CE

HPC

HYDRO PRO CONSOLE 6K|10K

OPERATING MANUAL

ORIGINAL INSTRUCTIONS

CALDER
VALVE TESTING & REPAIR SYSTEMS BY CLIMAX

P/N 87615-E
March 2019
Revision 3

CLIMAX | BORTECH CALDER H&S TOOL

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- Telephone number
- Machine model
- Serial number (if applicable)
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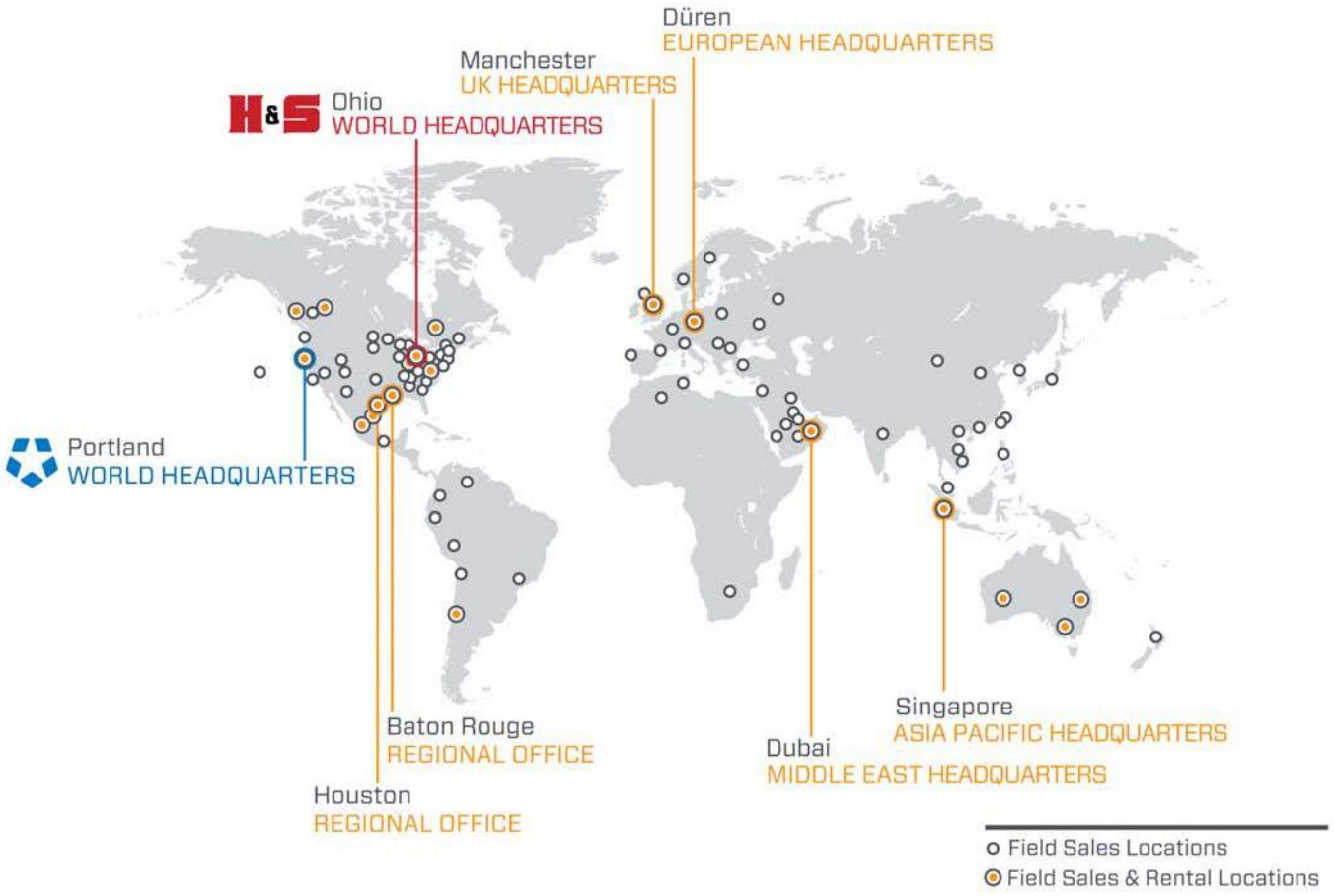
CLIMAX GLOBAL LOCATIONS



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
HYDROSTATIC TEST CONSOLE

Name, type or model, batch or serial number
MODEL 1900; P/N'S 87102, 87776, 87778,
87779, 87780, 87104, 87781, 87782, 87783,
87784, 87785

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

Name of Responsible Person within the EU
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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: 

Position Held: Director of Engineering; Research & Development

Date: August 16, 2016_

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 HPC.

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 HPC 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 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. Flame-resistant clothing with long sleeves and legs is recommended when operating the machine. Hot chips from the workpiece may burn or cut bare skin.

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.

1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

Eye hazard – This machine contains pressurized fluids. 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 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.

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 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 Portable Machine Tool valve tester and the workpiece as a whole.

⚠ 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.

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 HPC. 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 2.4).
☐	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 moving 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 labels should be on your machine. If any are defaced or missing, contact CLIMAX immediately for replacements.

TABLE 1-3. HPC LABELS

	P/N 29154 Serial, year, model, CE Plate		P/N 81008 Warning label: wear ear protection
	P/N 87889 Calder HPC–6K logo		P/N 87890 Calder HPC–10K logo
	P/N 87109 Warning label: do not pressurize system with panels removed		P/N 87118 Warning label in control panel: do not block drain line
	P/N 87492/87710 Warning label in control panel: purge air from system and valve under test		P/N 87593 Warning label: read the operating manual

1.7.2 Label location

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

FIGURE 1-1. FRONT LABELS FOR HPC–6K VERSION

Label P/N: 29154, 81008, 87593, 87889

FIGURE 1-2. FRONT LABELS FOR HPC–10K VERSION

Label P/N: 29154, 81008, 87593, 87890

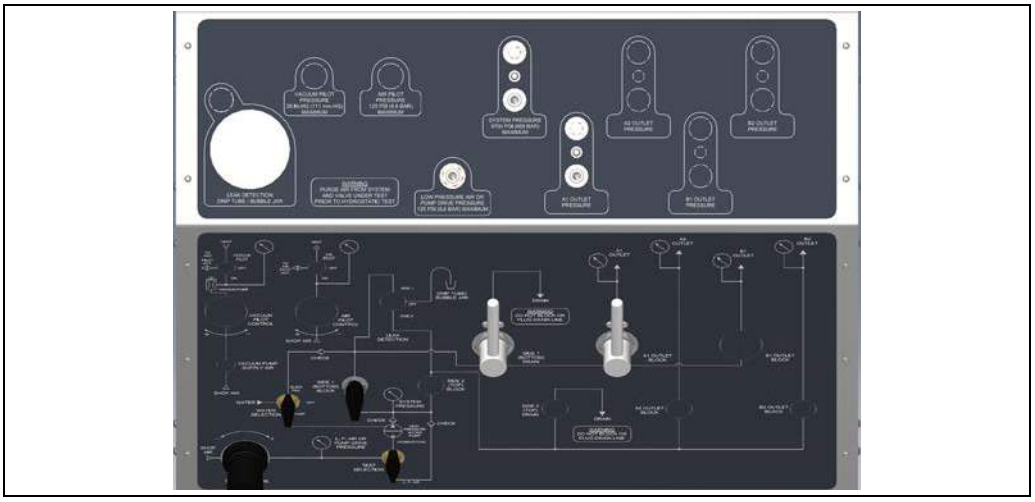

FIGURE 1-3. TOP LABELS (HPC–10K VERSION SHOWN)

Label P/N: 87118, 87492/87710

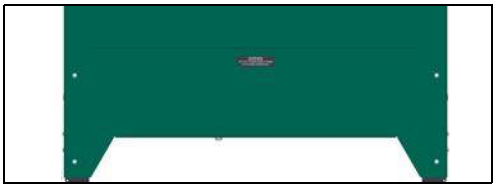

FIGURE 1-4. BACK PANEL LABEL LOCATION

Label P/N: 87109

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2 OVERVIEW

IN THIS CHAPTER:

2.1 Features and components

The HPC is a valve test system capable of providing test pressure for the following types of tests:

- High-pressure hydrostatic at 300–5,700 psi (20,7–393 bar) (for the HPC–6K system) or 400–9,700 psi (27,6–669 bar) (for the HPC–10K system), including these sub-types:
    - Shell
    - Seat leakage with drip tube (with leak detection option)
    - Pressure decay
- Low pressure air at 5–125 psi (0,3–8,7 bar), including a seat leakage with the bubble jar (with leak detection option)
- Single-sided pressurization
- Double-sided (bi-directional) pressurization (optional)

Standard features include the following:

- One-pressure outlet port with a block valve
- Hydrostatic test circuit
- Low-pressure air test circuit
- Water quick-fill circuit
- System pressure gauge (analog)
- Outlet line pressure gauge (digital)

Optional features include the following:

- Vacuum pilot actuation up to 28 in-Hg (711,2 mmHG)
- Air pilot actuation at 5–125 psi (0,3–8,7 bar)
- Side 2 (bi-directional) test circuit (adds a second outlet port, digital gauge, and block valve)
- Leak detection circuit with combination bubble jar and drip tube
- Station B side 1 circuit (adds one outlet port for a second test station, with a block valve and digital gauge)
- Station B side 2 circuit (adds bi-directional testing capability to the second test station, with a block valve and digital gauge)

Available accessories include the following:

- Recirculation system
- Chart recorders
- Data Acquisition and Analysis System (DAAS)
- Additional gauges

The HPC can provide test pressure to one or two test stations in one of the following arrangements:

- One clamp fixture (standard)
- One blind flanged valve (standard)
- Two clamp fixtures (with the Test Station B option)
- Two blind flanged valves (with the Test Station B option)
- One clamp fixture and one blind flanged valve (with the Test Station B option)

2.2 DEFINITIONS

This manual uses the following terms:

Valve under test–This refers to the customer's valve that the HPC tests. Other usage of the word "valve" or "valves" refers to valves integrated with the HPC (that is, instrumentation valves).

Clamp fixture–This refers to the equipment that holds the valve under test and seals the end or ends during pressurization. Calder clamp fixtures are usually hydraulically actuated but may be electrically or mechanically actuated. Clamp fixtures are not part of this equipment module but may be paired with this module to form a full system. If a clamp fixture is also purchased, refer to the clamp fixture operator manual for additional information.

2.3 CONTROLS AND CONNECTION POINTS

HPC hose connections are accessible on both the left and right sides of the panel, as shown in Figure 2-1.

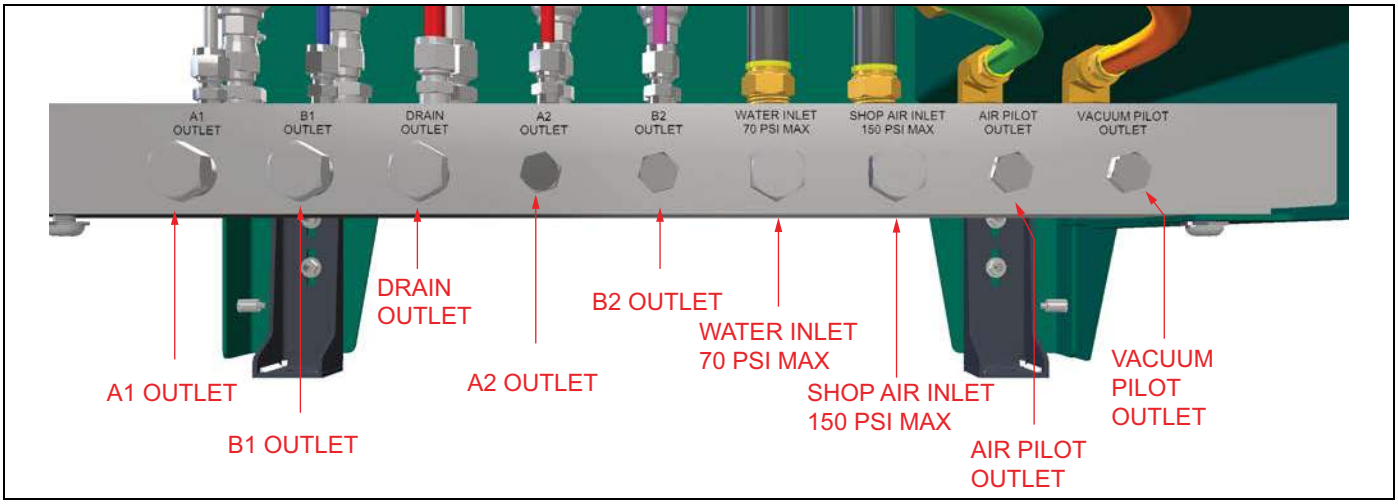

FIGURE 2-1. HOSE CONNECTIONS

NOTICE

Leave plugged whichever connections are not in use.

The HPC controls are all located on the machine, shown in the following figures.

