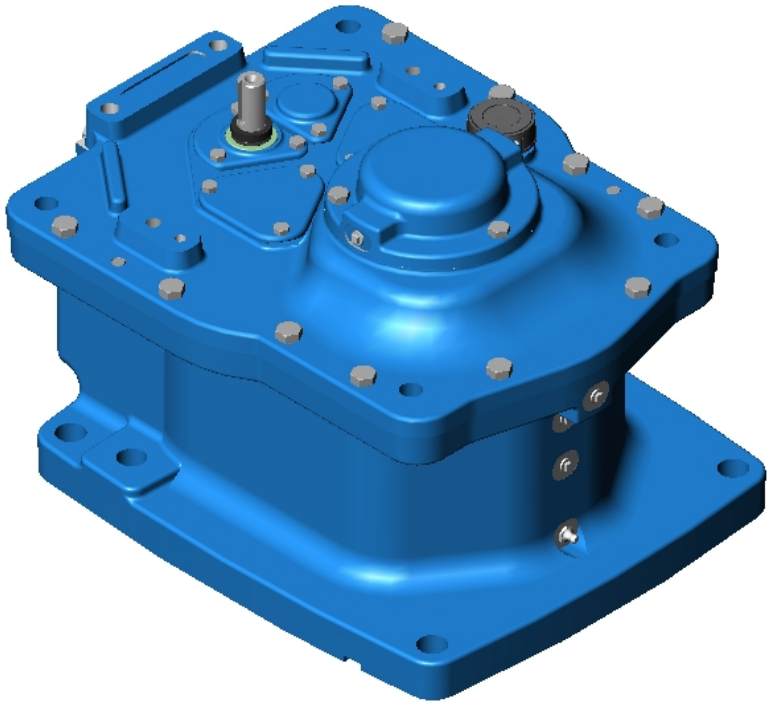
Maintenance Manual

Model 20 GT (Case Size 21, 22) Gear Drive

Triple Reduction



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1. INTRODUCTION

This manual contains instructions for 'GT' gear drive disassembly, assembly and an item List. Refer to the agitator manual for all other information relative to the agitator.

Other than periodic lubrication as defined in the *Lubrication* section of the Agitator Manual, no routine operational gear drive maintenance is required.

To assure the longest life from your gear drive, annual inspections which can correspond with plant shutdowns should be planned. Bolting and the condition of all seals should be checked. Worn parts should be replaced; and any areas of general concern should be brought to the attention of your **local Chemineer office.**

DISASSEMBLY

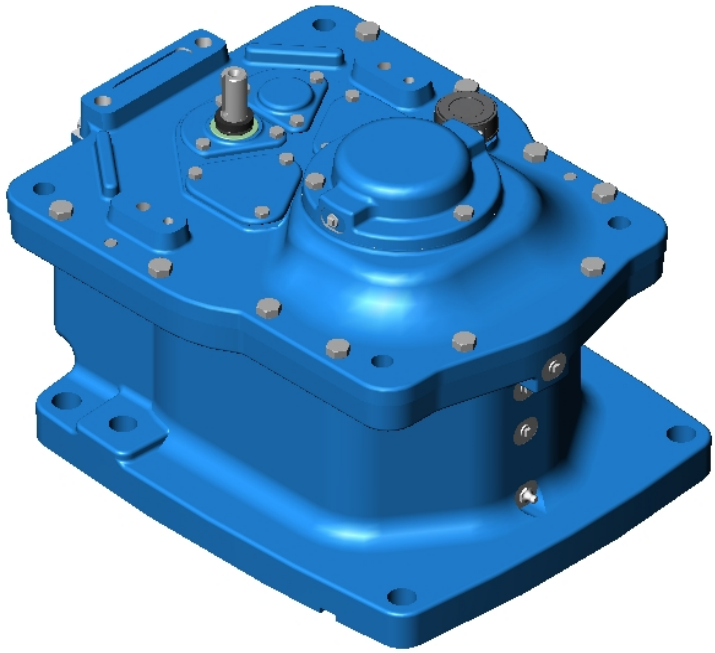

Figure 1 – Model 20 GT - Triple Reduction

2. DISASSEMBLY

A. Drain oil from the gear drive.

B. At input shaft, remove the following items (refer Figure 2):

- V-ring **[212]**
- Bolts **[213]**
- Input cap **[211]**
- Lip seal **[204]**
- O-ring **[206]**
- Shim set **[207]**

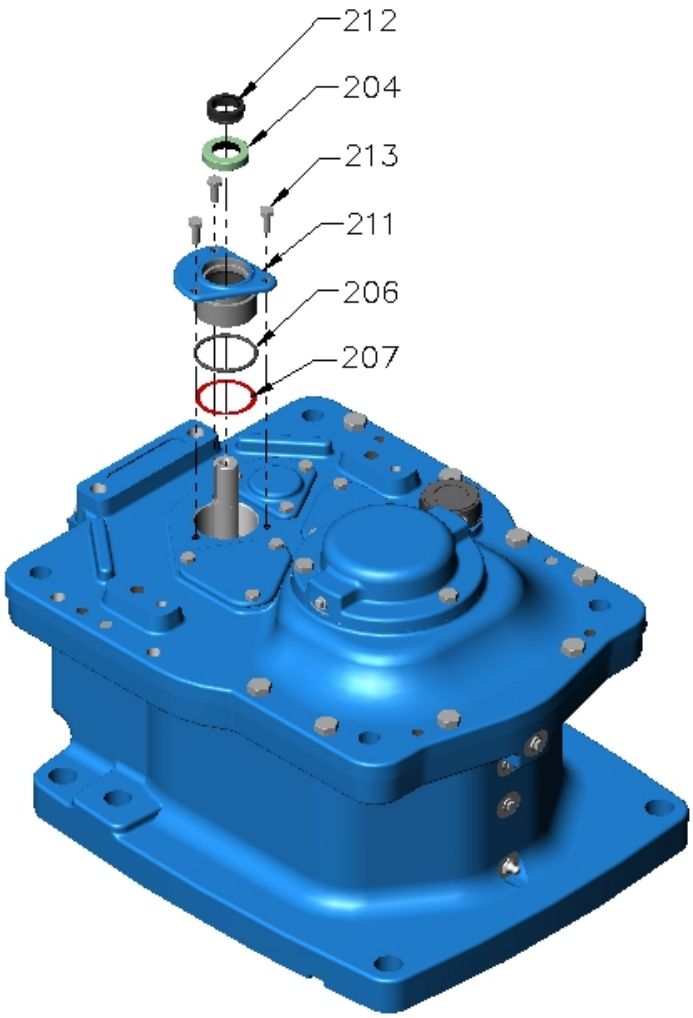

Figure 2 – Input Cap

C. At 1st intermediate shaft, remove the following items (refer Figure 3):

- Bolts **[311]**
- Intermediate cap **[310]**
- O-ring **[312]**
- Shim set **[207]**

