Jetstream®
Subsidiary of Federal Signal Corporation

H_3ORBITER™
(PN 65367)

PRODUCT INSTRUCTIONS

PI-177

The H_3Orbiter is designed for cleaning tanks, vessels, autoclaves, ducts, and reactor interiors. The tool is capable of working pressures up to 22,000 psi (1500 bar) and flow rates of 10 to 80 gpm. The wide range of flow rates is accommodated by the use of four different manifolds: High Flow, Medium Flow, Low Flow, and Extra Low Flow. A maintenance-free magnetic brake is used to control rotation speed.

Read these instructions thoroughly before installing, connecting, or using the H_3Orbiter tool. If any questions remain, call JETSTREAM at (800) 231-8192 or (832) 590-1300. Also read the yellow JETSTREAM SAFETY WARNING pamphlet included with the shipment of your new H_3Orbiter tool and reproduced inside this publication. This product is sold with the understanding that the purchaser agrees to thoroughly train all operators and maintenance personnel in the correct and safe installation, operation and maintenance of the product and to provide adequate supervision of personnel at all times. Retain these instructions for future reference. If this product is resold or otherwise conveyed, purchaser must pass on the instructions to the new user.

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SECTION 1: SAFETY

⚠ DANGER

Incorrect Use of High Pressure Waterblast Equipment May Cause Serious Injury
Read these instructions in their entirety before using any JETSTREAM products.

This information was prepared to aid in the identification of potentially unsafe conditions when using high pressure waterblast equipment. It should be noted that other potential hazards may exist which might have not been mentioned in this brochure.

In all cases, JETSTREAM products are sold with the understanding that the purchaser agrees to thoroughly train all operating and maintenance personnel in the correct and safe installation, operation of maintenance of waterblast equipment and to provide adequate supervision of personnel at all times.

Read the following in its entirety before connecting, operating or repairing equipment. Purchasers and operators also should be familiar with the current version of the “Industry Best Practices for the Use of High Pressure Waterjetting Equipment” published by the Waterjet Technology Association, as well as any applicable OSHA regulations, standards and guidelines.

Should any questions arise concerning safe and proper procedure, contact JETSTREAM prior to the installation or use at (800) 231-8192 or (832) 590-1300.

GENERAL WATERBLAST

1. Use only clear, clean water in high pressure system.

2. Place barricades with warning signs or barricade tape around work area.

3. Outfit all operators with Personal Protective Equipment (PPE). Hard hat with plastic face shield, rainsuit, non-skid knee boots **with metatarsal protection,** gloves, ear protection and body armor rated for operating pressures are considered minimum safety equipment. Proper respiratory protection is required where dangerous fumes or dust is present or created by the waterblasting operation. Follow applicable OSHA regulations, standards and guidelines regarding the use of respiratory protection if harmful fumes or dust is present during, or created by the waterblasting operation.

4. Use products intended for high pressure waterblasting only.

5. No product should be altered without written consent of the manufacturer.

6. Read and follow all manufacturer's instructions prior to using any waterblast product. Contact manufacturer.

7. Thoroughly review alternative methods before initiating any potentially dangerous waterblasting operation. Fully automated, semi-automated, and/or mechanized methods should all be considered first. Contact the applicable waterblasting manufacturers for assistance and recommendations.

8. The operator handling the cleaning device (with nozzle) must always have control of water pressure. A surface cleaning operator should operate a trigger style control gun capable of instantaneously stopping pressure to nozzle. A tube cleaning lance operator should operate a foot gun capable of instantaneously stopping pressure to the lance.

9. Inspect the condition of all components prior to use. Use no items which are in questionable condition.

10. Check the condition of thread connections prior to the make-up of any high pressure connection. Use Teflon tape and anti-seize on male pipe (NPT) thread for sealing purposes. Do not let tape overlap the male pipe thread end. Tape fragments may enter system water stream and clog nozzle's orifices.

Do Not use a component with missing or damaged threads on the high pressure connections.

11. Properly tighten all high pressure connections. All NPT connections must have a minimum engagement of four (4) threads. Pipe (NPT) connections should be made up hand tight plus two (2) full wrenched turns. Do not tighten NPT threads past two (2) wrenched turns.

⚠ CAUTION Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) for tightening components. Avoid using pipe wrench as wrench marks will cause high pressure components to crack and fail.

12. All high pressure hose connections require a hose restraint (whip check), including connection at fluid end discharge.

13. Before attaching a nozzle to the control gun or tube cleaning lance, **operate the pump at low speed to purge** dirt and debris from system. **Dirt and debris can clog nozzle orifice(s) and cause excessive system pressure which could lead to a lance failure.**

14. With nozzle installed, **operate the pump at a low speed (low pressure) for test**. Should system repairs or adjustments be necessary, stop pump and relieve all pressure before making required repairs or adjustments. The pump operator should watch the nozzle operator at all times in case any difficulty arises and it becomes necessary to depressurize system. If the pump operator does not have a clear line of sight to the nozzle operator, it may be necessary to have another employee available to communicate between the nozzle and pump operators.

15. With the system operating properly, **increase pump speed slowly until operating pressure is reached**-and adjusted. Pressure adjustments should always be made slowly. The nozzle operator shall be warned before any pressure adjustment is made by the pump operator. A sudden change in reaction force may cause the nozzle operator to lose balance.

16. Use **minimum pressure required**-for cleaning. Do not exceed the operating pressure of the system's lowest pressure-rated component. All equipment pressure rating markers and warning tags should be left intact.

17. Waterblast operators must be made aware that the **cleaning nozzle's discharge jets(s) can inflict serious body wounds.** Supervisors should demonstrate the potential danger of discharge jet(s) by showing all new operators the effect of a waterjet by cutting a scrap piece of wood such as a 2" x 4".

18. If equipment malfunctions or a system malfunction is suspected, immediately stop cleaning activity and relieve the pressure in the system before attempting any repairs. Always follow the manufacturer's repair instructions.

19. Only trained persons should be authorized to perform any maintenance or repair.

20.Following any repairs, the system should be operated at low pressure for test. Bring equipment up to operating pressure slowly.

21. For shutdown in freezing conditions, even for brief periods, drain water from all components. Prior to starting operations in freezing conditions, the operation of all equipment components must be checked carefully to make sure components are not frozen and can be operated.

22.Store components properly by protecting them from damage when not in use. Be sure all safety warning tags and markers remain intact.

PRESSURE RELIEF DEVICES

1. **Read General Safety** section prior to installing Relief Valve and/or Pressure Relief Devices.

2. A waterblast system should include both primary and secondary pressure relief protection:

   A. For primary protection a primary rupture disc assembly or spring-loaded relief set at 1.2 times, maximum operating pressure is recommended (i.e. relief valve is set at 12,000 psi if maximum operating pressure is 10,000 psi)

   B. For secondary protection a rupture disc assembly containing a manufacturer's approved disc having a burst rating of 1.4 times maximum operating pressure is recommended.

⚠WARNING Only use a rupture disc holder which will NOT permit the use of coins or other objects in place of discs.

3. Relief devices should never be mounted so the discharge could strike personnel.

4. Never install a shut-off valve between the pump and relief device.

5. "Set pressure" must be prominently displayed on all relief devices. Never install or use a relief device unless its "set pressure" is known.

6. Do not attempt to correct a leaking relief valve by increasing spring tension as this will increase its set pressure.

7. Do not use a pressure relief valve as a combination relief and throttling device.

8. Keep relief valve dry during freezing conditions.

NOTE: Pressure relief devices are imperative for the protection of both operator and equipment from dangerous over-pressurization.

HIGH PRESSURE HOSE

1. **Read General Safety** section prior to connecting high pressure hose.

2. Do not use a high pressure hose with a burst rating less that 2.5 time the pressure at which it will operate. 10,000 psi operating pressure high pressure must have a minimum 25,000 psi burst rating. 8,000 psi operating hose must have a minimum 22,000 psi burst rating.

3. Do not use a high pressure hose that has an unknown burst rating or manufacturer's operating pressure rating.

4. Use of a Safety Shroud is strongly recommended for added safety where hose connects to control gun.

5. Use of hose restraint (whip check) is required at all hose connections, including connections at fluid end.

6. Always apply wrench to wrench flats when making threaded connections. Do not apply wrench on the end fitting ferrule (collar).

7. **Remove hose from service if:**

   A. Cover is damaged and reinforcing wires are exposed to rust and corrosion;

   B. Cover is loose, has blisters or bulges;

   C. Hose has been crushed or kinked;

   D. End fitting shows evidence of damage, slippage, or leakage.

   E. Hose has been exposed to pressures greater than 50% of burst rating; or

   F. Hose is three or more years old, regardless of condition.

8. Disconnect, drain, coil and store hose properly after use.

9. Never attempt to repair or recouple high pressure hoses in field. High pressure hose end fittings are the permanently crimped type and can

only be properly installed with hydraulic crimping equipment.

NOZZLES

1. **Read General Safety** section.

