



**PERUN**

# *V2 Optical*

## Manual

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# 1. Basic information

Perun V2 *Optical* allows you to replace traditional, mechanical switches in version 2 gearboxes with modern, microcontroller steered MOSFET electronic device based on optical switches. Complete lack of moving parts provides great reliability in any situation and allows you to be confident, that your replica will not fail you in the heat of the action. Perun V2 *Optical* will also enhance your weapon with lots of features it did not have before.

## Warranty – 1 year from the purchase date

**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)

*Perun V2 should never be run without a fuse!*

**Power consumption when idle:** 1 mA

*Do not leave your replica with the battery plugged in for a longer period of time (more than a few days), because of the risk of complete battery discharge (which will permanently damage the battery).*

# 2. Programming

Video showing different features of Perun V3 *Optical* and explaining how to use them is available under the link below or the QR code shown here:

<https://youtu.be/Z-3x6Ax3GAg>



**Enter the programming** mode by quickly switching the selector from “SEMI” to “AUTO” and back twice or the other way round, from “AUTO” to “SEMI” and back twice. In order to be able to enter the programming mode, the selector must have been at rest for at least two seconds. Successful entering into the programming mode is signaled by a sound signal.

Whether we enter the programming mode starting from “SEMI” or “AUTO” selector position is relevant, if we are about to program firing mode (safe, semi, burst or auto). In case of other settings (AB, precocking etc.), it does not matter where the selector initially was.

After entering the programming mode, the settings are being changed by pressing the trigger correct amount of times and then saving the settings by holding the trigger until a confirmation in a form of a sound signal can be heard.

In case of features available after 7, 8, 10, 11 and 12 trigger pulls, one long sound signal means, that if we hold the trigger now to save the settings, the feature was disabled so far and now will be **enabled**. Three short sound signals would mean the opposite – the feature was enabled until now and after saving the settings it will be **disabled**. Pressing the trigger more than 12 times and saving allows to exit programming mode without making any changes.

## 2.1. Programming firing modes

*Programming firing modes – enter the programming mode for “SEMI” or “AUTO” selector position and **pull the trigger 0 to 6 times**, then hold the trigger until a sound signal can be heard to save the settings.*

Perun V2 allows the mechanical trigger lock to be retained. Because of that, with selector in “SAFE” position the replica will always remain safe (provided that the mechanical lock works properly). On both other selector settings („SEMI” and „AUTO”) any firing mode can be set, independently.

For example, to change firing mode for selector in “SEMI” position, quickly switch from “SEMI” to “AUTO” and back to “SEMI” twice. Entering the programming mode will be confirmed by a sound signal.

After entering the programming mode choose firing mode:

- Safe – save changes right after entering the programming mode.
- Single shot (semi) – pull the trigger once.
- 2-5 round burst – pull the trigger 2-5 times.
- Full auto – press the trigger 6 times.

Save changes by pulling and holding the trigger until a sound signal can be heard. All the changes will be stored in memory and valid also after disconnecting and connecting the battery again.

## 2.2. Active brake (AB)

*Active brake – enter programming mode for any selector position, **pull the trigger 7 times**, and hold the trigger until a sound signal can be heard to save the settings.*

Active break (AB) is a feature, which if enabled, stops the motor after each shot (in single fire mode) or after the last shot of a burst. This prevents main spring from remaining compressed and in case of replicas with lower muzzle energy and high rate of fire, prevents the problem of unwanted double shots in single fire mode.

Note that the use of active brake makes the motor heat up faster and accelerates wear of motor brushes. Therefore it is recommended to only keep AB on, if it is necessary. If not, it is much better to turn it on only at the end of the day, to fire just a few shots in single fire mode, so that the spring will remain uncompressed during storage.

While precocking is enabled, the AB setting is irrelevant.

## 2.3. Precocking

*Precocking – enter programming mode for any selector position, **pull the trigger 8 times**, and hold the trigger until a sound signal can be heard to save the settings.*

When precocking mode is enabled, the piston will remain in rear position after each shot with spring compressed and ready to fire. This works for single fire, burst and full-auto.

With the use of optical sensor, microcontroller checks sector gear's position and rotational speed. In case of replicas with high rate of fire, when the trigger is released Perun V2 will not power the motor any longer and only apply some active braking to set the piston in the right position, not letting it to overspin. In slower configurations, it calculates what amount of power would be just enough to set the piston in the rear position, taking into account the momentum of the motor and gears, and transfers that amount of power to the motor. This saves battery energy and decreases wear to motor brushes. Battery voltage and number of shots fired before the trigger was released is also taken into account.

The process is automatic, but due to some differences between replicas, fine adjustment is possible, by the way of precocking power feature described below.

It is recommended to turn precocking off at the end of the day and fire a few shots in single fire mode with AB on, so that the spring will remain uncompressed during storage.

