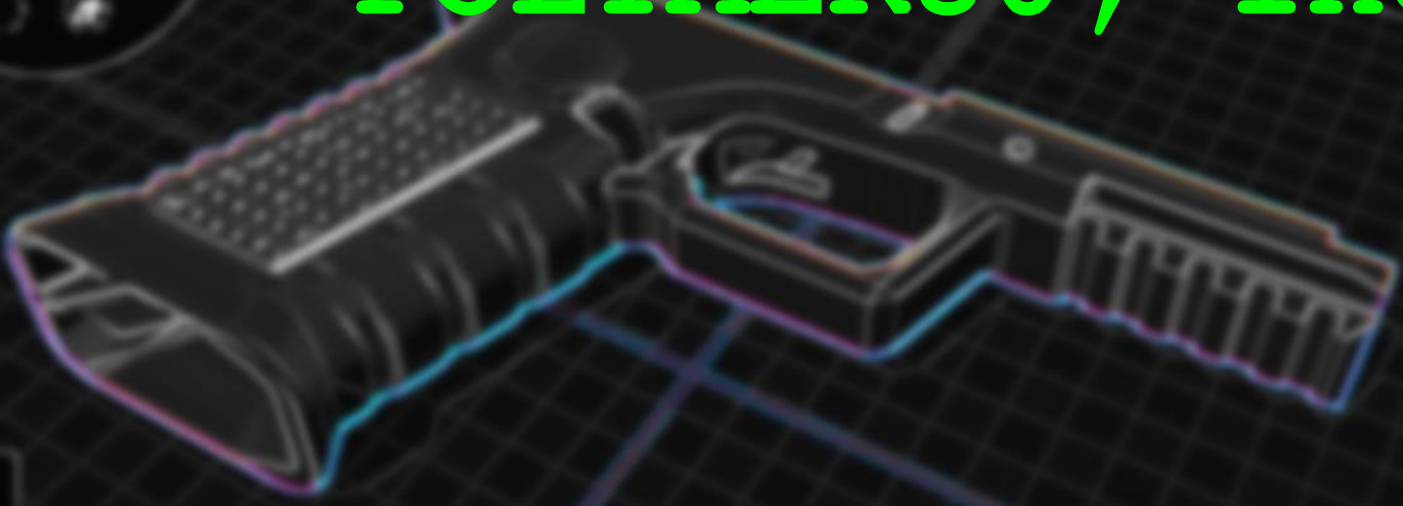


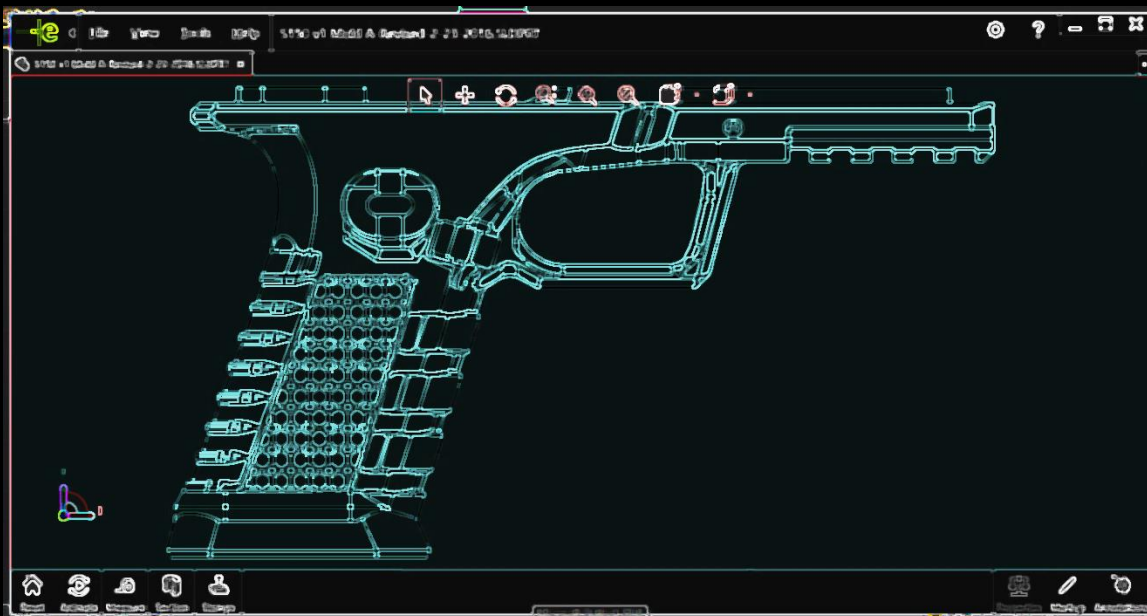
**POLYMER80, Inc.**



# **PF940 80% Pistol Frame**

Milling Instructions

V1.2





# PF940 Pistol Frame – 80% Milling Instructions

Author: David Borges, Polymer80 Co-Founder (updated 6/09/2016)

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## Introduction, A Must Read!

Thanks for choosing our products, we're very appreciative of your business. The following instructions are critical to understanding the details of how to build the pistol frame properly. **These instructions override any Polymer80 produced video or any other online videos/reviews** because, from a technical perspective, videos are difficult to update, are difficult to control in terms of current versioning, and nearly impossible to control in terms of what users are watching on YouTube as an example. Therefore, this is the control document which guarantees you the latest information required to finish your pistol project properly.

