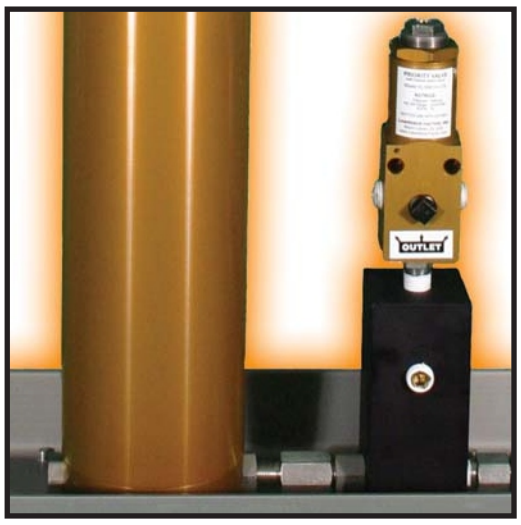
MANUAL

Of Operation, Service and Parts



Purification Appliance Model

HF-961-111

LAWRENCE FACTOR

High Purity At High Pressure

4740 NW 157 Street,
Miami Lakes, Florida 33014
305 430-0550

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Model Number	HF-961-111
Design Gas (Gases)	Compressed Air or Inert Gas
***Maximum Process Gas**	*18,000 Cubic Feet
Maximum Operating Pressure	5,000 PSI
Minimum Operating Pressure	2,000 PSI
Repressure Cycle Life	15,000 Cycles for Cartridge Holders
Safety Factor	4:1 (ASME)
Maximum Operating Temperature	100^{0}F
Minimum Operating Temperature	-40^{0}F
Maximum Ambient Temperature	105^{0}F
Minimum Ambient Temperature	-40^{0}F
Power Supply	Not Applicable
Ground Strap Requirement	Required (Not Supplied)
Dimensions	11” W x 38” H x 5” D
Inlet Port Size	1/4”
Discharge Port Size	1/4” FNPT
Auxiliary Port Size	1/4” FNPT
Non Adjustable Restricted Flow	9 SCFM At 3200psi

* Dependant on actual operating conditions.

Safety

Isolate appliance from gas stream and depressurize prior to any service action. Never direct compressed gases at bodily openings, eyes, or skin. Empty volatile gases from appliance into "drain gas" accumulator. Use appropriate monitoring devices when dealing with critical or life support gas. Never exceed maximum operating conditions set forth herein and/or on appliance nameplate. DO NOT use this appliance with Oxygen or Oxygen rich gas mixtures. DO NOT connect this appliance to any system common with compressed oxygen. Disconnect all power supplies prior to any service action. Some components used on this appliance may have a limited cycle lifespan and must be replaced after that span has lapsed. Carefully read supplement section.

WARNING: When performing installation, adjustments, or any kind of service work: ensure that ALL pressure has first been released and that ONLY trained personnel are carrying out tasks. NEVER remove retaining or adjusting screws while device is under pressure. Safety valve should be returned to factory for service.

*Use only genuine Lawrence Factor replacement parts in order to guard the validity of your warranty and reliability of this appliance.

Introduction

This L-Factor appliance is a “special application” compressed gas purifying system designed to operate at high pressures. It is intended to treat once purified gas a second time (second stage purification) in order to achieve ultrahigh levels of purity. This is a “once through” type appliance utilizing Disposable Cartridges. The appliance, or hardware, operates in concert with the cartridges, or software, which are the core of the system.

With the compressed gas entering the device, it is preconditioned by an optional Mechanical Filter and then flows evenly through a series of Cartridge Holders. These towers contain the Disposable Cartridges which can be configured according to customer needs and applications. It is of paramount iportance that the user not vary from the cartridge models specified on the appliance. Always change all cartridges at the same time, as a set.

On some models, a cartridge change indicating device (Eyeball Indicator) is fixed at the inlet to the tower chain in order to tap off a sample of the gas for constant evaluation. The standard device will indicate RH of the gas by coloremetric change as viewed through a window placed at the topside of the “Eyeball”. Replacement elements are available for a range of RH as well as other kinds and levels of substances.

