CORVAER

Service and Parts Manual
PL92-5013EN
10/06/2017

A2 Series
Advanced Drilling

Inline

Right Angle

Contents

Contents

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Ferrière

For this Instruction Manual:

The original language of this manual is English. This Instruction Manual is intended for all persons who will operate and maintain this equipment.

This instruction manual has the following purposes:

- It provides important instructions for safe and effective operation.
- It describes the function and operation of this equipment.
- It serves as a reference guide for technical data, service intervals, and spare parts ordering.
- It provides information regarding accessories and optional equipment.

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1 Product Safety:

Warnings and notes

Warning notes are identified by a signal word and a pictogram.

The signal word indicates the severity and probability fo the impending danger.

The pictogram indicates the type of danger.

WARNING!

Indicates a potentially hazardous situation for personal health and safety. If this warning is not observed, death or serious injury may occur.

CAUTION!

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property and environmental damage.

GENERAL NOTE identifies information that may include application tips but no hazardous situations.

Intended Use:

This positive feed drill is designed for fixtured drilling applications.

WARNING!

This equipment must not be modified in any manner unless approved in writing by Corvaer or Corvaer S.A.S.
All safety devices must be properly installed and maintained in good working order.

Any abuse or misuse of this equipment can cause equipment damage, death, or serious injury.

Failure to observe all safety warnings could result in equipment failure or personnel injury.

General Safety Instructions:

For additional product safety information refer to Corvaer or Corvaer S.A.S. document
CE-2009, General Safety Fixtured Drills.

These safety instructions must be accessible to the operator at all times. They must be shown and made available to all personnel involved in the operation of this equipment.

The operator must read and understand the safety instructions contained in this document before operating this equipment.

These safety instructions are not intended to be all inclusive. Study and comply with all applicable Federal, State and local regulations.

Do not remove any labels from this equipment. Replace any label that has been damaged and can not be easily read.

WARNING!

To avoid serious injury, keep hands free from rotating equipment.

Before operating this equipment, coordinate with your workplace safety professional to conduct a hazard assessment of the setup, operation, emergency shut down, start-up, and maintenance of this equipment prior to use. Always use identified safeguards, tooling, and safety procedures identified in the hazard assessment before operating this tool.

Product Installation:

WARNING!

Only qualified and trained personnel should install, adjust, repair or use this equipment.

Do not exceed equipment ratings.

Never attempt to operate this equipment at more than it's rated capacity. Overloading will cause equipment failure and possible personnel injury.

Air Supply:

The positive feed drill A2 type has been designed to be used at 89.9 to 108.8 psi (6.2 to 7.5 bar) dynamic air pressure and a flow rate of 60 cfm (1700 L/min).

In order to get a correct automatic cycle and a maximum output, the minimum dynamic air pressure must not be lower than 89.9 psi (6.2 bar). The minimum inside diameter of the air supply hose must be 7/16" (11mm) to allow sufficient air flow.

CAUTION!

DO NOT LUBRICATE THE TURBINE MOTOR. LUBRICATING THE TURBINE MOTOR WILL CAUSE DAMAGE.

The compressed air must be clean and dry to maintain proper tool performance. Install a filter-regulator-lubricator in the air supply line. Improper lubrication can affect the performance and life of the equipment.

Install the filter-regulator-lubricator at the same height or higher than the work station and a maximum hose length of 16 feet.

Compressed air quality according to ISO 8573-1: 2010 [2:4:3]:

Recommended oil (rotary vane motors only):

Airlube 533485 (1 US Gallon / 3L)
Airlube 540397 (1 US Quart / 0.9L)

Adjust the inline lubricator to dispense 2 drops of oil per minute at nominal flow.

Recommended grease (gear head and planetary):

Accrolube® High Efficiency Grease with PTFE (manufactured by Accro-Seal)

Any deviation of these instructions could generate abnormal operation on drill cycle of the tool, for which the manufacturer cannot be held responsible.

Product Operation:

Safety glasses or a face shield must be worn when operating this equipment. Wear hearing protection and other protective equipment, as required by the work environment and drilling application.

WARNING!

If the work environment or drilling application requires the use of protective gloves, avoid contact with the rotating parts of the tool.

Do not wear loose clothing, jewelry or rings and keep long hair away from the tool. Avoid direct skin contact with lubricants, grease or adhesives.

Make certain all personnel in the immediate area of the drilling operation are equipped with appropriate personal protective equipment before operating the tool.

WARNING!

Operating Safety Considerations:

- Do not remove any labels and replace any that are damaged or unreadable.
- Do not use this equipment in an explosive environment.
- Disconnect the air supply before performing any service or cutter changes.
- Make sure the air supply line is securely attached to the tool before operating.
- Keep hands away from the ejecting area near the nose unit.
- Use care when handling the sharp cutters.
- Keep clear of all moving parts during the tool's operating cycle.
- Before starting the drilling cycle, make sure the nose piece is securely mounted.

- Before starting the tool, make sure the “STOP” button is working properly.
- Before operating this equipment, run one non-cutting work test cycle.

Storage Instructions:

This equipment should be stored at temperatures of +40° - +100° F (4° - 38°C) with a maximum relative humidity of 80%.

Note: The electronic cycle counter option contains a battery.

Disposal:

Observe all local disposal guidelines for all components of this equipment and its packaging.

Wasted batteries must be disposed of. Return defective batteries to your company or local collection facility for disposal.

Safety Maintenance Checklist:

Implement a comprehensive safety maintenance program to provide regular inspection for all phases of tool operation and air supply equipment.

Replace worn or damaged parts using only genuine brand replacement parts manufactured by Corvaer or Corvaer S.A.S. The use of parts
other than those provided by the manufacturer may result in a drop in output or increased maintenance and may cancel the manufacturer’s warranty.

Never lubricate the tool with flammable or volatile liquid, gazoil, aircraft fuel, etc.

Disconnect the air supply before performing any maintenance on this equipment.

Daily:

- Visual inspection of air supply hose and connections.
- If lubrication is used, check the oil tank level and operation.
- Inspect all external tool components.
- Inspect the cutter for cracks or damage.
- Make sure lock screws and drill bushing are securely mounted.
- Inspect the tool for loose fasteners.
- Check the tool for excessive noise or vibration.

Weekly:

- Inspect the air supply hose for damage.
- Make sure the air inlet connection is securely tightened.
- Check the free speed of the tool.
- Make sure all tool fasteners are properly tightened.
- Inspect any guards (if equipped) for damage.

6 Months or sooner if needed:

- Check individual parts and replace as necessary.
- Replace all o-rings, seals and gaskets.

Only qualified and trained personnel should repair this equipment. Refer to the Sales and Service Center listing on the back of this document for authorized Corvaer or Corvaer S.A.S. repair facilities.

2 Product Specifications:

Tool thrust: 400 lbs. at 90psi/6.3bar dynamic air supply.

A2 Turbine Series Base Tool Options												
Base Tool						Standard Option		Rated Speeds -0/+20%			Feeds	
Code	Base Weight		Noise	Configuration		Code	Configuration	Turbine	Planetary Ratio	Number of Stages	ipr	mm/rev
	lbs.	kg										
A24T	5.2	2.4	<=82dBA	Right Angle	Turbine	M	Internal Mitis	5400 *	3.00	1	0.001	0.025
A26T	5.0	2.3	<=82dBA	In Line	Turbine		F3 - 1.5 times per rev.	4400	3.67	1	0.002	0.050
							F5 - 2.5 times per rev.	4000	4.00	1	0.003	0.080
							Amplitudes (mm)	3400	4.75	1	0.004	0.100
							0.10	2700	6.00	1	0.006	0.150
							0.15	1800 *	9.00	2	0.007	0.180
							0.20	1200	13.50	2	0.008	0.200
							0.25	1000	16.00	2	0.010	0.250
							0.30	850	19.00	2		
								700	22.56	2		
								650	24.00	2		
								550	28.50	2		
								450	36.00	2		

Turbine maximum spindle power: 2.2hp at 90psi/6.3bar dynamic air supply.

* Note: Available September 2016

Tool thrust: 400 lbs. at 90psi/6.3bar dynamic air supply.

A2 Vane * Motor Series Base Tool Options													
Base Tool						Standard Option		Rated Speeds -10/+10%				Feeds	
Code	Base Weight		Noise	Configuration		Code	Configuration	Vane	Motor Speed	Planetary Ratio	Number of Stages	ipr	mm/rev
	lbs.	kg											
A24V	5.5	2.5	<=82dBA	Right Angle	Vane	M	Internal Mitis	5,200	12,000	3.00	1	0.001	0.025
A26V	5.3	2.4	<=82dBA	In Line	Vane		F3 - 1.5 times per rev.	4,500	10,500	3.00	1	0.002	0.050
							F5 - 2.5 times per rev.	4,200	12,000	3.67	1	0.003	0.080
							Amplitudes (mm)	3,900	12,000	4.00	1	0.004	0.100
							0.10	3,700	10,500	3.67	1	0.006	0.150
							0.15	3,300	12,000	4.75	1	0.007	0.180
							0.20	2,900	10,500	4.75	1	0.008	0.200
							0.25	2,600	12,000	6.00	1	0.010	0.250
							0.30	2,300	10,500	6.00	1		
								1,700	12,000	9.00	2		
								1,500	10,500	9.00	2		
								1,150	12,000	13.50	2		
								1,000	12,000	16.00	2		
								800	12,000	19.00	2		
								700	12,000	22.56	2		
								650	12,000	24.00	2		
								600	10,500	22.56	2		
								550	12,000	28.50	2		
								500	6,000	16.00	2		
								430	12,000	36.00	2		
								400	6,000	19.00	2		
								350	6,000	22.56	2		
								325	6,000	24.00	2		
								275	6,000	28.50	2		
								220	6,000	3600	2		

Vane maximum spindle power: 1.4hp at 90psi/6.3bar dynamic air supply.

* Note: Available September 2016

Product Description:

This portable, pneumatic powered machine is designed for drilling, boring or milling in aerospace manufacturing applications. This machine consists of the following components:

- Power supply assembly
- Geared motor unit
- Gear unit assembly for rotation and feed
- Logic components
- Valve
- Spindle screw
- Cutting tool
- Nosepiece
- Various options

3 Maintenance:

General Notes:

Note: Intervals between inspection depend on a number of operation and use factors, most significant of which are:

- the operation frequency of the tool
- number of drilling cycles per use
- drilling torque and thrust required
- cycle time in use
- cleanliness of operation - lubricant/chip cleanup
- quality of air supply

The following recommendations are initial guidelines and should be adapted according to the tool utilization.

For additional information or guidance please contact your local Corvaer representative.

Recommended Minimum Service Intervals *

Calendar Time	Cycles	Run Time/hrs	Action
Daily **	NA	NA	Ensure tool is cleaned - all chips/debris removed
			Visually Inspect air supply hose, all pneumatic connections
			Inspect airline filter, regulator and lubricator for proper lubrication
			Check Air Supply Pressure (90psi dynamic)
			Check spindle stop nuts are securely mounted
			Check all guards are fitted
			Check the tool for excessive vibration/unusual noise
			Visual inspect all external components - Especially inder if fitted for wear
			Check Tool Function - Emergency Stop/Start/Manual Retract/Automatic Retract
			Perform test drill before each shift
3 Months	100,000	500	Check Motor Speed - If Low Clean Inlet Screen and Clean or Change Muffler then check/replace Motor Blades as necessary
			Check for External Air Leaks - Replace O Rings as necessary
			Inspect Fluid Inducer End Seal/Tube for wear/leaks - replace if necessary
			Apply grease to Gear Head
			Check operation of Lubricator
			Check thrust overload setting
6 Months	200,000	2,500	Inspect All O Rings/Seals - Replace as necessary
			Check spindle for wear on threads
1 Year	300,000	7,500	Replace All Bearings/Inspect Gears - refer to spare parts manualfor guidelines
			Check All springs

* Recommended Service Interval is based on 3 possible factors - Calendar Time, Run Time or Run Cycles - the number achieved first should be used to set maintenance schedule

** Alternatively Before or After Each Shift

MITIS™ Service Intervals				
Feed Rate		**Stroke Basis (S)**		**Recommended Service Interval (C)**
IPR	**mm/rev**	**inches**	**mm**	**Number of Cycles**
0.001	0.03	1	25.4	333
0.002	0.05	1	25.4	667
0.003	0.08	1	25.4	1,000
0.004	0.10	1	25.4	1,333
0.005	0.13	1	25.4	1,667
0.006	0.15	1	25.4	2,000
0.007	0.18	1	25.4	2,333
0.008	0.20	1	25.4	2,667
0.009	0.23	1	25.4	3,000
0.010	0.25	1	25.4	3,333

To calculate a User Specific Service interval based on actual stroke.

$$\text{Service Interval (Cycles)} = \frac{\text{Actual Stroke}}{\text{Stroke Basis (S)}} \times \text{Recommended Service Intervals (C)}$$

Note: To service MITIS, access the MITIS components. Remove and inspect for wear and replace as necessary. Reassemble and grease.

4 Service Parts:

Illustration 1: A2 Components

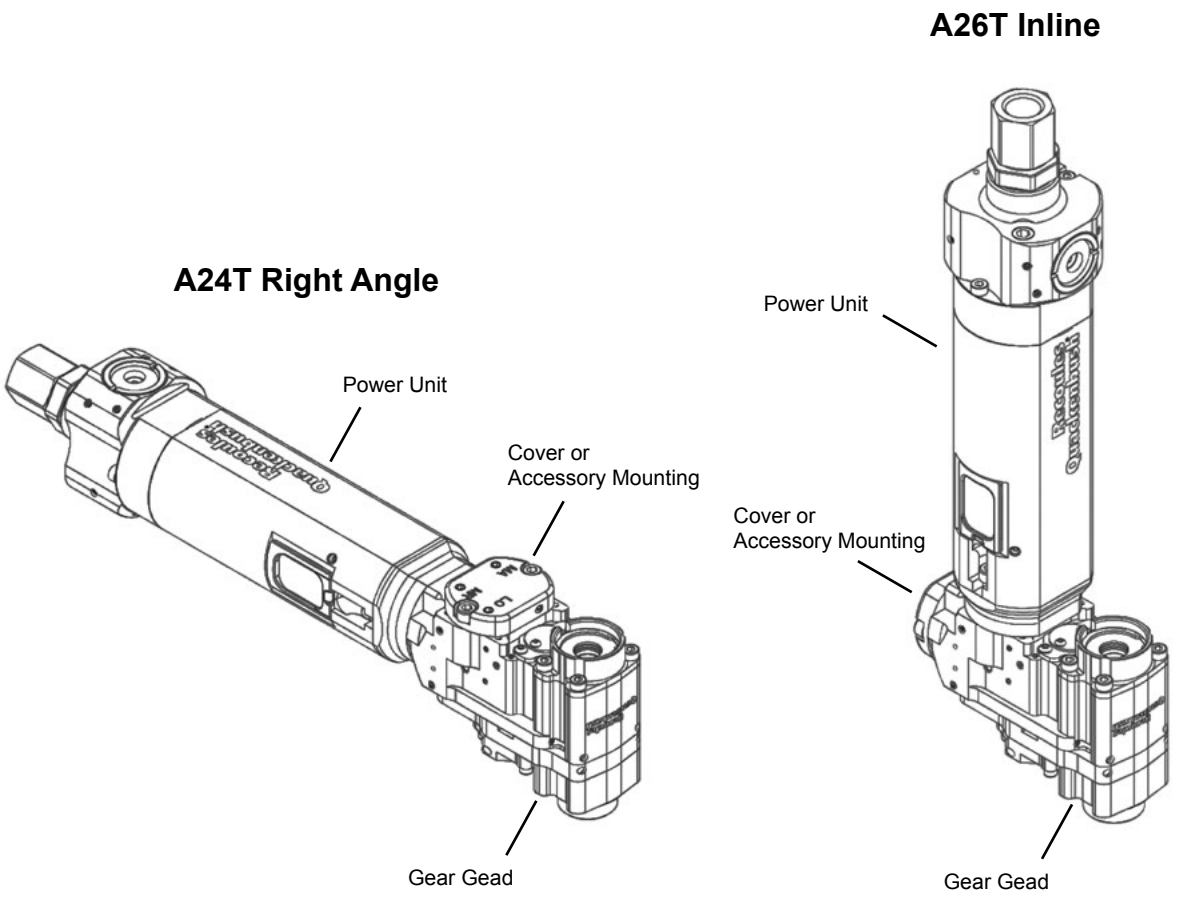


Illustration 2: 642659PT-XX Power Unit Overview

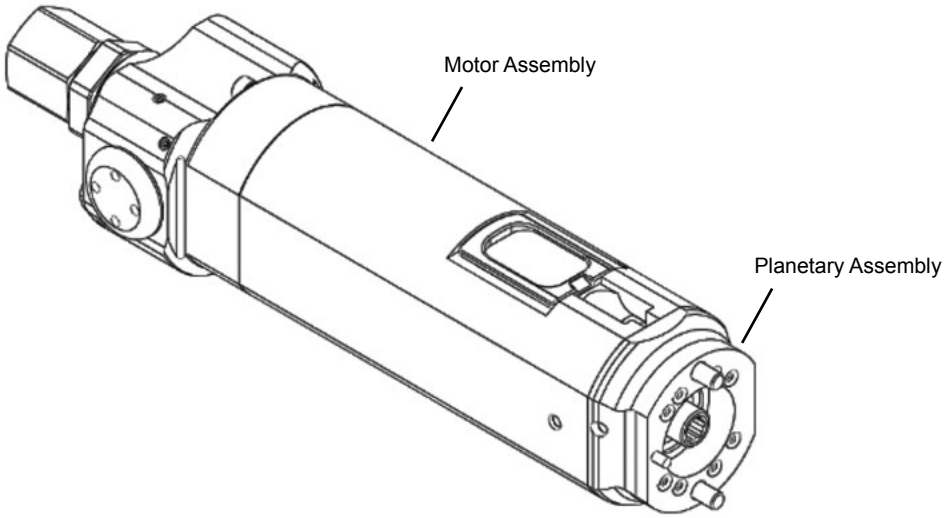


Illustration 2: 642659PT-XX Power Unit Overview

EN			
Power Unit	**Planetary**	**Planetary Description**	**Motor**
642659PT-1	642457PT	Single Stage - 3.67 Ratio	642510PT
642659PT-2	642456PT	Single Stage - 4.00 Ratio	642510PT
642659PT-3	642455PT	Single Stage - 4.76 Ratio	642510PT
642659PT-4	642454PT	Single Stage - 6.00 Ratio	642510PT
642659PT-5	642458PT	Double Stage - 13.50 Ratio	642510PT
642659PT-6	642459PT	Double Stage - 16.00 Ratio	642510PT
642659PT-7	642642PT	Double Stage - 19.00 Ratio	642510PT
642659PT-8	642460PT	Double Stage - 22.56 Ratio	642510PT
642659PT-9	642643PT	Double Stage - 24.00 Ratio	642510PT
642659PT-10	642644PT	Double Stage - 28.50 Ratio	642510PT
642659PT-11	642461PT	Double Stage - 36.00 Ratio	642510PT
642659PT-12	642670PT	Double Stage - 9.00 Ratio	642510PT
642659PT-13	642669PT	Single Stage - 3.00 Ratio	642510PT

Service Parts

Illustration 3: Turbine Motor Module

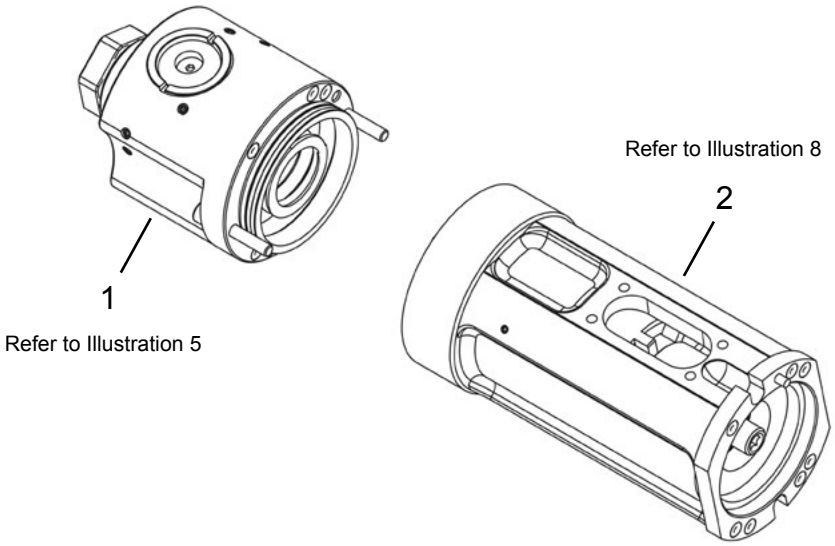


Illustration 4: 642687PT-X Rotary Vane Motor Module

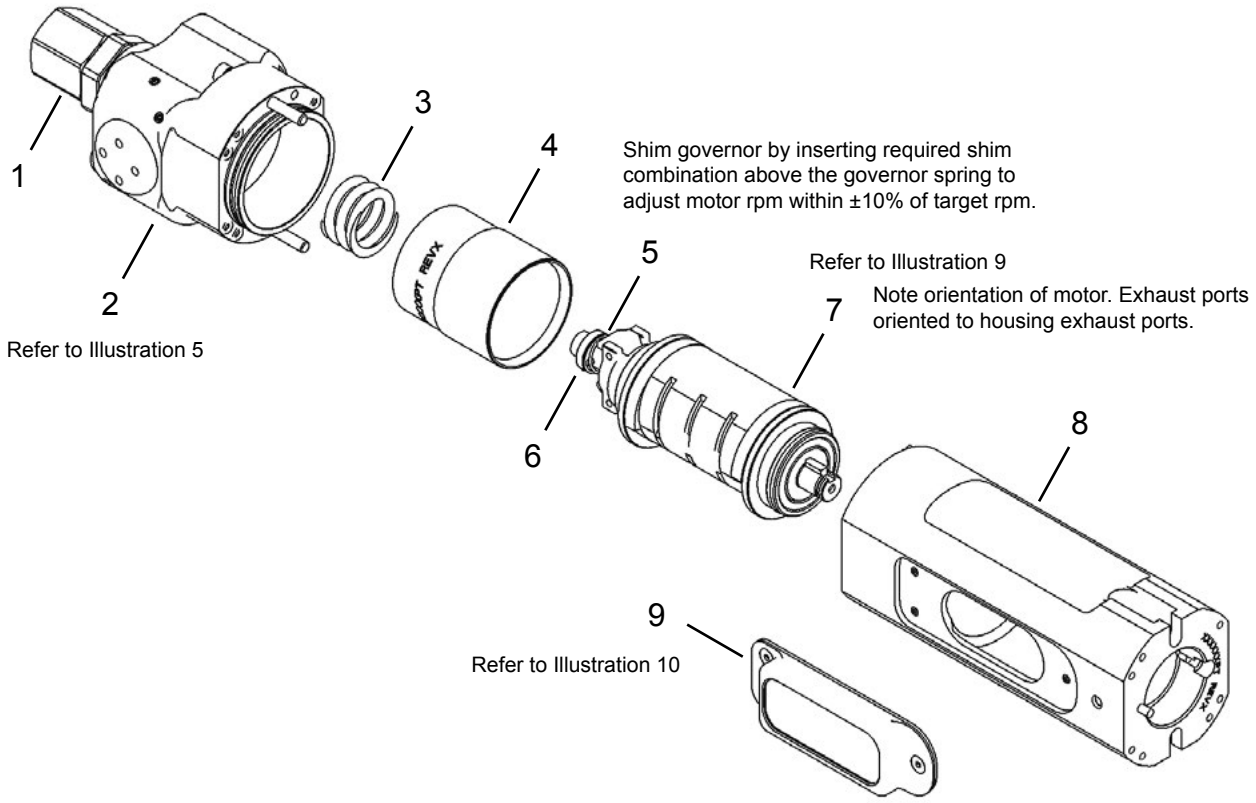


Illustration 3: Turbine Motor Module

Ref	Number	#	X	EN Description
1	642513PT	1		Safety Valve Assembly (Refer to Illustration 5)
2	642510PT	1		Motor Assembly (Refer to Illustration 8)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 4: 642687PT-X Rotary Vane Motor Module

Ref	Number	#	X	EN Description
1	635225PT	1	1	Inlet Adapter
2	642513PT	1		Safety Body Assembly (Refer to Illustration 5)
3	203575	1	1	Torque Spring (White)
4	635204PT	1		Governor Housing
5	Table "4A"	AR	AR	Governor Shim
6	Table "4B"	1	3	Compression Spring
7	642689PT	1		Rotary Vane Motor Assembly (Refer to Illustration 9)
8	642688PT	1		Motor Housing
9	642690PT	1		Muffler Assembly (Refer to Illustration 10)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

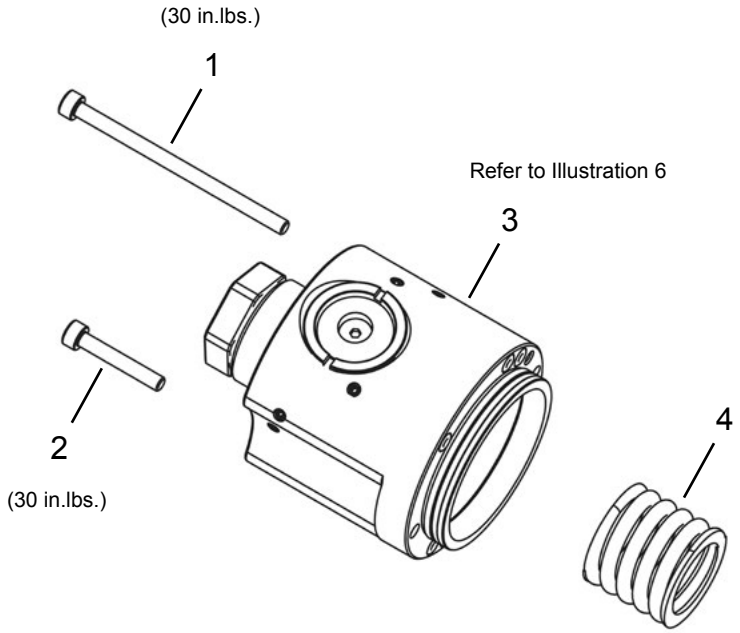
Table 4A

Single Shim Part Number	Single Shim Stack (mm)	Shim Pack Height (mm)
635229PT-1	0.2	0.2
635229PT-2	0.3	0.3
635229PT-1 + 635229PT-1	0.2 + 0.2	0.4
635229PT-2 + 635229PT-1	0.3 + 0.2	0.5
635229PT-2 + 635229PT-2	0.3 + 0.3	0.6
635229PT-3 + 635229PT-1	0.5 + 0.2	0.7
635229PT-3 + 635229PT-2	0.5 + 0.3	0.8
635229PT-3 + 635229PT-1 + 635229PT-1	0.5 + 0.2 + 0.2	0.9
635229PT-3 + 635229PT-3	0.5 + 0.5	1.0
635229PT-3 + 635229PT-2 + 635229PT-2	0.5 + 0.3 + 0.3	1.1
635229PT-3 + 635229PT-3 + 635229PT-1	0.5 + 0.5 + 0.2	1.2
635229PT-3 + 635229PT-3 + 635229PT-2	0.5 + 0.5 + 0.3	1.3
635229PT-3 + 635229PT-3 + 635229PT-1 + 635229PT-1	0.5 + 0.5 + 0.2 + 0.2	1.4
635229PT-3 + 635229PT-3 + 635229PT-2 + 635229PT-1	0.5 + 0.5 + 0.3 + 0.2	1.5
635229PT-3 + 635229PT-3 + 635229PT-2 + 635229PT-2	0.5 + 0.5 + 0.3 + 0.3	1.6

Table 4B

Ref.	Description	Motor Module Number					
		#	642687PT-1	#	642687PT-2	#	642687PT-3
			6,000 rpm		10,500 rpm		12,000 rpm
6	Compression Spring	1	635201PT-1	1	635201PT-2	1	635201PT-3

Illustration 5: 642513PT Safety Valve Assembly



WARNING!

The Safety Valve assembly is under spring load, remove carefully. The correct length screw must be used to allow spring tension release without the screws becoming detached from the motor housing.

