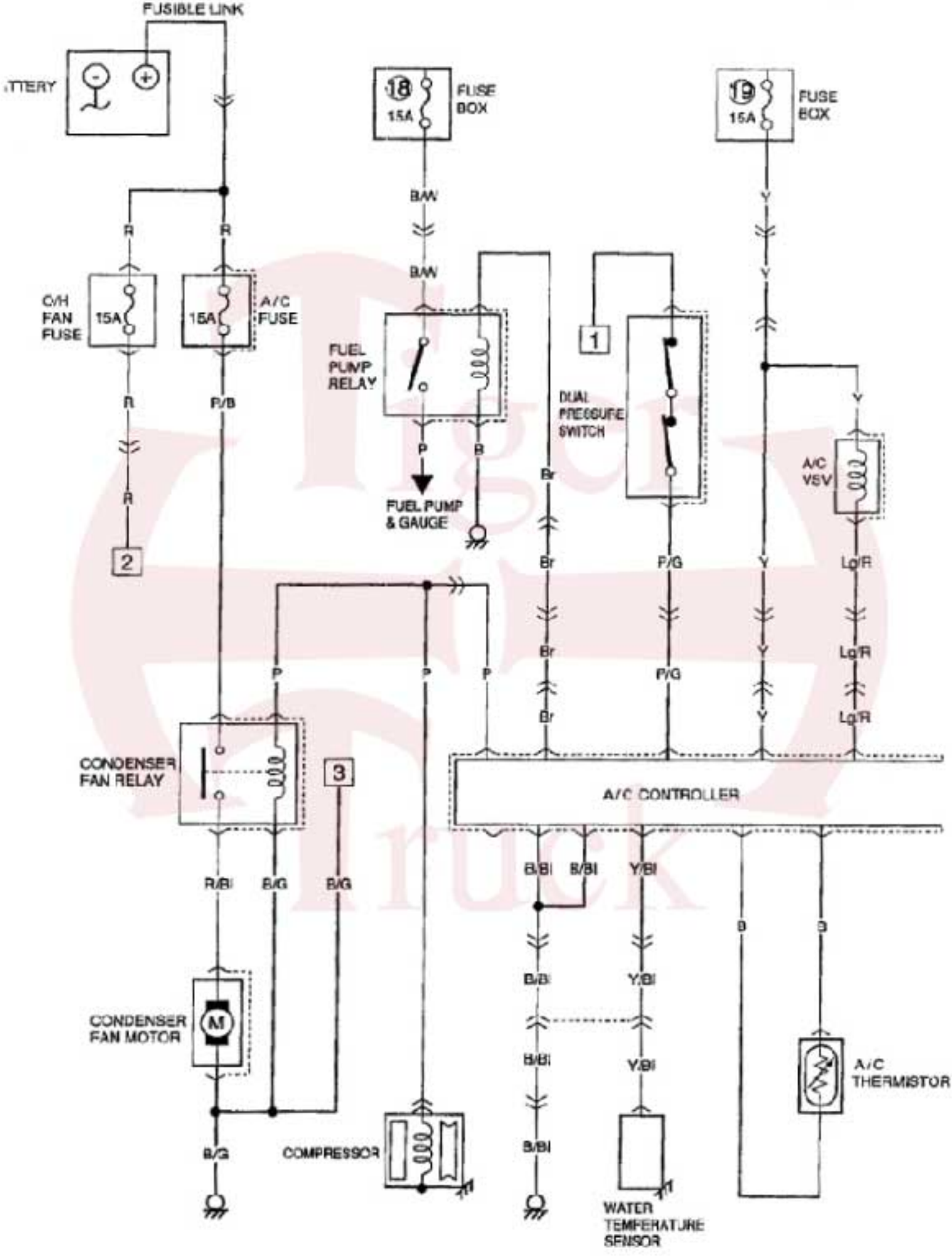
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HEATER AND AIR CONDITIONING



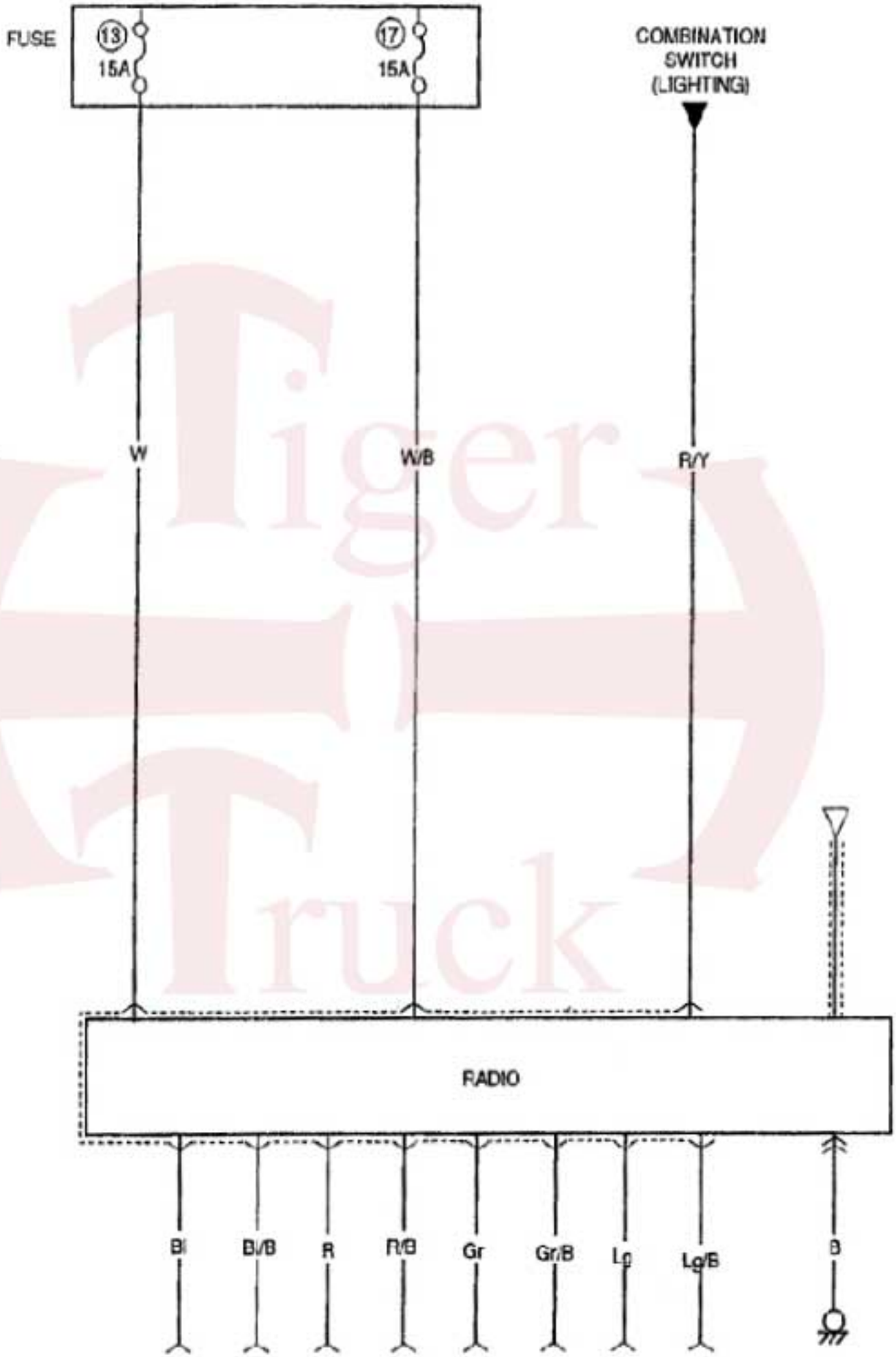
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HEATER AND AIR CONDITIONING



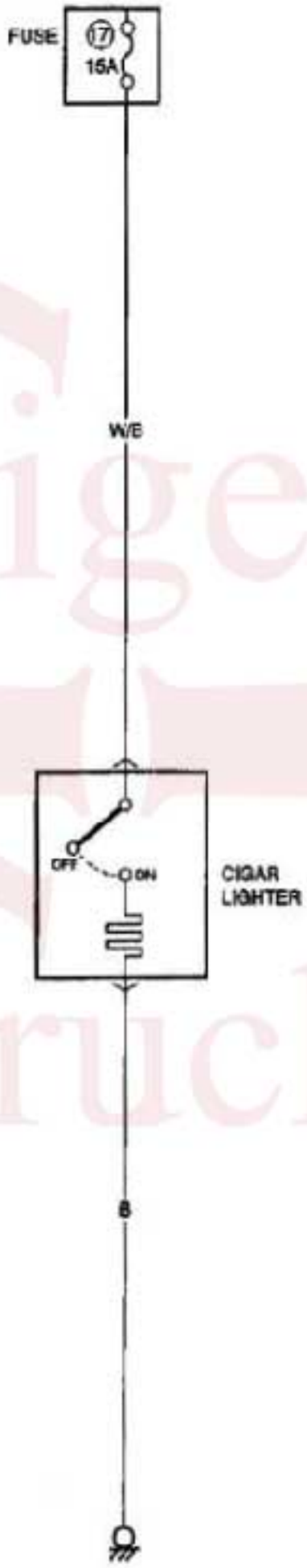
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RADIO