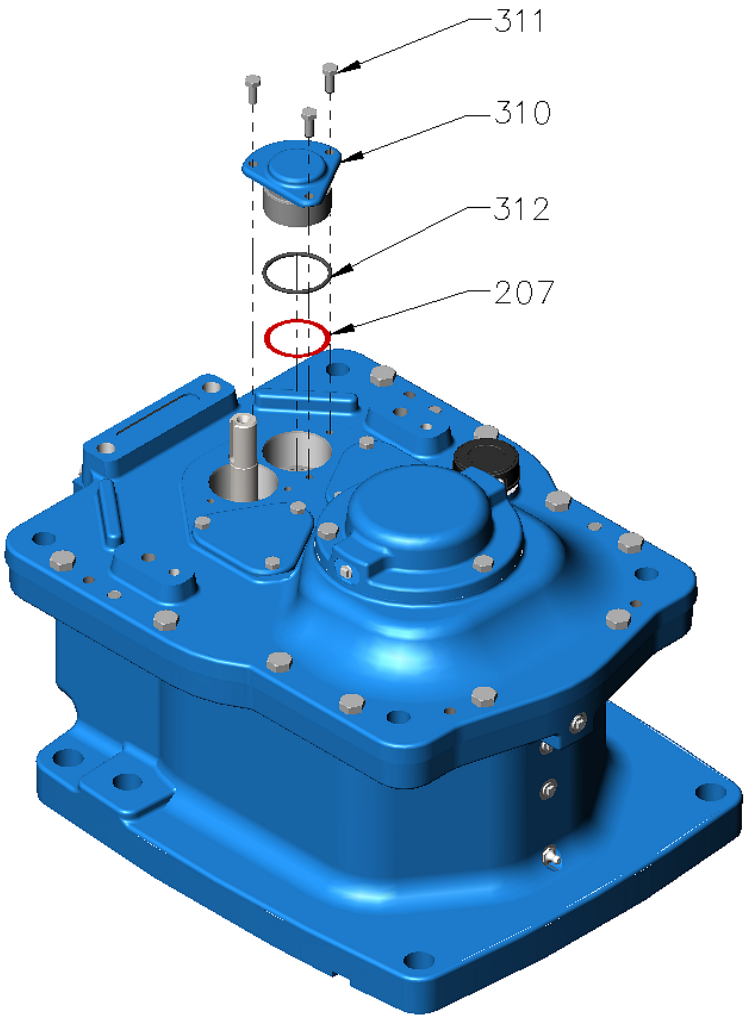

Figure 3 – 1st Intermediate Cap

D. At 2nd intermediate shaft, remove the following items (refer Figure 4):

- Bolts **[225]**
- Intermediate cap **[223]**
- O-ring **[222]**

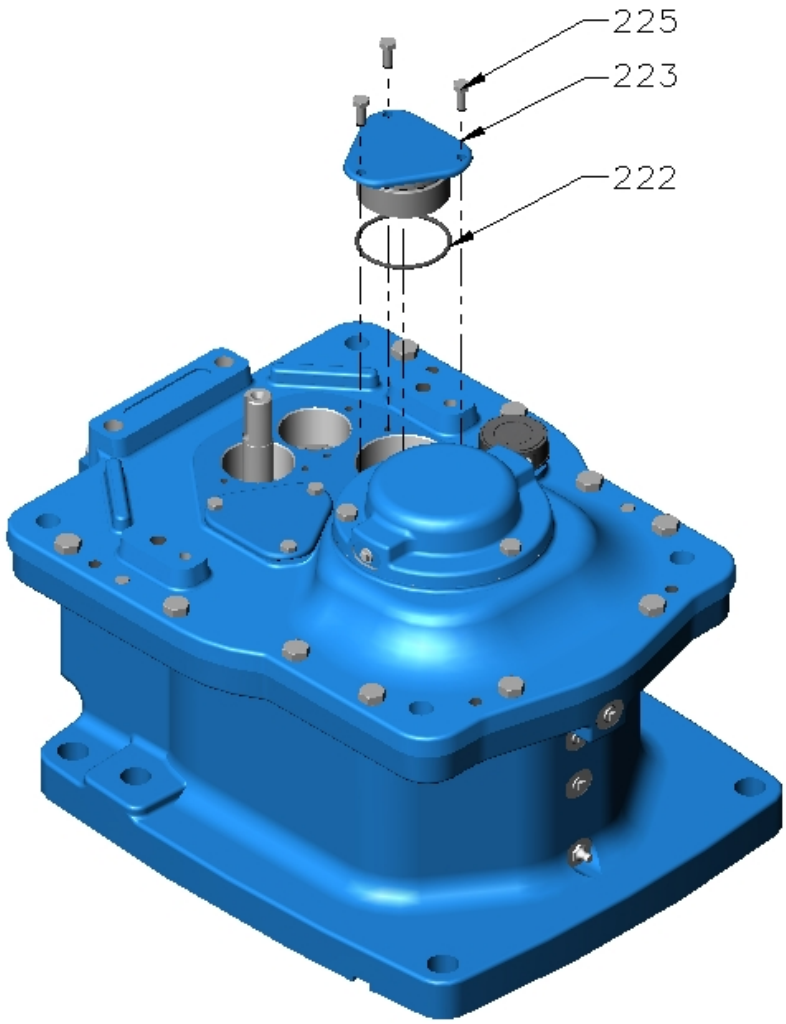

Figure 4 – 2nd Intermediate Cap

E. At output shaft, remove the following items (refer Figure 5):

- Bolts **[255]**
- Output cap **[254]** and only remove grease nipples **[260 and 261]** ***if necessary***
- O-ring **[253]**
- Bolts **[230]** and spring washers **[231]**
- Thrust washer **[228]**
- Shim set **[229]**

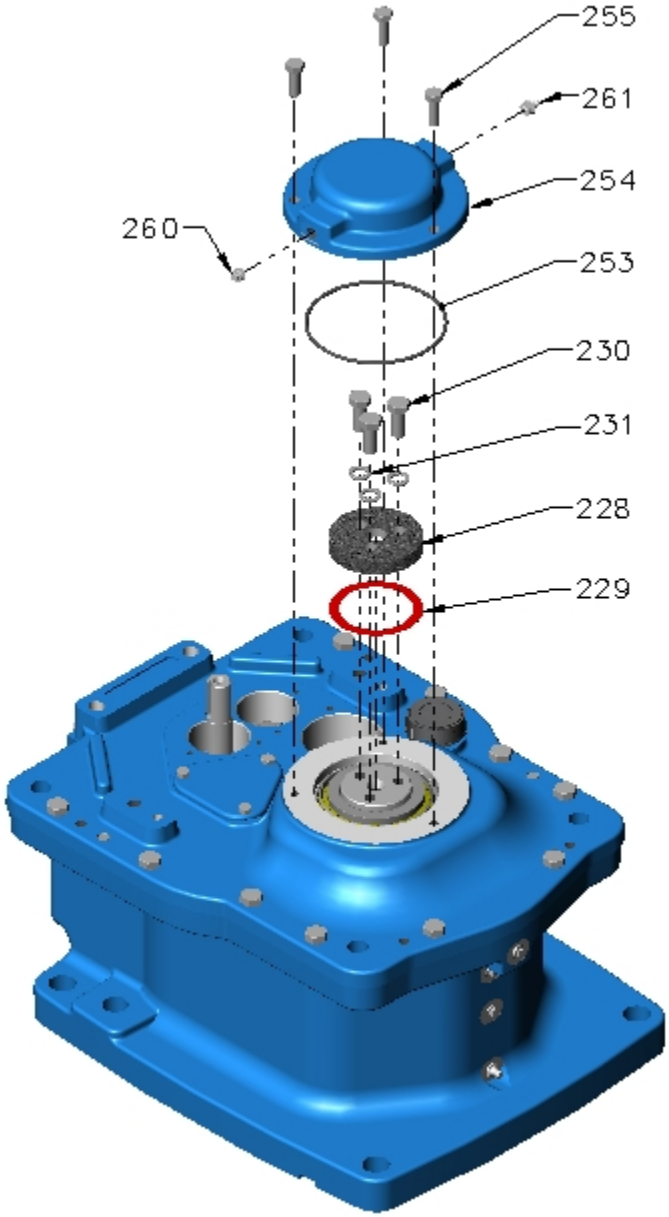

Figure 5 – Output Cap

F. Remove case lid **[247-1]** (refer Figure 6).

(1) Remove dipstick/breather **[258]**.

(2) Remove bolts **[250]**.

(3) Install jacking screws [Local supply].

(4) Tighten jacking screws [Local supply] until bearing **[233-2]** clears output shaft, then remove case lid **[247-1]**.

(5) Remove dowel pins **[252]**.

G. Remove from case lid **[247-1]** (refer Figure 6):

- Bearing cone **[233-2]**
- Bearing cup **[233-1]**
- Nilos ring **[235]**

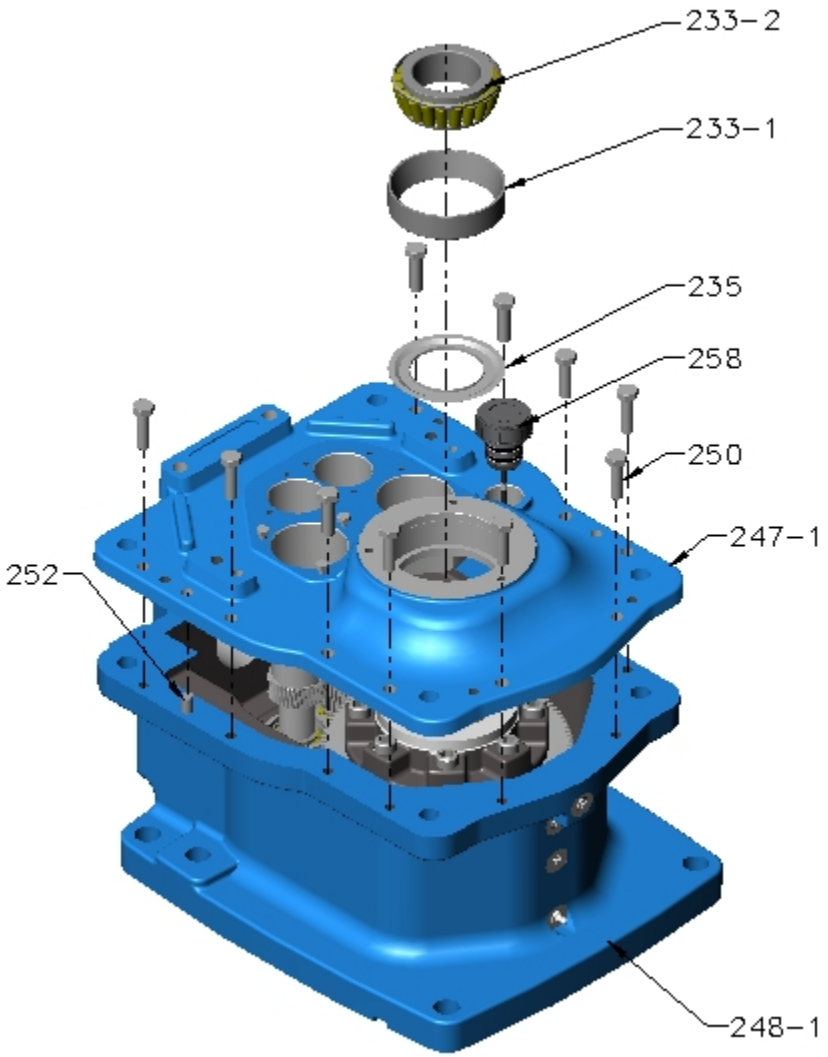

Figure 6 – Case Lid

H. Remove input shaft assembly (refer Figure 7).

I. Input shaft disassembly (refer Figure 7):

- Remove bearing cup **[203-1]**
- Press input shaft **[202]** out of bearing cone **[203-2]**
- Remove bearing cone **[205-2]**

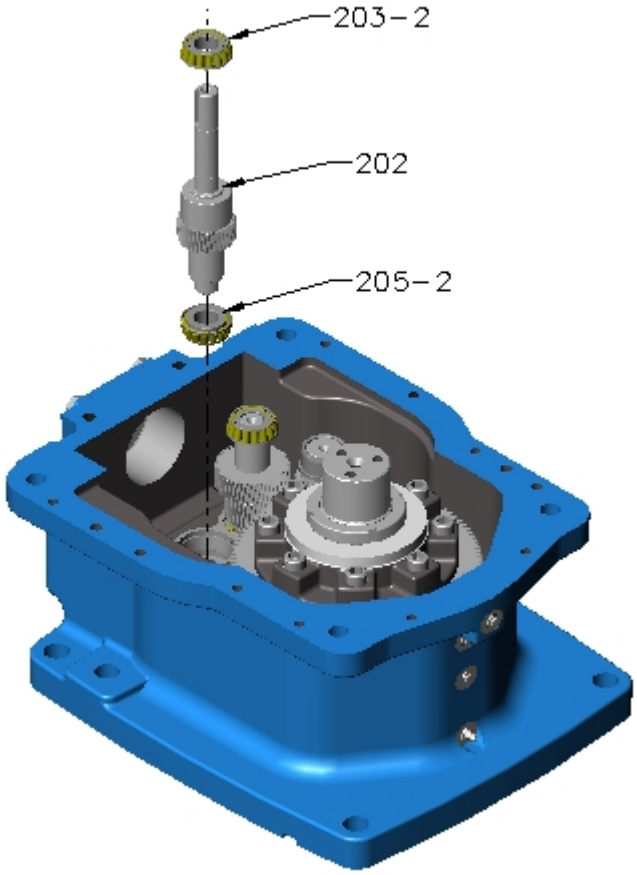

Figure 7 – Input Shaft

J. Remove 1st intermediate shaft assembly (refer Figure 8).

K. 1st intermediate shaft disassembly (refer Figure 8):

- Remove bearing cup **[330-1]**
- Press shaft **[334]** out of bearing cone **[335-2]**
- Press gear **[332]** off shaft **[334]** to remove bearing spacer **[331]** and bearing cone **[330-2]**
- Remove key **[333]**

