

Hydraulic Impact

Field Maintenance for Model IW16

One inch drive, Two hammer

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Your company will have it's own standards for field maintenance of hydraulic impacts.
Some outfits do no field maintenance; some do more than this class will cover.
You should first defer to your company's policies.

Description

Hydraulic impact wrenches (impact guns) are your weapon of choice in the subsea construction environment. They come in several different configurations and are classified according to drive size and number of hammers. Hydraulic impacts are usually powered from the surface by a hydraulic pump which circulates hydraulic fluid through the gun by means of a twin-hose setup, generally reel mounted. They may also be powered by the hydraulic circuit of an ROV. This is more common in sat diving than surface diving.

Rebuild kit

You will need a rebuild kit. In theory, these will be available as part of your load-out. In practice, you will not have one unless you steal one from the shop and keep it in your offshore bag. Ask before taking and most shop managers will let you hold on to one. You may also be able to find at least the o-rings you need in most standard o-ring kits. Ask the vessel crew for a favor. The parts of this kit most often used are, in order of most often needed to least:

Third largest o-ring

Goes in the hammer case at the nose of the gun where the anvil comes out. These wear fast, usually developing a flat all the way around the inside where they touch the anvil.

Largest o-ring

Goes between the hammer case and the motor housing. Most often damaged during maintenance. Go figure.

Bearing ring

Goes inside the hammer case between two flat washers.

Washers, flat

Goes inside the hammer case on either side of the bearing ring. Two required.

Washers, locking

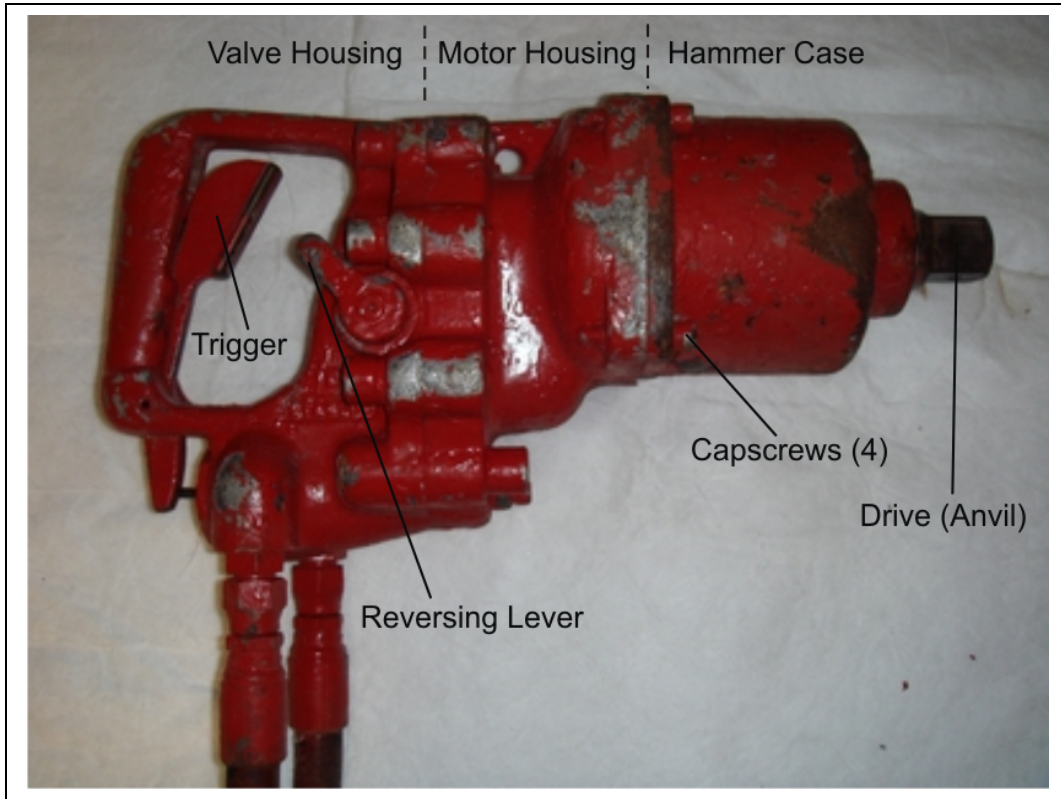
Typical rebuild kit has four, one for each of the cap-screws that hold the hammer case onto the motor housing. These get lost often, and without them, the cap-screws will vibrate loose.

The other parts in your rebuild kit are for the motor and valve assemblies. You will not often need them, but don't throw them away because when you do occasionally need to work on those parts of the gun, you'll need them.

Use the contents of your rebuild kit as needed. If you have several kits, open them one at a time as needed. It's a good idea to cut a corner off the open bag so you and other hands can tell which one is in play.



