Manual Transmission Workshop Manual P66M–D

CONTENTS

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FOREWORD

This manual explains the service points for the above-indicated automotive system. This manual covers all models with the above-indicated automotive system, not any one specific model.

In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.
As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers. This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

Mazda Motor Corporation
HIROSHIMA, JAPAN

GENERAL INFORMATION

00
SECTION

00–00 GENERAL INFORMATION

HOW TO USE THIS MANUAL

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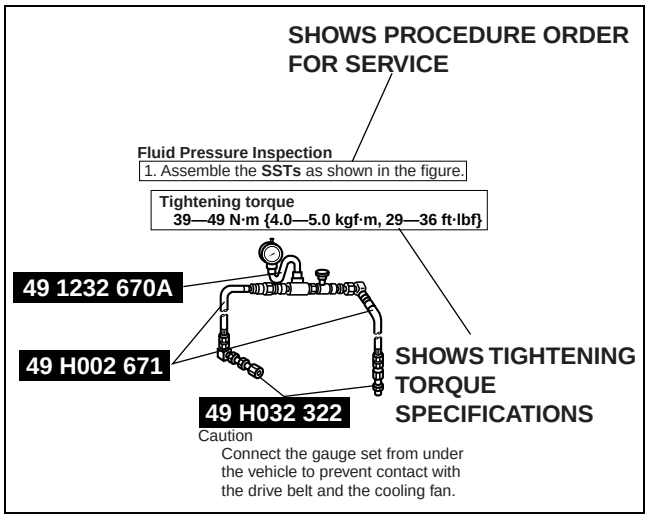
Range of Topics

- 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.

Service 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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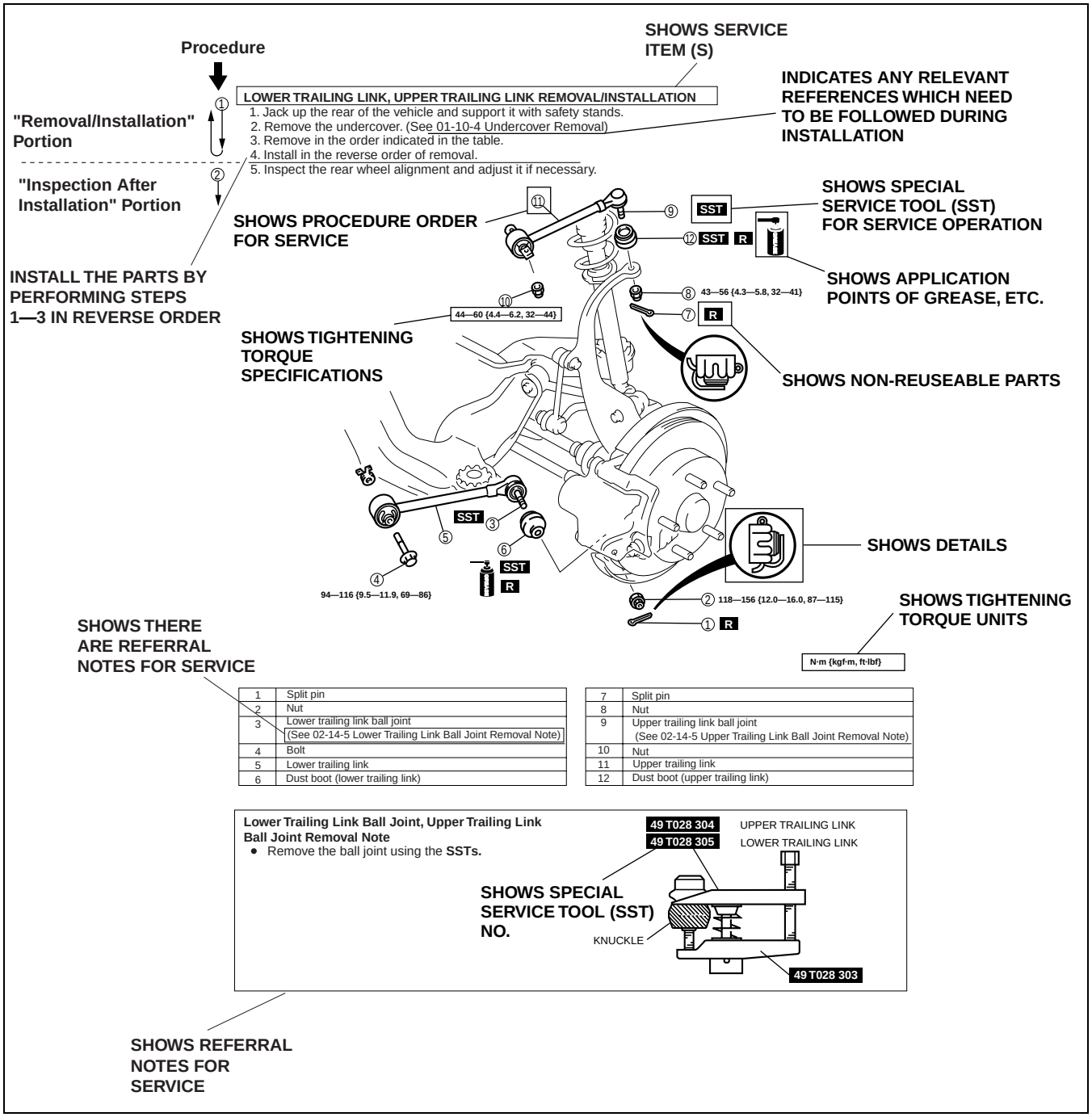
Repair procedure

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.
3. Procedure steps are numbered and the part that is the main point of that 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.



1	Split pin	7	Split pin
2	Nut	8	Nut
3	Lower trailing link ball joint (See 02-14-5 Lower Trailing Link Ball Joint Removal Note)	9	Upper trailing link ball joint (See 02-14-5 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)

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Symbols

- 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
R	Replace part	O-ring, gasket, etc.
SST	Use SST or equivalent	Appropriate tools

Advisory Messages

- 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.

Specification

- 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

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Electric 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)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Number of revolutions	rpm (revolutions per minute)
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	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^2 in the following specifications:

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

- The actual converted values for 2.7 kgf/cm^2 are 264 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

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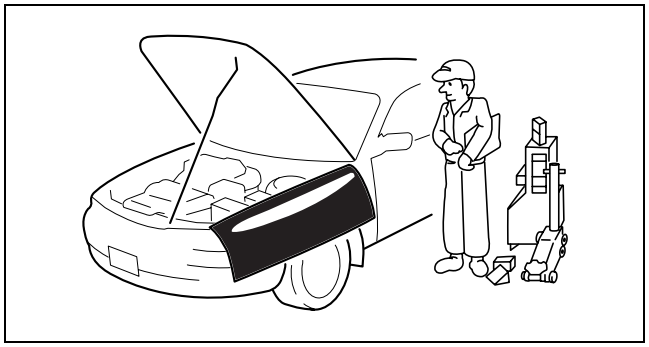
Preparation of Tools and Measuring Equipment

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



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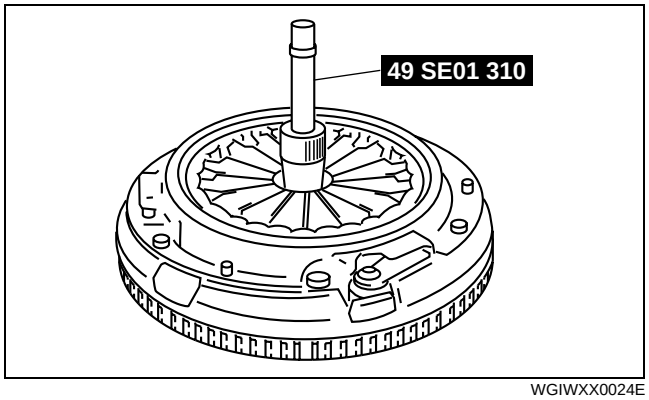
Special Service Tools

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



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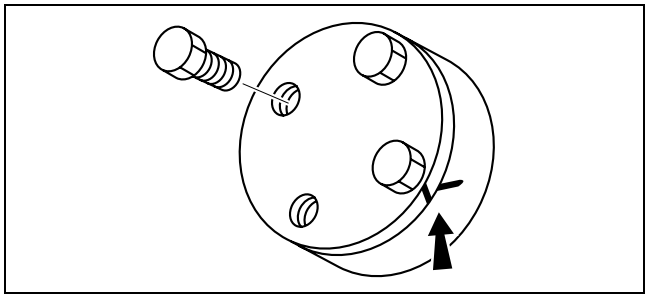
Disassembly

- 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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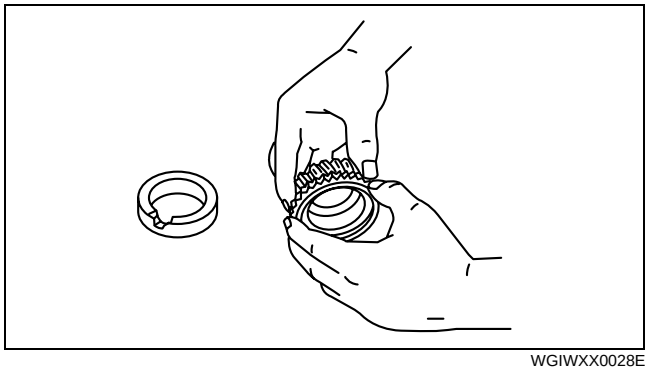
Inspection During Removal, Disassembly

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



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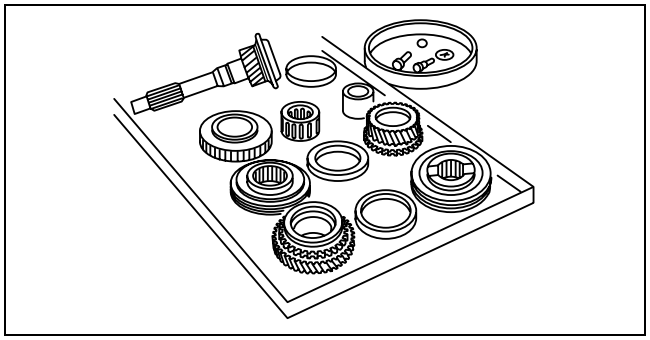
Arrangement of Parts

- 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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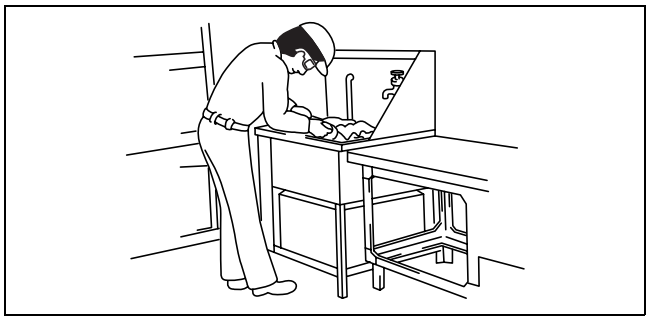
Cleaning of Parts

- 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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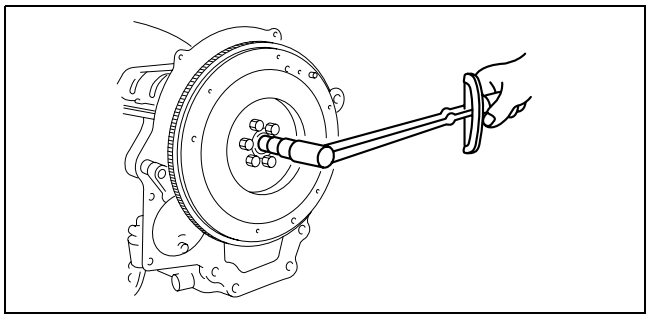
Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
  - — Oil seals
  - — Gaskets
  - — O-rings
  - — Lockwashers
  - — Cotter pins
  - — Nylon nuts



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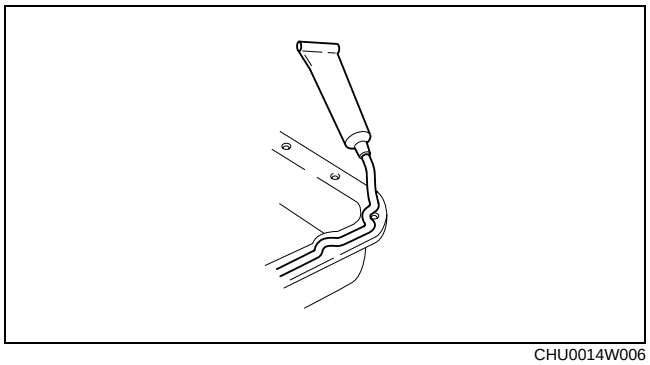
- Depending on location:
  - — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - — Oil should be applied to the moving components of parts.
  - — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



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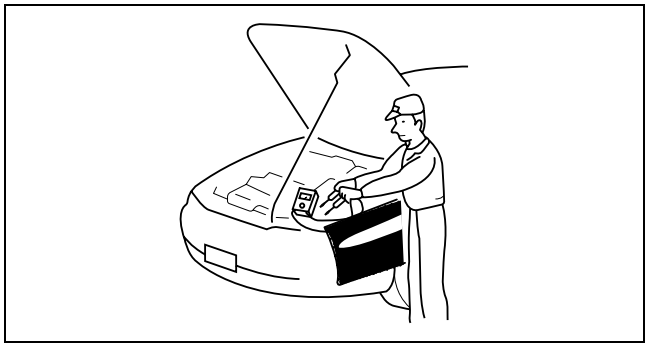
Adjustment

- Use suitable gauges and testers when making adjustments.



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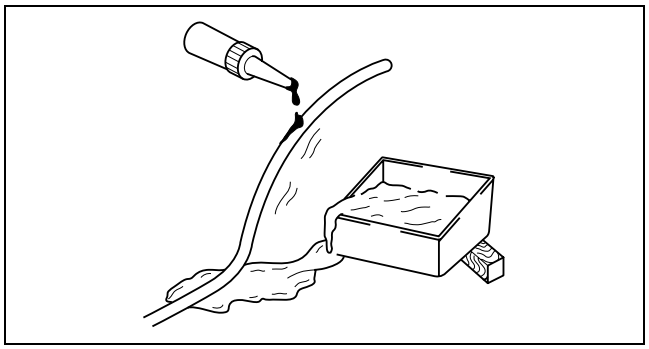
Rubber Parts and Tubing

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



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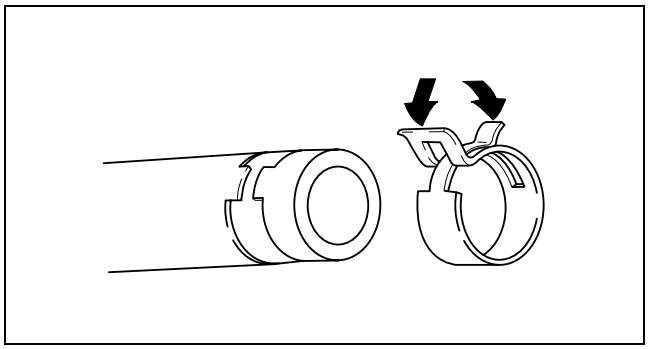
Hose Clamps

- 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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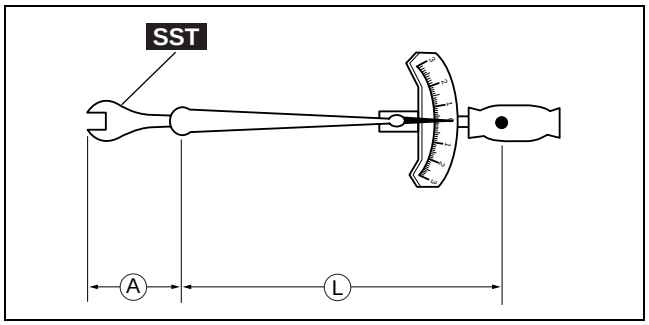
Torque Formulas

- 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 by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/ (L+A)]
kgf·m	kgf·m × [L/ (L+A)]
kgf·cm	kgf·cm × [L/ (L+A)]
ft·lbf	ft·lbf × [L/ (L+A)]
in·lbf	in·lbf × [L/ (L+A)]



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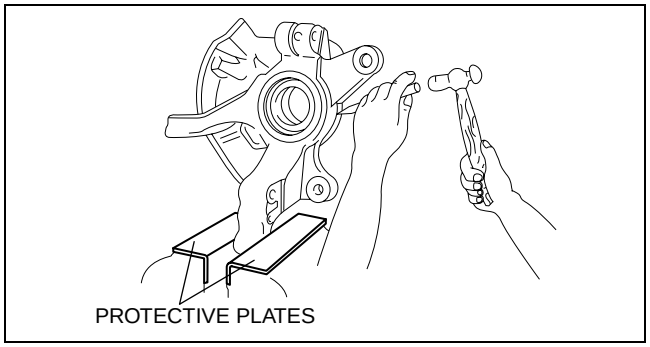
A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

Vise

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



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ELECTRICAL SYSTEM

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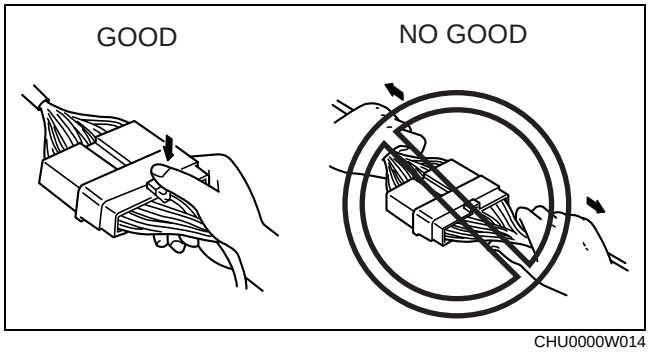
Connectors

Disconnecting connectors

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



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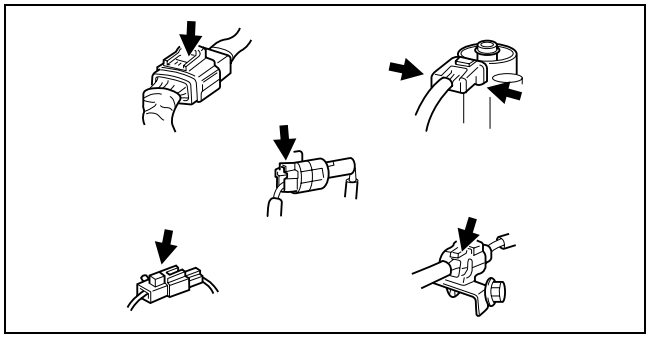
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



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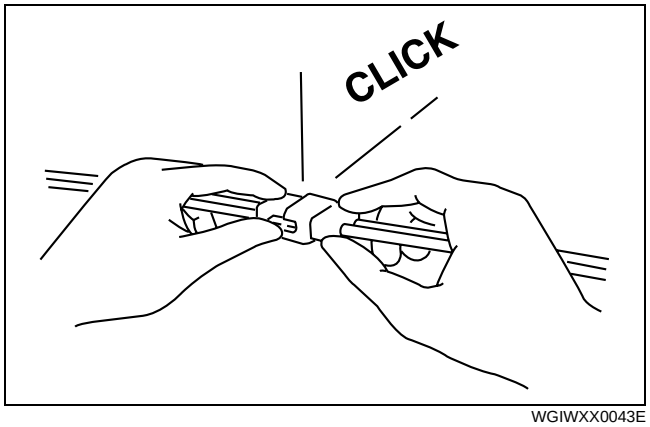
Locking connector

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



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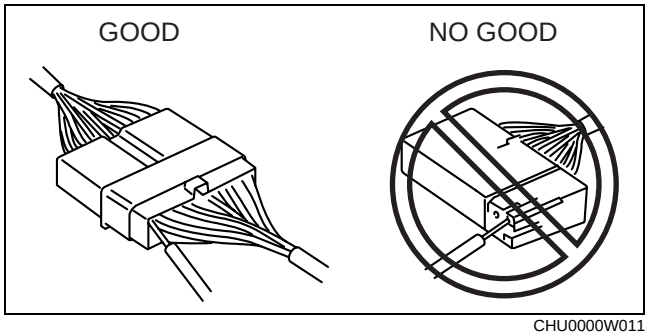
Inspection

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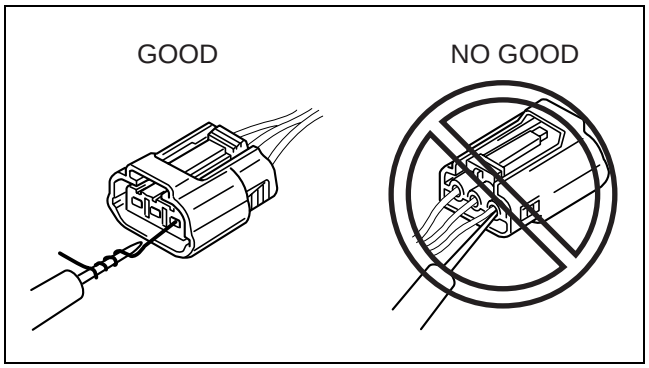

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SAE STANDARDS

E5U000000000105

- 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	Vb	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	

New Standard		Previous Standard		Remark
Abbrevi-ation	Name	Abbrevi-ation	Name	
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	Malfunction Indicator Lamp	—	Malfunction 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/SelfDiagnosis	
OL	Open Loop	—	Open Loop	
—	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	—	12 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	23 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	34 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	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
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

E5U000000000106

SST	Special Service Tools

TRANSMISSION/TRANSAXLE

05
SECTION

05–11 MANUAL TRANSMISSION

PRECAUTION

E5U051100000101

1. Clean the transmission exterior thoroughly using a steam cleaner or cleaning solvents 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.**

Caution

- **Cleaning sealed bearings using cleaning fluids or a steam cleaner can wash the grease out of the bearing.**

2. Clean the removed parts using cleaning solvent, and dry them using compressed air.
3. Clean out all holes and passages using compressed air, and check that there are no obstructions.
4. Make sure each part is cleaned before assembling.
5. Coat all movable parts with the specified oil.
6. Replace parts whenever required.
7. Remove old sealant from contact surfaces before applying new sealant.
8. Assemble the parts within **10 min** after applying sealant. Allow all sealant to cure at least **30 min** after assembling before filling the transmission with transmission oil.

