



## Bailey Engineering 2-Step Rev Limiter: Shift and Launch Controller

For Turbo Buick, DSM, 3000GT/Stealth, Supra,  
Mustang V6, and many more.

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## PACKAGE CONTENTS

The 2-Step unit is shipped with the following components:

- 2-Step controller unit
- 10 wire 'Signal Harness'
- 5 wire 'Power Harness'
- Package of terminals
- Instruction Manual

These are the basics for installation in most of the vehicles that are compatible with the 2-Step unit. The advanced modes and additional programmable features may require additional wiring or connections, which are available separately. Additional accessories can be obtained from the dealer where you purchased the unit.

## WARRANTY AND DISCLAIMER

The 2-Step unit carries a warranty of 1 year from date of purchase to be free of defects in materials and workmanship. It carries no warranty of merchantability or suitability for a particular purpose or for any damages or consequences of its use.

This product is intended for use on racing vehicles for off-highway competition use. Its installation does not affect the vehicle emissions when the unit is not activated. However, extended activation can drastically shorten the life of catalytic converters. Additionally, the use of this unit does operate the engine in a manner much different than normal driving. The manufacturer is not liable for any issues or damage to vehicle or powertrain as a result of its use.

## INTRODUCTION

Congratulations on your purchase of the Bailey Engineering 2-Step Shift and Launch Controller. This unit is highly advanced and is the only unit available with its unique combination of features, expandability and adjustability. The unit is designed to be compatible with many different types of vehicles, if yours is not listed within this manual, please consult [www.2Step.bailey-eng.com](http://www.2Step.bailey-eng.com) for manual additions, updates and accessories.

The 2-Step unit is designed to limit engine speed (RPM) to the desired presets to allow the driver to hold the accelerator floored while preparing to 'launch' the vehicle when racing. On vehicles equipped with manual transmissions, the unit is also used to cut engine power during 'speed shifts' to allow the driver to keep the accelerator pedal floored while shifting. These modes of operation allow increased performance on all types of vehicles, but especially so on those equipped with turbochargers.

Another important application for the 2-Step unit is to limit the top engine speed to below that of the engine control module (ECM, PCM). The ECM rev limiter disables the fuel injectors to cut engine power and prevent over-revs. On engines equipped with Nitrous Oxide or alcohol injection, disabling the fuel injectors while accelerating results in an extremely lean condition as the nitrous or alcohol is still flowing. This can cause serious engine damage and must be avoided. The "Main Limit" in the 2-Step unit is designed to prevent these occurrences by limiting engine speeds to a safe level.

The engine RPM limiting is achieved by disabling the spark to the engine. The fuel delivery is not prevented and the engine will pass fuel and air thru the disabled cylinder into the exhaust. Consequently, some popping in the exhaust when the unit is activated. Backfiring can result if the unit is activated for longer periods. This is simply the air and fuel that has passed through the disabled cylinder igniting in the exhaust manifold, header, or exhaust system.

## OPERATION

The 2-step unit gets its name from having two selectable settings for the rev limiting action. The Main RPM setting is always active, and will prevent the engine from exceeding the setting. The Trig. RPM sets the RPM limiting action lower than the Main, and is used to control the engine when staging (lining up for a race) or during a wide-open-throttle shift on a manual transmission vehicle. The details of how the triggering is connected to the unit varies depending on the vehicle and is described in the installation section.

The 2-step limits engine speed (RPM) by disabling the ignition/spark. The method for doing this differs depending on the vehicle. Some vehicles can have the spark disabled by preventing the trigger signal from reaching the circuitry that controls the ignition coil(s), in many of these vehicles (DSM,3000GT,Supra) the ECU monitors a feedback signal to be sure the ignition system is delivering spark to the engine. In these cases, this signal is generated by the 2-step unit so that no error codes are triggered in the ECU. Other types of vehicles cannot have the ignition trigger signal blocked, or they will lose

synchronization with the rotation of the engine (Buick V6, Mustang V6). In these cases, the power that feeds the ignition coil is turned off to prevent it from firing the spark plugs. The 2-step has is programmed to enable and disable the spark between cylinder events to ensure no mis-timing occurs.

