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Welcome



Welcome

## **G-TECH / Pro RR Performance Meter**

Thank you for purchasing your **G-TECH / Pro RR** Performance Meter.

I am very pleased and proud to present this product to you and welcome you to our G-tech users family.

As you read along and especially as you start having fun with your G-tech you will realize something. You will see that this is a precision instrument with a high level of sophistication designed by guys who – just like you – have gasoline in their blood and love for cars. Guys who have spent years of sleepless nights to perfect this product.

It's up to you to decide how far you want to take the G-tech. You can do 0-60 mph and 1/4 mile measurements after only a brief setup procedure.

Or, as you become more familiar with the G-tech's powerful capabilities, you will learn how to create very valuable tuning records and increase the consistency of your measurements.

For us, the G-tech has been a labor of love. It has all of the features you'll ever want and there is truly nothing else like it in the world.

Our motto has always been to bring the latest technology and innovation into the hands of our customers and maybe contribute, in a small way, to brightening their day.

So, without further ado, go out there and have some fun.

Please drive safely.

**Jovo Majstorovic**  
**President, Tesla Electronics Inc.**

**Warning:** Always obey all local and federal laws when using this device. This device is not intended for street or highway use. Use only in designated areas, closed courses and racetracks.

**Warning:** Adverse weather conditions can severely impair a vehicle's controllability, especially at high speed. When using this device, drive cautiously and within the limits of your vehicle under the conditions.

**Warning:** Don't take your eyes off the road. The G-tech will record your results for viewing and playback after the run. This device is designed as a test and tuning tool to measure performance and safety characteristics of a given vehicle. Use it for that purpose only.

Tesla Electronics, Inc. shall not be held liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance or use of this material.

Tesla Electronics, Inc. shall not be held liable in any way for any incidental or consequential damages to the vehicle, driver, passengers, and/or other involved parties or property occurring while using the G-tech.

TESLA Electronics Inc. reserves the right to make changes to this manual and other product specifications at any time without any further notice.

The content of this manual is for informational use only and is not intended as a commitment of any kind.

Please drive safely.

Welcome



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# Basics

---

# 2

This section will give you a basic overview of the G-tech.

*Every new user should read this section!!!*

## G-tech Front Side

Please follow the steps described in this section to familiarize yourself with the product, and to set it up.

**Note:** In this manual, we will refer to the G-TECH / Pro RR product simply as the “G-tech.”

All input to the G-tech is done through the buttons on the right-hand side.

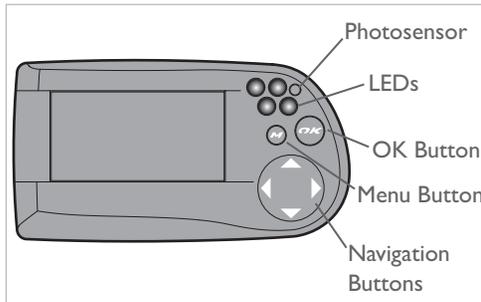


Figure 1: G-tech front

- **Photosensor** – measures ambient light

- **Light Emitting Diodes (LEDs)** – red lights that turn on under certain conditions
- **OK button** (OK) – used to confirm entry of data and make menu selections
- **MENU button** (MENU) – brings up multi-line menus
- **Navigation buttons** (←, →, ▲ and ▼) – used for moving cursor around in menus, graphs, etc.

## G-tech Back Side

The back of the G-tech has 2 connectors as shown in Figure 2:

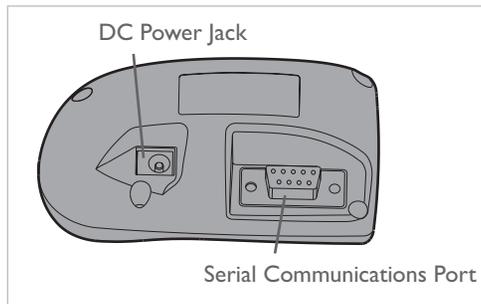


Figure 2: G-tech rear

- **DC Power Jack** – plug in either of the supplied DC power cables into this connector
- **Serial Communications Port** – plug in the supplied serial cable into this port to enable communications between the G-tech and a computer

## Cables

The G-tech ships with 3 separate cables:

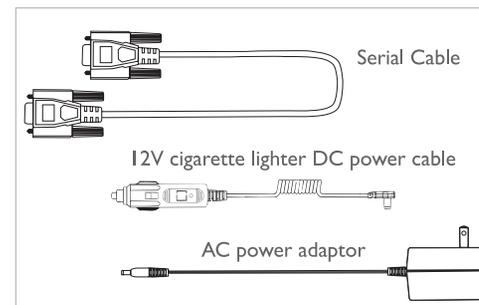
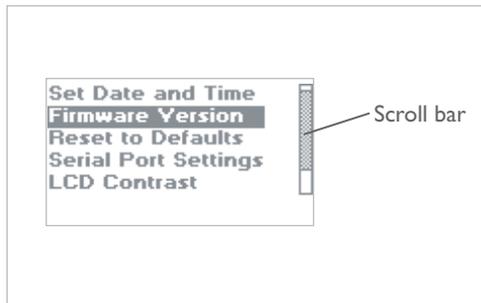


Figure 3: G-tech cables

- **Serial Cable** – used to connect the G-tech to a computer for data transfer
- **AC Power Adapter** – this cable supplies power from any 120V AC wall socket
- **12V cigarette lighter DC Power Cable** – supplies power from vehicle's accessory (cigarette lighter) plug.

## Menus and Scroll Bars

Generally, pressing **↻** will bring up a multi-line text menu. Figure 4 is an example of a G-tech menu:



**Figure 4: A G-tech menu with a scroll bar**

Some menus have a *scroll bar* on the right hand side. This means that there are more items in the menu than the G-tech can display at once.

Use the **▲** / **▼** arrow keys to move through all the choices in the menu.

The shaded portion of the scroll bar will move as you scroll through the choices.

## Operating Modes

The G-tech has 3 basic modes of operation.

**Configuration Mode** is used to tailor the G-tech to your vehicle and personal preferences.

**Drag Strip Mode** is used to measure straight-line performance characteristics, such 0-60 MPH, 1/4 mile E.T. & trap speed, horsepower & torque, and braking distance.

**Road Racer Mode** is used to record and analyze your G's & RPMs in a practice session on the track or a Solo event.

When you turn on the G-tech, it resumes in the same mode it was in before power-off.

Figure 5 shows the 3 main operating modes, and what the display looks like for each mode at power-on.

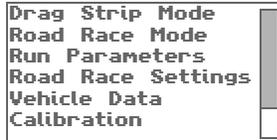
Power Up Mode	Display at power-on
Drag Strip Mode	
Road Racer Mode	
Configuration Mode	

Figure 5: Operating Modes — Main Screens

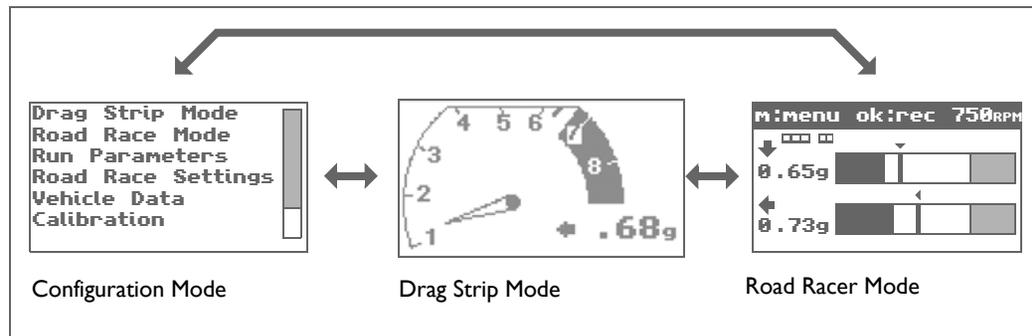


Figure 6: Drag Strip, Road Racer & Configuration Modes

You can switch between the 3 operating modes as shown in Figure 6.

In **Drag Strip Mode** and **Road Racer Mode**, press  to bring up a menu, and then select the mode you would like to use.

In **Configuration Mode**, the main screen initially displays a menu that allows you to select the mode you would like to use.

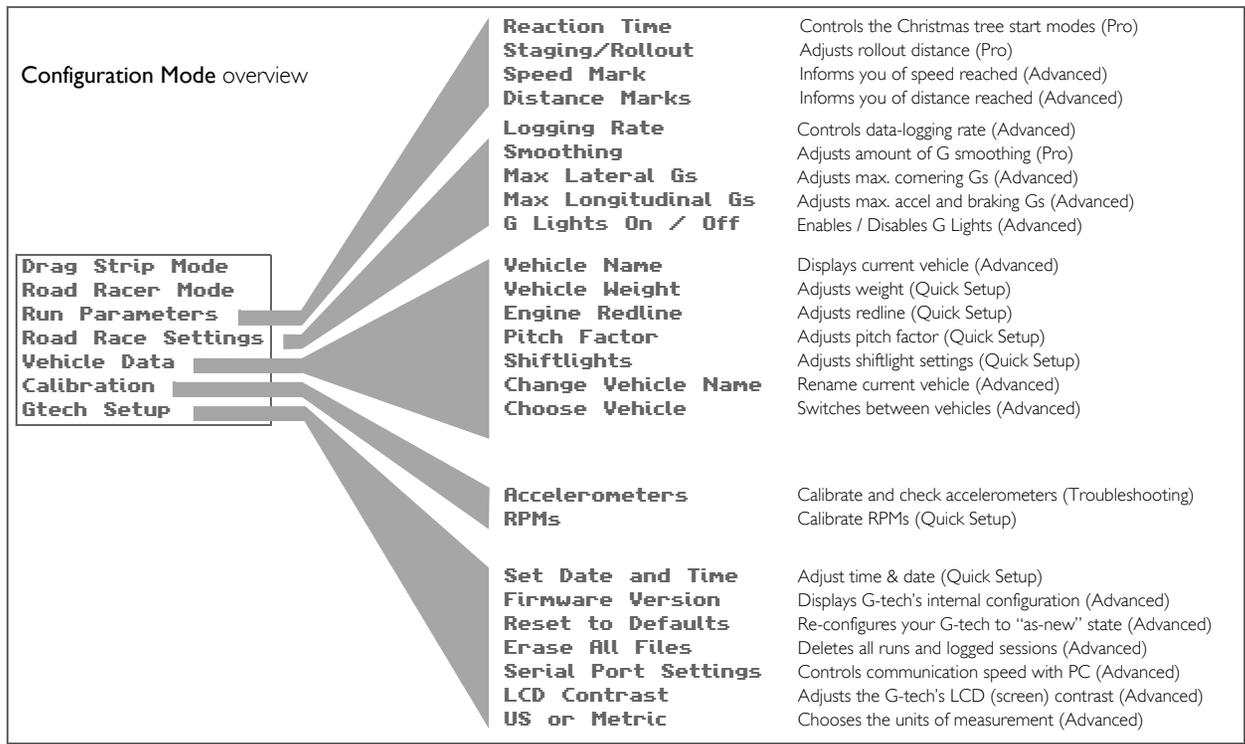


Figure 7: Configuration Mode Overview

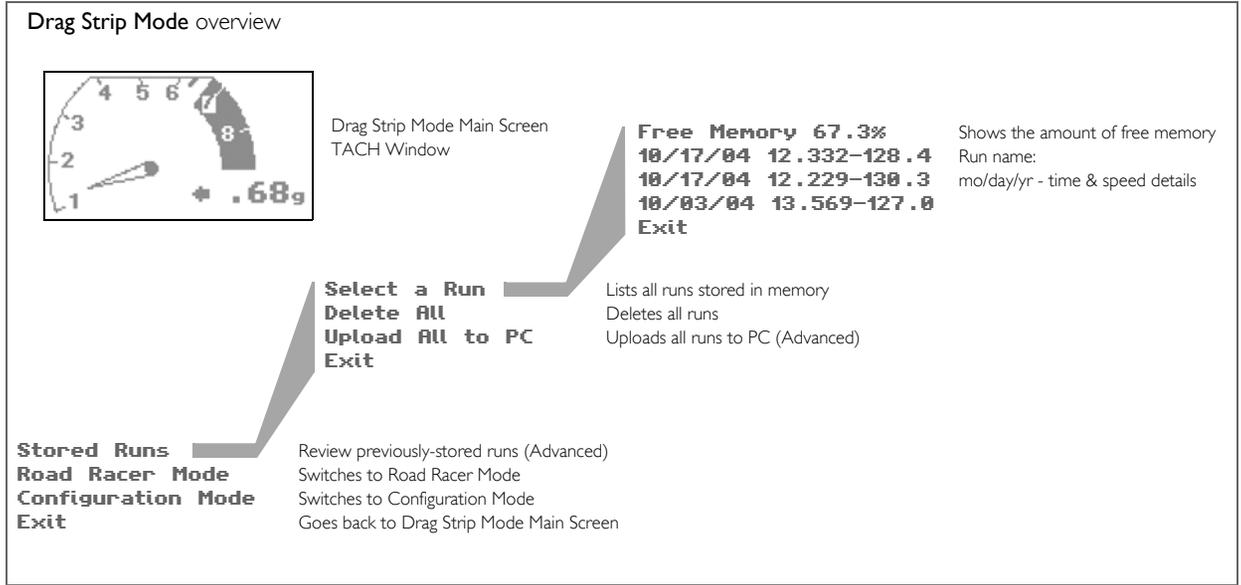


Figure 8: Drag Strip Mode overview

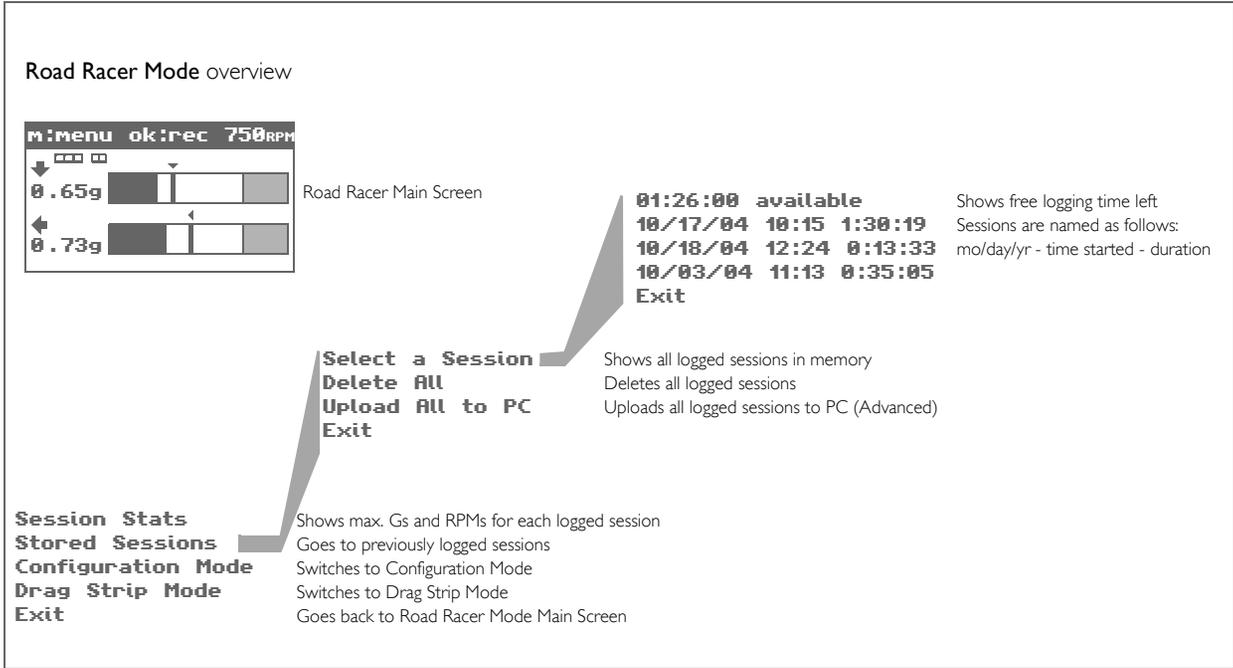


Figure 9: Road Racer Mode overview



# Quick Setup

This section will get you up and running as quickly as possible.

*This section must be completed to obtain accurate results!!!*

## Quick Setup and Use

Here you will customize the G-tech for your vehicle and your personal preferences.

The G-tech saves your configuration choices internally, even when it is powered off.

The table below summarizes the Quick Setup Procedure, and how much time each step will take to perform.

Setup Item	Estimated Completion Time
Set time and date	1 minute
Set vehicle redline	1 minute
Set shiftlight setpoint	1 minute
Set vehicle weight	1 minute
Calibrate RPMs	2 minutes
Mount G-tech	2 minutes

## Setting Time and Date

The G-tech has an internal clock that keeps time and date, even when no power is applied. Whenever you make measurements with the G-tech, it stores the time and date with the results.

- 1 Start in **Configuration Mode**.
  - 2 Select "**Gtech Setup**" and press .
  - 3 Select "**Set Date and Time**" and press .
  - 4 Set the date.  and  move between fields,  and  change values. Press  when done.  
**Jan 7 2003 Tue**
- Note:** *Day of week (e.g. Tuesday) is calculated automatically and cannot be set.*
- 5 Set the time in a similar fashion, then press .  
**12:20:50pm**

## Setting Vehicle Redline

- 1 Start in **Configuration Mode**.
- 2 Select "**Vehicle Data**" and press .
- 3 Select "**Engine Redline**" and press .
- 4 Enter vehicle's engine redline. Press  when done or press  to abort and discard the changes.

```
Enter engine redline
for this vehicle.
UP/DN changes value.
LT/RT changes columns.
Press OK to finish
or MENU to cancel.
  8750 rpm
```

## Setting the Shiftlight RPM level

The shiftlights illuminate to indicate when you should upshift into the next gear.

If you have a manual transmission vehicle, or a vehicle whose gears can be shifted under driver control, this feature may be of interest to you.

If you do not have control over when your vehicle shifts gears, you probably want to disable the shiftlights altogether (page 73).

Before using the G-tech's shiftlights feature, you must set the shiftlight RPM level.

Some people set the shiftlight RPM level to the same value as their vehicle's redline value; other people set it to a lower value, so that the lights turn on before they reach redline in a run. It is your preference and can be changed at any time.

The shiftlight setpoint is indicated on the graphical tachometer on the TACH-Window (page 34).

**Note:** The G-tech has a sequential shiftlight that illuminates the first shiftlight LED when vehicle RPMs reach a value that is 500 RPMs below the shiftlight RPM level. 250 RPMs below the shiftlight RPM level, 2 more LEDs turn on. Finally, when the actual shiftlight RPM level is reached, all four LEDs blink rapidly.

- 1 Start in **Configuration Mode**.
- 2 Select "**Vehicle Data**" and press **OK**.
- 3 Select "**Shiftlights**" and press **OK**.
- 4 Select "**Set Shiftpoint**" and press **OK**.
- 5 Enter RPM shiftpoint.  
Press **OK** when done or press **MENU** to abort and discard the changes.

```
Enter shiftpoint for
this vehicle. UP/DN
changes value, LT/RT
changes columns.
Press OK to finish,
or MENU to cancel.
  3000 rpm
```

## Setting Vehicle Weight

**Note:** Vehicle weight must be set properly in order to obtain accurate HP measurements. For help determining vehicle weight, please see page 105 for details.

- 1 Start in **Configuration Mode**.
- 2 Select "**Vehicle Data**" and press **OK**.
- 3 Select "**Vehicle Weight**" and press **OK**.
- 4 Enter the vehicle's gross weight.  
Press **OK** when done or press **MENU** to abort and discard the changes.

```
Enter GROSS vehicle
weight. UP/DN changes
digits. LT/RT changes
columns. Press OK to
finish, or MENU to
cancel.
  200 lbs
```

## Calibrating RPMs

Since every vehicle has a unique electronic “RPM signature,” the G-tech must learn the RPM signature at different RPM levels on your particular vehicle before it can measure and record RPMs.

Follow the steps below to calibrate the G-tech for your vehicle’s RPM signature.

**Note:** This step must be performed in the vehicle using the 12V cigarette lighter DC Power Cable (i.e. do not use the AC adapter to power the G-tech in this step).