2. Nozzle flow ratings must be compatible with pump discharge and pump pressure rating. (See Nozzle Flow Rating Chart on page 36.)

3. Use only nozzles with a manufacturer's pressure rating of at least the operating pressure or a burst rating or no less than 3.0 times the desired operating pressure.

4. Prior to installation, make sure the nozzle has no clogged orifices.

5. Apply 3 - 4 wraps of Teflon tape to male connection threads on the nozzle. Apply anti-seize compound over the sealant tape for additional protection against galling in connection threads. Wrench connection 1 1/2 - 2 turns past hand tight. A minimal thread engagement of four (4) threads should exist on all Jetstream NPT pipe connections.

6. ⚠ CAUTION Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) to tighten nozzle. Avoid using pipe wrench as wrench marks will cause nozzles to crack and fail.

7. Blocked orifice(s) can cause excessive system pressure and failure. If orifice(s) appear clogged or partially blocked with dirt or debris, remove nozzle from J-Force and clean immediately.

8. **Remove nozzle from service if:**

   A. Nozzle is split or damaged;

   B. Nozzle sidewall is worn by more than 25% at any point;

   C. Nozzle's ability to hold pressure is questionable

   D. Threads are missing or damaged

HIGH PRESSURE FITTINGS

1. **Read General Safety** section prior to installing fittings in system.

2. Use non-brass or non-cast iron fittings which are made for high pressure waterblast use.

3. Use only high pressure fittings which are clearly marked with the operating pressure.

4. High pressure fittings should have a known burst rating of not less than 3.0 times system operating pressure. Never use a damaged or

corroded fitting or one with damaged or missing threads.

5. Use only high pressure rated fittings and hose in the waterblast system. For 10,000 psi waterblast service all fittings and hose should have a minimum burst rating of 25,000 psi; for 15,000 psi service they should have a minimum burst rating of 37,500 psi; for 20,000 psi service they should have a minimum burst rating of 50,000 psi.

6. Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) to tighten fittings. Avoid using pipe wrench as wrench marks will cause high pressure fittings to crack and fail.

REPLACEMENT PARTS

1. **Read General Safety** section prior to repairing equipment and installing replacement parts.

2. Only trained persons should be authorized to perform maintenance or repairs to equipment.

3. Read and follow all manufacturer's repair instructions. All tool, torque, clearance and lubrication recommendations should be followed.

4. During replacement of any part, inspect mating part for wear and replace if necessary.

5. Do not attempt to install or use a part whose dimensions, clearances, function or use are suspect.

6. Test repaired equipment carefully and thoroughly before putting it into service. Do not put any piece of repaired equipment into service if its performance is questionable. If repaired equipment performance is questionable, call manufacturer of repair parts for assistance.

This section concludes all the same information included in the yellow JETSTREAM SAFETY WARNING pamphlet (PI-082).

SECTION 2: PRODUCT DESCRIPTION

The H_3Orbiter is designed for cleaning tanks, vessels, autoclaves, ducts, and reactor interiors. The tool is capable of working pressures up to 22,000 psi (1500 bar) and flow rates of 10 to 80 gpm. The wide range of flow rates is accommodated by the use of four different manifolds: High Flow (80-50 GPM), Medium Flow (55-28 GPM), Low Flow (30-16 GPM), and Extra Low Flow (18-10 GPM). A maintenance-free magnetic brake is used to control rotation speed. The complete H_3Orbiter cleaning cycle varies from about 4 to 30 minutes of operating time depending on rotation speed, which is determined by pressure, flow rate, nozzle diameter, manifold choice, and brake setting. A complete cleaning cycle is 92 revolutions of the body. The manifold revolves 2.36 times for each body revolution. When used in large vessels, extension arms up to 36 inches long can be used to reduce the jet standoff distance. The H_3Orbiter can be hung from the high pressure water hose or by the optional pulling ring available for the tool. It is recommended to blow out all internal water passages (nozzles, weep holes, inlet) with compressed air after each use.

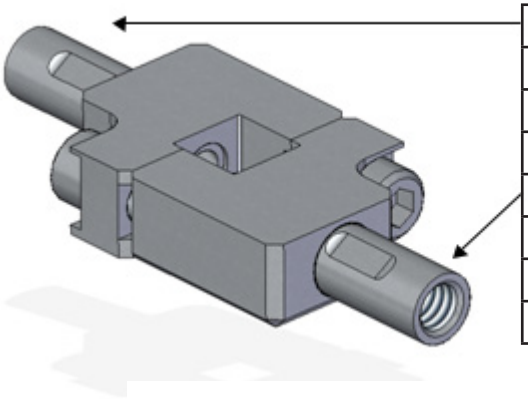
Product Specifications

Model Name	H_3Orbiter (PN 65367)
Maximum Operating Pressure (psi)	22,000
Minimum Operating Pressure (psi)	2000
Maximum Flow (gpm)	80
Maximum Operating Pressure (bar)	1500
Minimum Operating Pressure (bar)	138
Maximum Flow (l/min)	307
Inlet Connection	1” NPT, ¾” NPT, 1” MP, ¾” MP
Power Range	30-1000 hp
Cycle Time	4-24 minutes
Rotation Speed	Adjustable
Nozzle Type Accepted	HHTC Carbide, JS4
Nozzle Port Size	¼” NPT(P4)
Diameter (in)	4
Length (in)	16.65
Weight (lbs)	35
Diameter (mm)	100
Length (mm)	423
Weight (kg)	16
Tow Ring Max Load	600 lbs

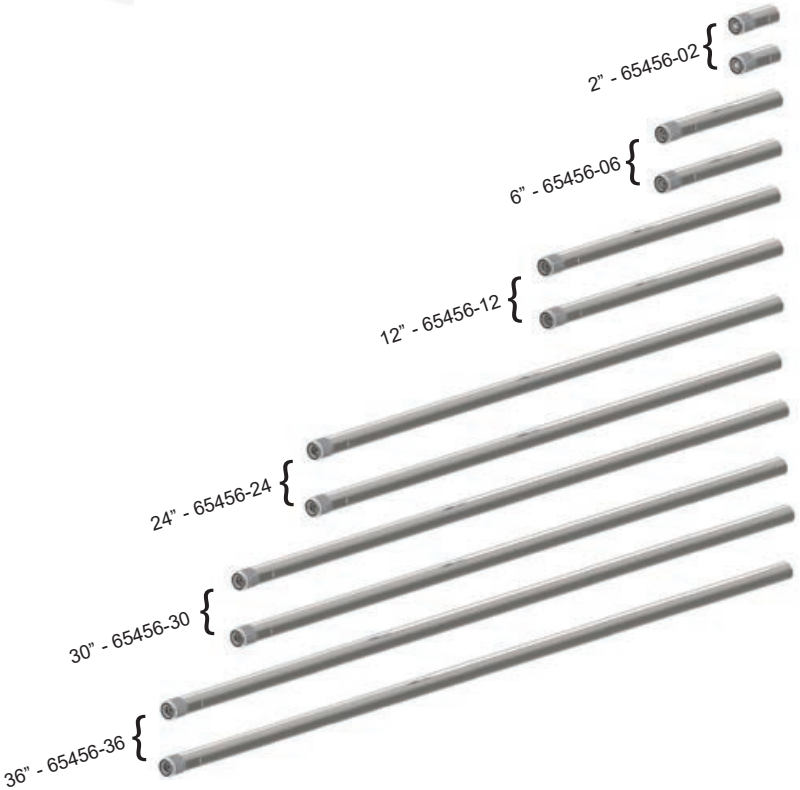
Nozzle Extension Assemblies

Extensions are available for the manifold to reduce the jet standoff distance in large vessels. Jetstream HHTC nozzles are to be utilized in extensions (not shown). These assemblies are provided as pairs and include the extender, flow straightener, and o-ring.

Note: Some form of extensions always required to install nozzles.

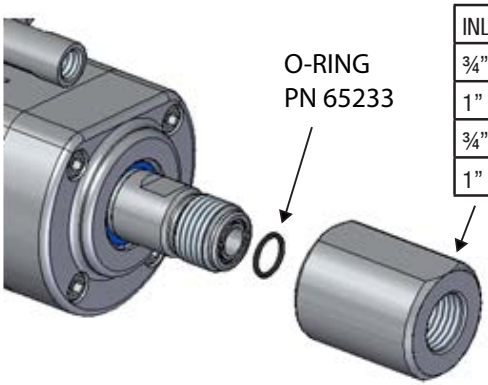


Nozzle Extensions	
1”	65456-01
2”	65456-02
6”	65456-06
12”	65456-12
24”	65456-24
30”	65456-30
36”	65456-36



Inlet Adapters

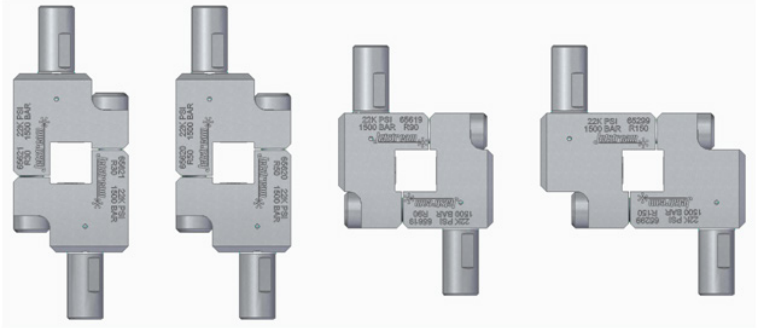
The inlet adapters are all female-female couplings. One end is an o-ring face seal that seals to the inlet shaft. The other end is available in 3/4" NPT, 1" NPT, 3/4"medium pressure, or 1" medium pressure.



