

IV. Assembly of Lower Receiver

Assembling the lower receiver is probably the most difficult process of the Challenge Kit. In our company, you won't be recognized as full-fledged until you can assemble a lower receiver.

Nonetheless, the most important point in this section is to follow the order of assembly. If you don't follow the order, you may have to redo some of the works! So make sure you follow the instructions step-by-step!

I. Installation of Trigger Guard Assembly

First, refer to right photo and insert Trigger-Guard Assembly (ASS-LR-01) to lower receiver, using the spring-loaded Trigger Guard Stopper Pin (LR-015) to held it in-place.



Next, press-fit Trigger Guard Set Pin (LR-018) with Teflon-based pliers as shown.

2. Install Magazine Latch

First, insert Magazine-Catch (LR-008) from left side of lower receiver. Next, place Magazine-Catch Spring (LR-010) over magazine-catch shaft from the right side. Then, screw Magazine-Catch Button (LR-009) on the magazine-catch shaft, over magazine-catch spring. After some screwing, press the magazine-catch button into the receiver until the magazine-catch sticks out from the left. Rotate the magazine catch clockwise several turns (as shown), then rest it into its original hole.



3. Glue Dummy Pin

There are total 6 pins to be glued: Trigger Dummy Pin and Hammer Dummy Pin (LR-019, 4x), and Full-Auto Sheer Dummy-Pin (LR-020, 2x). We recommend using Loctite 403, but any adhesive that does not leave any residual / coloration will be fine.

To glue the pins, dip a toothpick into the adhesive and use the toothpick to apply a very small amount of glue into the middle of each groove. Then place each dummy pin into their corresponding groove, and apply pressure until adhesive sets.

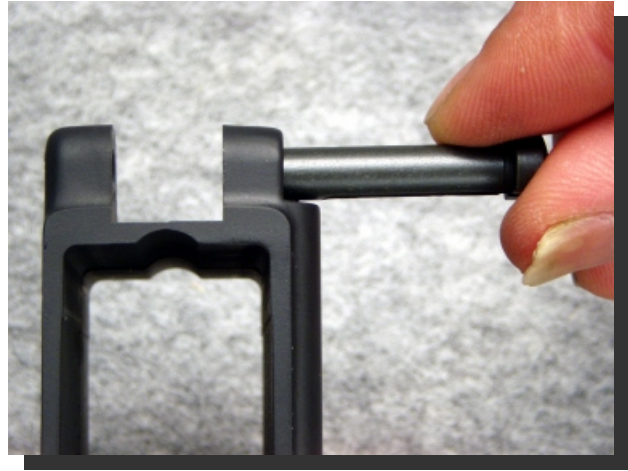


4. Glue Selector Cap

Using the same adhesive, apply small amount of glue into the ledge of the Selector-Cap (LR-021), and place it into its respective groove on the receiver. If needed, use a small plastic hammer to set it in place.

5. Assemble Pivot-Pin

Insert Pivot-Pin Spring (LR-004) and then Pivot-Pin Stopper-Pin (LR-003) into the corresponding hole from the front of the receiver. While holding both parts inside the hole, insert Pivot-Pin (LR-002) through the lower receiver as shown.



6. Install Motor

The trick to install motor correctly is to always remember this: **Positive terminal at the front.** If you look at the bottom of the motor, you should see a red mark over one of its terminal. That is the positive terminal. After the motor is installed, the red terminal should be facing for front (muzzle-end) of the gun.

To install motor, insert motor perpendicular to the lower receiver, and rotate it 90 degrees (as shown) to lock it in place. Remember the positive *red) terminal should be facing front; pay attention to it when you insert/rotate the motor.



Once the motor is in-place, insert the Motor Fixing Pins (LR-023, x2). If the pin do not fit in smoothly and tapping / hammering is required, make sure the motor is properly and evenly supported first. A piece of board under the motor to distribute the pressre would work. This is important because the motor is a structural part of the PTW, and it (or its joint to the lower receiver) must not be deformed.



IV. Assemble Slide-Stock

In this section we will be assembling the slide stock. Since the stock bears a great amount of force during operation, it is important that it is assembled securely and professionally. Properly apply torque in various tools are key to making the slide stock rock-solid.

