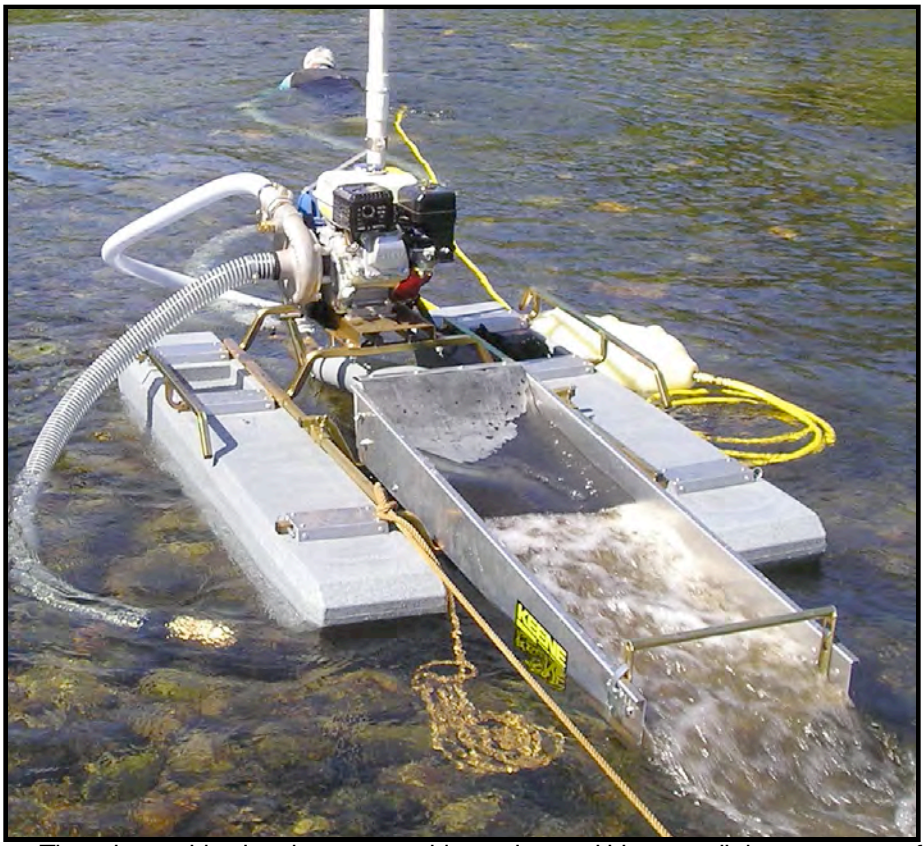
Product Report: Keene's New "Ultra" Dredge Models Offer Exciting New Gold Recovery Opportunities. By David Knowlen



There is an old axiom known to gold dredgers, being that big dredges do big work and give you big results and small dredges well, you get the picture. And it seems that this perception by many gold miners has always been assumed to be true.

But with Keene's new "Ultra" line of three and four inch suction gold dredges, this old theory can now been tossed out the window. The fact is that these new model gold dredges from Keene Engineering perform much like the larger Keene units and they are opening up new and more remote areas to productive gold dredging, including many streams that have never before been dredged.

Now that's exciting news.

I know this firsthand because this is exactly what happened to me last summer while dredging in a remote gold-bearing creek located in the higher elevations within a well known area of southwest Oregon's mountain wilderness.

Now here's the story behind my adventure.

What has now became the Keene "Ultra" series of dredges began some months ago in a discussion I had with Jerry, Pat and Mark Keene. We had been talking about a need for designing and developing new, lighter-weight Keene dredge models capable of being transported and operated in extremely remote, upper elevation areas often overlooked by today's gold miners. The concept was really quite simple, put big dredge performance into a small and highly portable package.

And small means that it had to fit into the back of a mini-truck or inside a small SUV.

So we'll begin with a fact. It is true that many of today's gold dredgers are aware that a lot of gold remains to be discovered in the hundreds of streambeds in remote and distant upper elevation rivers and creeks but the overwhelming challenge for dredgers is getting up and into these sites, especially with portable equipment that can do a reasonable job.

Years back I had told Mark and Pat Keene about a remote Oregon creek I had worked back in the 1980s which we discovered had good quantities of both fine and course gold. In the distant past and through the region's geological evolution, this stream had eroded a new channel directly across an ancient tertiary riverbed where ample amounts of gold once had resided. Some of that gold had been re-deposited in this new creek bed, and from what we saw in our sampling, the composition of the overburden indicated that no one had ever dredged on this location.

But here was the problem. Getting up to this creek was a major challenge because it's located in an especially remote and rugged mountainous upper elevation region with no nearby roads or trails for packing in our equipment. Getting up to this site requires several difficult hikes on terrain more suited for pack animals or mountain goats.

And large productive equipment of that time was just not light enough to be feasibly transported up to this creek. Back then we had successfully used a tiny backpack rig but the amount of recovery was not really worth the effort.

So Keene Engineering began work on designing what they now call the "Ultra" series of gold dredges. And last summer I gave one of their new models a test on this remote location.

It began with this new Keene dredge sitting in parts and pieces on my shop floor. Starting with the basic frame and floatation, in just ten minutes it was completely assembled. I was

impressed as easy and smooth the assembly went.

I also noticed that it looked similar to my five-inch Keene dredge, large in features but so much smaller in size and weight being just over forty-one inches wide and about six feet long, perfect for a small mini-truck or SUV. And it was powered with a reliable Honda 4 horsepower engine, a proven high-output (HO) Keene pump and connected to a T80 compressor for underwater operations.

Best of all, the sluice box had all of Keene's unique combination of Hungarian riffles, a large upper area of black rubber matting for checking values and a generous section of miner's moss used for trapping fine gold. All assembled on the light frame and two pontoons with the hoses, jet flare and Keene's great non-clogging coupler system it was noticeably lightweight.

And while my wife said it was cute, cute doesn't mean it will bring in the gold. The proof would be how it delivered in productivity and recovery.

So just a week later and a half-day's drive culminating at the end of an ancient logging road our travels had brought us within about a mile of this remote Oregon creek. I noticed that twenty years had not changed this area too much.

Jim, my dredging partner and I secured my truck in a clearing under a large oak tree and we unloaded the dredge components along with my other mining and camping gear. The hardest part lay ahead, packing in all the gear on a narrow and winding uphill trail. The plan was simple, we would arrange all of our gear into several moderate pack loads with as much as we could physically carry on each trip up and onto the site. The remainder of our gear would be kept here in our base camp.

The next day we were up early and I quickly noticed that Keene's new dredge component design made the unit weight much lighter and easier for us to carry. The most challenging single component was the engine, pump and compressor which we put on a custom-built hand (Page Two)

-truck with large wheels. While it took the better part of a day we packed in all o f our

operational “necessities” and by late afternoon our dredge was assembled and in the creek ready for its first trial early the next day.

Now something you should know is that I am now in my early sixties and a much younger man would have a whole lot less challenge in toting a gold dredge, support equipment and camping gear all the way up to a site such as this one. But I also believe that my enthusiasm for dredging and a long and recurring case of 'gold fever' all added to my stamina.

And before calling it a day and while gazing at the now-assembled “UIltra-3” floating in this creek was when I actually realized that for the first time we finally have a dredge up here that could find the gold that I had long dreamed of recovering. After completing oru camp and preparing dinner that evening Jim and I discussed our operating plan and both of us envisioned a hoped for sluice full of that precious yellow metal that we have chased for so many years.

The next morning and up early, we moved the dredge downstream to what looked like a promising low pressure spot where the creek gently makes a sweeping bend and there are three calm pools lying behind several large sloping bedrock outcroppings. While positioning Keene's new “Ultra-3” I noticed that this dredge slid nicely over the shallow bars and exposed rocks and the balance of the entire unit made it easy for one man to easily maneuver it to where we would begin our sampling efforts.

With the dredge in position and just one pull on the starter the Honda engine came to life we noticed the large volume of water flowing through the sluice box. We reduced the engine speed and adjusted the sluice angel and after checking my regulator I dove underwater and got to work sampling in several locations and tearing into the overburden. In operating the nozzle I was impressed when I felt the dredge nozzle's strong suction power quickly pulling material up and into the intake hose.

About an hour later and with a half dozen sample holes we confirmed in what we had believed, that our operation was likely the first time that anyone had ever dredged in this creek location. The overburden was about three feet deep and all the way down to the shallow bedrock it was hard-packed and the cobbles were properly stacked as only nature can arrange through time.

The farther down that I dredged the more the composite overburden changed color becoming dark gray, then black and finally shades of orange and red indicating decomposing iron composite in the material. I throttled back the engine to idle and pulled back the rubber dampener to inspect for values. Both of us quickly noticed that the sluice had done a great job in containing the heavier material which was packed nicely in behind each riffle. And best of

all there was gold, lots of gold!

Earlier I had noticed underwater that several small pieces of gold going into the intake nozzle and now looking at the sluice's black rubber matting what we saw had brought a big grin to both of us. All across the matting were specks, pieces and even some small flakes of gold. We both noticed a single "picker" resting in the upper corner near the opening of the jet flare. And all of the gold was located in the upper area of the sluice indicating that this dredge was doing its job and not loosing any recovered values.