Illustration 5: 642513PT Safety Valve Assembly

Ref	Number	#	X	EN Description
1	94234213	1		Socket Head Cap Screw (M4 x 65mm)
2	542940-42	1		Socket Head Cap Screw (M4 x 35mm)
3	----------	1		Safety Body Assembly (Refer to Illustration 6)
4	634587PT	1	1	Compression Spring

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Service Parts

Illustration 6: 642513PT Safety Body Assembly

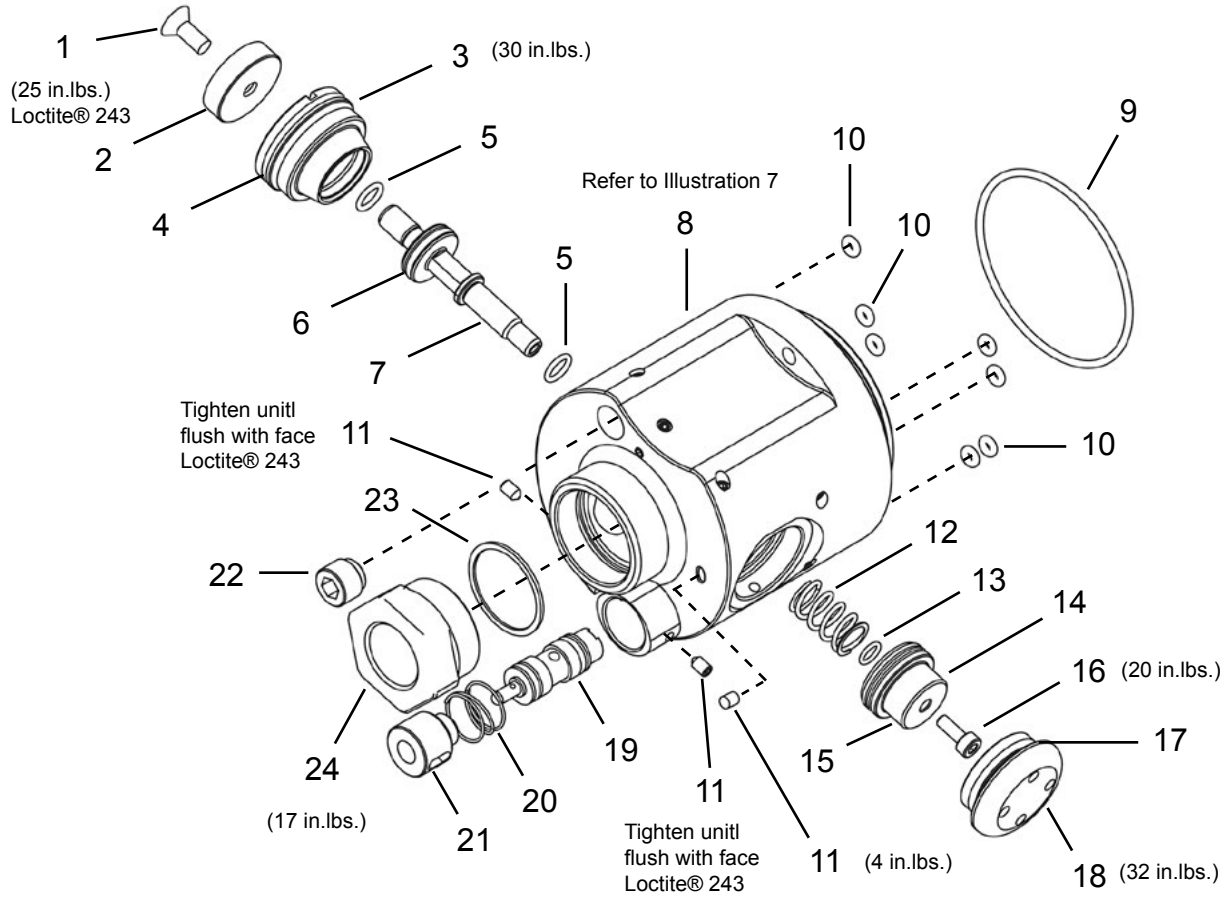


Illustration 7: 635045PT Safety Body Assembly

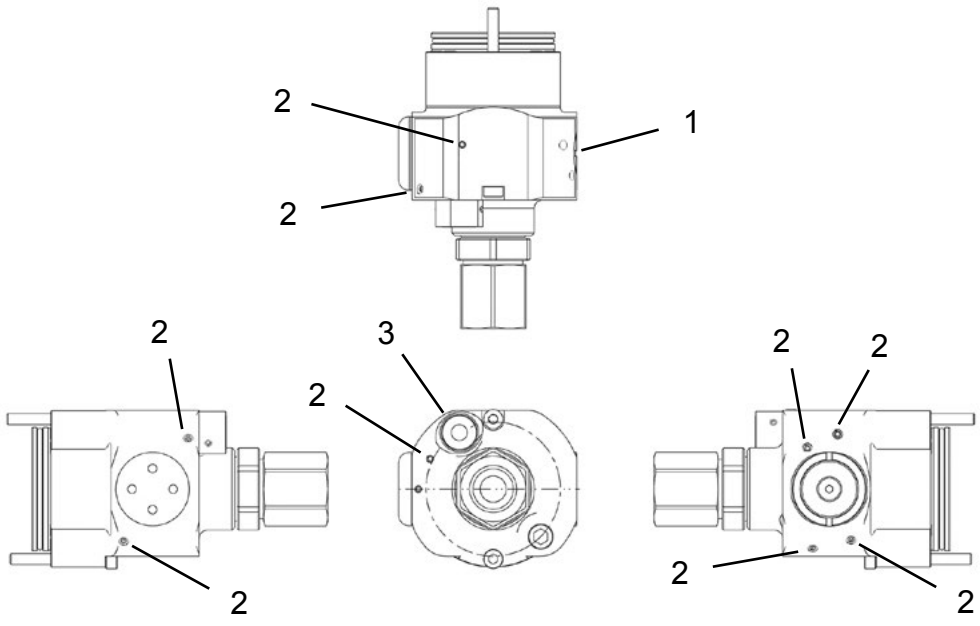


Illustration 6: 642513PT Safety Body Assembly

Ref	Number	#	X	EN Description
1	542940-25	1	1	Flat Head Screw (M4 x 0.7 x 8mm)
2	634640PT	1		Emergency Stop Button
3	90225692PT	1		Safety Valve Guide
4	91815721PT	1	3	O-Ring
5	91815155	2	6	O-Ring
6	91815351PT	1	3	O-Ring
7	93815041PT	1		Slide Valve
8	635045PT	1		Safety Body (Refer to Illustration 7)
9	1012614	1	3	O-Ring
10	91815042	7	21	O-Ring
11	94221100	3		Set Screw
12	93430952PT	1	3	Compression Spring
13	91815104	1	3	O-Ring
14	90231106	1	3	O-Ring
15	93050111PT	1		Piston
16	94234140	1		Socket Head Cap Screw (M3 x 8mm)
17	91815677	1	3	O-Ring
18	90225691PT	1		Safety Valve Cap
19	531226	1		Poppet Valve
20	634645PT	1	3	Compression Spring
21	642384PT	1		Start Button
22	90255216	1		Plug (Assemble flush to surface)
23	93800005	1	3	Screen
24	90810863PT	1		Inlet Adapter

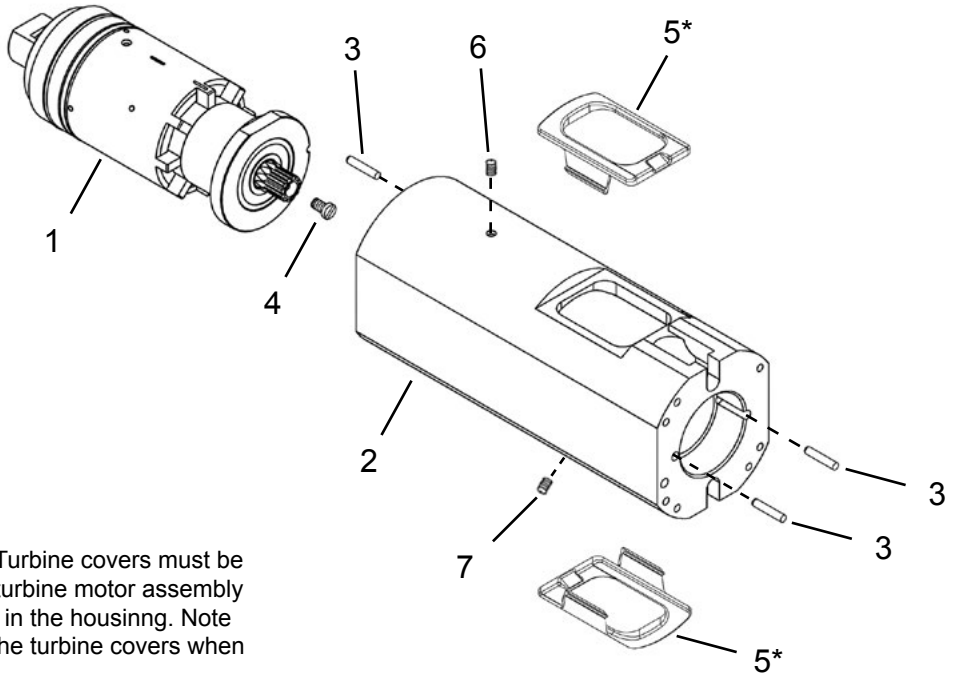
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 7: 635045PT Safety Body Assembly

Ref	Number	#	X	EN Description
1	635045PT	1		Safety Body
2	634323PT	9	9	Set Screw (M3 x 3mm)
3	634642PT	1		Differential Piston

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 8: 642510PT Turbine Motor Assembly



* Assembly Note: Turbine covers must be installed after the turbine motor assembly has been installed in the housinng. Note the orientation of the turbine covers when installed.

Illustration 9: 642689PT Vane Motor Assembly

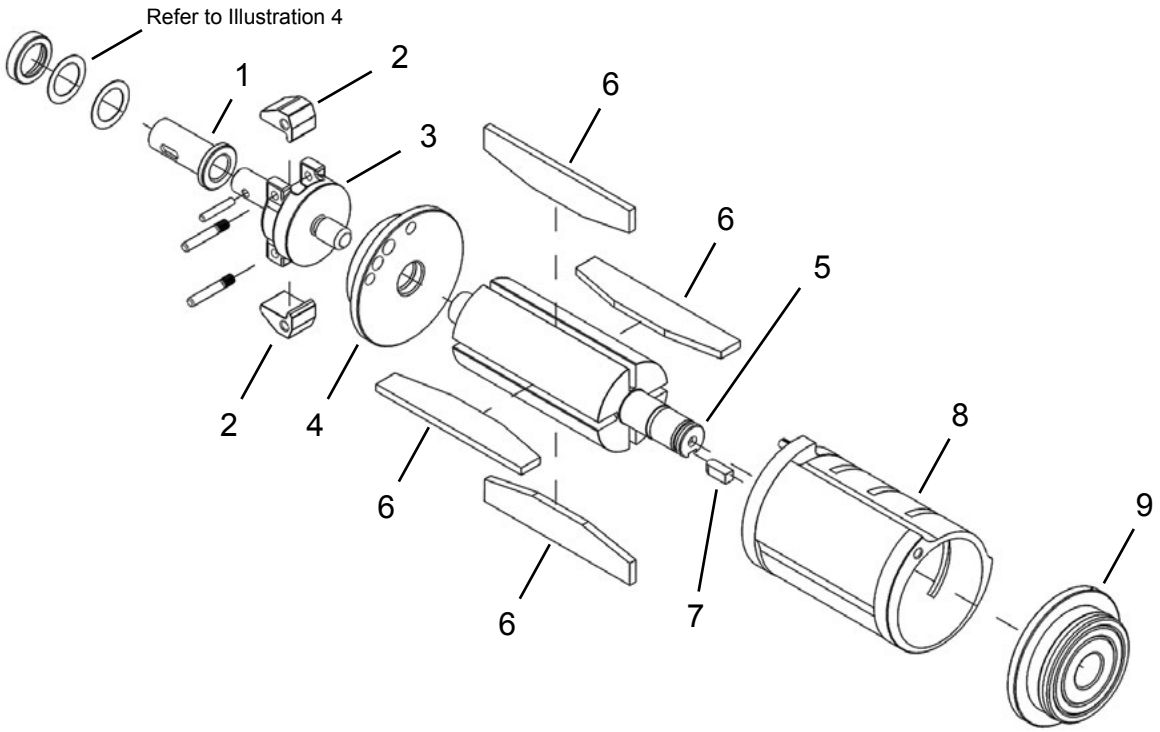


Illustration 8: 642510PT Turbine Motor Assembly

Ref	Number	#	X	EN Description
1	642492PT	1		Turbine Motor Assembly
2	642511PT	1		Turbine Motor Housing (Includes Ref. 3)
3	634339PT	3	3	Dowel Pin (3mm x 10mm)
4	864964	1	2	Grease Fitting
5	635057PT	2		Turbine Cover
6	635058PT	1	2	Set Screw (M3 x 6mm)
7	635059PT	1	2	Set Screw (M4 x 5mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 9: 642689PT Vane Motor Assembly

Ref	Number	#	X	EN Description
1	635244PT	1		Governor Valve
2	635243PT	2		Governor Weight
3	635242PT	1		Governor Body
4	207992PT	1		Rear End Plate
5	207997PT	1		Rotor
6	207988PT	4	12	Rotor Blade
7	635205PT	1	3	Rotor Key
8	207995PT	1		Cylinder (Includes Ref. 9)
9	208021PT	1		Front End Plate

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 10: 642690PT Vane Muffler Assembly

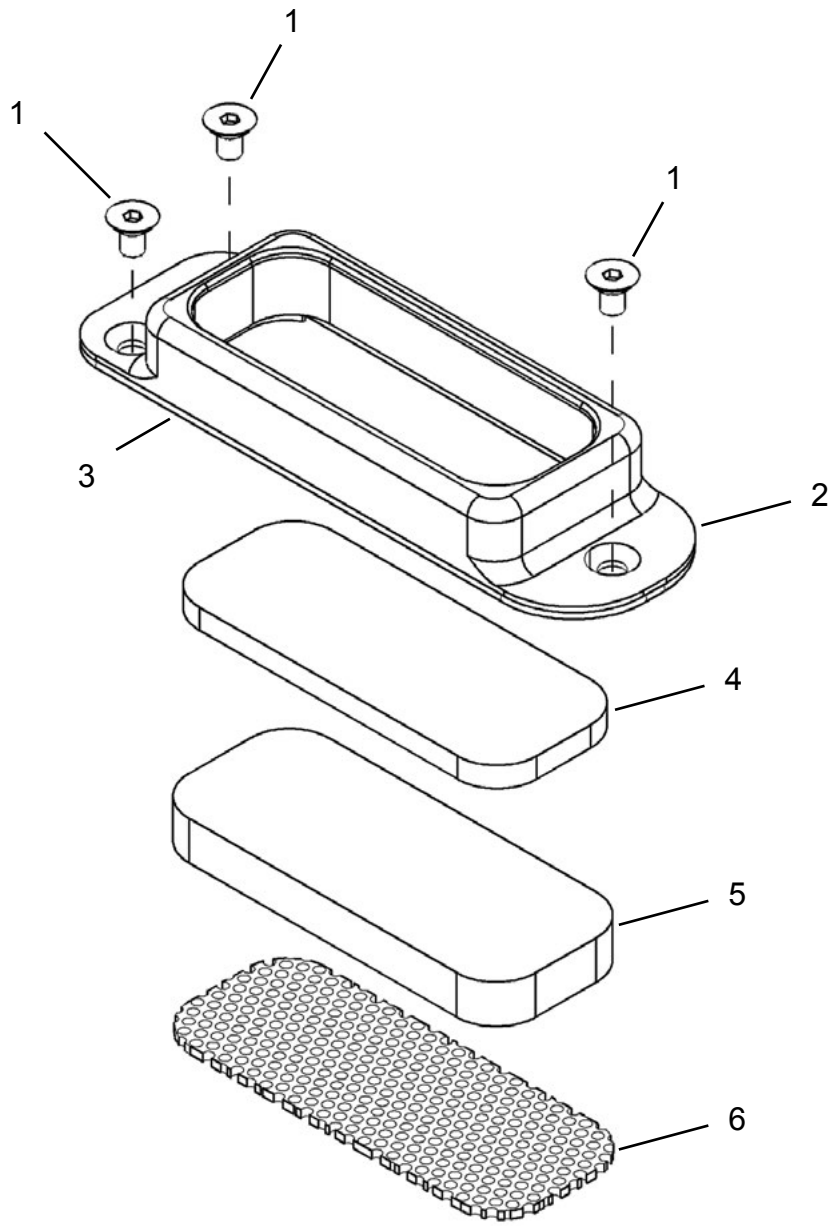


Illustration 10: 642690PT Vane Muffler Assembly

Ref	Number	#	X	EN Description
1	542940-62	3	6	Flat Head Screw (M3 x 5mm)
2	635206PT	1		Muffler Housing
3	867745	1	3	O-Ring (Muffler Housing)
4	635207PT	1	2	Muffler Diffuser
5	635208PT	1	2	Muffler Pad
6	635209PT	1	2	Muffler Element

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 11: 642669PT Single Stage Gearing (Gear Ratio 3.00)

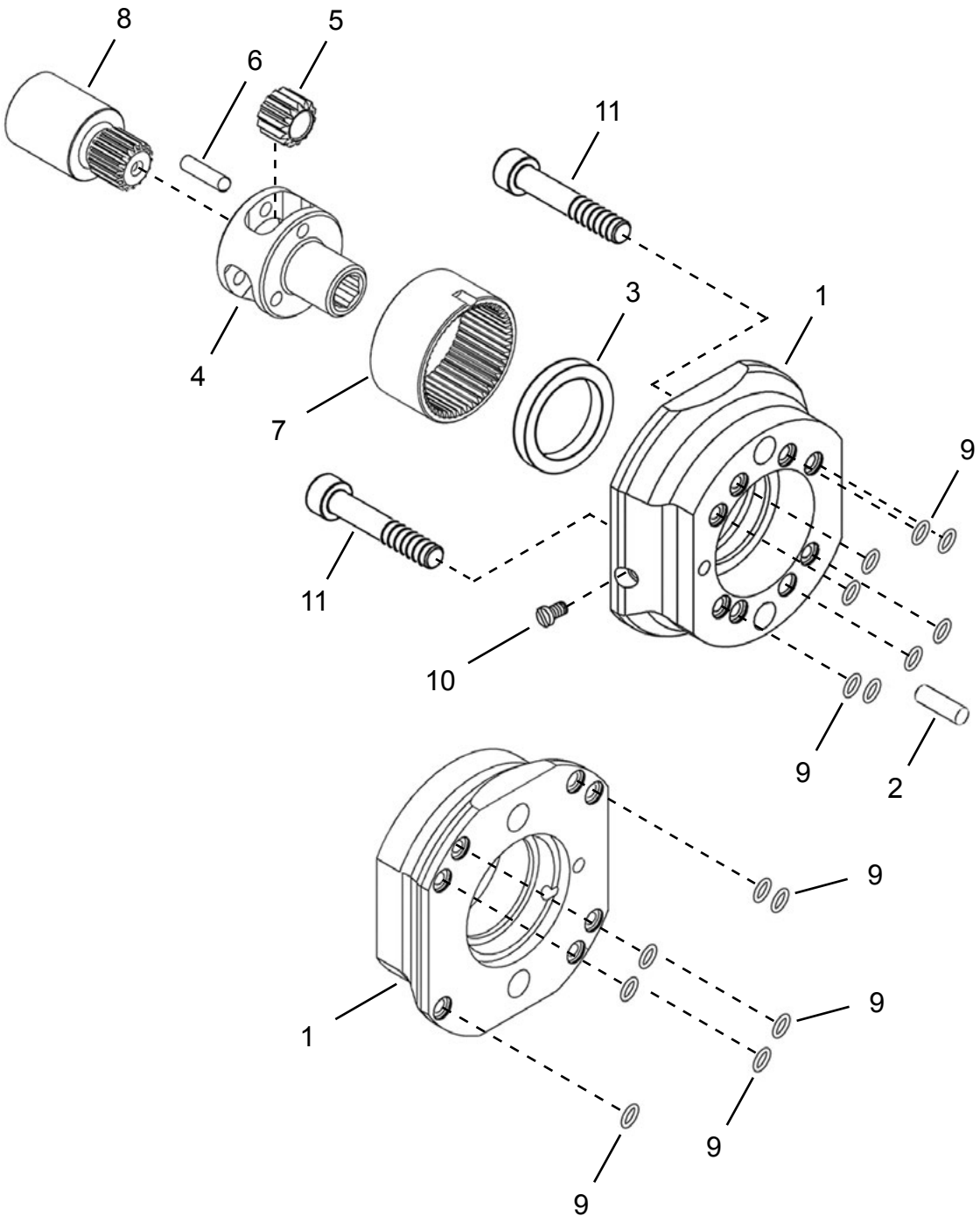


Illustration 11: 642669PT Single Stage Gearing (Gear Ratio 3.00)

Ref	Number	#	X	EN Description
1	634738PT	1		Planetary Gear Housing
2	634339PT	1	2	Dowel Pin (3mm x 10mm)
3	634814PT	1		Thrust Washer
--	642667PT	1		Gear Cage Assembly (Includes Ref. 4-7)
4	635114PT	1		Gear Cage
5	642666PT	3	6	Planetary Gear (11T)
6	635117PT	3	6	Planetary Gear Pin
7	634765PT	1		Ring Gear
8	635116PT	1		Extension Pinion
9	91815042	15	45	O-Ring
10	864964	1	1	Grease Fitting
11	542940-60	2	2	Socket Head Cap Screw (M5 x 30mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)
(T) Teeth

Illustration 12: Single Stage Gearing (Gear Ratios 3.67, 4.00, 4.75, 6.00)

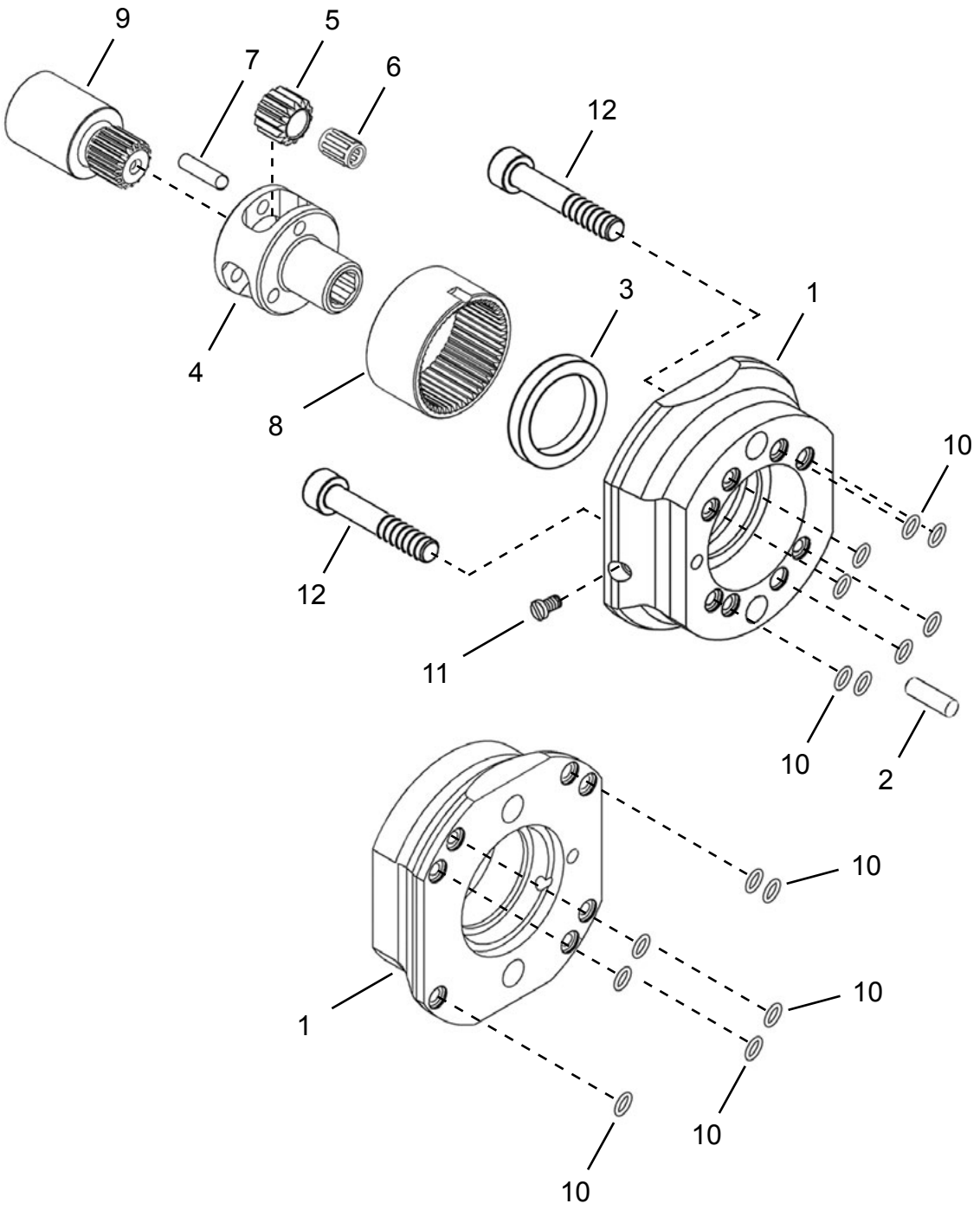


Illustration 12: Single Stage Gearing

Ref	Number	#	X	EN Description
1	634738PT	1		Planetary Gear Housing
2	634339PT	1	2	Dowel Pin (3mm x 10mm)
3	634814PT	1		Thrust Washer
--	Table "12"	1		Gear Cage Assembly (Includes Ref. 4-7)
4	Table "12"	1		Gear Cage
5	Table "12"	3	6	Planetary Gear
6	203749	3	6	Planetary Gear Bearing
7	541888	3	6	Planetary Gear Pin
8	Table "12"	1		Ring Gear
9	Table "12"	1		Extension Pinion
10	91815042	15	45	O-Ring
11	864964	1	1	Grease Fitting
12	542940-60	2	2	Socket Head Cap Screw (M5 x 30mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Table 12

Ref.	Description	Gearing Assembly Number							
		#	642457PT	#	642456PT	#	642455PT	#	642454PT
--	Gear Ratio		3.67		4.00		4.75		6.00
--	Gear Cage Assembly	1	642648PT	1	642649PT	1	642650PT	1	642651PT
4	Gear Cage	1	207936PT	1	207934PT	1	634677PT	1	634777PT
5	Planetary Gear	3	207939PT (14T)	3	207932PT (14T)	3	207808PT (15T)	3	207798PT (17T)
8	Ring Gear	1	634765PT	1	634794PT	1	634794PT	1	634794PT
9	Extension Pinion	1	634763PT	1	634762PT	1	634761PT	1	634760PT

(T) Teeth

Illustration 13: Double Stage Gearing (Gear Ratios 9.00, 13.50, 16.00, 19.00)

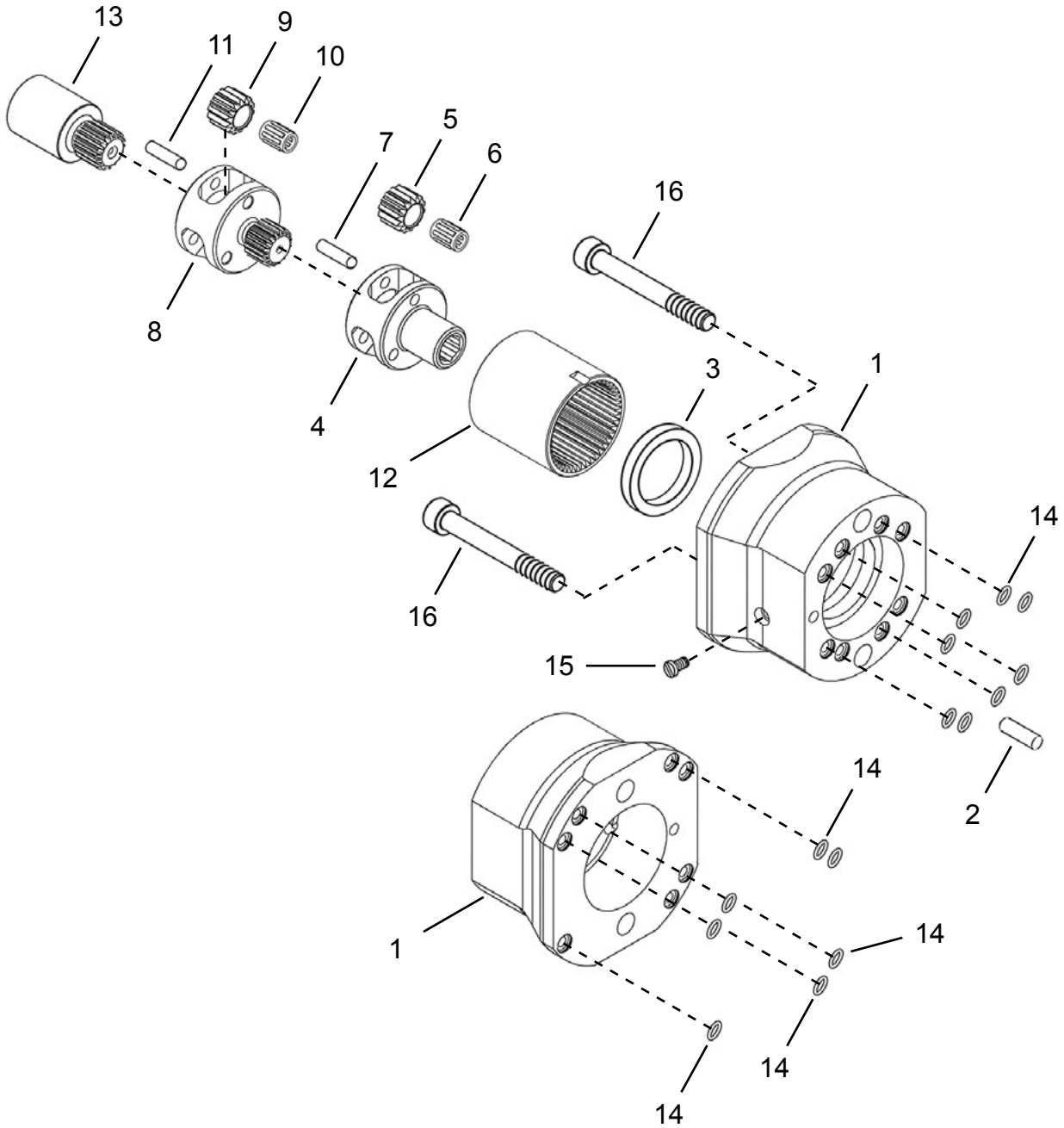


Illustration 13: Double Stage Gearing (Gear Ratios: 9.00, 13.50, 16.00, 19.00)

Ref	Number	#	X	EN Description
1	634740PT	1		Planetary Gear Housing
2	634339PT	1	2	Dowel Pin (3mm x 10mm)
3	634814PT	1		Thrust Washer
--	Table "13"	1		Lower Gear Cage Assembly (Includes Ref. 4-7)
4	Table "13"	1		Lower Planetary Gear Cage
5	Table "13"	3	6	Lower Planetary Gear
6	Table "13"	3	6	Lower Planetary Gear Bearing
7	Table "13"	3	6	Lower Planetary Gear Pin
--	Table "13"	1		Upper Planetary Cage Assembly (Includes Ref. 8-11)
8	Table "13"	1		Upper Planetary Gear Cage
9	Table "13"	3	6	Upper Planetary Gear
10	Table "13"	3	6	Upper Planetary Gear Bearing
11	Table "13"	3	6	Upper Planetary Gear Pin
12	Table "13"	1		Ring Gear
13	Table "13"	1		Extension Pinion
14	91815042	15	45	O-Ring
15	864964	1	1	Grease Fitting
16	542940-54	2	2	Socket Head Cap Screw (M5 x 45mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Table 13