On some vehicles (Buick Turbo, Supra with automatic transmission) the 2-step is primarily used when drag racing to control launch RPM. These vehicles are “brake-torqued” to build boost at the starting line and vehicle launch can be inconsistent without a 2-step to control the RPM.

On other vehicles (DSM, 3000GT, Supra with manual transmission) the unit is generally used to control launch RPM while revving with the clutch disengaged. When launching in this fashion, the throttle can be held open and the turbo will build boost in a consistent fashion.

Additionally, the unit can be used to briefly cut engine power when speed shifting, allowing the throttle to be held open and resulting in faster turbo recovery after the shift. In these vehicles, a clutch switch is used to trigger the unit and the TPS (throttle position sensor) signal is connected. If the throttle is wide open, and then the clutch pedal is pushed, the unit performs a PowerShift cut. If the clutch pedal is depressed first, the unit operates in launch mode using the Trig RPM setting.

# INSTALLATION

## OVERVIEW

The unit is designed to be mounted inside the vehicle. It is not waterproof, weatherproof, or otherwise capable of being mounted underhood. Water damage will void the warranty. Locate a suitable spot to mount the unit, there are user settings inside the unit for standard operation, and a USB port for advanced usage, tuning, and software update. The spot chosen should be accessible to allow adjustment of the settings. The sections that follow will detail the connections of power, ground, signal connections, and triggering. For each type of vehicle there will be wires that “SPLICE” or “TAP” to the ECM wiring.

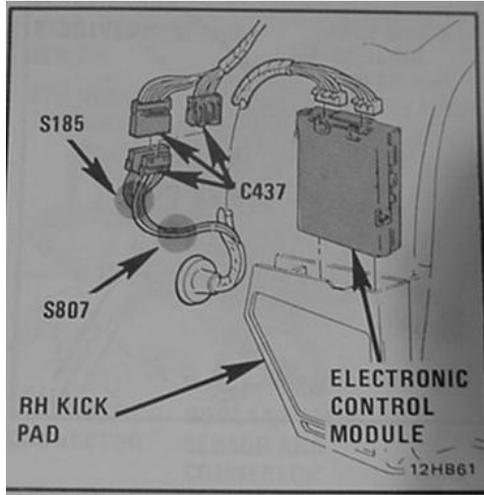
Where the instructions say “SPLICE” to an ECM wire, locate that wire at the ECM and follow it away from the ECM for 4 to 6 inches, then cut that wire and strip the ends .25”. Install a male spade terminal on the wire that leads to the ECM and a female spade terminal on the wire that leads to the engine. On the 2-Step wires install mating terminals and connect them to the ECM wires. For example, the Buick instructions indicate “SPLICE ECM-B4(white), White-ECM, Gray-Engine”. Locate the wire on terminal B4, it will be white. Follow it away from the ECM for 4-6 inches and cut it. Install a male spade terminal on the ECM side and a female on the engine side. Install a female terminal on the white 2-Step wire and connect to the ECM side wire, install a male terminal on the gray 2-Step wire and connect to the engine side wire.

Where the instructions say “TAP” we will be connecting into an ECM circuit without cutting it using a red IDC connector. For example, if the instructions say “TAP ECM-C13(blue)” Blue. For this connection locate the blue wire at ECM terminal C13 and follow the blue wire 4-6 inches from the ECM. At this point put a red IDC TAP connector around the ECM wire and insert the blue 2-Step wire into the side of it (do not strip either wire). Using a pair of regular pliers squeeze the tap connector so that the connector clip slides into the wires to be connected and is flush with the surface of the plastic. Tug on the wires gently to ensure the connection is made and then clip the plastic tab around the connector body. Do not use the tab to try to squeeze the connection, this must be done with pliers first. This style tap connector is reliable only if the wires are not subject to vibration or a lot of movement. A tie-wrap around the wires can help stabilize the connection. For more information visit [www.2step.bailey-eng.com](http://www.2step.bailey-eng.com).