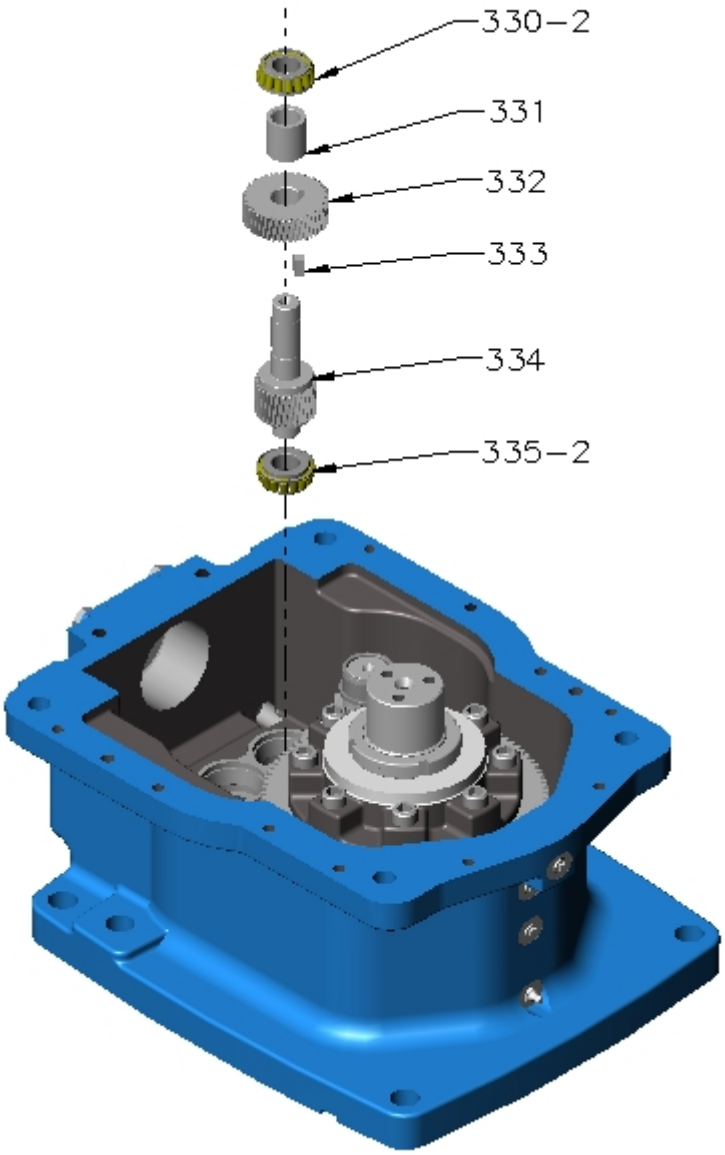

Figure 8 – 1st Intermediate Shaft

L. At output shaft **[244]**, remove following items (refer Figure 9):

- Loosen the locknut set screw then remove gear flange locknut **[236]**
- Press output shaft **[244]** out of gear flange **[237]**
- Key **[238]**
- Bolts **[240]**
- Gear flange **[237]**
- V-ring **[242]**
- Gear **[239]**

M. Output shaft **[244]** disassembly (refer Figure 9).

(6) Use a bearing puller to remove bearing cone **[245-2]** off output shaft **[244]**. Or if necessary, do following steps:

(a) Cut roller cage and remove rollers.

(b) Hold output shaft from large end.

CAUTION: BE CAREFUL TO HEAT THE BEARING RACE ONLY. USE A SMALL FLAME TO AVOID DAMAGE TO THE SHAFT.

(c) Turn the shaft and carefully apply heat with an acetylene torch to the bearing.

(d) The bearing will move off the shaft when it is hot enough, use a heat resistant tool to push the bearing off the shaft if it stops.

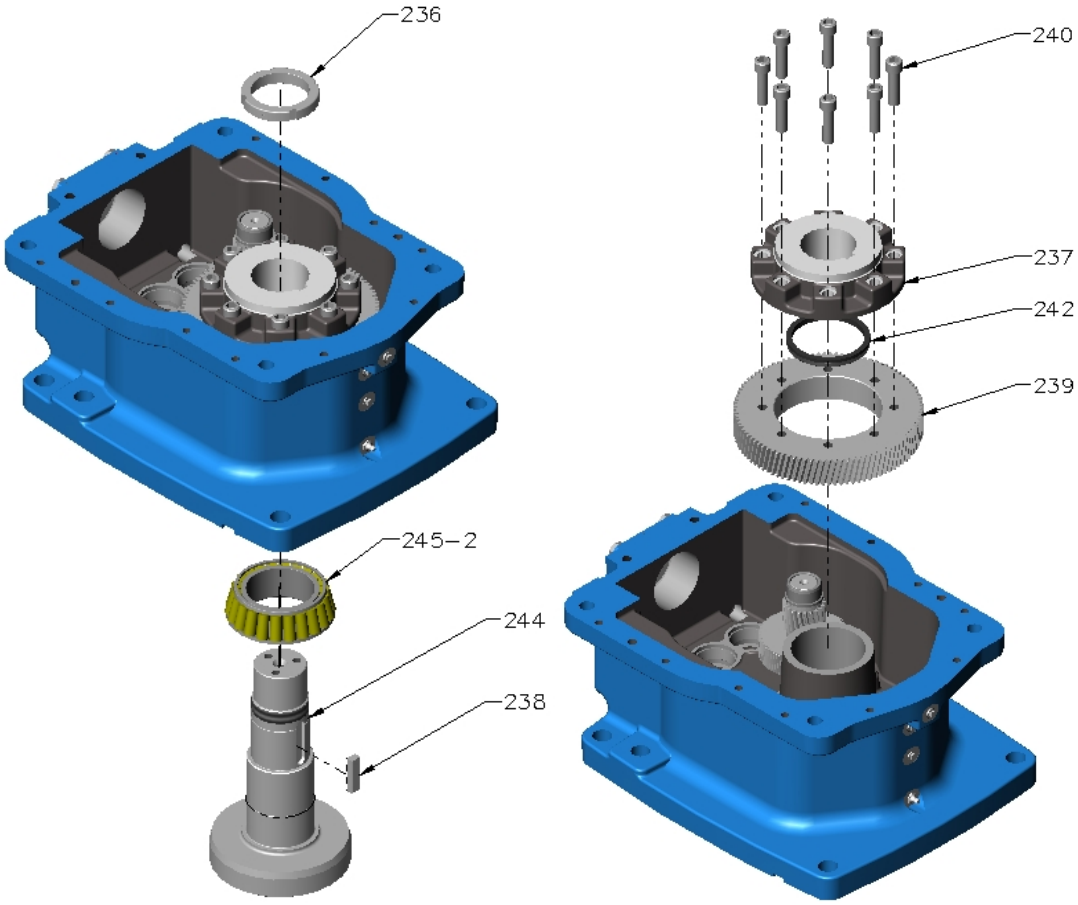

Figure 9 – Output Shaft

N. Remove 2nd intermediate shaft assembly (refer Figure 10).

O. 2nd intermediate shaft disassembly (refer Figure 10)):

- Remove bearing outer race **[217-1]**
- Press bearing inner race **[217-2]** off shaft **[218]**
- Press bearing inner race **[221-2]** and gear **[219]** off shaft **[218]**
- Remove key **[220]**

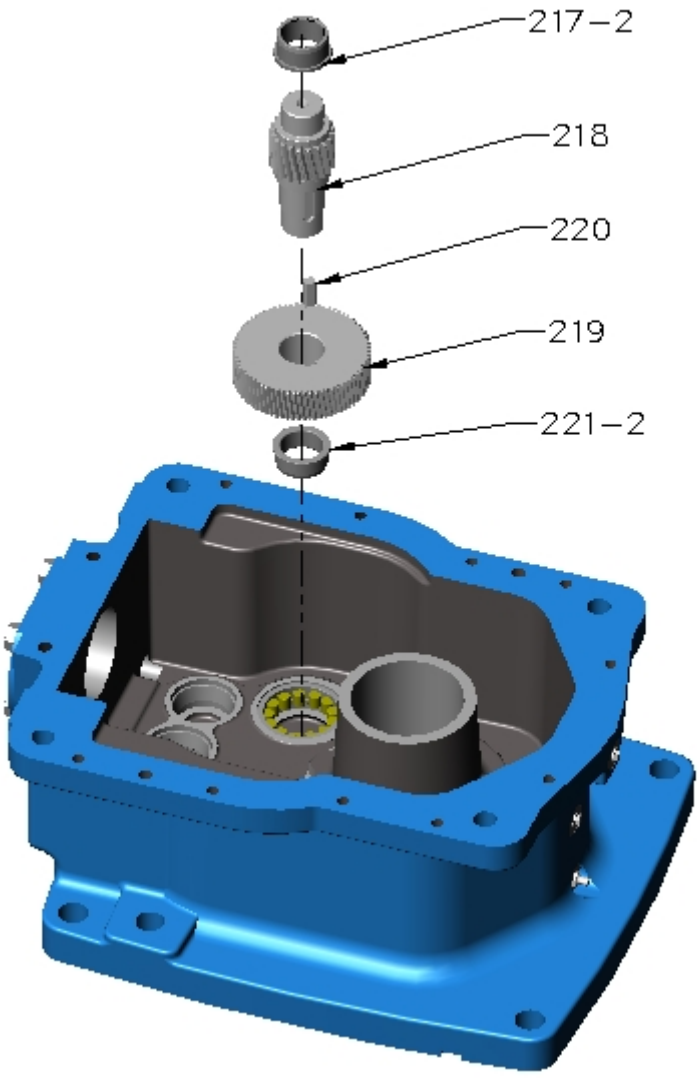

Figure 10 – 2nd Intermediate Shaft

P. At case lid remove following items (refer Figure 11):

- Bearing cup **[203-1]**
- Bearing cup **[330-1]**
- Bearing outer race **[217-1]**