Satisfied with the amount of gold at this specific location we began what could be called our production operation. And after our first cleanup it turned out that we were both well rewarded for this decision when that evening we saw lots of gold in the bottom of each of our gold pans.

Since Jim and I are quite careful about doing timely dredge cleanups, often as much as twice or three times a day. We once again used and praised the simplicity of Keene's time-saving Sluice Bucket Recovery System (SBRS). This device makes dredge cleanup so easy but best of all it prevents loosing any your gold while we used to fumble with the sluice, carpet, matting and riffles all the while holding a tub to catch our "cons". I highly recommend this unit for any small to medium-sized dredge operator.

And for the many days of work our "little" dredge performed flawlessly. I recall that we had only two plug-ups all during our operation and these were within the dredge hose due to us allowing oblong cobbles to pass into the nozzle. Amazingly we never once had to shutdown for a plug-up because Keene's quick release system has all but eliminated this former problem.

Well, the days flew by and our time for this trip went all too fast, as it always seems to do when you are into recovering good amounts of gold. Jim and I had spent several days dredging on this remote creek location and our time here was drawing to a close.

And when we finished our final day and looked at the results of our efforts we again appreciated just how easy it was to operate this new Keene dredge. The Ultra-3 had proven itself and clearly was a winner in our books.

And when it was time to depart each of us had a nice amount of gold to show for our dredging efforts. In fact the amount of gold we recovered here had literally paid for this new dredge.

We also realized just how fortunate we were in finding a lot of fine and course gold along with about two dozen small nuggets on this distant creek. It does not happen like this all the time. And while we completed our gold recovery later when we returned home and had weighed our results and divided our shares, both of us realize that we must return next year. The enclosed picture pretty much says it all, and this was just my share of our recovery

Thanks to our productive operation last year and to this new Keene "Ultra-3" dredge, Jim and I have already decided that next summer we shall make a return visit to this remote southwestern Oregon creek. And perhaps next time we'll give a new Keene "Ultra-4" a chance to increase our gold recovery even more. Either way I'm certain that Keene has a winner with their new "Ultra" series of dredges.

And if someone asks for our evaluation on the level of performance on this new dredge, well, it's really quite simple…small in size, light in weight and quite large on performance and productivity…..and truly a great value for the investment.

The gold in the picture really says it all.

MODEL	EQUIPMENT	WEIGHT
3400P	3" Dredge 3.5hp B&S P103	155 lbs
3400PH	3" Dredge 4hp Honda P104	159 lbs
3405P	3" Dredge 3.5hp B&S P103 T80	165 lbs
3405PH	3" Dredge 4hp Honda P104 T80	169 lbs
3500P	3" Dredge 6.5hp Honda P180	169 lbs
3500PH	3" Dredge 6.5hp Honda P180	167 lbs
3505P	3" Dredge 6.5hp P180 T80 Comp	179 lbs
3505PH	3" Dredge 6.5hp Honda P180 T80	177 lbs

Each dredge is equipped with 20 feet of 3 inch suction hose - sluice box is 14 inches x 48 inches. New oversized jet flare and jet with suction hose quick coupling - 2 Floats 60" x 10.5" x 10.5" - Dimensions are 60" x 40".

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Keene "ULTRA-2.5" 2-1/2 Inch Dredge Tests

Test Date: September 30, 2009

Product Operational Test Results and Report by Dave Knowlen

Test Location: Washington State's Peshastin Creek off State Highway 97 near Blewitt Pass and located within historic Blewitt gold mining district and Mineral Springs in Washington's north central Cascade Mountains. Tests were conducted on the North American Miner's Association mining claim. Participants included the author and two other experienced dredgers. Full product report will be submitted with author's photographs of the test operations.

Test Conditions: Depth of creek in all test locations was shallow due to low creek flow. All locations selected were too shallow to permit underwater diving. Dredge operators included Dave Knowlen, Bob Cleveland and Mike Tilden who concurred on the overall evaluation and the results of this test.

General Test Description and Results: Dredge was operated in different creek locations and in varying depths of water and volume/rate of flow. Standard Keene intake nozzle was used. Settings of sluice varied from four inches to twenty inches from upper stop. Optimum sluice settings appeared to be at approx. 12-14 inches downward with engine throttle operating at 60-70%.

New dredge sluice size was 12 inch in width and 40 inches in length. This configuration functioned very well with excellent gold recovery and retention with majority (over 90%) of fine gold, flakes and small nuggets located on Keene's new riffle rubber matting. Some small modifications were made prior to the tests including trimming to the rubber mat plate to improve sluice disassembly for ease of dredge clean-up. A .180 inch shim was installed under the joggled aluminum mat retainer in the upper jet flare to permit easier assembly.

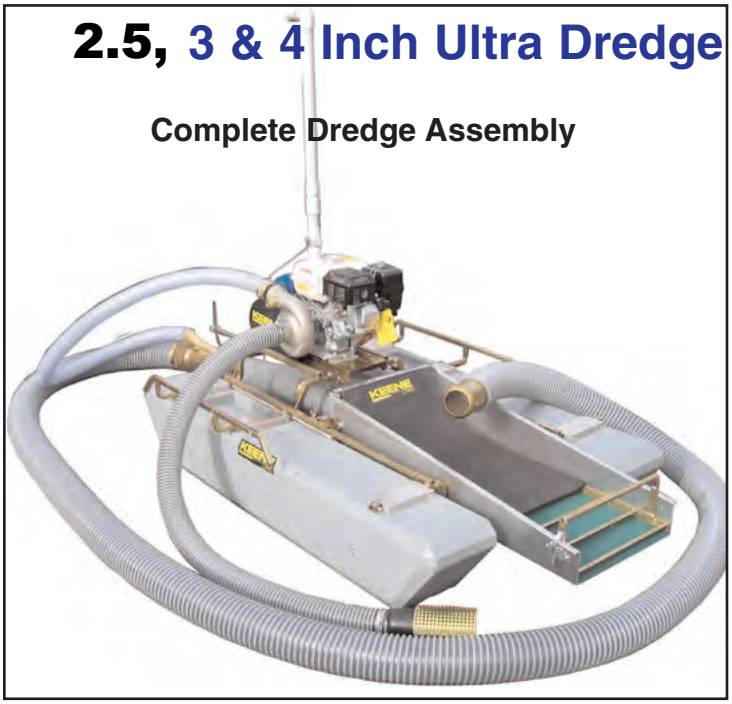
Engine/pump during tests was operated from idle to full throttle and we strived in all set-ups for determining an optimum speed for water volume, suction and flow to compliment the sluice angle settings to allow maximum recovery. Pump performed exceptionally well and nozzle suction was noted as strong and consistent throughout all power ranges and settings. Pump provided excellent volume for this sluice size. No loading of the sluice box with rocks/cobbles was noted and sluice cleaned itself well even at lower engine settings. Only one mid-hose plug-up was encountered

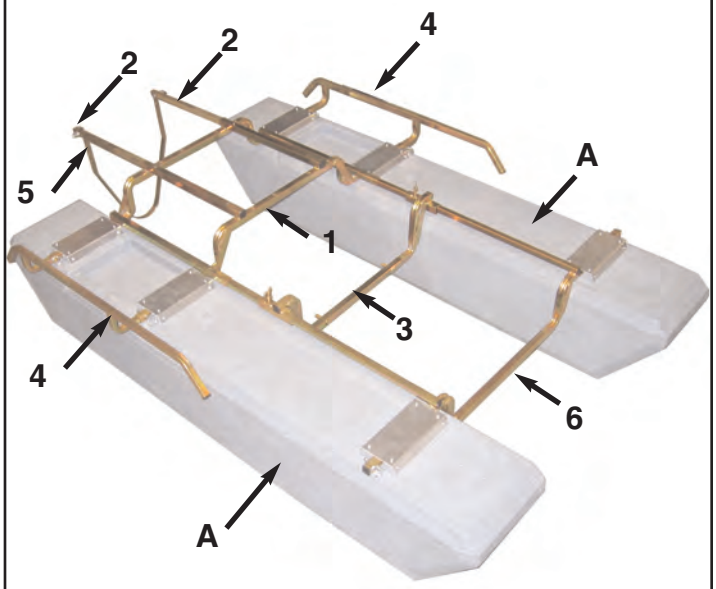
Overal Observations/Recommendations:

1. Dredge sluice size (40" X 12") is excellent for this setup and riffle placement is good. This design needs no additional modifications or configuration changes.
2. Operators noted no problem with the existing floatation which is generally adequate for the overall dredge weight even under considerable loading conditions.
3. New rubber matting did retain virtually all recovered gold (approx. 95%) below and within the formed rubber riffles. We had to remove the larger pieces of gold with a tweezers or sweep the mat with a utility brush to remove the fine gold as the matting provides strong adhesion to retain the values.
4. While the altered sluice design was used with a stock 2-1/2 inch jet flare it appears the dredge might perform more effectively with a wider 12 inch wide jet flare over the supplied ten inch unit which will make the removal of the rubber matting/plate easier for the operator during dredge cleanup.
5. In an earlier test this unit was operated with a smaller Honda 2.5 hp engine and P-95 pump and we noted the water volume appeared to be inadequate for this new and larger sluice size; however the smaller Honda engine works well with the current 10 inch sluice.
6. We highly recommend that Keene design and manufacture a 2.5 inch swivel nozzle to compliment this new dredge model which will improve operation

