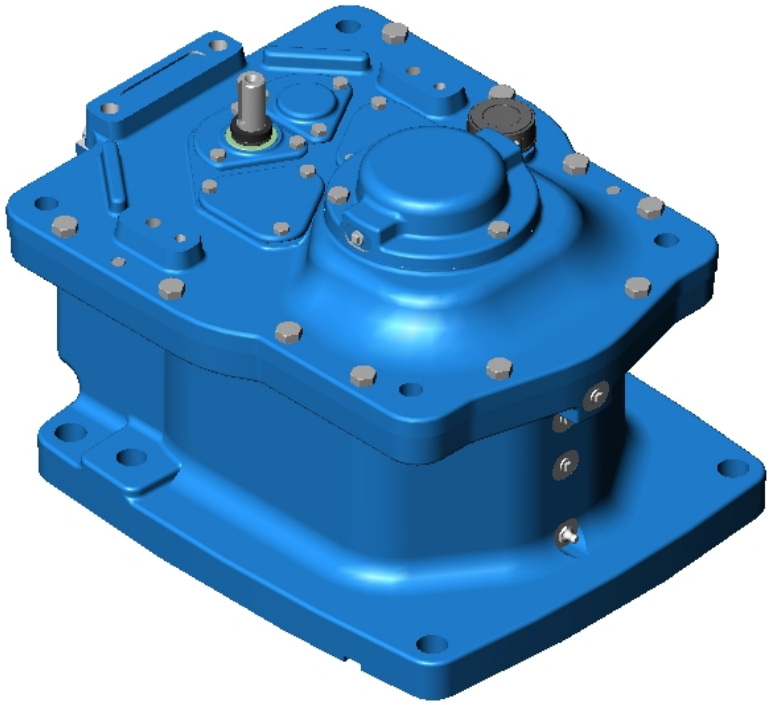
Maintenance Manual

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

Double Reduction



For service and information contact:

Chemineer, Inc.
5870 Poe Ave,
Dayton, OH 45414

Phone: 1 (937) 454 3200
Toll Free: 1-800-643-0641
Fax: 1 (937) 454 3379

E-mail: reachus@chemineer.com
Web: http://www.chemineer.com

Chemineer, Ltd.
7 Cranmer Road
West Meadows
Derby, UK
DE21 6XT

Phone: 00 +44 (0) 1332 363175
Fax: 00 +44 (0) 1332 290323

E-mail:
sales@chemineer.co.uk
engineering@chemineer.co.uk
spares@chemineer.co.uk

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1. INTRODUCTION

This manual contains instructions for 'Model 20 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