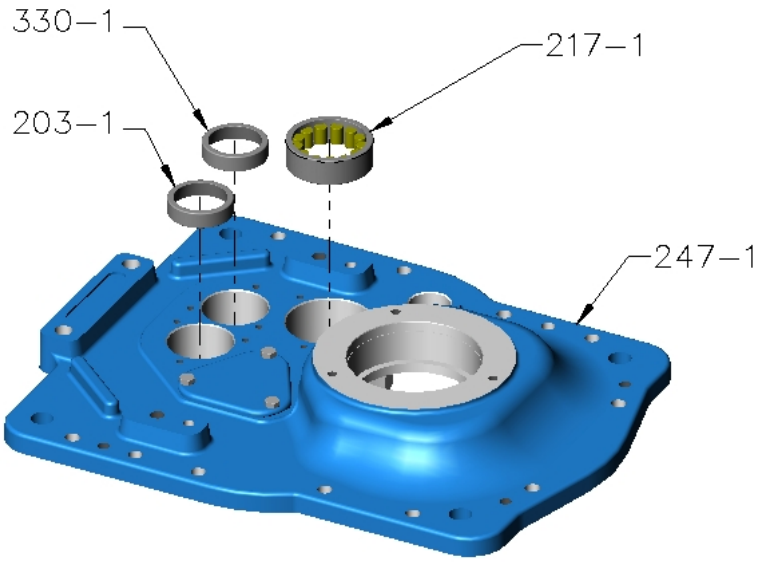

Figure 11 – Bearing races in case lid

Q. At bottom case [248-1], remove following items (refer Figure 12):

- Lip seal **[249]**
- Bearing cup **[245-1]**
- Bearing cup (Input) **[205-1]**
- Bearing cup (1st Intermediate) **[335-1]**
- Bearing outer race **[221-1]**

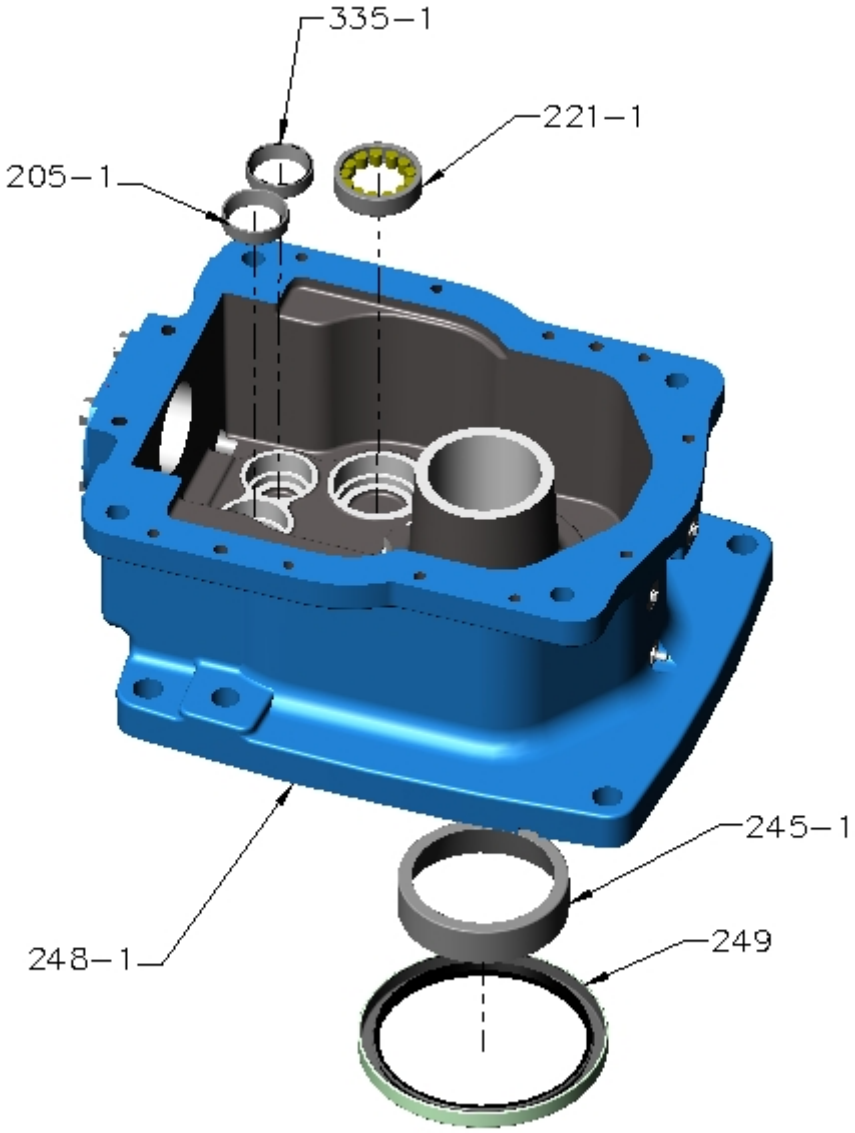

Figure 12 – Bottom Case

R. Standard Procedures

- Clean all parts and inspect for wear. Replace worn parts as necessary.
- Replace all bearings, lip seals and shims.
- Always replace both inner and outer bearing races (cup and cone).
- Always replace gears in complete gear pair sets.

ASSEMBLY

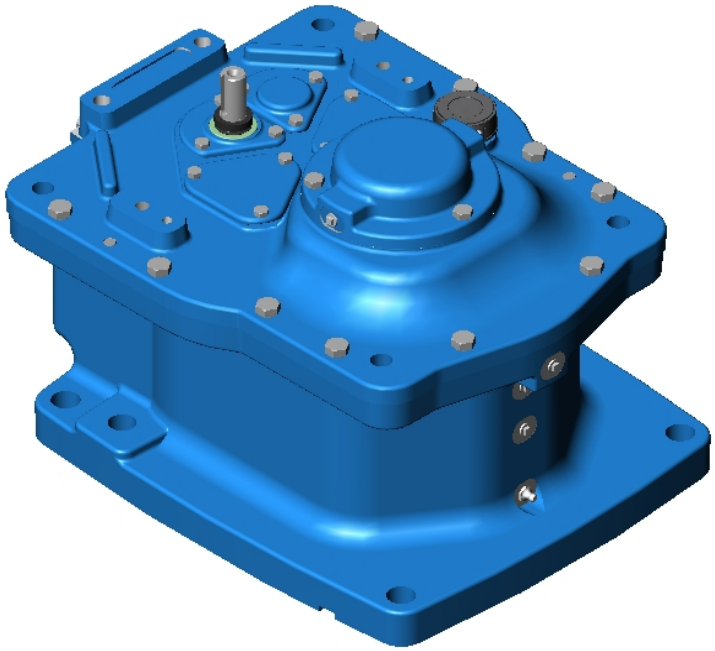

Figure 13 – Model 20 GT - Triple Reduction

3. ASSEMBLY

A. Standard Procedures

(1) Inspect threads, shank and head of all bolts and setscrews for damage after cleaning. If replacement is required, replace with equivalent type and strength.

(2) Inspect and clean all tapped holes. If threads are damaged, use the correct tap to repair.

(3) Use a torque wrench for the following assembly procedures. Table 1 gives the correct torque values as a function of thread size.

Table 1 - Bolt Tightening Torque for Carbon Steel

	Grade 8.8		**Grade 10.9**	
Bolt Size	**Nm**	**Ft-lb**	**Nm**	**Ft-lb**
M6 x 1	9.4	6.9	15.1	11.1
M8 x 1.25	22.9	16.9	36.8	27.1
M10 x 1.5	45.4	33.5	72.8	53.7
M12 x 1.75	79.2	58.4	127	93.7
M16 x 2.00	196.4	144.8	315	232.3
M20 x 2.50	383.2	282.4	615	453.5
M24 x 3.00	663.6	489.1	1065	785.4

(4) On assembly, lubricate all fasteners with grease, oil or an anti-seize material. Lubricate threads and contact surfaces of bolt heads and nuts. If fasteners cannot be lubricated, increase torque values given in Table 1 by a factor of 1.33.

(5) Bearing cones are installed with interference fits, heat cones and press on to the shaft. Heat bearings in oven or oil bath:

- Do not heat above 120°C (248° F)
- Do not apply direct flame
- Do not allow parts to touch bottom or sides of oven or oil bath

(6) Bearing cups are installed with interference fits, put the cups in dry ice to lower temperature and press into housing.

(7) Install lip seals with the seal lip towards the bearing. Coat the seal lip with bearing grease before installing the shaft.

B. At bottom case **[248-1]**, install following items (refer Figure 14):

- Bearing cup **[245-1]**. Use feeler gauge and make sure bearing cup **[245-1]** is seated against case shoulder
- Lip seal **[249]**
- Bearing cup (1st intermediate) **[335-1]**
- Bearing cup (input) **[205-1]**
- Bearing outer race **[221-1]**

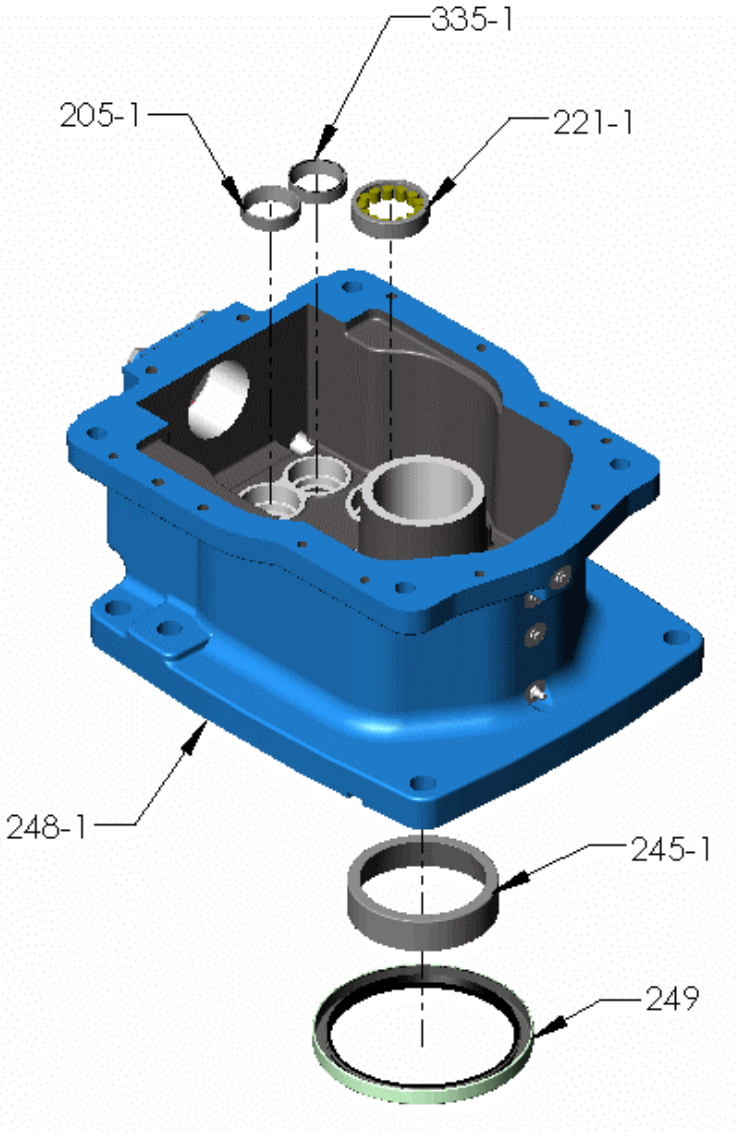

Figure 14 – Bottom Case

C. Output shaft assembly (refer Figure 15).

- Heat bearing cone **[245-2]** and press it on to the output shaft **[244]**.
- Use feeler gauge and make sure bearing cone **[245-2]** is seated against the shaft shoulder.
- Install key **[238]** on to the output shaft **[244]**