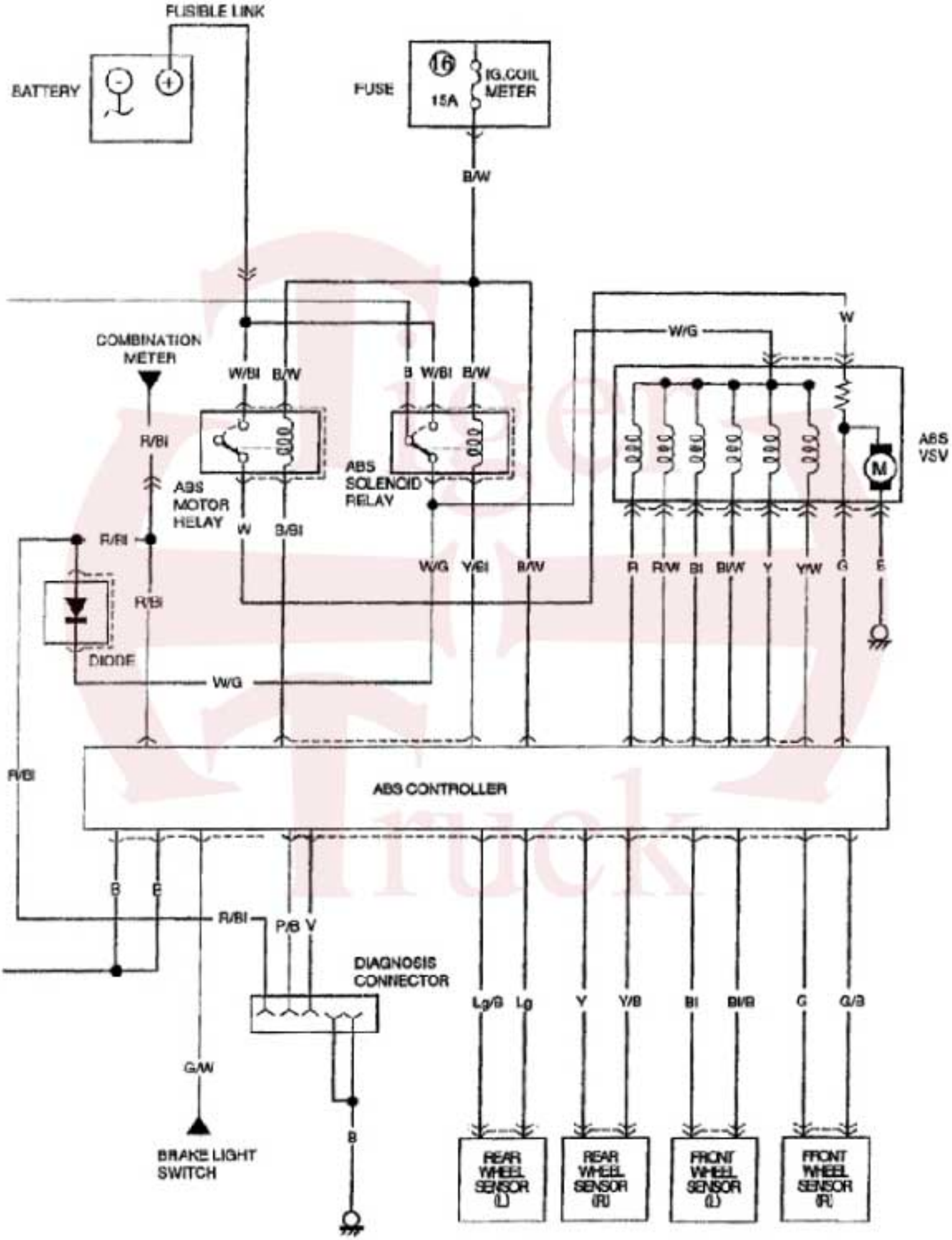
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CIGARETTE LIGHTER



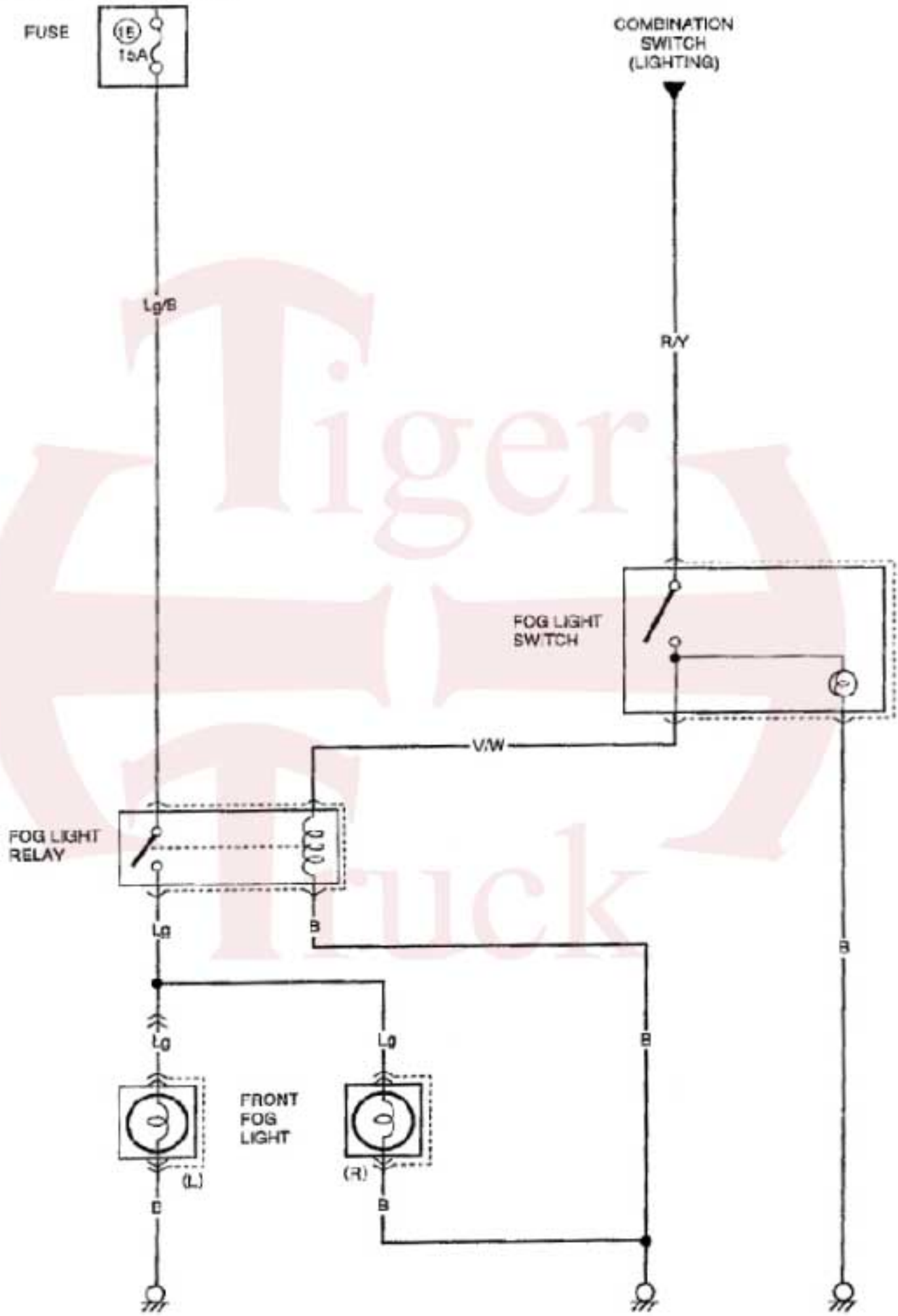
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ANTI-LOCK BRAKE SYSTEM



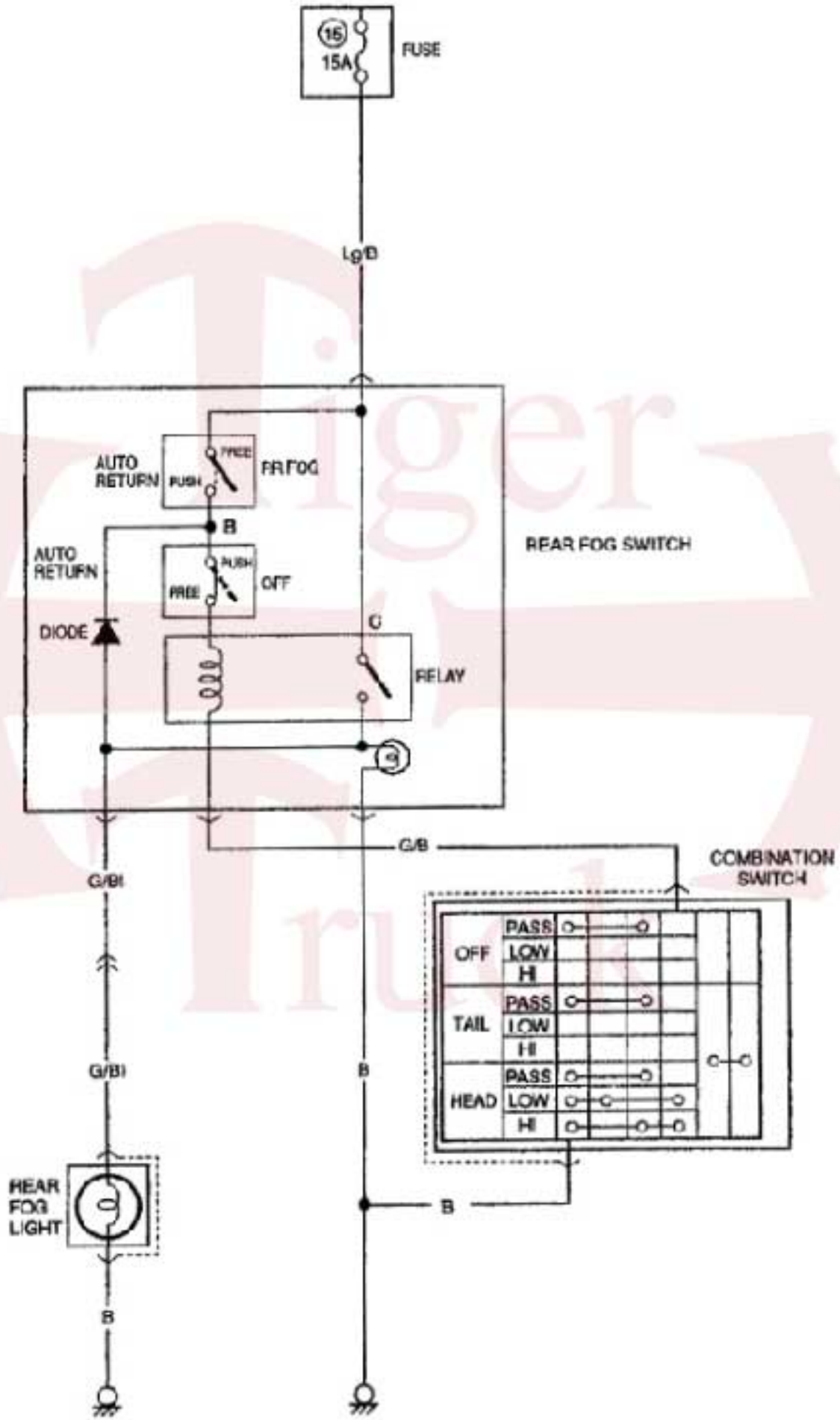
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FRONT FOG LIGHT



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REAR FOG LIGHT



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SECTION 9

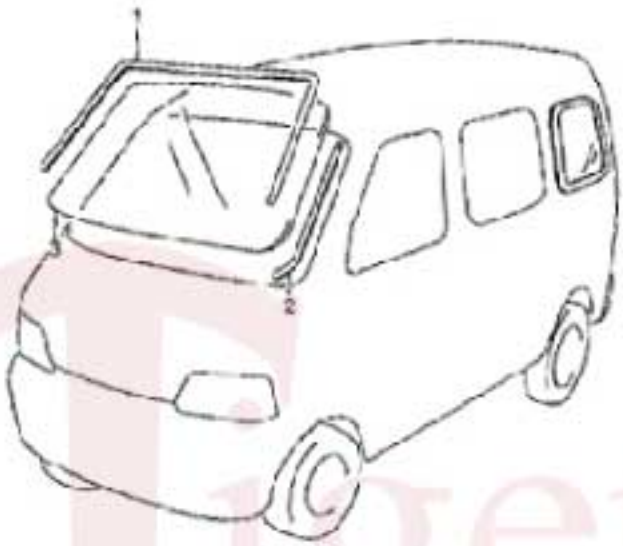
BODY SERVICE

CONTENTS

WINDSHIELD 9-15
SEATS 9-21
SEAT BELTS 9-23
ANTI-CORROSION TREATMENT 9-25
RUST-PROOF TREATMENT 9-28
DIMENSIONS 9-30

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WINDSHIELD



1. Molding
2. Windshield trim
3. Windshield

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For windshield glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

CAUTION:

- **Described in this section is the glass replacement by using 2 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use an adhesive of above mentioned type which has following property.