**Note:** You must set the redline in the G-tech (page 21) prior to this step!

**Note:** The steps documented here are current as of time of printing. Future enhancements may cause a deviation from the steps you see here... if so, just follow the on-screen instructions.

**Note:** The values you see in the following steps (such as a redline of 6750) are not necessarily the same values you will see during your own calibration. Do not worry - this is fine.

For detailed information on calibrating RPMs, please refer to “RPM Calibration Tips” on page 132.

- 1 Start in **Configuration Mode**.
  - 2 Select “**Calibration**” and press .
  - 3 Select “**RPMs**” and press .
  - 4 If the redline value is set properly, press  to continue. If not, press  to cancel, and then set the redline in the G-tech (page 21).
- 
- 5 First, the G-tech monitors your RPM signature at idle. Take your foot of the throttle pedal, let the RPMs settle to a stable level, and push .

- 6** Low RPM calibration: Rev the engine to the RPMs that G-tech is asking for and hold it there. Then press **OK** when vehicle RPMs are steady at the requested value.

```
Please Rev your engine
to: 2000 rpm
Use arrow keys to
adjust if necessary.
Press OK to continue
or MENU to cancel.
```

- 7** High RPM calibration: Again match vehicle RPMs to G-tech requested value, and press **OK** when vehicle RPMs are steady at the requested value.

```
Please Rev your engine
to: 4000 rpm
Use arrow keys to
adjust if necessary.
Press OK to continue
or MENU to cancel.
```

- 8** You will see a screen that indicates the RPM calibration procedure has been completed, and then you will be returned to the previous menu.

## Mounting the G-tech

The G-tech is shipped with a sophisticated mounting system that is used to hold the G-tech steady in your vehicle.

This section describes:

- the different pieces of the mounting bracket
- how to assemble the mounting bracket
- how to mount the bracket in your vehicle

**Note:** *In order to obtain accurate measurements, the G-tech must be mounted properly. Please read this section carefully, it is very important!*

For directions on removing the mounting bracket from your windshield, please refer to “Removing the bracket” on page 134.

For directions on permanently mounting the bracket in your vehicle, please refer to “Permanent Mounting” on page 135.

Figure 10 shows the different pieces of the G-tech mounting bracket.

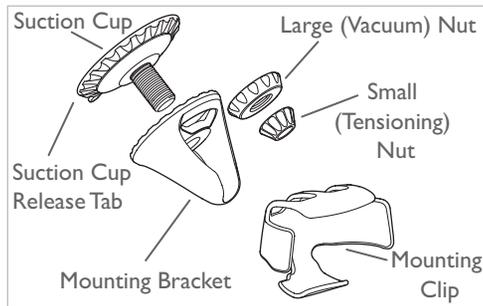
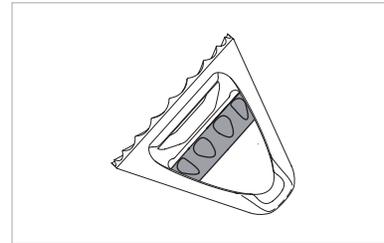


Figure 10: Mounting bracket parts

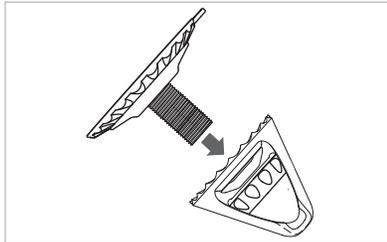
## Assembling the Bracket

1 Insert the Large Vacuum Nut into the Mounting Bracket.



Quick Setup

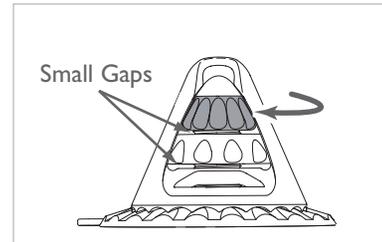
- 2** Insert the suction cup into the mounting bracket.



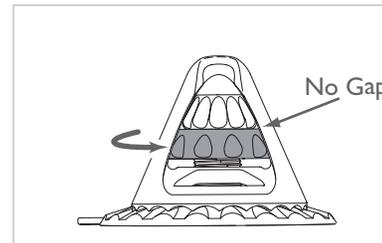
- 3** Turn the suction cup clockwise into the Large Vacuum Nut until approximately 1/4 inch of threads protrude.



- 4** Place the Small Tensioning Nut on the threaded spindle, and turn it clockwise until it is snug on the stem. There should be a small gap between the Small Tensioning Nut and the Large Vacuum Nut.



- 5** Now back off the Large Vacuum Nut counter-clockwise until it touches the Small Tensioning Nut.



- 6** Gently insert the rubber ball of the mounting clip into the mounting bracket. It should go in with very little force and it should fit snugly. If the rubber ball does not go in with little force, adjust the tensioning nut(s) until it goes in easily. Do not force the rubber ball into the mounting bracket, as this will deform and damage the rubber ball.

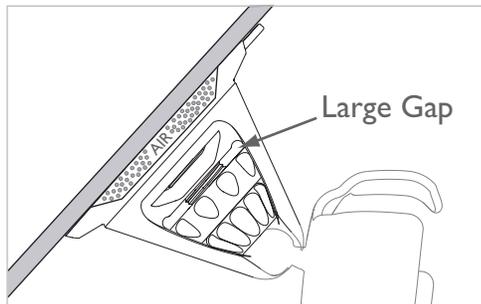


## Mounting the Bracket

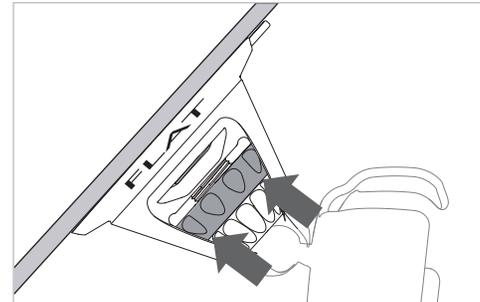
- 1 Find a place on your vehicle's windshield where you can mount the G-tech without affecting visibility.

**Note:** Make sure the mounting area on the windshield is very clean and dry; otherwise, the mounting bracket may not work properly.

- 2 Place the large rubber suction cup on the mounting area of the windshield. Make sure there is a large gap between the Large Vacuum Nut and the mounting bracket.

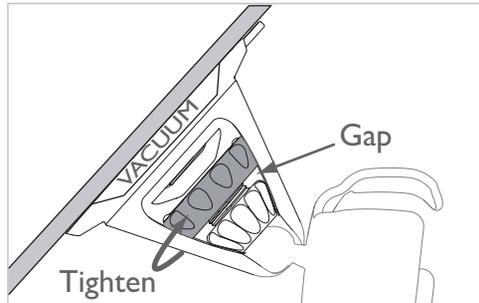


- 3 Push the Large Vacuum Nut firmly towards the windshield to expel all air between the suction cup and the windshield. This is a very important step to ensure proper operation of the mounting system.



- 4 At this point, the mounting bracket should stay attached to the windshield when you remove your hands. If it doesn't, inspect the rubber suction cup for cracks or tears, and make sure the windshield surface is clean.

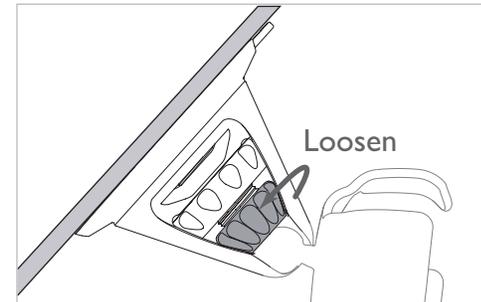
- 5** Turn the Large Vacuum Nut clockwise in order to create a vacuum between the suction cup and the windshield. Be sure to turn the Large Vacuum Nut as far as possible.



- 6** The mounting clip should be steady and should not move easily. If this is not the case, slowly turn the Small Tensioning Nut counter-clockwise just enough to secure the mounting clip.

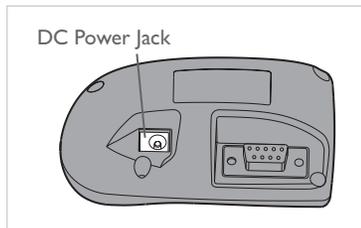
**Note:** You should only need to use the Small Tensioning Nut for fine adjustments the first time you mount the G-tech. After the initial mounting, you should secure the clip only by turning the Large Vacuum Nut clockwise to tighten it.

**Note:** The clip should be completely rigid. A G-tech which moves or vibrates during a run will provide inaccurate results.

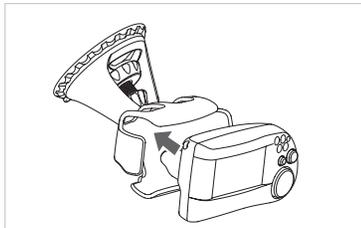


Quick Setup

- 7** Insert the small end of the power cord into the DC jack, which is located on the back of the G-tech.



- 8** Snap the G-tech into the mounting clip.



- 9** Plug the large end of the DC power cord into your vehicle's 12V cigarette lighter socket. The G-tech will power on.

**Note:** Some vehicles supply power to the 12V socket only when the ignition is in the ACCESSORY position or when the vehicle is running.

**Note:** The G-tech does not have an ON/OFF switch. Please be sure to unplug the G-tech when exiting your vehicle to avoid draining your vehicle's battery.

**Note:** Please do not move the mounting clip if you need to adjust the orientation of the G-tech! This will damage your mounting system and will not be covered under warranty. To safely re-orient the mounting clip, please refer to "Adjusting the Bracket" on page 133.

## If You Want To:

If you know what you want to do, but just don't know where to find the answer, this is the section for you!

If You Want To:	Go To:
Set up the G-tech so you can start using it	"Quick Setup and Use" (p. 20)
Measure your 1/4 mile performance	"Measuring Your Runs" (p. 36)
Log Gs and RPMs during a track session	"G-tech Road Road Racer Mode" (p. 116)
Calibrate RPMs	"Calibrating RPMs" (p. 23) and "RPM Calibration Tips" (p. 132)
Measure 0-60 MPH	"Measuring Your Runs" (p. 36) and "Results" (p. 50)
Use the shiftlights to improve track times	"Setting the Shiftlight RPM level" (p. 21), "Enabling / Disabling Shiftlights" (p. 73)

If You Want To:	Go To:
Measure horsepower and torque	"HP & Torque vs RPMs" (p. 51) and "Horsepower, Torque & G-tech" (p. 102)
Measure braking distance	"Braking Distance" (p. 60)
Do a 0-100-0 MPH run	"Speed vs time" (p. 57)
Measure lateral (cornering) G's, like a skid-pad test would	"G Smoothing" (p. 124), "Self-leveling the G-tech" on page 35, and "G-tech Road Road Racer Mode" (p. 116)
Use the G-tech in multiple vehicles	"Multiple Vehicle Usage" (p. 82)
Make measurements in metric mode	"Setting U.S. or Metric Mode" (p. 75)
Improve reaction time	"Reaction Time / Start Mode" (p. 88)
Analyze road racing sessions on a PC	"Upload session data" (p. 128)
Analyze dragstrip runs on a PC	"Uploading a Stored Run" (p. 64)

## Quick Setup

If You Want To:	Go To:
See shifts occurred at each point during the run	"RPM vs time" (p. 54)
Mount the G-tech	"Mounting the G-tech" (p. 24)
Know when a certain speed has been reached	"Setting the Speed Mark" (p. 71)
Know when a certain distance has been reached	"Setting the Distance Marks" (p. 72)
View the results from a previous run	"Loading a Stored Run" (p. 46) and "Results" (p. 50)
Customize the G-tech for a specific vehicle	"Multiple Vehicle Usage" (p. 82)
Be warned when a certain G-force has been reached	"G Lights" (p. 126)
Increase the accuracy measurements	"Tips for improving Accuracy" (p. 94)

If You Want To:	Go To:
Understand why lights keep blinking on the G-tech during driving	"Enabling / Disabling Shiftlights" (p. 73), "G Lights" (p. 126), "Setting the Speed Mark" (p. 71), "Setting the Distance Marks" (p. 72)
Compare laps (timing) from a Road Racer session	"Using Road Racer Mode" (p. 129)
Pause, rewind or fast forward during a Road Racer session	"Road Racer Mode Replay Screen" (p. 119)
Adjust the G-bar sensitivity in Road Racer Mode	"Max Lat / Long Gs" (p. 126)
View a summary (session stats) of a track session	"Session Stats" (p. 121)
Adjust data logging rate	"Logging Rate" (p. 123)
Adjust data smoothing	"G Smoothing" (p. 124)

# 4 Performing a Run

*This section will show you how to use the G-tech to monitor your vehicle's straight-line performance in Drag Strip Mode.*

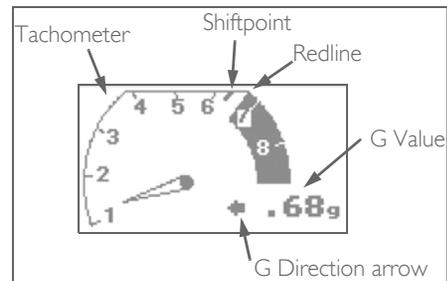
## Drag Strip Mode Basics

Put the G-tech into **Drag Strip Mode** (Figure 6 on page 14) to measure the straight-line performance of your vehicle.

In **Drag Strip Mode**, you can use the G-tech:

- to monitor your acceleration and RPMs on the TACH Window during everyday driving
- to measure straight-line performance (1/4 mile, 0-60 MPH, etc.) on the Run Window

When you first come up in **Drag Strip Mode**, the G-tech automatically begins measuring acceleration and RPMs, and displays the TACH Window (Figure 11):



**Figure 11: Drag Strip Mode — TACH Window screen**

The TACH Window has two main indicators:

- **Tachometer** – displays vehicle RPMs
- **G Force Meter** – displays current G-force measurement and direction

The tachometer indicates the vehicle redline and shiftlight shiftpoint that you entered during the Quick Setup Procedure.

**Note:** For the G Force Meter reading to be meaningful, your G-tech must be self leveled. If you have not performed an acceleration run since power-on, the G-tech is not self-leveled. Also, if you have moved or re-oriented the G-tech mounting clip since your last forward acceleration run, the G value will not be accurate. See page 35 for more information.

The G Direction Arrow shows the direction of dominant G force (acceleration). Figure 12 summarizes the indications of the G Direction Arrow.

If you see...	It means you are...
	Accelerating forward
	Braking
	Turning left
	Turning right

Figure 12: G Direction Arrow

## Self-leveling the G-tech

**Note:** When the G-tech is mounted in your vehicle and the vehicle is stationary on flat, level ground, G-Value will be very small. If not, you should “self-level” the G-tech (described below).

If your TACH Window G-Value does not read close to zero when your vehicle is stopped, this means the G-tech has not yet determined which direction is forward. The process by which the G-tech learns its orientation relative to the surface of the earth is called “self-leveling.”

To self-level the G-tech, simply do an acceleration run (page 36). You need only go far enough to trigger the G-tech and start the E.T. clock... just a few feet.

Once you have done this, **do not** move the G-tech mounting clip. Leave it in exactly the same mounting position that it was in when you did the acceleration run. When you get back to the TACH Window, the G-tech’s G-Value should read close to zero when the vehicle is stopped.

**Note:** The G Force Meter can only be used on flat, level ground. The readings will not be accurate on banked turns, hills, etc.

## Measuring Your Runs

To measure your vehicle's straight-line performance, the G-tech uses a display called the Run Window. You will use the Run Window to make measurements such as:

- 1/4 mile E.T. and speed
- 0-60 MPH measurements
- braking distance measurements
- horsepower and torque measurements

- 1 Make sure that the G-tech is in **Drag Strip Mode**, displaying the tachometer on the TACH Window,
- 2 Bring your vehicle to a complete stop on flat, level ground.

3

Press . You will initially see the Staging Screen as shown in Figure 13



Figure 13: Staging Screen

**Note:** If your G-tech does not look like Figure 13, that means it is configured to use the reaction time light tree. Please refer to “Reaction Time / Start Mode” on page 88 for information on disabling the reaction time light tree.

At this point, the G-tech is making sure that the vehicle is completely stopped. This process takes about 1 second, and is called “staging” in this manual.

- 4 After about 1 second, the upper left LED will begin blinking, and the screen will appear as in Figure 14. At this point, the G-tech is ready for you to perform an acceleration run.

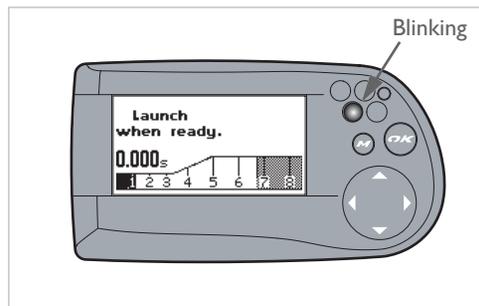
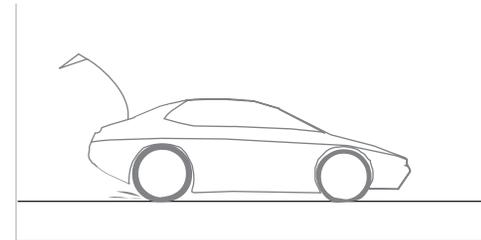


Figure 14: G-tech is staged and ready to go

- 5 To begin an acceleration run, press the throttle and accelerate your vehicle briskly off the line.



The G-tech will detect the forward acceleration and automatically start the E.T. clock. The blinking LED will go off once you have launched successfully.

**Note:** To avoid false starts, the G-tech requires a decent amount of “oomph” off the starting line, so don’t baby it! If your G-tech doesn’t start its E.T. clock, try launching your car with more force.

**Note:** Try to avoid wheel hop and crabbing when launching, as these motions can distort your results.

## Performing a Run

- 6 As you move forward and pass certain milestones, the G-tech will automatically display them for you, as shown in Figure 15:

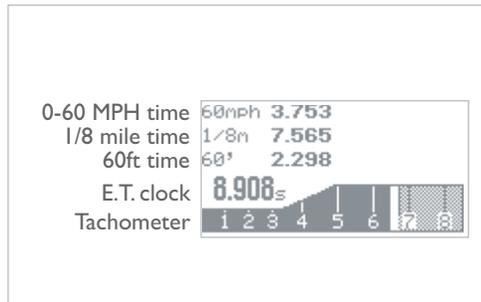


Figure 15: G-tech screen during a run

- **Tachometer** — indicates instantaneous vehicle RPMs
- **E.T. clock** — indicates elapsed run time

- 7 The G-tech stores the time for each of the following milestones as you pass them:

- 60 ft. time (displayed in real-time)
- 330 ft. time
- 0-60 MPH time (displayed in real-time)
- 660 ft. (1/8 mile) time and speed (displayed in real-time)
- 1000 ft. time
- 1/4 mile time and speed

**Note:** You don't need to do a full 1/4 mile to get results. The G-tech will automatically give you all results up to the point when the run stopped.

## Stopping the E.T. clock

Simply letting off the gas and coasting for a brief period will cause the G-tech's clock to stop automatically. In fact, any one of the following conditions will cause the clock to stop:

User...	presses  button
Vehicle...	coasts for a little over 1 second
Speed...	exceeds 300 MPH
Distance...	exceeds 4000 ft.
Elapsed Time...	approaches 1 minute

**Note:** If you brake strongly at the end of a run, the E.T. clock will continue running. This is to allow braking distance measurements. If you are not interested in braking distance, simply let off the throttle and coast until the E.T. clock stops.

When the E.T. clock stops, the display freezes and shows you the latest measured values (Figure 16).

If you completed a full 1/4 mile run, the E.T. clock will show the E.T.; otherwise, it will show the value when the clock stopped.

The HP value that is displayed represents the peak horsepower measured during the run

For information on viewing peak HP & TQ, please refer to "HP & Torque vs RPMs" on page 51.

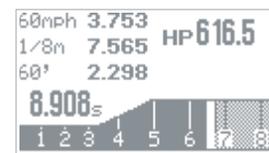


Figure 16: G-tech screen at completion of 1/4 mile run

**Note:** If you do not reach at least the 60 ft. mark during a run, no results will be saved. A screen will appear indicating this fact, and then you will be returned to the TACH Window.

After displaying the results for 5 seconds, the G-tech will automatically save the run and display a message as shown in Figure 17.