There are key details concerning how to mill and drill in this document that may surprise even the most experienced gunsmith or machinist, down to the fact that you should NOT use the jig to drill the pin holes on a drill press. You will hear this theme often in this document, and you will be warned several times. *As in our other products that require the use of our jigs, we do not recommend using a drill press to drill pin holes because the jig is not designed to be used in that manner (with a drill bit)*. The jig is designed to be used in a regular bench vice for the pin holes, and on a drill press or milling machine for the milling portion only because of the way the vice squeezes the jig during the two different operations.

## Warnings!! – Issues that impact warranty coverage!!

Polymer80, Inc. stands by our product and offers excellent no-hassle warranty coverage. However, there are limits to coverage, particularly when the customer damages the product through poor craftsmanship or improper control during the milling process, and when they drill holes using the wrong tools. Additionally, after the milling is completed, the build process seems to be where most people get into trouble, particularly during assembly and cleaning. Here are key areas that you need to watch for:

1. Surprise!! ☺ This won't be new if you read the introduction: **Do not drill the pin holes using a drill press and vice. Drill the pin holes using the bench vise and hand drill!**
2. Only use Loctite that is approved for contact with polymer based products.
3. Chemicals: Generally, you do not use penetrating lubricants on polymer products, they can damage the material.
  - a. Many oils are combined with rust penetrants or some other type of penetrant which can damage polymer based products. Regular gun oil, high quality grease or simple household oils can be used.
  - b. Do not utilize brake cleaner (it has acetone in it) or rust penetrants, they penetrate through polymer.
  - c. **Do not put acetone on the receiver.** Acetone will generally instantly destroy, tarnish, or weaken any polymer-based product.
4. **At the risk of becoming really annoying, do not drill the side pin holes using a drill press - see the Do's and Don'ts section below!**
5. Do not overtighten the jig in any vice, you can adversely adjust placement of holes to the pistol frame. Pin hole placements are critical on the pistol frame.

## PN: PF940 Parts List

Part Description	ITEM SKU	Qty per Lower
PF940 Pistol Frame Lower	P80-PF940V1BLK	1
Locking Block System	P80-LB940V1OX	1
Locking Block Screws	3-48 x ¼: Socket Cap Screw	2
Small End Mill Bit	S150-5/64ths end mill bit	1
Large End Mill Bit	Size varies depending on availability	1
PFJ940 Jig System	P80-PFJIG940V1RED	2 sides

### Methods of Finishing the Lower Receiver:

The goal of finishing the lower receiver is to mill out the following with the assistance of the jig:

- a. The three side holes for the pins, on each side of the receiver.
- b. Mill the barrel guard and ribbing on the top of the receiver to allow the barrel and slide fit later in the build process.
- c. Create the slide rail slots on the back of the receiver.
- d. Install the Polymer80 Multi-Function Locking Block provided with the kit.

These instructions will guide you through the process of milling and installing the locking block. There are different techniques utilized. In general, we will cover utilizing a drill press which has a cross vise installed on the drill press table. We won't go into much detail for those who have milling machines; the assumption is that a user at this level would already have strong milling and technical skills, allowing them to adapt to the following instructions.

Different techniques will result in different qualities of finish. Utilize this grid based on desired end-results and your access to tools. In all cases, use the included jig and drill bits and always level the jig in your vise:

Type of Finish	Tools Required
Excellent (recommended)	A drill press with cross vise, bench vise and basic tools such as a small hammer, various punches, hand files and 220 grit sand paper for finish work and refinement.
Highest Quality (recommended)	Milling machine, plus a hand drill and bench vise for the pin holes.

We prefer to utilize the drill press because it is faster, requires less time to set up, and you have absolute control if the cross vise is utilized properly.

For finish work, we prefer to use hand tools and sheets of sand paper rather than a Dremel tool for clean up because of the precision control and feel that is required. Dremels can do a WLDQ (Whole-Lotta-Damage-Quick).

## Example Tools

Example Tools	Additional Information
Cross Vise For Drill Press	<a href="http://www.northerntool.com/shop/tools/product_200199324_200199324">http://www.northerntool.com/shop/tools/product_200199324_200199324</a>
Drill Press	<a href="http://www.harborfreight.com/catalogsearch/result?q=drill+press">http://www.harborfreight.com/catalogsearch/result?q=drill+press</a>
Level	Utilized to ensure the drill press table is flat
Sand Paper	220 grit to fine tune milled areas and to clean up the rough edges of the nylon blended polymer utilized in the frame
Table Vise	Utilized to drill the side holes for the (3) different pins used on the frame, and to tap in the Polymer80 Multi-Function Locking Block
Drill	Used to drill the pin holes
Small Hex Key	To install the (2) provided hex screws for the locking block
Blue Loctite 242 or the Red Loctite <b>(DO NOT USE ON THE POLYMER FRAME)</b>	Used on the above screws only (metal to metal). You must use the appropriate type of Loctite, <b>but you cannot touch this type of Loctite to the Polymer Pistol Frame!!</b> <b>Use it on the screw to locking block threads only!!</b>

Additional tools to help refine the fit and finish of the frame to the Glock Slide. Small hand files, 220 grit sand paper, or dremel tool with sanding wheels.





## The Features and Description of the Jig

The Jig features a slot at the top where the included 5/64ths end mill is used to cut the rear slide slot. There are three other holes on each side of the jig to use with the appropriate sized drill bits that are included to drill the pin holes.



The pistol frame is inserted into the jig to prepare it for the milling and drilling procedures.