D. Lift the bottom case and align with output shaft assembly **[244]** (refer Figure 15).

E. Carefully lower bottom case until bearing **[245-2]** is seated (refer Figure 15).

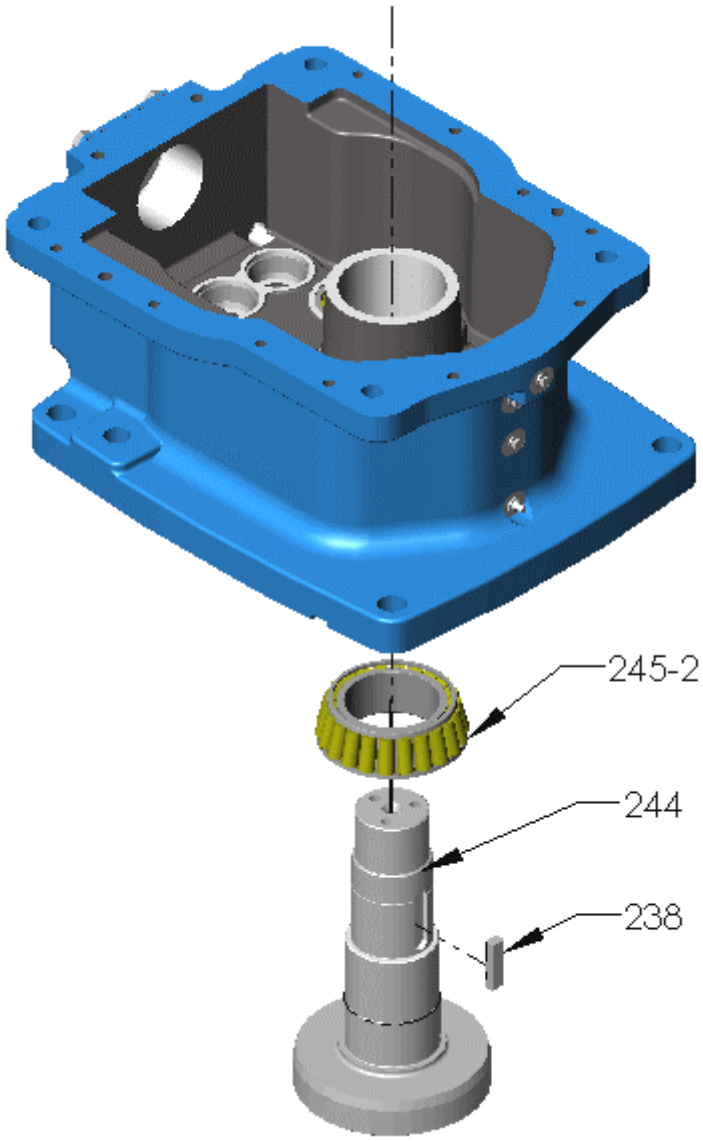

Figure 15 –Output shaft

F. 2nd intermediate shaft assembly (refer Figure 16).

- Press gear **[219]** with the key **[220]** and bearing inner race **[221-2]** on to the shaft **[218]**
- Press bearing inner race **[217-2]** on to the shaft **[218]**

G. Install 2nd intermediate shaft **[218]** assembly in the bearing outer race **[221-1]** in the case bottom (refer Figure 16).

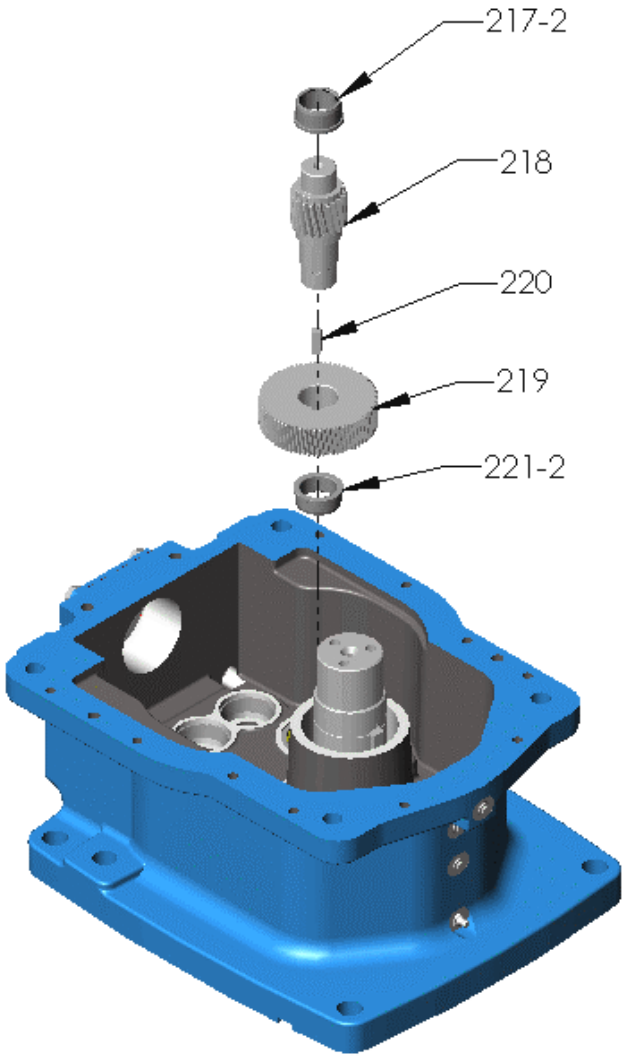

Figure 16 – 2nd Intermediate shaft

H. Install V-ring **[242]** in gear flange **[237]** and heat flange to 120° C (248° F) (refer Figure 17).

I. At output shaft **[244]**, install the following items: (refer Figure 17).

- Gear **[239]**
- Pre-heated gear flange **[237]**
- Gear flange locknut **[236]** and tighten locking set screws
    - Re-tighten the locknut after the gear flange cools down

J. Lift gear **[239]** to engage tenon on the flange and install bolts **[240]** (refer Figure 17). Make sure the gear is sitting flat on the gear flange. Use feeler gage to check

K. Torque-tighten bolts **[240]** to value given in Table 1 (refer Figure 17).

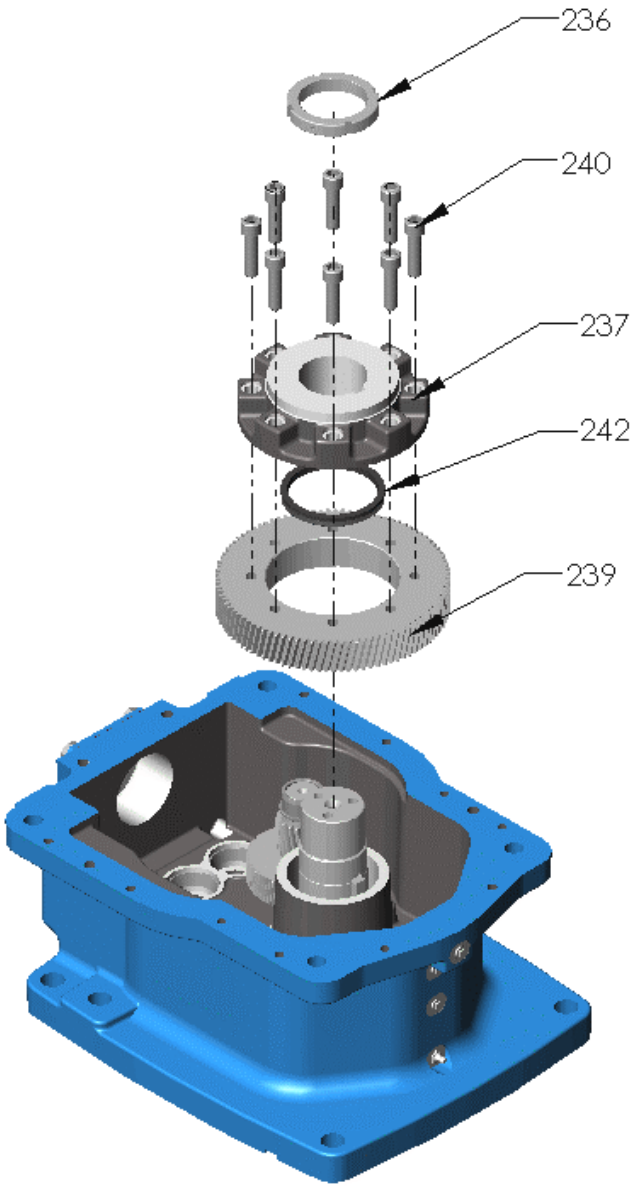

Figure 17 – Gear Carrier

L. 1st intermediate shaft assembly (refer Figure 18):

- Press bearing cone **[330-2]**, bearing spacer **[331]** and gear **[332]** with key **[333]** on to the shaft **[334]**
- Press bearing cone **[335-2]** on to the shaft **[334]**