In the case of compressed air, a minimum level of grade “E” (according to the CGA) is expected to enter the appliance.

The gas now follows a path through a final Micronic Filter towards discharge at the Priority Valve and into the outlet piping.

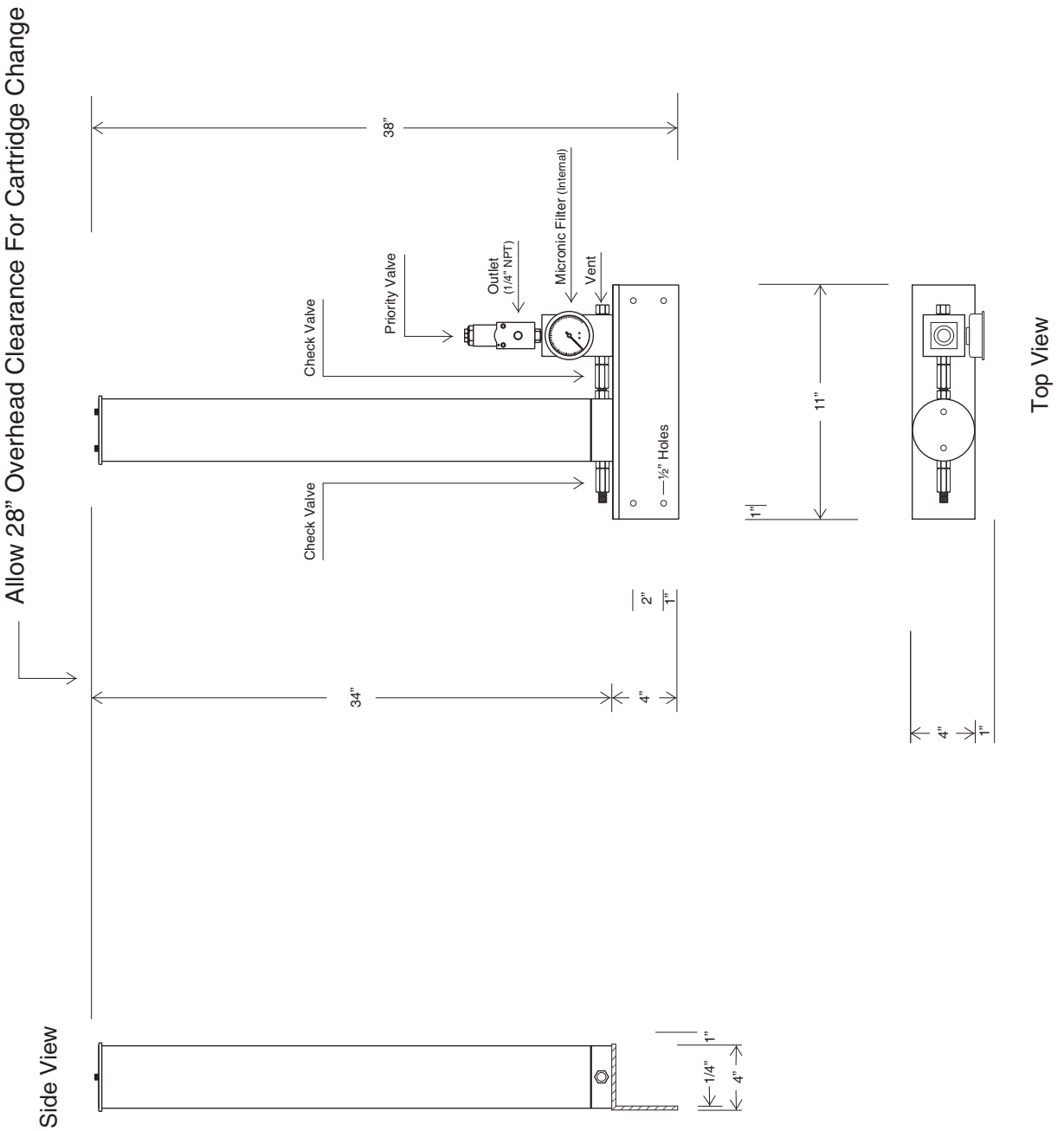
The standard Appliance is supported on an angle plate chassis that facilitates fixing to a permanent vertical foundation or hanging from another equipment. There is a Pressure Gauge at the discharge manifold in addition to a system Drainage Valve. Some models are supported by an optional freestanding chassis which also supports electronic monitoring units.

