

# PWM II Features and User Guide

## ACCELERATION:

Rate at which power is delivered to the motor.

1-12 slow-fast

- If the trigger is squeezed rapidly from a slow speed up to full throttle, then this control prevents the front of the car lifting the guide out of the slot. It helps to reduce the need for a front mounted weight to hold the nose down, so allowing a lighter car overall.
- Helps with loss of traction out of the corners and losing time down a straight due to snaking or shuddering.

---

## BRAKE:

Rate at which the motor is slowed when the trigger is released.

1-12 gentle – full

- Prevents shuddering/rattling and loss of traction, particularly with high gear ratios.
- Allows better corner entry speed so control is smoother when the power is re-applied.

MODE 1: Normal mode where the brakes are always applied at the rate set by the BRAKE control.

MODE 2: Sensing mode where brake is set by the rate you release the trigger and is modified by the actual motor speed.

On most tracks there are high speed sections often followed by a sharp bend, for which high brake rates are needed.

When the car reaches a section where that amount of braking is not needed, it will slow down too much, too soon. The MODE 2 sensing works in the background automatically adjusting the brakes to match the speed of the car.

The faster the car is going the harder the brakes are applied, while the slower it is going the more gently it brakes.

The main feature of MODE 2 Brakes is simply that the faster you let the trigger go, the more braking, and the slower you release the trigger the gentler the braking effect.

Once you learn this method of driving it's like having constantly user-variable braking without having to fiddle with controls.

MODE select Switches are inside the main controller aluminium box.

- Unscrew the 4 screws and gently move the sections apart taking care not to stress the ribbon cable joining them.
- The MODE Switches can be found next to the BRAKE and START SPEED controls. MODE 2 is with the switch towards the controller handle cable socket.

---

## HOLD:

Duration that brakes are applied and speed to which the car will slow before brakes release.

1-12 slow – fast

- Brake rate is set with the BRAKE control in either MODE 1 or MODE 2, and the HOLD sets the speed to which the car slows before braking stops and gives way to natural motor braking. This assists with a smooth transition from braking to re-applied power while the car slows under natural deceleration.
- Enables faster braking to be used without making the car almost stop before power is re-applied. The hold circuits look at the motor speed to see when it's reached the speed you set and lets the brakes go at that point.

---

## SPEED:

Sets the maximum speed limit.

1-12 slower – maximum

- Ideal where a track has a long straight with tight, twisty, difficult sections. Reducing the maximum speed enables the motor to be tamed for those twisty parts and banked or sweeping corners to allow confident full trigger squeeze without the car flying off the track.
- **BOOST:** When you come around to the long straight, you just press the BOOST button on the back of the handle to give full speed again. When released the speed returns to the setting you chose. The extra power feeds in at the rate set by the ACCELERATION control so there are not sudden surges in speed.

MODE 1: Speed control is in an open-loop. The controller feeds an amount of power to the track and assumes that the car will reach the desired speed. (Most controllers work this way)

MODE 2: Speed is in a partially close-loop. In this mode the controller feeds the same amount of power to the track as in mode 1, but checks the motor speed to ensure that it matches the desired setting. It is pretty much a torque or cruise control.

The easiest way to see MODE 2 working is to set the controller in MODE 1 and press the trigger so that the motor is

going at a fairly slow speed. Now hold your fingers against the wheels and note how easily it does slow down. Now change back to MODE 2 and so the same. You will feel the motor automatically drive harder to compensate for the extra load you apply trying to slow it down. The RPM hardly changes and you hear it working harder. MODE select Switches are inside the main controller aluminium box.

- Unscrew the 4 screws and gently move the sections apart taking care not to stress the ribbon cable joining them.
- The MODE Switches can be found next to the BRAKE and START SPEED controls. MODE 2 is with the switch towards the controller handle cable socket.

---

### START SPEED:

1-12 slow – fast (high ohms to low ohms)

- This adjustment is similar to controllers with a sensitivity or 'Ohms' adjustment and enables all cars to respond to the trigger movement over a useful range. On the PWM controller however there is an additional sensitivity control apart from this start speed setting.
- Once the start speed is decided, the rest of the power delivery is divided into 36 steps across the controller element. For a fast start speed then, the change in power between each of the 36 segments will be small, while for a slower start speed it will be greater.

---

### TRIGGER CONTROLS:

CURVE SENSITIVITY (Red control)

0-9 no curve – Maximum Curve (Linear – Logarithmic)

- This sets the element feel by adjusting the shape of the throttle response curve from linear at setting '0' to logarithmic at setting '9'
- The setting should be thought of as the sensitivity control since it directly affects the amount of power at given points along the trigger wiper element.

END SPEED (Black control)

0-9 minimum - maximum

- This sets the size of the jump in speed from the second last to the final segment on the wiper element. As you squeeze the trigger the motor speed changes gradually as set by the CURVE and START SPEED controls until it reaches the second last segment where the END STEP control sets the size of the final jump up to full speed as set via the SPEED adjustment.
- The higher the number on the control, the smaller the jump in speed, so more power is fed to the rest of the element. A lower number on the control sets a larger jump in speed so less power is fed to rest of the element. The idea is to give more control for difficult tracks and particularly those with a high voltage power supplies. While you are running around the difficult sections the top power is held back until the very last segment when you are ready for full speed when you pull the trigger all the way.
- '0' = Low END SPEED with a larger jump in speed at full throttle
- '9' = higher END SPEED with a smaller jump in speed at full throttle.

---

### POWER and BRAKE LEDs:

- With no car on the track, but power supplied to the controller, both LEDs illuminate. When the trigger is pressed under this condition, they both extinguish. This shows there is no electrical continuity (No car on the track, bad braids, poor track tape condition etc.)
- When a car is now placed on the track the Brake LED extinguishes, but the power LED remains illuminated. This shows electrical continuity to the car and motor. You're ready to go!
- When full power is applied the Power LED extinguishes, but remains illuminated at all other times.
- When using the SPEED limit settings and the trigger is at full throttle, pressing the BOOST button will extinguish the Power LED confirming that the switch is OK and the feature is working correctly.
- The Brake LED will illuminate while the brakes are active. With the HOLD on maximum at 12 and a car on the track, if you push the car forward, the Brake LED will illuminate to show that the circuits are all working. The Brake LED will illuminate BLUE when there is a short circuit fault either on the car or the track. This is a warning feature and prevents the controller from trying to dive power into the short circuit.

---

### SPRING TENSION AND THROW ADJUSTMENTS:

#### Spring Tension Adjustment:

- Under the trigger is a small screw that pushes on a tension cam arm to pull on the return spring.
- Turn clockwise to increase the spring tension.

#### Trigger Throw Adjustment:

- This adjustment screw is accessed through the rear fascia panel under the BOOST button. It changes the Brake stop position of the trigger when released. This shortens the throw of the trigger to give quicker start-up speeds. For endurance racing the shorter travel reduces hand fatigue due to the smaller motions that the fingers need to make to go from braking to maximum speed again.
- 

#### **Maintenance:**

- Once you feel a scratchy operation or can hear squeaking then it is advisable to apply a small amount of switch cleaner/lubricant (such as Servisol Super 10) to the wiper element board. This will keep it smooth, with a light trigger action, while maintaining good conductivity.
- The plug-in cable can be removed each time it is packed away, but is not essential. If you have trouble with the cable then a replacement can be bought from the web site under 'spares'.