WARNING

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

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

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

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

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

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

Mazda MX-5 Workshop Manual Supplement

FOREWORD

This manual contains the changes and/or additions relating to on-vehicle service and diagnosis procedures for the Mazda MX-5.

For proper repair and maintenance, a thorough familiarization with this manual is important, and it should always be kept in a handy place for quick and easy reference.

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

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

Mazda Motor Corporation
HIROSHIMA, JAPAN

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN), and related materials shown on the following page.

CONTENTS

There are explanations given only for the sections marked with shadow (■).

PRINTED IN JAPAN, JAN. 1999 Ⓐ
1656-10-99A

VEHICLE IDENTIFICATION NUMBERS (VIN)

JMZ NB18P60# 100001 —

RELATED MATERIALS

MX-5 Training Manual (Australia, Europe)	3165-10-89I
MX-5 Workshop Manual (Europe)	1221-10-89I
MX-5 Workshop Manual Supplement (Europe)	1246-10-90G
MX-5 Workshop Manual Supplement (Europe)	1372-10-93I
MX-5 Workshop Manual Supplement (Europe)	1451-10-94L
MX-5 Workshop Manual Supplement (Europe)	1509-10-95I
MX-5 Workshop Manual Supplement	1608-10-98A
Manual Transmission Workshop Manual Y16M-D ..	1657-10-99A
Mazda 323 Mazda 626/MX-6 Mazda MX-3 Mazda MX-5 XEDOS 9 ON-BOARD DIAGNOSIS SERVICE MANUAL	1529-10-95K
MX-5 Wiring Diagram (Europe (L.H.D.), General (L.H.D.))	5421-10-98A
MX-5 Wiring Diagram (UK)	5422-10-98A

GENERAL INFORMATION

HOW TO USE THIS MANUAL

RANGE OF TOPICS

- This manual indicates only changes/additions, as it is the supplemental for the related materials. Therefore it may not contain the necessary referential service procedures to operate the services indicated in this manual. Only the referential section, e.g. (Refer to section B), is indicated, so refer to the appropriate section of the related materials for details.

ABBREVIATIONS

SST	Special service tool

MANUAL TRANSMISSION (Y16M–D)

FEATURES

SERVICE

J2

OUTLINE

OUTLINE OF CONSTRUCTION

- Due to the adoption of a direct-controlled shift, fully synchronized, six-speed Y16M–D manual transmission, the following have been improved.

Improved drivability, fuel economy, and marketability
Improved operability

- Adoption of a triple synchronizer mechanism
- Adoption of a ball-type synchronizer mechanism
- Adoption of a bushing in the control rod and shift fork

Improved reliability

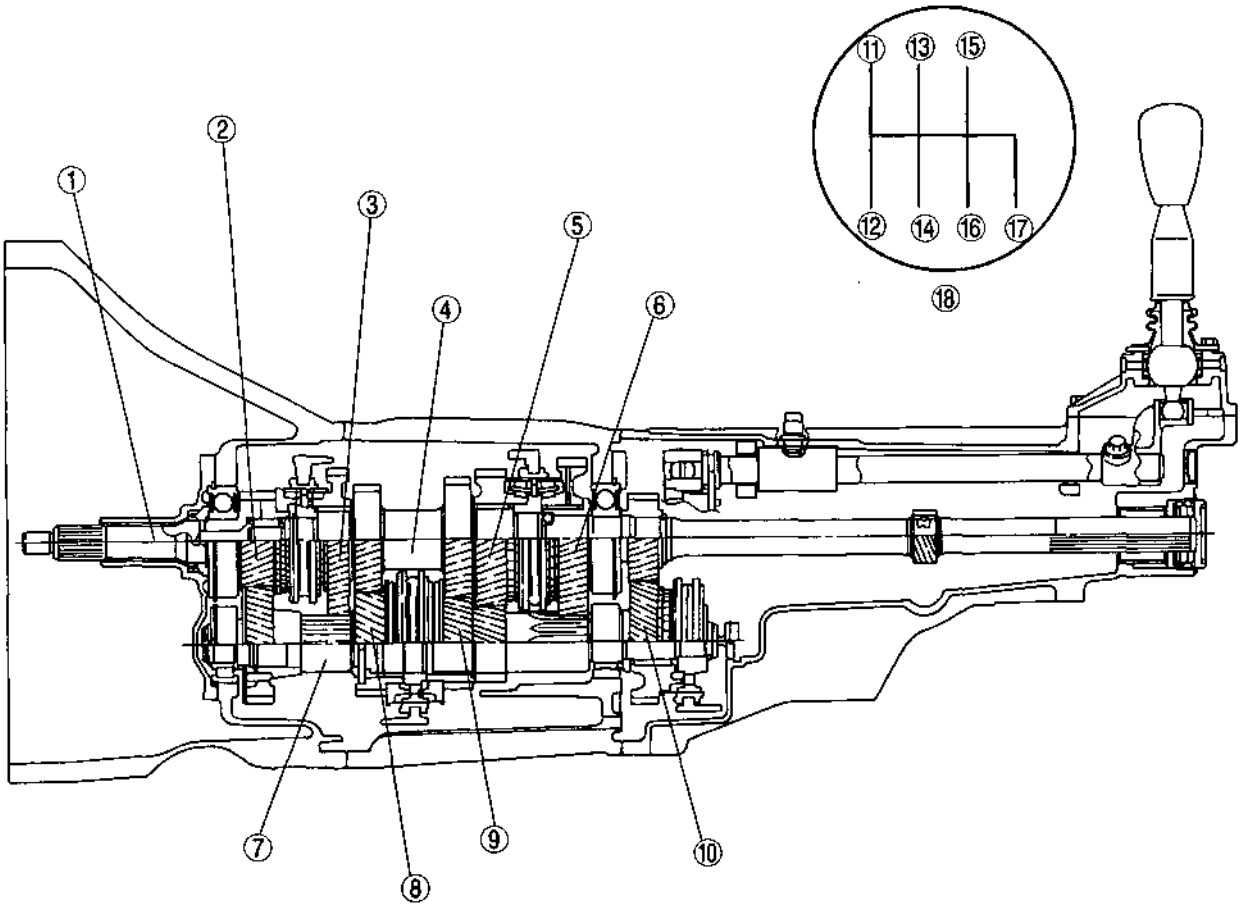
- Adopted a shift interlock mechanism
- Adopted a reverse lockout mechanism

SPECIFICATIONS

Item			Engine
			BP
Transmission type			Y16M-D
Transmission control			Floor shift
Operation system			Direct
Shift assist			Synchromesh
Gear ratio	1st		3.760
	2nd		2.269
	3rd		1.645
	4th		1.257
	5th		1.000
	6th		0.843
	Reverse		3.564
Oil	Grade		API Service GL-4 or GL-5
	Viscosity	All season	SAE 75 W—90
		Above 10 °C {50 °F}	SAE 80 W—90
	Capacity	(L {US qt, Imp qt})	1.75 {1.85, 1.54}

▭ Indicates new specification.

CROSS-SECTIONAL VIEW



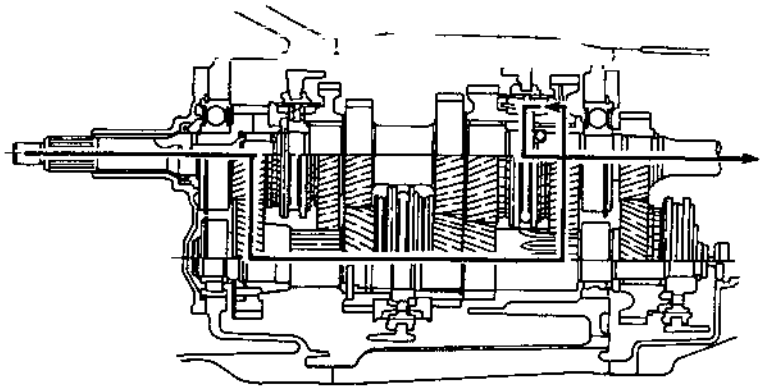
1	Inputshaft
2	Main drive gear (5th gear)
3	Reverse gear
4	Outputshaft
5	2nd gear
6	1st gear
7	Countershaft
8	4th gear
9	3rd gear

10	6th gear
11	1st
12	2nd
13	3rd
14	4th
15	5th
16	6th
17	Reverse
18	Shift pattern

