



NAVIGATOR (NAV-100) LIMITED RELEASE USER MANUAL

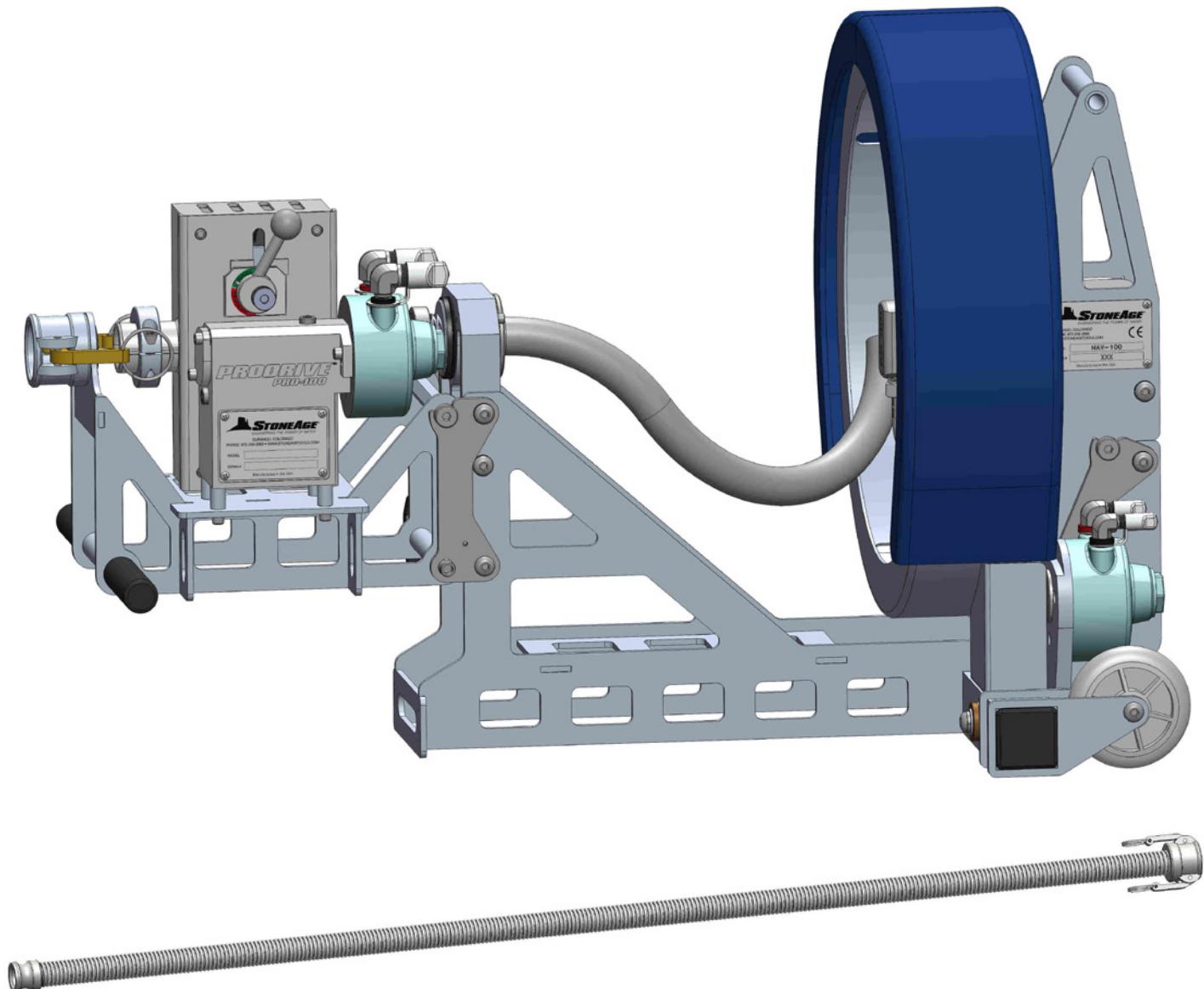


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This manual must be used in accordance with all applicable national laws. The manual shall be regarded as a part of the machine and shall be kept for reference until the final dismantling of the machine, as defined by applicable national law(s).

SPECIFICATIONS

GENERAL:

Hose feed rate	2.7 in/s to 32 in/sec (69 mm/s to 813 mm/s)
Min pipe size	2 in (51 mm)
Max pipe size	8 in (203 mm)
Max hose size	ø.27 in to ø.61 in and ø.85 3/8" Rubber cover
Air connection to CB	Chicago style twist-claw fitting
Air connection from CB to tractor	1/2" JIC

WEIGHTS:

Navigator NAV-100	90 lb (41 kg)
Not including hoses	
Winch pipe clamp	11 lb (5.0 kg)
Floor stand control box	18 lb (6.4 kg)

DIMENSIONS:

Navigator NAV-100	35" x 21" x 24"	(890 mm x 533 mm x 610 mm)
Snout	72" x 2"	(1829 mm x 51 mm)
ProDrive ABX-PRO	12.5" x 6" x 9.5"	(318 mm x 152 mm x 241 mm)
Winch pipe clamp	6.25" x .75" x 8.25"	(159 mm x 191 mm x 210 mm)
Floor stand control box	22" x 13" x 14"	(559mm x 330mm x 356mm)

DESCRIPTION OF EQUIPMENT AND INTENDED USE

The Navigator NAV-100 is a hose feed device designed to quickly and safely clean a broad range of pipes with or without a flange. The Navigator NAV-100 mounts to pipes from 2 inches (51 mm) to 8 inches (203 mm) in diameter. Standard safety practices should still be followed, but the Navigator NAV-100 allows the user to be stand away from the pipe entrance and shielded from a tool.

KEY FEATURES:

Navigator NAV-100

- Modular, lightweight design
- Quick install
- Winch Pipe Clamp accommodates a wide variety of pipes

Control Box CB-NAV

- Small, lightweight, ergonomic design that includes a portable floor stand and filter-regulator-lubricator assembly
- 8' (2438 mm) umbilical allows user to move with the controls
- Drive controls: forward/reverse hose feed
- Pneumatic dump control switch

WARNING AND SAFETY INSTRUCTIONS

OPERATOR TRAINING

Managers, Supervisors, and Operators MUST be trained in Health and Safety Awareness of High-pressure Water Jetting and hold a copy the Water Jetting Association (WJA) Code of Practice, or equivalent (see www.waterjetting.org.uk).

Operators MUST be trained to identify and understand all applicable standards for the equipment supplied. Operators should be trained in manual handling techniques to prevent bodily injury.

StoneAge has designed and manufactured this equipment considering all hazards associated with its operation. StoneAge assessed these risks and incorporated safety features in the design. StoneAge **WILL NOT** accept responsibility for the results of misuse.

IT IS THE RESPONSIBILITY OF THE INSTALLER/OPERATOR to conduct a job specific risk assessment prior to use. Job specific risk assessment MUST be repeated for each different set up, material, and location.

The risk assessment MUST conform to the Health and Safety at Work Act 1974 and other relevant Health and Safety legislation.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Use of Personal Protective Equipment (PPE) is dependent on the working pressure of water and the cleaning application. Managers, Supervisors, and Operators MUST carry out a job specific risk assessment to define the exact requirements for PPE. See Protective Equipment for Personnel (Section 6) of WJTA-IMCA's Recommended Practices For The Use Of High-pressure Waterjetting Equipment for additional information.

Hygiene - Operators are advised to wash thoroughly after all waterjetting operations to remove any waterblast residue which may contain traces of harmful substances.

First aid provision - users MUST be provided with suitable first aid facilities at the operation site.

Operators MUST read, understand, and follow the Operational and Training Requirements (Section 7.0) of WJTA-IMCA's Recommended Practices For The Use Of High-pressure Waterjetting Equipment, or equivalent.

Operators MUST read, understand and follow the Warnings, Safety Information, Assembly, Installation, Connection, Operation, Transport, Handling, Storage, and Maintenance Instructions detailed in this manual.

The risk assessment MUST consider potential material or substance hazards including:

- Aerosols
- Biological and microbiological (viral or bacterial) agents
- Combustible materials
- Dusts
- Explosion
- Fibers
- Flammable substances
- Fluids
- Fumes
- Gases
- Mists
- Oxidizing Agents

PPE may include:

- **Eye protection:** Full face visor
- **Foot protection:** Kevlar® brand or steel toe capped, waterproof, non-slip safety boots
- **Hand protection:** Waterproof gloves
- **Ear protection:** Ear protection for a minimum of 85 dBA
- **Head protection:** Hard hat that accepts a full face visor and ear protection
- **Body protection:** Multi-layer waterproof clothing approved for waterjetting
- **Hose protection:** Hose shroud
- **Respiratory protection:** May be required; refer to job specific risk assessment

WARNING AND SAFETY INSTRUCTIONS

⚠ WARNING

Operations with this equipment can be potentially hazardous. Caution MUST be exercised prior to and during machine and water jet tool use. Please read and follow all of these instructions, in addition to the guidelines in the WJTA Recommended Practices handbook, available online at www.wjta.org. Deviating from safety instructions and recommended practices can lead to severe injury and/or death.

- Do not exceed the maximum operating pressure specified for any component in a system.
- The immediate work area MUST be marked off to keep out untrained persons.
- Inspect the equipment for visible signs of deterioration, damage, and improper assembly. Do not operate if damaged, until repaired.
- Make sure all threaded connections are tight and free of leaks.
- Users of the Navigator NAV-100 MUST be trained and/or experienced in the use and application of high-pressure technology and cleaning, as well as all associated safety measures, according to the WJTA Recommended Practices for the use of High-pressure Waterjetting Equipment.
- An anti-withdrawal device (back-out preventer) MUST be used at all times. The back-out prevention device is located on the Splash Guard of the Navigator NAV-100. The adjustment instruction is located in the "ProDrive Set-up" section of this manual.
- The Control Box should be located in a safe location where the Operator has good visibility of the pipe and hose. The Navigator NAV-100 and Control Box MUST be supervised at all times and should never be left unattended.
- Always de-energize the system before servicing or replacing any parts. Failure to do so can result in severe injury and/or death.

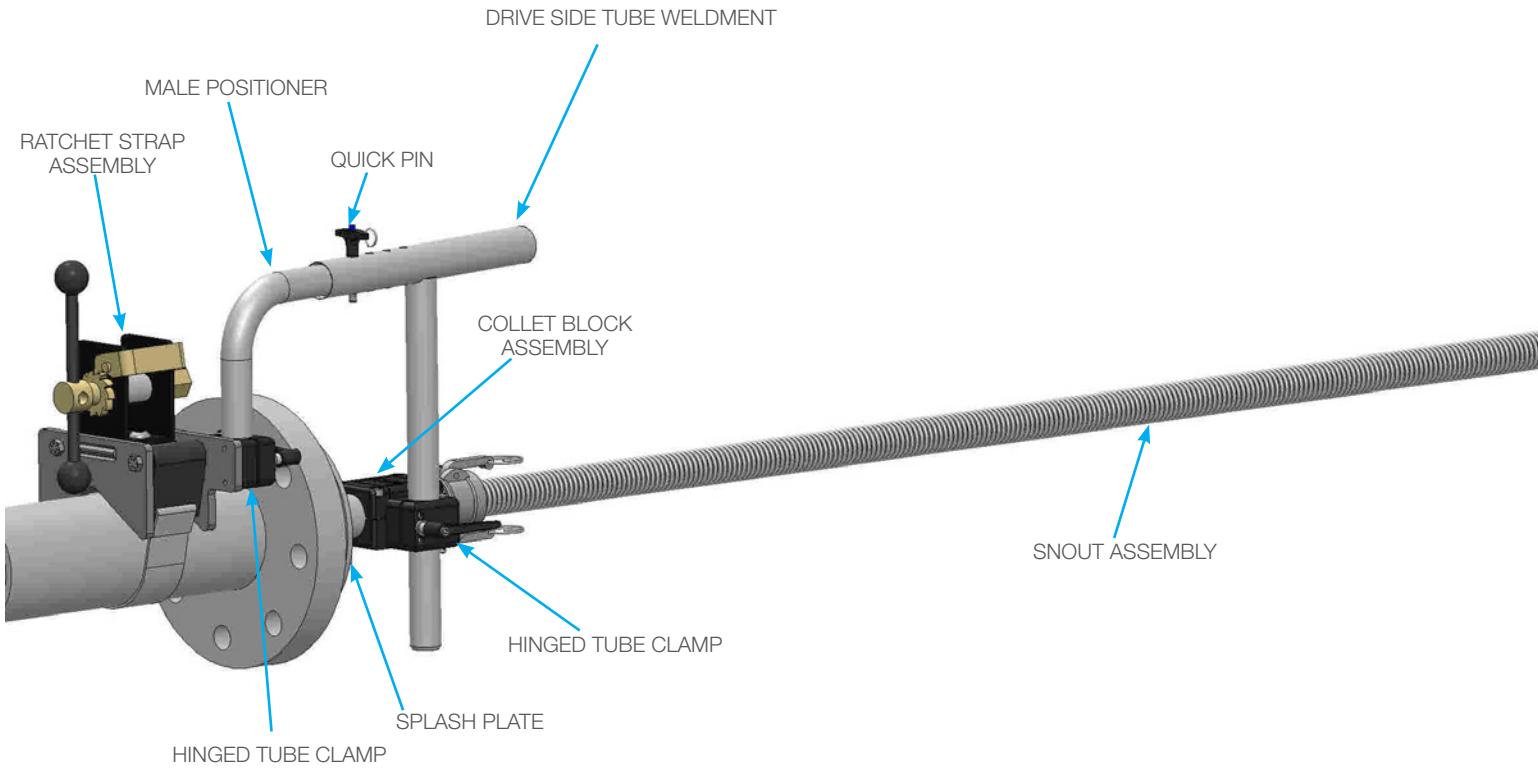
PRE-RUN SAFETY CHECK

Refer to WJTA-IMCA's, Recommended Practices For The Use Of High-pressure Waterjetting Equipment and/or The Water Jetting Association's, WJA Code of Practice for additional safety information.

- Complete a job specific risk assessment and act on the resulting actions.
- Adhere to all site specific safety procedures.
- Ensure the waterblasting zone is properly barricaded and that warning signs are posted.
- Ensure the work place is free of unnecessary objects (e.g. loose parts, hoses, tools).
- Ensure all Operators are using the correct Personal Protective Equipment (PPE).
- Check that the air hoses are properly connected and tight.
- Check all hoses and accessories for damage prior to use. Do not use damaged items. Only high quality hoses intended for waterblast applications should be used as high-pressure hoses.
- Check all high-pressure threaded connections for tightness.
- ****Ensure that a anti-withdrawal device (back-out preventer), and all other applicable safety devices are installed and set-up properly.****
- Test the Control Box before operating the Navigator NAV-100 with high-pressure water to verify the control valves move the hose in the intended direction, and that the dump valve and hose clamp are working properly.
- Ensure that Operators never connect, disconnect, or tighten hoses, adapters, or accessories with the high-pressure water pump unit running.
- Ensure no personnel are in the hydroblasting zone.