Warning

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

TOP COVER COMPONENT AND EXTENSION HOUSING DISASSEMBLY

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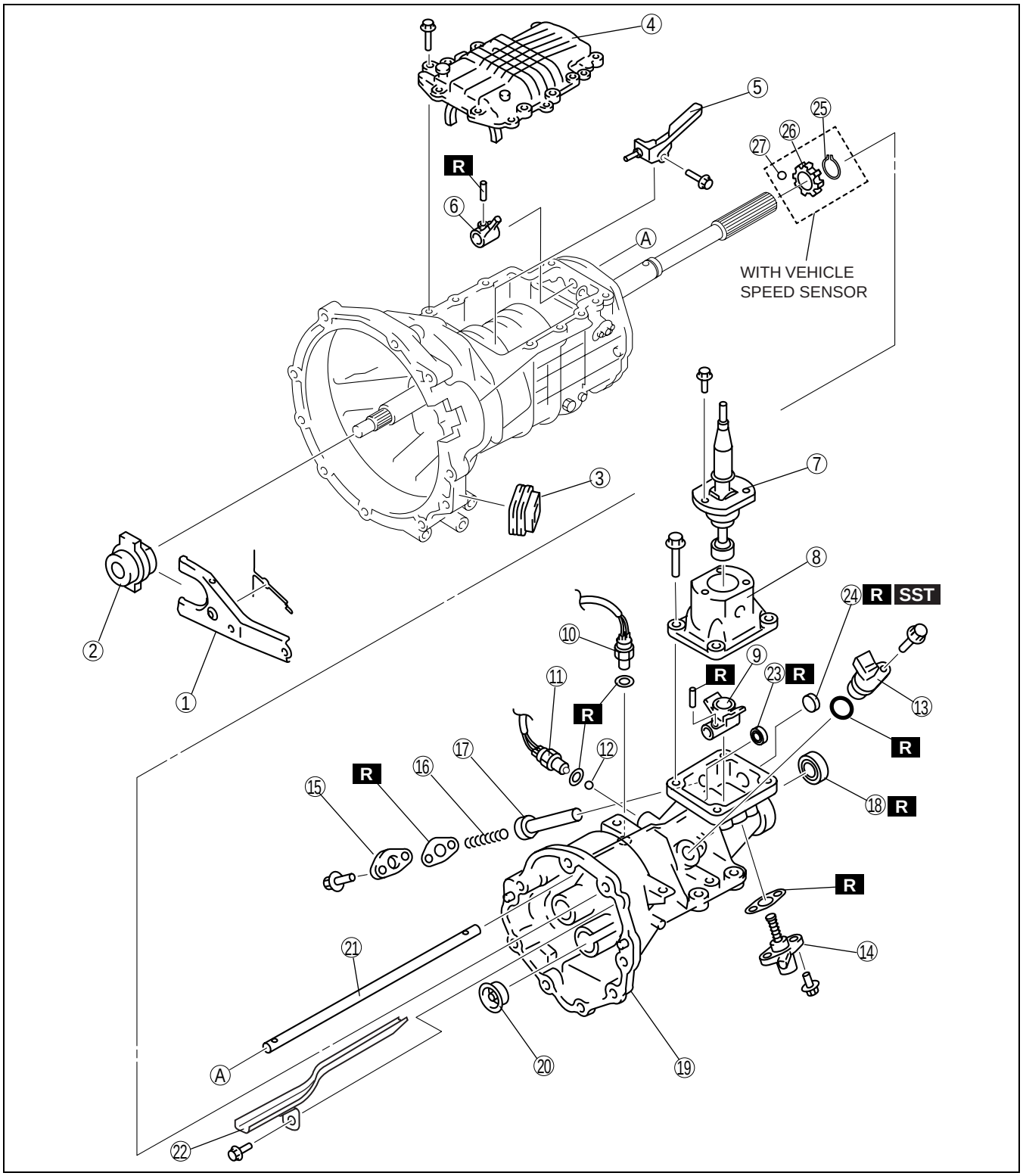
Caution

- **Remove the oil seal (extension housing and control rod) only if there is a malfunction.**

1. Disassemble in the order indicated in the table.



E5U511BM5001

1	Release fork
2	Release collar
3	Dust boot

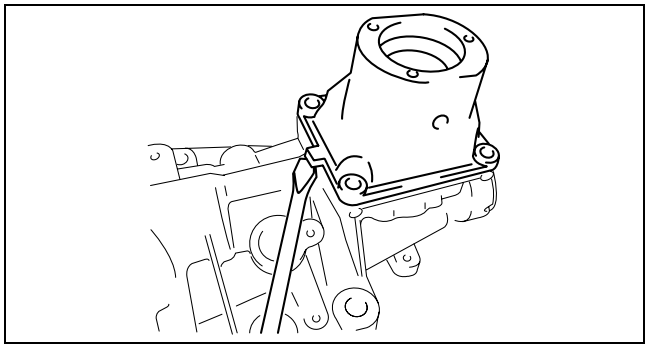
4	Top cover, shift component (See 05–11–5 Top Cover Disassembly Note.)
5	Oil passage

6	Control lever (See 05–11–5 Extension Housing Disassembly Note.)
7	Change lever component
8	Control case (See 05–11–4 Control Case Disassembly Note.)
9	Control rod end (See 05–11–5 Extension Housing Disassembly Note.)
10	Back-up light switch
11	Neutral switch
12	Steel ball
13	Vehicle speed sensor, hole cover
14	Select spindle component
15	Spring cap
16	Select lock spindle spring
17	Select lock spindle

18	Oil seal (extension housing) (See 05–11–5 Oil Seal (extension housing) Removal Note.)
19	Extension housing (See 05–11–5 Extension Housing Disassembly Note.)
20	Funnel
21	Control rod
22	Oil passage
23	Oil seal (control rod) (See 05–11–6 Oil Seal (control rod) Disassembly Note.)
24	Sealing cap (See 05–11–6 Sealing Cap Disassembly Note.)
25	Retaining ring
26	Sensor rotor
27	Steel ball

Control Case Disassembly Note

1. Pry the seal open at the projection on the case using a flathead screwdriver or similar tool as shown in the figure, and then remove the control case.



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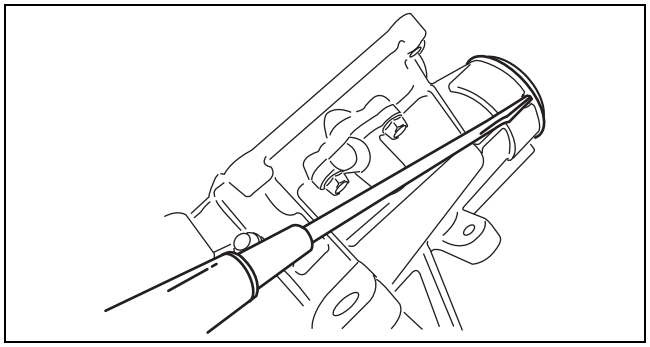
Oil Seal (extension housing) Removal Note

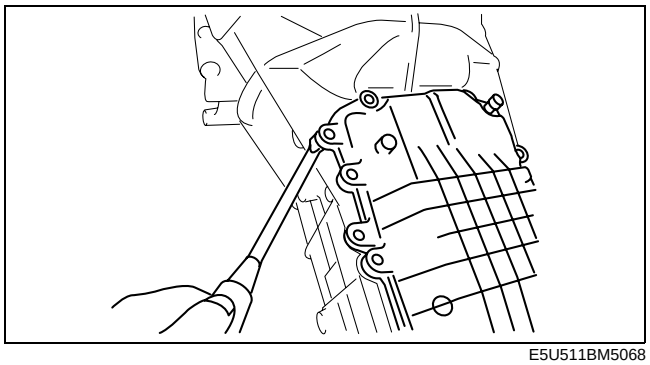
1. Remove the oil seal using a flathead screwdriver as shown in the figure.



E5U511BM5080

Top Cover Disassembly Note

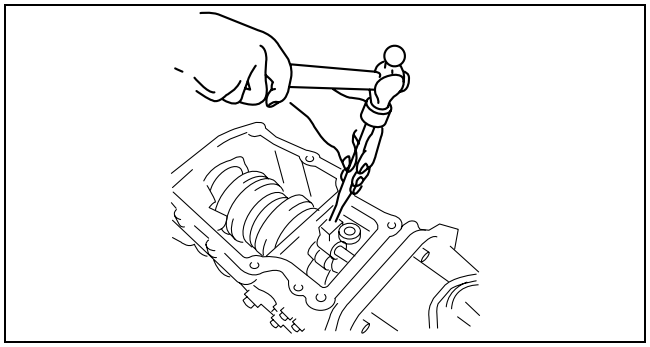
1. Pry the seal open at the projection on the case using a flathead screwdriver or similar tool as shown in the figure, and then remove the top cover.



E5U511BM5068

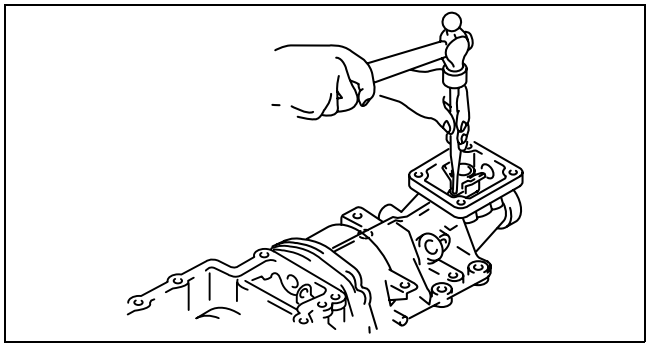
Extension Housing Disassembly Note

1. Remove the spring pin of the control lever using a pin punch in the figure.



E5U511BM5009

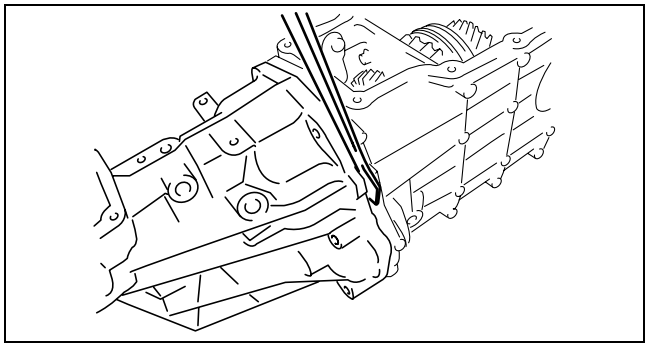
2. Remove the spring pin of the control rod end using a pin punch in the figure.



E5U511BM5071

3. Remove the extension housing component.

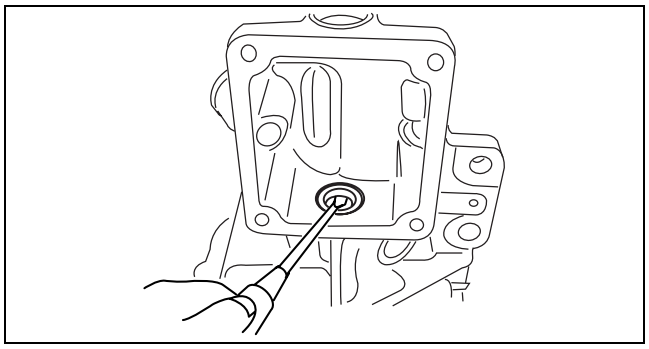
Note
- Pry open the seal at the projection on the case using a flathead screwdriver or similar tool as shown in the figure, and then remove the extension housing.



E5U511BM5069

Oil Seal (control rod) Disassembly Note

1. Using a flathead screwdriver, remove the oil seal as shown in the figure.

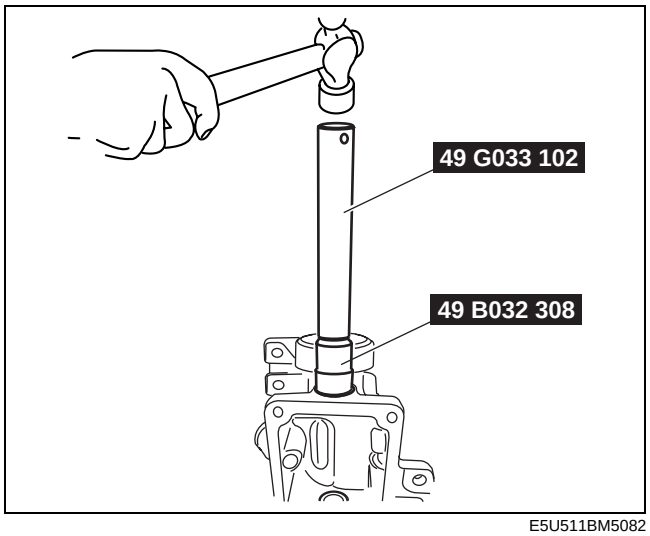


E5U511BM5081

Sealing Cap Disassembly Note

1. Remove the sealing cap using the **SST**.

Caution
- **Remove the sealing cap only if there is malfunction.**

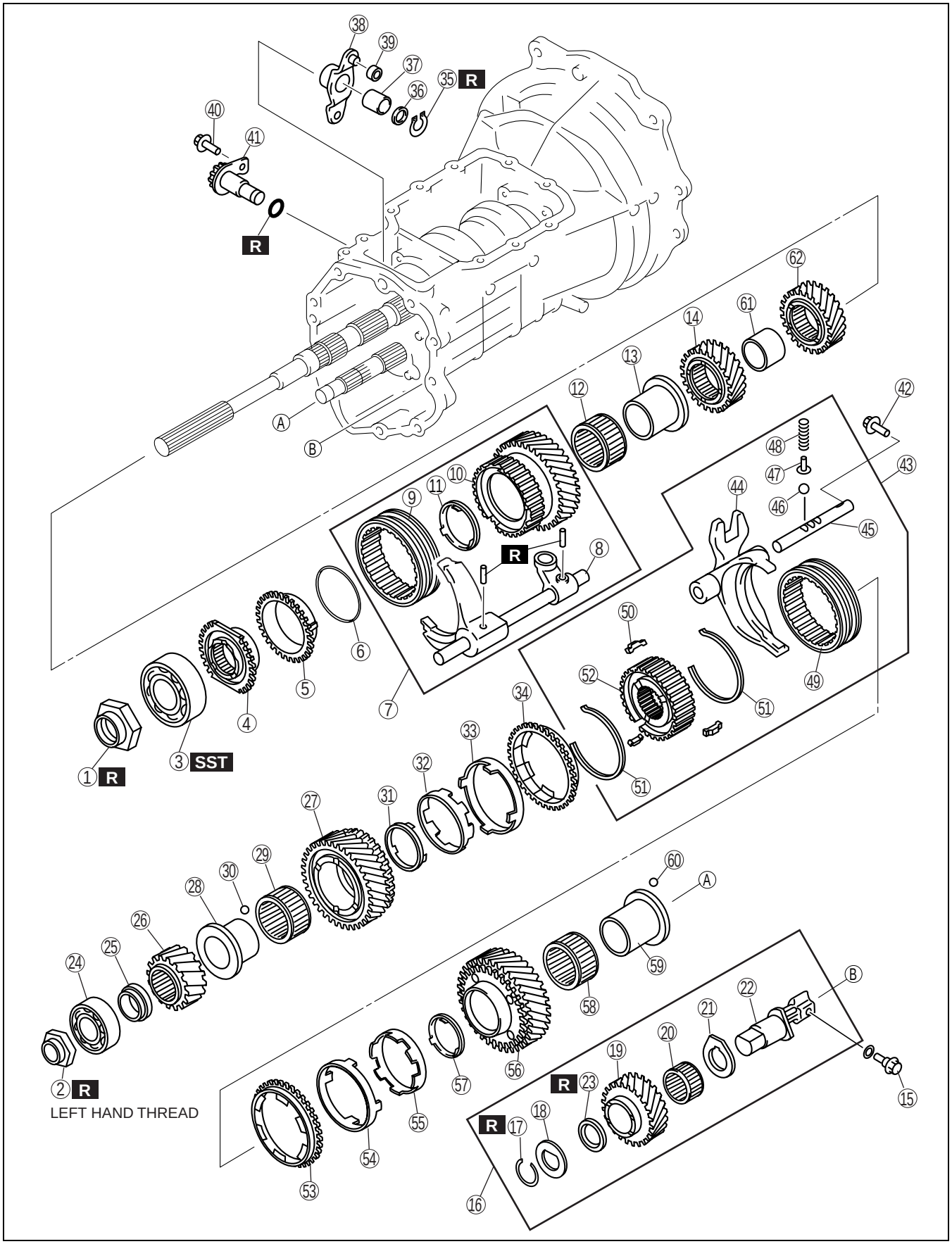


E5U511BM5082

REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT DISASSEMBLY

E5U051117030101

1. Disassemble in the order indicated in the table.



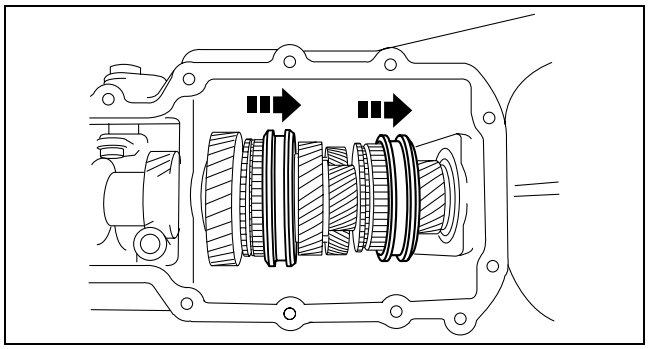
E5U511BM5002

1	Locknut (See 05–11–8 Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note.)
2	Locknut (See 05–11–8 Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note.)
3	Mainshaft rear bearing (See 05–11–9 Mainshaft Rear Bearing Disassembly Note.)
4	Reverse synchronizer cone
5	Synchronizer ring
6	Synchronizer key spring
7	Reverse gear, shift fork component
8	Reverse shift fork
9	Clutch hub sleeve
10	Reverse gear
11	Friction damper
12	Needle bearing
13	Needle bearing race
14	4th gear
15	Retaining bolt
16	Reverse idler gear shaft component (See 05–11–9 Reverse Idler Gear Shaft Component Disassembly Note.)
17	Retaining ring
18	Thrust washer
19	Reverse idler gear
20	Needle bearing
21	Thrust washer
22	Reverse idler gear shaft
23	Friction damper (See 05–11–10 Reverse Idler Gear Friction Damper Disassembly Note.)
24	Countershaft rear bearing
25	Collar
26	Reverse counter gear
27	4th counter gear
28	Needle bearing race

29	Needle bearing
30	Steel ball
31	Friction damper
32	Inner cone
33	Double cone
34	Synchronizer ring
35	Retaining ring
36	Spacer
37	Needle bearing
38	Counter lever (See 05–11–10 Counter Lever Disassembly Note.)
39	Bush
40	Retaining bolt
41	Counter lever shaft component (See 05–11–10 Counter Lever Disassembly Note.)
42	Retaining bolt
43	3rd/4th clutch hub and shift fork component (See 05–11–10 3rd/4th Shift Fork Disassembly Note.)
44	3rd/4th shift fork
45	3rd/4th shift rod
46	Detent ball
47	Spring seat
48	Detent spring
49	Clutch hub sleeve
50	Synchronizer key
51	Synchronizer key spring
52	3rd/4th clutch hub
53	Synchronizer ring
54	Double cone
55	Inner cone
56	3rd counter gear
57	Friction damper
58	Needle bearing
59	Needle bearing race
60	Steel ball
61	Spacer
62	3rd gear

Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note

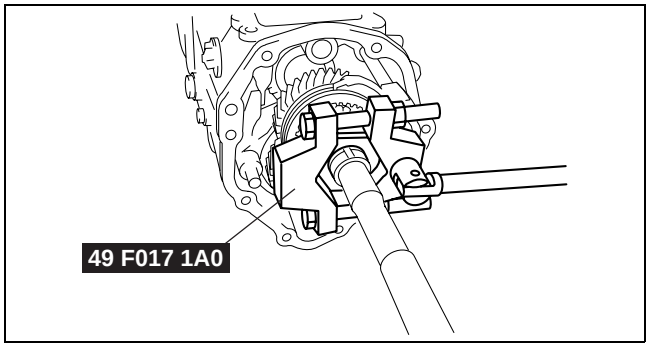
1. Slide the 5th/6th and 1st/2nd clutch hub sleeves to lock the transmission into 5th and 2nd gears.



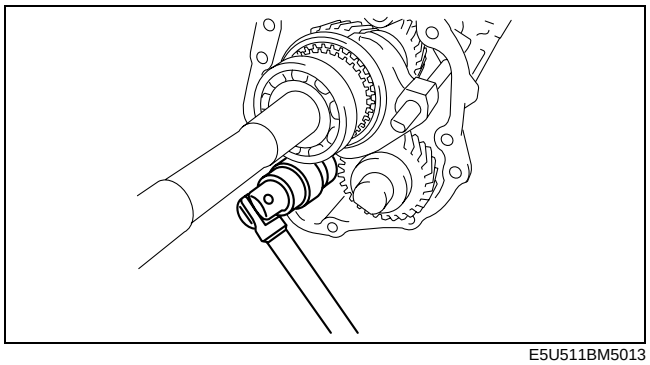
E5U511BM5011

2. Remove the mainshaft rear bearing locknut by rotating it counterclockwise using the **SST**.
3. Remove the countershaft rear bearing locknut by rotating it clockwise.

