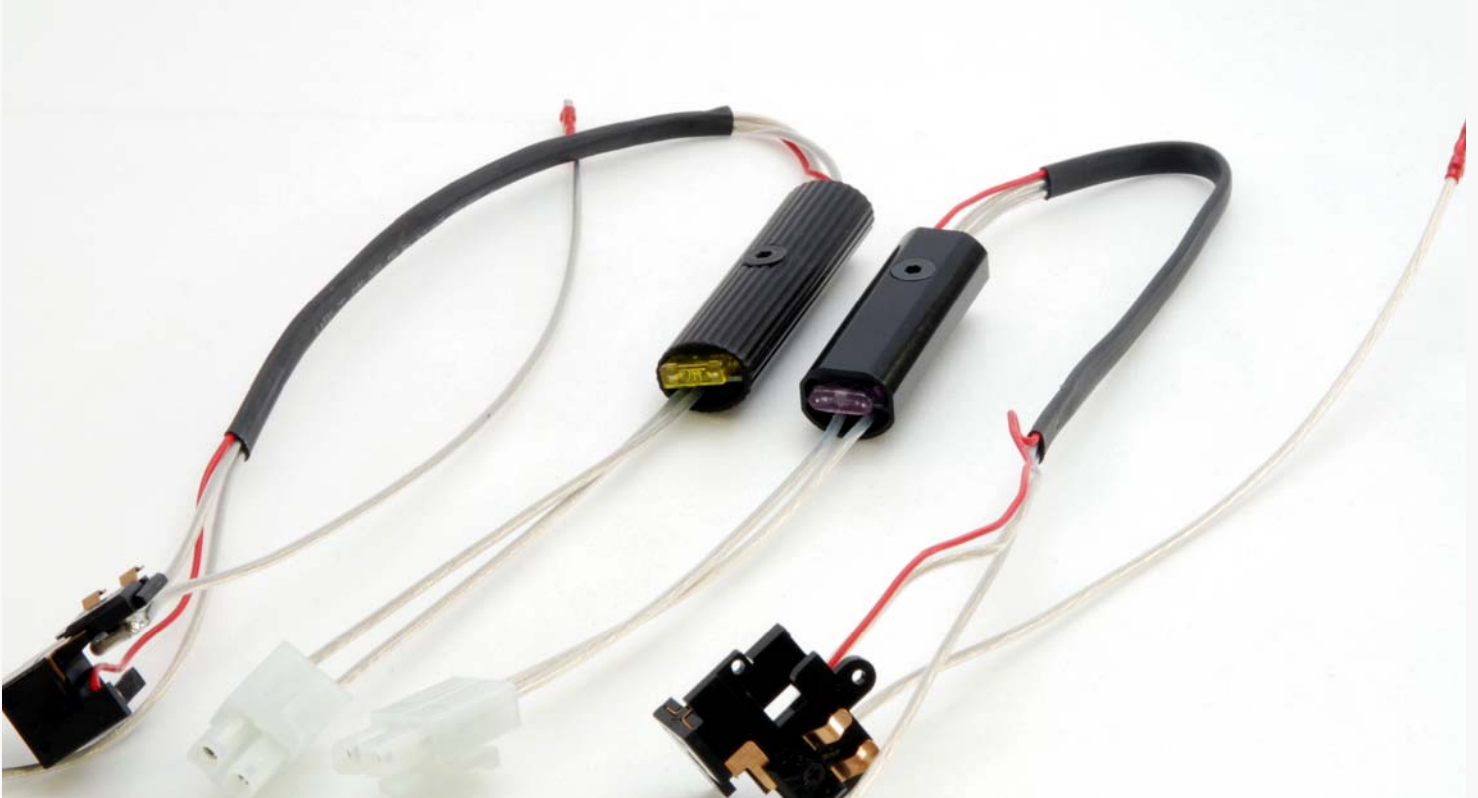


SYSTEMA Switch Device Usage Guide



1. Process of development

The SYSTEMA Switch Device was developed for our complete custom approximately 6 years ago. In an OEM TM Switch, the Cut-Off Lever acts as a block to aid the switch and extracts the single cycle needed to enable the Semi-Auto function from what is normally a Constant Cycling system. From a cost standpoint this simple switch design is quite superb; however from the custom perspective this item lacks durability when high loads and high current is taken into consideration. Back then our Complete Custom consisted of the M155 Spring, All Helical Torque-Up Spur Gear Set, 12V / 2400mAh Battery; which was considered High-Spec at that time. In particular, the battery that was used had a capacity that was much greater than standard in Semi-Auto fire (as stated earlier regarding the weakness of the switch) sparks on the terminal caused frequent melting and subsequent failure. To solve this dilemma we developed the SYSTEMA Switch Device. With this extremely simple design our FET was able to control the flow of current down to 1/1000 of the batteries full capability which made it able to utilize high capacity batteries.

2. Version

The evolution of the Switch Device has been inherited onto the PTW. The principal objective of the PTW design was to accomplish the discharge mechanism of semi-automatic fire via Electronic Control; which was our FET Switch Circuit. Furthermore, for the PTW we tackled the problem of dealing with an even smaller space through the use of a micro switch. It is through the switch device that completely satisfies the condition of a low current control circuit. There are three versions for the PTW series as well as three versions (I~III) for the SYSTEMA type for a total of Six Types of the Switch Device. At this point I would like to explain our mainstream types of the SYSTEMA Switch Device Version II and Version III currently used most frequently.

