

# Automatic Transaxle Workshop Manual JA5A-EL

## FOREWORD

This manual explains the structure, operation, and service points for the above-indicated automatic transaxle. In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

The information in this manual is current up to July, 2002. Any changes that occur after that time will not be reflected in this particular manual. Therefore, the contents of this manual may not exactly match the mechanism that you are currently servicing.

**Mazda Motor Corporation  
HIROSHIMA, JAPAN**

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## **WARNING**

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury, property damage, and failure of servicing increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Mazda-trained technicians in mind. This manual may be useful to non-Mazda trained technicians, but a technician with our service-related training and experience will be at less risk when performing service operations. However, all users of this manual are expected to at least know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Persons using procedures and tools which are not recommended by Mazda Motor Corporation must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing, and Mazda Motor Corporation reserves the right to change the vehicle designs and alter the contents of this manual without notice and without incurring obligation.

Parts should be replaced with genuine Mazda replacement parts or with parts which match the quality of genuine Mazda replacement parts. Persons using replacement parts of lesser quality than that of genuine Mazda replacement parts must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

Mazda Motor Corporation is not responsible for any problems which may arise from the use of this manual. The cause of such problems includes but is not limited to insufficient service-related training, use of improper tools, use of replacement parts of lesser quality than that of genuine Mazda replacement parts, or not being aware of any revision of this manual.

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## HOW TO USE THIS MANUAL

### HOW TO USE THIS MANUAL

#### RANGE OF TOPICS

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - Removal/Installation
  - Disassembly/Assembly
  - Replacement
  - Inspection
  - Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts and visual inspection) have been omitted.

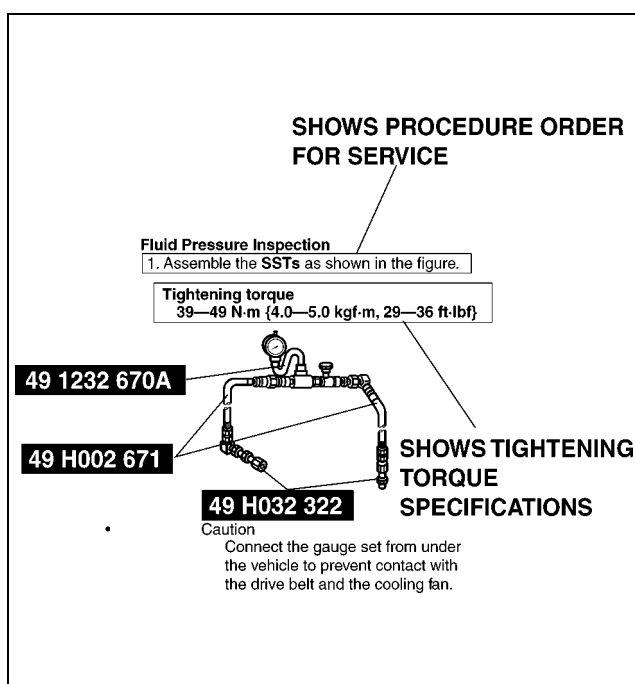
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#### SERVICING PROCEDURE

##### Inspection, Adjustment

- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.

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#### Repair Procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.

# HOW TO USE THIS MANUAL

3. Procedure steps are numbered and the part that is the main point of the procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.

**Procedure**

↓

①

"Removal/Installation" Portion

②

"Inspection After Installation" Portion

↓

INSTALL THE PARTS BY PERFORMING STEPS 1—3 IN REVERSE ORDER

SHOWS THERE ARE REFERRAL NOTES FOR SERVICE

**SHOWS SERVICE ITEM (S)**

**LOWER TRAILING LINK, UPPER TRAILING LINK REMOVAL/INSTALLATION**

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the undercover. (See N-5 Undercover Removal)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Inspect the rear wheel alignment and adjust it if necessary.

**INDICATES ANY RELEVANT REFERENCES WHICH NEED TO BE FOLLOWED DURING INSTALLATION**

**SHOWS SPECIAL SERVICE TOOL (SST) FOR SERVICE OPERATION**

**SHOWS APPLICATION POINTS OF GREASE, ETC.**

**SHOWS EXPENDABLE PARTS**

**SHOWS DETAILS**

**SHOWS TIGHTENING TORQUE UNITS**

N.m. (kgf.m, ft.lbf)

1	Split pin	7	Split pin
2	Nut	8	Nut
3	Lower trailing link ball joint (See R-6 Lower Trailing Link Ball Joint Removal Note)	9	Upper trailing link ball joint (See R-6 Upper Trailing Link Ball Joint Removal Note)
4	Bolt	10	Nut
5	Lower trailing link	11	Upper trailing link
6	Dust boot (lower trailing link)	12	Dust boot (upper trailing link)

**SHOWS REFERRAL NOTES FOR SERVICE**

**Lower Trailing Link Ball Joint, Upper Trailing Link Ball Joint Removal Note**

- Remove the ball joint using the SSTs.

**SHOWS SPECIAL SERVICE TOOL (SST) NO.**

49 T028 304 UPPER TRAILING LINK  
49 T028 305 LOWER TRAILING LINK

49 T028 303









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## HOW TO USE THIS MANUAL

### SYMBOLS

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- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/transmission fluid	New appropriate automatic transaxle/transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
	Replace part	O-ring, gasket, etc.
	Use SST or equivalent	Appropriate tools

### ADVISORY MESSAGES

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- You will find several **Warnings, Cautions, Notes, Specifications** and **Upper and Lower Limits** in this manual.

#### Warning

- A **Warning** indicates a situation in which serious injury or death could result if the warning is ignored.

#### Caution

- A **Caution** indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

#### Note

- A **Note** provides added information that will help you to complete a particular procedure.

#### Specifications

- The values indicate the allowable range when performing inspections or adjustments.

#### Upper and Lower Limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

# UNITS

## UNITS

### UNITS TABLE

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Electrical current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Number of revolutions	rpm (revolutions per minute)
Positive pressure	kPa (kilo pascal)
	kgf/cm <sup>2</sup> (kilogram force per square centimeter)
	psi (pounds per square inch)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	N (Newton)
	g (gram)
	oz (ounce)

#### Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

#### Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

#### Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm<sup>2</sup> in the following specifications:

**210—260 kPa {2.1—2.7 kgf/cm<sup>2</sup>, 30—38 psi}**  
**270—310 kPa {2.7—3.2 kgf/cm<sup>2</sup>, 39—45 psi}**

- The actual converted values for 2.7 kgf/cm<sup>2</sup> are 265 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

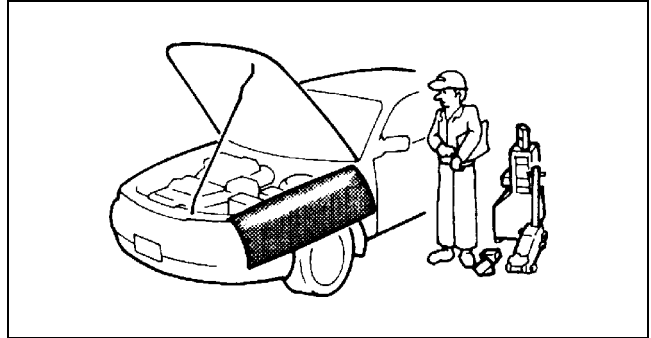
## FUNDAMENTAL PROCEDURES

### FUNDAMENTAL PROCEDURES

#### PREPARATION OF TOOLS AND MEASURING EQUIPMENT

- Be sure that all necessary tools and measuring equipment are available before starting any work.

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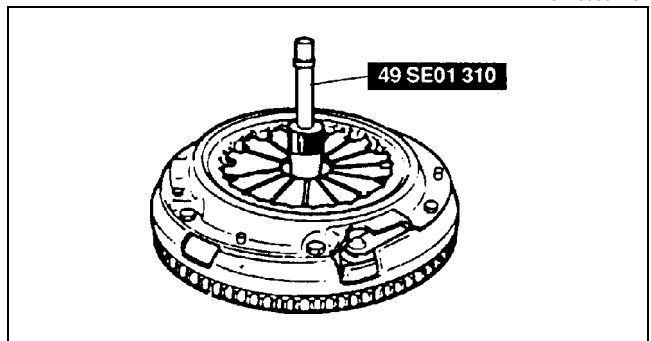


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#### SPECIAL SERVICE TOOLS

- Use special service tools or equivalent when they are required.

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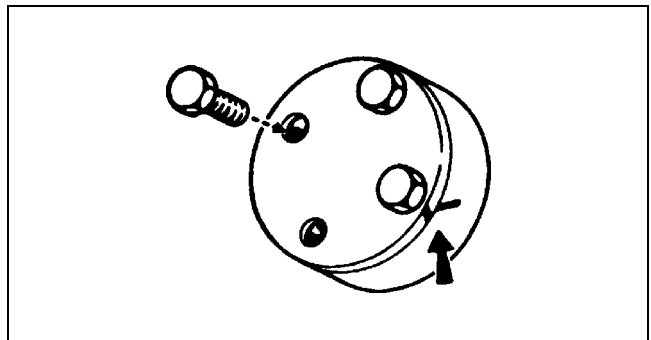


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#### DISASSEMBLY

- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.

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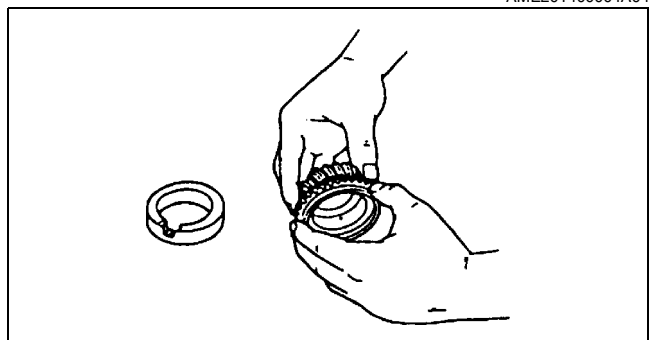


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#### INSPECTION DURING REMOVAL, DISASSEMBLY

- When removed, each part should be carefully inspected for malfunction, deformation, damage, and other problems.

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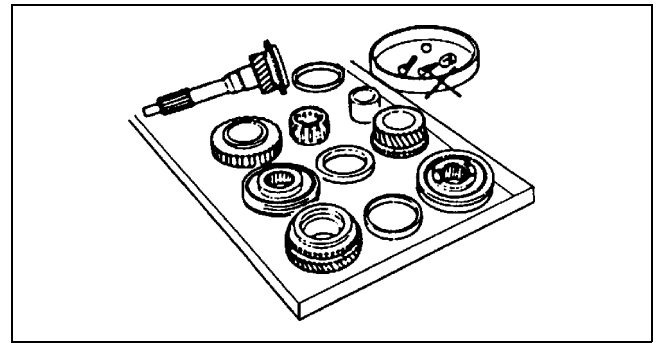
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## FUNDAMENTAL PROCEDURES

### ARRANGEMENT OF PARTS

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



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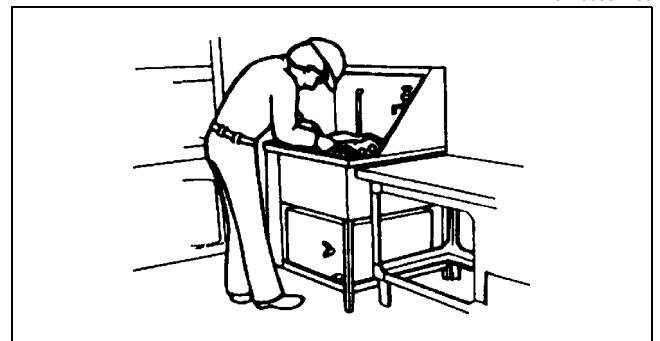
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### CLEANING OF PARTS

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

#### Warning

- **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

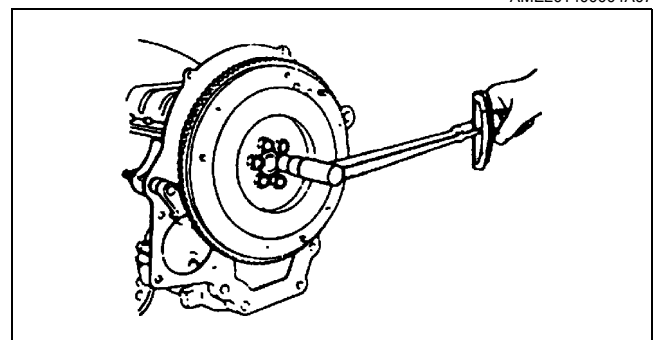


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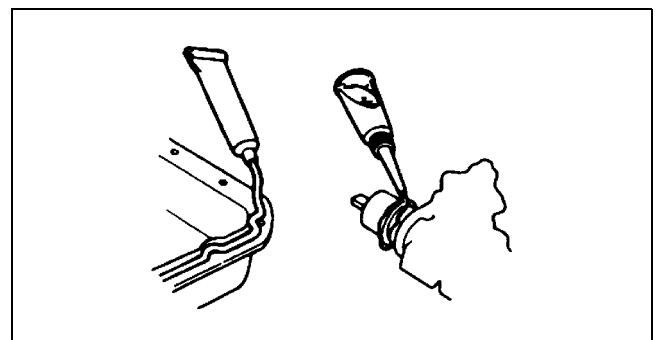
### REASSEMBLY

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, these parts should be replaced with new ones:
  - Oil seals
  - Gaskets
  - O-rings
  - Lockwashers
  - Cotter pins
  - Nylon nuts
- Depending on location:
  - Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - Oil should be applied to the moving components of parts.
  - Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



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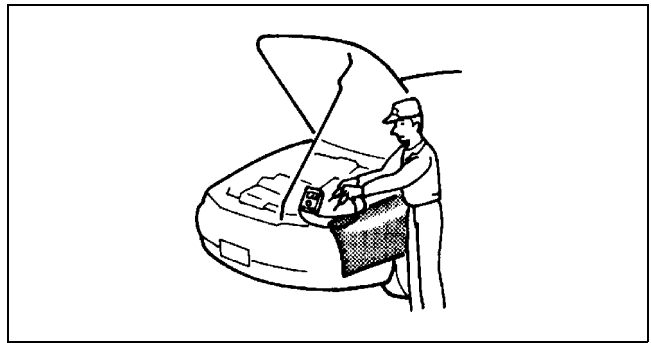
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## FUNDAMENTAL PROCEDURES

### ADJUSTMENT

- Use suitable gauges and/or testers when making adjustments.

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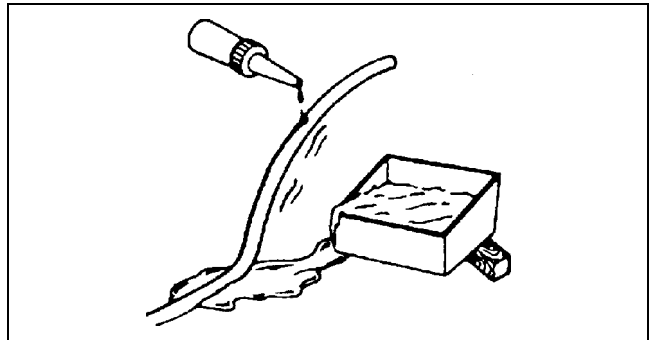


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### RUBBER PARTS AND TUBING

- Prevent gasoline or oil from getting on rubber parts or tubing.

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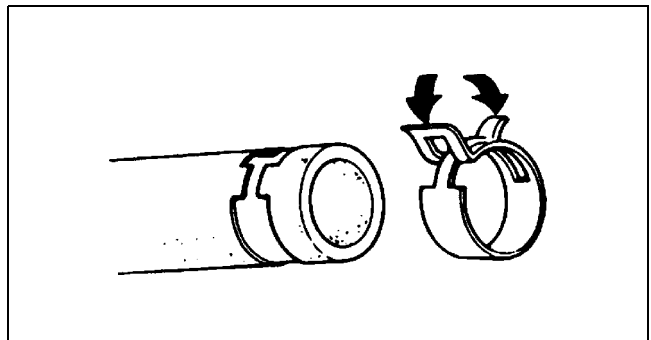


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### HOSE CLAMPS

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

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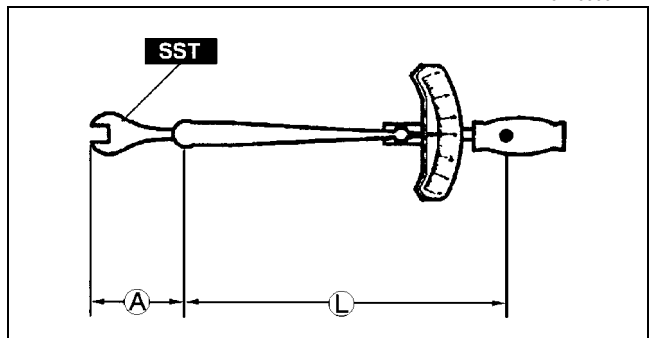


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### TORQUE FORMULAS

- When using a torque wrench-SST or equivalent combination, the written torque must be recalculated due to the extra length that the SST or equivalent adds to the torque wrench. Recalculate the torque using the following formulas. Choose the formula that applies to you.

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Torque Unit	Formula
N·m	$N \cdot m \times [L / (L + A)]$
kgf·m	$kgf \cdot m \times [L / (L + A)]$
kgf·cm	$kgf \cdot cm \times [L / (L + A)]$
ft·lbf	$ft \cdot lbf \times [L / (L + A)]$
in·lbf	$in \cdot lbf \times [L / (L + A)]$

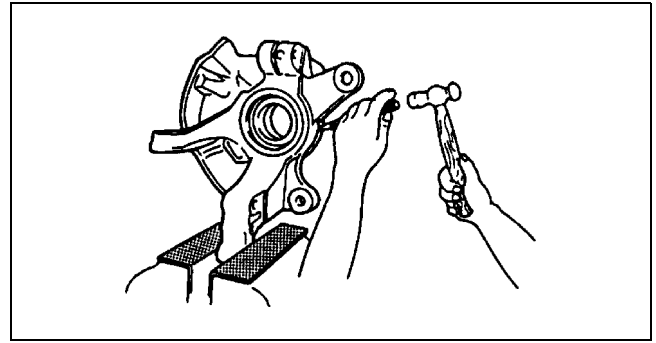
A : The length of the **SST** past the torque wrench drive  
 L : The length of the torque wrench

# FUNDAMENTAL PROCEDURES, ELECTRICAL SYSTEM

## WISE

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.

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## ELECTRICAL SYSTEM

### CONNECTORS

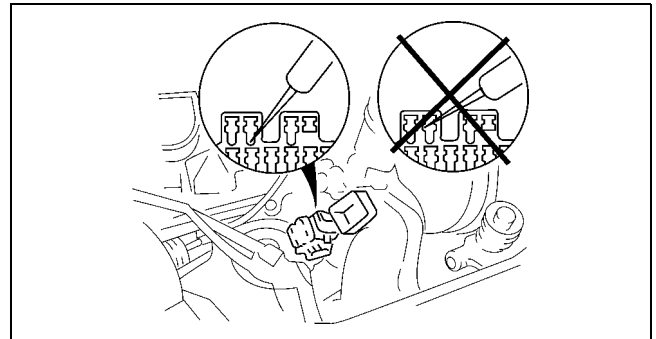
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#### Data Link Connector

- Insert the probe into the service hole when connecting a jumper wire to the data link connector.

#### Caution

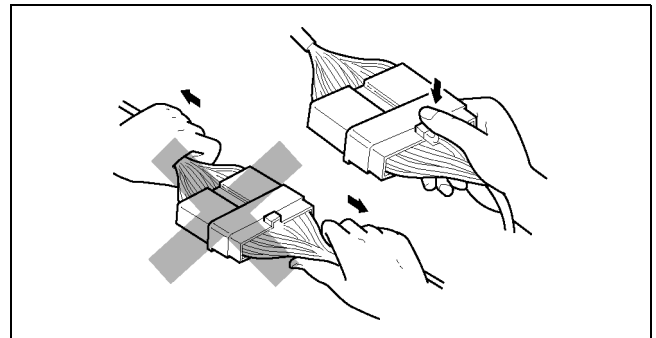
- Inserting a jumper wire probe into the data link connector terminal may damage the terminal.



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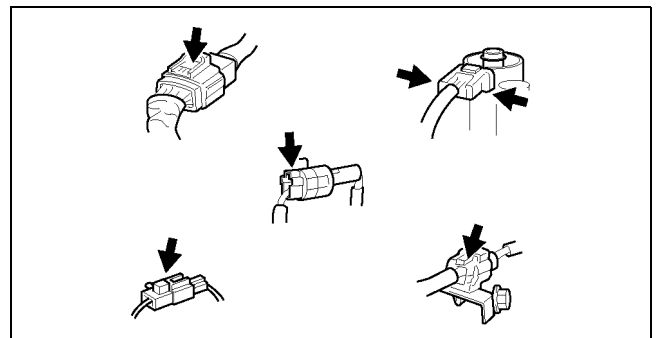
#### Disconnecting Connectors

- When disconnecting connector, grasp the connectors, not the wires.



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- Connectors can be disconnected by pressing or pulling the lock lever as shown.

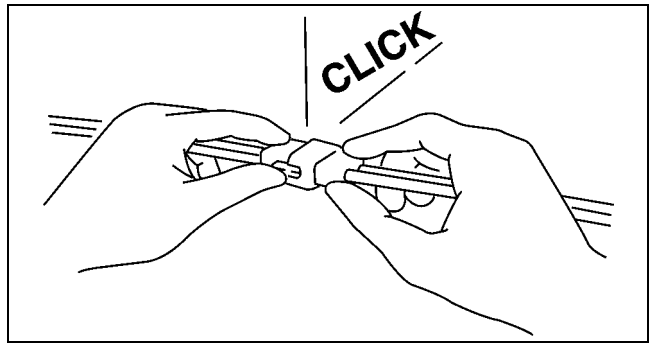


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## ELECTRICAL SYSTEM

### Locking Connector

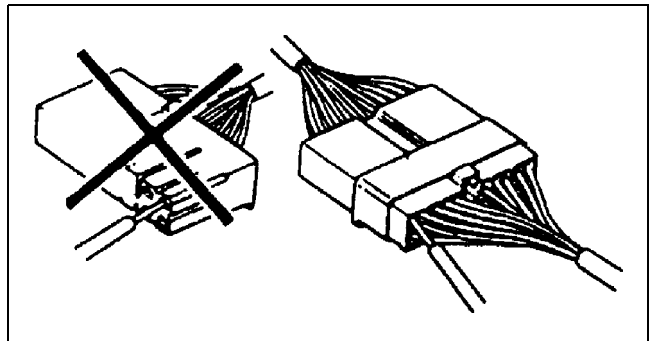
- When locking connectors, listen for a click indicating they are securely locked.



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### Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

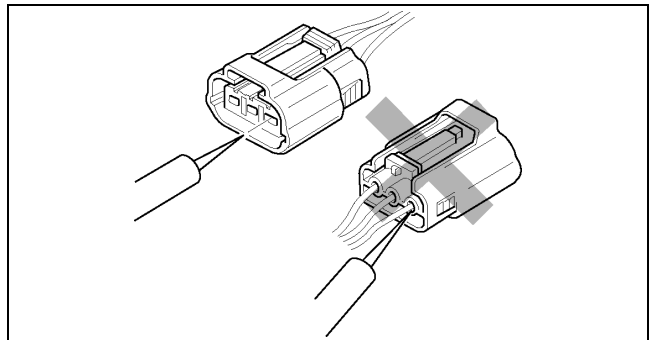


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- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

### Caution

- To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.

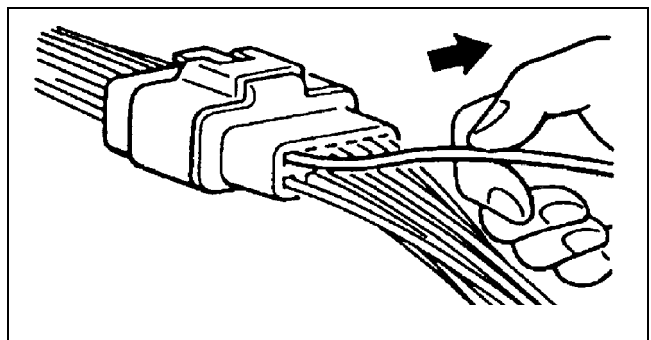


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### Terminals

#### Inspection

- Pull lightly on individual wires to verify that they are secured in the terminal.



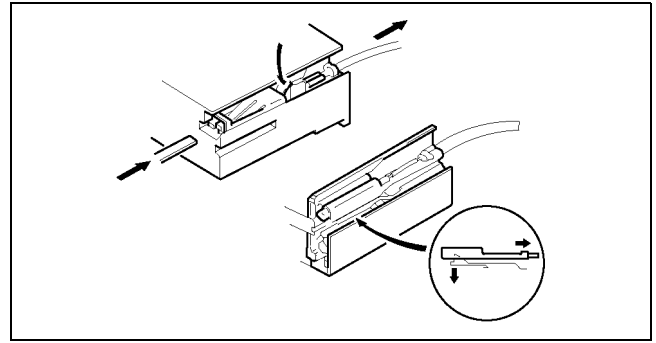
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# ELECTRICAL SYSTEM

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## Replacement

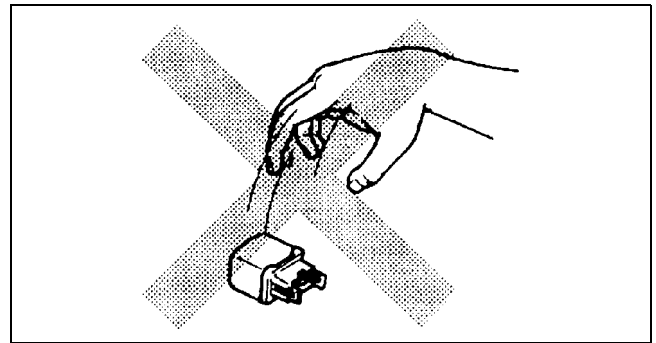
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



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## Sensors, Switches, and Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.



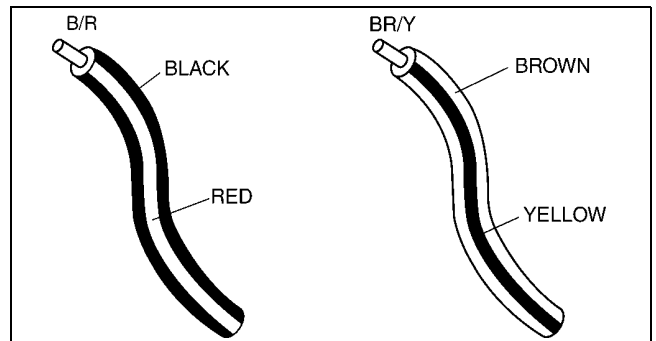
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## Wiring Harness

### Wiring color codes

- Two-color wires are indicated by a two-color code symbol.
- The first letter indicates the base color of the wire and the second the color of the stripe.

CODE	COLOR	CODE	COLOR
B	Black	O	Orange
BR	Brown	P	Pink
G	Green	R	Red
GY	Gray	V	Violet
L	Blue	W	White
LB	Light Blue	Y	Yellow
LG	Light Green		



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## NEW STANDARDS

### NEW STANDARDS

#### NEW STANDARDS TABLE

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- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V <sub>B</sub>	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Idle Switch	
CIS	Continuous Fuel Injection System	—	Clutch Position	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfuction Indicator Lamp	—	Malfuction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFL	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/Self Diagnosis	
OL	Open Loop	—	Open Loop	

## NEW STANDARDS

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multipoint Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1-2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2-3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3-4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	ECAT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Air flow Sensor	
WUTWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode

#2 : Controlled by the PCM

#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).

#4 : Device that controls engine and powertrain

#5 : Directly connected to exhaust manifold

#6 : Part name of diesel engine

## ABBREVIATIONS

### ABBREVIATIONS

#### ABBREVIATIONS TABLE

AME203000011A01

1GR	First gear
2GR	Second gear
3GR	Third gear
4GR	Forth gear
5GR	Fifth gear
ATX	Automatic transaxle
ATF	Automatic transaxle fluid
D	Drive
N	Neutral
P	Park
R	Reverse
SST	Special service tool
TFT	Transaxle fluid temperature
VSS	Vehicle speed sensor



# MECHANISM AND OPERATION

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## AUTOMATIC TRANSAXLE

### AUTOMATIC TRANSAXLE

#### AUTOMATIC TRANSAXLE OUTLINE

AME561401030A01

- Adopted new JA5A-EL automatic transaxle.
- Newly designed FF type five-speed automatic transaxle.
  - Use of 3 sets of planetary gears, and wider gear ratio setting realizes improvements of acceleration-from-standing-start performance, fuel economy, and quietness. Also, by placement of two sets of planetary gears in parallel with one set, the automatic transaxle is more compact.
- Adopted 2-4 brake clutch.
  - Adopted a wet-type, multi-plate 2-4 brake clutch instead of the 2-4 brake band used in the past, smoother gear switching performance.
- Adopted centrifugal balance clutch
  - The newly adopted centrifugal balance clutch pushes the clutch piston forcefully to low and high clutch by centrifugal hydraulic pressure for smoother gear switching with better response.

#### AUTOMATIC TRANSAXLE SPECIFICATIONS

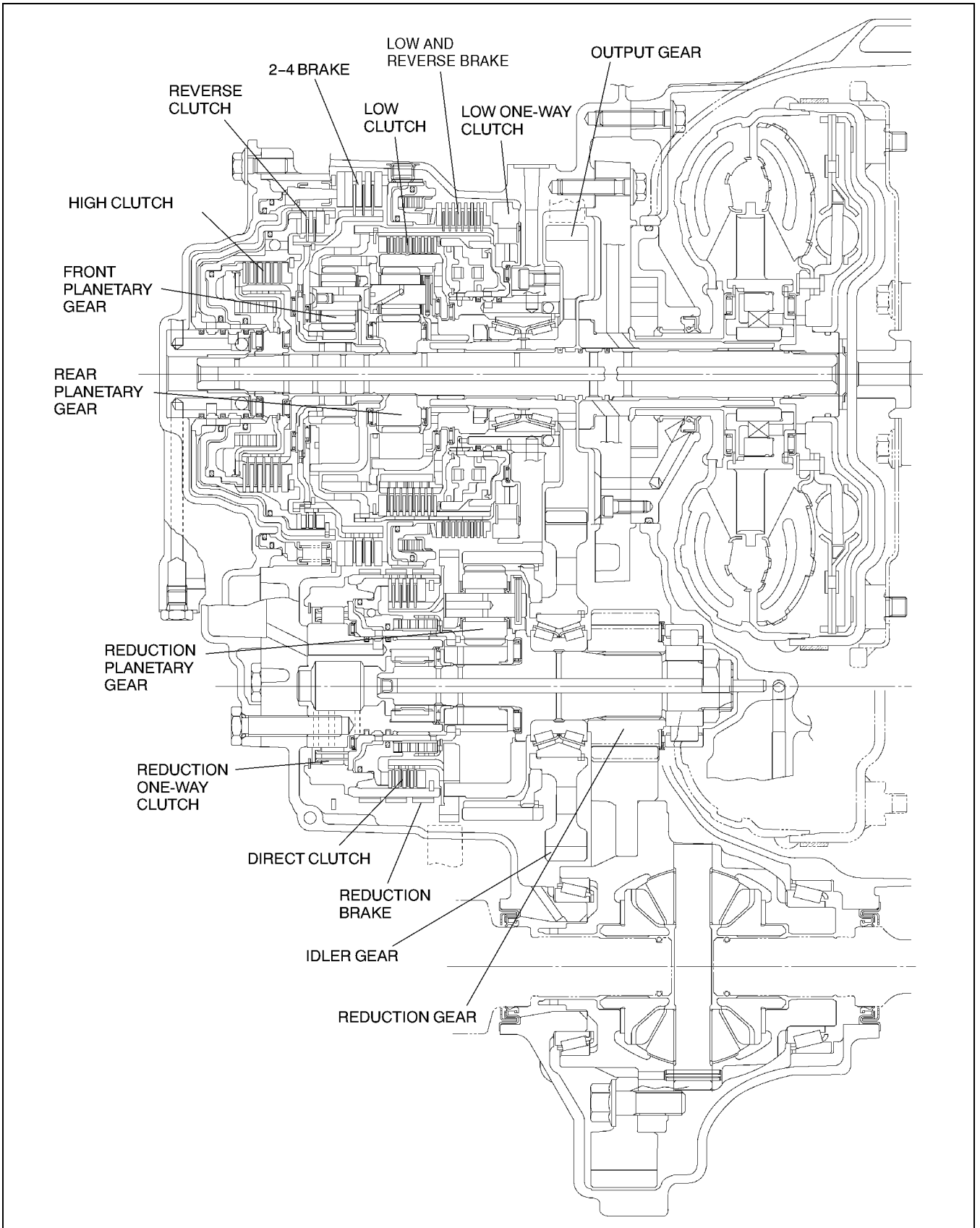
AME561401030A02

Item		MPV	
		For General (R.H.D.) specs.	Except for General (R.H.D.) specs.
Transaxle type		JA5A-EL	
Engine type		AJ	
Gear ratio	1GR	3.801	
	2GR	2.131	
	3GR	1.364	
	4GR	0.935	
	5GR (O/D)	0.685	
	Reverse	2.970	
Final gear ratio		3.290	3.491
ATF	Type	ATF M-III or equivalent (e.g. Dexron III)	
	Capacity (Approximate quantity) (L {US qt, Imp qt})	9.7 {10.3, 8.5}	
Torque converter stall torque ratio		1.86:1	
Hydraulic system (Number of drive/driven plates)	Low clutch	7/7	
	2-4 brake	3/4	
	High clutch	5/5	
	Direct clutch	4/4	
	Reverse clutch	2/2	
	Low and reverse brake	6/5	
Band servo (mm {in})	Reduction accumulator piston outer dia./reduction band servo piston outer dia.	49.66/57.64 {1.955/2.269}	
Number of front planetary gear teeth	Ring gear	74	
	Sun gear	34	
	Pinion gear	20	
Number of rear planetary gear teeth	Ring gear	75	
	Sun gear	42	
	Pinion gear	17	
Number of reduction planetary gear teeth	Ring gear	85	
	Sun gear	31	
	Pinion gear	27	
Number of output gear teeth		41	
Number of idler gear teeth		47	

# AUTOMATIC TRANSAXLE

## AUTOMATIC TRANSAXLE CROSS-SECTIONAL VIEW

AME561401030A03



AMU0517A501

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# AUTOMATIC TRANSAXLE

## AUTOMATIC TRANSAXLE DESCRIPTION

AME561401030A04

### Gear Position and Operation of Featured Parts

Position/Range	Mode	Gear position	Engine braking effect	Low clutch	2-4 brake	High clutch	Reverses clutch	Low and reverse brake	Reduction brake	Direct clutch	Low one-way clutch	Reduction one-way clutch	Solenoid valve					
													Shift solenoid A	Shift solenoid B	Shift solenoid C	Reduction timing solenoid	Neutral shift solenoid	
P	—	—	—						○				○	○	○			
R	—	—	Yes				○	○	○				○	○	○			
	R INH	—	No				○		○				○	○	○		○	
N	—	—	—						○				○	○	○			
D	HOLD switch OFF	1GR	No	○							●	●	○	○	○	○		
		2GR	No	○	○							●	●	○	○	○		
		3GR	No	○		○							●		○	○	○	
		4GR	No		○	○							●			○	○	
		5GR	Yes		○	○				○				○		○	○	
	HOLD switch ON	2GR	No	○	○								●	○	○	○	○	
		3GR	No	○		○							●		○	○	○	
		4GR	Yes		○	○			○							○	○	
		5GR	Yes		○	○				○				○		○	○	
		5GR	Yes		○	○				○				○		○	○	
S	HOLD switch OFF	1GR	No	○							●	●	○	○	○	○		
		2GR	No	○	○								●	○	○	○		
		3GR	No	○		○							●		○	○	○	
		4GR	Yes		○	○			○							○	○	
		5GR	Yes		○	○				○				○		○	○	
	HOLD switch ON	2GR	No	○	○								●	○	○	○	○	
		3GR	Yes	○		○			○						○	○	○	
		4GR	Yes		○	○			○							○	○	
		5GR	Yes		○	○				○				○		○	○	
		5GR	Yes		○	○				○				○		○	○	
L	HOLD switch OFF	1GR	No	○							●	●	○	○	○	○		
		2GR	No	○	○								●	○	○	○	○	
		3GR	Yes	○		○			○						○	○	○	
		4GR	Yes		○	○			○							○	○	
		5GR	Yes		○	○				○				○		○	○	
	HOLD switch ON	2GR	Yes	○	○				○					○	○	○	○	
		3GR	Yes	○		○			○						○	○	○	
		4GR	Yes		○	○			○							○	○	
		5GR	Yes		○	○				○				○		○	○	
		5GR	Yes		○	○				○				○		○	○	

○: Operating

●: Transmits the torque only when driving

AME5714W019

# AUTOMATIC TRANSAXLE

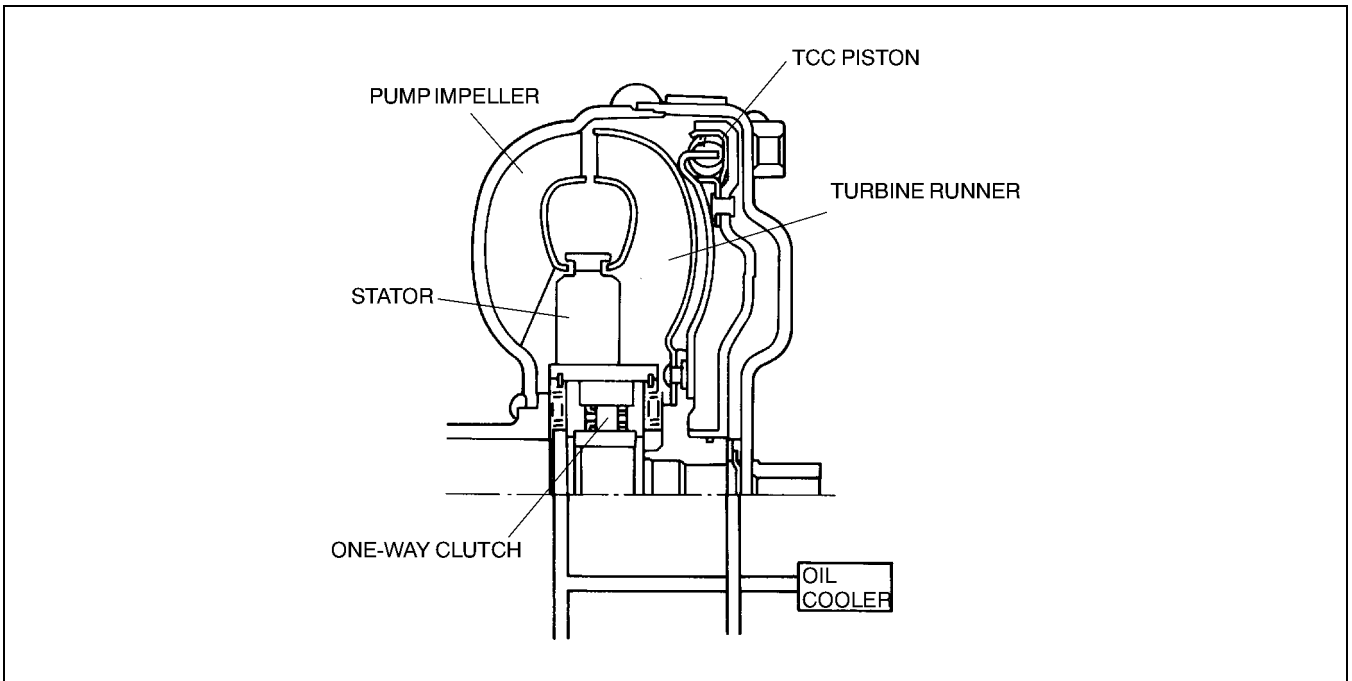
## TORQUE CONVERTER DESCRIPTION

AME561419100A01

### Outline

- The JA5A-EL uses a three-element, single-gear, two-phase torque converter with torque converter clutch (TCC) mechanism.
- The torque converter efficiently matches the output characteristic of AJ engine.
- By matching the output characteristics of the engine in order to optimize the configuration of the impellers, the torque converter increases the capacity coefficient in the practical range, thereby improving drivability and fuel economy.
- The TCC mechanism under certain conditions transmits the drive force by automatically connecting the pump impeller with the turbine runner as opposed to using fluid. Therefore it prevents the torque converter from slipping.

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AMU0517A503

# AUTOMATIC TRANSAXLE

## POWERTRAIN DESCRIPTION

AME561401030A05

### Component Descriptions

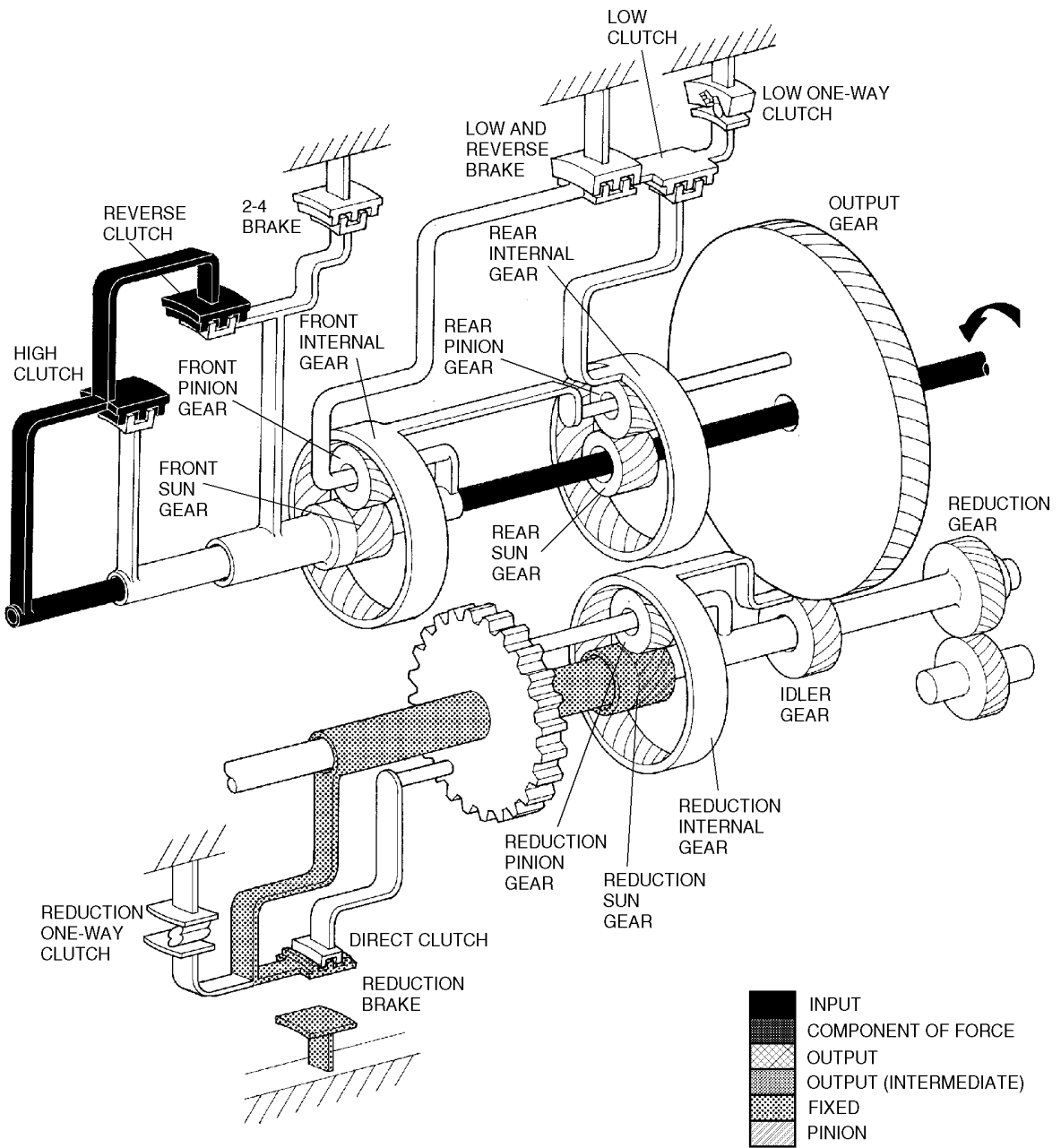
Component	Function
Low clutch	<ul style="list-style-type: none"><li>• Transmits rotation of low clutch drum to rear internal gear</li><li>• Operate in 1GR, 2GR, and 3GR operation</li></ul>
2-4 brake	<ul style="list-style-type: none"><li>• Prevents rotation of front sun gear</li><li>• Operate in 2GR, 4GR, and 5GR operation</li></ul>
High clutch	<ul style="list-style-type: none"><li>• Transmits rotation of input shaft to front planetary carrier</li><li>• Operate in 3GR, 4GR, and 5GR operation</li></ul>
Reverse clutch	<ul style="list-style-type: none"><li>• Transmits rotation of input shaft to front sun gear</li><li>• Operates when vehicle is backing</li></ul>
Reduction brake	<ul style="list-style-type: none"><li>• Prevents rotation of direct clutch drum and prevents rotation of reduction sun gear</li></ul>
Low and reverse brake	<ul style="list-style-type: none"><li>• Prevents rotation of low clutch drum and front planetary carrier</li></ul>
Direct clutch	<ul style="list-style-type: none"><li>• Transmits rotation of reduction planetary carrier to reduction sun gear</li><li>• Operates in 5GR position</li></ul>
Low one-way clutch	<ul style="list-style-type: none"><li>• Locks clockwise rotation of front planetary carrier</li></ul>
Reduction one-way clutch	<ul style="list-style-type: none"><li>• Locks counterclockwise rotation of reduction sun gear</li></ul>

### Note

- All rotations are viewed from the side cover.

# AUTOMATIC TRANSAXLE

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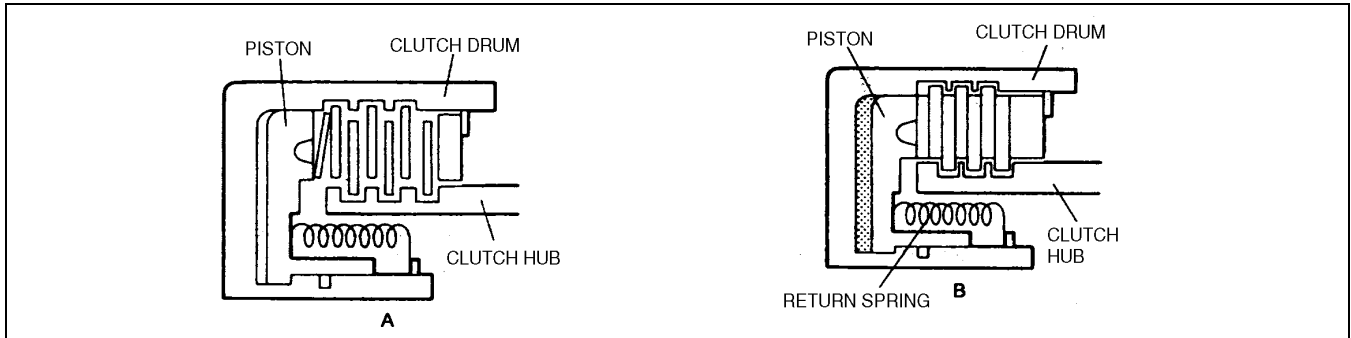


AMU0517A504

## AUTOMATIC TRANSAXLE

### Low Clutch, High Clutch, Reverse Clutch, 2-4 Brake, Low and Reverse Brake, Direct Clutch Structure/Operation

- The basic structure is as shown in the figure below. In figure A, the fluid is in the clutch plates (drive plates, driven plates) and the power is not transmitted because of the fluid slippage on each plate. Figure B shows the clutch condition with the hydraulic pressure acting on the piston; the drive plates and the driven plates are pressed tightly together to transmit the clutch drum rotation speed to the hub. When the hydraulic pressure in the piston is drained, the clutches are separated because of the return spring and return to the condition in figure A.



AMU0517A505

- The dished plates used for each clutch and brake reduce the shock caused by the sudden clutch engagement. The piston check ball built in the reverse clutch drains the ATF only during freewheel to prevent the hydraulic pressure from increasing to half-engage the clutches because of the residual ATF. In the low clutch and high clutch, the centrifugal balance chamber is installed opposite the general clutch chamber.

### One-Way Clutch

#### Low one-way clutch

##### Structure

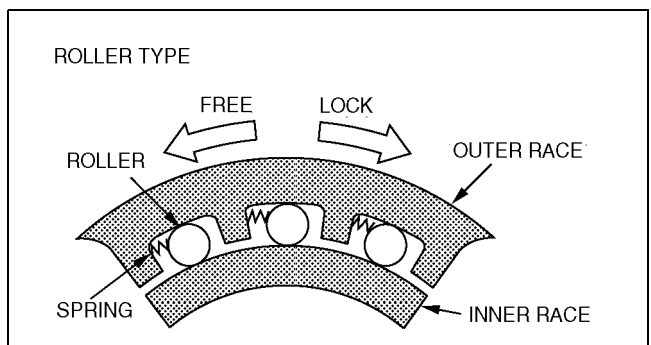
- The low one-way clutch locks the clockwise rotation (seen from the side cover side) of the front planetary carrier. The low one-way clutch operates in D range of the 1GR.
- The low one-way clutch inner race is integrated on contact with low clutch drum, and the low one-way clutch outer race is fixed to the transaxle case.

##### Operation

- The low one-way clutch inner race (front planetary carrier) rotates counterclockwise (seen from the side cover side) freely, but the rollers move to the shallower grooves and enter between the races to the rotation when the inner race tries to rotate clockwise.
- The low one-way clutch locks the clockwise rotation of the front planetary carrier.

##### Note

- All direction of rotation are viewed from the side cover.



AMU0517A507



# AUTOMATIC TRANSAXLE

## Reduction one-way clutch

### Structure

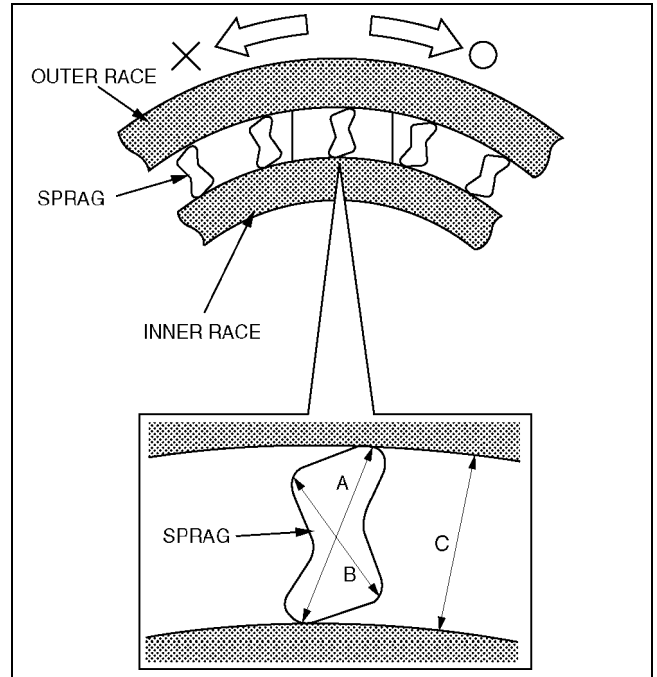
- The reduction one-way clutch counterclockwise rotation (seen from the side cover side) of the reduction sun gear.
- The reduction one-way clutch outer race is integrated on contact with direct clutch drum, and the reduction one-way clutch inner race is fixed to the transaxle case.

### Operation

- The reduction one-way clutch outer race (reduction sun gear) rotates clockwise (seen from the side cover) freely, but the sprags rise to lock the rotation when the outer race tries to rotate counterclockwise.
- The reduction one-way clutch locks the counterclockwise rotation of the reduction sun gear

### Note

- All direction of rotation are viewed from the side cover.



AMU0517A508

# AUTOMATIC TRANSAXLE

## PLANETARY GEAR SET DESCRIPTION

AME561401030A06

### Structure and Function

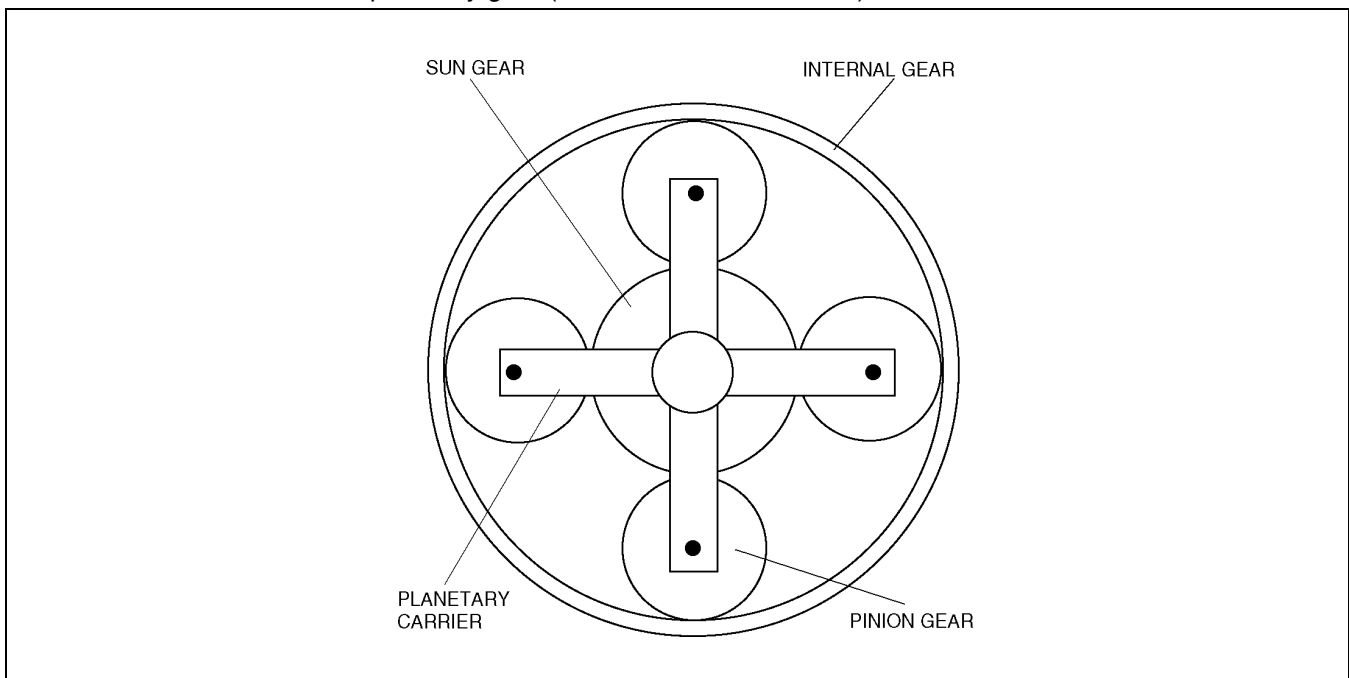
- The planetary gear set consists of the internal gear, sun gear, pinion gear, and planetary carrier. The planetary gear set functions as a transmission (creates various gear ratios) when input, output, and fixed conditions are applied to the internal gear, sun gear, and planetary carrier.
- Friction elements such as clutches and brakes are responsible for administering these conditions.
- A triple arranged gear with single planetary gear set is adopted for the automatic transaxle; Starting from the torque converter, they are the rear planetary gear, front planetary gear, and reduction planetary gear.
- The driving force transmitted from the engine to the input shaft via the torque converter is converted to an optimal driving force according to the driving condition by the triple arranged gear, and is then transmitted to the drive shaft.

### Structure and Operation

- The reverse clutch and high clutch are integrated with the reverse and high clutch drum, which are permanently engaged with the input shaft, and therefore, it is synchronized with the input rotation of the input shaft.
- The front sun gear is permanently engaged with the reverse clutch hub, so when the reverse clutch is engaged, the front sun gear and input shaft rotate together as the input condition. Also, since the reverse clutch hub is integrated with the 2-4 brake band hub, the front sun gear is fixed when the 2-4 brake is engaged.
- Since the front planetary gear is permanently engaged with the drive plate of the low and reverse brake and the inner race of the low one-way clutch via the low clutch drum. Due to this, it is fixed when the low and reverse brake is engaged. Under any other conditions, clockwise rotation is locked and it only rotates counterclockwise. The front planetary carrier is permanently engaged with the high clutch hub, and rotates with the input shaft when the high clutch is engaged.
- Since the front internal gear is integrated with the rear planetary carrier, and permanently engaged with the output gear, they rotate together.
- The rear sun gear is permanently engaged with input shaft and they rotate together.
- The rear internal gear is permanently engaged with the drive plate of the low clutch, and integrated with front planetary carrier when the low clutch is engaged.
- The reduction sun gear is permanently engaged with the direct clutch drum, and they rotate together.
- When the reduction brake is engaged, since the direct clutch drum is fixed, the reduction sun gear is also fixed.
- The reduction internal gear is permanently engaged with the idler gear and they rotate together.
- The reduction planetary carrier is permanently engaged with the reduction gear and the direct clutch hub. When the direct clutch hub is engaged, it rotates together with the reduction sun gear.
- Therefore, the reduction internal gear, the reduction sun gear, and the reduction carrier rotate together in this condition, and the idler gear and the reduction gear also rotate together.
- Each planetary carrier has two roles: supporting the rotation<sup>\*1</sup> axis of pinion gear, and extracting the revolution<sup>\*2</sup> factor of the pinion gear.

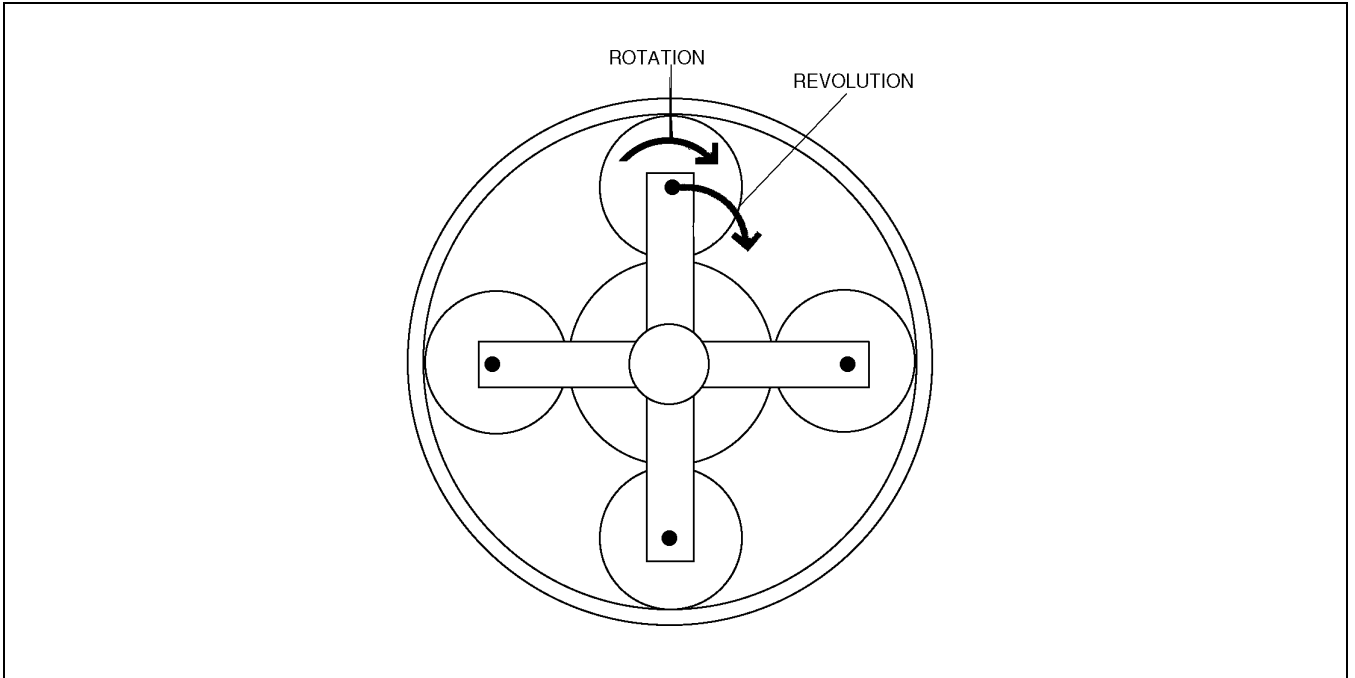
<sup>\*1</sup>:Around their own centers (referred to as "rotation")

<sup>\*2</sup>:Around the center of the planetary gear (referred to as "revolution")



AMU0517A509

## AUTOMATIC TRANSAXLE



AMU0517A510

**Note**

- All rotation is described as viewed from the side cover.

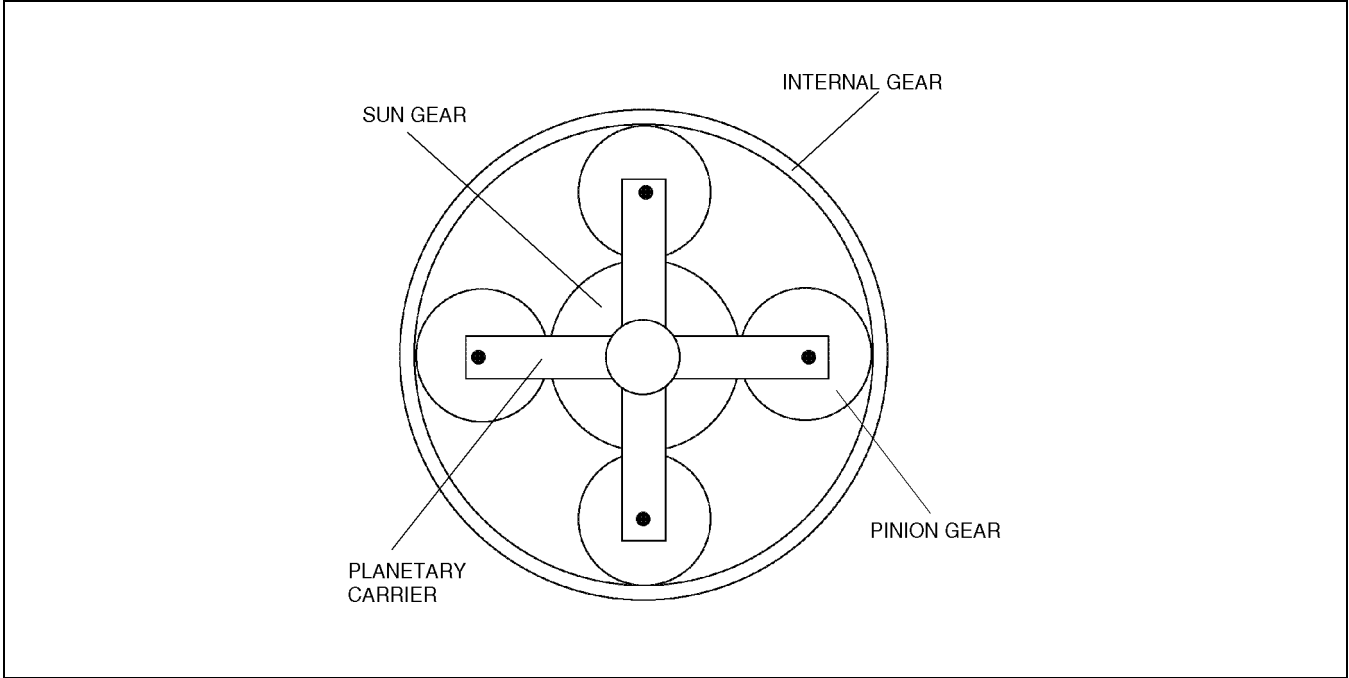
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# AUTOMATIC TRANSAXLE

## Calculation of planetary gear ratio

### Basic formula

- $(Z_R + Z_S) N_C = Z_R \times N_R + Z_S \times N_S$ : basic calculation formula of gear ratio  
In this formula Z stands for the number of teeth, N stands for the rotation speed, and R,S,C stand for each gear element (refer to the table below).
- Since a triple planetary gear set is adopted for the automatic transaxle, the unit identification symbols are input into the basic formula above in the following manner.  
 $(Z_{X_R} + Z_{X_S}) N_{X_C} = Z_{X_R} N_{X_R} + Z_{X_S} N_{X_S}$ : formula (1)
- The following unit identification symbols shall be input where "X" is indicated.

