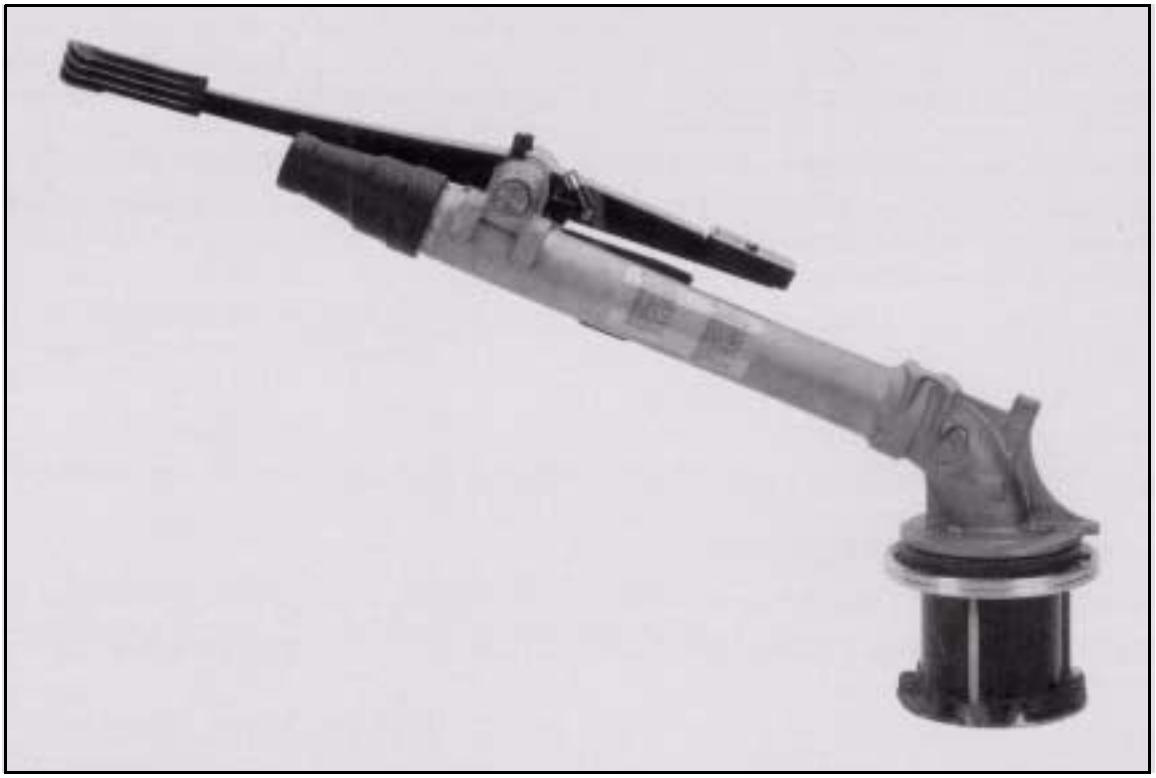
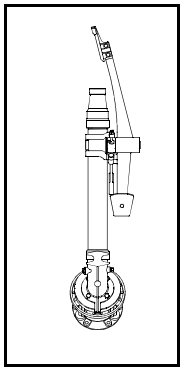
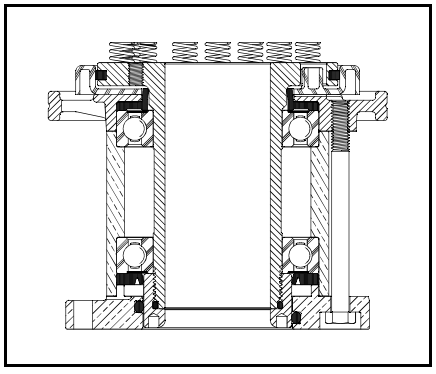
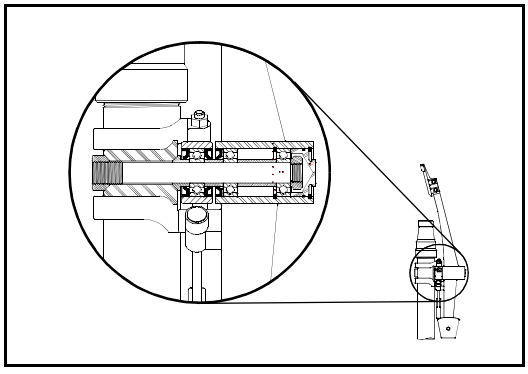
NELSON STAINLESS STEEL F150 BIG GUN®

Technical Manual









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NELSON IRRIGATION CORPORATION

Disclaimer

This manual is intended only as an installation, operation and maintenance guide for typical applications and may not apply to specific applications. Performance of Nelson BIG GUN® sprinklers is dependent on many factors not within the scope of this manual.

This manual is subject to change through revisions and additions without notice.

The information in this manual does not alter and is not part of the warranty agreement.

Warranty and Disclaimer

Nelson BIG GUN® sprinklers are warranted for one year from date of original sale to be free of defective materials and workmanship when used within the working specifications for which the product was designed and under normal use and service. The manufacturer assumes no responsibility for installation, removal or unauthorized repair. The manufacturer's liability under this warranty is limited solely to replacement or repair of defective parts, and the manufacturer will not be liable for any crop or other consequential damages resulting from any defects in design or breach of warranty.

This warranty is expressly in lieu of all other warranties, express or implied, including the warranties of merchantability and fitness for particular purposes and of all other obligations or liabilities of manufacturer.

No agent, employee, or representative of the manufacturer has authority to waive, alter or add to the provisions of this warranty, nor to make representations or warranty not contained herein.

Patents

Nelson BIG GUN® sprinklers are manufactured under U.S. patents 3,744,720 and 3,559,887.

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Tel: 509-525-7660 Fax: 509-525-7907

1.0 INTRODUCTION AND THEORY OF OPERATION

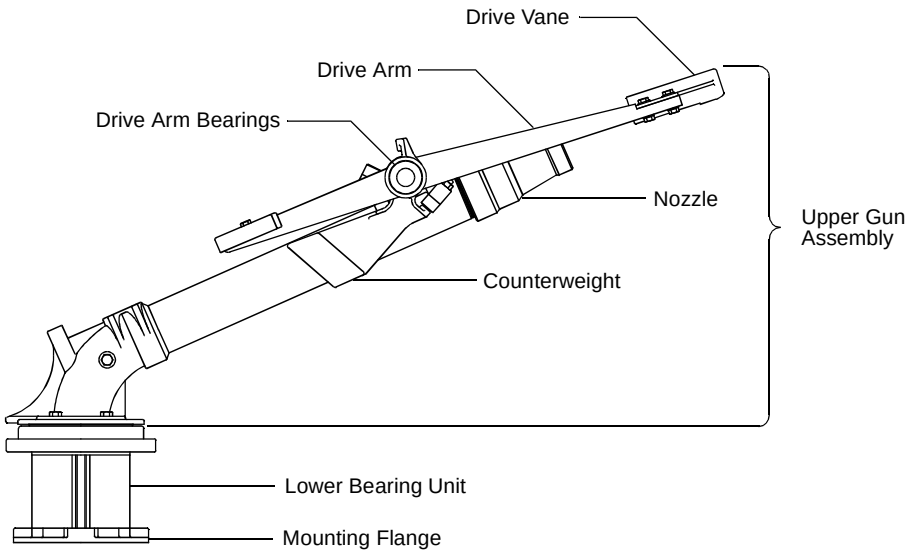


Figure 1. *Major components of the stainless steel F150 Big Gun*

BE CAREFUL!

1. Read operating instructions before operating sprinkler or making any adjustments.
2. Never make adjustments or perform service while the sprinkler is in operation.
3. Stand clear of operating sprinkler.
4. Stand clear of high velocity water stream.
5. Never direct water stream onto roadway or electrical transmission lines.

The Nelson Stainless Steel F150 Big Gun (F150SS) is a full circle sprinkler designed to handle industrial chemicals. The flow path is constructed of 316 stainless steel. The F150SS uses the same basic design as other versions that have been proven in many years of agricultural and industrial use. To insure a long, reliable life in different chemical applications, a choice of materials for seals and plastics is offered. For further details, contact a Nelson sales representative or engineer.

The F150SS is caused to operate when the drive vane on the drive arm contacts the water stream. The drive vane deflects a portion of the water stream sideways and upwards.

Sideways deflection pushes the gun to the side, causing rotation. Upward deflection pushes the drive vane down, out of the water stream, while lifting the counterweight up. When gravity pulls the arm weight down, the drive vane again contacts the water stream, and another stroke begins. The design of the drive arm allows a wide operating range.

The lower bearing unit takes the thrust loads of the water stream. It allows gun rotation while acting as a brake to control forward speed and provides a rotary water seal.

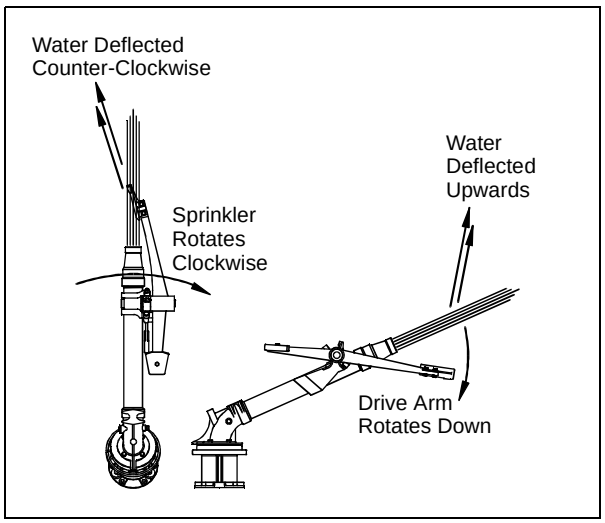


Figure 2. *How the F150SS is caused to operate.*

2.0 SETUP AND OPERATING INSTRUCTIONS

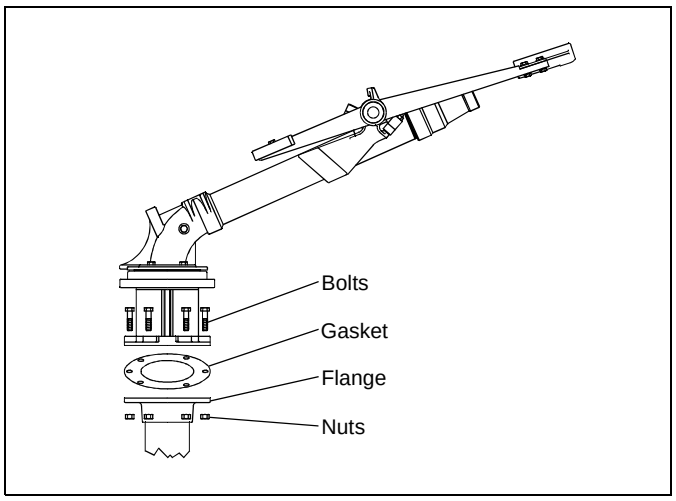


Figure 3. *Securely bolt the F150SS Big Gun to a riser.*

Step 1

Securely bolt the F150SS Big Gun to a riser designed to handle the operating loads of the sprinkler. (Refer to Appendix E, “Thrust Loads of a Gun in Operation.”) Use six .375”-16 UNC-2A bolts for mounting of the standard flange, or six M8 x 1,25 metric bolts for the metric flange. (Refer to Appendix H, “Overall Dimensions and Flange Options.”)