M. Install 1st intermediate shaft **[334]** in the bearing cup **[335-1]** in the case bottom (refer Figure 18).

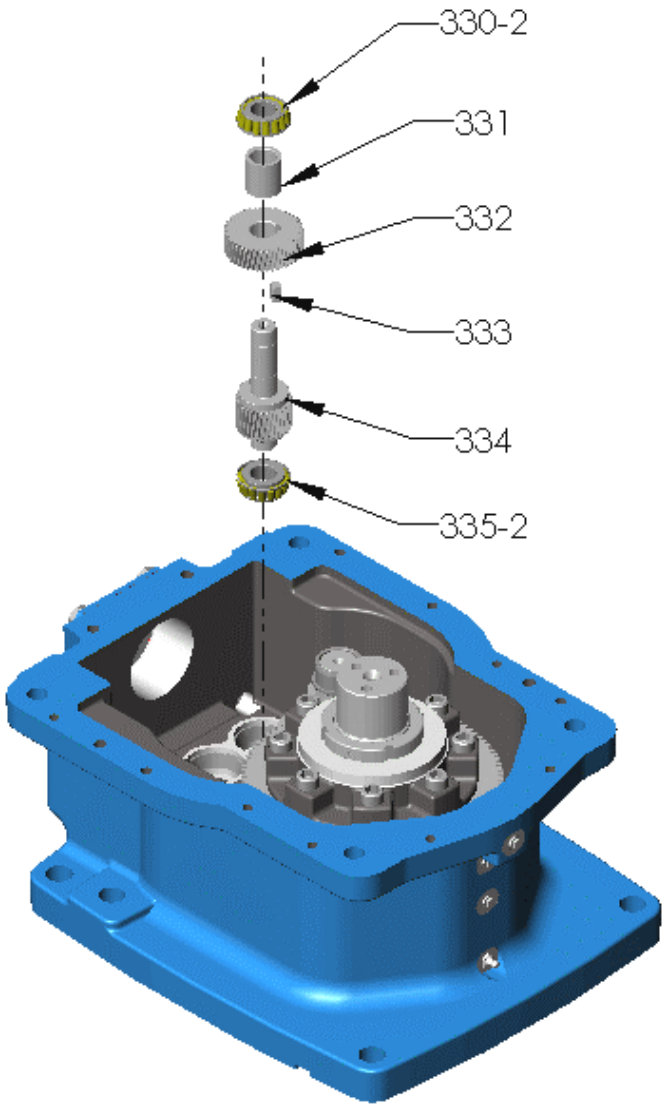

Figure 18 – 1st Intermediate shaft

N. Input shaft assembly (refer Figure 19):

- Press bearing cone **[203-2]** onto input shaft **[202]**
- Press bearing cone **[205-2]** onto input shaft **[202]**

O. Install input shaft **[202]** assembly in the bearing cup **[205-1]** in the case bottom (refer Figure 19).

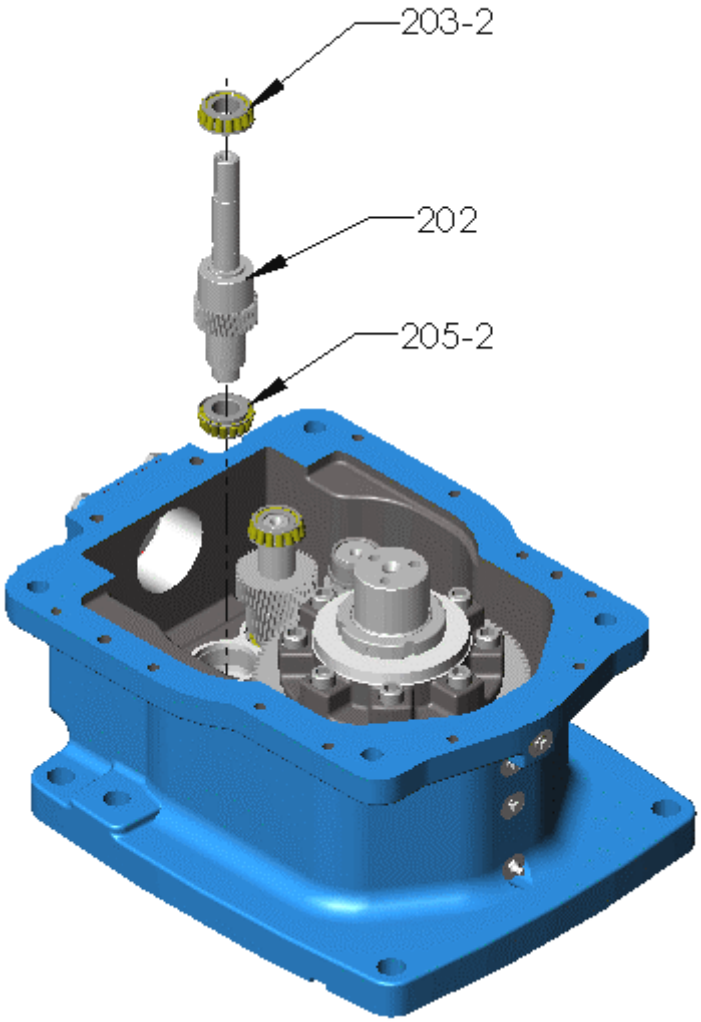

Figure 19 – Input Shaft

P. Install case lid **[247-1]** (refer Figure 20).

(1) Apply Three Bond Sealant 1215AA or equivalent to case bottom flange.

(2) Put case lid **[247-1]** on case bottom.

(3) Install dowel pins **[252]**.

(4) Install bolts **[250]** and torque-tighten to value given in Table 1.

Q. Install at output shaft (refer Figure 20):

- Nilos ring **[235]**.
- Bearing cup **[233-1]**.
- Heat bearing cone **[233-2]** at 120ºC (248ºF).
- Press the heated bearing cone **[233-2]** onto output shaft.

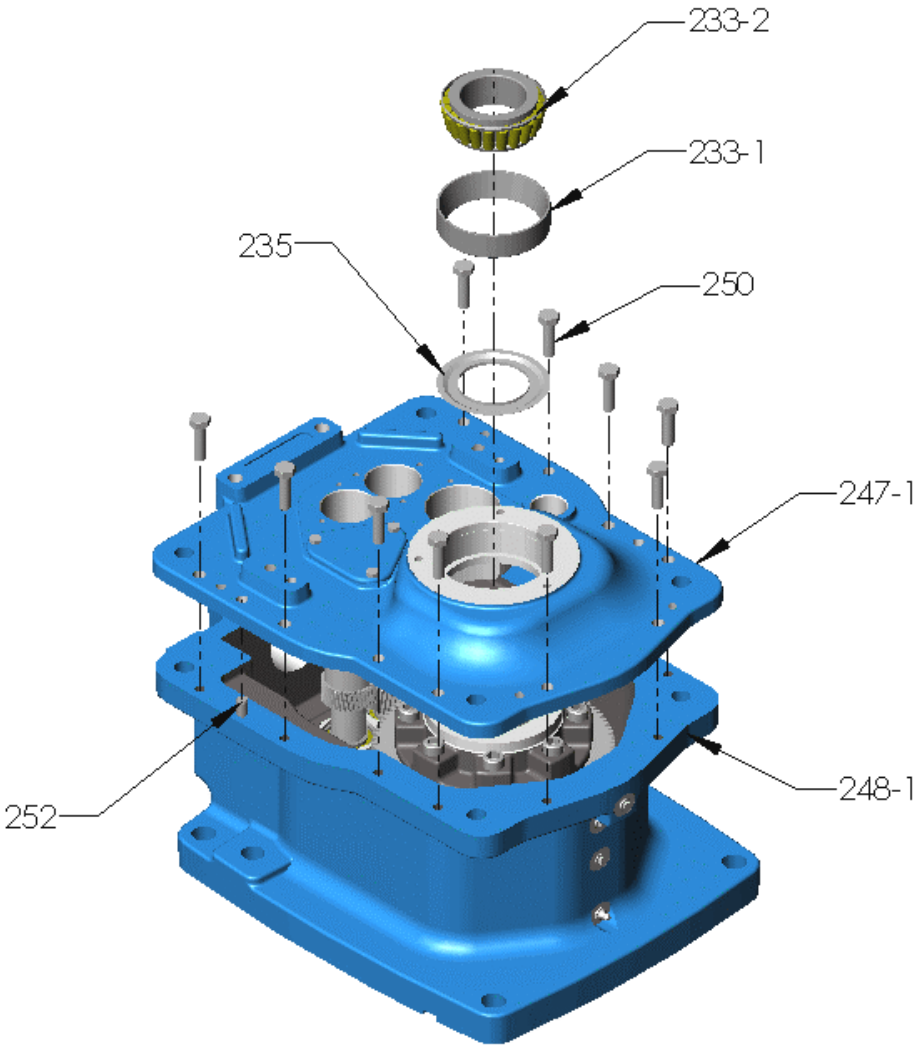

Figure 20 – Case Lid

R. Input cap shim selection (refer Figure 21).

(1) Put the bearing cone **[203-1]** in the case lid bore.

(2) Put the input cap **[211]** in the bore (no o-ring is necessary at this stage).

(3) Use hand pressure and push down on the input cap **[211]**.

(4) Using a Dial Test Indicator (DTI), check the end float on the input shaft by lifting up on the shaft. Record this measurement as “A”.

(5) Number of shims required = A – 0.002”. Select appropriate shims set **[207]**.

(6) Insert shim set **[207]**, input cap **[211]**, and bolts **[213]**.

(7) Torque-tighten bolts **[213]** to value given in Table 1.

(8) Check end float. It needs to be between 0.001” and 0.003”. Else remove input cap **[211]** and repeat from step 1.

(9) Remove input cap **[211]** and shim set **[207]**.