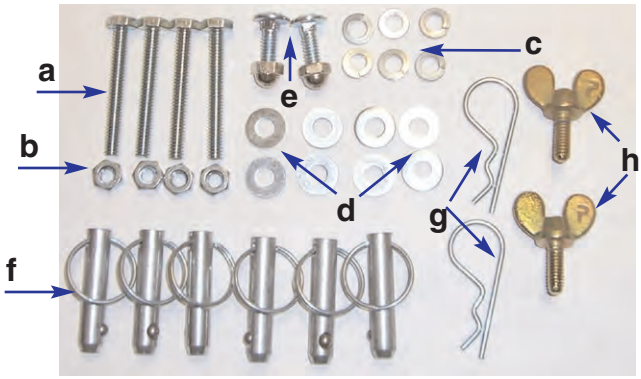
2.5, 3 & 4 Inch Ultra Dredge Assembly Instructions

Complete Dredge Assembly

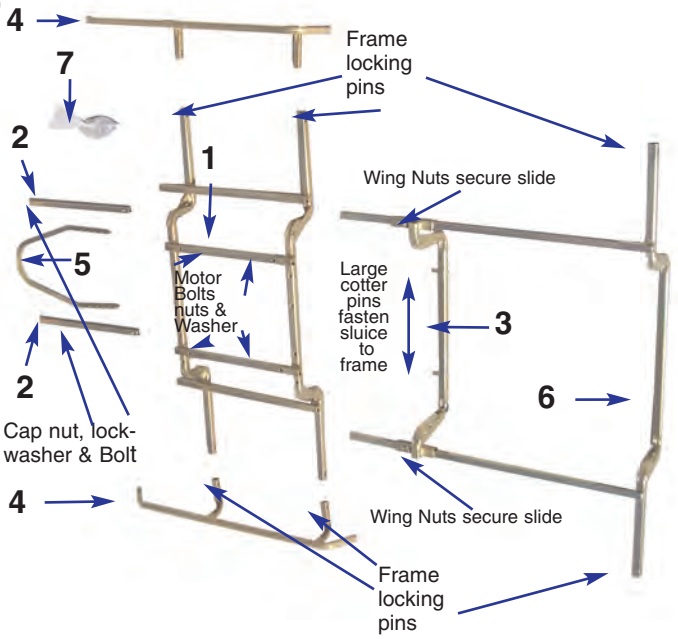




1. Engine Mounting Frame.
2. 2 each Jet Support slide bars.(slide in and out for transporting)
3. Sluice Tracking Bar. (Adjust angle of sluice)
4. 2 each Side Handles
5. Jet Support Hangar
6. Sluice Support Frame.
7. Bolt and Pin Assembly Kit (34 pieces)
a. 4 - 1/4"x2" Motor bolts - **b**. 4 -1/4" Nuts
c. 6 -1/4" lock washers **d.** 8 - Flat 1/4" washers
e. 2 - cap nut & bolt- **f.** 6 - Frame locking pins
g. 2 large cotter pins **h.** 2 - 1/4 inch wing bolts.



Frame Assembly Exploded View



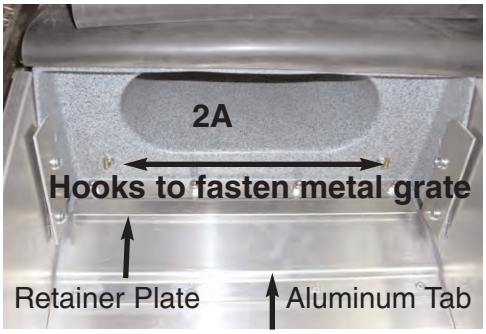
Pre-assemble frame

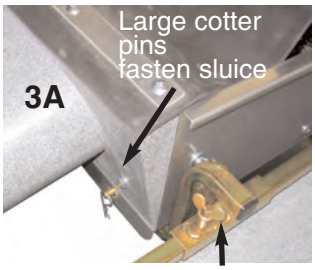
1. Pre-assemble frame less side handles, then slide pontoons onto frame and attach handles and lock into place and secure with frame locking pins. Attach frame as per illustration above using the necessary bolts, washers, lock washers, and wing nuts included in bolt kit.

Connect Flare to Sluice box

2A. Remove all hardware from Flare before attempting to connect to the sluice. Slide lower lip off flare into and under the aluminum tab located in the bottom portion of the sluice. Make sure the holes line up with the holes on the bottom of sluice. Replace the 4 each bolts from flare and use to bolt sluice to the flare with the aluminum retainer plates provided with flare assembly. **See fig. 2A and 3A on following page.**

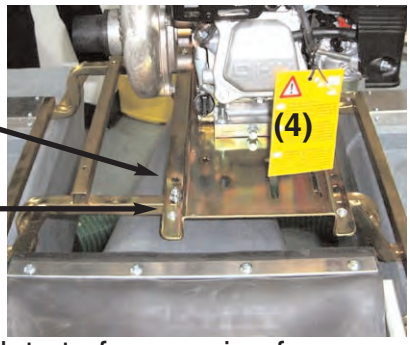
2.5, 3 & 4 Inch Ultra Dredge Assembly Instructions (Continued)





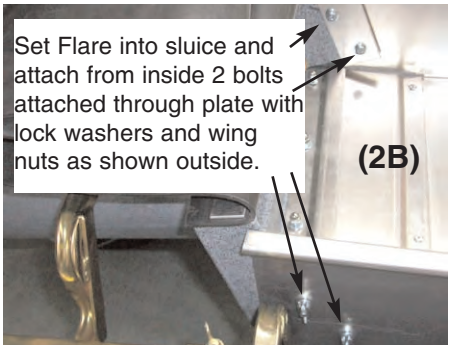
Long Motor Bolts nuts & Washers

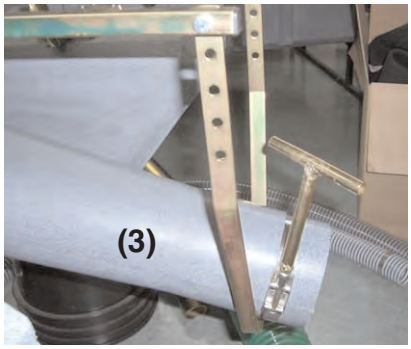
Engine and Pump position

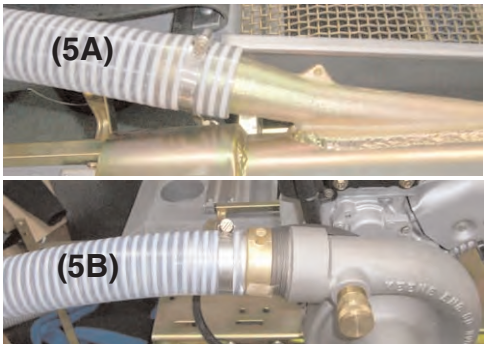


Large wing nuts are used to lock & adjust sluice tracking bar into position

3. Mount engine onto frame as per diagram above **(**fig **4**). Attach base plate to frame using four engine bolts. Sometimes only three bolts are necessary when adapting a compressor.



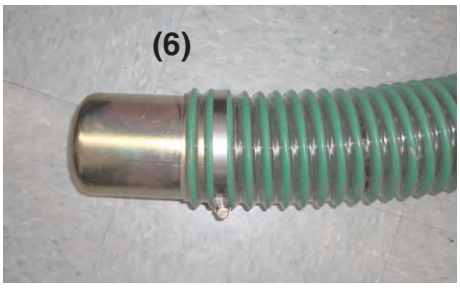


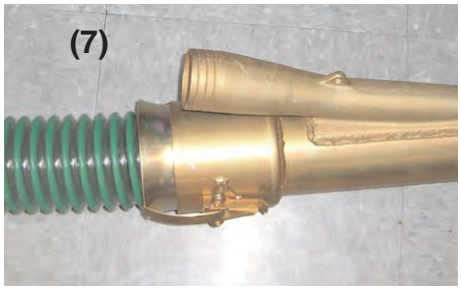


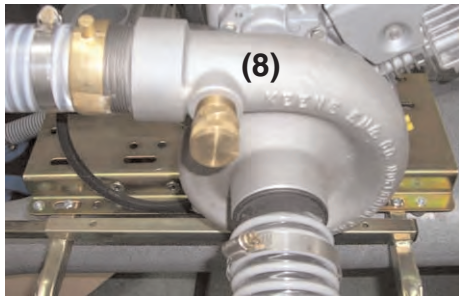
4.See Fig.3A to fasten sluice box to Sluice Tracking Bar. Fig **(fig 3A)**

5. Slide power jet through the jet support hanger into jet flare approximately 4 inches and clamp into position with "T" Handle clamp. **(fig 3)**

6. Attach pressure hose to power jet with hose clamps then attach opposite end with pressure hose coupling and fasten to discharge of pump. See **(fig 5A) & (fig 5B)** Be careful not to lose pressure hose coupling gasket (All three inch Ultras with 3400 Series use a1 1/4 to 1 1/2 inch adapter coupling.





