FOREWORD

This Workshop manual covers Disassembly, Inspection and Assembly procedures for the following Manual Transmission:

Manual Transmission: M150, M153

For On−vehicle Servicing (Inspection, Adjustment, Troubleshooting, Removal and installation) of the Manual transmission, refer to the repair manual for the applicable model.

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

CAUTION

This manual does not include all the necessary items about repair and service. This manual is made for the purpose of the use for the persons who have special techniques and certifications. In the cases that non−specialized or uncertified technicians perform repair or service only using this manual or without proper equipment or tool, that may cause severe injury to you or other people around and also cause damage to your customer's vehicle.

In order to prevent dangerous operation and damages to your customer's vehicle, be sure to follow the instruction shown below.

- Must read this manual thoroughly. It is especially important to have a good understanding of all the contents written in the PRECAUTION of "IN" section.
- The service method written in this manual is very effective to perform repair and service. When performing the operations following the procedures using this manual, be sure to use tools specified and recommended. If using non−specified or recommended tools and service method, be sure to confirm safety of the technicians and any possibility of causing personal injury or damage to the customer's vehicle before starting the operation.
- If part replacement is necessary, must replace the part with the same part number or equivalent part. Do not replace it with inferior quality.
- It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive, because it is important to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

INTRODUCTION

HOW TO USE THIS MANUAL TRANSMISSION WORKSHOP MANUAL

010CW–04

GENERAL INFORMATION

1. GENERAL DESCRIPTION

(a) This manual is made in accordance with SAE J2008.

(b) Generally repair operations can be separated in the following 3 main processes:
1. Diagnosis
2. Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting
3. Final Inspection

(c) This manual explains ”Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting”, but ”Final Inspection” is omitted.

(d) The following essential operations are not written in this manual, however these operations must be done in the practical situation.
(1) Operation with a jack or lift
(2) Cleaning of a removed part when necessary
(3) Visual check

2. INDEX

(a) An alphabetical INDEX is provided as a section on the end of the book to guide you to the item to be repaired.

3. PREPARATION

(a) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the repairing condition. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the Preparation section of this manual.

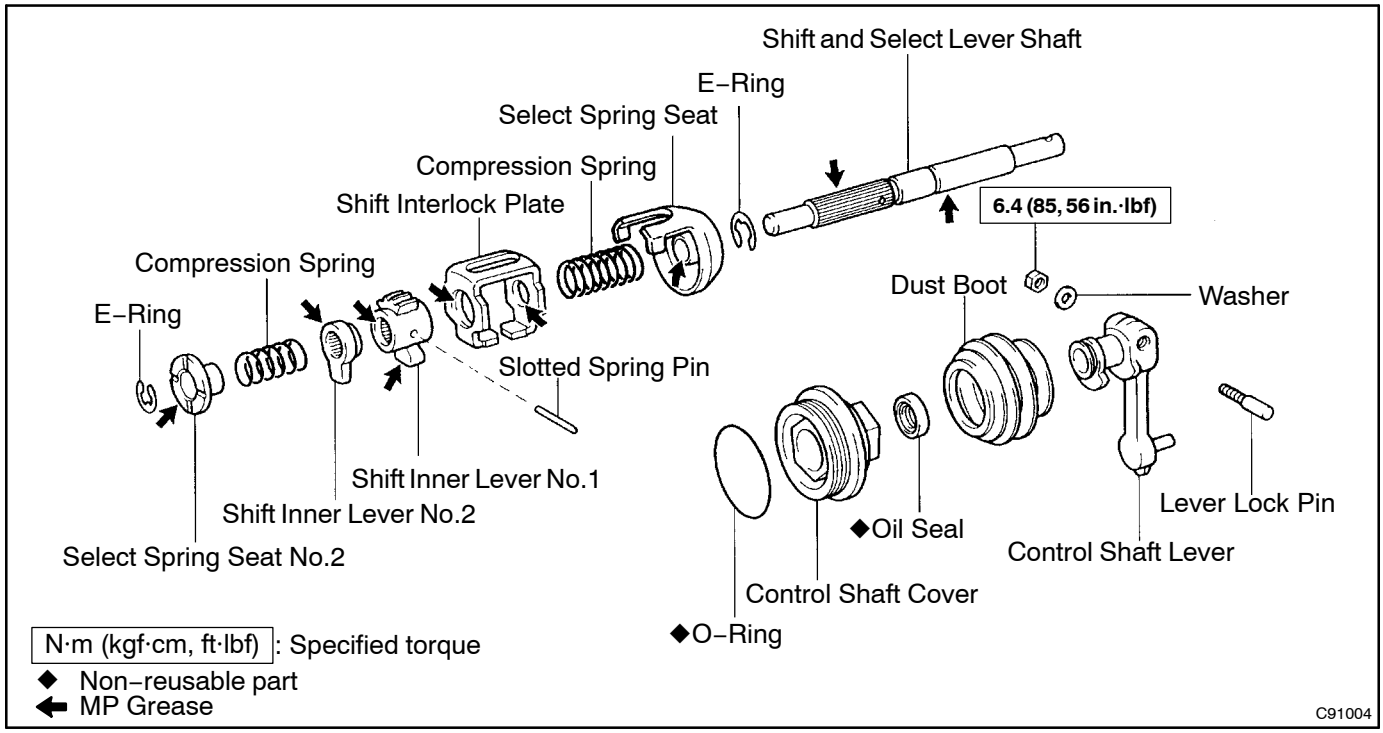
4. REPAIR PROCEDURES

(a) Component drawing is placed as the section or title when necessary.

(b) Illustrations of the parts catalog are placed as the ”disassembled parts drawing” so that it enables you to understand the fitting condition of the components.

(c) Non–reusable parts, grease applied parts, precoated parts and tightening torque are specified in the components drawing.

Example:



(d) Tightening torque, oil applying position, and non–reusable parts are described as important points in the procedure.

NOTICE:

There are cases where such information can only be indicated by an illustration. In that case, all the information such as torque, oil, etc. are described in the illustration.

(e) Installing procedure of operation items is performed in the reverse order of the removing, and only the important points are described.

(f) Only items with points are described in the procedure, and the operational portion and content are placed using an illustration. In the explanations, details of the operational method, standard value and notice are placed.

(g) There may be a case where the illustrations of similar models are used. In that case the details may be different from the actual vehicle.

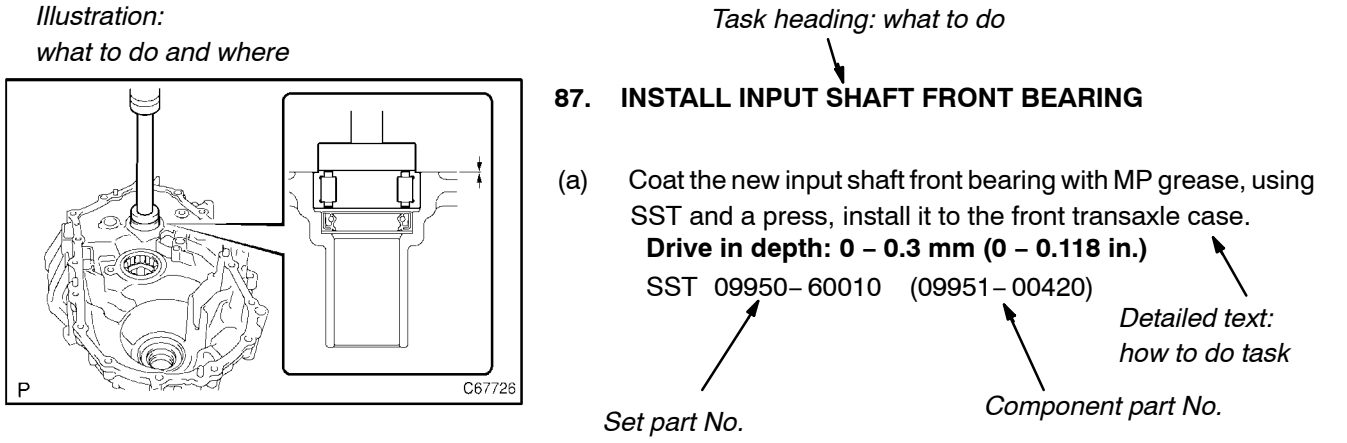
(h) The procedures are presented in a step–by–step format:

(1) The illustration shows what to do and where to do it.

(2) The task heading tells what to do.

(3) The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:



HINT:

This format provides an experienced technician with a FAST TRACK to the necessary information. The task heading can be read at a glance when necessary, and the text below provides detailed information. Important specifications and warnings always stand out in bold type.

5. SERVICE SPECIFICATIONS

(a) Specifications are presented in bold type throughout the manual. You never have to leave the procedure to look up your specifications. The specifications are also found in the Service Specifications section for a quick reference.

6. TERMS DEFINITION

CAUTION	Indicate the possibility of injury to you or other people.
NOTICE	Indicate the possibility of damage to the components being repaired.
HINT	Provide additional information to help you perform the repair efficiently.

7. SI UNIT

(a) The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

Example:

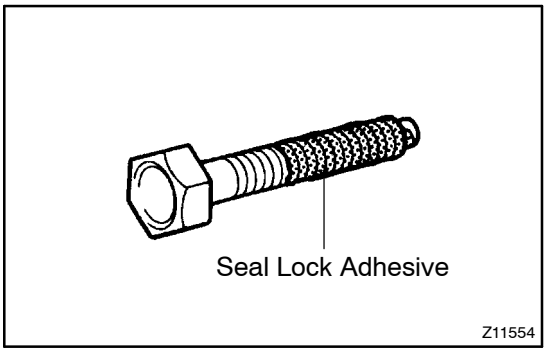
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

REPAIR INSTRUCTION FOR MANUAL TRANSMISSION WORKSHOP MANUAL

010CX–04

PRECAUTION

1. BASIC REPAIR HINT



(a) PRECOATED PARTS

(1) Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.

(2) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(3) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

NOTICE:

Do the torque checking with the lower limit value of the torque tolerance.

(4) Depending on the seal lock agent to apply, there may be a case where it is necessary to leave it for a specified time until it hardens.

(b) GASKETS

When necessary, use a sealer on gaskets to prevent leaks.

(c) BOLTS, NUTS AND SCREWS

Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

TERMS FOR MANUAL TRANSMISSION WORKSHOP MANUAL

ABBREVIATIONS USED IN THIS MANUAL

010CY–03

Abbreviations	Meaning
FIPG	Formed In Plce Gasket
Max	Maximum
Min	Minimum
MP	Multipurpose
No.	Number
RR	Rear
SSM	Special Service Materials
SST	Special service Tools
STD	Standard
1st	First
2nd	Second
3rd	Third
5th	Fifth

010CZ–03

GLOSSARY OF SAE AND HINO TERMS

This glossary lists all SAE–J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their HINO equivalents.

SAE ABBREVIATIONS	SAE TERMS	HINO TERMS ( )–ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	–
CAC	Charge Air Cooler	Inter cooler
CARB	Carburettor	Carburettor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CTP	Closed Throttle Potion	–
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Total Diagnosis Communication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Control Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only memory	Electrically Erasable Programmable Read Only memory (EEPROM), Erasable Programmable Read Only memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Distributorless Ignition (DI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO2S)
IAC	Idol Air Control	Idol Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection
IFS	Inertia Fuel–Shutoff	–

ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	–
MFI	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, O_2 Sensor (O_{2S})
OBD	On–Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CC_0
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
SRT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–
TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three–Way Catalytic Converter	Three–Way Catalytic (TWC) CC_{RO}
TWC+OC	Three–Way + Oxidation Catalytic Converter	$CC_R + CC_O$
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
WOT	Wide Open Throttle	Full Throttle

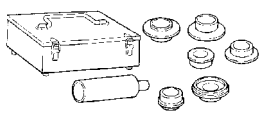
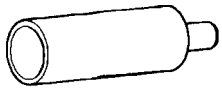
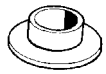
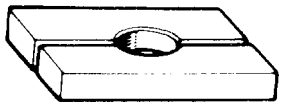
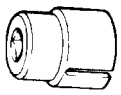
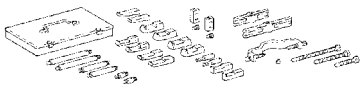
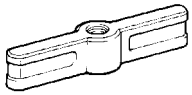
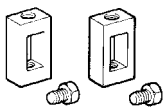
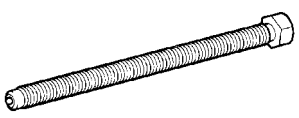
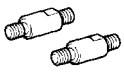
WU–OC	Warm Up Oxidation Catalytic Converter	–
WU–TWC	Warm Up Three–Way Catalytic Converter	Manifold Converter
3GR	Third Gear	–
4GR	Fourth Gear	–

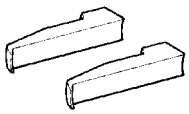
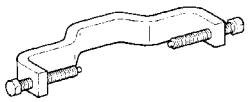
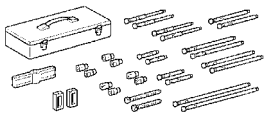
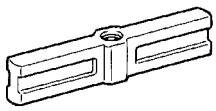
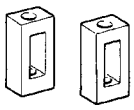
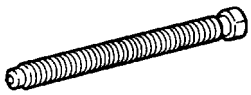
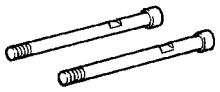
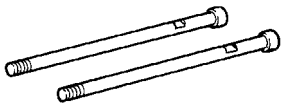
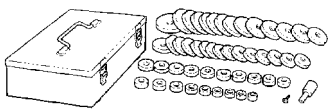
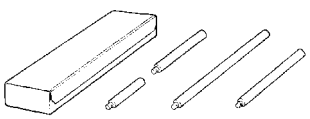
PREPARATION

022EA–01

PREPARATION

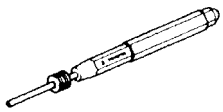
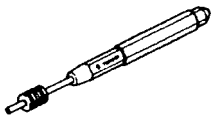
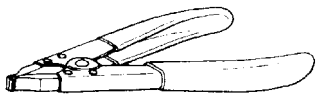
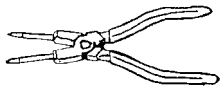
SST

	09316–60011	Transmission & Transfer Bearing Replacer	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09316–00011)	Replacer Pipe	MANUAL TRANSMISSION ASSY
	(09316–00031)	Replacer "B"	MANUAL TRANSMISSION ASSY
	(09316–00041)	Replacer "C"	OUTPUT SHAFT ASSY
	09505–20010	Differential Side Bearing Replacer	MANUAL TRANSMISSION ASSY
	09527–30010	Rear Axle Shaft Bearing Remover	INPUT SHAFT ASSY OUTPUT SHAFT ASSY
	09555–55010	Differential Drive Pinion Bearing Replacer	OUTPUT SHAFT ASSY
	09817–16011	Back–up Light Switch Tool	MANUAL TRANSMISSION ASSY
	09950–40011	Puller B Set	MANUAL TRANSMISSION ASSY
	(09951–04010)	Hanger 150	MANUAL TRANSMISSION ASSY
	(09952–04010)	Slide Arm	MANUAL TRANSMISSION ASSY
	(09953–04030)	Center Bolt 200	MANUAL TRANSMISSION ASSY
	(09954–04010)	Arm 25	MANUAL TRANSMISSION ASSY

	(09955–04011)	Claw No.1	MANUAL TRANSMISSION ASSY
	(09957–04010)	Attachment	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09958–04010)	Holder (J)	MANUAL TRANSMISSION ASSY
	09950–50013	Puller C Set	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09951–05010)	Hanger 150	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09952–05010)	Slide Arm	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09953–05020)	Center Bolt 150	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	(09954–05030)	Claw No.3	OUTPUT SHAFT ASSY
	(09954–05040)	Claw No.4	MANUAL TRANSMISSION ASSY
	(09957–04010)	Attachment	MANUAL TRANSMISSION ASSY OUTPUT SHAFT ASSY
	09950–60010	Replacer Set	MANUAL TRANSMISSION ASSY
	(09951–00460)	Replacer 46	MANUAL TRANSMISSION ASSY
	09950–70010	Handle Set	MANUAL TRANSMISSION ASSY

	(09951–07150)	Handle 150	MANUAL TRANSMISSION ASSY

Recomended Tools

	09031–00030	Pin Punch	MANUAL TRANSMISSION ASSY
	09031–00040	Pin Punch .	MANUAL TRANSMISSION ASSY
	09905–00012	Snap Ring No.1 Expander	MANUAL TRANSMISSION ASSY INPUT SHAFT ASSY OUTPUT SHAFT ASSY
	09905–00013	Snap Ring Pliers	MANUAL TRANSMISSION ASSY INPUT SHAFT ASSY OUTPUT SHAFT ASSY

Equipment

Brass bar	
Caliper gauge	
Dial indicator or dial indicator with magnetic base	
Feeler gauge	
Magnetic finger	
Micrometer	
MP grease	
Plastic hammer	
Press	
Snap Ring No.1 Expander	
Torque wrench	
Vernier calipers	
Vise	
Wooden block	

SSM

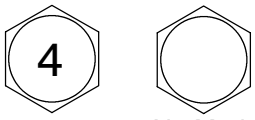
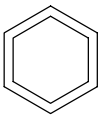
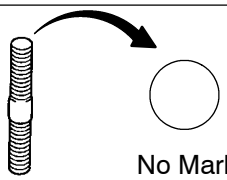
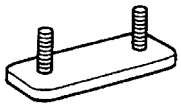
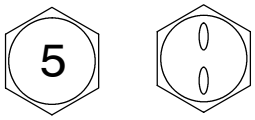
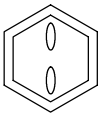
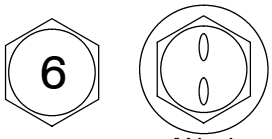
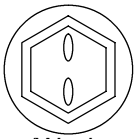
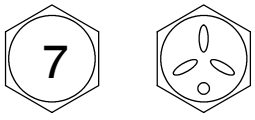
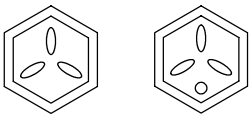
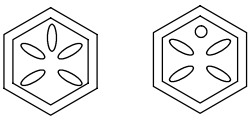
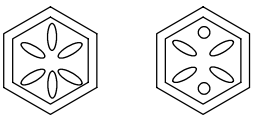
08826–00090	”Seal Packing 1281,” THREE BOND 1281 or equivalent (FIPG)	MANUAL TRANSMISSION ASSY
08833–00070	”Adhesive 1324,” THREE BOND 1324 or equivalent	SHIFT LEVER SHAFT HOUSING ASSY
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	MANUAL TRANSMISSION ASSY

SERVICE SPECIFICATIONS

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

030Y3–04

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
 No Mark	 No Mark	 No Mark		4T
				5T
 w/Washer	 w/Washer			6T
				7T
				8T
				9T
				10T
				11T

B06431

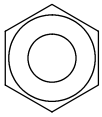
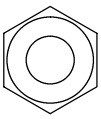
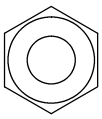
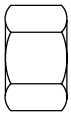
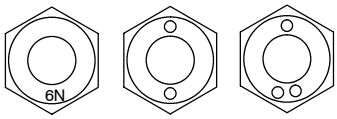
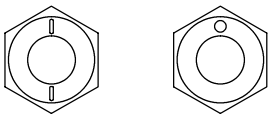
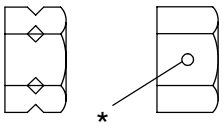
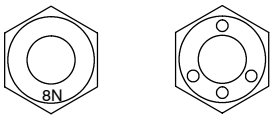
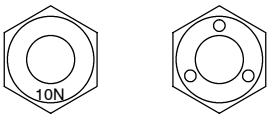
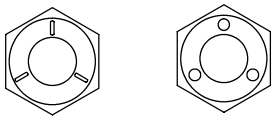
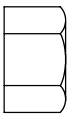
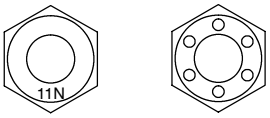
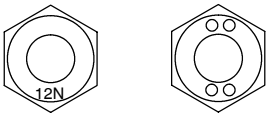
030Y4–04

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

030Y5–04

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/Washer)	 No Mark (w/Washer)	 No Mark	5N (4T)
 6N			6N
		 *	7N (5T)
 8N			8N
 10N		 No Mark	10N (7T)
 11N			11N
 12N			12N

*: Nut with 1 or more marks on one side surface of the nut.

