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Release Date: March 6, 2015

Owner's Manual  
Parts Manual  
Safety Precautions  
Operating Instructions  
Maintenance

Printed in the USA

## VARIABLE SPEED MODELS:

**RV-100**    **RV-150**  
**RV-200**    **RV-300**

### **NOTICE!**

All RV series units require the use of a motor case drain line. **THE DRAIN LINE MUST BE USED TO AVOID DAMAGE TO THE HYDRAULIC MOTOR.**

**MAX PRESSURE: 5000 PSI (344 BAR)**  
**MAX FLOW: 120 GPM (454 LPM)**

### **IMPORTANT!**

Variable speed motor **MUST NOT BE OPERATED** without being pre-filled with hydraulic fluid. Operating the motor without hydraulic fluid **WILL CAUSE EXTENSIVE DAMAGE.**

The motor has been equipped with quick connect couplers to ensure the motor has fluid at all times. The motor is filled with hydraulic fluid at the factory and is shipped in a ready to use condition.



**REVOLUTION**  
SERIES™

## PREFACE

This manual is used to familiarize you with safety, assembly, operation, adjustment, troubleshooting, and maintenance. Read and follow the recommendations in this manual to ensure safe and efficient operation. Keep this manual with the attachment at all times for future reference.

We want you to be completely satisfied with your new product, feel free to contact your local Authorized Service Dealer for help with service, replacement parts, or any other information you may require. If you need assistance in locating a dealer, visit our web site at [www.pengoattachments.com](http://www.pengoattachments.com) or call customer service at 1-800-599-0211.

Whenever you contact your Authorized Service Dealer or PENGGO, always have the model number and serial number of your product available. These numbers will help provide exact information about your specific product. You will find the model and serial numbers on an ID plate located on the product.

The descriptions and specifications in this manual are subject to change without notice. PENGGO reserves the right to improve products. Some product improvements may have taken place after this manual was printed. For the latest information on PENGGO attachments, visit our web site at [www.pengoattachments.com](http://www.pengoattachments.com) or call customer service at 1-800-599-0211.

**Thank you for buying and using PENGGO attachments!**

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## SAFETY STATEMENTS

### DANGER



THIS STATEMENT IS USED WHERE SERIOUS INJURY OR DEATH WILL RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.

### WARNING



THIS STATEMENT IS USED WHERE SERIOUS INJURY OR DEATH COULD RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.

### CAUTION



THIS STATEMENT IS USED WHERE MINOR INJURY COULD RESULT IF THE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.



THIS SYMBOL BY ITSELF OR USED WITH A SAFETY SIGNAL WORD THROUGHOUT THIS MANUAL IS USED TO CALL YOUR ATTENTION TO INSTRUCTIONS INVOLVING YOUR PERSONAL SAFETY OR THE SAFETY OF OTHERS. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.

### WARNING



#### READ MANUAL PRIOR TO INSTALL

Improper installation, operation, or maintenance of the equipment could result in serious injury or death. Operators and maintenance personnel should read this manual as well as all manuals related to this equipment. **FOLLOW ALL SAFETY INSTRUCTIONS IN THIS MANUAL.**

### WARNING



#### READ AND UNDERSTAND ALL SAFETY STATEMENTS

Read all safety decals and safety statements in all manuals prior to operating or working on this equipment. Know and obey all OSHA regulations, local laws and other professional guidelines for your operation. Know and follow good work practices when assembling, maintaining, repairing, mounting, removing or operating this equipment.



#### KNOW YOUR EQUIPMENT

Know your equipment's capabilities, dimensions and operations before operating. Visually inspect your equipment before you start, and never operate equipment that is not in proper working order with all safety devices intact. Check all hardware to assure it is tight. Make certain that all locking pins, latches, and connection devices are properly installed and secured. Remove and replace any damaged, fatigued or excessively worn parts. Make certain all safety decals are in place and are legible. Keep decals clean, and replace them if they become worn and hard to read.

### WARNING



#### DO NOT MODIFY EQUIPMENT

Modifications may weaken the integrity of the equipment and may impair the functions, safety, life, and performance of the equipment. When making repairs, use only the manufacturer's genuine parts, following authorized instructions. Other parts may be substandard in fit and quality.



#### PREPARE FOR EMERGENCIES

- Be prepared if a fire starts.
- Keep a first aid kit near by when operating equipment.

## GENERAL PRECAUTIONS

### WARNING



#### OPERATOR SAFETY

- Protective clothing and equipment should be worn at all times.
- Wear protective clothing and equipment appropriate for the job. Avoid loose fitting clothing.
- Prolonged exposure to excessive noise can cause hearing loss. Wear suitable hearing protection such as ear plugs.
- Operating equipment safely requires the full attention of the operator. Avoid distractions.
- Do not operate the unit when you are tired, ill or under the influence of alcohol, drugs or medication.
- Never let a minor or inexperienced person operate the unit.
- Keep all body parts away from the drilling bit at all times.
- Inspect the area to be drilled before operation. Remove objects which can be thrown or become entangled.
- DO NOT operate the Drive attachment in areas where carbon monoxide fumes can accumulate.

### CAUTION



#### PRODUCT SAFETY

- Inspect the entire product before operation.
- Replace parts that are cracked, chipped or damaged in any way before operation.
- Keep others away when making any adjustments to the unit.
- Damage to the Auger Drive and auger bit can result if the prime mover moves while the auger is still in the hole.

### WARNING



#### PRACTICE SAFE MAINTENANCE

- Use proper tools and equipment when conducting maintenance.
- Work in a clean dry area.
- Inspect all parts. Be sure parts are in good working condition and installed properly.
- Remove build up of grease, oil or any debris.
- Remove all tools and unused parts from equipment before beginning operation.

### WARNING



#### BE ALERT ON THE JOB SITE

Tragic accidents can occur if the operator is not alert to the presence of bystanders. Children in particular are often attracted to machinery and work activity. Never assume that children will remain where you last saw them. BE ALERT and turn the equipment off if children enter the work area. Keep children out of the work area and under supervision of another responsible adult.

### WARNING



#### DRILLING SAFETY

- Inspect the area to be drilled before operation. Remove objects which can be thrown or become entangled. Be alert when drilling in locations where any type of landscaping fabric / mat may be present. The material can be rapidly drawn into the point of operation, possibly causing injury or death to anyone standing on or near the fabric.
- Keep all parts of your body away from the drilling bit when operating the unit.
- DO NOT operate the Auger Drive when the auger bit is more than 12" (305mm) above ground. The auger bit may bind and cause injury to the operator and damage to the equipment.
- While the auger bit is rotating, DO NOT attempt to manually guide the auger to a location.
- Ensure that overhead power / utility lines do not come into contact with the Drive attachment.
- DO NOT use a shovel or any other object to remove material from the auger bit or the hole while the Drive attachment is in use.

### WARNING



#### UNDERGROUND HAZARDS

It is the responsibility of the operator to know where buried power, gas, telephone, and other utilities are at in the work area. This may lead to shock or an explosion. Have the work area marked for buried lines and do not dig in marked areas set by your local municipals. Striking a hard object underground with the auger turning can result in the slowing or stopping of the auger.

## GENERAL PRECAUTIONS - CONTINUED

### WARNING



#### LOWER OR SUPPORT RAISED EQUIPMENT

Do not work under raised booms without supporting them. Do not use support material made of concrete blocks, logs, buckets, barrels, or any other material that could suddenly collapse or shift positions. Make sure support material is solid, not decayed, warped, twisted, or tapered. Lower booms to ground level or on blocks. Lower booms and attachments to the ground before leaving the cab or operator's station. Whenever the boom structure must be raised for attachment installation or servicing block ensure the boom locking devices (if equipped) are deployed to prevent the accidental lowering of boom structures. **NEVER PLACE ANY BODY PART BETWEEN THE PRIME MOVER CHASSIS AND THE BOOM STRUCTURE!** Refer to the operating and maintenance instructions provided by the prime mover manufacturer for specific information.

### WARNING



#### USE CARE WITH SILICA DUST DURING OPERATION

Concrete and masonry products contain silica sand. Quartz, which is a form of silica and the most common mineral in the earth's crust, is associated with many types of rock. Some activities that silica dust may be present in the air include demolition, sweeping, loading, sawing, hammering, drilling, or planing of rock, concrete or masonry.

It is recommended to use dust suppression, dust collection or personal protective equipment during the operation of any attachment that may cause high levels of silica dust. The NIOSH recommended exposure limit for respirable crystalline silica is 0.05 mg/m<sup>3</sup> as a time-weighted average for up to 10 hours/day during a 40-hour workweek [NIOSH 1974].

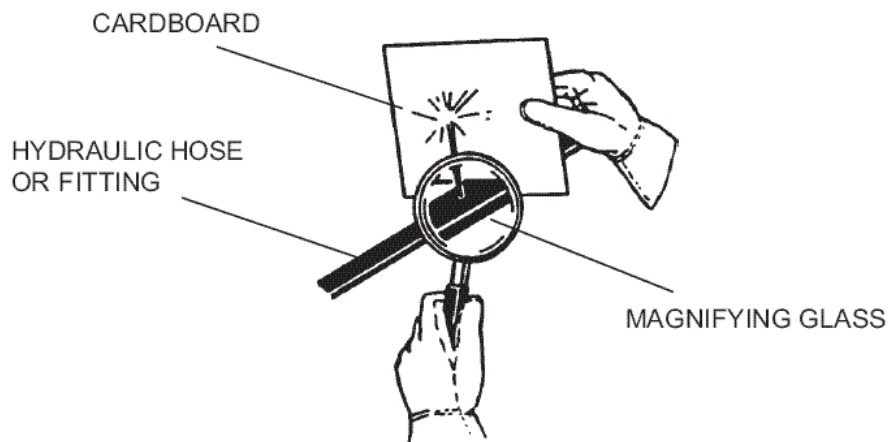
### WARNING



#### USE CARE WITH HYDRAULIC FLUID PRESSURE

Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Hydraulic leaks under pressure may not be visible. Before connecting or disconnecting hydraulic hoses, read your prime mover's operator's manual for detailed instructions on connecting and disconnecting hydraulic hoses or fittings.

- Keep unprotected body parts, such as face, eyes, and arms as far away as possible from a suspected leak. Flesh injected with hydraulic fluid may develop gangrene or other permanent disabilities.
- If injured by injected fluid, see a doctor at once. If your doctor is not familiar with this type of injury, ask him to research it immediately to determine proper treatment.
- Wear safety glasses, protective clothing, and use a piece of cardboard or wood when searching for hydraulic leaks. **DO NOT USE YOUR HANDS! SEE ILLUSTRATION.**



## GENERAL PRECAUTIONS - CONTINUED



**Know what's below.  
Call before you dig.**

One easy phone call to 811 starts the process to get your underground utility lines marked for free. When you call 811 from anywhere in the country (USA), your call will be routed to your local One Call Center. Local One Call Center operators will ask you for the location of your digging job and route your call to affected utility companies. Your utility companies will then send a professional locator to your location to mark your lines within a few days. Once your underground lines have been marked, you will know the approximate location of your utility lines and can dig safely, because knowing what's below protects you and your family.

