

# PERUN

## V3 *Optical*

### Installation manual

This is a manual for technicians, who will be installing Perun V3 Optical in the replica. Be sure to also read the user manual, so that you can properly test the replica. Installation can only be done by experienced airsoft technicians. The warranty does not cover damages resulting from incompetent montage.

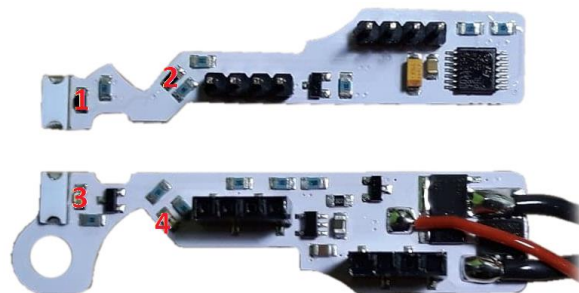
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# 1. How does it work?

Perun V3 Optical uses optical switches 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 Optical will work without problems in almost any combination of gearbox shells, triggers, selector plates and sector gears.

Key elements:

- 1 – sector gear optical sensor (small, black element)
- 2 – trigger optical sensor (small, black element)
- 3 – sector gear IR LED diode (small, yellow element)
- 4 – trigger IR LED diode (small, yellow element)



Optical sensors and IR LED diodes work in pair as a barrier switch. If the trigger is at rest, the infrared radiation flows from the diode to the sensor. Once the trigger is pulled, it obstructs vision between the trigger sensor and diode signaling that a shot should be fired.

The same principle is used for the sector gear. When sensor (1) and diode (3) are obstructed, it means that a gear tooth is between them. Perun V3 is using information whether gear teeth are present or not, to determine which gearbox cycle phase is currently taking place. Algorithm used for counting teeth allows any gear to be used and no adjustment has to be made to enable compatibility with DSG or short-stroked gears. The only exception are Max/Infinite Torque gears, which are incompatible with Perun V3 *Optical*.

In Perun V3 *Optical*, "SAFE" mode is provided by stock mechanical trigger lock. To see the difference between "SEMI" and "AUTO" selector positions, the selector plate position is detected by an IR reflective sensor, which is indicated by a red circle on the photo below.



It works by emitting infrared radiation and checking how much of it is mirrored back by the opposite surface. Most radiation is reflected, if the opposite surface is white and close to the sensor, and the least if it is black and far away (more than 5mm). When the selector is in "AUTO" position (or "SEMI" in AK type replicas), the selector plate sticker delivered together with Perun should be covering the selector sensor, reflecting a lot of infrared radiation back to the sensor, indicating "AUTO" (or "SEMI") selector position.



## 2. Compatibility

### 2.1. Compatible gearbox shells

Perun V3 Optical was tested with positive outcome in gearbox shells manufactured by: G&G, E&L, LCT, Ultimate, JG and Cyma (stock Cyma gears may however need modification). This refers to gearbox shells in Tokyo Marui standard. Perun V3 Optical will not work in gearboxes diverging from that standard, like for example ARES EFCS.

### 2.2. DSG

Perun V3 can be used in replicas utilizing dual sector gear, in that case it is recommended to enable AB and disable precocking.

### 2.3. Max Torque gears

Perun V3 *Optical* cannot be used with Max/Infinity Torque gears, because in their case sector gear teeth are seen at all times, making cycle detection impossible.

### 2.4. Main spring rate and rate of fire

Perun V3 can be used with any main spring, as it was tested with positive outcome even with M210 spring. The highest allowed rate of fire is 50RPS.

### 2.5. Batteries

Allowed battery voltage - 7V to 17V, which permits use of the following battery types:

Li-Po, 2 to 4 cells (7.4V to 14.8V)

NiMH/NiCd, 8 to 10 cells (9.6V to 12V)

Li-Fe, 3 to 4 cells (9.9V to 13.2V)

Batteries with any discharge rate („C” parameter) or capacity (mAh) can be used, as long as they are strong enough to power the replica properly.

### 3. Perun V3 Optical installation

A video showing the installation procedure for Perun V3 is available under this link or QR code:

<https://www.youtube.com/watch?v=IRv7h4e3Ido>



However, please do not rely solely on the video, as the manual below contains vital details that need to be known to the technician installing Perun V3.