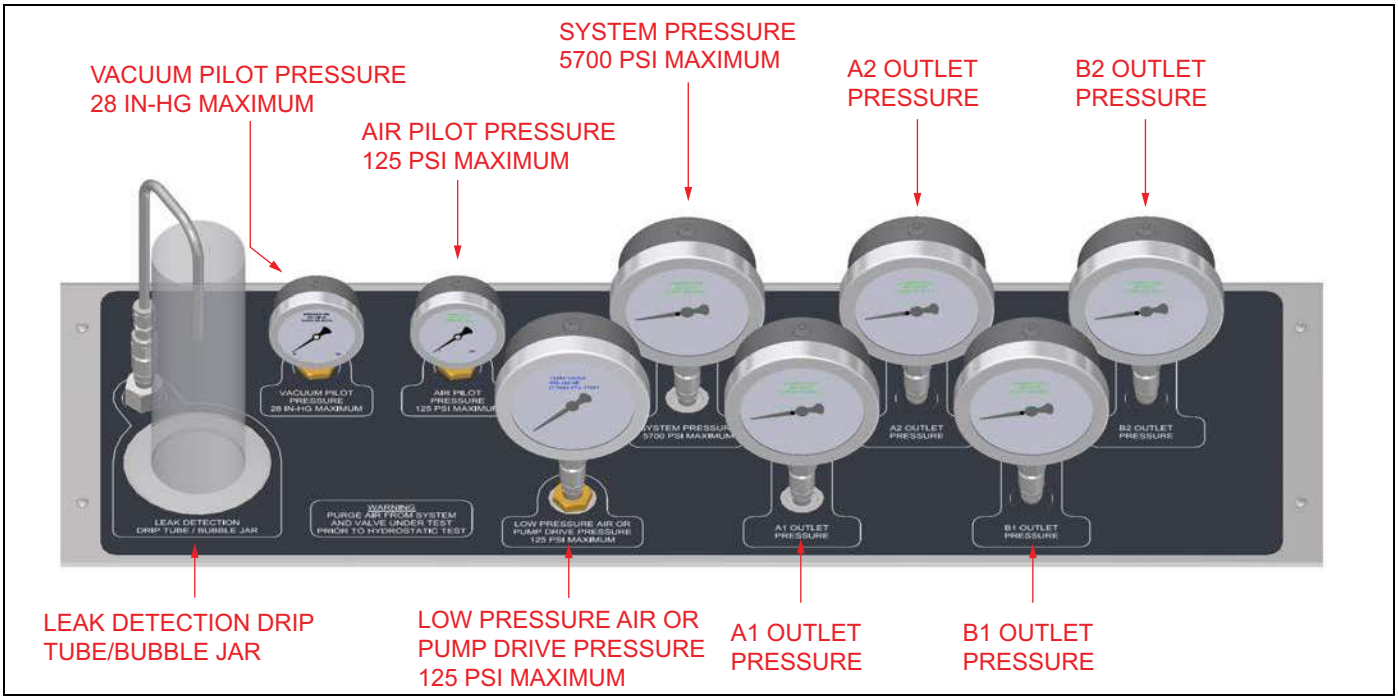

FIGURE 2-2. TOP INSTRUMENTS FOR HPC–6K

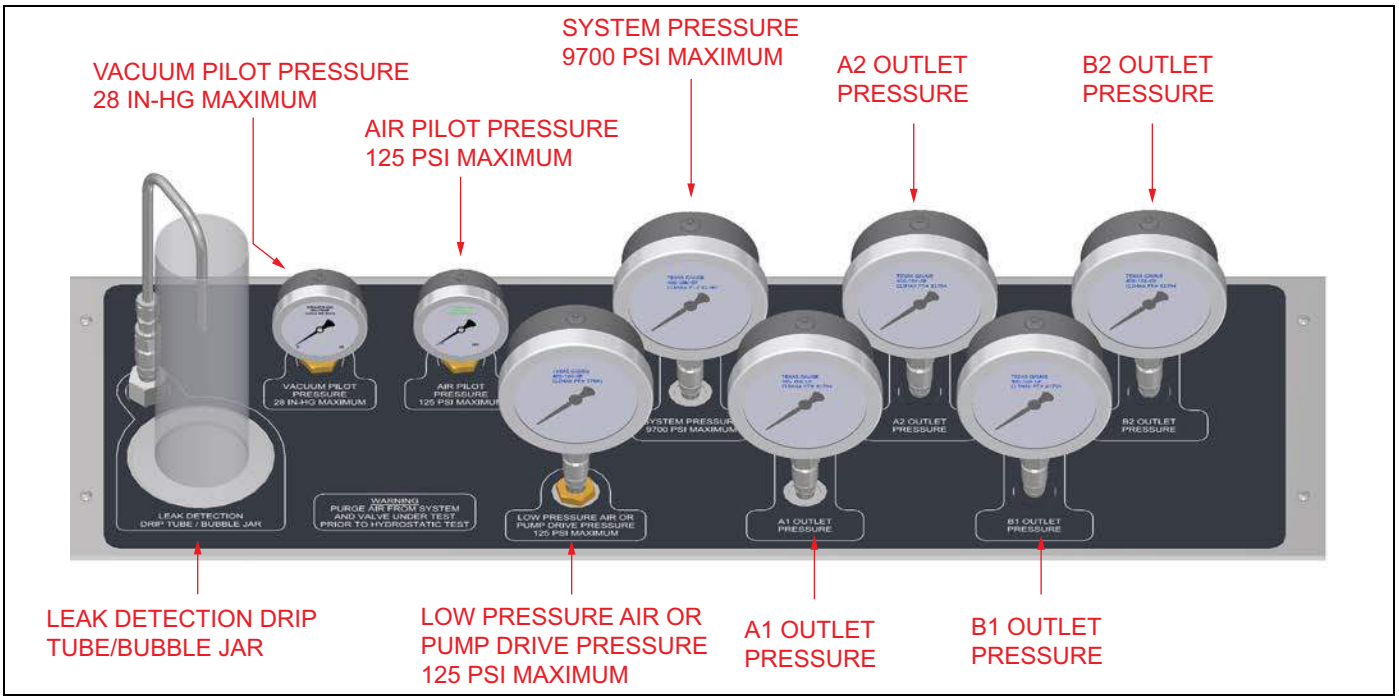

FIGURE 2-3. TOP INSTRUMENTS FOR HPC–10K

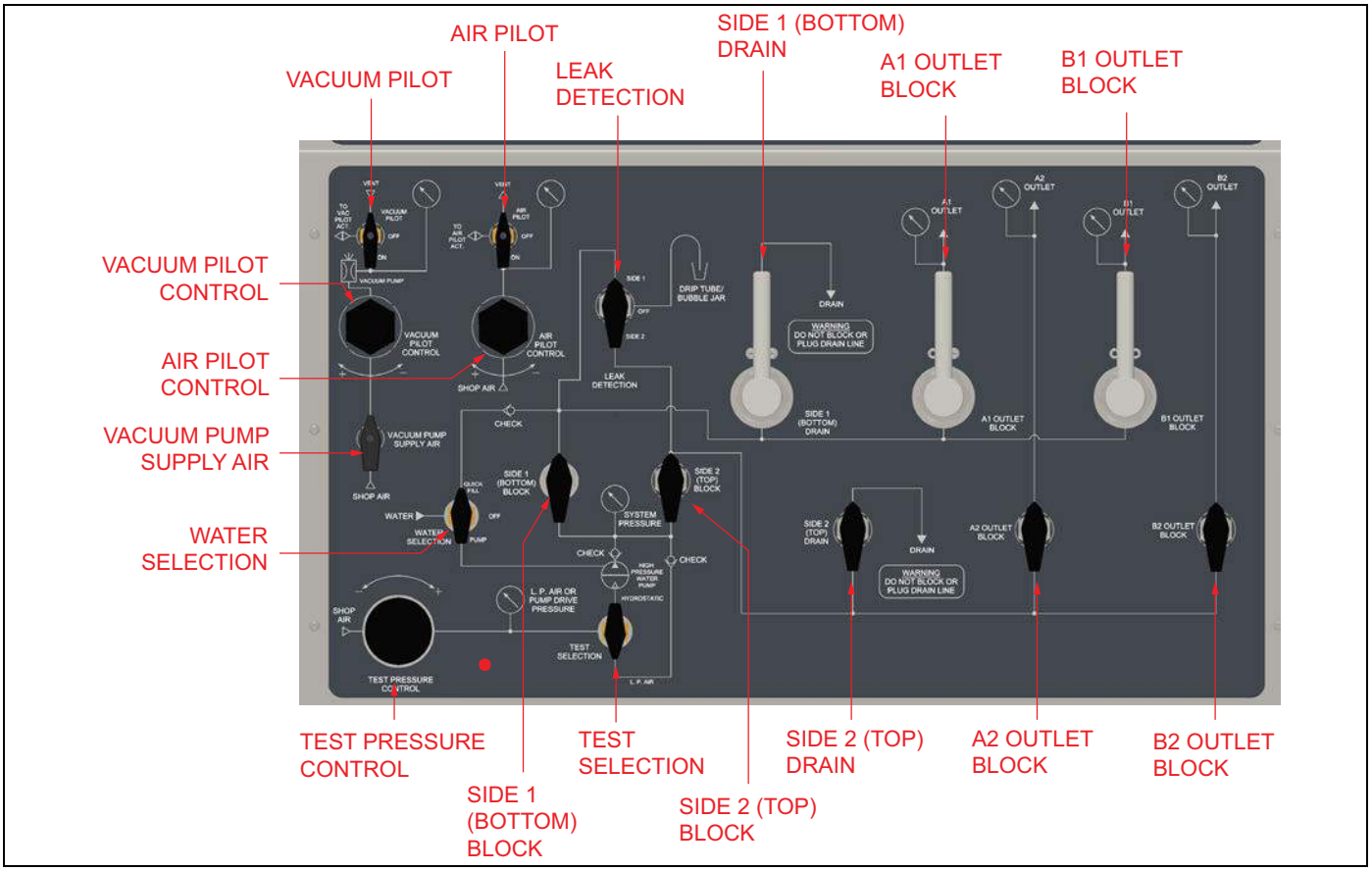

FIGURE 2-4. CONTROL PANEL FOR ALL OPTIONS

2.4 SPECIFICATIONS

TABLE 2-1. HPC SPECIFICATIONS

	HPC–10K system	HPC–6K system
Hydrostatic pressure:	400–9,700 psi (28,1–682,4 bar)	300–5,700 psi (21,1–401 bar)
Low-pressure air:	5–125 psi (0,3–8,7 bar)	5–125 psi (0,3–8,7 bar)
Air pilot pressure:	5–125 psi (0,3–8,7 bar)	5–125 psi (0,3–8,7 bar)
Vacuum pilot pressure:	0–28 inHG (vac) (0–711,2 mmHG)	0–28 inHG (vac) (0–711,2 mmHG)
Quick fill:	5 GPM (18.9 l/min)	5 GPM (18.9 l/min)
Water filtration:	125 micron (µm)	125 micron (µm)
Water inlet pressure:	50 psi (3,5 bar) recommended 70 psi (4,9 bar) maximum 25 psi (1,7 bar) minimum	50 psi (3,5 bar) recommended 70 psi (4,9 bar) maximum 25 psi (1,7 bar) minimum
Gauge accuracy (analog):	0.5% F.S.	0.5% F.S.
Gauge accuracy (digital–available upgrade):	0.25% F.S.	0.25% F.S.
System pressure decay (block valve to outlet port):	100 psi (7 bar)/10 minutes maximum	100 psi (7 bar)/10 minutes maximum
Hydrostatic test media:	• Water • Glycol • Water-soluble oil blends	• Water • Glycol • Water-soluble oil blends
Shop air requirement:	40 scfm at 100–150 psi (1,1 m^3/min at 7–10,5 bar)	40 scfm at 100–150 psi (1,1 m^3/min at 7–10,5 bar)
Water requirement:	7 GPM minimum at 50 psi (26.5 l/min minimum at 3.5 bar) 10 GPM at 60 psi recommended (37.9 l/min at 4.1 bar recommended)	7 GPM minimum at 50 psi (26.5 l/min minimum at 3.5 bar) 10 GPM at 60 psi recommended (37.9 l/min at 4.1 bar recommended)
Pump lubrication requirement:	25–30 pump strokes per drop	25–30 pump strokes per drop

⚠ 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.

2.5 ITEMS REQUIRED BUT NOT SUPPLIED

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

- Open end wrenches
- General purpose air tool oil
- Test pressure hoses (see Section 3), including the following types:
  - High pressure
  - Vacuum hose for vacuum pilot actuation (if applicable)
  - Air hose for air pilot actuation (if applicable)

NOTICE

Test pressure hoses may be included with the clamp fixture to connect the clamp fixture to the HPC.

- Shop air source for clean and dry air at 100–150 psi (7–10,5 bar) (125–150 psi [8,7–10,5 bar] if using the Air Pilot circuit to its full pressure)
- Water source with a 1/2" (13 mm) inner-diameter minimum line; 50 psi (3,5 bar) recommended (70 psi [4,9 bar] maximum)

3 SETUP

IN THIS CHAPTER:

This section describes the setup and assembly procedures for the HPC.

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.

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 HPC must be anchor-bolted to the floor before operation. Anchor feet may be attached to the outside for easy access or attached on the inside to allow consoles to be placed tightly side-by-side.

⚠ 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.

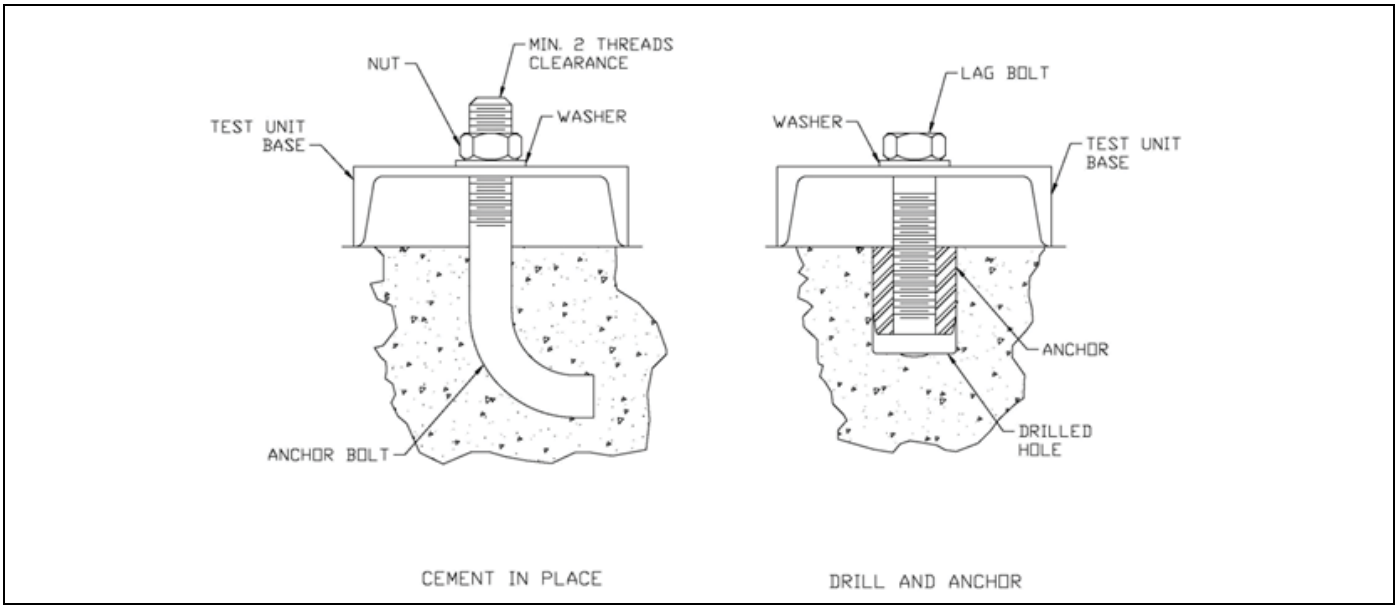

FIGURE 3-1. SECURING THE TEST STAND

3.3 FILLING THE LUBRICATOR

Before operating, do the following:

1. Fill the lubricator with general purpose tool oil.
2. Adjust the knob to set it to one drop per 25 strokes of the pump.

NOTICE

Operating the pump with insufficient lubrication will result in pump failure.

3.4 CONNECTING TEST HOSES

The outlet ports on the HPC are located on the manifold on the underside of the console. They may be reached from underneath or by removal of the back panel.

Refer to the engraved labels next to the outlet ports on the manifold for port identification. Leave outlet ports plugged for features not purchased.

3.4.1 High pressure

Connect the high-pressure outlet ports at the HPC to the inlet ports of the clamp fixture or the blind flange hoses. Use hoses rated to the working pressure of the system (see specs in Section 2.1 on page 9). Refer to Table 3-1 through Table 3-5 for typical connections.

NOTICE

Outlets A1 and B1 are larger than A2 and B2 for quick-fill and quick-drain capability. They are connected to the bottom end of the valves under test.

TABLE 3-1. TYPICAL SINGLE CLAMP FIXTURE STATION CONNECTIONS

HPC Outlet Port	Station A – Clamp Fixture Inlet Port
A1 Outlet (Bottom) →	Inlet Side 1 (Bottom)
A2 Outlet (Top) →	Inlet Side 2 (Top)
B1 Outlet (Bottom) → Plugged	--
B2 Outlet (Top) → Plugged	--

TABLE 3-2. TYPICAL SINGLE-BLIND FLANGE STATION CONNECTIONS

HPC Outlet Port	Station A – Blind Flange Inlet Port
A1 Outlet (Bottom) →	Bottom Flange
A2 Outlet (Top) →	Top Flange
B1 Outlet (Bottom) → Plugged	--
B2 Outlet (Top) → Plugged	--

TABLE 3-3. TYPICAL DUAL-CLAMP FLANGE STATIONS CONNECTIONS

HPC Outlet Port	Station A – Clamp Fixture Inlet Port	Station B – Clamp Fixture Inlet Port
A1 Outlet (Bottom) →	Inlet Side 1 (Bottom)	--
A2 Outlet (Top) →	Inlet Side 2 (Top)	--
B1 Outlet (Bottom) →	--	Inlet Side 1 (Bottom)
B2 Outlet (Top) →	--	Inlet Side 2 (Top)

TABLE 3-4. TYPICAL DUAL-BLIND FLANGE STATIONS CONNECTIONS

HPC Outlet Port	Station A – Clamp Fixture Inlet Port	Station B – Blind Flange Inlet Port
A1 Outlet (Bottom) →	Bottom Flange	--
A2 Outlet (Top) →	Top Flange	--
B1 Outlet (Bottom) →	--	Bottom Flange
B2 Outlet (Top) →	--	Top Flange

TABLE 3-5. TYPICAL CLAMP FIXTURE AND BLIND FLANGE STATIONS CONNECTIONS

HPC Outlet Port	Station A – Clamp Fixture Inlet Port	Station B – Clamp Fixture Inlet Port
A1 Outlet (Bottom) →	Inlet Side 1 (Bottom)	--
A2 Outlet (Top) →	Inlet Side 2 (Top)	--
B1 Outlet (Bottom) →	--	Bottom Flange
B2 Outlet (Top) →	--	Top Flange

3.4.2 Air pilot

Connect an air hose to the air pilot outlet port. Use a hose rated to the air pilot circuit working pressure (see the specifications in Section 2.4 on page 13). The other end of the air hose will be connected to the actuator of air-operated valves when air-actuated valves under test must be cycled.

3.4.3 Vacuum pilot

Connect a vacuum hose to the vacuum pilot outlet port. Use a hose rated to the vacuum pilot circuit working pressure (see the specifications in Section 2.4 on page 13). The other end of the vacuum hose will be connected to the actuator of vacuum-operated valves when vacuum-actuated valves under test must be cycled

3.5 CONNECTING THE UTILITIES

Connect all of the following before operating the HPC.

3.5.1 Connecting shop air

Connect shop air to the 1/2" (13 mm) NPT SHOP AIR INLET port. Shop air pressure is 100–150 psi (7–10,5 bar). The required shop air volume is 40 scfm (1,1 m^3/min).

NOTICE

Inadequate shop air pressure or volume will result in an inability to build test pressure.

3.5.2 Connecting the drain/vent

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, and route it 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 flow in the drain line.

⚠ 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 port. High-pressure fluid vented to the drain must be able to flow freely. Blocking the drain could result in rupture of the drain line or fittings and may result in equipment damage or personnel injury.

3.5.3 Connecting water from the source

Connect source water to the 1/2" (13 mm) NPT WATER INLET port. Typical water sources include the facility water or a water recirculation system. See Table 2-1 on page 13 for recommended pressures and flow rates.

NOTICE

Inadequate water pressure and flow will result in slow valve filling and inadequate supply to the high-pressure pump.

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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 that hoses are routed and secured to avoid tripping, entanglement, or other damage should an hose or connection fail.
4. Check that the lubricator is set to one drop per 25 pump strokes.
5. Check that all hand tools are removed from inside the machine and the work area.

4.2 TEST PREPARATION

Do the following before operating:

1. Check that all pressure gauges show 0 psi/bar.

⚠ WARNING

Connecting or disconnecting hoses or gauges while the system is pressurized may result in machine damage and personnel injury.

2. Check the connection arrangement of the outlet ports by completing these steps:

⚠ WARNING

Some systems are provided without a valve clamping fixture. The method of sealing the valve under test must be determined by the operator. The operator is responsible for selecting the appropriate fixture, valve size, and test pressure.

a) Check the connections to the clamp fixture.

TIP:

Typically the clamp fixture is permanently plumbed to the test console. It may be desirable in some cases to disconnect the pressure hoses from the clamp fixture and move them to a different clamp fixture or use them for blind flange testing. See Section 3.4.1 on page 17 for connection configurations.

b) If blind flange testing, connect the blind flange test pressure hoses coming from the HPC pressure outlets to the blind flanges. See Section 3.4.1 on page 17 for connection configurations.

3. Select and install the pressure gauges with the appropriate range for the test pressure.

⚠ WARNING

Performing a test with a gauge not rated to the test pressure will destroy the gauge and may result in personnel injury.

4. Refer to the diagram on the machine face plate (Figure 2-4 on page 12) when planning and performing tests.

4.3 HYDROSTATIC TESTS

NOTICE

When the system is equipped with controls for two test stations, close the output block valves of the output lines for the test station not in use and leave those valves closed. For example, when testing with Station A close B1 and B2 block valves for the entire test.

4.3.1 Pre-operation checklist

Do the following to conduct a hydrostatic test:

1. Check that the following valves are closed or off:
   - TEST SELECTION
   - WATER SELECTION
   - LEAK DETECTION (if equipped)
   - WATER SUPPLY
   - AIR SUPPLY
2. Check that the TEST PRESSURE CONTROL is turned to zero (counter-clock-wise).
3. Check that the following valves are open:
   - SIDE 1 MAIN BLOCK
   - SIDE 2 MAIN BLOCK (if equipped)
   - SIDE 1 DRAIN
   - SIDE 2 DRAIN (if equipped)
   - A1 BLOCK
   - A2 BLOCK (if equipped)
   - B1 BLOCK (if equipped)
   - B2 BLOCK (if equipped)
4. Check that the following pressure gauges read zero:
   - SYSTEM
   - A1
   - A2 (if equipped)
   - B1 (if equipped)
   - B2 (if equipped)
5. Close the following valves:
   - SIDE 1 MAIN BLOCK
   - SIDE 2 MAIN BLOCK (if equipped)
6. Clamp the valve according to the clamp fixture operator manual or blind flange the valve under test and connect the pressure lines.
7. Open the following valves:
   - WATER SUPPLY

- AIR SUPPLY

8. Do the following to fill the valve under test with water and vent out the air:
   a) If the valve under test is connected to OUTLET A2 or B2, then the top side will be ready to vent if the steps above have been followed. If the valve under test will be connected with only one line from the bottom side, then provide a means to vent air out the top as it is filling.
   b) Close SIDE 1 DRAIN valve.
   c) Check that SIDE 1 BLOCK valve is closed.
   d) Turn WATER SELECTION valve to QUICK-FILL.
   e) Allow valve under test to fill with water until all air is removed and no longer comes out the drain (if connected with Side 2 circuit) or out the open top of the valve under test.
   f) Once filled, turn the WATER SELECTION valve to OFF.
   g) Blind flange or plug the end of the valve under test, if applicable.

⚠ WARNING

Before performing hydrostatic tests, all air must be vented from the test machinery and the valve under test. Failure to do so could result in expansive release of fluid and may result in personnel injury.

4.3.2 Single-side pressurization with visual leak detection

Configuration–The valve under test is connected at the bottom inlet with one pressure line.

Test type–Types of tests include the following:

- Shell/integrity
- Backseat
- Closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-1. SINGLE-SIDE PRESSURIZATION TEST WITH VISUAL LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water and in the testing position.	Off	Off	Close	Close	Close	Open	Open	Close	Off	Zero
2. Open SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Open	Open	Close	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Close	Close	Open	Open	Close	Off	Zero
4. Increase the test pressure gradually to the target pressure and monitor SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Open	Close	Close	Open	Open	Close	Off	Increase
5. Observe for leakage for the required test period.	Hydro	Pump	Open	Close	Close	Open	Open	Close	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Open	Open	Close	Off	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Close	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.3 Dual-side pressurization with visual leak detection

Configuration–The valve under test is pressurized with two pressure lines successively and checked for leakage visually.

Test type–Double block and bleed

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-2. DUAL-SIDE PRESSURIZATION TEST WITH VISUAL LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water.	Off	Off	Close	Close	Close	Open	Open	Open	Off	Zero
2. Open SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Open	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Close	Close	Open	Open	Open	Off	Zero
4. Increase test pressure gradually to the target pressure and monitor SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Open	Close	Close	Open	Open	Open	Off	Increase
5. Observe for leakage from side 1.	Hydro	Pump	Open	Close	Close	Open	Open	Open	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Open	Open	Open	Off	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Open	Off	Zero
8. Close SIDE 1 BLOCK valve and SIDE 2 DRAIN.	Off	Off	Close	Close	Open	Close	Open	Open	Off	Zero
9. Open SIDE 2 BLOCK valve.	Off	Off	Close	Open	Open	Close	Open	Open	Off	Zero
10. Select the test type and supply the pump with water.	Hydro	Pump	Close	Open	Open	Close	Open	Open	Off	Zero
11. Increase the test pressure gradually to the target pressure and monitor SYSTEM and A2 or B2 PRESSURE gauges.	Hydro	Pump	Close	Open	Open	Close	Open	Open	Off	Increase
12. Observe for leakage from side 2.	Hydro	Pump	Close	Open	Open	Close	Open	Open	Off	Hold
13. Shut off the pressure source.	Off	Off	Close	Open	Open	Close	Open	Open	Off	Zero
14. De-pressurize.	Off	Off	Close	Open	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.4 Shell test with pressure decay leak detection

NOTICE

When performing hydrostatic pressure decay tests, it is critical that the outlet block valves in use are not leaking an amount that could cause false failures of the valve under test.

Before performing hydrostatic pressure decay tests, perform diagnostic checks on the outlet block valves (see Section 5.3.1 on page 44). In addition, when performing shell tests, it is preferable to pressurize the valve under test from one side and blind flange or plug the other end so that only one outlet block valve with the potential to leak as it wears is used.

Configuration–The valve under test is pressurized with one pressure line at the bottom end, and the other end is plugged or connected to the second test line.

Test type–Types of tests include the following:

- Shell/integrity
- Backseat

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-3. SHELL TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water. Close the top outlet block valve.	Off	Off	Close	Close	Close	Open	Open	Close	Off	Zero
2. Open SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Open	Open	Close	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Close	Close	Open	Open	Close	Off	Zero

TABLE 4-3. SHELL TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
4. Increase the test pressure gradually to the target pressure and monitor SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Open	Close	Close	Open	Open	Close	Off	Increase
5. Close the outlet block valve.	Hydro	Pump	Open	Close	Close	Open	Close	Close	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Open	Close	Close	Off	Zero
7. De-pressurize the system behind the outlet block valve.	Off	Off	Open	Close	Open	Open	Close	Close	Off	Zero
8. Allow one minute for pressure to stabilize, then observe for pressure decay at the A1 or B1 OUTLET PRESSURE gauge for the required time period.	Off	Off	Open	Close	Open	Open	Close	Close	Off	Zero
9. De-pressurize the outlet lines.	Off	Off	Open	Close	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.5 Bottom seat test with pressure decay leak detection

NOTICE

When performing hydrostatic pressure decay tests, it is critical that the outlet block valves in use are not leaking an amount that could cause false failures of the valve under test.

Before performing hydrostatic pressure decay tests, perform diagnostic checks on the outlet block valves (see Section 5.3.1 on page 44).

Configuration–The valve under test is pressurized with one pressure line at the bottom end, and the other end is open or connected to the second test line.