Ref.	Description	Gearing Assembly Number							
		#	642670PT	#	642458PT	#	642459PT	#	642642PT
--	Gear Ratio		9.00		13.50		16.00		19.00
--	Lower Gear Cage Assembly	1	642667PT	1	642648PT	1	642649PT	1	642649PT
4	Lower Planetary Gear Cage	1	635114PT	1	207936PT	1	207934PT	1	207934PT
5	Lower Planetary Gear	3	642666PT (11T)	3	207939PT (14T)	3	207932PT (14T)	3	207932PT (14T)
6	Lower Planetary Gear Bearing		--------	3	203749	3	203749	3	203749
7	Lower Planetary Gear Pin	3	635117PT	3	541888	3	541888	3	541888
--	Upper Gear Cage Assembly	1	642668PT	1	642652PT	1	642653PT	1	642656PT
8	Upper Planetary Gear Cage	1	635113PT	1	635060PT	1	635061PT	1	635064PT
9	Upper Planetary Gear	3	642666PT (11T)	3	207939PT (14T)	3	207932PT (14T)	3	207808PT (15T)
10	Upper Planetary Gear Bearing		--------	3	203749	3	203749	3	203749
11	Upper Planetary Gear Pin	3	635117PT	3	541888	3	541888	3	541888
12	Ring Gear	1	634795PT	1	634795PT	1	634796PT	1	634796PT
13	Extension Pinion	1	635116PT	1	634763PT	1	634762PT	1	634761PT

(T) Teeth

Illustration 14: Double Stage Gearing (Gear Ratios 22.56, 24.00, 28.50, 36.00)

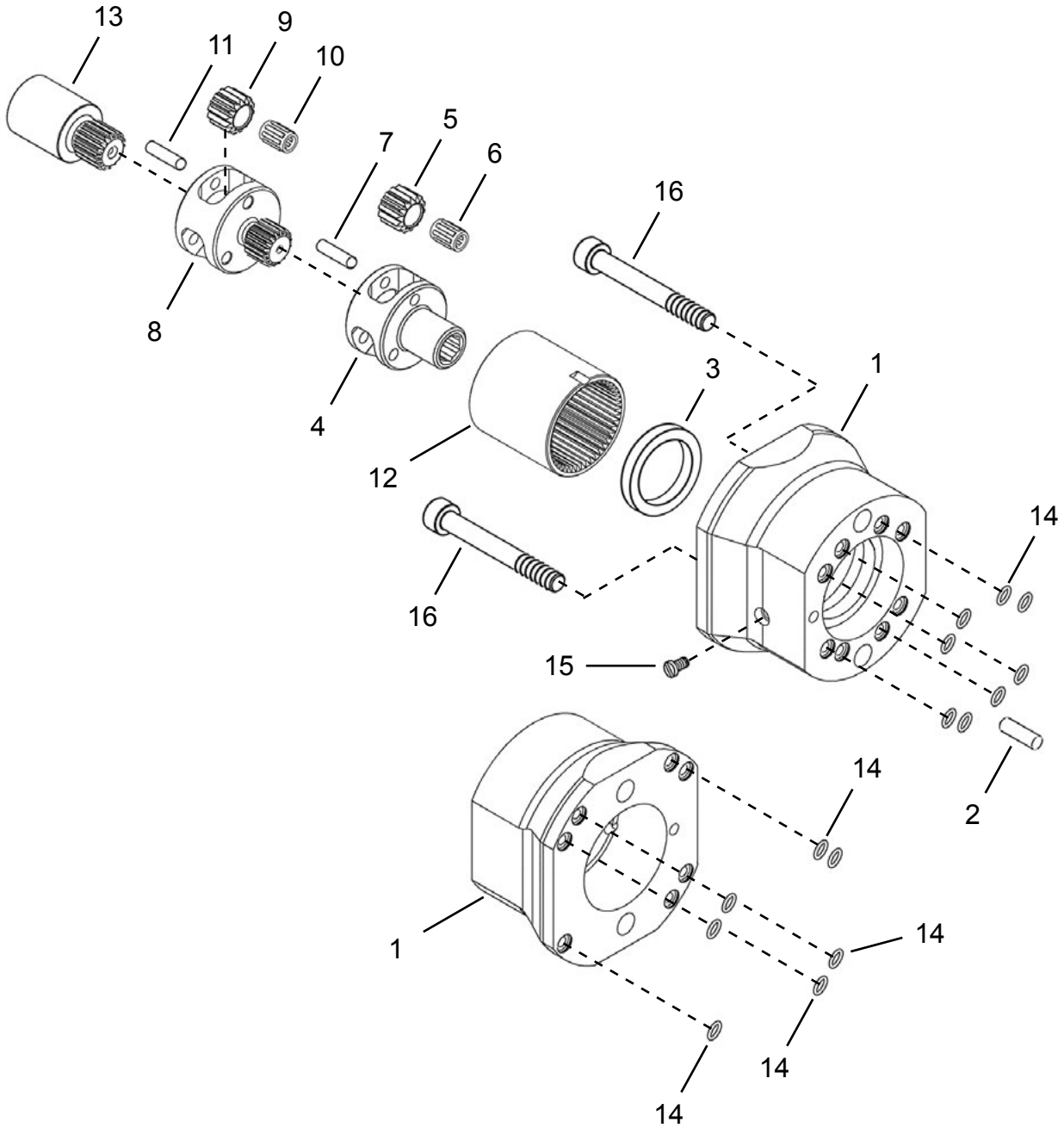


Illustration 14: Double Stage Gearing (Gear Ratios: 22.56, 24.00, 28.50, 36.00)

Ref	Number	#	X	EN Description
1	634740PT	1		Planetary Gear Housing
2	634339PT	1	2	Dowel Pin (3mm x 10mm)
3	634814PT	1		Thrust Washer
--	Table "14"	1		Lower Gear Cage Assembly (Includes Ref. 4-7)
4	Table "14"	1		Lower Planetary Gear Cage
5	Table "14"	3	6	Lower Planetary Gear
6	203749	3	6	Lower Planetary Gear Bearing
7	541888	3	6	Lower Planetary Gear Pin
--	Table "14"	1		Upper Planetary Cage Assembly (Includes Ref. 8-11)
8	Table "14"	1		Upper Planetary Gear Cage
9	Table "14"	3	6	Upper Planetary Gear
10	203749	3	6	Upper Planetary Gear Bearing
11	541888	3	6	Upper Planetary Gear Pin
12	634796PT	1		Ring Gear
13	Table "14"	1		Extension Pinion
14	91815042	15	45	O-Ring
15	864964	1	1	Grease Fitting
16	542940-54	2	2	Socket Head Cap Screw (M5 x 45mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Table 14

Ref.	Description	Gearing Assembly Number							
		#	642460PT	#	642643PT	#	642644PT	#	642461PT
--	Gear Ratio		22.56		24.00		28.50		36.00
--	Lower Gear Cage Assembly	1	642650PT	1	642649PT	1	642650PT	1	642651PT
4	Lower Planetary Gear Cage	1	634677PT	1	207934PT	1	634677PT	1	634777PT
5	Lower Planetary Gear	3	207808PT (15T)	3	207932PT (14T)	3	207808PT (15T)	3	207798PT (17T)
--	Upper Gear Cage Assembly	1	642654PT	1	642657PT	1	642658PT	1	642655PT
8	Upper Planetary Gear Cage	1	635062PT	1	635065PT	1	635066PT	1	635063PT
9	Upper Planetary Gear	3	207808PT (15T)	3	207798PT (17T)	3	207798PT (17T)	3	207798PT (17T)
13	Extension Pinion	1	634761PT	1	634760PT	1	634760PT	1	634760PT

(T) Teeth

Illustration 15: Right Angle Gear Head

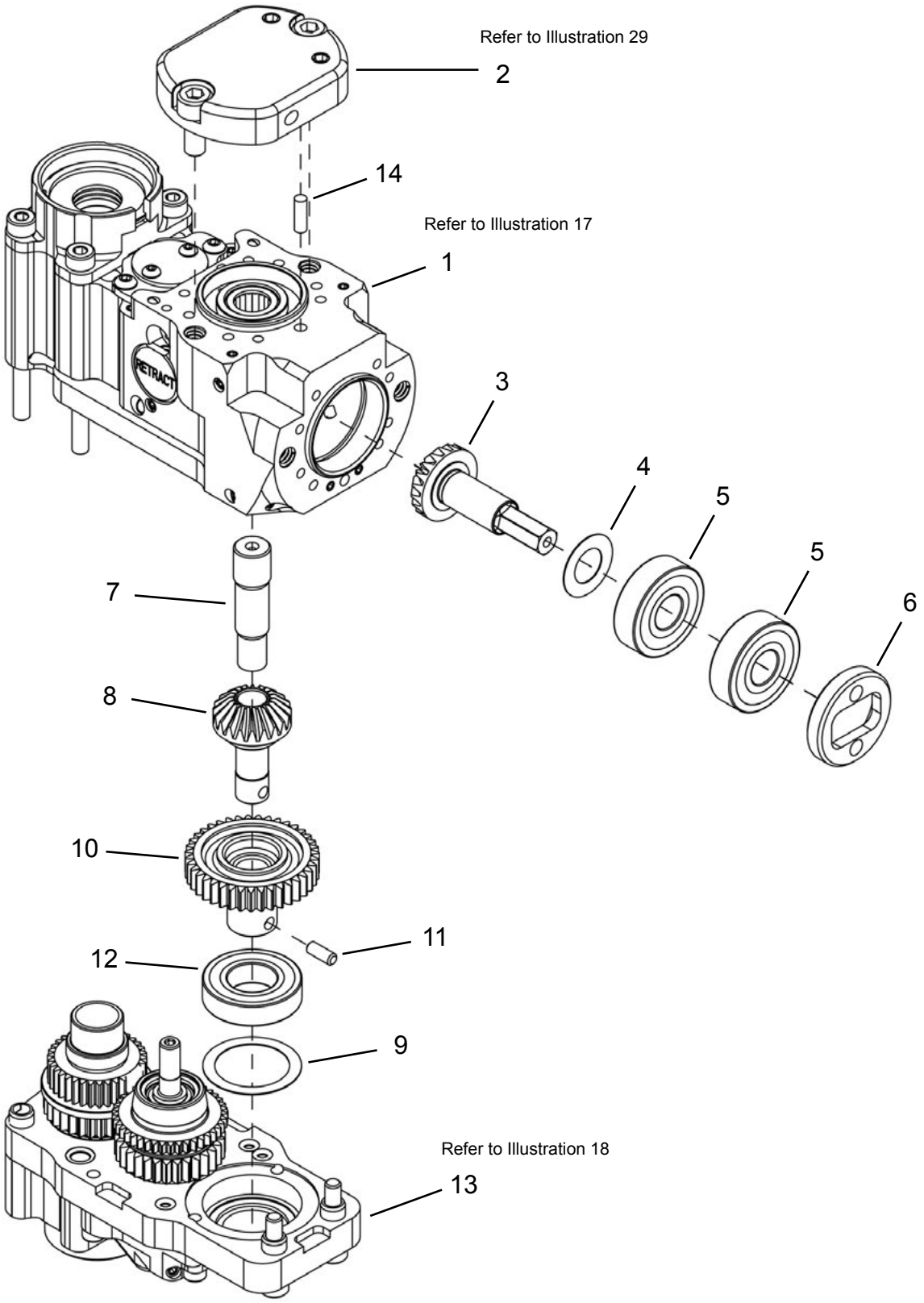


Illustration 15: Right Angle Gear Head

Ref	Number	#	X	EN Description
1	Illustration 17	1		Primary Gear Head
2	642478PT	1		Gear Head Cover (Refer to Illustration 29)
--	642479PT	1		Right Angle Gear Assembly (Includes Ref. 3-9)
3	634702PT	1		Pinion Gear
4	642646PT	1		Shim Kit (Includes the following shims)
	635085PT-001	1		Shim (.001")
	635085PT-003	1		Shim (.003")
	635085PT-005	1		Shim (.005")
	635085PT-007	1		Shim (.007")
	635085PT-009	1		Shim (.009")
	635085PT-010	1		Shim (.010")
5	634753PT	2	4	Ball Bearing
6	634704PT	1		Bearing Clamp Nut
7	634698PT	1		Bevel Gear Shaft
8	634703PT	1		Bevel Gear
9	642647PT	1		Shim Kit (Includes the following shims)
	635086PT-001	1		Shim (.001")
	635086PT-003	1		Shim (.003")
	635086PT-005	1		Shim (.005")
	635086PT-007	1		Shim (.007")
	635086PT-009	1		Shim (.009")
	635086PT-010	1		Shim (.010")
10	634705PT	1		Drive Pinion Gear
11	634819PT	1	3	Shear Pin
12	634557PT	1	2	Ball Bearing
13	Illustration 18	1		Secondary Gear Head
14	634339PT	2		Dowel Pin

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 16: Inline Gear Head

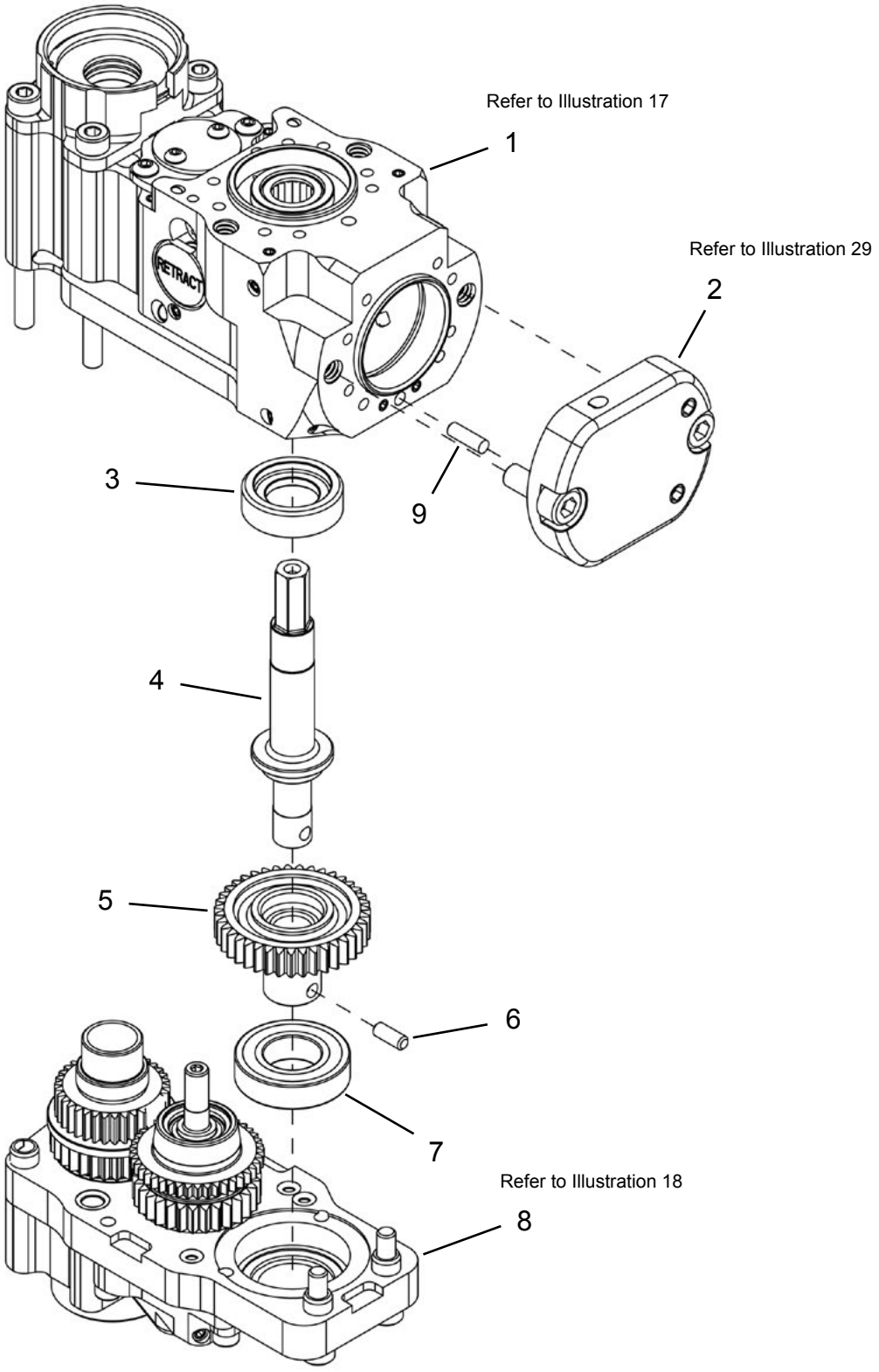


Illustration 16: Inline Gear Head

Ref	Number	#	X	EN Description
1	Illustration 17	1		Primary Gear Head
2	642478PT	1		Gear Head Cover (Refer to Illustration 29)
3	634798PT	1	2	Wear Bushing
4	634699PT	1		Inline Drift Shaft
5	634705PT	1		Drive Pinion Gear
6	634819PT	1	3	Shear Pin
7	634557PT	1	2	Ball Bearing
8	Illustration 18	1		Secondary Gear Head
9	634339PT	2		Dowel Pin

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 17: Primary Gear Head

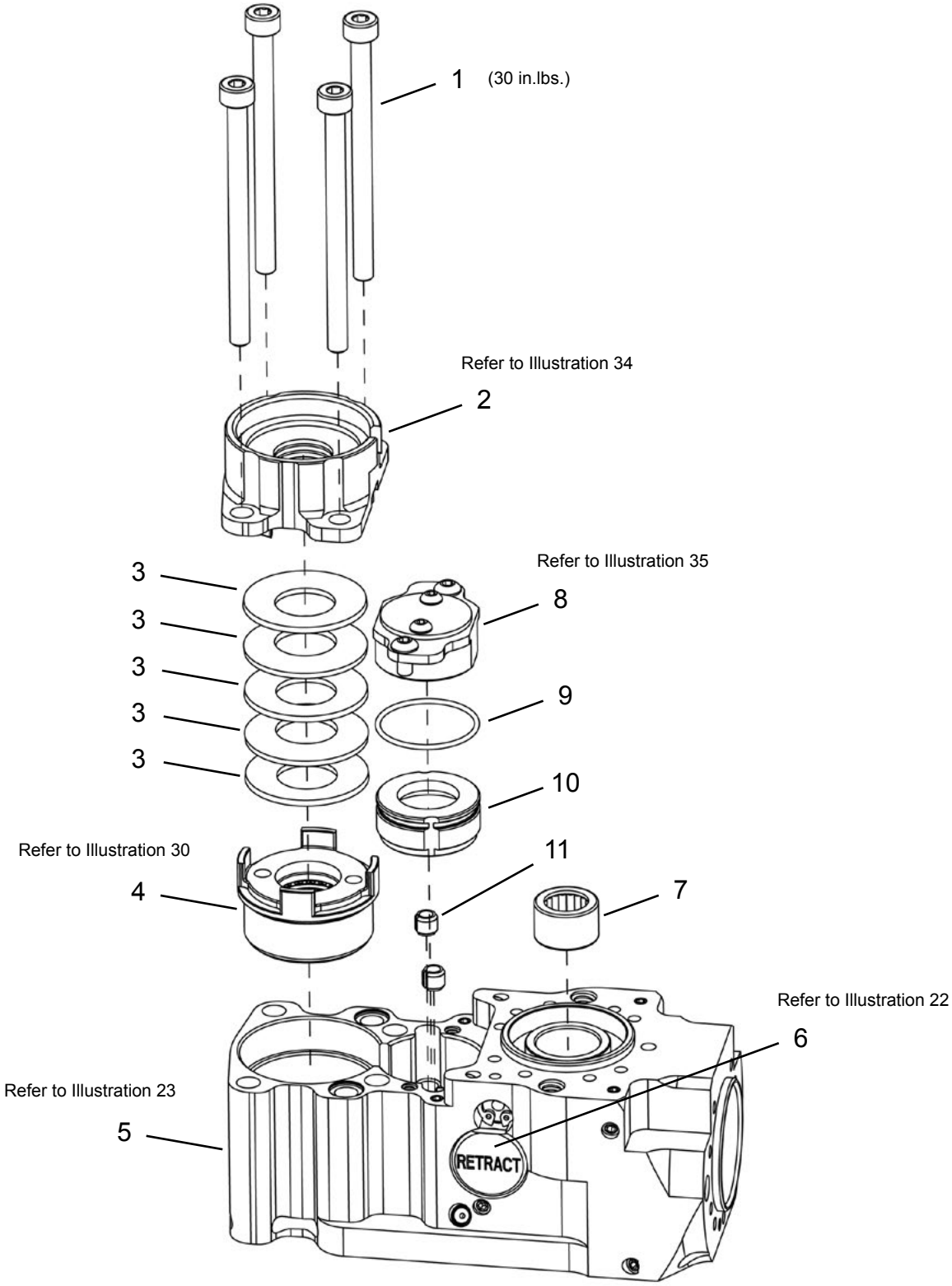


Illustration 17: Primary Gear Head

Ref	Number	#	X	EN Description
1	94234211	4		Socket Head Cap Screw (M4 x 55mm)
2	642564PT	1		Thrust Pack Cap Assembly (Illustration 34)
3	634807PT	5		Belleville Washer
4	642487PT	1		Spindle Thrust Pack Kit (Illustration 30)
	642641PT	1		Spindle Thrust Pack Kit - High Speed (Illustration 31)
	642488PT	1		Spindle Thrust Pack Kit - MITIS (Illustration 32)
5	642470PT	1		Primary Housing (Illustration 23)
6	Illustration 22	--		Valve Assemblies
7	634752PT	1	2	Needle Bearing
8	642490PT	1		Differential Shaft Support (Illustration 35)
9	634811PT	1	3	O-Ring
10	634700PT	1		Clutch Cup
11	634813PT	2	2	Clutch Cup Pin

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 18: Secondary Gear Head

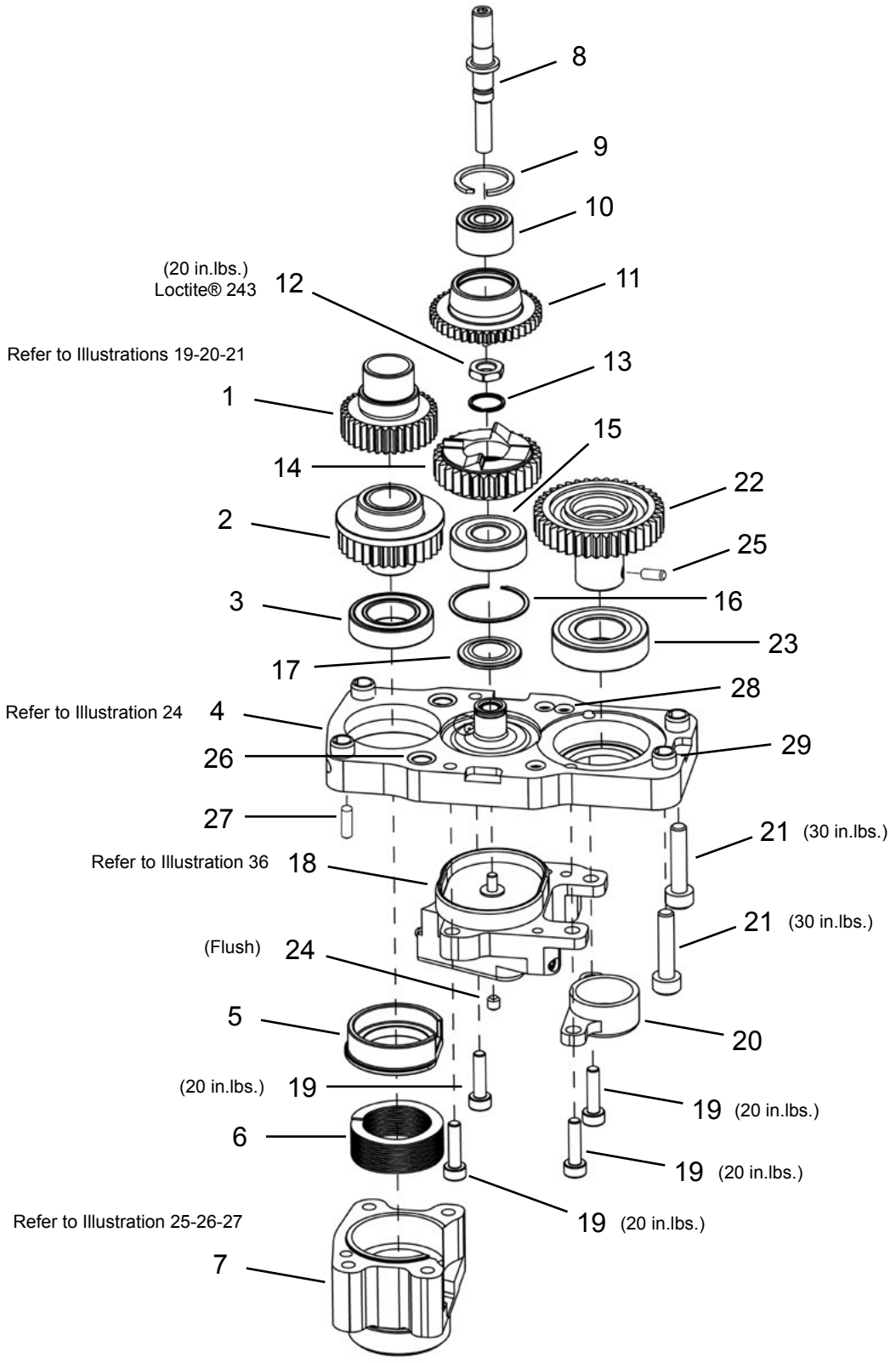


Illustration 18: Secondary Gear Head

Ref	Number	#	X	EN Description
1	634709PT	1		Spindle Feed Gear (Illustration 19)
	634787PT	1		Spindle Feed Gear - High Speed (Illustration 20)
	642486PT	1		Spindle Feed Gear - Mitis (Illustration 21)
2	642560PT	1		Spindle Drive Gear
3	635050PT	1	2	Ball Bearing (with lifter)
4	642471PT	1		Secondary Housing (Illustration 24)
5	634988PT	1		Bearing Guide
6	634754PT	1	2	Wave Spring
7	634693PT	1		Standard Nose Adapter - (Illustration 25)
	642585PT	1		Lever Style Indexer Nose Adapter (Illustration 27)
	642323PT	1		Manual Indexer Nose Adapter (Illustration 26)
8	634697PT	1		Differential Feed Shaft
9	634802PT	1	2	Retaining Ring
10	634751PT	1	2	Ball Bearing - Double Row
11	634708PT	1		Differential Feed Gear
12	634743PT	1	3	Differential Shaft Nut
13	634800PT	1	3	Retaining Ring
14	634706PT	1		Intermediate Drive Gear
15	634750PT	1	2	Ball Bearing
16	634801PT	1	2	Retaining Ring
17	634958PT	1		Bearing Spacer
18	642569PT	1		Differential Piston Housing Assembly (Illustration 36)
19	94234150	4		Socket Head Cap Screw (M3 x 12mm)
20	634695PT	1		Shear Pin Cover
21	634356PT	2		Socket Head Cap Screw (M4 x 18mm)
22	634705PT	1		Drive Pinion Gear
23	634557PT	1	2	Ball Bearing
24	634323PT	1	2	Set Screw (M3 x 3mm)
25	634819PT	1	3	Shear Pin
26	634817PT	4	12	O-Ring
27	634339PT	1		Dowel Pin
28	91815042	6	18	O-Ring
29	634532PT	4		Alignment Pin

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 19: 634709PT-XX Spindle Feed Gear

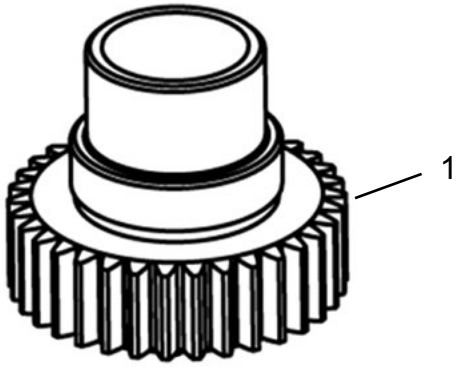


Illustration 20: 634787PT-XX Spindle Feed Gear - High Speed

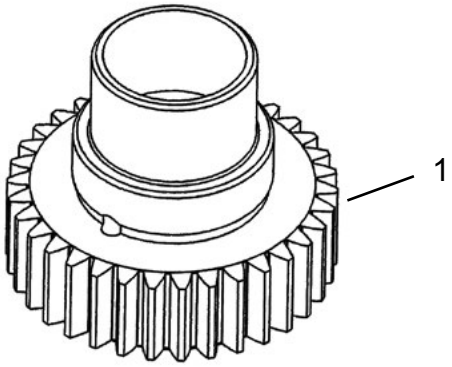


Illustration 21: 642486PT-XX Spindle Feed Gear - MITIS

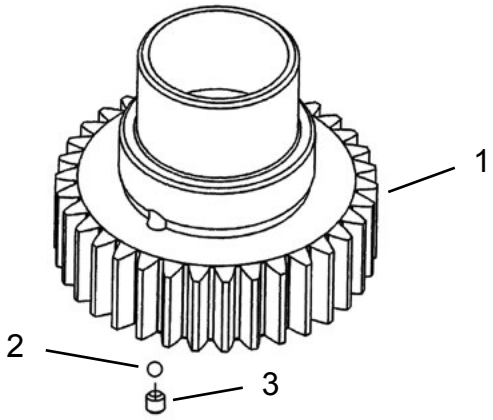


Illustration 19: 634709PT-XX Spindle Feed Gear

Ref	Number	#	X	EN Description
1	634709PT-10	1		Spindle Feed Gear (Feed Rate: ipr = 0.001 in/rev)
	634709PT-20	1		Spindle Feed Gear (Feed Rate: ipr = 0.002 in/rev)
	634709PT-30	1		Spindle Feed Gear (Feed Rate: ipr = 0.003 in/rev)
	634709PT-40	1		Spindle Feed Gear (Feed Rate: ipr = 0.004 in/rev)
	634709PT-60	1		Spindle Feed Gear (Feed Rate: ipr = 0.006 in/rev)
	634709PT-70	1		Spindle Feed Gear (Feed Rate: ipr = 0.007 in/rev)
	634709PT-80	1		Spindle Feed Gear (Feed Rate: ipr = 0.008 in/rev)
	634709PT-100	1		Spindle Feed Gear (Feed Rate: ipr = 0.010 in/rev)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 20: 634787PT-XX Spindle Feed Gear - High Speed