B06432

HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

MANUAL TRANSMISSION / TRANSAXLE

030ZD–03

SERVICE DATA

Output shaft journal diameter		
1st gear	Min.	57.975 mm (2.2825 in.)
2nd gear	Min.	53.975 mm (2.1250 in.)
3rd gear	Min.	46.975 mm (1.8494 in.)
5th gear	Min.	36.975 mm (1.4557 in.)
Output shaft flange thickness	Max.	4.85 mm (0.1909 in.)
Output shaft runout	Max.	0.05 mm (0.0020 in.)
Reverse gear inside diameter	Max.	53.975 mm (2.1250 in.)
Counter gear roller bearing journal diameter	Min.	36.957 mm (1.4550 in.)
Gear thrust clearance		
1st & 2nd	STD	0.10 – 0.35 mm (0.0039 – 0.0138 in.)
3rd	STD	0.10 – 0.60 mm (0.0039 – 0.0238 in.)
5th	STD	0.10 – 0.50 mm (0.0039 – 0.0197 in.)
Reverse	STD	0.15 – 0.40 mm (0.0059 – 0.0157 in.)
Reverse idler	STD	0.10 – 0.50 mm (0.0038 – 0.0197 in.)
Gear oil clearance		
1st	STD	0.030 – 0.075 mm (0.0012 – 0.0030 in.)
2nd & Reverse	STD	0.030 – 0.081 mm (0.0012 – 0.0032 in.)
3rd & 5th	STD	0.015 – 0.066 mm (0.0006 – 0.0026 in.)
Reverse idler gear	STD	0.015 – 0.059 mm (0.0006 – 0.0026 in.)
Shift fork to hub sleeve clearance	Max.	0.35 mm (0.014 in.)
Synchronizer ring to gear clearance		
1st	Min.	1.1 – 1.9 mm (0.043 – 0.075 in.)
2nd and 3rd	Min.	0.82 – 1.78 mm (0.0323 – 0.0701 in.)
4th and 5th	Min.	0.8 – 1.6 mm (0.031 – 0.063 in.)
Oil seal drive in depth		
Front bearing retainer	(14B)	15.0 – 15.8 mm (0.590 – 0.622 in.)
	(W04D–J)	15.3 – 16.1 mm (0.602 – 0.634 in.)
Rear bearing retainer		0.1 – 0.9 mm (0.004 – 0.035 in.)
Speedometer driven gear		19.7 – 20.3 mm (0.776 – 0.799 in.)
Select outer lever		0 – 1.0 mm (0 – 0.039 in.)
Shift outer lever		–0.2 – 0.6 mm (–0.008 – 0.024 in.)
Interlock pin hole plug drive in depth	.	0.3 – 1.3 mm (0.012 – 0.051 in.)
No.2 shift lever tight plug drive in depth	.	1.7 – 2.5 mm (0.067 – 0.098 in.)
Input shaft snap ring thickness	Mark	
	2	2.50 – 2.55 mm (0.0984 – 0.1004 in.)
	3	2.55 – 2.60 mm (0.1004 – 0.1024 in.)
	4	2.60 – 2.65 mm (0.1024 – 0.1043 in.)
	5	2.65 – 2.70 mm (0.1043 – 0.1063 in.)
	6	2.70 – 2.75 mm (0.1063 – 0.1083 in.)
	7	2.75 – 2.80 mm (0.1083 – 0.1102 in.)
Output shaft snap ring thickness	Mark	
No.2 clutch hub	2	1.90 – 1.95 mm (0.0748 – 0.0768 in.)
	3	1.95 – 2.00 mm (0.0768 – 0.0787 in.)
	4	2.00 – 2.05 mm (0.0787 – 0.0807 in.)
	5	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
	6	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	7	2.15 – 2.20 mm (0.0846 – 0.0866 in.)

3rd gear	Mark	
	A	2.90 – 2.95 mm (0.1142 – 0.1161 in.)
	B	2.95 – 3.00 mm (0.1161 – 0.1181 in.)
	C	3.00 – 3.05 mm (0.1181 – 0.1201 in.)
	D	3.05 – 3.10 mm (0.1201 – 0.1220 in.)
	E	3.10 – 3.15 mm (0.1220 – 0.1240 in.)
No.3 clutch hub	Mark	
	4	1.90 – 1.95 mm (0.0748 – 0.0768 in.)
	5	1.95 – 2.00 mm (0.0768 – 0.0787 in.)
	6	2.00 – 2.05 mm (0.0787 – 0.0807 in.)
	7	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
	8	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	9	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
Counter gear snap ring thickness	Mark	
	0	1.95 – 2.00 mm (0.0768 – 0.0787 in.)
	1	2.00 – 2.05 mm (0.0787 – 0.0807 in.)
	2	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
	3	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	4	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	5	2.20 – 2.25 mm (0.0866 – 0.0886 in.)

030Z8–07

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Magnet x Transmission front case	12	120	9
Oil receiver pipe x Transmission rear case	4.9	50	43 in.·lbf
Shift fork x Shift fork shaft	34	350	25
Transmission front case x Transmission rear case	37	380	27
Front bearing retainer x Transmission front case	17	170	12
Rear bearing retainer x Transmission rear case	34	350	25
Shift lever shaft housing x Transmission front case	17	170	12
Clutch housing x Transmission front case	37	380	27
Power take off cover	14	145	11
Speedmeter driven gear lock plate	11.3	115	8
Back–up light switch	44	450	32
Output shaft rear lock nut	127	1,300	94
Drain plug x Transmission front case	37	380	27
Filler plug x Transmission front case	37	380	27
Shift outer lever No.1 lock pin x nut	20	200	15
Select outer lever lock pin x nut	7.8	80	69 in.·lbf

MANUAL TRANSMISSION/TRANSAXLE

MANUAL TRANSMISSION SYSTEM

410CS–01

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

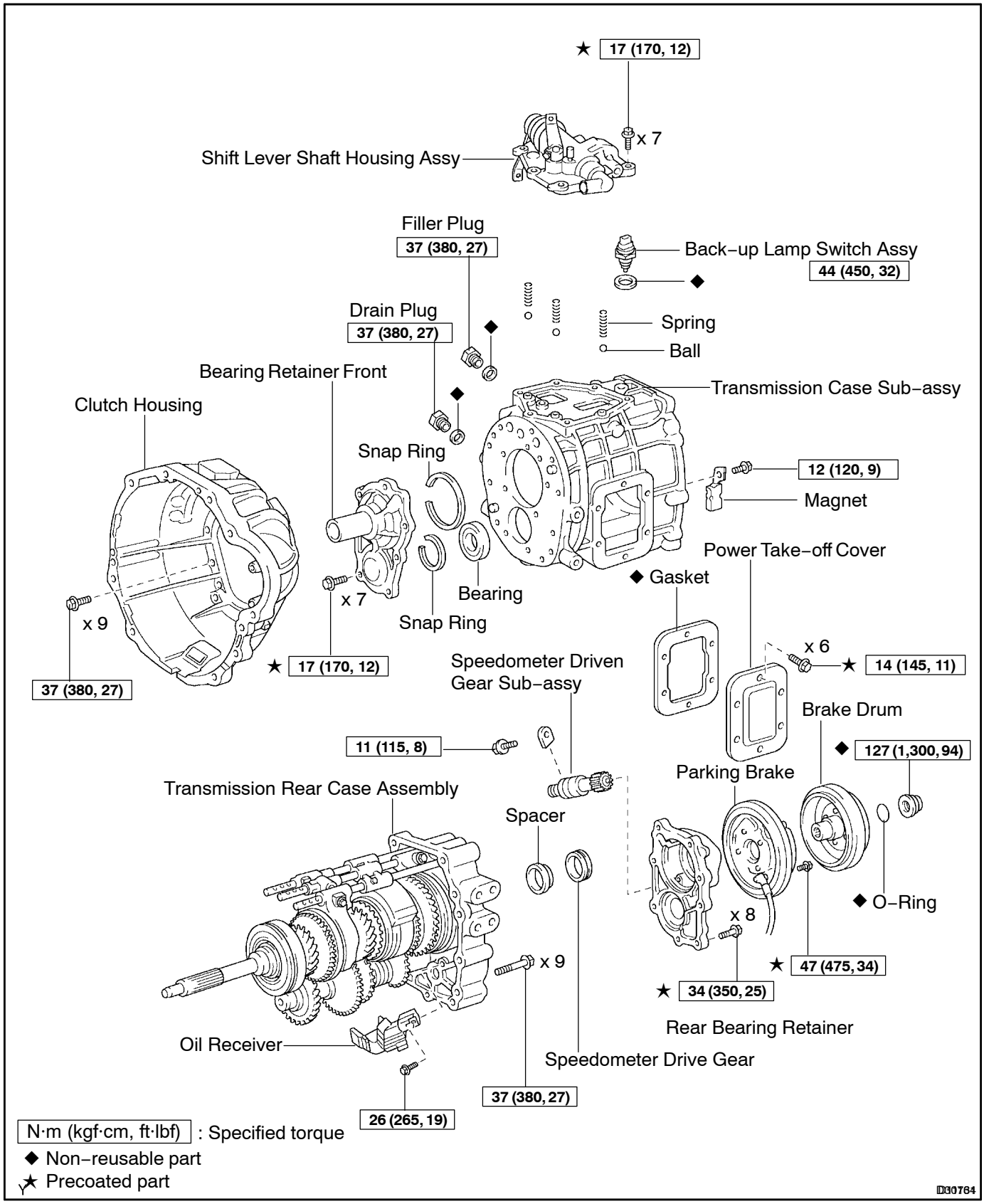
Symptom	Suspected Area	See Page
Noise	1. Oil (Level low)	★
	2. Oil (Wrong)	★
	3. Gear (Worn or damaged)	41–4 41–22 41–26 41–38
	4. Bearing (Worn or damaged)	41–4 41–22 41–26 41–38
Oil leakage	1. Oil (Level too high)	★
	2. Gasket (Damaged)	41–4
	3. Oil seal (Worn or damaged)	41–4 41–40
Hard to shift or will not shift	1. Synchronizer ring (Worn or damaged)	41–4 41–22 41–26
	2. Shift key spring (Damaged)	41–26
Jumps out of gear	1. Locking ball spring (Damaged)	41–4
	2. Shift fork (Worn)	41–4 41–26
	3. Gear (Worn or damaged)	41–4 41–22 41–26 41–38
	4. Bearing (Worn or damaged)	41–4 41–22 41–26 41–38

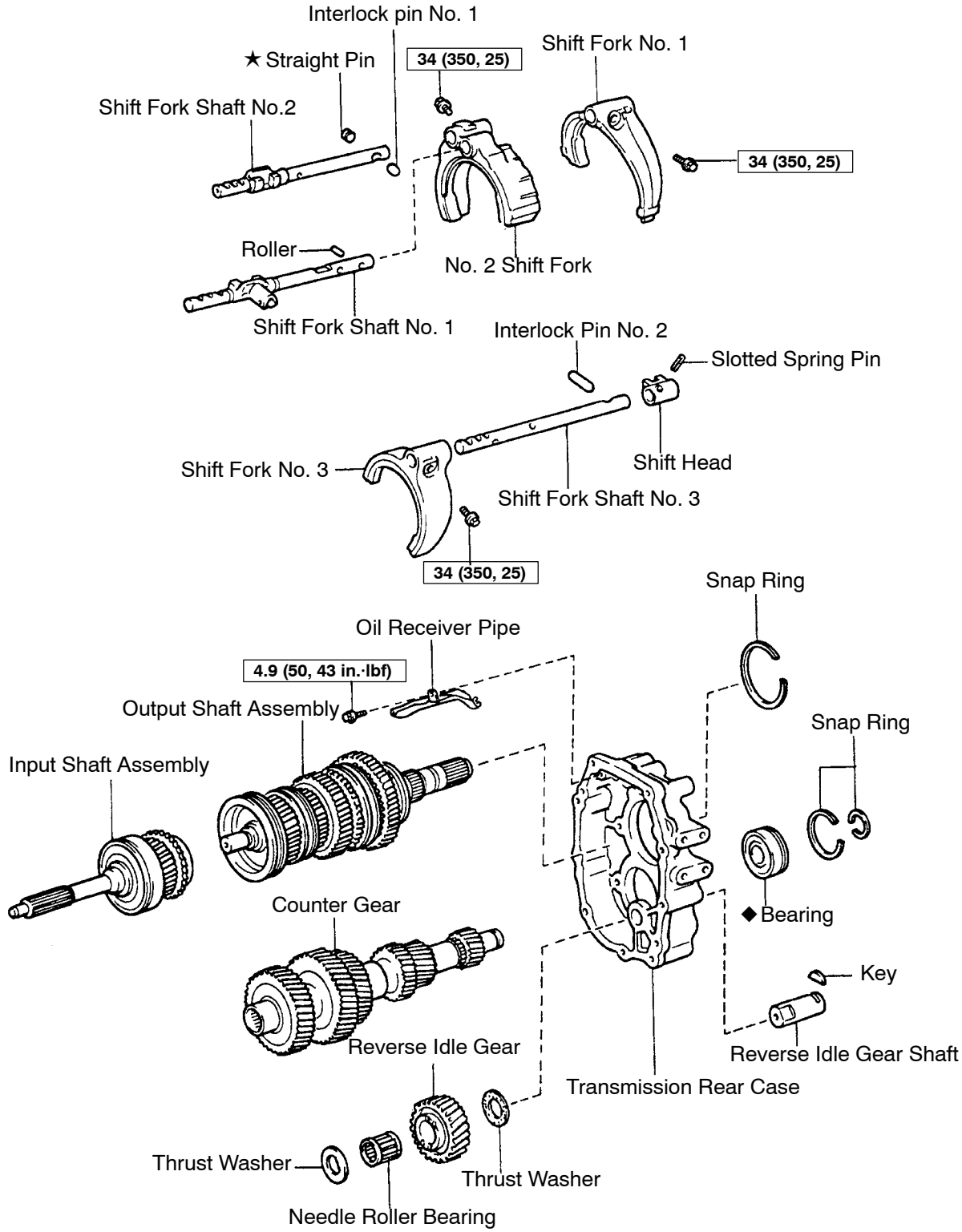
HINT:★ See Pub. No. S1–YXZE05A on page 41–2

MANUAL TRANSMISSION ASSY

410CT–01

COMPONENTS





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part

D11133

410CU–01

OVERHAUL

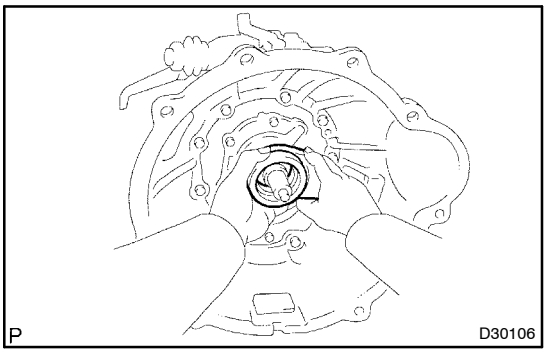
NOTICE:

When working with FIPG (Seal packing) material, you must observe the following items.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with non–residue solvent.**
- **Apply FIPG to an approx. 1.2 mm (0.05 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes after application. Otherwise, the FIPG material must be removed and reapplied.**

1. REMOVE DRAIN PLUG

2. REMOVE FILLER PLUG

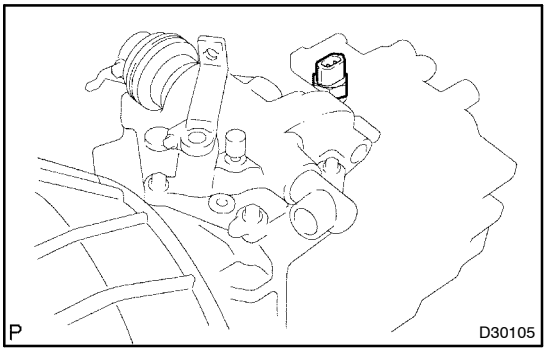


3. REMOVE CLUTCH RELEASE BEARING ASSY

4. REMOVE CLUTCH RELEASE FORK SUB–ASSY

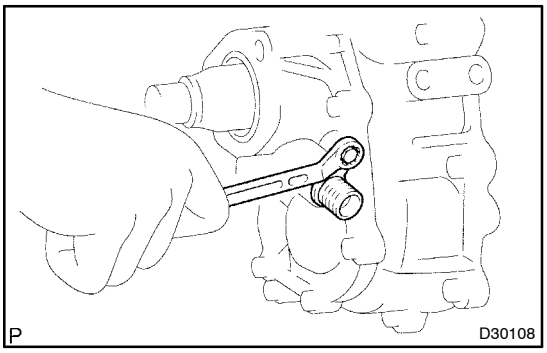
5. REMOVE RELEASE FORK SUPPORT

6. REMOVE CLUTCH RELEASE FORK BOOT

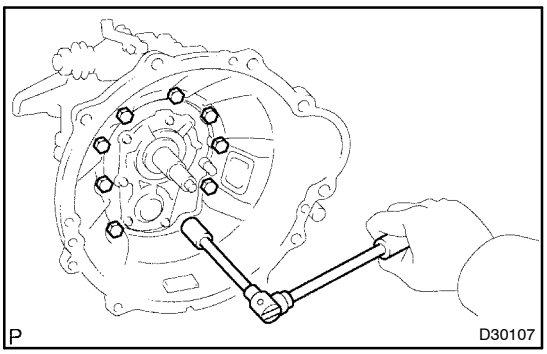


7. REMOVE BACK–UP LAMP SWITCH ASSY

(a) Using SST, remove the switch.
SST 09817–16011

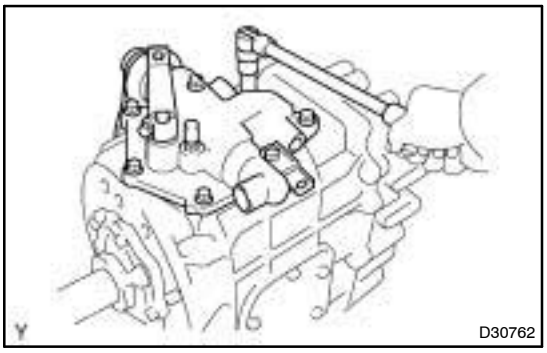


8. REMOVE SPEEDOMETER DRIVEN (MTM) GEAR SUB–ASSY



9. REMOVE CLUTCH HOUSING

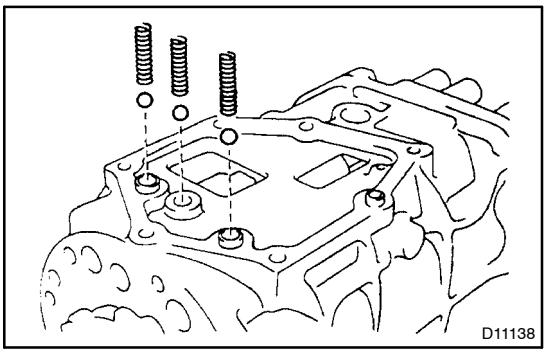
(a) Remove the 9 bolts and clutch housing.



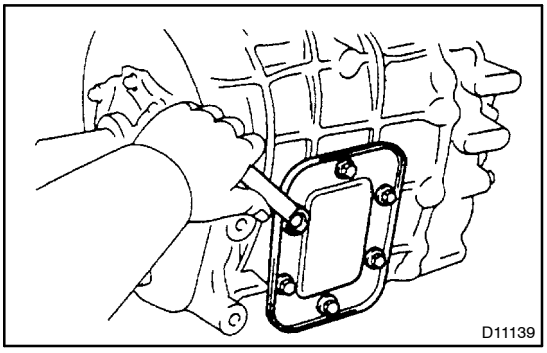
10. REMOVE SHIFT LEVER SHAFT HOUSING ASSY

(a) Remove the 7 bolts and wire clamp.

(b) Using a plastic–faced hammer, tap the shift lever shaft housing.

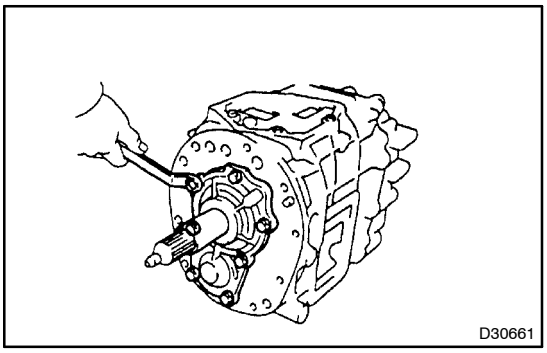


(c) Using a magnetic finger, remove the 3 springs and balls.



11. REMOVE MANUAL TRANSMISSION POWER TAKE–OFF COVER

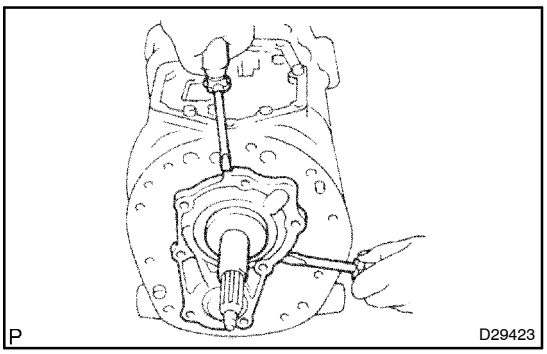
(a) Remove the 6 bolts, cover and gasket.



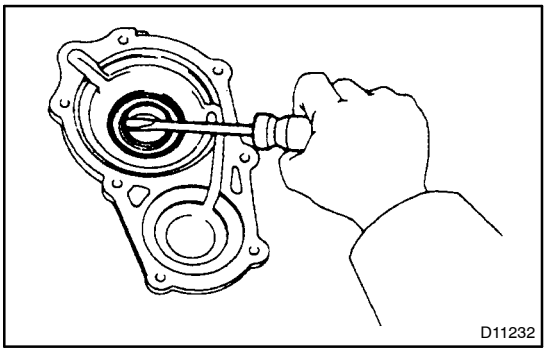
12. REMOVE BEARING RETAINER FRONT (MTM)

(a) Remove the 7 bolts.

(b) Using a brass bar and a hammer, tap the bearing retainer.

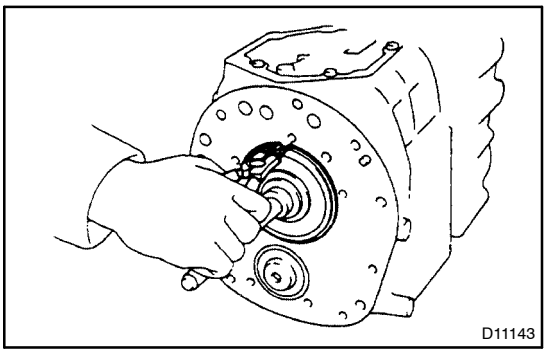


(c) Using 2 screwdrivers, pry out the bearing retainer.