The complete kit is pictured here:



The large end mill bit is used to clear the temporary rails along the top and barrel block inside the pistol frame. The patent pending custom Polymer80 Multi-Function Locking Block replaces the locking block and slide of a Glock designed frame.

## Critical Do's and Don'ts

1. **DO NOT DRILL THE PIN HOLES IN THE DRILL PRESS.** The biggest problems from our builds came when testers attempted to drill the six pin holes (for the trigger and locking blocks) using the jig laid on its side with a Drill Press. Instead, when drilling the pin holes, the jig should be placed in a bench vise, and squeezed from the sides. You don't need to squeeze the jig to the point of deformation or crushing. **Snug, not crushed.**

## Preparation

(Assumes you are using a Drill Press and a Bench Vise)

1. Prep the drill press. When using a drill press, the spinning chuck head of the drill press needs to be firmly attached by slamming it with a mallet up into the press, or the vibration of the below procedure can sometimes make the entire head fall out (destroying things in the process).
2. The table of the drill press must be level
3. If you are using a cross vise you must "indicate" the vise to make sure it is moving at perfectly straight angles to cut perfectly straight lines. (I put the larger end mill bit in the chuck, pull the bit down to the straight edge of the vise and then spin the vertical handle so the vise edge runs along the drill bit or end mill bit perfectly flush. If you don't do this, when you mill the rear rails, they will be cut at an angle.
4. The end mill cross slide vise installed on the drill press (a link is provided above) is the absolute fastest and most secure way to finish this part. Using a tool like this, as opposed to just using a Dremel tool, will allow for more accuracy. We utilize the cross vise in various ways around the shop, as it is a great tool that can be mounted on the drill press table clamped tightly, or bolted down, or on your bench underneath a smaller bench drill press to be utilized for many other projects.
5. Final Mental Prep: Building a firearm takes craftsmanship and pride, **so don't be in a hurry!** Slow down and work precisely and methodically, **Measuring Twice and Cutting Once!!** After you drill something out, you can't put it back; so approach things conservatively. In my personal experience, if I'm feeling like I may be lacking patience, I just stop. I'll put the tools down, walk away from the bench and go take care of whatever made me be in a hurry in the first place. This sounds sort of simple, but I've destroyed too many things in the past from my lack of patience.

## High Level Steps

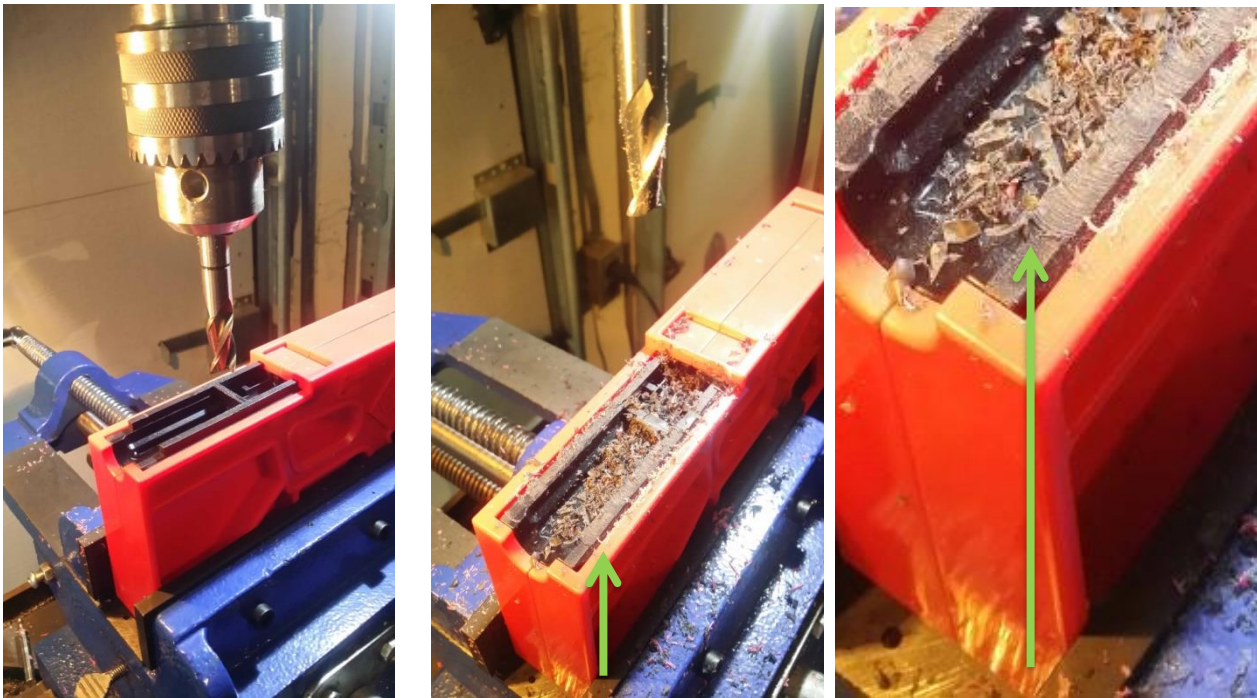
1. Drill the side holes in a regular table vise; you can and should use hand drill to finish the three side holes.
2. Use the large end mill bit to mill off the top rails.
3. Use the large end mill bit to mill off the interior barrel block to carefully remove a slot that will allow the spring and guide rod on your Glock Slide to move freely.
4. Use the small 5/64ths end mill bit while installed in the cross vise and drill press to finish the rails.
5. Install the Locking Block System which includes the slide rails; and then use Loctite to install the screws, being careful to not put Loctite on the Polymer frame (use Loctite on the metal locking block and screws only).
6. Assemble your firearm (instructions for assembling a Glock 17 not included in these instructions).