Ref	Number	#	X	EN Description
1	634787PT-10	1		Spindle Feed Gear (Feed Rate: ipr = 0.001 in/rev)
	634787PT-20	1		Spindle Feed Gear (Feed Rate: ipr = 0.002 in/rev)
	634787PT-30	1		Spindle Feed Gear (Feed Rate: ipr = 0.003 in/rev)
	634787PT-40	1		Spindle Feed Gear (Feed Rate: ipr = 0.004 in/rev)
	634787PT-60	1		Spindle Feed Gear (Feed Rate: ipr = 0.006 in/rev)
	634787PT-70	1		Spindle Feed Gear (Feed Rate: ipr = 0.007 in/rev)
	634787PT-80	1		Spindle Feed Gear (Feed Rate: ipr = 0.008 in/rev)
	634787PT-100	1		Spindle Feed Gear (Feed Rate: ipr = 0.010 in/rev)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 21: 642486PT-XX Spindle Feed Gear - MITIS

Ref	Number	#	X	EN Description
1	642486PT-10	1		Spindle Feed Gear (Feed Rate: ipr = 0.001 in/rev)
	642486PT-20	1		Spindle Feed Gear (Feed Rate: ipr = 0.002 in/rev)
	642486PT-30	1		Spindle Feed Gear (Feed Rate: ipr = 0.003 in/rev)
	642486PT-40	1		Spindle Feed Gear (Feed Rate: ipr = 0.004 in/rev)
	642486PT-60	1		Spindle Feed Gear (Feed Rate: ipr = 0.006 in/rev)
	642486PT-70	1		Spindle Feed Gear (Feed Rate: ipr = 0.007 in/rev)
	642486PT-80	1		Spindle Feed Gear (Feed Rate: ipr = 0.008 in/rev)
	642486PT-100	1		Spindle Feed Gear (Feed Rate: ipr = 0.010 in/rev)
2	635055PT	1	3	Steel Ball (1.5mm)
3	635056PT	1	3	Cup Point Set Screw (M2 x 2mm)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 22: Gear Head Valve Assemblies

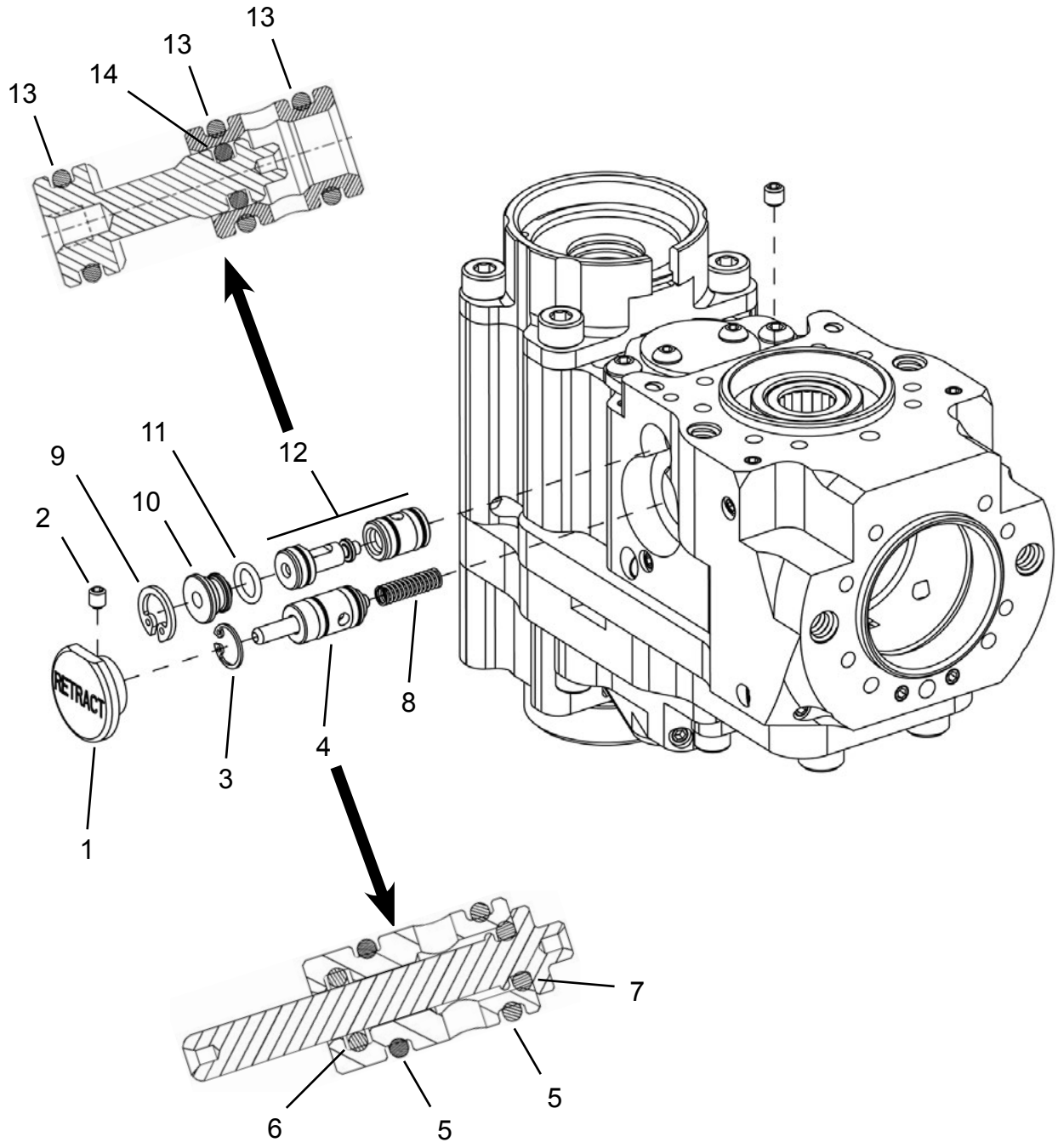


Illustration 22: Gear Head Valve Assemblies

Ref	Number	#	X	EN Description
1	634701PT	1	1	Push Button
2	634624PT	1	3	Set Screw (M2.5 x 3mm)
3	634804PT	1	1	Retaining Ring
4	642474PT	1		JAV-2C Valve Assembly (includes Ref. 5-7)
5	91815104	2	3	O-Ring (1mm x 4.5mm)
6	634396PT	1	3	O-Ring (1mm x 2.5mm)
7	634809PT	1	3	O-Ring (0.04" x 0.07")
8	634950PT	1	3	Compression Spring
9	634803PT	1	1	Retaining Ring
10	634720PT	1		Valve Plug
11	91815104	1	3	O-Ring (1mm x 4.5mm)
12	642473PT	1		JAVO-3C Valve Assembly (includes Ref. 13-14)
13	91815104	3	9	O-Ring (1mm x 4.5mm)
14	634809PT	1	3	O-Ring (0.04" x 0.07")

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 23: 642470PT Primary Housing

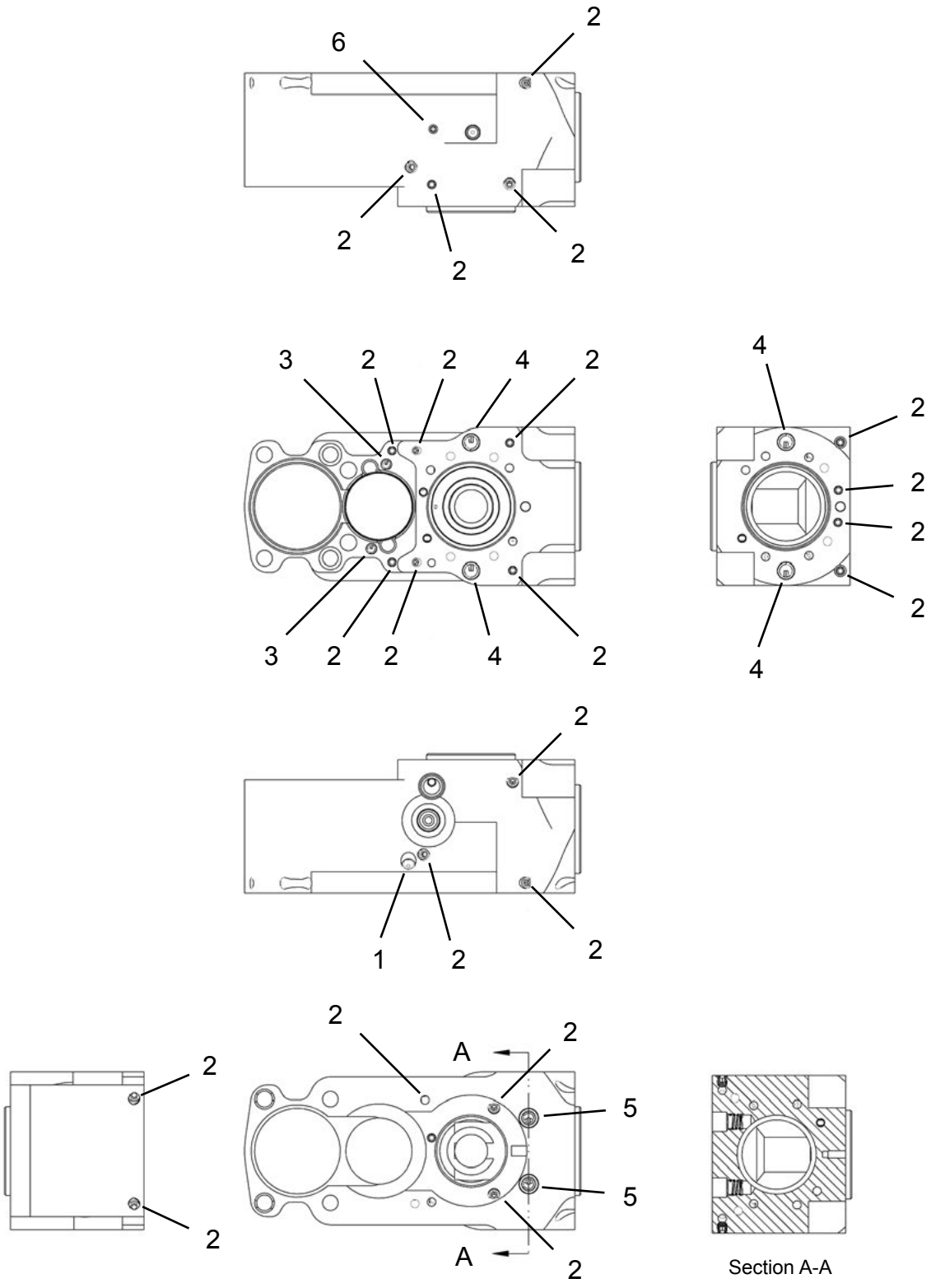
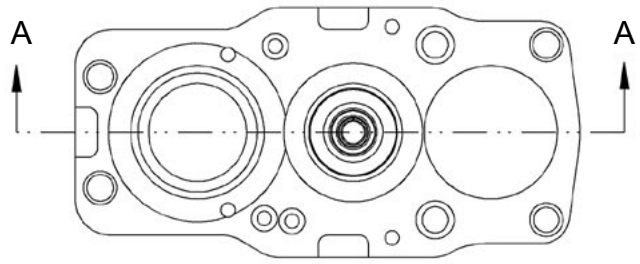


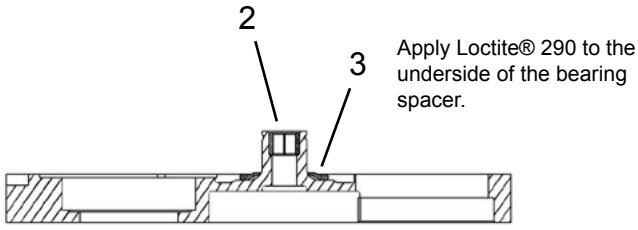
Illustration 23: 642470PT Primary Housing

Ref	Number	#	X	EN Description
1	864964	2	2	Grease Fitting
2	634323PT	22	11	Set Screw (M3 x 3mm)
3	634326PT	2		Heli-Coil (M3 x 6mm)
4	634327PT	4		Heli-Coil (M5 x 7.5mm)
5	634608PT	2		Heli-Coil (M4 x 4mm)
6	634829PT	1		Orifice Screw (M3 x 4mm)

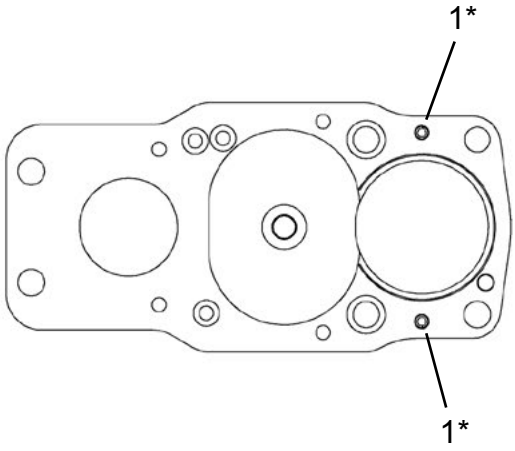
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

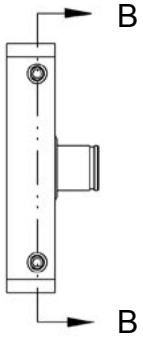
Illustration 24: 642471PT Secondary Housing

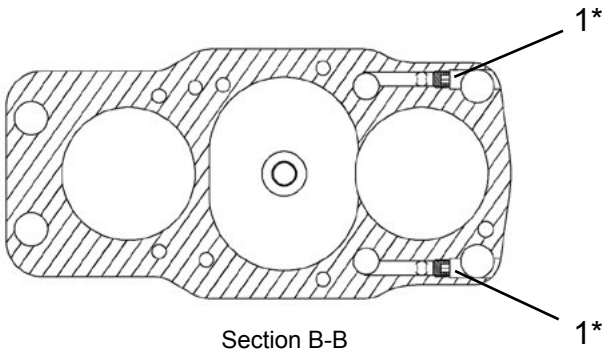




Section A-A







Section B-B

* Assembly Notes:
Install set screws just below flush of face and bottom of counterbores.

Do not bottom out set screws.

Illustration 24: 642471PT Secondary Housing

Ref	Number	#	X	EN Description
1	634323PT	4		Set Screw (M3 x 3mm)
2	634805PT	1		Bushing
3	634958PT	1		Bearing Spacer

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 25: 634393PT Standard Nose Adapter

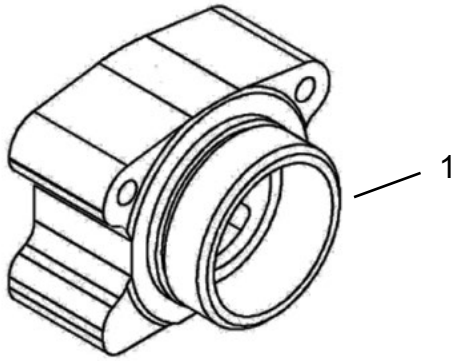


Illustration 26: 642323PT Manual Indexer Nose Adapter

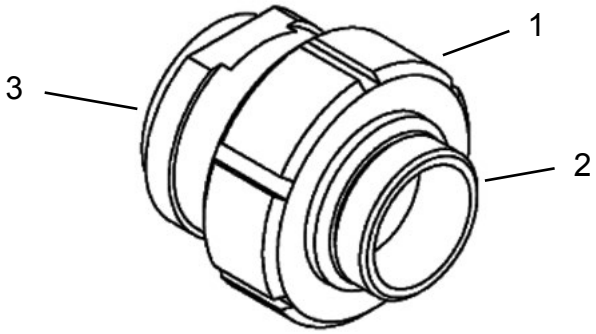


Illustration 27: 642585PT Lever Style Indexer Nose Adapter

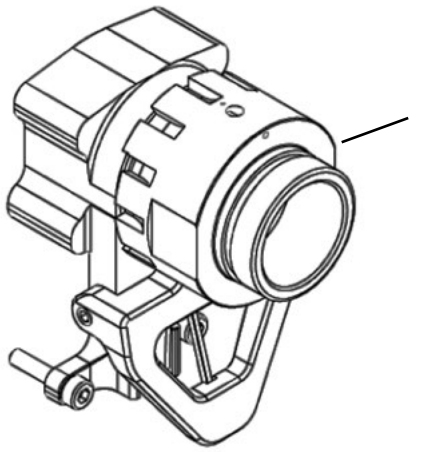


Illustration 25: 634693PT Standard Nose Adapter

Ref	Number	#	X	EN Description
1	634693PT	1		Standard Nose Adapter (1"-20 LH Thread)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 26: 642323PT Manual Nose Adapter

Ref	Number	#	X	EN Description
--	642323PT	1		Manual Nose Adapter (1"-20 LH Thread) (includes Ref. 1-3)
1	625567	1		Clamp Nut
2	634409PT	1		Nose Adapter
3	634425PT	1		Tool Adapter

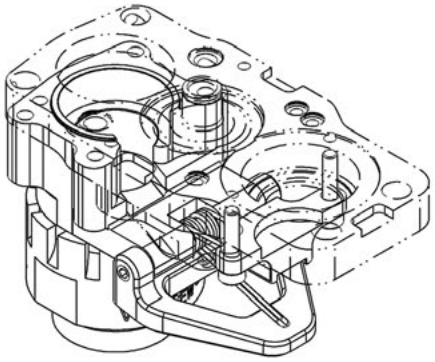
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

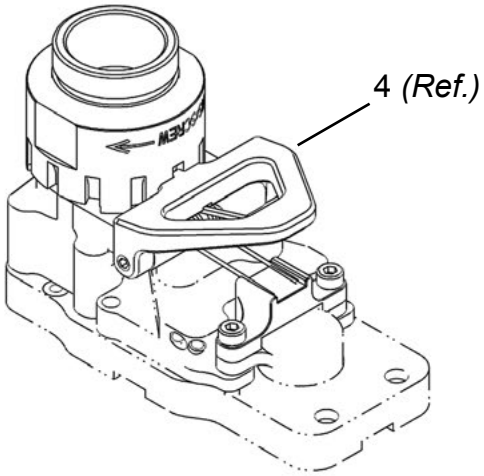
Illustration 27: 642585PT Lever Style Indexer Nose Adapter

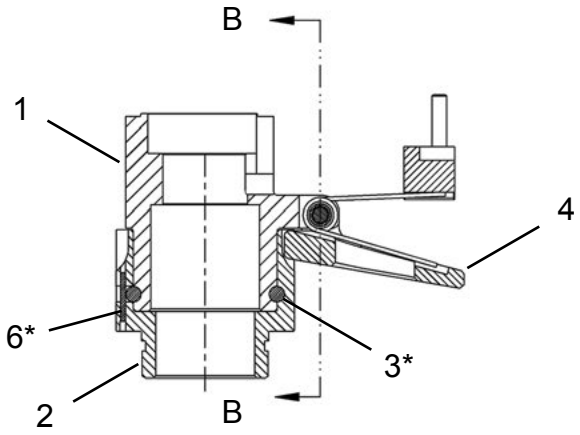
Ref	Number	#	X	EN Description
1	642585PT	1		Lever Nose Adapter (1"-20 LH Thread) (Illustration 28)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

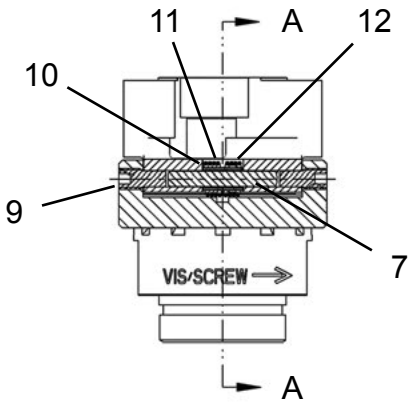
Illustration 28: 642585PT Indexer Assembly



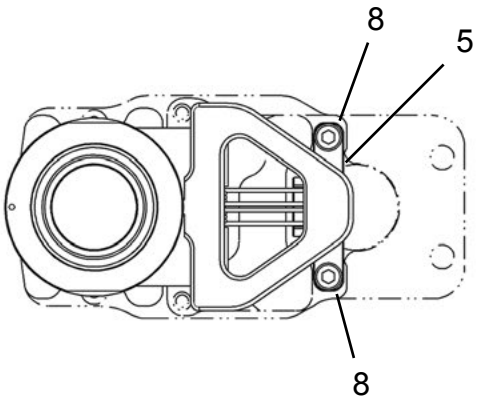




Section A-A



Section B-B



* Assembly Notes:
Ref. 3: Apply Chevron Black Pearl grease NLGI 2 to the inner and outer ball race.

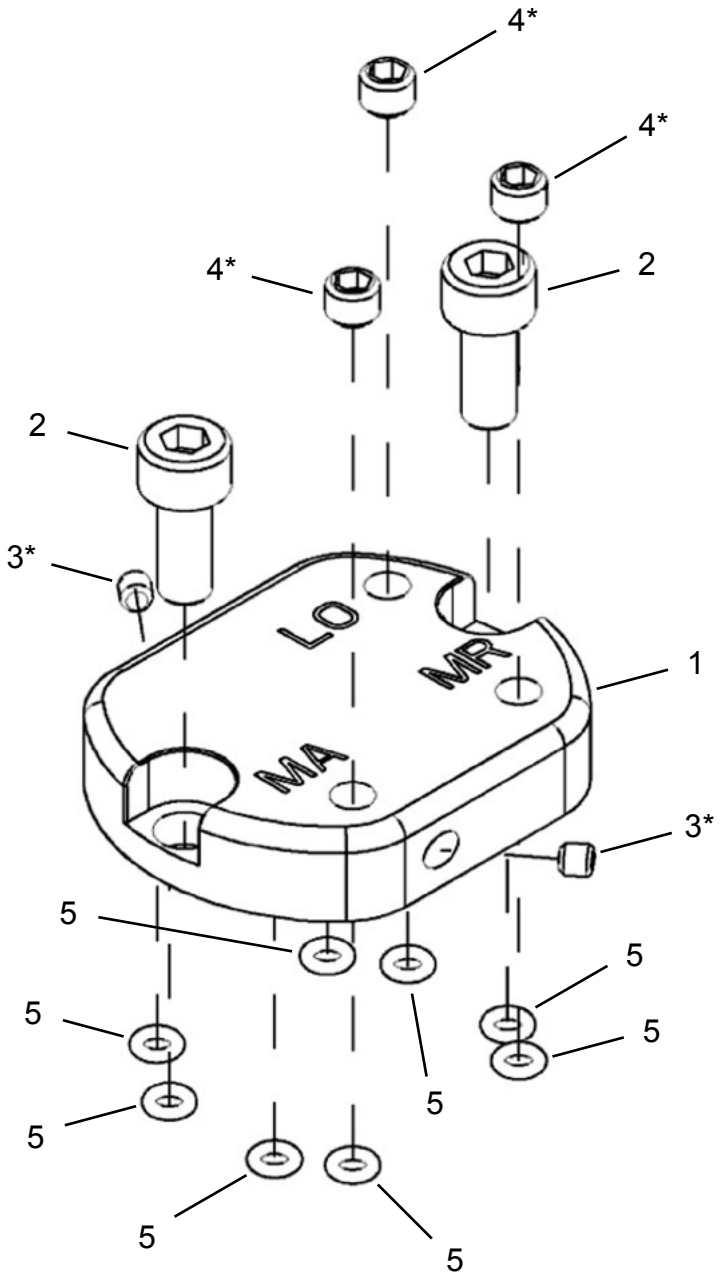
Ref. 6: Peen top and bottom of dowel pin hole to keep pin from falling out.

Illustration 28: 642585PT Indexer Assembly

Ref	Number	#	X	EN Description
1	634979PT	1		Indexer Nose Adapter
2	90830924	1		Male End Adapter
3	90245140	30	30	Steel Ball
4	634973PT	1		Indexer Lever
5	634980PT	1		Spring Rest Pad
6	90010015	1		Pin
7	634977PT	1		Dowel Pin (3mm x 22mm)
8	634221PT	2		Socket Head Cap Srew (M3)
9	632626	1		Fulcrum Screw
10	634976PT	1		Spacer
11	634975PT	1	3	Torsion Spring (Left Hand)
12	634974PT	1	3	Torsion Spring (Right Hand)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 29: 642478PT Gear Head Cover Assembly



* Assembly Note:
Install set screws just below flush of face and bottom of counterbores.

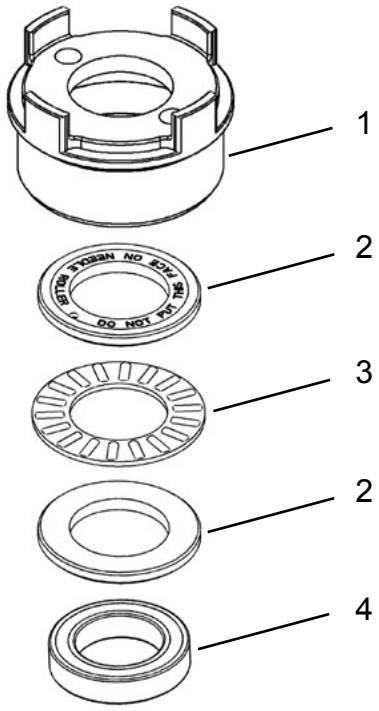
Assembly Note:
Apply O-Ring lubricant to O-Rings during assembly.

Illustration 29: 642478PT Gear Head Cover Assembly

Ref	Number	#	X	EN Description
1	642783PT	1		Gear Head Cover
2	542940-51	2		Socket Head Cap Screw (M5 x 12mm)
3	634323PT	2		Set Screw (M3 x 3mm)
4	634534PT	3		Set Screw (M5 x 4mm)
5	91815042	8	24	O-Ring

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 30: 642487PT Spindle Thrust Cap Kit - Standard



2 Assembly Note: Assemble spacer as shown.

3 Assembly Note: Pack thrust bearing with Accrolube.

2 Assembly Note: Assemble spacer as shown.

Illustration 31: 642641PT Spindle Thrust Cap Kit - High Speed

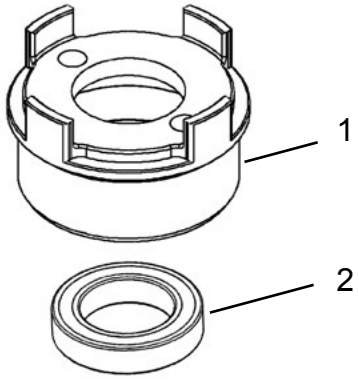


Illustration 30: 642487PT Spindle Thrust Cap Kit - Standard

Ref	Number	#	X	EN Description
1	634711PT	1		Spindle Thrust Cap
2	634713PT	2		Feed Gear Spacer
3	634749PT	1	2	Needle Thrust Bearing
4	634748PT	1	2	Ball Bearing

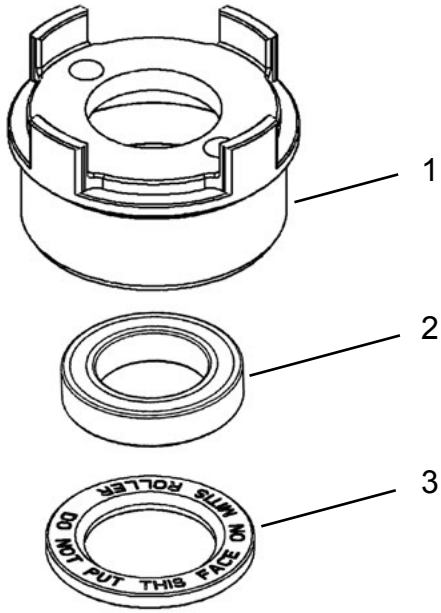
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 31: 642641PT Spindle Thrust Cap Kit - High Speed

Ref	Number	#	X	EN Description
1	634786PT	1		Spindle Thrust Cap
2	635072PT	1	2	Ball Bearing

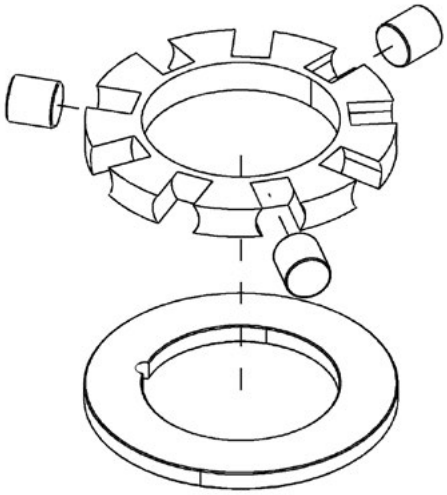
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 32: 642488PT Spindle Thrust Cap Kit - MITIS (No Cam)



Assembly Note: Assemble spacer as shown.

Illustration 33: MITIS Cam Kits



3 Roller Cam Kit shown

Illustration 32: 642488PT Spindle Thrust Cap Kit - MITIS (No Cam)

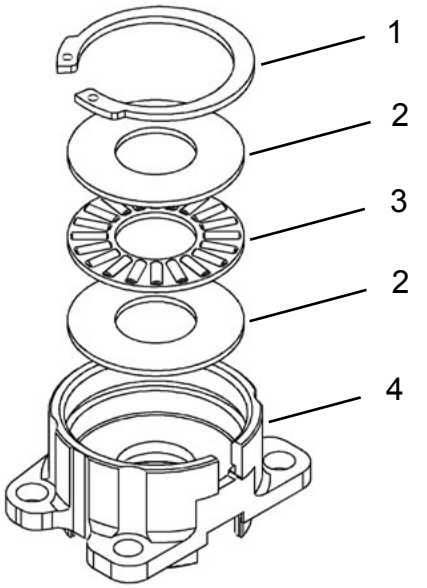
Ref	Number	#	X	EN Description
1	634712PT	1		Spindle Thrust Cap
2	634747PT	1	2	Ball Bearing
3	634714PT	1		Feed Gear Spacer

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 33: MITIS Cam Kits

3 Roller Cam	5 Roller Cam	Cam Height (mm)
642661PT-10	642686PT-10	0.10
642661PT-15	642686PT-15	0.15
642661PT-20	642686PT-20	0.20
642661PT-25	642686PT-25	0.25
642661PT-30	642686PT-30	0.30
642661PT-35	642686PT-35	0.35

Illustration 34: 642564PT Thrust Pack Cap Assembly



Assembly Note: Pack thrust bearing with Accrolube.

