

DISSECTING #1 AND T.J.P.

DIVORCING AN IRONHEAD SPORTSTER

SHORTSTERS STYLE

What is a Divorced Sportster?

Divorce: Verb; to separate or dissociate (something) from something else.

Synonyms; separate, disconnect, detach, isolate, alienate, set apart, CUT OFF!



INTRO:

Why? I'm sure many of you are asking this. Mostly, ...because you can! The Sportster is a tough engine that has appealed to the competitive areas with its 4-cam design. Their transmissions, however, were not as tough. Damaging the transmission case halves is common. So common that the aftermarket companies made replacement case corners for repair. If you don't damage the areas machined for bearings, there is possibly extensive welding and machining that could lead to a lot of work and money. You can't break your toys if you don't play with them. When they break, you want to fix them and keep playing with them. It's another option, and it's always to be the only kid on the block with something different! We don't encourage doing this to good, undamaged bikes. So don't go cutting that perfectly good 57 in half. There are plenty of basket cases around the world that can be picked up inexpensively for just that reason. But its yours and you can play with it however you want!

Ironhead Sportsters are fairly inexpensive to buy...especially if the transmission cases are busted up. By using Shortsters' three products (frame tail section, motor mounts, and primary belt-drive) it will provide the ability to build a low budget custom chopper while keeping the Sportster title, easy registration, and cheap insurance. As an added bonus, the Big Twin transmission has a more forgiving kicker ratio and thus cures Ironhead knee disease.

Divorcing a Sportster isn't anything new. This is an old trick that has been done for a long time in the competitive fields. After google-ing "when the first Sportster was divorced" and getting no results, we can only assume that this happened on a dragstrip in 1958 when one of the first Sportsters blew up a transmission and took the cases out with it. Perhaps one of the reasons why the trap-door was added. This conversion could be a bit of work. We are going to tell you how to do this and hopefully we have made this conversion much easier.

This process includes having to cut off the original Sportster transmission, attaching new rear motor mounts, installing and aligning a Big-twin transmission to the engine and rear wheel, and linking the engine and transmission together with the primary belt drive. For this application we will be using the products designed by us at Shortsters to aid in making this application much easier. Front and Rear Motor Mounts, Frame Tail Section, and Primary Belt Drive.

DIVORCING THE CASES:

Divorcing the cases is not as complicated as what most people think. Once the trap door and transmission is removed you can see that there is a wall that separates the engine from the transmission.....don't cut that! There are some differences in the cases. The only major differences that concern the divorcing and attaching motor mounts came in 1977. There are a couple differences in the 60's models to take into consideration which will be explained during the process. So we will be referring to the differences as "Early Models" (76 and older) and "Late Models" (77 and newer). When we do in-house divorces we use a CNC program to clean up the back side of the cases. However, equipment like this is **not** necessary. We will be explaining this process using tools found in most home garages or could be purchased at your local hardware store.

F.A.Q.: Do I need to split the cases, or can I do this without disassembling my engine?

No, you do not need to split the cases or disassemble your engine. It makes it much easier though. However you must seal up the engine to prevent debris from getting into the engine. We will advise that you take into consideration that you are using 30+ year old engines. If it hasn't been rebuilt since it came from the factory it probably needs to be. So before making the decision to not split the cases, check the tolerances of the engine components. You will thank us later!

NEEDED TOOLS:

Permanent marker, 4" cutting wheel and grinder or saws-all, large standard screwdriver or chisel.

EARLY (76 & OLDER): There are some differences in the pre 70's models that we will explain through this process.



LATE (77 & NEWER)



1. To begin this process remove the primary cover, primary, clutch basket, trap door transmission, starter assembly, cam cover, cams, and oil pump. Clean off the engine as best as you can and using brake clean prep the surface so you can mark where you are supposed to cut. Mark out as straight of a line as possible marking where to cut as shown.

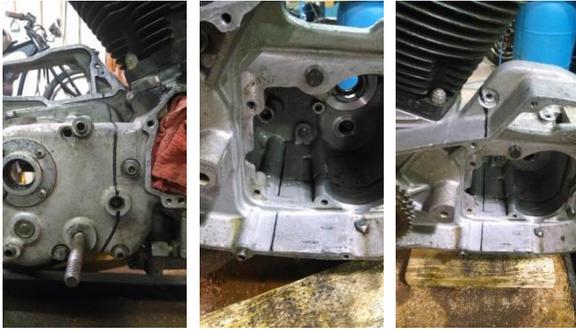
EARLY 70-76: Be sure to stay behind the oil return port.