I. Installation of Stock-Tube

Prepare stock tube by installing Stock Tube Nut (SST-012) onto the Stock Tube (SST-011) with the four notches facing the rear. Thereafter, insert Stock Set Plate (SST-013) over the threaded part of stock tube.



Next, insert Take-Down Pin (LR-005) into the lower receiver. Then from behind the receiver, insert Take Down Pin Stopper Pin (LR-006) and then the Take Down Pin Stopper Pin Spring (LR-007) into their insertion hole, as illustrated.

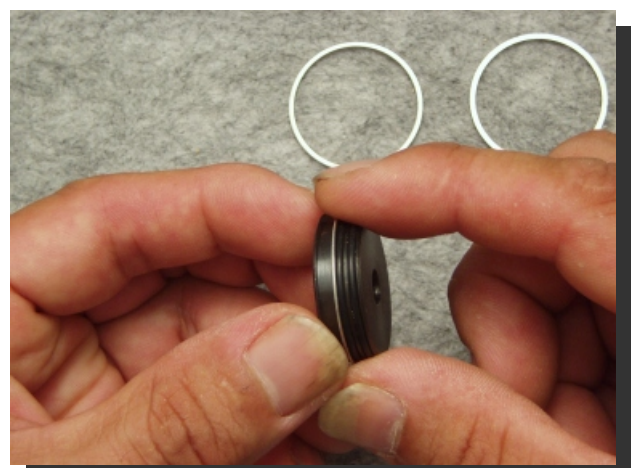
Finally, screw stock tube into lower receiver. Pay attention to the positioning; the front end of the stock tube should not protude from the lower receiver. If the stock tube is too far forward, the receivers won't close. Typically the front of the stock tube should still be about 2mm recessed.

Once the stock tube is in position, use a stock tube wrench to loosely tighten the stock tube nut. Do not fully tighten the nut yet because you may need to loosen it and re-adjust the stock tube front/aft in the next step.



2. Adjust Stock-Tube Cap

The Stock-Tube Cap (SST-015)'s main purpose is to lock the upper receiver in-place when the receiver is closed. There is a hole in the middle of the stock tube cap where the click-ball of the cylinder unit fits into. Proper positioning of the stock-tube cap is important for proper operation, and it is adjusted using shims (look like large silver rings) included with the stock tube cap.



3. Assemble Slide Stock

Position the Slide Lock (SST-004) under the stock with the hole aligned, and securely hold it in place with your hand. Then place Slide Lock Pin Spring (SST-003) over Slide Lock Pin (SST-002), and insert the pin, from inside the stock, through the hole on the bottom of the stock and out through the slide lock.

With the threaded tip of the slide lock pin sticking out from the bottom, thread the Slide Lock Nut (SST-005) over it to secure the slide lock in place. The slide lock nut should be fastened to the shown position (refer to photo). Thereafter, press-fit the Fixing Pin for Slide Lock Nut (SST-006) into the opening between the slide lock nut / slide lock pin to prevent the slide lock nut from loosening.

Finally, install O-rings on Battery Stopper Cap (SST-008-7.2), and then twist the stopper cap into the slide stock's front opening as shown.



4. Installation of Slide Stock

While pushing the slide lock all the way downward (as shown), insert slide stock over stock tube.

Once the slide stock is in-place, glue the sponge-sheet (SST-007) over both sides of the stock. Never pull the sheet during installation or it will become stretched and will not obtain proper fit. Evenly and gently glue them starting from the edge of the sponge sheet and work your way across should result in good finish.