SYSTEM ASSEMBLY - OVERVIEW

NAVIGATOR PIPE ATTACHMENT ASSEMBLIES



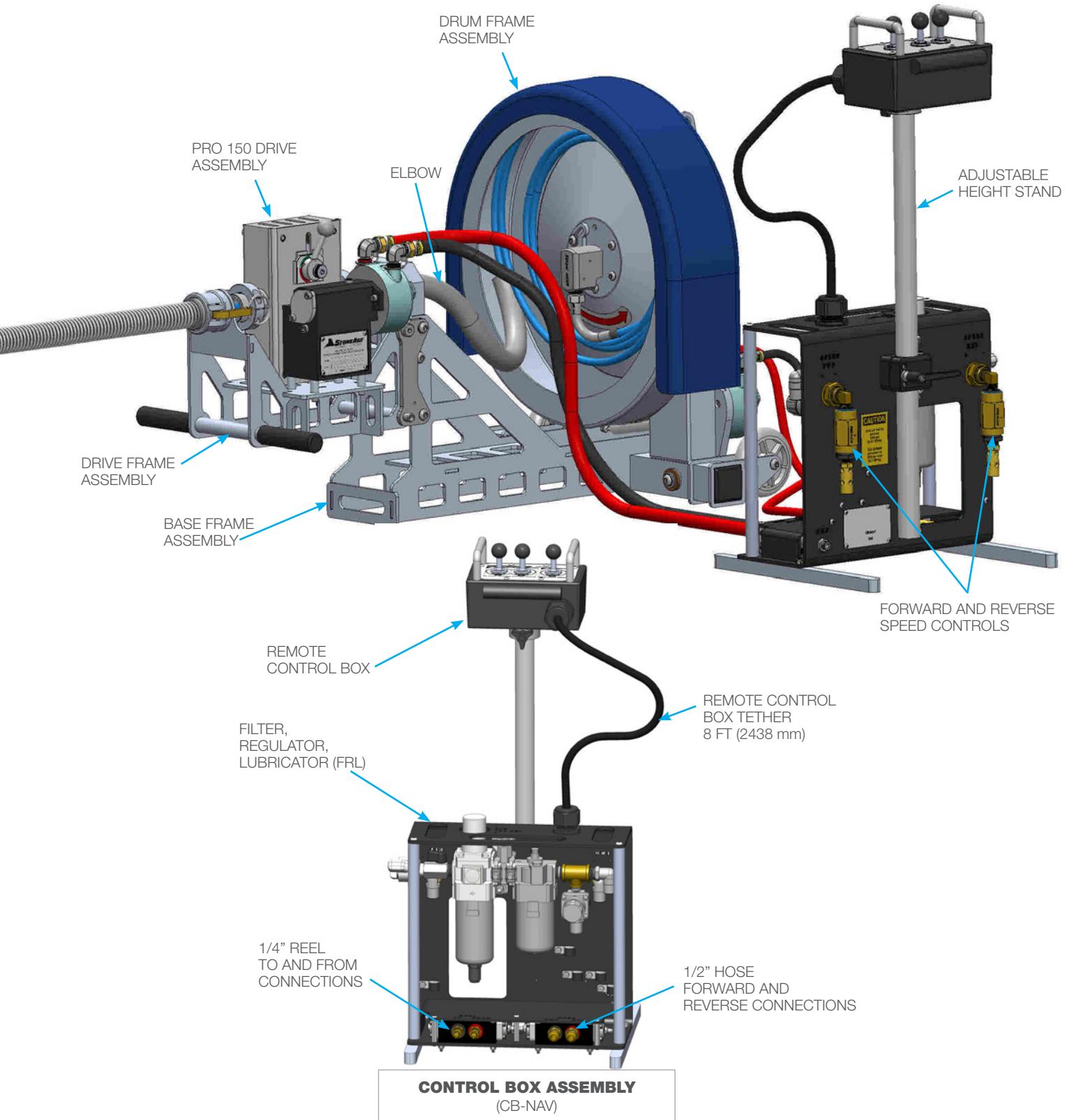
NAVIGATOR PIPE FLANGE ATTACHMENT OPTIONS



QUARTER PLATE BOP
BOP 010-2-4 QTR

DRIVE SIDE TUBE WELDMENT, MALE POSITIONER
ARM, QUICK PIN, RATCHET STRAP ASSEMBLY,
HINGED TUBE CLAMPS, COLLET ASSEMBLY AND
SPLASH PLATE

FLANGE MOUNT PLATE ASSEMBLY
BOP 010-X-X

NAVIGATOR WITH CONTROL BOX ASSEMBLY
(NAV-100 AND CB-NAV)**CONTROL BOX ASSEMBLY**
(CB-NAV)

NAVIGATOR SET-UP

HOSE DRUM ASSEMBLY TO BASE FRAME ASSEMBLY

1. Remove Quick Release Pin from Base Frame Assembly. Install the Hose Drum Assembly onto the Base Frame Assembly by placing the shoulder screw heads into the notches on the Joint Plates and inserting the Quick Release Pin through the holes in the Joint Plates. **(Figure 1)**

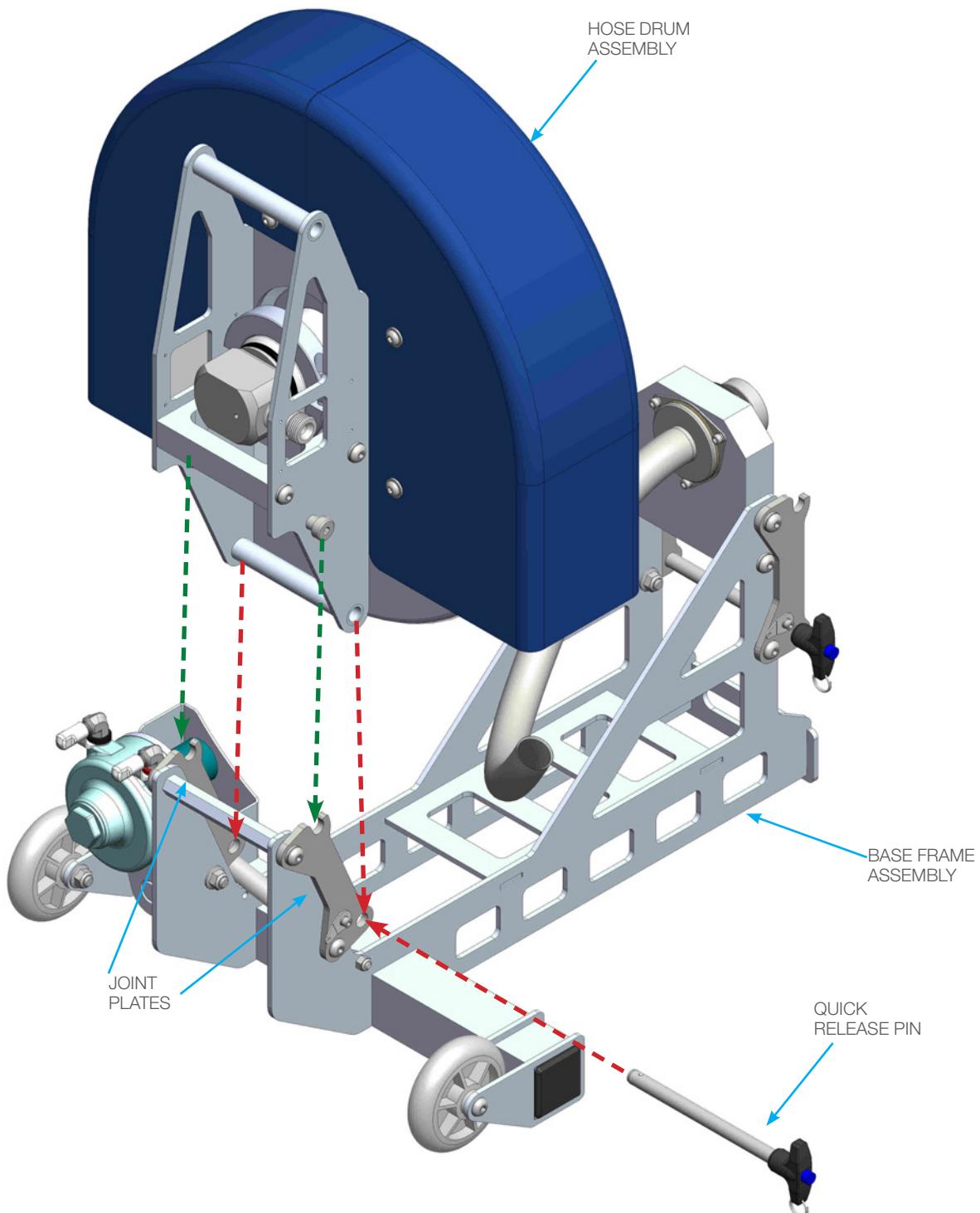
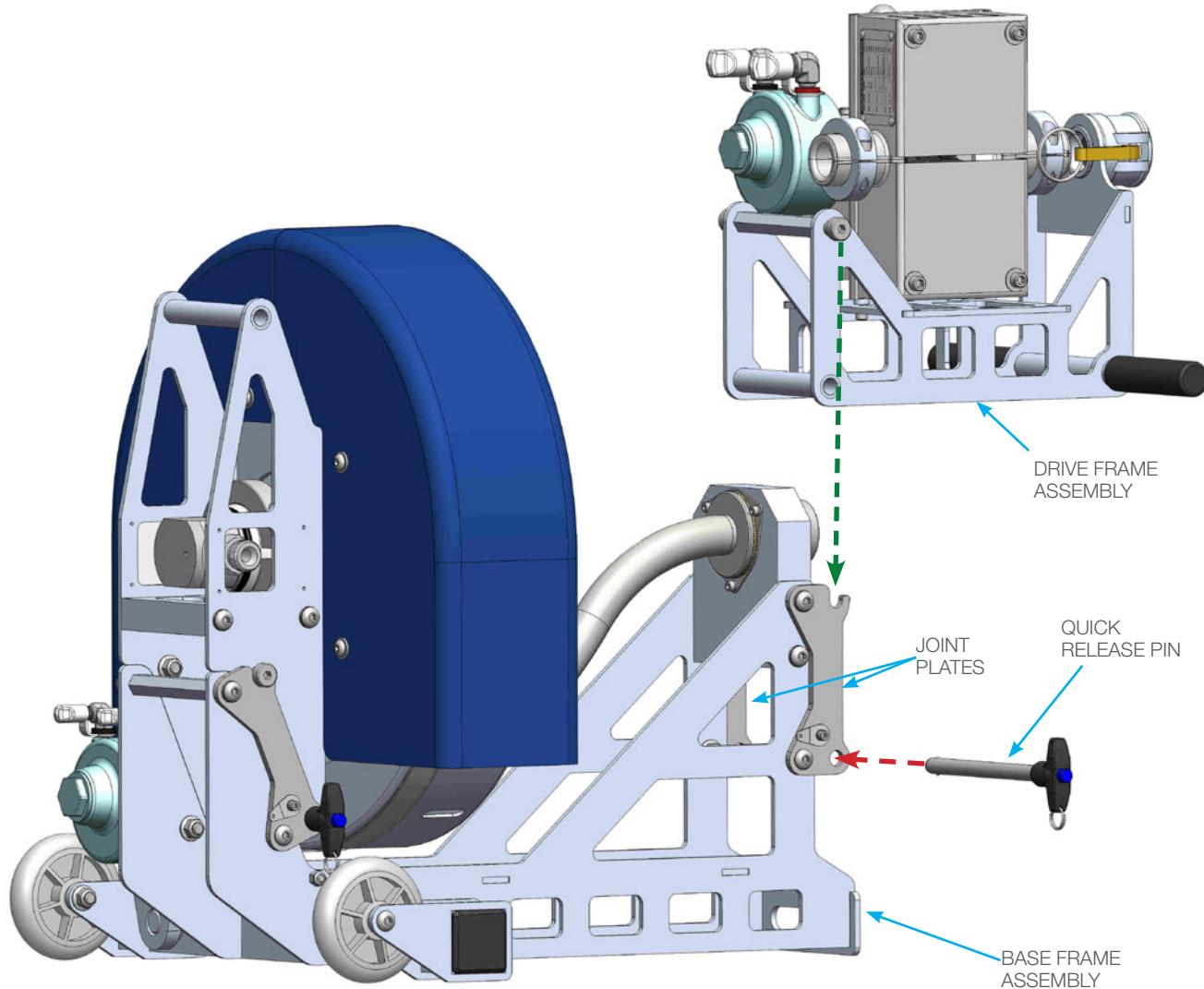


FIGURE 1

DRIVE ASSEMBLY TO BASE FRAME ASSEMBLY

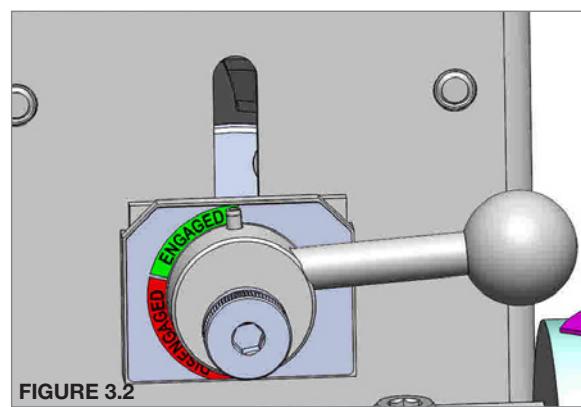
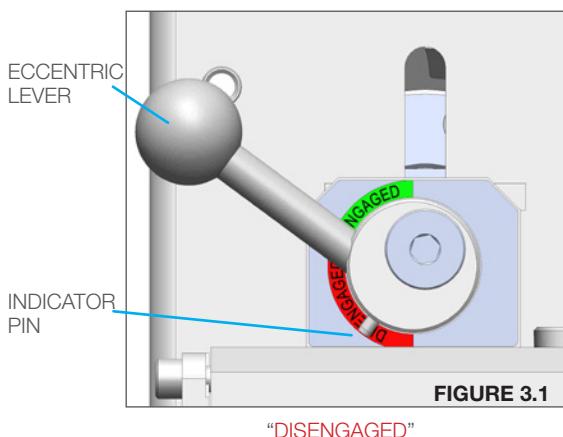
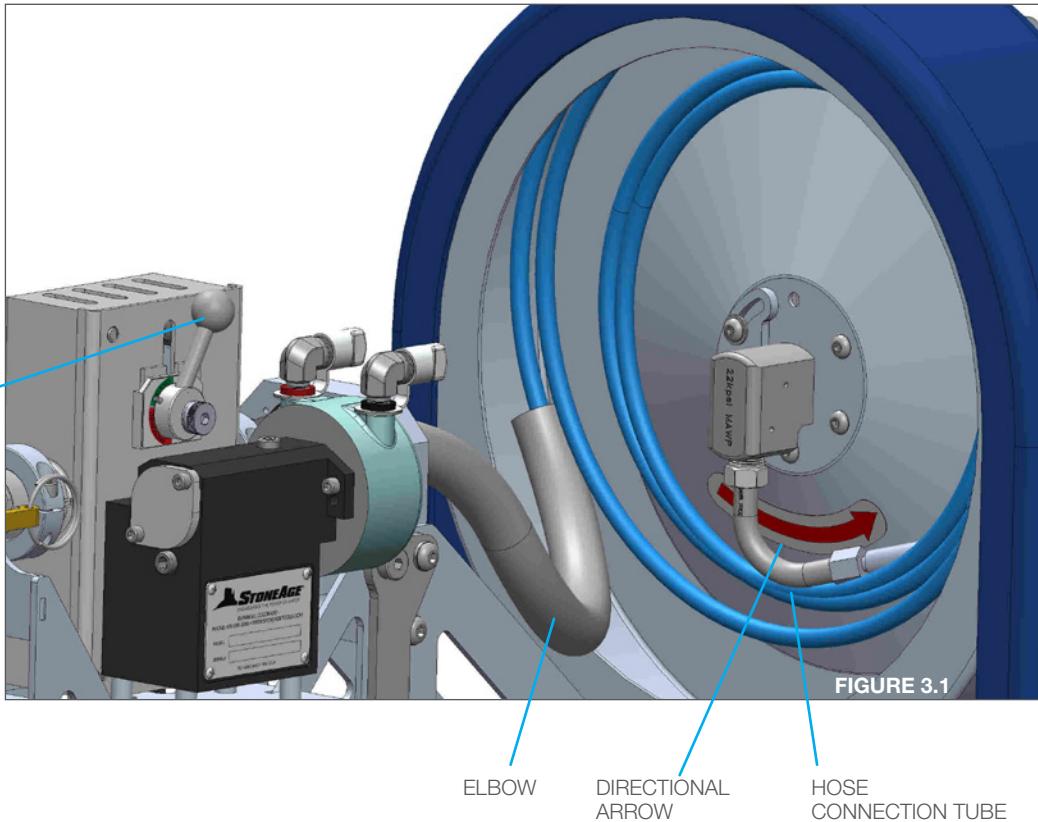
2. Remove Quick Release Pin from Base Frame Assembly, Install the Drive Assembly onto the Base Frame Assembly by placing the shoulder screw heads into the notches on the Joint Plates and inserting the Quick Release Pin through the holes in the Joint Plates. **(Figure 2)**

**FIGURE 2**

NAVIGATOR SET-UP

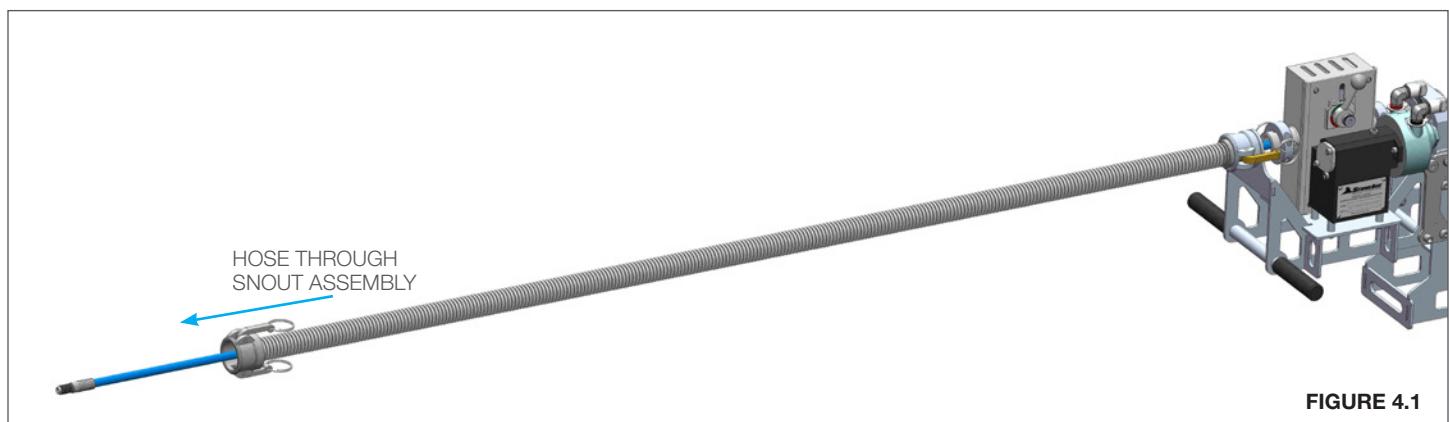
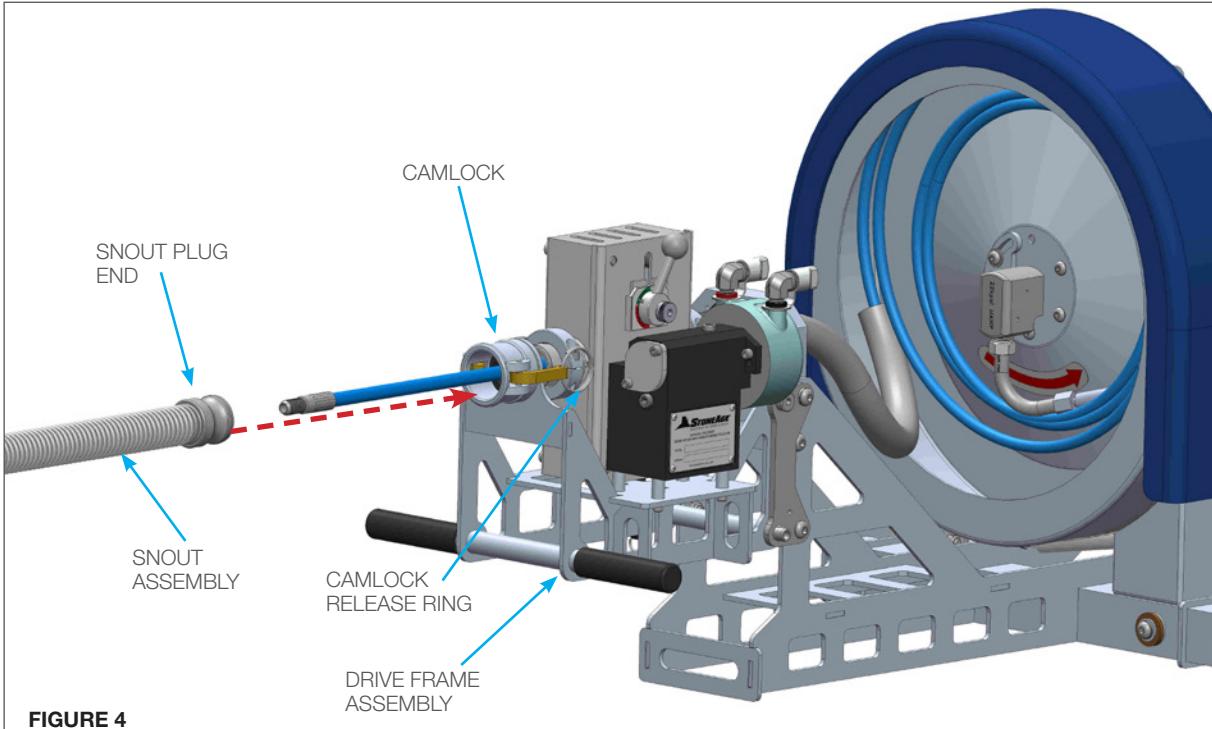
HOSE CONNECT AND FEED THROUGH PRODRIVE