Test type–Closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-4. BOTTOM SEAT TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water, then close the valve under test.	Off	Off	Close	Close	Close	Open	Open	Open	Off	Zero
2. Open the SIDE 1 BLOCK valve.	Off	Off	Open	Close	Close	Open	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Close	Close	Open	Open	Open	Off	Zero
4. Increase the test pressure gradually to the target pressure and monitor the SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Open	Close	Close	Open	Open	Open	Off	Increase
5. Close the outlet block valve.	Hydro	Pump	Open	Close	Close	Open	Close	Open	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Open	Close	Open	Off	Zero
7. De-pressurize the system behind the outlet block valve.	Off	Off	Open	Close	Open	Open	Close	Open	Off	Zero
8. Allow one minute for pressure to stabilize, then observe for pressure decay at the A1 or B1 OUTLET PRESSURE gauge for the required time period.	Off	Off	Open	Close	Open	Open	Close	Open	Off	Zero
9. De-pressurize the outlet lines.	Off	Off	Open	Close	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.6 Top seat test with pressure decay leak detection

NOTICE

When performing hydrostatic pressure decay tests, it is critical that the outlet block valves in use are not leaking an amount that could cause false failures of the valve under test.

Before performing hydrostatic pressure decay tests, perform diagnostic checks on the outlet block valves (see Section 5.3.1 on page 44).

Configuration–The valve under test is pressurized with one pressure line at the top end, and the other end is open or connected to the second test line.

Test type–Closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-5. TOP SEAT TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water and closed.	Off	Off	Close	Close	Close	Open	Open	Open	Off	Zero
2. Open the SIDE 2 BLOCK valve and SIDE 1 DRAIN valve. Close the SIDE 2 DRAIN.	Off	Off	Close	Open	Open	Close	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Close	Open	Open	Close	Open	Open	Off	Zero
4. Increase the test pressure gradually to the target pressure and monitor SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Close	Open	Open	Close	Open	Open	Off	Increase
5. Close the outlet block valve.	Hydro	Pump	Close	Open	Open	Close	Open	Close	Off	Hold
6. Shut off the pressure source.	Off	Off	Close	Open	Open	Close	Open	Close	Off	Zero

TABLE 4-5. TOP SEAT TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
7. De-pressurize the system behind the outlet block valve.	Off	Off	Close	Open	Open	Open	Open	Close	Off	Zero
8. Allow one minute for pressure to stabilize, then observe for pressure decay at the A2 or B2 OUTLET PRESSURE gauge for the required time period.	Off	Off	Close	Open	Open	Open	Open	Close	Off	Zero
9. De-pressurize the outlet lines.	Off	Off	Close	Open	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.7 Dual-side pressurization with pressure decay leak detection

NOTICE

When performing hydrostatic pressure decay tests, it is critical that the outlet block valves in use are not leaking an amount that could cause false failures of the valve under test.

Before performing hydrostatic pressure decay tests, perform diagnostic checks on the outlet block valves (see Section 5.3.1 on page 44).

Configuration–The valve under test is pressurized with two pressure lines and checked for leakage using pressure decay.

Test type–Types of tests include the following:

- Double block and bleed
- Three-way valve closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-6. DUAL-SIDE PRESSURIZATION TEST WITH PRESSURE DECAY LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water.	Off	Off	Close	Close	Close	Close	Open	Open	Off	Zero
2. Open SIDE 1 AND 2 BLOCK valves.	Off	Off	Open	Open	Close	Close	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Open	Close	Close	Open	Open	Off	Zero
4. Increase the test pressure gradually to the target pressure and monitor the SYSTEM and A1 or B1 and A2 or B2 PRESSURE gauges.	Hydro	Pump	Open	Open	Close	Close	Open	Open	Off	Increase
5. Close the outlet block valves.	Hydro	Pump	Open	Open	Close	Close	Close	Close	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Open	Close	Close	Close	Close	Off	Zero
7. De-pressurize the system behind the outlet block valves.	Off	Off	Open	Open	Open	Open	Close	Close	Off	Zero
8. Allow one minute for pressure to stabilize, then observe for pressure decay at the A1 or B1 and A2 or B2 OUTLET PRESSURE gauge for the required time period.	Off	Off	Open	Open	Open	Open	Close	Close	Off	Zero
9. De-pressurize the outlet lines.	Off	Off	Open	Open	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.8 Bottom-side pressurization test with drip tube leak detection

Configuration–The valve under test is pressurized with one pressure line at the bottom end and connected on the top end for capturing leakage.

Test type–Closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-7. BOTTOM-SIDE PRESSURIZATION TEST WITH DRIP TUBE LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water and open.	Off	Off	Close	Close	Close	Close	Open	Open	Off	Zero
2. Close SIDE 2 DRAIN and open SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Close	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Open	Close	Close	Close	Open	Open	Off	Zero
4. Fill the DRIP TUBE with water (enough water must flow through the pump check valves when the pump is off to fill the drip tube).	Hydro	Pump	Open	Close	Close	Close	Open	Open	Side 2	Zero
5. Close the valve under test.	Hydro	Pump	Open	Close	Close	Close	Open	Open	Side 2	Zero
6. Increase test pressure gradually to the target pressure and monitor the SYSTEM and A1 or B1 PRESSURE gauges.	Hydro	Pump	Open	Close	Close	Close	Open	Open	Side 2	Increase
7. Observe for leakage at the DRIP TUBE for the required time period.	Hydro	Pump	Open	Close	Close	Close	Open	Open	Side 2	Hold
8. Shut off the pressure source.	Off	Off	Open	Close	Close	Close	Open	Open	Side 2	Zero
9. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Open	Side 2	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.3.9 Top-side pressurization test with drip tube leak detection

Configuration–The valve under test is pressurized with one pressure line at the top end and connected on the bottom end for capturing leakage.

Test type–Closure/seat leakage

Pre-testing–See Section 4.3.1 on page 23.

Post-testing–Drain the valve under test according to Section 4.4.2 on page 35.

TABLE 4-8. TOP-SIDE PRESSURIZATION TEST WITH DRIP TUBE LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is already filled with water and open.	Off	Off	Close	Close	Close	Open	Open	Open	Off	Zero
2. Close SIDE 2 DRAIN and open SIDE 2 BLOCK.	Off	Off	Close	Open	Close	Close	Open	Open	Off	Zero
3. Select the test type and supply the pump with water.	Hydro	Pump	Close	Open	Close	Close	Open	Open	Off	Zero
4. Fill the DRIP TUBE with water (enough water flows through the pump check valves when the pump is off to fill the drip tube).	Hydro	Pump	Close	Open	Close	Close	Open	Open	Side 1	Zero
5. Close the valve under test.	Hydro	Pump	Close	Open	Close	Close	Open	Open	Side 1	Zero
6. Increase test pressure gradually to the target pressure and monitor the SYSTEM and A2 or B2 PRESSURE gauges.	Hydro	Pump	Close	Open	Close	Close	Open	Open	Side 1	Increase

TABLE 4-8. TOP-SIDE PRESSURIZATION TEST WITH DRIP TUBE LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
7. Observe for leakage at the DRIP TUBE for the required time period.	Hydro	Pump	Close	Open	Close	Close	Open	Open	Side 1	Hold
8. Shut off the pressure source.	Off	Off	Close	Open	Close	Close	Open	Open	Side 1	Zero
9. De-pressurize.	Off	Off	Close	Open	Open	Open	Open	Open	Side 1	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.4 POST-TESTING

4.4.1 De-pressurizing

Do the following to de-pressurize SIDE 1 only:

1. Close the SIDE 1 BLOCK valve.
2. Open the SIDE 1 DRAIN valve.
3. Open the A1 or B1 BLOCK valve to drain the output line.

Do the following to de-pressurize SIDE 2 only:

1. Close the SIDE 2 BLOCK valve.
2. Open the SIDE 2 DRAIN valve.
3. Open the A2 or B2 BLOCK valve to drain the output line.

Do the following to de-pressurize SYSTEM pressure:

1. Turn TEST PRESSURE CONTROL to zero (counter-clockwise).
2. Close the TEST SELECTION valve.
3. Close the WATER SELECTION valve.
4. Open the SIDE 1 MAIN BLOCK valve and open the SIDE 1 DRAIN valve (or open the SIDE 2 MAIN BLOCK valve and SIDE 2 DRAIN valve).

4.4.2 Draining water with air pressure

The Low-Pressure Air Circuit is standard with the HPC. Air pressure can be used to remove water from the valve under test by pressurizing the top and draining from the bottom. This can only be done with the Side 2 (bi-directional) Testing option installed.

Do the following to drain water from the valve under test with air pressure:

1. Open the SIDE 1 DRAIN valve.
2. Close the SIDE 2 DRAIN valve.
3. Close the LEAK DETECTION valve (if equipped).
4. Open the A1 and A2 BLOCK valves, if using Station A.
5. Open the B1 and B2 BLOCK valves, if using Station B.
6. Open the SIDE 2 MAIN BLOCK valve.
7. Close the SIDE 1 MAIN BLOCK valve.
8. Turn the TEST SELECTION valve to L.P. AIR.
9. Increase TEST PRESSURE CONTROL (clockwise) until the water in the valve under test begins to flow out the drain. Do not exceed 70 psi (4,9 bar) on the L.P. AIR or PUMP DRIVE PRESSURE gauge.
10. Allow the water to drain out until air comes out the drain line.
11. Decrease the TEST PRESSURE CONTROL to zero (counter-clockwise) and turn the TEST SELECTION valve to OFF.

4.5 LOW-PRESSURE AIR TESTS

NOTICE

When the system is equipped with controls for two test stations, close the output block valves of the output lines for the test station not in use and leave those valves closed.
For example, when testing with Station A, close B1 and B2 block valves for the entire test.

4.5.1 Pre-testing

Do the following before operating:

1. Check that the following valves are closed or off:
   - TEST SELECTION
   - WATER SELECTION
   - SIDE 1 MAIN BLOCK
   - SIDE 2 MAIN BLOCK (if equipped)
   - LEAK DETECTION (if equipped)
   - AIR SUPPLY
   - WATER SUPPLY
2. Check that the TEST PRESSURE CONTROL is turned to zero (counter-clockwise).
3. Check that the following valves are open:
   - SIDE 1 DRAIN
   - SIDE 2 DRAIN (if equipped)

- A1 BLOCK, if using Station A
- A2 BLOCK (if equipped and if using Station A)
- B1 BLOCK (if equipped and if using Station B)
- B2 BLOCK (if equipped and if using Station B)

4. Check that the SYSTEM, A1, A2 (if equipped), B1 (if equipped), and B2 (if equipped) pressure gauges read zero.
5. Clamp the valve according to the clamp fixture operator manual, or blind flange the valve under test and connect the pressure lines.
6. Open the AIR SUPPLY valve.
7. Remove water from the system (there should be no water in valve under test).

If there is water in the valve under test, see Section 4.4.2 on page 35 for instructions on how to remove it.

If there is water in the system, do the following to remove it:

1. Open the SIDE 1 and SIDE 2 DRAIN valves.
2. Open the SIDE 1 and SIDE 2 BLOCK valves.
3. Turn the TEST SELECTION valve to L.P AIR.
4. Increase TEST PRESSURE CONTROL (by turning it clockwise) gradually to 25 psi (1,7 bar).
5. Close the SIDE 2 BLOCK valve, wait approximately 10 seconds, then open it.
6. Close the SIDE 1 BLOCK valve, wait approximately 10 seconds, and leave it closed.
7. Close the SIDE 2 DRAIN valve and wait 10 seconds.
8. If the LEAK DETECTION option is included and the bubble tube installed, do the following:
   a) Check that the graduated cylinder has no water in it.
   b) Close the SIDE 1 DRAIN.
   c) Turn the LEAK DETECTION valve to SIDE 1 and allow water to drain from the bubble tube into the graduated cylinder.
   d) Turn the LEAK DETECTION valve to SIDE 2 and allow water to drain out of the bubble tube into the graduated cylinder.
   e) Turn the LEAK DETECTION valve to OFF.
9. After clearing the lines of water, turn the TEST SELECTION valve to OFF and decrease TEST PRESSURE CONTROL to zero (turning counter-clockwise).
10. Open the SIDE 1 and SIDE 2 DRAIN valves.
11. Close the SIDE 1 and SIDE 2 MAIN BLOCK valves.

4.5.2 Single-side pressurization air test with visual leak detection

Configuration–The valve under test is pressurized with one pressure line. Leak detection is performed visually, such as by filling the open side with water and observing for bubbles, or by using a bubble-forming spray.

Test type–Closure/seat leakage

Pre-testing–See Section 4.5.1 on page 36.

TABLE 4-9. SINGLE-SIDE PRESSURIZATION AIR TEST WITH VISUAL LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is emptied of water and is in the testing position.	Off	Off	Close	Close	Close	Open	Open	Open	Off	Zero
2. Open the SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Open	Open	Open	Off	Zero
3. Select the test type.	L.P. Air	Off	Open	Close	Close	Open	Open	Open	Off	Zero
4. Increase test pressure gradually to the target pressure and monitor the L.P. AIR OR PUMP DRIVE PRESSURE gauge.	L.P. Air	Off	Open	Close	Close	Open	Open	Open	Off	Increase
5. Observe for leakage for the required test period.	L.P. Air	Off	Open	Close	Close	Open	Open	Open	Off	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Open	Open	Open	Off	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Open	Off	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.5.3 Bottom-side pressurization air test with bubble jar leak detection

Configuration–The valve under test is pressurized with one pressure line at the bottom end and connected on the top end for capturing leakage.

Test type–Closure/seat leakage

Pre-testing–See Section 4.5.1 on page 36.

TABLE 4-10. BOTTOM-SIDE PRESSURIZATION AIR TEST WITH BUBBLE JAR LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is emptied of water and is in the testing position.	Off	Off	Close	Close	Close	Close	Open	Open	Side 2	Zero
2. Open the SIDE 1 BLOCK.	Off	Off	Open	Close	Close	Close	Open	Open	Side 2	Zero
3. Select the test type.	L.P. Air	Off	Open	Close	Close	Close	Open	Open	Side 2	Zero
4. Increase test pressure gradually to the target pressure and monitor the L.P. AIR OR PUMP DRIVE PRESSURE gauge.	L.P. Air	Off	Open	Close	Close	Close	Open	Open	Side 2	Increase
5. Observe for leakage at the BUBBLE JAR for the required test period.	L.P. Air	Off	Open	Close	Close	Close	Open	Open	Side 2	Hold
6. Shut off the pressure source.	Off	Off	Open	Close	Close	Close	Open	Open	Side 2	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Open	Side 2	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.5.4 Top-side pressurization air test with bubble jar leak detection

Configuration–The valve under test is pressurized with one pressure line at the top end and connected on the bottom end for capturing leakage.

Test type–Closure/seat leakage

Pre-testing–See Section 4.5.1 on page 36.

TABLE 4-11. TOP-SIDE PRESSURIZATION AIR TEST WITH BUBBLE JAR LEAK DETECTION

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 or B1 Outlet Block[a]	A2 or B2 Outlet Block[b]	Leak Detection	Test Pressure Control
1. Check that the valve under test is emptied of water and is in the testing position.	Off	Off	Close	Close	Close	Close	Open	Open	Side 1	Zero
2. Open the SIDE 2 BLOCK.	Off	Off	Close	Open	Close	Close	Open	Open	Side 1	Zero
3. Select the test type.	L.P. Air	Off	Close	Open	Close	Close	Open	Open	Side 1	Zero
4. Increase test pressure gradually to the target pressure and monitor the L.P. AIR OR PUMP DRIVE PRESSURE gauge.	L.P. Air	Off	Close	Open	Close	Close	Open	Open	Side 1	Increase
5. Observe for leakage at the BUBBLE JAR for the required test period.	L.P. Air	Off	Close	Open	Close	Close	Open	Open	Side 1	Hold
6. Shut off the pressure source.	Off	Off	Close	Open	Close	Close	Open	Open	Side 1	Zero
7. De-pressurize.	Off	Off	Close	Open	Open	Open	Open	Open	Side 1	Zero

a.If testing with Station A, use A1 OUTLET BLOCK valve.
If testing with Station B, use B1 OUTLET BLOCK valve. Leave closed the one not in use.
b.If testing with Station A, use A2 OUTLET BLOCK valve.
If testing with Station B, use B2 OUTLET BLOCK valve. Leave closed the one not in use.

4.6 POST-TESTING

Do the following to de-pressurize SIDE 1 only:

1. Close the SIDE 1 BLOCK valve.
2. Open the SIDE 1 DRAIN valve.
3. Open the A1 or B1 BLOCK valve to drain the output line.

Do the following to de-pressurize SIDE 2 only:

1. Close the SIDE 2 BLOCK valve.
2. Open the SIDE 2 DRAIN valve.
3. Open the A2 or B2 BLOCK valve to drain the output line.

Do the following to de-pressurize SYSTEM pressure:

1. Turn the TEST PRESSURE CONTROL to zero (turning counter-clockwise).
2. Close the TEST SELECTION valve.
3. Close the WATER SELECTION valve.
4. Open the SIDE 1 MAIN BLOCK valve and the SIDE 1 DRAIN valve, or open SIDE 2 MAIN BLOCK valve and SIDE 2 DRAIN valve.

4.7 AIR PILOT ACTUATION

The air pilot circuit is for actuating an air-piloted valve under test.

Operate it according to the following guidelines:

- Connect the AIR PILOT OUTLET port to the pilot inlet port of the valve under test actuator.
- Regulate the actuation pressure with the AIR PILOT CONTROL and monitor the pressure on the AIR PILOT PRESSURE gauge.
- To actuate the valve under test actuator, turn the AIR PILOT valve to ON.
- To remove the pilot signal, turn the AIR PILOT valve to VENT.
- When not using the air pilot circuit, turn the AIR PILOT valve to OFF and decrease AIR PILOT CONTROL to zero.

4.8 VACUUM PILOT ACTUATION

The vacuum pilot circuit is for actuating a vacuum-piloted valve under test.

Operate it according to the following guidelines:

- Connect the VACUUM PILOT OUTLET port to the pilot inlet port of the valve under test actuator.
- Open the VACUUM PUMP SUPPLY AIR valve and regulate vacuum pressure with the VACUUM PILOT CONTROL and monitor the vacuum pressure with the VACUUM PILOT PRESSURE gauge.
- To actuate the valve under test actuator, turn the VACUUM PILOT valve to ON. There will be a delay in actuation as the vacuum is drawn on the actuator—times will vary based on actuator internal volume.
- To remove the pilot signal, turn the VACUUM PILOT valve to VENT.
- When not using the vacuum pilot circuit, turn the VACUUM PILOT valve to OFF, decrease VACUUM PILOT CONTROL to zero, and close the VACUUM PUMP SUPPLY AIR valve.

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5 MAINTENANCE

IN THIS CHAPTER:

5.1 MAINTENANCE CHECKLIST

Table 5-1 lists maintenance intervals and tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task	Reference
Before each use	Check that the lubricator level is within range.	Section 3.3 on page 16
Before and after each use	Remove debris, oil, and moisture from machine surfaces.	--
As needed	Replace the Air Prep Unit Filter (P/N 87437)	Section 5.3.3 on page 47
	Replace the vacuum filter element (P/N 87434)	Section 5.3.7 on page 52
	Replace the water filter element (P/N 87436)	Section 5.3.4 on page 48
	Top off the air tool oil with general purpose air tool oil.	--

5.2 MAINTENANCE TASKS

Maintenance tasks are described in the following sections.

5.2.1 Calibrating the gauge

The gauges on the HPC are mounted on the top of the console for easy removal and calibration.

5.3 CONDUCTING SYSTEM DIAGNOSTIC TESTS

The HPC must be diagnostically checked periodically to verify that the system performs as required and to monitor deterioration of wear-able components such as valves.

The following procedures assume that the machine includes all configuration options. If your machine does not include some of the options, skip those steps.

5.3.1 Outlet block valves diagnostic test

During a pressure decay test, the outlet block valves form part of the pressure boundary where leakage is detected.

Internal leakage within the test equipment can cause false failures of the valve under test. Therefore, it is critical to periodically check the outlet block valves to monitor their condition and wear.

TABLE 5-2. OUTLET BLOCK VALVES DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 and Side 2 Blocks	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. De-pressurize the system and check that all the test pressure gauges read zero.	Off	Off	Open	Open	Open	Off	Zero
2. Close and lock out the AIR SUPPLY valve. Close the SIDE 1 and SIDE 2 BLOCK valves.	Off	Off	Close	Open	Open	Off	Zero
3. Disconnect the hoses from A1, A2, B1, B2 OUTLET ports and install plugs rated to the system pressure in the outlet ports.	Off	Off	Close	Open	Open	Off	Zero
4. Close the drain valves.	Off	Off	Close	Close	Open	Off	Zero
5. Open the SIDE 1 and SIDE 2 BLOCK valves.	Off	Off	Open	Close	Open	Off	Zero
6. Open the AIR SUPPLY and WATER SUPPLY valves.	Off	Off	Open	Close	Open	Off	Zero
7. Select the test and supply the pump with water.	Hydro	Pump	Open	Close	Open	Off	Zero

TABLE 5-2. OUTLET BLOCK VALVES DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 and Side 2 Blocks	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
8. Increase SYSTEM PRESSURE to the maximum (5,700 or 9,700 psi [401 or 682,4 bar]; check the label next to the SYSTEM PRESSURE gauge). Check that the A1, A2, B1, B2 OUTLET PRESSURE gauges show the same pressure as SYSTEM PRESSURE gauge.	Hydro	Pump	Open	Close	Open	Off	Increase
9. Close the A1, A2, B1, B2 OUTLET BLOCK valves.	Hydro	Pump	Open	Close	Close	Off	Hold
10. Shut off the pressure source.	Off	Off	Open	Close	Close	Off	Zero
11. De-pressurize the system behind the outlet block valves.	Off	Off	Open	Open	Close	Off	Zero
12. Allow one minute for the pressure to stabilize, then monitor A1, A2, B1, B2 PRESSURE gauges for pressure decay. Maximum pressure decay for a new machine is 100 psi (7 bar) over 10 minutes.	Off	Off	Open	Open	Close	Off	Zero
13. Check for external leakage from the fittings, valves, or hoses.	Off	Off	Open	Open	Close	Off	Zero
14. De-pressurize the outlet lines.	Off	Off	Open	Open	Open	Off	Zero

Table 5-3 defines the results of the test.