INLET ADAPTERS	
¾" NPT (P12)	65666
1" NPT (P16)	65667
¾" MP	65664
1" MP	65665

Manifolds

There are four manifold options depending on required flow rate. These are shown with a 2" nozzle extension assembly (ordered separately).



R30 50-80 GPM PN 65675 | R50 28-55 GPM PN 65676 | R90 16-30 GPM PN 65677 | R150 10-18 GPM PN 65678

Part Number	Flow Rate		Designation (-xxx)
	gpm	lpm	
65675	50-80	189-303	-030 (R30)
65676	28-55	106-208	-050 (R50)
65677	16-30	61-114	-090 (R90)
65678	10-18	38-68	-150 (R150)

Speed Adjustment

The rotation speed of the H_3Orbiter may be adjusted using the speed adjustment shaft located at the opposite end from the inlet. The shaft may be set at any location between slow and fast. Any suitable tool such as a phillips head screwdriver may be used to adjust the speed by inserting the tool thru the access slot on the housing and into the hole in the shaft. To change from slow to fast, turn the speed adjustment shaft approximately 50° to the right. Marks are engraved on the outside of the body to indicate slow and fast settings. Changing the speed from slow to fast will increase speed by approx. three times (i.e. slow 10 rpm; fast 30 rpm). The rotational speed depends on the torque produced by the operating pressure, flow, manifold version and brake setting. The average operating speed range of the cross-shaft is approximately 8-16 rpm on slow and approximately 25-50 rpm on fast.

⚠ WARNING This system contains several high-energy, rare-earth magnets that produce a magnetic field. Persons with a pacemaker or other electronic medical device must use extreme caution when handling or in close proximity. It is recommended that a minimum distance of 6 inches (152mm) be maintained at all times between the H_3Orbiter and any electronic medical devices.

⚠ CAUTION The use of gloves is recommended when handling the tool after operation as the body may reach temperatures greater than 200°F.

SECTION 3: PREPARATION FOR USE

3.0 Before use, inspect the tool and nozzles for wear or damage, and repair or rebuild as necessary.

3.1 See Nozzle Chart in Appendix C to choose nozzle configuration, manifold, flow rate, and desired operating pressure based on the type of cleaning application and desired operating pressure and flow. Install nozzles in nozzle extensions.

SECTION 4: SETUP

4.0 Prior to installing the H_3Orbiter onto the hose, flush the system to clear any debris.

4.1 Check that the o-ring is present in the groove on the face of the inlet shaft. Install required inlet adapter on the inlet shaft with anti-seize. Do not use thread tape.

4.2 Check that a seal is present on the face of the nozzle extensions. Install nozzle extensions onto associated Manifold Assy with anti-seize. Do not use thread tape.

4.3 Install Manifold assembly onto tool output shaft. Use anti-seize on the bolts.

4.4 Apply anti-seize compound to the threads of any male MP inlet connections. Do not use thread tape.
OR
Apply 3-4 wraps of Teflon thread sealant tape to the male NPT inlet connections. Apply anti-seize compound over the sealant tape for protection against galling in connection threads.

4.5 Install the H_3Orbiter onto associated hose connection and tighten the connection 1-1/2 to 2 turns past hand tight. All NPT pipe connections should have a minimum thread engagement of 4 threads.

4.6 Prior to installing nozzles in the H_3Orbiter, turn on the pump and run at low pressure to flush debris from the system.

4.7 Refer to nozzle charts to verify you are using the correct nozzle configuration for your application. Install associated nozzles into H_3Orbiter. Apply 3-4 wraps of Teflon thread sealant tape to the male NPT Nozzle connections. Apply anti-seize compound over the sealant tape for protection against galling in connection threads.

4.8 Set speed adjustment to minimum.

SECTION 5: OPERATION

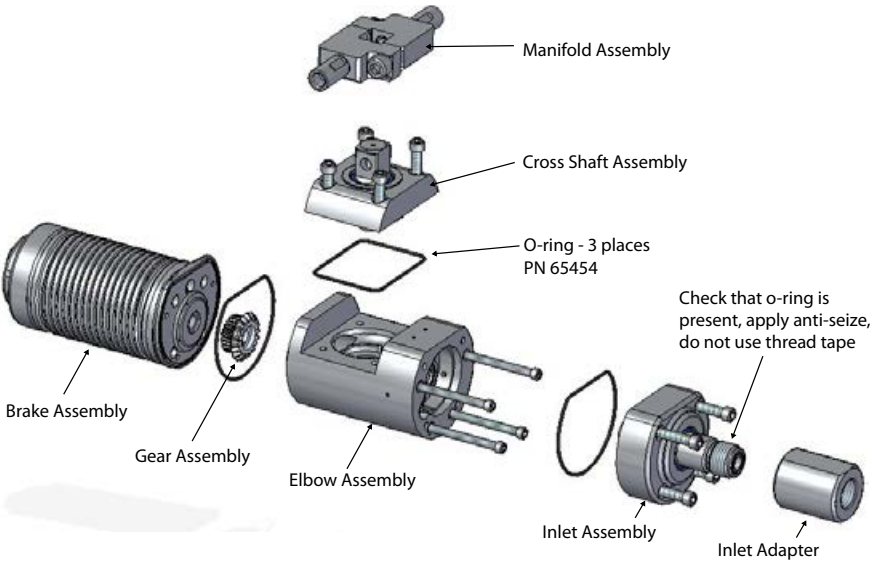
5.0 As per the WJTA-IMCA Recommended Practices, all operators shall follow the OSHA regulations for personal protective equipment. (OSHA guidelines for Personal Protective Equipment are available in document number 3151-12R 2004, which can be obtained from www.osha.gov.) All operators shall be issued suitable head protection, eye protection, hearing protection, body protection, hand and foot protection, and respiratory protection (if needed). For detailed specifications on all protections required, refer to the WJTA-IMCA 'Recommended Practices for the Use of High Pressure Waterjetting Equipment' Section 6, Protective Equipment For Personnel.

⚠ CAUTION The H3Orbiter can be used in a minimum ambient temperature of 1°C (33°F) and a maximum ambient temperature of 48°C (120°F). Use at lower or higher than recommended temperatures may result in premature tool failure.

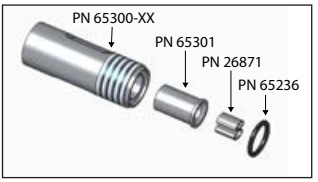
5.1 Start by slowly increasing pressure to 500 psi and check the entire system, including all connections, for leaks. The weep holes in the body of the Orbiter will probably leak a lot until pressure is increased above 2000 PSI. This is normal. Increase pressure in increments, pausing at each to inspect system for leaks, proper rotation of tool, temperature, and other operational anomalies. If any problems are discovered, lower pressure back to zero and turn off source of power before making any adjustments.

SECTION 6: SERVICE

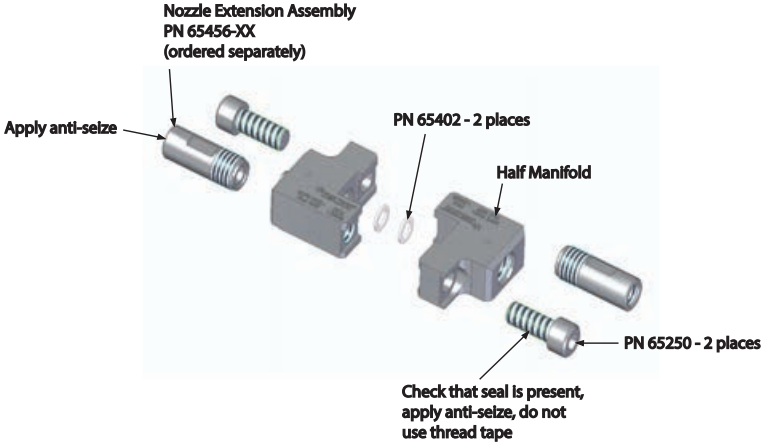
H3Orbiter Main Assembly (PN 65367)



