MANUAL TRANSMISSION

CONTENTS

PREPARATION ............................................................... 3
Special Service Tools .................................................... 3
Commercial Service Tools ................................................ 5

NOISE, VIBRATION AND HARSHNESS (NVH)
TROUBLESHOOTING ...................................................... 6
NVH Troubleshooting Chart ............................................. 6
MANUAL TRANSMISSION .................................................. 6

DESCRIPTION
Cross-sectional View .................................................... 7

ON-VEHICLE SERVICE
Replacing Rear Oil Seal ................................................. 8
REMOVAL ...................................................................... 8
INSTALLATION .................................................................. 8
Position Switch Check .................................................... 8

REMOVAL AND INSTALLATION ........................................ 9
Removal ........................................................................ 9
Installation ..................................................................... 10

OVERHAUL
Case Components .......................................................... 11
Gear Components ........................................................... 12
Shift Control Components .............................................. 13

DISASSEMBLY
Case Components .......................................................... 14
DISASSEMBLY ................................................................ 14
Shift Control Components .............................................. 14
DISASSEMBLY ................................................................ 14
Gear Components ........................................................... 15
DISASSEMBLY ................................................................ 15

INSPECTION
Shift Control Components .............................................. 18
INSPECTION .................................................................. 18
Gear Components ........................................................... 18
INSPECTION .................................................................. 18

ASSEMBLY
Gear Components ........................................................... 20
ASSEMBLY .................................................................... 20
Shift Control Components .............................................. 20
ASSEMBLY .................................................................... 27

Case Components .......................................................... 27
ASSEMBLY .................................................................... 27

SERVICE DATA AND SPECIFICATIONS (SDS) .................. 30
General Specifications ..................................................... 30
Gear End Play ............................................................... 30
Clearance Between Baulk Ring and Gear ....................... 31
2nd & 3rd baulk ring ..................................................... 31
Available Snap Rings ....................................................... 31
MAIN DRIVE GEAR BEARING ......................................... 31
MAINSHAFT FRONT ......................................................... 31
COUNTER DRIVE GEAR ................................................. 31
OD MAINSHAFT BEARING ............................................. 32
Available Shims ............................................................. 32
COUNTERSHAFT FRONT BEARING ............................... 32

FS5W71C

FS5R30A
CONTENTS (Cont’d)

Shift Control Components ......................................... 47
DISASSEMBLY .......................................................... 48
Case Components ..................................................... 48
DISASSEMBLY .......................................................... 48
Shift Control Components ......................................... 49
DISASSEMBLY .......................................................... 49
Gear Components ..................................................... 50
DISASSEMBLY .......................................................... 50
INSPECTION .................................................................. 54
Shift Control Components ......................................... 54
INSPECTION .................................................................. 54
Gear Components ..................................................... 54
INSPECTION .................................................................. 54
ASSEMBLY .................................................................... 56
Gear Components ..................................................... 56
ASSEMBLY .................................................................... 56
Shift Control Components ......................................... 64
ASSEMBLY .................................................................... 64
Case Components ..................................................... 65
ASSEMBLY .................................................................... 65

SERVICE DATA AND SPECIFICATIONS (SDS) ............. 67
General Specifications ................................................ 67
Gear End Play ............................................................. 67
Clearance Between Baulk Ring and Gear .................... 67
2ND AND 3RD BAULK RING ........................................ 68
Distance between Rear Surface of Reverse Cone and Reverse Baulk Ring ............................................. 68
Available Snap Ring ................................................... 68
MAIN DRIVE GEAR SNAP RING ................................ 68
MAINSHAFT FRONT SNAP RING ................................ 68
COUNTER GEAR REAR SNAP RING ............................. 69
Available C-ring .......................................................... 69
MAINSHAFT C-RING ...................................................... 69
Available Shim and Washer ......................................... 69
TABLE FOR SELECTING PROPER COUNTER GEAR FRONT BEARING THRUST WASHER ............ 69
REVERSE IDLER REAR THRUST WASHER ....................... 69

MT-2
### Special Service Tools

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.) Tool name</th>
<th>Description</th>
</tr>
</thead>
</table>
| ST23810001 (—) Adapter setting plate | Fixing adapter plate with gear assembly  
a: 166 mm (6.54 in)  
b: 270 mm (10.63 in) |
| KV32101330 (See J26349-A) Puller | Removing overdrive mainshaft bearing  
a: 447 mm (17.60 in)  
b: 100 mm (3.94 in) |
| KV31100401 (—) Transmission press stand | Pressing counter gear and mainshaft |
| ST22520000 (J26348) Wrench | Tightening mainshaft lock nut  
a: 100 mm (3.94 in)  
b: 41 mm (1.61 in) |
| ST23540000 (J25689-A) Pin punch | Removing and installing fork rod retaining pin  
a: 2.3 mm (0.091 in) dia.  
b: 4 mm (0.16 in) dia. |
| ST30031000 (J22912-01) Puller | Removing and installing 1st gear bushing  
Removing main drive gear bearing  
a: 90 mm (3.54 in) dia.  
b: 50 mm (1.97 in) dia. |
| ST23860000 (—) Drift | Installing counter drive gear  
a: 38 mm (1.50 in) dia.  
b: 33 mm (1.30 in) dia. |
| ST22360002 (J25679-01) Drift | Installing counter gear front and rear end bearings  
a: 29 mm (1.14 in) dia.  
b: 23 mm (0.91 in) dia. |
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.) Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST22350000 (J25678-01) Drift</td>
<td>Installing OD gear bushing&lt;br&gt;a: 34 mm (1.34 in) dia.&lt;br&gt;b: 28 mm (1.10 in) dia.</td>
</tr>
<tr>
<td>ST23800000 (J25691-01) Drift</td>
<td>Installing front cover oil seal&lt;br&gt;a: 44 mm (1.73 in) dia.&lt;br&gt;b: 31 mm (1.22 in) dia.</td>
</tr>
<tr>
<td>ST33400001 (J26082) Drift</td>
<td>Installing rear oil seal&lt;br&gt;a: 60 mm (2.36 in) dia.&lt;br&gt;b: 47 mm (1.85 in) dia.</td>
</tr>
<tr>
<td>ST33290001 (J34286) Puller</td>
<td>Removing rear oil seal&lt;br&gt;a: 250 mm (9.84 in)&lt;br&gt;b: 160 mm (6.30 in)</td>
</tr>
<tr>
<td>ST30720000 (J25405) Drift</td>
<td>Installing mainshaft ball bearing&lt;br&gt;a: 77 mm (3.03 in) dia.&lt;br&gt;b: 55.5 mm (2.185 in) dia.</td>
</tr>
<tr>
<td>ST30613000 (J25742-3) Drift</td>
<td>Installing main drive gear bearing&lt;br&gt;a: 71.5 mm (2.815 in) dia.&lt;br&gt;b: 47.5 mm (1.870 in) dia.</td>
</tr>
<tr>
<td>ST33200000 (J26082) Drift</td>
<td>Installing counter rear bearing&lt;br&gt;a: 60 mm (2.36 in) dia.&lt;br&gt;b: 44.5 mm (1.752 in) dia.</td>
</tr>
<tr>
<td>Tool name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Puller</td>
<td>Removing counter bearings, counter drive and OD gears</td>
</tr>
</tbody>
</table>