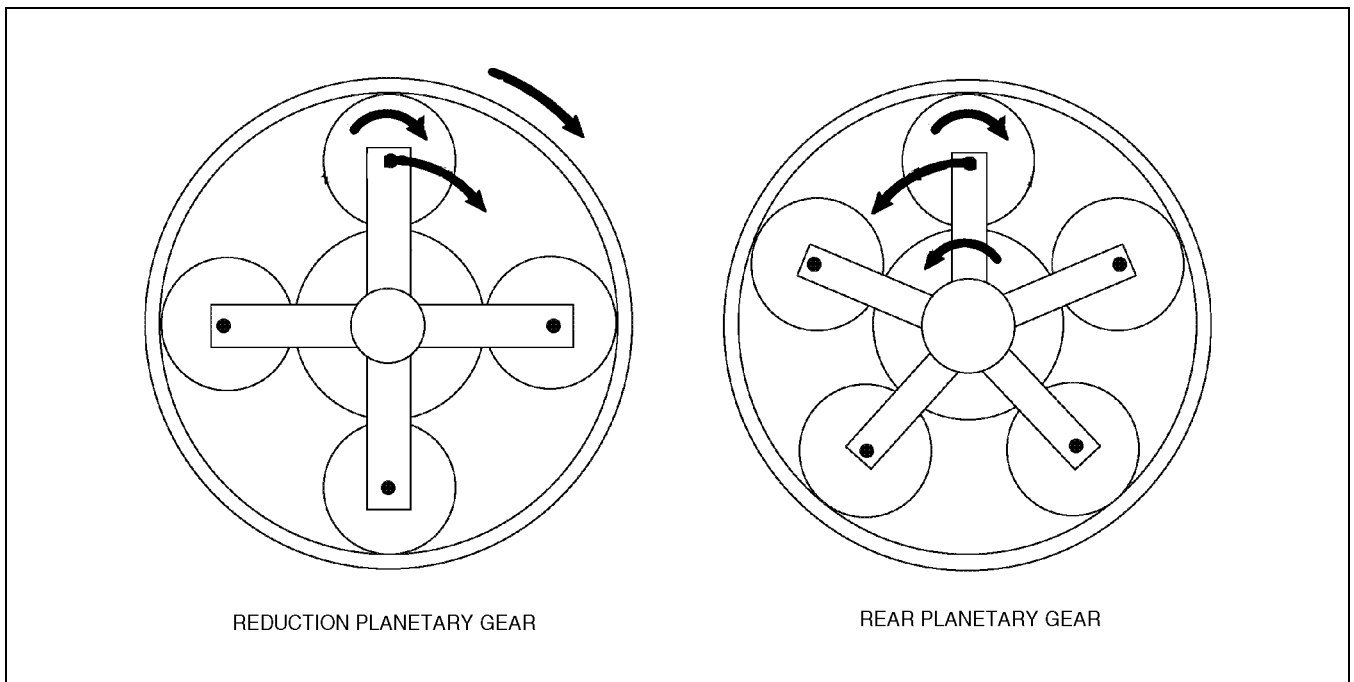


AMU0517A511

Planetary gear unit	Planetary gear element	Number of teeth	Unit identification symbol	
			Unit	Gear element
Front	Internal gear	74	F	R
	Planetary carrier	20	F	C
	Sun gear	34	F	S
Rear	Internal gear	75	R	R
	Planetary carrier	17	R	C
	Sun gear	42	R	S
Reduction	Internal gear	85	D	R
	Planetary carrier	27	D	C
	Sun gear	31	D	S

# AUTOMATIC TRANSAXLE

## First gear



AMU0517A512

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	–	NRR (fixed)	NDR (input)
planetary carrier	–	NRC (output)	NDC (output)
Sun gear	–	NRS (input)	NDS (fixed)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_1$  as the gear ratio in first gear,

$i_1 = \text{Rear planetary gear ratio } (i_1') \times \text{Reduction planetary gear ratio } (i_{RD})$

First, find  $i_1'$ :

- Since the setting of the planetary gear in first gear is  $NRR = \text{fixed} = 0$ , substitute this condition in formula (1).

$$(ZRR + ZRS)NRC = ZRS \times NRS$$

$$i_1' = NRS / NRC = (ZRR + ZRS) / ZRS$$

Next, find  $i_{RD}$ :

- Since the setting of the planetary gear in first gear is  $NDS = \text{fixed} = 0$ , substitute this condition in formula (1).

$$(ZDR + ZDS)NDC = ZDR \times NDR$$

$$i_{RD} = NDR / NDC = (ZDR + ZDS) / ZDR$$

(Since the  $i_{RD}$  of first to fourth gears and reverse gear are common, the calculation formula is omitted except for fifth gear.)

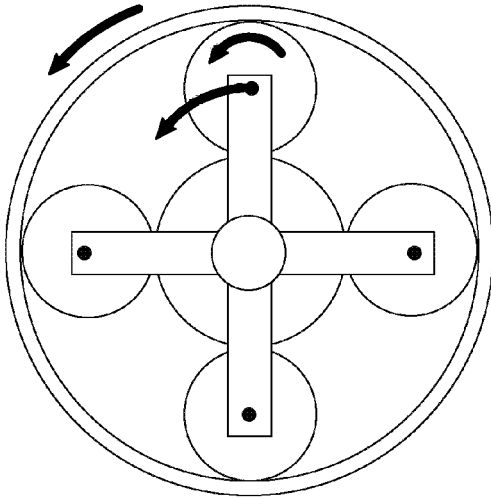
Therefore,  $i_1$  shall be as follows:

$$i_1 = i_1' \times i_{RD} = (ZRR + ZRS) / ZRS \times (ZDR + ZDS) / ZDR = (75 + 42) / 42 \times (85 + 31) / 85 = 3.802$$

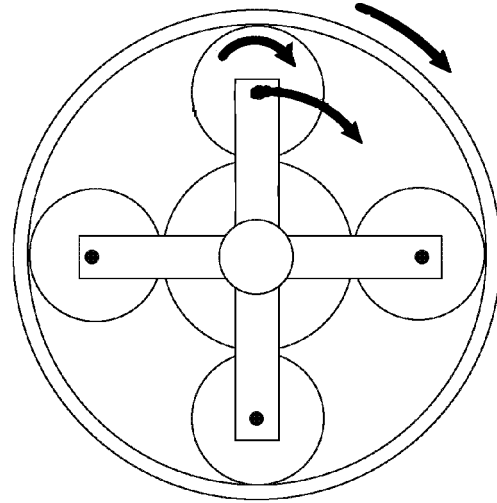
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# AUTOMATIC TRANSAXLE

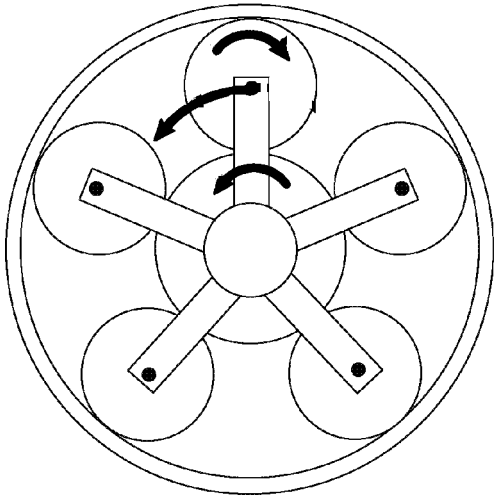
## Second gear



FRONT PLANETARY GEAR



REDUCTION PLANETARY GEAR



REAR PLANETARY GEAR

AMU0517A513

## AUTOMATIC TRANSAXLE

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	NFR (output)	NRR	NDR (input)
planetary carrier	NFC	NRC (output)	NDC (output)
Sun gear	NFS (fixed)	NRS (input)	NDS (fixed)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_2$  as the gear ratio in second gear,

$i_2 = \text{Front and rear planetary gear ratio } (i_2') \times \text{reduction planetary gear ratio } (i_{RD})$

$i_2' = \text{NRS/NRR}$

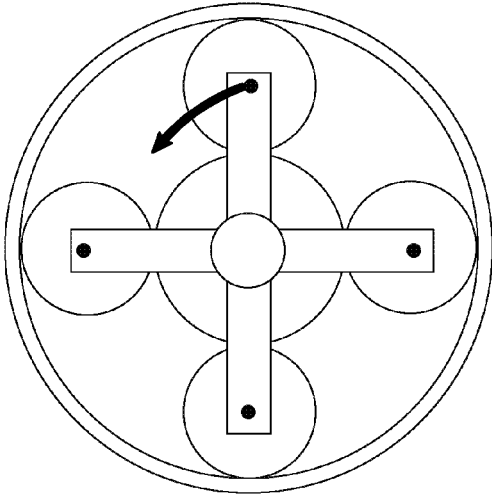
$\text{NRC} = \text{NFR}$ ,  $\text{NRR} = \text{NFC}$ : condition A

- From formula (1), the relation between the front and rear planetary gear unit is indicated in following formulas (2) and (3).  
 $(ZFR + ZFS) \times \text{NFC} = ZFR \times \text{NFR} + ZFS \times \text{NFS}$ : (2)  
 $(ZRR + ZRS) \times \text{NRC} = ZRR \times \text{NRR} + ZRS \times \text{NRS}$ : (3)
- Since the setting of the planetary gear in second gear is NFS = fixed = 0, substitute this condition in formula (2).  
 $\text{NFC} = ZFR / (ZFR + ZFS) \times \text{NFR}$ : (4)
- According to condition A  
 $\text{NFC} = \text{NRR} = ZFR / (ZFR + ZFS) \times \text{NRC}$
- Here we substitute condition A in formula (3)  
 $(ZRR + ZRS) \times \text{NRC} = ZRR \times ZFR / (ZFR + ZFS) \times \text{NRC} + ZRS \times \text{NRS}$   
 $i_2' = \text{NRS/NRC} = ((ZRR + ZRS) - ZRR \times ZFR / (ZFR + ZFS)) / ZRS$   
 Therefore,  $i_2$  shall be as follows:  
 $i_2 = i_2' \times i_{RD} = ((ZRR + ZRS) - ZRR \times ZFS / (ZFR + ZFS)) / ZRS \times (ZDR + ZDS) / ZDR$   
 $= ((75 + 42) - 75 \times 74 / (74 + 34)) / 42 \times (85 + 31) / 85$   
 $= 2.132$

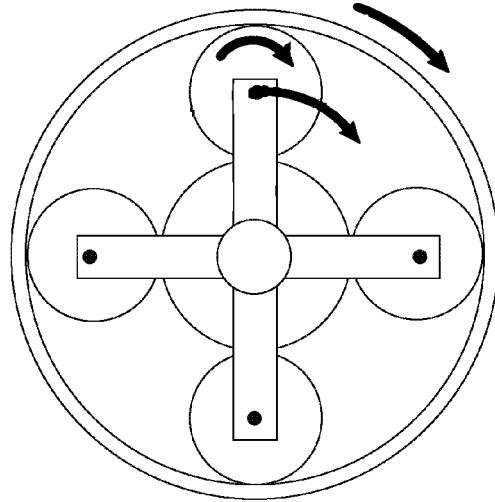
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# AUTOMATIC TRANSAXLE

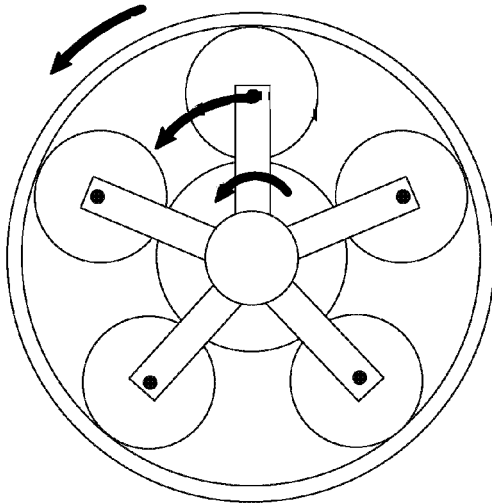
## Third gear



FRONT PLANETARY GEAR



REDUCTION PLANETARY GEAR



REAR PLANETARY GEAR

AMU0517A514



## AUTOMATIC TRANSAXLE

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	–	NRR (input)	NDR (input)
Planetary carrier	–	NRC (output)	NDC (output)
Sun gear	–	NRS (input)	NDS (fixed)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_3$  as the gear ratio in third gear,

$i_3 = \text{Rear planetary gear ratio } (i_3') \times \text{Reduction planetary gear ratio } (i_{RD})$

$i_3' = \text{NRR}/\text{NRC}$

According to the setting of the planetary gear in third gear, "NRR = NRS" ∴ condition B

- Here we substitute condition B in formula (1)  
 $(ZRR+ZRS) \times \text{NRC} = ZRR \times \text{NRS} + ZRS \times \text{NRS}$   
 $(ZRR+ZRS) \times \text{NRC} = (ZRR+ZRS) \times \text{NRS}$   
 $i_3' = \text{NRS}/\text{NRC} = (ZRR+ZRS)/(ZRR+ZRS) = 1.000$

Therefore,  $i_3$  shall be as follows:

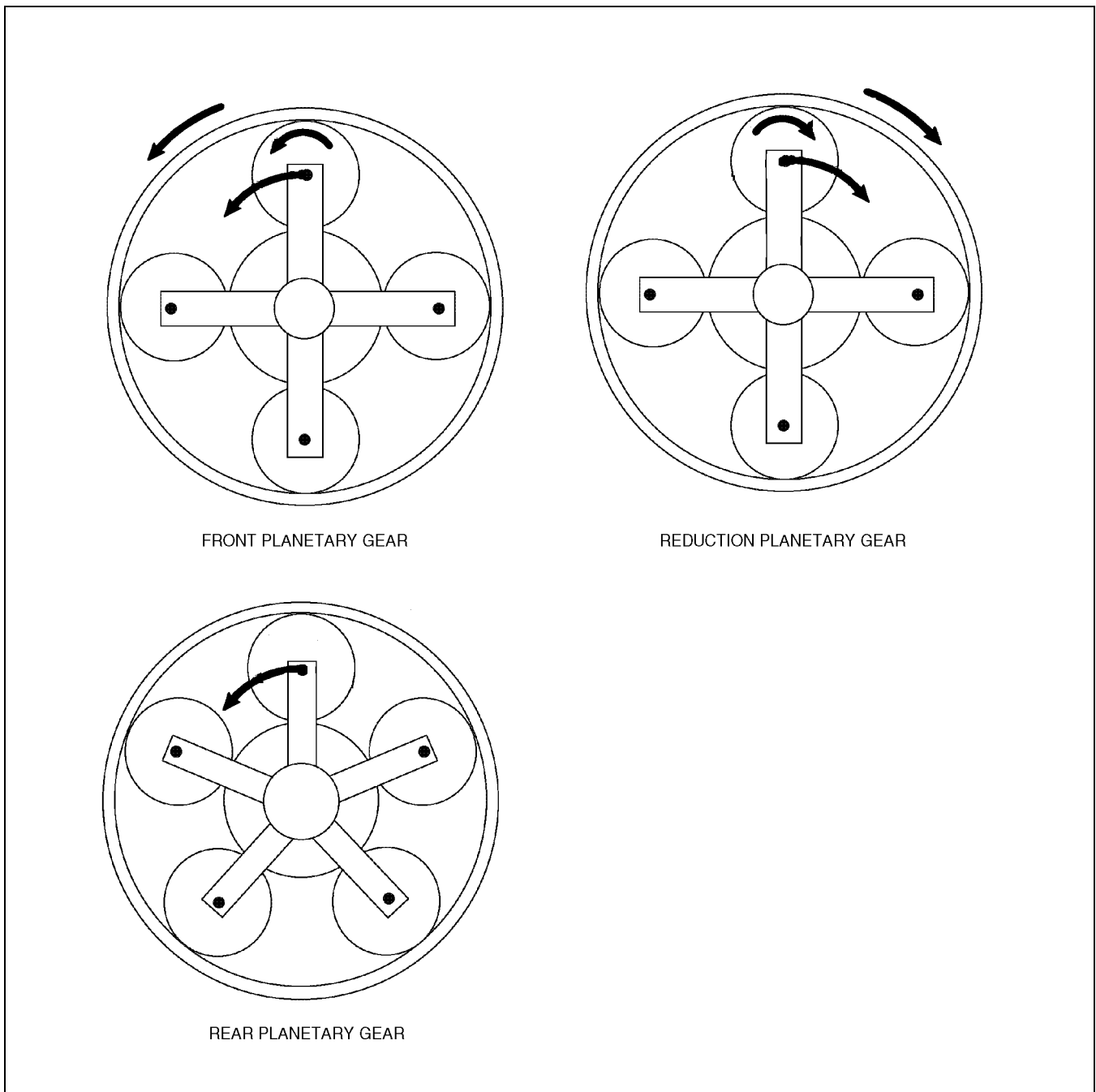
$$i_3 = (ZRR+ZRS)/(ZRR+ZRS) \times (ZDR+ZDS)/ZDR$$

$$= (75+42)/(75+42) \times (85+31)/85$$

$$= 1.365$$

# AUTOMATIC TRANSAXLE

## Fourth gear



AMU0517A515

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	NFR (output)	–	NDR (input)
Planetary carrier	NFC (input)	–	NDC (output)
Sun gear	NFS (fixed)	–	NDS (fixed)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_4$  as the gear ratio in fourth gear,

$i_4 = \text{Front planetary gear ratio } (i_4') \times \text{Reduction planetary gear ratio } (i_{RD})$

$i_4' = \text{NFC/NFR}$

- According to the setting of planetary gear in fourth gear, substitute "NFS = fixed = 0".

$$(ZFR + ZFS) \times \text{NFC} = ZFR \times \text{NFR}$$

$$i_4' = \text{NFC/NFR} = ZFR / (ZFR + ZFS)$$

Therefore,  $i_4$  shall be as follows:

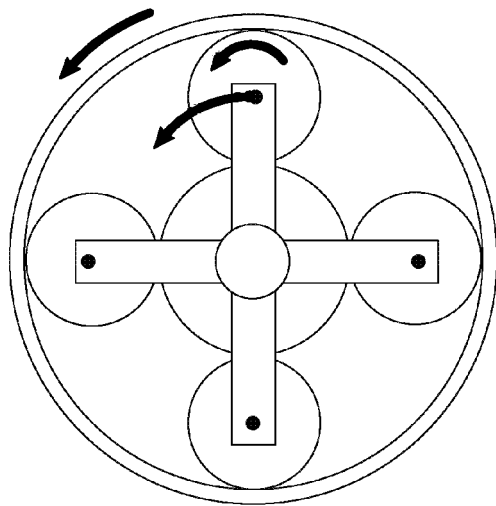
$$i_4 = ZFR / (ZFR + ZFS) \times (ZDR + ZDS) / ZDR$$

$$= 74 / (74 + 34) \times (85 + 31) / 85$$

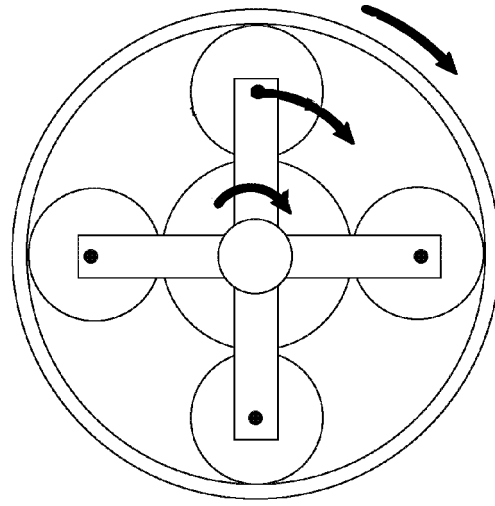
$$= 0.935$$

# AUTOMATIC TRANSAXLE

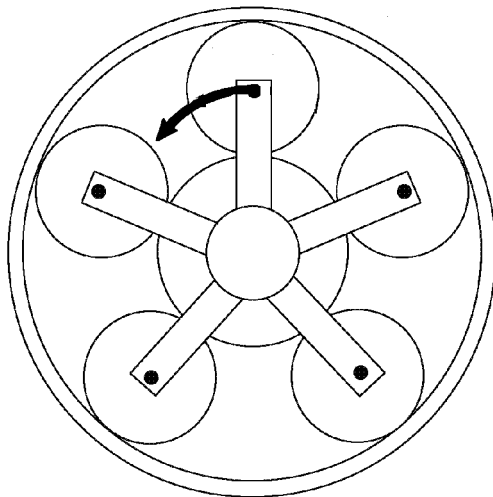
## Fifth gear



FRONT PLANETARY GEAR



REDUCTION PLANETARY GEAR



REAR PLANETARY GEAR

AMU0517A516

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	NFR (output)	–	NDR (input)
Planetary carrier	NFC (input)	–	NDC (output)
Sun gear	NFS (fixed)	–	NDS (output)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_5$  as the gear ratio in fifth gear,

$i_5 = \text{Front planetary gear ratio } (i_5') \times \text{Reduction planetary gear ratio } (i_{RD})$

Since the setting of front planetary gear is the same as that in fourth gear, " $i_5 = i_4$ ". (Formula is omitted.)

- According to the setting of reduction planetary gear in fifth gear, substitute " $NDC = NDS$ ".: condition C

- Here we substitute condition C in formula (1)

$$(ZDR + ZDS) \times NDC = ZDR \times NDR + ZDS \times NDC$$

$$i_{RD} = NDR / NDC = (ZDR + ZDS) / (ZDR + ZDS) = 1.000$$

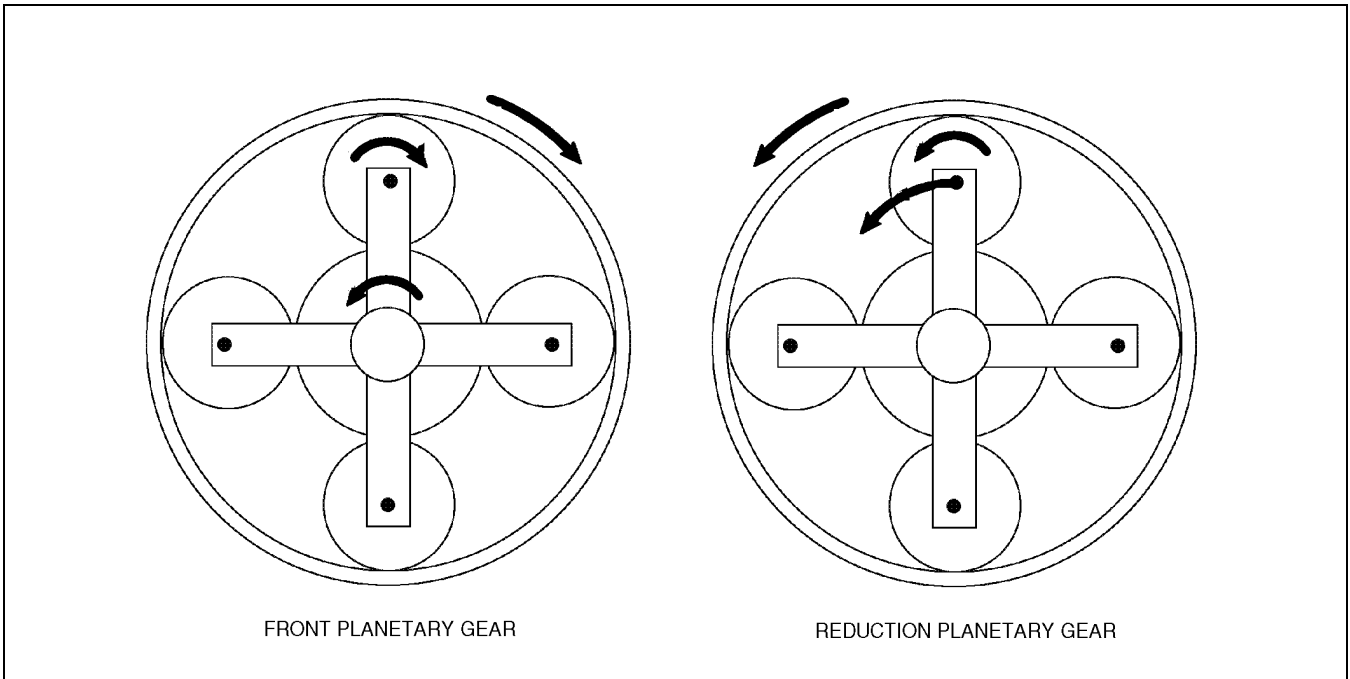
Therefore,  $i_5$  shall be as follows:

$$i_5 = i_4' \times i_{RD} = ZFR / (ZFR + ZFS) \times (ZDR + ZDS) / (ZDR + ZDS) = 0.685$$

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# AUTOMATIC TRANSAXLE

## Reverse



AMU0517A517

### Planetary gear setting

Planetary gear unit	Front	Rear	Reduction
Internal gear	NFR (output)	-	NDR (input)
Planetary carrier	NFC (fixed)	-	NDC (output)
Sun gear	NFS (input)	-	NDS (fixed)

The rotation speed is "0" for "fixed" as it does not rotate.

Taking  $i_R$  as the gear ratio in reverse gear,

$i_R = \text{Front planetary gear ratio } (i_R') \times \text{Reduction planetary gear ratio } (i_{RD})$

$i_R' = NFS/NFR$

- According to the setting of planetary gear in reverse gear, substitute "NFC = fixed = 0".

$$0 = ZFR \times NFR + ZFS \times NFS$$

$$i_R' = NFS/NFR = -ZFR/ZFS$$

Therefore,  $i_R$  shall be as follows:

$$i_R = -ZFR/ZFS \times (ZDR + ZDS)/ZDR$$

$$= -74/34 \times (85 + 31)/85$$

$$= -2.970$$

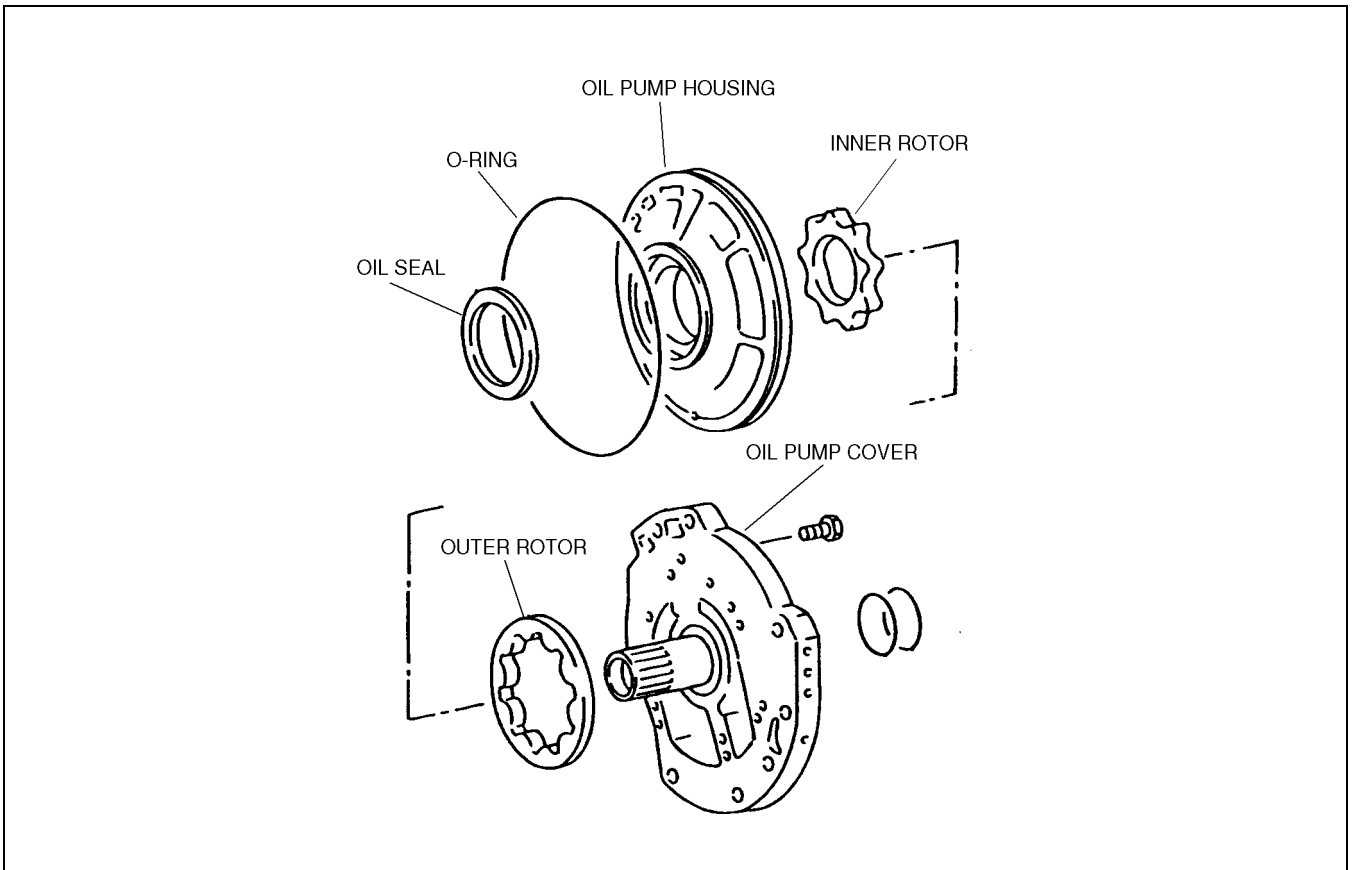
# AUTOMATIC TRANSAXLE

## OIL PUMP DESCRIPTION

AME561419220A01

### Outline

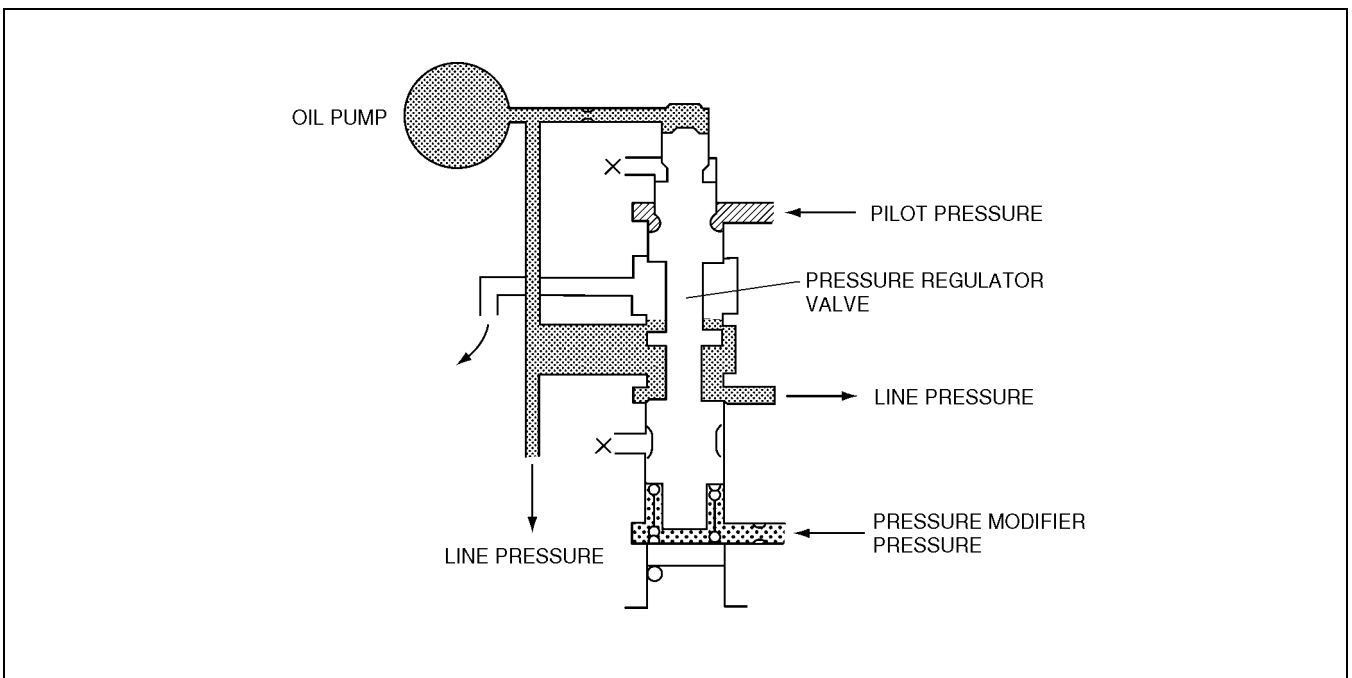
- The light-weight, compact, and quiet trochoid type oil pump reduces pump driving torque.
- The direct drive type oil pump is placed behind the torque converter.



AMU0517A518

### Structure/Operation

- The outer rotor and inner rotor are installed in the oil pump housing.
- The inner rotor in the oil pump housing is driven by the torque converter.
- When the inner rotor in the oil pump rotates, the ATF is drawn to the oil pump. The discharge amount is proportional to the rotating speed of the torque converter.



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# AUTOMATIC TRANSAXLE

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## CONTROL VALVE DESCRIPTION

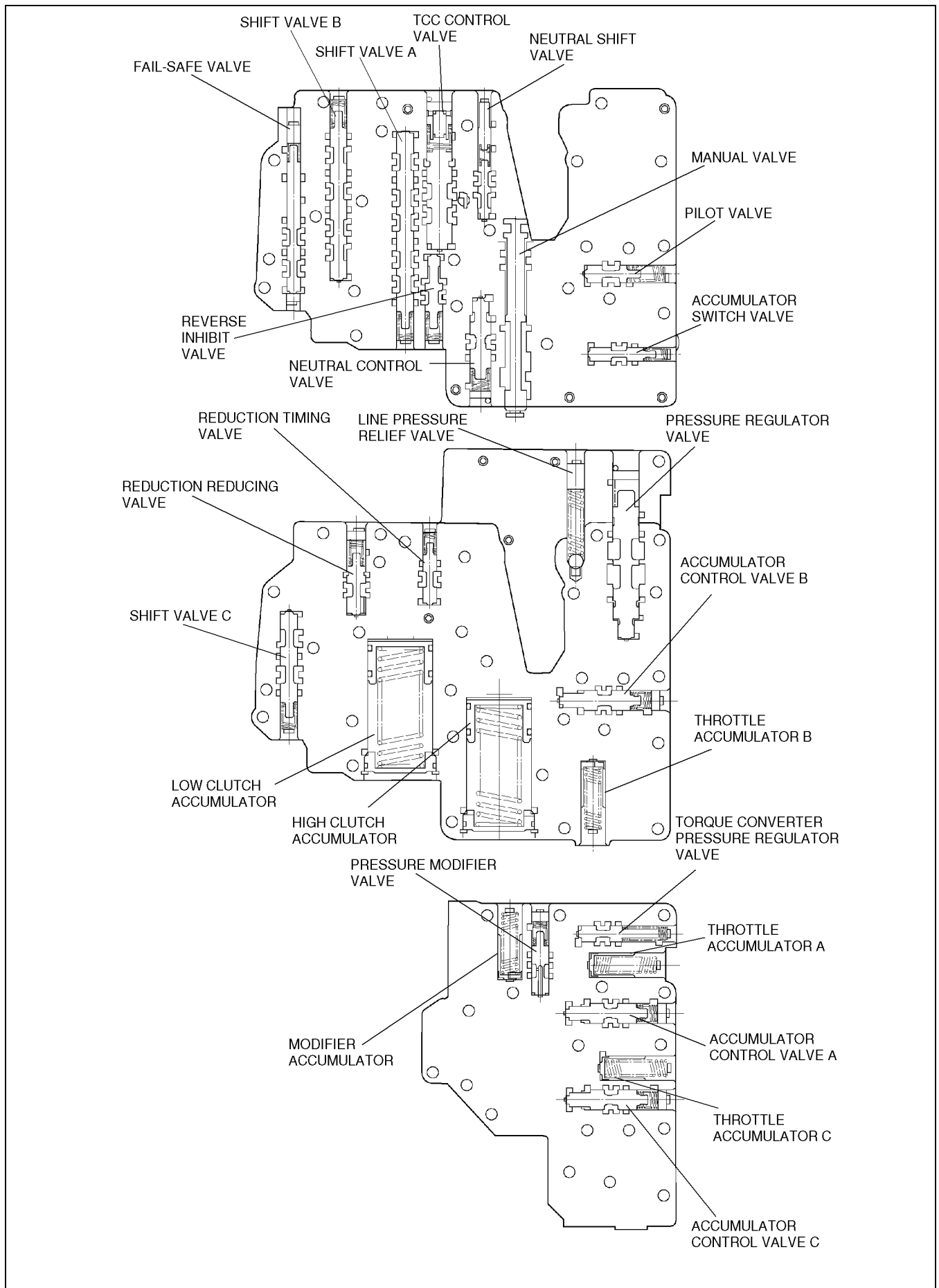
AME561421100A01

### Outline

- The control valve body is composed of four bodies: the sub lower body, lower body, internal body, and the upper body.
- To minimize the component in the control valve body, clutch engagement is electronically controlled, hydraulic circuits were simplified and the valve types reduced.

# AUTOMATIC TRANSAXLE

## Control Valve Component Location



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## AUTOMATIC TRANSAXLE

### Control Valve Component Description

Component	Function
Pressure regulator valve	<ul style="list-style-type: none"> <li>Reduces oil pump discharge pressure according to pressure modifier pressure and adjusts it to line pressure.</li> </ul>
Pressure modifier valve	<ul style="list-style-type: none"> <li>Reduces pilot pressure according to throttle pressure and adjusts it to pressure modifier pressure.</li> </ul>
Pilot valve	<ul style="list-style-type: none"> <li>Reduces line pressure and adjusts to it pilot pressure.</li> </ul>
Accumulator control valve A	<ul style="list-style-type: none"> <li>Reduces line pressure according to discharge pressure from pressure control solenoid and adjusts it to accumulator control pressure.</li> </ul>
Accumulator control valve B	<ul style="list-style-type: none"> <li>Reduces line pressure according to discharge pressure from 2-4 brake solenoid and adjusts it to accumulator control pressure.</li> </ul>
Accumulator control valve C	<ul style="list-style-type: none"> <li>Reduces line pressure according to discharge pressure from high clutch solenoid and adjusts it to accumulator control pressure.</li> </ul>
Torque converter pressure regulator valve	<ul style="list-style-type: none"> <li>Reduces line pressure and adjusts supply pressure to torque converter.</li> </ul>
Neutral control valve	<ul style="list-style-type: none"> <li>Adjusts low clutch operation pressure according to the output pressure from pressure control solenoid. This pressure is not supplied to low clutch when neutral shift valve is not switched.</li> </ul>
Reduction reducing valve	<ul style="list-style-type: none"> <li>When reduction timing valve is not switched, reduces line pressure according to discharge pressure from accumulator control valve B and adjusts it to reduction reducing pressure.</li> </ul>
Line pressure relief valve	<ul style="list-style-type: none"> <li>When line pressure exceeds specified level, this valve opens to reduce the line pressure.</li> </ul>
Torque converter clutch control valve	<ul style="list-style-type: none"> <li>Locks or releases torque converter clutch according to the discharge pressure of torque converter clutch solenoid valve. Reduces shift shock by gradually changing line pressure during locking and releasing.</li> </ul>
Shift valve A	<ul style="list-style-type: none"> <li>Switches hydraulic circuits according to the operation of shift solenoid and enables shifting from first to fifth gear by arrangement of shift valves A to C.</li> </ul>
Shift valve B	
Shift valve C	
Accumulator switch valve	<ul style="list-style-type: none"> <li>Since high clutch accumulator is common to high clutch and reverse clutch, switches circuits regardless of line pressure supply from manual valve.</li> </ul>
Reverse inhibit valve	<ul style="list-style-type: none"> <li>When vehicle is in forward motion and mistakenly shifted into R, it shifts to N position by switching low and reverse brake circuits and producing neutral condition.</li> </ul>
Neutral shift valve	<ul style="list-style-type: none"> <li>Switches hydraulic circuits of low clutch pressure to pressure adjusted by neutral control valve or line pressure, according to the operation of neutral shift solenoid.</li> </ul>
Manual valve	<ul style="list-style-type: none"> <li>Distributes line pressure to each control valve according to gear selector position.</li> </ul>
Fail-safe valve	<ul style="list-style-type: none"> <li>A locked valve that only forms hydraulic circuits but has no function.</li> </ul>
Reduction timing valve	<ul style="list-style-type: none"> <li>Switches timing of reduction brake operation when shifting selector lever to force engine braking. Operates by switching of reduction timing solenoid.</li> </ul>
Low clutch accumulator	<ul style="list-style-type: none"> <li>Locks or releases low clutch with optimum timing to reduce shift shock.</li> </ul>
High clutch accumulator	<ul style="list-style-type: none"> <li>Locks or releases high clutch with optimum timing to reduce shift shock.</li> </ul>
Modifier accumulator	<ul style="list-style-type: none"> <li>Reduces pulsation of pressure modifier pressure.</li> </ul>
Throttle accumulator A	<ul style="list-style-type: none"> <li>Reduces pulsation of throttle pressure.</li> </ul>
Throttle accumulator B	<ul style="list-style-type: none"> <li>Reduces pulsation of control pressure to accumulator control valve B.</li> </ul>
Throttle accumulator C	<ul style="list-style-type: none"> <li>Reduces pulsation of control pressure to accumulator control valve C.</li> </ul>



# AUTOMATIC TRANSAXLE

## Pressure Regulator Valve

### Outline

- The pressure regulator valve regulates oil pump discharge pressure and adjusts to the line pressure according to driving conditions.

### Operation

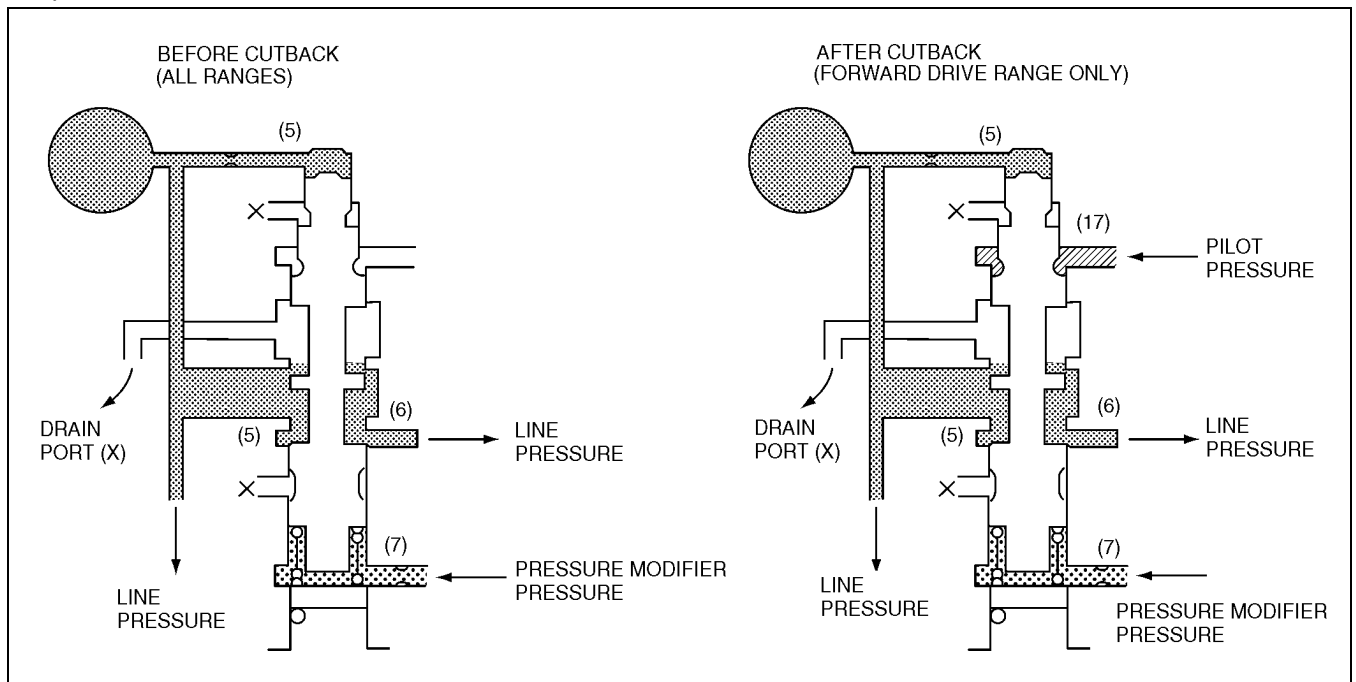
- See figure. Pressure regulator valve is pushed upward by spring force.

### Before cutback (all ranges)

- Spring force and pressure modifier pressure (7) are applied to the bottom end of the valve and push the valve upward. Conversely, oil pump discharge pressure (5) is applied to the top end of the valve and pushes the valve downward. Oil pump discharge pressure (5) is usually greater than spring force thus forcing the valve to move downward. When the valve moves downward, the drain port (X) will open and oil pump discharge pressure (5) will be reduced. Thus, oil pump discharge pressure (5) and spring force maintain the balance. Oil pump discharge pressure (5) is also called line pressure.

### After cutback (forward drive range only)

- Pilot pressure (17) is applied to the middle position of the valve and pushes the valve downward. Compared to before cutback, the force to push the valve downward is greater and oil pump discharge pressure (5) (line pressure) will be drained by the lower pressure. Specifically, line pressure (5) will adjust to the lower pressure. If, at this point, the accelerator is depressed, pressure modifier pressure (7) will pressurize. Pressure modifier pressure (7) pushes the valve upward and closes the drain port (X) of oil pump discharge pressure (5). This adjusts oil pump discharge pressure (line pressure) (5) to the higher pressure. Thus, line pressure (5) is adjusted according to pressure modifier pressure (7) and operates as each clutch and brake operation pressure.



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# AUTOMATIC TRANSAXLE

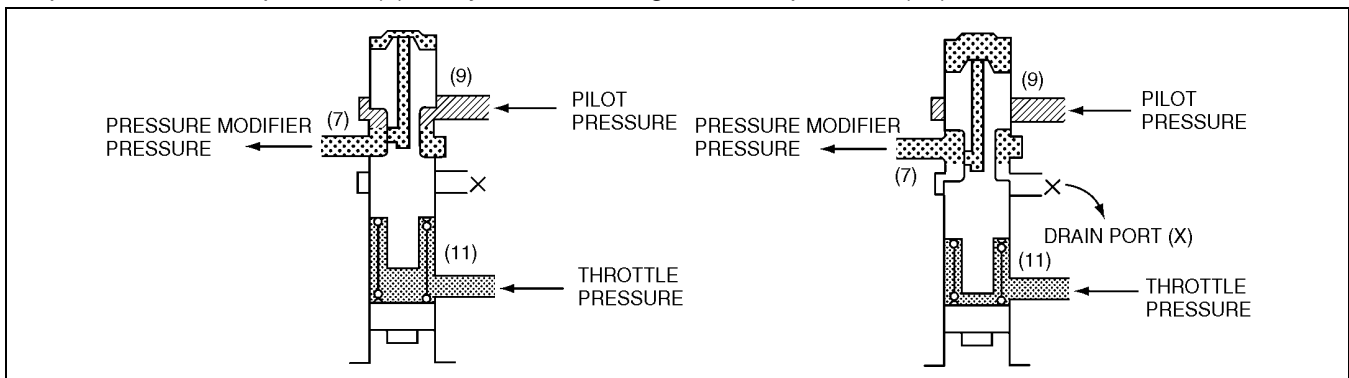
## Pressure Modifier Valve

### Outline

- The pressure modifier valve reduces the pilot pressure according to the throttle pressure and adjusts to the pressure modifier pressure. The throttle pressure is adjusted by the pressure control solenoid. The pressure modifier pressure is applied to the pressure regulator valve and works as a signal pressure to adjust the line pressure.

### Operation

- Spring force and throttle pressure (11) are applied to the bottom end of the valve and push the valve upward. Conversely, pressure modifier pressure (7) flows through the oil passage inside the valve, is applied to the top end of the valve, and pushes the valve downward. Pressure modifier pressure (7) and throttle pressure (11) maintain the balance. Thus, pilot pressure (9) is reduced becoming pressure modifier pressure.
- When pressure modifier pressure (7) is lower than throttle pressure (11), the valve moves upward and opens pilot pressure (9) oil passage (See figure). This forces the pilot pressure to flow through oil passage (9) to oil passage (7) and pressurizes the pressure modifier pressure. Pressurized pressure modifier pressure (7) moves the valve downward and closes the pilot pressure (9) oil passage. This causes pressure modifier pressure (7) to not pressurize.
- When pressure modifier pressure (7) is higher than throttle pressure (11), the valve moves downward and opens drain port (X) (See figure). This causes pressure modifier pressure (7) to depressurize. If pressure modifier pressure (7) is depressurized, the force to push the valve downward will decrease and the valve will move up and drain port (X) will close. This causes pressure modifier pressure (7) to not pressurize. Thus, pressure modifier pressure (7) is adjusted according to throttle pressure (11).



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## Pilot Valve

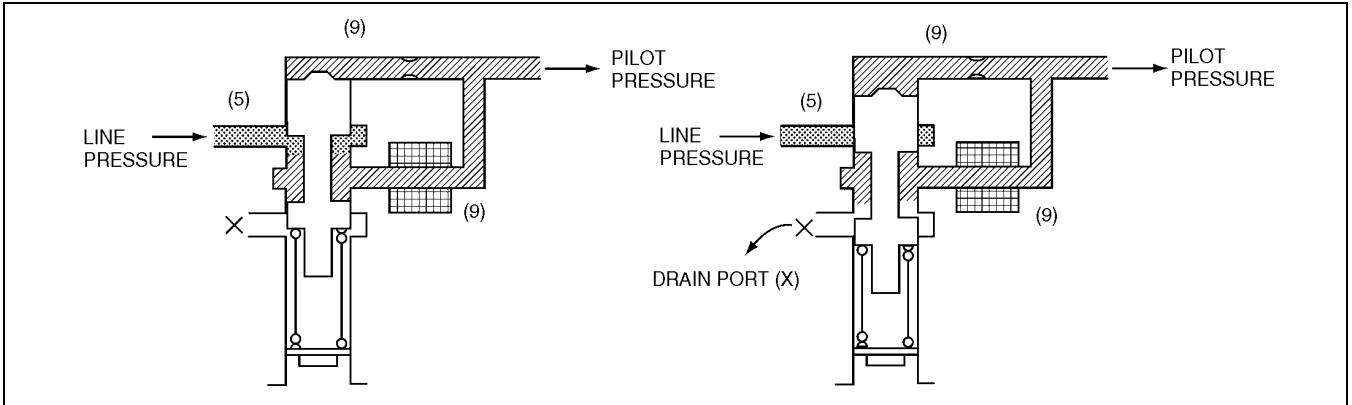
### Outline

- The pilot valve reduces line pressure and adjusts to the pilot pressure. Pilot pressure is adjusted to the fixed pressure irrelevant of driving conditions and operates as a signal pressure for each solenoid valve.

### Operation

- Spring force is applied to the bottom end of the valve and moves the valve upward. Conversely, pilot pressure (9) is applied to the top end of the valve and pushes the valve downward. Pilot pressure (9) and spring force maintain the balance. By this balance, line pressure (5) is depressurized and adjusted to the fixed pilot pressure. When pilot pressure (9) is lower than the spring force, the pilot valve moves upward and opens line pressure oil passage (5). This forces the line pressure to flow through oil passage (5) to oil passage (9) and pressurizes pilot pressure (9). Pressurized pilot pressure (9) moves the valve downward and closes the oil passage of the line pressure (5). This causes the pilot pressure to not pressurize.
- When pilot pressure (9) is greater than the spring force, the valve moves downward and opens drain port (X). This causes pilot pressure (9) to depressurize. When pilot pressure (9) is depressurized, the force to push the valve downward decreases and the valve moves up and drain port (X) closes. This causes the pilot pressure to not depressurize. Thus, pilot pressure (9) is adjusted to the fixed pressure according to the balance with the spring force.

# AUTOMATIC TRANSAXLE



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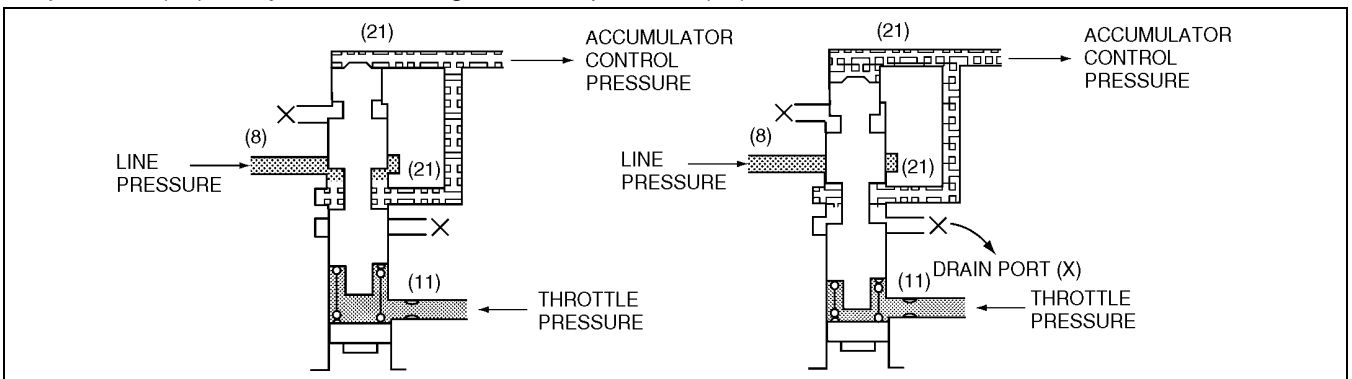
## Accumulator Control Valve A

### Outline

- Accumulator control valve A reduces line pressure according to the throttle pressure and adjusts to the accumulator control valve. The accumulator control pressure is applied to the low clutch accumulator and increases the line pressure at optimal timing according to the driving conditions.

### Operation

- Spring force and throttle pressure (11) are applied to the bottom end of the valve and push the valve upward. Conversely, accumulator control pressure (21) is applied to the top end of the valve and pushes the valve downward.
- Accumulator control pressure (21) and throttle pressure (11) maintain the balance. By this balance line pressure (8) is depressurized and adjusted to accumulator control pressure (21). When accumulator control pressure (21) is lower than the throttle pressure (11), the valve moves upward and opens line pressure (8) oil passage (See figure). This causes the line pressure to flow through oil passage (8) to oil passage (21) and pressurizes accumulator control pressure (21). Pressurized accumulator control pressure (21) moves the valve downward and closes line pressure (8) oil passage. This causes the accumulator control pressure to not pressurize.
- When accumulator control pressure (21) is higher than throttle pressure (11), the valve moves downward and opens drain port (X). This causes accumulator control pressure (21) to depressurize. When accumulator control pressure (21) is depressurized, the force to push the valve downward is less, the valve moves up and drain port (X) closes. This causes accumulator control pressure to not depressurize. Thus, accumulator control pressure (21) is adjusted according to throttle pressure (11).



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# AUTOMATIC TRANSAXLE

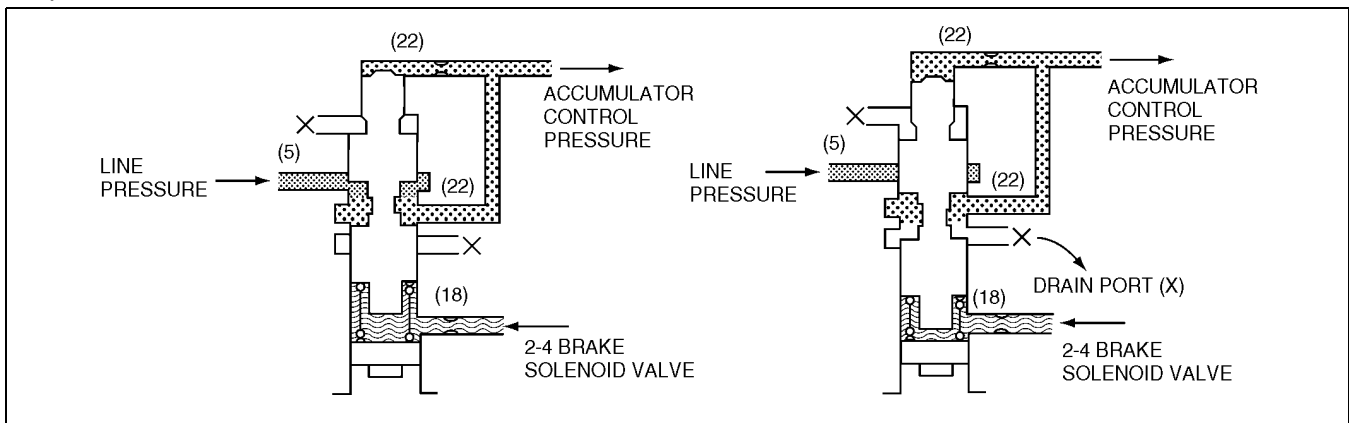
## Accumulator Control Valve B

### Outline

- Accumulator control valve B reduces the line pressure according to the operation of the 2-4 brake solenoid valve and adjusts to the accumulator control pressure. The accumulator control pressure is applied to the 2-4 brake accumulator and increases the line pressure at optimal timing according to the driving conditions.

### Operation

- Spring force and 2-4 brake solenoid valve pressure (18) are applied to the bottom end of the valve and push the valve upward. Conversely, accumulator control pressure (22) is applied to the top end of the valve and pushes the valve downward.
- Accumulator control pressure (22) and 2-4 brake solenoid valve pressure (18) maintain the balance. By this balance, line pressure (5) is depressurized and adjusted to accumulator control pressure (22). When accumulator control pressure (22) is lower than 2-4 brake solenoid valve pressure (18), the valve moves upward and opens line pressure oil passage (5) (See figure). This causes the line pressure to flow through oil passage (5) to oil passage (22) and pressurizes accumulator control pressure (22). Pressurized accumulator control pressure (22) moves the valve downward and closes line pressure (5) oil passage. This causes accumulator control pressure (22) to not be pressurized.
- When accumulator control pressure (22) is higher than 2-4 brake solenoid valve pressure (18), the valve moves downward and opens drain port (X). This causes accumulator control pressure (22) to depressurize. When accumulator control pressure (22) is depressurized, the force to push the valve downward decreases, the valve moves upward and closes drain port (X). This causes accumulator control pressure (22) to not depressurize. Thus, accumulator control pressure (22) according to the change in the 2-4 brake solenoid valve pressure.



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## Accumulator Control Valve C

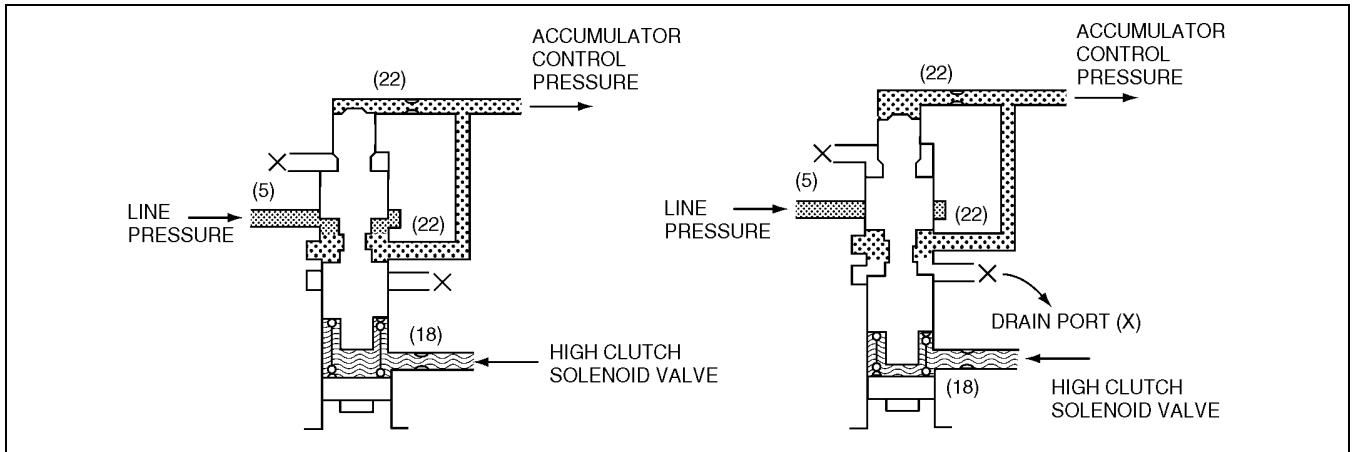
### Outline

- Accumulator control valve C reduces the line pressure according to the operation of the high clutch solenoid valve and adjusts to the accumulator control pressure. The accumulator control pressure is applied to the high clutch accumulator and the direct clutch and increases the line pressure at optimal timing according to the driving conditions.

### Operation

- Spring force and high clutch solenoid valve pressure (18) are applied to the bottom end of the valve and push the valve upward. Conversely, accumulator control pressure (22) is applied to the top end of the valve and pushes the valve downward.
- Accumulator control pressure (22) and high clutch solenoid valve pressure (18) maintain the balance. By this balance, line pressure (5) is depressurized and adjusted to accumulator control pressure (22). When accumulator control pressure (22) is lower than high clutch solenoid valve pressure (18), the valve moves upward and opens line pressure oil passage (5) (See figure). This causes the line pressure to flow through oil passage (5) to oil passage (22) and pressurizes accumulator control pressure (22). Pressurized accumulator control pressure (22) moves the valve downward and closes line pressure (5) oil passage. This causes accumulator control pressure (22) to not be pressurized.
- When accumulator control pressure (22) is higher than high clutch solenoid valve pressure (18), the valve moves downward and opens drain port (X). This causes accumulator control pressure (22) to depressurize. When accumulator control pressure (22) is depressurized, the force to push the valve downward decreases, the valve moves upward and closes drain port (X). This causes accumulator control pressure (22) to not depressurize. Thus, accumulator control pressure (22) adjusts according to the change in the high clutch solenoid valve pressure.

# AUTOMATIC TRANSAXLE



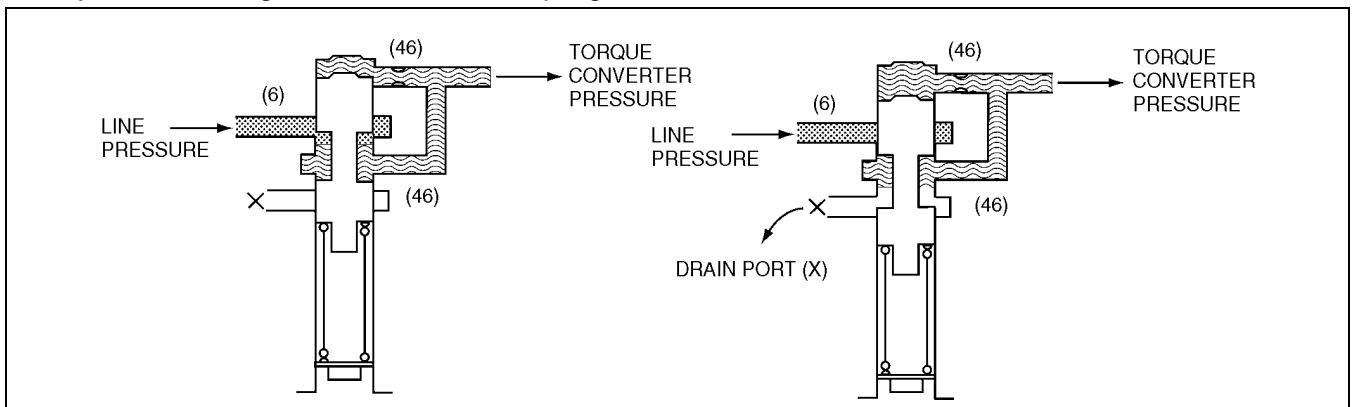
AMU0517A533

## Torque Converter Pressure Regulator Valve Outline

- The torque converter pressure regulator valve reduces the line pressure and adjusts to the torque converter pressure. Torque converter pressure is applied to the torque converter and it is also used as lubricating oil pressure for the component parts of the transaxle.

