

# VERICOM VC3000 BRAKE METER CONDENSED OWNERS MANUAL

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## 1. INTRODUCTION & QUICK START

**W**elcome to state of the art technology in Vehicle Testing. The VC3000 has been designed for ease of use and simplicity of operation for quick and easy results. The unit is preprogrammed with standard defaults so that it is ready to operate immediately. The new VC3000 also measures lateral G Force. The more acquainted you become with your unit the more applications you will discover. Use the optional Profile Express software to download data to your computer and the VC3000 becomes a professional tool.

The two most common uses of the VC3000 in the Braking Mode are: (1) Determining the coefficient of friction of the road surface and (2) Analyzing the vehicle's braking ability.

The most common use of the VC3000 in the Acceleration mode is to measure time and speed at a specified distance.

This manual is a condensed version and covers everything necessary to operate your VC3000. If you would like an expanded version in PDF format please see the support/downloads page on our web site.

The following instructions are quick starts for the various common uses, utilizing the default modes except where noted. Please refer to the detailed operating instructions for more information. If you do not wish to use the batteries on the VC3000, plug the provided power cord into back of VC3000 and into vehicle's accessory jack.

### Quick start guide to Brake Mode



Press the red **Power** key. From the READY screen press **Braking**. The VC3000 will zero adjust itself and display:

Push  
Auto Start



Press **Auto Start**. The VC3000 will display 'Auto-Start-Ready' and the current G reading. To avoid false triggering you may press **Auto Start** any time after zero adjusting.

Accelerate the car to the desired initial braking speed. After reaching the desired initial braking speed, hit the brakes hard and fast, applying maximum brake pedal pressure until the vehicle comes to a complete stop.

After a braking run elapsed time, speed, distance, adjusted distance, average X-axis, average Y-axis G and G-force every 1/10<sup>th</sup> second will be displayed. Use the up and down arrow keys to scroll through the data.



Press the down arrow **↓ 0** for lateral average and peak G force and G force for every 0.10 second.



Press the up arrow **↑ 5** to scroll backwards through the display.

## Quick start guide to Acceleration Mode

### Auto Start

- Press the Red **Power** key. From the READY screen press **Acceleration**. The VC3000 will then zero adjust itself and display:

Select  
Option or  
Auto Start

- Press **Auto Start** to start the VC3000 timing when you launch the vehicle. It does this by sensing when the vehicle exceeds the G force threshold, which can be changed as described in Chapter 7, Setup. To avoid false triggering you may press **Auto Start** any time after zero adjusting.
- After reaching the ¼ mile point, the VC3000 will display distance, time, speed and G force for all the quickset points. Pressing the down arrow **↓ 0** will scroll through various distances, speeds, peak and average G force, and peak horsepower.
- Press the up arrow **↑ 5** to scroll backwards through the display.
- To power off the VC3000, hold down the red **Power** key until the unit beeps.

## Quick start guide to Continuous Mode

- Press the red **Power** key. From the READY screen press **Continuous**.

Monitor longitudinal and lateral G force. VC3000 will read a negative G force for a right turn and positive G force for a left turn. The Vehicle must be stopped and level so the VC3000 can zero adjust itself accurately.

### Example:

- Press **Continuous**.

- The VC3000 will then display:

Save in File  
memory?  
Depress YES or NO

- Press **ENTER / YES** or **CLEAR / NO**  
The unit will zero adjust and then display the current X and Y G-Force and the Peak X and Y G-Force.
- Press the **Graph/Data** key to display a G-force bar graph.
- Press **CLEAR / NO** to return to the Ready screen.
- To power off the VC3000, hold down the red **Power** key until the unit beeps.

## Putting your VC3000 together

Check to see that the following items are supplied with your VC3000:

- 1 VC3000 Unit
- 1 Power cord (to cigarette lighter)
- 1 AC adapter
- 1 VC3000 manual
- 1 Case
- 4 Extra Suction Cups

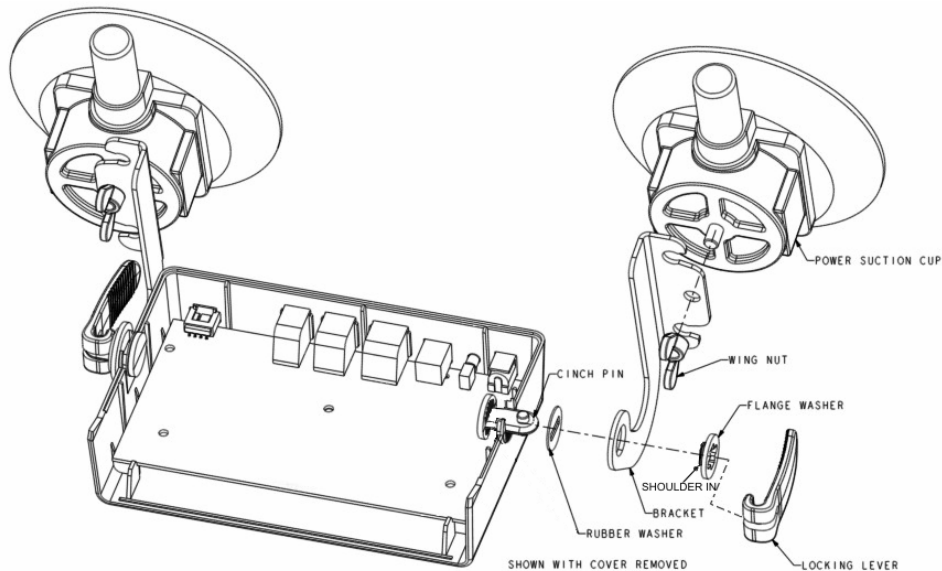
Optional Accessories:

- 1 Micro Printer assy.
- 2 Profile Express Software.

**Assembly:**

1. Put a rubber washer over the cinch pin. Attach the bracket with the suction cups angled to the outside as shown in Figure 1.
2. Place the flange washer with the shoulder facing inward toward the bracket and center the bracket on the shoulder of the washer.
3. With the unit facing you, snap the locking lever over the pin with the lever facing back. Then rotate the lever forward to lock.
4. If you do not wish to use the batteries, plug the power cord into the back of the VC3000 and into the vehicle's cigarette lighter.

**Figure 1: VC3000 Assembly w/vacuum cups**



## 2. OPERATING YOUR VC3000: THE BASICS

### Mounting

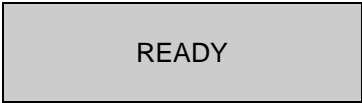
Most testing will be conducted by mounting the VC3000 roughly in the middle of the windshield using the supplied brackets and suction cups. It may also be mounted anywhere in the vehicle that allows the unit to be parallel to the road surface both longitudinally and laterally. Keep the VC3000 flat and level and keep vibration to a minimum. Foam may be used under the unit if mounting to a hard surface to eliminate vibration, but be sure the unit is tight to the foam so it doesn't move during the test. The unit should not shift in its mounting during the test.

### Leveling

Choose a location on your windshield that best allows for viewing the display and operation of the function keys. Do not mount the VC3000 on the windshield if that is in violation of federal, state or local laws. Be sure the windshield and suction cups are clean. To release them pull the release tab located on the edge of each cup. Square the VC3000 to within 3 degrees to the direction of travel and attach it to the windshield. Usually this means selecting a location that is roughly in the middle of the windshield. Align the VC3000 parallel to the road surface both longitudinally and laterally. Reference the integrated bubble levels only if the surface is flat and level in both axes.

You may position the vehicle level on a flat road surface or parking lot and use the integrated bubble levels to level it. Align the VC3000 to within 3 degrees of level and lock the levers forward. The VC3000 will zero adjust itself before each run, so you do not need to reference the bubble levels to get full accuracy. Eyeballing it is sufficient. Your VC3000 is ready for operation.

Turn on the VC3000. The VC3000 will display:



## Modes of Operation

From the READY screen you may select from the three basic modes of operation of the VC3000: **Acceleration** runs, **Braking** runs and **Continuous** display of G.

If at any point you would like to back up and redo your steps, you can get back to the READY screen by pressing the **CLEAR** key a few times. Should you want further instructions on what to do next any time press the **HELP** key.

## Run Data Memory

The VC3000 stores all runs to flash memory. Runs stored in memory can be viewed on the VC3000 display, printed or imported into Profile Express for Windows. Eventually the memory will fill up or the number of files will exceed 255. When this happens you will have to clear memory. Be sure to print or import any important data before clearing memory. The display will prompt you to clear memory after an error message appears. You should clear run data memory periodically to ensure data storage is successful. To clear memory, press the **CLEAR** button when the screen displays READY and follow the prompts. See troubleshooting section on page 18 for details on each error message.

## Slope of the road and zero adjusting

When performing a test the VC3000 will zero adjust itself for the slope of the road. The Average G-Force (Drag Factor) given by the VC3000 will include the grade of the road.

When doing a long (¼ mile) acceleration test you will need a level test track to get good data from your VC3000. A rise or fall of several feet over a quarter mile will not effect the accuracy of the VC3000, but if you make your runs on a hilly road you will not get good data.

The VC3000 will also give you accurate data if you operate it on a test track that is not strictly level but is of a constant grade. You must allow the VC3000 to perform its zero adjusting on that same grade. When investigating an accident on a grade, zero adjust the VC3000 at the scene of the accident and the data will be accurate.

When testing on an incline if you zero adjust on the slope the VC3000's average G will be the Drag Factor and the number to use in speed formulas. Drag factor equals Coefficient of friction - (downhill) or + (uphill) gradient. When measuring Coefficient of Friction or Braking Efficiency do your skid test on a level road surface.