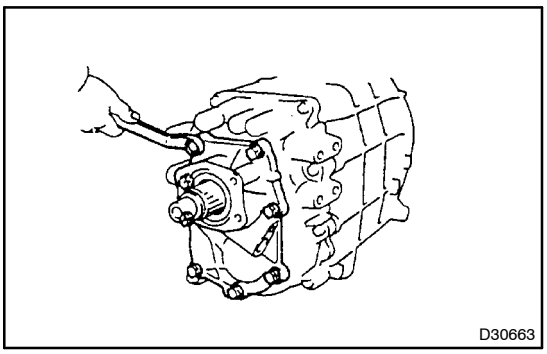
13. REMOVE TRANSMISSION FRONT BEARING RETAINER OIL SEAL

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



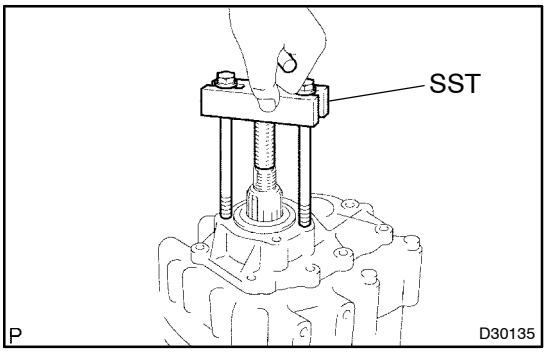
14. REMOVE FRONT BEARING SNAP RING

(a) Using snap ring pliers, remove the snap ring from the input shaft bearing.

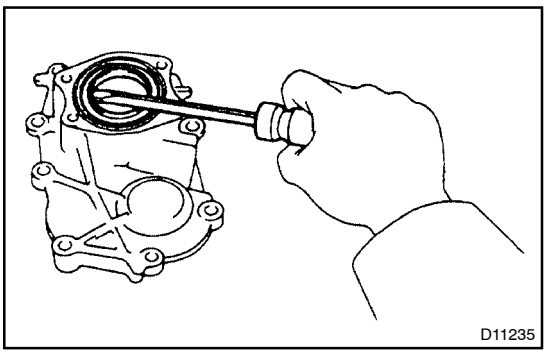


15. REMOVE OUTPUT SHAFT REAR BEARING (MTM) RETAINER

(a) Remove the 8 bolts.

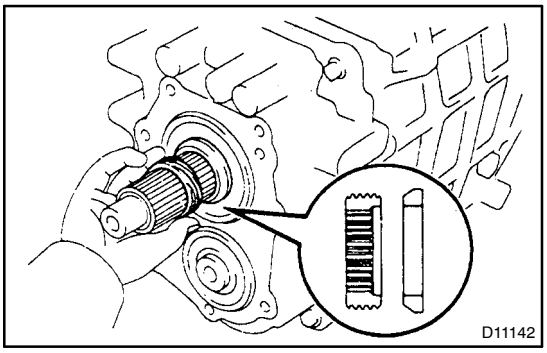


(b) Using SST, remove the bearing retainer.
SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05040)



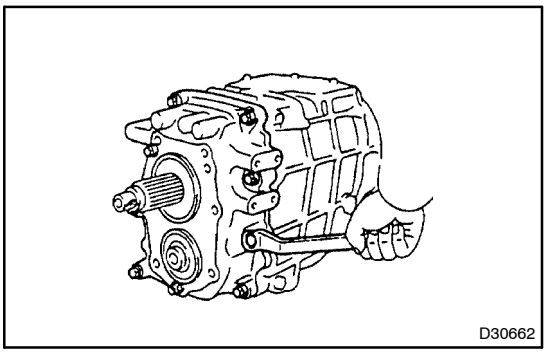
16. REMOVE TRANSMISSION REAR BEARING RETAINER OIL SEAL

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



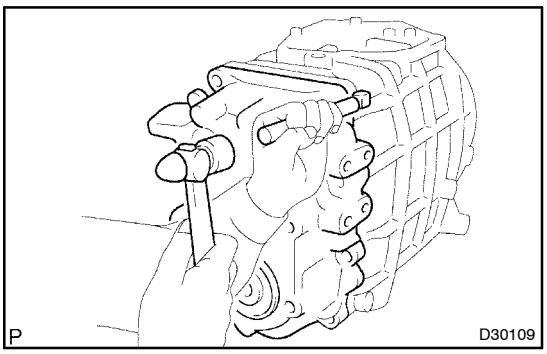
17. REMOVE SPEEDOMETER DRIVE (MTM) GEAR

18. REMOVE SPEEDOMETER DRIVE GEAR SPACER

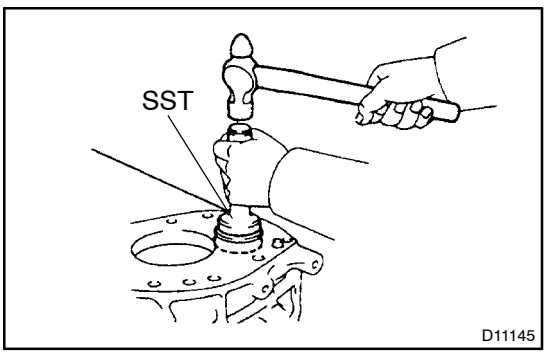


19. REMOVE TRANSMISSION FRONT CASE

(a) Remove the 9 bolts.



(b) Using a brass bar and hammer, carefully tap out the case.

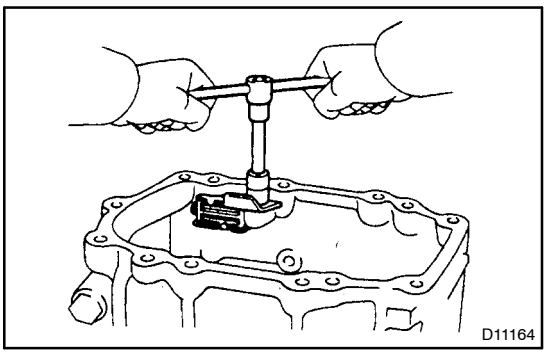


20. REMOVE COUNTER GEAR FRONT BEARING OR ROLLER

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

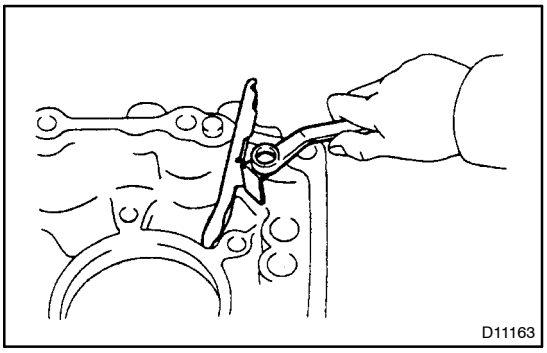
(b) Using SSTand a hammer, tap out the bearing.

SST 09505–20010



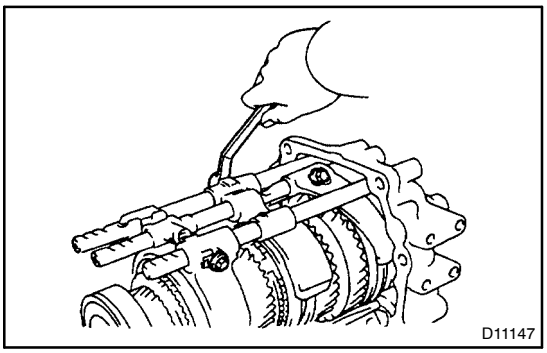
21. REMOVE TRANSMISSION MAGNET

(a) Remove the bolt and magnet.

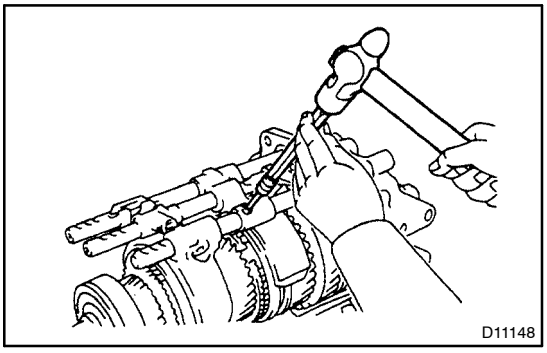


22. REMOVE OIL RECEIVER PIPE

(a) Remove the bolt and receiver pipe.

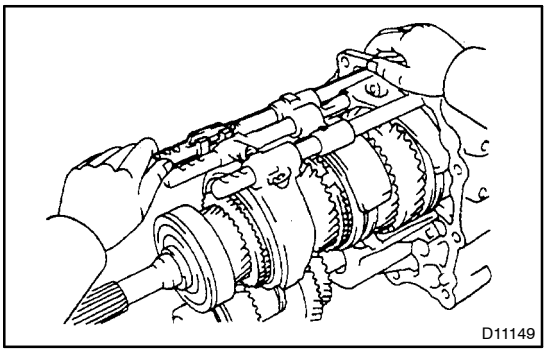


23. REMOVE SHIFT FORK SET BOLT



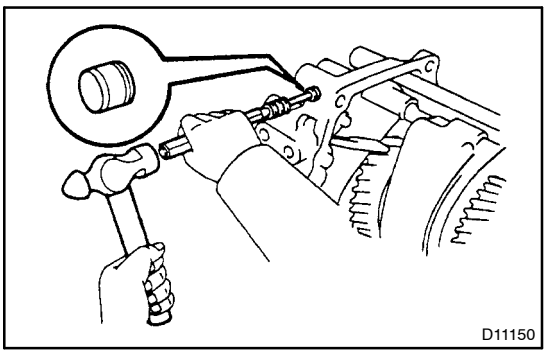
24. REMOVE SHIFT HEAD SET SLOTTED SPRING PIN

(a) Using a pin punch and hammer, tap out the pin.

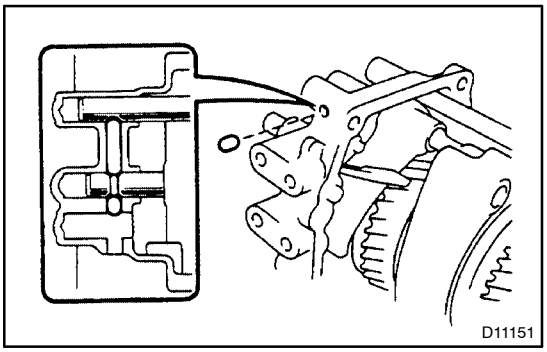


25. REMOVE GEAR SHIFT FORK SHAFT NO.2

(a) Pull out the shift fork shaft.

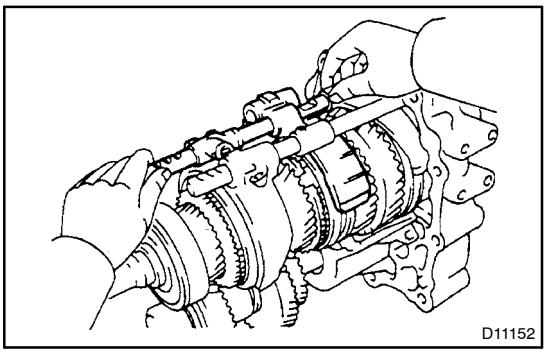


(b) Using a pin punch and a hammer, tap out the plug.



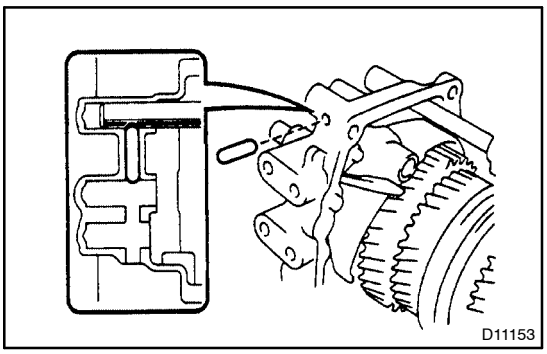
26. INSTALL INPUT SHAFT

(a) Using a magnetic finger, remove the interlock pin No.1.



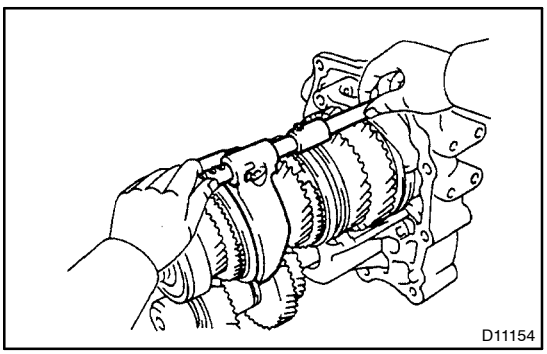
27. REMOVE GEAR SHIFT FORK SHAFT SUB–ASSY NO.1

(a) Pull out the shift fork shaft No. 1.
(b) Using a magnetic finger, remove the roller from the shaft hole.
(c) Remove the shift fork No. 2.



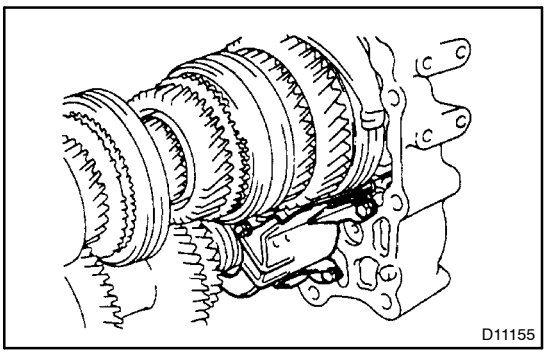
28. REMOVE SHIFT INTERLOCK PIN NO.2

(a) Using a magnetic finger, remove the interlock pin from the rear case.



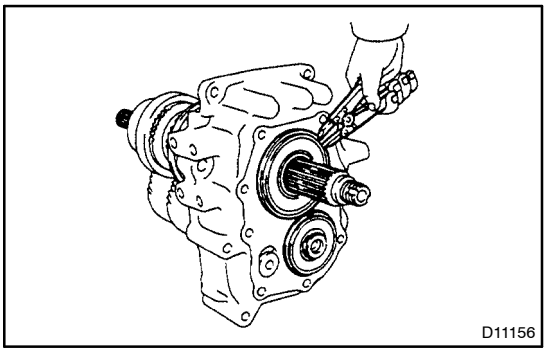
29. REMOVE GEAR SHIFT FORK SHAFT NO.3

(a) Pull out the shift fork shaft No. 3.
(b) Remove the shift fork No. 3 and shift head.



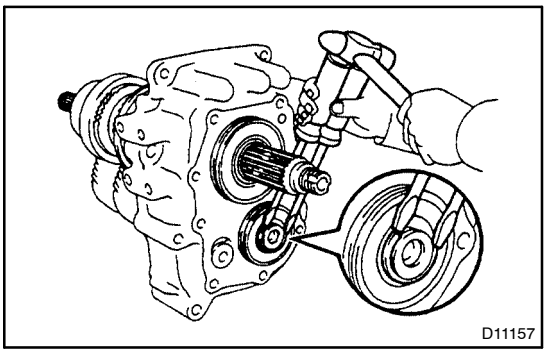
30. REMOVE MANUAL TRANSMISSION CASE RECEIVER

(a) Remove the 3 bolts and oil receiver.



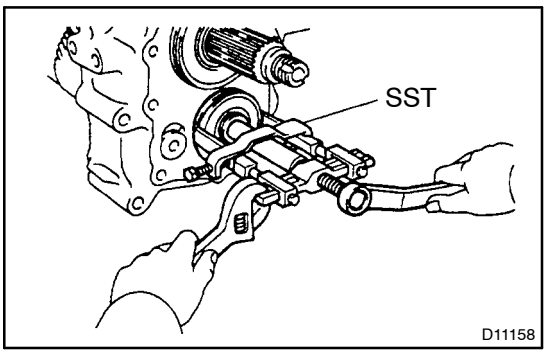
31. REMOVE OUTPUT SHAFT BEARING SHAFT SNAP RING

(a) Using snap ring pliers, remove the 2 snap rings.



32. REMOVE SNAP RING COUNTER GEAR REAR BEARING

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

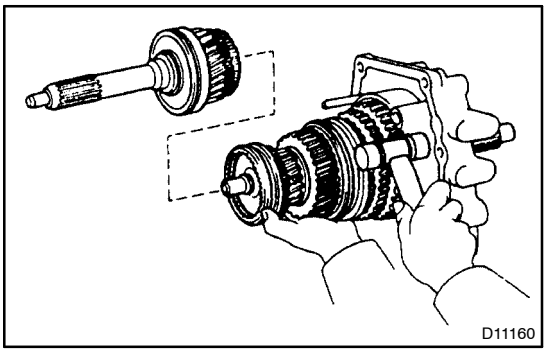


33. REMOVE COUNTER GEAR REAR BEARING

(a) Using SST, remove the rear bearing.

SST 09950–40011 (09951–04010, 09952–04010, 09953–04030, 09954–04010, 09955–04011, 09957–04010, 09958–04010)

34. REMOVE COUNTER GEAR



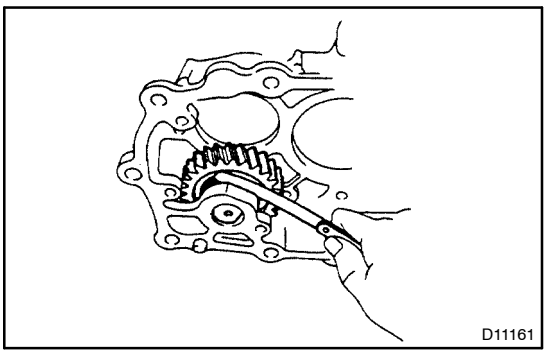
35. REMOVE INPUT SHAFT

(a) Remove the input shaft with the 12 needle roller bearings from the output shaft.

36. REMOVE OUTPUT SHAFT

(a) Remove the output shaft from the rear case by pulling the output shaft and tapping on the rear case with a plastic hammer.

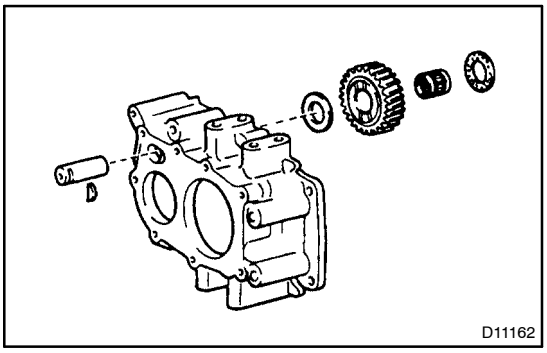
(b) Remove the shift fork No. 1.



37. INSPECT REVERSE IDLER GEAR THRUST CLEARANCE

(a) Using a filler gauge, measure the gear thrust clearance.
Standard clearance:
0.10 – 0.50 mm (0.0039 – 0.0197 in.)

If the clearance is greater than the standard, replace the thrust washers.

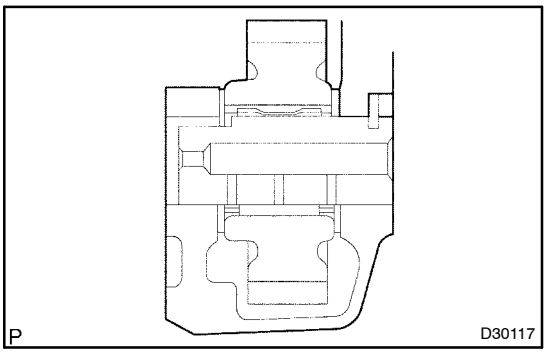


38. REMOVE REVERSE IDLER GEAR SUB–ASSY

(a) Pull out the shaft toward the rear.
(b) Remove the idler gear and thrust washers.

39. INSTALL REVERSE IDLER GEAR SUB–ASSY

(a) Apply MP grease to the thrust washers.
(b) Install the idle gear and thrust washers.

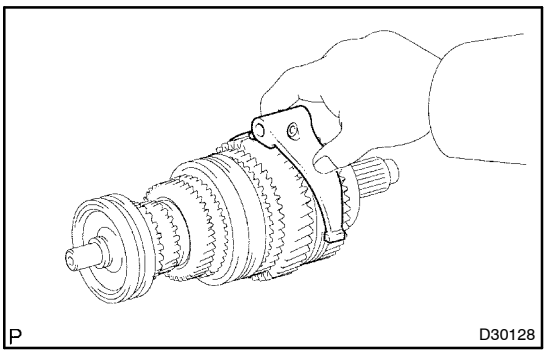


HINT:

- Make sure that the dimpled surfaces of both washers face the reverse idler gear.
- Make sure that the protruding part of the rear washer fits in the case groove.

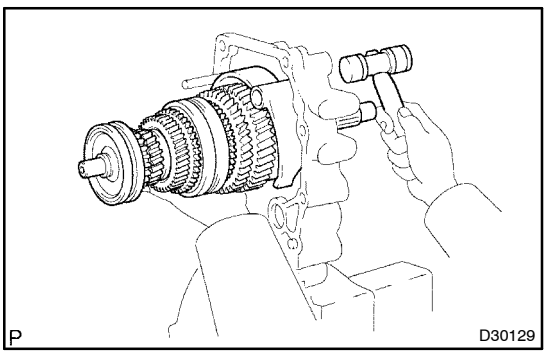
(c) Install the shaft with the woodruff key through the gear.

40. INSPECT REVERSE IDLER GEAR THRUST CLEARANCE (See Step 37)



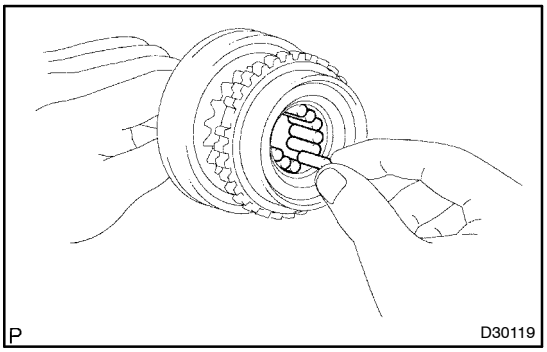
41. INSTALL OUTPUT SHAFT

(a) Place the shift fork No. 1 into the groove of the hub sleeve No. 1.