## Detailed Procedure:

- 1) Prepare the provided screws and locking block with Loctite so it has time to set prior to installation. Use Red Loctite to make sure the screws don't come loose. Don't touch Loctite on the polymer frame.
- 2) Drill the side holes in a regular table vise; you can and should use hand drill to finish the three side holes
  - a) Use the provided drill bits to complete the side hole drilling. This can be done with a hand drill and a regular bench vise.
  - b) If the 5/32nds drill bit fits tight to the hole, do not be concerned – it will place the drilled hole accurately.



Use the large end mill bit to mill off the top rails, making sure to level the jig in the cross vise. There is no need to get overly aggressive at this stage. You can always leave a little extra material to sand down by hand or use a Dremel to refine the top part of the frame to attain a smooth and clean finish. Note on the right side image how I left a little bit of material on the top (near the muzzle). Later, I'll sand and refine that area.



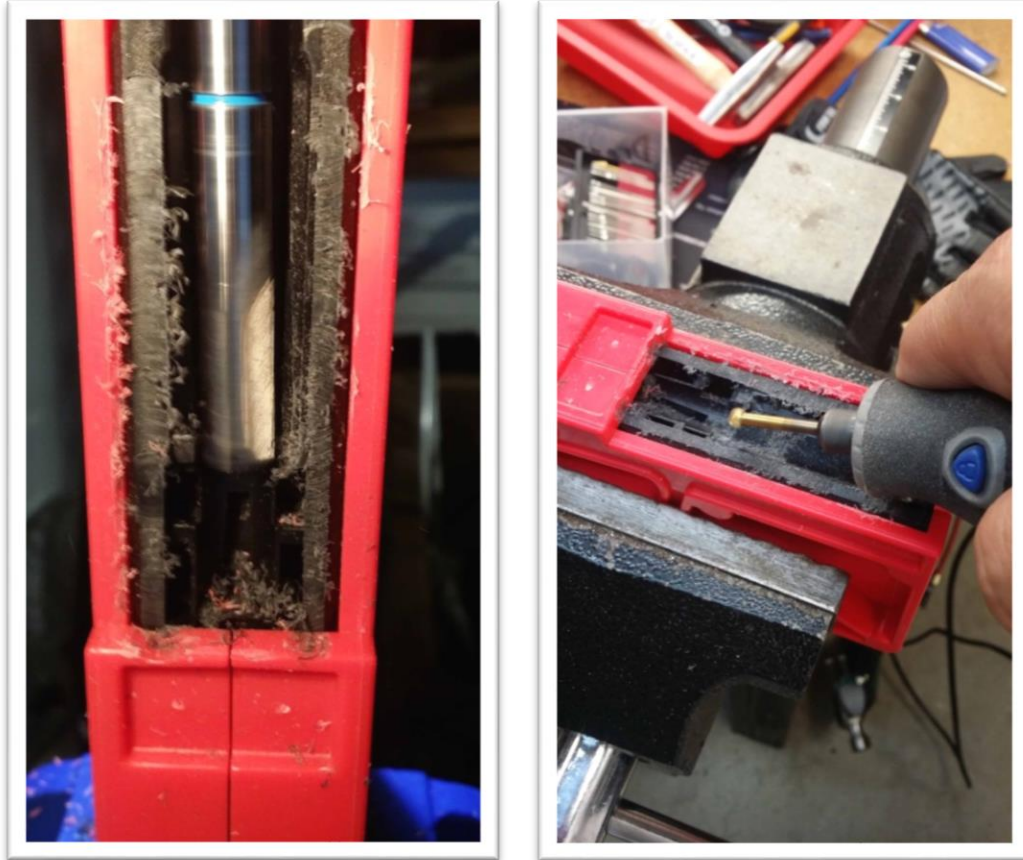
Hand file and sand this down to perfection once you finish milling. Leave a little material on top to sand down



3) Use the large end mill bit to mill off the interior barrel block to carefully remove a slot that will allow the spring and guide rod on your Glock slide to move freely.

Re-insert the jig and frame upright into the drill press, adjusting the table appropriately. You will now drill downward to remove the barrel block. Try to get even with the half-moon shape that is already provided on the opposite side of the barrel block as pictured here.