Manifold Assembly

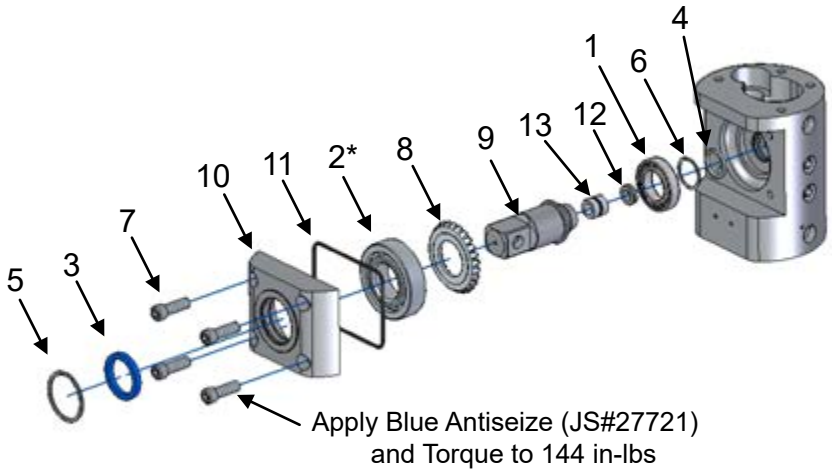


	Manifold Assemblies	Half Manifold
HIGH FLOW R30	65675	65621
MEDIUM FLOW R50	65676	65620
LOW FLOW R90	65677	65619
EXTRA LOW FLOW R150	65678	65299



Cross Shaft Assembly

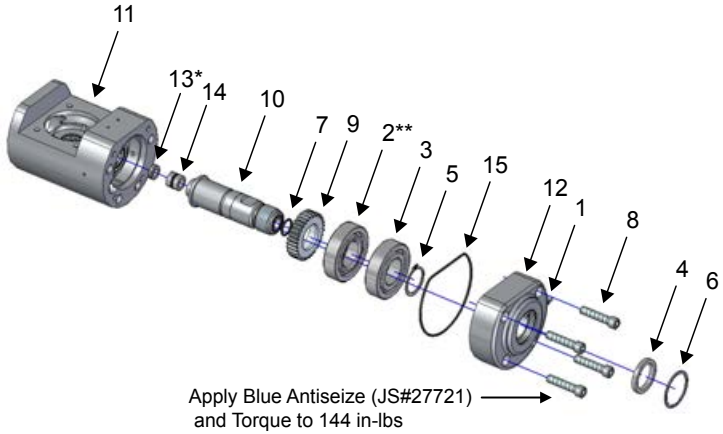
Line No.	PN	Description	
1	65214	BEARING, BALL, DEEP GROOVE	25 X 42 X 9MM
2	65215	BEARING, BALL, ANGULAR-CONTACT	30 X 62 X 16MM
3	65220	SEAL, OIL, DOUBLE LIP	30 X 38 X 5 TC
4	65221	SEAL, OIL, SINGLE LIP	20 X 24 X 2.5 VC
5	65229	RING, RETAINING, SPIRAL INTERNAL	1.56"
6	65230	RING, RETAINING, SPIRAL INTERNAL	25MM
7	65240	CAPSCREW, .31 C X 1.0	SOC HD, SS, SEAL
8	65292	GEAR, BEVEL, SIDE SHAFT	H_3Orbiter
9	65298	SHAFT, DISCHARGE	H_3Orbiter, 22K PSI MAX WP
10	65410	COVER, OUTPUT SHAFT	H_3Orbiter
11	65454	O-RING, 70 DURO, 3-1/2 X 1/16	2-043 BUNA
12	65463	SEAT, CARBIDE	H_3Orbiter
13	65645	SEAL AY, SWIVEL	H_3Orbiter



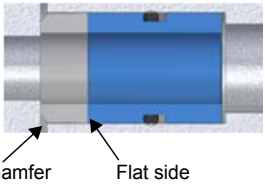
* Angular contact bearing narrow outer race towards gear

Inlet Assembly

Line No.	PN	Description	
1	27492	ZERK, GREASE, 1/4-28	MALE TAPER, STRAIGHT, SST
2	65215	BEARING, BALL, ANGULAR-CONTACT	30 X 62 X 16MM
3	65217	BEARING, BALL, DEEP GROOVE	30 X 62 X 16MM
4	65220	SEAL, OIL, DOUBLE LIP	30 X 38 X 5 TC
5	65226	RING, RETAINING, EXTERNAL	30MM, HEAVY DUTY
6	65229	RING, RETAINING, SPIRAL INTERNAL	1.56"
7	65233	O-RING, 5/8ID X 1/16	2-016, 90 DURO, BUNA
8	65239	CAPSCREW, .31 C X 1.5	SOC HD, SS, SEAL
9	65290	GEAR, SPUR, INPUT SHAFT	H_3Orbiter
10	65297	SHAFT, INLET	H_3Orbiter, 22K PSI MAX WP
11	65333	ELBOW, BODY	H_3Orbiter, 22K PSI MAX WP
12	65409	CAP, INLET	H_3Orbiter
13	65463	SEAT, CARBIDE	H_3Orbiter
14	65645	SEAL AY, SWIVEL	H_3Orbiter
15	65454	O-RING, 70 DURO, 3-1/2 X 1/16	2-043 BUNA



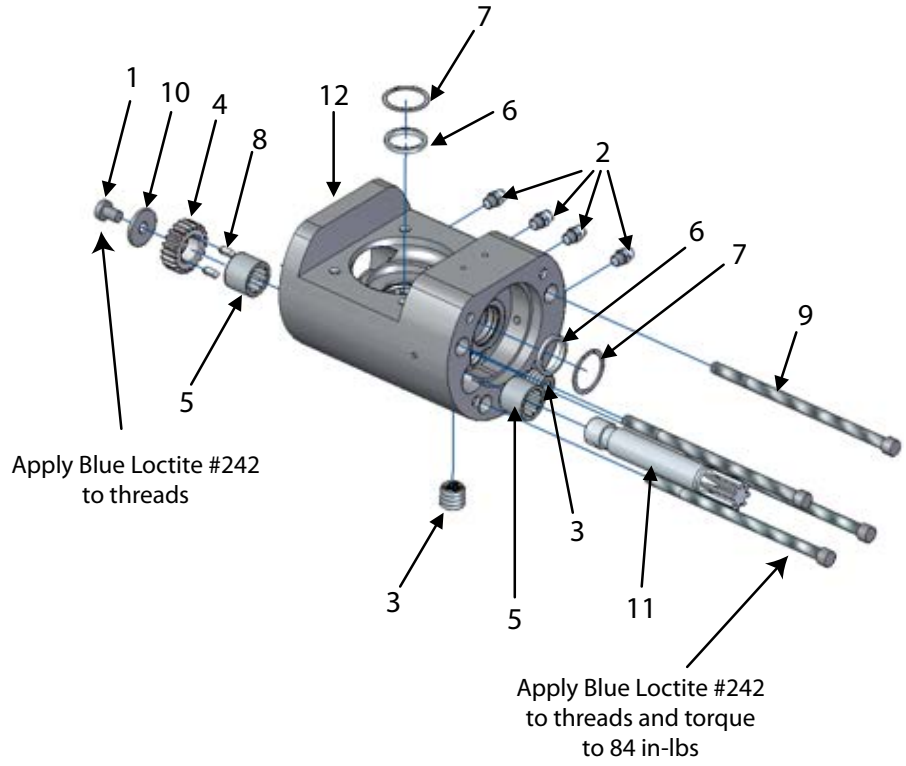
* Chamfer is on side opposite the seal. Flat side faces seal. If the carbide seat is installed backwards, the tool will leak.