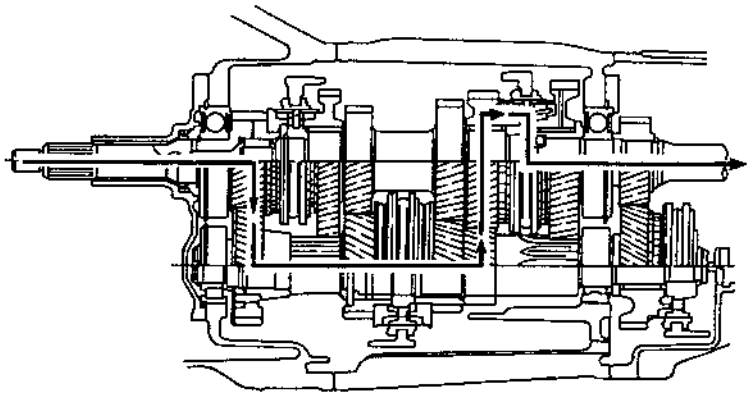
MANUAL TRANSMISSION

POWER FLOW

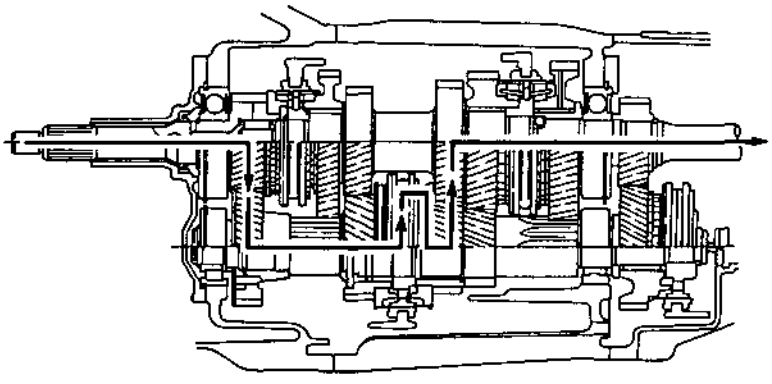
1st



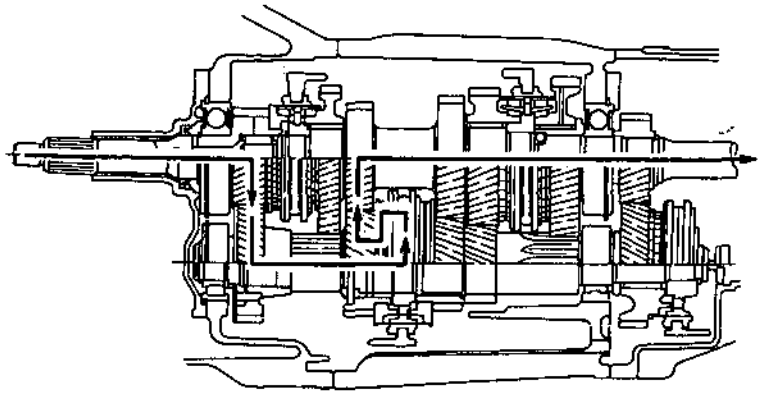
2nd



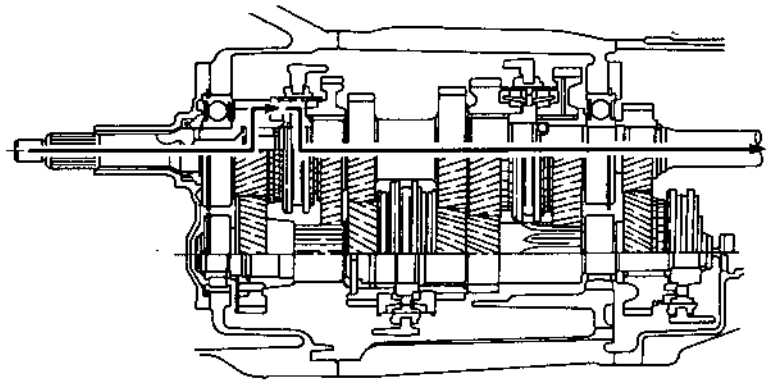
3rd



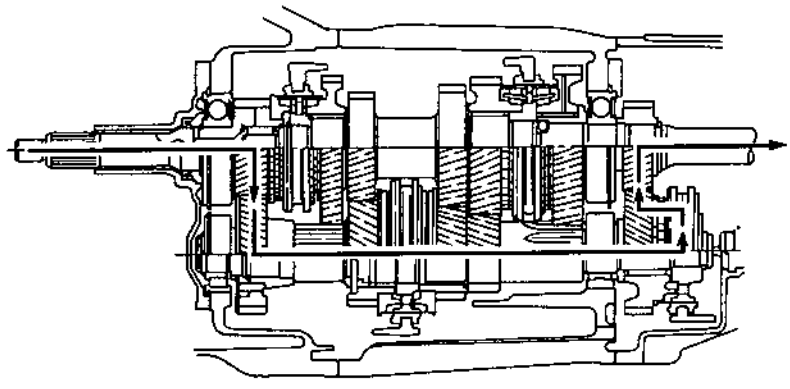
4th



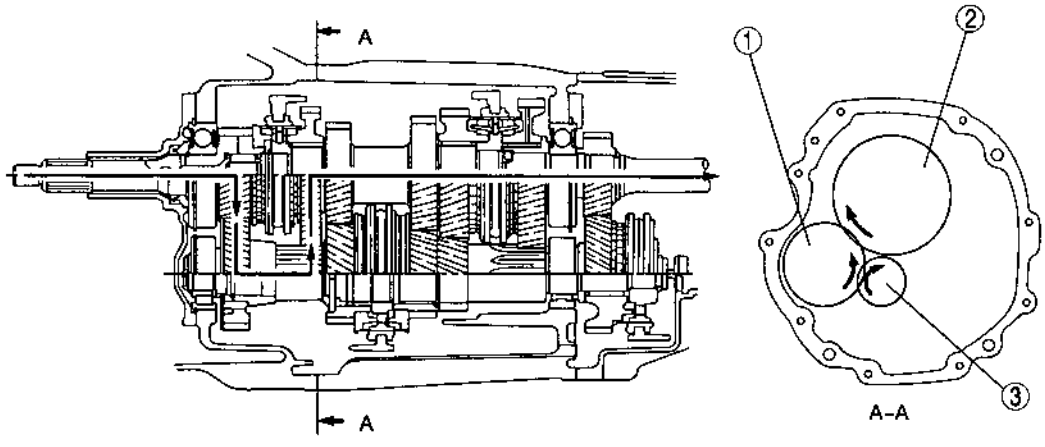
5th



6th



Reverse



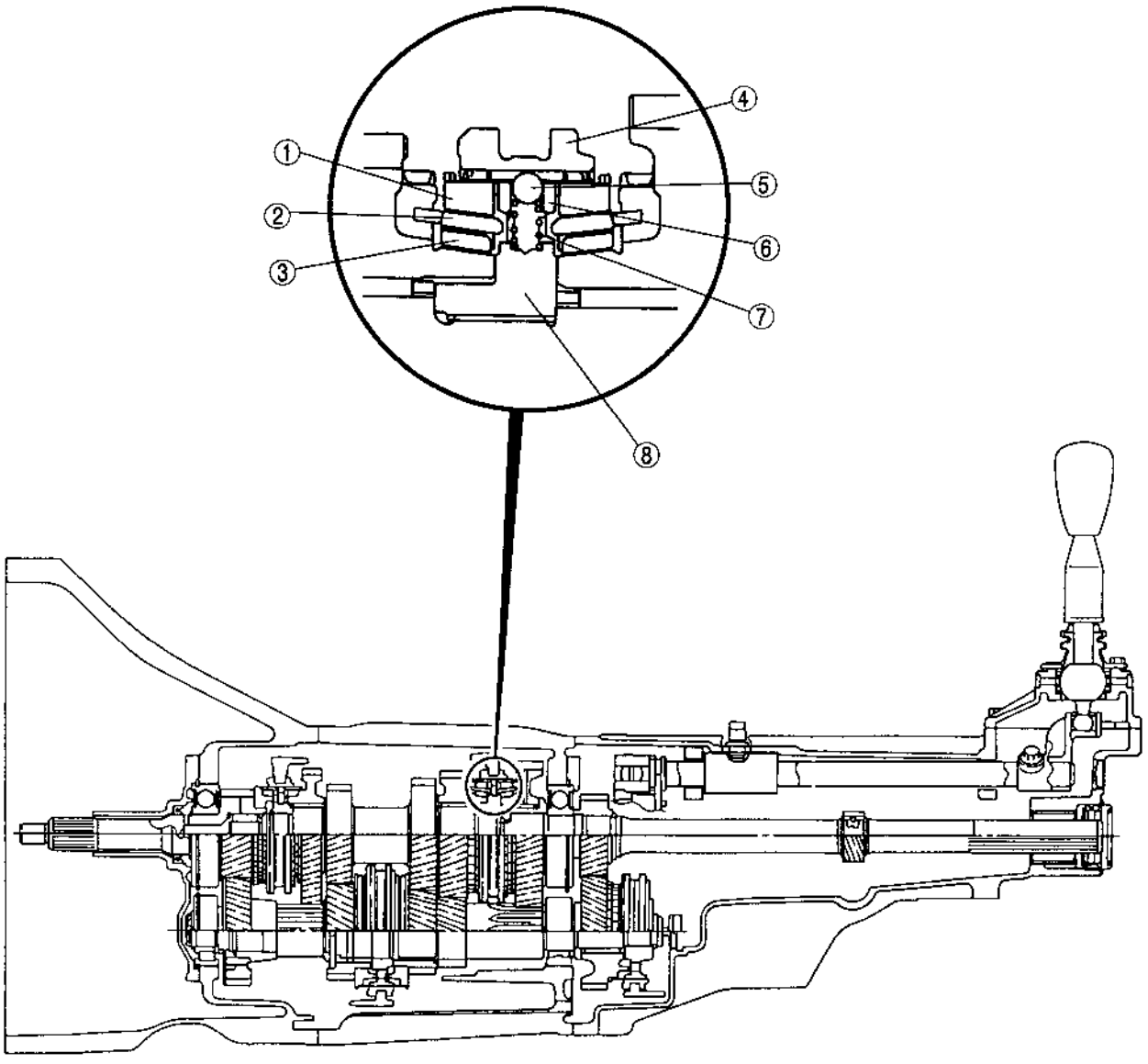
1	Reverse idler gear
2	Reverse gear

3	Counter reverse gear

SYNCHRONIZER MECHANISM

- A ball-type synchronizer mechanism has been adopted in each gear.
- The ball-type synchronizer mechanism consists of a coil-type synchronizer key spring, a synchronizer key, and a ball. Placing these components in the clutch hub reduces the length of the manual transmission and makes the synchronizer mechanism more compact.

TRIPLE SYNCHRONIZER MECHANISM



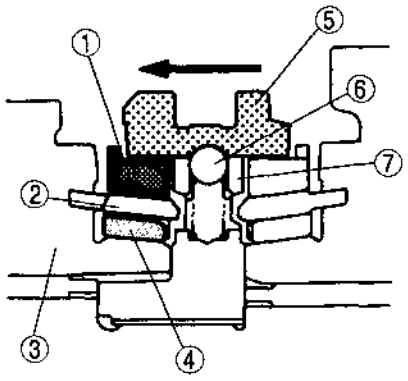
1	Synchronizer ring
2	Middle ring
3	Inner ring
4	Hub sleeve

5	Ball
6	Synchronizer key
7	Spring
8	Clutch hub

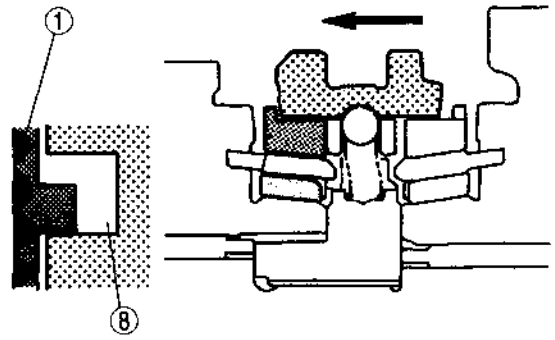
- A triple synchronizer mechanism is used for the first and second gears to improve synchromesh capacity.
- The triple synchronizer mechanism consists of a synchronizer ring, a middle ring, and an inner ring.
- The gear side inner surface of the inner ring can also be used as a friction surface in the triple synchronizer mechanism. This provides adequate synchronization force compared to the double cone synchronizer mechanism and reduces operation force and meshing time.

TRIPLE SYNCHRONIZER MECHANISM OPERATION

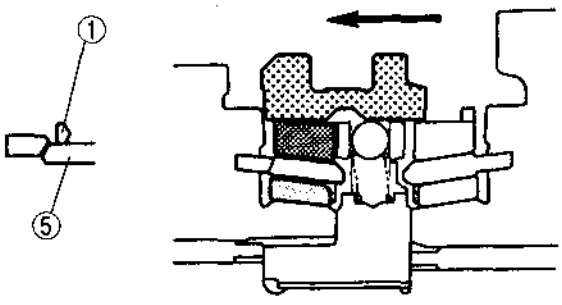
1.