Caution
- **Note that the countershaft rear bearing locknut has a left-hand thread.**



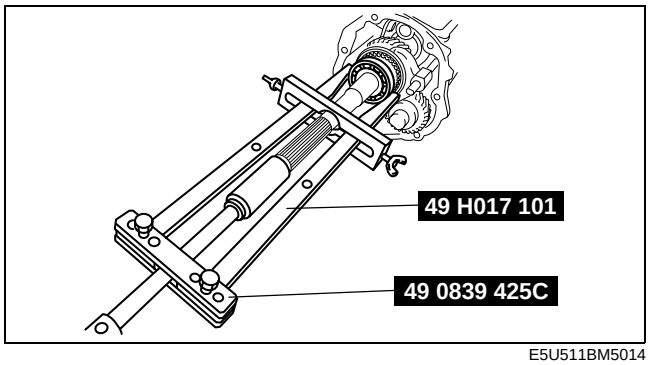
E5U511BM5012



E5U511BM5013

Mainshaft Rear Bearing Disassembly Note

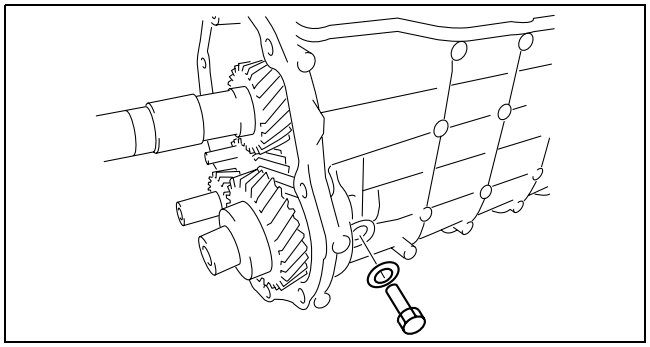
1. Using the **SSTs** remove the mainshaft rear bearing.



E5U511BM5014

Reverse Idler Gear Shaft Component Disassembly Note

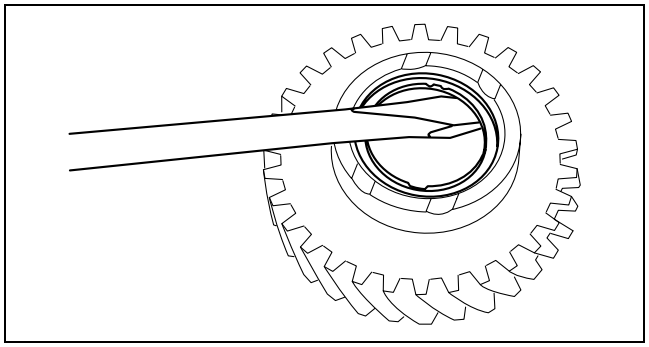
1. Remove the reverse idler gear shaft retaining bolt and then remove the reverse idler gear shaft component from the transmission case.



E5U511BM5015

Reverse Idler Gear Friction Damper Disassembly Note

1. Remove the friction damper using a flathead screwdriver.

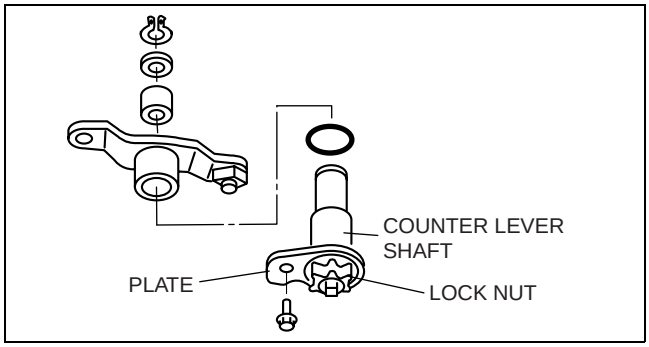


E5U511BM5019

Counter Lever Disassembly Note

Caution

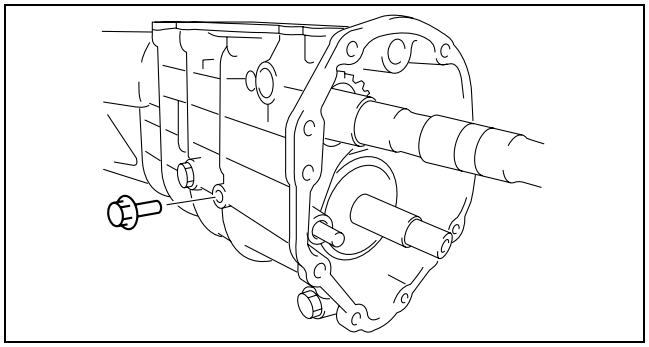
- **To prevent the shaft position from deviating when removing the counter lever, remove the countershaft lever component without loosening the locknut unless it is necessary.**



E5U511BM5016

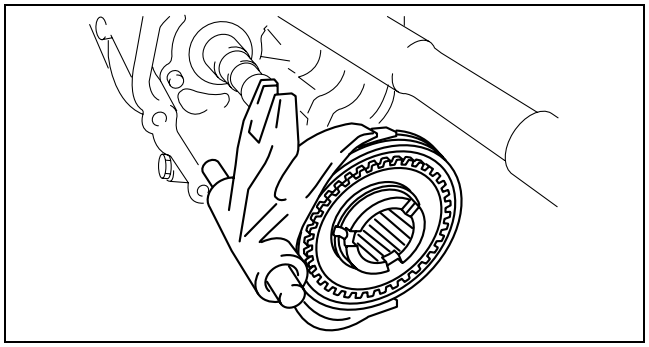
3rd/4th Shift Fork Disassembly Note

1. Remove the 3rd/4th shift rod retaining bolt.



E5U511BM5017

2. Remove the 3rd/4th shift fork component and 3rd/4th clutch hub component at the same time.

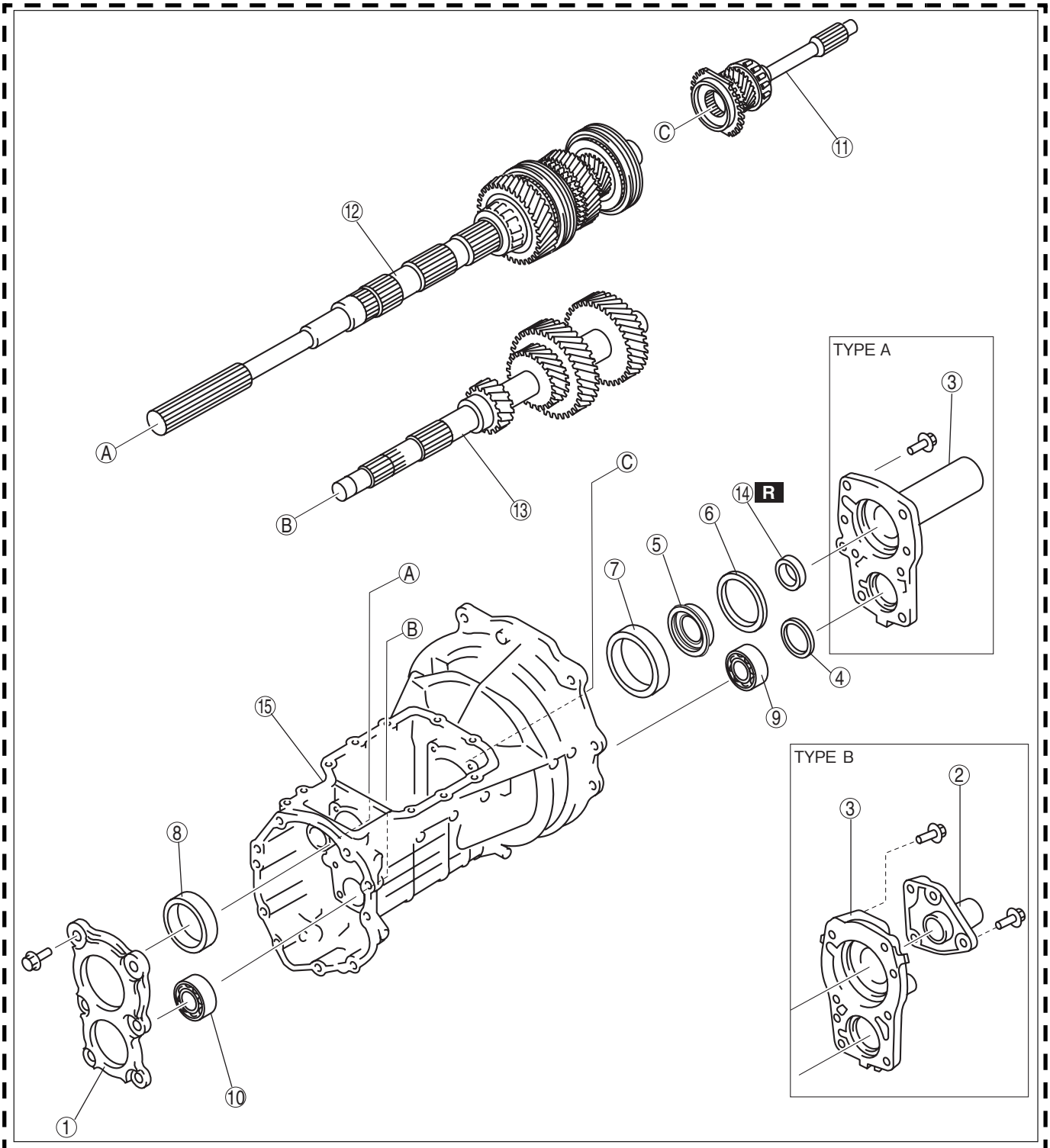


E5U511BM5018

MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE DISASSEMBLY

E5U051117030104

1. Disassemble in the order indicated in the table.



GHG0517M5001

1	Bearing cover
2	Front cover No.2
3	Front cover (See 05–11–12 Front Cover Disassembly Note.)
4	Bearing shim
5	Oil baffle
6	Bearing shim
7	Maindrive gear bearing race (See 05–11–12 Bearing Race Disassembly Note.)
8	Mainshaft bearing race (See 05–11–12 Bearing Race Disassembly Note.)
9	Countershaft front bearing
10	Countershaft rear bearing
11	Maindrive gear (See 05–11–12 Mainshaft Component and Countershaft Component Disassembly Note.)

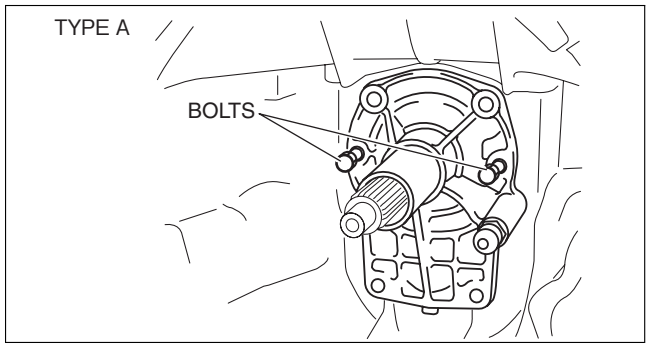
12	Mainshaft component (See 05–11–12 Mainshaft Component and Countershaft Component Disassembly Note.)
13	Countershaft component (See 05–11–12 Mainshaft Component and Countershaft Component Disassembly Note.)
14	Front oil seal
15	Transmission case

Front Cover Disassembly Note

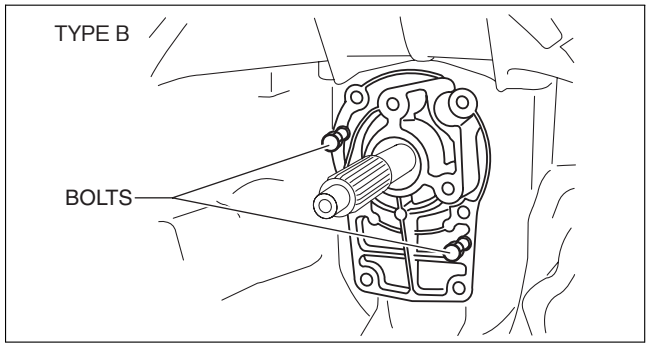
1. Remove the front cover.

Caution

- **Insert the front cover tightening bolts into the bolt holes for the front cover disassembly, tighten the two bolts uniformly and, then remove the front cover.**



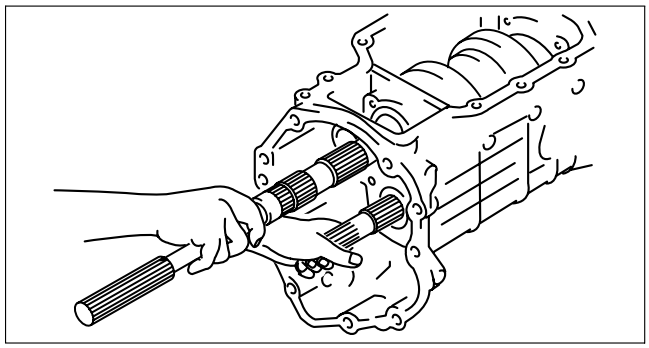
GHG0517M5002



GHG0517M5003

Bearing Race Disassembly Note

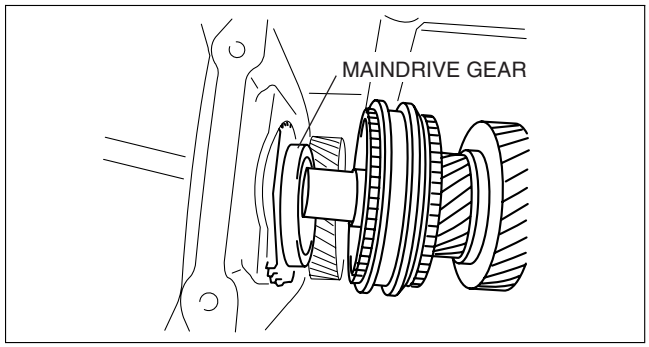
1. Grasping the mainshaft and countershaft, move them forward and back to remove the bearing races.



E5U511BM5074

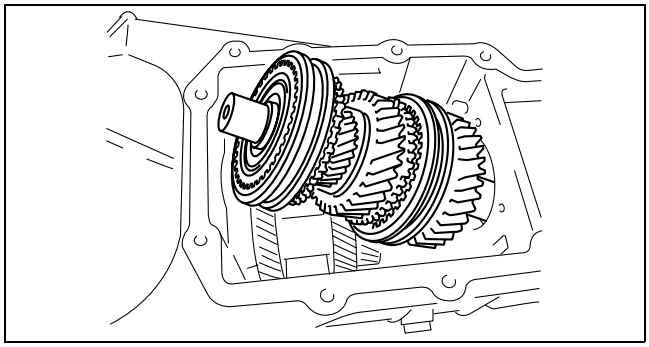
Mainshaft Component and Countershaft Component Disassembly Note

1. Separate the maindrive gear component from the mainshaft component and remove it from the front cover installation holes.



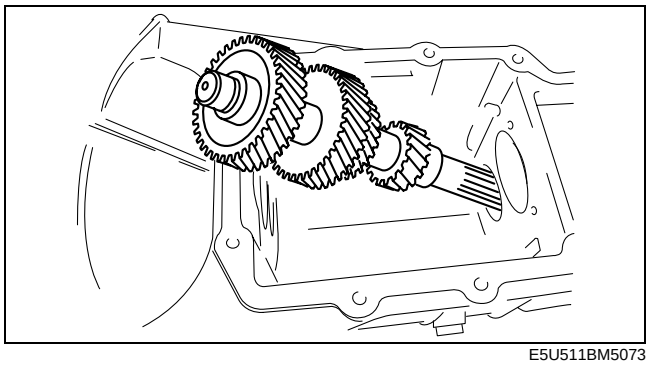
E5U511BM5020

2. Tilt the mainshaft component as shown in the figure and remove it from the transmission case.



E5U511BM5021

3. Tilt the countershaft component as shown in the figure and remove it from the transmission case.



E5U511BM5073

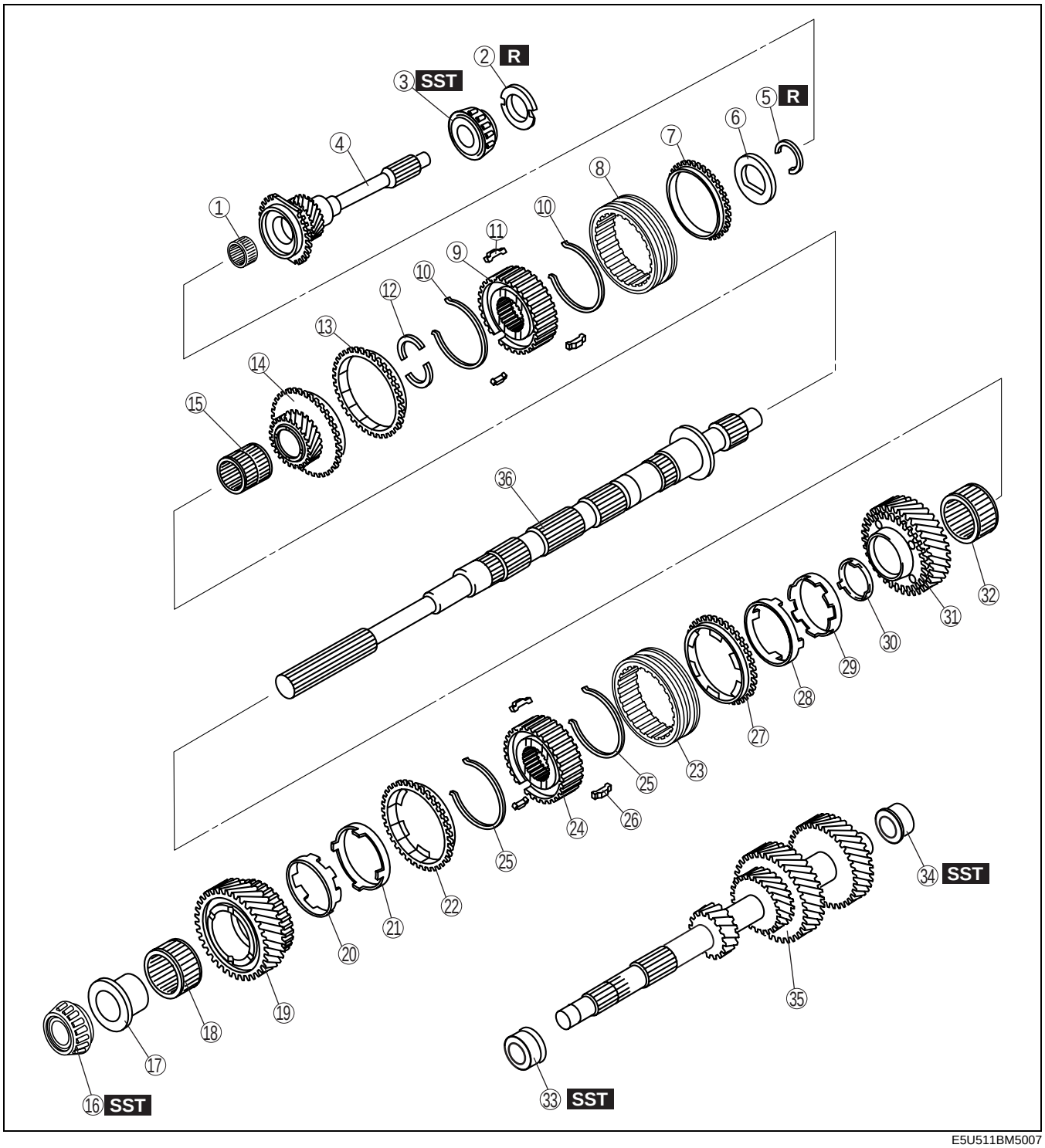
1ST/2ND GEAR COMPONENT, 5TH/6TH GEAR COMPONENT AND COUNTERSHAFT DISASSEMBLY

E5U051117030105

Caution

- **Remove the countershaft center bearing race only if there is a malfunction.**

1. Disassemble in the order indicated in the table.



E5U511BM5007

1	Needle bearing
2	Scoop ring
3	Maindrive gear shaft bearing (See 05–11–16 Maindrive Gear Shaft Bearing Disassembly Note.)
4	Maindrive gear shaft

5	Retaining ring (See 05–11–15 5th/6th Clutch Hub Component Disassembly Note.)
6	Needle bearing
7	Synchronizer ring
8	Clutch hub sleeve

9	5th/6th clutch hub (See 05–11–15 5th/6th Clutch Hub Component Disassembly Note.)
10	Synchronizer key spring
11	Synchronizer key
12	Thrust washer
13	Synchronizer ring
14	6th gear
15	Needle bearing
16	Mainshaft center bearing (See 05–11–16 1st/2nd Clutch Hub Component Disassembly Note.)
17	Needle bearing race
18	Needle bearing
19	1st gear
20	Inner cone
21	Double cone
22	Synchronizer ring
23	Clutch hub sleeve

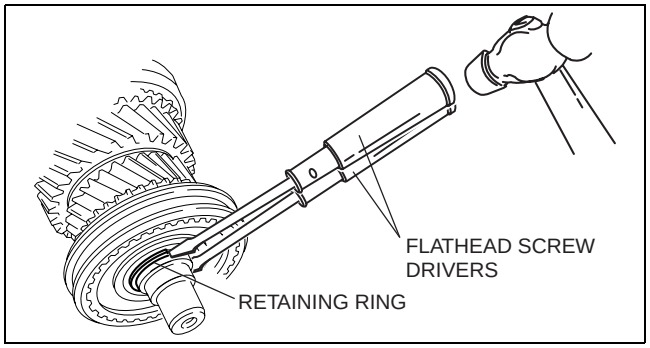
24	1st/2nd clutch hub (See 05–11–16 1st/2nd Clutch Hub Component Disassembly Note.)
25	Synchronizer key spring
26	Synchronizer key
27	Synchronizer ring
28	Double cone
29	Inner cone
30	Friction damper
31	2nd gear
32	Needle bearing
33	Countershaft center bearing race (See 05–11–16 Countershaft Center Bearing Race Disassembly Note.)
34	Countershaft front bearing race (See 05–11–17 Countershaft Front Bearing Race Disassembly Note.)
35	Countershaft
36	Mainshaft

5th/6th Clutch Hub Component Disassembly Note

1. Remove the retaining ring using the two flathead screwdrivers.

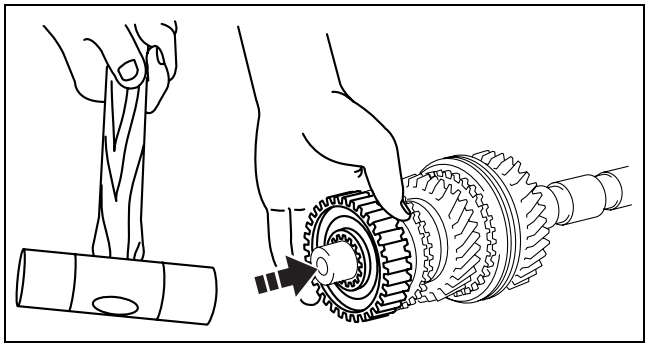
Caution

- **Do not reuse the retaining ring.**



E5U511BM5010

2. Supporting the 5th/6th clutch hub with your hand as shown in the figure, tap the mainshaft with a plastic hammer to remove the 5th/6th clutch hub.