Illustration 35: 642490PT Differential Shaft Support Assembly

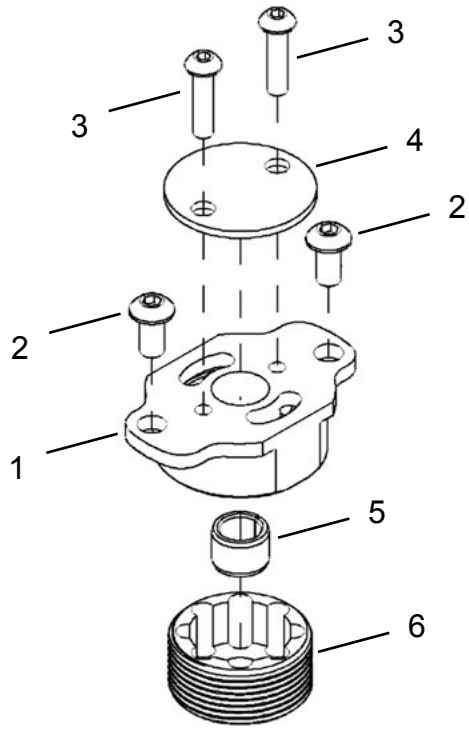


Illustration 34: 642564PT Thrust Pack Cap Assembly

Ref	Number	#	X	EN Description
1	634799PT	1	1	Retaining Ring
2	634380PT	2		Thrust Washer
3	634381PT	1	2	Needle Thrust Bearing
4	634688PT	1		Rear Cap

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 35: 642490PT Differential Shaft Support Assembly

Ref	Number	#	X	EN Description
1	634689PT	1		Differential Shaft Support
2	634357PT	2	2	Button Head Screw (M3 x 6mm)
3	634824PT	2	2	Button Head Screw (M2.5 x 10mm)
4	635071PT	1		Differential Cover
5	634806PT	1		Bushing
6	634790PT	1		Spring Adjustment Nut

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 36: 642569PT Differential Piston Housing Assembly

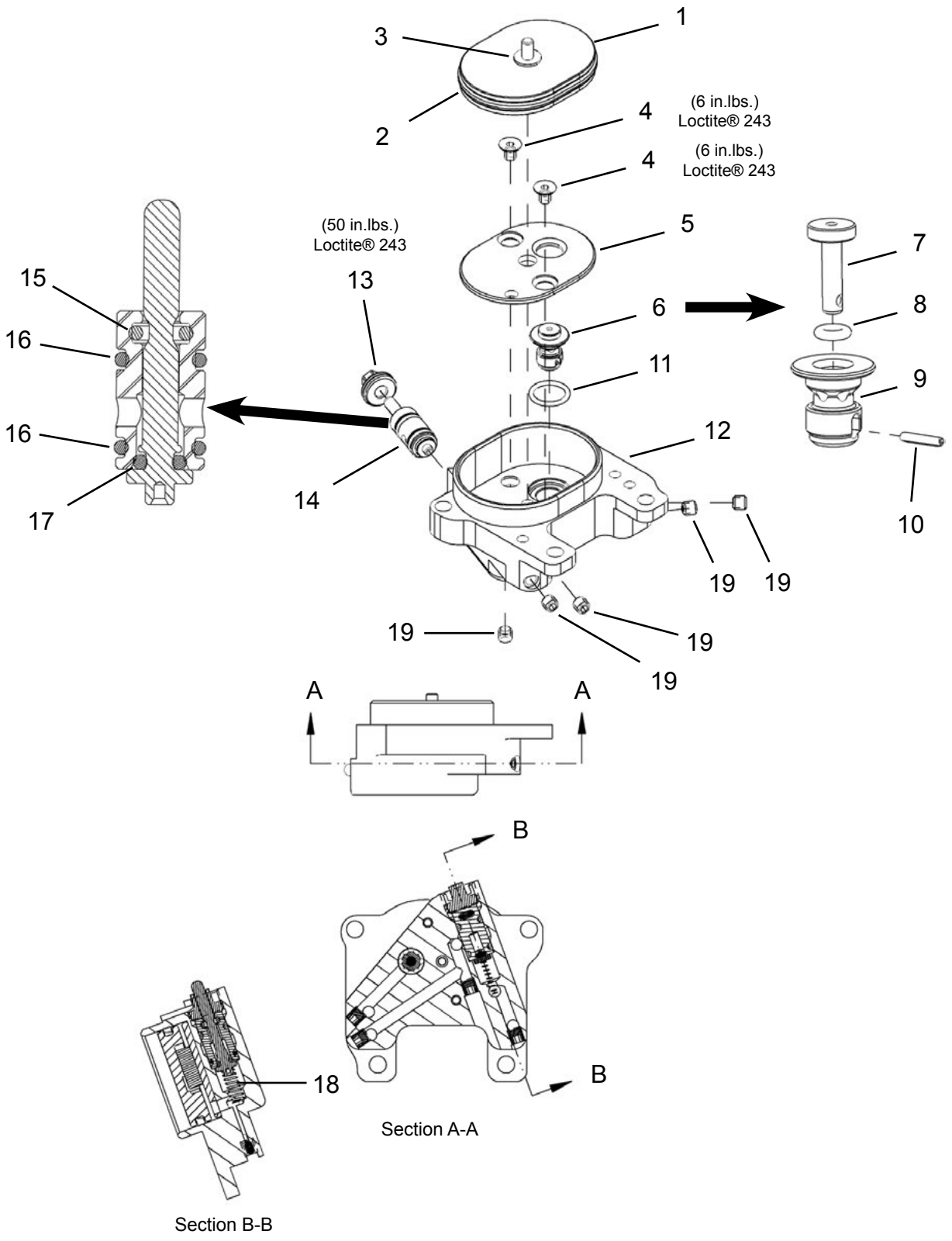


Illustration 36: 642569PT Differential Piston Housing Assembly

Ref	Number	#	X	EN Description
1	642570PT	1		Differential Magnet Piston (includes Ref. 2-3)
2	634331PT1	1	3	Quad Seal
3	642660PT	1		Shim Kit (includes the following shims)
	634949PT-50	1		Shim (0.50mm)
	634949PT-55	1		Shim (0.55mm)
	634949PT-60	1		Shim (0.60mm)
	634949PT-65	1		Shim (0.65mm)
	634949PT-70	1		Shim (0.70mm)
4	634650PT	2		Hex Socket Flat Head Screw (M2.5 x 4mm)
5	634916PT	1		O-Ring Plate
6	642541PT	1		JAV-2C Valve (includes Ref. 7-10)
7	634891PT	1		JAV-2C Rod
8	634809PT	1	3	O-Ring
9	634890PT	1		JAV-2C/3C Housing
10	634894PT	1	2	Spring Pin
11	634895PT	1	3	O-Ring
12	634915PT	1		Differential Piston Housing
13	634758PT	1		Shutoff Guide
14	642476PT	1		JAV-3C Valve (includes Ref. 11-13)
15	634396PT	1	3	O-Ring (1mm x 2.5mm)
16	91815104	2	6	O-Ring (1mm x 4.5mm)
17	634809PT	1	3	O-Ring (0.40" x 0.070")
18	634951PT	1	3	Compression Spring
19	634323PT	5	5	Set Screw (M3 x 3mm)

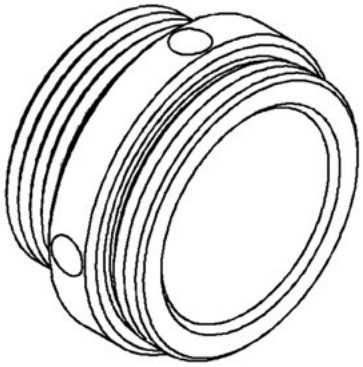
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 37: Spindles

Cutter Interface Spindle Threads Available *												
1/4"-28			5/16"-24			3/8"-24			9/16"-18		
Part Number	Overall Length		Part Number	Overall Length		Part Number	Overall Length		Part Number	Overall Length	
	In.	mm		In.	mm		In.	mm		In.	mm
90277054	4.5	115	90277049	4.5	115	90277064	4.5	115	90277684PT	4.5	115
90277053	5.3	135	90277048	5.3	135	90277063	5.3	135	90277685PT	5.3	135
90277052	5.7	145	90277047	5.7	145	90277062	5.7	145	90277686PT	6.1	155
90277051	6.1	155	90277046	6.1	155	90277061	6.1	155	90277687PT	6.9	175
90277055	6.5	165	90277050	6.5	165	90277065	6.5	165	90277688PT	7.7	195
90277232	6.9	175	90277070	6.9	175	90277111	6.9	175	90277617PT	8.1	205
90277233	7.7	195	90277071	7.7	195	90277112	7.3	185	90277689PT	8.5	215
90277236	8.5	215	90277238	8.5	215	90277235	7.7	195	90277692PT	9.3	235
90277261	10.0	255	90277240	9.3	235	90277269	8.5	215	90277693PT	10.0	255
			90277242	10.0	255	90277286	9.3	235			
			90277265	14.0	355	90277276	10.0	255			
						90277245	11.6	295			
						90277660	10.8	275			

* Note: E200 Collet Clamp and other Straight Shank capable spindles available upon request.

Illustration 38: 634989PT Spindle Guard Adapter



634989PT Spindle Guard Adapter allows use of existing 15 series spindle guards.

Illustration 39: Slotted Spindle Guard

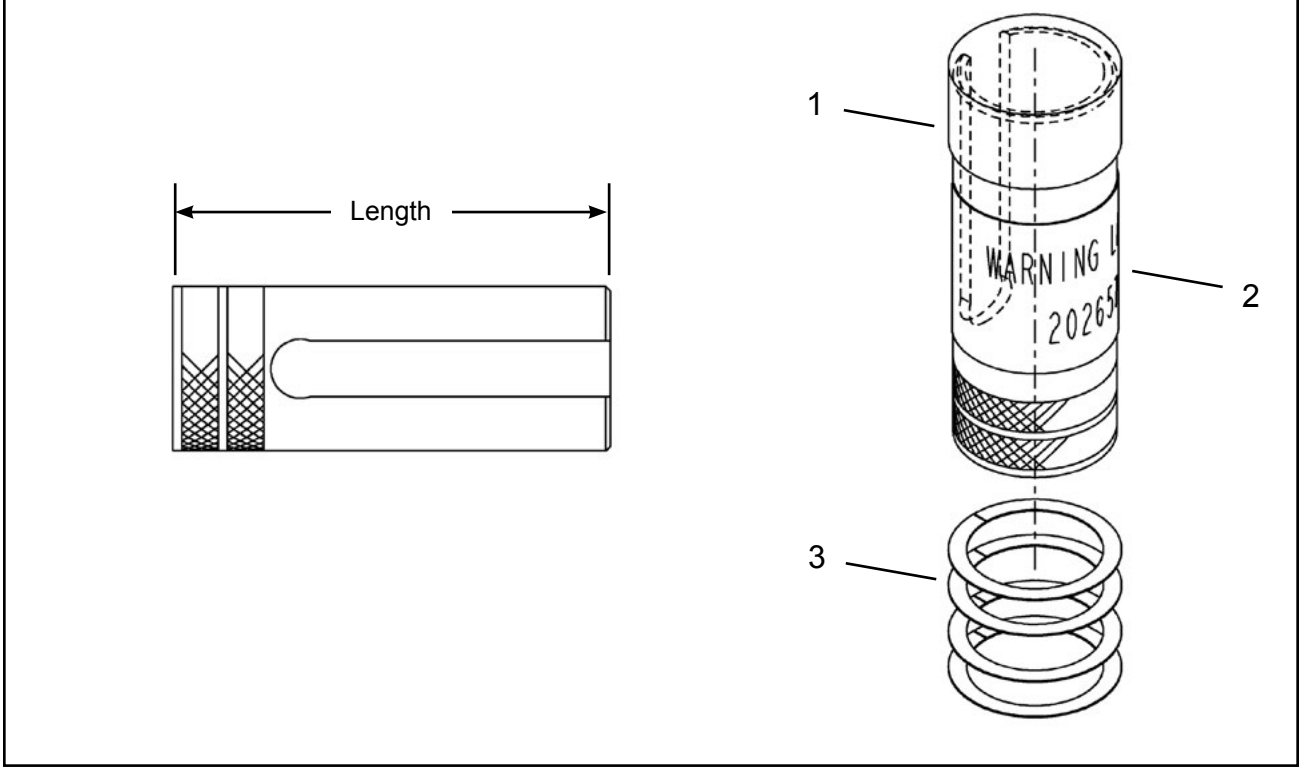


Illustration 39: Slotted Spindle Guard

Ref	Number	#	X	EN Description
1	Table "39"	1		Slotted Spindle Guard (includes Ref. 2-3)
2	202657	1	1	Warning Label
3	624351	4		Shim (0.010" Thick)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Table 39: Slotted Spindle Guard

Part No.	Length	
	in.	mm
624328	2.00	50.8
624329	3.00	76.2
624330	4.00	101.6
624331	5.00	127.0
624332	6.00	152.4
624333	7.00	177.8

Part No.	Length	
	in.	mm
624334	8.00	203.2
624335	9.00	228.6
624336	10.00	254.0
624337	11.00	279.4
634125PT	14.00	355.6
624338	19.00	482.6

Illustration 40: Solid Spindle Guard

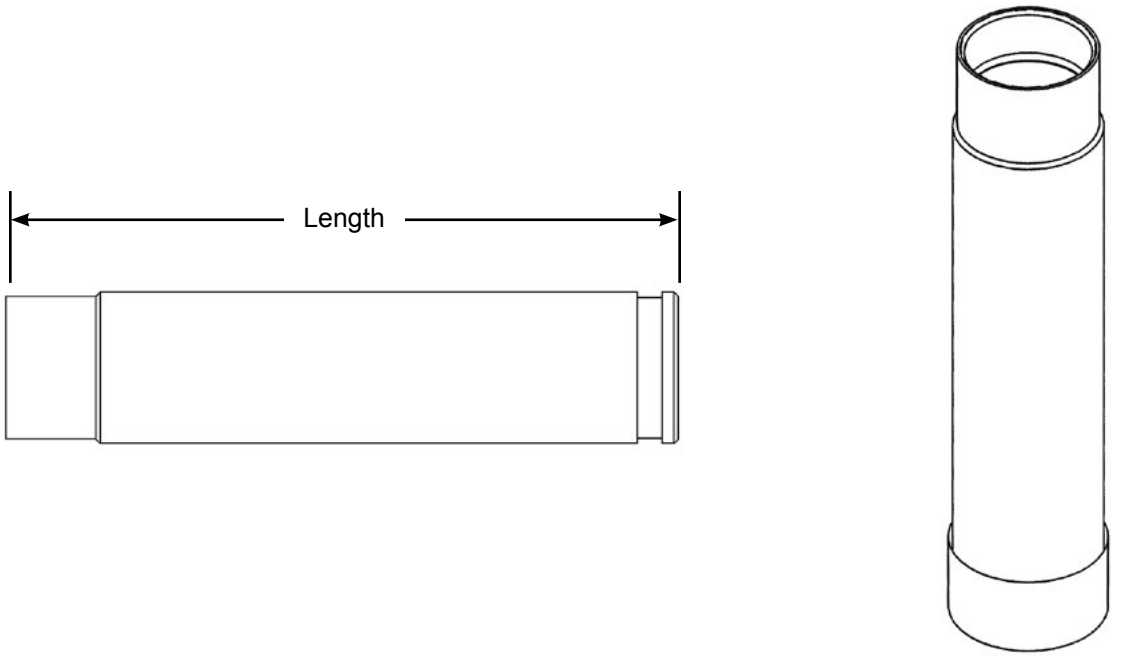


Illustration 40: Solid Spindle Guard

Part No.	Length		Material
	in.	mm	
624339	1.000	25.4	Aluminum
627118	1.375	34.9	Aluminum
624340	2.000	50.8	Aluminum
624341	3.000	76.2	Aluminum
624095	4.000	101.6	Aluminum
624342	5.000	127.0	Aluminum
624096	6.000	152.4	Aluminum
624343	7.000	177.8	Aluminum
624344	8.000	203.2	Aluminum
624345	9.000	228.6	Aluminum
624346	10.000	254.0	Aluminum
624347	11.000	279.4	Aluminum
624777	14.000	355.6	Aluminum
624348	18.000	457.2	Aluminum

Part No.	Length		Material
	in.	mm	
624339S	1.000	25.4	Steel
627118S	1.375	34.9	Steel
624340S	2.000	50.8	Steel
624341S	3.000	76.2	Steel
624095S	4.000	101.6	Steel
624342S	5.000	127.0	Steel
624096S	6.000	152.4	Steel
624343S	7.000	177.8	Steel
624344S	8.000	203.2	Steel
624345S	9.000	228.6	Steel
624346S	10.000	254.0	Steel
624347S	11.000	279.4	Steel
624777S	14.000	355.6	Steel
624348S	18.000	457.2	Steel

Illustration 41: 642602PT End Feed Fluid Inducer

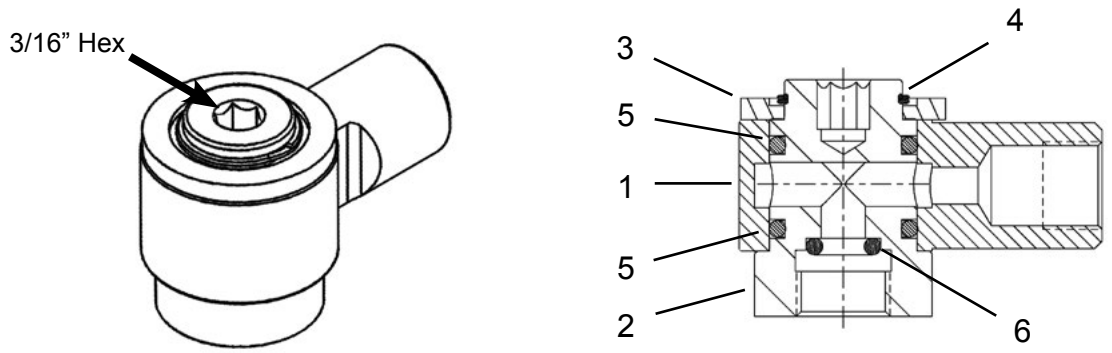


Illustration 41: 642602PT End Feed Fluid Inducer

Ref	Number	#	X	EN Description
--	642602PT	1		End Feed Fluid Inducer (includes Ref. 1-6)
1	624352	1		Swivel Collar
2	634995PT	1		Fluid Body
3	622590	1		Washer
4	617409	1	1	Retaining Ring
5	613336	2	6	O-Ring (0.489" I.D.)
6	844303	1	3	O-Ring (0.176" I.D.)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 42: 642691PT End Feed Fluid Inducer

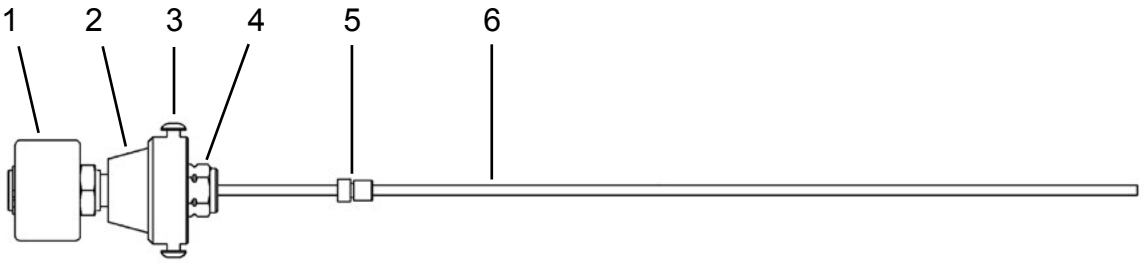


Illustration 42: 642691PT End Feed Fluid Inducer

Ref	Number	#	X	EN Description
--	642691PT	1		End Feed Fluid Inducer (includes Ref. 1-6)
1	633473PT	1		Fluid Swivel
2	633480PT	1		Guard Cap
3	17-042	2	2	Screw
4	635224PT	1		Tube Fitting (1/8" NPT x 1/8")
5	642692PT	1		Stuffing Box (5mm)
6	635212PT	1		Tube (1/8" OD x 12")

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 43: 642489PT Retract Stop Nut

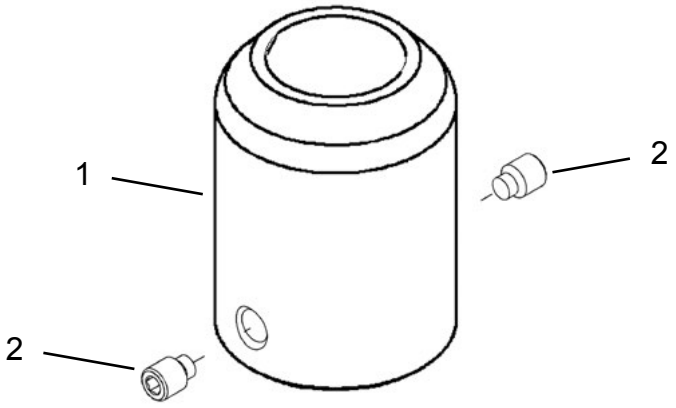


Illustration 44: 642678PT Rear Depth Stop Nut

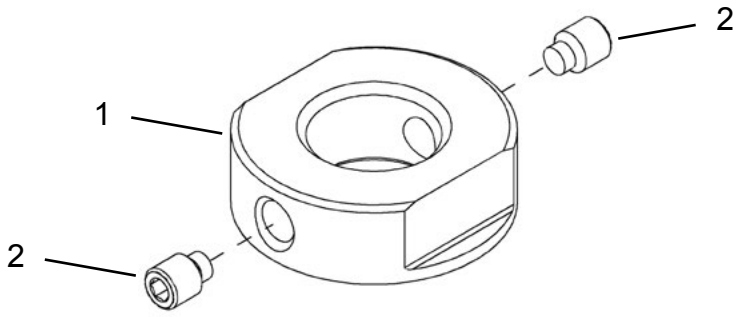


Illustration 45: 23500046 Microstop

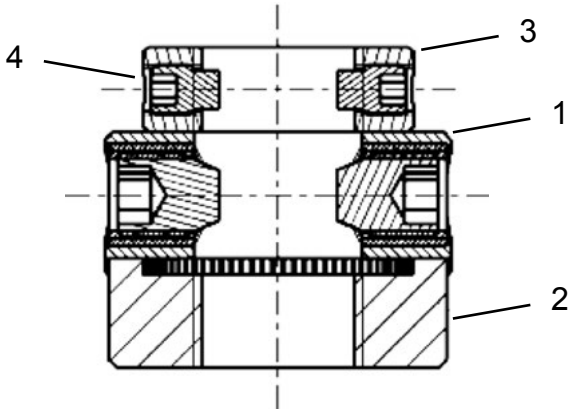


Illustration 43: 642489PT Retract Stop Nut

Ref	Number	#	X	EN Description
1	642489PT	1		Retract Stop Nut (includes Ref. 2)
2	634823PT	2	2	Set Screw

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 44: 642678PT Rear Depth Stop Nut

Ref	Number	#	X	EN Description
1	642678PT	1		Rear Depth Stop Nut (includes Ref. 2)
2	634823PT	2	2	Set Screw

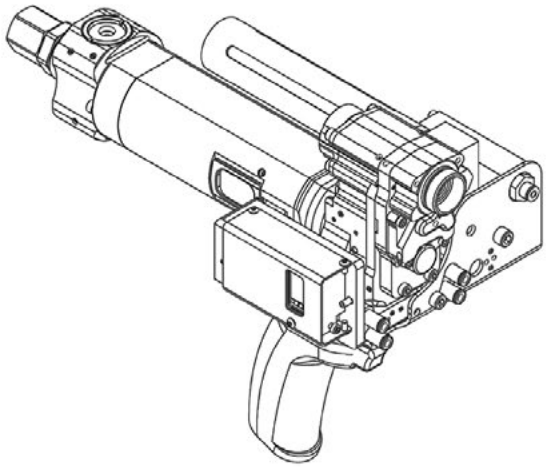
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 45: 23500046 Microstop

Ref	Number	#	X	EN Description
--	23500046	1		Microstop (includes Ref. 1-4)
1	90285066	1		Notched Race
2	90285067	1		Notched Race
3	90810101	1		Stop Nut
4	94235075	2	2	Set Screw

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 46: Accessory Kits



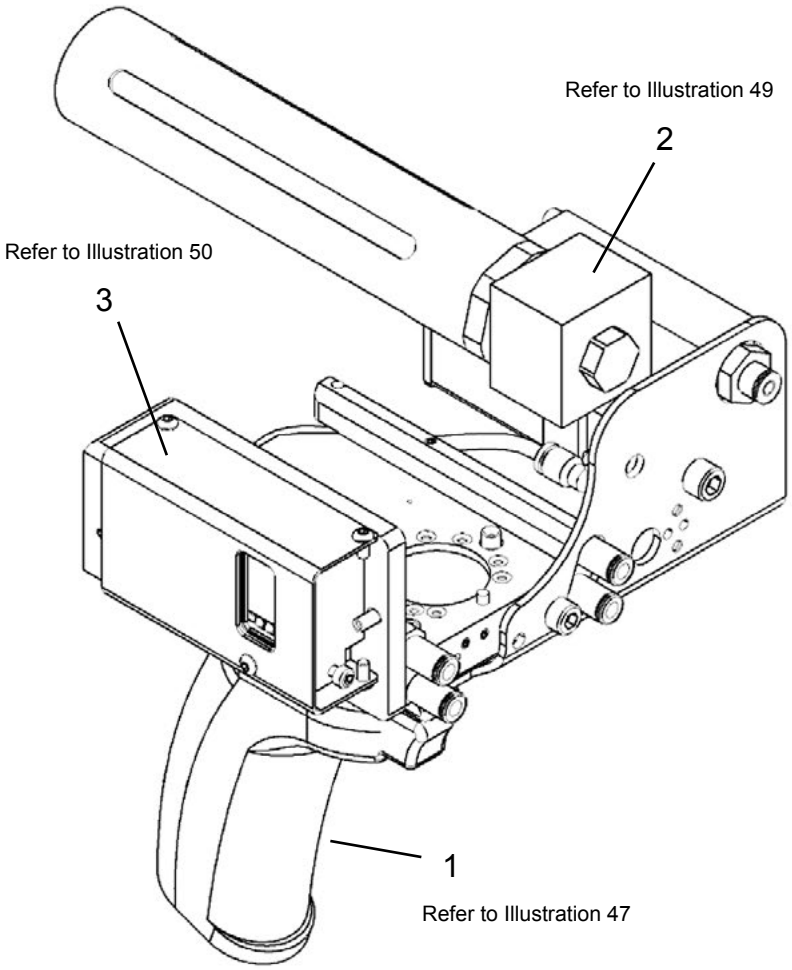


Illustration 46: Pistol Grip Accessory Kits

Ref	Number	#	X	EN Description
1	642579PT	1		Pistol Grip Handle Kit (Illustration 47)
2	642593PT	1		Lubricator Kit (Illustration 49)
3	642591PT	1		Counter Kit (Illustration 50)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 47: 642579PT Pistol Handle Kit

