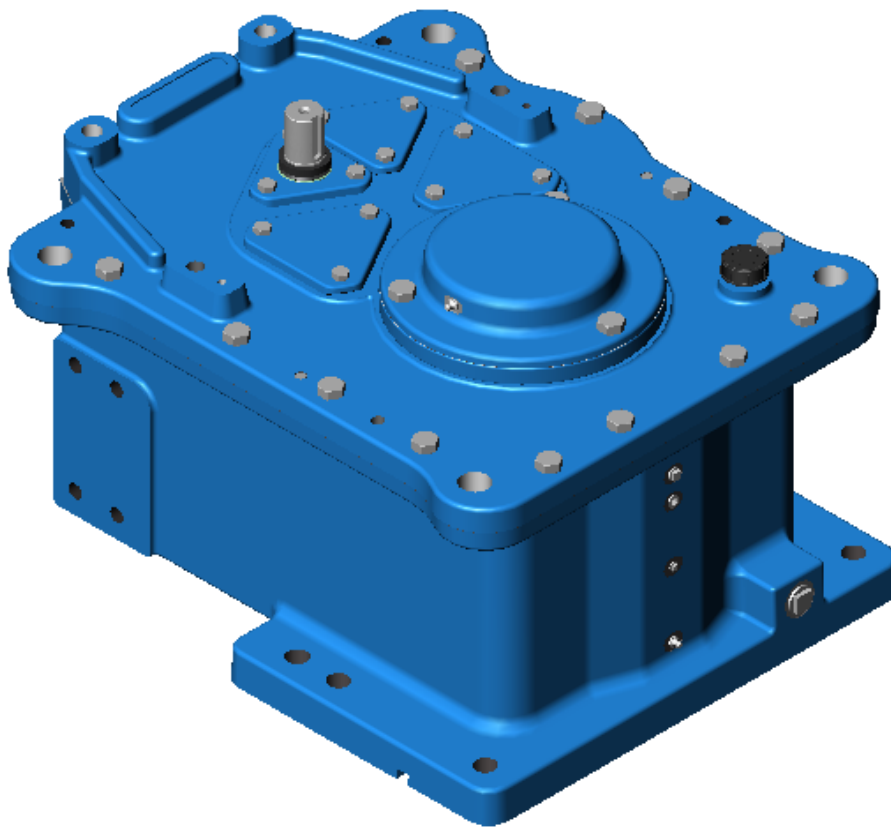


Maintenance Manual
Model 20 GT (Case Size 23) Gear Drive
Double Reduction



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1. INTRODUCTION

This manual contains instructions for '23 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

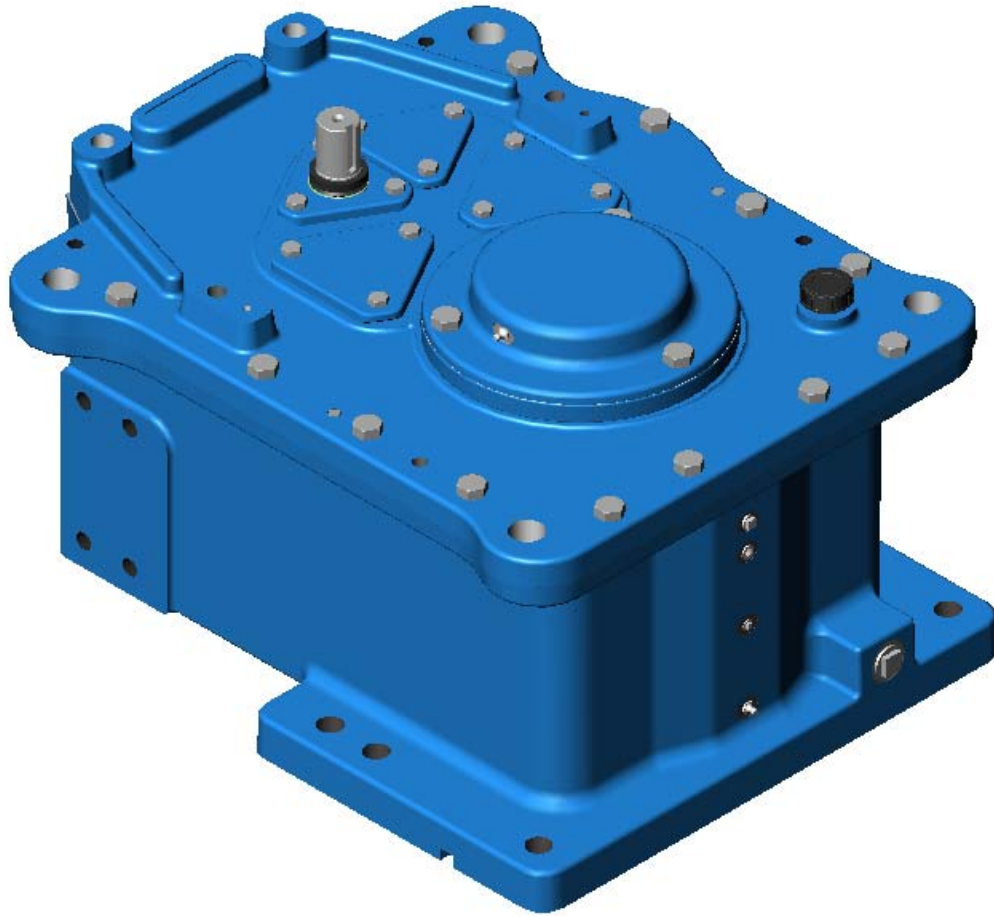


Figure 1 – 23 GT - Double Reduction

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]
 - Bearing Spacer [208]