**Note:** To bypass the 5 second delay, simply press  to immediately save the run.



**Figure 17: G-tech display while run is being saved**

The run name consists of the date followed by the E.T. and trap speed.

Notice that the G-tech gives you an update on how much free memory you have left after saving the run.

Once the run has been automatically saved, you will see a menu

## G-tech Stored Runs Capacity

The G-tech can store approximately 300 total seconds of high resolution drag racing. For example:

Typical Run Length	Typical Number of Runs Stored
10 seconds	30 runs
12 seconds	25 runs
15 seconds	20 runs
20 seconds	15 runs

This is a rough guideline — you should always be aware of how much free storage memory you have left (See “Checking Free Memory” on page 41.) Keep in mind that G-tech memory is shared with road racing sessions.

The G-tech imposes a limit of 30 runs total that can be stored, regardless of length. Enthusiasts who store many short runs might encounter this situation. If you do encounter this situation, you will see the following screen when you attempt to store the 31st run:

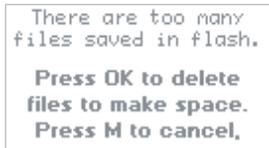


Figure 18: G-tech 30 file limit warning

Press **OK** to delete a file to make space for the run you just performed. You will then be presented with the following screen:



Figure 19: Choose a file to delete

Press **M** to cancel, or press **OK** to automatically replace the selected file with the new run.

## Checking Free Memory

**Road Racer Mode** and **Drag Strip Mode** use the same memory space. Over time you may begin to use up the free memory as you log data and save runs.

You can use all the G-tech's memory for drag strip runs, road racing sessions, or both... the G-tech manages the free memory for you. Deleting stored data in either mode of operation will free up memory that can be used in either mode.

In **Road Racer Mode** you have a choice of recording data 10 or 20 times per second. If you store data at a rate of 10 times per second, you can store twice as much time, but with half the amount of detail, as compared to 20 times per second.

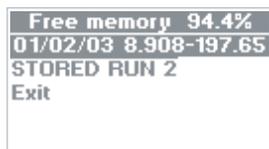
**Drag Strip Mode** runs have much higher resolution and consume a lot more memory per second compared to data logging in **Road Racer Mode**.

You may want to upload your runs to the PC (p. 80) for future analysis before deleting them.

The length of the stored run determines how much memory it uses inside the G-tech (longer runs take up more memory).

You can use the following procedure to check how much free memory you have left in your G-tech.

- 1 Start in **Drag Strip Mode**.
- 2 Press **MEM** to bring up the **Drag Strip Mode** Main Menu.
- 3 Select "**Stored Runs**".
- 4 Choose "**Select a run**".
- 5 You will see the amount of free memory indicated in the bar on the top of the screen. The free memory is indicated as a percentage (100% free is the most free memory).



Free memory 94.4%  
01/02/03 8.908-197.65  
STORED RUN 2  
Exit

## Saving a run / low on memory

Suppose you perform a run and then want to save the run, but the G-tech doesn't have enough free memory.

This could be your best run of the day and the G-tech will give you an opportunity to delete one or more of your saved runs to make room for the new run.

Should this occur, the G-tech will present a screen indicating that there is not enough memory to store the current run.

At this point, you have two choices:

- If you decide you don't want to save the run, press **MEM**
- If you want to save the run, press **CRK** to delete one or more of your stored runs in order to make room

If you press **CRK**, a screen showing the runs and required space will appear.

The top line ("**required**") indicates how much room you need to free up before saving the run.

The line below it ("**selected**") indicates how much room will be freed if you delete the run that is currently selected. Use the arrow keys to move to between different runs.

If you press , the selected run will be deleted, and the numerical values will be updated accordingly.

Once you have deleted enough runs to make room for the new run, the new run will be saved automatically.



# 5 Analyzing Runs

This section will show you how to use the G-tech to review and analyze the details of your dragstrip runs.

## Loading a Stored Run

Use the following procedure to recall/load a stored run.

- 1 Start in **Drag Strip Mode**.
- 2 Press  to bring up the Drag Strip Main Menu, then press  to select "**Stored Runs**"
- 3 Press  to choose "**Select a run**"
- 4 Use , and  to select a run, and then press  to load it.
- 5 Press  to choose "**View this run**". While the run is being loaded, the G-tech displays a screen with the run name
- 6 Once the run has been loaded, the G-tech displays the Run Viewing Menu as described in the next section.

## Overview — Run Viewing Menu

The Run Viewing Menu provides you with many options for analyzing your runs.

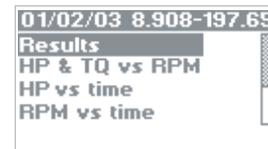
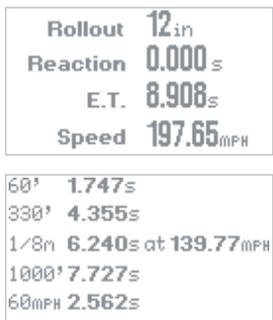
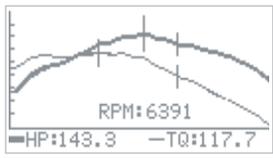


Figure 20: Run Viewing Menu

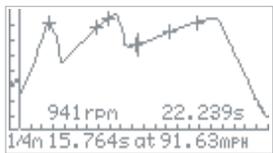
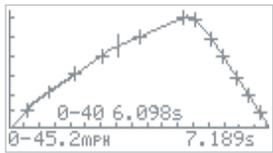
You can choose to view your run immediately after completing it, and you can also recall it later.

Figure 21 on page 49 provides an overview of each option in the Run Viewing Menu. Use it to become familiar with what each option does and then choose the options that interest you.

## Run Viewing Menu

Menu Item	Graph	Provides	Useful For...	Go to...
Results		60 ft. time, 330 ft. time, 0-60 MPH time, 1/8 mile E.T. and trap speed, 1000 ft. time, 1/4 mile E.T. and trap speed	<ul style="list-style-type: none"> <li>Measuring vehicle's straight line performance</li> </ul>	p. 50
HP & TQ vs RPM		Graph of Horsepower & Torque curves for a particular gear and RPM range	<ul style="list-style-type: none"> <li>Getting a "dyno plot" of your vehicle</li> <li>Determining the best shift point</li> </ul>	p. 51

# Analyzing Runs

Menu Item	Graph	Provides	Useful For..	Go to...
HP vs time		Graph of Horsepower output throughout the run	<ul style="list-style-type: none"> <li>• Estimating effects of wind drag on your vehicle</li> <li>• Looking at horsepower throughout the run</li> </ul>	p. 53
RPM vs time		Graph of Vehicle RPMs throughout the run	<ul style="list-style-type: none"> <li>• Seeing where you shifted into each gear</li> <li>• Measuring time between gear shifts</li> <li>• Detecting wheelspin</li> </ul>	p. 54
Speed vs time		Graph of Vehicle speed throughout the run	<ul style="list-style-type: none"> <li>• Measuring time to get from one speed to another speed (e.g. 0-100 MPH, 50-70 MPH, 0-100-0 MPH, etc.)</li> </ul>	p. 57

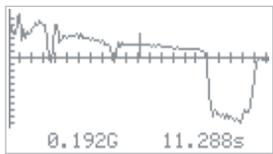
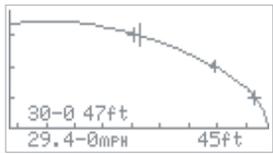
Menu Item	Graph	Provides	Useful For...	Go to...
Gs vs time	 0.192G 11.288s	Graph of Forward acceleration throughout the run	<ul style="list-style-type: none"> <li>• See how strong your car was pulling (accelerating) throughout the run</li> <li>• See how many negative Gs your car pulls while braking hard</li> <li>• Detecting wheelspin</li> </ul>	p. 58
Braking Distance	 30-0 47ft 29.4-0 MPH 45ft	Graph of Speed vs. Distance	<ul style="list-style-type: none"> <li>• Measuring how many feet it takes your vehicle to stop from a given speed</li> </ul>	p. 60

Figure 21: G-tech Run Viewing Menu Capabilities

## Results

The “**Results**” menu entry provides you with all the information you’d get from a dragstrip timeslip, including milestones such as 60 ft. time, 1/8 mile time and speed, etc. For runs performed with a reaction time start mode (see p. 89), your reaction time is given as well.

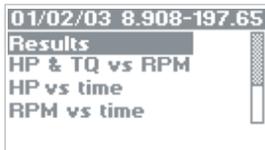


Figure 22: G-tech Run Viewing Menu

Select “**Results**” and press **OK** to view the results for the run.

The first screen you will see (Figure 23) shows the 1/4 mile results, reaction time and rollout distance:

Rollout	12 <sup>in</sup>
Reaction	0.000 <sup>s</sup>
E.T.	8.908 <sup>s</sup>
Speed	197.65 <sup>MPH</sup>

Figure 23: G-tech 1/4 mile results screen

**Note:** In this example, we did not use the Reaction Time measuring feature (page 88). Thus, the “**Reaction**” field reads **0.000**.

**Note:** If you do not travel a full 1/4 mile, the “**E. T.**” and “**Speed**” fields will read **0.000**.

To view all the milestones from your run, press **OK** again to get the Milestones screen (Figure 24).

60'	1.747 <sup>s</sup>
330'	4.355 <sup>s</sup>
1/8 <sup>mi</sup>	6.240 <sup>s</sup> at 139.77 <sup>MPH</sup>
1000'	7.727 <sup>s</sup>
60 <sup>MPH</sup>	2.562 <sup>s</sup>

Figure 24: G-tech milestones screen

**Note:** The G-tech will display “**0.000**” for any milestone that you did not reach during the run.

## HP & Torque vs RPMs

One of the most exciting features of the G-tech is its ability to measure and graph your vehicle's horsepower and torque against an RPM range.

The G-tech's "HP & TQ vs RPM" menu entry provides you with a graph of horsepower and torque in an RPM range. This is the "dyno plot" that everyone is accustomed to seeing.

After you perform a run, the G-tech analyzes the data and then creates a graph based on the gear in which maximum horsepower was attained.

**Note:** In order for you to get consistent HP & TQ graphs, there is an optimal driving technique to use. This technique is different than the driving technique you would use for a quick 1/4 mile!

Please refer to "Horsepower, Torque & G-tech" on page 102 for more information on optimal technique for performing horsepower runs.

To view the horsepower (HP) and torque (TQ) graph for a run, select the menu choice titled "HP & TQ vs RPM" and press **OK**:



You will see a screen (Figure 25) that gives you a summary of the horsepower and torque measurements for the run.

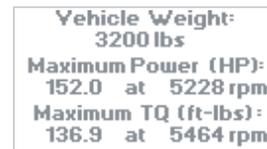


Figure 25: Horsepower / Torque summary

The G-tech calculates horsepower and torque throughout the RPM range measured during the run and finds the peak value for each. It displays the values, along with the vehicle weight, on the summary screen.

**Note:** Vehicle weight is displayed because the G-tech uses vehicle weight in the horsepower calculation. If you accidentally entered the wrong weight, the calculated horsepower will be off.

Refer to “Horsepower, Torque & G-tech” on page 102 for more information on vehicle weight and horsepower/torque calculations.

To proceed to the “HP & TQ vs RPM” graph, press  again.

You will see a graph such the one shown in Figure 26. Of course the shape of the curve, as well as the numbers and ranges, will be different for your vehicle.

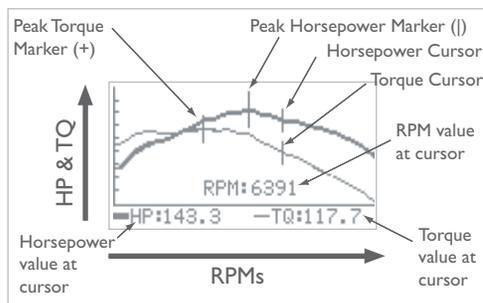


Figure 26: Graph of Horsepower & Torque vs RPMs

You will notice a few things about the graph screen:

- The horsepower curve is drawn with a **thick line**; the torque curve is drawn with a thin line.
- The peak horsepower and torque values are marked on the graph with vertical bars.
- The peak horsepower and torque markers correspond to the values seen on the Horsepower/Torque summary screen (Figure 25).
- The graph has moveable cursors for HP and TQ. The cursors move left and right using  and .
- The HP cursor rides along the HP curve, and the TQ cursor rides along the TQ curve.
- As the cursor moves, the “RPM,” “HP,” and “TQ” values are updated to reflect the current cursor position.

## HP vs time

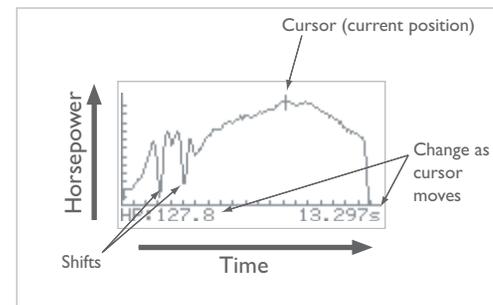
The **"HP vs time"** menu entry provides you with a graph of horsepower throughout the run.

This is not the optimal graph for analyzing horsepower. It will show artifacts around shiftpoints that are due to factors other than engine horsepower. The graph will also show the increasing effect of aerodynamic drag on the vehicle and the corresponding lower "net horsepower" as the speed increases.

To view the horsepower (HP) vs. time graph for a run, select the menu choice titled **"HP vs time"** and press **OK**:



You will see a graph such the one shown in Figure 27. Of course the shape of the curve, as well as the numbers and ranges, will be different for your vehicle.



**Figure 27: Graph of horsepower vs time**

- As you move the cursor with **◀** and **▶**, the horsepower and time values are adjusted to follow the cursor.
- Note the "dips" in measured horsepower on the 1-2 shift and the 2-3 shift
- This was a "3rd gear horsepower run" because the user spent the most time in 3rd gear
- Each tic mark on the horizontal axis represents 1 second
- Each tic mark on the vertical axis represents 10 HP

## RPM vs time

The “**RPM vs time**” menu entry provides you with a graph of vehicle RPMs throughout the run.

**This is one of the most-used G-tech graphs.**

By looking at the data in this graph, you can find out:

- how much time you spent in each gear
- what time each shift occurred
- how long each shift lasted
- the RPM range in each gear
- the RPMs (and implied gear) for each milestone
- whether you experienced wheelspin (look for a sudden sharp rise in RPMs)
- whether you should stay in a particular gear longer for better results (for example, maybe you're shifting into 4th gear just before the 1/4 mile mark and would actually benefit from remaining in 3rd gear through the finish line)

To view the RPM vs. time graph for a run, select the menu choice titled “**RPM vs time**” and press :

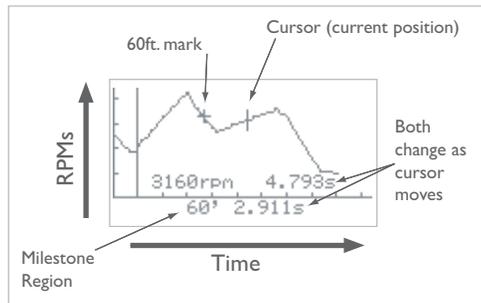


In order to give you the feel and excitement of the run, the RPMs are replayed in real-time, just as they were happening during the run. This means that if you did a 15-second run, it will take 15 seconds to draw the RPM plot. During RPM replay, the G-tech illuminates an LED at any point where the shiftlights were on during the run.

**Note:** To finish the replay quickly, rather than in real-time, simply press the  button while it is being drawn.

Once the graph is fully drawn, you will see a graph such the one shown in Figure 28.

**Note:** Your graph will look different due to your driving style and vehicle.



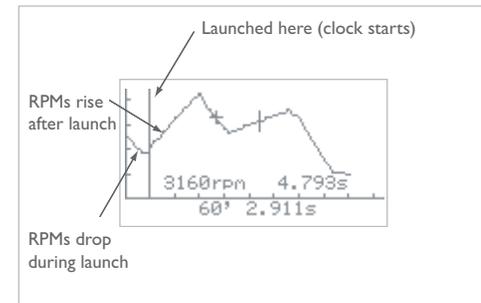
**Figure 28: Graph of RPMs vs Time**

On this graph, use the ◀ and ▶ buttons to move the cursor along the RPM curve.

As the cursor moves, the RPM value and timestamp value adjust to reflect the values at the cursor position.

Each tic mark on the horizontal axis represents 1 second.

Each tic mark on the vertical axis represents 1000 RPM.

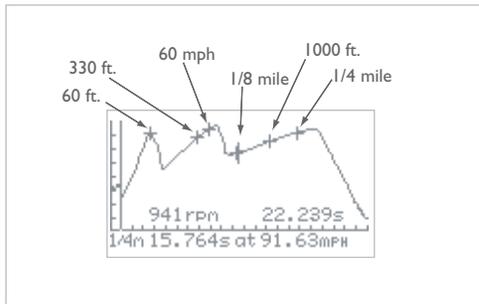


**Figure 29: RPMs vs Time — launch**

You will see a tall vertical bar on the graph that marks the launch where the G-tech began timing. Thus, you can see what your RPMs were at launch, and even for a brief period before launch. (Generally you will see a dip in RPMs at the launch, as the clutch engages).

**Note:** *The launch is perhaps the most crucial part of a run. By using the G-tech to analyze graphs of your RPMs (p. 54) and your forward acceleration (p. 58), you can perfect your launch technique and improve your times.*

# Analyzing Runs



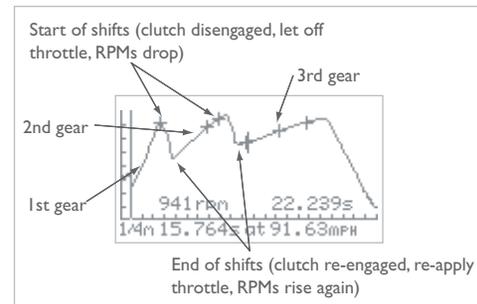
**Figure 30: RPMs vs Time — milestones**

You will see a plus sign (+) on the graph at each place where a milestone occurred (Figure 30). When you move the cursor over a milestone marker, the milestone region will be updated with the name of the milestone and its timestamp.

**Note:** You must move the cursor over a milestone (from either direction) to update the milestone region. If you move the cursor near another milestone, but not over it, the milestone region will not be updated.

Assuming that you let off the throttle during a shift, note that by placing the cursor at each peak in the graph, you can determine the time and RPM value where you shifted into each gear.

Figure 31 shows how to use this graph to analyze the time spent in each gear and how long each shift took.



**Figure 31: RPMs vs time — shifts and gears**

You can determine how long a gear shift took by doing the following:

- place the cursor at a peak RPM value for one gear and make note of the time
- move the cursor to the right just until the RPMs begin rising again and make note of the time

The difference between these times is the shift time. Your vehicle actually slows a bit during shifts, so keep this time to a minimum!

## Speed vs time

The "**Speed vs time**" menu entry provides you with a graph of speed throughout the run.

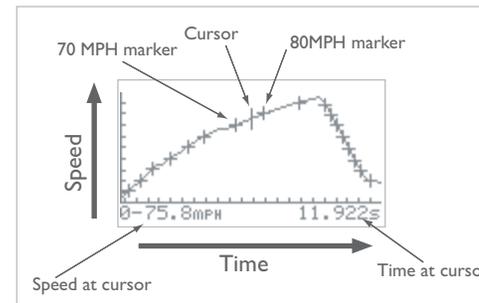
You can use this graph to measure things such as:

- time to get from one speed to another speed (e.g., 0-50 MPH, 40-60 MPH, etc.)
- time to accelerate from 0 to a certain speed, and brake to 0 again (e.g., 0-100-0 test)
- time to brake to a halt from a particular speed (e.g., 60-0 braking time)

To view the speed vs. time graph for a run, select the menu choice titled "**Speed vs time**" and press **OK**:

```
01/02/03 8.908-197.65
Results
HP & TQ vs RPM
HP vs time
RPM vs time
Speed vs time
```

You will see a graph such as the one shown in Figure 32. Of course the shape of the curve, as well as the numbers and milestones, will be different for your vehicle.



**Figure 32: Graph of Speed vs time**

You can use **◀** and **▶** to move the cursor on the graph.

As you move the cursor, the current speed and elapsed time indicators are updated to match the cursor position.