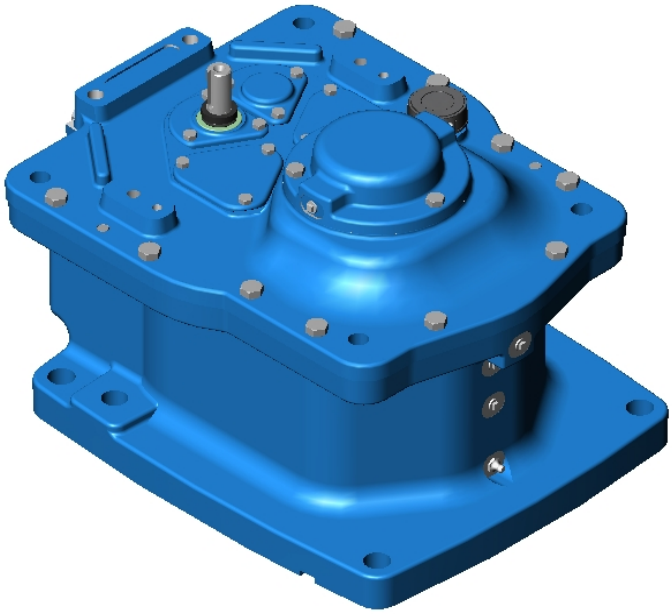

Figure 1 – Model 20 GT - Double Reduction

2. DISASSEMBLY

A. Drain oil from 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]**

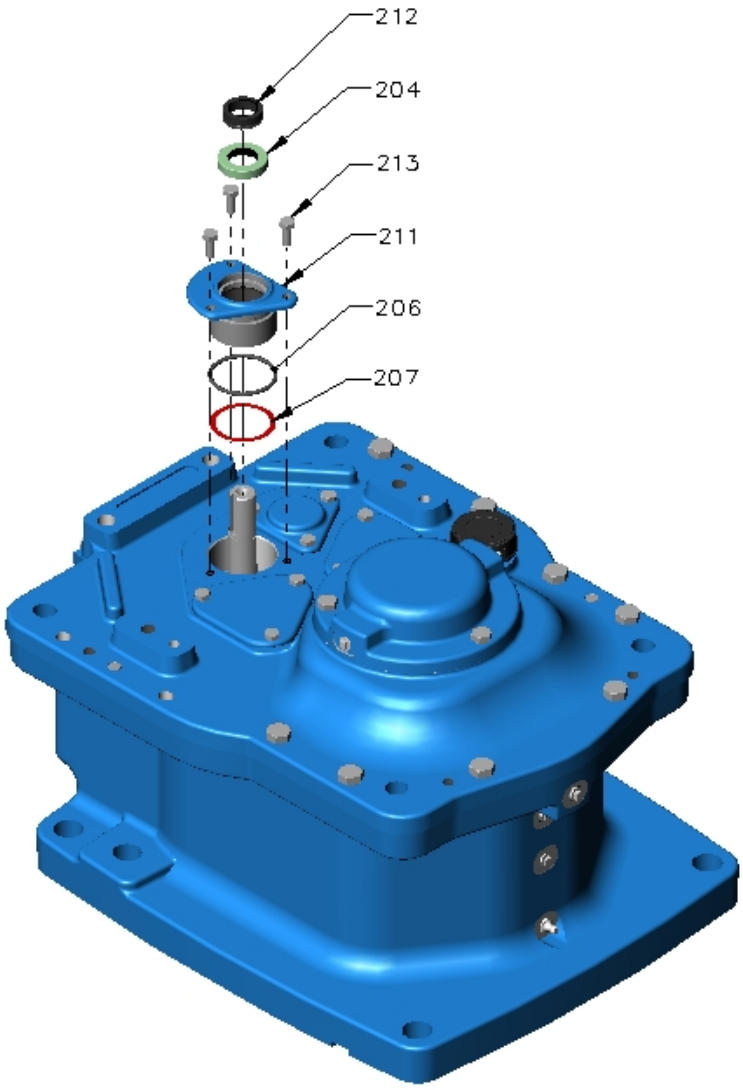

Figure 2 – Input Cap

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

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

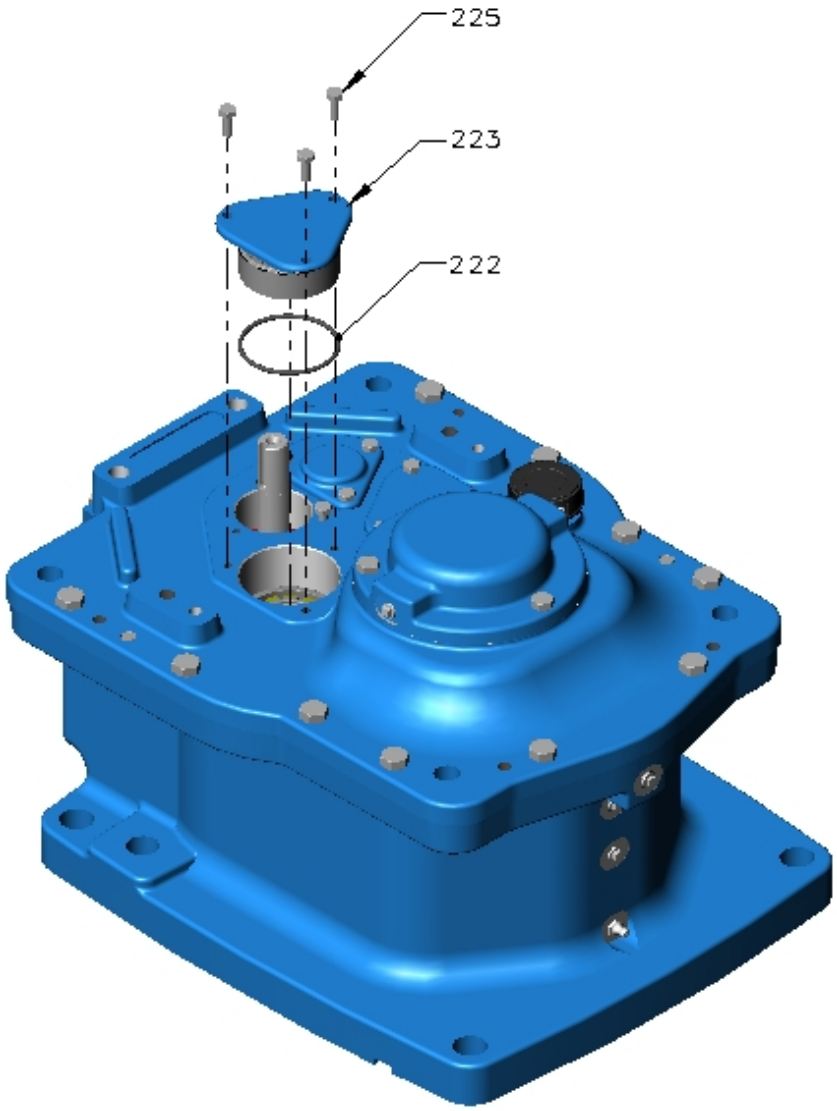

Figure 3 – Intermediate Cap

D. At output shaft, remove the following items (refer Figure 4):

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

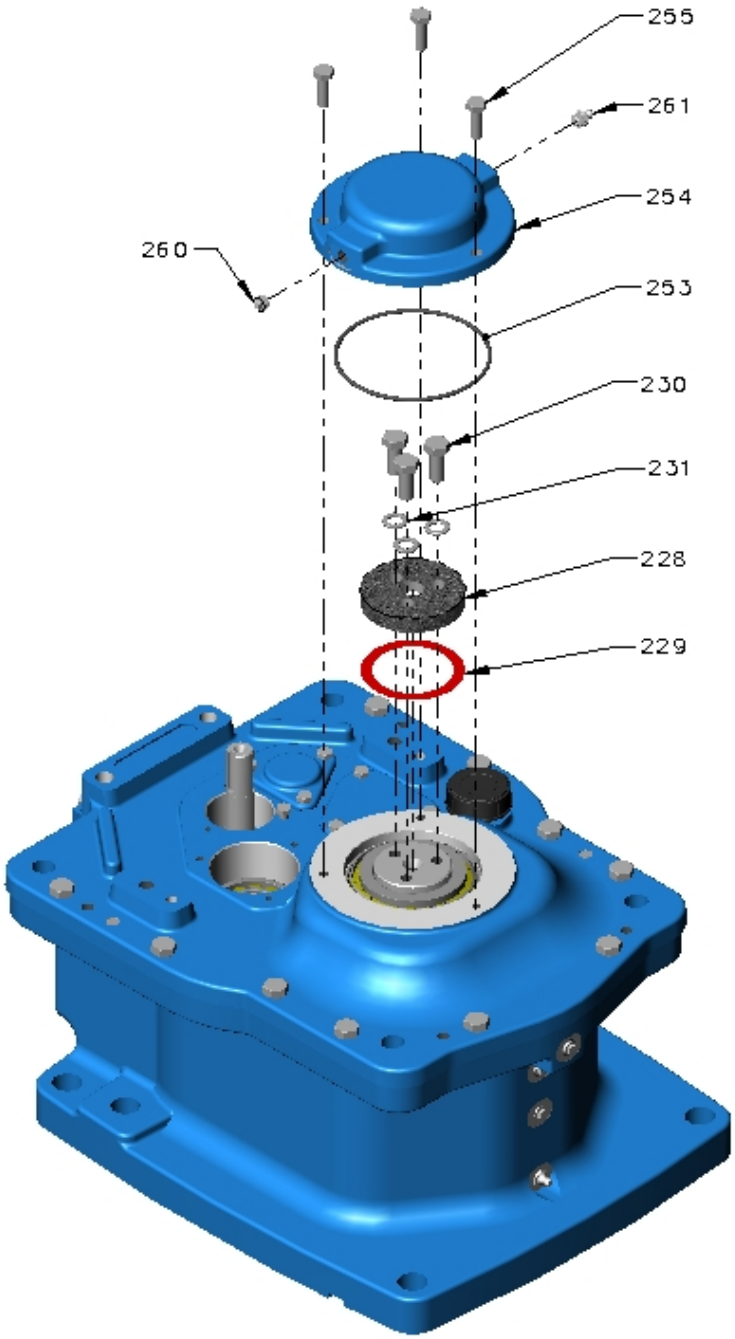

Figure 4 – Output Cap

E. Remove case lid **[247-1]** (refer Figure 5).

- Remove dipstick/breather **[258]**.
- Remove dowel pins **[252]**.
- Remove bolts **[250]**.
- Install jacking screws [Local supply].
- Tighten jacking screws [Local supply] until bearing **[233]** clears output shaft, then remove case lid **[247-1]**.