3. Connect the female hose end to the hose connection tube and wind the hose in the direction of the arrow inside the drum. (**Figure 3**) Using the Eccentric Lever move the Indicator Pin to “**Disengaged**” then feed the male hose end into the elbow and through the ProDrive 150. (**Figure 3.1**) Using the Eccentric Lever move the Indicator Pin back to “**Engaged**” (**Figure 3.2**)



SNOUT ASSEMBLY TO BASE FRAME ASSEMBLY

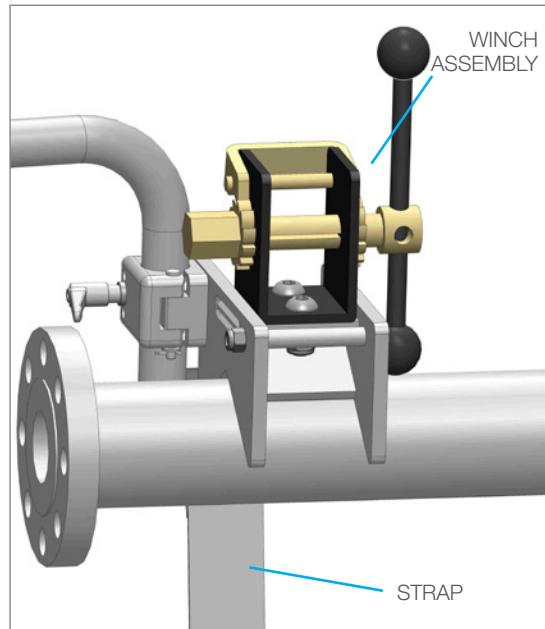
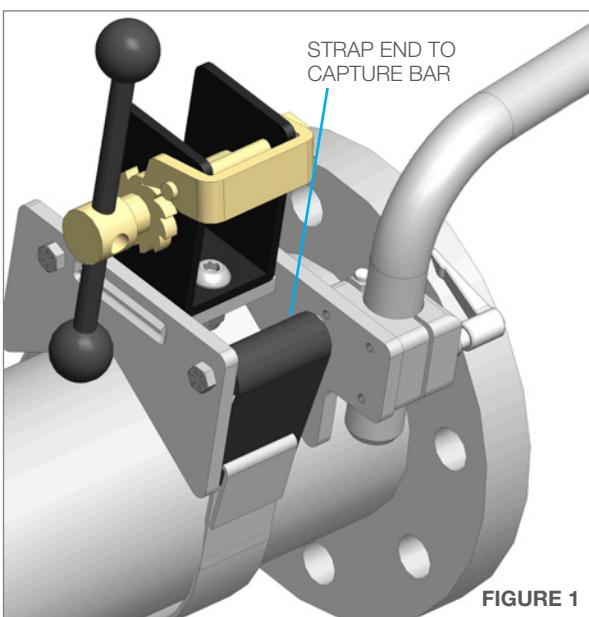
4. Slide the Snout Assembly over the hose end. Pull Camlock Release Rings out to ready the Camlock to receive the Snout Plug End. Install the Snout Plug End into the Camlock and push the Camlock pins back into place, locking the Plug End. (**Figure 4**) Pull on the Snout Assembly to make sure it is secured. Feed the rest of the hose through the Snout Assembly and leave enough length to feed through a pipe attachment. (**Figure 4.1**)



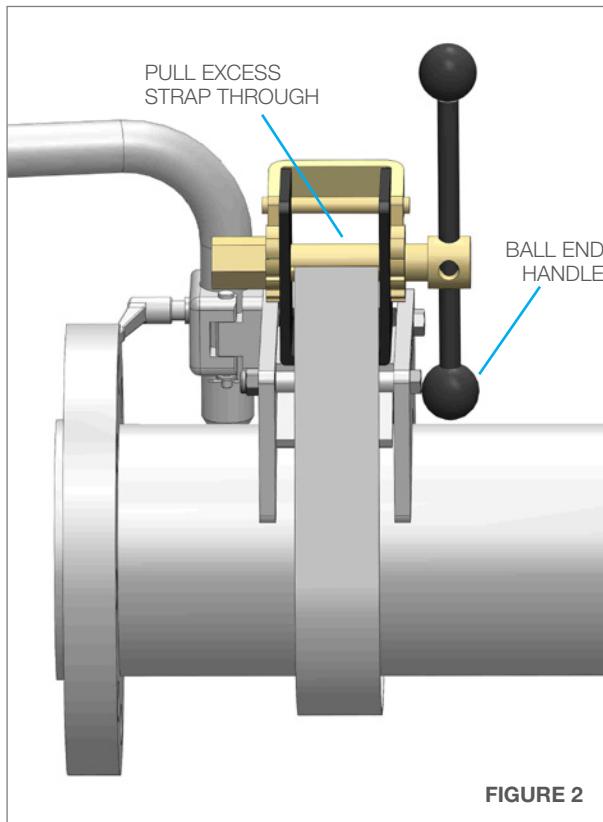
NAVIGATOR SET-UP

RATCHET STRAP / WINCH MOUNT TO PIPE

1. Attach the strap end to the strap capture bar and wrap the strap around the pipe towards the Winch Assembly. (**Figure 1**)



2. Pull excess strap through the Winch Assembly and tighten down with the Ball End Handle (**Figure 2**)



DRIVE SIDE TUBE MOUNT AND BACKOUT PREVENTION COLLET

3. Install the Drive Side Tube onto the Male Positioner Arm (**Figure 3**) and push the Quick Release Pin through one of the incremental hole settings. Pull Camlock, Snout, and Hose with Male End toward the Plug End. Pull the Quick Release Pin and remove the Collet. Push the Male Hose End through Plug End and 1.75" Tube. Replace the Collet and Quick Release Pin. Pull back on the hose to ensure the Male Hose End does not back out past the Collet. (**Figure 3.2**)

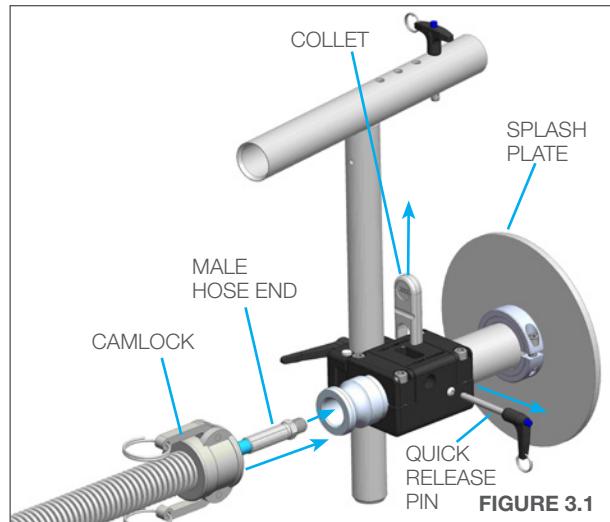


FIGURE 3.1

RECOMMENDED ROLLERS AND COLLETS FOR COMMON HOSE SIZES				
ROLLER	HOSE OD	SPIRSTAR	PARKER	COLLET SIZE
Ø 0.34	0.26"-0.38"	3/2	2240D-02	0.297
		3/4, 4/2	2240D-025, 2440D-02	0.328
		3/6, 5/2	2240D-03	0.406
Ø 0.46	0.39"-0.50"	4/4	2448D-025	0.438
		4/6, 5/4, 6/2	2240D-04	0.460
			2640D-025, 2740D-025	0.484
		6/4	2440D-04	0.516
Ø 0.58	0.51"-0.61"	5/6, 8/2	2240D-05, 2740D-03	0.547
		8/4		0.594
			2440D-05	0.625
Ø 0.89	0.80" - 0.93"	3/8" RUBBER WB HOSE		NONE

It is the responsibility of the user to select proper sizing to assure the end sleeve of the hose will not pass through the collet.

It is the responsibility of the user to select proper sizing to assure the end sleeve of the hose will not pass through the collet. This chart is located on the ABX-PRO housing.

⚠ WARNING

Prior to use, always tighten and test the Backout Preventer to ensure the tool does not pass backward toward the Collet Block Assembly. Failure to do so can result in severe injury and/or death.

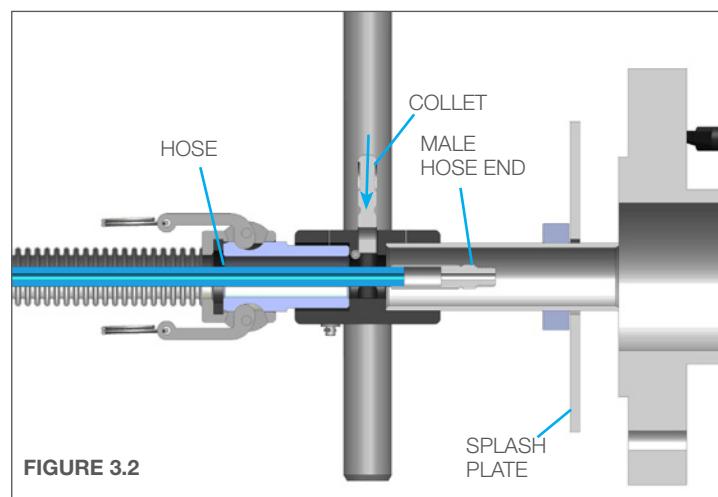


FIGURE 3.2

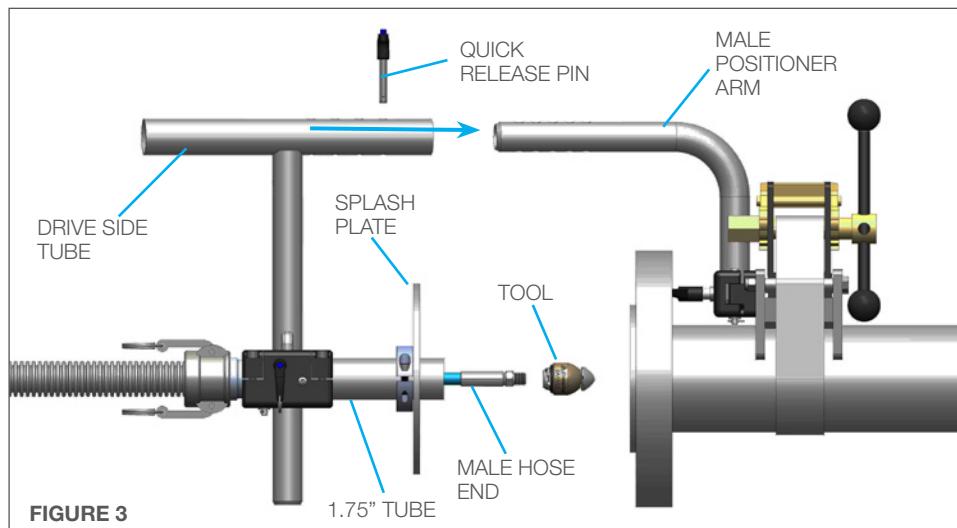
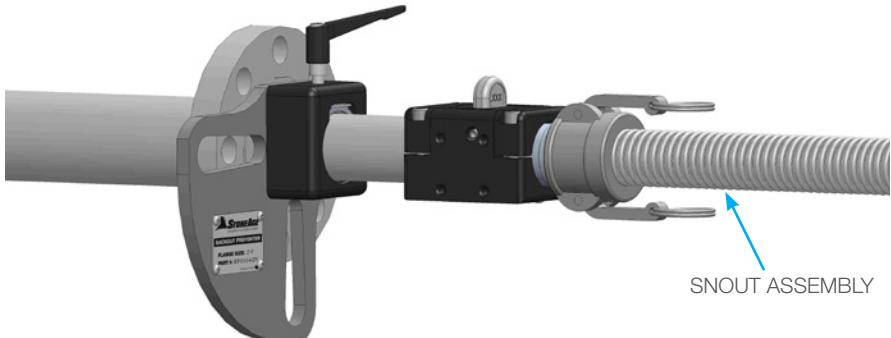


FIGURE 3

NAVIGATOR PIPE FLANGE ATTACHMENT OPTIONS - STRAIGHT MOUNTS

NAVIGATOR PIPE FLANGE ATTACHMENT OPTIONS FOR STRAIGHT MOUNTS

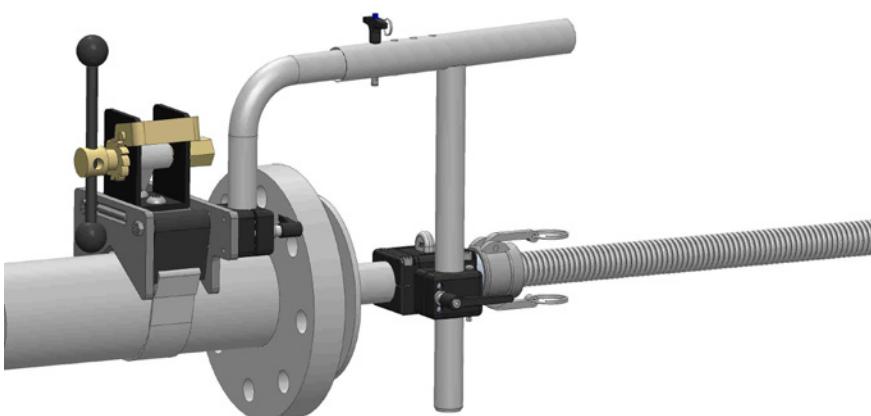


2" Flanged Pipe, shown for graphic representation only. Not included in assembly.

2"-4" PIPE

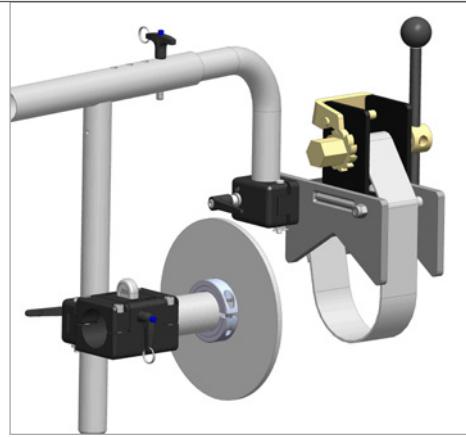


QUARTER PLATE BOP
BOP 010-2-4 QTR

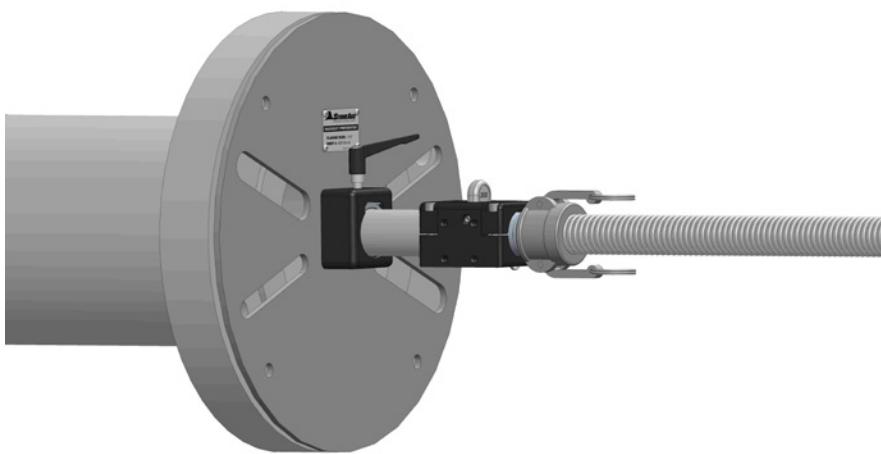


4" Flanged Pipe, shown for graphic representation only. Not included in assembly.

