

USER GUIDE

MERF 3.2

LAST UPDATE ON DECEMBER 22, 2016

WWW.GATEE.EU



Please be careful, there are some fake MERF 3.2 being sold on the Internet. They are manufactured from cheap and low quality components. Using the fake MERF 3.2 is dangerous and may damage your gun and battery.

HOW TO RECOGNIZE A FAKE MERF 3.2?

- green soldermask
- no original box

NOTICE

Information contained in this document is subject to updating without notice.

You should program your **MERF 3.2** before the first use.

**FOR YOUR OWN SAFETY, PLEASE READ THIS USER MANUAL
CAREFULLY BEFORE INSTALLING THE DEVICE**

SAFETY SUMMARY

THE DEVICE COVER MUST NOT BE REMOVED BY THE USER

DANGER!

Caution must be exercised to prevent short circuiting the battery as the consequences can be very dangerous.

FOR YOUR SAFETY

We recommend that this product should be installed by an experienced airsoft service.

WARNING: Before starting installation process, please ensure that your AEG is empty and there are no BBs inside.

WARNING: Always use a fuse between the battery and the AEG controller.

WARNING: Incorrectly connecting positive and negative battery terminals will cause immediate damage to the unit and it can lead to fire.

NOTE:

Please check if you have downloaded the latest manual from the Technical Support section of our website: www.gatee.eu. The Product Warranty Form is also available there.

In case you have any difficulties while installing or using this product, we recommend to email us at support@gatee.eu.

GATE Menet, Wojtak Sp. J. does not take any responsibility for damages, injuries and accidents resulting in the use of this product or the use of Air Electric Gun with the product installed.

PRODUCT DISPOSAL INSTRUCTIONS



The symbol shown here means that the product is classed as Electrical or Electronic Equipment and should not be disposed with other household and commercial waste at the end of its working life. The Waste of Electrical and Electronic Equipment (WEEE Directive 2012/19/UE) has been put in place to recycle products using best available recovery and recycling techniques to minimize the impact on the environment. Purchasers shall take any old electrical equipment to waste recycling public centers or points of sale.



CERTIFICATE OF CONFORMITY

GATE Menet, Wojtak Sp. J. hereby declares under our sole responsibility that the product GATE **MERF 3.2** is in conformity with the essential requirements of the following Directives: EC DIRECTIVE 2011/55/EU



This product has been certified as RoHS Compliant.

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01. OVERVIEW

Multifunctional programmable 3rd generation MOSFET. The AEG controller has 11 functions. Its latest feature is the 3-rd Burst Mode, which allows for limiting the number of shots. **MERF 3.2** allows for lossless rate of fire adjustment. It protects Li-Ion batteries: LiPoly and LiFePO4. It has a built-in active brake and it protects contacts against damage. The Smart Trigger function enables achieving faster trigger response. Thanks to two operating modes, the system works with both the original and the modified AEG installation. The system is designed for all replicas and especially for the upgraded ones. It has been adapted to work even with the most powerful springs, including M170.

MAIN FUNCTIONS

- MOSFET
- Active Brake
- Electronic Fuse
- Battery Protection
- Over temperature protection
- Debouncing
- 3rd Gen MOSFET
- ROF Control
- Smart Trigger
- 3-rd Burst
- Plug&Play

FEATURES

- The system works correctly in a wide range of voltages 3.2 - 15V
- Compatibility with the strongest AEG replicas
- Simple installation
- Protections
- Very low current consumption in stand-by (0.15mA)
- Very low resistance ~2,4mΩ
- Compatible with all types of GearBox
- 4 LED Display
- DEANS-T Connectors

OPERATING LIMITS

Battery Voltage	7.2 - 12.8V
Battery Type	NiCd, NiMH, Li-ion, Li-Poly, LiFePO₄
Spring	M170, M210

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	3.2 - 15V
Maximum continuous current	35A
Maximum current (3 min)	50A
Resistance	2.4mΩ

KEY FUNCTIONS

**MOSFET****MOSFET**

Do you want to achieve higher rate of fire and faster trigger response? Are you planning power upgrade of your rifle? In that case, you need a MOSFET.