TABLE 5-3. OUTLET BLOCK VALVES DIAGNOSTIC TEST RESULTS

Outcome	Meaning
All outlet pressure gauges show acceptable pressure decay.	Good
External leakage found.	Resolve leaks and perform the diagnostic test again.
One or more of the outlet pressure gauges shows excessive leakage.	Repair or replace the outlet block valve for that line.

5.3.2 Hydrostatic pressure diagnostic test

The high-pressure water pump contains moving parts that are subject to wear over time. Perform this diagnostic test periodically to monitor pump condition or if the system is not building hydrostatic pressure.

The steps in Table 5-4 assume that the system has been installed correctly and that the lubricator is supplying the correct amount of lubricant to the pump.

TABLE 5-4. HYDROSTATIC PRESSURE DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 and Side 2 Blocks	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. Close all valves downstream of the SYSTEM PRESSURE gauge.	Off	Off	Close	Close	Close	Close	Zero
2. Open the AIR SUPPLY and WATER SUPPLY valves.	Off	Off	Close	Close	Close	Close	Zero
3. Select the HYDROSTATIC test and supply the pump with water.	Hydro	Pump	Close	Close	Close	Close	Zero
4. Increase TEST PRESSURE CONTROL gradually. Listen for the pump to cycle and monitor SYSTEM PRESSURE and L.P. AIR OR PUMP DRIVE PRESSURE gauges. Increase SYSTEM PRESSURE to maximum (listed on the label next to the gauge).	Hydro	Pump	Close	Close	Close	Close	Increase
5. Compare L.P. AIR OR PUMP DRIVE PRESSURE to the value in Table 5-6 for the pump drive air pressure.	Hydro	Pump	Close	Close	Close	Close	Hold
6. Shut off the pressure source.	Off	Off	Close	Close	Close	Close	Zero
7. De-pressurize.	Off	Off	Open	Open	Open	Close	Zero

Table 5-5 defines the results of the test.

TABLE 5-5. HYDROSTATIC PRESSURE DIAGNOSTIC TEST RESULTS

Outcome	Meaning
SYSTEM PRESSURE reaches the maximum.	Good
L.P. AIR OR PUMP DRIVE PRESSURE falls short of the approximate pump drive pressure value shown in Table 5-6 by more than 5 psi (0.34 bar).	Pump is not being supplied with sufficient drive air pressure. Perform the low-pressure air diagnostic test (Section 5.3.3 on page 47).
The pump is supplied with sufficient air pressure, but is still not building sufficient pressure.	Tee into the pump drive air line with a pressure gauge (150–200 psi [10,5–14 bar]) between the lubricator and the pump, then perform the steps in Table 5-4 again. Check that the air pressure shown on the L.P. AIR/PUMP DRIVE PRESSURE gauge is reaching the pump. If pressure is not reaching the pump, then the PCV-03 regulator is likely faulty. Contact CLIMAX for a replacement.
The pump is supplied with sufficient air pressure (checked at the pump inlet), but it is still not building sufficient pressure.	The pump is most likely faulty. Contact CLIMAX for a replacement or for a pump repair kit.

TABLE 5-6. DRIVE AIR AND OUTPUT PRESSURES FOR THE H.P. PUMP

System model	Approximate pump drive pressure	Output pressure
HPC–6K	81 psi (5,7 bar)	5,700 psi (401 bar)
HPC–10K	91 psi (6,4 bar)	9,700 psi (682,4 bar)

5.3.3 Low-pressure air diagnostic test

Shop air drives the hydrostatic pump and may also be directed into the test circuit for low-pressure air tests.

Complete Table 5-7 to check that air pressure and volume is delivered to the TEST SELECTION valve.

Check that the system is correctly installed and that the shop air line to the test equipment is at least 1/4" (6.4 mm) ID.

TABLE 5-7. LOW-PRESSURE AIR DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 and Side 2 Blocks	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. Check the pressure of the air supply line to the test equipment (125–150 psi [8,7–10,5 bar]).	Off	Off	Open	Open	Open	Close	Zero
2. Open the AIR SUPPLY valve. Check that the air inlet regulator gauge reads 125–130 psi (8,7–9,1 bar).	Off	Off	Open	Open	Open	Close	Zero
3. Select the L.P. AIR test.	L.P. Air	Off	Open	Open	Open	Close	Zero
4. Increase TEST PRESSURE CONTROL and check for air flowing from the drain. Vigorous air flow from the drain indicates good flow volume.	L.P. Air	Off	Open	Open	Open	Close	Increase
5. Close the SIDE 1 and 2 BLOCK valves.	L.P. Air	Off	Close	Open	Open	Close	Hold
6. Increase TEST PRESSURE CONTROL until L.P. AIR OR PUMP DRIVE PRESSURE gauge reads 125 psi (8,7 bar).	L.P. Air	Off	Close	Open	Open	Close	Increase
7. Shut off the pressure source.	Off	Off	Close	Open	Open	Close	Zero
8. De-pressurize.	Off	Off	Open	Open	Open	Close	Zero

Table 5-8 defines the results of the test.

TABLE 5-8. LOW-PRESSURE AIR DIAGNOSTIC TEST RESULTS

Outcome	Meaning
Air system delivers sufficient pressure and volume.	Good
Air system delivers sufficient pressure but insufficient volume.	Replace the air filter element and perform the steps in Table 5-7 again.
Air system delivers sufficient volume but insufficient pressure, and the air inlet regulator shows sufficient air pressure.	TEST PRESSURE CONTROL regulator (PCV-02) may be faulty. Contact CLIMAX for a replacement.
Air inlet regulator gauge shows insufficient air pressure while the equipment is being supplied with sufficient volume and pressure.	Air inlet regulator (PCV-01) may be faulty. Contact CLIMAX for a replacement.

5.3.4 Water supply diagnostic test

Inlet water is filtered as it enters the HPC. The filter element should be replaced as needed.

Perform the steps in Table 5-9 to verify sufficient flow through the system.

Before performing this test, check that the test equipment is supplied with 3 GPM (11,4 l/min minimum) at a recommended pressure of 50 psi (3,5 bar) (70 psi [4,9 bar] maximum). Insufficient pressure or volume increases the filling times of the valve under test.

TABLE 5-9. WATER SUPPLY DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. Close and lock out the AIR SUPPLY valve. Check that all pressure gauges read zero.	Off	Off	Open	Open	Open	Open	Open	Off	Zero
2. Redirect the drain line to a bucket of known volume (5 gallons [19 liters] recommended).	Off	Off	Open	Open	Open	Open	Open	Off	Zero
3. Close the SIDE 1 BLOCK, SIDE 2 DRAIN, and OUTLET BLOCK valves.	Off	Off	Close	Open	Open	Close	Close	Off	Zero
4. Open the WATER SUPPLY valve and select QUICK FILL. Measure the time it takes to fill the bucket with the drain line (should be no longer than 20 seconds per gallon [3 GPM (11,4 l/min)]).	Off	Quick fill	Close	Open	Open	Close	Close	Off	Zero

TABLE 5-9. WATER SUPPLY DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
5. Shut off the WATER SELECTION valve.	Off	Off	Close	Open	Open	Close	Close	Off	Zero
6. Shut off the WATER SUPPLY valve.	Off	Off	Close	Open	Open	Close	Close	Off	Zero
7. De-pressurize.	Off	Off	Open	Open	Open	Open	Open	Off	Zero

Table 5-10 defines the results of the test.

TABLE 5-10. WATER SUPPLY DIAGNOSTIC TEST RESULTS

Outcome	Meaning
Flow rate exiting the drain is 3 GPM (11,4 l/min) or more.	Good
Flow rate exiting the drain is less than 3 GPM (11,4 l/min).	Replace the filter element.

5.3.5 L.P. air relief and check valve diagnostic test

The low-pressure air line (L.P. air line) that feeds into the system pressure circuit uses a check valve to protect it from high pressure during hydrostatic testing.

If the check valve leaks or hangs open, pressure is relieved to atmosphere by a pressure relief valve (PRV-01) connected to the L.P. air line.

Perform the test in Table 5-11 if the PRV-01 relief valve is leaking air or water.

TABLE 5-11. L.P. AIR RELIEF AND CHECK VALVE DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. Open the AIR SUPPLY and WATER SUPPLY valves.	Off	Off	Open	Open	Open	Open	Off	Zero
2. Close the SIDE 1 and SIDE 2 BLOCK valves.	Off	Off	Close	Close	Open	Open	Off	Zero
3. Select the HYDROSTATIC test and direct water to the pump.	Hydro	Pump	Close	Close	Open	Open	Off	Zero
4. Increase TEST PRESSURE CONTROL until the SYSTEM PRESSURE gauge reads maximum pressure.	Hydro	Pump	Close	Close	Open	Open	Off	Increase
5. Observe whether relief valve PRV-01 leaks. Note if it leaks air or water.	Hydro	Pump	Close	Close	Open	Open	Off	Hold

TABLE 5-11. L.P. AIR RELIEF AND CHECK VALVE DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 and Side 2 Drains	A1, B1, A2, and B2 Outlet Blocks	Leak Detection	Test Pressure Control
6. Shut off the pressure source.	Off	Off	Close	Close	Open	Open	Off	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Off	Zero
8. Close the SIDE 1 BLOCK.	Off	Off	Close	Close	Open	Open	Off	Zero
9. Select the L.P. AIR test.	L.P. Air	Off	Close	Close	Open	Open	Off	Zero
10. Increase TEST PRESSURE CONTROL until the L.P. AIR OR PUMP DRIVE PRESSURE gauge reads 125 psi (8,7 bar).	L.P. Air	Off	Close	Close	Open	Open	Off	Increase
11. Observe whether the relief valve PRV-01 leaks air.	L.P. Air	Off	Close	Close	Open	Open	Off	Hold
12. Shut off the pressure source.	Off	Off	Close	Close	Open	Open	Off	Zero
13. De-pressurize.	Off	Off	Open	Open	Open	Open	Off	Zero

Table 5-12 defines the results of the test.

TABLE 5-12. L.P. AIR RELIEF AND CHECK VALVE DIAGNOSTIC TEST RESULTS

Outcome	Meaning
PRV-01 relief valve does not leak.	Good
PRV-01 relief valve leaks water continuously while the system is pressurized hydrostatically.	Check valve DV-01 is faulty or installed incorrectly. Contact CLIMAX for replacement.
PRV-01 leaks air during L.P AIR test.	Relief valve PRV-01 is faulty. Contact CLIMAX for replacement.

5.3.6 Quick fill relief & check valve diagnostic test

The quick fill line that feeds into the side 1 pressure circuit uses a check valve to protect it from high pressure during hydrostatic testing.

If the check valve leaks or hangs open, pressure is relieved to atmosphere by a pressure relief valve connected to the quick fill line (PRV-02).

Perform the test in Table 5-13 if the PRV-02 relief valve is leaking water.

TABLE 5-13. QUICK FILL RELIEF AND CHECK VALVE DIAGNOSTIC TEST

Step	Test Selection	Water Selection	Side 1 Block	Side 2 Block	Side 1 Drain	Side 2 Drain	A1 and B1 Outlet Blocks	A2 and B2 Outlet Blocks	Leak Detection	Test Pressure Control
1. Open the AIR SUPPLY and WATER SUPPLY valves.	Off	Off	Open	Open	Open	Open	Open	Open	Off	Zero
2. Close the SIDE 1 and SIDE 2 BLOCK valves.	Off	Off	Close	Close	Open	Open	Open	Open	Off	Zero
3. Select the HYDROSTATIC test and direct water to the pump.	Hydro	Pump	Close	Close	Open	Open	Open	Open	Off	Zero
4. Increase TEST PRESSURE CONTROL until the SYSTEM PRESSURE gauge reads maximum pressure.	Hydro	Pump	Close	Close	Open	Open	Open	Open	Off	Increase
5. Observe whether relief valve PRV-01 leaks.	Hydro	Pump	Close	Close	Open	Open	Open	Open	Off	Hold
6. Shut off the pressure source.	Off	Off	Close	Close	Open	Open	Open	Open	Off	Zero
7. De-pressurize.	Off	Off	Open	Close	Open	Open	Open	Open	Off	Zero
8. Isolate the SIDE 1 circuit.	Off	Off	Close	Close	Close	Open	Close	Open	Off	Zero
9. Select QUICK FILL.	Off	Quick fill	Close	Close	Close	Open	Close	Open	Off	Zero
10. Observe whether relief valve PRV-02 leaks.	Off	Quick fill	Close	Close	Close	Open	Close	Open	Off	Zero
11.Shut off the WATER SELECTION.	Off	Off	Close	Close	Close	Open	Close	Open	Off	Zero
12. De-pressurize.	Off	Off	Open	Open	Open	Open	Open	Open	Off	Zero

Table 5-14 defines the results of the test.

TABLE 5-14. QUICK FILL RELIEF AND CHECK VALVE DIAGNOSTIC TEST RESULTS

Outcome	Meaning
PRV-02 relief valve does not leak.	Good

TABLE 5-14. QUICK FILL RELIEF AND CHECK VALVE DIAGNOSTIC TEST RESULTS

Outcome	Meaning
PRV-02 relief valve leaks water only while the system is pressurized hydrostatically.	Check valve DV-02 is faulty or installed incorrectly. Contact CLIMAX for replacement.
PRV-02 relief valve leaks water only while QUICK FILL is selected.	Relief valve PRV-02 is faulty. Contact CLIMAX for replacement.

5.3.7 Vacuum pilot diagnostic test

The vacuum pilot circuit has an air-driven vacuum pump with no moving parts. The vacuum pump has an optimum performance at a drive air pressure of 65 psi (4,5 bar). A regulator on the panel is used to control the pump output vacuum pressure. An additional regulator is installed in the system to limit pressure to the pump slightly above the optimum drive pressure.

If peak vacuum is not achieved, it may be necessary to decrease the VACUUM PILOT CONTROL slightly to drive it at optimum pressure.

Perform the test in Table 5-15 with the vacuum pilot port open at the manifold or at the end of the connecting hose (that is, not connected to an actuator).

Check that the inlet air pressure is at least 70 psi (4,9 bar).

Inspect the vacuum filter element for accumulated particles. Replace as necessary.

TABLE 5-15. VACUUM PILOT DIAGNOSTIC TEST

Step	Air Supply	Vacuum Pump Supply Air	Vacuum Pilot Control	Vacuum Pilot	Test Selection	Water Supply	Water Selection	Test Pressure Control
1. Open the AIR SUPPLY valve.	Open	Close	Zero	Off	Off	Close	Off	Zero
2. Open the VACUUM PUMP SUPPLY AIR valve.	Open	Open	Zero	Off	Off	Close	Off	Zero
3. Increase the VACUUM PILOT CONTROL incrementally until the VACUUM PILOT PRESSURE reaches 28 in-Hg (711,2 mmHG).	Open	Open	Increase	Off	Off	Close	Off	Zero
4. Shut off the vacuum pump supply air and decrease the VACUUM PILOT CONTROL to zero.	Open	Off	Zero	Off	Off	Close	Off	Zero
5. Turn the VACUUM PILOT valve to ON. The VACUUM PILOT PRESSURE should move to zero since the vacuum pilot port is open.	Open	Off	Zero	On	Off	Close	Off	Zero

TABLE 5-15. VACUUM PILOT DIAGNOSTIC TEST

Step	Air Supply	Vacuum Pump Supply Air	Vacuum Pilot Control	Vacuum Pilot	Test Selection	Water Supply	Water Selection	Test Pressure Control
6. Close the AIR SUPPLY valve and shut off the VACUUM PILOT valve.	Close	Off	Zero	Off	Off	Close	Off	Zero

Table 5-16 defines the results of the test.

TABLE 5-16. VACUUM PILOT DIAGNOSTIC TEST RESULTS

Outcome	Meaning
Vacuum builds to 28 in-Hg (711,2 mmHG).	Good
Vacuum does not build to 28 in-Hg (711,2 mmHG).	Potential issues include the following: • VACUUM PILOT valve is leaking. • VACUUM PILOT CONTROL regulator is faulty. • Vacuum regulator is faulty. • Vacuum pump is faulty. • Vacuum pilot fittings or hoses are leaking.

5.3.8 Air pilot diagnostic test

Perform the test in Table 5-17 with the air pilot port open at the manifold or at the end of the connecting hose (not connected to an actuator).

Check that the inlet air pressure is 125–130 psi (8,7–9,1 bar).

TABLE 5-17. AIR PILOT DIAGNOSTIC TEST

Step	Air Supply	Air Pilot Control	Air Pilot	Test Selection	Water Supply	Water Selection	Test Pressure Control
1. Open the AIR SUPPLY valve.	Open	Zero	Off	Off	Close	Off	Zero
2. Increase the AIR PILOT CONTROL incrementally until the AIR PILOT PRESSURE reaches 125 psi (8,7 bar).	Open	Increase	Off	Off	Close	Off	Zero
3. Decrease AIR PILOT CONTROL to zero.	Open	Zero	Off	Off	Close	Off	Zero
4. Turn the AIR PILOT valve to ON. The AIR PILOT PRESSURE should move to zero since the air pilot port is open.	Open	Zero	On	Off	Close	Off	Zero

Table 5-18 defines the results of the test.

TABLE 5-18. AIR PILOT DIAGNOSTIC TEST RESULTS

Outcome	Meaning
Air pilot pressure goes to 125 psi (8,7 bar).	Good
Air pilot pressure does not reach 125 psi (8,7 bar).	Potential issues include the following: • AIR PILOT CONTROL regulator is faulty. • AIR PILOT valve is faulty. • Air pilot fittings or hoses are leaking.

5.4 TROUBLESHOOTING

Table 5-19 lists some common issues and recommended diagnostic tests for them.

TABLE 5-19. TROUBLESHOOTING

Symptom	Recommended diagnostic test	Section reference
System does not build hydrostatic pressure.	Hydrostatic pressure diagnostic test	Section 5.3.2 on page 45
System does not build air pressure when performing L.P. air tests.	Low pressure air diagnostic test	Section 5.3.3 on page 47
Circuits driven by shop air are receiving insufficient air volume or pressure.	Low pressure air diagnostic test	Section 5.3.3 on page 47
Relief valve PRV-01 leaks.	L.P. air relief and check valve diagnostic test	Section 5.3.5 on page 49
Relief valve PRV-02 leaks.	Quick fill relief & check valve diagnostic test	Section 5.3.6 on page 50
The valve under test, which is known to be good, fails the pressure decay test.	Outlet block valves diagnostic test	Section 5.3.1 on page 44
Vacuum pilot circuit does not build enough vacuum.	Vacuum pilot diagnostic test	Section 5.3.7 on page 52
Air pilot circuit does not build enough pressure.	Air pilot diagnostic test	Section 5.3.8 on page 53
The quick fill function is slower than usual.	Water supply diagnostic test	Section 5.3.4 on page 48

6 STORAGE AND SHIPPING

6.1 STORAGE

Proper storage of the HPC will extend its usefulness and prevent undue damage.

Before storing, do the following:

1. Clean and dry the machine.
2. Drain all liquids.

6.1.1 Short-term storage

Do the following for short-term storage (three months or less):

1. Remove hoses.
2. Cap the ports.

6.1.2 Long-term storage

Do the following for long-term storage (longer than three months):

1. Store in an enclosed container.
2. Add a desiccant pouch to the container. Replace according to manufacturer instructions.
3. Store the container in an environment out of direct sunlight with temperature < 70ºF (21ºC) and humidity < 50%.

6.2 SHIPPING

The HPC can be shipped in its original shipping container.

6.3 DECOMMISSIONING

To decommission the HPC prior to disposal, remove the air tool oil from the reservoir. Refer to Appendix A for component assembly information.