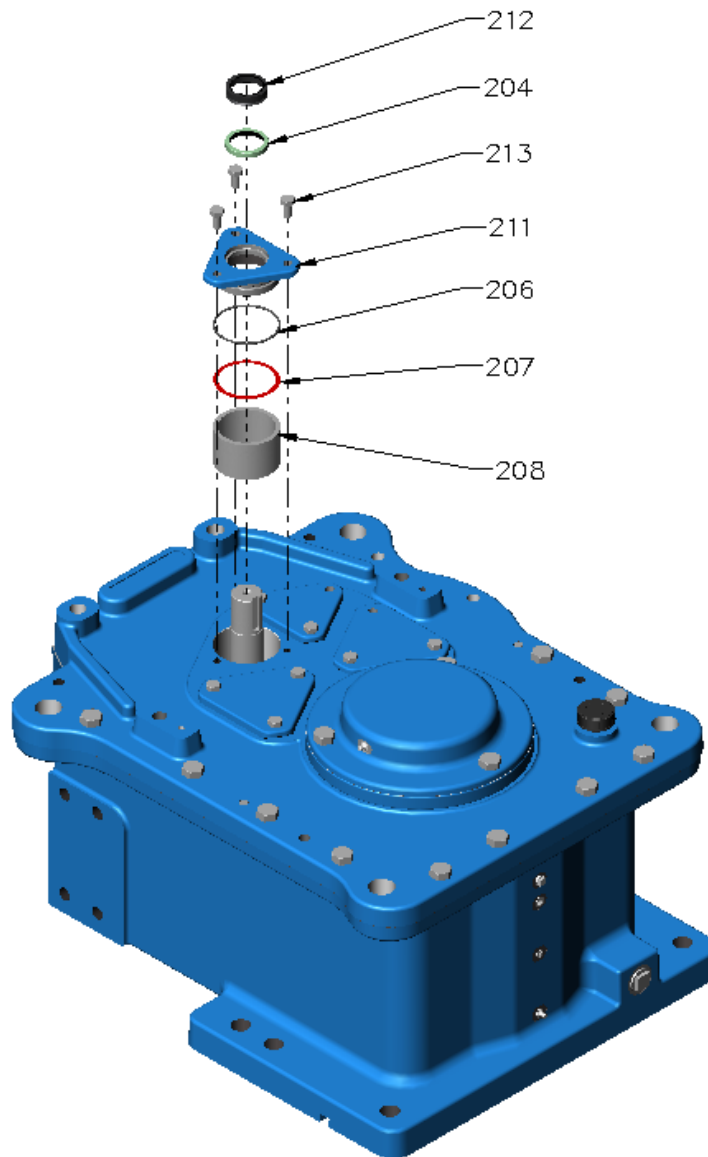


Figure 2 – Input Cap

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

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

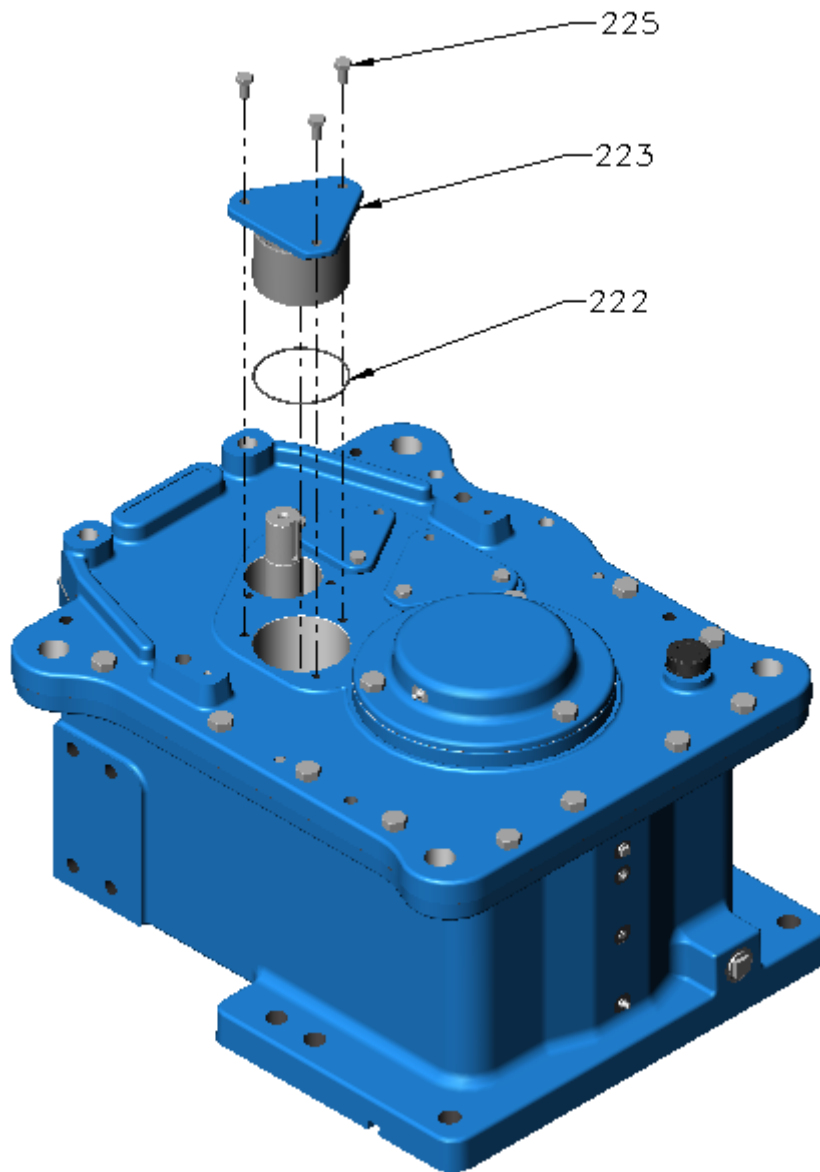


Figure 3 – Intermediate Cap

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]

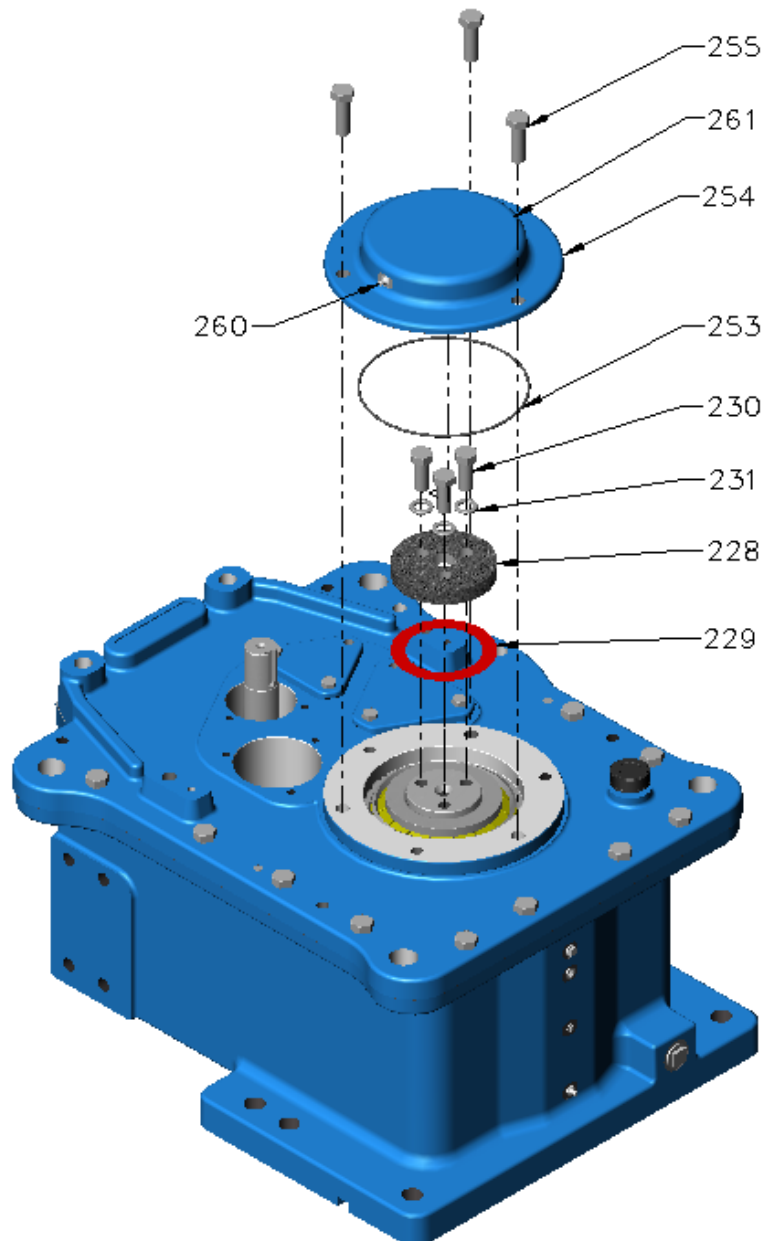


Figure 4 – Output Cap

E. At output shaft (refer Figure 4):

- Insert Bolts [255] into threaded holes of the bearing carrier [246]
- Tighten the bolts to lift the bearing carrier
- Disassemble the bearing carrier to remove nilos ring [235], inner outer [233-2] and outer race [233-1]

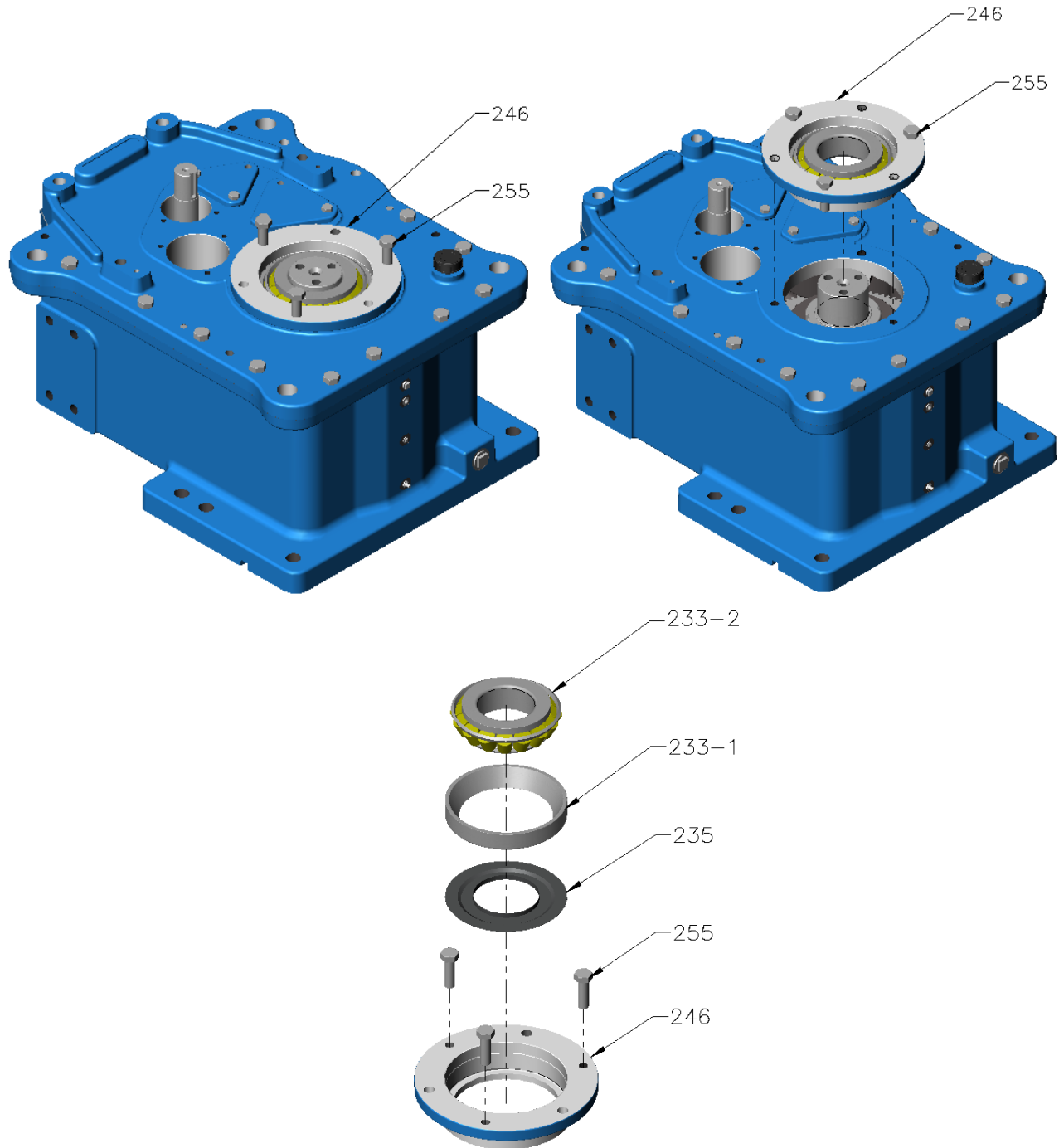


Figure 5 – Bearing Carrier

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

- Remove dipstick/breather [258].
- Remove dowel pins [252].
- Remove bolts [250].
- Install jacking screws [Local supply].
- Tighten jacking screws [Local supply] and remove case lid [247-1]

