

AUTOSTROKE™ (AST-200-V2)

FOR USE WITH THE AUTOBOX[®] PRODUCT LINE

USER MANUAL



TABLE OF CONTENTS

MANUFACTURER'S INFORMATION.....	2
SPECIFICATIONS	3
DESCRIPTION OF EQUIPMENT AND INTENDED USE	3
KEY FEATURES.....	3
EC DECLARATION OF CONFORMITY	4
WARNING AND SAFETY INSTRUCTIONS	6
OPERATOR TRAINING.....	6
PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS.....	6
PRE-RUN SAFETY CHECK	7
SYSTEM ASSEMBLY - OVERVIEW	8
ABX-2L AND ABX-2L-V2 MANIFOLD UPGRADE.....	10
AUTOSTROKE AIR MANIFOLD CONVERSION OVERVIEW	10
REMOVAL OF MANIFOLD AND INSTALLATION OF CONVERSION	11
SPLICING THE TUBING FOR THE T-FITTINGS	12
ABX-2L AND ABX-2L-V2 AUTOSTROKE SET-UP	13
ABX-3L AND ABX-3L-V2 AUTOSTROKE SET-UP.....	15
OPERATION.....	17
MAINTENANCE	18
STORAGE, TRANSPORTATION, AND HANDLING	18
AIR MOTOR GENERATOR REPLACEMENT INSTRUCTIONS.....	19
PART DIAGRAMS	22
TERMS AND CONDITIONS	26

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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).

Updated manuals can be downloaded at:
<https://www.stoneagetools.com/manuals>

SPECIFICATIONS	
AutoStroke (AST-200-V2) Weight:	18 lbs (8.2 kg)
AutoStroke (AST-200-V2) Dimensions:	16.9" Long x 11.7" Tall x 7.9" Wide (429 mm x 297mm x 201mm)
Air Pressure:	40 to 125 psi (2.8 to 8.6 bar)
Air Consumption:	3 CFM (5 m³/hr)

DESCRIPTION OF EQUIPMENT AND INTENDED USE

The AutoStroke (AST-200-V2) is an accessory for the Autobox® ABX-2L, ABX-2L-V2, ABX-3L, and ABX-3L-V2, that can be mounted to both Autobox® Control Boxes. The AutoStroke detects when the lance encounters a blockage in a tube and retracts the lance for a set time before continuing forward again, allowing the banshee to continue to rotate and reducing potential hose damage.

KEY FEATURES:

- Air motor generator allows operation with compressed air as opposed to batteries.
- Automatically retracts lance when blockage is encountered.
- Adjustable hose push force.
- Adjustable retract time.
- Switch allows disabling functionality when not desired.
- Mounts on CB stand and connects in line with Autobox® ABX-2L, ABX-2L-V2, ABX-3L, and ABX-3L-V2L forward, reverse, and clamp, airlines with two additional signal lines from the ABX unit.

EU DECLARATION OF CONFORMITY

Manufacturer:

StoneAge Incorporated
466 South Skyline Drive
Durango, CO 81303
USA

Authorized Representative:

StoneAge Netherlands BV
Reedijk 7Q
3274 KE Heinenoord
Netherlands
Bob Van Wordragen, Operations Manager StoneAge NL

Declare that:

**AutoStroke (AST-200-V2) blockage detector accessory
for high pressure water cleaning of system parts.**

Is compliant with the following Directives and Standards:

Directive 2006/42/EC (Machinery Directive)

EN ISO 12100:2010 (E) Safety of machinery – General principles for design – Risk assessment and risk reduction

2011/65/EU Restriction of Hazardous Substances (RoHS2) Directive.

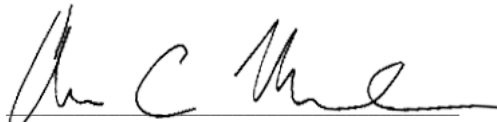
EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements-Part 1:General requirements

The Technical File for AutoStroke (AST-200-V2) is maintained at:

StoneAge Incorporated, 466 South Skyline Drive, Durango, CO 81303, USA and was compiled by the Engineering Manager.

The Technical File is available through the Authorized Representative.

This Declaration of Conformity is issued under the exclusive responsibility of StoneAge Incorporated.



StoneAge Incorporated, Durango, CO, USA
Adam Markham, Engineering Manager, Robotics

02/11/2019
Date



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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.

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

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.

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 if damaged, until repaired.
- Make sure all threaded connections are tight and free of leaks.
- The AutoStroke (AST-200-V2) is an accessory to the AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, and ABX-3L-V2. Users of the AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, and ABX-3L-V2 **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 AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, and ABX-3L-V2.
- The AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, ABX-3L-V2, AutoStroke (AST-200-V2), and Control Box **MUST** be supervised at all times and should never be left unattended.
- Test the Control Box before operating the AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, ABX-3L-V2, and AutoStroke (AST-200-V2) 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. See the "Operation" section of this manual for adjustment settings.
- 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.

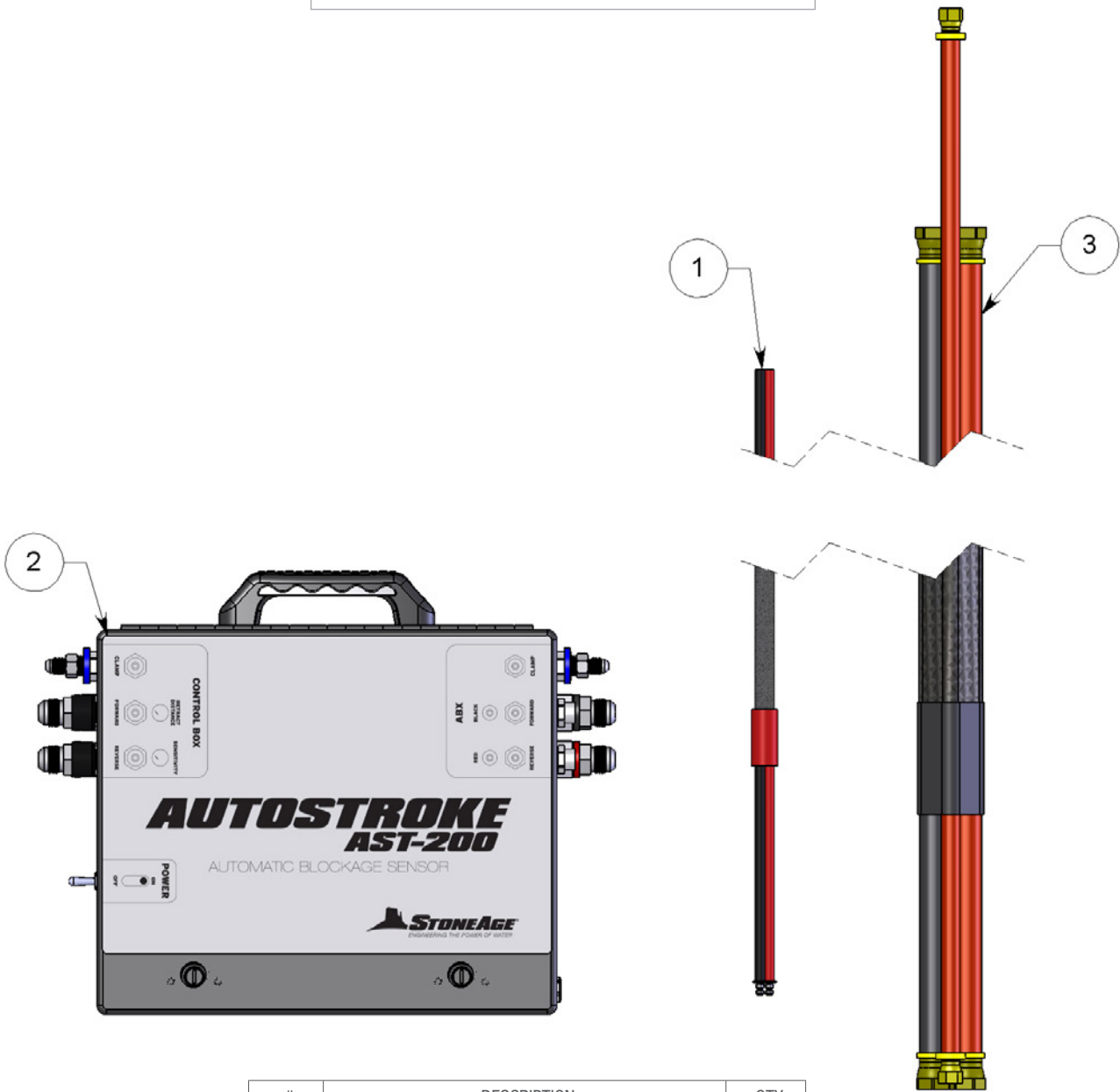
PRE-RUN SAFETY CHECK

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.
- Test the Control Box before operating the AUTOBOX® ABX-2L, ABX-2L-V2, ABX-3L, ABX-3L-V2, and AutoStroke (AST-200-V2) 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. See the "Operation" section of this manual for adjustment settings.
- 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

