

RC Car ESC: Control Logic General Description

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Introduction

This is an algorithm, which is basically applicable to the circuits without a microcontroller found in this folder. Circuit provided by StefanV is a bit different not having clear selector of “BRAKE” action, rather an action by “default” in the absence of any throttling activity.

Glossary

- Rising edge: LOW -> HIGH
- Falling edge: HIGH -> LOW
- Leading edge: an edge which defines the beginning of the event
- Trailing edge: an edge which defines the end of the event
- “REVERSE” - reverse action and part of the circuitry which is responsible for reverse movement
- “FORWARD” - forward action and part of the circuitry which is responsible for forward movement

In principle, “REVERSE” or “FORWARD” might not have anything to do with movement: these are just activators for the sub-circuits.

Basic Example Circuit

lazy-b-2004-1.sch

Pulse duration ranges

- 1.5ms pulse is our neutral gear
- between 1ms and 1.5ms - “REVERSE”
- between 1.5ms and 2ms - “FORWARD”

General description

R3-Q1-C2-R4-P1 is a monostable multivibrator which sets duration of a neutral pulse. Discharge time time is defined by RC chain *C2-R4-P1*. Normal state is HIGH (output of *U2-3 pin 3*). On the leading edge of the input it's set to LOW. If the trailing edge of the input signal happens before the end of the “neutral” pulse, then it's decoded as a “REVERSE” signal. Output of the corresponding gate goes HIGH until the end of the neutral pulse, thus enabling the “REVERSE”.

Rising edge of the “neutral” blocks “REVERSE”: *U1-2 pin 5* goes HIGH, - and enables “FORWARD” movement by setting *U1-1 pin 2* to LOW.

If the trailing edge of the RX-signal occurs after the trailing edge of the “neutral” pulse, “FORWARD” control gate is activated thus enabling it.

Algorithm

U1-1 controls the “FORWARD”, *U1-2* controls the “REVERSE”.

On the leading edge of the RX pulse:

- *U1-1 pin 1* is LOW
- *U1-2 pin 6* is HIGH
- Monostable multivibrator *R3-Q1-C2-R4-P1* is triggered; *U2-3 pin 7* goes HIGH and *U2-3 pin 6* is LOW for a time defined by the discharge time of *C2* via *R4-P1*.
- As the result of mono triggering, *U1-2 pin 5* is LOW, *U1-1 pin 2* is HIGH as gating signal is inverted by *U1-3*

If the RX trailing edge happens before trailing edge of a “neutral” pulse: *U1-1 pin 1* goes HIGH, *U1-2 pin 6* goes LOW; as *U1-2 pin 5* was already low due to mono action, therefore *U1-2 pin 4* goes HIGH, thus activating the “REVERSE”.

If the “neutral” trailing edge happens before RX trailing edge: *U1-1 pin 1* is still LOW, *U1-1 pin 2* goes LOW => *U1-1 pin3* goes HIGH thus activating “FORWARD”; *U1-2 pin 5* goes HIGH, thus blocking the “REVERSE” completely.