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.

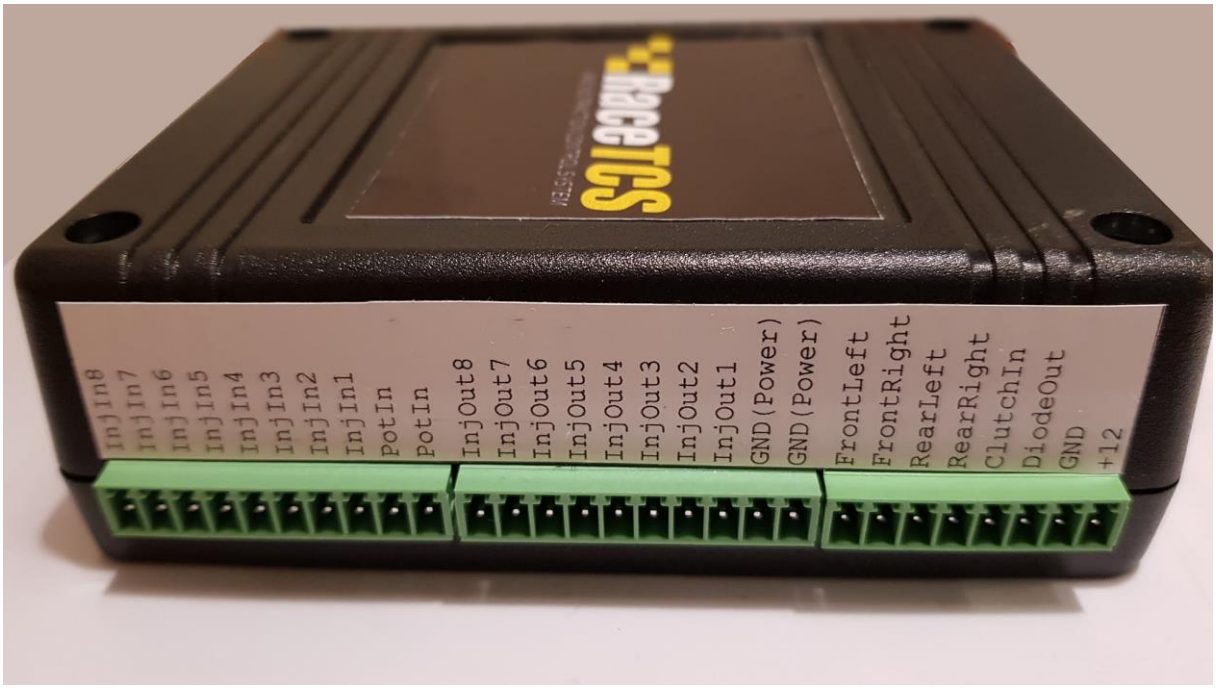
RaceTCS holds no responsibility for damages caused by improper installation or use.

Read the manual before attempting to install the device or ask a professional for help.