AUTOSTROKE™ (AST-200-V2)
AUTOMATIC BLOCKAGE SENSOR



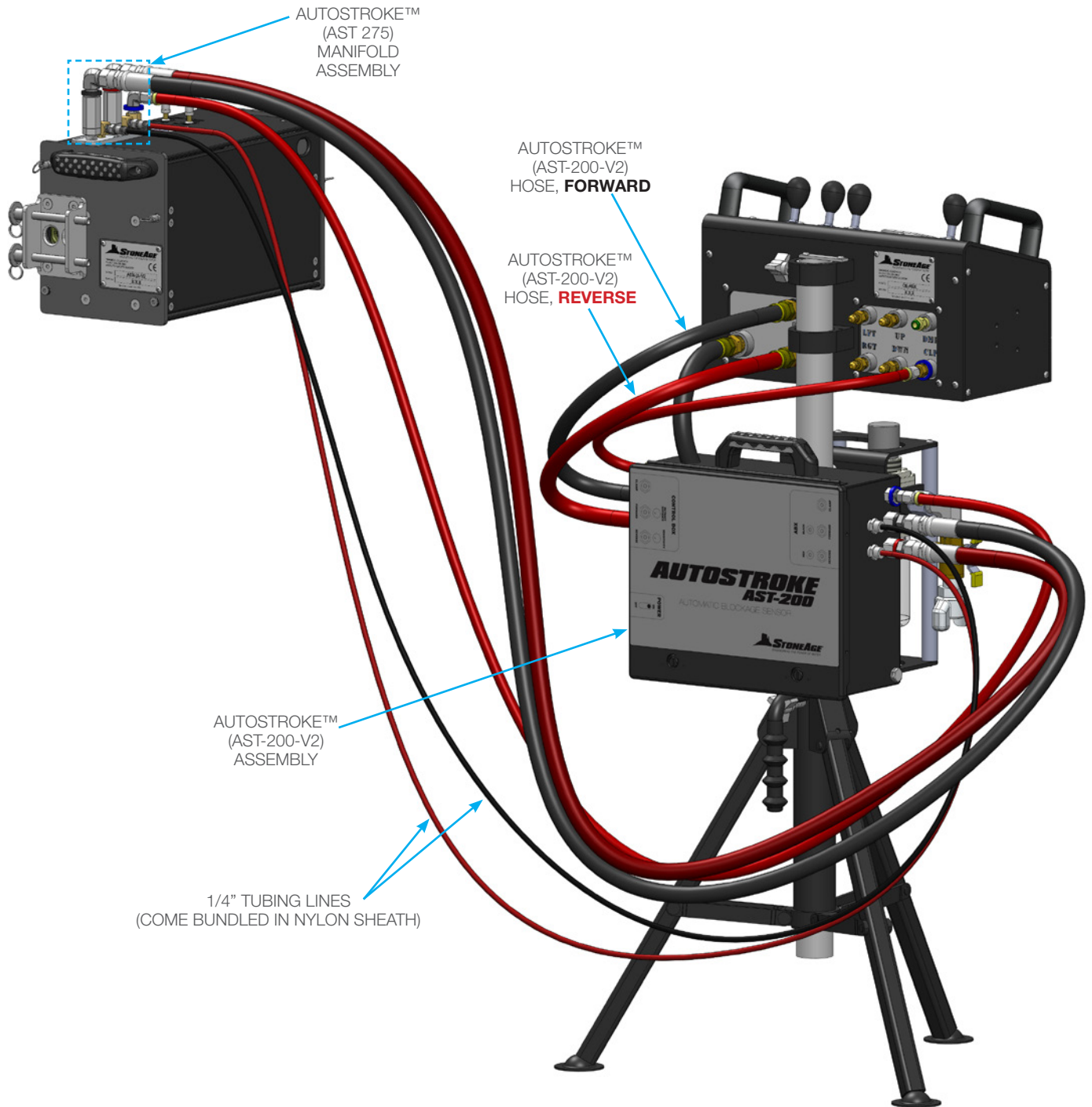
#	DESCRIPTION	QTY
1	AST 277-25 AUTOSTROKE™ UMBILICAL ASSEMBLY	1
2	AST 301-V2 AUTOSTROKE™ BOX WITH GENERATOR	1
3	AST 340 AUTOSTROKE™ HOSE BUNDLE ASSY	1

TOOLS REQUIRED FOR INSTALLATION		
TOOL	SIZE	WHERE USED
ALLEN WRENCH HEX KEY	5/32"	FLAT HEAD CAP SCREWS
CLOSED END BOX WRENCH	7/16"	HEX HEAD BOLTS AND QUICK DISCONNECT FITTINGS
OPEN END BOX WRENCH	9/16"	1/4 JIC FITTINGS ON HOSE ENDS
OPEN END BOX WRENCH	3/4"	JIC FITTING ASSEMBLIES ON MANIFOLD
OPEN END BOX WRENCH	7/8"	1/2 JIC FITTINGS ON HOSE ENDS
LOCTITE® 567 PIPE DOPE OR TAPE	-	ALL NEW OR REPLACED TAPERED PIPE FITTINGS

NOTE: THIS COLOR CODE SYSTEM IS USED THROUGH THE SYSTEM FOR TUBE AND HOSE CONNECTIONS AND COLOR I.D.

■ REVERSE ■ FORWARD

AUTOSTROKE™ (AST-200-V2)
SHOWN WITH AUTOBOX® ABX-2L AND CB-ABX ASSEMBLY



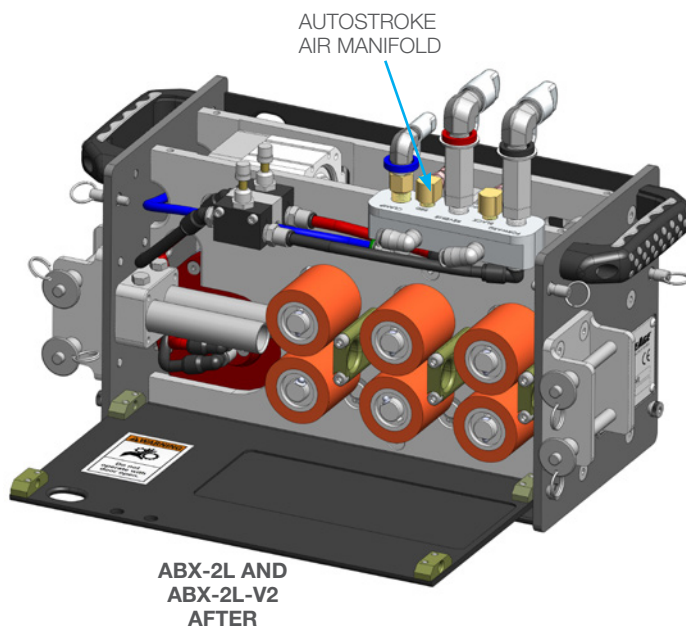
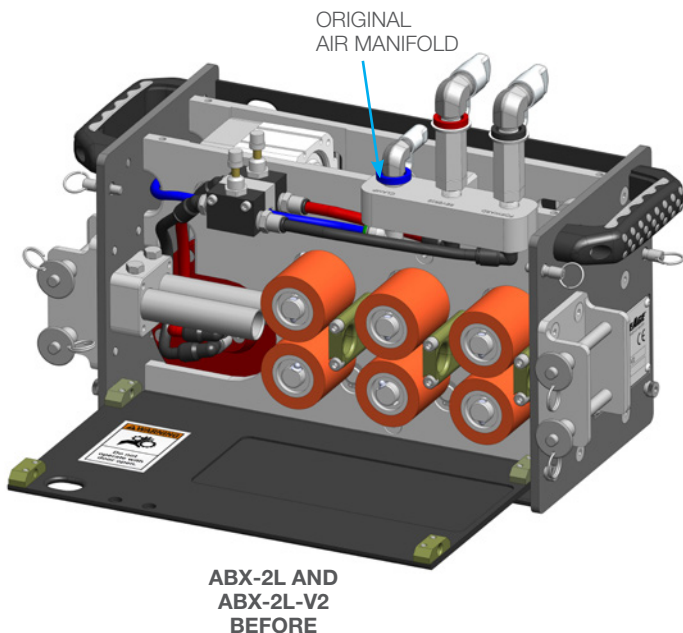
ABX-2L AND ABX-2L-V2 MANIFOLD UPGRADE

THE AUTOSTROKE AIR MANIFOLD CONVERSION OVERVIEW

This conversion guide describes how to replace the Air Manifold and add T-connections in order to provide necessary air signals from the ABX-2L and ABX-2L-V2 to the AutoStroke. This first step is mandatory to allow the AutoStroke AST-200-V2 to function with the Autobox® ABX-2L and ABX-2L-V2.

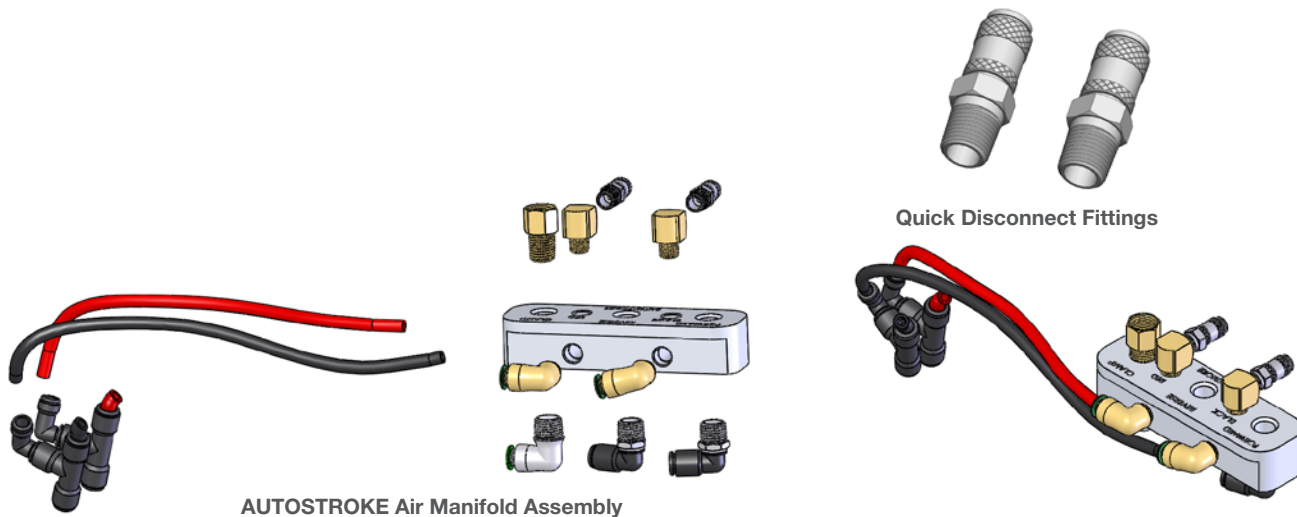
NOTICE

The Autobox® ABX-3L and ABX-3L-V2 come ready to hook-up to the AutoStroke and therefore this upgrade is NOT necessary for the Autobox® ABX-3L and ABX-3L-V2.



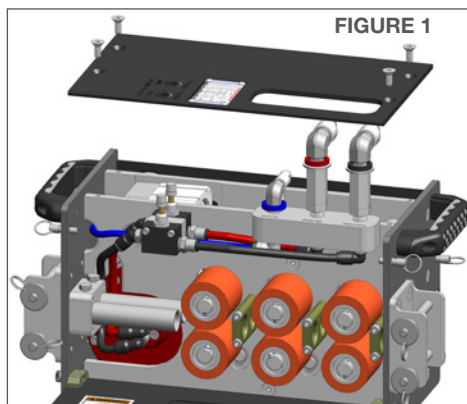
THE AUTOSTROKE AIR MANIFOLD CONVERSION PARTS KIT

The parts below are included in the AST 275 AutoStroke Air Manifold Conversion Kit.

