

# TR-6

High Tech Ignition System

FOR

# BUICK TURBO V6

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## Introduction

The TR6 is the most advanced ignition upgrade available for the Buick turbo V6. It is plug-in compatible with the powertrains found in 1986-1987 Buick Regals with the VIN-7 turbo+intercooled engine as well as the 1989 anniversary turbo TransAm. The 1984-1985 turbo Regals are compatible with some wiring changes.

The TR6 has many advanced features including:

- Advanced 32bit Microprocessor
- Selectable wastespark or sequential (coil-per-plug) ignition
- Uses late-model powerful “smart coils”
- 2-Step Rev Limiter built in, can use “pills” to set the RPM.
- LEDs for critical signals and sensors
- Full signal and sensor diagnostics, Error LED and display on tachometer
- Safety mode: shuts down engine if unsafe signals or sensors are detected
- Cam sensor phasing can be displayed on the tachometer
- Software is updatable by the user
- Heavy, die-cast aluminum enclosure, powdercoated.
- Fully plug-and-play with the vehicle harness.
- Mounts in the stock location.

## Installation

Standard installation uses the wastespark coilpack. Remove the enclosure lid. Mount the coilpack to the top of the enclosure using the supplied screws and lockwashers. Tighten the screws ‘fairly tight’, the mounting pattern is symmetrical, so the coilpack cannot be installed backwards. Remove the stock ignition system from the engine. The harness connection uses a ¼” headed lockbolt, the module is fastened to the engine using 2 13mm nuts, and one bolt either 10mm or 13mm. These nuts and bolt will be reused. Remove the

mounting bracket from the stock ignition module by loosening the 3 nuts on the underside. Mount the TR6 to the stock bracket using the supplied locknuts.

**Note: the TR6 system is a higher power ignition system than the stock one. Due to this, the CCCI fuse in the fuseblock must be up-sized to 25A. The stock wiring is adequate to handle the increased current flow, just the fuse requires changing.**

**Note: the stock module and the new TR6 module both require a solid electrical ground via the mounting hardware. The mounting nuts have integral lockwashers to ensure this occurs. If you wish to paint the mounting bracket before reinstalling, be sure to scrape the paint away from the area contacted by the lockwashers to ensure a good ground.**

Mode 1	BaseTiming mode – see Advanced section. Set to OFF
Mode 2	Software Update Mode – Set to OFF
Mode 3	Cam Sensor Phasing Mode – Set to OFF
Mode 4	Wastespark Mode – Set to ON
Mode 5	Safety Mode – see Advanced section. Set to OFF
Mode 6	Invert Trigger – See 2-step section. Set to OFF
Mode 7	Retard 10 degrees when triggered – See 2-step section Set to OFF.
Mode 8	Retard 5 degrees when triggered – See 2-step section Set to OFF.

Now set the Rev Limit settings as follows. The MAIN limiter is always enabled, it prevents the engine from over-revving in case of a transmission failure, loss of traction, or missed shift. It is also used to prevent the engine from hitting a fuel-cutoff rev limiter in the ECM, as this can damage the engine if using alcohol or N2O injection. The TRIG limiter is activated using the trigger wire in the harness. This limiter is set lower than the MAIN and is used for “staging” when racing. It is usually set near the “stall speed” of the torque converter for automatic transmission vehicles, or at the “Launch RPM” for manual transmission vehicles.

The Rev Limit settings are a set by adding the RPM values for each switch tab. To set the MAIN limiter to 6300 RPM, turn on the tabs for 4000 , 2000 , 200 , and 100. Note that these add up to 6300. Likewise, set the Trig Limit values to the

desired setting. If the Trig limit is not going to be used, set it to 3000. If “Pills” are going to be used to set the Trig limit, then set all the TRIG switches off and refer to the Advanced section for more details on how to install and configure this feature.

## Advanced Features

There are several advanced features built into the TR6, they are enabled using the various Config and Mode dipswitches as detailed in the introduction section. They are described in detail in this section.

