



BOILER TUBE CLEANER™ (BTC-200) USER MANUAL

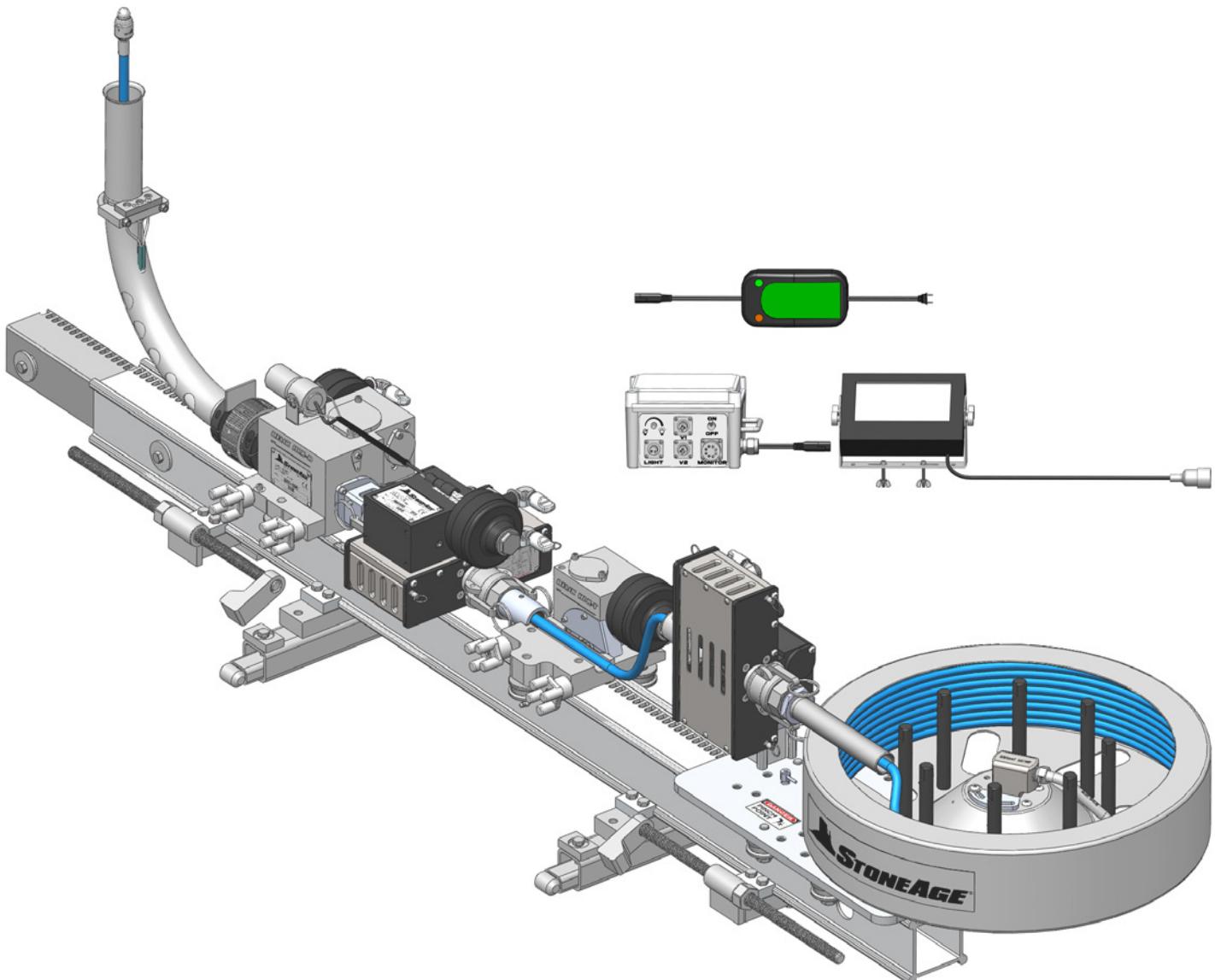


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This manual must be used in accordance with all applicable national laws. The manual shall be regarded as a part of the machine and shall be kept for reference until the final dismantling of the machine, as defined by applicable national law(s).

SPECIFICATIONS	Weight	Air Volume	Speed	Dimensions	Connections
ABX-PRO Tractor	20 lb (9 kg)	20 cfm	2-18 IPS		1.25 inch Camlock
BTC Tractor	20 lb (9 kg)	10 cfm	5 IPM		Rollers on Box Rail
BTC Rotator	20 lb (9 kg)	10 cfm	2 RPM		Rollers on Box Rail
Hose Containment	40 lb (18 kg)	5 cfm		24 inch diameter x 12 inch high	Position Held by Pin
Control Panel	30 lb (13.6 kg)	90 psi air, 20 cfm			
Video Camera	2 lb (.9 kg)			5x7 inch display	12v Battery or 120v AC

TRAVEL: UP TO 5 FEET PER MINUTE CONTROLLED BY VALVE HANDLE POSITION

ROTATION: 2 RPM CONTROLLED BY VALVE HANDLE POSITION

HOSE SPEED: 2 IPS TO 18 IPS CONTROLLED BY NEEDLE VALVE SPEED CONTROLS

HOSE FEED SPEED: CONTROLS WILL MOVE THE HOSE IN THE FORWARD DIRECTION AT 9-50 FT/MIN, AND INDEPENDENTLY IN THE REVERSE DIRECTION AT 9-50 FT/MIN.

DESCRIPTION OF EQUIPMENT AND INTENDED USE

The BTC-200 Boiler Tube Cleaner was developed as a safe and efficient alternative to manual cleaning requiring vessel entry and cleaning of tube bundles such as steam generator tubes in fossil fueled boilers. Specifically designed for the mud drum of small package boilers that are used for process steam in chemical and petroleum refining plants. The Boiler Tube Cleaner can be adapted to fit other types of boilers by modifying the size of a few components.

This system automates the cleaning process, increasing both safety and efficiency, yet remains flexible, portable, and fast.

The Camera Assembly is sold separately and is CE certified by the vendor. The Technical File for the Camera is maintained with the camera system's manufacturer.

KEY FEATURES:

- Cleans vertical and horizontal tubing
- Removes thin, hard scale and corrosion.
- Will work with manways as small as 16 inches wide
- Camera System gives the Operator the ability to quickly align with each boiler tube inside of the mud drum.
- Capable of accommodates Helix hose with a Helix Roller Kit.
- Optimally paired with 5mm or 6mm hose with Blast-Pro fitting.
- Can be paired with any StoneAge rotary pipe or tube cleaning tool. StoneAge recommends utilizing the 2" Badger or the 25mm Banshee Beetle Rotating Nozzle for boiler tube cleaning. Both tools are capable of navigating the bends commonly found in boiler tubes

Tool Benefits:

- Safely operated from outside the water blast zone
- Requires a single operator to run



**CE DECLARATION OF INCORPORATION
OF PARTLY COMPLETED MACHINERY**

We: StoneAge, Inc. 466 South Skylane Drive Durango, CO 81303, USA

Declare that this "partly completed machinery" supplied with this declaration:

Equipment: Boiler Tube Cleaner™ Assembly

Model name: BTC-200 is in accordance with the following Directives: and

- is designed and manufactured solely as a non-functional component to be incorporated into a machine requiring completion;
- must not be put into service within the European Community ("EC") until the final machinery into which it is to be incorporated has been declared in conformity with the Machinery Directive and all other applicable EC Directives; and
- is designed and manufactured to comply with the 2006/42/EC Essential Health and Safety Requirements of the Machinery Directives and the relevant parts of the following specifications:

EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction

We hereby declare that the equipment named above has been tested and found to comply with the relevant sections of the above referenced specifications and directives.

Date 05/01/2017

StoneAge Europe
Unit 2, Britannia Business Centre
Britannia Way
Malvern WR14 1GZ
United Kingdom

The Technical File for the Boiler Tube Cleaner™ (BTC-200) is maintained at: StoneAge, Inc. 466 South Skylane Drive, Durango, CO 81303, USA

CE

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 of 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.

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.

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.

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

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 until repaired. Make sure all threaded connections are tight and free of leaks.
- Users of the Boiler Tube Cleaner™ (BTC) 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.
- The Control Box should be located in a safe location where the operator has good visibility of the mud drum entrance. The Boiler Tube Cleaner™ (BTC) and Control Box MUST be supervised at all times and should never be left unattended.
- Always de-energize the system before attempting to service or replace any parts. Failure to do so can result in severe injury and/or death.

WARNING AND SAFETY INSTRUCTIONS

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- 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 Boiler Tube Cleaner™ (BTC-200) Hose Tractor 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 Water jetting Equipment.
- An anti-withdrawal device (back-out preventer) MUST be used at all times. The back-out prevention device is the Hose Stop Collet located within the Hose Guide Assembly. StoneAge offers several different size Hose Stop Collets. The Collet Size Reference guide is located on the Hose Guide Assembly.
- The Control Box should be located in a safe location where the Operator has good visibility of the tool entering the exchanger tubes. The Boiler Tube Cleaner™ (BTC-200) Hose Tractor and Control Box MUST be supervised at all times and should never be left unattended.
- Do not fully release the hose clamp (decreasing pressure to zero) during operation, or the Boiler Tube Cleaner™ (BTC-200) Hose Tractor will release the hose and may create a dangerous runaway hose condition, which can result in severe injury and/or death.
- Always de-energize the system before opening the door to service or replace any parts. Failure to do so can result in severe injury and/or death.
- When moving the Boiler Tube Cleaner™ (BTC-200) Hose Tractor lift with care to prevent bodily injury.
- Do not operate the Boiler Tube Cleaner™ (BTC-200) Hose Tractor while either side door is open.

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 an anti-withdrawal device (back-out preventer), whip checks (hose whips), and all other applicable safety devices are installed and set-up properly.**
- Ensure the doors of the Boiler Tube Cleaner™ (BTC-200) Hose Tractor are closed and securely latched.
- Test the Control Box before operating the Boiler Tube Cleaner™ (BTC-200) Hose Tractor with high pressure water to verify the control valves move the hose in the intended direction, and that the high pressure 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.

BOILER TUBE CLEANER™ BTC-200**HLXR-100-001 ROTATOR**

The Rotator aligns the Hose and water jet tool with the boiler tubes. The Rotator is comprised of an air motor drive, double worm gear reduction, overload slip clutch, and elbow. The Hose and water jet tool exit the HLXR 040 Rotator Elbow and enter the boiler tubes. Rotator extension tubes are available through StoneAge to match the internal diameter of the boiler tube. The Rotator and the Tractor allow the operator to align the Hose with each individual boiler tube before launching the Hose.

HLXT-100-001 TRACTOR DRIVE ASSEMBLY

The Tractor moves the entire Boiler Tube Cleaner unit forward and backward along the rail.

ABX-PRO DRIVE

The Drive will feed or retract the Hose through the assembly into the boiler tube ports. The Drive can exert up to 50 lbs (23 Kg) of push when needed to clear plugged tubes or travel long distances.

ABX-PRO-5 HOSE CONTAINMENT DRIVE

The Hose Containment Drive is a hose drive with an air motor driving rollers to take up slack in the hose and push it into the containment drum.

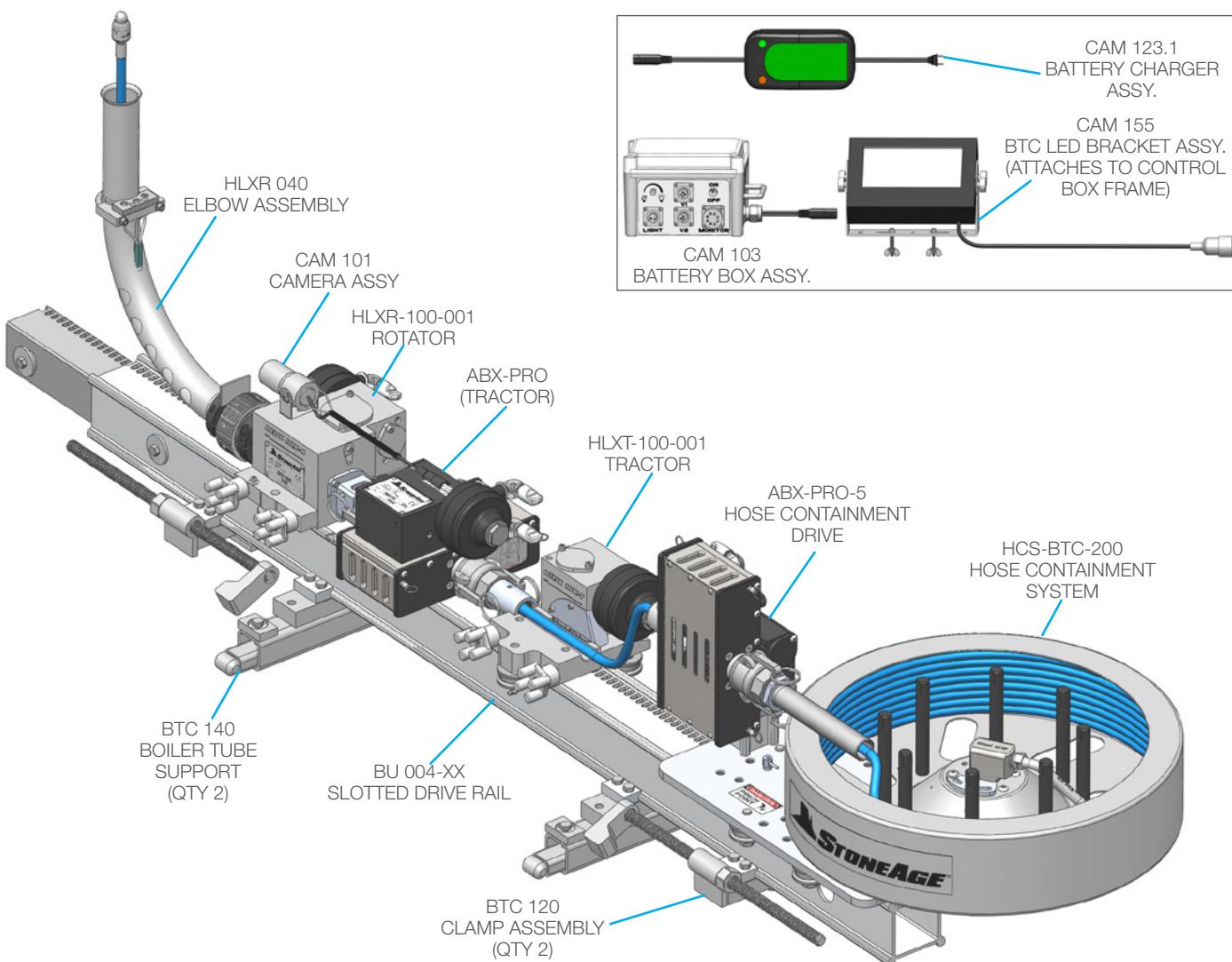
HCS-BTC-200 HOSE CONTAINMENT SYSTEM

The Hose Containment System remains outside of the boiler and is designed to keep the Hose managed and protected.

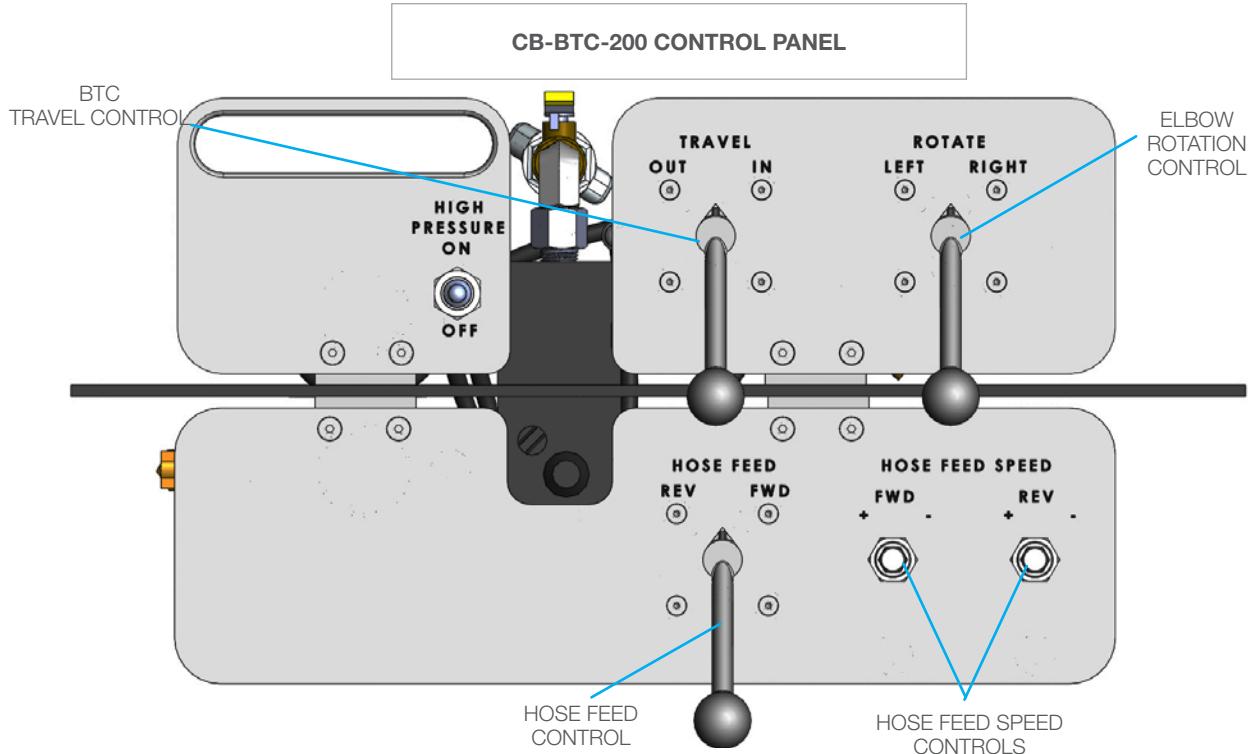
HOSE TYPES- STANDARD POLY OR HELIX

The Boiler Tube Cleaner comes standard with Poly rollers for poly hose. It can be retrofit to accommodate Helix hose with HLXD 625 Helix Roller Kits installed in the ABX-PRO Tractor and the ABX-PRO-5 Hose Containment Drive.

NOTE: If there is any question about the appropriate hose size for the flow limit or water jet tool being used, please contact your StoneAge Customer Service Representative. 1-866-795-1586

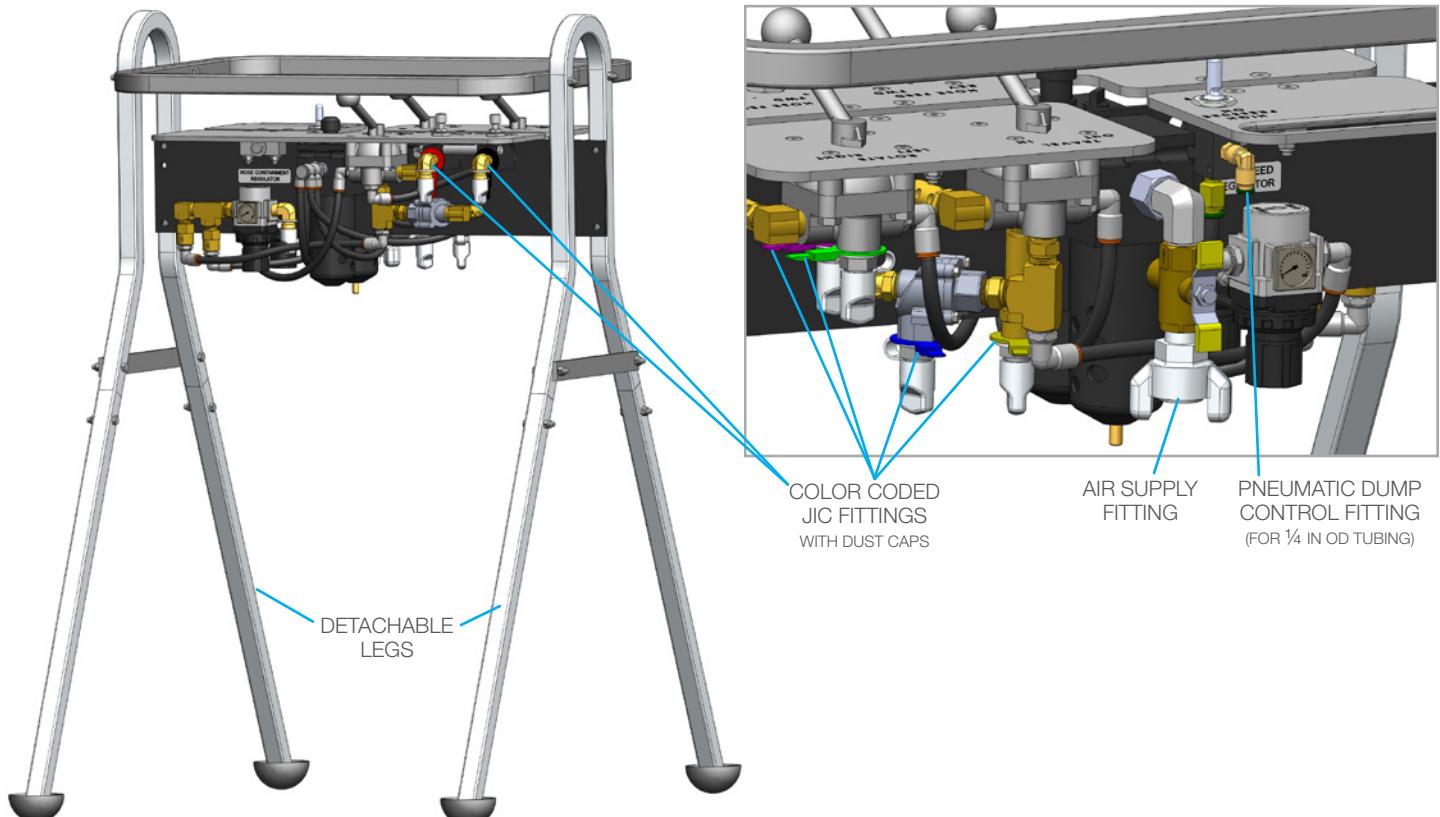


OVERVIEW - CB-BTC-200 CONTROL BOX



CONTROL BOX
FRONT VIEW

CONTROL BOX
REAR VIEW



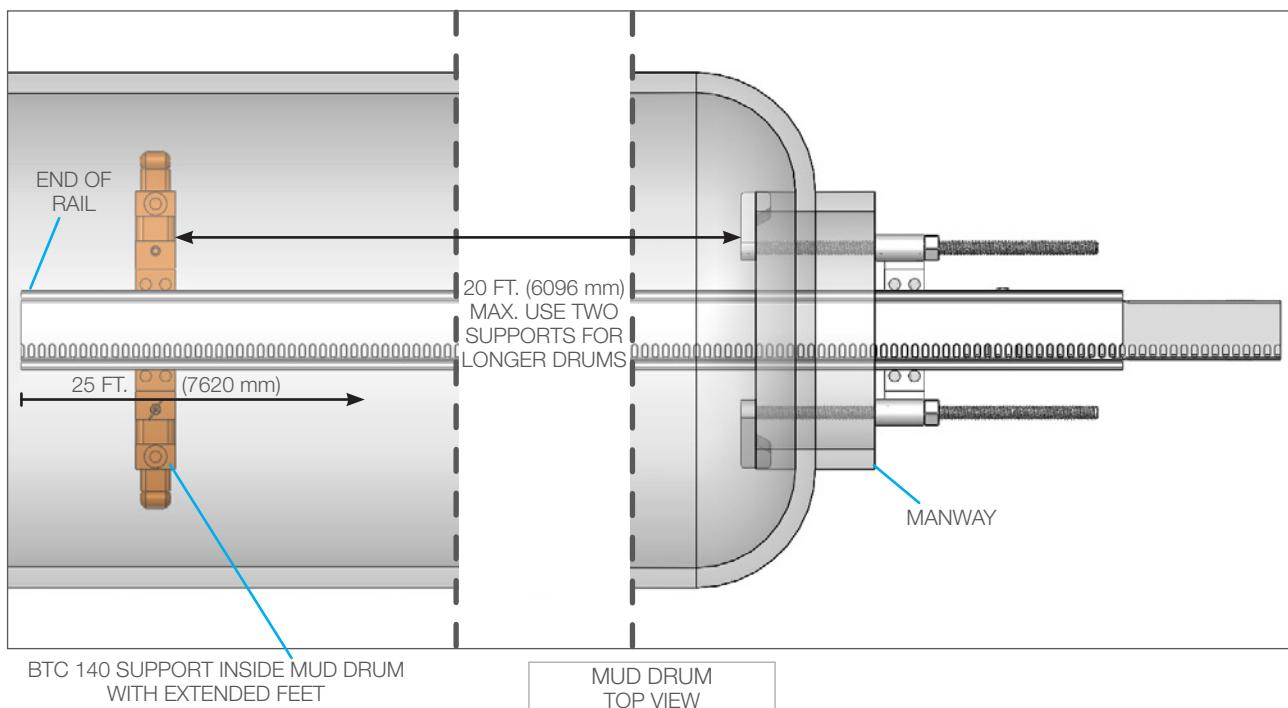
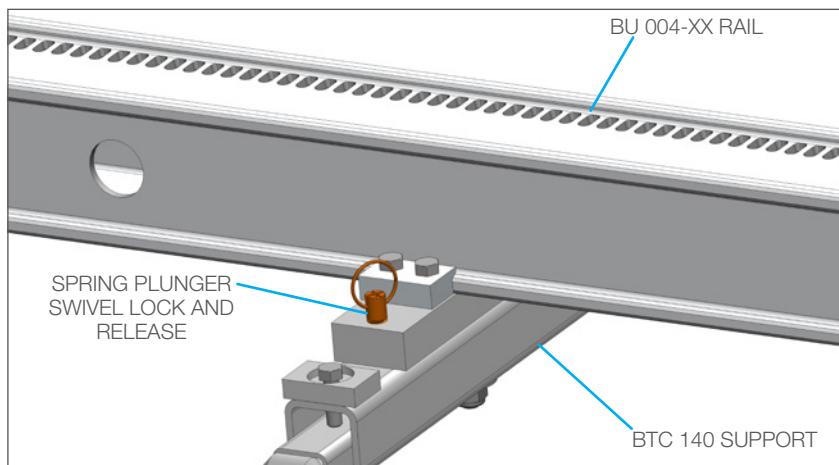
BU 004-XX RAIL

The slotted box rail with BTC 140 Support and BTC 120 Clamps act as the support for the BTC-200 system components. Rails are available to match the length of any mud drum. The BTC will ship mounted to a 6ft rail.