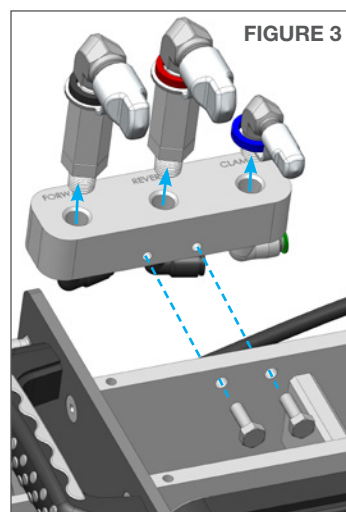
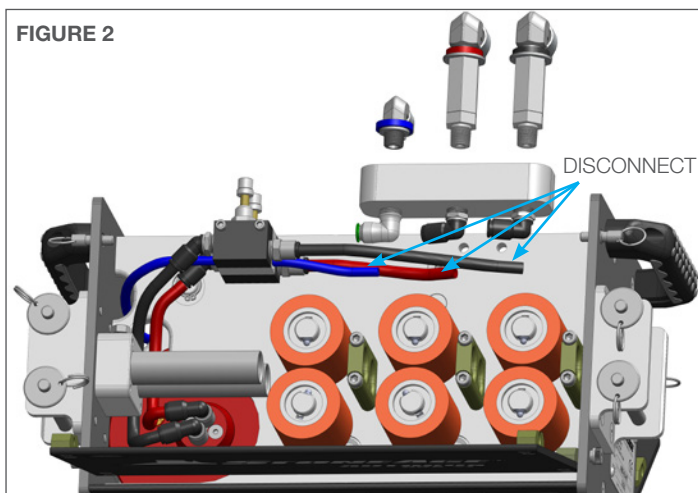


REMOVING THE ABX-2L AIR MANIFOLD

1. Remove the 4 flat head cap screws from the Top Plate using a 5/32 Allen wrench hex key. Set the Top Plate and screws aside, and open the Side Door. **(FIGURE 1)**

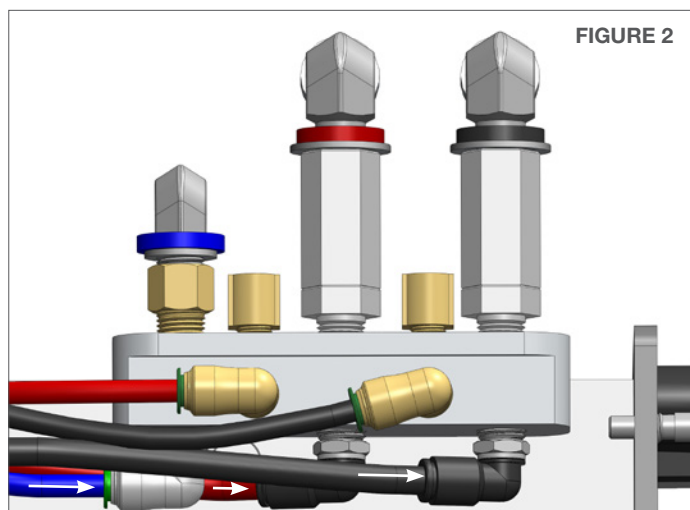
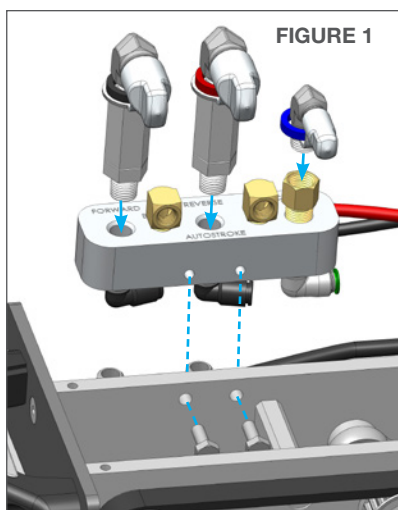


2. Unplug the three tubes from the bottom of the manifold **(FIGURE 2)** and remove the 2 hex head bolts using a 7/16 socket driver or box wrench. Remove and retain the top 3 JIC fitting assemblies, and disconnect the 3 air tubes from the bottom of the Air Manifold. Discard the old manifold. **(FIGURE 3)**



INSTALLING THE AUTOSTROKE AIR MANIFOLD CONVERSION

1. Install the 3 JIC fitting assemblies to the new AutoStroke Air Manifold. Use pipe dope or tape on the NPT tapered threads. Re-attach the air manifold using the 2 hex head bolts that were reserved from the original manifold assembly. **(FIGURE 1)**
2. Reconnect the 3 air tubes (blue, red, and black) to the push-to-connect fittings on the bottom of the air manifold. **(FIGURE 2)**



ABX-2L AND ABX-2L-V2 MANIFOLD UPGRADE

SPLICING THE TUBING FOR THE T-FITTINGS

1. Disconnect the red and black air tubes from the fittings on the left side of the flow controls. **(FIGURE 1)** Cut exactly 2 inches off the end of the red tube and 3 inches off the black tube. **(FIGURE 2)**

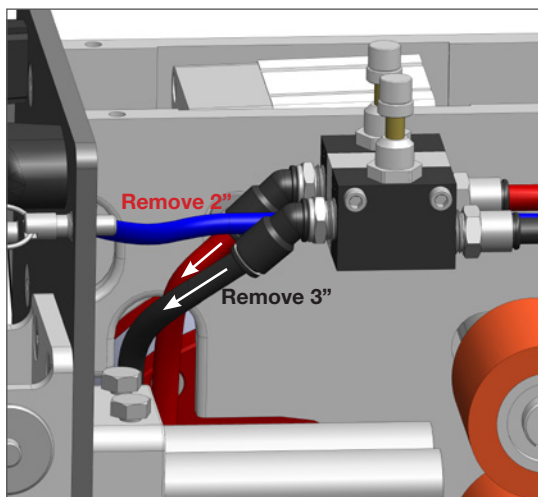


FIGURE 1

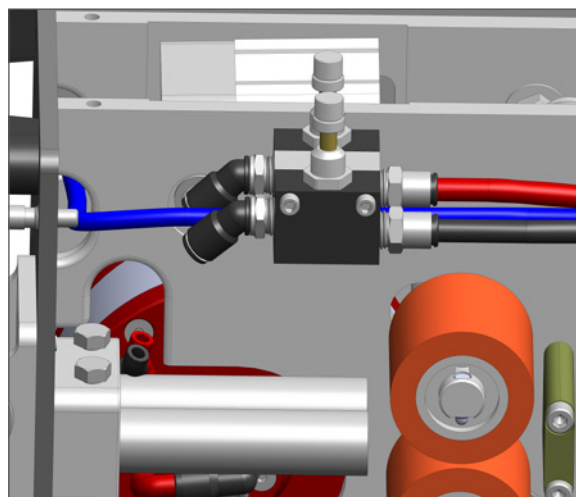


FIGURE 2

2. Connect the red and black tubes with the T-fittings from the manifold to the fittings on the left side of the flow controls. Connect the other end of the T-fittings to the end of the cut tubing. The tubes from the manifold assembly should lie between the flow control knobs. **(FIGURE 3)**
3. Attach the Top Plate and close the Side Door Assembly. **(FIGURE 4)**

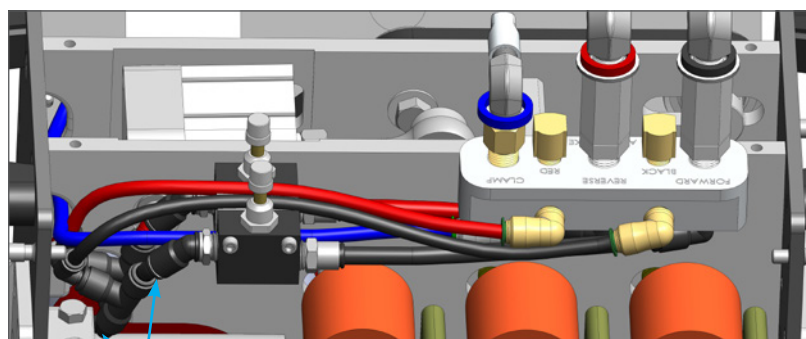


FIGURE 3
CONNECT T-FITTINGS

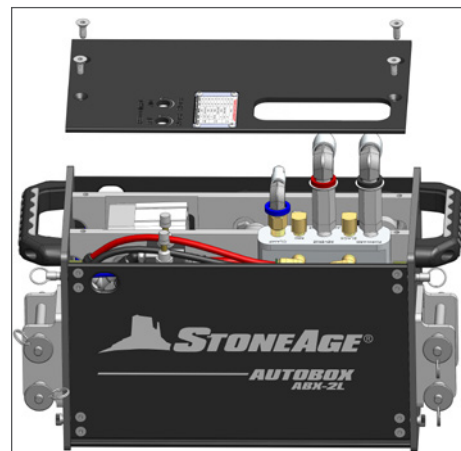


FIGURE 4

4. Install the two Quick Disconnect Fittings to the brass elbows using pipe dope or tape on the tapered threads. **(FIGURE 5)**

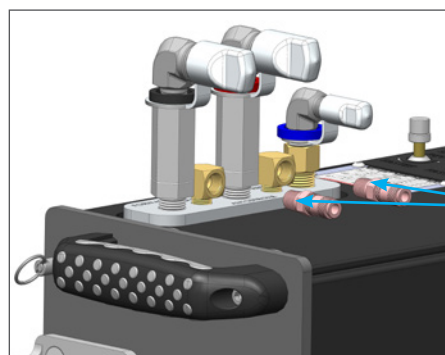


FIGURE 5



CONNECTING THE AST-200-V2 AUTOSTROKE TO THE CB-ABX CONTROL BOX

1. Disconnect the air hose from the back of the Control Assembly. Loosen the Thumb Screw on the Pole Mount on the Control Assembly. Carefully lift the Control Assembly off of the Mounting Pole and put aside. **(Figure 1)**
2. Slide the AutoStroke Assembly onto the Mounting Pole and hand tighten the Thumb Screw. Then slide the Control Assembly back onto the Mounting Pole. Align the Thumb Screw with the top hole on the Mounting Pole and hand tighten. **(Figure 2)**
3. Connect the air hose from the FRL to the back of the Control Assembly. **(Figure 3)**

