RaceTCS is designed for motorsport use only and cannot be used on public roads. Incorrect installation of RaceTCS might result in damage to RaceTCS or other car components.

RaceTCS holds no responsibility for damages caused by improper installation or use.

Read the manual before attempting to install the device or ask a professional for help.
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1. Requirements
   In order for RaceTCS to be safe for engine, some requirements need to be met first:
   a. Sequential Fuel Injection (or injection once per 2 crank revs). RaceTCS does not support Direct Injection
   b. High impedance fuel injectors
   c. The car has no misfire detection (or has it disabled). If misfire detection is active and RaceTCS is connected, Check Engine Light can pop up and indicate damaged ignition coil.
   d. Injectors are not PWM controlled

2. RaceTCS functions
   a. Keeping wheel slip in range (between Min Slip and Max Slip)
      i. This function is activated, when minimal RPM is exceeded (Activation RPM) and when minimum vehicle speed is exceeded (Activation speed). If any wheel is turning slower, wheel slip control won't be active
      ii. MaxSlip and MinSlip define difference in wheel speed, which enables wheel slip control. If wheel speed difference exceeds MinSlip, fuel cut will take place. If wheel speed difference exceeds MaxSlip, fuel cut will achieve maximum value defined by MaxSlipFuelCut.
   b. Keeping RPM below specified threshold
      i. Keeping RPM after start – RPM after start won’t exceed value (Start RPM), until the car (all wheels) do not exceed (Activation speed). This feature limits wheelspin shortly after launch
      ii. LaunchControl – if clutch is pressed (down) and car is stationary, RPM will be limited to specified value (LC RPM). This requires (Enable LC) to be checked
      iii. FlatShift – this allows for manual gear change without releasing the throttle. With this function RPM will be limited to (FS RPM) when car is moving and clutch is pressed (down). It is active when (Enable FS) is checked
3. Installing RaceTCS

RaceTCS device with accessories

RaceTCS pinout
RaceTCS connection schematics for VR sensors

RaceTCS connection without ABS

Connect 2 pins only

Potentiometer for Preset selection
• +12 – power supply with ignition
• GND (ground) – connect to common ground with separate wire
• DiodeOut
  o Indicates current RaceTCS setting. When user changes settings via potentiometer, diode will blink indicating current preset (1-6). When RaceTCS is completely off, the diode will be constantly on. 12V LED should be connected to this output with negative end, while positive end should be connected to +12
  
  When RaceTCS is active and wheel spin is detected, it will also indicate this condition by blinking the LED
  
  In case of a factory handbrake indication on the dashboard with a simple switch, it is possible to connect this output in parallel to this switch, to have RaceTCS indication on the dash.
• ClutchIn – clutch switch input. This is mandatory if FlatShift or LaunchControl needs to be used. ClutchIn can use 4 input signals:
  o 0 – clutch press shorts to ground
  o 1 – clutch press disconnects ground (normally short to ground)
  o 2 – clutch press shorts to +12
  o 3 – clutch press disconnects +12 (normally short to +12)
• FrontLeft – wheel sensor input for front left wheel
• FrontRight – wheel sensor input for front right wheel
• RearLeft – wheel sensor input for rear left wheel
• RearRight – wheel sensor input for rear right wheel

ABS signals – it is most convenient to pick up ABS signals near ABS pump main connector. Each sensor wire consists of 2 wires, shield (outside) and hot wire. Shield will be short to ground when connected to ABS pump (and ignition is on), so identifying the hot wire is easy when ignition is on. With VR (variable reluctance) sensor, hot wire will have sinusoid signal.

In case of Hall sensor (as in Nissan 350z or BMW E46), you need to find signal wire. In case of a Nissan 350z it does not require any additional resistors. Some cars, like BMW E46 or Mazda MX5 3.5 (facelift) have hall effect sensor and they need additional resistor in series on negative wire. Hall sensor produces current, so voltage drop on that resistor is the pickup signal for RaceTCS. Some Hall sensors have 3 wires, +12/Ground/Signal. 3rd wire is signal pickup.

