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<http://trigger-master.com>

Congratulations on your new digital fire control computer! This unit will change the way you use and look at your electric gun. With this short document, you will know all you need to install and use your new **Trigger Master Mark III (MkIII)** unit!

You should have basic soldering skills and feel comfortable with the idea of disassembling and re-wiring your gun before you start this. If you do not, get your local Airsoft gun mechanic to install this for you.

Firing Modes Available

Normal (Safe-Semi-Full)	Fire selector works like a normal gun.
Burst/Full Hybrid Mode (Safe-Semi-Burst/Full)	When on "FULL", a 3-shot burst is fired. If the trigger is held down after the burst, the gun begins firing in full-auto.
Semi-only (*) (Safe-Semi-Semi)	The gun will only fire semi-auto, regardless of selector switch setting.
Burst Mode (Safe-Semi-Burst)	When on "FULL", a 3-shot burst is fired. No full auto follows the burst.
Sniper/DM mode (*)	Like Semi-only, but with a 1-second shot delay between each shot to simulate the delay from recoil and careful aim. (This mode can be useful to allow electric Sniper/DM guns higher FPS limits, when semi-only is not enough of a handicap.)
Bonus Mode (Safe-Burst-Full)	Provided as an extra bonus firing mode for those who like to try out experimental things!

Modes marked with an () are the only modes available on semi-locked units (by special order only.)*

Technical Details

Size and Weight: 50.8mm x 16.5mm x 13.5mm. 14 grams. Unit can fit in a 19mm diameter tube.

Voltage Range: Accepts from 7.0V to 16.0V (maximum).

Power: The Trigger Master is rated for 450 Amps peak, 60 Amps continuous. It can deliver 7000 Watts of power.

Low Battery Warning: Low battery signal happens when the battery drops to 85% of the initial voltage. Shutdown will occur when the battery voltage is either under 7.0V (too low to run the Trigger Master), or drops below 80%.

STEP 1: Disassemble your Gun

You will need to access and change some wiring in your gun to install and use the Trigger Master. If you are not comfortable with doing that, find a gunsmith who can do the installation for you.

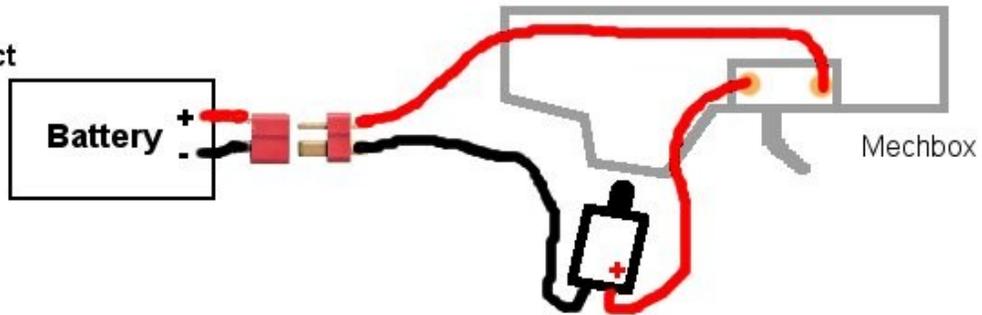
STEP 2: Install the Trigger Master unit and Wiring

The Trigger Master is small enough to be placed in almost any spot inside an AEG. It can even sit in the same space as a normal fuse holder (replacing the stock fuse) if space is tight. (Though keeping your fuse in place is recommended.)

One of pair of wires goes to the battery, one pair goes to the motor, and one pair is for the trigger contacts as shown in the following diagrams:

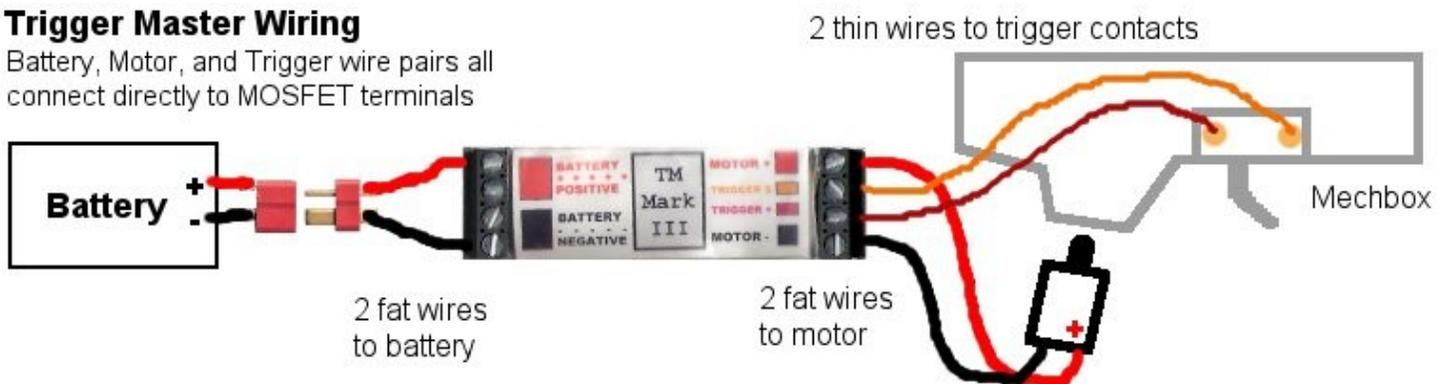
Normal AEG Wiring

Trigger contacts connect power directly to motor when trigger is pulled.



Trigger Master Wiring

Battery, Motor, and Trigger wire pairs all connect directly to MOSFET terminals



NOTE: There are two “Battery +” and two “Battery -” terminals on the Trigger Master. You need only connect the battery wires to one positive and one negative. (You do not need to use both “+” and both “-” terminals.)

Additional Wiring Details and Notes

- One trigger wire is marked “Trigger +” and the other is marked “Trigger S”. It doesn't matter which wire goes to which trigger contact.
- 16 (or 18) gauge wire is appropriate for the battery and motor wires. These wires carry a lot of current, so the thicker the better. Thinner wire (24 gauge) is OK to use for the trigger wires.
- The **Trigger Master Mk III** has screw terminals (use a 0.1” or 2.5mm flathead) for solder-free wire connections to the unit. Strip about 1/8” of wire, fit it into the screw terminal, and tighten the screw. If you know how to solder, tin the stripped end of wire for a fray-free end to work with.

- The wires to and from the Trigger Master should be twisted in pairs where possible. (Diagrams do not show the wires twisted to make it easier to see what wires go where.)



This picture shows a good twist. Try to twist wire pairs whenever possible when you install. Twisting helps minimize electrical noise and voltage spikes due to the large currents used by the motor.

- Double and Triple-check your battery wires **before** you power up! Be extra sure to connect the “+” and “-” wires appropriately! (Deans connectors have a small + and - marked on the plugs.)
- The trigger wires should connect directly to the trigger switch contacts in the trigger assembly of the mechbox. The most common way to do this is by soldering the trigger wire ends to the contacts. Alternately, snip the existing wires attached to the contacts at a convenient place, and splice into those instead.
- Double and Triple-check that you have the polarity of the wires to the motor right! If you wire the motor backwards, you will be running it in reverse which will probably damage your gun.
- The diagrams do not show the AEG fuse. If at all possible, it is recommended that you leave your AEG fuse in place (between the battery and the Trigger Master unit) for extra protection.

STEP 3: Testing

1. Connect a battery. Touch the grip of the gun (where the motor is). You will feel a **short** vibration, then a **longer** vibration. This means that the power-up self-test is complete and OK. (If you do NOT feel the pulses described, disconnect power and check your wiring. If you feel four pulses, either you are holding the trigger down, or there is a short in the trigger wiring.)
2. Put the gun into SEMI and fire the gun 5 times. Pull the trigger completely for each shot. The MOSFET computer will now be “trained” for your gun, battery, and gear timing. (NOTE: You should do this every time you power up the gun - fire the first 5 shots in SEMI.)
3. Put the selector on FULL and pull the trigger. You should get a burst. If you keep the trigger held down after the burst, the gun will go full-auto.
4. If all went well, you are done! Leave things alone to “just work”, or read on for advanced uses!