NT077
NVH Troubleshooting Chart

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

## MANUAL TRANSMISSION

### Reference page

- **OIL (Oil level is low)**
  - Refer to "Checking M/T Oil".
- **OIL (Wrong oil)**
- **OIL (Oil level is high)**
- **GASKET (Damaged)**
- **OIL SEAL (Worn or damaged)**
- **CHECK PLUG RETURN SPRING AND CHECK BALL (Worn or damaged)**
- **SHIFT FORK (Worn)**
- **GEAR (Worn or damaged)**
- **BEARING (Worn or damaged)**
- **BAULK RING (Worn or damaged)**
- **INSERT SPRING (Damaged)**

### SUSPECTED PARTS

- **(Possible cause)**

### Symptom

<table>
<thead>
<tr>
<th>Symptom</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Oil leakage</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hard to shift or will not shift</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Jumps out of gear</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Replacing Rear Oil Seal

REMOVAL
1. Remove the propeller shaft. Refer to PD section ("Removal and Installation", "PROPELLER SHAFT").
2. Remove rear oil seal using Tool.
   - Always replace with a new seal once it has been removed.

INSTALLATION
1. Install new oil seal until it stops.
   - Apply multi-purpose grease to seal lip of oil seal before installing.
2. Install any part removed.

Position Switch Check
- Check continuity.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back-up lamp switch</td>
<td>Reverse</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Except reverse</td>
<td>No</td>
</tr>
<tr>
<td>Park/neutral position (PNP) switch</td>
<td>Neutral</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Except neutral</td>
<td>No</td>
</tr>
</tbody>
</table>
Removal

- **NGMT0030**
- **AMT183**
- **GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX**

Removal and Installation FS5W71C

- MT-9

- N·m (kg·m, ft·lb)
CAUTION:
Before separating the transmission from the engine, remove the crankshaft position sensor (OBD) from the transmission. Be careful not to damage sensor edge or ring gear teeth.

NOTE:
To prevent oil spills, drain transmission oil before removing transmission or insert plug into rear oil seal after removing propeller shaft.

- Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.
1. Remove battery negative terminal.
2. Remove crankshaft position sensor (OBD) from transmission upper side.
3. Remove clutch operating cylinder from transmission.
4. Remove back-up switch and park/neutral position (PNP) switch harness connectors.
5. Remove starter motor from transmission.

7. Remove shift lever.
8. Support engine by placing a jack under oil pan.
- Do not place jack under oil pan drain plug.
9. Separate transmission from engine.

WARNING:
Support manual transmission while removing it.

Installation
1. Tighten bolts securing transmission.

<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Tightening torque N·m (kg·m, ft·lb)</th>
<th>ℓ mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>65 (2.56)</td>
</tr>
<tr>
<td>2</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>58 (2.28)</td>
</tr>
<tr>
<td>3*</td>
<td>16 - 22 (1.6 - 2.2, 12 - 16)</td>
<td>25 (0.98)</td>
</tr>
<tr>
<td>4</td>
<td>16 - 22 (1.6 - 2.2, 12 - 16)</td>
<td>16 (0.63)</td>
</tr>
</tbody>
</table>

*: With nut
2. Tighten clutch operating cylinder to the specified torque. Refer to “CLUTCH SYSTEM”, CL-5.
Apply gear oil to gears, shafts, synchronizers and bearings when assembling.

- Select proper thickness.
- Pay attention to its direction.
- N·m (kg-m, ft-lb)
- Should be lubricated with grease.
Shift Control Components

CAUTION:
To avoid damage when replacing shift knob, remove shift lever with knob, as assembled.
Case Components

DISASSEMBLY

1. Remove rear extension.
   a. Remove control housing, check ball, return spring plugs, select check plungers and return springs. Also remove reverse check plug, check spring and check ball.
   * Be careful not to lose check balls.
   
   b. Drive out striking lever retaining pin.
   c. Remove striking lever from striking rod.
   d. Remove rear extension by lightly tapping on it.

2. Remove front cover, gasket, counter gear front bearing shim and main drive gear ball bearing snap ring.
3. Separate transmission case from adapter plate by lightly tapping on it.

4. Remove oil seal from front cover.
   * Be careful not to damage mating surface of front cover.

Shift Control Components

DISASSEMBLY

1. Set up Tool on adapter plate.
2. Remove striking rod from adapter plate.
3. Remove check ball plugs, check springs, and check balls.
4. Drive out retaining pins. Then drive out fork rods and remove interlock balls.

Gear Components

DISASSEMBLY
1. Before disassembly, measure the end play of each gear.
   - If end play is not within the specified limit, disassemble and inspect the parts.
   - Replace any part which is worn or damaged.
     Gear end play:
     Refer to SDS, MT-30.

2. Mesh 2nd and reverse gear, then remove counter gear front bearing using a suitable puller.
3. Remove snap ring, then remove sub-gear bracket, sub-gear spring and sub-gear.
4. Remove counter drive gear together with main drive gear assembly using a suitable puller.
   - When removing main drive gear assembly, be careful not to drop pilot bearing or baulk ring.
5. Remove snap ring, then remove 3rd & 4th synchronizer assembly and 3rd main gear.
6. Disassemble parts at rear of adapter plate as follows:
   a. Release staking on both countergear and mainshaft lock nuts, then loosen both nuts.
      Mainshaft lock nut: Left-hand thread
b. Remove overdrive counter gear together with counter gear rear end bearing using a suitable puller.
c. Remove reverse counter gear and spacer.
d. Remove snap rings from reverse idler shaft, then remove reverse idler gear, thrust washers and reverse idler gear bearing.

e. Remove snap ring and pull out overdrive mainshaft bearing, then remove snap ring.
f. Remove mainshaft lock nut.
g. Remove speedometer drive gear and steel ball.
h. Remove thrust washer, steel roller, roller bearing and washer.
i. Remove overdrive main gear, needle bearing and baulk ring (overdrive).
j. Remove counter gear by tapping on rear end of counter gear.
k. Press out overdrive gear bushing and overdrive & reverse synchronizer assembly.
l. Remove reverse main gear and needle bearing.
m. Press out reverse gear bushing.

7. Remove thrust washer, steel ball, 1st main gear and needle bearing.
   - Be careful not to lose steel ball.

8. Press out 1st gear bushing together with 2nd main gear using Tool.
   Remove 2nd gear needle bearing.
9. Remove main drive gear ball bearing.
a. Remove snap ring.
b. Remove main drive gear ball bearing.
Shift Control Components

INSPECTION

- Check contact and sliding surfaces of fork rods for wear, scratches, projections and other damage.