Each tic mark on the horizontal axis marks a 1-second difference.

Each tic mark on the vertical axis marks a 10 MPH difference.

A plus sign (+) marks where each 10 MPH increment occurred on your run. Whenever you move the cursor past a plus sign, the numbers on the bottom of the graph are updated to reflect the time to get to that speed from 0 MPH.

For example, when you move the cursor over the 7th plus sign, the numbers reflects the 0-70 MPH time.

**Note:** *The speed milestone indicator will not change until the cursor rolls over a different 10 MPH marker.*

## Gs (Acceleration) vs time

Gs (pronounced like "Geez") are a measure of acceleration.

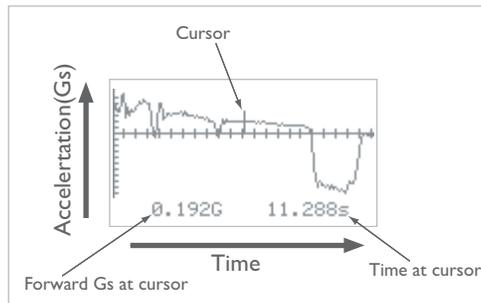
The "Gs vs time" menu entry provides a graph of forward acceleration ("Gs") vs time. Larger G values indicate stronger acceleration.

This graph is useful for seeing how hard your vehicle was pulling when it was accelerating (positive Gs) and how hard it was decelerating while braking (negative Gs).

To view the Gs vs. time graph for a run select the menu choice titled "Gs vs time" and press :



You will see a graph such the one shown in Figure 33.

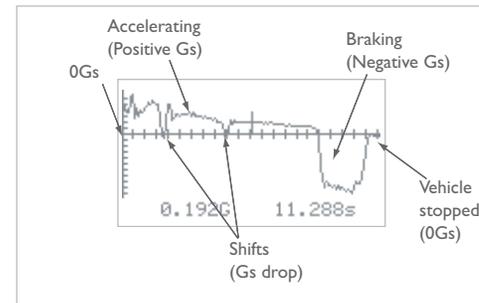


**Figure 33: Graph of Gs vs time**

Some things to note about this graph:

- As with other graphs, you can use ◀ and ▶ to move the cursor. The G-reading and timestamp always reflect their respective readings at the current cursor position.
- Each tic mark on the horizontal axis marks 1 second
- Each tic mark on the vertical axis marks 0.1G of acceleration

Figure 34 highlights some other useful information on the graph.



**Figure 34: Braking and accelerating**

- When the G plot is above the horizontal axis, it means the vehicle is accelerating.
- When the G plot is below the horizontal axis, it means the vehicle is decelerating (e.g. coasting, braking).
- The brief dips you see in the graph are shift points. When you shift, you temporarily remove power, and this causes the vehicle to decelerate briefly, until you re-engage the next gear.
- In a very powerful vehicle, or a traction-limited vehicle, you may also spot dips in acceleration that are not due to shifts.

These are due to more power being applied to the wheels than can be handled. The net result is that the wheels spin and the vehicle does not accelerate much.

- The large dip you see at the end of the graph is hard braking at the end of the run.
- Notice at the end of the graph, Gs are zero. This is because the vehicle came to a stop. Hence there is no acceleration or deceleration.

## Braking Distance

The "Braking Distance" graph is useful for seeing how many feet it took your vehicle to stop from a specific speed.

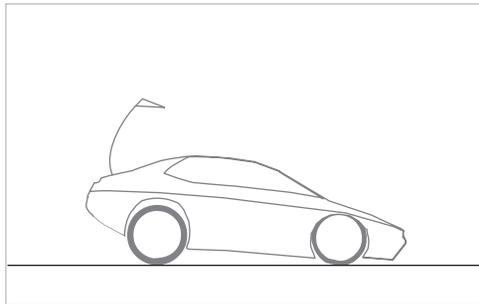
For example, you can use this graph to determine 60-0 MPH braking distance. This is a common measurement in automobile reviews.

As another example, when upgrading the brakes or tires on your car, you might be interested in a "before" and "after" comparison of your braking distance.

This graph also allows you to view intermediate braking results, such as 100MPH - 40MPH, or any other endpoints you choose.

**Note:** *If you do not brake to a complete stop at the end of your run, and let the E.T. clock stop, the data on this graph will not be very useful to you.*

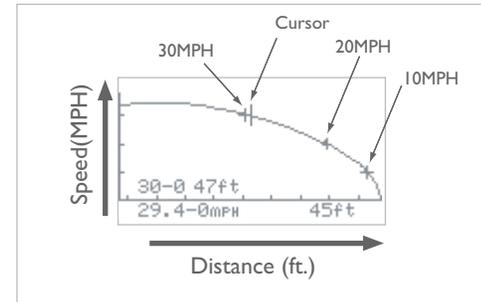
- 1 Perform an acceleration run, **ending the run by braking hard to a complete stop**. Make sure that the E.T. clock continues to run until the vehicle is completely stopped. If the E.T. clock stops before the vehicle stops, your results will not be meaningful.



- 2 Select the "Braking distance" entry and press **OK**:



- 3 You will see a graph such the one shown below. On the vertical axis, the tic marks identify 10 MPH increments. Each plus sign (+) identifies a 10 MPH milestone during vehicle braking. The cursor is "live" and can be moved along the plot with **◀** and **▶**.

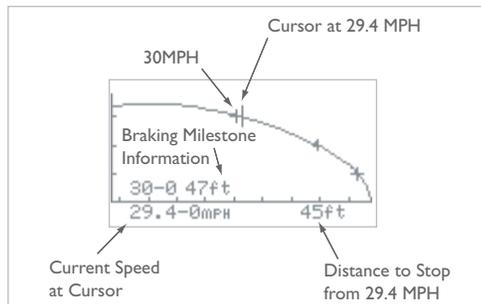


# Analyzing Runs

# 4

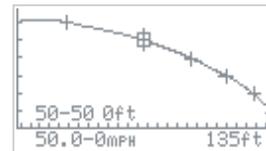
As the cursor is moved, the “current speed” and “distance to stop” fields are updated. Each time the cursor is rolled over a plus sign on the graph, the braking milestone information is updated for that milestone. In the following graph:

- At the cursor, “current speed” is 29.4 MPH, and “distance to stop” is 45ft. Thus, it took 45 ft. to stop from 29.4 MPH.
- The braking milestone information indicates that it took 47 feet to brake from 30 MPH. Moving the cursor further to the right would give braking distance from 20 MPH, 10 MPH, etc.

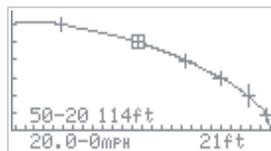


For intermediate braking results (e.g. 50-20 MPH), use the  button while on a milestone, as shown in the following example.

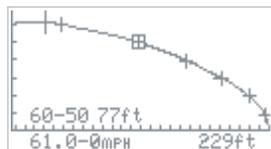
Move the cursor to the upper milestone, and press . In this example we will measure 50-20 MPH braking distance, so we put the cursor on the 50 MPH milestone and press . A box appears around the milestone, indicating that braking distance will be measured relative to 50 MPH.



- 2 Move the cursor to the right until it reaches the 20 MPH milestone. The G-tech displays the braking distance from 50-20 MPH.



- 3 Move the cursor to the left until it reaches the 60 MPH milestone. The G-tech displays the braking distance from 60-50 MPH. Notice that in all cases, the bottom line of information always reflects the braking distance from the current cursor position to 0 MPH.



## Deleting a Stored Run

Once you have recalled a stored run from the G-tech (page 46), you can choose to delete it from the G-tech's internal memory. This will free up memory so that you can store other runs.

The procedure to delete a recalled run is as follows:

- 1 Select **"Delete this run"** and press **OK**.
- 2 A screen will appear instructing you how to proceed with the deletion, or cancel. Press **▼** if you want to delete the run, or **↩** if not.

## Uploading a Stored Run

Once you have recalled a stored run from the G-tech (page 46), you can transfer (upload) it from the G-tech to a computer.

**Note:** Transferring a run to the computer does not delete it from the G-tech.

**Note:** Before transferring a run to the computer, you should connect the serial cable between the G-tech and the computer. Refer to “G-tech-Computer Connection” on page 139 for more information. You should also ensure that the G-tech Performance Analysis System Software (PASS) is ready to receive data from the G-tech. Further instructions are provided with the PC software.

**Note:** Transferring a run to the PC does not remove it from the G-tech.

Use the following procedure to transfer all the stored runs on your G-tech:

- 1 Start in **Drag Strip Mode**.
- 2 Press  to bring up the Drag Strip Main Menu, then press  to select “**Stored Runs**”.
- 3 Choose “**Upload all to PC**” and press .
- 4 A screen will appear, indicating that the G-tech is sending race data. You can cancel the transfer at any time by pressing .

# Advanced Features

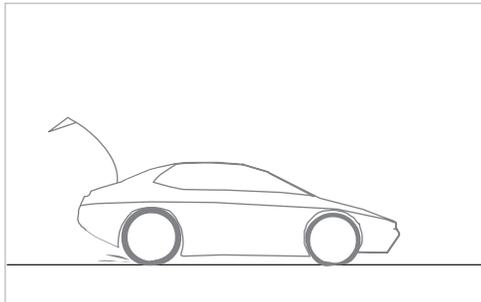
This section will show you how to use some of the more advanced features of the G-tech.

## Measuring 0-40 MPH, etc.

Suppose you want to measure the time it takes you to reach a certain speed (say, 40 MPH) from a standstill. (In this example, we measure 0-40 MPH time, but you can use the same procedure to measure the time it takes to reach any speed you wish.)

1 Perform an acceleration run, **making sure you hit the speeds you want to measure.**

In this example, we are measuring 0-40 MPH, so we made sure the driver reached 40 MPH during the acceleration run.

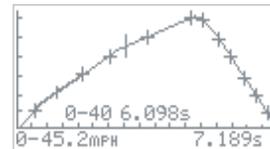


2 To view the Speed vs. Time graph, select the menu choice titled “**Speed vs time**” and press **OK**:



3 Notice how the speed (vertical axis) rises for a while, and then falls again. This is because the vehicle braked to a complete stop at the end of the run. For now (0-40 MPH), we only care about the rising part of the graph, during acceleration from 0 to 40 MPH.

Use the **◀ ▶** keys to move the cursor over the 40 MPH milestone *on the rising part of the graph*. The 0-40 MPH time is displayed.



## Measuring 50-70 MPH, etc.

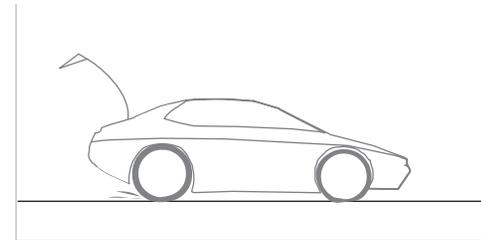
Suppose you want to measure a vehicle's acceleration at highway speeds (sometimes referred to as a "passing test"). This test is often done in the vehicle's top gear (5th or 6th gear in most vehicles) to measure how well the vehicle can accelerate on the highway without downshifting.

You may also wish to use this feature to measure the same interval (e.g. 50-70 MPH) in several different gears. For example, many vehicles can cover 50-70 MPH in 2nd gear, 3rd gear, 4th gear, and 5th gear. This measurement will tell you which single gear is the best choice for this speed range.

Let's suppose you want to measure your 50-70 MPH time. This example will show you how to use the G-tech to do it.

**Note:** You can measure any interval you wish using the procedure described below — we have just chosen 40-60 MPH for this particular example.

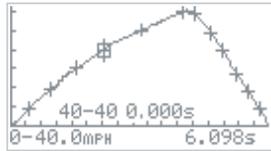
1 Perform an acceleration run, **making sure you hit the speeds you want to measure.** In this example, we are measuring 40-60 MPH, so we made sure the driver reached 60 MPH during the acceleration run.



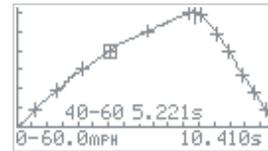
2 To view the Speed vs. Time graph, select the menu choice titled "**Speed vs time**" and press **OK**:

```
01/02/03 8.908-197.65
Results
HP & TQ vs RPM
HP vs time
RPM vs time
Speed vs time
```

- 3 Notice how the speed (vertical axis) rises for a while, and then falls again. This is because the vehicle braked to a complete stop at the end of the run. For measuring the 40-60 MPH acceleration time, we only care about the *rising* part of the graph, during acceleration from 40 to 60 MPH. Use the   keys to move the cursor over the 40 MPH milestone *on the rising part of the graph*. Press  and a box will be drawn around the 40 MPH milestone. Since the cursor is still on 40 MPH, a 40-40 MPH time of 0.000 is displayed.



- 4 Now use the  key to move the cursor over the 60 MPH milestone *on the rising part of the graph*. Since the cursor is now on 60 MPH, the 40-60 MPH time is displayed.



## Measuring 0-100-0, etc.

Suppose you want to perform the classic 0-100-0 MPH timed measurement... how quickly can your vehicle reach 100 MPH, and how quickly can it bring the vehicle back to a stop?

The G-tech provides you with all the tools you need to perform this test!

This section will show you how to perform this measurement.

**Note:** *In this example, we demonstrate measuring 0 - 60MPH - 0 MPH. You can measure “0 - <any speed> - 0” you wish using the procedure described below – we have just chosen 0 - 60MPH - 0 MPH for this particular example.*

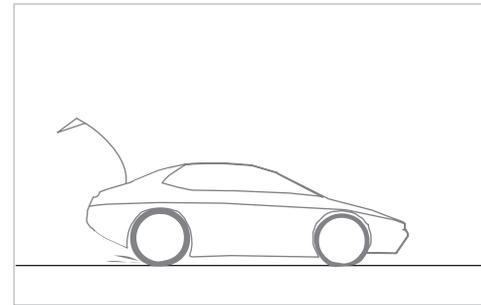
When doing a test like this, we recommend:

- disabling all distance marks (page 72)
- disabling your shiftlights (page 73)

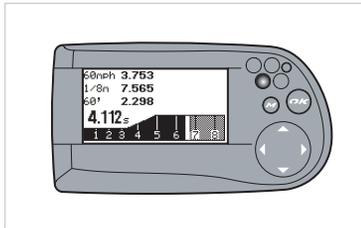
Next, set the speed mark to the desired speed (in this case, 60 MPH - see page 71 for details on setting the speed mark).

This ensures the only light that will come on during your run is the 60 MPH speedmark light.:

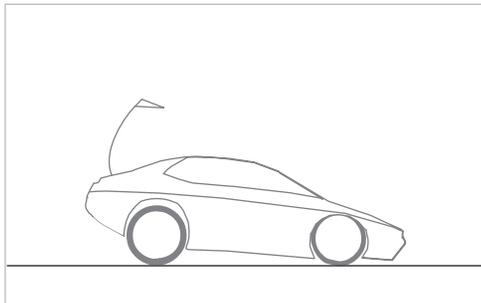
Launch your vehicle and start an acceleration run (page 36).



- 2 Keep accelerating until the speedmark is lit.



- 3 Immediately brake hard, all the way to a stop.

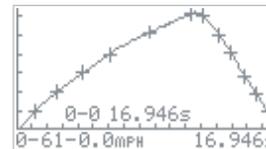


- 4 Keep the vehicle at a stop until the E.T. clock stops counting (about one second once you have completely stopped).

- 5 Bring up the "Speed vs time" graph for this run.



- 6 Notice the "upside down V" shape to the curve. Use the  key to move the cursor all the way to the right hand side of the screen. In this case, the driver actually went up to 61 MPH, so we get the 0-61-0 time, which is displayed on the bottom line.



## Setting the Speed Mark

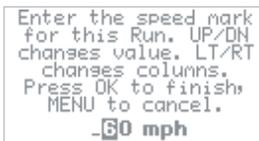
Have you ever wondered at what point you reach a certain speed during an acceleration run?

With the G-tech's Speed Mark feature, now you will know.

Simply set the Speed Mark value to whatever speed you want, and then during an acceleration run, the lower left LED will illuminate for 1 second when your vehicle reaches that speed.

- 1 Start in **Configuration Mode**.
- 2 Select "**Run Parameters**".
- 3 Select "**Speed Mark**".

- 4 Enter your desired speed mark by using the arrow keys. Press **OK** when done, or press **ABORT** to abort.



```
Enter the speed mark
for this Run. UP/DN
changes value. LT/RT
changes columns.
Press OK to finish.
MENU to cancel.
  50 mph
```

**Note:** The speed mark can be set to any value in the range 20-150 MPH. It cannot be turned off completely. However, setting it to 150 MPH will effectively turn it off in a vehicle that doesn't reach 150 MPH.

## Setting the Distance Marks

Have you ever wondered at what point you reach a certain distance during an acceleration run?

With the G-tech's Distance Marks feature, now you will know.

There are three distance marks:

- 60 ft. mark
- 1/8 mile mark
- 1/4 mile mark

Each of these marks can be individually enabled or disabled.

When you have a distance mark enabled, and the vehicle has reached that distance, the G-tech illuminates the upper right LED for one second.

For example, if you have all three distance marks enabled, and you do a full 1/4 mile acceleration run, the upper right LED turns on three times during the run.

- 1 Start in **Configuration Mode**.
- 2 Select "**Run Parameters**".
- 3 Select "**Distance Marks**".
- 4 Use ▲ and ▼ to move the cursor to the desired speed mark. Pressing  toggles the speed mark on and off. An asterisk (\*) next to a mark means it is on.  
When done, select "**Exit**" and press .

## Shiftlights Overview

In **Drag Strip Mode**, the G-tech is always monitoring vehicle RPMs, and can be programmed to turn on LEDs (shiftlights) when you desire. This is an individual preference and depends on your driving style and your goals.

You determine the RPM level where the shiftlights come on, and you can also enable/disable the shiftlights at will.

As you analyze your runs with the G-tech and measure your horsepower and torque vs. RPMs (p. 51), you may determine that the best shiftpoint is not at vehicle redline, but at a different value.

The shiftlights feature can help with this by turning on at an RPM value you've set, so that you shift for optimal power delivery.

Since no one can shift instantaneously, the G-tech gradually prepares you for the shift by illuminating the shiftlights in three sequential stages as you approach the shiftpoint. This sequential activation allows you to anticipate when to shift. Our research indicates that this improves consistency.

## Enabling / Disabling Shiftlights

Use the following procedure for enabling/disabling the Shiftlight LEDs. (Refer to page 21 for information on setting the RPM shiftlight shiftpoint.)

- 1 Start in **Configuration Mode**.
- 2 Select "**Vehicle Data**".
- 3 Select "**Shiftlights**".
- 4 Select On or Off by using ▲ and ▼, then press  to make your selection. An asterisk (\*) indicates your current choice. Select "**Exit**" and press  when done.

## View Firmware Ver. and Serial No.

If you ever call Tech Support, you will probably be asked about the firmware version and serial number of your G-tech. This information assists in the troubleshooting process.

The firmware version in the G-tech indicates how recently your G-tech has been updated with new code. You can check the Tesla Electronics website at: <http://www.gtechpro.com> to see if newer G-tech firmware is available.

The serial number is a unique identifier for your G-tech.

- 1 Start in **Configuration Mode**.
- 2 Select "**Gtech Setup**" and press .
- 3 Select "**Firmware Version**" and press .
- 4 A screen such as this will appear and provide information on the G-tech firmware version and its unique serial number. *Your screen will differ, depending on which version of firmware you are running. (Naturally, the serial number will be different too.)*

**Firmware Version:**  
4.0

**Serial Number:**  
00-0-0007678497

**Feb 27 2004 16:14:33**
- 5 Press  to exit.

## Setting U.S. or Metric Mode

The G-tech can display units in U.S. mode (feet, pounds, miles per hour, etc.) or metric mode (meters, kilograms, kilometers per hour, etc.).

Set the G-tech to operate in whichever mode you prefer to view data.

**Note:** When you switch between metric and U.S. modes, it affects only how the data are displayed, not how the data are saved inside the G-tech.