Special attention has been paid to all materials and treatments in order to guard the ability of this equipment to achieve the high gas purities required of it. Carefully follow the instructions set forth in this manual and use added precautions to avoid internal contamination.

It is of paramount importance that the user does not exceed the operating limitations set forth for this appliance. Do Not exceed pressure, flow rate, or temperature ratings.

Identification of Components

Refer to this illustration in order to identify components as they are discussed throughout the remainder of this manual. Be aware that some items may not appear in the exact form as they exist on the actual appliance.



Installation

It is assumed that the person installing this equipment is experienced in this field and fully acquainted with the standard engineering practices.

Carefully unpack unit while ensuring to protect any sensitive devises such as pressure gauges and instruments.

DO NOT open any valves until unit is fully installed. This appliance has been carefully cleaned and protected against contamination by atmospheric substances.

Refer to "IDENTIFICATION" page of this manual for location of components.

Appliance should be permanently affixed to a solid foundation by means of the anchoring holes located at the back of the angle plate or (in the case of freestanding models) on the feet of the main chassis. Consider all piping joints when orienting unit. DO NOT expose to excessive vibration.

Make up piping connections using joint compound which is compatible with the compressed gas application. If using Teflon tape, do not allow to overlap edges of fittings since pieces may break loose under operation and cause blockages.

- INLET CONNECTION should be made with a flexible hose.
- DISCHARGE CONNECTION should be made with a flexible hose. Note that the discharge is located at the “back pressure valve" and there are two (2) ports for your use, one may be plugged if not required.
- RELIEF VALVE (*if supplied*) vents to atmosphere. An optional valve is available with NPT vent connection to facilitate controlled discharge. Never tamper with relief valve settings.
- SYSTEM VENT discharges to atmosphere. An optional valve is available with NPT connection to facilitate controlled discharge.
- A GROUNDING STRAP (not provided) must be attached to appliance.
- ADEQUATE CLEARANCES must be allowed for servicing and cartridge changes.
- PROVIDE MEANS OF ISOLATION of this appliance from gas stream during service and cartridge changes.
- CONTAMINANT DETECTION (Optional) and alarm should be installed at discharge of appliance when in life support air/gas service.
- OVER TEMPERATURE PROBE (Optional) and alarm with system shutdown devise should be installed at discharge of compressor system as well as at the discharge of this appliance.

DO NOT install in location where ambient temperatures could exceed 110F degrees. DO NOT expose to electrical charges or sparks. DO NOT install in system where gas flow rates could exceed the rating of this appliance. The cartridge set must be installed prior to placing appliance into service. See section on “Installing Cartridges”.

Start Up

The following procedure must be followed on initial start-up (AFTER CARTRIDGES HAVE BEEN INSTALLED) and on each occasion where the appliance has been shutdown, serviced, or had a cartridge change.

NOTE that some appliances will come supplied with storage elements installed and slightly pressurized.

- VENT pressure from appliance using "System Vent". Be careful to drain the appliance slowly.
- REMOVE CARTRIDGE elements from holders according to "Cartridge Change" instructions and install new cartridge elements. (This is done ONLY on initial start-up and on occasions where elements are due for change)
- CLOSE "System Vent Valve".
- PRESSURIZE appliance (SLOWLY) by opening the "Inlet Isolation Valve" (Optional). Bring up to full operating pressure in 500 PSI steps while verifying there are no leaks in system.
- FLUSH contaminants from main appliance and piping by opening the "Outlet Isolation Valve" (Optional) and permitting a small flow of air to discharge downstream or to atmosphere.
- THE APPLIANCE MAY NOW BE PLACED ON LINE by fully opening the "Isolation Valves".