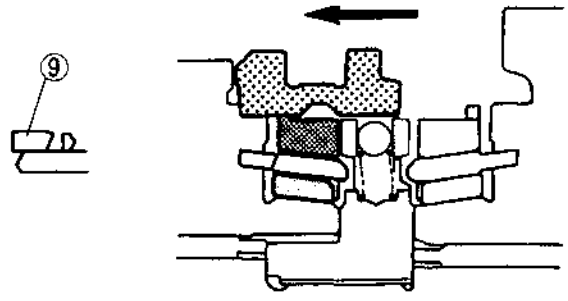
2.



3.



4.

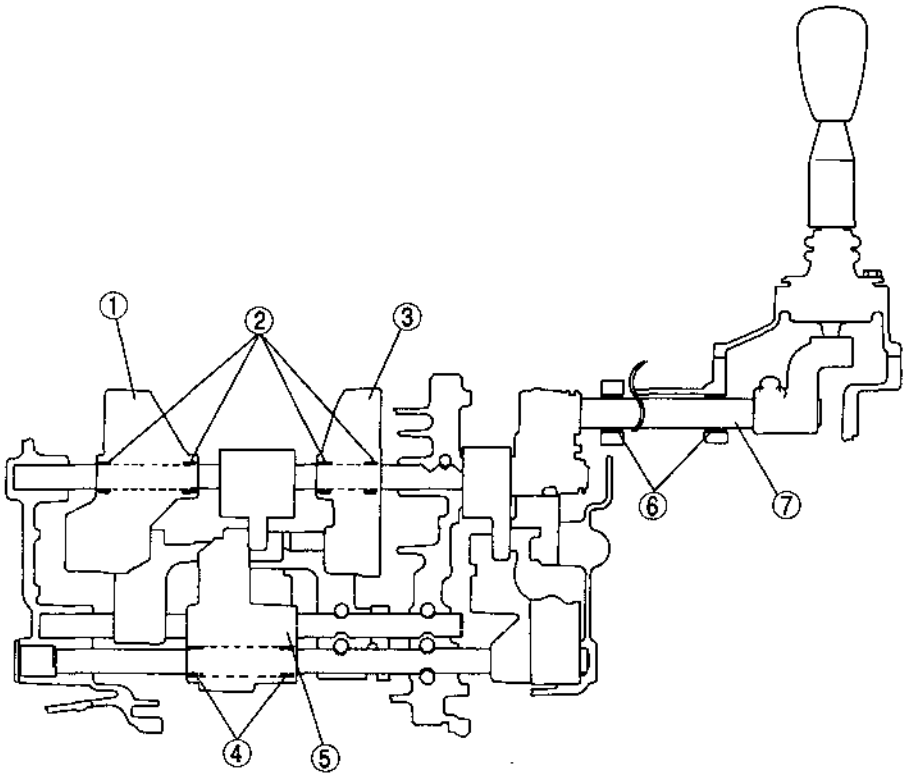


1	Synchronizer ring
2	Middle ring
3	2nd gear
4	Inner ring
5	Hub sleeve

6	Ball
7	Synchronizer key
8	Clutch hub key groove
9	2nd gear teeth

1. As the hub sleeve moves leftward (in the direction of the arrow), the synchronizer key presses against the end of the synchronizer ring. As the hub sleeve continues moving leftward, the synchronizer key presses onto the synchronizer ring. The synchronizer ring presses onto the middle ring, the middle ring presses onto the inner ring, and the inner ring presses onto the second gear.
2. As the hub sleeve continues moving leftward, friction is produced along the friction surfaces of the synchronizer ring, middle ring, inner ring, and second gear, and the synchronizer ring rotates only an amount equivalent to the space in the hub sleeve's key groove. As a result, the chamfers of the hub sleeve and the synchronizer ring become aligned. As the hub sleeve continues moving leftward, friction between each component becomes greater and the difference between the rotational speeds of the synchronizer ring, middle ring, inner ring, and second gear gradually disappears.
3. As the hub sleeve continues moving leftward, the difference between the rotational speeds of the second gear and the hub sleeve disappears, and synchronization is completed. When synchronization is completed, the hub sleeve rides over the ball and engages the synchronizer ring.
4. As the hub sleeve continues moving leftward, the hub sleeve then engages the synchro teeth to complete the shift.