### Operation

- Spring force is applied to the bottom end of the valve and pushes the valve upward. Conversely, torque converter pressure (46) is applied to the top end of the valve and pushes the valve downward. Torque converter pressure (46) and the spring force maintain the balance. By this balance, line pressure (6) is depressurized and adjusted to torque converter pressure (46).
- When torque converter pressure (46) is lower than spring force, the valve moves upward and opens line pressure oil passage (6). This causes the line pressure to flow through oil passage (6) to oil passage (46) and pressurizes torque converter pressure (46). Pressurized torque converter (46) moves the valve downward and closes line pressure (6) oil passage. This causes torque converter pressure (46) to pressurize.
- When torque converter pressure (46) is greater than spring force, the valve moves downward and closes drain port (X). This causes torque converter pressure (46) to depressurize. When torque converter (46) is depressurized, the force to push the valve decreases and the valve moves upward and closes drain port (X). This causes torque converter pressure (46) to not depressurize. Thus, torque converter pressure (46) is adjusted according to the balance of the spring force.



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# AUTOMATIC TRANSAXLE

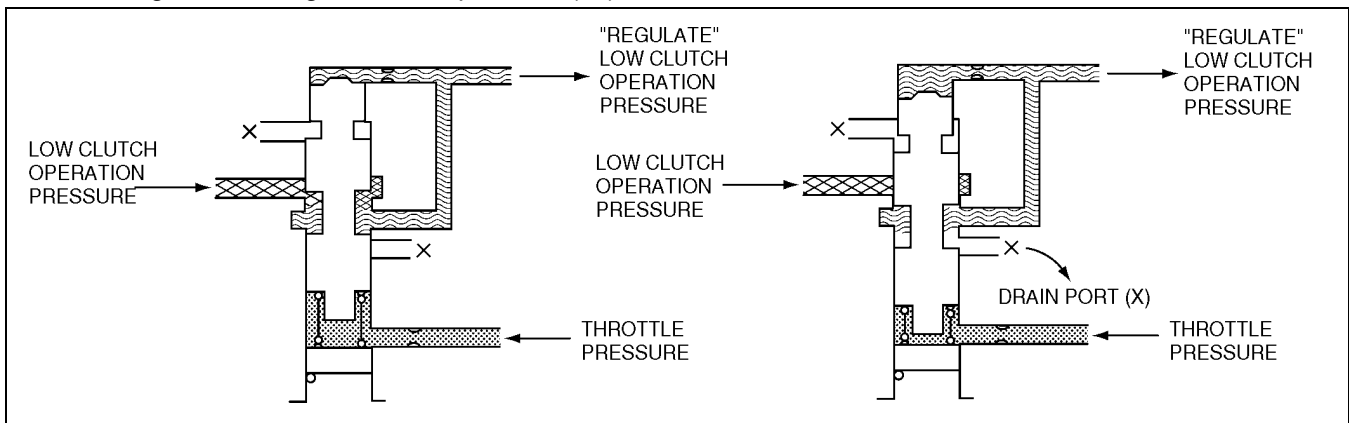
## Neutral Control Valve

### Outline

- The neutral control valve operates in conjunction with the neutral shift valve. When down shifting, the neutral control valve controls the low clutch operation pressure to acquire the neutral condition.

### Operation

- Spring force and throttle pressure (11) are applied to the bottom end of the valve and push the valve upward. Conversely, "regulate" low clutch operation pressure (45) is applied to the top end of the valve and pushes the valve downward. "Regulate" low clutch operation pressure (45) and throttle pressure (11) maintain the balance. By this balance, low clutch operation pressure (35) is adjusted to "regulate" low clutch operation pressure (45).
- When "regulate" low clutch operation pressure (45) is lower than throttle pressure (11), the valve moves upward and opens low clutch operation pressure oil passage (35) (See figure). This causes the low clutch operation pressure in oil passage (35) to flow into oil passage (45) and pressurizes "regulate" low clutch operation pressure (45). Pressurized "regulate" low clutch operation pressure (45) moves the valve downward and closes low clutch operation pressure (35) oil passage. This causes the "regulate" low clutch operation pressure to not pressurize.
- When "regulate" low clutch operation pressure (45) is greater than throttle (11), the valve moves downward and opens drain port (X). This causes "regulate" low clutch operation pressure (45) to depressurize. When "regulate" low clutch operation pressure (45) is depressurized, the force to push the valve downward decreases and the valve moves upward and drain port (X) will close. This causes "regulate" low clutch operation pressure (45) to not depressurize. Thus, the "regulate" low clutch operation pressure (45) is adjusted according to the change in throttle pressure (11).



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## Reduction Reducing Valve

### Outline

- The reduction reducing valve reduces the line pressure and adjusts to the reduction reducing pressure allowing the reduction brake to operate at the optimal pressure. While in the forward drive ranges, the line pressure is depressurized by the reduction reducing valve and is applied to the reduction brake. While in R position, the line pressure does not depressurize and is applied to the reduction brake.

### Operation

- Spring force and back pressure of accumulator control valve B (39) are applied to the bottom end of the valve and push the valve upward.

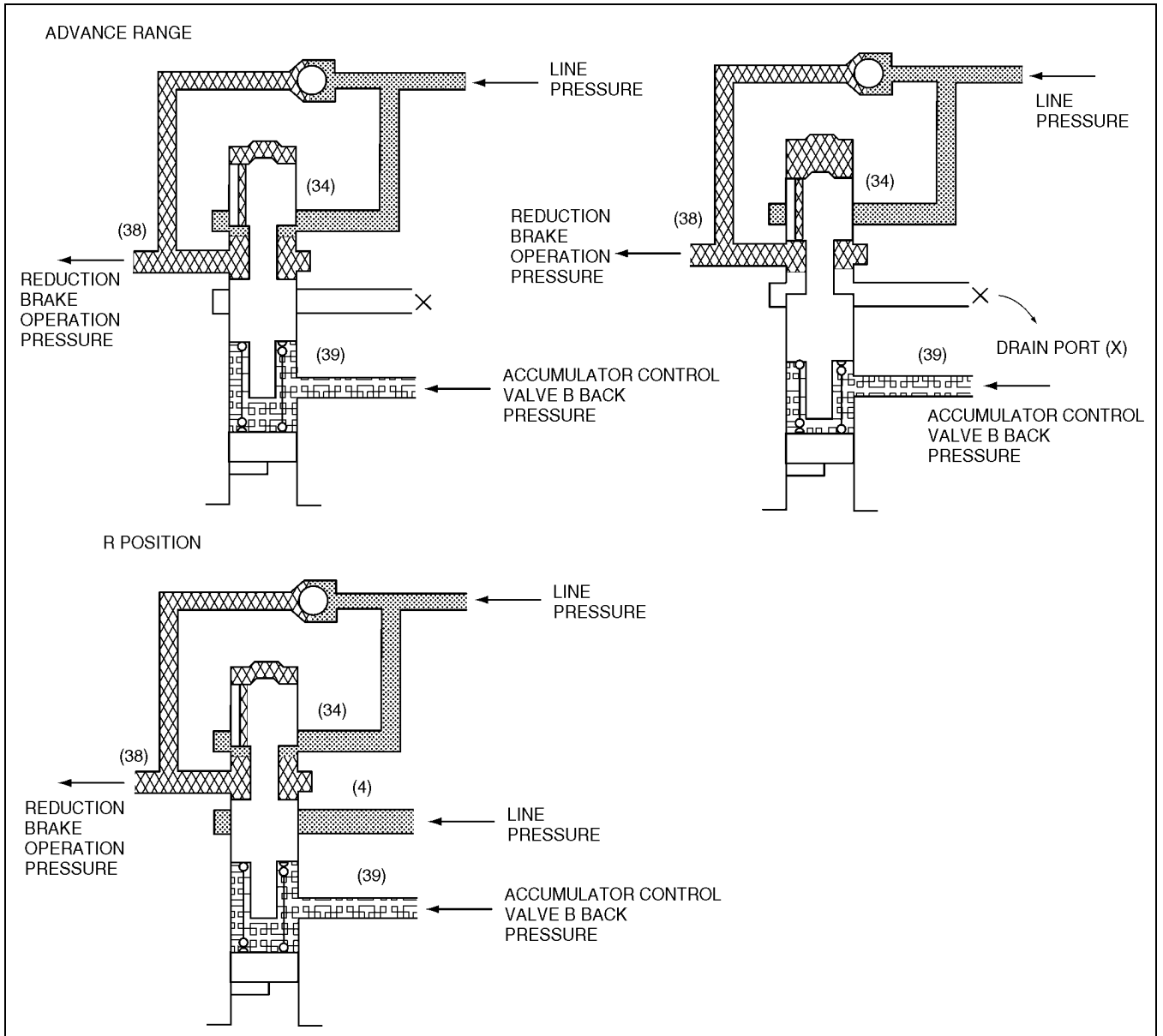
### Forward drive range

- Spring force and back pressure of accumulator control valve B (39) are applied to the bottom end of the valve and push the valve upward. Conversely, reduction brake operation pressure (38) flows through the inside of the valve, is applied to the top end of the valve, and pushes the valve downward. The back pressure of accumulator control valve B (39) and reduction brake operation pressure (38) maintain the balance. This causes line pressure (34) to decrease and is applied to the reduction brake.
- When reduction brake operation pressure (38) is lower than back pressure of the accumulator control valve B (39), the valve moves upward and opens line pressure (34) oil passage (See figure). This causes the line pressure to flow through oil passage (34) to oil passage (38) and pressurizes reduction brake operation pressure (38). Pressurized reduction brake operation pressure (38) moves the valve downward and closes the oil passage of line pressure (34). This causes reduction brake operation pressure (38) to not depressurize. When reduction brake operation pressure (38) is higher than the back pressure of accumulator control valve (39), the valve moves downward and opens drain port (X) (See figure). This causes reduction brake operation pressure (38) to depressurize. When reduction brake operation pressure (38) is depressurized, the force to push the valve downward decreases, the valve moves upward and drain port (X) closes. This causes the reduction brake operation pressure to not depressurize. Thus, reduction brake operation pressure (38) is adjusted according to the change in the back pressure of accumulator control valve B (39).

# AUTOMATIC TRANSAXLE

## R position

- While in R position also, the valve operates by the balance of reduction brake operation pressure (38) and back pressure of accumulator control valve B (39), the same as when in the forward drive ranges. However, while in the R position, since the line pressure (reverse clutch operation pressure) is applied to the oil passage (4), the line pressure is applied to the reduction brake irrelevant of the valve motion.



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# AUTOMATIC TRANSAXLE

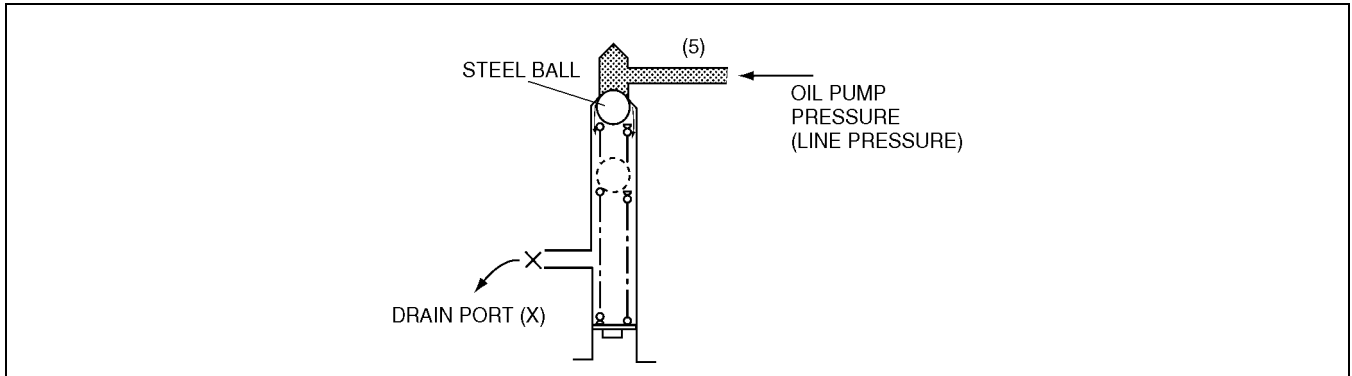
## Line Pressure Relief valve

### Outline

- The line pressure relief valve adjusts the oil pump pressure to the fixed level.

### Operation

- The line pressure relief valve consists of a steel ball and a spring. The steel ball is pushed against the top end of the valve by spring force.



AMU0517A540

- When oil pump discharge pressure (5) (applied to the top end of the valve) becomes greater than spring force, the steel ball is pushed downward, drain port (X) opens and oil pump pressure (5) depressurizes.
- If oil pump pressure (5) is depressurized, the steel ball is pushed upward by spring force and drain port (X) closes. This causes oil pump pressure (5) to not depressurize. Thus, the oil pump pressure is adjusted to the fixed pressure.



# AUTOMATIC TRANSAXLE

## Shift Valve A, B, and C

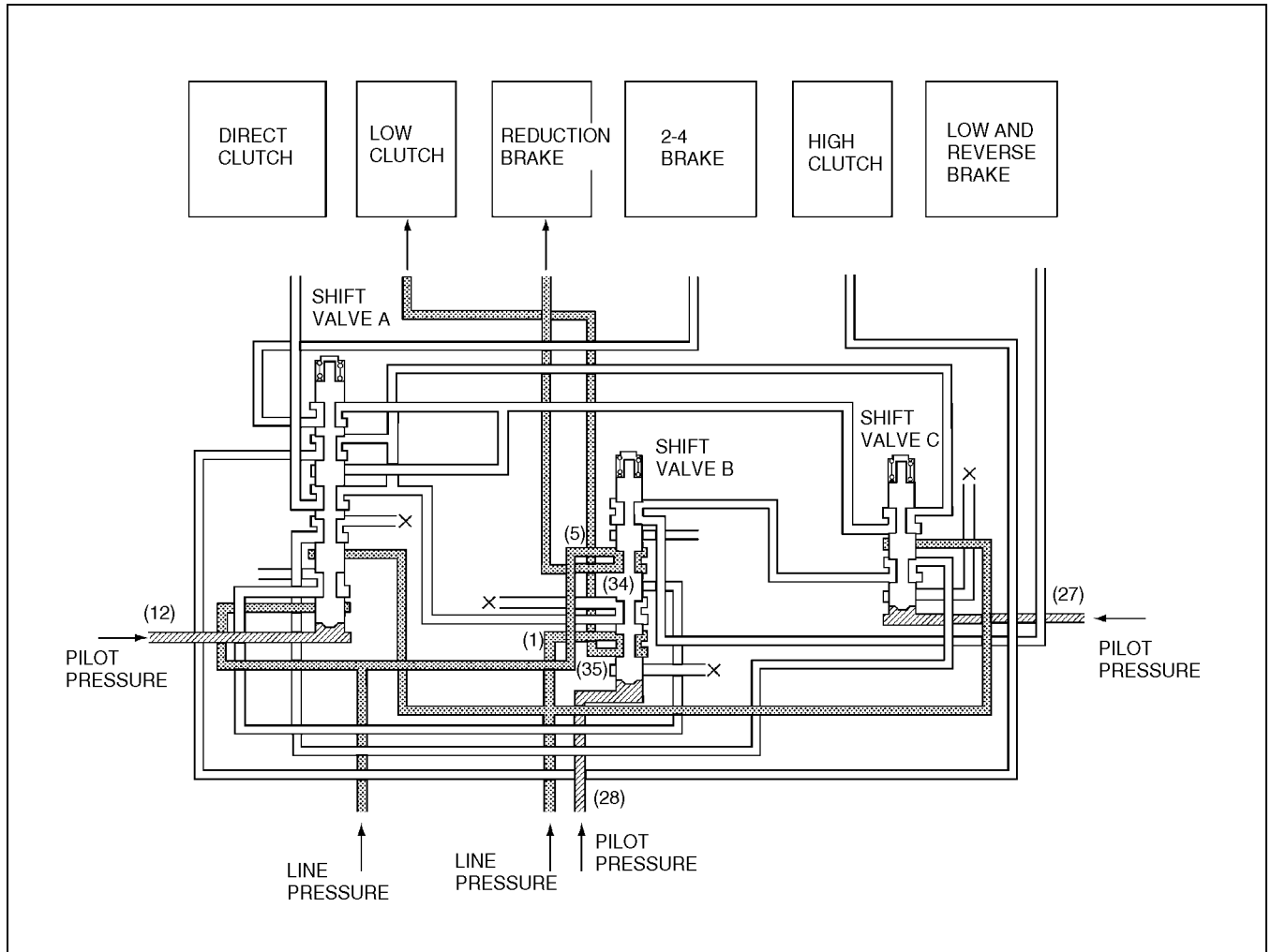
### Outline

- Shift valves A, B, and C switch the oil passages. These valves switch the line pressure oil passage according to each shift solenoid operation and apply operation pressure (line pressure) to each clutch and brake.

### Operation

#### First gear (engine brake operation not possible)

- Each shift solenoid is set to first gear (engine brake operation not possible) mode. The pilot pressure is applied to the bottom end of every shift valve and each shift valve is positioned on the upper side. Line pressure (1) is applied to the low clutch passing through shift valve B (oil passage (35)). Line pressure (5) is not applied to the reduction brake passing through shift valve B (oil passage (34)).



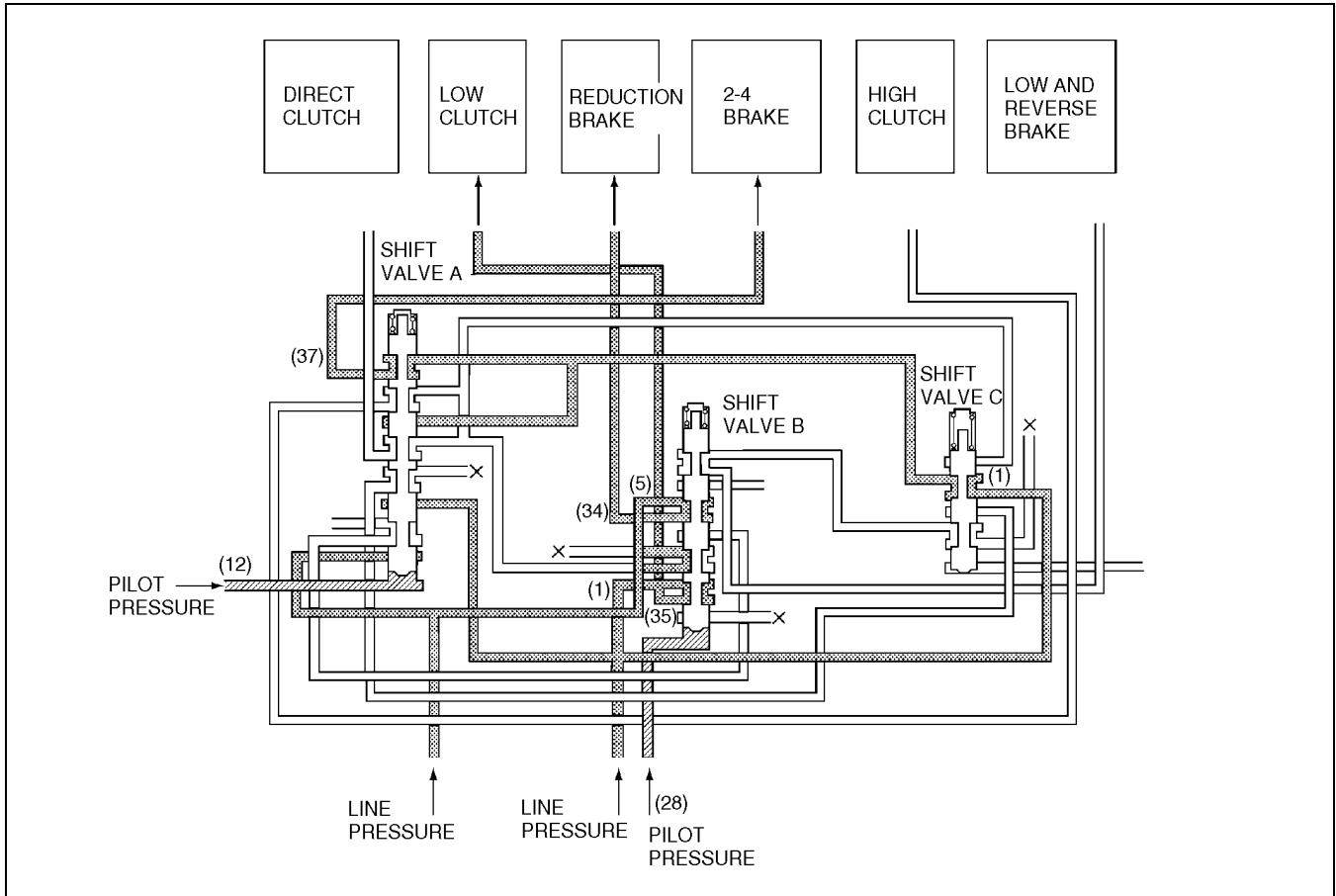
AMU0517A541

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# AUTOMATIC TRANSAXLE

## Second gear

- Each shift solenoid is set to second gear mode. Pilot pressure is applied to the bottom end of shift valves A, B, and shift valves A, B are positioned on the upper side. Conversely, shift valve C is positioned on the down side by spring force. Line pressure (1) flows through shift valve B and is applied to the low clutch (oil passage (35)). Also, line pressure (1) flows through shift valve C and is applied to 2-4 brake acting through shift valve A (oil passage (37)). Line pressure (5) is not applied to the reduction brake flowing through shift valve B (oil passage (34)).



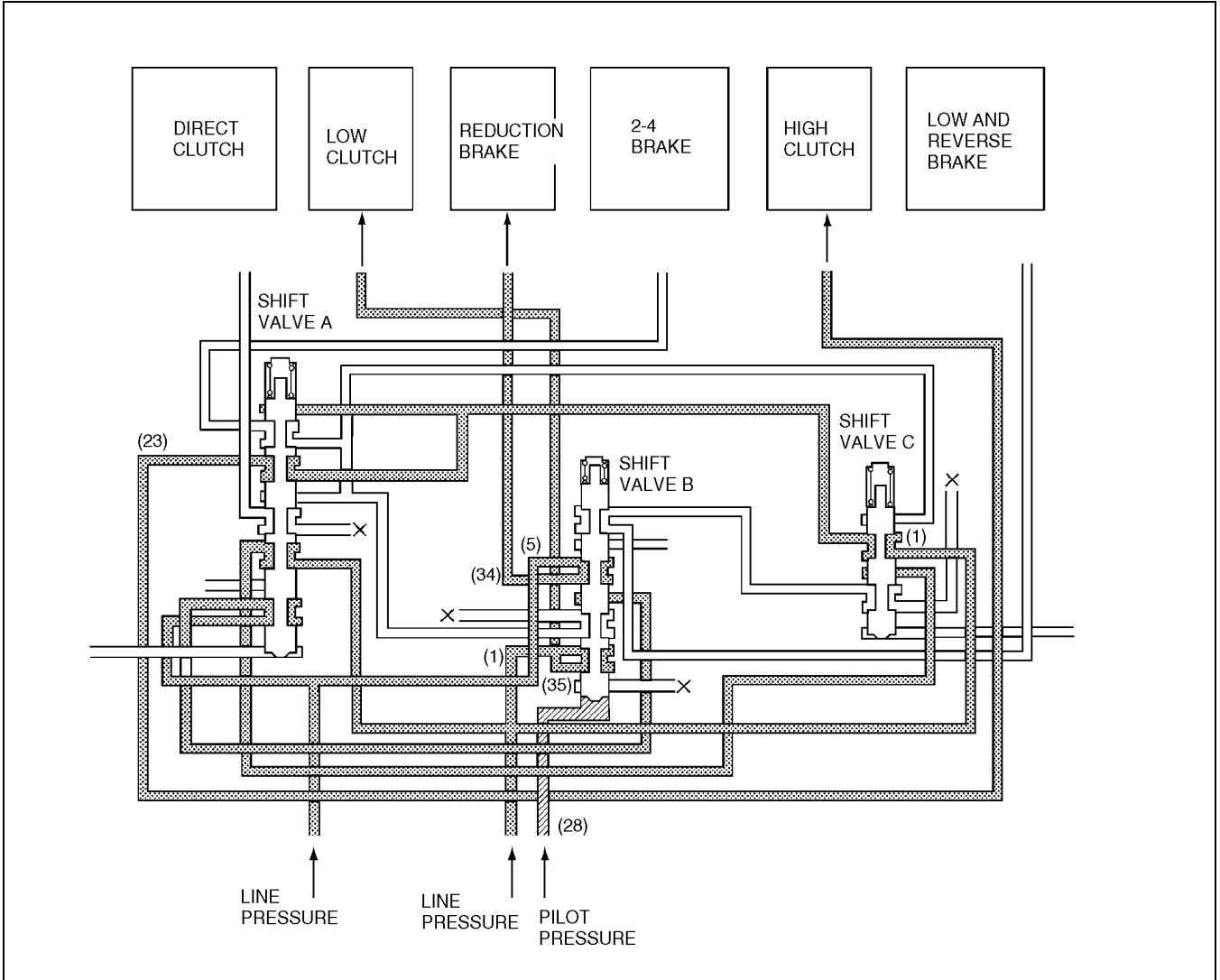
AMU0517A542

# AUTOMATIC TRANSAXLE

## Third gear

- Each shift solenoid is set to third gear mode. Pilot pressure is applied to the bottom end of shift valve B and shift valve B is positioned on the upper side. Conversely, shift valves A and C is positioned on the down side by spring force. Line pressure (1) flows through shift valve B and is applied to the low clutch (oil passage (35)). Also, line pressure (1) flows through the shift valve C and acts through the shift valve A and is applied to the high clutch (oil passage (23)). Line pressure (5) flows through shift valve B and is not applied to the reduction brake (oil passage (34)).

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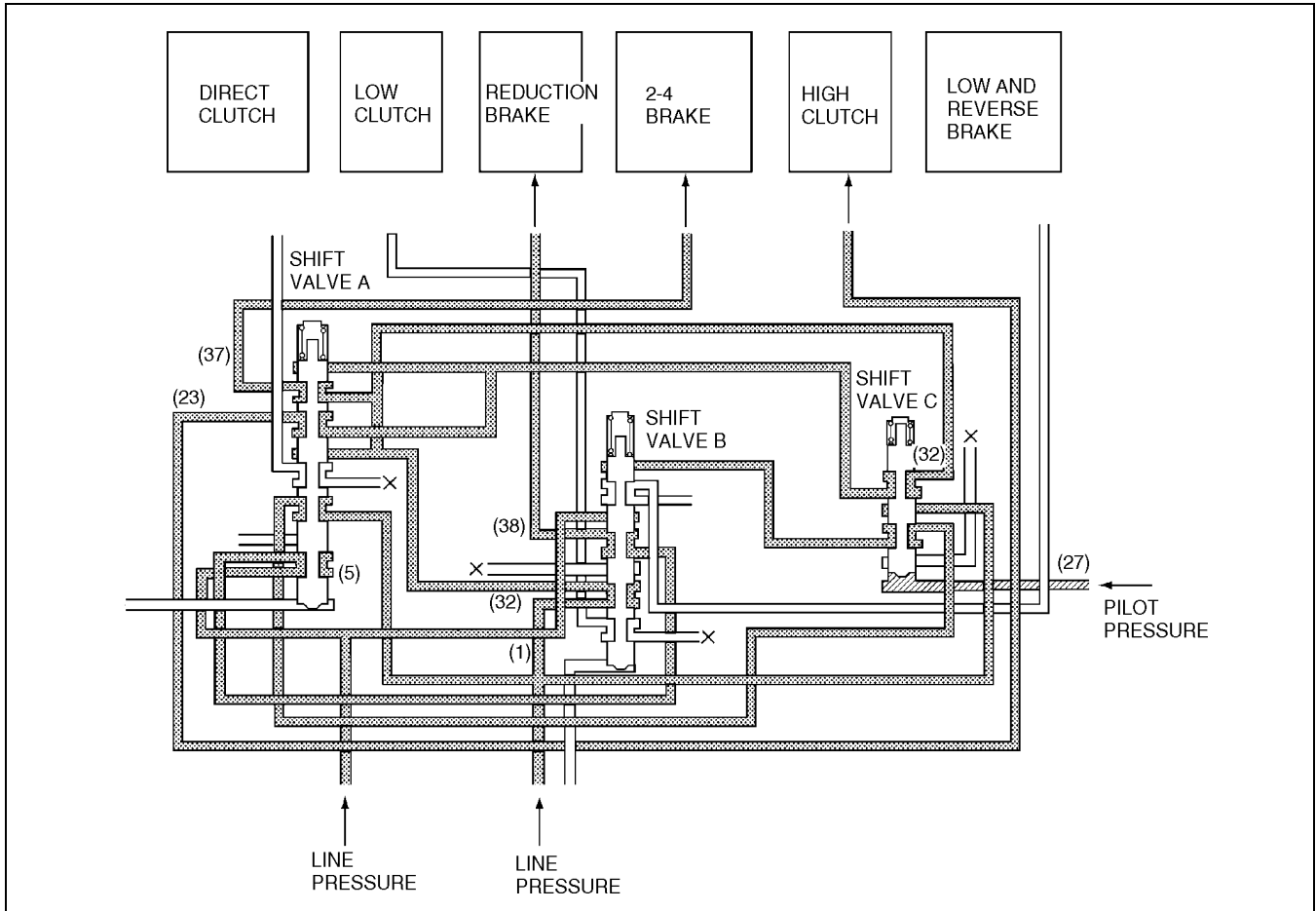


AMU0517A543

# AUTOMATIC TRANSAXLE

## Forth gear

- Each shift solenoid is set to forth gear mode. Pilot pressure is applied to the bottom end of shift valve C and positioned on the upper side. Conversely, shift valve A and B is positioned on the down side by spring force. Line pressure (1) flows through shift valve B and acts through the shift valve A and is applied the 2-4 brake (oil passage (37)). Conversely, line pressure (32) flows through shift valve C and acts through the shift valve A and is applied to the high clutch (oil passage (23)). Line pressure (5) flows through shift valve A and acts through shift valve B and is not applied to the reduction brake (oil passage (38)).



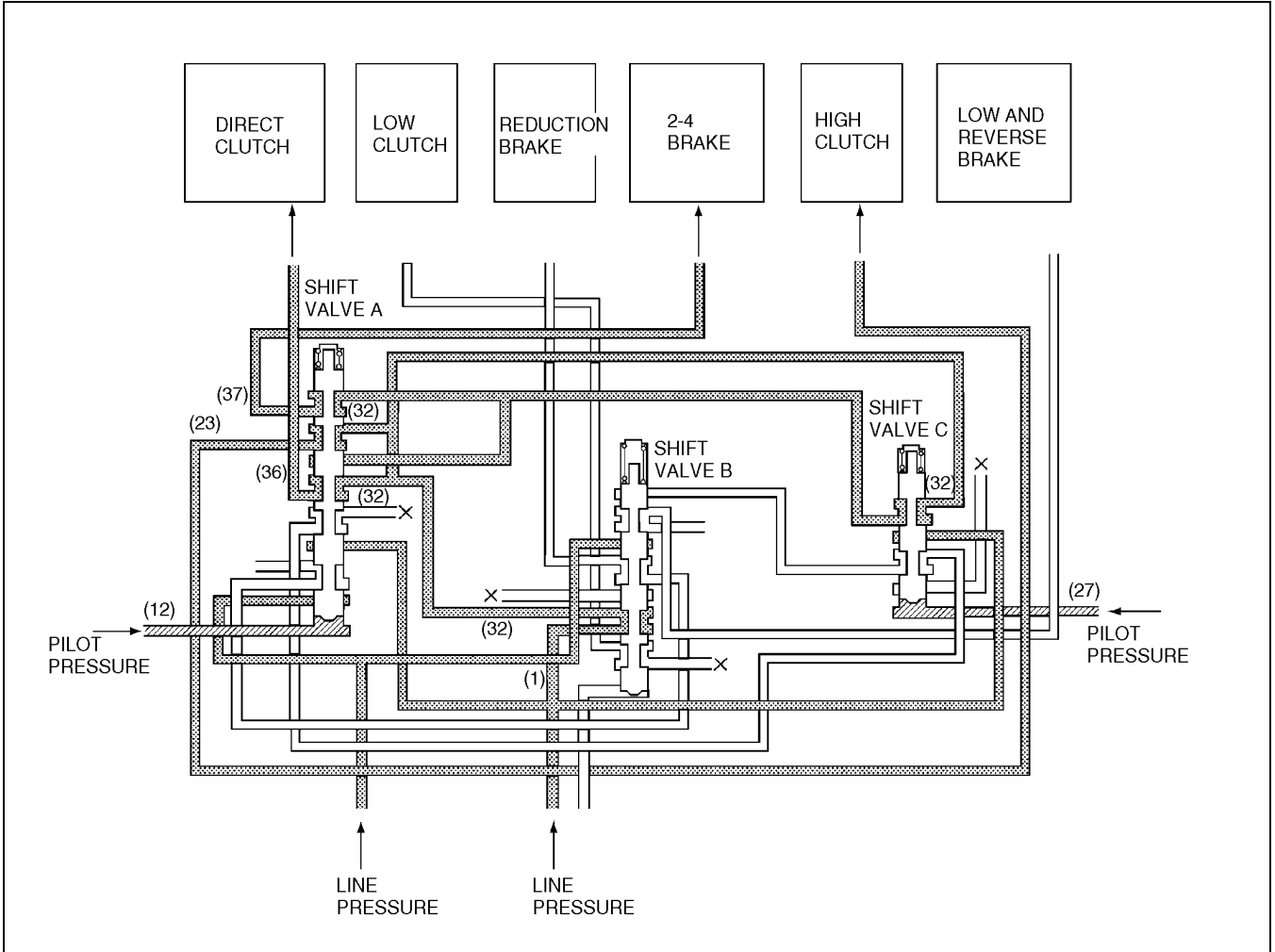
AMU0517A544

# AUTOMATIC TRANSAXLE

## Fifth gear

- Each shift solenoid is set to fifth gear mode. Pilot pressure is applied to the bottom end of shift valves A, C and shift valves A, C are positioned on the upper side. Conversely, shift valve B is positioned on the down side by spring force. Line pressure (1) flows through shift valve B and acts through shift valve A and is applied to the direct clutch (oil passage (36)). Line pressure (32) flows through shift valve A and is applied to the high clutch (oil passage (23)). Also, line pressure (1) that flows through shift valve B goes to shift valve C and is applied to the 2-4 brake acting through shift valve A (oil passage (37)).

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AMU0517A545

## AUTOMATIC TRANSAXLE

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### Torque Converter Clutch Control Valve

#### Outline

- The torque converter clutch control valve locks or releases the torque converter clutch by switching the oil passage of the torque converter pressure. Switching of the torque converter oil passage takes place via the torque converter clutch solenoid operation.

#### Operation

- Spring force operates on the right side of the valve and pushes the valve to the left. Conversely, torque converter clutch solenoid output pressure (10) is applied to the left side of the valve and pushes the valve to the right.

#### Releasing torque converter clutch

- Since torque converter clutch solenoid pressure (10) isn't applied to the valve, the valve is positioned on the left side by spring force. At this time, the torque converter pressure flows through oil passage (46) to oil passage (48) and is applied to the torque converter clutch releasing pressure passage of the torque converter. As a result, the torque converter clutch is released.

#### Locking torque converter clutch

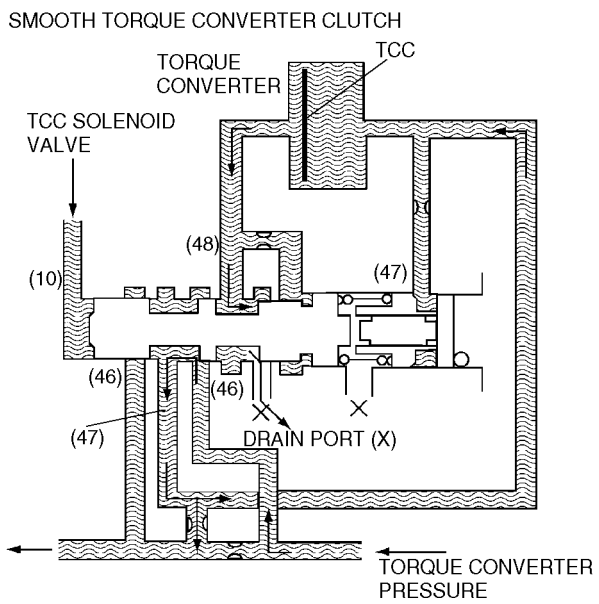
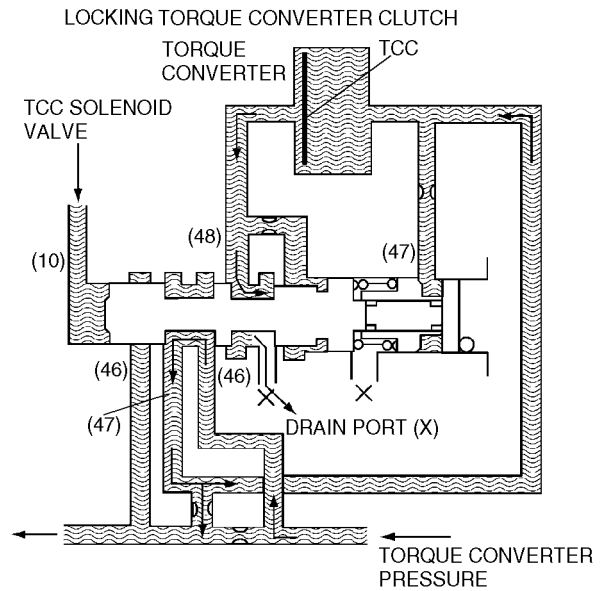
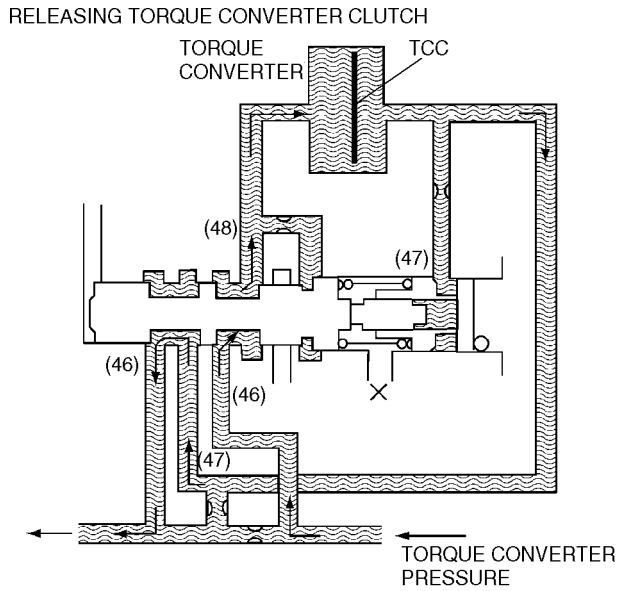
- Torque converter clutch solenoid output pressure (10) is applied to the valve and moves the valve to the right. At this time, oil passages (46) and (48) are blocked and the torque converter pressure that was applied to the torque converter clutch releasing passage is drained from drain port (X). Also, the torque converter pressure flows through oil passage (46) to oil passage (47) and is applied to the torque converter clutch locking passage. As a result, the torque converter clutch is locked.

#### Smooth Torque Converter Clutch

- Torque converter clutch solenoid output pressure (10) is gradually pressurized and is applied to the left end of the valve. Thus, the valve moves gradually to the right and drain port (X) opens.
- When drain port (X) begins to open, torque converter pressure (48) that was applied to the torque converter clutch release passage of the torque converter will gradually depressurize. Because of the balance between torque converter clutch solenoid output pressure (10) that was applied to the left of the valve, and spring force that was applied to the right of the valve, torque converter pressure (48) that was applied to the torque converter clutch release passage of the torque converter is controlled.
- The torque converter that is applied to torque converter clutch release passage (48) is depressurized as torque converter clutch solenoid output pressure (10) becomes higher. Thus, smooth torque converter clutch takes place by gradual pressurization of torque converter clutch solenoid output pressure (10).

# AUTOMATIC TRANSAXLE

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# AUTOMATIC TRANSAXLE

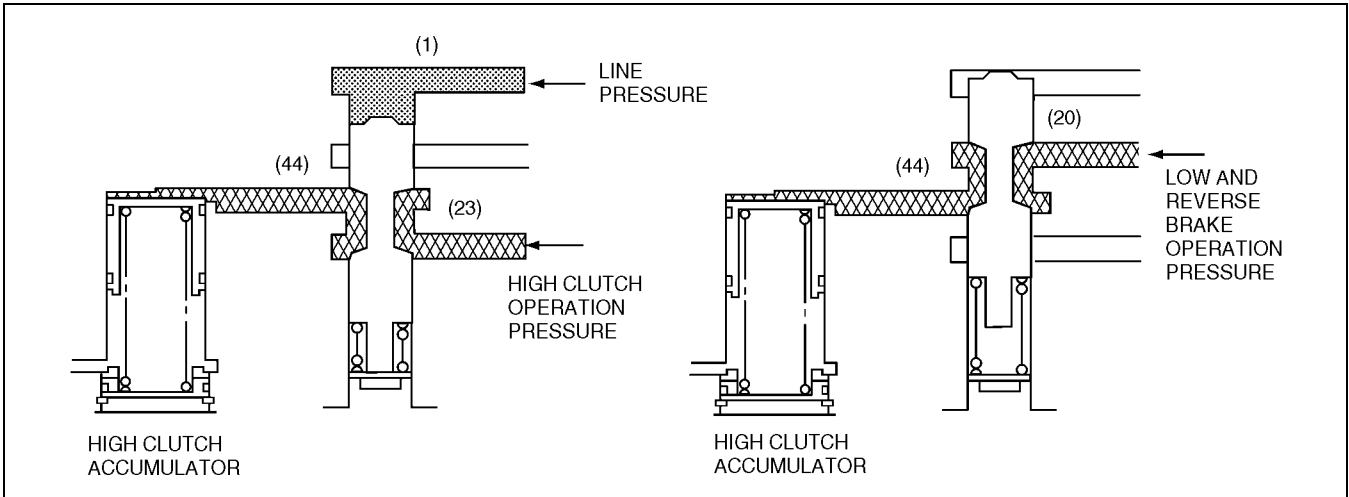
## Accumulator Switch Valve

### Outline

- The accumulator switch valve switches the oil passage that is applied to the high clutch accumulator. While in the forward drive range, the high clutch operation pressure is applied to the high clutch accumulator via the accumulator switch valve. While in R position, low and reverse brake operation pressure is applied to the high clutch accumulator via the accumulator switch valve.

### Operation

- The accumulator switch valve is pushed upward by spring force. While in the forward drive range, line pressure (1) from the manual valve is applied to the top end of the accumulator switch valve and pushes the valve downward. In this condition, high clutch operation pressure (23) is applied to the high clutch accumulator via the valve.



AMU0517A548

- While in R position the valve is pushed upward by the spring force because line pressure (1) is drained. In this condition, low and reverse brake operation pressures (20) are applied to the high clutch accumulator via the valve.

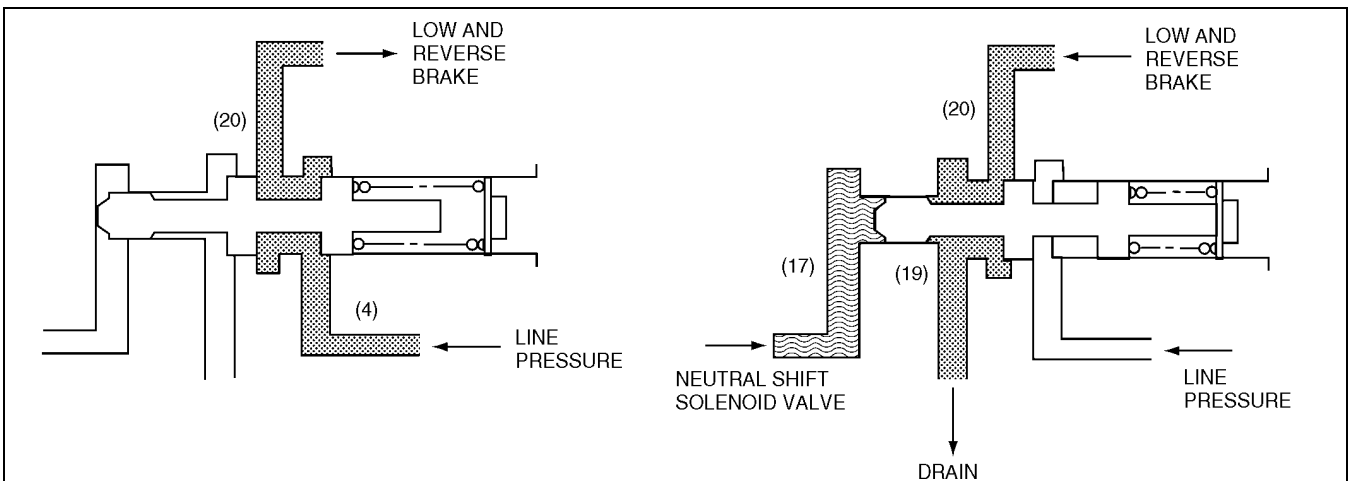
## Reverse Inhibit Valve

### Outline

- The reverse inhibit valve switches the line pressure oil passage that is applied to the low and reverse brakes while in reverse.

### Operation

- Spring force is applied to the right side of the valve and pushes it to the left. While in reverse, the neutral shift solenoid valve does not operate so the valve is positioned on the left by spring force. In this condition, oil passages (4) and (20) are connected and line pressure (4) from the manual valves is applied to the low and reverse brake via oil passage (20). When driving forward with speed of 30 km/h {19 mph} or more and the R position is selected, the neutral shift solenoid is ON to prevent shock or engine stoppage, and pilot pressure (17) generates. By this pressure, the reverse inhibit valve is pushed to the right and line pressure passage to the low and reverse brake is blocked. Since the low and reverse brake are drained, the drive force is not transferred the transmission is put in are neutral.



AMU0517A549



# AUTOMATIC TRANSAXLE

## Manual Valve

### Outline

- The manual valve and selector lever operate simultaneously. It is a valve that distributes optimum line pressure to the control valve according to the drive ranges.

### Operation

- The manual valve is connected to the selector lever mechanically through linkage and switches the oil passage according to the selector lever movement from the P position to the L range. Line pressure (5) from the oil pump is always applied to the manual valve.

### P position

- Line pressure (5) is not distributed to any of the control valves.

### R position

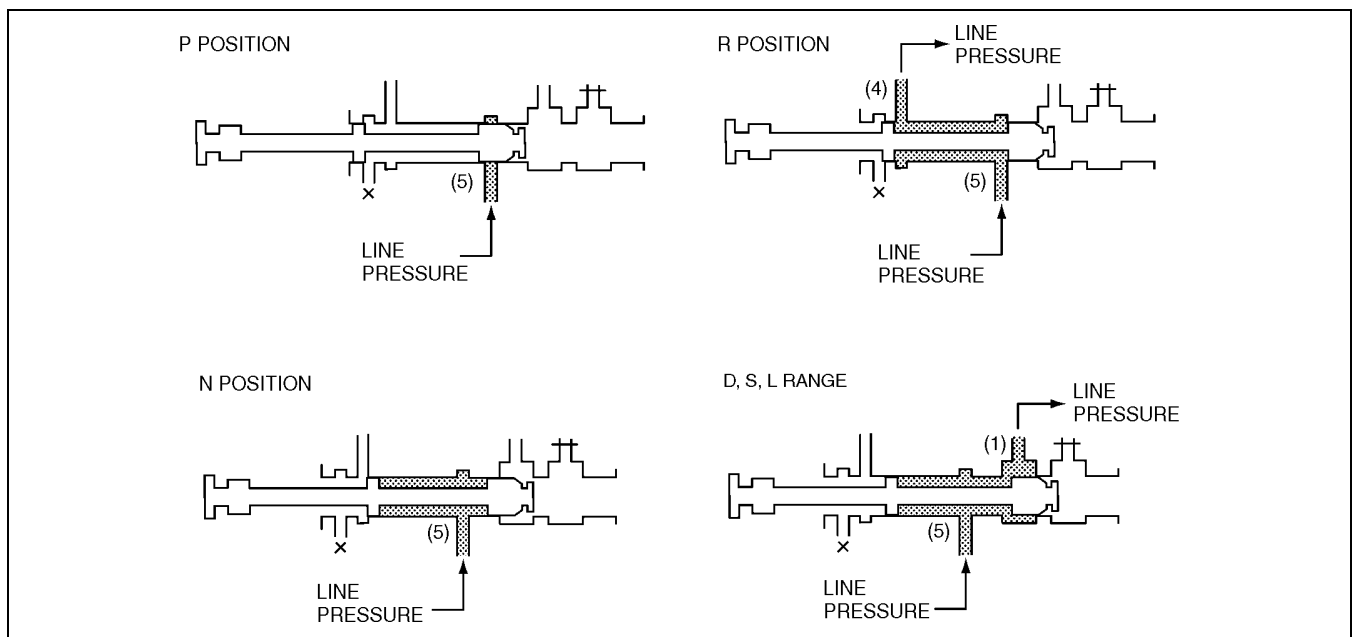
- Line pressure (5) is distributed to oil passage (4) passing the manual valve and is applied to the reverse clutch, low and reverse brake, and the reduction brake operation pressure.

### N position

- Line pressure (5) is not distributed to any of the control valves.

### D, S, L range

- Line pressure (5) is distributed to oil passage (1) passing the manual valve and is applied to each clutch and brake operation pressure according to the gear range.



AME5614A002

# AUTOMATIC TRANSAXLE

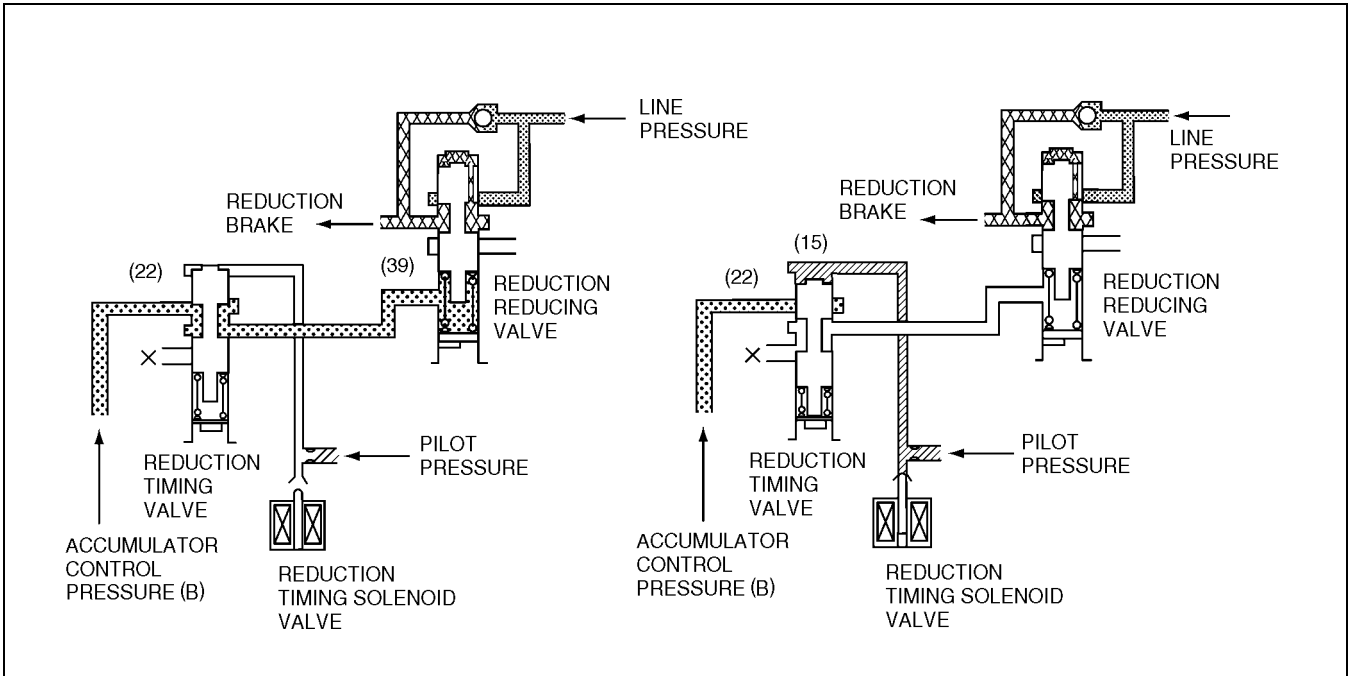
## Reduction Timing Valve

### Outline

- The reduction timing valve switches the oil passage according to the operation of the reduction timing solenoid. By this valve, the reduction reducing valve pressure adjustment point changes.

### Operation

- Spring force is applied to the bottom end of the valve and pushes the the valve upward. Conversely, reduction timing solenoid pressure (15) is applied to the top end of the valve and pushes the valve downward.
- When the reduction timing solenoid is in the OFF condition, the reduction timing valve is positioned on the upper side by spring force, and back pressure of accumulator control pressure B (22) is applied to oil passage (39) of the reduction reducing valve.
- When the reduction timing solenoid is in the ON condition, the reduction timing valve is positioned on the lower side below and oil pressure is not applied to the reduction reducing valve.



AME5714A007

# AUTOMATIC TRANSAXLE

## Low Clutch Accumulator

### Outline

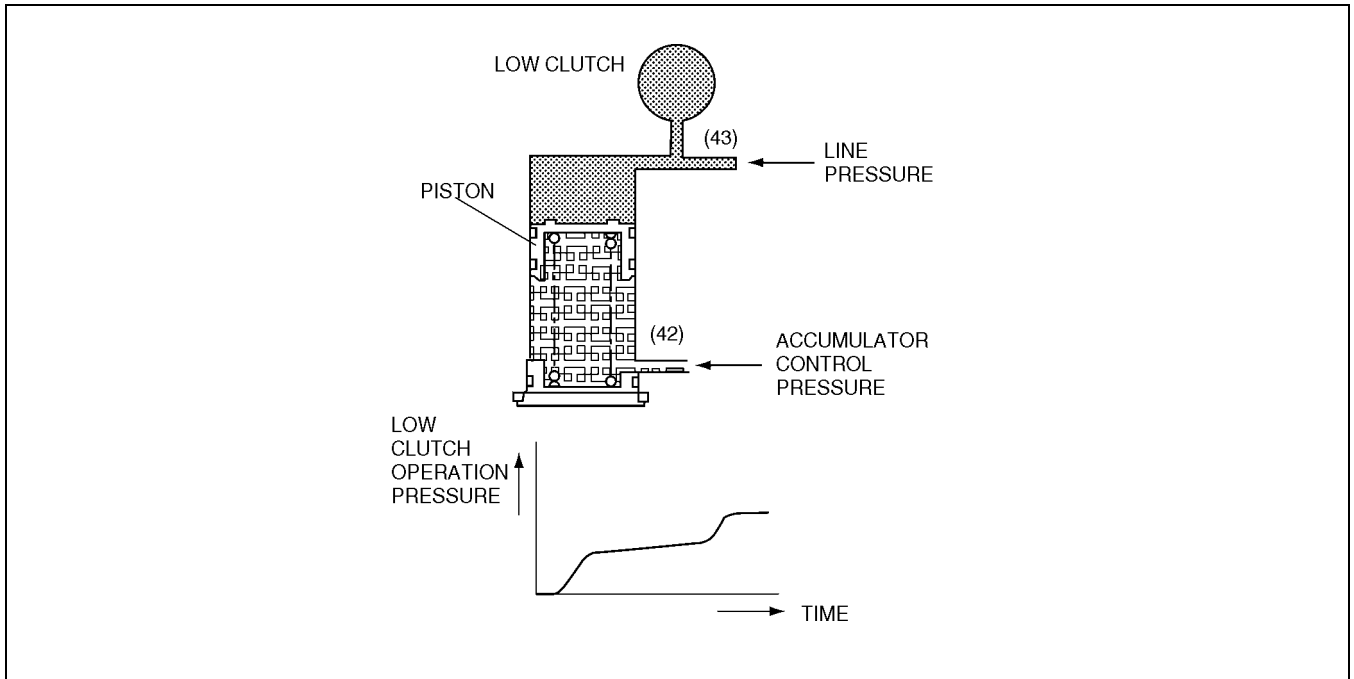
- The low clutch accumulator locks the low clutch smoothly.

### Operation

- The low clutch accumulator piston is pushed upward by spring force.

### Selecting N position to D range

- While in the N position, accumulator control pressure (42) is applied to the bottom end of the accumulator control piston and pushes the piston upward.
- When D range is selected from the N position, line pressure (43) is applied to the low clutch and low clutch accumulator. When line pressure (43) is applied to the upper part of the accumulator piston, the piston begins to move downward. While the piston is moving, line pressure (43) is pressurized gradually and the shock from the low clutch locking will decrease.



AMU0517A552

# AUTOMATIC TRANSAXLE

## High Clutch Accumulator

### Outline

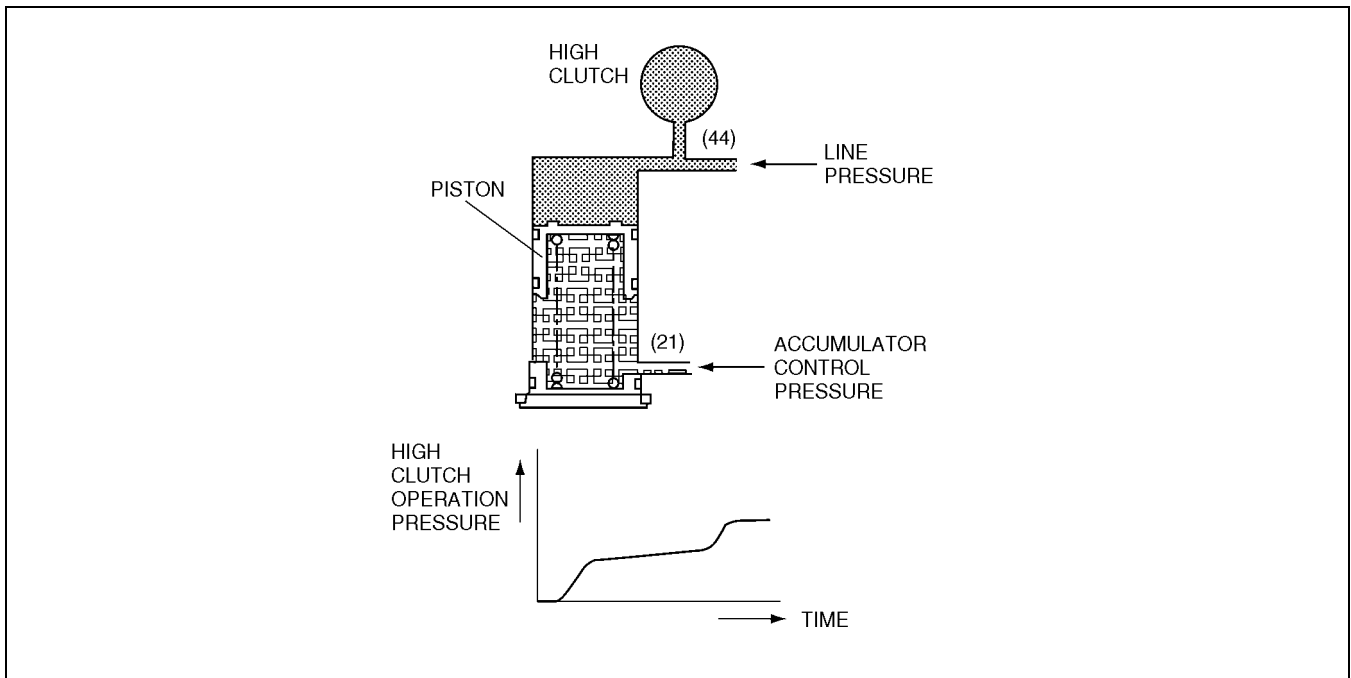
- The high clutch accumulator locks the high clutch smoothly. Also, when shifting up to third gear and shifting down from third gear, the high clutch accumulator controls the locking and releasing timing of the high clutch. Moreover, the high clutch accumulator plays the role of locking the low and reverse brake smoothly when selecting R position.

### Operation

- The high clutch accumulator piston is pushed upward by spring force.

### Forward drive ranges

- While in the forward drive range, accumulator control pressure (21) is applied to the bottom part of the accumulator control piston and pushes the piston upward. When shifting up to third gear, line pressure (44) is applied to the high clutch and the high clutch accumulator. When line pressure (44) is applied to the upper part of the accumulator piston, the piston begins to move downward. While the piston is moving, line pressure (44) is pressurized gradually and the shock from the high clutch locking will decrease.



AMU0517A553

### R position

- While in the R position, the accumulator switch valve switches the line pressure passage, and low and reverse brake operation pressure instead of high clutch operation pressure is applied to the high clutch accumulator. As a result, when locking the low and reverse brakes, the operation pressure (line pressure) gradually pressurizes and decreases the select shock.

## Modifier Accumulator

### Outline

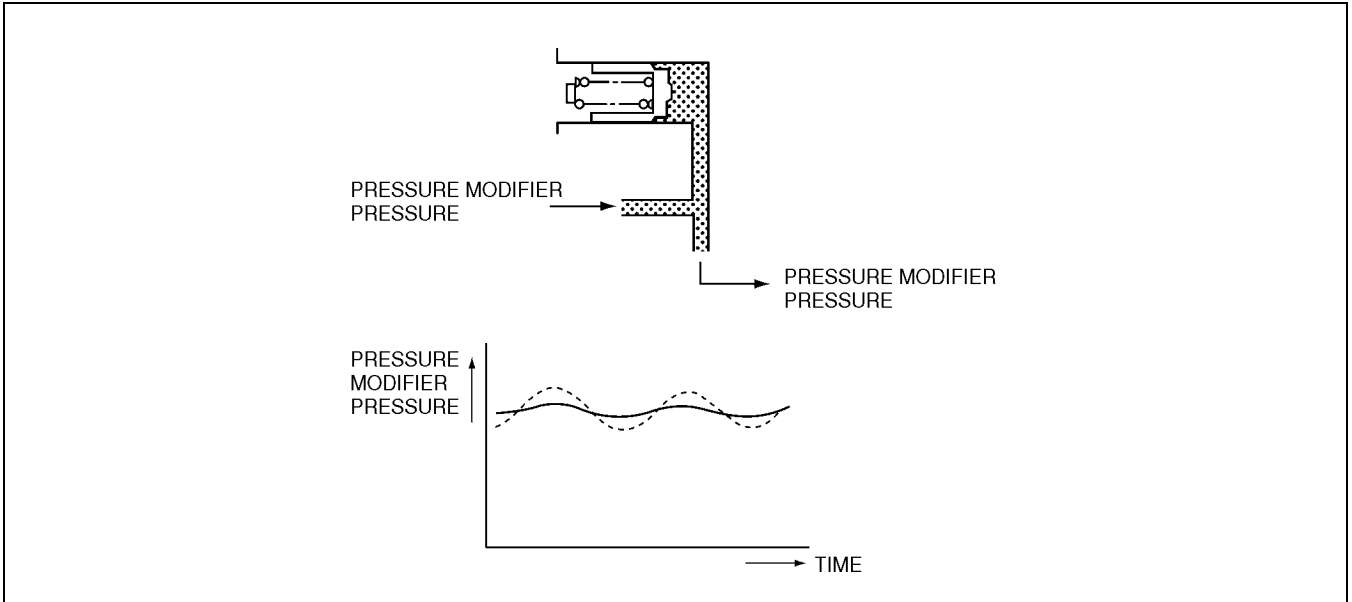
- The modifier accumulator has the role of absorbing the pulsation from the pressure modifier pressure.

### Operation

- The accumulator piston is pushed to the right by spring force. Conversely, pressure modifier pressure is applied to the right side of the piston and pushes the piston to the left side. The accumulator piston is maintained by the balance of pressure modifier pressure and spring force. The piston moves to the left when the pressure modifier pressure becomes high and absorbs the pressure. Conversely, when the pressure becomes low, the piston moves to the right and compensates for the pressure insufficiency.