Every state has different rules and regulations governing digging, some stricter than others. In addition, 62 separate One Call Centers serve different areas of the country; now 811 will connect you directly to your local one call center.

For more information go to [www.call811.com](http://www.call811.com)

**Always call 811 before starting any digging project!**

\*\*Customers outside the United States need to contact their local utility company for underground safety regulations specific to the area.



**Know what's below.  
Call before you dig.**

## PRODUCT / EQUIPMENT PRECAUTIONS

### CAUTION



#### PRIME MOVER LIFT CAPACITY

Alert yourself to the weight of the Drive Unit. **DO NOT** exceed the recommended lift capacity of the prime mover. Refer to your prime mover's owners manual for suggested lift capacity and lift considerations.



#### OPERATING THE PRIME MOVER

Avoid steep hillside operation, which could cause the prime mover to overturn. Consult your prime mover operator's and safety manuals for maximum incline allowable.



#### TRANSPORTING THE DRIVE ATTACHMENT

- Travel only with the Drive attachment in a safe transport position to prevent uncontrolled swinging.
- Tether the Drive attachment with a chain, if necessary, to prevent uncontrolled swinging of the auger when moving from hole to hole.
- Remove the earth auger or helical anchor from the Drive attachment before transporting to and from the job site.
- Drive slowly over rough ground and on slopes. Position the Drive attachment as low to the ground as possible maintaining a low center of gravity.

### WARNING



#### PRIME MOVER / ATTACHMENT INSTALLATION

Ensure all attaching pins, fasteners and latches are properly secured. Ensure that the mounting frame / attachment mounting plate is rigidly secured to the prime mover. Improper installation can result in product damage, personal injury and death.

Ensure all hydraulic hose assemblies are of adequate length and have enough slack for full Drive attachment movement. Failure to provide adequate length hydraulic hoses can result in hose rupturing. A hydraulic hose rupture can result in product damage, personal injury and death.

## SERIAL NUMBER IDENTIFICATION

Its important to make the correct reference to the serial number of the unit when making repairs or ordering parts. The serial number plate will be located near the top of the Anchor / Auger Drive attachment. Below is an example of the serial number plate.



Figure 1



## SAFETY DECAL INFORMATION



### SAFETY DECALS

This unit comes equipped with all safety decals in place. They are designed to help you safely operate your unit. Read and follow all safety decals.

- Keep all safety decals clean and legible at all times.
- Replace safety decals that are missing or have become illegible.
- Safety decals are available from your distributor or manufacture.
- Some parts installed during repair may require safety decals to be affixed to the replacement part. When ordering the replacement part(s) be sure the correct safety decal(s) are included in your order.



### INSTALLING SAFETY DECALS

- Clean the desired area with warm soapy water.
- Decide on exact position before you remove the backing paper.
- Peel backing paper from decal. Press firmly on the surface.
- Air pockets can be pierced with a pin and smoothed.

### Typical Decals used on Pengo Anchor / Auger Drive Attachments



350247

Figure 2

## PRODUCT SPECIFICATIONS

Output speed and torque specifications are NOT listed at 100% efficiency. Maximum efficiencies have been applied to the torque and speed charts according to the manufacturers recommendations. Speed and torque output are dependant on the overall system efficiencies associated with the prime movers hydraulic system. When the purchaser is determining criteria for specific applications please contact Pengo. Pengo has made every attempt to present accurate and suitable information published on this document. This document should be used for information and comparative purposed only. When application specific information is required, please contact Pengo.

Pengo continually looks for new ways to improve its products. Therefore, Pengo reserves the right to make changes to our products and specifications without notice.



## PRODUCT SPECIFICATIONS

AUGER/ ANCHOR DRIVE MODEL		
<b>RV-100</b>		
<b>TOTAL UNIT WEIGHT</b>	2850 LBS / 1292 Kg	
HYDRAULIC MOTOR INFORMATION		
Displacement	13.73 cu/in (225cc)	
Motor Type	Variable Speed Bidirectional	
Motor Output Shaft	13T 8/16 Spline	
Motor Mount	SAE - E 4 Bolt	
Motor Ports	Code 62 SAE Split Flge	
Cross Over Pressure Relief	Not Equipped	
PLANETARY GEARBOX INFORMATION		
Gearbox Type	Planetary Three Stage	
Reduction Ratio	126:1	
Output Shaft	150mm Square	
Oil Capacity	9.5 Gallons	
Oil Type	SAE 80W90 GL-5	
Shaft Pull Out (lbs.)	100,000 lbs.	
TORQUE CHART		
Pressure PSI (Bar)	Torque (ft/lbs)	2500 - 2900 psi utilizes the hydraulic motors low displacement setting of 147cc.
2500 (172)	32244	
2600 (179)	33534	
2700 (185)	34824	
2800 (192)	36114	
2900 (199)	37403	
*Variable Torque Range 2901 - 3099 psi*		
3100 (213)	61226	3100 - 5000 psi utilizes the hydraulic motors high displacement setting of 225cc.
3200 (220)	63201	
3300 (227)	65176	
3400 (234)	67151	
3500 (241)	69126	
4000 (275)	79001	Maximum Torque Range (225cc).
4500 (309)	88876	
5000 (344)	98751	
SPEED CHART - Low Displacement (147cc)		
Flow GPM (Liter)	Speed (rpm)	The motor will operate in low displacement setting up to 3100 PSI.
80 (302)	14	
90 (370)	16	
100 (378)	18	
110 (416)	19	
120 (454)	21	
SPEED CHART - High Displacement (225cc)		
Flow GPM (Liter)	Speed (rpm)	At 3100 PSI the motor will operate in high displacement setting.
80 (302)	9	
90 (370)	10	
100 (378)	11	
110 (416)	13	
120 (454)	14	

AUGER/ ANCHOR DRIVE MODEL		
<b>RV-150</b>		
<b>TOTAL UNIT WEIGHT</b>	3800 LBS / 1723 Kg	
HYDRAULIC MOTOR INFORMATION		
Displacement	13.73 cu/in (225cc)	
Motor Type	Variable Speed Bidirectional	
Motor Output Shaft	13T 8/16 Spline	
Motor Mount	SAE - E 4 Bolt	
Motor Ports	Code 62 SAE Split Flge	
Cross Over Pressure Relief	Not Equipped	
PLANETARY GEARBOX INFORMATION		
Gearbox Type	Planetary Four Stage	
Reduction Ratio	208.54:1	
Output Shaft	177mm Square	
Oil Capacity	11 Gallons	
Oil Type	SAE 80W90 GL-5	
Shaft Pull Out (lbs.)	180,000 lbs.	
TORQUE CHART		
Pressure PSI (Bar)	Torque (ft/lbs)	2500 - 2900 psi utilizes the hydraulic motors low displacement setting of 147cc.
2500 (172)	51506	
2600 (179)	53566	
2700 (185)	55626	
2800 (192)	57686	
2900 (199)	59747	
*Variable Torque Range 2901 - 3099 psi*		
3100 (213)	97799	3100 - 3500 psi utilizes the hydraulic motors high displacement setting of 225cc.
3200 (220)	100954	
3300 (227)	104109	
3400 (234)	107263	
3500 (241)	110418	
4000 (275)	126192	Maximum Torque Range (225cc).
4500 (309)	141967	
5000 (344)	157741	
SPEED CHART - Low Displacement (147cc)		
Flow GPM (Liter)	Speed (rpm)	The motor will operate in low displacement setting up to 3100 PSI.
80 (302)	9	
90 (370)	10	
100 (378)	11	
110 (416)	12	
120 (454)	13	
SPEED CHART - High Displacement (225cc)		
Flow GPM (Liter)	Speed (rpm)	At 3100 PSI the motor will operate in high displacement setting.
80 (302)	5	
90 (370)	6	
100 (378)	7	
110 (416)	8	
120 (454)	9	

## PRODUCT SPECIFICATIONS

AUGER/ ANCHOR DRIVE MODEL		
<h1>RV-200</h1>		
<b>TOTAL UNIT WEIGHT</b>	4200 LBS / 1905 Kg	
HYDRAULIC MOTOR INFORMATION		
Displacement	13.73 cu/in (225cc)	
Motor Type	Variable Speed Bidirectional	
Motor Output Shaft	13T 8/16 Spline	
Motor Mount	SAE - E 4 Bolt	
Motor Ports	Code 62 SAE Split Flge	
Cross Over Pressure Relief	Not Equipped	
PLANETARY GEARBOX INFORMATION		
Gearbox Type	Planetary Four Stage	
Reduction Ratio	265.64:1	
Output Shaft	177mm Square	
Oil Capacity	14 Gallons	
Oil Type	SAE 80W90 GL-5	
Shaft Pull Out (lbs.)	250,000 lbs.	
TORQUE CHART		
Pressure PSI (Bar)	Torque (ft/lbs)	2500 - 2900 psi utilizes the hydraulic motors low displacement setting of 119.6cc.
2500 (172)	65608	
2600 (179)	68233	
2700 (185)	70857	
2800 (192)	73481	
2900 (199)	76105	
*Variable Torque Range 2901 - 3099 psi*		
3100 (213)	124522	3100 - 3500 psi utilizes the hydraulic motors high displacement setting of 225cc.
3200 (220)	128539	
3300 (227)	132556	
3400 (234)	136572	
3500 (241)	140590	
4000 (275)	160674	Maximum Torque Range (225cc).
4500 (309)	180757	
5000 (344)	200842	
SPEED CHART - Low Displacement (147cc)		
Flow GPM (Liter)	Speed (rpm)	The motor will operate in low displacement setting up to 3100 PSI.
80 (302)	6	
90 (370)	7	
100 (378)	8	
110 (416)	9	
120 (454)	10	
SPEED CHART - High Displacement (225cc)		
Flow GPM (Liter)	Speed (rpm)	At 3100 PSI the motor will operate in high displacement setting.
80 (302)	4	
90 (370)	5	
100 (378)	5	
110 (416)	6	
120 (454)	7	

AUGER/ ANCHOR DRIVE MODEL		
<h1>RV-300</h1>		
<b>TOTAL UNIT WEIGHT</b>	5000 LBS / 2268 Kg	
HYDRAULIC MOTOR INFORMATION		
Displacement	13.73 cu/in (225cc)	
Motor Type	Variable Speed Bidirectional	
Motor Output Shaft	13T 8/16 Spline	
Motor Mount	SAE - E 4 Bolt	
Motor Ports	Code 62 SAE Split Flge	
Cross Over Pressure Relief	Not Equipped	
PLANETARY GEARBOX INFORMATION		
Gearbox Type	Planetary Four Stage	
Reduction Ratio	400:1	
Output Shaft	200mm Square	
Oil Capacity	16.25 Gallons	
Oil Type	SAE 80W90 GL-5	
Shaft Pull Out (lbs.)	300,000 lbs.	
TORQUE CHART		
Pressure PSI (Bar)	Torque (ft/lbs)	2500 - 2900 psi utilizes the hydraulic motors low displacement setting of 119.6cc.
2500 (172)	98792	
2600 (179)	102744	
2700 (185)	106697	
2800 (192)	110648	
2900 (199)	114600	
*Variable Torque Range 2901 - 3099 psi*		
3100 (213)	187505	3100 - 3500 psi utilizes the hydraulic motors high displacement setting of 225cc.
3200 (220)	193554	
3300 (227)	199602	
3400 (234)	205651	
3500 (241)	211699	
4000 (275)	241942	Maximum Torque Range (225cc).
4500 (309)	272184	
5000 (344)	302428	
SPEED CHART - Low Displacement (147cc)		
Flow GPM (Liter)	Speed (rpm)	The motor will operate in low displacement setting up to 3100 PSI.
80 (302)	4	
90 (370)	4	
100 (378)	5	
110 (416)	6	
120 (454)	7	
SPEED CHART - High Displacement (225cc)		
Flow GPM (Liter)	Speed (rpm)	At 3100 PSI the motor will operate in high displacement setting.
80 (302)	3	
90 (370)	3	
100 (378)	4	
110 (416)	4	
120 (454)	5	

## SET-UP INSTRUCTIONS

READ AND UNDERSTAND ALL SAFETY INFORMATION PRIOR TO MOUNTING YOUR DRIVE UNIT TO THE PRIME MOVER. SEE PAGES 7 & 13.