Operation

PRECAUTIONS: Always employ safe practices in handling of volatile or respiratory gases. Wear protective gear when installing, operating, or servicing compressed gas apparatus. Never smoke, cause sparks or fire, or switch electrical equipment while in the presence of volatile gases. MSDS are available for materials contained in disposable cartridges. Use approved methods of disposal for cartridges. Never exceed ratings of this appliance.

INSTALLATION: Appliance must be properly installed prior to operation. See section titled "Installation".

CARTRIDGE INSTALLATION AND CHANGES: Cartridges must be properly installed prior to operation. See section titled "Cartridge Installation".

SERVICE AND MAINTENANCE: See section titled "Maintenance Schedule" and instructions for each individual component at the "Supplements" section of this manual.

Once the appliance is running it will manage itself. The operator need only perform proper maintenance, drain condensate from mechanical filter when needed, and cartridge changes when due. The "Eyeball Indicator" will assist the operator in determining cartridge change. See "Supplements" section of this manual.

DRAINING CONDENSATE FLUID must be done on a periodic basis. Since each system is operating under various conditions the intervals between drainings should be established after operating experience.

Installation of Cartridges

PRECAUTIONS: Always depressurize and remove electrical source from this appliance prior to performing any service. Do Not direct compressed gases at bodily openings, eyes, or skin. Do Not attempt to regenerate disposable cartridges. Do Not rotate cartridges - always replace all cartridges as a set, otherwise contaminants could be reintroduced to gas stream.

CARTRIDGE SERVICE INTERVALS: This appliance can only process the amount of gas rated on the nameplate of the appliance as well as on the front page of this manual. Cartridges must be changed at their maximum calculated life or every six months, whichever comes first. Many variables will contribute to the capability of this equipment. It is our recommendation that a reliable monitor be placed at the discharge point in order to gauge the humidity level of the gas in determining the appropriate change of cartridges. Otherwise, approximated cartridge change can be calculated with the following formula.

$$\frac{\textit{Gas Process Rating of Appliance in SCF}}{\textit{SCFH Gas Flow}} = \textit{Life expectancy of cartridge set in operating hours}$$

This formula is based on average operating conditions for appliance. Low pressures or high temperatures will reduce useful cartridge life.

TOOLS REQUIRED: Spanner wrench (available from manufacturer) or 5/8" closed end wrench, non-hydrocarbon grease with applicator, graphite paste, leak detector pliers and a flashlight.

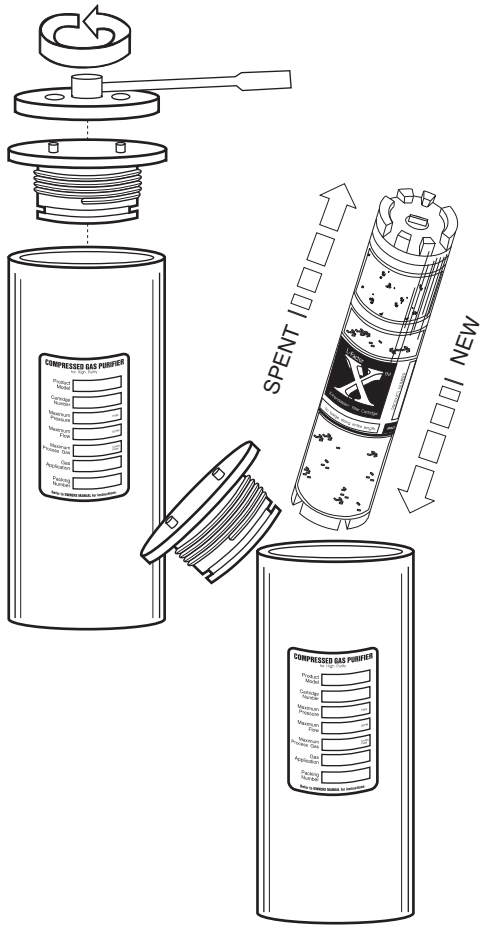
PROCEDURE: Refer to "IDENTIFICATION" page of this manual for location of components. Turn system "OFF" and isolate appliance from gas stream by means of isolation valves (optional). Vent compressed air from system by means of system pressure release valve. Monitor gauges to be certain that appliance is empty.