Just before a run the VC3000 will zero adjust itself. During zero adjusting the vehicle must be at a complete stop and on the same grade that the test is being run.

## 3. BRAKING MODE

The braking mode allows you to accurately measure a vehicle's braking performance and the average G (drag factor) of the road surface. To test a vehicle's braking performance you will need to perform the test over a straight and level surface. During the test the attitude of the vehicle must be straight and level within 4 degrees. When testing or measuring Drag Factor the road surface does not have to be level; however, you must zero adjust the VC3000 at the same spot you are testing. This will allow the VC3000 to compensate for gradient and

all data will be accurate. The VC3000 will zero adjust itself before each run. The vehicle must be at a complete stop during zero adjusting.

## Getting VC3000 ready

If you do not wish to use the batteries on the VC3000 plug provided power cord into back of VC3000 and into vehicle's accessory jack. Plug external activation connector into VC3000 if you are using it (see page 14 for external activation). Mount the VC3000 using the suction cups near the center of the windshield, but not so it blocks your vision of the road. Level the VC3000 as described above. Drive to the spot you will be testing and bring the vehicle to a complete stop. Do not use this unit in violation of federal, state or local laws. For safety reasons the driver should never press any keys on the VC3000 while the vehicle is in motion. If observation and operation of the VC3000 is required from a moving vehicle, use a separate observer/passenger. Please buckle up and drive safely. See Brake Mode quick start on page 1 for operation sequence. Step by step examples of drag factor measuring and testing a vehicle's brakes are on our web site on the support/downloads page.

## How to avoid false triggering

To avoid false triggering of your braking run, you may press **Auto Start** any time after zero adjusting. For example, you may press **Auto Start** after the vehicle has reached the desired braking speed and before applying the brakes.

## Information available after a braking run

After a braking run elapsed time, speed, distance, adjusted distance, average X-axis G, average Y-axis G and G-force every 1/10<sup>th</sup> second will be displayed. Use the up and down arrow keys to scroll through the data. Braking Data may be displayed in metric (see page 11).

- Elapsed Time (E/T): The time from when the VC3000 was activated (see threshold page 11) until the vehicle came to a complete stop.
- Speed: The speed of the vehicle when the VC3000 was activated (see threshold page 11).
- Distance: The distance the vehicle traversed during the braking time.
- Distance (AdjD): Stopping distance assuming the vehicle was traveling at exactly the Brake MPH (usually 20) when the brakes were applied.
- Avg. Gx\*: Average longitudinal G force from when the VC3000 was activated to stop.
- Avg. Gy\*: Average lateral G force from when the VC3000 was activated to stop.
- Peak Gx: The maximum longitudinal G-Force obtained from activation to stop and the time where it occurred.
- Peak Gy: The maximum positive and negative lateral G-Force obtained from activation to stop.
- 1<sup>st</sup> PkGx: The maximum longitudinal G-Force obtained from activation to 0.75 seconds and the time where it occurred. This is useful to determine if a braking systems mechanical reaction time is sufficient.
- Reaction Time (R/T): The time from external trigger to the G threshold. (Shows only if externally triggered)
- R/T Dist: The distance traveled during the reaction time. (Shows only if externally triggered)
- G(x.x): The instantaneous G-Force at the corresponding time.
- Graphs: Press the **Graph/Data** key to display graphs of the run. Press 4 – 7 to get the data on the key. Press the same key again to scroll through multiple graphs, such as lateral G-Force.

\* The VC3000's Average G force (Drag Factor) is calculated by summing the G values and dividing by the number of samples. This will give the same result as using velocity and time.

While viewing the last test, press **Braking** to start a new Brake test without re-zeroing the accelerometer.

The Braking mode operating limits are:

	<u>English</u>	<u>Metric</u>
Maximum time	99.9 seconds	99.9 sec
Maximum speed	255 MPH	511 KPH
Maximum distance	9000 feet	1800 meters
Maximum acceleration	-2G	-2G

## 4. ACCELERATION MODE

### Getting the VC3000 ready

If you do not wish to use the batteries on the VC3000 plug provided power cord into the back of the VC3000 and into the vehicle's accessory jack if one is available. Mount the VC3000 using the suction cups near the center of the windshield, but not so it blocks your vision of the road. Level the VC3000 as described on page 3. Drive to the spot you will be testing and bring the vehicle to a complete stop. Do not use this unit in violation of federal, state or local laws. For safety reasons the driver should never press any keys on the VC3000 while the vehicle is in motion. If observation and operation of the VC3000 are required from a moving vehicle, use a separate observer/passenger. Please buckle up and drive safely.

### Performing the test

QuickSet™ is Vericom's term for one button programming for the ¼ mile. It assumes a ¼ mile acceleration run so programming to 1320 feet is not necessary. The VC3000 records data at 7 other distance points and 2 speeds within the ¼ mile (QuickData™ table). See "Reading acceleration data" on page 7.