It targets the energy from the battery directly to the motor, bypassing the mechanical trigger contacts. As a result, you gain a higher rate of fire of the rifle and faster trigger response, and the contacts are protected against burn out.

**ACTIVE BRAKE****Active Brake**

Do you care about realism? Would you like to increase the life of the gearbox? Does your rifle have such high rate of fire that you are not able to make a single shot? Active brake sorts things out.

In SEMI Mode, the brake does not allow for compressing a piston after a shot. The piston will stop in front position which eliminates unnecessary stresses, increasing the service life of gearbox and its parts. It is very important, especially with an AEG power upgrade.

After releasing the trigger, the rifle immediately stops firing. Thus, you gain more realism and, additionally, you do not waste your precious ammunition.

**ELECTRONIC FUSE****Electronic Fuse**

We know how important reliability is on the battlefield. That's why our new MOSFET has thermal protection. In tandem with a time-lag fuse, it fully protects your AEG installation.

**BATTERY PROTECTION****Protection against Over-Discharge of Battery (UVP Protection)**

Modern LiPoly batteries are very sensitive to over-discharge. If you do not want to damage the battery and you care about its service life, this protection is indispensable. The microprocessor constantly monitors the battery voltage. When it drops down to a critical level, it will not permit firing.

**DEBOUNCING****Debouncing (Digital Interface)**

This provides full compatibility with the micro-switches. It is fully resistant to contact bounce. You gain a bigger ROF, a faster trigger response and your MOSFET is less prone to heating.



3rd GEN MOSFET

3rd Generation MOSFET

The usage of modern transistors and microcontroller has enabled us to create the smallest and most reliable AEG Controller in the market.



ROF CONTROL

Rate Of Fire Control

It enables lossless reduction of rifle's rate of fire, so you can use stronger LiPo batteries, and still have ROF just like in a real gun.



SMART TRIGGER

Smart Trigger

We know how vital the fast trigger response is during combat. Victory is often a matter of fractions of seconds. This is why we have developed the Smart Trigger function. This function enables you to achieve faster trigger response.

It works with the ROF Control system. During the first shot, the microprocessor sets ROF Control to 100%. After the first shot, it is switched to the previously programmed value, e.g. 30%. As a consequence, the first shot is fired with full rate of fire, and subsequent ones with a reduced ROF. The best results can be achieved by using a battery with higher voltage than a standard one. For example, if we use a 7.4V battery, we can change it to 11.1V. In this way, we will achieve faster trigger response with the same rate of fire as with a standard battery.

3rd Burst



3-rd burst mode

Burst mode enables you to make 3-shot series. In this way you can save ammunition and increase the realism. You can change AUTO mode to BURST mode or SEMI* mode to BURST mode.

If in SAFE/SEMI/BURST mode you release the trigger earlier, you can make one or two shots. The burst time is set in the menu with accuracy to 4ms. The processor actively compensates for the change in burst time with a decrease in the rate of fire due to battery discharging.

**SEMI to BURST in enhanced mode only*

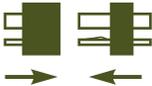


CONFIGURABLE FIRE SELECTOR

The function gives you the option to program your fire selector. There are five modes:

- STOCK WIRING SEMI/AUTO
- STOCK WIRING SEMI/BURST
- MODIFIED WIRING SEMI/AUTO
- MODIFIED WIRING SEMI/BURST
- MODIFIED WIRING BURST/AUTO

Plug&Play



Operating Modes

You can connect the system to a rifle in two ways. Depending on the selected method, you should set a proper operating mode: Plug&Play or Enhanced