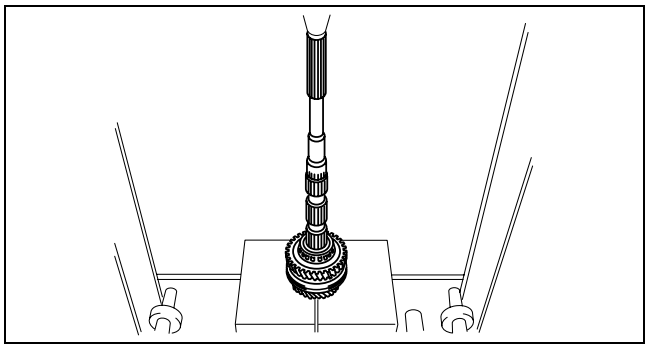
E5U511BM5022

1st/2nd Clutch Hub Component Disassembly Note

1. Using a press, remove the mainshaft center bearing, 1st gear, 1st synchronizer ring component, 1st/2nd clutch hub component, 2nd synchronizer ring component and 2nd gear at the same time.

Caution

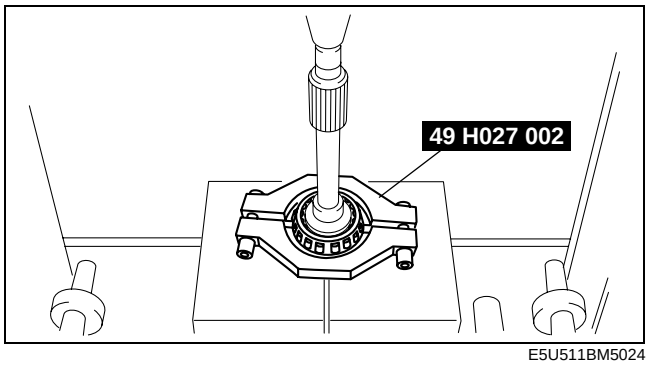
- **Be sure to support the mainshaft component so that it does not fall.**



E5U511BM5023

Maindrive Gear Shaft Bearing Disassembly Note

1. Remove the maindrive gear shaft bearing using the **SST** and press.



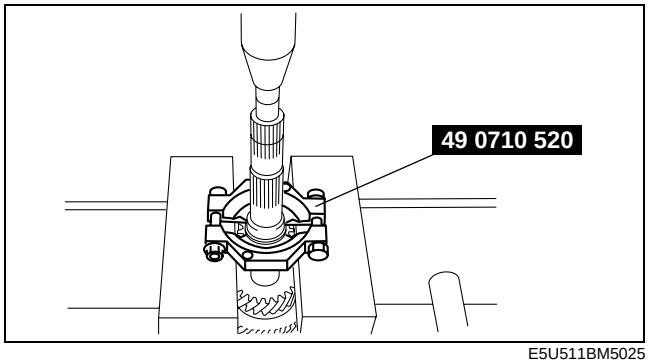
E5U511BM5024

Countershaft Center Bearing Race Disassembly Note

1. Remove the countershaft center bearing race using the **SST** and press.

Caution

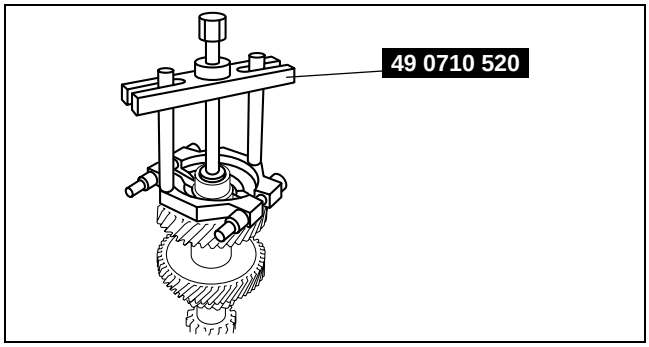
- **Be sure to support the countershaft so that it does not fall.**



E5U511BM5025

Countershaft Front Bearing Race Disassembly Note

1. Remove the countershaft front bearing race using the **SST**.

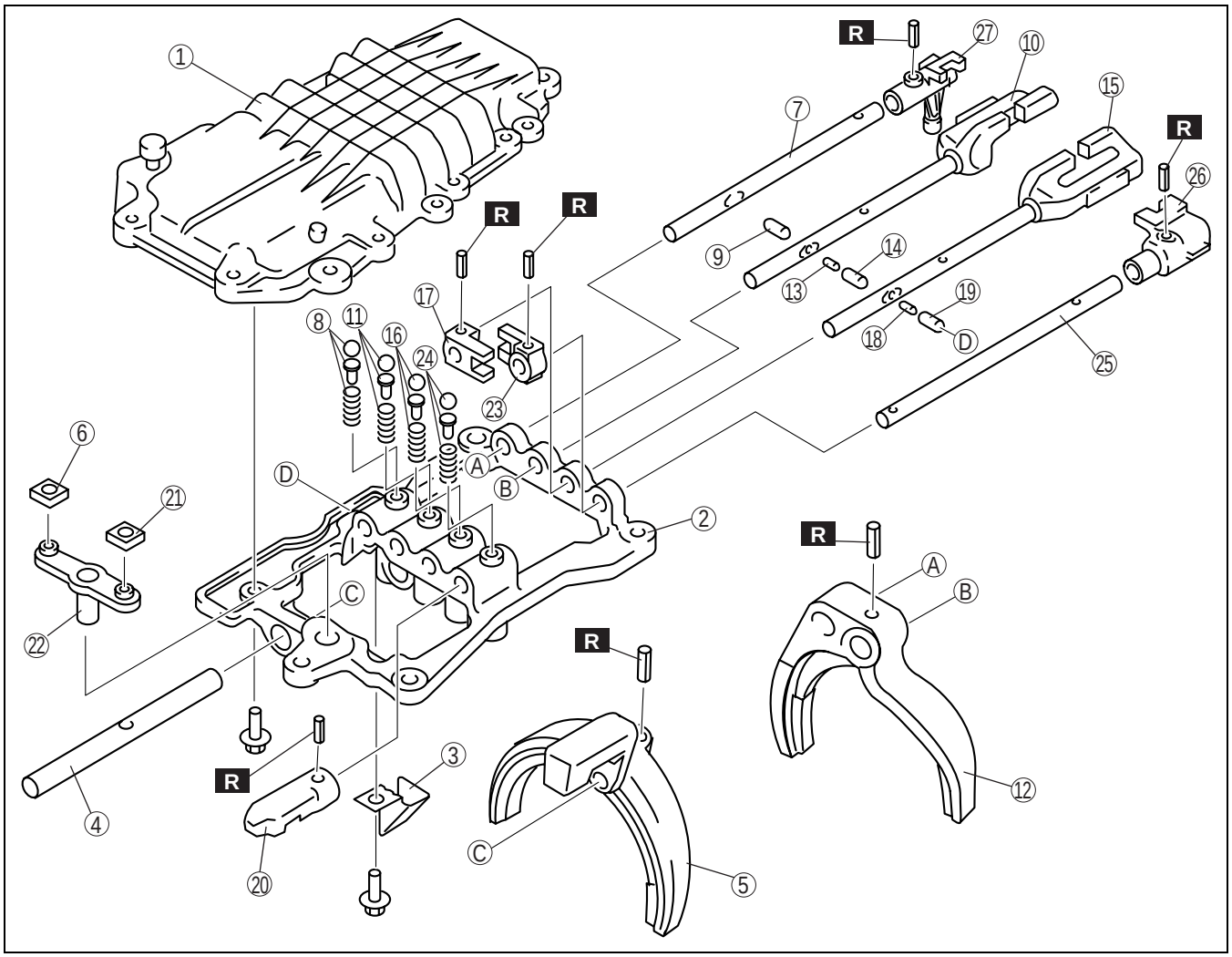


E5U511BM5026

SHIFT COMPONENT DISASSEMBLY

E5U051117030108

1. Disassemble in the order indicated in the table.



E5U511BM5055

1	Top cover
2	Change frame
3	Baffle plate
4	5th/6th shift rod
5	5th/6th shift fork
6	Change bush
7	Reverse shift rod (See 05–11–18 Shift Rod Disassembly Note.)
8	Detent ball, spring seat, spring
9	Interlock pin

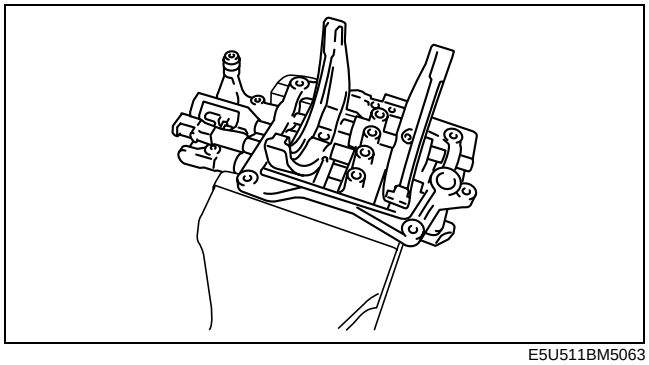
10	1st/2nd shift rod (See 05–11–18 Shift Rod Disassembly Note.)
11	Detent ball, spring seat, spring
12	1st/2nd shift fork
13	Interlock pin
14	Interlock pin
15	3rd/4th shift rod (See 05–11–18 Shift Rod Disassembly Note.)
16	Detent ball, spring seat, spring
17	Stopper block

18	Interlock pin
19	Interlock pin
20	Shift gate
21	Change bush
22	Crank lever
23	Stopper block
24	Detent ball, spring seat, spring
25	5th/6th shift rod (See 05–11–18 Shift Rod Disassembly Note.)
26	5th/6th shift rod end
27	Reverse Shift rod end

Shift Rod Disassembly Note

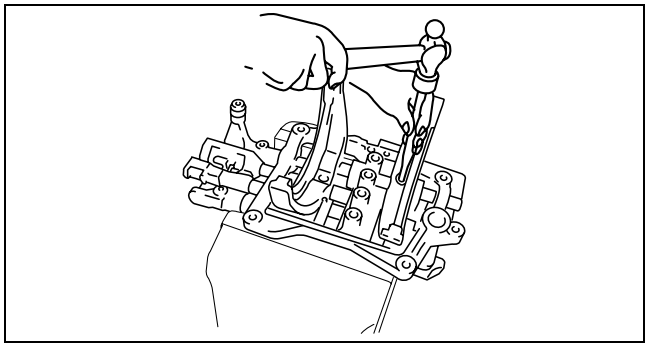
1. Set the change frame in the vise as shown in the figure.

   Caution
   - **Insert aluminum plates in the vise and tighten the vise handle lightly so as not to damage the part.**



E5U511BM5063

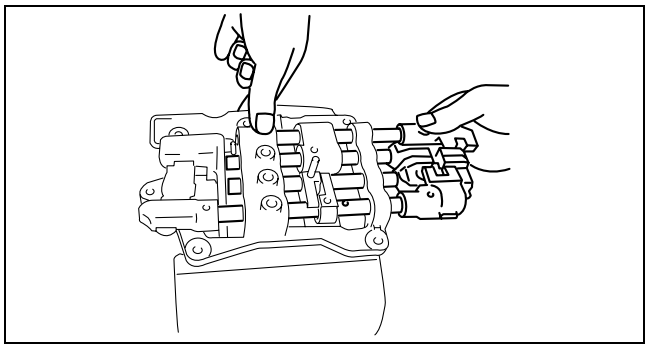
2. Remove the spring pins from each of the shift rods using a pin punch.
3. Place the shift mechanism in the neutral position.



E5U511BM5054

4. Pull out the shift rods from the change frame.

   Caution
   - **When pulling out the shift rods, press the top of each detent ball so that it doesn't spring out.**



E5U511BM5064

MANUAL TRANSMISSION PARTS INSPECTION

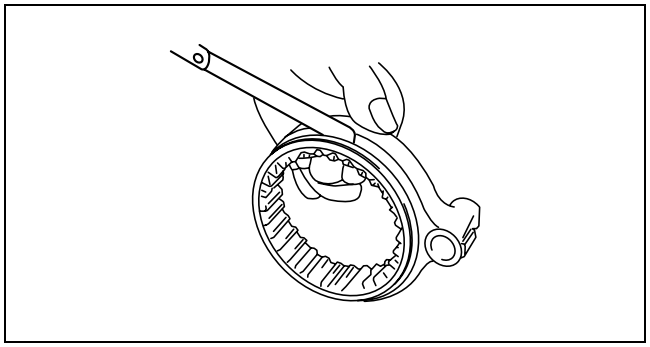
E5U051100000102

Clutch Hub Component

1. Measure the clearance between each shift fork and clutch hub sleeve groove using a feeler gauge.
   - If not within the specification, replace the shift fork and clutch hub sleeve as a set.

Standard clearance between shift fork and clutch hub sleeve groove
0.05—0.40 mm {0.002—0.015 in}

Maximum clearance between shift fork and clutch hub sleeve groove
0.5 mm {0.020 in}



BHJ0511M018

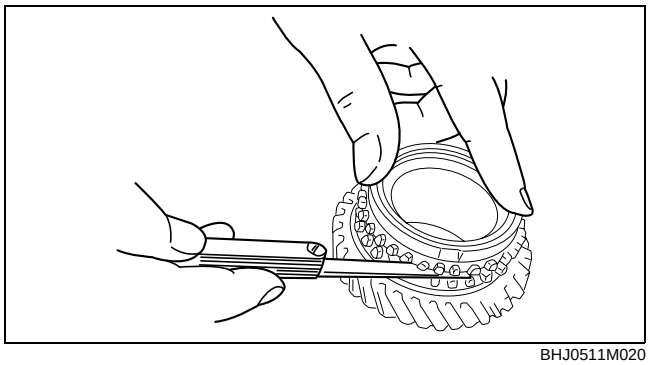
Synchronizer Ring

1. Measure the clearance between the synchronizer ring and flank surface of the gear using a feeler gauge around the entire circumference.
   - If not within the specification, replace the synchronizer ring.

Standard clearance between synchronizer ring and flank surface of gear
1.5 mm {0.059 in}

Maximum clearance between synchronizer ring and flank surface of gear
0.8 mm {0.031 in}

Note
- Set the synchronizer ring squarely in the gear.



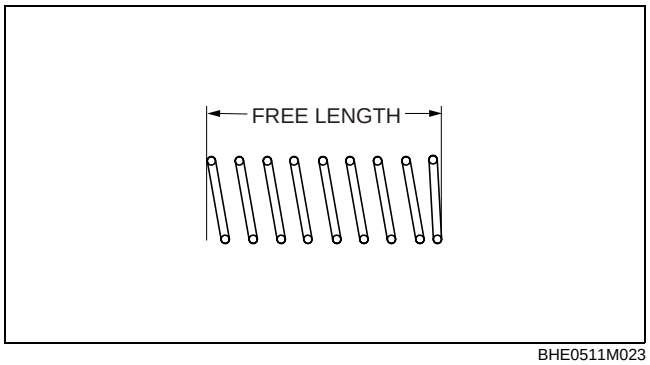
BHJ0511M020

Spring

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

Detent ball spring
Standard length: 23.5 mm {0.925 in}

1st/2nd select return spring
Standard length: 83.5 mm {3.287 in}

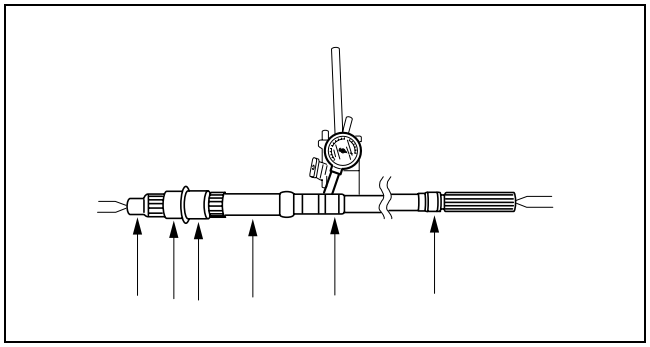


BHE0511M023

Mainshaft

1. Measure the mainshaft runout using a dial gauge.
   - If it exceeds the maximum specification, replace the mainshaft.

Mainshaft maximum runout
0.03 mm {0.0012 in}

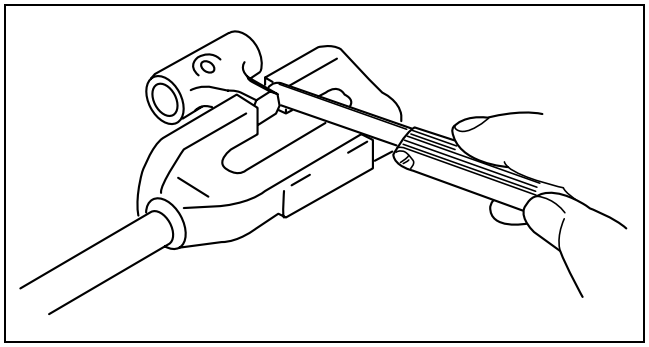


BHJ0511M084

Shift Rod End, Control Lever

1. Measure the clearance between the shift rod end and control lever using a feeler gauge.
   - If not within the specification, replace the shift rod end or control lever as a set.

Standard clearance between shift rod end and control lever
0.5 mm {0.020 in} or less

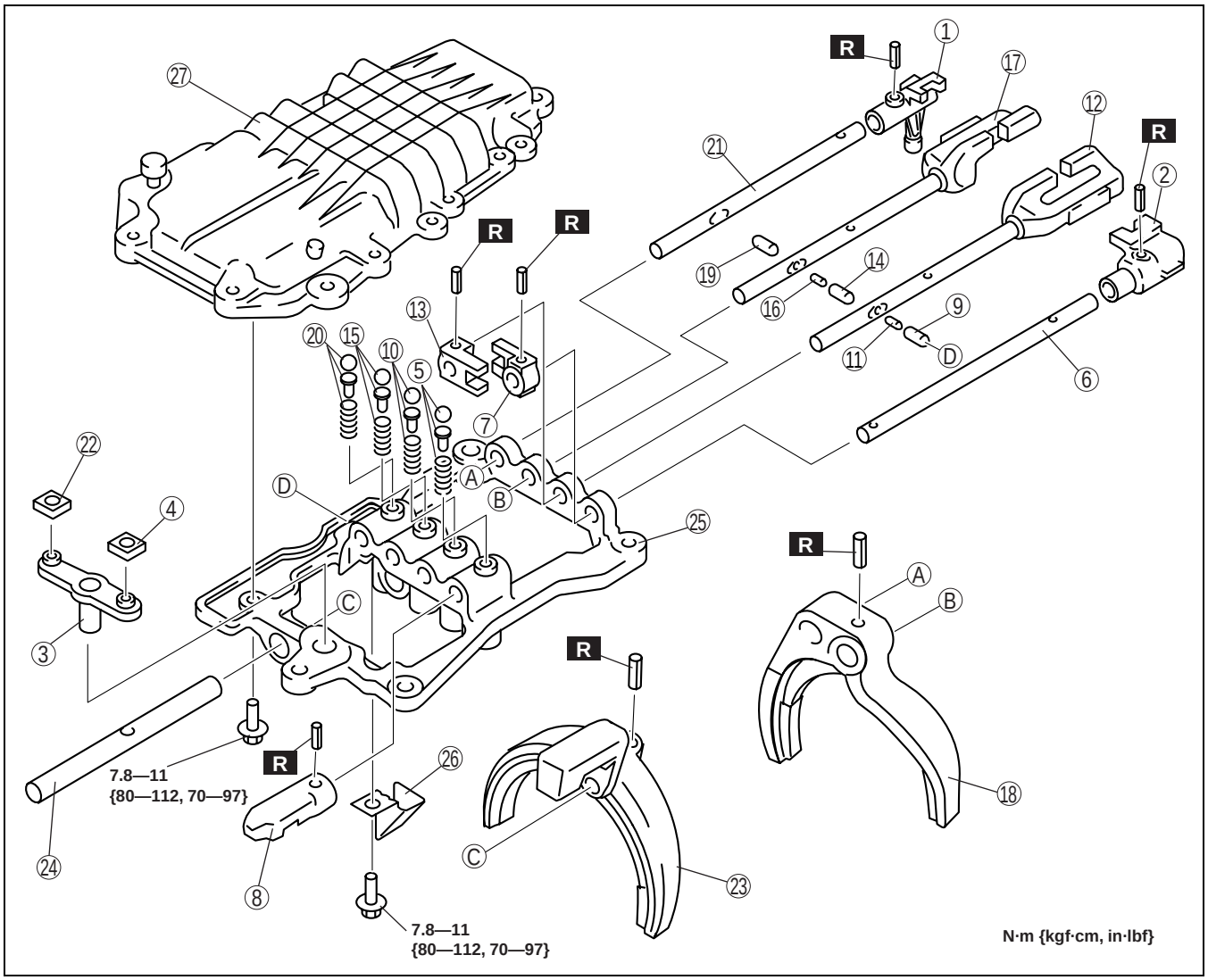


E5U511BM5087

SHIFT COMPONENT ASSEMBLY

E5U051117030107

1. Assemble in the order indicated in the table.



E5U511BM5056

1	Reverse shift rod end
2	5th/6th shift rod end
3	Crank lever
4	Change bush
5	Detent ball, spring seat, spring
6	5th/6th shift rod (See 05–11–21 Shift Rod Assembly Note.)
7	Stopper block

8	Shift gate
9	Interlock pin
10	Detent ball, spring seat, spring
11	Interlock pin
12	3rd/4th shift rod (See 05–11–21 Shift Rod Assembly Note.)
13	Stopper block
14	Interlock pin

15	Detent ball, spring seat, spring
16	Interlock pin
17	1st/2nd shift rod (See 05–11–21 Shift Rod Assembly Note.)
18	1st/2nd shift fork
19	Interlock pin
20	Detent ball, spring seat, spring

21	Reverse shift rod (See 05–11–21 Shift Rod Assembly Note.)
22	Change bush
23	5th/6th shift fork
24	5th/6th shift rod
25	Change frame
26	Baffle plate
27	Top cover

Shift Rod Assembly Note

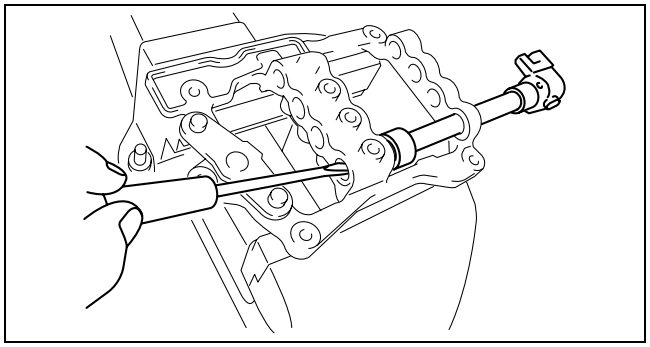
1. Install each shift rod.