SHIFT MECHANISM
Control Rod Operation



1	5th/reverse shift fork
2	Bushing
3	1st/2nd shift fork
4	Bushing

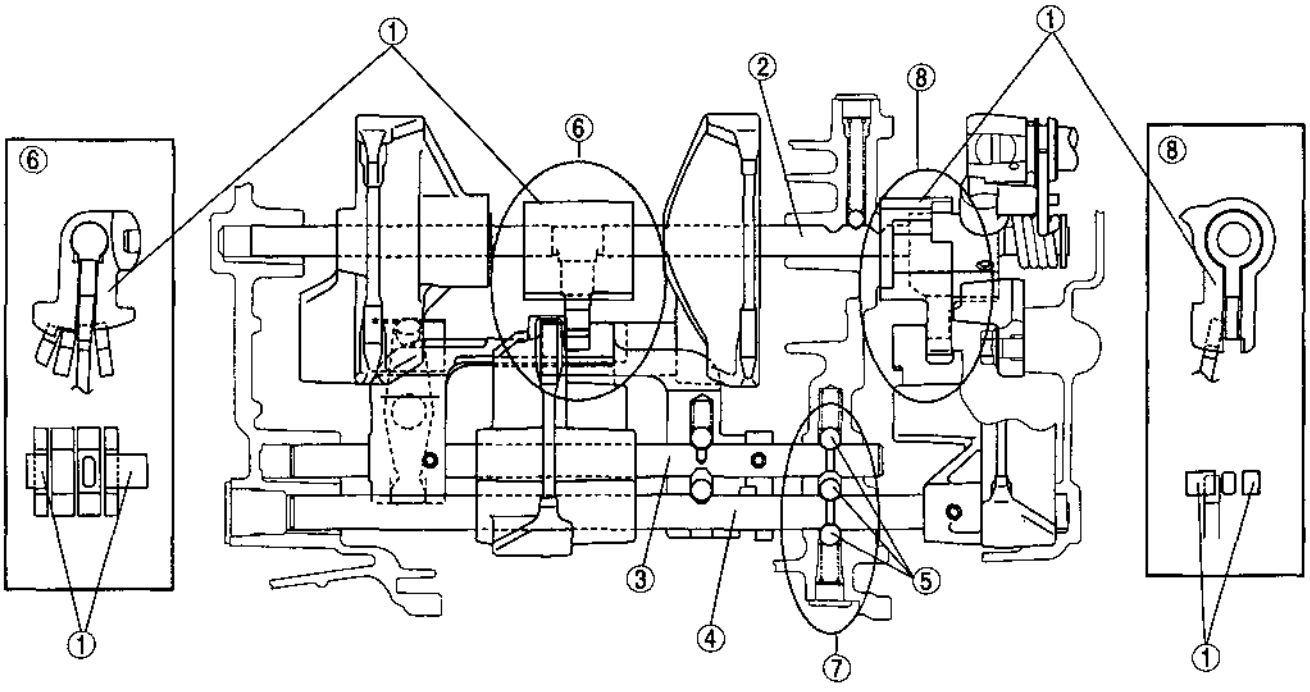
5	3rd/4th shift fork
6	Bushing
7	Control rod

- The control rod sliding section and the supports of each shift fork are equipped with a teflon bushing, which reduces sliding resistance during shifts and thereby improves shift feeling.

SHIFT INTERLOCK MECHANISM

- The shift interlock mechanism prevents double engagement. Two interlock blocks, which can only move in the select direction, and a ball located between shift fork shafts No.2 and No.3 operate together to restrict the movement of the shift forks that weren't selected, thereby ensuring reliability.

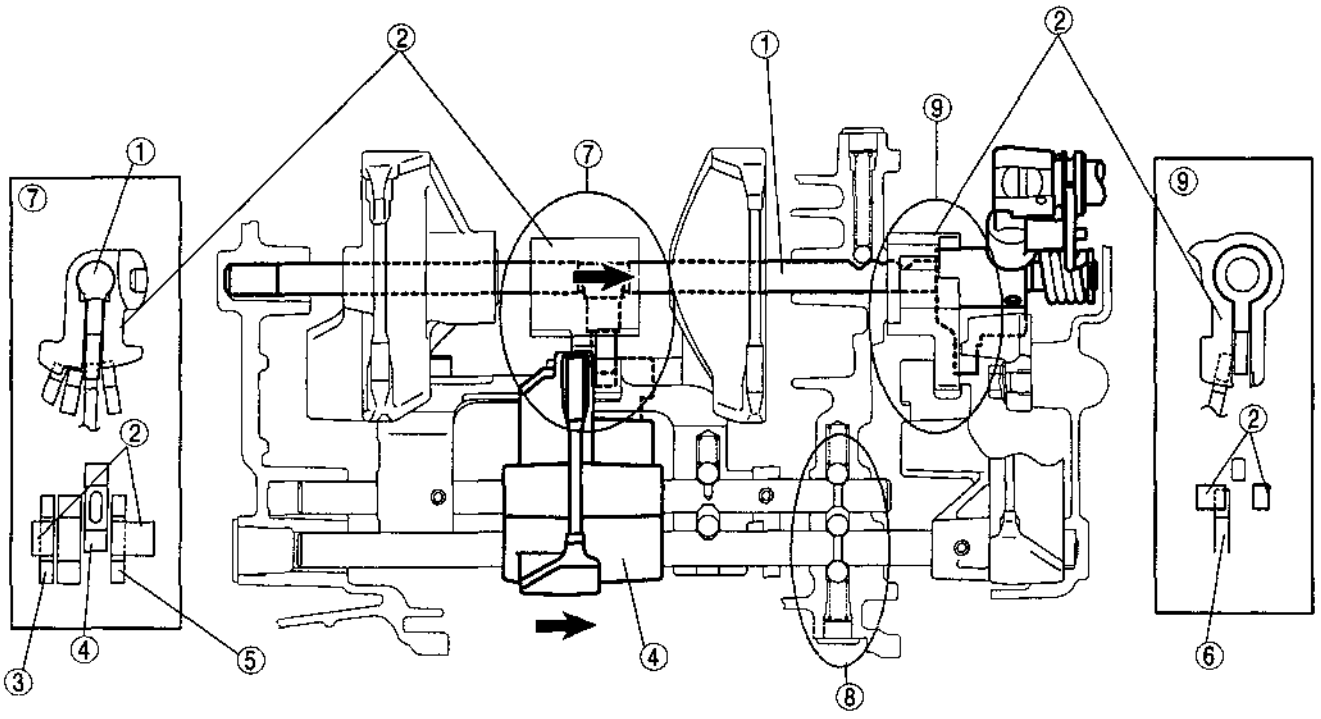
SHIFT INTERLOCK MECHANISM OPERATION
In Neutral Position