EARLY 69 & OLDER: you will draw and cut in the same place. You will be cutting into the oil feed line in the case. Don't worry, we will be relocating this and the vent line.



LATE 77 & NEWER:



2. Rough cutting the cases. The easiest way to do this is to have the cases split, empty, and run it through a band saw. But, since most people do not have access to one we have found that a 4" cutting wheel on a hand grinder or a metal bit on a sawsall works well. If you are not intending to split the cases and rebuild you engine you will need to seal off all ports to prevent any debris from getting into the engine components. Otherwise you will be rebuilding your engine soon.



3. I now pronounce you divorced!.....roughly. With the transmission case divorced from the engine you can see all the excess material that needs to be removed. Using the permanent marker identify all the excess material you will need to be removing.

EARLY 76 & OLDER:



LATE 77 & NEWER: All excess material to be removed as shown. Bottom case bolt hole will be shortened to 5/8" for clearance of the frame. It will later be used in the installation of the rear motor mounts.



4. To remove large pieces of material use the hand grinder with the 4" cutting wheel to cut slits in the aluminum near the depth that you want. These teeth will break off easily with a flat screwdriver or a chisel. Then you can use the hand grinder with a grinding wheel to smooth out the back side and make it look nice.



INSTALLING MOTOR MOUNTS:

F.A.Q.: Will this require aluminum welding?

No. The way this was done in the past, an aluminum platform was welded to the back of the cases. The way we'll be doing this is using the Shortsters Rear Motor Mounts that will bolt to existing fixtures on your engine. The only welding that is required is simple MIG welding on steel.



FRONT: The front motor mounts is NOT needed to build an original frame Shortsters conversion. The front motor mount set converts Sportster motor mounts to Big-twin style in height and longitudinal location for custom frame applications. The bar is undrilled for your desired lateral engine position.



NEEDED TOOLS: 13/32 drill bit, drill, clamps, welder.

1. To install: attach the two side brackets to the case with the provided bolts. The two side brackets will fit on their proper sides.



2. Mock up the front shelf across the two side brackets bolted to the case and clamp them together using square blocks.



3. At this point, you will want to move on to the rear motor mounts and get them mocked up, the engine located to the lateral position needed, squared, and aligned with the belt drive to the transmission.
4. Once everything in step #3 is completed, locate where the holes are to be and drill them using the 13/32 drill bit.

REAR (EARLY): The early rear motor mount set is designed to bolt to the back of divorced engine cases of 1976 and older cases if **divorced by our procedures**. (Possibly the K-models as well. But, we have yet to do this with a K-model, so keep this in mind if you choose to do so). The rear motor mounts will be the same as a Big-twin in style, height, and longitudinal position. With the use of the rear motor mounts along with the front set, you can put this into a Big-twin frame, but there are a few modifications that will need to be made to make the Big-twin frame fit for clearances. Refer to the “**Big-twin frame**” section.



NEEDED TOOLS: Drill, 5/16 drill bit, 3/8-16 tap, rotary file/grinder, allen wrenches, blue Loctite, welder

1. Divorce the cases according to the instructions in the section **“Divorcing the Cases”**. Remove the oil pump and cam cover and inspect them for any damage or tolerances of wear in according to your Harley Sportster Manual if they haven't already been.
2. Inspect the two primary chain tensioner holes for cracks. (**NOTE:** most commonly the top hole. It is a factory weak point and is common to cracking) There will be three bolts here. So if the bottom two are strong perhaps it will create less stress on the top bolt. So it is up to you to judge on whether it needs to be repaired and to what extent. Go ahead and remove the screen and expose the vent. This vent needs to be plugged. The easiest way to do this is to just weld it shut. It's a steel vent so welding it is quite easy.



3. Attach the primary side bracket to the chain tensioner bolt holes. **DO NOT** drill the 3rd hole yet.



4. Fitting the top platform can be a bit tedious. You will need to make the proper clearances. This is a tight fit. Test fit the top bracket and mark the surfaces that is preventing it from lining up. You can also grind clearances in the platform itself along with the back side of the case. **DO NOT**

grind on the back of the oil return line! You will probably have to refer back to this step after step #4.