Shearing strength: 40 kg/cm^2 (569 lb/in^2) or more

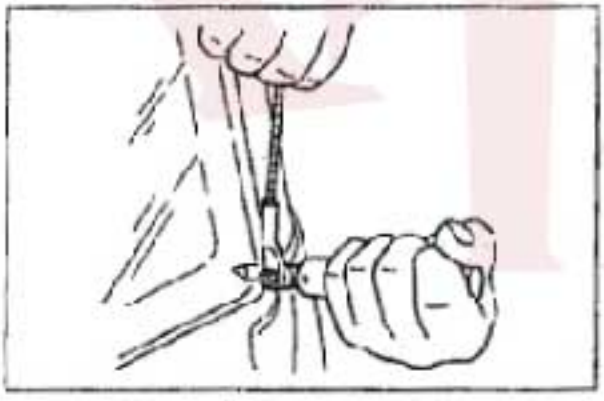
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Adhesive materials and tools required for removal and installation.

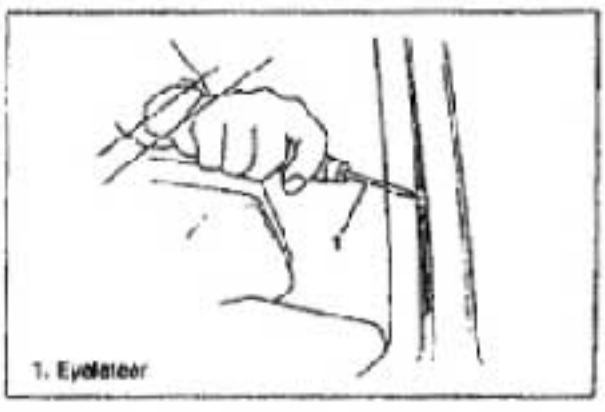
- One component urethane adhesive and primers used in combination (For one sheet of windshield).
  Adhesive (300 g (14.1 oz.))
  Primer for glass (15 g (0.5 oz.))
  Primer for body (15 g (0.5 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

REMOVAL

1) Clean both inside and outside of glass and around it.
2) Remove wiper arms.
3) Remove garnish and stoppers.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove instrument panel and head lining.

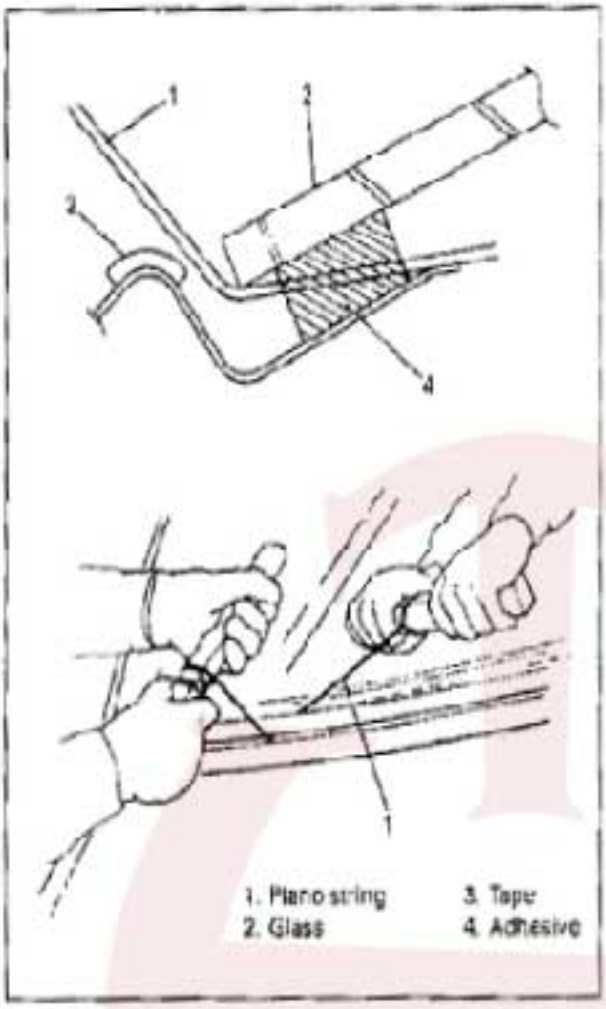


6) Remove rear view mirror, sunvisor, front pillar trims and then windshield trims from front pillars (right & left).
7) Remove (or cut) windshield molding all around until windshield edge comes out.
8) Cut adhesive all around glass with windshield knife.
   If cut with piano string, follow step 9) and 10).


1. Eyeleteer

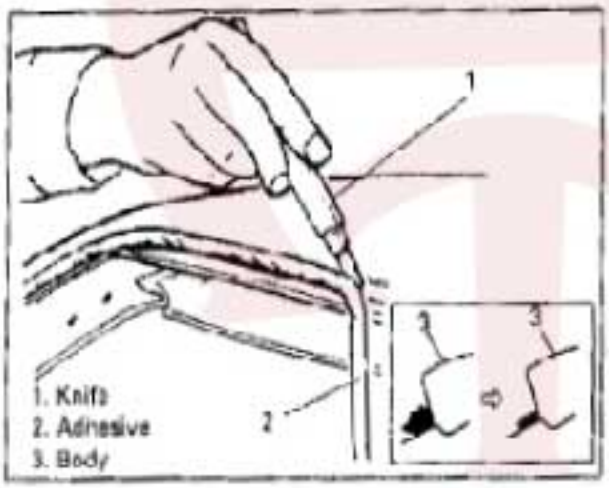
9) Drill hole with eyeleteer through adhesive and let piano string through it.

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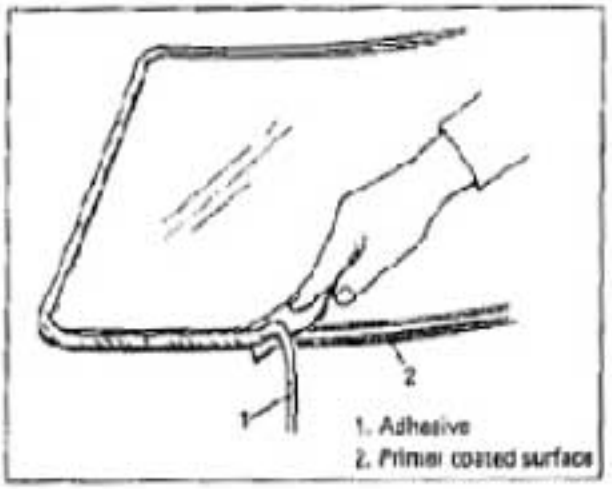
10) Cut adhesive all around glass with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.



11) Using knife, smooth adhesive remaining on body side so that it is 1 – 2 mm (0.04 to 0.08 in.) thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

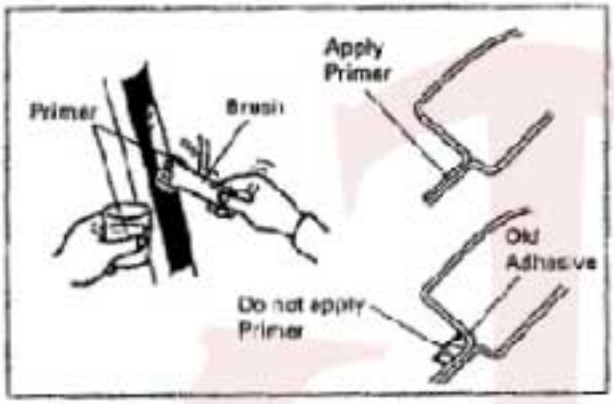


12) When re-using glass, remove spacer and adhesive from glass completely.

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INSTALLATION

1) Using cleaning solvent (white gasoline), clean surface of adhesive remaining on body (or windshield edge) where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)

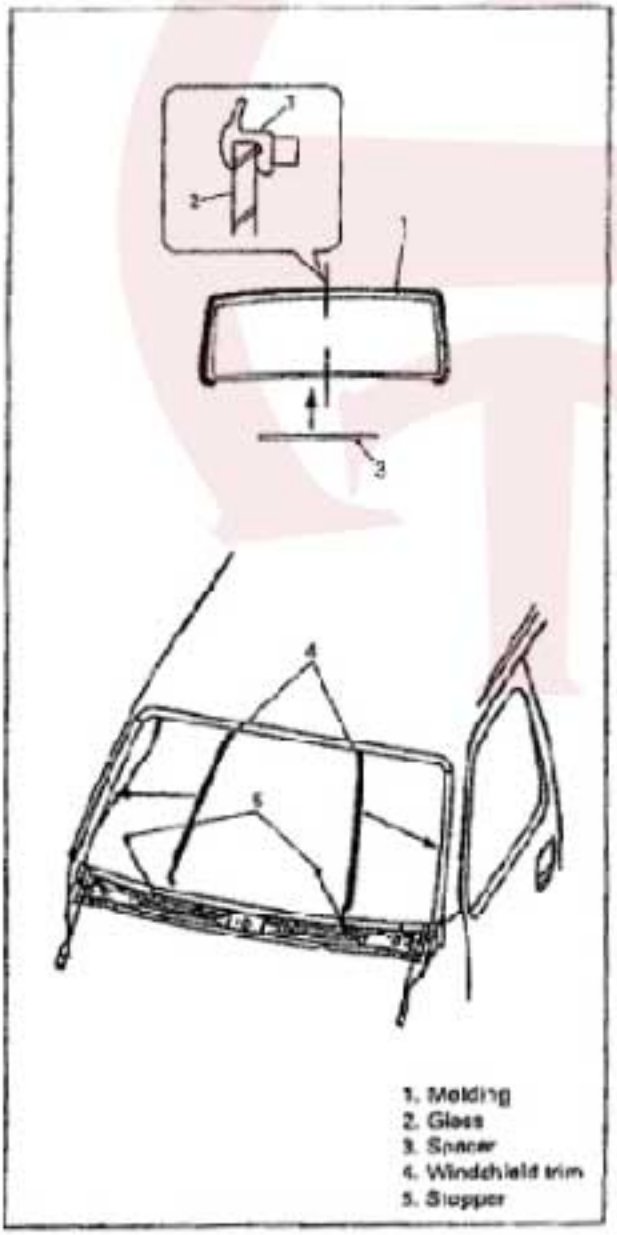


2) Clean contact surfaces of old adhesive, paint or bare metal thoroughly.
If surfaces of paint or bare metal come out, apply primer for body with caution not to apply primer to surface of adhesive remaining on body.