F. Remove from case lid **[247-1]** (refer Figure 5):

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

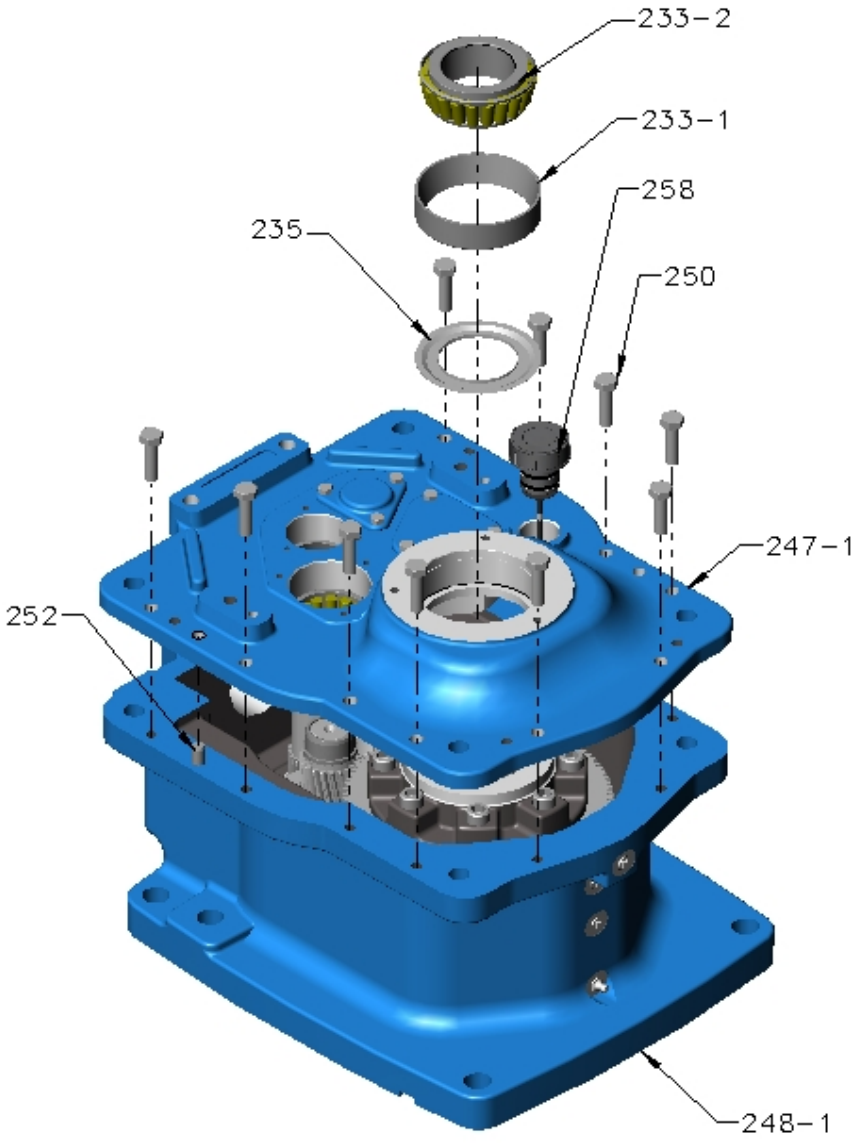

Figure 5 – Case Lid

G. Remove input shaft assembly (refer Figure 6).

H. Input shaft disassembly (refer Figure 6):

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

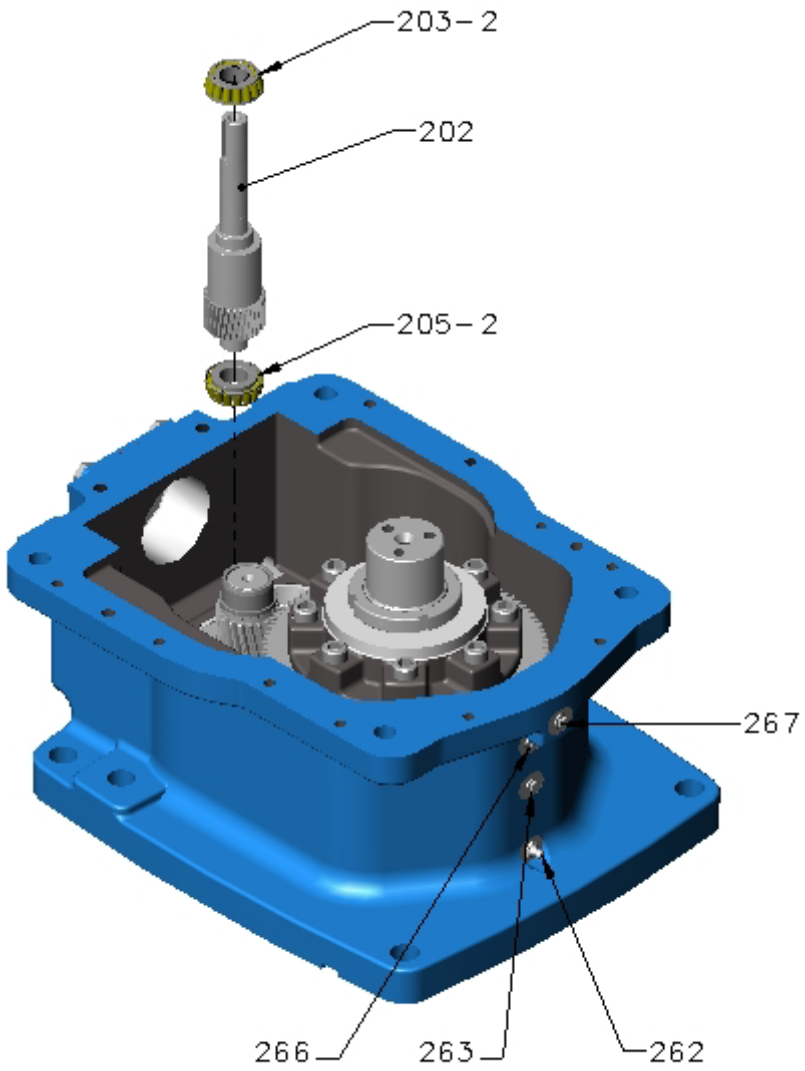

Figure 6 – Input Shaft

I. At output shaft **[244]**, remove the following items (refer Figure 7):

- 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]**

J. Output shaft **[244]** disassembly (refer Figure 7).

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.

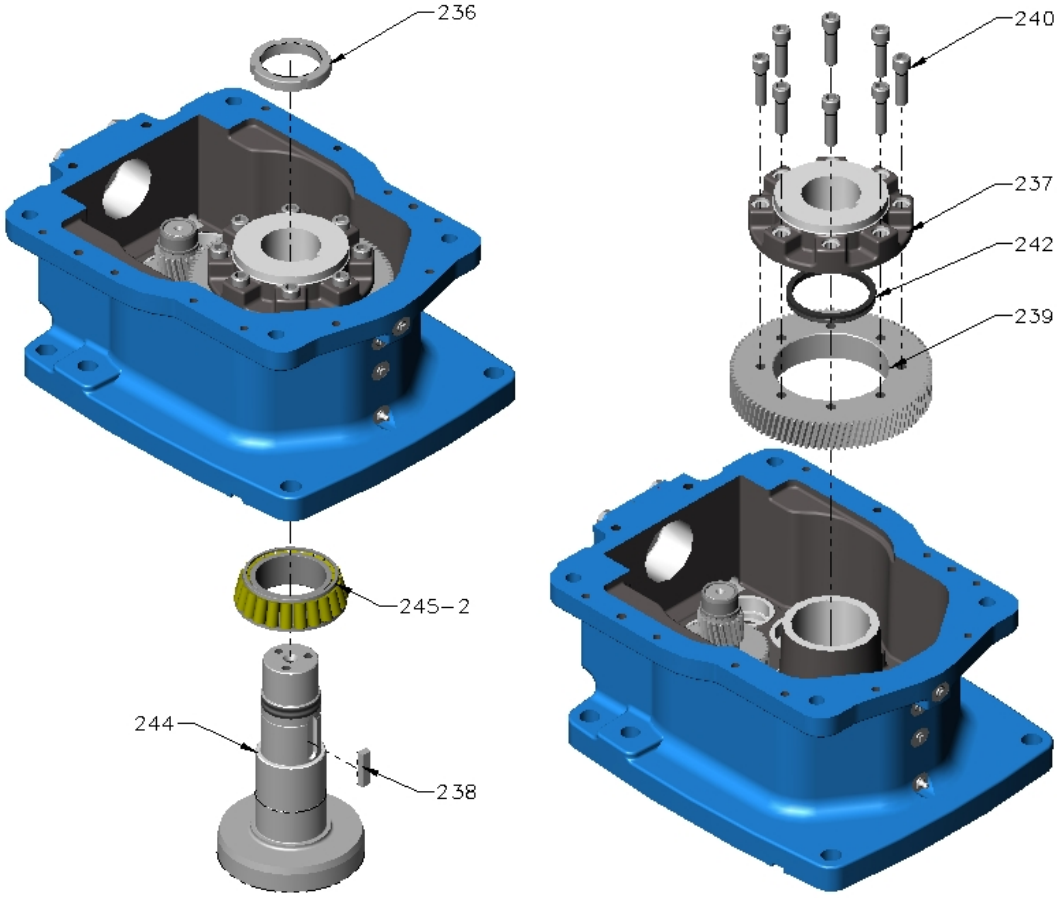

Figure 7 – Output Shaft

K. Remove intermediate shaft assembly (refer Figure 8).

L. Intermediate shaft disassembly (refer Figure 8):

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

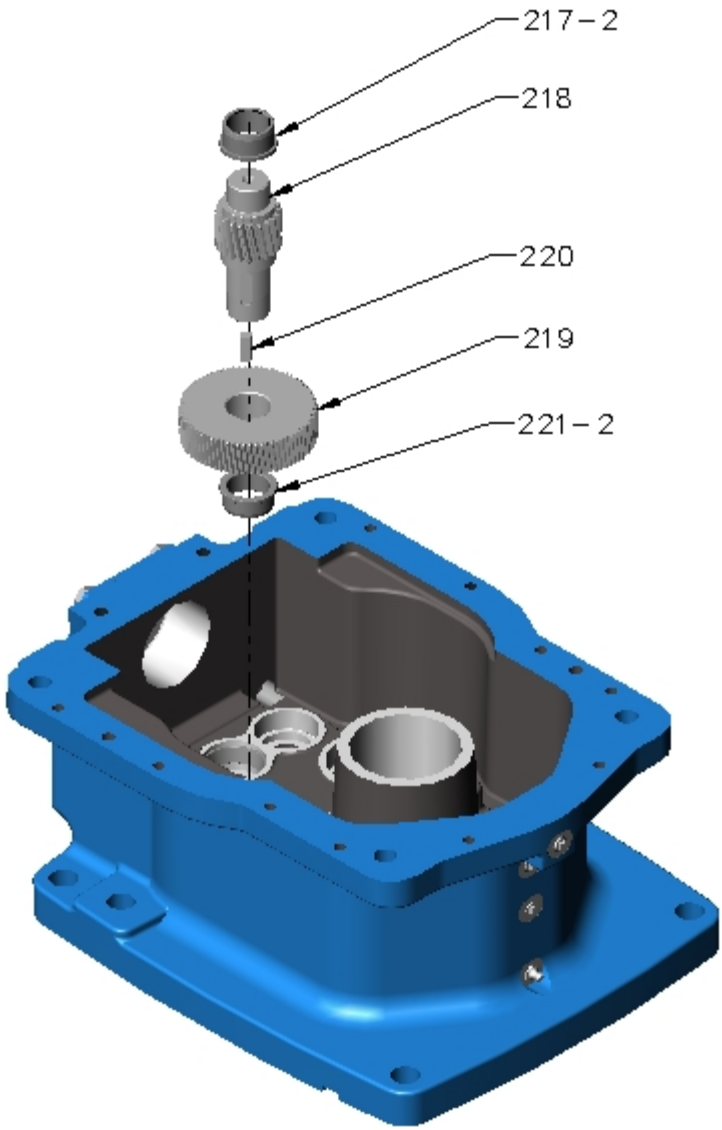

Figure 8 – Intermediate Shaft

M. At case lid remove following items (refer Figure 9):

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

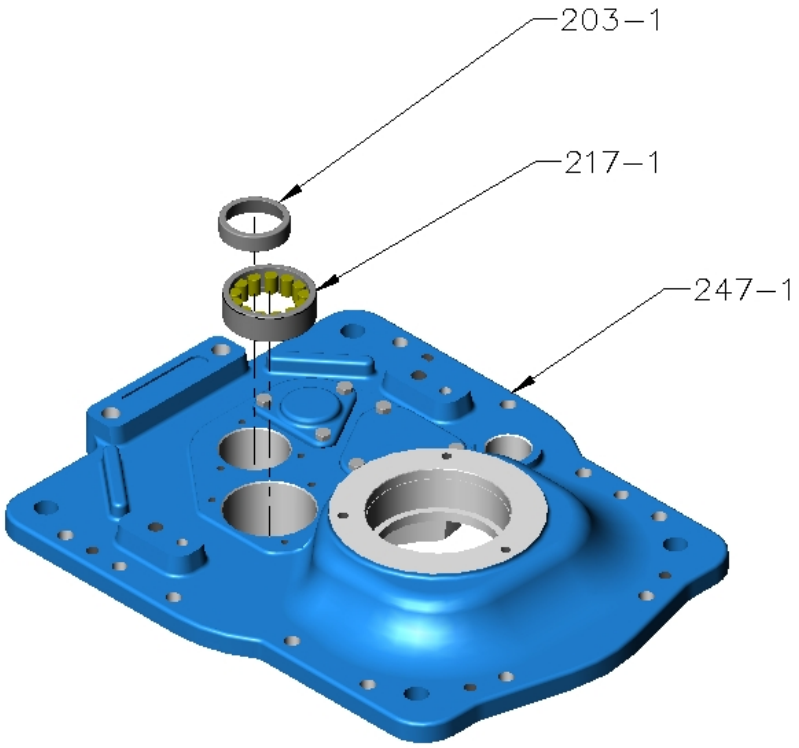

Figure 9 – Bearing races in case lid

N. At case bottom **[248-1]** remove following items (refer Figure 10):

- Lip seal **[249]**
- Bearing cup **[245-1]**
- Bearing cup **[205-1]**
- Bearing outer race **[221-1]**