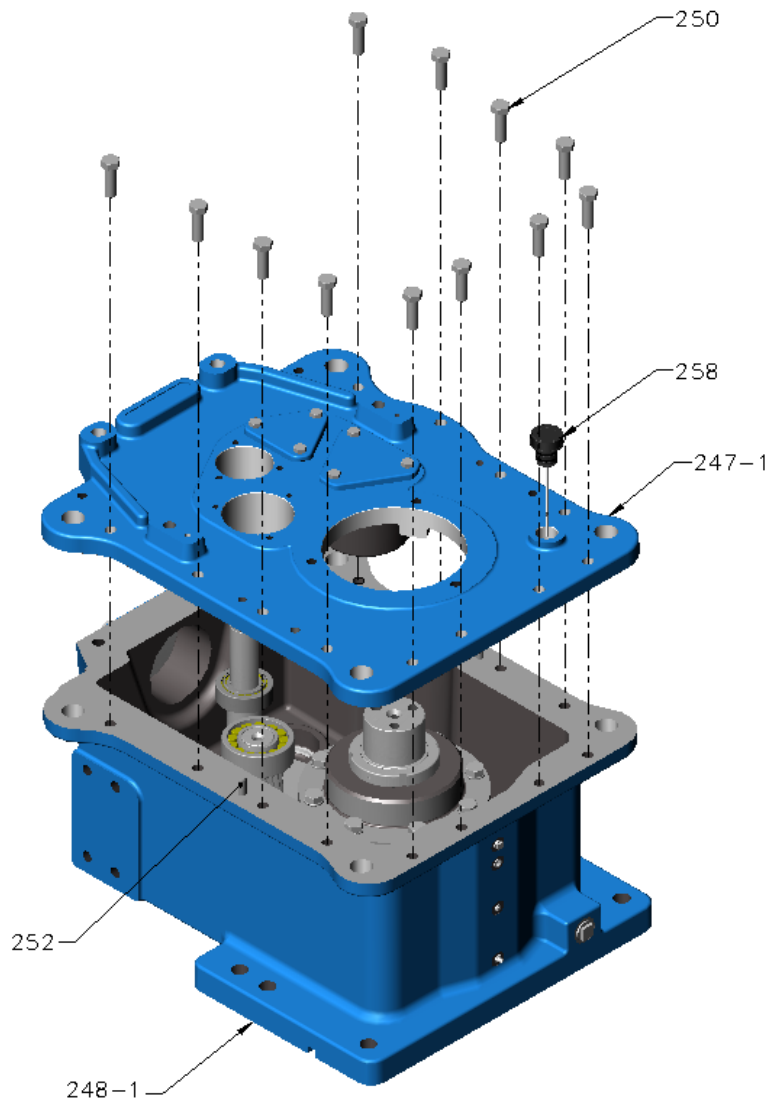


Figure 6 – Case Lid

- G. Remove input shaft assembly (refer Figure 7).
- H. Input shaft disassembly (refer Figure 7):
- Press input shaft [202] out of bearing cone [203-2]
 - Remove bearing cone [205-2]

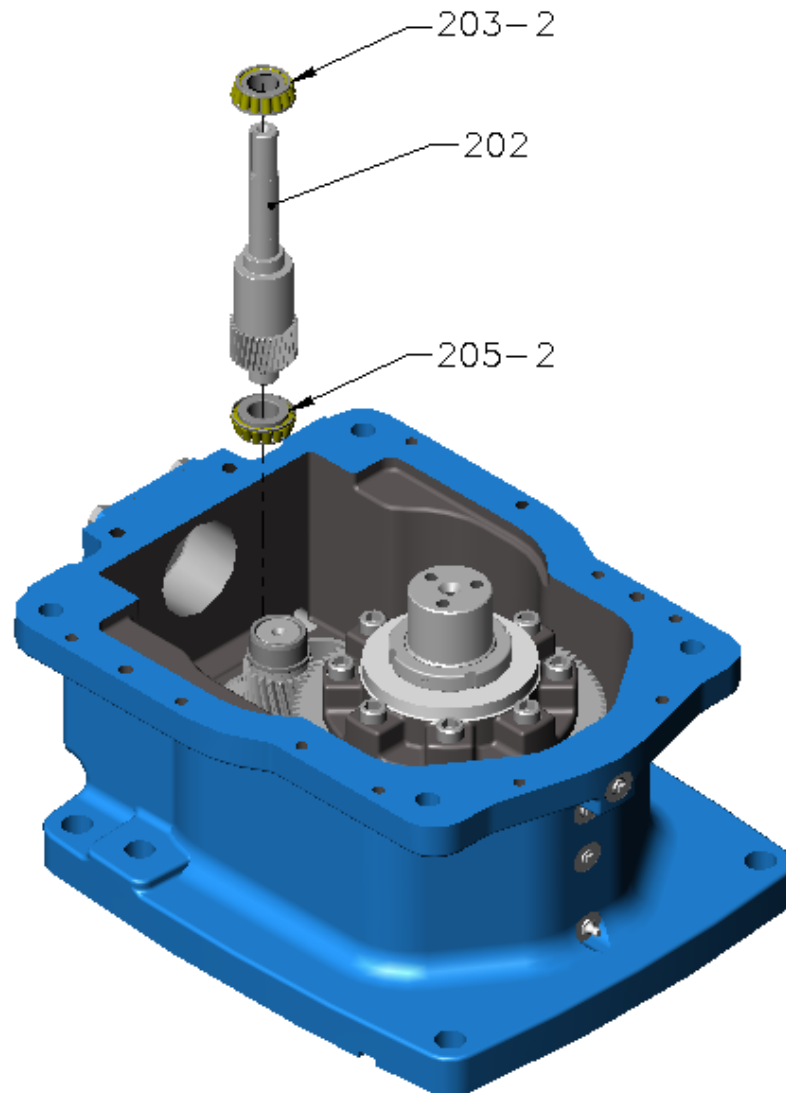


Figure 7 – Input Shaft

- I. At output shaft [244], remove the following items (refer Figure 8):
- 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 8).
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.

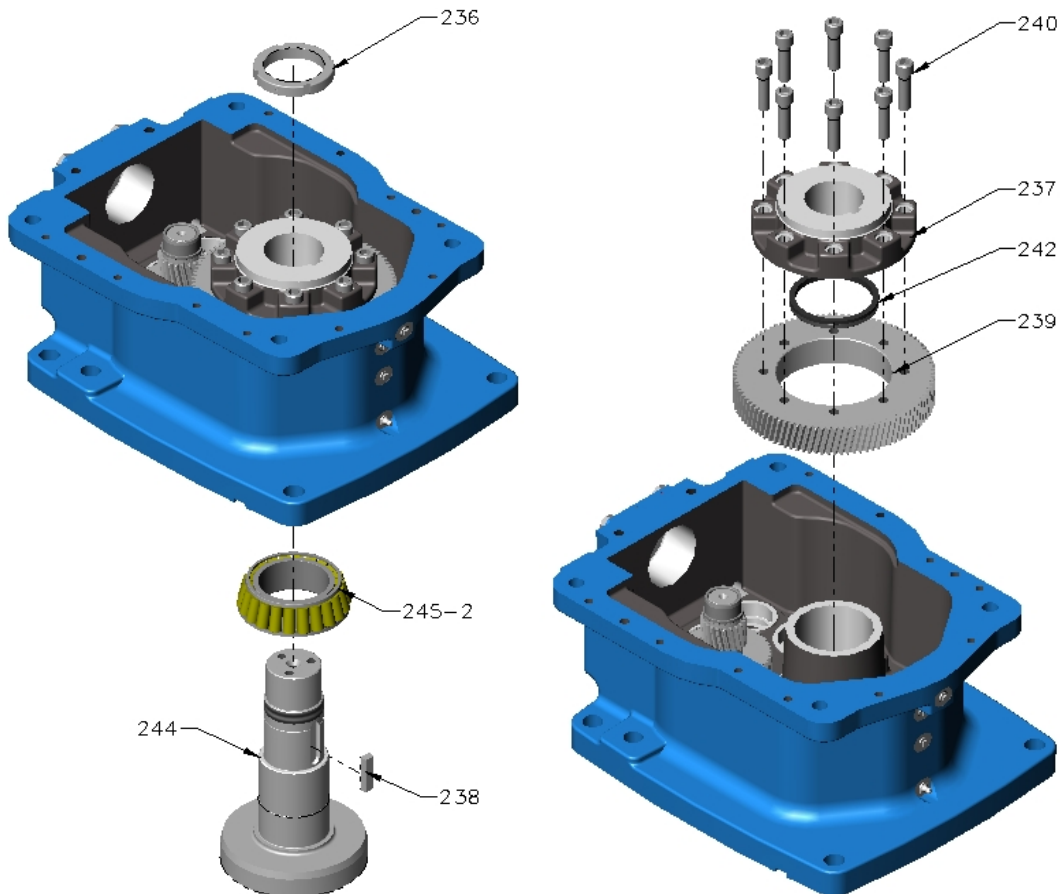


Figure 8 – Output Shaft

- K. Remove intermediate shaft assembly (refer Figure 9).
- L. Intermediate shaft disassembly (refer Figure 9):
- 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]