*In other words, you can switch between metric and U.S. modes at any time, without losing any configuration information or vehicle measurements.*

The following table lists the units for each configuration item in the G-tech, both in U.S. mode and Metric mode:

Item	U.S. unit	Metric unit
Weight	lbs	kilograms
Speed	miles per hour	kilometers per hour
Distance	inches, feet	cm, meters
Power	horsepower	kilowatts
Torque	ft-lbs	newton-meters

When performing and viewing runs, there are also corresponding measurements in both modes:

U.S. Mode Measurement	Metric Mode Measurement
60 ft time	20m time
330 ft time	100m time
1/8 mile time and speed	200m time and speed
1000 ft time	300m time
1/4 mile time and speed	400m time and speed
0-60 MPH time	0-100 km/h time

The G-tech measures and stores both full sets of measurements on every run, regardless of which mode you are in. In other words, even if you perform a run in U.S. mode, the G-tech is also monitoring and storing all the metric milestones as well, and vice versa.

This means that now enthusiasts all over the globe can compare results with each other, just by switching modes after a run is completed!

For example, let's suppose an enthusiast named Joe is in U.S. Mode when he does all of his acceleration runs, and an enthusiast named Simon is in Metric Mode for his runs.

All Joe and Simon have to do to compare their runs against each other ("apples to apples") is put their G-techs into the same mode (U.S. or Metric) before they review their runs.

When Joe compares his 100M time against Simon's 100M time, they are comparing exactly when each of them crossed the 100M point.

Joe and Simon can also compare U.S. mode milestones simply by putting their G-techs in U.S. mode.

Use the following procedure to switch between U.S. mode and Metric mode in the G-tech.

- 1 Start in **Configuration Mode**.
- 2 Select "**Gtech Setup**" and press .
- 3 Scroll down and select "**US or Metric**" and press .
- 4 Choose U.S. Mode or Metric Mode.  
The asterisk (\*) indicates the active choice.  
 /  moves cursor, and  makes selection.  
When done, select "**Exit**" and press .

## Resetting to Factory Defaults

In some cases you may want to restore the G-tech to the condition it was in when it was shipped from the factory.

This will clear out all the configuration information and stored runs.

**Note:** Resetting the G-tech to Factory Defaults resets nearly all the information stored in the G-tech. Perform this step only if you are sure that you want to delete all configuration information and stored runs!

- 1 Start in **Configuration Mode**.
- 2 Select "**Gtech Setup**" and press .
- 3 Select "**Reset To Defaults**" and press .
- 4 Because this is a drastic step, a screen will appear, warning you that all saved data will be lost. Press  to continue the process, or  to cancel.

- 5 One final level of confirmation is needed before the reset. Press  to completely reset the G-tech, or  to cancel.

**Note:** After you have performed this step, you will need to perform the steps in the *Quick Setup* section again (page 46) before using your G-tech!

## Serial Port Baud Rate

The G-tech uses a serial port to communicate with external devices such as your PC.

The "baud rate" determines how fast the G-tech communicates with the computer. The higher the baud rate, the faster the G-tech sends and receives data.

Some PCs cannot keep up with the G-tech at high baud rates, however. Therefore, the G-tech allows you adjust the baud rate so that you can match it to a baud rate on the computer that works reliably.

When using the serial port, start by using the fastest baud rate (115,200) on both the computer and the G-tech. If you

have problems getting the two devices to communicate, lower the baud rate on both and try again.

- 1 Start in **Configuration Mode**.
- 2 Select "**Gtech Setup**" and press .
- 3 Select "**Serial Port Settings**" and press .
- 4 Use   to select the desired baud rate and press . The current baud rate is indicated with an asterisk (\*). Select "**Exit**" and press  when finished.



## Adjusting the LCD Contrast

The G-tech uses a Liquid Crystal Display (LCD) to display information. You may want to adjust the contrast on the LCD due to personal preferences, environmental conditions, etc..

- 1 Start in **Configuration Mode**.
- 2 Select "**Gtech Setup**" and press .
- 3 Select "**LCD Contrast**" and press .
- 4 You will see a screen similar to the screen shown here. Use   to adjust the contrast on the LCD, and press  to save changes and exit.



## Deleting ALL Stored Runs

At some point, you may wish to delete all of the stored Drag Strip Runs in your G-tech.

**Note:** *This is a drastic step that will cause you to lose all information about the runs in your G-tech. Be sure this is what you want to do before proceeding!*

Use the following procedure to delete all the stored runs on your G-tech.

- 1 Start in **Drag Strip Mode**.
- 2 Press  to bring up the Drag Strip Main Menu, then press  to select "**Stored Runs**".
- 3 Choose "**Delete all**" and press .

- 4 You will see a screen that indicates you must press  to continue the deletion process. To cancel this and keep all your runs intact, press .
- 5 To finish the process, press . To cancel this and keep all your runs intact, press .

## Uploading All Stored Runs

At some point, you may wish to analyze all your runs in more detail on a computer, or to transfer all your runs to a computer so you can delete them from the G-tech. (Transferring runs to the PC does not automatically delete them).

**Note:** Refer to “G-tech-Computer Connection” on page 139 for more information on connecting the G-tech to your computer. You should also ensure that the G-tech PASS PC software is ready to receive data from the G-tech..

- 1 Start in **Drag Strip Mode**.
- 2 Press  to bring up the Drag Strip Main Menu, then press  to select “**Stored Runs**”.
- 3 Choose “**Upload all to PC**” and press .
- 4 A screen will appear indicating the runs are being transferred. You can cancel the transfer at any time by pressing .

# Multiple Vehicles

This section will show you how to use the G-tech with up to 4 different vehicles.

## Multiple Vehicle Usage

Many G-tech enthusiasts will want to use the G-tech in multiple vehicles.

Perhaps you have several vehicles that you want to compare against each other... or maybe you have a friend with a vehicle that you want to benchmark.

With the G-tech's ability to support up to four vehicles, you just tell the G-tech about the information that is specific to each vehicle.

When you move the G-tech to another vehicle, just select that vehicle in the G-tech. The G-tech adjusts everything based on the vehicle you have selected.

## Vehicle-Specific Data

The first time you select a vehicle in the G-tech (page 83), you must enter in the information specific to that vehicle before using it.

This is a list of the information that you must enter for each vehicle that you use with the G-tech:

- Vehicle name (page 84)
- Vehicle weight (page 22)
- RPM calibration (page 23)
- Engine Redline (page 21)
- Shiftlights Shiftpoint RPM value (page 21)
- Shiftlights On/Off setting (page 73)

## Selecting a Vehicle

As mentioned earlier, the G-tech stores information specific to as many as four different vehicles. Use the procedure below to select a different vehicle.

- 1 Start in **Configuration Mode**.
- 2 Select "**Vehicle Data**" and press .
- 3 Scroll down and select "**Choose Vehicle**" and press .

4

You will see a screen similar to the following. An asterisk (\*) identifies the active vehicle. To select a different vehicle, move the highlight bar and press . The G-tech will re-configure itself to use the information for the new vehicle and display the **Configuration Mode** main menu. To exit without selecting a different vehicle, either press the  button, or go down to "**Exit**," and press .



```
*1: MUSTANG 66
2: noname2
3: noname3
4: noname4
Exit
```

## The G-tech Keyboard Screen

Some of the G-tech features allow you to enter text. The G-tech has an on-screen keyboard to allow this.

- Use to move the selection cursor around the keyboard
- Press to append the currently-selected character to the text in the entry area
- To erase a letter in the entry area, move the selection cursor to the back-arrow (), and press .

When done, press the button or move the cursor to “Enter” on the keyboard, and press .



## Renaming a Vehicle

In the Quick Setup Procedure earlier in the manual, you may remember setting parameters such as vehicle weight and redline. In fact, you were setting information for the first vehicle.

To rename a vehicle, first select the vehicle (page 83) to make it the active vehicle.

- 1 Start in **Configuration Mode**.
- 2 Select “**Vehicle Data**” and press .
- 3 You will see a screen similar to this one. In this example, the user has changed the name to “**MUSTANG 66**”.



- 4 Scroll down to “**Change Vehicle Name**” and press .
- 5 The G-tech keyboard screen (page 84) will appear.
  - Enter the new name for the vehicle using the keyboard.
  - Vehicle names can be up to 15 characters long

## Showing the Active Vehicle

Use the procedure below to determine which vehicle is currently active in your G-tech.

- 1 Start in **Configuration Mode**.
- 2 Select “**Vehicle Data**” and press .
- 3 The active/current vehicle is indicated by name across the top of the display.





# Pro Features

This section will show you how to use the most advanced features of the G-tech.

## Reaction Time / Start Mode

If you have been to a drag strip before, you are probably familiar with the "Timing Tree" (a.k.a. "Christmas tree") at the starting line.

(For more information, refer to "Drag Strip Concepts" on page 95.)

If you want to practice your launch technique or improve your reaction time when you are not at the track, the G-tech's Reaction Time modes can help you perfect your technique.

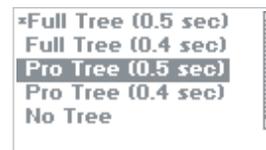
You can choose from a **Full Tree** (also known as the "Sportsman's Tree") or **Pro Tree**. Each of these can be used with 0.5 second or 0.4 second timing.

With a **Full Tree**, the three amber lights turn on sequentially, and with a **Pro Tree**, all three amber lights turn on simultaneously.

Generally when you are at the drag strip with a real Christmas tree setup, you do not want the G-tech displaying a reaction time light tree on its screen.

Instead, you want to launch based on the Christmas tree at the track. In these cases, you would configure the G-tech for "**No Tree**" mode launches..

- 1 Start in **Configuration Mode**.
- 2 Select "**Run Parameters**."
- 3 Select "**Reaction time**."
- 4 The asterisk (\*) indicates the active choice. Move the highlighted selection bar to the choice you want, and press **OK**..  
In this example, a **Full Tree** with 0.5 second timing is the current choice as indicated by the asterisk (\*) next to it.  
If you were to press **OK**, the mode would switch to a Pro Tree with 0.5 second timing.

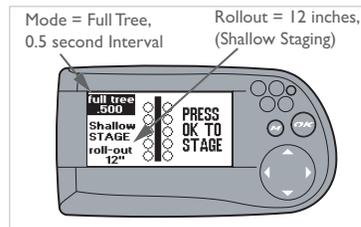


## Using the Timing Tree Modes

The following information describes the start procedure in any of the four Timing Tree modes. *This example assumes the user has set the mode to "Full Tree (0.5 second)."*

**Note:** The colors "amber" and "green" refer to the colors on an actual dragstrip Christmas tree, not the G-tech itself.

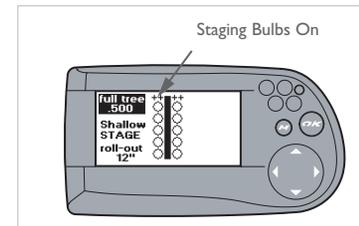
- 1 Start in **Drag Strip Mode**.
- 2 Press **OK** to stage the G-tech. Your current settings for reaction tree mode and rollout are displayed.



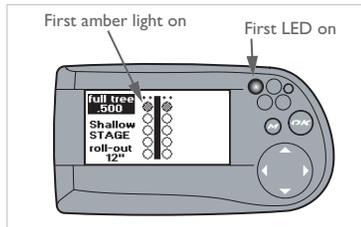
3

Press **OK** to activate the tree. After a brief period, the simulated staging bulbs will come on. (On a real track, these lights would come on when your vehicle is properly positioned).

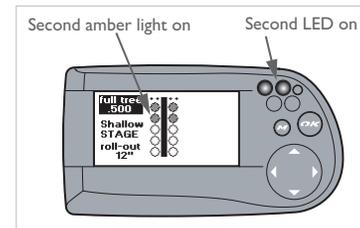
**Note:** If the staging bulbs never appear, the accelerometers need to be re-calibrated. Press **OK** to go back to the G-Window screen with the tachometer, and refer to "Re-Calibrating Accelerometers" on page 109 for details on this procedure.



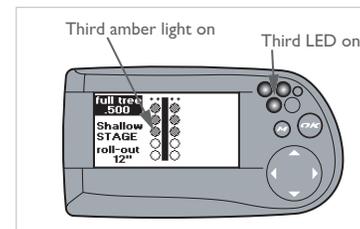
- 4** After a small, random amount of time, the tree countdown will begin — just like at the track. Since this is a **0.5 second Full Tree**, the three amber lights will come on in succession, 0.5 seconds apart.
- The green light will come on 0.5 seconds after the third and final amber light.
- The G-tech's LEDs will illuminate at the same time as do the tree lights on the LCD screen. This way, you can use the bright LEDs to judge when to start, (i.e., you do not have to look at the LCD).



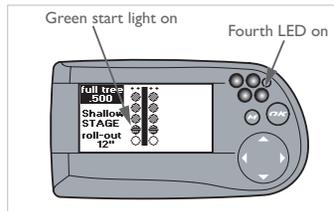
- 5** 0.5 seconds later, the second amber will light come on.



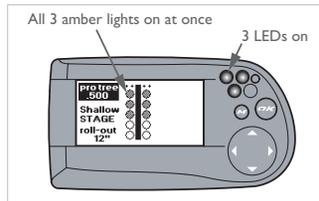
- 6** 0.5 seconds later, the third and final amber light will come on. At this point, the reaction time clock starts.



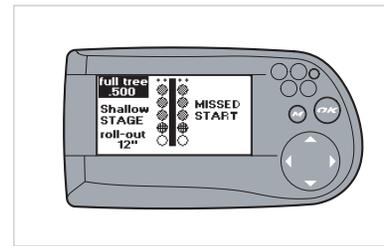
- 7 0.5 seconds later, the green start light will come on. In a perfect launch, your vehicle would have just finished rollout. The reaction time clock stops once your vehicle has moved the rollout distance.



- 8 With a "Pro Tree" instead of a "Full Tree" the only difference would be that all three amber lights (and LEDs) would come on simultaneously, instead of one-at-a-time. This is just like a Pro Tree at the track.



- 9 If you do not launch your vehicle within a few seconds of the reaction time clock starting (i.e., when the third amber light comes on), the G-tech assumes you do not want to perform an acceleration run. In this case you will see the following screen. "Missed Start" indicates the tree counted down, but the G-tech never saw the vehicle launch. After a few seconds you will be returned to the [G-Window](#).



## Setting the Rollout Distance

The rollout distance is the distance that the vehicle moves before the E.T. clock starts timing. This is exactly what happens at a dragstrip.

By configuring the G-tech with a rollout distance that is identical to the rollout distance you use at the track, your times will be very close to those measured with the track's equipment.

**Note:** You should use the same rollout value when doing several runs that you will compare against one another.

For more information, refer to "Drag Strip Concepts" on page 95.

- 1 Start in **Configuration Mode**.
- 2 Select "**Run Parameters**."
- 3 Select "**Staging/Rollout**".

- 4 Enter your desired rollout distance. Valid values are in the range 0-16 inches.  
Press  to save changes.  
Press  to abort and discard changes.



Enter rollout 0-16"  
for this Run. UP/DN  
changes value. LT/RT  
changes columns.  
To Finish, press OK  
2 inches

---

# Accuracy

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This section will insure that you get the best possible results with your G-tech.

## Tips for improving Accuracy

- Do your acceleration runs on a very flat / level track. Even a very gentle slope may cause your readings to be off.
- Avoid measurements on windy days. A tail wind will artificially lower your time and increase your measured horsepower. A head wind will artificially increase your time and lower your measured horsepower.
- Do several runs in both directions to average out the effects of slope and wind.
- Ensure that the G-tech is not loose in its mounting bracket and also make sure the mounting bracket is firmly installed.
- A smooth, strong launch will typically yield the most repeatable measurements. A jerky or violent launch might cause the G-tech to trigger before or after you intend.
- Rollout distance affects results (both E.T. and trap speed). If you program the G-tech with a large rollout, your E.T. will be faster and your trap speed will be higher. Always use the same rollout setting for runs that

you will compare against one another. For more information, see "Rollout" in the Glossary (p. 140).

- When doing a braking test, bring the vehicle to a complete stop *and wait for the E.T. clock to stop counting*. If you begin moving again before the E.T. clock stops, you may not be able to view braking distance results.
- To get the results to match the track timeslip follow the instructions under p. 102 (p. 102) and Adjusting the Pitch Factor (p. 102).
- When trying to measure horsepower and torque, please follow the procedure in the manual very closely (p. 102)
- Avoid leaving your G-tech in any extreme temperature conditions. Extreme temperatures will not affect the physical appearance but may impact the accuracy of the G-tech's accelerometer calibration. Examples of extreme temperatures could include freezing outdoor temperatures and car interiors in direct summer sunlight.

## Drag Strip Concepts

At a dragstrip, there is a small region which contains two beams that determine where your front tires are. The first beam your vehicle encounters is called the "Pre-Stage Beam", and the second beam is called the "Stage Beam".

When you first move your vehicle into the starting line region, the "Pre Stage" bulb on the track's Christmas tree illuminates to tell you that your front tires have blocked the Pre-Stage Beam and are close to the Stage Beam.

When you roll forward a bit more (usually about 6-8 inches), a second bulb, called the "Staging Bulb", comes on. This indicates your front tires have blocked the Stage Beam. At this point, your vehicle is "staged", and ready for a legal start.

You can typically continue to inch your vehicle forward about one foot (depending on your tire diameter) and the Stage Bulb will remain on. As you inch forward, eventually the Pre Stage Bulb will turn off. This is OK, you are still staged.

If you continue to roll your vehicle forward, the Staging Bulb will go out, indicating your front tires are no longer blocking the Stage Beam, now you are no longer staged and you must

back up your vehicle and re-stage before the run can begin. The Christmas Tree will not begin the countdown until your vehicle (and the vehicle next to you) is staged.

As long as the Staging Bulb is illuminated, i.e., as long as any part of your front tire is blocking the Stage Beam, you are "staged" for a legal start.

If you stop inching your vehicle forward immediately after the Staging Bulb comes on, you have "shallow staged" (i.e., you have barely entered the staging area). This will generally give you a longer reaction time but a faster E.T. and trap speed, because the vehicle has more of a "running start" before the E.T. clock starts.

If you continue to inch your vehicle forward until you have almost left the staging area, you have "deep staged" (i.e., you are very close to the starting line). Deep stagers will often roll forward until the Pre Stage Bulb goes out... making sure not to turn off the Stage Bulb as well.

Deep staging will generally give you a shorter reaction time, but a slower E.T. and trap speed, because the vehicle has virtually no running start before the E.T. clock starts.

The E.T. clock begins running once the vehicle's front tires have rolled far enough forward so that they are no longer

blocking the Stage Beam. This means if you sit at the starting line for a bit after you should have launched, it won't affect your E.T., since your vehicle will still be blocking the Stage Beam. The E.T. clock stops running once the driver passes the quarter-mile mark.

The reaction time clock begins timing as soon as the third amber light comes on. Even if your vehicle doesn't move, the reaction time clock is running! The reaction time clock stops running once the vehicle moves forward enough to unblock the Stage Beam (this is exactly when the E.T. clock begins timing.)

Rollout is defined as how far your vehicle moves from a stop (when it is staged) until the E.T. clock starts. The G-tech allows you to set the rollout distance, i.e. how far the vehicle moves before the E.T. clock starts.

A large rollout distance (such as 16") gives the vehicle more of a "running start" before the E.T. clock starts. This can result in shaving several tenths of a second from the E.T.

As an example, say you set the rollout distance in the G-tech to 12 inches. When you launch your vehicle, the G-tech knows when your car has *barely* begun to move, i.e. a fraction of an inch. But it won't start the E.T. clock until it determines your vehicle has traveled 12 inches forward. At the track, this

would mean your vehicle traveled 12 inches before the front tires rolled far enough to unblock the Stage Beam.

In any of the 4 Timing Tree modes, the G-tech will measure your reaction time. Also just like a track, it will begin measuring your 1/4 mile time when the vehicle has traveled the full rollout distance.

*A poor reaction time will not hurt your 1/4 mile time. In other words, if you sit at the starting line for 2 seconds after you should have launched, you will have a terrible reaction time, but your 1/4 mile E.T. will still reflect the time it took your vehicle to move a 1/4 mile once it crossed the starting line.*

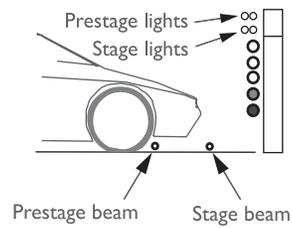
**If...**

You typically stop your vehicle as soon as the Stage Bulb comes on at the track, this means you are a shallow stager. Set your rollout to a distance like 8, 10 or 12 inches.