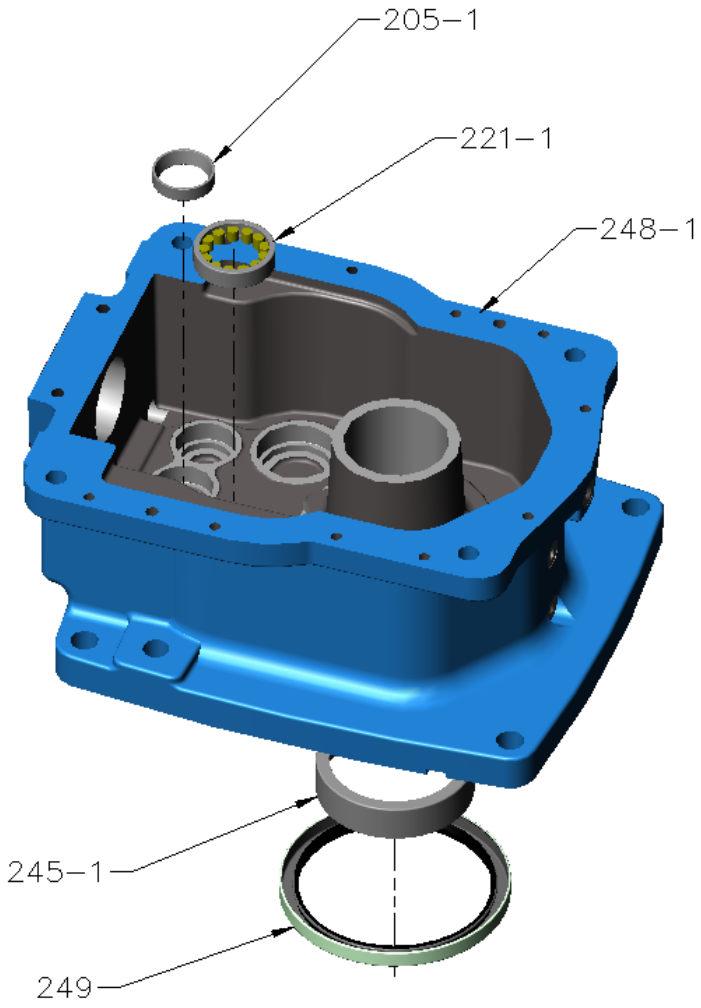

Figure 10 – Case Bottom

O. Standard Procedures

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

ASSEMBLY

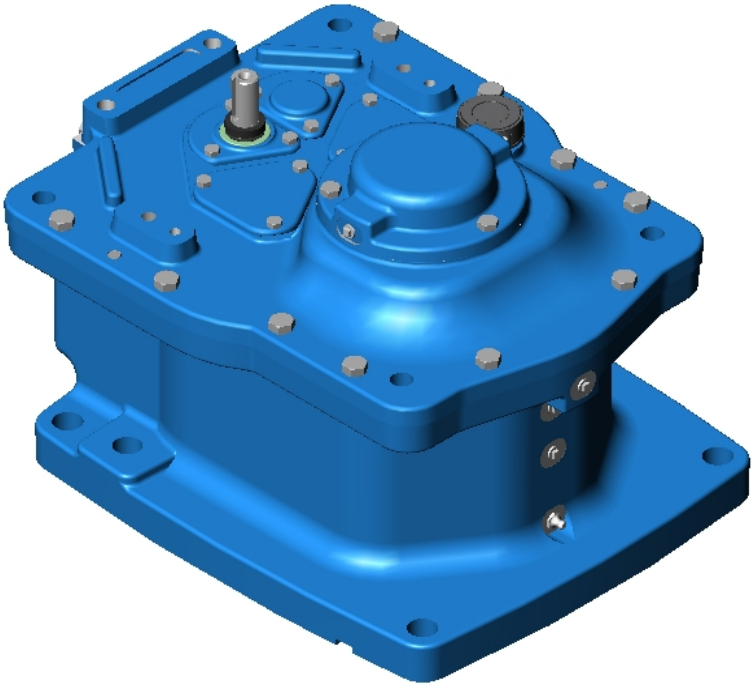

Figure 11 – Model 20 GT - Double Reduction

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 onto 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.

NOTE: New v-rings and lip seals must be used when rebuilding the gearbox.

B. At case bottom, install following items (refer Figure 12):

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

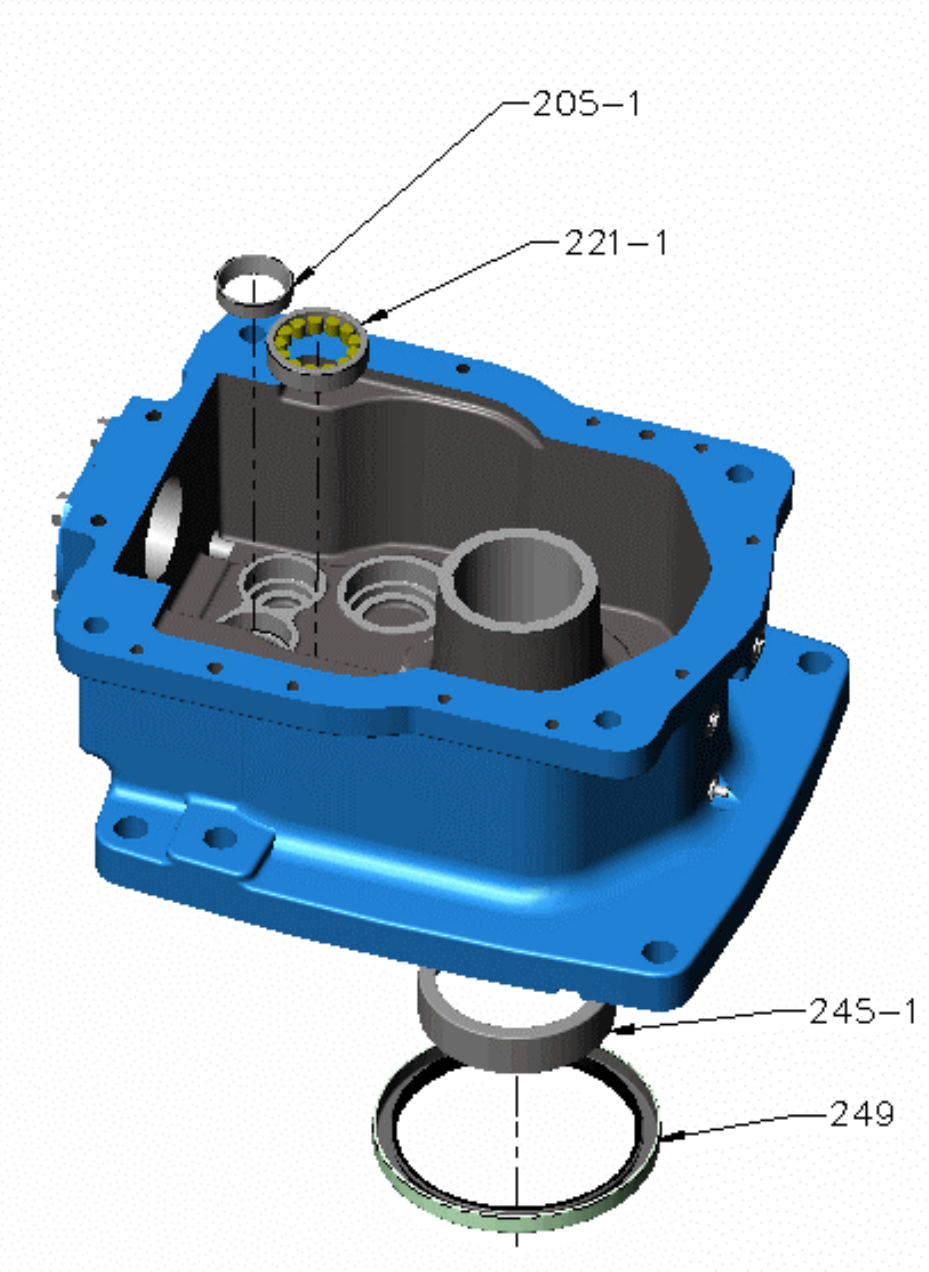

Figure 12 – Case Bottom

C. Output shaft assembly (refer Figure 13):

- Heat bearing cone **[245-2]** to 120ºC (248ºF) 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.
- Insert key **[238]** into output shaft **[244]** keyway.