TROUBLESHOOTING

- Four pulses at powerup instead of the normal short then long pulse? The trigger is either being held down (don't pull it when powering up) or there is a short or other wiring problem with the trigger.
- Is your gun “stuttering” when it tries to fire in burst or auto? Does it not complete shots in semi-auto? This is probably due to a trigger malfunction. Make sure your trigger wire connections to the trigger contacts are good. Or your trigger contacts might be dirty, corroded, not making proper contact when you pull the trigger, or all of the above! Clean them up (or replace them) to make sure you are getting good operation. (Arcing on the trigger contacts from stock-wired guns

damages them and can cause this problem, and it means your trigger switch would eventually fail completely; the good news is that the Trigger Master MOSFET eliminates this arcing.)

- If the operation of your gun ever seems completely messed up (or you can't remember what you did or didn't change in the configuration), do a **FACTORY RESET** - see the next section for how.
- 99% of problems can be traced to low batteries! Having strange problems? Charge your batteries with a good quality charger and give it another go!

USING THE TRIGGER MASTER - CARE AND MAINTENANCE

- **Always fire the first 5 shots in SEMI after powering up to train the gun's auto-timing.**
- Pull the trigger completely for each shot when in SEMI-AUTO; try not to release the trigger “early” before the firing cycle is complete (especially during those first 5 shots in SEMI.)
- Using a Li-Po battery? No problem, but to avoid overdischarging your battery pack (which is very bad for a Li-Po) change the battery as soon as you get the “Low Battery” warning - which is one pulse from the motor after a shot is fired. “Low Battery” kicks in when the battery drops to 85% voltage.
- Disconnect the battery while the gun is in storage. (The Trigger Master uses a small amount of power while connected to a battery, which will slowly drain the battery over a long time if not connected.)
- If you ever pull the trigger and the gun does something strange (or doesn't fire) - **STOP!** Release the trigger and look for the problem.
- Try to use the same battery packs with the same gun. The computer uses a highly accurate method of timing for bursts, but switching to a much higher or much lower voltage/capacity battery can confuse the auto-timing. Always fire the first 5 shots in semi-auto after powering up.

ADVANCED CONFIGURATION

Many people are perfectly happy with the default settings for the Trigger Master, but if you'd like to explore the additional options and firing modes, this next section is for you!

Remember you can **ALWAYS** return your Trigger Master to the factory defaults by doing a **FACTORY RESET**, so don't be afraid to play around!

Advanced Configuration Reference

The following options are available to be programmed into the Trigger Master via a system of trigger pulls and motor grip-pulses for feedback. For advanced users only. Anything you set here will be remembered even if you disconnect the battery.

To enter advanced option programming mode, pull the trigger ONCE after the first short pulse when the battery is first connected to the gun.

You will feel 1 pulse. This means you are in MODE selection.

Pulling the trigger one or more times within the next two seconds will set the gun's function: **(Only modes 3 and 5 can be selected if you have a semi-locked model.)**

1 Trigger pull = Normal Mode (SAFE-SEMI-FULL)

2 Trigger pulls = Burst/Full Hybrid Mode (SAFE-SEMI-BURST/FULL)

3 Trigger pulls = Semi Only (SAFE-SEMI-SEMI)

4 Trigger pulls = Burst Mode (SAFE-SEMI-BURST with no full-auto after a burst)

5 Trigger pulls = Sniper/DM Mode (Semi only with forced 1 second delay between shots)

*6 Trigger pulls = **BONUS** Mode (SAFE-BURST-FULL). The burst timing on this experimental mode is not guaranteed to always be – it is possible that after sustained use the burst timing may result in the occasional burst that is not exactly 3 shots. This is because the auto-timing adjustment relies on semi-auto and “semi-auto” has been turned into “BURST”. The good news is that none of this can damage your gun or MOSFET settings, so feel free to try it out!*

Note: The first 5 “training” shots in Sniper/DM mode will not have the shot delay.

Note: The first 5 “training” shots in the BONUS mode (SAFE-BURST-FULL) are always semi-only; they will not be bursts.

If you do not wish to change this parameter, do nothing.

You will now feel 2 pulses. You are in BURST TIME REDUCTION mode.

Pulling the trigger one or more times within the next two seconds will shorten the length of time of a burst. This is useful to manually correct the timing if the gun happens to be shooting more than 3 shots for a burst, or if you want to manually tweak it to get 2-shot bursts.

