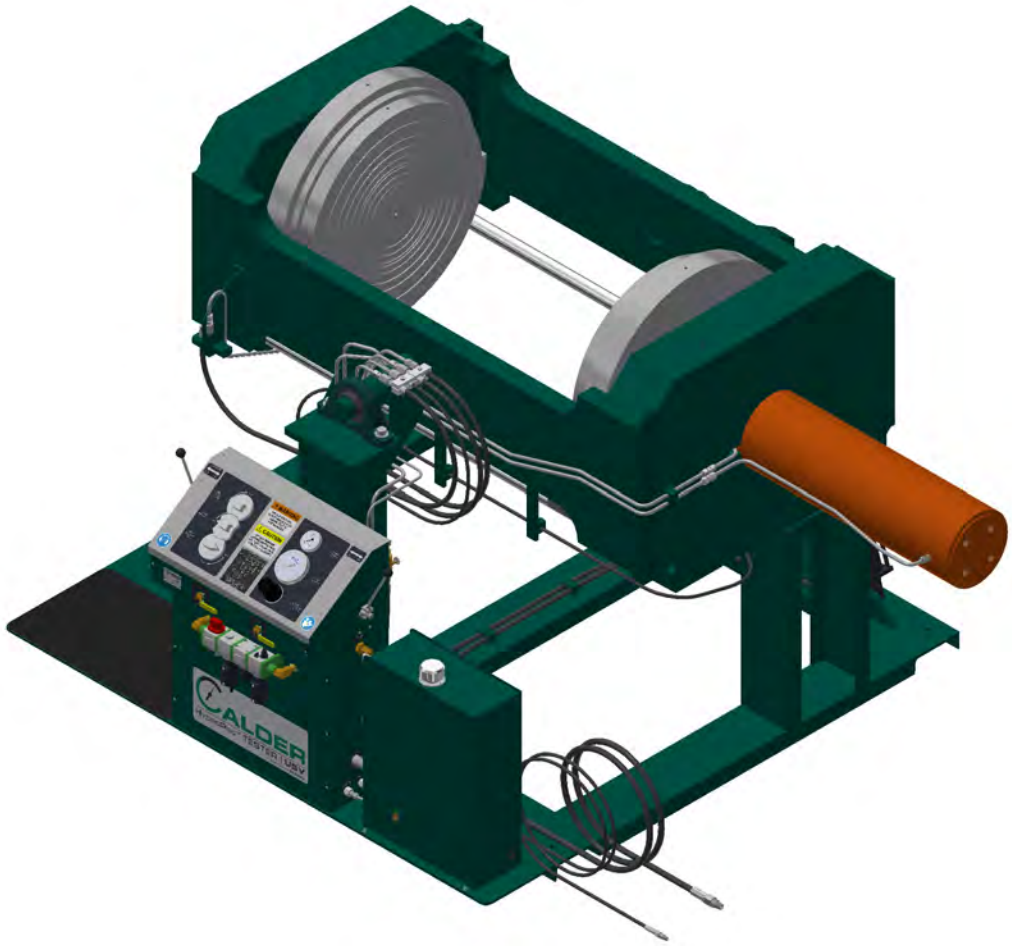
CE USV-16-200T

HYDRO PRO UNIVERSAL STRAIGHT BODY VALVE TESTER

OPERATING MANUAL

ORIGINAL INSTRUCTIONS



CALDER
VALVE TESTING & REPAIR SYSTEMS BY CLIMAX

P/N 96563
February 2020
Revision 0

CLIMAX | BORTECH CALDER H&S TOOL

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- Your name
- Shipping address
- Telephone number
- Machine model
- Serial number (if applicable)
- Date of purchase

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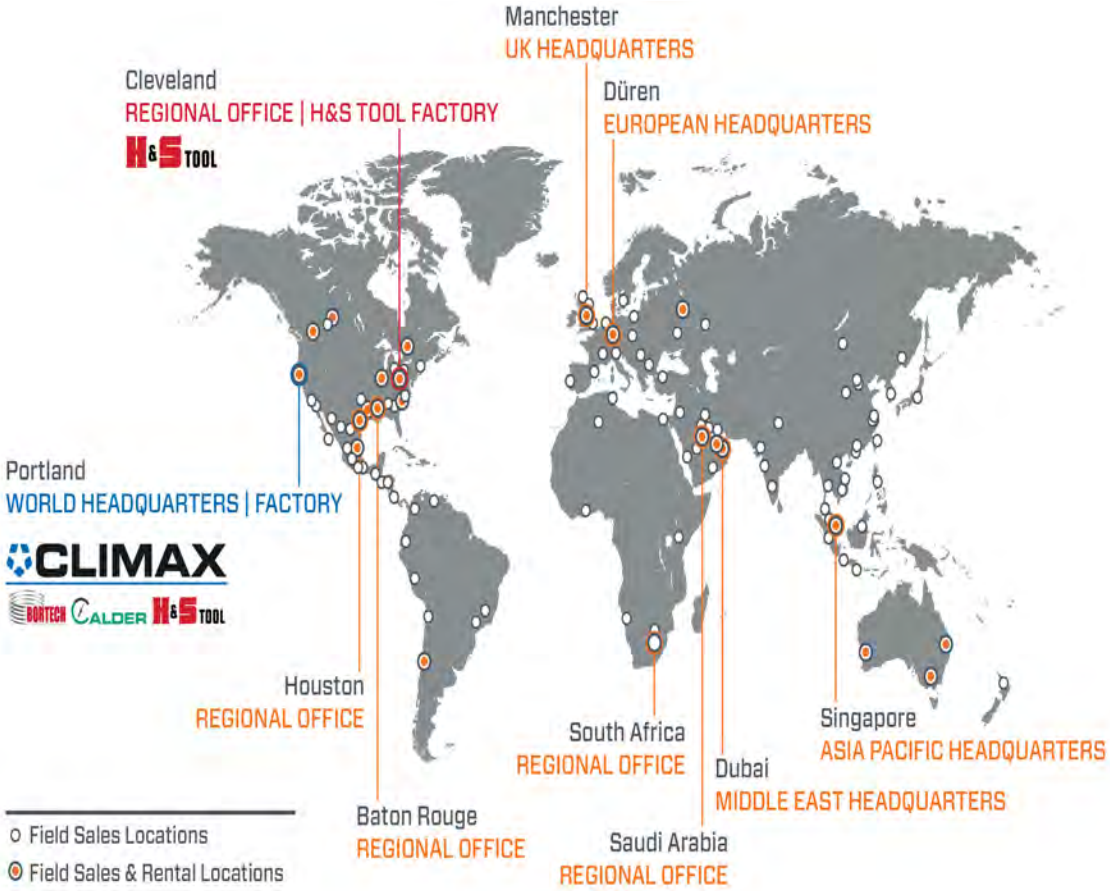
CLIMAX GLOBAL LOCATIONS



CE DOCUMENTATION

DECLARATION OF CONFORMITY

2006/42/EC Machinery Directive

Name of manufacturer or supplier
Climax Portable Machining and Welding Systems

Full postal address including country of origin
2712 E. Second St., Newberg, OR 97132, USA

Description of product
UNIVERSAL STRAIGHT VALVE TESTER; MODEL 600

Name, type or model, batch or serial number
MODEL 600; P/N'S 88572, 88576, 88018,
88271, 87988, 87989, 88573, 88577, 88574,
88578, 88575, 88579, 88591, 88581, 88272,
88273, 88990, 87991, 88592, 88583, 88593,
88586, 88594, 88590, 89021

Standards used, including number, title, issue date and other relative documents
EN 349, EN 3744, EN 11201, EN 12100-1, EN 13849-1, EN 14121-1

Full postal address if different from manufacturers
Climax GmBH
Am Langen Graben 8
52353 Duren, Germany

Declaration

I declare that as the Manufacturer, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

Signature of Manufacturer: _____

Scott J. Thiel

Position Held: **Director of Engineering; Research & Development**

Date: 9/14/2019

CE

LIMITED WARRANTY

CLIMAX Portable Machine Tools, Inc. (hereafter referred to as “CLIMAX”) warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of two years after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

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- Damage after the date of shipment not caused by defects in materials or workmanship
- Damage caused by improper or inadequate machine maintenance
- Damage caused by unauthorized machine modification or repair
- Damage caused by machine abuse
- Damage caused by using the machine beyond its rated capacity

All other warranties, express or implied, including without limitation the warranties of merchantability and fitness for a particular purpose are disclaimed and excluded.

Terms of sale

Be sure to review the terms of sale which appear on the reverse side of your invoice. These terms control and limit your rights with respect to the goods purchased from CLIMAX.

About this manual

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

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1 INTRODUCTION

IN THIS CHAPTER:

1.1 HOW TO USE THIS MANUAL

This manual describes information necessary for the setup, operation, maintenance, storage, shipping, and decommissioning of the USV-16-200T.

The first page of each chapter includes a summary of the chapter contents to help you locate specific information. The appendices contain supplemental product information to aid in setup, operation, and maintenance tasks.

Read this entire manual to familiarize yourself with the USV-16-200T before attempting to set it up or operate it.

1.2 SAFETY ALERTS

Pay careful attention to the safety alerts printed throughout this manual. Safety alerts will call your attention to specific hazardous situations that may be encountered when operating this machine.

Examples of safety alerts used in this manual are defined here[1]:

DANGER

indicates a hazardous situation which, if not avoided, ***WILL*** result in death or severe injury.

WARNING

indicates a hazardous situation which, if not avoided, ***COULD*** result in death or severe injury.

1. For more information on safety alerts, refer to *ANSI/NEMA Z535.6-2011, Product safety Information in Product Manuals, Instructions, and Other Collateral Materials*.

⚠ CAUTION

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

indicates a hazardous situation which, if not avoided, could result in property damage, equipment failure, or undesired work results.

1.3 GENERAL SAFETY PRECAUTIONS

CLIMAX leads the way in promoting the safe use of portable machine tools and valve testers. Safety is a joint effort. You, the end user, must do your part by being aware of your work environment and closely following the operating procedures and safety precautions contained in this manual, as well as your employer's safety guidelines.

Observe the following safety precautions when operating or working around the machine.

Training – Before operating this or any machine tool, you should receive instruction from a qualified trainer. Contact CLIMAX for machine-specific training information.

Risk assessment – Working with and around this machine poses risks to your safety. You, the end user, are responsible for conducting a risk assessment of each job site before setting up and operating this machine.

Intended use – Use this machine in accordance with the instructions and precautions in this manual. Do not use this machine for any purpose other than its intended use as described in this manual.

Personal protective equipment – Always wear appropriate personal protective gear when operating this or any other machine tool.

Work area – Keep the work area around the machine clear of clutter. Restrain cords and hoses connected to the machine. Keep other cords and hoses away from the work area.

Lifting – Many CLIMAX machine components are very heavy. Whenever possible, lift the machine or its components using proper hoisting equipment and rigging. Always use designated lifting points on the machine.

Lock-out/tag-out – Lock-out and tag-out the machine before performing maintenance.

Moving parts – CLIMAX machines have numerous exposed moving parts and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for stationary operating controls, avoid contact with moving parts by hands or tools during machine operation. Remove gloves and

secure hair, clothing, jewelry, and pocket items to prevent them from becoming entangled in moving parts.

1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

Eye hazard – This machine may produce liquid spray during operation. Always wear eye protection when operating the machine.

Sound level – This machine produces potentially harmful sound levels. Hearing protection is required when operating this machine or working around it.

Hazardous environments – Do not operate the machine in environments where potentially explosive materials, toxic chemicals, or radiation may be present.

Pressurization – Do not over-pressurize the valve test system beyond the limits described in this manual and on machine labels. Do not pressurize the system while the side panels are removed from the test console.

Test gauges – Do not use any gauge above its rating. Do not remove test gauges while the system is pressurized.

Utility service requirements – Do not exceed the pressure ratings stated in this manual and on the machine labels.

⚠ WARNING

This machine is equipped with interlocking valve control knobs to prevent accidental release of clamp pressure while the valve under test is pressurized.

Do not operate this machine if these interlocking knobs are missing, damaged, or altered. Doing so could result in property damage or personnel injury.

1.5 RISK ASSESSMENT AND HAZARD MITIGATION

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to Hydro Pro Universal Straight Body Valve Testers.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of hydrostatic testing, identifying one or more hazard that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the valve tester and the workpiece as a whole.

1.6 RISK ASSESSMENT CHECKLIST

The following checklist is not intended to be an all inclusive list of things to watch out for when setting up and operating this Hydro Pro Universal Straight Body Valve Tester. However, these checklists are typical of the types of risks the assembler and operator should consider. Use these checklists as part of your risk assessment:

TABLE 1-1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

	Before set-up
☐	I took note of all the warning labels on the machine.
☐	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
☐	I considered the need for personnel safety guarding and installed any necessary guards.
☐	I considered the potential hazards that are inherent in high-pressure valve testing, including the possibility of high velocity fluid escape or workpiece fragmentation, and have installed appropriate protective barriers.
☐	I read the machine assembly instructions (Section 3) and took inventory of all the items required but not supplied (Section 2.5).
☐	I considered how this machine operates and identified the best placement for the controls, cabling, and the operator.
☐	I evaluated and mitigated any other potential risks specific to my work area.

TABLE 1-2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

	After set-up
☐	I checked that the machine is safely installed (according to Section 3).
☐	I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
☐	I followed the required maintenance checklist (Section 5).
☐	I checked that all affected personnel have the recommended personal protective equipment, as well as any site-required or regulatory equipment.
☐	I checked that all affected personnel understand and are clear of the danger zone.
☐	I evaluated and mitigated any other potential risks specific to my work area.

1.7 LABELS

1.7.1 Label identification

The following warning and identification labels should be on your machine. If any are defaced or missing, contact CLIMAX immediately for replacements.

TABLE 1-3. LABELS

	P/N 29154 ID plate		P/N 81008 Warning label: wear ear and eye protection
	P/N 85417 Warning label: do not release clamp while pressurized		P/N 85437 Warning label: hand crush hazard
	P/N 87593 Warning label: read the operating manual		P/N 88808 Calder USV plate
	P/N 89122 Warning label: leave lifting device until fully clamped		P/N 89123 Warning label: overhead danger

1.7.2 Label location

The following figures display the location of the labels on each of the components of the USV-16-200T. For further identification of location placement, refer to the exploded views in Appendix A.