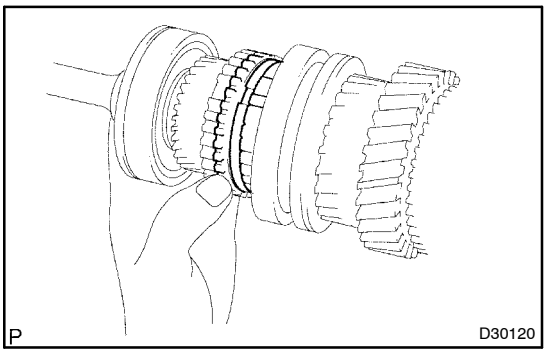
(b) Install the output shaft into the rear case by pushing on the output shaft and tapping on the rear case.

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

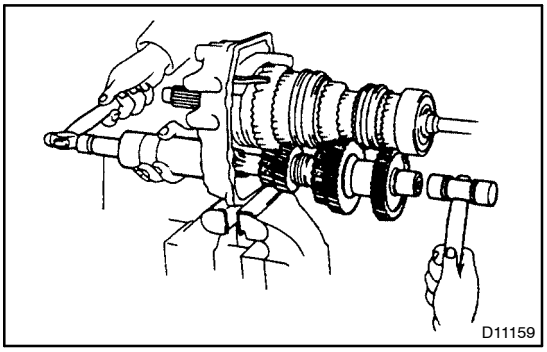


42. INSTALL INPUT SHAFT

(a) Apply MP grease to the 12 needle roller bearings and install them into the input shaft.



(b) Install the input shaft to the output shaft with the synchronizer ring slots aligned with the shifting keys.



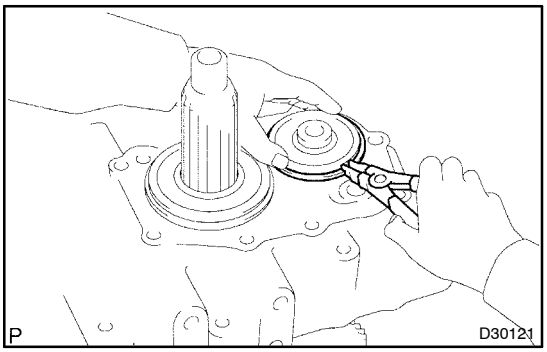
43. INSTALL COUNTER GEAR

(a) Install the counter gear into the rear case while holding the counter gear, and install the counter rear bearing with SST.

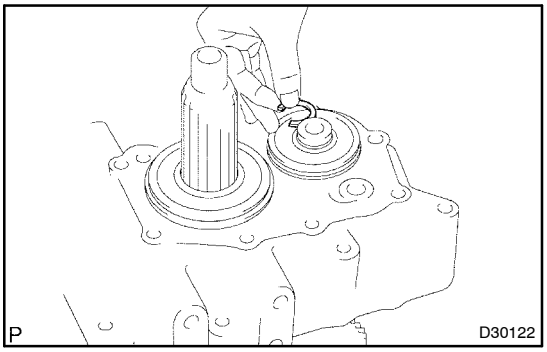
SST 09316–60011 (09316–00011, 09316–00031)

HINT:

When installing the rear bearing, support the counter gear in front with a 3–5 lb hammer or equivalent. Make sure that the output shaft and counter gear do not interfere with each other.



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

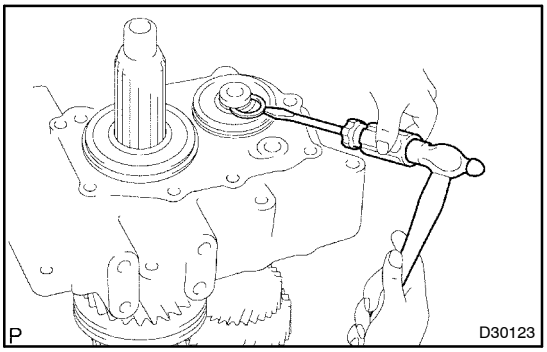


44. INSTALL OUTPUT SHAFT BEARING SHAFT SNAP RING

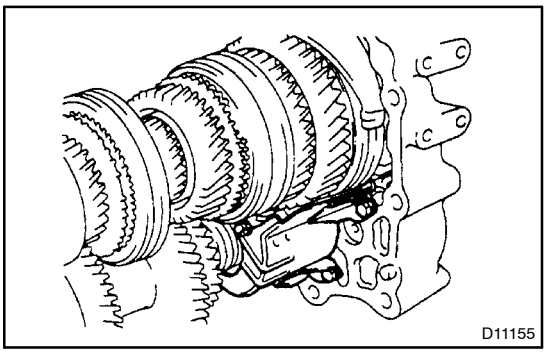
(a) Select a snap ring that allows minimum axial play.

Mark	Thickness mm (in.)
0	1.95 – 2.00 (0.0768 – 0.0787)
1	2.00 – 2.05 (0.0787 – 0.0807)
2	2.05 – 2.10 (0.0807 – 0.0827)
3	2.10 – 2.15 (0.0827 – 0.0846)
4	2.15 – 2.20 (0.0846 – 0.0866)
5	2.20 – 2.25 (0.0866 – 0.0886)

(b) Using a screwdriver and hammer, tap in the snap ring.



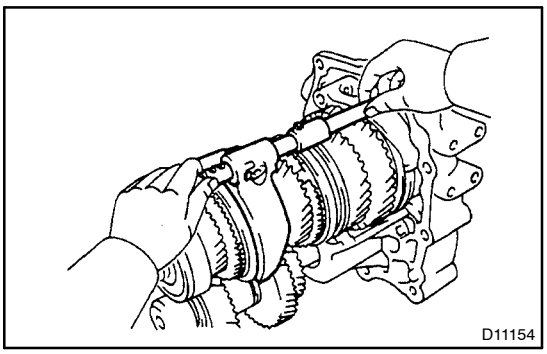
45. INSTALL MANUAL TRANSMISSION CASE RECEIVER



46. INSTALL GEAR SHIFT FORK SHAFT NO.3

(a) Place the shift fork No. 3 into the groove of the hub sleeve No. 3.

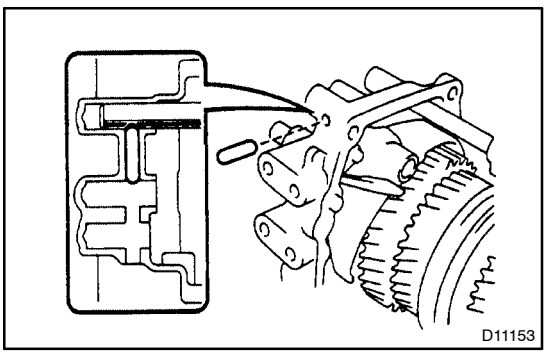
(b) Install the shift fork shaft No. 3 to the rear case through the shift fork No. 3 and shift head.

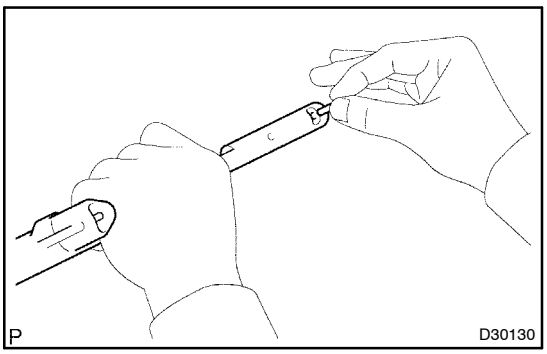


47. INSTALL SHIFT INTERLOCK PIN NO.2

(a) Apply MP grease to the interlock pin No.2.

(b) Insert the interlock pin into the rear case.

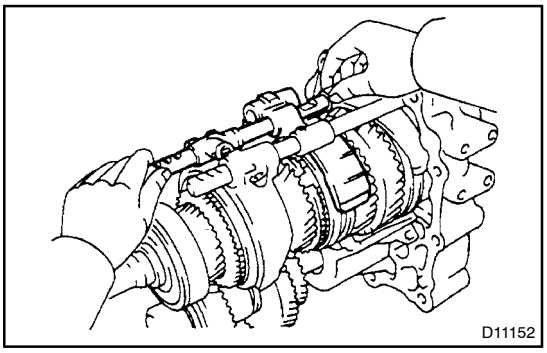




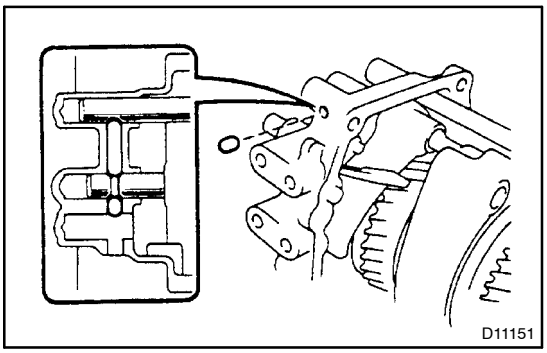
48. INSTALL GEAR SHIFT FORK SHAFT SUB–ASSY NO.1

(a) Apply MP grease to the roller.

(b) Install the roller into the shaft hole.



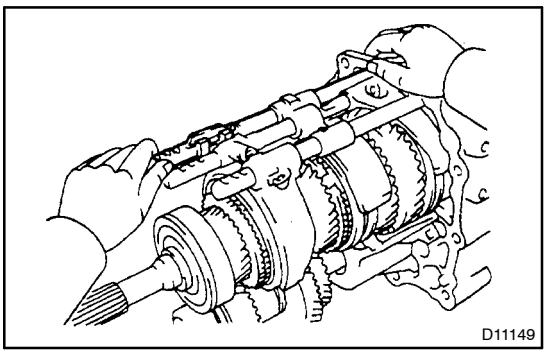
(c) Install the shift fork shaft No. 1 to the rear case through the shift fork No. 2 and shift fork No. 1.



49. INSTALL SHIFT INTERLOCK PIN NO.1

(a) Apply MP grease to the interlock pin No.1.

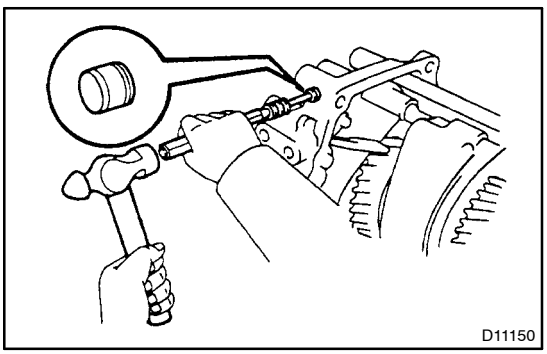
(b) Install the interlock pin No.1 into the rear case.



50. INSTALL GEAR SHIFT FORK SHAFT NO.2

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

(b) Install the shift fork shaft No. 2 to the rear case through the shift fork No. 2.

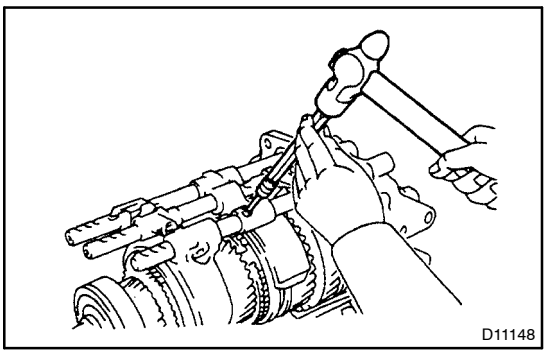


(c) Apply seal packing to the hole plug, and install the hole plug to the rear case.

Seal packing:

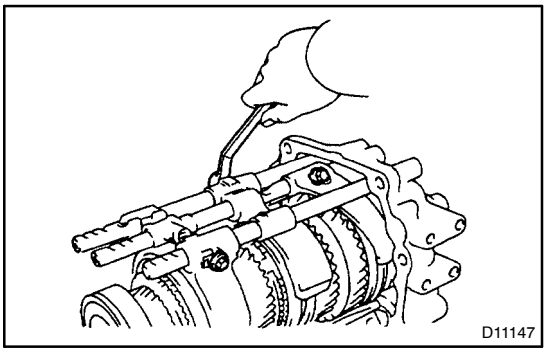
Part No. 08833 – 00070, THREE BOND 1324 or equivalent

Tap in depth: 0.3 – 1.3 mm (0.012 – 0.051 in.)



51. INSTALL SHIFT HEAD SET SLOTTED SPRING PIN

(a) Using a pin punch and hammer, tap in the slotted spring pin to the shift head.



52. INSTALL SHIFT FORK SET BOLT

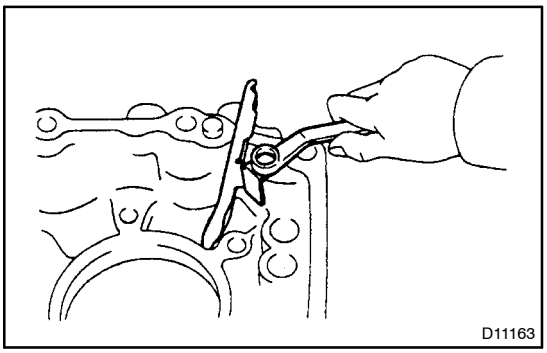
(a) Install the 3 bolts.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

53. CHECK INTERLOCK

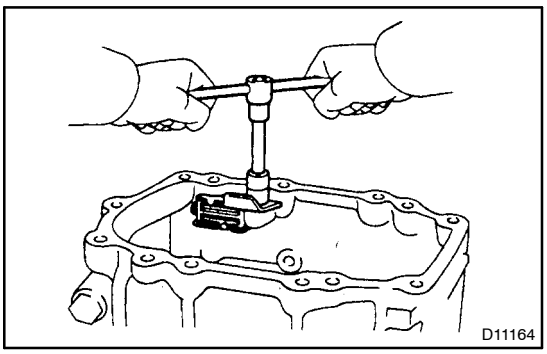
(a) Shift the fork shaft No. 1 into the 1st speed position.

(b) Check that the fork shaft No. 2 and fork shaft No. 3 should not move.



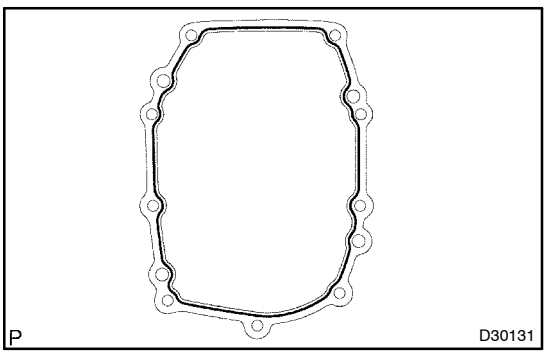
54. INSTALL OIL RECEIVER PIPE

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



55. INSTALL TRANSMISSION MAGNET

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

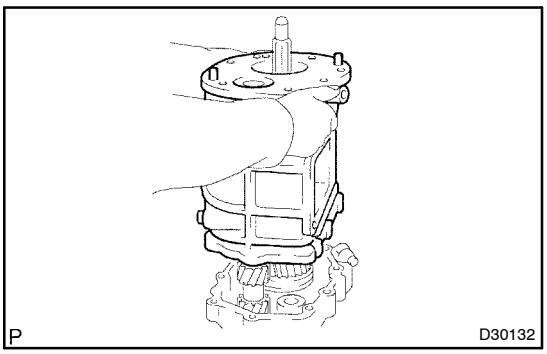


56. INSTALL MANUAL TRANSMISSION CASE SUB–ASSY

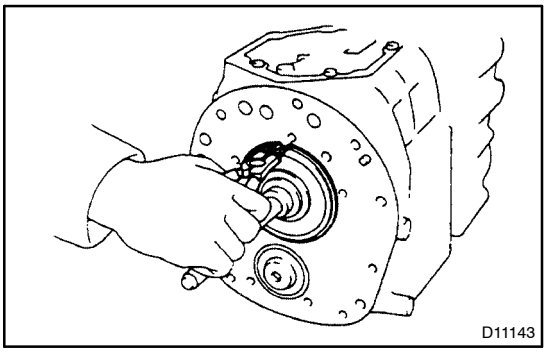
(a) Apply seal packing to the case, as shown in the illustration.

Seal packing:

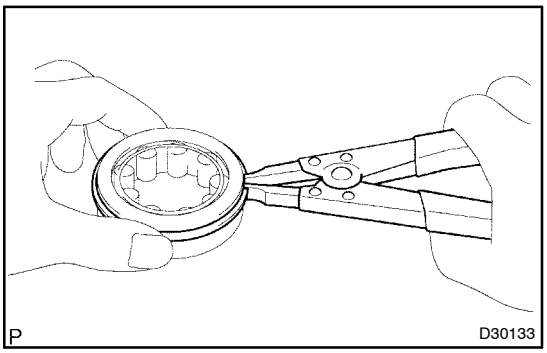
Part No. 08826 – 000090, THREE BOND 1281 or equivalent



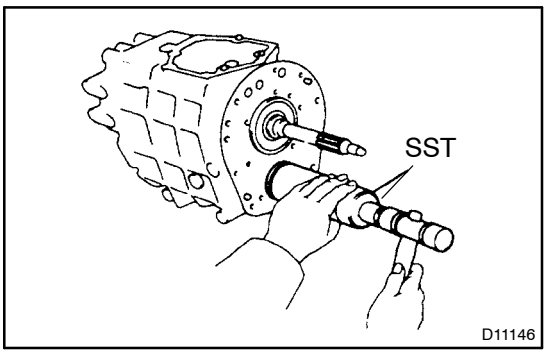
(b) Align each bearing outer race and each fork shaft end with the case installation holes, and install the case. If necessary, tap on the case with a plastic–faced hammer.



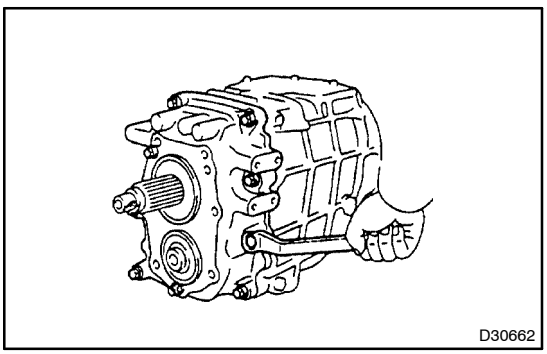
(c) Using snap ring pliers, install the snap ring to the input shaft bearing.



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

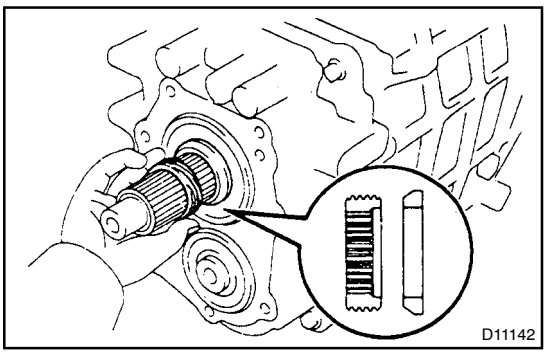


(e) Using SST, tap in the counter front bearing.
SST 09316–60011 (09316–00011)



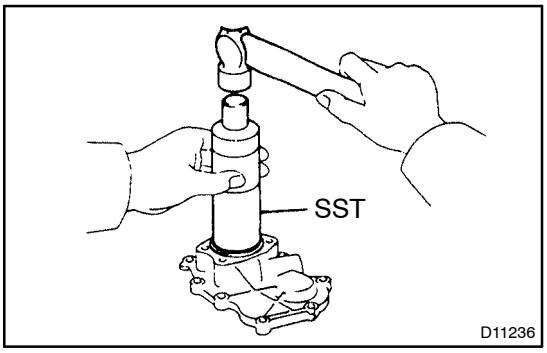
(f) Apply seal packing to the bolts.
Seal packing:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(g) Install the 9 bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



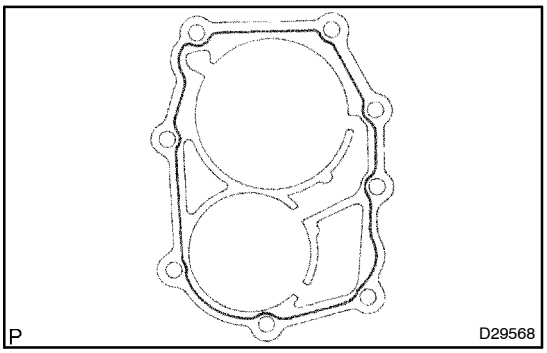
57. INSTALL SPEEDOMETER DRIVE GEAR SPACER

58. INSTALL SPEEDOMETER DRIVE (MTM) GEAR



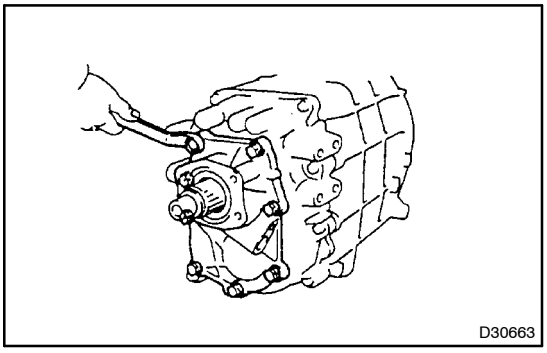
59. INSTALL TRANSMISSION REAR BEARING RETAINER OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal.
SST 09316–60011 (09316–00011)
Drive–in depth: 0.1 – 0.9 mm (0.004 – 0.0035 in.)