### MOUNTING AND INSTALLATION


There are several ways to mount your Drive Unit depending on the prime mover and application.

#### **Backhoe and Excavator Mounting**

Remove the bucket from the dipper arm and curl cylinder pin connections.

### AUGER / ANCHOR CONNECTION

1. Align the auger bit or anchor with the output shaft of the Drive Unit.
2. Slide the connecting coupler (hub) over the output shaft and align the coupler hole with the output shaft hole.
3. Connect the auger bit or anchor to the Drive Unit output shaft and secure it with appropriate connecting hardware.

**WARNING**  When selecting connecting hardware ensure that the bolt or pin does not protrude from the coupler (hub) any more than necessary to secure.

Hardware that protrudes an excessive amount can be a safety hazard and cause entanglement.


## HYDRAULIC SYSTEM HOOK-UP

Your Pengo Planetary Drive Unit receives its hydraulic oil flow and pressure from the prime mover through the auxiliary hydraulic circuit via two quick release couplers near the end of the truck boom or excavator arm. Follow the steps below to complete the hydraulic hook-up between your prime mover and Drive Unit.


### HYDRAULIC SYSTEM HOOK-UP

1. Locate the auxiliary hydraulic connection ports on the prime mover.
2. Determine the length of hydraulic hose necessary to connect the auxiliary hydraulic circuit to the Drive Unit. Be sure to allow sufficient “slack” in the hose length to allow the Drive Unit to perform its full range of operation.

3. Ensure that the hydraulic hose couplers are compatible with the hydraulic quick couplers on the Drive Unit.

**WARNING**  If a hydraulic leak develops, correct it immediately. Escaping hydraulic fluid can have extremely high pressure. A stream of high pressure fluid may penetrate the skin. It is imperative that the connections are tight and that all hoses are in good working condition.

4. Once all of the hydraulic connections have been made and checked for leaks, the Drive Unit is ready for operation.

**CAUTION**  Hydraulic hoses and fittings used on the prime mover and Drive Unit must have a continuous operating pressure rating of at least 25% higher than the maximum pressure of the hydraulic system being used. Refer to the Drive Unit specification chart for allowable maximum pressure.

## OPERATING PROCEDURES

Before operating, always ensure that the Drive Unit and auger or anchor are connected correctly to the prime mover.

### DRILLING / ANCHORING OPERATION

1. To begin drilling/installation, position the auger or anchor on the ground in the desired location. Engage the parent machines auxiliary hydraulics to rotate the auger or anchor in a clockwise direction.
2. Lower the parent machines arm(s) to engage the auger or anchor into the ground. Use only enough down pressure to assure positive penetration. Ease up on the down pressure if the auger or anchor rotation slows down drastically or stalls. Excessive down pressure will cause the Drive Unit to stall frequently.  
**Note:** Do not continually stall the Drive Unit! Continued stalling may cause excessive heating of the hydraulic system and possible damage to the Drive Unit.
3. As the auger or anchor digs in the ground, the prime movers arm(s) or boom may travel through an arc. This means the operator may need to continually reposition the auger or anchor to ensure vertical application of the auger or anchor.

## OPERATING PROCEDURES CONT.

### DRILLING OPERATION ONLY

**After steps 1-3 above have been completed continue with the following steps for drilling applications.**

4. When the auger has penetrated the ground about 24" (610mm), raise the auger from the hole to clean out the loose material.

5. Once the required hole depth is reached, allow the auger to turn a few seconds at this depth to clean the hole.

6. Stop rotation of the auger and raise the auger out of the hole. Swing the auger away from the newly drilled hole. Spin the loose material off the auger.

**Note:** *Do not reverse the auger rotation while the auger is still in the hole. The loose material will back fill the hole.*

If necessary, repeat steps 4 through 6 to obtain a cleaner hole.

### OPERATIONS TO AVOID

1. In some soil conditions or when excessive down pressure is applied, the auger may "screw" itself into the ground. This can cause the auger to become stuck causing the Drive Unit to stall. If this situation occurs, reverse the auger rotation and slowly raise the auger from the hole.

2. If the auger becomes lodged under rocks, tree roots, or other large obstructions, do not attempt to raise the auger out of the ground. See Step 1 of this section to relieve the auger.

3. Avoid excessive side loading. This can cause damage to both the Drive Unit and the auger bit.

4. Keep all auger teeth and pilot bits in good condition. Avoid using damaged teeth and holders.

## MAINTENANCE INSTRUCTIONS

Before operating the Drive Unit ensure it is properly lubricated and inspected for any worn or damaged areas. Only a minimum amount of time and effort is required to regularly lubricate and maintain the Drive Unit. Preventive maintenance will help ensure long life and trouble free operation.

### LUBRICATION MAINTENANCE

The Drive Unit must be properly lubricated to achieve the most efficient operation. Clean excess grease, gear oil, and hydraulic fluid for the Drive Unit. This is especially important in sandy conditions.

### HYDRAULIC OIL MAINTENANCE

#### *CLEAN HYDRAULIC OIL IS ESSENTIAL!*

80% of all hydraulic component failures are caused by contamination of the hydraulic oil. Always keep all dirt and other contaminants from entering the hydraulic system during disconnect and connect operations. Always use dust caps and plugs on all quick disconnects when not in use. Tightly cap all hydraulic openings to hold oil in and keep dirt and other contaminants from entering hydraulic systems.

### HYDRAULIC HOSE MAINTENANCE

Inspect all hydraulic hoses daily for cracked and brittle covers caused by excessive heat. Reduced viscosity of hydraulic oil occurs at higher operating temperatures and causes a breakdown of fluid additives, such as wear inhibitors. Excessive heat will cause higher internal leakage in the Drive Unit motor, which will make the Drive Unit less efficient. It can also cause seals in the drive unit motor to become brittle and crack. Replacement of hoses before failure will prevent loss of hydraulic oil and down time.

## MAINTENANCE INSTRUCTIONS

### GEARBOX MAINTENANCE

The planetary gearbox is filled with gear oil lubricant. If oil is observed leaking, the seal should be inspected for damage or wear and replaced if necessary. Inspect the gearbox for any other possible damage that could be causing the leakage.

Change planetary gear oil after the first 50 hours of operation. Change the gear oil every 1000 hours or 12 months whichever occurs first. *CHECK OIL LEVEL DAILY* to assure proper lubrication is maintained. See the CHECKING AND CHANGING GEAR OIL section for gear oil grade.

### HARDWARE MAINTENANCE

Check Drive Unit and all accessories daily for loose, bent, cracked, or worn bolts and fasteners. Always use Grade 5 or harder replacements bolts. Always use lock washers with standard hex nuts or self locking nuts.

Check all connecting pins daily for bends, cracks, breaks, or wear. Replace if any of these conditions exist.

### OUTPUT SHAFT MAINTENANCE

Check the Drive Unit output shaft daily for cracks or excessive wear near or around the connection hole. The output shaft should be replaced if any of these conditions exist.

Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your unit to original specifications. Manufacturer will not claim responsibility for use of unapproved parts or accessories and other damages as a result of their use.

If equipment has been altered in any way from its original design, manufacturer does not accept any liability for injury or warranty.

## STORAGE INSTRUCTIONS

When the Drive Unit will not be used for an extended period of time, it should be thoroughly checked and prepared for storage so that a minimum amount of work will be required to put the Drive Unit back into operation. The following are suggestions for storage:

1. Thoroughly clean the Drive Unit.
2. Ensure the hydraulic motor and the hoses are full of clean oil. Be sure the planetary gearbox is full (to the recommended capacity for each model).
3. Tighten all bolts and pins to the recommended torque values.
4. Protect the output shaft with grease or a rust inhibitor.
5. Check the Drive Unit for worn or damaged parts.
6. Store the Drive Unit away from active areas and in a clean dry location.
7. Paint all scratched or bare metal surfaces.

## CHECKING / CHANGING GEAR OIL

The Planetary gearbox used on your Drive Unit uses a gear oil to keep the internal gears lubricated. To check and or replace the oil, follow the steps below.

### CHECKING THE GEAR OIL:

1. Make sure the Drive Unit is in an upright position when checking the oil.
2. Slowly loosen the Oil Fill-Drain plug. As you reach the end of the treads on the plug, oil should start to ooze out.
3. If you see oil starting to ooze out of the port, quickly retighten the plug. This is an indication that the oil level is adequate, but in order to correctly measure the amount of oil the gearbox should be drained and the correct amount of oil replenished.

### CHANGING THE GEAR OIL:

1. Position the Drive unit in a position in which the oil can flow freely from the gearbox once the plug is removed.
2. Place a drain pan under the drain port that will hold at least one gallon.
3. Remove the drain plug and allow the oil to completely drain out.
4. Position the gearbox for filling by orientating the unit so that the same port used for draining is now used to fill.
5. Fill the gearbox with the required amount of gear oil. **For the correct capacity of gear oil refer to the model specification page.** The gear oil specifications is listed below:

### Lubrication Recommendations:

SAE 80W90 GL-5 Oil

Density / 15 deg C:	0.895
Viscosity Index:	97
Viscosity @ 40 deg C:	138
Flash Point COC:	200
Viscosity @ 100 deg C:	13.9
Pour Point (deg C):	-30

Illustration to the right is representative of RV series gearboxes.

The Bail Housing will need to be partially removed to allow access to all ports during oil change.