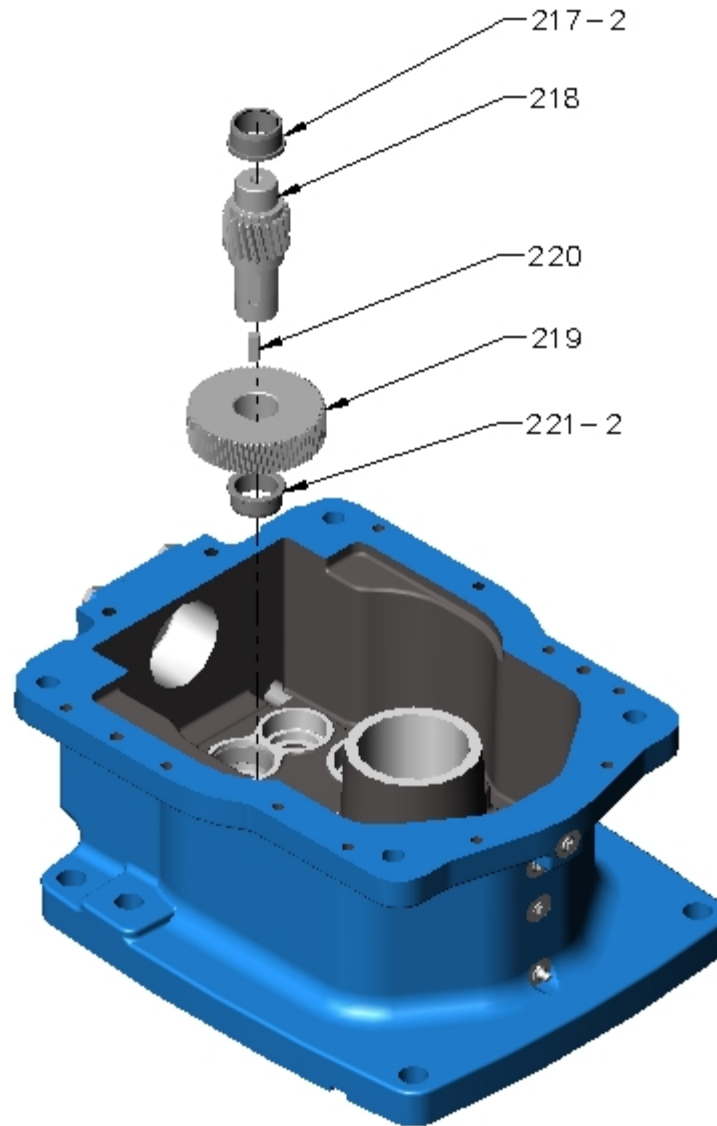


Figure 9 – Intermediate Shaft

M. At case lid remove following items (refer Figure 10):

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

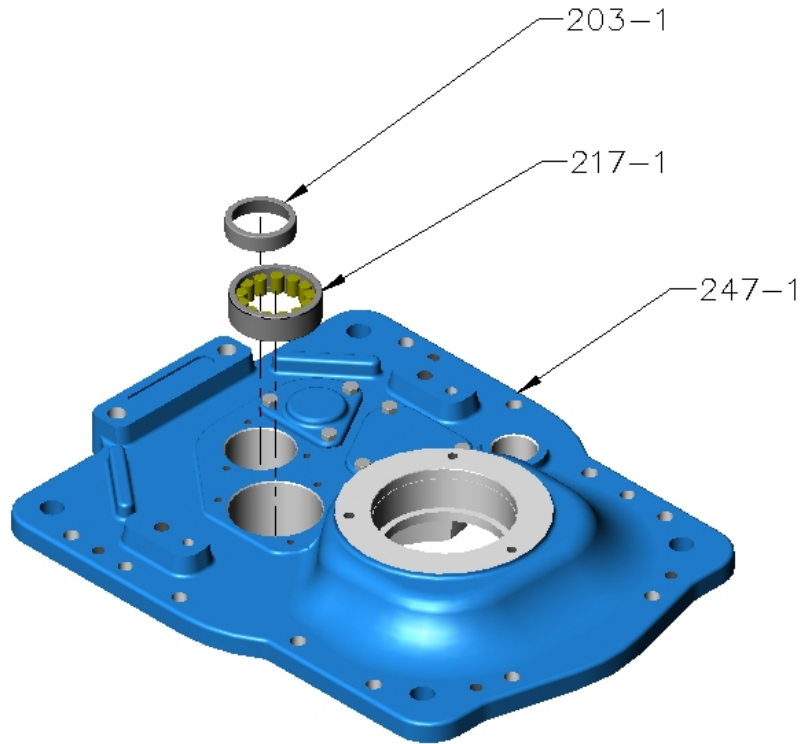


Figure 10 – Bearing races in case lid

N. At case bottom **[248-1]** remove following items (refer Figure 11):

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

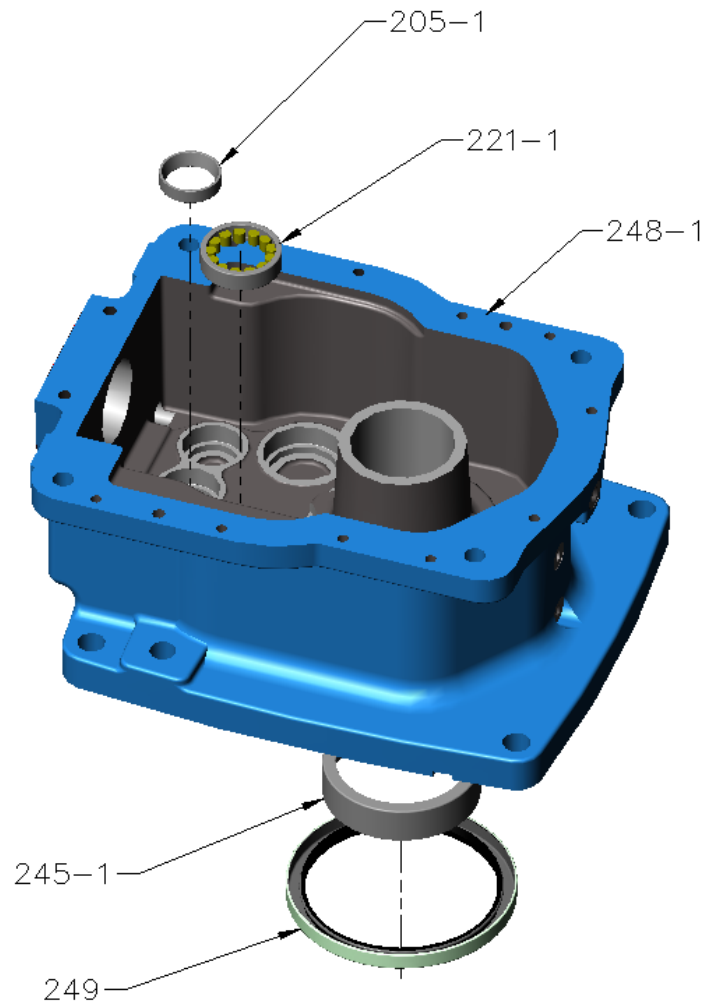


Figure 11 – Case Bottom

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

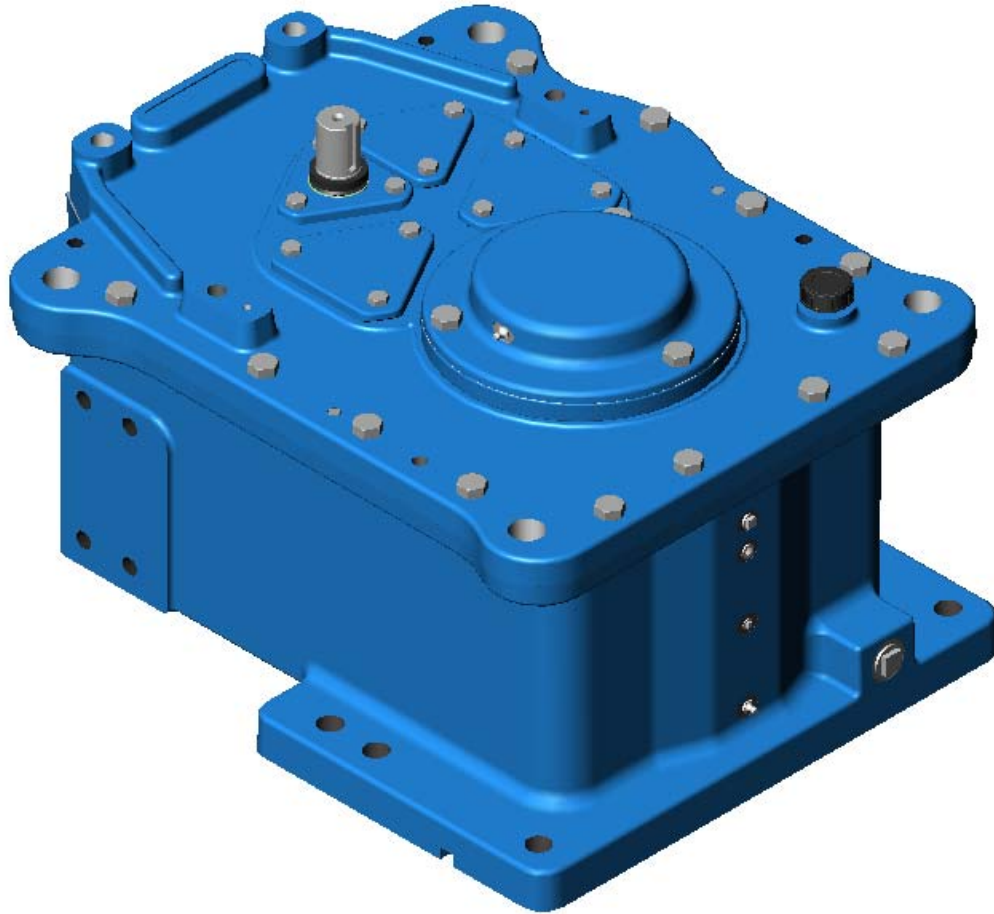


Figure 12 – 23 GT - Double Reduction

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

Bolt Size	Grade 8.8		Grade 10.9	
	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 13):
- 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]