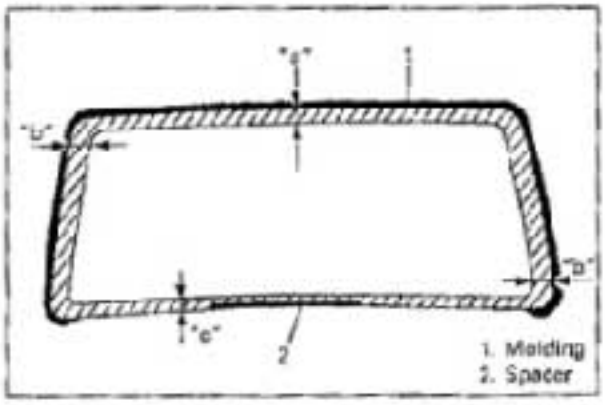
NOTE:

- **Be sure to refer to primer maker's instruction for proper handling and drying time.**
- **Do not touch body and old adhesive surfaces when glass is to be adhered.**

3) Install new molding and spacer to glass. Warming molding for over half an hour at 35°C (95°F) temperature will facilitate work.
4) Clean glass surface to be adhered to body with clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.
5) Install windshield trims to front pillars.
Install stopper.



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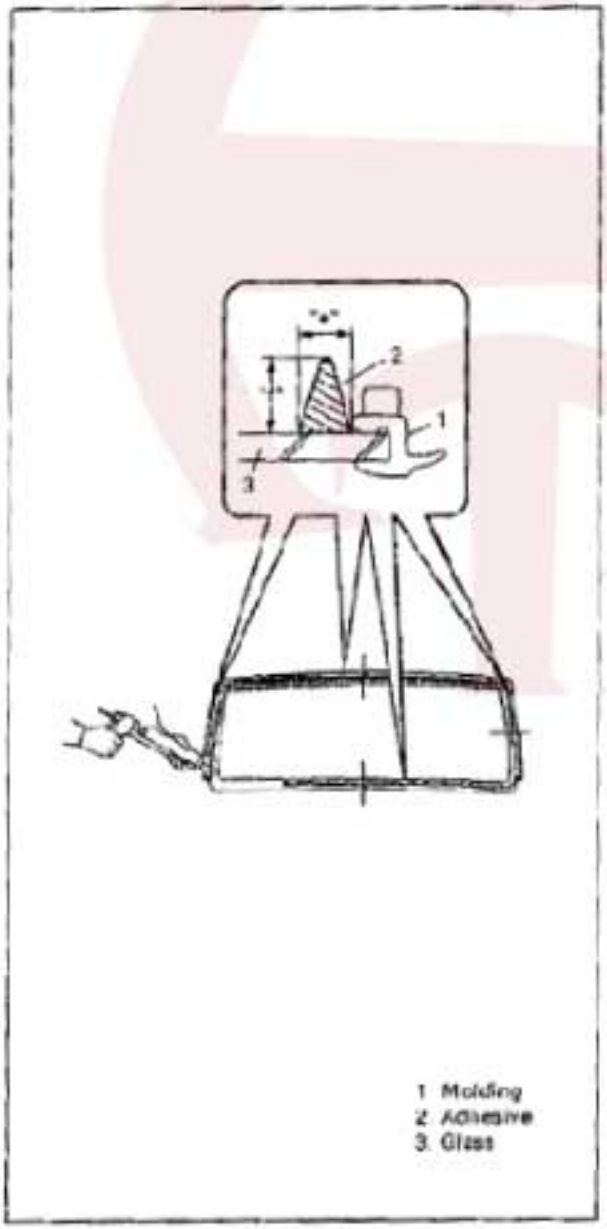


6) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to body.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width "a": Approx. 20 mm (0.78 in.)
"b": Approx. 15 mm (0.59 in.)
"c": Approx. 18 mm (0.70 in.)



7) Apply adhesive referring to figure at the left.

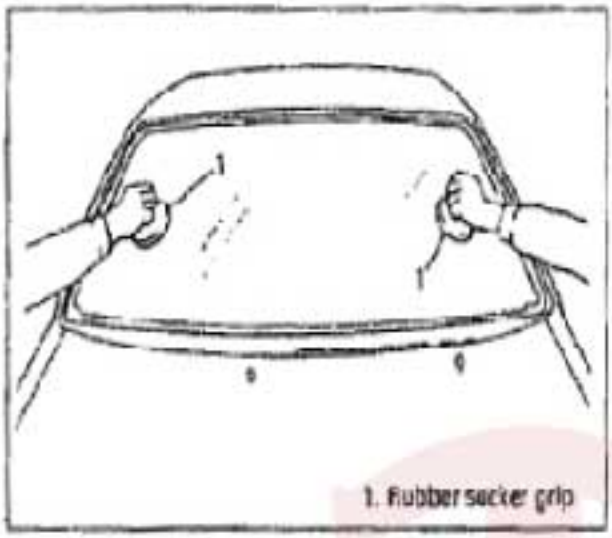
NOTE:

- **Start from bottom side of glass.**
- **Be careful not to damage primer.**
- **Height of adhesive applied to lower side should be higher than that of other three sides.**

Upper, right and left sides
Width "e" : Approx. 8 mm (0.31 in.)
Height "f" : Approx. 14 mm (0.55 in.)

- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive is applied.**
- **Perform step 7) to 9) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**

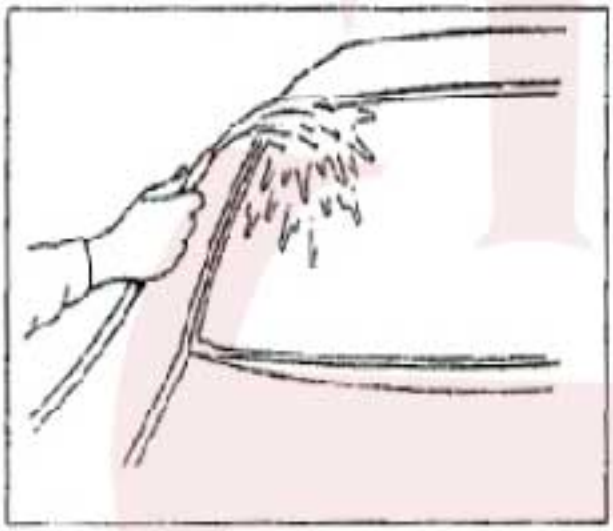
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1. Rubber sucker grip

8) Peel remaining paper from molding and spacer.
9) Holding rubber sucker grips, press glass onto body and place the glass securely by tapping glass surface and molding all around.

NOTE:
Use care not to damage glass surface or body.

10) Attach roof molding.



11) Check for water leakage by running water from hose over window. If leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:
- Do not use high pressure water.
- Do not blow compressed air directly at adhesive applied part when drying.
- Do not use infrared lamp or the like for drying.

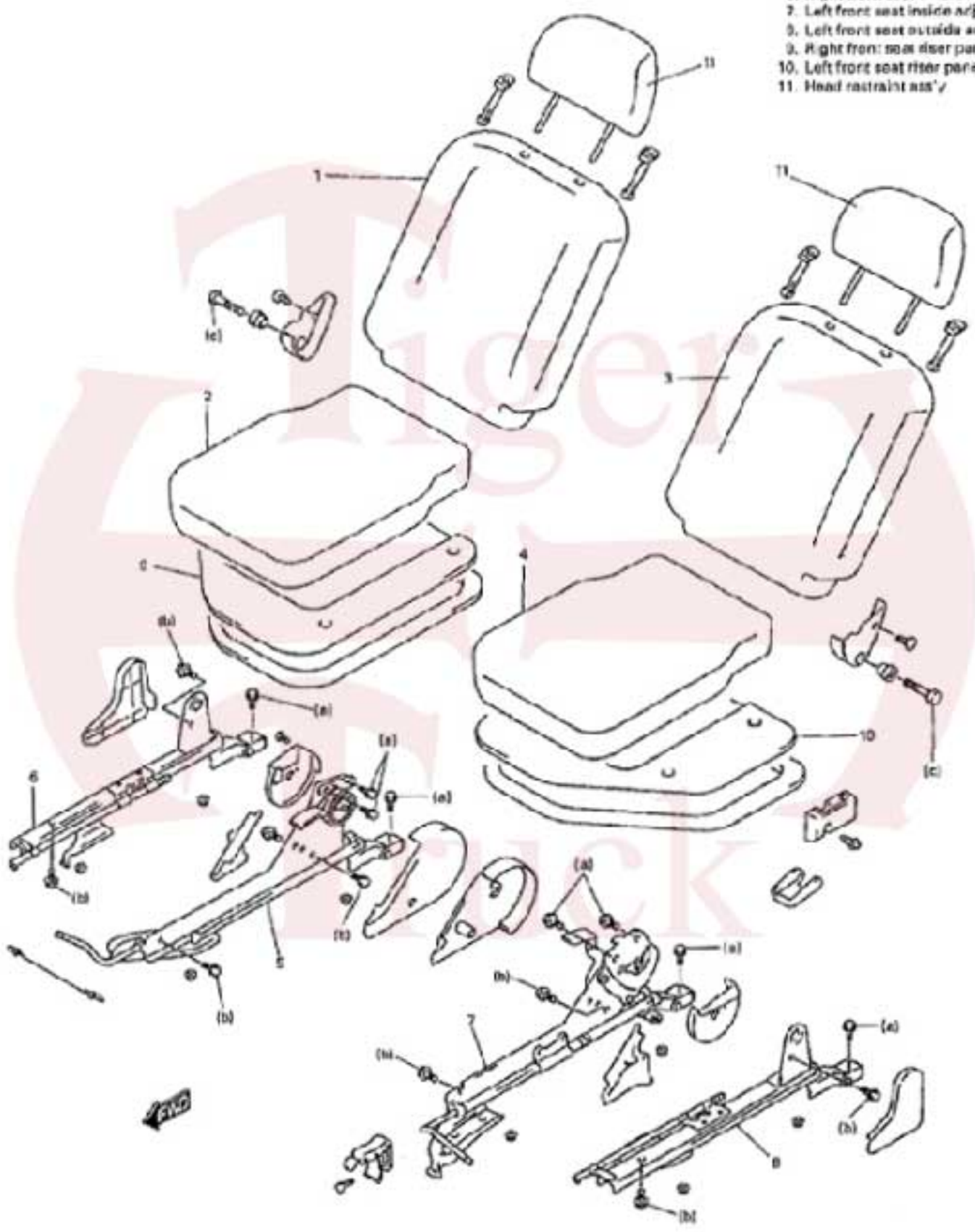
CAUTION:
Upon completion of installation, note the following.
- Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.
- If molding is not securely in place, hold it down with a tape until adhesive is completely set.
- Each adhesive has its own setting time. Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.
- Refrain form driving till adhesive is completely set so as to ensure proper and sufficient adhesion.