Use shielded or twisted pair wire for ABS signals! You can use Ethernet cable with 4 twisted pairs.
- GND (Power) – power ground for injectors. Is internally connected with normal GND, but this one is close to transistors and it is recommended to have a thicker wire or 2 wires that will support 5-10A current (0.75mm² or 1mm²). Should use separate wire from other GND.

- InjOut1-8 – injector output (ground). Connect it to injectors, as RaceTCS will operate the injectors instead of original ECU.

- PotIn – potentiometer input (10kOhm). Only 2 out of 3 connectors in potentiometer are used, because potentiometer works as adjustable resistor in this application. Connection order is not important. Potentiometer has 11 positions, each position selects different preset:
  
  Position 1-2 : preset1  
  Position 3 : preset2  
  Position 4 : preset3  
  Position 5 : preset4  
  Position 6 : preset5  
  Position 7 : preset6  
  Position 8-11 : RaceTCS inactive  

  When potentiometer is disconnected, it selects preset1 as default (safe setting).

  Each preset is indicated by LED blinks, number of blinks represents a preset. Preset 1 - 1 blink, preset 6 - 6 blinks. When RaceTCS is inactive, LED will be on all the time.

  If you connect potentiometer using left (crossed out) pin, it will work in other direction. Maximum to the right will select preset 1, maximum to the left RaceTCS inactive.

- InjIn1-8 – injector input (ground controlled injectors). ECU output for injectors should be connected to InjIn

  Supplied RaceTCS connectors are detachable for easier connection of wires. Make sure wires are tight and secure to avoid problems. Spring loaded connectors work better with bare wire (no soldering).
4. RaceTCS logic

RaceTCS logic can be divided into 2 sub functions:

a. RPM limiter
   i. Clutch pressed (down)
      1. Car stationary – LC RPM limit (if enabled)
      2. Car moving – FS RPM limit (if enabled)
   ii. Clutch not pressed (up)
      1. Car speed below Activation speed – limit RPM to Start RPM
b. Wheel speed limiter
   i. Car speed above Activation speed and RPM above Activation RPM - injector cutting depending on slip severity
      1. Slip $\leq$ Min Slip - 0% cut
      2. Slip $\geq$ Max Slip - 100% cut (or Max Slip fuel cut, whichever is smaller)
      3. Slip between Min Slip and Max Slip – cut proportional to the slip
5. **PC app – RaceTCS Configurator**

![Image of RaceTCS Configurator interface]

- **PC app requires .Net framework 3.5 (Windows 7 and higher have it preinstalled)**
- **Each setting in PC app has a tooltip – hover mouse over to see the explanation**

  a. PC app is used to configure RaceTCS. The most important settings are wheel size and ABS tooth count. To verify these settings are correct, open Logging tab and run a log while the car is moving straight without any wheelspin. All wheel speed should be identical and similar/equal to speedometer/GPS.
  
  b. Logging – after logging is started (play icon) current readings will be displayed live. All logs are automatically saved to Log directory in the main app directory. Each log start will create file name with date and time. Log can be opened in RaceTCS Configurator for later analysis or sent to support.

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c. Read conf. from device reads configuration from connected device

d. Save conf. to device saves config to device and restarts RaceTCS. It is recommended to do this while engine is off

e. File menu Save/Load settings allow to store settings on your computer
6. RaceTCS configuration

RaceTCS configurator is a portable application. It means you do not install it on your PC, just download the zip file (http://racetcs.com/files/RaceTCSConfiguratorV2.zip) and unpack (extract) the content to a folder. You should see following folder content. Run RaceTCSConfiguratorV2.exe to start the application.