** Side B towards gear 65290. If the bearing is installed backward, the tool will not spin.

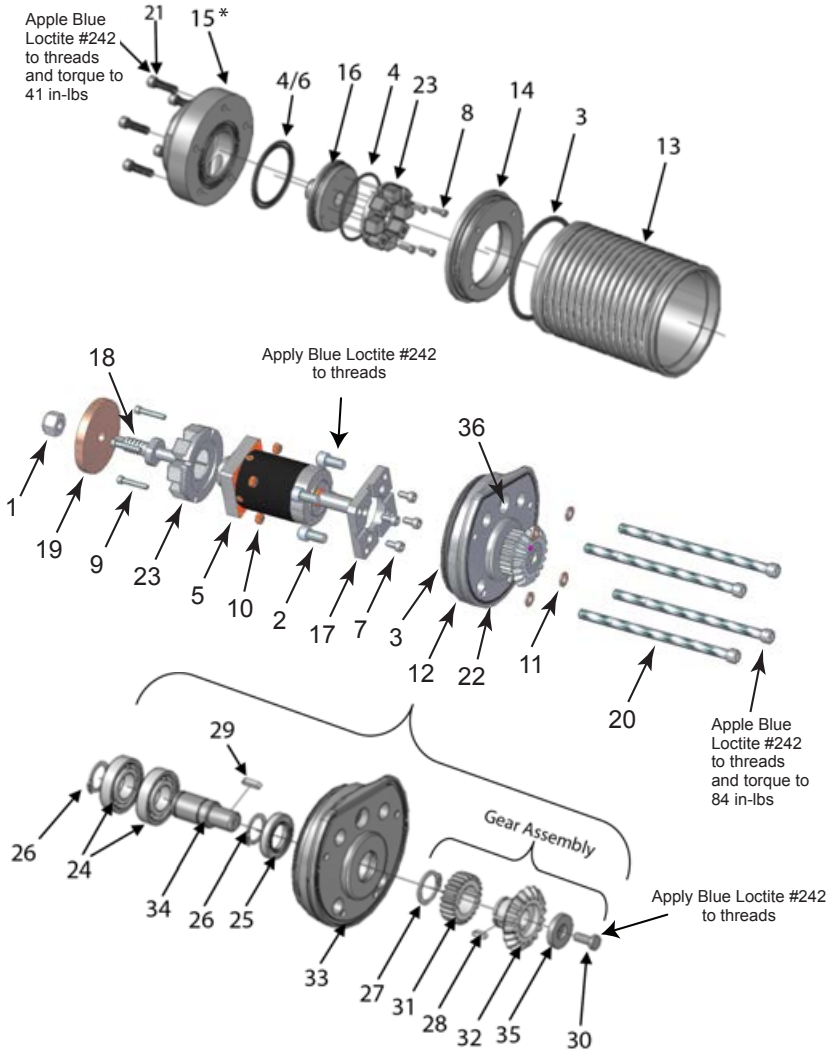
Elbow Assembly

Line No.	PN	Description	
1	25782	CAPSCREW .25 C X .38	BTN HD, SS
2	27492	ZERK, GREASE,1/4-28	MALE TAPER, STRAIGHT, SST
3	64682	PLUG, 1/4 NPT SOC HD.	22000 PSI MAX WP, SST
4	65207	CHANGE GEAR, 21 TOOTH	20 PITCH, 1.05 PD
5	65218	BEARING, NEEDLE	5/8" X 13/16" X 5/8"
6	65221	SEAL, OIL, SINGLE LIP	20 X 24 X 2.5 VC
7	65230	RING, RETAINING, SPIRAL INTERNAL	25MM
8	65237	KEY, ROUND END	1/8 X 1/8 X 3/8
9	65241	CAPSCREW .25 C X 5.0	SOC HD, SS
10	65248	WASHER, FLAT, M7	OVERSIZED, SS
11	65291	SHAFT, PINION	H_3Orbiter
12	65333	ELBOW, BODY	H_3Orbiter, 22K PSI MAX WP



Brake & Gear Assembly

Line No.	PN	Description	
1	25296	NUT .38 C, HX	SS NYLON LOCK
2	29980	CAPSCREW .25 C X .5	SOCKET HEAD, SS
3	65816	O-RING, 3ID X 1/8"	2-234, BUNA, 70 DURO
4	57927	O-RING, 2" ID X 1/16"	2-033, BUNA, 70 DURO
5	65213	GEARBOX, PLANETARY	20:1 REDUX
6	65234	O-RING, 1-3/4ID X 1/16"	2-031, 70 DURO, BUNA
7	65242	CAPSCREW M4 X 0.7 X 8	SOC HD, SS
8	65243	CAPSCREW #5-40 X .38	SOC HD, SS
9	65244	CAPSCREW #5-40 X .75	SOC HD, SS
10	65246	NUT #5-40, HX	SS NYLON LOCK
11	65247	WASHER, SEAL, COPPER	1/4 BSPP
12	65411	PLATE, BRAKE MOUNT	H_3Orbiter
13	65412	HOUSING, BRAKE	H_3Orbiter
14	65413	COVER, BRAKE, LOWER	H_3Orbiter
15	65414	CAP, PULLING RING	H_3Orbiter
16	65415	CAP, SPEED ADJUST	H_3Orbiter
17	65417	PLATE, ADAPTER, GEARBOX	H_3Orbiter
18	65419	SHAFT, BRAKE ROTOR	H_3Orbiter
19	65420	ROTOR, BRAKE	H_3Orbiter
20	65452	CAPSCREW .25 C X 4.5"	SOC HD SS
21	65453	CAPSCREW, #12-24 X .75"	SOC HD, SS, FULL THD
22	65454	O-RING, 70 DURO, 3-1/2 X 1/16	2-043, BUNA
23	65455	BRAKE ASSEMBLY, MAGNETIC	H_3Orbiter
24	65216	BEARING,BALL,DEEP GROOVE	17 X 35 X 8MM
25	65219	SEAL,OIL,DOUBLE LIP	17 X 29 X 5 TC
26	65227	RING,RETAINING,EXTERNAL	17MM OD
27	65228	RING,RETAINING,EXTERNAL	19MM OD
28	65237	KEY,ROUND END	1/8 X 1/8 X 3/8
29	65238	KEY,ROUND END	1/8 X 1/8 X 1/2
30	65245	CAPSCREW #10-24 X .50	BTN HD,SS
31	65289	GEAR,SPUR,BRAKE	H_3Orbiter
32	65293	GEAR,BEVEL,BRAKE	H_3Orbiter
33	65411	PLATE,BRAKE MOUNT	H_3Orbiter
34	65655	SHAFT, BRAKE INPUT	H_3Orbiter
35	65421	RETAINER, GEARBOX INPUT	H_3Orbiter
36	J70561	PLUG, 1/4 NPT, SOC HD, 150 PSI	SS



* The pulling ring cap should be installed with the speed adjustment slot on the opposite side of the flat on the body. If the cap is installed with a different orientation, speed adjustment will not work as labeled.

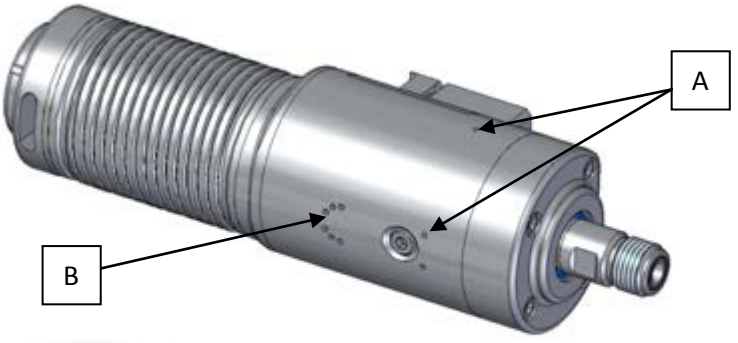
⚠ CAUTION The use of gloves is recommended when handling the tool after operation as the body may reach temperatures greater than 200°F.

6.1 HIGH PRESSURE (HP) SEAL

The H_3Orbiter has two high pressure seals, one in the inlet shaft, and one in the cross shaft. These seals are identical; they may leak water at low pressure (under 1000 psi) and will leak water continuously at operating pressure during failure.

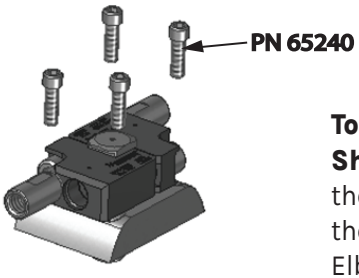
If water is leaking out any of the 6 weep holes closest to the inlet indicated as “A” below, the inlet seal is damaged.

If the water is leaking out any of the 6 weep holes furthest from the inlet indicated as “B” below, the cross-shaft seal is damaged.

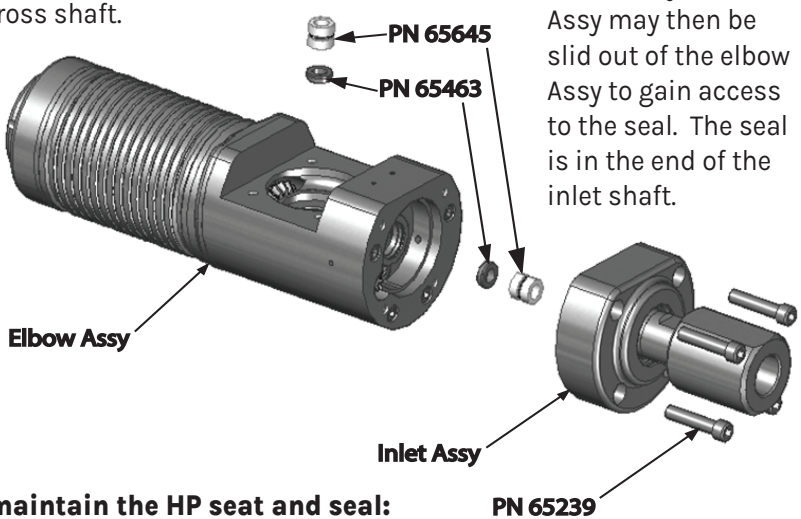


HP Seal Replacement

To access the Cross Shaft Seal, rotate the manifold as needed to gain access to the 4 screws that hold the Cross shaft Assy to the Elbow Assy. The seal is in the end of the cross shaft.



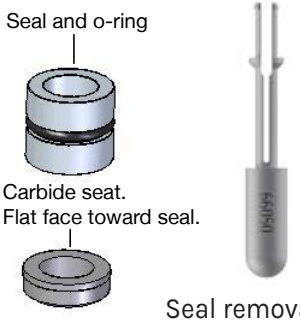
To access the Inlet Shaft Seal, remove the 4 screws holding the Inlet Assy to the Elbow Assy. The inlet Assy may then be slid out of the elbow Assy to gain access to the seal. The seal is in the end of the inlet shaft.