# AUTOMATIC TRANSAXLE

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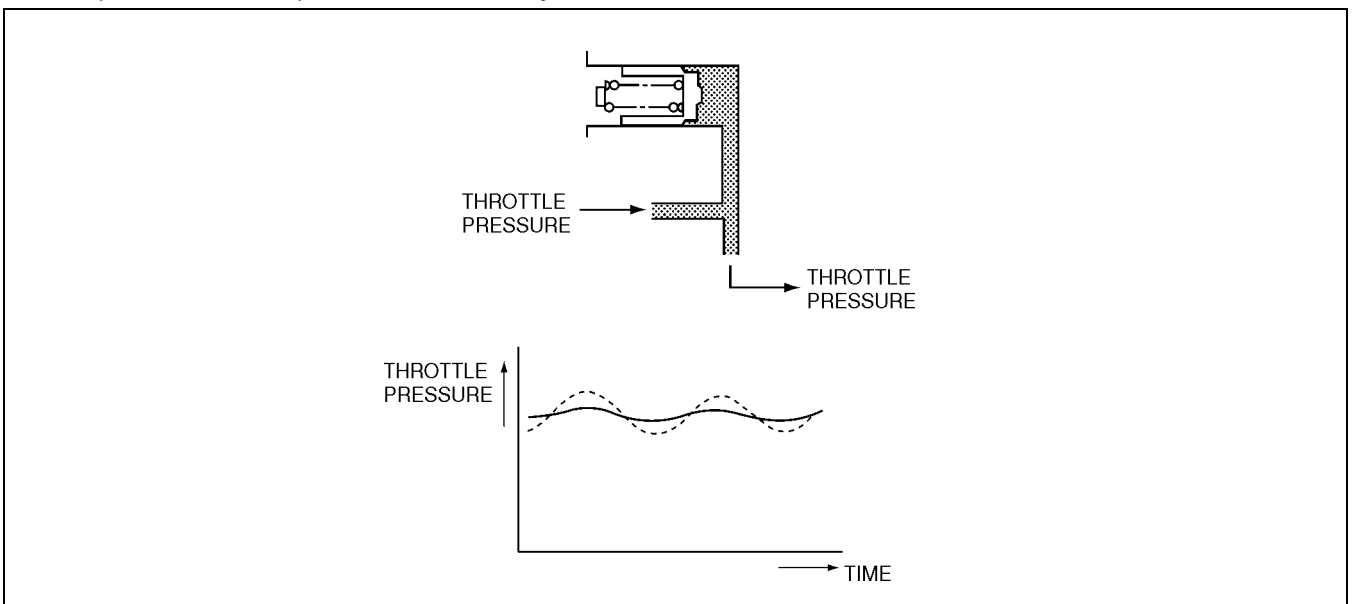
## Throttle Accumulator A, B, and C

### Outline

- The throttle accumulator has the role of absorbing the pulsation from the throttle pressure.

### Operation

- The accumulator piston is pushed to the right by spring force. Conversely, throttle pressure is applied to the right side of the piston and pushes the piston to the left side. The accumulator piston is maintained by the balance of the throttle pressure and the spring force. When the throttle pressure is high, the piston moves to the left and absorbs the pressure. Conversely, when the pressure is low, the piston moves to the right and compensates for the pressure insufficiency.



AMU0517A555

# AUTOMATIC TRANSAXLE

## POWER TRANSMISSION/HYDRAULIC MECHANISM DESCRIPTION

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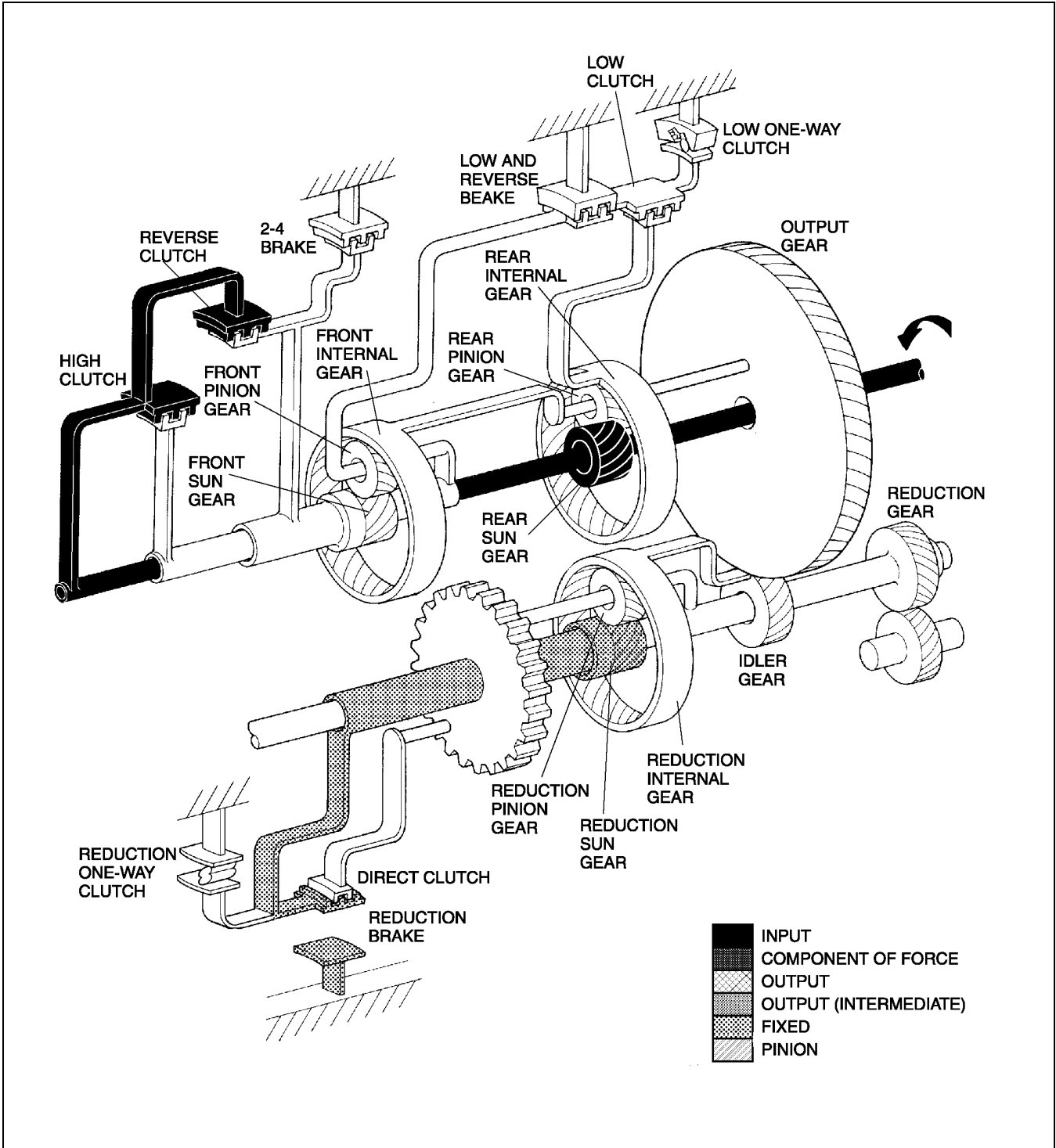
### Note

- All rotation is described as viewed from the side cover

### P/N Position

#### Outline

- Engine starting is possible only when in P and N position.
- The output shaft of the transaxle is mechanically locked in P position.



AME5714A006

## AUTOMATIC TRANSAXLE

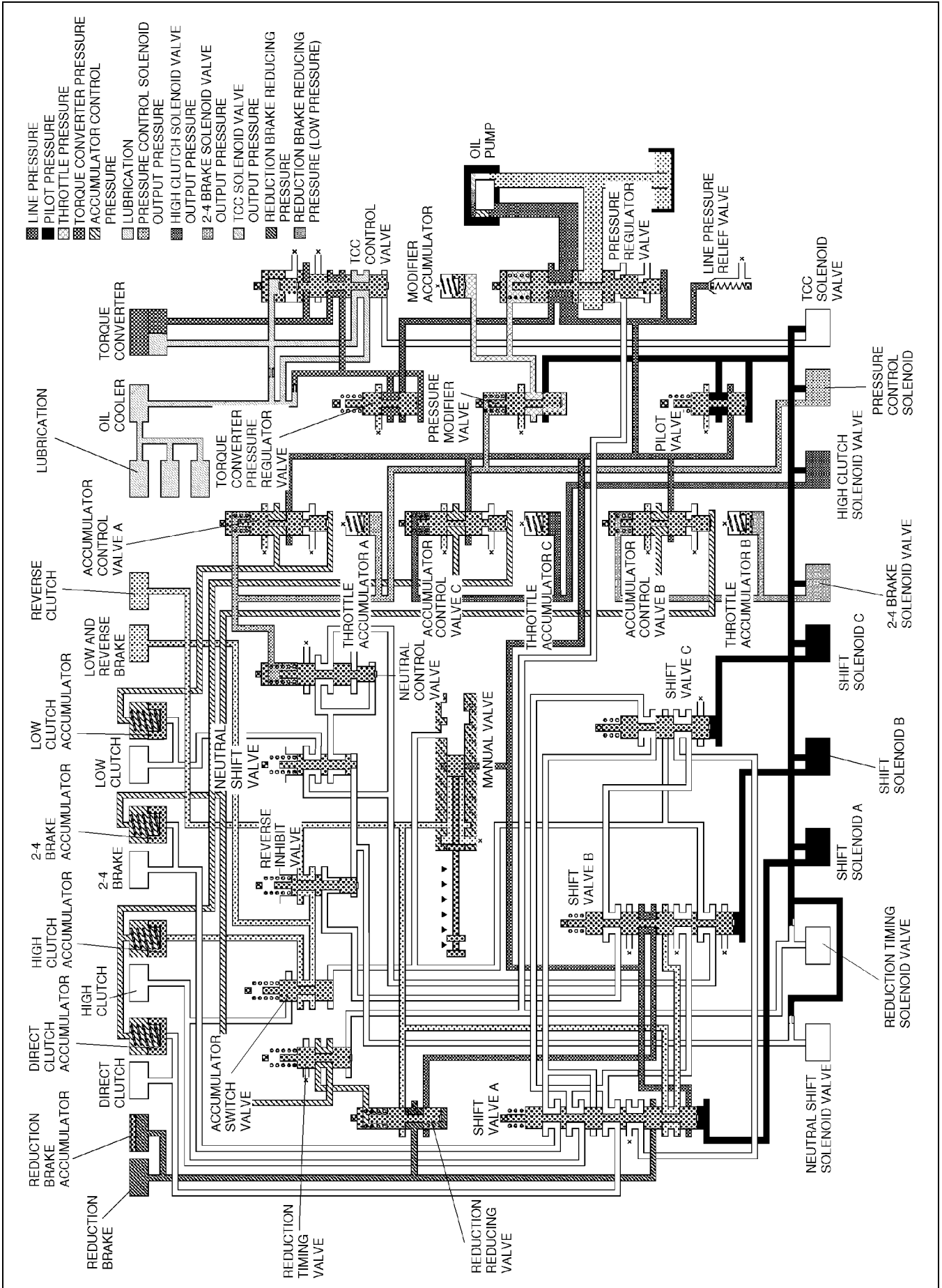
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### Operation

- The driving force of the input shaft is transmitted to the reverse and high clutch drum, and rear sun gear.
- Neither the reverse clutch nor high clutch is engaged, so the driving force of the reverse and high clutch drum is not transmitted.
- The driving force of the rear sun gear is transmitted to the rear pinion and rear internal gear. However, the rear internal gear only rotates freely, and the driving force is not transmitted because the low clutch is not engaged. (These descriptions are applicable to both P and N positions.)
- When P position is selected, the parking rod operates due to the linkage structure with the selector lever, and the parking gear is mechanically locked by the parking pawl, resulting in the final gear being fixed.

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# AUTOMATIC TRANSAXLE



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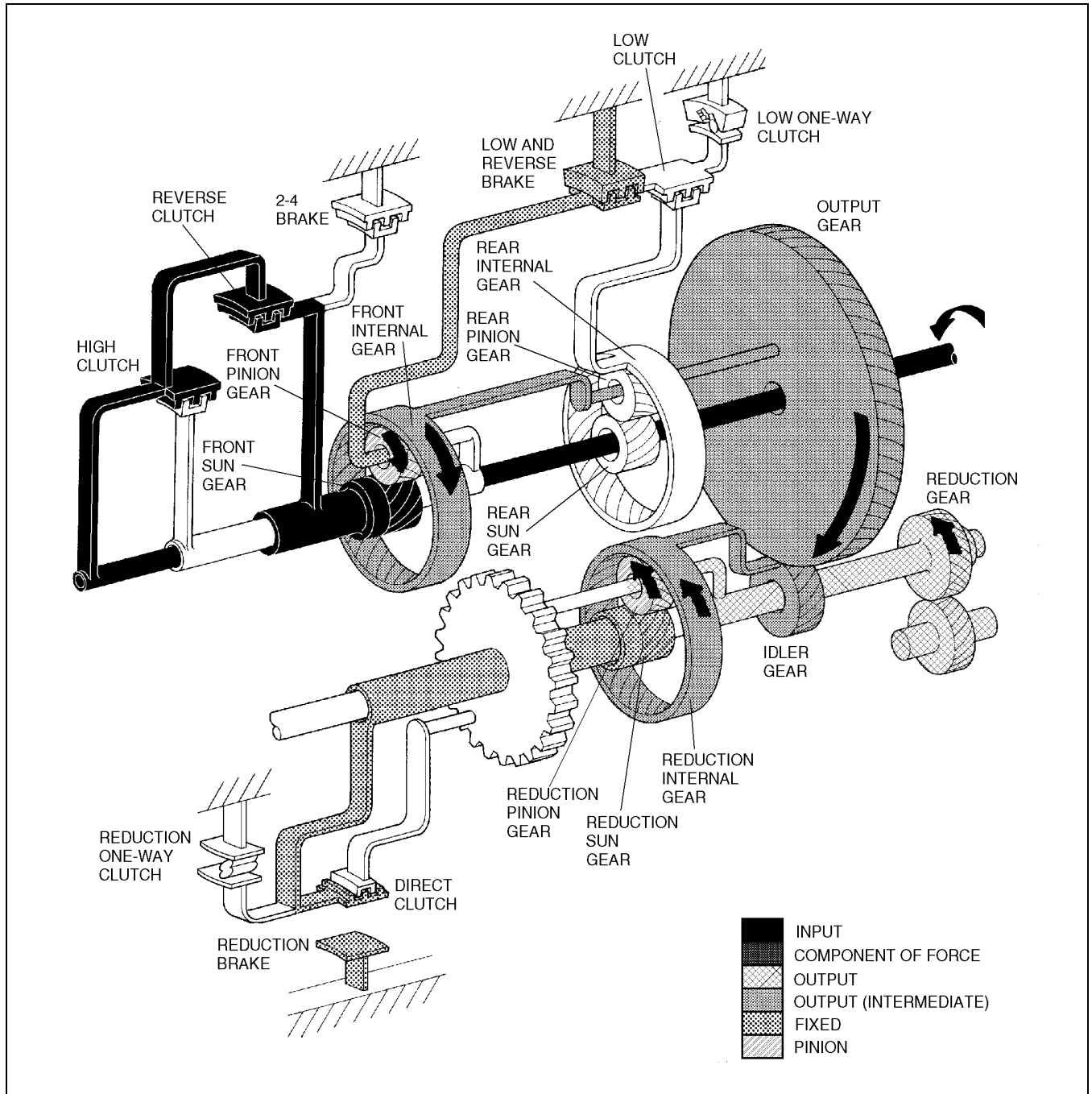
# AUTOMATIC TRANSAXLE

## R Position

### Outline

- When R position is selected, the hydraulic circuit of the manual valve is switched which engages the reverse clutch and low and reverse clutch.
- Gear changes can not occur in R position. However, when the driving speed is over 30 km/h {19 mph} during forward movement and R position is selected, the low and reverse brake does not operate and the driving force is not transmitted due to the operation of the reverse inhibit valve. With this mechanism, driving safety is ensured by preventing misoperation of the selector lever.

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## AUTOMATIC TRANSAXLE

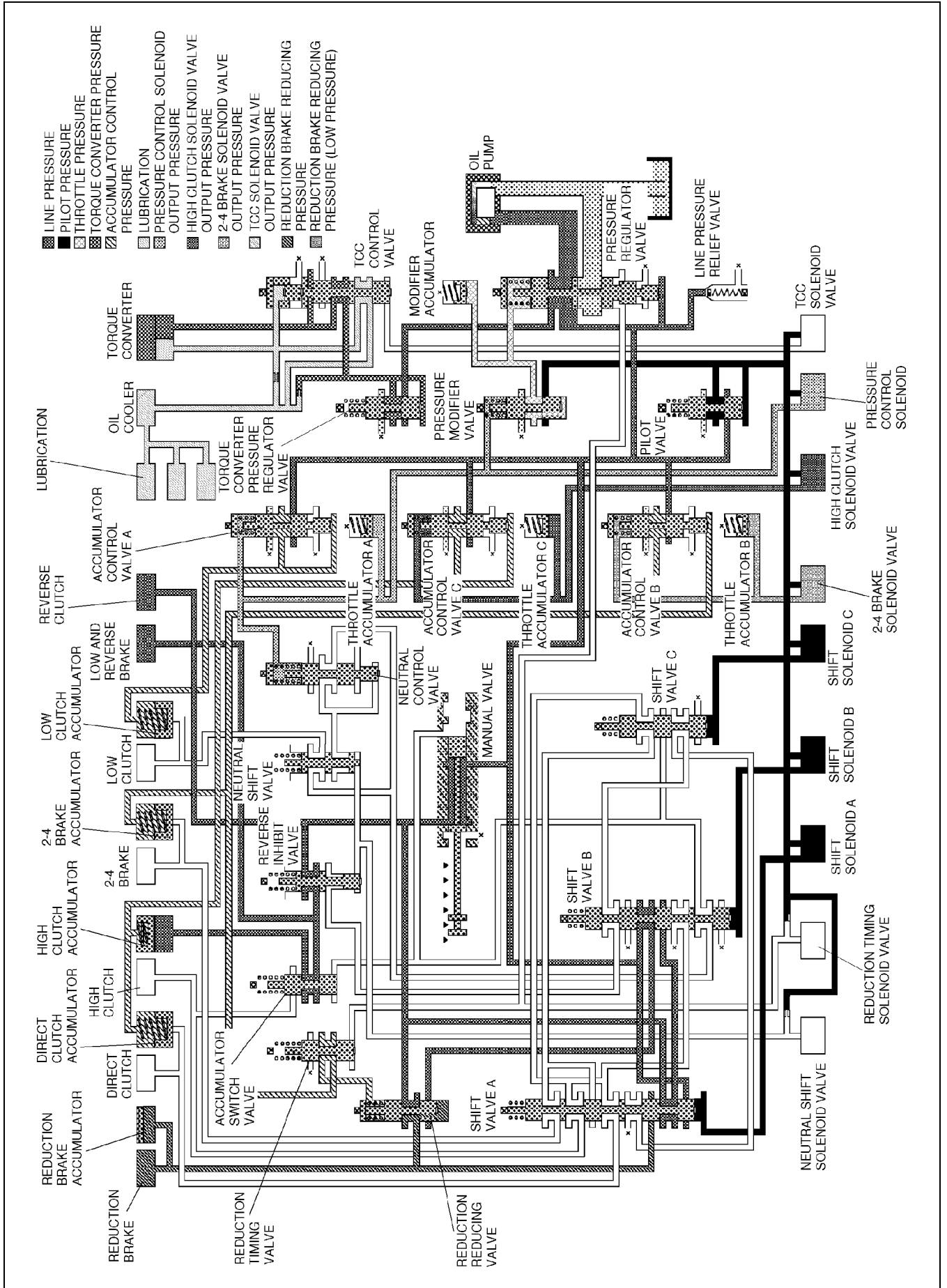
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### Operation

- The driving force of the input shaft is transmitted to the front sun gear via the reverse clutch hub because the reverse clutch is engaged.
- When the front sun gear rotates counterclockwise, it causes the front pinion to revolve counterclockwise. However, since the front planetary carrier is fixed to the low and reverse brake via the low clutch drum, revolution of the front pinion is locked. As a result, the front pinion can not revolve around the front sun gear but rather starts to rotate clockwise on its center, causing the front internal gear to also rotate clockwise. The driving force is transmitted to the output gear in clockwise rotation because the front internal gear is integrated with rear planetary carrier. (This is the opposite to rotation during forward movement.)
- As the driving force transmitted from the output gear to the idler gear tries to rotate the reduction internal gear counterclockwise and to revolve the reduction pinion counterclockwise, the force also tries to rotate the reduction pinion counterclockwise and to rotate the reduction sun gear clockwise as the load from the vehicle is applied to the reduction planetary carrier. This load acts as a force that prevents the reduction planetary carrier from rotating counterclockwise.
- However, the reduction pinion overcomes the load from the vehicle to revolve counterclockwise while rotating counterclockwise as the reduction sun gear is fixed by the reduction brake.
- This counterclockwise revolution of the reduction pinion is transmitted to the reduction planetary carrier and then to the reduction gear.
- During deceleration, the torque is transmitted from the driving wheels in the opposite direction of that during acceleration, and engine braking is applied. The torque from the opposite direction is also transmitted in R position because the one-way clutch is not used.

# AUTOMATIC TRANSAXLE

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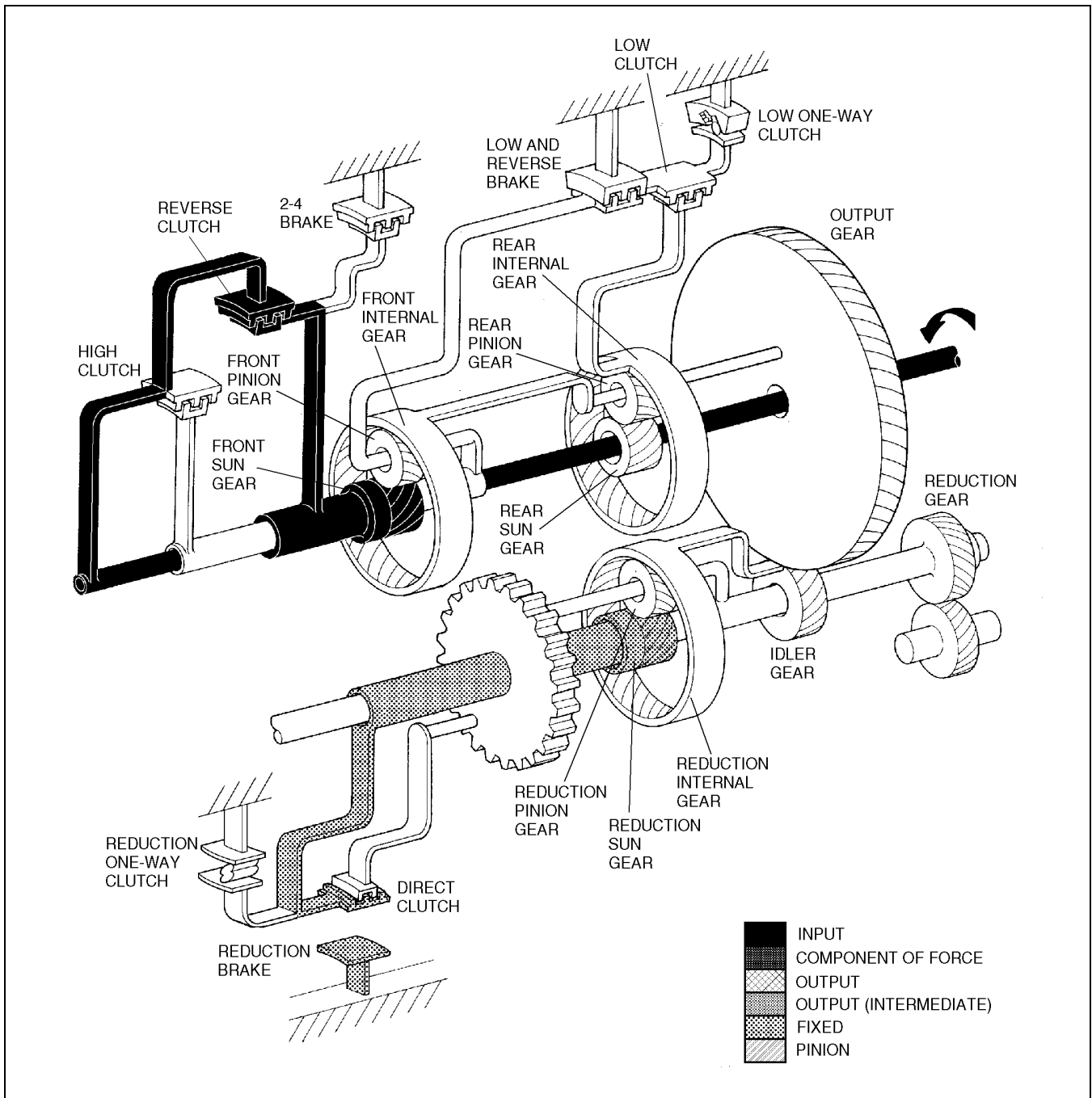
AMU0517A558

# AUTOMATIC TRANSAXLE

## R Position (Reverse Inhibition Control)

### Outline

- The driving force of the input shaft is transmitted to the reverse and high clutch drum, and then to the front sun gear through the reverse clutch, causing the front sun gear to rotate counterclockwise.
- None of the low and reverse brake are operating, however, so this force is not transmitted to the output gear.



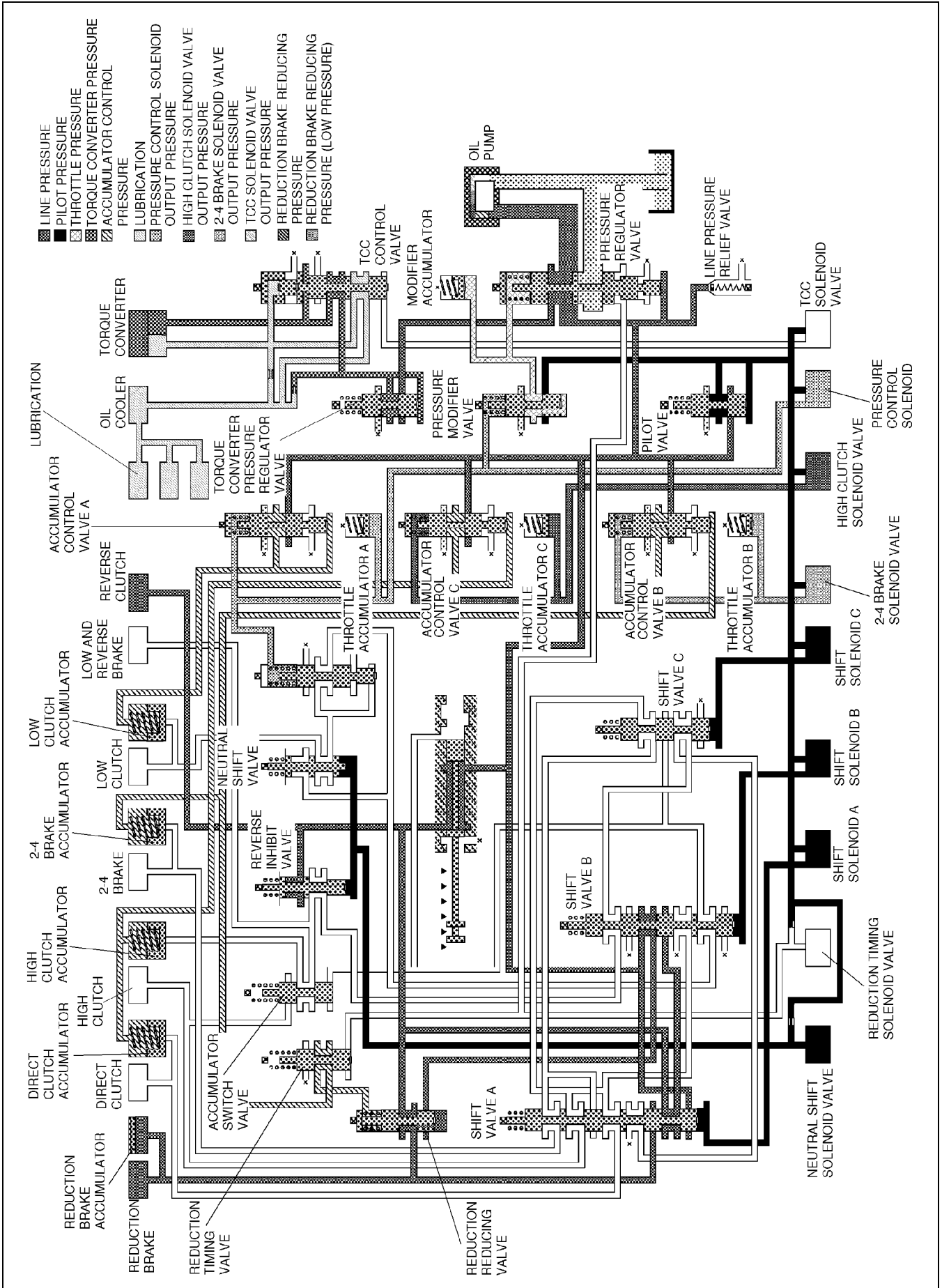
## AUTOMATIC TRANSAXLE

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### Operation

- Line pressure applied to the manual valve is transmitted to line pressure, which engages the reverse clutch.
- Neutral shift solenoid valve is ON, the low and reverse brake does not engage.
- Line pressure driven to the pressure regulator valve is transmitted to torque converter pressure and sent to the torque converter through the TCC control valve.

# AUTOMATIC TRANSAXLE



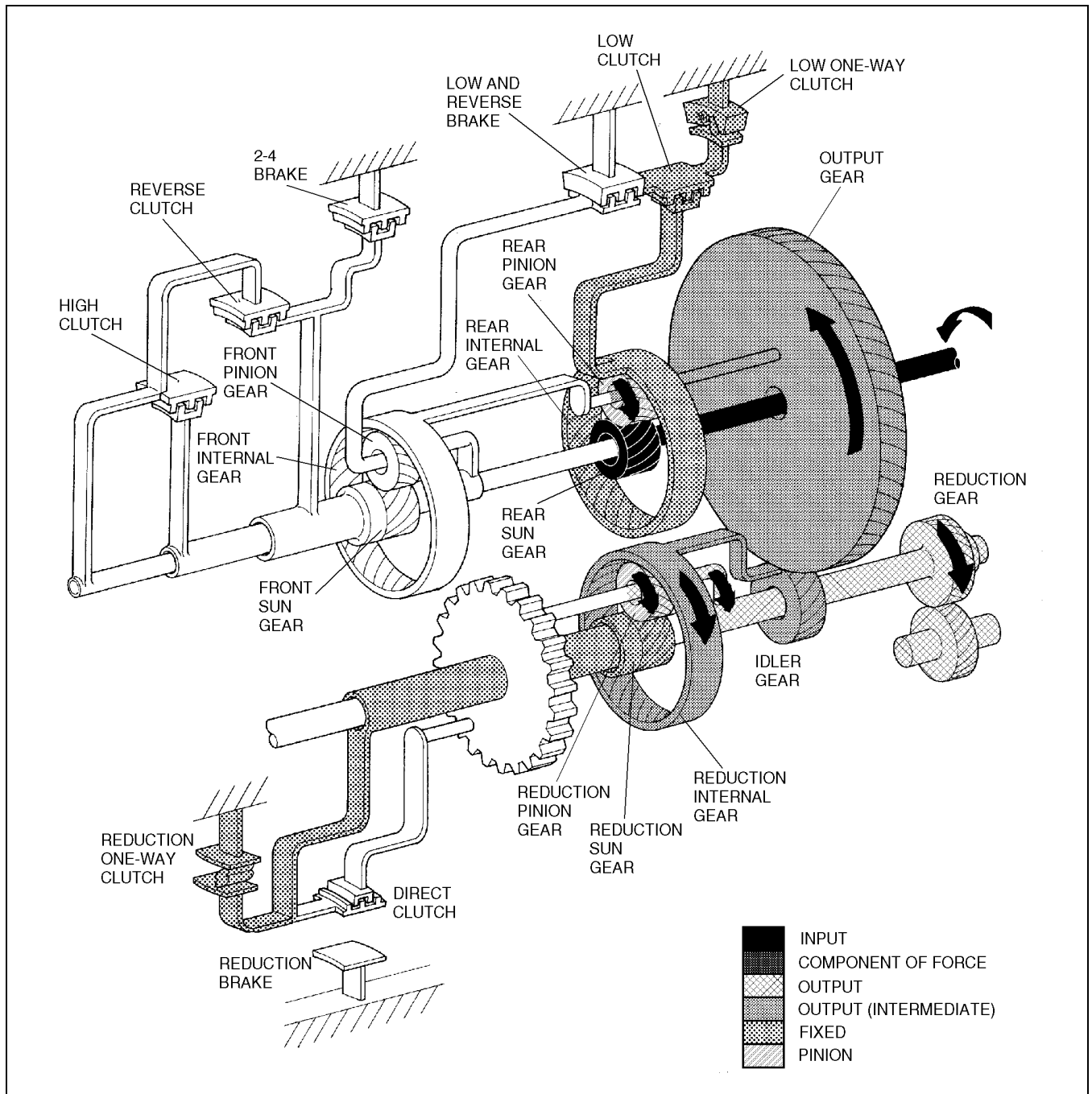
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# AUTOMATIC TRANSAXLE

## First Gear (D range)

### Outline

- When the manual valve is switched to D range, line pressure is supplied to the shift valve.
- Since shift solenoids A, B, and C are ON in first gear, pilot pressure is applied to the bottom end of each shift valve, causing each shift valve to move upwards, resulting in engagement of the low clutch.



## AUTOMATIC TRANSAXLE

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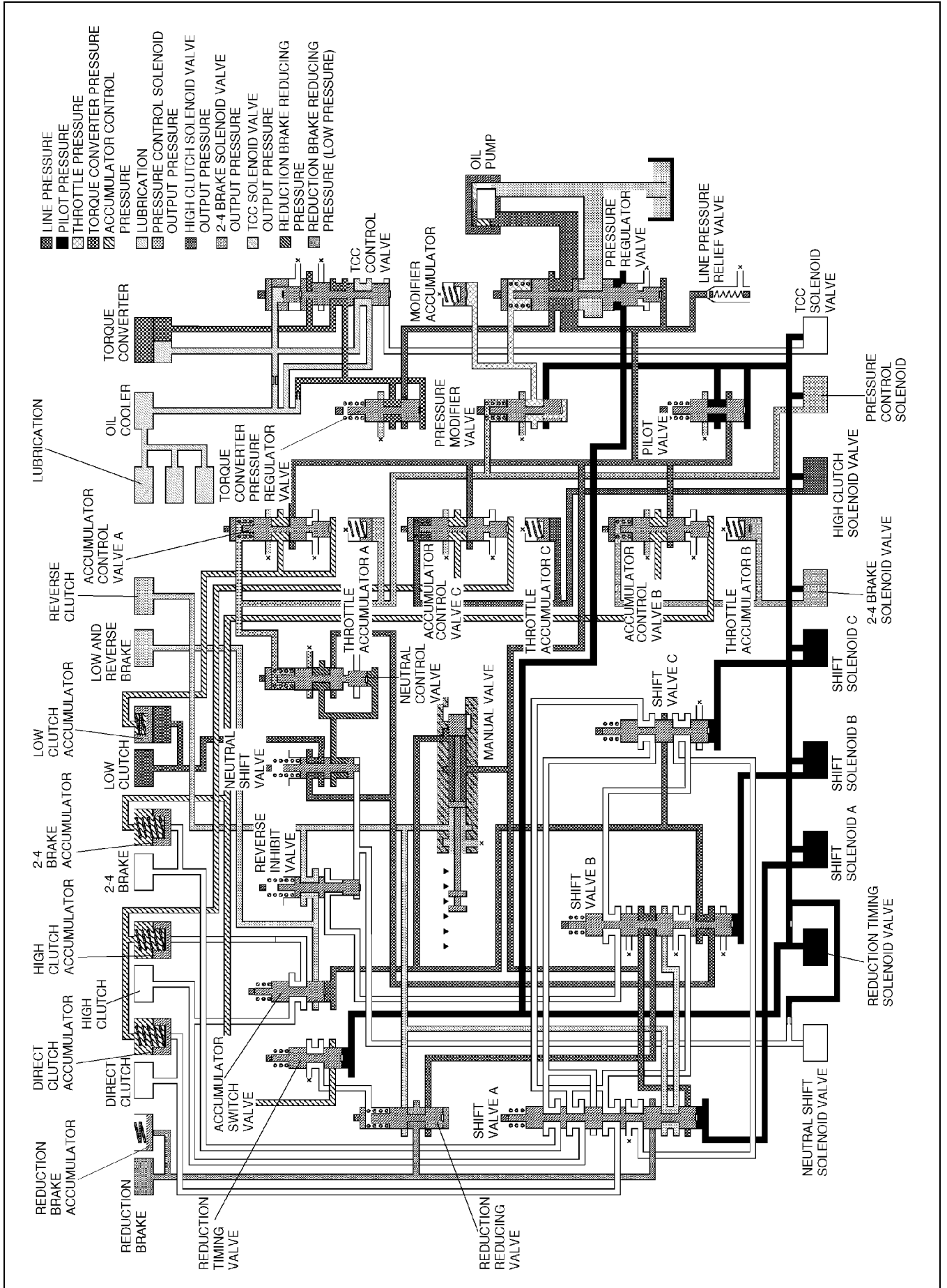
### Operation

- The driving force of the input shaft is transmitted to the rear sun gear to rotate it counterclockwise, applying force to the rear pinion to revolve counterclockwise. Since the rear planetary carrier is integrated with the output gear, load from the vehicle (force that tries to prevent the rear planetary carrier from rotating counterclockwise) is applied and the rear pinion gear tries to rotate clockwise.
- Though the rear internal gear tries to rotate clockwise due to the clockwise rotation force of the rear pinion gear, the rear internal gear rotation is locked by the low one-way clutch due to the engagement of the the low clutch.
- Due to this, the driving force of the rear pinion overcomes the load from the vehicle to revolve counterclockwise while rotating clockwise, and rotates the rear planetary carrier counterclockwise.
- Therefore, the output gear also rotates counterclockwise and the driving force is transmitted to the reduction internal gear via the idler gear.
- As the reduction gear rotates clockwise trying to revolve the reduction pinion clockwise, the reduction pinion tries to rotate clockwise as the load from the vehicle (force that prevents the reduction carrier from rotating clockwise) is applied.
- The force of the reduction pinion, which tries to rotate clockwise, tries to rotate the reduction sun gear counterclockwise. However, counterclockwise rotation of the reduction sun gear is locked by the reduction one-way clutch. Due to this, the driving force of the reduction pinion overcomes the load from the vehicle to revolve clockwise while rotating clockwise, and rotates the reduction carrier clockwise.
- Therefore, the reduction gear also rotates clockwise and the driving force is transmitted to the driving wheels.
- During deceleration, torque is transmitted from the driving wheels to the engine in the opposite direction of that during acceleration. First, force is transmitted from the driving wheels via the final gear and reduction gear to rotate the reduction carrier clockwise. Also, this force tries to revolve the reduction pinion clockwise.
- The force that revolves the reduction pinion clockwise tries to rotate the reduction internal gear clockwise. However, as the load from the engine (force that tries to prevent the reduction internal gear from rotating clockwise) is applied to the reduction internal gear, the reduction pinion rotates counterclockwise.
- Due to the counterclockwise rotation of the reduction pinion, the reduction sun gear tries to rotate clockwise. However, at this time, the reduction one-way clutch that is locked during vehicle acceleration becomes free which allows the reduction sun gear to rotate freely.
- Due to this, the reduction pinion force that tries to rotate the reduction internal gear clockwise is absorbed by the free rotation of the reduction sun gear. Therefore, torque is not transmitted to the reduction internal gear and engine braking is not applied.



# AUTOMATIC TRANSAXLE

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- ▨ LINE PRESSURE
- ▩ PILOT PRESSURE
- ▧ THROTTLE PRESSURE
- ▦ TORQUE CONVERTER PRESSURE
- ▥ ACCUMULATOR CONTROL PRESSURE
- ▤ LUBRICATION
- ▣ PRESSURE CONTROL SOLENOID OUTPUT PRESSURE
- ▢ HIGH CLUTCH SOLENOID VALVE OUTPUT PRESSURE
- 2-4 BRAKE SOLENOID VALVE OUTPUT PRESSURE
- TCC SOLENOID VALVE OUTPUT PRESSURE
- ▧ REDUCTION BRAKE REDUCING PRESSURE
- ▦ REDUCTION BRAKE REDUCING PRESSURE (LOW PRESSURE)

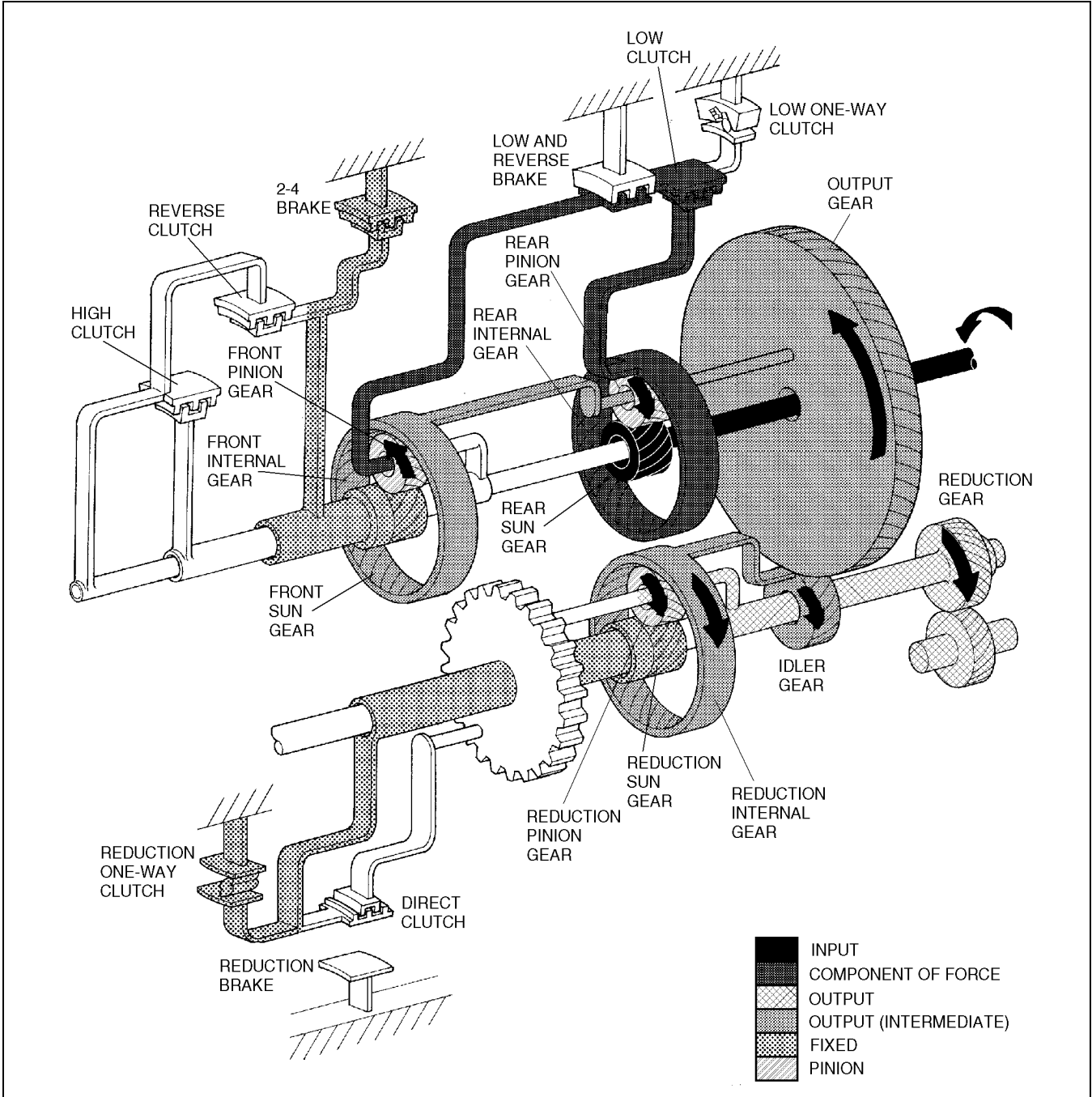
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# AUTOMATIC TRANSAXLE

## Second Gear (D, S, L range)

### Outline

- Since only shift solenoid C turns OFF when shifting from first gear, the hydraulic circuit for the 2-4 brake opens to engage the low clutch and 2-4 brake.
- In second gear, as in first, the rear sun gear is the input of driving force transmission and the rear carrier is the output.
- The difference between first and second gear is that the rear internal gear, fixed in first gear, starts to rotate counterclockwise as the front sun gear rotating freely and clockwise in first gear is fixed by engagement of the 2-4 brake.



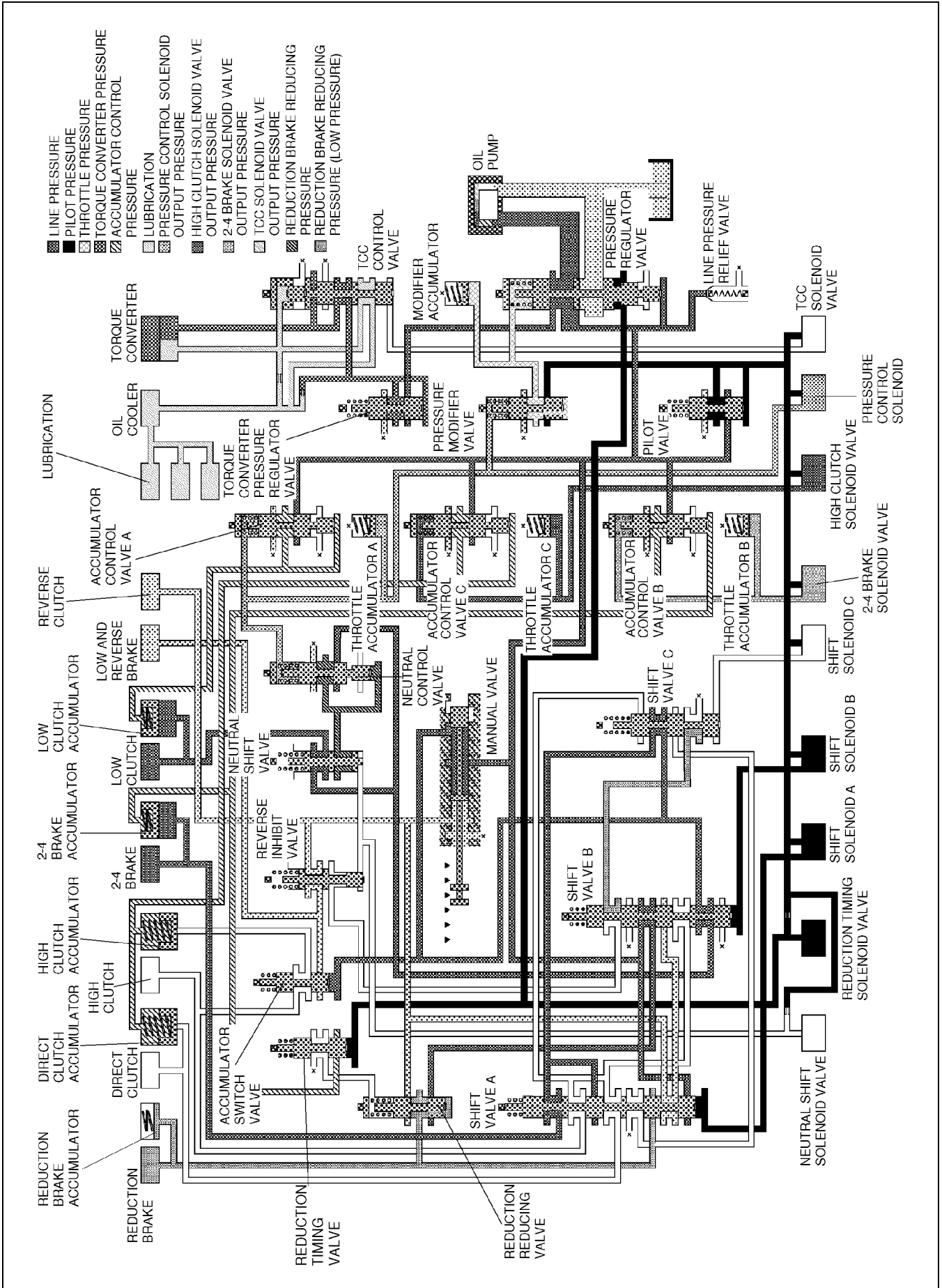
## AUTOMATIC TRANSAXLE

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### Operation

- When in first gear, the front internal gear integrated with rear planetary carrier rotates counterclockwise, and the front planetary carrier is fixed by the force of the low one-way clutch via low clutch drum.
- In this condition, the front sun gear rotates clockwise with no load. When the 2-4 brake is engaged in second gear, the front sun gear is fixed and the front pinion starts to revolve counterclockwise while rotating counterclockwise due to the movement of the front internal gear.
- Therefore, the front planetary carrier starts to rotate counterclockwise. At this time, the low and one-way clutch (low clutch drum) is unlocked to rotate counterclockwise.
- The rear internal gear, integrated with the front planetary carrier, also starts to rotate counterclockwise. Due to this, the counterclockwise revolving speed of the rear pinion increases and the force is transmitted to the rear planetary carrier.
- The increased speed amount of the rear planetary carrier is the amount of gear ratio change between the first and second gear.
- The driving force transmission to the reduction gear is the same as that in first gear. As the operation of the reduction gear during deceleration is also the same as that in first gear and engine braking is not applied, the description is omitted.

# AUTOMATIC TRANSAXLE



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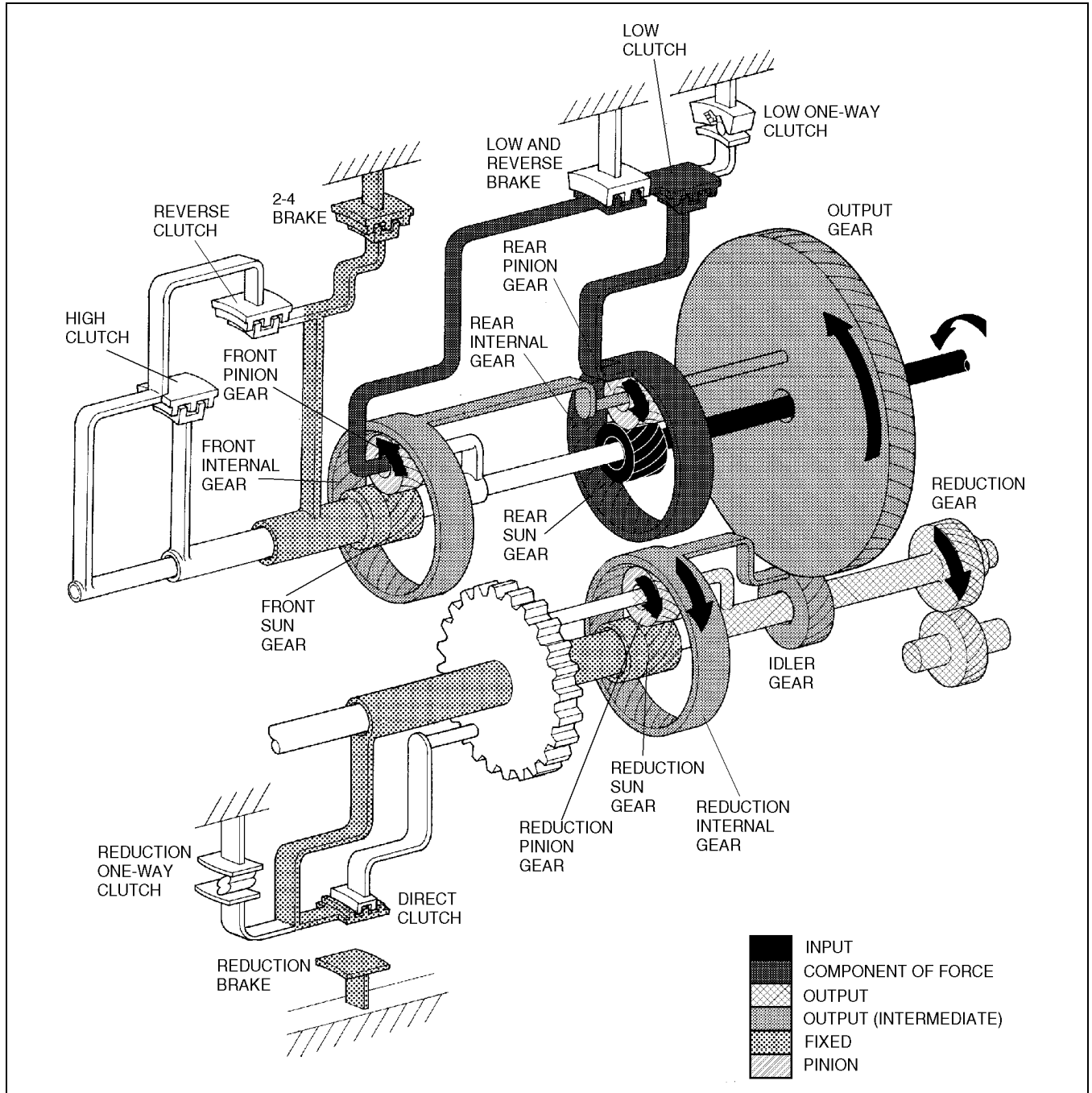
# AUTOMATIC TRANSAXLE

## Second Gear (L Range HOLD)

### Outline

- The operation of shift solenoids A, B, and C in L range HOLD mode in second gear is the same as that of the D range in second gear. However, as the reduction timing solenoid is OFF in L range HOLD mode, the reduction timing valve is switched to adjust the reduction reducing pressure higher and engage the reduction brake, resulting in engine braking being applied.
- Line pressure is also switched to high pressure before cut back to prepare for engine braking.

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## AUTOMATIC TRANSAXLE

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### Operation

#### While driving:

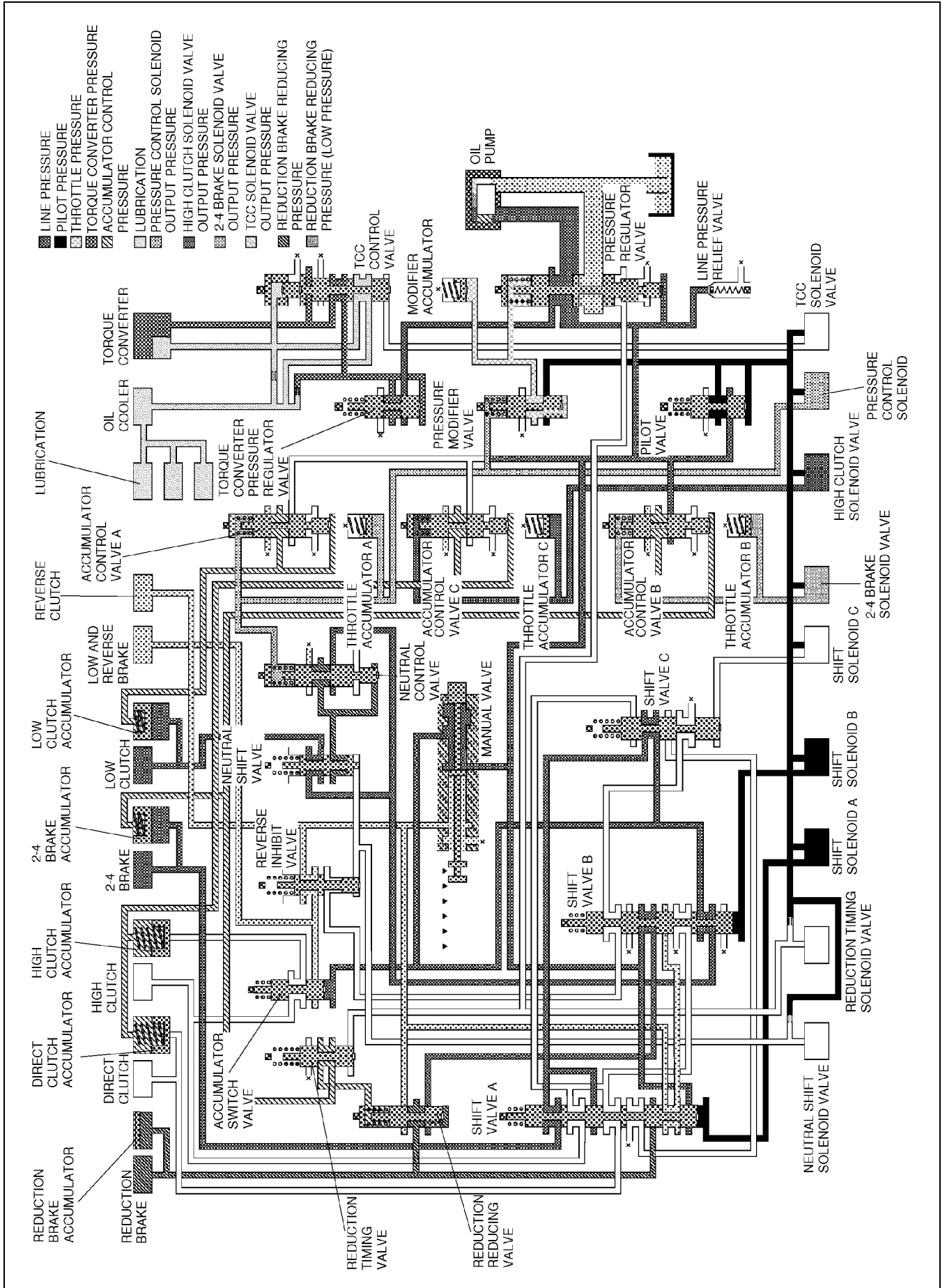
- As the operation while driving is the same as that in D range, the description is omitted.

#### Engine braking applied:

- During deceleration, torque is transmitted from the driving wheels to the engine in the opposite direction of that during acceleration. At first, the driving force is applied to rotate the reduction carrier clockwise via the final gear and reduction gear. Also, this force tries to revolve the reduction pinion clockwise.
- Though the force of the reduction pinion, which tries to revolve clockwise, tries to rotate the reduction internal gear clockwise, the reduction pinion tries to rotate counterclockwise as the load from the engine (force that prevents the reduction internal gear from rotating clockwise) is applied to the reduction internal gear.
- The force of the reduction pinion, which tries to rotate counterclockwise, tries to rotate the reduction sun gear clockwise. However, the reduction sun gear is fixed and does not rotate as the reduction brake is engaged.
- Due to this, the driving force of the reduction pinion overcomes the load from the engine to rotate the reduction internal gear clockwise and the output gear counterclockwise via the idler gear. Moreover, this driving force is transmitted to the engine via the front and rear planetary gear, and engine braking is applied.

# AUTOMATIC TRANSAXLE

K



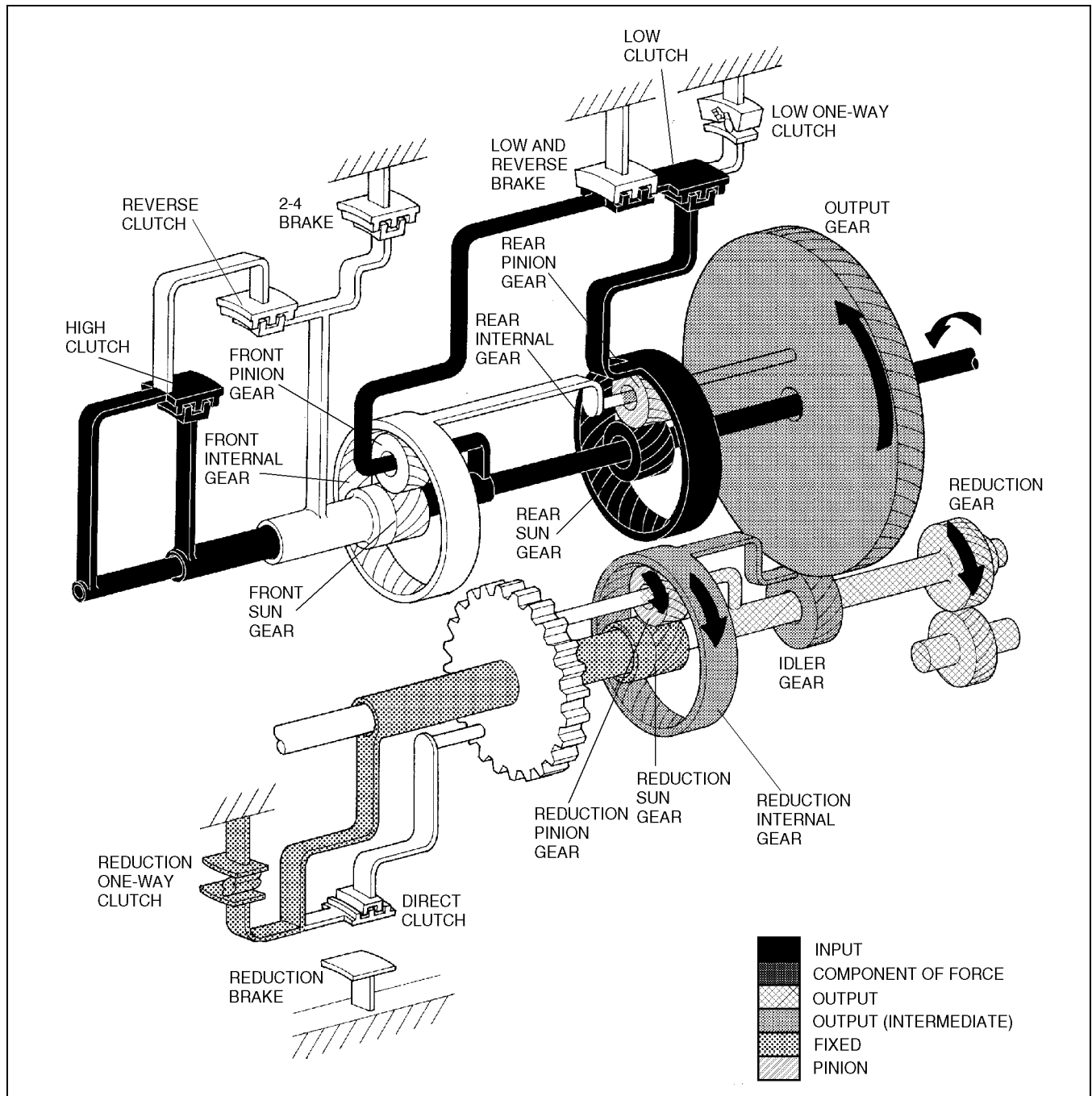
AMU0517A566

# AUTOMATIC TRANSAXLE

## Third Gear (D Range)

### Outline

- Shift solenoids A and C are OFF, and only B is ON in third gear.
- As shift valve A moves to the lower side, the operation pressure of the 2-4 brake is drained and operation pressure is supplied to the high clutch.