Gear Components

INSPECTION

Gears and Shafts

- Check shafts for cracks, wear and bending.
- Check gears for excessive wear, chips and cracks.

Synchronizers

- Check spline portion of coupling sleeves, synchronizer hubs, and gears for wear, chips, and cracks.
- Check baulk rings for cracks and deformation.
- Check shifting inserts for wear and deformation.
- Check insert spread springs for deformation.
Measure baulk ring wear.

1) Measure clearance between baulk ring and gear.

- Clearance between baulk ring and gear:
  - Refer to SDS, MT-MT-31.
  - If the clearance is less than the wear limit, replace baulk ring.

2) Measure 2nd and 3rd baulk ring wear.

- Place baulk rings in position on synchronizer cone.
- While holding baulk rings against synchronizer cone as far as possible, measure dimensions “A” and “B”.
  - Standard:
    - Inner “A”: 0.7 – 0.9 mm (0.028 – 0.035 in)
    - Outer “B”: 0.6 – 1.1 mm (0.024 – 0.043 in)
  - Wear limit: 0.2 mm (0.008 in)
- If dimension “A” or “B” is smaller than the wear limit, replace outer baulk ring, inner baulk ring and synchronizer cone as a set.

Bearsings

- Make sure all bearings roll freely and are free from noise, cracks, pitting or wear.
1. Install bearings into case components.
2. Assemble adapter plate parts.
   - Install oil gutter on adapter plate and expand on rear side.
   - Install bearing retainer.
     a. Insert reverse idler shaft, then install bearing retainer.

b. Tighten each screw, then stake each one at two points.

3. Install main drive gear ball bearing.
   a. Press main drive gear ball bearing.
b. Select and install proper main drive gear snap ring to achieve proper clearance of groove.
   
   **Allowable clearance of groove:**
   
   $0 - 0.13 \text{ mm (}0 - 0.0051 \text{ in)}$
   
   **Main drive gear bearing snap ring:**
   Refer to SDS, MT-31.

4. Assemble synchronizers.
   - 1st and 2nd synchronizer

   - Check coupling sleeve and synchronizer hub orientation.
● 2nd and 3rd double baulk ring type synchronizer.

● 3rd & 4th synchronizer
5. Assemble front side components to mainshaft.
   a. Install 2nd main gear, needle bearing and 1st & 2nd synchronizer assembly; then press 1st gear bushing on mainshaft.
   b. Install 1st main gear.

   c. Install steel ball and 1st gear washer.
   ● Before installation, apply multi-purpose grease to steel ball and to both sides of the 1st gear washer.

6. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft as follows:
   a. Press mainshaft assembly into adapter plate using Tool.
b. Press counter gear into adapter plate using Tool.

c. Install 3rd main gear and needle bearing, then press 3rd & 4th synchronizer assembly onto mainshaft.
- Pay attention to the direction of 3rd & 4th synchronizer.

d. Install front mainshaft snap ring.
Select proper front mainshaft snap ring to achieve proper clearance of groove.
- Allowable clearance of groove:
  - 0 - 0.18 mm (0 - 0.0071 in)
- Mainshaft front snap ring:
  Refer to SDS, MT-31.

e. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

f. Press counter drive gear together with main drive gear using Tool.
- Pay attention to the direction of counter drive gear.

g. Install sub-gear components.

i. Install sub-gear and sub-gear bracket on counter drive gear and then select proper snap ring that will minimize clearance of groove in counter gear.
- Do not install sub-gear spring at this time.
  - Allowable clearance of groove:
    - 0 - 0.18 mm (0 - 0.0071 in)
  - Counter drive gear snap ring:
    Refer to SDS, MT-31.

ii. Remove snap ring, sub-gear bracket and sub-gear from counter gear.

iii. Reinstall sub-gear, sub-gear spring, sub-gear bracket and snap ring.
7. Install rear side components on mainshaft and counter gear as follows:
   a. Install sub-gear parts (sub-gear, sub-gear spring, sub-gear bracket, steel ball and snap ring) on the reverse idler gear.
   b. Install reverse idler gear to reverse idler shaft along with reverse idler thrust washer, snap rings and reverse idler gear bearing.
   c. Install bushing, reverse main gear and overdrive & reverse synchronizer to mainshaft.
      - Pay attention to the direction of synchronizer hub.
   d. Install overdrive gear bushing to mainshaft using Tool.
   e. Install overdrive main gear and needle bearing to mainshaft.
   f. Install spacer, reverse counter gear and overdrive counter gear to counter/gear.
      - OD main gear and OD counter gear should be handled as a matched set.
   g. Install washer, roller bearing, steel roller and thrust washer.
   h. Tighten mainshaft lock nut temporarily.
      - Always use new lock nut.
i. Install counter/gear rear end bearing using Tool.

8. Mesh 2nd and reverse gears, then tighten mainshaft lock nut using Tool.
   - **Always use new lock nut.**
     
     Mainshaft lock nut:
     
     \[ \text{Mainshaft lock nut:} \]
     
     \[ \text{: 137 - 167 N-m (14.0 - 17.0 kg-m, 101 - 123 ft-lb)} \]

   - Use the chart shown at left to determine the proper reading torque.
     (Length of torque wrench vs. setting or reading torque)
   
   Reference: Formula to convert torque wrench indication to the true torque value:
   
   \[ T = \frac{(0.1 \text{ m (0.33 ft)} + L)}{L} \times C \]
   
   If the specified torque is \( T \text{ kg-m (ft-lb)} \), the torque wrench scale indication \( C \) is determined using the following formula.
   
   \[ C = \frac{T}{(0.1 \text{ m (0.33 ft)} + L)} \]

9. Tighten counter gear lock nut.
   - **Always use new lock nut.**
     
     Counter gear lock nut:
     
     \[ \text{Counter gear lock nut:} \]
     
     \[ \text{: 98 - 127 N-m (10.0 - 13.0 kg-m, 72 - 94 ft-lb)} \]

10. Stake mainshaft lock nut and counter gear lock nut using a punch.


12. Install snap ring and OD mainshaft bearing, then snap ring.
   
   **Allowable clearance:**
   
   \[ 0 - 0.14 \text{ mm (0 - 0.0055 in)} \]

   OD mainshaft bearing snap ring:
   
   Refer to SDS, MT-32.
Shift Control Components

ASSEMBLY

1. Install fork rods, interlock plunger, interlock balls and check balls.

2. Install 1st & 2nd shift fork, then drive in retaining pin.

3. Install 3rd & 4th shift fork, then drive in retaining pin.

4. Install overdrive & reverse shift fork, then drive in retaining pin.

Case Components

ASSEMBLY

1. Install front cover oil seal using Tool.
   - Apply multi-purpose grease to seal lip.
2. Apply sealant to mating surface of transmission case as shown in the figure at left.
   - Use genuine anaerobic liquid gasket, Three Bond TB1215, Loctite Part No. 51813 or equivalent.