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SEATS

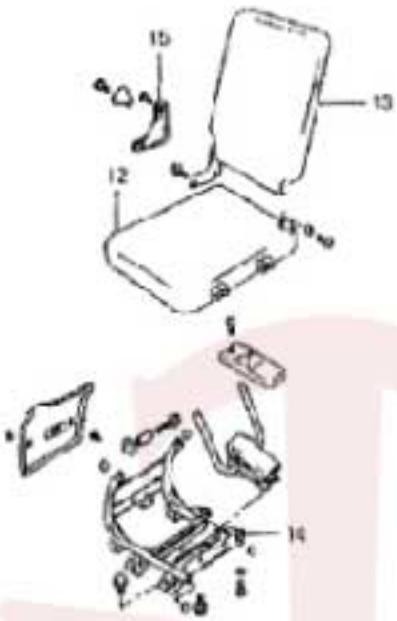
FRONT SEAT

1. Right front seat back ass'y
2. Right front seat cushion ass'y
3. Left front seat back ass'y
4. Left front seat cushion ass'y
5. Right front seat inside adjuster
6. Right front seat outside adjuster
7. Left front seat inside adjuster
8. Left front seat outside adjuster
9. Right front seat riser panel
10. Left front seat riser panel
11. Head restraint ass'y

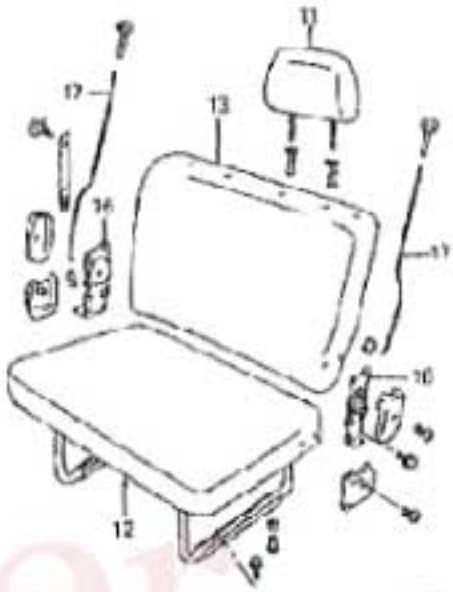


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2ND R SEAT
(for vehicle equipped with third seat)



2ND L SEAT
(for vehicle equipped with third seat)



3RD SEAT (for vehicle equipped with third seat)
2ND SEAT (for vehicle equipped with second seat)



11. Head restraint ass'y
12. Rear seat cushion ass'y
13. Rear seat back ass'y
14. Rear seat leg ass'y
15. Rear seat hinge ass'y
16. Rear seat reclining ass'y
17. Rear seat reclining rod

REMOVAL

1) Remove seat rail mounting bolts. Then, remove seat ass'y with seat rail (front seats).
2) Disassemble and repair seat as necessary.

INSTALLATION

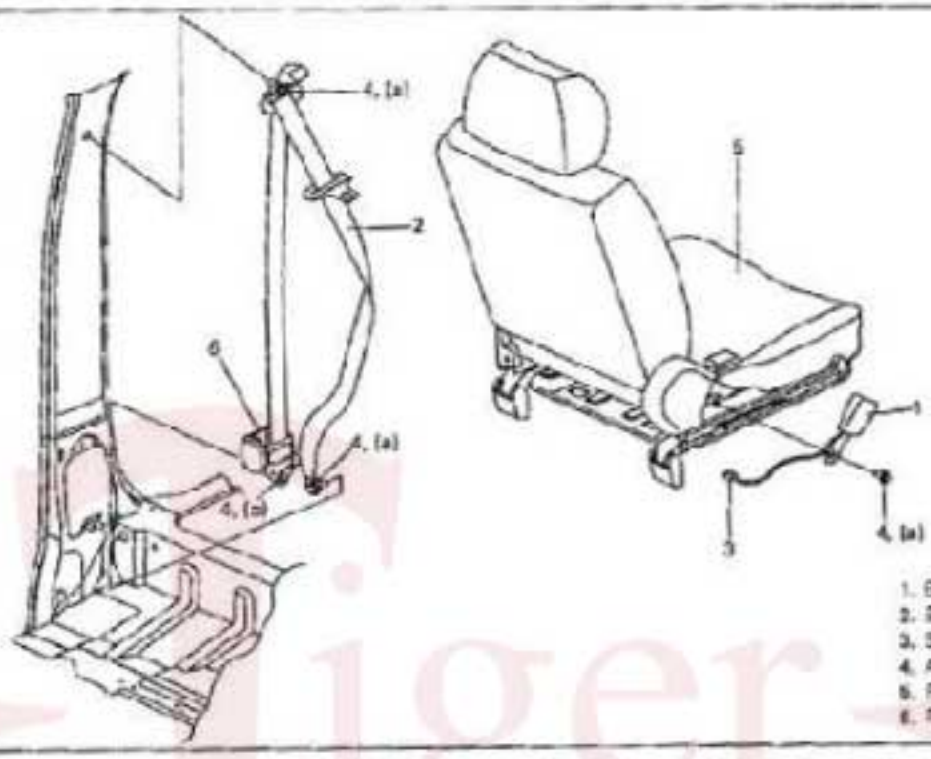
Reverse removal procedure to install front seat.
Torque it to specifications, as given below.

Tightening Torque

(a): 35 N·m (3.5 kg-m, 25.3 lb-ft)
(b): 23 N·m (2.3 kg-m, 16.6 lb-ft)
(c): 5 N·m (0.5 kg-m, 3.61 lb-ft)

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SEAT BELT



1. Buckle
2. Seat belt
3. Seat belt coupler (If equipped)
4. Anchor bolt
5. Front seat
6. Retractor ass'y

WARNING:
If replacing seat belt is necessary, replace buckle and ELR (or webbing) together as a set. This is for the reason of ensuring locking of tongue plate with buckle.
If these parts are replaced individually, such a locking condition may become unreliable. For this reason, Suzuki will supply only the spare buckle and ELR (or webbing) in a set part.

SERVICING SEAT BELTS

Before servicing or replacing seat belts, refer to following precautionary items.

1) Seat belts should be normal relative to strap retractor and buckle portions.
2) Keep sharp edges and damaging objects away from belts.
3) Avoid bending or damaging any portion of belt buckle or latch plate.
4) Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
5) When installing a seat belt anchor bolt and nut, start bolt and nut by hand to prevent cross-threading.
6) Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
7) Keep belts dry and clean at all times.
8) If there exist any parts in question, replace such parts.
9) Replace belts whose webbing is cut or otherwise damaged.
10) Do not put anything into trim panel opening which seat belt webbing passes through.

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REMOVAL AND INSTALLATION

Refer to figure on previous page to remove and install front and rear seat belts.

NOTE:

Be sure to tighten seat belt anchor bolts to specified torque below.

Seat belt anchor bolt and nut should have an unified fine thread (7/16 – 20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Tightening Torque

(a): 35 N·m (3.5 kg-m, 25.3 lb-ft)

INSPECTION

Seat belts and attaching parts can affect the vital components and systems of a vehicle.

Therefore, they should be inspected carefully and replaced with genuine parts only.