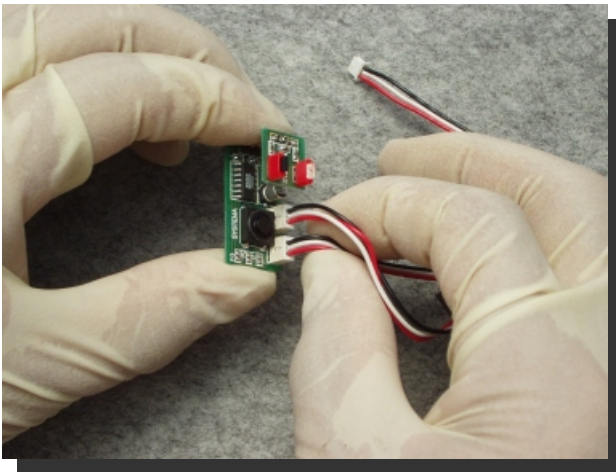


Vi. Installation of Electrical Components

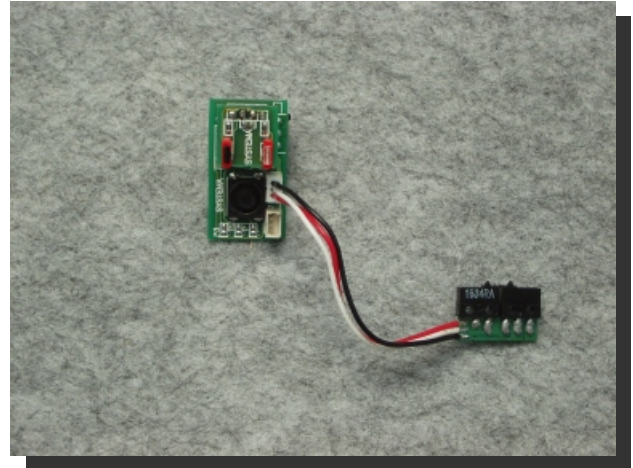
This is the longest section of the entire manual, which deals with installation of various electrical components - the control circuits of the PTW. Please note that any electronic components are sensitive to static electricity, so wearing either a good quality grounding lanyard or the included rubber gloves are highly recommended. In addition, in this section two wires must be soldered to the motor. Care should be taken to avoid serious burning injuries from the solder iron or other parts that has been heated up during the process.

1. Connect Electrical Control Unit

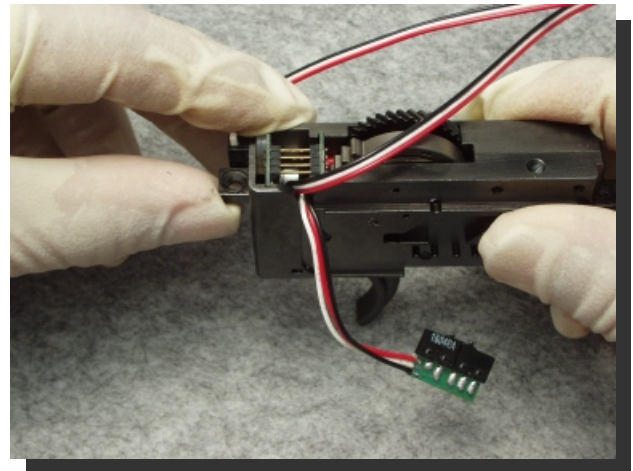
Locate the Selector Switch Board (EL-002), and connect the 3-wire lead (its mini connector) to the upper socket of the SYSTEMA/Electrical Control Unit (EL-001). (Upper socket is the one closer to the center of the circuit board.)



Finally, insert the Electrical Control Unit very carefully into the gearbox. Pay extra attention to now each control cable exits the gearbox from the side. You should try to arrange the cables as shown.



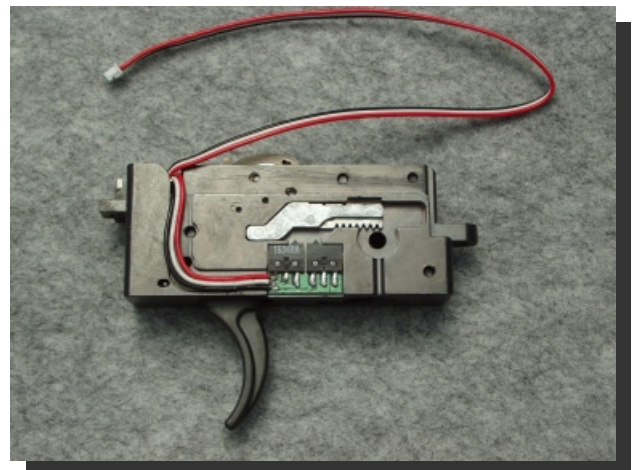
Connect one end of the Control Cable (EL-004) on to the lower socket of the electrical control unit. Note the use of rubber glove.