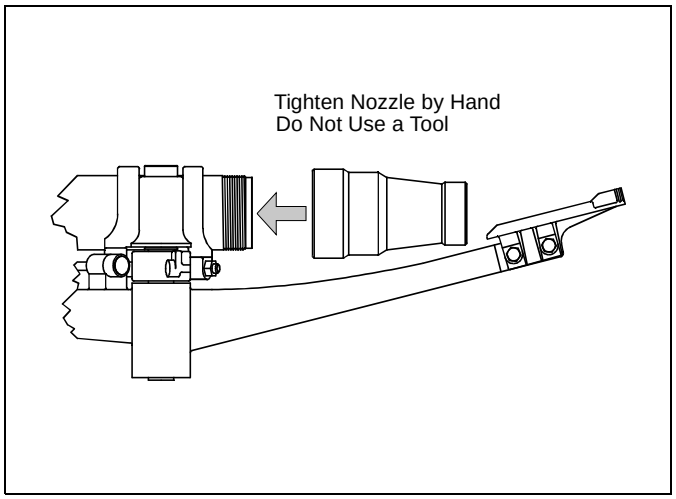


Figure 4. *Install the nozzle onto the range tube.*

Step 2

Install the nozzle to the range tube. On plastic nozzles, you must apply a small amount of RTV silicone compound to the threads to insure the nozzle will not unscrew during operation. Tighten the nozzle by hand. *Do not use* a tool to tighten the nozzle. Be careful not to ding, or to get silicone or No-Weld on flowpath surfaces of nozzle. It may adversely affect the distance of throw of the water stream.

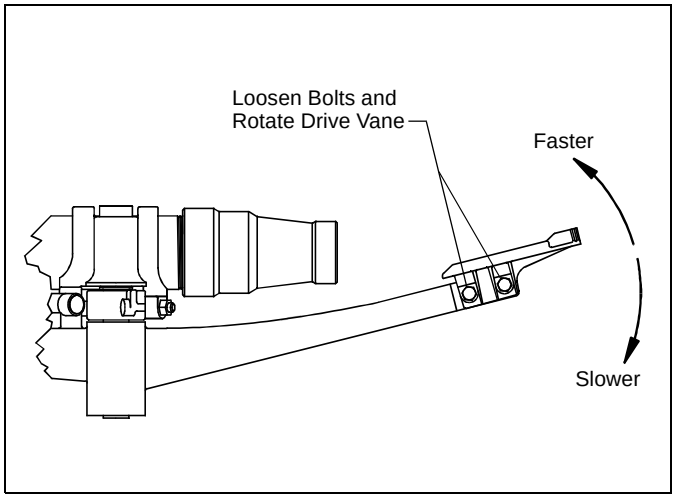


Figure 5. *If necessary, adjust the drive vane setting.*

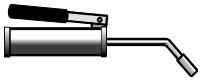
Step 3

The F150SS Big Gun is water tested and factory set for proper operation under most operating conditions. Differences in fluid density or extreme operating conditions may require you to make minor adjustments to the drive vane setting.

If the drive arm moves in short, choppy strokes, and the drive arm does not touch or pickup the counterweight, it usually indicates marginal operating pressure. To correct for this condition, loosen the two bolts called out in Figure 5 and adjust the drive vane 1/16-inch (1,5mm) further into the water stream.

3.0 GENERAL MAINTENANCE NOTES

3.1 Lubrication

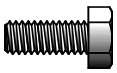


The F150SS Big Gun sprinkler is lifetime lubricated and does not require periodic lubrication. The ball bearings in the drive arm, counterweight, and lower bearing unit operate in a water resistant grease that is packed into the housing cavities and retained by seals. If you make repairs to these areas, it is recommended you repack the cavities with Nelson 6143 lubricant, or a good grade of water resistant grease, such as Lubriplate 130-AA.

If you are going to operate the sprinkler in temperatures near or below freezing, the grease in the drive arm cavity will thicken. This condition may cause sluggish or slow drive arm action. It will help if you repack the cavity with a thinner grease such as Lubriplate Low-Temp or Lubriplate 105.

The 6048 drive arm seals, and the 8475 O-ring seal in the lower bearing unit, are pre-lubricated with Dow Corning 33 medium-consistency silicone grease. (Refer to section 5.0, “Parts List—F150SS Big Gun.”) Pre-lubrication minimizes friction between the seals and the surfaces they ride on, providing smoother operation. If you replace or reinstall these seals, use a *small* amount of silicone grease and adequately coat *only* the seals. *Do not pack* the bearing cavities with this grease. It is too thick for smooth operation and does not adequately protect the bearings from corrosion.

3.2 Use of Anti-Seize Compound



You *must* use No-Weld, or another appropriate anti-seize compound, on all threaded connections between stainless steel and stainless steel. This prevents galling or welding together of the components.

3.3 Use of a Torque Wrench

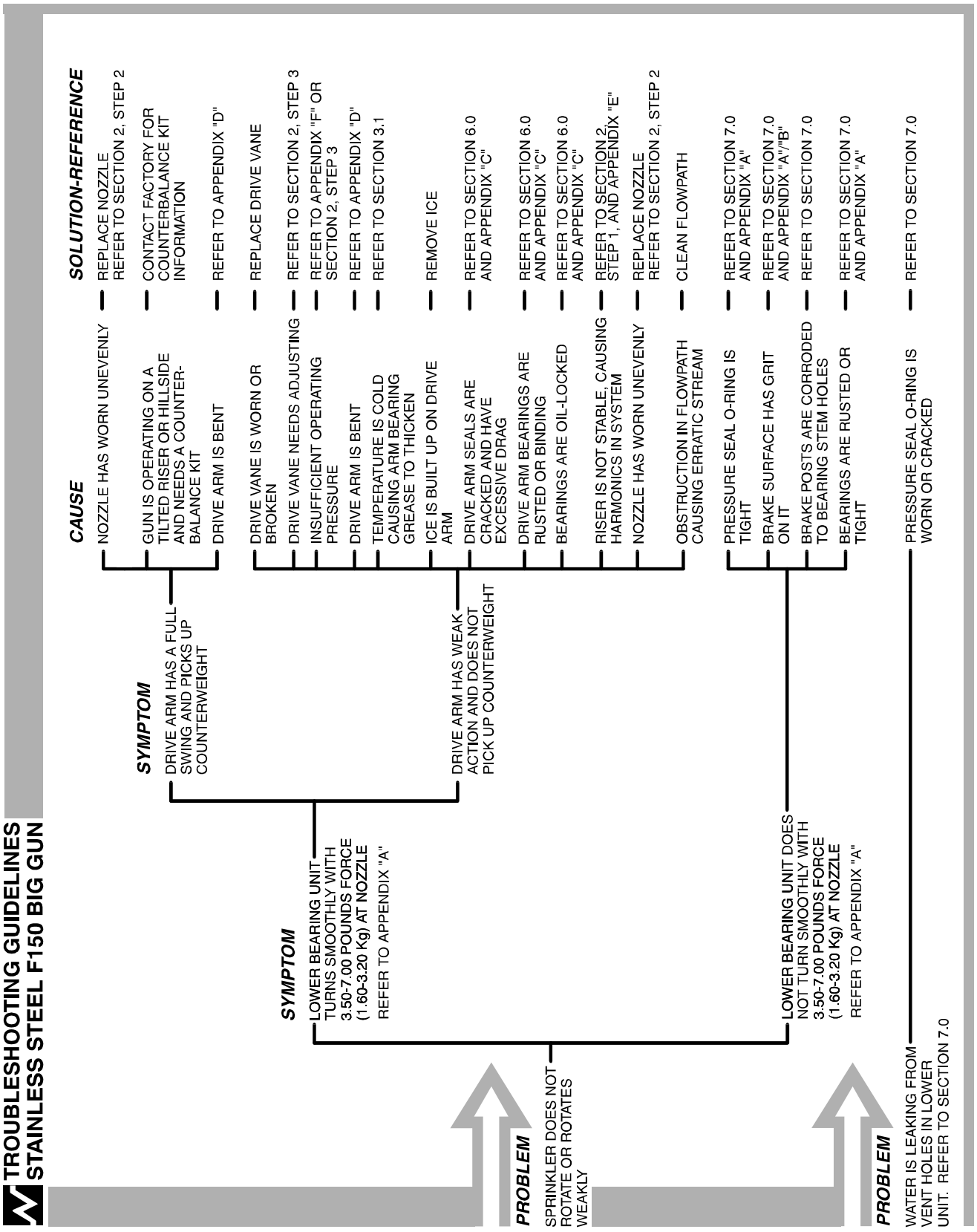
You *must* use a torque wrench when assembling threaded components to insure the components are not over- or under-stressed. Use the Torque Conversion Chart below to convert to a familiar unit:

Table 1. Torque Conversion Chart

Units to Convert	American			S.I.			Metric		
	ozf.in	lbf.in	lbf.ft	mN.m	cN.m	N.m	gf.cm	kgf.cm	kgf.m
mN.m	0.142	0.009	0.0007	1	0.1	0.001	10.2	0.01	0.0001
cN.m	1.416	0.088	0.007	10	1	0.01	102	0.102	0.001
N.m	141,6	8.851	0.738	1000	100	1	10,197	10.20	0.102
oxf.in	1	0.0625	0.005	7.062	0.706	0.007	72	0.072	0.0007
lbf.in	16	1	0.083	113	11.3	0.113	1152.1	1.152	0.0115
lbf.ft	192	12	1	1356	135.6	1.356	13,826	13.83	0.138
gf.cm	0.014	0.0009	0.00007	0.098	0.01	0.0001	1	0.001	0.0001
kgf.cm	13.89	0.868	0.072	98.07	9.807	0.098	1000	1	0.01
kgf.m	1389	86.8	7.233	9807	980.7	9.807	100,000	100	1