Caution

- **Do not forget to insert the interlock pins.**

Note

- Insert the shift rod while pressing the detent ball with a flathead screwdriver as shown in the figure.

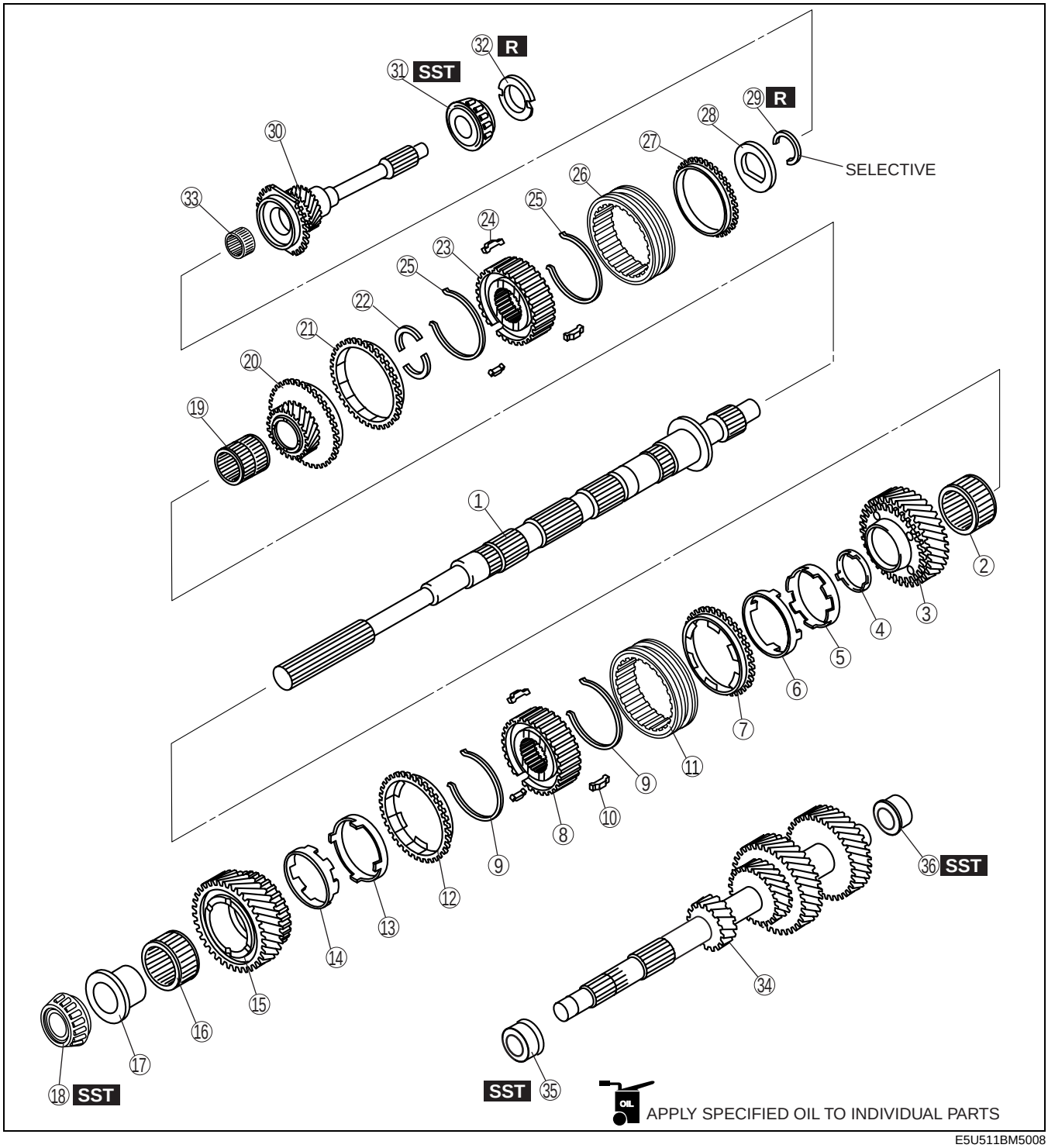


E5U511BM5065

1ST/2ND GEAR COMPONENT, 5TH/6TH GEAR COMPONENT AND COUNTERSHAFT ASSEMBLY

E5U051117040103

1. Assemble in the order indicated in the table.



E5U511BM5008

1	Mainshaft
2	Needle bearing
3	2nd gear
4	Friction damper
5	Inner cone
6	Double cone
7	Synchronizer ring

8	1st/2nd clutch hub (See 05–11–24 1st/2nd Clutch Hub Component Assembly Note.)
9	Synchronizer key spring
10	Synchronizer key
11	Clutch hub sleeve
12	Synchronizer ring
13	Double cone
14	Inner cone

15	1st gear
16	Needle bearing
17	Needle bearing race
18	Mainshaft center bearing (See 05–11–24 1st/2nd Clutch Hub Component Assembly Note.)
19	Needle bearing
20	6th gear
21	Synchronizer ring
22	Thrust washer
23	Clutch hub (See 05–11–25 5th/6th Clutch Hub Component Assembly Note.)
24	Synchronizer key (See 05–11–25 5th/6th Clutch Hub Component Assembly Note.)
25	Synchronizer key spring (See 05–11–25 5th/6th Clutch Hub Component Assembly Note.)
26	Clutch hub sleeve (See 05–11–25 5th/6th Clutch Hub Component Assembly Note.)
27	Synchronizer ring
28	Needle bearing
29	Retaining ring (See 05–11–25 5th/6th Clutch Hub Component Assembly Note.)
30	Maindrive gear
31	Maindrive gear shaft bearing (See 05–11–26 Maindrive Gear Shaft Bearing Assembly Note.)
32	Scoop ring
33	Needle bearing
34	Countershaft
35	Countershaft center bearing race (See 05–11–26 Countershaft Center Bearing Race Assembly Note.)
36	Countershaft front bearing race (See 05–11–27 Countershaft Front Bearing Race Assembly Note.)

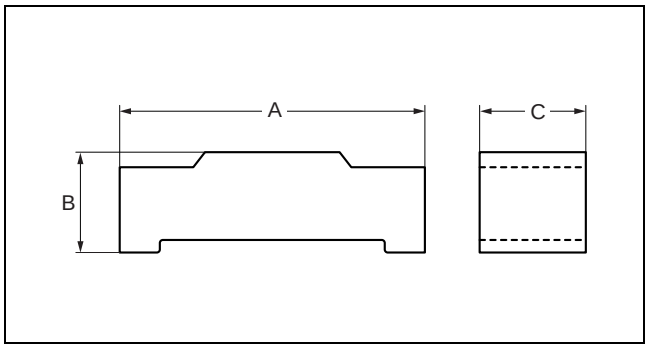
1st/2nd Clutch Hub Component Assembly Note

Caution

- **Be sure to assemble the clutch hub components and synchronizer ring components while aligning the synchronizer ring grooves with the synchronizer keys.**
- **The standard synchronizer key dimensions are as follows:**

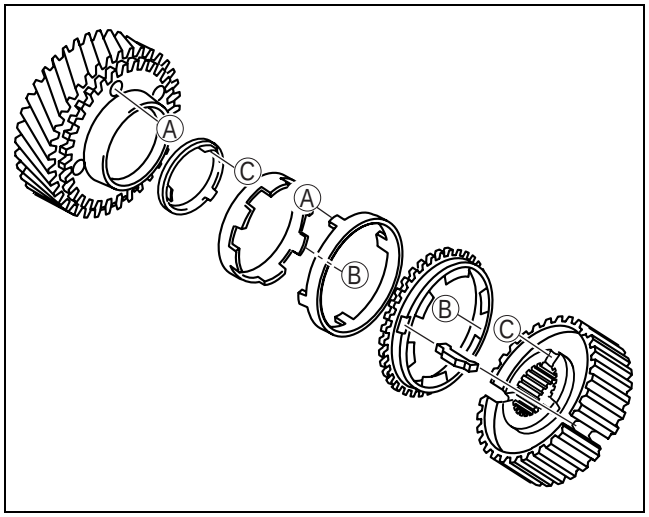
mm {in}

	A	B	C
1st/2nd	17.0 {0.670}	4.7 {0.185}	5.0 {0.197}



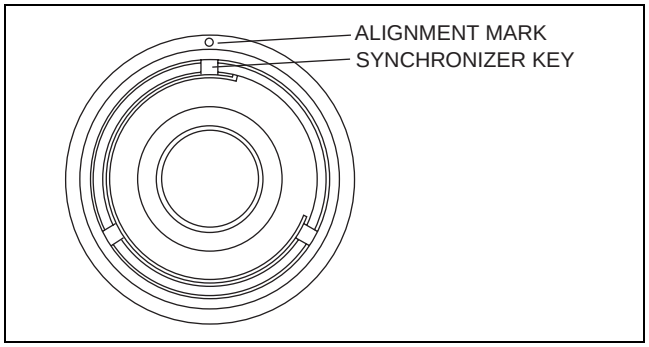
A6E5110M131

- **Be sure to align the synchronizer ring projections with the inner cone notches.**



E5U511BM5057

- **Be sure to assemble the gears and the synchronizer ring components while aligning the double cone projections with the gear holes as shown in the figure.**
- **Align the friction damper projections with the clutch hub grooves. (2nd gear)**

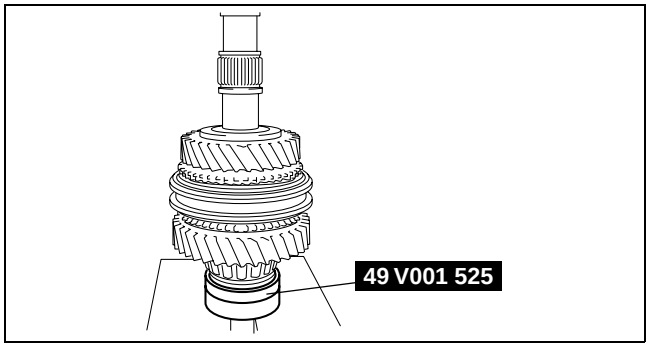


E5U511BM5058

- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**

1. Using a **SST** and press, assemble the needle bearing, 2nd gear, synchronizer ring component (2nd), 1st/2nd clutch hub component, synchronizer ring component (1st), 1st gear, needle bearing, needle bearing race and mainshaft center bearing to the mainshaft at the same time.

Caution
- **When using a press, be careful not to damage the parts.**

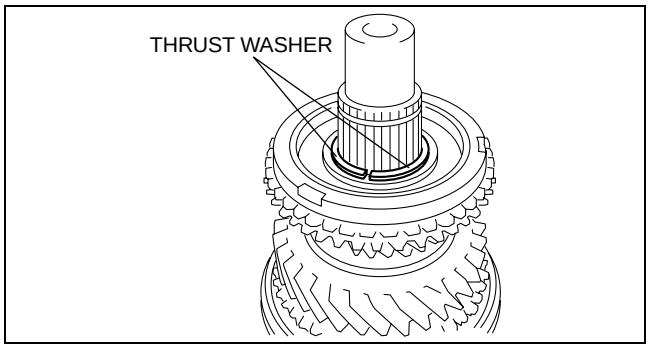


E5U511BM5027

5th/6th Clutch Hub Component Assembly Note

1. Place the thrust washers onto the 6th gear.

Note
- Apply petroleum jelly making sure the thrust washer does not deviate.



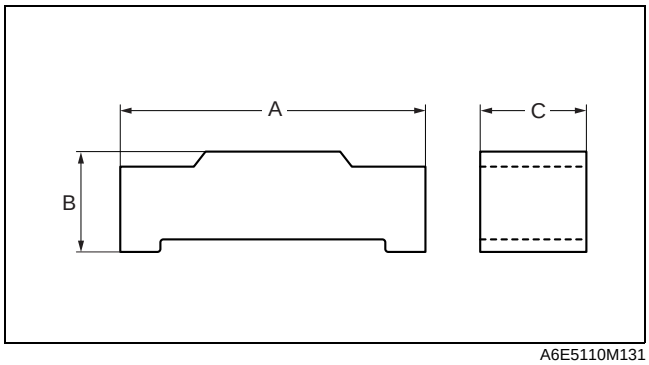
E5U511BM5028

2. Assemble the 5th/6th clutch hub component.

Caution
- **The standard synchronizer key dimensions are as follows:**

mm {in}

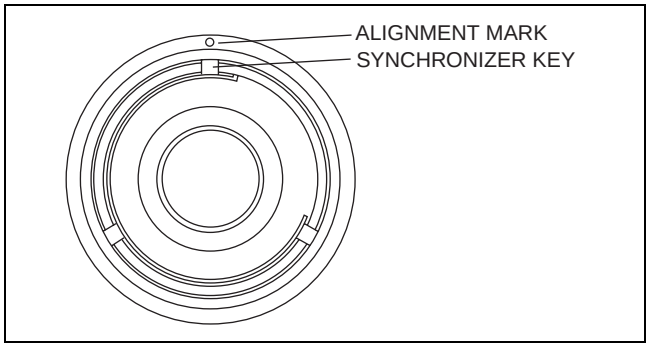
	A	B	C
5th/6th	17.0 {0.670}	4.25 {0.167}	5.0 {0.197}



A6E5110M131

- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**

3. Install the 5th/6th clutch hub component to the mainshaft.
4. Install the retaining ring.



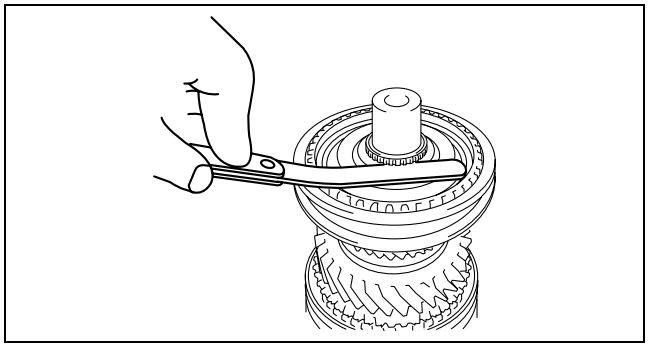
E5U511BM5058

5. Measure the clearance between retaining ring and groove of the mainshaft.
   - If not within the specification, adjust by choosing the proper retaining ring.

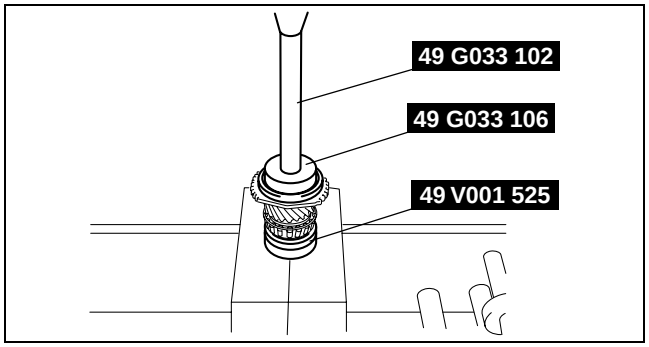
5th/6th clutch hub end play
0—0.05 mm {0—0.0019 in}

5th/6th clutch hub retaining ring

Thickness (mm {in})
1.50 {0.0591}
1.55 {0.0610}
1.60 {0.0630}
1.65 {0.0650}
1.70 {0.0669}
1.75 {0.0689}
1.80 {0.0709}
1.85 {0.0728}
1.90 {0.0748}
1.95 {0.0768}

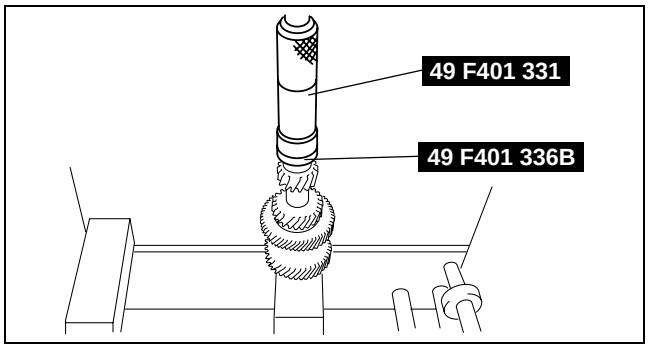

E5U511BM5029

Maindrive Gear Shaft Bearing Assembly Note
1. Assemble the maindrive gear shaft bearing using the **SSTs**.



E5U511BM5066

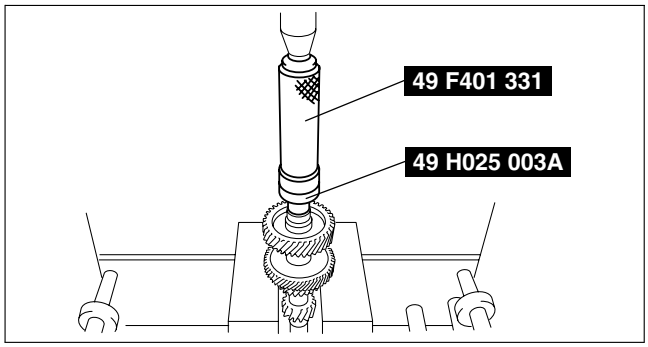
Countershaft Center Bearing Race Assembly Note
1. Assemble the countershaft center bearing race using the **SSTs**.



E5U511BM5030

Countershaft Front Bearing Race Assembly Note

1. Assemble the countershaft front bearing race using the **SSTs**.

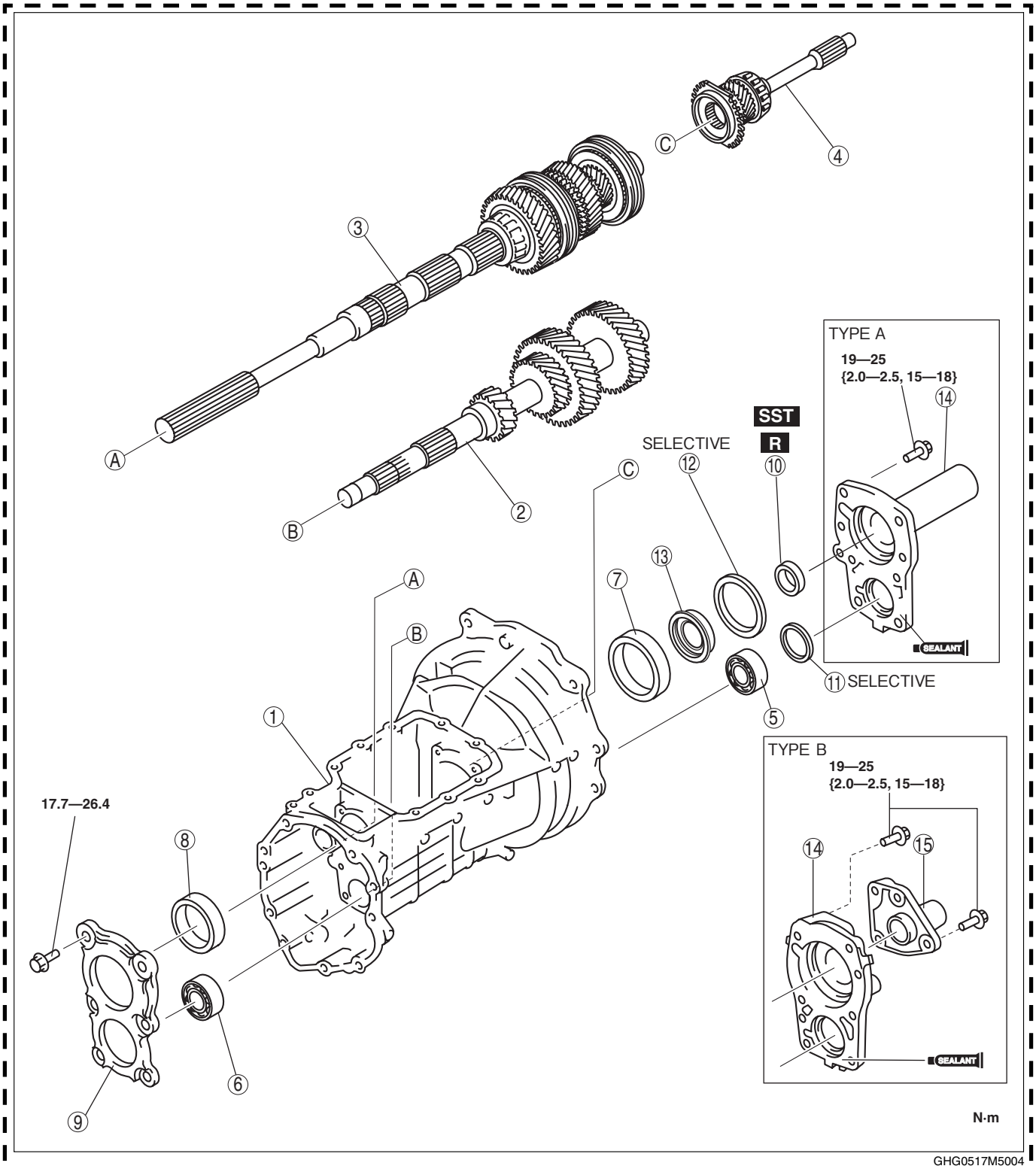


E5U511BM5031

MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE ASSEMBLY

E5U051117040106

1. Assemble in the order indicated in the table.



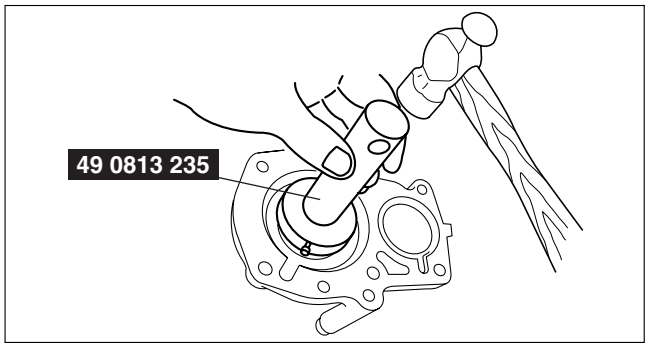
GHG0517M5004

1	Transmission case
2	Countershaft component (See 05–11–29 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)
3	Mainshaft component (See 05–11–29 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)
4	Maindrive gear (See 05–11–29 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)

5	Countershaft front bearing
6	Countershaft rear bearing
7	Maindrive gear bearing race
8	Mainshaft bearing race
9	Bearing cover
10	Front oil seal (See 05–11–29 Front Oil Seal Assembly Note.)
11	Bearing shim
12	Bearing shim
13	Oil baffle
14	Front cover (See 05–11–29 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)
15	Front cover No.2

Front Oil Seal Assembly Note

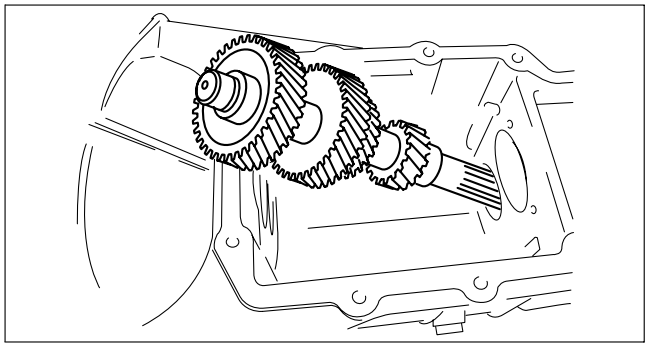
1. Install the oil seal to the front cover using the **SST**.