3. Slide gear assembly onto adapter plate by lightly tapping it using a soft hammer.

4. Install main drive gear ball bearing snap ring.

5. Apply sealant to mating surface of adapter plate as shown at left.
   - Use genuine anaerobic liquid gasket Three Bond TB1215, Loctite Part No. 51813 or equivalent.

6. Place shift forks in neutral position.
7. Install striking lever and rod onto adapter plate and align striking lever with shift brackets.
8. Install rear extension.
   ● Tighten mounting bolts equally in a criss-cross pattern.

9. Install striking lever retaining pin.

10. Select counter gear front bearing shim.
    Allowable clearance (A) from bearing surface to transmission case:
    0 - 0.16 mm (0 - 0.0063 in)
    Countershaft front bearing shim:
    Refer to SDS, MT-32.

11. Install gasket and front cover.

12. Install check ball, return springs, select check plungers and plugs.

13. Install control housing and gasket.
**General Specifications**

<table>
<thead>
<tr>
<th>Applied model</th>
<th>KA24DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>FS5W71C</td>
</tr>
<tr>
<td>Number of speed</td>
<td>5</td>
</tr>
<tr>
<td>Shift pattern</td>
<td>![Shift Pattern Diagram]</td>
</tr>
</tbody>
</table>

**Synchromesh type**

<table>
<thead>
<tr>
<th>Gear ratio</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>OD</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td></td>
<td></td>
<td>3.592</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td>2.246</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td></td>
<td>1.415</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td></td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td></td>
<td></td>
<td>0.821</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td></td>
<td>3.657</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mainshaft (Number of teeth)**

<table>
<thead>
<tr>
<th>Gear ratio</th>
<th>Drive</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>OD</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Countershaft gear (Number of teeth)**

<table>
<thead>
<tr>
<th>Gear ratio</th>
<th>Drive</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>OD</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td></td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reverse idler gear (Number of teeth)**

<table>
<thead>
<tr>
<th>Gear ratio</th>
<th>Drive</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>OD</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Oil capacity**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>2.0 (4/14, 3-1/2)</th>
</tr>
</thead>
</table>

**Remarks**

- Reverse synchronizer: Installed
- Double cone synchronizer: 2nd & 3rd
- Sub-gear: Counter drive gear & reverse idler gear

**Gear End Play**

<table>
<thead>
<tr>
<th>Gear</th>
<th>End Play (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st gear</td>
<td>0.31 - 0.41</td>
</tr>
<tr>
<td>2nd gear</td>
<td>0.11 - 0.21</td>
</tr>
<tr>
<td>3rd gear</td>
<td>0.11 - 0.21</td>
</tr>
<tr>
<td>Overdrive</td>
<td>0.24 - 0.41</td>
</tr>
</tbody>
</table>
### Clearance Between Baulk Ring and Gear

**Standard**

<table>
<thead>
<tr>
<th>Gear Type</th>
<th>Standard Wear Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1.20 - 1.60 (0.0472 - 0.0630)</td>
</tr>
<tr>
<td>Main drive</td>
<td>1.20 - 1.60 (0.0472 - 0.0630)</td>
</tr>
<tr>
<td>Overdrive</td>
<td>1.20 - 1.60 (0.0472 - 0.0630)</td>
</tr>
<tr>
<td>Reverse</td>
<td>1.10 - 1.55 (0.0433 - 0.0610)</td>
</tr>
</tbody>
</table>

**Wear limit**

<table>
<thead>
<tr>
<th>Gear Type</th>
<th>Wear Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st, 2nd</td>
<td>0.80 (0.0315)</td>
</tr>
<tr>
<td>3rd, main drive</td>
<td>0.80 (0.0315)</td>
</tr>
<tr>
<td>Overdrive</td>
<td>0.80 (0.0315)</td>
</tr>
<tr>
<td>Reverse</td>
<td>0.70 (0.0276)</td>
</tr>
</tbody>
</table>

### 2nd & 3rd baulk ring

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Wear limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.7 - 0.9 (0.028 - 0.035)</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>B</td>
<td>0.6 - 1.1 (0.024 - 0.043)</td>
<td></td>
</tr>
</tbody>
</table>

### Available Snap Rings

#### MAIN DRIVE GEAR BEARING

**Allowable clearance** 0 - 0.13 (0 - 0.0051)

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.87 (0.0736)</td>
<td>32204-78001</td>
</tr>
<tr>
<td>1.94 (0.0764)</td>
<td>32204-78002</td>
</tr>
<tr>
<td>2.01 (0.0791)</td>
<td>32204-78003</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

#### MAINSHAFT FRONT

**Allowable clearance** 0 - 0.18 (0 - 0.0071)

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 (0.094)</td>
<td>32263-V5200</td>
</tr>
<tr>
<td>2.5 (0.098)</td>
<td>32263-V5201</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

#### COUNTER DRIVE GEAR

**Allowable clearance** 0 - 0.18 (0 - 0.0071)

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4 (0.055)</td>
<td>32215-E9000</td>
</tr>
<tr>
<td>1.5 (0.059)</td>
<td>32215-E9001</td>
</tr>
<tr>
<td>1.6 (0.063)</td>
<td>32215-E9002</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.
### OD MAINSHAFT BEARING

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0.14 (0 - 0.0055)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 (0.043)</td>
<td>32228-20100</td>
</tr>
<tr>
<td>1.2 (0.047)</td>
<td>32228-20101</td>
</tr>
<tr>
<td>1.3 (0.051)</td>
<td>32228-20102</td>
</tr>
<tr>
<td>1.4 (0.055)</td>
<td>32228-20103</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

### COUNTERSHAFT FRONT BEARING

#### Available Shims

<table>
<thead>
<tr>
<th>Thickness of shim</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.52 - 4.71 (0.1780 - 0.1854)</td>
<td>Not necessary</td>
</tr>
<tr>
<td>4.42 - 4.51 (0.1740 - 0.1776)</td>
<td>0.1 (0.004) 32218-V5000</td>
</tr>
<tr>
<td>4.32 - 4.41 (0.1701 - 0.1736)</td>
<td>0.2 (0.008) 32218-V5001</td>
</tr>
<tr>
<td>4.22 - 4.31 (0.1661 - 0.1697)</td>
<td>0.3 (0.012) 32218-V5002</td>
</tr>
<tr>
<td>4.12 - 4.21 (0.1622 - 0.1657)</td>
<td>0.4 (0.016) 32218-V5003</td>
</tr>
<tr>
<td>4.02 - 4.11 (0.1583 - 0.1618)</td>
<td>0.5 (0.020) 32218-V5004</td>
</tr>
<tr>
<td>3.92 - 4.01 (0.1543 - 0.1579)</td>
<td>0.6 (0.024) 32218-V5005</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.
## Special Service Tools