D. Lift the bottom case and align with output shaft assembly **[244]** (refer Figure 13).

E. Carefully lower bottom case until bearing cone **[245-2]** is seated (refer Figure 13).

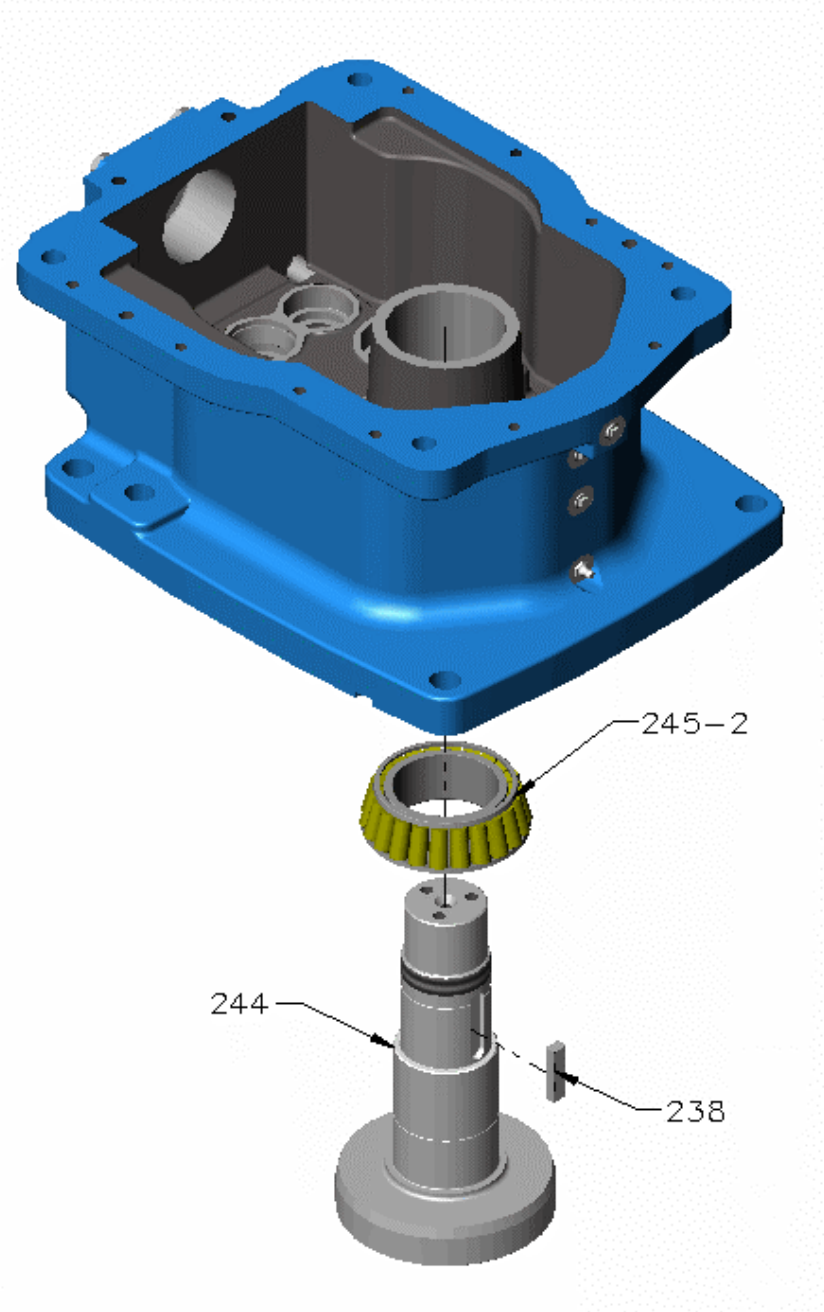

Figure 13 – Output Shaft

F. Intermediate shaft assembly (refer Figure 14):

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

G. Install intermediate shaft assembly into bearing outer race **[221-1]** in the case bottom (refer Figure 14).

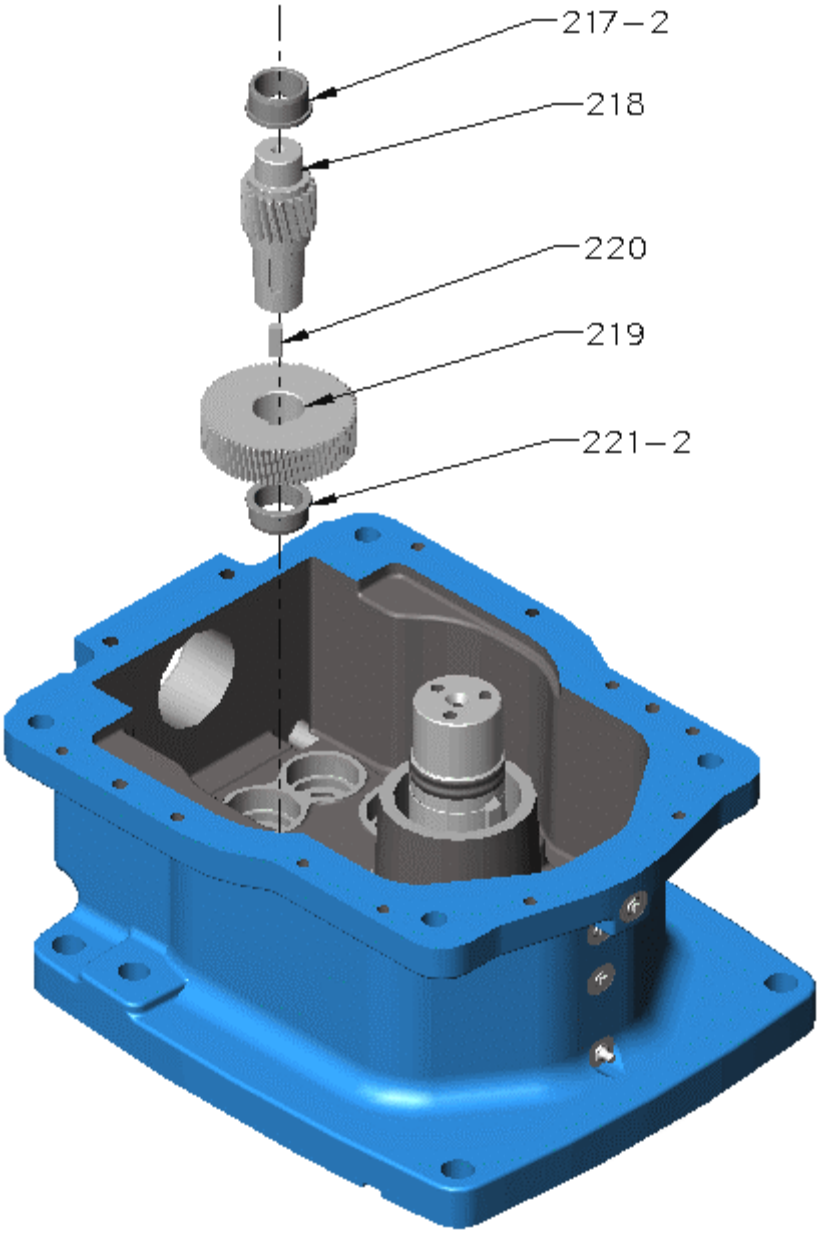

Figure 14 – Intermediate Shaft

H. Install V-ring **[242]** on the gear flange **[237]** and heat flange to 120° C (248° F) (refer Figure 15).

I. At output shaft **[244]**, install following items (refer Figure 15):

- 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 15). Make sure the gear is sitting flat on the gear flange. Use feeler gage to check this.