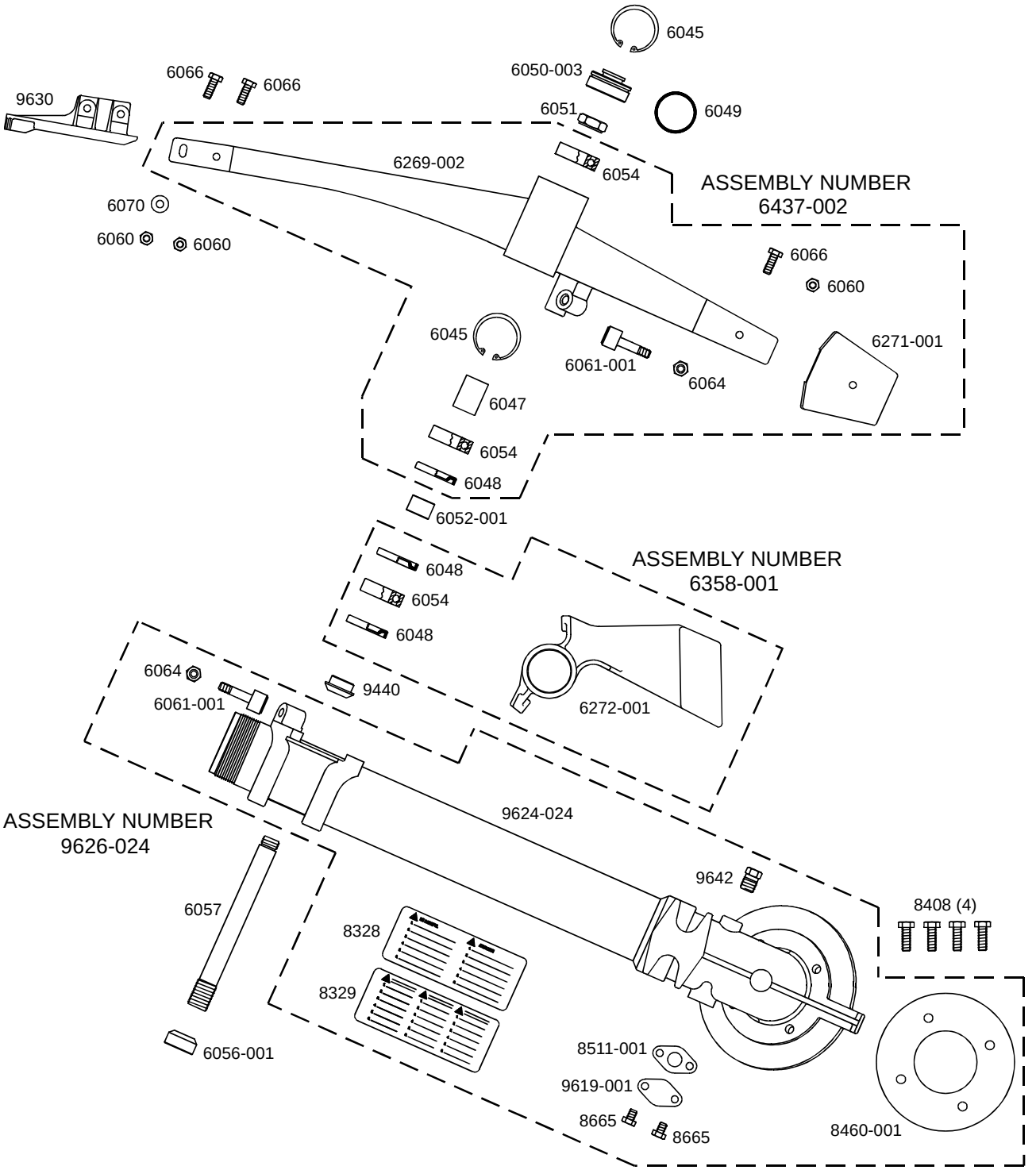
4.0 TROUBLE SHOOTING

Table 2. ***Troubleshooting Guidelines for the F150SS***



5.0 PARTS LIST— F150SS BIG GUN

5.1 Upper Gun Components



5.2 Lower Bearing Unit Assembly

ASSEMBLY NUMBER 9628

NOTE: This assembly comes with (4) 8408 Bolts and (1) 8460-001 Gasket

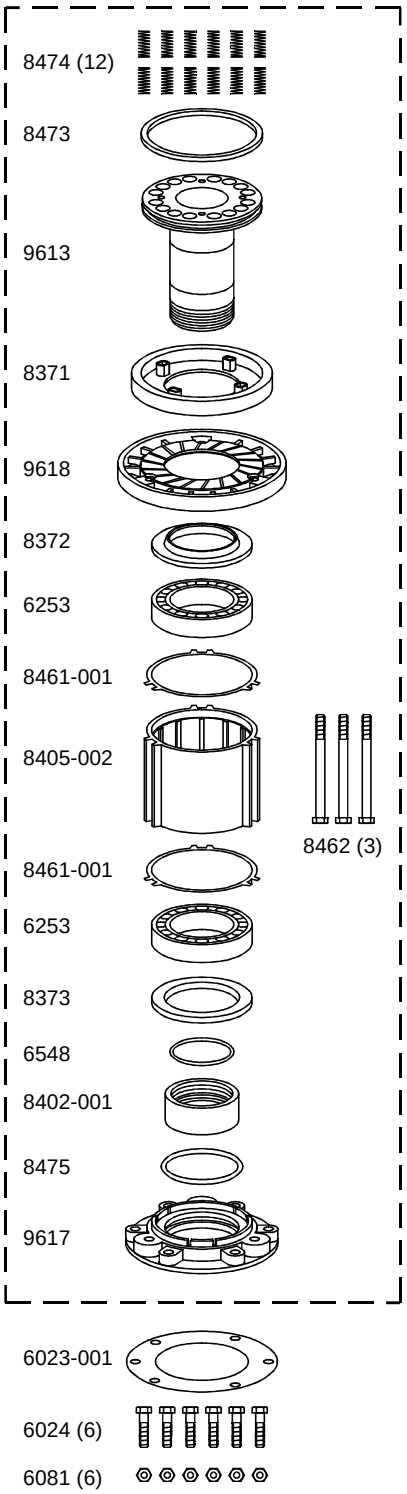


Table 3. *Parts List—F150SS Big Gun*

Part No.	Description	Qty.
6023-001	Gasket (Flange)	1
6024	Bolt, 3/8” - 16 x 1 1/2”	6
6045	Retaining Ring	2
6047	Spacer (Arm Bearing)	1
6048	Seal	3
6049	O-ring	1
6050-003	Cap, Arm	1
6051	Nut (Arm Shaft), 5/8” - 18	1
6052-001	Spacer	1
6054	Ball Bearing	3
6056-001	Centering Nut	1
6057	Shaft	1
6060	Nut, 1/4” - 20	3
6061-001	Bumper Assembly	2
6064	Nut, 5/16” - 18	2
6066	Bolt, 1/4” - 20 x 1” Long	3
6070	Washer, 1/4”	1
6081	Nut, 3/8” - 16	6
6253	Ball Bearing	2
6269-002	Drive Arm (Casting Only) Powder Coated	1
6271-001	Weight, Drive Arm-Powder Coated	1
6272-001	Counterweight (Casting Only) Powder Coated	1
6358-001	Counterweight Assembly-Powder Coated	1
6437-002	Drive Arm Assembly-Powder Coated	1
6548	O-ring	1
8328	Caution Label (English, Spanish)	1
8329	Caution Label (French, German, Swedish)	1
8371	Brake	1
8372	Seal, Upper	1
8373	Seal, Lower	1
8402-001	Retainer Nut	1
8405-002	Housing-Powder Coated	1
8408	Bolt, 5/16” - 18 x 7/8” Long	4
8460-001	Gasket, Elbow	1
8461-001	Gasket, Housing	1
8462	Bolt, 3/8”-16 x 41/2” Long	3
8473	Seal, Dust	1
8474	Spring	12
8475	O-ring (-338)	1
8511-001	Gasket, Secondary	1
9440	Cone Spacer	1
9613	Bearing Stem	1
9617	Flange	1
9618	Cover	1
9619	Cover Plate	1
8665	Bolt, 1/4” - 20 x 3/8” Long	2
9624-024	24” Tube, Elbow, and Bracket Assembly	1
9626-024	24” Body Group, Stainless Steel	1
9628	Bearing Assembly, Stainless	1
9630	Drive Vane	1
9642	Plug, 1/4” NPT	1
	Service Items	
6143	Bearing Grease (16 oz. can)	1
6793	RTV Sealant (3 oz. tube)	1
9674	Silicone Seal Grease (1 oz.)	1
6454	Pliers for 6045 Retaining Ring	1
9675	HD150 Retainer Nut Tool (1/2” drive)	1
6624	No Weld (16 oz. can)	1

6.0 DRIVE ARM

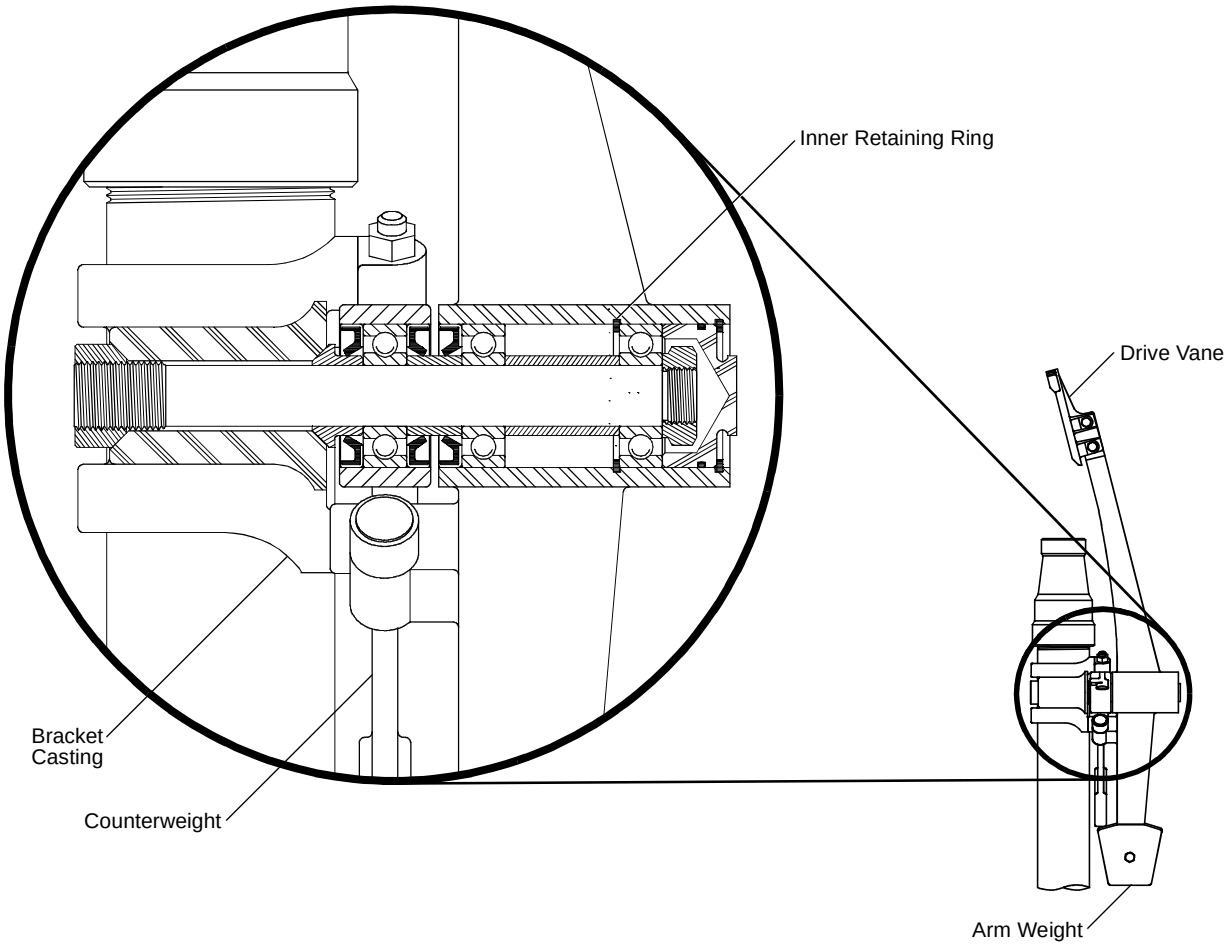


Figure 6. *Cut-away of drive arm assembly*

6.1 Theory of Drive Arm Operation

The drive arm assembly diverts energy from the water stream to cause rotary gun motion. This rotary motion is controlled by the brake in the lower bearing unit.

The drive arm assembly operates in vertical strokes as it pivots on the drive arm bearings. A stroke begins when the drive vane contacts the water stream, deflecting a portion of the water stream sideways and upwards. Sideways deflection pushes the gun to the side, causing rotation. Upward deflection pushes the drive vane down, out of the water stream, while lifting the counterweight up.

When gravity pulls the arm weight down, the drive vane again contacts the water stream, and another stroke begins. The counterweight acts as a damper, smoothing out drive action, allowing a consistent drive over a wide range of nozzle sizes and water pressures.

To perform this work, the drive arm assembly must be in proper condition. Drive arm bearings must be virtually friction-free, not “sticky.” You can verify this by performing the procedure in Appendix C, “Checking Drive Arm Bearing Drag.” After checking seals and bearings, inspect for a bent drive arm shaft. Make repairs as required.

