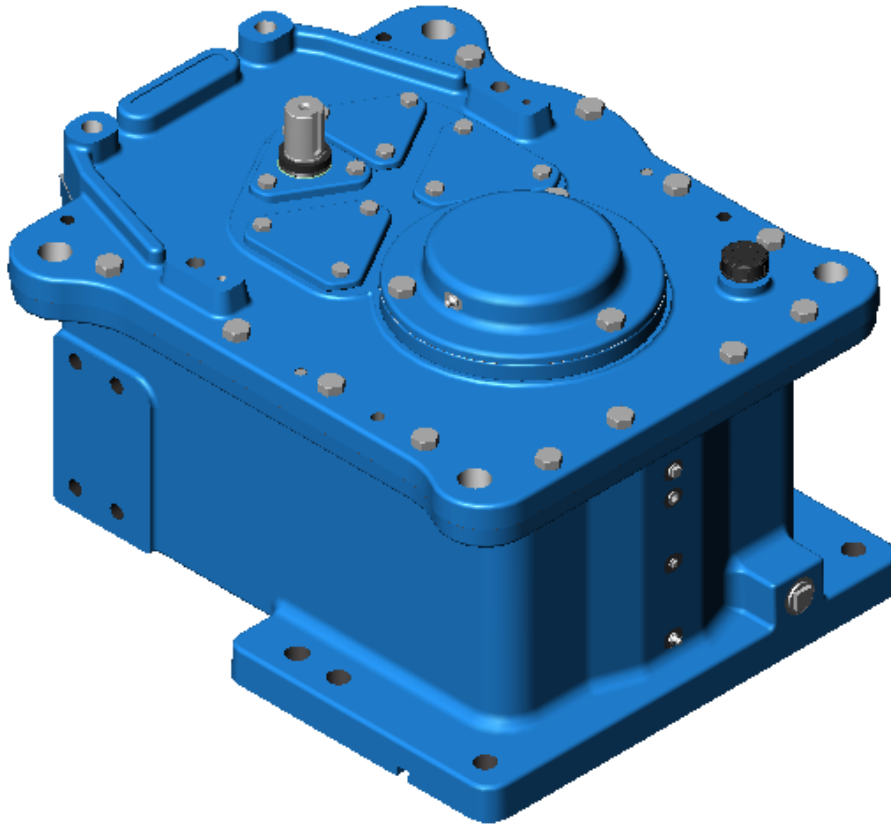


Maintenance Manual
Model 20 GT (Case Size 23) Gear Drive
Triple Reduction



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
spares@chemineer.co.uk

PROPRIETARY

THIS DOCUMENT AND THE INFORMATION CONTAINED HEREIN ARE THE PROPERTY OF CHEMINEER. RECIPIENT AGREES TO HOLD ALL SUCH INFORMATION IN CONFIDENCE AND AGREES IT SHALL BE USED ONLY FOR RECIPIENT'S INTERNAL PURPOSES TO MAINTAIN RECIPIENT'S EQUIPMENT OR AS MAY OTHERWISE BE PERMITTED IN AN APPLICABLE AGREEMENT BETWEEN RECIPIENT AND CHEMINEER. THIS DOCUMENT AND THE INFORMATION CONTAINED HEREIN SHALL NOT BE USED FOR ANY OTHER PURPOSE, INCLUDING THE CREATION, MANUFACTURE, DEVELOPMENT, OR DERIVATION OF ANY REPAIRS, MODIFICATIONS, SPARE PARTS, DESIGN, OR CONFIGURATION CHANGES. RECIPIENT AGREES NOT TO DISCLOSE SUCH INFORMATION TO ANY THIRD PARTY, EXCEPT AS MAY OTHERWISE BE PROVIDED FOR IN AN APPLICABLE AGREEMENT BETWEEN RECIPIENT AND CHEMINEER. COPYING OR DISCLOSURE OF THIS DOCUMENT AND THE INFORMATION CONTAINED HEREIN BY ANYONE WITHOUT CHEMINEER'S PRIOR WRITTEN PERMISSION IS NOT AUTHORIZED AND MAY RESULT IN CRIMINAL AND/OR CIVIL LIABILITY.

The data in this document were developed only to maintain systems and/or parts manufactured by or for Chemineer or approved by Chemineer. The data may not be applicable to any other systems and/or parts, regardless of their apparent similarity to systems and/or parts manufactured by or for Chemineer or approved by Chemineer. Do not rely in any way on data in this document to maintain or otherwise support systems and/or parts that were not manufactured by or for Chemineer or approved by Chemineer without evidence that any other regulatory agency has determined that the data in this document is valid for such use.

Chemineer assumes no liability whatsoever, whether contractual, warranty, tort or otherwise, for unauthorized alteration or alterations not performed in accordance with Chemineer approved procedures.

TABLE OF CONTENTS

1. INTRODUCTION 1
2. DISASSEMBLY..... 3
3. ASSEMBLY..... 17
4. ITEM LIST 33

LIST OF TABLES

TABLE 1 - BOLT TIGHTENING TORQUE FOR CARBON STEEL 17
TABLE 2 – ITEM LIST FOR MODEL 20 GT GEAR DRIVE – TRIPLE REDUCTION 34

LIST OF FIGURES

FIGURE 1 – 23 GT - TRIPLE REDUCTION..... 2

FIGURE 2 – INPUT CAP 3

FIGURE 3 – 1ST INTERMEDIATE CAP 4

FIGURE 4 – 2ND INTERMEDIATE CAP 5

FIGURE 5 – OUTPUT CAP 6

FIGURE 6 – OUTPUT BEARING..... 7

FIGURE 7 – CASE LID 8

FIGURE 8 – INPUT SHAFT 9

FIGURE 9 – 1ST INTERMEDIATE SHAFT 10

FIGURE 10 – OUTPUT SHAFT 11

FIGURE 11 – 2ND INTERMEDIATE SHAFT..... 12

FIGURE 12 – BEARING RACES IN CASE LID 13

FIGURE 13 – BOTTOM CASE 14

FIGURE 14 – MODEL 20 GT - TRIPLE REDUCTION..... 16

FIGURE 15 – BOTTOM CASE 18

FIGURE 16 –OUTPUT SHAFT 19

FIGURE 17 – 2ND INTERMEDIATE SHAFT 20

FIGURE 18 – GEAR CARRIER 21

FIGURE 19 – 1ST INTERMEDIATE SHAFT 22

FIGURE 20 – INPUT SHAFT 23

FIGURE 21 – CASE LID 24

FIGURE 22 – INPUT CAP 26

FIGURE 23 – 1ST INTERMEDIATE CAP..... 27

FIGURE 24 – 2ND INTERMEDIATE CAP 28

FIGURE 25 - OUTPUT BEARING WITH CARRIER 29

FIGURE 26 – OUTPUT CAP 31

FIGURE 27 – MODEL 20 GT TRIPLE REDUCTION..... 32

FIGURE 28 – SECTIONAL VIEW OF MODEL 20 GT – TRIPLE REDUCTION..... 33

THIS IS A BLANK PAGE

1. INTRODUCTION

This manual contains instructions for a triple reduction 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

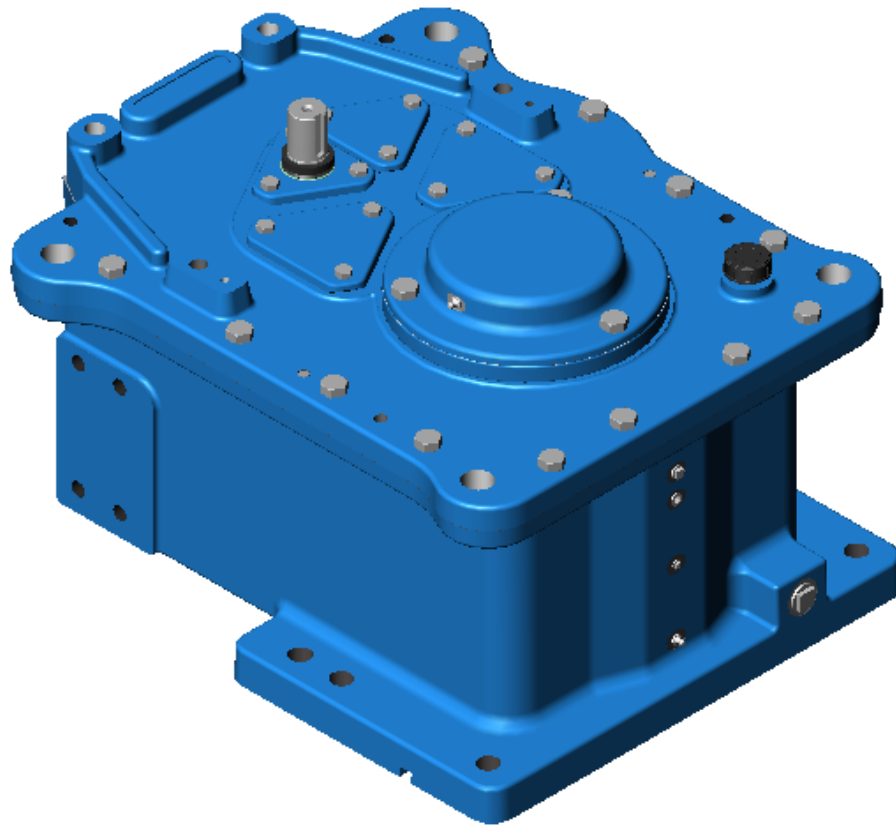


Figure 1 – 23 GT - Triple Reduction

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]
 - Bearing spacer [208]

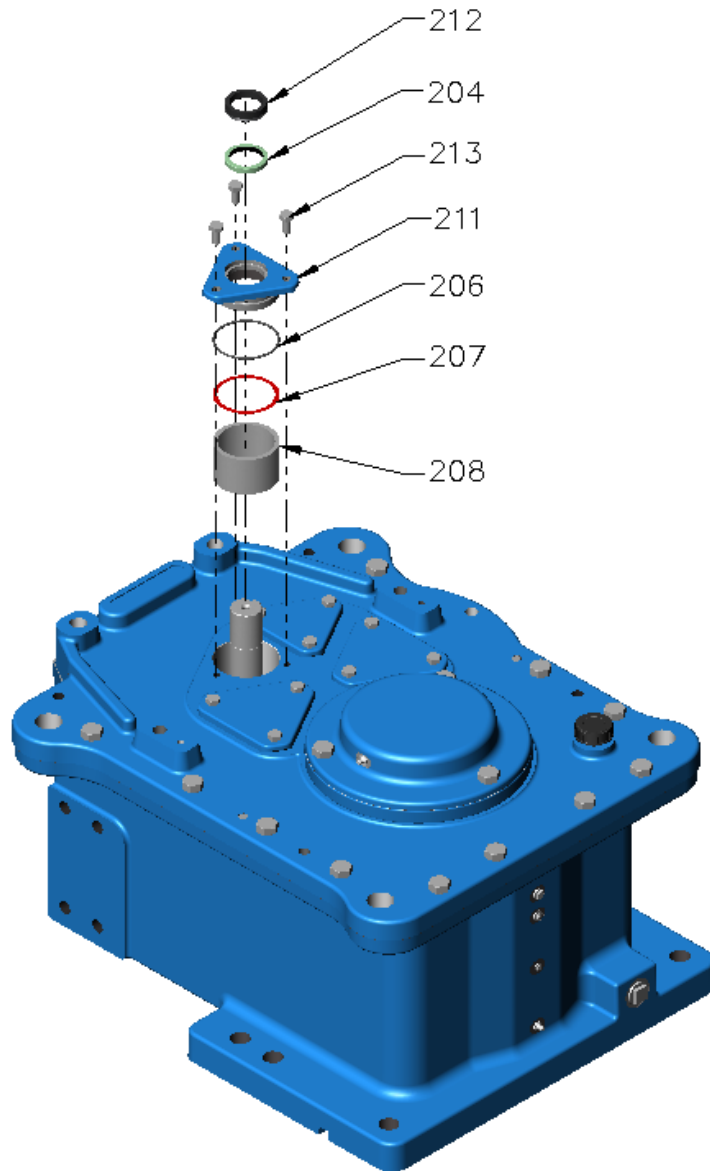


Figure 2 – Input Cap

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

- Bolts [311]
- Intermediate cap [310]
- O-ring [312]
- Shim Set [207]
- Bearing spacer [307]