BTC 140 SUPPORT

1. Before attaching to the rail, set the BTC 140 Support in the drum. Check the height of the bearing surface to be sure it is level with the manway. Adjust the extendable feet if needed to level the support 6" (15.24 cm) below the drum centerline. Attach to rail with rail slots positioned on the right and Spring Plungers on the left, when looking into the mud drum.
2. Pull up on the ring of the Spring Plunger Pin to unlock the swivel mechanism of the BTC-140 Support.
3. Swivel the Support until it allows for insertion into the mud drum.
4. Insert the BTC 140 Support and the rail into the mud drum with the extendable feet facing down.
5. Swivel the Support so the feet touch the sides of the mud drum and lock the Spring Plunger Pin in place.
6. The distance you insert the rail into the mud drum is dependent on the length of the mud drum. If the rail span exceeds 20 ft. (6096 mm), use two supports evenly spaced.

NOTE: If the manway is higher than 12" (30.48 cm), block up the rail to center the HLXR-100-001 Rotator.

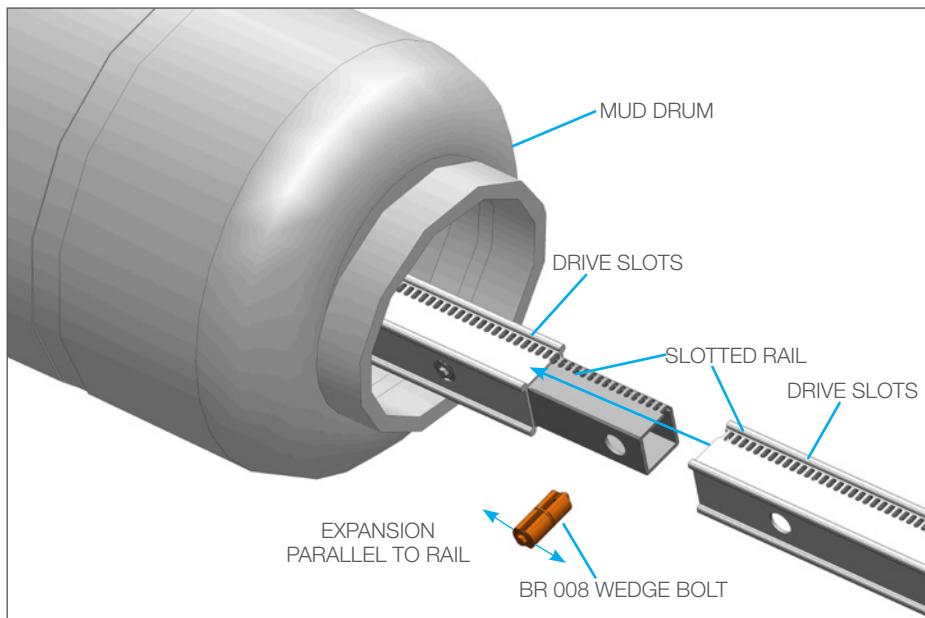


BTC-200 STEP BY STEP ASSEMBLY ON RAIL

JOINING RAILS

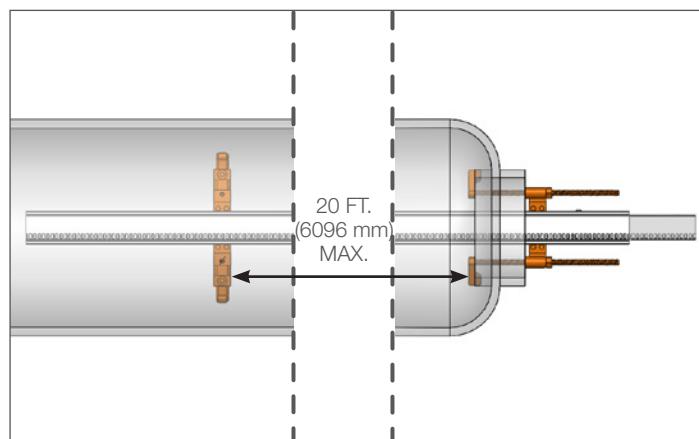
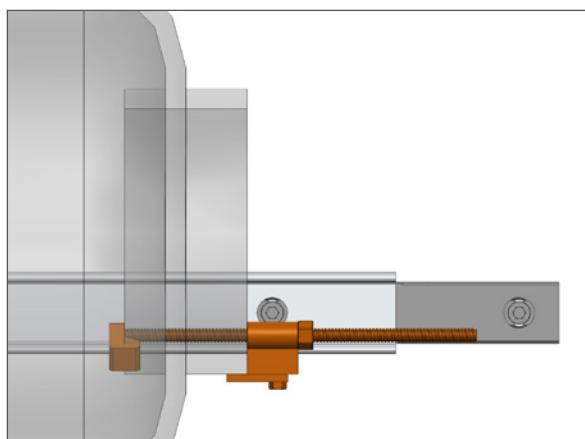
Additional rail length may be needed when the assembly is slid into the inside of the mud drum. Tighten the wedge bolts evenly to synchronize the rail slots.

1. Slide Rail Extension over the Splice Tube. When joining multiple rails, it is important to align the drive slots as illustrated.
2. Make sure the slots are clear to allow the gears of the Boiler Tube Cleaner to engage freely.
3. Install Wedge Bolt through both Rail and Splice Tube and tighten the bolt to expand the diameter and secure the rails together. Make sure the rail edges are match to allow rollers to travel freely across joints.
4. There must be at least 6 ft. (1829 mm) of rail outside the manway to allow the Elbow, Rotator, Tractor, Hose Drive, and Hose Containment System to be assembled. Setup on site is easier if all components are installed on a rail section.



BTC-120 CLAMP

1. Place the BTC 120 Clamp under the rail at the point where the rail contacts the man way. Make sure the clamp end is outside the manway and the hook end is inside the man way. Hook the clamps inside the manway flange.
2. Hand-tighten the two Acme nuts onto the threaded rods to pull the BTC 120 Clamp against the face of the man way. Use a wrench to tighten the two clamps to 100 in-lb (11.3 Nm).

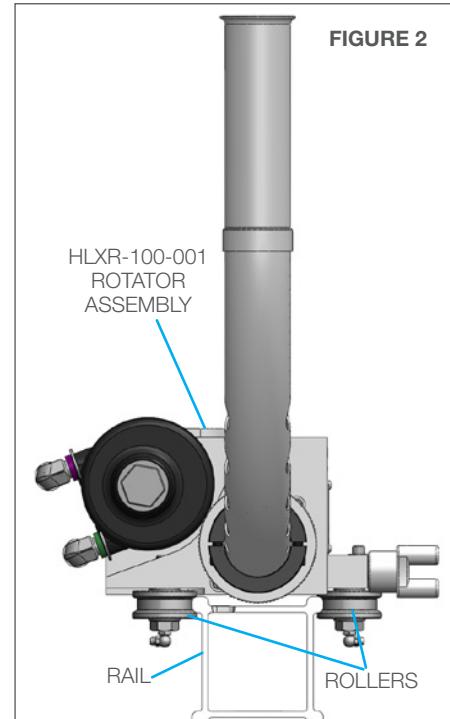
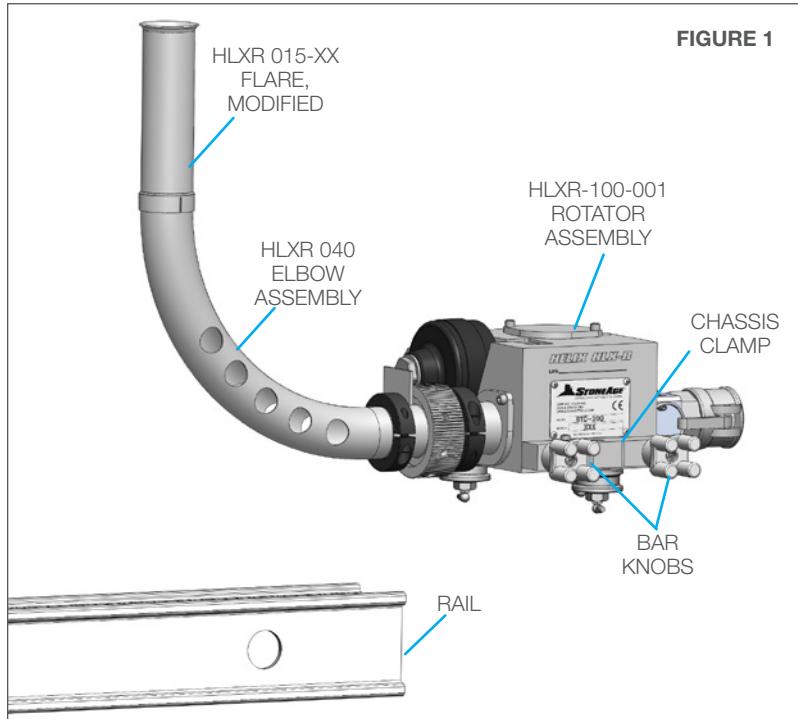


HLXR-100-001 ROTATOR TO RAIL ASSEMBLY

NOTICE

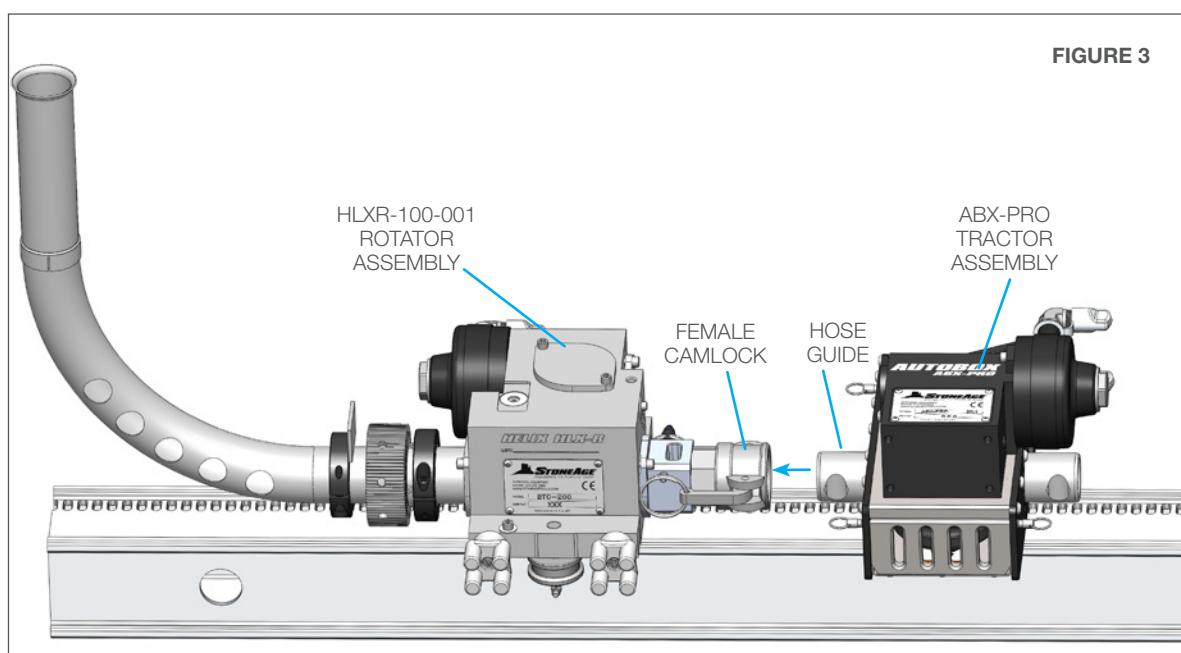
Before assembling the BTC-200 be sure the desired rollers (Poly or Helix) are installed in the ABX-PRO and ABX-PRO-5. See the Roller Replacement section of this manual for instructions on how to change out the rollers.

- To install the HLXR-100-001 Rotator on the rail, loosen the bar knobs on the Chassis Clamp and slide the Rotator on the rail into position. Tighten the bar knobs to 50 in-lbs (5.65 Nm). Make sure the roller grooves engage the rail and the Chassis Clamp is completely closed. (**Figures 1 & 2**)



ABX-PRO TRACTOR TO HLXR-100-001 ROTATOR

- Slide the hose guide on the ABX-PRO Tractor into the Female Camlock on the HLXR-100-001 Rotator and engage the Camlock lever lock pins. Make sure the air fittings are pointed away from the Rotator and the AUTOBOX label is facing up. (**Figure 3**)

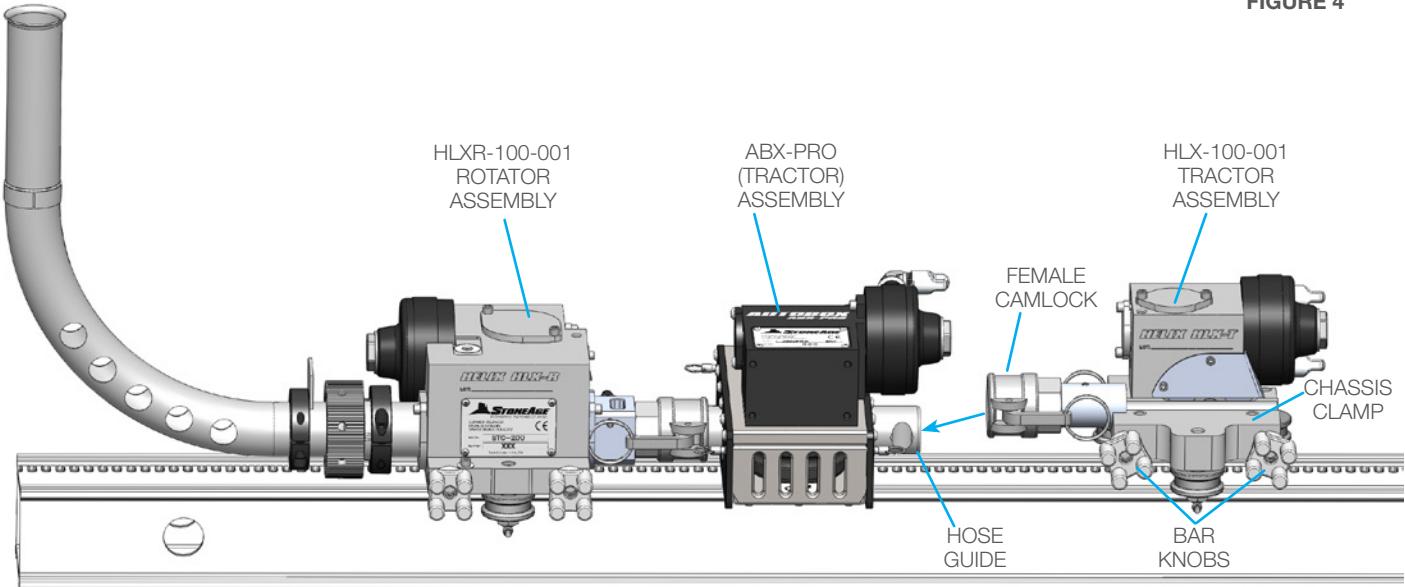


BTC-200 STEP BY STEP ASSEMBLY ON RAIL

HLXT-100-001 TRACTOR TO ABX-PRO TRACTOR

- To install the HLXT-100-001 Tractor on the rail, loosen the bar knobs on the Chassis Clamp and slide the HLXT-100-001 Tractor on the rail onto the Hose Guide on the ABX-PRO (Tractor). Tighten the bar knobs to 50 in-lbs (5.65 Nm). Make sure the roller grooves engage the rail and the Chassis Clamp is completely closed. (**Figures 4**)

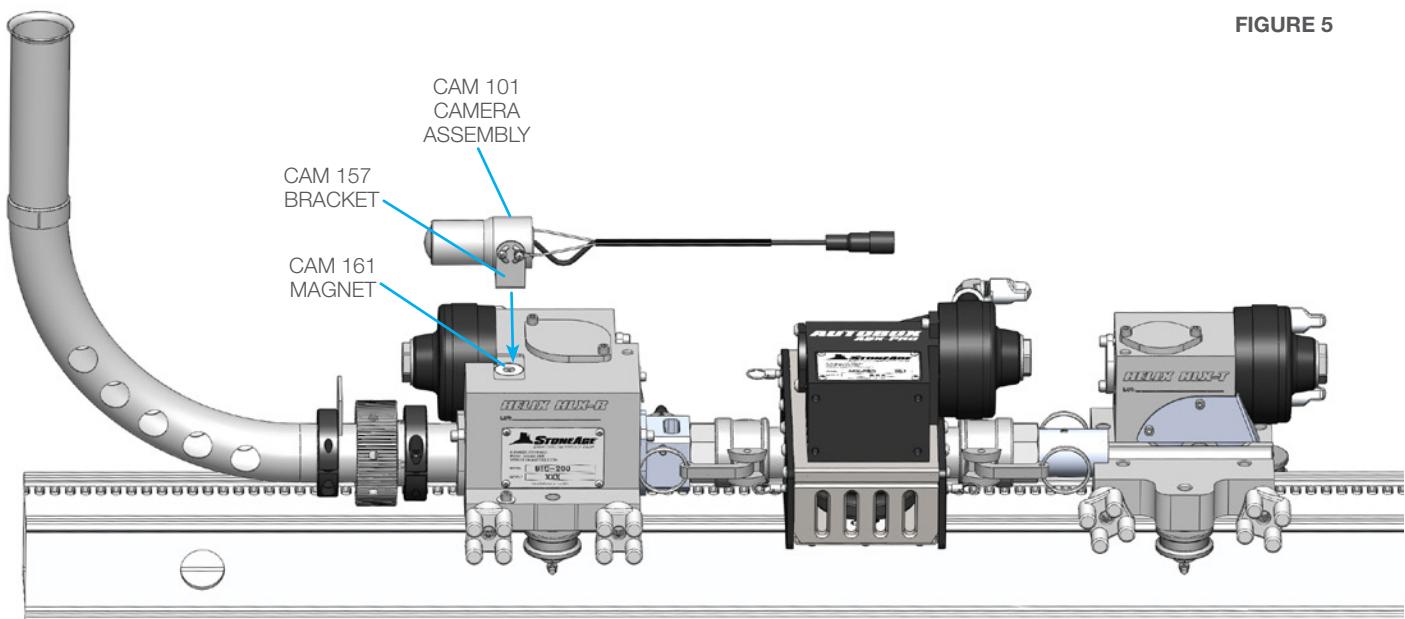
FIGURE 4



CAM 101 CAMERA TO BTC-200

- Attach the CAM 101 Camera Assembly by placing the CAM 157 Bracket into the slot on the Rotator until it engages with the CAM 161 Magnet. (**Figure 5**)

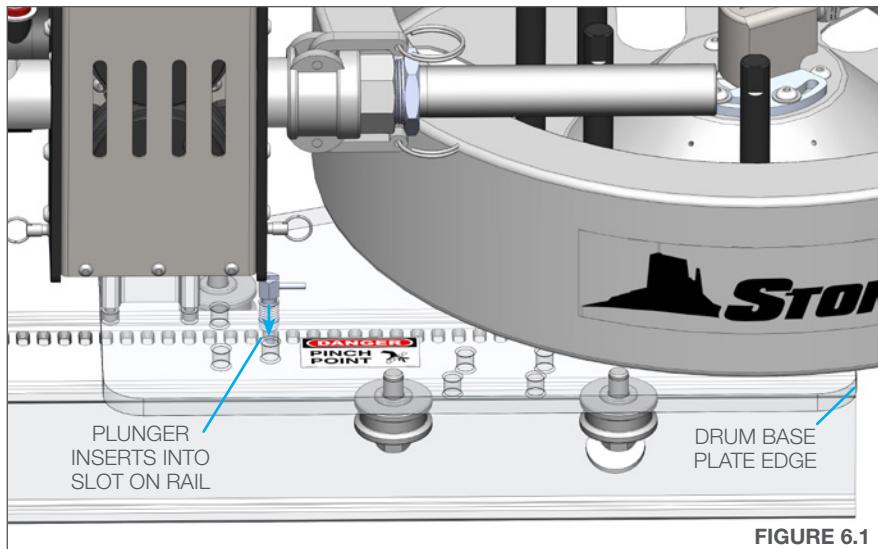
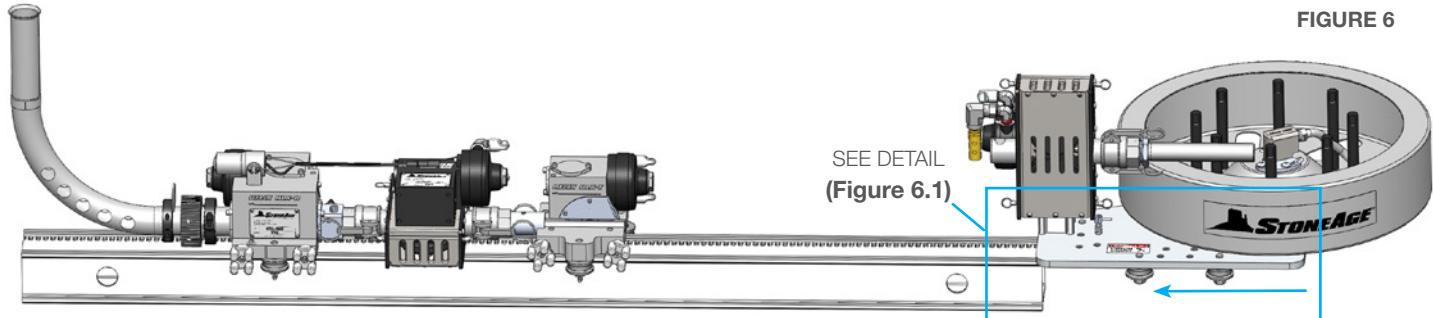
FIGURE 5



BTC-200 STEP BY STEP ASSEMBLY ON RAIL

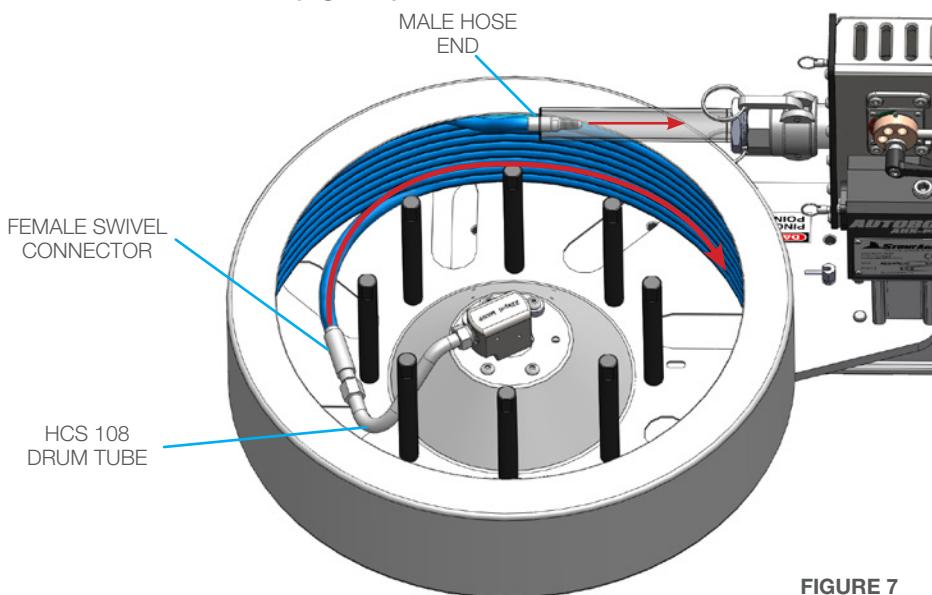
HCS-BTC-200 HOSE CONTAINMENT SYSTEM TO BTC-200