Remove cylinder head(s) from cartridge holder(s) as illustrated. You should be able to turn the cylinder head with moderate pressure. If force is required, STOP and recheck appliance pressure to verify that it is empty.

Lift spent cartridge from cylinder using the lifting bail provided at top of cartridge.

Using flashlight CAREFULLY inspect interior of cylinder for extraneous matter and any wear exhibited on the cylinder walls. Any deterioration may be cause for replacement.

Remove cartridges from packaging, one at a time, holding them with the outer wrapper used as a "glove" in order to prevent contamination by handling. Remove lower protective seal from mating end of cartridge. Suspending cartridge by lifting bail, lower new cartridge into place. NEVER drop cartridge into cylinder. Apply slight pressure to seat cartridge onto mating stem/port of cylinder.



Installation of Cartidges

PROCEDURE (continued) Using applicator, lubricate cylinder head O-Ring(s) with non-hydrocarbon grease. Also, apply a light film of graphite paste to the threads using care not to contaminate interior of cylinder (non-hydrocarbon grease may be used in place of the graphite paste).

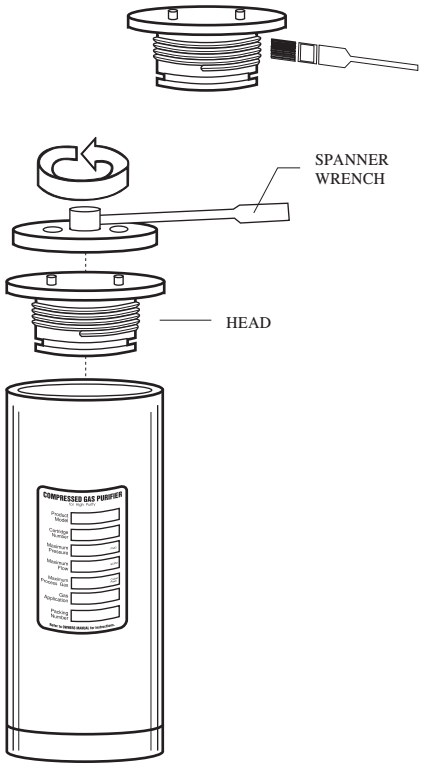
Note that the cylinder foot should be serviced periodically in this same manner. Refer to the maintenance schedule for recommendations

Reassemble in reverse order using the spanner wrench. If binding is encountered STOP and check for obstructions, cartridge position, and thread clearance. DO NOT over tighten cylinder ends. Tighten until dust cover or lip touches cylinder and then back out slightly.

Open the inlet isolation valve to permit gas flow into appliance. Repressurize in 500psi steps while checking for leakage until working pressure is reached. Verify appliance pressure by means of the gauges. Note that the back pressure valve will limit gas flow from leaving appliance until pressure range of 1800-2200psi is reached.

Purge contaminated air from system by means of the system pressure release valve.

Open discharge isolation valve to place appliance back on line.



MAINTENANCE SCHEDULE

	Anytime service is performed	Upon Demand	Monthly	Every 3 Months	Every 6 Months
Replace FILTER CARTRIDGES		✖			✖
Lubricate O-RING SEALS in "Cartridge Holders"	✖				✖
Apply grease to CYLINDER HEADS AND FEET of "Cartridge Holders"	✖				✖
Replace O-RING SEALS in "Cartridge Holders"					✖
Replace MICRONIC FILTER element and seal		✖			✖
Lubricate O-RING SEALS and THREADS in "Mechanical Filter"		✖			✖
Replace O-RING SEALS in "Mechanical Filter"					✖
Replace O-RING SEALS in "Eyeball" Indicator					✖
Replace SEALS in "Drain Valve" and "Vent"					✖
Replace all SEALS in "Priority Valve"					✖
Replace all SEALS in "Check Valves"					✖
TEST "Relief Valve" operation	✖		✖		
Replace all SEALS in "Isolation Valve"					✖
Inspect all PIPING JOINTS for leakage	✖				✖
Inspect all SEAL JOINTS and COMPONENTS throughout appliance for leaks	✖				✖
Inspect CYLINDER wall conditions	✖				✖
Inspect FLUID LEVEL in "Gauges" and replace gauge if less than 2/3 full	✖			✖	
Replace MECHANICAL FILTER unit at limits of repressurization cycle life		✖			
Replace CARTRIDGE HOLDERS at limit of repressurization cycle life		✖			

*Please refer to SUPPLEMENTS SECTION for details and procedures.