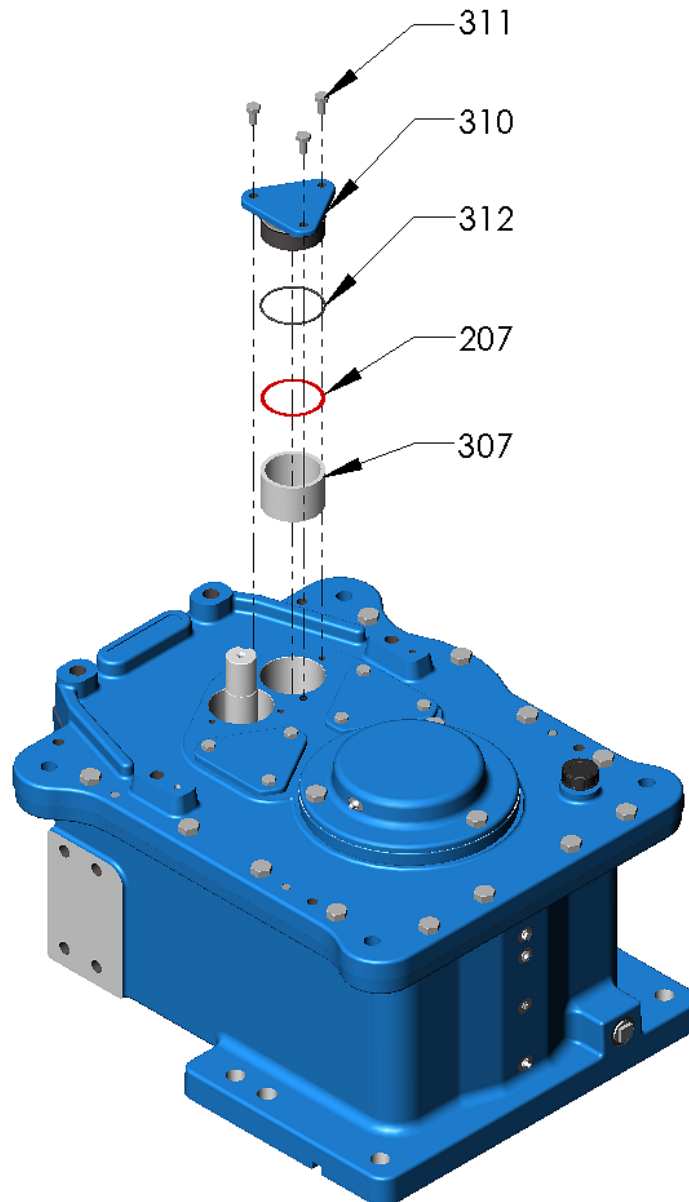


Figure 3 – 1st Intermediate Cap

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

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

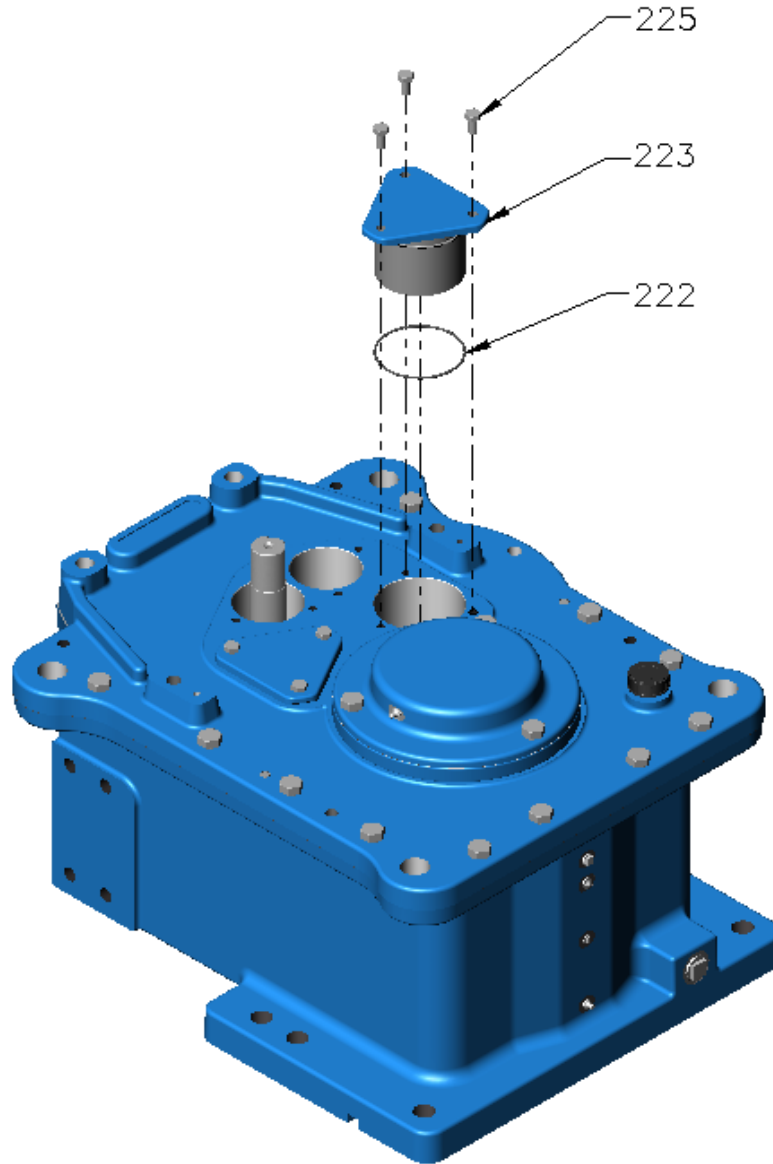


Figure 4 – 2nd Intermediate Cap

- E. At output shaft, remove the following items (refer Figure 5):
- Bolts [255]
 - Output cap [254] and only remove grease nipples [260, 261] *if necessary*
 - O-ring [253]
 - Bolts [230] with spring washers [231]
 - Thrust washer [228]
 - Shim set [229]

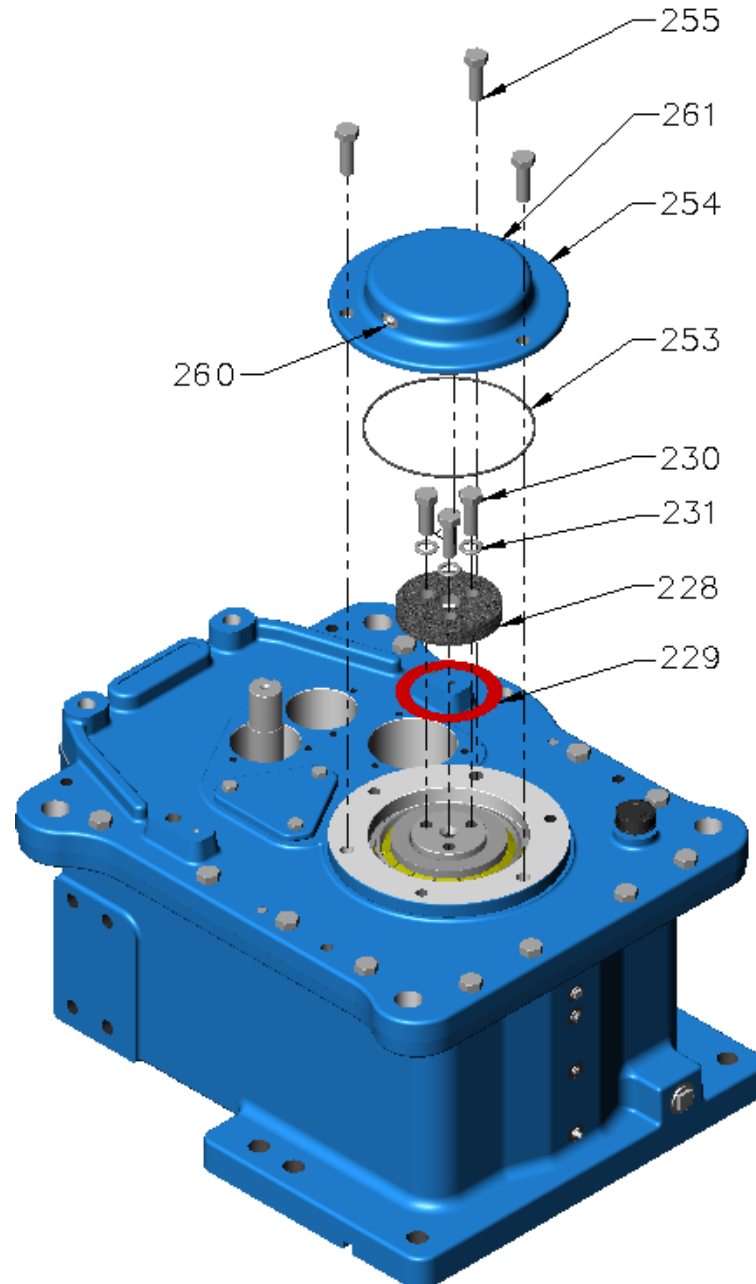


Figure 5 – Output Cap

F. At output shaft (Refer Figure 6):

- 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]