To perform an acceleration run:

1. From the READY screen press **Acceleration**. The VC3000 will zero adjust itself and then display:

Select  
Option or  
Auto Start

2. Press **Auto Start**. Now start your run. Launch the car hard enough to trigger the Auto Start threshold (see threshold page 11).
3. To program a specific Time, Speed, Distance or G force, press the Time, Speed, Distance or G force button instead of the **Auto Start** button. Then enter the parameters, then **Auto Start**.

The run will end when:

1. The ¼ mile is completed for QuickSet™ mode.
2. The programmed end point is reached.
3. 99.9 seconds has elapsed.
4. The vehicle exceeds 255 MPH.
5. Any key is pressed.

Any information gathered up to when the run ended will be available.

The VC3000 is accurate through the ¼ mile, however, it is not recommended for use over ½ mile.

## Reading the data

After an acceleration run, bring the vehicle to a complete stop. Press the **Distance** or **G-Force** keys and the respective data will be displayed. Press the up **5** and down **0** arrows to scroll the data:

### QuickData™ table:

#### **Distance**:

- Ending Time, Speed, Distance and G.
- Time, Speed and G at the ¼ mile.
- Time, Speed and G at 1000 feet.
- Time, Speed and G at the 1/8 mile.
- Time, Speed and G at 330 feet.
- Time, Speed and G at 60 feet.
- Time, Speed and G at 30 feet.
- Time, Speed and G at 15 feet.
- Time, Distance and G at 30 MPH.
- Time, Distance and G at 60 MPH.
- Average Gx, Average Gy.
- Peak Gx and the Time, Speed and Distance where it occurred.
- Peak Gy and the Time, Speed and Distance where it occurred.
- Peak HP and the Speed and Distance where it occurred.
- Reaction Time. (Countdown start)

#### **G-Force**:

- Longitudinal and lateral G-force at each QuickData point reached.

#### **Graph/Data**:

- Display graphs of the run. Press 4 – 9 to get the data on the key. Press the same key again to scroll through multiple graphs, such as longitudinal and lateral G-Force.

Press **CLEAR** to get back to the READY screen.

While viewing the last test, press **Acceleration** to start a new acceleration test without re-zeroing the accelerometer.

The Acceleration Mode operating limits are:

	<u>English</u>	<u>Metric</u>
Maximum time	99.9 seconds	99.9 sec
Maximum speed	255 MPH	511 KPH
Maximum distance	9000 feet	1800 meters
Maximum acceleration	+2G	+2G

## 5. CONTINUOUS MODE

In this mode the VC3000 functions as a high-resolution G meter. As a G meter, it measures acceleration in two axes. The display is updated every 0.5 second with an average of several accelerometer readings.

To get into the Continuous G Mode:



Press the red **Power** key. From the READY screen press **Continuous**.

Monitor longitudinal and lateral G force. VC3000 will read a negative G force for a right turn and positive G force for a left turn. The Vehicle must be stopped and level so the VC3000 can zero adjust itself accurately.

☞ The VC3000 will then display:  
 Save in File  
 memory?  
 Depress YES or NO

☞ Press **ENTER / YES** to save the data or **CLEAR / NO**.  
 The unit will zero adjust and then display the current X and Y G-Force and the Peak X and Y G-Force.

☞ Press the **Graph/Data** key to scroll through various bar graphs and a friction circle graph.

☞ Press **CLEAR / NO** to return to the Ready screen.

☞ To power off the VC3000, hold down the red **Power** key until the unit beeps.

Max Lateral Acceleration can be measured using the VC3000. The vehicle is driven in a circle accelerating and turning inward toward the center of the circle making the radius smaller until the vehicle skids laterally (sideways). This is called a skid pad test. When using the Coefficients of Friction to compare different road surfaces for skid pad testing static friction should be used instead of kinetic friction because "peak" G is being measured.