Note: Always employ safe practices in handling volatile or respiratory gases. Wear protective gear when installing, operating, or servicing compressed gas apparatus. Never smoke, cause sparks or fire, or switch electrical equipment while in the presence of volatile gases. MSDS are available for materials contained in disposable cartridges. Use approved methods for disposal of cartridges. Never exceed ratings for this appliance. Always depressurize this appliance prior to any service activity. Do not direct compressed gases at bodily openings, eyes, or skin. Do not attempt to regenerate disposable cartridges.

Supplement Inserts

These supplement pages are provided for additional detail on each component. Refer to them for replacement parts and service information.

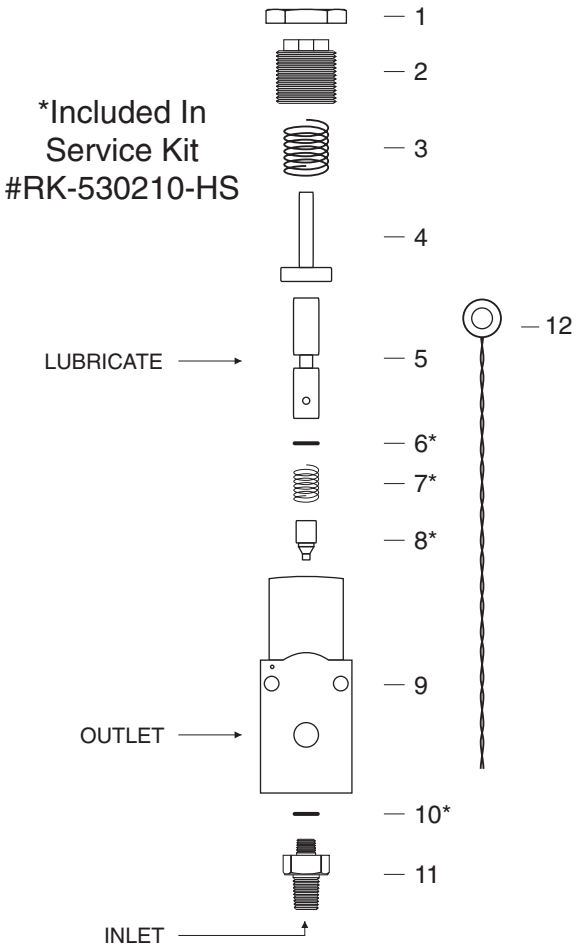
Lawrence Factor, Inc. is not responsible for the accuracy or reliability of these inserts.

ASSEMBLY AND DISASSEMBLY

Assembly and disassembly can be done by following the drawings and parts list. Also refer to the repair section on the opposite side of this sheet for disassembly sequence.

PARTS LIST - SERVICE KIT #RK-530210-HS

ITEM	QTY	DESCRIPTION
1	1	locking nut
2	1	adjusting screw
3	1	spring (red)
4	1	guide
5	1	piston
6	1	o-ring
7	1	counter spring
8	1	poppet
9	1	body
10	1	o-ring
11	1	seat / inlet fitting
12	1	safety wire



GENERAL

The possible applications of the priority valve (a.k.a. back pressure valve or pressure maintaining valve) are numerous but typically serving to increase the efficiency of the purification process. The valve maintains a constant high pressure load on both the coalescor and adsorbent bed thus increasing filter life as much as 400%..

This is a sturdy valve, designed to withstand harsh environments and brutal usage. All internal wetted areas are constructed of corrosion resistant materials including stainless steel and hard-coat aluminum. An internal check valve provides for non-return of the compressed gas. Three (3) discharge ports conveniently turn this valve into a very practical manifold block as well.