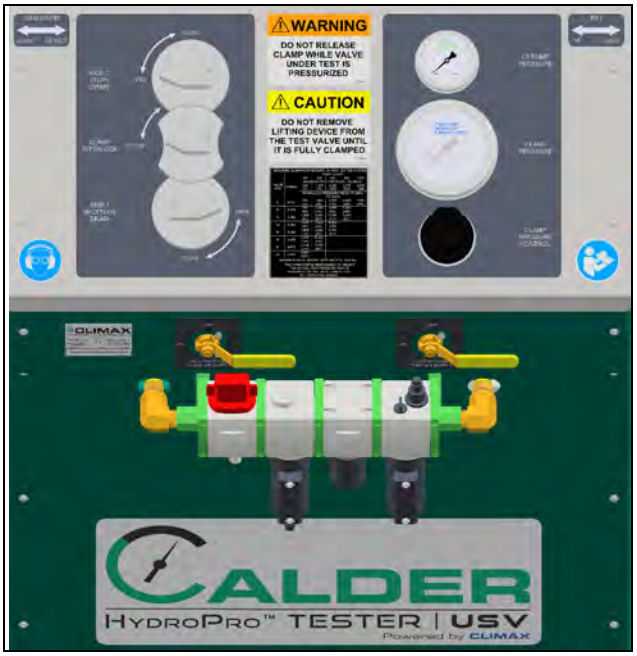

FIGURE 1-1. CONSOLE LABEL LOCATIONS

Label P/N: 29154, 81008, 85417, 87593, 88808, 89122

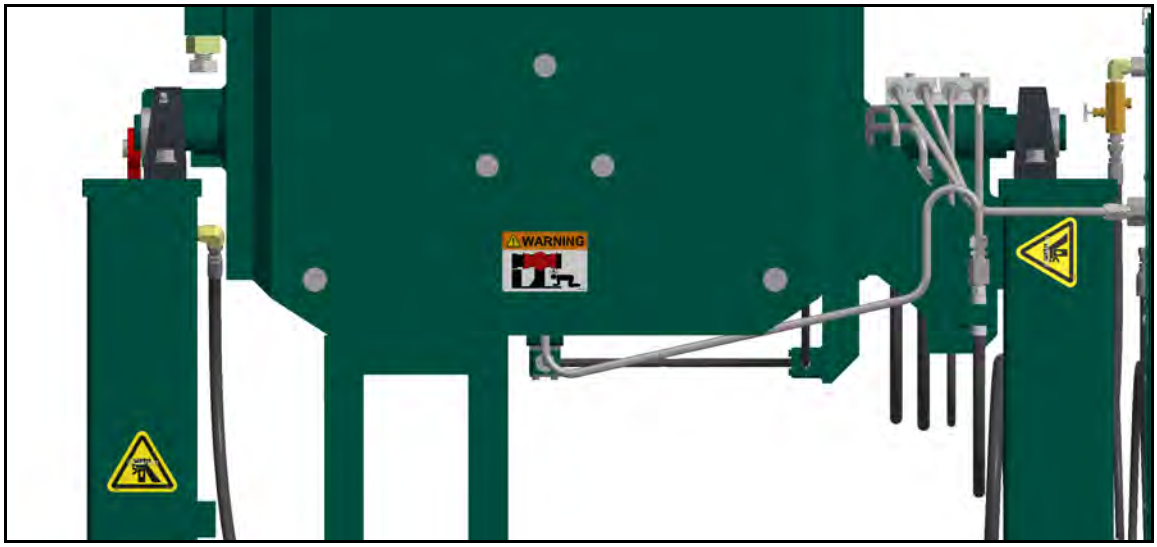

FIGURE 1-2. CLAMP BOX LEFT LABEL LOCATION

Label P/N: 85437, 89123

FIGURE 1-3. REAR CLAMP BOX AND FRAME LABEL LOCATIONS

Label P/N: 85437

2 OVERVIEW

IN THIS CHAPTER:

2.1 Features and components

The USV-16-200T clamp fixture is a valve testing system that hydraulically clamps and seals straight-body valves for hydrostatic and low-pressure air testing. It may be pressurized from a variety of hydrostatic pressure sources up to 9,700 psi (669 bar) and low-pressure air sources up to 125 psi (8.6 bar).

Principle components are shown in Figure 2-1.

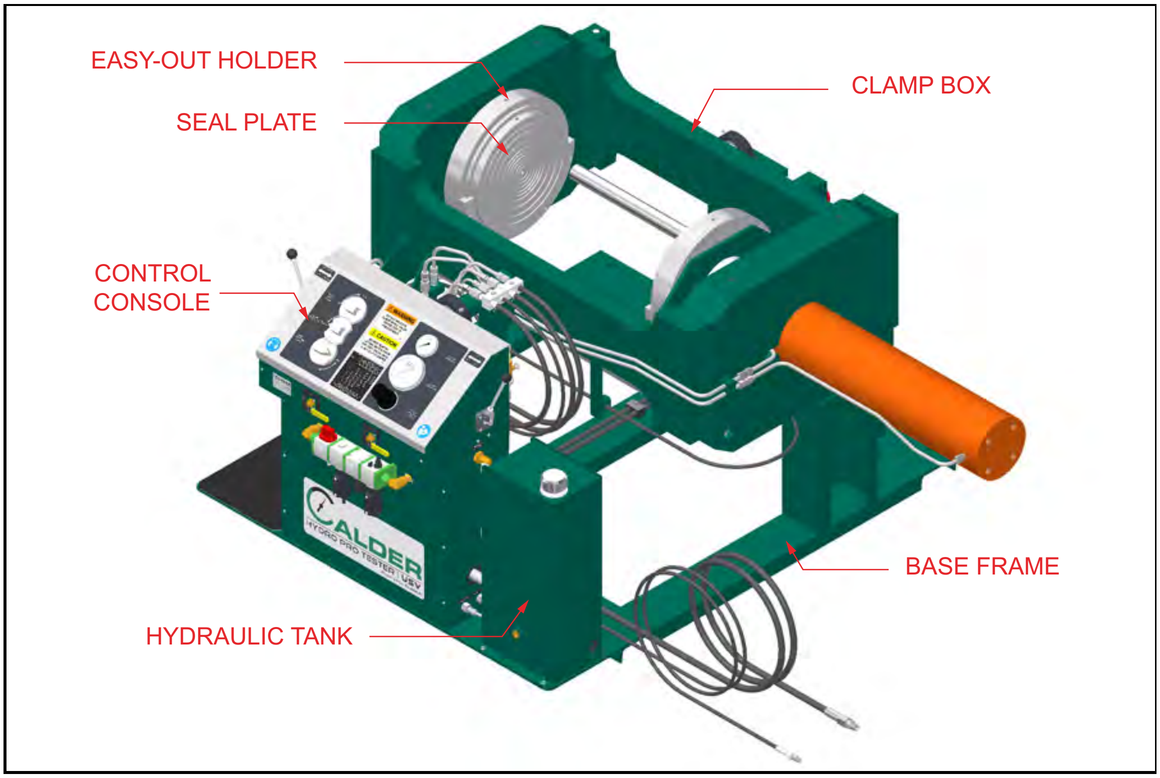

Figure 2-1. Components

Features include:

- **Safety interlock–** This feature prevents accidental release of valve clamp hydraulic pressure which the valve under test is pressurized.

Multiple leakage test types–Connection points to both ends of the valve under test equip this machine for shell and seat leakage tests.

Hydraulic tilting–This option is available to tilt the valve under test from horizontal to vertical for optimal valve pre-filling with water.

Easy-out seal plate holder–This option is available for easy change-out of seal plates when different styles of seal plates are used.

2.2 CONTROLS

The USV-16-200T controls are all located on the machine (shown in Figure 2-2).

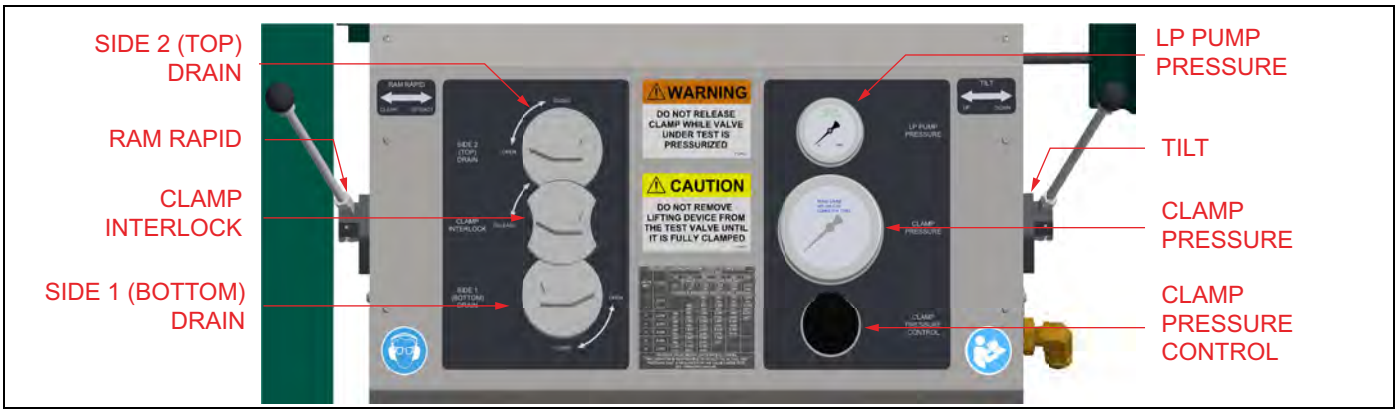

FIGURE 2-2. CONSOLE CONTROLS

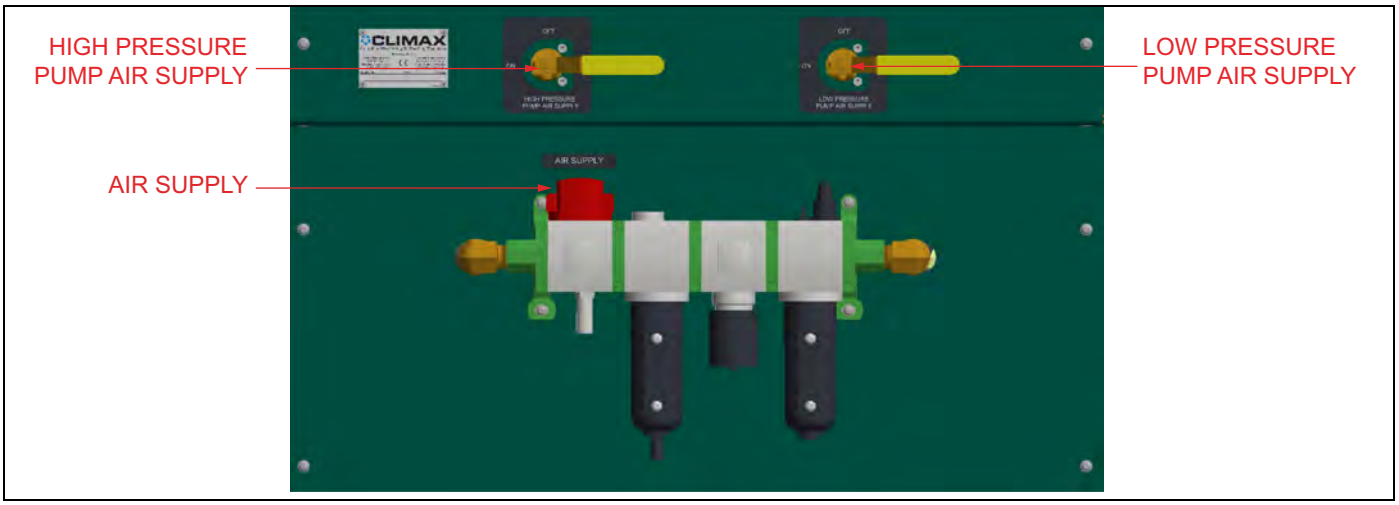

FIGURE 2-3. LOWER CONSOLE CONTROLS

2.3 DIMENSIONS

Figure 2-4 on page 12 shows the machine dimensions.

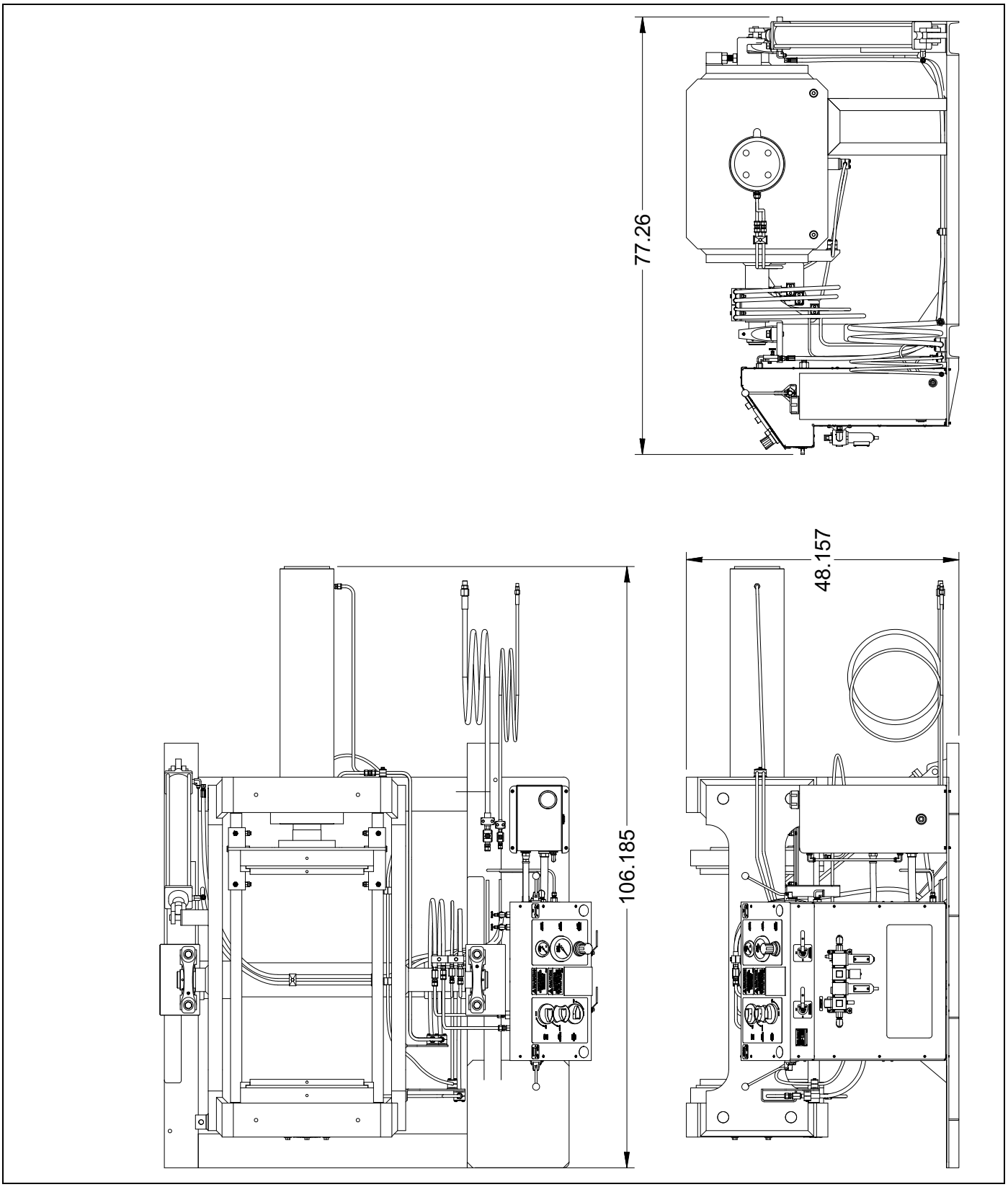

FIGURE 2-4. CLAMP FIXTURE DIMENSIONS

2.4 SPECIFICATIONS

Table 2-1 and Table 2-2 on page 14 provides the operating specifications. See the marketing literature for additional information.

TABLE 2-1. SPECIFICATIONS

Test media:	Water, air, glycol, water soluble oil blends
Maximum water test pressure:	9,700 psi (669 bar)
Maximum air test pressure:	125 psi (8.6 bar)
Types of valves that can be tested:	Straight pattern ball, globe, gate, butterfly, and check valves[1]
Shop air required:	100–150 psi at 40 scfm (6.9–10.3 bar at 1.13 m^3/min)
Water quick fill:	3 gpm (11 l/min) minimum
Maximum opening between seal plates:	27" (940 mm)
Minimum opening between seal plates:	5" (127 mm)
Maximum inside width:	29.5" (750 mm)
Hydraulic ram force:	200 tons (181.5 tonnes)
Approximate machine weight	6,000 lbs (2730 kg)
Approximate shipped weight	6,300 lbs (2865 lg)

1.Special seal plate adapters may be required to seal against the valve or to prevent external loading of the valve body when clamping.