#### TURBO BUICK AND 1989 TURBO TRANS-AM

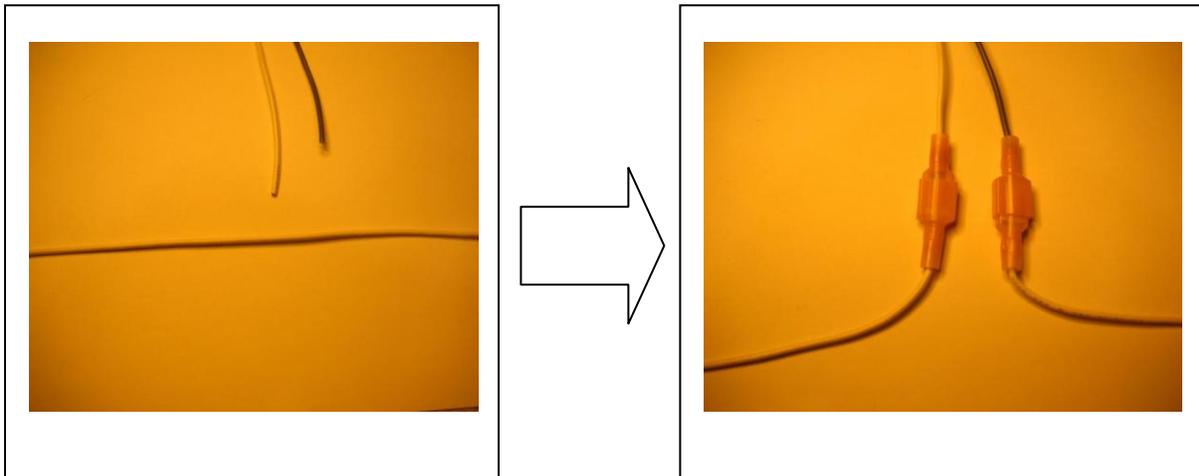
Mount the unit in a suitable location, connect both harnesses (signal and power) to the unit. The Power harness has 5 wires, the red+pink wires must be connected at the fusebox. Pull the gray, and brown wires out of the plastic tubing for half the length of the harness. Run the Power harness under the dashboard to the fusebox that is near the driver’s left foot, under the dash. Be sure to route it such that it does not interfere with the operation of the pedals or steering. The Power harness has a fuse-box adapter installed on the end of the red and pink wires. Remove the CCCI fuse (Buick), or INJ-FP2 fuse (Turbo TA), and insert the fuse-box adapter so that the wires extend to the



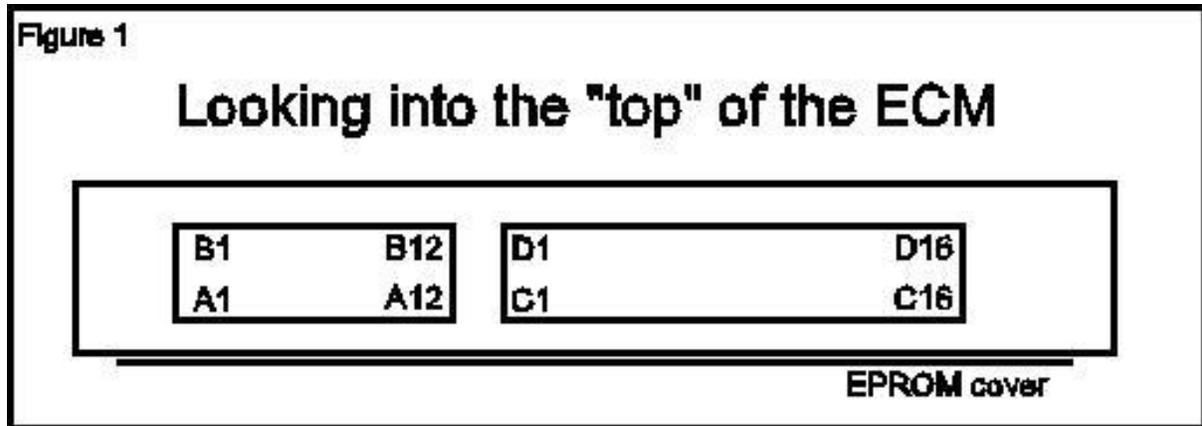


Next we connect the signal harness. Refer to the overview section for details on how to make these connections.