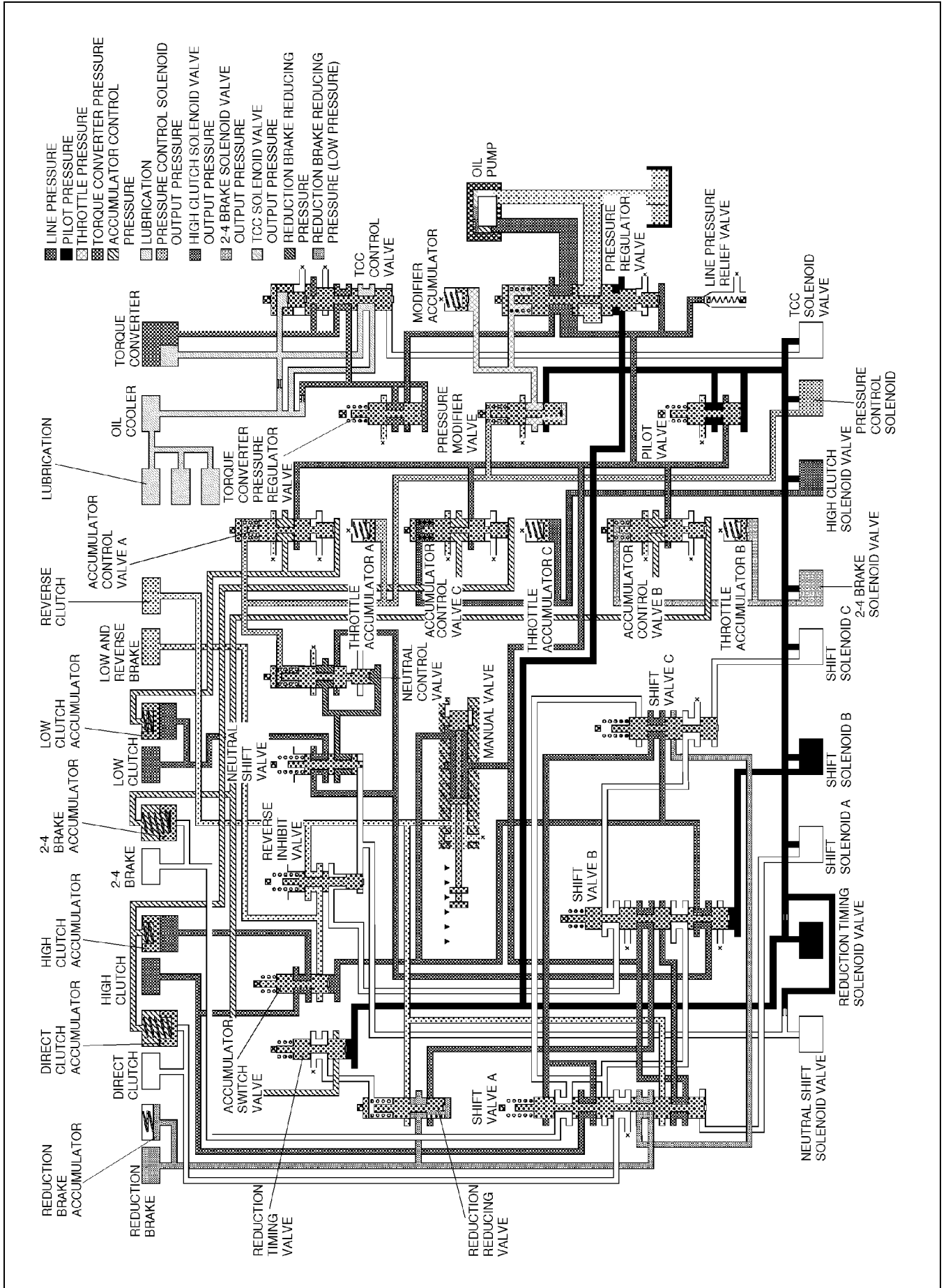
### Operation

- The driving force of the input shaft is transmitted in two directions: to the rear sun gear which is permanently engaged with the input shaft, and, when the high clutch is engaged, to the reverse and high clutch drum, high clutch hub, front planetary carrier, low clutch drum, and then the rear internal gear via the low clutch.
- The rear sun gear and rear internal gear rotate counterclockwise at the same speed as the input shaft.
- As the rear pinion, which is positioned between and rotates together with rear sun gear and rear internal gear, the rear planetary carrier also rotates counterclockwise at the same speed to transmit the driving force to the output gear.
- The driving force transmission in the reduction gear is the same as that in the first gear.
- During deceleration, engine braking is not applied for the same reason as that of first gear.



# AUTOMATIC TRANSAXLE

K



- LINE PRESSURE
- PILOT PRESSURE
- THROTTLE PRESSURE
- TORQUE CONVERTER PRESSURE
- ACCUMULATOR CONTROL PRESSURE
- LUBRICATION
- PRESSURE CONTROL SOLENOID OUTPUT PRESSURE
- HIGH CLUTCH SOLENOID VALVE OUTPUT PRESSURE
- 2-4 BRAKE SOLENOID VALVE OUTPUT PRESSURE
- TCC SOLENOID VALVE OUTPUT PRESSURE
- REDUCTION BRAKE REDUCING PRESSURE
- REDUCTION BRAKE REDUCING PRESSURE (LOW PRESSURE)

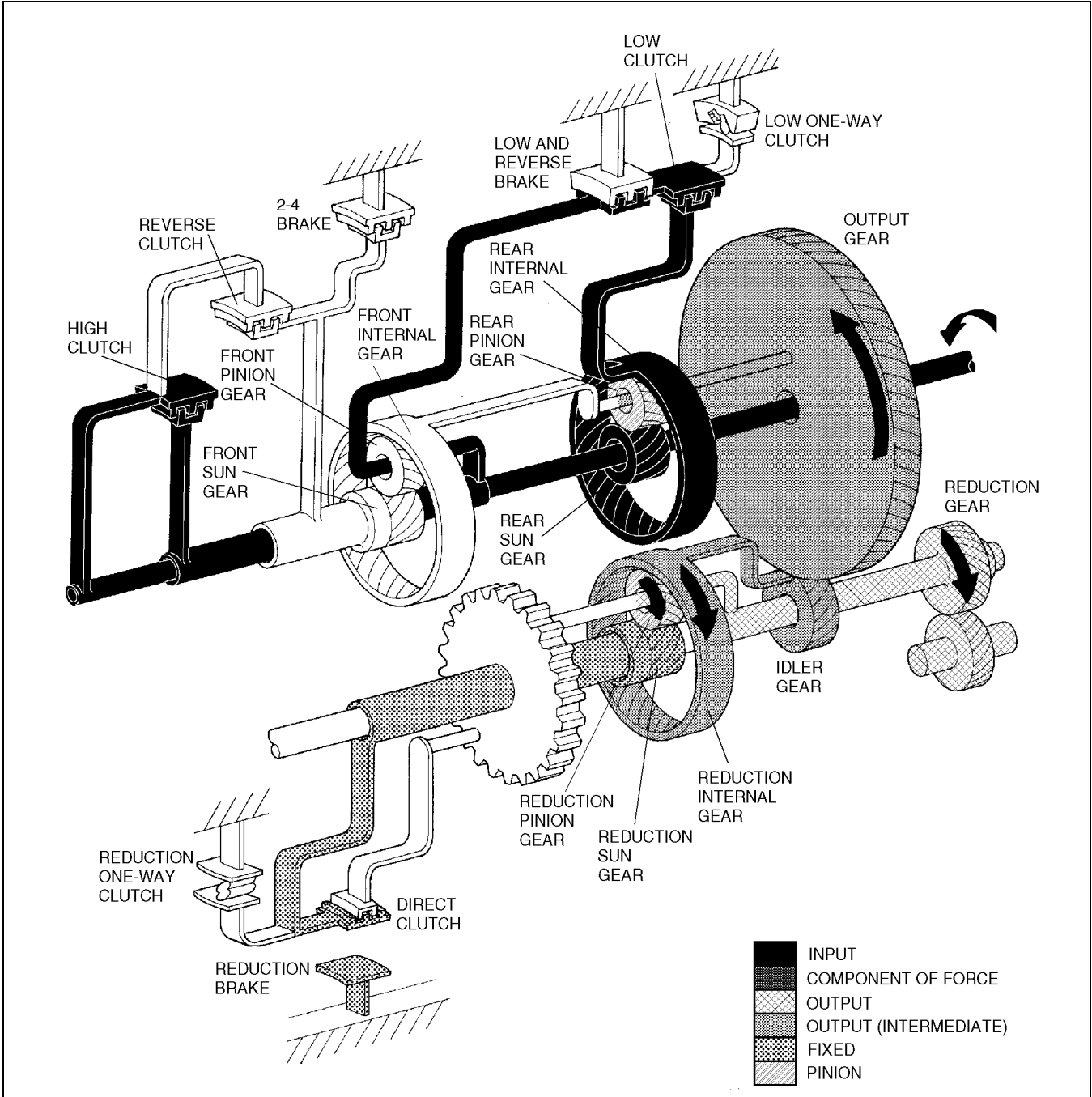
AMU0517A568

# AUTOMATIC TRANSAXLE

## Third Gear (S Range)

### Outline

- With shift solenoids A and C OFF, only C is ON in third gear, and the reduction timing solenoid is OFF in third gear. (same as D range in the third gear)
- The operation of the front planetary gear and rear planetary gear of the S range in third gear is the same as that of D range in third gear. However, since the reduction timing solenoid is OFF, the reduction timing valve is switched to adjust the reduction reducing pressure higher and engage the reduction brake, resulting in engine braking being applied.
- Line pressure is also switched to high pressure before cut back to prepare for engine braking.



AMU0517A569

## AUTOMATIC TRANSAXLE

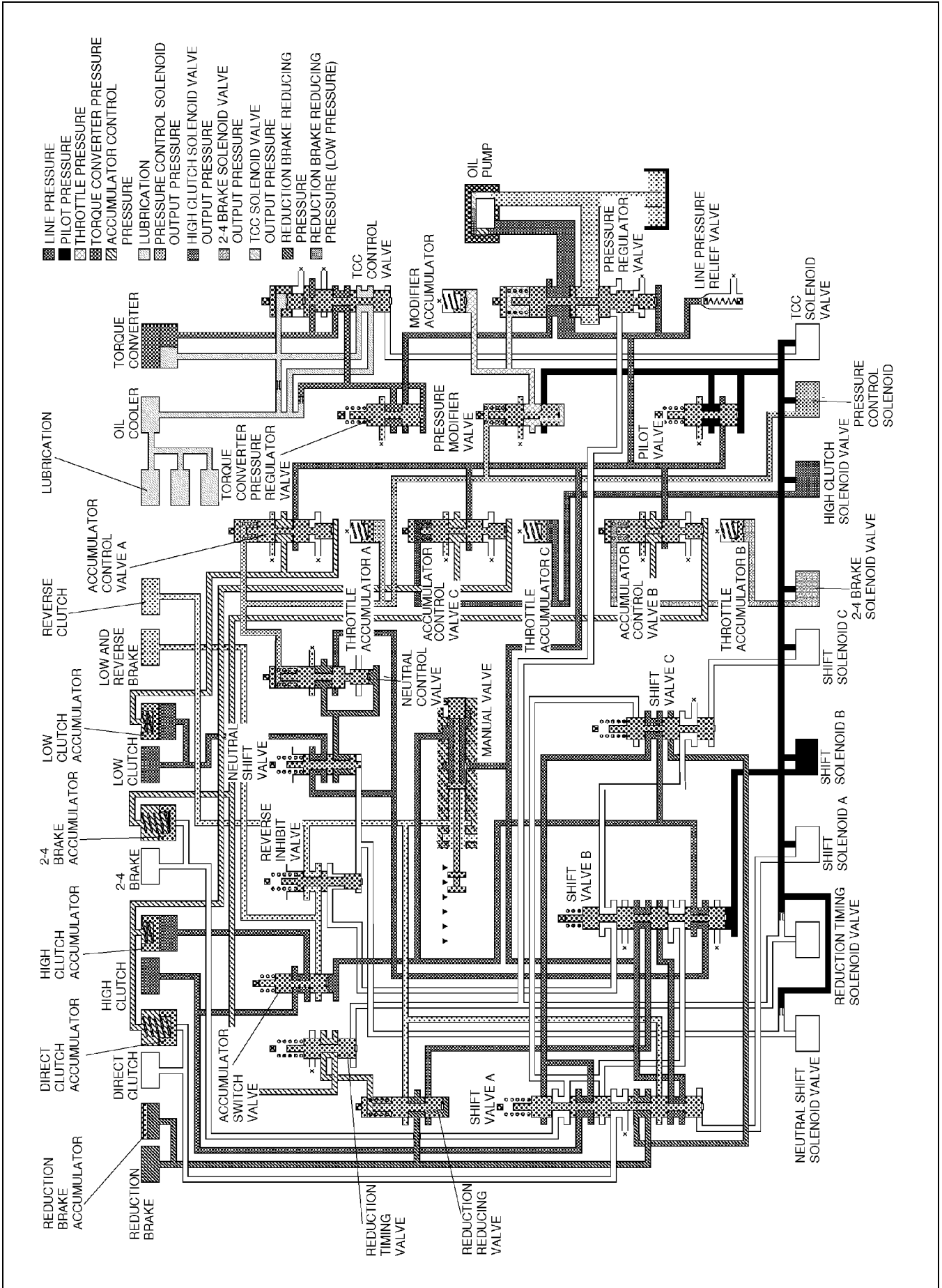
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### Operation

- The driving force of the input shaft is transmitted in two directions: to the rear sun gear which is permanently engaged with the input shaft, and, when the high clutch is engaged, to the reverse and high clutch drum, high clutch hub, front planetary carrier, low clutch drum, and then the rear internal gear via low clutch.
- The rear sun gear and rear internal gear rotate counterclockwise at the same speed as the input shaft.
- As the rear pinion, which is positioned between and rotates together with rear sun gear and rear internal gear, the rear planetary carrier also rotates counterclockwise at the same speed to transmit the driving force to the output gear.
- The driving force transmission in reduction gear is the same as that in first gear.
- During deceleration, engine braking is not applied for the same reason as that of L range HOLD in second gear.

K

# AUTOMATIC TRANSAXLE



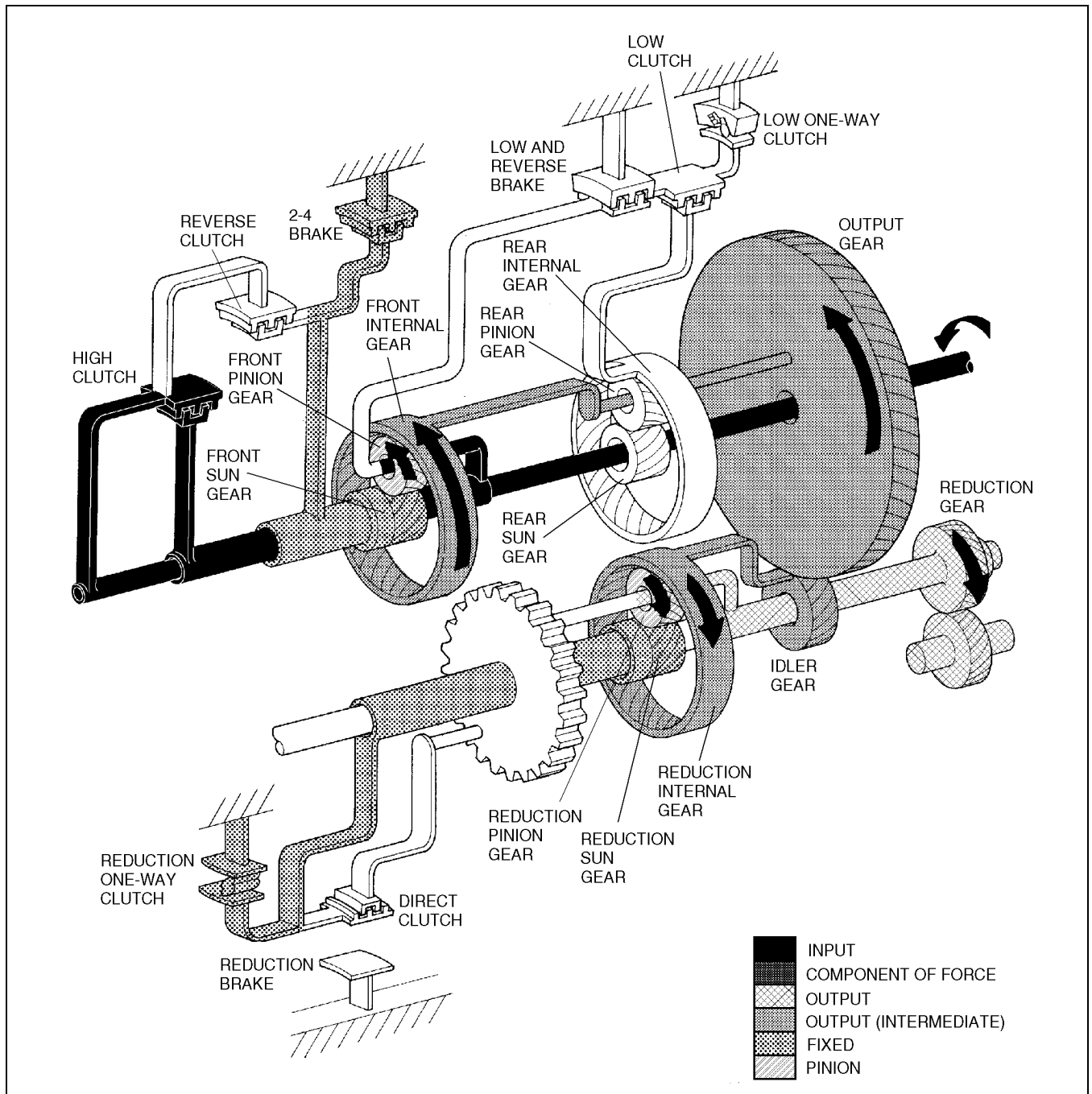
AMU0517A570

# AUTOMATIC TRANSAXLE

## Fourth Gear (D range)

### Outline

- Shift solenoids A and B are OFF, and only C is ON in fourth gear.
- As shift valve B moves to the lower side, operation pressure of the low clutch is drained. Then, as the shift valve C moves to the upper side, operation pressure is supplied to the 2-4 brake.

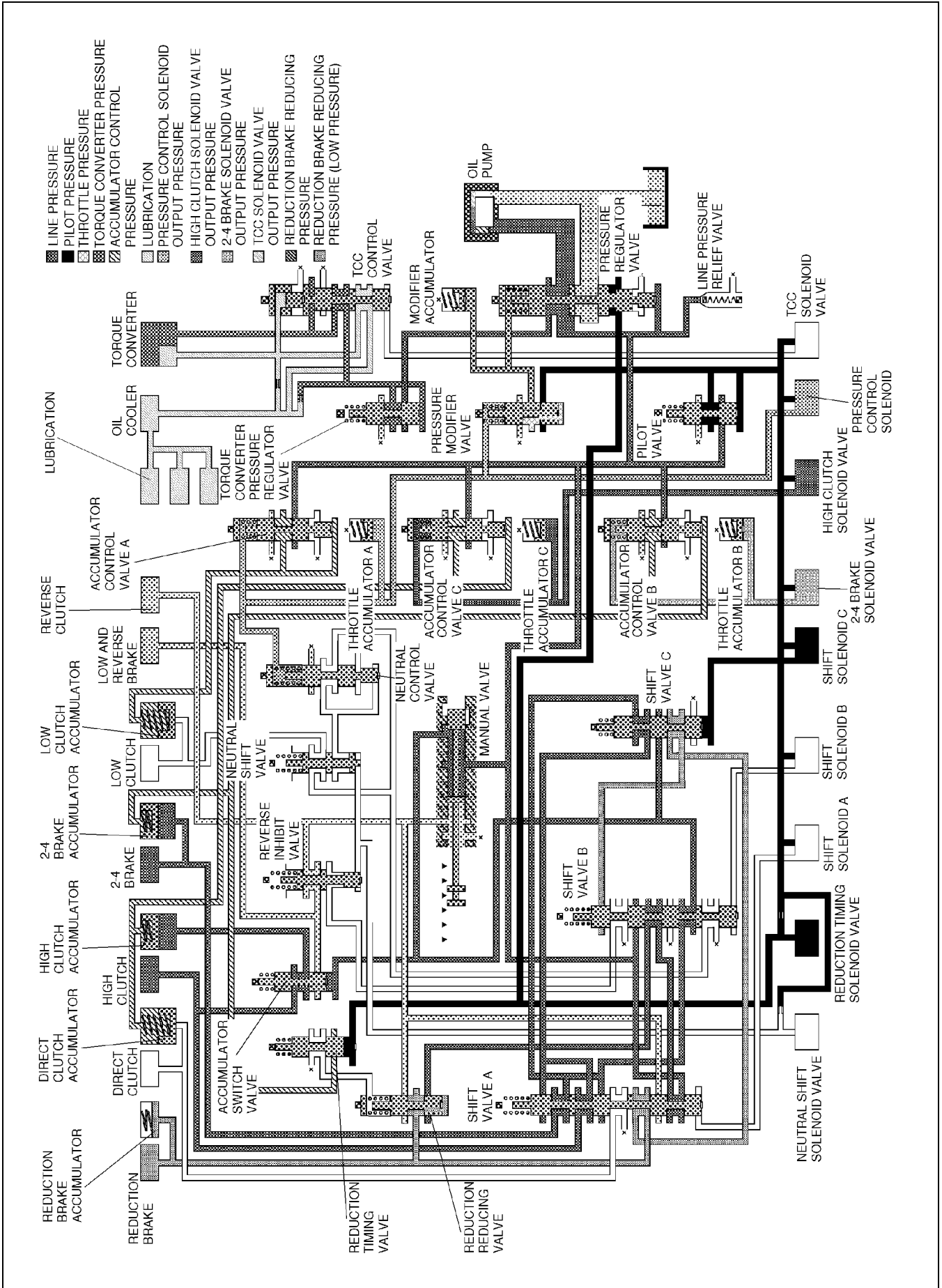


AMU0517A571

### Operation

- The driving force of the input shaft is transmitted to the front planetary carrier via the high clutch causing it to revolve the front pinion counterclockwise. However, as the load from the vehicle is applied, the front pinion tries to rotate clockwise and the front sun gear tries to rotate counterclockwise.
- Since the front sun gear is fixed by engagement of the 2-4 brake, the front pinion tries to rotate counterclockwise, while revolving counterclockwise because the front sun gear is fixed.
- Due to this, the driving force of the front pinion overcomes the load from the vehicle to rotate the front internal gear counterclockwise faster than the counterclockwise rotation speed of front planetary carrier (input). (Rotation speed of the output gear is faster than that of the input shaft.)
- The driving force transmission of the reduction gear is the same as that in first gear.
- During deceleration, engine braking is not applied for the same reason as that of first gear.

# AUTOMATIC TRANSAXLE



AMU0517A572

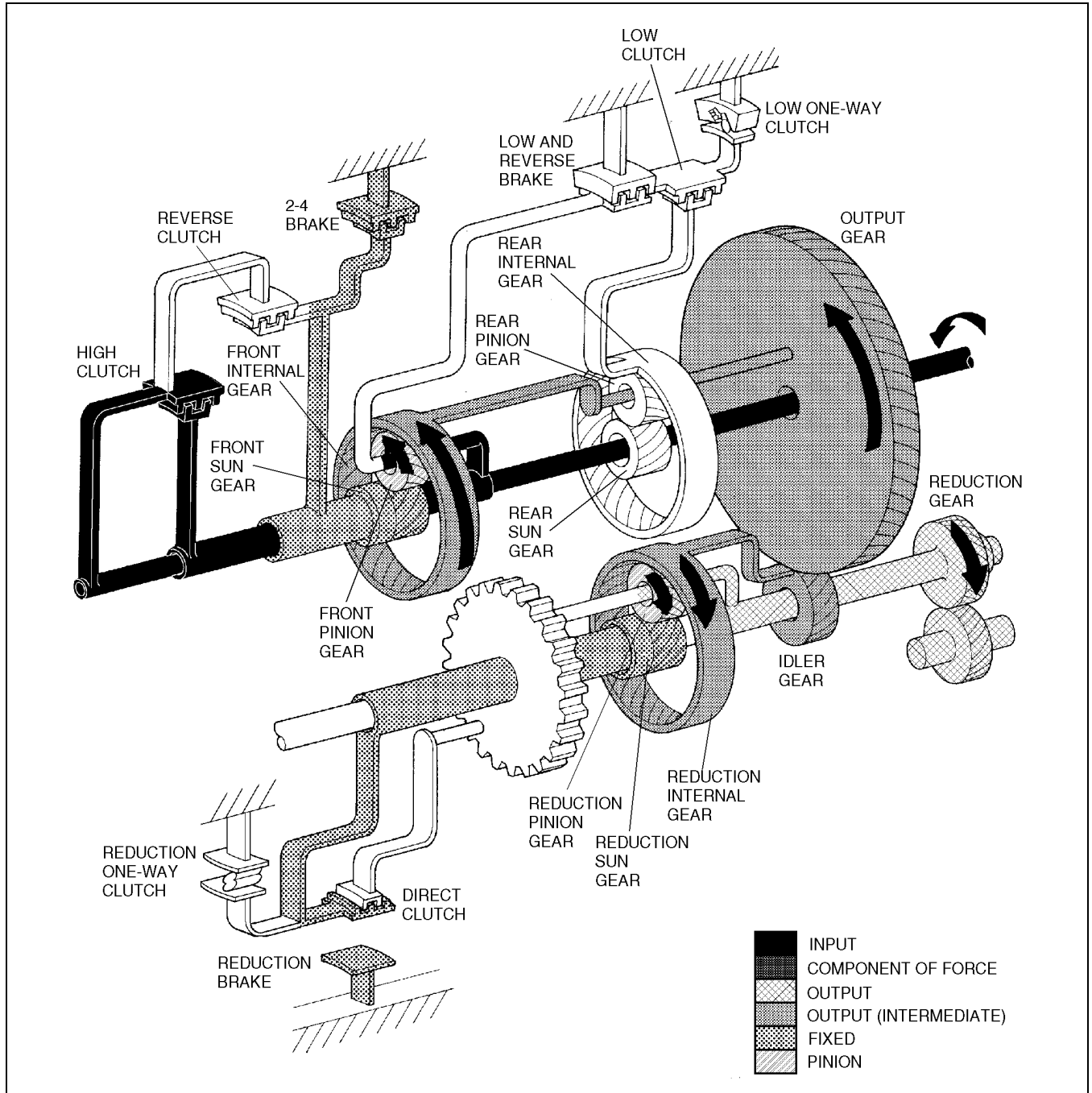
# AUTOMATIC TRANSAXLE

## Fourth Gear (D range HOLD, S, L range)

### Outline

- The operation of the front planetary gear and rear planetary gear of fourth gear in the D range HOLD, S, and L range is the same as that of D range in the fourth gear.
- However, since the reduction timing solenoid is OFF, the reduction timing valve is switched to adjust the reduction reducing pressure higher and engage the reduction brake, resulting in engine braking being applied.
- Line pressure is also switched to high pressure before cut back to prepare for engine braking.

K



AMU0517A573

## AUTOMATIC TRANSAXLE

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### Operation

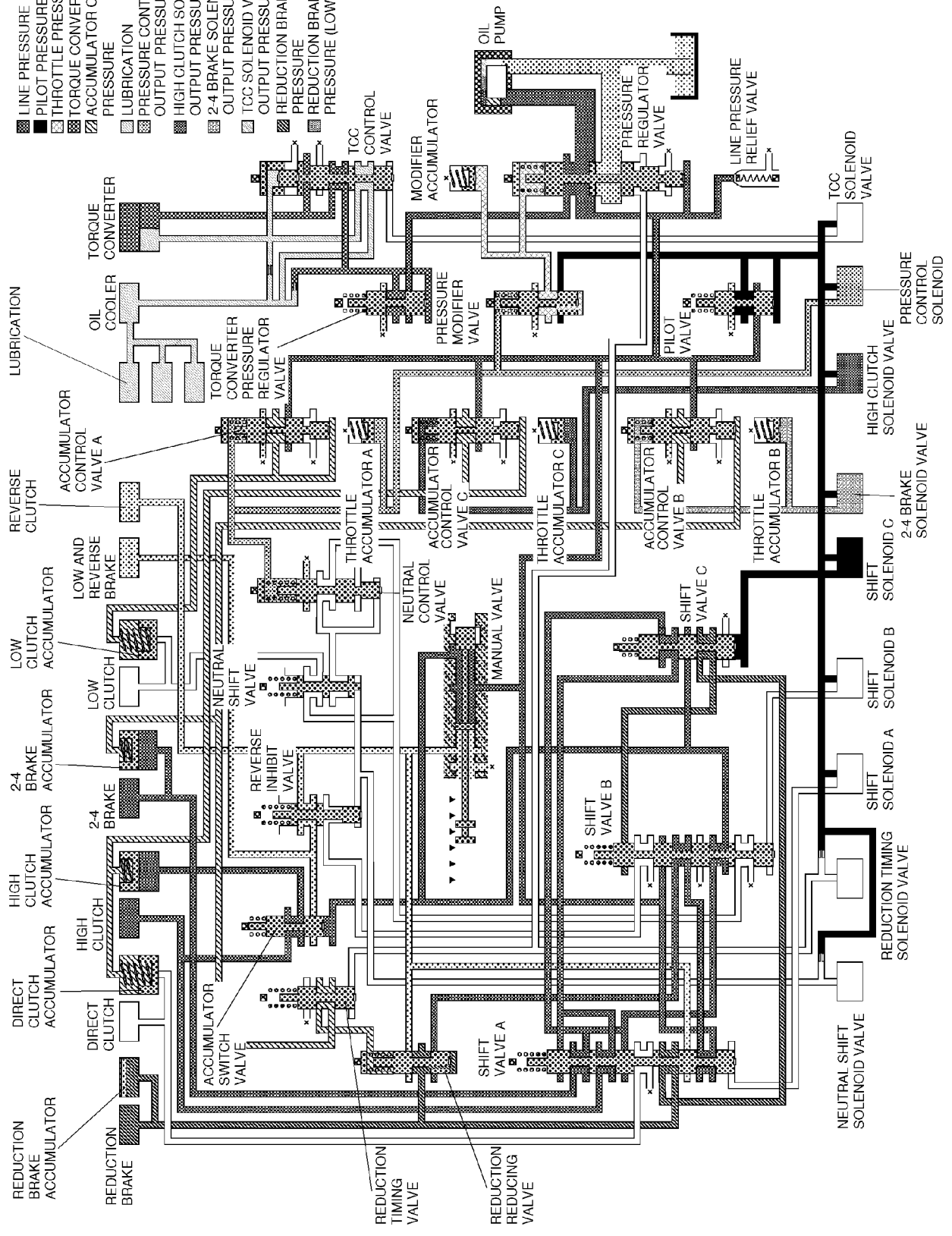
- The driving force of the input shaft is transmitted to the front planetary carrier via the high clutch causing it to revolve the front pinion counterclockwise. However, as the load from the vehicle is applied, the front pinion tries to rotate clockwise and the front sun gear tries to rotate counterclockwise.
- Since the front sun gear is fixed by engagement of the 2-4 brake, the front pinion tries to rotate counterclockwise, while revolving counterclockwise because the front sun gear is fixed.
- Due to this, driving force of the front pinion overcomes the load from the vehicle to rotate the front internal gear counterclockwise faster than the counterclockwise rotation speed of front planetary carrier (input). (Rotation speed of the output gear is faster than that of the input shaft.)
- The driving force transmission in reduction gear is the same as that in the first gear.
- During deceleration, engine braking is not applied for the same reason as that of L range HOLD in second gear.



# AUTOMATIC TRANSAXLE

K

- LINE PRESSURE
- PILOT PRESSURE
- THROTTLE PRESSURE
- TORQUE CONVERTER PRESSURE
- ACCUMULATOR CONTROL PRESSURE
- LUBRICATION PRESSURE
- PRESSURE CONTROL SOLENOID OUTPUT PRESSURE
- HIGH CLUTCH SOLENOID VALVE OUTPUT PRESSURE
- 2-4 BRAKE SOLENOID VALVE OUTPUT PRESSURE
- TCC SOLENOID VALVE OUTPUT PRESSURE
- REDUCTION BRAKE REDUCING PRESSURE
- REDUCTION BRAKE REDUCING PRESSURE (LOW PRESSURE)



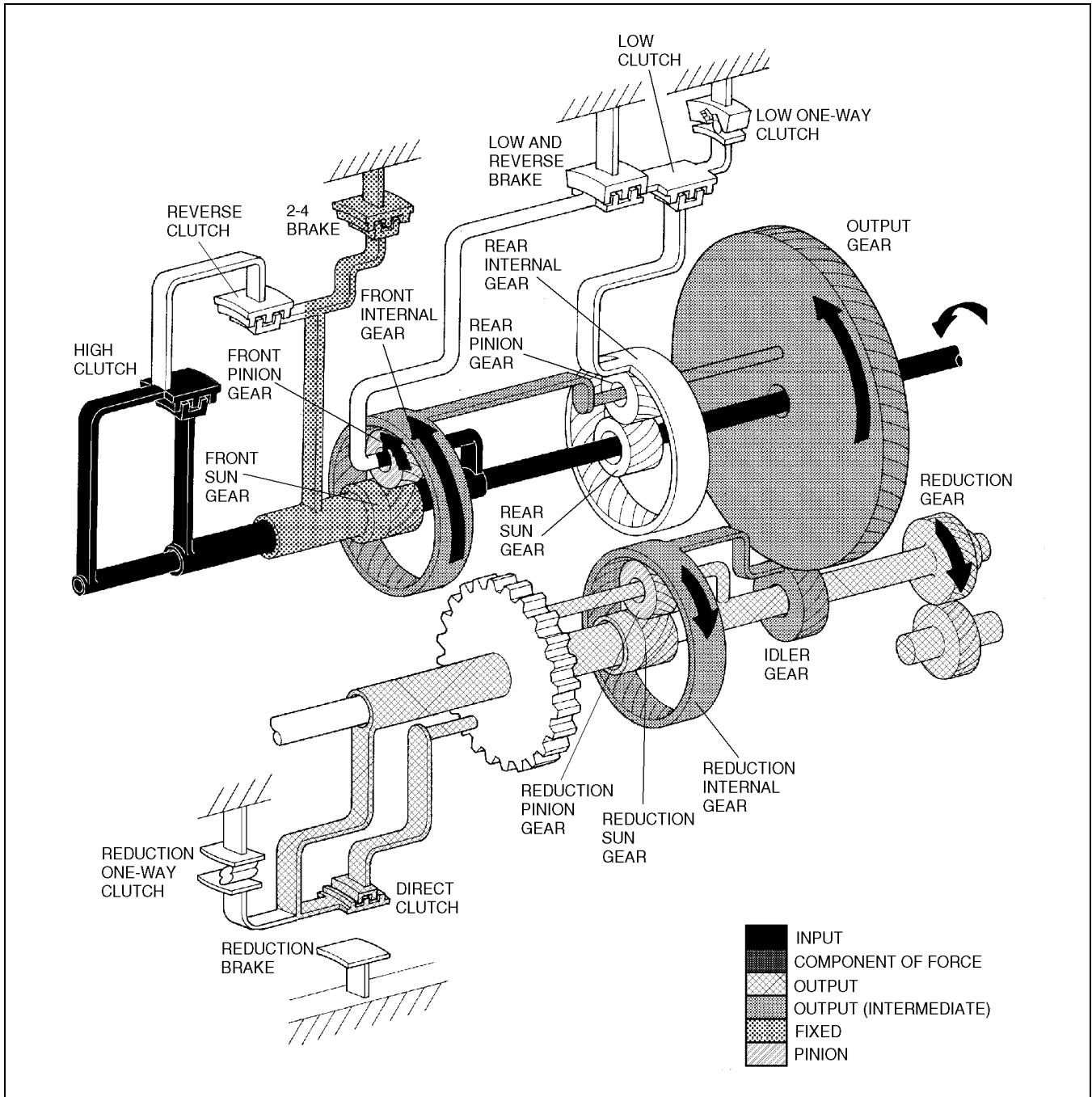
AMU0517A574

# AUTOMATIC TRANSAXLE

## Fifth Gear

### Outline

- Shift solenoids A and C is ON, and only B is OFF in fifth gear.
- As the shift valve A moves to the upper side, operation pressure of the reduction brake is drained, and operation pressure is supplied to the direct clutch.



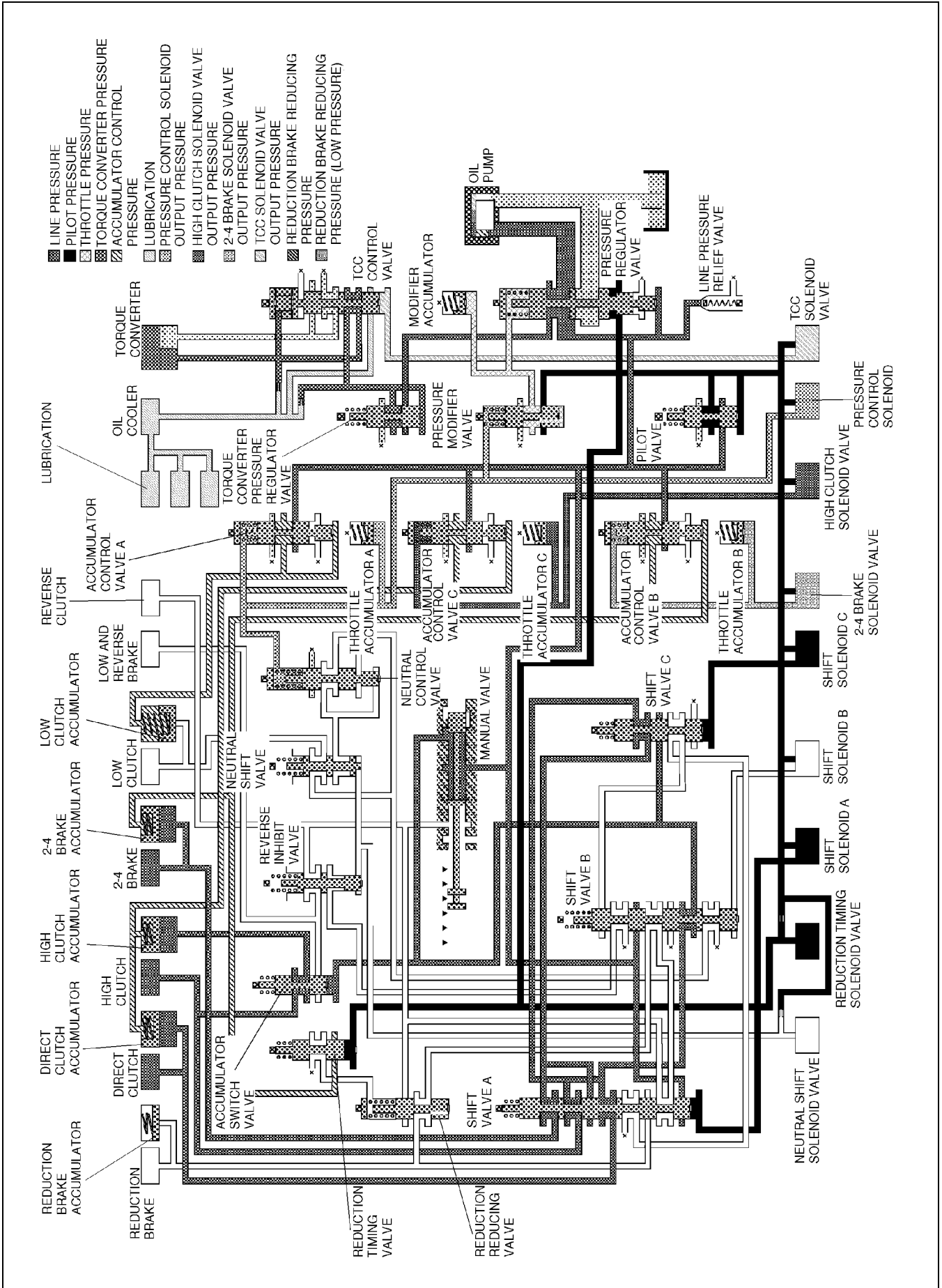
## AUTOMATIC TRANSAXLE

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### Operation

- The driving force transmission from the input shaft to the output gear is the same as that in fourth gear.
- Since only the reduction gear operation is different in fifth gear when compared with fourth gear, description for the driving force transmission from the input shaft to the output gear is omitted.
- The driving force of the output gear counterclockwise rotation is transmitted to the idler gear as clockwise rotation driving force.
- Since the reduction internal gear, which is integrated with the idler gear, rotates clockwise it tries to revolve the reduction pinion clockwise.
- Since the direct clutch is engaged, the driving force of the reduction pinion, which tries to rotate clockwise, is transmitted to the reduction carrier and then to the reduction sun gear via the direct clutch.
- Due to this, the reduction carrier and reduction sun gear rotate together.
- Since the reduction pinion is integrated with the reduction carrier, when the internal gear tries to rotate the reduction pinion, the reduction carrier and reduction sun gear rotate together. (Direct connection)
- Since the driving force transmission using the one-way clutch such as in first to fourth gear does not occur in fifth gear, engine braking is applied during deceleration.
- However, since the gear ratio is small in fifth gear, efficiency of engine braking may be reduced.

# AUTOMATIC TRANSAXLE



AMU0517A576

# OVERHAUL

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# AUTOMATIC TRANSAXLE

## AUTOMATIC TRANSAXLE

### AUTOMATIC TRANSAXLE CLEANING

AME571401030A01

#### Cleaning Notes

1. Clean the transaxle exterior thoroughly with steam, cleaning solvents, or both, before disassembly.

#### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.

### AUTOMATIC TRANSAXLE DISASSEMBLY

AME571401030A02

#### Precaution

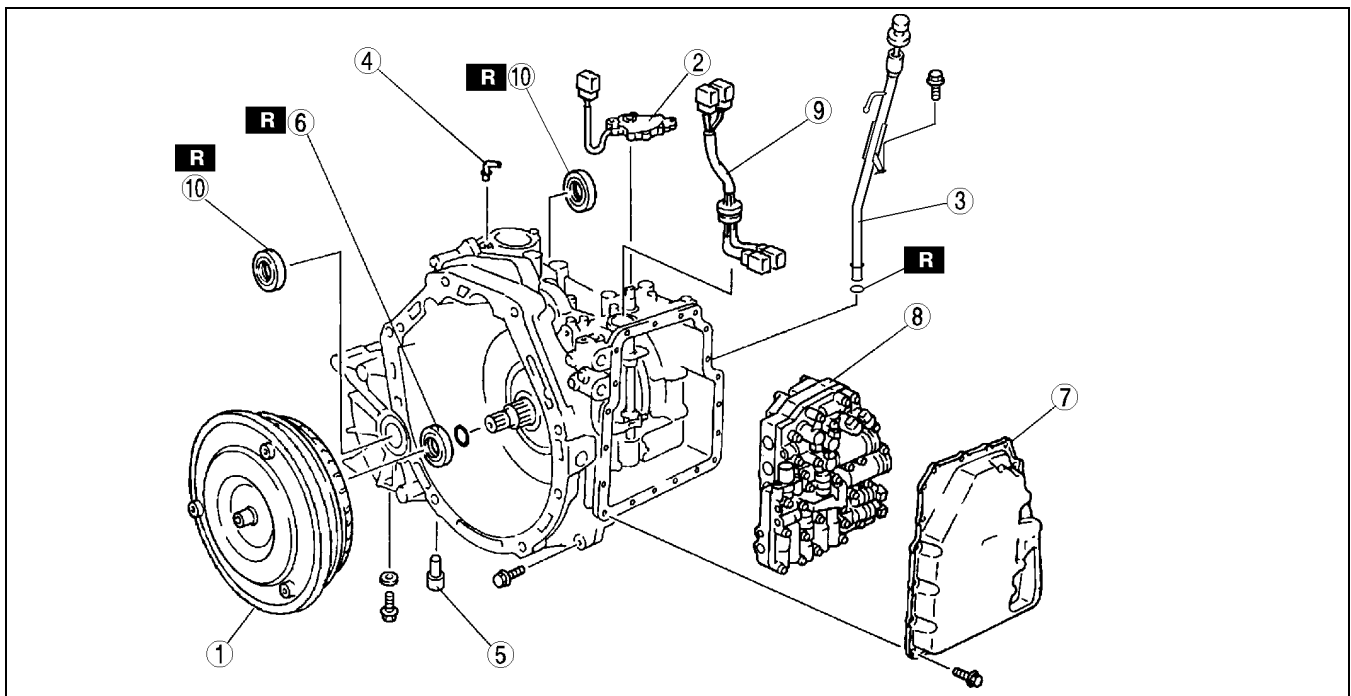
#### General notes

1. Disassemble the transaxle in a clean area (dust-proof work space) to prevent entry of dust into the mechanisms.
2. Inspect the individual transaxle components in accordance with the QUICK DIAGNOSIS CHART during disassembly.
3. Use only plastic hammers when applying force to separate the light alloy case joints.
4. Never use rags during disassembly; they may leave particles that can clog fluid passage.
5. Because several parts resemble one another, arrange them so that they do not get mixed up.
6. Disassemble the control valve component and thoroughly clean it when the clutch or brake band has burned or when the ATF has degenerated.

#### Warning

- Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.

#### Disassembly Components



AMJ5614A069

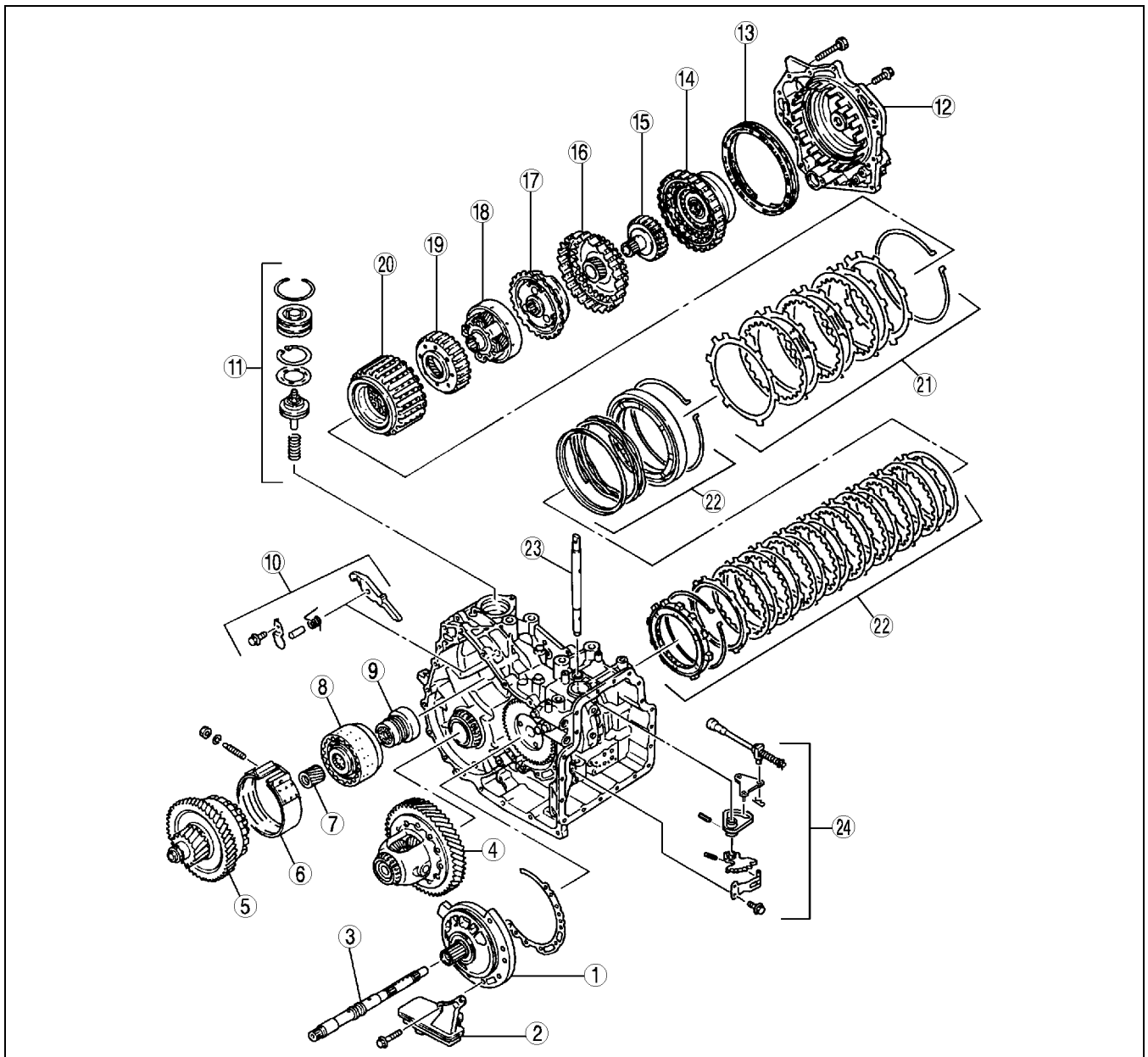
1	Torque converter
2	Transaxle range switch
3	Oil filler tube

4	Air brezer
5	Drain plug
6	Oil seal

# AUTOMATIC TRANSAXLE

7	Control valve body cover
8	Control valve body

9	Terminal component
10	Differential oil seal



AMU0517A002

1	Oil pump
2	Oil strainer
3	Input shaft
4	Differential gear
5	Reduction gear
6	Reduction brake band
7	Sun gear
8	Direct clutch
9	One-way clutch inner race
10	Parking mechanism
11	Band servo
12	End cover

13	Return spring
14	Reverse clutch and high clutch component
15	High clutch hub
16	Reverse clutch hub
17	Front planetary carrier
18	Rear planetary carrier
19	Internal gear
20	Low clutch
21	2-4 brake
22	Low and reverse brake
23	Manual shaft
24	Parking component

K1

# AUTOMATIC TRANSAXLE

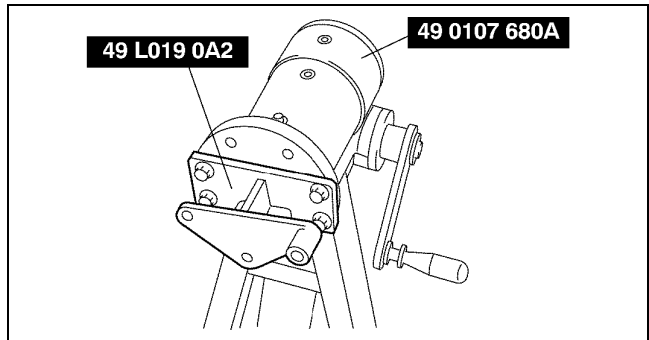
## Disassembly procedure

1. Remove the torque converter, and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling.
2. Remove the transaxle range switch.
3. Set the transaxle to a transmission stand using the SST.

### Caution

- Be careful not to scratch the mating surfaces of the control valve body cover and the transaxle case.
- After removing the control valve body cover, remove the liquid gasket remaining on the mating surfaces.

4. Remove the control valve body cover.
5. Disconnect coupling connector between the solenoid valves and the terminal component.

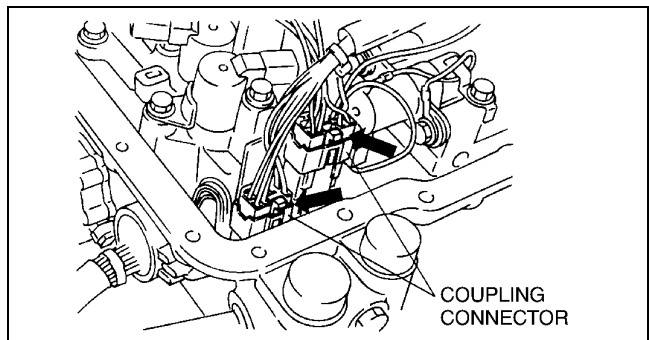


AMU0517A164

6. Remove the bolts which secure the control valve body to the transaxle case as shown in the figure.

### Note

- When removing control valve body, be careful not to drop the manual valve.

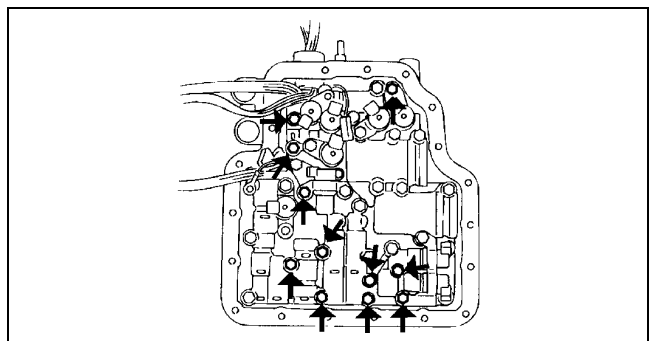


AMU0517A005

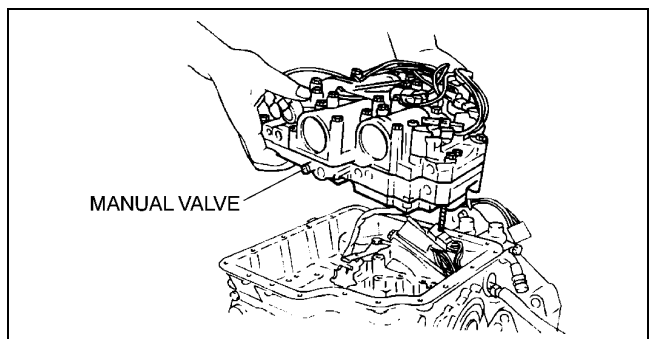
7. Remove the control valve body from the transaxle case.

### Caution

- If the seal ring has dropped or is scratched, do not reuse it.



AMU0517A006



AMU0517A007



## AUTOMATIC TRANSAXLE

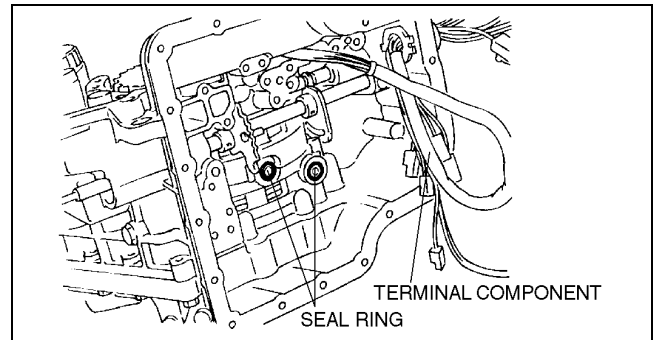
8. Remove the seal rings from the transaxle case.
9. Remove the bracket from coupling connector, then remove the terminal component.

### Caution

- If the converter housing is hard to remove, lightly tap perimeter of the converter housing using a plastic hammer.  
Do not separate the converter housing and the transaxle case using a screwdriver.  
Be careful not to scratch mating surfaces of the converter housing and the transaxle case.

- After removing the converter housing, remove the liquid gasket remaining on the mating surfaces.

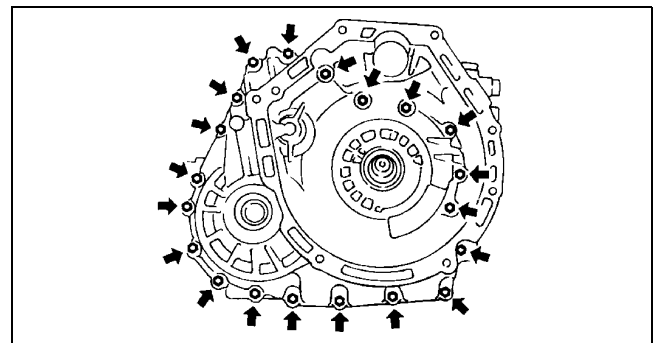
10. Remove the bolts, then remove the converter housing.



AMU0517A008

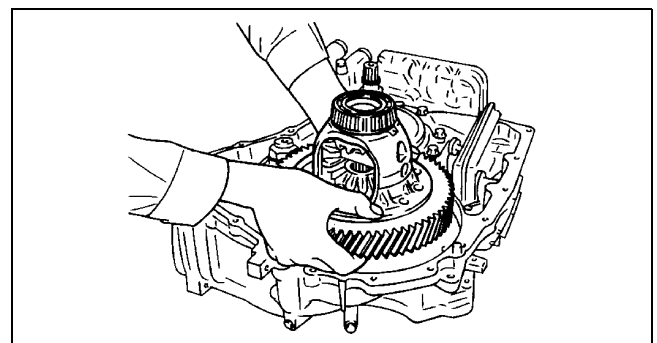
K1

11. Remove the differential component.
12. Remove the oil strainer.

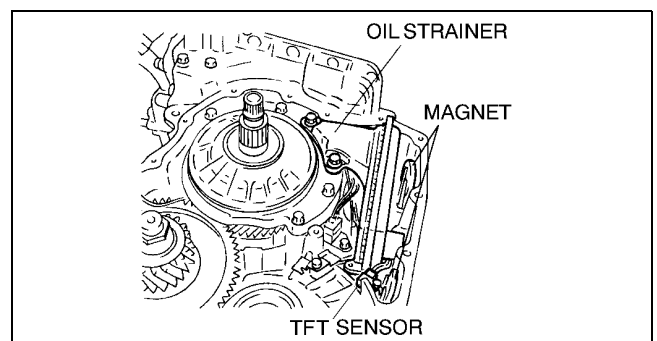


AMU0517A009

13. Remove the transaxle fluid temperature (TFT) sensor and two magnets.



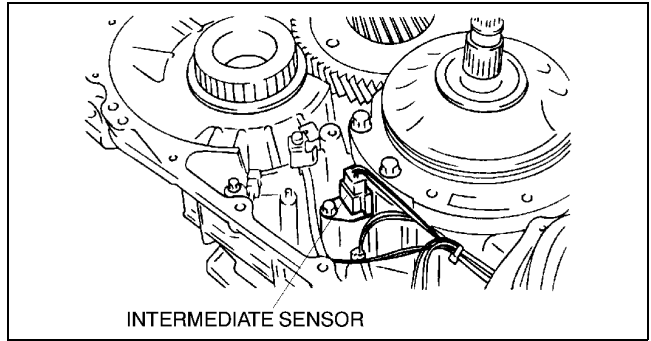
AMU0517A010



AMU0517A011

## AUTOMATIC TRANSAXLE

14. Disconnect the intermediate sensor connector.
15. Remove the intermediate sensor with the clip.

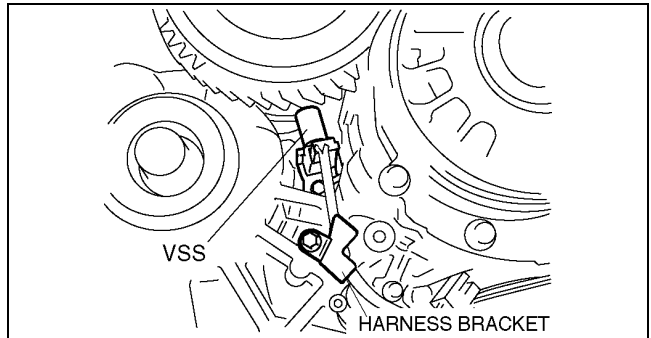


AMU0517A012

16. Disconnect the vehicle speedometer sensor (VSS) connector.
17. Remove the VSS with the clip and harness bracket.

### Note

- Do not reuse the O-ring.



AMU0517A013

18. Remove the O-ring from the input shaft.
19. Remove the bolts, then remove the oil pump component.

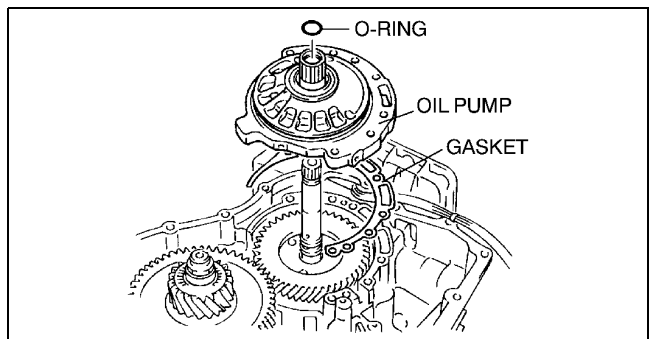
### Caution

- If the oil pump gasket is bent or scratched, do not reuse it.

20. Remove the oil pump gasket.

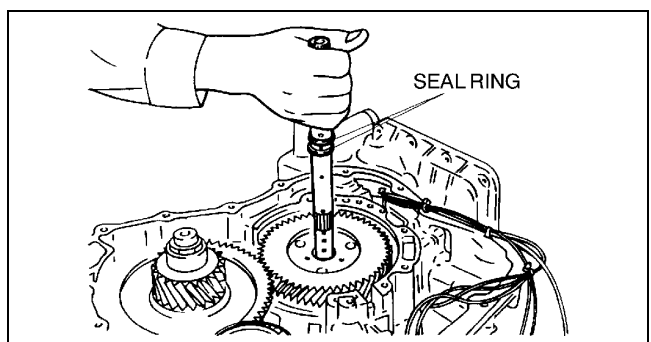
### Note

- Do not reuse the seal rings.



AMU0517A014

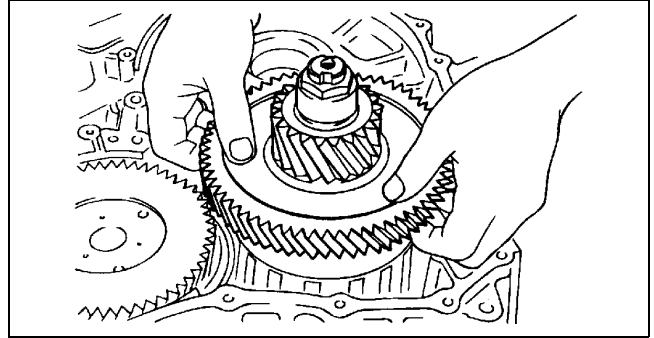
21. Pull out the input shaft.
22. Remove the seal rings from the input shaft.



AMU0517A015

## AUTOMATIC TRANSAXLE

23. Remove the reduction gear component.

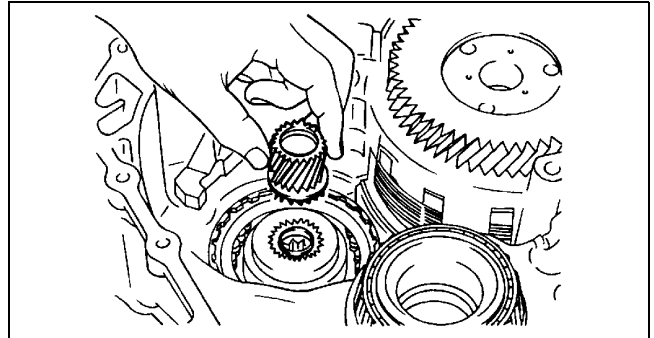


AMU0517A016

24. Remove the sun gear on the reduction gear.

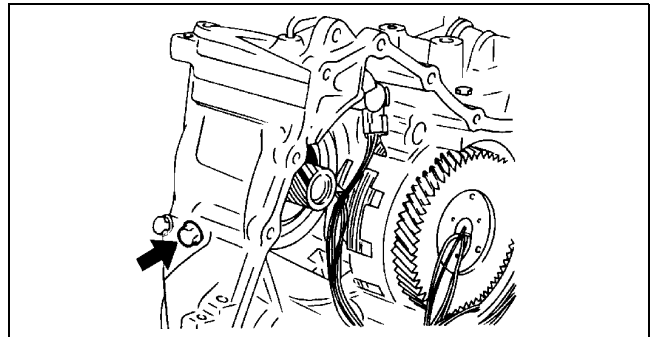
**Note**

- Do not reuse the anchor end bolt.



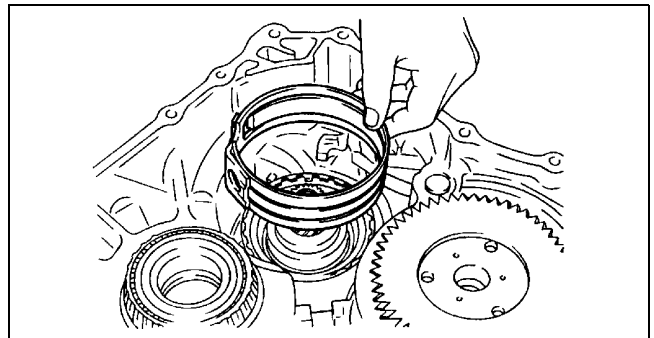
AMU0517A017

25. Remove the anchor end bolt which secures the reduction brake band.



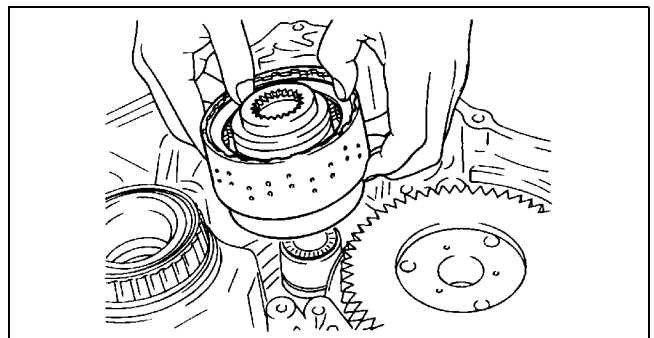
AMU0517A019

26. Remove the reduction brake band.



AMU0517A020

27. Remove the direct clutch component.



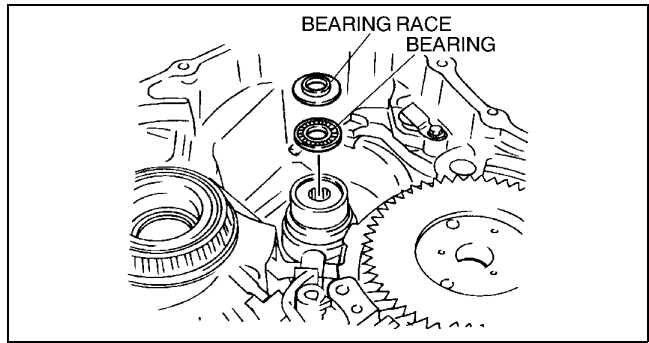
AMU0517A021

## AUTOMATIC TRANSAXLE

28. Remove the bearing race and bearing from one-way clutch inner race.

### Caution

- If the end cover is hard to remove, lightly tap perimeter of the end cover using a plastic hammer.
- Do not separate the end cover and the transaxle case using a screwdriver. Be careful not to scratch mating surfaces of the end cover and the transaxle case.
- After removing the end cover, remove the liquid gasket remaining on the mating surfaces.