S. At input shaft, install following items (refer Figure 21):

- Shim set **[207]**
- Lip seal **[204]**** (take care so that the keyway does not cut the lip seal)
- Input cap **[211]** with O-ring **[206]**
- Bolts **[213]**, torque-tighten bolts **[213]** to value given in Table 1.
- V-ring **[212]****

** Grease lip seal and v-ring before installation

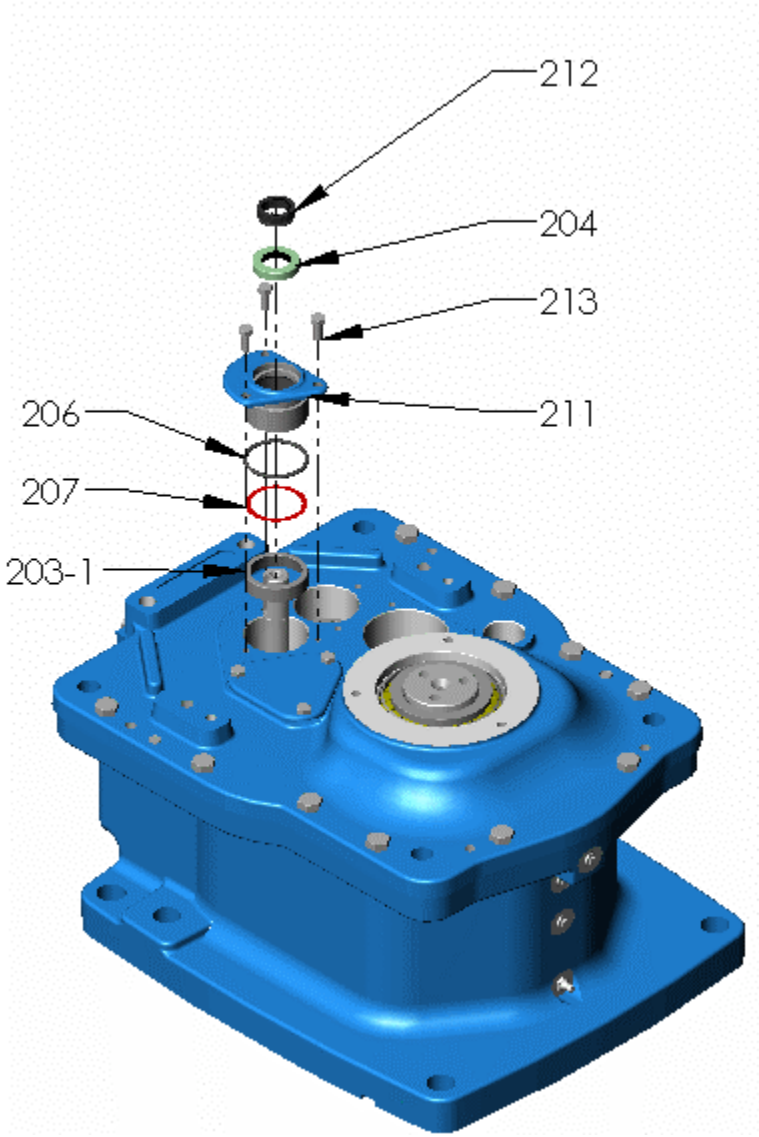

Figure 21 – Input Cap

T. At 2nd intermediate shaft, install following items (refer Figure 22):

- Bearing outer race **[217-1]**
- O-ring **[222]**
- Intermediate cap **[223]**
- Bolts **[225]**, torque-tighten bolts **[225]** to value given in Table 1

NOTE: No shimming required

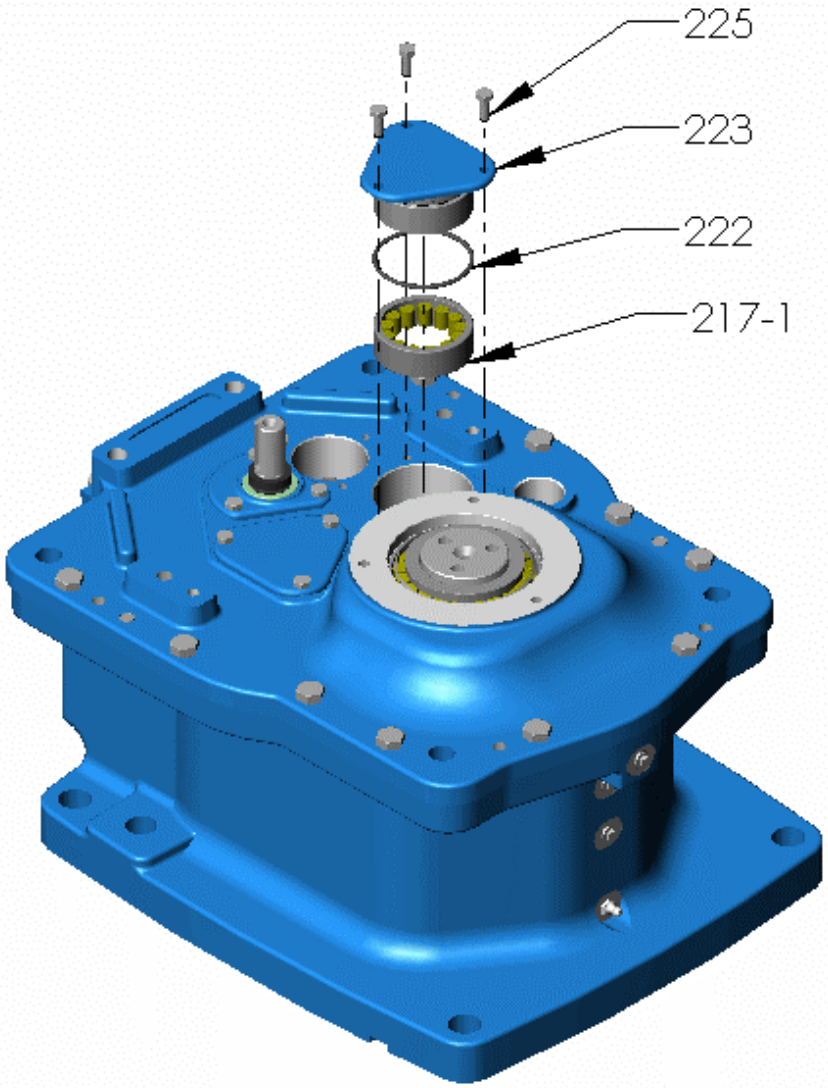

Figure 22 – 2nd Intermediate Cap

U. At 1st intermediate shaft, install following items (refer Figure 23):

- Bearing cup **[330-1]**
- O-ring **[312]**
- Shim set **[207]**
- Intermediate cap **[310]**
- Bolts **[311]**, torque-tighten bolts **[311]** to value given in Table 1

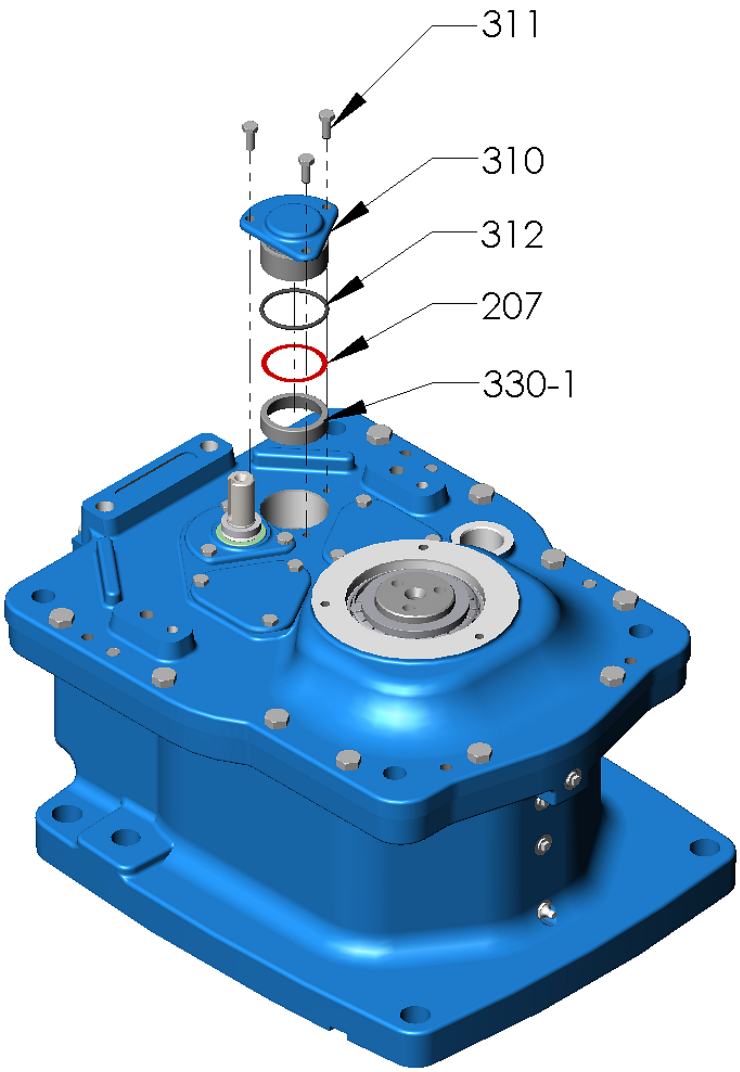

Figure 23 – 1st Intermediate Cap

V. Output shaft shim selection (refer Figure 24).

- Make sure any fixture or arrangement to prevent the output shaft **[244]** from rotating is removed before shimming.
- Install thrust washer **[228]** and bolts **[230]**. Torque-tighten bolts **[230]** to value given in Table 1.
- Use a Dial Test Indicator (DTI) to measure end float of output shaft.
  - (a) Install eye bolt to end of shaft.
  - (b) Carefully tap shaft down with a mallet.
  - (c) Lift shaft up with a pry bar on the eye bolt and measure the end float with the DTI. Record this as measurement 'A'.
  - (d) Required shim thickness = A – 0.002". Select shim set **[229]** accordingly. Check the end float (0.001"– 0.003" is acceptable).
  - (e) Remove bolts **[230]**, spring washers **[231]**, and thrust washer **[228]**.

W. At output shaft, install following items (refer Figure 24):

- Shim set **[229]**
- Thrust washer **[228]**
- Bolts **[230]** with spring washers **[231]**, torque-tighten to value given in Table 1
- O-ring **[253]**
- Output cap **[254]**
- Bolts **[255]**, torque-tighten to value given in Table 1.
- Grease fittings **[260]** and **[261]** if they were removed.