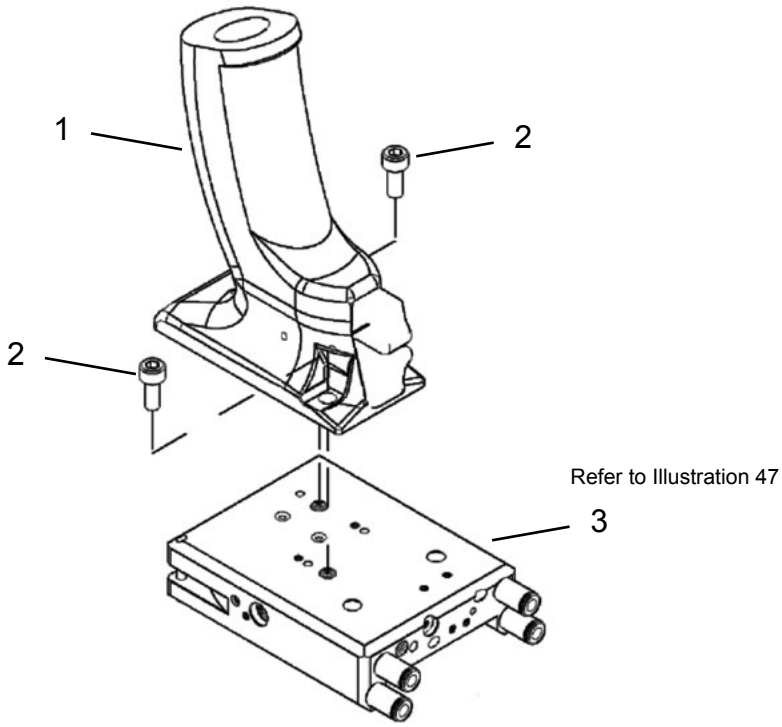


Illustration 48: 642600PT Logic Manifold Kit

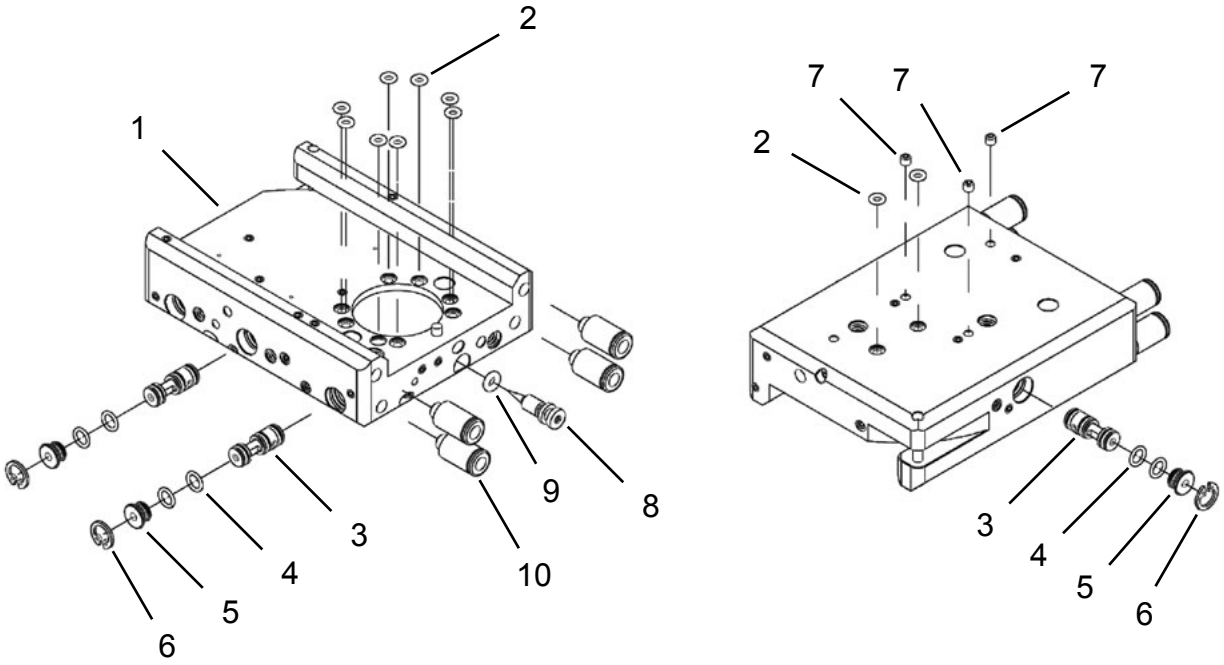


Illustration 47: 642579PT Pistol Grip Handle Kit

Ref	Number	#	X	EN Description
--	642579PT	1		Pistol Grip Handle Kit (includes Ref. 1-3))
1	642601PT	1		Pistol Grip Handle
2	542940-51	2	2	Socket Head Cap Screw (M5 x 12mm)
3	642600PT	1		Logic Manifold Kit (Illustration 48)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 48: 642600PT Logic Manifold Kit

Ref	Number	#	X	EN Description
--	642600PT	1		Logic Manifold Kit (includes Ref. 1-10)
1	642580PT	1		Handle Manifold Plate
2	91815042	10	30	O-Ring
3	642473PT	3		JAVO-3C Valve
4	91815104	6	18	O-Ring
5	634720PT	3		Valve Plug
6	634803PT	3	3	Retaining Ring
7	634323PT	3		Set Screw
8	622026	1		Needle Valve
9	844301	1	3	O-Ring
10	624906	4		Straight Male Push-In Fitting

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 49: 642593PT Lubricator Kit

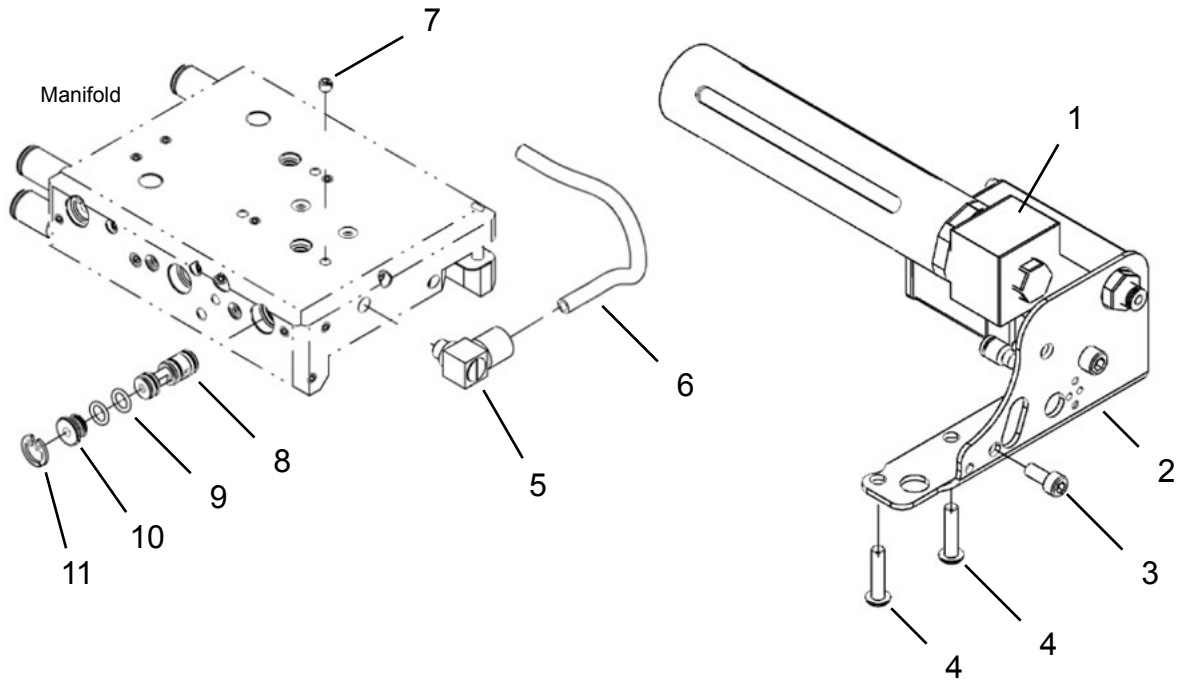


Illustration 50: 642591PT Counter Kit

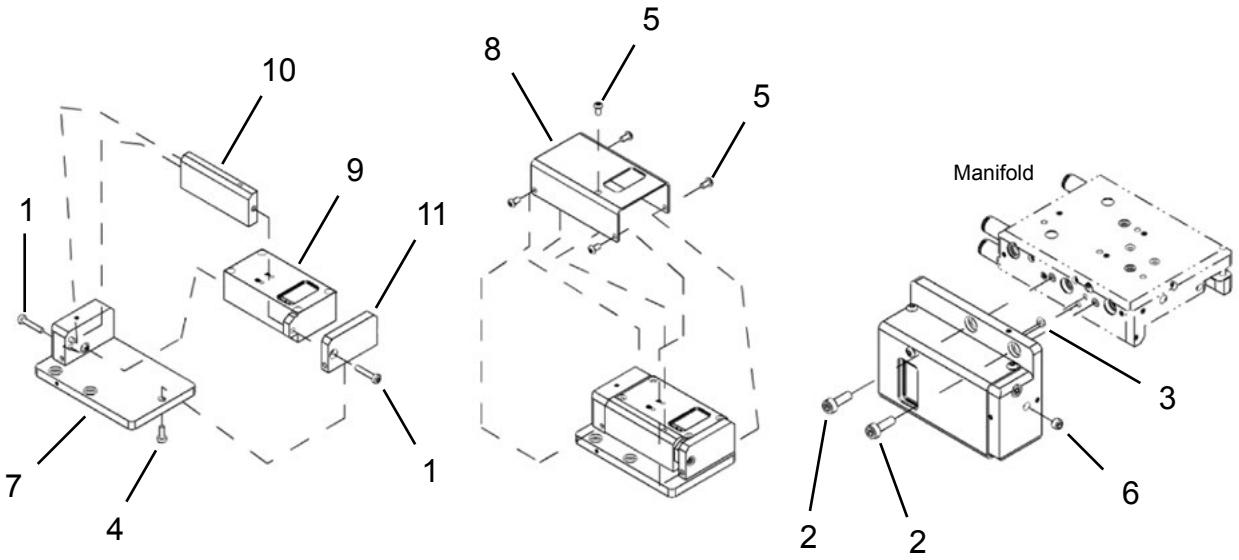


Illustration 49: 642593PT Lubricator Kit

Ref	Number	#	X	EN Description
--	642593PT	1		Lubricator Kit (includes Ref. 1-11)
--	642609PT	1		Lubricator and Bracket Assembly (includes Ref. 1-2)
1	634130PT	1		Lubricator Assembly
2	634984PT	1		Lubricator Bracket
3	542940-51	1		Socket Head Cap Screw (M5 x 12mm)
4	634985PT	2		Button Head Screw (M5 x 22mm)
5	627950	1		Miniature Fitting (Metric)
6	68-008	1		5/32" Tubing (4mm) - 0.4 feet
7	634323PT	1	1	Set Screw (M3 x 3mm)
8	642473PT	1		JAVO-3C Valve
9	91815104	2	6	O-Ring
10	634720PT	1		Valve Plug
11	634803PT	1	1	Retaining Ring

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 50: 642591PT Counter Kit

Ref	Number	#	X	EN Description
--	642591PT	1		Counter Kit (includes Ref. 1-11)
1	542940-3	2		Socket Head Cap Screw
2	542940-48	2		Socket Head Cap Screw (M4 x 12mm)
3	91815042	1	3	O-Ring
4	634345PT	1		Socket Head Cap Screw (M3 x 8mm)
5	634357PT	5		Button Head Screw (M3 x 6mm)
6	634534PT	1		Set Screw (M5 x 4mm)
7	642592PT	1		Counter Base Plate Assembly
8	90420847PT	1		Guard
9	90544009PT	1		Electronic Counter
10	90835925PT	1		Spacer
11	93055957PT	1		Protection Plate

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 51: Template Foot Kits

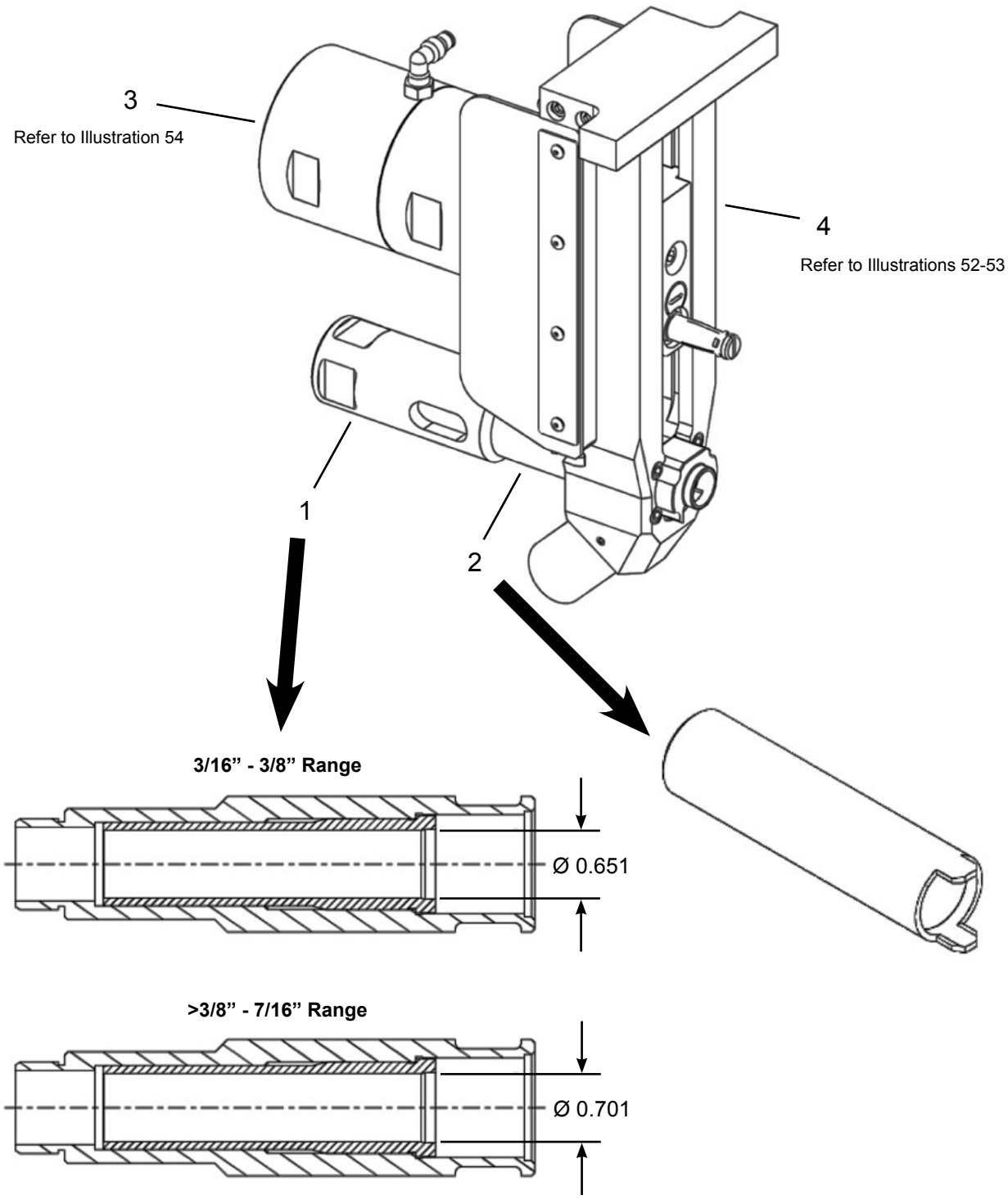


Illustration 51: Template Foot Kits

Ref	EN	Template Foot Kit				
		642355PT	642356PT	642680PT	642357PT	642697PT
	Description	3/16"-3/8" Range			>3/8"-7/16" Range	
1	Spindle Guide Nose	642348PT	642348PT	642348PT	642349PT	642349PT
2	Spindle Guide Bushing	634062PT	634062PT	634062PT	634471PT	634471PT
3	Single Cylinder Clamp Assembly (Illustration 54)	----------	642296PT	----------	----------	----------
	Double Cylinder Clamp Assembly (Illustration 54)	642222PT	----------	----------	642222PT	----------
	Lead Screw Clamp Assembly (Illustration 54)	----------	----------	642681PT	----------	642681PT
4	Variable Spacing Foot (Illustrations 52-53)	642176PT	642176PT	642176PT	642358PT	642358PT

Illustration 52: Template Foot: 642176PT & 642358PT with Lead Screw Kit

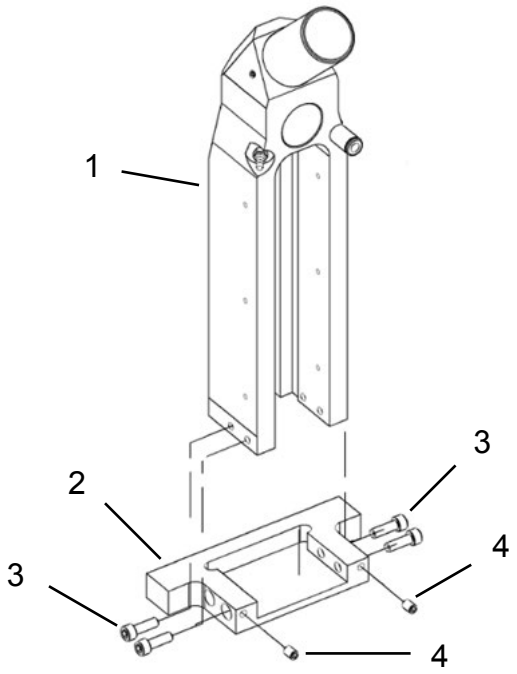


Illustration 53: Template Foot 642176PT & 642358PT with Piston Clamp Kit

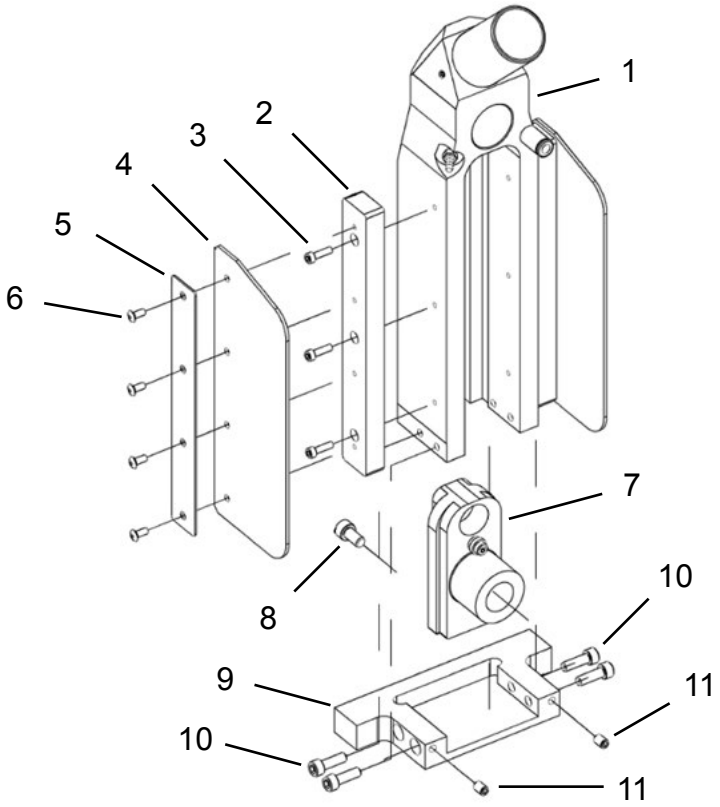


Illustration 52: 642176PT & 642358PT with Lead Screw Kit

Ref	Number	#	X	EN Description
1	642176PT	1		Variable Spacing Foot (3/16"-3/8")
	642358PT	1		Variable Spacing Foot (>3/8"-7/16")
2	634050PT	1		Fixed Tail Pad
3	883191	4	4	Socket Head Cap Screw (#8-32 UNC)
4	93350028	2	2	Set Screw (#8-32 UNC-3A)

(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

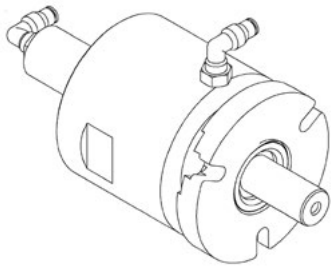
Illustration 53: 642176PT & 642358PT with Piston Clamp Kit

Ref	Number	#	X	EN Description
1	642176PT	1		Variable Spacing Foot (3/16"-3/8")
	642358PT	1		Variable Spacing Foot (>3/8"-7/16")
2	634051PT	2		Guard Spacer
3	622332	6	6	Socket Head Cap Screw (#4-40 UNC)
4	56-035	2		Lift Bar Guard
5	56-108	2		Lift Bar Guard Bearing Plate
6	1019249	8	8	Button Head Cap Screw (#4-40 x 1/4)
7	642177PT	1		Collet Holder Assembly
8	622056	1	1	Socket Head Cap Screw (#10-32)
9	634050PT	1		Fixed Tail Pad
10	883191	4	4	Socket Head Cap Screw (#8-32 UNC)
11	93350028	2	2	Set Screw (#8-32 UNC-3A)

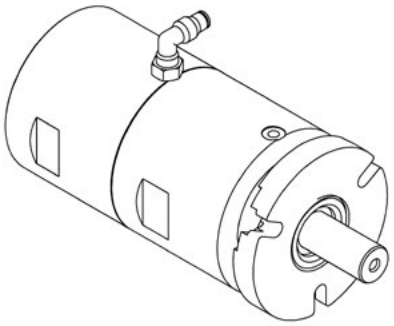
(#) Quantity
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration 54: Template Foot Clamp Type

642296PT: Single Cylinder



642222PT: Double Cylinder



642681PT: Lead Screw

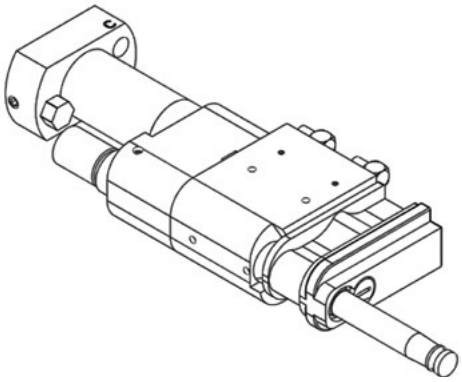


Illustration 55: 634992PT “C” Type Cutter Guide

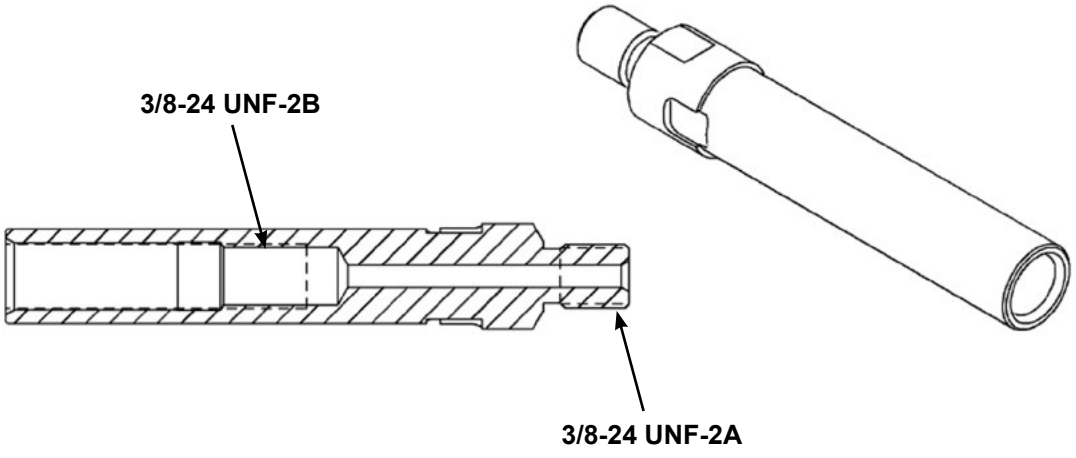


Illustration 56: Template Foot Collets and Mandrels

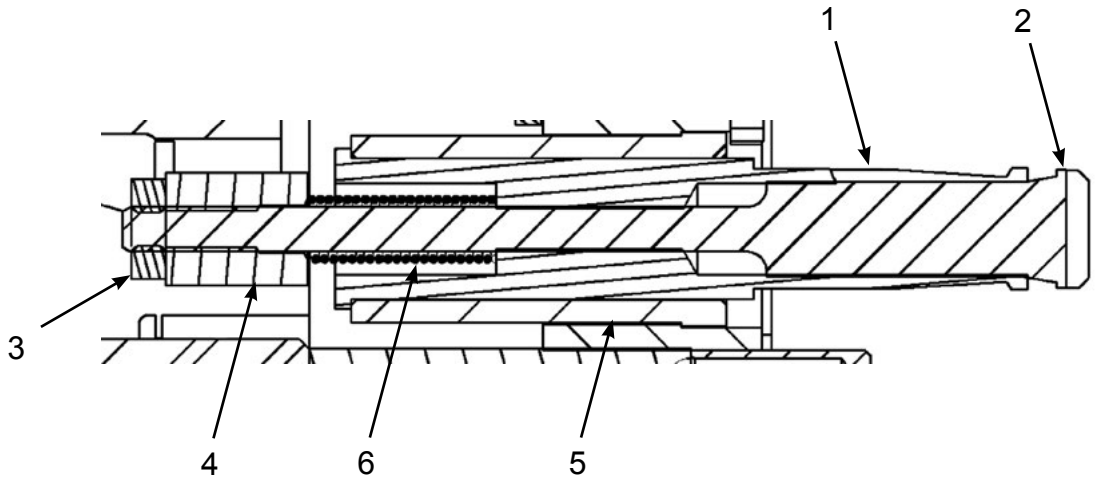


Illustration 56: Template Foot Collets and Mandrels

Air Cylinder Clamp								
Range (in.)	Nominal Grip Range		Collet (1)	Mandrel (2)	Mandrel Nut (3)	Mandrel Insert (4)	Collet Guide (5)	Mandrel Spring (6)
	Min.	Max.						
.1815 - .1895	0.00	0.75	623849PT	623895	93210002	634046PT	634044PT	632822
.2435 - .2515	0.25	1.00	624003	623713	93210002	634046PT	634044PT	632822
.3065 - .3145	0.25	1.00	624000	623719	93210002	634046PT	634045PT	632822
.3685 - .3765	0.50	1.25	624953	627074	93210002	634046PT	634045PT	632822
.4315 - .4395	0.50	1.25	624975	627093	93210002	634046PT	634474PT	632822

Lead Screw Clamp								
Range (in.)	Nominal Grip Range		Collet (1)	Mandrel (2)	Mandrel Nut (3)	Mandrel Insert (4)	Collet Guide (5)	Mandrel Spring (6)
	Min.	Max.						
.1815 - .1895	0.00	0.75	623849PT	623891	93210002	----------	634044PT	632822
.2435 - .2515	0.25	1.00	624003	624004	93210002	----------	634044PT	632822
.3065 - .3145	0.25	1.00	624000	624001	93210002	----------	634045PT	632822
.3685 - .3765	0.50	1.25	624953	623727	93210002	----------	634045PT	632822
.4315 - .4395	0.50	1.25	624975	624951	93210002	----------	634474PT	632822

Illustration 57: Template Bosses

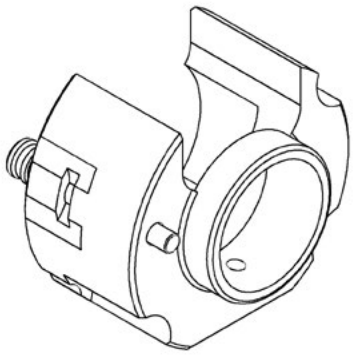


Illustration 57: Template Bosses

Template Boss Assembly				
Assembly	**Template Boss**	**Boss OD (in)**	**Boss ID (in.)**	**Mating vs Foot**
642295PT	634312PT	0.498	0.398	642176PT
642232PT	634052PT	0.623	0.524	642176PT
642233PT	634053PT	0.748	0.649	642176PT
642350PT	634473PT	0.873	0.710	642358PT

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5 Service Instructions:

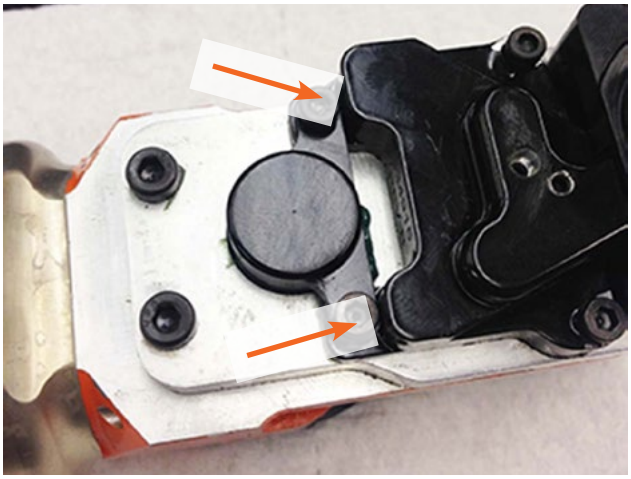
5.1 Replacing a shear pin:

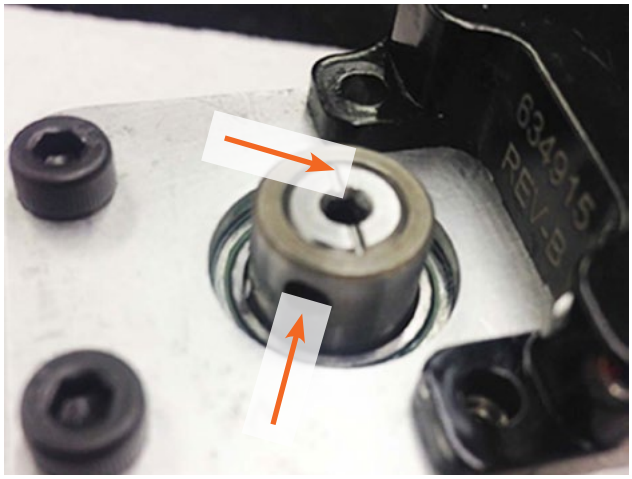
Refer to the following illustrations for a detailed parts listing.

642475PT Gearhead Assembly: Illustrations 13-16

Using a 2.5mm Allen key, remove the two screws securing the shear pin cover to the housing.

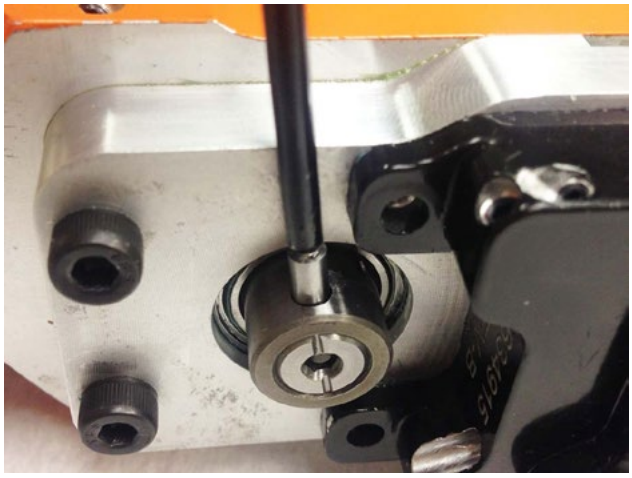
If the notch and the holes on the outside diameter of the shaft are not aligned, the shear pin needs to be replaced.