External components



Why hydraulic impact guns require periodic rebuilding

Impact guns used underwater are subject to water infiltration. Over several dives, dependent on the quality of the seals, the hammer case will become full of seawater and mud which displaces/degrades the grease inside. The hammers will bind and the gun will cease to function. This class will teach you how to return such a failed gun to service by breakdown, inspection, lubrication, and correct reassembly. If you are a tender to be reckoned with, you will be rebuilding your guns every so often whether they fail or not. You'll soon get a feel for just how often that should be. "Every time they come out of the water" may be excessive, but it's not a bad place to start, time and deck allowing.

Water may also infiltrate the motor housing, though this is less likely to be your problem when the gun fails. Tearing down the motor and valve housings is beyond the scope of this class and will usually be undertaken only at a land based facility. There are, of course, exceptions.

Lubrication

Use the right grease

Waterproof lithium grease is preferred. Non-waterproof grease can be used, but you will be rebuilding your guns that much more often. Water intrusion is going to occur. Coat internals liberally, but do not pack the hammer case full of grease.

Maintenance

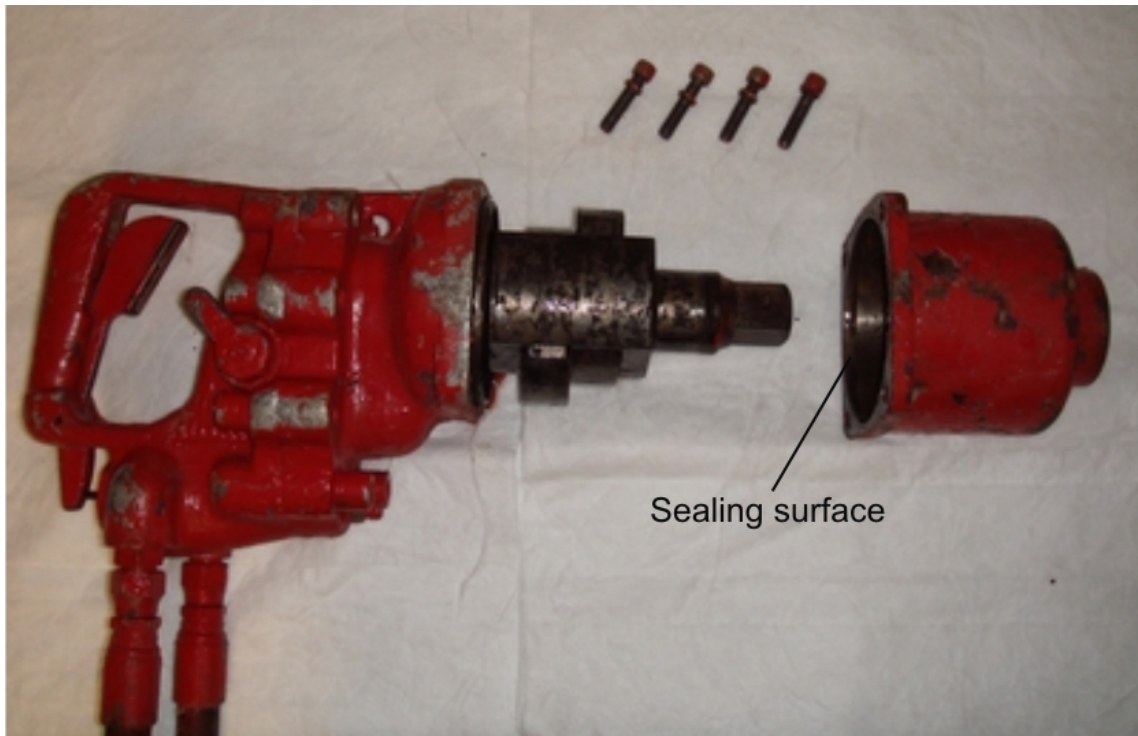
Maintenance is the key to keeping your guns hard hitting and reliable offshore. The first you'll hear about it when they're not will be your dive sup telling you to get up on the hydraulics and swap out the gun. A failed gun is a waste of bottom time. Pick it up, swap it out, and get it back on the downline quick as you can. Rebuild the failed gun as soon as possible because you'll want it ready when the time comes, which it inevitably will. You can usually avoid a gun failing on bottom by rebuilding them early and often, as said above.

Get yourself a clean and stable place to work, where you can safely lay out parts and not have them in the way of other work on deck.

Disassembly

Remove and service the hammer case

Remove the four cap-screws holding the hammer case onto the motor housing. Each should have a lock washer. The hammer case should slide easily off the anvil.



Inspect the sealing surface just inside the hammer case flange for nicks or gouges. Use emory cloth to smooth any that appear to compromise the seal, but use it lightly.