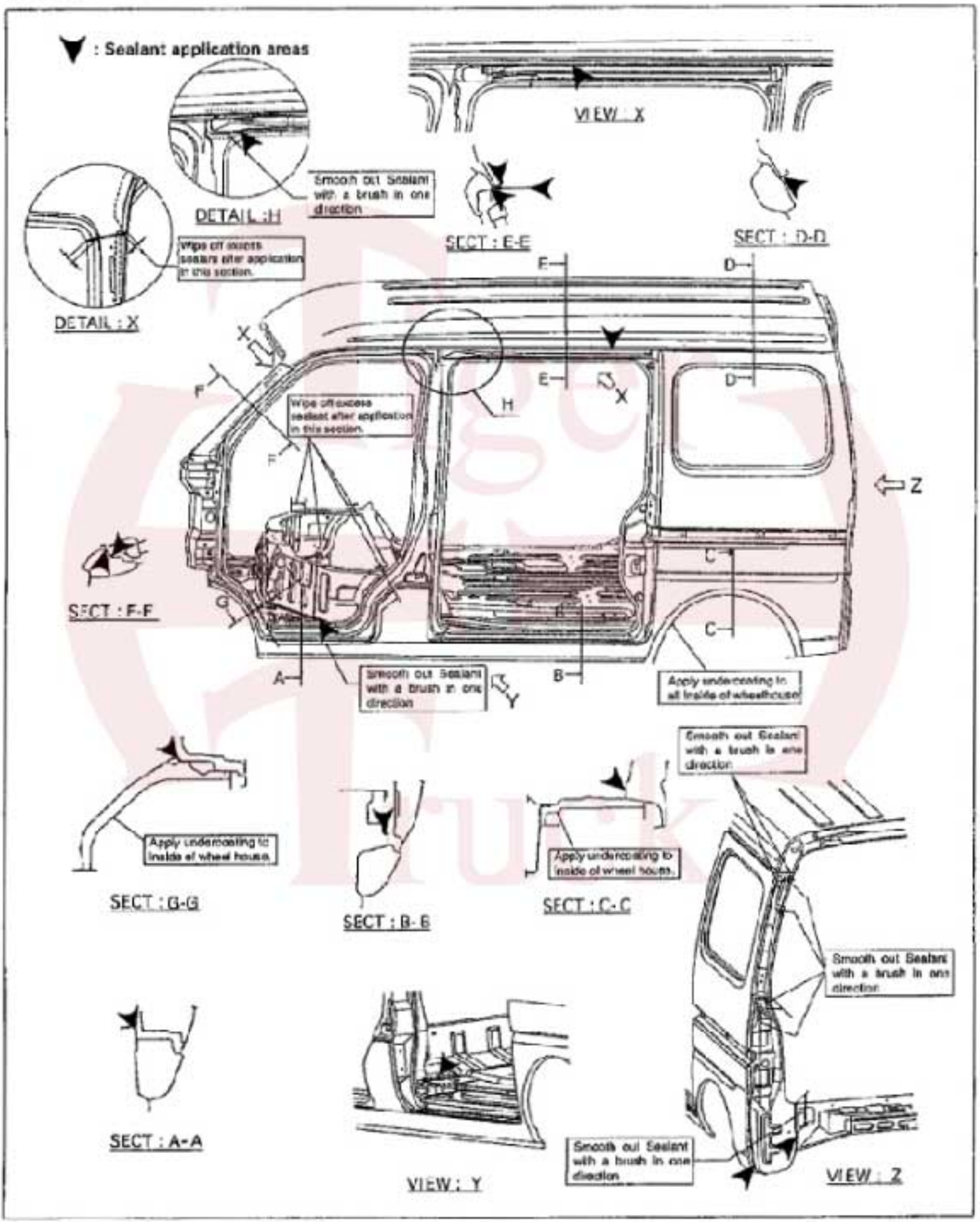
1) Seat belt
   Its webbing or strap should be free from damage.
2) Retractor
   It should lock webbing when pulled quickly.
   The front seat belt retractor should pass the above inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
3) Anchor bolt
   Anchor bolts should be torqued to specification.
4) Belt latch
   It should be secure when latched.
5) Warning system
   Check driver's seat belt strap switch.

   For the details of seat belt warning system, refer to the Section 8 "BODY ELECTRICAL SYSTEM".

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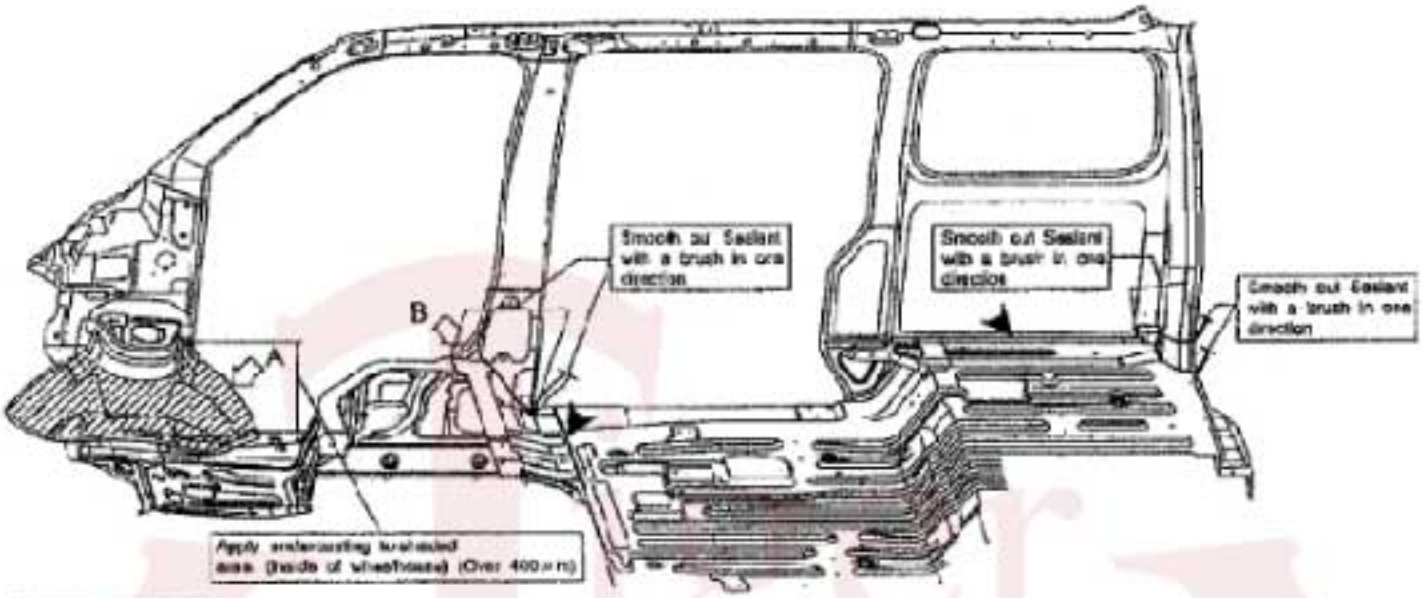
ANTI-CORROSION TREATMENT

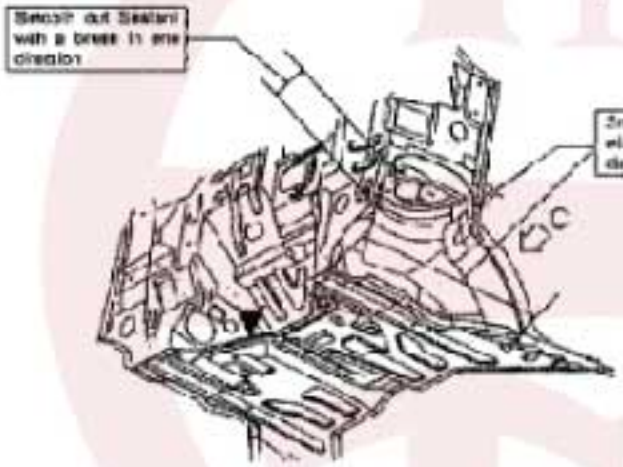
SEALANT APPLICATION AREAS



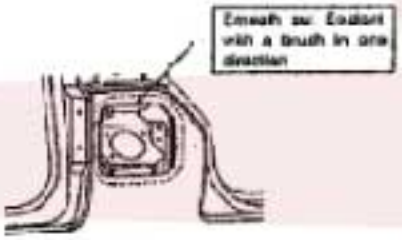
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▼ : Sealant application areas





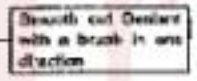
VIEW:A



VIEW:B
(RH ONLY)