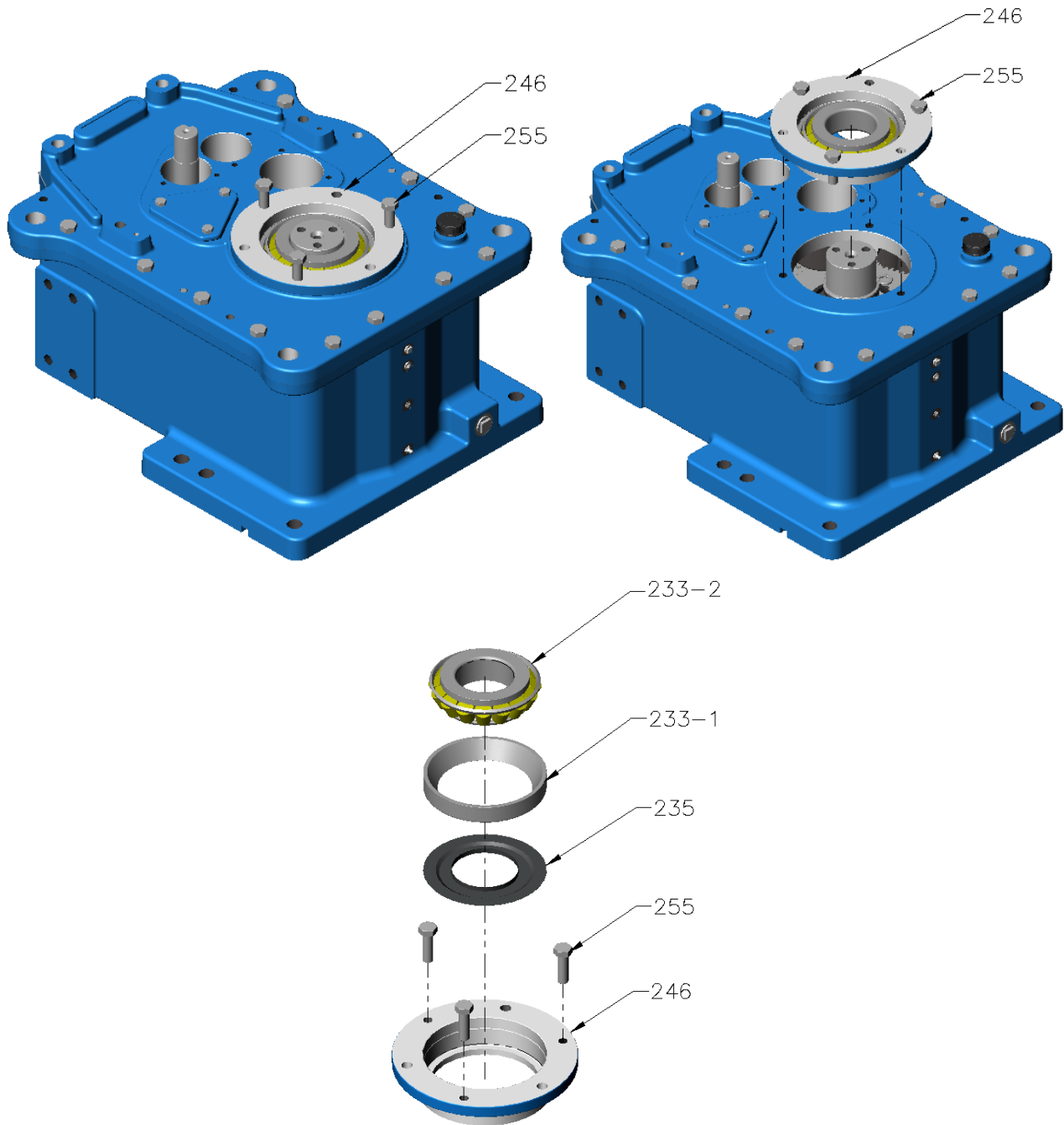


Figure 6 – Output bearing

- G. Remove case lid **[247-1]** (refer Figure 7).
- 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]**

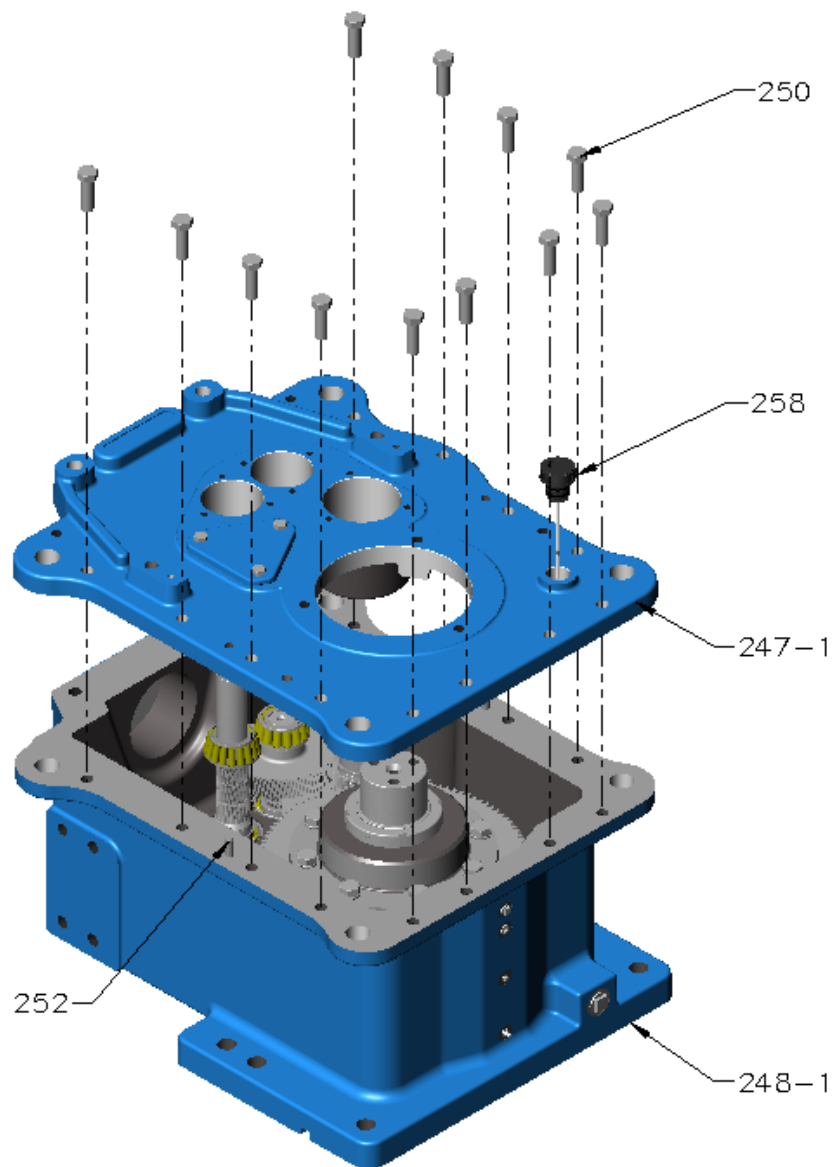


Figure 7 – Case Lid

- H. Remove input shaft assembly (refer Figure 8).
- I. Input shaft disassembly (refer Figure 8):
- Remove bearing cup **[203-1]**
 - Press input shaft **[202]** out of bearing cone **[203-2]**
 - Remove bearing cone **[205-2]**

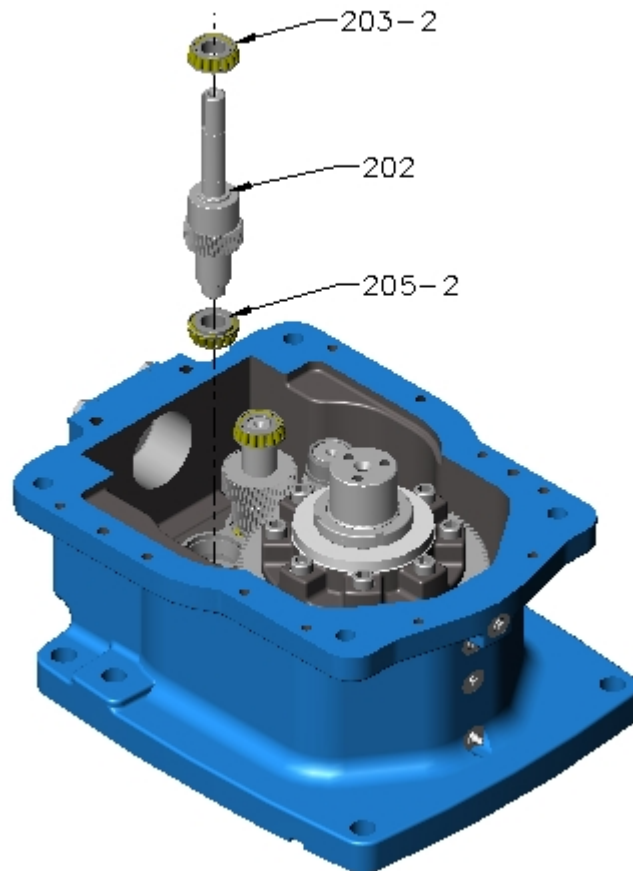


Figure 8 – Input Shaft

- J. Remove 1st intermediate shaft assembly (refer Figure 9).
- K. 1st intermediate shaft disassembly (refer Figure 9):
- 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]

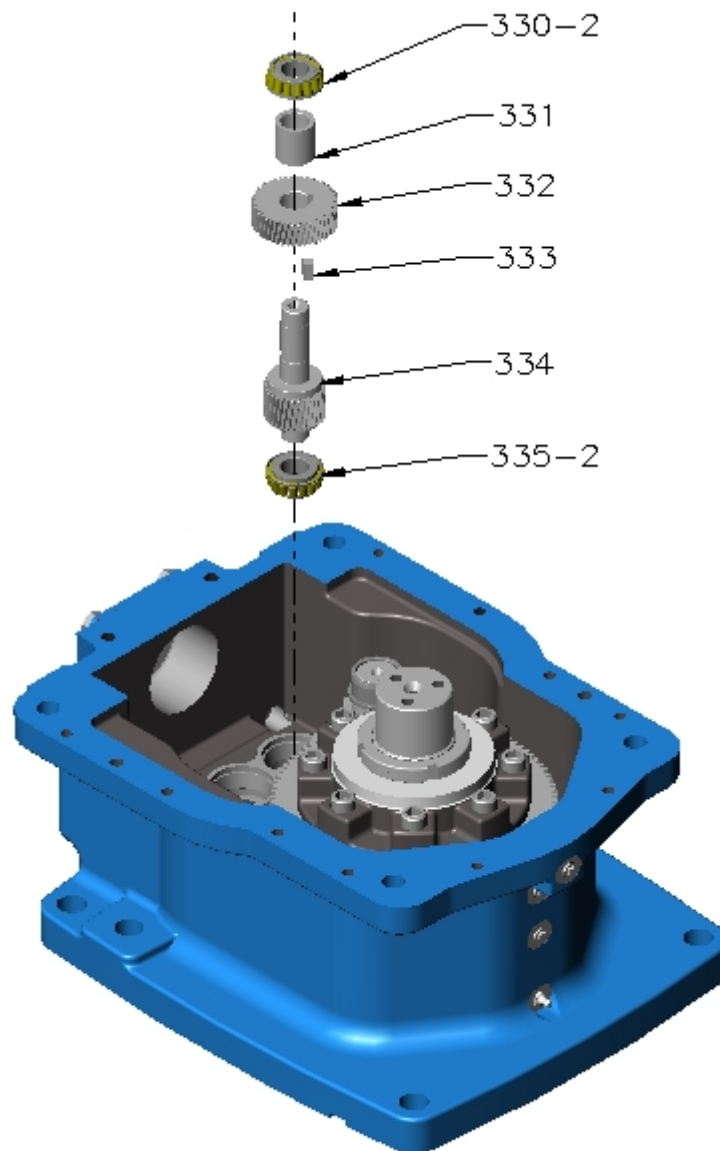



Figure 9 – 1st Intermediate Shaft

- L. At output shaft [244], remove following items (refer Figure 10):
- 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 10).
- (1) 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.