To maintain the HP seat and seal:

-Remove the Cardbide seat and HP seal with seal removal tool 66050. Inspect the seat for chips on edges. Replace if damaged. Inspect the related face of the Elbow Assy for dings or pits. If damaged, it must be faced or replaced, otherwise the seal will leak.

-Apply o-ring lubricant sparingly to o-ring on new HP seal and install into bore of cross or inlet shaft with seal removal tool 66050. Place the carbide seat on the seal with the flat side against the seal. The chamfered side should face the Elbow Assy.



Seal removal tool

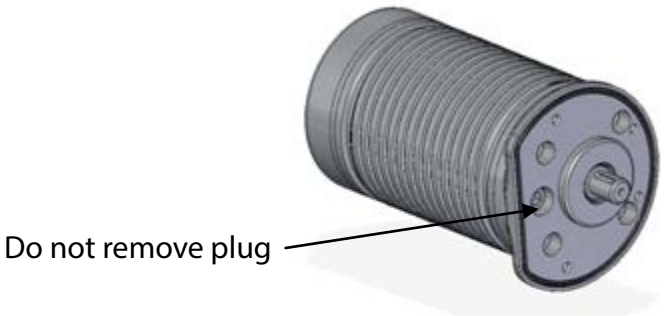
⚠ CAUTION The use of gloves is recommended when handling the tool after operation as the body may reach temperatures greater than 200˚F.

6.2 LUBRICATION AND STORAGE

It is recommended to grease the tool every 100 hours of operation. Any multi-purpose NLGI 2 grease is acceptable. There are five grease fittings located on the outside of the body, plus one on the tow ring. 2 pumps of the grease gun is typical. No damage will result from over-greasing the tool but the operator will likely see any extra grease leaking out around the shaft seals under operation. It is also recommended to blow out all internal water passages (nozzles, weep holes, inlet) with compressed air after each use to maximize the life of internal components.

6.3 MAGNETIC BRAKE

The magnetic brake requires no lubrication or maintenance. If a problem is suspected with the magnetic brake assembly, it should be sent to a Jetstream Rental Center for service or replacement. It is filled with a non-silicone based oil – do not remove the plug shown below.



⚠WARNING This system contains several high-energy, rare-earth magnets that produce a magnetic field. Persons with a pacemaker or other electronic medical device must use extreme caution when handling or in close proximity. It is recommended that a minimum distance of 6 inches (152mm) be maintained at all times between the H_3Orbiter and any electronic medical devices.

6.4 THREADED HIGH PRESSURE CONNECTIONS

To avoid galling, for pipe thread connections use anti-seize and teflon tape. For all other threaded high pressure connections use anti-seize lubricant alone.

6.5 THREADED FASTENERS

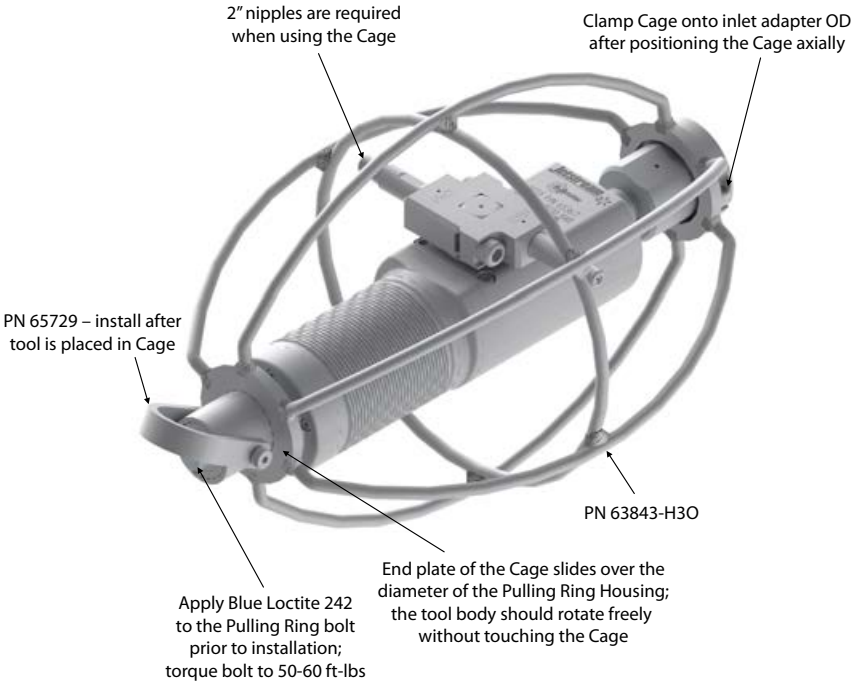
It is HIGHLY IMPORTANT that all threaded fasteners be reassembled per the following procedure: A) Fasteners labeled with a specific Blue Loctite #242 note are to be reassembled and torque as noted. B) All other fasteners are to be reassembled using anti-seize and torque if specified.

SECTION 7: TROUBLESHOOTING

Problem	Possible Cause	Remedy
Leaks from main body weep holes	Seals not yet seated	Increase pressure, seals should seat by 2000 PSI
	HP seal / seat failure	Replace worn parts
Will not spin	Nozzles worn, plugged, or wrong size	Replace nozzles
	HP seal / seat failure	Replace
	Bearing failure	Return for service
	Debris	Clean
Spins slowly	Incorrect nozzle size or worn nozzles	Replace nozzles
	Debris	Clean
Low pressure	Nozzles worn, plugged, or wrong size	Replace nozzles
	HP seal /seat failure	Replace
	Connections not tight, leak	Find and repair leak
Spins too quickly	Incorrect nozzle size or worn nozzles	Replace nozzles
	Brake problem	Return brake for service

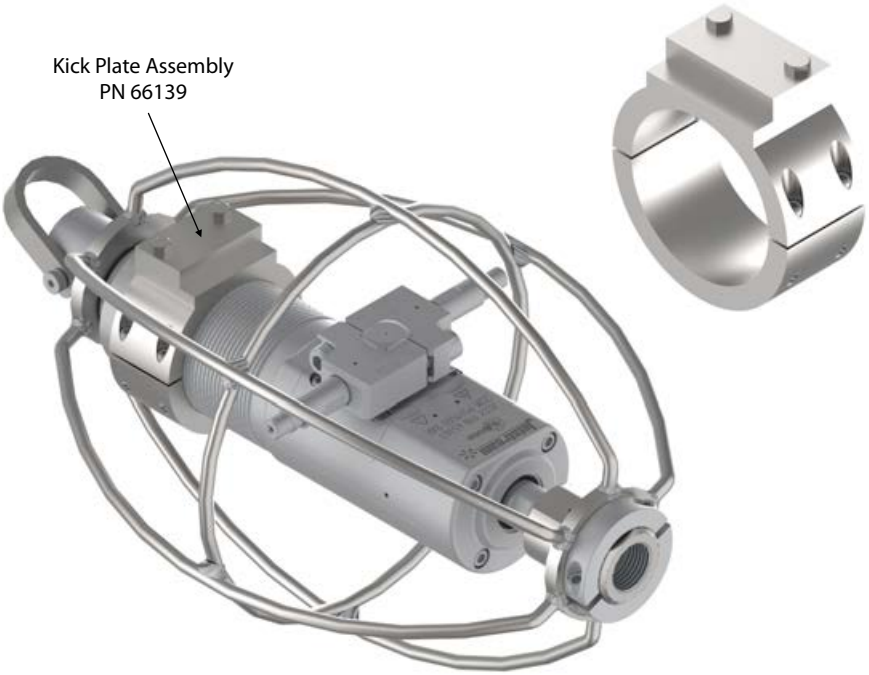
APPENDIX A

Cage and Pull Ring



NOTE: Only 1" or 2" extensions can be used when the H_3Orbiter is installed in the centralizer.