6.2 Drive Arm Disassembly and Assembly

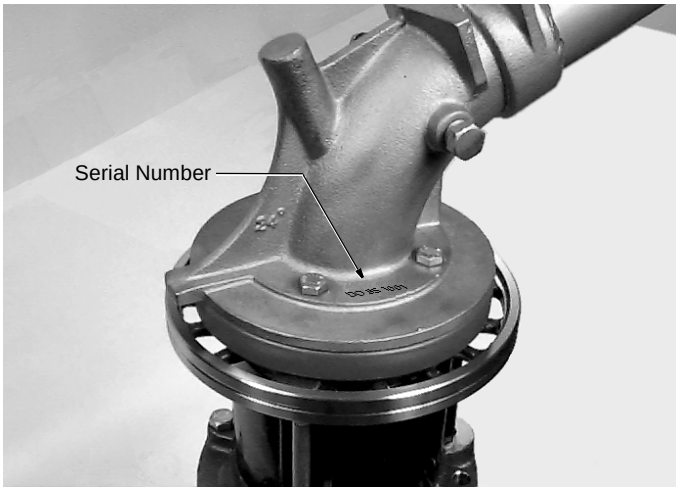


Figure 7. *Locate the serial number on your Big Gun.*

Step 1

Locate the serial number on your F150SS as shown in Figure 7. You will need it when ordering repair parts. The serial number contains the build year and month, as shown below. Knowing the build date may be helpful when determining the amount of rebuilding required.

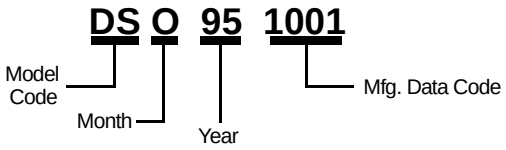


Figure 8. *Remove arm-shaft nut to remove drive arm.*

Step 2

Using retaining ring pliers, remove 6045 retaining ring. Remove 6050-003 arm cap. Hold 6056-001 centering nut and remove 6051 arm-shaft nut with a 15/16” socket.

IMPORTANT: Do not grasp 6057 shaft with any tool.

IMPORTANT: 6051 arm-shaft nut must be removed before drive arm can be removed.

Figure 9. *Remove components in sequence shown.*

Step 3

In sequence, remove 6437-002 drive arm assembly, 6052-001 spacer, 6358-001 counterweight assembly, and 9440 cone spacer. Remove 6057 arm shaft.

Step 4

Inspect spacer and counterweight spacer for scars, scratches, or gouges. If spacers show excessive wear, replace both 9440 and 6052-001 spacers, and 6048 seals. Both spacers are Teflon coated to minimize friction. To remove seals, drive a thin-bladed screw driver under lip of seal and pop seal out. Check 6054 ball bearings and replace if necessary. Pack bearings with 6143 grease. To install new seals, use a block of wood over seal. Make sure lip of seal is on the outside. Secure by lightly tapping on block, setting seal flush with assembly.

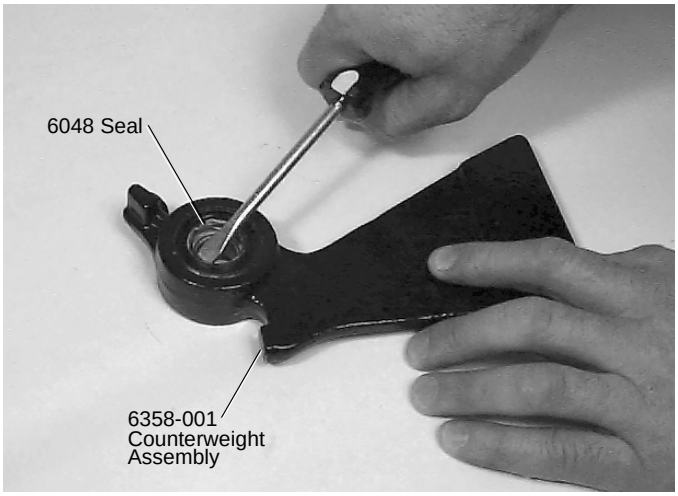


Figure 10. *If necessary, remove seals from counterweight.*

Step 5

Without removing from drive arm, rotate both 6054 ball bearings to check for freedom of movement. If bearing motion is impaired, disassemble and replace bearings. To remove drive arm ball bearings and seal, press seal into hub of drive arm until outer bearing is pressed from hub. Remove 6045 retaining ring and 6047 spacer. Press out inner bearing and seal. Thoroughly clean out hub cavity.

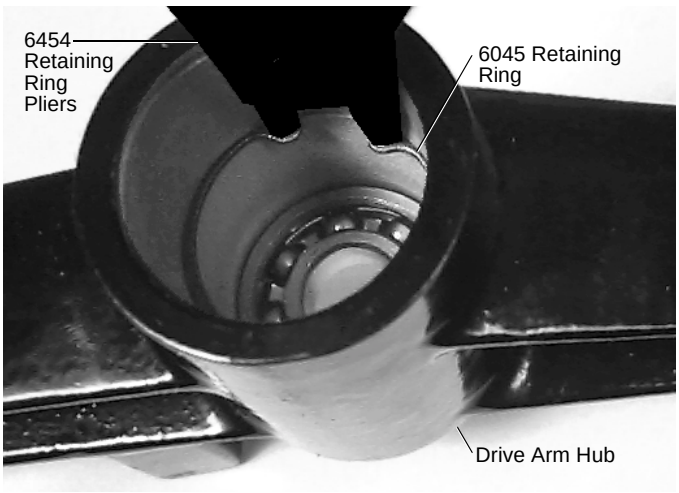


Figure 11. *Remove retaining ring and press bearings out.*

Step 6

To install bearings and seal, install 6045 retaining ring. Press one bearing and seal into inner end of drive arm hub until seal is pressed 1/32” (,8mm) past hub face. Insert spacer and pack hub with 6143 lubricant. Press other bearing into outer end of hub until seated against retaining ring. The retaining ring properly positions the bearings and seal within the drive arm hub.

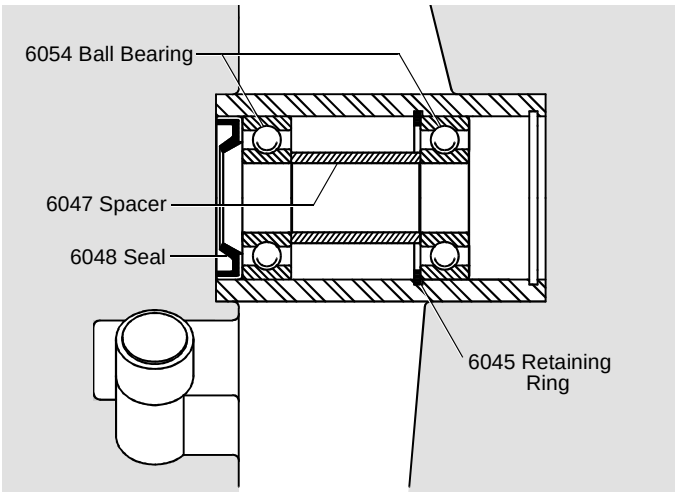


Figure 12. *Install retaining ring, then bearings and seal.*

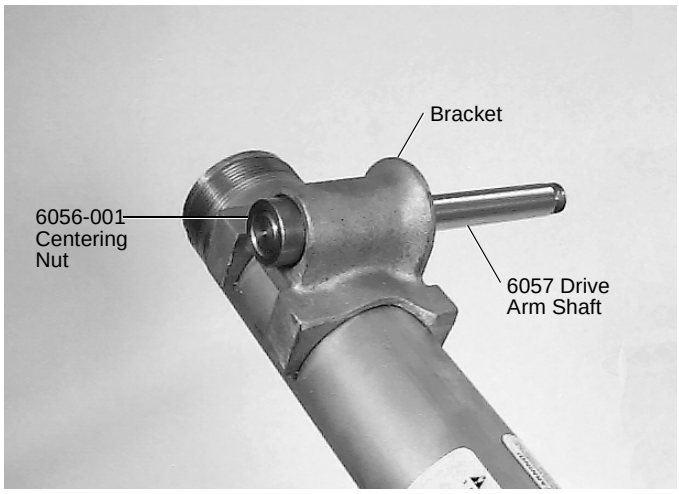


Figure 13. *Install drive arm shaft/centering nut into bracket.*

Step 7

Using a straight edge, inspect 6057 drive arm shaft and determine if shaft is bent. If necessary, replace shaft. Screw 6056-001 centering nut on shaft until nut is flush with end of shaft. Install shaft into bracket as shown in Figure 13.

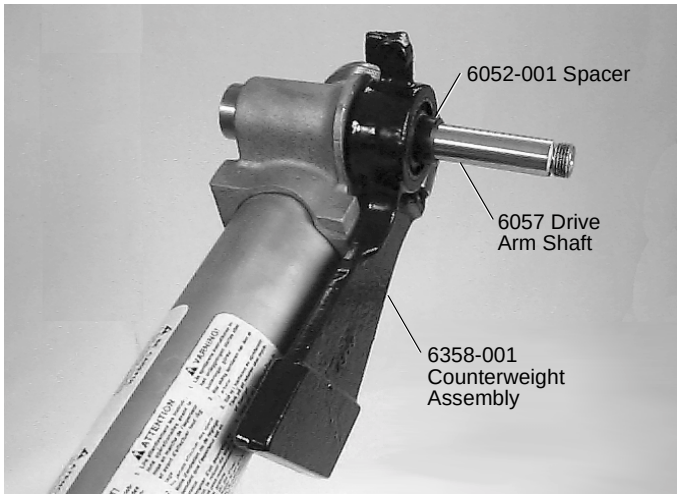


Figure 14. *Install counterweight on drive arm shaft.*

Step 8

Install 9440 cone spacer onto 6057 drive arm shaft with tapered edge facing bracket. Apply 9674 silicone grease to seal lips of 6358-001 counterweight and slide assembly onto shaft as shown in Figure 14. Install 6052-001 spacer onto 6057 shaft.

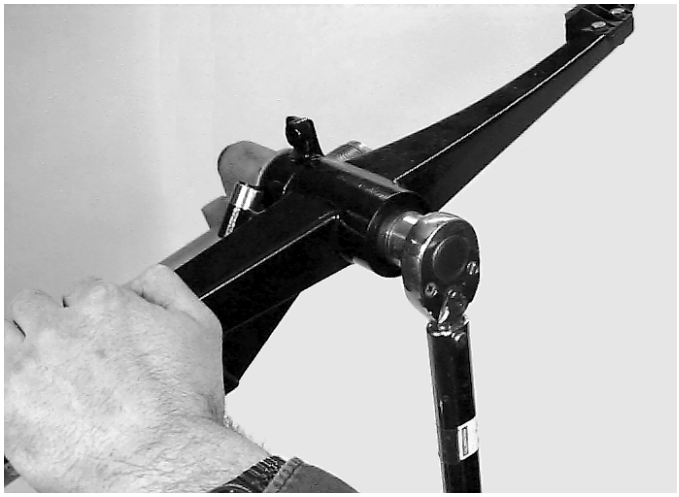


Figure 15. *Carefully torque arm-shaft nut to prevent damage.*

Step 9

Apply 9674 silicone grease to seal lip of drive arm. Using finger to align 6047 drive arm spacer, slide drive arm onto drive arm shaft. With washer face of 6051 arm-shaft nut facing bearing, install nut on shaft. Screw nut until finger tight, seating washer face of nut against inner race of bearing. Torque nut to 50-60 ft-lbs (67-81 N·m).

IMPORTANT: Over-tightening 6051 nut can cause damage to 6057 arm shaft and bracket casting.

IMPORTANT: Silicone grease minimizes drive arm seal friction, allowing unrestricted drive arm movement.

Step 10

Thoroughly pack 6143 lubricant into hub of drive arm until lubricant is even with end of hub. Fill inside of 6050-003 arm cap with lubricant. Using fingers, press cap into cavity. If sufficient lubricant was packed into hub, excess lubricant will be forced past seal, expelling trapped air. Using retaining ring pliers, install 6045 retaining ring.