E5U511BM5043

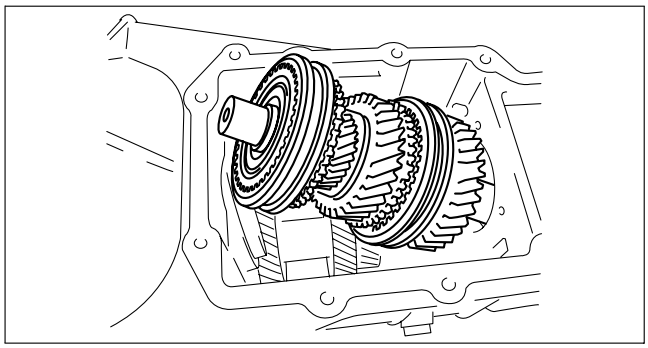
Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note

1. Install the countershaft component.



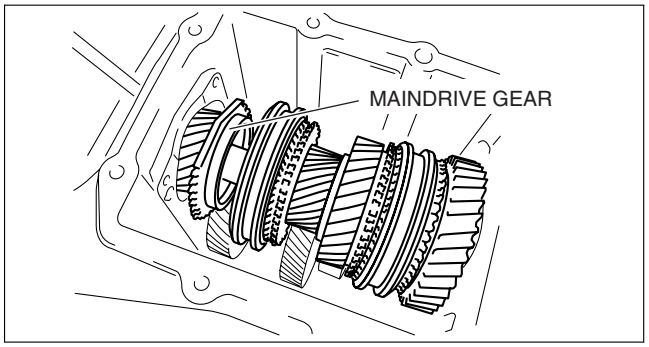
E5U511BM5073

2. Install the mainshaft component.



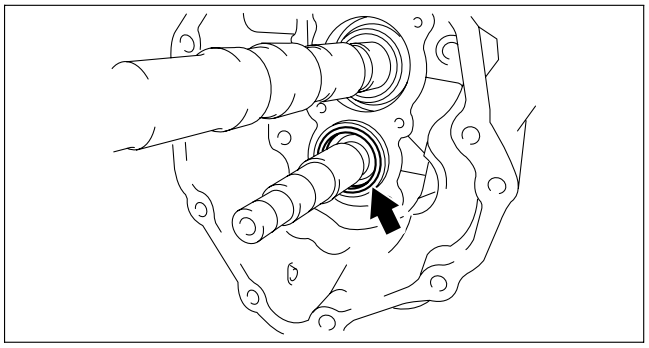
E5U511BM5044

3. Insert the maindrive gear component from the front cover hole and assemble to the mainshaft component.

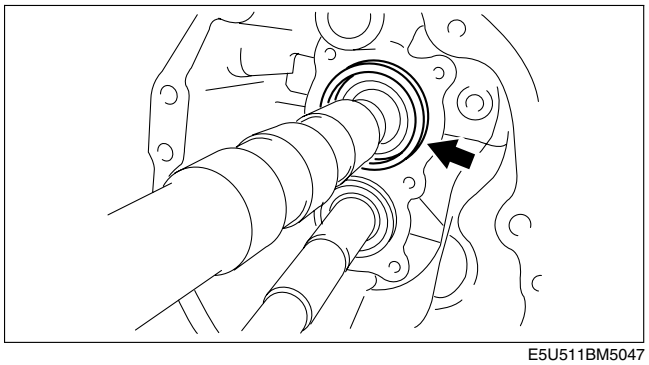


E5U511BM5045

4. Install the countershaft front and center bearing.

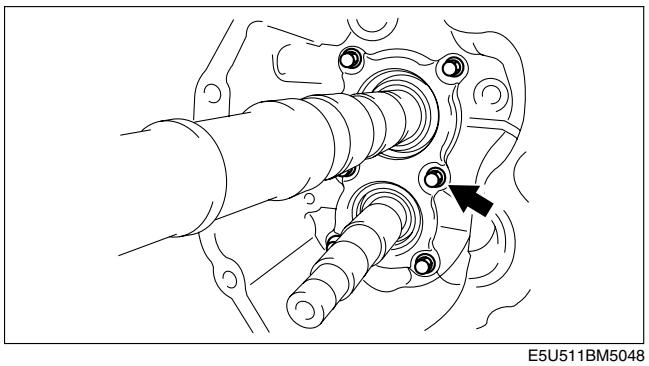

E5U511BM5046

5. Install the maindrive gear bearing race and mainshaft center bearing race.


E5U511BM5047

6. Install the bearing cover with the arrow pointing to the top of the case.

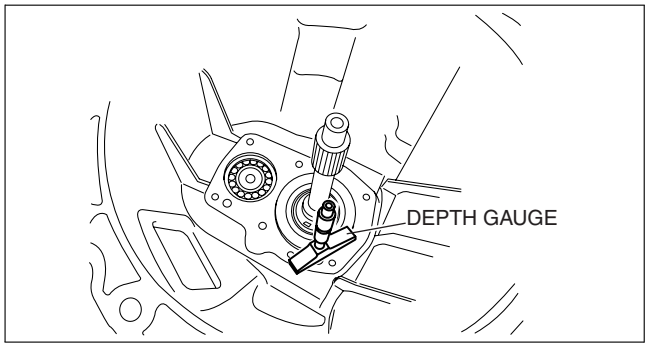
   Tightening torque:
   17.7—26.4 N·m {1.81—2.69 kgf·m, 13.1—19.4 ft·lbf}


E5U511BM5048

7. Select the mainshaft component and countershaft component bearing shims according to the following procedure.
   (1) Set the clutch housing side upward and level the transmission case.

Caution
- **Securely assemble the mainshaft, maindrive gear component, and countershaft component so that there is no looseness or play.**

(2) Using a depth gauge, measure the maindrive gear bearing outer race height A.



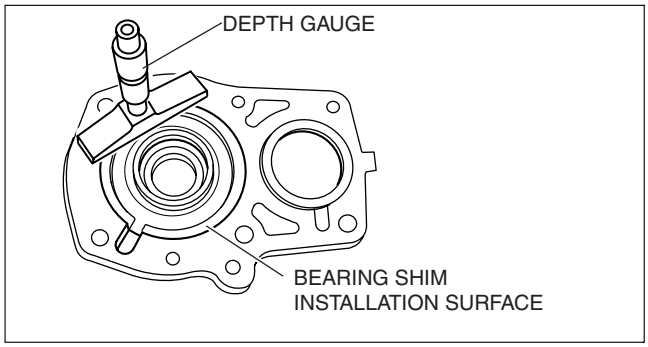
E5U511BM5049

(3) Using a depth gage, measure the maindrive gear bearing retainer depth B.
(4) Calculate and select the correct maindrive gear bearing shim thickness.

Formula: C = B - A

C :Dimension between the maindrive gear bearing and bore in the front cover
B: Depth of the maindrive gear bearing bore in the front cover
A: Maindrive gear bearing height

- Refer to the maindrive gear bearing shim selective chart.



E5U511BM5050

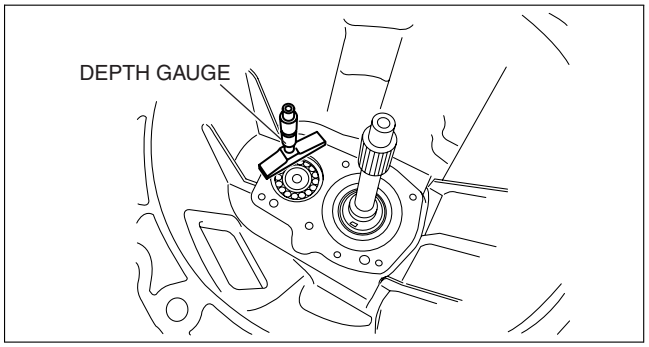
Maindrive gear bearing shim selective chart

Dimension C (mm {in})	Shim thickness (mm {in})
2.75—2.85 {0.1083—0.1122}	2.7 {0.106}
2.85—2.95 {0.1122—0.1161}	2.8 {0.110}
2.95—3.05 {0.1161—0.1201}	2.9 {0.114}
3.05—3.15 {0.1201—0.1240}	3.0 {0.118}
3.15—3.25 {0.1240—0.1280}	3.1 {0.122}
3.25—3.35 {0.1280—0.1319}	3.2 {0.126}
3.35—3.45 {0.1319—0.1358}	3.3 {0.130}
3.45—3.55 {0.1358—0.1398}	3.4 {0.134}
3.55—3.65 {0.1398—0.1437}	3.5 {0.138}
3.65—3.75 {0.1437—0.1476}	3.6 {0.142}
3.75—3.85 {0.1476—0.1516}	3.7 {0.147}
3.85—3.95 {0.1516—0.1555}	3.8 {0.150}
3.95—4.05 {0.1555—0.1594}	3.9 {0.154}
4.05—4.15 {0.1594—0.1634}	4.0 {0.157}
4.15—4.25 {0.1634—0.1673}	4.1 {0.161}

Maindrive gear shaft total end play
0.05—0.15 mm {0.0020—0.0059 in}

(5) Using a depth gauge, measure the countershaft front bearing depth D.

Note
- The countershaft bearing is located below the contact surface of the case and front cover.



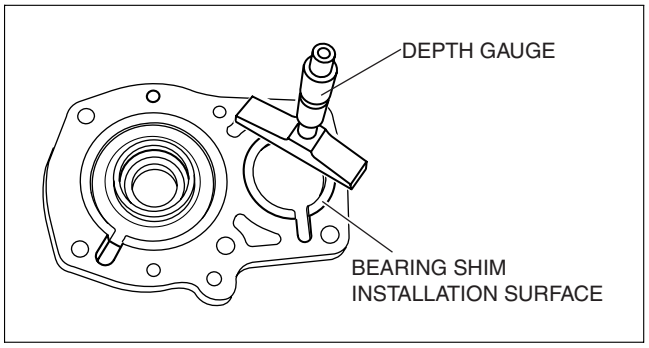
E5U511BM5052

(6) Using a depth gauge, measure the countershaft front bearing retainer depth E.
(7) Calculate and select the correct countershaft front bearing shim thickness.

Formula: F = E + D

F :Dimension between the countershaft front bearing and bore in the front cover
E: Depth of the countershaft front bearing bore in the front cover
D: Countershaft front bearing depth

- Refer to the countershaft front bearing shim selective chart.



E5U511BM5053

Countershaft front bearing shim selective chart

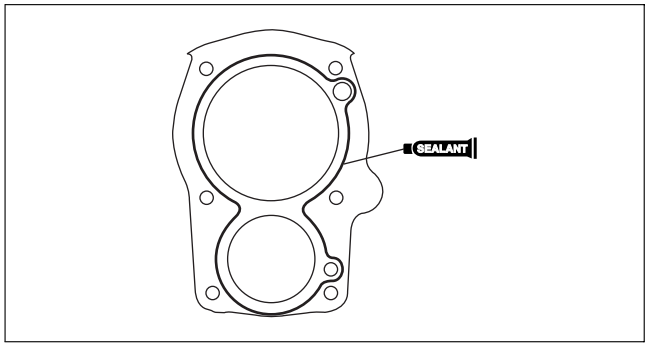
Dimension F (mm {in})	Shim thickness (mm {in})
2.45—2.55 {0.0965—0.1004}	2.3 {0.091}
2.55—2.65 {0.1004—0.1043}	2.4 {0.094}
2.65—2.75 {0.1043—0.1083}	2.5 {0.098}
2.75—2.85 {0.1083—0.1122}	2.6 {0.102}
2.85—2.95 {0.1122—0.1161}	2.7 {0.106}
2.95—3.05 {0.1161—0.1201}	2.8 {0.110}
3.05—3.15 {0.1201—0.1240}	2.9 {0.114}
3.15—3.25 {0.1240—0.1280}	3.0 {0.118}
3.25—3.35 {0.1280—0.1319}	3.1 {0.122}

Countershaft total end play
0.15—0.25 mm {0.0059—0.0098 in}

8. Position the maindrive gear bearing shim, oil baffle, and the countershaft bearing shim onto the front cover.

Note
- If necessary, apply a light coat of petroleum jelly to the shims and oil baffle.

9. Apply sealant to the contact surfaces of the transmission case and front cover as shown in the figure.

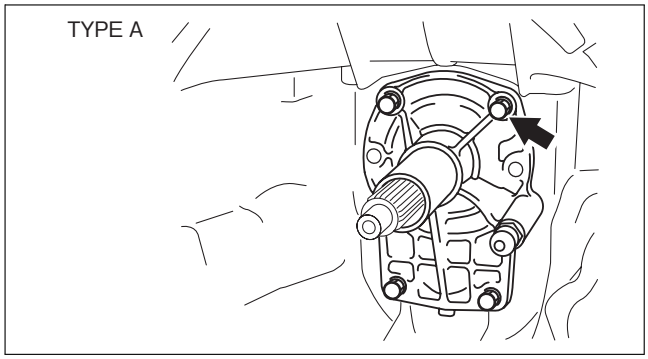


E5U511BM5078

10. Install the front cover to the transmission case.

Tightening torque:
19—25 N·m {2.0—2.5 kgf·m, 15—18 ft·lbf}

Note
- To prevent damage to the oil seal lip during assembly, tape maindrive gear shaft splines.



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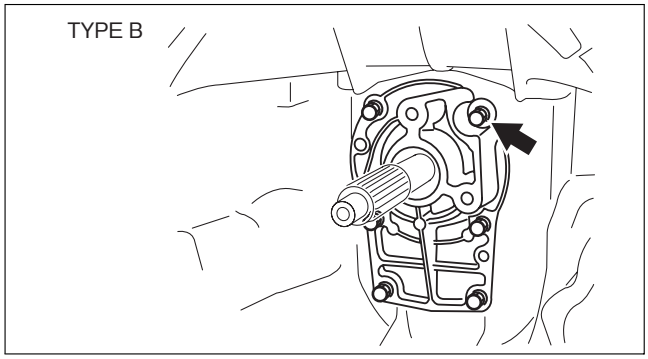
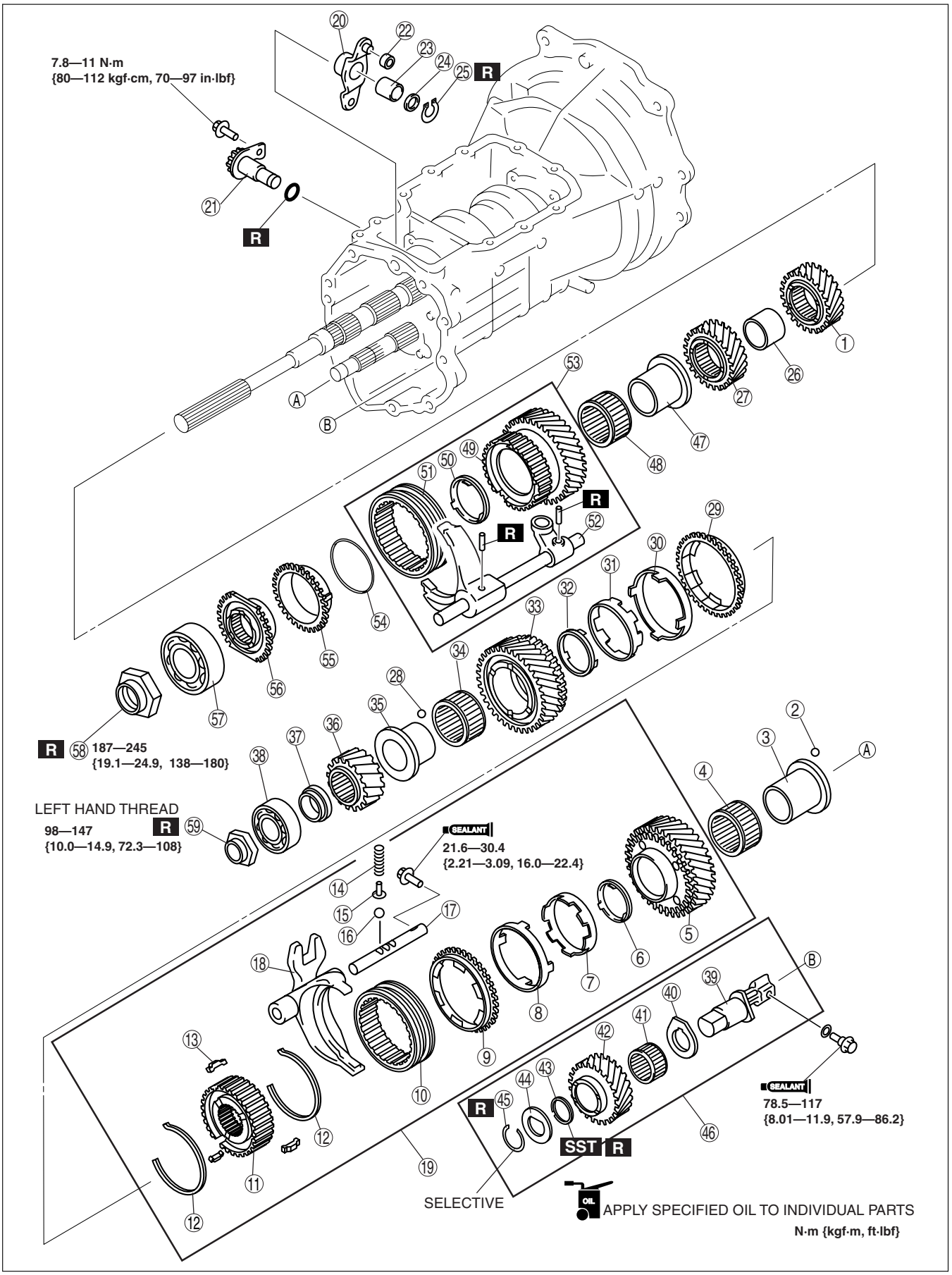


GHG0517M5006

REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT ASSEMBLY

E5U051117040105

1. Assemble in the order indicated in the table.

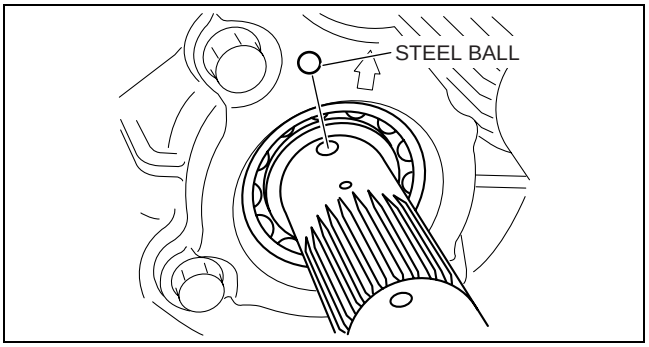


E5U511BM5005

1	3rd gear
2	Steel ball
3	Needle bearing inner race (See 05–11–35 3rd Gear Bearing Inner Race Assembly Note.)
4	Needle bearing
5	3rd counter gear
6	Friction damper
7	Inner cone
8	Double cone
9	Synchronizer ring
10	Clutch hub sleeve
11	3rd/4th clutch hub
12	Synchronizer key spring
13	Synchronizer key
14	Detent spring
15	Spring seat
16	Detent ball
17	3rd/4th shift rod
18	3rd/4th shift fork
19	3rd/4th clutch hub component (See 05–11–36 3rd Counter Gear, 3rd/4th Clutch Hub Component and 3rd/4th Shift Fork Assembly Note.)
20	Counter lever
21	Counter lever shaft component (See 05–11–37 Counter Lever Shaft Assembly Note.)
22	Bush
23	Needle bearing
24	Spacer
25	Retaining ring
26	Spacer
27	4th gear
28	Steel ball
29	Synchronizer ring
30	Double cone
31	Inner cone
32	Friction damper
33	4th counter gear
34	Needle bearing
35	Needle bearing race
36	Reverse counter gear
37	Collar
38	Countershaft rear bearing
39	Reverse idler gear shaft
40	Thrust washer
41	Needle bearing
42	Reverse idler gear
43	Friction damper
44	Thrust washer
45	Retaining ring
46	Reverse idler gear component (See 05–11–38 Reverse Idler Gear Component Assembly Note.)
47	Needle bearing race
48	Needle bearing
49	Reverse gear
50	Friction damper
51	Clutch hub sleeve
52	Reverse shift fork
53	Reverse gear, shift fork component (See 05–11–39 Reverse Gear and Reverse Clutch Hub Component Assembly Note.)
54	Synchronizer key spring
55	Synchronizer ring
56	Reverse synchronizer cone
57	Mainshaft rear bearing (See 05–11–40 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)
58	Locknut (See 05–11–40 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)
59	Locknut (See 05–11–40 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)

3rd Gear Bearing Inner Race Assembly Note

1. Install the steel ball to the countershaft.
2. Align the ball groove position of the 3rd gear bearing inner race and assemble it to the countershaft.