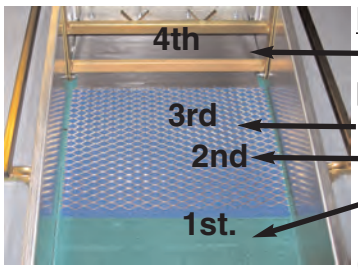


7. Attach suction tip to suction hose with hose clamp **(fig 6)**. *(We recommend to cover hose clamp with a type of duct or friction tape to prevent potential injury from sharp extruding objects)*

8. Attach suction male metal coupling into power jet and lock into position with latches **(fig 7)**.

9. Attach foot valve and hose assy to slip fitting on intake of pump and secure into position with hose clamp **(fig 8)**. *(we recommend using silicone gel to prevent the occurance of air leaks around intake)*

10. See detail of assembled sluice box. Place metal grate over upper section of box **(fig 10)**



Placement of screens and matting in sluice box

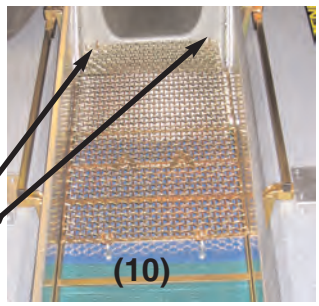
4th- black rubber matting slides under metal plate fastened to flare jet.

3rd- layer wire mesh

2nd- layer Miner Moss

1st.- layer green carpet

Fasten metal grate to hooks at entry of sluice box (See illustration **(fig 10)**.



PARTS LIST SERIES 2600-3400-3500-4400 ULTRA

#	2600	3400	3500	4400	Description
1	HP160	HP160			3.5 to 6.5HP Briggs & Stratton Engine Threaded Shaft
2	4HPH	4HPH			4 HP Honda Engine Treaded Shaft
3	P103H	P103H			4 HP Honda Engine &P100 Pump
4	P103CH	P103CH			4 HP Honda Engine HP160 Pump wIth T80 Compressor
5	P103CH	P103CH			4 HP Honda Engine HP160 Pump with KAC1 Compressor
6			65HPP	65HPP	6.5 HP Briggds & Stratton Intec Pro Threaded Shaft
7			65HPP	65HPP	6.5 Honda Engine Threaded Shaft
8			P185H	P185CH	6.5 Honda Engine Engine and Pump
9			P185CH	P185CH	6.5 Honda Engine Engine and Pump w/T80 or KAC1 Comp.
10	T80	T80	T80	T80	Air Compressor T-80
11	PU6X58	PU6X58	PU6X58	PU6X58	Air Compressor Pully Keyed (T80)
12	BELTA27	BELTA27	BELTA27	BELTA27	Air Compressor Drive Belt
13	P3	P3	P3	P3	Air Compressor T-80 Drive Incl. Belt & Pully
14	KAS1	KAS1	KAS1	KAS1	Air Compressor T-80 Snorkel
15	BG5	BG5	BG5	BG5	Air Compressor T-80 Belt Guard
16	KAC1	KAC1	KAC1	KAC1	Air Compressor KAC1
17	KACP	KACP	KACP	KACP	Air Compressor Pully Keyed (KAC1)
18	KACD	KACD	KACD	KACD	Air Compressor (KAC1) Drive Incl. Belt & Pully
19	KACS	KACS	KACS	KACS	Air Compressor (KAC1) Snorkel
20	KACBG	KACBG	KACBG	KACBG	Air Compressor (KAC1) Belt Guard
21	P-2	P-2	P-2	P-2	Engine Base
22	SB25F	SB31	SB31	SB41	Sluice Box
23	PPJF25	PPJF30	PPJF30	PPJF40	Oversize Jet Flare
24	PJFA250				Jet Flare to hose adapter
25	HDC25T	HDC3T	HDC3T	HDC4T	Heavy Duty T Handle Clamp for Jet FIlare
26	PJ25	PJ3150	PJ320	PJ420	Power Jet Oversized w/Suction hose Quick Coupler
27	SH25	SH3	SH3	SH4	Suction Hose
28	SN2515				Suction Nozzle
29	PH15				Pressure hose (standard length 22 feet)
30	PHC15F				Pressure hose coupling (1 1/2 inch)
31	ST25	ST3	ST3	ST4	Suction Tip
32	SS44	SS44	SS44	SS52	Suction Hose Clamp
33	FVA20				Foot falve and Hose Assembly fo 2500 series
34		FVA20			Foot falve and Hose Assembly 2 inch
35			FVA25	FVA25	Foot falve and Hose Assembly 2.5 inch
36	PHC15F	PHC15F	PHC2F	PHC2F	Female Coupling
37	PH125				6 Feet pressure Hose 1 1/4 inch
38		PH15			6 Feet pressure Hose 1 1/2 inch
39			PH2	PH2	6 Feet pressure Hose 2 inch
40	SS24	SS24			2 each hose Clamp 1 1/2 inch
41			SS32	SS32	2 each hose Clamp 2 inch
42	SS44				3 each 2.5 inch hose Clamp 2.5 inch
43	PFA25	PFA44	PFA44	PFA44	2 each floats
44	PFF44M	PFF44M	PFF44M	PFF44M	Frame Assembly
45	RG15	RG15	RG2	RG2	Water Pump Kit Spares (optional Recommended)
46	WPK2	WPK2	WPK2	WPK2	Pressure hose Rubber Gasket (optional Recommended)
47	5ST25	SST3	SST3	SST4	Suction Hose Swivel Tip (optional Recommended)
48		SBRS	SBRS	SBRS	Sluice Box Clean up Tub (optional Recommended)

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INSTALLATION & REPLACEMENT OF A PUMP SEAL, MARLEX PUMP COUPLER & A COMPRESSOR DRIVE ASSEMBLY

The water pump seal must be replaced if water is observed leaking between the engine and pump adapter or around the engine shaft,. To replace a seal or to install a compressor drive assembly (engine shaft pulley and drive belt), the pump must first be removed from the engine.

INSTRUCTIONS TO REMOVE THE PUMP FROM THE ENGINE:

Note: If the pump has been in use for a year or more, we suggest that you apply a penetrant such as "WD-40" to the engine shaft threads and allow it to penetrate the threads of the engine shaft. Saturate for 24 hours before attempting to remove the impeller from the engine shaft!

1. Remove the four housing bolts and remove the pump housing. If the housing does not pull off easily, gently pry it off with a screwdriver. Inspect the housing gasket and replace if necessary.
2. The impeller is directly mounted to the engine shaft and will unscrew in a counter clockwise direction. Before attempting to remove the impeller the engine shaft must be locked in a fixed position to prevent it from turning. A simple way of locking the shaft is to insert a pointed tool such as a screwdriver or an awl through one of the many holes in the starter assembly and turning the engine over until the tool is firmly locked in place by the starter housing cover.

IMPORTANT: Always disconnect the spark plug wire before attempting any repairs or service on your pump or engine. Once the engine shaft is locked into position, there are two methods that can be used to remove the impeller.

Method #1. Use a block of wood, such as a 2x4 and place one corner of it into one of the impeller vanes on the left side of the impeller and strike the block of wood sharply with a hammer. This should loosen the impeller and enable it to be unscrewed in a counter clock-wise direction.

Method #2. If the above is not successful, use a thin breaker bar or a heavy duty screw driver. Insert the blade into one of the impeller vanes towards the left side and try to unscrew the impeller by applying a downward pressure. If this still does not work carefully strike the end of the bar with a hammer until the impeller loosens from the shaft. If this still does not work, strike gently with a hammer. This method may cause a chip in the vane of the impeller. Depending on the size break of the corner of the impeller, it may or may not have adverse effects on the performance of the pump. So be careful!

SEAL REMOVAL AND INSTALLATION:

1. All of our pumps use a two piece seal assembly, with the exception of some older models (P-50 and P-60). One half of the seal located in the backside of the impeller is called the "seat", or ceramic portion. The other side of the seal is shrouded in a brass encasement, encasing a hardened material that rests against the ceramic portion of the seal. Always replace both sides of the seal. Remove the ceramic portion with a sharp object similar to a screwdriver and press the new seat into place by hand. Always inspect the seal to note that it is not cracked. Always place the smooth surface of the seal to the outside.

2. Remove the pump adapter from the engine and press the brass portion of the seal towards the outside from the back of the adapter. If it cannot be pressed out easily, place a screwdriver handle on the seal and gently tap it out. When replacing, it is suggested that a small amount of silicone sealant be placed on the brass portion that fits into the adapter to ensure that it will not leak. Be careful not to get any sealant on the face of the seal. Position the seal in the center of the hole and press gently by hand into the cavity as far as possible. Use a screwdriver or a blunt instrument and tap the seal gently around the edge of the seal in a circular motion until the seal is firmly fitted into place. Wipe off seal facing with a clean cloth before reassembling.
3. After both sides of the seals is installed, replace the pump adapter onto the engine and carefully tighten. Thread the impeller onto the engine shaft until the impeller is hand tight. Install the housing and use care not to over tighten the bolts to avoid stripping the threads as they are a soft alloy aluminum.