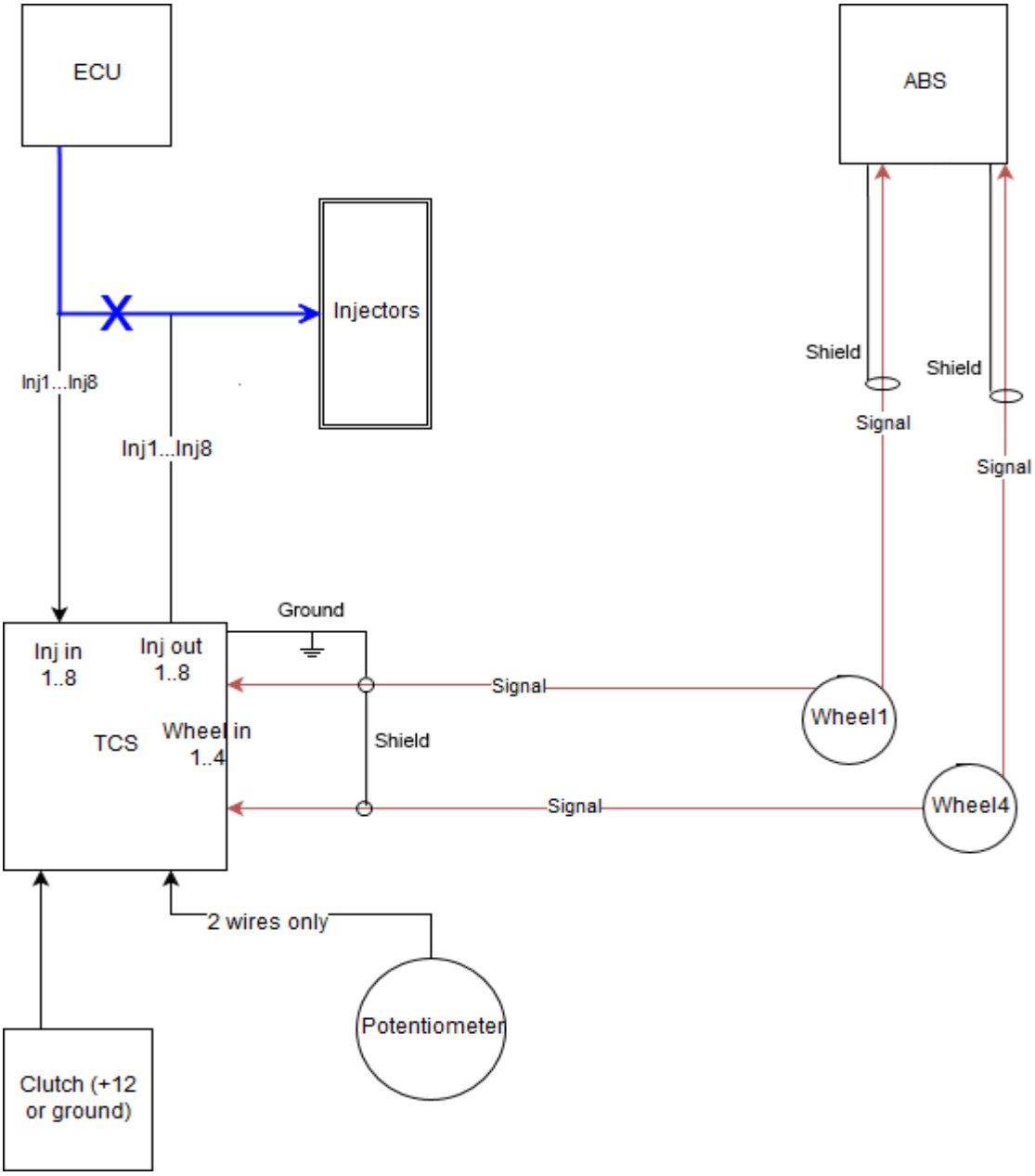
1. Requirements
   In order for TCS to be safe to engine, some requirements need to be met first:
   a. Sequential Fuel Injection
   b. High impedance fuel injectors
   c. The car has no misfire detection (or has it disabled). If misfire detection is active and TCS is connected, Check Engine Light can pop up and indicate damaged ignition coil.
   d. Injectors are not PWM controlled
2. TCS functions
   a. Keeping wheel spin in range (between **Activation 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 spin control won't be active
      ii. **MaxSlip** and **ActivationSlip** define percent difference in wheel speed, which enables wheel slip control
   b. Keeping RPM in range
      i. Keeping RPM after start in range – RPM after start won't exceed set 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 LC**) is checked