2. Install Selector Switch Board

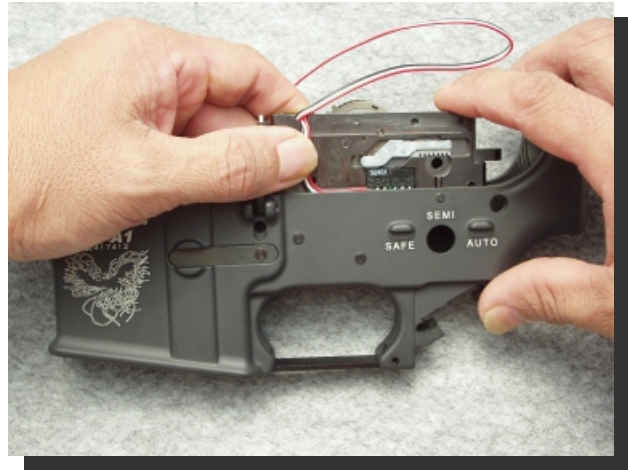
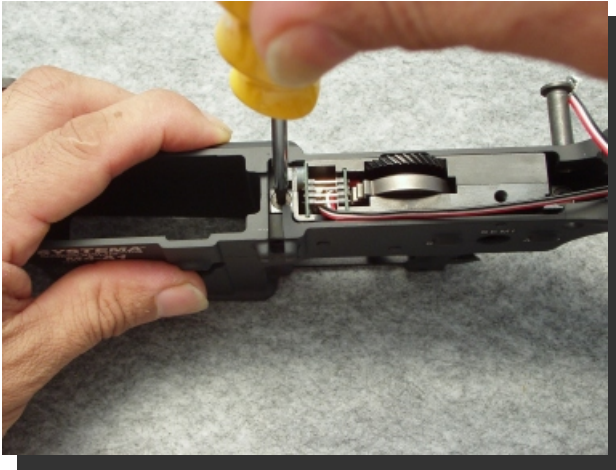
Route the selector switch board control along the groove cut into the left side gear case. The cable must lay flat against the gearbox as shown, or the completed gearbox will not fit into the receiver.

With the cable properly situated, the 4 holes on the selector switch board (2 holes per switch) should line up with the 4 studs on the left side gear case. Push the switch board against the gearbox so that each stud is fully inserted into its corresponding hole in the switch board, securing it.



3. Install Gearbox

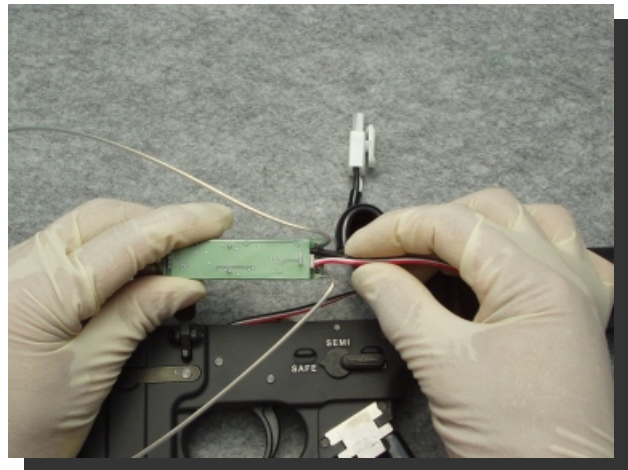
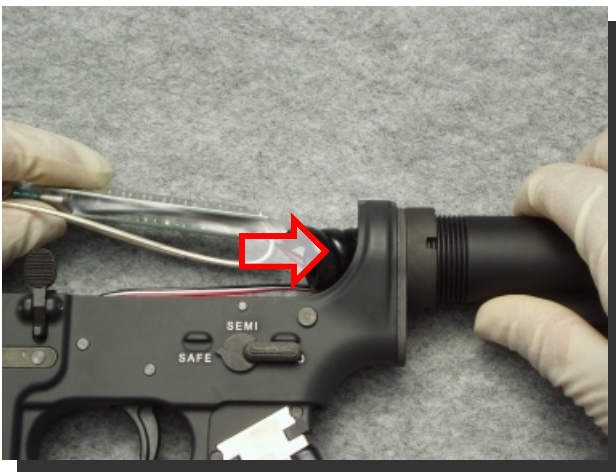
Insert motor as shown. Make sure the motor stays perpendicular to the gearbox at all times, and do not left out the selector rack gear (the silver piece). Also pay attention to not pinch any of the control wires.