Kick Plate Assembly

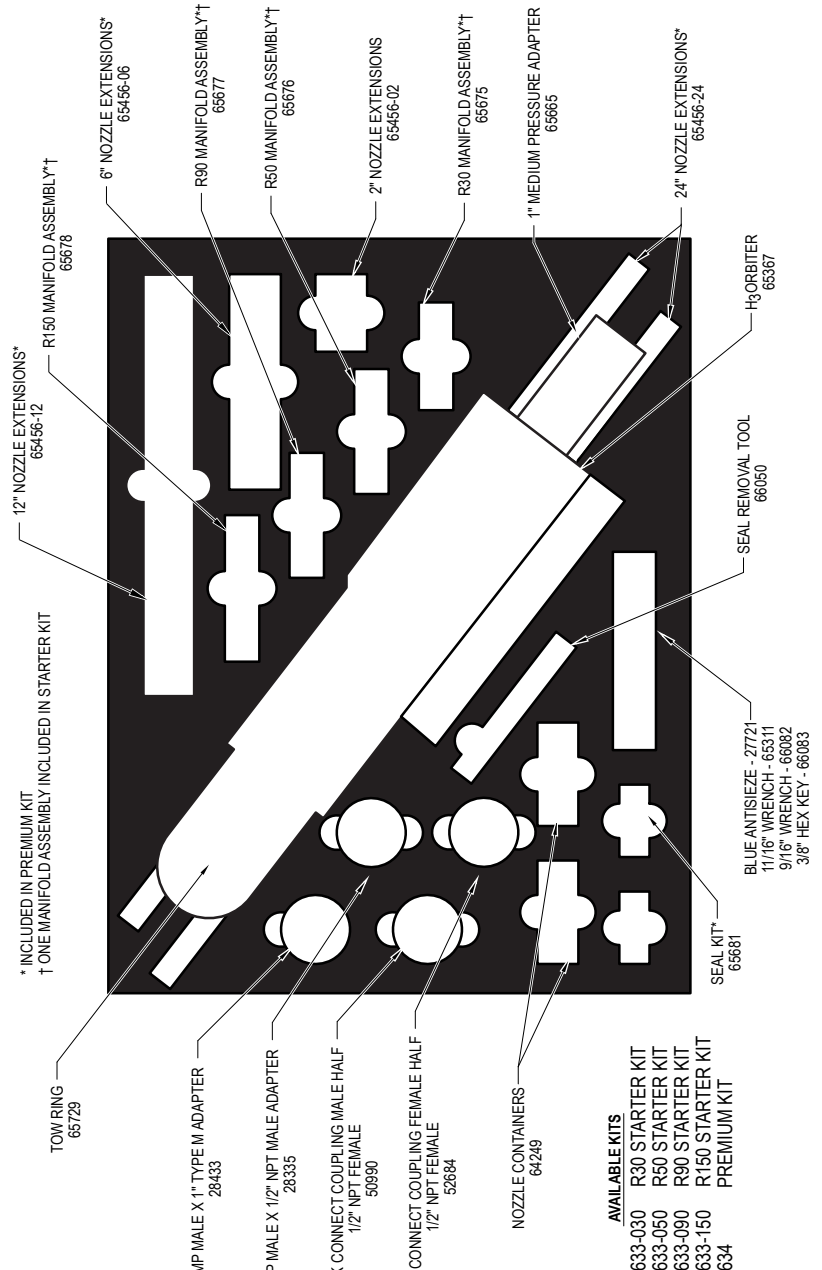


The H_3Orbiter can be utilized in pipe cleaning applications by installing the tool in a centralizer (PN 63843-H30). The apparatus can be moved through the pipe in two ways – pulling via the tow ring or by using an optional kick plate assembly (PN 66139). When installed, the kick plate allows self generated forward movement for each 180° rotation of the manifold.

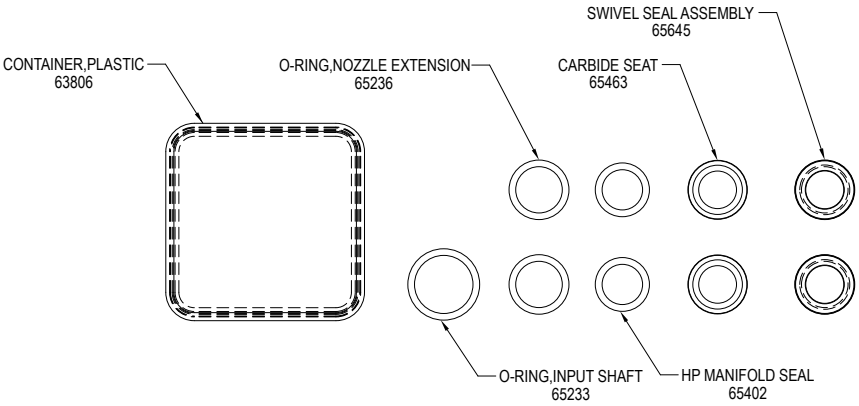
NOTE: Effectiveness of the kick plate is dependent on tool setup (nozzle/manifold) and material in pipe. At 20K operation, a minimum flow of 17gpm with the R90 manifold is recommended. Use of the R150 manifold with the kick plate assembly is not recommended.

APPENDIX B

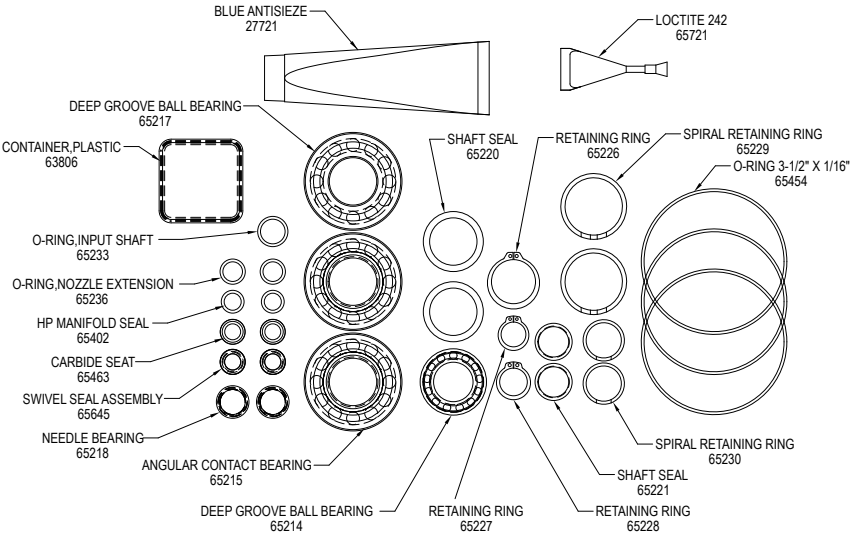
Parts Placement



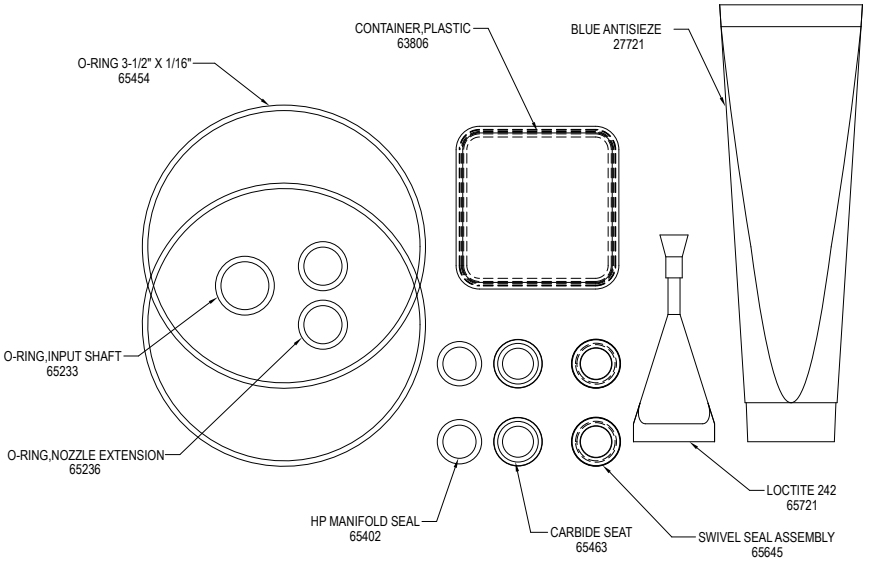
Seal Kit (PN 65681)



Rebuild Kit (PN 65632)

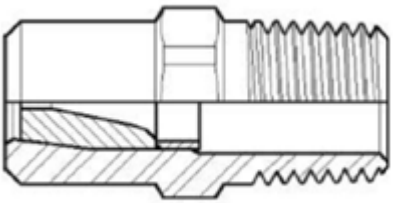


Service Kit (PN 65631)



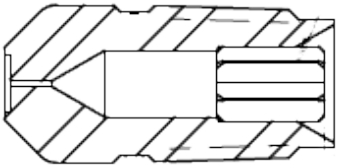
Accessories

HHTC Nozzles



- Stainless steel
- Carbide Orifice
- 1/4” NPT male connection

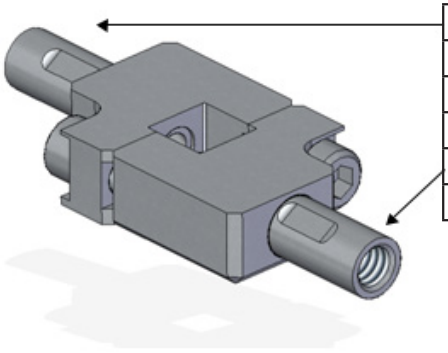
JS4 Nozzles



- Stainless steel
- Precision Drilled Orifice
- 1/4” NPT male connection

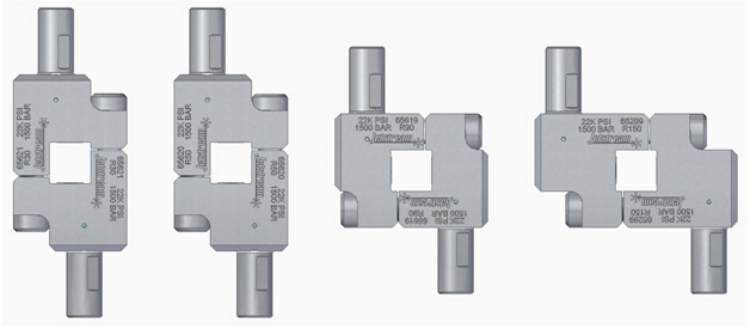
Seal Removal Tool (PN 66050)