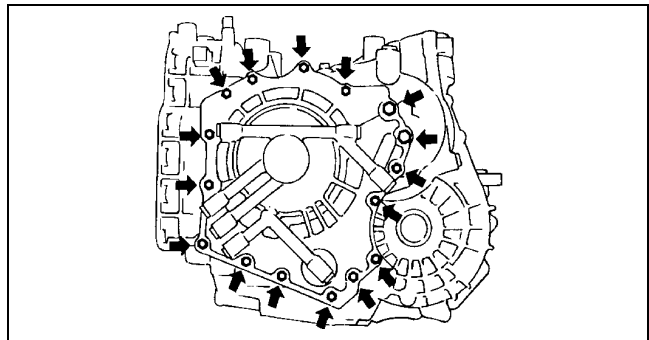


AMU0517A022

29. Remove the bolts, then remove the end cover.

### Note

- Do not reuse the O-ring.

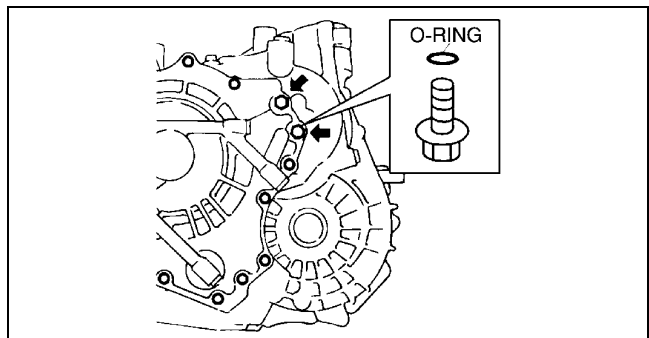


AMU0517A025

30. Remove the O-rings from two bolts.

### Caution

- When removing the bolts, be careful not to drop the one-way clutch inner race.



AMU0517A026

31. Remove the bolts which secure the one-way clutch inner race.

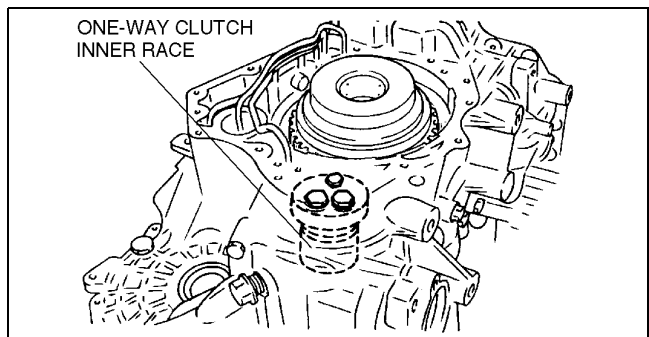
### Note

- Do not reuse the O-ring.

32. Remove the O-rings from two bolts.  
33. Remove the one-way clutch inner race.

### Note

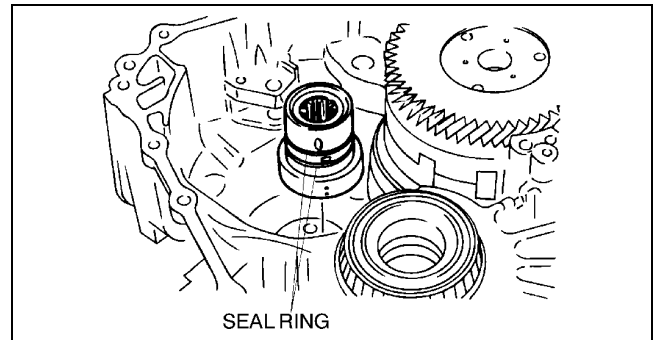
- Do not reuse the seal rings.



AMU0517A027

## AUTOMATIC TRANSAXLE

34. Remove the seal rings from the one-way clutch inner race.



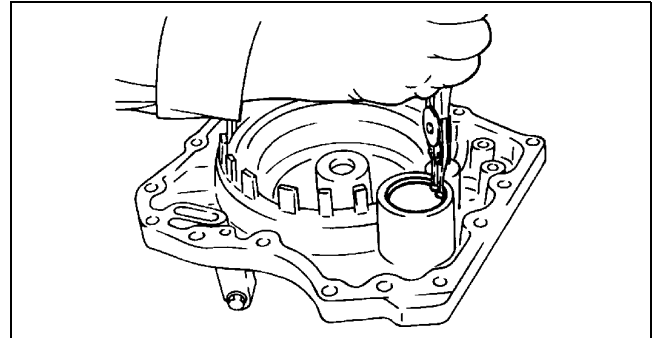
AMU0517A028

35. Remove the snap ring which secures the 2-4 brake accumulator onto the end cover.  
36. Remove the 2-4 brake accumulator cover and spring.

**Note**

- Do not reuse the O-ring.

37. Remove the O-ring from the 2-4 brake accumulator cover.



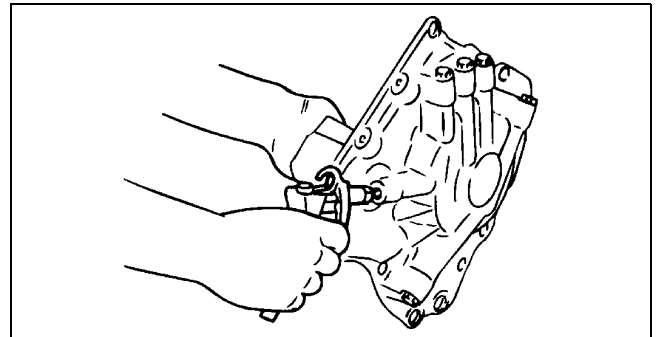
AMU0517A029

38. Hold the 2-4 brake accumulator piston by hand. Then, blow out the piston using an air gun to blow air into oil circuit as shown in the figure.

**Note**

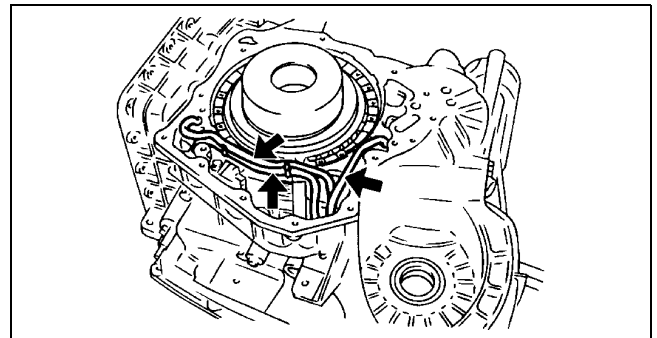
- Do not reuse the O-ring.

39. Remove the O-rings from the 2-4 brake accumulator piston.



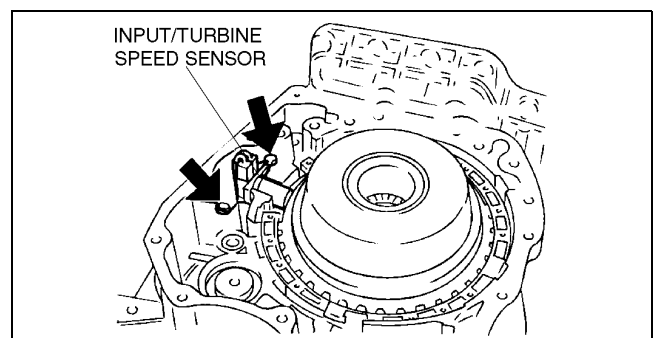
AMU0517A030

40. Pull out the oil pipes.  
41. Disconnect the connector from the turbine sensor.



AMU0517A031

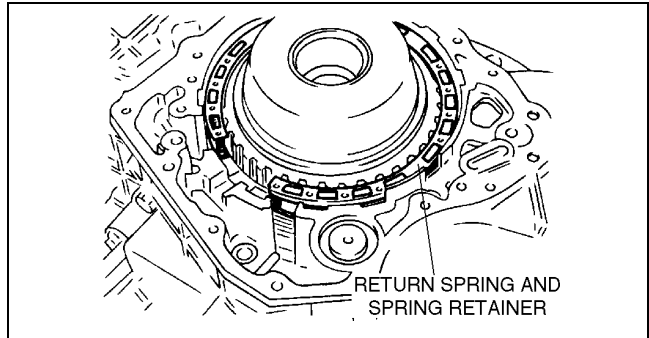
42. Remove the bolts, then remove the turbine sensor.



AMU0517A032

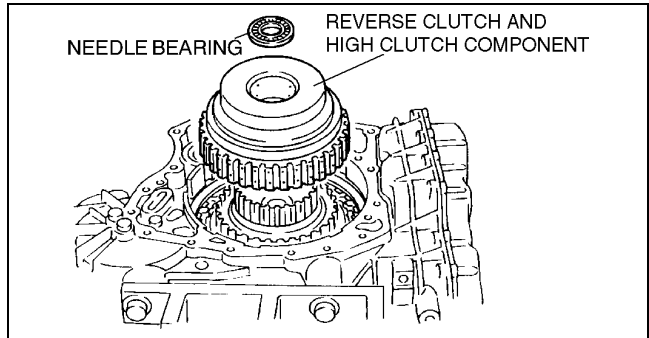
## AUTOMATIC TRANSAXLE

43. Remove the return spring and spring retainer.



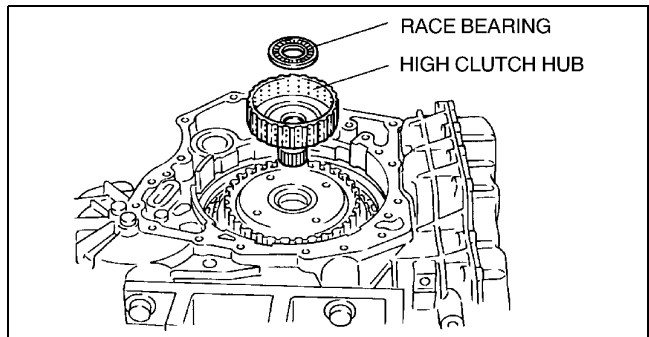
AMU0517A033

44. Remove the reverse clutch and high clutch component.  
45. Remove the needle bearing from the reverse clutch and high clutch component.



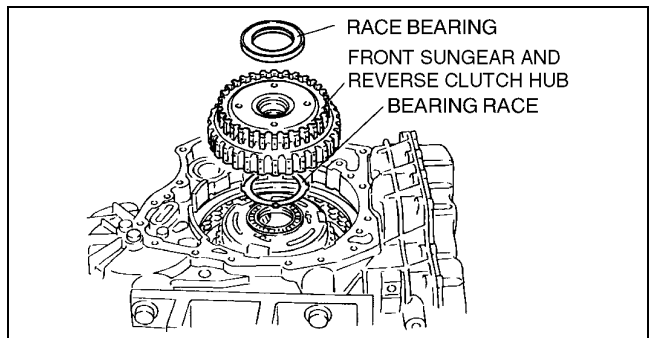
AMU0517A034

46. Remove the high clutch hub.  
47. Remove the race bearing from the high clutch hub.



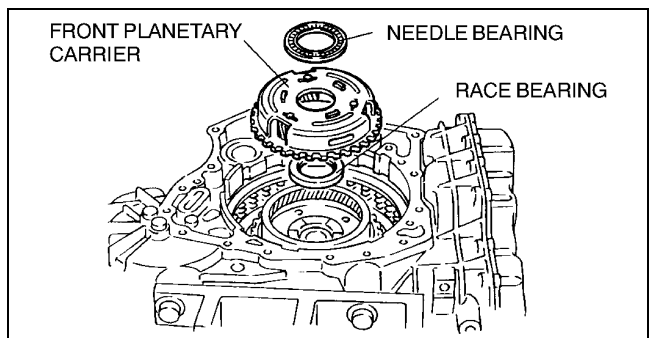
AMU0517A035

48. Remove the reverse clutch hub.  
49. Remove the race bearing and bearing race from the reverse clutch hub.



AMU0517A036

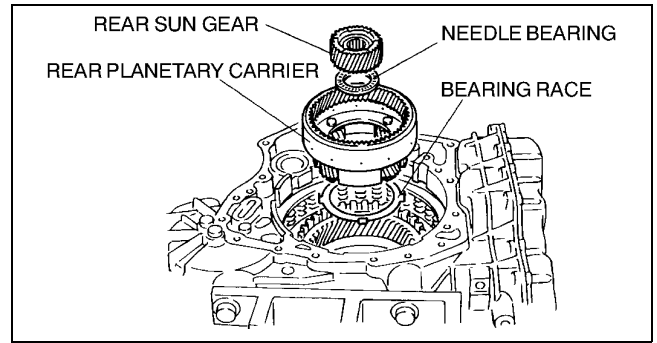
50. Remove the front planetary carrier component.  
51. Remove the needle bearing and race bearing from the front planetary carrier component.



AMU0517A037

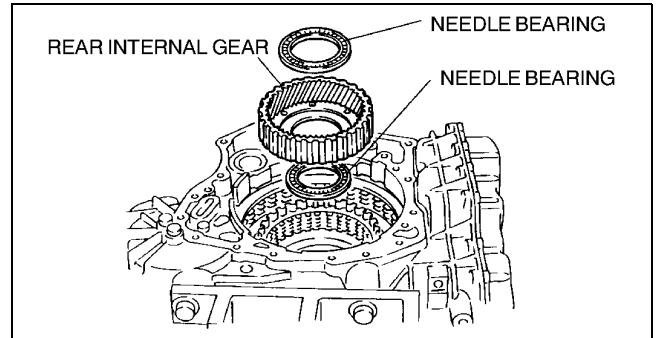
## AUTOMATIC TRANSAXLE

52. Remove the rear sun gear.
53. Remove the rear planetary carrier component.
54. Remove the needle bearing and bearing race from the rear planetary carrier component.



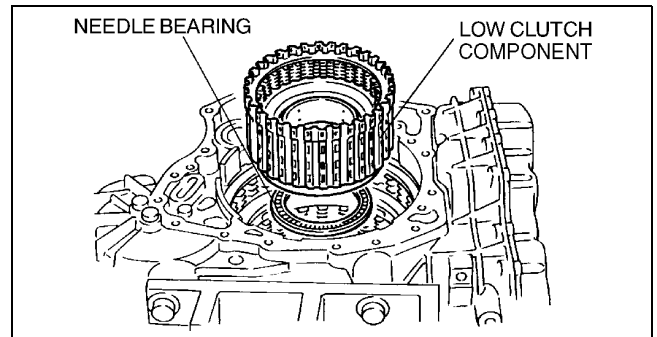
AMU0517A038

55. Remove the rear internal gear.
56. Remove the needle bearing from the rear internal gear.



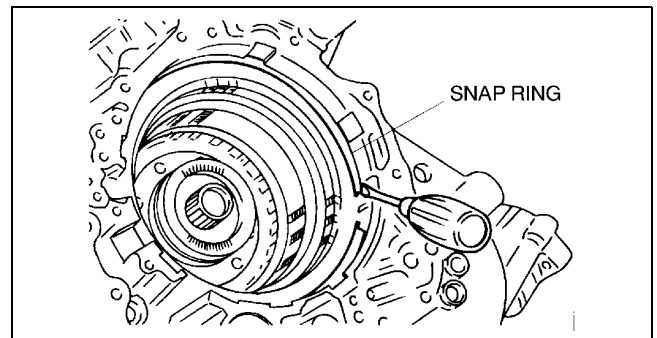
AMU0517A039

57. Remove the low clutch component.
58. Remove the needle bearing.



AMU0517A040

59. Remove the 2-4 brake.
  - (1) Remove the snap ring.
  - (2) Remove 2-4 brake retaining plates, drive plates, and driven plates as a unit.



AMU0517A041

K1

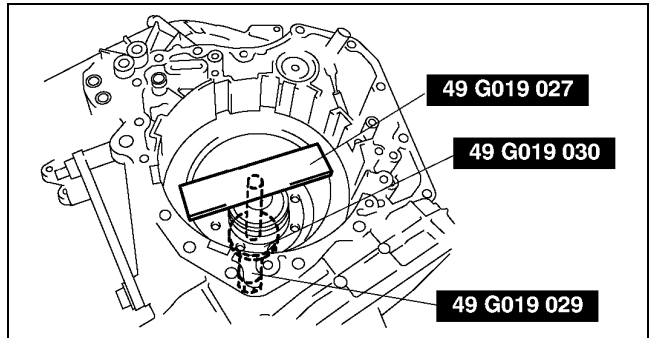
## AUTOMATIC TRANSAXLE

60. Remove the low and reverse brake.

### Caution

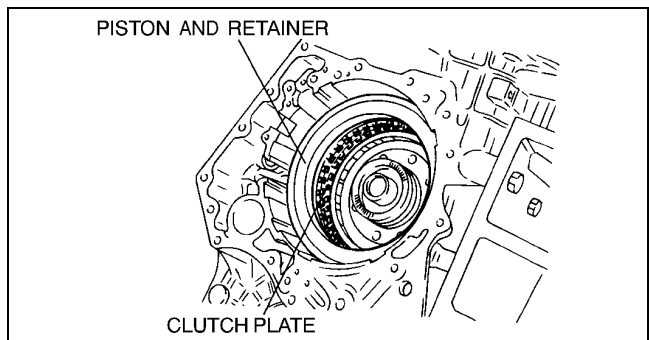
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.**

- (1) Install the **SSTs** in the transaxle case as shown in the figure.
- (2) Remove the snap ring.
- (3) Remove the **SSTs**.



AMU0517A167

- (4) Remove the piston and retainer, return spring, and spring retainer.
- (5) Remove the low and reverse brake dished plate, drive plates, driven plates, and retaining plate as a unit.

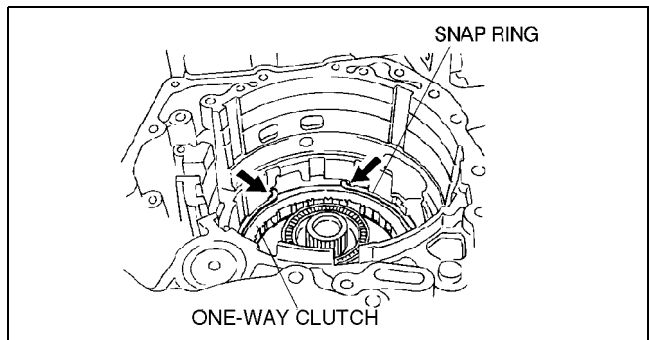


AMU0517A043

- (6) Remove the snap ring.
- (7) Remove the low one-way clutch.

### Caution

- **Be careful not to drop the low one-way clutch rollers.**



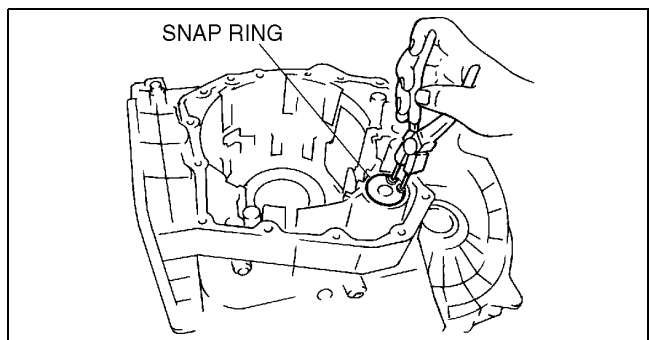
AMU0517A044

61. Remove the direct clutch accumulator.

- (1) Remove the snap ring.

### Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

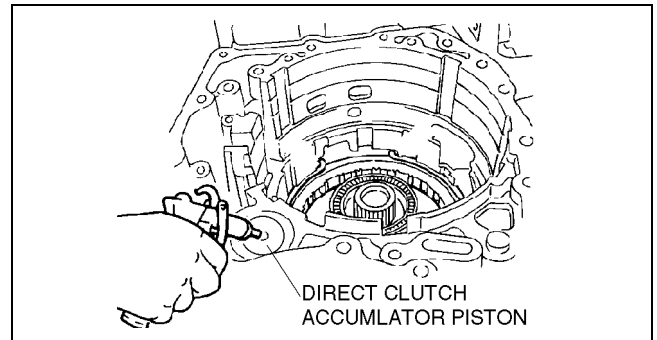


AMU0517A159



## AUTOMATIC TRANSAXLE

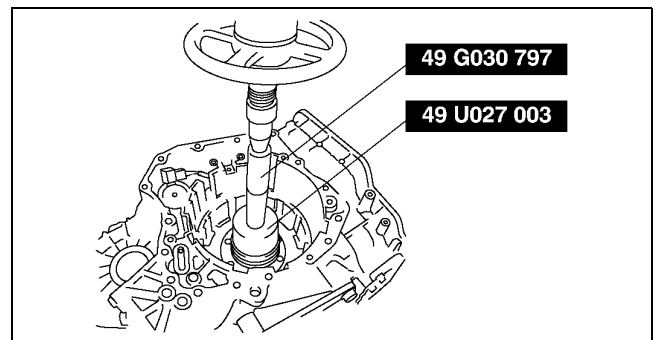
- (2) Remove the direct clutch accumulator piston by applying compressed air through the hole of the direct clutch accumulator piston.
- (3) Remove the springs.



AMU0517A146

### 62. Remove the output gear.

- (1) Remove the installation bolts of output gear.
- (2) Set the **SSTs** to the output gear, and remove the output gear using a press.



AMU0517A177

### 63. Remove the brake band servo.

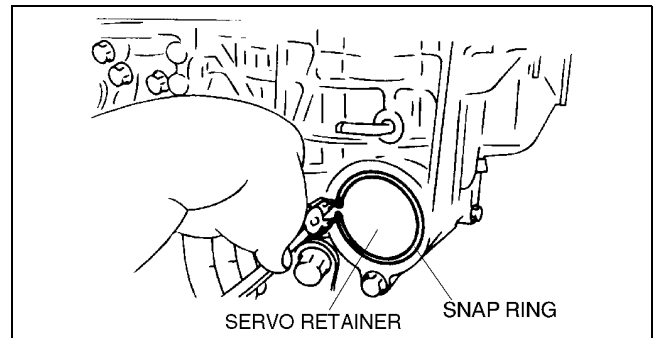
- (1) Remove the snap ring.

#### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

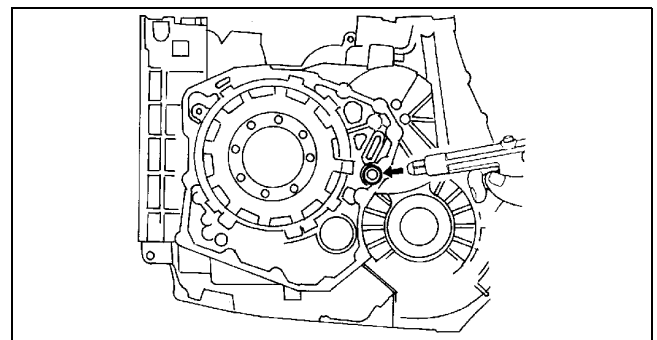
#### Caution

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.



AMU0517A018

- (2) Remove the servo retainer and reduction accumulator piston component by applying compressed air as shown.

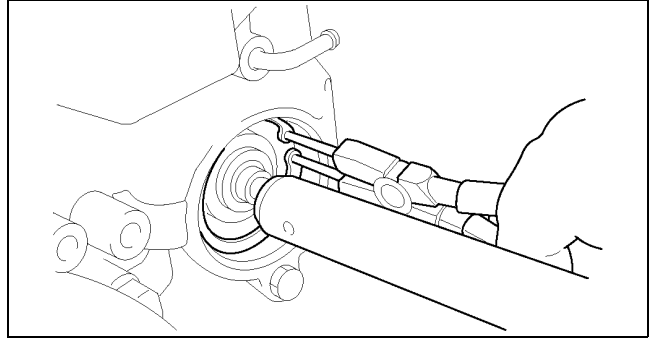


AMU0517A147

K1

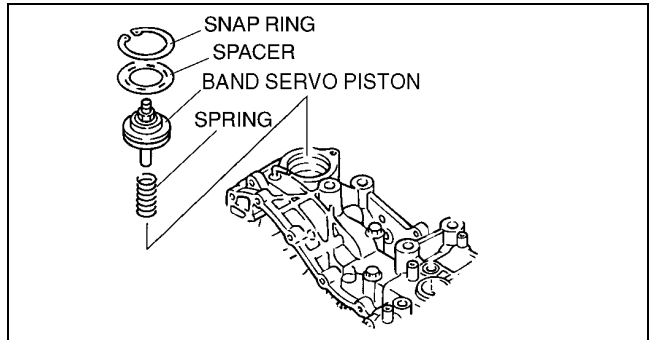
## AUTOMATIC TRANSAXLE

- (3) Pushing the piston stem using a wood stick, remove the snap ring.



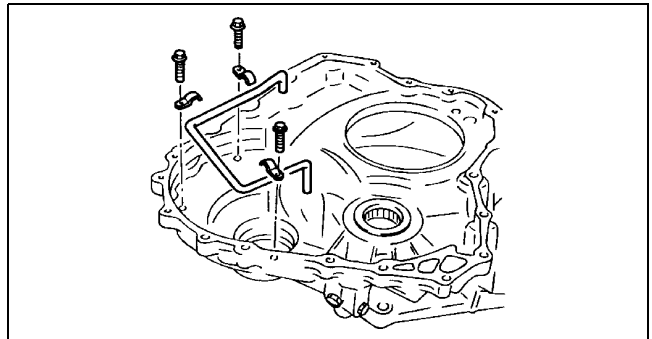
AMU0517A160

- (4) Remove the spacer, band servo piston, and spring.



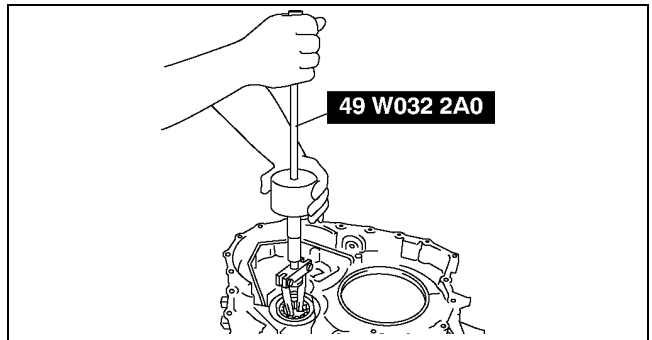
AMU0517A133

64. Remove the oil pipe from the converter housing.  
65. Remove the baffle plate.



AMU0517A125

66. Set the **SST** to the reduction gear bearing outer race, and remove it.



AMU0517A187

### TORQUE CONVERTER INSPECTION

1. Inspect the outer surface of the torque converter for damage or cracks, and replace it if necessary.
2. Inspect for rust and damage on the pilot hub of the torque converter or on the boss.
  - If there is any, remove the rust completely.

AME571419100A01

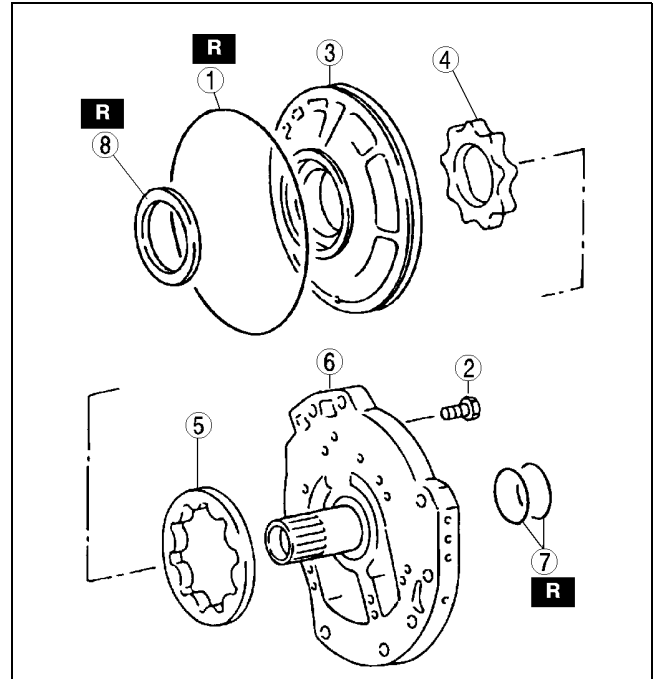
### OIL PUMP DISASSEMBLY

1. Disassemble in the order indicated in the table.

AME571419220A01

# AUTOMATIC TRANSAXLE

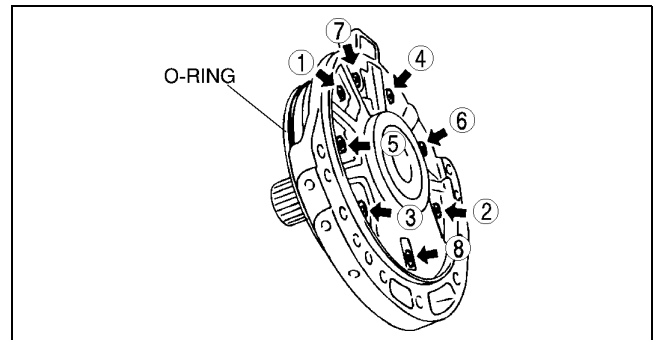
1	O-ring
2	Bolt
3	Oil pump housing
4	Inner rotor (See K1-15 Inner Rotor, Outer Rotor Disassembly Note)
5	Outer rotor (See K1-15 Inner Rotor, Outer Rotor Disassembly Note)
6	Oil pump cover (See K1-15 Oil Pump Cover Disassembly Note)
7	Seal ring
8	Oil seal



AME5714A002

### Oil Pump Cover Disassembly Note

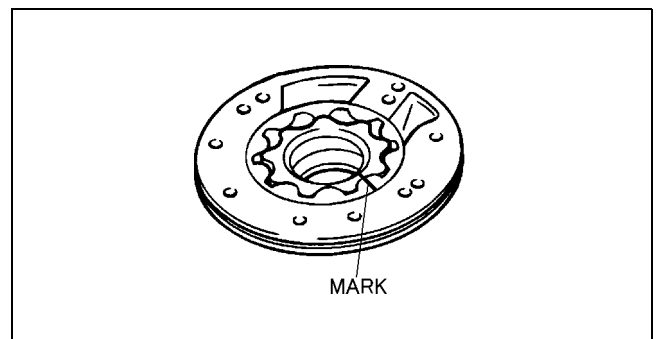
1. Remove mounting bolts evenly in the pattern shown and remove the oil pump cover from the oil pump housing.



AMU0517A048

### Inner Rotor, Outer Rotor Disassembly Note

1. Mark the outer and inner rotors without scratching or denting them, then remove them from the oil pump housing.



AMU0517A143

K1

# AUTOMATIC TRANSAXLE

## OIL PUMP INSPECTION

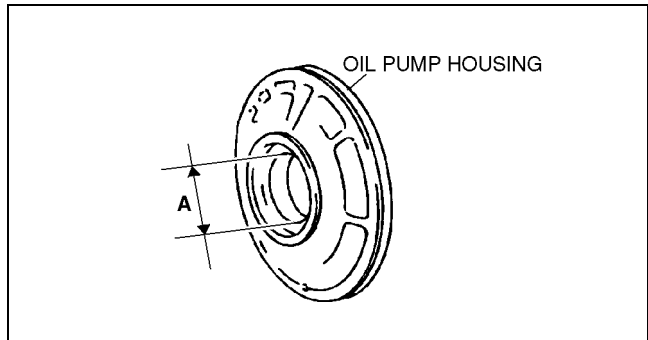
AME571419220A02

1. Check frictional surfaces of the inner rotor, outer rotor, and oil pump housing for damage or abnormal wear.
2. Check bushings for damage or abnormal wear.
3. Check other parts for external.
4. Measure the inner diameter of the oil pump housing A.

### Specification A

**Maximum: 42.045 mm {1.6553 in}**

- If not as specified, replace the oil pump housing.
5. Measure the rotor side clearances.
    - (1) Install outer and inner rotors to the oil pump housing.



AMU0517A188

- (2) Using straightedge and thickness gauge, measure height difference (side clearance) between the oil pump end surface and the rotor upper surface.

### Clearance

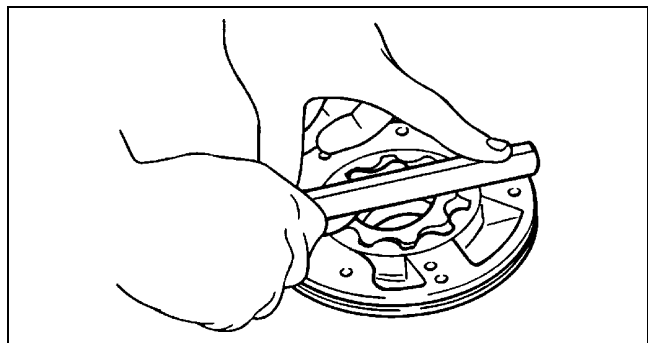
**Outer rotor: 0.02—0.04 mm**

**{0.0008—0.0015 in}**

**Inner rotor: 0.02—0.05 mm**

**{0.0008—0.0019 in}**

- If not as specified, replace the oil pump.
6. Using thickness gauge, measure the clearance between the outer rotor and the inner rotor.



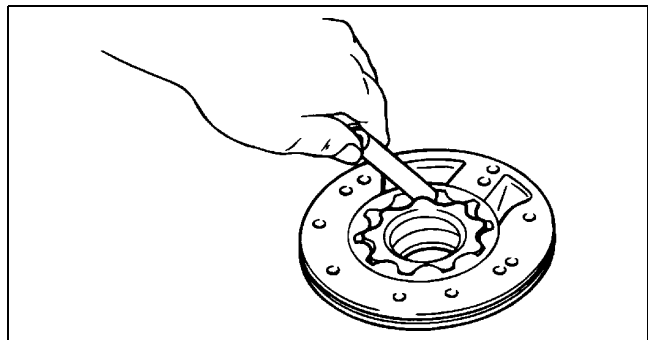
AMU0517A049

### Oil clearance

**Standard: 0.02—0.15 mm**

**{0.0008—0.0059 in}**

- If not as specified, replace the oil pump component where necessary.



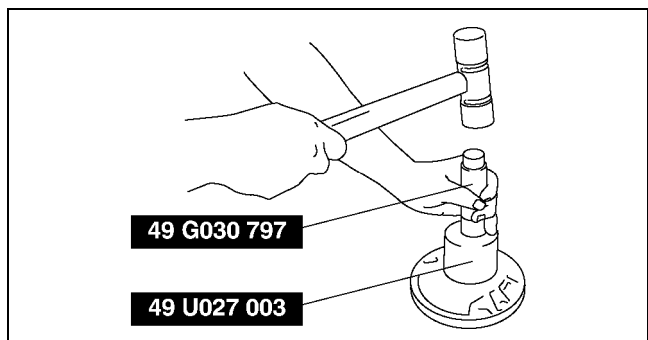
AMU0517A050

## OIL PUMP ASSEMBLY

AME571419220A03

### Assembly Procedure

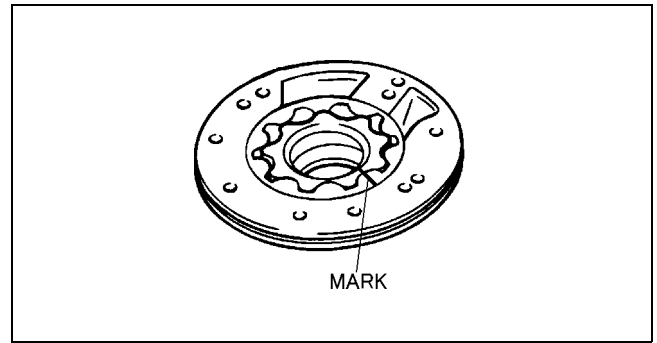
1. Install the new oil seal to the oil pump housing using the SSTs.
2. Apply ATF to the outer and inner rotors.



AMU0517A168

## AUTOMATIC TRANSAXLE

3. Align the marks and install the outer and inner rotors.
4. Install the outer and inner rotors to the oil pump housing.



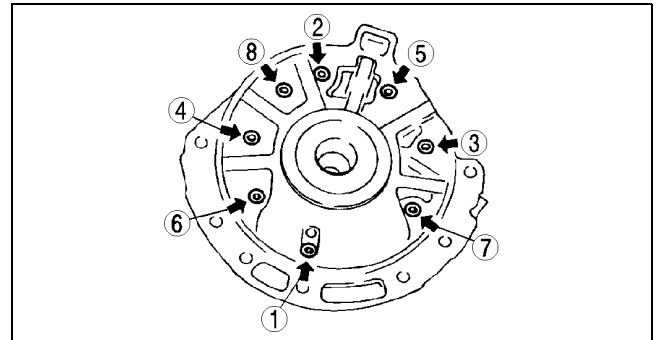
AMU0517A143

5. Install the bolts securing the oil pump housing as shown in the figure.

### Tightening torque

6.9—11.0 N·m {0.7—1.1 kgf·m, 5.1—7.9 ft·lbf}

6. Install a new O-ring to the oil pump housing.



AMU0517A051

## REVERSE CLUTCH AND HIGH CLUTCH PREINSPECTION

AME571419500A01

### Clutch Operation

1. Set the reverse clutch and high clutch component onto the end cover.

### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

### Caution

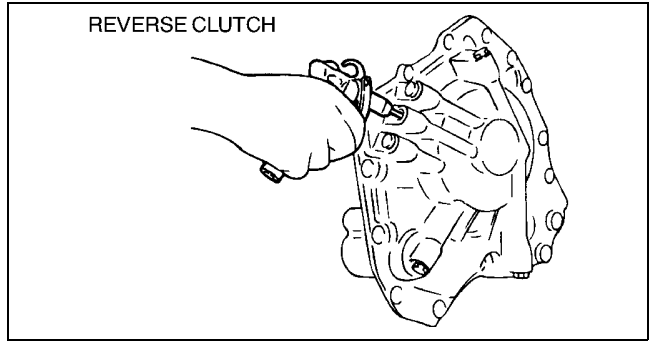
- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

### Note

- Regarding the position of the hole into which air is blown, refer to item "Oil pressure circuit" of this manual.

## AUTOMATIC TRANSAXLE

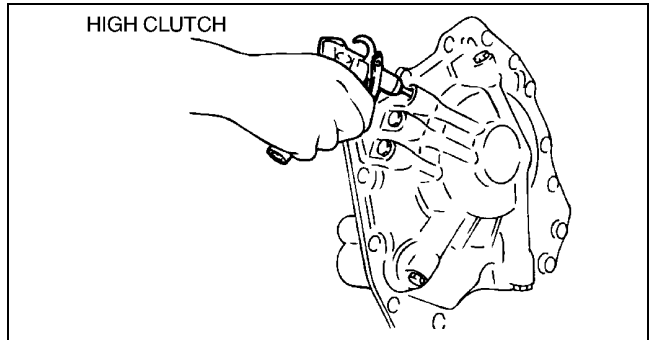
2. Inspect the clutch operation by applying compressed air through the fluid passages shown.



AMU0517A062

- If not as specified, replace parts where necessary.

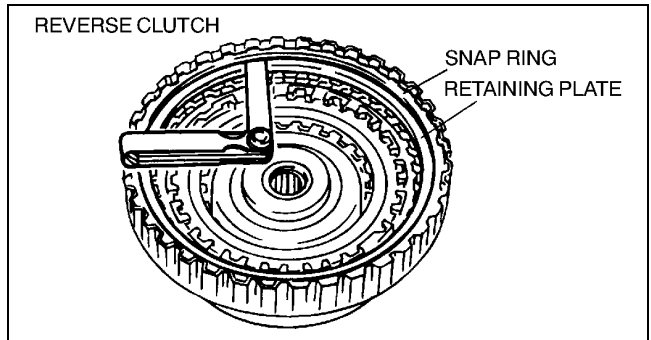
**Air pressure**  
390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.



AMU0517A063

### Clutch Clearance

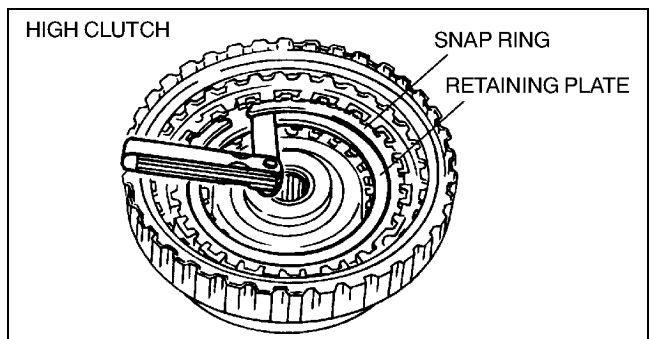
1. Using a thickness gauge, measure clearance between the retaining plate and the snap ring.



AMU0517A064

- If not as specified, replace parts where necessary.

**Clearance**  
Reverse clutch: 0.5—0.8 mm  
{0.020—0.031 in}  
High clutch: 0.8—1.1 mm {0.031—0.043 in}



AMU0517A065

### Retaining plate thickness (Reverse clutch)

mm {in}

3.6 {0.142}	3.8 {0.150}	4.0 {0.157}
4.2 {0.165}	—	—

### Retaining plate thickness (High clutch)

mm {in}

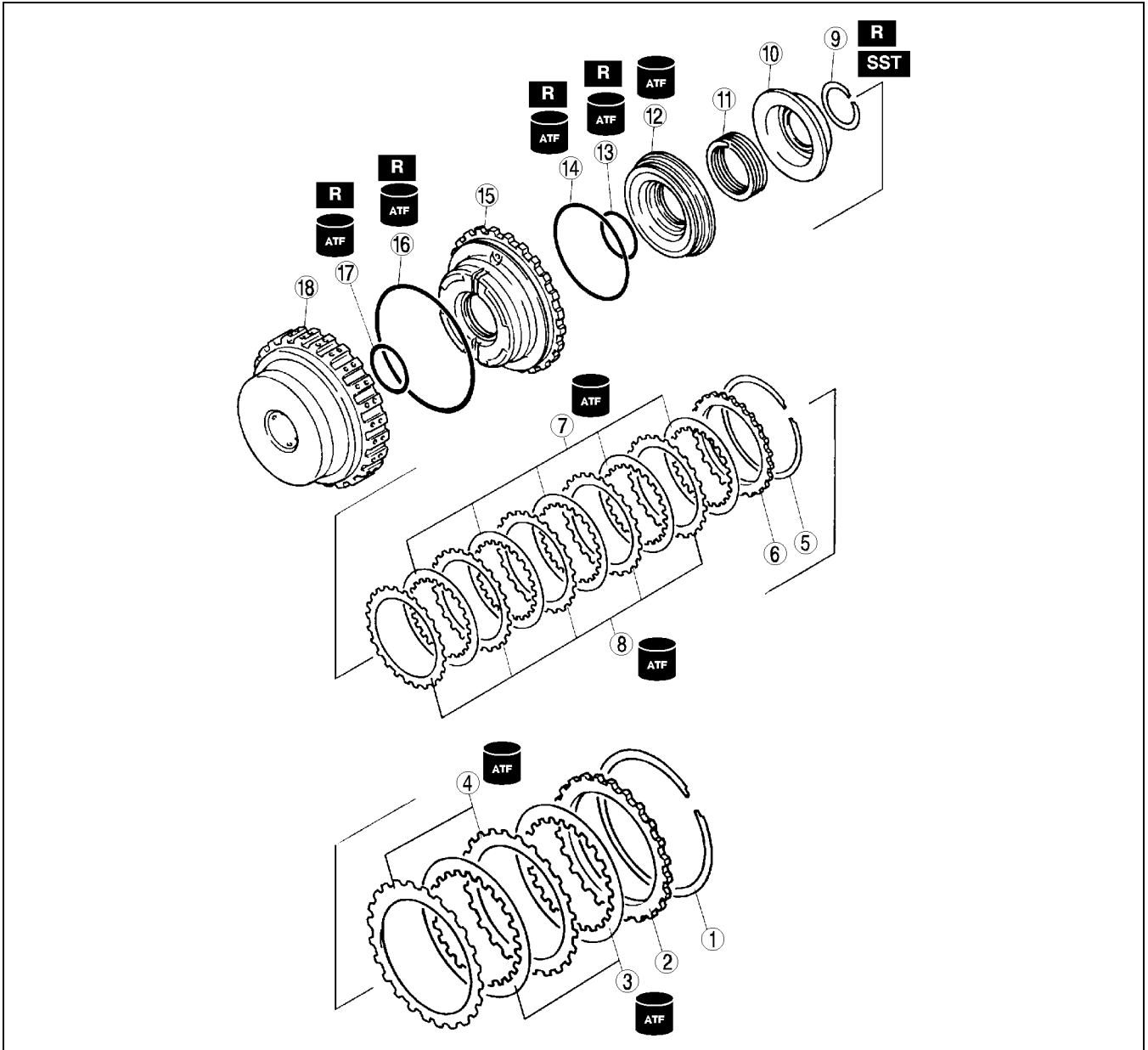
3.0 {0.118}	3.2 {0.126}	3.4 {0.134}
3.6 {0.142}	—	—

# AUTOMATIC TRANSAXLE

## REVERSE CLUTCH AND HIGH CLUTCH DISASSEMBLY

AME571419500A02

1. Disassemble in the order indicated in the table.



AMU0517A053

1	Snap ring
2	Retaining plate
3	Drive plate
4	Driven plate
5	Snap ring
6	Retaining plate
7	Drive plate
8	Driven plate
9	Snap ring (See K1-20 Snap Ring Disassembly Note)
10	Spring retainer

11	Return spring
12	High clutch piston (See K1-20 Reverse Clutch Piston and High Clutch Piston Disassembly Note)
13	O-ring
14	O-ring
15	Reverse clutch piston (See K1-20 Reverse Clutch Piston and High Clutch Piston Disassembly Note)
16	O-ring
17	O-ring
18	Clutch drum

K1

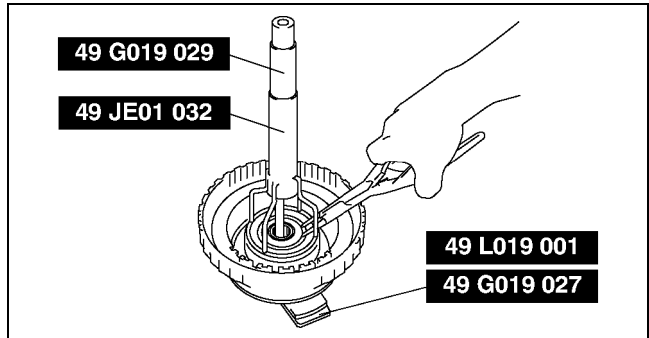
# AUTOMATIC TRANSAXLE

## Snap Ring Disassembly Note

### Caution

- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.**

1. Install the **SSTs** in the clutch drum as shown.
2. Compress the spring and retainer.
3. Remove the snap ring.
4. Remove the **SSTs**.



AMU0517A165

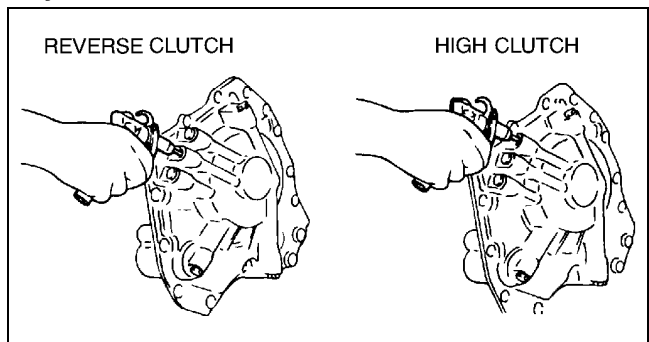
## Reverse Clutch Piston and High Clutch Piston Disassembly Note

1. Remove the clutch piston as follows:
  - (1) Assemble the clutch drum to the end cover.
  - (2) Using an air gun, blow air into circuit as shown in the figure to blow out the piston.

### Note

- Regarding the position of the hole into which air is blown, refer to item "Oil pressure circuit" of this manual.

2. Remove the O-rings from the piston.



AMU0517A057

## REVERSE CLUTCH AND HIGH CLUTCH INSPECTION

### Drive Plate Inspection

1. Measure the facing thickness in three places and calculate the average value.
  - If not within the specification, replace the drive plates.

AME571419500A03

### Thickness

**Minimum: 1.7 mm {0.067 in}**

### Spring and Retainer Inspection

1. Measure the free length of the spring and inspect for deformation.
  - If not within the specification, replace the spring and retainer.

### Specification

Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire thickness x wire width (mm {in})
73.0 {2.87}	27.0 {1.06}	14	1.1 {0.043} x 5.5 {0.217}

### Reverse Clutch Piston Inspection

### Warning

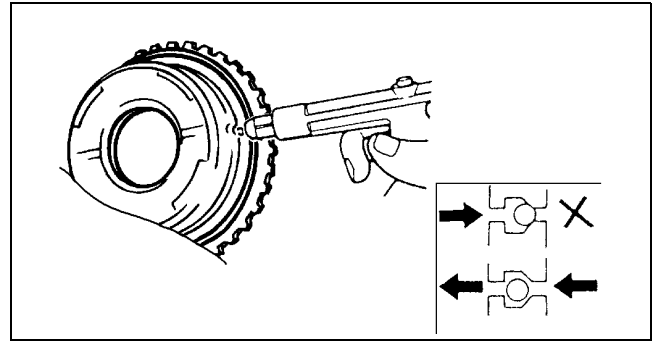
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



## AUTOMATIC TRANSAXLE

1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is airflow when applying compressed air through the oil hole on the return spring side.
  - Replace the coasting clutch piston if it is damaged or malfunctioning.

**Air pressure**  
**390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.**



AMU0517A144

K1

### REVERSE CLUTCH AND HIGH CLUTCH ASSEMBLY

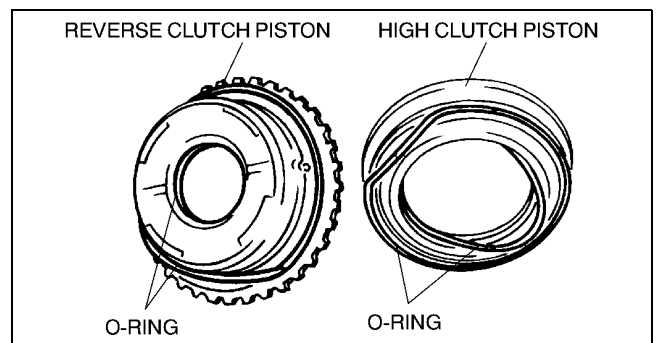
AME571419500A04

#### Assembly Procedure

1. Apply a coat of ATF to new O-rings, then install them to reverse and high clutch pistons.
2. Apply a coat of ATF to inside of reverse clutch piston, then install the high clutch piston into the reverse clutch piston while rotating the piston by hand.
3. Apply a coat of ATF to inside of drum, then install the reverse clutch piston into drum while rotating the piston by hand.

#### Note

- After installing required parts to the piston, ensure that the piston rotates smoothly by hand. If not, the O-ring may be caught.



AMU0517A058

4. Install the return spring.
5. Install the spring retainer as follows.
  - (1) Position the spring retainer.

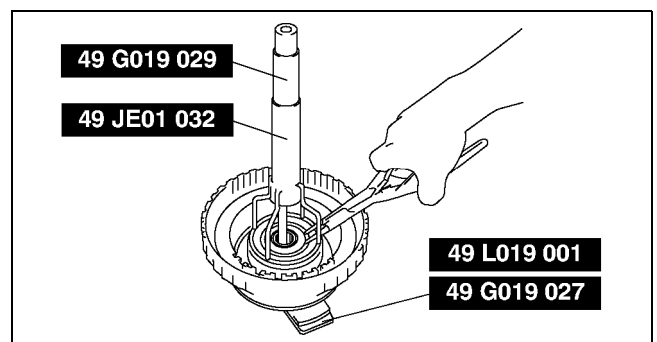
#### Caution

- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.**

- (2) Install the **SSTs** in clutch drum as shown.
- (3) Install the snap ring.
- (4) Remove the **SSTs**.

#### Caution

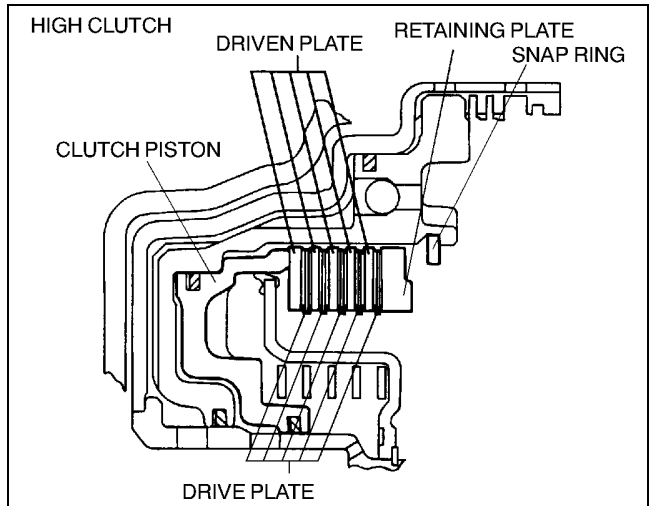
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer component edges.**



AMU0517A165

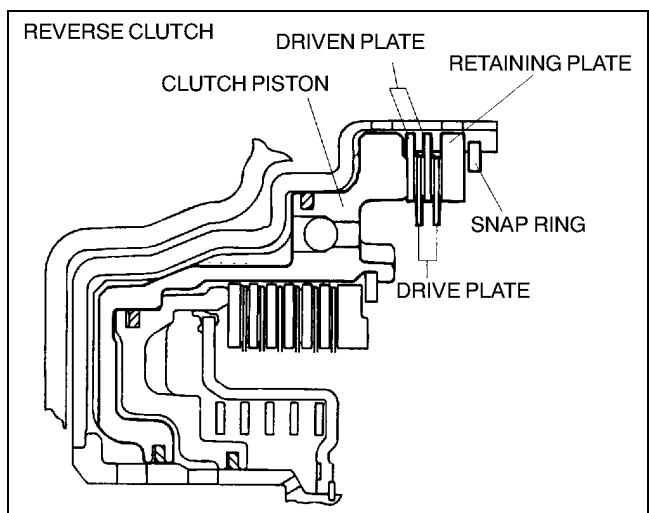
## AUTOMATIC TRANSAXLE

6. Install the plates and driven plates in the order as shown in the figure.



AMU0517A060

7. Install the retaining plate.  
8. Install the snap ring.



AMU0517A061

### LOW CLUTCH PREINSPECTION

AME571419500A05

#### Clutch Operation

1. Set the low clutch onto the transaxle case.

#### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

#### Caution

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

#### Note

- Regarding the position of the hole into which air is blown, refer to item "Oil pressure circuit" in this manual.

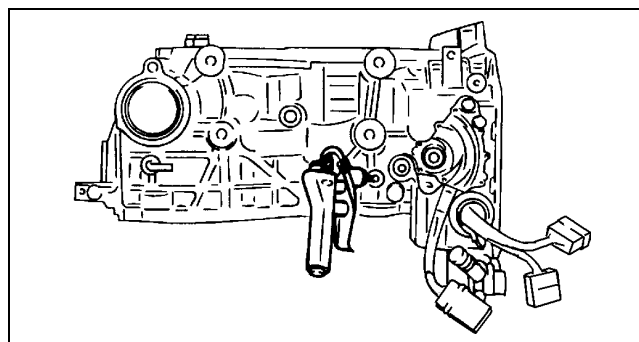
## AUTOMATIC TRANSAXLE

2. Inspect the clutch operation by applying compressed air through the fluid passages shown.

- If not as specified, replace parts where necessary.

**Air pressure**

**390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.**



AMU0517A073

**K1**

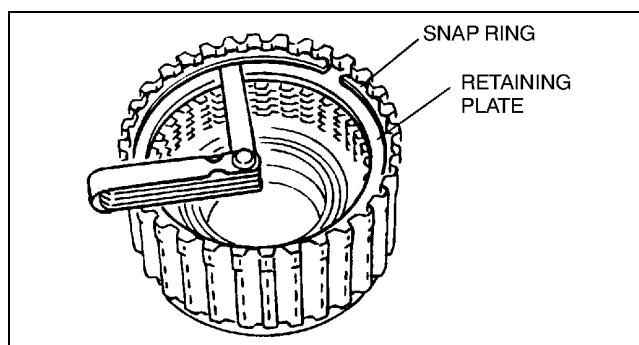
**Clutch Clearance**

1. Using a thickness gauge, measure clearance between the retaining plate and the snap ring.

- If not as specified, replace parts where necessary.
- If the specified clearance is exceeded, replace all clutch plates with new ones. And then, select a suitable retaining plate so that the specified clearance is obtained.

**Clearance:**

**1.1—1.3 mm {0.044—0.051 in}**



AMU0517A074

**Retaining plate thickness**

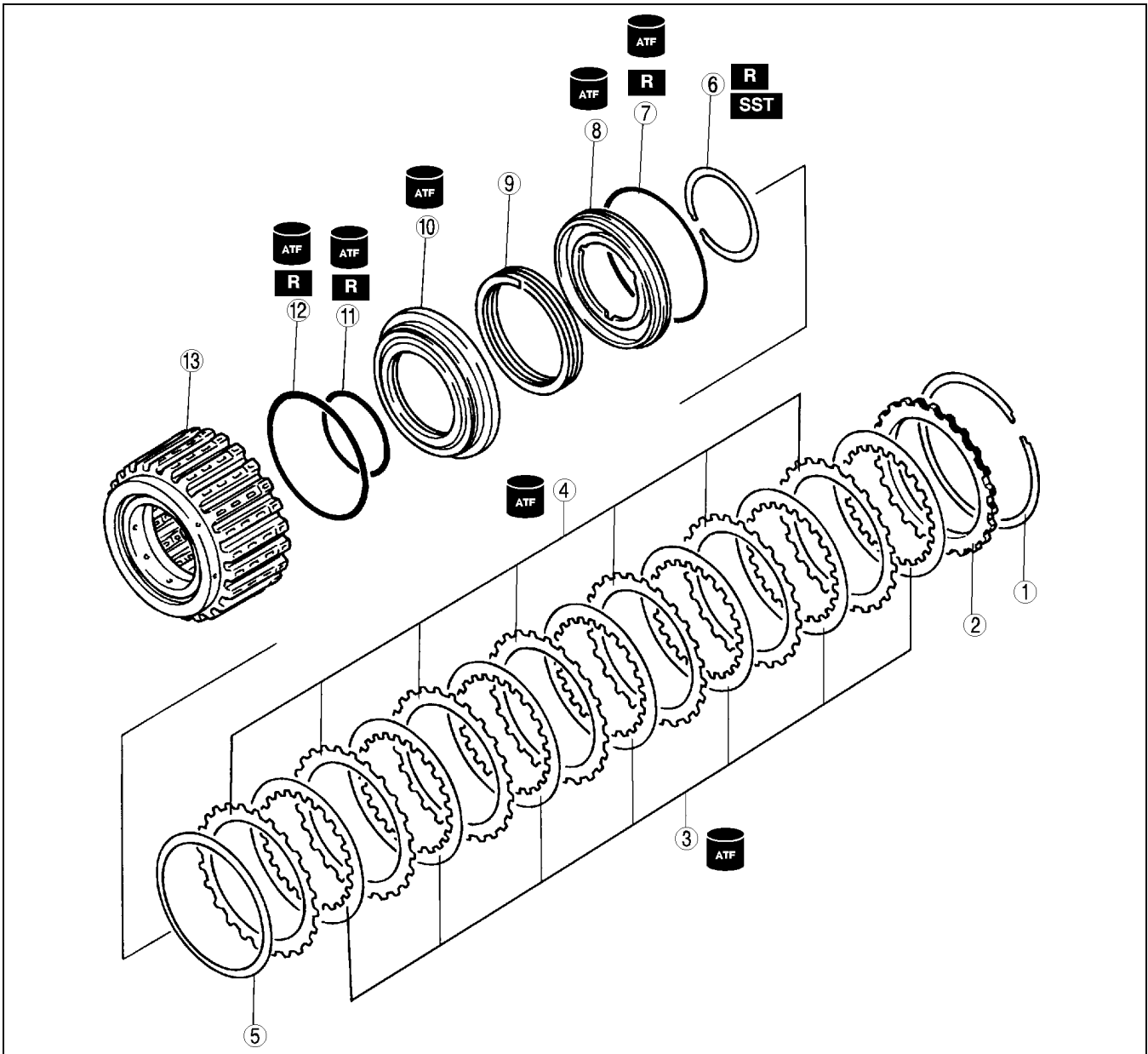
mm {in}

3.8 {0.150}	3.9 {0.154}	4.0 {0.157}
4.1 {0.161}	4.2 {0.165}	4.3 {0.169}
4.4 {0.173}	4.5 {0.177}	4.6 {0.181}

# AUTOMATIC TRANSAXLE

## LOW CLUTCH DISASSEMBLY

AME571419500A06



AMU0517A066

1	Snap ring
2	Retaining plate
3	Drive plate
4	Driven plate
5	Dished plate
6	Snap ring (See <a href="#">K1-24 Snap Ring Disassembly Note</a> )
7	O-ring

8	Cancel force cover
9	Return spring
10	Piston (See <a href="#">K1-25 Clutch Piston Disassembly Note</a> )
11	O-ring
12	Seal ring
13	Clutch drum

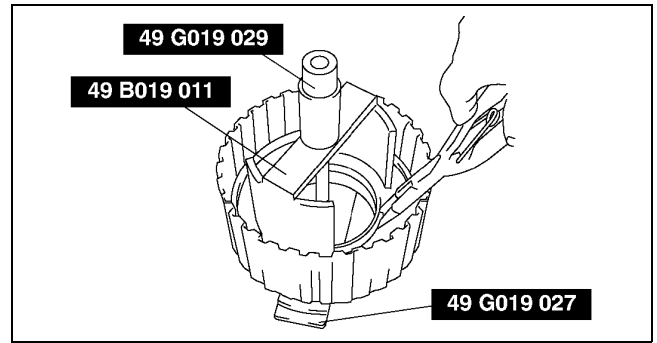
### Snap Ring Disassembly Note

#### Caution

- Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.

## AUTOMATIC TRANSAXLE

1. Install the **SSTs** in the clutch drum as shown.
2. Remove the snap ring.
3. Remove the **SSTs**.
4. Remove the cancel force cover.
5. Remove the O-ring from cancel force cover.
6. Remove the return spring.



AMU0517A166

K1

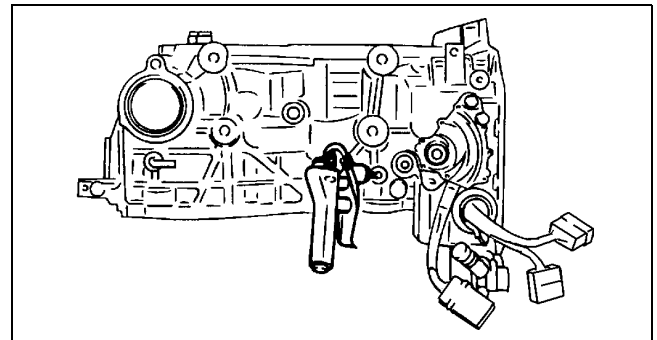
### Clutch Piston Disassembly Note

1. Assemble the clutch drum to the transaxle case.
2. Using an air gun, blow air into circuit as shown in the figure to blow out the piston.

**Note**

- Regarding the position of the hole into which air is blown, refer to item "Oil pressure circuit" in this manual.

3. Remove the seal ring and O-ring from the piston.



AMU0517A073

### LOW CLUTCH INSPECTION

AME571419500A07

#### Drive Plate Inspection

1. Measure the facing thickness in three places and calculate the average value.
  - If not within the specification, replace the drive plates.

**Thickness**

**Minimum: 1.7 mm {0.067 in}**

#### Spring and Retainer Inspection

1. Measure the free length of the spring and inspect for deformation.
  - If not within the specification, replace the spring and retainer.