Each trigger pull = 4% shorter burst timing

NOTE

For SEMI-LOCKED Trigger Masters installed on fullauto-only guns (meaning gearboxes that have no semi-auto, e.g. M249) the “Burst Time Reduction” manually *decreases* the length of a single firing cycle. (A semi-locked full-auto gun is technically firing “bursts” that are only one shot long.) If you did not specifically order a semi-locked unit, ignore this.

If you do not wish to change this parameter, do nothing.

You will now feel 3 pulses. You are in BURST TIME INCREASE mode.

Pulling the trigger one or more times within the next two seconds will lengthen the length of time of a burst. This is useful to manually correct the timing if the gun happens to be shooting less than 3 shots for a burst for some reason.

Each trigger pull = 2% longer burst timing

NOTE

For SEMI-LOCKED Trigger Masters installed on fullauto-only guns (meaning gearboxes that have no semi-auto, e.g. M249) the “Burst Time Increase” manually *increases* the length of a single firing cycle. (A semi-locked full-auto gun is technically firing “bursts” that are only one shot long.) If you did not specifically order a semi-locked unit, ignore this.

If you do not wish to change this parameter, do nothing.

You will now feel 4 pulses. You are in MOTOR SPEED REDUCTION mode.
Pulling the trigger one or more times within the next two seconds will reduce the speed of the motor, effectively reducing the rate of fire.

Each trigger pull = 10% slower motor speed

If you do not wish to change this parameter, do nothing.

You will now feel 5 pulses. You are in MOTOR SPEED INCREASE mode.
Pulling the trigger one or more times within the next two seconds will increase the speed of the motor, effectively increasing the rate of fire.

Each trigger pull = 10% faster motor speed

If you do not wish to change this parameter, do nothing. Factory default is 100%.

You will now feel 6 pulses. You are in SHOT DELAY END VIBE ON/OFF mode.
This option only applies to the Sniper/DM firing mode (which has a forced 1 second delay between each semi-auto shot.) If you want the motor to make a short vibration to signal to you exactly when the shot delay is over and you can fire again, enable this option. (Not to be confused with the low battery warning, which is a longer vibration.)

*Pull the trigger once to enable the Shot Delay End Vibe in Sniper/DM Mode.
Pull the trigger twice to disable the Shot Delay End Vibe. (Default)*

To leave this parameter unchanged, do nothing. Shot delay end vibe is OFF by default.

You will now feel 7 pulses. You are in BURST COMPLETION ON/OFF mode.
When turned on, bursts will complete even if the trigger is released early (as long as the trigger is down long enough for at least 1 shot to finish, the burst will complete.) This option only applies to firing modes with burst capability.

When off, shooting always stops as soon as the trigger is released - just like on real firearms.

*Pull the trigger once to enable Burst Completion.
Pull the trigger twice to disable Burst Completion. (Default)*

To leave this parameter unchanged, do nothing. Burst Completion is OFF by default.

You will now feel 8 pulses. You are in FACTORY RESET mode.

If you do not wish to enforce a factory reset, do nothing.

*Otherwise, pull the trigger and hold it down until you feel a long vibration. This will completely reset the gun's programming and set it back to factory defaults. Disconnect, then reconnect the battery to complete the reset and start the **Trigger Master** fresh.*

Remember, after powering up the gun you should always fire the gun 5 times in semi-auto mode to train it – this is especially true after doing a Factory Reset.

You will feel a long pulse when the Advanced Configuration mode is ended. **You must now disconnect and reconnect the battery** to use the new settings.

Startup Codes Reference

After connecting power, the Trigger Master does a power-up self-check which lasts a few seconds. After the check, the results are communicated by vibrating the motor.

One Pulse	All systems go (normal).
Two Pulses	Battery voltage is less than 7.0 volts. (Battery is really dead!)
Three Pulses	Battery voltage is more than 16.0 volts (too high!)
Four Pulses	Trigger is down during startup. Keep your finger off the trigger, disconnect and re-connect battery. If your finger is <i>not</i> on the trigger, check the trigger wiring for a short.

If the gun did not shut down as a result of an error, a **long** pulse will now signal the user that the gun is ready to fire.

