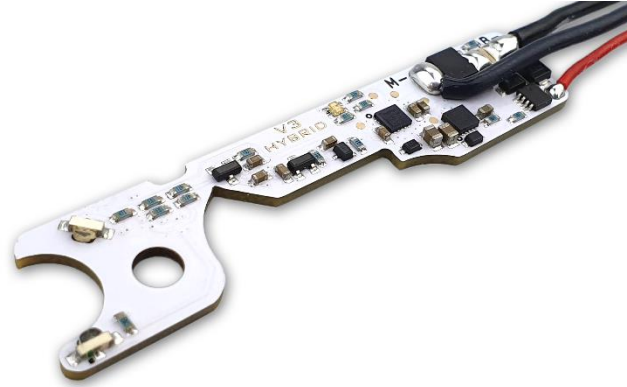


Perun V3 Hybrid – semi only version

User and installation manual



Perun V3 Hybrid replaces mechanical contacts in your replica and provides lots of useful features. Optical and magnetic sensors allow to eliminate many moving parts that are prone to damage, thus increasing the reliability. The elasticity of this unit gives you certainty, that replica made from parts made by different manufacturers will not have any incompatibility issues. Adaptive trigger control allows switching from a very short trigger travel to a long one even in the field, with almost any trigger, including stock ones.

Reading this manual will help you fully exploit this unit’s potential and in case of encountering any problems, you can look for solutions to them here.

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1. Technical data

Recommended power sources

Perun V3 Hybrid works with any power source that provides a voltage between 7 and 17 volts and can deliver enough current to ensure smooth cycling of the replica. Li-Po and Li-Ion batteries with a nominal voltage of 7.4, 11.1 or 14.8 volts are recommended. It is also advised to use batteries with possibly high „C” parameter and capacity. This is safer for the battery, as it should not be working on the edge of its capability. In this video, we are showing why:

<https://www.youtube.com/watch?v=s8RKcly810A>

Capacity and the „C” parameter also influence the rate of fire of the replica:

<https://www.youtube.com/watch?v=5hO25aPvHcU>

Compatibility with high-ROF and high-power builds

Perun V3 Hybrid can work with any replicas, including highly tuned.

Compatible gearboxes, gears, and triggers

Perun V3 Hybrid are designed to fit version 3 gearboxes in Tokyo Marui standard.

Gearbox color or its “shininess” has no effect on the operation of Perun V3 Hybrid.

Perun V3 Hybrid was successfully tested in and should fit **without the need for any modification** in the gearboxes made by following manufacturers: ASG, E&L, LCT, G&G, JG (including Echo 1 versions) and Ultimate. Grinding of the contacts screw area is needed in Cyma gearboxes. Incompatibility with JG FAL has been reported. Please be advised, that despite our best efforts to provide reliable information, we cannot guarantee full compatibility for all the gearbox shells mentioned above. Replica manufacturers sometimes slightly change dimensions of their parts from batch to batch, bringing need for some adjustment or in extreme cases, making them incompatible.

Perun V3 Hybrid works with any gearset, including DSG, TSG, short stroked, helical, non-helical, and with any ratio. Stock and aftermarket triggers in Tokyo Marui standard can be used with Perun V3 Hybrid. Trigger color does not affect the operation. Perun V3 Hybrid will not work in Steyr AUG or any other replica, which does not have a selector plate.

Electronic fuse

Perun V3 Hybrid has an integrated electronic fuse, which will automatically cut the power off in case of a short circuit or when a gearbox jam is detected. The fuse does not wear out when it is activated.

Battery connector type


Perun V3 Hybrid comes with a T-Plug connector (T-Deans).

Stand-by current consumption

Whenever the battery is connected and selector is set to “SAFE”, the mosfet consumes 1.5 mA of current. While unnoticeable during normal play, it may deplete your battery completely and damage it, if you store the replica with battery connect for a week or more. Therefore, always remember to disconnect the battery after use.

Brushless motors

Perun V3 Hybrid works with BLDC motors like Option No. 1 or Warhead. However, a few cases were reported where a BLDC motor was not properly detected by the unit.

 *RoF reduction feature must not be activated when these motors are used.*

2. How does it work?

Perun V3 Hybrid uses optical and magnetic sensors for the detection of sector gear, trigger, and selector plate position. It has no moving parts at all. That provides not only great reliability but also flexibility, thanks to which Perun V3 Hybrid will work without problems in almost any combination of gearbox shells, triggers, selector plates and sector gears.

Sector gear detection

Sector gear phototransistor (sensor) and IR LED diode work in pair as a barrier switch. When sensor and diode cannot “see” each other, it means that the sector gear cut-off cam is between them. Perun V3 Hybrid is using information whether the cam can be seen or not, to determine which gearbox cycle phase is currently taking place. Photo below shows the line between the sensor and the diode.

