PERUN X ARCTURUS PE V3 MOSFET

User Manual

This is the manual for Arcturus AK12 replicas with pre-installed PE V3 MOSFET made by Perun Airsoft. Reading this manual will help user fully exploit this replica's potential and in case of encountering any problems with the electronics, user can look for solutions to them here.

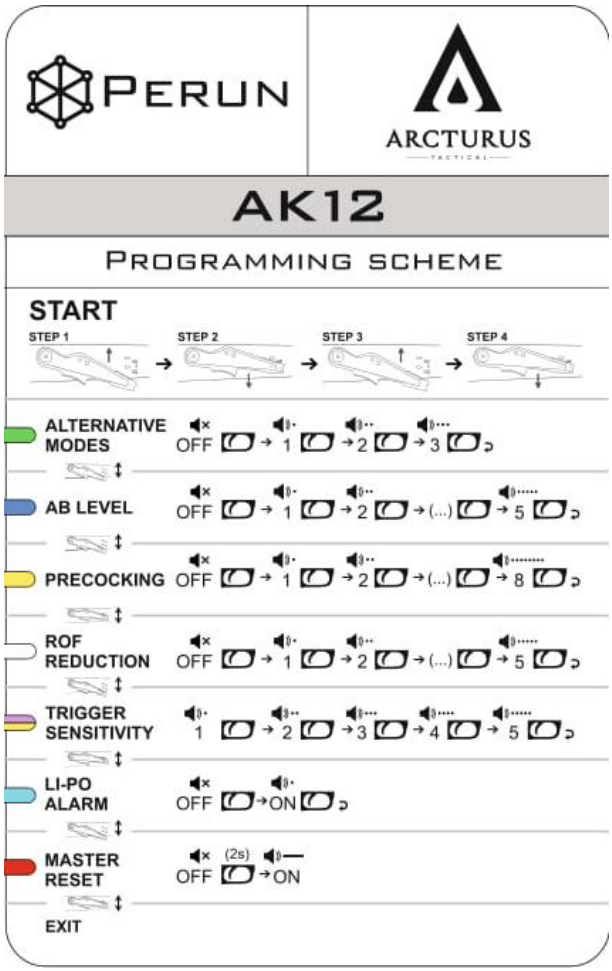
Recommended power sources

PE V3 MOSFET can work with any power source that provides voltage between 7 and 17 volts and is able to deliver enough current to ensure smooth cycling of the replica. We especially recommend Li-Po and Li-Ion batteries with nominal voltage of 7.4, 11.1 or 14.8 volts. It is recommended to use batteries with highest possible "C" parameter and capacity.

Changing the settings

To enter the settings mode, quickly switch from SEMI to 2RD BURST to SEMI to 2RD BURST and finally to SEMI. Successful entry into the settings mode will be confirmed by a sound signal.

Switching the selector lever between SEMI and 2RD BURST will switch between the modes, while pulling the trigger allows user to enable, disable or set levels of the modes. Observe the indicator LED color through the receiver gap in front of the trigger to identify which programming function the replica is currently in.



Full feature description

Function and LED color	Description
Alternative modes  Green	Alternative modes allow the user to choose different firing mode combinations than standard. Following modes are available: OFF (standard): SAFE-AUTO-2RD BURST-SEMI Alternative 1: SAFE-AUTO-BINARY TRIGGER-SEMI Alternative 2: SAFE-3RD BURST-BINARY-SEMI Alternative 3: SAFE-SEMI-SEMI-SEMI Binary trigger, which is available in some of the alternative settings is a mode, where both the pull and the release of the trigger will result in a single shot. No sound signal while LED glows green means, that alternative modes are disabled. 1 to 3 signals indicate activation of alternative modes.
Active Brake  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. ***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 5 seconds, making sure the spring remains uncompressed. It is advised to use this feature before storage of replica after use.* ***Attention!*** *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).
Precocking  Yellow	Precocking keeps the piston in rear position, ready for shot. This decreases the time between pulling the trigger and the actual shot, increasing realism, and giving advantage in CQB scenario. When off, active braking is active. 8 precocking levels are available, from 1, where the piston is pulled to the rear only slightly, to 8, where the piston is pulled all the way back. Please note, that in some tuned replicas, especially with those having a high rate of fire, higher precocking levels may become excessive and lead to double shots on semi. In such case, use lower precocking level. *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 active brake and no precocking to be fired after 5 seconds, making sure the spring remains uncompressed. . It is advised to use this feature before storage of replica after use.* 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).