⚠ WARNING

Do not use the machine in any application that exceeds these operating specifications. Failure to follow these guidelines could result in personnel injury and property damage, and will void the warranty.

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TABLE 2-2. VALVE SIZE AND PRESSURE COVERAGE

Valve size (nominal)	ANSI valve class					
	150	300	600	900	1500	2500
	Maximum test pressure					
	450 psi (31 bar)	1125 psi (78 bar)	2250 psi (155 bar)	3375 psi (233 bar)	5625 psi (388 bar)	9375 psi (646 bar)
2" (51 mm)			X	X	X	X
3" (76 mm)		X	X	X	X	X
4" (102 mm)	X	X	X	X	X	X
5" (127 mm)	X	X	X	X	X	X
6" (152 mm)	X	X	X	X	X	
8" (203 mm)	X	X	X	X		
10" (254 mm)	X	X	X	X		
12" (305 mm)	X	X	X			
14" (356 mm)	X	X				
16" (406 mm)	X	X				

⚠ WARNING

The test pressures listed by valve class represent machine capability and may not apply to your valve to be tested. Actual valve test pressures may be lower than the pressures listed in Table 2-2 due to the valve material, intended operating temperature, and potential other factors. Refer to the valve manufacturer's specifications for the correct testing pressure. Failure to do this could result in property damage or personnel injury.

2.5 ITEMS REQUIRED BUT NOT SUPPLIED

The following items are required but not supplied in your CLIMAX product kit:

- Hydraulic oil AW-32
- General purpose air tool oil
- Shop air at 100–150 psi and 40 scfm (6.9–10.3 bar at 1.13 m^3/min)
- Anchor bolts/hardware

3 SETUP

IN THIS CHAPTER:

This section describes the setup and assembly procedures for the USV-16-200T Hydro Pro Universal Straight Body Valve Tester.

3.1 RECEIPT AND INSPECTION

Your CLIMAX product was inspected and tested prior to shipment, and packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery.

When you receive your CLIMAX product, perform the following receipt checks:

1. Inspect the shipping containers for damage.
2. Check the contents of the shipping containers against the included invoice to make sure that all components have been shipped.
3. Inspect all components for damage, lifting the USV-16-200T with a forklift using the fork points in the base frame.

Contact CLIMAX immediately to report damaged or missing components.

NOTICE

Keep the shipping container and all packing materials for future storage and shipping of the machine.

3.2 SECURING THE TEST STAND

The USV-16-200T must be anchor-bolted through the base frame to the floor before operation.

NOTICE

Do not operate the machine unless it has been anchored to the floor. The floor must be level within ±5°.

WARNING

All units must be stabilized for operator safety. The operator must determine what is necessary to provide a safe environment.

3.2.1 Cement in place (option 1 – recommended)

Cement the anchor bolts into the floor. The exposed threads of the anchor must protrude a minimum of two threads past the nut and washer. See Figure 3-1.

3.2.2 Drill and anchor (option 2)

Drill holes into the floor for an expanding type anchor sleeve. A .5" (12.7 mm) lag bolt will require a minimum of 1.5" (38.1 mm) thread engagement. See Figure 3-1.

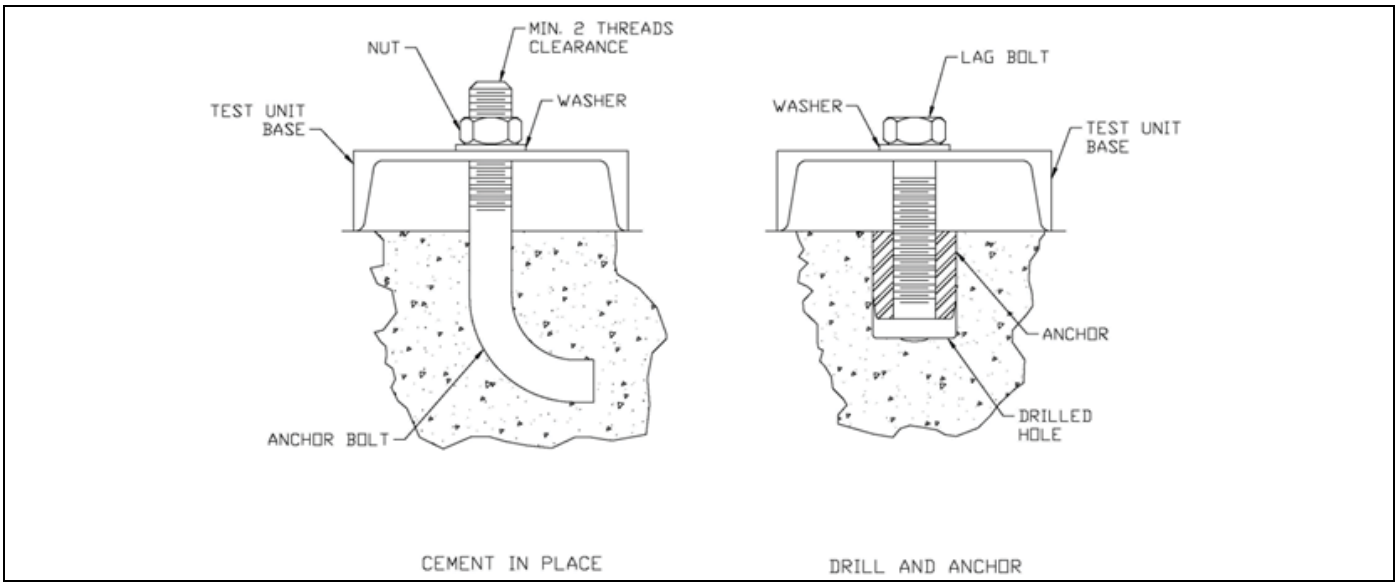

FIGURE 3-1. SECURING THE TEST STAND

3.3 FILLING THE LUBRICATOR AND HYDRAULIC TANK

Do the following to fill the lubricator and hydraulic tank:

1. Check that the lubricator is filled with general purpose air tool oil.
2. Retract the hydraulic cylinders and fill the hydraulic tank with AW-32 hydraulic oil to the top of the sight gauge.

NOTICE

If the hydraulic cylinders are not retracted when filled, the hydraulic tank might later overflow when the hydraulic cylinders are retracted.

NOTICE

The fill level must be visible in the sight tube throughout all modes of operation.

3.4 CONNECTING TO THE TEST PRESSURE SOURCE

The USV-16-200T can be paired with a variety of hydrostatic and low-pressure air pressure sources as long as the hydrostatic and air pressures are within the limits specified in Section 2.4 on page 13.

Typical Calder testing systems include a clamp fixture, such as this Hydro Pro Universal Straight Body Valve Tester, and a test pressure source and control console, such as a Hydro Pro Console. Refer to the operating manual for the Hydro Pro Console (or other pressure source) for setup instructions for that module.

⚠ CAUTION

Always use test pressure hoses rated to the full system working pressure. Failure to do this could result in property damage or personnel injury.

Do the following to assemble the machine:

1. Connect the 1/2" (13 mm)-ID high-pressure inlet hose to the pressure source's primary outlet (that is, the side through which the valve is filled). This is the connection to the lower seal plate when the clamp fixture is tilted up.

NOTICE

If the pressure source has quick fill ability, connect the outlet line from the test pressure source with quick-fill ability to the 1/2" (13 mm)-ID high-pressure inlet hose.

2. Connect the 1/4" (6 mm)-ID high-pressure inlet hose to the pressure source's second pressure outlet. This is the connection to the top plate (when tilted up).

NOTICE

If the pressure source has only one pressure outlet, this hose may be capped or removed and the port plugged.

3.5 CONNECTING THE UTILITIES

Connect shop air to the 1/2" NPT SHOP AIR INLET port. Shop air pressure is 100–150 psi (6.9–10.3 bar). The required shop air volume is 40 scfm (1.13 m^3/min).

Connect a drain hose with a 1/2" (13 mm) minimum inside diameter and rated to the system maximum pressure or higher to the DRAIN OUTLET port. Route the hose to a safe location. The drain line may be connected to the return port of a recirculation system if the recirculation system does not obstruct the drain line's flow.

⚠ CAUTION

Secure the hose end to prevent hose whip when high-velocity fluid travels through the drain hose. Hose whip could result in property damage or personnel injury.

⚠ WARNING

Do not block the DRAIN OUTLET port. High-pressure fluid vented to the drain must be able to flow freely. Blocking the drain could rupture the drain line or fittings prevent the safety interlock from functioning and may result in property damage or personnel injury.

3.6 CONFIGURING THE SEAL PLATES

Machines equipped with the optional easy-out seal plate holders may be configured with different seal plates (such as RTJ seal plates and bore seal adapter plates) before operation.

To remove the seal plates from the easy-out holder, do the following:

1. Check that the clamp box is in the horizontal position (if the machine is equipped with optional tilt)
2. Thread a lifting eye into the seal plate and lift it out of the easy-out holder using a hoist.

To install the seal plates, reverse the removal steps above. Check the condition of the small o-ring at the center of the easy-out holders before installing the seal plates.

4 OPERATION

IN THIS CHAPTER:

4.1 PRE-OPERATION CHECKS

Do the following checks before operating the machine:

1. Complete the risk assessment checklist in Table 1-2 on page 5.
2. Check that the work area is clear of non-essential personnel and equipment.
3. Check all hand tools are removed from inside the machine and the area.
4. Check that the o-ring seals in the seal plates are in good condition (free of nicks, tears, and not brittle).
5. Check that the seal plates are in good condition.

⚠ CAUTION

Damage (such as dents and dings) to the seal plates, especially next to the o-ring seals, could cause the valve under test to fail to form a seal against the plates.

6. Check that the air lubricator has adequate volume of air tool oil.
7. Check that the hydraulic tank has adequate volume of hydraulic oil.
8. Check that the machine has adequate shop air pressure and volume.
9. Check that the L.P. AIR SUPPLY and H.P. AIR SUPPLY valves are closed.
10. Turn on the AIR SUPPLY valve.
11. Check that the appropriate protective barriers are in place.

⚠ WARNING

High-pressure valve testing may result in the sudden, unexpected release of stored energy with the potential to cause property damage or personnel injury. Potential hazards may include the possibility of high-velocity fluid escaping and high-energy projectile impact. The end-user must assess the application and install protective barrier devices, as appropriate.

4.2 CLAMPING A VALVE

WARNING

Before clamping the valve to be tested, check that the valve is rated to the pressure for which it will be tested. Check the valve manufacturer's specifications for the correct test pressure. If the valve is not rated to the test pressure that will be applied, the valve or the machine may be damaged and could result in personnel injury.

WARNING

This machine applies a clamping load across the body of the valve under test. Before clamping the valve to be tested, check that clamping across the valve body is a suitable method to clamp the valve during test, and that it can withstand the clamping force that is required. If the valve cannot withstand the clamping force, this could result in property damage and personnel injury.

Do the following to clamp a valve:

1. Check that the clamp box is tilted down to the horizontal position (if equipped with the tilt option). If the clamp box needs to be repositioned, refer to Section 4.3 on page 23.
2. Open the L.P. PUMP AIR SUPPLY valve, then position the ram using the RAM RAPID control so that the seal plates have an opening large enough for the valve under test to fit between them.

TIP:

The ram may also be advanced by opening the H.P. PUMP AIR SUPPLY valve and increasing pressure using the CLAMP PRESSURE CONTROL regulator. Note that the ram can only be retracted with the CLAMP INTERLOCK in the RELEASE position, which requires the SIDE 1 and SIDE 2 interlock DRAINS to be opened first.

3. Lower the valve under test (typically with an overhead hoist) into the clamp box and position it with its flanges centered on the seal plates.

WARNING

Use chains or straps to lower the valve under test into the clamp box. Do not place hands or any other body part between the seal plates or between the valve and the seal plates, as this could result in bodily injury.

4. Advance the ram using the RAM RAPID control until the seal plates contact and clamp against the valve flanges. At this point the valve is clamped with low pressure only. Continue supporting the weight of the valve with the hoist until full clamp pressure has been applied.

⚠ CAUTION

Do not remove the lifting device from the test valve until the test valve is fully clamped. Failure to follow this guideline could result in the test valve falling, causing personnel injury or property damage.

⚠ WARNING

Do not crawl under or place any body part underneath the test valve. If the test valve falls, it could result in bodily injury.

NOTICE

When clamping small valves, use RAM RAPID to move the seal plates close to the flanges, then use CLAMP PRESSURE CONTROL to advance the ram and clamp it to the required clamp pressure as described in the following two steps.

5. Determine the clamp pressure required by using the clamping pressure chart located on the control panel (shown in Table 4-1 on page 22) and by following these steps:
   a) Select the correct valve size in the first column.
   b) Select the correct valve class and test pressure from the header rows.
   c) Determine the hydraulic clamping pressure at the intersection of the selected row and column.

      Example (see highlighted cells): using a 8" class 600 valve at 2,250 psi test pressure = 4,100 psi clamp pressure.

TABLE 4-1. USV-16-200T CLAMPING PRESSURE

Valve size	O-ring size	ASME class					
		150	300	600	900	1,500	2,500
		Maximum test pressure, psi (bar)[a]					
		450 (31)	1,125 (78)	2,250 (155)	3,375 (233)	5,625 (388)	9,375 (646)
		Hydraulic pressure required to seal, psi (bar)					
2" (51 mm)	2-230			400 (28)	600 (41)	1,300 (90)	1,600 (110)
3" (76 mm)	2-239		400 (28)	800 (55)	1,200 (83)	1,900 (131)	3,100 (214)
4" (102 mm)	2-350	300 (21)	700 (48)	1,300 (90)	1,900 (131)	3,200 (221)	5,200 (359)
5" (127 mm)	2-358	400 (28)	900 (62)	1,800 (124)	2,700 (186)	4,500 (310)	7,400 (510)
6" (152 mm)	2-364	500 (34)	1,300 (90)	2,500 (172)	3,800 (262)	6,200 (428)	
8" (203 mm)	2-372	900 (62)	2,100 (145)	4,100 (283)	6,100 (421)		
10" (254 mm)	2-379	1,300 (90)	3,200 (221)	6,300 (434)	9,500 (655)		
12" (305 mm)	2-382	1,800 (124)	4,400 (303)	8,700 (600)			
14" (356 mm)	2-383	2,000 (138)	5,000 (345)				
16" (406 mm)	2-385	2,600 (179)	6,500 (448)				

a.The operator is responsible to select the actual test pressure that is required for the valve under test.

CAUTION

The test pressures listed by valve class represent machine capability and may not apply to your valve to be tested. Actual valve test pressures may be lower due to the valve material, intended operating temperature, and potential other factors.

Refer to the valve manufacturer's specifications for the correct testing pressure. Failure to do this could result in property damage or personnel injury.

6. Open the H.P. PUMP AIR SUPPLY valve and increase the CLAMP PRESSURE CONTROL until the clamp pressure gauge reads the required clamp pressure.

⚠ WARNING

During testing, leave the H.P. PUMP AIR SUPPLY valve open and the CLAMP PRESSURE CONTROL at the clamp pressure setting. This allows the pump to compensate for small amounts of leakage in the case that the hydraulic system begins to slowly leak.

Failure to do this could result in a valve becoming unclamped during testing and could cause property damage or personnel injury.

NOTICE

If the H.P. PUMP cycles after the clamp pressure has been set, it may indicate that the hydraulic system has a leak. Perform a hydraulic leakage check (see Section 5 on page 27) and correct any hydraulic leaks.