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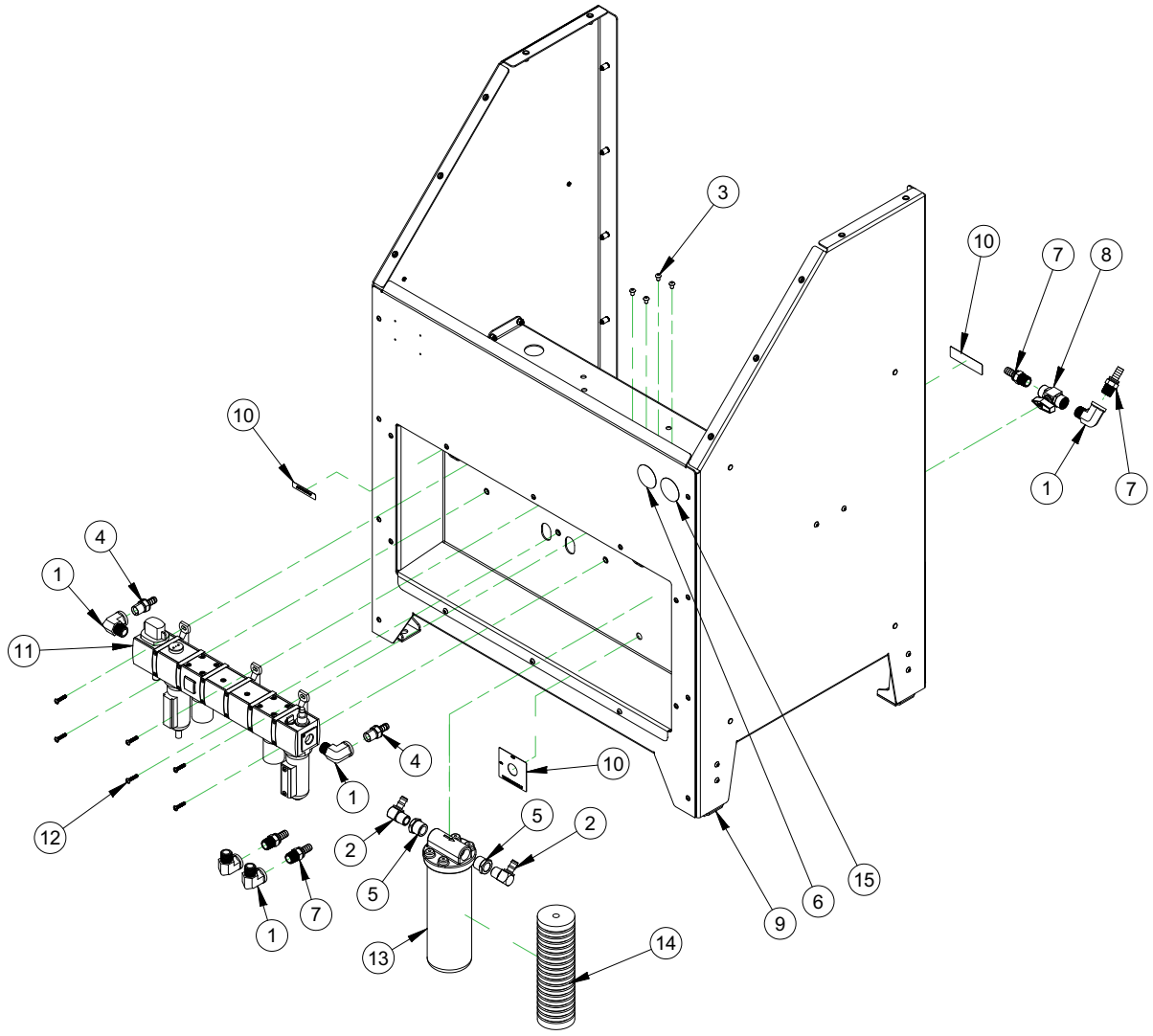
APPENDIX A ASSEMBLY DRAWINGS

Drawing list



PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	5	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS	
2	2	77427	FTG BARB 1/2 NPTM X 1/2 HOSE 90 DEG ELBOW	
3	4	77602	SCREW 1/4-20 X 3/8 BHCS SS	
4	2	77649	FTG BARB 1/2 NPTM X 1/2 HOSE BRASS	
5	2	77877	FTG BUSHING BRASS 3/4 NPTM X 1/2 NPTF	
6	1	81008	LABEL WEAR HEARING AND EYE PROTECTION 2.0 DIA	
7	4	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS	
8	1	83364	VALVE BALL 2-WAY 1/2 NPTF 1000 PSI BRASS	V-03
9	1	87062	CONSOLE 36 IN HTC	
10	1	87109	LABEL SET CALDER HTC BASE FRAME	
11	1	87113	ASSY AIR PREP UNIT & LUBRICATOR HTC	L-01, PCV-03, V-01, F-02, PCV-01
12	6	87231	SCREW 10-32 X 1 BHSCS FLANGED SS316	
13	1	87236	FILTER ASSY 3/4 NPTF 9-3/4 CTG LENGTH SS HOUSING	F-01
14	1	87436	FILTER CARTRIDGE WATER 9-3/4" LONG 125 MICRON	
15	1	87593	LABEL WARNING - CONSULT OPERATORS MANUAL 2.0 DIA	

FIGURE A-1. HPC BASE FRAME ASSEMBLY (P/N 87105)

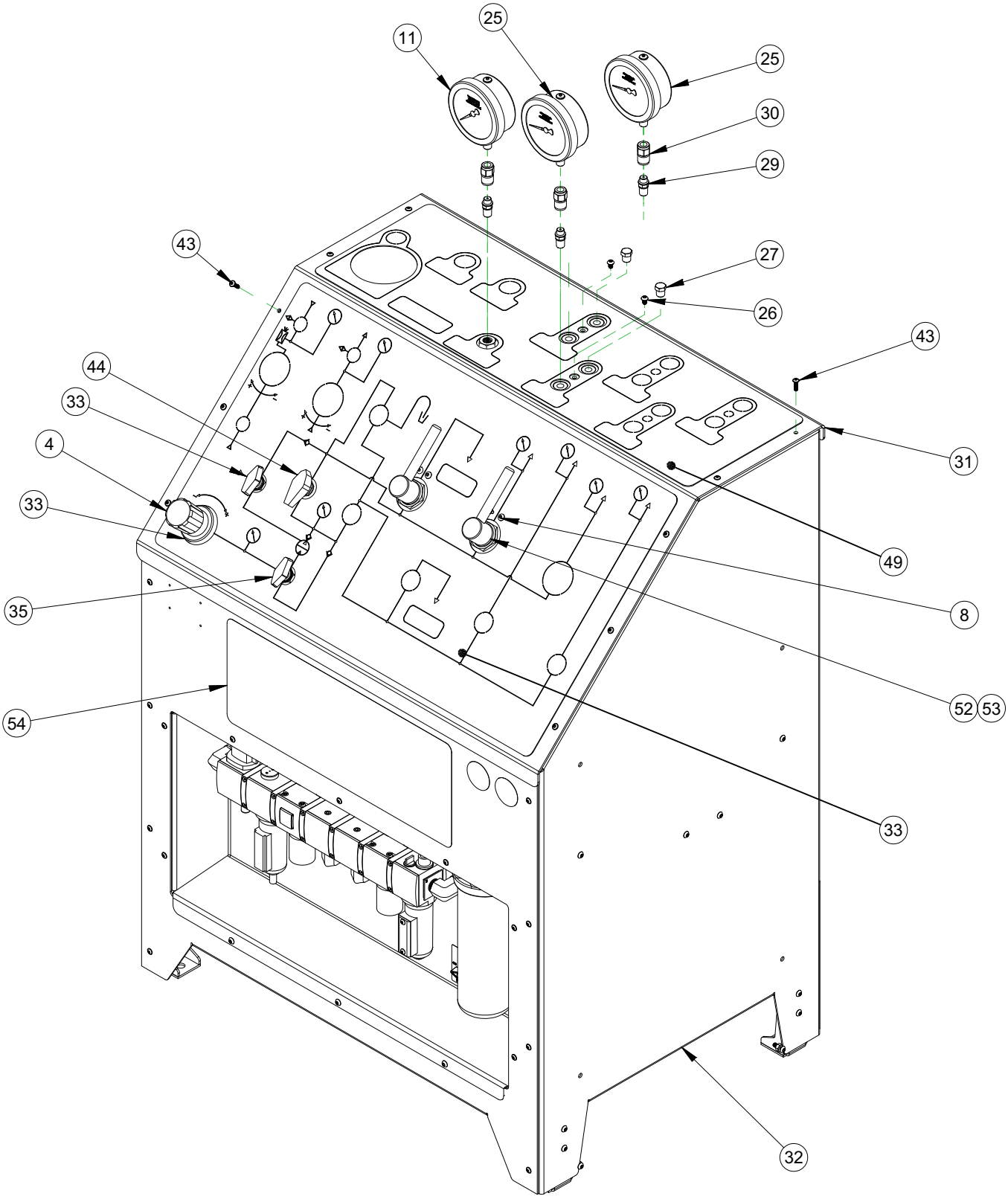


FIGURE A-2. HPC–6K BASE ASSEMBLY (P/N 87174)

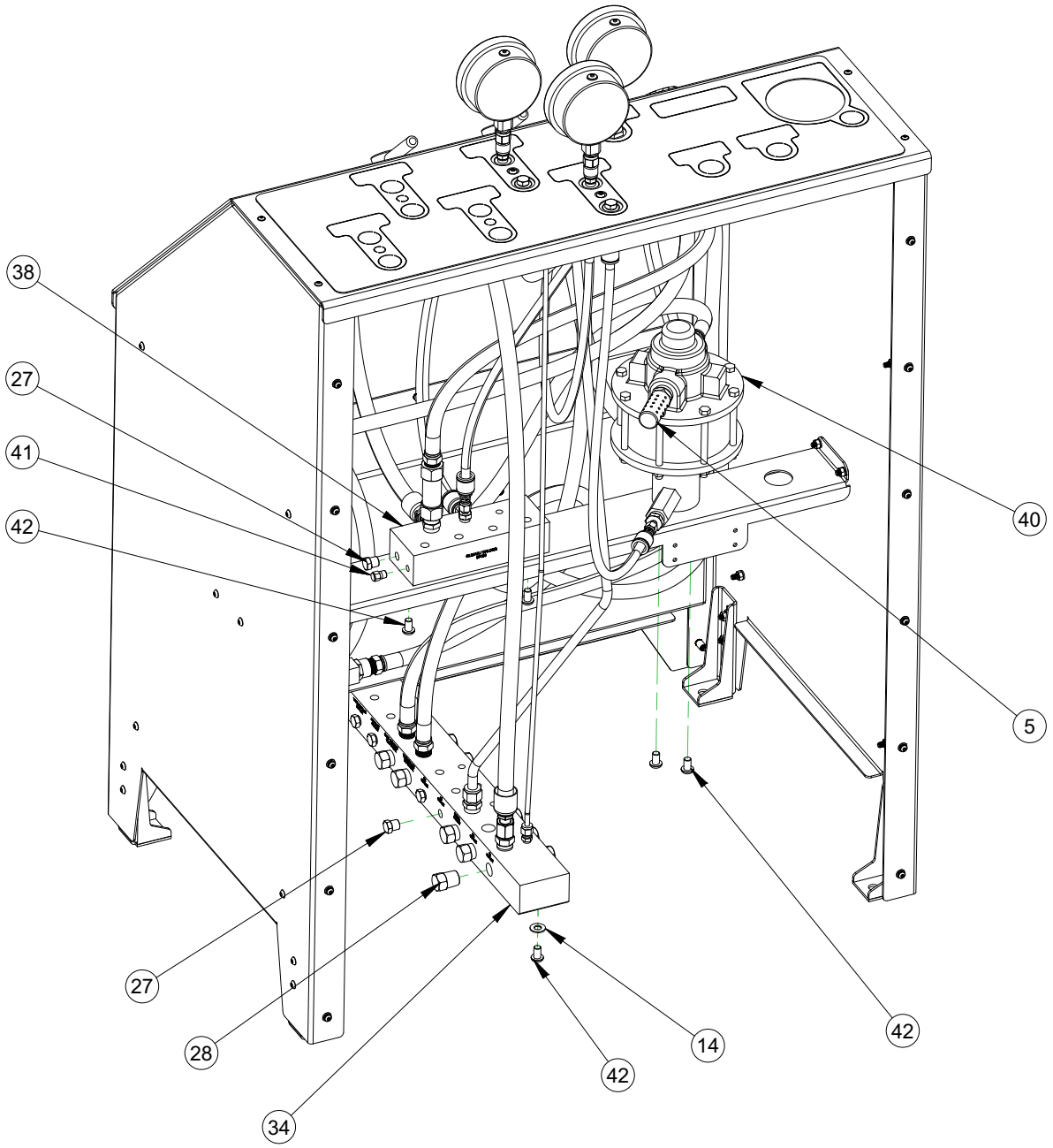
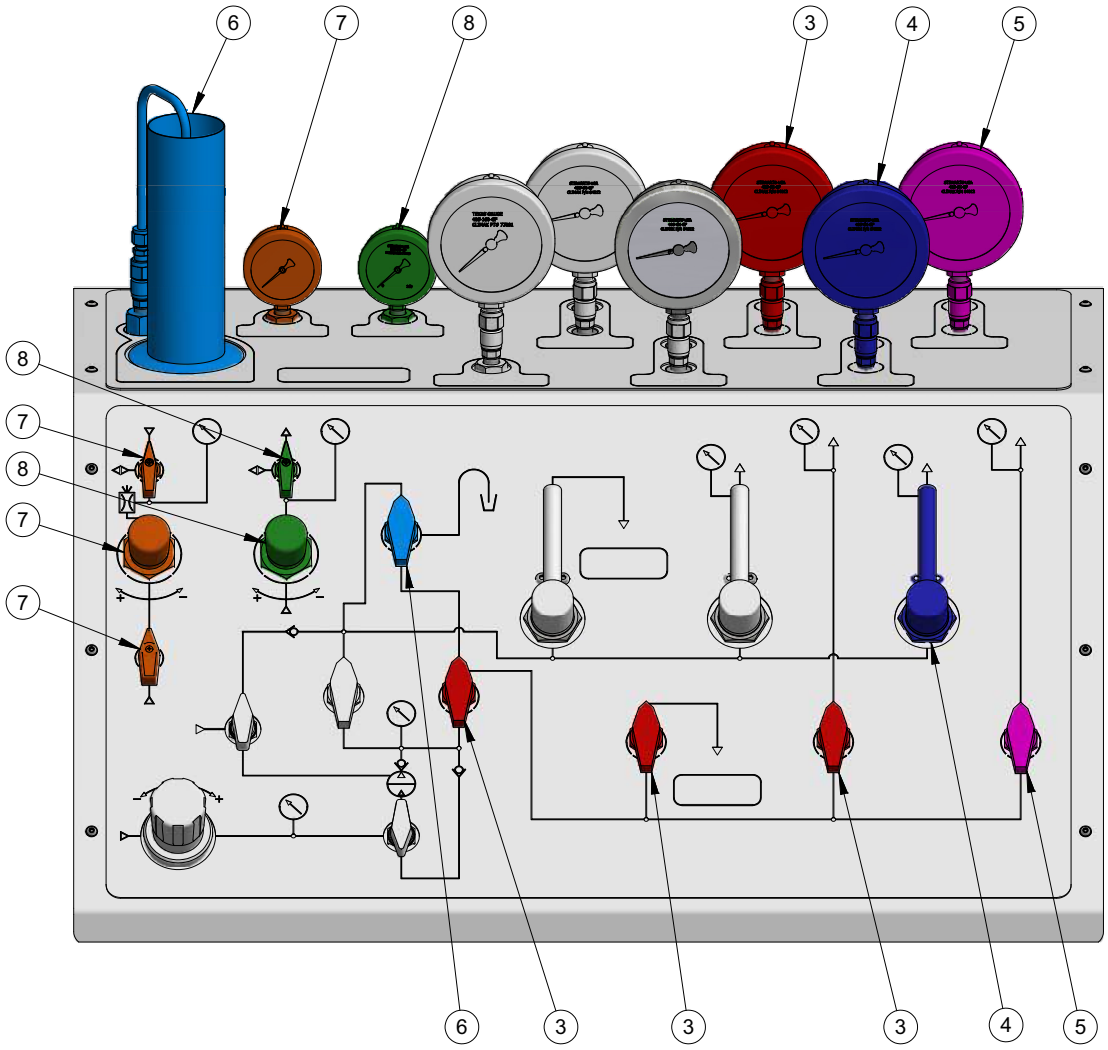


FIGURE A-3. HPC–6K BASE ASSEMBLY BACK VIEW (P/N 87174)

ITEM	QTY	P/N:	DESCRIPTION
1	48	10704	HOSE LOW PRESSURE PUSH LOK 1/4 ID
2	3	10705	FTG BARB 1/4 NPTM X 1/4 HOSE BRASS
3	1	35883	FTG ELBOW 1/4 NPTM X 1/4 NPTF STREET 90 DEG BRASS
4	1	77394	REGULATOR AIR 1/2 NPT 125 PSI
5	1	77399	HIGH FLOW MUFFLER 3/4 NPTM COMPACT
6	2	77422	FTG TEE 1/2 NPTM X 1/2 NPTF MALE RUN TEE BRASS
7	3	77427	FTG BARB 1/2 NPTM X 1/2 HOSE 90 DEG ELBOW
8	4	77602	SCREW 1/4-20 X 3/8 BHCS SS
9	2	77649	FTG BARB 1/2 NPTM X 1/2 HOSE BRASS
10	1	77871	FTG CHECK VALVE 10 KSI 1/2 NPTF
11	1	77881	GAUGE PRESSURE 4 INCH DIA 160 PSI 1/4 NPTM BOTTOM MOUNT GLYCERIN FILLED
12	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS
13	1	77963	FTG NIPPLE 1/2 NPT HEX SS 10KSI
14	2	78672	WASHER 3/8 FLTW SS
15	1	81787	MOUNT NUT REGULATOR PANEL
16	1	81791	FTG CHECK VALVE 1/4 FNPT 10 KSI SS
17	7	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS
18	2	82359	FTG ELBOW 1/4 NPTM X 1/4 NPTF 90 DEG BRASS LOW PROFILE
19	1	82465	FTG BARB 1/4 NPTM X 1/4 HOSE 90 DEG ELBOW BRASS
20	300	82847	HOSE LOW PRESSURE PUSH LOK 1/2 ID
21	3	83135	FTG BUSHING 1/2 NPTM x 1/4 NPTF BRASS
22	2	83916	FTG MALE CONNECTOR 1/2 TUBE x 1/2 MNPT SS
23	1	83984	FTG BULKHEAD 1/4 NPTF X 1/4 NPTF BRASS
24	1	84571	FTG TEE 1/4" NPT STREET BRASS
25	2	84812	GAUGE PRESSURE 4 INCH DIA 6000 PSI GLYCERIN FILLED 1/4 MNPT BOTTOM MOUNT
26	2	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS
27	16	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI
28	10	86003	PLUG 1/2 NPT 15000 PSI SS
29	3	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER
30	3	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS
31	1	87066	INSTRUMENT PANEL HTC
32	1	87105	ASSY BASE FRAME & COMMON COMPONENTS HTC
33	1	87118	LABEL INSTRUMENT PANEL OVERLAY HTC
34	1	87142	MANIFOLD PROCESS HPC 10 KSI
35	2	87225	VALVE DIVERTING 3-PORT 1/2 NPTF BRASS
36	2	87277	VALVE PRESSURE RELIEF AIR 150 PSI 1/4 NPTM
37	2	87422	MANIFOLD GAUGE HTC 10 KSI
38	1	87438	MANIFOLD INTERMEDIATE HTC 10 KSI
39	1	87468	ADAPTER 1/4 NPTM X 1/4 NPTM STAINLESS 15 KSI
40	1	87543	PUMP AIR DRIVEN 7000 PSI WATER SERVICE
41	2	87572	FTG PLUG 1/8 NPTM HEX HEAD 10KSI
42	6	87594	SCREW 3/8-24 X 5/8 BHSCS 18-8 SS
43	10	87609	SCREW 10-32 X 3/4 BHSCS FLANGED SS 18-8
44	1	87668	VALVE BALL 2 WAY 1/4 NPTF 6000 PSI
45	1	87675	HOSE ASSY 3/8 ID X 3/8 FEM JIC SS WITH 1/2 NPTM SS ADAPTER BOTH ENDS X 27.2 IN OAL
46	1	87683	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 46.5 IN OAL
47	1	87684	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 33.2 IN OAL
48	1	87685	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/2 NPTM SS ADAPTER X 32 IN OAL
49	1	87710	LABEL CONSOLE TOP OVERLAY HPC-6K
50	1	87763	TUBE A1 OUTLET GAUGE 1/4 OD HTC
51	1	87764	TUBE SIDE 1 DRAIN 1/2 OD HTC
52	2	87787	VALVE BALL 2 WAY 1/2 NPTF 15,000 PSI
53	2	87788	PANEL NUT BALL VALVE 8FKB SERIES
54	1	87889	LABEL CALDER HPC-6K 20 X 8
55	2	91599	FTG STRAIGHT 8 JICM X 1/2 NPTM SS
56	1	91600	HOSE ASSY 6 KSI 1/2 JIC-8F SS X 1/2 NPTM SS X 52 OAL STRAIGHT ENDS
57	1	91601	HOSE ASSY 6 KSI 1/2 JIC-8F SS X 1/2 NPTM SS X 26 OAL STRAIGHT ENDS