- To install the HCS-BTC-200 Hose Containment System, release the Retractable Spring Plunger on the drum plate and slide the Hose Containment System onto the rail until the edge of the Drum Plate lines up with the end of the rail. Lock the Retractable Spring Plunger into a slot in the Rail. (**Figure 6**)



HIGH PRESSURE HOSE CONNECTION TO HCS-BTC-200 HOSE CONTAINMENT SYSTEM

- Thread the female swivel end of the high pressure hose onto the HCS 108 Drum Tube and wrap the remainder of the hoses around the rods, in the direction of the red arrow (**Figure 7**)



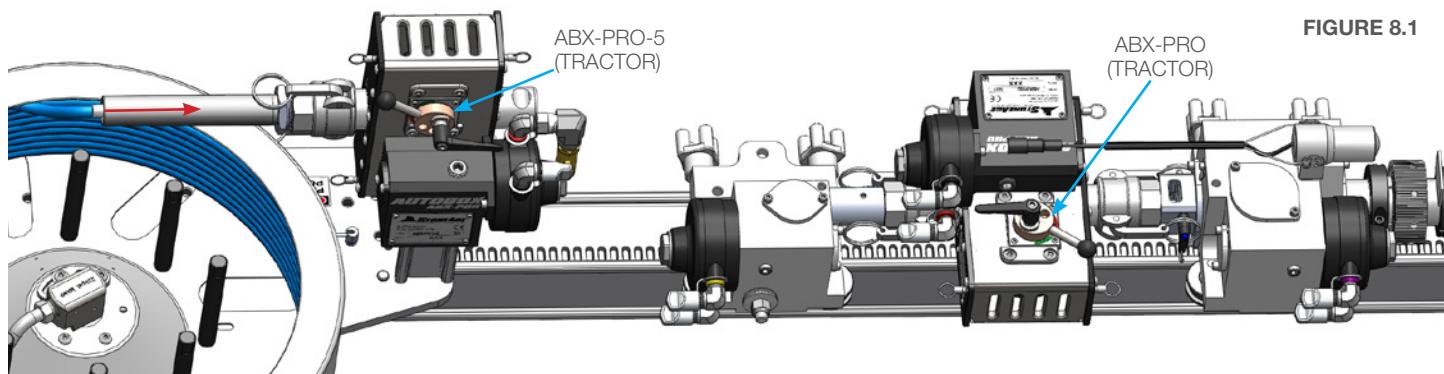
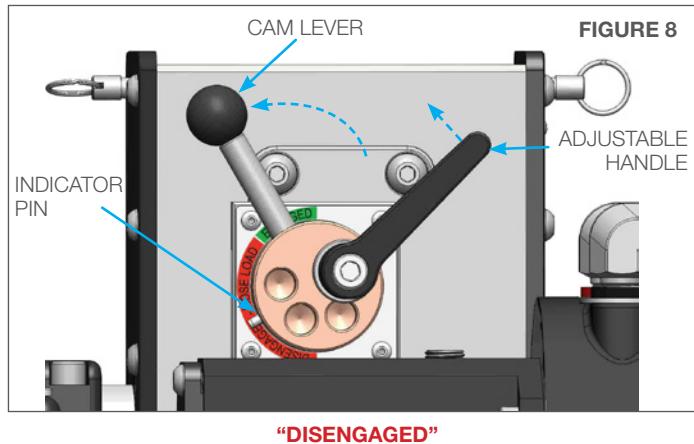
BTC-200 STEP BY STEP ASSEMBLY ON RAIL

LOADING THE HIGH-PRESSURE HOSE

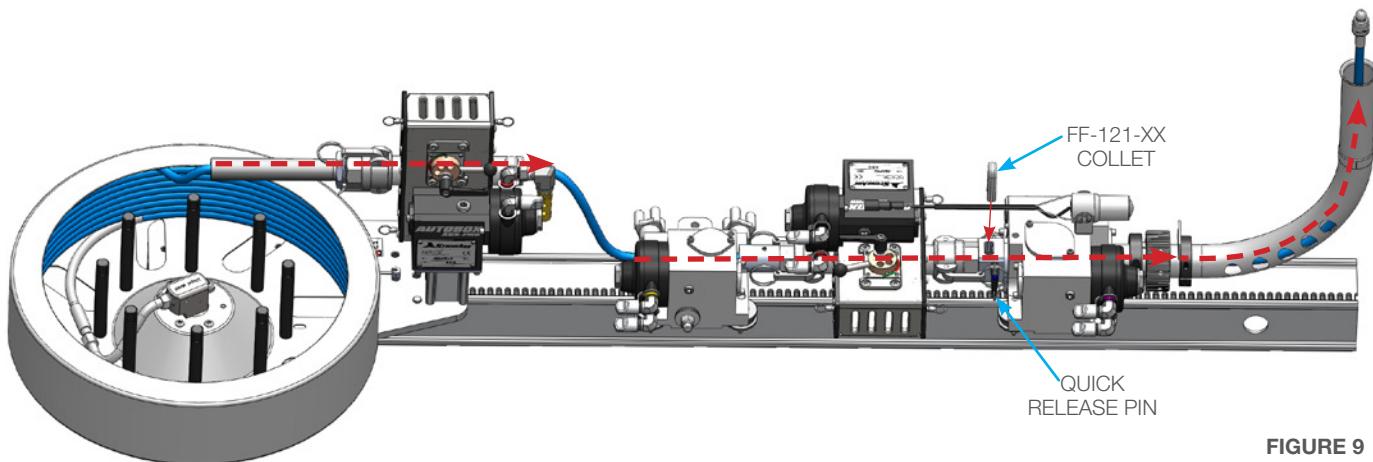
NOTICE

Only high quality hoses intended for waterblast applications should be used as high-pressure hoses. Pressure rating of high-pressure hoses MUST NEVER be exceeded. Do not use a shrouded hose or hose with a steel protective cover. This will cause severe damage to the Rollers.

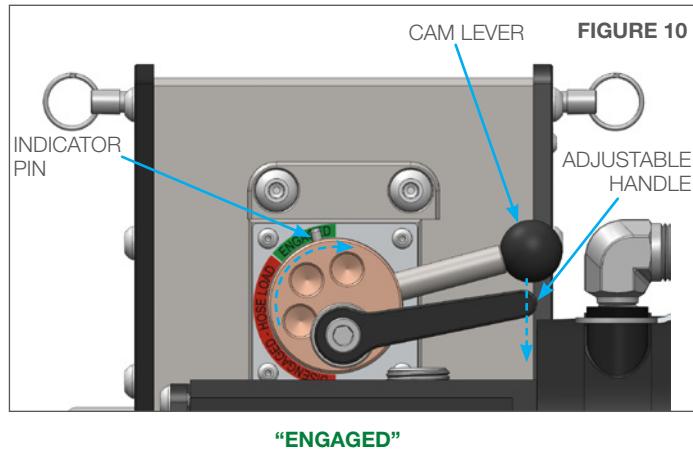
- To load a hose, release the Adjustable Handle and rotate the Cam Lever until the Indicator Pin is in the “**Disengaged**” position. This opens up the space between the rollers. (**Figure 8**) This will need to be done at the ABX-PRO-5 (Tractor) and the ABX-PRO (Tractor). (**Figure 8.1**)



- Continue to feed the male hose end of the high pressure hose through the ABX-PRO-5, HLXT-100-001, ABX-PRO, HLXR-100-001, and the HLXR 040 Elbow Assembly, in the direction of the red arrow shown below. Pull out the Quick Release Pin and insert the FF-121-XX Collet just behind the HLXR-100-001 Rotator. (**Figure 9**)



9. When the male end of the High Pressure hose projects out of the Elbow, rotate the Cam Levers clockwise on both the ABX-PRO-5 and ABX-PRO (Tractors) until the Indicator Pin is in the “**Engaged**” position. Then rotate the Adjustable Handle clockwise to increase tension on the hose. (**Figure 10**)

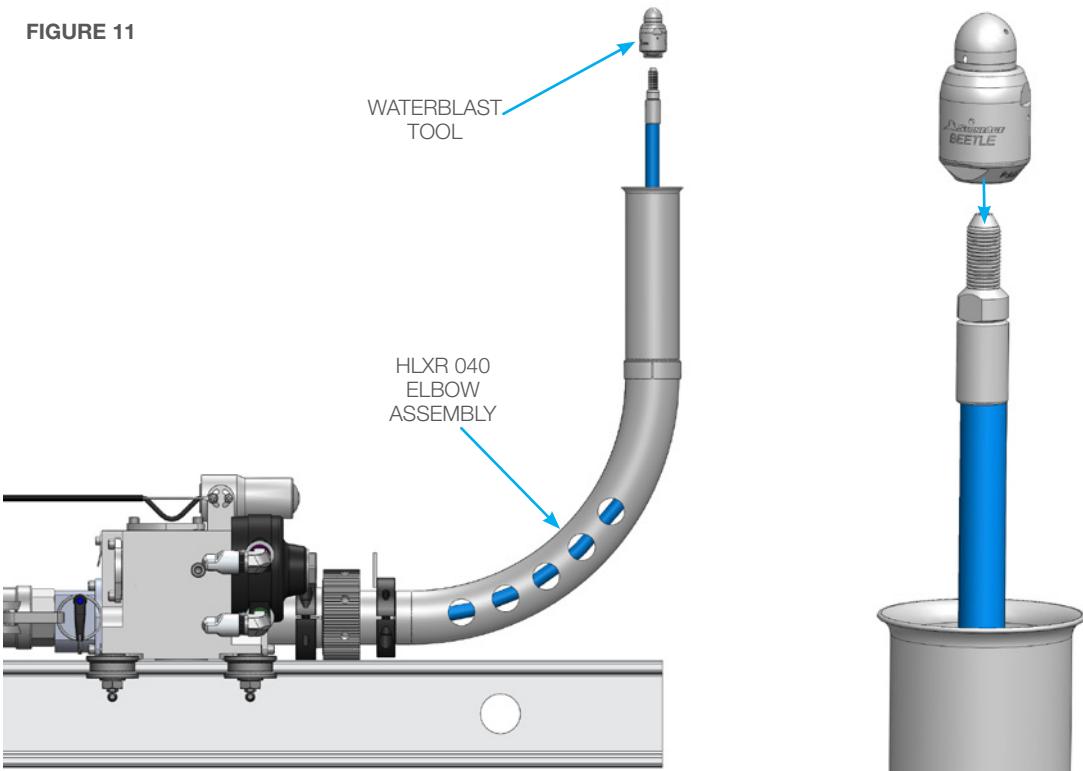


INSTALL TOOL

10. Thread the chosen tool on the male hose end. Shown below with the Banshee® Beetle BT25-XXX, available through StoneAge® Tools. (**Figure 11**)

NOTICE

Never use Pipe Wrenches or Pliers to install or maintain the Banshee® Beetle. After each use, always blow water out of the tool and fill with light oil such as WD-40



CONTROL BOX SET-UP

CB-BTC-200 CONTROL BOX

The Control Box may be operated with or without installing the detachable legs. Remove the legs for portability or to operate the Control Box in smaller spaces.

1. Remove the lower bolts and nuts from the Control Box frame.
2. Install the detachable legs onto the tube inserts.
3. Install the lower bolts and nuts through the legs and tube inserts. Use a 7/16 in wrench and socket to tighten the bolts.



PNEUMATIC SUPPLY LINES

1. Remove the dust caps from the Joint Industry Council (JIC) fittings on the Control Box and the motors on the BTC-200.
2. Following the "Pneumatic Supply Line Color Chart", connect the equally bundled hose ends to the fittings on the Control Box. Assuming the air supply is connected to the Control Box, blow out the hoses before connecting to them to the motors on the BTC-200 to remove any debris.
3. Immediately following the blow out procedure, connect the other end to the motors on the BTC-200 using the color coding on the JIC fittings. Use a 7/8 in. wrench to tighten the JIC Swivel nuts.
4. Test the Control Box before operating the BTC with high-pressure water to verify the control valves move the hose in the intended direction, and that the dump valve is working properly.

PNEUMATIC SUPPLY LINE COLOR CHART

HCS-BTC-200
HOSE CONTAINMENT SYSTEM

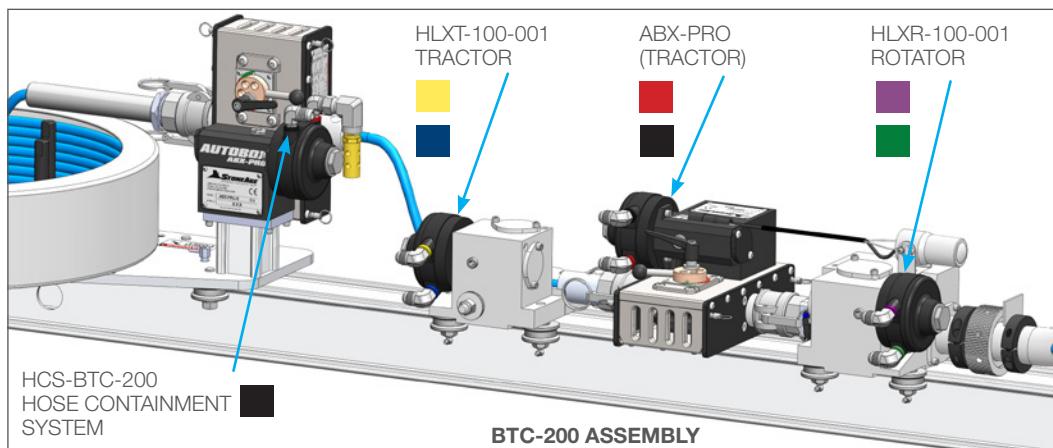
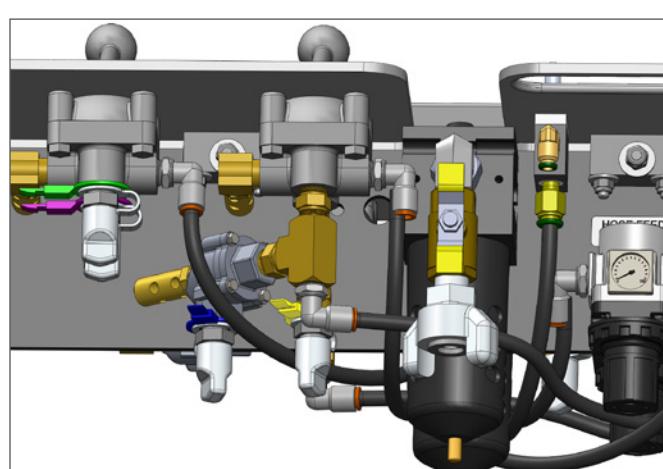
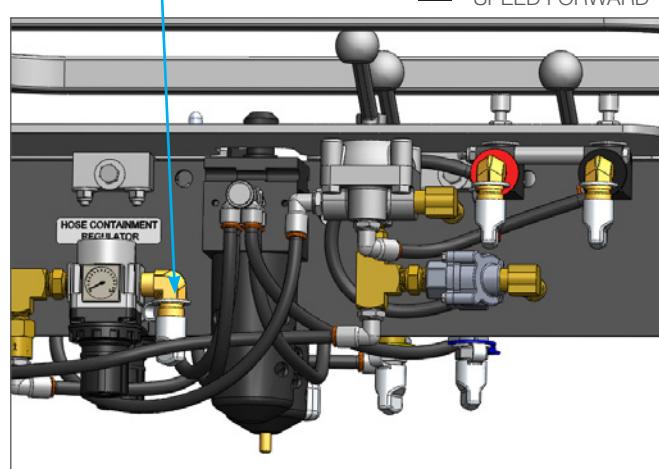
ABX-PRO (TRACTOR)
■ HOSE FEED
■ SPEED REVERSE
■ HOSE FEED
■ SPEED FORWARD

HLXR-100-001 ROTATOR

■ RIGHT
■ LEFT

HLXT-100-001 TRACTOR

■ IN
■ OUT



OPERATION

CB-BTC CONTROL PANEL

The **TRAVEL CONTROL** moves the BTC-200 Assembly in and out of the mud drum along the rail. The **OFF** position is at the 12 O'clock position.

The **HOSE FEED CONTROL** will move the hose in the forward (feeding) and reverse (retracting) directions. The **OFF** position is at the 12 O'clock position.

NOTE: Ensure that the elbow is lined up with a boiler tube before advancing the hose. Use remote camera to line up elbow. A manual tube locating instruction is in the "Maintenance" section of this manual.

The **HOSE FEED SPEED CONTROLS** will move the hose in the forward direction at 9-50 ft/min, and independently in the reverse direction at 9-50 ft/min. The control acts on the motor exhaust in the return hoses. Turn the controls clockwise to decrease the feed rate, and counter-clockwise to increase the feed rate.

The **ROTATE CONTROL** rotates the elbow. There is a stop on the Elbow that will contact the rail and activate the internal slip clutch if you over-rotate the elbow to either side. This prevents damage to the tool. Adjust the elbow length, so you can see the tool move out of the tube and there is a gap between the elbow and the tube.

NOTE: Do not travel or rotate while the hose is extended into a boiler tube. This can damage hose. Always retract the tool into the elbow before moving the Helix Tractor or Helix Rotator controls.

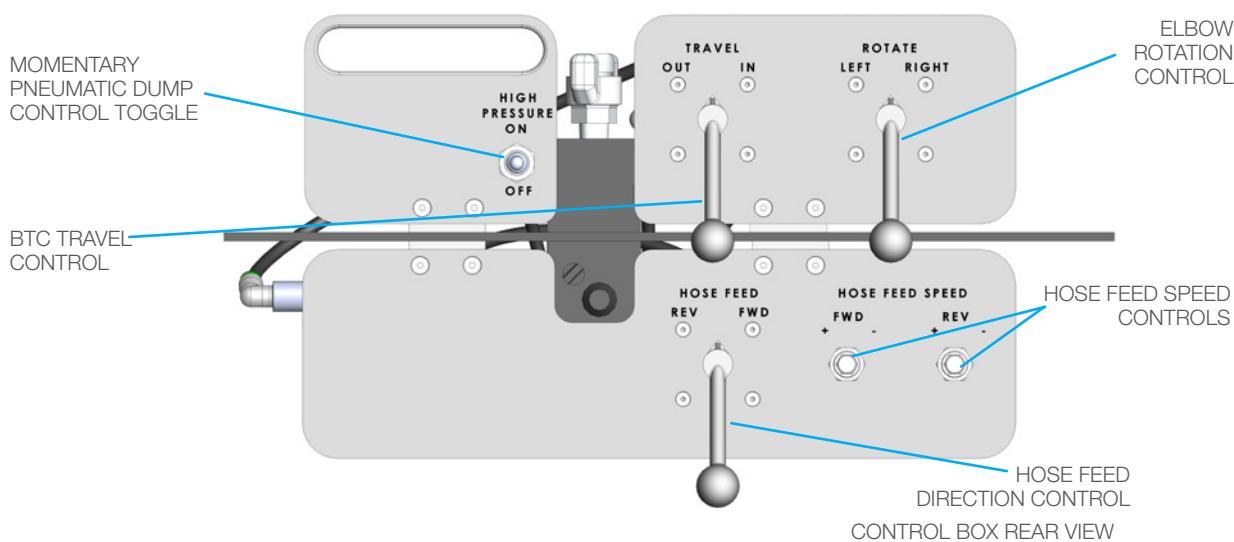
To use the **MOMENTARY PNEUMATIC DUMP CONTROL TOGGLE**, hold it in the **HIGH PRESSURE ON** position to route the high-pressure water to the tool. Release the toggle to the **OFF** position to release the high-pressure water away from the tool.

NOTE: Ensure that the tool end is inside a boiler tube before going to high pressure

To pause the system, turn the **HOSE FEED CONTROL** to the **CENTER**, 12 O'clock position and release the **MOMENTARY PNEUMATIC DUMP CONTROL TOGGLE** to the **OFF** position. This will stop the assembly from moving and reroute the high-pressure water away from the BTC-200.

⚠ WARNING

Always turn off pump system before servicing or replacing any parts. Failure to do so can result in severe injury and/or death.

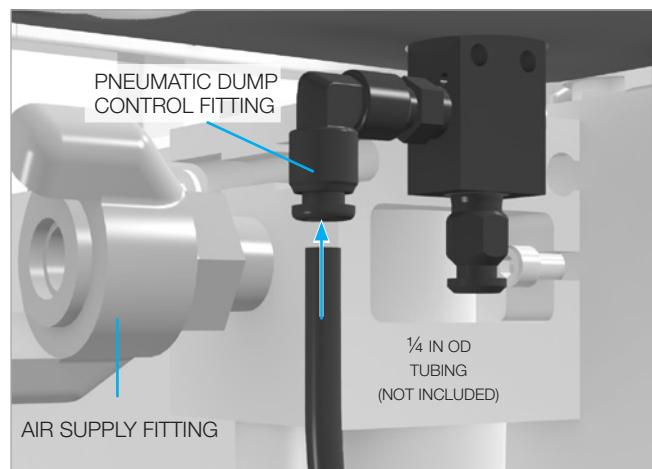


AIR SUPPLY FITTING

A universal **AIR SUPPLY FITTING** (Chicago style) is located on the back of the Control Box. 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.

PNEUMATIC DUMP CONTROL FITTING AND LINE

A **MOMENTARY PNEUMATIC DUMP CONTROL TOGGLE** is located on the control panel and should be set up to control an air actuated dump valve. Install 1/4 in OD tubing (not included) by pushing the tubing into the fitting to connect the **PNEUMATIC DUMP CONTROL FITTING** to the pneumatic dump valve.



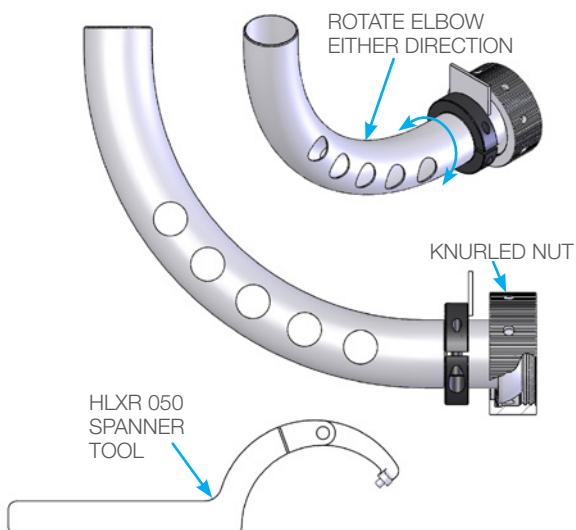
PRE-RUN SAFETY CHECK

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.
- Ensure the waterblasting zone is properly barricaded and that warning signs are posted.
- Adhere to all site safety procedures.
- Ensure no personnel are in the hydroblasting zone.
- 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).
- Ensure whip checks (hose whips), and all other applicable safety devices are installed and set-up properly.
- 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.
- Ensure that operators never connect, disconnect, or tighten hoses, adapters, or accessories with the high-pressure water pump unit running.
- Test the Control Box before operating the BTC-200 with high-pressure water to verify the control valves move the hose in the intended direction, and that the dump valve is working properly.
- Check that the BTC-200 is anchored securely for the application and pressure of the waterjet tool being used.
- Check all high-pressure threaded connections for tightness.
- Check - air supply attachment, high pressure pump function, air controlled dump function

INSERTING ASSEMBLY THROUGH MANWAY

- Use the HLXR 050 spanner tool to loosen the knurled nut that holds the elbow onto the Helix Rotator.
 - Rotate and/or tilt the elbow into a position that will allow it to fit through the manway, into the mud drum.
 - Drive the BTC-200 into the drum slightly.
 - Once the elbow is inside the mud drum, the elbow can return to its operating position. Tighten the collar to hold the elbow in position.
- NOTE:** The end of the elbow should be approximately 2 1/2" from the inside surface of the 24" mud drum. The boiler tubes may project 1/2" inside the drum. There should be 2" clearance between the end of the elbow and the tubes. Depending on field conditions, you may need to shorten or lengthen the elbow. This can be easily done by adding length to the elbow, or saw off and form flare. StoneAge has HLXR-015 Flares available in custom lengths.



- When beginning the cleaning process, run the "train" ALL the way into the drum and index BACKWARDS to avoid clogging of the rail slots.