4.3 TILTING A VALVE

⚠ CAUTION

Seal plates with machines equipped with easy-out holders are held in by gravity, and so they may fall if the clamp box is tilted upright without a valve clamped in the clamp box.

If the machine has easy-out holders, do not tilt the clamp box upright without a valve clamped between the seal plates, as this could result in property damage or personnel injury.

Do the following to tilt a valve:

1. Check that the valve under test is clamped securely to the required clamp pressure.
2. Disconnect the valve under test from the overhead hoist.
3. Check that all personnel are clear of the clamp box and the valve under test, then open the L.P. PUMP AIR SUPPLY valve and use the TILT lever to tilt the valve up or down.
4. Turn off the L.P. PUMP AIR SUPPLY valve after tilting the valve into position.

NOTICE

If the machine is tilted to the vertical position, the clamp cylinder can leak down and cause the hydraulic tank to overflow.

4.4 PRE-TESTING

⚠ CAUTION

Prior to performing a hydrostatic test, check that all air has been vented from the valve under test. Failure to do this could result in property damage or personnel injury.

Do the following for pre-testing:

1. Check that the valve under test is clamped to the correct clamp pressure.

NOTICE

If testing with water and the machine has the tilt option, check that the valve under test is tilted into the upright position. This allows the valve under test to be filled from the bottom up while air is vented out the top.

If the tilt option has not been purchased or if pressurizing with a single line, the valve under test must be vented while filling using an alternate means. This will vary based on valve design.

2. Close the SIDE 1 and SIDE 2 DRAIN valves at the clamp fixture control panel.
3. Fill the valve under test with water by using the Hydro Pro Console test pressure controls (or alternate test pressure source) to fill through the 1/2" (13 mm) line and to vent the air from the valve under test by opening the 1/4" (6 mm) line to drain. Refer to the manual of the Hydro Pro Console (or alternate test pressure source) for specific filling instructions.

4.5 TESTING

This machine is designed to perform high-pressure hydrostatic and low-pressure air tests. Refer to Section 2.4 on page 13 for maximum pressures.

⚠ WARNING

Do not use this machine for high-pressure gas testing, which could result in property damage or personnel injury.

Do the following to complete a valve test:

1. Check that the H.P. PUMP AIR SUPPLY valve is open and that the CLAMP PRESSURE CONTROL is set for the correct clamp pressure.
2. Close the SIDE 1 and SIDE 2 DRAIN valves at the clamp fixture controls, if not already closed.

3. Pressurize the valve under test per the instructions provided with the test pressure source.

⚠ WARNING

Do not pressurize the machine above the maximum pressure rating. Refer to Section 2.4 on page 13. Pressurizing the machine above the maximum pressure rating could result in property damage or personnel injury.

⚠ WARNING

Do not attempt to release the clamp pressure while the valve under test is pressurized. Releasing a valve under pressure could result in property damage or personnel injury.

4.6 POST-TESTING

Do the following after completing a test:

1. Shut off the test pressure source.
2. Drain the test pressure from the valve under test using the controls at the test pressure source.
3. Drain the water from the valve using low-pressure air, if the test pressure source has this feature.
4. If the clamp fixture has the tilt option, tilt the clamp box and the valve under test to the horizontal position.

4.7 UNCLAMPING A VALVE

⚠ WARNING

Do not release the clamp pressure while the valve under test is pressurized. Releasing a valve under pressure could result in property damage or personnel injury.

Do the following to unclamp a valve:

1. Support the valve under test with an overhead hoist.

⚠ CAUTION

Do not release the clamp unless supporting the valve with a hoist or other suitable device. Releasing an unsupported valve could result in property damage or personnel injury.

2. Back off the CLAMP PRESSURE CONTROL to zero.
3. Close the H.P. PUMP AIR SUPPLY valve.
4. Turn the SIDE 1 and SIDE 2 interlock DRAIN valves to OPEN, and then turn the CLAMP INTERLOCK to RELEASE.
5. Open the L.P. PUMP AIR SUPPLY valve and RETRACT the ram using the RAM RAPID controls.
6. Close the L.P. PUMP AIR SUPPLY valve.
7. Lift the valve under test out of the clamp box.

5 MAINTENANCE

5.1 MAINTENANCE CHECKLIST

Table 5-1 lists maintenance intervals and tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task
Before each use	Check air lubricator level and refill with general purpose air tool oil as necessary.
	Check hydraulic oil level and refill with AW-32 as necessary.
	Check seal plate O-rings/sealing surface condition.
Periodically	Check the condition of the hoses and replace as necessary.
	Replace the air inlet filter with Air Prep Unit Filter (P/N 87437) as necessary.
	Check for hydraulic leakage (see Section 5.2).
	Grease the pillow block bearings when equipped with the tilt option.

5.2 CHECKING FOR HYDRAULIC LEAKAGE

The hydraulic system must be maintained in a leak-free condition to assure consistent and reliable clamping throughout the test.

Perform the following check periodically or if the hydraulic system is ever suspected of leaking.

⚠ CAUTION

Do not apply test pressure at any time during this check, as that may result in property damage or personnel injury.

Do the following to check for hydraulic leakage:

1. If equipped with the tilt option, place the clamp box in the horizontal position.
2. Select a valve or similar component that can be clamped with more than 5,000 psi (345 bar) of clamping pressure.
3. Clamp the valve in the clamp box to a minimum of 5,000 psi (345 bar), but not more than the test piece can handle.

4. Keep the test piece supported with an overhead hoist, and shut off the H.P. PUMP AIR SUPPLY valve and reduce the CLAMP PRESSURE CONTROL regulator to zero. This will allow the system to leak down if a leak is present without the pump replenishing pressure.
5. Monitor the clamp pressure for a minimum of 10 minutes. Pressure loss must not be more than 100 psi (6.9 bar) in 10 minutes.

6 STORAGE AND SHIPPING

6.1 STORAGE

Proper storage of the Hydro Pro Universal Straight Body Valve Tester will extend its usefulness and prevent undue damage.

Before storing, do the following:

1. Retract the hydraulic cylinders.
2. Drain all water from the lines and dry the machine surfaces.
3. Drain the hydraulic fluid from the tank and lines.
4. Drain the air lubricator.

6.2 DECOMMISSIONING

To decommission the Hydro Pro Universal Straight Body Valve Tester prior to disposal, drain all fluids from the system. Refer to Appendix A for component assembly information.

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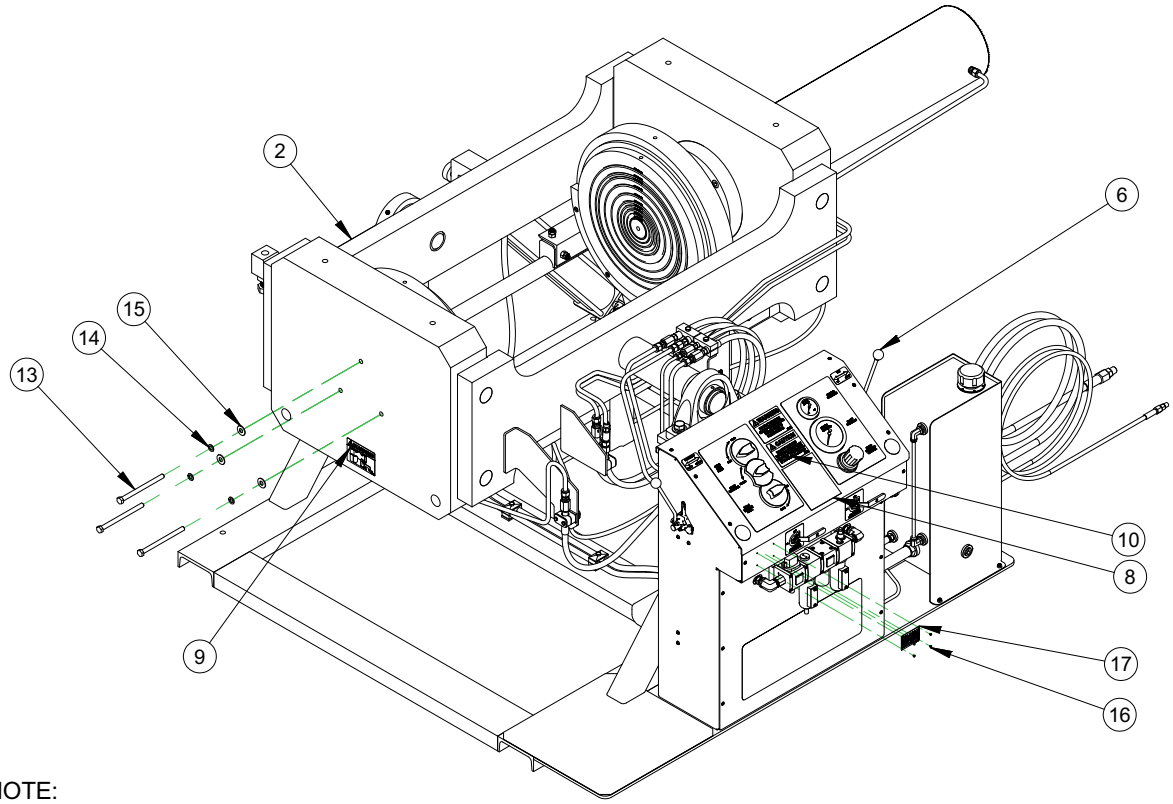
APPENDIX A ASSEMBLY DRAWINGS

Drawing list



NOTE:

1. CONFIGURATION SHOWN IS 88573.
   SEE OPTIONS TABLE FOR OTHER
   CONFIGURATIONS.

OPTIONS TABLE

		QTY IN TOP LEVEL P/N			
P/N	OPTIONS	88573	88577	88583	88592
91534	KIT - NON-TILT	0	0	1	1
91444	KIT - FIXED SEAL PLATES	0	1	1	0
91477	KIT - EASY OUT HOLDERS WITH SEAL PLATES	1	0	0	1
91448	KIT - TILT	1	1	0	0

PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	96563	(NOT SHOWN) MANUAL INSTRUCTION USV-16-200T
2	1	91593	ASSY BASE MODEL USV-16-200T
3	CHART	91534	(NOT SHOWN) KIT - NON TILT MODEL USV-16
4	CHART	91477	KIT - EASY OUT HOLDERS WITH SEAL PLATES USV - 16 -200T
5	1	91458	(NOT SHOWN) CRATE 114 X 88 X 54 ECORRCRATE USV-16
6	CHART	91448	KIT - TILT USV-16-200T
7	CHART	91444	(NOT SHOWN) KIT - FIXED SEAL PLATES USV-16
8	1	91300	LABEL CLAMPING CHART USV-12-150T
9	1	89123	LABEL CAUTION - DO NOT CRAWL UNDER 4-5/8 X 3-1/4
10	1	89122	LABEL CAUTION - DO NOT REMOVE LIFTING DEVICE 4-5/8 X 3-1/4
11	1	89028	(NOT SHOWN) SCHEMATIC CALDER USV CLAMP FIXTURE
12	4	85437	LABEL WARNING - HAND CRUSH/FORCE FROM BELOW 3.80 X 3.29
13	3	83840	SCREW 1/2-13 X 7 HHCS S.S. PARTIAL THREAD
14	3	78665	WASHER 1/2 LOCW SS
15	3	78415	WASHER 1/2 FLTW SS
16	4	71912	RIVET BLIND 1/8 DIA .126-.187 GRIP ALUMINUM
17	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0

FIGURE A-1. USV-16-200T CLAMP FIXTURE ASSEMBLY (P/N 88573)

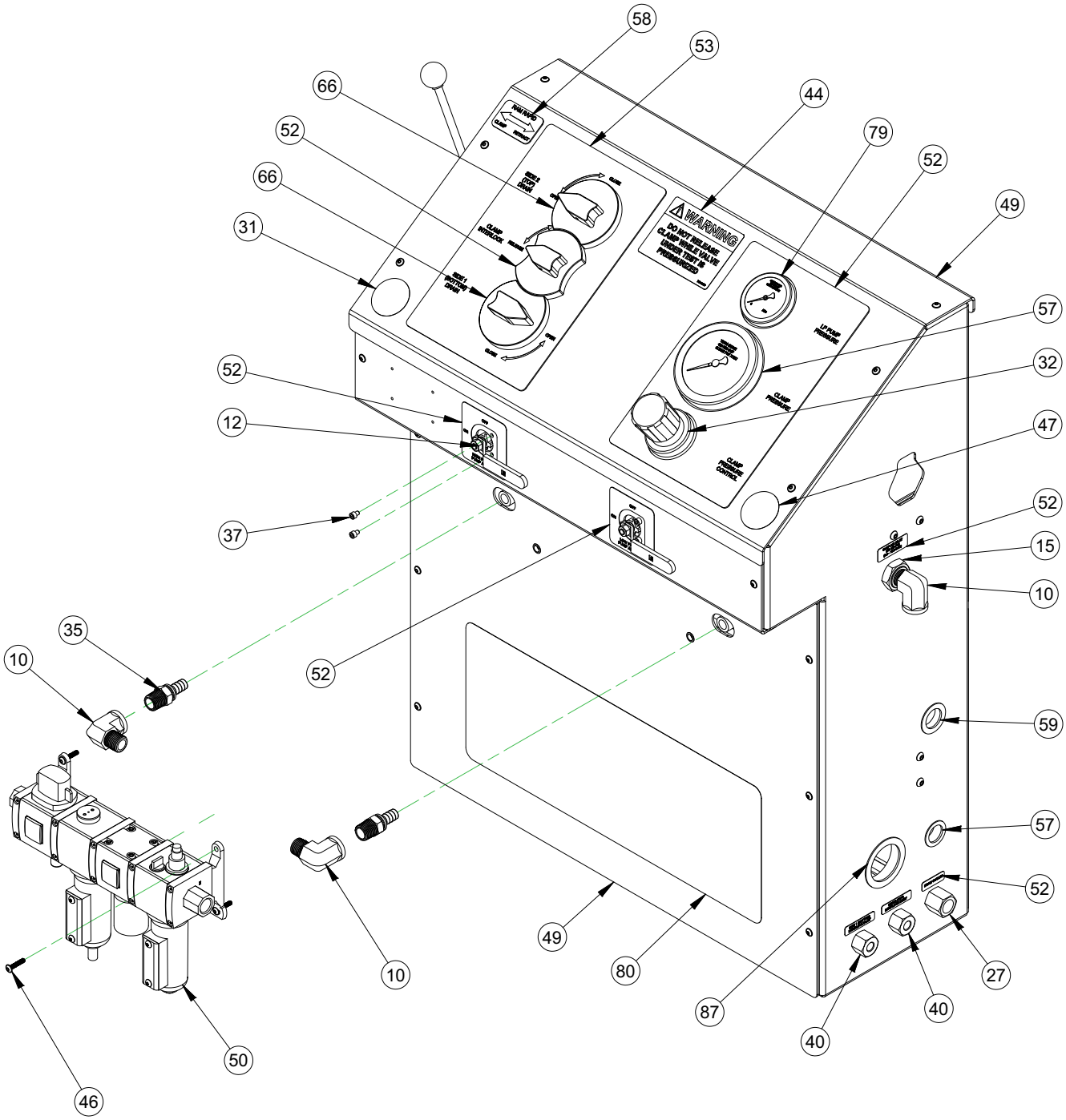


FIGURE A-2. CONTROL CONSOLE USV ASSEMBLY FRONT (P/N 89020)