SPLICE ECM-B4(white) White-ECM Gray-Engine



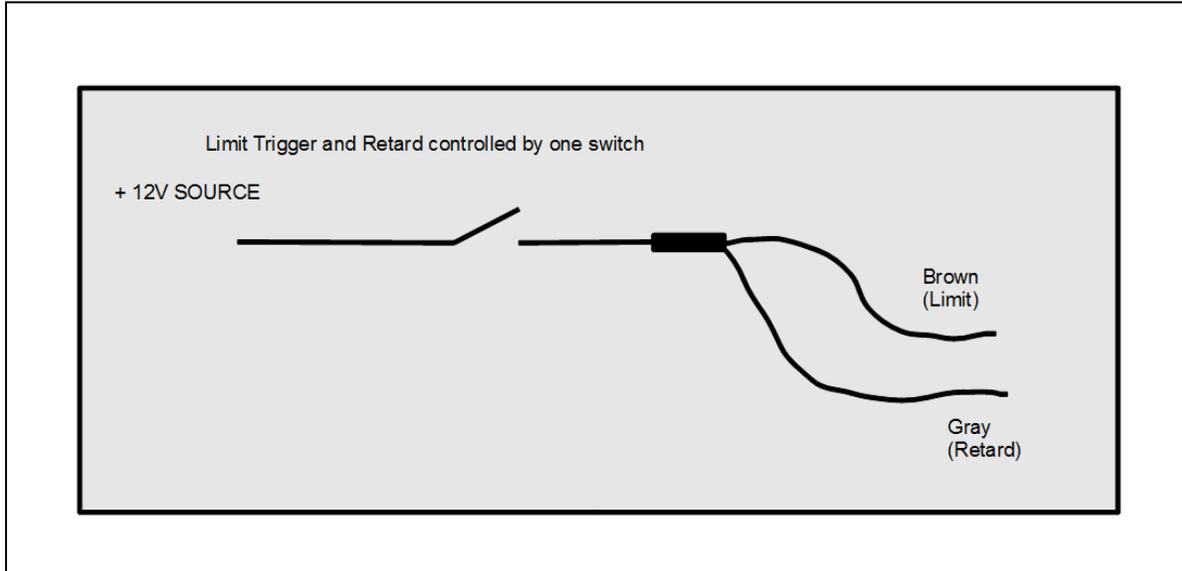
Refer to the ECM connector diagram below. The ECM is located in the passenger side kick panel.



The rest of the wires in the “signal” harness will not be connected, wrap them up and secure them out of the way.

The gray and brown wires in the Power harness are used for triggering the unit. There are many ways to configure these, depending on the configuration of the vehicle. The Brown wire activates the 2-step rev-limiting feature, and the Gray wire activates the timing retard.

Connecting these wires to a voltage source activates them, they are not activated by a ‘ground’. The inputs have spike suppression built in, but it is not recommended to connect them directly to a trans-brake solenoid. A relay is recommended. A suggested connection scheme is shown below. Visit [www.2step.bailey-eng.com](http://www.2step.bailey-eng.com) for more information.