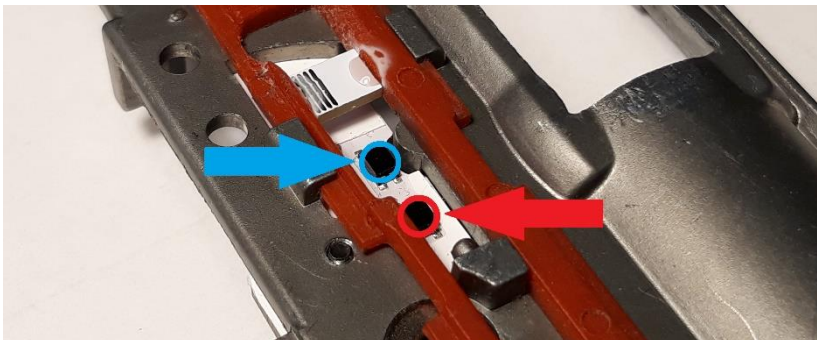


Selector sensor

There are two selector sensors on Perun V3 Hybrid, marked blue (for semiautomatic mode) and red (for auto) on the photo to the right. These sensors work by emitting infrared (IR) radiation and detecting, how much of it is coming back to them due to reflection from nearby objects. White objects reflect most of the IR, while black almost none. Also, objects must be very close (less than 1mm) to the sensors to be detected, so lack of anything above them also results in no readings.

When the white area on the selector sticker is above the “SEMI” sensor, it is reflecting IR back to it, letting the unit know that the corresponding selector position has been set – provided that the sticker is well placed. The same principle works for “AUTO”.

“SAFE” is detected, when the white area on the sticker is not present above any of the sensors.



Trigger

Hall-effect sensors are monitoring the magnetic field generated by the magnet in the magnet holder installed on the trigger. These readings are then conveyed to the microcontroller of the unit, which depending on the sensitivity setting and trigger position, may trigger a shot. The magnetic sensors are also able to detect, whether an external magnetic object is present near to the replica and in such case, will activate external magnetic field alarm to prevent an unintended shot.

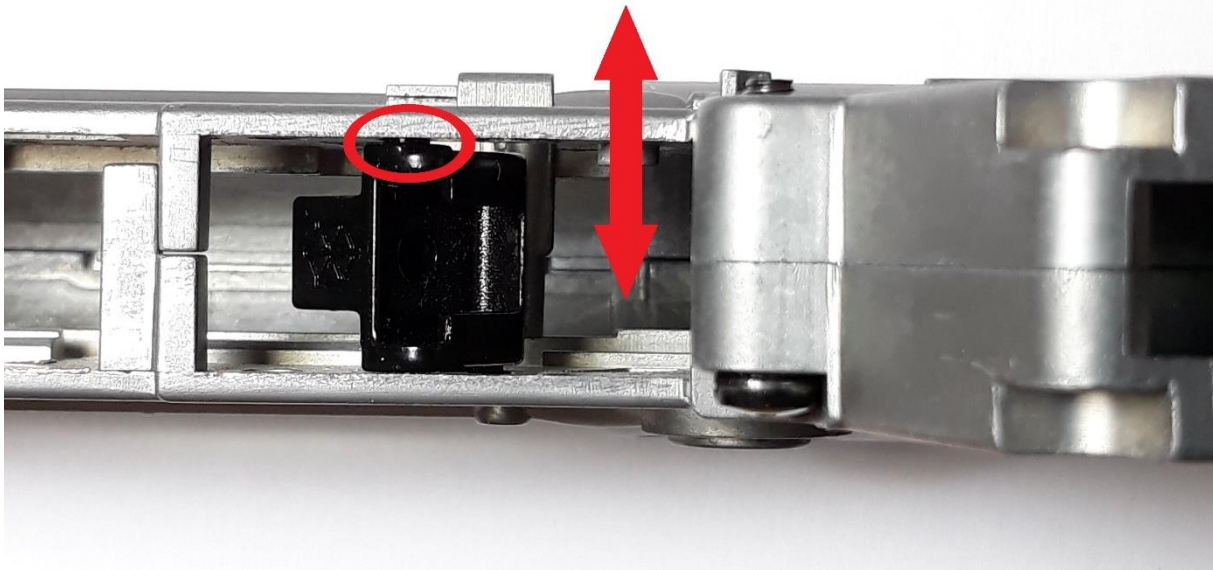
3. Installation

Supplementary video manual is available here:

<https://www.youtube.com/watch?v=oud8-2KDeQk>

*Note for AK-type replica users – because AUTO and SEMI in AK's are reversed in comparison most systems and we need to hold to single terminology, **for the time of installation let us assume a "SAFE->SEMI->AUTO" selector setting**, like in most replicas. After the installation is finished, you will be easily able to set a standard AK "SAFE->AUTO->SEMI" setting.*

1. Disassemble the replica and the gearbox. Remove everything from the gearbox.
2. Place only the magnet holder in the gearbox and screw the shell back. Check, whether the magnet holder does not have too much space and can move to the sides, as shown on the photo below.