TEST RUN PROCEDURE

- Adjust the hose feed speed controls. Proper forward and reverse speeds will vary, depending on the type of material being removed. Adjustment of the hose feed speed controls may be necessary during operation in order to optimize cleaning and overall productivity.
- Operate the high-pressure water at full pressure and use the **MOMENTARY PNEUMATIC DUMP CONTROL TOGGLE** to verify that the dump valve is working properly.

MAINTENANCE

Maintenance Item	Frequency	Maintenance Required
Gearbox oil level for HLXT-100-001, HLXR-100-001, ABX-PRO AND ABX-PRO-5 Tractors	Every 100 Hours of use	Drain the refill with Mobil® SCH™ 634 synthetic gear oil. See individual part diagram pages for gearbox fill orientations.
All air fittings	Before each use	Inspect threads for wear or damage.
All air 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 fittings to keep moisture and dirt out.
Carriage rollers	Every 100 Hours of use	Lubricate Zerks on all Carriage Rollers using any multipurpose NLGI 2 grease. Carriage rollers will continue to function normally after some wear. Roller replacement is required when wear begins to affect the Drive movement in forward or reverse.
Drive Rollers inside both the ABX-PRO and ABX-PRO-5	When Needed	The BTC-200 BOILER TUBE CLEANER comes with two pairs of the PRO 174-46 installed in the ABX-PRO and ABX-PRO-5 TRACTORS. Inspect for wear and replace if damaged. See the "Roller Replacements Instructions" section in this manual.

Contact StoneAge for Safety Data Sheets for material usage, a complete list of spare part numbers, and service instructions for the Boiler Tube Cleaner BTC-200 Boiler Tube Cleaner and CB-BTC-200 Control Box.

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STORAGE, TRANSPORTATION, AND HANDLING

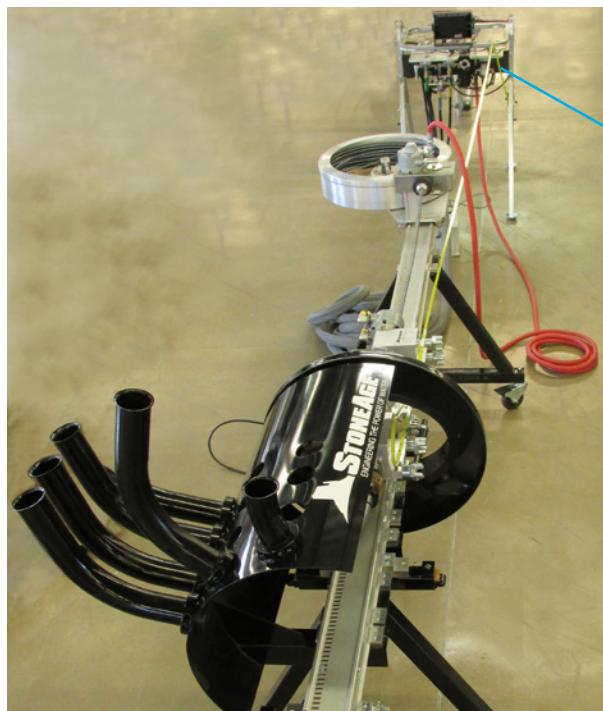
- When moving the BTC-200, lift with care to prevent bodily injury.
- When storing the unit, use compressed air to blow out the air lines to remove debris and moisture. Use mild soapy water to clean the machine in order to remove corrosive materials.
- Store unit in a clean and dry area.
- Apply a small amount of air tool oil directly into the motor 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 fittings to keep moisture and dirt out.

BTC-200 BOILER TUBE MANUAL LOCATING INSTRUCTIONS

It is possible to track the depth of the BTC inside the boiler using a flexible tape measure. If at any time during a job the BTC needs to be retracted from the boiler, it is a huge benefit to know exactly how far in the unit is in order to pick up where you left off. This may also be useful if the Camera System malfunctions.

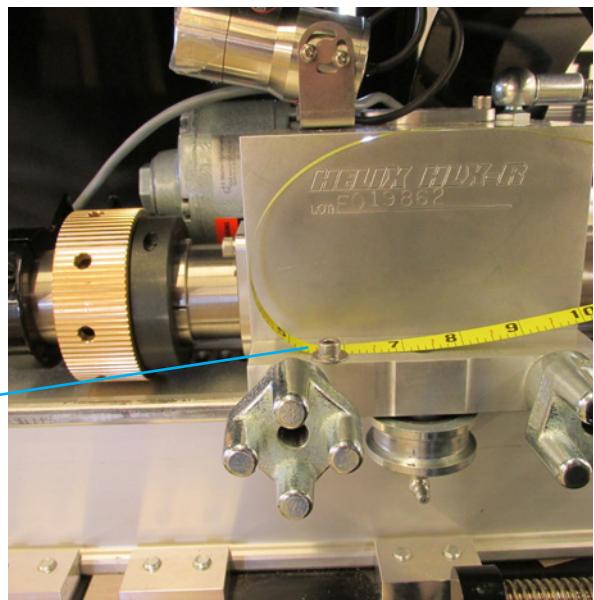
1. Align the end of the tape measure with the center of the flange on the top end of the elbow. Fasten the tape where it lies on the HLXR-100 Rotator to the socket head cap screw and washer on the HLXR-100 Rotator. It should measure approximately 18" +/- at the washer.
2. Zip tie the end of the tape measure back onto itself, so that it does not get caught up in the assembly.
3. Once the tape is fastened to the HLXR-100 Rotator, drape the other end over the frame of the control box and clip it to the frame. The distance measurement should be checked at the face of the mud drum. For a tutorial on this procedure go to the YouTube page below.

StoneAge® Boiler Tube Cleaner BTC-200 Training
<https://www.youtube.com/watch?v=17SZ34so9L4>



DRAPE TAPE
MEASURE OVER
CONTROL BOX
FRAME

FASTEN TAPE
MEASURE
HERE AND ZIP
TIE IT BACK
ONTO ITSELF.



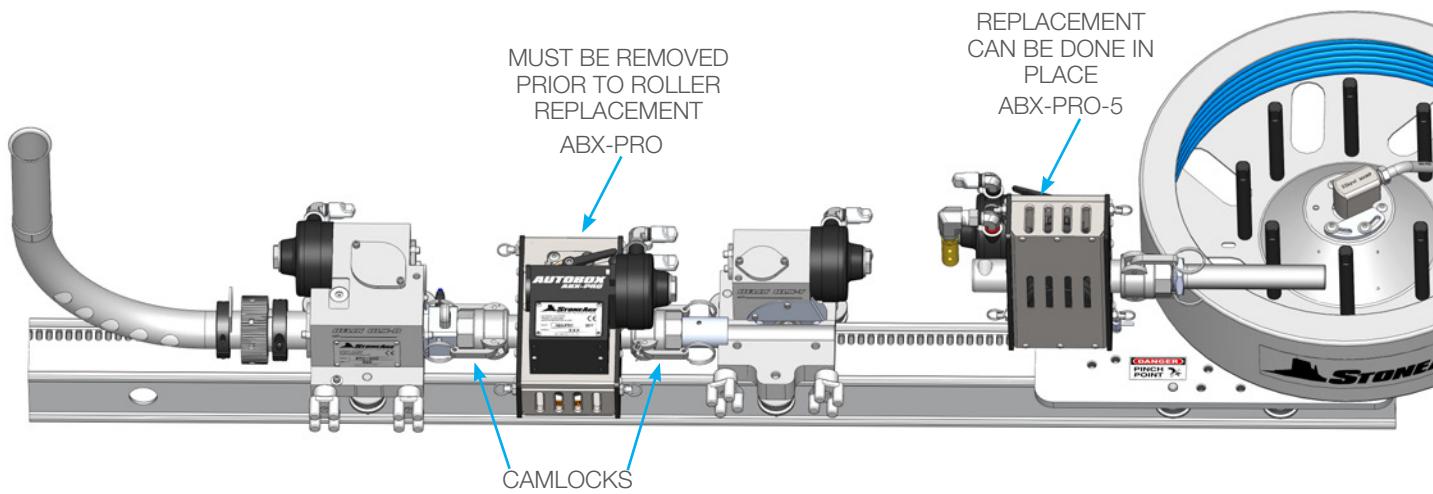
ROLLER REPLACEMENT INSTRUCTIONS

ROLLER REPLACEMENT

It will be necessary to replace rollers when they are worn or if changing to a Helix hose. The following steps will be typical for Poly and Helix Roller replacements for both ABX-PRO Tractor and ABX-PRO-5 Tractor Assemblies. The ABX-PRO Tractor must be removed from the BTC-200 Assembly to access the Rollers inside the tractor housing. Removing the ABX-PRO Tractor is a simple process. Remove the waterblast tool from the end of the hose. Retract the hose into the Hose Containment. Release both Camlocks on the ABX-PRO-5 Tractor to release it from the BTC-200 Assembly. The roller replacement on the ABX-PRO-5 Tractor can be done in place.

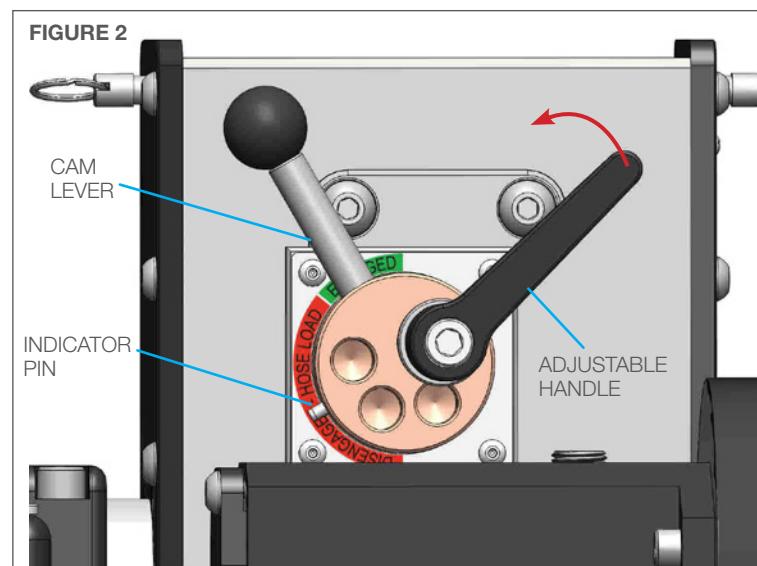
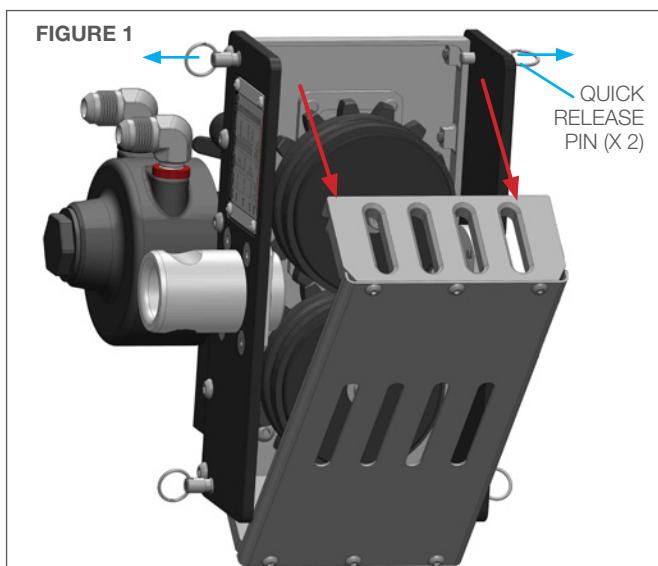
⚠ WARNING

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.



ROLLER REMOVAL

1. Open the back cover of the tractor by pulling the top two Quick Release Pins in the outward direction. (**Figure 1**)
2. Push the Adjustable Handle in the counterclockwise direction to loosen the CAM Lever and bushing. Next, push the Eccentric Lever in the counterclockwise direction, moving the indicator pin to “**Disengaged**”. (**Figure 2**)



ROLLER REPLACEMENT INSTRUCTIONS

3. Loosening the Cam Lever opens up the space between the Spline Roller Assemblies. (**Figure 3**)
4. Remove the two socket head cap screws, Roller Washers, Hub Outer Plates and Rollers. (**Figure 4**)

FIGURE 3

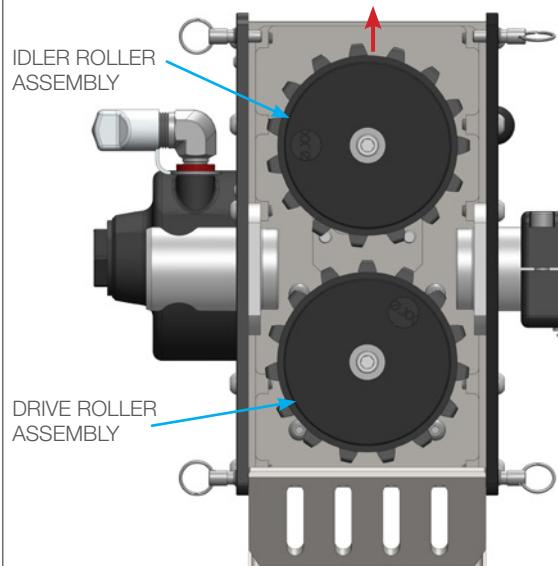
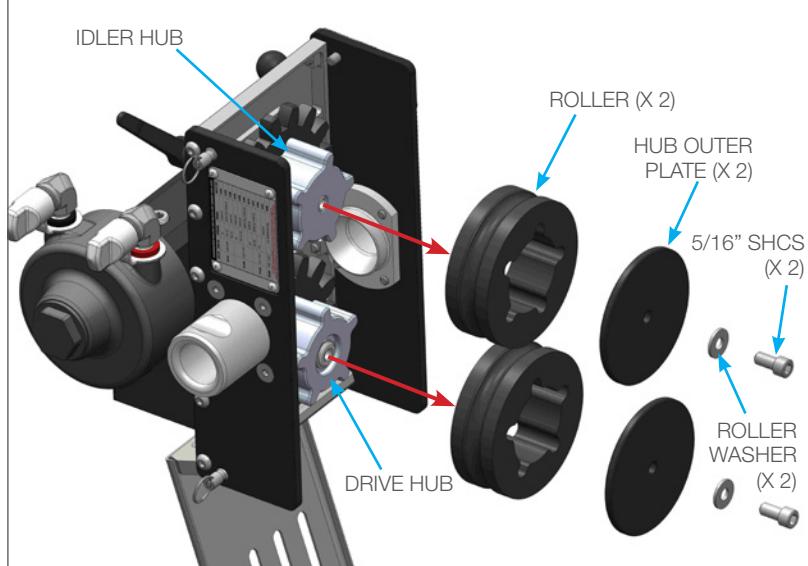


FIGURE 4



POLY ROLLER INSTALLATION (See the Step 6 for Helix Roller Kit installation)

5. Slide the new Poly Rollers onto the Hubs. Be sure to align the holes in Hub Outer Plates so the size inscription on the Poly Roller shows through. (**Figure 6**) Then fasten the Hub Outer Plates and Roller Washers onto the Hubs with the two 5/16" socket head cap screws. Lightly coat the threads with Blue Goop® a Swagelock Brand Anti-seize. An equivalent alternative is acceptable. (**Figure 5**) **Skip to Step 9.**

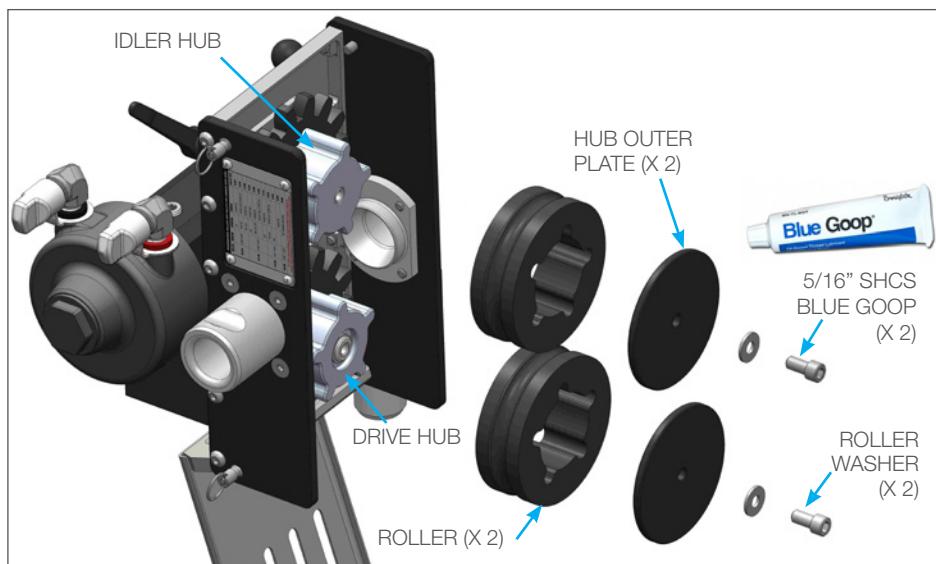


FIGURE 5

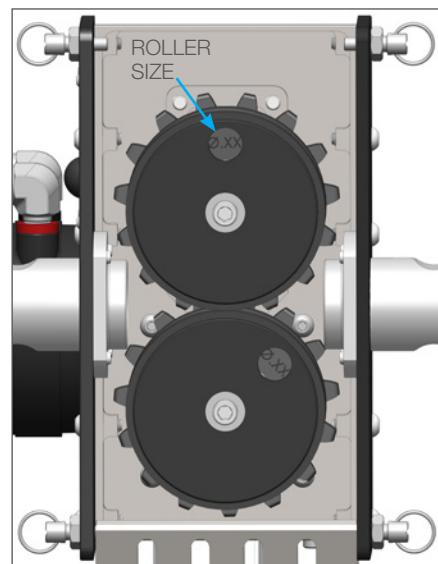
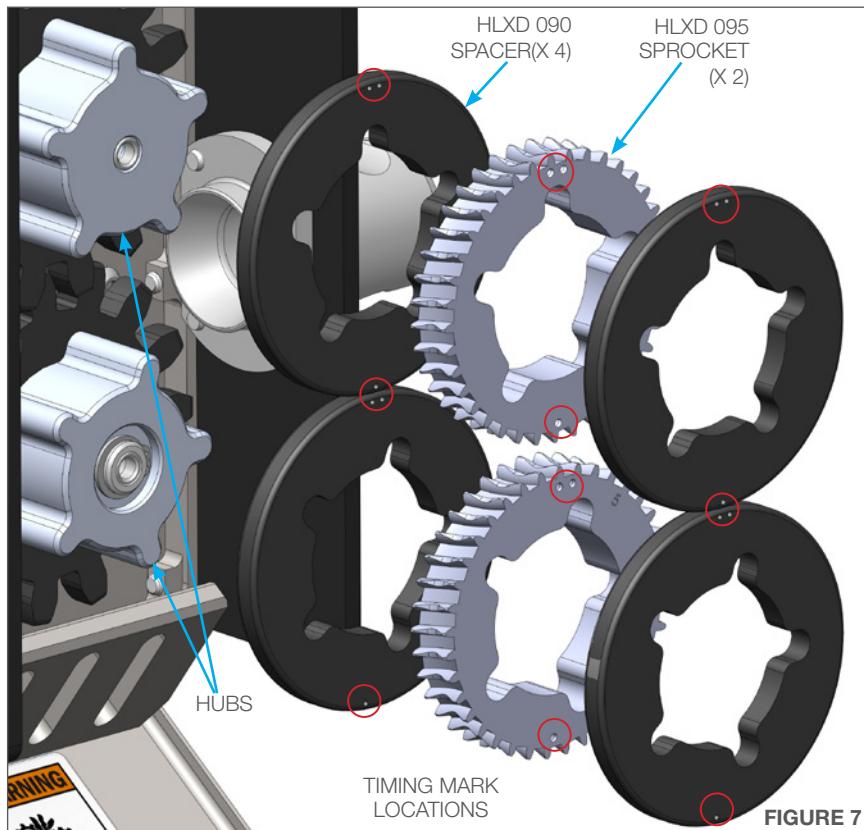


FIGURE 6

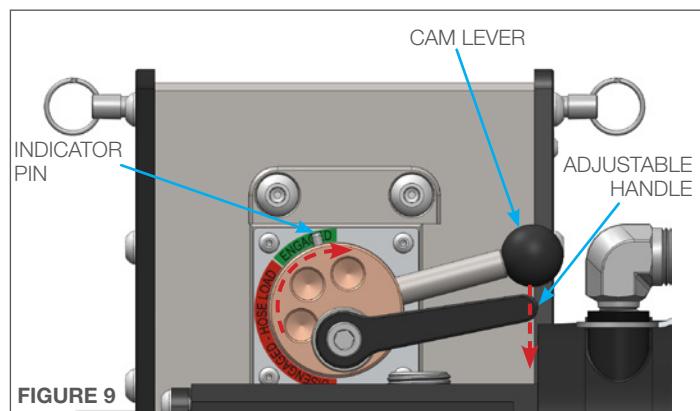
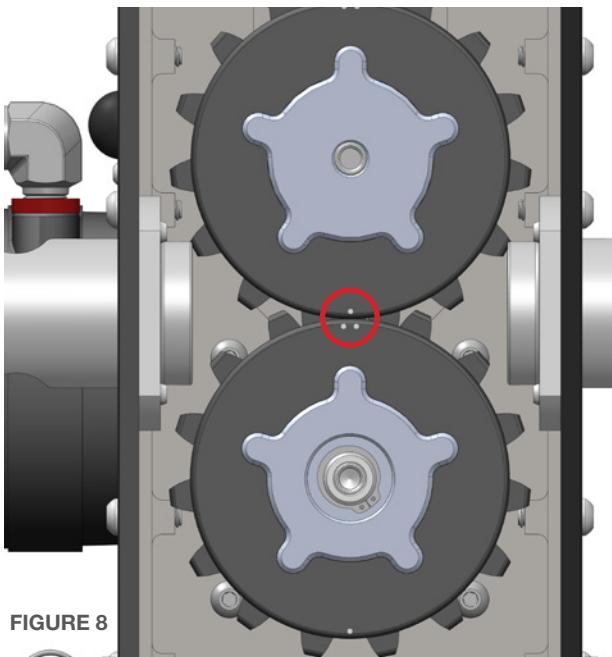
ROLLER REPLACEMENT INSTRUCTIONS

HELIX ROLLER KIT INSTALLATION

- If installing the Helix Roller Kit, align the timing marks on Spacers and Sprockets as shown in **(Figure 7)** and slide a set onto each Hub.

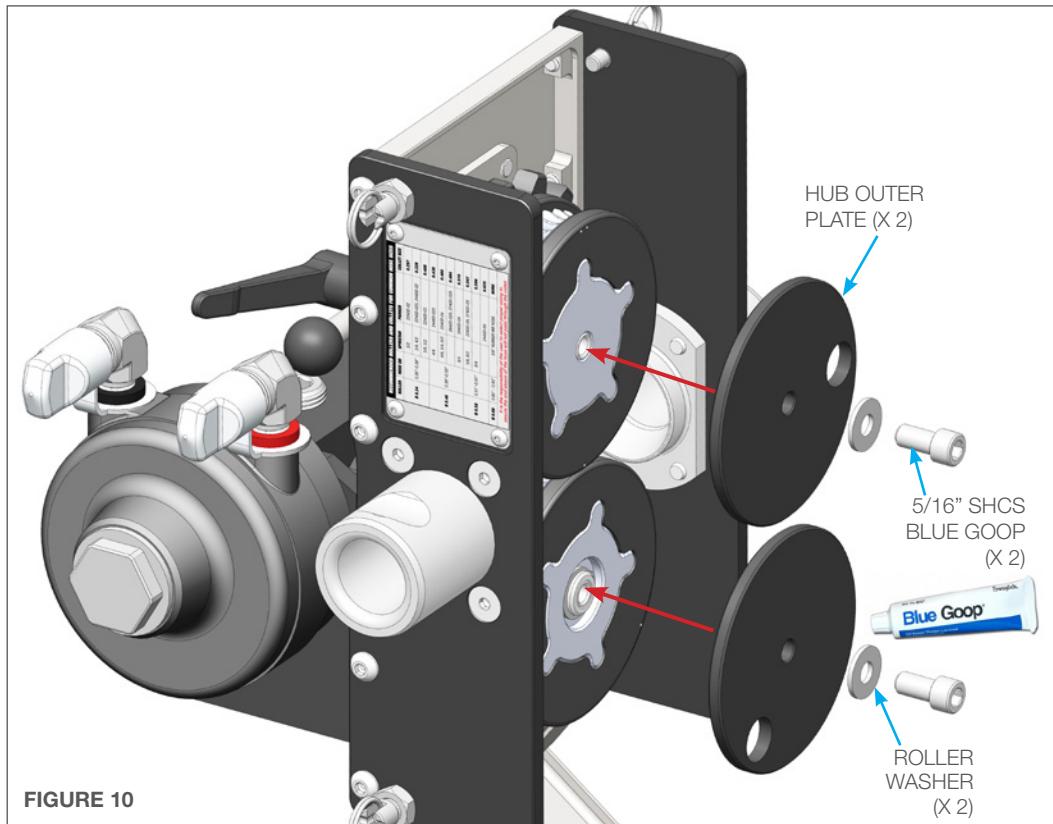


- The dots must also be aligned between the 2 sprockets when the tractor lever is set into the "ENGAGED" range. **(Figures 8 &9)** This alignment is crucial to the sprockets engaging the helix wrap correctly. The drive will jam if sprockets not aligned.