2"-8" PIPE

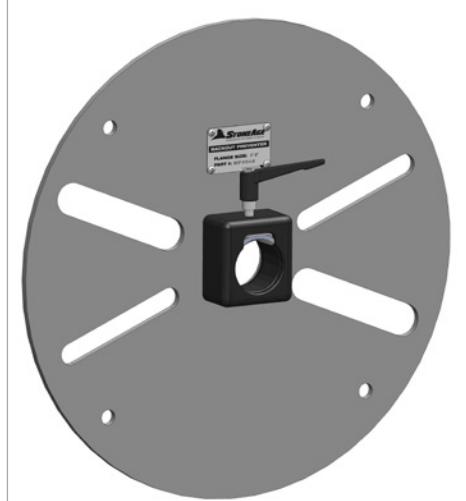


DRIVE SIDE TUBE WELDMENT, MALE POSITIONER ARM, QUICK PIN, RATCHET STRAP ASSEMBLY, HINGED TUBE CLAMPS, COLLET ASSEMBLY AND SPLASH PLATE



8" Flanged Pipe, shown for graphic representation only. Not included in assembly.

4"-8" PIPE

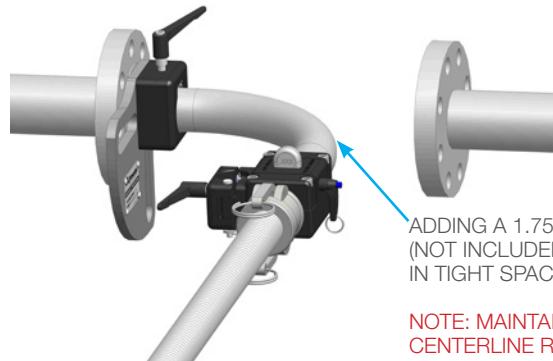


FLANGE MOUNT PLATE ASSEMBLY
BOP 010-X-X

NAVIGATOR PIPE FLANGE ATTACHMENT OPTIONS- TIGHT PIPE JOINTS

NAVIGATOR PIPE FLANGE ATTACHMENT OPTIONS FOR TIGHT PIPE JOINTS

2" Flanged Pipe, shown for graphic representation only. Not included in assembly.

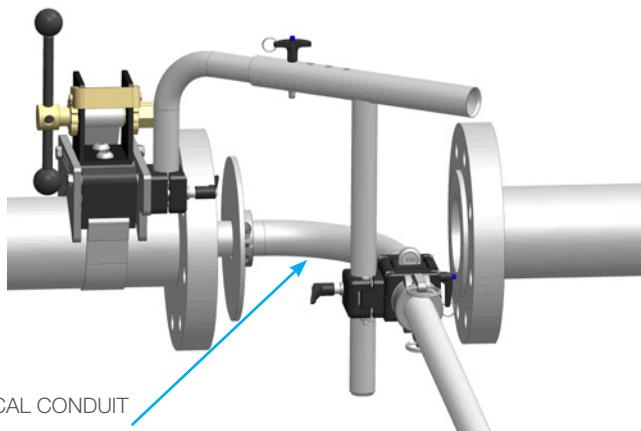


ADDING A 1.75" BENT ELECTRICAL CONDUIT (NOT INCLUDED) ENABLES THE CONNECTION IN TIGHT SPACES.

NOTE: MAINTAIN A GREATER THAN 6" CENTERLINE RADIUS BEND TO AVOID CONSTRAINING THE MOVEMENT OF THE TOOL.

2"-4" PIPE

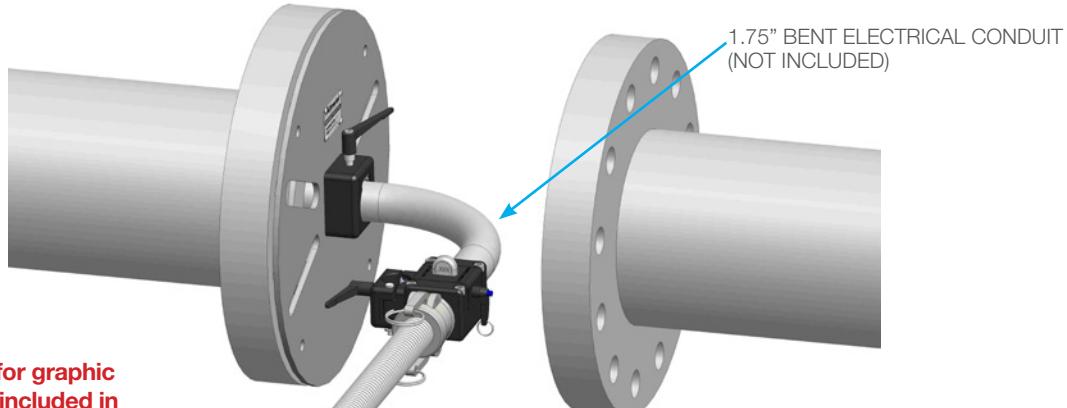
4" Flanged Pipe, shown for graphic representation only. Not included in assembly.



1.75" BENT ELECTRICAL CONDUIT (NOT INCLUDED)

2"-8" PIPE

8" Flanged Pipe, shown for graphic representation only. Not included in assembly.



1.75" BENT ELECTRICAL CONDUIT (NOT INCLUDED)

4"-8" PIPE

CONTROL BOX SET-UP

4. Pull the Dust Caps off the Pneumatic Air Fittings. Connect the 1/4" Pneumatic Supply Lines from the Control Box to the Hose Drum Assembly. (**Figure 4.2**) Connect the 1/2" Pneumatic Supply Lines from the Control Box to the ProDrive Assembly. (**Figure 4.1**) Pay attention to the color coded tabs on the air fittings of the Air Motors and the Control Box. Connect the red hose to the red banded air fittings and the black hose to the black banded air fittings. (**Figure 4 & 5**)

CONTROL BOX WITH FLOOR MOUNT

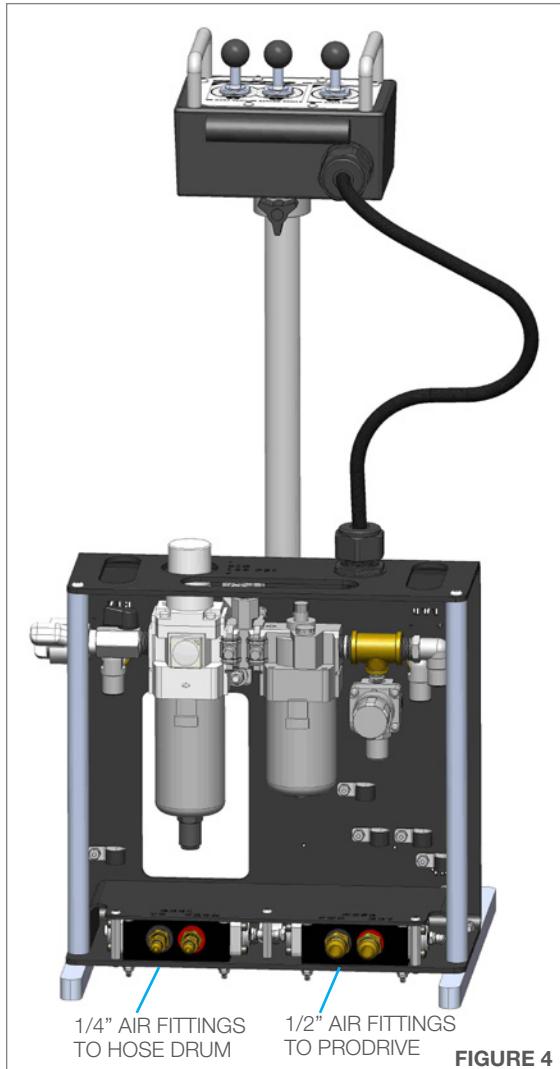


FIGURE 4

AIR MOTOR ON PRODRIVE ASSEMBLY

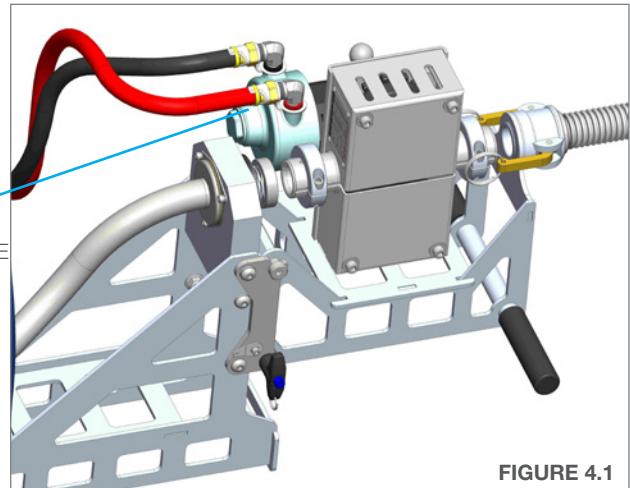


FIGURE 4.1

AIR MOTOR ON HOSE DRUM ASSEMBLY

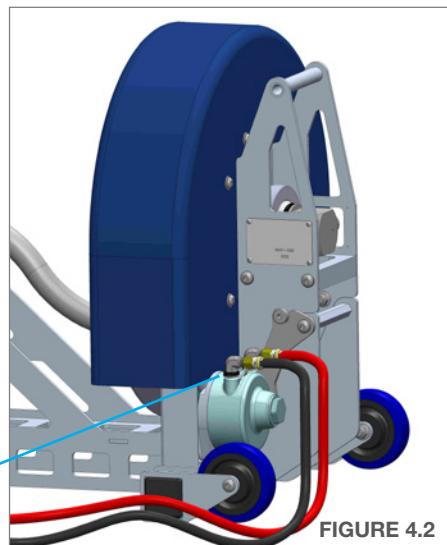


FIGURE 4.2

PNEUMATIC AIR LINES

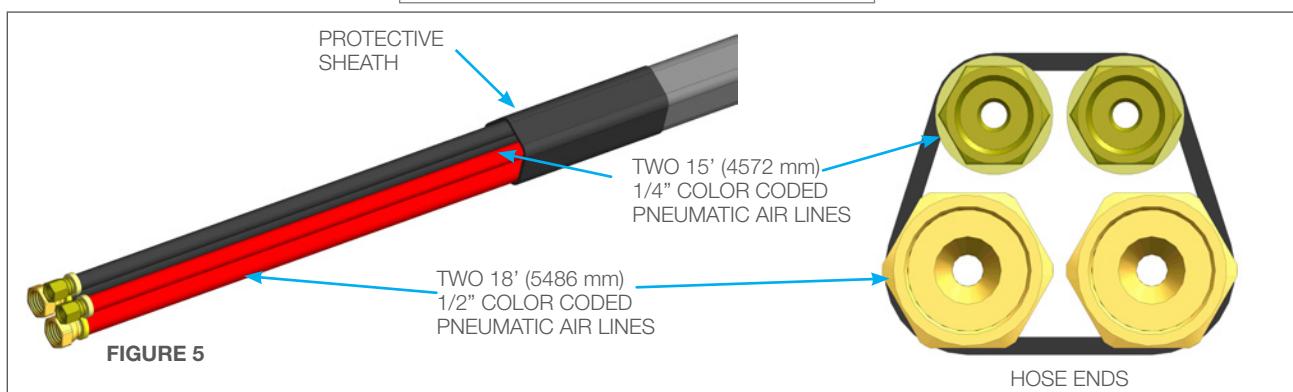


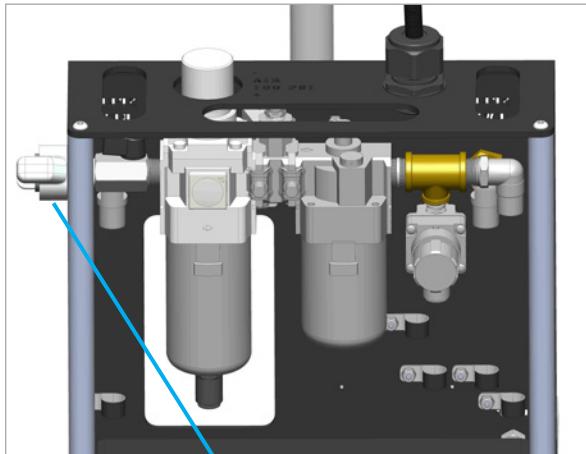
FIGURE 5

AIR SUPPLY AND LUBRICATOR SETTING

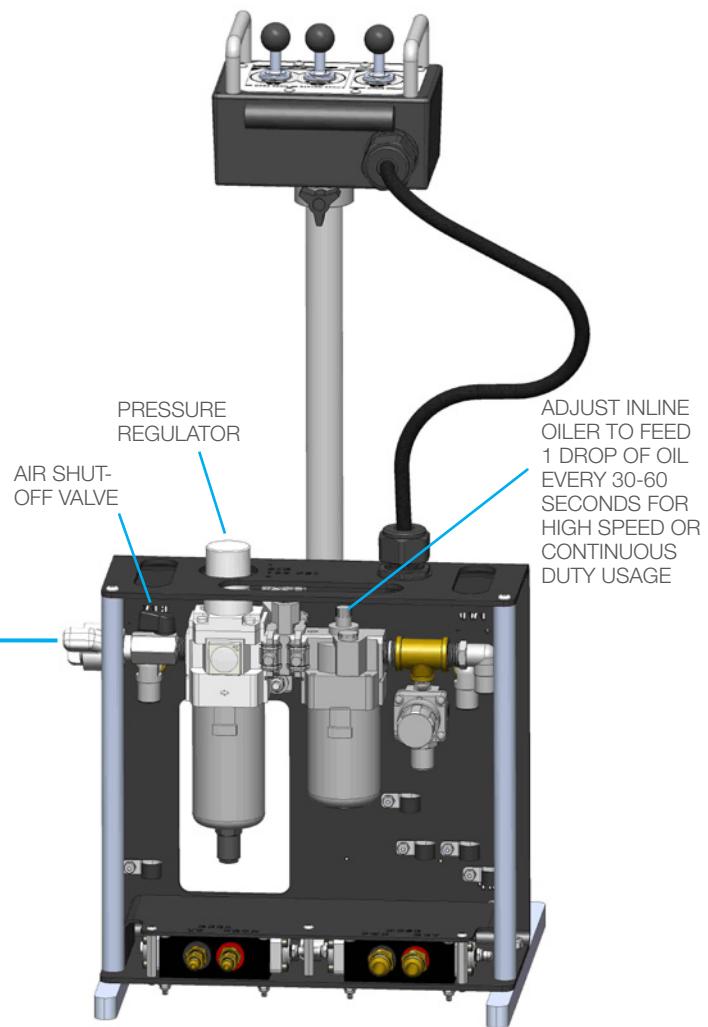
1. The Control Box is supplied with a twist claw style inlet coupling (Chicago style) located on the side of the FRL Assembly. Connect a compatible compressed air line (not included) according to the Manufacturer's instructions. If another pneumatic connection is preferred, this fitting can be removed and any male 1/2 in NPT fitting may be used.
2. Using the pressure regulator on the FRL, adjust the operating pressure to 100 psi (0.7 MPa) for the application.

 WARNING

Maximum operating pressure is 100 psi (0.7 MPa). Never exceed 140 psi (0.97 MPa) supply pressure. Exceeding 140 psi supply pressure may result in injury to the Operator and/or damage to the equipment.

**AIR SUPPLY FITTING**

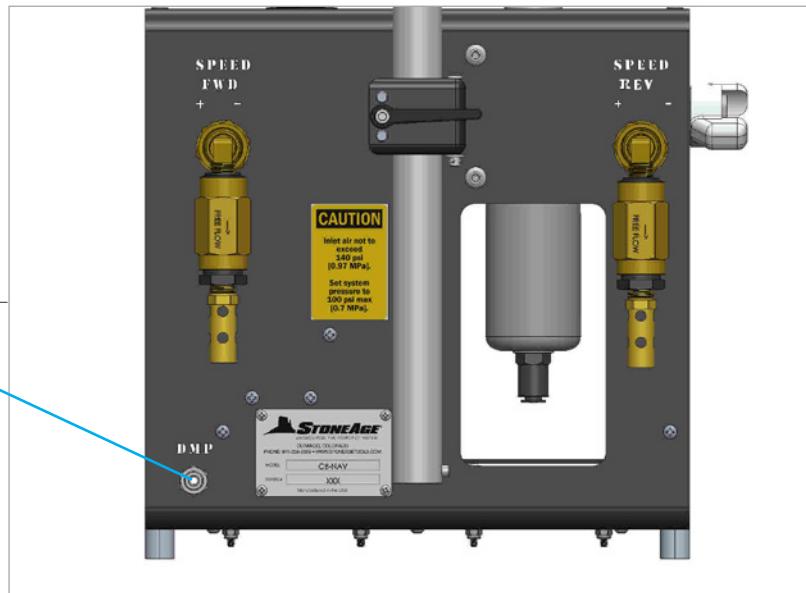
A universal **AIR SUPPLY FITTING** (Chicago style) is located on the FRL. Connect a compatible compressed air line (not included) according to the manufacturer's instructions. If another pneumatic connection is preferred, this fitting can be removed and any male 1/2 in NPT fitting may be used.