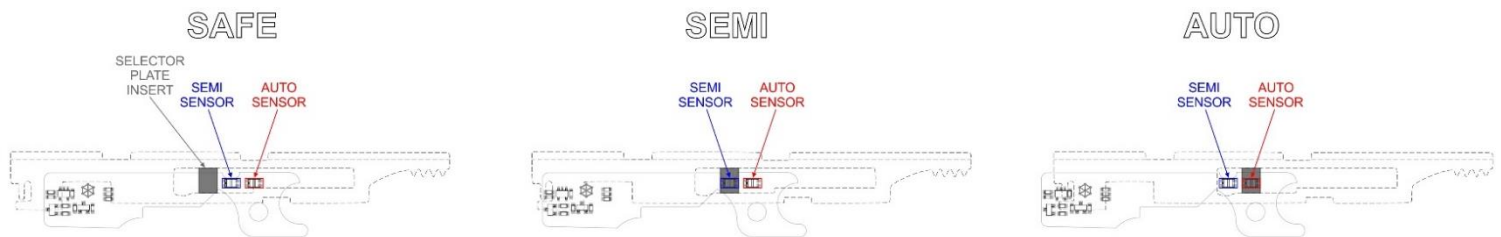


If there is too much space, limit it using standard AEG washers, exactly the same as the ones used for shimming the gears. The quantity of washers should be such, that the **magnet holder can wobble only a little bit, while it can still move completely free and without resistance**. It is very important, as either too much sideways play of the holder or friction, which would cause it not to return to exactly the same position each time the trigger is released, could result in faulty functioning of the unit, including activation of the "external magnetic field" error code.



3. Screw Perun in place. Make sure it is held firmly by the screw and **does not wobble**. Do not worry about the PCB, as in the screw area there are no electronic paths, and you do not need to use any gaskets. Do not use excessive force, though.
4. Tear one of the selector inserts off the provided 3-piece set and cut it (or even better – sand it down) to a length that will make it tightly fit in the selector. **The insert should be as close to the sensors as possible!** The horizontal black lines on the selector are there to help you better control how much material you remove and to do it evenly. Make sure that they face upwards (outside of the gearbox) after installation. The sketch below shows, how does the selector sensor work and how should the selector insert be placed in relation to the selector sensors. For some more popular replicas you can also **refer to selector insert placement guide on page 17!** Use the scheme shown above to find the right spot to place the insert and apply a small amount of cyanoacrylate glue to fix it in place.

The result should look like on the photo below (**the exact placement of the selector plate insert may vary between replica models!**):



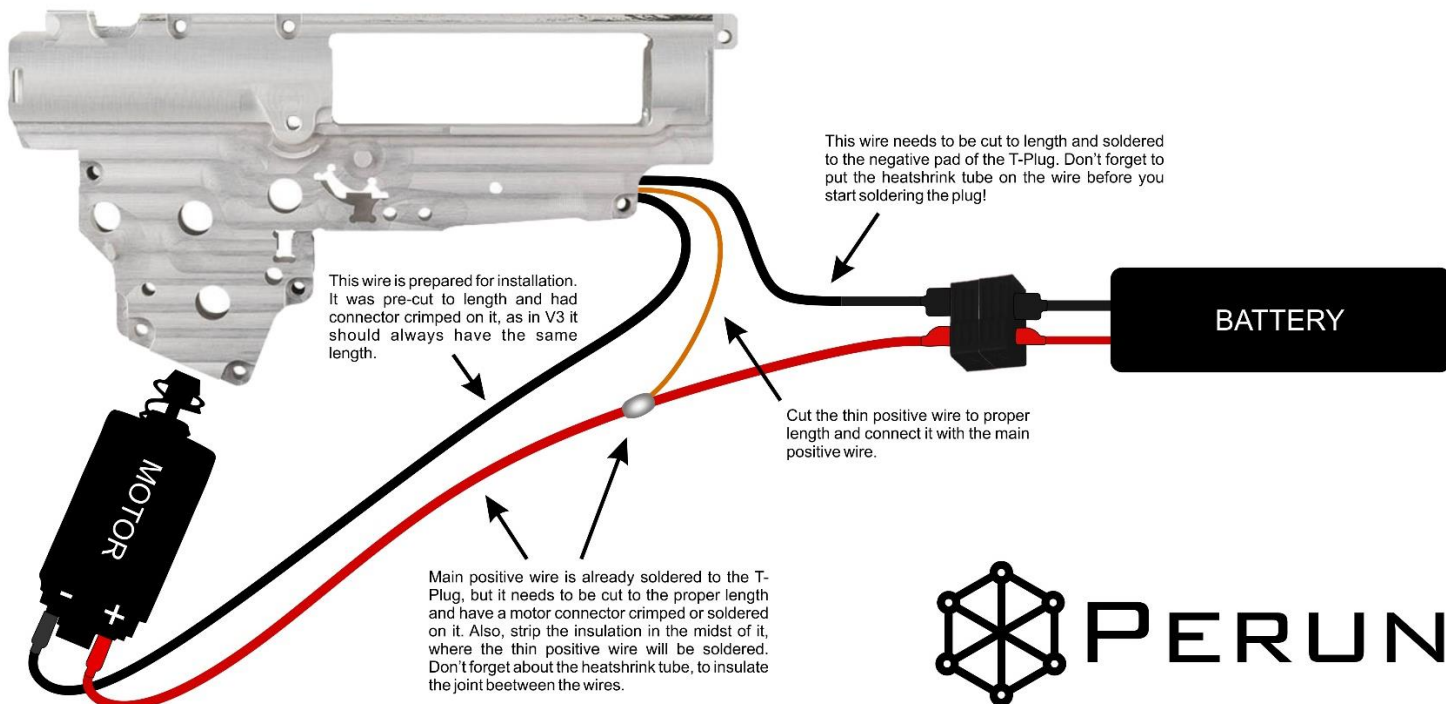
Selector plate insert is to the left of the semi sensor.