Once the gearbox is fully seated into the lower receiver, secure the gearbox by fastening two Set Screws for Gear Box (GB-025) through the mounting holes of the gearbox, onto the lower receiver.

4. Install Switch Device

First, plug the control cable from the electrical control unit into the Switch Device (EL-003).

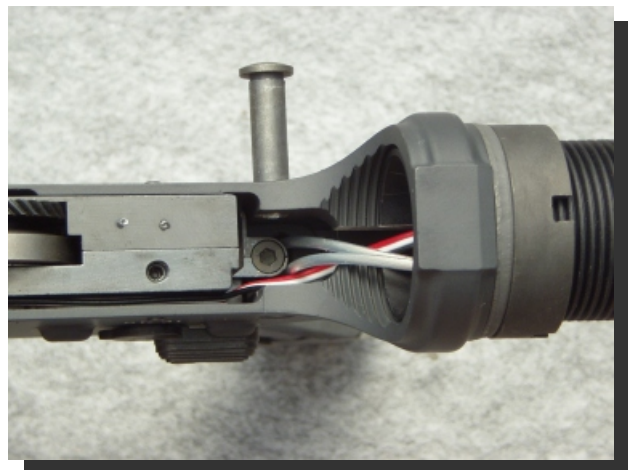


Then remove the stock tube cap, and push the battery plug, coiled cord, and the switch device (in this order) into the stock tube. Replace stock tube cap when done.

As illustrated, route the two motor wires through the small opening in the lower receiver (located behind the gearbox) into the grip/motor compartment. Also, tuck the control cable into the grooves as shown.

NOTE

It is generally preferred to route the negative motor wire through the right hole (the side where the take-down pin is sticking out), and the positive motor wire through the left hole.



5. Install Selector Lever

First ensure the selector rack gear is at the forward (SAFE) position. Use a small pin punch or tooth pick to make sure it is pushed forward fully.

Then slightly grease the Selector Lever (GB-018) shaft, and then insert it into the opening, while orienting it to the "SAFE" position (selector lever pointing the front / muzzle end of the gun). Once fully inserted, rotate it from SAFE to AUTO to ensure full range of movement.



Finally, insert Selector Click Ball (GB-021) and then Selector Click Ball Spring (GB-020) through the small, threaded opening at the top of the gearbox. Then fasten Selector Click Ball Screw (GB-019) over the hole, slowly tighten the screw until resistant is felt. The selector lever's resistant is adjustable by how tight you fasten the selector click ball screw.



6. Install Line Set Plate

Insert the small plastic plate called Line Set Plate into the groove as shown. It will prevent the control cable from popping out during operation.

WARNING

The control cable must be positioned as long in the body as possible, otherwise it may be damaged by the upper receiver tab when you assemble the two parts together.



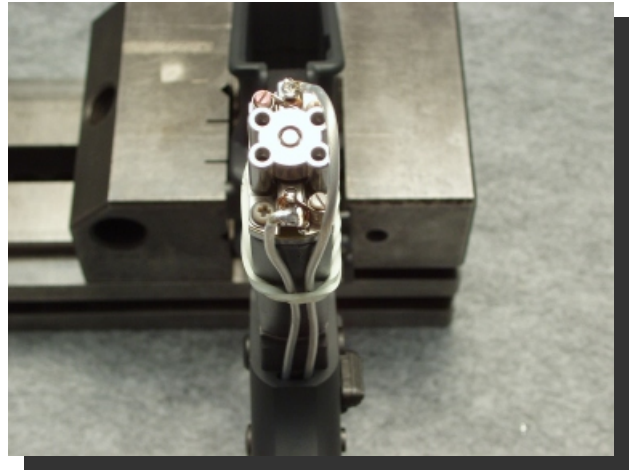
7. Install Bolt Stop

Insert Bolt Stop Spring (LR-012) into the corresponding hole in the lower receiver. Then position the Bolt Stop (LR-011) over the bolt stop spring, aligning the hole with the retention pin holes on the lower receiver. Finally insert Set Pin for Bolt Stop (LR-013) through the corresponding hole from the rear (butt stock side) of the receiver, with the knurled end facing the rear. Use a pin punch to secure the pin in place.