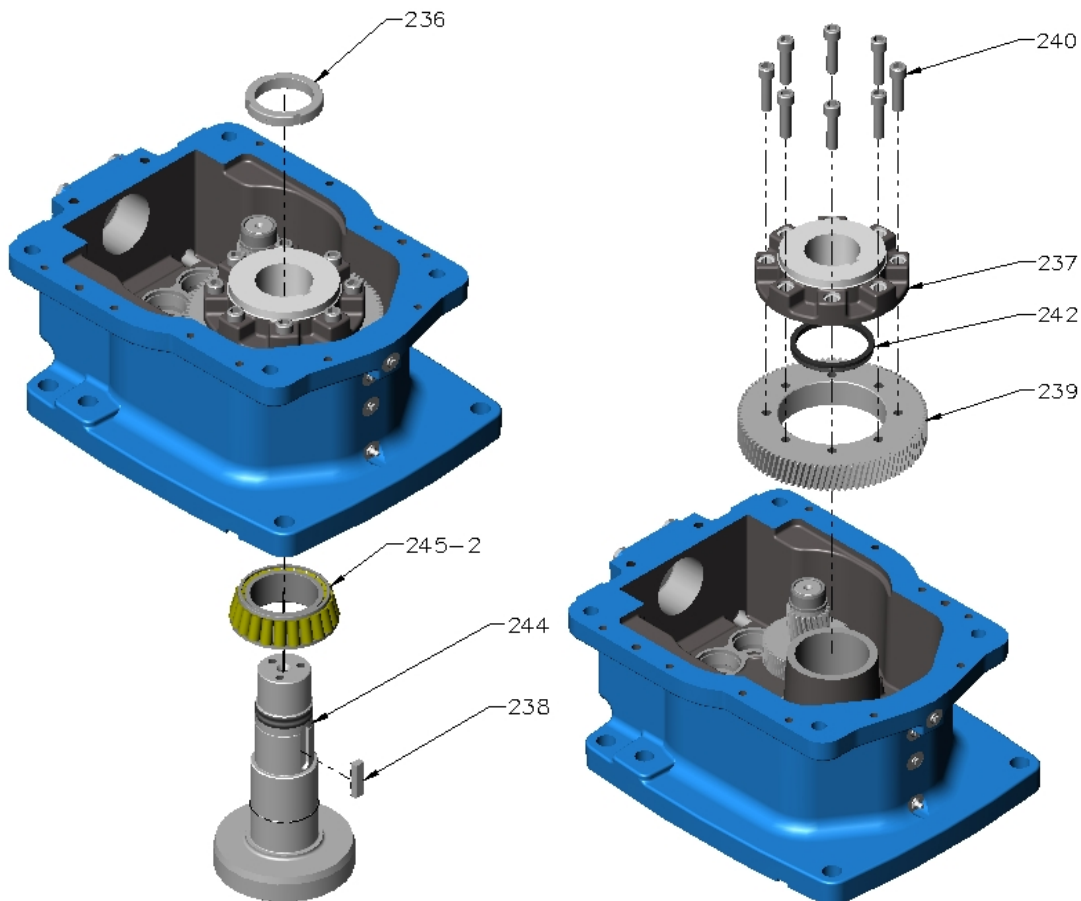


Figure 10 – Output Shaft

- N. Remove 2nd intermediate shaft assembly (refer Figure 11).

- O. 2nd intermediate shaft disassembly (refer Figure 11):
- 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]

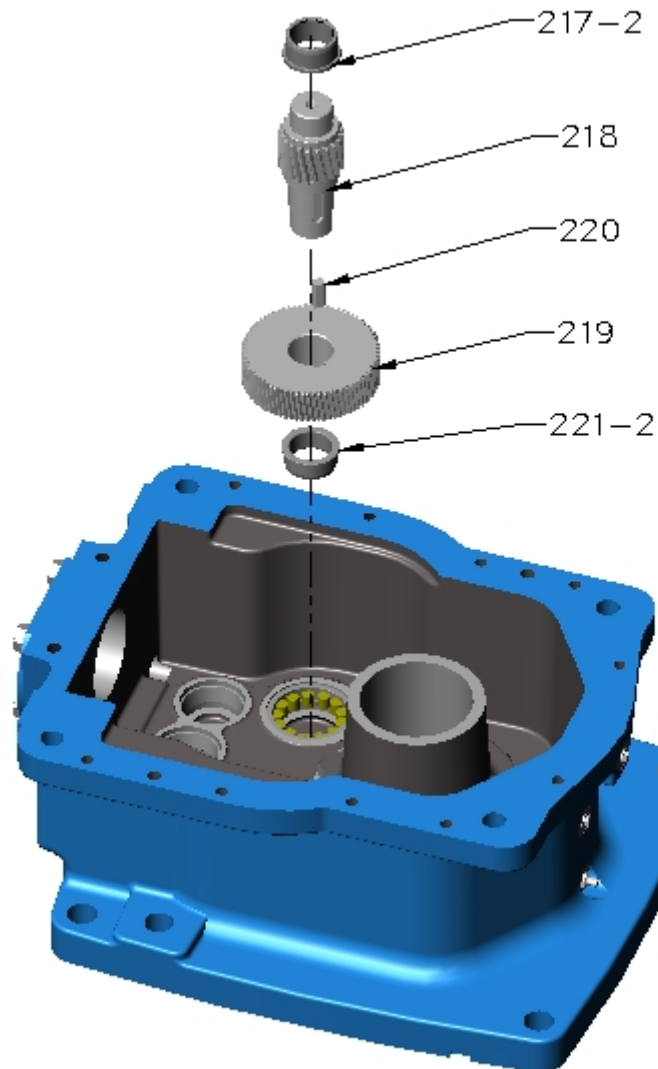


Figure 11 – 2nd Intermediate Shaft

P. At case lid remove following items (refer Figure 12):

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

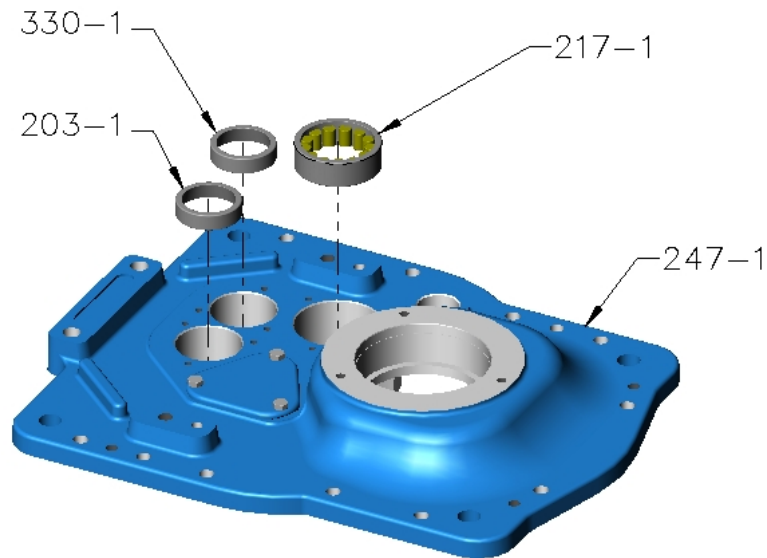


Figure 12 – Bearing races in case lid

Q. At bottom case [248-1], remove following items (refer Figure 13):

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

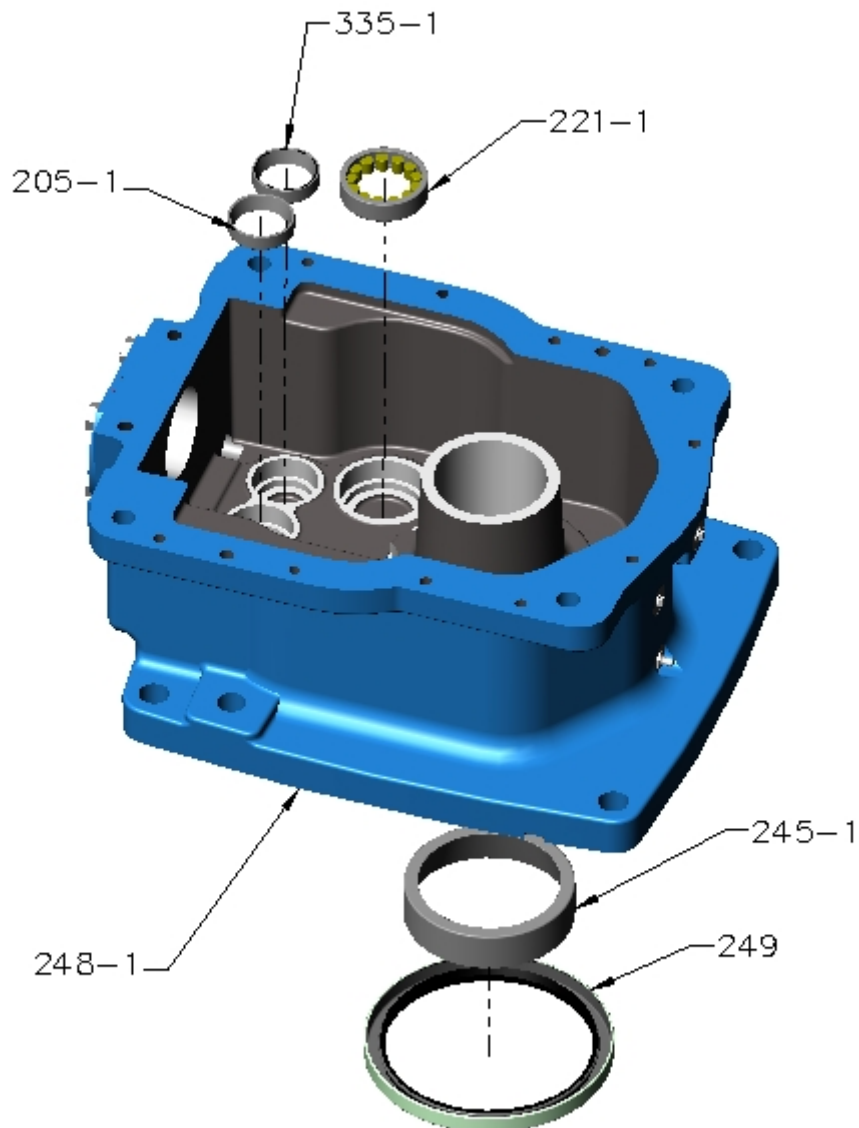


Figure 13 – Bottom Case

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

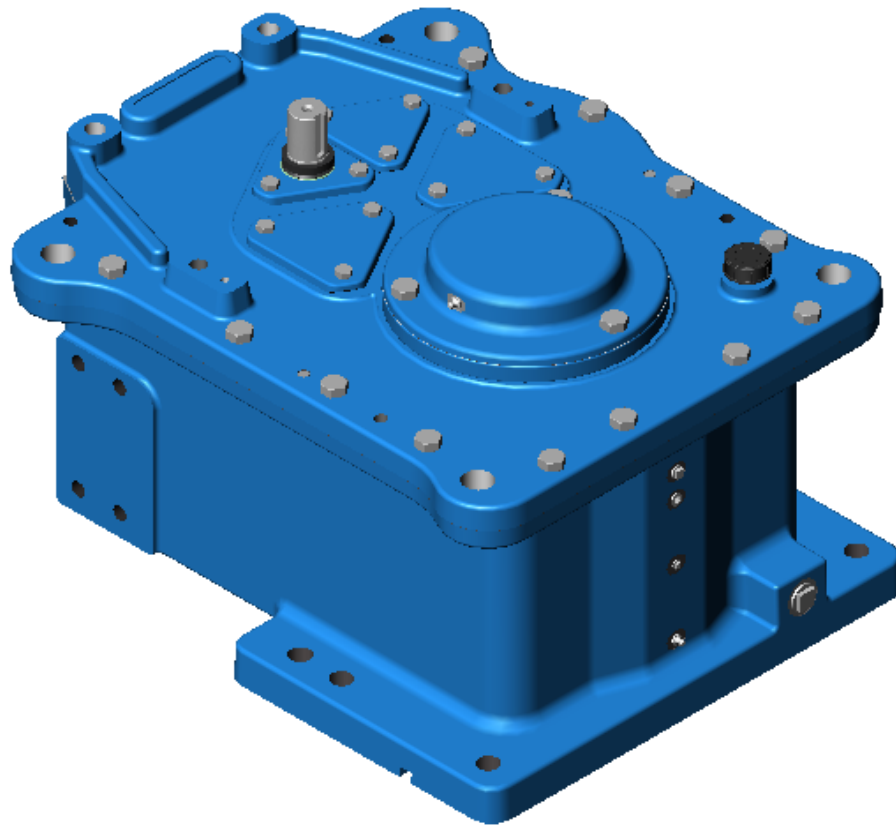


Figure 14 – Model 20 GT - Triple Reduction

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

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 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 15):
- 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]**