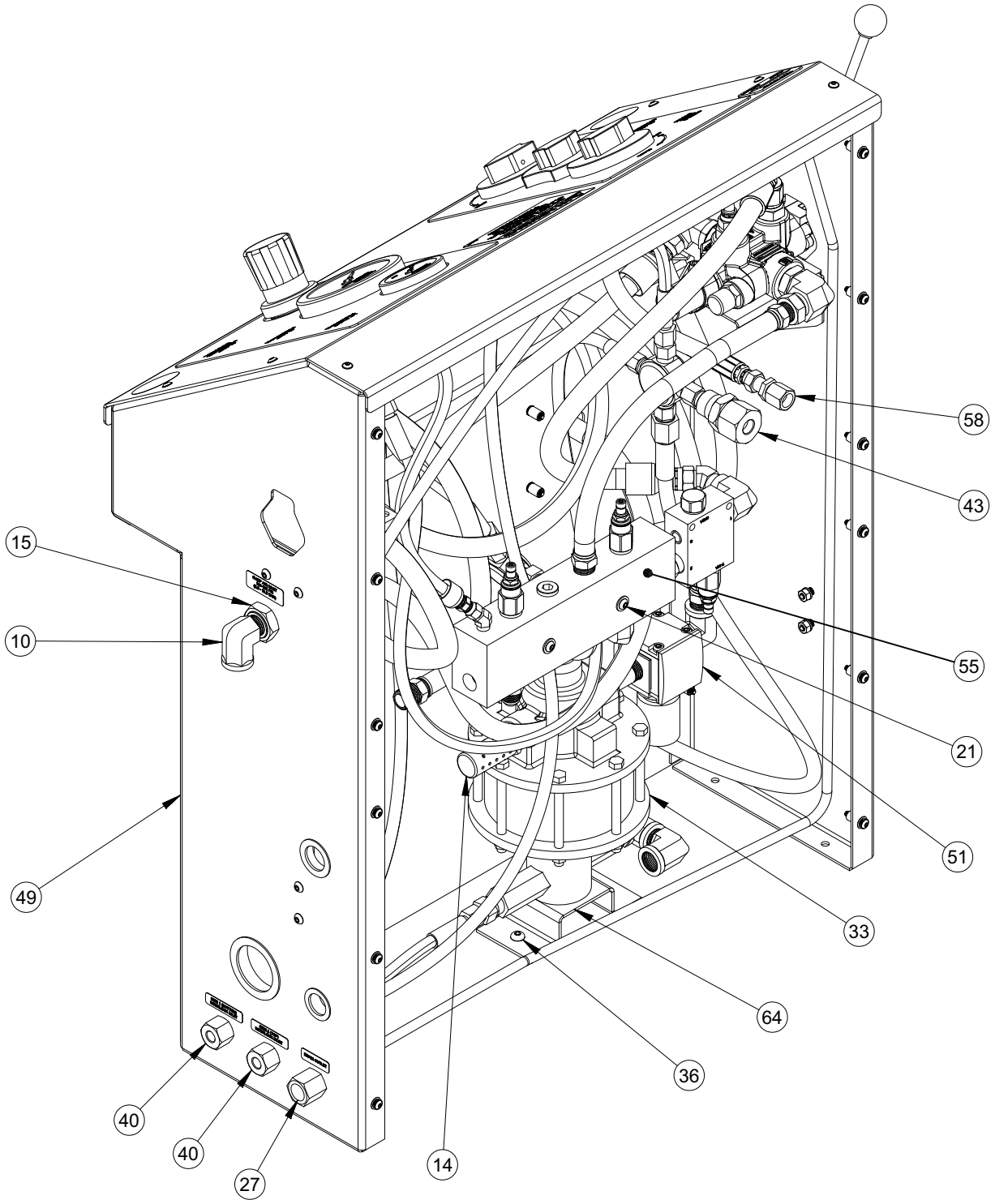


FIGURE A-3. CONTROL CONSOLE USV ASSEMBLY BACK (P/N 89020)

ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	1	12579	FTG PLUG 1/2 NPTM SOCKET	
2	1	12876	FTG REDUCER BUSHING 3/4 NPTM X 1/2 NPTF	
3	2	12974	FTG ELBOW 1/2 NPTM X JIC-8 MALE 90 DEG	
4	1	13211	FTG ELBOW 1/2 NPTM X 1/2 NPTF STREET 90 DEG	
5	1	13253	FTG ADAPTER 1/2 NPTM X #8 JICM	
6	1	13828	FTG ELBOW 1/2 NPTM X 1/2 NPTM 90°	
7	1	14704	FTG NIPPLE 1/2 NPTM X 1/2 NPTM	
8	1	16047	FTG ADAPTER SAE-10M X JIC-8M STRAIGHT	
9	2	33991	PLUG HEX 3/4 NPT BRASS	
10	11	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS	
11	1	55054	FTG ADAPTER SAE-10 MALE X JIC-6 MALE	
12	2	77389	BALL VALVE 1/2 NPT FEMALE 160 PSI	V-02, V-03
13	1	77394	REGULATOR AIR 1/2 NPT 125 PSI	PCV-03
14	1	77399	HIGH FLOW MUFFLER 3/4 NPTM COMPACT	
15	1	77421	FTG BULKHEAD 1/2 NPTF BRASS	
16	1	77422	FTG TEE 1/2 NPTM X 1/2 NPTF MALE RUN TEE BRASS	
17	2	77427	FTG BARB 1/2 NPTM X 1/2 HOSE 90 DEG ELBOW	
18	1	77461	FTG TUBE TEE UNION 3/8 TUBE	
19	2	77493	FTG CONNECTOR 1/4 NPTM X 3/8 TUBE SS	
20	2	77544	WASHER 1/4 FLTW SS	
21	2	77557	SCREW 1/4-20 X 1/2 BHCS SS	
22	3	77606	NUT 1/4-20 HEX STAINLESS 316	
23	1	77652	GAUGE PRESSURE 4 DIA 0-10000 PSI 1/4 NPTM LOWER BACK MOUNT	PI-02
24	3	77792	VALVE BALL 2 WAY 1/4 NPTF 10000 PSI	V-05, V-06, V-07
25	1	77871	FTG CHECK VALVE 10 KSI 1/2 NPTF	DV-01
26	1	77879	FTG ELBOW 3/4 NPT STREET 90 DEG	
27	1	77911	FTG BULKHEAD 1/2 NPTF X 3/8 TUBE	
28	1	78143	FTG ELBOW SAE-12M X JIC-8M	
29	3	79131	SCREW 1/4-20 X 1-1/2 SHCS SS	
30	1	80974	FTG ELBOW 45 DEG 1/2 NPT MALE 8 JICM	
31	1	81008	LABEL WEAR HEARING AND EYE PROTECTION 2.0 DIA	
32	1	81787	MOUNT NUT REGULATOR PANEL	
33	1	81792	PUMP AIR DRIVEN 10,000 PSI WATER SERVICE	P-01
34	1	81810	FTG ADAPTER PIPE 9/16 TYPE M X 3/8 NPTM 15000 PSI	
35	12	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS	
36	2	82603	SCREW 5/16-18 X 1/2 BHCS 18-8 SS	
37	4	82641	SCREW 10-24 X 1/4 SHCS SS	
38	144	82847	HOSE LOW PRESSURE PUSH LOK 1/2 ID	
39	1	85072	FTG COUPLING 1/4 NPTF X 1/4 NPTF SS HEAVY WALL 10K PSI	
40	2	85232	FTG BULKHEAD 1/4 NPTF 15000 PSI	
41	1	85259	ADAPTER 9/16 TYPE M X 1/4 MNPT STAINLESS 15 KSI	
42	3	85270	FTG ADAPTER TYPE M12 X 3/8 MNPT 15,000 PSI	
43	1	85407	FTG BULKHEAD 3/8 NPTF X 3/8 NPTF 15000 PSI SS	
44	1	85417	LABEL WARNING - DO NOT RELEASE CLAMP 4-5/8 X 3-1/4	
45	1	85756	FTG PUSH-ON HOSE BARB 3/4 NPTM X 3/4 HOSE 90 DEG	
46	4	87231	SCREW 10-32 X 1 BHSCS FLANGED SS316	
47	1	87593	LABEL WARNING - CONSULT OPERATORS MANUAL 2.0 DIA	
48	1	87608	FTG ADAPTER 9/16 TYPE M X 1/2 NPTM STAINLESS 15 KSI	
49	1	87834	CONSOLE CLAMP FIXTURE USV	
50	1	87836	ASSY AIR PREP UNIT & LUBRICATOR USV	V-01, PCV-01, F-01, L-01
51	1	87838	REGULATOR 1/2 NPTF 7-125 PSIG W/BRACKET & PANEL NUT	PCV-02
52	1	87839	KNOB INTERLOCK CLAMP RELEASE VALVE	
53	1	87887	LABEL OVERLAY SET CLAMP FIXTURE MODEL USV	

FIGURE A-4. CONTROL CONSOLE USV ASSEMBLY PARTS LIST 1 (P/N 89020)

PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
54	2	88016	VALVE RELIEF DIRECT-ACTING T-10A CAVITY	PRV-01, PRV-02
55	1	88017	MANIFOLD CONSOLE CLAMP FIXTURE	
56	1	88033	FTG NIPPLE 1/2 NPTM X 2-1/2 BRASS	
57	1	88046	GROMMET LOCKING NYLON BLACK 15/16 ID X 1-1/4 PANEL HOLE	
58	1	88047	FTG BULKHEAD 3/8 NPTF X 3/8 JICM	
59	1	88051	GROMMET LOCKING NYLON BLACK 1-1/16 ID X 1-1/2 PANEL HOLE	
60	1	88057	FTG HEX NIPPLE 3/8 NPTM X 3/8 NPTM 15000 PSI	
61	1	88058	FTG CROSS 3/8 FEMALE NPT SS 15,000 PSI	
62	1	88059	FTG TEE 3/8 FEMALE NPT SS 15,000 PSI	
63	1	88060	FTG HEX NIPPLE REDUCING 1/2 NPTM X 3/8 NPTM 15000 PSI SS	
64	1	88088	PUMP BRACKET	
65	2	88091	SCREW 3/8-24 X 5/8 HHCS SS 18-8	
66	2	88097	KNOB INTERLOCK TOP PLATE DRAIN VALVE	
67	1	88201	HOSE ASSY .31 ID 3/4 FEM TYPE M X 46.3 IN OAL 15KSI	
68	1	88202	HOSE ASSY .31 ID 1/4 NPTM X 3/4 FEM TYPE M X 20.9 IN OAL 15KSI	
69	1	88203	HOSE ASSY .23 ID 3/8 NPTM X 9/16 FEM TYPE M X 46 IN OAL 17.4KSI (6/2WL)	
70	1	88204	HOSE ASSY .23 ID 9/16 FEM TYPE M X 60 IN OAL 17.4KSI (6/2WL)	
71	1	88205	HOSE ASSY .23 ID 1/4 NPTM SS X 49.1 IN OAL 17.4KSI (6/2WL)	
72	1	88206	HOSE ASSY .23 ID 1/4 NPTM SS X 41.2 IN OAL 17.4KSI (6/2WL)	
73	1	88207	HOSE ASSY 3 KSI 3/8 JIC-6F X 16.1 OAL STRAIGHT END AND AND 90° END	
74	1	88208	FTG ADAPTER 1/4 NPTM X JIC-8 MALE	
75	1	88209	HOSE ASSY 3 KSI 1/2 JIC-8F X 20.8 OAL STRAIGHT END AND AND 90° END	
76	1	88216	TUBE 3/8 DRAIN CONSOLE	
77	1	88217	TUBE 3/8 DRAIN BOTTOM PLATE	
78	1	88218	TUBE 3/8 DRAIN TOP PLATE	
79	1	88249	GAUGE 1000 PSI 2-1/2 INCH 1/4 MNPT C-CLAMP	PI-01
80	1	88808	LABEL CALDER HYDRO PRO TESTER USV 20 X 8	
81	1	89017	VALVE INLINE W/REVERSE FLOW CHECK	DV-02
82	1	89018	VALVE RELIEF DIRECT ACTING 25 GPM	PRV-03
83	1	89063	HOSE ASSY 3 KSI 1/2 JIC-8F X 24.7 OAL STRAIGHT ENDS	
84	1	89101	FTG ADAPTER 45 DEG 1/4 NPT MALE 4 JICM	
85	1	89102	HOSE ASSY 3 KSI 1/2 JIC-8F X 25.5 OAL STRAIGHT END AND AND 90° END	
86	1	89103	HOSE ASSY 3 KSI 1/4 JIC-4F X 1/4 NPTF X 13.6 OAL STRAIGHT ENDS	
87	1	89113	GROMMET LOCKING NYLON BLACK 1-31/32 ID X 2-1/2 PANEL HOLE	
88	1	90479	VALVE HYD CONTROL MANUAL 4-WAY 3 POS SPRING CENTER MOTOR SPOOL SAE PORT	V-04
89	1	90524	FTG ELBOW SAE-12M X 3/4 NPTF STEEL	

FIGURE A-5. CONTROL CONSOLE USV ASSEMBLY PARTS LIST 2 (P/N 89020)

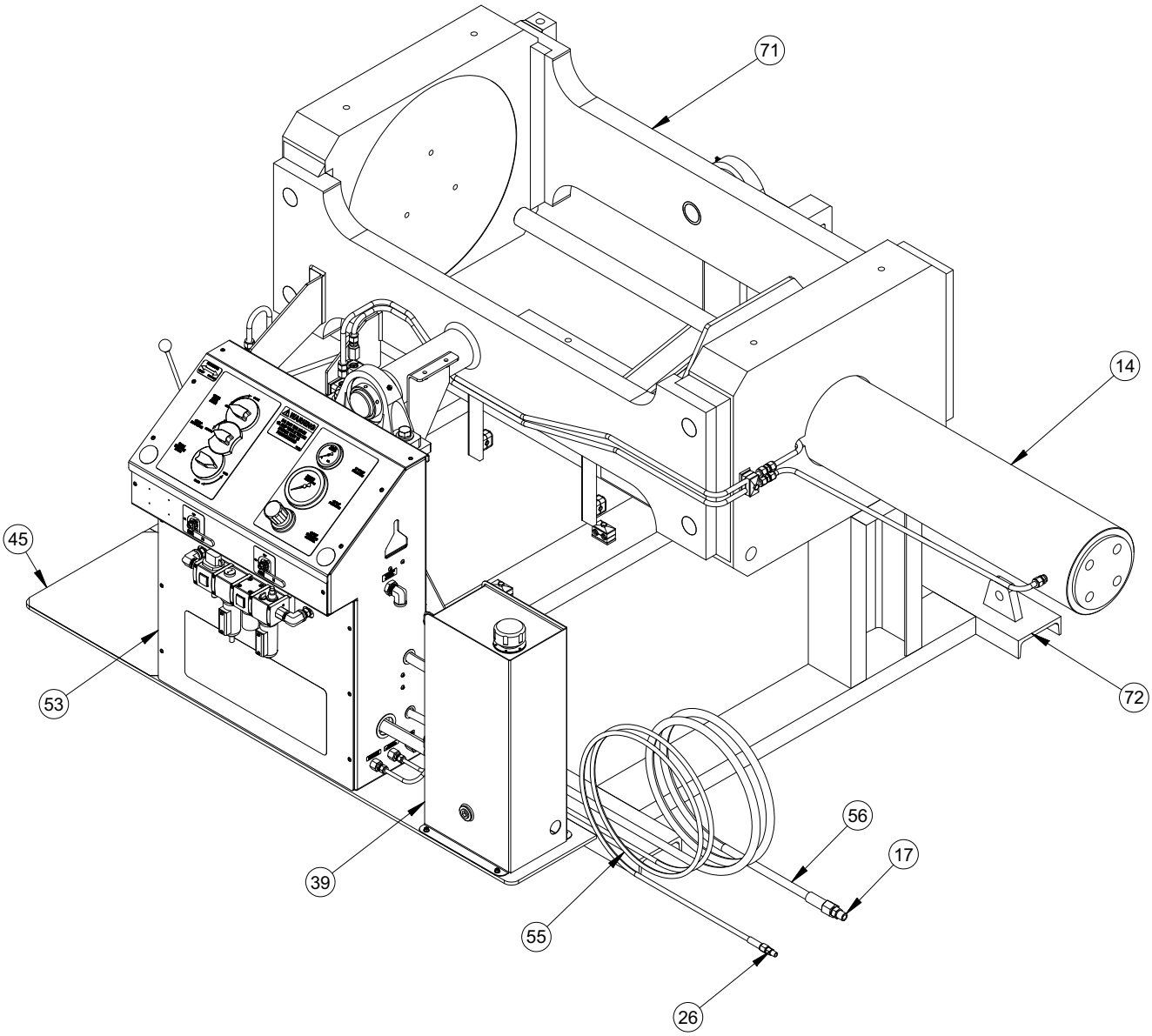


FIGURE A-6. USV-16-200T ASSEMBLY 1 (P/N 91593)