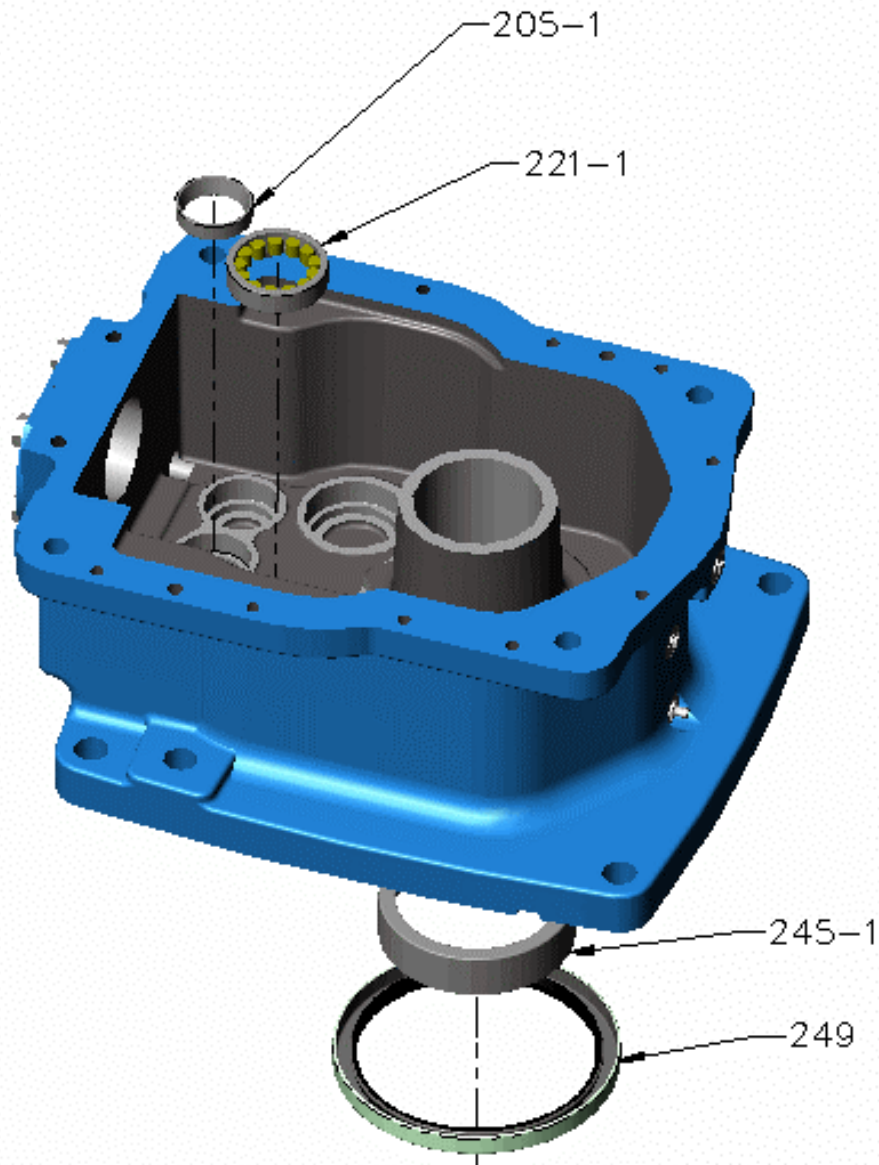


Figure 13 – Case Bottom

- C. Output shaft assembly (refer Figure 14):
- Heat bearing cone [245-2] to 120°C (248°F) 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 14).
- E. Carefully lower bottom case until bearing cone [245-2] is seated (refer Figure 14).

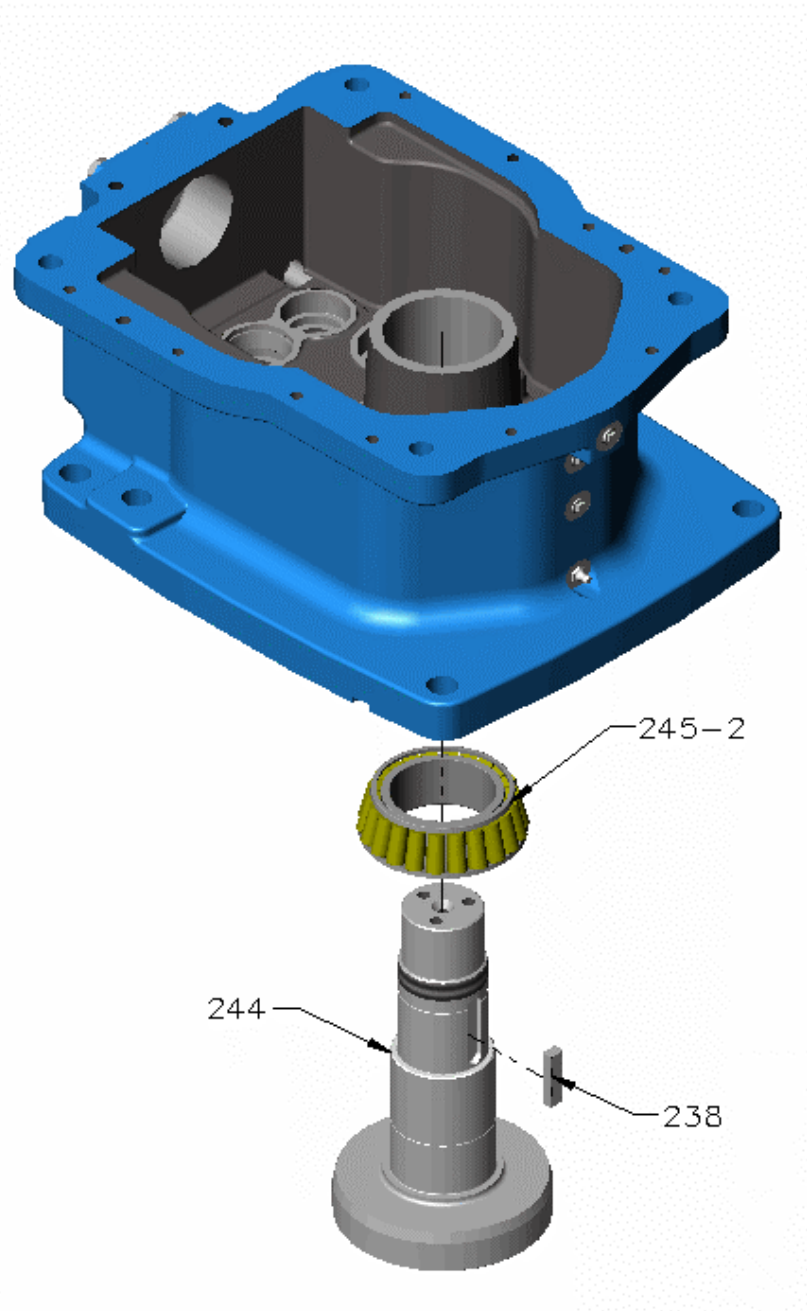


Figure 14 – Output Shaft

- F. Intermediate shaft assembly (refer Figure 15):
- 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 15).

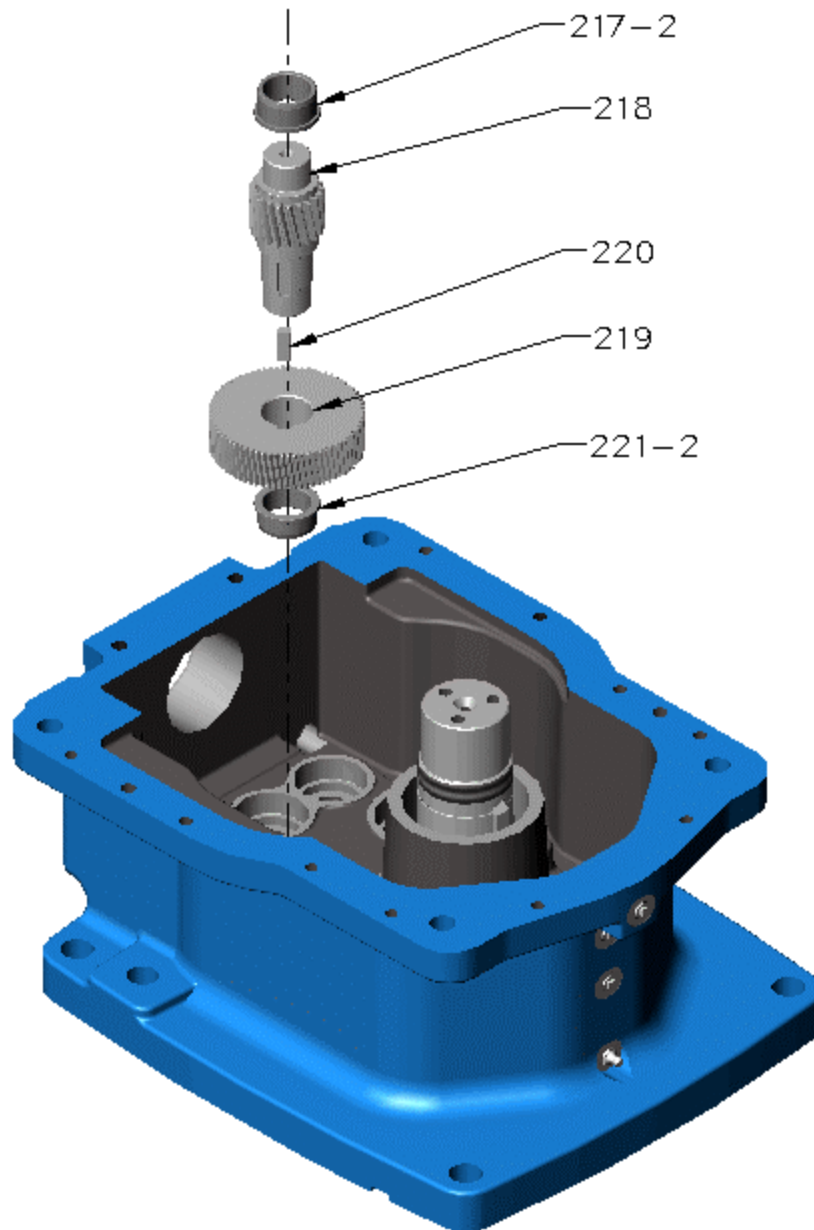


Figure 15 – Intermediate Shaft

- H. Install V-ring **[242]** on the gear flange **[237]** and heat flange to 120° C (248° F) (refer Figure 16).
- I. At output shaft **[244]**, install following items (refer Figure 16):
- 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 16). 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 16).