SPECIFICATIONS

Maximum PSI	7000 PSI
Adjustable PSI	1000 - 5000 PSI (adj. 300 - 5000)
Flow capacity	75 SCFM
Inlet	1/4” NPT Male (stainless steel)
Outlet (3)	1/4” NPT Female

INSTALLATION

Two (2) mounting points are provided in cases where it is desirable to affix or flush mount the valve. Use a suitable pipe thread sealant such as TEFLON tape on all connections to the inlet/outlet ports. It is suggested that a gauge be installed at the outlet port on the face of the valve. This will accommodate setting of the open point of the valve as well as downstream pressure at any time. Any unused outlet ports may be plugged. If the valve is installed in a piping line ensure that it is adequately supported. WARNING: This product is NOT approved for use in compressed oxygen environments.

The valve comes pre-tested and set at approximately 2000psi. This can be adjusted to your needs by loosening the locking nut and then rotating the adjusting screw clockwise to increase or counter-clockwise to decrease the opening pressure.

OPERATION

In operation, the Priority Valve will maintain it’s set pressure upstream and regulate enough gas flow through the valve in order to sustain this pressure.

MAINTENANCE & REPAIR

Routine maintenance is generally not required. Under extended or severe operation it is helpful to re-lubricate the piston or replace the poppet. Refer to the blow up illustration for order of assembly / disassembly. Reset the valve as instructed above. In any case, the valve may be returned to the factory for repair.

PU-960003-AF Holder

PRECAUTIONS: Follow safe engineering practices when installing or servicing this assembly. Depressurize system and dis-connect electrical supplies prior to any service action. Do not over tighten cylinder head or foot. Do not exceed working conditions set forth herein.

INSTALLATION: Mount to solid foundation in upright position (optional mounting kit is available). Gas flow through unit must be in direction of arrow imprint on cylinder foot. Use appropriate thread sealant when making connections. Apply nameplate, when installation is complete.

Use extreme care to prevent internal contamination since this unit has bee prepared for hyper clean environment.

SPECIFICATIONS

STYLE	Cartridge Holder
MODEL NO	PU-960003-AF
WORKING PRESSURE	2,000 - 5,000 PSI
MAXIMUM PRESSURE	5,000 PSI
TEST PRESSURE	7,500 PSI
BURST PRESSURE	20,000 PSI
SAFETY FACTOR	4:1 ASME
REPRESSURE CYCLE LIFE	15,000
MINIMUM TEMPERATURE	40^0 F
MAXIMUM TEMPERATURE	120^0 F
DIMENSIONS	3.750"OD x 33" H
PORT SIZE	No. 6-AN
CARTRIDGE SUPPLIED	Specified by application

MAINTENANCE SCHEDULE

	Anytime service is performed	Upon demand	Monthly	Every 3 months	Every 6 months
Replace FILTER ELEMENT		✖			✖
Lubricate O-RING SEALS	✖			✖	✖
Apply grease to CYLINDER HEADS AND FEET	✖			✖	✖
Replace O-RING SEALS					✖
Inspect all PIPING JOINTS for leakage	✖				✖
Inspect all SEAL JOINTS and COMPONENTS for leaks	✖				✖
Inspect CYLINDER wall conditions	✖				✖
Replace CARTRIDGE HOLDER at limits of cycle life	EVERY 15,000 CYCLES				

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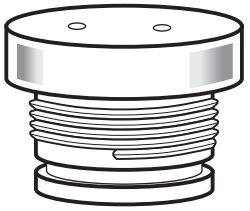
Always depressurize this equipment prior to any service activity. Do not direct compressed gases at bodily openings, eyes, or skin.



CYLINDER HEAD
NOT AVAILABLE SEPARATELY

SEAL KIT
Part No. Sk-535306-BB

CYLINDER
NOT AVAILABLE SEPARATELY

SEAL KIT
Part No. SK-535306-BB

CYLINDER FOOT
NOT AVAILABLE SEPARATELY

LAWRENCE FACTOR

High Purity At High Pressure

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