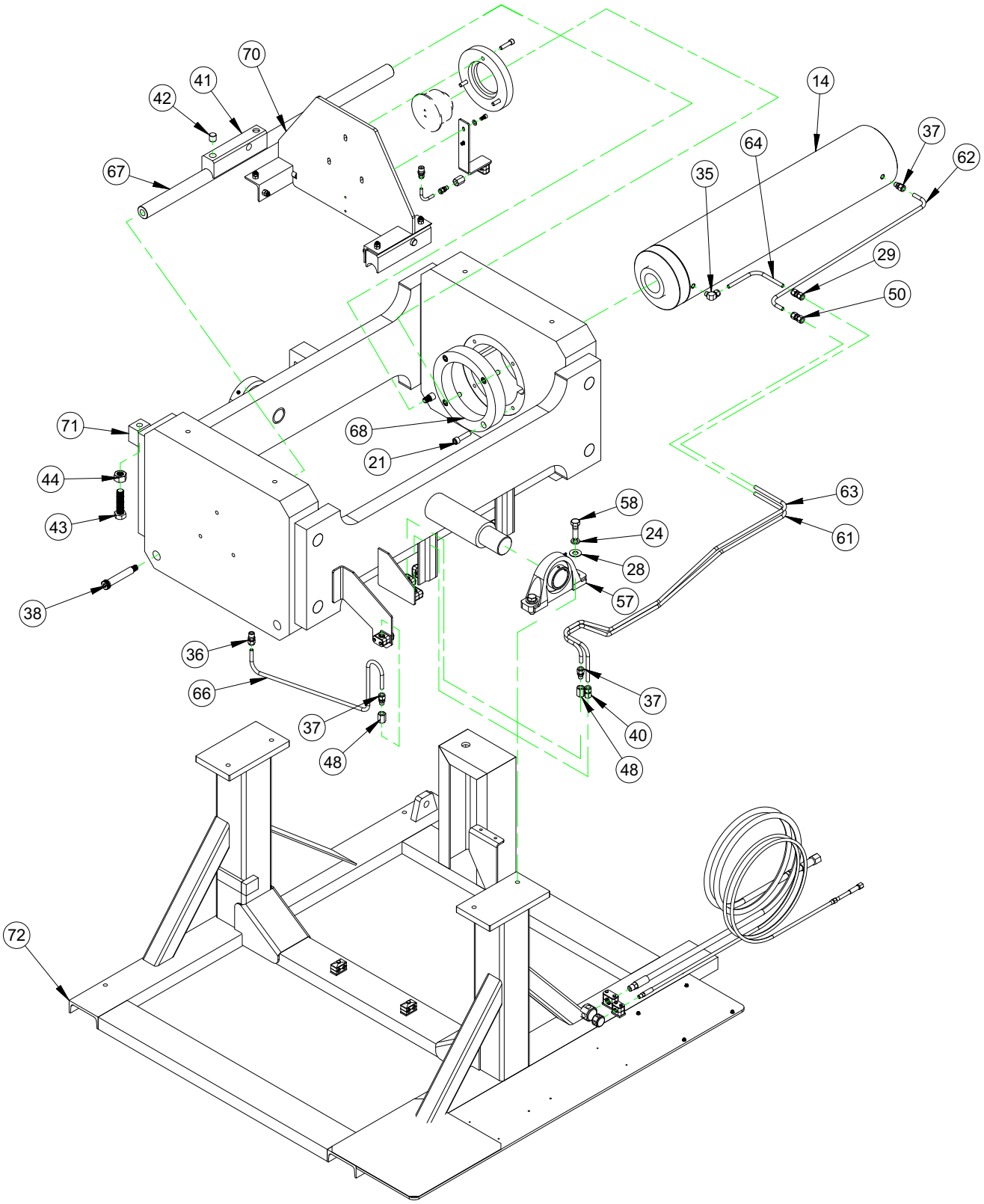


FIGURE A-7. USV-16-200T ASSEMBLY (P/N 91593)

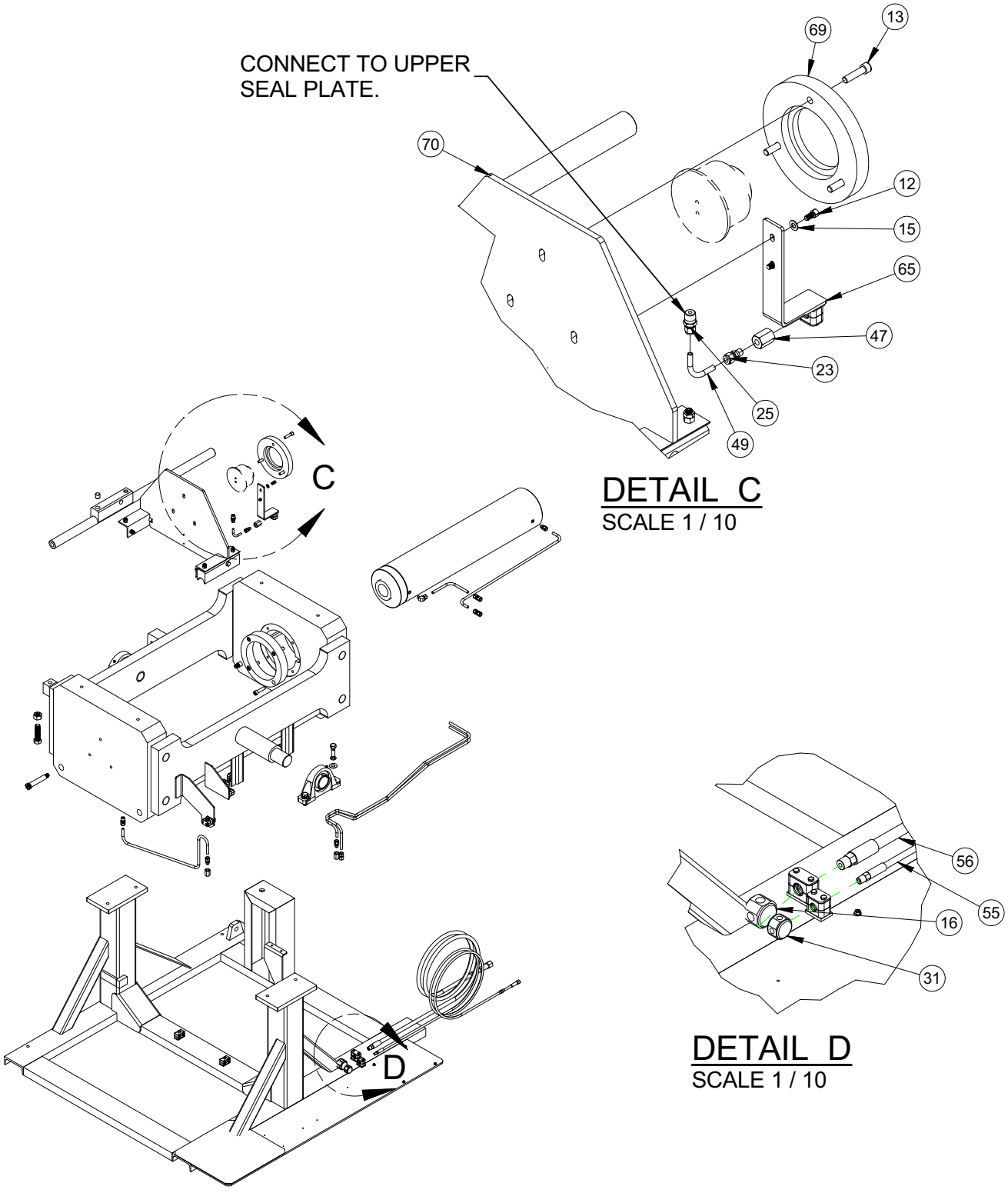


FIGURE A-8. USV-16-200T ASSEMBLY DETAIL C AND D 1 (P/N 91593)

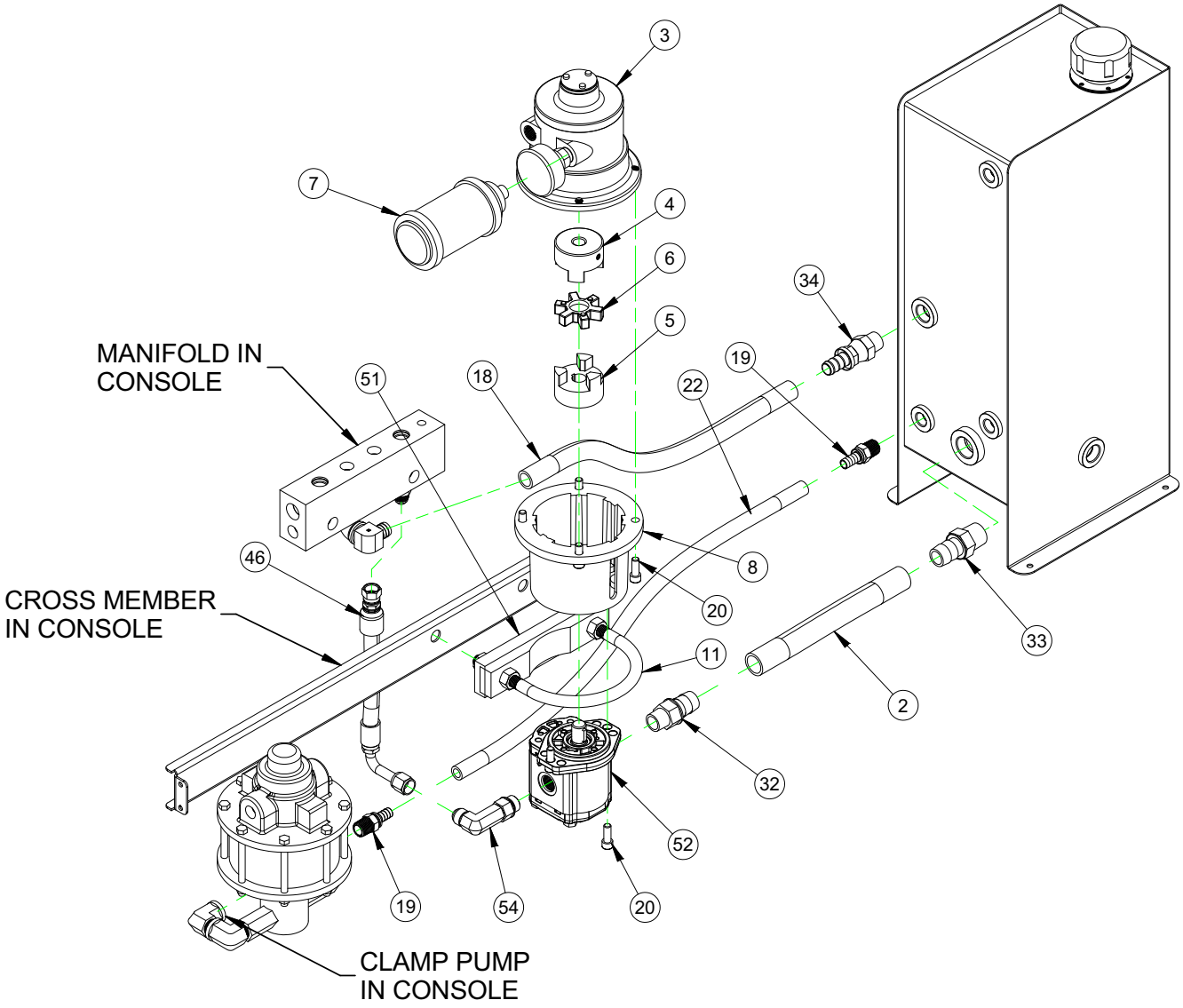


FIGURE A-9. USV-16-200T HYDRAULIC TANK ASSEMBLY (P/N 91593)