Clean the hammer case thoroughly, removing all mud and old grease.

Inside the nose of the hammer case you will find a small o-ring which seals against the anvil when the gun is assembled. Remove the o-ring and clean out the groove. If the o-ring needs replacing, replace it with a new one from your re-build kit. Otherwise, clean and re-lube the o-ring and re-install it. Whichever, lube both the groove and the o-ring thoroughly.

Remove and service the anvil

Pull the anvil out the hammer assembly. It will slide right out with a little jiggling. Don't drop it. A little word to the wise here: Do not rebuild your impact anywhere near the edge of the vessel. You don't want to be the guy that loses part of the gun overboard.

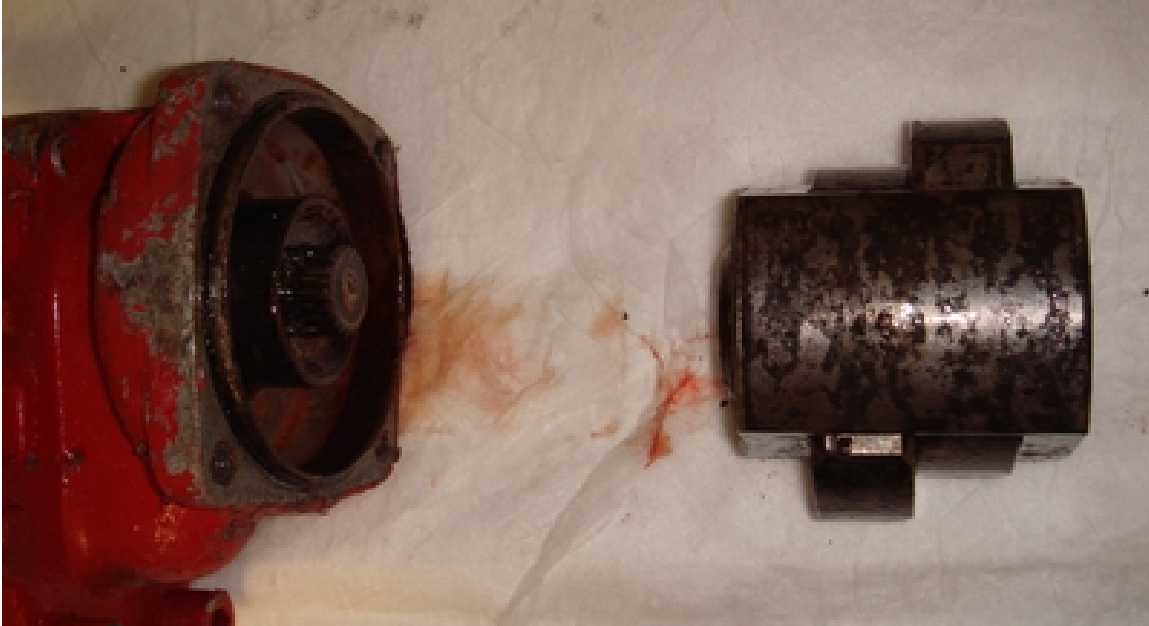


Inspect the anvil for nicks and chips. Pay particular attention to the sealing zone behind the flats where the o-ring in the nose of the hammer case makes a seal. Again, use emory cloth if necessary. Clean the anvil thoroughly and grease it. Pay particular attention to the hole in the end. The anvil is hollow. Clean out the inside and pack it with grease.

If you do find a chip out of your anvil, or any other part of the internals, watch for the missing chip as you proceed with disassembly. It may be old damage, but if it is recent, you don't want that little chunk of tool steel kicking around in there.

Remove and service the hammer assembly

The hammers and hammer frame will slide off the main shaft with a little tug from you. If they are difficult to remove, get them started with a screwdriver, but be careful of the o-ring seal area on the motor housing.



Remove the hammer pins (2 ea.) and hammers (2 ea.) from the hammer frame. The hammer pins will slide out with a little pressure on their ends from the back of the hammer frame. Each pin holds in one hammer. In other words, remove a pin and a hammer will fall out.

Probably wise to do this over your work surface and not drop the hammers. Remove both pins and both hammers. Again, don't do this anywhere near the edge of the vessel.



Clean both hammers thoroughly and inspect for damage. Burrs may be smoothed with light emory cloth work. You already know what to do if you see any chipping. Grease the hammers liberally and set them aside. Next, clean and inspect the hammer frame. You will note that one end fits over the teeth on the main shaft; inspect the gear end and clean it thoroughly to make sure there are no little chunks of anything in there that could bind it up. Now grease the hammer frame and set it aside too.