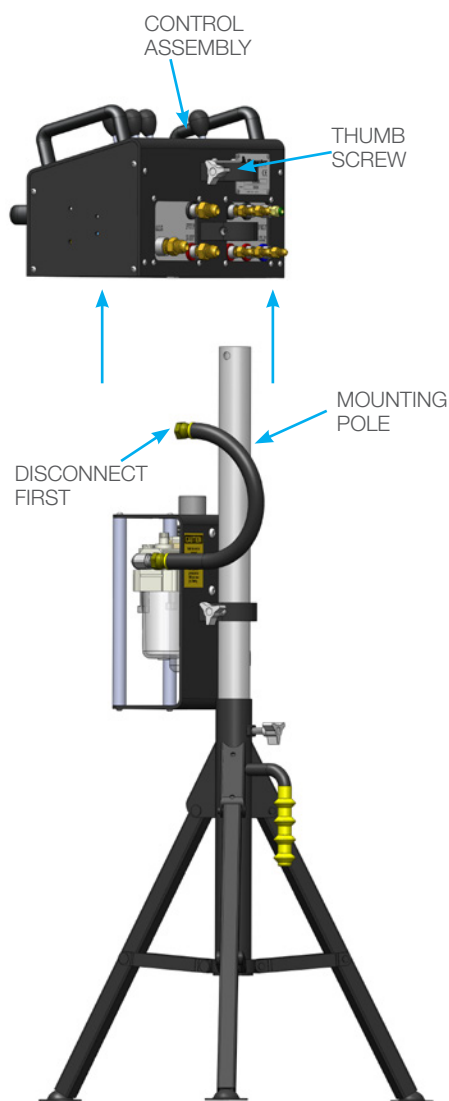


FIGURE 1

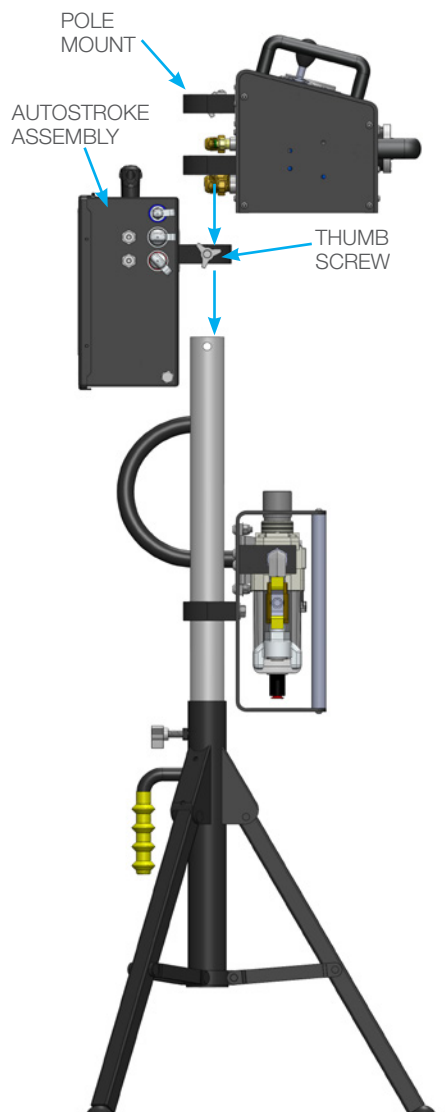
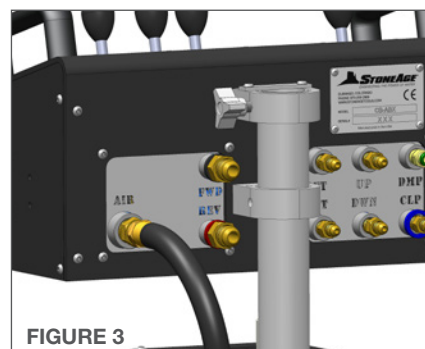


FIGURE 2



COMPLETE

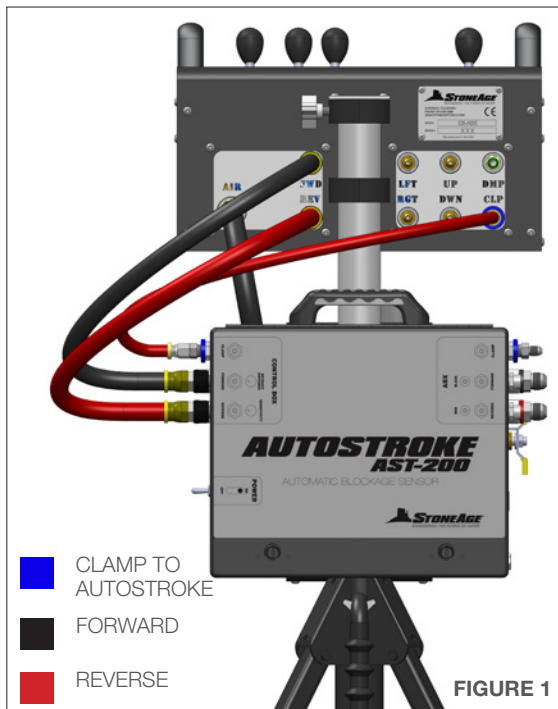
ABX-2L AND ABX-2L-V2 AUTOSTROKE SET-UP

HOSE CONNECTIONS

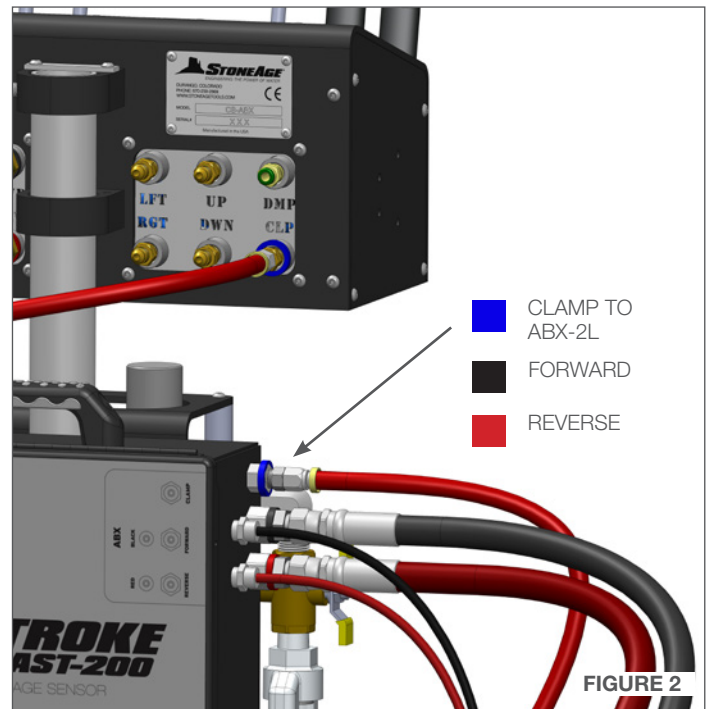
1. Connect the **BLACK** and **RED** 1/2" lines from the AutoStroke "Forward" and "Reverse" connections to the "Forward" and "Reverse" connections on the back of the CB-ABX. Connect the **SHORT** 1/4" I.D. Hose to the fitting marked "**CLAMP**" on the left side of the AutoStroke to the "**CLAMP**" fitting on the Control Box. (**Figure 1**)
2. Connect the **LONG** 1/4" I.D. Hose to the fitting marked "**CLAMP**" on the right side of the AutoStroke and the opposite end to the "**CLAMP**" fitting on the ABX-2L or ABX-2L-V2. Insert the ends of the 1/4" **BLACK** and **RED** tubing into the press lock fittings on the right side of the AutoStroke. Push the opposite ends of each tube into the color labeled, press lock, fittings on the manifold atop the ABX-2L or ABX-2L-V2. Connect the **BLACK** and **RED** 1/2" lines to the right side of the AutoStroke marked "Forward" and "Reverse" and connect the opposite ends to the manifold on the ABX-2L or ABX-2L-V2. (**Figure 2 & 3**)
3. Skip to the "OPERATIONS" page of this manual.

NOTICE

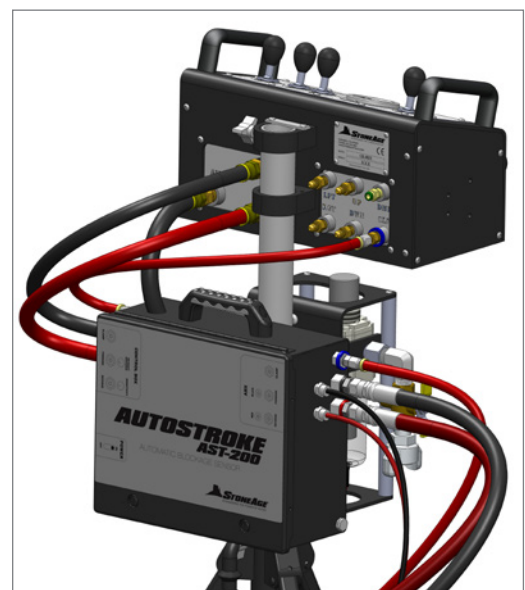
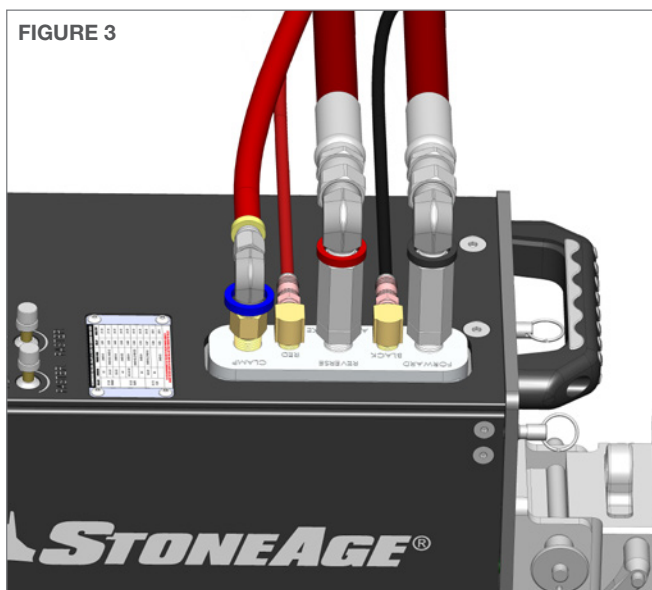
The AutoStroke and the CB-ABX are labeled "Forward" and "Reverse" and color coded. Make sure the hoses mate to their corresponding labeled connections on both ends.



CORRECT AUTOSTROKE CONNECTION TO ABX-2L



CORRECT AUTOSTROKE CONNECTION TO CONTROL BOX



CONNECTING THE AST-200-V2 AUTOSTROKE TO THE CBX-ABX CONTROL BOX

1. Disconnect the air hose from the back of the Control Assembly. Loosen the Thumb Screw on the Pole Mount and carefully lift the Control Assembly off of the Mounting Pole. Put the Control Assembly aside. **(Figure 1)**
2. Slide the AutoStroke Assembly onto the Mounting Pole, with the Decal side facing away from the FRL. Then hand tighten the Thumb Screw. Then slide the Control Assembly back onto the Mounting Pole. Then hand tighten the Thumb Screw to secure the Control Assembly to the Mounting Pole. **(Figure 2)**
3. Connect the air hose from the FRL to the back of the Control Assembly. **(Figure 3)**