3. Connecting TCS

RaceTCS device with accessories



RaceTCS pinout



TCS connection schematics for VR sensors

Potentiometer for adjusting slip

- +12 – power supply with ignition
- GND (ground)
- DiodeOut
    - Indicates current TCS setting. When user changes settings via potentiometer, diode will blink one time every for every 5% of allowed slip (blink once for 5%, blink twice for 10%, blink 5 times for 25%). When TCS 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 TCS 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 TCS indication on the dash. **Invert TCS output** might be required to be checked to make this work
- ClutchIn –clutch switch input. This is mandatory if **FlatShift** or **LaunchControl** needs to be used. ClutchIn can use 4 input signals:
    - 0 – clutch press shorts to ground
    - 1 – clutch press disconnects ground (normally short to ground)
    - 2 – clutch press shorts to +12
    - 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), you need to find ground wire with resistor in series. Hall sensor produces current, so voltage drop on that resistor is the pickup signal for ABS and TCS. Some Hall sensors have 3 wires, +12/Ground/Signal. 3rd wire is signal pickup.

  Use shielded 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

- InjOut1-8 – injector output (ground). Original wires from ECU to injectors (after being cut) should be connected here, so that TCS controls injectors
- PotIn – potentiometer input (10kOhm). Only 2 out of 3 connectors in potentiometer are used, as potentiometer works as adjustable resistor in this application. Connection order is not important

  When potentiometer is connected, it allows to set (**Activation Slip**) in 5%-25% range, while (**Max slip**) will be set in relation to this value. Setting potentiometer towards 0 Ohm resistance (short) disables TCS completely, which is indicated by lighting up LED on DiodeOut.

  When potentiometer is connected, PC app settings are ignored for slip thresholds. The rest of settings from PC app are still active
- InjIn1-8 – injector input (ground controlled injectors). ECU output for injectors should be connected here and wires should be cut from original injectors

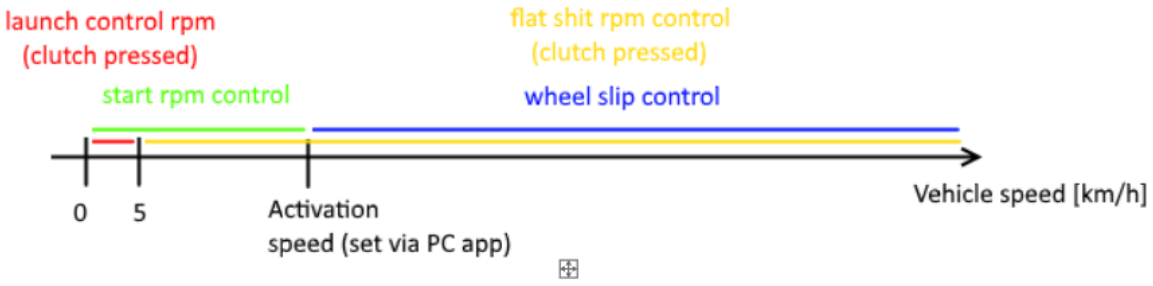
  Supplied TCS connectors are detachable for easier connection of the wires. Make sure wires are tight and secure to avoid problems

4. TCS configuration
    a. Wheel size and ABS trigger wheel configuration – in case trigger tooth count is unknown, this should be after setting tire size from the log. After trial and error wheel speed on the log should be the same as real vehicle speed (accurate speedometer or GPS). The most important thing is that all 4 wheels show the same speed while driving straight.
    b. RPM configuration – in case of sequential fuel injection this (Events/rev) should be set to 1. It is possible to connect half-group (2) or full-group injectors (4) to TCS and configure RPM correctly, but because of how TCS works , it can result in leaning out instead of full fuel cut.
    c. StartRPM and activation speed – StartRPM is used to help engine produce torque, so start from 0 is quick. This means if you have turbocharged engine, this should be RPM at which turbo produces some boost. Most cars use ~3500rpm. Activation speed should be set 10-15% lower than your speed at StartRPM. If you set StartRPM to 3500 and in 1st gear at 3500rpm your speed is 30km/h, set activation speed to 27km/h. This will allow the car to maintain 10% slip on driven wheels when switching from RPM limiter to Wheel speed limiter. In addition activation speed should be above minimum reliable speed TCS can read. If you see smooth reading at 30km/h, but at 25km/h readings are noisy, then set activation speed to 30km/h and StartRPM to RPM which you have at 33km/h (30km/h + 10%).
    d. MaxSlipFuelCut – this should be set to minimum value, where TCS can still control wheel spin. ~70% is enough even in wet or icy conditions, but the lower the value, the smoother the cut will work.