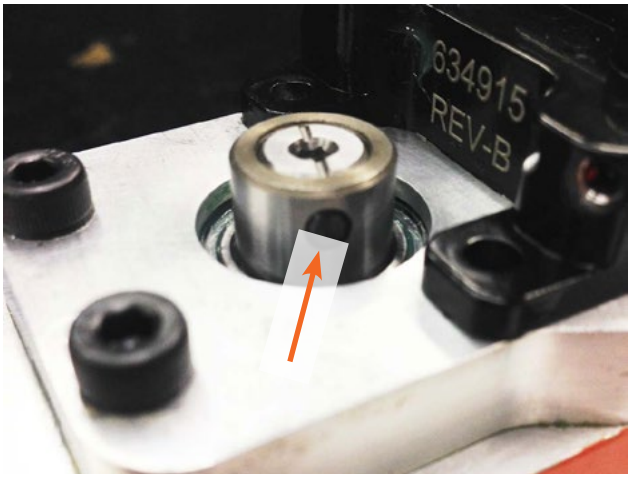




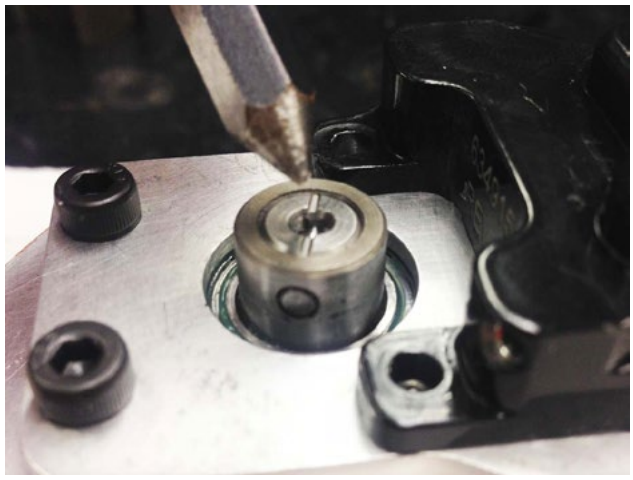
1. Remove all remnants of the broken shear pin.
2. Re-align the notch and holes on the shaft.

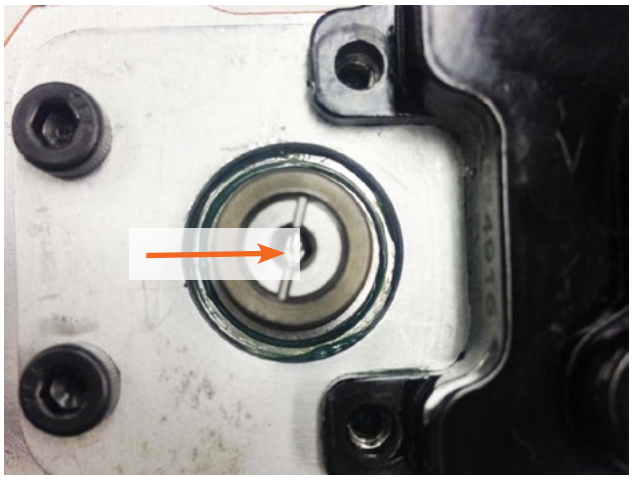
   Note: There is a 2.5 hex drive at the bottom of the inner shaft used for re-alignment.
3. Insert a new shear pin (634819PT).
4. Using a punch and hammer, drive the shear pin in until it is flush with the outside diameter of the shaft.





5. Using a pointed punch and hammer, peen the shear pin through the hex drive opening of the inner shaft to ensure that the shear pin is securely installed.





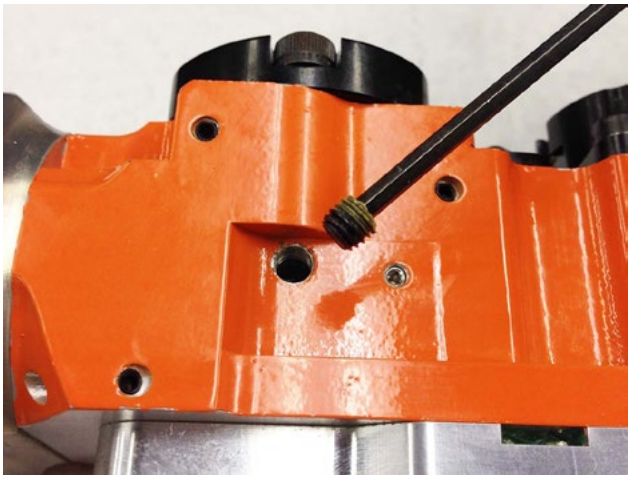
6. Install the shear pin cover and secure with the two screws.

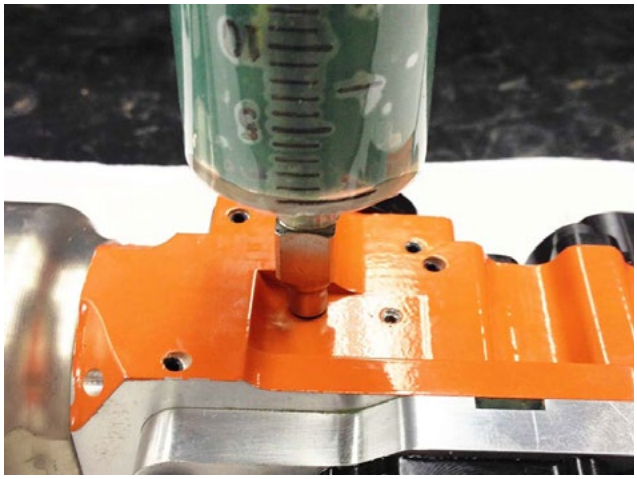
5.2 Gearhead Lubrication:

Using an Allen key, remove the set screw from the grease port in the side of the gearhead housing.

Apply 2.5 mL of Accro Lube through the grease port.

Install the set screw into the grease port.





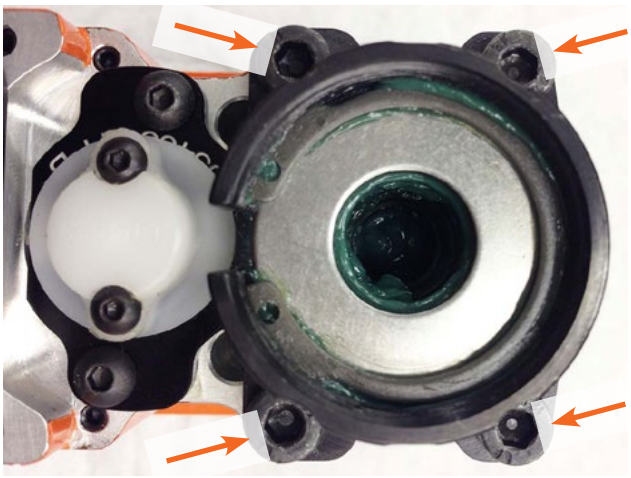
5.3 Changing Feed Gear

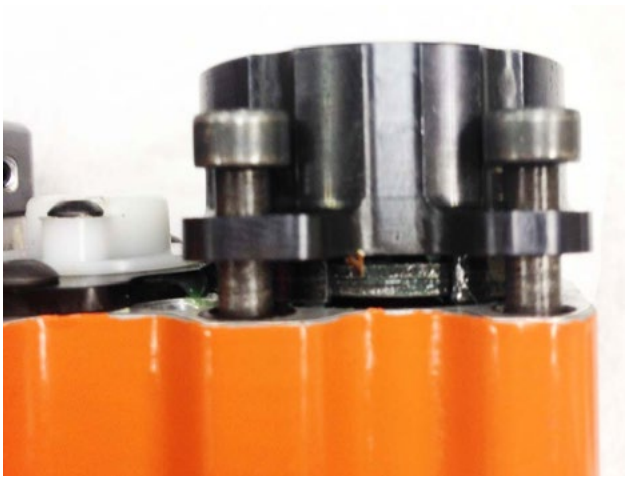
Refer to the following illustrations for a detailed parts listing.

642475PT Gearhead Assembly: Illustrations 13-16

Using a 3mm Allen key remove the four (4) bolts (94234211) securing the thrust pack cap assembly to the gearhead housing.

NOTE: The bolts should be removed using a lug nut pattern to reduce tension from the belleville washers.

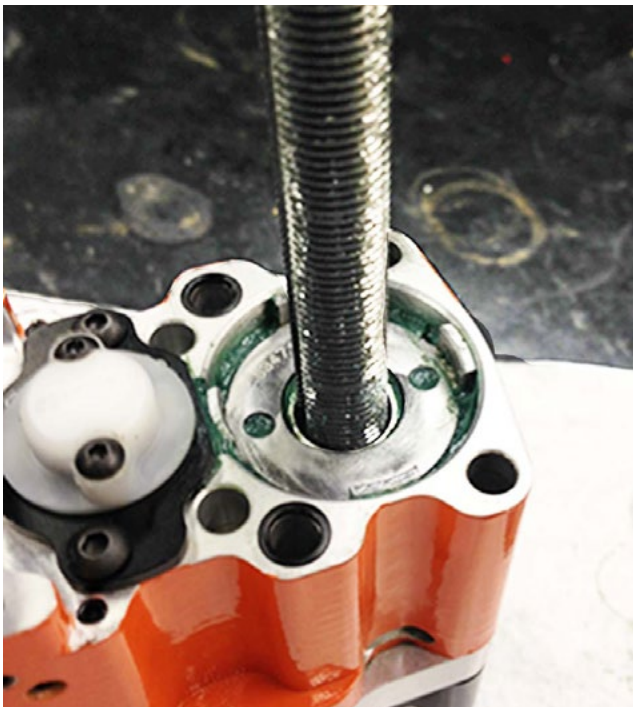




Remove the thrust pack cap and the five (5) bellville washers.

Remove the thrust cap and feed gear from the gear head housing.

For ease in removal, thread a spindle into the feed gear (counterclockwise) and pull the assembly out of the housing.



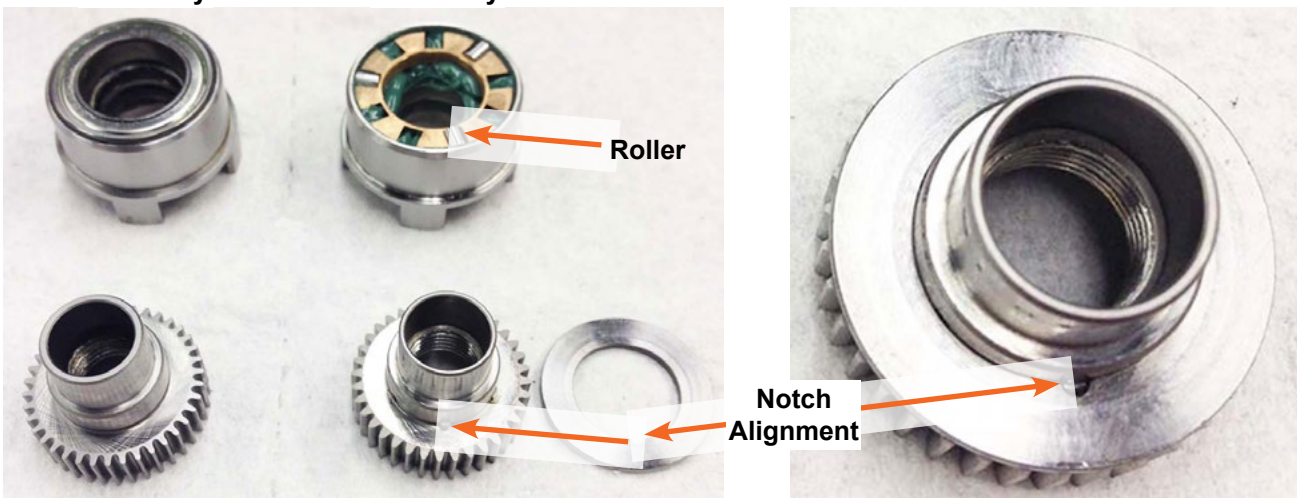
MITIS feed gear and thrust cap assembly:

- Make certain the notch on the inside diameter of the MITIS cam is aligned with the ball on the feed gear.
- The rollers must be evenly spaced in the cage as shown below.

Always apply a generous amount of Accro lube when assembling a non-MITIS or MITIS thrust cap.

Install the feed gear into the gear head housing with the MITIS cam attached (if applicable).

NOTE: Apply a generous amount of Accro lube on the feed gear teeth and the MITIS cam (if

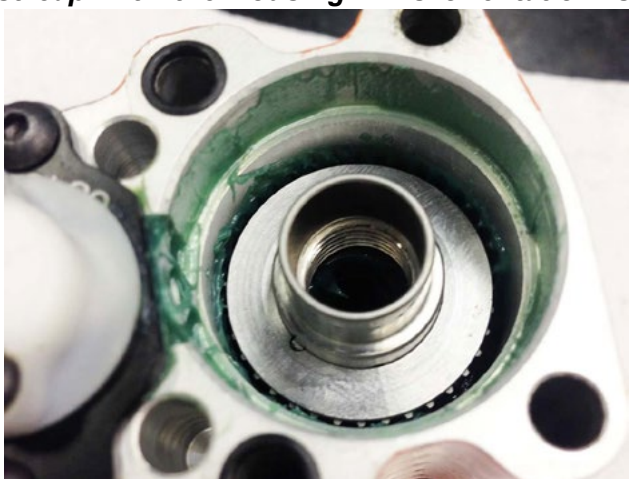


applicable) before installation. The following images are shown without grease for clarity.

Make certain the feed gear teetth are fully meshed with the intermediate feed gear teeth. To assure proper installation, press on the rim of the feed gear with your thumb and turn the input hex at the rear of the gear head, if the motor is not attached. You can also install a spindle through the front nose to turn the spindle.

Apply a generous amount of Accro lube to the thrust cap assembly and install it onto the feed gear.

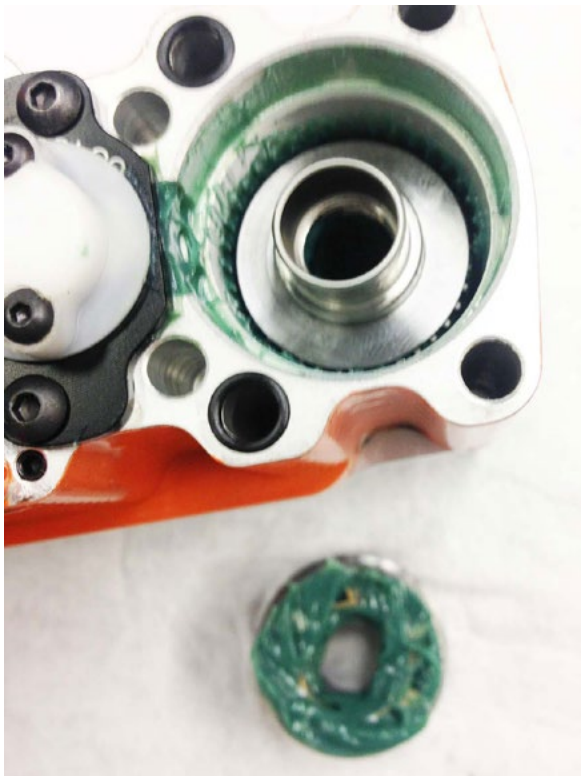
Note the orientation of the tangs on the thrust cap with the housing. This orientation is

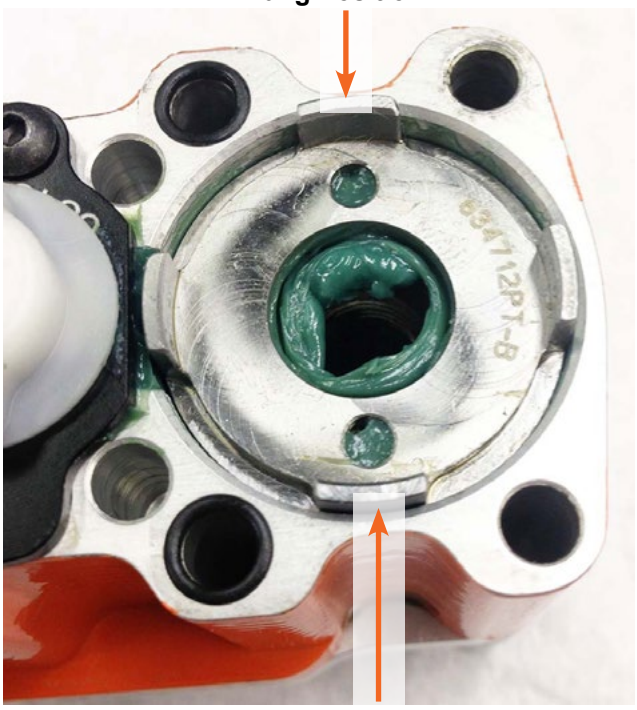


important for additional assembly later.

Assemble the belleville washers onto the thrust cap.

NOTE: The correct positioning of the bellville washers is critical for proper tool operation.





Follow the stacking sequence shown below.

Belleville washer assembly positions

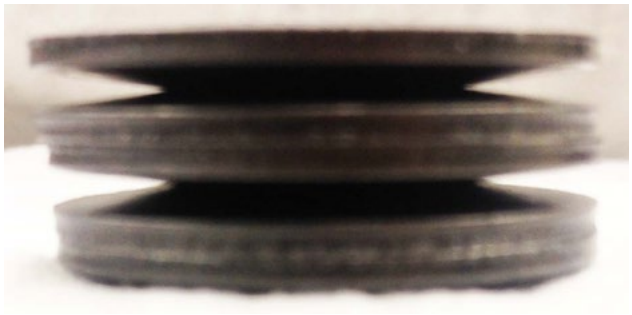
5: UP

4: DOWN

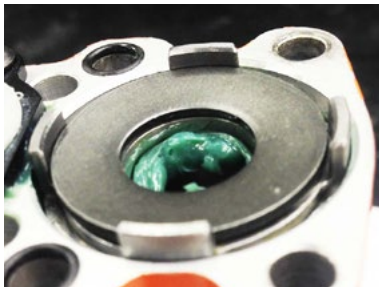
3: UP

2: DOWN

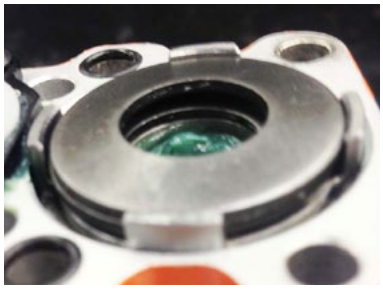
1: UP



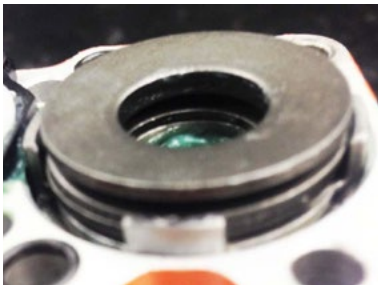
Washer 1: UP



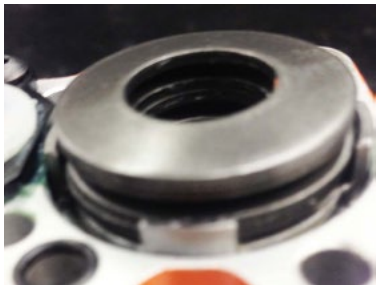
Washer 2: DOWN



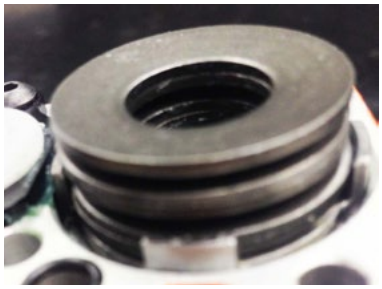
Washer 3: UP



Washer 4: DOWN

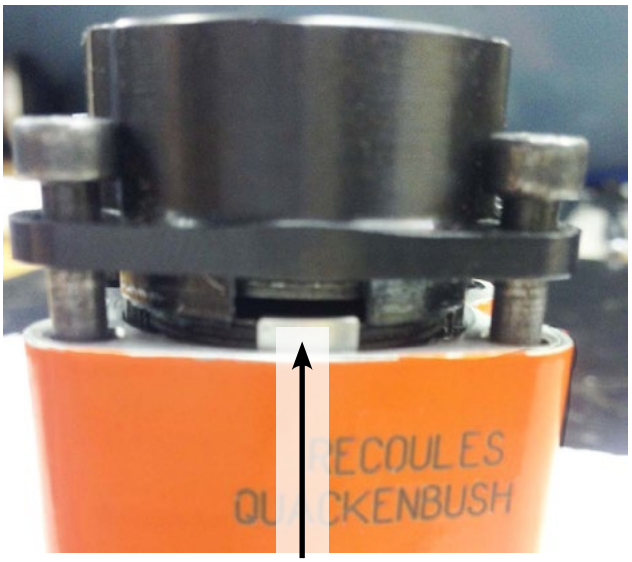


Washer 5: UP

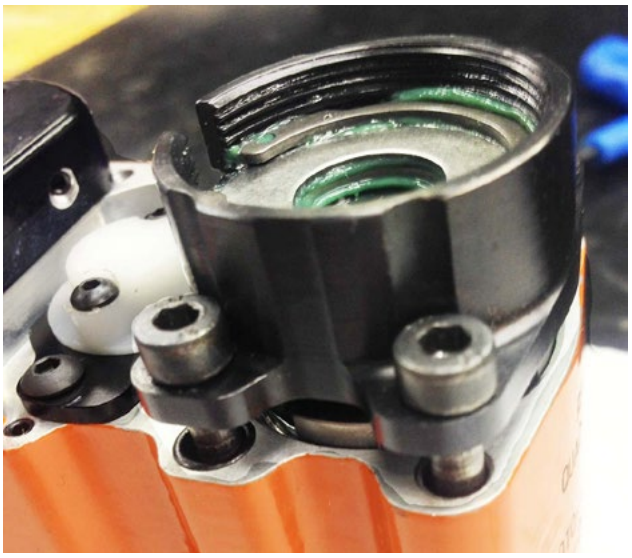


Install the rear cap assembly onto the gear housing and secure with the four (4) bolts. Tighten the bolts in a lug nut pattern to assure proper compression of the belleville washers.

NOTE: Make certain the tangs on the thrust cap assembly are aligned with the rear cap cutouts.



Tang Position

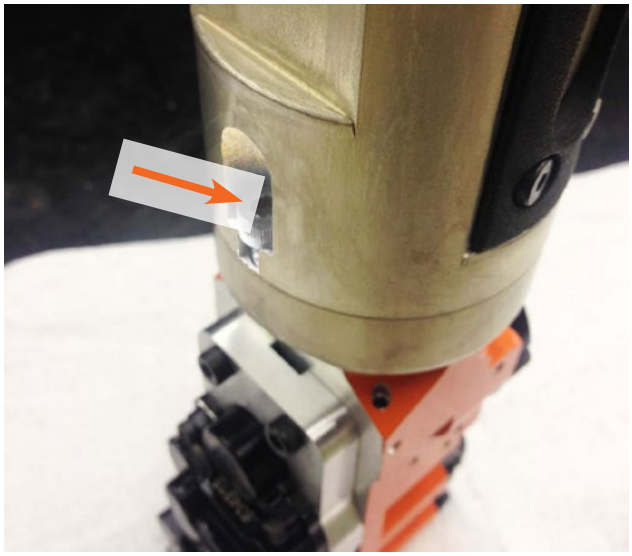


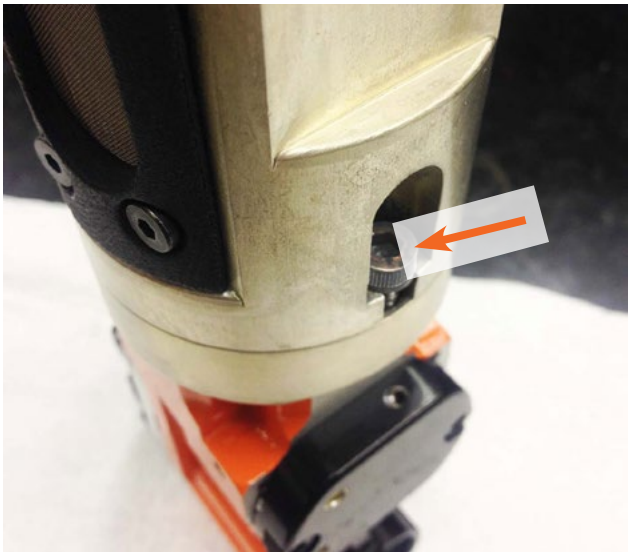
5.4 Removing a Planetary Gear

Refer to the following illustrations for a detailed parts listing.

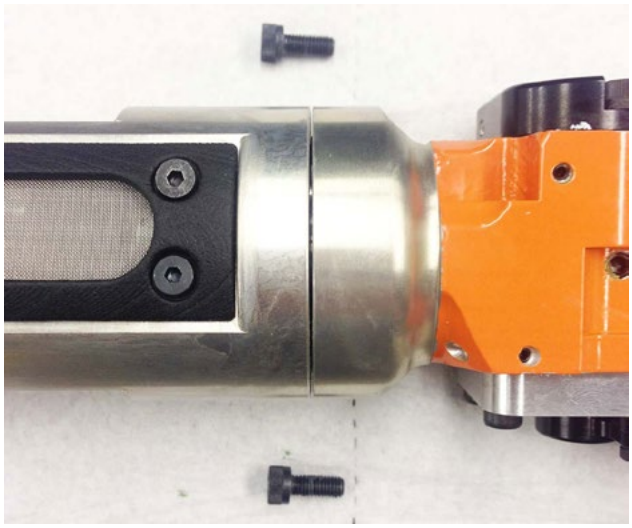
642475PT Gearhead Assembly: Illustrations 13-16

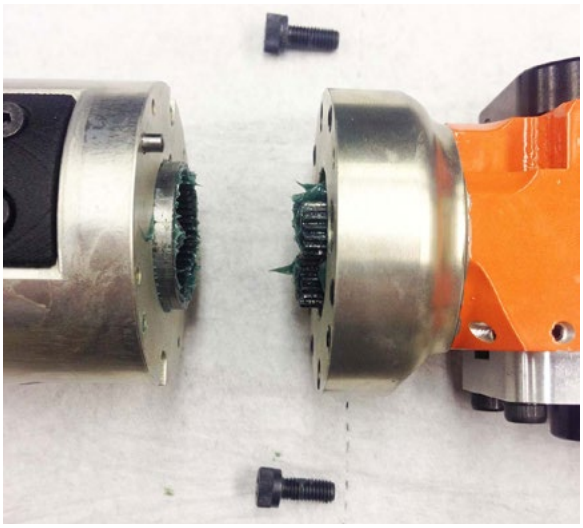
Using a 4mm Allen key remove the two (2) bolts securing the motor housing assembly to the planetary gear housing.



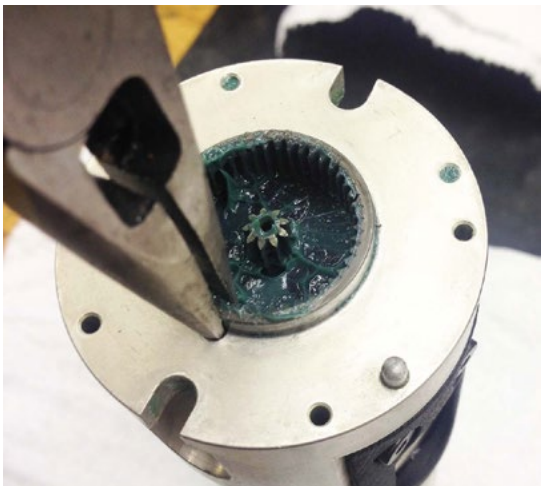


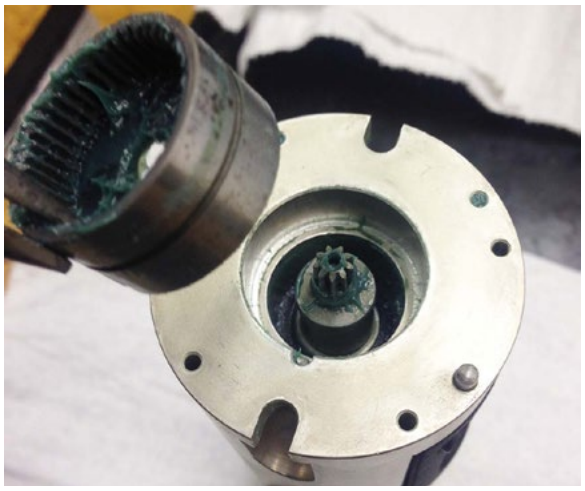
Remove the motor housing from the planetary gear housing.



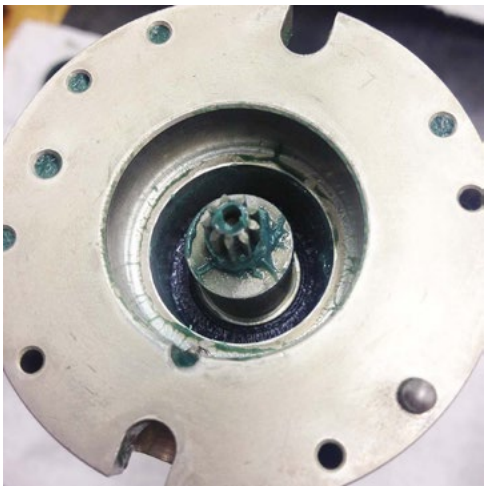


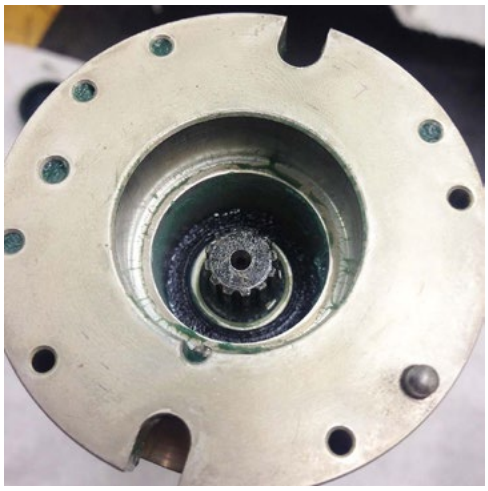
Using needle nose pliers, remove the ring gear from the motor housing.