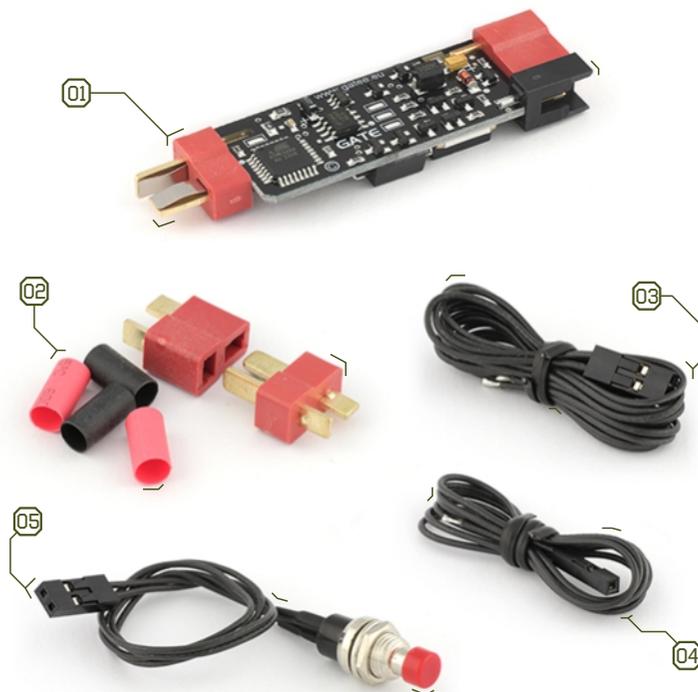
Plug&Play: All you need to do is connect the system between the battery and the rifle.

Enhanced Mode: It requires modification of AEG installation.

Connect trigger contacts to **MERF 3.2**. You can do it using the signal wire attached to the kit.

INCLUDED IN THE KIT:

- 01 **MERF 3.2**
- 02 **Additional kit of Deans-T Connectors**
- 03 **Double signal wire for trigger contacts**
- 04 **Single signal wire for trigger contacts**
- 05 **Programming button**



02. INSTALLATION

Thanks to two operating modes, **MERF 3.2** works with both standard and modified installation.

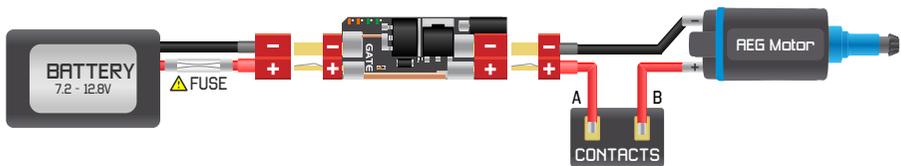
1. Simple installation *(no modification to your AEG is required):*

FIG 1. STANDARD AEG INSTALLATION

Connect **MERF 3.2** between the battery and the AEG. You can make configuration using programming button from the kit.

2. Enhanced installation:

To adapt the standard AEG installation to work with **MERF 3.2** you have to get to the trigger contacts. In case of GB v2 contacts are located inside a gearbox. With a version 3 gearbox, installation is easier because the contacts are on the outside of the gearbox. Please consult a local airsoft technician if you have never disassembled a gearbox before or if you have any installation concerns.

a) Installation of MERF 3.2 without replacement of wires .

Using this method, the original wiring is kept, and the connections are modified. Referencing Figure 2, de-solder A wire from the one of the trigger contacts and then solder it to the B wire. It does not matter which wire you disconnect from the trigger

contacts, just join two wires together at one terminal. In the place of the A wire, solder additional single signal wire (3 – provided with the **MERF 3.2** kit). The GATE wire is thin because it handles very low current and is only used for switch-detection. If you have already connected the **MERF 3.2** between the battery and the AEG, do not forget about a signal wire. Connect it to the top pin.