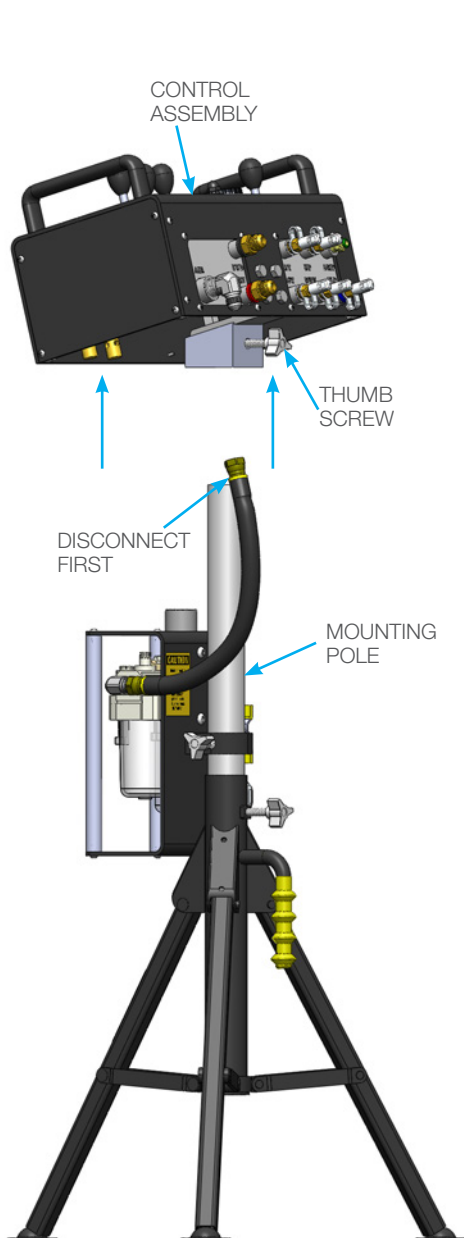


FIGURE 1

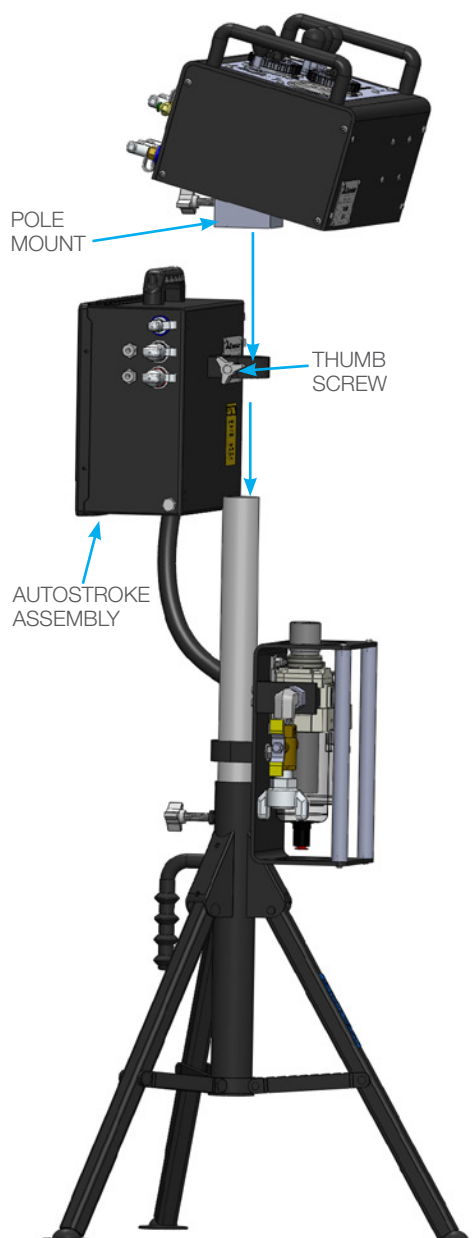


FIGURE 2

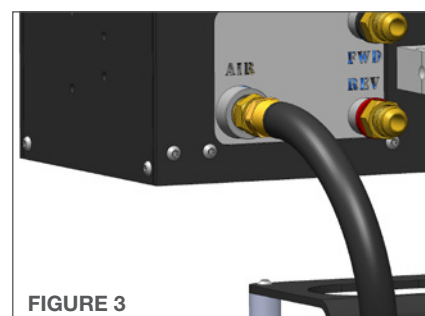


FIGURE 3



COMPLETE

ABX-3L AND ABX-3L-V2 AUTOSTROKE SET-UP

HOSE CONNECTIONS

1. Connect the **BLACK** and **RED** 1/2" lines from the AutoStroke "Forward" and "Reverse" connections to the "Forward" and "Reverse" connections on the back of the CBX-ABX. Connect the **SHORT** 1/4" I.D. Hose to the fitting marked "**CLAMP**" on the left side of the AutoStroke to the "**CLAMP**" fitting on the Control Box. **(Figure 1)**
2. Connect the **LONG** 1/4" I.D. Hose to the fitting marked "**CLAMP**" on the right side of the AutoStroke and the opposite end to the "**CLAMP**" fitting on the ABX-3L or ABX-3L-V2. Insert the ends of the 1/4" **BLACK** and **RED** tubing into the press lock fittings on the right side of the AutoStroke. Push the opposite ends of each tube into the color labeled, press lock, fittings on the manifold atop the ABX-3L or ABX-3L-V2. Connect the **BLACK** and **RED** 1/2" lines to the right side of the AutoStroke marked "Forward" and "Reverse" and connect the opposite ends to the manifold on the ABX-3L or ABX-3L-V2. **(Figure 2 & 3)**

NOTICE

The AutoStroke and the CBX-ABX are labeled "Forward" and "Reverse" and color coded. Make sure the hoses mate to their corresponding labeled connections on both ends.