Service the motor housing

Thoroughly clean and inspect the motor housing face. Remove the o-ring. Clean out the o-ring groove. If the o-ring needs replacing, do so with one from your re-build kit, otherwise, re-use. Lube thoroughly both o-ring and groove. Clean and inspect the teeth on the main shaft. Now pick up the hammer case. Make sure it fits snugly over the o-ring and that the flange faces are tight and square. Remove the hammer case and put it aside again.



If they have not already fallen out, there are four more things on the main shaft that have to come out. These are the thrust spacer, a washer called a thrust race, a circular needle bearing, and another thrust race.

Remove them now. The thrust spacer should practically fall off, but the races and the bearing may take some fiddling. Try using the tips of two small screw drivers on either side.



From left to right you are seeing here: the motor housing, a thrust race, the needle bearing, another thrust race, and the thrust spacer. This is the order in which they should have come off the main shaft and is the order in which they go back on. Clean them thoroughly. Examine the two thrust races for damage or excessive wear. Examine the needle bearing for missing rollers or a cracked or broken housing.

One or two or half a dozen missing rollers is not the end of the world. A broken bearing housing is. Tell your dive sup. The gun will still hit without the bearing race, but its there for a reason. If you can spare it, red tag the gun instead of sending it down again.

Examine the thrust spacer. Notice that it is concave at one end and flat on the other. You'll need to remember that later.

Coat these four things with grease and set them aside.

Reassembly

Since you have been cleaning and greasing everything as you took it apart, and since you paid attention to how it came apart, putting your impact back together should be a snap. But there are two important things you need to pay particular attention to.

Important thing #1:

Hammer alignment. The picture below illustrates the correct alignment of hammers to hammer frame during reassembly. Note that the hammers are reversed from each other:



If you get this wrong and orient both hammers the same way, the anvil will still fit and the gun will still go back together, but will only hit half as well. Not good. Make sure the hammers go back in reversed from each other. Also, if you encounter an impact that shakes hard when you squeeze the trigger, suspect hammer alignment, as in correct configuration they counter-balance each other.

The hammer pin heads should be flush with the surface of the hammer frame when you reinstall them. If they are not flush, you put them in from the wrong direction. They go in from the anvil side.



With the hammers and hammer pins in the hammer frame, you should be able to press on the hammers and have them move alternately from each other like this:



Important thing #2:

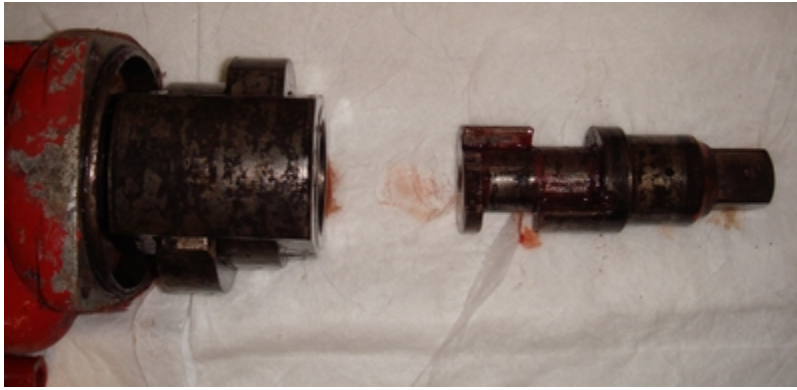
Reinstall the thrust races, needle bearing, and thrust spacer in the correct order.



Grease the main shaft and then install a thrust race over it, followed by the needle bearing, then another thrust race, and finally the thrust spacer, flat side toward the motor housing. Grease the concave face of the thrust spacer and main shaft teeth.



Reinstall the hammer assembly over the main shaft. The hammer frame has a raised bevel around the gear end that fits the concave face of the thrust spacer.



Insert the anvil into the hammer assembly. After it is in, you should be able to rotate it about 1 1/3 turns in either direction before it stops moving. The hammers will move as you do this.



Re-attach the hammer case to the motor housing with the four cap-screws. Make sure they are tight. Each cap-screw should have a lock washer; without lock-washers the vibration of the gun will back them out.

Rigging

Hydraulic impacts are subject to hose fitting damage if not rigged with a strain relief. Use ¼ inch rope. Tie good knots.

The gun in this picture is rigged to relieve hose strain. It is also rigged for mid-water work. This rigging would allow the gun to hang horizontal in the water if you were to put a five gallon bucket on the lanyard and air up the bucket sufficient to float the gun at the work site. If you put such a gun/bucket rig on the downline, fill the bucket with water before it goes overboard so it doesn't hang around at the surface where it is of no use to anybody.

This is just one way of many to rig an impact for strain relief. However you rig it, consider leaving about 24 inches of rope between the gun and hose knot to give the diver more freedom of movement.