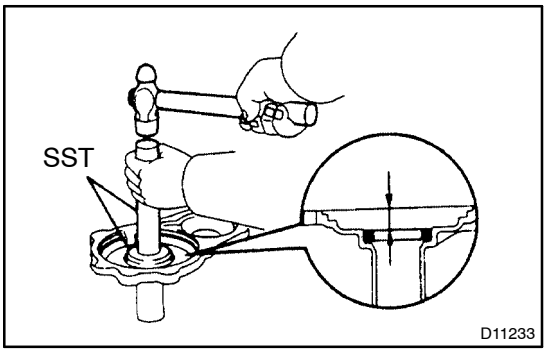
60. INSTALL OUTPUT SHAFT REAR BEARING (MTM) RETAINER

(a) Apply seal packing to the retainer, as shown in the illustration, and install the retainer to the rear case.
Seal packing:
Part No. 08826–00090, THREE BOND 1281 or equivalent



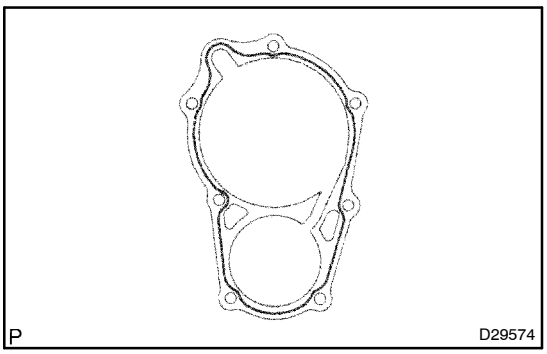
(b) Apply seal packing to the bolts.
Seal packing:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the 8 bolts.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)



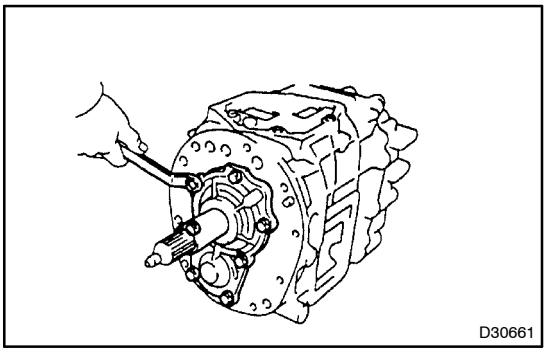
61. INSTALL TRANSMISSION FRONT BEARING RETAINER OIL SEAL

(a) Uning SST and a hammer, tap in a new oil seal.
SST 09950–60010 (09951–00460), 09950–70010 (09951–07150)
Oil seal depth:
14B engine: 15.0 – 15.8 mm (0.590 – 0.622 in.)
W04D–J engine: 15.3 – 16.1 mm (0.602 – 0.634)



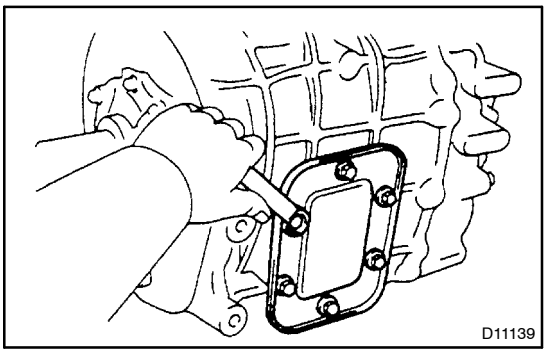
62. INSTALL BEARING RETAINER FRONT (MTM)

(a) Apply seal packing to the retainer, as shown in the illustration, and install the retainer to the front case.
Seal packing:
Part No. 08826–00090, THREE BOND 1281 or equivalent



(b) Apply seal packing to the bolts.
Seal packing:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

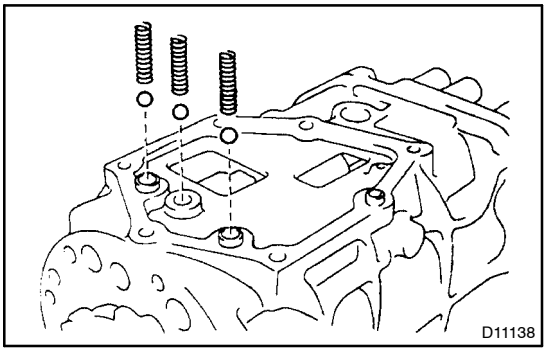
(c) Install the 7 bolts.
Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)



63. INSTALL MANUAL TRANSMISSION POWER TAKE–OFF COVER

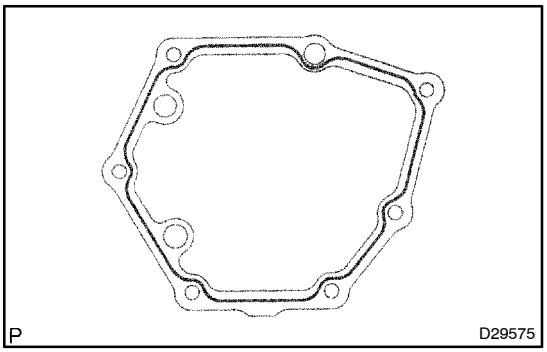
(a) Apply seal packing to the bolts.
Seal packing:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install a new gascket and the power take–off cover with the 6 bolts.
Torque: 14 N·m (145 kgf·cm, 11 ft·lbf)



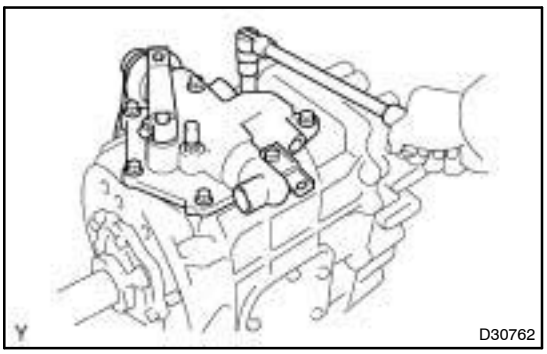
64. INSTALL SHIFT LEVER SHAFT HOUSING ASSY

(a) Install the 3 balls and springs.



(b) Apply seal packing to the housing as shown in the illustration, and install the housing to the front case.
Seal packing:
Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT:
Make sure that the tip of the shift lever No. 2 is securely positioned in the shift head.

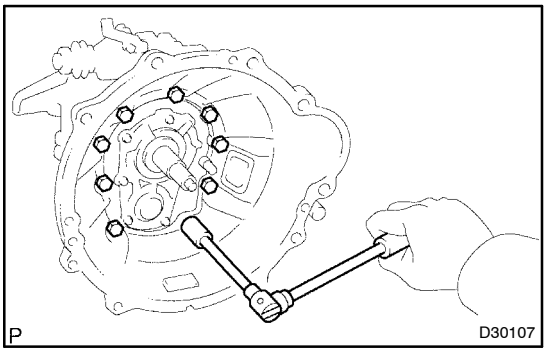


(c) Apply seal packing to the bolts.
Seal packing:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Install the 7 bolts.
Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)

HINT:

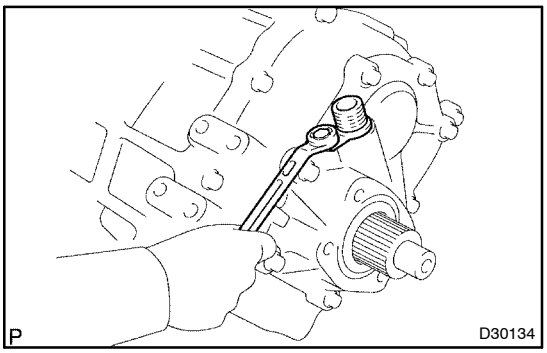
- Check to see that the input and output shafts rotate smoothly.
- Check to see that shifting into all positions is smooth.



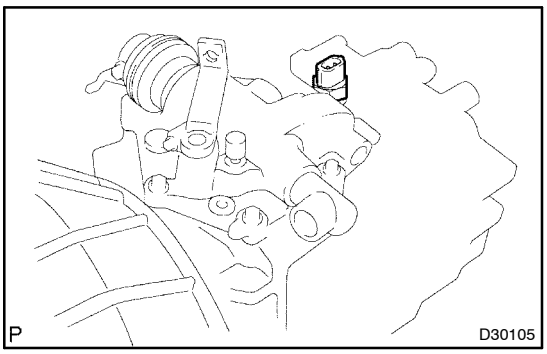
65. INSTALL CLUTCH HOUSING

(a) Install the clutch housing.

(b) Install the 9 bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



66. INSTALL SPEEDOMETER DRIVEN (MTM) GEAR SUB–ASSY
Torque: 11.3 N·m (115 kgf·cm, 8 ft·lbf)

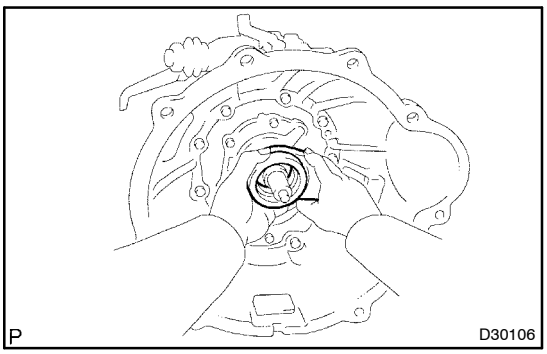


67. INSTALL BACK–UP LAMP SWITCH ASSY

(a) Using SST, install the switch.
SST 09817–16011
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

68. INSTALL CLUTCH RELEASE FORK BOOT

69. INSTALL RELEASE FORK SUPPORT
Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)



70. INSTALL CLUTCH RELEASE FORK SUB–ASSY

(a) Apply release hub grease to the release fork and hub contact, the release fork and push rod contact, and the release fork pivot points.
Grease:
Part No. 08887–01806, RELEASE HUB GREASE or equivalent

71. INSTALL CLUTCH RELEASE BEARING ASSY

(a) Apply clutch spline grease to the input shaft spline.
Grease:
Part No. 08887–01706, CLUTCH SPLINE GREASE or equivalent

(b) Install the bearing to the release fork, and then install them to the transmission.

72. INSTALL DRAIN PLUG

(a) Install a new gasket and the drain plug.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

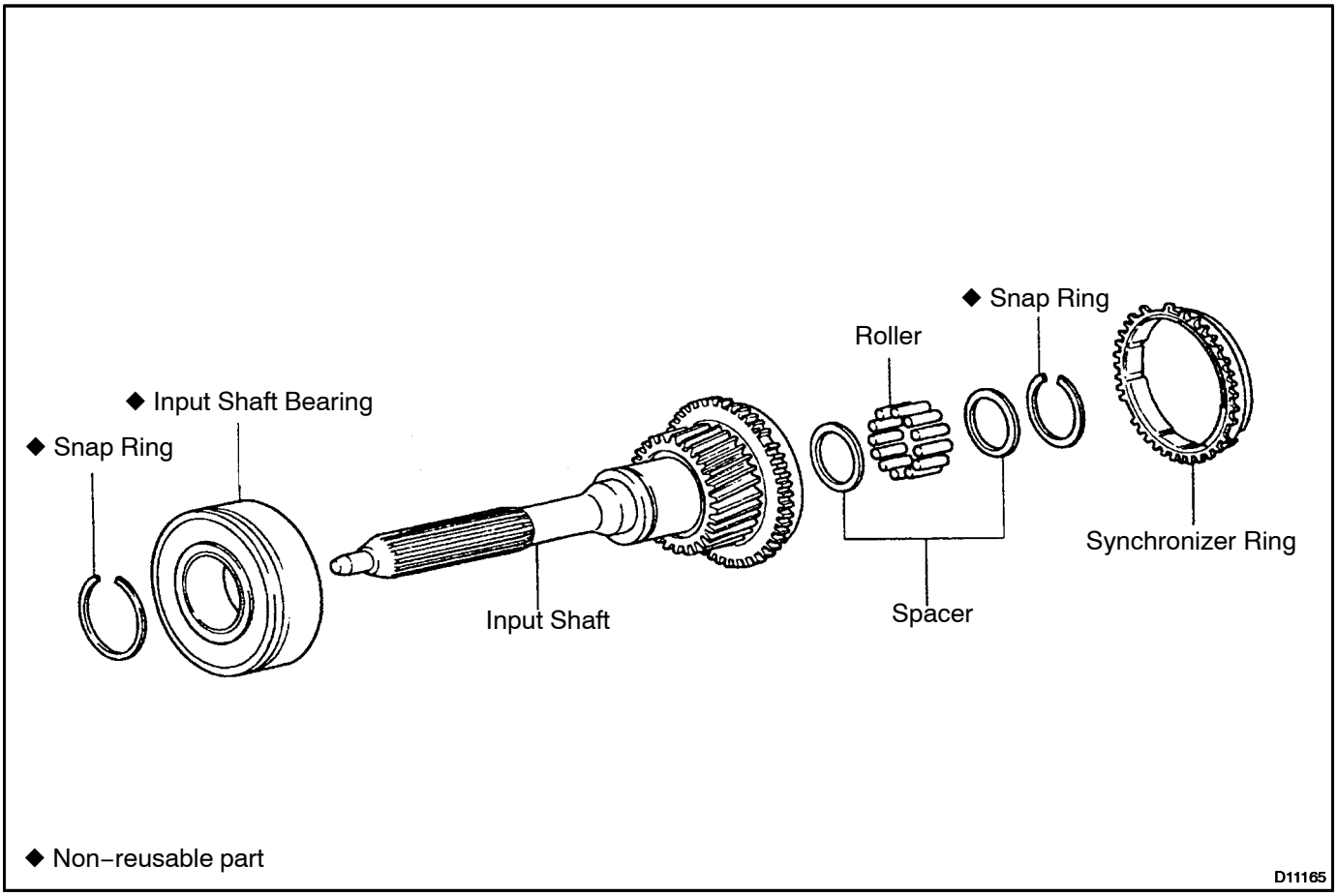
73. INSTALL FILLER PLUG

(a) Install a new gasket and the filler plug.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

INPUT SHAFT ASSY

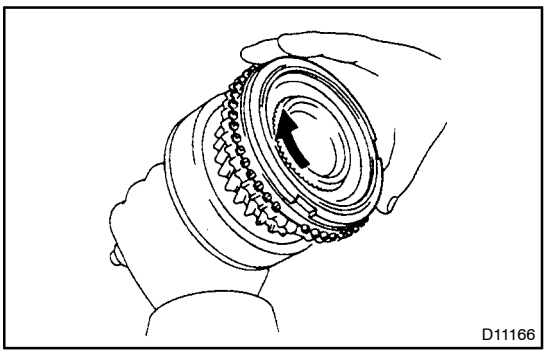
COMPONENTS

410CV–01



410CW–01

OVERHAUL



1. INSPECT SYNCHRONIZER RING

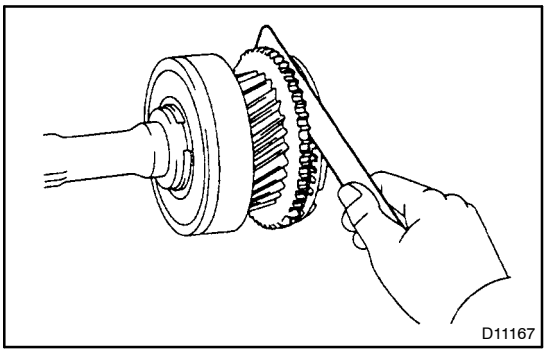
(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Then, lightly rub the synchronizer ring and gear cone together.

HINT:

Wash off the fine lapping compound completely after rubbing.



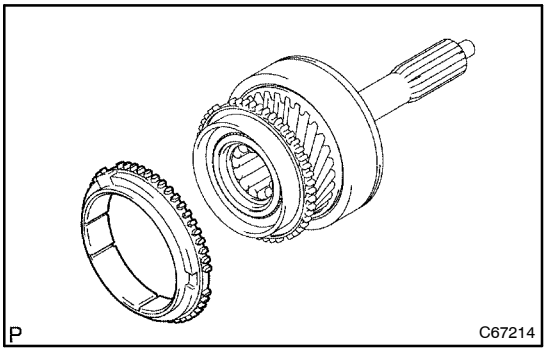
(c) Check the braking effect of the synchronizer ring again.
If it does not lock, replace the synchronizer ring.

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance: 0.8 mm (0.031 in.)

HINT:

- When replacing either the synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear corn.
- Lightly rub the synchronizer ring and gear cone together.
- Wash off the fine lapping compound completely after rubbing.
- When replacing both the synchronizer ring and gear, it is not neccesary to apply any compound or to rub them together.

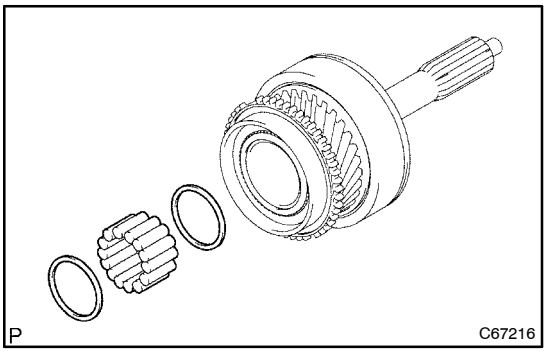
2. REMOVE SYNCHRONIZER RING

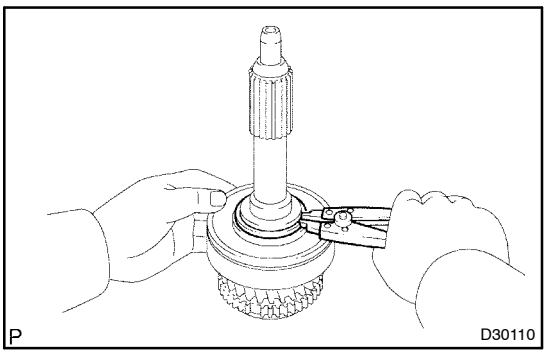


3. REMOVE ROLLER

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

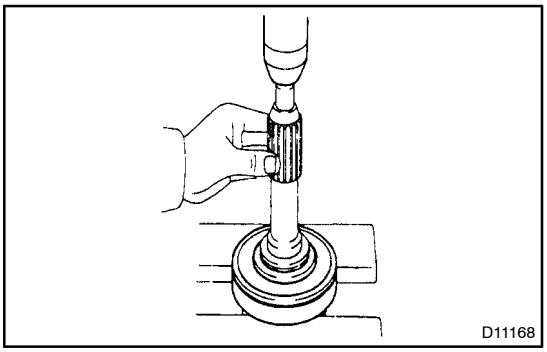
(b) Remove the 12 rollers and 2 spacers.





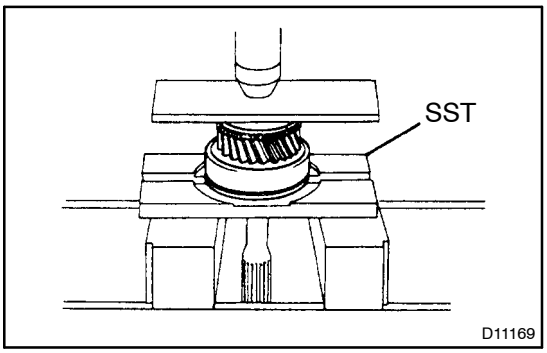
4. REMOVE FRONT BEARING SHAFT SNAP RING

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



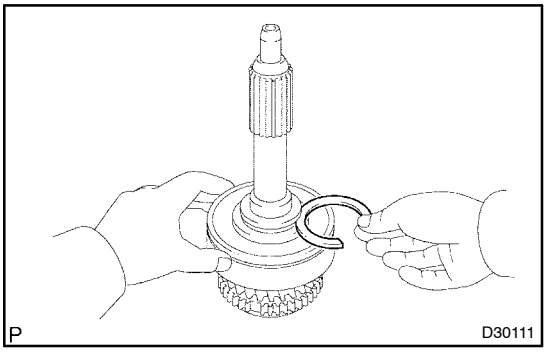
5. REMOVE INPUT SHAFT FRONT BEARING

(a) Using a press, press out the bearing.



6. INSTALL INPUT SHAFT FRONT BEARING

(a) Using SST and a press, press in a new bearing.
SST 09527–30010

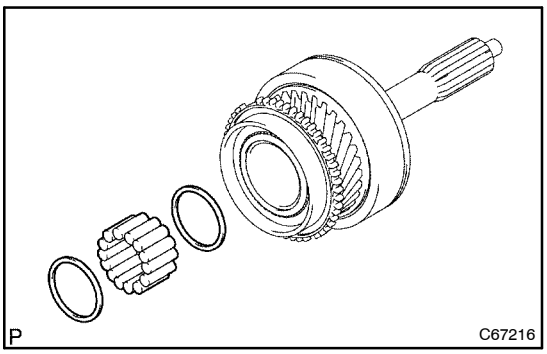


7. INSTALL FRONT BEARING SHAFT SNAP RING

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

Snap ring thickness:

Mark	Thickness mm (in.)
2	2.50 – 2.55 (0.0984 – 0.1004)
3	2.55 – 2.60 (0.1004 – 0.1024)
4	2.60 – 2.65 (0.1024 – 0.1043)
5	2.65 – 2.70 (0.1043 – 0.1063)
6	2.70 – 2.75 (0.1063 – 0.1083)
7	2.75 – 2.80 (0.1083 – 0.1102)



8. INSTALL ROLLER

(a) Install the 12 rollers and 2 spacers.

HINT:

Apply MP grease to the 12 rollers and install them into the input shaft.