Selector plate insert is above the semi sensor.

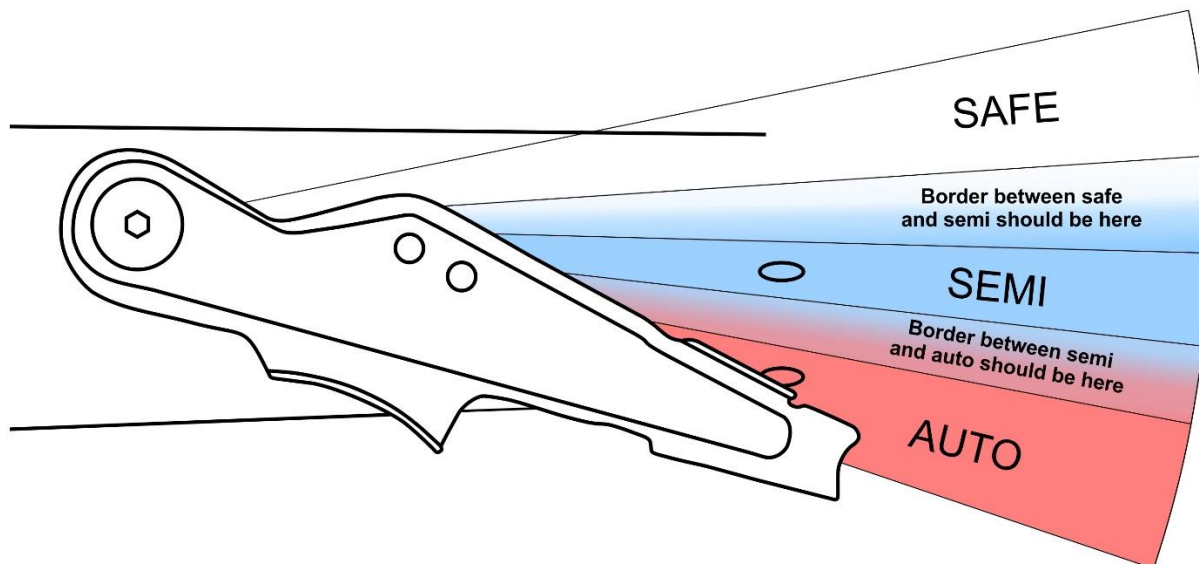
Selector plate insert is above the auto sensor.



- Assemble the gearbox only with the sector gear, Perun, and the trigger inside.
- Cut the wires to desired lengths and solder them according to the scheme below. Do not forget about the heatshrink tubes!