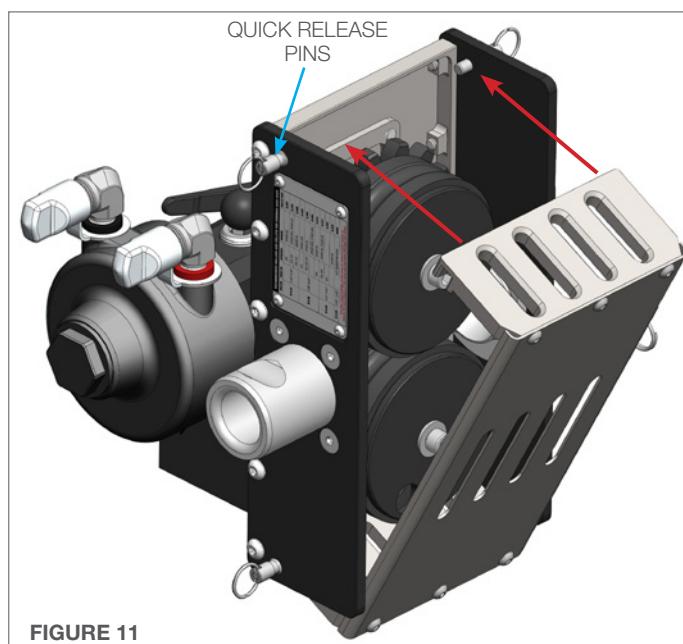


ROLLER REPLACEMENT INSTRUCTIONS

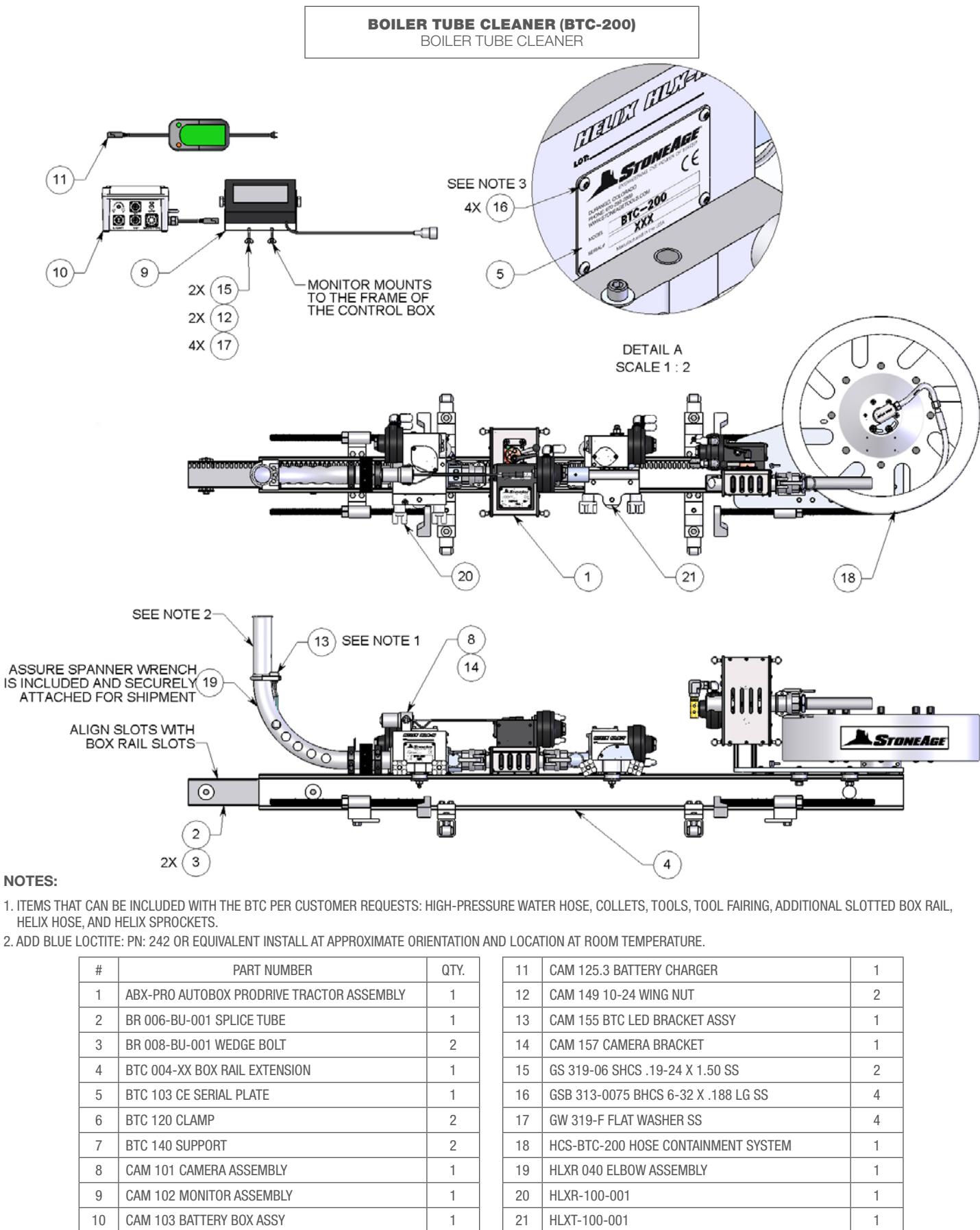
- Fasten the Hub Outer Plates and Roller Washers onto the Hubs with the two 5/16" socket head cap screws. Lightly coat the threads with Blue Goop® a Swagelock Brand Anti-seize. An equivalent alternative is acceptable. (**Figure 10**)

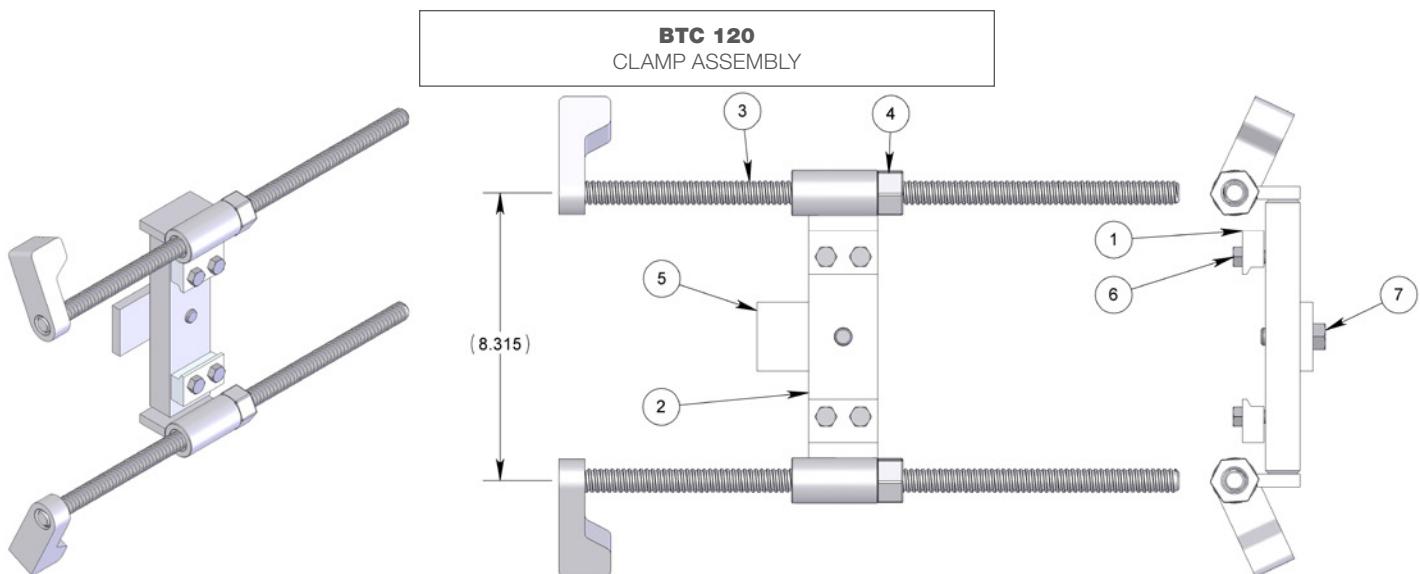


- Push the back cover back into the closed position and secure the two Quick Release Pins on the top of the tractor. (**Figure 11**)

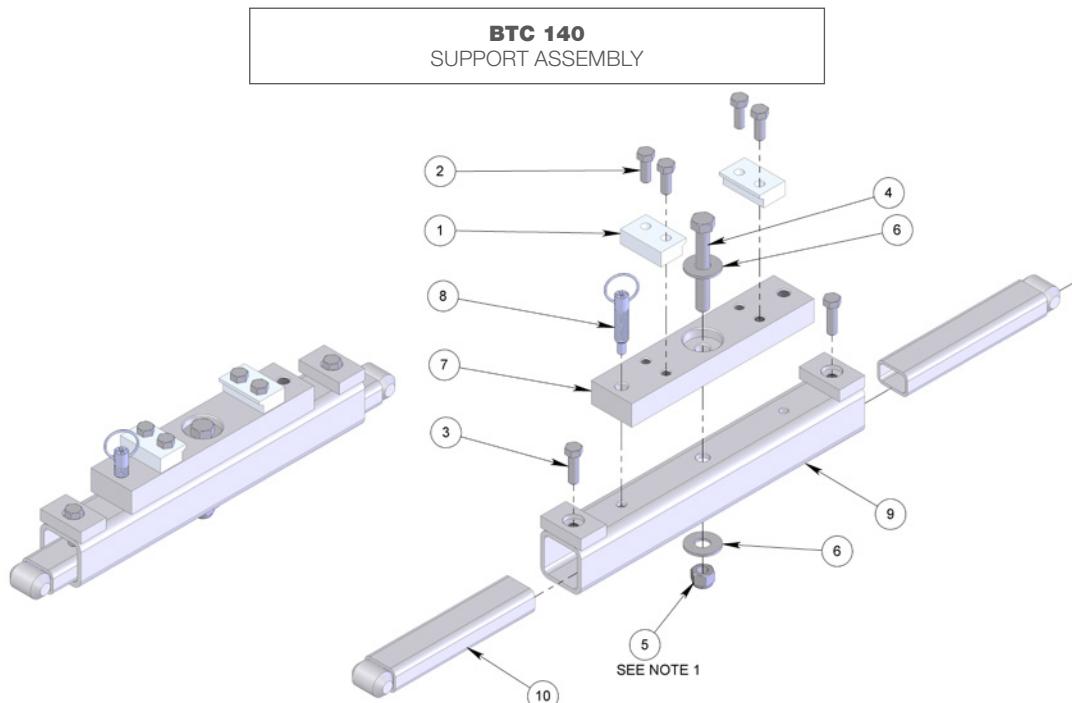


PARTS DIAGRAM





#	PART NUMBER	QTY.
1	BR 060-D RAIL CLAMP, DRILLED	2
2	BTC 121 CLAMP WELDMENT	1
3	BTC 122 ACME WELDMENT	2
4	BTC 123 ACME NUT	2
5	BTC 124 SUPPORT PLATE	1
6	GB 537-04 BOLT, HEX .37-16 X 1.00	4
7	GB 550-06 BOLT, HEX .50-13 X 1.50	1



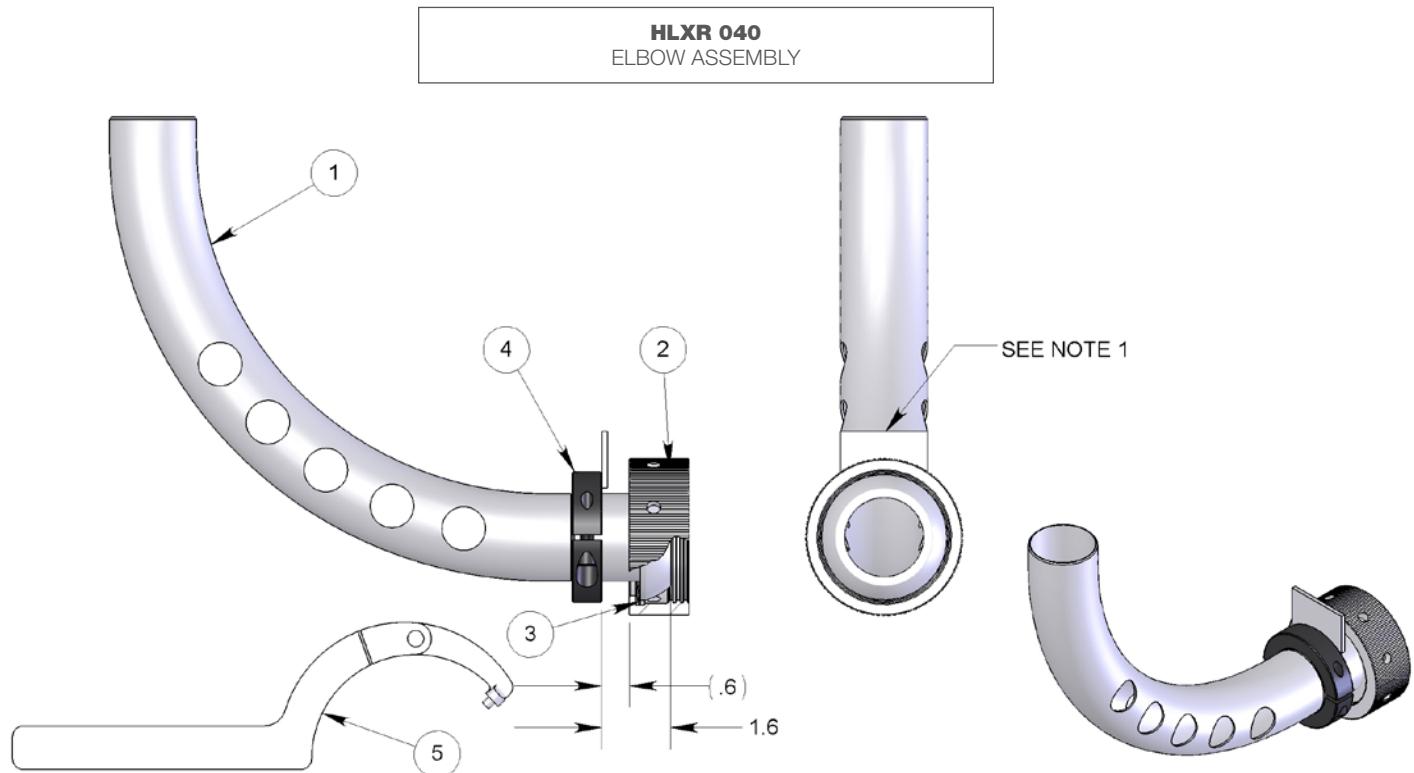
NOTE:

1. DO NOT TIGHTEN COMPLETELY, ASSEMBLY MUST ROTATE FREELY.

#	PART NUMBER	QTY.
1	BR 060-D RAIL CLAMP, DRILLED	2
2	GB 537-04 BOLT, HEX .37-16 X 1.00	4
3	GB 537-05 BOLT, HEX .37-16 X 1.25	2
4	GB 350-07 BOLT, HEX .50-13 X 1.75 SS	1
5	GN 550-L NYLOCK NUT	1

6	GW 343-F FLAT WASHER SS	2
7	BTC 143 PIVOT PLATE	1
8	BTC 144 SPRING PLUNGER	1
9	BTC 141 TUBE, OUTER WELDMENT	1
10	BTC 142 TUBE, INNER WELDMENT	2

PARTS DIAGRAM

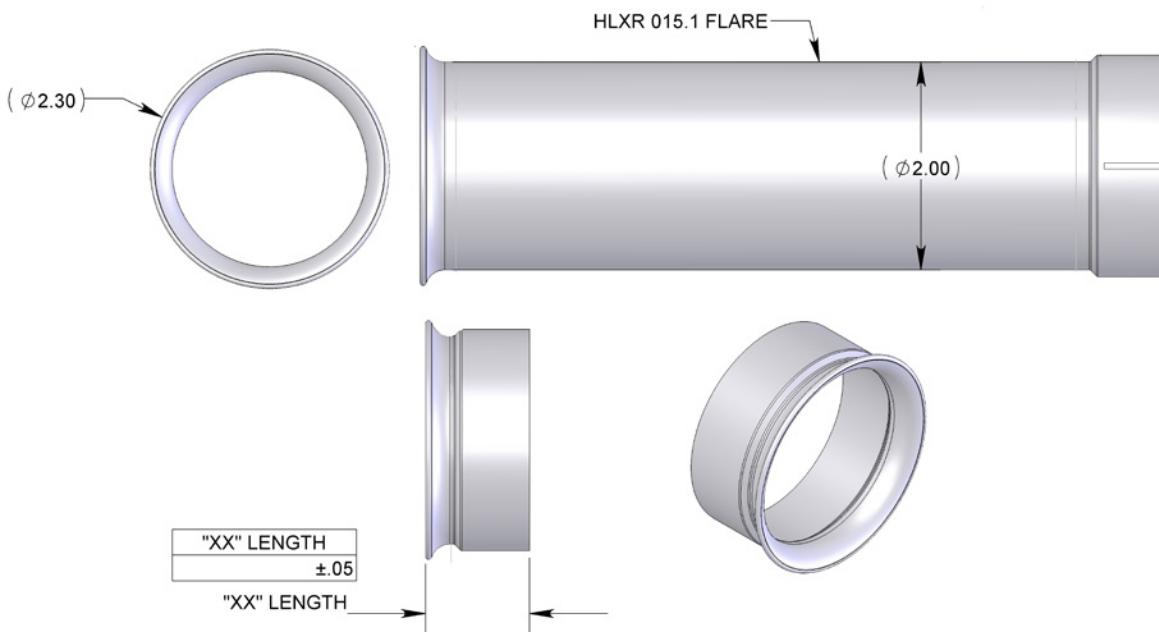


NOTES:

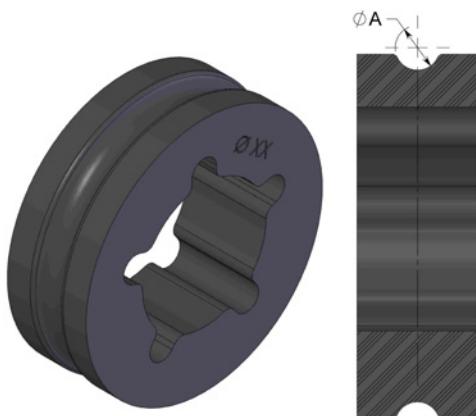
1. ALIGN ELBOW STOP VERTICALLY TO ELBOW BY VISUAL ESTIMATE, APPROXIMATELY AS SHOWN.

#	PART NUMBER	QTY.
1	HLXR 010 ELBOW, WELDMENT	1
2	HLXR 011 KNURLED NUT	1
3	HLXR 012 WAVE SPRING, ELBOW	1
4	HLXR 013 STOP, ELBOW	1
5	HLXR 050 TOOL	1

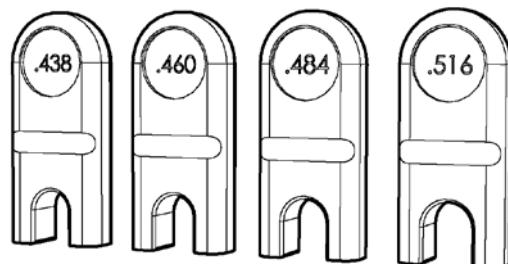
HLXR 015-XX
FLARE



PRO174-46
HOSE DRIVE ROLLER



FF 121-XXX
COLLET STOPS

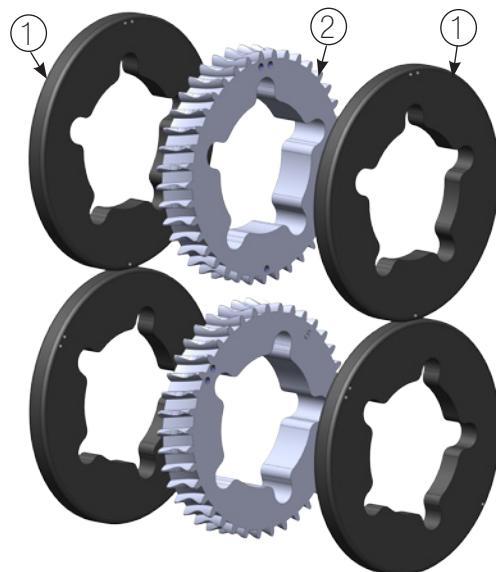


The BTC-200 BOILER TUBE CLEANER comes with one customer specified FF 121-XXX Collet installed in the BOP 030 Collet Block Assembly. It is necessary to change the Collet size when changing to a different diameter hose. THE REPLACEMENTS SHOWN IN THE CHART BELOW ARE THE ONLY SIZES TO BE USED WITH THE BTC-200 ASSEMBLY.