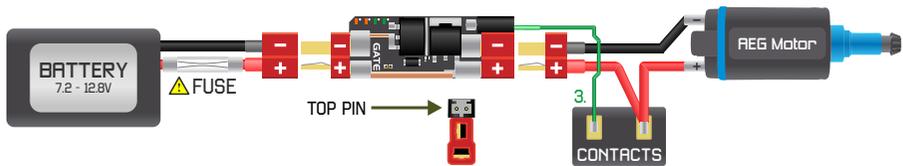


FIG 2. CONNECTION-MODIFICATION SCHEME

b) Installation of MERF 3.2 with replacement of wires

Replacing the existing AEG wiring with high-quality, low-resistance wiring in conjunction with the installation of a MOSFET allows for the ultimate in efficiency. 16 awg or thicker wire is recommended. Solder the double signal wire (provided with the kit) to the contacts, according to the Figure 3.

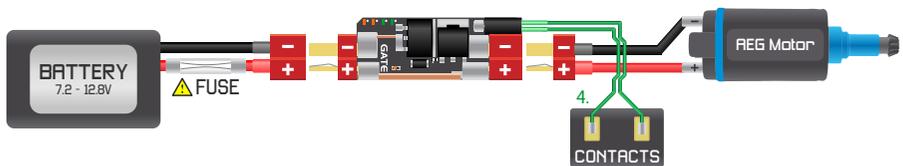
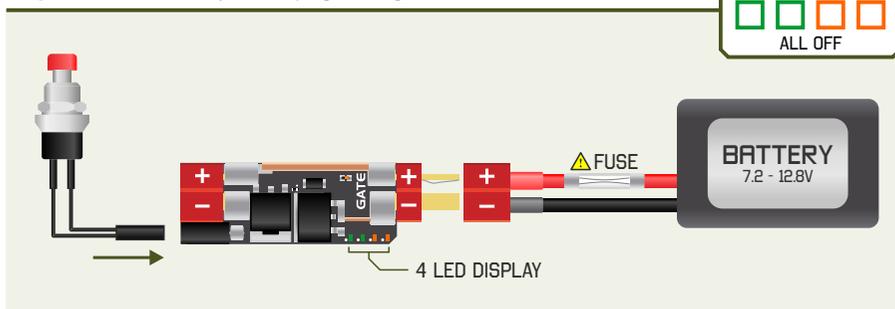


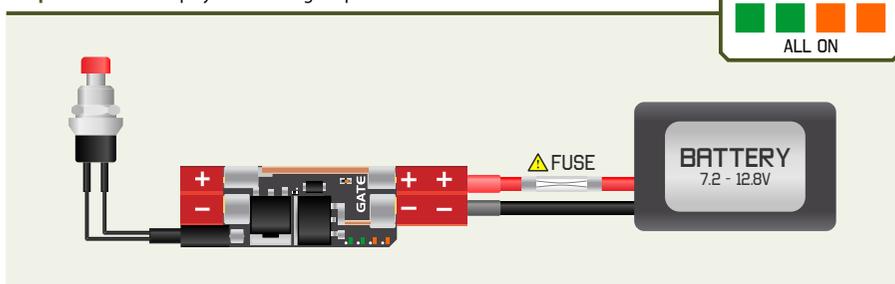
FIG 3. COMPLETE RE-WIRING SCHEME

03. SET UP YOUR MERF 3.2

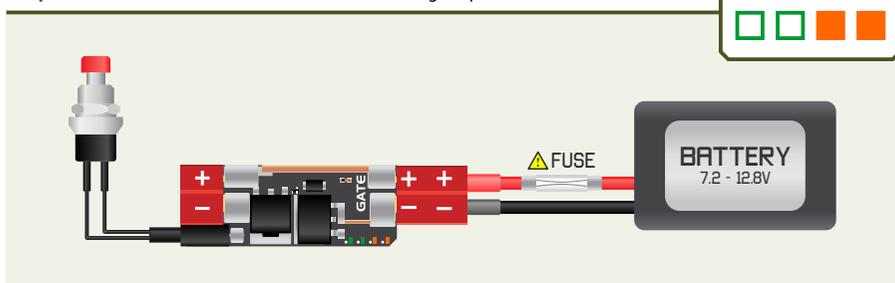
Step 1. Connect the battery and the programming button to **MERF 3.2**



Step 2. Automatic display test. LEDs light up for a second.