FIGURE A-4. HPC–6K BASE ASSEMBLY PARTS LIST (P/N 87174)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
2	1	87174	ASSEMBLY BASE PACKAGE CALDER HPC-6K
3	1	87176	KIT SIDE 2 WITH OUTLET A2 HPC-6K
4	1	87178	KIT OUTLET B1 CIRCUIT HPC-6K
5	1	87182	KIT OUTLET B2 CIRCUIT HPC-6K
6	1	87185	KIT LEAK DETECTION HPC-6K
7	1	87189	KIT VACUUM PILOT ACTUATION HPC
8	1	87190	KIT AIR PILOT ACTUATION HPC
9	1	87449	(NOT SHOWN) SHIPPING PALLET KIT
10	1	87615	(NOT SHOWN) MANUAL INSTRUCTION CALDER HPC
11	4	87775	RIVET BLIND 1/8 DIA SS 316

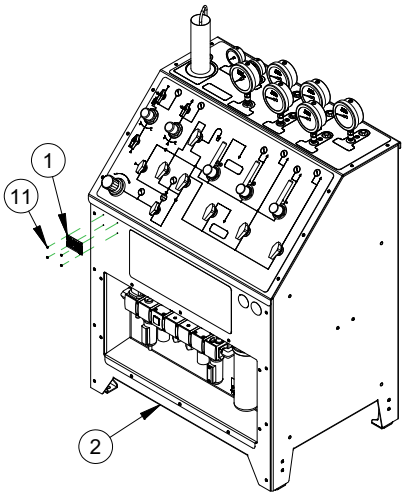
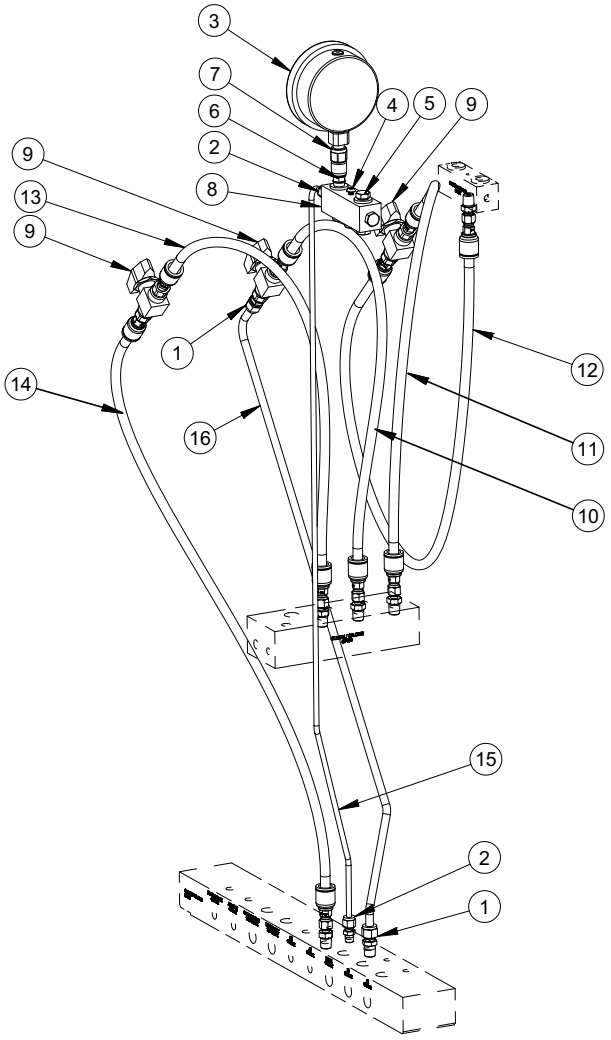
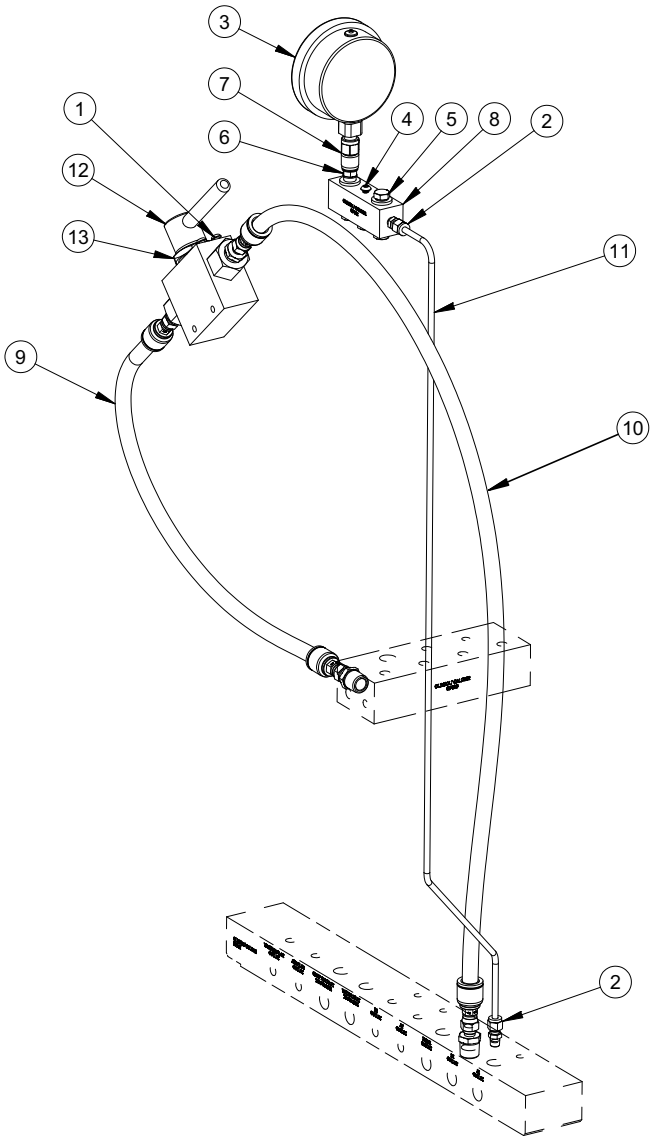


FIGURE A-5. HPC–6K CONTROLS FOR ALL OPTIONS (P/N 87104)



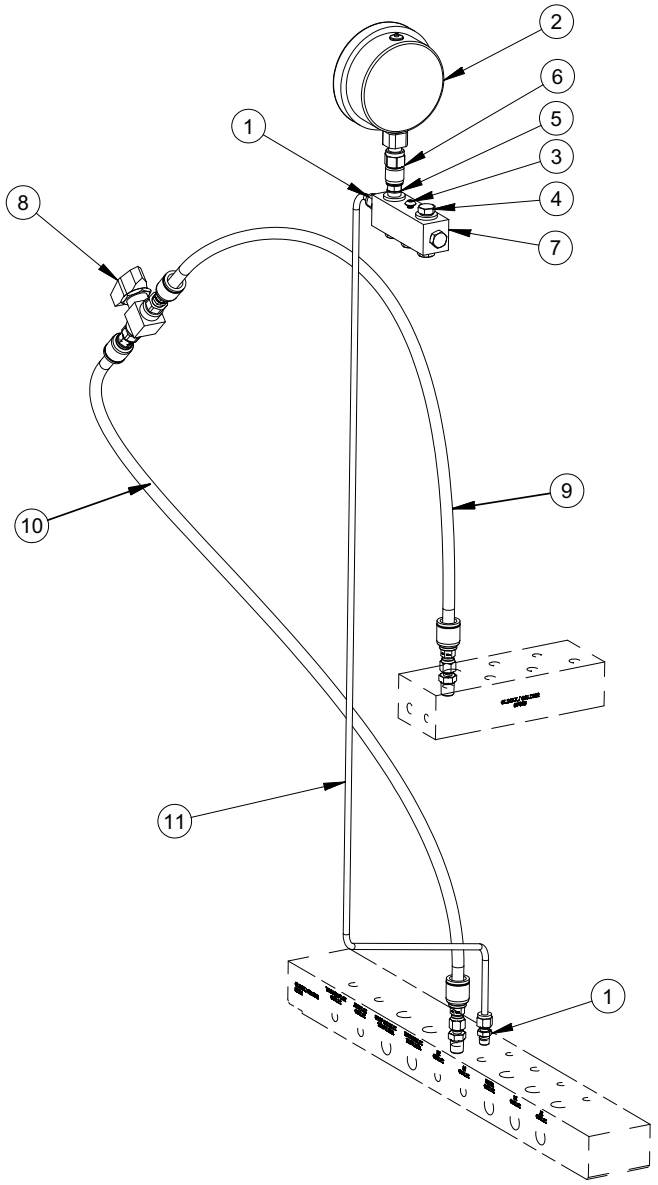
PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77493	FTG CONNECTOR 1/4 NPTM X 3/8 TUBE SS	
2	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
3	1	84812	GAUGE PRESSURE 4 INCH DIA 6000 PSI GLYCERIN FILLED 1/4 MNPT BOTTOM MOUNT	PI-10
4	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
5	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
6	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
7	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
8	1	87422	MANIFOLD GAUGE 10 KSI	
9	3	87668	VALVE BALL 2 WAY 1/4 NPTF 6000 PSI	V-10, V-11, V-12
10	1	87686	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 28.7 IN OAL 6KSI	
11	1	87687	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 30 IN OAL 6KSI	
12	1	87688	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 49.6 IN OAL 6KSI	
13	1	87689	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 29.3 IN OAL 6KSI	
14	1	87690	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 36.5 IN OAL 6KSI	
15	1	87767	TUBE A2 OUTLET GAUGE 1/4 OD HTC	
16	1	87795	TUBE SIDE 2 DRAIN 3/8 OD HTC-6K	

FIGURE A-6. HPC–6K SIDE 2 KIT WITH OUTLET A2 (P/N 87176)



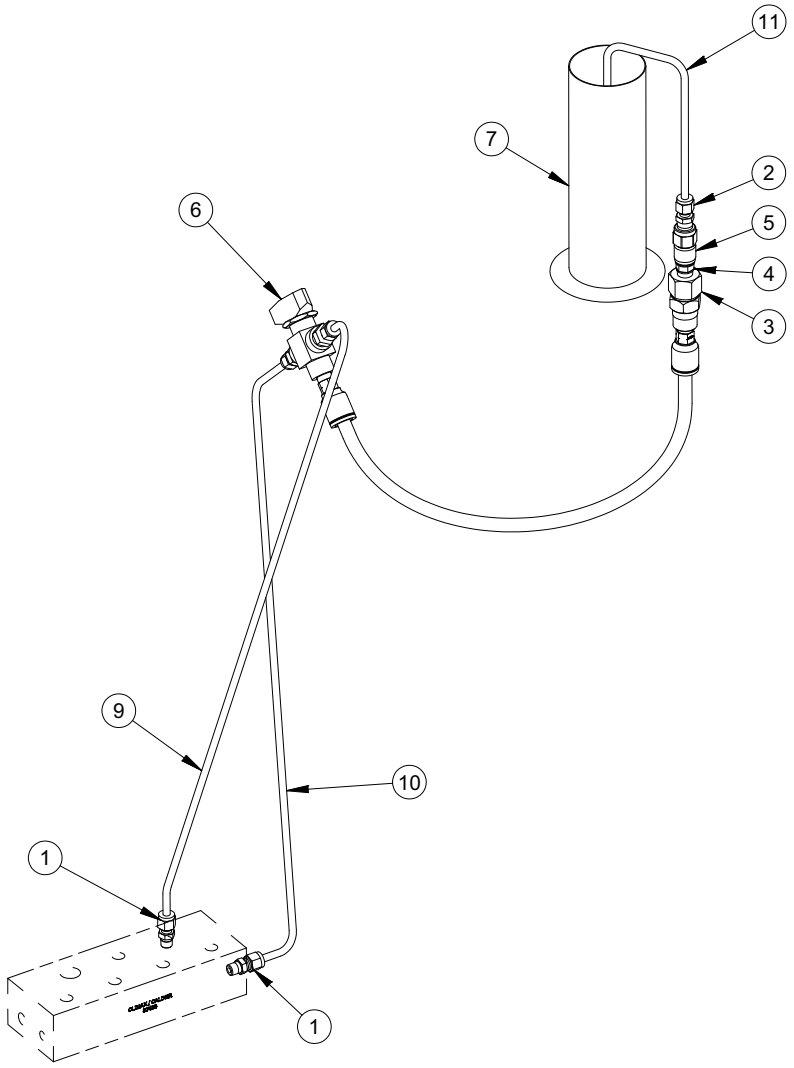
PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77602	SCREW 1/4-20 X 3/8 BHCS SS	
2	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
3	1	84812	GAUGE PRESSURE 4 INCH DIA 6000 PSI GLYCERIN FILLED 1/4 MNPT BOTTOM MOUNT	PI-30
4	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
5	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
6	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
7	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
8	1	87422	MANIFOLD GAUGE HTC 10 KSI	
9	1	87691	HOSE ASSY 3/8 ID X 3/8 FEM JIC SS WITH 1/2 NPTM SS ADAPTER BOTH ENDS X 27.2 IN OAL	
10	1	87692	HOSE ASSY 3/8 ID X 3/8 FEM JIC SS WITH 1/2 NPTM SS ADAPTER BOTH ENDS X 54 IN OAL	
11	1	87769	TUBE OUTLET B1 GAUGE 1/4 OD HTC	
12	1	87787	VALVE BALL 2 WAY 1/2 NPTF 15,000 PSI	V-30
13	1	87788	PANEL NUT BALL VALVE 8FKB SERIES	

FIGURE A-7. HPC–6K OUTLET B1 CIRCUIT KIT (P/N 87178)



PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
2	1	84812	GAUGE PRESSURE 4 INCH DIA 6000 PSI GLYCERIN FILLED 1/4 MNPT BOTTOM MOUNT	PI-40
3	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
4	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
5	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
6	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
7	1	87422	MANIFOLD GAUGE HTC 10 KSI	
8	1	87668	VALVE BALL 2 WAY 1/4 NPTF 6000 PSI	V-40
9	1	87693	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 32.4 IN OAL 6KSI	
10	1	87694	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 FEM JIC SS WITH 1/4 NPTM SS ADAPTER X 37.5 IN OAL 6KSI	
11	1	87770	TUBE OUTLET B2 GAUGE 1/4 OD HTC	

FIGURE A-8. HPC–6K OUTLET B2 CIRCUIT KIT (P/N 87182)



PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
2	1	77945	FTG CONNECTOR 1/4 NPTM X 1/4 TUBE	
3	1	85232	FTG BULKHEAD 1/4 NPTF 15000 PSI	
4	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
5	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
6	1	87270	VALVE BALL 3-WAY 1/4 TUBE X 1/4 NPT X 1/4 TUBE STAINLESS 10,000 PSI	V-70
7	1	87571	CYLINDER GRADUATED 500 ML POLY	
8	1	87695	HOSE ASSY 1/4 ID 1/4 NPTM SS X 1/4 NPTM SS X 21.7 IN OAL 6KSI (T6004D)	
9	1	87772	TUBE 1 LEAK DETECT 1/4 OD HTC	
10	1	87773	TUBE 2 LEAK DETECT 1/4 OD HTC	
11	1	95273	TUBE DRIP/BUBBLE LEAK DETECT 1/4 OD HPC API 598	

FIGURE A-9. HPC–6K LEAK DETECTION KIT (P/N 87185)

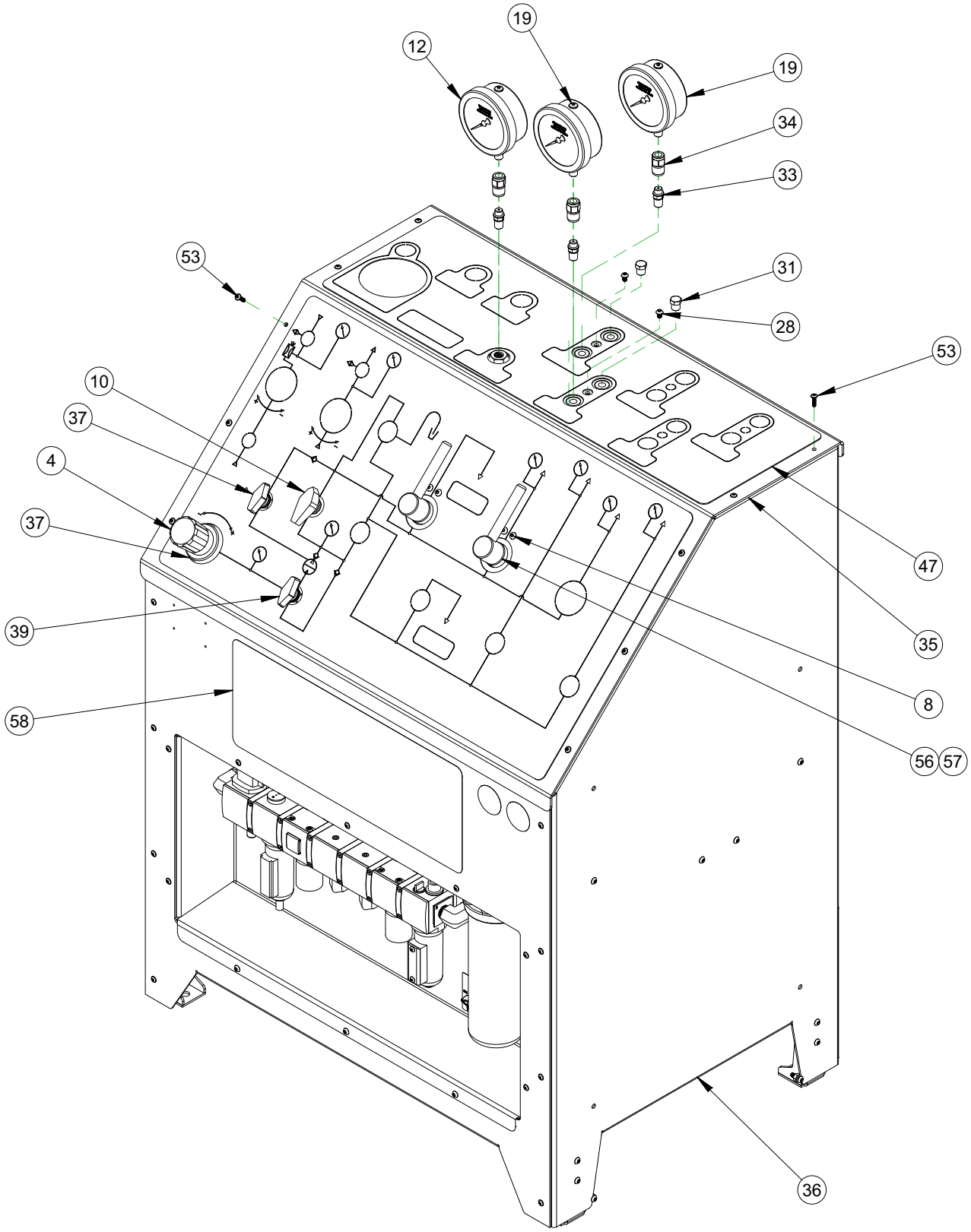


FIGURE A-10. HPC–10K BASE ASSEMBLY (P/N 90354)