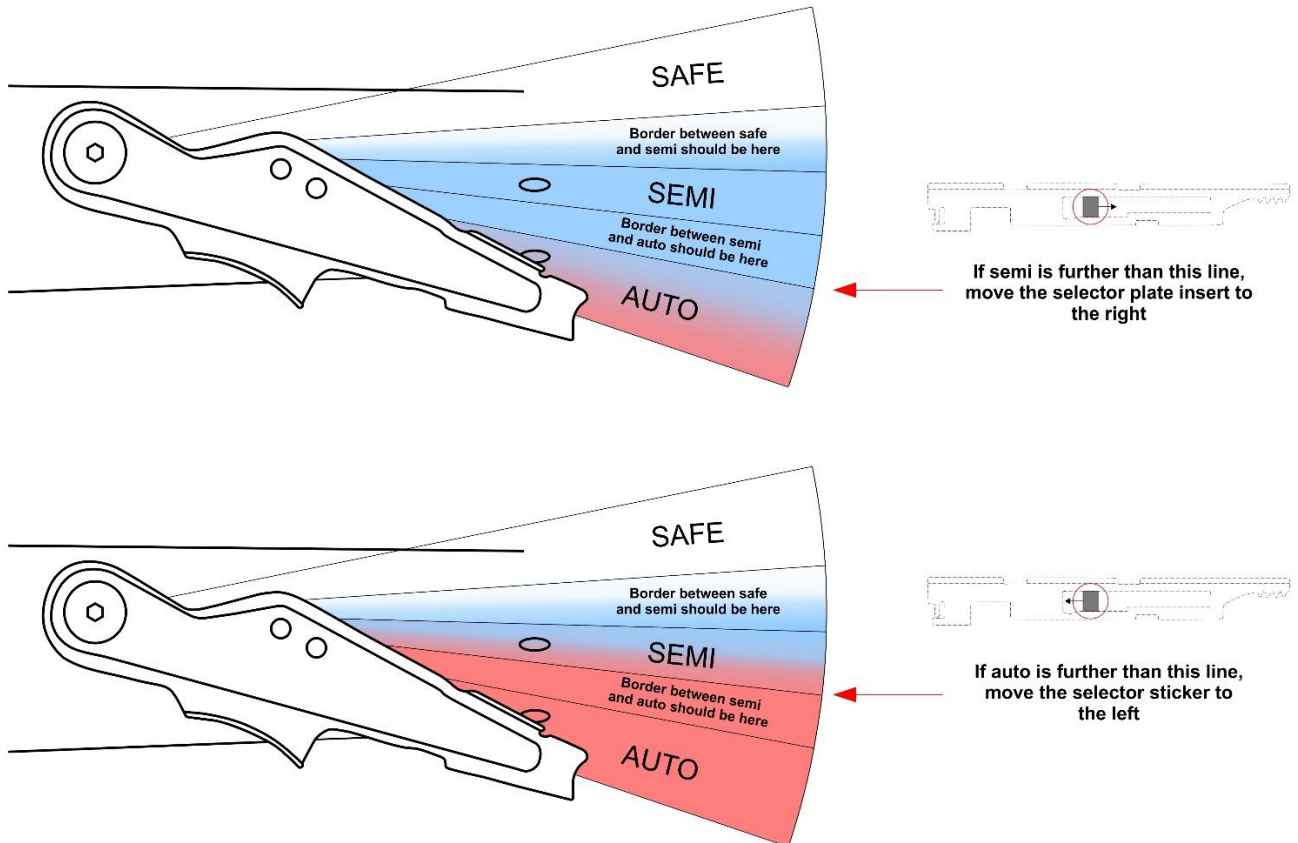


- Put the gearbox in the receiver, install the selector lever.
- Connect the battery to the mosfet (with the motor still disconnected) and use the **Sensor check feature (more details on page 15)** to check, whether all the sensors work properly. The selector should work in a following way:



Also check the trigger and the sector gear. In case Perun does not detect trigger, sector gear, or selector positions properly at any of these trials, please refer to solutions described on the scheme above and below:

- The selector must be on "SAFE" when the battery is being plugged in.
- If the trigger does not seem to be working, make sure that the magnet together with its plastic holder is on the trigger and it is placed correctly. The correct polarization of the magnet (which end of the magnet is pointing at the board) is important.
- If the sector gear is not being detected, try releasing the screw that holds the electronic board, moving the board to the sides (if possible) and then screwing it back and checking again.
- If "SEMI" and "AUTO" positions seem off, please refer to the solution shown below:



9. If everything works correctly, remove the gearbox from the receiver.
10. Open the gearbox again and put the rest of the components inside. **Note, that you can leave the mechanical safety mechanism, if you like, but it is not necessary.** It is a matter of your preference.
11. Assemble the gearbox. Put the whole replica together. Watch out for the wires, make sure that the insulation does not get damaged during the assembly!
12. It is recommended to check for any short circuits between the plugs, gearbox and body using a multimeter.

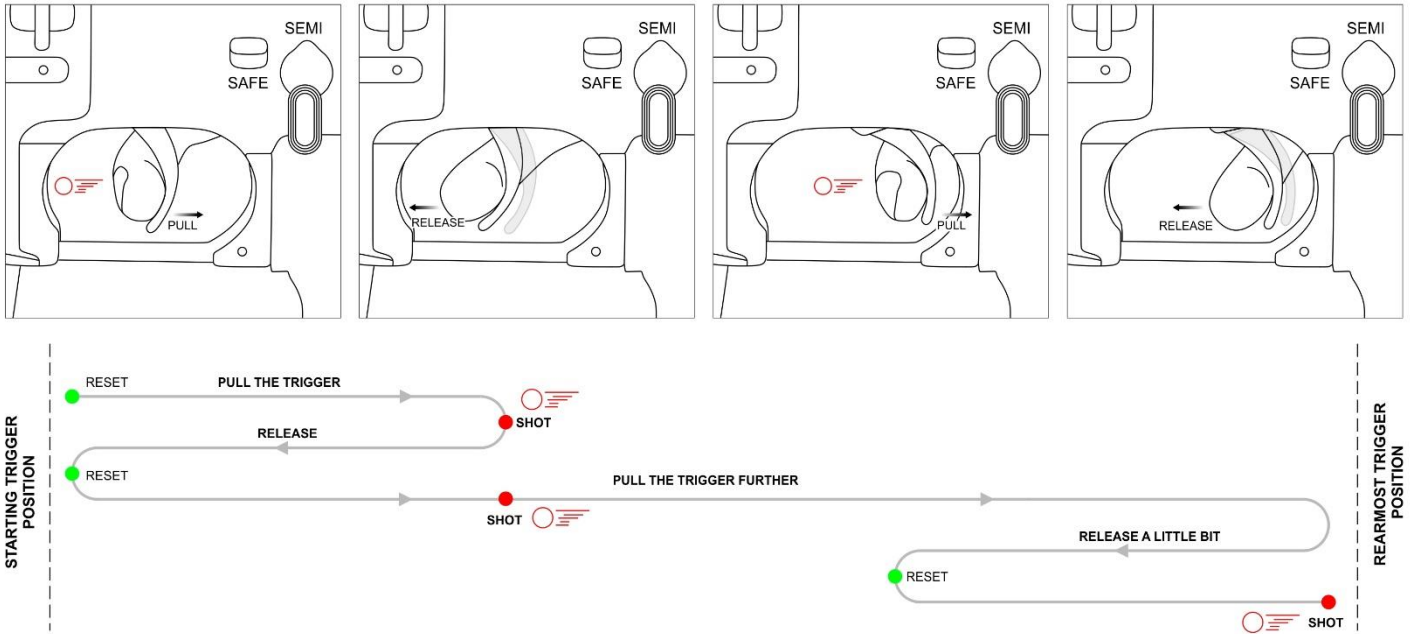
4. During the start-up

Every time, when connecting the battery to the replica, make sure that the selector is set to "SAFE". This is a safety concern, but it also helps Perun find out, where the "SAFE" position is. If you will connect the battery with the selector on "SEMI" or "AUTO", the replica may not shoot unless you switch to "SAFE" first or even if it does, the unit may sometimes function abnormally until the "SAFE" position is reached at least once.