8. Solder Motor Wires

Use a rubber band or electrical tape to temporarily secure the motor wire in-place. Then solder the wire as shown. Note the longer wire is positive which should be connected to the brush case next to the brush spring post painted red, and the shorter wire is the negative which is to be connected to the other brush case.



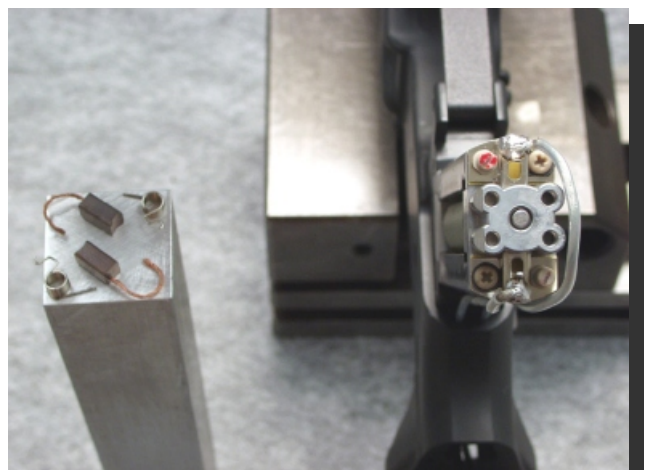
TIP

A common technique for expert soldering is called “pre-solder”. Pre-solder involves applying sufficient amounts of solders to both parts prior of them to be joined. When you are ready to join them, simply stack the two together and press with your solder iron. For example, we apply solder to the end of the motor wire first (left). Then we apply some more solder on the motor’s brush case (middle). There after, we just place the wire’s end over the terminal, and melt them together. Its that simple!



WARNING

Do Not Over-solder! If you apply too much solder on the brush case, it may overflow into the inside of the brush case, bonding the brush as well. The motor brush must move freely inside the brush case for the motor to work properly, as it needs to constantly self-adjust while making contact with the commutator. If you are inexperienced with solder, consider removing the brush and brush spring from the motor first (as shown), before you solder the wires.



9. Install Grip and Grip End

Gently slide the Grip (LR-022) over the motor, ensuring the motor wires do not get squeezed or pinched between the grip and the motor.



Once the grip is fully inserted, through the opening at the bottom make sure the positive motor wire is routed towards the side of the motor's bottom mount point. There is a small notch on either side of the grip end for the wire to rest. If the wire do not rest in said groove, it will be damaged.

Next, place Grip End (LR-025) over the bottom opening of the grip with the correct orientation (see picture) and fasten the grip end to the motor by using the 4 Group End Screws (LR-027).

Finally install Rotor Adjust Screw (LR-026) in the center opening of the grip end, but do not tighten. The newer motor that comes with the kit does not require adjustment anymore, and the rotor adjust screw is just there to cover the hole. Fasten the screw until the top of the screw is flush with the top of the hole.



VII. Testing Function

A few tests to ensure proper function prior to fully assembling your PTW!

1. Check function of Gearbox

With the upper and lower receiver still separated, install battery in the battery compartment (sliding stock), depress the bolt-release button, switch the gun to "SEMI", and pull the trigger. The helical gear and sector gear should rotate. Be careful not to get your hand caught/cut on the gears!

A. Notice the rotation of the internal sector gear. It should be rotating the teeth towards the rear of the gun over the exposed area. If the sector gear rotate in the wrong direction, STOP! Disassemble grip end and check for motor orientation and wiring. The positive and negative wire may be reversed.