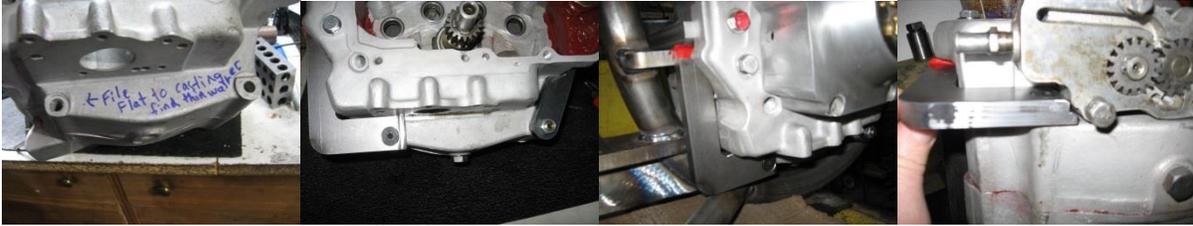
5. Attach the drill fixture with the ¼-20 screws to cam cover holes allowing for the head of the case bolt to rest in the big hole of the fixture. It will only go on one way. The drill bushing now locates the 5/16 hole that you will drill through the case. Using a drill, 5/16 drill bit, and the drill fixture secured into its proper place, go ahead and drill the hole. **NOTE:** Drill bushing is only a guide it will not guarantee straight. This connection is not for strength, just alignment. This hole will position the proper location for the top cross bar once bolted together with the provided 15/16-18 bolt.



6. After the 5/16 hole is drilled through the case using the drill fixture the top platform can now be bolted in using the 15/16-18 bolt provided. If it does not line up square then more clearance is needed somewhere. If so refer back to step #3.



7. Remove the case bolt from behind the oil pump and file the case until the washer is proud of the casing around the faced surface of the case bolt. Once this is done the "L" bracket should fit flat to the washer **not the case**. Replace the factory case bolt with the flat head socket cap screw. Blue Loctite on final assembly.



8. Once you have the three pieces mocked up and square install it into your frame. If using a Big Twin frame refer to Big Twin Frame section. If using a Shortsters Tail Section install the engine into the frame using the stock front motor mounts with proper spacers along with the top cylinder mounts if the cylinders and heads are still together. This will locate the engine within the front half of the frame. If the Shortsters Frame Tail Section is on far enough the motor mount bolt holes in the frame and motor mounts should align up. Make sure everything is aligned before welding (Refer to the Shortsters Frame Tail Section installation instructions). You are now set to weld the three pieces together. **NOTE:** It is difficult to reach all the edges that need welded. Weld what you can reach. Let cool. Then remove the bracket to weld the others.
9. Now that the bracket is welded together and final assembly complete the 3rd hole on the primary side bracket needs to be drilled and tapped. Using the 5/16 drill bushing in the lower hole of the primary side bracket and a drill with a 5/16 drill bit to drill a hole 3/4" deep. **IMPORTANT:** Only 3/4 of an inch deep because we do not want to break through into the crank case! After drilling tap the hole with a 3/8-16, 1/2" deep. Blue Loctite all fasteners.



LATE: in 77 the factory made major changes to the engine cases. Changing the cases from a round, 45 style case to a square sumped case. Also a different style oil pump, eliminating the cast oil return port, and a different primary chain adjuster. So a whole different set of motor mounts was needed to be designed. So being the gluttons for punishment that we are..... In our research we have noticed that On some of these bikes that have been around for 40+ years many of them are missing one or both top cylinder head brackets. With this set up we recommend running both the front and rear cylinder head bracket or build a center head motor mount. So don't say we didn't warn you!





1. Once the cases have been divorced according to the section **Divorcing the Engine** and cleaned up there is a couple more modifications to make for the instillation to be possible.



2. A notch needs to be cut in the casting on the primary case half as shown. This needs to be done to allow proper clearance for the primary side case bracket.