IMPORTANT: Confirm there is a 1/16" (1,5mm) gap between drive arm and counterweight, and between counterweight and bracket casting. If this clearance does not exist between the castings, check the 6052-001, 9440, and 6047 spacers for correct installation. Also, check that the 6054 ball bearing is centered in the 6272-001 counterweight casting.

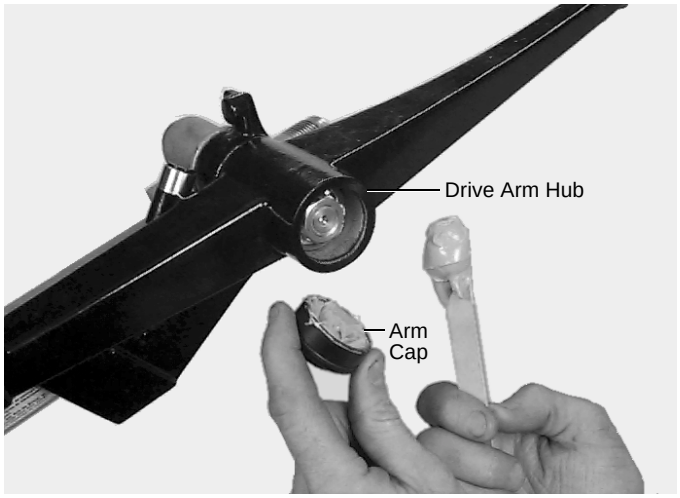


Figure 16. *After packing hub with lubricant, fill inside of arm cap and press cap into cavity.*

7.0 LOWER BEARING UNIT

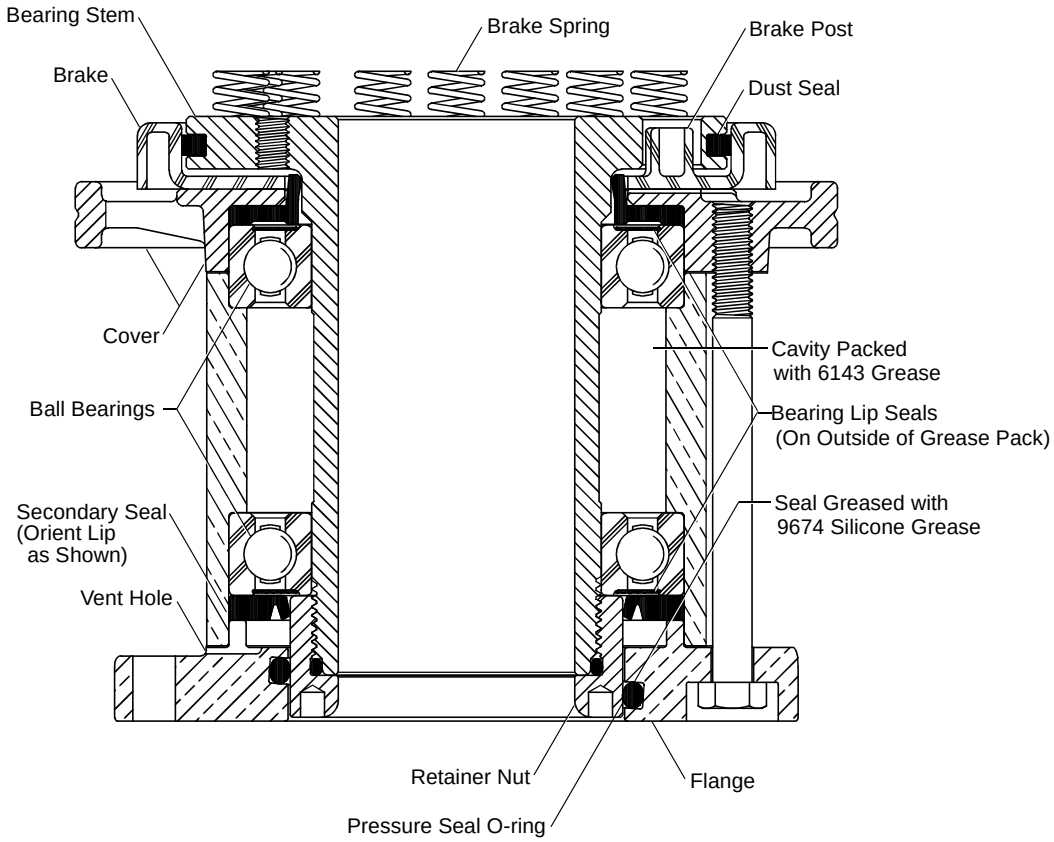


Figure 17. *Cut-away of lower bearing assembly*

7.1 Theory of Lower Bearing Unit Operation

The lower bearing unit does the following: enables the sprinkler to rotate, transmits operating loads to the riser, provides a rotary water seal, and maintains a constant rotational speed using a brake.

The brake operates similar to a clutch. Pre-loaded springs exert a constant force against the elbow flange (the “clutch face”), pressing the plastic brake surface (the “clutch disc”) against the face of the cover (the “flywheel”). Constant friction between the two surfaces provides the necessary braking action, preventing too high a rotational speed.

Corroded brake springs, brake springs bound to the bearing stem, or corroded posts on the plastic brake can cause braking action that is too tight, making the sprinkler rotate too slow; or braking action that is too loose, allowing the sprinkler to rotate too fast.

Slow rotation can also occur under certain water conditions that cause the pressure seal O-ring to bind to the retainer nut. To help relieve the binding, disassemble the flange and apply a coating of silicone grease to the retainer nut.

Water leaking through the vent holes indicates the pressure seal O-ring has failed. Disassemble the flange and replace the O-ring. To help insure smooth operation, coat the retainer nut and O-ring with silicone grease prior to assembly.

7.2 Lower Bearing Unit Disassembly and Assembly

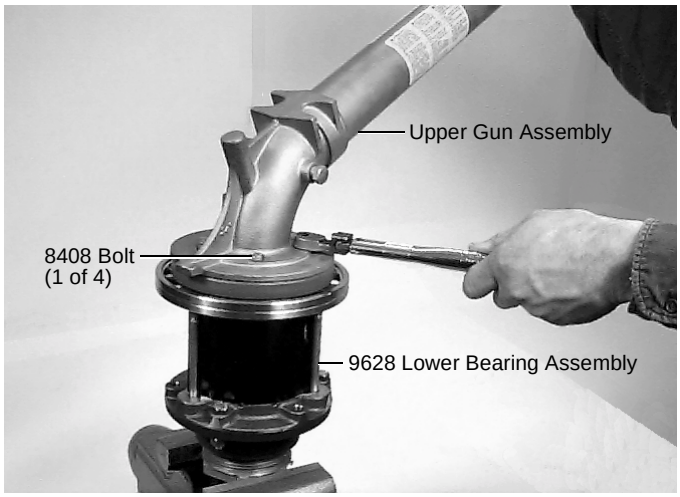


Figure 18. *Remove four bolts at base of upper gun assy.*

Step 1

To begin disassembly of lower bearing unit, remove four 8408 5/16”-18 bolts as shown in Figure 18. Carefully separate upper gun assembly from lower bearing unit. Set aside the twelve 8474 brake springs that were held between the two assemblies. Be careful not to lose any springs.

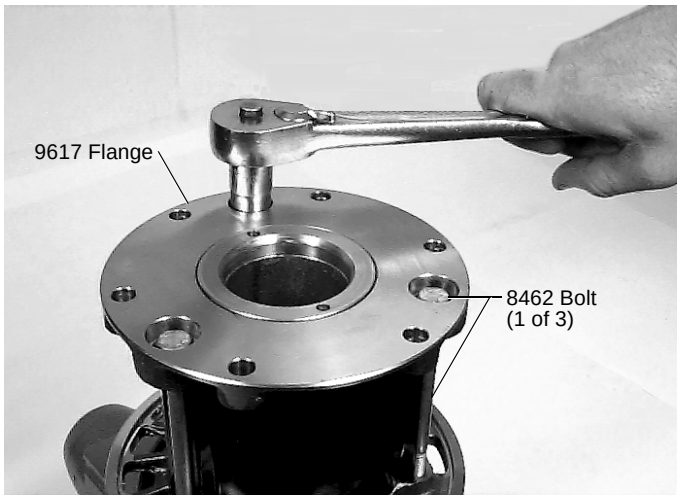


Figure 19. *Invert and remove three bolts to remove flange.*

Step 2

Insert two 5/16”-18 bolts into top of bearing stem from above. Invert lower bearing assembly and secure in a vise by clamping bolt heads tightly. Remove three 8462 bolts. Remove 9617 flange from lower bearing unit.

Step 3

With lower bearing assembly in vise, remove 8402-001 retainer nut using spanner wrench. Slide 8405-002 housing from bearing stem.

Note: Instead of the spanner wrench shown in Figure 20, the 9675 retainer nut tool may be used [or a bar with two .19-inch (4,83mm) diameter pins spaced 2.74-inches (69,60mm) apart].

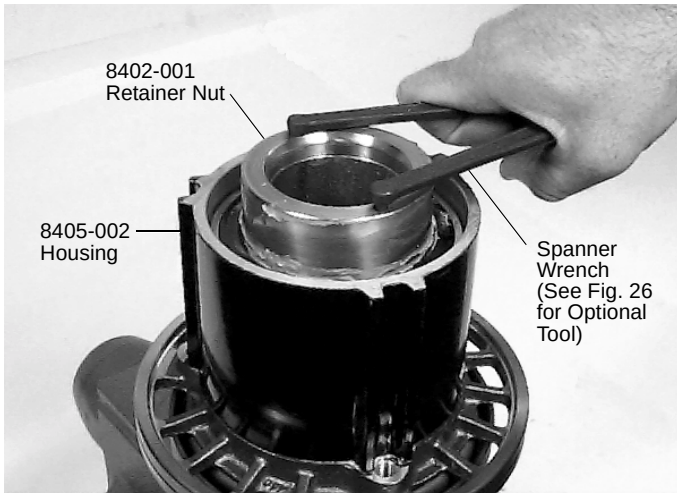


Figure 20. *Remove retainer nut using spanner wrench.*

Step 4

Remove 8373 seal. As shown in Figure 21, use a hammer and three blocks of wood to remove two 6253 bearings by tapping lightly around outer race of bearing. Bearings are removed from opposite sides of 8405-002 housing.

Figure 21. *Lightly tap around outer race to remove bearings.*

Step 5

Remove 9618 cover from 9613 bearing stem. Remove 8372 seal from cover. Remove 8371 brake and 8473 dust seal from bearing stem.

Inspect all parts for wear and corrosion. Replace as required.

Figure 22. *After disassembly, inspect all parts for wear.*

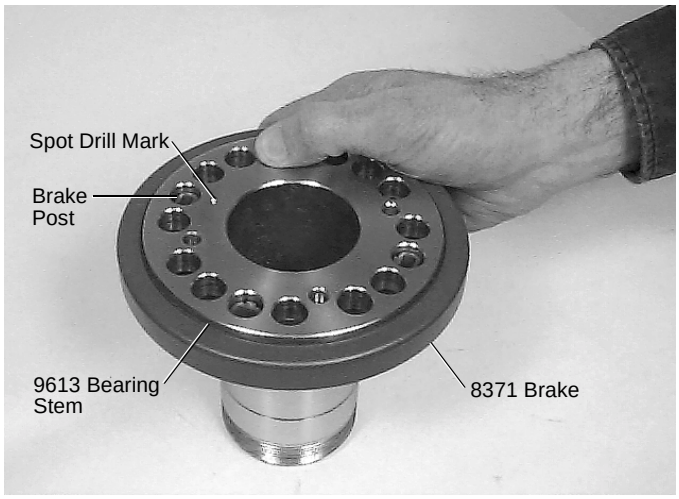


Figure 23. *Assemble dust seal to bearing stem.*

Step 6

To begin assembly of the lower bearing unit, install 8473 dust seal onto 9613 bearing stem. Slide 8371 brake onto bearing stem. Rotate brake until one of the posts on the brake aligns with the spot-drilled mark on the bearing stem. Press brake on bearing stem, being careful not to fold the dust seal.