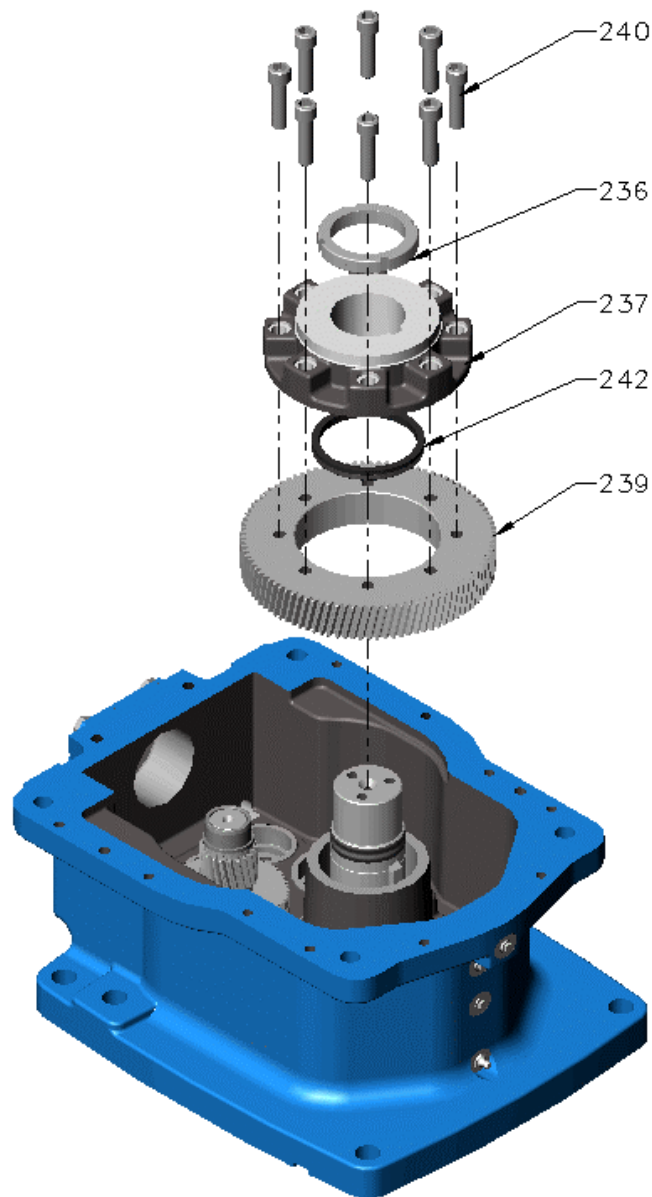


Figure 16 – Output Gear and Gear Flange

- L. Input shaft assembly (refer Figure 17):
- 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 17).

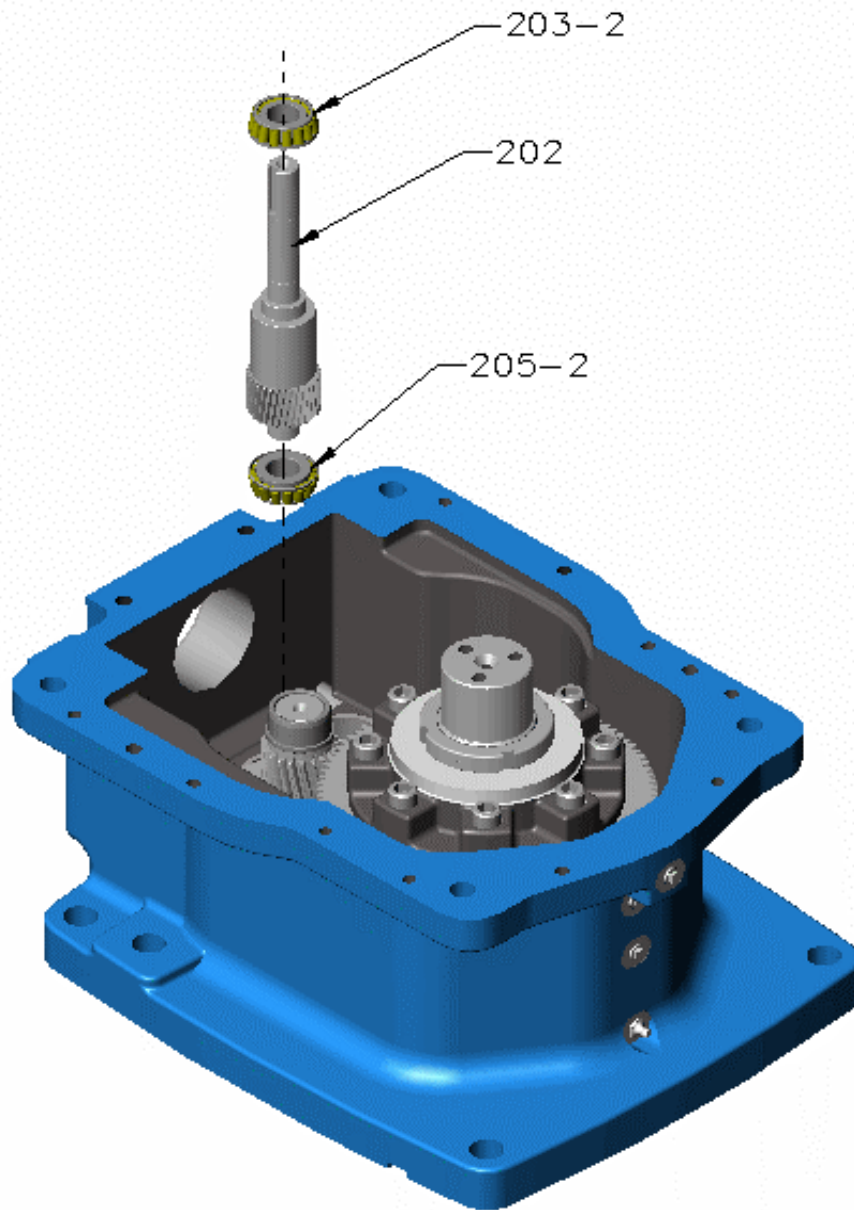


Figure 17 – Input Shaft

- N. Install case lid **[247-1]** (refer Figure 18).
- (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 dipstick **[258]** (refer Figure 18):

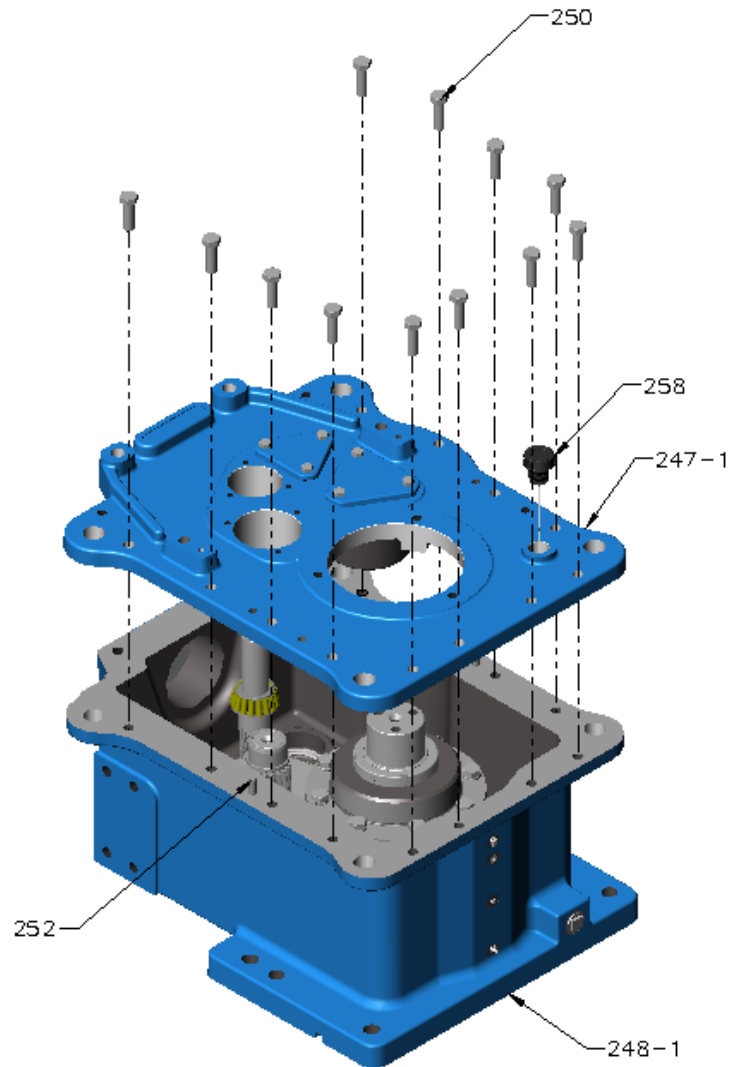


Figure 18 – Case Lid

- P. Input cap shim selection (refer Figure 19).
- (1) Put the bearing cone **[203-1]** and the bearing spacer **[208]** 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]**.
- Q. At input shaft, install following items (refer Figure 19):
- 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