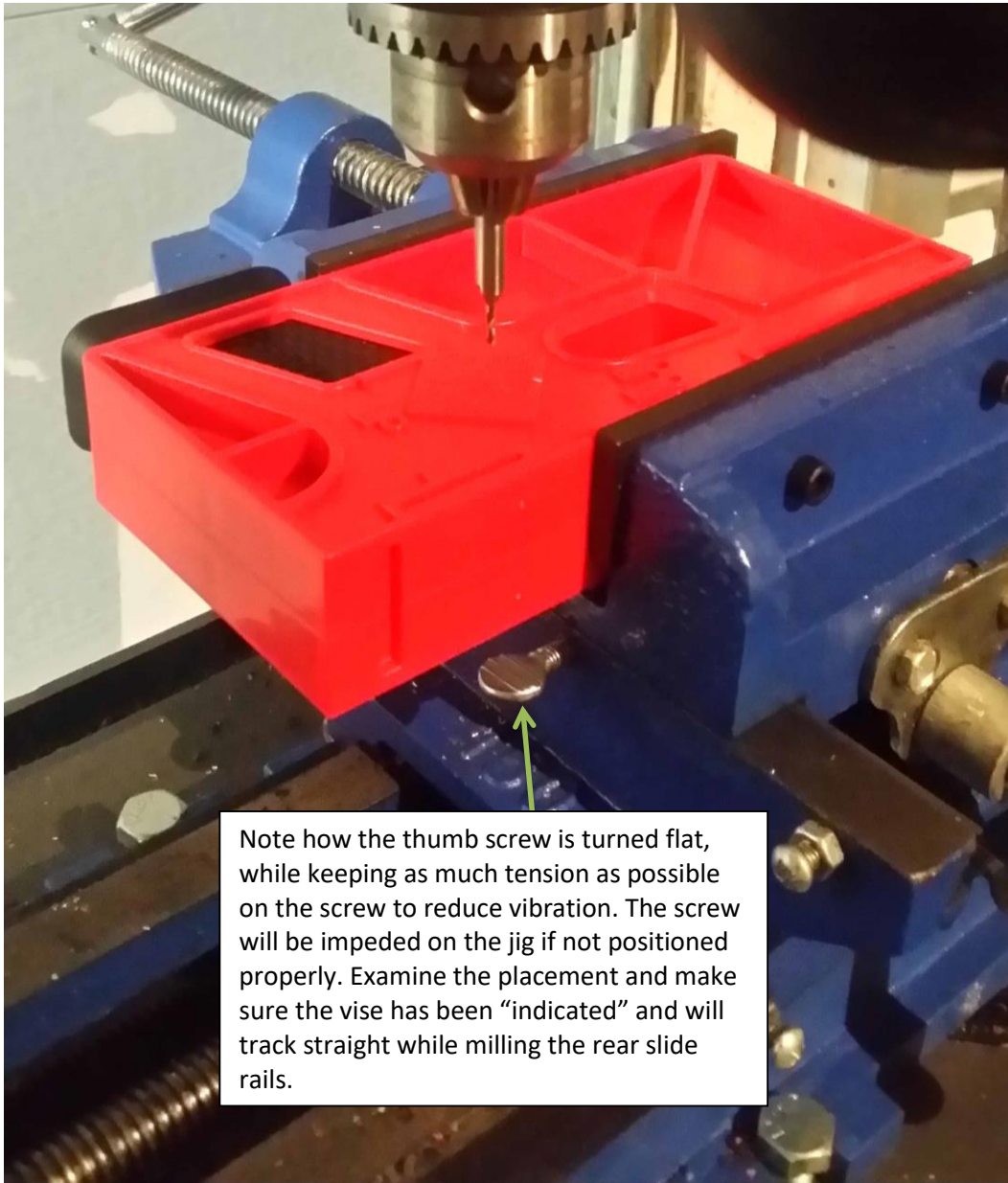
After I bring the jig and pistol frame back to the bench vise, I can refine the shape with a Dremel bit as pictured below or use a sanding wheel on the Dremel to refine my work.



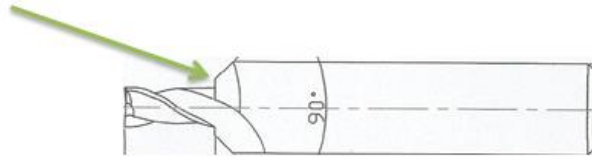
Make the hole the same as the plunger rod/spring seat shape

- 4) Now that you are warmed up and familiar with the cross vise, it's time to use the small 5/64ths end mill bit while installed in the cross vise and drill press to finish the rear rail section, which requires exacting procedure.

Take your time and make sure the jig is installed flat and level, inspect all around to make sure components and thumb tightening screws on the vise itself are not impeding on the jig. Because there are various types of cross vises on the market, it is impossible for us to demonstrate each one; but I'll point out some areas of concern on my cross vice, which is one of the cheaper harbor freight versions:



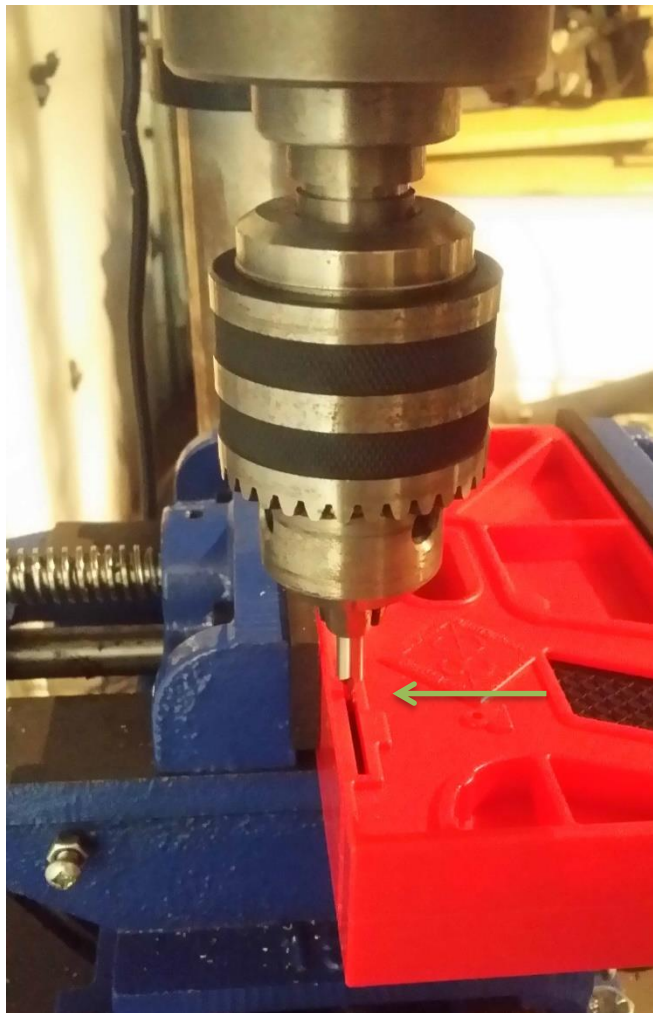
**This procedure is the most difficult**, but the jig is designed to be used with the 5/64ths end mill that has a slight straight edge built into the end mill that acts as a depth indicator. It allows you to manually adjust the drill press and set the Drill Stop to prevent the drill press from going too deeply. Utilize the drill press Stop Adjustment to prevent going deeper than necessary. The slight edge is shown here, you should not allow the drill press to drill deeper than this edge. **Adjust the drill press stop to not allow you to go deeper, using this edge as the general indicator.**