*Precocking power – enter programming mode for any selector position and **pull the trigger 9 times**. Change the precocking power by switching the selector between "SEMI" and "AUTO" positions. Hold the trigger until a sound signal can be heard to save the settings.*

To precisely adjust the precocking power in replicas with different motors, main springs and gears, there is a possibility to choose one of 5 precocking power levels, where the 1. is recommended for replicas with highest rate of fire and 5. for those with lowest RPS rate.

Correct precocking power level should be individually selected for each replica through experiment, so that both in single fire mode, as well as in full-auto the trigger will remain in rear position. If precocking is enabled, but time between pulling the trigger and shot being fired is too long, select a higher precocking power level. This should be done, until optimal trigger response is achieved. Should a too high precocking power level be selected, malfunctions like overspin may occur, or a necessity to pull the trigger twice to fire a shot. In that case, choose lower precocking power level. In case of replicas with extremely high rate of fire use of precocking may lead to malfunctions even at precocking level 1, especially in full-auto firing mode. This may happen if motor's and gear's speed is too great, for the active brake be able to stop them on time. In that case, we suggest to disable precocking and turn AB on instead, since the trigger response will be quick anyway.

## 2.4. Li-Po protection

*Li-Po protection – enter programming mode for any selector position, **pull the trigger 10 times**, and hold the trigger until a sound signal can be heard to save the settings.*

Batteries should never be discharged below certain level. Perun V2 offers a feature which warns its user that his Li-Po battery is almost completely discharged and should be changed.

With Li-Po protection enabled, Perun will automatically detect number of Li-Po cells in connected battery and if voltage for that number of will drop below safe limits, short sound signals will be heard every 30 seconds.

## 2.5. Double shot

*Double shot – enter programming mode for any selector position, **pull the trigger 11 times**, and hold the trigger until a sound signal can be heard to save the settings.*

When double shot feature is enabled, if single fire mode is used, shots will be fired both after the trigger has been pulled and released.

## 2.6. Calibration mode

*Calibration mode - enter programming mode for any selector position, **pull the trigger 12 times**, and hold the trigger until a sound signal can be heard to save the settings.*

Enabling this function will make Perun V2 enter calibration mode at next start-up. This feature is meant mainly for technicians and more information about it can be found in installation manual.

### 3. Troubleshooting

Below we show known problems that are possible to occur during installation, and solutions to those problems. In case of uncertainty, whether the problem is caused by Perun itself or the installation, we recommend to the diagnostic test.

Film showing how to conduct the test is available under the following link:

[https://www.youtube.com/watch?v=o0\\_3gucBDq4](https://www.youtube.com/watch?v=o0_3gucBDq4)



Problem	Possible cause	Solution
Perun V2 does not pass the calibration procedure successfully (a long sound signal is heard at the end of procedure and calibration is initiated at next start-up).	Atypical selector plate position.	Use one of the other selector plate stickers included in the "Selector sticker" kit
	Selector plate sensor malfunction.	Send Perun V2 back for repair.
Perun V2 does not detect the difference between „SEMI" and „AUTO" selector positions.	Selector plate sensor needs to be calibrated.	Enable calibration procedure at next start-up the following way: <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 V2,</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 V2 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,</li> <li>9) pass the calibration procedure.</li> </ol>
	Selector plate sensor malfunction.	Send Perun V2 back for repair.

<b>Problem</b>	<b>Possible cause</b>	<b>Solution</b>
Replica starts shooting by itself.	Light enters the gearbox.	Ensure, that there are no holes through which light could enter the gearbox and all protective stickers are in the right place. If needed, you can also additionally protect gearbox from light with the use of black insulation tape sticked on any holes in it.
	Trigger sensor needs calibration.	Go through the calibration procedure; try pulling the trigger further than during previous calibration.
Perun V2 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 V2 will detect trigger to be pressed at start-up.	Trigger remained pressed during the start-up.	Release the trigger, replica will start to function normally.
	Trigger sensor needs calibration.	<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 V2 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 V2,</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 V2 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>
	Light enters the gearbox.	Ensure, that there are no holes through which light could enter the gearbox and all protective stickers are in the right place. If needed, you can also additionally protect gearbox from light with the use of black insulation tape sticked on any holes.
Replica fires a 2-round burst in semi-auto mode.	Motor and battery are too strong for the main spring, which causes overspin.	Enable AB or precocking.

Problem	Possible cause	Solution
Perun V2 will not shoot or emit any sounds.	Blown fuse.	Check what was the reason the fuse had blown. In such situation never run Perun V2 without fuse!
	Disconnected motor connector.	Squeeze the connector, so that it is tighter and connect it back to the motor.
	Incompatible battery T-deans socket.	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.
Semi-automatic fire does not work (replica only fires bursts or fully automatic).	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 V2 back for repair.
Semi-automatic fire does not work (replica only fires bursts or fully automatic), <b>but only when precocking is on and the ROF of those bursts seems to be lower than normal.</b>	Sector gear is too far from the sector gear sensor.	Try moving Perun V2 to the left (when having it in of front of yourself in an open gearbox) and shimming the sector gear so, that it almost touches the upper half of Perun V2.



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.	