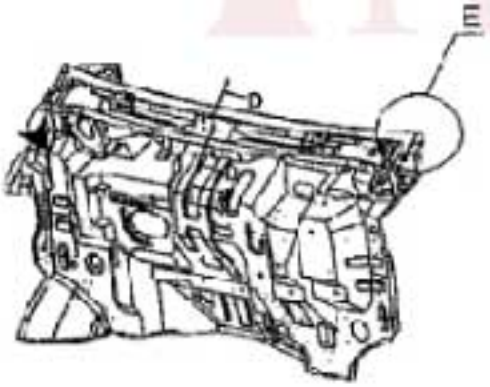
VIEW:C

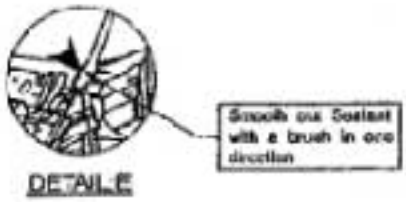






SECT:D-D



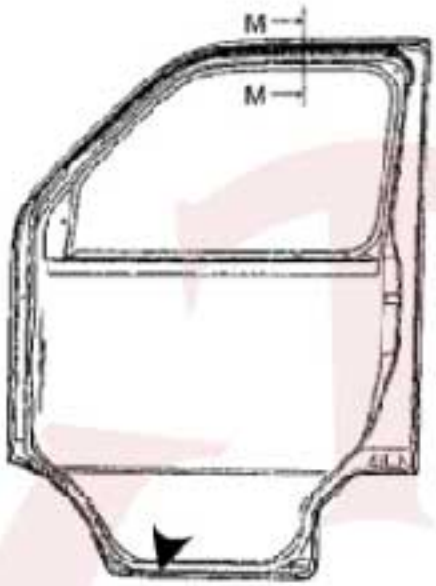


DETAIL:E

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: Apply sealant

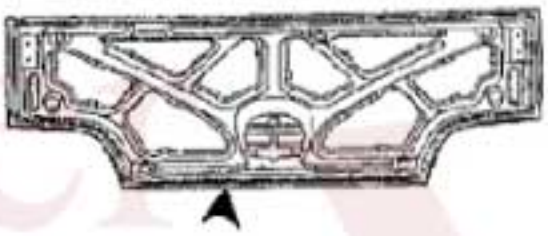
FRONT DOOR



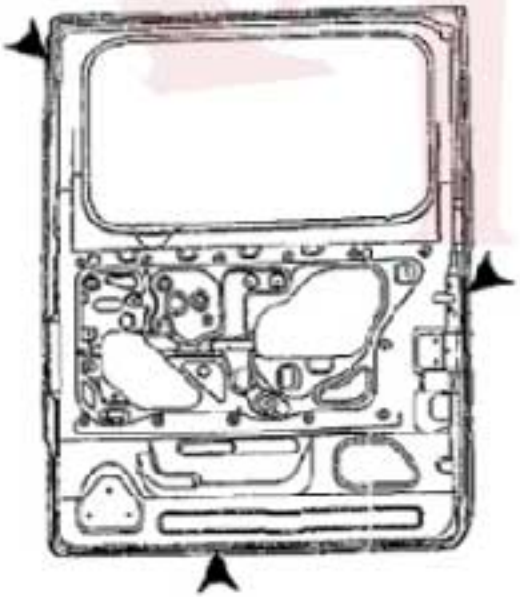


SECT : M-M

HOOD



REAR DOOR



BACK DOOR



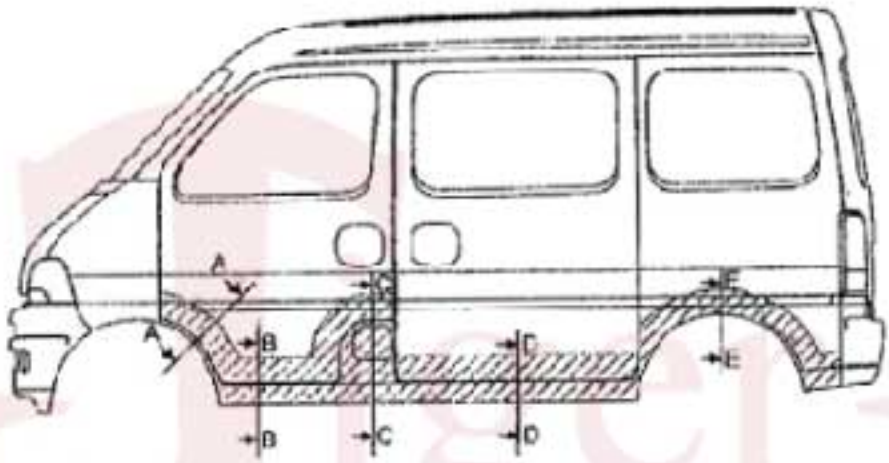
https://truckmanualshub.com/

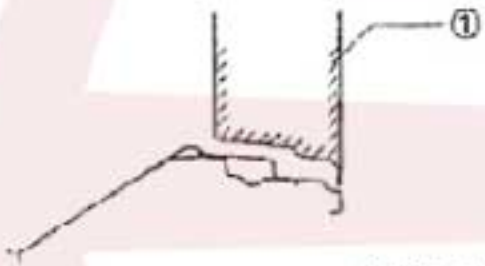
RUST-PROOF TREATMENT

////: Apply rust preventive to shaded area.

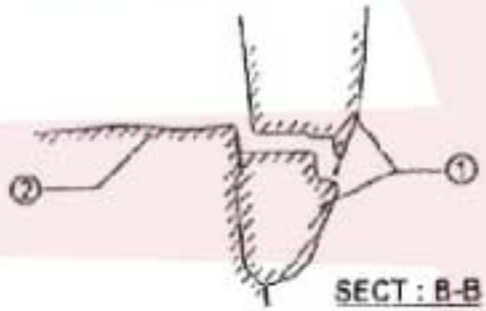
① : Hot wax

② : Underbody coat wax

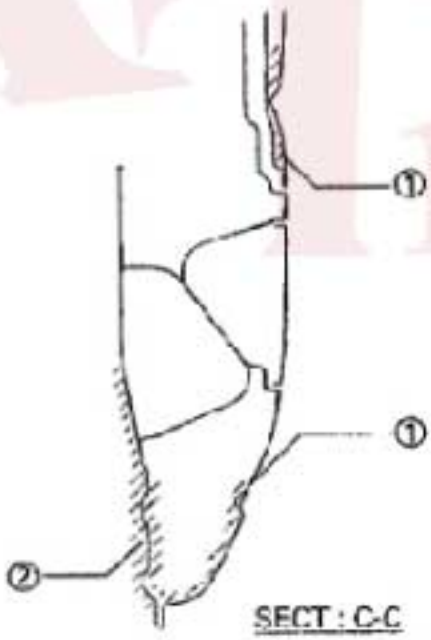




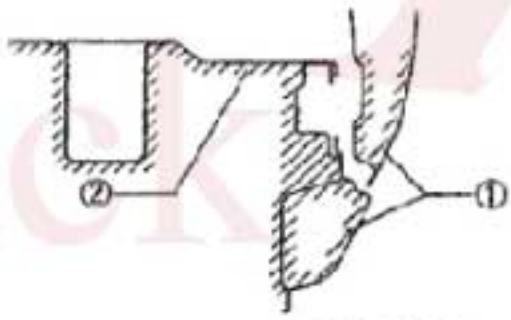
SECT : A-A



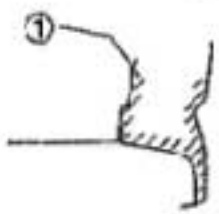
SECT : B-B



SECT : C-C



SECT : D-D

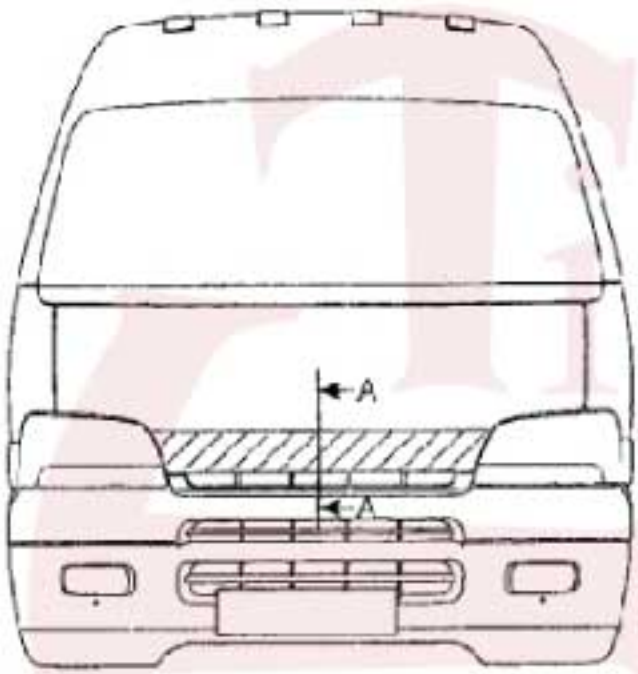


SECT : E-E

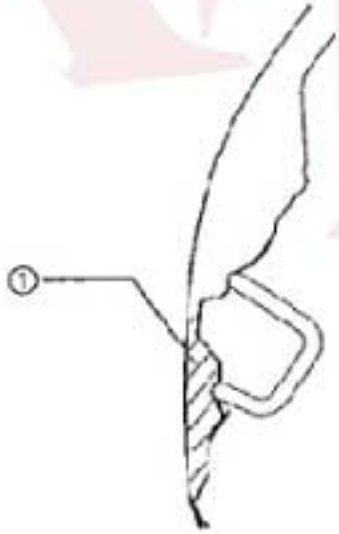
https://truckmanualshub.com/

////: Apply rust preventive to shaded area.