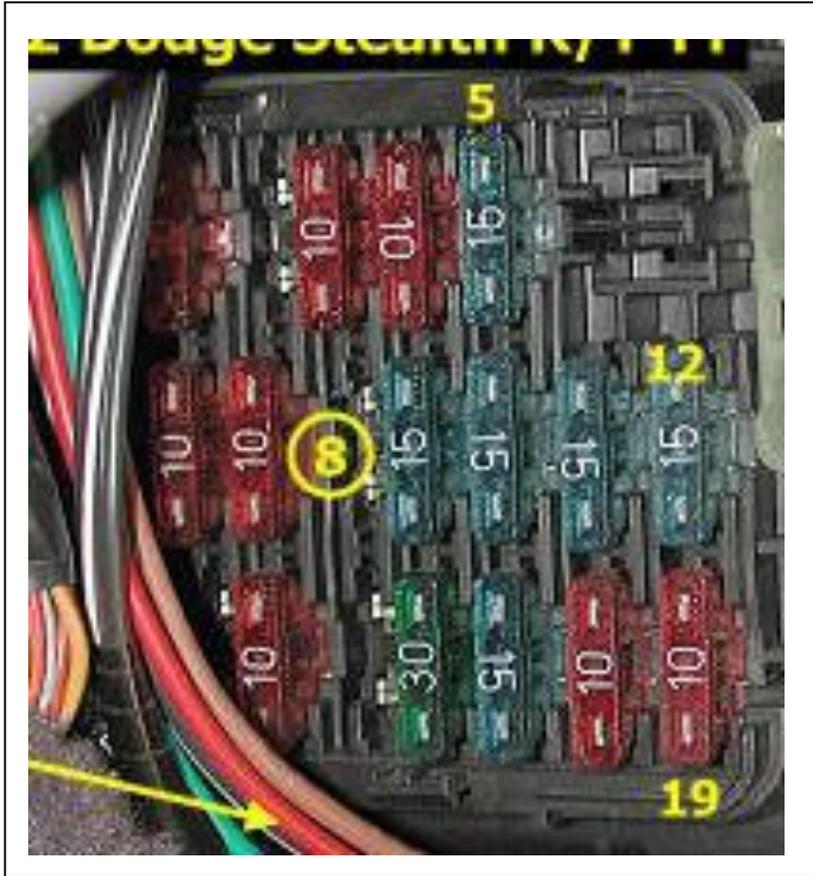


#### ECLIPSE / TALON / LASER (DSM)

TBD.

#### 3000GT / STEALTH

Mount the unit in a suitable location, connect both harnesses (signal and power) to the unit. The Power harness has 5 wires, the red+pink wires must be connected at the fusebox. Pull the black, gray, and brown wires out of the plastic tubing for half the length of the harness. Run the Power harness under the dashboard to the fusebox that is near the driver's left foot, under the dash. Be sure to route it such that it does not interfere with the operation of the pedals or steering. The Power harness has a fuse-box adapter installed on the end of the red and pink wires. The fusebox has an empty slot, this is fuse number 8. Insert a 10A fuse into the open slot on the fuse-box adapter and plug the fuse-box adapter into the empty slot at fuse number 8 with the wires extending up.



Run the black wire to the ECU, cut it to length, strip it, and install a ring terminal on the end using a strong crimp. Make sure the crimp is solid, as many cheap crimpers cannot generate the necessary force to ensure a good crimp. Tug on the crimped terminal firmly and ensure the wire does not move. Secure the ground wire to one of the screws holding on the side of the center console under the dash. The best ground is a true engine ground, the center console metal structure is a good compromise. Next we connect the signal harness. Refer to the overview section for details on how to make these connections.

SPLICE ECM-B4(white) White-ECM Gray-Engine

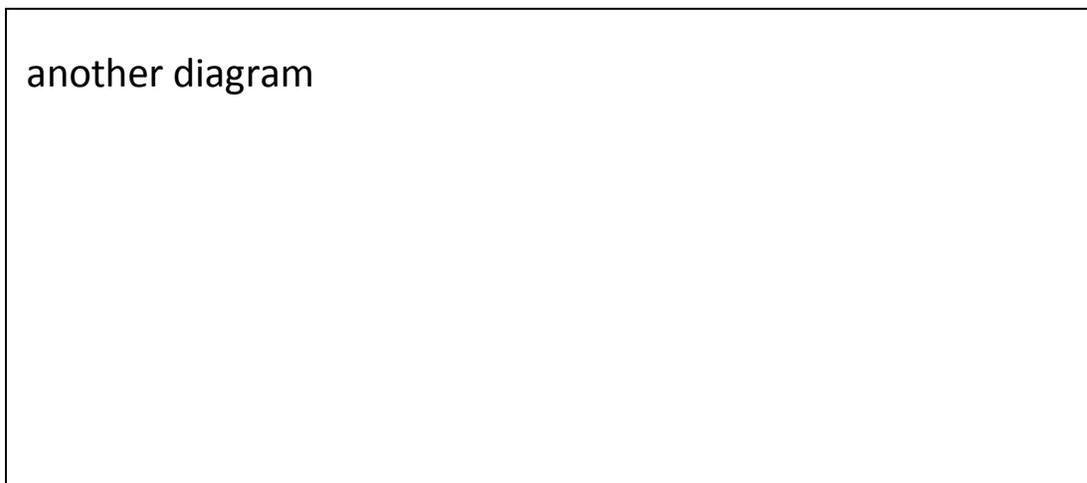
SPLICE ECM-B4(white) xxxxx-ECM xxxx-Engine

SPLICE ECM-B4(white) xxxx-ECM xxxx-Engine

SPLICE ECM-B4(white) xxxx-ECM xxxx-Engine

TAP ECM-C13(blue) Blue

Refer to the connector diagram below.