1	Interlock block
2	Main shift fork shaft
3	Shift fork shaft No.2
4	Shift fork shaft No.3

5	Ball
6	Section A
7	Section B
8	Section C

In 1st, 2nd, 3rd, and 4th Gear Positions
Example: in 3rd gear position

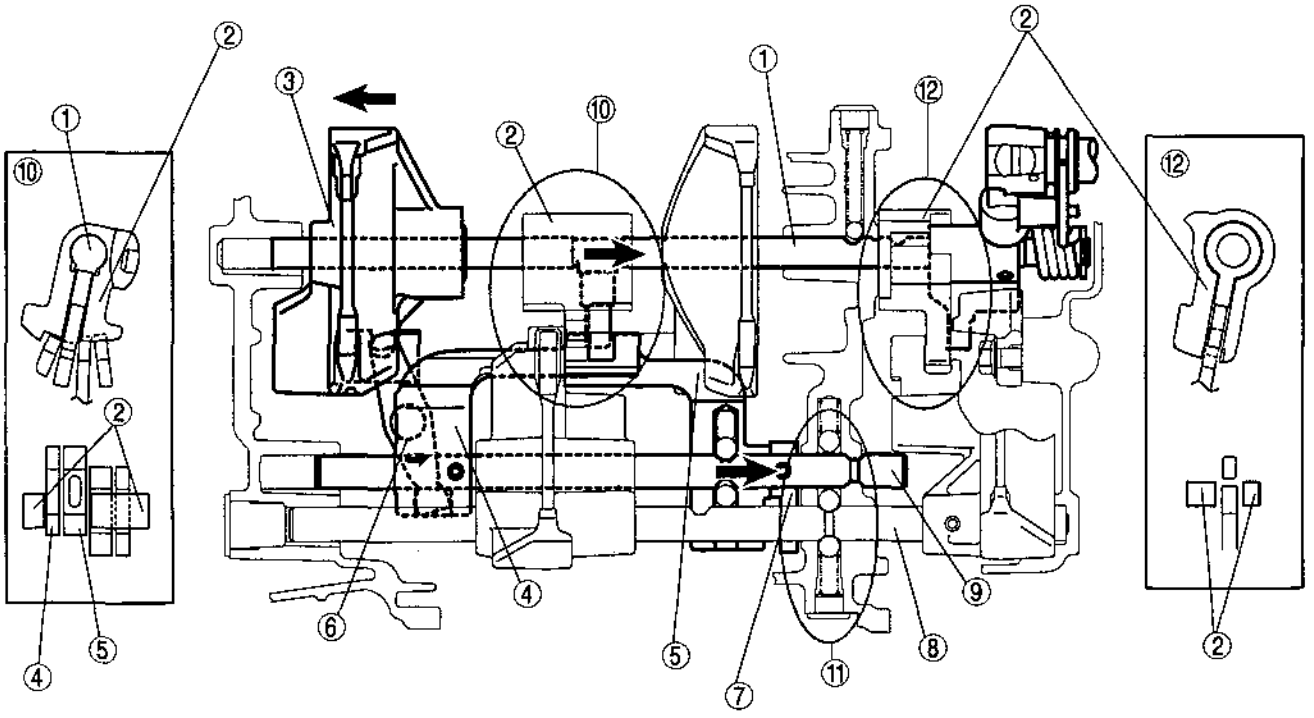


1	Main shift fork shaft
2	Interlock block
3	Reverse shift arm head
4	3rd/4th shift fork
5	1st/2nd shift fork

6	6th shift fork
7	Section A
8	Section B
9	Section C

- When the shift lever is shifted into third gear, the main shift fork shaft moves rightward (see figure) and moves the third/fourth shift fork in the same direction to complete the shift into third gear. At the same time, the first/second shift fork and the reverse shift arm head are held in neutral position by the interlock block in section A, and the sixth shift fork is also held in neutral position by the interlock block in section C. In this way, the shift forks that weren't selected are locked, thus preventing double engagement.
- In the same way, when shifting into first, second, or fourth gears, the interlock blocks in sections A and C restrict the movement of the shift forks that weren't selected to prevent double engagement.

In 5th Gear Position

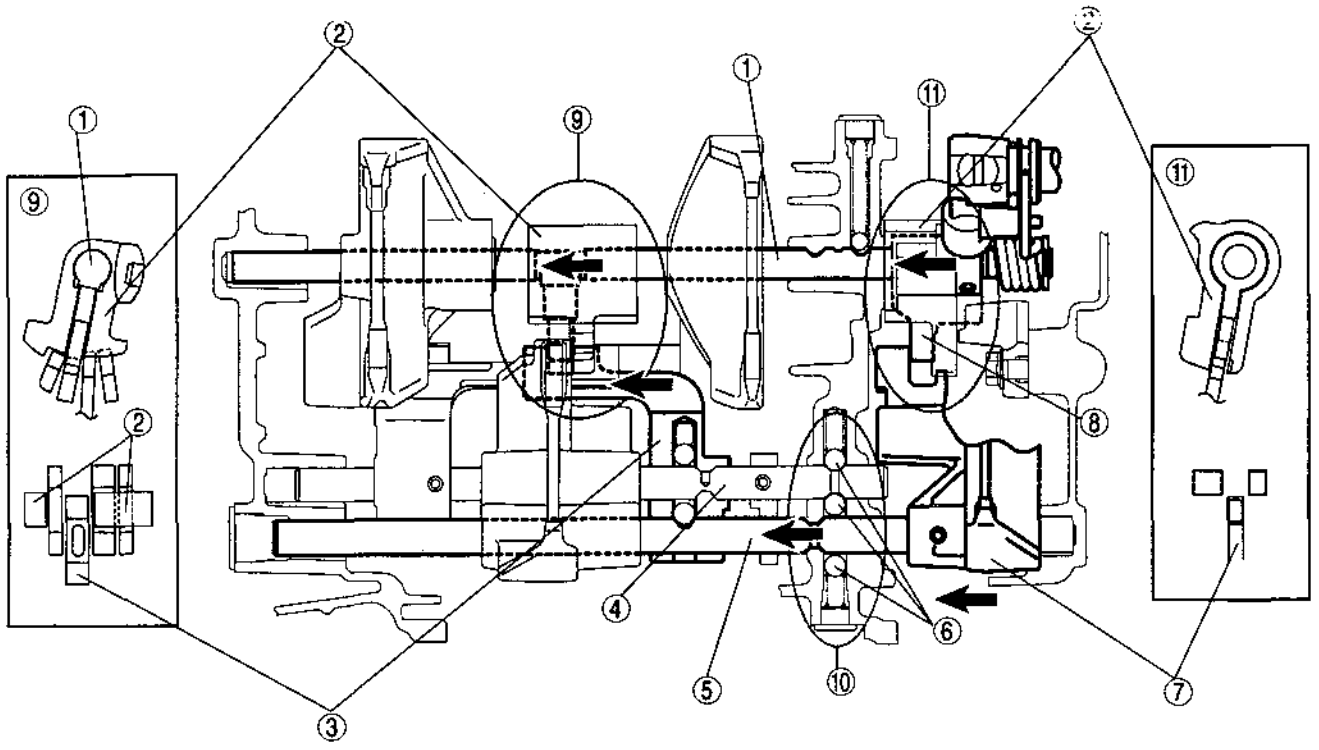


1	Main shift fork shaft
2	Interlock block
3	5th/reverse shift fork
4	Reverse shift arm head
5	5th shift head
6	Shift arm

7	5th shift head stopper block
8	Shift fork shaft No.3
9	Shift fork shaft No.2
10	Section A
11	Section B
12	Section C

- When the shift lever is shifted into fifth gear, the main shift fork shaft moves rightward (see figure), which simultaneously moves the fifth shift head and the fifth shift head stopper block rightward. As the fifth shift head stopper block is fixed to shift fork shaft No.2 by a pin, the shift fork shaft moves when the shift head stopper block moves. Likewise, the reverse shift arm head, which is fixed to shift fork shaft No.2 by a pin, also moves rightward. As a result, the fifth/reverse shift fork moves leftward through the shift arm connected to the reverse shift arm head, thereby shifting the gear into fifth gear. At the same time, the interlock block in section A fixes the shift forks except the fifth shift head and reverse shift arm head in neutral position. Also, shift fork shaft No.2, which is moved rightward by the fifth shift head, presses onto the ball out of the ridge to fix shift fork shaft No.3, thereby preventing double engagement during fifth gear shifting.