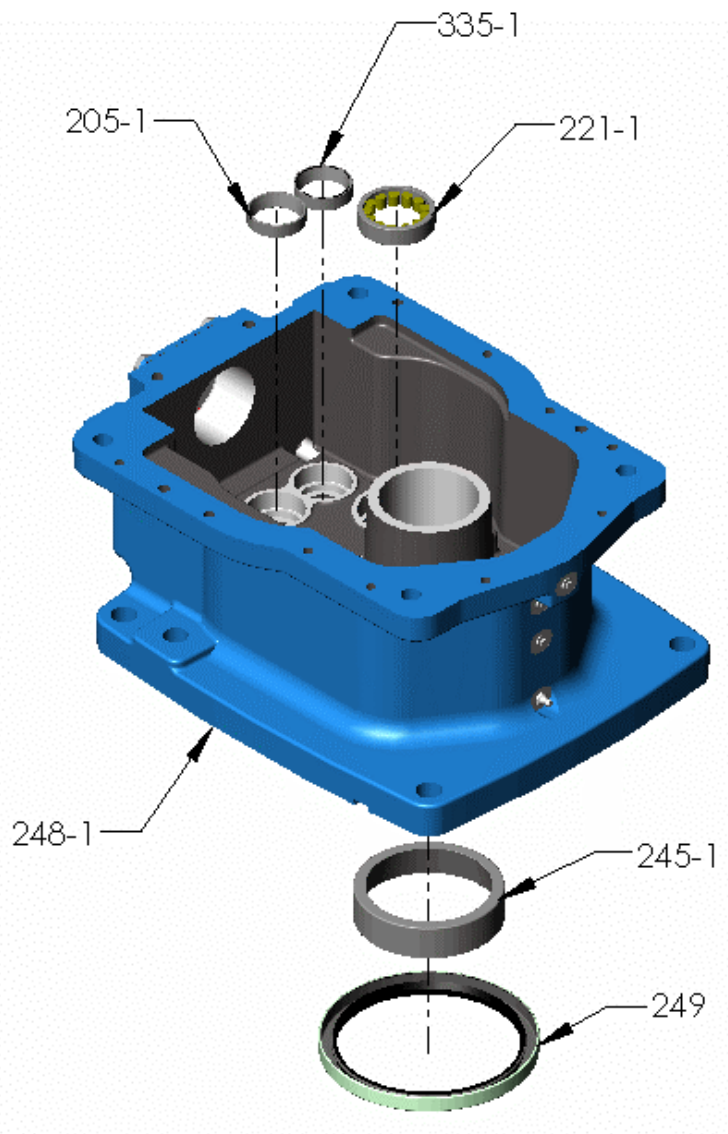


Figure 15 – Bottom Case

- C. Output shaft assembly (refer Figure 16).
- 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 16).
- E. Carefully lower bottom case until bearing [245-2] is seated (refer Figure 16).

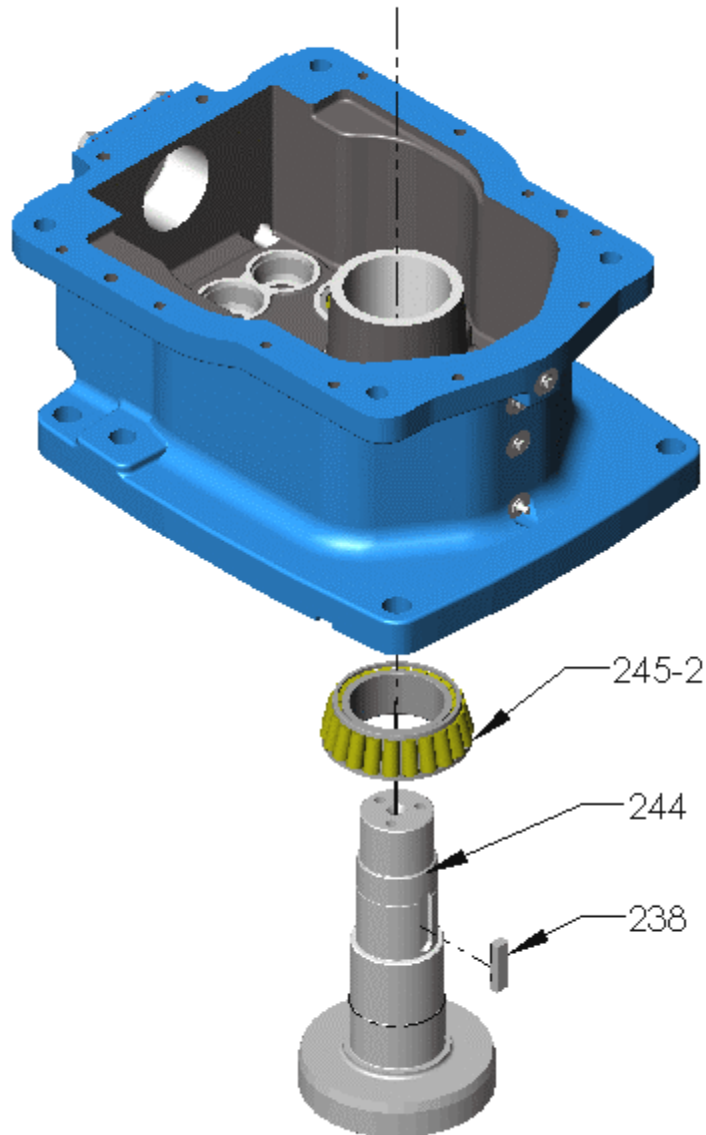


Figure 16 –Output shaft

- F. 2nd intermediate shaft assembly (refer Figure 17).
- 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 17).

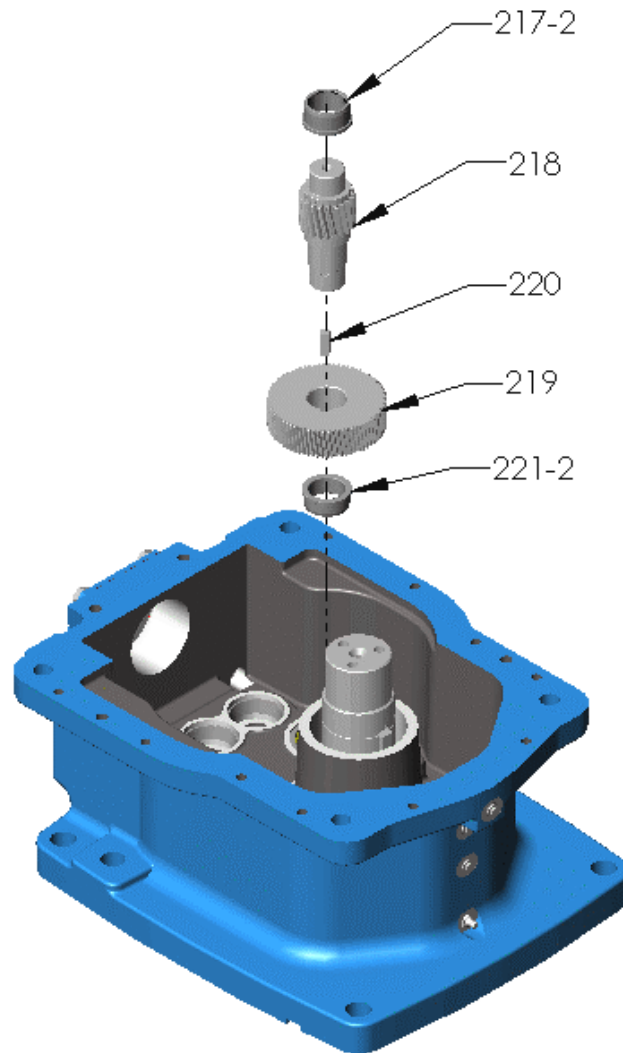


Figure 17 – 2nd Intermediate shaft

- H. Install V-ring [242] in gear flange [237] and heat flange to 120° C (248° F) (refer Figure 18).
- I. At output shaft [244], install the following items: (refer Figure 18).
- 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 18). 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 18).

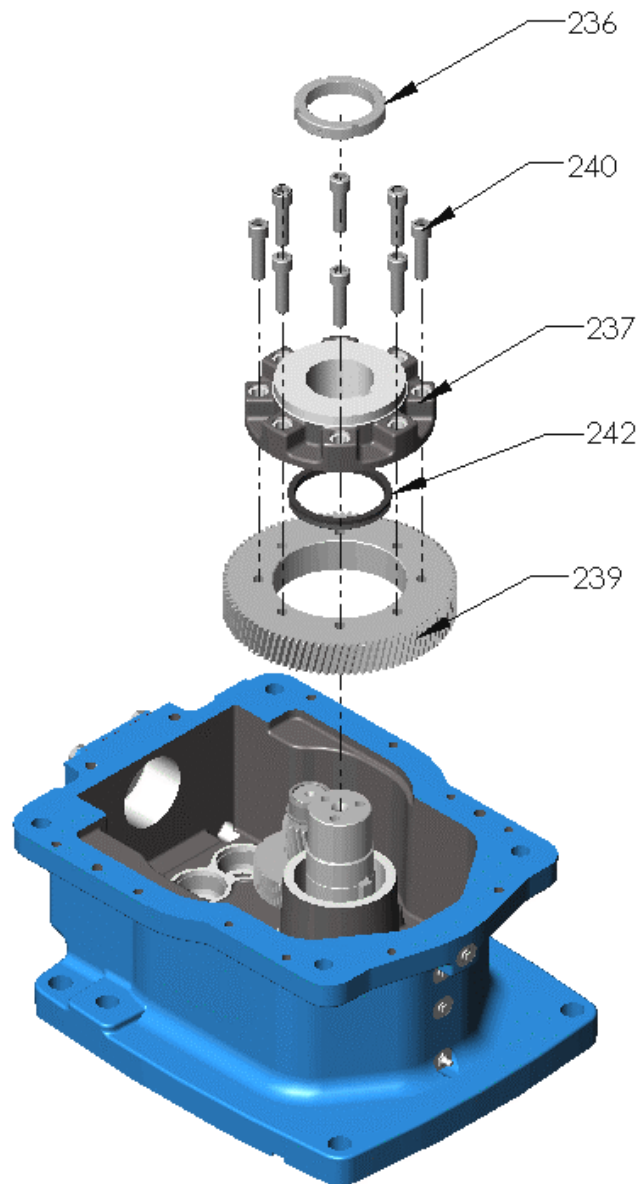


Figure 18 – Gear Carrier

- L. 1st intermediate shaft assembly (refer Figure 19):
- 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 19).

