TMC/TRAUMA LED Eye

Matrix Anti-Chop System

Instruction Manual

TMC LED Eye – Matrix Anti-Chop System
Revision1.1

Introduction

The TMC Eye is a replacement circuit board and breech for the Generation-E Matrix paintball marker. The anti-chop eye system prevents the marker from firing unless a paintball is fully loaded, thus avoiding chops and the ensuing mess that can temporarily remove a player from the game.

Features

- Increase reliability with break-beam style infrared emitter and receiver unaffected by sunlight, angle, or paint color.
- Maximize firing rate with eye-controlled logic that reduces the time between shots.
- Shorten trigger-pull response time with scanning at over five million times per second.
- Lengthen battery life to over 50,000 shots.
- Take advantage of future developments with upgradeable software.
- Easily disassemble with plug free two-piece breech design that hides all wires.
- Tune performance with customizable settings for trigger debounce and front pulse.

Operation

Turning on the marker

To turn the marker on, press the power button once and release. The status LED will light a solid color, and will flash every time the marker is fired. The anti-chop eye system is activated every time the marker is turned on.

When the eyes are activated, the marker will not fire without a paintball in the breech, unless you pull and hold the trigger for a half second. This is called a “force fire”, and can be used to clear out the barrel, or fire a ball that has lodged in the ball detents and cannot be seen by the eyes.

Turning off the eye system

To deactivate the eye system, pull and hold the trigger until the LED starts flashing (5 seconds). The marker will operate like a stock Matrix in this mode, with a capped rate of fire derived from the front pulse setting (see Settings). The back pulse setting, or delay between shots, is fixed at 45 milliseconds while the eye system is disabled.

Turning on the eye system

The anti-chop eye system is activated every time the marker is turned on.

To re-activate the eye system, you must turn the marker off, then back on.

Turning off the marker

To turn the marker off, press and hold the power button. The LED will stay lit and then turn off after ¾ of a second. Release and the marker will be off.

The marker will automatically turn itself off if left sitting for 10 minutes.

Settings

There are three settings that the user is able to configure:

Debounce

The debounce amount is used for electronically debouncing the trigger switch. All electrical switches suffer from a phenomenon called switch bounce, which occurs when the contacts of the switch being closed or opened are close enough to let electricity jump across them, which the software picks up as trigger pulls. The debounce time lets the software ignore trigger contacts after the initial closing or opening so you cannot have multiple readings per switch closing or opening. Debounce times are made adjustable in order to make the marker as fast as possible while still being legal in tournament use. The default setting is 10 milliseconds, and should be tested thoroughly before changing. The adjustment range is 2 to 30, in one millisecond increments.

Front pulse

The front pulse is the amount of time that the solenoid directs air to the bolt kit to cause the bolt to move forward, thus firing the marker. The default setting is 15 milliseconds. The adjustment range is 10 to 30, in one millisecond increments. Shorter front pulse settings increase the rate of fire, however it requires higher pressures that are more likely to damage paintballs.

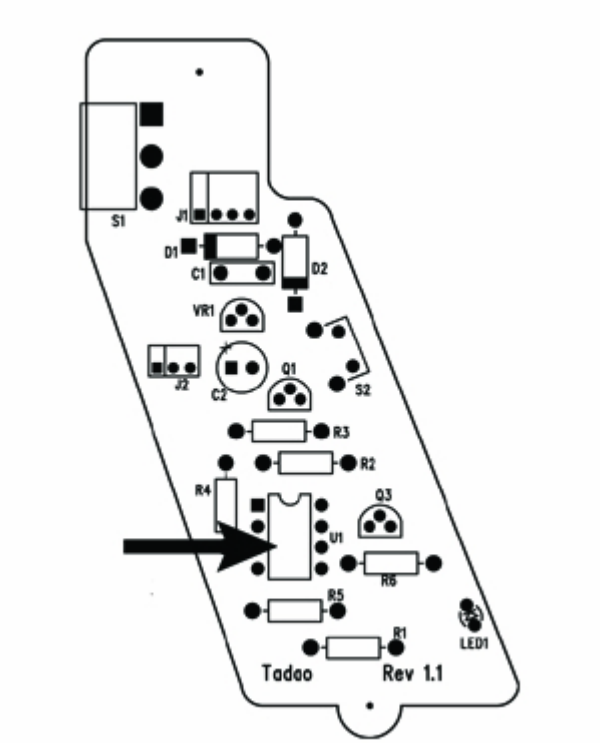
Loader speed

The loader speed setting is used by the eye logic to determine the correct amount of time after the eyes detect a ball to wait before firing. This is necessary due to the two piece breech design. This variable has three settings, determined in the menu by the blink patterns. 1 is for HALO users, 2 is for Egg users, and 3 is for Revolution users. The default is 3, and will function fine with all loaders, but to attain maximum performance it is recommended that you use the setting that matches your setup. Improperly setting the the loader speed may result in chops.

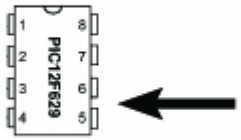
Additionally, Anti-Bolt Stick (ABS) programming is included, which helps combat the first shot low problem commonly found with the Generation-E Matrix. ABS time is set at 8 seconds and uses a 35ms front pulse.

Entering programming mode

To enter the programming mode, the marker must be off. Remove the grips on the left hand side of the marker. Locate the microcontroller (the “chip”) on the circuit board, indicated by the arrow in the following diagram:



Notice that the microcontroller has eight pins. To enter programming mode, two of these pins must be shorted, or touched together with a conductive material. The allen wrench (hex) used to remove the grip screws to get into the gripframe is adequate. A small screwdriver or piece of wire is also sufficient. The following diagram shows the two pins that need to be shorted, pin 5 and pin 6, located on the lower right side of the microcontroller.