In 6th Gear Position

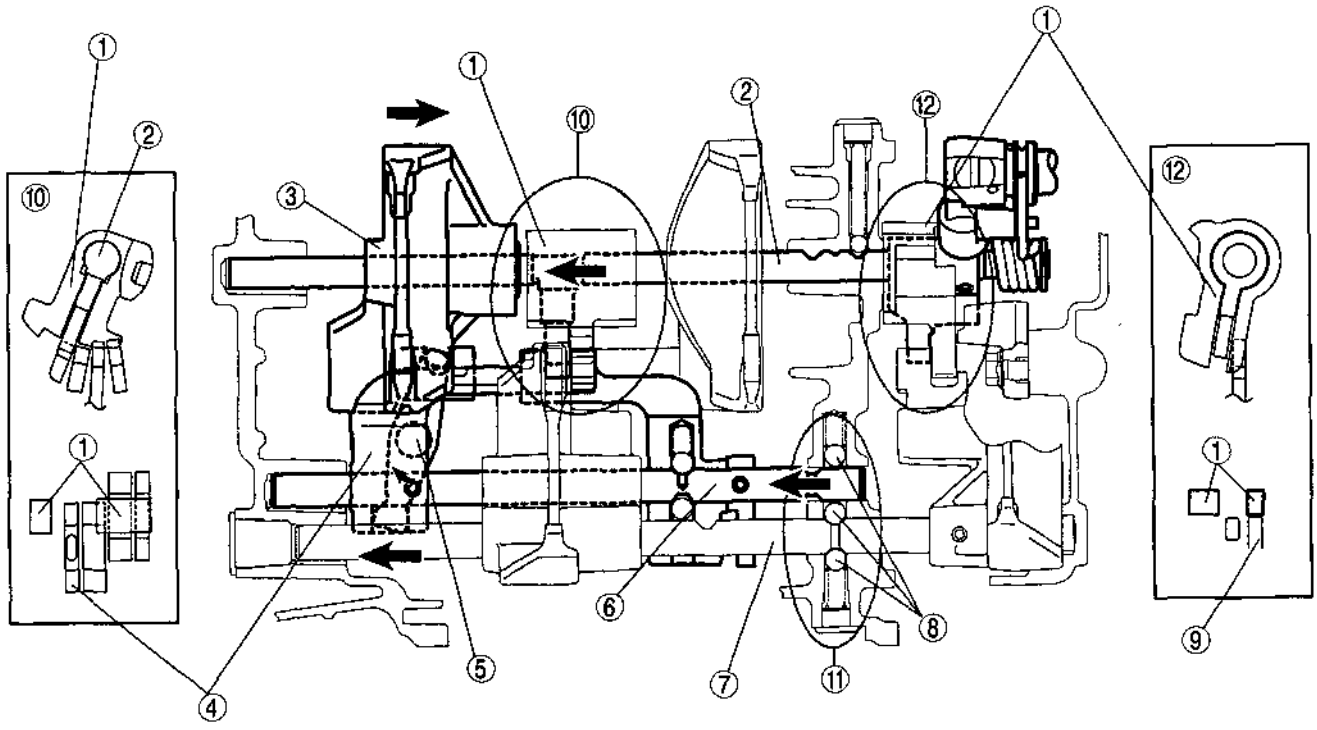


1	Main shift fork shaft
2	Interlock block
3	5th shift head
4	Shift fork shaft No.2
5	Shift fork shaft No.3
6	Ball

7	6th shift fork
8	Lever
9	Section A
10	Section B
11	Section C

- When the shift lever is shifted into sixth gear, the main shift fork shaft and the lever in section C move leftward (see figure), which moves the sixth shift fork and shifts the gear into sixth gear. At the same time, the interlock block in section A fixes the shift forks except the fifth shift head in neutral position. Also, shift fork shaft No.3, which is moved leftward by the sixth shift fork, presses onto the ball out of the ridge to fix shift fork shaft No.2, thereby preventing double engagement during sixth gear shifting.
  Also, during sixth gear shifting, the main shift fork shaft also moves the fifth shift head, but as shift fork shaft No.2 is fixed by the ball, the fifth shift head moves leftward on the top of the shaft by itself and is not directly affected by shift operation.

In Reverse Gear Position



1	Interlock block
2	Main shift fork shaft
3	5th/reverse shift fork
4	Reverse shift arm head
5	Shift arm
6	Shift fork shaft No.2

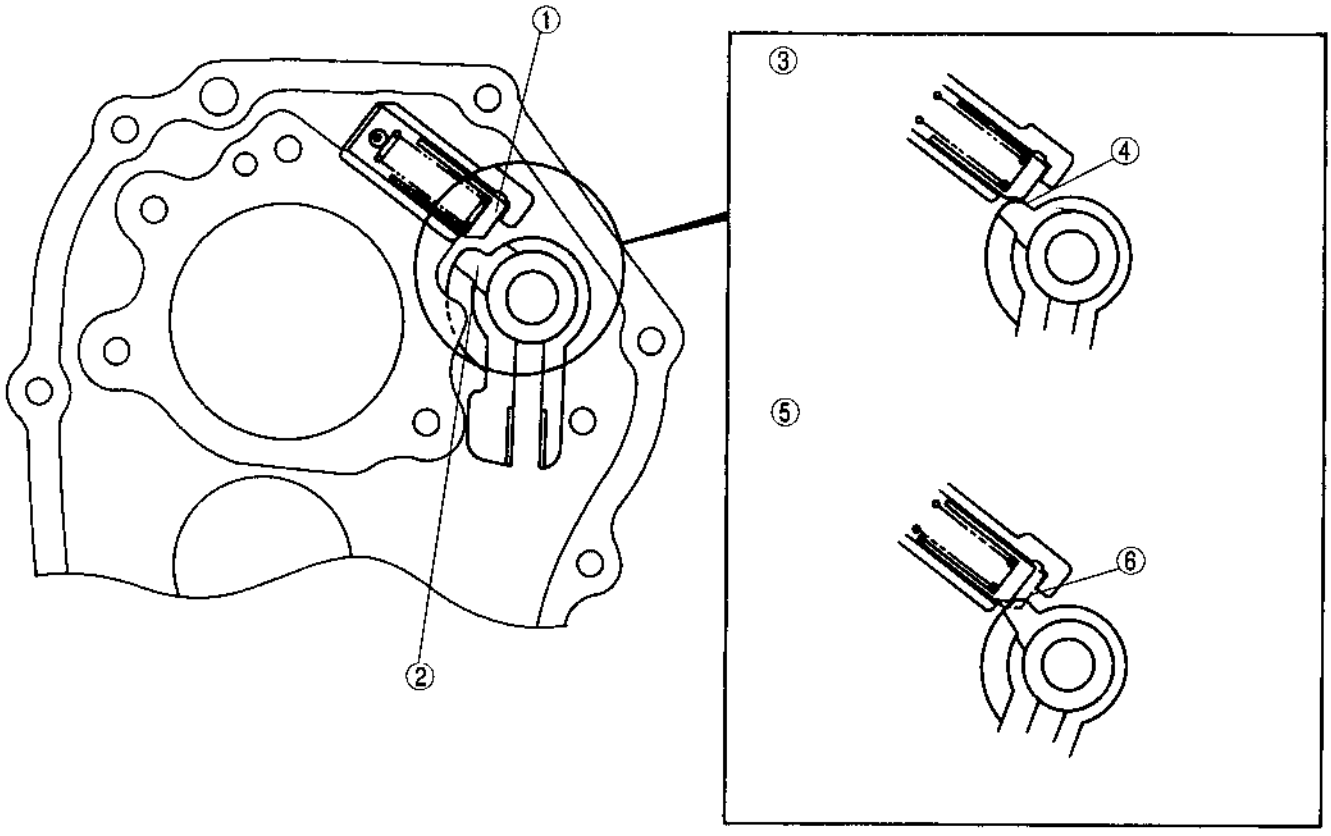
7	Shift fork shaft No.3
8	Ball
9	6th shift fork
10	Section A
11	Section B
12	Section C

- When the shift lever is shifted into reverse gear, the main shift fork shaft moves leftward (see figure), which moves the reverse shift arm head leftward. As a result, the fifth/reverse shift fork moves rightward through the shift arm connected to the reverse shift arm head, thereby shifting the gear into reverse. At the same time, the interlock blocks in sections A and C fix the shift forks except the fifth shift head and reverse shift arm head in neutral position. Also, shift fork shaft No.2, which is moved leftward by the reverse shift arm head, presses onto the ball out of the ridge to fix shift fork shaft No.3, thereby preventing double engagement during reverse shifting.

REVERSE LOCKOUT MECHANISM

- The plunger-type reverse lockout mechanism, which is mounted on the back of the middle case, prevents unintentional selection of reverse gear when selecting fifth or sixth gear, thereby ensuring reliability.

REVERSE LOCKOUT MECHANISM OPERATION



1	Reverse restrict pin
2	Shift interlock block
3	Selecting 5th or 6th gear

4	Prevents selecting reverse
5	Selecting reverse
6	Release lockout

- Selecting reverse gear becomes possible when the weight of the shift interlock block overcomes the force of the reverse restrict pin's spring, thus enabling shifts into reverse. Selecting reverse requires more force than other selections, which prevents unintentional selection.

SUPPLEMENTAL SERVICE INFORMATION

The following changes and/or additions have been made since publication of the Mazda MX-5 Workshop Manual Supplement (1608-10-98A).

Manual transmission

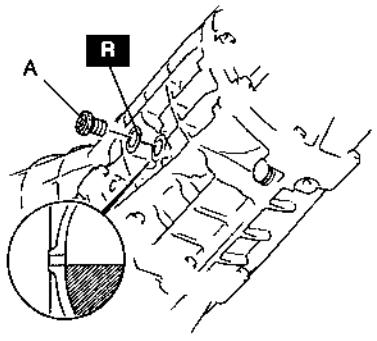
- Transmission oil inspection procedure has been added.
- Transmission oil replacement procedure has been added.
- Oil seal (rear) replacement procedure has been added.
- Removal/Installation procedure has been added.