#### Specification

Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire thickness x wire width (mm {in})
108.8 {4.28}	24.4 {0.96}	9	1.1 {0.043} x 6.0 {0.236}

### LOW CLUTCH ASSEMBLY

AME571419500A08

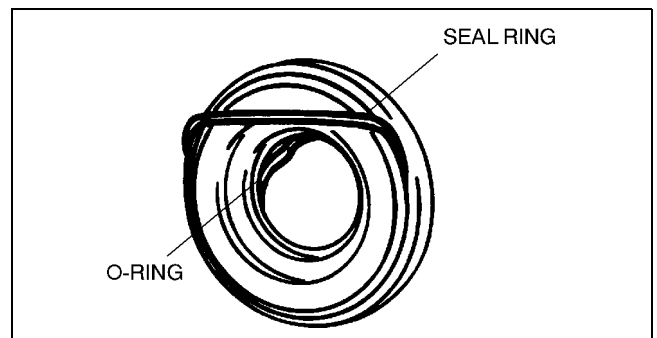
#### Assembly Procedure

1. Apply a coat of ATF to new seal ring and new O-ring, then install them onto piston.
2. Apply a coat of ATF to inside of the drum, then install the piston while rotating it by hand.

**Note**

- After installing required parts to the piston, ensure that the piston rotates smoothly by hand. If not, the lip seal may be caught.

3. Apply a coat of ATF to a new O-ring, then install it to the cancel force cover.



AMU0517A070

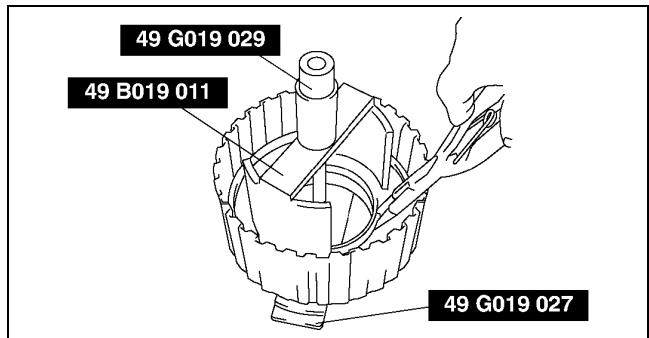
## AUTOMATIC TRANSAXLE

- Position the return spring and cancel force cover.

### Caution

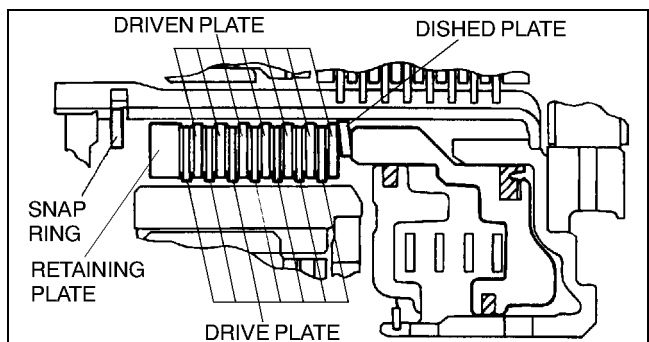
- Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.

- Install the **SSTs** in the clutch drum as shown.
- Install the snap ring.
- Remove the **SSTs**.



AMU0517A166

- Install the dished plate, drive plates, and driven plates in the order as shown in the figure.
- Install the retaining plate.
- Install the snap ring.



AMU0517A072

## DIRECT CLUTCH PREINSPECTION

### Clutch Operation

- Set the direct clutch onto the transaxle case.

AME571419500A09

### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

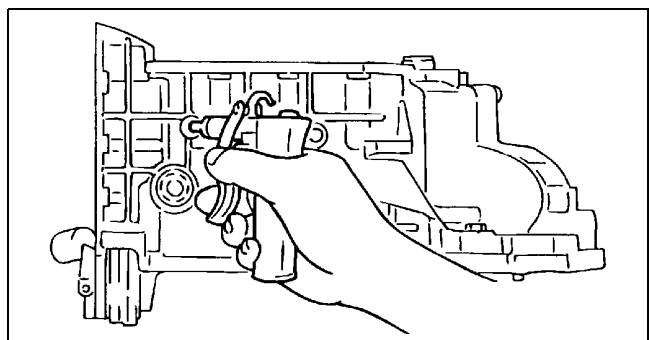
### Caution

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

- Inspect the clutch operation by applying compressed air through the fluid passages shown.
  - If not as specified, replace parts where necessary.

### Air pressure

390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.



AMU0517A079

## AUTOMATIC TRANSAXLE

### Clutch Clearance

1. Using thickness gauge, measure clearance between the retaining plate and the snap ring.
  - If not as specified, replace parts where necessary.
  - If the specified clearance is exceeded, replace all clutch plates with new ones. Then, select a suitable retaining plate so that the specified clearance is obtained.

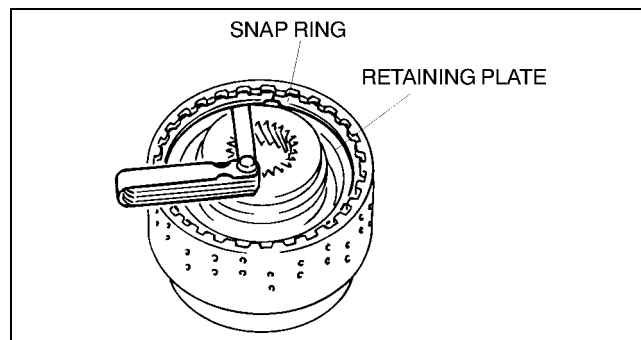
### Clearance

1.8—2.2 mm {0.07—0.09 in}

### Retaining plate thickness

mm {in}

4.0 {0.157}	4.2 {0.165}	4.4 {0.173}
4.6 {0.181}	4.8 {0.189}	5.0 {0.197}



AMU0517A083

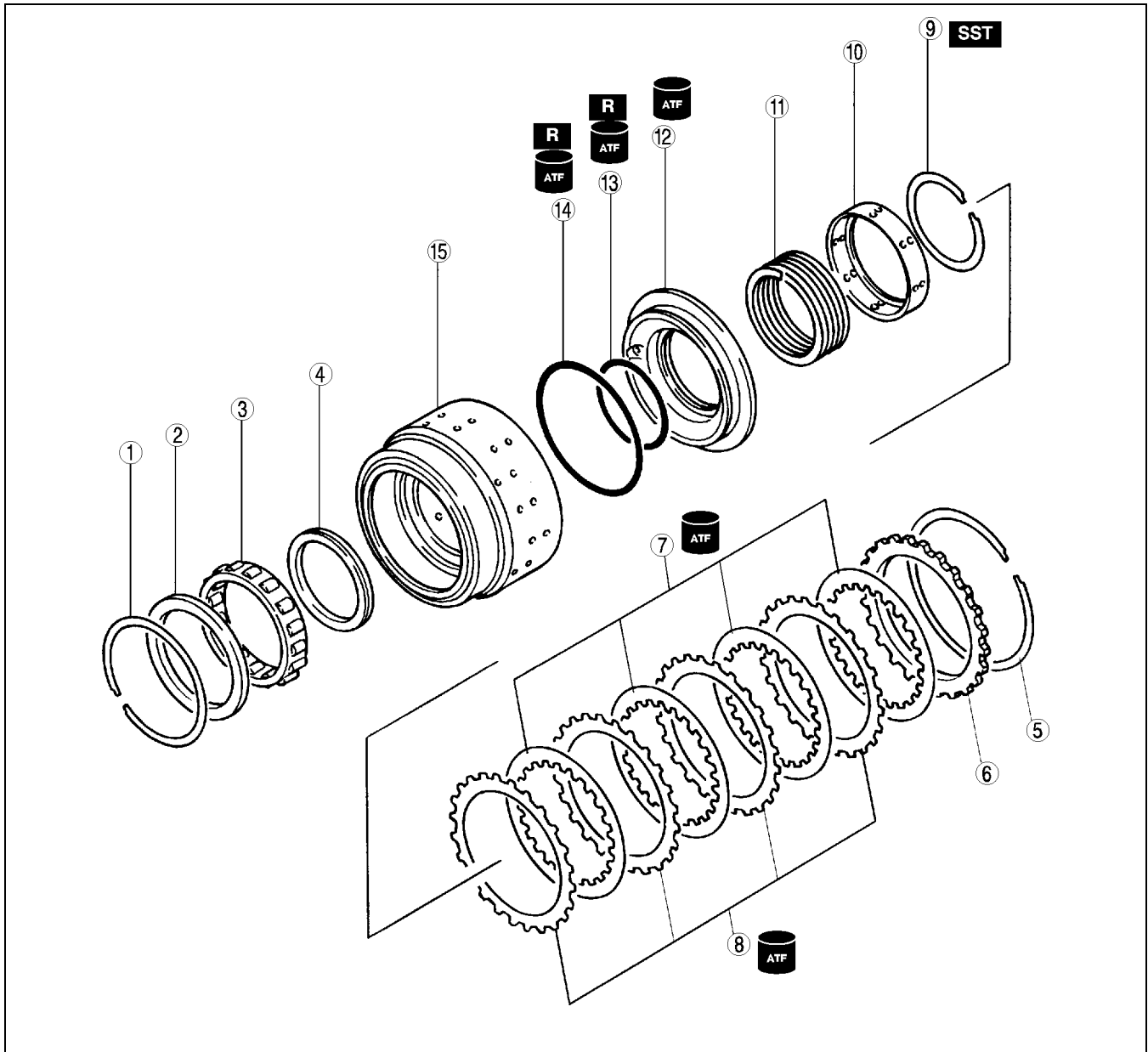
K1

# AUTOMATIC TRANSAXLE

## DIRECT CLUTCH DISASSEMBLY

AME571419500A10

1. Disassemble in the order indicated in the table.



AMU0517A075

1	Snap ring
2	Retainer
3	One-way clutch
4	Needle bearing
5	Snap ring
6	Retaining plate
7	Drive plate
8	Driven plate

9	Snap ring (See <a href="#">K1-28 Snap Ring Disassembly Note</a> )
10	Spring retainer
11	Return spring
12	Direct piston (See <a href="#">K1-29 Direct Piston Disassembly Note</a> )
13	O-ring
14	O-ring
15	Direct Clutch drum

### Snap Ring Disassembly Note

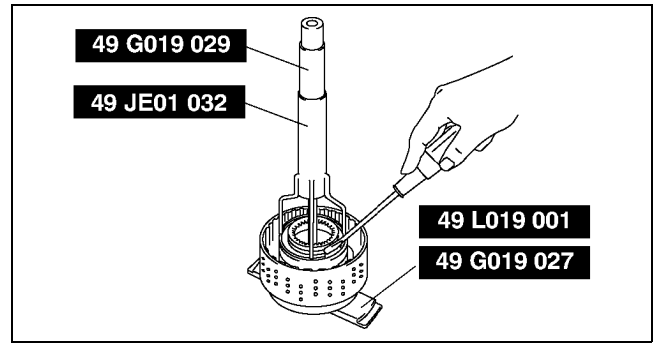
#### Caution

- Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.



## AUTOMATIC TRANSAXLE

1. Install the **SSTs** in the clutch drum as shown.
2. Remove the snap ring.
3. Remove the **SSTs**.
4. Remove the spring retainer.
5. Remove the return spring.



AMU0517A180

K1

### Direct Piston Disassembly Note

1. Assemble the clutch drum to the transaxle case.

#### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

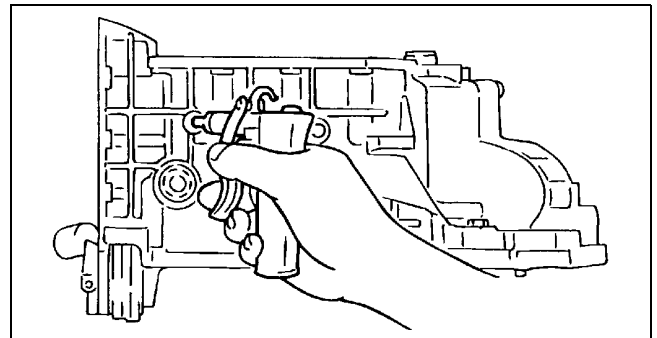
#### Caution

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

#### Note

- Regarding the position of the hole into which air is blown, refer to item "Oil pressure circuit" in this manual.

2. Remove the direct piston by applying compressed air through the fluid passage.
3. Remove the O-ring from piston.



AMU0517A079

## DIRECT CLUTCH INSPECTION

AME571419500A11

### Drive Plate Inspection

1. Measure the facing thickness in three places and calculate the average value.
  - If not within the specification, replace the drive plates.

#### Thickness

Minimum: 1.7 mm {0.067 in}

### Return Spring Inspection

1. Measure the spring free length.
  - If not within the specification, replace the spring.

#### Specification

Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire thickness x wire width (mm {in})
66.9 {2.63}	33.2 {1.30}	9	1.3 x 4.5 {0.05 x 0.17}

# AUTOMATIC TRANSAXLE

## Clutch Piston Inspection

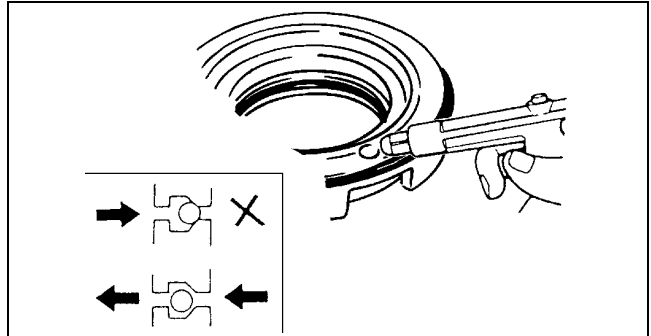
### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is airflow when applying compressed air through the oil hole on the return spring side.
  - Replace the 3-4 clutch piston if it is damaged or malfunctioning.

### Air pressure

390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.



AMU0517A145

## DIRECT CLUTCH ASSEMBLY

### Assembly Procedure

1. Apply a coat of ATF to new O-rings, then install them to the piston.
2. Apply a coat of ATF to inside of the clutch drum, then install the piston while rotating it by hand.

### Note

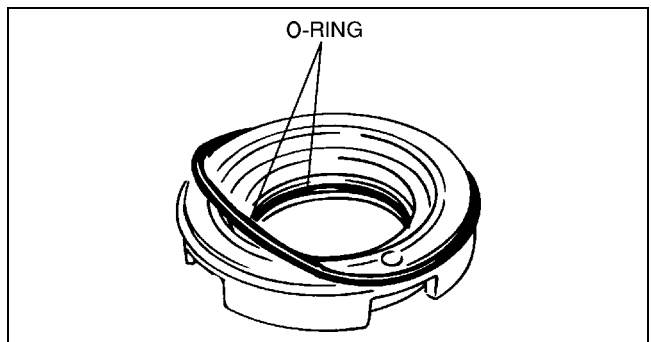
- After installing the drum, ensure that the piston rotates smoothly by hand. If not, the O-ring may be caught.

3. Install the return spring.
4. Position the spring retainer.

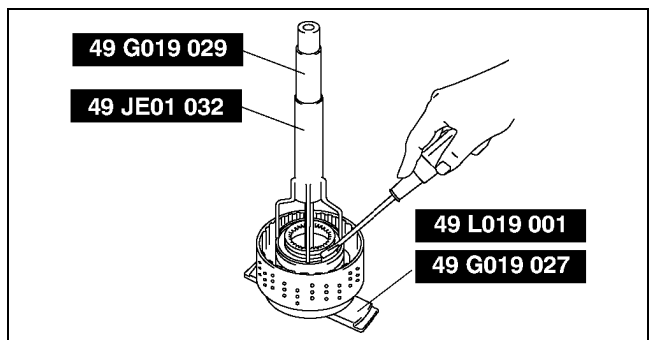
### Caution

- Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.

5. Install the **SSTs** in the clutch drum as shown.
6. Install the snap ring.
7. Remove the **SSTs**.



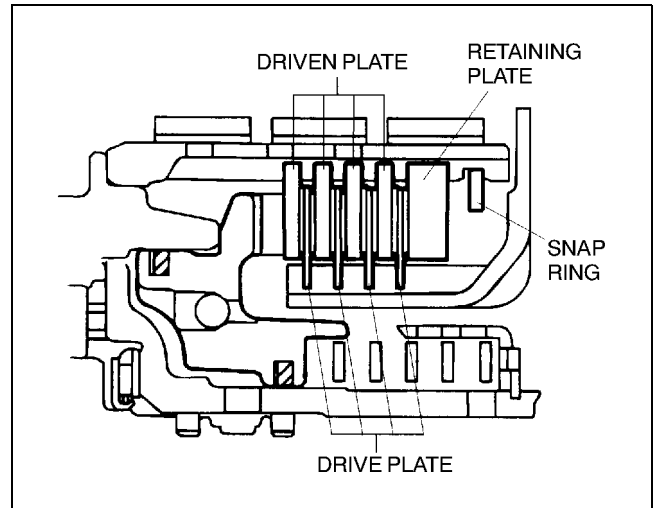
AME571419500A12



AMU0517A180

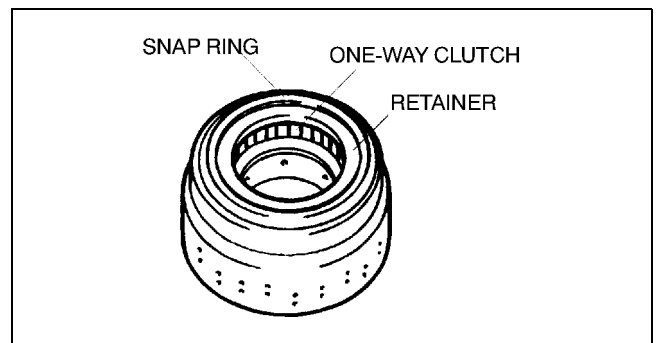
## AUTOMATIC TRANSAXLE

8. Install the drive plates and driven plates in the order as shown in the figure.
9. Install the retaining plate.
10. Install the snap ring.



AMU0517A082

11. Place the direct clutch upside down, then install the one-way clutch and retainer.
12. Install the snap ring.



AMU0517A084

K1

# AUTOMATIC TRANSAXLE

## 2-4 BRAKE, LOW AND REVERSE BRAKE PREINSPECTION

AME571419091A01

### Clutch Operation Inspection

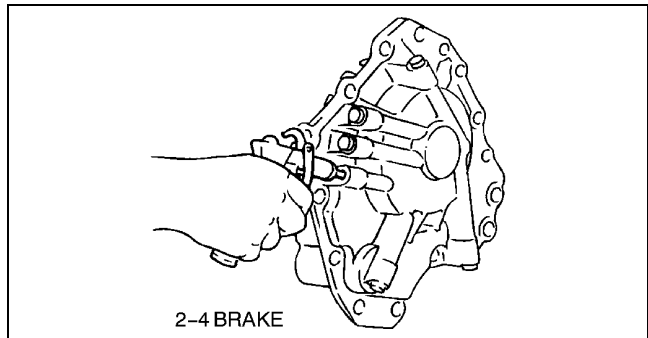
#### Warning

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

#### Caution

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

1. Inspect operation of the brake piston by applying compressed air as shown.

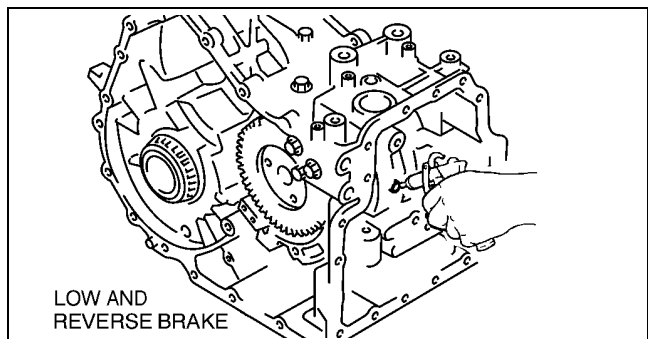


AME5714A005

- If the operation is abnormal, replace parts where necessary.

#### Air pressure

390 kPa {4.0 kgf/cm<sup>2</sup>, 57 psi} max.



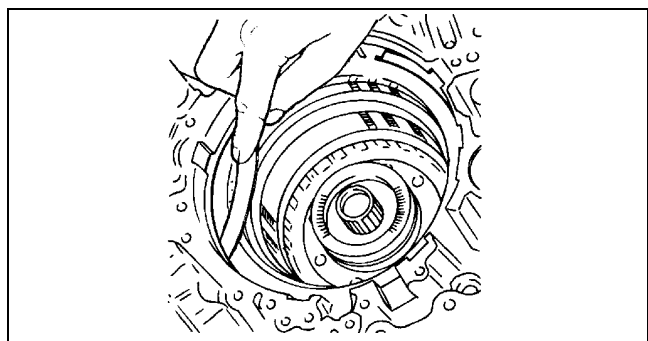
AME5714A004

### Clutch Clearance Inspection

1. Measure the clearance between the retaining plate and the snap ring using a thickness gauge.
  - If not as specified, replace parts where necessary.

#### Clearance

0.8—1.1 mm {0.032—0.043 in}



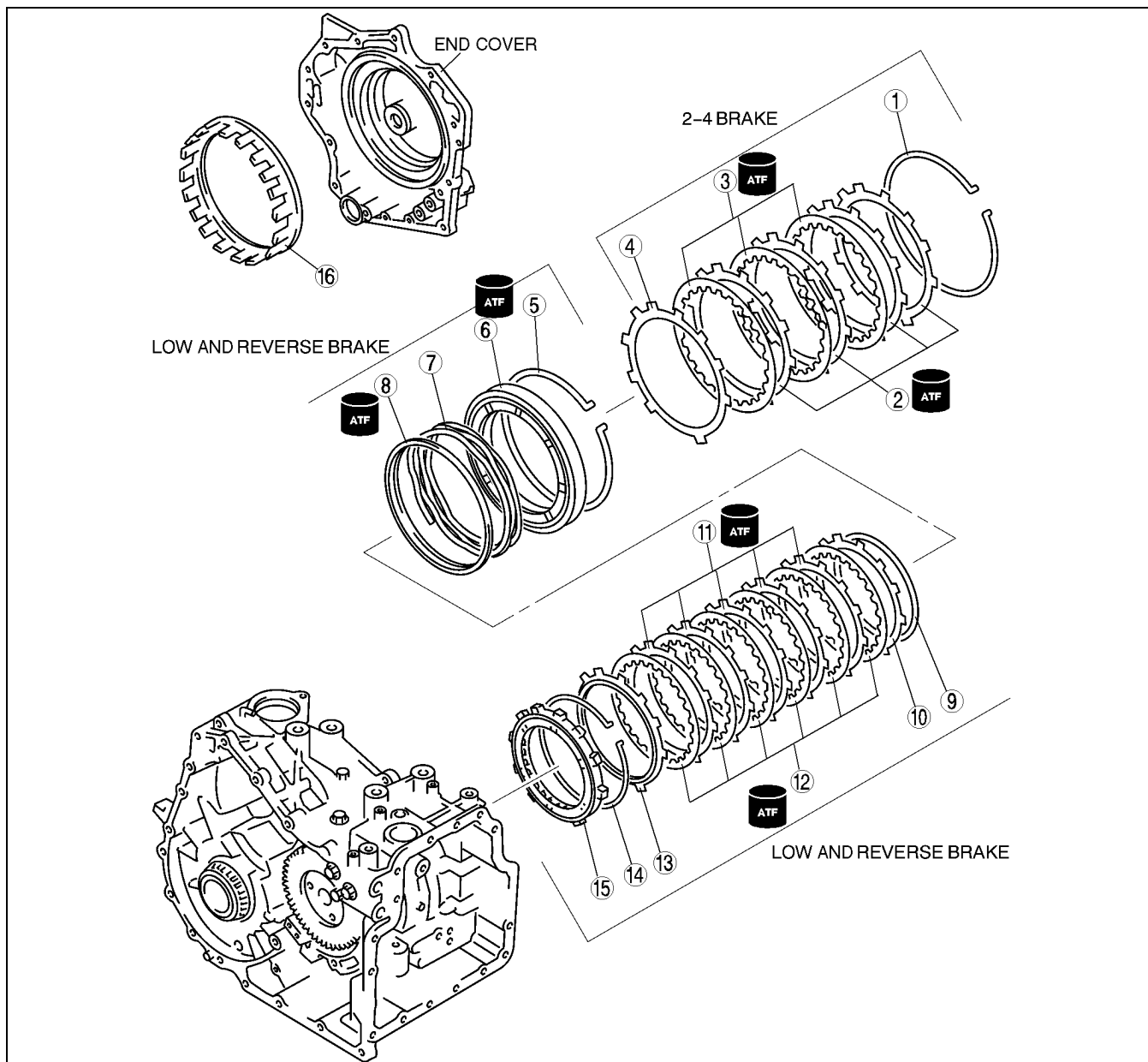
AMU0517A183

# AUTOMATIC TRANSAXLE

## 2-4 BRAKE, LOW AND REVERSE BRAKE DISASSEMBLY

AME571419091A02

1. Disassemble in the order indicated in the table.



AMU0517A085

1	Snap ring
2	Driven plate
3	Drive plate
4	Retaining plates
5	Snap ring (See <a href="#">K1-34 Snap Ring Disassembly Note.</a> )
6	Piston and retainer
7	Return spring
8	Spring retainer

9	Dished plate
10	Retaining plate
11	Driven plate
12	Drive plate
13	Retaining plate
14	Snap ring
15	One-way clutch
16	2-4 brake piston (See <a href="#">K1-34 2-4 Brake Piston Disassembly Note.</a> )

K1

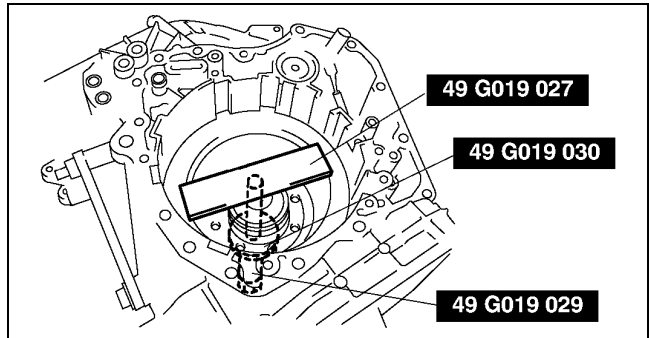
# AUTOMATIC TRANSAXLE

## Snap Ring Disassembly Note

### Caution

- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.**

1. Install the **SSTs** in the transaxle case as shown in the figure.
2. Remove the snap ring.
3. Remove the **SSTs**.



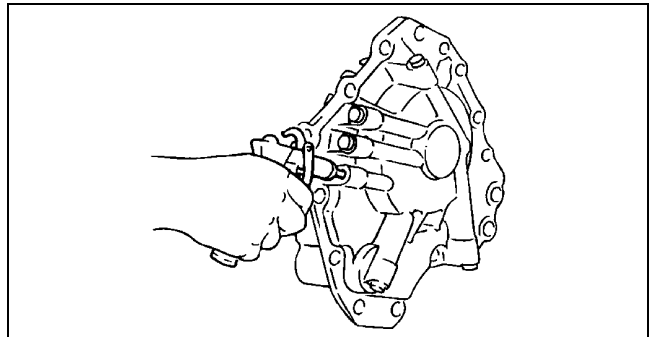
AMU0517A167

## 2-4 Brake Piston Disassembly Note

### Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

1. Using an air gun, blow air into circuit to blow out the 2-4 brake piston as shown in the figure.
2. Remove the seal ring and O-ring from the 2-4 brake piston.



AMU0517A086

## 2-4 BRAKE, LOW AND REVERSE BRAKE INSPECTION

AME571419091A03

### Drive Plate Inspection

1. Measure the facing thickness in three places, and determine the average of the three readings.
  - If not within the specification, replace the drive plates.

### Thickness

**Minimum: 1.7 mm {0.067 in}**

### Spring and Retainer Inspection

1. Measure the free length of each spring and inspect for deformation.
  - If not within the specifications, replace the spring and retainer.

# AUTOMATIC TRANSAXLE

## Specification

### 2-4 brake return spring

Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire diameter (mm {in})
8 {0.31}	21.4 {0.84}	6.6	1.0 {0.039}

### Low and reverse return spring

Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire thickness x wire width (mm {in})
178.9 {7.04}	20.3 {0.79}	4	1.3 x 5.2 {0.05 x 0.20}

## 2-4 BRAKE, LOW AND REVERSE BRAKE ASSEMBLY

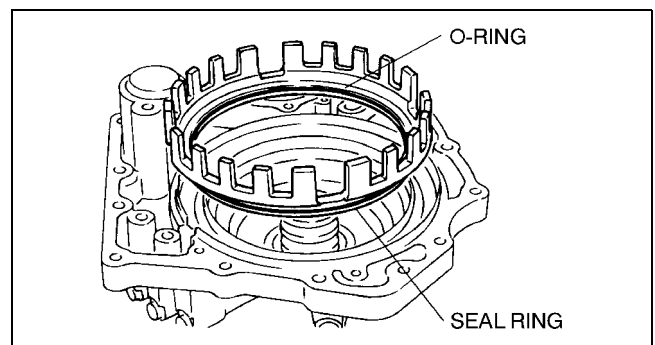
AME571419091A04

### Assembly Procedure

1. Apply a coat of ATF to a new seal ring and new O-ring, then install them to the 2-4 brake piston.

#### Note

- After installing the piston, ensure that piston rotates smoothly by hand. If not, the lip seal may be caught.



AMU0517A087

### Low and reverse brake

1. Measure the snap ring groove width A.
2. Measure the snap ring thickness B.
3. Calculate the clearance using the following formula.

$$\text{Clearance} = A - B$$

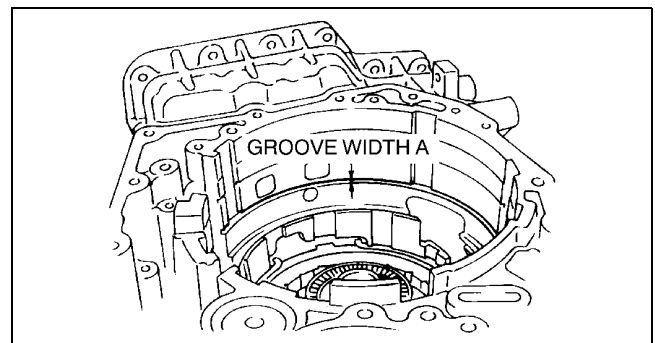
$$0.0 - 0.2 \text{ mm } \{0.000 - 0.008 \text{ in}\}$$

4. If the clearance is out of specification, select a suitable snap ring.

### Selectable snap ring thickness

mm {in}

2.1 {0.083}	2.2 {0.087}	2.3 {0.091}
-------------	-------------	-------------



AMU0517A088

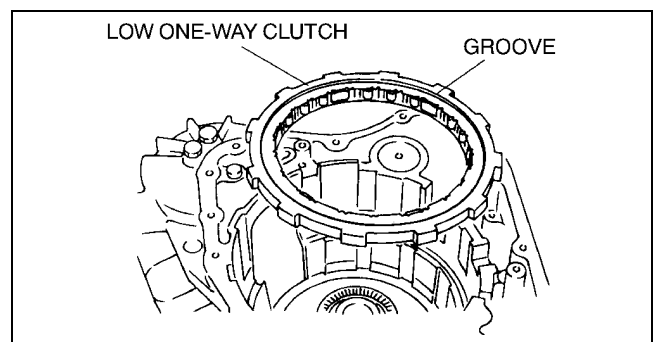
#### Note

- The low one-way clutch must be installed with the groove facing upward.

5. Install the low one-way clutch.

#### Note

- The snap ring opening must be positioned as shown in the figure.



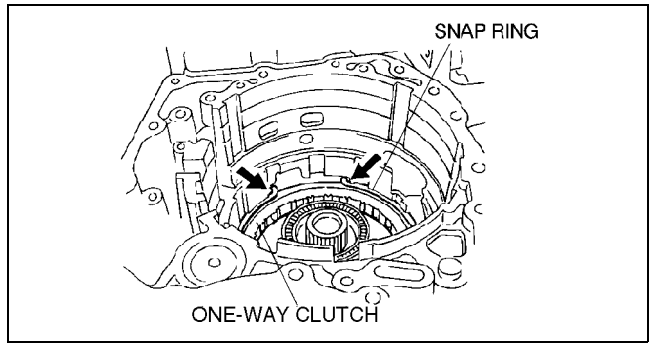
AMU0517A089

## AUTOMATIC TRANSAXLE

6. Install the snap ring.
7. Install the retaining plates, drive plates, driven plates, dished plate, and spring retainer.
8. Install the return spring.

### Note

- When installing the piston and retainer, align the oil holes as shown in the figure.

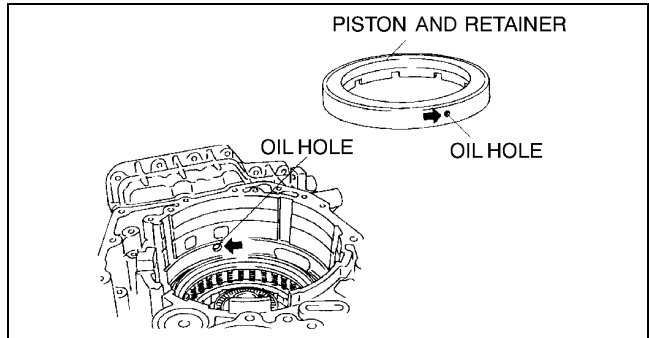


AMU0517A044

9. Install the piston and retainer.

### Caution

- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.**

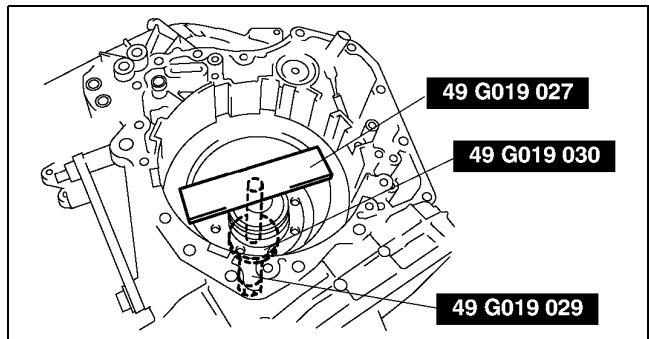


AMU0517A090

10. Install the **SSTs** in the transaxle case as shown in the figure.

### Note

- The snap ring opening must be positioned as shown in the figure.

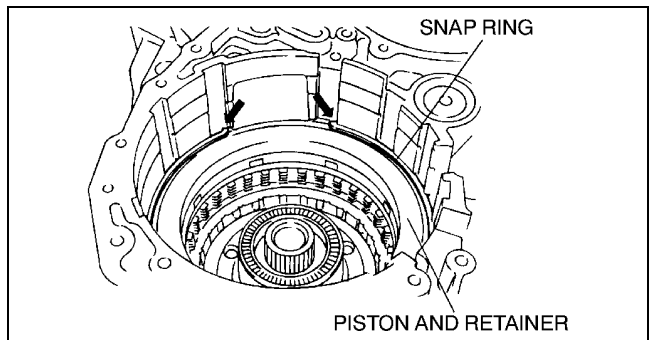


AMU0517A167

11. Install the snap ring.

### Note

- The snap ring opening must be positioned as shown in the figure.

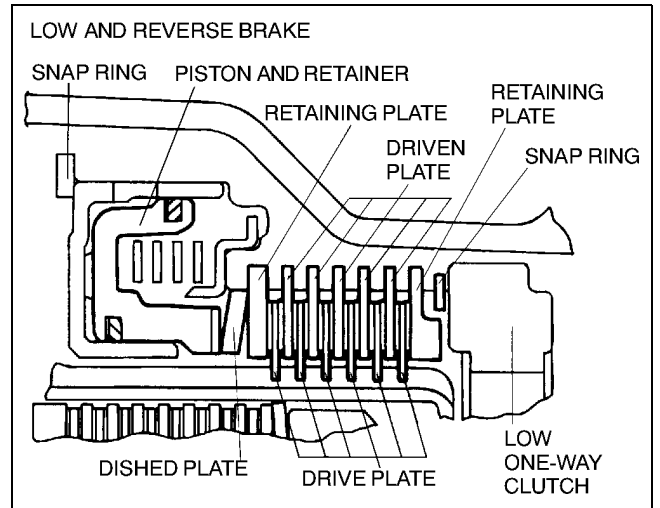


AMU0517A091



# AUTOMATIC TRANSAXLE

12. Remove the **SSTs**.



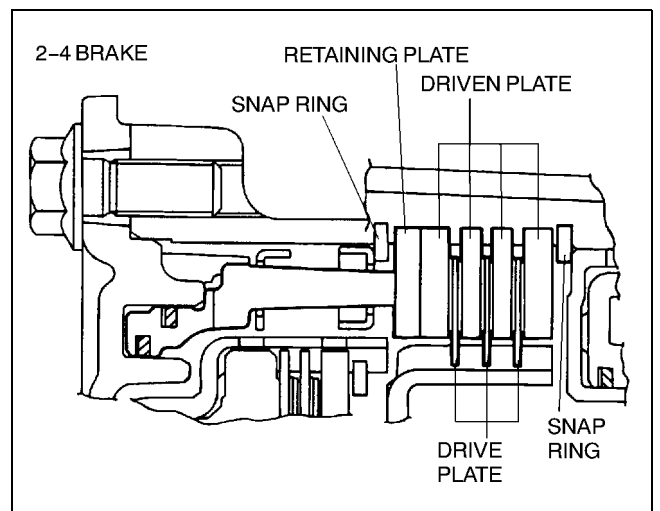
AMU0517A092

## 2-4 brake

1. Install the clutch plates, drive and driven plates as shown in the figure.
2. Using the dial depth gauge and the **SST**, measure clearance between the retaining plate and the snap ring.

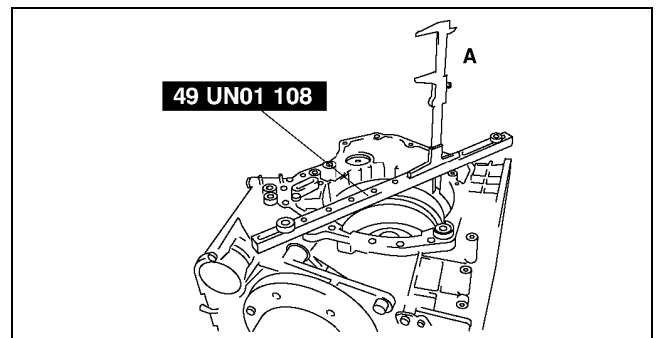
### Note

- When measuring the 2-4 brake clearance, do not install the retaining plate in the transaxle case.



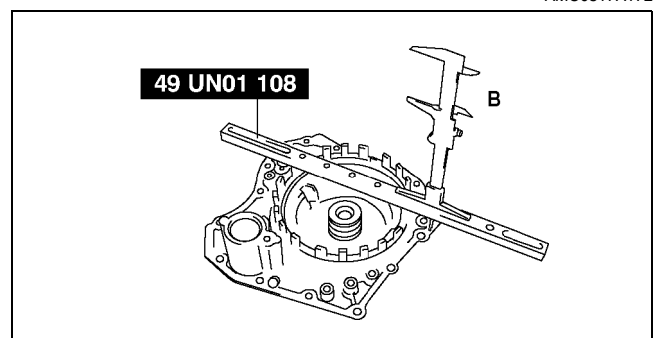
AMU0517A093

- (1) Position the **SST** on the surface of the transaxle case where it contacts the end cover.
- (2) Measure the height A between the **SST** surface and the driven plate.



AMU0517A172

- (3) Position the **SST** on the piston edge of the end cover.
- (4) Measure the height B between the **SST** surface and the contact surfaces of the end cover and transaxle case.
- (5) Measure the retaining plate thickness C.
- (6) Calculate the clearance using the following formula.



AMU0517A171

$$\text{Clearance} = A - B - C$$

$$0.6 - 0.9 \text{ mm } \{0.02 - 0.04 \text{ in}\}$$

K1

## AUTOMATIC TRANSAXLE

3. If clearance is out of specification, select a suitable retaining plate.

### Retaining plate thickness

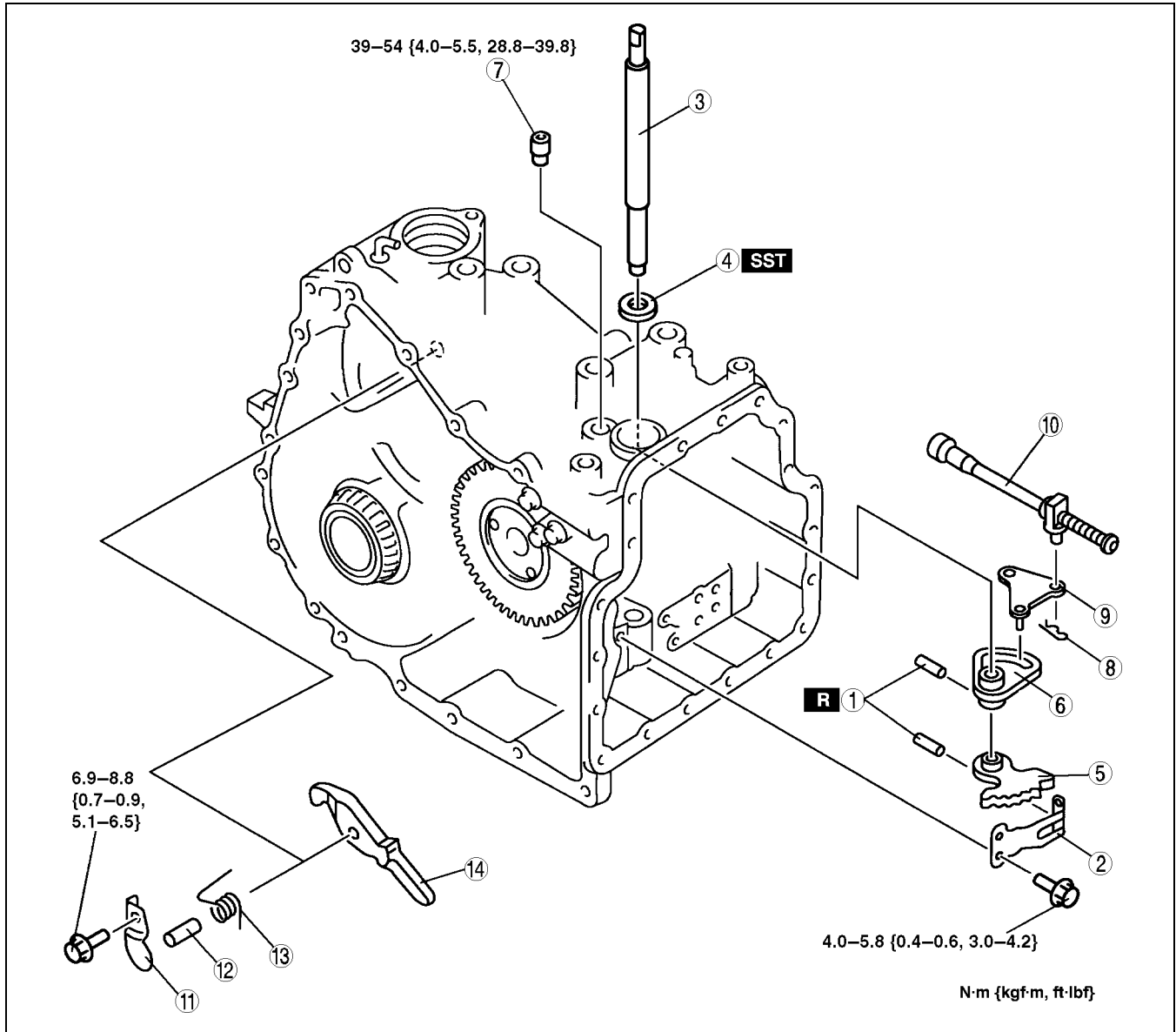
mm {in}		
3.0 {0.118}	3.2 {0.126}	3.4 {0.134}
3.6 {0.142}	3.8 {0.150}	4.0 {0.157}
4.2 {0.165}	—	—

4. Install the retaining plate and snap ring.

### PARKING MECHANISM DISASSEMBLY/ASSEMBLY

AME571421400A01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



AMU0517A158

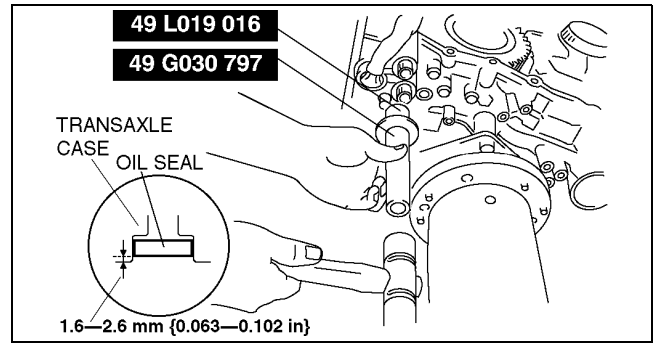
1	Spring pin
2	Detent spring
3	Manual shaft
4	Oil seal (See <a href="#">K1-39 Oil Seal Assembly Note.</a> )
5	Manual plate
6	Parking rod guide
7	Plug

8	Clip
9	Parking lever
10	Parking rod assembly
11	Plate
12	Shaft
13	Spring
14	Parking pawl

## AUTOMATIC TRANSAXLE

### Oil Seal Assembly Note

1. Assemble the oil seal in the transaxle case using the **SSTs**.



AMU0517A170

K1

### CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY

AME571421100A01

#### Caution

- **Denting or scratching the control valve body components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**

1. Remove the harness clips.
2. Disassemble in the order indicated in the table.
3. Neatly arrange the removed parts to avoid confuse on with similar parts.

#### Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

4. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.

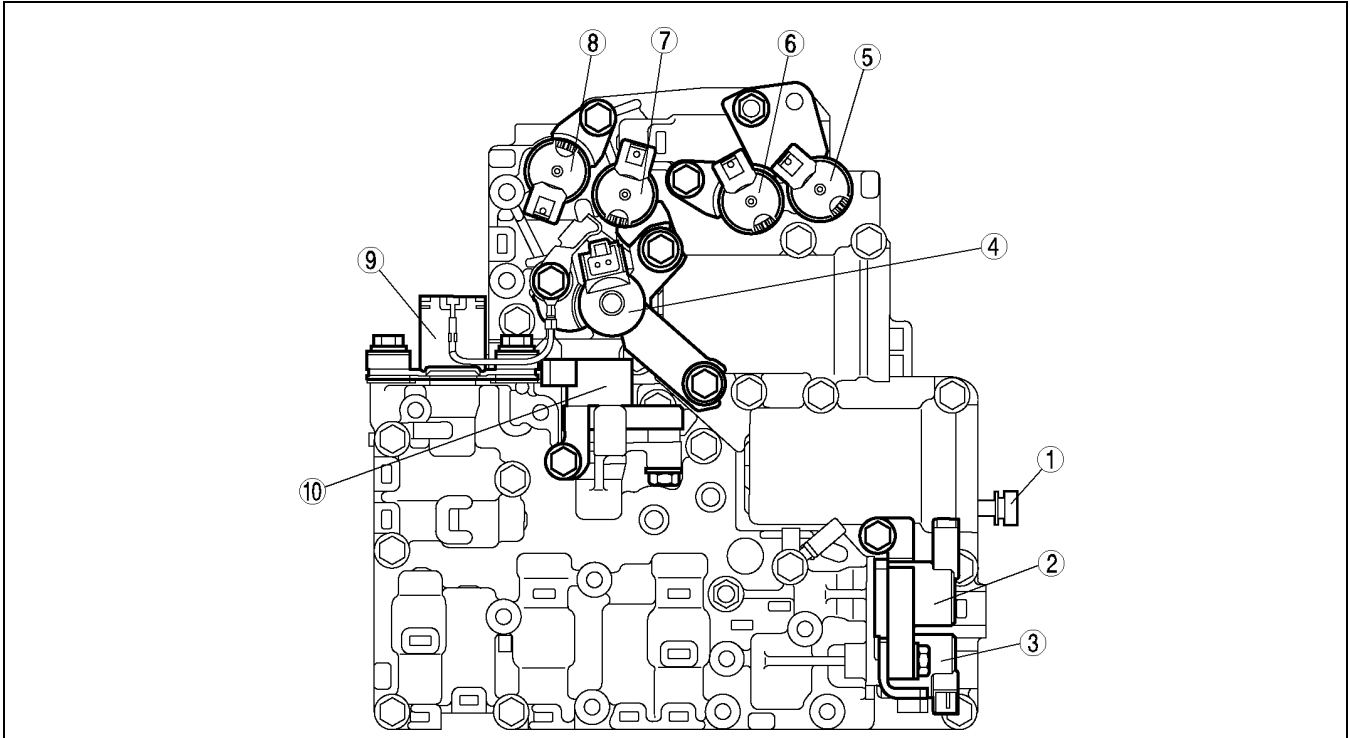
## AUTOMATIC TRANSAXLE

5. Assemble in the reverse order of disassembly.

### Tightening torque (all bolts)

8.34—10.30 N·m

{85—105 kgf·cm, 74—91 in·lbf}



AMU0517A155

1	Manual valve
2	2-4 brake solenoid valve
3	Neutral shift solenoid valve
4	TCC solenoid valve
5	Shift solenoid C

6	Shift solenoid B
7	Reduction timing solenoid valve
8	Shift solenoid A
9	Pressure control solenoid
10	High clutch solenoid valve

### OUTPUT GEAR BEARING PRELOAD

1. Install the output gear component into the transaxle case. (See [K1-41 AUTOMATIC TRANSAXLE ASSEMBLY](#).)

AME571419204A01

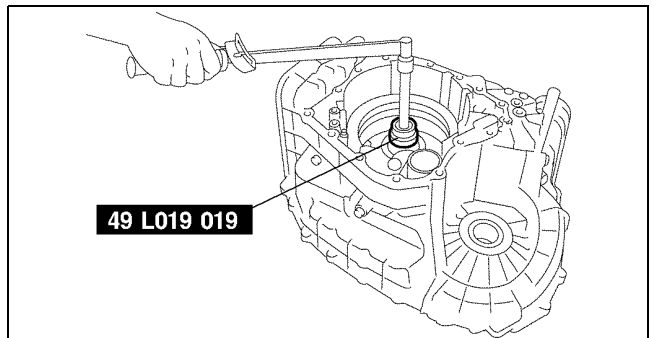
2. Set the **SST** on the output gear component as shown in the figure.
3. Verify that the preload scale reading is within the specification.
  - If not as specified, replace the output gear.

#### Preload

0.63—1.30 N·m

{6.4—13.3 kgf·cm, 5.6—11.5 in·lbf}

4. Remove the **SST** and the output gear component.



AMU0517A181

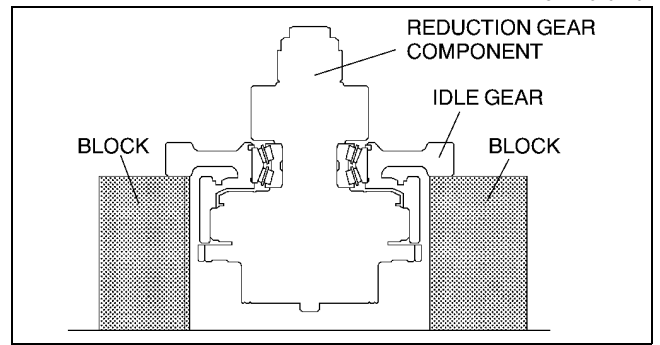
# AUTOMATIC TRANSAXLE

## REDUCTION GEAR BEARING PRELOAD

1. Set the reduction gear component on the two blocks as shown in the figure.

### Note

- To measure accurately, place only the idle gear on the blocks and do not allow the reduction gear component rotation part to contact the blocks.



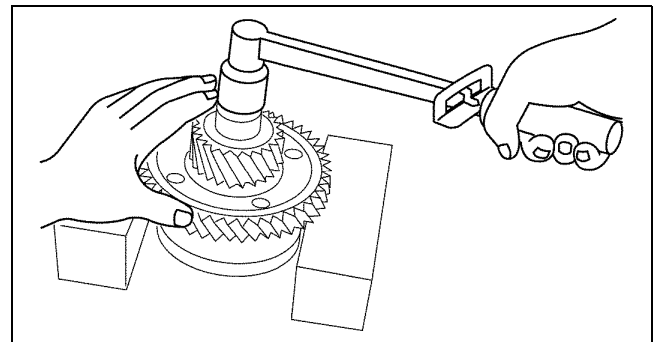
AMU0517A157

2. Holding the idle gear by hand, verify that the preload scale reading is within the specification.
  - If not as specified, replace the reduction gear component.

### Preload

0.6—1.75 N·m

{6.1—17.8 kgf·cm, 5.3—15.5 in·lbf}



AMU0517A163

## AUTOMATIC TRANSAXLE ASSEMBLY

AME571401030A03

### Precaution

#### General notes

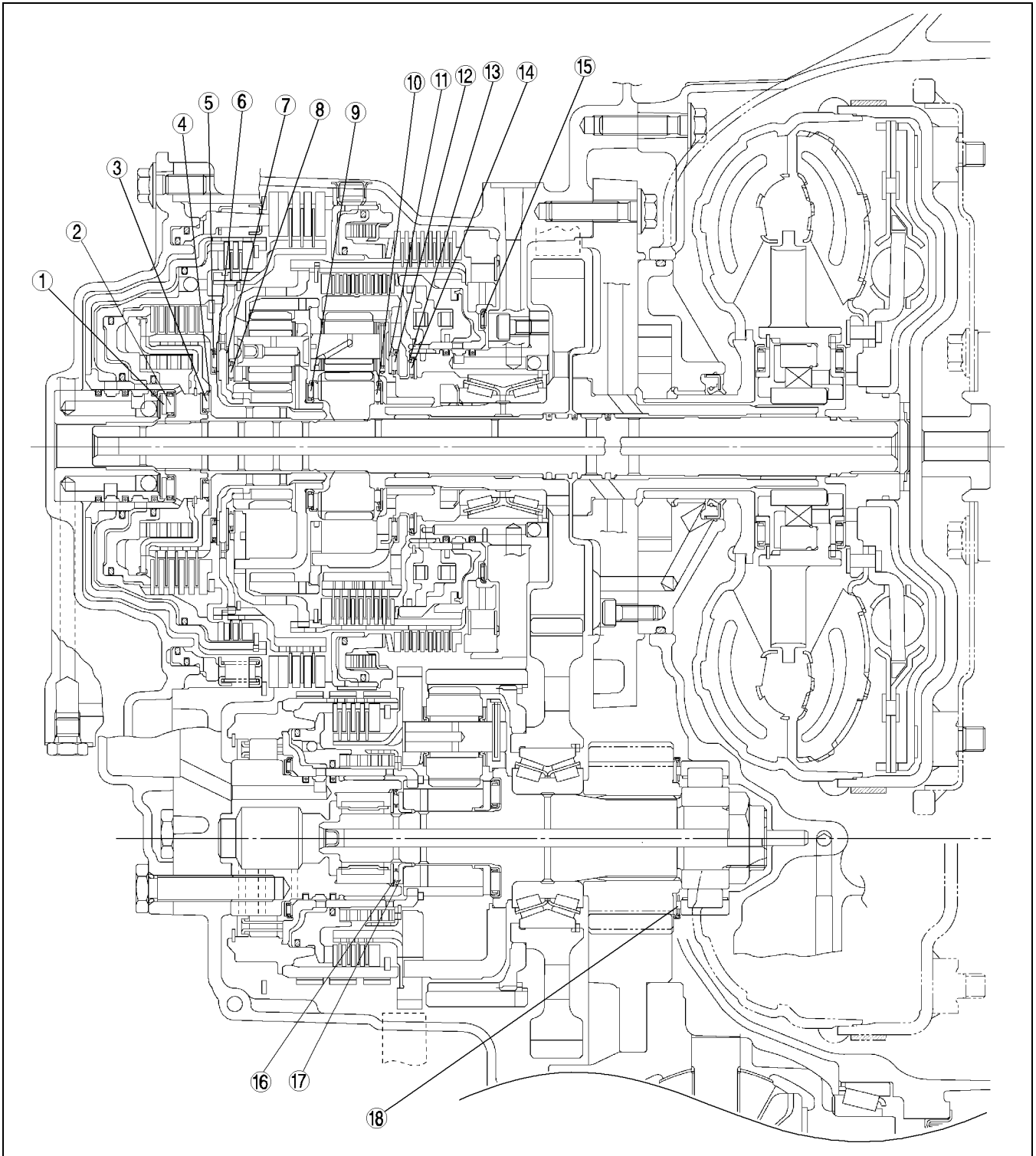
1. Select the adjustment shims, referring to Bearing Preload.
2. If the drive plates or 2-4 brake band are replaced with new ones, soak the new part in ATF for at least two hours before installation.
3. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, and sliding parts.
4. All O-rings, seals, and gaskets must be replaced with the new ones included in the overhaul kit.
5. Use petroleum jelly, not grease, when assembling again.
6. When it is necessary to replace a bushing, replace the subcomponent that includes the bushing.
7. Assemble the housing within 10 minutes after applying sealant, and allow it to cure for at least 30 minutes after assembly before filling the transaxle with ATF.

### Warning

- Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.

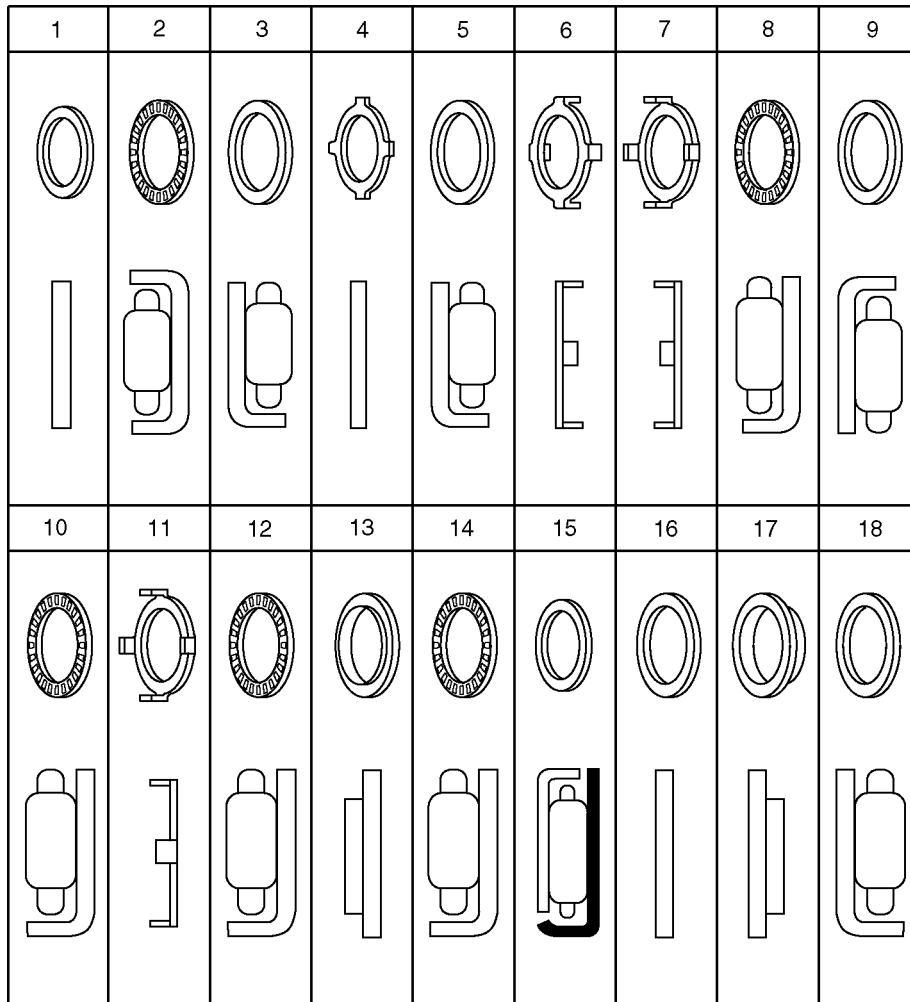
# AUTOMATIC TRANSAXLE

## Assembly Bearing and race locations



AME5714A001

## AUTOMATIC TRANSAXLE



AMU0517A151

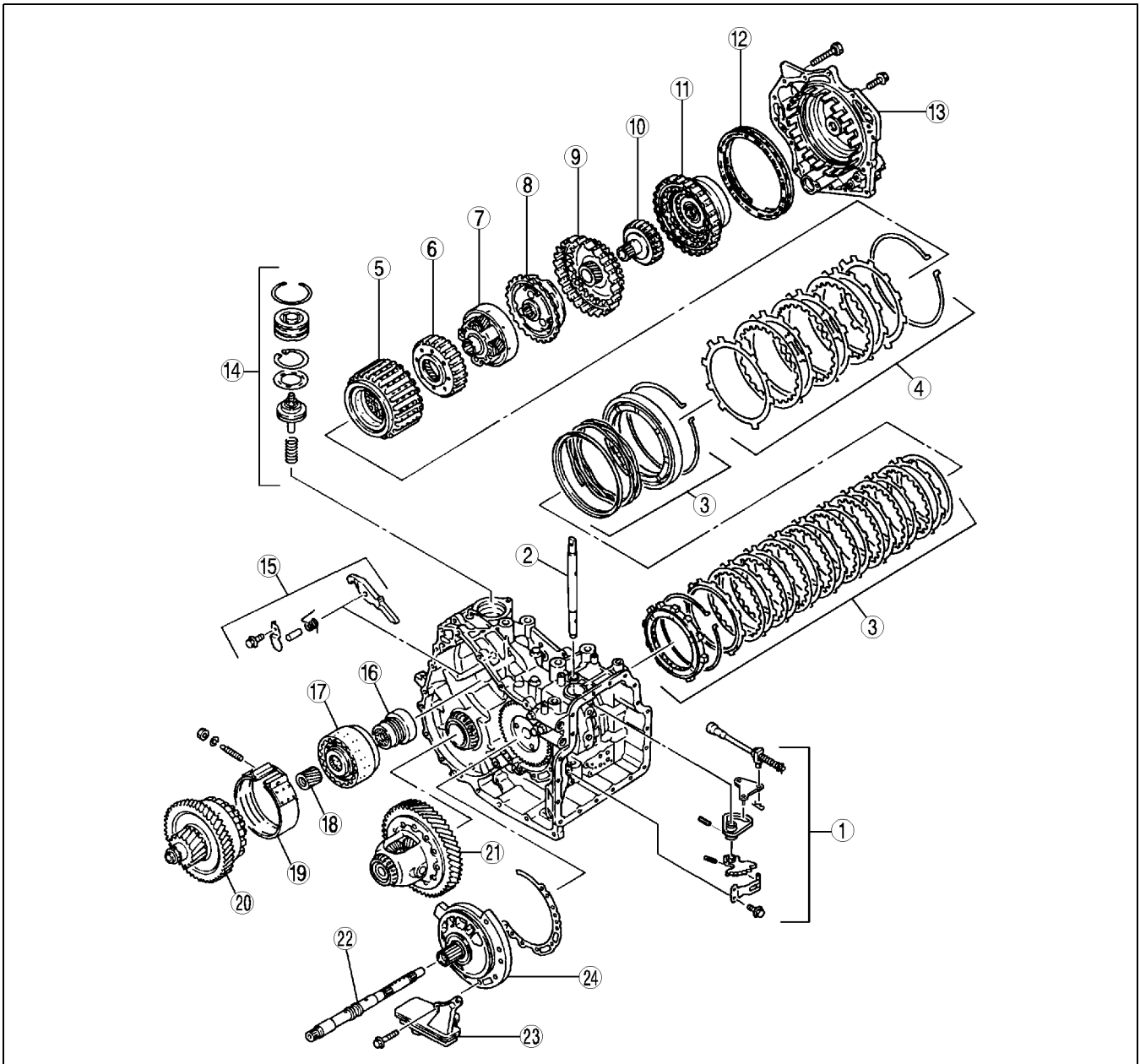
### Diameter of bearing and race

No.	Inner diameter (mm {in})	Outer diameter (mm {in})
1	25.0 {0.98}	42.3 {1.67}
2	23.0 {0.91}	44.0 {1.73}
3	25.5 {1.00}	46.0 {1.81}
4	27.4 {1.08}	45.0 {1.77}
5	58.0 {2.28}	78.0 {3.07}
6	60.0 {2.36}	80.0 {3.15}
7	52.6 {2.07}	80.0 {3.15}
8	52.1 {2.05}	70.0 {2.76}
9	35.0 {1.38}	53.0 {2.09}
10	34.0 {1.34}	53.0 {2.09}
11	58.8 {2.32}	75.0 {2.95}
12	58.0 {2.28}	78.0 {3.07}
13	52.0 {2.05}	69.5 {2.74}
14	50.0 {1.97}	72.0 {2.83}
15	93.1 {3.67}	110.9 {4.37}
16	21.1 {0.83}	39.5 {1.56}
17	25.0 {0.98}	37.3 {1.47}
18	44.4 {1.75}	64.4 {2.54}

K1

# AUTOMATIC TRANSAXLE

## Components



AMU0517A152

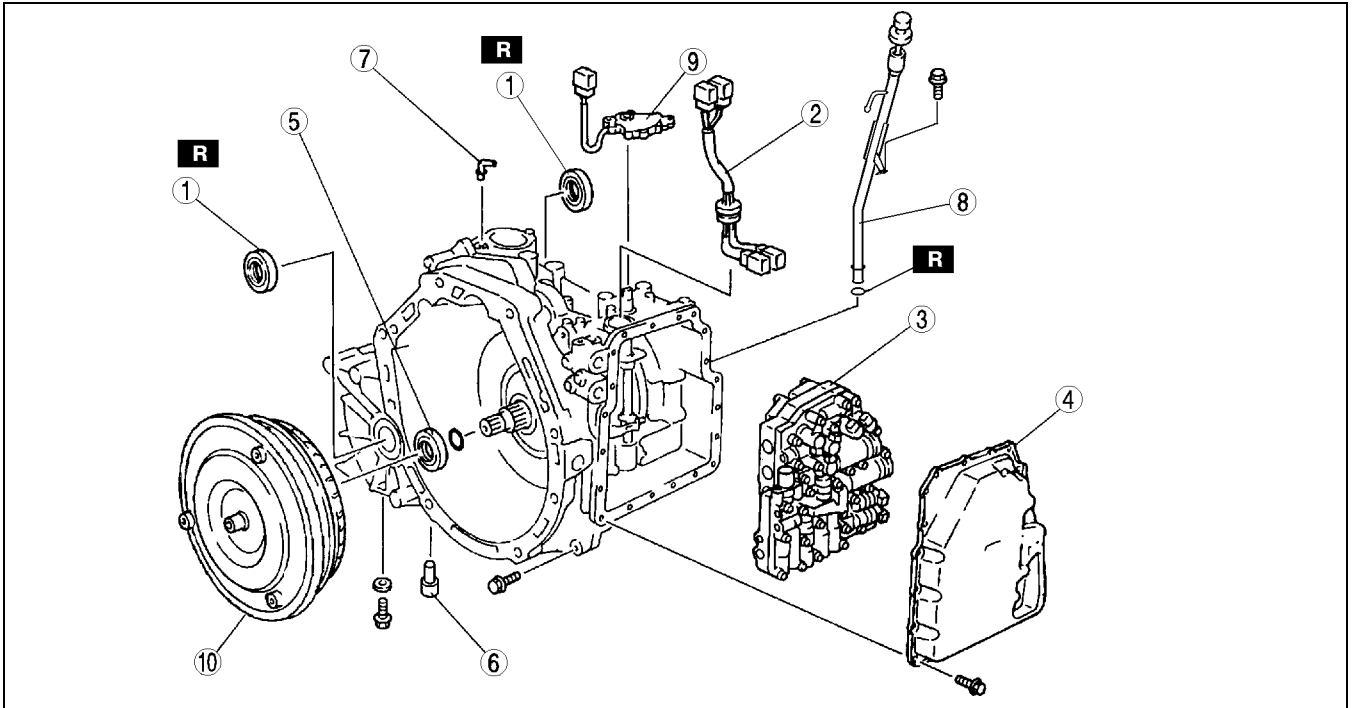
1	Parking component
2	Manual shaft
3	Low and reverse brake
4	2-4 brake
5	Low clutch
6	Internal gear
7	Rear planetary carrier
8	Front planetary carrier
9	Front sun gear component and reverse clutch hub
10	High clutch hub
11	Reverse clutch and high clutch component
12	Return spring

13	End cover
14	Band servo
15	Parking mechanism
16	One-way clutch inner race
17	Direct clutch
18	Reduction sun gear
19	Reduction brake band
20	Reduction gear
21	Differential gear
22	Input shaft
23	Oil strainer
24	Oil pump



# AUTOMATIC TRANSAXLE

K1



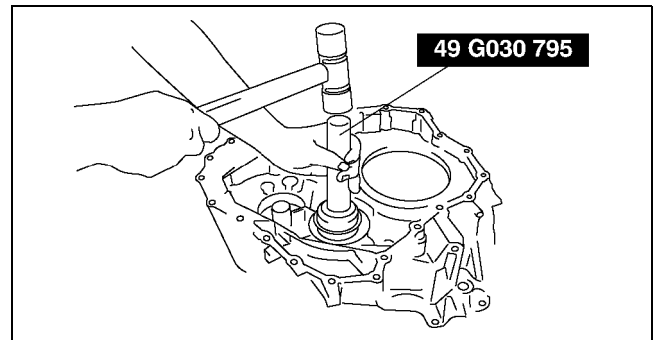
AMJ5614A068

1	Differential oil seal
2	Terminal component
3	Control valve body
4	Control valve body cover
5	Oil seal

6	Drain plug
7	Air brezer
8	Oil filler tube
9	TR switch
10	Torque converter

## Assembly procedure

- Using the **SSTs** and a hammer, install the reduction gear outer race.