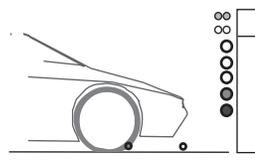
**If...**

You typically roll your vehicle forward a few inches after the Stage Bulb comes on, you are a deep stager. Your rollout will be smaller, maybe 2 or 4 inches.

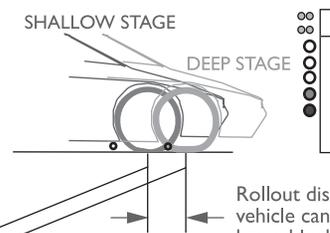
### Step 1 Drive-up



### Step 2 Prestage

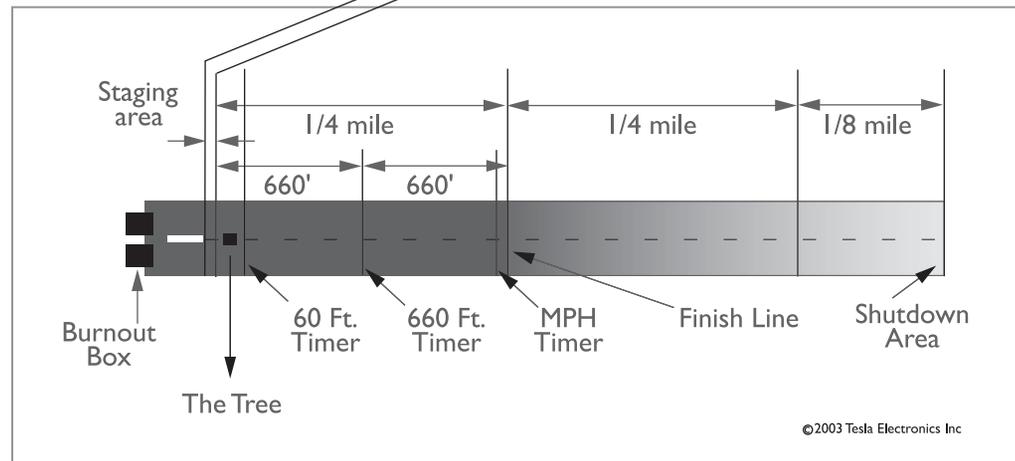


### Step 3 Stage



You are staged as soon as you block the Stage beam. E.T. timer starts when the stage beam is unblocked. Rollout can be up to 16" long (depending on your wheel and tire size).

Rollout distance is based on how far vehicle can travel and have the stage beam blocked by the wheel.



# Accuracy

## G-tech Results & the Race Ticket

Many people take the G-tech to the drag strip and compare the G-tech's results against the race ticket. There are two major components that will affect how well your numbers "match-up" with the racing ticket: how you stage (rollout) and vehicle pitch under acceleration.

This section describes the effects of rollout on your E.T. and trap speed; the next section describes how vehicle pitch impacts your results.

Your staging technique at the track can have a large impact on your results. A long rollout (shallow staging) provides more of a "running start" for your vehicle before it crosses the starting line. (When we say "crosses the starting line", we mean "rolls far enough to unblock the stage beam.") This running start can shave several tenths of a second from a vehicle's E.T.

The following chart demonstrates the effect of rollout on the 1/4-mile E.T. and trap speed. In this chart, the driver drives the EXACT SAME WAY, the only difference is how much rollout the driver uses, i.e., how deeply the driver stages. (In this example, for the sake of illustration, we are assuming the

vehicle pulls about 0.35g of acceleration continuously throughout the run.)

Rollout Distance	0 in.	4 in.	8 in.	12 in.	16 in.
Rollout Time (s.)	0.000	0.226	0.319	0.391	0.452
Speed at end of rollout (MPH)	0.00	2.01	2.85	3.49	4.02
1/4 mile E.T. (s)	14.215	13.991	13.899	13.829	13.770
1/4 mile trap speed (MPH)	126.63	126.64	126.66	126.67	126.69

Notice how significantly the E.T. is affected by rollout distance, whereas the effect on trap speed is minor.

*This chart indicates that the E.T. for the exact same driver in the exact same car can vary by approximately 0.5 second just because of rollout!*

In other words, significant time discrepancies can arise at the track due entirely to rollout. The time it takes to roll those

first few inches has an enormous effect on the timed milestones (e.g., 60 ft. mark, 1/8 mile mark, 1/4 mile mark).

In all likelihood, when you're at the track, you will stage slightly differently each time. Maybe 6 inches one time, 8 inches the next pass, 5 inches the time after that...

The bottom line is this: for the G-tech results to match up nicely with the race ticket, the G-tech has to start timing at exactly the same time the track's E.T. clock starts timing. And the only way this can happen is if the rollout setting in the G-tech is set to exactly the same rollout distance you are about to use on this pass down the track.

On the track, you have to concentrate on your opponent, the officials, spectators, the Christmas tree, your car, the launching revs and many other variables. We have found that concentrating on matching the actual track rollout to what is set in the G-tech is extremely difficult unless you have somebody to measure the exact rollout distance as you are staging.

If you still want to try to "match-up" the numbers it's best to set your G-tech to 12" rollout and shallow stage (barely turn the stage light on) at the track.

Then adjust the pitch factor so that the trap speeds (not E.T.s) match. This is explained in the next section.

## Adjusting the Pitch Factor

“Vehicle pitch” is the term that describes the up and down movement of the front (and conversely, the back) of your vehicle during acceleration.

You may be aware that under strong braking conditions, most vehicles experience “nose dive.” By the same token, most vehicles experience a slight raising of the front end under strong forward acceleration. The fact that the vehicle does not stay perfectly level under acceleration and deceleration means that the G-tech’s measurements require slight adjustments to account for this movement.

The G-tech has an adjustable “pitch correction factor” that allows you to fine tune the G-tech’s accuracy. You must set the pitch factor correctly to ensure the best accuracy.

Typical cars have a pitch correction factor of approximately 2 degrees per forward G of acceleration, and this is the default setting. Most cars will not require any adjustment at all. If you have particularly stiff suspension, lower the pitch factor. If you have a very soft suspension, consider raising it.

You can take the guesswork out of determining this value by going to your local dragstrip and doing a few runs while using the G-tech.

First, you must set your pitch correction factor to 0.0, or the following procedure will not work! (The default pitch correction factor is 2.0).

Perform a run at a dragstrip with the G-tech. Then you will have the track speed from your racing ticket and the G-tech trap speed from the G-tech results.

Your pitch correction factor can be calculated by the following formula:

$$\text{Pitch Factor} = \left( \left( \frac{\text{Gtech Trap Speed}}{\text{Track Trap Speed}} - 1 \right) \times 57.3 \right)$$

**Note:** *The above formula assumes that the G-tech’s trap speed is always greater than the trap speed from the track timeslip, which it almost always is. If the G-tech’s trap speed is lower than the timeslip’s trap speed, use a pitch correction factor of 0.0.*

The following example shows how to calculate the pitch correction factor for a real-world situation.

**Example:** Determine the correct pitch factor when the G-tech indicates a trap speed of 104.0 MPH and the track ticket gives a trap speed of 100.3 MPH.

$$\begin{aligned}\text{Pitch Factor} &= \left( \frac{\text{Gtech Trap Speed}}{\text{Track Trap Speed}} - 1 \right) \times 57.3 \\ &= \left( \frac{104.0}{100.3} - 1 \right) \times 57.3 \\ &= (1.03689 - 1) \times 57.3 \\ &= (0.03689) \times 57.3 \\ &= 2.1\end{aligned}$$

After you enter a pitch factor of 2.1 into your G-tech for this vehicle, the G-tech traps speeds will agree more closely with the track timeslip.

**Note:** Even with proper pitch correction, G-tech E.T.s will not agree closely with the timeslip unless your rollout is set properly!

Changes to your vehicle's suspension, weight distribution, etc. can affect the pitch correction factor. Also, not all dragstrips

are as level as they seem. This can also have small effects on your pitch correction factor on different terrains.

## Horsepower, Torque & G-tech

This section provides detailed information on the G-tech's horsepower & torque measurements and some guidelines and tips to help you get repeatable results.

The G-tech does not measure *engine horsepower at the crank*, which is what the automobile manufacturers and magazines typically report.

The G-tech does not measure *wheel horsepower* either (a dyno measures *wheel horsepower*). As you may know, *wheel horsepower* always measures lower than *engine horsepower*, since it includes drivetrain loss, the rolling resistance of the tires on the road, and other factors.

The G-tech measures *net horsepower*, which reads even lower than *wheel horsepower*. The G-tech's *net horsepower* value is a measurement of all the horsepower that is available to accelerate your vehicle after all power losses have been subtracted.

As one example, on a dyno, the vehicle is not experiencing any aerodynamic drag ("wind resistance") because it is not actually moving through the air — it is stationary on rollers.

However, in the "real world" (i.e., at the track), your vehicle has to contend with issues such as aero drag.

Suppose that two vehicles with identical engines, drivetrains, and tires go to the same dyno. One vehicle has been modified to minimize aerodynamic drag. They both go to the dyno in town and measure identically.

On the G-tech, the vehicle that is more aerodynamic will measure a higher *net horsepower*. This is because it loses less power due to aerodynamic drag on the track as it is slicing through the air.

*The optimal driving technique for measuring horsepower and torque is nothing like the technique for obtaining the best 1/4 mile results.*

We will describe the technique here and then provide some supporting information afterwards.

1. Stage the G-tech just as you would for a 1/4 mile run. Wait for the "Launch when Ready" message.
2. At a moderate RPM value, start your vehicle briskly off the line, enough to trigger the G-tech and start its clock. Don't launch as hard as you would for a quarter mile. For example, if your vehicle redline is 6000 RPM, launch at 1500 to 2000 RPM.

3. Shift out of 1st gear before you are halfway to your vehicle's redline. So if your vehicle has a 6000 RPM redline, shift to 2nd before you reach 3000 RPM in first gear. Be sure to let off the throttle between shifts, i.e., while the clutch is not fully engaged, and be sure to shift smoothly and avoid jerks.
4. As soon as 2nd gear is fully engaged (which should be at a low RPM, since you shifted out of 1st gear very early), floor the accelerator. Keep the "pedal to the metal" until your vehicle's redline.
5. This allows you to cover a very wide RPM range in 2nd gear at full throttle. Don't worry about the fact that you aren't in the "sweet spot" of your power band when you first shift into 2nd gear. That's the point: we're measuring the power over the whole RPM range.
6. Once you reach your upper RPM value (e.g. redline) in 2nd gear, shift into 3rd gear and accelerate briefly (maybe one second or so.) This does not have to be full-throttle, since we are using 2nd gear for our horsepower measurement.
7. At this point, you can press  to stop the G-tech from measuring, or just coast (foot off accelerator). The G-tech will stop its clock.
8. Now you can view the "Horsepower and Torque vs RPMs" graph for your run (p. 51).

#### Some notes on horsepower runs

- There is significantly less wind drag in 2nd gear as opposed to 3rd gear; that is the reason we chose 2nd gear in this example.
- Shop dyno testing is often done in 4th gear, because in many cars, 4th gear provides a 1:1 gear ratio with the least amount of driveline loss. However, using 4th gear for dyno testing with the G-tech is usually not practical (and certainly not necessary) because of high speed and large aero drag.
- No matter which gear you do your runs in, be sure to use the same gear for all runs you wish to compare. Suppose you do a 2000-7000 RPM run in 2nd gear and another run from 2000-7000 RPM in 4th gear. The run in 4th gear was at a much greater speed, and hence the aero drag was much greater. This will have the effect of lowering the *net horsepower* on the 4th gear run.
- Vehicles with extraordinary power, or poor traction, may spin the wheels at full-throttle in 2nd (and even later) gears. The G-tech horsepower measurement relies on no wheelspin being present, just like a chassis dyno. If your vehicle experiences wheelspin in 2nd gear, please perform the run in 3rd (or 4th...) gear.

- Be sure to do multiple runs and average the results for the most accurate and repeatable numbers. You can use the G-tech's PC Analysis Software PASS to assist with this.
- Remember that with the G-tech, repeatability and tuning is the goal here, not necessarily comparisons to magazines or dynos.
- Vehicle weight is factored into the horsepower calculation. This number should be as accurate as possible. Refer to "How much does my vehicle weigh?" on page 105 for more information on vehicle weight.
- External environmental conditions such as wind, air temperature, and humidity affect *net horsepower*. The same vehicle with the same driver will measure more *net horsepower* at 32 degrees Fahrenheit than it will at 100 degrees Fahrenheit. Cold air is more dense, and hence contains more combustible oxygen. That's why your vehicle feels so much stronger when it's cool outside!
- Cars with Continuously Variable Transmissions (CVT) might be a problem, as the G-tech relies on gear shifts and broad RPM ranges when determining peak horsepower and torque. For these situations, you can use the G-tech's Horsepower vs. Time graph to find the peak horsepower.
- Make sure that your RPMs are calibrated properly and working throughout the entire RPM range before doing a horsepower run. Otherwise your results will be skewed.

## How much does my vehicle weigh?

In order to calculate meaningful horsepower measurements, you must provide an accurate value for your vehicle's weight.

*In this manual, the term "vehicle weight" refers to all the weight that is supported by the vehicle's tires (including the tires themselves). So this includes the driver's body weight, fuel weight, tools, fast food wrappers, etc.*

If you are fortunate enough to have access to an accurate vehicle scale, go ahead and weigh the vehicle as it would be equipped at the track (i.e., with you in it, the correct amount and type of fuel in the tank, etc.)

Some tracks even have scales available for weighing your vehicle. Also, some towns have dumps or refuse collection areas with large scales that you may be able to use. Moving companies may have vehicle scales as well.

If you cannot weigh your vehicle directly, you can estimate it. Use the manufacturer's data to obtain vehicle weight (check the Owner's Manual or perhaps the Internet). Then adjust the weight based on the difference between your car as it was stock, and as it is now (Have you added a heavier stereo?

Have you removed the spare tire?). Don't forget to include your own body weight and the fuel as well.

You do NOT want to use the Gross Vehicle Weight Rating (**GVWR**) value that is provided in the vehicle door jamb as the actual vehicle weight.

**GVWR** is the fully-loaded vehicle weight with passengers.

**GVWR** is always higher than the actual (empty) vehicle weight.

If you enter **GVWR** instead of actual vehicle weight, your horsepower numbers will be artificially inflated.

There is a very rough rule of thumb that you can use to estimate your vehicle weight from the **GVWR**, but you should not rely on this being too accurate.

Again, this is a very ROUGH rule of thumb... each manufacturer calculates **GVWR** in its own way...

The rule of thumb is to take the passenger capacity of the vehicle (e.g., 5 for a mid-sized sedan) and subtract from the **GVWR** 180lbs for each missing person.

Example: Suppose **GVWR** = 4200 lbs, vehicle capacity is 5

people, but we have only a driver. Thus there are 4 missing passengers, which means we subtract  $4 \times 180\text{lbs}$ . The value  $4200\text{ lbs} - 720\text{lbs} = 3480\text{ lbs}$ . Thus you would enter 3480 lbs into the G-tech for vehicle weight.

# Accelerometers

This is an advanced section dealing with sensors inside the G-tech; reading this material is not necessary for most users.

## Diagnostics G Screen

If you suspect the G-tech is not measuring acceleration accurately, please contact Tech Support. You will probably be instructed to view the **"Diagnostics Gs screen."** This display shows you the current accelerometer readings measured by your G-tech.

- 1 Start in **Configuration Mode**.
- 2 Select **"Calibration"** and press .
- 3 Select **"Accelerometers"** and press .
- 4 Select **"Diagnostics G Screen"** and press .

- 5 The diagnostics screen will appear:

X: -0.190	175
Y: +0.003	249
Z: +0.990	
Mag: +1.016	Temp 96F

*The values on your display will not match these values. That is not a problem, this is just an example screen.*

*The information on this screen is provided for engineering support; generally you will be reporting these values to Technical Support.*

## Erasing Accel. Calibration

**Note:** Erasing accelerometer calibration data is a drastic step and should only be done if advised by one of our technicians!

Use the following procedure to erase the G-tech's accelerometer calibration data.

- 1 Start in **Configuration Mode**.
- 2 Select "**Calibration**" and press .
- 3 Select "**Accelerometers**" and press .
- 4 Select "**Erase Calibration Data**" and press .
- 5 Press  to erase the calibration. or press  to keep the current calibration.

## Re-Calibrating Accelerometers

The G-tech contains high-precision measuring instruments called accelerometers.

**Note:** Re-calibrating accelerometers is a drastic step and should only be done if advised by one of our technicians!

**Note:** Do not perform the calibration with the engine running. A running engine causes vibrations in the vehicle that can affect your calibration results.

The accelerometer calibration procedure does not need to be done inside the vehicle. You may find the procedure easier if you do it indoors using the AC adapter to power your G-tech.

The accelerometer calibration procedure will generally go faster if you can rest the G-tech on a flat, level surface such as a table or a console. Generally, the faster the calibration goes, the better the results.

**Note:** If you do not have the G-tech oriented properly during calibration (i.e. upside down, rotated by 90 degrees, etc.), it will reject the calibration and display a message notifying you of this fact. Just re-attempt the calibration and pay close attention to the instructions on the display.

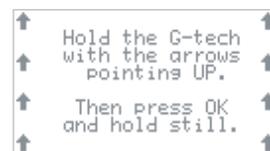
**Note:** The G-tech functions best when calibrated at 2 different temperatures that are as far apart as possible (page 114). If you attempt to perform a calibration and the G-tech determines that it has already been calibrated at (or near) the current temperature, it will “reject” your calibration attempt and notify you with a message on the display. If you get this message, let the G-tech warm up or cool down so that its temperature is significantly different than the current temperature, and try again.

Please follow the steps below to calibrate the G-tech's accelerometers.

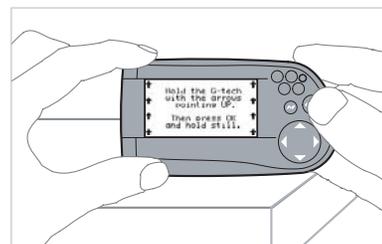
- 1 Start in **Configuration Mode**.
- 2 Select “**Calibration**” and press .
- 3 Select “**Accelerometers**” and press .

4 Select “**Calibrate Axes**” and press .

5 You will see the following screen:



6 With the G-tech resting on a flat, level surface, orient it with the arrows pointing up to the sky as shown in the picture below.

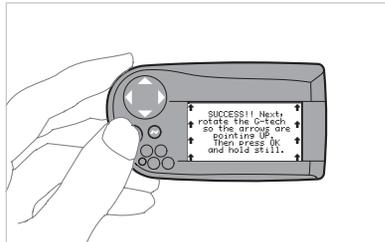


- 7 Hold the G-tech very still, and then press . The G-tech will automatically move on to the next step once it takes some measurements.

**Note:** If you are not holding the G-tech very still, you will see a blinking black bar on the display as shown below. If you see a display like this, you must hold the G-tech very steady until the black bar goes away.



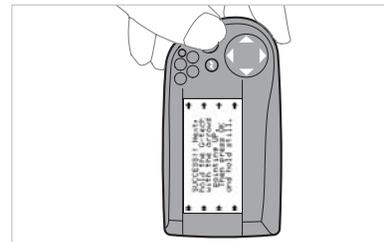
- 8 Next, orient the G-tech as shown and press .



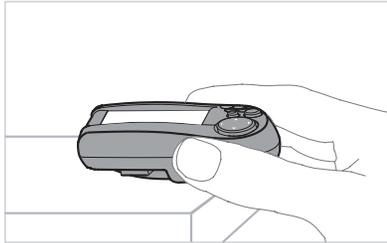
- 9 Next orient the G-tech as shown with the arrows pointing up, and press .



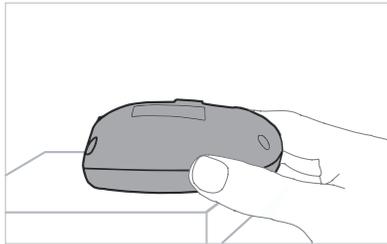
- 10 Again orient the G-tech as shown with the arrows pointing up, and press .