MANUAL TRANSMISSION

TRANSMISSION OIL INSPECTION

1. Put the vehicle on level ground.
2. Remove the filler plug A.
3. Verify that the oil is at the brim of the filler plug hole as shown. If it is low, add the specified oil from the filler plug hole.

Specified oil
Grade: API service GL-4 or GL-5
Viscosity:
SAE 75 W-90 (All season) or
SAE 80 W-90 (Above 10 °C {50 °F})

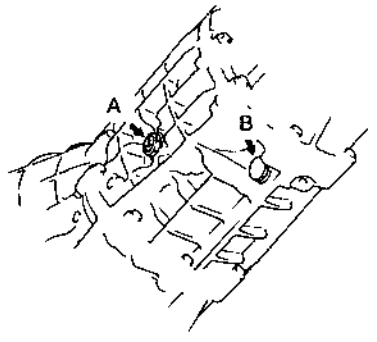


4. Install the filler plug A (with new washer).

Tightening toque
A: 27—48 N·m {2.7—4.9 kgf·m, 20—35 ft·lbf}

TRANSMISSION OIL REPLACEMENT

1. Put the vehicle on level ground.
2. Remove the filler plug A and the drain plug B.



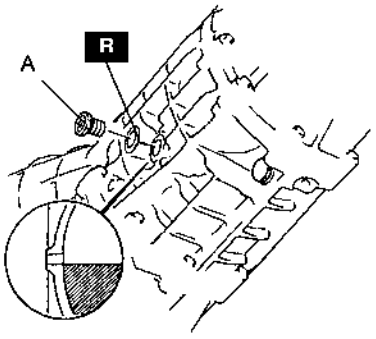
3. Drain the oil into a container.
4. Wipe the drain plug B clean.
5. Install the drain plug B (with new washer).

Tightening torque
B: 27—48 N·m {2.7—4.9 kgf·m, 20—35 ft·lbf}

6. Add the specified oil from the filler plug hole.

Specified oil
Grade: API service GL-4 or GL-5
Viscosity:
SAE 75 W-90 (All season) or
SAE 80 W-90 (Above 10 °C {50 °F})
Capacity: 1.75 L {1.85 US qt, 1.54 Imp qt}

7. Verify that the oil is at the brim of the filler plug hole.



8. Install the filler plug A (with new washer).

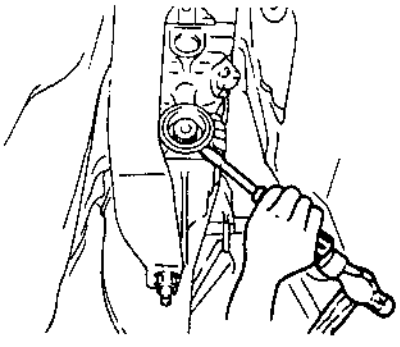
Tightening toque
A: 27—48 N·m {2.7—4.9 kgf·m, 20—35 ft·lbf}

OIL SEAL (REAR) REPLACEMENT

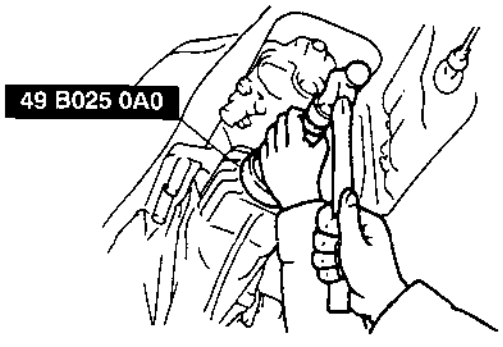
1. Raise the vehicle and support it with safety stands.
2. Remove the propeller shaft. (Refer to Section L.)

Caution
- **Do not damage the extension housing and mainshaft spline when removing the oil seal.**

3. Remove the oil seal from the extension housing using a screwdriver.



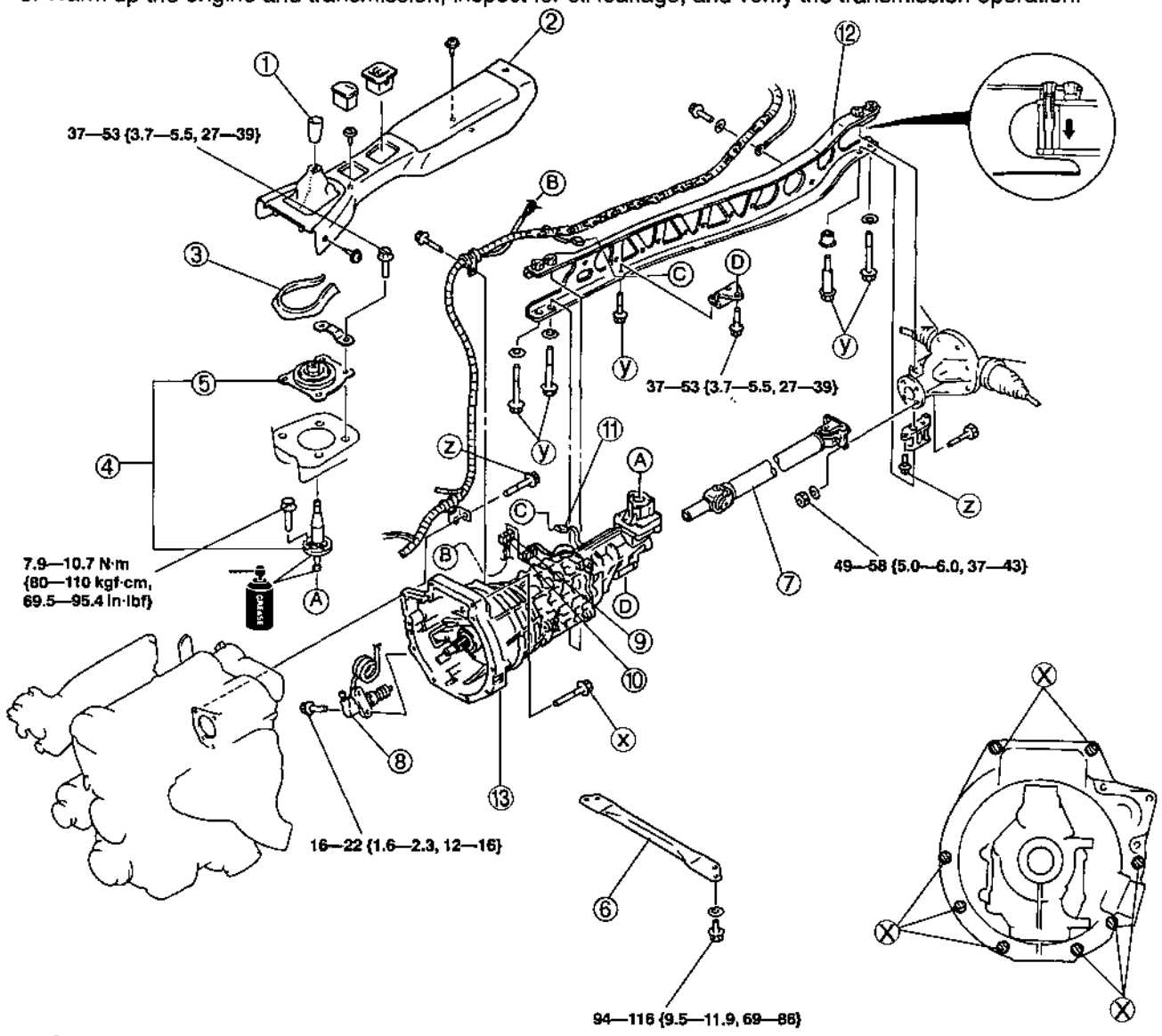
4. Apply the specified oil to a new oil seal.
5. Install the new oil seal using the **SST**.



6. Install the propeller shaft. (Refer to section L.)
7. Inspect the oil level. (Refer to TRANSMISSION OIL INSPECTION.)

MANUAL TRANSMISSION REMOVAL/INSTALLATION

1. Drain the transmission oil. (Refer to TRANSMISSION OIL REPLACEMENT.)
2. Remove the undercover and the transcover.
3. Remove the starter. (Refer to section G.)
4. Remove the front pipe and middle pipe. (Refer to section F.)
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Add the specified amount and type of transmission oil. (Refer to TRANSMISSION OIL REPLACEMENT.)
8. Warm up the engine and transmission, inspect for oil leakage, and verify the transmission operation.