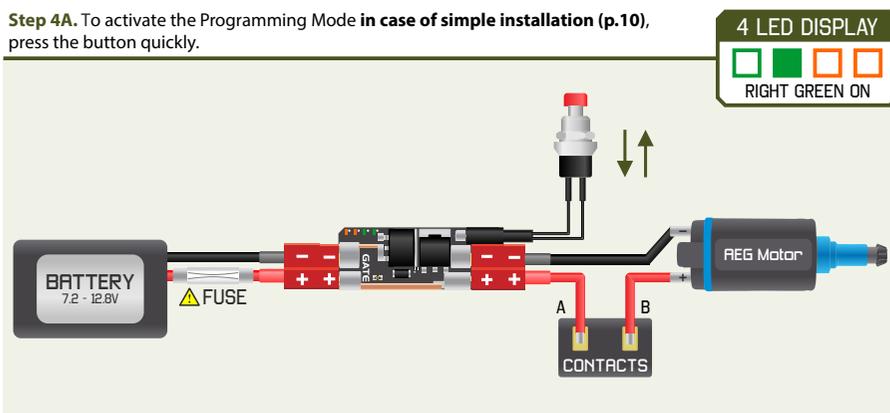
Step 3. Automatic software version check. Two LEDs light up for a second.



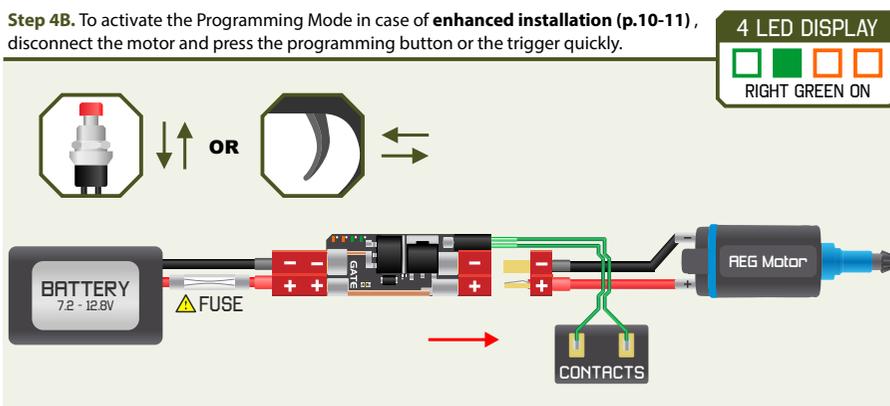
MERF 3.2 recognizes long and short button presses



Step 4A. To activate the Programming Mode in case of simple installation (p.10), press the button quickly.

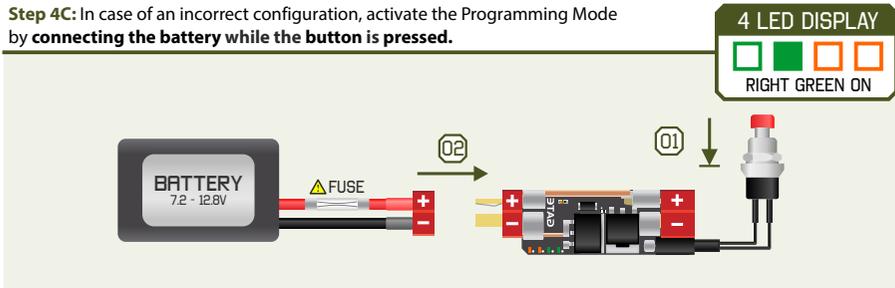


Step 4B. To activate the Programming Mode in case of enhanced installation (p.10-11), disconnect the motor and press the programming button or the trigger quickly.