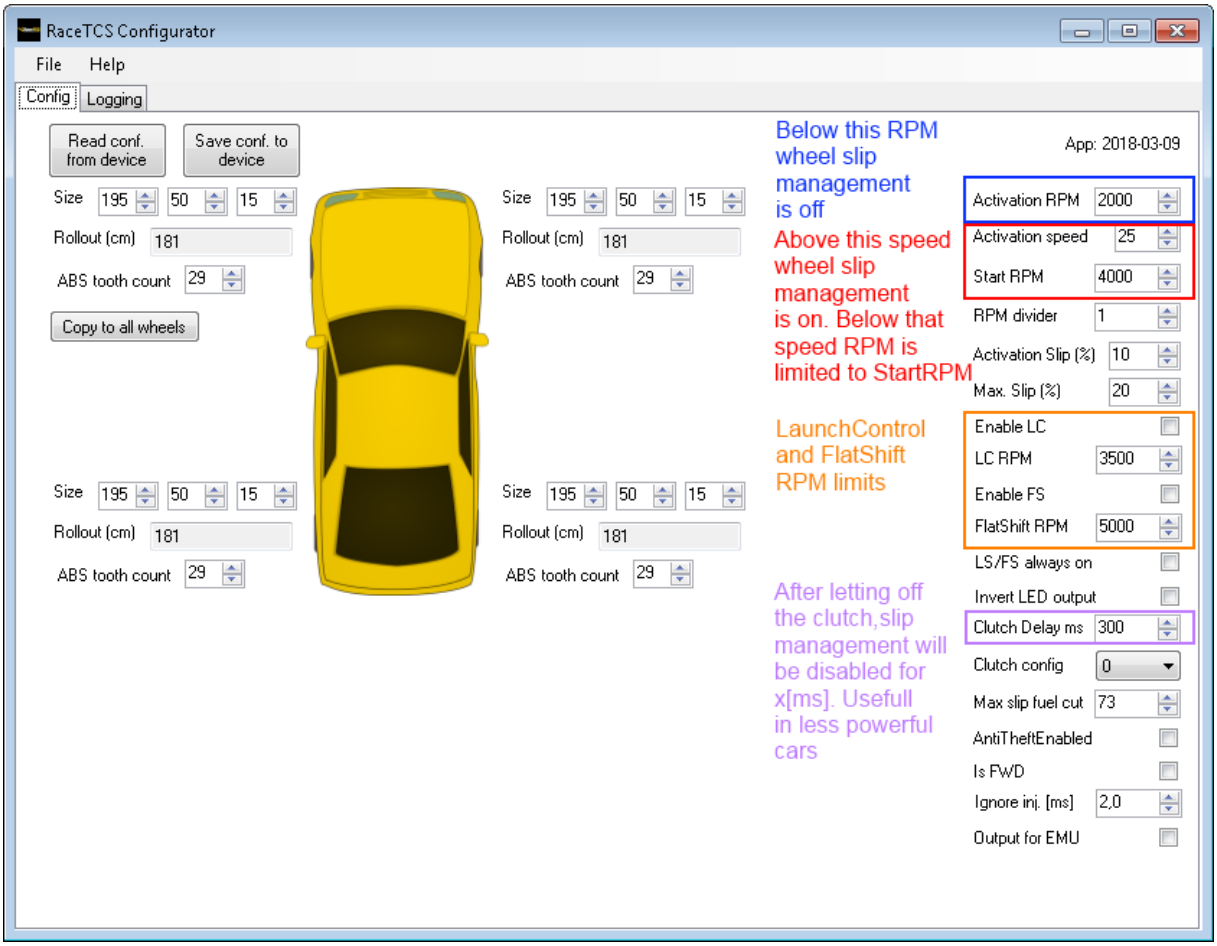
5. TCS logic

TCS logic can be divided into 2 sub functions:

a. RPM limiter
    i. Clutch pressed (down)
        1. Car stationary – LC RPM limit
        2. Car moving – FS RPM limit
    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 <= **Activation Slip** - 0% cut
        2. Slip >= **Max Slip** - 100% cut (or **Max Slip fuel cut**, whichever is smaller)
        3. Slip between **Activation Slip** and **Max Slip** – cut proportional to the slip

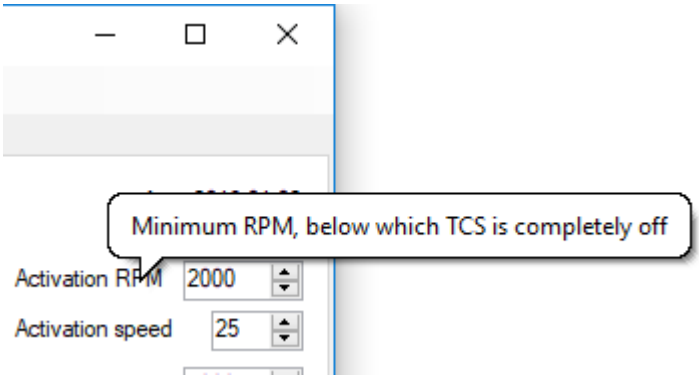


6. PC app – TCS Configurator



PC app requires .Net framework 3.5 (Windows 7 and higher have it preinstalled)

Each setting in PC app has a hint – hover mouse over to see the explanation



a. PC app is used to configure TCS. 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 is can be opened in TCS Configuratorfor later analysis

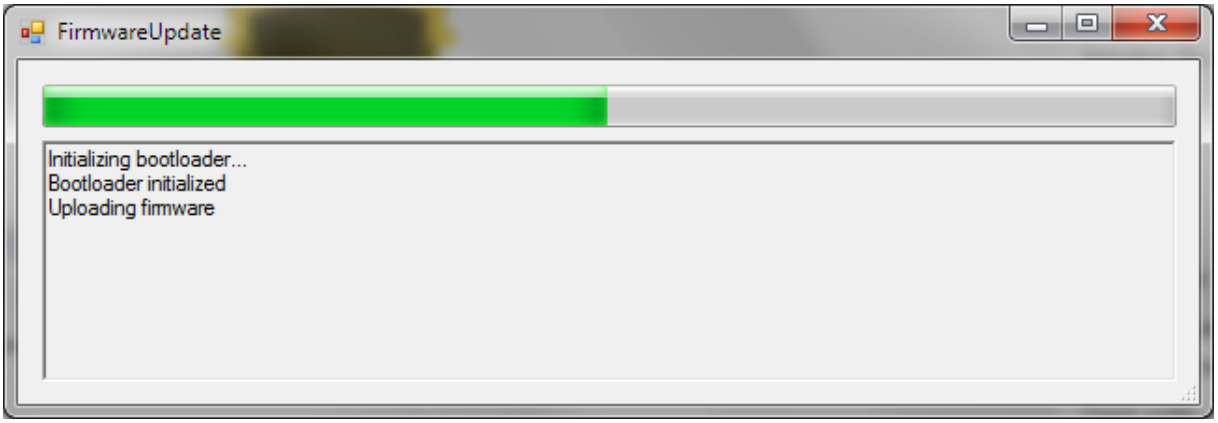
c. Read conf. from device reads configuration from connected device