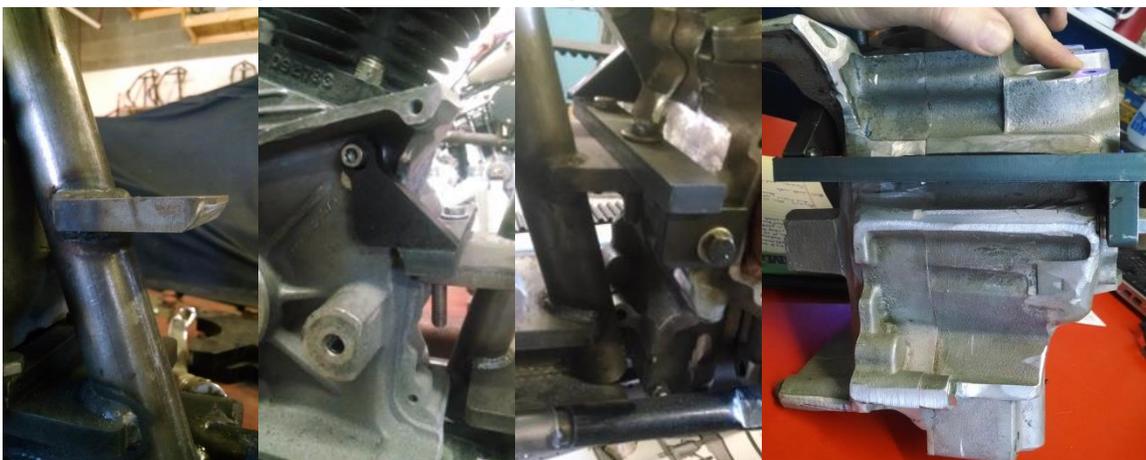
3. The other case modification will need to be to the case bolt at the lower rear of the case. On other divorced Ironheads we have seen some remove this all together. We think that it is a long way between case bolts without this. So in order to clear the seat post and keep the case bolt you must first cut off all but 5/8" off the case bolt passageway. That passageway now needs to be tapped out with a 3/8 -24 tap. While on the primary side the threaded holes need to be drilled out to 3/8" to accept the 3/8 -24 bolt through the outside of the case. Some material will need to be removed from the outside of the case for the bolt to set flat.



4. On both sides of the cases remove the proper case bolts. Using the supplied hardware attach both side brackets with the proper washers to space out the brackets so they clear the cases. The side brackets rest on the washers, **NOT** the cases. Usually no more than 2/side is needed.



5. Fit the engine into the frame with it aligned square with the transmission. (Refer to **Frames** section for instructions to square up the engine) If you are using the Shortsters Frame Tail Section some material will need to be removed from the lower edge of the frame rear mount platform for it to fit the back side of the late model cases. Once the engine is square and secure in the frame you can go ahead and tack weld together.



6. With the motor mounts tack welded together the engine can be removed to fully weld together. It will be a little difficult to get each location welded inside the frame.



FRAMES

Shortsters Frame Tail Section: The frame tail section attaches to the front half of a stock sportster frame. It is designed to accommodate the Shortsters Rear Motor Mounts and adapt and align it to a Shovelhead 4-speed transmission. With this custom setup it will allow you to keep the Harley title while also keeping it cheap and easy to register and insure. Besides the frame itself it comes with 2 plugs for the lower frame rails, 1 stepped plug for the backbone, transmission 5th bolt mount, axle, and axle adjusters.



F.A.Q.: Why is this tail section so much more expensive than the others on the market?

Because this isn't a typical frame tail section. There is not another like this on the market. There is a lot more to it than the others. Besides a new set of rear motor mounts it is set up to adapt and align a Big Twin 4-speed transmission with the engine and rear wheel. Also unlike most other tail sections on the market an axle and adjusters are provided.

TOOLS NEEDED: Permanent marker, tape measure, sawsall or 4" cutting wheel, grinder, file, welder

1. Remove everything from the frame. Mark where you want to cut the frame. On the back bone measure from the very back edge 6 inches. On the two bottom rails measure back $\frac{3}{4}$ inch back from the back side of the kickstand mount. Always remember to cut the ends long. Its easier to make them shorter than it is to make them longer.



77-81 FRAMES: In these frame years the cross bar between the two lower frame rails needs to be removed. (not required on 76 & older frames) Cleaning up the welds on the frame rails where the cross bar was removed will be required for good fitment. This will be reinforced when the two halves are welded together. You will also have to take a grinder and bevel the leading lower edge of the motor mount platform of the frame as shown below for a little extra clearance for the back of the late model engine cases.