#### ATTENTION:

- *If Perun V3 was used before and will be installed in another gearbox or, if in the current gearbox trigger or selector plate will be changed, before disassembly, program Perun V3 to enter the **calibration mode** at next start-up. You can read more about **calibration mode** in “First run” section. To program **calibration mode** at next start-up, enter the programming mode, pull the trigger 12 times, then save settings by holding the trigger until a signal is heard.*

- 1) Disassemble the replica and open the gearbox.
- 2) Remove gears, contacts together with the wiring and the cut-off lever.
- 3) Remove any excess grease and clean the space were contacts used to be, as well as the vicinity of the sector gear.
- 4) Separate Perun V3's halves and screw the bottom part in place of the contacts using screw, which held the cut-off lever. Use of nylon gasket **is not mandatory** here. It should be used only, if without it the screw will be protruding from the other side of the gearbox, hindering selector plate movement or if the lower part of Perun V3 will not be firmly fixed.
- 5) Check if after screwing Perun V3 in place, selector plate moves freely. If such situation will take place, shorten the screw a little bit, use a shorter one or use the nylon gasket.
- 6) Put sector gear in place.
- 7) Put one of the stickers from „Trigger sticket” kit on the trigger element in a way shown here:

#### ATTENTION:

- *We recommend using cyanoacrylic glue to strenghten the bond.*

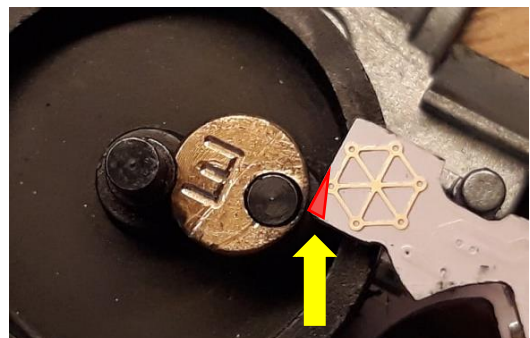


- 8) Join the upper part with the lower part. Make sure, that the sector gear will not rub against Perun V3.

#### ATTENTION:

- *Check, whether the delayer is not obstructed by Peruns' upper part. If needed, you can sand down part of Perun indicated by red triangle.*

- 9) Assemble the gearbox.



10) Degrease the selector plate and put one of the stickers from „Selector stickers” kit on it. The sticker should be positioned so, that it will not cover the selector sensor when the selector is set on „SEMI” and cover it on „AUTO” (or the other way round in AK type replicas). It is only important that the sensor is covered on one of the firing modes and not on the other. The position of selector plate on „SAFE” is irrelevant, because Perun V3 uses standard mechanical lock for safety.

*AK type selector – selector plate in „SEMI” position (left) and „AUTO” (right); selector sensor is indicated by red circle*



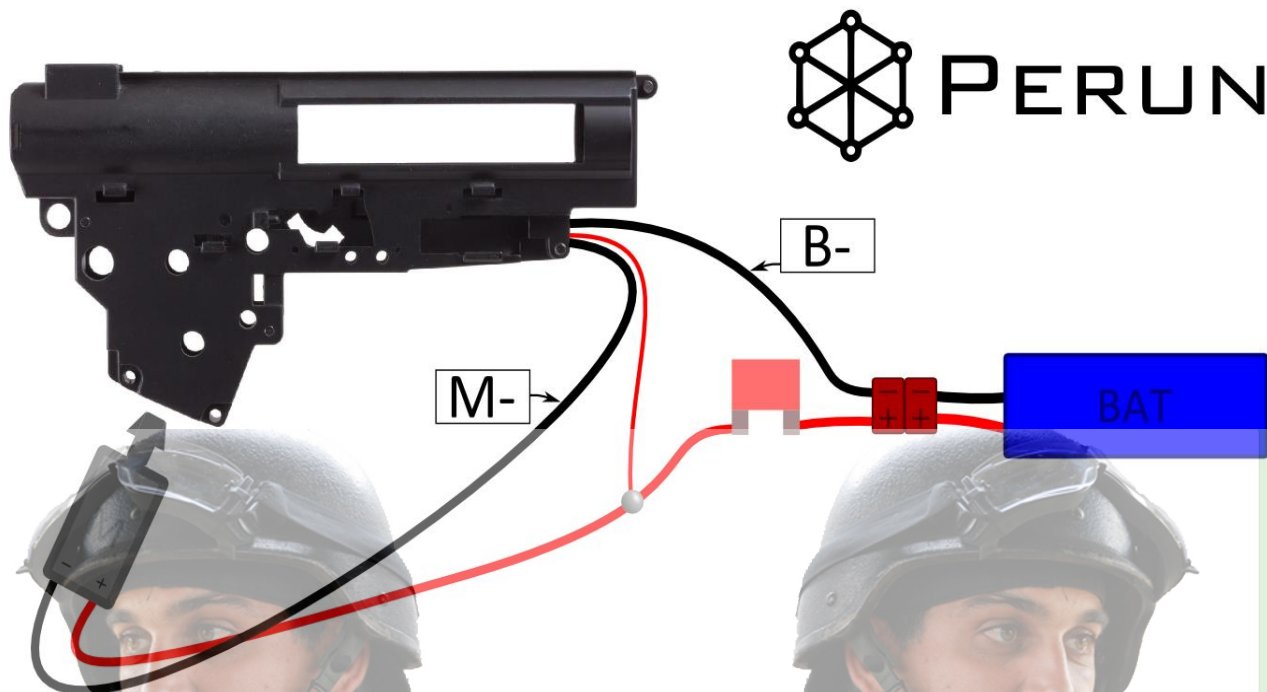
*G36 type selector – selector plate in „SEMI” position (left) and „AUTO” (right); selector sensor is indicated by red circle*