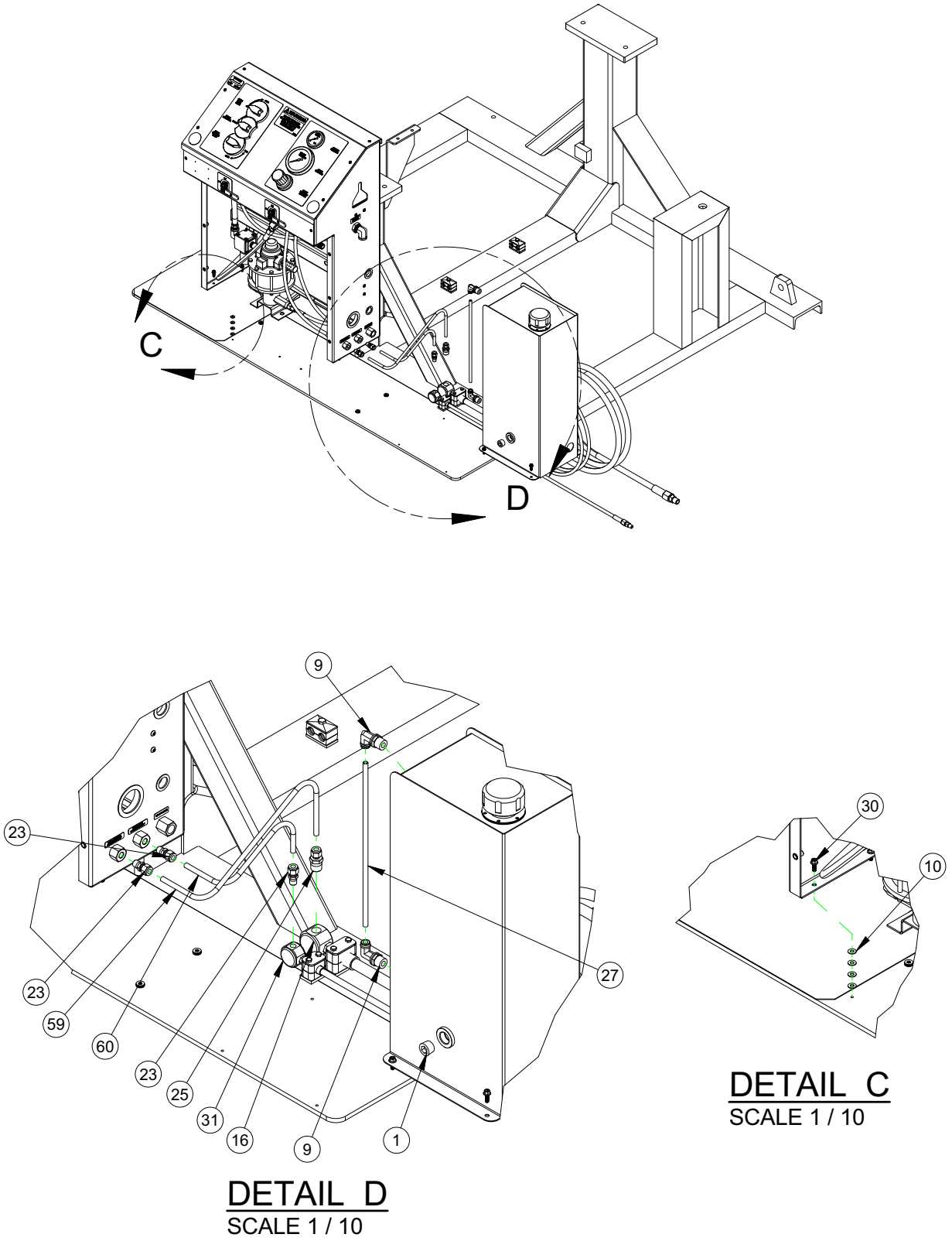


FIGURE A-10. USV-16-200T ASSEMBLY DETAIL C AND D 2 (P/N 91593)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	33991	PLUG HEX 3/4 NPT BRASS
2	1	55805	HOSE 801 SERIES PUSHLOK 1 INCH ID GRAY
3	1	77405	MOTOR AIR 1/2 NPTM INLET X 1/2 NPTM OUTLET
4	1	77406	COUPLING SHAFT 5/8 ID X 2-27/32 FLEXIBLE
5	1	77407	COUPLING SHAFT 3/4 ID X 2-27/32 FLEXIBLE
6	1	77408	SPIDER COUPLING SHAFT
7	1	77409	HIGH FLOW MUFFLER 1/2 NPTM
8	1	77411	ADAPTER MOTOR TO HYDRAULIC PUMP
9	2	77459	FTG ELBOW 1/2 NPTM X 3/8 TUBE PRESTOLOC SWIVEL 90 DEG BRASS
10	16	77544	WASHER 1/4 FLTW SS
11	1	77561	U-BOLT CLAMPING M16 THREAD FOR 5-13/16 OD 5 PIPE
12	2	77979	SCREW 3/8-16 X 3/4 SHCS SS
13	3	78402	SCREW 1/2-13 X 2 SHCS SS 316 FULL THREAD
14	1	78611	RAM HYDRAULIC 200 TON 32 INCH STROKE DOUBLE-ACTING
15	2	78672	WASHER 3/8 FLTW SS
16	1	81871	FTG TEE 1/2 FEMALE NPT SS 15,000 PSI
17	1	81874	FTG MALE ADAPTER SS 15,000 PSI 1-12 TYPE M X 1/2 MNPT
18	1	81894	HOSE LOW PRESSURE PUSH-LOK 3/4 ID
19	2	81917	FTG PUSH-ON BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS
20	6	82668	SCREW 3/8-16 X 1 SHCS SS
21	4	82683	SCREW 5/8-11 X 2-1/2 SHCS SS
22	1	82847	HOSE LOW PRESSURE PUSH LOK 1/2 ID
23	4	83105	FTG TUBE CONNECTOR 1/4 NPTM X 3/8 TUBE SUPER DUPLEX
24	4	83280	WASHER 3/4 LOCW SS
25	2	83671	FTG CONNECTOR 1/2 NPTM X 3/8 TUBE SUPER DUPLEX
26	1	85259	ADAPTER 9/16 TYPE M X 1/4 MNPT STAINLESS 15 KSI
27	1	85289	TUBING 3/8 OD X 1/4 ID POLYETHELYNE
28	4	85904	WASHER 3/4 FLTW 18-8 STAINLESS
29	1	87054	FTG UNION 1/2 X 1/2 TUBE STAINLESS
30	8	87076	SCREW 1/4-20 X 3/4 HHCS FLANGE HEAD GR5
31	1	87856	FTG TEE 1/4 NPTF 15 KSI
32	1	88031	FTG PUSH ON HOSE BARB BRASS 1 HOSE X 3/4 MALE NPT
33	1	88032	FTG PUSH ON HOSE BARB BRASS 1 HOSE X 1 MALE NPT
34	1	88040	FTG PUSH-ON BARB 3/4 NPTM X 3/4 HOSE SWIVEL BRASS
35	1	88085	FTG ELBOW 1/2 SWAGE TUBE X 3/8 MALE NPT SS
36	1	88115	FTG CONNECTOR MALE 1/2 NPT X 1/2 TUBE SUPER DUPLEX

FIGURE A-11. USV-16-200T PARTS LIST 1 (P/N 91593)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
37	3	88116	FTG CONNECTOR MALE 3/8 NPT X 1/2 TUBE SUPER DUPLEX
38	4	88121	SCREW 1 DIA X 5 X 3/4-10 SHLDCS 18-8 SS
39	1	88147	RESERVOIR HYDRAULIC
40	1	88185	FTG CONNECTOR FEMALE 1/2 TUBE x 3/8 NPTF
41	2	88186	TROLLEY BLOCK USV
42	4	88187	PIN DOWEL 1 DIA X 1 18-8 SS
43	1	88198	SCREW 1-8 X 4 HHCS GR 5 ZINC PLATED FULLY THREADED
44	1	88199	NUT 1-8 HEAVY HEX NUT 2H ZINC PLATED
45	1	88200	ABRASIVE ANTISLIP TAPE 18" WIDE
46	1	88211	HOSE ASSY 3 KSI 1/2 JIC-8F X 11 OAL STRAIGHT END AND AND LONG DROP 90° END
47	1	88225	FTG COUPLER 1/4 NPTF X 1/4 NPTF 15000 PSI SS
48	2	88226	FTG COUPLER 3/8 NPTF X 3/8 NPTF 15000 PSI SS
49	1	88236	TUBE 3/8 SUPER DUPLEX TOP PLATE CLAMP FIXTURE USV
50	1	88263	FTG UNION 1/2 X 1/2 TUBE SUPER DUPLEX
51	1	88998	SPACER U-BOLT CLAMP
52	1	89019	PUMP HYDRAULIC SAE-A 11.9 GPM CLOCKWISE DRIVE
53	1	89020	CONTROL CONSOLE USV
54	1	89108	FTG ELBOW SAE-10M (7/8-14) X JIC-10M (5/8)
55	1	89318	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 240 IN OAL 17.4KSI (6/2WL)
56	1	89319	HOSE ASSY .50 ID 1/2 NPTM SS X 1-12 FEM TYPE M SS X 240 IN OAL 15KSI (13/2W)
57	2	90039	BRG PILLOW BLOCK 2.9375 DIA
58	4	90594	SCREW 3/4-10 X 2-1/2 HHCS SS
59	1	91336	TUBE 3/8 SUPER DUPLEX BOTTOM INTERLOCK INLET CLAMP FIXTURE USV
60	1	91390	TUBE 3/8 SUPER DUPLEX TOP INTERLOCK INLET CLAMP FIXTURE USV
61	1	91503	TUBE 1/2 SUPER DUPLEX CLAMP BOX FIXTURE USV 200T
62	1	91504	TUBE 1/2 SUPER DUPLEX CYLINDER PORT CLAMP FIXTURE USV 200T
63	1	91513	TUBE SS 1/2 CLAMP BOX USV 200T
64	1	91525	TUBE 1/2 SS CYLINDER PORT LOWER CLAMP FIXTURE USV 200T
65	1	91527	TOP PLATE BRACKET USV 200T
66	1	91532	TUBE 1/2 SUPER DUPLEX BOTTOM PLATE CLAMP FIXTURE USV 200T
67	2	91541	BAR TROLLEY MODEL USV-16-200T
68	1	91543	CYLINDER COLLAR MODEL USV-16-200T
69	1	91570	SWIVEL RING MODEL USV-16-200T
70	1	91577	TROLLEY WELD USV 200T
71	1	91586	WELDMENT CLAMP BOX USV-16-200T
72	1	91592	WELDMENT BASE FRAME MODEL USV-16-200T

FIGURE A-12. USV-16-200T PARTS LIST 2 (P/N 91593)

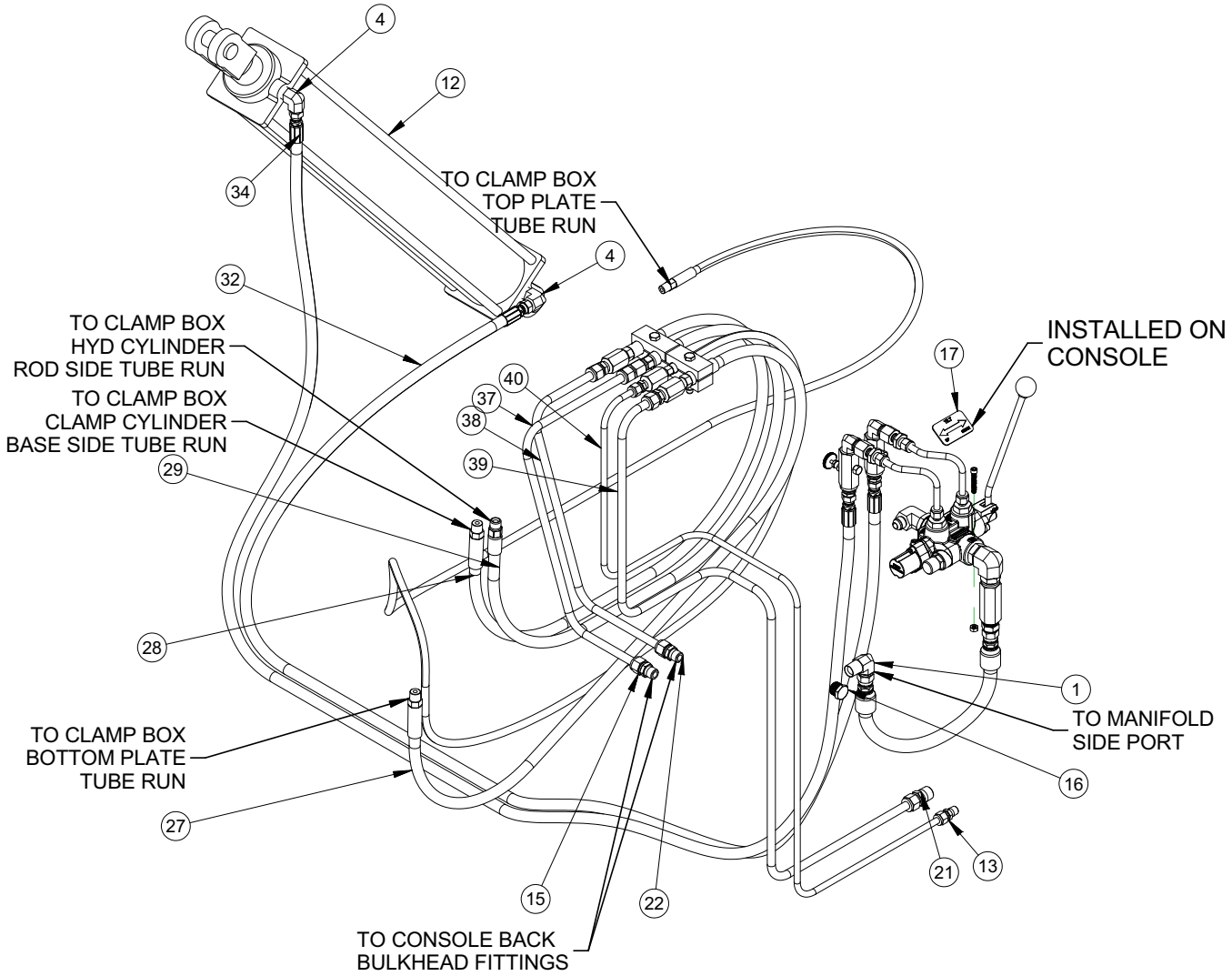


FIGURE A-13. TILT MODEL KIT ASSEMBLY (P/N 91448)