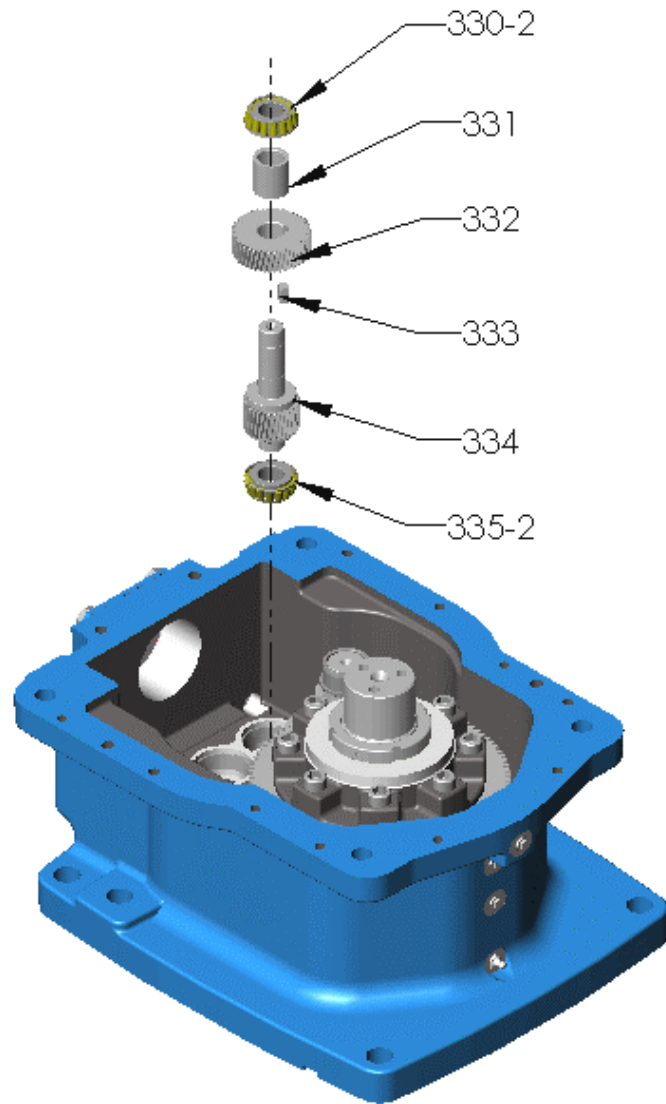


Figure 19 – 1st Intermediate shaft

- N. Input shaft assembly (refer Figure 20):
- 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 20).

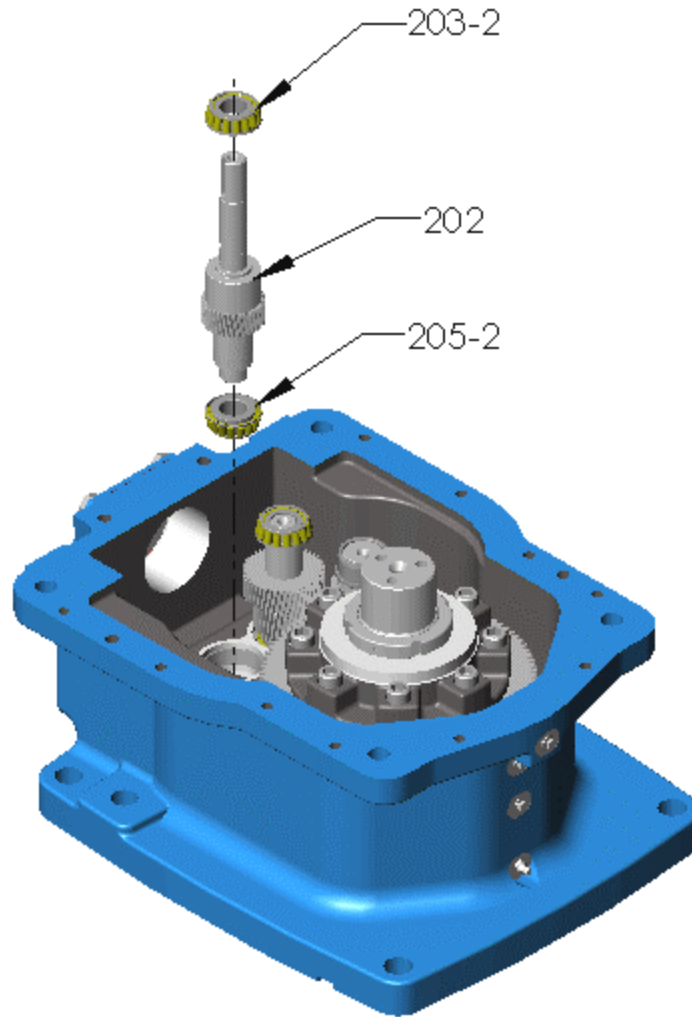


Figure 20 – Input Shaft

- P. Install case lid **[247-1]** (refer Figure 21).
- (8) Apply Three Bond Sealant 1215AA or equivalent to case bottom flange.
 - (9) Put case lid **[247-1]** on case bottom.
 - (10) Install dowel pins **[252]**.
 - (11) Install bolts **[250]** and torque-tighten to value given in Figure 21.
- Q. Install dipstick **[258]** (refer Figure 21):

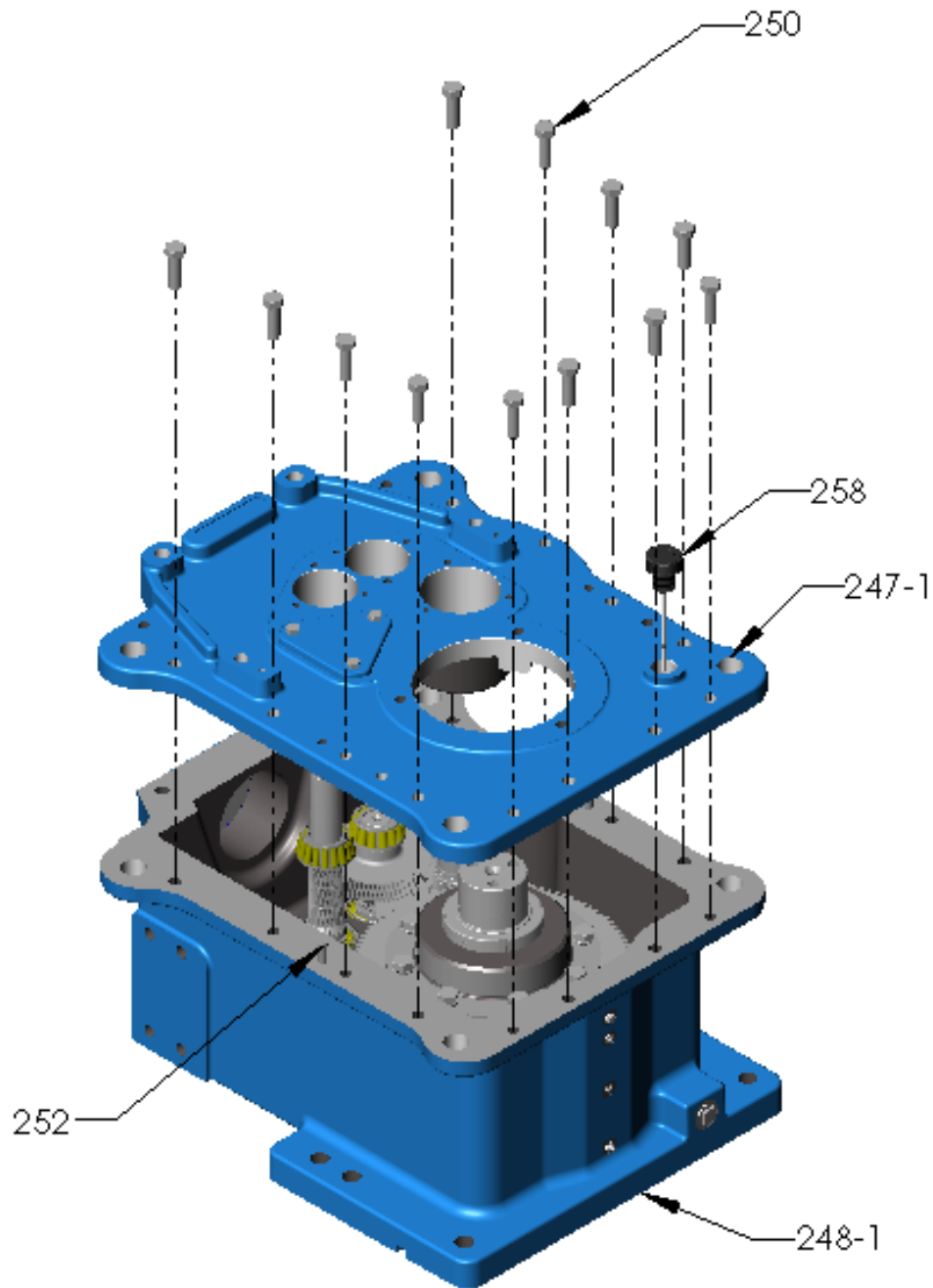


Figure 21 – Case Lid

- R. Input cap shim selection (refer Figure 22).
- (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 Figure 22.
 - (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 22):
- 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 Figure 22
 - V-ring **[212]****

** Grease lip seal and v-ring before installation

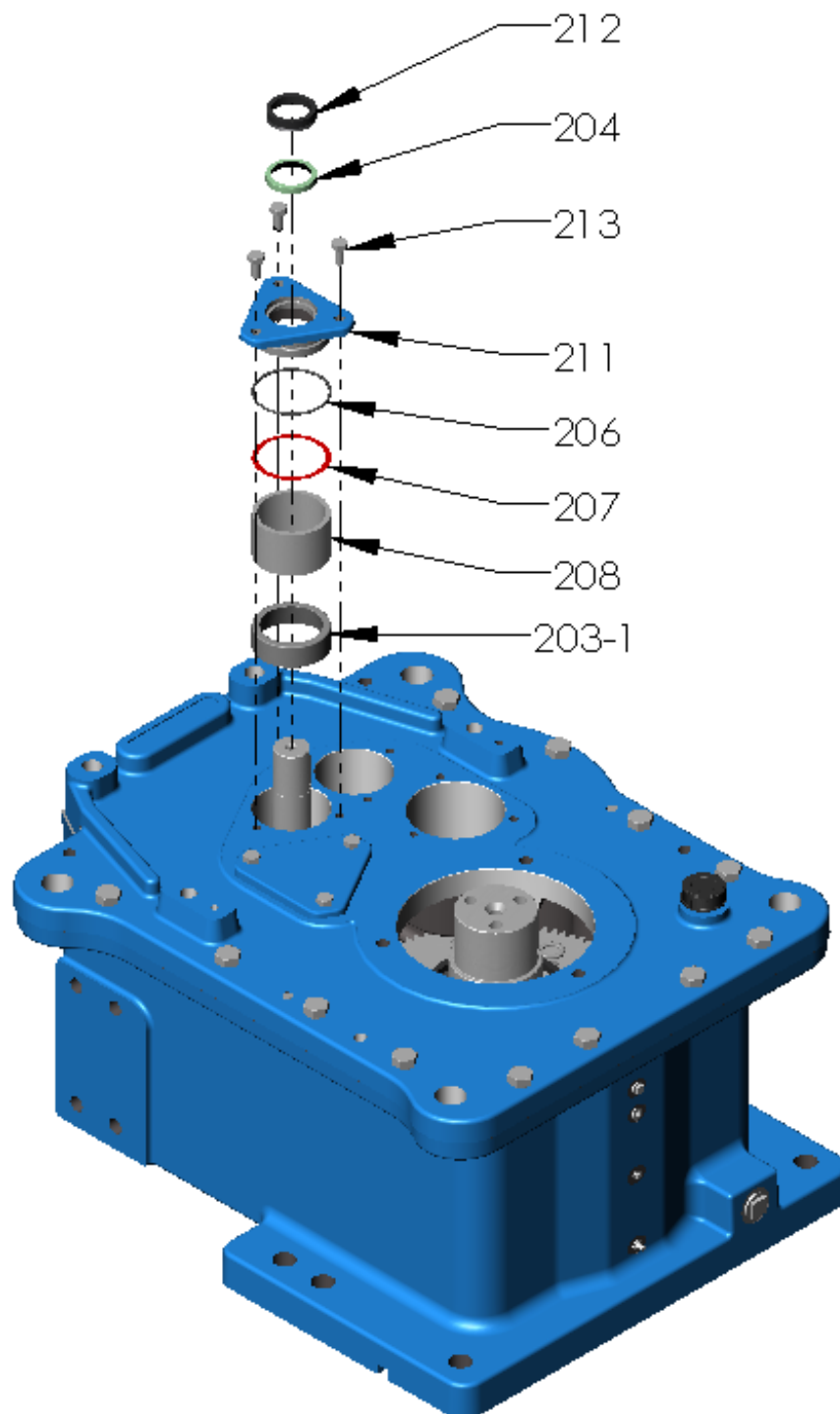


Figure 22 – Input Cap

- T. At 1st intermediate shaft, install following items (refer Figure 23):
- Bearing cup [330-1]
 - Bearing spacer [307]
 - Shim set [207]
 - O-ring [312]
 - Intermediate cap [310]
 - Bolts [311], torque-tighten bolts [311] to value given in Table 1