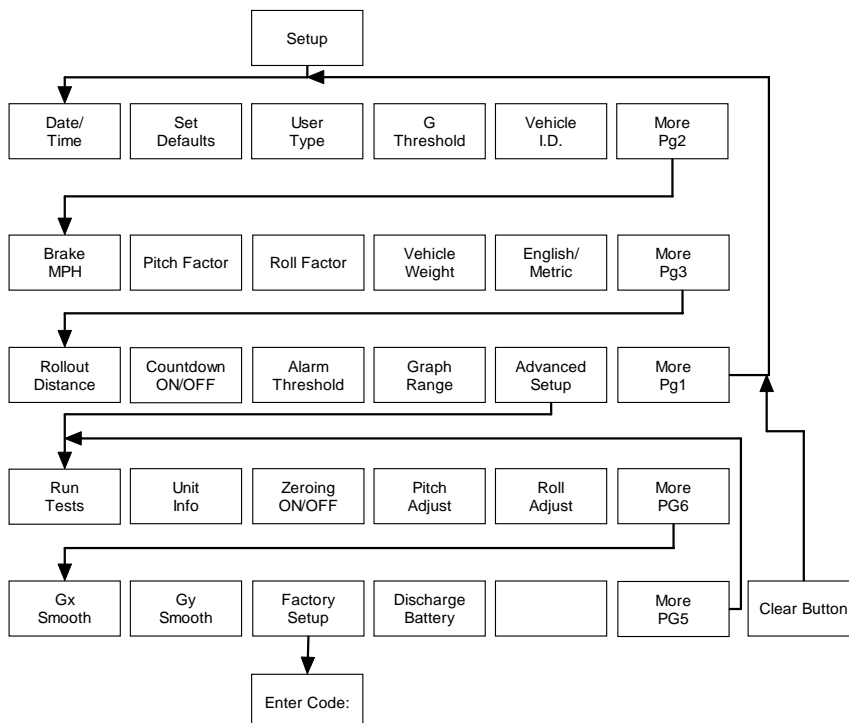
## 6. SETUP

Press the **Setup** key from the READY screen to enter Setup mode and change the factory default values of user variables. Alternately, use Profile Express (Tools/VC3000 Setup) to inspect or change any of the VC3000 Settings.

### Flow Chart:

The following diagram is a flow chart of the various prompts and option selections on the VC3000. A detailed description of each setting follows. The unit will operate in default mode without any operator intervention after power up if desired.

**Figure 2 Setup Flowchart**



## Description of each setting:

### Date/Time:

All VC3000's have a date chip that maintains time and date even in the absence of power. It contains a lithium battery supply, which will last a minimum of 10 years. It is Y2K-Compliant and keeps track of the century. The time and date of the run is stored in memory and will be printed or uploaded to Profile Express.

1. Set the time for your time zone by entering every number, including zeros. To enter time of 9:00 enter 0, 9, 0, 0.
2. Enter 1 for am or 2 for pm after the digits are entered. Press Enter if date is valid.
3. Enter the date including zeros. After the date is entered the VC3000 sets the time and date in memory.

**CLEAR** may be pushed anytime to abort setting the time and date.

### Set Defaults:

This sets the user variables to factory default values of:

- Units = English
- User Type = Advanced
- G Threshold = 0.200 (See note below)
- Vehicle I.D. = 0
- Brake MPH = 20
- Pitch and Roll factor = 1, (adjustment = 0.9700)
- Vehicle weight = 1000
- Rollout distance = 0
- Alarm thresholds = 0.000
- Graph Range = 1.0
- Countdown = OFF
- Gx and Gy smoothing = 3
- Zeroing = ON

G Threshold note: Units shipped with requested New York State specifications have a default threshold of 0.100 G.

### User Type:

Changing the user type changes the data that is displayed after a test and when runs are selected from memory. In some cases it will change how the test starts and will change other user settings.

### Accident Reconstruction:

Display – Brake mode:

- Reaction Time
- Reaction Time distance
- Elapsed Time
- Speed
- Distance
- Avg. Gx
- Avg. Gy
- Peak Gx and the time it occurred
- Peak  $\pm$  Gy
- G every 0.10 sec.

Display – Acceleration mode:

- Time to programmed parameter
- Speed to programmed parameter
- Distance to programmed parameter
- Avg. Gx

### Transit:

Display – Brake mode:

- Reaction Time

- Reaction Time distance
- Elapsed Time
- Speed
- Distance
- Adjusted Distance to predetermined speed
- Avg. Gx
- Avg. Gy
- Peak Gx and the time it occurred
- 1<sup>st</sup> Peak Gx and the time it occurred under 0.75 seconds

Display – Acceleration mode:

- Time to programmed parameter
- Speed to programmed parameter
- Distance to programmed parameter
- Avg. Gx

**OT - Rehab:**

- Does not zero the accelerometer before a run

Display – Brake mode:

- Reaction Time
- Reaction Time distance
- Elapsed Time
- Speed
- Distance

Display – Acceleration mode:

- Time to programmed parameter
- Speed to programmed parameter
- Distance to programmed parameter
- Avg. Gx

**Advanced:**

Display – Brake mode:

- Reaction Time
- Reaction Time distance
- Elapsed Time
- Speed
- Distance
- Adjusted Distance to predetermined speed
- Avg. Gx
- Avg. Gy
- Peak Gx and the time it occurred
- 1<sup>st</sup> Peak Gx and the time it occurred under 0.75 seconds
- Peak ± Gy
- G every 0.10 sec

Display – Acceleration mode:

- Time to programmed parameter
- Speed to programmed parameter
- Distance to programmed parameter
- Waypoints
- Avg. Gx
- Avg. Gy
- Peak Gx at time, speed, dist
- Peak Gy at time, speed, dist