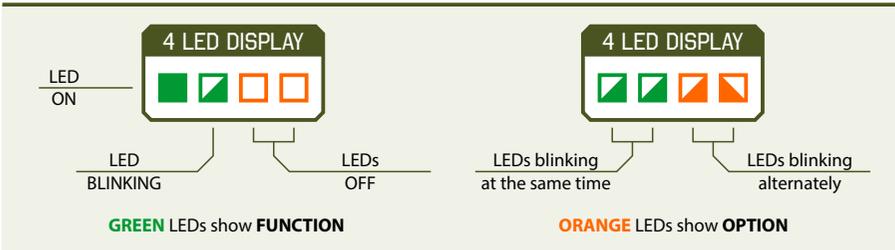


MERF 3.2 will recognize the absence of the motor and will activate the Programming Mode.

Step 4C: In case of an incorrect configuration, activate the Programming Mode by **connecting the battery while the button is pressed.**



4 LEDS DISPLAY LEGEND



04. MENUS

Press the button quickly to cycle through the main functions of **MERF 3.2**.

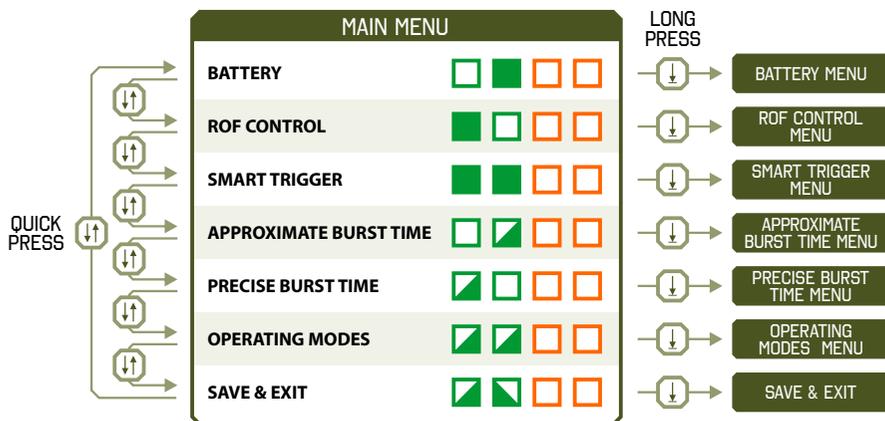
Press and hold the button for about a second if you want to enter a particular function.

When you enter the function menu, cycle through the function settings by short presses. Press the button for about a second to enter a chosen setting. Press and hold the button again and you will be moved back to the Key Functions Menu.

PLEASE NOTE:

Remember to always **SAVE** your settings after programming the **MERF 3.2**, otherwise the session **will be lost**.

MERF 3.2 remembers the settings after disconnecting the battery.



SUB-MENUS



QUICK PRESS:
NEXT SETTING



LONG PRESS:
SAVE & EXIT TO
MAIN MENU

BATTERY MENU	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
NiCd 7.2V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
NiCd 8.4V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
NiCd 9.6V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
NiCd 10.8V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
NiCd 12V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
LiPoly 7.4V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
LiPoly 11.1V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
LiFePO ₄ 9.6V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
LiFePO ₄ 12.8V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

ROF CONTROL MENU	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
30%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
40%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
50%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
60%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
70%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
80%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
90%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
100%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>

SMART TRIGGER MENU	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPROXIMATE BURST TIME MENU	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
96ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
128ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
160ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
192ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
224ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
288ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
352ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
416ms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

PRECISE BURST TIME MENU		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+0ms	+0ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
+4ms	+8ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
+8ms	+16ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
+12ms	+24ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
+16ms	+32ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
+20ms	+40ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
+24ms	+48ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
+28ms	+56ms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

MERF 3.2 offers 64 settings of burst time for your AEG.

Settings up to 192 ms in the Approximate Burst Time Menu let you adjust by 4 ms increments in the Precise Burst Time Menu.

Settings from 224 - 416 ms in the Approximate Burst Time Menu, can be adjusted by 8 ms increments in the Precise Burst Time Menu.