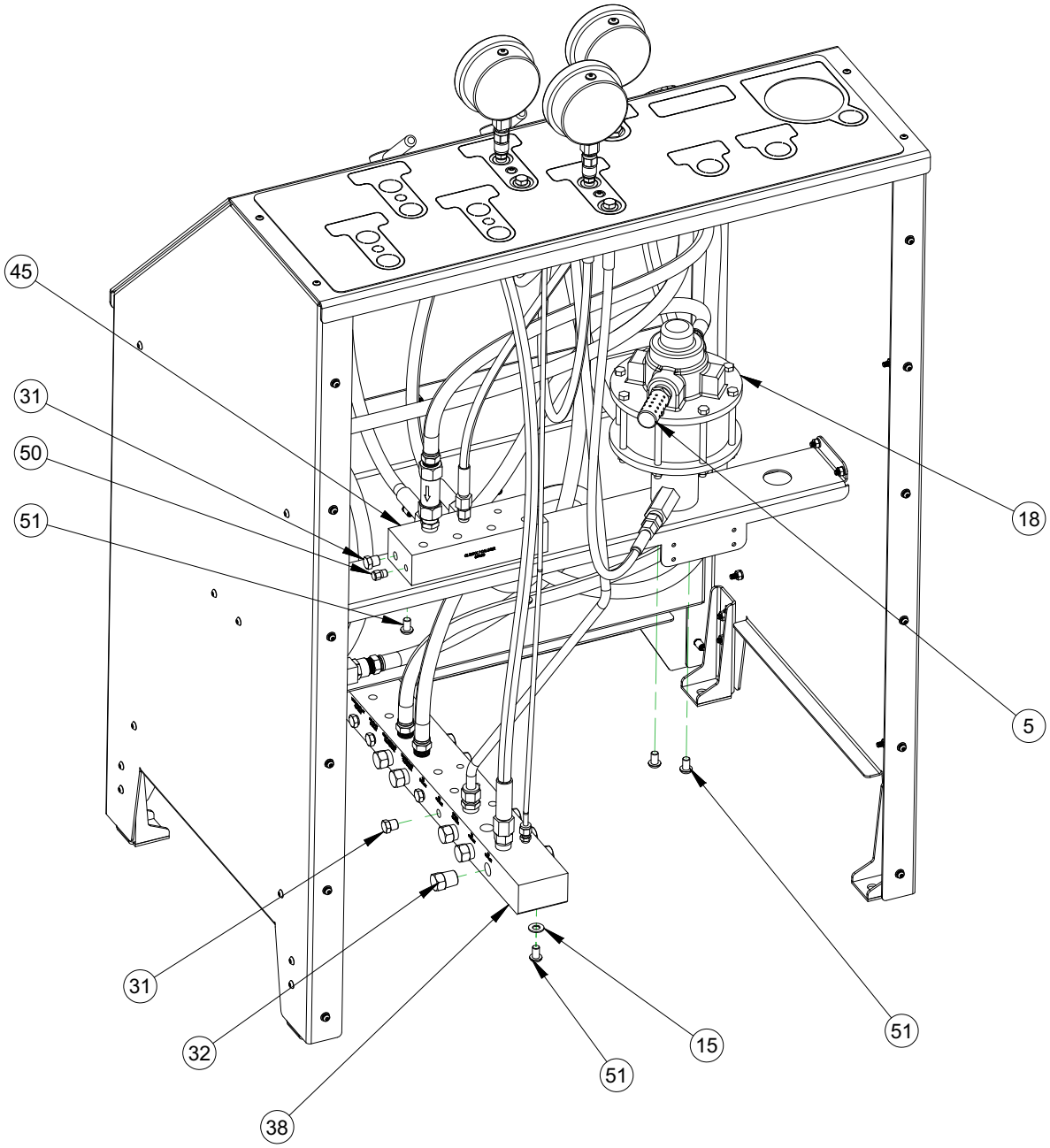
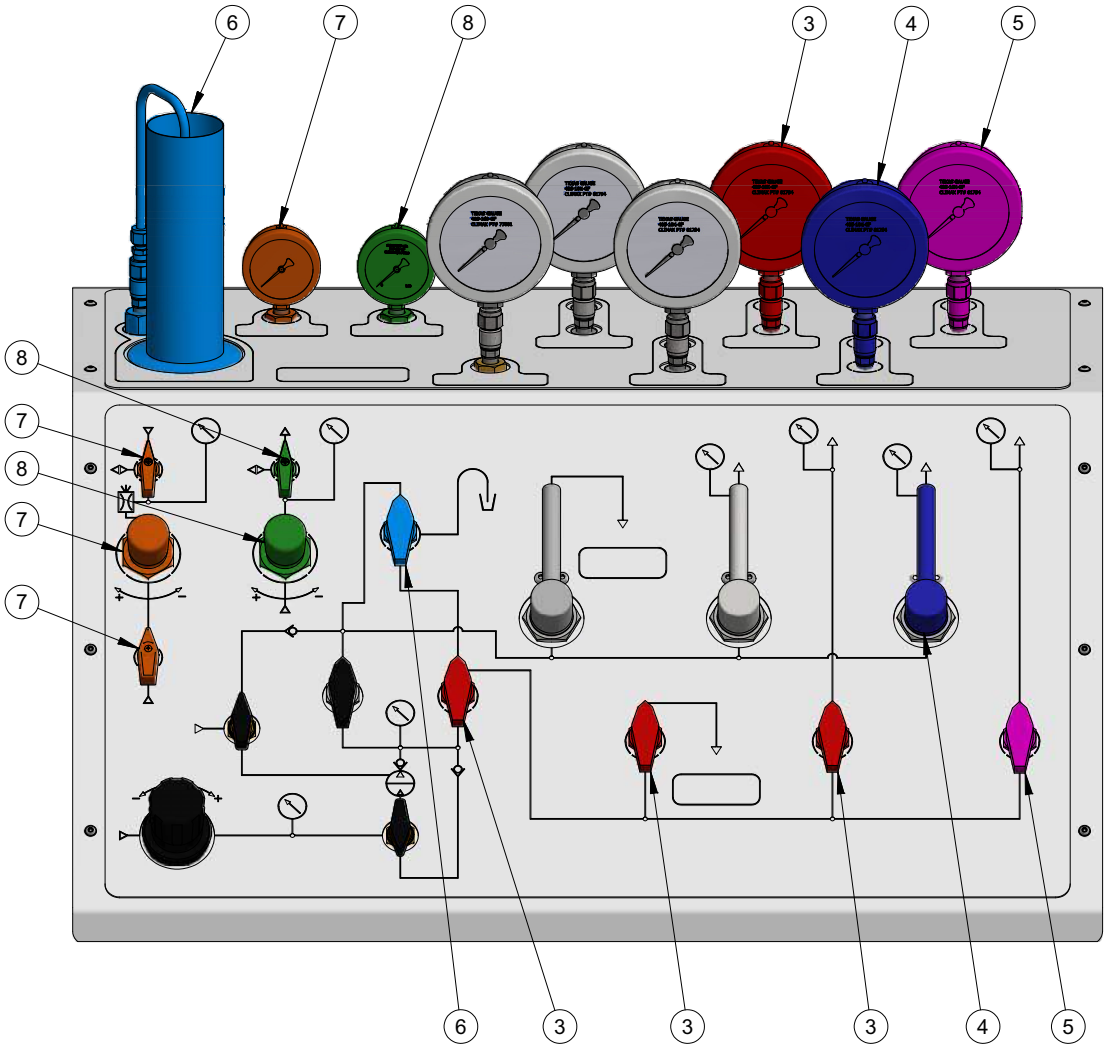


FIGURE A-11. HPC–10K BASE ASSEMBLY BACK VIEW (P/N 90354)

ITEM	QTY	P/N:	DESCRIPTION
1	48	10704	HOSE LOW PRESSURE PUSH LOK 1/4 ID
2	2	10705	FTG BARB 1/4 NPTM X 1/4 HOSE BRASS
3	1	35883	FTG ELBOW 1/4 NPTM X 1/4 NPTF STREET 90 DEG BRASS
4	1	77394	REGULATOR AIR 1/2 NPT 125 PSI
5	1	77399	HIGH FLOW MUFFLER 3/4 NPTM COMPACT
6	2	77422	FTG TEE 1/2 NPTM X 1/2 NPTF MALE RUN TEE BRASS
7	3	77427	FTG BARB 1/2 NPTM X 1/2 HOSE 90 DEG ELBOW
8	4	77602	SCREW 1/4-20 X 3/8 BHCS SS
9	2	77649	FTG BARB 1/2 NPTM X 1/2 HOSE BRASS
10	1	77792	VALVE BALL 2 WAY 1/4 NPTF 10000 PSI
11	1	77871	FTG CHECK VALVE 10 KSI 1/2 NPTF
12	1	77881	GAUGE PRESSURE 4 INCH DIA 160 PSI 1/4 NPTM BOTTOM MOUNT GLYCERIN FILLED
13	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS
14	1	77963	FTG NIPPLE 1/2 NPT HEX SS 10KSI
15	2	78672	WASHER 3/8 FLTW SS
16	1	81787	MOUNT NUT REGULATOR PANEL
17	1	81791	FTG CHECK VALVE 1/4 FNPT 10 KSI SS
18	1	81792	PUMP AIR DRIVEN 10,000 PSI WATER SERVICE
19	2	81794	GAUGE PRESSURE 4 IN DIA 10000 PSI 1/4" NPT BOTTOM MOUNT
20	7	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS
21	2	82359	FTG ELBOW 1/4 NPTM X 1/4 NPTF 90 DEG BRASS LOW PROFILE
22	1	82465	FTG BARB 1/4 NPTM X 1/4 HOSE 90 DEG ELBOW BRASS
23	300	82847	HOSE LOW PRESSURE PUSH LOK 1/2 ID
24	3	83135	FTG BUSHING 1/2 NPTM x 1/4 NPTF BRASS
25	2	83916	FTG MALE CONNECTOR 1/2 TUBE x 1/2 MNPT SS
26	1	83984	FTG BULKHEAD 1/4 NPTF X 1/4 NPTF BRASS
27	1	84571	FTG TEE 1/4" NPT STREET BRASS
28	2	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS
29	1	85256	FTG BARBED BRASS 1/4 HOSE X 1/4 MNPT SWIVEL BRASS
30	2	85259	ADAPTER 9/16 TYPE M X 1/4 MNPT STAINLESS 15 KSI
31	16	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI
32	10	86003	PLUG 1/2 NPT 15000 PSI SS
33	3	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER
34	3	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS
35	1	87066	INSTRUMENT PANEL HTC
36	1	87105	ASSY BASE FRAME & COMMON COMPONENTS HTC
37	1	87118	LABEL INSTRUMENT PANEL OVERLAY HTC
38	1	87142	MANIFOLD PROCESS HPC 10 KSI
39	2	87225	VALVE DIVERTING 3-PORT 1/2 NPTF BRASS
40	2	87277	VALVE PRESSURE RELIEF AIR 150 PSI 1/4 NPTM
41	1	87292	HOSE ASSY .39 ID 1/2 NPTM SS X 3/4 FEM TYPE M SS X 25.7 IN LG 15KSI (10/2W)
42	3	87293	FTG ADAPTER 3/4-16 TYPE M X 1/2 MNPT SS 15 KSI
43	1	87320	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 44.7 IN OAL 15KSI (6/2WL)
44	2	87422	MANIFOLD GAUGE HTC 10 KSI
45	1	87438	MANIFOLD INTERMEDIATE HTC 10 KSI
46	1	87468	ADAPTER 1/4 NPTM X 1/4 NPTM STAINLESS 15 KSI
47	1	87492	LABEL CONSOLE TOP OVERLAY HPC-10K
48	1	87562	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 31.5 IN OAL 15KSI (6/2WL)
49	1	87563	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 30.5 IN OAL 15KSI (6/2WL)
50	2	87572	FTG PLUG 1/8 NPTM HEX HEAD 10KSI
51	6	87594	SCREW 3/8-24 X 5/8 BHSCS 18-8 SS
52	1	87608	FTG ADAPTER 9/16 TYPE M X 1/2 NPTM STAINLESS 15 KSI
53	10	87609	SCREW 10-32 X 3/4 BHSCS FLANGED SS 18-8
54	1	87763	TUBE A1 OUTLET GAUGE 1/4 OD HTC
55	1	87764	TUBE SIDE 1 DRAIN 1/2 OD HTC
56	2	87787	VALVE BALL 2 WAY 1/2 NPTF 15,000 PSI
57	2	87788	PANEL NUT BALL VALVE 8FKB SERIES
58	1	87890	LABEL CALDER HPC-10K 20 X 8
59	1	90279	HOSE ASSY .50 ID 1/2 NPTM SS X 3/4 FEM TYPE M SS X 51.4 IN OAL 15KSI (13/2W)
60	1	90322	HOSE ASSY .50 ID 1/2 NPTM SS X 3/4 FEM TYPE M SS X 25.5 IN OAL 15KSI (13/2W)

FIGURE A-12. HPC–10K BASE ASSEMBLY PARTS LIST (P/N 90354)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
2	1	87173	ASSEMBLY BASE PACKAGE CALDER HPC-10K
3	1	87175	KIT SIDE 2 WITH OUTLET A2 HPC-10K
4	1	87177	KIT OUTLET B1 CIRCUIT HPC-10K
5	1	87180	KIT OUTLET B2 CIRCUIT HPC-10K
6	1	87183	KIT LEAK DETECTION HPC-10K
7	1	87189	KIT VACUUM PILOT ACTUATION HPC
8	1	87190	KIT AIR PILOT ACTUATION HPC
9	1	87449	(NOT SHOWN) SHIPPING PALLET KIT CALDER HPC
10	1	87615	(NOT SHOWN) MANUAL INSTRUCTION MODEL HPC
11	4	87775	RIVET BLIND 1/8 DIA SS 316

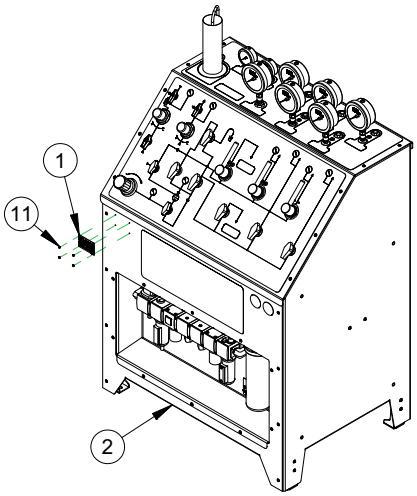
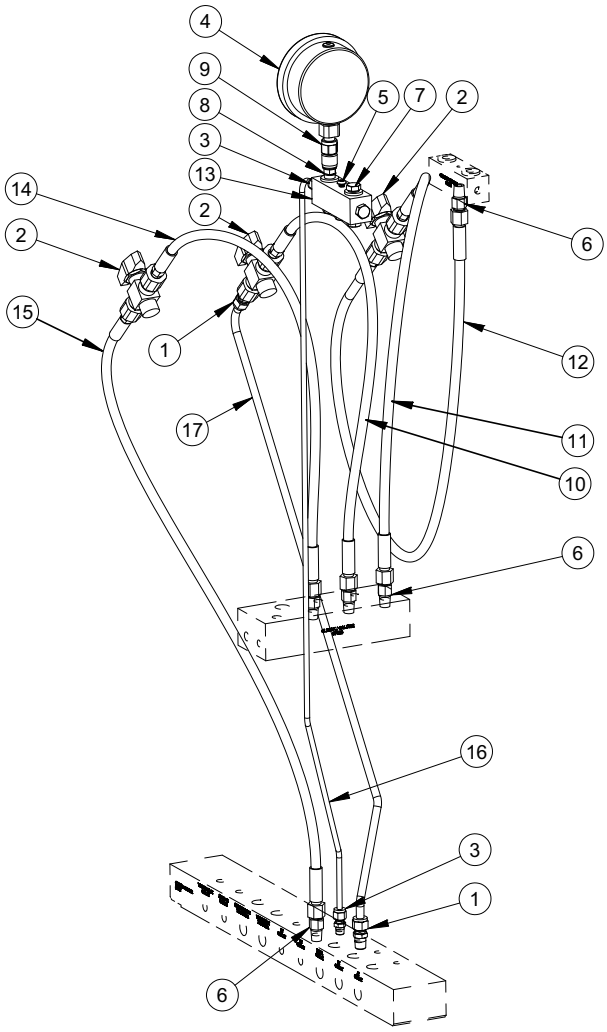
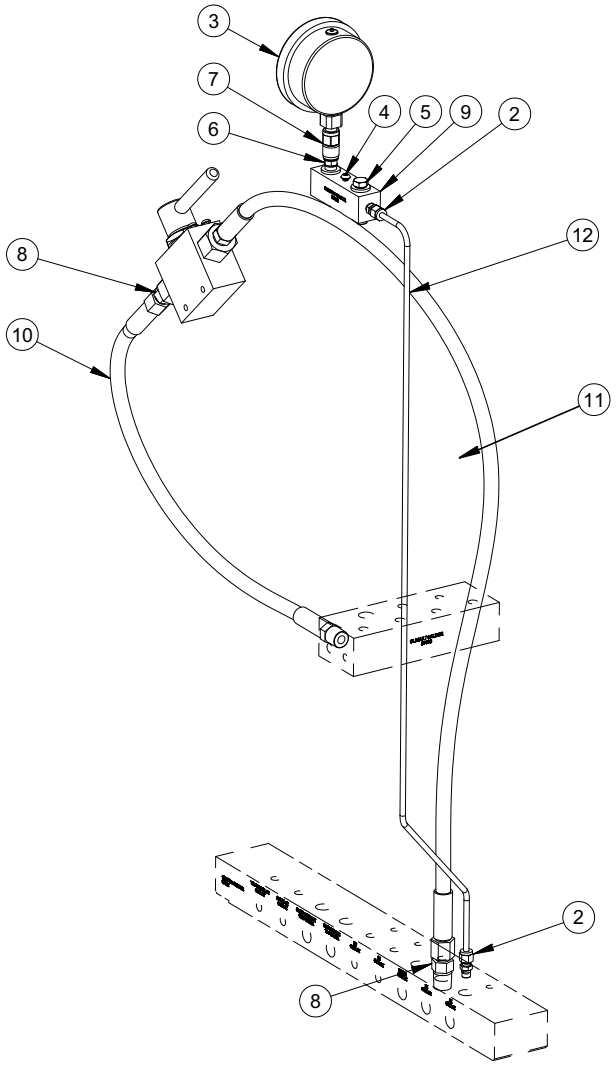


FIGURE A-13. HPC–10K CONTROLS FOR ALL OPTIONS (P/N 87102)



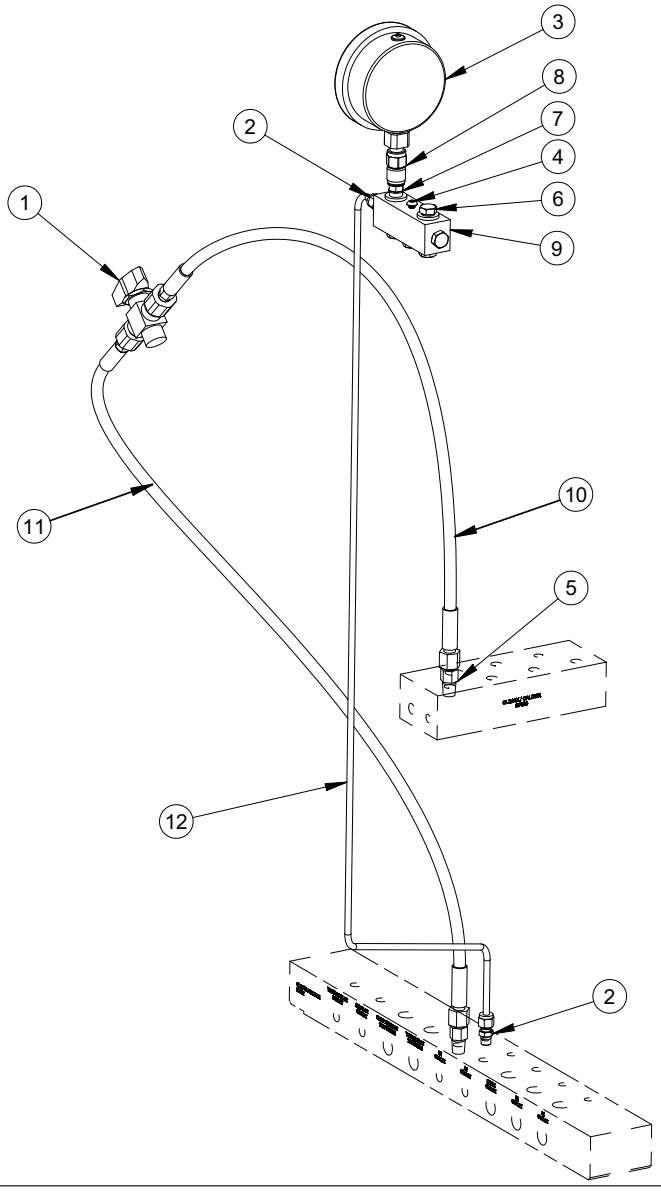
PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77493	FTG CONNECTOR 1/4 NPTM X 3/8 TUBE SS	
2	3	77792	VALVE BALL 2 WAY 1/4 NPTF 10000 PSI	V-10, V-11, V-12
3	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
4	1	81794	GAUGE PRESSURE 4 IN DIA 10000 PSI 1/4" NPT BOTTOM MOUNT	PI-10
5	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
6	5	85259	ADAPTER 9/16 TYPE M X 1/4 MNPT STAINLESS 15 KSI	
7	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
8	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
9	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
10	1	87295	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 27 IN OAL 15KSI (6/2WL)	
11	1	87297	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 28.4 IN OAL 15KSI (6/2WL)	
12	1	87319	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 47.9 IN OAL 15KSI (6/2WL)	
13	1	87422	MANIFOLD GAUGE HTC 10 KSI	
14	1	87568	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 27.7 IN OAL 15KSI (6/2WL)	
15	1	87569	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 34.8 IN OAL 15KSI (6/2WL)	
16	1	87767	TUBE A2 OUTLET GAUGE 1/4 OD HTC	
17	1	87768	TUBE SIDE 2 DRAIN 3/8 OD HTC-10K	

FIGURE A-14. HPC–10K SIDE 2 KIT WITH OUTLET A2 (P/N 87175)