ROLLER INSIDE ABX-PRO	HOSE O.D.	SPIR STAR	PARKER	COLLET SIZE	STONEAGE PART NUMBER
PRO 174-46 Ø 0.46 IN.	0.39 - 0.50 IN.	4/4	2440D-025	0.438 in. / 11.0 mm	FF 121-438
		5/4		0.460 in. / 11.7 mm	FF 121-460
			2440D-03	0.484 in. / 12.3 mm	FF 121-484
		6/4	2440D-04	0.516 in. / 13.0 mm	FF 121-516

HLXD 625
HELIX DRIVE ROLLER KIT

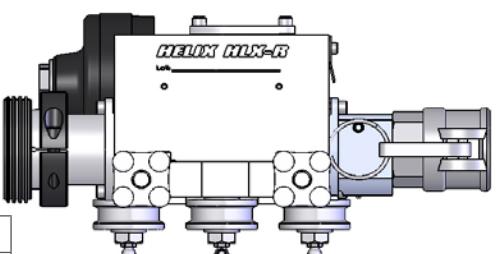
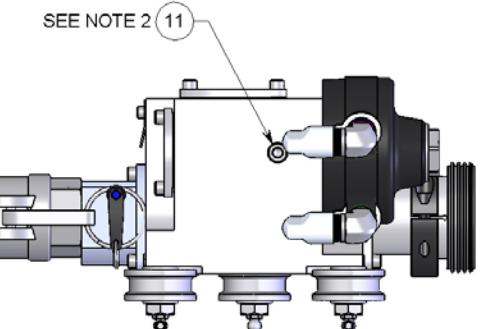
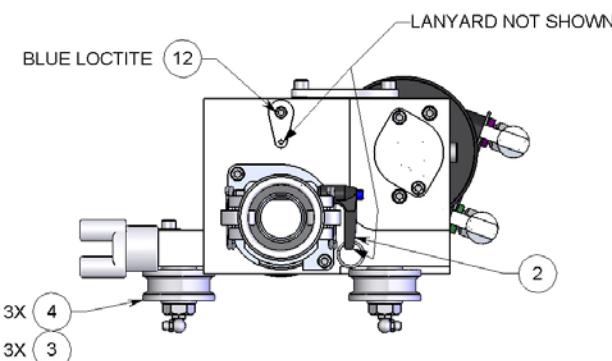
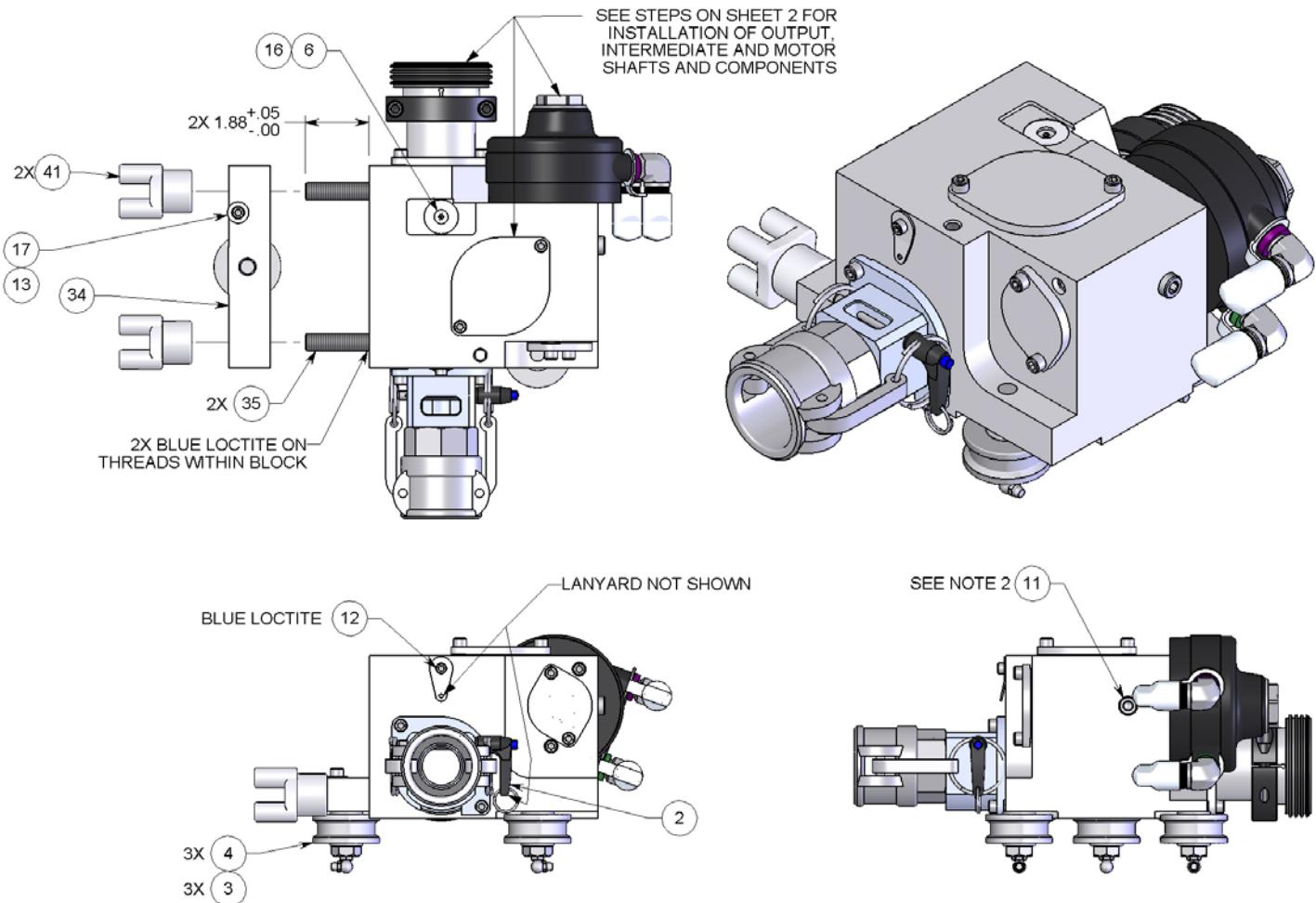
#	PART NUMBER	QTY.
1	HLXD 090 HLX 5 SPACER	4
2	HLXD 095 HLX 5 SPROCKET	2



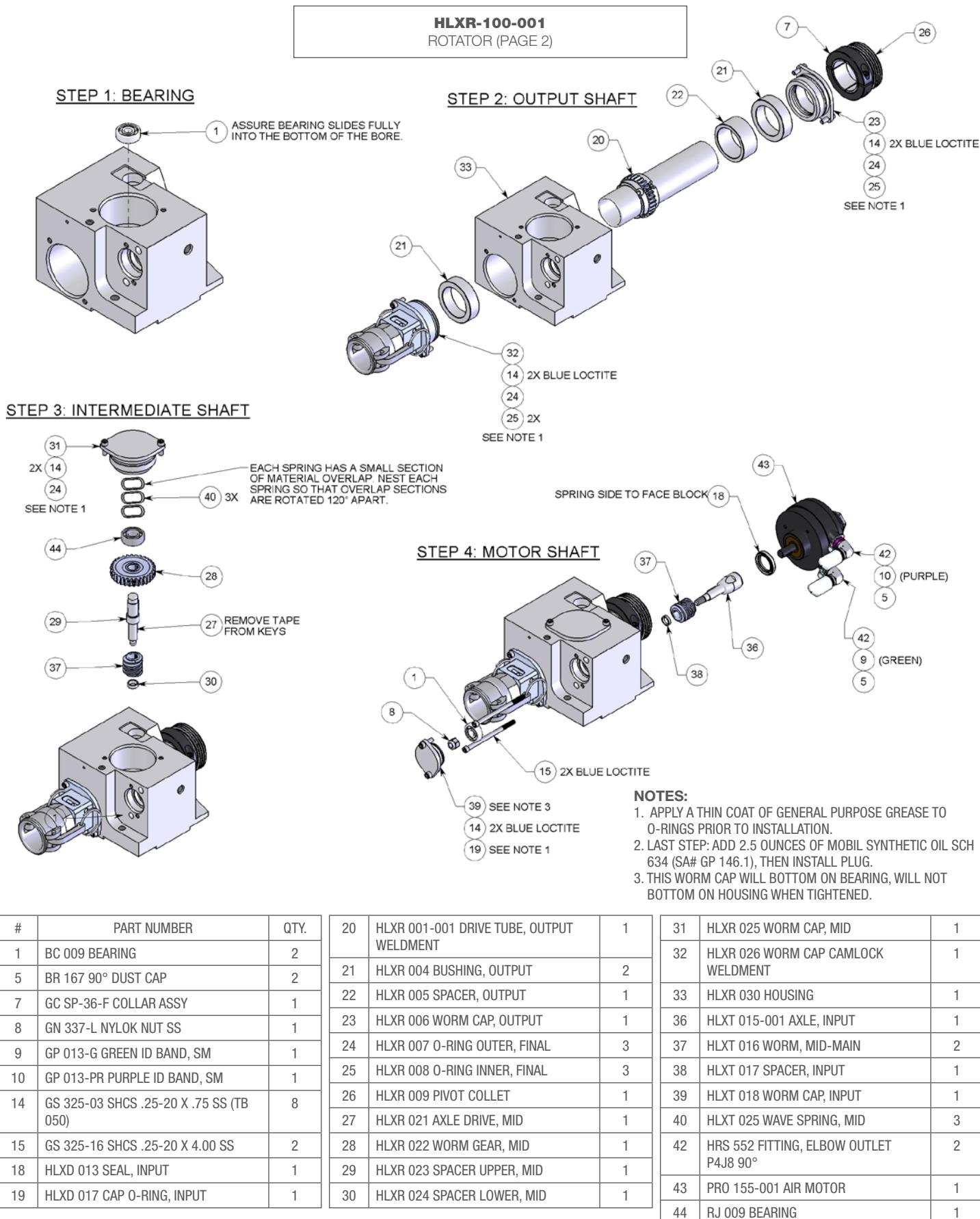
If changing rollers on both the ABX-PRO Tractor and the ABX-PRO-5 Hose Containment Drive, order a quantity of two HLXD 625 kits.

PARTS DIAGRAM

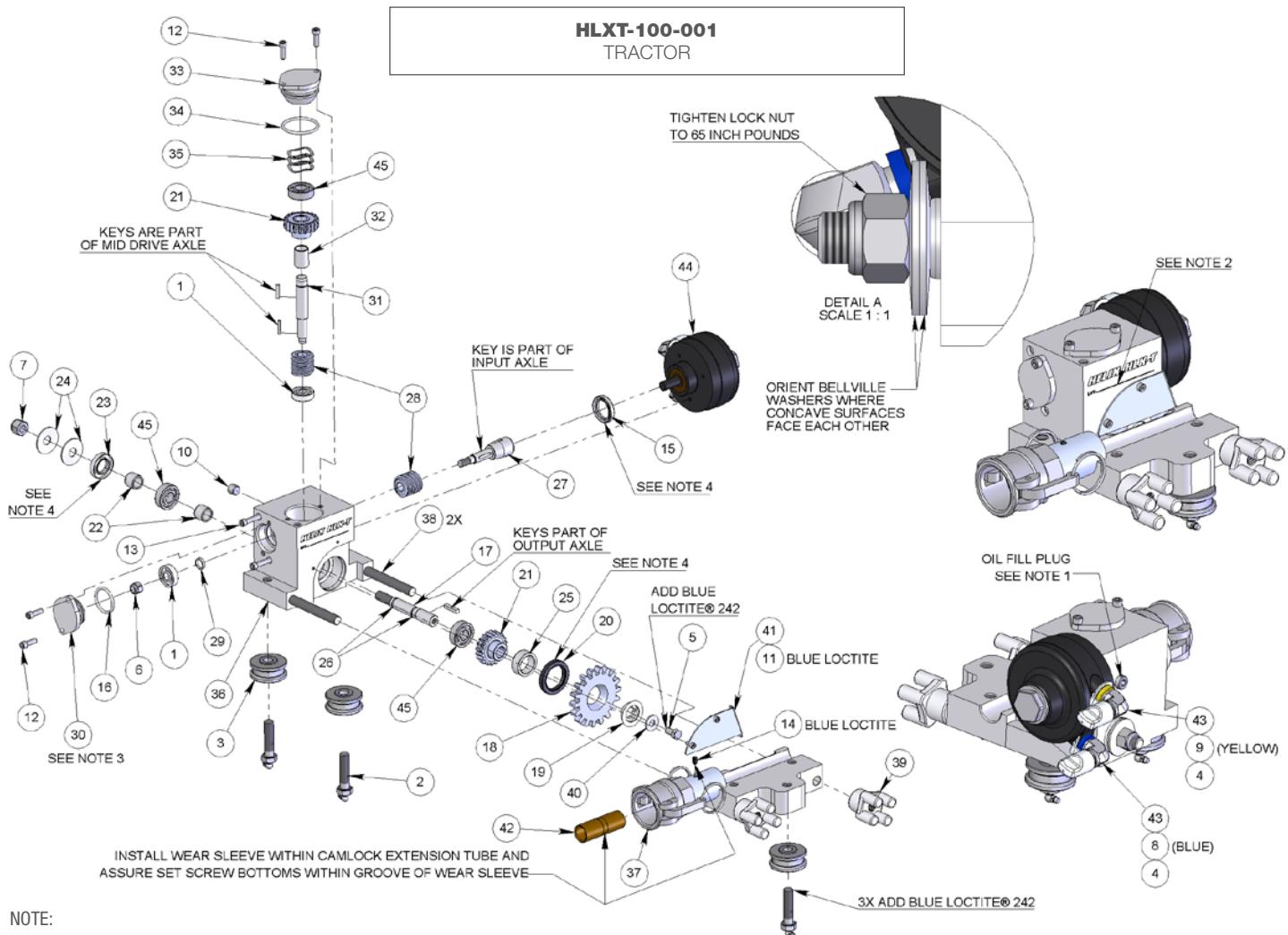
HLXR-100-001
ROTATOR (PAGE 1)



#	PART NUMBER	QTY.
2	BOP 033 QUICK PIN	1
3	BR 052-2.0-90 AXLE-ZERK	3
4	BR 055 ROLLER ASSY	3
6	CAM 161 MAGNET	1
11	GP 025-P4SS HEX SOCKET PLUG	1
12	GS 319-015 SHCS .19-24 X .38 SS	1
13	GS 325-02 SHCS .25-20 X .50 SS	1
16	GSF 319-03 FHCS .19-24 X .75 LG SS	1
17	GW 325-F FLAT WASHER SS	1
34	HLXR 031 SPLIT CLAMP	1
35	HLXR 033 .50-13 THREADED ROD SS	2
41	HLXT 038 BAR KNOB-.50	2



PARTS DIAGRAM



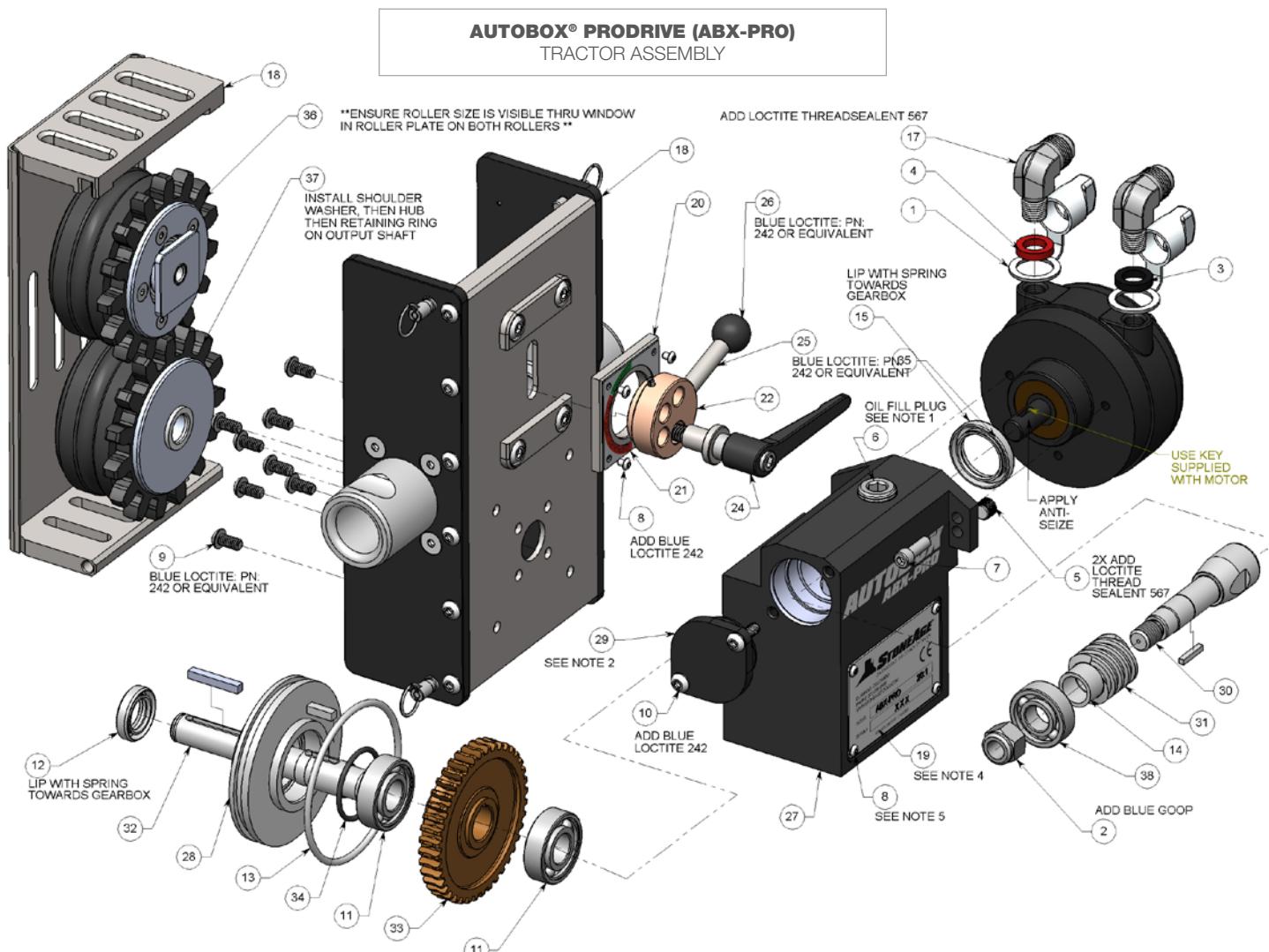
NOTE:

1. ADD 1.5 OUNCES OF MOBIL SYNTHETIC OIL SCH 634 (SA# GP 146.1)
2. LOT# TO BE ADDED BY STONEAGE.
3. THIS WORM CAP WILL BOTTOM ON BEARING, WILL NOT BOTTOM ON HOUSING WHEN TIGHTENED
4. ALL SEALS MUST HAVE LIP WITH SPRING FACING GEAR BOX.

#	PART NUMBER	QTY.
1	BC 009 BEARING	2
2	BR 052-2.0-90 AXLE-ZERK	3
3	BR 055 ROLLER ASSY	3
4	BR 167 90° DUST CAP	2
5	GB 331-025 BOLT, HEX .31-18 X .625 SS	1
6	GN 337-L NYLON NUT SS	1
7	GN 350-L-20 NYLOK NUT SS	1
8	GP 013-B BLUE ID BAND, SM	1
9	GP 013-Y YELLOW ID BAND, SM	1
10	GP 025-P4SS HEX SOCKET PLUG	1
11	GS 319-015 SHCS .19-24 X .38 SS	2
12	GS 325-03 SHCS .25-20 X .75 SS (TB 050)	4
13	GS 325-16 SHCS .25-20 X 4.00 SS	2
14	GSS 325-20-37CU SET SCREW	1

15	GW 319-F FLAT WASHER SS	2
16	HLXD 013 SEAL, INPUT	1
17	HLXD 017 CAP O-RING, INPUT	1
18	HLXT 001 AXLE, OUTPUT	1
19	HLXT 002 SPUR GEAR, OUTPUT	1
20	HLXT 003 BUSHING, OUTPUT	1
21	HLXT 004 34 X 48 X 7 TC SEAL, FINAL	1
22	HLXT 005 WORM GEAR, OUTPUT	2
23	HLXT 006 SPACER, OUTPUT	2
24	HLXT 007 20 X 36 X 7 TC SEAL, FINAL	1
25	HLXT 008 BELLVILLE WASHER	2
26	HLXT 009 SEAL SLEEVE, OUTPUT	1
27	HLXT 010 O-RING, FINAL	2
28	HLXT 015-001 AXLE, INPUT	1
29	HLXT 016 WORM, MID-MAIN	2
30	HLXT 017 SPACER, INPUT	1
31	HLXT 018 WORM CAP, INPUT	1

32	HLXT 021 AXLE, MID	1
33	HLXT 022 GEAR SPACER, MID	1
34	HLXT 023 WORM CAP, MID	1
35	HLXT 024 O-RING, MID	1
36	HLXT 025 WAVE SPRING, MID	3
37	HLXT 030 HOUSING	1
38	HLXT 031-001 LOWER CHASSIS CLAMP WELDMENT	1
39	HLXT 033 .50-13 THREADED ROD	2
40	HLXT 038 BAR KNOB-.50	2
41	HLXT 042-FLAT WASHER..375 SS	1
42	HLXT 043 GEAR COVER	1
43	HLXT 044 WEAR SLEEVE	1
44	HRS 552 FITTING, ELBOW OUTLET P4J8 90°	2
45	PRO 155-001 AIR MOTOR	1
46	RJ 009 BEARING	3



NOTE:

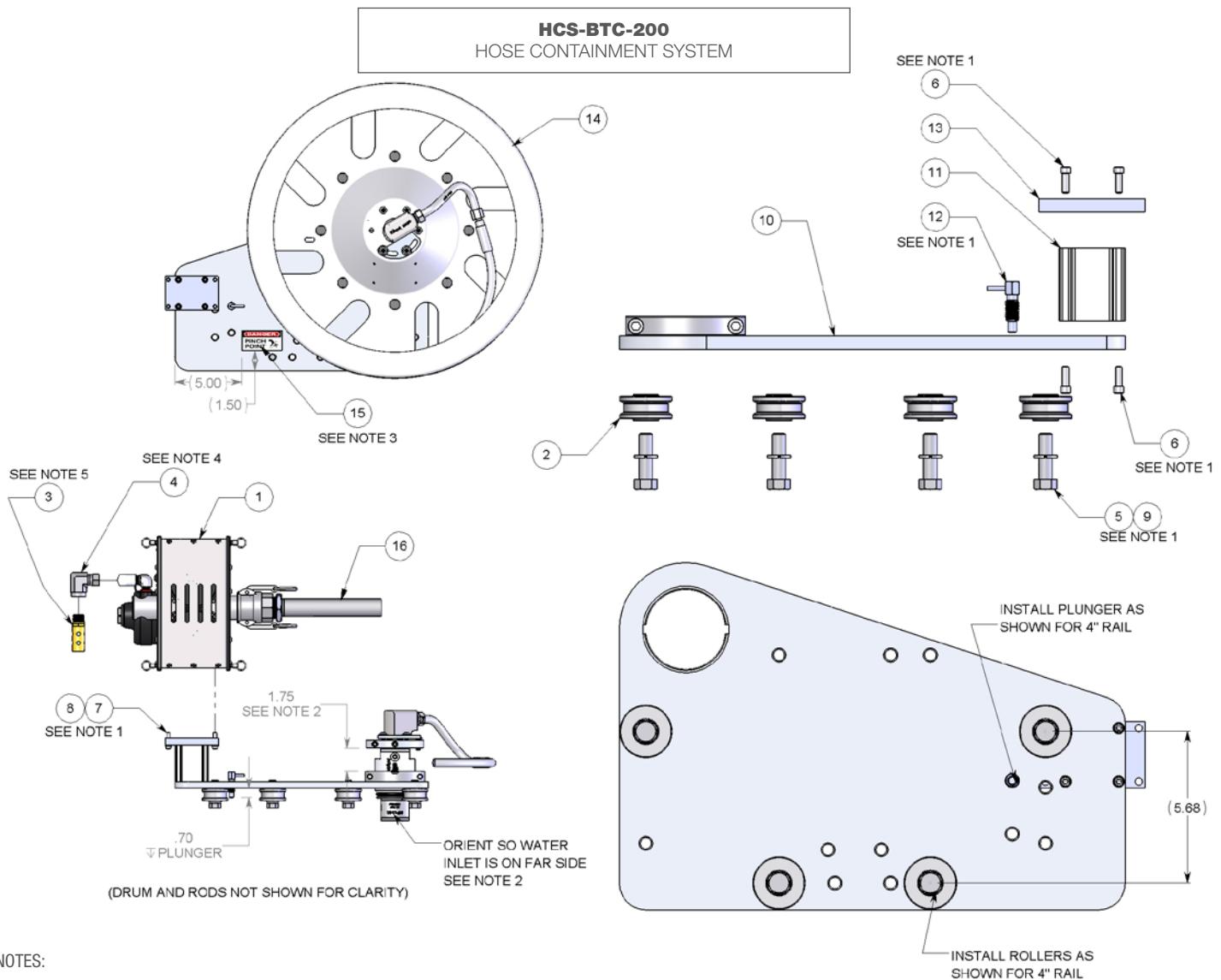
1. ADD 5.0 OUNCES OF MOBIL SYNTHETIC OIL SCH 634 (SA# GP 146.1)
2. THIS WORM CAP WILL BOTTOM ON BEARING, WILL NOT BOTTOM ON HOUSING WHEN TIGHTENED
3. ADD PRELUBE TO ALL SHAFTS, GEARS, BEARINGS, AND SEALS.
4. CLEAN SURFACE PRIOR TO INSTALLING SERIAL PLAQUE. STAMP IN ACCORDANCE WITH WORK INSTRUCTIONS.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

#	PART NUMBER	QTY.
1	BR 167 90° DUST CAP	2
2	GN 550-L NYLOK NUT	1
3	GP 013-BK BLACK ID BAND, SM	1
4	GP 013-R RED ID BAND, SM	1
5	GP 025-P2SS HEX SOCKET PLUG	1
6	GP 025-P8SS HEX SOCKET PLUG	1
7	GS 325-03 SHCS .25-20 X .75 SS (TB 050)	2
8	GSB 313-0075 BHCS 6-32 X .188 LG SS	8
9	GSB 325-02 BHCS .25-20 X .50 LG SS	8
10	GSB 325-03 BHCS .25-20 X .75 LG SS	2
11	HLXD 002 BEARING, OUTPUT	2
12	HLXD 003 SEAL, OUTPUT	1

13	HLXD 006 O-RING, OUTPUT	1
14	HLXD 011 SPACER	1
15	HLXD 013 SEAL, INPUT	1
16	HLXD 017 CAP O-RING, INPUT	1
17	HRS 552 FITTING, ELBOW OUTLET P4J8 90°	2
18	PRO 101 HOUSING ASSEMBLY	1
19	PRO 109 CE SERIAL PLATE	1
20	PRO 112 CAM PLATE	1
21	PRO 113 CAM PLATE, DECAL	1
22	PRO 114 CAM BUSHING	1
23	PRO 115 ROLL PIN	1
24	PRO 116 ADJUSTABLE HANDLE ASSEMBLY	1

25	PRO 117 CAM LEVER SHAFT	1
26	PRO 118 CAM LEVER KNOB	1
27	PRO 130 GEARBOX HOUSING	1
28	PRO 131 BULKHEAD, OUTPUT	1
29	PRO 132 INPUT CAP	1
30	PRO 133 INPUT SHAFT	1
31	PRO 134 WORM 20-1	1
32	PRO 136 OUTPUT SHAFT	1
33	PRO 137 WORM GEAR 20-1	1
34	PRO 138 O-RING	1
35	PRO 155-001 AIR MOTOR	1
36	PRO 170 IDLER ROLLER ASSEMBLY	1
37	PRO 181 DRIVE ROLLER ASSEMBLY	1
38	RJ 009 BEARING	1