The rest of the wires in the “signal” harness will not be connected, wrap them up and secure them out of the way.

The gray and brown wires in the Power harness are used for triggering the unit. A suggested connection scheme is shown below.

Triggering diagram for manual transmission vehicle showing clutch switch and arming switch.

TOYOTA SUPRA

MUSTANG V6

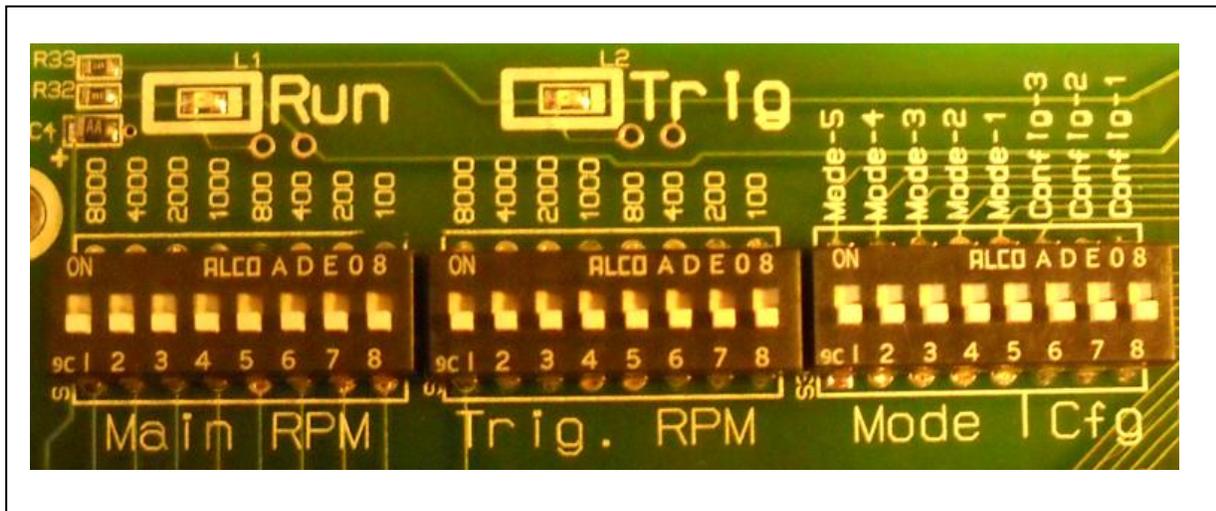
ADDITIONAL VEHICLES

## INTERNAL ADJUSTMENTS AND SETTINGS

### OVERVIEW

Inside the 2-Step control unit are 2 green LEDs labeled “Run” and “Trig”. The Run LED lights whenever the engine is running. It will blink whenever the Main RPM limit has activated and is controlling RPM. Also the Run LED will blink whenever the DIP-Switch settings are changed to verify the change was recognized.

The Trig LED lights whenever the Trigger inputs have activated the Trig limit setting. This is somewhat different depending on the vehicle. This LED will blink whenever the Trig RPM limit has activated and is controlling RPM.



The unit has 3 “DIP-Switches” inside. 2 are used to set the Main and Trig RPM settings. For these, each switch tab has an RPM value shown next to it. For all switch tabs that are in the On position, add their respective RPM values together to arrive at the setting for that switch. For example, to set the Main RPM to 6500 RPM turn on the 4000, 2000, 400, and 100 switch tabs.

The third switch has 8 tabs, 5 are used for setting the “Mode” of the 2-step unit which enables or controls various advanced features of the unit. 3 tabs are used to set the “Configuration” of the 2-step unit to match the unit to the type of vehicle that the unit is installed in.

Note that the switches themselves have numbers printed on them, these should not be confused with the correct indicators printed above the switches.