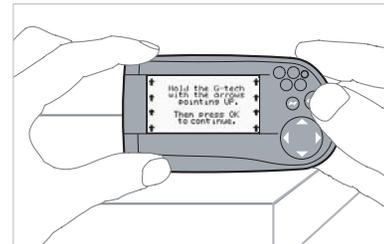
- 11** Lay the G-tech on a flat (horizontal) surface with the display facing up, as shown, and press .



- 12** Orient the G-tech with the display facing down, as shown, and press .



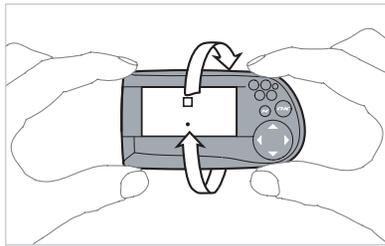
- 13** Now it is time for some final checks. Orient the G-tech as shown, read the screen, and press .



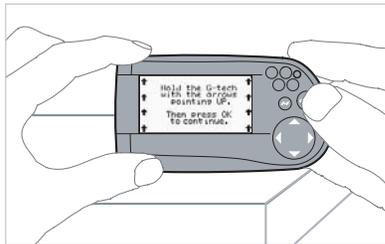
- 14** Read the following instruction screen & press .

```
↑ On the next screen ↑
  tip the G-tech ↑
  back and move the ↑
  ball into the box ↑
  and hold still. ↑
  Press OK to ↑
  continue. ↑
```

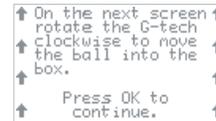
- 15** Tilt the G-tech back as shown, so the ball rests in the box. The G-tech will automatically advance to the next calibration step afterwards.



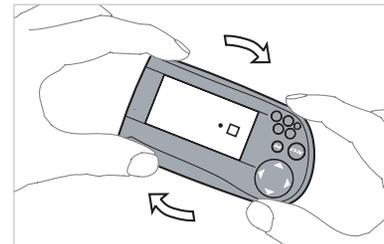
- 16** Re-orient the G-tech as shown and press .



- 17** Read the following instruction screen & press .



- 18** Tilt the G-tech clockwise as shown so that the ball rests in the square.



- 19** You will see a screen that indicates that calibration is complete. Congratulations!

For more information on calibrating the accelerometers, please refer to “Accelerometer Tips” on page 114.

## Accelerometer Tips

A blinking black rectangle on the display during calibration indicates that the G-tech is seeing shaking/movement. Try to hold the G-tech as still as possible. If you cannot get the rectangle to go away, please call Tesla Technical Support at (310) 452-0030.

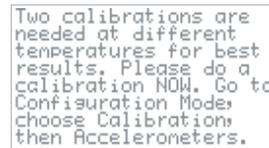
Ensure that you calibrate the accelerometers at two different times, as far apart in operating temperature as possible (p. 114). Our recommended calibration procedure for accelerometers is:

1. Put the G-tech into **Configuration Mode**, erase calibration (p. 109) and then power off the G-tech.
2. Let the G-tech sit powered off for at least 12 hours at room temperature.
3. Power on the G-tech and immediately perform a calibration (p. 109). This would be the “cold” calibration.
4. Leave the G-tech powered on for at least 1 hour so that it reaches full operating temperature.
5. Perform a second accelerometer calibration. This would be the “warm” calibration.

## Calibration & Temperature

The G-tech's accelerometers are sensitive to changes in temperature. Your G-tech was calibrated at the factory at two different temperatures that are far apart. This helps the G-tech maintain accuracy across a wide range of temperatures.

To maintain accuracy, the G-tech monitors temperature with a built-in thermal sensor. When the G-tech detects that its current temperature is far from the calibration temperature, it displays a message as shown in Figure 35.



```
Two calibrations are
needed at different
temperatures for best
results. Please do a
calibration NOW. Go to
Configuration Mode,
choose Calibration,
then Accelerometers.
```

**Figure 35: G-tech accelerometer calibration request**

This will most likely never happen to you, but if you are using the G-tech in extreme temperature conditions it is a possibility. In this case, please re-calibrate the accelerometers (p. 109).

# Road Racer Mode

This section will teach you how to get the most out of your G-tech in Road Racing and Solo activities.

## G-tech Road Road Racer Mode

In **Road Racer Mode** you can monitor, record and replay your handling Gs and RPMs in real time. There are three main screens in the **Road Racer Mode**.

- Normally you will be using the **everyday screen**, monitoring your G's and RPMs. This is the screen that is displayed when you first enter **Road Racer Mode**.
- You can record your Gs during a session this is done in the **recording screen** identified by a **REC** indicator in the upper left corner of the screen on the info bar.
- You can replay your stored sessions in the **replay screen**. This is indicated by the play symbol and playback speed in the upper left corner of the screen.

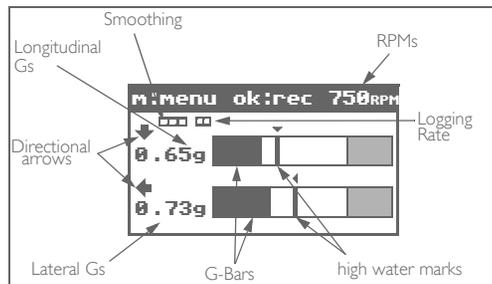
**Attention:** *In order for Road Racer Mode to work properly, the G-tech needs to know its orientation in the vehicle. To orient the G-tech you need to make a quick acceleration run in Drag Strip Mode before you can do any Road Racer Mode measurements. See page 35 for more information on self-leveling the G-tech.*

## Road Racer Mode Everyday Screen

The main screen in **Road Racer Mode** is known as the Road Racing everyday screen. It is designed to give you the most important information during everyday driving.

This screen is not intended to be viewed during high-G maneuvering, that's why it has "high water marks" which show the highest G level that has been reached in each direction.

**Warning:** Do not take your eyes off the road especially during high G maneuvering. Resist the temptation to glance over and "quickly" look at the screen, this can have devastating results. All information is recorded in the G-tech for later viewing.



**Figure 36: Road Racer Everyday screen**

The upper bar shows accelerating and braking Gs (Longitudinal Gs) and the lower bar shows left/right Gs (lateral Gs) depending on which way you are turning. Gs are continuously displayed with the “high water marks” for the maximum G’s which have been achieved since entering the everyday screen.

The left end of each G-bar represents 0.0 Gs. The right end of each G-bar represents the Maximum G level for the indicated direction. The Maximum G level for Longitudinal Gs and Lateral Gs can be viewed / set independently in **Configuration Mode** (p. 126).

The shaded area on the right-hand side of each bar represents 80% of the maximum.

To reset the maximum G high water marks simply exit the everyday screen by pushing the button. When you return to the everyday screen, the high water marks will be reset.

G-tech always indicates the dominant lateral and longitudinal Gs. The directional arrows indicate the direction of the Gs. The small triangular arrows above the “high water marks” indicate the direction of the maximum Gs.

During normal driving (i.e. relatively low Gs) you will notice that the high water marks change quickly; this is because the high water marks always correspond to the dominant acceleration. For example, when you are accelerating, the upper G bar (Longitudinal Gs) will correspond to forward acceleration, and the high-water mark will show you the maximum forward acceleration that has been achieved. When you begin braking, the upper G bar will show braking Gs, and the high-water mark will switch to show the maximum braking Gs that have been achieved.

The data smoothing type (see p. 124) and data logging rate (see p. 123) are indicated just below the info bar.

Note in Figure 36 that the G-tech is indicating that the user can press to bring up a menu, or press to begin recording Gs and RPMs.

## Road Racer Recording Screen

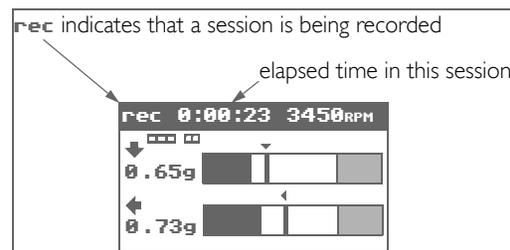
The G-tech can store approximately 1.5 hours of logged session data at the highest logging rate (20 times per second). At the slower logging rate of 10 times per second, you can store twice as much session time, about 3 hours.

This total amount of time can be used however you want. Suppose you are a solo racer and most of your runs are shorter than two minutes. In that case you will have space for a great many of them. An endurance racer, on the other hand, might be more interested in recording only a handful of longer driving sessions.

Bear in mind that G-tech storage memory is shared between **Drag Strip Mode** and **Road Racer Mode**. In other words, stored runs in **Drag Strip Mode** will reduce the amount of memory available for logging in **Road Racer Mode** (and vice versa).

**Note:** *Since the G-tech shares its storage memory with both drag racing runs and road racer sessions, you might be confused to see the G-tech list no stored runs, and also indicate less than the maximum capacity... this indicates the other mode has stored runs that are consuming storage memory.*

To start recording, push  from the everyday screen. This will change the info bar on the top of the screen to indicate that the recording is going on. Also in the middle of the info bar is the elapsed time of the current run.



**Figure 37: Road Racer Recording screen**

All the other display features are the same as in every-day screen.

Once your session is done you can stop data logging simply by pushing the  button.

G-tech will indicate on the display that it is saving data, this may take a few moments. The name for a session is automatically generated by the G-tech and it includes the date and time it was taken (military time- hours shown from 0-23) as

well as the duration of the session. This information is helpful later when you are reviewing the sessions.

When recording is completed and all data is saved safely, the G-tech returns to the everyday screen.

**Attention:** *In order to prevent loss of data, you should always properly stop a recording session before removing power from the G-tech. If the “rec” indicator is shown, be sure to press  and stop recording and allow all remaining data to be saved before removing power.*

## Road Racer Mode Replay Screen

Once you have logged one or more sessions, you will want to review the details and replay the run(s).

To review recorded sessions do the following steps.

- 1 Start in **Road Racer Mode**. 
- 2 Press  to bring up the **Road Racer Mode** main menu.
- 3 Select “**Stored Sessions**” and press .
- 4 Select “**Select a Session**” and press .
- 5 Choose the session you want and press .

Road Racer Mode

6 There are two ways you can replay the session. You can choose to look at the **Session Stats** first and then jump directly to the particular point where a given maximum occurred. Or you can choose to **Replay this Session** from the beginning. At this point you can also choose to **Delete this Session** or choose to **Upload to PC**.

When replaying the run from the beginning, G-tech will start replaying in real time. This is indicated by a “play sign” (shown as a right-pointing triangle) and a speed of 1x.

To slow down the replay, simply push ◀, and to speed up the replay push ▶. You can have several replay speeds: 1/4x, 1/2x, 1x (real-time), 2x, 4x, 8x, and 16x.

Notice that pushing ◀ will decrease the forward replay speed all the way down to 1/4x and then, if you keep pushing ◀, G-tech will start playing in reverse. Reverse play is indicated by a left-pointing triangle.

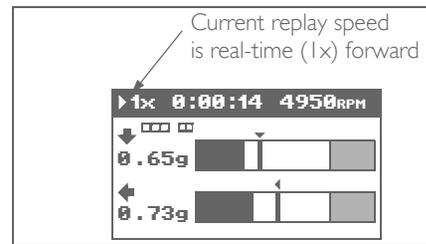


Figure 38: Road Racer Replay screen

To pause the replay at any time push ⏸. Pause will be indicated with the pause sign (▢▢) on the info bar. To resume the replay simply push ▶ again. The G-tech will start replaying forward at real-time speed (1x) when you resume replay.

You can also advance one frame at a time by first pausing and then simply pushing ◀ and ▶ to advance the frames.

When the end of the session is reached, playback will be paused automatically on the last frame.

## Session Stats

Every session has maximum Gs recorded in each direction (accelerating, braking, turning left, turning right) as well as maximum RPMs reached. This information is part of the **Session Stats**. The **Session Stats** are valuable because you can quickly go through your sessions and see the unique “signature” (G and RPM maximums) of that session – features that help identify a particular session.

Here is how to go through sessions quickly by viewing their stats:

- 1 Start in **Road Racer Mode**.
- 2 Press  to bring up the **Road Racer Mode** main menu.
- 3 Select “**Session Stats**” and press .

- 4 G-tech will show the **Session Stats** screen showing maximum Gs in all four directions and maximum RPMs along with times in the session where each of these events occurred.
- 5 Now you can select any of these maximums by using   to move and then press  to go straight to the place in the session where the given maximum occurred.
- 6 You can also push  or  in order to view the stats of the previous or next session. When you do this, notice how the run name at the top of the screen changes as you scan through the stats for each run. This gives you a quick way to get an overview of all your sessions at a “summary view” perspective.

The most valuable feature of the **Session Stats** is that you can quickly “jump” to the exact point where you reached maximum left turning Gs, maximum braking Gs, maximum RPMs, etc. To do this simply use   to choose the particular stat that you are interested in, and then push . This will take you to the exact point in time in the session when that maximum occurred. The G-tech will be paused in replay

mode after jumping to that point; to start replaying from that point simply push .

You can also choose the sessions by the name by going to the **"Stored Sessions"**. Here each session will be identified by its unique session name.

## Road Racer Mode Settings

The G-tech is set at the factory with default values for all **Road Racer Mode** settings but you might want to customize some of the features.

To change **Road Racer Mode** settings, please perform the following steps:

- 1 Start in **Configuration Mode**.
- 2 Select **"Road Race Settings"** and press .
- 3 There are five settings in this menu. Each setting is described in its own section.

**Logging Rate**  
**Snoothing**  
**Max Lateral Gs**  
**Max Longitudinal Gs**  
**G Lights On/Off**

## Logging Rate

The **Logging Rate** setting determines how often the acceleration and RPM data is stored during your driving sessions.

The G-tech allows you to store data at either 10 times per second, or 20 times per second.

The default logging rate is 10 times per second.

Logging 20 times per second will store twice as much data in the same amount of time. Generally, this means replay is smoother, especially when viewed frame by frame. However, the faster logging rate cuts down the total amount of time that you can log data. At a logging rate of 10 times per second, you can log twice as much driving time. Ultimately it is your choice, try both logging rates and then see which rate best suits your needs and preferences.

Set the logging rate to 10 for most “tin tops” (sports cars and sedans). A logging rate of 20 should be used in open wheel cars (formula cars and carts) since their vehicle dynamics tend to be more responsive.

When you are on the **everyday** screen, the display indicates the logging rate that would be used if you were to press OK and start recording.

When you are on the **recording** screen, the display indicates the logging rate being used as data is recorded.

When you are on the **replay** screen, the display indicates the logging rate that was used for the session being replayed.

The logging rate indicator shows how the logging rate is indicated on the display:

	Logging 10 times per second
	Logging 20 times per second

**Figure 39: Logging Rate Indicator**

When viewing the list of recorded sessions, you are presented with an amount of time remaining at the top of the display. This value takes into account the current logging rate. For example, suppose the value indicated 25 minutes remaining at a logging rate of 20 times per second. If the logging rate were changed to 10 times per second, the amount of logging time available would double to 50 minutes.

## Road Racer Memory Usage

As mentioned earlier, the **Logging Rate** affects the amount of time that can be logged, i.e. a higher logging rate fills up the memory faster, and affords a shorter logging period.

The G-tech is always monitoring memory usage during logging. If, during a logging session, the G-tech determines only a handful of minutes remain in logging memory, the “record” indicator is replaced with a “Low Memory” indicator, and the LCD backlight will flash on and off to alert the driver.

If the driver does nothing in this situation, the G-tech reaches a point where it automatically shuts off recording and saves all data logged up to that point. The user is informed of this via a message on the LCD.

As mentioned earlier, the logging rate impacts the amount of remaining time that can be recorded.

## G Smoothing

The **Smoothing** setting determines how much the high frequency components (i.e. the “short wiggles”) are suppressed in the acceleration data in order to emphasize the low frequency components (i.e. the longer trends).

During track driving, the vehicle experiences a lot of transient vibrations and small variations in acceleration. Because the G-tech can detect even the slightest change in acceleration (changes so small you cannot feel them but the G-tech can sense them), if you simply looked at the raw data from the sensors, it would appear to be very “noisy”.

For this reason, the G-tech “smooths” the acceleration data to remove the noise, while keeping the overall shape and features of the acceleration profile.

The G-tech allows you to adjust the “smoothing” setting to various degrees. The setting you use will depend on what you hope to accomplish with the data.

**Note:** *The greater the smoothing, the more immune the G-tech is to abrupt changes in G-force. Bear this in mind when using the G-Lights (page 126).*

Figure 40 is an example of lateral acceleration recorded while going through a series of turns. It shows how the different kinds of smoothing available in the G-tech remove the noise (the “wiggles”) from the underlying signal.

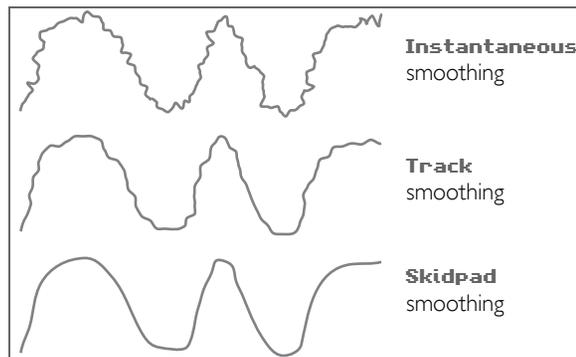


Figure 40: Different smoothing settings

- Set the **Smoothing** to **Instantaneous** to look at the “raw” data (valuable when looking at the quick changes in direction, suspension tuning etc.) This setting shows the most detail but can also make overall trends difficult to spot.

- Set the **Smoothing** to **Track** most of the time. **This is often the best setting for evaluating overall driver performance.**
- Set the **Smoothing** to **Skidpad** when doing Lateral G skidpad measurements only in order to get the data which is comparable to standard magazine tests (you have to sustain 3 seconds of continuous / stable Gs).

The default smoothing setting in the G-tech is “Track.”

When you are on the **everyday** screen or the **recording** screen, the display indicates the current (active) smoothing type. When you are on the **replay** screen, the display indicates the type of smoothing that was used for the session being replayed.

<input type="checkbox"/>	<b>Instantaneous</b> smoothing
<input checked="" type="checkbox"/>	<b>Track</b> smoothing
<input type="checkbox"/>	<b>Skidpad</b> smoothing

Figure 41: Smoothing Type Indicator

## Max Lat / Long Gs

Setting **Max Lateral Gs** and **Max Longitudinal Gs** will set the maximum G values for the G-bars.

You can configure a different “Max G Level” for lateral Gs and longitudinal Gs. This allows you to tailor the sensitivity of the G bars for each type of acceleration.

For example, if your driving will involve a lot of abrupt and severe braking and accelerating, and not too much turning, you might want to configure the Max Longitudinal Gs to a larger value than the Max Lateral Gs value.

A larger value (such as 5 G) will allow you to see large G values register, at the expense of resolution.

A smaller value (such as 1 G) will allow you to see finer resolution (i.e. see smaller changes in G force) at the expense of dynamic range (i.e. how much of a “swing” in G force can be seen).

The default G-force value for both G-bars is 2.0 Gs.

## G Lights

Setting **G Lights On/Off** will determine whether or not you will be warned with Bright LEDs as you are getting close to the maximum lateral or longitudinal Gs.

All four LEDs will start blinking at 80% of the maximum G values that you entered indicated by the gray area of the G-bars. This will provide you with an early warning as you are getting close to the “edge.”

Road conditions, as well as many other factors, will influence the continuously varying road holding capabilities of your car.

Use this feature conservatively and only as a guide indicating when you are getting close to the limit; do not use the G Lights to indicate that you are **at** the limit!

Suppose your car can pull 0.90 Gs on a dry skidpad. That might be something like 0.60 Gs on a wet skidpad. By taking the road conditions into account when setting the thresholds, you can choose values that are tailored to the area where you live. For example, in a dry climate the limit might be set closer to dry conditions (0.80 Gs or so). In a damp climate the G limits would be lower.

We have found that this feature is most useful at the track, since it's valuable to have a visual indication of when you are approaching the adhesion limits of your vehicle. On a track day, you should set up the limits according to the current conditions (dampness, temperature, track surface, tire wear, suspension settings, etc.)