PARTS DIAGRAM

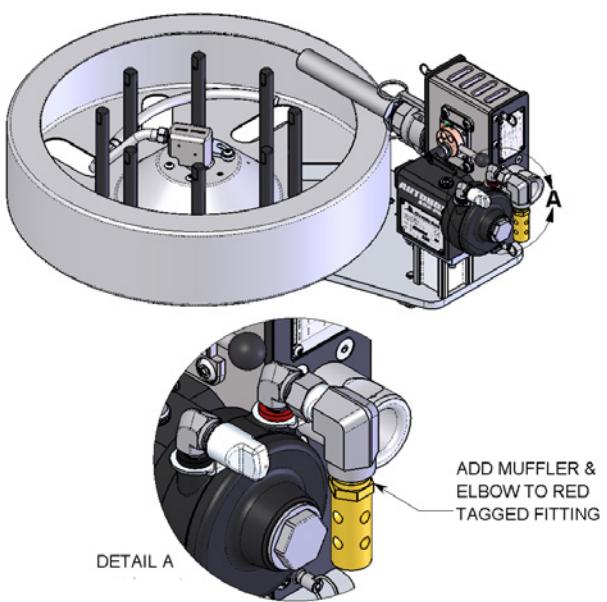


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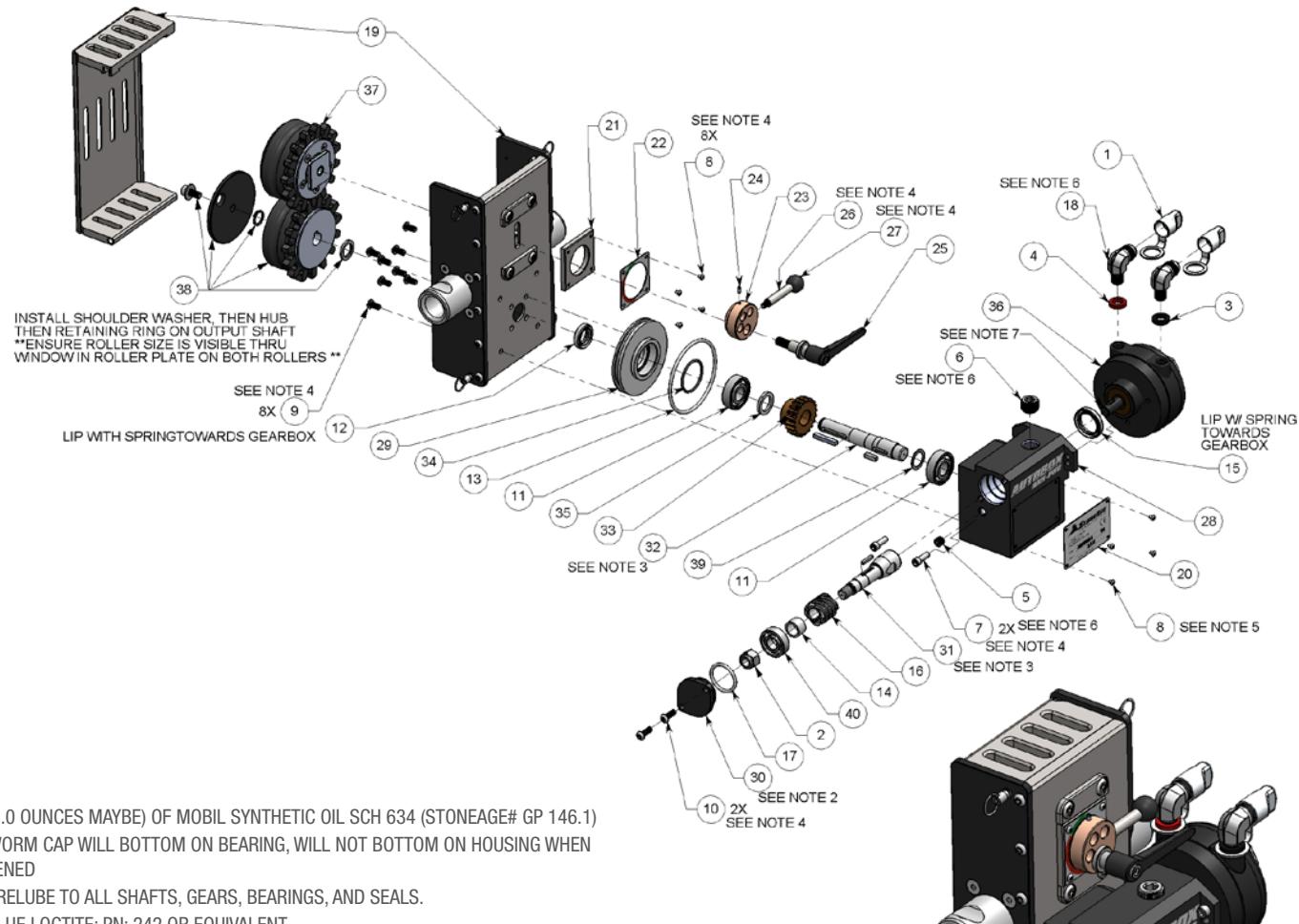
1. ADD BLUE LOCTITE: PN: 242 OR EQUIVALENT TO ALL THREADED HARDWARE
2. SECURE SWIVEL WITHIN CLAMP ON BASE PLATE AT HEIGHT & ORIENTATION SHOWN IN SIDE VIEW.
3. CLEAN ALL DEBRIS & OILS BEFORE INSTALLING. INSTALL AT APPROXIMATE ORIENTATION AND LOCATION & AT ROOM TEMP.
4. ADD BLUE GOOP, IT IS A SWAGELOK BRAND ANTI-SEIZE. AN EQUIVALENT ALTERNATIVE IS ACCEPTABLE.
5. ADD LOCTITE THREAD SEALANT ® 567 OR EQUIVALENT TO ALL NPT THREADS.

#	PART NUMBER	QTY.
1	ABX-PRO-5 AUTOBOX PRODRIVE TRACTOR ASSEMBLY	1
2	BR 055-SS ROLLER ASSY	4
3	BR 155 MUFFLER	1
4	CB 162 FTG, P8FJ8F 90DEG ELBOW	1
5	GB 350-07 BOLT, HEX .50-13 X 1.75 SS	4
6	GS 325-03 SHCS .25-20 X .75 SS	8
7	GS 325-04 SHCS .25-20 X 1.00 SS (BC 053)	4

8	GW 325-L LOCK WASHER SS	4
9	GW 350-L LOCK WASHER SS	4
10	HCS 101-001 DRUM BASE PLATE WELDMENT	1
11	HCS 102-001 2.5IN BOX RAIL, CUT AND TAPPED	1
12	HCS 115 RETRACTABLE SPRING PLUNGER	1
13	HCS 124 TOP PLATE, MOUNT	1
14	HCS-200-24-MP12TM9	1
15	PL 160 PINCH POINT 1.5X3.0 DECAL	1
16	PRO 190-08 GUIDE ASSEMBLY	1

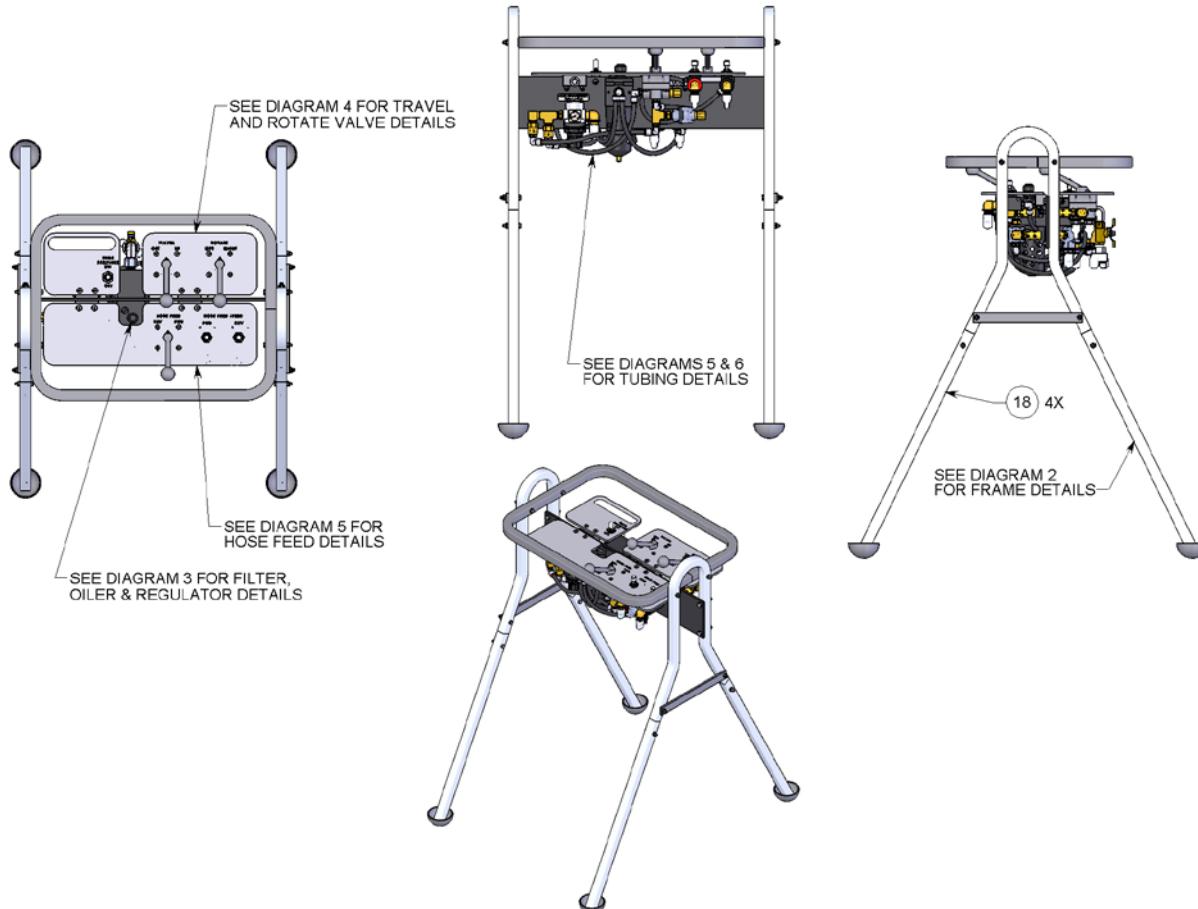


ABX-PRO-5
AUTOBLOCK PRODRIVE TRACTOR ASSEMBLY 5:1 RATIO



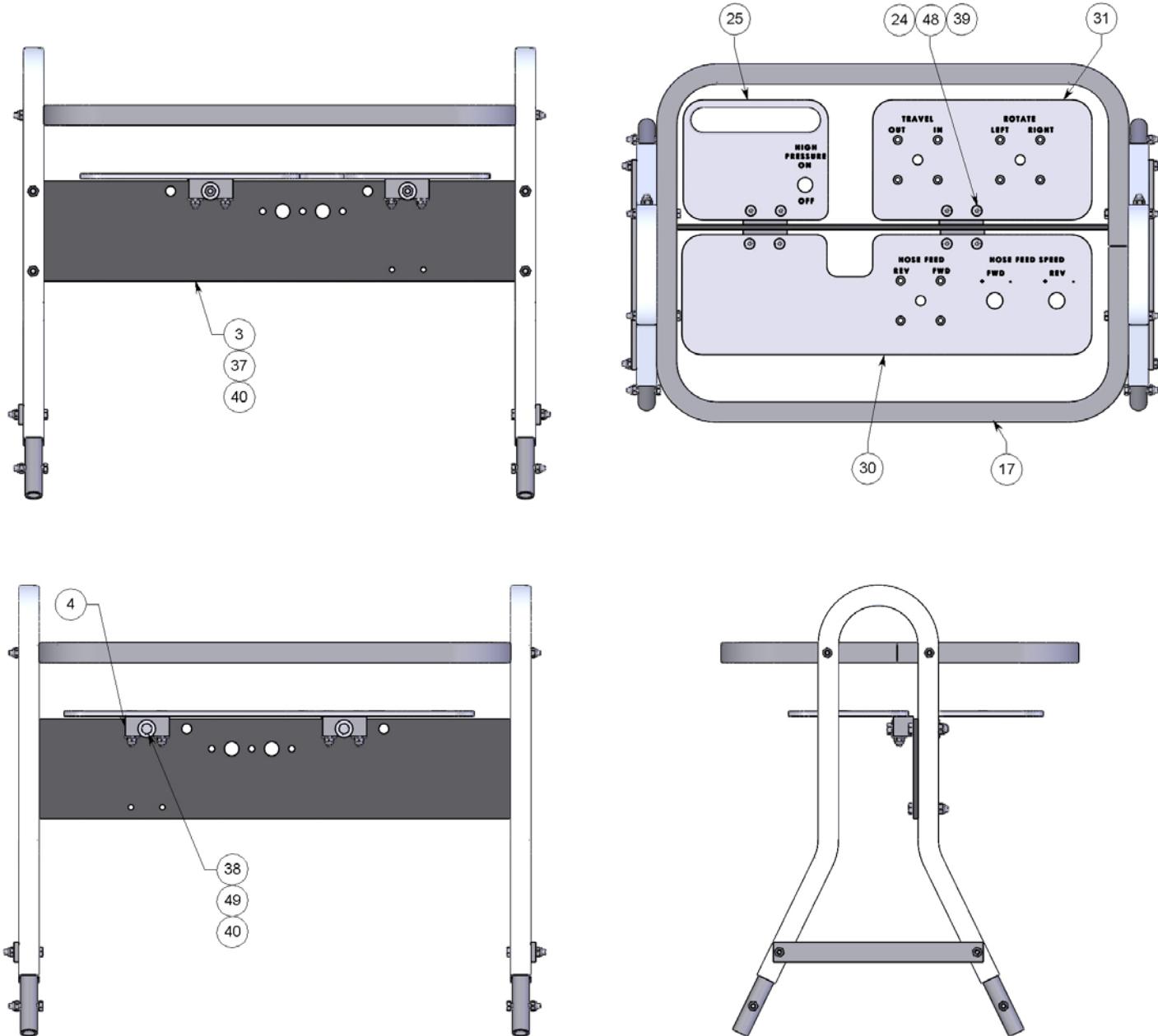
PARTS DIAGRAM

CB-BTC-200
BTC CONTROL BOX (DIAGRAM 1)



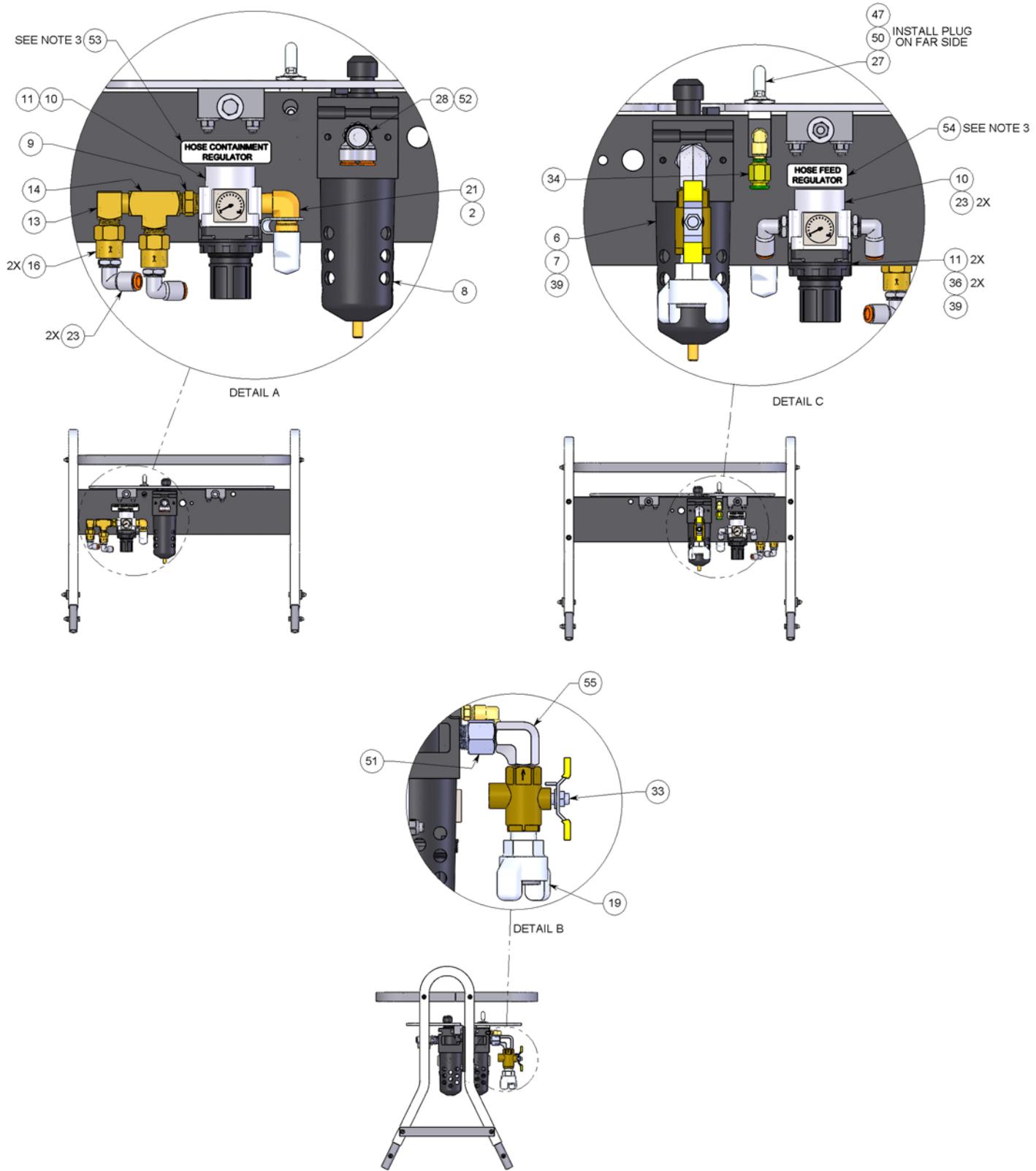
#	PART NUMBER	QTY			
1	BR 154 MUFFLER, P6M	5	20	CB 122 FTG, NIPPLE P6 JIC8	4
2	BR 167 DUST CAP	7	21	CB 126 FTG, ELBOW 90 P6M JIC8	3
3	CB 004-BTC MOUNTING PLATE	1	22	CB 142 VALVE SELECTOR	3
4	CB 006 MOUNTING BLOCK	4	23	CB 352 FTG P6PL6 SWIVEL ELBO	13
5	CB 011-001 QUICK EXHAUST VALVE, P6	2	24	CB 508 FSHCS, 1/4-20 X 1-3/4" SS	8
6	CB 020 FILTER	1	25	CB 513 DUMP PLATE, ABX	1
7	CB 021 SHCS, 1/4-20 X 1-1/4 BLK	2	26	CB 514 SPACER	1
8	CB 022 OILER	1	27	CB 515 TOGGLE 3 WAY, MOM, MOM	1
9	CB 026 FTG, NIPPLE P6	5	28	CB 516 FTG, 4 WAY MANIFOLD, P6M X PL6	1
10	CB 032 AIR REGULATOR	2	29	CB 528 FLOW CONTROL VALVE, P6	2
11	CB 033 MOUNTING BRACKET FOR K33 AIR REGULATOR	2	30	CB 532 MAIN PLATE	1
12	CB 034 FTG, NIPPLE, P6, 2.5" L, BRASS	1	31	CB 533 POSITION PLATE	1
13	CB 035 FTG, ELBOW, P6F X P6M, BRASS	5	32	CB 555 FSHCS 10-24 X .50 SS	12
14	CB 036 FTG, TEE, P6F, BRASS	3	33	CB 792 VALVE, AUTO DRAIN, P8	1
15	CB 037 CHECK VALVE, P6F X P6M, BRASS	1	34	DB 251 FITTING, BUSHING P2-PL6	1
16	CB 039 CHECK VALVE, P6F X P6M, BRASS	2	35	GB 525-19 BOLT, HEX .25-20 X 4.75	1
17	CB 100 FRAME SUBASSEMBLY	1	36	GB 525-035 BOLT 1/4-20 X 7/8 ZINC	2
18	CB 107 LEG WELDMENT	4	37	GB 531-07 BOLT 5/16-18 X 2-3/4 ZINC	4
19	CB 114 INLET FITTING W/ PIN	1	38	GB 531-11 NUT 1/4 LOCK ZINC	2
			39	GN 525-L NUT 1/4 LOCK ZINC	13

CB-BTC-200
BTC CONTROL BOX
(DIAGRAM 2)

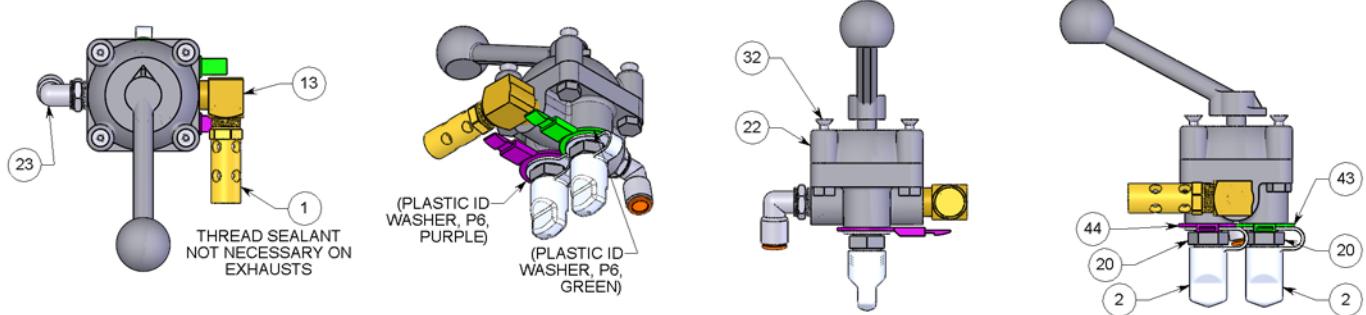


PARTS DIAGRAM

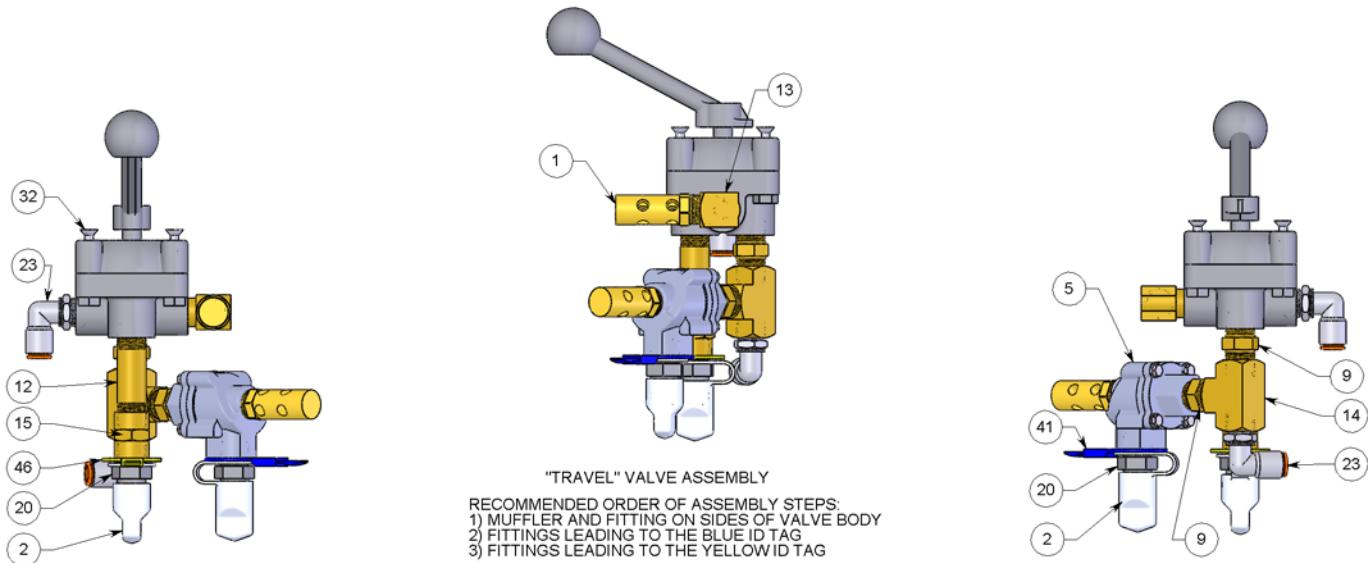
CB-BTC-200
BTC CONTROL BOX
(DIAGRAM 3)



CB-BTC-200
BTC CONTROL BOX
(DIAGRAM 4)