OPERATING MODES MENU	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENHANCED MODE SEMI/AUTO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ENHANCED MODE SEMI/BURST	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ENHANCED MODE BURST/AUTO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SIMPLE MODE SEMI/AUTO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SIMPLE MODE SEMI/BURST	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

FACTORY SETTINGS

To restore Factory Settings activate the programming mode and input the settings listed below.

ORIGINAL SETTINGS		
BATTERY	NiCd 7.2V	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
ROF CONTROL	100%	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
SMART TRIGGER	OFF	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
APPROXIMATE BURST TIME	288ms	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
PRECISE BURST TIME	+0ms	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
OPERATING MODES	ENHANCED MODE SEMI/AUTO	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

05. BURST TIME SETTING

MERF 3.2 allows you to use 3-rd burst firing mode. It supports replicas which rate of fire ranges from 7 to 31 shots per second. Set Burst Time in menu to calibrate burst.

THE THEORETICAL EXPLANATION

Burst Time is time of three shots expressed in millisecond. One millisecond (1ms) is a thousandth (0.001) of a second. You can set it up with a resolution 4ms for times 96ms - 220ms, and with a resolution 8ms for times 224ms - 472ms.

Table (approximate):

BURST TIME	RATE OF FIRE IN SHOTS PER SECOND
96ms	31 rps
128ms	23 rps
160ms	18 rps

192ms	15 rps
224ms	13 rps
288ms	10 rps
352ms	8 rps
416ms	7 rps

Precise Burst Time adds to the Burst Time the selected value.

EXAMPLE 1:

Burst Time: 160ms

Precise Burst Time: +8ms / +16ms

Result : 160ms+8ms=168ms

EXAMPLE 2:

Burst Time: 224ms

Precise Burst Time: +8ms / +16ms

Result: 224ms+16ms=240ms

You can set 64 different Burst Times on the display which has only four segments.

THE PRACTICAL EXPLANATION

There are two ways for Burst Time setting: setting by **hearing** or setting by making a **measurement of rate of fire** via a microphone or chronometer.

a) Burst Time setting by hearing (if you do not know the ROF):

1. Set approximate **Burst Time** on three shots
2. Reduce the approximate **Burst Time** by one level
3. Check if your AEG fires two shots (if not - get back to Step 2)
4. Go to the menu Precise Burst Time and increase it by one level
5. Check if your AEG fires three shots (if not - get back to Step 4)
6. THE END

You have just set the burst on three shots so as the piston stops in the front position without causing stress in the gearbox.

b) Burst Time setting (if you know the ROF):

If you know the exact ROF of your AEG, you just have to type in the menu a time of three shots.

Make the conversion in a simple way according to the formula:

$$\text{Burst Time [ms]} = 3000 / \text{ROF rps}$$

An example: for ROF 20 shots/second: $3000 / 20 = 150\text{ms}$

06. GATE LIMITED WARRANTY POLICY

GATE Menet, Wojtak Sp. J. warrants that its Product is free from manufacturing and material defects at the date of purchase and for a period of one (1) year from the date of purchase and it is not-extendable. This Limited Warranty is conditioned upon proper use of Product by Purchaser.

1. This Limited Warranty is valid provided that the owner provides a proof of purchase and properly completed warranty form. The warranty form is available on our website: <http://www.gatee.eu/>.

2. This Limited Warranty does not cover: (a) defects or damage (eg. mechanical, thermal or chemical) resulting from accident, misuse (misinterpretation of the instructions), abuse, neglect, unusual physical, electrical or electromechanical stress, water immersion, repairs or structural modification of any part of Product (eg. heat-shrink tube removal), or (b) the Product that has the serial number removed or made illegible; (c) defects or damage from improper operation, maintenance or installation, (d) installation of the products.

3. Requests for warranty are processed as soon as possible, not exceeding seven (7) working days. The company's obligation under this Limited Warranty shall be limited to providing replacement of part/s only.

Contact: support@gatee.eu