The Config settings are as follows:

Vehicle Type	Config-3:	Config-2:	Config-1:
Unit disabled	OFF	OFF	OFF
Buick V6 and TTA	OFF	OFF	<b>ON</b>
3000GT/Stealth	OFF	<b>ON</b>	OFF
Supra 7MGTE	OFF	<b>ON</b>	<b>ON</b>
Mustang V6 TFI	<b>ON</b>	OFF	OFF
Future application	<b>ON</b>	OFF	<b>ON</b>
Future application	<b>ON</b>	<b>ON</b>	OFF
Future application	<b>ON</b>	<b>ON</b>	<b>ON</b>

The details for the Mode settings are listed in the vehicle specific operation sections below.

#### BUICK TURBO V6 AND PONTIAC 1989 TURBO TRANS AM

The 5 “Mode” tabs control various modes of operation. Refer to the table below for details on which features are controlled by which tab. There are 2 main functions, Retard and Limiter. Retard uses Mode-1 and Mode-2. The Limiter uses Mode-3, and Mode-4.

Retard: the Timing is retarded when the gray trigger wire is activated. The amount of timing retard is controlled by the settings of the Mode switch.

Timing retard	Mode-2	Mode-1
0	OFF	OFF
8	OFF	<b>ON</b>
16	<b>ON</b>	OFF
24	<b>ON</b>	<b>ON</b>

Limiter Mode	Mode-4	Mode-3
Full Cut	OFF	OFF
Partial at 250 rpm under setting, full cut at setting.	OFF	<b>ON</b>
Partial at 500 RPM under setting, full cut at setting	<b>ON</b>	OFF
Partial cut at limit setting, no full cut	<b>ON</b>	<b>ON</b>

Mode-5 -- reserved for future feature.

3000GT AND DODGE STEALTH

TBD

## TROUBLESHOOTING

- No LEDs light up, engine does not start.
  - Check for fuse installed in the fuse box adapter in the Power Harness. Check that the ground wire is connected to grounded metal.
- Trig LED will not light.
  - Check that the trigger input sources are voltage sources and not grounds.
- Run LED flashes when setting is changed.
  - This is normal and confirms that the setting was received by the unit.
- Engine starts then stalls (Buick).
  - Verify that the EST splice connections are not reversed.

## ADDITIONAL FEATURES AND ADVANCED PROGRAMMING

Additional features are in development, check [www.2step.bailey-eng.com](http://www.2step.bailey-eng.com) for details