B. After each time you pull the trigger, the sector gear should stop at the same position with almost all of its gears hidden from view. If not, remove and disassemble gearbox, and check orientation of the internal sector gear.

After the semi-auto check, switch the gun to full-auto and pull the trigger. The gear should rotate for as long as the trigger is depressed, and as soon as the trigger is released it will stop the sector gear at the same position similar to semi-auto firing.



2. Joining Upper and Lower Receiver

Extend both the pivot pin and take-down pin as shown. Then align the front tab of the upper receiver with the hole of the pivot pin, and push pivot pin through the upper receiver until it locks in place.



During installation, if you have to hammer the pin in place, make sure the holes in the upper/lower receivers are perfectly lined up first to avoid damage to the receiver.

Finally, before you close the upper receiver, check the stock tube cap spacing again, and adjust the shims as needed. The receivers should "lock" in place securely without excessive force.



3. Close Receiver and Test Fire

Finally, with the cylinder unit fully inserted into the upper receiver, close the upper receiver as shown, and press in the take-down pin. Make sure there is no BB in the barrel /chamber, and test fire the gun without inserting any magazine in both SEMI and FULL mode. Unlike traditional AEG, the Systema rifle can be “dry fired” without any risk of damage, even though dry firing can exert as much as 4 times the force onto certain components within the gearbox (as opposed to when a BB is loaded). This is a standard durability test we do to every PTW before it is shipped to our customers.



4. Adjust Hop-Up

The Challenge Kit allows precise control of the hop-up by using a set screw, accessible from the magazine well. The hop up is already factory-adjusted for 0.20g BBs, so unless you will be using different weight BB, no adjustment is necessary. Nonetheless, if you want to increase the hop-up effect (more back-spin, BB sails higher), turn the set screw counter-clockwise. For less hop-up effect, turn the set screw clockwise. Only turn the screw 1/4 turns each time and repeat as needed.



That's it! Congratulations on successfully conquering the Challenge! I hope you will enjoy your new, state-of-the-art Systema rifle as much as we enjoyed making it.

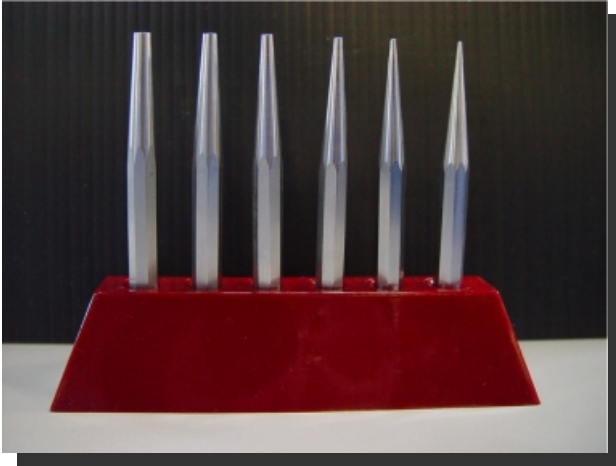


VIII. Tools

In this section we will introduce you to a few unique tools mentioned in this instruction. We believe this is helpful because every tool is carefully chosen after many years of experience, and we use them every day to assemble our products!

1. Pin Punch

The first picture is conventional pin punch. They are fairly common tools although not many people have a full set.



This is a more specialized set with tapered head, they are useful to limit the depth of travel, useful for items such as the take-down pin.

2. Hammer

We use 3 types of hammers, because it is very important to apply the appropriate force depends on the strength of the parts being worked on. The plastic and rubber head hammers not only reduce the chance of damage to the parts, it also transfer less energy hence allow us to better control the force used.