Use the cross vice with a forward and backward motion while holding the handle down to mill out the rear rails.

**NOTE: WHEN MILLING FAVOR THE SIDE OF THE SLOT THAT IS CLOSEST TO THE PISTOL GRIP ON BOTH SIDES. THIS WILL LEAVE MAXIMUM MATERIAL TO WORK WITH LATER AS YOU FINISH YOUR CUSTOM FITMENT. SEE GREEN ARROW BELOW.**

Later on, if the fitment is tight when installing the slide on the pistol frame, you can use small hand files to fine tune the fitment.



When starting off, favor the slot side that's closest to the pistol grip on both sides. This will leave you the most options (the most material) for the rail when fine tuning fitment.

The slot for the rails will end up along the green line below on both sides, but it will not penetrate through to the opposite interior side of the entire polymer section. It will be deep enough for the slide to glide along and stay locked onto the pistol frame.





# Pistol Build, Tuning and Fitment



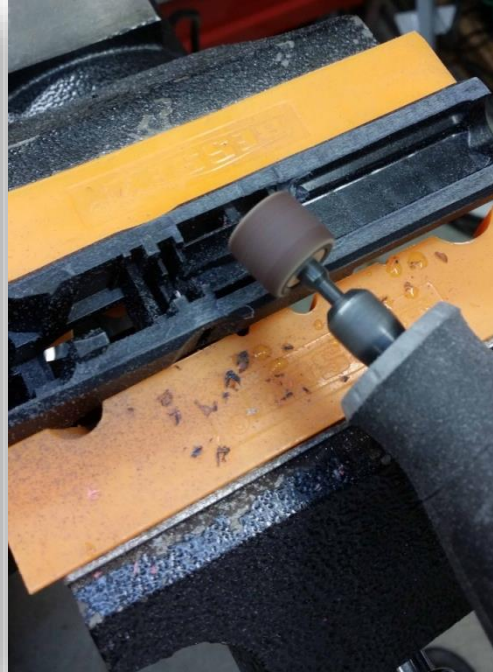
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## Parts of the PF940 80% Frame

Provided below is a complete list of parts that are needed to finish your own PF940 polymer pistol frame. We have included a list of retailers that offer the necessary parts to finish a G17-based 9mm on our website. Specific parts for builds based on other Glock models can easily be found by navigating these sites and others.

<u>Upper/Slide Parts List</u>	<u>Lower Receiver/Frame Parts</u>
1) Front Sight	18) Trigger w/ Trigger Bar
2) Rear Sight	19) Locking Block/Slide Rail w/ screws (provided by Polymer80)
3) Extractor	20) Trigger Mechanism Housing (Shown Assembled)
4) Slide	21) Trigger Spring (Shown Assembled)
5) Extractor Depressor	22) Connector (Shown Assembled)
6) Extractor Depressor Spring	23) Slide Stop Lever
7) Spring Loaded Bearing	24) Magazine Catch
8) Firing Pin Channel Liner	25) Magazine Catch Spring
9) Spring Cups	26) Slide Locking Lever Spring
10) Firing Pin Springs	27) Slide Locking Lever
11) Firing Pin Spacer Sleeve	28) Locking Block Pin
12) Firing Pin	29) Trigger Pin
13) Firing Pin Safety	30) Trigger Mechanism Housing Pin
14) Firing Pin Safety Spring	31) Frame (Polymer80 PF940 80% Polymer Pistol Frame)
15) Barrel	32) Polymer80 Finishing Jig
16) Recoil Spring/Guide Rod Assembly	
17) Slide Cover Plate	

After the milling procedure is done, it's time to start doing some cleanup. These pictures show us using 220 grit sandpaper to clean up edges and milled surfaces. Clean up any loose material and remove before installing the locking block.



Use small tools or blast air to clean out pockets

Dremel is ok to use, but a hand file and sanding is the best!!