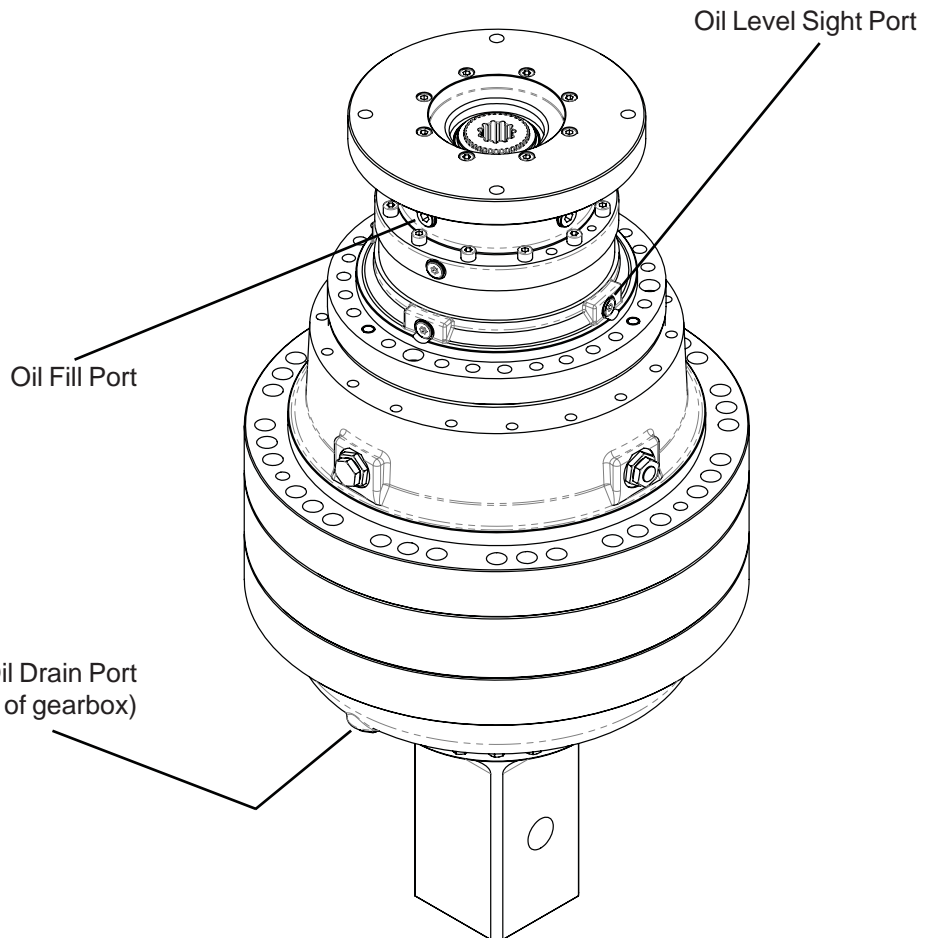


Figure 3



## IMPORTANT!

**DO NOT** overfill gearbox when replacing the gear oil. Excessive amount of gear oil will reduce the amount of room in the gearbox for expansion and cause damage to the seals.



## TROUBLESHOOTING

In the event your Pengo Drive Unit malfunctions or does not appear to have enough speed or power, please refer to the section below to identify the cause of the problem and possible remedy. If the problem persists, contact your Authorized Service Dealer for assistance.

### **SLOW SPEED (RPM) OR INSUFFICIENT POWER:**

- Low oil flow / Obstructed oil flow. *Check prime mover pump. Check for faulty pressure relief valve.*
- Auger Drive is too large for machine. *Review Drive Unit specs. Contact your Authorized Service Dealer.*
- Check auger and teeth for excessive wear. *Replace worn auger components.*

### **NO OUTPUT ROTATION:**

- Quick release couplers not engaged. *Check coupler connection.*
- Quick release coupler faulty. *Replace faulty coupler(s).*
- Hydraulic oil tank is low. *Fill oil tank to maximum level.*
- Planetary gear failure. *Contact your Authorized Service Dealer.*
- Machine oil pump failure. *Refer to prime mover manual.*
- Insufficient oil flow. *All variable speed models require a min of 50 GPM to operate.*

### **BAIL HOUSING LEAKING OIL:**

- Hose(s) of Fitting(s) leaking. *Tighten or replace.*
- Motor O-ring / seal failure. *Replace damaged O-ring and or seal.*

### **OUTPUT SHAFT LEAKING OIL:**

- Output shaft seal damaged. *Replace seal.*
- Seal not sealing in the housing. *Replace seal or use a sealant on OD of seal.*
- Bolts are loose. *Tighten Bolts.*

### **AUGER / ANCHOR BIT WILL NOT ENGAGE OR DIG:**

- Auger bit is worn or damaged. *Replace cutting head or entire auger bit.*
- Drive Unit speed is too fast. *Reduce speed (rpm) to allow bit to engage ground.*
- Anchor not installing vertically. *Level Drive unit. Allow Drive unit to hang freely.*

### **NO TORQUE:**

- Oil pressure is too low. *Review Drive unit pressure requirements.*
- Drive unit too small for parent machine. *Review Drive Unit specs. Contact your Authorized Service Dealer.*
- Hydraulic system is overheating. *See the "Oil Overheating" section below.*

### **HYDRAULIC OIL OVERHEATING:**

- Oil pressure is too low. *Set relief valve to machine specifications.*
- Hydraulic line is restricted. *Inspect and repair.*
- Auger continually stalling. *Limit down pressure used.*
- Hydraulic oil tank is low. *Fill oil tank to maximum level.*
- Oil passing over relief valve. *Check for a faulty relief valve.*
- Prime Mover is too small. *Attach Drive Unit to larger prime mover.*
- Dirty or contaminated oil. *Replace prime mover hydraulic oil and oil filters.*



## VARIABLE SPEED HYDRAULIC MOTOR INFORMATION

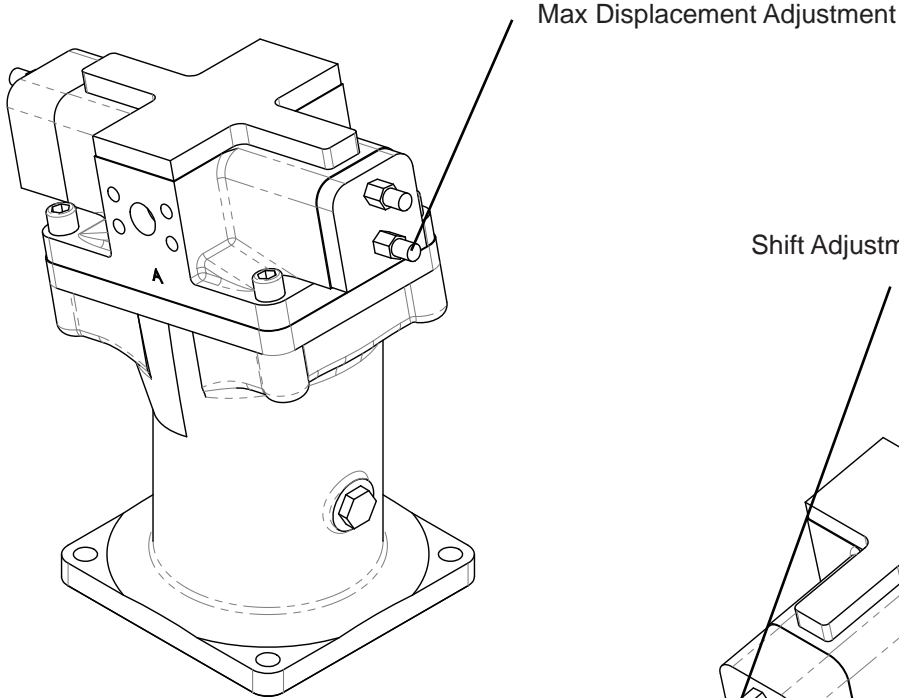


Figure 4

Shift Adjustment Pre-Set @ 3100 PSI

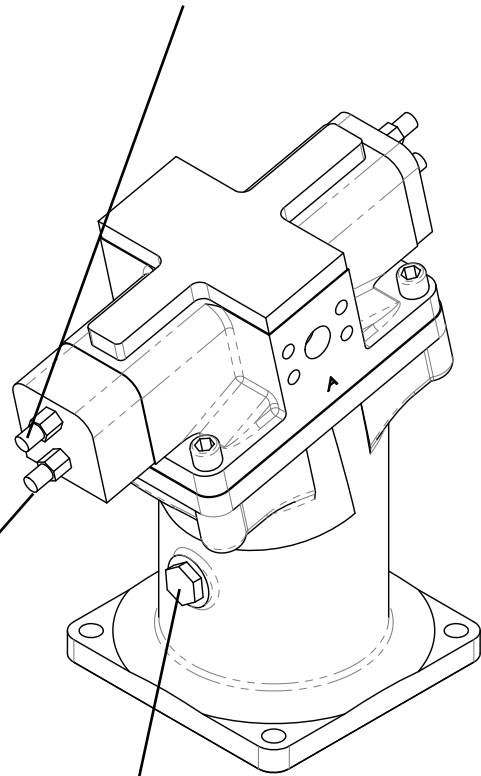


Figure 5

Min Displacement Adjustment

Case Drain Port.



### IMPORTANT!

Variable speed motor **MUST NOT BE OPERATED** without being pre-filled with hydraulic fluid. Operating the motor without hydraulic fluid **WILL CAUSE EXTENSIVE DAMAGE.**

The motor has been equipped with quick connect couplers to ensure the motor has fluid at all times. The motor is filled with hydraulic fluid at the factory and is shipped in a ready to use condition.

All RV series units require the use of a motor case drain line. **THE DRAIN LINE MUST BE USED TO AVOID DAMAGE TO THE HYDRAULIC MOTOR.**