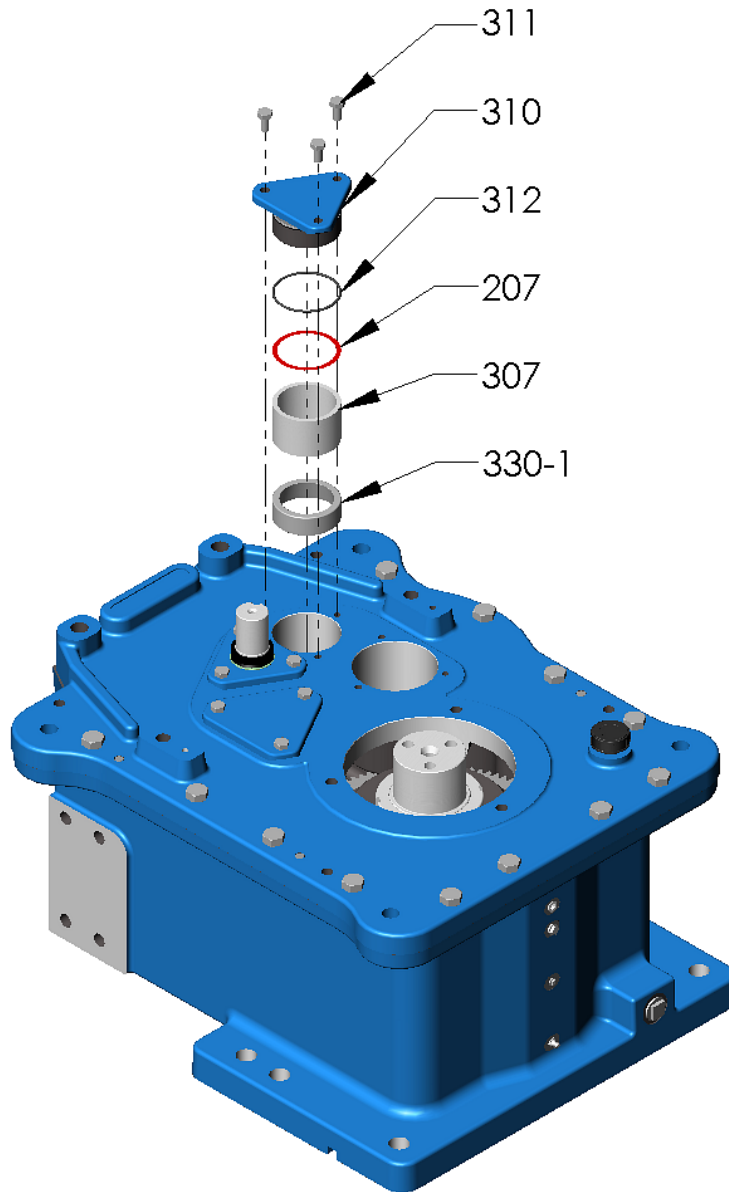


Figure 23 – 1st Intermediate Cap

- U. At 2nd intermediate shaft, install following items (refer Figure 24):
- 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

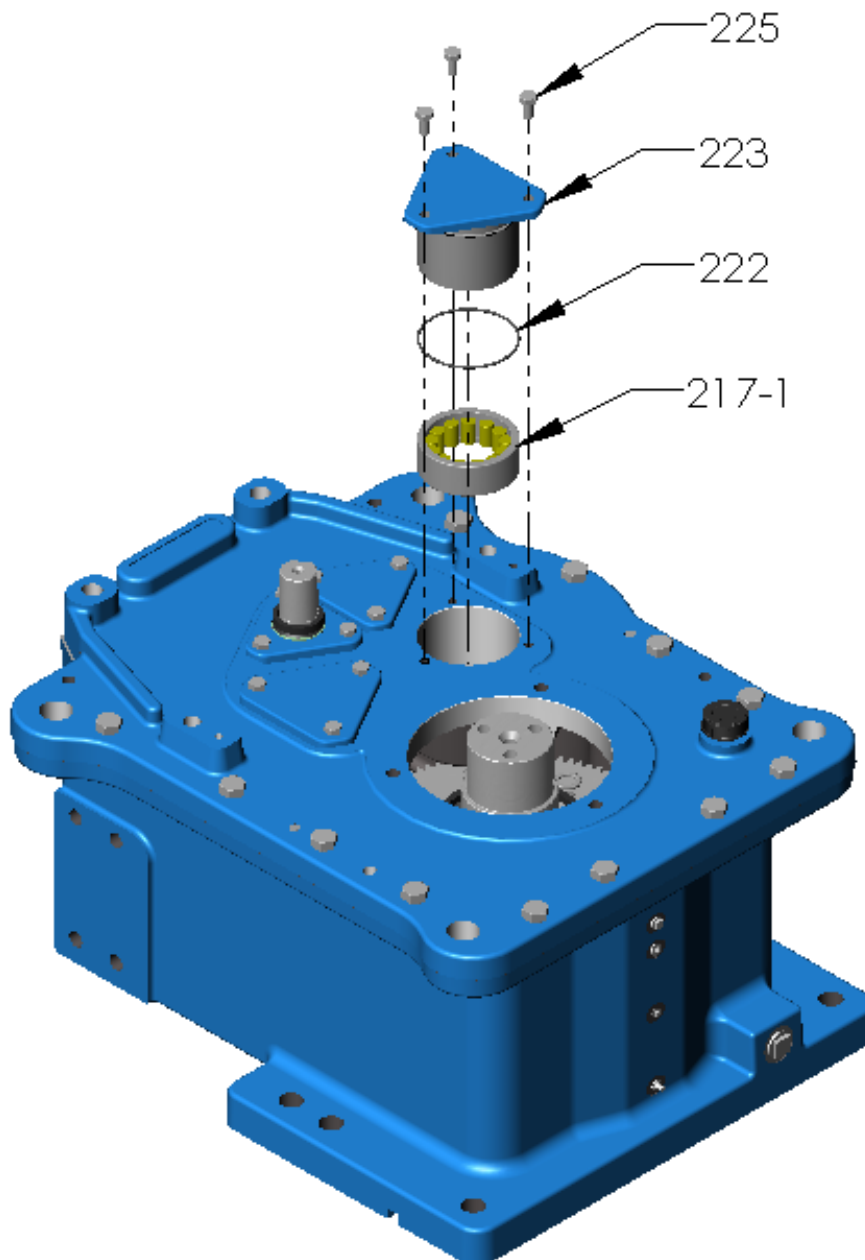


Figure 24 – 2nd Intermediate Cap

- V. Install output bearing with bearing carrier (refer Figure 25):
- (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]**

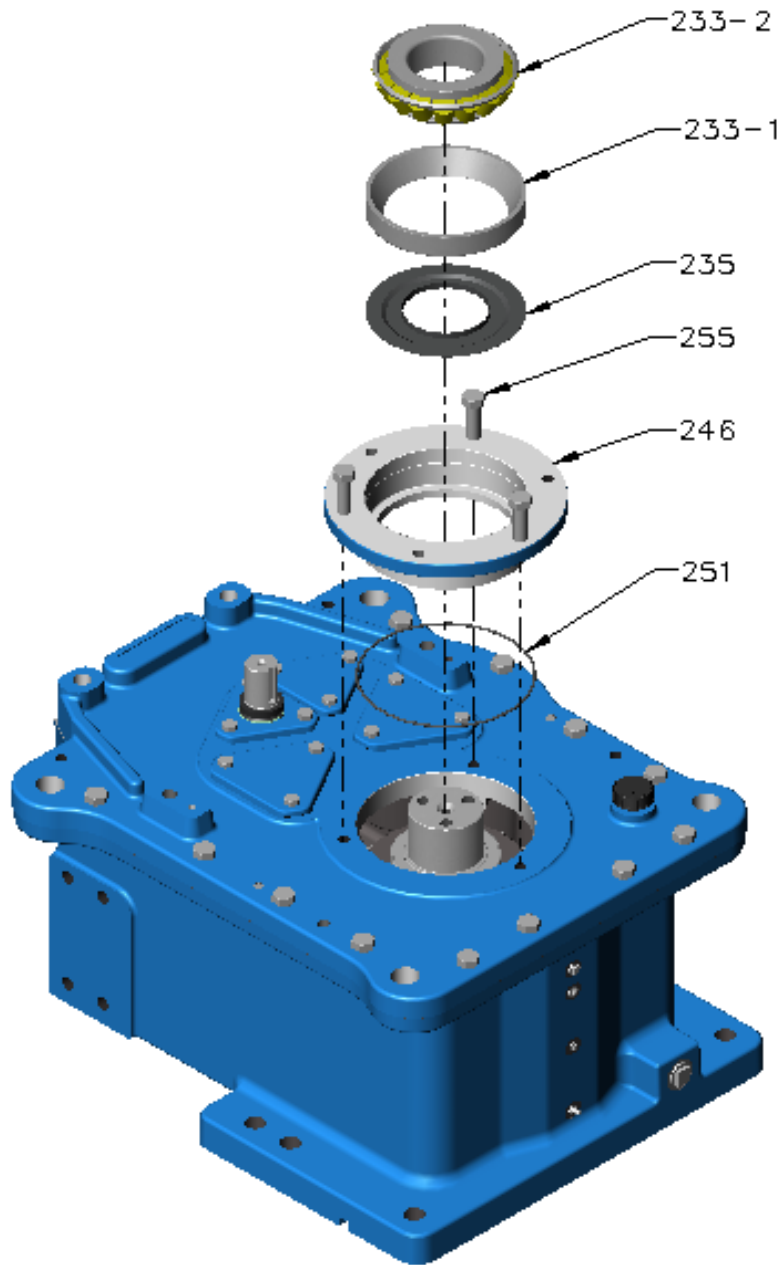


Figure 25 - Output bearing with carrier

- W. Output shaft shim selection (refer Figure 26):
- (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]**.
- X. At output shaft, install following items (refer Figure 26):
- 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
 - Check the end float (0.001"– 0.003" is acceptable)