E5U511BM5032

3rd Counter Gear, 3rd/4th Clutch Hub Component and 3rd/4th Shift Fork Assembly Note

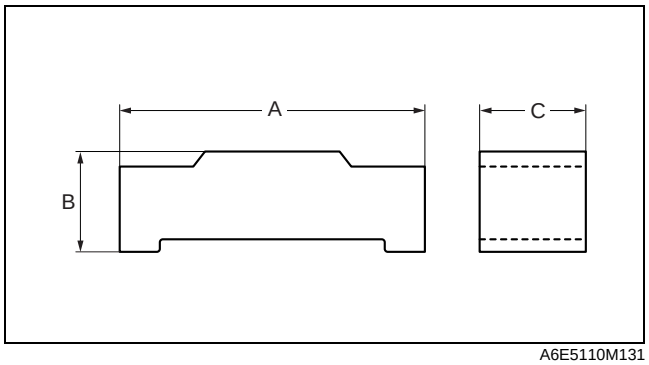
1. Assemble the 3rd drive gear and 3rd/4th clutch hub component.

Caution

- **Be sure to assemble the clutch hub components and synchronizer ring components while aligning the synchronizer ring grooves with the synchronizer keys.**
- **The standard synchronizer key dimensions are as follows:**

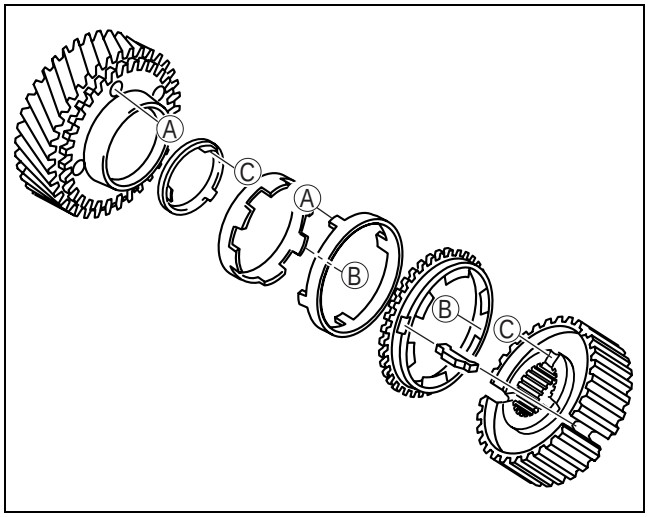
mm {in}

	A	B	C
5th/6th	17.0 {0.670}	4.25 {0.167}	5.0 {0.197}



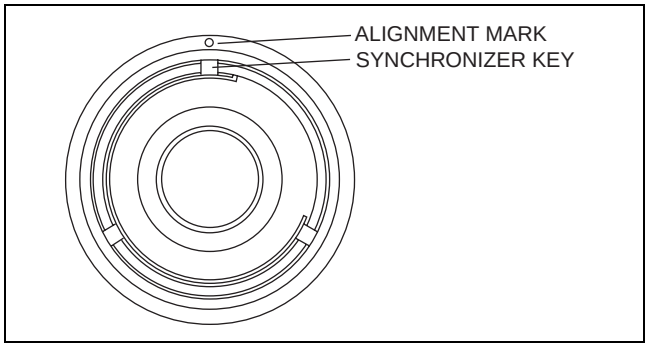
A6E5110M131

- **Be sure to align the synchronizer ring projections with the inner cone notches.**
- **Be sure to assemble the gears and the synchronizer ring components while aligning the double cone projections with the gear holes as shown in the figure.**
- **Align the friction damper projections with the clutch hub grooves.**



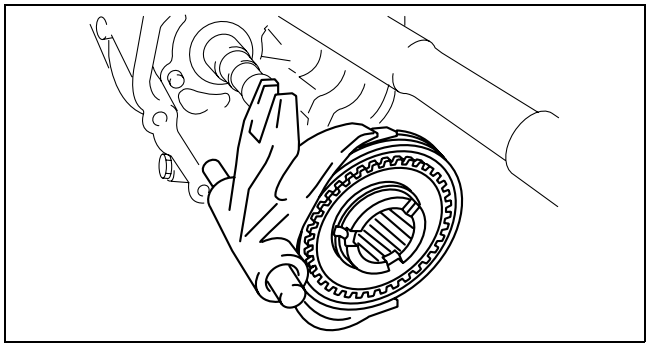
E5U511BM5057

- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**



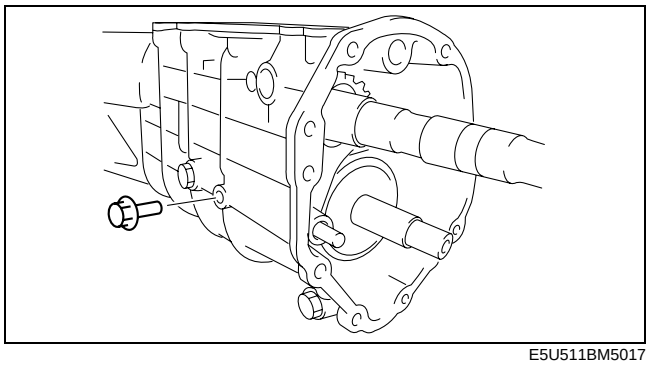
E5U511BM5058

2. Assemble the 3rd counter gear component, 3rd/4th clutch hub component, and 3rd/4th shift fork component as a single unit.


E5U511BM5018

3. Install the 3rd/4th shift rod retaining bolt.

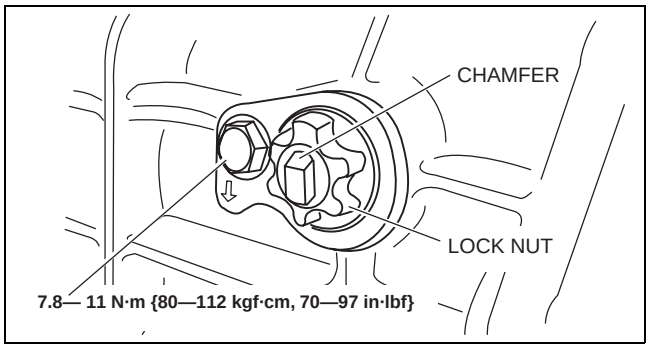
Tightening torque:
21.6—30.4 N·m {2.21—3.09 kgf·m, 16.0—22.4 ft·lbf}


E5U511BM5017

Counter Lever Shaft Assembly Note

1. Install the counter lever shaft component.

Caution
- **If the counter lever shaft has been replaced or the locknut is loose, assemble the counter lever shaft with the chamfer side of the shaft pointed straight upward.**
- **Apply sealant to the threads of the locknut.**
- **If there is an abnormality in the 3rd/4th shift stroke after assembling, loosen the locknut and readjust.**



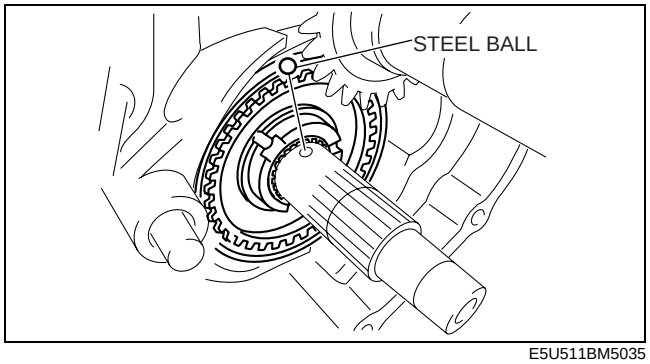
E5U511BM5072

Locknut tightening torque:
37.3—51.9 N·m {3.81—5.29 kgf·m, 27.6—38.2 ft·lbf}

4th Counter Gear, 4th Synchronizer ring, 4th Bearing Inner Race Assembly Note

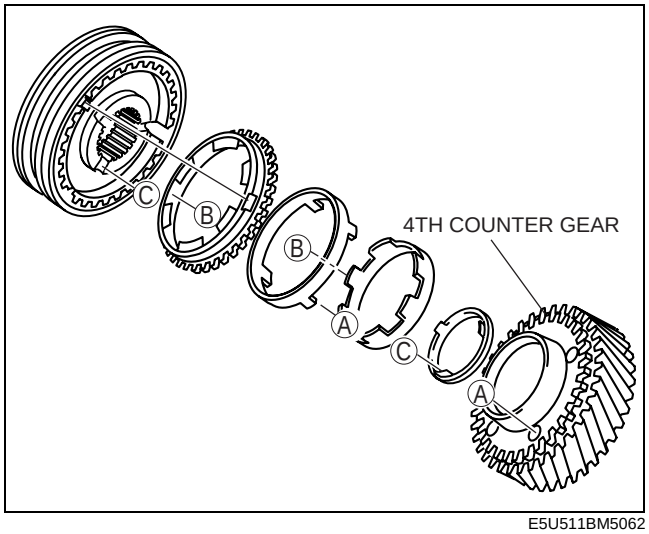
1. Install the steel ball to the countershaft.
2. Assemble the 4th counter gear component to the 3rd/4th clutch hub.

Caution
- **Be sure to assemble the clutch hub components and synchronizer ring components while aligning the synchronizer ring grooves with the synchronizer keys.**
- **Be sure to align the synchronizer ring projections with the inner cone notches.**
- **Be sure to assemble the gears and the synchronizer ring components while aligning the double cone projections with the gear holes as shown in the figure.**
- **Align the friction damper projections with the clutch hub grooves.**



E5U511BM5035

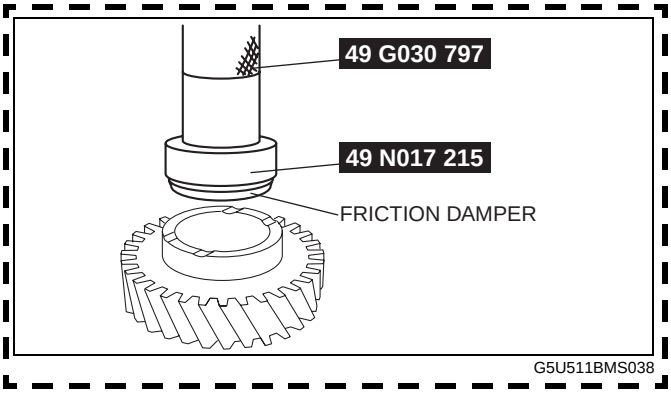
3. Align the ball groove position of the 4th counter gear bearing inner race and assemble it to the countershaft.



E5U511BM5062

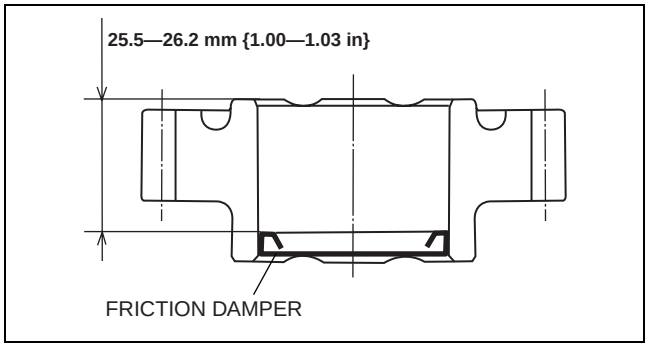
Reverse Idler Gear Component Assembly Note

1. Using the **SST**, install the friction damper to the reverse idler gear.
   - Verify the depth of the friction damper installation position.



G5U511BMS038

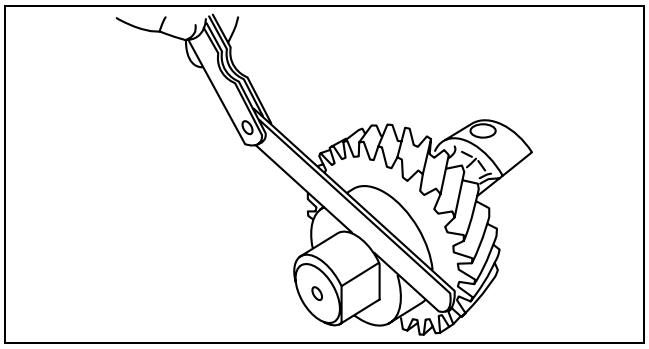
2. Assemble the reverse idler gear component.



E5U511BM5088

3. Measure the clearance between the retaining ring and thrust washer.
   - If not within the specification, adjust by choosing the proper retaining ring.

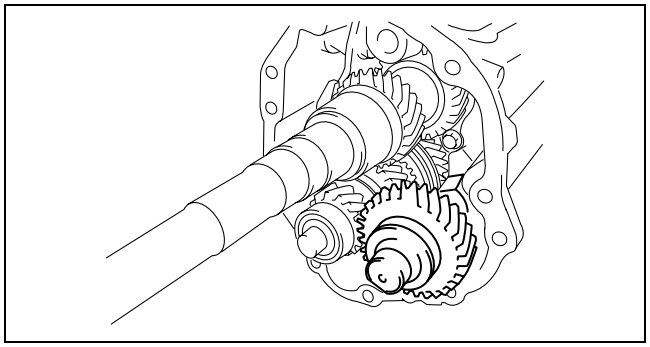
   Reverse idler gear end play
   0.1—0.2 mm {0.0040—0.0078 in}


E5U511BM5039

Reverse idler gear retaining ring

Thickness (mm {in})
1.5 {0.059}
1.6 {0.063}
1.7 {0.067}
1.8 {0.071}
1.9{0.075}

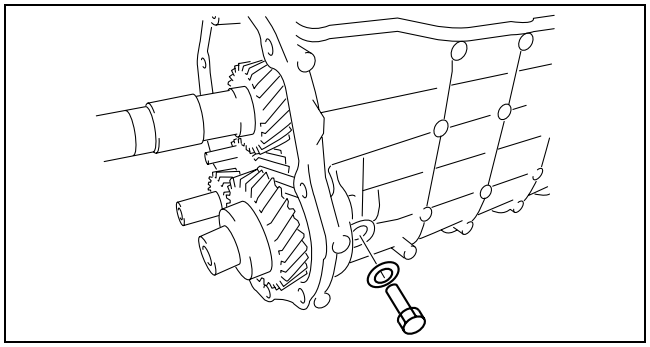
4. Install the reverse idler gear component to the transmission case.



E5U511BM5070

5. Install the reverse idler gear shaft retaining bolt.

   Tightening torque
   78.5—117 N·m {8.01—11.9 kgf·m, 57.9—86.2 ft·lbf}

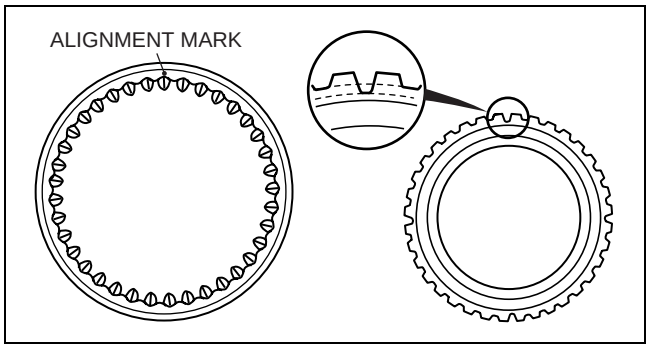


E5U511BM5015

Reverse Gear and Reverse Clutch Hub Component Assembly Note

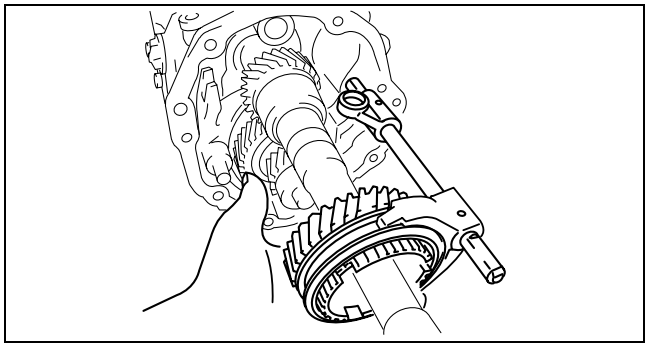
1. Assemble the reverse gear and clutch hub sleeve.

   Caution
   - **Align the clutch hub sleeve alignment mark with the deepened valley of the reverse gear spline, and assemble them so that the synchronizer teeth are facing outward**



E5U511BM5061

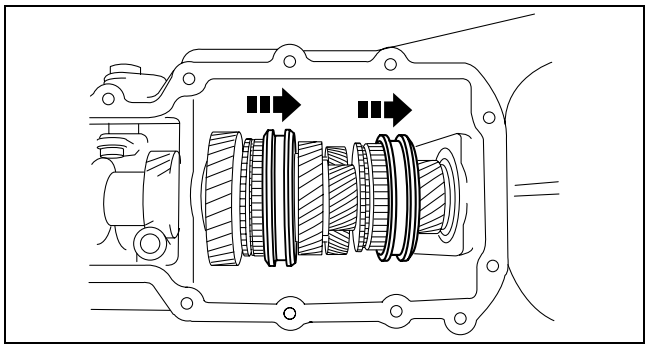
2. Assemble the reverse gear, clutch hub sleeve and shift fork as a single unit.



E5U511BM5040

Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note

1. Slide the 5th/6th and 1st/2nd clutch hub sleeves to lock the transmission into 5th and 2nd gears.
2. Insert the mainshaft rear bearing into the mainshaft and install the locknut.

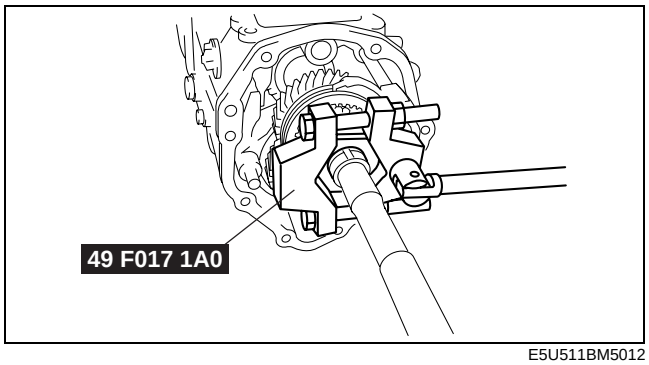


E5U511BM5011

3. Attach the SST to the locknut and tighten the nut to the specified torque.

Caution
- **Attach the SST with the locknut seated in the bearing.**

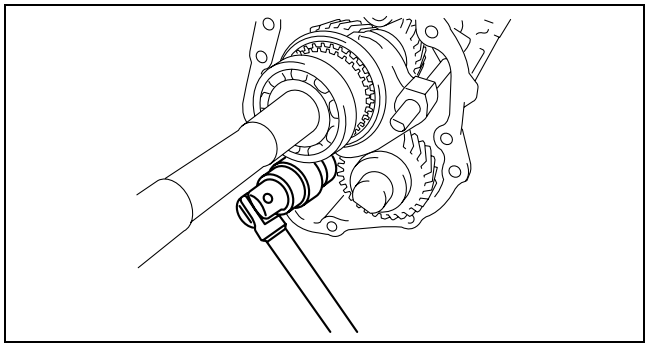
Tightening torque:
187—245 N·m {19.1—24.9 kgf·m, 138—180 ft·lbf}



E5U511BM5012

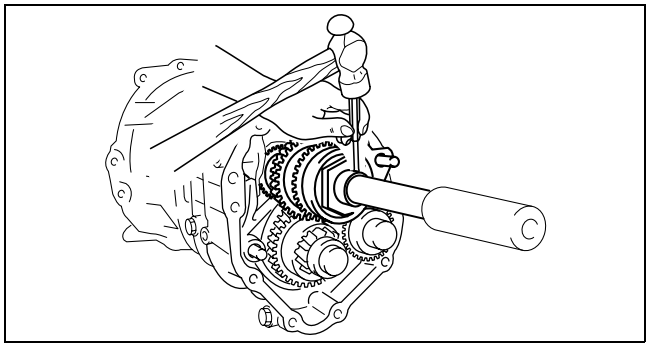
4. Tighten the countershaft locknut in the counterclockwise direction.