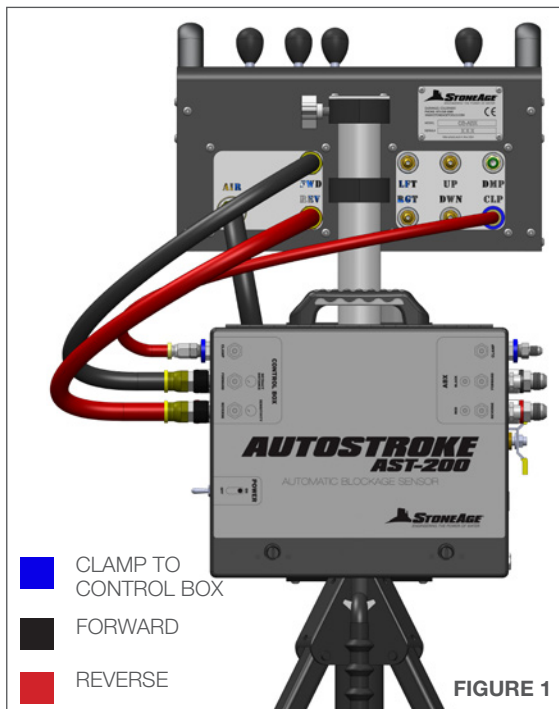


FIGURE 1

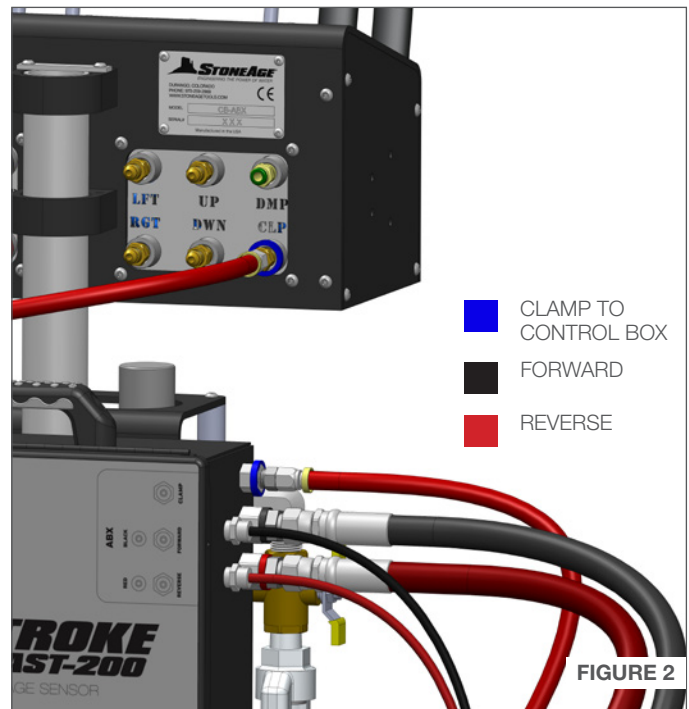


FIGURE 2

CORRECT AUTOSTROKE CONNECTION TO ABX-3L OR ABX-3L-V2

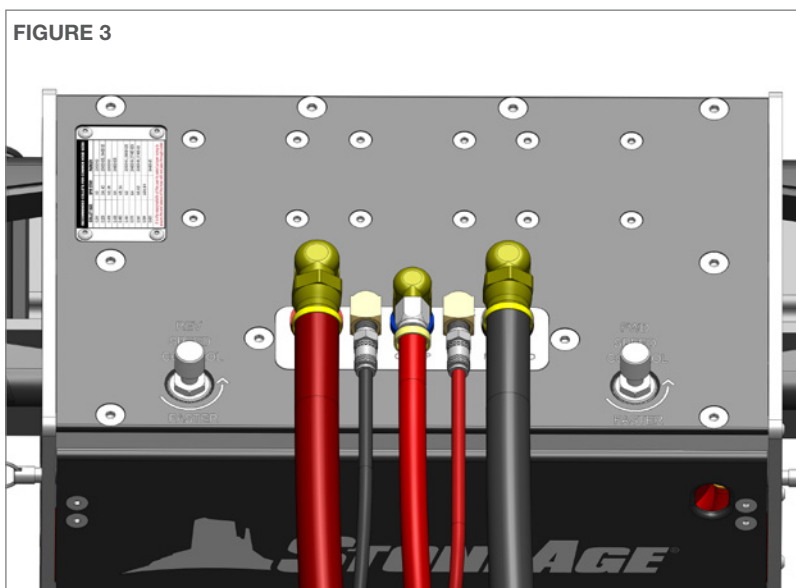


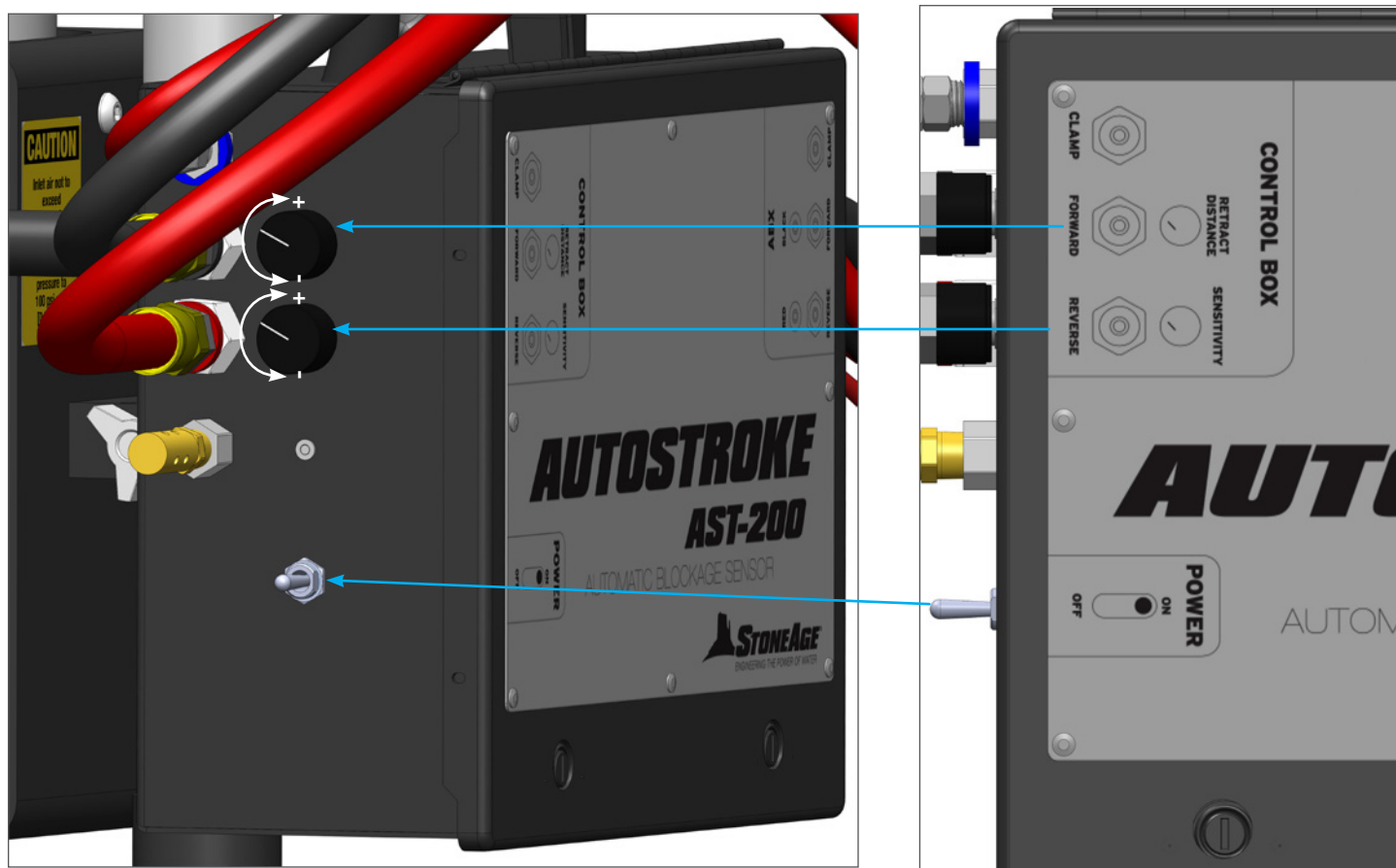
FIGURE 3



CORRECT AUTOSTROKE CONNECTION TO CONTROL BOX

AUTOSTROKE AST-200-V2 FUNCTIONS

- With the AutoStroke in the **“OFF”** Position, run the Autobox Tractor in Reverse until the Air Motor Generator goes silent. This may take up to one minute and will allow the Air Motor Generator to charge.
- Turn the AutoStroke toggle to the **“ON”** Position and make sure the power light comes on.
- To setup the AutoStroke turn the **SENSITIVITY** knob all the way in the counter-clockwise direction. (Increase turn clockwise, Decrease turn counter-clockwise)
- Next position your nozzles so they hit the tube sheet face and run them into the tube sheet. While holding the feed in lever increase the sensitivity until it just starts to peck at the tube sheet face.
- Adjust the **RETRACT DISTANCE** (Increase turn clockwise, Decrease turn counter-clockwise) until you like how far it is retracting the nozzles.
- The AutoStroke is now operational.



MAINTENANCE

MAINTENANCE

Maintenance Item	Frequency	Maintenance Required
Air Motor Generator Replacement	When Needed	If the Air Motor Generator fails on the AutoStroke, it is possible to replace it. Please call your StoneAge Customer Service Representative to order part number AMG-100-V2 AIR MOTOR GENERATOR, WITH FITTINGS . Follow the Air Motor Generator Replacement instructions located in this manual
All Air Fittings	After each use	Reinstall all dust caps to protect from dirt and moisture.
Air Lines	Before each use	Blow out before making connections to the AutoStroke
Electrical Connections	Frequently	Visually inspect for corrosion.

Contact StoneAge for Safety Data Sheets for material usage and any other pertinent information that may be required.

TROUBLESHOOTING

Problem	Solution
AST-200 is not functioning	<ul style="list-style-type: none">-Check that airlines are connected properly-Check that switch is on and red LED is lit while feeding forward-Increase sensitivity-Verify that fuse is not blown
AST-200 continues to reverse feed	<ul style="list-style-type: none">-Check that hose is not getting hung up behind the ABX-Reduce sensitivity-Reduce hose drag
AST-200 power light is not coming on but the switch is in the "ON" position	<ul style="list-style-type: none">- Toggle the AutoStroke to the "OFF" Position, run the Autobox Tractor in Reverse until the Air Motor Generator goes silent. This may take up to one minute and will allow the Air Motor Generator to charge. The charge time could be longer with lower pressures.

NOTICE

Electronic components are not user serviceable. If troubleshooting the system fails it must be sent back to StoneAge Tools for service. Contact your customer service representative. 1-866-795-1586

STORAGE, TRANSPORTATION, AND HANDLING

The AutoStroke™ (AST-200-V2) should be stored in a dry location between jobs. Before storing the unit, use compressed air to blow out any debris and moisture. Use mild soapy water to clean the machine in order to remove corrosive materials. Apply a small amount of air tool oil directly into the forward and reverse fittings. Install the dust caps onto all fittings to keep moisture and dirt out.

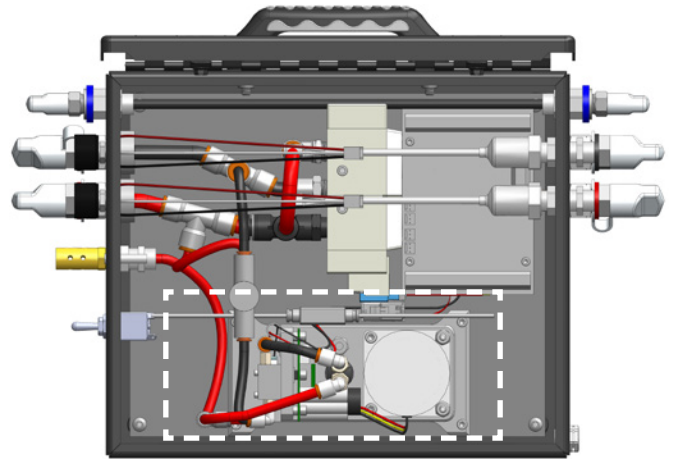
AIR MOTOR GENERATOR REPLACEMENT INSTRUCTIONS

These replacement instructions describe how to replace an air motor generator within an AST-200-V2 AutoStroke.

AIR MOTOR GENERATOR REMOVAL INSTRUCTIONS

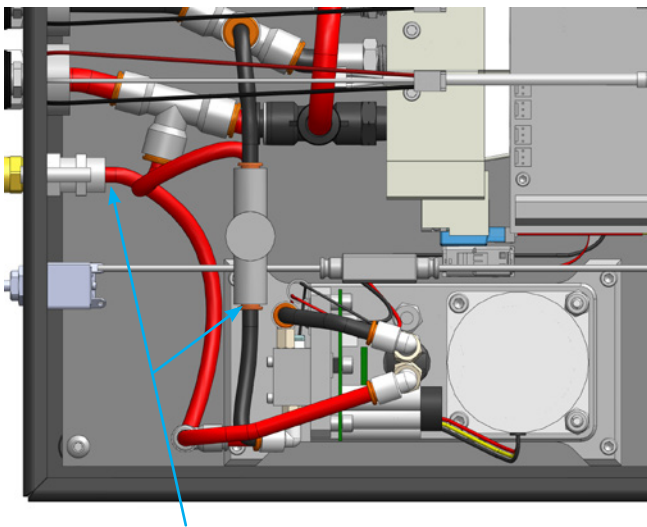
NOTICE

Airline connections should be removed at least 10 minutes before servicing to allow time for stored electrical energy to dissipate.

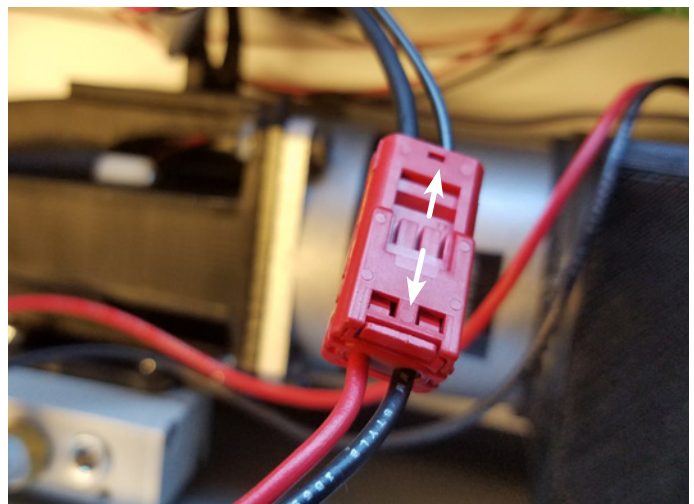


1. Using a flat screwdriver, turn the quarter turn latches counterclockwise 90 degrees and open the AutoStroke enclosure.

AST-200-V2 AUTOSTROKE shown without cover
Air Motor Generator location



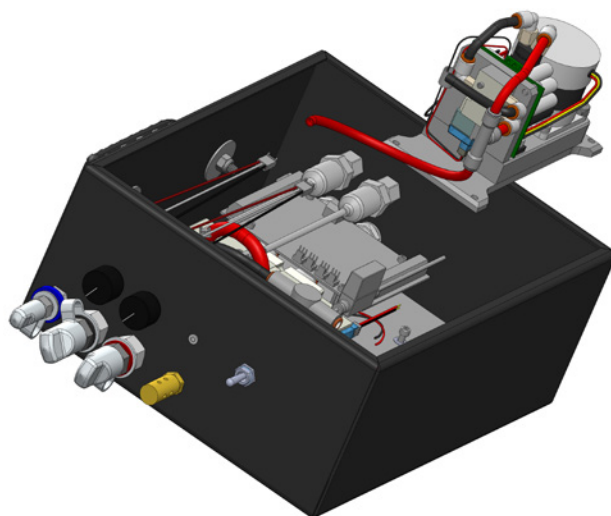
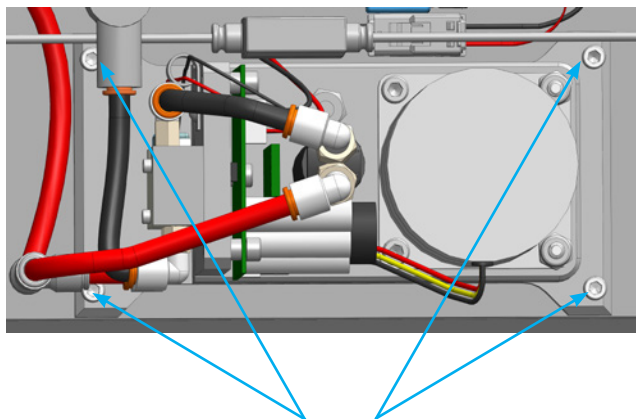
2. Disconnect the 2 air tubes from the air motor generator