K. Torque-tighten bolts **[240]** to value given in Table 1 (refer Figure 15).

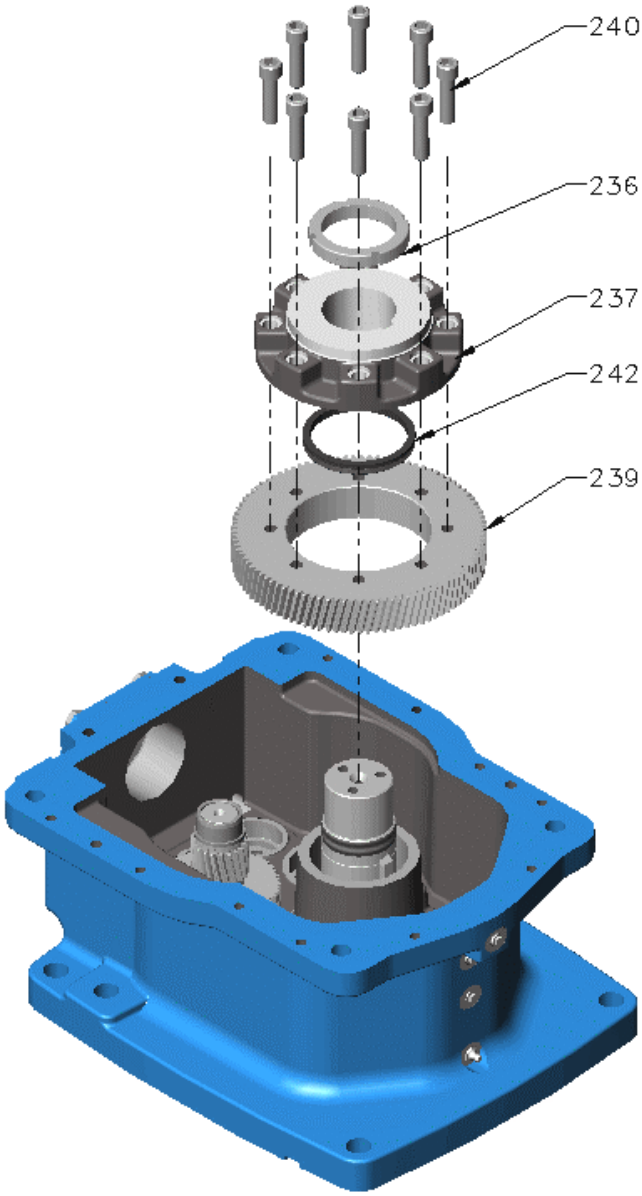

Figure 15 – Output Gear and Gear Flange

L. Input shaft assembly (refer Figure 16):

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

M. Install input shaft assembly in the bearing cup **[205-1]** (refer Figure 16).

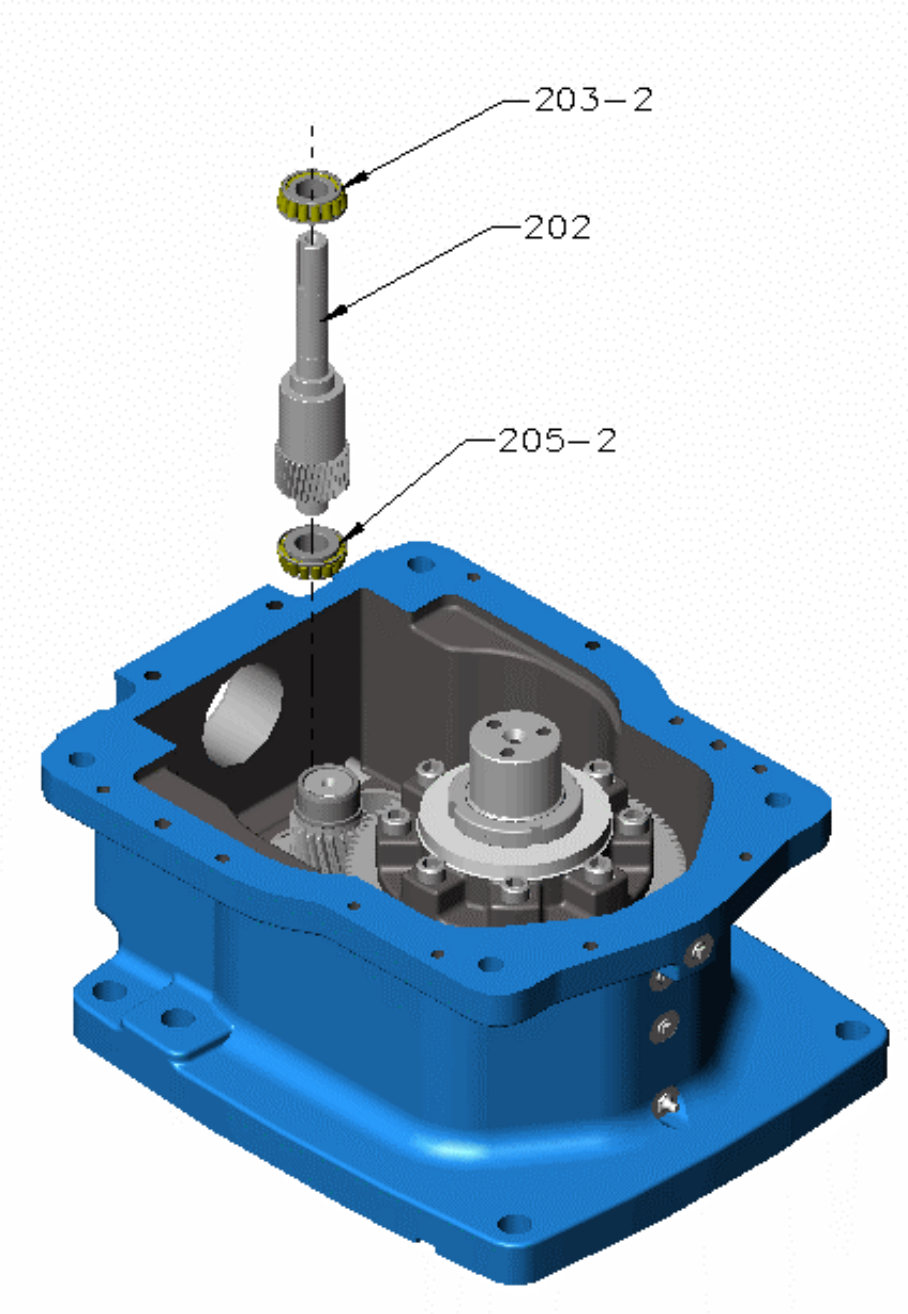

Figure 16 – Input Shaft

N. Install case lid **[247-1]** (refer Figure 17).

(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.

O. Install at output shaft (refer Figure 17):

- Nilos ring **[235]**.
- Bearing cup **[233-1]**.
- Heat bearing cone **[233-2]** at 120ºC (248ºF).

P. Press the heated bearing cone **[233-2]** onto output shaft.

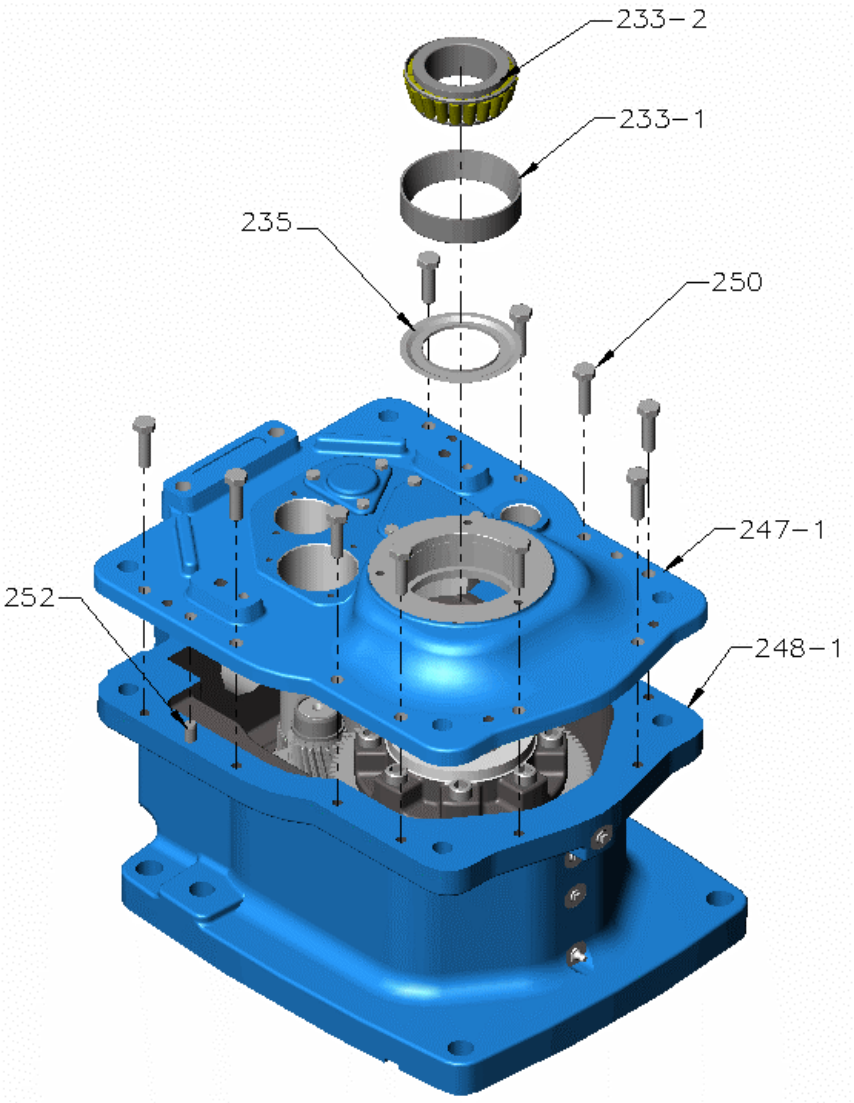

Figure 17 – Case Lid

Q. Input cap shim selection (refer Figure 18).

(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]**.