5. Adaptive trigger control

Each time the battery is connected, Perun senses the trigger resting position and uses it as a reference (therefore, make sure to never pull the trigger during startup). Depending on the current trigger sensitivity setting, Perun will automatically fire after the trigger has traveled a long enough distance. This allows very short trigger pulls with no trigger modification needed whatsoever and the trigger sensitivity changes possible even in the field.

When in normal semiautomatic mode, the Perun Hybrid uses a progressive trigger activation method. This means that the trigger threshold and reset points are mobile and move together with the trigger, as shown on the sketch below:



This results in two things:

1. If high trigger sensitivity is set, in most cases (depending on the trigger model) you should be able to pull the trigger all the way back and shoot by only slightly releasing it from the rearmost position and pulling it again. It also allows to easily “spam” in the semiautomatic mode because you only need to quickly pull the trigger, not necessarily having to make sure it is fully released. This might be a point of interest, particularly for speedsoft players.
2. For players looking for more realism, what might be important is that the trigger must always be reset (released) a certain distance before another shot can be taken, which is noticeable at lower sensitivities. This emulates how triggers in real firearms work and provides a greater degree of control.

The progressive method does not work when DMR mode is enabled.

6. Features and programming

Supplementary video manual is available here:

<https://www.youtube.com/watch?v=2o4eWEYyw7c>

To enter the programming mode, you can do it:

1. using the selector:

For “SEMI” – keep the selector on “SEMI” for a couple of seconds, then go to “AUTO” and back, twice. (“SEMI” → “AUTO” → “SEMI” → “AUTO” → “SEMI”)

Successful entry into the programming mode for “SEMI” will be confirmed by **one sound signal and a blue LED light**.

For “AUTO” – keep the selector on “AUTO” for a couple of seconds, then go to “SEMI” and back, twice. (“AUTO” → “SEMI” → “AUTO” → “SEMI” → “AUTO”)

Successful entry into the programming mode for “AUTO” will be confirmed by **three sound signals and red LED light**.



Switching the selector between “AUTO” and “SEMI” and back allows to move between the modes. Pulling the trigger allows to enable, disable, or set levels for the modes.


2. by pulling the trigger within 3 seconds after connecting the battery.

Holding the trigger for around half a second, allows to move between the modes. Pulling the trigger briefly, allows to enable, disable, or set levels for the modes.









Full feature description


All the settings are set independently for “SEMI” and “AUTO” selector positions, except for Li-Po alarm and Master reset, which work for both selector positions.

Function and LED color	Description
Firing mode  Green	Choose one of the firing modes for any selector position: safe or semi. No sound signal, steady green light – safe 1 short single signal and blink – semi
AB  Blue	Active brake (AB) stops the motor after the shot, preventing the spring from remaining in a compressed state and eliminates double shots on semi in replicas with high rate of fire (“overspin”). 5 levels of braking strength are available – from 1 (weakest braking) to 5 (the strongest). Braking can be also completely disabled. It is advised not to use braking or use it on the lowest level, if stronger braking is not necessary, as it negatively impacts the service life of motor brushes and causes increased heating. <i>Tip: Switch to semi, fire a single shot, and hold the trigger after the shot. This will cause a second single shot with strongest AB setting to be fired after 3 seconds, making sure the spring remains uncompressed. It is advised to do that when you finish shooting.</i>

 While precocking is on, the AB setting becomes irrelevant. However, any programmed AB setting will be stored in memory and will become effective as soon as precocking is disabled.

No sound signal while LED glows blue means, that the active brake is disabled. 1 to 5 signals indicate braking levels from 1 (the weakest) to 5 (the strongest).