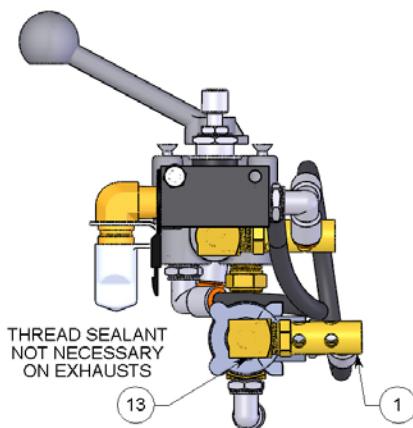
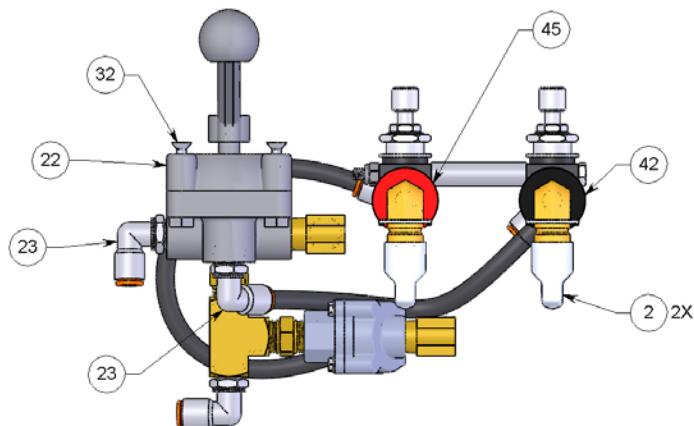
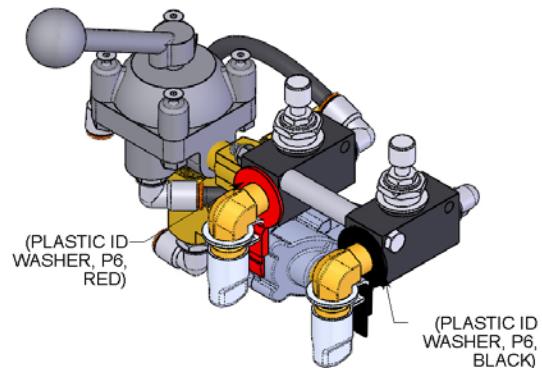
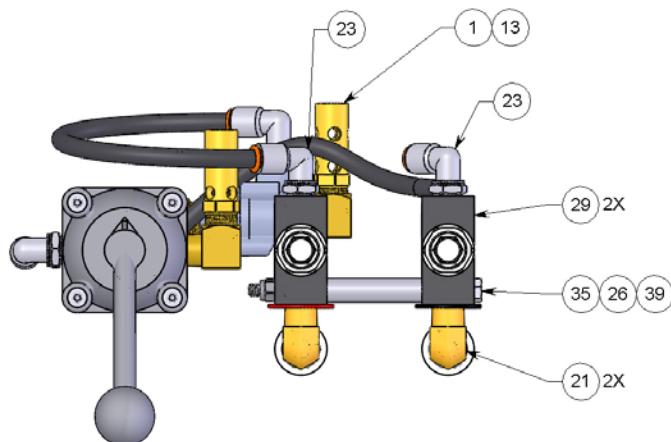


"ROTATE" VALVE ASSEMBLY

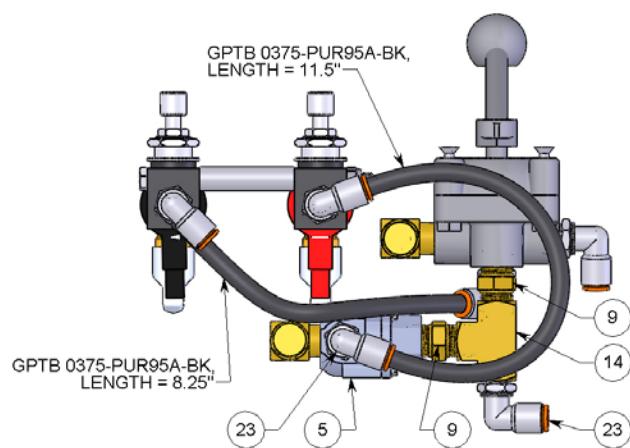


PARTS DIAGRAM

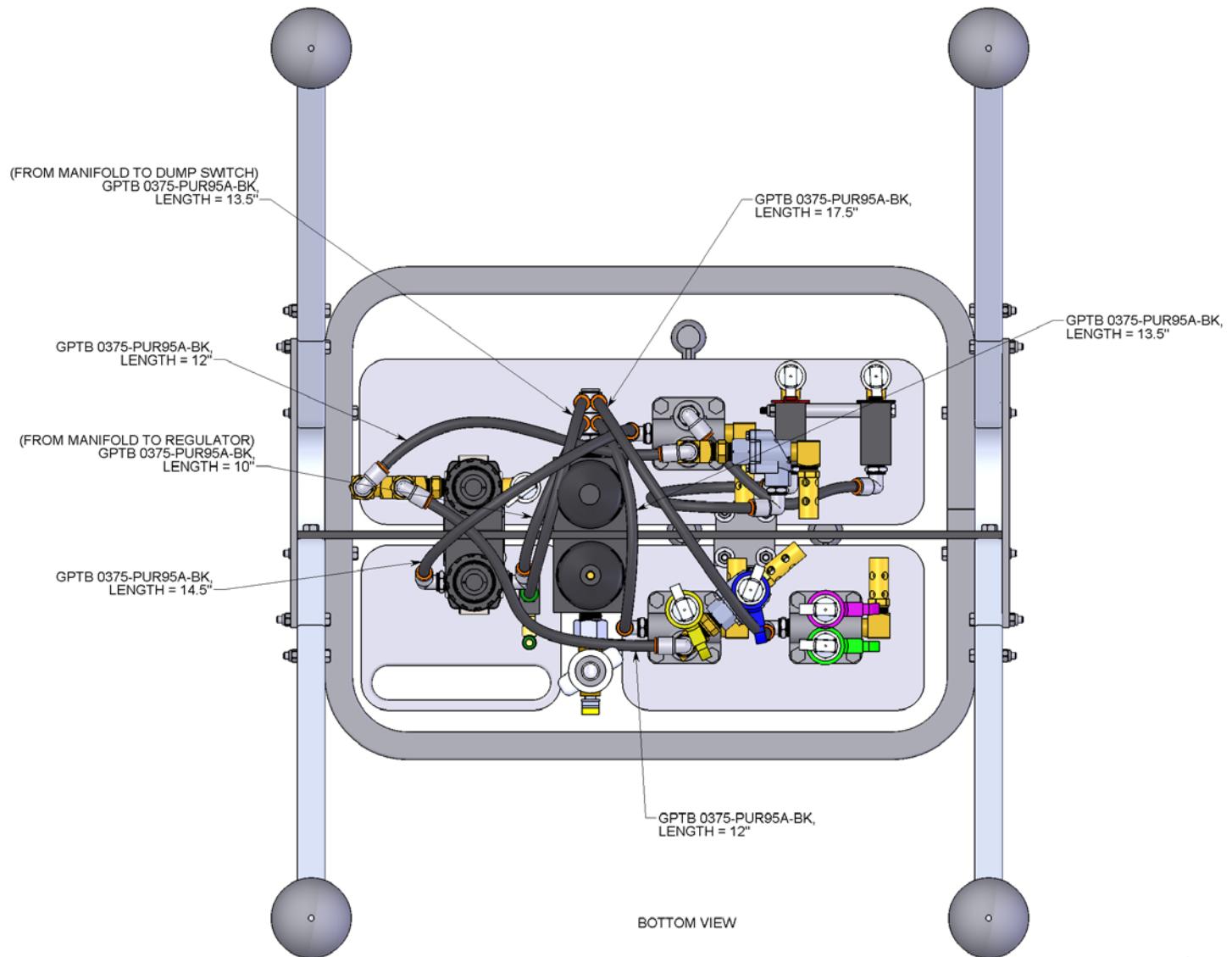
CB-BTC-200
BTC CONTROL BOX
(DIAGRAM 5)



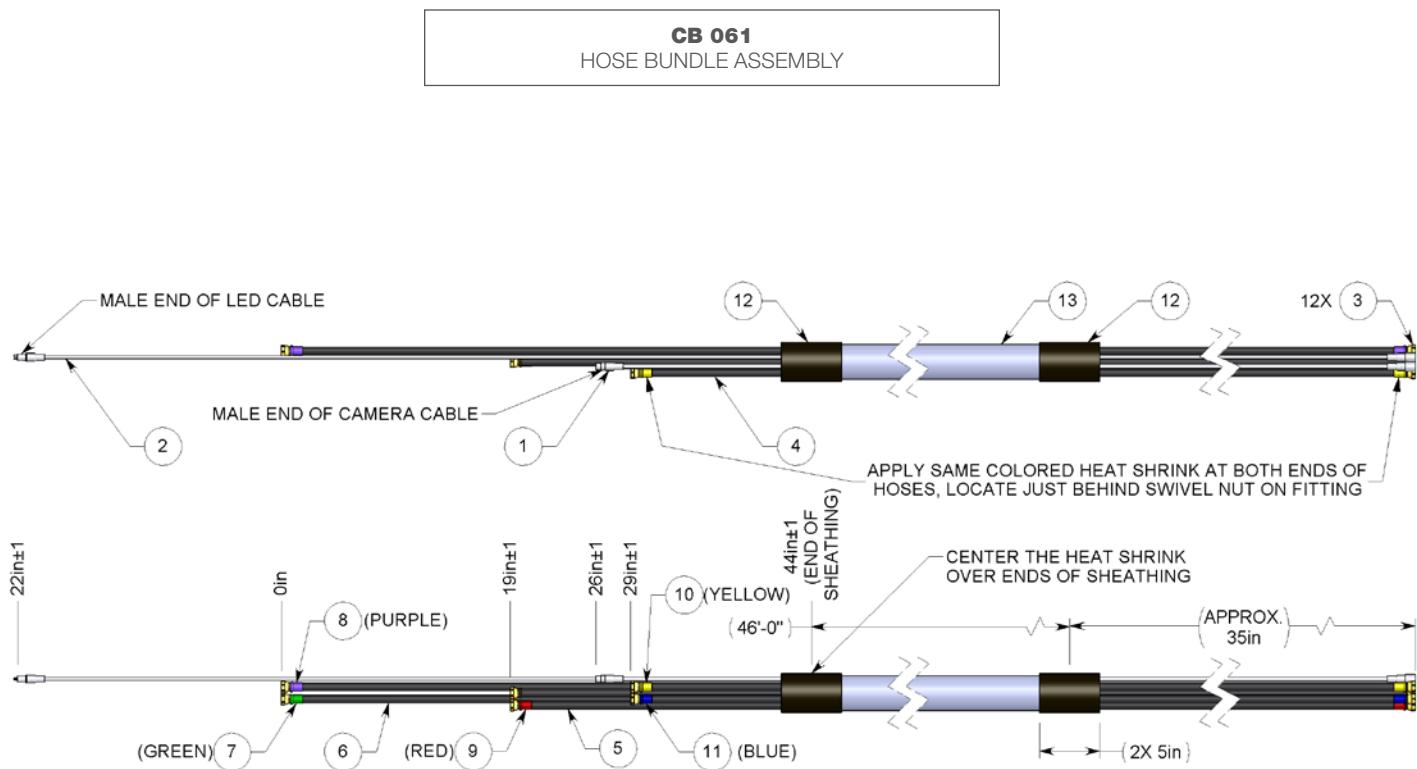
"HOSE FEED" VALVE AND FLOW CONTROL ASSEMBLIES



CB-BTC-200
BTC CONTROL BOX
(DIAGRAM 6)



PARTS DIAGRAM



#	PART NUMBER	DESCRIPTION	QTY.	LENGTH
1	CAM 145 CAMERA CABLE ASSEMBLY	CAMERA CABLE ASSEMBLY	1	N/A
2	CAM 146 LED CABLE ASSEMBLY	LED CABLE ASSEMBLY	1	N/A
3	CB 063 FTG, BARBED, JIC8F HB6	JIC8F X HB6 PUSH-ON BRASS HOSE FITTING	12	N/A
4	GPHO 0375-RUB-BK	3/8ID X 5/8OD PUSH-ON AIR HOSE, BUNA-N RUBBER, 250PSI, BLACK ("REF" MC 5288K12-BLACK)	2	50'-0" ±3"
5	GPHO 0375-RUB-BK	3/8ID X 5/8OD PUSH-ON AIR HOSE, BUNA-N RUBBER, 250PSI, BLACK (REF MC 5288K12-BLACK)	2	50'-10" ±3"
6	GPHO 0375-RUB-BK	3/8ID X 5/8OD PUSH-ON AIR HOSE, BUNA-N RUBBER, 250 , BLACK (REF MC 5288K12-BLACK)	2	52'-5" ±3"
7	GPHS 1000-B2-GN	1.00 OD HEAT SHRINK TUBE, GREEN ("REF" HEATSHRINK.COM 5121015)	2	2" +0.5"
8	GPHS 1000-B2-PR	1.00 OD HEAT SHRINK TUBE, PURPLE ("REF" HEATSHRINK.COM 5121017)	2	2" +0.5"
9	GPHS 1000-B2-RD	1.00 OD HEAT SHRINK TUBE, RED ("REF" HEATSHRINK.COM 5121012)	2	2" +0.5"
10	GPHS 1000-B2-YL	1.00 OD HEAT SHRINK TUBE, YELLOW ("REF" HEATSHRINK.COM 5121014)	2	2" +0.5"
11	GPHS 1000-B2-BL	1.00 OD HEAT SHRINK TUBE, BLUE ("REF" HEATSHRINK.COM 5121016)	2	2" +0.5"
12	GPHS 3000-OLE-A-BK	3.00 DIA HEAVY DUTY MOISTURE SEAL HEAT-SHRINK ("REF" MC 7270K87)	2	5" ±0.5"
13	GPSL 3000-NYL-G-BK	3.0 DIA BRAIDED EXPANDABLE HEAVY DUTY NYLON ("REF" TECHFLEX GORILLA SLEEVE NHN3.00BK)	1	46'-0" ±3"

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NOTES

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TERMS AND CONDITIONS

1. Acceptance of Terms and Conditions. Receipt of these Terms and Conditions of Sale ("Terms and Conditions") shall operate as the acceptance by StoneAge, Inc. ("Seller") of the order submitted by the purchaser ("Buyer"). Such acceptance is made expressly conditional on assent by Buyer to these Terms and Conditions. Such assent shall be deemed to have been given unless written notice of objection to any of these 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 Buyer with prompt and efficient service. However, to individually negotiate the terms of each sales contract would substantially impair Seller's ability to provide such service. Accordingly, the product(s) furnished by Seller are sold only according to the terms and conditions stated herein and with the terms and conditions stated in any effective StoneAge Dealer Agreement or StoneAge Reseller Agreement, if applicable. Notwithstanding any terms and conditions on Buyer's order, Seller's performance of any contract is expressly made conditional on Buyer's agreement to these Terms and Conditions 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.

2. Payment/Prices. Unless other arrangements have been made in writing between Seller and Buyer, payment for the product(s) 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 the product(s), and the collection of which Seller is or may be responsible to provide to any governmental authority, unless acceptable exemption certificates are provided by Buyer in accordance with applicable 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 product(s) being purchased, whether now in effect or hereafter imposed by any governmental authority, foreign or domestic.

3. Warranty. SELLER MAKES NO WARRANTIES OR REPRESENTATIONS AS TO THE PERFORMANCE OF ANY PRODUCT EXCEPT AS SET FORTH IN THE STONEAGE LIMITED WARRANTY PROVIDED WITH THE PRODUCT.

4. 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. The proposed shipment date is an estimate. Seller will notify Buyer promptly of any material delay and will specify the revised delivery date as soon as practicable. 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).

All product(s) will be shipped F.O.B. point of origin, unless specifically agreed otherwise, and Buyer shall pay all shipping costs and insurance costs from that point. Seller, in its sole discretion, will determine and arrange the means and manner of transportation of the product(s). Buyer shall bear all risk of loss commencing with the shipment or distribution of the product(s) from Seller's warehouse. Order shortages or errors must be reported within fifteen (15) business days from receipt of shipment to secure adjustment. No product(s) may be returned without securing written approval from Seller.

5. Modification. These Terms and Conditions are intended by Seller and Buyer to constitute a final, complete and exclusive expression of agreement relating to the subject matter hereof and cannot be supplemented or amended without Seller's prior written approval.

6. Omission. Seller's waiver of any breach or Seller's failure to enforce any of these 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 hereof.

7. Severability. If any provision of these Terms and Conditions is held to be invalid or unenforceable, such invalidity or unenforceability shall not affect the validity or enforceability of the other portions hereof.

8. Disputes. Seller and Buyer shall attempt in good faith to promptly resolve any dispute arising under these Terms and Conditions by negotiations between representatives who have authority to settle the controversy. If unsuccessful, Seller and Buyer 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 Seller and Buyer.

9. Governing Law. 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.

10. Jurisdiction and Venue. Seller and Buyer agree that the state or federal courts located within the City and County of Denver, Colorado shall have sole and exclusive jurisdiction over any litigation concerning any dispute arising under these Terms and Conditions not otherwise resolved pursuant to Section 9 as well as any alleged defects of any Products or damages sustained as a result of such alleged defects. Seller and Buyer further agree that should any litigation be commenced in connection with such a dispute, it shall only be commenced in such courts. Seller and Buyer agree to the exclusive jurisdiction of such courts and neither will raise any objection to the jurisdiction and venue of such courts, including as a result of inconvenience.

11. Attorney's Fees. 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 mediation.

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.

<http://www.sapatents.com>

STONEAGE TERMS AND WARRANTY

View StoneAge's Terms and Warranty Conditions online.

<http://www.stoneagetoools.com/terms>

<http://www.stoneagetoools.com/warranty>

Warranties set forth herein extend only to End-Users, meaning customers acquiring, or that have previously acquired, a product manufactured by StoneAge ("Product") for their own use and not for resale, either directly from StoneAge Inc. ("StoneAge") or from a StoneAge Authorized Dealer or Reseller ("Dealer"). No warranty of any kind or nature is made by StoneAge beyond those expressly stated herein.

1. LIMITED WARRANTY PERIOD. Subject to the limitations and conditions hereinafter set forth, StoneAge warrants its Product to be free from defects in workmanship and material for a period of one (1) year from the date of purchase by the End-User, provided that the end of the limited warranty period shall not be later than eighteen (18) months from the date of shipment of the Product to the Dealer or the End-User by StoneAge ("Limited Warranty Period"). All replacement parts which are furnished under this Limited Warranty and properly installed shall be warranted to the same extent as the original Product under this Limited Warranty if, and only if, the original parts were found to be defective within the original Limited Warranty Period covering the original Product. Replacement parts are warranted for the remainder of the original Limited Warranty Period. This Limited Warranty does not cover any component part of any Product not manufactured by StoneAge. Any such component part is subject exclusively to the component manufacturer's warranty terms and conditions.

2. LIMITED WARRANTY COVERAGE. StoneAge's sole obligation under this Limited Warranty shall be, at StoneAge's option and upon StoneAge's inspection, to repair, replace or issue a credit for any Product which is determined by StoneAge to be defective in material or workmanship. StoneAge reserves the right to examine the alleged defective Product to determine whether this Limited Warranty is applicable, and final determination of limited warranty coverage lies solely with StoneAge. No statement or recommendation made by a StoneAge representative, Dealer or agent to End-User shall constitute a warranty by StoneAge or a waiver or modification to any of the provisions hereof or create any liability for StoneAge.

3. WARRANTY SERVICE PROVIDERS. Service and repair of the Product is to be performed only by StoneAge authorized service representatives, including Dealers who are authorized repair centers, with StoneAge approved parts. Information about StoneAge authorized service representatives can be obtained through the StoneAge website at www.stoneagetools.com/ service. Unauthorized service, repair or modification of the Product or use of parts not approved by StoneAge will void this Limited Warranty. StoneAge reserves the right to change or improve the material and design of the Product at any time without notice to End-User, and StoneAge is not obligated to make the same improvements during warranty service to any Product previously manufactured.

4. WARRANTY EXCLUSIONS. This Limited Warranty does not cover, and StoneAge shall not be responsible for the following, or damage caused by the following: (1) any Product that has been altered or modified in any way not approved by StoneAge in advance in writing; (2) any Product that has been operated under more severe conditions or beyond the rated capacity specified for that Product; (3) depreciation or damage caused by normal wear and tear, failure to follow operation or installation instructions, misuse, negligence or lack of proper protection during storage; (4) exposure to fire, moisture, water intrusion, electrical stress, insects, explosions, extraordinary weather and/or environmental conditions including, but not limited to lightning, natural disasters, storms, windstorms, hail, earthquakes, acts of God or any other force majeure event; (5) damage to any Product caused by any attempt to repair, replace, or service the Product by persons other than StoneAge authorized service representatives; (6) costs of normal maintenance parts and services; (7) damage sustained during unloading, shipment or transit of the Product; or (8) failure to perform the recommended periodic maintenance procedures listed in the Operator's Manual accompanying the Product.

5. REQUIRED WARRANTY PROCEDURES. To be eligible for warranty service, the End-User must: (1) report the Product defect to the entity where the Product was purchased (i.e. StoneAge or the Dealer) within the Limited Warranty Period specified in this Limited Warranty; (2) submit the original invoice to establish ownership and date of purchase; and (3) make the Product available to a StoneAge authorized service representative for inspection to

determine eligibility for coverage under this Limited Warranty. This Limited Warranty shall not extend to any person or entity who fails to provide proof of original purchase from StoneAge or a Dealer. No Product may be returned for credit or adjustment without prior written permission from StoneAge.

6. DISCLAIMER OF IMPLIED WARRANTIES AND OTHER REMEDIES. EXCEPT AS EXPRESSLY STATED HEREIN (AND TO THE FULLEST EXTENT ALLOWED UNDER APPLICABLE LAW), STONEAGE HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ANY AND ALL WARRANTIES, REPRESENTATIONS OR PROMISES AS TO THE QUALITY, PERFORMANCE OR FREEDOM FROM DEFECT OF THE PRODUCT COVERED BY THIS LIMITED WARRANTY. STONEAGE FURTHER DISCLAIMS ALL IMPLIED INDEMNITIES.

7. LIMITATION OF LIABILITY. End-User specifically acknowledges that the Product may be operated at high speeds and/or pressures, and that as such it may be inherently dangerous if not used correctly. End-User shall familiarize itself with all operation materials provided by StoneAge and shall at all times use and require its agents, employees and contractors to use all necessary and appropriate safety devices, guards and proper safe operating procedures. In no event shall StoneAge be responsible for any injuries to persons or property caused directly or indirectly by the operation of the Product if End-User or any agent, employee, or contractor of End-User: (1) fails to use all necessary and appropriate safety devices, guards and proper safe operating procedures; (2) fails to maintain in good working order such safety devices and guards; (3) alters or modifies the Product in any way not approved by StoneAge in advance in writing; (4) allows the Product to be operated under more severe conditions or beyond the rated capacity specified for the Product; or (5) otherwise negligently operates the Product. End-User shall indemnify and hold StoneAge harmless from any and all liability or obligation incurred by or against StoneAge, including costs and attorneys' fees, to or by any person so injured.

TO THE FULL EXTENT ALLOWED BY APPLICABLE LAW, STONEAGE SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES (INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF GOODWILL, DIMINUTION OF VALUE, WORK STOPPAGE, INTERRUPTION OF BUSINESS, RENTAL OF SUBSTITUTE PRODUCT, OR OTHER COMMERCIAL LOSS EVEN TO THE EXTENT SUCH DAMAGES WOULD CONSTITUTE DIRECT DAMAGES), WITH RESPECT TO THE COVERED STONEAGE PRODUCT, OR OTHERWISE IN CONNECTION WITH THIS LIMITED WARRANTY, REGARDLESS OF WHETHER STONEAGE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

IT IS UNDERSTOOD THAT STONEAGE'S LIABILITY, WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY, IN NEGLIGENCE, OR OTHERWISE SHALL NOT EXCEED THE AMOUNT OF THE PURCHASE PRICE PAID BY THE END-USER FOR THE PRODUCT. STONEAGE'S MAXIMUM LIABILITY SHALL NOT EXCEED, AND END-USER'S REMEDY IS LIMITED TO EITHER (1) REPAIR OR REPLACEMENT OF THE DEFECTIVE WORKMANSHIP OR MATERIAL OR, AT STONEAGE'S OPTION, (2) REFUND OF THE PURCHASE PRICE, OR (3) ISSUANCE OF A CREDIT FOR THE PURCHASE PRICE, AND SUCH REMEDIES SHALL BE END-USER'S ENTIRE AND EXCLUSIVE REMEDY.

YOU, THE END-USER, UNDERSTAND AND EXPRESSLY AGREE THAT THE FOREGOING LIMITATIONS ON LIABILITY ARE PART OF THE CONSIDERATION IN THE PRICE OF THE STONEAGE PRODUCT YOU PURCHASED.

Some jurisdictions do not allow the limitation or exclusion of liability for certain damages, so the above limitations and exclusions may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction. If any provisions of this Limited Warranty is held to be invalid or unenforceable, such invalidity or unenforceability shall not affect the validity or enforceability of the other portions hereof.



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