**G Threshold:**

When using the Auto Start, the VC3000 starts timing your run when the vehicle reaches a  $\pm 0.2G$  threshold. If you launch or brake too gently you will be accelerating or decelerating before the VC3000 considers the run to have started, so your run will be off by that much. Be sure to launch or brake hard enough to trigger the VC3000 the instant the car changes motion; otherwise your data will be off by the time and speed it takes for the car to reach the  $\pm 0.2G$  threshold. If you have trouble launching or braking hard enough to trigger the Auto Start threshold, use the Countdown mode or change the G threshold to 0.1G. If the VC3000 is starting too soon such as in a large truck that decelerates quickly when there is no throttle applied, use a 0.3G threshold.

G Threshold note: Units shipped with requested New York State specifications have a default threshold of 0.100 G.

**Vehicle I.D.:**

The VC3000 allows the user to insert a vehicle ID for each test. The I.D. will print on the thermal printer when printing a run and will import to Profile Express as the vehicle.

**Brake MPH:**

The VC3000 will calculate the distance for an exact speed, as long as the actual test speed and desired target speed are within 5mph. The default is 20 MPH. Speeds from 1 to 100 may be entered.

**Pitch/Roll Factor:**

Enter the pitch and roll factors. The default is 1 for each. Pitch is the front-to-back tilt, and roll is the side-to-side tilt.

The VC3000 is affected slightly by the tilt of the car caused by suspension shifts under acceleration or deceleration. This effect is slight and for the purposes of the VC3000 is considered to be similar for all vehicles designed to be driven on the highways including motorcycles, passenger cars, semi tractor trailers and most off road vehicles. The VC3000 is set at a common pitch and roll factor (factor 1) for all vehicles with useful suspension systems.

The VC3000 is shipped with Pitch factor and Roll factor of 1, which is an adjustment of 0.9700. Once the Pitch and Roll factors are changed it will default to the new Pitch and Roll factors every time the VC3000 is turned on. The Pitch and Roll adjustment can be finely adjusted using advanced settings.

For rail cars, vehicles with abnormal or no suspension system and marine application the following guide will help you decide which pitch and roll factor to use:

Pitch and roll factor 0: Low Pitch and roll factor, for vehicles with no suspension system such as transit rail cars, fork lifts or farm tractors. Use 0 for testing on very low friction surfaces such as ice.

Pitch and roll factor 1: Normal Pitch and roll factor or default Pitch and roll factor, for all highway vehicles with useful suspension systems. Including motorcycles, passenger cars, semi tractor-trailers and most off road vehicles.

Pitch and roll factor 2: High Pitch and roll factor, for very short wheel based vehicles with a long suspension travel.

Pitch and roll factor 3: Very high Pitch and roll factor, for marine or similar application when the bow rises higher than the stern.

Pitch and roll factor 4: Extreme high Pitch and roll factor, for marine or similar application when the bow rises higher than the stern.

**Vehicle Weight:**

The VC3000 defaults to 1000 pounds unless you have changed it. It recalls the last weight you typed in even if the batteries have gone dead. Vehicle weight is used in horsepower calculations. If you do not change the weight, horsepower will be per 1000 pounds. Simply multiply by vehicle weight (including cargo) and divide by 1000 to get actual rear wheel HP.

**English/Metric:**

The VC3000 can give English or metric data for braking or acceleration runs.

The Metric data will be displayed in the following units:

KPH:	Kilometers Per Hour
M:	Meters

Metric runs are limited to 511 KPH and 1800 meters and the start to stop speed must be 10 KPH apart. The QuickSet™ mode will give distance QuickData™ points in English units and speed in metric.

**Rollout Distance:**

In acceleration mode, the distance traveled before the VC3000 starts timing the run. This simulates a drag strip timing system. Typically the rollout distance is 12 inches. Default is 0. If rollout distance is 0, the VC3000 assumes a 12 inch rollout.

**Countdown On/Off:**

Turn countdown on to start the brake or acceleration run with a countdown sequence. When the Auto Start button is pushed the VC3000 will delay momentarily, then start the countdown. Acceleration runs use 3333, 2222, 1111 to simulate a drag strip tree with 0.50 sec. between each number and records reaction time. Brake runs use 5555, 4444, 3333, 2222, 1111 with 0.50 sec. between each number. In Acceleration mode the reaction timer starts when 1111 is displayed and the run timer starts when the rollout distance is reached. In Braking mode the run starts when the countdown is completed and the display shows “B R A K I N G”.

**Alarm Threshold:**

There are 3 alarms that can be set so the VC3000 beeps when the threshold is exceeded; Accelerating, Braking and cornering. The alarm is turned off when it is set to 0.

**Graph Range:**

Set the maximum range of the VC3000 bar graphs and friction circle graph.