Ⓧ 64—89 {6.5—9.1, 48—65}

Ⓨ 104—123 {10.6—12.6, 79.7—91.1}

Ⓩ 38—51 {3.8—5.3, 28—38}

N·m {kgf·m, ft·lbf}

1	Shift lever knob
2	Rear console
3	Insulator
4	Shift lever component ☞ Section J
5	Dust boot
6	Front crossbar
7	Propeller shaft ☞ Section L

8	Clutch release cylinder
9	Back-up light switch connector
10	Neutral switch connector
11	Speedometer sensor connector
12	Power plant frame (PPF) ☞ Section J
13	Transmission ☞ Section J

FRONT AND REAR AXLE

FEATURES

OUTLINE

OUTLINE OF CONSTRUCTION

- With the addition of the 6-speed manual transmission, the reduction ratio of the differential has been changed.

SPECIFICATIONS

Item			Specification
Front axle	Wheel bearing type		Angular ball bearing
Rear axle	Wheel bearing type		Angular ball bearing
Drive shaft	Joint type	Wheel side	Bell joint
		Differential side	Double offset joint
	Shaft diameter (mm {in})		24.0 {0.94}
Differential	Reduction gear		Hypoid gear
	Differential gear		Helical gear [LSD]
	Differential ring gear size (mm {in})		181.6 {7.15}
	Reduction ratio		3.636
	Oil	Grade	API service GL-5
		Viscosity	Above -18 °C {0 °F}: SAE 90 Below -18 °C {0 °F}: SAE 80
		Capacity (L {US qt, Imp qt})	1.00 {1.06, 0.88}

Indicates new specification.

M

SUSPENSION

FEATURES

SERVICE

OUTLINE

OUTLINE OF CONSTRUCTION

The construction and operation of the suspension is basically the same as the current MX-5. However with the adoption of the hard Suspension, the following are the differences between the current MX-5 and new MX-5.

- The diameter of the rear stabilizer has been changed.
- Front strut bar has been added.

SPECIFICATIONS

Item				Specification
Front suspension	Suspension type			Double-wishbone
	Shock absorber type			Cylindrical, double-acting (low-pressure gas charged)
	Spring type			Coil spring
	Stabilizer	Type		Torsion bar
		Diameter	(mm {in})	22 {0.87}
	Wheel alignment (*Unloaded)	Maximum steering angle	Inner	38° ±3°
			Outer	33° ±3°
		Total toe-in	(mm {in})	Tire: 3±4 {0.12±0.15}, Rim inner: 2±3 {0.08±0.12}
			(degree)	0° 17' ±24'
		Camber angle		0° 06' ±1°
		Caster angle		5° 48' ±1°
		Steering axis inclination		11° 38'
Rear suspension	Suspension type			Double-wishbone
	Shock absorber type			Cylindrical, double-acting (low-pressure gas charged)
	Spring type			Coil spring
	Stabilizer	Type		Torsion bar
		Diameter	(mm {in})	12 {0.47}
	Wheel alignment (*Unloaded)	Total toe-in	(mm {in})	Tire: 3±4 {0.12±0.15}, Rim inner: 2±3 {0.08±0.12}
			(degree)	0°19' ±24'
		Camber angle		-0°47' ±1°

*: Fuel tank full; engine coolant and engine oil at specified level, and spare tire, jack and tools in designated positions.

Indicates new specification.

R

SUPPLEMENTAL SERVICE INFORMATION

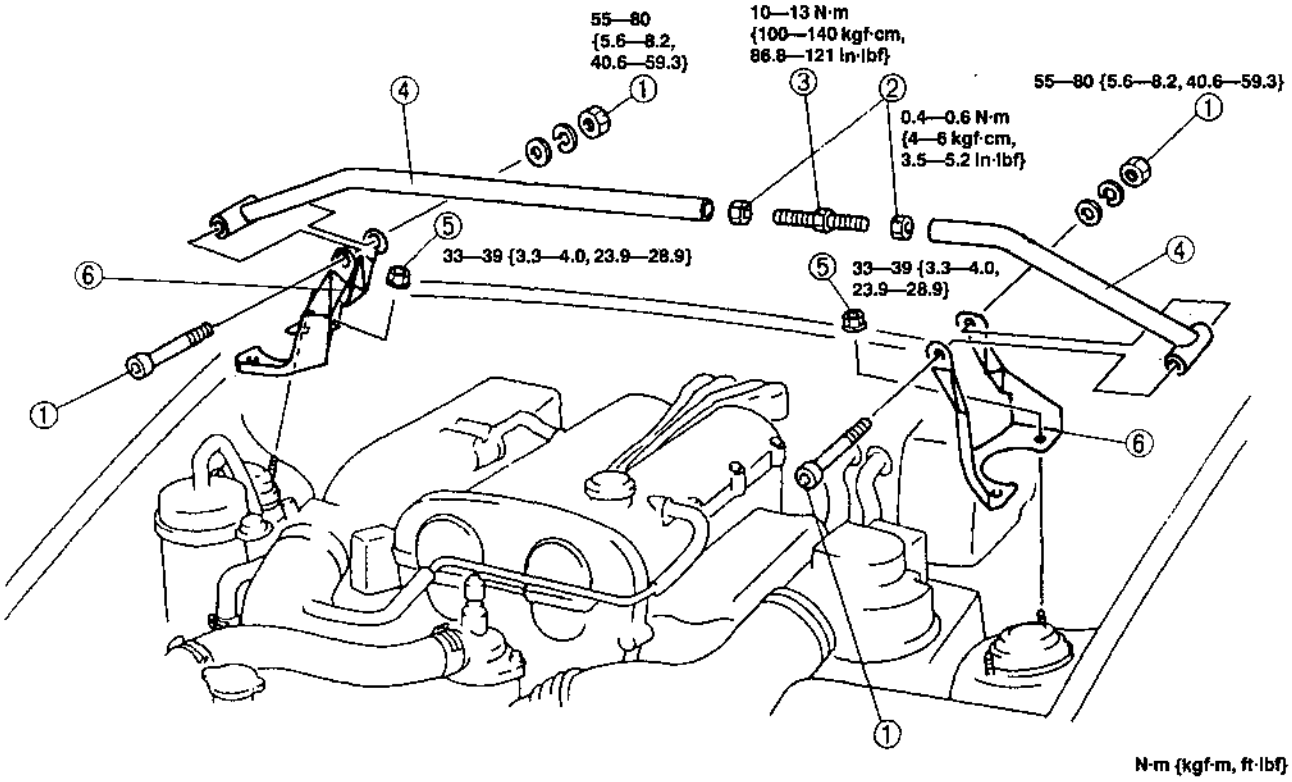
The following changes and/or additions have been made since the Mazda MX-5 Workshop Manual (1608-10-98A).

Front strut bar
- Removal/installation procedure added.

FRONT SUSPENSION

FRONT STRUT BAR REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.
2. Temporarily install all component parts, then tighten in the reverse order of removal.

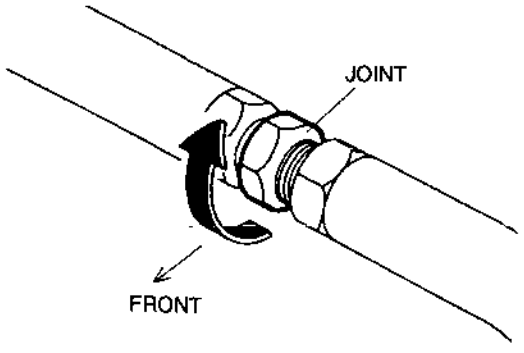


1	Nut, Bolt
2	Lock nut
3	Joint ☞ Removal Note

4	Front strut bar
5	Nut
6	Strut plate

Joint Installation Note
- Tighten the joint in the direction shown in the figure.

Tightening torque
10—13 N·m
{100—140 kgf·cm, 86.8—121 in·lbf}



TECHNICAL DATA

TECHNICAL DATA

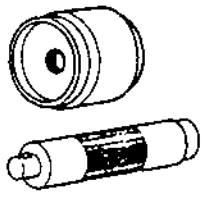
MANUAL TRANSMISSION

Item			Specification
Manual transmission type			Y16M-D
Transmission oil	Type		API service GL-4 or GL-5
	Viscosity	All-season	SAE 75W-90
		Above 10 °C {50 °F}	SAE 80W-90
	Capacity	(L {US qt, Imp qt})	1.75 {1.85, 1.54}

SPECIAL TOOLS

SPECIAL TOOLS

MANUAL TRANSMISSION

49 B025 0A0 Dust seal installer 	—	—

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