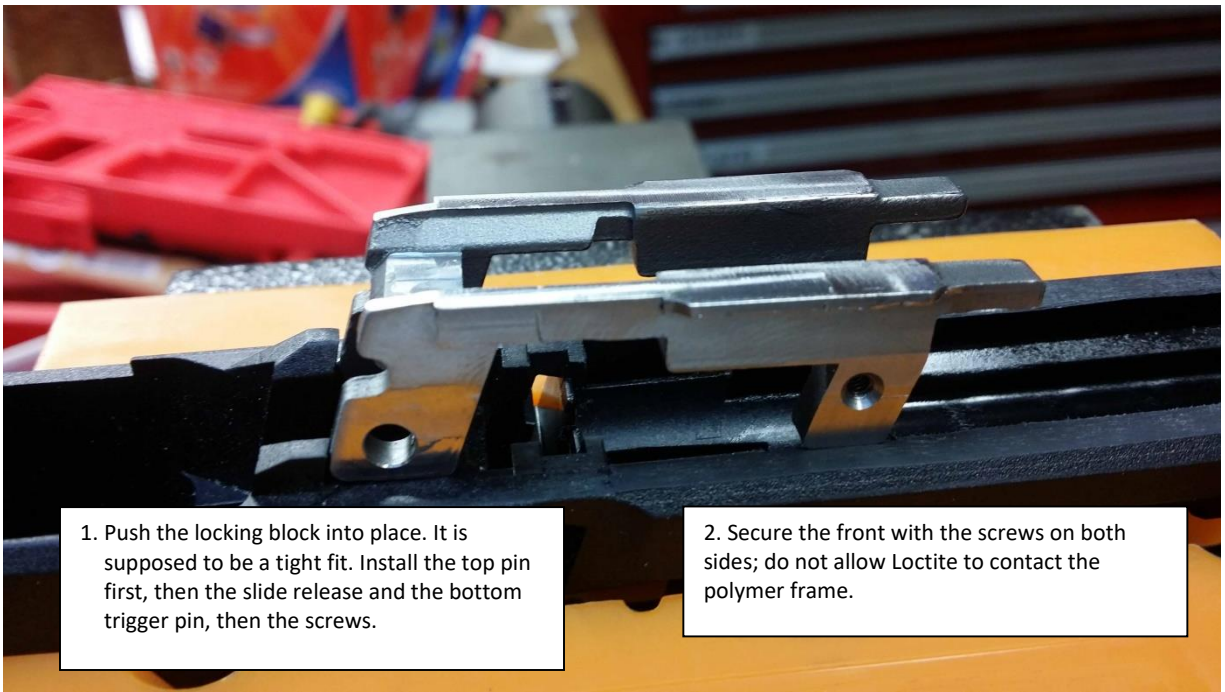
Using 220 grit sand paper and even finer sand paper will allow you to get the surface finishes smooth and clean on this Polymer frame.

Now that the cleanup and tweaking is complete, it's time to start building the pistol. The process requires fine tuning and fitment. These are important chronological steps

#### Installation Steps (A high level overview is on video on our website)

- a) Install the Magazine Catch Spring (25), gently tapping the pin into the hole inside the magwell with a hammer and punch. The pin sticks up into the Magazine Catch (24) area approximately 2mm when completed. Install the Magazine Catch using long needle nose pliers to nudge the pin in place until it snaps into the safety switch hole.
- b) Install Trigger Housing Mechanism into the rear of the pistol frame, along with the Trigger (see items 33, 20, 18). Tap the Trigger Housing Pin through the frame, and Trigger Housing Mechanism. This can be tough, so you can loosen things up by running the drill bit all the way through a few times to gently open up all three holes together so they align better.
- c) Install the Polymer80 provided Locking Block, inserting the Locking Block pin **first**, then the following procedure.
  - i) Install the Slide Release Mechanism, Trigger and Locking Block together using the large Trigger Pin. This is the toughest installation step because a small hammer, punch and periodic foul language and smashed thumbs are required to finish this step. Again, aligning them and passing the drill bit through all three a few times can become the deciding factor, but usually we try to install them without running the drill bit through at first.
  - ii) Once the pins are in, use a vice to gently pinch the Locking Block and Pistol Frame together until the front screw holes are aligned. Install the small black screws provided with the kit. Do not over tighten, use Loctite, Gorilla Glue or Super Glue or (see image below)

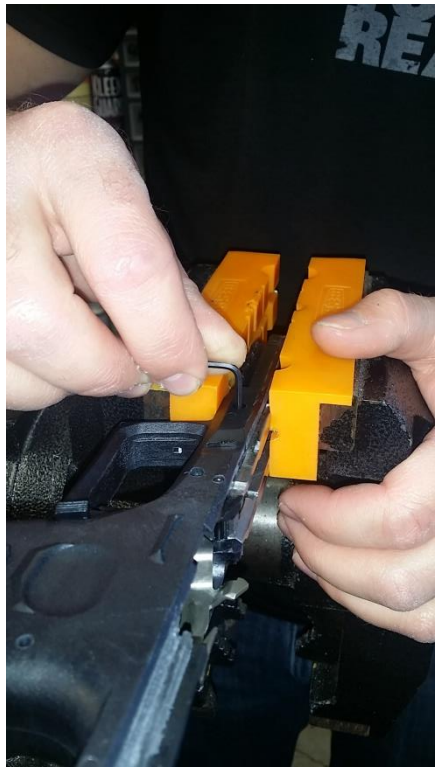
**TIP:** The plastic pin that comes with the trigger kits tends to get trashed when using a hammer on it. We recommend replacing with a second Locking Block Pin because it's longer and it's made out of metal. Because our pistol grip, it's more thick than the Glock frame, so you can get away with using this longer metal pin.