**ATTENTION:**

- We recommend using cyanoacrylic glue to strenghten the bond.
- In AK type replicas it is essential to ensure, that selector level is not loose. Any slack can make it difficult to sense selector position.

11) Solder wiring according to scheme shown below. Recommended way of soldering the wiring can be seen on Perun V3 installation instructional video. Link to the video can be found in the beginning of this chapter.



In case Perun V3 is being installed again and wires are without original markings, refer to scheme below for information, which wire should be connected to battery minus (B-) and motor minus (M-). Special care should be taken here, because reversed polarity will permanently damage Perun V3. We also advise using existing wires and extending them if needed, because soldering around MOSFETs on the PCB is hard, and if made improperly, may also result in malfunction.



12) Assemble the replica.

Ready! Now it's time for the first run.

## 4. First run

During the first run of Perun V3, trigger and selector sensors have to be calibrated. After the battery is plugged in for the first time, Perun V3 will automatically enter **calibration mode**. Take following steps:

- 1) Plug the battery in.
- 2) Set the selector in „AUTO” position (or “SEMI” in AK type replicas).
- 3) Pull the trigger and hold it in any position, in which a continuous sound signal can be heard, until the signal stops. If you want a short trigger, stop pulling the trigger further once the signal starts to be heard and keep it there until the setting is saved. In other case pull the trigger further and hold. Perun V3 will now remember this trigger position and start to fire once it has been reached.
- 4) Set the selector in „SEMI” position (or “AUTO” in AK type replicas).
- 5) Repeat the trigger procedure from step 3).

If the procedure has passed without problems, the next time battery is plugged in Perun V3 will not enter into calibration mode and will be ready to shoot. However, if after finishing step 5), you will hear a long, single signal meaning that there are problems with “SEMI” and “AUTO” position detection, the next time the battery is plugged in, Perun V3 will enter calibration mode again. At this point repositioning of selector sticker may be needed.

In case there is a need to go through the calibration procedure again, enter the programming mode on any selector position, press the trigger 12 times and save the setting by holding the trigger until a sound signal can be heard.

## 5. Fuse

40A fuse can be installed on the wiring. If the replica has spring softer than M130 **and** the rate of fire is lower than 25RPS, it is recommended to change the fuse to 25A (included). After doing so, test if the fuse parameters are not too low by firing a couple of quick shots in semi-auto mode.

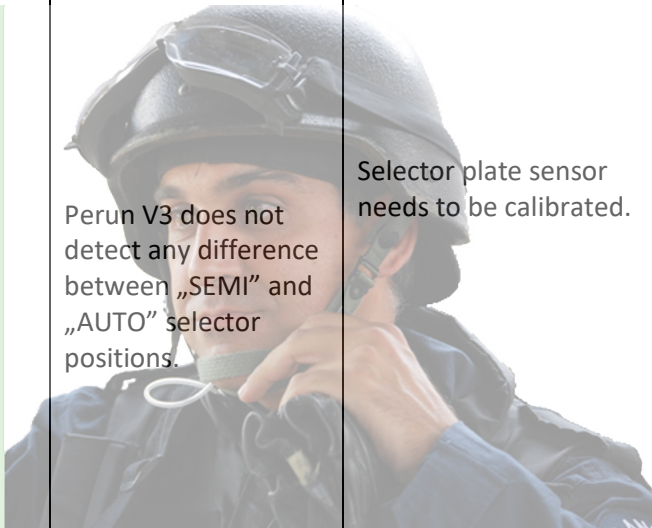
## 6. Factory settings

Perun V3 is delivered with functions programmed following way:

- single fire on „SEMI” selector position (automatic fire in AK type replicas),
- automatic fire on „AUTO” selector position (single fire in AK type replicas);
- AB off,
- precocking off,
- precocking power set to 1 (this will only have effect, if precocking is enabled),
- Li-Po protection off,
- double shot off.