R. At input shaft, install following items (refer Figure 18):

- 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

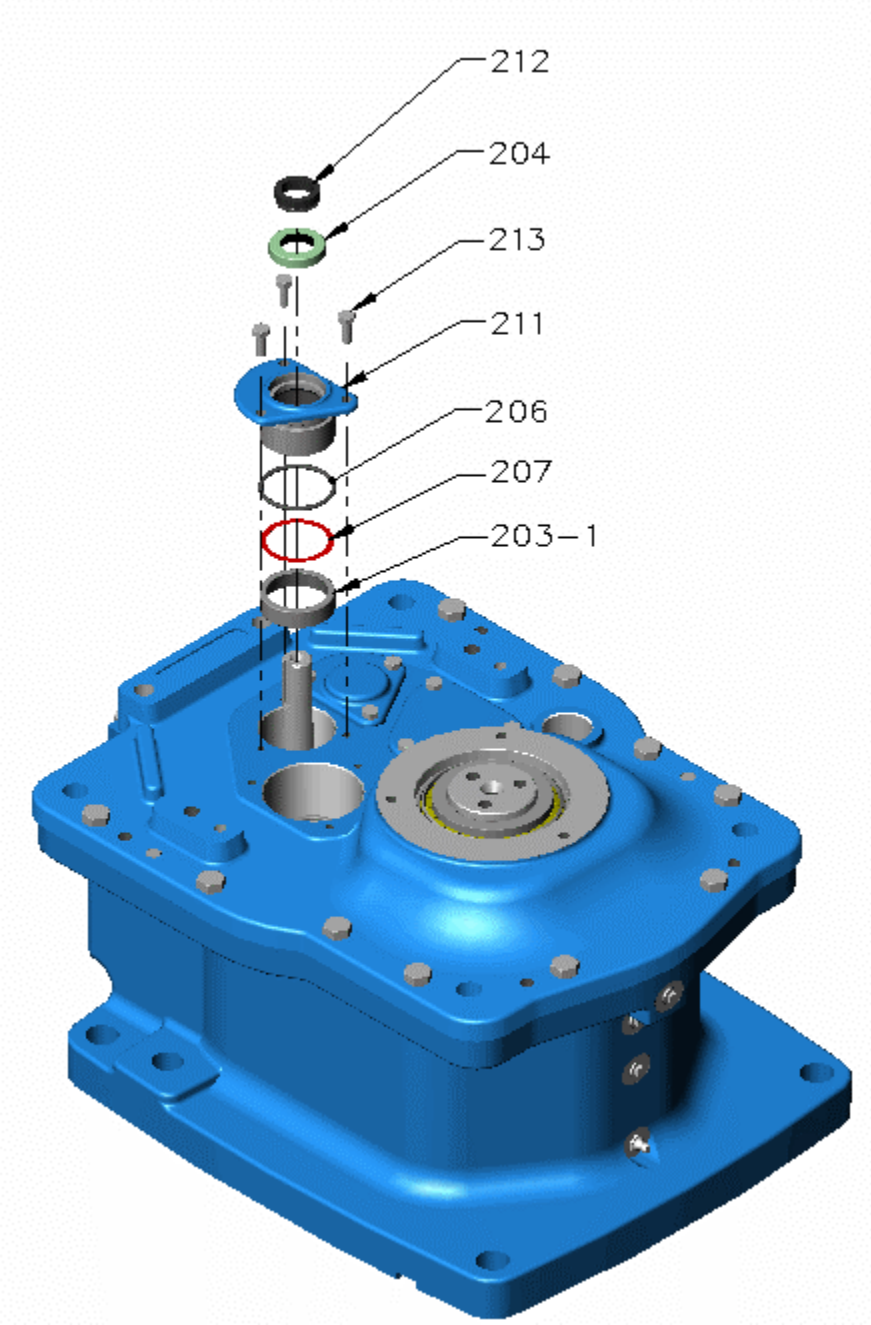

Figure 18 – Input Cap

S. At intermediate shaft, install following items (refer Figure 19):

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

NOTE: No shimming required

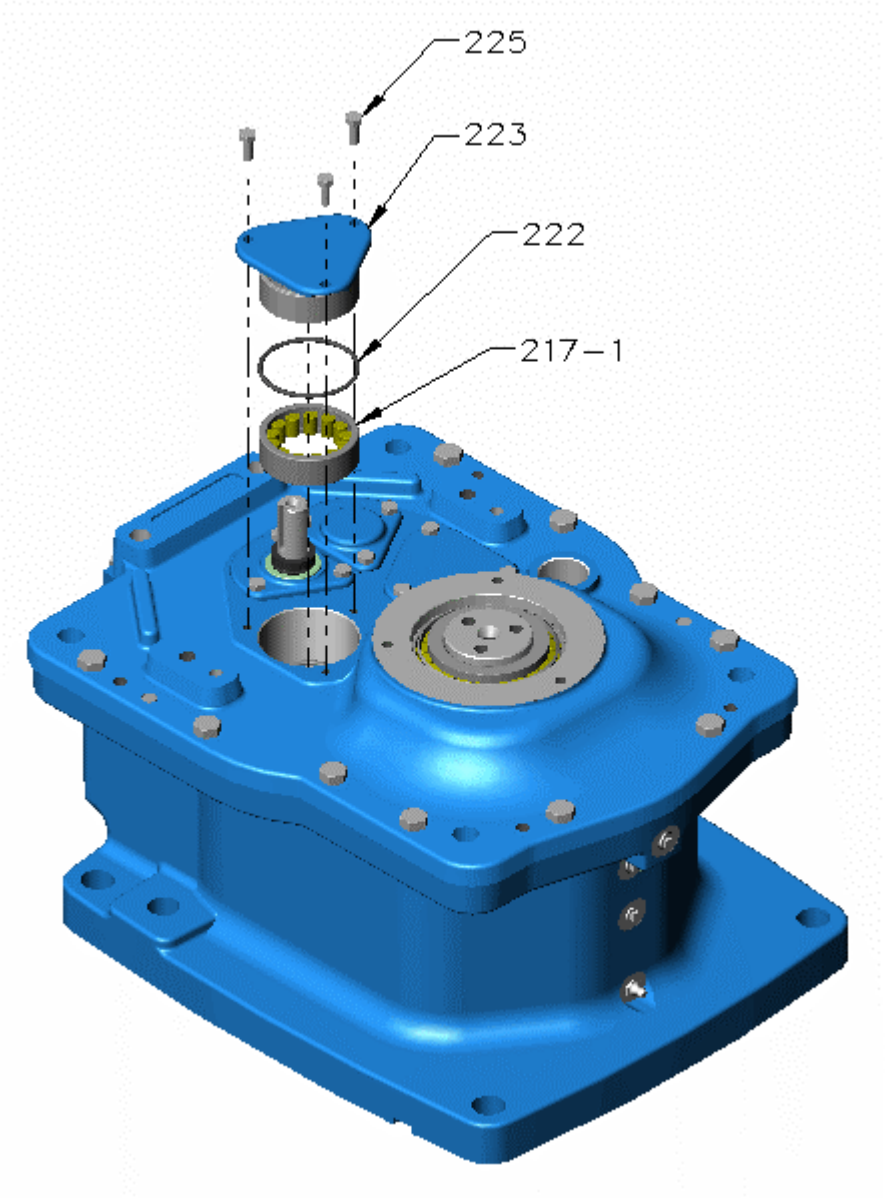

Figure 19 – Intermediate Cap

T. Output shaft shim selection (refer Figure 20).

(1) Make sure any fixture or arrangement to prevent the output shaft **[244]** from rotating is removed before shimming.

(2) Install thrust washer **[228]**, bolts **[230]**. Torque-tighten bolts **[230]** to value given in Table 1.

(3) 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]**.