Function and LED color	Description
ROF reduction White	Rate of fire reduction allows user to lower the rate of automatic fire. 5 reduction levels are available, where 1 is the lowest reduction and 5 is the highest. Semi-automatic shots and the first shot in burst are always fired without any power reduction to retain good trigger response. No sound signal while LED glows white means, that the ROF reduction is disabled. 1 to 5 signals indicate reduction levels from 1 (the smallest) to 5 (the greatest).
Trigger sensitivity Purple and yellow blinking alternately	Trigger sensitivity adjust the pull distance for trigger break point. Low level means longer trigger travel and high level means short trigger travel. 1 to 5 signals indicate levels from 1 (longest trigger travel) to 5 (shortest trigger travel).
Li-Po and Li-Ion alarm Teal	Li-Po and Li-Ion alarm informs the user that the battery voltage has fallen below **3.7V per cell**, at which point the battery should not be further used and must be recharged. Should the voltage fall below **3.2V per cell**, the mosfet will turn itself off. Unit automatically detects number of cells in the battery and determines safe voltage range. Disable this function if user is using batteries other than Li-Po or Li-Ion. The need for battery replacement is signaled by short sound signals every 15s, while voltage drop to 3.2V per cell is signaled by cyan and yellow lights blinking alternately. No sound signal while LED glows teal means, that the alarm is disabled. 1 signal indicates activation of the alarm.
Master reset Red	Master reset returns the unit to factory settings. To reset, pull and hold the trigger for 2 seconds. A long sound signal confirms return to factory settings.

Factory settings

New units and units where master reset was activated will have modes set in the following settings:

- Alternative modes – disabled
- Active brake – level 2
- Precocking – disabled
- ROF reduction – disabled
- Trigger sensitivity – level 3
- Li-Po and Li-Ion alarm – enabled

Progressive trigger

When in semiautomatic mode, PE V3 mosfet uses progressive trigger activation method. This means that the trigger threshold and reset points are mobile and move together with the trigger. This results in two things:

1. If high trigger sensitivity is set, user can pull the trigger all the way back and shoot by only slightly releasing it from the rearmost position and pulling the trigger again. It also allows to easily “spam” in semiautomatic mode because user only needs 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) at a certain distance before another shot can be taken, which is noticeable at lower

sensitivities (Level 1 and 2). This emulates how triggers in real firearms work and provides a greater degree of realism.

Diagnostic system

PE V3 mosfet has a diagnostic system that will help user find the source, should user encounter a problem. After the battery is connected, 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.

Diagnostic system can inform the user about following problems:

Problem and LED color	Description
Disconnected motor/Sensor check  Yellow, blinking	This not only provides information about disconnection of the motor, but it is also a diagnostic mode for the trigger. After disconnecting the motor and pulling the trigger, LED will glow purple as long, as the trigger is being held. This can be used during installation to check the trigger mechanism. Reconnecting the motor will restore normal functioning of the unit.
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. Unit will start functioning normally after the battery is reconnected, unless there still is a short circuit that will be detected at next start-up.
Gearbox cycle detection failure  Yellow and green blinking alternately	Unit did not receive information about cycle end from the sector gear switch 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.
Too high unit temperature  Yellow and white blinking alternately	Too high temperature of the unit (electronic board) was detected. It will not function until it cools down.
Battery with too low voltage is connected  Yellow and teal blinking alternately	Battery with a voltage under 7V is connected. Change the battery to one with voltage between 7 and 17V.
Battery with too high voltage is connected  Red and teal blinking alternately	**Battery with a voltage over 17V is connected. The battery should be immediately disconnected!** Change the battery to one with voltage between 7 and 17V.
Main transistor or driver damage  Red and yellow blinking alternately	Main transistor or driver is damaged. Unit needs to be sent back for repair.
Battery voltage sensing malfunction  Red and white blinking alternately	Battery detection system is malfunctioning. Unit needs to be sent back for repair.

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. Unit will be blocked until the source of the magnetic field is not removed.

Sensor check

User can easily check the sensor readings by disconnecting the motor. When the replica is connected to the battery and disconnected from the motor, yellow, flashing light will indicate sensor check function is active. If during sensor check, a properly working and connected switch is activated, the unit will signal by flashing the LED once in designated color corresponding to that switch.

Attention! *To enter this mode, the motor must be disconnected first before connecting the battery!*
Attention! *After replica enters the sensor check mode, it will be active for 5 minutes, after which the unit will shut down. To restart, simply reconnect the battery.*

LED color	Switch
Disconnected motor / Sensor check  Yellow, blinking	No sensor detects any change at this moment.
Selector switched to “SAFE”  White	This should happen after the selector is switched to “SAFE”.
Selector switched to “AUTO”  Red	This should happen after the selector is switched to “AUTO”.
Selector switched to “2RD BURST”  Teal	This should happen after the selector is switched to “2RD BURST”.
Selector switched to “SEMI”  Blue	This should happen after the selector is switched to “SEMI”.
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”, “2RD BURST” 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 all internal components, except for Perun and the sector gear (make sure to keep shimming the same as in assembled replica, it can influence proper function of the sensor). Spin the sector gear by hand and see, whether the color of the light changes to green when the sector cam is passes through the sensor.

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 disable 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. 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.	Reconnect the battery and do not hold the trigger during the startup.
	The trigger has too much slack and can move sideways, which can activate the error.	Shim the trigger so that it cannot move sideways, only back on forth.
	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.	Make sure the trigger can move freely and completely unobstructed.
		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.