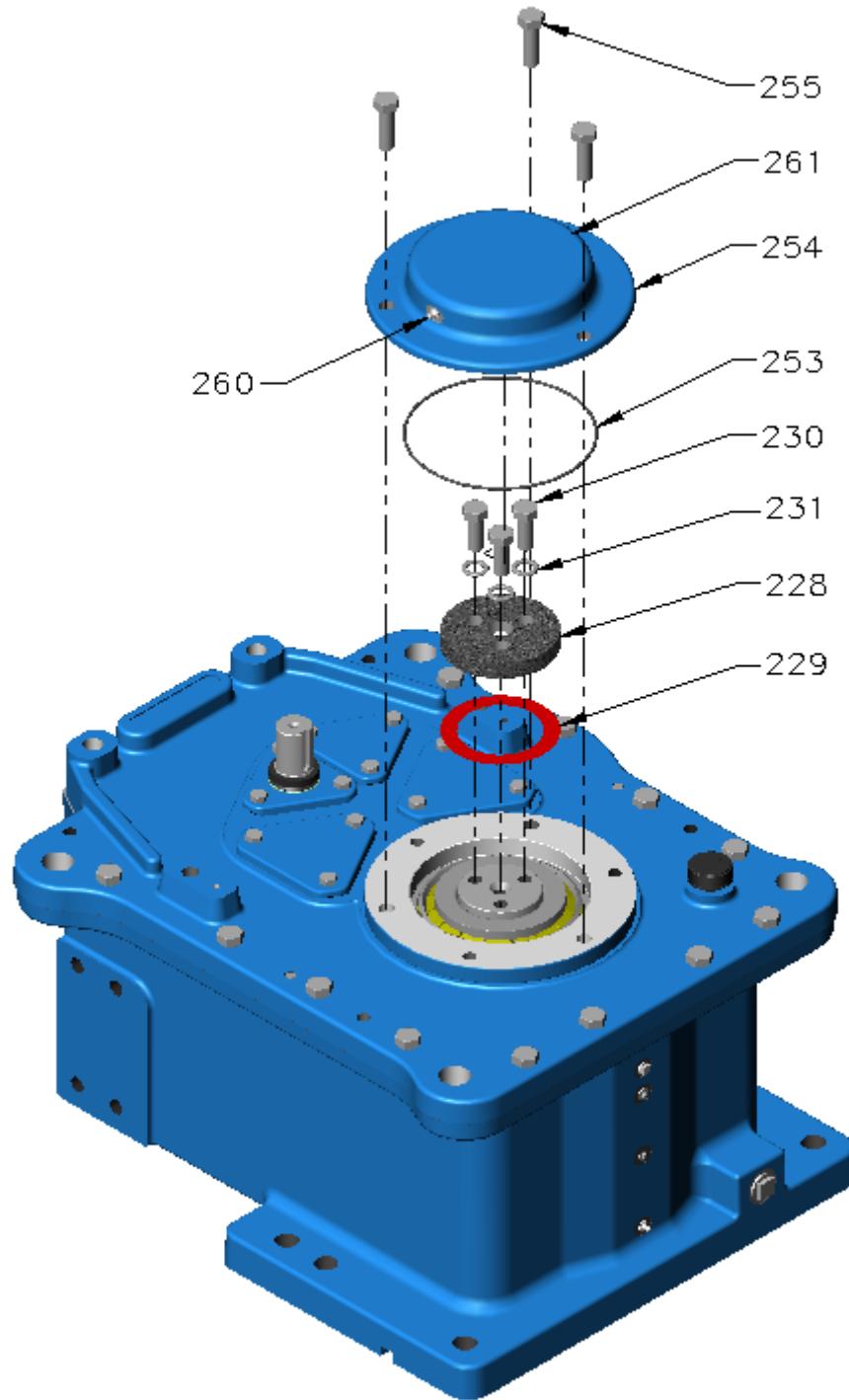


Figure 26 – Output Cap

- 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).

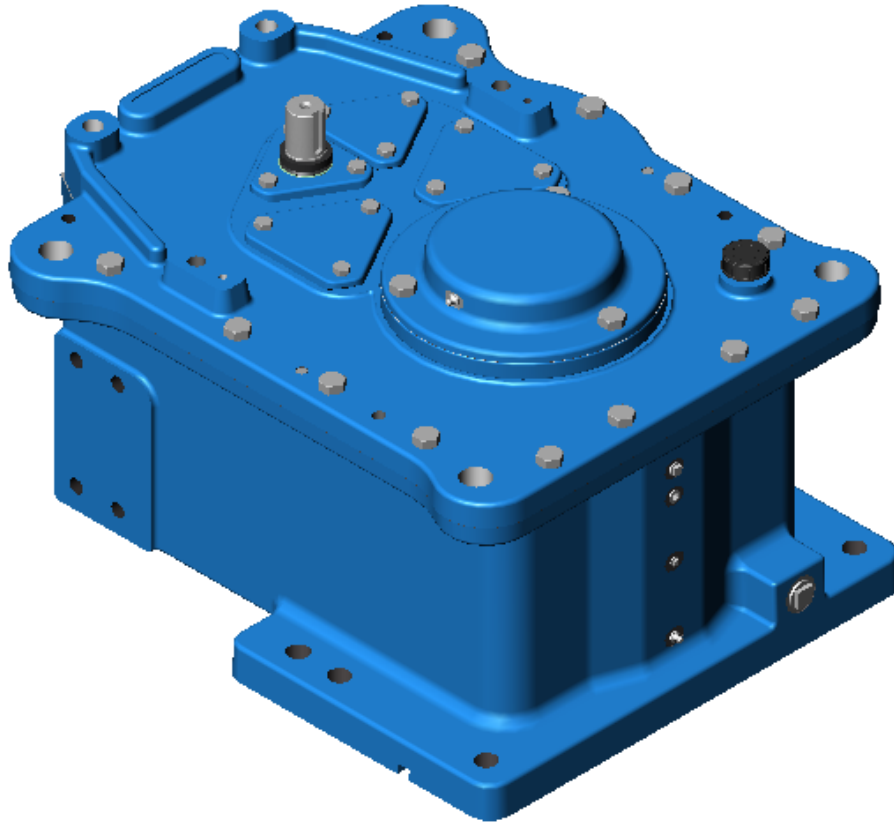


Figure 27 – Model 20 GT Triple Reduction

4. ITEM LIST

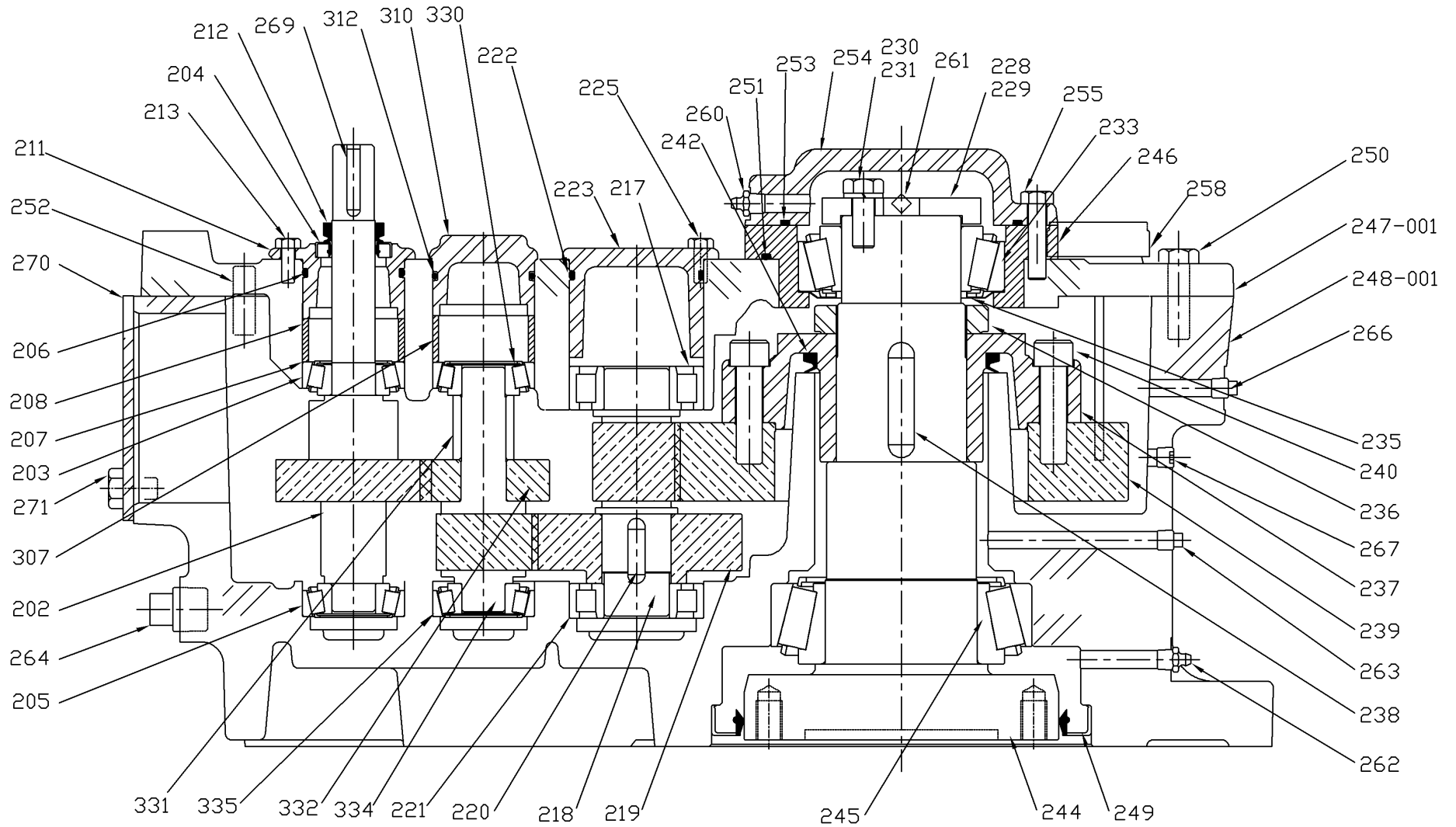


Figure 28 – Sectional View of Model 20 GT – Triple Reduction

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

Item #	Description	Qty.	Item #	Description	Qty.	Item #	Description	Qty.
			225	bolt	3	254	output cover	1
200	gear drive assembly	1	228	output shaft washer	1	255	bolt	3
			229	shim set	1	258	breather/dipstick	1
202	input shaft	1	230	bolt	3	260	grease fitting	1
203	bearing (taper roller)	1	231	lockwasher	3	261	pipe plug, NPT	1
203-1	bearing cup	1	233	bearing (taper roller)	1	262	grease fitting	1
203-2	bearing cone	1	233-1	bearing cup	1	263	pipe plug, NPT	1
204	lip seal	1	233-2	bearing cone	1	264	magnetic drain plug, NPT	1
205	bearing (taper roller)	1	235	nilos ring	1	266	pipe plug, NPT	1
205-1	bearing cup	1	236	lock nut	1	267	hex socket plug, NPT	1
205-2	bearing cone	1	237	gear flange	1	269	input shaft key	1
206	O-ring	1	238	key	1	270	cap	1
207	shim set	1	239	gear	1	271	bolt	4
208	bearing cap spacer	1	240	bolt	8	307	bearing cap spacer	1
211	input cap	1	242	V-ring	1	310	bearing cap	1
212	V-ring	2	244	output shaft	1	311	bolt	3
213	bolt	3	245	bearing (taper roller)	1	312	O-ring	1
217	bearing (Cylindrical Roller)	1	245-1	bearing cup	1	330	bearing (taper roller)	1
217-1	bearing outer race	1	245-2	bearing cone	1	330-1	bearing cup	1
217-2	bearing inner race	1	246	bearing carrier	1	330-2	bearing cone	1
218	pinion shaft	1	247-1	gear drive lid	1	331	bearing spacer	1
219	gear	1	248-1	gear drive housing	1	332	gear	1
220	key	1	249	lip seal	1	333	key	1
221	bearing (Cylindrical Roller)		250	bolt	10	334	pinion shaft	1
221-1	bearing outer race	1	251	O-ring	1	335	bearing (taper roller)	1
221-2	bearing inner race	1	252	dowel pin	2	335-1	bearing cup	1
222	O-ring	1	253	O-ring	1	335-2	bearing cone	1
223	bearing cap	1	254	output cover	1			



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

www.chemineer.com