Nozzle Extensions



Nozzle Extensions	
1”	65456-01
2”	65456-02
6”	65456-06
12”	65456-12
24”	65456-24

Manifolds



R30 50-80 GPM
PN 65675

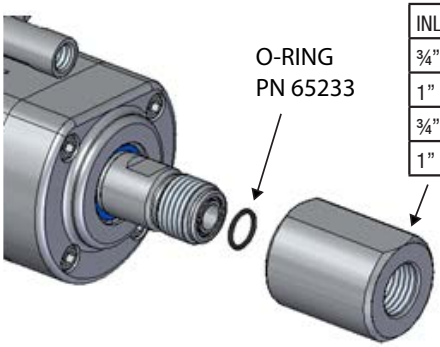
R50 28-55 GPM
PN 65676

R90 16-30 GPM
PN 65677

R150 10-18 GPM
PN 65678

Part Number	Flow Rate		Designation (-xxx)
	gpm	lpm	
65675	50-80	189-303	-030 (R30)
65676	28-55	106-208	-050 (R50)
65677	16-30	61-114	-090 (R90)
65678	10-18	38-68	-150 (R150)

Inlet Adapters



INLET ADAPTERS	
¾" NPT (P12)	65666
1" NPT (P16)	65667
¾" MP	65664
1" MP	65665

APPENDIX C

Flow Charts

Pressure (psi)		Nozzle Diameter (inches)												
		0.035	0.038	0.042	0.047	0.052	0.057	0.063	0.067	0.069	0.073	0.075	0.078
2000	Flow, GPM												
	Manifold												
5000	Flow, GPM								17	18	20	21	23
	Manifold								R150	R150	R150	R150	R150
10000	Flow, GPM				12	15	18	21	24	26	29	31	33
	Manifold				R150	R150	R150	R150	R90	R90	R90	R90	R90
15000	Flow, GPM		10	12	15	18	21	26	30	32	35	37	40
	Manifold		R150	R150	R150	R90	R90	R90	R50	R50	R50	R50	R50
20000	Flow, GPM	10	11	14	17	21	25	30	34	36	41	43	46
	Manifold	R150	R150	R150	R90	R90	R90	R50	R50	R50	R50	R50	R30

Pressure (psi)		Nozzle Diameter (inches)											
		0.082	0.090	0.093	0.098	0.106	0.110	0.115	0.125	0.135	0.145	0.155	0.165
2000	Flow, GPM					27	29	32	38	44	51	58	66
	Manifold					R150	R150	R150	R150	R150	R90	R90	R90
5000	Flow, GPM	26	31	33	37	43	46	50	60	70	80		
	Manifold	R150	R90	R90	R90	R90	R90	R50	R50	R50	R50		
10000	Flow, GPM	36	44	47	52	61	65	71					
	Manifold	R50	R50	R50	R50	R50	R30	R30					
15000	Flow, GPM	44	53	57	64	74							
	Manifold	R50	R30	R30	R30	R30							
20000	Flow, GPM	51	62	66	73								
	Manifold	R30	R30	R30	R30								

WARRANTY

Limited Warranty. Each Waterblast Unit, Bareshaft Pump, and Fluid End manufactured by Jetstream is warranted against defects in material and workmanship for a period of 12 months or 1,000 hours, provided it is used in a normal and reasonable manner and in accordance with all operating instructions. If sold to an end user, the applicable warranty period commences from the date of delivery to the end user. If used for rental purposes, the applicable warranty period commences from the date of delivery to the party holding the equipment available for rent. This limited warranty may be enforced by any subsequent transferee during the warranty period. This limited warranty is the sole and exclusive warranty given by Jetstream.

Exclusive Remedy. Should any warranted product fail during the warranty period, Jetstream will cause to be repaired or replaced, as Jetstream may elect, any part or parts of such Waterblast Unit, Bareshaft Pump, or Fluid End that the examination discloses in Jetstream's sole judgment to be defective in material or factory workmanship. Repairs or replacements are to be made at Jetstream in Houston, Jetstream FS Solutions Rental Center, the customer's location, or at other locations approved by Jetstream. Labor is furnished only when the unit or part is returned to the factory or when travel and expenses are paid by the purchaser. Freight, travel and expenses incurred in connection with repair or warranty are excluded from this warranty and shall be paid by the purchaser. The foregoing remedies shall be the sole and exclusive remedies of any party making a valid warranty claim.

The Jetstream Limited Warranty shall NOT apply to (and Jetstream shall NOT be responsible for):

1. Major components or trade accessories that have a separate warranty from their original manufacturer, such as, but not limited to: diesel engines, electric motors, electronic soft starter and/or across the line starter panels, axles, PTO's, clutch packs, high pressure gauges, high pressure hoses, flex lances, etc.

2. Normal adjustments and maintenance services.

3. Normal wear parts such as, but not limited to: oil, clutches, belts, filters, packing, cartridges, univalves, face seals, diffusers, gland nut bushings, plungers, nozzles, rupture disks, etc.

4. Failures resulting from the machine being operated in a

manner or for a purpose not recommended by Jetstream including failures or malfunctions resulting from corrosion, misapplication, overpressurization, inadequate pump suction conditions, improper water quality, improper maintenance, or misuse.

5. Repairs, modifications or alterations which in Jetstream's sole judgment, have adversely affected the machine's stability, operation or reliability as originally designed and manufactured.

6. Items subject to misuse, negligence, accident or improper maintenance.

NOTE The use of any part other than ones approved by Jetstream may invalidate this warranty. Jetstream reserves the right to determine, in its sole discretion, if the use of non-approved parts invalidates the warranty. Nothing contained in this warranty shall make Jetstream liable for loss, injury, or damage of any kind to any person or entity resulting from any defect or failure in the machine or part.

THIS WARRANTY IS, AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE DISCLAIMED. THIS DISCLAIMER AND EXCLUSION SHALL APPLY EVEN IF ANY WARRANTY POSSIBLY ASSERTED FAILS OF ITS ESSENTIAL PURPOSE.

This warranty is in lieu of all other obligations or liabilities, contractual and otherwise, on the part of Jetstream. For the avoidance of doubt, Jetstream shall not be liable for any indirect, special, incidental or consequential damages, including, but not limited to, loss of use or lost profits. Jetstream makes no representation that the unit has the capacity to perform any functions other than as contained in Jetstream's written literature, catalogs or specifications accompanying delivery of the machine. No person or affiliated company representative is authorized to alter the terms of this warranty, to give any other warranties or to assume any other liability on behalf of Jetstream in connection with the sale, servicing or repair of any machine manufactured by Jetstream. Any legal action based hereon must be commenced within eighteen (18) months of the event or facts giving rise to such action.

Jetstream reserves the right to make design changes or improvements in its products without imposing any obligation upon itself to change or improve previously manufactured products.

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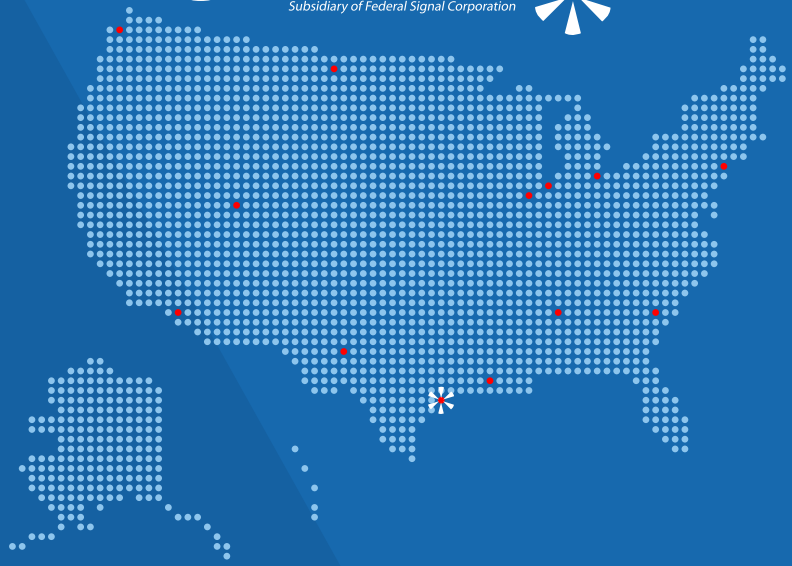

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Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Jetstream; contact your representative for application approval. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.