HOW TO INSTALL THE HOSE ADAPTOR PUMP INTAKE COUPLER: (For all models except the P-50 and P-300 Series).
The tolerance of the Hose Adapter is critical for proper pump performance. The hose Adapter should be installed as close as possible to the intake portion of the impeller. Center the adapter into the housing opening and press in by hand to locate it into place and place a wooden block against the outside of the adapter and gently tap until the adapter is firmly seated against the face of the impeller. Pull the starter rope until the engine turns. When the coupler is properly seated, the engine should be somewhat difficult to turn over, making sure that the adapter is against the face of the impeller.

COMPRESSOR DRIVE INSTALLATION:
To install the shaft pulley and belt for a compressor adaptation, the pump must be completely removed from the engine. For larger engines to include the 8 HP through 18 HP engines, slide the pulley to the back of the engine shaft and tighten the set screw. To install the engine pulley on smaller engines to include the 3HP to 5HP Engines, the furnished bushing should be pressed onto the pulley at the factory to ensure proper alignment and spacing. If you choose to install it yourself, this can be accomplished by placing the pulley on a flat surface, center the bushing in the hole of the pulley and gently drive it through by tapping it with a hammer taking care not to damage the bushing. The bushing should be pressed or driven through the pulley, in a flush position to the other side of the pulley. It should not extend though the other side. Then install the V Belt before placing the pulley and bushing over the engine shaft. After the pump is installed and secured, mount the compressor and compressor pulley. Install the V Belt to compressor and make sure that the alignment is correct. You can compensate for some misalignment by adjusting the compressor pulley on the compressor shaft. Tighten firmly the set screw and all bolt and check for any misalignment before starting.

GENERAL OPERATING INSTRUCTIONS

THE FOLLOWING INFORMATION SHOULD ENABLE YOU TO UNDERSTAND THE BASIC THEORY OF OPERATION OF A PORTABLE DREDGE.

For more complete understanding on this subject, we recommend you read any one of a variety of books available through the Keene Library of Books, such as The Gold Miners Handbook, Dredging for Gold or Advanced Dredging Techniques. The vacuum on a portable dredge is created by a "venturi principal". A volume of water is pumped through a tapered orifice (jet), by a special designed water pump. A high velocity jet stream is created within the jet tube producing a powerful vacuum. As indicated in the diagram gravel is dredged into the suction hose and is delivered to the sluice jet flare. As a slurry of water and gravel enters the jet flare and is spread evenly over a classifier screen. The smaller and heavier particles drop below the classifier screen into an area of less velocity, allowing a slower and more selective classification of values. Often values are recovered and easily observed before they even enter the riffle section. The lighter non bearing values and larger aggregate are returned back into the water. The riffles, or gold traps in the sluice box are best described as "Hungarian Riffles". This type of riffle has proven to be the most efficient gold recovery system. As material flows over the riffles, a vortex, or eddy current is formed between each riffle opening. This force allows the heavier material to settle out of suspension and the lighter, non value bearing material to be washed away. This continuous self cleaning principal allows a dredge to be operated for prolonged periods of time. Normal conditions require a sluice box to be cleaned only once or twice a day.

PRIMING THE PUMP

Before starting the engine, the pump must be fully primed. This means the pump must be full of water and all air removed. All jetting pumps provided with our dredges have a mechanical water pump seal. Without the presence of water in the pump, friction could cause a seal to overheat and require replacement. Priming the pump on some of the smaller models is accomplished by thrusting the foot valve back and forth under the surface of the water in a reciprocating motion. This will pump water into the foot valve assembly and into the pump. A pump is fully primed when water is observed flowing out of the discharge end of the pump. It may sometimes become necessary to hold the discharge hose above the level of the pump to complete the priming operation. The larger dredges that have a rigid foot valve, are easily primed by removing the cap provided on the foot valve and filling, until water overflows. Caution must be exercised to prevent sand from entering the foot valve or intake portion of the pump. Excess amounts of sand could damage the water pump seal, or pump impeller. It is recommended that the intake portion of the foot valve be placed in a sand free environment underwater, such as a small bucket or pan.

PRIMING THE SUCTION HOSE

Priming the suction hose need not be of concern in most dredging operations, but is important to understand the principal. When the tip of the suction hose is taken out of the water during operation air will enter the suction system and cause the suction power to cease temporarily, until submerged again. The suction will commence as soon as the air has passed through the system. It is important to ensure that no air leaks occur in the suction system.

SUCTION SYSTEM OBSTRUCTIONS

The suction system can become jammed while dredging. This can be caused by dredging an excess of sand, causing the suction hose to load up, or a rock that has become stuck in the suction system. Rock jams generally occur in the jet, or just before entry into the jet. This can easily be cleared by removed by flipping the rubber damper back over the jet flare and thrusting the probe rod down through the jet flare and jet in an effort to strike the obstructed area. It may occasionally be necessary to remove the suction hose to remove an obstruction. If this is not successful. it may be necessary to locate the blockage in the transparent hose and dislodge it by a striking the obstruction, taking care not to damage the hose.

SOLID CONTENT

Care must be exercised to prevent dredging excess amounts of sand. A solid to water balance must be maintained. The solid content being dredged should never exceed 10%. If a suction tip is buried in the sand and not metered properly the solid content could cause the suction hose to become overloaded with solids and suction will cease, this will also cause the sluice box to become overloaded with solid content, resulting in a loss of values.

SLUICE BOX ADJUSTMENT

Most models have a slight adjustment to raise or lower the sluice box. The proper sluice box adjustment can effect the recovery of values. If the sluice does not have enough angle, the sluice box will "load up" causing the riffle openings to fill with unwanted excess material. Too much angle will cause the material to flow too fast, resulting in loss of values, evidenced by the riffles running too clean. The optimum adjustment of a properly working sluice box is evident by only a portion of the riffle is visible while operating. A loss of values can also occur if the solid content of the suction discharge is too heavy in solid content. Remember, the solid content should not exceed 10 %. A normal sluice box tilt is approximately 3/4” inch to the running foot. Afour foot sluice box should have an approximate tilt of 3"

CLEANING THE SLUICE BOX

Before attempting to clean the sluice box, it should be allowed to run with only water for a few minutes in order to wash

out any excess gravels that have accumulated. Either turn engine off, or let run with a slow idle, then remove the classifier screen and replace the wing nut to prevent losing it. Unsnap the riffle latches, fold the riffle tray up, and let rest against the jet flare, taking care not to let it drop back into place while cleaning. This could result in a potential injury! Place a wide tray, bucket or large gold pan at the end of the sluice, then carefully roll up the riffle matting and wash into the container at the end of the sluice. Rinse any excess gravel that remains in the sluice into container. All material must be removed before replacing the riffle matting, riffle tray and classifier screen.

ENGINE SPEED

Most small engines are throttle controlled. The speed of the engine can be controlled with the use of a lever. Although the rated horsepower is achieved on most small engines at 3600 R.P.M., it may not be necessary to operate the dredge at full speed. Lower speeds conserve engine life and fuel economy. Be sure to read all instructions and especially the engine instructions that are provided with each unit. **ENGINES ARE NOT SHIPPED FROM THE FACTORY CONTAINING OIL. OIL MUST ADDED PRIOR TO USE! ENGINES OPERATED WITHOUT SUFFICIENT OIL SUPPLY WILL INVALIDATE ENGINE WARRANTEE!**

TROUBLE SHOOTING

[A] IF SUCTION DECLINES

1. Check the suction device for an obstruction. An obstruction can be removed by probing the obstructed area with the provided probe rod. I may be necessary to check the suction hose for a visible obstruction. This can be remedied by either back flushing the system or dislodging the obstruction with a gentle blow.