CONTROL BOX AIR SUPPLY FITTING

PNEUMATIC DUMP CONTROL FITTING AND LINE

A **MOMENTARY PNEUMATIC DUMP CONTROL** is located on the Control Box panel and can be set up to control an air actuated dump valve. To utilize the toggle, the end user will need to install 1/4 in. (6.35 mm) O.D. Nylon tubing (not included) between the **PNEUMATIC DUMP CONTROL FITTING** and the pneumatic dump valve. (NOT INCLUDED)



REAR VIEW

OPERATION

CONTROL PANEL

The **HOSE FEED LEVER** will move the hose in the forward (feeding) and reverse (retracting) directions. The **OFF** position is at the spring centered middle position and will stop the ProDrive from feeding or retracting.

The **HOSE ROTATE LEVER** will rotate the hose independently. It will also rotate while moving in both the forward (feeding) and reverse (retracting) directions if the **HOSE FEED LEVER** is activated. The **OFF** position is at the spring centered middle position and will stop the ProDrive from feeding or retracting.

To use the **MOMENTARY PNEUMATIC DUMP CONTROL**, hold it in the **UP/FORWARD** position to route the high-pressure water to the tool. Release the knob to divert the high-pressure water away from the tool.

To de-energize the system, release the **HOSE FEED LEVER** and release the **MOMENTARY PNEUMATIC DUMP CONTROL**. This will stop the ProDrive from feeding or retracting and reroute the high-pressure water away from the ProDrive.

SPEED CONTROLS are located on the back side of the FRL. Speed is independently adjustable for Forward/Reverse.

(Minimum speed is 2.7 in/s (69 mm/s). Maximum speed is 32 in/sec (813 mm/s).

Rotate the brass colored, speed controls in the + or - directions to increase or decrease forward and reverse speeds.



CONTROL PANEL



SPEED CONTROLS

MAINTENANCE AND TROUBLESHOOTING

MAINTENANCE

Maintenance Item	Frequency	Maintenance Required
Lubricator of control box	Before each use	Add oil when fluid drops below minimum level marking.
Webbing strap	Before each use	Replace strap when frayed, cut or torn
Gearpack grooves	Before each use	Replace roller if cuts or roughness is present. (See Pages 15-18 for Gearpack Replacement Instructions)
Forward and reverse fittings	After each use	Apply a small amount of air tool oil directly into the forward and reverse fittings. Then, briefly operate the controls at slow speed for a short duration in each direction to coat the interior parts of the motor. Install the dust caps onto all three fittings to keep moisture and dirt out.
All components the hoses pass through	After each use	As wear occurs the rounded edges could become sharp and damage hoses. Any components showing excessive wear should be replaced.

TROUBLESHOOTING

Problem	Solution
No air is delivered to tool	<ul style="list-style-type: none"> -Check that shut-off valve near regulator is open -Check that regulator is set to 100 psi -Open flow control valves by rotating the brass colored speed controls in the counterclockwise direction.
Hose is being damaged by gearpacks	<ul style="list-style-type: none"> -Check that the proper gearpacks are installed (see roller and collet reference plate) -Tighten eccentric lever to retain clamp force on hose. -Check gearpacks for excessive wear in groove
Hose slippage on gearpacks	<ul style="list-style-type: none"> -Check that the proper gearpacks are installed (see roller and collet reference plate) -Tighten eccentric lever to retain clamp force on hose.

Contact StoneAge for Safety Data Sheets for material usage, a complete list of spare part numbers, and service instructions for the ProDrive and Control Box.

STORAGE, TRANSPORTATION, AND HANDLING

When storing the unit, use compressed air to blow out the air lines to remove debris and moisture. Use mild soapy water to clean the machine in order to remove corrosive materials.

ROLLER REMOVAL INSTRUCTIONS

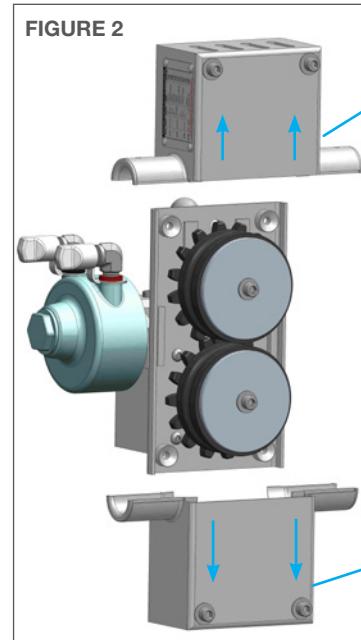
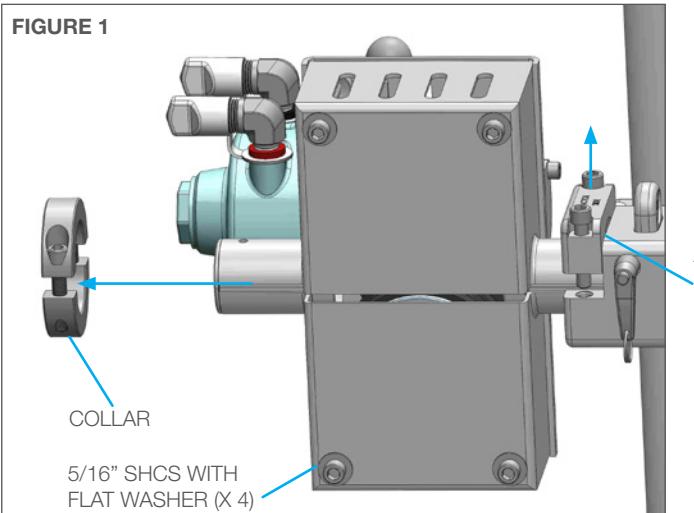
GEARPACK REMOVAL

NOTE: This process will be typical to every size Roller for the PRO 150 Drive Assembly. Installation of the appropriate Roller should be complete prior to setting up the ProDrive ABX-PRO Assembly on a pipe.

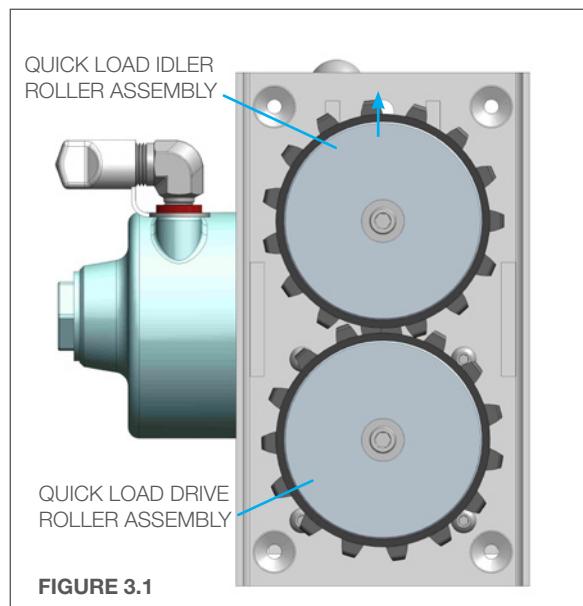
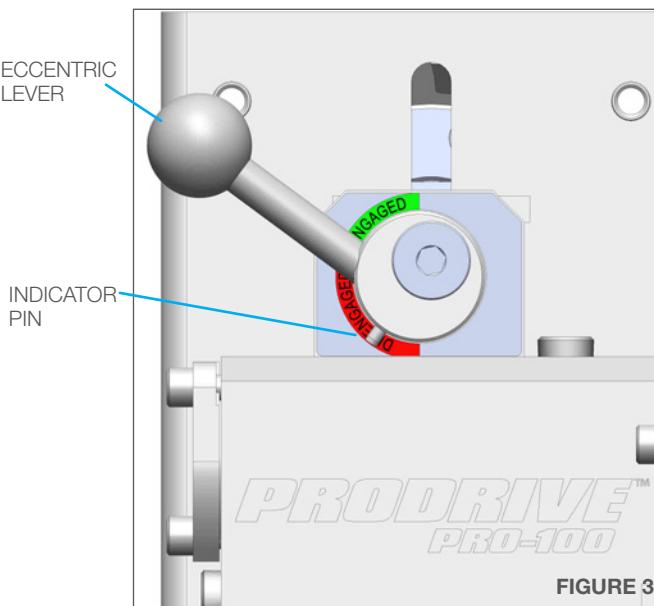
⚠ WARNING

Always de-energize the system before servicing or replacing any parts. Failure to do so can result in severe injury and/or death. Keep hands, hair, and clothing clear of rotating parts.

1. Remove the protective Gearbox Cover Plates by removing the Collar Assembly, loosening the Tractor Side Collet Block, and unscrewing the four 5/16" screws with flat washers on both cover plates. (**Figure 1**)
2. Slide the Upper and Lower Cover Plates off in opposing directions and set all parts aside. (**Figure 2**)

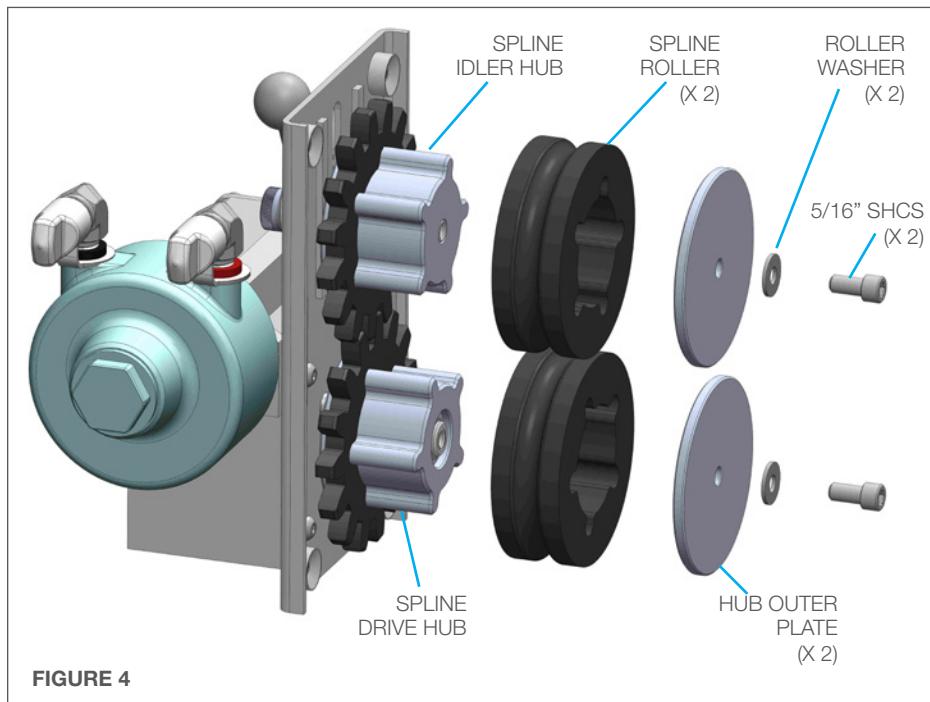


3. Set the Eccentric Lever to “**Disengaged**” in order to raise the Quick Load Idler Roller Assembly. (**Figure 3 and Figure 3.1**) This will create space to ease in the removal of the Poly Rollers.



ROLLER REMOVAL INSTRUCTIONS

4. Remove the two socket head cap screws, Roller Washers, Outer Hub Plates and Spline Rollers. (**Figure 4**)



ROLLER INSTALLATION INSTRUCTIONS

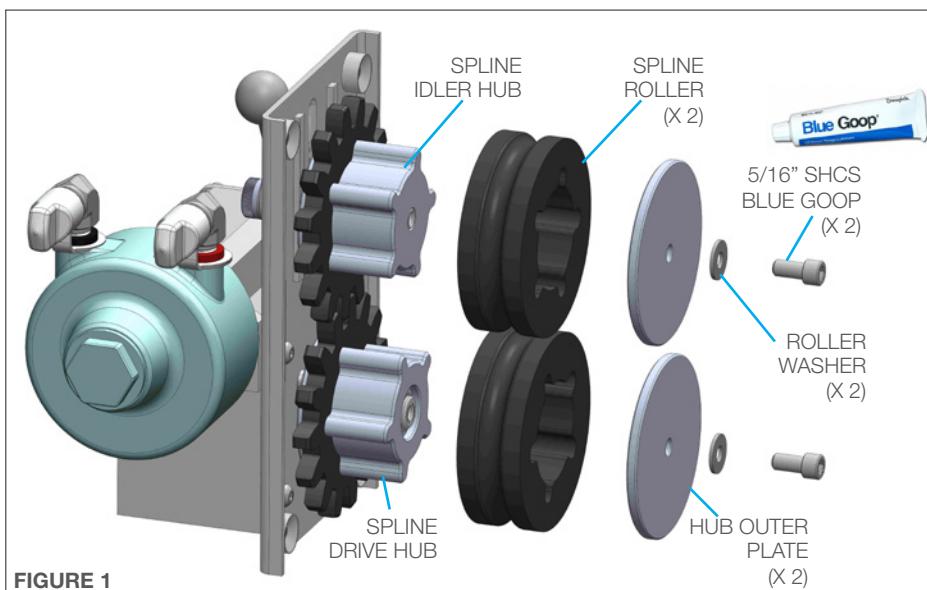
ROLLER INSTALLATION

NOTE: This process will be typical to every size Roller for the PRO 150 Drive Assembly. Installation of the appropriate Roller should be complete prior to setting up the ProDrive ABX-PRO Assembly on a pipe.

⚠ WARNING

Always de-energize the system before servicing or replacing any parts. Failure to do so can result in severe injury and/or death. Keep hands, hair, and clothing clear of rotating parts.

1. Replace the Spline Rollers with an alternate size or replacement roller. Slide the desired Spline Load Rollers onto the Spline Hubs. Then fasten the Hub Outer Plates and Roller Washers onto the Spline Load Rollers with the two 5/16" socket head cap screws. (**Figure 1**)



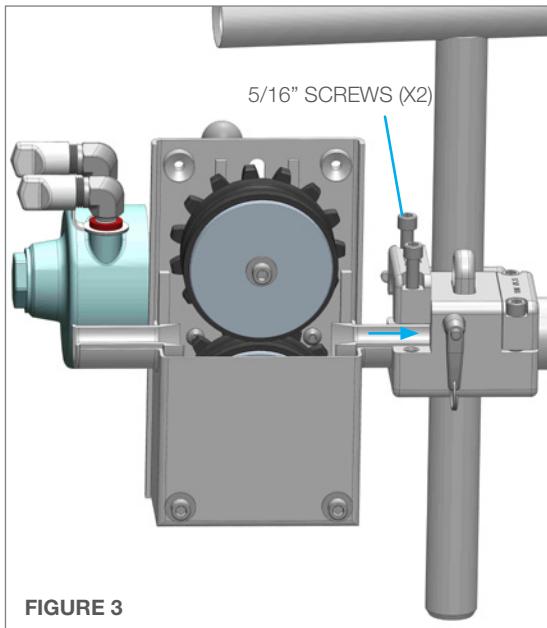
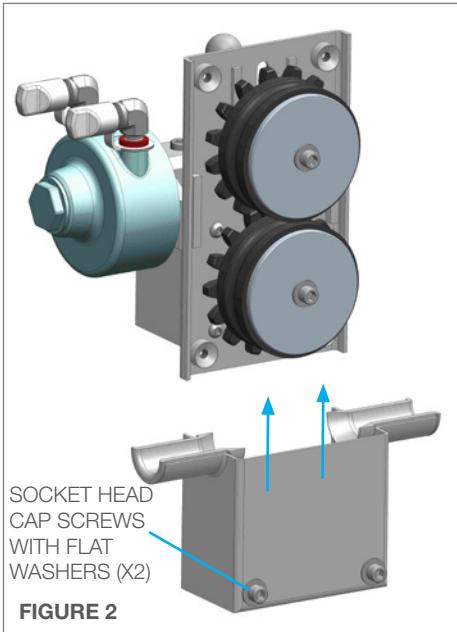
ALTERNATE SIZE ROLLERS



PART NUMBER	ØA
SPLINE POLY ROLLER-34	Ø.34
SPLINE POLY ROLLER-46	Ø.46
SPLINE POLY ROLLER-58	Ø.58
SPLINE POLY ROLLER-89	Ø.89