Tightening torque:
98—147 N·m {10.0—14.9 kgf·m, 72.3—108 ft·lbf}



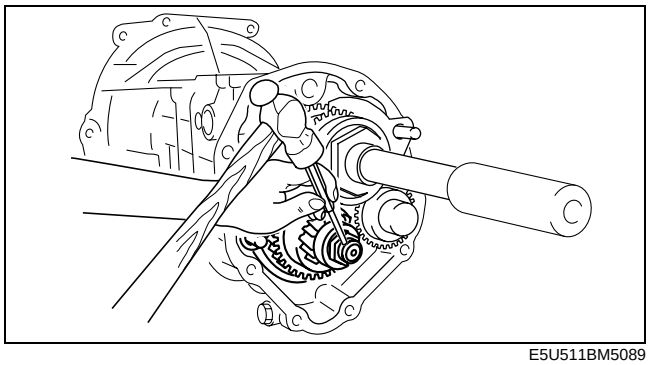
E5U511BM5013

5. Using the pin punch, stake the mainshaft rear bearing locknut.



E5U511BM5042

6. Using the pin punch, stake the countershaft rear bearing locknut.

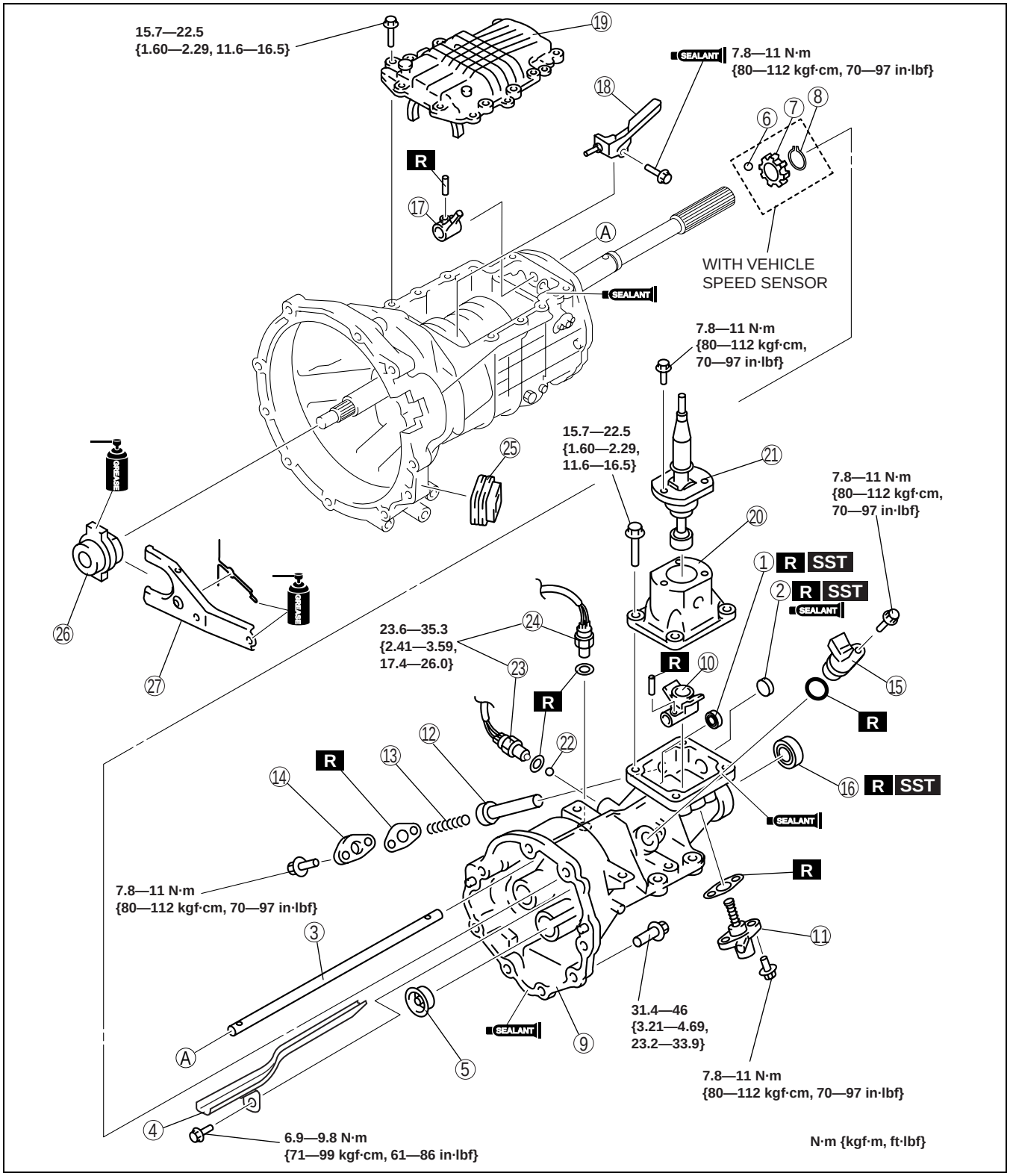


E5U511BM5089

TOP COVER COMPONENT AND EXTENSION HOUSING ASSEMBLY

E5U051117011103

1. Assemble in the order indicated in the table.



E5U511BM5004

1	Oil seal (control rod) (See 05–11–43 Oil Seal (control rod) Assembly Note.)
2	Sealing cap (See 05–11–44 Sealing Cap Assembly Note.)
3	Control rod

4	Oil passage
5	Funnel
6	Steel ball
7	Sensor rotor
8	Retaining ring

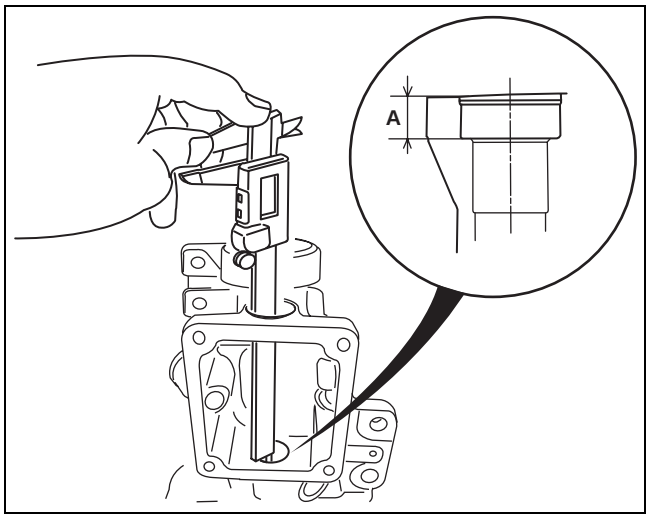
9	Extension housing (See 05–11–45 Extension Housing Assembly Note.)
10	Control rod end
11	Select spindle component
12	Select lock spindle
13	Select lock spindle spring
14	Spring cap
15	Vehicle speed sensor, hole cover
16	Oil seal (extension housing) (See 05–11–44 Oil Seal (Extension Housing) Assembly Note.)
17	Control lever
18	Oil passage
19	Top cover, shift component (See 05–11–45 Top Cover Assembly Note.)
20	Control case (See 05–11–45 Control Case Assembly Note.)
21	Change lever component
22	Steel ball
23	Neutral switch
24	Back-up light switch
25	Dust boot
26	Release collar (See 05–11–45 Release Collar, Release Fork Assembly Note.)
27	Release fork (See 05–11–45 Release Collar, Release Fork Assembly Note.)

Oil Seal (control rod) Assembly Note

1. Measure the depth A of the oil seal installation hole as shown in the figure.
2. Calculate the oil seal installation depth B.

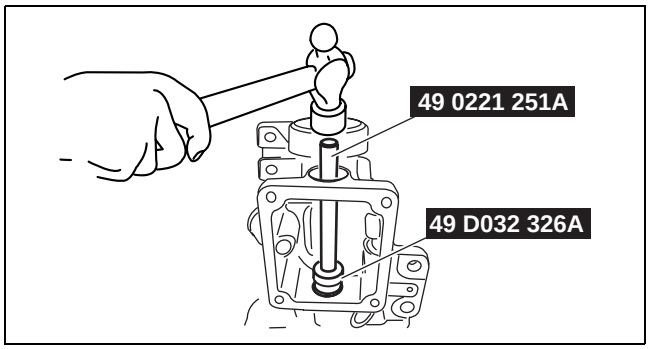
   Formula: B = A - (6.5—7.5 mm {0.158—0.295 in})

   B: Depth of the oil seal installation position
   A: Depth of the oil seal installation hole



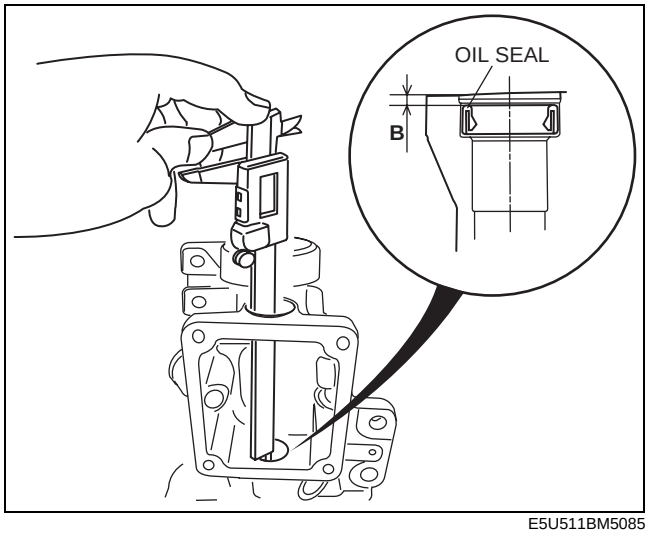
E5U511BM5084

3. Install the oil seal using the **SST** through the sealing cap hole as shown in the figure.



E5U511BM5083

- Verify that the depth B is within the calculated value in step 2.



E5U511BM5085

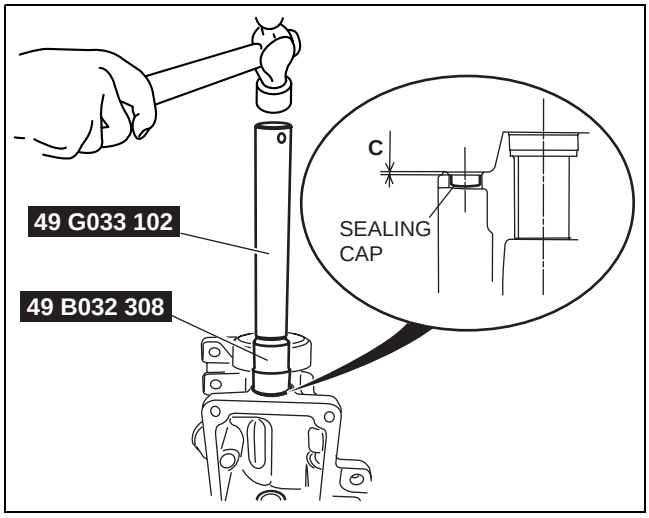
Sealing Cap Assembly Note

1. Install the sealing cap using the **SST**.

Caution

- **Apply silicone sealant to the sealing cap.**

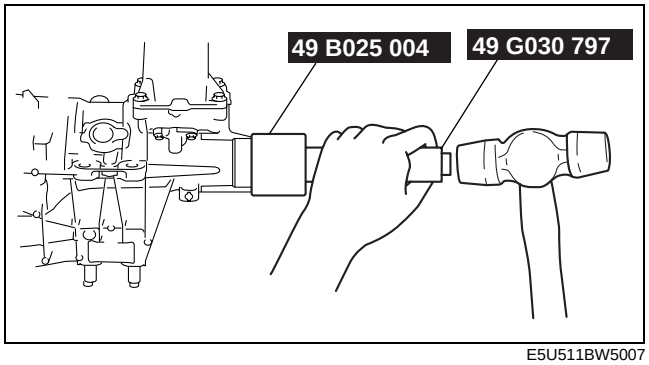
Installation depth C:
2.0—4.0 mm {0.079—0.157 in}



E5U511BM5086

Oil Seal (Extension Housing) Assembly Note

1. Apply specified oil to the lip of a new oil seal.
2. Install the oil seal evenly and gradually using the **SST** and a hammer.

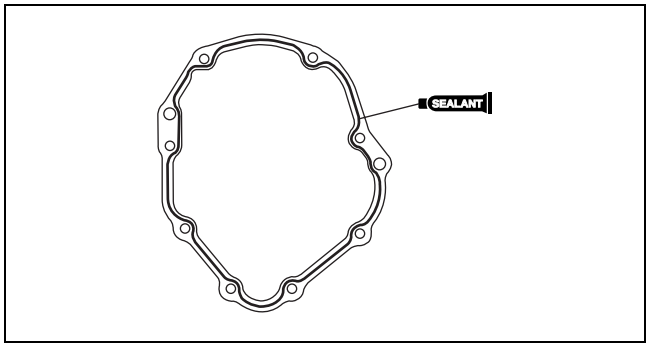


E5U511BW5007

Extension Housing Assembly Note

1. Apply sealant to the contact surfaces of the extension housing and transmission case as shown in the figure.
2. Install the extension housing to the transmission case.

Tightening torque:
31.4—46 N·m {3.21—4.69 kgf·m, 23.2—33.9 ft·lbf}

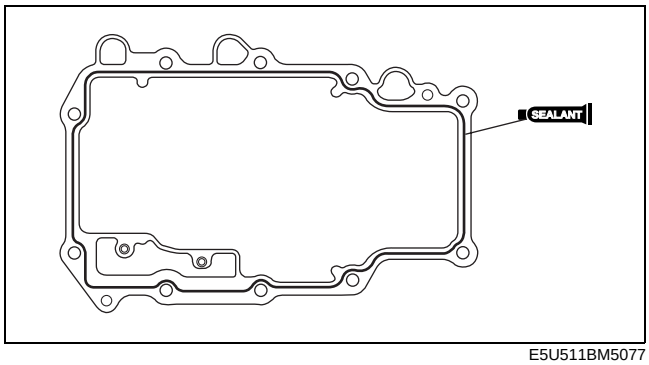


E5U511BM5075

Top Cover Assembly Note

1. Apply sealant to the contact surfaces of the transmission case and top cover as shown in the figure.
2. Install the top cover component to the transmission case.

Tightening torque:
15.7—22.5 N·m {1.60—2.29 kgf·m, 11.6—16.5 ft·lbf}

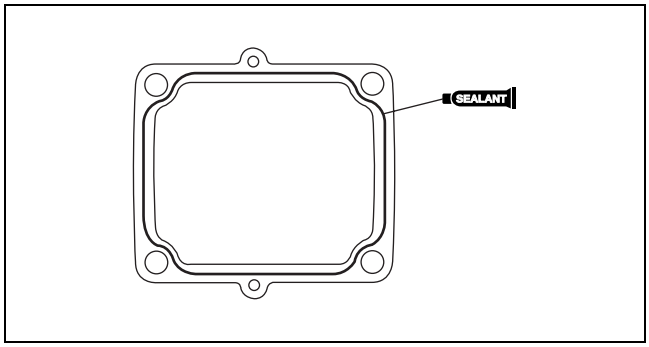


E5U511BM5077

Control Case Assembly Note

1. Apply sealant to the contact surfaces of the control case and extension housing as shown in the figure.
2. Install the control case to the extension housing.

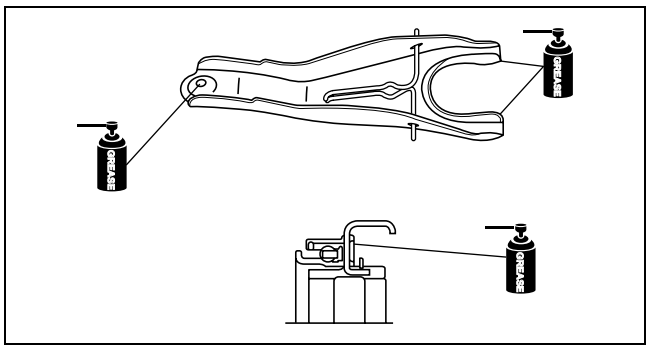
Tightening torque:
15.7—22.5 N·m {1.60—2.29 kgf·m, 11.6—16.5 ft·lbf}



E5U511BM5076

Release Collar, Release Fork Assembly Note

1. Apply specified grease to the areas shown in the figure.
2. Install the release collar and release fork.



BHJ0511M219

05–50 TECHNICAL DATA

TRANSMISSION/TRANSAXLE

E5U055000000103

Item	Specification
Standard clearance between shift fork and clutch hub sleeve groove	0.05—0.40 mm {0.002—0.015 in}
Maximum clearance between shift fork and clutch hub sleeve groove	0.5 mm {0.020 in}
Standard clearance between synchronizer ring and flank surface of gear	1.5 mm {0.059 in}
Maximum clearance between synchronizer ring and flank surface of gear	0.8 mm {0.031 in}
Detent ball spring	Standard length: 23.5 mm {0.925 in}
1st/2nd select return spring	Standard length: 83.5 mm {3.287 in}
Mainshaft maximum runout	0.03 mm {0.0012 in}
Standard clearance between shift rod end and control lever	0.5 mm {0.020 in} or less
5th/6th clutch hub end play	0—0.05 mm {0—0.0019 in}
Maindrive gear shaft total end play	0.05—0.15 mm {0.0020—0.0059 in}
Countershaft total end play	0.15—0.25 mm {0.0059—0.0098 in}
Reverse idler gear end play	0.1—0.2 mm {0.0040—0.0078 in}

5th/6th clutch hub retaining ring

Thickness (mm {in})
1.50 {0.0591}
1.55 {0.0610}
1.60 {0.0630}
1.65 {0.0650}
1.70 {0.0669}
1.75 {0.0689}
1.80 {0.0709}
1.85 {0.0728}
1.90 {0.0748}
1.95 {0.0768}

Maindrive gear bearing shim selective chart

Dimension C (mm {in})	Shim thickness (mm {in})
2.75—2.85 {0.1083—0.1122}	2.7 {0.106}
2.85—2.95 {0.1122—0.1161}	2.8 {0.110}
2.95—3.05 {0.1161—0.1201}	2.9 {0.114}
3.05—3.15 {0.1201—0.1240}	3.0 {0.118}
3.15—3.25 {0.1240—0.1280}	3.1 {0.122}
3.25—3.35 {0.1280—0.1319}	3.2 {0.126}
3.35—3.45 {0.1319—0.1358}	3.3 {0.130}
3.45—3.55 {0.1358—0.1398}	3.4 {0.134}
3.55—3.65 {0.1398—0.1437}	3.5 {0.138}
3.65—3.75 {0.1437—0.1476}	3.6 {0.142}
3.75—3.85 {0.1476—0.1516}	3.7 {0.147}
3.85—3.95 {0.1516—0.1555}	3.8 {0.150}
3.95—4.05 {0.1555—0.1594}	3.9 {0.154}
4.05—4.15 {0.1594—0.1634}	4.0 {0.157}
4.15—4.25 {0.1634—0.1673}	4.1 {0.161}

Countershaft front bearing shim selective chart

Dimension F (mm {in})	Shim thickness (mm {in})
2.45—2.55 {0.0965—0.1004}	2.3 {0.091}
2.55—2.65 {0.1004—0.1043}	2.4 {0.094}
2.65—2.75 {0.1043—0.1083}	2.5 {0.098}
2.75—2.85 {0.1083—0.1122}	2.6 {0.102}
2.85—2.95 {0.1122—0.1161}	2.7 {0.106}
2.95—3.05 {0.1161—0.1201}	2.8 {0.110}
3.05—3.15 {0.1201—0.1240}	2.9 {0.114}
3.15—3.25 {0.1240—0.1280}	3.0 {0.118}
3.25—3.35 {0.1280—0.1319}	3.1 {0.122}

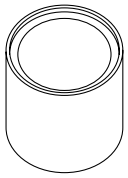
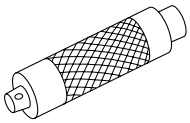
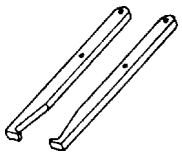
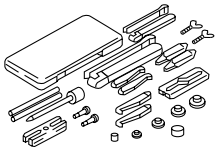
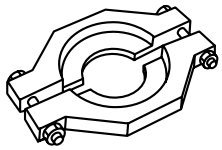
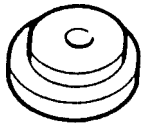
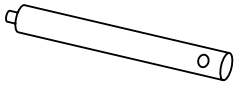
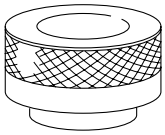
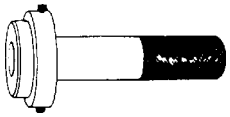
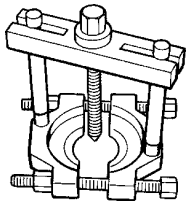
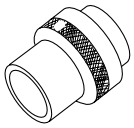
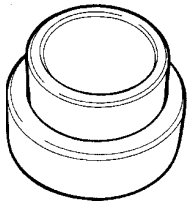
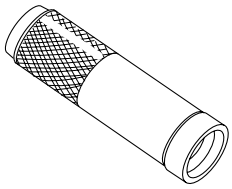
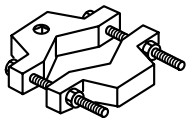
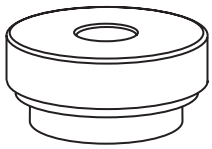
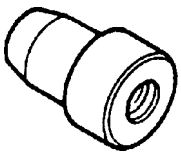
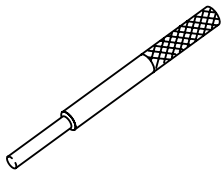
Reverse idler gear retaining ring

Thickness (mm {in})
1.5 {0.059}
1.6 {0.063}
1.7 {0.067}
1.8 {0.071}
1.9{0.075}

05–60 SERVICE TOOLS

SERVICE TOOLS

E5U056000000101

49 B025 004 Installer, Dust Seal 	49 G030 797 Handle 	49 H017 101 Hook 
49 0839 425C Bearing Puller Set 	49 H027 002 Remover, Bearing 	49 G033 106 Attachment 
49 G033 102 Handle 	49 V001 525 Installer, Dust Boot 	49 0813 235 Main Bearing Puller & Installer 
49 0710 520 Bearing Puller 	49 H025 003A Bearing Installer 	49 F401 336B Attachment B 
49 F401 331 Body 	49 F017 1A0 Universal Wrench 	49 N017 215 Installer 
49 B032 308 Attachment A 	49 0221 251A Valve Guide Installer 	49 D032 326A Attachment