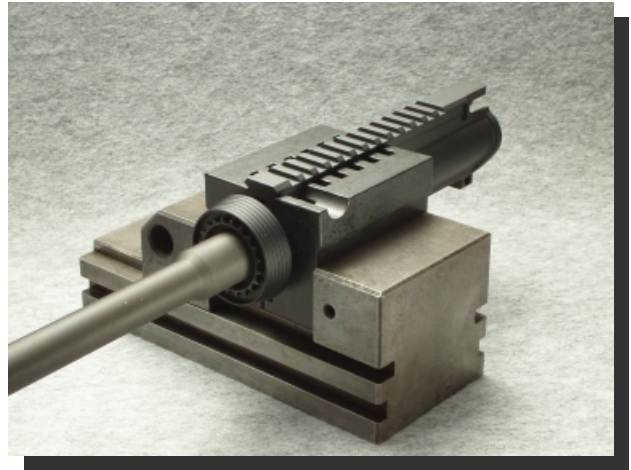
3. Teflon-Based Pliers

We use this very often because it does not scratch or scar the surface of the item being worked on. You can also remove one of the base when you need more grip on just one end. It may be lavish, but it is quite convenient if you can own two pairs.



4. Upper Receiver Clamp

This clamp was originally designed to hold real gun in place, but it is an excellent tool during barrel installations. You do not have to worry about applying too much force on the upper receiver or damaging it.



5. P.T.W. Wrench

This is a product we imported from a U.S. firearm manufacturer, Bushmaster. It was originally designed for real gun's barrel nut and stock tube nut, and we added a special cut and attachments so that it can also be used to work on cylinders. It is truly a multi-talented wrench!



6. Adhesive

Choosing adhesive is important. We meet with adhesive makers frequently to evaluate new products and help them improve their existing adhesives. After years of use, we've found these adhesives to be of superior quality:

Cyanon 722, Loctite 403 and Loctite 702.



7. Grease

This is one of the best-selling Systema product, and its quality is well-known. With these two you can cope with most situations.



IX. Final Words

1. Convenience and Organization

This is a topic that should have been mentioned in the very beginning, but was forced to be put at the end due to layout reasons.

In our company, you can easily tell who is an assembly expert by observing one's desk.

Foundation for assembly work, or any other work, is organization. That is, placing tools you use with right hand on the right side and vice versa.

Skilled workers call it "Convenience."

It is simple. If a right-handed person tries soldering with soldering iron cord coming from left, he will have to work under significant stress.

Another point is clearing desk. Unless you can organize your work in steps, you will not be able to put away any material you do not need for the current task. Naturally, there will be fewer mistakes if you are organized.

"Convenience" and "organization": there are more than techniques you can learn from an expert.

2. Maintenance

Now that you assembled the whole P.T.W., we should assume you know which parts need maintenance work, but we will review it as the last thing on the agenda.

- 1. Wipe off all greased parts, and replace all grease completely. Never just add grease.**
- 2. Clean barrel often. Chamber-packing of P.T.W. is fairly durable for its thicker-than-usual design, nevertheless be careful when cleaning the packing.**
- 3. P.T.W. is made with significant amount of steel parts in order to make the weight and balance equivalent to real gun. These steel parts, in most cases, are finished with Parker Rising process (phosphoric manganese finish). For those surfaces, apply anti-rust oil such as CRC-556.**
- 4. Apply commercial silicon spray solely to chamber about once every 300 shots. This will maintain the gun in good operating condition.**

3. Troubleshooting

Although it is a self-assemble kit, it is still our product and we always strive to support our product as much as possible. If you do not understand the instruction or if the assembled gun doesn't work no matter what you do, please contact us in the following order:

- 1. Your first line of defense will be the dealer from whom you purchase your Challenge Kit from. Almost all authorized Systema Challenge Kit dealer have in-house expertise to troubleshoot the product. This is one of the main reason to support your local airsoft dealers, where you will receive much better support and convenience. Most of the time if it is a simple oversight that they can point out quickly, they will not charge you a fee.**
- 2. Contact the Systema PTW Owner's Club (online community, will be available soon). As a Challenge Kit owner, you are encouraged to join the online club already, so why not take advantage of the expertise there. Perhaps you can find someone locally that can help you troubleshoot your problem. You may even run into our engineer on the forum!**
- 3. Contact SYSTEMA directly, either our Japanese Headquarter or regional distributors. Please note that due to the nature of a self-assembled kit, we cannot guarantee that the finished product will always function 100% because we have no control of the assembly process. However we are still more then happy to help, just keep in mind that depends on the level of involvement, engineering time and/or replacement parts will be subjected to fee.**