3. Electric Current Circuit

Prior to explaining points of caution we would like to give a basic explanation. The Switch Device is a Switch Circuit utilizing an FET.

When a strong spring, large-capacity battery and a high torque motor (that consumes a large amount of electricity) are put together it is obvious that a very large amount of electric current cycles through the AEG. In order for this large amount of Electric Current to be controlled, an FET with a lot of capacity is needed. However, it goes without saying that the safest way to maintain this system is to not have the load itself more than necessary. In order to lighten the burden going through the FET we would like to list the elements that have control over that factor.

① Load

Defined more specifically as the Main Spring (the Tappet Plate Spring also has a great influence in Load). However tension (of the spring) does not singly define load. First please confirm whether the spring is set straight and is not bent. Particularly in a high tensioned spring there is a tendency where the spring will want to bend. In the event that the spring is bent it causes an unusual amount of resistance between the piston and the spring thus not only decreasing the muzzle velocity but also resulting in a higher than normal amount of current usage.

② Gear Ratio

After choosing the spring, always select a gear set that can easily handle that amount of torque. If the selection is done incorrectly the rise in the electric current will damage the Device. As a safety margin always remember to select a slower ratio Gear Set.

③ Motor

Our Magnum Motor has a unique characteristic of both high level of Torque while at the same time use a low level of Electric Current. Although it is noted as a Torque Type motor if the voltage is the same as the Turbo Version Motor we can claim that it possesses the ability to cycle much faster than any other company's motor. Please give our motor a try with a High Rate Spring.

④ Other load factors

Although it may not be regarded as very important, however the following points are matters that would require attention at the time of assembly.

Please confirm as while doing the procedures.

• Inner Grip Motor Cord setting

If the setting is not done correctly, the Motor will not be set in the correct position, furthermore an unnecessary amount of electricity is used and in the worst case the motor as well as the fuse will blow out. Please refer to the TM Assembly and Disassembly guide while taking care in these procedures.

• Connection of the motor cord to the motor

Depending on the situation, the Motor Cord insulation could be damaged easily.

When this insulation film is damaged a short will occur which will cause a large amount of current to flow through the circuit. Attention is necessary in handling without putting too much reliance in the fuse.

4. Word of Caution: Be wary of overconfidence

As stated above, the possibility of the AEG opens up with the Switch Device; however it is not to say that there are no problems with the item. Firstly, what should be controlled is the current necessary to cycle, as it should never exceed the permissible capacity of the FET to prevent premature failure (of the FET). Furthermore, the symptom of damage would be that even when the trigger is released the cycling does not stop. The particular weak point in the Switch Device is that the circuit board itself requires an amount of the power supply. Once the Device is damaged, until the Battery is disconnected the AEG will continue to discharge; it goes without saying that the a high risk of danger is prevalent.

To prevent such an occurrence from happening we would like to introduce a few guidelines. As stated earlier we set up our FET with a substantial safety margin, however there are situations that surpass that value.

Examples of causes are listed as below.

- When a battery that is not made by us, it is natural to expect damage. We have not explored all batteries that are currently available today nor have we calculated the electric discharge characteristics of all batteries as that would be impossible therefore we are not able to calculate them into our settings. It would not be an exaggeration to state that the majority of our PTW's damage be attributed to the use of non-sanctioned (non-approved) batteries.
- In the event that the battery is used till the end of its capacity (or if placed in a situation such as that) the current capacity will inevitably be decreased.

In a battery with a low capacity the AEG makes the attempt to supplement functionality by increasing the current discharge. On that occasion the electric discharge amount spikes beyond the prescribed level thus damaging the Device. When this situation is repeated, thus continuing to place a high load, heat is produced thus worsening the situation. Similarly to a real firearm, a heated barrel with continual use is a problem. Firing over 1000 rounds in continuation with an M150 Spring is asking for trouble. It is our business to constantly strive to lift limitations, however in certain situations we are not able defy the laws of physics.

5. Regarding our Future Developments

As mentioned above, AEG tuning today is based heavily on how efficiently one can improve on the electric components, this has been a very important goal in our development. We can say that the problem is to find a balance between the discharge ability based on the Spring tension, Output Efficiency from the Motor (and it's corresponding slowdown mechanism), and the source of the Kinetic Energy which is the Battery and it's electric discharge characteristics. Conversely, presently we were able to confirm the potential limits. For example, with what is considered to be the standard in Mecha Box design TM's box is designed to handle our Helical Gear Set which has the greatest slowdown gear ratio (to accommodate very high torque); beyond that would be physically impossible. In addition, the motor output is also very close to its limits.

The use of a magnet that surpasses the magnetic force from what we adopted in our motor (Neodymium) would have physical limits that would lower many expectations. It is these barriers that we face that give us the challenge. The higher the goals and the harder the challenge we are inspired to develop even better products. I am convinced that you will see the fruit of our results in the near future.

As we at SYSTEMA are quite fond of the concept of discharge mechanism, please look forward to our future products.