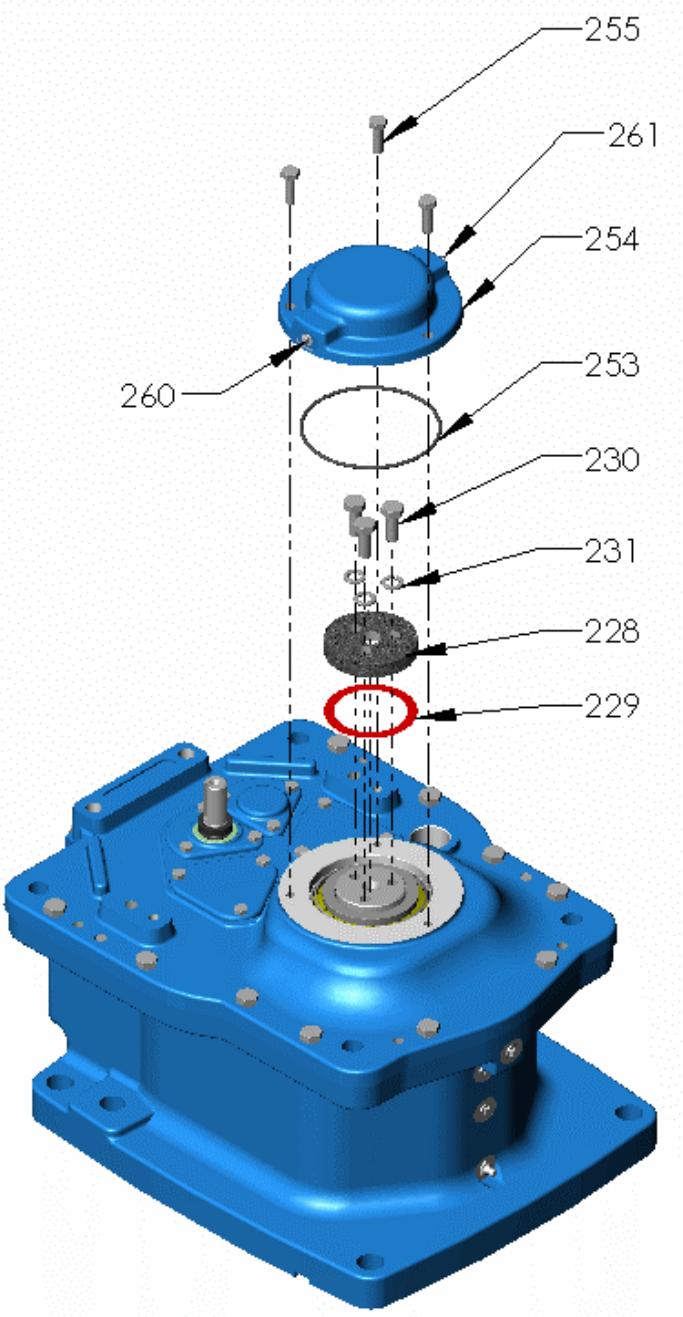

Figure 24 – Output Cap

- Replace any fittings/nipples that were removed.
- Replace oil drain plug, if removed.
- Apply grease to the bearings as necessary and fill the gear drive housing with oil (Refer to related Agitator IOM, Lubrication Section).

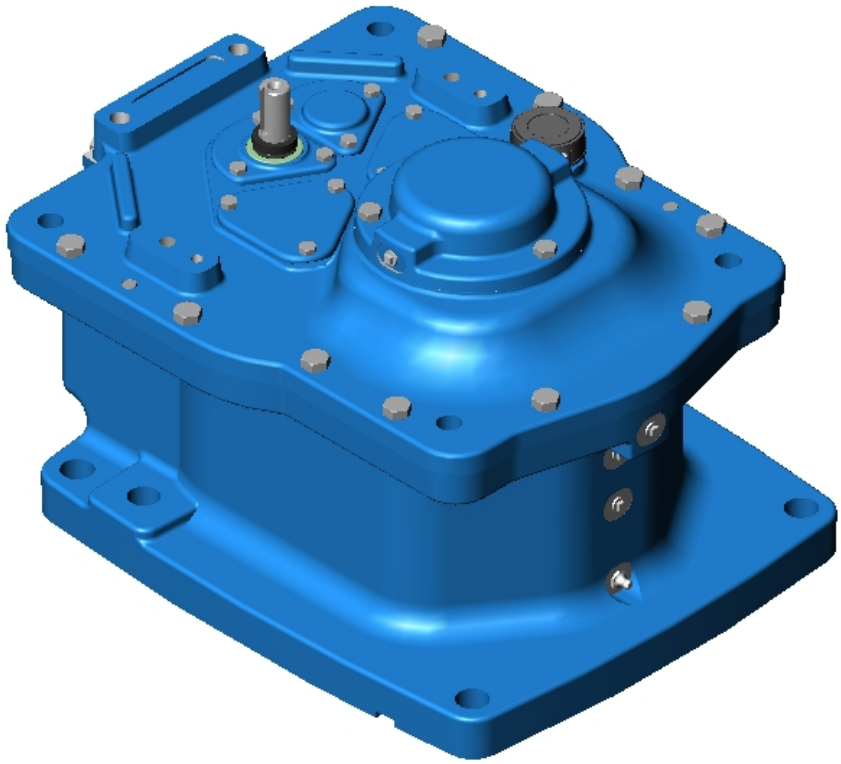

Figure 25 – Model 20 GT Triple Reduction

4. ITEM LIST

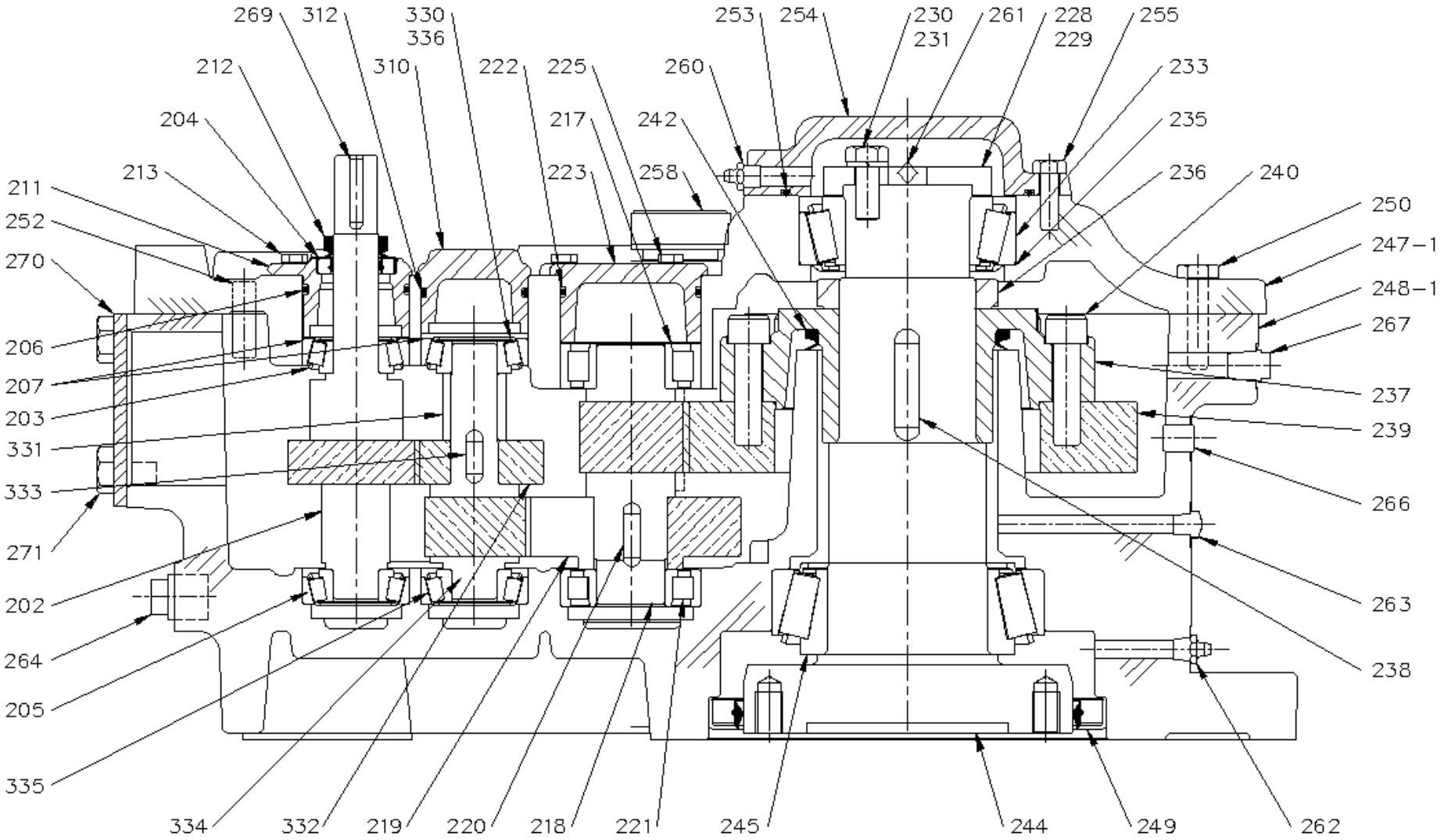

Figure 26 – Sectional View of Model 20 GT – Triple Reduction

Table 2 – Item List for Model 20 GT Gear Drive – Triple Reduction

Item #	Description	Qty.	Item #	Description	Qty.	Item #	Description	Qty.
			223	bearing cap	1	255	bolt	3
200	**gear drive assembly**	**1**	225	bolt	3	258	breather/dipstick	1
			228	output shaft washer	1	260	grease fitting	1
202	input shaft	1	229	shim set	1	261	relief fitting, NPT	1
203	bearing (taper roller)	1	230	bolt	3	262	grease fitting	1
203-1	bearing cup	1	231	lockwasher	3	263	relief fitting, NPT	1
203-2	bearing cone	1	233	bearing (taper roller)	1	264	magnetic drain plug, NPT	1
204	lip seal	1	233-1	bearing cup	1	266	set screw plug, NPT	1
205	bearing (taper roller)	1	233-2	bearing cone	1	267	pipe plug, NPT	1
205-1	bearing cup	1	235	nilos ring	1	269	input shaft key	1
205-2	bearing cone	1	236	lock nut	1	270	cap	1
206	O-ring	1	237	gear flange	1	271	bolt	4
207	shim set	1	238	key	1	310	bearing cap	1
211	input cap	1	239	gear	1	311	bolt	3
212	V-ring	2	240	bolt	8	312	O-ring	1
213	bolt	3	242	V-ring	1	330	bearing (taper roller)	1
217	bearing (Cylindrical Roller)	1	244	output shaft	1	330-1	bearing cup	1
217-1	bearing outer race	1	245	bearing (taper roller)	1	330-2	bearing cone	1
217-2	bearing inner race	1	245-1	bearing cup	1	331	bearing spacer	1
218	pinion shaft	1	245-2	bearing cone	1	332	gear	1
219	gear	1	247-1	gear drive lid	1	333	key	1
220	key	1	248-1	gear drive housing	1	334	pinion shaft	1
221	bearing (Cylindrical Roller)		249	lip seal	1	335	bearing (taper roller)	1
221-1	bearing outer race	1	250	bolt	10	335-1	bearing cup	1
221-2	bearing inner race	1	252	dowel pin	2	335-2	bearing cone	1
222	O-ring	1	254	output cover	1			

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