U. At output shaft, install following items (refer Figure 20):

- 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

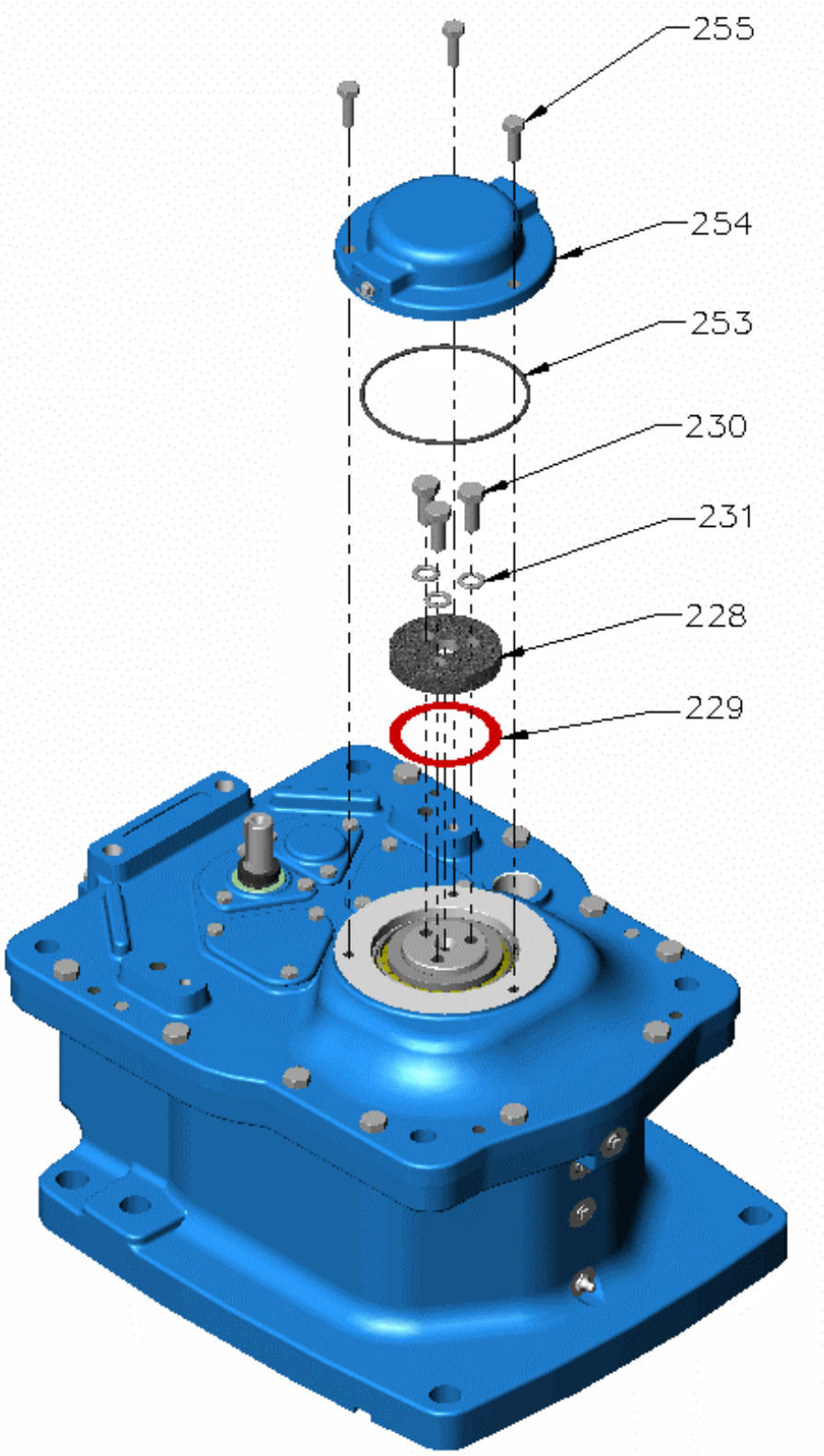

Figure 20 – Output Cap

- 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).

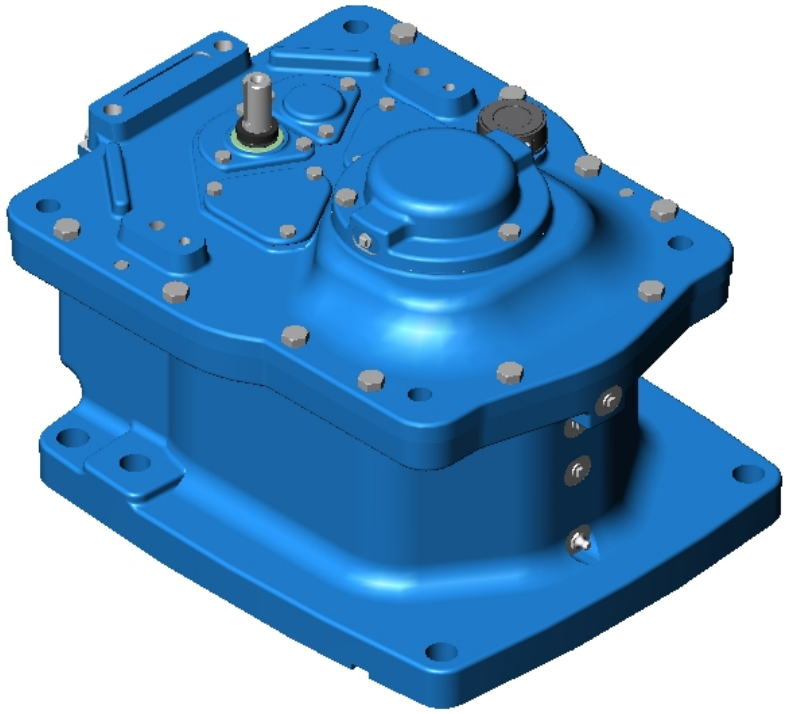

Figure 21 – Model 20 GT - Double Reduction

4. ITEM LIST

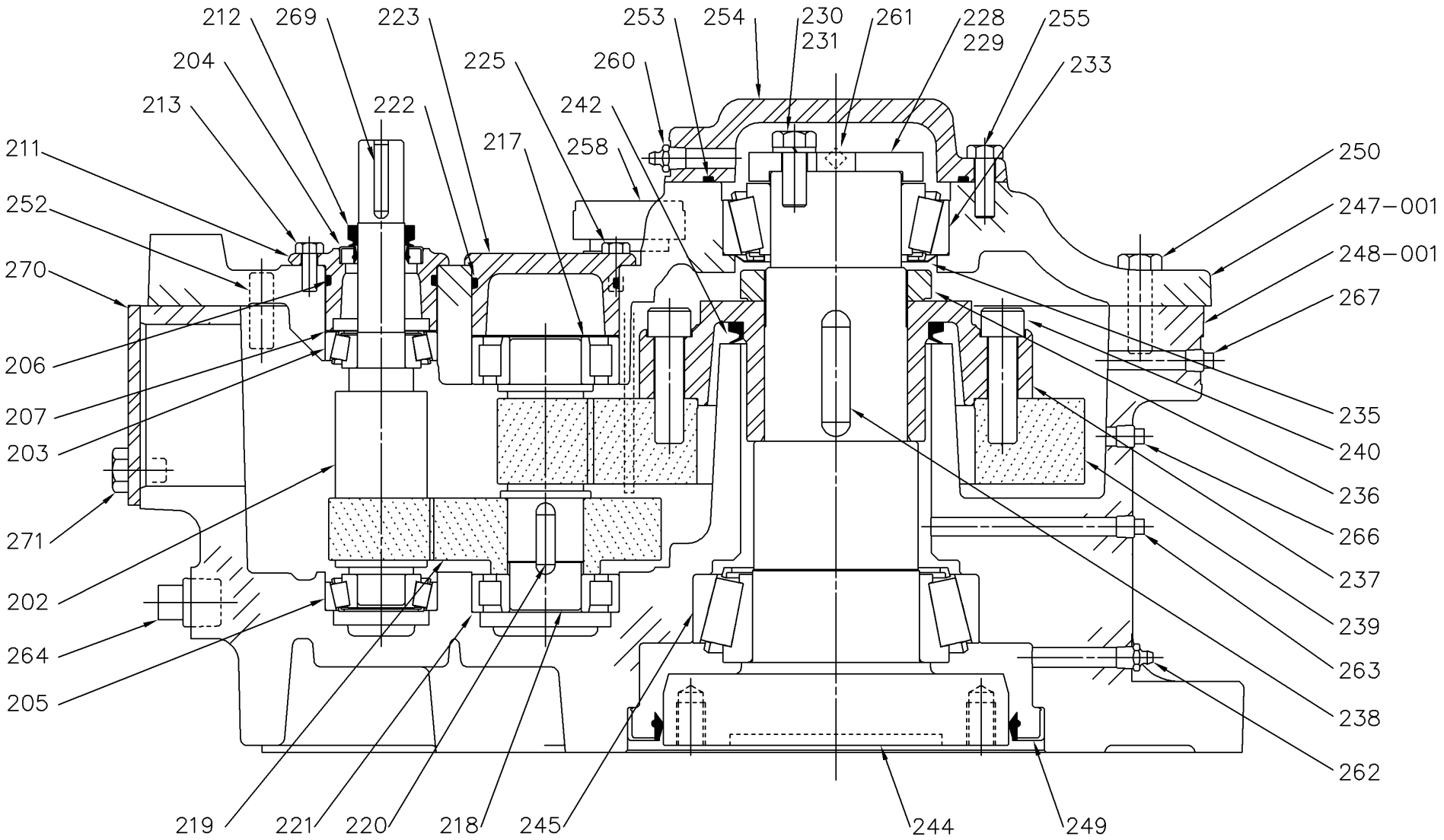

Figure 22 – Sectional View of Model 20 GT – Double Reduction

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

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

P.O. Box 1123
Dayton, Ohio 45401
Phone: (937) 454-3200
FAX: (937) 454-3379

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