Post-Firing Codes Reference

After shooting and releasing the trigger, if any of the following conditions were met the user will be signaled by vibrations from the motor:

One pulse	Battery is Low. (Technically, battery has dropped below 85%.) This is a single pulse felt immediately after shooting. If the battery drops much further, the gun will stop firing. If you are using a LI-Po battery, change batteries now to prevent overdischarge of your battery pack.
Two pulses	Overcurrent detected. Peak current was over 500 Amps. Motor is stopped immediately and the gun will not fire. (Motor will "click" when trigger is pulled, due to motor startup then immediate shutdown.) Check for shorts or other wiring or motor problem.
Three pulses	Overheating detected (>75 degrees celsius at CPU). Release the trigger, disconnect the power, and inspect your gun for faults.

Technical Support

Your Trigger Master is covered by a full warranty against manufacturing defects! This warranty does not extend to damage caused by improper installations (but we'll do what we can to help you out.)

If you need technical support or have a warranty concern, please go to <http://trigger-master.com> or email store@unconventional-airsoft.com .

About the Trigger Master

The **Trigger Master** is based on the excellent PANTHER and CHEETAH hardware platforms by Terry Fritz and available from <http://extreme-fire.com>.

All hardware and software used is **open source**. You can obtain copies of the hardware design and source code at <http://unconventional-airsoft.com>. You are absolutely free to make and modify your own as long as you keep the hardware and software design free!

For additional help and the latest documentation, you can always go to <http://trigger-master.com> or email store@unconventional-airsoft.com.

Advanced Configuration Quick Reference

Disconnect and re-connect battery. Pull trigger once after the first pulse (but before the second long one.)		
One pulse (Firing Mode)	<ol style="list-style-type: none"> 1. Normal (Safe-Semi-Full) 2. Burst/Full (Safe-Semi-Burst/Full) 3. Semi-only Mode 	<ol style="list-style-type: none"> 4. Burst mode (Safe-Semi-Burst) 5. Sniper/DM (Semi with shot delay) 6. Bonus mode (Safe-Burst-Full)
Two pulses (Shorter bursts)	4% shorter burst time for each trigger pull.	
Three pulses (Longer bursts)	2% longer burst time for each trigger pull.	
Four pulses (Motor slow down)	10% slower motor speed (and therefore lower rate-of-fire) per trigger pull.	
Five pulses (Motor speed up)	10% faster motor speed per trigger pull. (Default is 100%)	
Six pulses (Shot delay end vibrate)	<ol style="list-style-type: none"> 1. Short vibration to signal end of shot delay in Sniper/DM mode is ON. 2. No vibration at end of shot delay in Sniper/DM mode. (default) 	
Seven pulses (Burst Completion)	<ol style="list-style-type: none"> 1. Burst Completion is ON. 2. Burst Completion is OFF. (default) 	
Eight pulses (Factory Reset)	Pull and hold trigger until the long pulse (see below) is felt to return unit to factory defaults.	
Long pulse	End of advanced configuration. Disconnect and re-connect battery to use new settings. Remember to fire 5 shots in semi-auto after connecting power to your gun for training the timing.	

Firing Modes Quick Reference

Name	Selector Switch Function	Description / Notes
Normal	SAFE - SEMI - FULL	Selector works like on a normal gun.
Burst/Full Hybrid	SAFE - SEMI - BURST/FULL	When selector is on FULL, a 3-round burst is fired. If the trigger remains held down after the burst, full-auto begins.
Semi-Only	SAFE - SEMI - SEMI	Only one shot per trigger pull regardless of selector setting.
Burst Mode	SAFE - SEMI - BURST	When selector is on FULL, the gun fires a 3-round burst. The burst does <u>not</u> become full-auto if the trigger is held down.
Sniper/DM	SAFE - SEMI - SEMI	Only one shot per trigger pull. 1 second of "dead time" is forced between each shot. <i>(Note: The first 5 training shots after powering up the gun do not have a shot delay)</i>
Bonus Mode	SAFE - BURST - FULL	After the first 5 timing shots after powerup, SEMI becomes BURST. Use at your own risk. This mode's results are experimental and harmless but not guaranteed.... it is for the curious only!

Tips and Reminders

1. After connecting a battery, there is a short pulse then a long one. The gun is now ready.
2. **Always shoot the first 5 shots with the selector in "SEMI" after powering up the gun.** This is to train the Trigger Master on your gun's timing to make sure it is up-to-date.
3. The Trigger Master uses a small amount of power when plugged in. To prevent a dead battery, unplug battery when not in use.
4. One short vibration felt immediately after a shot is fired is the Low Battery Warning.