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
</table>
| ST23540000 (J25689-A)       | Pin punch | Removing and installing retaining pin  
  a: 2.3 mm (0.091 in) dia.  
  b: 4 mm (0.16 in) dia. |
| ST30031000 (J22912-01)       | Puller    | Removing 1st & 2nd synchronizer assembly  
  Removing counter gear rear thrust bearing  
  Removing main drive bearing  
  a: 90 mm (3.54 in) dia.  
  b: 50 mm (1.97 in) dia. |
| ST33290001 (J25810-A)       | Puller    | Removing rear oil seal  
  a: 250 mm (9.48 in)  
  b: 160 mm (6.70 in) |
| ST33230000                  | Drift     | Removing mainshaft and counter gear  
  a: 51 mm (2.01 in) dia.  
  b: 28.5 mm (1.122 in) dia. |
| KV38100300 (J25523)         | Drift     | Removing counter gear front bearing (Use with  
  KV38100300)  
  a: 34 mm (1.34 in) dia.  
  b: 28 mm (1.10 in) dia. |
| ST30720000 1 (J34286)       | Drift     | 1 Removing mainshaft front bearing  
  2 Installing mainshaft front bearing  
  a: 77 mm (3.03 in) dia.  
  b: 55.5 mm (2.185 in) dia. |
| ST33210000 1 (J25523)       | Drift     | 1 Installing counter gear front bearing  
  2 Installing front cover oil seal  
  a: 44 mm (1.73 in) dia.  
  b: 24.5 mm (0.965 in) dia. |
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST30613000 (J25742-3)</td>
<td>Drift</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>
|                            | Installing main drive gear bearing | a: 72 mm (2.83 in) dia. 
|                            |             | b: 48 mm (1.89 in) dia. |
| ST37750000 (J34286)        | 1 (J34332)  | ![Diagram](image) |
|                            | 2 (J34334)  |          |
|                            | 3 (J25679-01) |         |
|                            | Drift       |          |
|                            | 1 Removing counter gear rear bearing | |
|                            | 2 Installing OD gear bushing | |
|                            | 2 Removing and installing mainshaft rear bearing | (4WD model) |
|                            | 2 Installing reverse cone | |
|                            | 3 Installing reverse counter gear | |
|                            | 4 Installing counter gear rear end bearing | a: 40 mm (1.57 in) dia. 
|                            |             | b: 31 mm (1.22 in) dia. |
| ST22452000 (J34337)        | Drift       | ![Diagram](image) |
|                            | Installing reverse hub | |
|                            | Installing mainshaft rear bearing (2WD model) | a: 45 mm (1.77 in) dia. 
|                            |             | b: 36 mm (1.42 in) dia. |
| ST334000001 (J26082)       | Drift       | ![Diagram](image) |
|                            | Installing rear oil seal | a: 60 mm (2.36 in) dia. 
|                            |             | b: 47 mm (1.85 in) dia. |
| (J26349-3) Puller leg      |             | ![Diagram](image) |
|                            | Installing mainshaft and counter gear | (Use with J34328) |
| (J34328) Puller            |             | ![Diagram](image) |
|                            | Installing mainshaft and counter gear | (Use with J26349-3) |
| (J26092) Drift             |             | ![Diagram](image) |
|                            | Installing sub-gear snap ring | a: 44.5 mm (1.752 in) dia. 
|                            |             | b: 38.5 mm (1.516 in) dia. |
| (J34342) Drift             |             | ![Diagram](image) |
|                            | Installing OD main gear | |
|                            | Installing reverse gear bushing | a: 44.5 mm (1.752 in) dia. 
<p>|                            |             | b: 40.5 mm (1.594 in) dia. |</p>
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST33220000 (J25804-01)</td>
<td>Drift</td>
<td>Installing mainshaft rear bearing&lt;br&gt;a: 37 mm (1.46 in) dia.&lt;br&gt;b: 22 mm (0.87 in) dia.</td>
</tr>
</tbody>
</table>

### Commercial Service Tool

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puller</td>
<td>Removing counter gear rear end bearing&lt;br&gt;Removing mainshaft rear bearing (2WD model)&lt;br&gt;Removing reverse synchronizer hub&lt;br&gt;Removing reverse counter gear</td>
</tr>
</tbody>
</table>

NT077
NVH Troubleshooting Chart

Use the chart below to help you find the cause of the problem. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

### MANUAL TRANSMISSION

<table>
<thead>
<tr>
<th>Reference page</th>
<th>OIL (Level low)</th>
<th>OIL (Wrong)</th>
<th>OIL (Level too high)</th>
<th>GASKET (Damaged)</th>
<th>OIL SEAL (Worn or damaged)</th>
<th>O-RING (Worn or damaged)</th>
<th>CHECK PLUG RETURN SPRING AND CHECK BALL (Worn or damaged)</th>
<th>SHIFT FORK (Worn)</th>
<th>GEAR (Worn or damaged)</th>
<th>BEARING (Worn or damaged)</th>
<th>BAULK RING (Worn or damaged)</th>
<th>INSERT SPRING (Damaged)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSPECTED PARTS</td>
<td>Noise</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil leakage</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hard to shift or will not shift</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jumps out of gear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference page: Refer to "Checking M/T Oil".
### Position Switch Check

<table>
<thead>
<tr>
<th>Switch</th>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back-up lamp switch</td>
<td>Reverse</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Except reverse</td>
<td>No</td>
</tr>
<tr>
<td>Park/neutral position (PNP) switch</td>
<td>Neutral</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Except neutral</td>
<td>No</td>
</tr>
</tbody>
</table>

**Diagram:**
- Back-up lamp switch
- Park/neutral position (PNP) switch

**On-Vehicle Service FS5R30A**

MT-40
Removal

CAUTION:
When removing the M/T assembly from engine, first remove the crankshaft position sensor (OBD) from the M/T assembly. Be careful not to damage sensor edge.

2WD MODEL

1. Remove battery negative terminal.
2. Remove shift lever with control housing from transmission.
3. Remove crankshaft position sensor (OBD) from upper side of transmission case.
4. Remove clutch operating cylinder from transmission. Tighten clutch operating cylinder to the specified torque. Refer to “CLUTCH SYSTEM”, CL-5.
5. Disconnect speed sensor, back-up lamp switch, rear heated oxygen sensor and park/neutral position (PNP) switch harness connectors.
6. Remove starter motor from transmission.  
   : 41 - 52 N·m (4.2 - 5.3 kg-m, 30 - 38 ft-lb)
   - Insert plug into rear oil seal after removing propeller shaft.
   - Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.
8. Remove gussets from transmission or engine.
10. Support manual transmission with a jack.
11. Remove rear mounting member. Tighten rear mounting member to the specified torque. Refer to “ENGINE REMOVAL”, EM-99.
12. Lower manual transmission as much as possible.