**CASE DRAIN MUST BE INSTALLED AND USED AT ALL TIMES**

**UNIT IS LIMITED TO 60 GPM DURING WARM-UP / FREE SPIN MODE.**

**\*\*MAX HYDRAULIC FLOW IS 120 GPM  
DAMAGE WILL OCCUR IF UNIT RECEIVES  
MORE THEN 120 GPM!\*\***

## VARIABLE SPEED HYDRAULIC MOTOR INFORMATION PARTS BREAKDOWN (ALL MODELS)

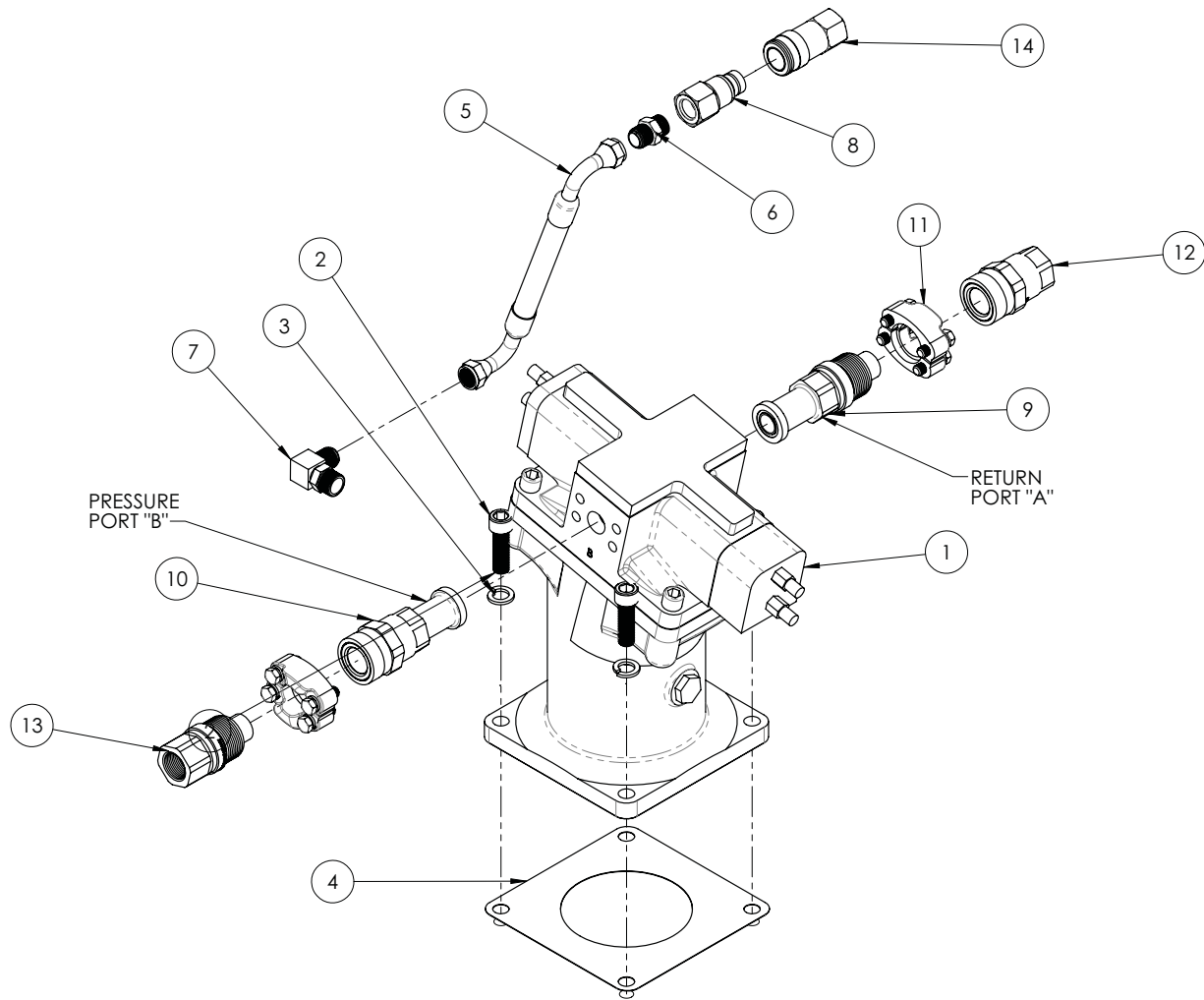
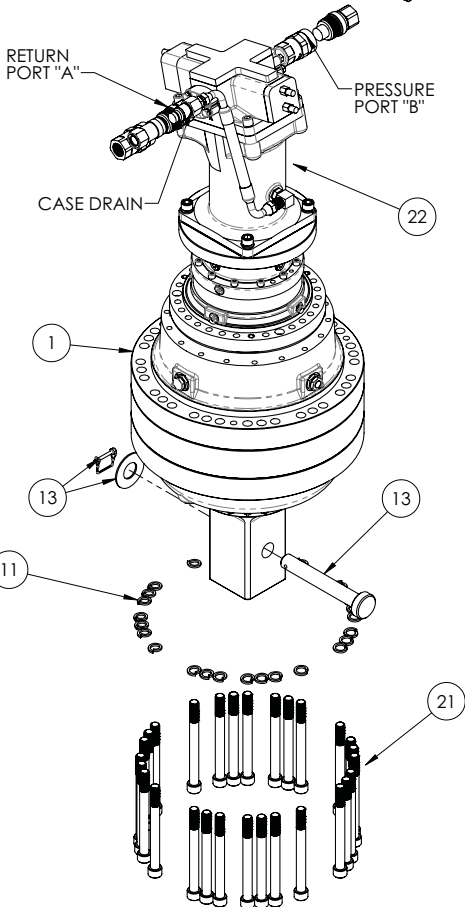
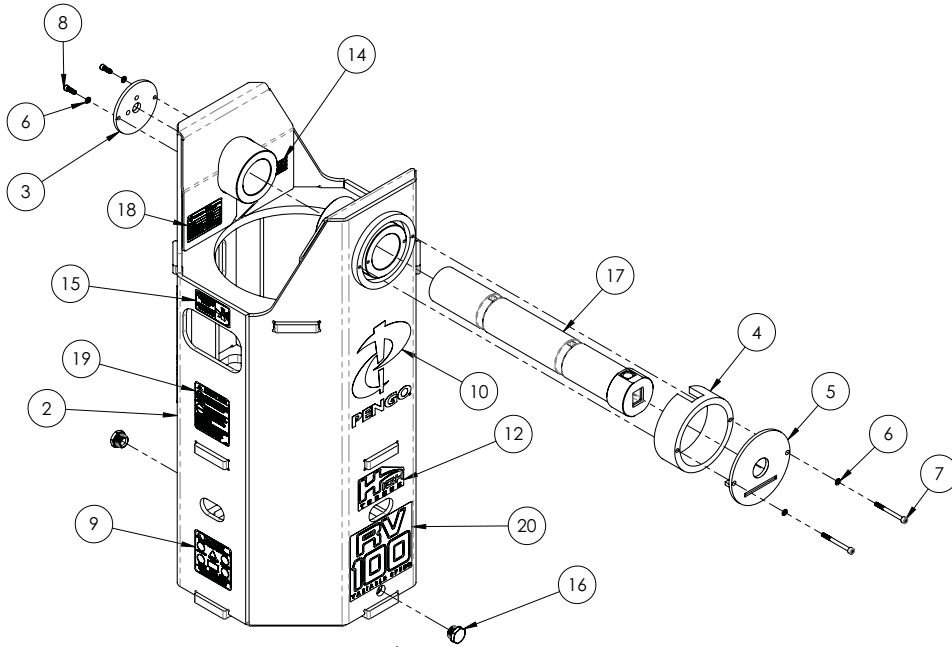


Figure 6

ITEM	PART No.	QTY	DESCRIPTION
1	610012	1	MOTOR HYD EATON BAV-225
2	610094	4	SCREW HEX SOC M20 X 65mm
3	610095	4	WASHER LOCK 20mm
4	610096	1	GASKET SAE-E 4 BOLT
5	610203	1	HOSE ASSY CASE DRAIN RV SERIES
6	610208	1	FITTING MJ-MORB STRAIGHT
7	610204	1	FITTING MJ-MAORB 90 DEG
8	660825	1	FITTING QC 3/4" MALE FF
9	610241	1	FITTING QC 1-1/4" CODE 62 NPL
10	610240	1	FITTING QC 1-1/4" CODE 62
11	610239	2	SPLIT FLANGE ASSY CODE 62 1-1/4"
12	610210	1	FITTING QC 1-1/4" VEP COUPLER
13	610211	1	FITTING QC 1-1/4" VEP NIPPLE
14	660824	1	FITTING QC 3/4" FEMALE FF

Motor Shaft Seal Replacement - Part No. 610628

## RV-100 (610589) PARTS BREAKDOWN OPEN TOP BAIL CONFIGURATION



ITEM	PART No.	QTY	DESCRIPTION
1	610454	1	GEARBOX RV-100
2	610580	1	BAIL PAINTED OPEN TOP RV-70
3	610567	2	CAP PIN RETAINER RV-70 / 100
4	610604	1	SLEEVE PIN RV-70 / 100
5	610606	1	CAP RV-70 / 100
6	160415	6	WASHER LOCK 3/8"
7	661121	2	SCREW HEX 3/8" X 4" GRADE 8
8	151667	4	SCREW HEX SOC HEAD 3/8" X 1"
9	350247	2	DECAL DANGER AUGER DRIVE
10	350289	2	DECAL PENGGO LARGE
11	610504	28	WASHER LOCK M24
12	350305	2	DECAL HIGH TORQUE
13	610595	1	PIN ASSY 1-9/16" X 11"
14	610169	1	SERIAL TAG
15	350303	2	DECAL WARNING
16	610627	2	PLUG 1"-11 BSP
17	-	-	PIN, not included with Drive
18	350316	2	DECAL DRIVE SPEC RV-100
19	350315	2	DECAL CAUTION HYD
20	350276	2	DECAL MODEL RV-100
21	610447	28	SCREW HEX SOC M24 X 260MM
22	610012	1	MOTOR HYD EATON BAV-225

See page 17 for Hose and Fitting information.

Figure 7

## RV-100 GEARBOX (610454) PARTS LIST

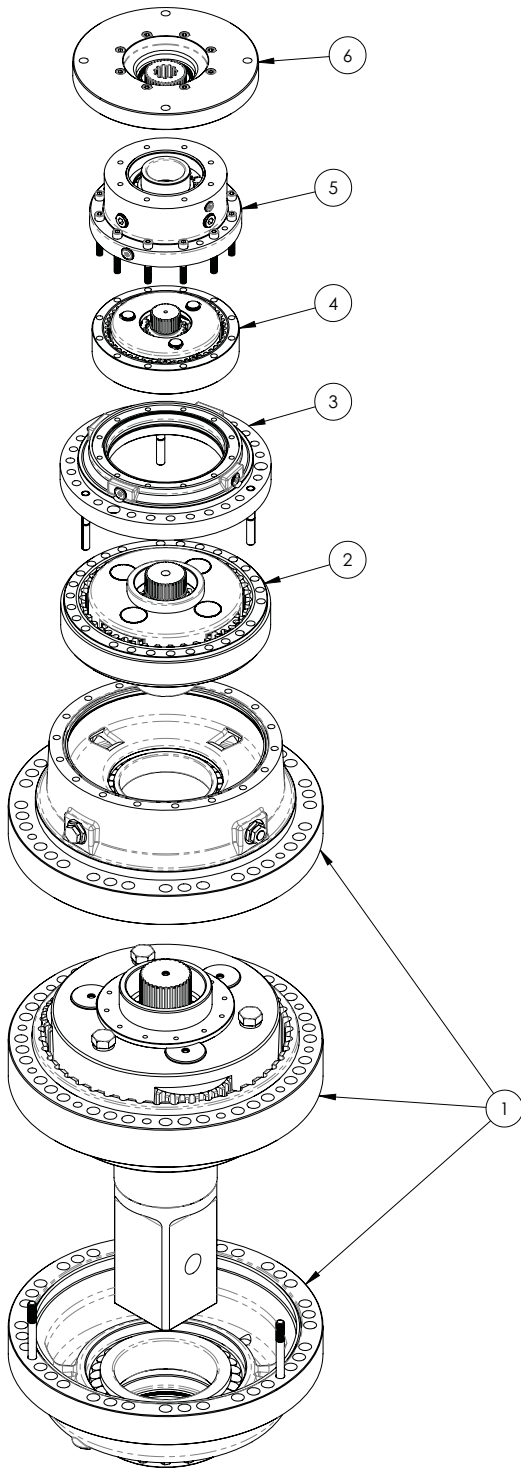


Figure 8

ITEM	PART No.	QTY	DESCRIPTION
1	610509	1	OUTPUT GB 16001 HRI 4.40
2	610512	1	GEARSET RE 3000 4.70
3	610513	1	INTERM FLANGE RE 2520
4	610514	1	GEARSET RE 1020 5.10
5	610248	1	INPUT SUPPORT RE 810/1020
6	610261	1	MOTOR INPUT RV-70
*	610612	1	SEAL KIT RV-100 GEARBOX

### GEARBOX REPLACEMENT PARTS

Replacement parts for the gearbox are sold in modules as indicated by the exploded view drawing. These modules are intended to provide quick and complete replacement. Each module will include all the parts necessary to complete the section, this include seals and o-rings. The seal kit which includes all seals and o-rings can be purchased separately.