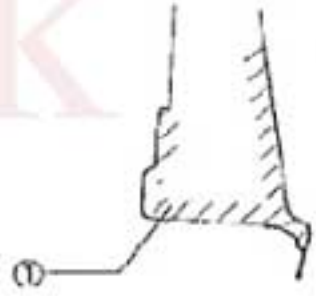
①: Hot wax







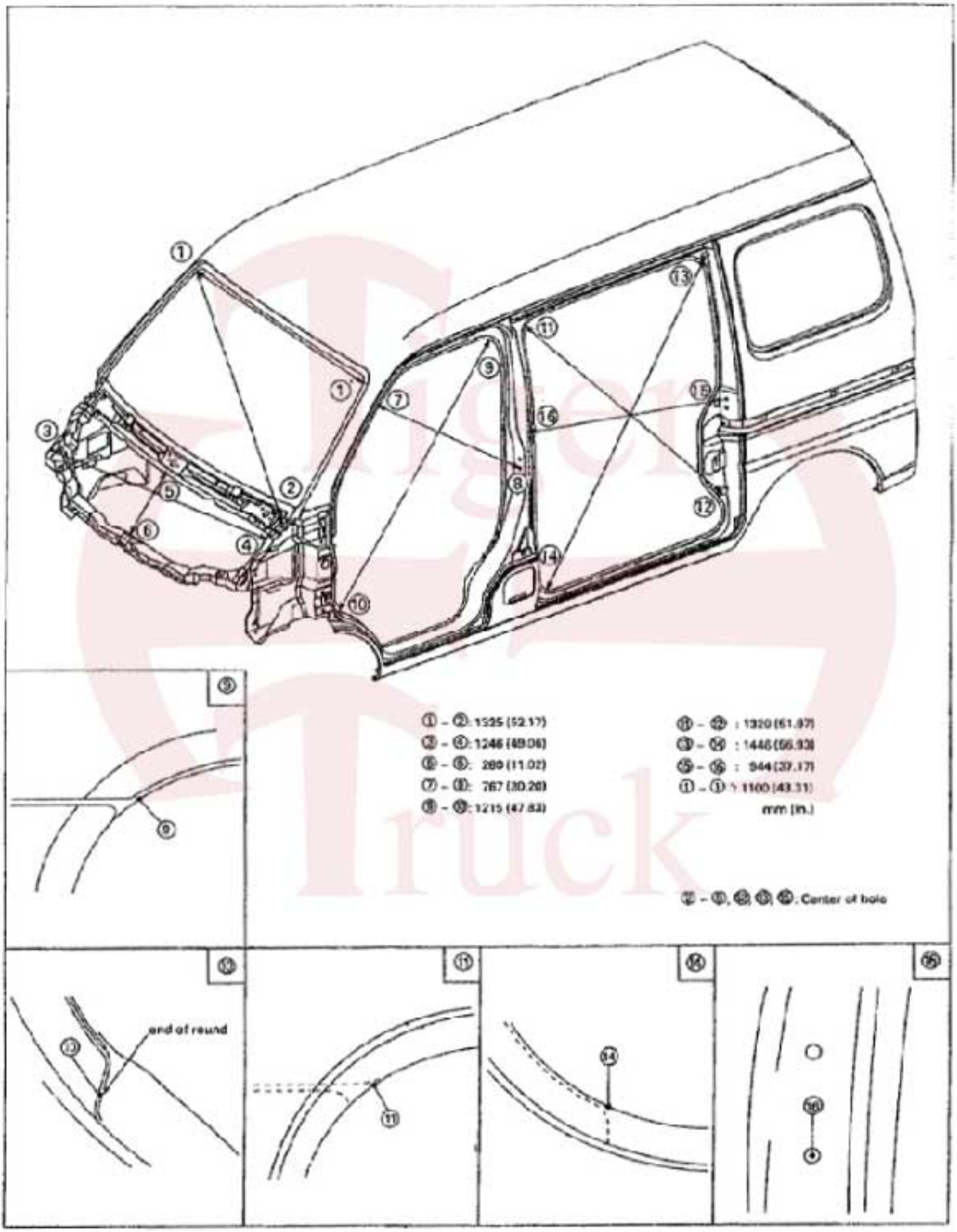
SECT : A-A

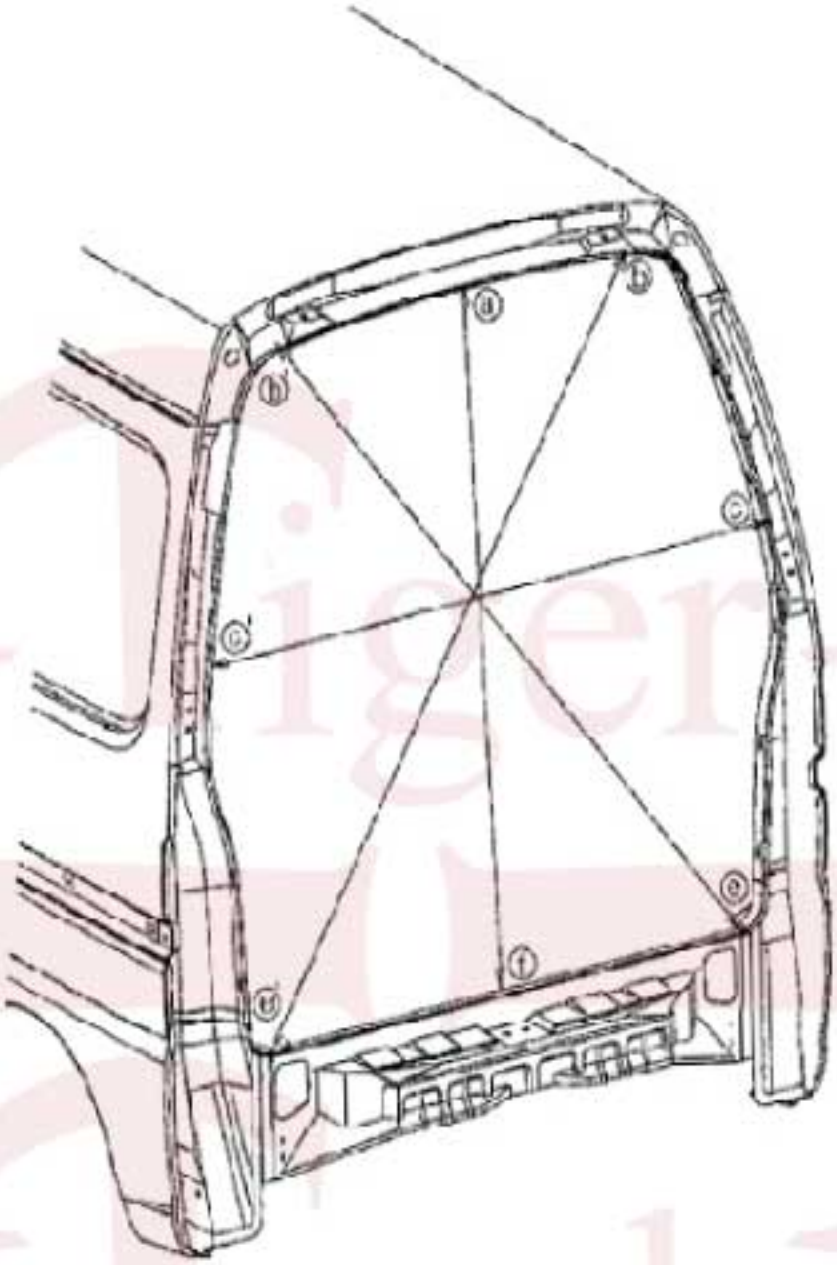


SECT : B-B

https://truckmanualshub.com/

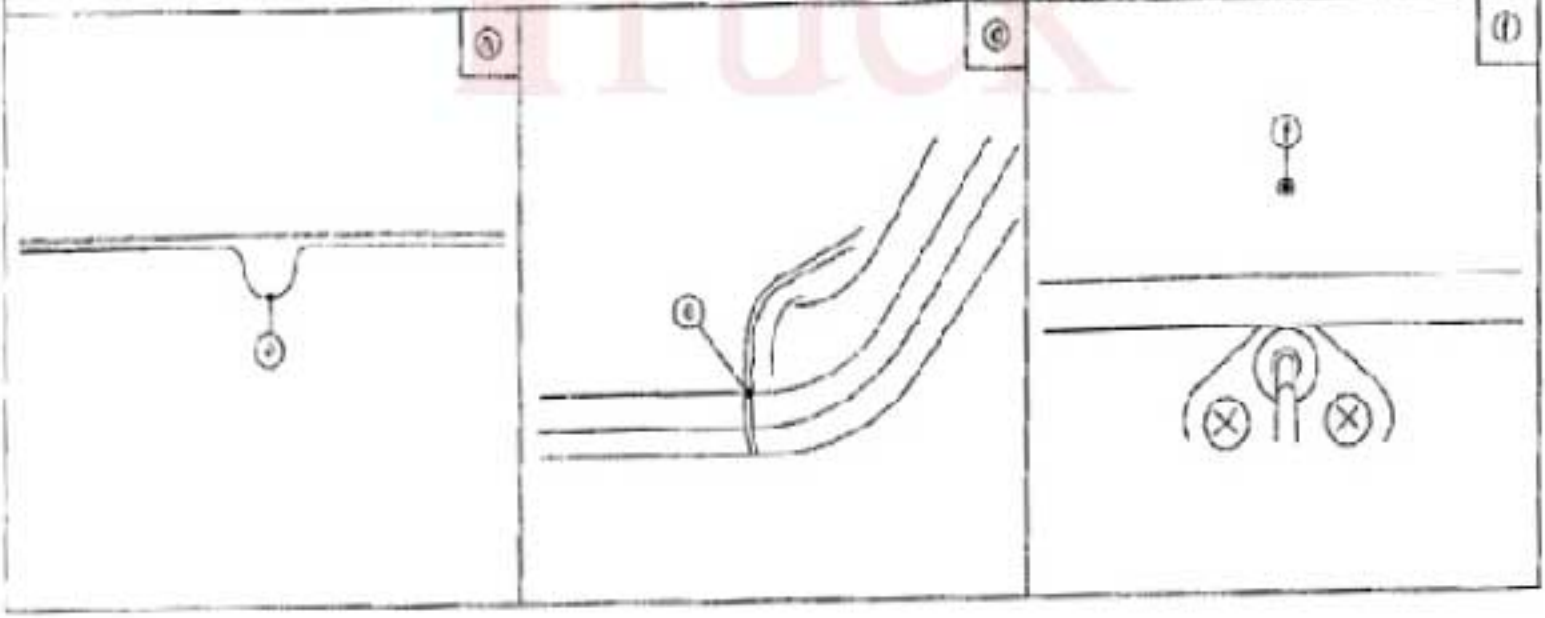
BODY DIMENSIONS





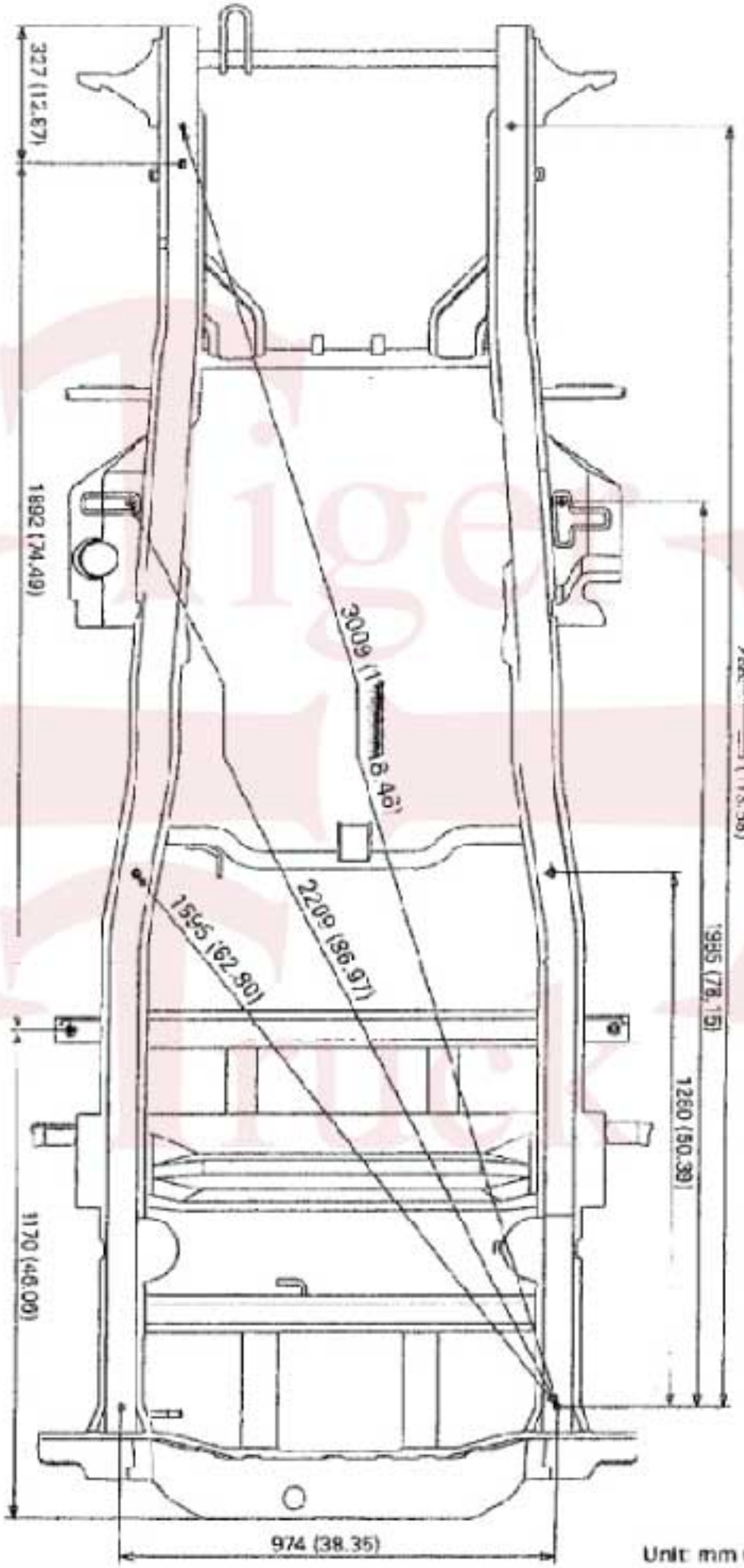
ⓐ - Ⓕ : 1142 (44.96)
ⓑ - ⓔ' : 1437 (56.57)
ⓒ' - ⓓ : 1437 (56.57)
ⓔ - ⓔ' : 1228 (48.27)
mm (in.)

ⓑ, ⓒ : Center of hole



https://truckmanualshub.com/

UNDERBODY DIMENSIONS



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