![Folder content]

To correctly configure your RaceTCS for the 1st time, please follow these steps:

a. Run PC application

b. Load settings for your car from **File-> Load settings** menu

![Load settings menu]

- BMW E36.xml
- Mazda RX8.xml
- Nissan 350z.xml
- Opel Speedster na dutch.xml
- Opel Speedster turbo.xml
- Seat Ibiza 6k.xml
- Test.xml

- Configure wheel sizes, if yours are different than in a preset. Make sure to copy wheel settings to all presets (there are 6 presets , each with separate settings) by clicking “Current wheels to all” button.

c. Verify that each preset has correct wheel setting by selecting “**Current preset**” from 1 to 6.

d. Save the settings from **File->Save settings** for future use. You can now close RaceTCS configurator and load saved settings later.
f. When you connect your PC to RaceTCS device and turn ignition on for the 1st time, load your saved settings (previous step) and press “Save to device” button you should see a confirmation message.

![Save settings success](image1)

g. If your RaceTCS is not powered or not correctly connected, you can see error message when trying to save

![Unable to connect](image2)

This can indicate also that USB drivers are not installed on your system. You can try installing newest drivers for FTDI VCP [https://www.ftdichip.com/Drivers/VCP.htm](https://www.ftdichip.com/Drivers/VCP.htm)

h. If you correctly save settings to your RaceTCS device, you can verify that all is set up correctly. Go to logging tab and press start log button.

![RaceTCS Configurator V2](image3)

You should see a log being displayed. Log file is automatically saved to Logs folder.
Now you can start the engine and drive around a bit. Verify, that wheel speeds are identical (or very close to each other) while driving at constant speed in a straight line. It should look like in the picture below:
i. If you have difference between wheels, verify that tire size settings match your tires on the car and ABS tooth count is correct. If you do not know the correct ABS tooth count, you can just change the settings, save to device and start the log again to verify. **Remember to copy wheel settings to all presets after each change.**

Picture below shows an incorrect setting - rear wheel speed is higher than front.

![Incorrect Setting](image1)

j. If everything with wheel size is correct, you can try accelerating so that you lose traction. It should be visible in a log. Wheel speed between driven wheels and reference wheels should be different (blue lines), slip should be indicated by pink line and fuel cut by green line.

![Correct Setting](image2)
7. **Firmware update**

To update firmware, select File menu, Firmware Update and select firmware file to be updated. Green progress bar will indicate when process is finished. RaceTCS should automatically restart, so do not update firmware when engine is running.
8. Wiring diagrams
   
a. Nissan 350Z
      
   o ECU diagrams
VDS/TCS/ABS Diagrams

Nissan 350z

Colors do not represent actual wire colors in car wiring

ECU

GND

InjIn1

InjIn2

InjIn3

InjIn4

InjIn5

InjIn6

InjOut1

InjOut2

InjOut3

InjOut4

InjOut5

InjOut6
b. **Opel Speedster/VX220 turbo**
c. BMW E36

FL signal – 37, RL signal – 34, FR signal – 15, RR signal – 35

FL signal – 1, RL signal – 6, FR signal – 19, RR signal – 22
FL signal – 48, RL signal – 46, FR signal – 47, RR signal – 45
d. BMW E46

BMW E46 uses hall sensors with built in resistor in ABS pump on +12 line. RaceTCS requires signal on ground wire, so a series resistor (~ 100ohm) is needed to be added.

There are 4 different ASC/DSC pumps with different pinouts, but all share the same wiring colors.

- FR – BR GE (solder resistor on BR)
- FL – BR BR/RT (solder resistor on BR)
- RR – GE/BR GE/SW (solder resistor on GE/BR)
- RL – BR BL (solder resistor on BR)

braun BR = brown
blau BL = blue
rot RT = red
gelb GE = yellow
grau GR = gray
schwarz SW = black
weiss (weiß ) WS = white
grun GN = green
orange OR = orange
rosa RS = pink
violett VI = violet
FR ground – 19, FL ground – 1, RR ground – 23, RL ground – 5
e. Mazda RX8

Mazda RX8 pre R3 used VR sensors on all wheels.

Wire colors and pin position in ABS/DSC connector is shown on a diagram below:
f. Mazda MX5 NC 2012+

MX5 3.5 and up use Hall effect sensors (the same is with RX8 R3 version). You need to solder 100ohm resistor on ground wire and connect signal pickup between Resistor and wheel sensor.