IMPORTANT: One brake post must lineup with the spot drill mark.

Figure 24. *With Nelson name toward bearing, install lip seal.*

Step 7

With Nelson name toward ball bearing, place 8372 lip seal into 9618 cover as shown in Figure 24. Pack 6253 bearing (not shown) with 6143 lubricant or equivalent (refer to section 3.1, “Lubrication”). Orient integral seal of 6253 bearing towards 8372 lip seal and press bearing into 9618 cover. Slide cover assembly onto bearing stem.

IMPORTANT: Do not get grease or oil on brake surfaces. To clean plastic brake, use soap and water (solvents may damage plastic). Clean 9618 cover with acetone.

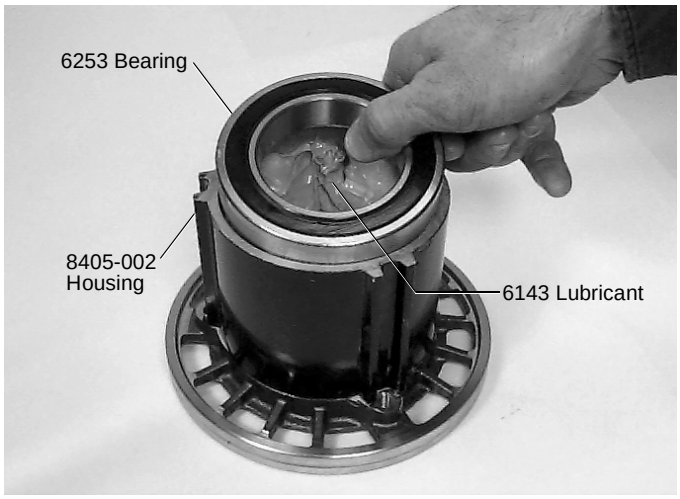


Figure 25. *Assemble bearing into housing with seal side out.*

Step 8

Assemble 8461-001 gasket. Press on 8405-002 housing. Fully pack housing with 6143 lubricant. Assemble 6253 bearing into housing with integral seal facing out as shown in Figure 25.

Step 9

Install 6548 O-ring in 8402-001 retainer nut and assemble retainer nut on shaft. Using method described in Step 2, secure bearing shaft from rotating. Torque retainer nut to 120 ft-lbs (163 N·m). Use 9675 retainer nut tool or equivalent.

Holes in retainer nut are .22-inch diameter, on a 2.74-inch diameter bolt circle.

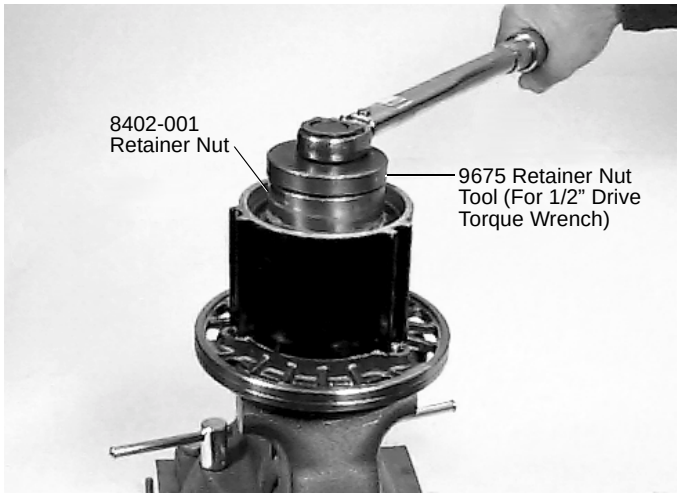


Figure 26. *Torque retainer nut.*

Step 10

Apply a thin coating of 9674 silicone grease to retainer nut and 8373 seal. Install seal into 8405-002 housing with lip side of seal facing out as shown in Figure 27.

To confirm that all seals are oriented correctly with respect to the grease pack, see Figure 17, "Cut-away of lower bearing assembly."

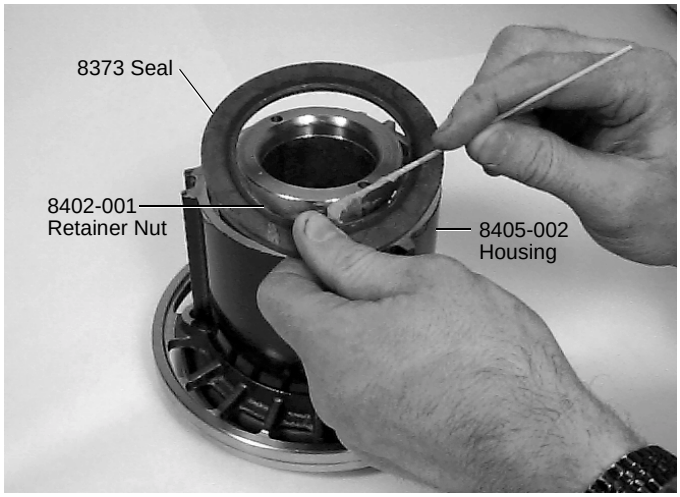


Figure 27. *Install seal into housing with lip side facing out.*

Step 11

Assemble 8461-001 gasket. Lubricate 8475 O-ring with 9674 silicone grease and install in 9617 flange.

IMPORTANT: 9674 silicone grease lubricates O-ring seal, minimizing friction and allowing seal to break in properly.

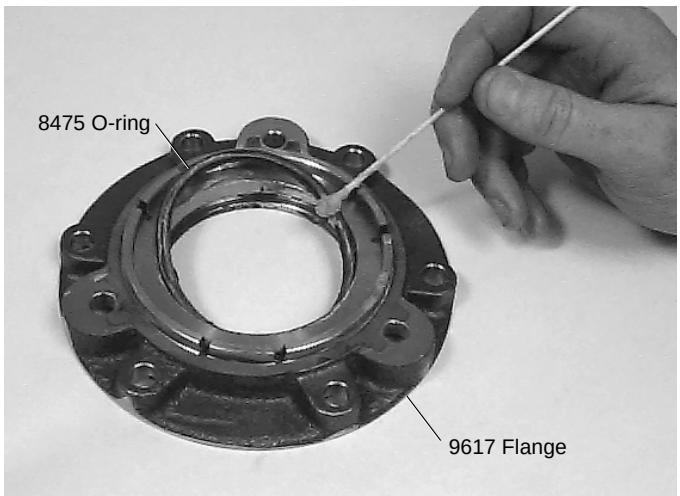


Figure 28. *Lubricate O-ring with 9674 silicone grease.*

Figure 29. *Mount flange to lower unit and torque bolts.*

Step12

Mount flange assembly to lower unit with three 8462 bolts. Torque bolts to 22 ft-lbs (33 N·m).

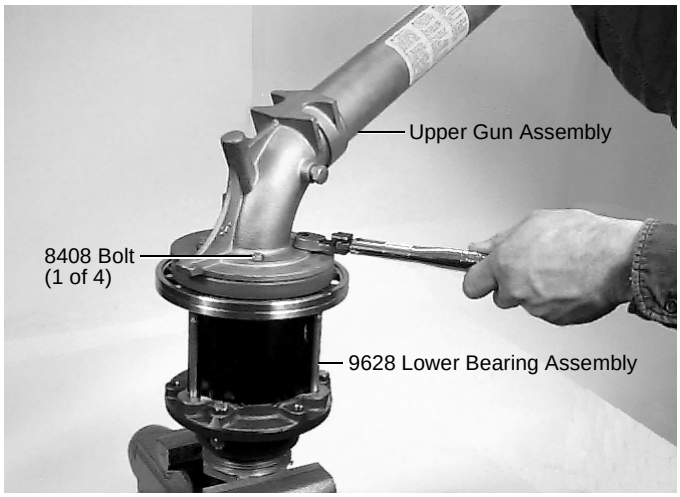


Figure 30. *Install upper gun assembly on lower bearing unit.*

Step 13

Install upper gun assembly on 9628 lower bearing unit. Inspect 8460-001 gasket and replace if damaged. Use two, long 5/16” x 18 bolts to align upper gun assembly. Install two original 8408 bolts, compress and tighten. Install the two remaining bolts. Torque all bolts to 130-150 in-lbs (14.7-17 N·m). Check lower bearing unit as described in Appendix A.

Note: If lower bearing unit was completely rebuilt, initial brake loads may be slightly less than the 3.50 lbs (1.60 kg) force specified at nozzle. However, after first hour of operation, force should increase to 3.50 lbs.

APPENDIXES

Appendix A Checking Lower Bearing Unit Torque

The lower bearing unit of a Big Gun should have a long, reliable operating life without any maintenance. If your F150SS is old, or if it has been operated in adverse conditions, you may need to replace the bearings and seals. You can perform the following test to determine if the lower bearing unit torque is within factory specifications:

Step 1

Turn off all water pressure.

Step 2

With lower bearing unit flange held firmly, place a force gauge against the end of the nozzle as shown in Figure 31.

Step 3

Push the gauge gently until the Gun just starts to rotate.

Step 4

Observe the gauge and note the force required to rotate.

Step 5

The force required to rotate the lower bearing unit of a properly operating F150SS will be 3.50-7.00 lbs (1.60-3.20 kg) measured at the nozzle.

Step 6

If the force required exceeds the above specification, refer to section 7.0, “Lower Bearing Unit,” and follow the instructions for disassembly and repair.

If the F150SS has been operated in adverse conditions, the brake surfaces may have grit or buildup on them. The presence of grit will require excess force for rotation. In this situation, refer to Appendix B for instructions on how to lower the brake load.