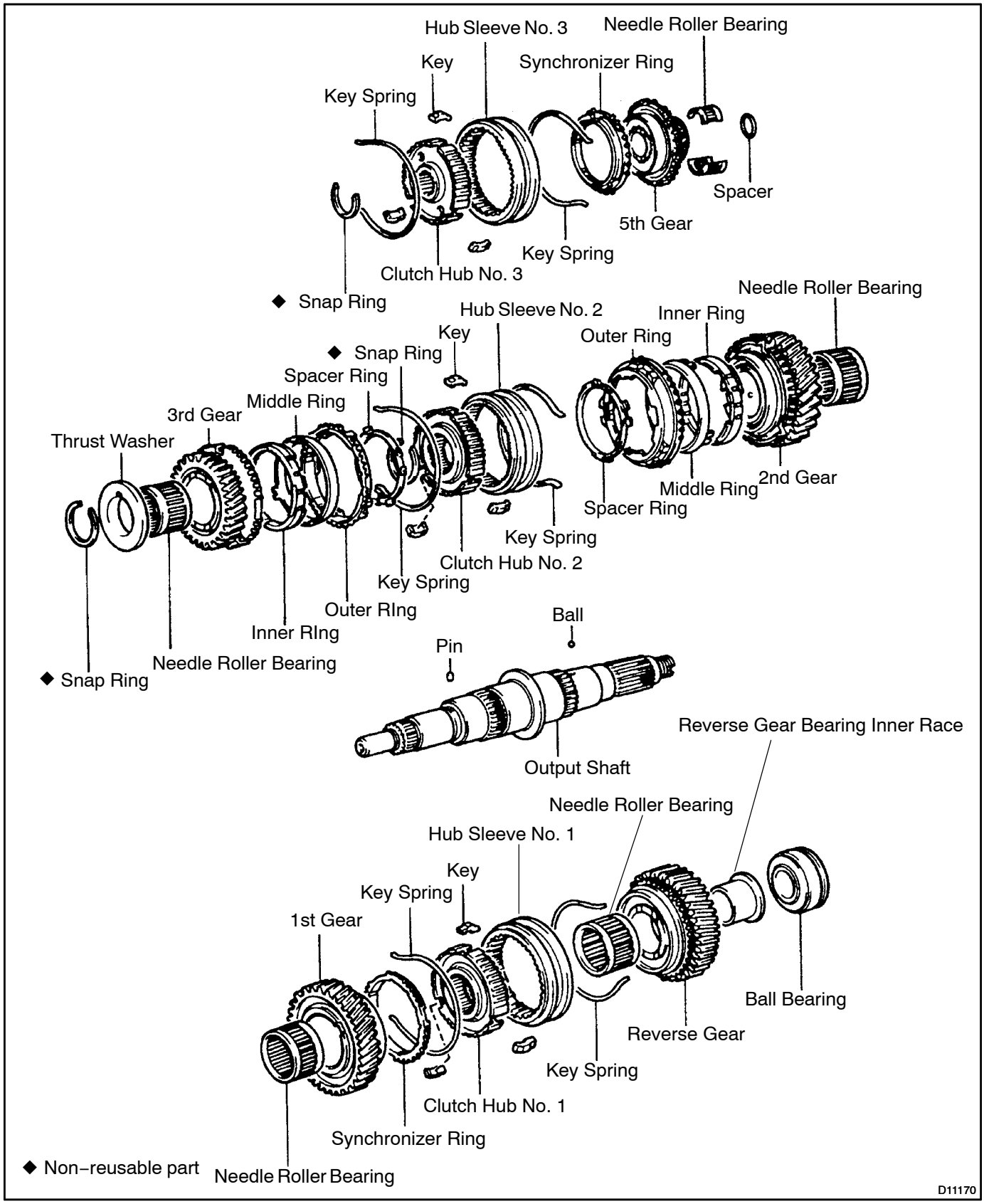
(b) Using snap ring pliers, install the snap ring.

(c) Check that the input shaft needle roller bearing rotates smoothly and that it is not stuck.

OUTPUT SHAFT ASSY

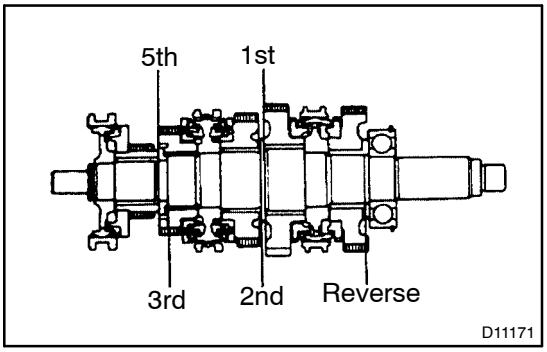
410CX–01

COMPONENTS



410CY–01

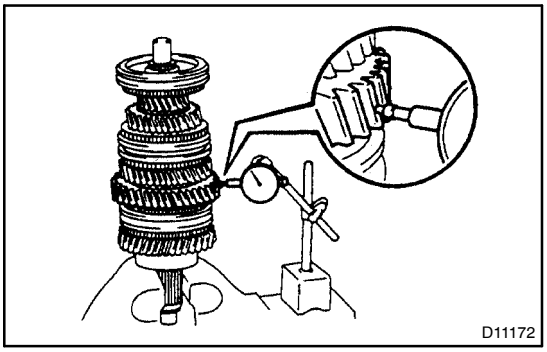
OVERHAUL



1. INSPECT EACH GEAR THRUST CLEARANCE

Standard gear thrust clearance:

Gear	Thrust Clearance mm (in.)
1st	0.1 – 0.35 (0.0039 – 0.0138)
2nd	0.1 – 0.35 (0.0039 – 0.0138)
3rd	0.1 – 0.60 (0.0039 – 0.0236)
5th	0.1 – 0.50 (0.0039 – 0.0197)
Reverse Gear	0.15 – 0.30 (0.0059 – 0.0118)



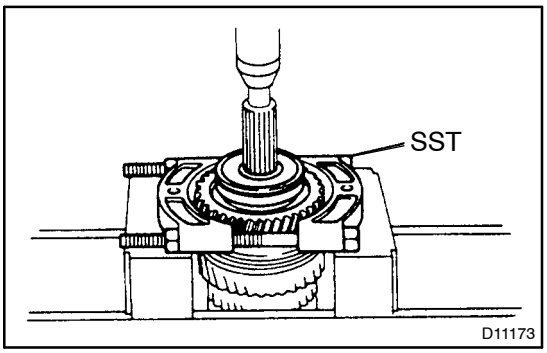
2. INSPECT EACH GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard radial clearance:

Gear	Radial Clearance mm (in.)
1st	0.030 – 0.075 (0.0012 – 0.0030)
2nd and Reverse	0.030 – 0.081 (0.0012 – 0.0032)
3rd and 5th	0.015 – 0.066 (0.0006 – 0.0026)

If necessary, replace the gear, needle roller bearing or shaft.



3. REMOVE REVERSE GEAR

(a) Using SST and a press, press out the reverse gear.
SST 09555–55010

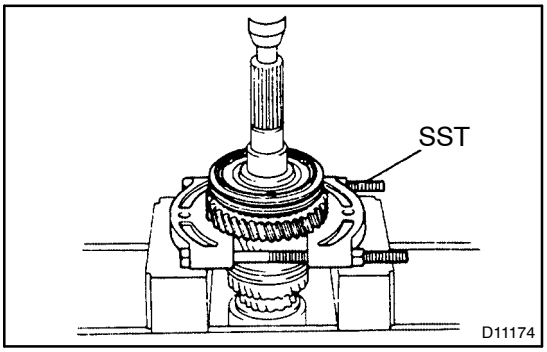
4. REMOVE OUTPUT SHAFT REAR BEARING

5. REMOVE REVERSE GEAR BEARING RACE INNER

(a) Using SST and press, press out the rear bearing, reverse gear and inner race.
SST 09555–55010

(b) Remove the needle roller bearing.

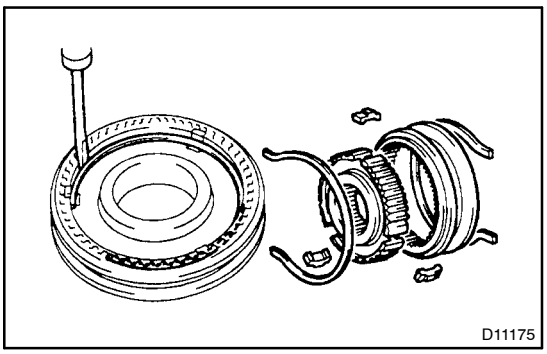
(c) Using a magnetic finger, remove the steel ball from the output shaft.



6. REMOVE 1ST GEAR

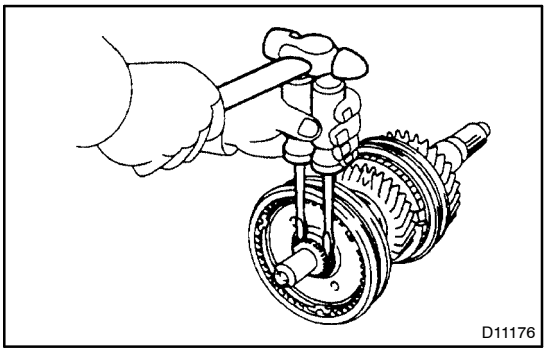
(a) Using SST and press, press out the 1st gear, synchronizer ring and clutch hub No. 1 assy.
SST 09555–55010

(b) Remove the needle roller bearing.



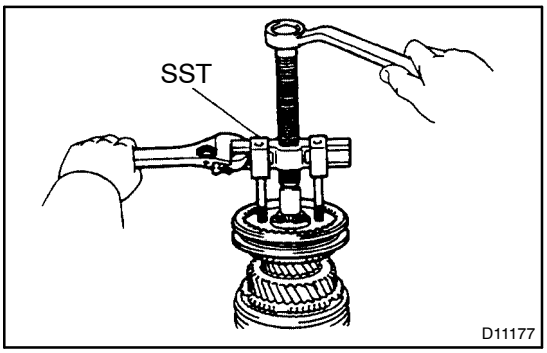
7. REMOVE TRANSMISSION CLUTCH HUB NO.1

(a) Using a screwdriver, remove the 3 shifting keys, 2 springs and clutch hub No.1 from the hub sleeve No.1.



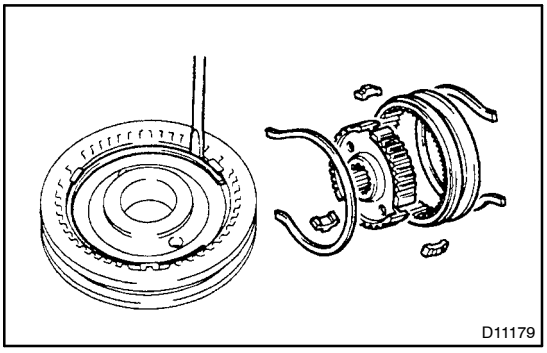
8. REMOVE TRANSMISSION CLUTCH HUB NO.3

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

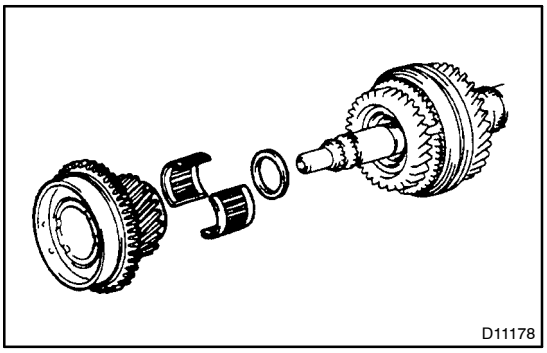


(b) Using SST, remove the clutch hub No. 3 assy.
SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05030, 09957–04010)

(c) Remove the synchronizer ring.

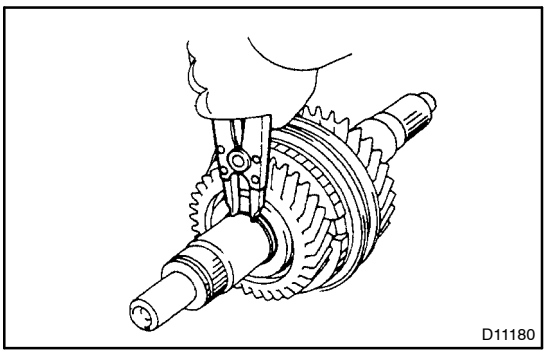


(d) Using a screwdriver, remove the 3 shifting keys and 2 springs and clutch hub No. 3 from the hub sleeve No. 3.



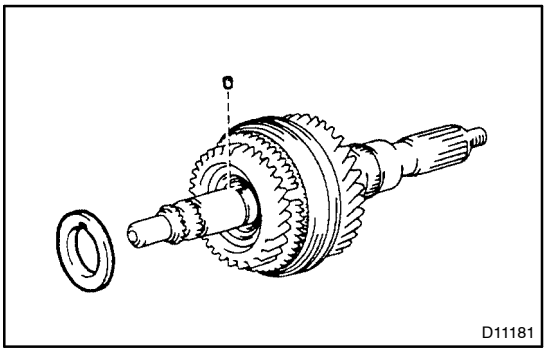
9. REMOVE 5TH GEAR

(a) Remove the 5th gear, needle roller bearing and spacer.

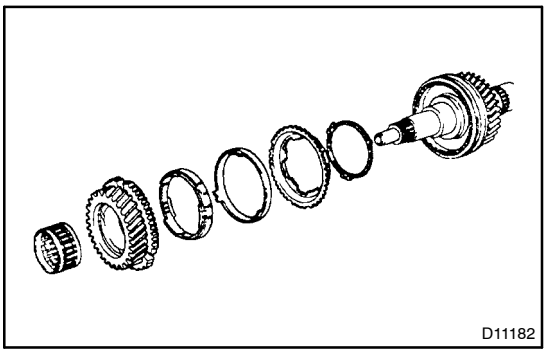


10. REMOVE 3RD GEAR

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



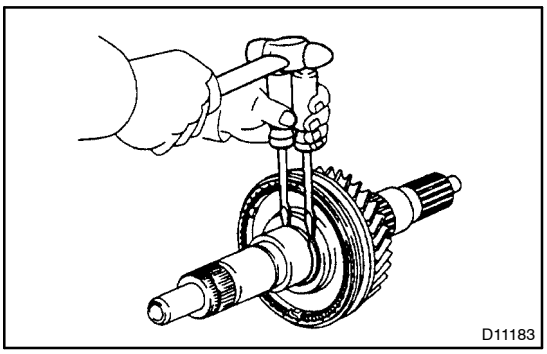
(b) Remove the thrust washer and straight pin.



(c) Remove the 3rd gear, needle roller bearing and synchronizer rings.

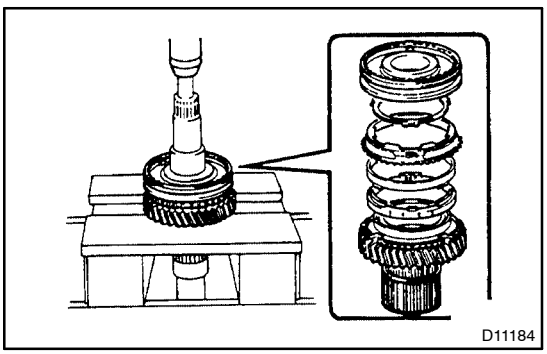
HINT:

When dismantling the manual transmission, make sure the 3rd gear's inner, middle and outer synchronizer rings are tagged together with the spacer ring.



11. REMOVE 2ND GEAR

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.



(b) Using a press, remove the 2nd gear, synchronizer rings and hub sleeve No. 2 assembly.

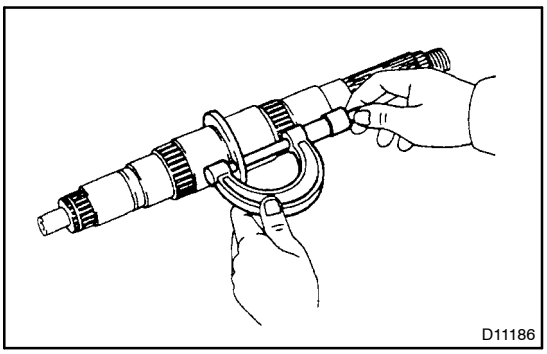
HINT:

When dismantling the manual transmission, make sure the 2nd gear's inner, middle and outer synchronizer rings are tagged together with the spacer ring.

(c) Remove the needle roller bearing.

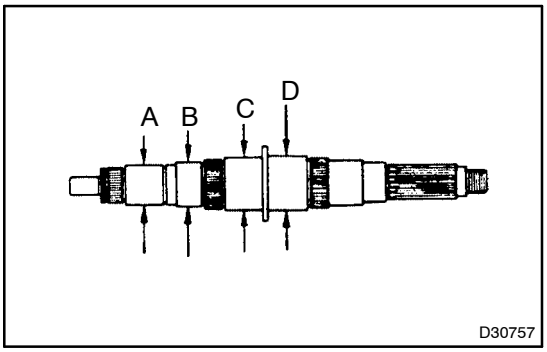
12. REMOVE TRANSMISSION CLUTCH HUB NO.2

(a) Remove the clutch hub, shifting keys and springs from the hub sleeve.


D11186

13. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the flange thickness.
Minimum thickness: 4.85 mm (0.1909 in.)

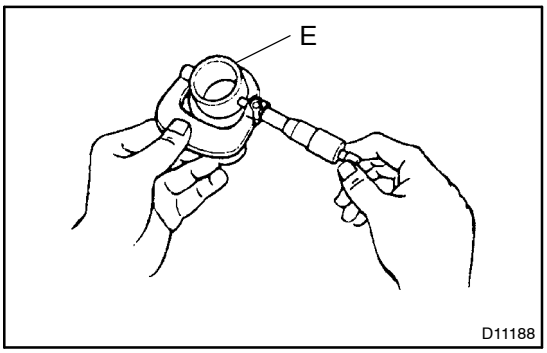


D30757

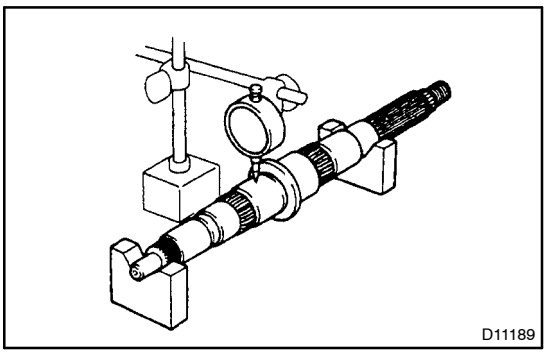
(b) Using a micrometer, measure the journal diameter.
Minimum diameter:

Gear	Diameter mm (in.)
A 5th	36.975 (1.4557)
B 3rd	46.975 (1.8494)
C 2nd	53.975 (2.1250)
D 1st	57.975 (2.2825)
E Reverse	53.975 (2.1250)

If the orinner race diameter is less than the minimum, replace the output shaft.

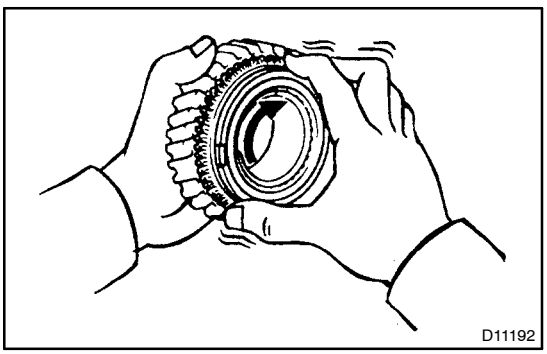


D11188


D11189

(c) Using a dial indicator, check the shaft runout.
Maximum runout: 0.05 mm (0.0020 in.)

If the runout is less than the minimum, replace the output shaft.


D11192

14. INSPECT SYNCHRONIZER RINGS FOR 1ST, 4TH AND 5TH

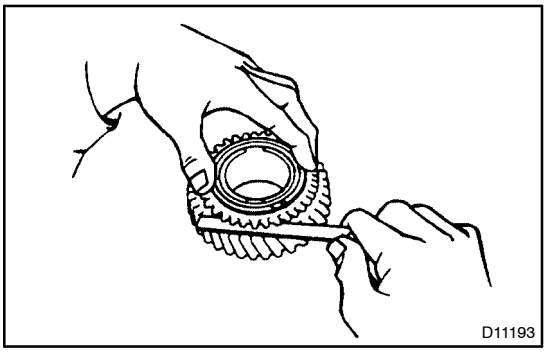
(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring locked.

If the braking effect is insufficient, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

HINT:
Wash off completely the fine lapping compound after robbing.

(c) Check again the braking effect of the syncronizer ring.If it does not lock, replace the synchronizer ring.

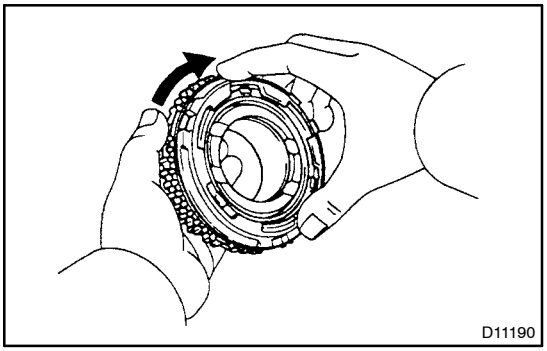


(d) Using filler gauge, measure the clearance between the synchronizer ring back and gear spine end.
Standard clearance:

Gear	Clearance mm (in.)
1st	1.1 – 1.9 (0.043 – 0.075)
4th and 5th	0.8 – 1.6 (0.031 – 0.063)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.
- Wash off completely the fine lapping compound after rubbing.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.



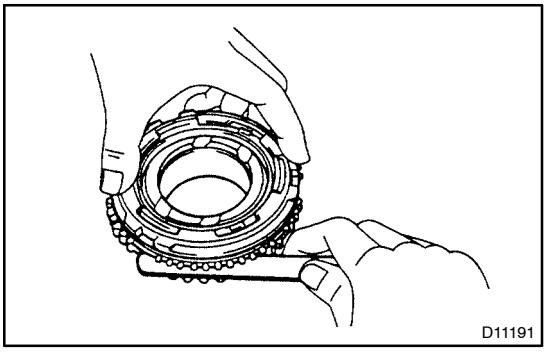
15. INSPECT SYNCHRONIZER RINGS FOR 2ND AND 3RD

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring locks.