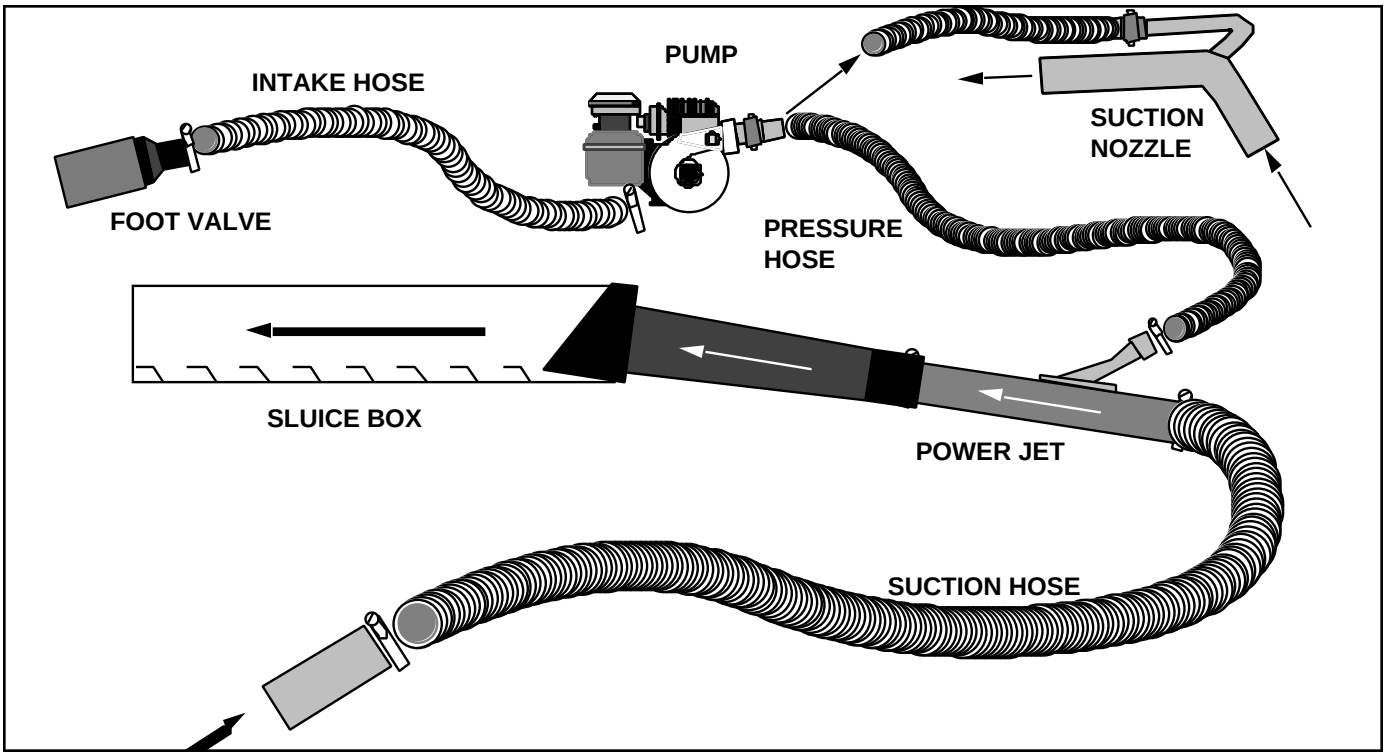
2. Check the pump for loss of prime or blockage. The foot valve may be too close to the surface of the water and air may enter the intake of the pump via a small whirlpool. The pump intake or foot valve screen may be plugged with leaves or moss, restricting flow into the intake of the pump. Check and tighten all clamps to prevent an air leak.

[B] IF PRIMING THE PUMP BECOMES DIFFICULT

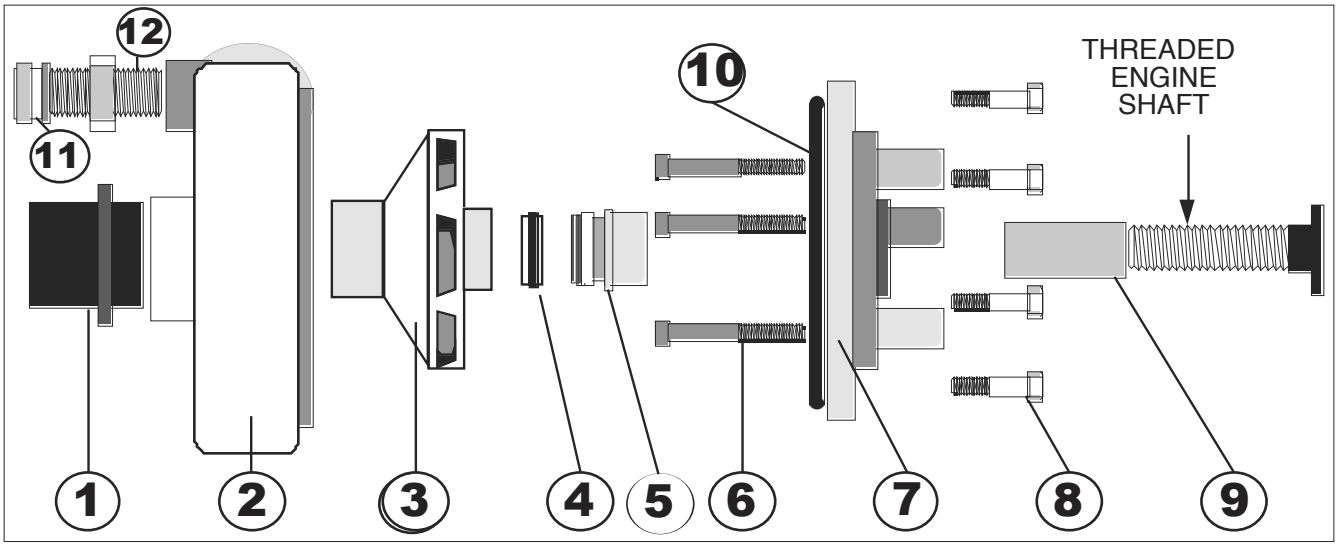
1. Check all clamps for an air leak.

2. It may be necessary to check the foot valve for a small leak. This is accomplished by removing the foot valve assembly from the pump and blowing air into the hose portion of the assembly and listening for an air escape. It may be necessary to remove the hose and check the rubber valve for an evidence of a leak, or for a small obstruction preventing the valve from sealing.

3. If a water pump seal is either defective or damaged, a leak will be evident on the inside portion of the pump around the drive shaft. Often a new pump will leak slightly, until the seal and gasket has become fully seated. This is a common occurrence in most new pumps.



CENTRIFUGAL PUMP ASSEMBLY
STANDARD 5/8" THREADED SHAFT ENGINE



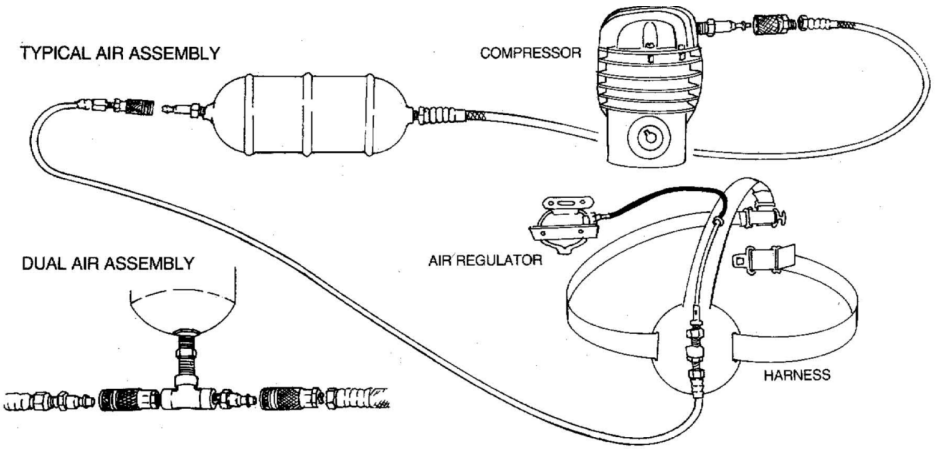
PHP160 & P180 PUMP PARTS

ITEM	DESCRIPTION	QUANTITY	PART NO. PHP160	PART NO. P180
1	Hose Adapter	1		HA2
2	Outer Housing	1	161	181
3	Impeller	1	162	182
4	Pump Seal (ceramic)	1	WPS (PT#1)	WPS (PT#1)
5	Pump Seal (Spring & Casing)	1	WPS (PT#2)	WPS (PT#2)
6	Mounting Plate Bolt	3	MB	MB
7	Mounting Back Plate	1	105	105
8	Housing Bolt	4	HB	HB
8A	Housing Bolt Washer	4	HW	HW
9	Shaft Bushing	1	SB	SB
9A	Compressor Drive	1	P3	P3
10	O Ring Gasket	1	104	104
11	Flusher Adapter Cap	1	FAC	FAC
12	Flusher Adapter	1	FA	FA
13	Flusher Adapter Seal (inside Cap)	1	FACS	FACS

INSTALLATION NOTES:
The rotation of all is counter-clockwise. Water must be contained within the pump while it is running. Do not run the pump dry, as it will damage the pump seal and may lead to the need to replace the seal. To ensure continuous performance, it is always a good idea to carry a spare seal, in case you need to replace it. For maximum pump performance, use only Keene Engineering foot valves.