**Warning:** Adverse weather conditions severely impair vehicle controllability, especially at high speed. When using this device, drive cautiously and within the limits of your vehicle under the conditions.

**Warning:** Do not rely on the G-Lights for indications of tire adhesion/safety. Many factors can affect the G limit of your vehicle, such as tire pressure and wear, temperature, aerodynamic drag, bank of road/track, road condition, and others. The G-tech should not be used as the only basis for driving decisions.

**Warning:** There is a slight lag between when the G-tech senses Gs and when the G-lights are activated. This is affected by the smoothing setting (page 124). Acquaint yourself with the G-tech's G-lights behavior on a familiar track and in a familiar vehicle.

**Note:** *The G-lights will not be useful on banked turns.*

## Shift Lights

Shiftlights are fully-functional in **Road Racer Mode** just as they are in **Drag Strip Mode**.

Shiftlights can be used simultaneously with G-Lights, i.e. they can be enabled or disabled independently of each other. Any time the G level or the RPM level changes, the G-tech updates the lights accordingly.

Generally we have found that using both sets of lights at the same time is confusing for most users, but we did not want to be the ones to tell you "you can't have your cake and eat it too."

For more information on setting the shiftlight setpoint, please refer to "Setting the Shiftlight RPM level" on page 21.

For more information on enabling/disabling shiftlights, please refer to "Enabling / Disabling Shiftlights" on page 73.

## Upload session data

To upload a particular session from the G-tech to the PC, please perform the following steps. (Make sure that you first go to the Download menu in your PASS RR software and select Download Data)

- 1 Start in **Road Racer Mode**.
- 2 Select "**Stored Session**" and press .
- 3 Select "**Select a Sessions**" and press .
- 4 Choose the desired session and press .
- 5 Select "**Upload to PC**" and press .
- 6 G-tech will show you a screen indicating that the transmission is in progress.

To upload **all** sessions, please perform the following steps:

- 1 Start in **Road Racer Mode**.
- 2 Select "**Stored Sessions**" and press .
- 3 Select "**Upload all to PC**" and press .
- 4 G-tech will show you a screen indicating that the transmission is in progress.

## Using Road Racer Mode

In Solo or skidpad testing you will find out that using the G-tech by itself will give you all the results that you will need.

However, when road racing, where you go through several laps in particular session, you will find that you need timing information to make the recorded data most useful.

The G-tech does not automatically determine lap timing around the track so you have to resort to timing information from beacon based timing equipment (Hot Lap, etc.) or stopwatch timing from a friend as you cross a fixed point.

You must coordinate the timing information between the G-tech and the stopwatch or timing system. This is important when analyzing the laps in the PASS RR software because you will need lap timing information to divide the session into individual laps.

Start the stopwatch in the pits at the exact same moment as you start recording on the G-tech. This way as you go out the pits and do your warm-up lap you will record the time from the moment you started the stopwatch (and G-tech session) to the time when you first crossed Start/Finish line

(or wherever the timing person is) at the beginning of a first timed lap. You have to know the time between when the G-tech started its session and the beginning of the first timed lap. You will enter this time as the warm-up lap in the PASS RR.

If you are using a beacon based timing equipment the technique is a bit different. After your warm-up lap you will start recording the session at the exact moment as you are crossing the Start/Finish line (or wherever the beacon is) for the first time. That way you can enter the lap times that you get from the timing system in to PASS RR and they will brake-up the session in proper laps. In this case you will enter zero time for the warm-up lap in the PASS RR.

This could be a bit tricky in some race cars with 5 point seat belts because it might not be that easy to reach the  button to start recording while strapped in. So, while you are in the pits, make sure you can do this safely and position the G-tech accordingly.

What you need to end-up with is a list of lap times (with the warm-up period in a case of a stopwatch) along with recorded session. So that you can enter these times in the PASS RR software and the software will separate the session into laps for easy analysis.



# Additional Info

This section is a collection of tips, technical information and reference information for your use.

## RPM Calibration Tips

The G-tech monitors vehicle RPMs constantly. In order to accurately convert your vehicle's electrical signature to RPMs, however, you must first perform an "RPM calibration" (page 23).

You can perform the RPM calibration while the vehicle is stationary or while it is moving (in gear).

The only thing that matters during RPM calibration is that the vehicle RPMs are stable (unchanging) and that they are at the value requested by the G-tech.

This means that if the G-tech instructs you to rev the engine to 4000 RPM and press , make sure the RPMs are steady right at 4000 RPM before pressing . The more careful you are during calibration, the better your RPM readings will be.

Some vehicles will allow you to rev the engine to redline while parked; others have a rev limiter that kicks in early (such as at 3000 RPM) when the vehicle is not moving.

If your vehicle rev limiter kicks in early while stopped, you will need to calibrate your RPMs while moving in gear. In this

case, you should have assistance from a passenger. You can calibrate the RPMs when the vehicle is moving in gear, or in neutral and stopped, so long as the RPMs are at the specified level.

Vehicles with automatic transmissions might need to be placed in first gear to keep the transmission from upshifting during the High RPM calibration.

Some vehicles have a very faint RPM signal. If you have performed an RPM calibration but the G-tech tachometer does not accurately represent your RPMs, your vehicle might fall into this category.

On these vehicles, you may have better results by turning on some of your electrical systems (such as the headlights, defroster, or fan) during the RPM calibration process. If you do this, however, you should keep these systems powered when using the G-tech as well.

Another point of note: with many vehicles, the RPM signal is very weak below 1000 RPMs (even 1500 RPM on some vehicles). If this is true of your vehicle, at low RPMs the G-tech will register the default value of 750.

During the RPM calibration process, the G-tech suggests two RPM values to use (e.g., 4000 RPM and 2000 RPM). These

suggestions are based on what you input for your vehicle redline.

In all but a few cases, the suggested RPM values will provide a good RPM calibration. If you are not pleased with how well the G-tech is measuring RPMs after a calibration, the G-tech will allow you to change the two RPM calibration points.

For example, for a vehicle with a redline of 6500 RPM, the G-tech may suggest revving to 4000 RPM for the high value, but you are free to change this number to a larger number, like 6000 RPMs, during the calibration process.

For example, during RPM calibration, the first screen may come up as such:

```
Please Rev your engine
to: 4000 rpm
Use arrow keys to
adjust if necessary.
Press OK to continue
or MENU to cancel.
```

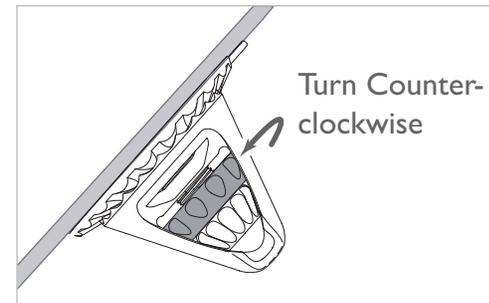
If you would like to calibrate at 6000 RPMs instead of 4000 RPMs, just press **▲** twice to change the "4000" to a "6000", and then rev your engine to 6000 RPMs and press **OK**.

## Adjusting the Bracket

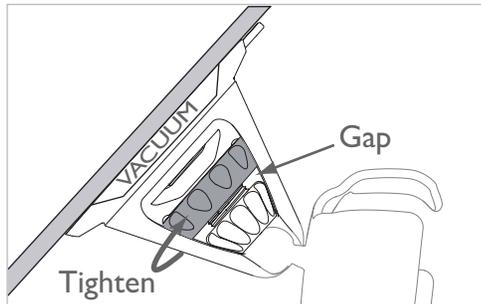
This section describes how to adjust the position of the mounting clip for better viewing.

It is very important that this technique be followed in order to avoid damage to your mounting system.

Turn the Large Vacuum Nut *counter-clockwise* until the mounting clip can rotate freely.



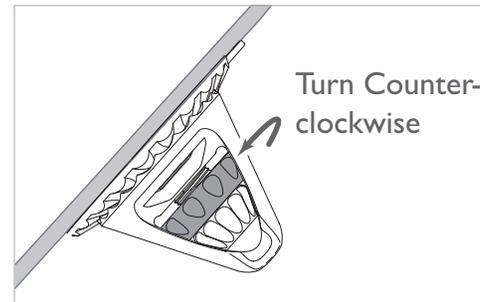
- 2 Adjust the position of the mounting clip gently. If the clip does not pivot easily, loosen the Large Vacuum Nut even more, otherwise you risk damaging the ball portion of the mounting clip.
- 3 Turn the Large Vacuum Nut *clockwise* until it is snug and the mounting clip is held firmly in place.



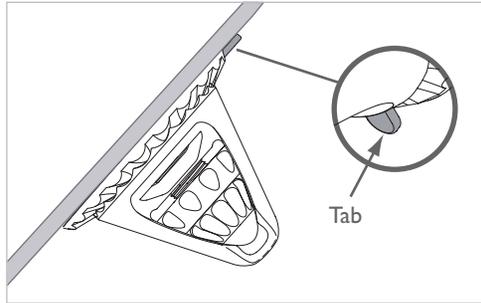
## Removing the bracket

It is very important that this technique be followed in order to avoid damage to your mounting system.

- 1 Turn the Large Vacuum Nut *counter-clockwise* until it is snug up against the Small Tensioning Nut.



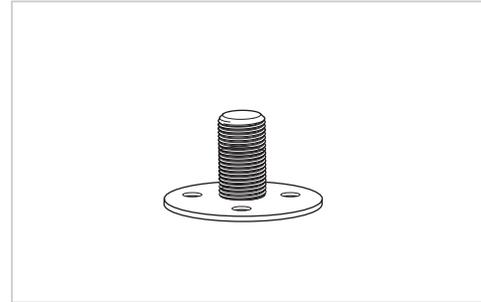
- 2** Find the small rubber tab protruding from the side of the large rubber suction cup that is attached to the windshield. Pull the rubber tab gently away from the windshield. This should break the vacuum seal and the entire mounting apparatus should come off easily.



## Permanent Mounting

Your G-tech is supplied with a permanent mounting stem (Figure 42) which can be attached to a part of your vehicle other than the windshield.

**Note:** To use the permanent mounting system, holes must be drilled on a relatively flat surface within the vehicle.



**Figure 42: Permanent Mounting Stem**

Use the provided screws to mount the permanent mounting stem in your vehicle. Re-assemble the mounting bracket as shown in page 25. Remember not to overtighten.

## Battery Replacement

The G-tech contains a small internal battery that powers its internal clock when no external power is applied.

The battery will last several years, but at some point the G-tech's internal battery may need replacing.

If the G-tech loses the current date/time when you power it off and then on again, the battery needs replacing. You can determine whether the battery is dead by going into **Configuration Mode** and going into the "Set Date and Time" menu (p. 20).

If you encounter this situation, please contact Tesla Electronics Technical Support (p. 143).

## Initializing G-tech

Under certain circumstances, the G-tech may elect to perform certain "housekeeping" functions at the time of power up. This is particularly likely after a firmware upgrade or after deleting all runs & stored sessions.

If the G-tech indicates it is initializing at power-up via a message on the display, just let it do its thing, and do not power off the G-tech until the initialization process is complete.

Failure to let the G-tech initialize properly can cause the unit to malfunction.

## Frequently Asked Questions

**Note:** You can visit the G-tech Pro Forums website at: <http://www.gtechproforums.com/> to discuss the G-tech and ask questions.

**Note:** Please visit the Tesla Electronics Inc. website at: <http://www.gtechpro.com/support.html> for the most up-to-date list of Frequently Asked Questions.

**Q : Can I disable the speed mark?**

A : No. But you can set it to 150MPH, which is essentially the same effect for most vehicles, since very few vehicles can reach 150MPH in the span of a 1/4 mile.

**Q : The horsepower and torque numbers I see seem to be way off. What is going on here?**

A : There is a specific driving style and procedure that we recommend when measuring horsepower and torque. The driving style is different than that for 1/4 mile runs. Please refer to "Horsepower, Torque & G-tech" on page 102.

**Q : Can I use the G-tech with my motorcycle?**

A : Yes, although the RPMs generally won't work with a motorcycle. Therefore, you can get 0-60 MPH, 1/4 mile, etc. and other straight-line measurements, but graphs such as RPM vs. time, and HP & TQ vs. RPM, will probably be meaningless.

The problem with RPMs on motorcycles is due to differences between motorcycle and automotive electrical systems.

**Q : Can I "hardwire" my G-tech into my vehicle?**

A : For this, we recommend that you buy a 12V extension power cable, such as Part Number 270-1592 — "10-Ft. Coiled 12VDC Car Power Adapter Extension Cord" — from Radio Shack, and then modify and route that cable to your preference.

Most importantly, please do not cut or modify the cable that came with your G-tech!!! Tesla Electronics Inc. cannot replace cables that have been modified or damaged.

## Troubleshooting

**Note:** Please visit the Tesla Electronics Inc. website at: <http://www.gtechpro.com/support.html> for the most up-to-date troubleshooting information.

### The G-tech does not light up.

The 12V cigarette lighter DC Power Cable has a fuse in the end that plugs into your vehicle. If the cable does not seem to provide power when the vehicle is running, the fuse may be blown and need replacing.

To replace the fuse, unscrew the tip and replace the fuse with a standard 1 AMP fuse. Fuses can normally be purchased at any automotive parts store.

### The tach needle moves when my vehicle's RPMs change, but it is not accurate.

*This indicates that the RPMs need calibrating for this vehicle. Please refer to p. 23 for information on RPM calibration, and p. 132 for RPM calibration tips.*

### The tach needle is sporadic, or does not move at all, after I have performed an RPM calibration.

*If the tach needle does not respond at all to changes in your vehicle's RPMs, this indicates that the G-tech may be having difficulty locking on to your vehicle's RPM signature. Please refer to p. 138 for troubleshooting.*

### My G-tech keeps saying "Staging" forever when I press from the G-Window. In other words, I never get the "Launch when ready" message.

*Your G-tech's accelerometers need to be calibrated. Please refer to "Re-calibrating accelerometers".*

### I have a message on my screen that says "DIAGS FAILED" or "Diagnostics" with some other text.

*Your G-tech's built-in diagnostics have detected an internal problem. Please call Tesla Technical Support at 310-452-0030 for assistance.*

## G-tech-Computer Connection

In order to upgrade the firmware in your G-tech or transfer data (such as stored runs) to your computer, you must ensure that the G-tech is powered on and connected to the computer via the supplied serial cable.

Generally you will be doing this indoors, so you can use the AC power adapter to power the G-tech.

The serial cable is designed so that only one end will plug into the G-tech. The other end plugs into an available serial port on your computer. It does not matter whether the G-tech is powered on or not when you connect the serial cable.

**Note:** *If your computer does not have a serial port, you will need to use a serial-to-USB converter device. Companies such as Belkin, Keyspan, D-Link, and Tripp Lite make these devices. Tesla Electronics Inc. cannot provide technical support for any of these devices however.*

Further instructions are provided with firmware upgrades and the PC Analysis Software. Please visit the Tesla Electronics website at <http://www.gtechpro.com> for updates to the G-tech firmware and the PC software.

## Glossary

**Acceleration run:** a procedure where the vehicle accelerates from a stop when the G-tech is staged and ready to begin timing. The staged G-tech starts timing the acceleration run automatically when the vehicle begins moving. For more information on acceleration runs, see “Measuring Your Runs” on page 36.

**Accelerometer:** a precision device which outputs an electrical signal that changes under acceleration.

**Calibration:** the process of teaching a device how to relate a measurement of a system into a useful, quantified value.

**Configuration Mode:** One of 3 operating modes in the G-tech. In this mode, all settings and configuration items are entered.

**Cornering Gs:** see [Lateral Acceleration](#).

**Cornering Lights:** LEDs on the G-tech that illuminate when lateral G forces of a specific value are exceeded.

**Deep Staging:** A fairly short rollout. On a track, to stage deep, you would keep the vehicle rolling forward to within a few inches of the stage beam. This gives the vehicle almost no distance to move forward and pick up speed prior to starting the clock.

**Distance Mark:** An LED that comes on when a specific distance milestone (60 ft, 1/8 mile or 1/4 mile) has been reached.

**Drag Strip Mode:** One of 3 operating modes in the G-tech. In this mode, the G-tech allows the user to measure, store and review straight-line performance data of a vehicle.

**E.T.:** Elapsed time.

**Foul:** Occurs when the user launches a vehicle too early, and it crosses the starting line before it should.

**Full Tree:** A Christmas light tree where the three amber bulbs are lit in succession, one after another, followed by the green starting light.

**G-Lights:** LEDs that are activated when pulling certain amount of Gs.

**G Limits:** In the G-tech, you can configure G limits for lateral and longitudinal Gs. These limits affect the G-bar resolution (page 126) and the G Lights behavior (page 126).

**Lateral Acceleration:** Sometimes referred to as “cornering Gs,” this is what is actually called “centripetal acceleration.” It is the reason that when you turn your vehicle sharply while accelerating, you feel like you are going to slide out of the seat.

**Launch:** The process of getting your vehicle moving from a standstill.

**LEDs:** Light Emitting Diodes, the red lights on the G-tech are LEDs.

**Logging Rate:** How often data are stored during road racing (page 123).

**Menu:** A multi-line text display in the G-tech that allows a user to make a selection. Generally in a menu:  selects the currently-highlighted item;  goes up one level in the menu;  and  move the highlighted selection cursor to another item.

**Pitch:** The small up/down motion of the front and rear of your vehicle as it experiences changes in acceleration.

**Pro Tree:** A Christmas light tree where the three amber bulbs are lit together, followed by the green starting light.

**Reaction Time:** The elapsed time from the last amber bulb coming on until the vehicle crosses the starting line.

**Road Racer Mode:** One of 3 operating modes in the G-tech. In this mode, the G-tech allows the user to measure, store and review track performance data of a vehicle.

**Rollout:** The distance a vehicle can travel in the staging area during a drag race before the clock starts timing.

**Session:** Time period of recording Gs and RPMs in **Road Racer Mode**.

**Shallow Staging:** A fairly long rollout. On a track, you would stop the vehicle rolling forward as soon as the stage beam is broken. This would typically give the vehicle 12 inches to move forward and pick up speed prior to starting the clock. Shallow staging will yield a faster E.T. and trap speed than will deep staging, everything else being equal.

**Shiftlights:** LEDs that come on when the vehicle RPMs approach the shiftpoint.

**Shiftpoint:** An RPM value programmed into the G-tech. At this value, the shiftlights blink at full intensity.

**Smoothing:** The degree to which small changes in data are shown (page 124).

**Speed Mark:** A speed that is programmed into the G-tech. When the vehicle reaches this speed, an LED is illuminated for one second.

**Stored Runs:** Acceleration runs that you have stored in the G-tech's internal memory. You can store up to 30 runs in the G-tech.

**Trap Speed:** The average speed of a vehicle during the last 66 feet of a quarter mile at a dragstrip. For the G-tech, "trap speed" is the speed of the vehicle when it crosses the quarter mile mark.

## For more info

Tesla Electronics Main Company Website:  
<http://www.gtechpro.com>

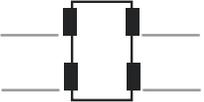
G-tech Technical Support:  
<http://www.gtechpro.com/support.html>

G-tech Discussion Forums:  
<http://www.gtechproforums.com>

Company Contact Information:  
Tesla Electronics, Inc.  
G-tech Division  
1749 14th St.  
Santa Monica, CA 90404  
Phone: (310) 452-0030  
Fax: (310) 452-0078

# G-TECH Run Log

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Date:		Notes:	
Track:		1/4 or 1/8 (circle one)	
Time of Run:		AM PM (circle one)	
Lane:		Right Left (circle one)	
Humidity:		%	
Temp:			
Altitude:			
Tire Pressure:			
		Launch RPM:	
Roll Out:		Shallow Deep (circle one) Approximate Rollout Distance (inches):	
Shift Points:	1st RPM	2nd RPM	3rd RPM
	4th RPM	5th RPM	
E.T.:	60Ft Time:		330Ft
Trap Speed:	1000Ft Time:		0-60mph:

Make several photocopies of this page and fill them out after each run. Make sure to take notes regarding anything relevant that occurred during a particular run. We have found that having a record of this information is a tremendous help in tracking your performance improvements.

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