

Why do Transponders Miss laps?

This is a question we get from time to time. The story usually goes “I went to a track and my transponder missed laps, it works fine everywhere else” or “My transponder has started missing laps at my local track”.

To understand why this happens and more important do something about it you need to understand a few things about how transponders work. In simple terms they are a small transmitter sending out a coded signal about 300 times a second. The coded signal contains the transponder number. The strength of the signal and the number of signals available to the loop depends on where the transponder is mounted.

The loop acts like an aerial for the decoder. Its sensitivity depends on how it is laid out and will vary from track to track. It is also possible for loops to deteriorate, particularly if water gets inside the insulation.

If your transponder signal is low and you visit a track with a less sensitive loop then you might miss laps.

To avoid missed laps you should aim to get the transponder signal outside the car as strong as possible. The two materials in RC cars (and boats) that block the transponder signal are metal and carbon fibre. Fibreglass and plastic are OK. To illustrate this here is the transponder signal data from a Rallycross car. The signal graphic has two components, strength (horizontal) and number of signals received (vertical). Notice the sudden change from 5pm on the 7th to 10am on the 8th. This was achieved by moving the transponder from the centre of an aluminium chassis to the edge and raising it up off the chassis. The strength improves but the number of signals received increases significantly. Increasing the number of signals received makes the timing more accurate but significantly reduces the chances of a missed lap particularly for off road.

Name	Avg. Signal	Laps	Time	Race	Country
[Redacted]	[Green bar]	32	02:36 PM 09	A. Semi (Buggy)	[Redacted]
[Redacted]	[Green bar]	34	01:35 PM 09	A. (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	02:04 PM 08	Heat (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	10:52 AM 08	Heat (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	05:17 PM 07	Heat (Buggy)	[Redacted]
[Redacted]	[Green bar]	12	02:05 PM 07	Heat (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	10:53 AM 07	Heat (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	06:15 PM 06	Practice (Buggy)	[Redacted]
[Redacted]	[Green bar]	13	02:56 PM 06	Practice (Buggy)	[Redacted]
[Redacted]	[Green bar]	9	11:26 AM 06	Practice (Buggy)	[Redacted]

All Meetings Look in Archive Hold Mouse down over Driver to display Transponder Signal and Contact details. OK

If your car has a carbon fibre chassis the blocking of the signal will be even greater than aluminium. If you imagine the transponder is a light source, carbon fibre is cardboard and aluminium is smoked glass consider how much light is illuminating the track. This will give you an indication of how much of the signal is able to be detected. In practice the decoder can detect a transponder with only a few signals provided it is consistently in the same position on the track when it passes the loop and on all 4 wheels. This is less likely to be the case with off road cars than with circuit cars. Loops in on road circuits tend to be just below the surface of the track but at off road tracks might be deeper to prevent the loop being ripped up during a race.

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The signal from the transponder is directional!



Mounting the transponder on its side on the steering servo will “illuminate” the track to the side of the car but not directly below it. If the transponder is on the left side of a car with a metal or carbon fibre chassis and the car goes to the left side of the loop the signal might “miss” the loop. In the case of an Off Road car on its right hand wheels the signal is going to be reduced even if the car is in the centre of the track.

Where best to put the loop?

The position of the loop will contribute to the reliability and more important the accuracy of the timing. The best place for the loop is in a fast (and flat) part of the track where the cars are going straight and there is a possibility to race for the line. This is where the start/finish line is at full sized circuits and they use exactly the same decoders and transponder technology as we do. The faster the car goes the less time it is in a single place and so the recorded time is going to be more accurate. Putting the loop in a corner means that cars can aim for the inside of the corner and not slow down on the last lap and record a better time. The decoder will first detect the transponder when it is up to 2 meters away from the loop. As the transponder approaches the loop the signal strength increases and dips as the transponder is between the two wires and then drops away as the transponder moves away from the loop. Once the signal is lost the decoder attempts to calculate the dip time and reports this to the timing computer. The more signals to sample the more accurate the calculation. This is why the “beep” happens when the car is well past the loop. You can record a “passing” without actually crossing the loop. With the loop in a corner this is easy to do, not so if the loop is on the straight.

Loops can deteriorate so it is a good idea to check the sensitivity of the loop from time to time. MyLaps have produced a couple of guides on testing and positioning loops. Links can be found on www.bbkssoftware.com. You will find that the pickup area of the loop extends beyond the side of the track. This will cause problems if the cars get close to the loop towards the end of the track. Ideally the cars should stay well away from the loop after the first 25% of the lap where the minimum lap time parameter in the race timing software will discard passing data. It's also not a good idea to store broken cars near the loop!

You can reduce the sensitivity of the RC3/4 Decoder to reduce this pickup area but this will affect the timing of cars with badly positioned transponders. Reducing the sensitivity of the decoder should always be the last resort, better to design the track properly and keep the cars away from it at the end of the lap.