Please note modules will not be broken apart to supply an individual item within the module, the entire module must be purchased.

### \*WARRANTY NOTICE\*:

Any attempt to disassemble or make field repairs to the planetary gearbox will VOID the warranty. Please contact your dealer or distributor for further information.

**Please order replacement parts by PART NO. and DESCRIPTION.**

## RV-150 (610600) PARTS BREAKDOWN OPEN TOP BAIL CONFIGURATION

ITEM	PART No.	QTY	DESCRIPTION
1	610010	1	GEARBOX RV-150
2	610599	1	BAIL PAINTED OPEN TOP RV-100
3	610504	28	WASHER LOCK 24mm
4	-	-	PIN NOT INCLUDED
5	610592	1	PIN ASSY 1-9/16" X 14" W/LINCH
6	610567	1	CAP PIN RETAINER PAINTED
7	160415	6	WASHER LOCK 3/8"
8	151667	4	SCREW HEX SOC HEAD 3/8" X 1"
9	610604	1	SLEEVE PAINTED RV-150
10	610606	1	CAP WELD ALIGN RV-150
11	661121	2	SCREW HEX SOC HEAD 3/8" X 4"
12	350303	2	DECAL WANRING PINCH POINT
13	610169	1	SERIAL TAG
14	350289	2	DECAL PENG0 LARGE
15	350305	2	DECAL HIGH TORQUE
16	350247	2	DECAL DANGER
17	610627	2	PLUG 1"-11 BSP
18	350313	2	DECAL MODEL RV-150
19	350317	2	DECAL DRIVE SPEC RV-150
20	350315	2	DECAL CAUTION HYD
21	610447	28	SCREW HEX SOC HEAD M24 X 260mm
22	610012	1	MOTOR HYD EATON BAV-225

See page 17 for Hose and Fitting information.

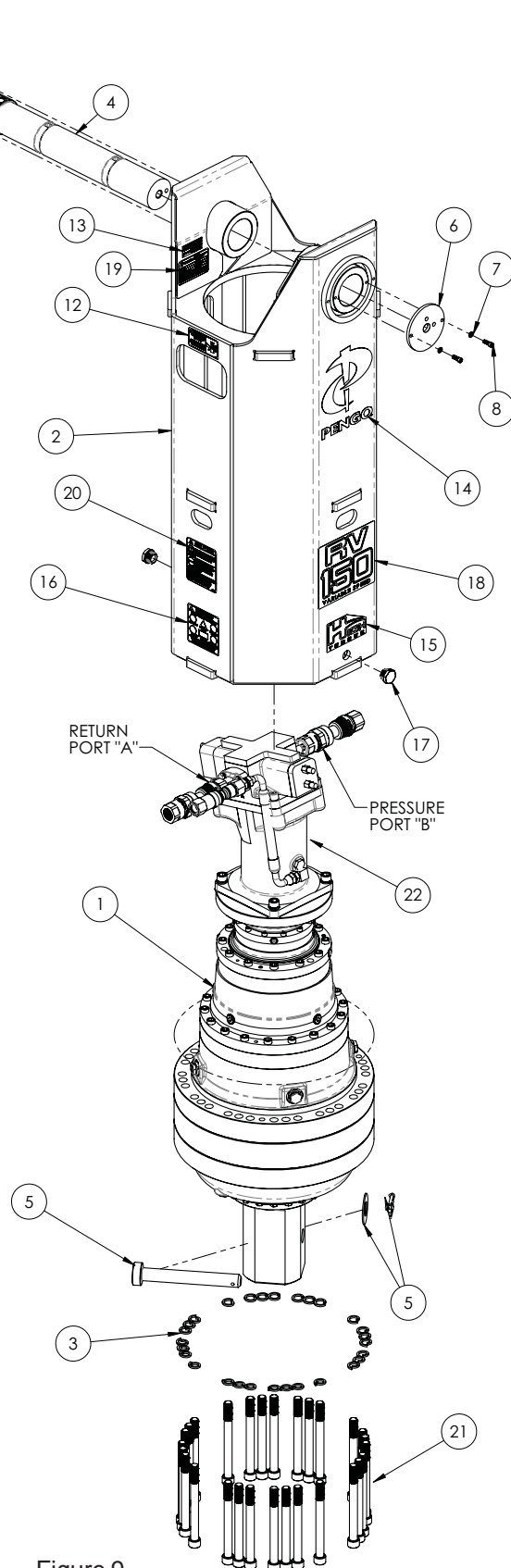


Figure 9

## RV-150 GEARBOX (610010) PARTS LIST

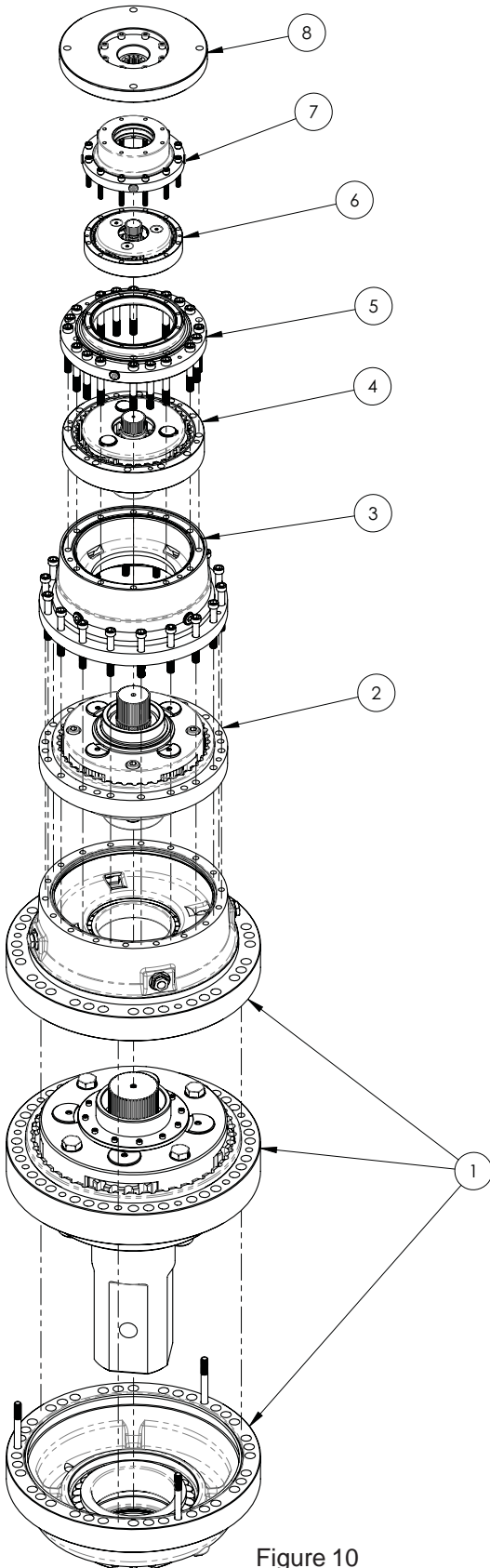


Figure 10

ITEM	PART No.	QTY	DESCRIPTION
1	610638	1	OUTPUT GB 16001 HRI 4.40
2	610523	1	GEARSET RE 4800 3.84
3	610258	1	INTERM FLANGE RE 3510
4	610524	1	GEARSET RE 1520 RE 3.43
5	610508	1	INTERMEDIATE FLANGE RE 1520
6	610264	1	GEARSET RE 510 3.60
7	610702	1	INPUT SUPPORT RE310
8	610525	1	MOTOR INPUT RV-150
*	610613	1	SEAL KIT RV-150 GEARBOX

### GEARBOX REPLACEMENT PARTS

Replacement parts for the gearbox are sold in modules as indicated by the exploded view drawing. These modules are intended to provide quick and complete replacement. Each module will include all the parts necessary to complete the section, this include seals and o-rings. The seal kit which includes all seals and o-rings can be purchased separately.

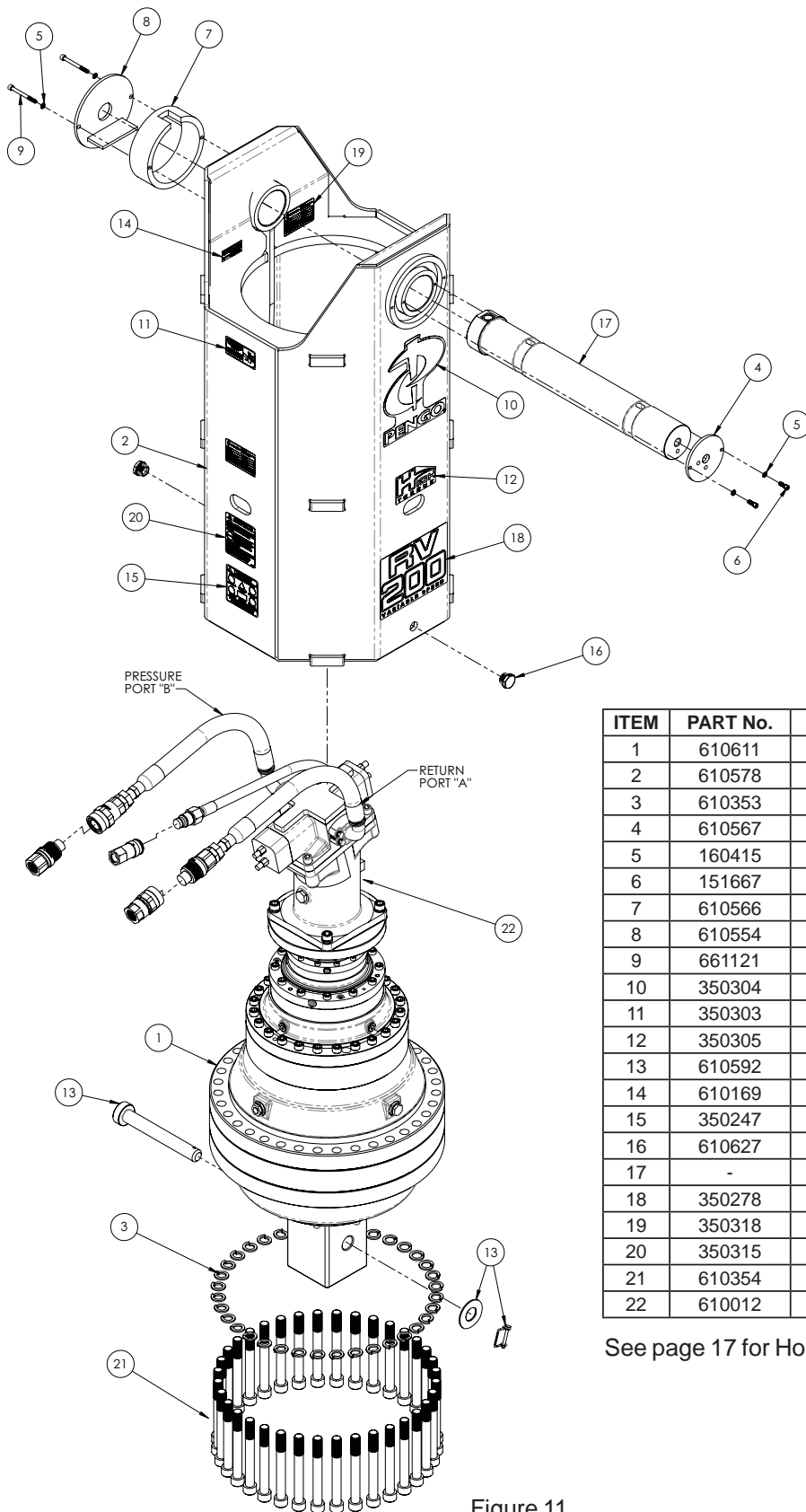
Please note modules will not be broken apart to supply an individual item within the module, the entire module must be purchased.