If the braking effect is insufficient, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.
HINT:
Wash off completely the fine lapping compound after robbing.

(c) Check the braking effect of the syncronizer ring again. If it does not lock, replace the synchronizer ring.

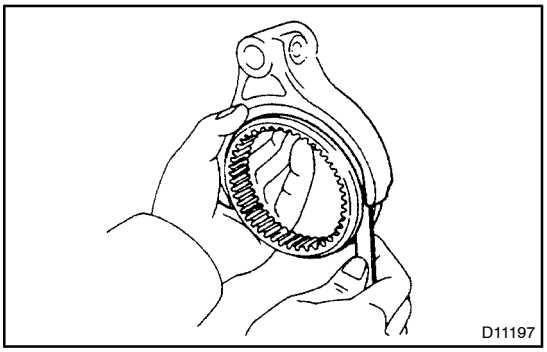


(d) Using filler gauge, measure the clearance between the synchronizer ring back and the gear spline end.
Standard clearance:
0.82 – 1.78 mm (0.0323 – 0.0701 in.)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

- Wash off completely the fine lapping compound after rubbing.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.

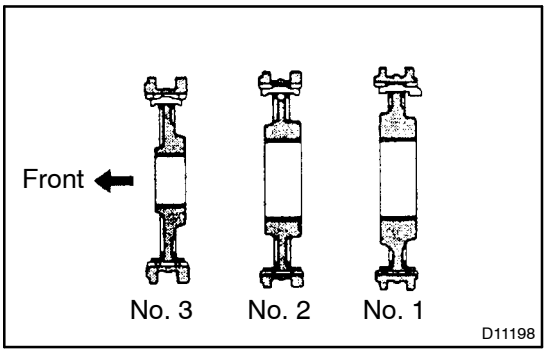


16. INSPECT SHIFT FORK AND HUB SLEEVE CLEARANCE

(a) Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 0.35 mm (0.014 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



17. INSTALL TRANSMISSION CLUTCH HUB NO.1

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

18. INSTALL TRANSMISSION CLUTCH HUB NO.2

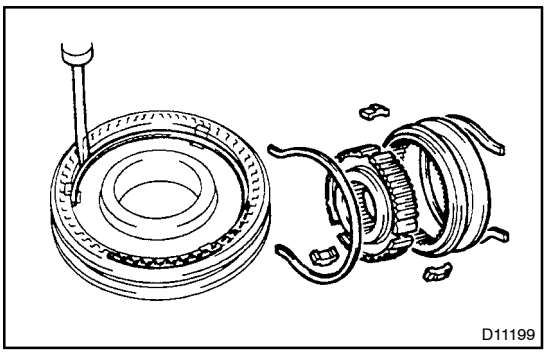
(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

19. INSTALL TRANSMISSION CLUTCH HUB NO.3

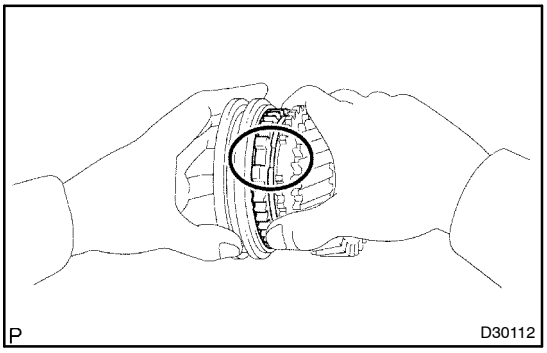
(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.



NOTICE:

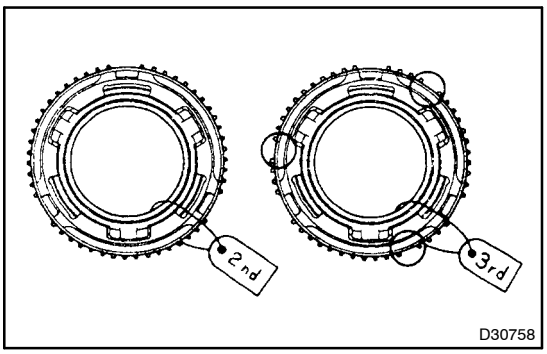
Install the key springs so that their end gaps are not in line.



20. INSTALL 2ND GEAR AND TRANSMISSION HUB SLEEVE NO.2

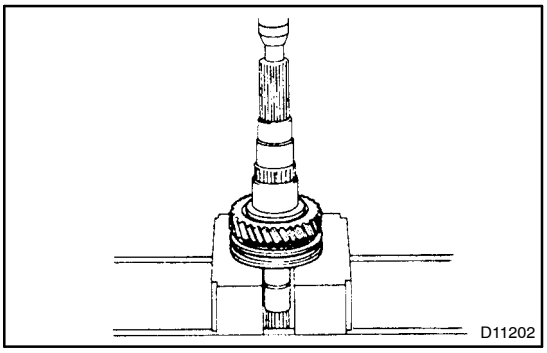
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer rings on the gear and align the ring slots with the shifting keys.

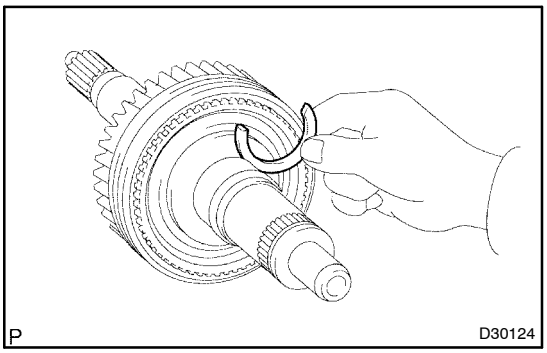


NOTICE:
The outer synchronizer ring for the 3rd gear has 1 tooth less in each group of the driven teeth than the 2nd gear. Make sure that the correct synchronizer ring is installed for the gear.

(c) Install the needle roller bearing in the 2nd gear.



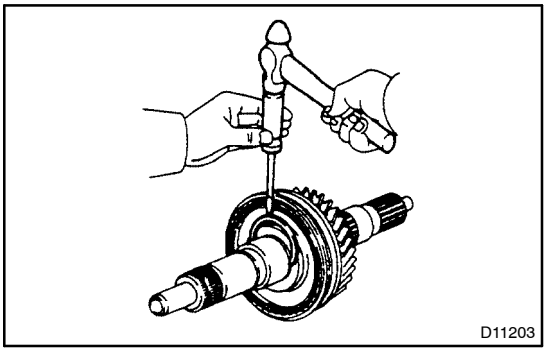
(d) Using a press, install the 2nd gear and No. 2 hub sleeve.



21. INSTALL CLUTCH HUB NO.2 SETTING SHAFT SNAP RING

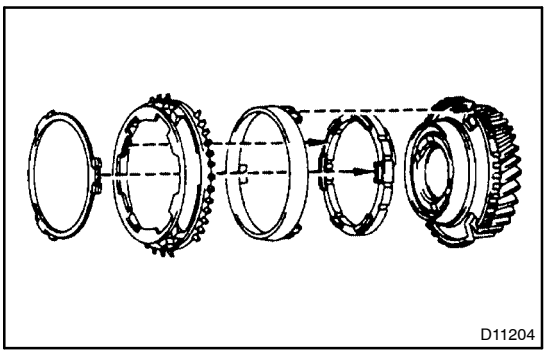
(a) Select a snap ring that allows minimum axial play.

Mark	Thickness mm (in.)
2	1.90 – 1.95 (0.0748 – 0.0768)
3	1.95 – 2.00 (0.0768 – 0.0787)
4	2.00 – 2.05 (0.0787 – 0.0807)
5	2.05 – 2.10 (0.0807 – 0.0827)
6	2.10 – 2.15 (0.0827 – 0.0846)
7	2.15 – 2.20 (0.0846 – 0.0866)



(b) Using a screwdriver and hammer, tap in the snap ring.

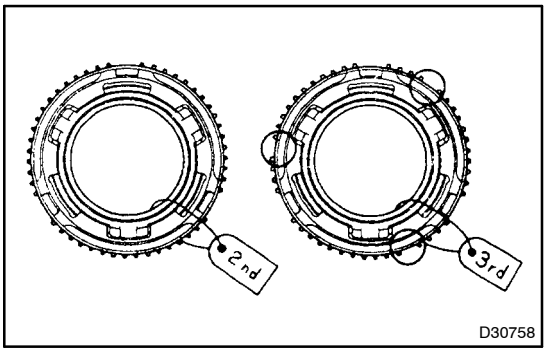
22. INSPECT 2ND GEAR THRUST CLEARANCE (See step 1)


D11204

23. INSTALL 3RD GEAR AND THRUST WASHER

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

(b) Assemble the 3rd gear, synchronizer ring and needle roller bearing.

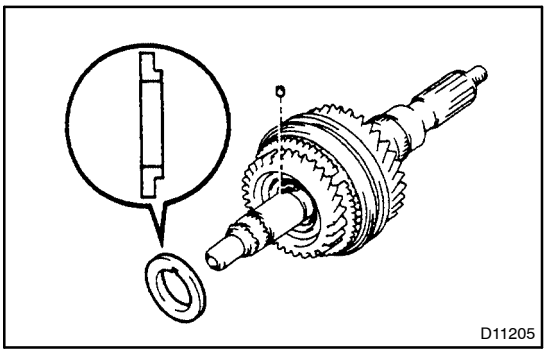


D30758

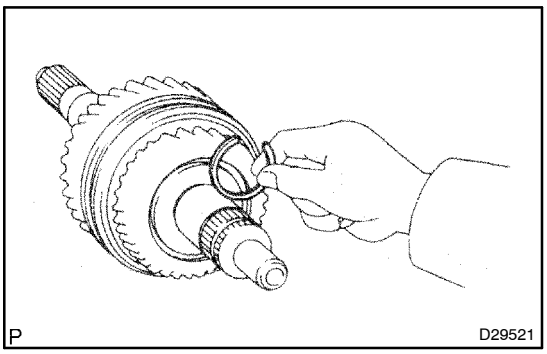
NOTICE:

The outer synchronizer ring for the 3rd gear has 1 tooth less in each group of the driven teeth than the 2nd gear. Make sure that the correct synchronizer ring is installed for the gear.

(c) Install the assembly on the shaft with the synchronizer ring slots aligned with the shifting keys.


D11205

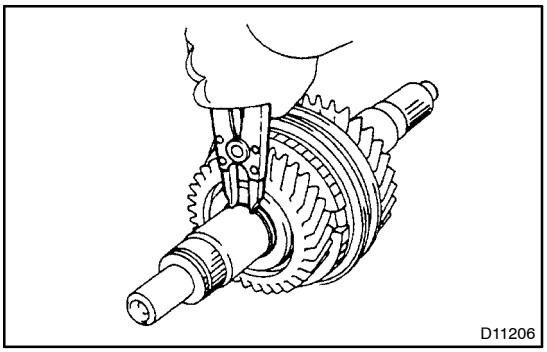
(d) Install the thrust washer onto the output shaft with the straight pin aligned with the thrust washer.


P D29521

24. INSTALL GEAR THRUST WASHER SHAFT SNAP RING

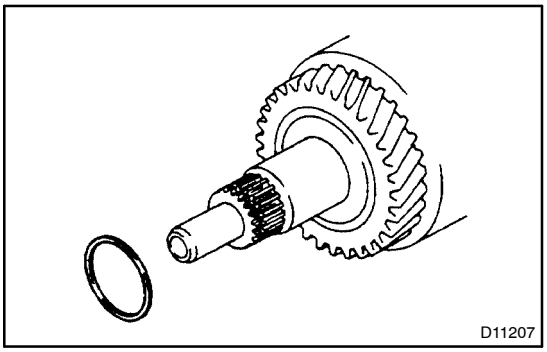
(a) Select a snap ring that allows minimum axial play.

Mark	Thickness mm (in.)
A	2.90 – 2.90 (0.1142 – 0.1161)
B	2.95 – 3.00 (0.1161 – 0.1181)
C	3.00 – 3.05 (0.1181 – 0.1201)
D	3.05 – 3.10 (0.1201 – 0.1220)
F	3.10 – 3.15 (0.1220 – 0.1240)


D11206

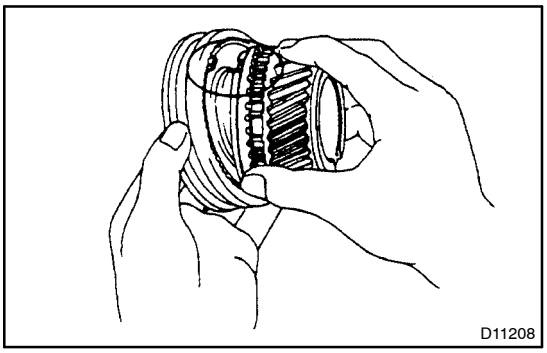
(b) Using snap ring pliers, install the snap ring.

25. INSPECT 3RD GEAR THRUST CLEARANCE (See step 1)

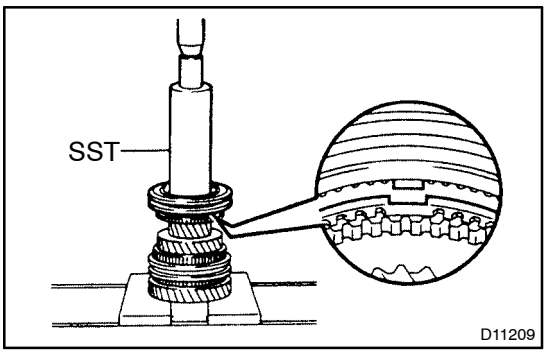


26. INSTALL 5TH GEAR AND TRANSMISSION HUB SLEEVE NO.3

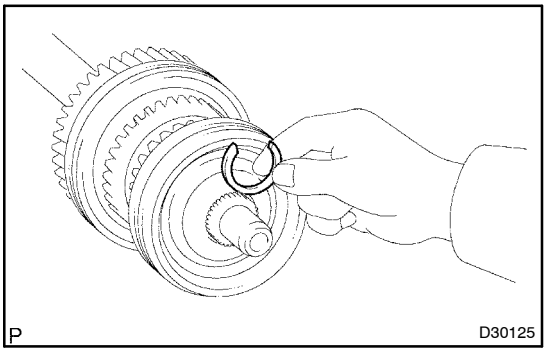
(a) Install the spacer on the output shaft.



(b) Apply gear oil to the needle roller bearing.
(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
(d) Install the needle roller bearing in the 5th gear.



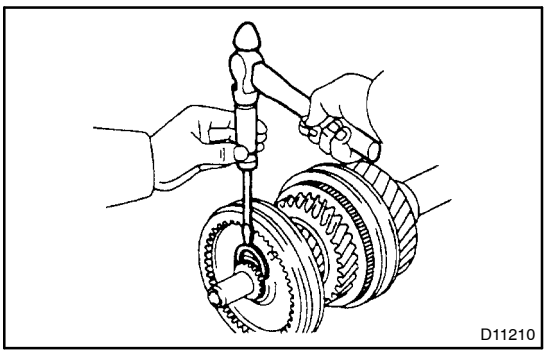
(e) Using SST and a press, press in the 5th gear and hub sleeve No. 3.
SST 09316–60011 (09316–00011)



27. INSTALL TRANSMISSION CLUTCH HUB NO.3 SHAFT SNAP RING

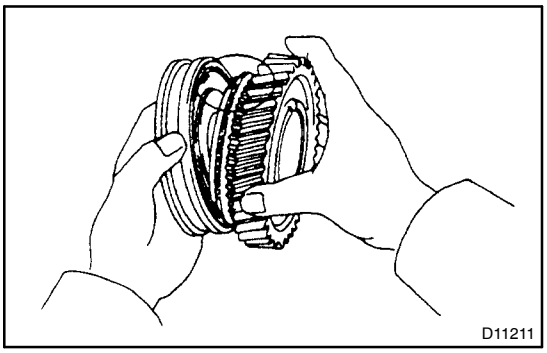
(a) Select a snap ring that allows minimum axial play.

Mark	Thickness mm (in.)
4	1.90 – 1.95 (0.0748 – 0.0768)
5	1.95 – 2.00 (0.0768 – 0.0787)
6	2.00 – 2.05 (0.0787 – 0.0807)
7	2.05 – 2.10 (0.0807 – 0.0827)
8	2.10 – 2.15 (0.0827 – 0.0846)
9	2.15 – 2.20 (0.0846 – 0.0866)



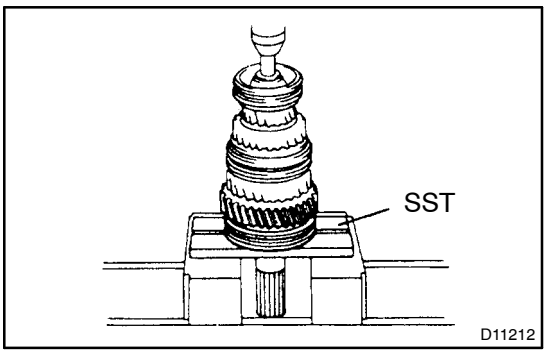
(b) Using a screwdriver and hammer, tap in the snap ring.

28. INSPECT 5TH GEAR THRUST CLEARANCE (See step 1)



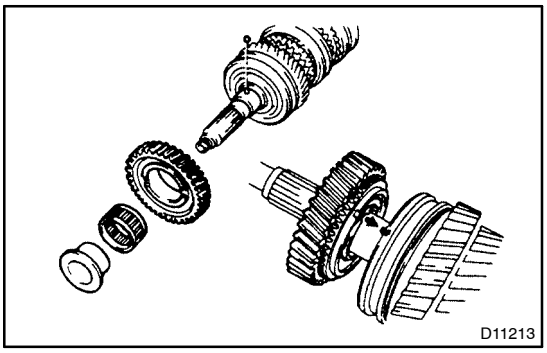
29. INSTALL 1ST GEAR AND TRANSMISSION HUB SLEEVE NO.1

(a) Apply gear oil to the shaft and needle roller bearing.
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
(c) Install the needle roller bearing in the 1st gear.



(d) Using SST and a press, install the 1st gear and hub sleeve No.1.
SST 09527–30010

30. INSPECT 1ST GEAR THRUST CLEARANCE (See step 1)

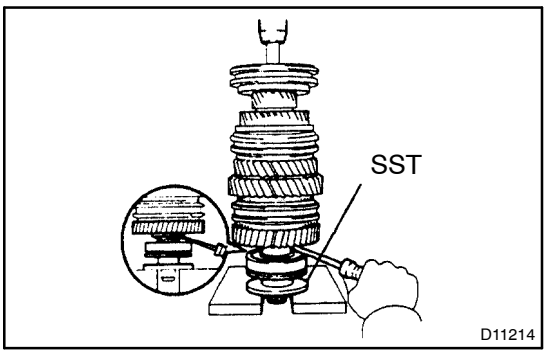


31. INSTALL REVERSE GEAR BEARING

(a) Install the steel ball into the output shaft.
(b) Apply gear oil to the needle roller bearing.
(c) Install the needle roller bearing and the inner race in the reverse gear.

32. INSTALL REVERSE GEAR

(a) Install the reverse gear on the shaft.



33. INSTALL OUTPUT SHAFT REAR BEARING

(a) Using SST and a press, press in the bearing on the shaft with the outer race snap ring groove toward the rear.
SST 09316–60011 (09316–00041)

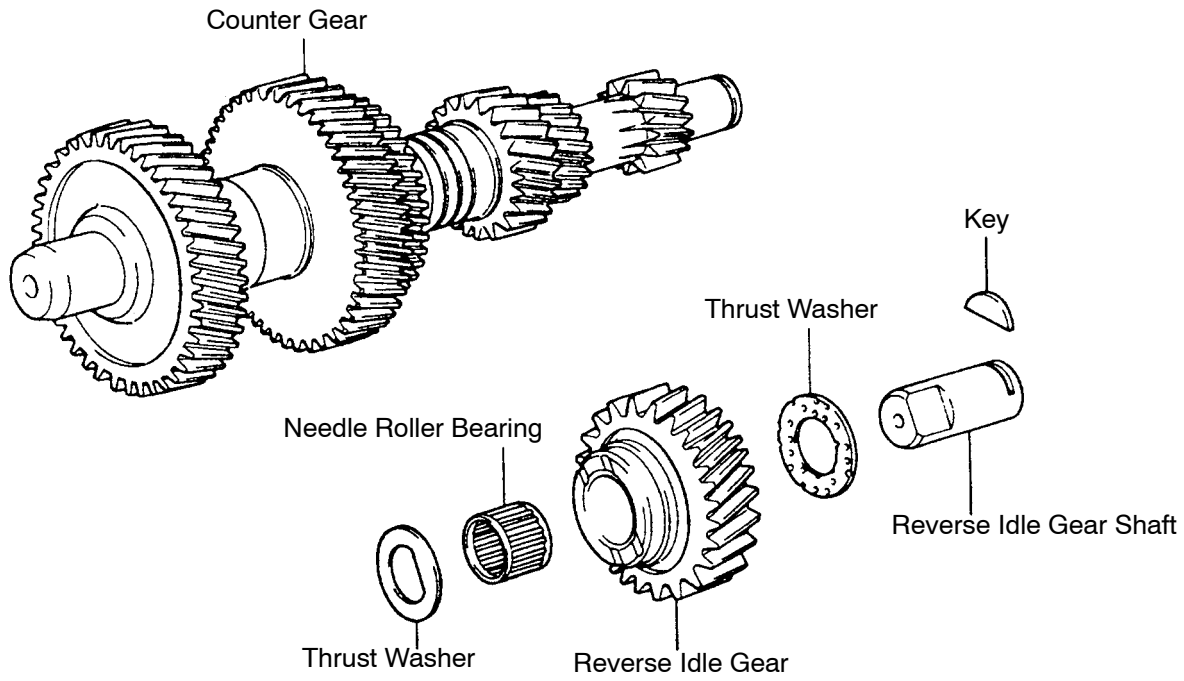
HINT:
Using a screwdriver, hold the reverse gear and inner race to prevent it from falling.