Function and LED color	Description
Precocking  Yellow	<p>When shooting on semi, precocking keeps the piston in the rear position, ready for the shot. This decreases the time between pulling the trigger and the actual shot, increasing realism, and giving advantage in CQB fights.</p> <p>Correct precocking level must be set individually to each replica and according to user preferences. Precocking power is automatically adjusted to battery voltage and semi or automatic shots.</p> <p><i>Tip: To release the spring after using precocking, switch to semi, fire a single shot, and hold the trigger after the shot. This will cause a second single shot with the strongest active brake setting to be fired after 3 seconds, making sure the spring remains uncompressed. It is advised to do that when you finish shooting.</i></p> <p>No sound signal while LED glows yellow means, that the precocking is disabled. 1 to 8 signals indicate precocking levels from 1 (the weakest) to 8 (the strongest).</p>
Trigger sensitivity  Violet and yellow blinking alternately	<p>This parameter decides how sensitive is the trigger. 5 levels are available, which result with a shot after the lower tip of the trigger travels roughly:</p> <p>1 – 6 mm 2 – 4 mm 3 – 3 mm 4 – 2 mm 5 – 1 mm</p> <p> <i>Those are approximate values and may vary depending on parts used.</i></p> <p>1 to 5 signals while the LED blinks violet and yellow alternately indicate sensitivity levels from 1 (the lowest) to 5 (the highest).</p>
DMR mode  Purple	<p>DMR Mode allows only semiautomatic shots and limits their frequency as well. Its main use is for high power DMR-styled replicas on fields, which demand such limitations. 0.25s, 0.5s, 1s, 2s and 3s intervals are available.</p> <p>No sound signal while the LED glows purple means, that the DMR mode is disabled. 1 to 5 signals indicate interval levels from 1 (the shortest) to 5 (the longest).</p>
Li-Po and Li-Ion alarm  Teal	<p>Li-Po and Li-Ion alarm informs the user that battery voltage has fallen below 3.7V per cell, at which the battery should not be further used and must be recharged. Unit automatically detects number of cells in the battery and determines safe voltage range. The need for battery replacement is signaled by short sound signals every 30s. Disable this function if you are using batteries other than Li-Po or Li-Ion.</p> <p>No sound signal while the LED glows white means, that the alarm is disabled. 1 signal indicates activation of the alarm.</p>
DSG  Green and blue blinking alternately	<p>This function must be enabled when dual sector gear is used, to provide proper cycle control.</p> <p>No sound signal while LED glows green and blue alternately means, that DSG is disabled. 1 signal indicates activation of the DSG mode.</p>
Selector plate mode  Red and white	<p>In replicas without a selector plate, this feature should be set to “off”. This way, unit not be sensing the selector plate, allowing the replica to function without it, however without the electronic safety and the possibility to enter the programming mode using the selector.</p> <p> <i>When selector plate mode is off, make sure that the mechanical trigger lock works properly and will not allow the replica to shoot even with trigger sensitivity set to 5!</i></p> <p>No sound signal while LED glows red and white alternately means, that selector plate mode is disabled. 1 signal indicates activation of the selector plate mode.</p>

Function and LED color	Description
Master reset  Red	Master reset returns the unit to the factory settings. To reset, pull and hold the trigger for 2 seconds or simply wait 10 seconds while the LED glows red and until the reset takes place without using the trigger. A long sound signal confirms return to factory settings.










3. Factory settings



New units and units where master reset was activated will have modes set in a following way:

- Firing mode – semi on “SEMI” and “AUTO”
- AB – level 3
- Precocking – disabled
- Binary trigger – disabled
- Two-stage trigger – disabled
- Trigger sensitivity – level 3
- DMR Mode – disabled
- ROF reduction – disabled
- Li-Po and Li-Ion alarm – enabled
- DSG – disabled
- Selector plate mode - enabled

4. Diagnostic system

Perun V3 Hybrid has a diagnostic system that will help you find the source, should you encounter a problem. After the battery is connected, the unit undergoes a start-up check, to make sure replica is ready to work. Successful completion of this check is indicated by a short green blink of the LED.

Problem and LED color	Description
Disconnected motor/Diagnostic mode  Yellow, blinking	This not only provides information about the disconnection of the motor, but it is also a diagnostic mode for the trigger, selector, and sector gear sensors. With the motor disconnected, engaging the sensors will cause the LED to glow purple (trigger), white, blue and red (selector), or green (sector gear) for a moment. This can be used for troubleshooting. Reconnecting the motor will restore normal function. <p style="text-align: center;"> <i>Motor check only takes place at start-up. A disconnection after the start-up will not be signaled!</i></p>
Fuse activation  Red, continuous, or blinking	Activation of the fuse with a distinction between a short circuit (continuous red) and gearbox jam (blinking red). In some situations, this distinction may not be correct, for instance, a gearbox jam may be incorrectly read as a short circuit and vice versa. Electronic fuse might as well be activated by parts combination, which draws too much current (e.g., high speed motor and gears). The Unit will start functioning normally after the battery is reconnected unless there still is a short circuit that will be detected at the next start-up.
Gearbox cycle detection failure  Yellow and blue blinking alternately	The unit did not receive information about cycle end from the sector gear sensor and stopped firing only after safety time limit was exceeded. Check whether the gears or the sensors are not damaged and whether the sensors are properly engaged by the gears.
Unit temperature is too high  Yellow and white blinking alternately	Too high temperature of the unit (electronic board) was detected. It will not function again until it cools down, after which it will operate normally.
Battery with too low voltage is connected  Yellow and teal blinking alternately	Battery with a voltage below 7 V is connected. Change the battery to one with a voltage between 7 V and 17 V.
Battery with too high voltage is connected  Red and teal blinking alternately	<p style="text-align: center;"> Battery with a voltage over 17 V is connected. The battery must be immediately disconnected, as it can cause permanent damage! Change the battery to one with a voltage between 7 V and 17 V.</p>
An external magnetic field was detected  Red and violet blinking alternately	External magnetic field (originating not from the trigger magnet) was detected by the trigger sensors. The unit will be blocked until the source of the magnetic field is not removed.

Problem and LED color	Description
Main transistor or driver damage  Red and yellow blinking alternately	The main transistor or driver is damaged. The unit needs to be sent back for repair.
Battery voltage sensing malfunction  Red and white blinking alternately	The battery detection system is malfunctioning. The unit needs to be sent back for repair.