### \*WARRANTY NOTICE\*:

Any attempt to disassemble or make field repairs to the planetary gearbox will VOID the warranty. Please contact your dealer or distributor for further information.

**Please order replacement parts by PART NO. and DESCRIPTION.**

## RV-200 (610577) PARTS BREAKDOWN OPEN TOP BAIL CONFIGURATION



ITEM	PART No.	QTY	DESCRIPTION
1	610611	1	GEARBOX RV-200
2	610578	1	BAIL PAINTED OPEN TOP RV-140
3	610353	36	WASHER LOCK 27mm
4	610567	2	CAP PIN RETAINER PAINTED
5	160415	6	WASHER LOCK 3/8"
6	151667	4	SCREW HEX SOC HEAD 3/8" X 1"
7	610566	1	SLEEVE PAINTED
8	610554	1	CAP WELD ALIGN RV-200
9	661121	2	SCREW HEX SOC HEAD 3/8" X 4"
10	350304	2	DECAL PENGCO X-LARGE
11	350303	2	DECAL WARNING PINCH POINT
12	350305	2	DECAL HIGH TORQUE
13	610592	1	PIN ASSY 1-9/16" X 14"
14	610169	1	SERIAL TAG
15	350247	2	DECAL DANGER
16	610627	2	PLUG 1"-11 BSP
17	-	-	PIN NOT INCLUDED
18	350278	2	DECAL MODEL RV-200
19	350318	2	DECAL DRIVE SPEC RV-200
20	350315	2	DECAL CAUTION HYD
21	610354	36	SCREW HEX SOC M27 X 240mm
22	610012	1	MOTOR HYD EATON BAV-225

See page 17 for Hose and Fitting information.

Figure 11



## RV-200 GEARBOX (610011) PARTS LIST

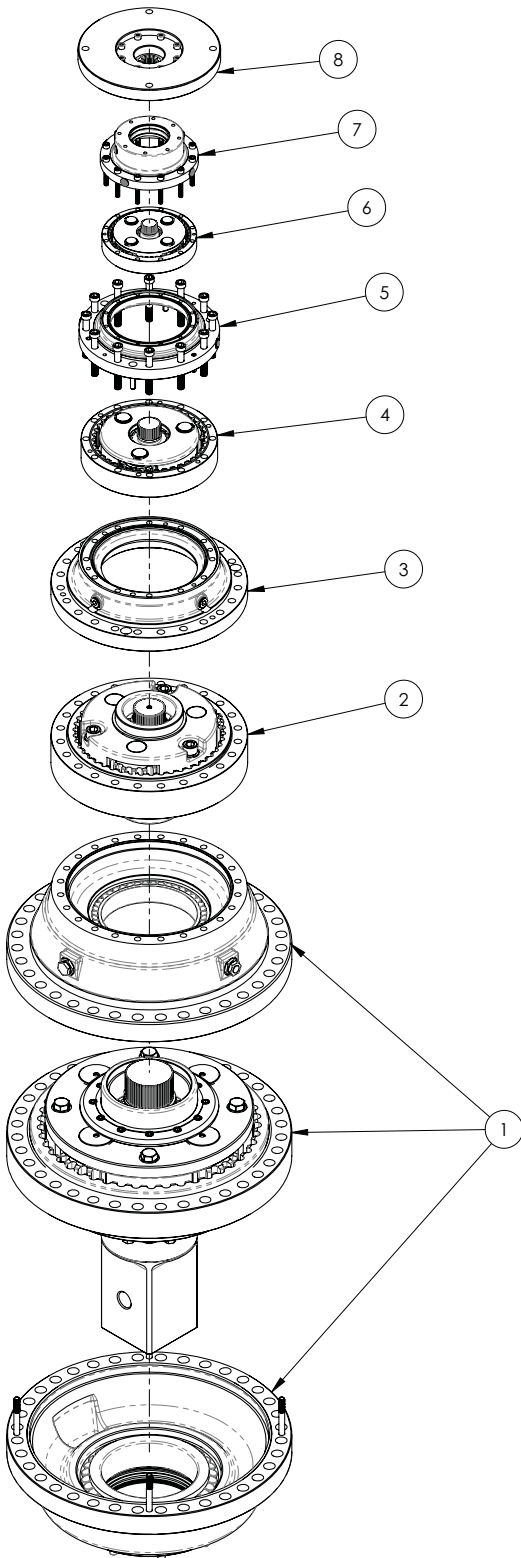


Figure 12

ITEM	PART No.	QTY	DESCRIPTION
1	610526	1	OUTPUT GB 21001 HRI 3.68
2	610529	1	GEARSET RE 6000 4.14
3	610530	1	INTERMEDIATE FLANGE RE 5020
4	610531	1	GEARSET RE 2000 3.83
5	610508	1	INTERM FLANGE RE 1520
6	610532	1	GEARSET RE 610 4.54
7	610702	1	INPUT SUPPORT RE310 / 510
8	610525	1	MOTOR INPUT
*	610614	1	SEAL KIT RV-200 GEARBOX

### GEARBOX REPLACEMENT PARTS

Replacement parts for the gearbox are sold in modules as indicated by the exploded view drawing. These modules are intended to provide quick and complete replacement. Each module will include all the parts necessary to complete the section, this include seals and o-rings. The seal kit which includes all seals and o-rings can be purchased separately.

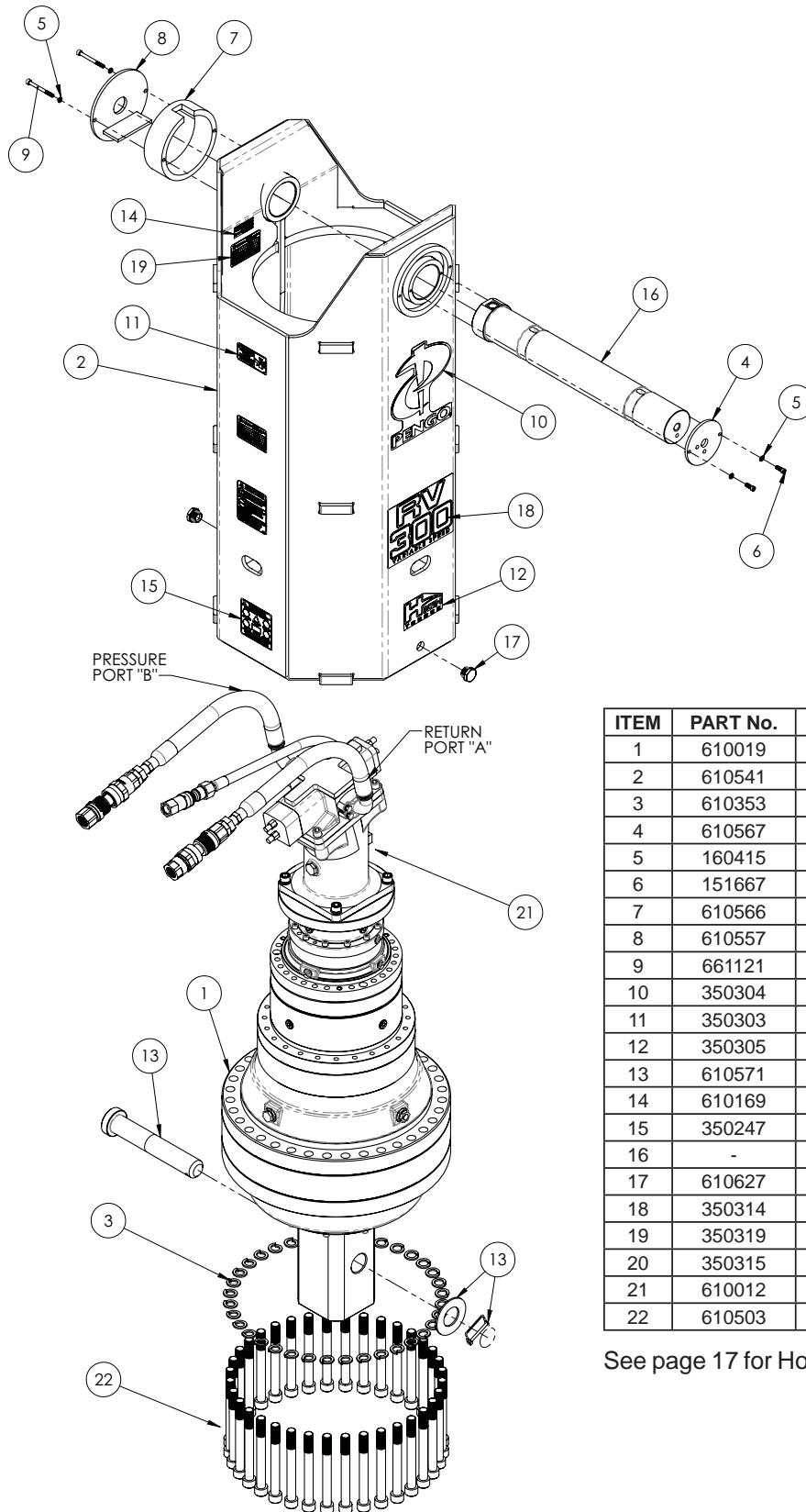
Please note modules will not be broken apart to supply an individual item within the module, the entire module must be purchased.

### \*WARRANTY NOTICE\*:

Any attempt to disassemble or make field repairs to the planetary gearbox will VOID the warranty. Please contact your dealer or distributor for further information.