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

e. File menu Save/Load settings allow to store settings on disk

7. Firmware update

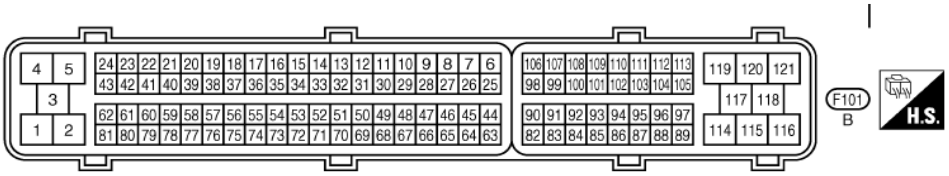
To update firmware, select File menu, Firmware Update and select firmware file to be updated. Green progress bar will indicate when process is finished. TCS should automatically restart, so do not update firmware when engine is running

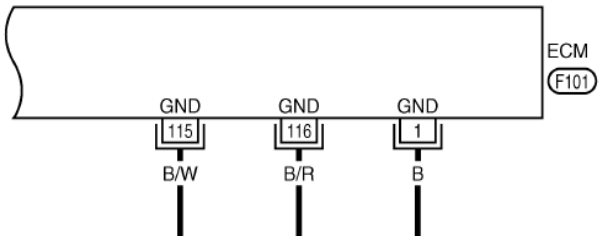


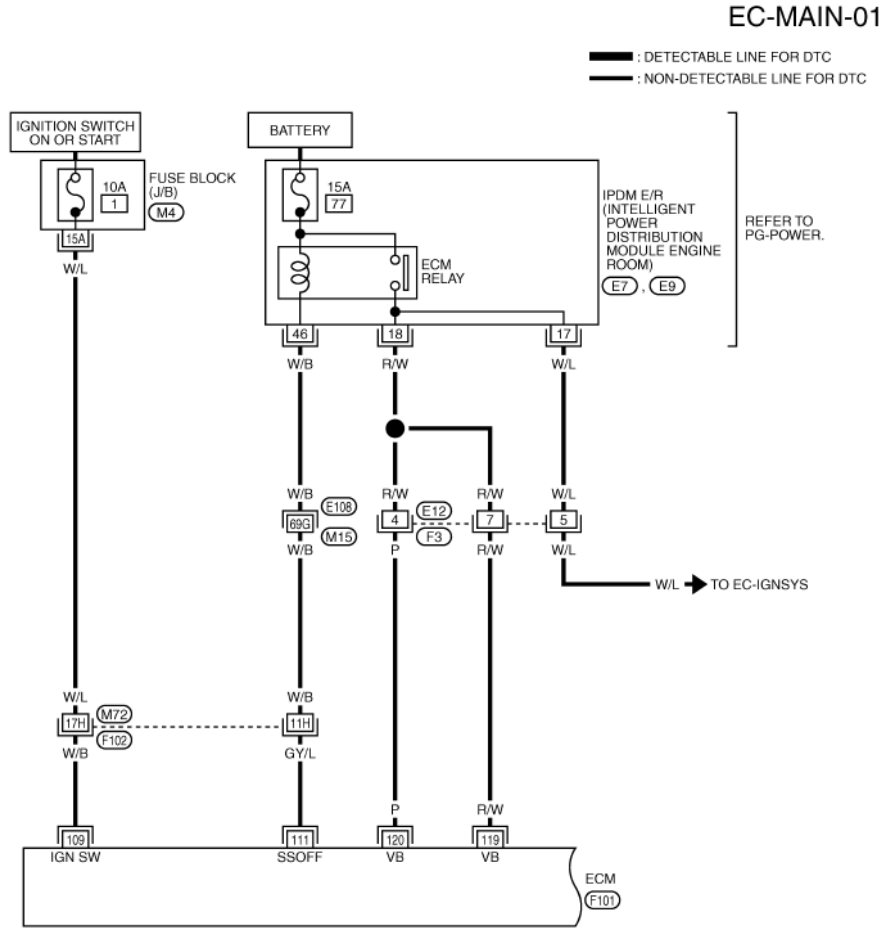
8. Wiring diagrams

   a. Nissan 350Z

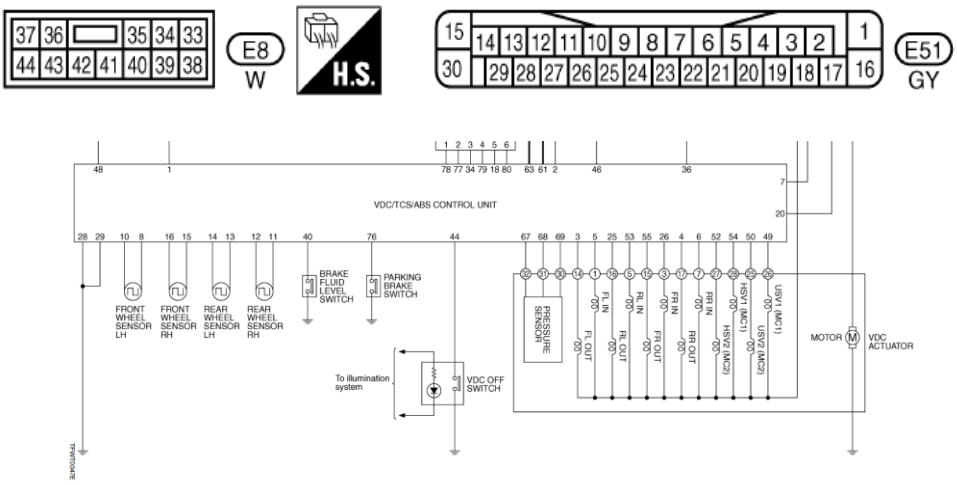
      - **ECU diagrams**



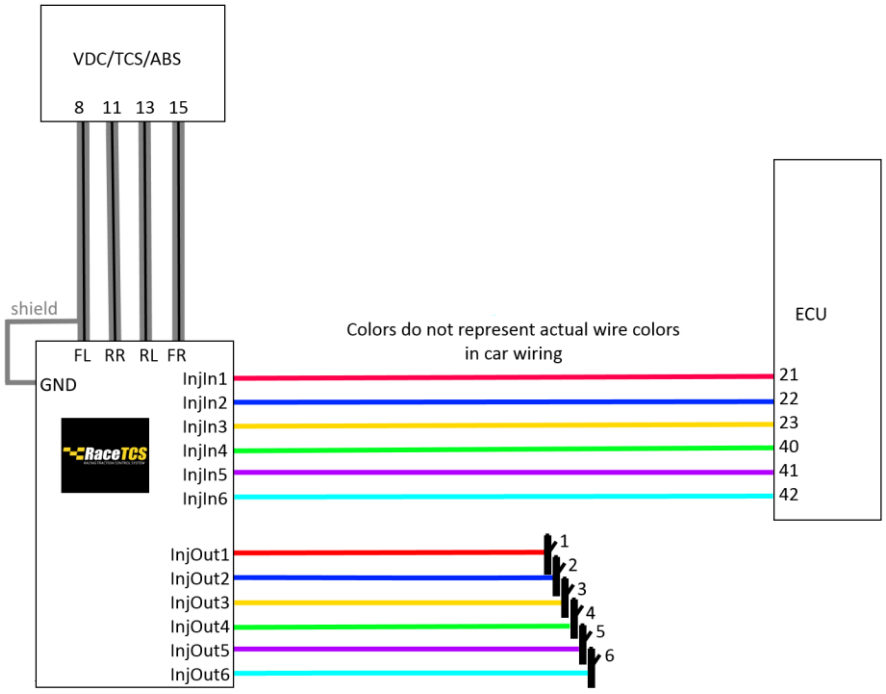




- **VDS/TCS/ABS Diagrams**



Nissan 350z



b. Opel Speedster/VX220 turbo