## SOFTWARE UPDATE

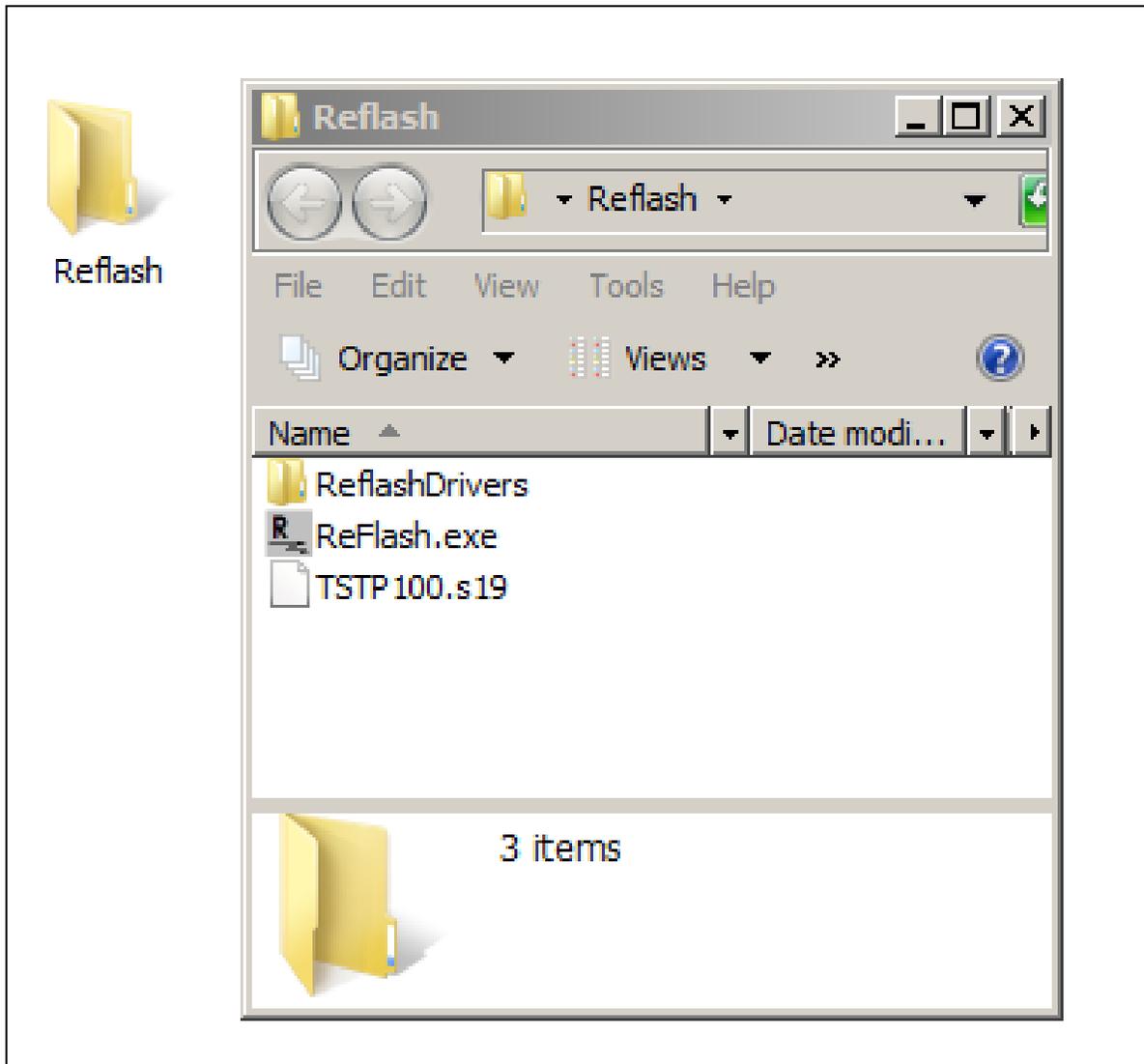
The unit can be updated (reflashed) by the user by connecting it to your computer using a standard USB cable. This cable is not included with the 2-step unit, but is available from the dealer where you purchased the unit, or any computer, electronics, or appliance store. The unit can be powered via the USB cable so it is not necessary to reflash the unit in the vehicle.

The version of software in the unit can be verified by setting the config switch tabs to all OFF. The Trig LED will then blink out the version number. Zero is represented by a short flash, other digits by a series of longer flashes. For example, 1.0.0 will appear as 1 long flash, pause, short flash, pause, short flash. This sequence repeats indefinitely. Do not run the engine in this mode.

The latest updates can be downloaded from [www.2Step.bailey-eng.com](http://www.2Step.bailey-eng.com) The unit does not need to be installed in a vehicle to perform this update. To update the unit, follow the procedure below.  
(additional help is available at the web site)

- Download the update software from the website listed above. The software will be in a 'zip' file which is treated as a 'compressed folder' by the later versions of Windows.
- Save the zip file (compressed folder) onto the Windows desktop.
- Open the zip file (compressed folder), inside you will find a folder named "Reflash" click and drag this folder out of the compressed folder and drop it on the desktop. Then delete the compressed folder.
- Double click the "Reflash" folder to open it, inside will be 2 files and another folder named "ReflashDrivers". The 2 files are "Reflash.exe" and TSTPxxx.S19 (the software update, xxx is the version)
- Double click the "Reflash" program, and a window will open as shown.
- Click the "Reflash" button, a file select window will open, select the update "S19" file, and click Open.

- If this is the first time reflashing the unit, Windows will launch a wizard to install the drivers for the reflash. Direct the wizard to the “ReflashDrivers” folder that is in the “Reflash” folder you dragged to the desktop.
- Once the driver is installed the software will reflash the unit.



## ReFlash

This program will load a new software file into the unit. Connect unit, click the button below. You will be prompted to select a file. If you have not previously loaded drivers Windows will launch a wizard to install them.

Reflash

Quit