**Base Timing Mode:** When this switch is turned on, the Spark timing is forced to the crank sensor transition at 10° BTDC to allow checking of ‘Base Timing’. In this mode a timing light can be used to verify that the crank sensor and balancer trigger are properly aligned. With an aftermarket engine management system the “Crank Reference Angle” can be adjusted so that the timing mark appears at 10 degrees. Alternatively the trigger on the balancer can be corrected by a competent machine shop. The engine RPMs are limited to 3000 RPM in this mode to ensure the vehicle is not operated with this feature turned on.

**Safety Mode:** When set to ON, this feature will shut the engine off if a synchronization failure is detected. This can happen if the Crank Sensor is defective, loose or intermittent, or the CAM sensor is defective, loose or intermittent. These failures are considered major failures and on a high performance engine can cause significant damage. When racing these engines are pushed to the extreme, and a sensor failure can destroy the engine. This feature should **NOT EVER BE USED** when driving in normal traffic, as the key must be turned off and then back on to restart the engine. This is very dangerous on public streets where an intermittent sensor will still allow control of the vehicle and avoidance of an accident. So, to reiterate, **THIS FEATURE IS FOR OFF-ROAD USE ONLY!!!!**

Cam Sensor Phasing Mode: when enabled, this mode will display the measured cam sensor timing on the tachometer. The tach will read 3000 RPM until the engine is started, then it will read the cam sensor setting with 3000 RPM representing the 'proper' 25 degree setting. If the sensor is advanced, the tach will read lower, and if retarded, read higher. The tach reading is 1000 RPM per 10 degrees, so if the sensor is advanced 10 degrees, the tach will read 2000 RPM.

Note that the engines will run fine with the cam sensor +/- 20 degrees as long as the reading is stable. For best results the sensor should be adjusted slightly advanced, or between 2000 and 3000 on the tach.

## 2-Step Rev Limiter

The TR6 has a built in 2-step rev limiter that is used to build boost when staging/racing. The trigger wire is the orange wire in the system harness, pin 1. To use this feature, first set the limiter RPM dipswitches. See the introduction section for help in setting the switches. When the trigger input is activated, the engine RPMs will be limited to the set value. When the trigger is active, the Trig/Error LED will glow SOLID. When the system is limiting RPM, the Trig/Error LED will flash quickly. (When not triggered, the Trig/Error LED will flash quickly when the main rev limiter has engaged.) The trigger is normally activated by applying voltage to the trigger wire. If the Invert Trigger switch is ON, then the trigger is activated when there is NO voltage applied to the Trig input. The Config-1 switch can be used to supply "Pullup Voltage" to the trigger input so that "Grounding" the trigger input will activate it. If the Trig Limit switches are all set to OFF, then by setting the Config-2 switch to ON, and connecting an MSD "Pill" from Analog input 1 to ground, the Triggered RPM limit (2-step) can be controlled remotely. Contact [TR6@bailey-eng.com](mailto:TR6@bailey-eng.com) for more details. The Mode7 and Mode 8 switches can be used to retard the timing when the 2-step trigger is activated

(RPM must be greater than 1500). Mode 8 retards 5 degrees, Mode 7 retards 10 degrees, with both Mode 7 and Mode 8 on, the TR6 will retard 15 degrees.

## Diagnostics

The TR6 performs diagnostic checks of the sensors and signals, and will blink error codes on the red LED as well as making the tach output “blink”. The user can read these codes to assist in troubleshooting a failed or intermittent sensor.

The error codes are as follows

Cam ReSync Error : 12

Cam Sensor Signal Missing or Mis-timed : 13

Cam Sensor Extra Pulses : 14

Cam Sensor Pulse Moved : 15

Cam Sensor Signal Lost : 16

Coil Power Missing (Main connector Pin M – check CCCI fuse) : 18

Crank Sensor Signal Missing : 31

Crank Sensor “Jittery” : 32

Crank Sensor “Rising Edge” error : 33

Crank Sensor “Falling Edge” error : 34

EST\_Missing, // 41

EST\_In\_TimingInvalid, // 42

BypassSignalMissing, // 43