To comply with the original, in AK type replicas firing modes should be reprogrammed after first run, because „SEMI” and „AUTO” selector positions will be switched between each other.

## 7. Troubleshooting

Problem	Possible cause	Solution
Perun V3 cannot pass the calibration procedure successfully (a long sound signal is heard at the end of procedure and calibration is initiated at next start-up).	Improper selector sticker position.	Change selector sticker position.
	Loose selector lever (in AK replicas).	Remove any slack, so that even slight selector lever movement will result in selector plate movement.
	Selector plate sensor malfunction.	Send Perun V3 back for repair.
 <p>Perun V3 does not detect any difference between „SEMI” and „AUTO” selector positions.</p>	Selector plate sensor needs to be calibrated.	<p>Enable calibration procedure at next start-up the following way:</p> <ol style="list-style-type: none"> <li>1) remove gearbox from the body,</li> <li>2) connect the motor, so that sound signals can be heard; fasten the motor to a heavy object, so that it will not jump around in case a signal to fire was received by Perun V3,</li> <li>3) plug-in the battery,</li> <li>4) enter the programming mode by touching the selector plate sensor and pulling it away twice,</li> <li>5) pull the trigger 12 times and save the setting, so that at next start-up Perun V3 will enter calibration mode,</li> <li>6) disconnect the battery and motor,</li> <li>7) put gearbox back in body, put back pins and screw the pistol grip,</li> <li>8) connect the motor, pass the calibration procedure.</li> </ol>
	Loose selector lever (in AK replicas).	Remove any slack, so that even slight selector lever movement will result in selector plate movement.
Semi-automatic fire does not work (replica only fires bursts or fully automatic).	Selector plate sensor malfunction.	Send Perun V3 back for repair.
	Burst has been programmed on „SEMI” selector position.	Program semi-automatic fire on „SEMI”.
	Sector gear optical sensor and/or sector gear LED diode are covered with grease.	Remove grease from optical sensor and diode.
	Sector gear optical sensor and/or sector gear LED diode are damaged.	Send Perun V3 back for repair.



Problem	Possible cause	Solution
<p>Perun V3 emits sound signals right after the battery has been plugged in, which means that protection against accidental firing and start-up was triggered. It enables if Perun V3 will detect trigger to be pressed at start-up</p>	<p>Trigger was held during the start-up.</p>	<p>Release the trigger, replica will start to function normally.</p>
	<p>Trigger sensor needs calibration.</p>	<p>Enable calibration procedure at next start-up the following way:</p> <ol style="list-style-type: none"> <li>1) disassemble gearbox and remove Perun V3 from it,</li> <li>2) connect the motor, so that sound signals can be heard; fasten the motor to a heavy object, so that it will not jump around in case a signal to fire was received by Perun V3,</li> <li>3) place a large piece of plastic between trigger optical sensor and trigger diode,</li> <li>4) plug-in the battery,</li> <li>5) enter the programming mode by touching the selector plate sensor and pulling it away twice,</li> <li>6) simulate pulling the trigger 12 times by removing the piece of plastic from between the trigger sensor and diode and putting it back, then save the settings by removing the piece of plastic for a longer time, so that at next start-up Perun V3 will enter calibration mode,</li> <li>7) disconnect the battery and motor,</li> <li>8) put gearbox back in body, put back pins and screw the pistol grip,</li> <li>9) connect the motor,</li> <li>10) go through the calibration procedure.</li> </ol>
<p>Replica fires a 2-round burst in semi-auto mode.</p>	<p>Motor and battery are too strong for the main spring, which causes overspin.</p>	<p>Enable AB or precocking.</p>
<p>Perun V3 will not shoot or emit any sounds.</p>	<p>Blown fuse.</p>	<p>Check what was the reason the fuse had blown. In such situation never run Perun V3 without fuse!</p>
	<p>Disconnected motor connector.</p>	<p>Squeeze the connector, so that it is tighter and connect it back to the motor.</p>
	<p>Incompatible battery T-deans socket.</p>	<p>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 T-deans socket made by different manufacturer.</p>

Problem	Possible cause	Solution
Battery and/or the motor heat up very much.	The battery has a 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 excessive friction, for example caused by: - improper shimming, - motor positioned askew in the pistol grip.	Remove the cause of the friction.
The same battery and/or motor didn't heat up earlier.	Low-resistance MOSFET transistor and wiring used in Perun V2 provide resistance much lower than mechanical contacts and some other MOSFET circuits. According to Ohm's law, that allows more current to be drawn from the battery and directed to the motor. This makes the trigger response and rate of fire faster, but higher current draw also leads to increased heating of electronic elements. This may become too demanding for previous battery and/or motor and a need to change to new ones may arise.	