WARNING:
Support Manual Transmission while removing it.
1. Remove battery negative terminal.
2. Remove shift lever from transmission and control lever from transfer.
3. Remove clutch operating cylinder from transmission. Tighten clutch operating cylinder to the specified torque. Refer to "CLUTCH SYSTEM", CL-5.
4. Disconnect speed sensor, back-up lamp switch, rear heated oxygen sensor and Park/neutral position (PNP) switch harness connectors.
5. Remove starter motor from transmission.
   \[ \text{Torque} : 41 - 52 \text{ N\cdot m (4.2 - 5.3 kg-m, 30 - 38 ft-lb)} \]
   - Insert plug into rear oil seal after removing propeller shaft.
   - Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.
7. Remove exhaust tube mounting bracket from transmission. Refer to "EXHAUST SYSTEM", FE-8.
8. Remove front exhaust tubes and center pipe.
9. Remove torsion bars and mounts.
10. Remove rear torsion bar cross mounts.
11. Remove gussets from transmission or engine.
13. Remove rear mounting member. Tighten rear mounting member to the specified torque. Refer to "ENGINE REMOVAL", EM-99.
14. Lower manual transmission as much as possible.

**WARNING:**
Support Manual Transmission together with transfer, while removing it.
15. Remove crankshaft position sensor (OBD) from upper side of transmission case.
16. Remove transmission bolts.

**WARNING:**
Support Manual Transmission together with transfer, while removing it.

**Installation**
- Apply sealant as below: — 4WD model

**APPLICATION**

<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Tightening torque N·m (kg·m, ft·lb)</th>
<th>( \ell ) mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>65 (2.56)</td>
</tr>
<tr>
<td>2</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>58 (2.28)</td>
</tr>
<tr>
<td>3</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>25 (0.98)</td>
</tr>
</tbody>
</table>

Gusset to engine 29 - 39 (3.0 - 4.0, 22 - 29) 20 (0.79)
Case Components

DISASSEMBLY

1. Remove check ball plug, check spring and check ball. Then remove interlock stopper.
   - If interlock assembly is removed as a unit, the check ball can fall into transmission case.
   - Be careful not to lose check ball.

2. Remove control housing, return spring and check ball.
   - Be careful not to lose check ball.

3. Drive out retaining pin from striking arm.

4. Remove rear extension (or OD gear case) together with striking arm by tapping lightly.

5. Remove front cover and gasket.
6. Remove stopper ring and main drive bearing snap ring.

7. Remove transmission case by tapping lightly.

8. Remove front cover oil seal.

**Shift Control Components**

**DISASSEMBLY**

1. Mount adapter plate on vise.
2. Remove OD & reverse fork rod.
3. Drive out retaining pin from striking lever.
4. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift fork.
5. Drive out retaining pin from OD shift fork.
6. Pull out OD fork rod and then remove OD shift fork.

Gear Components
DISASSEMBLY
1. Before removing gears and shafts, measure each gear end play.
   Gear end play:
   Refer to SDS, MT-67.
   • If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.

2. Remove rear side components on mainshaft and counter gear.
   a. Remove reverse coupling sleeve.
   b. Remove mainshaft rear snap ring and counter gear rear snap ring.
   c. Remove C-ring holder and mainshaft C-rings from mainshaft. Use punch and hammer to remove C-rings.
   d. Pull out counter gear rear end bearing.
   e. Remove reverse idler gear and reverse idler thrust washers.
f. Pull out mainshaft rear bearing (2WD model).


g. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.

h. Pull out reverse counter gear.

i. Remove OD coupling sleeve together with OD baulk ring, reverse baulk ring and spring inserts.

j. Pull out reverse gear bushing.

k. Pull out OD counter gear together with reverse cone.
3. Press out mainshaft and counter gear alternately.

4. Remove front side components on mainshaft.
   a. Remove 1st gear washer and steel ball.
   b. Remove 1st main gear and 1st gear needle bearing.
      • **Be careful not to lose steel ball.**
   c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
   d. Remove mainshaft front snap ring.
   e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.
5. Remove front side components on counter gear.
   a. Remove counter gear rear thrust bearing.

   b. Remove sub-gear components.

6. Remove main drive gear bearing.
   a. Remove main drive gear snap ring.
   b. Press out main drive gear bearing.

7. Remove bearings from case components.
Shift Control Components

INSPECTION
- Check contact surface and sliding surface for wear, scratches, projections or other damage.

Gear Components

INSPECTION
Gears and Shafts
- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Synchronizers
- Check spline portion of coupling sleeves, hubs, and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.
- Measure wear of main drive, 1st and OD baulk rings.
  Clearance between baulk ring and gear:
  Refer to SDS, MT-67.
- If the clearance is smaller than the wear limit, replace baulk ring.
Measure wear of 2nd and 3rd baulk rings.

a) Place baulk rings in position on synchronizer cone.
b) While holding baulk rings against synchronizer cone as far as it will go, measure dimensions “A” and “B”.

**Standard:**
- A 0.7 - 0.9 mm (0.028 - 0.035 in)
- B 0.6 - 1.1 mm (0.024 - 0.043 in)

**Wear limit:**
- 0.2 mm (0.008 in)

If dimension “A” or “B” is smaller than the wear limit, replace outer baulk ring, inner baulk ring and synchronizer cone as a set.

Measure wear of reverse baulk ring.

a) Place baulk ring in position on reverse cone.
b) While holding baulk ring against reverse cone as far as it will go, measure dimension “A” with dial indicator.

**Dimension “A”:**
- Standard −0.1 to 0.35 mm (−0.0039 to 0.0138 in)
- Wear limit 0.7 mm (0.028 in)

c) If dimension “A” is larger than the wear limit, replace baulk ring.

**Bearings**
- Make sure bearings roll freely and are free from noise, crack, pitting or wear.
1. Install bearings into case components.
2. Install main drive gear bearing.
   a. Press main drive gear bearing.
   b. Select proper main drive gear snap ring to minimize clearance of groove.
      
      **Allowable clearance of groove:**
      
      0 - 0.1 mm (0 - 0.004 in)

      Main drive gear snap ring:
      
      Refer to SDS, MT-68.
   
   c. Install selected snap ring on main drive gear.

3. Install components on counter gear.
   a. Install sub-gear components.
      
      ● When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.
b. Install counter gear rear thrust bearing.

4. Install front side components on mainshaft.
   a. Assemble 1st & 2nd synchronizer.
   b. Assemble 3rd & 4th synchronizer.
   c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.
      ● Pay attention to direction of synchronizer assembly.
   d. Select proper snap ring to minimize clearance of groove.
      Allowable clearance of groove:
      0 - 0.1 mm (0 - 0.004 in)
      Mainshaft front snap ring:
      Refer to SDS, MT-68.
   e. Install selected snap ring on mainshaft.
f. Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.

g. Press on 1st gear bushing using 1st gear washer.

h. Install 1st main gear and needle bearing.

i. Install steel ball and 1st gear washer.