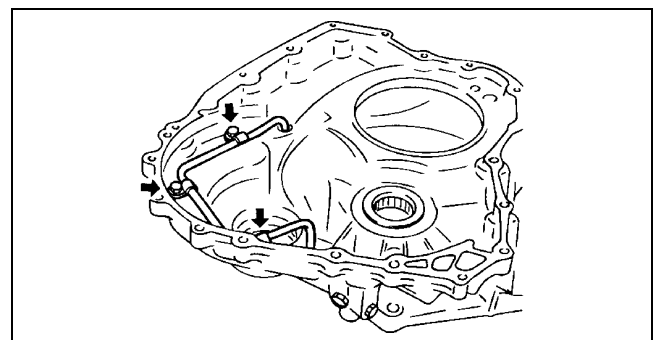
AMU0517A126

- Install the oil pipe to converter housing.
  - Check the oil pipe and seal surface for dents or damage.
    - Replace the parts if necessary.
  - Install the oil pipe.

## Tightening torque

4.9—6.9 N·m {0.5—0.7 kgf·m, 3.6—5.1 ft·lbf}

- Install the baffle plate to the converter housing.

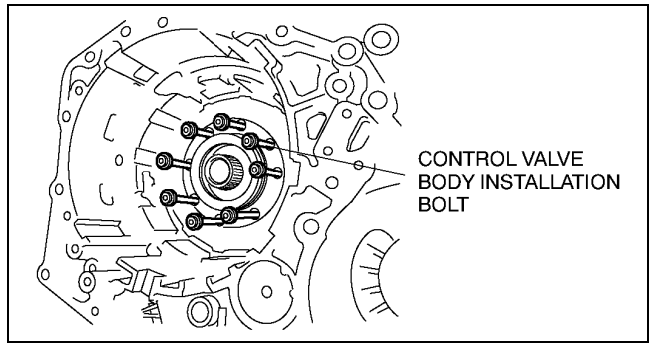


AMU0517A127

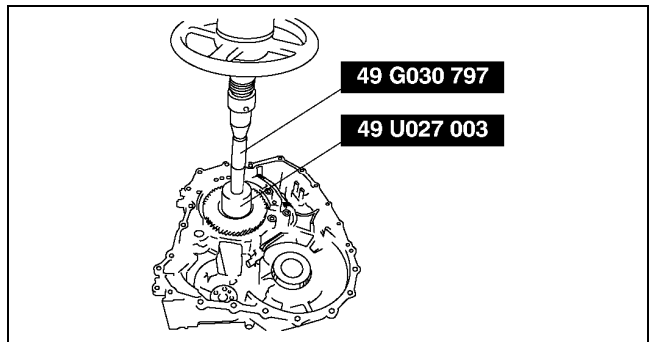
## AUTOMATIC TRANSAXLE

### 4. Install the output gear.

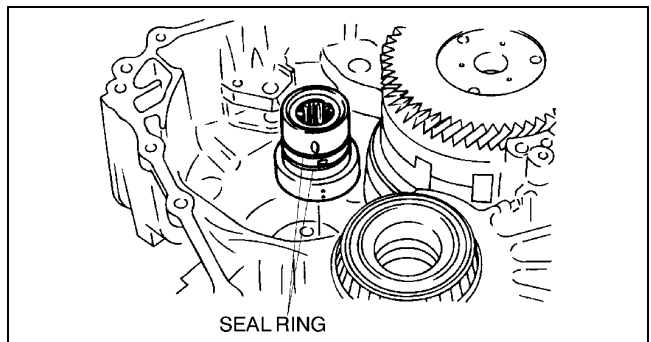
- (1) Set the installation bolts on the control valve body to the transaxle case and the output gear.



- (2) Set the **SSTs** to the output gear, and install the output gear using a press.



5. Apply petroleum jelly to new seal rings, and then install them onto the one-way clutch inner race.
6. Apply a coat of ATF to new O-rings, and then attach them in two bolts.
7. Install the one-way clutch inner race.

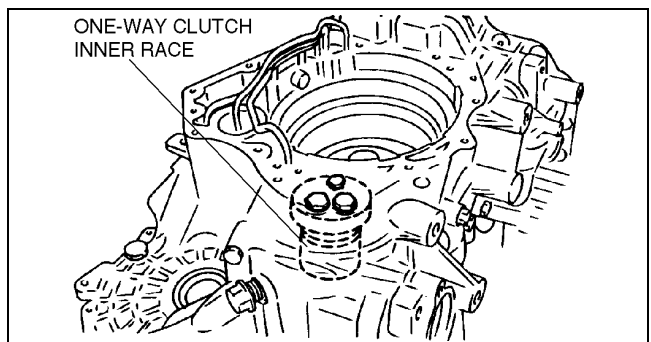


8. Install the bolts which secure the one-way clutch inner race.

### Tightening torque

32.4—38.3 N·m

{3.30—3.90 kgf·m, 23.9—28.2 ft·lbf}



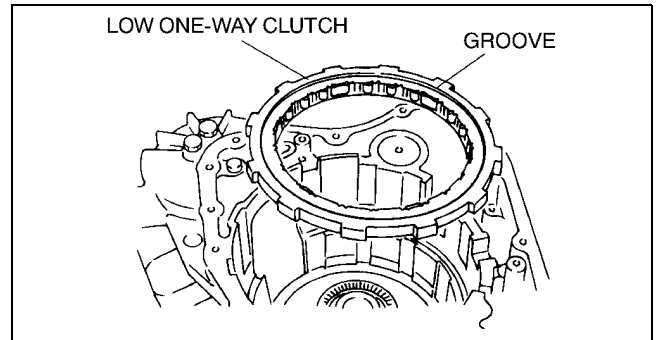
## AUTOMATIC TRANSAXLE

9. Install the low and reverse brake.

- (1) Install the low one-way clutch with the groove facing upward.

### Note

- The snap ring opening must be positioned as shown in the figure.

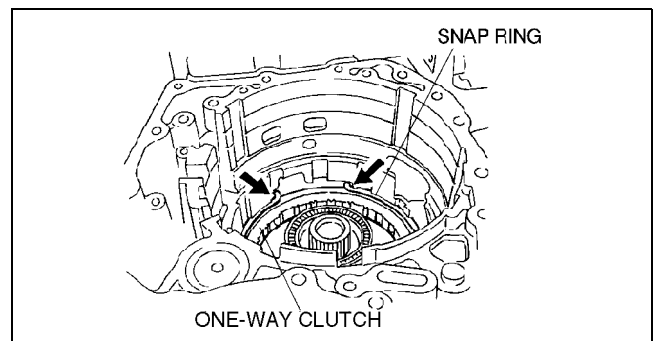


AMU0517A089

- (2) Install the snap ring.
- (3) Install the retaining plate, drive plates, driven plates, and dished plate as a unit.
- (4) Install the spring retainer and return spring.

### Caution

- Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.

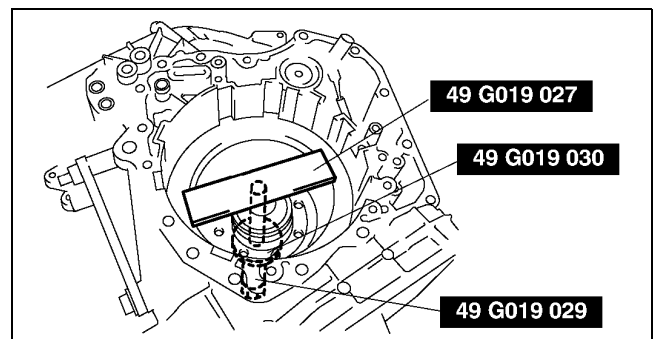


AMU0517A044

- (5) Install the **SSTs** in the transaxle case as shown in the figure.

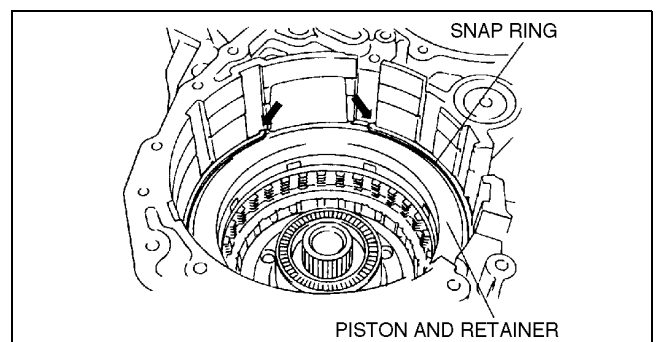
### Note

- The snap ring opening must be positioned as shown in the figure.



AMU0517A167

- (6) Install the snap ring.
- (7) Remove the **SSTs**.

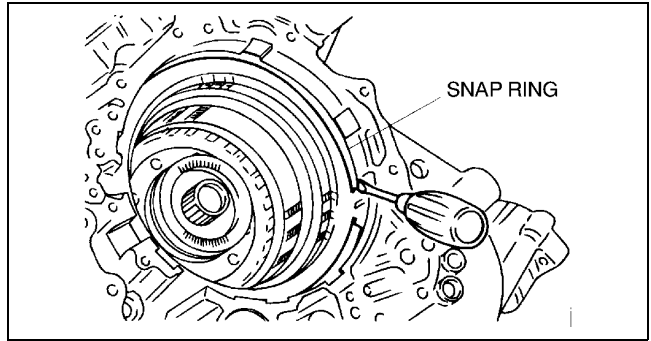


AMU0517A154

K1

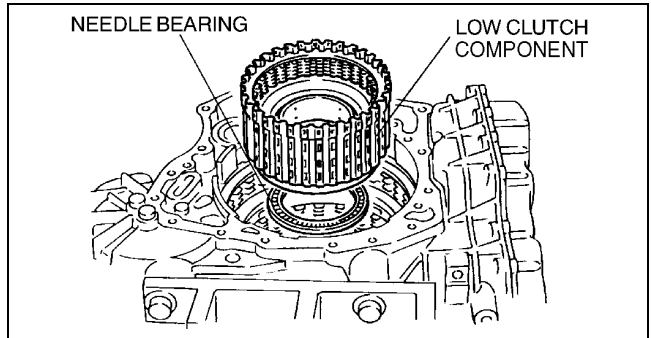
## AUTOMATIC TRANSAXLE

10. Install the 2-4 brake.
  - (1) Install the retaining plate.
  - (2) Install the drive plate and driven plate.
  - (3) Install the retaining plates.
  - (4) Install the snap ring.



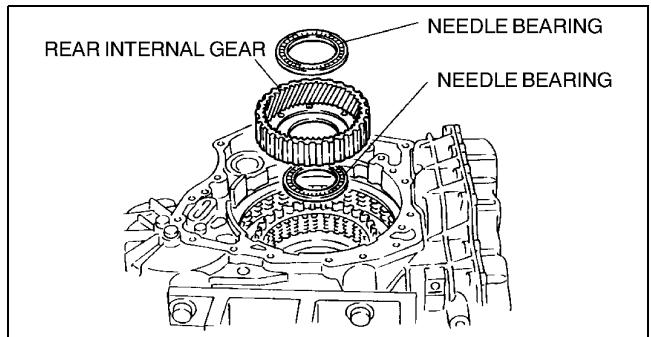
AMU0517A041

11. Apply petroleum jelly to the needle bearing, then install it to the low clutch component.
12. Install the low clutch component.



AMU0517A040

13. Apply petroleum jelly to the needle bearing, then install it to the rear internal gear.
14. Install the rear internal gear.



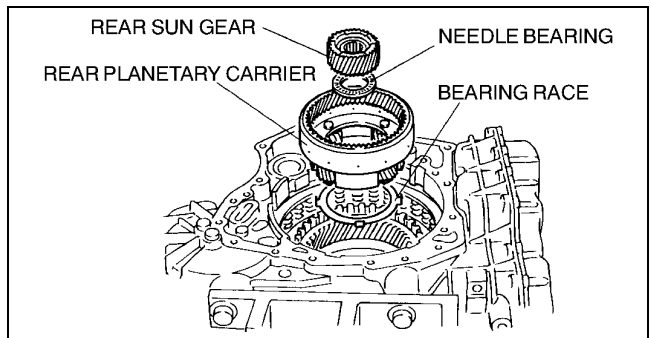
AMU0517A039

15. Apply petroleum jelly to the needle bearing and bearing race, then install it to the rear planetary carrier component.

**Note**

- The race bearing must be installed with the black surface towards the front planetary carrier.

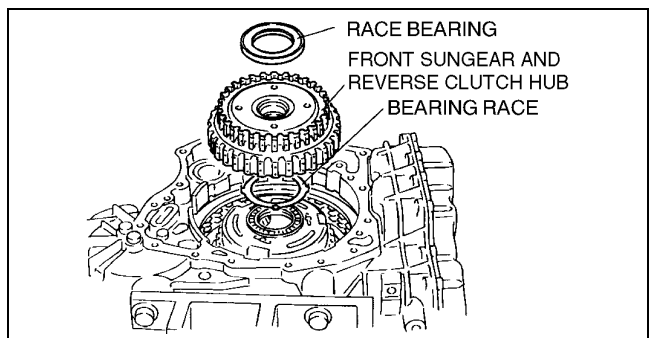
16. Install the front planetary carrier component.



AMU0517A038

17. Apply petroleum jelly to the race bearing and bearing race, and then install it to the low clutch hub with the black surface towards the low clutch hub.

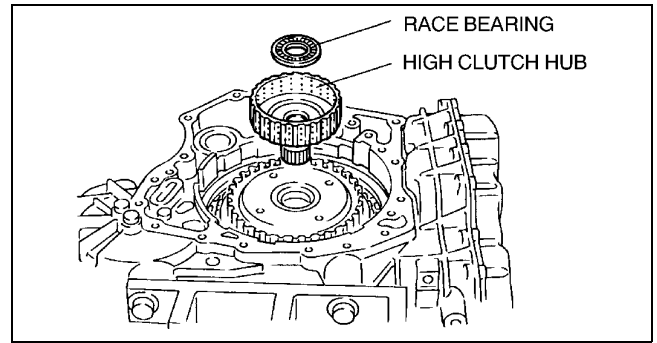
18. Install the reverse clutch hub.



AMU0517A036

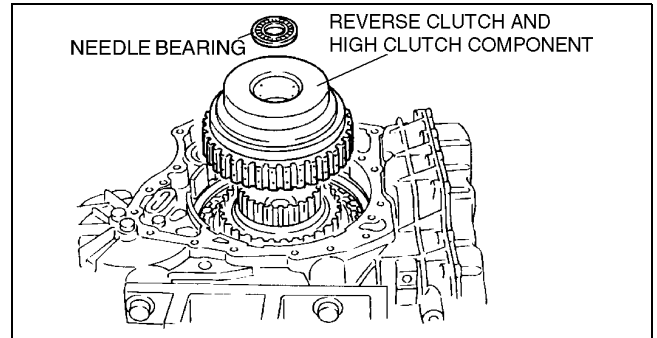
## AUTOMATIC TRANSAXLE

19. Apply petroleum jelly to the race bearing, and then install it to the high clutch hub with the black surface towards the high clutch hub.
20. Install the high clutch hub.



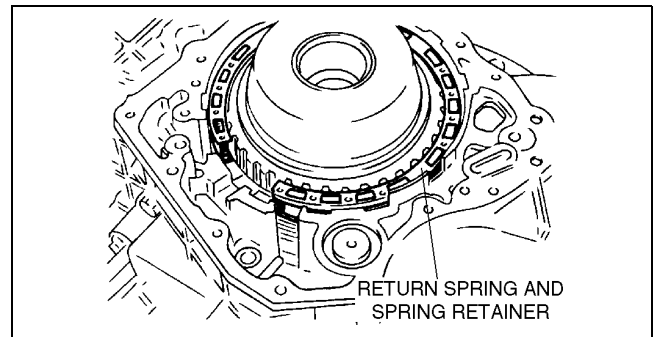
AMU0517A035

21. Apply petroleum jelly to the needle bearing, and then install it to the reverse and high clutch component.
22. Install the reverse clutch and high clutch component.



AMU0517A034

23. Install the return spring and spring retainer.



AMU0517A033

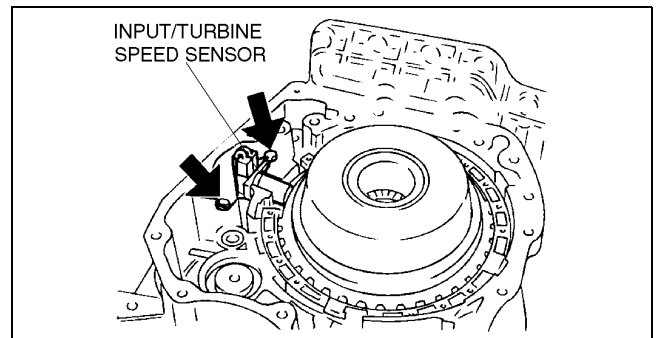
24. Install the input/turbine speed sensor.

**Tightening torque**

**6.9—8.8 N·m**

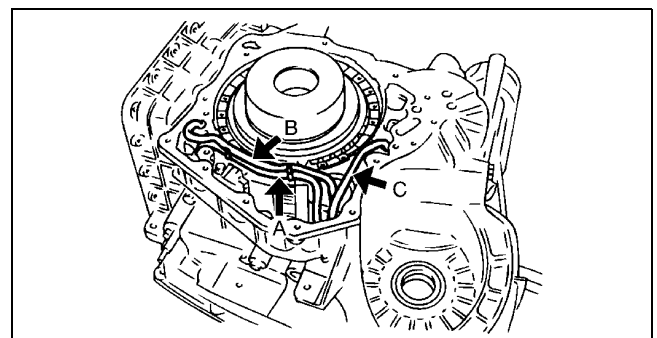
**{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}**

25. Connect the input/turbine speed sensor connector.



AMU0517A032

26. Install the oil pipes in the order of A, B, and C.



AMU0517A129

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## AUTOMATIC TRANSAXLE

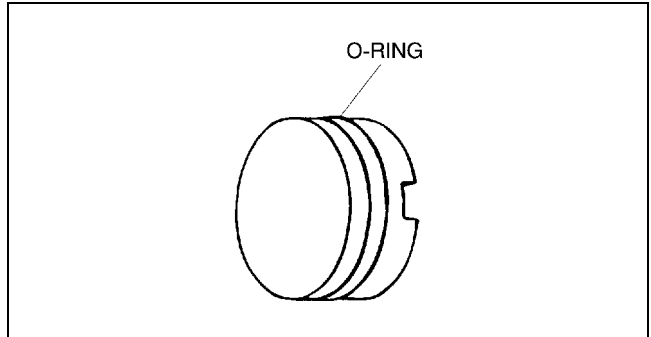
27. Install the direct clutch accumulator.

- (1) Measure the free length of the springs and inspect for deformation.
  - If not within the specification, replace the spring.

### Specification

Type	Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire diameter (mm {in})
Large	27.0 {1.06}	54.6 {2.15}	5.2	2.5 {0.10}
Small	20.0 {0.79}	54.5 {2.15}	7.5	1.9 {0.07}

- (2) Install the direct clutch accumulator large spring and direct clutch accumulator small spring.
- (3) Apply coat of ATF to a new O-rings, then assemble them to the direct clutch accumulator piston.
- (4) Install the direct clutch accumulator piston.

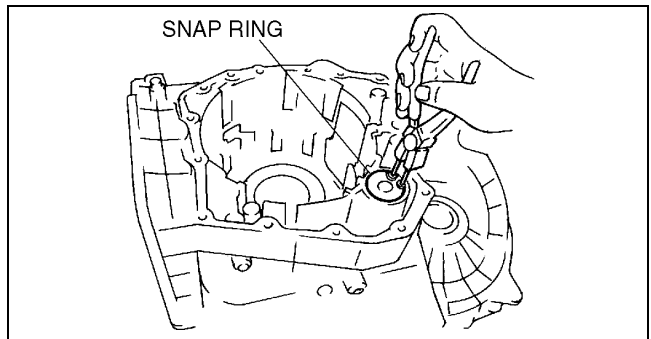


AMU0517A130

(5) Install the snap ring.

28. Install the 2-4 brake accumulator.

- (1) Measure the free length of the spring and inspect for deformation.
  - If not within the specification, replace the spring.



AMU0517A159

### Specification

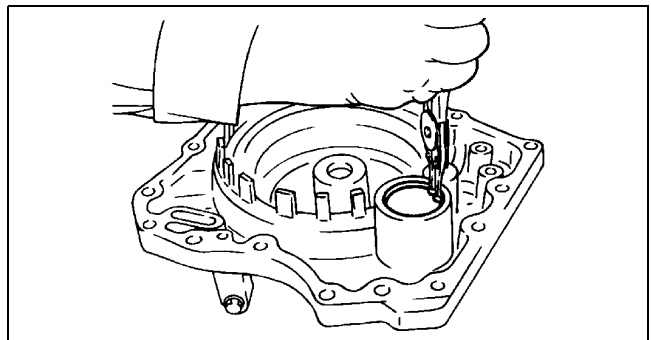
Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire diameter (mm {in})
27.0 {1.06}	73.8 {2.91}	6.8	2.6 {0.10}

- (2) Apply coat of ATF to a new O-ring, and then install it to the 2-4 brake accumulator cover.
- (3) Install the 2-4 brake accumulator cover and spring.
- (4) Install the snap ring which secures the 2-4 brake accumulator onto the end cover.

29. Check the end play using a dial depth gauge and the SST.

### Note

- When measuring the end play, do not install the needle bearing on the reverse clutch and high clutch component.



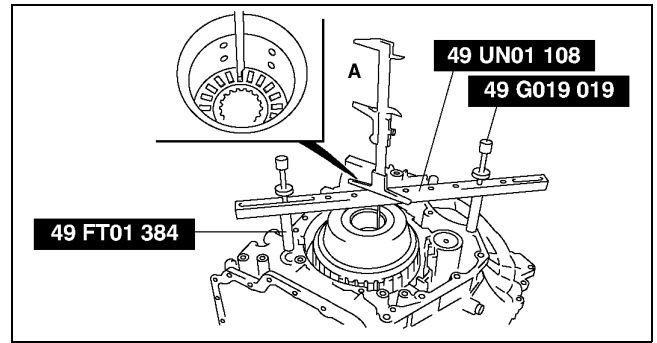
AMU0517A029

# AUTOMATIC TRANSAXLE

(1) Measure dimension A as shown in the figure.

**Note**

- When measuring the end play, do not install the needle bearing on the surface of the end cover where it contacts the needle bearing.



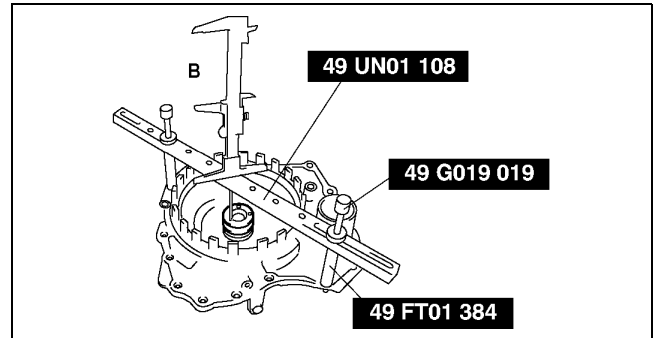
AMU0517A174

(2) Measure dimension B as shown in the figure.

**Note**

- When measuring the end play, do not install the needle bearing on the reverse clutch and high clutch component.

- (3) Measure the bearing race thickness C.  
 (4) Measure the **SSTs** height D.  
 (5) Calculate the end play using the following formula.



AMU0517A173

**End play = (A – D) – (D – B) – C**  
**Specification: 0.25—0.55 mm {0.01—0.02 in}**

(6) If the end play is out of specification, select a suitable bearing race.

**Bearing race sizes**

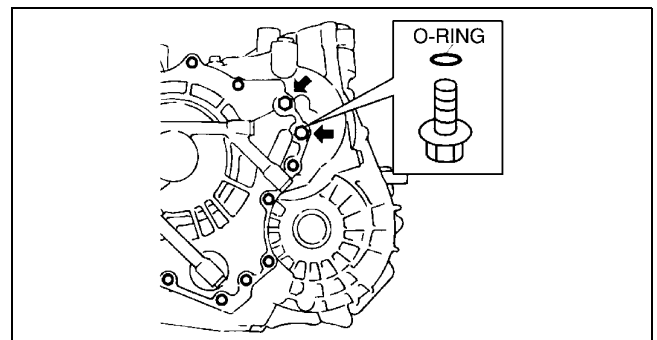
mm {in}		
1.4 {0.055}	1.6 {0.063}	1.8 {0.071}
2.0 {0.079}	2.2 {0.087}	—

30. Apply a light coat of silicone sealant to the contact surfaces of the transaxle case and the end cover.

31. Assemble a new O-ring to two bolts.

**Caution**

- Do not hammer the end cover.

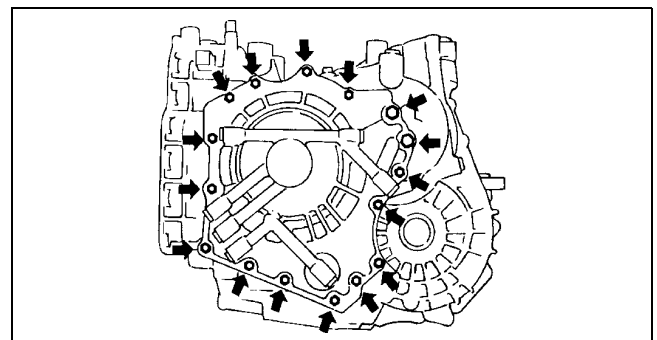


AMU0517A026

32. Install the end cover.

**Tightening torque**

**19—22 N·m {1.9—2.2 kgf·m, 14—16 ft·lbf}**

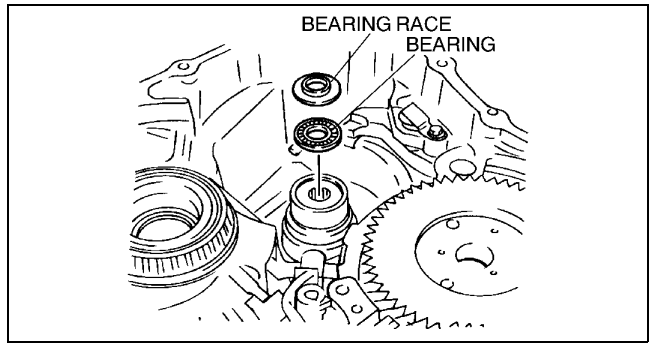


AMU0517A025

K1

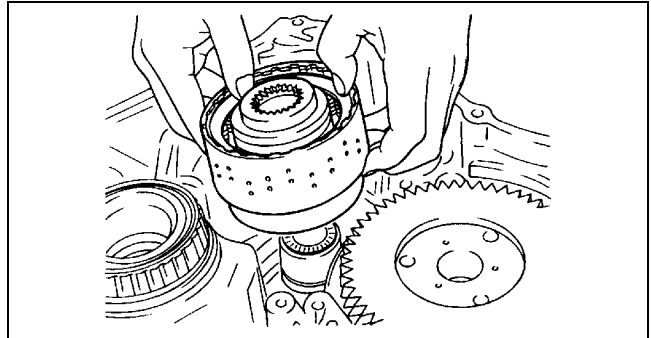
## AUTOMATIC TRANSAXLE

33. Apply petroleum jelly to the needle bearing, bearing race, and then install them to the one-way clutch inner race.



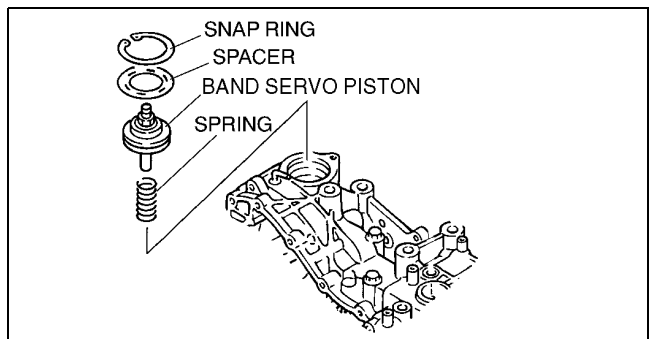
AMU0517A022

34. Install the direct clutch component.  
35. Install the reduction brake band.  
(1) Apply a coat of ATF to a new O-ring, then install it to the reduction brake band piston.



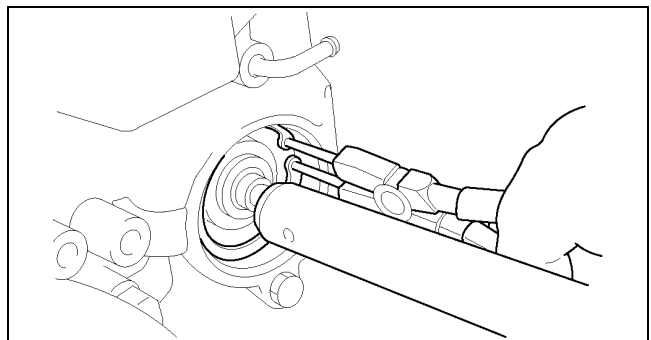
AMU0517A021

- (2) Install the spring, band servo piston, and spacer.



AMU0517A133

- (3) Pushing the piston stem using a wood stick, install the snap ring.

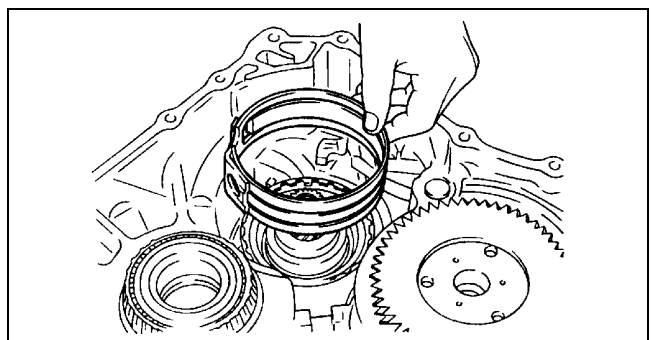


AMU0517A160

36. Apply a coat of ATF to the friction surface of reduction brake band, then install it to the direct clutch component.

### Note

- Do not reuse the anchor end bolt.
- The tip of anchor end bolt must be inserted to the band groove.



AMU0517A020

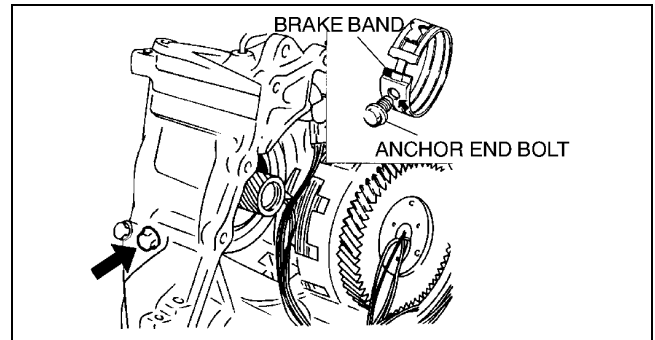


## AUTOMATIC TRANSAXLE

37. Install a new anchor end bolt.

### Tightening torque

64—94 N·m {6.5—9.5 kgf·m, 47—69 ft·lbf}



AMU0517A134

38. Adjust the brake band.

- (1) Set the **SST** to prevent the brake band piston from turning.
- (2) Tighten the piston stem.

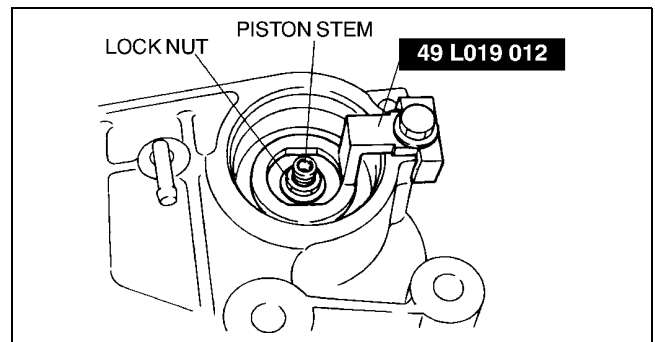
### Tightening torque

4.0—6.0 N·m  
{0.40—0.60 kgf·m, 2.9—4.3 ft·lbf}

- (3) Loosen the piston stem 5 rotations.
- (4) Tighten the lock nut while preventing the piston stem from turning.

### Tightening torque

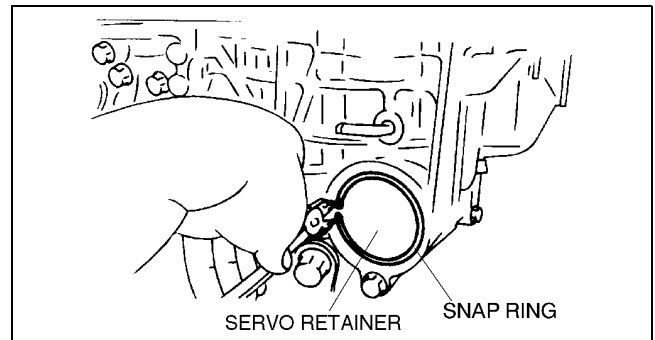
39—50 N·m {4.1—5.2 kgf·m, 40—51 ft·lbf}



AMU0517A135

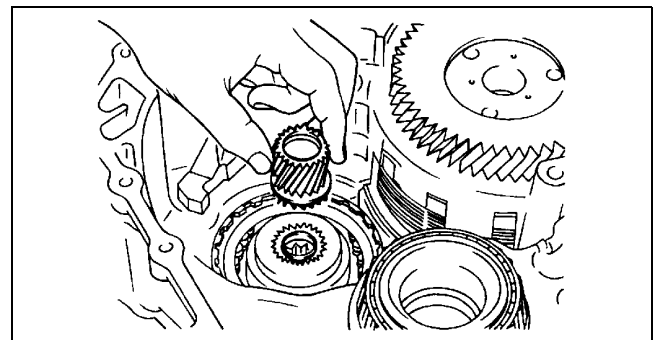
39. Position the reduction brake band servo.

40. Install the snap ring which secures the reduction brake band servo.



AMU0517A018

41. Install the sun gear on the direct clutch drum.

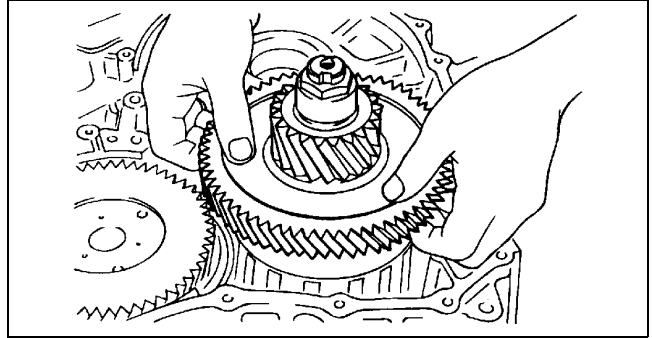


AMU0517A017

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## AUTOMATIC TRANSAXLE

42. Install the reduction gear component.



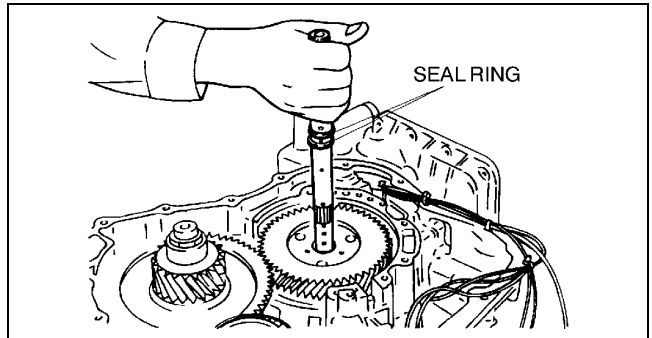
AMU0517A016

43. Apply petroleum jelly to new seal rings, then assemble them to the input shaft.

44. Install the input shaft.

### Caution

- If the oil pump gasket is bent or scratched, do not reuse it.



AMU0517A015

45. Position the oil pump gasket.

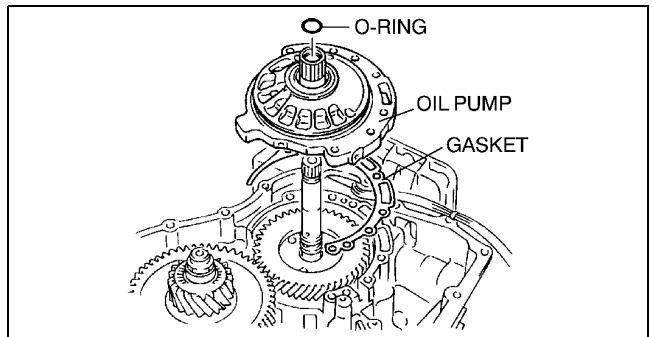
46. Install the oil pump component and tighten bolts.

### Tightening torque

19—22 N·m

{1.9—2.2 kgf·m, 14—16 ft·lbf}

47. Apply a coat of ATF to a new O-ring, then install it to the input shaft.



AMU0517A014

48. Install the vehicle speedometer sensor (VSS).

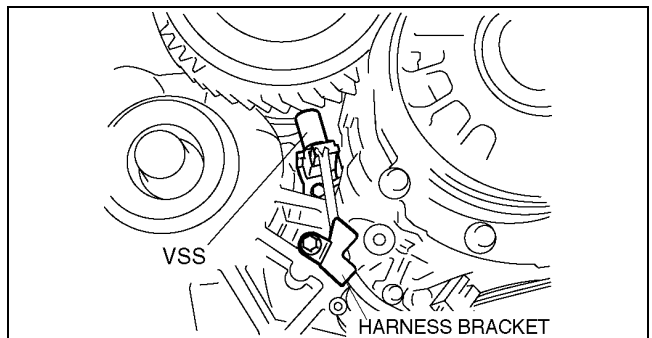
### Tightening torque

6.9—8.8 N·m

{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

49. Connect the VSS connector.

50. Install the harness bracket.



AMU0517A013

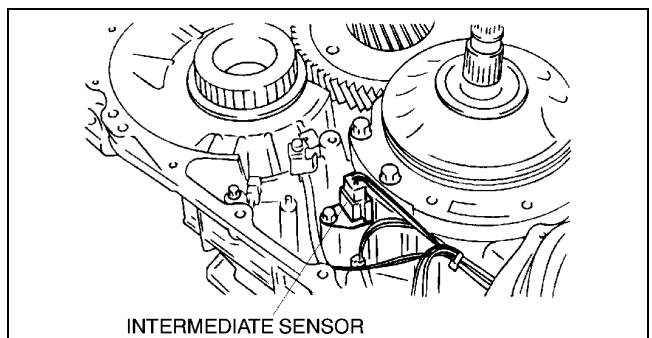
51. Install the intermediate sensor.

### Tightening torque

6.9—8.8 N·m

{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

52. Connect the intermediate sensor connector.



AMU0517A012

## AUTOMATIC TRANSAXLE

53. Install the magnets.
54. Install the transaxle fluid temperature (TFT) sensor.

### Tightening torque

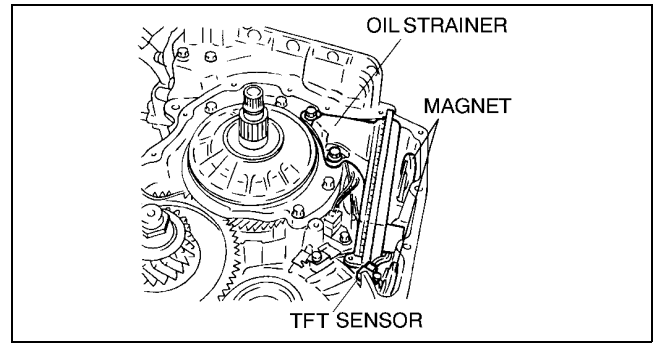
6.9—8.8 N·m  
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

55. Install the oil strainer.

### Tightening torque

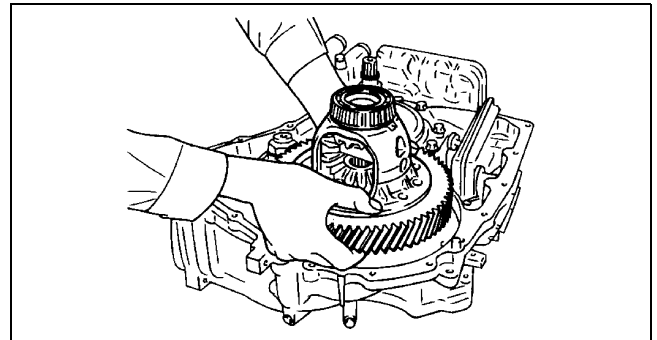
19—22 N·m  
{1.9—2.2 kgf·m, 14—16 ft·lbf}

56. Install the differential component.



AMU0517A011

K1



AMU0517A010

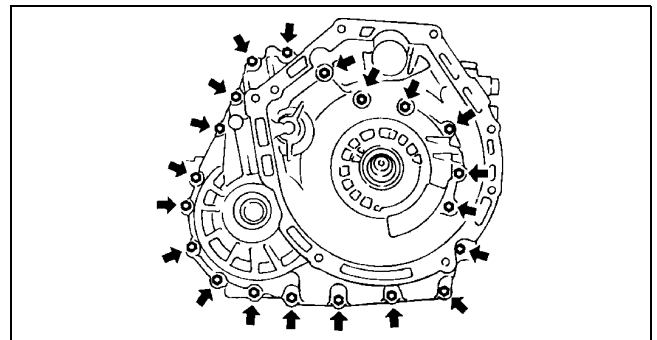
57. Install the converter housing.

### Tightening torque

27—30 N·m {2.8—3.1 kgf·m, 20—22 in·lbf}

### Caution

- Be careful not to scratch the mating surface of the converter housing and transaxle case.



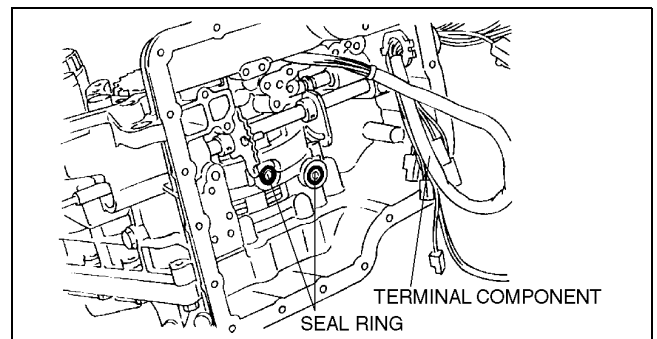
AMU0517A009

58. Install the terminal component.
59. Install the bracket to the coupling connector.

### Note

- If the seal ring is misplaced or scratched, do not reuse it.

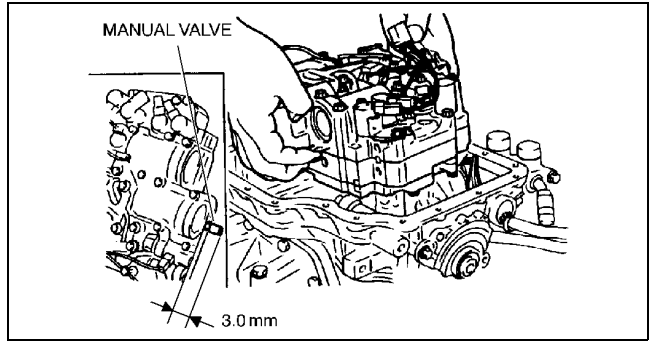
60. Apply a coat of ATF to new seal rings, then install them to the transaxle case.



AMU0517A008

## AUTOMATIC TRANSAXLE

61. Install the control valve body to the transaxle case.
- (1) Set the manual shaft at L range.
  - (2) Position the manual valve so that it protrudes from the control valve body end by 3.0 mm.
  - (3) Install the control valve body while holding the manual valve in the position.
  - (4) Move the manual shaft, when verify in conjunction with manual valve.



AMU0517A186

62. Tighten the bolts which secure the control valve body to the transaxle case.
- (1) Tighten the bolt A. (10 pieces)

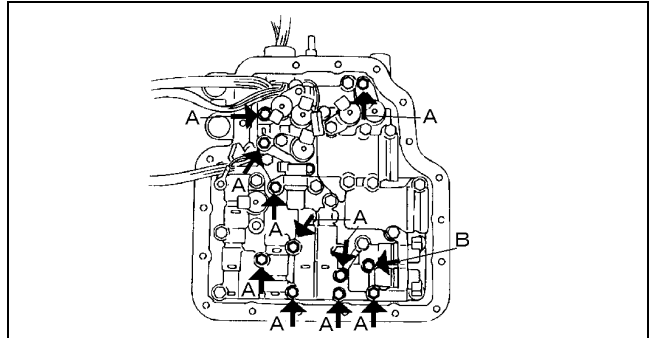
### Tightening torque

6.9—8.8 N·m  
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

- (2) Tighten the bolt B. (1 pieces)

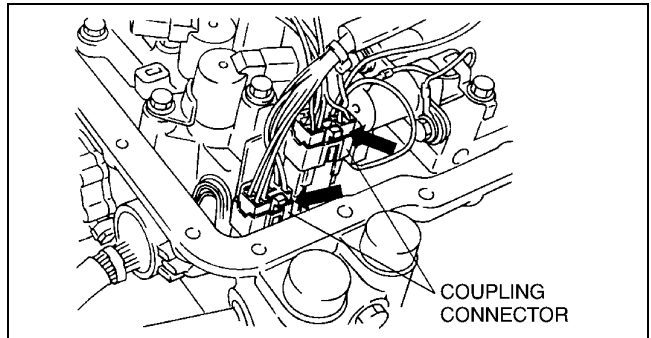
### Tightening torque

6.9—8.8 N·m  
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}



AMJ5614A072

63. Tighten the bracket on the coupling connector.
64. Connect the coupling connectors between the solenoid valves and terminal component.
65. Apply a light coat of silicone sealant to the contact surfaces of the control valve body cover and transaxle case.



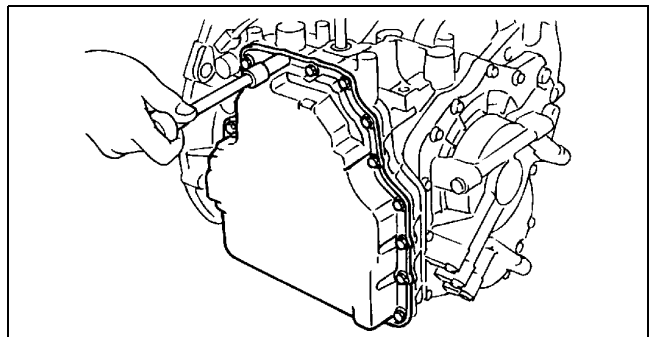
AMU0517A005

66. Install the control valve body cover.

### Tightening torque

6.9—8.8 N·m  
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

67. Remove the transaxle from the transaxle stand.



AMU0517A184

## AUTOMATIC TRANSAXLE

68. Install the transaxle range (TR) switch.
- (1) Rotate the manual shaft to the right fully, then return 2 notches to set the N position.
  - (2) Loosen the TR switch mounting bolts.

### Caution

- Improper adjustment of the TR switch will cause abnormal operation of the automatic transaxle. Be sure to use the SST to adjust the TR switch correctly.

- (3) Using the **SST** and by turning the TR switch, adjust the positions of the manual shaft and the TR switch neutral hole.
- (4) Tighten the TR switch mounting bolts.

### Tightening torque

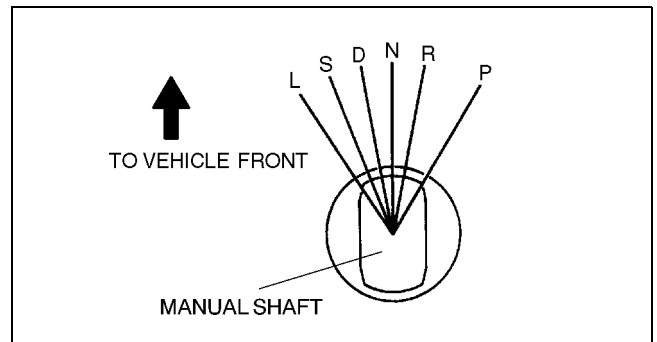
4.9—6.9 N·m  
{50.0—70.4 kgf·cm, 43.4—61.1 in·lbf}

- (5) Remove the **SST**.

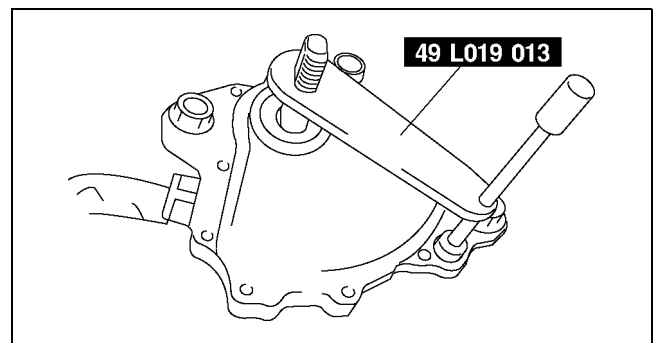
69. Install the torque converter.

### Note

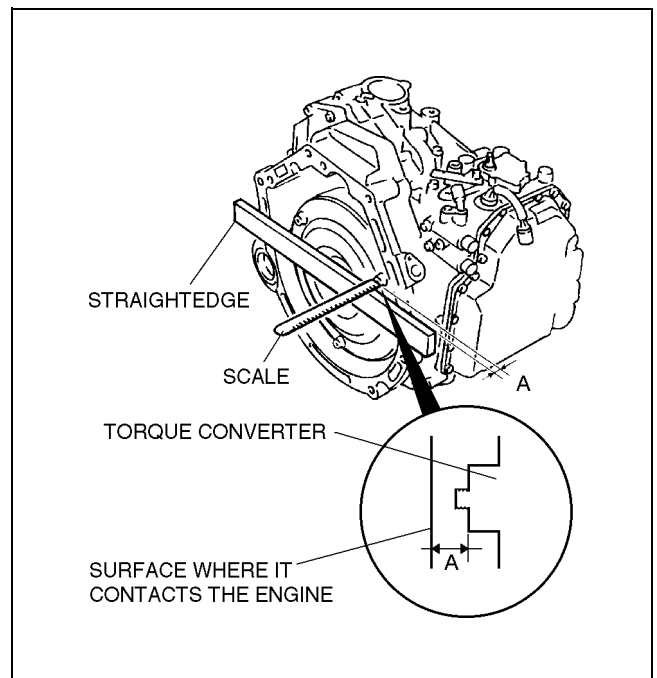
- Ensure that the torque converter is inserted at least 18.0 mm {0.71in} as shown by "A" in the figure.



AME5714W013



AMU0517W050



AME5714A003

K1

# TECHNICAL DATA

TECHNICAL DATA ..... TD-2  
AUTOMATIC TRANSAXLE..... TD-2

TD

## TECHNICAL DATA

### TECHNICAL DATA

#### AUTOMATIC TRANSAXLE

AME931001030A02

Item			Transaxle type
			JA5A-EL
Oil pump	Outer rotor and oil pump clearance(mm {in})	Standard	0.02—0.04 {0.0008—0.0015}
	Inner rotor and oil pump clearance(mm {in})	Standard	0.02—0.05 {0.0008—0.0019}
	Outer and inner rotor clearance(mm {in})	Standard	0.02—0.15 {0.0008—0.0059}
Reverse clutch	Number of drive/driven plates		2/2
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		0.5—0.8 {0.020—0.031}
	Retaining plate size(mm {in})		3.6 {0.142}, 3.8 {0.150}, 4.0 {0.157}, 4.2 {0.165}
	Snap ring size(mm {in})		2.0 {0.079}
High clutch	Number of drive/driven plates		5/5
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		0.8—1.1 {0.031—0.043}
	Retaining plate size(mm {in})		3.0 {0.118}, 3.2 {0.126}, 3.4 {0.134}, 3.6 {0.142}
	Snap ring size(mm {in})		2.0 {0.079}
Low clutch	Number of drive/driven plates		7/7
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		1.1—1.3 {0.044—0.051}
	Retaining plate size(mm {in})		3.8 {0.150}, 3.9 {0.154}, 4.0 {0.157}, 4.1 {0.161}, 4.2 {0.165}, 4.3 {0.169}, 4.4 {0.173}, 4.5 {0.177}, 4.6 {0.181}
	Snap ring size(mm {in})		1.6 {0.063}
Direct clutch	Number of drive/driven plates		4/4
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		1.8—2.2 {0.07—0.09}
	Retaining plate size(mm {in})		4.0 {0.157}, 4.2 {0.165}, 4.4 {0.173}, 4.6 {0.181}, 4.8{0.189}, 5.0 {0.197}
	Snap ring size(mm {in})		2.0 {0.079}
Low and reverse brake	Number of drive/driven plates		6/5
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		0.8—1.1 {0.031—0.043}
	Retaining plate size(mm {in})		2.2 {0.087}, 2.4 {0.094}, 2.6 {0.102}, 2.8 {0.110}, 3.0 {0.118}
	Snap ring size(mm {in})		2.1 {0.083}, 2.2 {0.087}, 2.3 {0.091}
2-4 brake	Number of drive/driven plates		3/4
	Drive plate thickness (mm {in})	Minimum	1.7 {0.067}
	Clutch clearance (mm {in})		0.5—0.8 {0.019—0.031}
	Retaining plate size(mm {in})		3.0 {0.118}, 3.2 {0.126}, 3.4 {0.134}, 3.6 {0.142}, 3.8 {0.150}, 4.0 {0.157}, 4.2 {0.165}
	Snap ring size(mm {in})		2.0 {0.079}
Total end play(mm {in})			0.25—0.55 {0.01—0.02}
End play adjust race(mm {in})			1.4 {0.055}, 1.6 {0.063}, 1.8 {0.071}, 2.0 {0.079}, 2.2{0.087}
Output gear bearing preload (N·m {kgf·cm, in·lbf})			0.63—1.30 {6.4—13.3, 5.6—11.5}
Reduction gear bearing preload (N·m {kgf·cm, in·lbf})			0.60—1.75 {6.1—17.8, 5.3—15.5}

## TECHNICAL DATA

Spring		Item				
		Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire diameter (mm {in})	Wire thickness x wire width (mm {in})
2-4 brake accumulator		27.0 {1.06}	73.8 {2.91}	6.8	2.6 {0.10}	—
Direct clutch accumulator	Large	27.0 {1.06}	54.6 {2.15}	5.2	2.5 {0.10}	—
	Small	20.0 {0.79}	54.5 {2.15}	7.5	1.9 {0.07}	—
Low clutch		108.8 {4.28}	24.4 {0.96}	9	—	1.1 x 6.0 {0.043 x 0.236}
High clutch and reverse clutch		73.0 {2.87}	27.0 {1.06}	14	—	1.1 x 5.5 {0.043 x 0.217}
2-4 brake (Spring and retainer component)		8.0 {0.31}	21.4 {0.84}	6.6	1.0 {0.039}	—
Low and reverse brake		178.9 {7.04}	20.3 {0.79}	4	—	1.3 x 5.2 {0.05 x 0.20}
Direct clutch		66.9 {2.63}	33.2 {1.30}	9	—	1.3 x 4.5 {0.05 x 0.17}

TD



# SPECIAL TOOLS

SPECIAL TOOLS .....	ST-2
AUTOMATIC TRANSAXLE.....	ST-2

ST

# SPECIAL TOOLS

## SPECIAL TOOLS

### AUTOMATIC TRANSAXLE

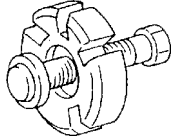
AME941001024A02

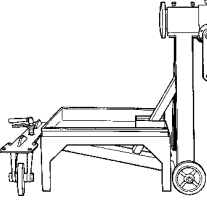
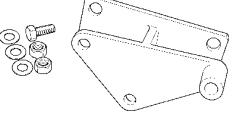
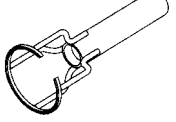
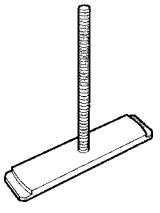
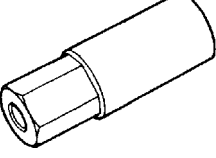
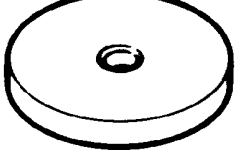
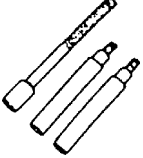
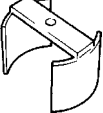
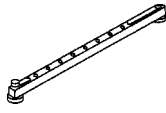
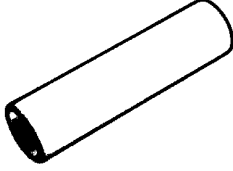

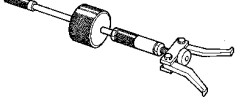
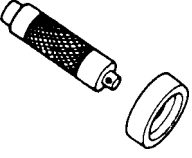
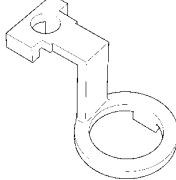
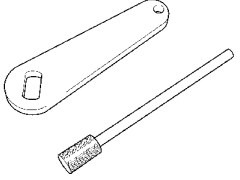

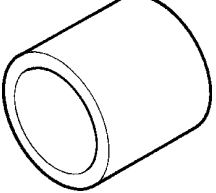

1: Mazda SST number  
2: Global SST number

**Example**

1:49 UN30 3009  
2:303-009

Crankshaft  
damper  
remover



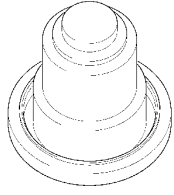
<p>1:49 0107 680A 2: -</p> <p>Engine stand</p> 	<p>1:49 L019 0A2 2: -</p> <p>Hanger set</p> 	<p>1:49 JE01 032 2:307-209</p> <p>Compressor</p> 
<p>1:49 G019 027 2: -</p> <p>Attachment A</p> 	<p>1:49 G019 029 2: -</p> <p>Nut</p> 	<p>1:49 G019 030 2: -</p> <p>Plate</p> 
<p>1:49 L019 001 2: -</p> <p>Bolt</p> 	<p>1:49 B019 011 2: -</p> <p>Return spring compressor</p> 	<p>1:49 UN01 108 2:307-300</p> <p>Gauge bar</p> 
<p>1:49 FT01 384 2: -</p> <p>Collar</p> 	<p>1:49 G019 019 2: -</p> <p>Bolt set</p> 	<p>1:49 W032 2A0 2: -</p> <p>Bearing remover set</p> 
<p>1:49 G030 795 2: -</p> <p>Oil seal installer</p> 	<p>1:49 L019 012 2: -</p> <p>Stopper</p> 	<p>1:49 L019 013 2: -</p> <p>Adapter</p> 
<p>1:49 L019 019 2: -</p> <p>Adapter</p> 	<p>1:49 U027 003 2: -</p> <p>Oil seal installer</p> 	<p>1:49 G030 797 2: -</p> <p>Handle</p> 

## SPECIAL TOOLS

1:49 L019 016

2: -

Installer



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