Pin 5 and pin 6 must only be shorted for a moment. If done correctly, the status LED will blink rapidly for a few seconds to indicate that the board has entered programming mode. Next it will enter the main menu, where the status LED will flash off and on a certain number of times to indicate which mode the user currently is in.

1 flash, pause, 1 flash, pause – debounce mode.
2 flashes, pause, 2 flashes, pause – front pulse mode.
3 flashes, pause, 3 flashes, pause – loader speed mode.

Changing between programming modes

To change between the debounce and front pulse programming modes, pull the trigger once and release, quickly. The flash pattern will change.

Changing settings

1. To change the setting of the current programming mode, pull and hold the trigger until the status LED turns off (approx. 2 seconds).

2. Upon releasing the trigger, the status LED will flash to indicate the current setting. The number of flashes is equal to the number of milliseconds currently set.

3. When the status LED stops flashing, you have three seconds to begin entering a new setting. If the current setting is adequate, do nothing for the three seconds. The settings will not be changed.

   You can enter a new setting by pulling the trigger one time for each millisecond. After the final trigger pull, wait three seconds to save your new setting. The status LED will blink rapidly for a few seconds to indicate that the setting was saved, then resume the flashing pattern of the programming mode, meaning you are back in the main menu.

Exiting programming mode

To exit programming mode, push and hold the power button for ¾ of a second, and the marker will turn off.

Returning to default settings

To return all settings to the default values (10 millisecond debounce, 15 millisecond front pulse, and the loader speed set to 3):

1. Enter the programming mode.
2. Press and hold the power button until the status LED turns off and then back on (approx 10 seconds).
3. The status LED will be lit, which indicates that the settings have been reset.
4. Release the power button and the gun will be off, and the settings will have returned to their default values.

Programming Mode Example

If you want to change the loader speed to the HALO setting:

1. Enter the programming mode.
2. By default, you are now in the debounce mode of the main menu.
3. Pull and release the trigger once to switch to the front pulse mode.
4. Pull and release the trigger again to switch to the loader speed mode.
5. Pull and hold the trigger until the status LED turns off.
6. Release the trigger and watch the status LED flash the current setting (should be 3 blinks to indicate Revolution speed).
7. After the status LED stops flashing, pull and release the trigger 1 time. The status LED will light each time the trigger is pulled.
8. Wait approx. 3 seconds until the status LED blinks rapidly to indicate the setting was saved, then it will resume it’s flashing pattern for the loader speed mode, meaning that you are now back in the main menu.
9. Push and hold the power button until the status LED turns off, then release.

Maintenance

In addition to standard maintenance necessary to keep a Matrix running (refer to Matrix documentation), it is necessary to make sure the eyes are clean. This is most easily done by removing the breech and running water through it, followed by a blast of compressed air and a soft paper towel to remove any residue. Use a damp rag or soft paper towel to clean the eyes while they are attached to the marker.

Troubleshooting

Eye Malfunction

If you suspect that there is a malfunction with the eye system, deactivate the eyes and see if your issue is resolved by pulling and holding the trigger for approximately 5 seconds, until the status LED flashes constantly.

If your issue is not resolved when the eyes are deactivated (meaning it's not the eye system that is malfunctioning), check the paint supply, air source, and battery power.

If your issue is resolved when the eyes are deactivated try the following suggestions one at a time until your issue has been resolved.

1. Clean the eyes properly, see Maintenance.
2. Make sure the eyes are properly plugged into the circuit board.
3. Reset the TMC Eye to the default settings, see Settings.
4. Contact the supplier or installer of the TMC Eye, see Contact Information.

Paintball breakage

While the TMC Eye is meant to avoid chopped paintballs and messy breakage, it is not impossible for paintballs to break in the marker. If a paintball breaks in the marker, first check the status LED. If the status LED is flashing, the eyes were deactivated. A ball may be chopped when the eyes are deactivated, the same as a standard Matrix.

If the status LED is a solid light, the eyes are activated. If there is broken paint in the marker, you should deactivate the eyes. Deactivate the eyes by pulling and holding the trigger for approximately 5 seconds, until the status LED flashes constantly. A ball may be chopped when the eyes are deactivated, the same as a standard Matrix.

To re-establish performance, make sure the eyes and breech are properly cleaned (See Maintenance).

Slow Fire

If the marker feels unusually slow, the eyes may be blocked. If the eyes become blocked (i.e. if there is broken paint in the hopper), the rate of fire is capped. The eyes not only watch for a paintball to be in the breech, but for the bolt on its return stroke. If the eyes do not see the bolt clear the breech, the back pulse, or delay between shots, is extended, slowing the rate of fire.

To re-establish performance, make sure the eyes and breech are properly cleaned (See Maintenance).

Shootdown or Drop-off

If the marker works fine while firing slowly, and then seems to get weaker as the rate of fire is increased, check to make sure the air system is properly maintained (ie, lube the regulator pistons), the low pressure regulator is set high enough, and the battery power. All can cause shootdown or drop-off.

Failure to Fire

If your marker fails to fire, first try to force fire by holding the trigger for a half second. If the marker fires, confirm paintballs are loaded.

If the marker fails to fire when you force fire or the eyes are disabled, check the status of your battery and air supply.

Contact Information

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