ROLLER INSTALLATION INSTRUCTIONS

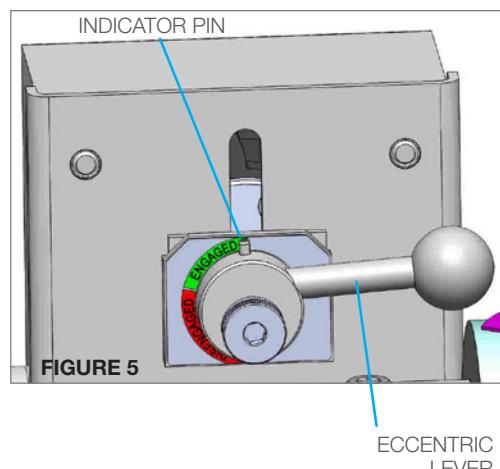
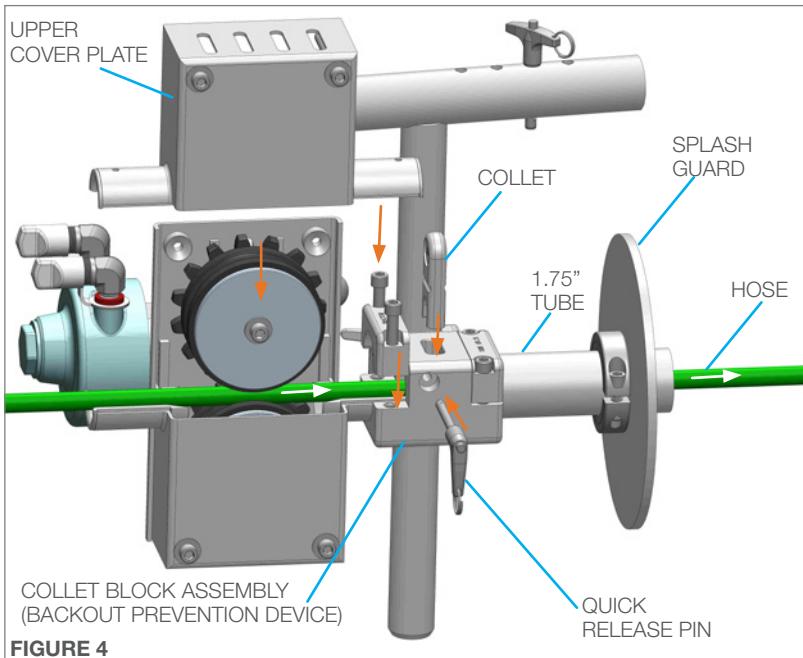
2. Install the Lower Cover Plate. Tighten the 2 socket head cap screws with flat washers. (**Figure 2**)
3. Slide the Lower Cover Plate into the Tractor Side of the Collet Block Assembly. Leave the two 5/16" screws on the Collet block loose. (**Figure 3**)

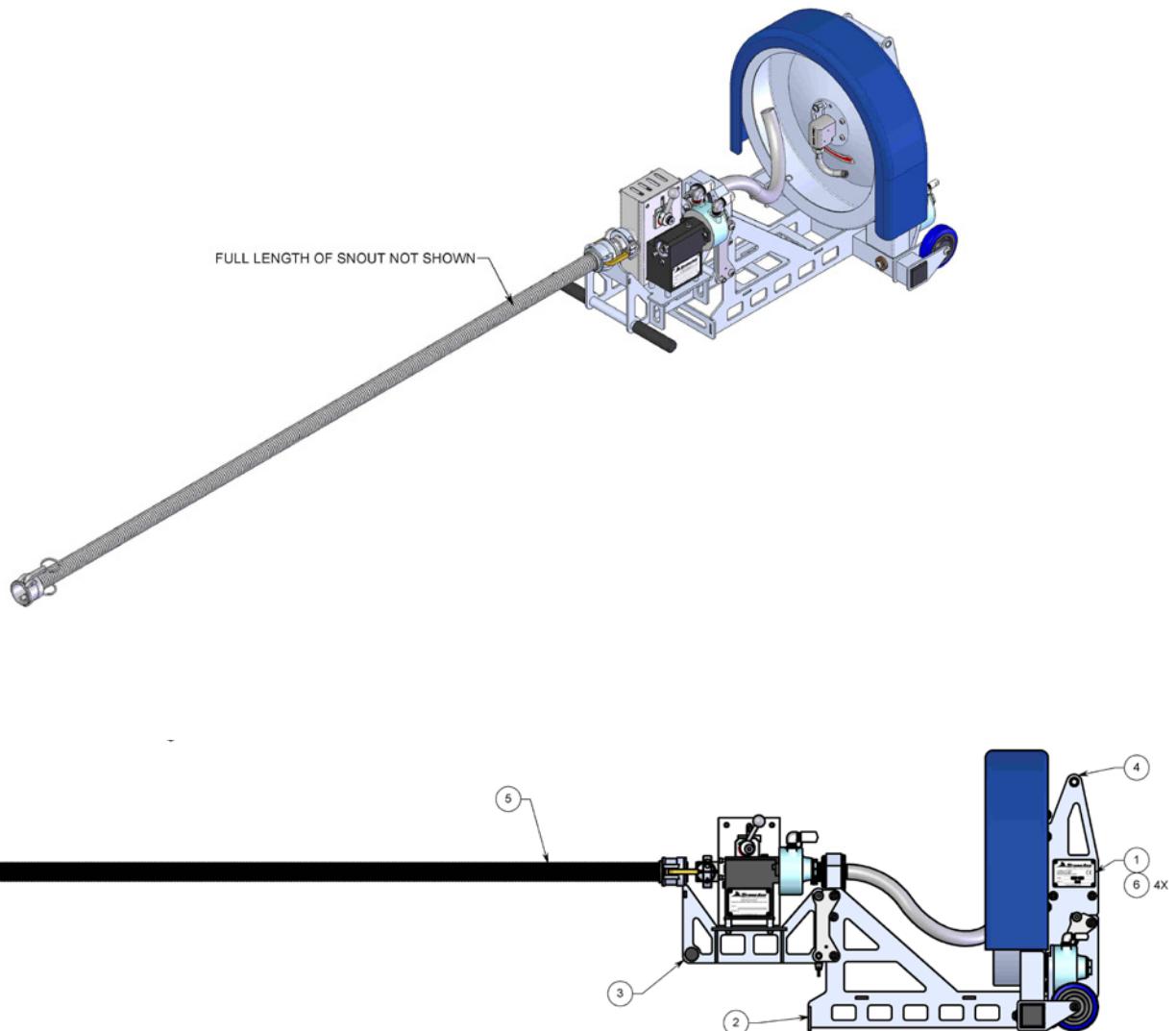


4. Install Hose into Pro-100 ProDrive Assembly

- Remove the Quick Release Pin and pull the Collet from the Collet Block Assembly.
- Insert tool end of the hose through the Collet Block Assembly, 1.75" pipe, and past the Splash Guard.
- If the tool is less than 2 inches in diameter, pull back on the hose to ensure that the Collet does not allow the hose crimp to back through into the Collet Block Assembly
- Select the appropriate Collet size for the hose being used with the ProDrive Assembly. (See "Recommended Collets For Common Hose Sizes" plaque on the PRO 150 ProDrive Assembly.) Install the Collet and quick release pin.
- Rotate the Eccentric Lever to "**Engaged**" so the Idler Roller tightens down onto the hose.
- Install the Upper Cover Plate by sliding one side into the loosened Collet Block Assembly.
- Tighten the two screws on the Collet Block and the two 5/16" socket head cap screws with flat washers on the Upper Cover.

NOTE: Through loading of the hose is possible with low profile male hose fittings.

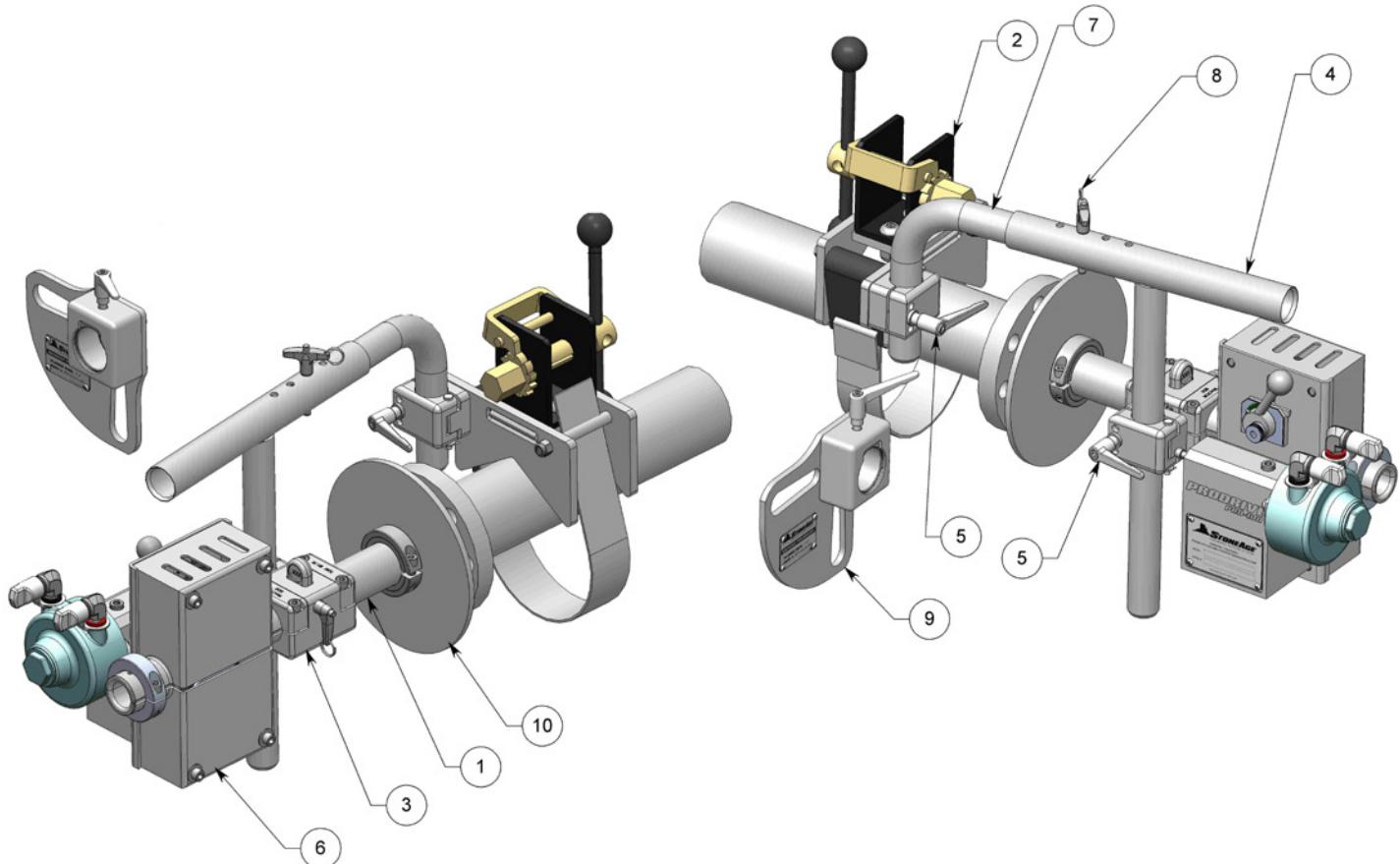


**NAVIGATOR (NAV-100)
FULL ASSEMBLY**

#	PART NUMBER	QTY.
1	PLACARD, SERIAL PLATE, CE	1
2	BASE FRAME ASSEMBLY	1
3	DRIVE FRAME ASSEMBLY	1
4	DRUM FRAME ASSEMBLY	1
5	SNOUT, CORRUGATED, 1-1/4 CAMLOCKS, 6'	1
6	SCREW, THREAD-CUTTING, 6-32 X .25	4

PARTS DIAGRAM

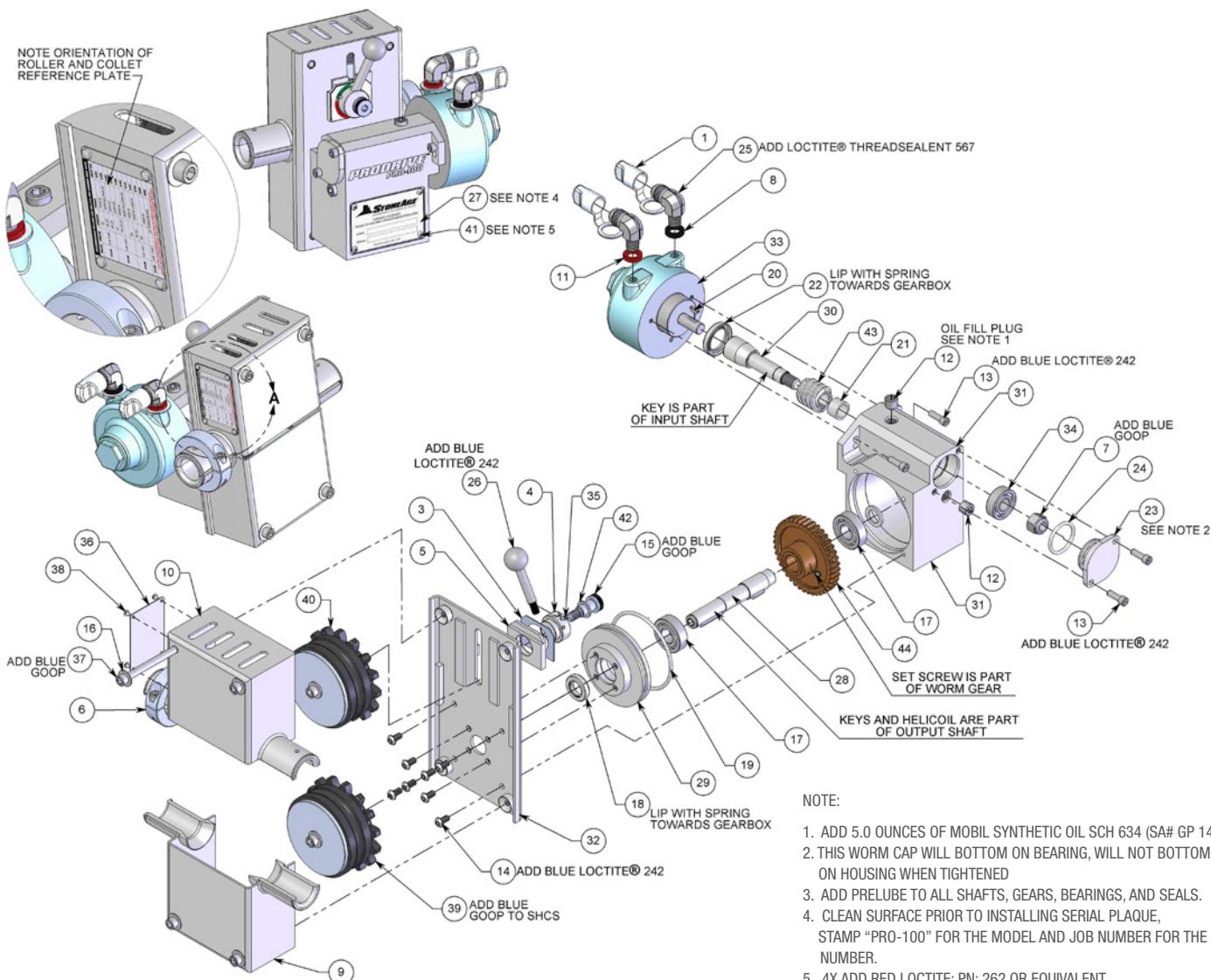
PRODRIVE (PRO-100)
FULL ASSEMBLY



#	PART NUMBER	QTY.
1	1.75 OD TUBE	1
2	RATCHET STRAP CLAMP ASSY V2	1
3	COLLET BLOCK ASSEMBLY	1
4	DRIVE SIDE TUBE WELDMENT	1
5	HINGED TUBE CLAMP 1.25ID ASSEMBLY	2
6	PRO 150 PRODRIVE TRACTOR ASSEMBLY	1
7	POSITIONER ARM MALE 1.250D	1
8	QUICK PIN .312X1.5	1
9	BOP 010-2-4 QTR, QUARTER PLATE BOP	1
10	SPLASH PLATE WELDMENT	1
11	GS 325-025 SHCS .25-20 X .62 SS	8
12	FF 121-XXX HOSE STOP COLLET SINGLE, XXX	1

PRODRIVE (ABX-PRO)

DRIVE ASSEMBLY



NOTE:

1. ADD 5.0 OUNCES OF MOBIL SYNTHETIC OIL SCH 634 (SA# GP 146.1)
 2. THIS WORM CAP WILL BOTTOM ON BEARING, WILL NOT BOTTOM ON HOUSING WHEN TIGHTENED
 3. ADD PRELUBE TO ALL SHAFTS, GEARS, BEARINGS, AND SEALS.
 4. CLEAN SURFACE PRIOR TO INSTALLING SERIAL PLAQUE,
STAMP "PRO-100" FOR THE MODEL AND JOB NUMBER FOR THE SERIAL
NUMBER.
 5. 4X ADD RED LOCTITE: PN: 262 OR EQUIVALENT.