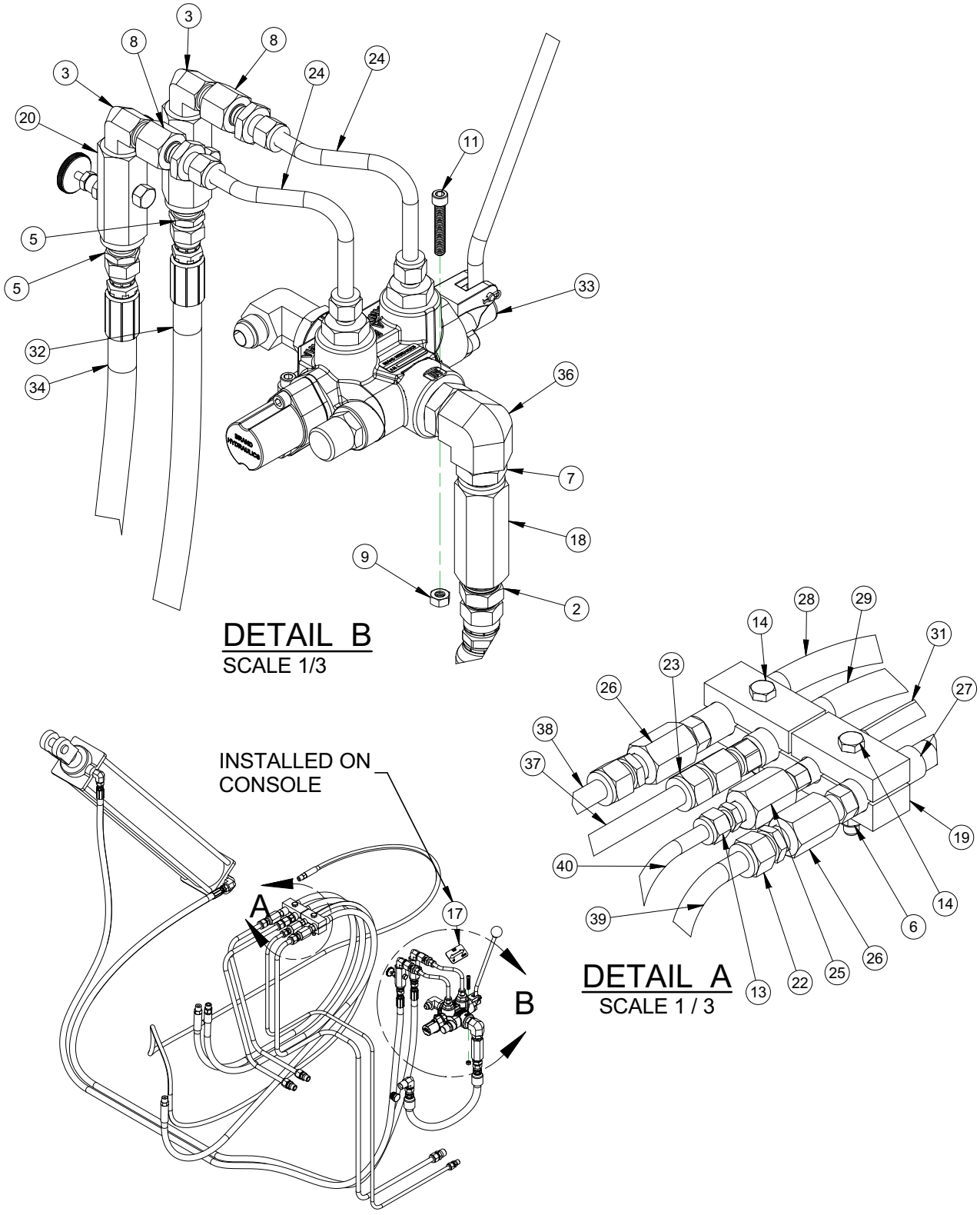


FIGURE A-14. TILT MODEL KIT ASSEMBLY DETAIL A AND B (P/N 91448)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	12974	FTG ELBOW 1/2 NPTM X JIC-8 MALE 90 DEG
2	1	13253	FTG ADAPTER 1/2 NPTM X #8 JICM
3	2	18238	FITTING ELBOW 3/8 NPTM 90°
4	2	28719	FITTING ELBOW 90° 1/2 NPTM X JIC-6 MALE
5	2	59196	FITTING STRAIGHT JIC-6 MALE X 3/8 NPTM
6	2	70385	NUT 3/8-16 NYLON INSERT LOCKING NUT ZINC PLATED GRADE 5
7	1	75788	FTG REDUCER NIPPLE 3/4 NPTM X 1/2 NPTM HEX
8	2	77465	FTG BULKHEAD 3/8 NPTF X 3/8 TUBE
9	2	77606	NUT 1/4-20 HEX STAINLESS 316
10	1	78143	FTG ELBOW SAE-12M X JIC-8M
11	2	79131	SCREW 1/4-20 X 1-1/2 SHCS SS
12	1	80174	CYLINDER HYDRAULIC 4.0 BORE X 30 STROKE
13	2	83105	FTG TUBE CONNECTOR 1/4 NPTM X 3/8 TUBE SUPER DUPLEX
14	2	83274	SCREW 3/8-16 X 2 1/2 HHCS SS
15	1	84839	FTG MALE CONNECTOR 1/2 TUBE X 3/8 MNPT SS
16	1	86005	PLUG 1/2 NPT BRASS
17	1	87888	LABEL TILT OPTION USV
18	1	88044	FTG CHECK VALVE 1/2 FEMALE NPT X 1/2 FEMALE NPT 2000 PSI
19	1	88084	CLAMP SET HOSE ANCHOR
20	2	88092	VALVE NEEDLE 3/8 NPTF 2000 PSI BRASS
21	1	88115	FTG CONNECTOR MALE 1/2 NPT X 1/2 TUBE SUPER DUPLEX
22	3	88116	FTG CONNECTOR MALE 3/8 NPT X 1/2 TUBE SUPER DUPLEX
23	1	88185	FTG CONNECTOR FEMALE 1/2 TUBE x 3/8 NPTF
24	2	88219	TUBE 3/8 TILT CONTROL A
25	1	88225	FTG COUPLER 1/4 NPTF X 1/4 NPTF 15000 PSI SS
26	2	88226	FTG COUPLER 3/8 NPTF X 3/8 NPTF 15000 PSI SS
27	1	88227	HOSE ASSY .39 ID 3/8 NPTM SS X 3/8 NPTM SS X 60.8 IN OAL 15KSI (10/2W)
28	1	88228	HOSE ASSY .39 ID 3/8 NPTM X 3/8 NPTM X 56.1 IN OAL 15KSI (10/2W)
29	1	88232	HOSE ASSY 3 KSI 3/8 NPTM X 54.9 OAL STRAIGHT ENDS
30	1	89062	HOSE ASSY 3 KSI 1/2 JIC-8F X 22.7 OAL STRAIGHT ENDS
31	1	90094	HOSE ASSY .23 ID 3/8 NPTM SS X 3/8 NPTM SS X 138 IN OAL 17.4KSI (6/2WL)
32	1	90099	HOSE ASSY 3 KSI 3/8 JIC-6F X 87.5 OAL STRAIGHT ENDS
33	1	90478	VALVE HYD CONTROL MANUAL 4-WAY 3 POS SPRING CENTER A-B BLOCKED SAE PORT
34	1	90506	HOSE ASSY 3 KSI 3/8 JIC-6F X 103.3 OAL STRAIGHT ENDS
35	2	90523	FTG CONNECTOR 3/8 TUBE X 10 ORBM SS
36	1	90524	FTG ELBOW SAE-12M X 3/4 NPTF STEEL
37	1	91301	TUBE SS 1/2 CONSOLE TO FRAME USV 200T
38	1	91302	TUBE 1/2 SUPER DUPLEX CONSOLE TO FRAME CLAMP FIXTURE 200T
39	1	91303	TUBE 1/2 SUPER DUPLEX INLET BOTTOM PLATE CLAMP FIXTURE 200T
40	1	91304	TUBE 3/8 SUPER DUPLEX INLET TOP PLATE CLAMP FIXTURE 200T

FIGURE A-15. TILT MODEL KIT PARTS LIST (P/N 91488)

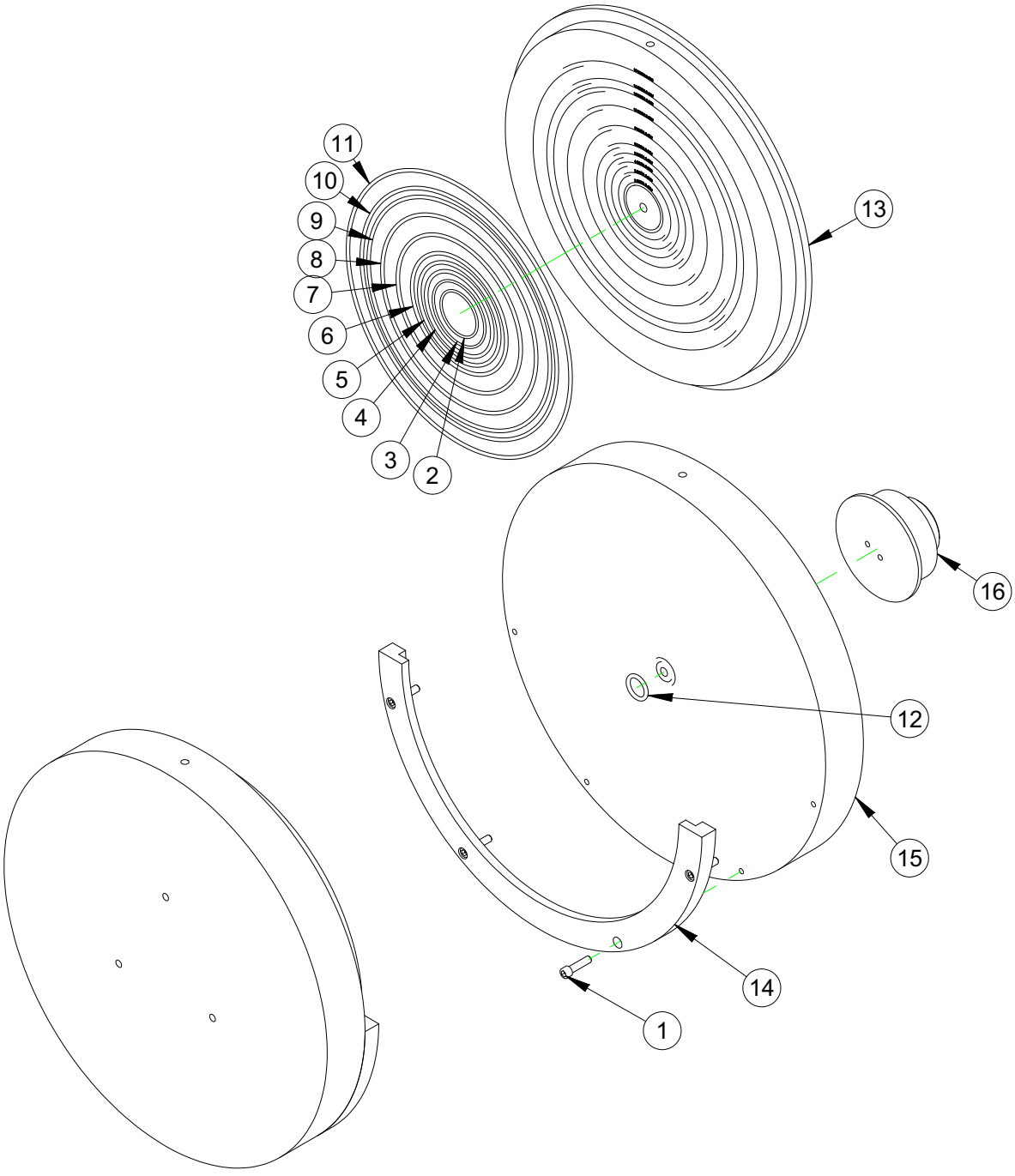


FIGURE A-16. EASY OUT HOLDER ASSEMBLY (P/N 91477)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	13907	SCREW 3/8-16 X 1-1/2 SHCS STAINLESS
2	2	77588	O-RING 2-1/2 ID X 2-3/4 OD X 1/8 W NITRILE 90 DUROMETER (2-230)
3	2	77589	O-RING 3-5/8 ID X 3-7/8 OD X 1/8 W NITRILE 90 DUROMETER (2-239)
4	2	77590	O-RING 4-5/8 ID X 5 OD X 3/16 W NITRILE 90 DUROMETER (2-350)
5	2	78456	O-RING 5-5/8 ID X 6 OD X 3/16 W NITRILE 90 DUROMETER (2-358)
6	2	78457	O-RING 6-3/4 ID X 7-1/8 OD X 3/16 W NITRILE 90 DUROMETER (2-364)
7	2	78458	O-RING 8-3/4 ID X 9-1/8 OD X 3/16 W NITRILE 90 DUROMETER (2-372)
8	2	78513	O-RING 11 ID X 11-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-379)
9	2	78514	O-RING 13 ID X 13-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-382)
10	2	78590	O-RING 14 ID X 14-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-383)
11	2	78591	O-RING 16 ID X 16-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-385)
12	2	86774	O-RING 1-1/8 ID X 1-1/2 OD X 3/16 W NITRILE 90 DUROMETER (2-320)
13	2	91456	SEAL PLATE EASY OUT 3"-16" O-RINGS
14	2	91459	PAIR CRADLE SEAL HEAD EASY OUT 16"
15	2	91468	HOLDER SEAL HEAD EASY OUT 16"
16	1	91475	CYLINDER HEAD 200 TON

FIGURE A-17. EASY OUT HOLDER ASSEMBLY PARTS LIST (P/N 91477)

TABLE A-1. KIT – NON-TILT (P/N 88276)

Part number	Description	Quantity
12974	FTG ELBOW 1/2 NPTM X JIC-8 MALE 90 DEG	1
33991	FTG PLUG 3/4 NPTM HEX BRASS	1
85904	WASHER 3/4 FLTW 18-8 STAINLESS	1
86005	PLUG 1/2 NPT BRASS	2
88285	SCREW 3/4-10 x 1-1/2 HHCS 18-8 SS	1

TABLE A-2. SPARE PARTS LIST

Part number	Description	Quantity
77588	O-RING 2-1/2 ID X 2-3/4 OD X 1/8 W NITRILE 90 DUROMETER (2-230)	4
77589	O-RING 3-5/8 ID X 3-7/8 OD X 1/8 W NITRILE 90 DUROMETER (2-239)	4
77590	O-RING 4-5/8 ID X 5 OD X 3/16 W NITRILE 90 DUROMETER (2-350)	4
78456	O-RING 5-5/8 ID X 6 OD X 3/16 W NITRILE 90 DUROMETER (2-358)	4
78457	O-RING 6-3/4 ID X 7-1/8 OD X 3/16 W NITRILE 90 DUROMETER (2-364)	4
78458	O-RING 8-3/4 ID X 9-1/8 OD X 3/16 W NITRILE 90 DUROMETER (2-372)	4
78513	O-RING 11 ID X 11-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-379)	4
78514	O-RING 13 ID X 13-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-382)	4
78590	O-RING 14 ID X 14-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-383)	4
78591	O-RING 16 ID X 16-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-385)	4
86774	O-RING 1-1/8 ID X 1-1/2 OD X 3/16 W NITRILE 90 DUROMETER (2-320)	4

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APPENDIX B SCHEMATICS

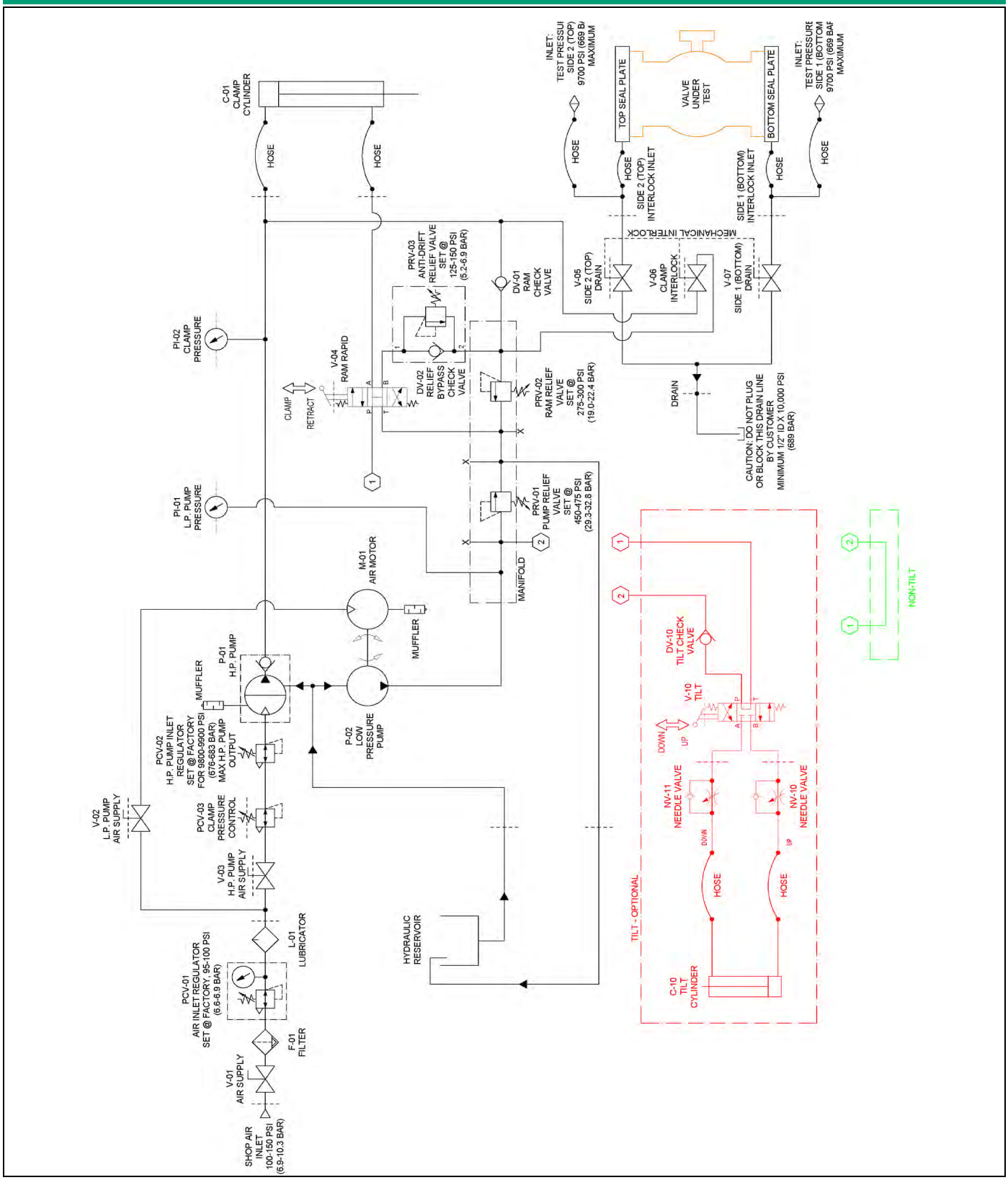

FIGURE B-1. SCHEMATIC P/N 89028

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APPENDIX C SDS

Contact CLIMAX for the current list of Safety Data Sheets.

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CLIMAX
BORTECH
CALDER
H&S TOOL