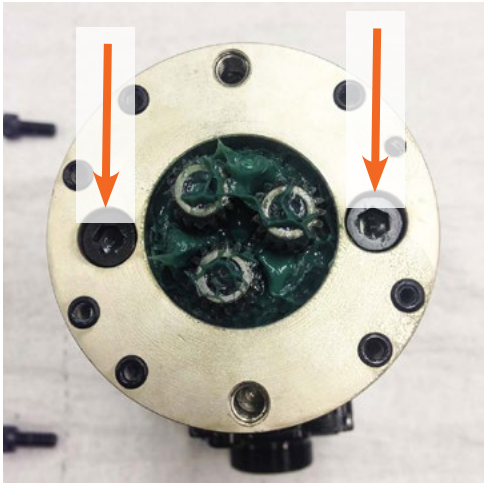


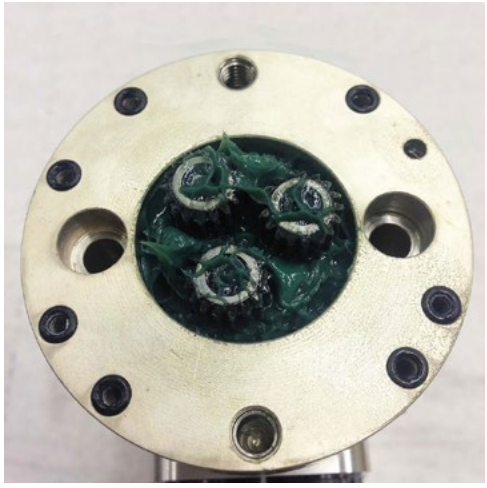
Turbine Motor: Remove the pinion from the turbine planetary gear output spline.



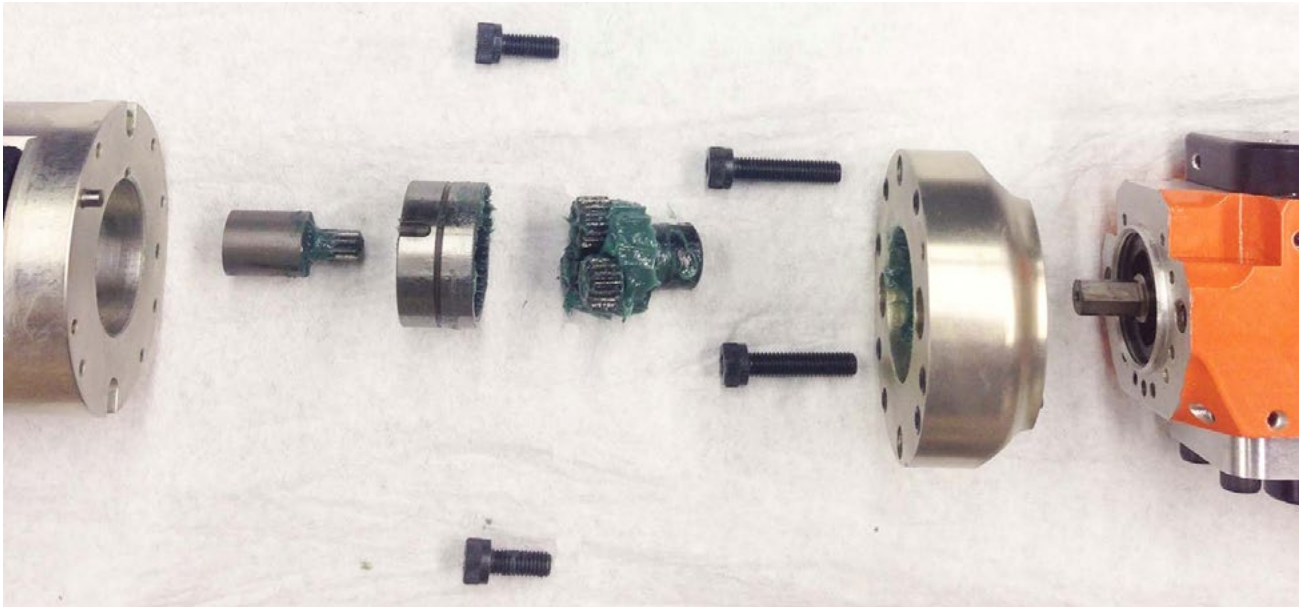


Using a 4mm Allen key remove the two (2) bolts securing the planetary gear to the gearhead.

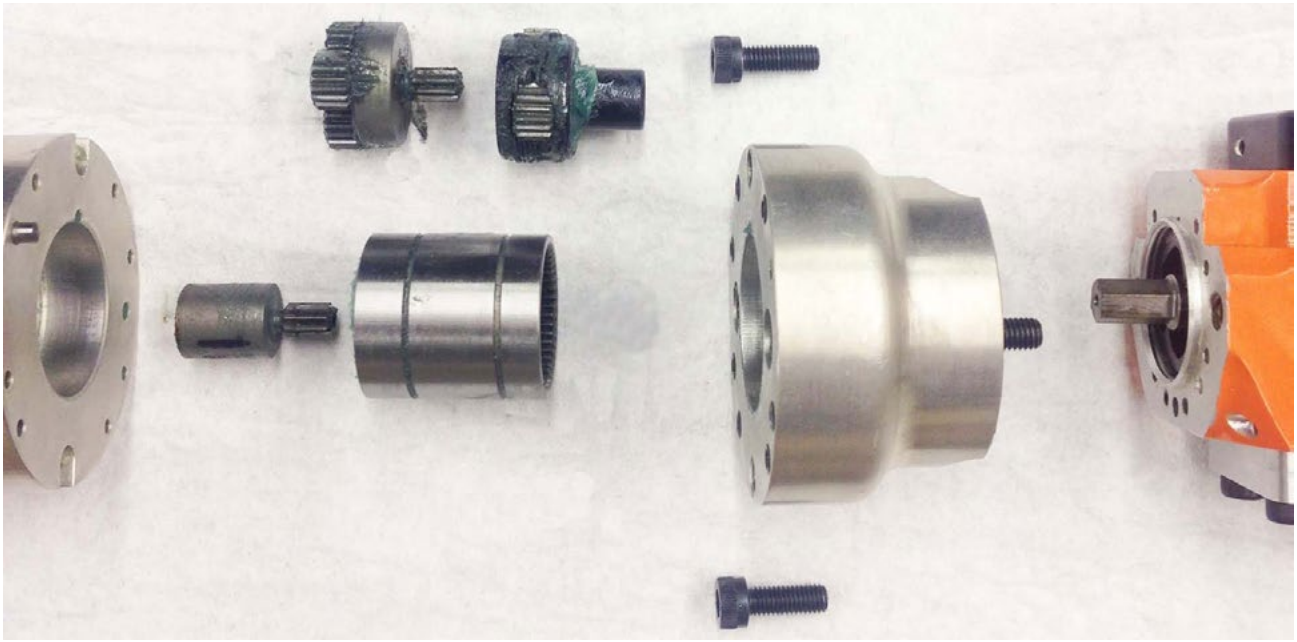




Single stage planetary gearing components.



Double stage planetary gearing components.

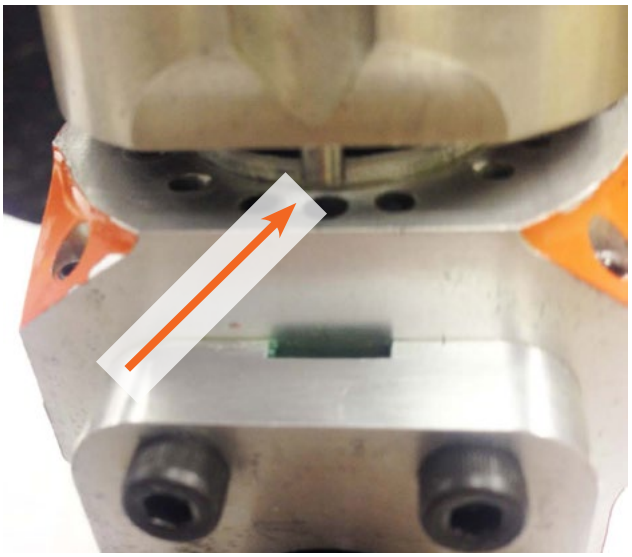


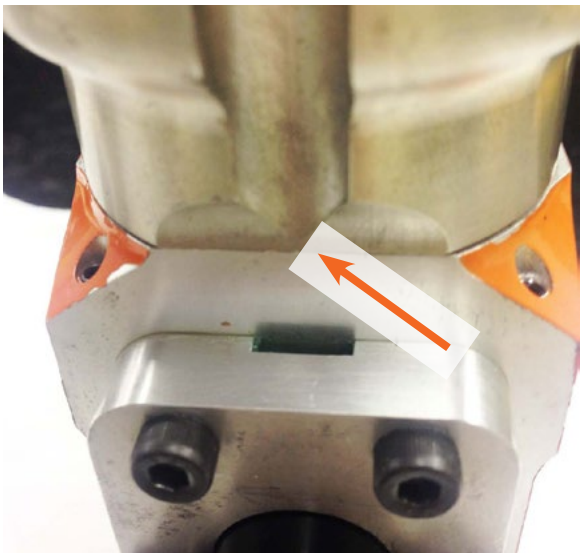
5.5 Planetary Gear Assembly - Single Stage

Refer to the following illustrations for a detailed parts listing.

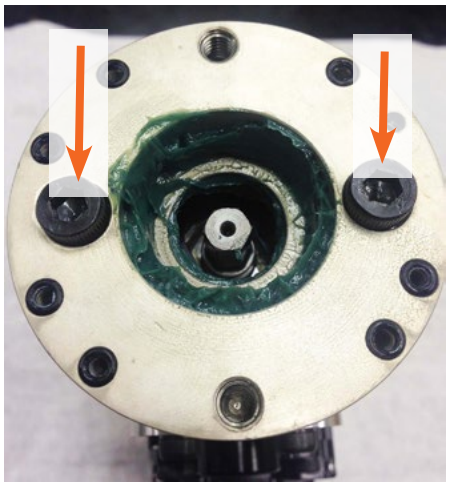
642475PT Gearhead Assembly: Illustrations 13-16

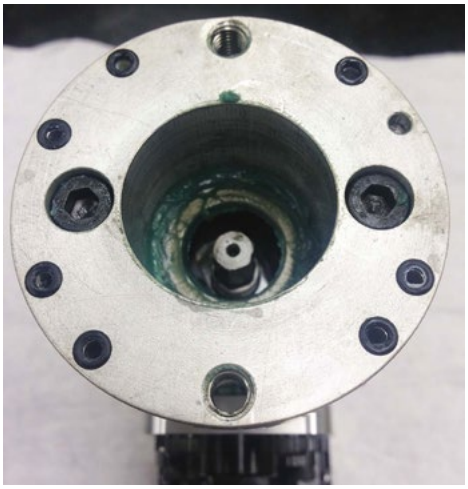
Install the planetary gear housing onto the gearhead. Align the dowel pin in the planetary gear housing with the hole in the gearhead.





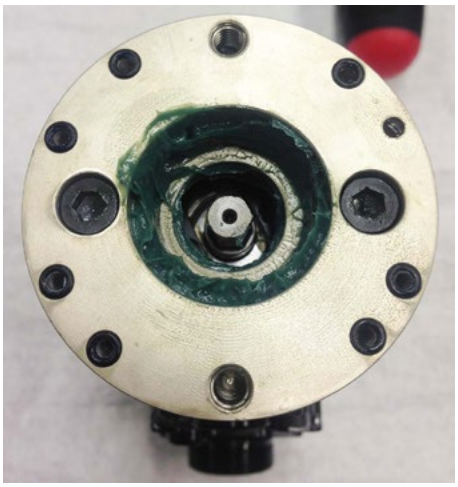
Using a 4mm Allen key tighten the two (2) bolts securing the planetary gear housing to the gearhead.

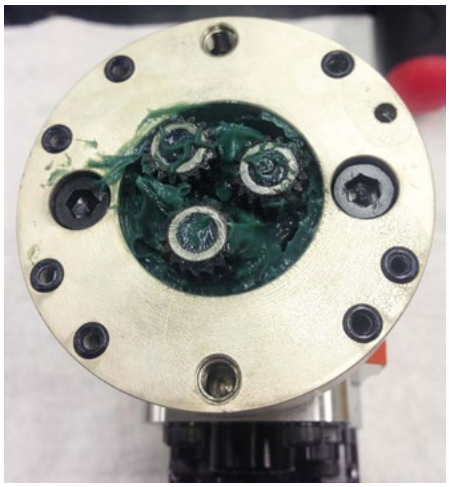




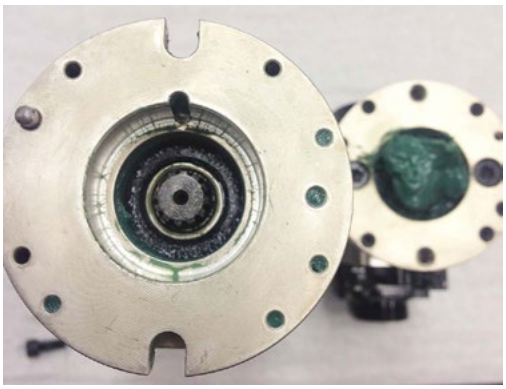
Install the planetary gear carrier, with gears, onto the input hex shaft of the gearhead.

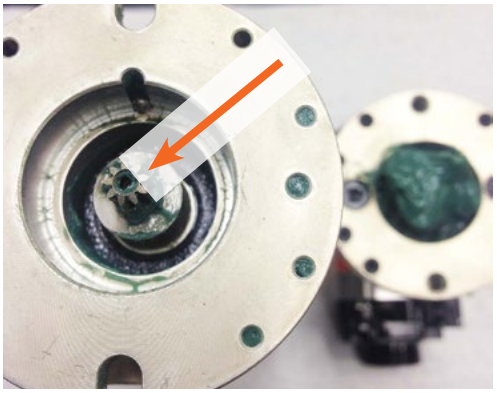
Apply a generous amount of Accro lube to the planetary gears.





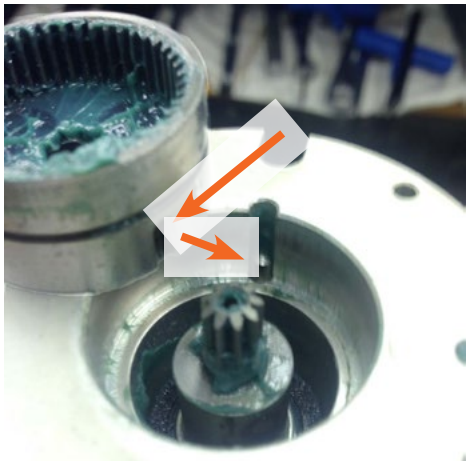
Turbine Motor: Install the planetary gear pinion on the turbine ouptut spline.

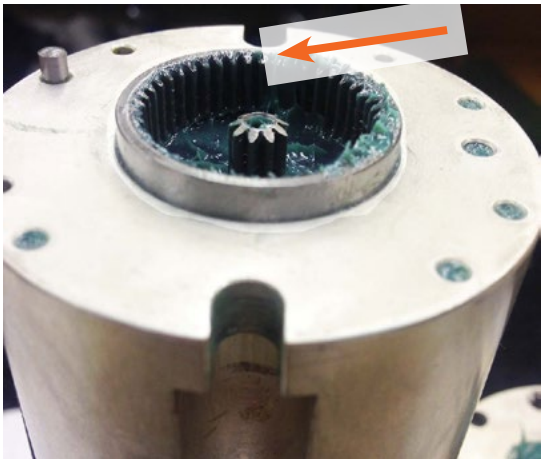




Install the ring gear into the motor housing. ***Assembly Note: The notch in the ring gear MUST align with the locating pin in the motor housing.***

Assembly Tip: To make sure the ring gear is seated properly, use your thumb to press down on the edge of the ring gear directly above the locating pin.

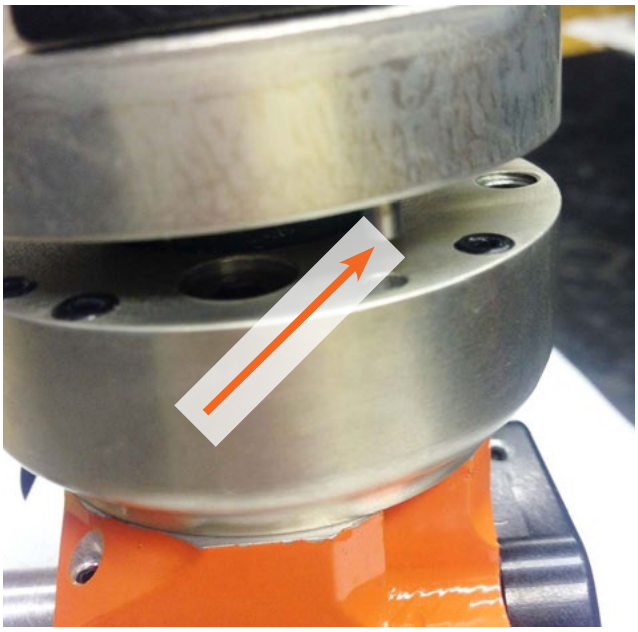


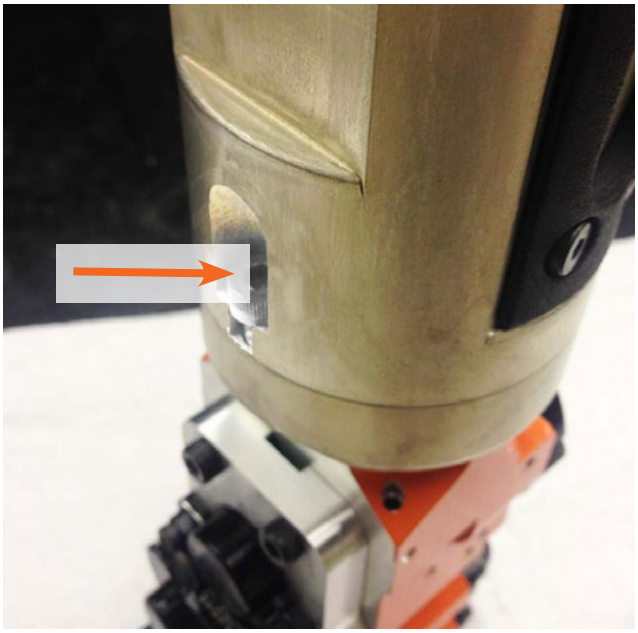


Place the motor housing on the planetary gear housing and rotate the housing until the ring gear fully engages with the planetary gears.

Make certain the dowel pin in the motor housing is located in the dowel pin hole in the planetary gear housing.

Using a 4mm Allen key, install and tighten the two (2) bolts securing the motor housing to the planetary gear housing.



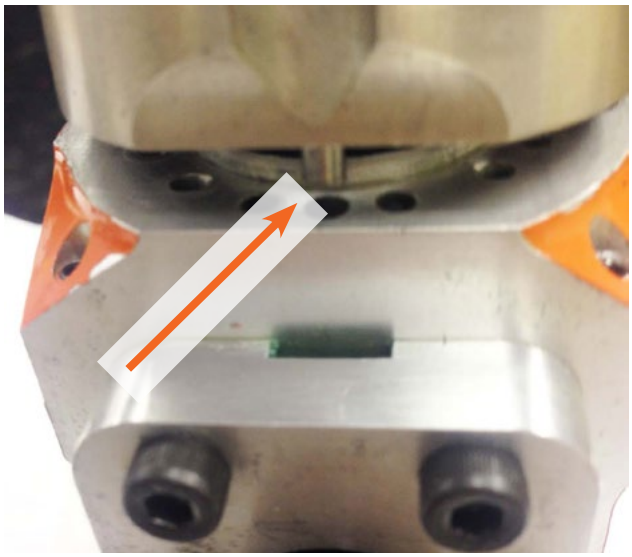


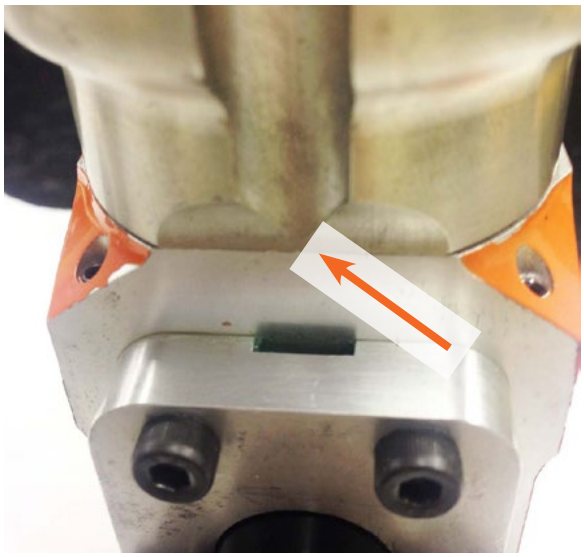
5.6 Planetary Gear Assembly - Double Stage

Refer to the following illustrations for a detailed parts listing.

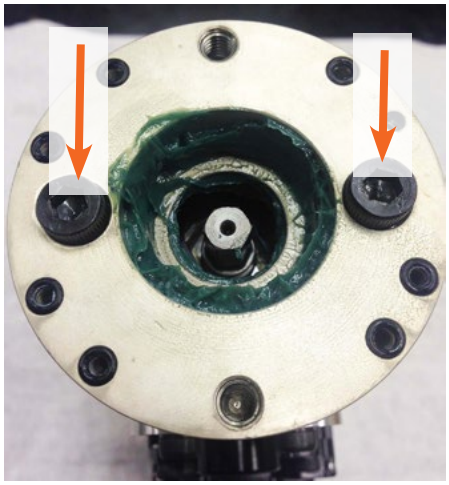
642475PT Gearhead Assembly: Illustrations 13-16

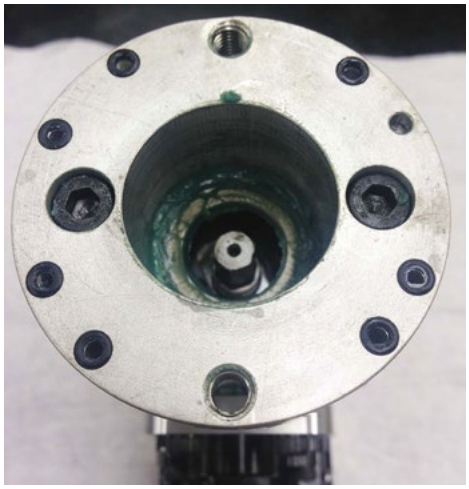
Install the planetary gear housing onto the gearhead. Align the dowel pin in the planetary gear housing with the hole in the gearhead.



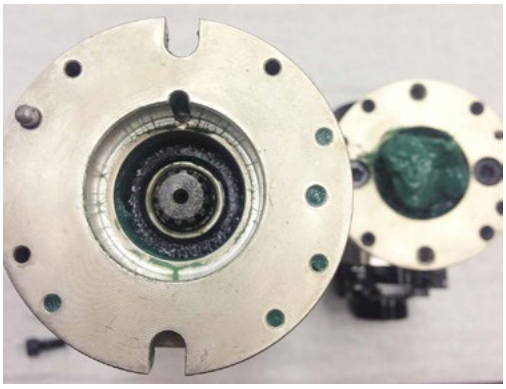


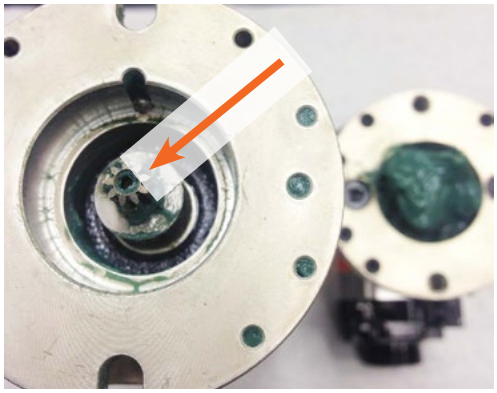
Using a 4mm Allen key tighten the two (2) bolts securing the planetary gear housing to the gearhead.





Turbine Motor: Install the planetary gear pinion on the turbine ouptut spline.





Install the first reduction planetary gear carrier, with gears, into the ring gear.

Apply a generous amount of Accro lube to the planetary gears.

Install the second reduction planetary gear carrier, with gears, into the ring gear.

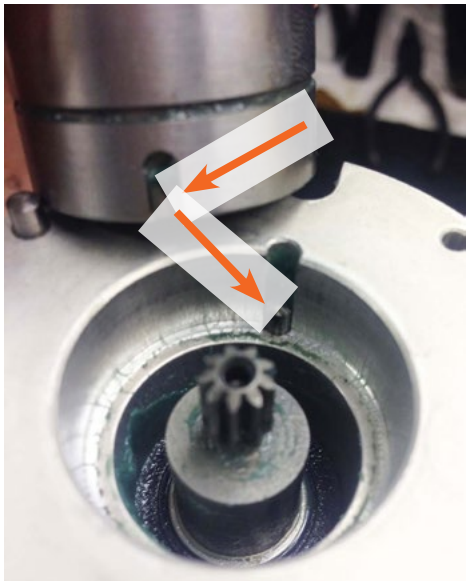
Apply a generous amount of Accro lube to the planetary gears.

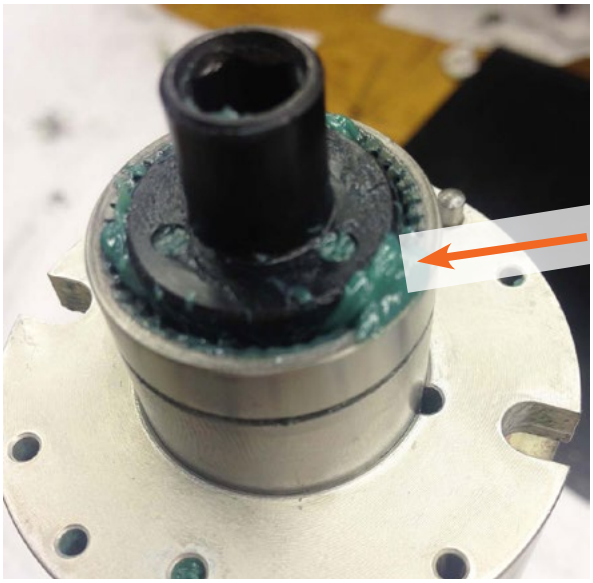
During installation, carefully rotate the second reduction planetary to assure full gear engagement with the pinion gear and ring gear.

Install the ring gear into the motor housing.

Assembly Note: The notch in the ring gear MUST align with the locating pin in the motor housing.

Assembly Tip: To make sure the ring gear is seated properly, use your thumb to press down on the edge of the ring gear directly above the locating pin.

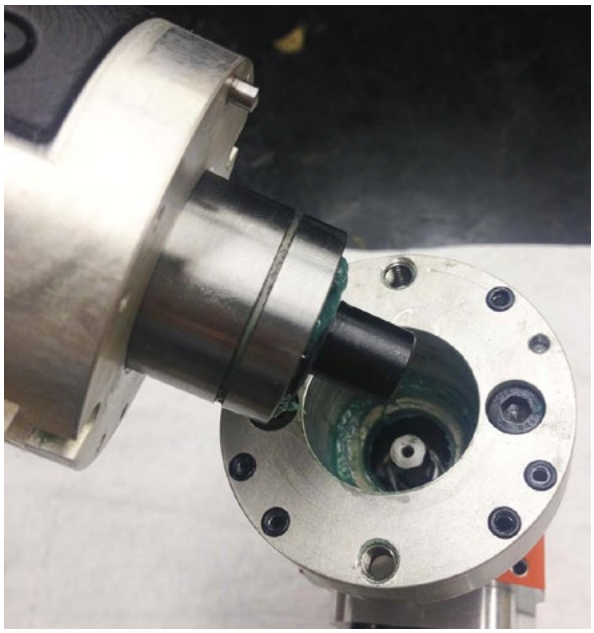


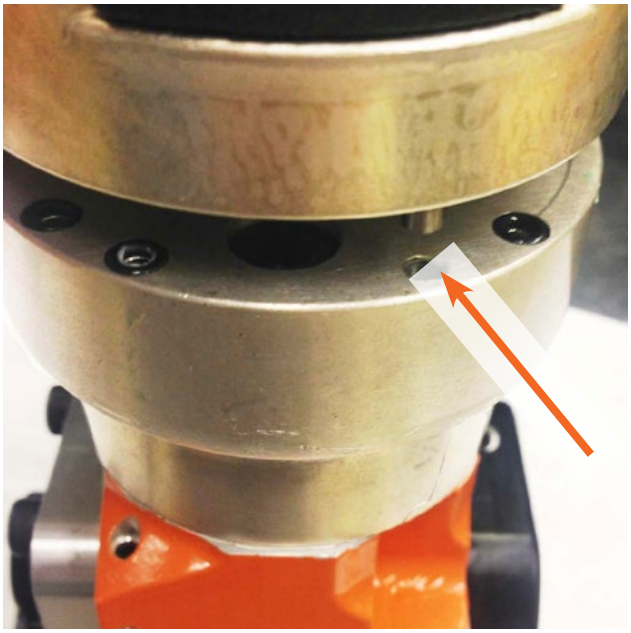


Assemble the motor housing to the planetary gear housing. Use caution to prevent the ring gear assembly from coming out of the motor housing during assembly.

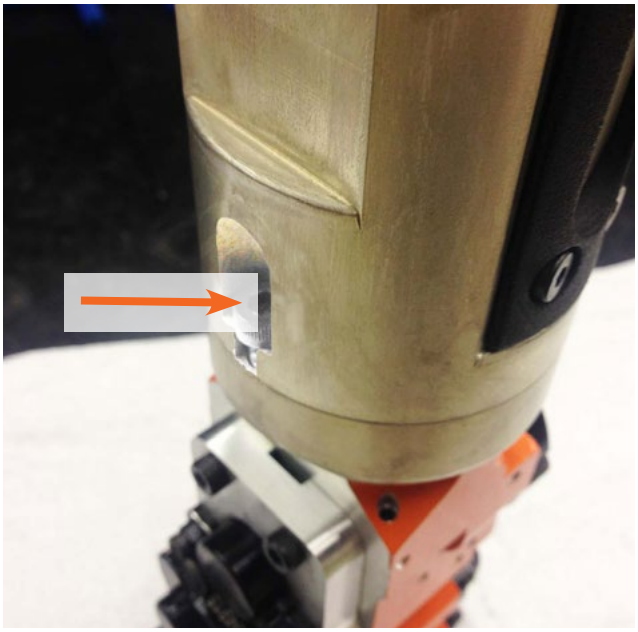
After placing the motor housing on the planetary gear housing, rotate the motor housing until the hex socket and the hex drive are engaged.

Make certain the dowel pin in the motor housing is located in the dowel pin hole in the planetary gear housing.





Using a 4mm Allen key, install and tighten the two (2) bolts securing the motor housing to the planetary gear housing.



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