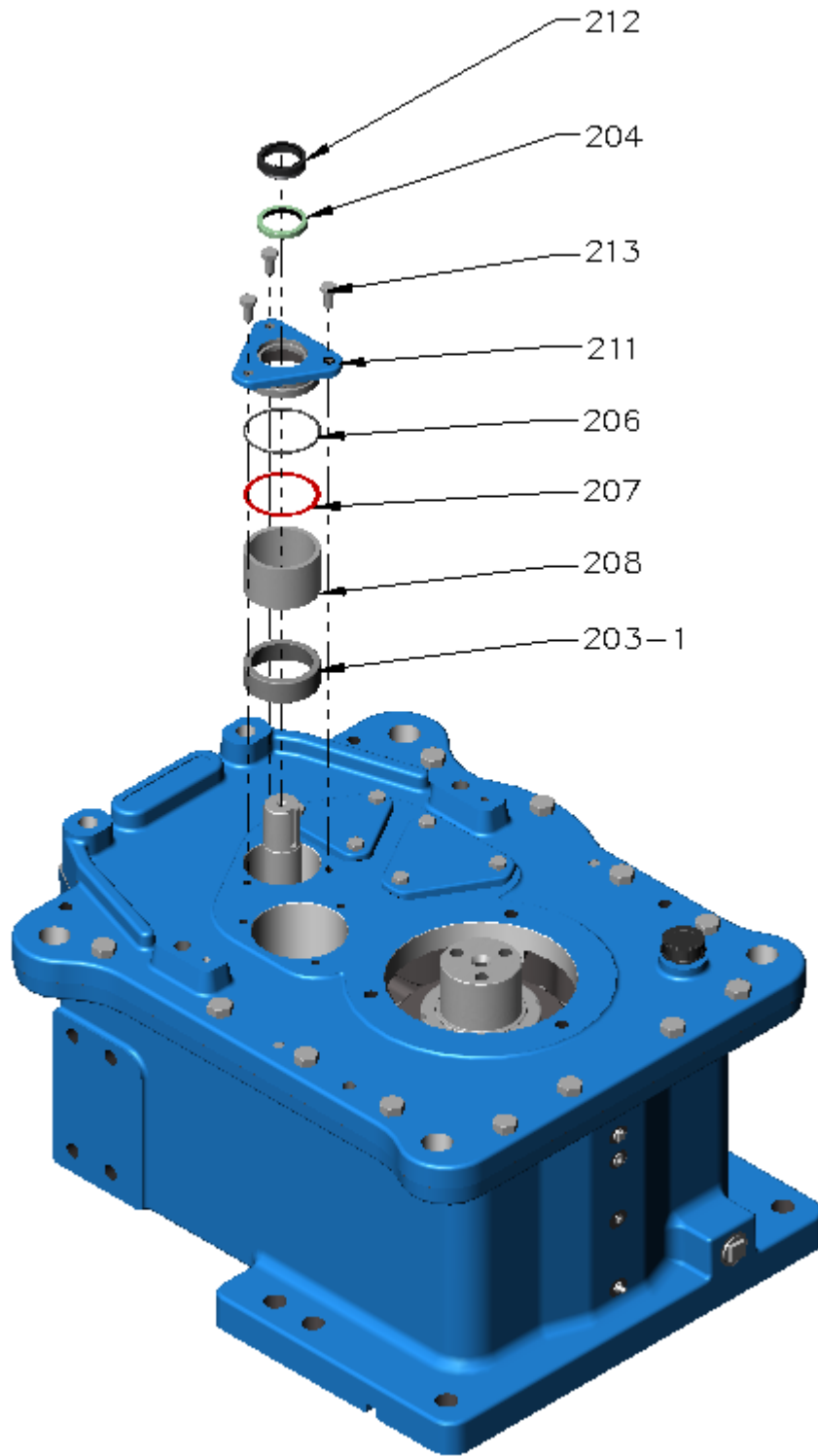


Figure 19 – Input Cap

R. At intermediate shaft, install following items (refer Figure 20):

- 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

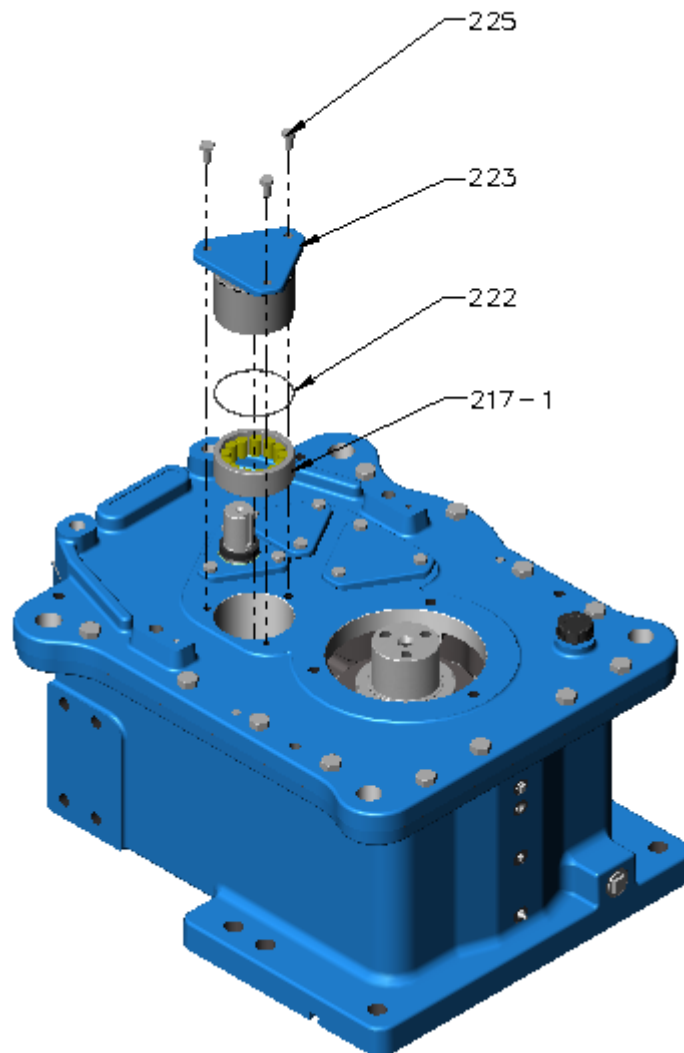


Figure 20 – Intermediate Cap

- S. Install output bearing with bearing carrier (refer Figure 21):
- (1) Install the bearing carrier **[246]** along with the o-ring **[251]**
 - (2) Torque-tighten the Bolts **[255]** to value given in Table 1
 - (3) Place the nilos ring **[235]** into the bearing carrier
 - (4) Install the bearing cup **[233-1]** into the bearing carrier
 - (5) Heat bearing cone **[233-2]** at 120°C (248°F) and install it in the bearing cup **[233-1]**

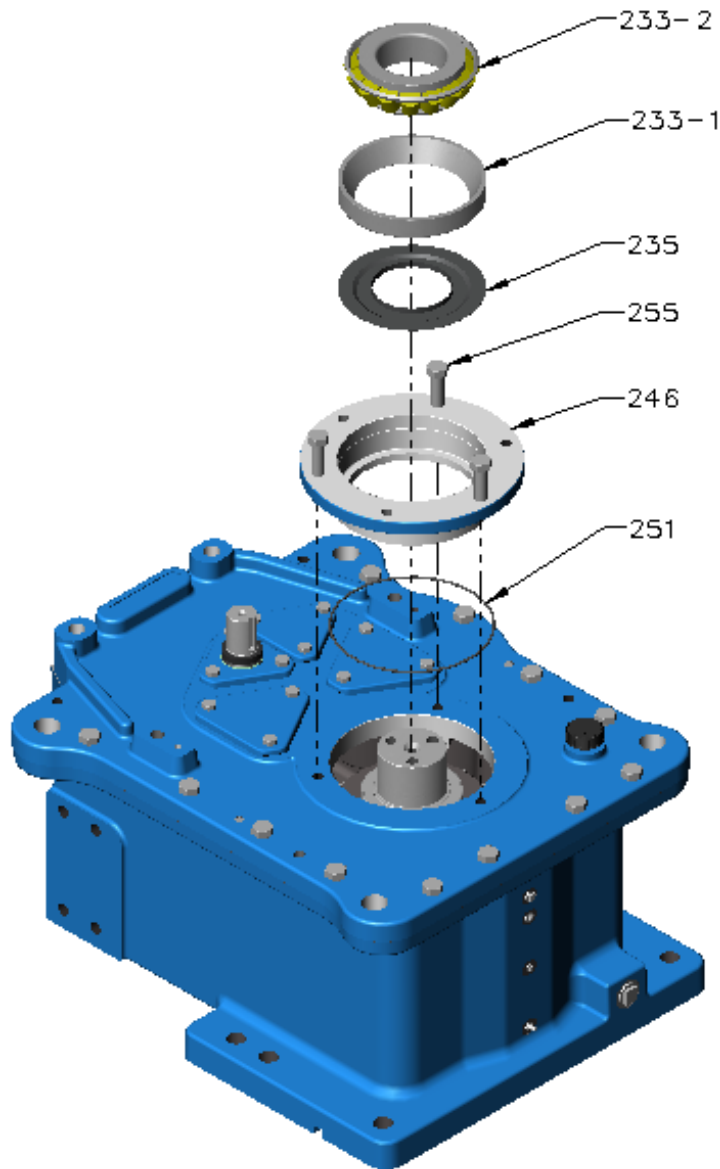


Figure 21 - Output bearing with carrier

- T. Output shaft shim selection (refer Figure 22).
- (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 22):
- 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