3. Depress the tab on the back of the electrical connector and carefully separate the electrical connection.

AIR MOTOR GENERATOR REPLACEMENT

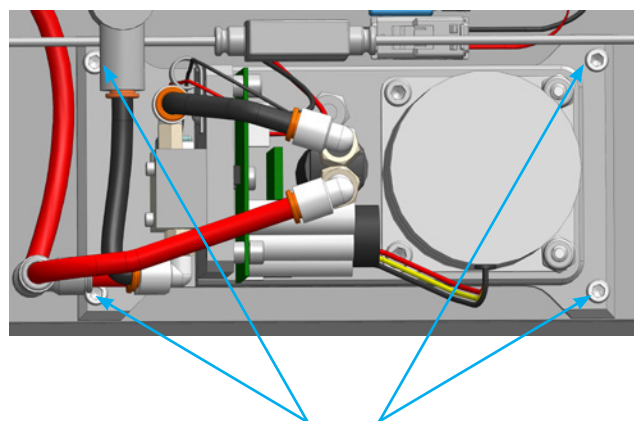
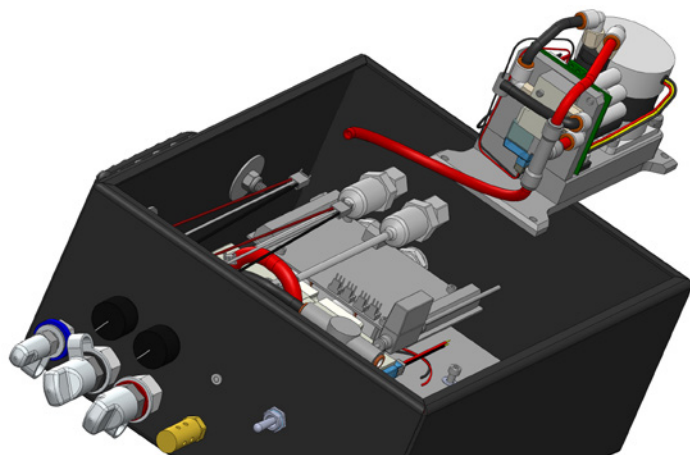
AIR MOTOR GENERATOR REMOVAL INSTRUCTIONS.....CONTINUED



4. Remove the four screws securing the Air Motor Generator with a 9/64" Hex Key

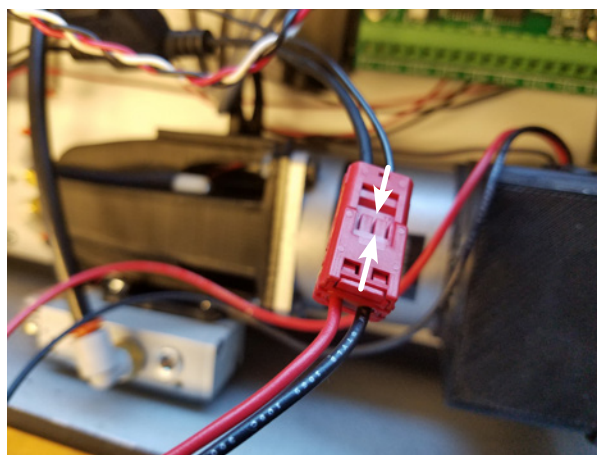
5. Remove the Air Motor Generator from the AutoStroke enclosure.

AIR MOTOR GENERATOR INSTALLATION INSTRUCTIONS



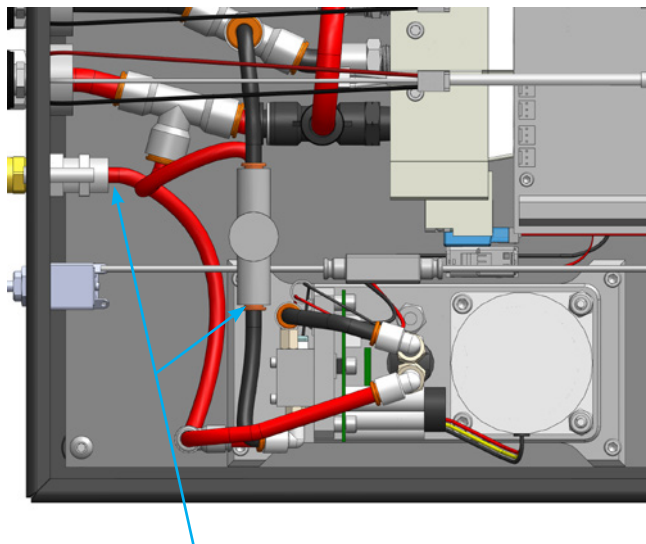
1. Install the replacement Air Motor Generator into the AutoStroke enclosure as shown.

2. Install the four screws securing the air motor generator with a 9/64" Hex Key.

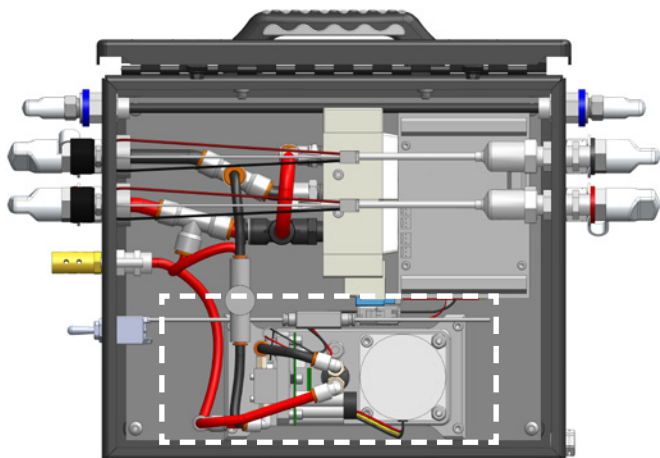


3. Carefully reconnect the electrical connection.

AIR MOTOR GENERATOR INSTALLATION INSTRUCTIONS.....CONTINUED



4. Connect the 2 air tubes from the air motor generator.

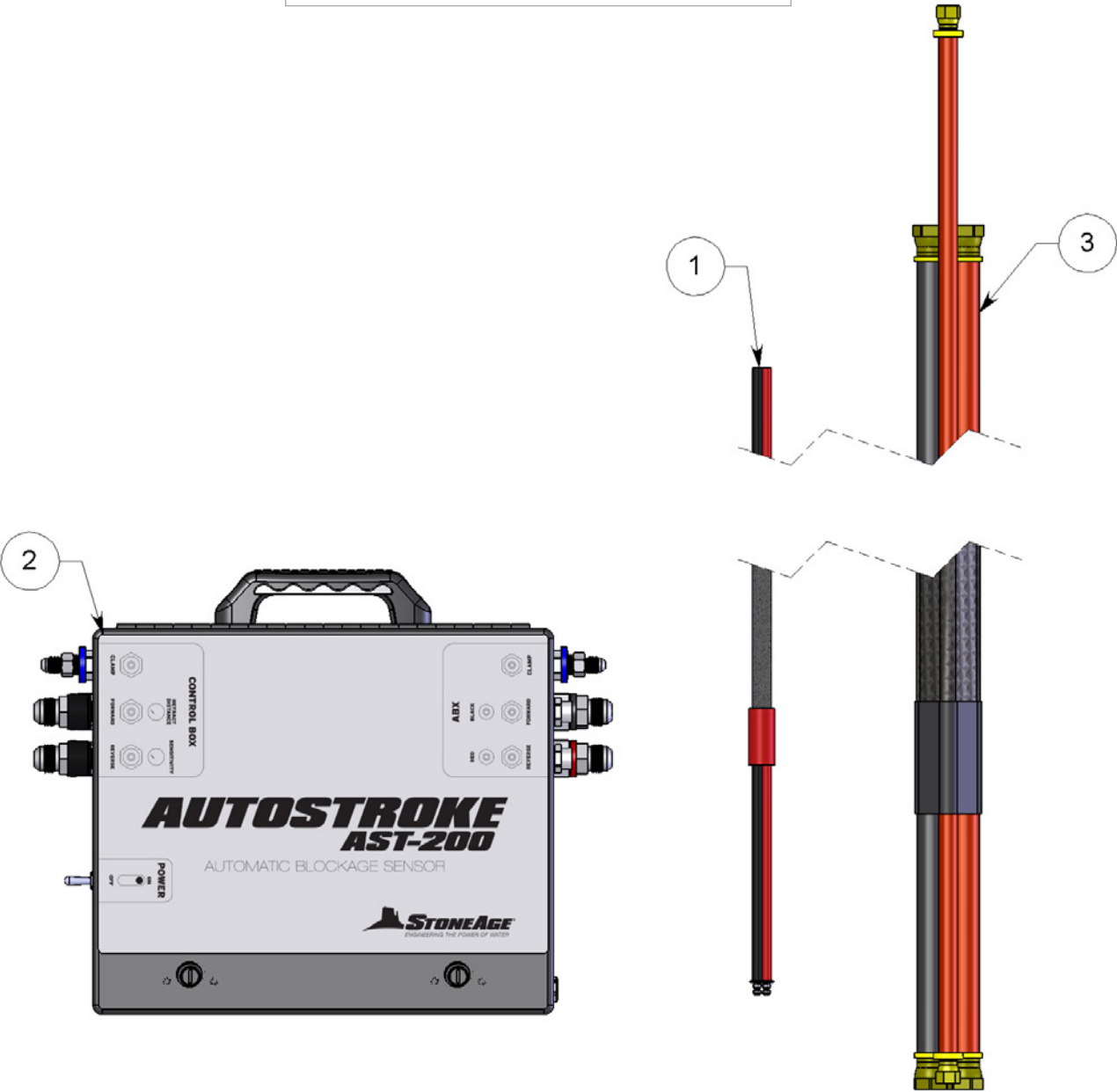


Correct Air Motor Generator location inside the
AST-200-V2 AUTOSTROKE



5. Close the AutoStroke lid with a flat screwdriver. Turn the quarter turn latches clockwise 90 degrees and tighten the cover onto the AutoStroke.

AUTOSTROKE (AST-200-V2)
AUTOMATIC BLOCKAGE SENSOR



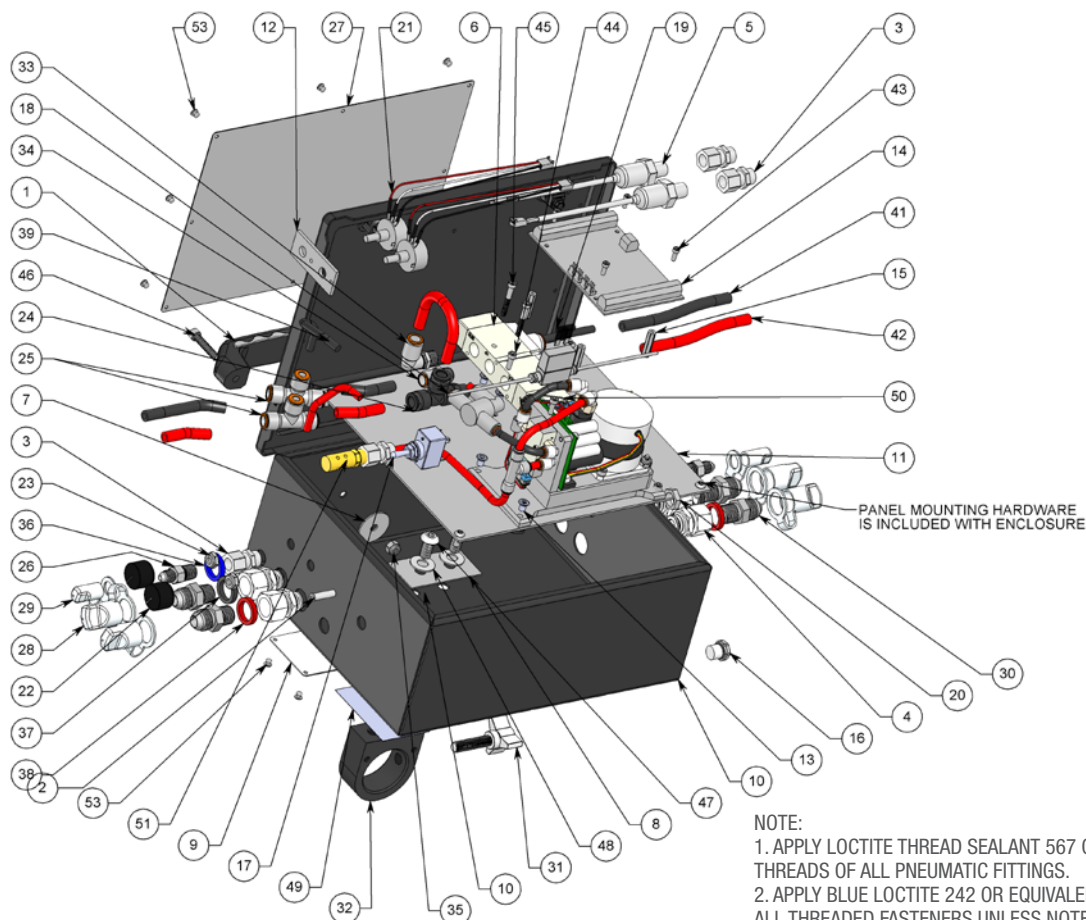
NOTICE

This color code system is used throughout the AutoStroke™ (AST-200-V2), Autobox®, and Control Box Assembly