34. INSPECT REVERSE GEAR THRUST CLEARANCE (See step 1)

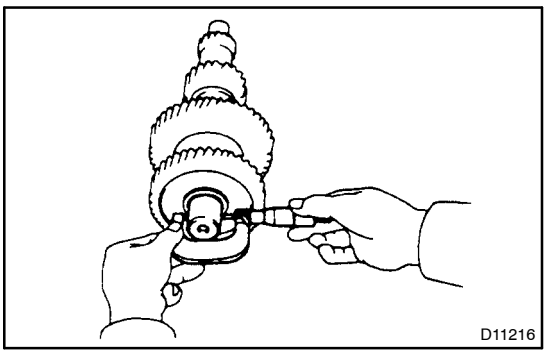
COUNTER GEAR ASSY

410CZ-01

COMPONENTS



410D0–01

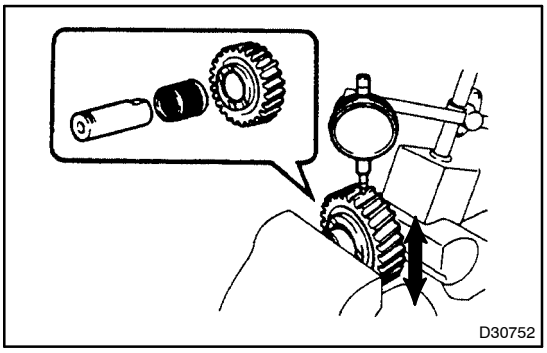

D11216

OVERHAUL

1. INSPECT COUNTER GEAR

(a) Using a micrometer, measure the outer diameter of the counter gear journal.

Minimum diameter: 36.957 mm (1.4550 in.)


D30752

2. INSPECT REVERSE IDLER GEAR SUB–ASSY

(a) Using a dial indicator, measure the reverse idler gear oil clearance.

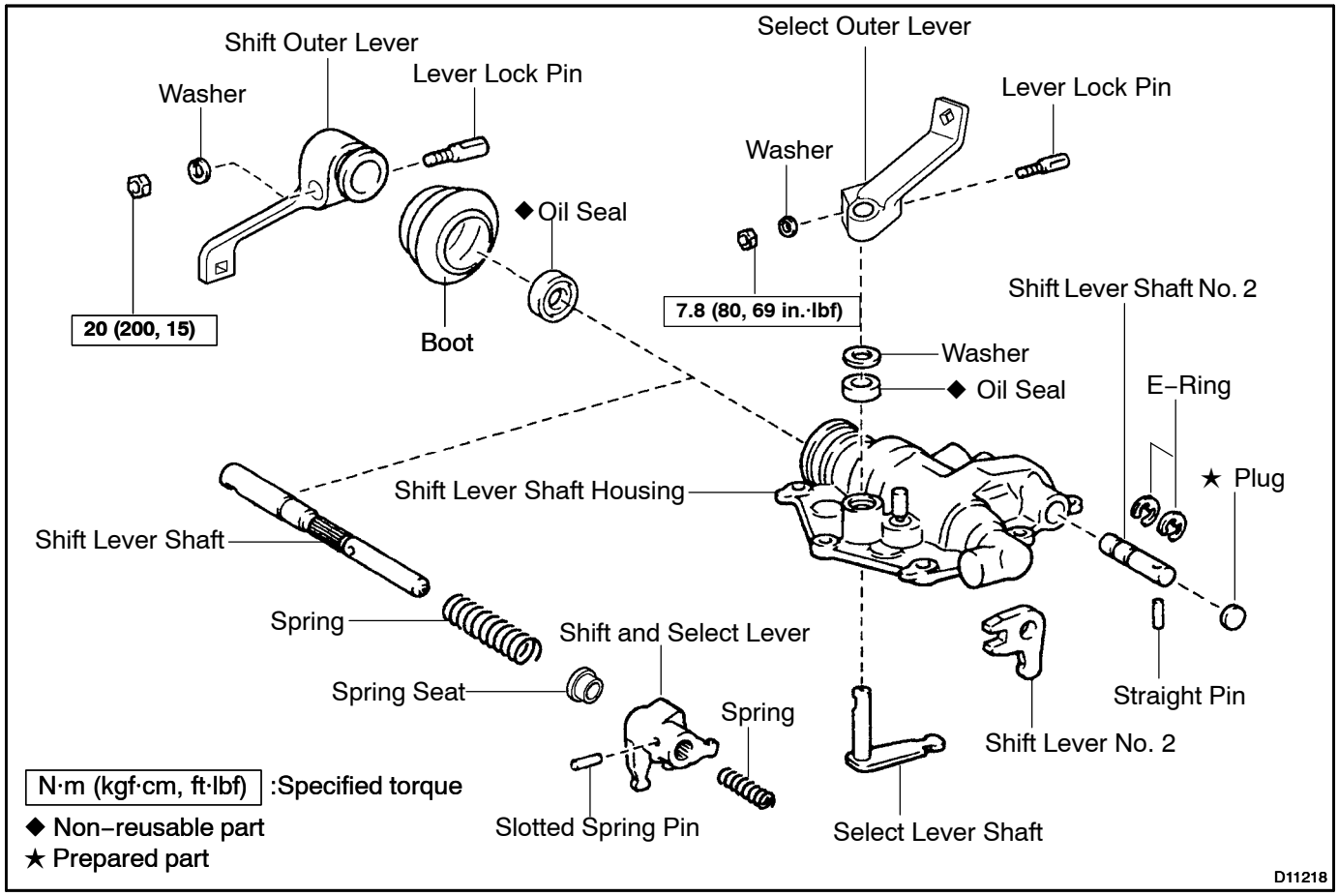
Standard clearance:
0.015 – 0.059 mm (0.0006 – 0.0026 in.)

If necessary, replace the gear or shaft.

SHIFT LEVER SHAFT HOUSING ASSY

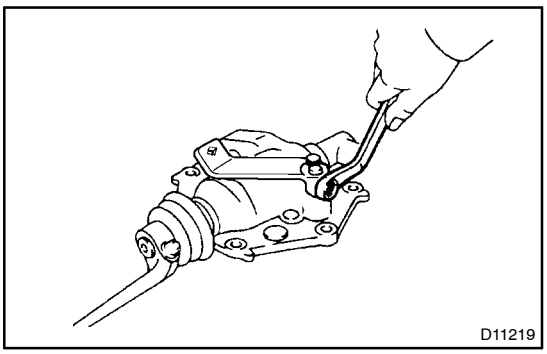
410D1–01

COMPONENTS



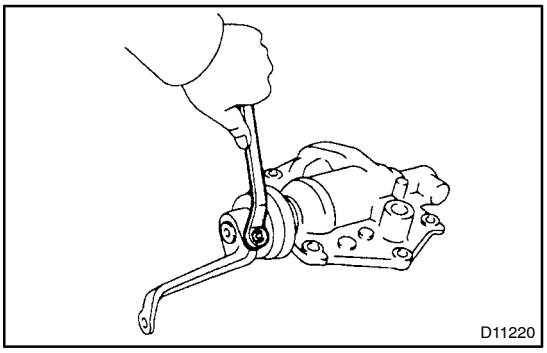
410D2–01

OVERHAUL



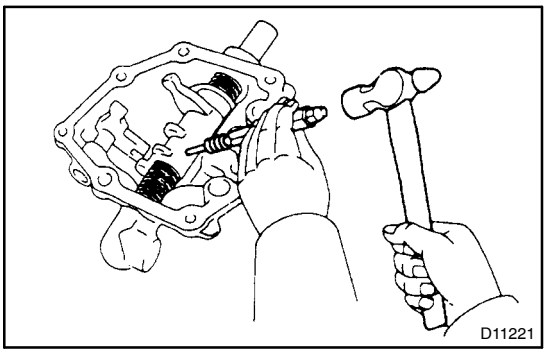
1. REMOVE SELECT OUTER LEVER AND SELECT LEVER SHAFT

(a) Remove the nut and washer.
(b) Using a brass bar and a hammer, tap out the lever lock pin.
(c) Remove the select outer lever, plate washer and lever shaft from the shift lever housing.

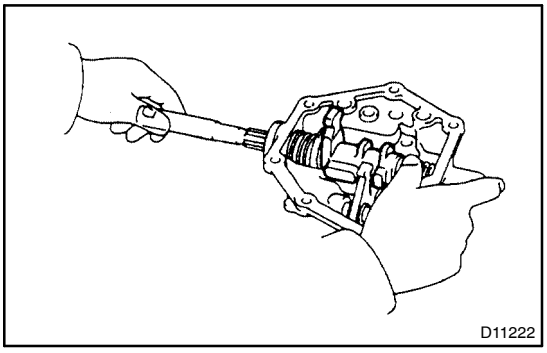


2. REMOVE SHIFT OUTER LEVER AND SHIFT LEVER SHAFT

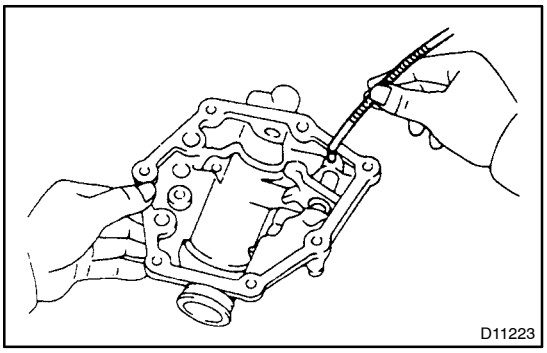
(a) Remove the nut and washer.
(b) Using a brass bar and a hammer, tap out the lever lock pin.
(c) Pull out the shift outer lever and boot from the shift lever shaft.



(d) Using a pin punch and hammer, tap out the slotted spring pin.

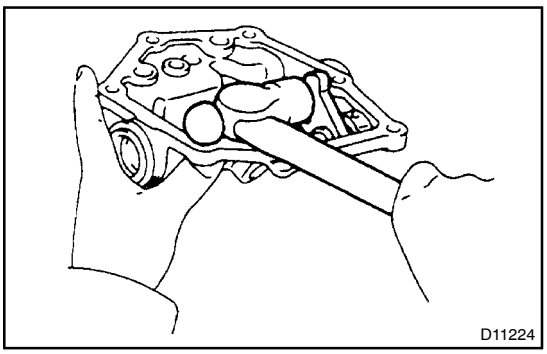


(e) Remove the shift lever shaft.
(f) Remove the shift and select lever, 2 compression springs and seat.

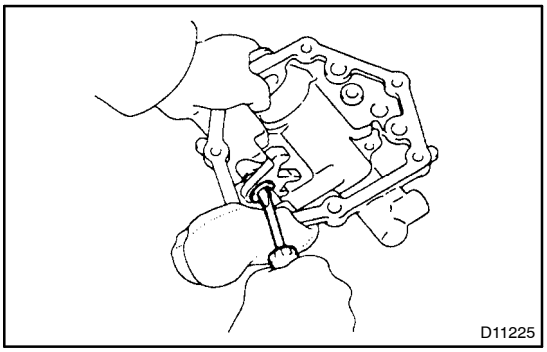


3. REMOVE SHIFT LEVER INNER NO.2 AND SHIFT LEVER SHAFT NO.2

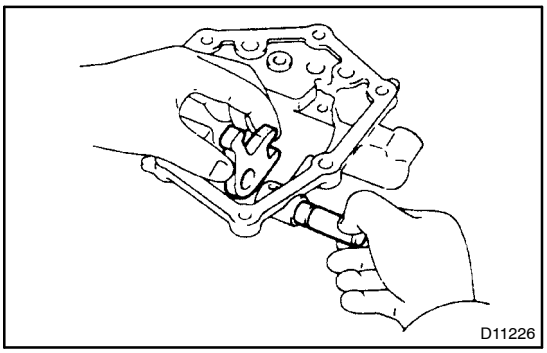
(a) Using a magnetic finger, remove the straight pin.



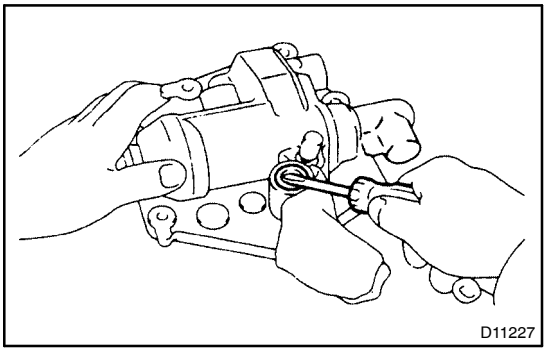
(b) Using a plastic–faced hammer, tap the shift lever No. 2 and remove the tight plug.



(c) Remove the 2 E–rings.

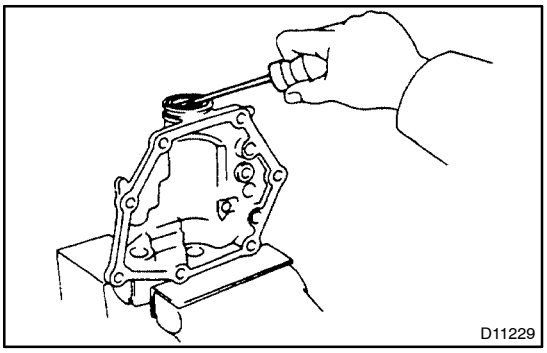


(d) Remove the shift lever No. 2 and shift lever shaft No. 2.



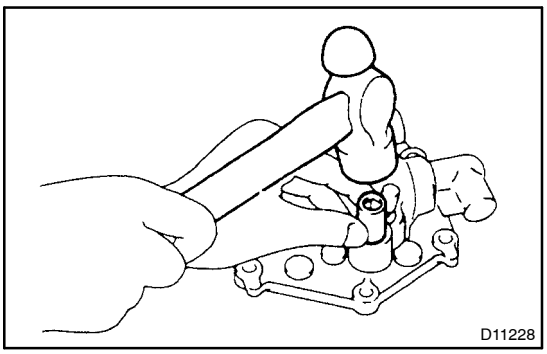
4. REMOVE SELECT OUTER LEVER OIL SEAL

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



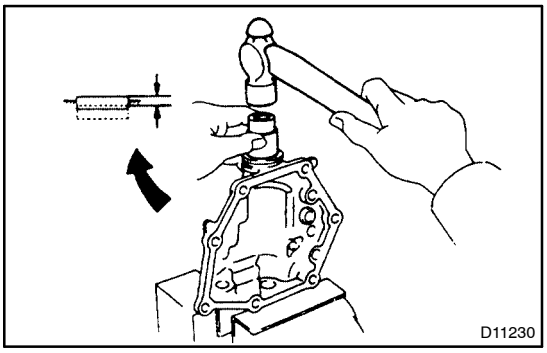
5. REMOVE SHIFT LEVER SHAFT HOUSING ASSY

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



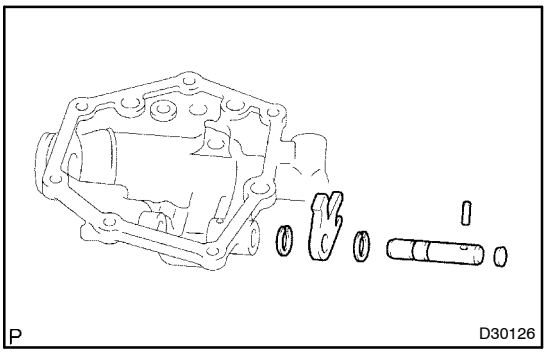
6. INSTALL SHIFT OUTER LEVER OIL SEAL

(a) Using a 14 mm socket wrench and hammer, tap in a new oil seal.
Tap in depth: 0 – 1.0 mm (0 – 0.039 in.)



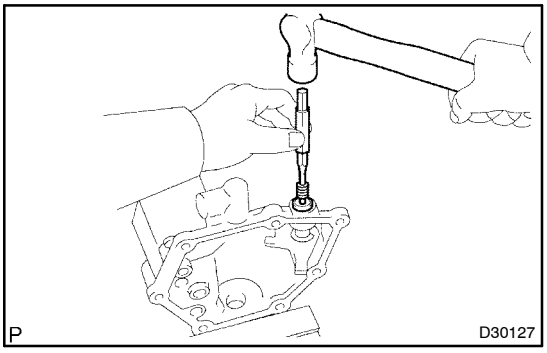
7. INSTALL SELECT OUTER LEVER OIL SEAL

(a) Using a 24 mm socket wrench and hammer, tap in a new oil seal.
Drive–in depth: –0.2 – 0.6 mm (–0.008 – 0.024 in.)

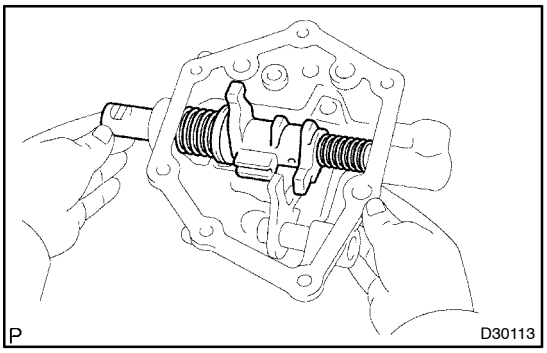


8. INSTALL SHIFT LEVER SHAFT NO.2

(a) Install the shift lever No. 2 and shaft lever shaft No.2.
(b) Apply MP grease to the straight pin.
(c) Align the pin hole of the shaft and housing, and install the straight pin.
(d) Install the 2 E–rings.

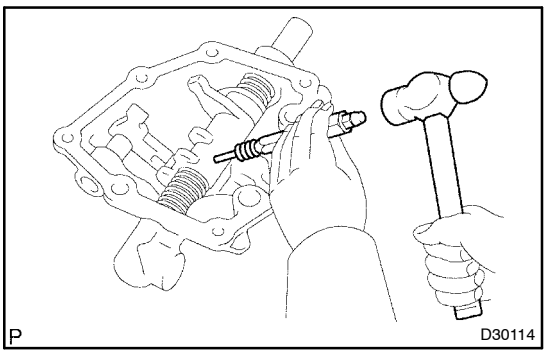


(e) Apply seal packing to the tight plug.
Seal packing:
Part No. 08833 – 00070, THREE BOND 1324 or equivalent
(f) Install the plug to the housing.
Drive–in depth: 1.7 – 2.5 mm (0.067 – 0.098 in.)

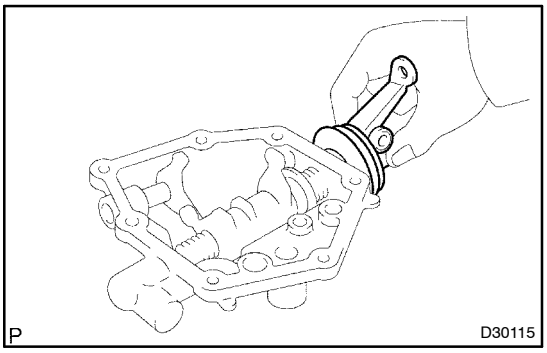


9. INSTALL SHIFT LEVER SHAFT

(a) Install the shift and select lever, 2 compression springs and seat.
(b) Install the shift lever shaft.

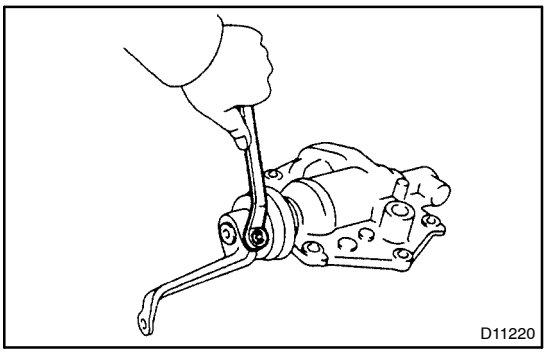


(c) Using a pin punch and hammer, tap in the slotted spring pin.

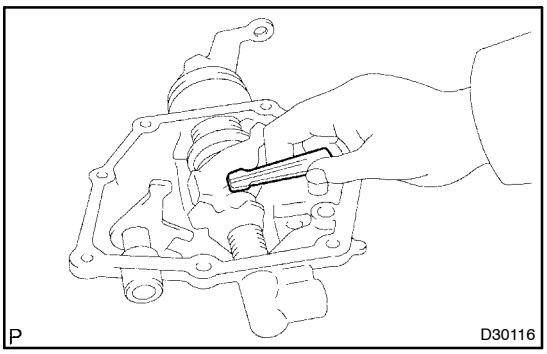


10. INSTALL SHIFT OUTER LEVER NO.1

(a) Install the shift outer lever and boot to the housing.

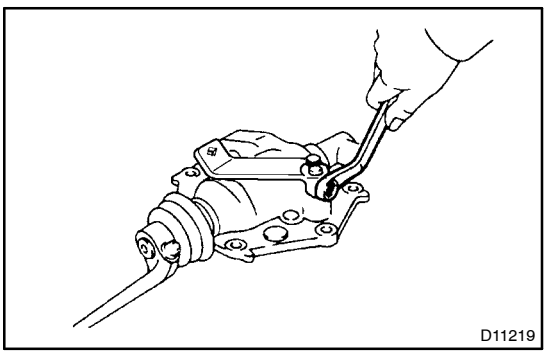


(b) Install the lock pin and nut.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)



11. INSTALL SELECT OUTER LEVER

(a) Install the select lever shaft.



(b) Install the plate washer and select outer lever.
(c) Install the lock pin and nut. Torque the nut.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

ALPHABETICAL INDEX

A

C

G

H

I

M

O

P

R

S

T