Other known problems:

Problem	Cause	Solution
Replica fires a 2-round burst in semi-auto mode.	Motor and battery are too strong for the main spring, which causes an overspin.	Enable AB or precocking.
	Too high precocking level	Set precocking to a lower level.
	Trigger mechanism malfunction.	Check the cut-off lever and contacts, replace if needed.
Replica does not shoot; the unit does not emit any light or sound.	Incompatible T-Deans battery connector.	T-deans plugs and sockets from various manufacturers may sometimes not work together reliably. Although the plug may seem to fit the socket nicely, the conductive surfaces may not contact each other, cutting the power off. In that case try with another battery, most preferably with a T-deans socket made by different manufacturer.
Battery and/or the motor heat up very much.	The battery has too low capacity (mAh) and/or "C" parameter.	Use a battery with higher capacity and/or "C" parameter.
	The motor is too weak.	Use a stronger motor, possibly with neodymium magnets.
	Increased motor load caused by an excessive friction, for example caused by: - improper shimming, - motor positioned askew in the pistol grip.	Remove the cause of the friction.
	The motor/gear ratio/spring combination draws too much current (for instance – high speed motor, high speed gears and M120 spring).	Change the replica configuration by using a softer spring, gears with higher ratio (lower speed, higher torque) or motor with higher TPA number (or lower revolution speed).
When trying to shoot, replica remains silent or shortly vibrates, after which green LED appears and one beep is heard	A gearbox jam or a short-circuit is present but because of low battery power or bad connection with the battery, the unit resets due to voltage drop instead of the electronic fuse properly activating.	Remove the reason of the gearbox jam or short-circuit.
	The build is too power demanding for the battery use and the unit resets due to voltage drop.	Use a higher-powered battery.







There are too many or too little shots compared to what was programmed and the cycle detection error code does not appear	The sector gear is too close to the sensor line, or the gear is too dirty and prevents proper readings.	Unscrew the unit, move it to the right as far as possible and screw it back again. <hr/> Clear the sector gear of excess grease.
External magnetic field error appears, despite no external magnet being close to the replica	Trigger was being held at startup. <hr/> The trigger has too much slack and can move sideways, which can activate the error. <hr/> The triggers movement is obstructed and when it is released, it may end up in slightly different positions. If at some moment the trigger will move further back than it was at startup, this can activate the error.	Reconnect the battery and do not hold the trigger during the startup. <hr/> Shim the trigger so that it cannot move sideways, only back on forth. <hr/> Make sure the trigger can move freely and completely unobstructed. <hr/> Use stronger trigger spring.
When RoF reduction is enabled, electronic fuse activates, or the replica just does not shoot	The RoF reduction is too great, and the motor is not able to cycle the gearbox.	Reduce RoF reduction or disable it completely.
Trigger works as if the binary feature was activated, but it is not	The magnet holder and the trigger can travel further than they should. This can happen with some combinations of triggers and gearbox shells.	Mechanically prevent the magnet holder from travelling too far. This can be achieved, for instance, by gluing a piece of material to the end of the channel in the gearbox, through which the magnet holders' blocking element is travelling when the trigger is pulled.
Motor beeps from time to time	Li-Po alarm has activated	Replace the battery (if you're not using a Li-Po or Li-Ion, disable the Li-Po alarm).

In case of any technical questions, please contact us at: info@perunairsoft.pl

5. Sensor check

You can easily check the sensor readings by disconnecting the motor. When Perun V3 Hybrid is connected to the battery, but disconnected from the motor, it informs about this by yellow, flashing light. If during that flashing a properly working and connected sensor will be engaged, the unit will signal that by changing the LED color for a moment. After you enter the sensor check mode, it will be active for 5 minutes, after which the unit will shut down. To restart it, simply reconnect the battery.

 *To enter this mode, the motor must be disconnected first, only then connect the battery!*

LED color	Sensor
Disconnected motor / Sensor check  Yellow, blinking	None of the sensors detects any change at this moment.
Selector switched to "AUTO"  Red	This should happen after the selector is switched to "AUTO".
Selector switched to "SEMI"  Blue	This should happen after the selector is switched to "SEMI".
Selector switched to "SAFE"  White	This should happen after the selector is switched to "SAFE".
Trigger  Purple	Trigger pull detected.
Sector gear  Green	Sector gear movement detected.

Checking the trigger and selector sensor can be done by simply pulling the trigger or switching the selector between "SAFE", "SEMI" and "AUTO" positions. This can be done without disassembling the whole replica.

To check the sector gear sensor, it is best to open the gearbox and remove everything out of it, except for Perun and the sector gear (make sure to keep the shimming the same as in assembled replica, it can influence whether the sensor would work or not). Then spin the sector gear by hand and see, whether the color of the light changes to green.

6. Selector insert placement guides

Below you will find guides to the placement of the selector plate insert for some of the more popular replicas. These are our recommendations based on replicas on which we have worked on ourselves. Please keep in mind, that the following parts must be original to make this guide work:

- gearbox,
- selector plate,
- receiver,
- selector lever
- other selector system parts.

Change in any of these parts may cause enough shift in the selector plate insert so that it will need some corrections.

We also cannot guarantee immediate success even if the replica is fully stock, because differences in dimensions can occur between various models made by the same manufacturer or different batches of the same model. If the selector does not work as it should, refer to correction guidelines shown at step 8. on page 7 of the installation manual.

We advise to print the guide and use it as a stencil for precise and convenient placement of the selector plate insert. Make sure that the print configuration is set to real size.