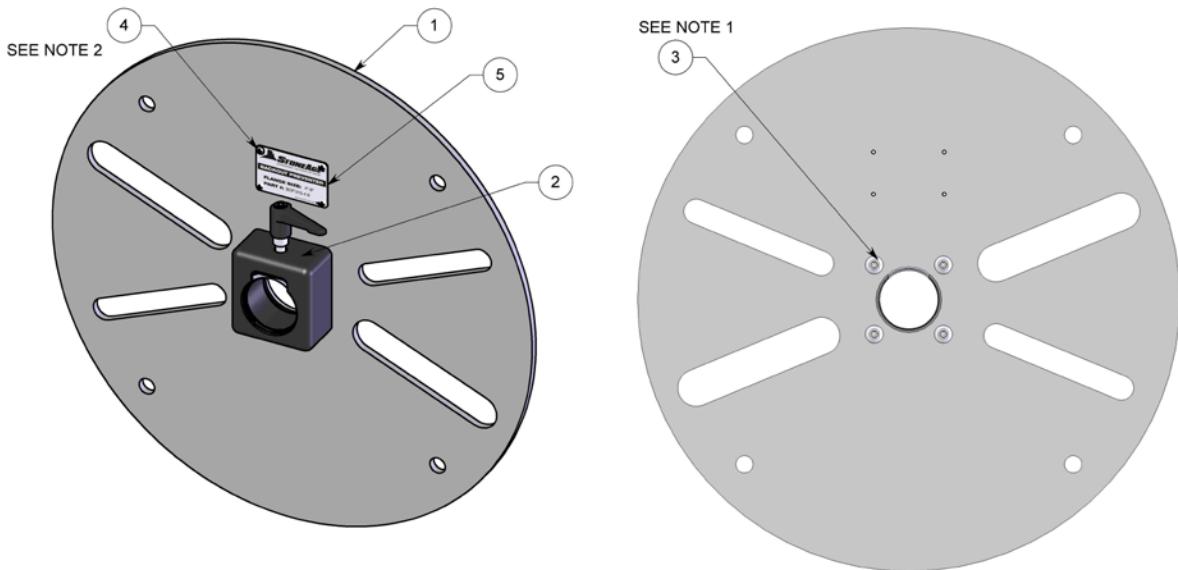
#	PART NUMBER	QTY.
1	BR 167 90° DUST CAP	2
2	DRIVE SHAFT SHOULDER WASHER	1
3	ECC EPLATE, ANODIZE	1
4	ECC BUSHING	1
5	ECC PLATE	1
6	GC SP-26-A COLLAR ASSY	1
7	GN 350-L NYLOK NUT SS	1
8	GP 013-BK BLACK ID BAND, SM	1
9	GEARBOX COVER WELDMENT-B	1
10	GEARBOX COVER WELDMENT-T	1
11	GP 013-R RED ID BAND, SM	1
12	GP 025-P4SS HEX SOCKET PLUG	2
13	GS 325-03 SHCS .25-20 X .75 SS (TB 050)	4
14	GSB 325-02 BHCS .25-20 X .50 LG SS	8
15	GSSH 0500-0750-SS SHOULDER SCREW	1

16	GW 331-F FLAT WASHER SS	4
17	HLXD 002 BEARING, OUTPUT	2
18	HLXD 003 SEAL, OUTPUT	1
19	HLXD 006 O-RING, OUTPUT	1
20	HLXD 007 WOODRUFF KEY	1
21	HLXD 011 SPACER	1
22	HLXD 013 SEAL, INPUT	1
23	HLXD 016 WORM CAP, INPUT	1
24	HLXD 017 CAP O-RING, INPUT	1
25	HRS 552 FITTING, ELBOW OUTLET P4J8 90°	2
26	HANDLE	1
27	PL 152 STONEAGE LABEL, SERIAL NUMBER PLAQUE	1
28	PRO 001 OUTPUT SHAFT .625	1
29	PRO 005 BULKHEAD, OUTPUT	1
30	PRO 015 INPUT SHAFT	1

31	PRO 018 MAIN GEARBOX	1
32	PRO 061 GEARBOX BASE PLATE WELDMENT	1
33	PRO 155 AIR MOTOR	1
34	RJ 009 BEARING	1
35	ROLL PIN	1
36	ROLLER AND COLLET REFERENCE PLATE	1
37	SHCS .31-18X3 SS (MC 92196A595)	4
38	SOLID RIVET	4
39	SPLINE LOAD DRIVE ROLLER ASSEMBLY	1
40	SPLINE LOAD IDLER ROLLER ASSEMBLY	1
41	THREAD CUTTING SCREW, 6-32 X .25	4
42	THRUST WASHER	1
43	WORM 20-1	1
44	WORM GEAR 20-1	1

PARTS DIAGRAM

BOP-010-4-8
BOP PLATE 4"-8"

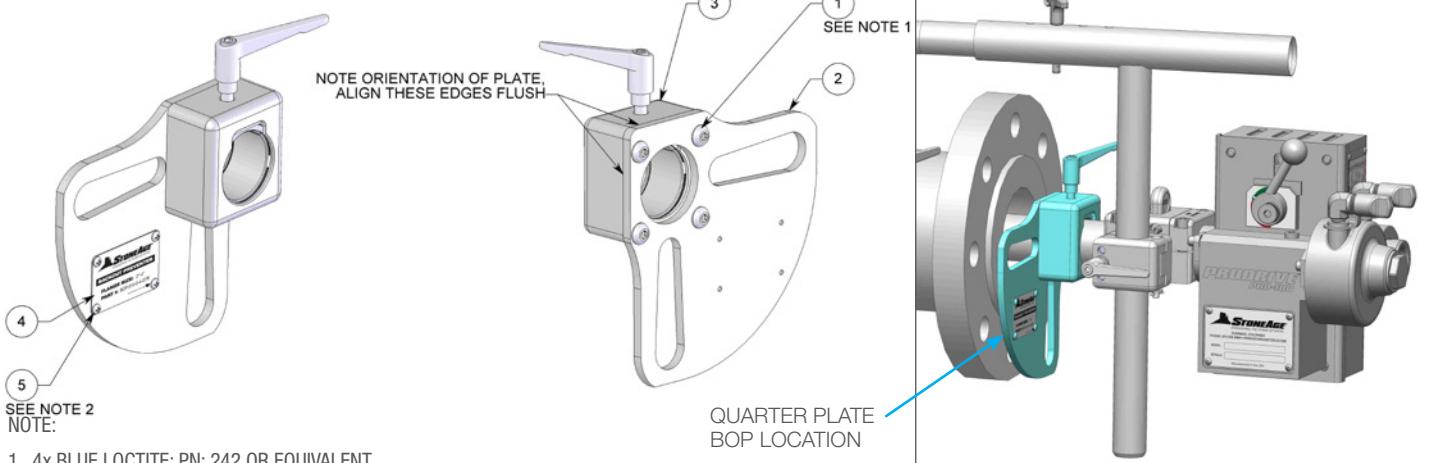


#	PART NUMBER	QTY.
1	BOP 002-4-8 FLANGE MOUNT PLATE	1
2	BOP 007 TUBE CLAMP ASSEMBLY	1
3	GSB 331-03 BHCS .31-18 X .75 LG	4
4	THREAD CUTTING SCREW, 6-32 X .25	4
5	BOP 001-4-8 DECAL PLATE	1

NOTE:

1. 4x BLUE LOCTITE: PN: 242 OR EQUIVALENT
2. 4x RED LOCTITE: PN: 262 OR EQUIVALENT

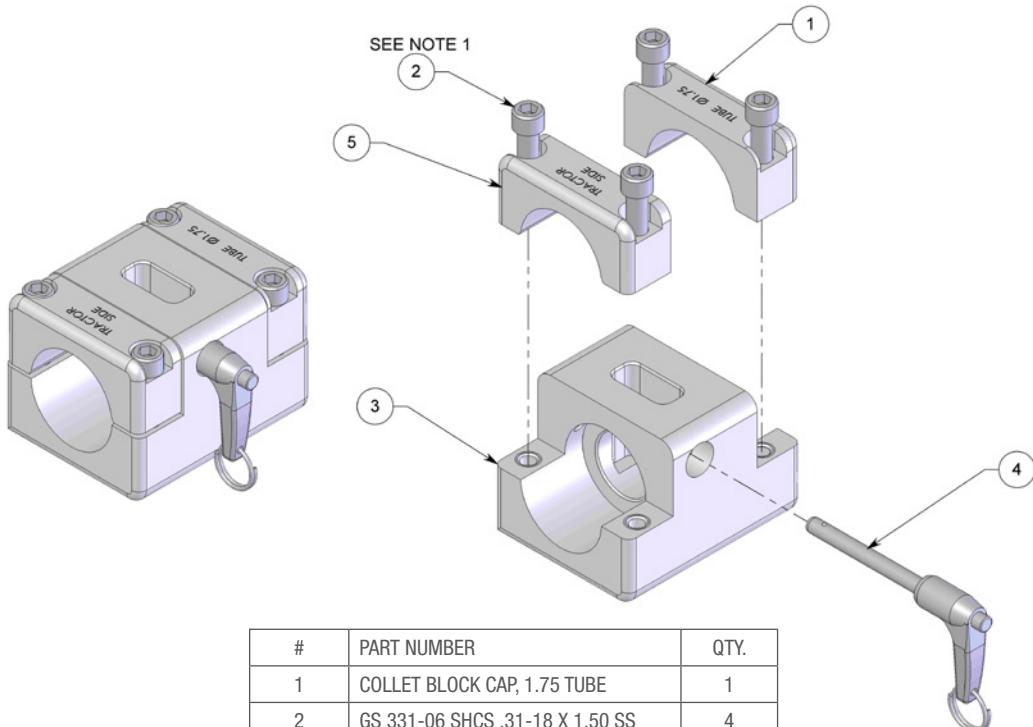
PRODRIVE (BOP-010-2-4 QTR)
QUARTER PLATE BOP



SEE NOTE 2

1. 4x BLUE LOCTITE: PN: 242 OR EQUIVALENT
2. 4x RED LOCTITE: PN: 262 OR EQUIVALENT

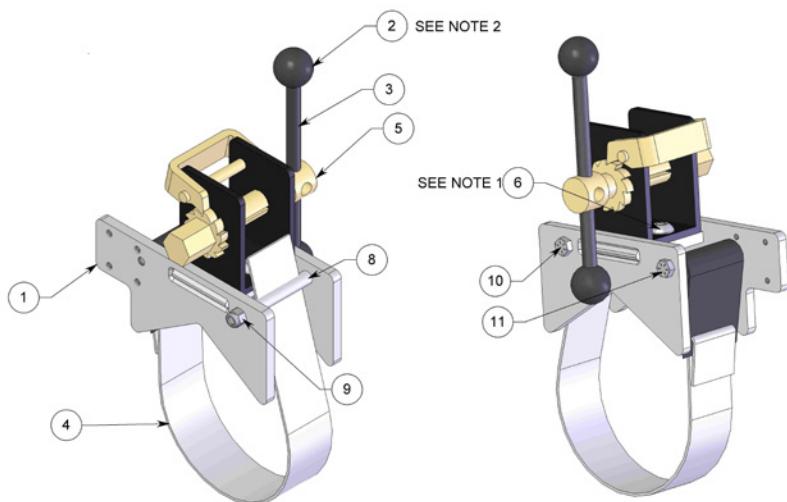
#	PART NUMBER	QTY.
1	GSB 331-03 BHCS .31-18 X .75 LG	4
2	BOP 002-2-4-QTR QUARTER FLANGE PLATE 2-4IN	1
3	BOP 007 TUBE CLAMP ASSEMBLY	1
4	BOP DECAL PLATE, 2"-4"	1
5	THREAD CUTTING SCREW, 6-32 X .25	4

PRODRIVE
COLLET BLOCK ASSEMBLY


NOTE:

1. ADD BLUE GOOP (A SWAGELOK BRAND) ANTI-SEIZE. TO ALL THREADED HARDWARE. AN EQUIVALENT ALTERNATIVE IS ACCEPTABLE.

#	PART NUMBER	QTY.
1	COLLET BLOCK CAP, 1.75 TUBE	1
2	GS 331-06 SHCS .31-18 X 1.50 SS	4
3	PRODRIVE COLLET BLOCK BODY	1
4	QUICK RELEASE PIN .25X2	1
5	COLLET BLOCK CAP, TRACTOR SIDE	1

PRODRIVE
RATCHET STRAP CLAMP ASSEMBLY V2


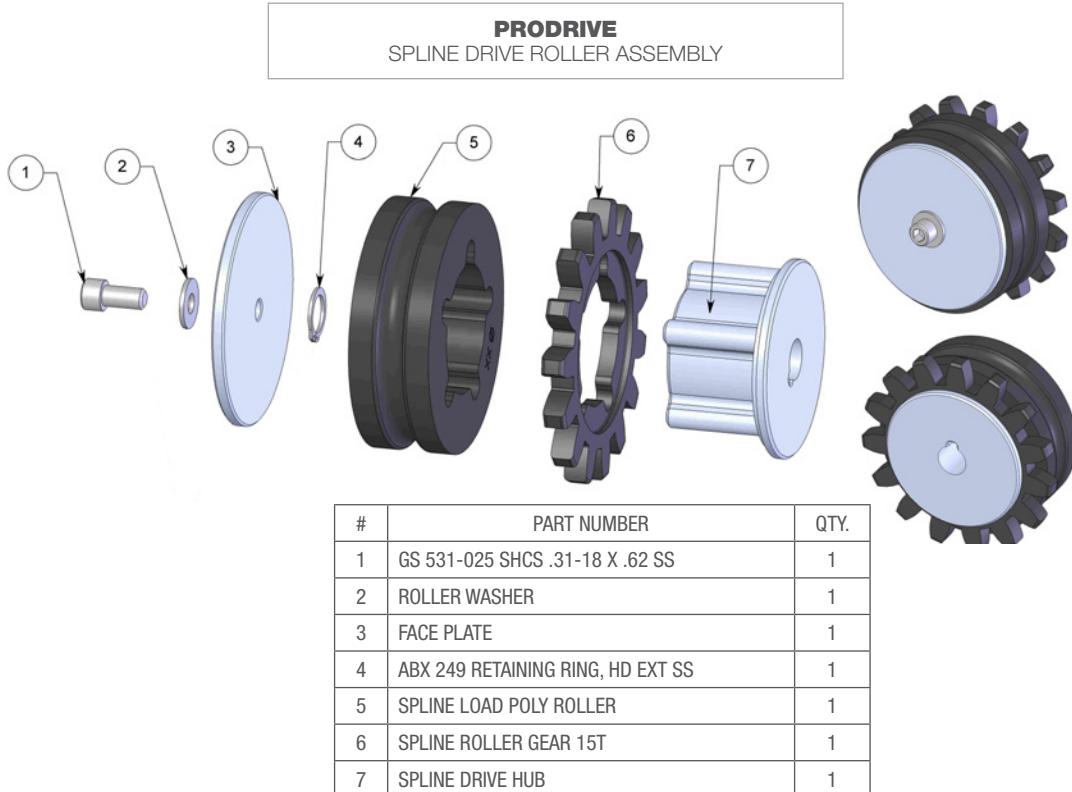
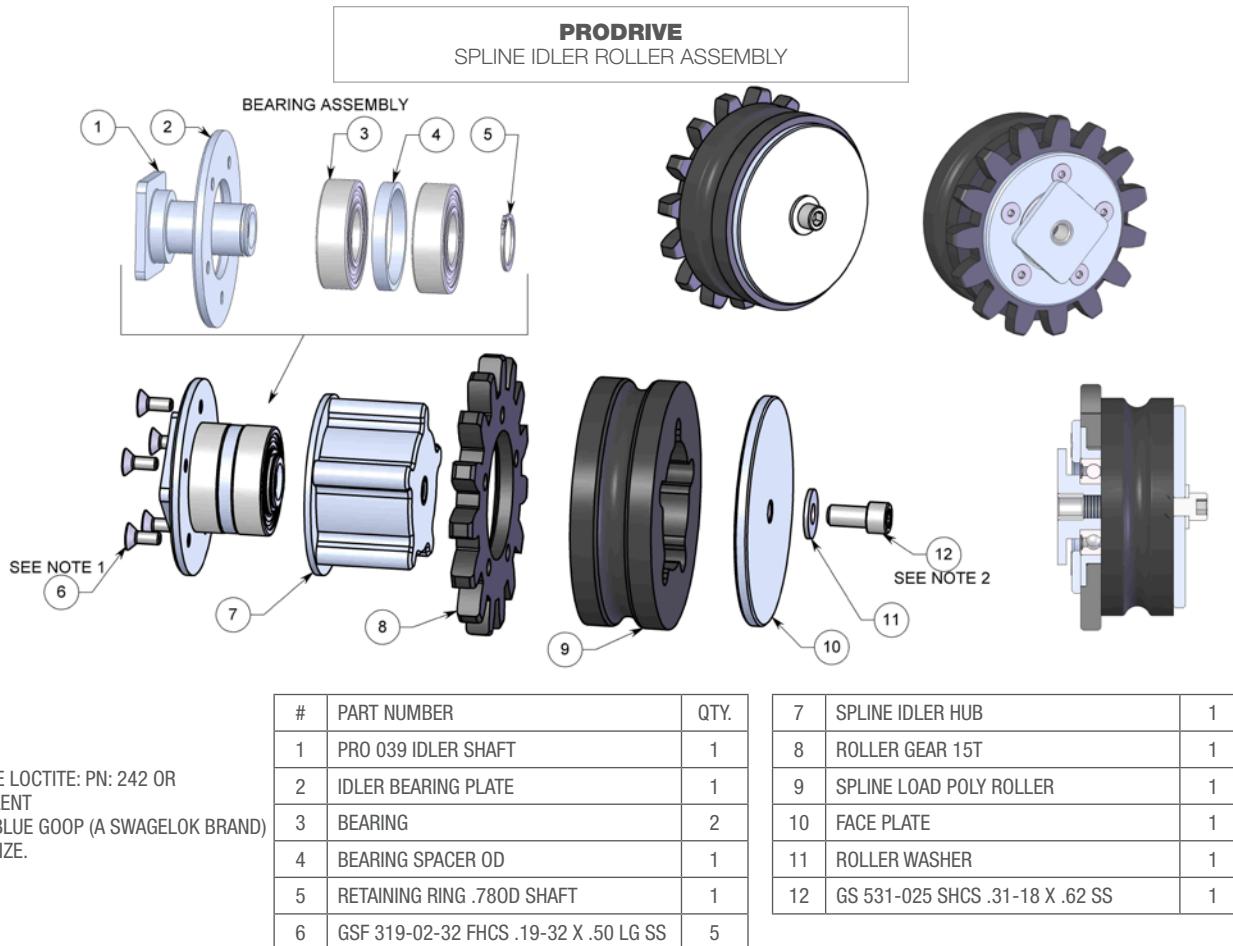
NOTE:

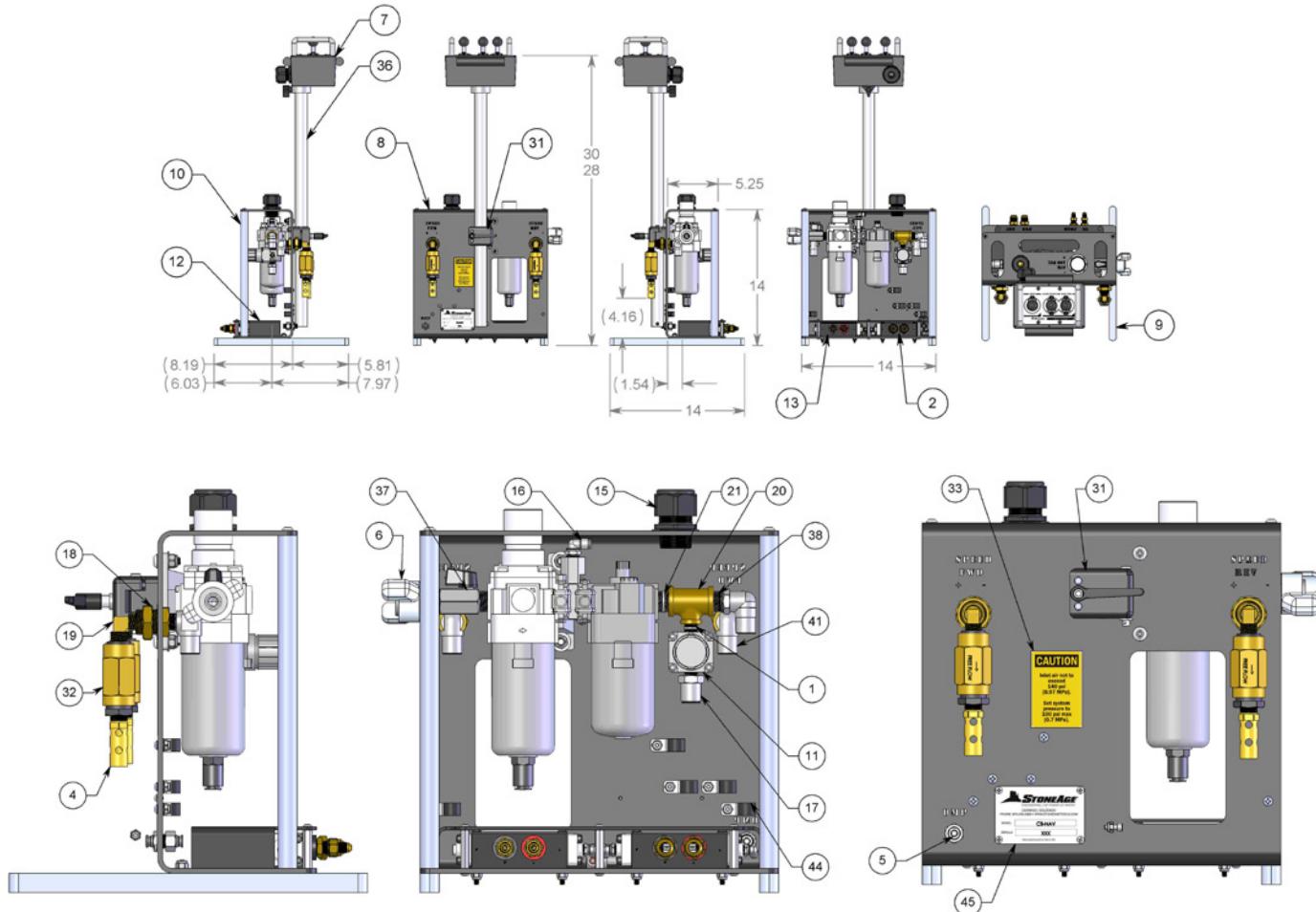
1. ADD BLUE GOOP (A SWAGELOK BRAND) ANTI-SEIZE. TO ALL THREADED HARDWARE. AN EQUIVALENT ALTERNATIVE IS ACCEPTABLE.
2. BLUE LOCTITE: PN: 242 OR EQUIVALENT TO THREADS.

#	PART NUMBER	QTY.
1	V BLOCK WELDMENT, AL V2	1
2	PHENOLIC BALL KNOB, 6046K190	1
3	LEVER HANDLE, 6303K500	1
4	2.00 WEBBING STRAP	1
5	TIE DOWN WINCH	1

6	GSB 350-05 BHCS .50-13 X 1.25 LG SS	2
7	GN 350-L NYLOK NUT SS	2
8	ROLLER BAR	2
9	GN 537-L NYLOK NUT	1
10	GB 837-16 BOLT, HEX .37-16 X 4.00	1
11	GB 837-14 BOLT, HEX .37-16 X 3.50	1

PARTS DIAGRAM



NAVIGATOR (CB-NAV)
 CONTROL BOX ASSEMBLY


#	PART NUMBER	QTY.
1	FTG P4 NIPPLE	1
2	CB 706 VALVE ASSY DRIVE	1
3	CB 720 AAP1359 SMC FRL WITH AIR TAP	1
4	BR 154 MUFFLER	2
5	BULKHEAD FITTING	1
6	CB 114 INLET FITTING	1
7	CB 700 NAVIGATOR REMOTE BOX	1
8	CB 701 FRL FRAME	1
9	CB 702 FRL BASE LEG	2
10	CB 703 FRL ROD	2
11	CB 704 PR 60 PSI	1
12	CB 705 FRL VALVE COVER	1
13	CB 707 VALVE ASSY DRUM	1
14	CB 710 OR VALVE	1
15	CORD GRIP, .51-.79	1
16	ELBOW FITTING	1

17	FTG P4MPL8 STRAIGHT	1
18	FTG P6 BULK HEAD	2
19	FTG P6MP6M ELBOW	2
20	FTG P8FP4FP8F REDUCING T	1
21	FTG P8MX1_125 SS NIPPLE	1
22	GN 319-L-24 NYLOK NUT SS	1
23	GN 325-L NYLOK NUT SS (TB 044.1)	6
24	GN 331-L NYLOK NUT SS	2
25	GS 319-02 SHCS .19-24 X .50 SS	1
26	GS 325-03 SHCS .25-20 X .75 SS	4
27	GSB 325-03 BHCS .25-20 X .75 LG SS	6
28	GSB 331-035 BHCS .31-18 X .88 LG SS	2
29	GTB 319-02-32 BHTS .19-32 X .50 LG TORX-SS	6
30	GW 331-F FLAT WASHER SS	2
31	HINGED TUBE CLAMP 1.25ID ASSEMBLY	1
32	IN-LINE FLOW CONTROL	2
33	PL 156 CAUTION INLET AIR	1

34	CB 715 NAV HOSE BUNDLE ASSEMBLY	1
35	CB 717 NAV UMBILICAL	1
36	REMOTE BOX POLE, 1.25OD	1
37	SHUT-OFF VALVE	1
38	TUBE FITTING P8PL8 90DEG	1
39	TEE, 3X PL2	1
40	THREAD CUTTING SCREW, 6-32 X .25	4
41	FTG P6MPL8ELBOW	2
42	GPH 319-08 PHPMS 10-24 X 2.00 SS	8
43	GN 319-L NYLOK NUT SS (HC 025.1)	13
44	CB 711 LOOP CLAMP	5
45	CB-NAV SERIAL PLATE	1
46	CB 712 HEX STANDOFF	3
47	GPH 319-02 RHPMS 10-24 X .500 SS	5
48	1-2 POLY TUBE	4 FT
49	GP 011-R RED ID BAND	2
50	GP 011-BK BLACK ID BAND	2

1. Acceptance of Terms and Conditions. These Terms and Conditions shall operate as Seller's acceptance of Buyer's purchase order, and such acceptance is made expressly conditional on assent by Buyer to the Terms and Conditions. Such assent shall be deemed to have been given unless written notice of objection to any of such Terms and Conditions (including inconsistencies between Buyer's purchase order and this acceptance) is given by Buyer to Seller promptly on receipt hereof.

Seller desires to provide its Buyer with prompt and efficient service. However, to negotiate individually the terms of each sales contract would substantially impair Seller's ability to provide such service. Accordingly, products furnished and services rendered by Seller are sold only on the Terms and Conditions stated herein. Notwithstanding any Terms or Conditions on Buyer's order, Seller's performance of any contract is expressly made conditional on Buyer's agreement to Seller's Terms and Conditions of sale unless otherwise specifically agreed to in writing by Seller. In the absence of such agreement, commencement of performance, shipment and/or delivery shall be for Buyer's convenience only and shall not be deemed or construed to be an acceptance of Buyer's Terms and Conditions. **PRODUCTS SOLD BY SELLER ARE DESIGNED AND INTENDED TO BE USED AT HIGH PRESSURES AND SPEEDS, AND MAY BE DANGEROUS IF OPERATED IMPROPERLY OR WITHOUT THE USE OF APPROPRIATE SAFETY DEVICES AND GUARDS. BUYER IS CAUTIONED TO CAREFULLY READ AND UNDERSTAND THESE TERMS AND CONDITIONS, AS THEY HAVE IMPORTANT LEGAL CONSEQUENCES.**

2. Payment/Prices. Unless other arrangements have been made in writing between Seller and Buyer, payment for product delivered shall be made upon receipt of invoice. The prices shown on the face hereof are those currently in effect. Prices invoiced shall be per price list in effect at the time of shipment. Prices are subject to increase for inclusion of any and all taxes which are applicable and which arise from the sale, delivery or use of Seller's products or services and for the collection of which Seller is or may be responsible to any governmental authority unless acceptable exemption certificates are provided by Buyer in accordance with law. Buyer shall pay all charges for transportation and delivery and all excise, order, occupation, use or similar taxes, duties, levies, charges or surcharges applicable to the equipment or services being purchased, whether now in effect or hereafter imposed by any governmental authority, foreign or domestic.

3. Warranty. Subject to the limitations and conditions hereinafter set forth, Seller warrants to the original Buyer that its products are free from defects in workmanship and material for a period of one (1) year from shipment date. Seller's obligation under this warranty shall be limited to repairing, replacing or issuing a credit for, at Seller's option, any products or services it finds to be defective in material or workmanship. In no event shall Seller be liable for any incidental, consequential or indirect damages of any kind. **THIS WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY FOR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.** No statement or recommendation made by Seller or its representative to Buyer or User shall constitute a warranty by Seller or a waiver or modification to any of the provisions hereof or create any liability for Seller. All warranty claims are subject to the exclusions and limitations set forth below:

a. The warranty shall not apply if the product or service (1) has been subject to misuse, negligence or accident; (2) has not been installed or operated in accordance with Seller's recommendations; (3) has been operated under more severe conditions than those specified for the particular product or service; (4) has been operated beyond the rated capacity of the product; or (5) has been repaired or altered outside Seller's facilities or in any way so as, in Seller's judgment, to affect its stability or reliability.

b. Products that Seller furnishes, but does not manufacture, carry only the warranty of the Manufacturer of such products. Where other Manufacturers' or Suppliers' products used in Seller's products or services prove defective, Seller's liability shall exist only to the extent that Seller is able to recover from such Manufacturers or Suppliers for such defects.

c. Any warranty granted by Seller to the Buyer shall be deemed void if any goods covered by such warranty are used for any purpose not recommended or permitted. In addition, the Buyer shall indemnify Seller and hold Seller harmless from and against any and all claims, damages, losses, costs, expenses and other liability of whatever nature that Seller suffers or incurs by reason of any such unintended use.

d. Notice of defective product or service must be given in writing to Seller by Buyer or User within fifteen (15) business days following receipt of goods. Buyer or User shall keep such products or services in an unaltered condition for examination by Seller's representative. No goods may be returned for credit or adjustment without prior written permission from Seller.

4. Product Liability. Buyer specifically acknowledges that the products being purchased may be operated at high speeds and/or pressures, and that as such they may be inherently dangerous if not used correctly. Buyer shall be solely responsible for the safe operation of the products at all times and for determining the safety devices and guards that may be required for the safe operation of the products. Buyer shall undertake to specify and order all safety devices and guards necessary for the safe operation of the equipment covered. All safety devices and guards offered in Seller's quotations are recommended for purchase. Seller may provide necessary safety devices and guards not offered in this quotation at an extra price in accordance with the specifications of Buyer. Buyer shall at all times use and require its contractors to use all necessary and appropriate safety devices, guards and proper safe operating procedures. Buyer shall ensure that proper Operator training is provided. Buyer shall not remove or modify any such devices, guards or warning signs and shall insist on safe operating practices on the part of its personnel. In no event shall Seller be responsible for any injuries to persons or property caused by defects in any equipment, including by way of illustration and not limitation, any pumps, compressors, fittings, connections, components, piping or hoses up to the point that same are connected to the product. Buyer agrees to indemnify and to save Seller harmless from any and all liability or obligation incurred by or against Seller, including costs and attorneys' fees, to or by any persons injured directly or indirectly in the operation of the equipment furnished under the following conditions:

TERMS AND CONDITIONS

- a. if Buyer fails to purchase and use necessary and appropriate safety devices and guards as determined and/or recommended by Seller;
- b. if Buyer fails to maintain in good working order such safety devices and guards as are purchased from Seller;
- c. if Buyer adds, omits, repairs, modifies, replaces or substitutes any components on the equipment without permission from Seller;
- d. if Buyer exceeds at any time the maximum safe loads, pressures or speeds recommended by Seller for the equipment furnished hereunder without the specific written consent of Seller; or
- e. if Buyer otherwise fails to operate the product or equipment in accordance with Seller's printed instructions or otherwise negligently operates the equipment.

5. Delivery. Seller is not obligated to make delivery by a specified date, but will always use its best efforts to make delivery within the time requested. All deliveries are based on F.O.B. Seller's factory, unless specifically agreed otherwise, and Buyer shall pay all shipping costs and insurance from that point. Seller, in its sole discretion, will determine and arrange the means and manner of transportation of the products. Responsibility of Seller shall cease and Buyer assumes all risk of loss or damages upon Seller's delivery to and receipt by a common carrier. Carriers shall be responsible for goods lost or damaged in transit and Buyer shall immediately notify the carrier in writing of such loss or damage. At Buyer's request Seller will offer its assistance. THE PROPOSED SHIPMENT DATE IS AN ESTIMATE. UNDER NO CIRCUMSTANCES SHALL SELLER HAVE ANY LIABILITY WHATSOEVER FOR LOSS OF USE OR FOR ANY DIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM DELAY REGARDLESS OF THE REASON(S). Shortages or errors must be reported within fifteen (15) business days from receipt of shipment to secure adjustment. No merchandise may be returned without securing written approval from Seller. Seller will notify Buyer promptly of any material delay and will specify the revised delivery date as soon as practicable. Seller shall not be liable for any delay in delivery or performance, or for any failure to manufacture, deliver or perform due to (a) any cause beyond its reasonable control; (b) any act of God, act of Buyer, act of civil or military authority, governmental priority, strike or other labor disturbance, flood, epidemic, war, riot, delay in transportation or car shortage; or (c) inability on account of any cause beyond the reasonable control of Seller to obtain necessary materials, components, services or facilities. In the event of any such delay, the date of delivery or of performance shall be extended for a period equal to the time lost by reason of the delay.

6. Technical Advice. All technical advice, recommendations and services of Seller are intended for use by persons having adequate skill, at their own risk, and Seller assumes no responsibility, and Buyer hereby waives all claims against Seller, for results obtained or damages incurred from the use of Seller's advice, recommendations and services.

7. Modification. These Terms and Conditions are intended by Seller and Buyer to constitute a final, complete and exclusive expression of agreement and cannot be supplemented or amended without Seller's prior written approval. Seller's waiver of any breach, or failure to enforce any of the Terms and Conditions at any time, shall not in any way affect,

limit or waive Seller's right thereafter to enforce and compel strict compliance with every Term and Condition thereof. If any provisions of these Terms and Conditions are held to be invalid or unenforceable, such invalidity or unenforceability shall not affect the validity or enforceability of the other portions hereof.

8. Disputes. Buyer and Seller shall attempt in good faith promptly to resolve any dispute arising under these Terms and Conditions by negotiations between representatives who have authority to settle the controversy. If unsuccessful, Buyer and Seller shall further attempt in good faith to settle the dispute by nonbinding third-party mediation, with fees and expenses of such mediation apportioned equally to each side. Any dispute not so resolved by negotiation or mediation may then be submitted to a court of competent jurisdiction in accordance with the terms hereof. These procedures are the exclusive procedures for the resolution of all such disputes between the parties. All sales, agreements for sale, offers to sell, proposals, acknowledgments and contracts of sale, including, but not limited to, purchase orders accepted by Seller, shall be considered a contract under the laws of the State of Colorado and the rights and duties of all persons, and the construction and effect of all provisions hereof shall be governed by and construed according to the laws of such state. A state or federal court located within the State of Colorado shall have sole and exclusive jurisdiction over any litigation concerning any such matters as well as any alleged defects of any products or equipment covered thereby or damages sustained as a result of such alleged defects. If any litigation is commenced between Seller and Buyer, or their personal representatives, concerning any provision hereof, the party prevailing in the litigation shall be entitled, in addition to such other relief that is granted, to a reasonable sum as and for their attorneys' fees and costs in such litigation or arbitration.

STONEAGE TRADEMARK LIST

View the list of StoneAge's trademarks and service marks and learn how the trademarks should be used. Use of StoneAge trademarks may be prohibited, unless expressly authorized.

<http://www.StoneAgetools.com/trademark-list/>

STONEAGE PATENT DATA

View the list of StoneAge's current U.S. patent numbers and descriptions.

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