- Apply multi-purpose grease to steel ball and 1st gear washer before installing.

5. Select proper counter gear front bearing thrust washer when replacing transmission case, counter gear, counter gear rear thrust bearing or sub-gear components.

a. Install counter gear with sub-gear components, counter gear front and rear bearing thrust washer on adapter plate.

b. Remove counter gear front bearing thrust washer from transmission case.

c. Place adapter plate and counter gear assembly in transmission case (case inverted).
d. Tighten adapter plate to transmission case using 2 bolts.

e. Place dial indicator on rear end of counter gear.

f. Move counter gear up and down and measure dial indicator deflection.

g. Select proper thrust washer using table below as a guide.

Counter gear end play:
0.10 - 0.25 mm (0.0039 - 0.0098 in)

Table for selecting proper counter gear front bearing thrust washer:
Refer to SDS, MT-69.

6. Select proper reverse idler rear thrust washer when replacing rear extension (or OD gear case), reverse idler gear, reverse idler shaft or reverse idler front thrust washer.

a. Install reverse idler gear, reverse idler needle bearings, reverse idler front thrust washers and reverse idler shaft into rear extension (or OD gear case).

- When replacing reverse idler rear thrust washer, install either A or B.

Reverse idler rear thrust washer:
Refer to SDS, MT-69.
b. Place dial indicator on front end of reverse idler shaft.

c. Put straightedge on front surface of rear extension (or OD gear case) as a stopper of reverse idler shaft.

d. Move reverse idler shaft up and down and measure reverse idler gear end play.

   **Reverse idler gear end play:**
   
   0.30 - 0.53 mm (0.0118 - 0.0209 in)

    e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.

7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.

   a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.

    b. Install mainshaft a little on mainshaft front bearing.

    * To allow for installation of counter gear, do not install mainshaft completely.

   c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.
When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.

d. Install Tools (J26349-3) onto adapter plate and C-ring and C-ring holder on mainshaft.
e. Install Tool (J34328) on mainshaft.

f. Install mainshaft and counter gear completely by extending length of (J26349-3).

8. Install rear side components on mainshaft and counter gear.
   a. Install OD gear bushing while pushing on the front of counter gear.

b. Install OD main gear.
   ● Pay attention to direction of OD main gear. (B is wider than A as shown at left.)
c. Install adapter plate with gear assembly onto transmission case.
d. Install OD gear needle bearing and then install OD counter gear and reverse idler shaft.
e. Install reverse gear bushing with speedometer drive gear (2WD model).

f. Install reverse cone.

g. Install insert springs and reverse baulk ring on OD coupling sleeve. Then install them and OD baulk ring on OD counter gear.
   - Pay attention to direction of OD coupling sleeve.

h. Install reverse counter gear.

i. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.
j. Install reverse hub.
  * Pay attention to its direction.

k. Install mainshaft spacer and mainshaft rear bearing (2WD model).

l. Install counter gear rear end bearing.

m. Separate adapter plate from transmission case and mount adapter plate on vice again.

n. Select proper mainshaft C-ring to minimize clearance of groove.
   
   **Allowable clearance of groove:**
   0 - 0.1 mm (0 - 0.004 in)
   
   **Mainshaft C-ring:**
   Refer to SDS, MT-69.

o. Install selected C-ring, C-ring holder and mainshaft rear snap ring.
p. Select proper counter gear rear snap ring to minimize clearance of groove.
   - **Allowable clearance of groove:**
     - 0 - 0.1 mm (0 - 0.004 in)
   - **Counter gear rear snap ring:**
     - Refer to SDS, MT-69.
q. Install selected counter gear rear snap ring.

r. Install reverse coupling sleeve.
   - **Pay attention to its direction.**
s. Measure each gear end play as a final check. Refer to "DISASSEMBLY", MT-50.

---

**Shift Control Components**

**ASSEMBLY**

1. Install OD fork rod and OD shift fork. Then install retaining pin into OD shift fork.
2. Install 1st & 2nd, 3rd & 4th and reverse shift fork onto coupling sleeve.

3. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever.
   - **Make sure that striking rod moves smoothly.**
1. Install front cover oil seal.
   - **Apply multi-purpose grease to seal lip.**

2. Install selected counter gear front bearing shim onto transmission case.
   - **Apply multi-purpose grease.**

3. Apply sealant to mating surface of transmission case.

4. Install gear assembly onto transmission case.

5. Install check spring and check ball into interlock stopper.
   - **Apply multi-purpose grease to check ball.**

6. Install interlock stopper assembly and then tighten check ball plug.
   - **Apply sealant to thread of check ball plug.**
   - Refer to Shift Control Components, MT-47.

7. Install stopper ring and main drive bearing snap ring.

8. Install front cover and gasket.
   - **Apply sealant to thread of 3 bolts shown left.**
   - Refer to Case Components, MT-44.

9. Apply sealant to mating surface of adapter plate.
10. Install OD gear case together with striking arm.

11. Install retaining pin into striking arm.

12. Install return spring and check ball and then install control housing.
   - Apply sealant to mating surface of OD gear case. Refer to Case Components, MT-44.

13. Tighten control housing bolts.
    - **Bolt head size:**
      - A bolts 12 mm (0.47 in)
      - B bolts 13 mm (0.51 in)
General Specifications

<table>
<thead>
<tr>
<th>Transmission</th>
<th>FS5R30A</th>
</tr>
</thead>
<tbody>
<tr>
<td>2WD</td>
<td></td>
</tr>
<tr>
<td>4WD</td>
<td></td>
</tr>
</tbody>
</table>

Number of speed

| Number of speed | 5 |

Shift pattern

![Shift pattern diagram]

Synchromesh type

| Synchromesh type | Warner |

Gear ratio and Number of teeth

<table>
<thead>
<tr>
<th>Gear</th>
<th>Mainshaft</th>
<th>Countershaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>—</td>
<td>22</td>
</tr>
<tr>
<td>1st</td>
<td>3.580</td>
<td>32</td>
</tr>
<tr>
<td>2nd</td>
<td>2.077</td>
<td>30</td>
</tr>
<tr>
<td>3rd</td>
<td>1.360</td>
<td>29</td>
</tr>
<tr>
<td>4th</td>
<td>1.000</td>
<td>—</td>
</tr>
<tr>
<td>OD</td>
<td>0.811</td>
<td>24</td>
</tr>
<tr>
<td>Reverse</td>
<td>3.636</td>
<td>30</td>
</tr>
<tr>
<td>Reverse idler gear</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

Oil capacity \( (\text{US pt, Imp pt}) \) \( 2.4 (5-1/8, 4-1/4) \) \( 5.1 (10-3/4, 9) \)