**Advanced Setup**

**Run Tests:**

Test some of the hardware on the circuit board including the accelerometer and the flash memory. **WARNING:** this test will erase all run memory!

**Unit Info:**

Display the software revision, hardware I.D. and the date it was last calibrated.

**Zeroing ON/OFF:**

The VC3000's accelerometer is set to a zero G reference at the factory on a calibrated level bench. When zeroing is turned off the VC3000 will use the zero G reference instead of zeroing before a test. Default is on. It should be turned off only in isolated cases, such as when zeroing before a test is not possible and the surface area to be tested is level.

**Pitch Adjust:**

Use this to finely adjust the Pitch factor. The VC3000 is affected slightly by the tilt of the car caused by suspension shifts under acceleration or deceleration. This effect is slight and for the purposes of the VC3000 is considered to be similar for all vehicles designed to be driven on the highways including motorcycles, passenger cars, semi tractor trailers and most off road vehicles. The VC3000 is set at a common pitch and roll factor (factor 1) for all vehicles with useful suspension systems.

The VC3000 is shipped with “Pitch factor” and “Roll factor” of 1, which is an adjustment of 0.9700.

**Roll Adjust:**

Use this to finely adjust the Roll factor.

**Gx and Gy Smooth:**

Smoothing is used to eliminate some of the vibration associated with vehicle testing. Smooth factors from 0 to 9 may be entered. The smooth factors affect the VC3000 calculations very little.

**Factory Setup:**

Factory only settings

### **Discharge Battery:**

Allows the battery to discharge quicker by leaving the backlighting on, and discharges more completely by not shutting off when a low battery condition is detected. Leave the unit on at least one hour after the green power light goes out. This should be done periodically to keep the battery pack in good condition.

## **7. BRINGING UP A RUN FROM MEMORY**

A run stored in memory can be viewed on the VC3000 display or printed to our portable thermal micro printer or imported into Profile Express. Press **Select Run** then select "Run Display" to display the data on the screen or "Run Print" to print to the printer. When printing be sure the printer is connected before pressing the "Run Print" key.

## **8. PRINTING**

### **Printing on the Thermal Printer:**

**Figure 3 Thermal Printer**



Run information can be printed on a portable thermal printer.

To print the data from a run:

1. Connect the serial cable from the VC3000 to the Printer.
2. Turn the printer on.
3. From the READY screen press **Select Run** then the file number.
4. Enter file number 999 to print all runs stored in memory.
5. Select "Run Print".
6. The data will immediately be sent to the printer through the serial port at 9600 baud.

Any screen can be printed.

To print the current screen:

1. Connect the serial cable from the VC3000 to the Printer.
2. Turn the printer on.
3. Press the **Auto Start** key.
4. The data will immediately be sent to the printer through the serial port at 9600 baud.

## 9. VC3000 TO PC INTERFACE

The VC3000 Brake Meter version can be used with the PC compatible software "Profile Express<sup>®</sup>". With Profile Express, Time, Longitudinal G, Lateral G, Speed, Distance, and Horsepower can be analyzed every 1/10 sec. Express is also a convenient way to check or set the VC3000 setup.

The VC3000 Brake Meter has an RS232 serial port that can be connected to a communications port of a PC compatible computer. After gathering data into the VC3000, connect the serial cable to a PC compatible computer. If your computer does not have an RS232 port but has a USB port, you will have to buy an RS232 to USB converter. You will find these at any computer or electronics store or at an internet store and the price should range from \$20 to \$50.

Once the cable is plugged in and the VC3000 is turned on, no additional key pushes on the VC3000 are required. Profile Express controls communications. See Profile Express Software Manual for software description and installation. Contact Vericom or visit our web site to purchase Profile Express.

## 10. USING THE ACTIVATION SWITCH (External Activation Input)

The External Activation Input is used for starting the run when one of the Reaction timers is used, when 12V is applied, or other input switch is used. This switch allows the operator to bypass the Auto Start G threshold. When using the external activation switch the activation of the test will be either the switch or the G threshold (0.2G default) which ever comes first. This switch may be used in the Acceleration mode as well as the Braking mode.

When using the reaction timer switch the run will start the instant a button is pushed and a lamp turns on.

When using the brake light switch the brake run will start the instant the brake lights come on, which is typically before the 0.2G threshold is reached. Drag Factor (Average G) will be significantly less when using the external activation switch because of the increase in time due to the braking systems mechanical reaction time. The activation switch may be connected to any 12V input.

**Figure 4:** External Activation Switch input



To install the external activation input use an External Activation cable available from Vericom Computers, Inc.

Insert the black 4-pin connector of the cable into the External Activation connector located in the back of the VC3000.

To perform a braking run using the brake switch:

1. From the READY screen press **Braking** (VC3000 will zero adjust itself).
2. Press **Auto Start**. The VC3000 will display 'Auto Start ready'.
3. Accelerate the vehicle to the desired initial braking speed.