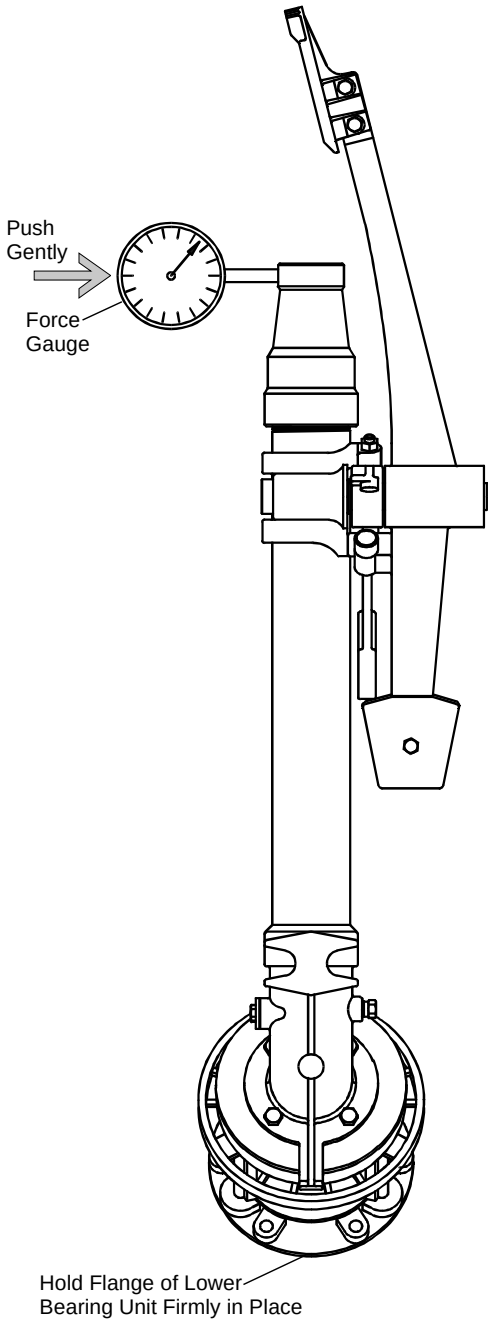


Figure 31. *How to check lower bearing unit torque.*

Appendix B Lowering Brake Load of Lower Bearing Unit

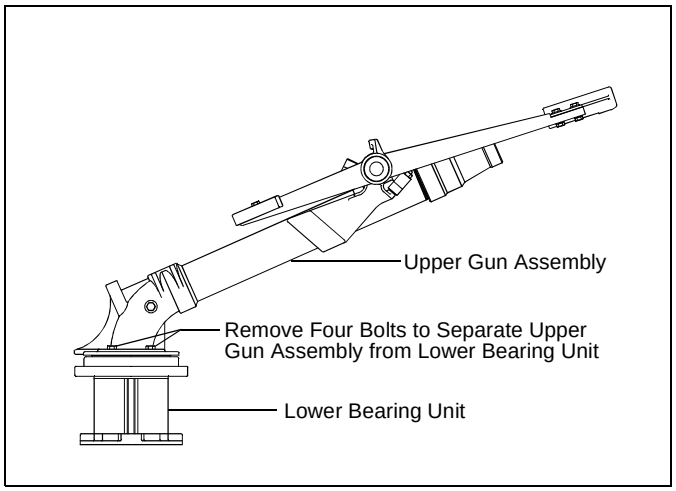


Figure 32. *Separate upper gun from lower bearing unit.*

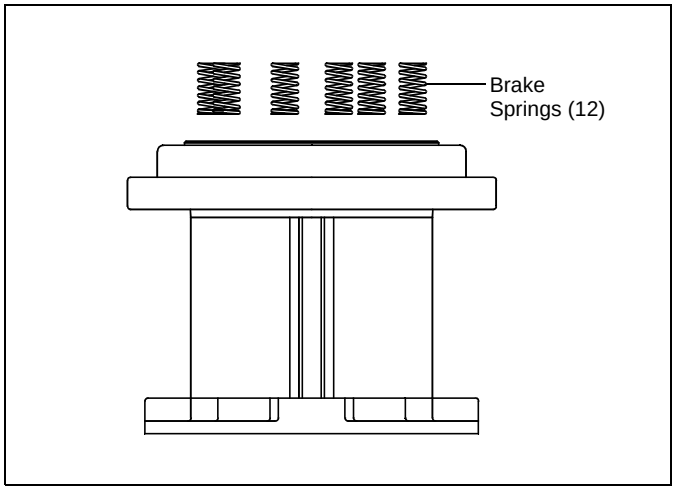


Figure 33. *12 springs are held between the assemblies.*

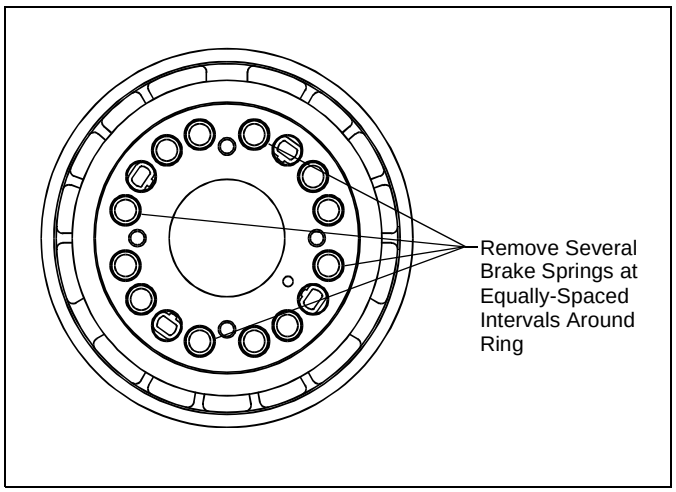


Figure 34. *To lower brake load, remove several springs.*

The stainless steel F150SS lower bearing unit is designed to give a constant brake load for the life of the product. (Refer to section 7.0, “Lower Bearing Unit.”) In some conditions, mainly slurries and other dirty water applications, the brake load may be setup too tight.

To loosen the brake:

Step 1

Remove four 8408 5/16”-18 bolts and carefully separate upper gun assembly from lower bearing unit (see Figure 32). Note the twelve 8474 brake springs that were held between these two assemblies (see Figure 33). Be careful not to lose any springs.

Step 2

Remove several brake springs from the lower bearing unit at equally-spaced intervals around the ring (see Figure 34).

IMPORTANT: If too many springs are removed, the Gun will tend to “fall backwards” slightly when the Gun riser is tilted. This would be noticeable as the Gun is trying to drive towards the uphill side. In this situation, a counterbalance kit may be required for proper operation. Contact a Nelson sales representative for details.

Step 3

Install upper gun assembly onto lower bearing unit of sprinkler. To make alignment of components easier while compressing the springs, temporarily use two 5/16”-18 UNC x 1.5” bolts to connect lower bearing unit to upper gun assembly. Compress springs slightly. Install two original bolts. Remove two long bolts and install remaining two original bolts. Torque all four bolts to 130-150 in-lbs (14.7-17 N·m).

Step 4

Run sprinkler and observe results. If required, repeat steps 1-4 until satisfactory brake action is achieved.

Appendix C Checking Drive Arm Bearing Drag

If drive arm bearings are rusty or seized, or if there is excessive seal drag, the drive arm will not operate properly.

To determine if drive arm bearings are in good working order, you can perform the simple check shown in Figure 35.

For instructions on how to disassemble, inspect, and repair a drive arm, refer to section 6.0, “Drive Arm.”

IMPORTANT: At temperatures near or below freezing, the grease in the drive arm cavity will thicken and this can cause similar problems. For further information, refer to section 3.1, “Lubrication.”

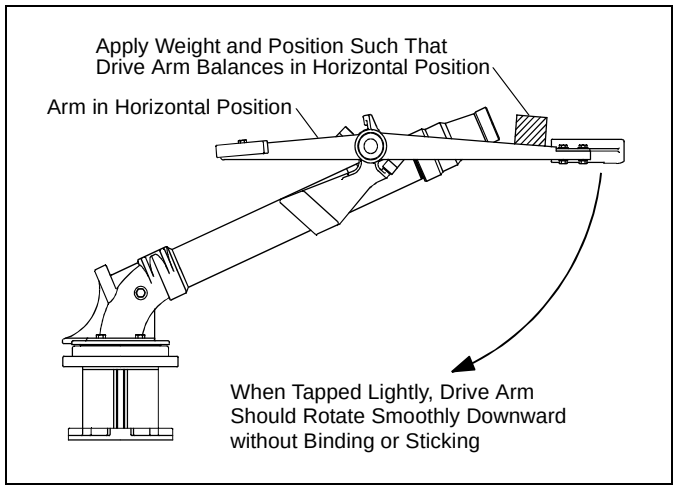


Figure 35. *How to check drive arm bearing drag.*

Appendix D Checking for a Bent Drive Arm

Using a straight edge, check for a bent drive arm as shown below in Figure 36. Both of the surfaces indicated should be straight to within 1/16-inch (1,5mm). If the arm is bent, straighten it with care, as the casting may be cracked. Also, if the arm is bent, check for a bent drive arm shaft (refer to section 6.2, step 7).

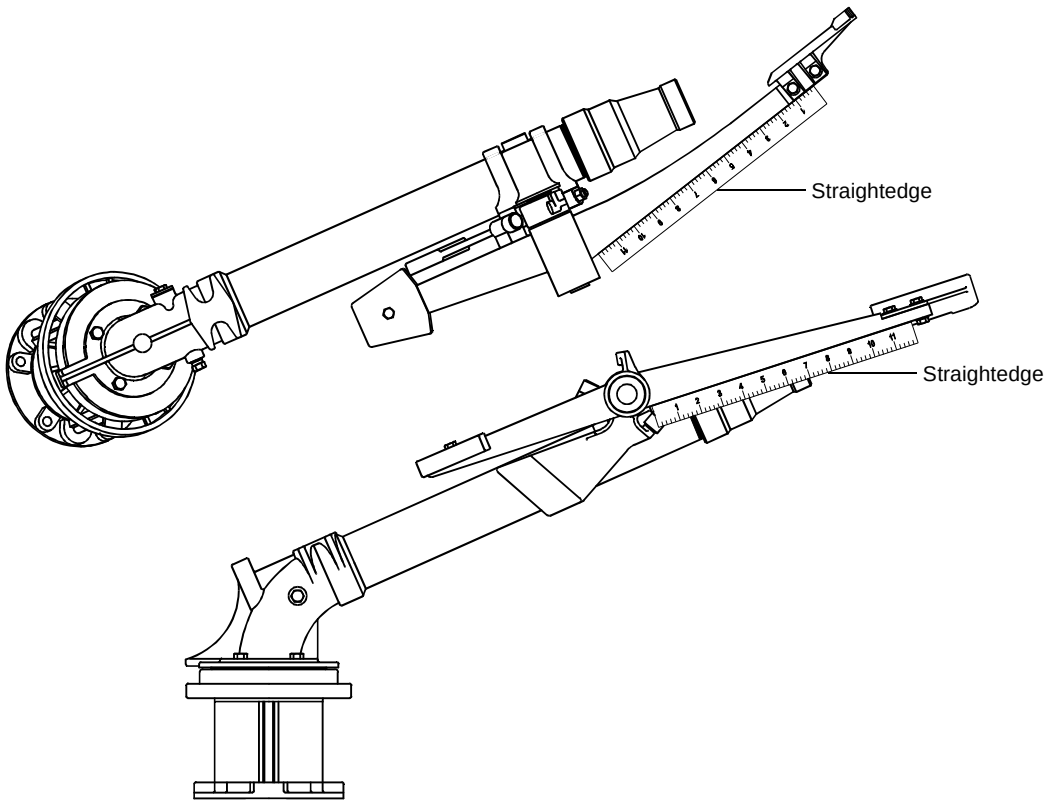


Figure 36. *Use a straight edge to check for a bent drive arm.*

Appendix E Thrust Loads of a Gun in Operation

The thrust force for the Big Gun can be calculated by knowing the flow rate through the gun and the nozzle pressure of the gun. The following equation shows the relationship.

$$T = 2P\frac{Q}{38\sqrt{P}} \quad (1)$$

where,

T is thrust force of nozzle (lb)

P is nozzle pressure (psi)

Q is flow rate (gpm)

As seen in Figure 37, the thrust force is directly opposite the nozzle exit. Since the thrust force *(T)* is now known, the horizontal *(H)* and vertical *(V)* thrust forces can be calculated using trigonometry.

$H = T$ cos (gun angle from horizontal) (2)

$V = T$ sin (gun angle from horizontal) (3)

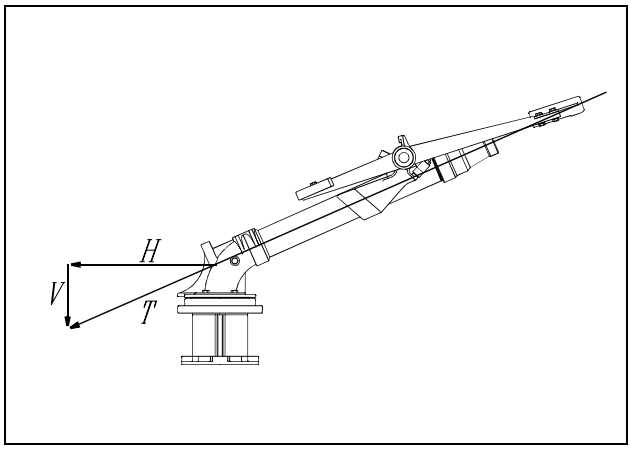


Figure 37. *Thrust loads on Nelson Big Gun.*

The tables below show values of thrust force *(T)* and horizontal thrust force *(H)* for the F150SS Big Gun with varying pressures and nozzle sizes.