Remarks

2nd & 3rd double baulk ring type synchronizer

Gear End Play

<table>
<thead>
<tr>
<th>Gear</th>
<th>End play</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st main gear</td>
<td>0.23 - 0.33</td>
</tr>
<tr>
<td>2nd main gear</td>
<td>0.23 - 0.33</td>
</tr>
<tr>
<td>3rd main gear</td>
<td>0.06 - 0.16</td>
</tr>
<tr>
<td>OD counter gear</td>
<td>0.23 - 0.33</td>
</tr>
<tr>
<td>Reverse main gear</td>
<td>0.33 - 0.43</td>
</tr>
<tr>
<td>Counter gear</td>
<td>0.10 - 0.25</td>
</tr>
<tr>
<td>Reverse idler gear</td>
<td>0.30 - 0.53</td>
</tr>
</tbody>
</table>

Clearance Between Baulk Ring and Gear

<table>
<thead>
<tr>
<th>Gear</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1.05 - 1.3</td>
<td>0.7 (0.028)</td>
</tr>
<tr>
<td>Main drive</td>
<td>1.05 - 1.3</td>
<td>0.7 (0.028)</td>
</tr>
<tr>
<td>OD</td>
<td>1.05 - 1.3</td>
<td>0.7 (0.028)</td>
</tr>
</tbody>
</table>
2ND AND 3RD BAULK RING

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.7 - 0.9 (0.028 - 0.035)</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>B</td>
<td>0.6 - 1.1 (0.024 - 0.043)</td>
<td></td>
</tr>
</tbody>
</table>

Distance between Rear Surface of Reverse Cone and Reverse Baulk Ring

<table>
<thead>
<tr>
<th>Dimension &quot;A&quot;</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>−0.1 to 0.35 (−0.0039 to 0.0138)</td>
<td>0.7 (0.028)</td>
</tr>
</tbody>
</table>

Available Snap Ring

MAIN DRIVE GEAR SNAP RING

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.1 (0 - 0.004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>Part number</td>
</tr>
<tr>
<td>1.89 (0.0744)</td>
<td>32204-01G60</td>
</tr>
<tr>
<td>1.95 (0.0768)</td>
<td>32204-01G61</td>
</tr>
<tr>
<td>1.99 (0.0783)</td>
<td>32204-01G62</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

MAINSHAFT FRONT SNAP RING

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.1 (0 - 0.004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>Part number</td>
</tr>
<tr>
<td>1.99 (0.0783)</td>
<td>32204-01G62</td>
</tr>
<tr>
<td>2.03 (0.0799)</td>
<td>32204-01G63</td>
</tr>
<tr>
<td>2.07 (0.0815)</td>
<td>32204-01G64</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

MT-68
### Counter Gear Rear Snap Ring

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Part number</th>
<th>Thickness (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.32 (0.0520)</td>
<td>32236-01G00</td>
<td>1.56 (0.0614)</td>
<td>32236-01G04</td>
</tr>
<tr>
<td>1.38 (0.0543)</td>
<td>32236-01G01</td>
<td>1.62 (0.0638)</td>
<td>32236-01G05</td>
</tr>
<tr>
<td>1.44 (0.0567)</td>
<td>32236-01G02</td>
<td>1.68 (0.0661)</td>
<td>32236-01G06</td>
</tr>
<tr>
<td>1.50 (0.0591)</td>
<td>32236-01G03</td>
<td>1.74 (0.0685)</td>
<td>32236-01G07</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

### Available C-ring

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Part number</th>
<th>Thickness (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.63 (0.1035)</td>
<td>32348-01G15</td>
<td>3.19 (0.1256)</td>
<td>32348-01G07</td>
</tr>
<tr>
<td>2.70 (0.1063)</td>
<td>32348-01G00</td>
<td>3.26 (0.1283)</td>
<td>32348-01G08</td>
</tr>
<tr>
<td>2.77 (0.1091)</td>
<td>32348-01G01</td>
<td>3.33 (0.1311)</td>
<td>32348-01G09</td>
</tr>
<tr>
<td>2.84 (0.1118)</td>
<td>32348-01G02</td>
<td>3.40 (0.1339)</td>
<td>32348-01G10</td>
</tr>
<tr>
<td>2.91 (0.1146)</td>
<td>32348-01G03</td>
<td>3.47 (0.1366)</td>
<td>32348-01G11</td>
</tr>
<tr>
<td>2.98 (0.1173)</td>
<td>32348-01G04</td>
<td>3.54 (0.1394)</td>
<td>32348-01G12</td>
</tr>
<tr>
<td>3.05 (0.1201)</td>
<td>32348-01G05</td>
<td>3.61 (0.1421)</td>
<td>32348-01G13</td>
</tr>
<tr>
<td>3.12 (0.1228)</td>
<td>32348-01G06</td>
<td>3.68 (0.1449)</td>
<td>32348-01G14</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

### Available Shim and Washer

**Table for Selecting Proper Counter Gear Front Bearing Thrust Washer**

<table>
<thead>
<tr>
<th>Dial indicator deflection</th>
<th>Thickness of proper washer (mm)</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.93 - 1.02 (0.0366 - 0.0402)</td>
<td>0.80 (0.0315)</td>
<td>32218-01G00</td>
</tr>
<tr>
<td>1.01 - 1.10 (0.0398 - 0.0433)</td>
<td>0.88 (0.0346)</td>
<td>32218-01G11</td>
</tr>
<tr>
<td>1.09 - 1.18 (0.0429 - 0.0465)</td>
<td>0.96 (0.0378)</td>
<td>32218-01G12</td>
</tr>
<tr>
<td>1.17 - 1.26 (0.0461 - 0.0496)</td>
<td>1.04 (0.0409)</td>
<td>32218-01G13</td>
</tr>
<tr>
<td>1.25 - 1.34 (0.0492 - 0.0528)</td>
<td>1.12 (0.0441)</td>
<td>32218-01G14</td>
</tr>
<tr>
<td>1.33 - 1.42 (0.0524 - 0.0559)</td>
<td>1.20 (0.0472)</td>
<td>32218-01G04</td>
</tr>
<tr>
<td>1.41 - 1.50 (0.0555 - 0.0591)</td>
<td>1.28 (0.0504)</td>
<td>32218-01G15</td>
</tr>
<tr>
<td>1.49 - 1.58 (0.0587 - 0.0622)</td>
<td>1.36 (0.0535)</td>
<td>32218-01G16</td>
</tr>
<tr>
<td>1.57 - 1.66 (0.0618 - 0.0654)</td>
<td>1.44 (0.0567)</td>
<td>32218-01G17</td>
</tr>
</tbody>
</table>

*Always check with the Parts Department for the latest parts information.

### Reverse Idler Rear Thrust Washer

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Part number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1.97 (0.0776)</td>
<td>32284-01G10</td>
</tr>
<tr>
<td>B 2.07 (0.0815)</td>
<td>32284-01G11</td>
</tr>
</tbody>
</table>
*Always check with the Parts Department for the latest parts information.