2. When you have the frame cut in the proper places grind smooth the ends of the back bone and lower rails flat and deburr all edges. You may have to take a file and clean up any high spots inside the rails to get the plugs to slide in properly. With the 2 lower rail plugs slid $\frac{1}{2}$ way in tack weld them into place to keep from sliding. Now the frame halves can be fitted together on the 2 lower rail plugs. Now you can slide the backbone plug into place. It is a stepped plug and the narrower end goes in from the back first. It will only plug together one way.



79-81 FRAMES: these three years of frames have an odd design. Most of this will get cut off. The only differences is the back bone. The area where it is to be plugged has been dented for factory clearance. You have two options. **1:** using a torch heat up the dented tube and pound out the dent allowing the plug to be inserted. **2:** cut out the dent and add an extension to replace the

dented section. By replacing the dented section you will unfortunately lose the hole for the rear cylinder head mount. This will either need to be replaced or a center head motor mount needs to be made.



82-85 FRAMES: (NOTE: This frame design continues until the rubber mount designs. We are ending in 85 because that's the last of the Ironheads. We haven't ventured into evo-land yet and we will not put anything out to the public without testing it first.)

In 82 the frame design changed again. The only thing that effects this operation is that the factory started using larger diameter tubing. A couple modifications will need to be made here.



1:On the Shortsters Frame Tail Section you will need to remove some material from the edge of the plate that sits in between the bottom frame rails to acomidate the larger diameter of the OEM frame half.



2: on the OEM frame half you will need to cut the frame just behind the top motor mount and replace it with a new section. The section that gets replaced will be the same diameter as the Shortsters Frame Tail Section. The change in diameter will be welded together under the gas tank and not noticed. There will also be a slight bend in the backbone when finished since the OEM frame has a slightly different angle. Once again this wont be noticed when you install a gas tank.



3. Before welding the two halves together there are a few things to first check. Most importantly if the frame is on far enough the rear motor mount holes should line up together on the platforms with the engine secured to the front motor mounts, AND with your 4-speed transmission installed the Shortsters Primary Belt Drive should fit. If not, or if the belt is too tight with the transmission all the way forward, more material needs to be removed from the back side of the rails and backbone of the front half of the frame. This will allow the two halves to fit together closer. You can always adjust the transmission farther back, but, it will only go so far forward. Failure in doing this may result in having to cut the frame back apart.....and the creation of new cuss words. Also looping a string around the top neck cup and pulling it tight to the center of the backbone and aligning it with the center of the axle or wheel will insure square.



4. Once you have everything plugged, aligned, and square weld the frame halves together. Now is also the time when you can go ahead and weld the motor mount brackets together.
5. The transmission 5th bolt mount that is provided with the Shortsters Frame Tail Section needs to be installed. With the transmission bolted into place properly on a transmission plate and slid all the way forward attach the 5th bolt mount into place. Attach it will the bracket all the way back so when its welded on you will have maximum adjustment.



BIG TWIN FRAMES: With the use of both front and rear motor mounts you can install a divorced ironhead into a big twin frame. There are a few modifications to be made to the frame to get the proper fitment. **(NOTE: We have yet to do a complete build using an actual Big Twin frame. We are passing along everything that we DO know. #1 was built with a 45 Magnum frame. Its similar but not exact.)**

Aftermarket frames should fit much easier since they do not have the stamped section at the bottom of the seat post.

If using an early set of cases and Shortsters Early Rear Motor Mounts the rear platform on the frame will need to be cut and a new hole drilled to fit on the right side.



PRIMARY BELT DRIVE

The Shortsters Primary Belt Drive is different than any other belt drive on the market. The front pulley is modified to accept the Sportsters splines on the engine sprocket shaft.



The belt drive is a modified Karata and the 8.07 mm belt will **NOT** exchange with any other belt or pulleys. The ratio is for Shovelhead but our Shortsters lose 100 lbs and you have the option of the bagger 1st gear and unlimited adjustment of overall gearing at wheel or transmission sprocket.

The center-to-center distance of pulleys is for a factory Shovelhead. This pulls our kit components together perfectly.

FINALLY!

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Patent Pending **\$75**

Bolt-on mounts for 76 and earlier "short" case XL

\$375

1 1/2" Belt Drive with modified Front Pulley

Early Ironhead Weld-on Rigid with Axle and Adjusters

\$550

Frame: Big Twin: With Shortsters Motor Mounts you will need 1/4" spacer under the rear shelf. This was made for a Shortster frame not a Big Twin so some modification.