Table 4. *T* – Thrust Force (lbs) of F150SS Big Gun Nozzles

Pressure (psi)	Nozzle 0.7”	Nozzle 0.8”	Nozzle 0.9”	Nozzle 1.0”	Nozzle 1.1”	Nozzle 1.2”	Nozzle 1.3”
50	37	48	62	76	95	112	130
60	45	58	74	92	112	135	157
70	53	68	87	108	130	156	183
80	60	78	99	123	148	179	210
90	68	87	111	137	167	202	237
100	75	97	124	153	187	224	263
110	83	108	136	168	204	246	290
120	91	118	149	185	222	268	314

.

Table 5. *H* – Horizontal Thrust Force (lbs) of F150SS Big Gun Nozzles with 24° Trajectory

Pressure (psi)	Nozzle 0.7”	Nozzle 0.8”	Nozzle 0.9”	Nozzle 1.0”	Nozzle 1.1”	Nozzle 1.2”	Nozzle 1.3”
50	34	44	56	70	87	102	119
60	41	53	68	84	103	123	143
70	48	62	79	99	119	143	167
80	55	71	90	112	136	164	191
90	62	80	102	126	153	185	217
100	69	89	113	140	171	204	241
110	76	98	125	154	187	224	265
120	83	108	136	169	203	245	287

Appendix F Performance Data for Gun

150 Series Big Guns — 24° Trajectory

Table 6. 150 T Taper Bore Nozzles

	Nozzle 0.7”		Nozzle 0.8”		Nozzle 0.9”		Nozzle 1.0”		Nozzle 1.1”		Nozzle 1.2”		Nozzle 1.3”	
P.S.I.	GPM	DIA.	GPM	DIA.	GPM	DIA.	GPM	DIA.	GPM	DIA.	GPM	DIA.	GPM	DIA.
50	100	250’	130	270’	165	290’	205	310’	255	330’	300	345’	350	360’
60	110	265’	143	285’	182	305’	225	325’	275	345’	330	365’	385	380’
70	120	280’	155	300’	197	320’	245	340’	295	360’	355	380’	415	395’
80	128	290’	165	310’	210	335’	260	355’	315	375’	380	395’	445	410’
90	135	300’	175	320’	223	345’	275	365’	335	390’	405	410’	475	425’
100	143	310’	185	330’	235	355’	290	375’	355	400’	425	420’	500	440’
110	150	320’	195	340’	247	365’	305	385’	370	410’	445	430’	525	450’
120	157	330’	204	350’	258	375’	320	395’	385	420’	465	440’	545	460’

Table 7. 150 T Taper Bore Nozzles - Metric Units

Nozzle Diameter	0.7” 17,8mm			0.8” 20,3mm			0.9” 22,9mm			1.0” 25,4mm			1.1” 27,9mm			1.2” 30,5mm			1.3” 33,0mm		
Pressure kg/cm^2	L/S	M^3/H	M	L/S	M^3/H	M	L/S	M^3/H	M	L/S	M^3/H	M	L/S	M^3/H	M	L/S	M^3/H	M	L/S	M^3/H	M
3,5	6,39	23,0	76,0	8,29	29,8	82,0	10,5	37,8	88,0	13,0	46,9	95,0	15,9	57,1	101	19,0	68,3	105	22,3	80,1	110
4,0	6,83	24,6	79,6	8,86	31,9	85,6	11,2	40,4	91,6	13,9	50,1	97,8	16,9	61,0	104	20,3	73,0	109	23,8	85,7	114
5,0	7,63	27,5	85,4	9,91	35,7	91,6	12,6	45,2	98,6	15,6	56,0	105	18,9	68,2	111	22,7	81,7	117	26,6	95,8	121
6,0	8,36	30,1	89,7	10,9	39,1	96,7	13,8	49,5	104	17,0	61,3	110	20,8	74,7	117	24,9	89,5	123	29,1	105	128
7,0	9,03	32,5	95,0	11,7	42,2	101	14,9	53,5	108	18,4	66,3	114	22,4	80,7	122	26,8	96,6	128	31,5	113	134
8,0	9,66	34,8	99,3	12,5	45,1	105	15,9	57,2	112	19,7	70,8	118	24,0	86,3	126	28,7	103	132	33,7	121	138
9,0	10,2	36,9	104	13,3	47,9	110	16,8	60,6	117	20,9	75,1	123	25,4	91,5	131	30,4	110	137	35,7	129	143

Note: Above data is complied in ideal conditions, with no wind, good hydraulic entrance conditions, and range tubes with straightening vanes. Other conditions may affect flow rate and distance of throw.

Appendix G Materials Used in Construction

The Nelson stainless steel F150 Big Gun is designed for use in high pH (alkaline) fluid conditions and has a 316 stainless steel flowpath. The drive arm and center housing in the lower unit are anodized and powder-coated aluminum. The drive vane is nylon, and remaining plastic components are acetal. All fasteners are 18-8 stainless steel. The seals are Buna-n rubber.

If your application requires other materials, contact a Nelson sales representative or engineer.

Appendix H Overall Dimensions and Flange Options

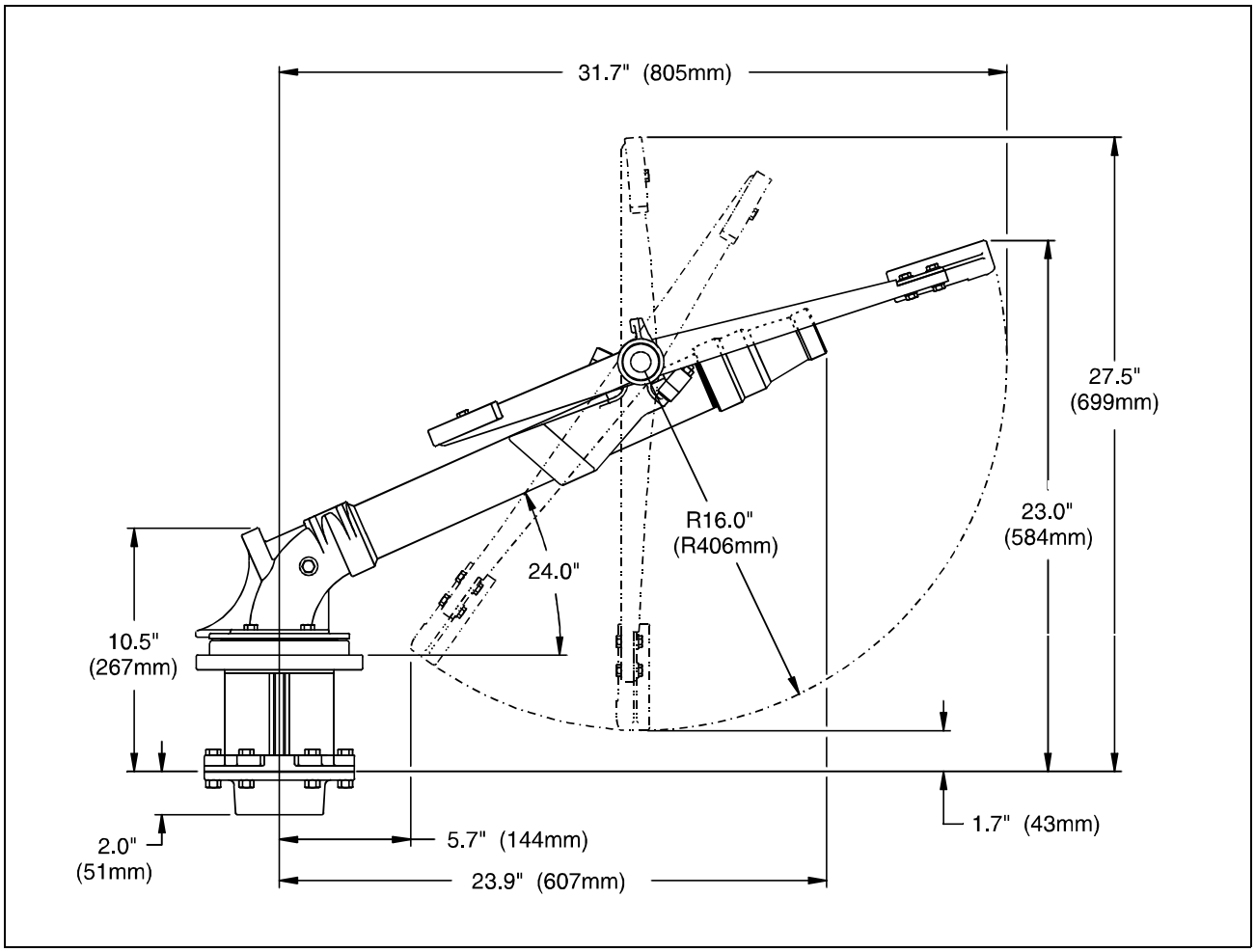


Figure 38. *Overall dimensions of Nelson stainless steel F150 Big Gun*

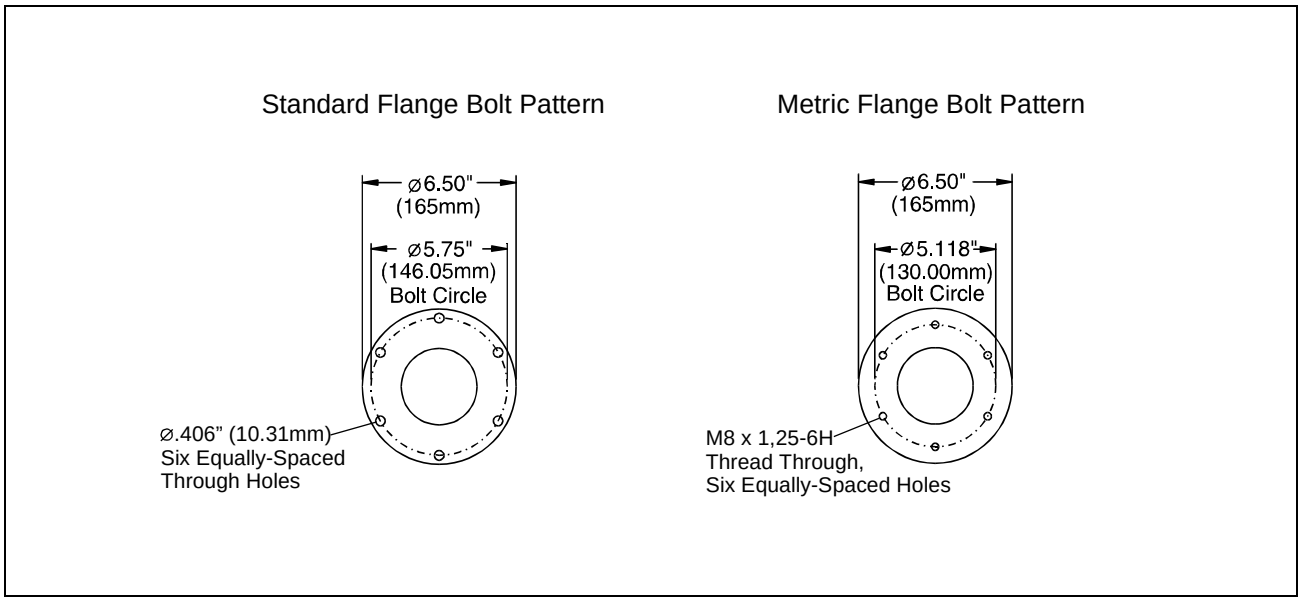


Figure 39. *Standard and optional metric flange for Nelson stainless steel F150 Big Gun*

NOTES

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