■ REVERSE ■ FORWARD

#	DESCRIPTION	QTY
1	AST 277-25 AUTOSTROKE™ UMBILICAL ASSEMBLY	1
2	AST 301-V2 AUTOSTROKE™ BOX WITH GENERATOR	1
3	AST 340 AUTOSTROKE™ HOSE BUNDLE ASSY	1

AUTOSTROKE™ (AST 301-V2)
MANIFOLD ASSEMBLY

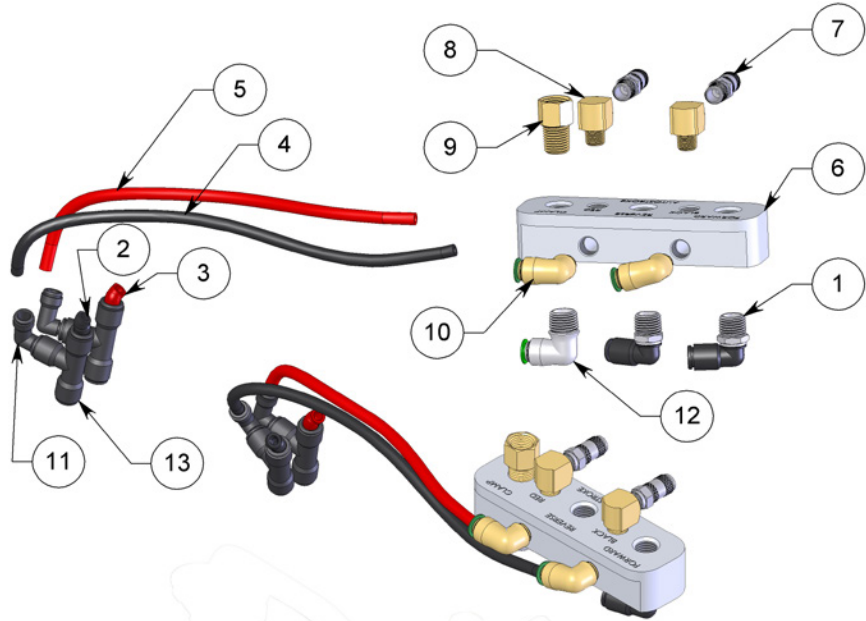


NOTE:

1. APPLY LOCTITE THREAD SEALANT 567 OR EQUIVALENT TO THREADS OF ALL PNEUMATIC FITTINGS.
2. APPLY BLUE LOCTITE 242 OR EQUIVALENT TO THREADS OF ALL THREADED FASTENERS UNLESS NOTED OTHERWISE.
3. LISTED MATERIAL OR EQUIVALENT ROHS COMPLIANT MATERIAL TO BE USED FOR ALL ITEMS.

#	PART NUMBER	QTY.	18	AST 318.2 INLINE FUSE HOLDER	1	37	GP 011-BK BLACK ID BAND MED	2
1	ABX 215 PULL HANDLE RUBBER GRIP GREY	1	19	AST 319 FUSE, ATO 1A	1	38	GP 011-R RED ID BAND MED	2
2	AST 207 LED INDICATOR	1	20	AST 320 NUT, ENCLOSURE VENT	1	39	GPTB 0250-PUR95A-BK	24IN
3	AST 221 BULKHEAD PL4 P4F	5	21	AST 321 POTENTIOMETER ASSEMBLY	2	40	GPTB 0250-PUR95A-RD	12IN
4	AST 229 BULKHEAD P6F PL6	4	22	AST 322 POTENTIOMETER KNOB	2	41	GPTB 0375-PUR95A-BK	12IN
5	AST 230 PRESSURE TRANSDUCER ASSEMBLY	2	23	AST 323 ROTARY SHAFT SEAL	2	42	GPTB 0375-PUR95A-RD	15IN
6	AST 237 SOLENOID VALVE	1	24	AST 324 MALE RUN TEE P4MPL6	1	43	GS 313-015 SHCS .138-32 X .38 SS	8
7	AST 251 FENDER WASHER	2	25	AST 328 REDUCING TEE PL6 PL4	2	44	GS 316-02 SHCS .16-32 X .50 SS (HC 014)	4
8	AST 252 WASHER PLATE	1	26	AST 329 FTG P4J4 STEEL MALE TO MALE	2	45	GS 316-05 SHCS .16-32 X 1.25 SS	2
9	AST 303-V2 SERIAL PLATE	1	27	AST 350-V2 AUTOSTROKE GRAPHIC	1	46	GS 325-05 SHCS .25-20 X 1.25 SS	2
10	AST 305-V2 ENCLOSURE	1	28	BR 167 DUST CAP	4	47	GSB 337-03 BHCS .37-16 X .75 LG SS	2
11	AST 306-V2 BACK PANEL	1	29	BR 168 DUST CAP, J4	2	48	GW 337-F FLAT WASHER SS	2
12	AST 312 POTENTIOMETER SPACER	1	30	CB 122 FITTING, OUTLET P6J8	4	49	PL 156-125 CAUTION INLET AIR, 125PSI MAX	1
13	AST 314 RIVET NUT, 8-32	6	31	CB 314 3-LOBE KNOB	1	50	AMG-100-V2 AIR MOTOR GENERATOR ASSEMBLY	1
14	AST 315 MICROCONTROLLER	1	32	CB 328-001 POLE MOUNT	1	51	BR 153 MUFFLER P4	1
15	AST 316 HEX STANDOFF	4	33	CB 351 FTG P4PL6 SWIVEL ELBOW	1	52	AMG 071 FEMALE CONNECTOR	1
16	AST 317 ENCLOSURE VENT	1	34	CB 354 FTG P4PL6 STRAIGHT	1	53	GR 125-AL-063-125-S RIVET, SEALING	12
17	AST 318.1 TOGGLE SWITCH, DPST	1	35	GN 325-L NYLOK NUT SS (TB 044.1)	2			
			36	GP 011-B BLUE ID BAND MED	2			

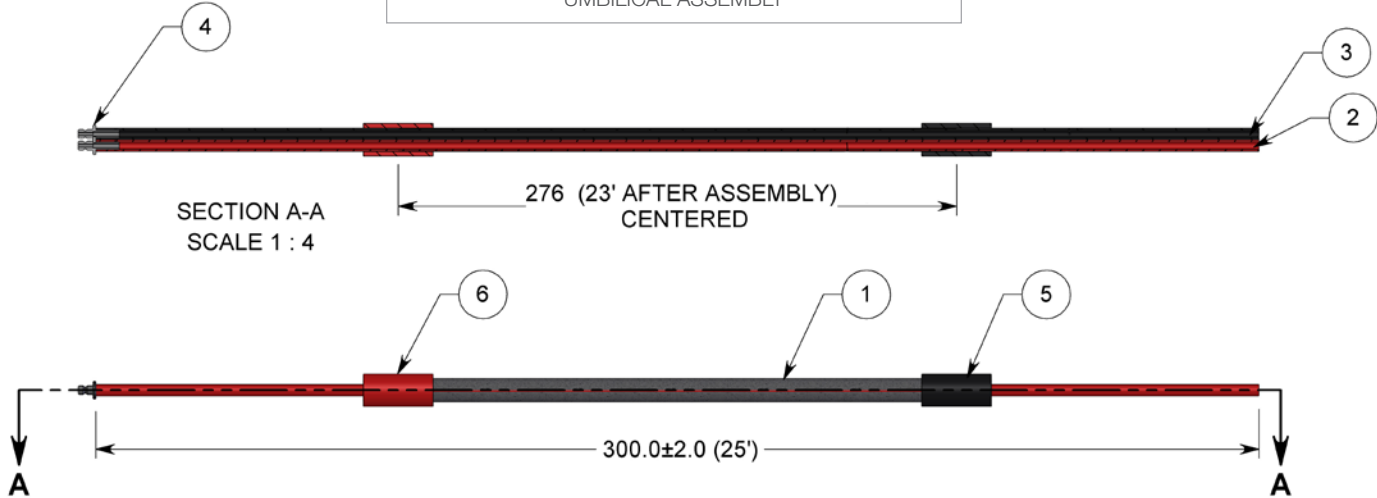
AUTOSTROKE™ (AST 275)
MANIFOLD ASSEMBLY



#	PART NUMBER	QTY.
1	ABX 260 FTG, P4M X PL8MMF 90° ELBOW	2
2	ABX 268.1 AST TUBE, BK, 8MM	1
3	ABX 268.2 AST TUBE, RD, 8MM	1
4	ABX 270.1 AST TUBE, BK, .250	1
5	ABX 270.2 AST TUBE, RD, .250	1
6	AST 276 ABX-2L MANIFOLD AUTOSTROKE™ (AST 275)	1

7	AST 278 FTG P2M QUICK DISCONNECT	2
8	AST 279 FTG P2MP2F ELBOW BRASS	2
9	AST 280 FTG P2MP2F	1
10	AST 281 FTG P2PL4 BRASS	2
11	AST 283 FTG PL4 TO STEM ELBOW	2
12	CB 558 FTG, ELBOW P4PL4	1
13	AST 282 FTG, REDUCING TEE 8MM PL X 6MM PL	1

AUTOSTROKE™ (AST 277-25)
UMBILICAL ASSEMBLY



#	PART NUMBER	QTY.
1	AST 277.1 POLYESTER TUBE UMBILICAL SLEEVE	1
2	AST 277.2 UMBILICAL TUBE, RED	1
3	AST 277.3 UMBILICAL TUBE, BLACK	1

4	AST 277.4 PLUG QUICK DISCONNECT	2
5	AST 277.6 UMBILICAL HEAT SHRINK BLACK	1
6	AST 277.7 UMBILICAL HEAT SHRINK RED	1

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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 pricelist 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.stoneagetools.com/terms>

<http://www.stoneagetools.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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