**Please order replacement parts by PART NO. and DESCRIPTION.**

## RV-300 (610547) PARTS BREAKDOWN OPEN TOP BAIL CONFIGURATION



ITEM	PART No.	QTY	DESCRIPTION
1	610019	1	GEARBOX RV-300
2	610541	1	BAIL PAINTED OPEN TOP RV-200
3	610353	36	WASHER LOCK 27mm
4	610567	1	CAP PIN RETAINER PAINTED
5	160415	6	WASHER LOCK 3/8"
6	151667	4	SCREW HEX SOC HEAD 3/8" X 1"
7	610566	1	SLEEVE PAINTED
8	610557	1	CAP WELD ALIGN RV-300
9	661121	2	SCREW HEX SOC HEAD 3/8" X 4"
10	350304	2	DECAL PENG0 X-LARGE
11	350303	2	DECAL WARNING PINCH POINT
12	350305	2	DECAL HIGH TORQUE
13	610571	1	PIN ASSY 2-3/8" X 14"
14	610169	1	DECAL MODEL RV-200
15	350247	2	DECAL DANGER
16	-	-	PIN NOT INCLUDED
17	610627	2	PLUG 1"-11 BSP
18	350314	2	DECAL MODEL RV-300
19	350319	2	DECAL DRIVE SPEC RV-300
20	350315	2	DECAL CAUTION HYD
21	610012	1	MOTOR HYD EATON BAV-225
22	610503	36	SCREW HEX SOC M27 X 260mm

See page 17 for Hose and Fitting information.

Figure 13

## RV-300 GEARBOX (610019) PARTS LIST

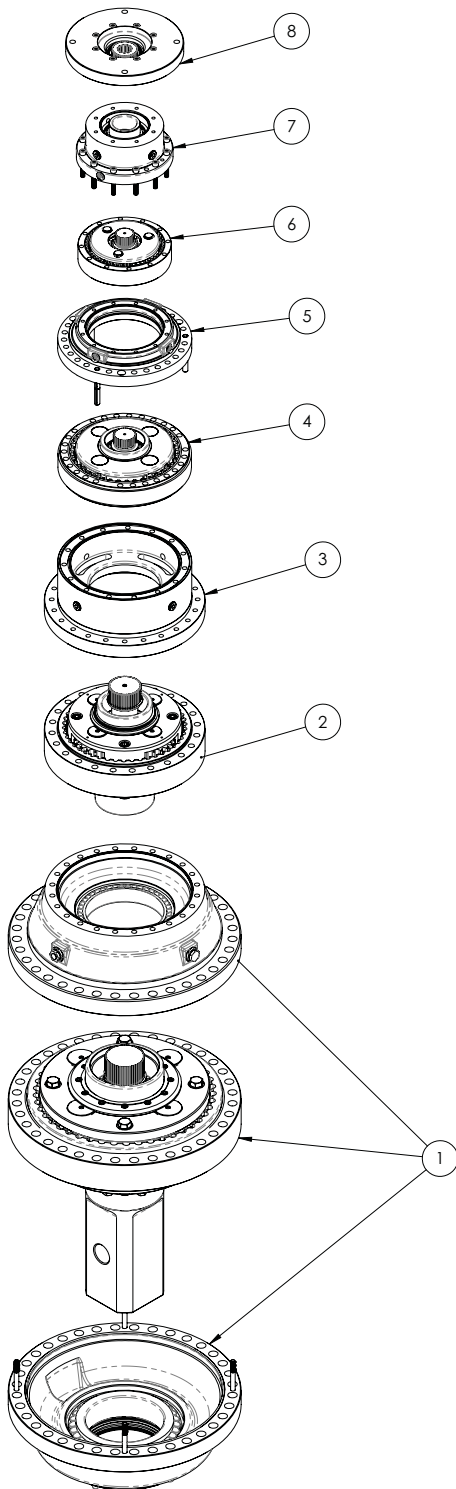


Figure 14

ITEM	PART No.	QTY	DESCRIPTION
1	610617	1	OUTPUT GB 26004 HRI 3.68
2	610533	1	GEARSET RE 8000 4.67
3	610534	1	INTERMEDIATE FLANGE RE 6520
4	610713	1	GEARSET RE 3000 4.00
5	610513	1	INTERM FLANGE RE 2520
6	610536	1	GEARSET RE 1020 5.82
7	610248	1	INPUT SUP RE 810 / 1020
8	610261	1	MOTOR INPUT
*	610615	1	SEAL KIT RV-300 GEARBOX

### GEARBOX REPLACEMENT PARTS

Replacement parts for the gearbox are sold in modules as indicated by the exploded view drawing. These modules are intended to provide quick and complete replacement. Each module will include all the parts necessary to complete the section, this include seals and o-rings. The seal kit which includes all seals and o-rings can be purchased separately.

Please note modules will not be broken apart to supply an individual item within the module, the entire module must be purchased.

### \*WARRANTY NOTICE\*:

Any attempt to disassemble or make field repairs to the planetary gearbox will VOID the warranty. Please contact your dealer or distributor for further information.

**Please order replacement parts by PART NO. and DESCRIPTION.**

## WARRANTY POLICY

### LIMITED WARRANTY

PENGO, warrants its products against faulty design, material, and workmanship for the periods listed below. The warranty starts on the delivery date to the retail owner and is non-transferable.

### WARRANTY PERIOD (Dating from the delivery to the original user)

Gearbox: 24 months or 500 operational hours, whichever occurs first.

Hyd. Motor: 12 months or 250 operational hours, whichever occurs first.

### WARRANTY SERVICE

All new PENGO products are warranted to be free from defects in material and workmanship, which may cause failure under normal usage and service when used for the purpose intended.

The PENGO warranty covers faulty workmanship and defective parts manufactured by PENGO. The warranty does not extend to transportation cost of parts nor does it cover consequential loss, damage to Hydraulic Hoses or ground engaging parts such as Sprockets, Digging Chain, Bearings and Teeth.

PENGO Equipment must be operated in accordance with the recommended procedures and within the ranges as specified both on the Unit and contained in the Operating Manual.

Any claims under this warranty must be made within fourteen (14) days after the buyer learns of the facts upon which claim is based. All claims not made in writing and not received by PENGO within the time specified above may be deemed waived. PENGO will not be responsible for or accept any charges for work carried out by any repairs, or for any charges for any spare parts fitted to any PENGO products without written approval from PENGO. PENGO's liability for any and all losses and damages to buyer resulting from any cause whatsoever, including PENGO negligence irrespective of whether such defects are discoverable or latent, shall in no event exceed the purchase price of the particular parts, with respect to which losses or damages are claimed, or, at the discretion of PENGO the repair or replacement of defective or damaged parts.

### VOID WARRANTY

This warranty is void if field repairs or modifications have been made to the motor, gearbox and or controls without written approval. The complete unit must be available for inspection in it's original but alleged failed condition. This warranty does not apply to normal wear or to damage resulting from accident, abnormal use, abuse or neglect.

### PRODUCT IMPROVEMENTS

Product improvement and modifications is an on going process at PENGO. PENGO reserves the right to make changes or additions to any product or to the warranty without incurring any obligations to make such changes available for previously sold products.

PENGO makes no other warranty. All other warranties, whether expressed or implied, such as warranties of merchantability or fitness for a particular purpose, are hereby excluded and disclaimed to the extent that they exceed the warranties expressly granted in this limited warranty. In no event shall PENGO be liable for consequential or incidental damages.

## RETURNED GOODS POLICY






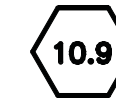
PENGO reserves the right to determine whether products claimed to be defective shall be inspected by our personnel in the field or returned to the factory. If judged by PENGO to be defective in material or workmanship, the product will be replaced or a credit issued at the option of Pengo.

Upon notification of defect, PENGO's Inside Sales Department will issue a Return Materials Authorization (RMA) number. All returns for replacement or credit **MUST** be accompanied by a RMA number. **Products returned without an RMA number will be rejected and returned to the sender freight collect.** All returns must be shipped "prepaid". Products shipped "collect" will be refused. Proof of purchase such as invoice number must accompany returns.

**All RMA's must be returned within 30 days of the request.**

## TORQUE CHART FOR COMMON BOLT SIZES

The chart below lists the correct tightening torque for fasteners. When bolts are to be tightened or replaced, refer to this chart to determine the grade of the bolt and the proper torque. Except when specific torque values are list in a particular application.

													
Bolt Size (In)	Grade 2		Grade 5		Grade 8		Bolt Size (mm)	Class 5.8		Class 8.8		Class 10.9	
tpi	Nm	Ft-Lbs	Nm	Ft-Lbs	Nm	Ft-Lbs	mm x	Nm	Ft-Lbs	Nm	Ft-Lbs	Nm	Ft-Lbs
1/4"-20	7.4	5.6	11	8	16	12	M5 X 0.8	4	3	6	5	9	7
1/4"-28	8.5	6	13	10	18	14	M6 X 1	7	5	11	8	15	11
5/16"-18	15	11	24	17	33	25	M8 X 1.25	17	12	26	19	36	27
5/16"-24	17	13	26	19	37	27	M8 X 1	18	13	28	21	39	29
3/8"-16	27	20	42	31	59	44	M10 X 1.5	33	24	52	39	72	53
3/8"-24	31	22	47	35	67	49	M10 X 0.75	39	29	61	45	85	62
7/16"-14	43	32	67	49	95	70	M12 X 1.75	58	42	91	67	125	93
7/16"-20	49	36	75	55	105	78	M12 X 1.5	60	44	95	70	130	97
1/2"-13	66	49	105	76	145	105	M12 X 1	90	66	105	77	145	105
1/2"-20	75	55	115	85	165	120	M14 X 2	92	68	145	105	200	150
9/16"-12	95	70	150	110	210	155	M14 X 1.5	99	73	155	115	215	160
9/16"-18	105	79	165	120	235	170	M16 X 2	145	105	225	165	315	230
5/8"-11	130	97	205	150	285	210	M16 X 1.5	155	115	240	180	335	245
5/8"-18	150	110	230	170	325	240	M18 X 2.5	195	145	310	230	405	300
3/4"-10	235	170	360	265	510	375	M18 X 1.5	220	165	350	260	485	355
3/4"-16	260	190	405	295	570	420	M20 X 2.5	280	205	440	325	610	450
7/8"-9	225	165	585	430	820	605	M20 X 1.5	310	230	650	480	900	665
7/8"-14	250	185	640	475	905	670	M24 X 3	480	355	760	560	1050	780
1"-8	340	250	875	645	1230	910	M24 X 2	525	390	830	610	1150	845
1"-12	370	275	955	705	1350	995	M30 X 3.5	960	705	1510	1120	2100	1550
1-1/8"-7	480	355	1080	795	1750	1290	M30 X 2	1060	785	1680	1240	2320	1710
1-1/8"-12	540	395	1210	890	1960	1440	M36 X 3.5	1730	1270	2650	1950	3660	2700
1-1/4"-7	680	500	1520	1120	2460	1820	M36 X 2	1880	1380	2960	2190	4100	3220
1-1/4"-12	750	555	1680	1240	2730	2010							
1-3/8"-6	890	655	1990	1470	3230	2380							
1-3/8"-12	1010	745	2270	1670	3680	2710							
1-1/2"-6	1180	870	2640	1950	4290	3160							
1-1/2"-12	1330	980	2970	2190	4820	3560							

tpi = Nominal thread diameter in inches per inch.

Nm = Newton Meters.

Ft-Lbs = Foot Pounds

mm x = Nominal thread diameter in millimeters x thread pitch.



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