INSTALLATION INSTRUCTIONS:
1. Before installing the mounting plate (7) to the engine, the spring portion of the water pump seal (5) must be installed. Place this portion of the seal into the center of the mounting plate, with the use of a light hammer and or blunt instrument and a seal setting tool. Tap the perimeter metal portion of the seal to set the seal into position. Care must be taken to avoid contact with the carbon portion of the seal. A small amount of Silicone Rubber Cement placed in this section will insure a water tight seal. Insert the FOURmounting bolts (6) into the mounting plate (7). Tighten the bolts evenly so as to prevent mis-alignment.
2. Fit "O" Ring gasket (OR1) into "O" slot on the front face of the mounting plate, making sure that it is properly seated. Place the ceramic portion of the water pump seal (4) into the center of the impeller (3) firmly, using the heal of your hand to insure a proper fit. The ceramic surface of the seal must be facing outwards. Thread the impeller onto the engine shaft by turning it gently in a clockwise rotation, taking care to avoid damage to the threads on the impeller.
3. Attach the outer housing (2) to the mounting plate, using the housing bolts (8) and washers (8A). Tighten the housing bolts evenly to ensure proper tension and alignment. Extreme care must be taken to prevent over tightening of the bolts. Too much torque will damage the threads in the outer housing.

INTRODUCTION TO HOOKAH DIVING



WARNING CARBON MONOXIDE GAS

If you're considering diving with a "Hookah Compressor", It is most important that you become aware of potential danger associated with exhaust emissions. We place a caution label on the engine, warning of dangerous engine fumes and also illustrate further warning in " Introduction to Hookah Diving" that is issued with the purchase of all diving equipment.

WHAT IS CARBON MONOXIDE GAS?

Carbon Monoxide is an invisible odorless gas which gives no warning of its presence. It is the product of the incomplete burning of any material such as ; Oil Gasoline, Wood, Coal, etc. that contains carbon.

WHAT IS THE EFFECT OF CARBON MONOXIDE EXPOSURE?

Carbon Monoxide deprives the blood of its ability to carry oxygen throughout the body. When Carbon Monoxide is inhaled, it chemically combines with hemoglobin, the oxygen carrier in the blood. Even ifthere is plenty of oxygen in the air, hemoglobin combines much more readily with Carbon Monoxide thanwith oxygen. As the oxygen level of the blood is reduced, the heart must pump faster in an effort to supplysufficient amounts of oxygen to the brain and other parts of the body. When the brain does not receive enough oxygen, symptoms of headache, dizziness and mental confusion occur. Further exposure to the gas causes lack of coordination, weakness and nausea. The final effect of excessive exposure are convulsions,coma and death. Needless to say, we cannot emphasize strongly enough that caution must be exercised. Never dive alone,never dive in an enclosed area, or in an area where good ventilation is not eminent such as; under piers, narrow grottos, under heavily overgrown brush or trees or in any area where a good air circulation does not occur. Always make an effort to position your air unit to allow the prevailing breeze to carry any exhaust emissions away from the air intake of the compressor. Remember, Carbon Monoxide is the product of incomplete burning of gasoline and oil, so it most important to keep your unit properly running and clean. Never allow gasoline to overfill or spill anywhere near engine or compressor.

There are two air supply systems that are used for underwater diving activities. One system, known as Self Contained Underwater Breathing Apparatus (SCUBA), involves the use of high pressure metal tanks which are worn on the diver's back while diving. The equipment used in SCUBA diving is quite technical in nature, and SCUBA gear should not be used by persons who have not become a certified diver involving specialized instruction. Without a certification card indicating completion of such a course, you cannot purchase compressed air.

Of course, the SCUBA air system has its advantages as well.

A diver using SCUBA gear is literally "an entity unto himself," since he carries his life giving air supply on his back at all times. He can go anywhere he chooses, completely free of any ties with the world topside.

There are many times when an underwater diver does not need the total freedom that is afforded by the S C U B A air system, particularly in cases in which the diver is submerged in a limited area for long periods of time.

For these applications, the "Hookah" (Surface Air Supply) was invented. The Hookah air system uses no high pressure air tanks of the type worn on a diver's back

Instead, it uses a small air compressor which is located at the surface. It is commonly powered by a portable gasoline engine or electric motor, and the air is delivered to the diver via a floating air hose. With the Hookah system, the diver has an unlimited and nearly "cost free" air supply which will only stop flowing when the engine or motor that powers the compressor ceases to operate. T h i s makes for a truly economical air system, which will quickly pay for itself when compared to the cost of refilling a SCUBA tanks every hour or so.

The only operating cost for a Hookah system is fuel, since the vast majority of Hookah compressor units are gasoline powered. It is not uncommon to get two hours diving time on a single gallon of gas, which shows just how economical the Hookah air system can be.

You must have a dive buddy or a diving tender at all times. Never dive alone.

THE AIR COMPRESSOR

Typical Hookah Air Compressor T80

The Hookah air system begins at the diver's air compressor. Hookah compressors are small, lightweight, and of simple design. They are commonly constructed of an aluminum alloy, and utilize a rubber diaphragm as the means of air displacement.

There are also compressors that use a "piston" arrangement to displace air and these types generally deliver more air at higher pressures than the diaphragm models. The moving parts

inside a Hookah compressor are lubricated with Teflon for the life of the unit, and need no additional lubrication. The air that is delivered by this type of Hookah compressor is pure, oil free air. It is however recommended that at least a 40 micron filter be included to remove any solid particles that may occur.

This type of Hookah compressors contains sealed bearings rather than oil for lubrication which can contaminate the air supply. Most compressors utilize an “oil bath lubrication system which will contaminate the air supply.

Hookah compressors operate at a relatively low pressure. The maximum pressure available from the higher capacity models is about 125 pounds per square inch. The higher the operating pressure, the lower the air output. Consistently high operating pressures (unless the unit specifically designed for high pressure use) will shorten the life of the compressor by a noticeable degree. Conversely, the LOWER the operating pressure, the greater the air output, and the longer the compressor life. A compressor should not be operated at high pressures unless a diver intends to be submerged at greater depths. If a diver is working at depths of 33 feet or less, he will need only 30 to 40 pounds per square inch for optimum operation of his regulator.

Most Hookah compressors have a built in "pressure relief valve" which prevents excessive pressure from building up in the compressor head when the diver is only making a small "demand" on the compressor. This valve is usually preset at the factory at approximately 50 p.s.i., which will give the average diver at shallow depths enough air to operate his regulator while leaving enough pressure left over to allow for increased exertion.

If a diver is breathing at a normal rate (light exertion), the pressure relief valve will occasionally "pop off" and shoot out a burst of air. This is normal, as it prevents excess buildup of pressure in the compressor head.

If a diver is breathing heavily and is under physical exertion, he will be demanding all of the volume and pressure that the compressor can deliver. In this case, the pressure relief valve will rarely, if ever discharge excess pressure or "pop off."

The type of Hookah compressor that is required for a given diving operation is dependent upon the extent of underwater physical exertion, the depth, and the number of divers that are connected to the system.

A single diver under light exertion at shallow depths will require a relatively small air output that is measured in "cubic feet per minute," or "CFM". The same diver under heavy exertion will require additional air at slightly higher pressure and volume. If more than one diver is connected to an air system, or if diving at greater than normal depths, more air volume at higher pressures may be required.

THE AIR RESERVE TANK

The next major component in the Hookah air system is the reserve tank. This very important piece of equipment performs four vital functions:The reserve tank operates as an air ``reservoir," that supplies a constant volume of air at all times. If, you are diving under heavy exertion and demanding a greater amount of air, the large volume of air in the reserve tank will supply the reserve air required. If you were breathing directly from compressor itself, your rate of inhalation might actually surpass he air volume provided by the compressor, and you would not get a sufficient amount of air.

The reserve tank functions as a cooling and condensation vessel. Few divers realize it, but the air emerging from a Hookah compressor is quite hot, and can actually reach temperatures as high as 190 degrees.

As the air enters the reserve tank, it will expand and cool. This expansion

process will also condense most of the water contained in the compressed air. Hookah compressors, because of their small size,do not have the capability to remove the moisture from the air and hence,they deliver air with an appreciable moisture content. The expansion process in the reserve tank allows the water to condense, ensuring that the diver breaths less moisture in the air.

The reserve tank also suppresses surges from the compressor or any temporary decrease in running speed. Often a the compressor's engine will run uneven due to moisture in the gasoline. The reserve tank can compensate for this by delivering an even flow of air.

And finally, the most important function of all. The reserve tank will contain enough pressurized air to give the diver a couple of breaths of breathing time, should his compressor, or engine failure run out of fuel or cease to operate.

Equipment breakdown is not a pleasant thing to consider while working underwater, but is always a possibility. In the event of an engine failure without a reserve tank in the system, a diver could experience an immediate loss of air that could lead to desperation and panic. Any experienced diver will tell you, that panic is the leading cause of drowning incidents.

THE AIR HOSE

The next component in the Hookah air system is the air hose. Hookah air hose is made of a special vinyl plastic construction, is resistant to the effects of oil, gasoline and sunlight that exists in the environment.

Conventional rubber hose should never be used for diving, because it will gradually deteriorate and become toxic. Hookah hose commonly has an inside diameter of 3/8ths of an inch. It is constructed of an inner liner of food grade vinyl wrapped with a nylon webbing reinforcement and covered with a heavy duty PVC abrasion resistant wall. Hookah hose is designed to prevent kinking and collapsing that could prevent the flow of air being shut off.