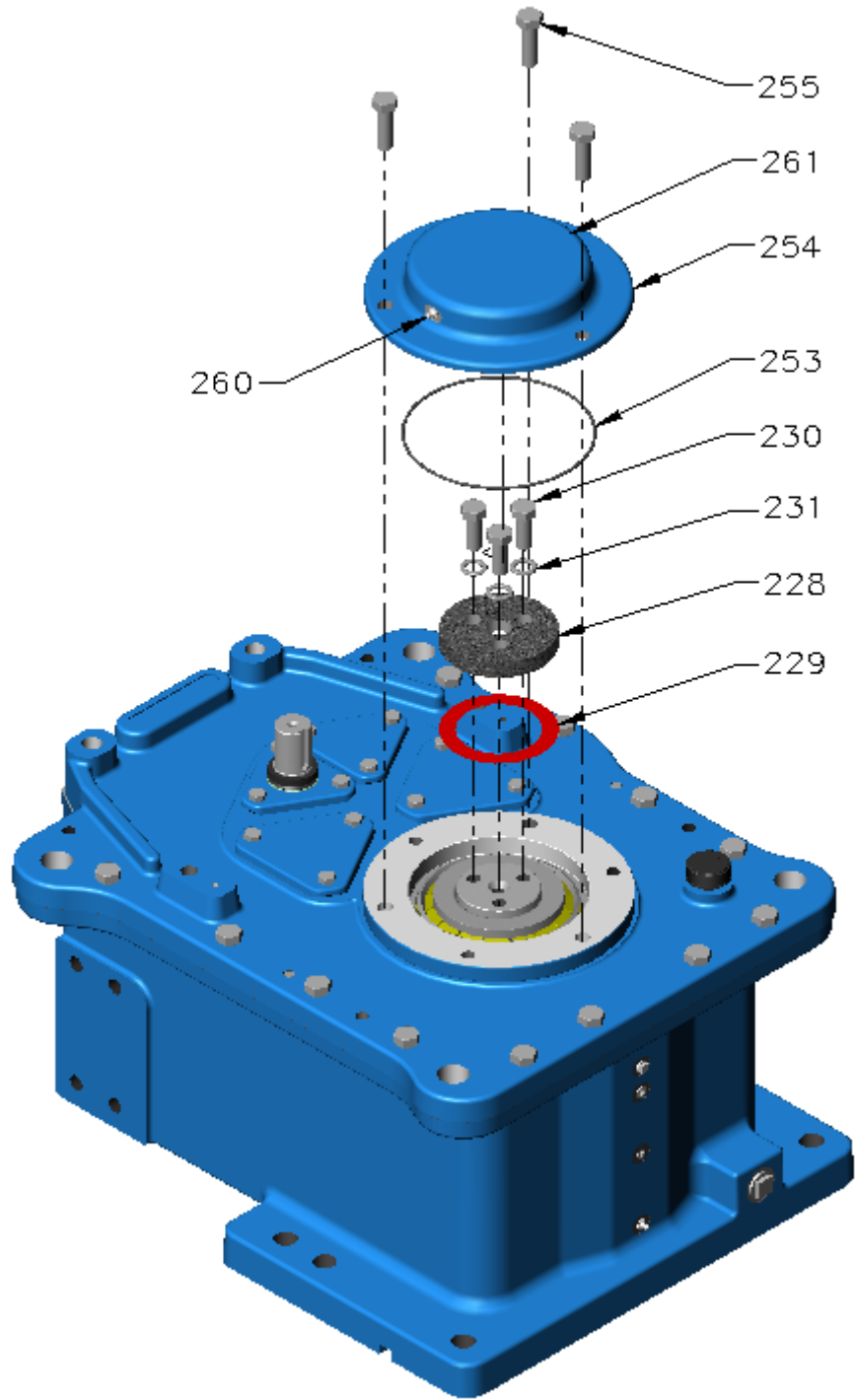


Figure 22 – Output Cap

- 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).

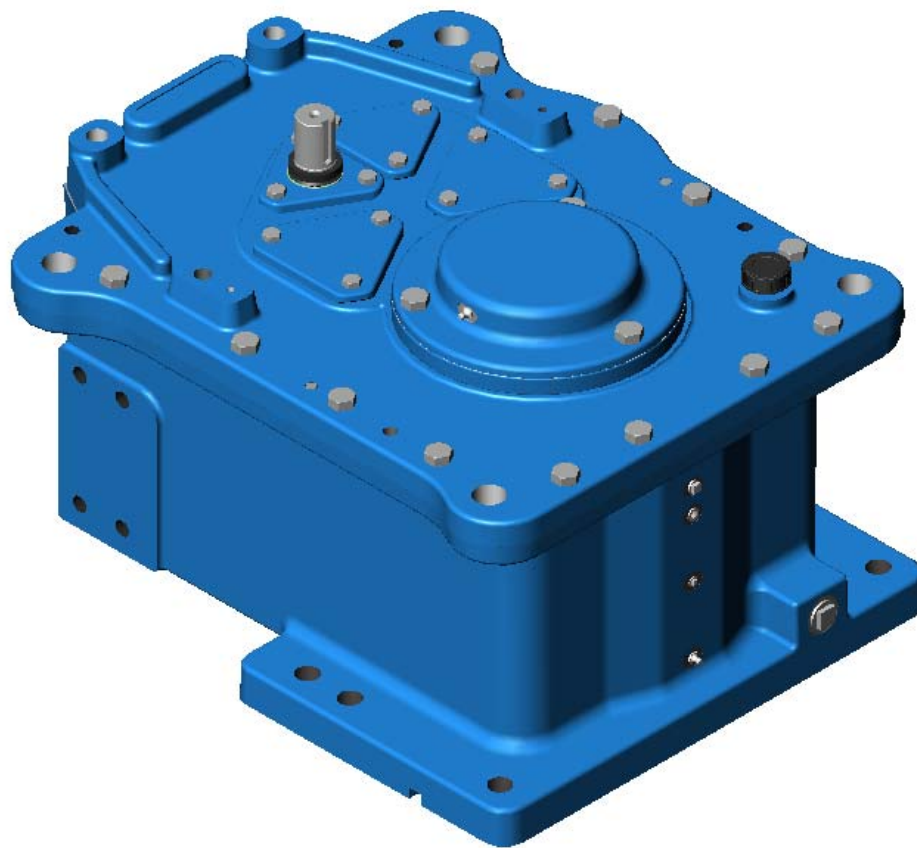


Figure 23 – 23 GT - Double Reduction

4. ITEM LISTS

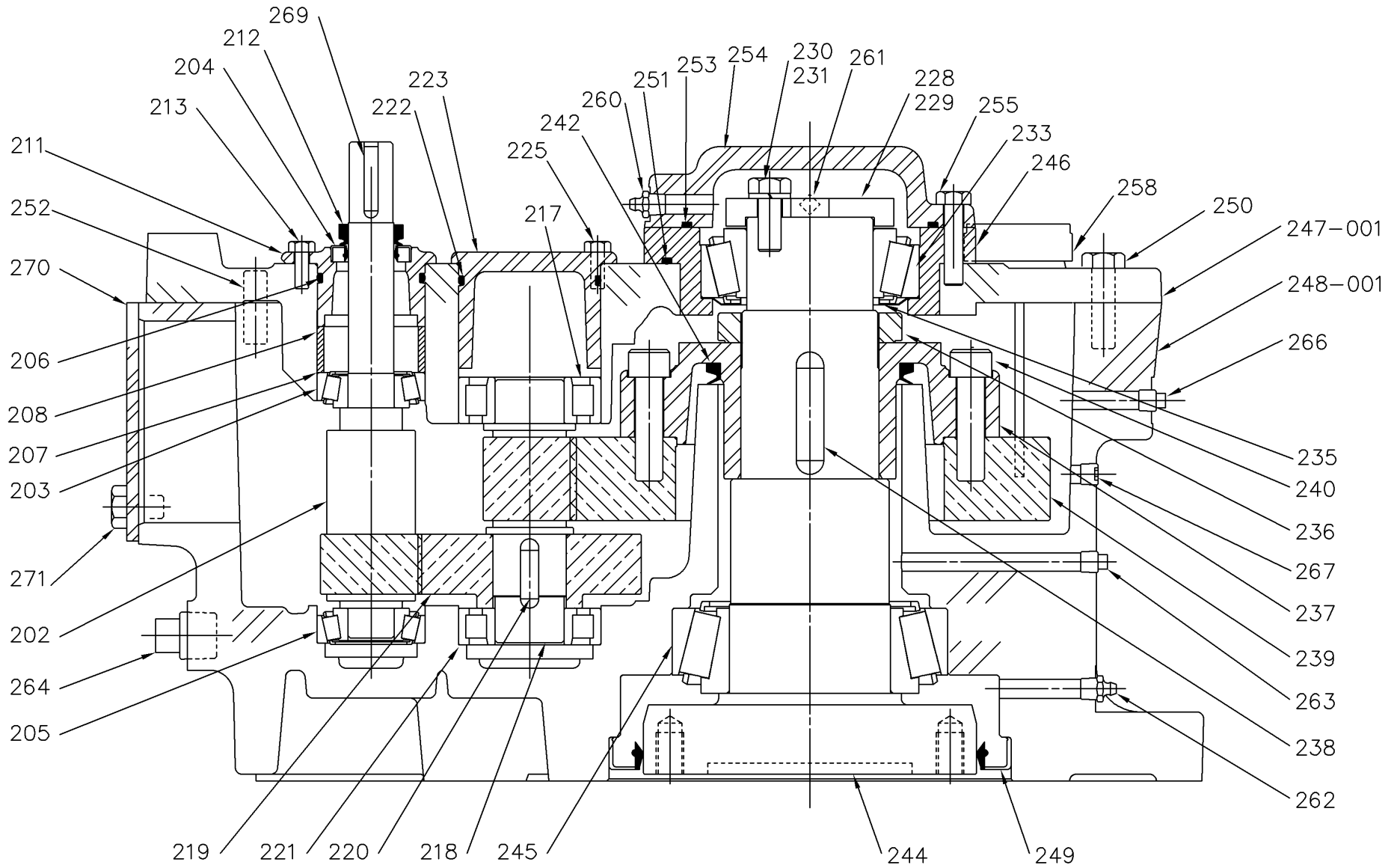


Figure 24 – Sectional View of 23 GT – Double Reduction

Table 2 – Item List for 23 GT Gear Drive – Double Reduction

Item #	Description	Qty.	Item #	Description	Qty.	Item #	Description	Qty.
200	gear drive assembly	1	221	bearing (Cylindrical Roller)		245-1	bearing cup	1
			221-1	bearing outer race	1	245-2	bearing cone	1
202	input shaft	1	221-2	bearing inner race	1	246	bearing carrier	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	251	O-ring	1
205-1	bearing cup	1	230	bolt	3	252	dowel pin	2
205-2	bearing cone	1	231	lockwasher	3	253	O-ring	1
206	O-ring	1	233	bearing (taper roller)	1	254	output cover	1
207	shim set	1	233-1	bearing cup	1	255	bolt	3
208	bearing cap spacer	1	233-2	bearing cone	1	258	breather/dipstick	1
211	input cap	1	235	nilos ring	1	260	grease fitting	1
212	V-ring	2	236	lock nut	1	261	pipe plug, NPT	1
213	bolt	3	237	gear flange	1	262	grease fitting	1
217	bearing (Cylindrical Roller)	1	238	key	1	263	pipe plug, NPT	1
217-1	bearing outer race	1	239	gear	1	264	magnetic drain plug, NPT	1
217-2	bearing inner race	1	240	bolt	8	266	pipe plug, NPT	1
218	pinion shaft	1	242	V-ring	1	267	hex socket plug, NPT	1
219	gear	1	244	output shaft	1	269	input shaft key	1
220	key	1	245	bearing (taper roller)	1	270	cap	1
						271	bolt	4



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