1. Push the locking block into place. It is supposed to be a tight fit. Install the top pin first, then the slide release and the bottom trigger pin, then the screws.

2. Secure the front with the screws on both sides; do not allow Loctite to contact the polymer frame.

Use the Vice to gently squeeze the rails down so the holes on the locking block slide rail align to the Frame holes, then use the hex head screws and Hex Key (allen) driver to install the screws, see below picture. Use a flashlight to look down into the hole. Note the soft orange vice grips that don't mar the pistol frame. They are magnetic on the vise side so they pull off easily. These are great tools for just about any type of work on finished products. Search google for Bessey, Model #BV-NVJ Non-Marring Vise Jaws.



**Final Steps**

- a) Install the Slide Lock Spring and Slide Lock using a screw driver to push the spring down tightly. This might require someone tapping the Slide Lock in while you hold the spring down....it's a bit tight.
- b) Test install the Slide, barrel, and recoil spring and guide rod on the pistol frame. Normally, things will be very tight at first. Don't over force things. The next step is to determine what needs fine tuning.



## Fitment to Slide and Testing

- 1) At first, the slide may go on rather tight. Your goal is to loosen up the pistol frame and slide as a system to allow it to move back into battery with just a slight pulling back of the slide and letting go. You might notice that the Slide skims along on the metal front guide rails smoothly, but as it connects to the rear polymer slides it begins to get tight.
  - a. Examine the rear rails closely as the Slide comes into contact **TIP:** flip the Slide around and insert it in backwards **without** the Slide Cover Plate installed to understand whether or the slide can smoothly insert over the rails.
  - b. If it is tight, there are two areas to consider sanding:
    - i. The underneath side of the rails to raise the Slide up off the frame slightly (preferred option)
    - ii. (last option) The top of the rear polymer rails to reduce the height of the rails and bring the Slide closer to the frame overall.
    - iii. One way or the other, if things are tight the pistol frame design allows for a custom fit. Slides from various manufacturers have completely different tolerances; most of them are much tighter than a Glock OEM part.



Again, your goal is to loosen it up to tune it to your own slide, whatever the manufacturer you chose. Use the small files and or sand paper to get the required refinements. Keep at it, the fitment can take up to an hour or more, and maybe even some field time to make sure the pistol is operating smoothly. Go ahead and add some grease to the rails too **early on**, rack the system a few times and get it to work together.

**TIP:** There's been a few builds where we've had to sand the top backside of the Locking Block to get that one extra refinement. How will you know when to do this? If you see the *finish* of the top of the slide rails being scraped off after you've racked the slide back and forth multiple times, AND your pistol is not simultaneously going into battery while conducting fitment or shooting trials, then a quick touch on a belt sander or hand sanding or using file could help fitment. Take a thousandth or two off where you see witness marks, then rack it and see how it's working. You can add a small amount of black marker or paint to re-examine if the slide is being scraped at the top.

### **Refinement Tips:**

Normally, things will slowly fall into place as the system begins to loosen up with some oil or grease, small refinements, and careful examination. Eventually, smoothness of pull on the slide is your indicator.

- a) Finishing the project requires a "feel", slowly pulling the slide back and carefully noticing resistance where it shouldn't be. The Glock is normally "sufficiently" loose AND smooth, so you are trying to replicate to something close. If you have a Glock, **empty the gun and make it safe**, then sit there for a few minutes pulling the slide back and releasing to allow your muscle memory to take over to understand the goal.
- b) On the PF940 frame with the slide, check to make sure the spring is not binding or touching the polymer interior by noticing any scratching on the recoil spring or parts touching or scraping. If you've milled the bridge off properly and to the floor and even with the spring seat, you shouldn't have a problem.
- c) Make sure the screws aren't touching or scraping the spring, if so just file them down a little.
- d) Also, while doing fitment stick to one Slide, one Spring and Guide Rod, one Barrel...DON'T START MIXING PARTS until you get one pistol setup and working properly. Be scientific and controlled about the process and you'll have one system working. Only then should you move on to other parts (if you intend to use other slides and barrels as an example).

**Final Test, and perfect action: The final test on tuning, and the moment you know things are going to**



work great is when you slightly pull the Slide back a ½ inch to maybe a few inches and then release.... the slide should go to full battery position. The recoil spring is not impinged, and it's strong enough to lightly pull that slide all the way forward, the barrel is then seated properly and you are ready to go. That's when you know you've found the sweet spot.

Now, do the same procedure but pointing the pistol straight up. Even gravity can negatively affect the action, so test it. If it goes into battery while pointing up, you've achieved the next level of tuning and you're ready to hit the field and do some shooting!!

**CHECK BACK HERE OVER TIME AS WE CONTINUE TO ADD INFORMATION THAT WILL EXPAND AND REFINE THE INSTRUCTIONS**



Example of a file being used to carefully bring down the material for custom fitment. Use 220 grit sand paper to finish

Milling off the top of the slide is usually the last procedure. It's better to thin things out in the area underneath the rear slide, sanding upwards. See below



In some cases, using a small thin file to refine the milled area upwards (demonstrated in blue here) is necessary to get that tight fit that doesn't impeded on performance. Take your time, the more time you put in the effort without rushing. A smooth and tight finish will make your pistol more accurate, and you'll take more pride in the finished product.

## AFTER MARKET PARTS

If your questions can't be answered here, call support at 1-800-517-1243 or send a Customer Support ticket through <http://www.polymer80.com/contact>