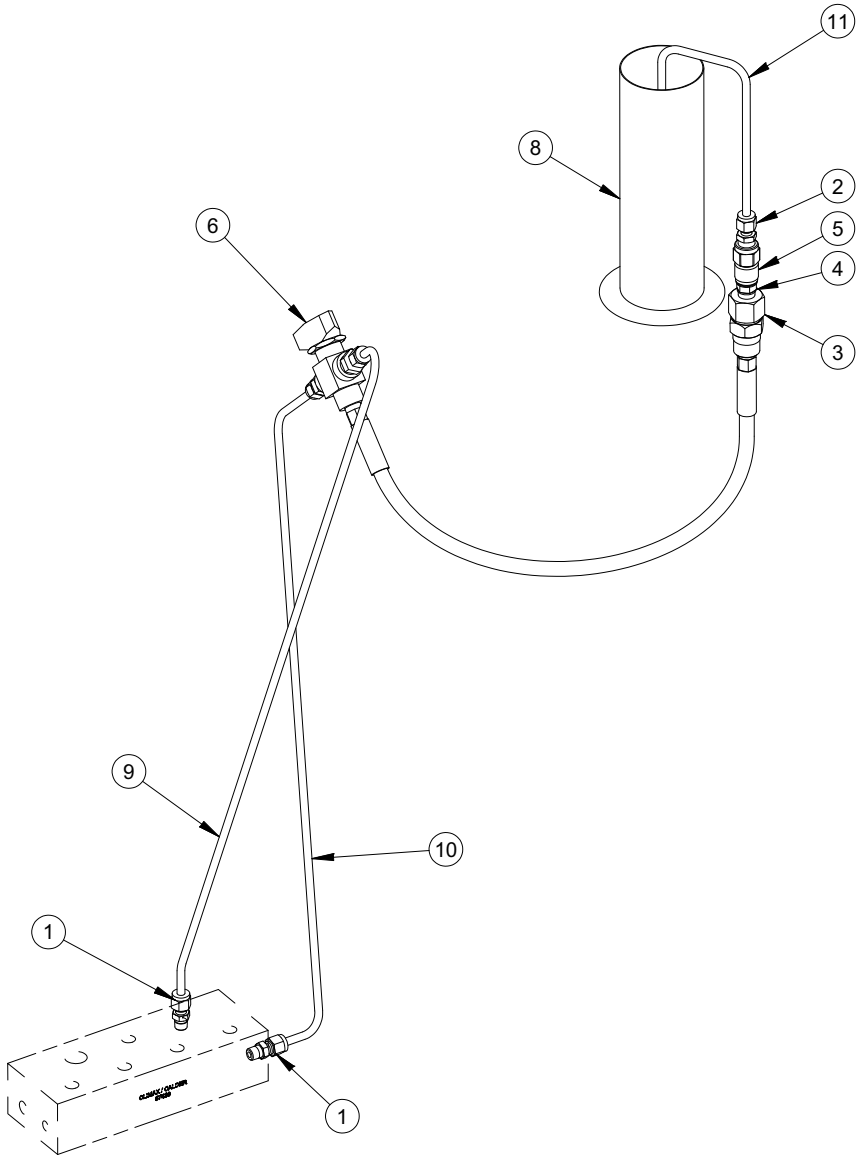
PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77602	SCREW 1/4-20 X 3/8 BHCS SS	
2	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
3	1	81794	GAUGE PRESSURE 4 IN DIA 10000 PSI 1/4" NPT BOTTOM MOUNT	PI-30
4	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
5	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
6	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
7	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
8	2	87293	FTG ADAPTER 3/4-16 TYPE M X 1/2 MNPT SS 15 KSI	
9	1	87422	MANIFOLD GAUGE HTC 10 KSI	
10	1	87566	HOSE ASSY .39 ID 1/2 NPTM SS X 3/4 FEM TYPE M SS X 26 IN OAL 15KSI (10/2W)	
11	1	87567	HOSE ASSY .39 ID 1/2 NPTM SS X 3/4 FEM TYPE M SS X 52.4 IN OAL 15KSI (10/2W)	
12	1	87769	TUBE OUTLET B1 GAUGE 1/4 OD HTC	
13	1	87787	VALVE BALL 2 WAY 1/2 NPTF 15,000 PSI	V-30
14	1	87788	PANEL NUT BALL VALVE 8FKB SERIES	

FIGURE A-15. HPC–10K OUTLET B1 CIRCUIT KIT (P/N 87177)



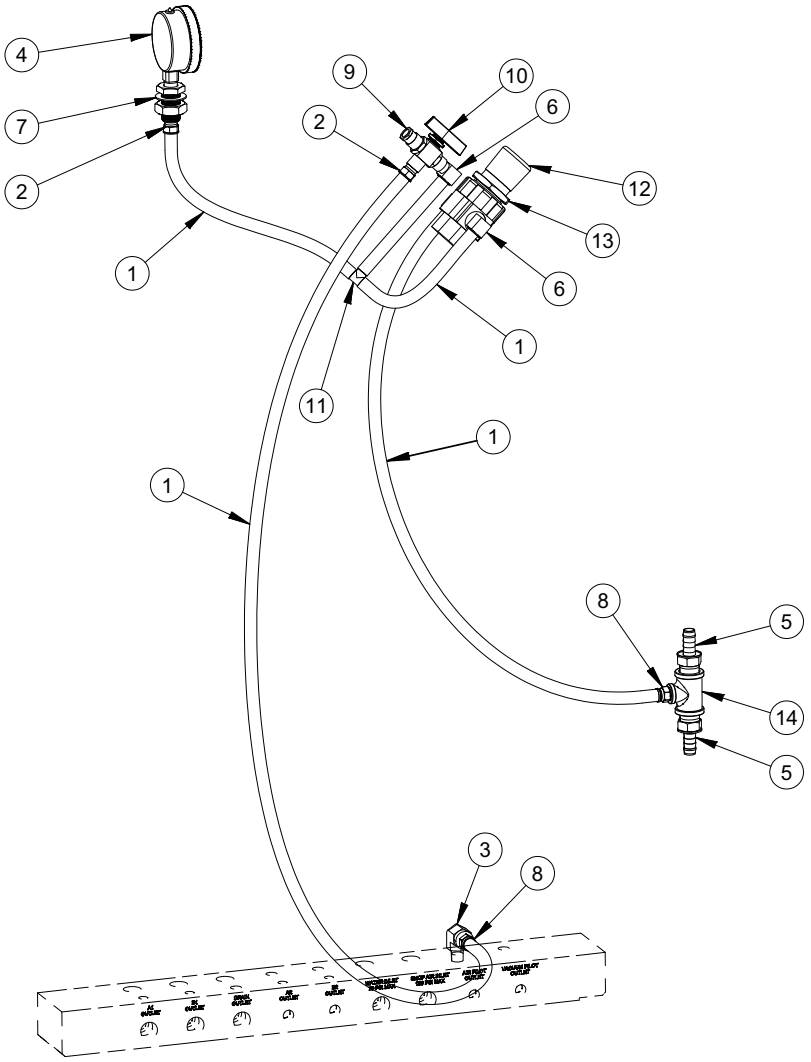
PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	1	77792	VALVE BALL 2 WAY 1/4 NPTF 10000 PSI	V-40
2	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
3	1	81794	GAUGE PRESSURE 4 IN DIA 10000 PSI 1/4" NPT BOTTOM MOUNT	PI-40
4	1	84926	SCREW 1/4-20 X 3/8 BHSCS 18-8 SS	
5	2	85259	ADAPTER 9/16 TYPE M X 1/4 MNPT STAINLESS 15 KSI	
6	5	85330	FTG PLUG 1/4 NPTM HEX HEAD 15 KSI	
7	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
8	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
9	1	87422	MANIFOLD GAUGE HTC 10 KSI	
10	1	87564	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 30.8 IN OAL 15KSI (6/2WL)	
11	1	87565	HOSE ASSY .23 ID 1/4 NPTM SS X 9/16 FEM TYPE M SS X 36.8 IN OAL 15KSI (6/2WL)	
12	1	87770	TUBE OUTLET B2 GAUGE 1/4 OD HTC	

FIGURE A-16. HPC–10K OUTLET B2 CIRCUIT KIT (P/N 87180)



PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	2	77896	FTG STRAIGHT 1/4 TUBE X 1/8 NPTM SS	
2	1	77945	FTG CONNECTOR 1/4 NPTM X 1/4 TUBE	
3	1	85232	FTG BULKHEAD 1/4 NPTF 15000 PSI	
4	1	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
5	1	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
6	1	87270	VALVE BALL 3-WAY 1/4 TUBE X 1/4 NPT X 1/4 TUBE STAINLESS 10,000 PSI	V-70
7	1	87570	HOSE ASSY .23 ID 1/4 NPTM SS X 1/4 NPTM SS X 21.7 IN OAL 15KSI (6/2WL)	
8	1	87571	CYLINDER GRADUATED 500 ML POLY	
9	1	87772	TUBE 1 LEAK DETECT 1/4 OD HTC	
10	1	87773	TUBE 2 LEAK DETECT 1/4 OD HTC	
11	1	95273	TUBE DRIP/BUBBLE LEAK DETECT 1/4 OD HPC API 598	

FIGURE A-17. HPC–10K LEAK DETECTION KIT (P/N 87183)



PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	108	10704	HOSE LOW PRESSURE PUSH LOK 1/4 ID	
2	2	10705	FTG BARB 1/4 NPTM X 1/4 HOSE BRASS	
3	1	35883	FTG ELBOW 1/4 NPTM X 1/4 NPTF STREET 90 DEG BRASS	
4	1	76619	GAUGE ANALOG 2.5 DIA. 160 PSI BOTTOM MOUNTED 1/4 NPTM	PI-50
5	2	77649	FTG BARB 1/2 NPTM X 1/2 HOSE BRASS	
6	3	82465	FTG BARB 1/4 NPTM X 1/4 HOSE 90 DEG ELBOW BRASS	
7	1	83984	FTG BULKHEAD 1/4 NPTF X 1/4 NPTF BRASS	
8	2	85256	FTG BARBED BRASS 1/4 HOSE X 1/4 MNPT SWIVEL BRASS	
9	1	86762	VENT BREATHER 1/4 NPTM	
10	1	87280	BALL VALVE DIVERTING 3 PORT 1500 PSI 1/4 NPTF PORTS	V-50
11	1	87311	FTG TEE 1/4 HOSE BARB BRASS	
12	1	87456	REGULATOR AIR 1/4 NPT 125 PSI SERIES 05R	PCV-50
13	1	87458	MOUNT NUT REGULATOR PANEL	
14	1	87536	FTG TEE REDUCING 1/2 NPTF X 1/4 NPTF BRASS	

FIGURE A-18. AIR PILOT ACTUATION KIT (P/N 87190)

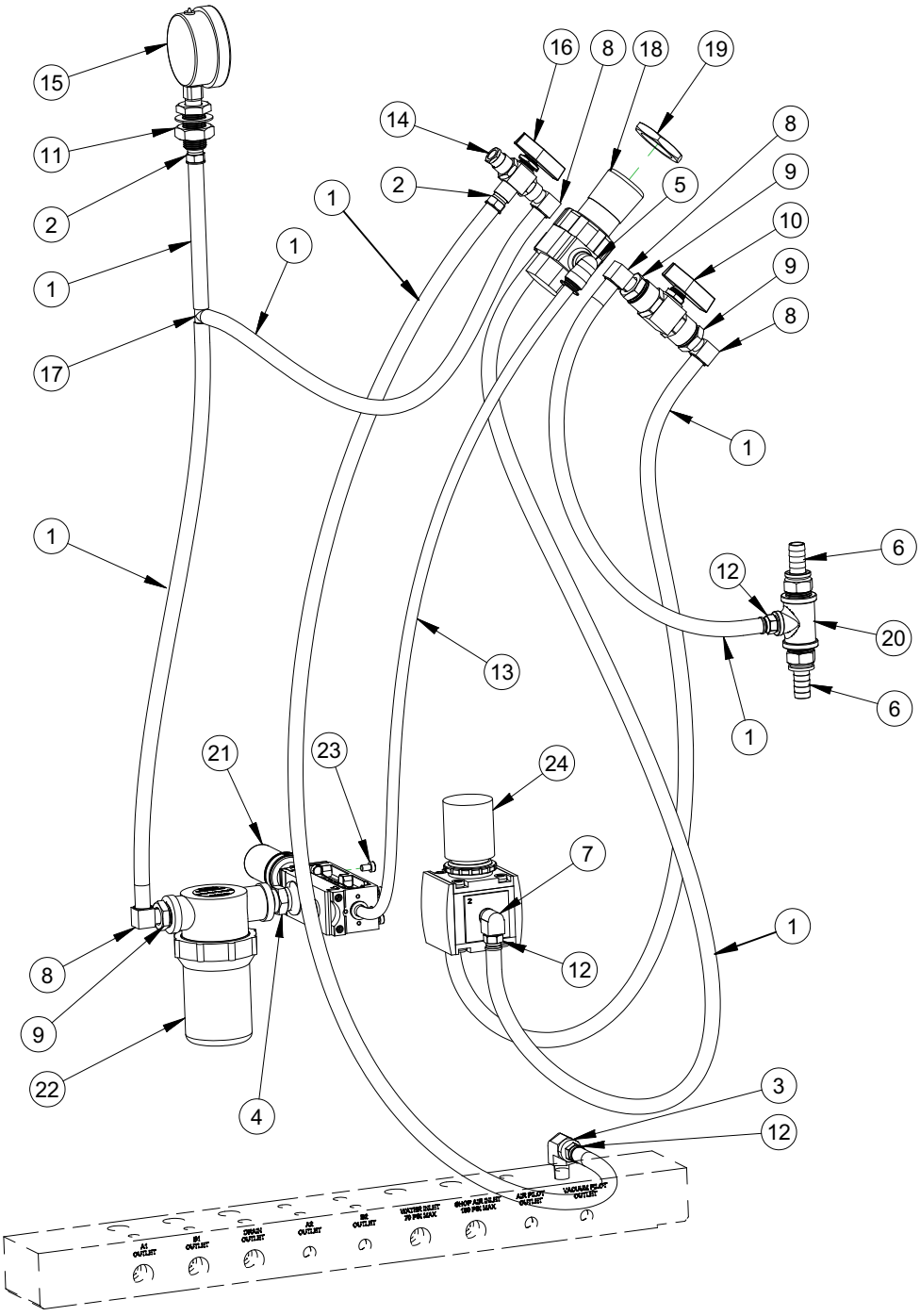


FIGURE A-19. VACUUM PILOT ACTUATION KIT FOR ALL OPTIONS (P/N 87189)

PARTS LIST				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
1	192	10704	HOSE LOW PRESSURE PUSH LOK 1/4 ID	
2	2	10705	FTG BARB 1/4 NPTM X 1/4 HOSE BRASS	
3	1	35883	FTG ELBOW 1/4 NPTM X 1/4 NPTF STREET 90 DEG BRASS	
4	1	77786	FTG NIPPLE 1/2 NPTM X 1/2 NPTM BRASS HEX	
5	1	77965	FTG ELBOW 90 DEG 1/4 NPTM x 3/8 TUBE PRESTOLOK	
6	2	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS	
7	2	82359	FTG ELBOW 1/4 NPTM X 1/4 NPTF 90 DEG BRASS LOW PROFILE	
8	5	82465	FTG BARB 1/4 NPTM X 1/4 HOSE 90 DEG ELBOW BRASS	
9	3	83135	FTG BUSHING 1/2 NPTM x 1/4 NPTF BRASS	
10	1	83364	VALVE BALL 2-WAY 1/2 NPTF 1000 PSI BRASS	V-61
11	1	83984	FTG BULKHEAD 1/4 NPTF X 1/4 NPTF BRASS	
12	4	85256	FTG BARBED BRASS 1/4 HOSE X 1/4 MNPT SWIVEL BRASS	
13	28	85289	TUBING 3/8 OD X 1/4 ID POLYETHELYNE	
14	1	86762	VENT BREATHER 1/4 NPTM	
15	1	87276	GAUGE VACUUM 2.50 DIA TOP MOUNT 1/4 NPTM 30 IN-HG	PI-60
16	1	87280	BALL VALVE DIVERTING 3 PORT 1500 PSI 1/4 NPTF PORTS	V-60
17	1	87311	FTG TEE 1/4 HOSE BARB BRASS	
18	1	87456	REGULATOR AIR 1/4 NPT 125 PSI SERIES 05R	PCV-51
19	1	87458	MOUNT NUT REGULATOR PANEL	
20	1	87536	FTG TEE REDUCING 1/2 NPTF X 1/4 NPTF BRASS	
21	1	87545	VACUUM PUMP P5010	P-60
22	1	87550	VACUUM FILTER 1/2 NPTF	F-60
23	4	88364	SCREW M5 X 0.8 X 8MM SHCS ZINC PLATED	
24	1	91610	REGULATOR VACUUM PILOT HPC 70 PSI PRESET	PCV-60

FIGURE A-20. VACUUM PILOT ACTUATION KIT PARTS LIST FOR ALL OPTIONS (P/N 87189)

TABLE A-1. SPARE PARTS KIT

Part number	Description	Quantity
87434	ELEMENT VACUUM 10 MICRON	1
87436	CARTRIDGE WATER 9-3/4" (247 mm) LONG 125 MICRON	1
87437	ELEMENT REGULATOR AIR 40 MICRON	1

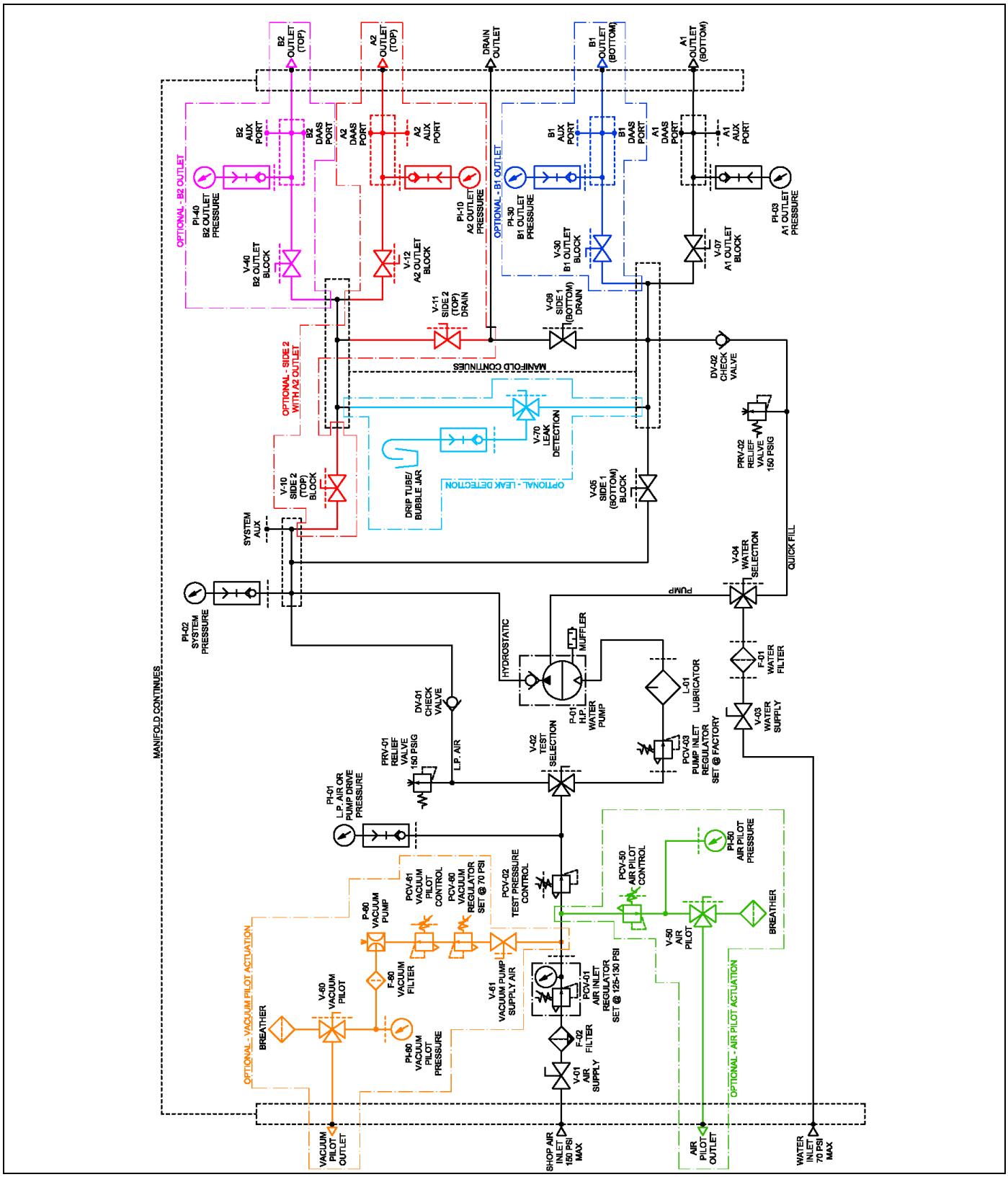


FIGURE B-1. HYDROSTATIC TEST CONSOLE SCHEMATIC (P/N 86730)

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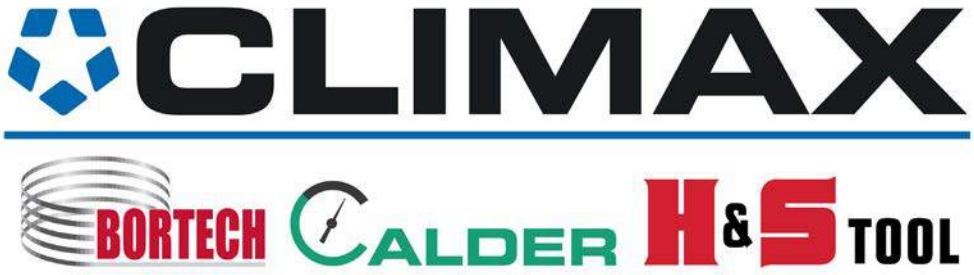
CLIMAX
BORTECH
CALDER
H&S TOOL