A quality Hookah hose will be colored a bright yellow or orange, for a high degree of visibility. It will also float, so that any excess hose not actually being used will float on the surface, away from the d i v e r, reducing the possibility of entan-

glements on the bottom. For example: If you are diving in ten feet of water but are using a thirty foot length of air hose, the excess twenty feet will float on the surface, away from you.

A quality Hookah air will not impart any "flavoring" to the air, and should meet **“FDA and OSHA”** requirements.

THE REGULATOR

The regulator is an oral respiration device that is worn in the divers mouth. The regulator regulates the amount of air that is received by the diver each time he inhales. Because the divers nose is covered by his face mask, air must be inhaled through the divers mouth .

There are two types of diving regulators, those designed for SCUBA use and those designed for Hookah applications. A SCUBA regulator is designed for use with SCUBA a air tank, and delivers maximum efficiency when operated at a pressure exceeding 100 p.s.i. They require a "first stage" valve assembly, attached to the SCUBA tank. The function of the first stage is to reduce the extremely high pressure of the air in the SCUBA tank from approximately 2,250 p.s.i. to approximately 180 p.s.i. This pressure then goes to the "second stage," which is the part that is worn in the diver's mouth. The second stage of a SCUBA regulator has a spring loaded "downstream" valve which delivers the correct amount of air to the diver when driven by an air pressure ranging from 100 to 250 p.s.i.

A prospective Hookah diver must realize that SCUBA regulators CANNOT be used for Hookah applications without special modifications. A typical Hookah compressor operates in an average pressure range of 30 to 50 p.s.i., which is not enough pressure to drive the spring loaded downstream valve of a SCUBA regulator.

A diver who already owns a SCUBA regulator, but who wishes to use it for Hookah applications, must take his

regulator to a competent dive shop or repair station and get the regulator converted over for low pressure use. He should not attempt to do it himself. The conversion can be made by installing a set of low tension springs which will give maximum efficiency when operated at low Hookah pressures. A dive shop or repair station will also have the necessary test gauges, etc., to make certain the adaptation has been effective. A Hookah regulator is entirely different from a SCUBA regulator. It consists of a "second stage" only, which is fed directly from the output of the reserve tank via the air hose.

There are no valve assemblies of the type that are used with SCUBA tanks. Hookah regulators employ a "tilt," or "pin" valve, which delivers a full air flow to the diver at a pressure as low as 30 p.s.i. This type of regulator is specifically designed for use with low pressure Hookah compressors. Hookah regulators, as are all modern regulators, are of the single hose, "demand" type. A "demand" regulator works on a relatively low volume of air, since it only has to deliver air as the diver breathes, or upon demands.

THE HARNESS

A regulator should not be used for Hookah diving unless it is in conjunction with a "chest harness." The harness serves two principle functions:

1. It keeps the air hose from getting in the diver's way when he is working underwater. The harness has a "back plate" which is automatically positioned over the center of the diver's back when the harness is properly attached. Since the air hose terminates at the diver's back, thus preventing the occurrence of potential entanglements around the diver's body.
2. The regulator intake hose that attaches to the check valve prevents any pulling motion from the regulator while working underwater.

For example; if a diver were moving around underwater and inadvertently came to the end of the air hose, the harness would absorb the shock of the regulator and would not be jerked from the diver's mouth.

INCIDENTAL ACCESSORIES, HOSES, HINTS, PRECAUTIONS:

One accessory hose item you will need is a short length of hose for routing the air output from the compressor to the input of the reserve tank. The type of hose that is needed depends upon the compressor you are using. Diaphragm models that operate in the 30 to 50 p.s.i. range use a simple hose connector that is made of standard hookah air hose.

The high pressure, high volume piston compressors that are capable of delivering pressure of 100 p.s.i., require a connector made of special certified "heat resistant steam" hose, due to the fact that these models discharge air at higher

temperatures.

When setting up a Hookah air system, you will frequently need an array of metal fittings. For use around water, you should use stainless steel or brass fittings only.

This is especially important when diving in salt water. Fittings made of ferrous metal will rust or corrode when used in, or near a water environment.

If your Hookah compressor is powered by a gasoline engine, make every effort to ensure that the engine exhaust (which contains deadly carbon monoxide gas), is always placed DOWNWIND from the compressor. This will help prevent exhaust from being accidentally pulled into the compressor's air inlet. Always use a “snorkel” extension on any compressor that can elevate the intake of the air supply away from engine exhaust contaminates. Never use a gasoline powered compressor in confined areas, such as underneath piers, in close, narrow grottos, etc. This will prevent the exhaust

Typical air system for one diver includes an air hose, reserve tank, regulator, harness, and connector hose to compressor.

gases from dissipating into the atmosphere safely. Also, never dive in an area where there is little or limited ventilation or air movement. Take special precautions when diving in areas where the air is extremely still, as dead air spaces, or poor ventilation can cause exhaust gases to linger in the immediate area of the,engine and compressor unit. Always install a long extension on the intake of your compressor to avoid the possibility of contamination of Carbon Monoxide Gas from the engine exhaust system. The air intake of a compressor must tower over placed away from the engine exhaust at a sufficient height or distance to avoid intake of engine exhaust gas. If this gas is inhaled even in small quantities for short periods, it can cause severe headaches and possibly result in sickness. In larger quantities it can kill you, so please be careful!

If you are using Hookah equipment around salt water, be sure to rinse off all your components with freshwater afterwards. This includes your regulator, diving mask, harness, metal fittings, and air hose (flush it out on the inside as well as outside). A salt water environment will quickly corrode aluminum parts such as: Hookah compressors and gasoline engines. It is advisable to keep all metal components freshly painted and cleaned to avoid excess corrosion.

If you are using a gasoline powered compressor always shut of the engine before attempting to refuel. Do not attempt to refill the engine's gas tank while the engine is still running, as this will increase the possibility of spilling gasoline onto a hot engine, which could result in a potential fire or cause an explosion.

A diver should always surface and shut off the engine first prior to refueling and allow time for the engine to cool down. Always use a funnel for refilling the gas tank, or a special spillproof gas container to prevent spillage.

Every Hookah diver should understand the basic rudiments of engine and compressor maintenance, and should always keep his or her equipment in top condition. If you take proper care of your equipment, it will give you many years of trouble free service. Knowing how to work on or repair your own equipment will also come in handy, should you experience any mechanical failures on a diving trip. It is a good idea to carry along some spare parts for your air compressor, and the necessary tools to make repairs.

All of the basic "rules of the deep" that apply to SCUBA diving also apply to Hookah diving as well.

UNDER NO CIRCUMSTANCE SHOULD YOU DIVE ALONE.!

Always Hookah dive with a partner or dive tender to watch over you.

If you were to experience underwater problems, your "diving partner or dive tender should be available to come to your immediate assistance.

Even though no formal instruction is required to use Hookah equipment, we strongly recommend that all divers should take a **“CERTIFIED SCUBA”** course at your local county or diving supply store. Some dive shops offer a courses on Hookah diving as well.

You should also read information on the subject of underwater diving safety and study thoroughly. This will further familiarize you with the "rules of the deep".

WARNING CARBON MONOXIDE GAS

If you're considering diving with a "Hookah Compressor" , It is most important that you become aware of Potential Danger associated with exhaust emissions. We place a caution label on the engine, warning of dangerous engine fumes and also illustrate further warning in " Introduction to Hookah Diving" and Safety in Gold Dredging that is issued with the purchase of all diving equipment.

WHAT IS CARBON MONOXIDE GAS?
Carbon Monoxide is an invisible odorless gas which gives no warning of its presence. It is the product of the incomplete burning of any material such as ; Oil Gasoline, Wood, Coal, etc. that contains carbon.

WHAT IS THE EFFECT OF CARBON MONOXIDE EXPOSURE?
Carbon Monoxide deprives the blood of its ability to carry oxygen throughout the body. When Carbon Monoxide is inhaled , it chemically combines with hemoglobin, the oxygen carrier in the blood. Even if there is plenty of oxygen in the air, hemoglobin combines much more readily with Carbon Monoxide than with oxygen. As the oxygen level of the blood is reduced, the heart must pump faster in an effort to supply sufficient amounts of oxygen to the brain and other parts of the body. When the brain does not receive enough oxygen, symptoms of headache, dizziness and mental confusion occur. Further exposure to the gas causes lack of coordination, weakness and nausea. The final effect of excessive exposure are convulsions, coma and death.

Needless to say, we cannot emphasize strongly enough that caution must be exercised. Never dive alone, never dive in an enclosed area, or in an area where good ventilation is not eminent such as; under piers, narrow grottos, under heavily overgrown brush or trees or in any area where a good breeze does not occur. Always make an effort to position your air unit to allow the prevailing breeze to carry any exhaust emissions away from the air intake of the compressor.

Remember, Carbon Monoxide is the product of incomplete burning of gasoline and oil, so it most important to keep your unit properly running and clean. Never allow gasoline to overfill or spill anywhere near engine and compressor.

THE SAFETY AIR SNORKEL DOES NOT ELIMINATE CARBON MONOXIDE GAS, IT ONLY AIDS IN THE REDUCTION OF FUMES. ALL THE SAFETY CAUTIONS MUST BE OBSERVED !