4. After reaching the desired initial braking speed, brake as efficiently as possible until the vehicle comes to a complete stop.

**E/T** will be the time from when the switch was activated to when the vehicle came to a complete stop. **Reaction time** is the time from when activated to the G-Force threshold. **Speed** will be the speed when the switch was activated. **Distance** will be the distance from where the switch was activated to where the vehicle came to a complete stop. **Reaction distance** is the distance traveled during the reaction time.

To avoid false triggering of your braking run, you may press **Auto-Start** at any time after zero adjusting. Your foot may be on the brake pedal when the **Auto Start** key is pushed but the next time the brake lights come on the unit will activate if connected to the brake lights. You may need to set the G threshold high enough so it doesn't activate before the external trigger. If the G threshold is not reached during the test, the VC3000 will run for a minimum of 10.00 seconds, so set the threshold to a value that will be reached during the test. See G threshold in Setup on page 11. You can test the operation of the switch before doing a run by pressing the **Braking** key, let it zero adjust, push the **Auto Start** key, then press the brake pedal. The VC3000 should run for 10.00 seconds then shut off.

## 11. CONFIRMING ACCURACY

### To confirm the accuracy of the VC3000 using Gravity:

When measuring a slope the G force reading equals the sine of the angle. The sine of 90° is 1.000.

An accelerometer is a sensor that can measure both acceleration and deceleration. For traffic accident investigation an accelerometer is used almost exclusively to measure longitudinal G-force. Likewise it can be rotated 90° up or down to measure the vertical axis such as the acceleration of an elevator. In the vertical position an accelerometer can be used to measure the gravitational pull of the earth.

To check the calibration of the VC3000 using gravity only four items are needed:

1. A VC3000 (without the mounting brackets)
2. A flat and level surface
3. Gravity
4. A small mirror

The procedure is to set the Pitch and Roll factors to 0, then use gravity to check calibration. Remove brackets from VC3000 before checking calibration.

### To check the longitudinal accelerometer:

1. Turn the unit on. The READY screen will be displayed.
2. Press the **Setup** key to enter setup mode.
3. Press "More", then "Pitch Factor", then 0.
4. Press "Roll Factor", then 0.
5. At the setup screen press **CLEAR**.
6. Disconnect all connections to the back of the VC3000 and rotate the VC3000 so the front panel is facing up and the back panel is resting flat on the level surface.
7. Press the **Continuous** key, then the **CLEAR** key: Unit will zero adjust itself for temperature and incline. Do not move the unit during this time.
8. 'Gx = 0.000' will be displayed on the top line. Unit may now be moved.
9. Rotate the VC3000 180° so the front panel is facing down with the bottom most portion of the front panel on the level surface, allowing the display portion of the unit to hang over the edge of the level surface.
10. Using a mirror or looking up from the floor, 'Gx = 2.000' ±0.020 will be displayed on the top line.

If only checking the longitudinal accelerometer, set the pitch and roll factors back to 1. Follow steps 1 and 2 above, then in steps 3 and 4 press 1 instead of 0.

The lateral accelerometer is more difficult to check because the panels are not flat and there are bracket pins sticking out so the unit will not set flat on its side. The side panels have an angle of 3 degrees so if the unit is flat on the side panel this calibration check will produce an error of 0.002 G.

**To check the lateral accelerometer:**

1. Follow the first five steps above.
2. Disconnect all connections to the back of the VC3000 and rotate the VC3000 so the X-axis bubble level (left side of unit) is facing down on the level surface. The pin will have to hang over the edge. Hold the unit so the bottom is perpendicular to the surface.
3. Press the **Continuous** key, then the **CLEAR** key: Unit will zero adjust itself for temperature and incline. Do not move the unit during this time.
4. 'Gy = 0.000' will be displayed on the middle line. Unit may now be moved.
5. Rotate the VC3000 180° so the right side of the unit is down on the level surface. Hold the unit so the bottom is perpendicular to the surface.
6. 'Gy = 2.000' ±0.030 will be displayed on the middle line. Y-axis calibration check is completed.

Set the pitch and roll factors back after completing the calibration check. Use "Set Defaults" in setup (page 9) or set the pitch and roll alone (page 11).

## 12. SUMMARY: What can be done from the READY screen

<u>Key</u>	<u>Action</u>
<b>Acceleration</b>	QuickSet™ and Programmed Acceleration runs.
<b>Braking</b>	Braking runs.
<b>Continuous</b>	G meter.
<b>Setup</b>	Set time/date, G-threshold, vehicle I.D., etc. See page 8.
<b>Select Run</b>	Select a run from memory to print or display.
<b>Help</b>	Display a help message for the current screen.
<b>CLEAR</b>	Clear the run data memory, or get back to the READY screen

## 13. CHARGING THE BATTERY

The battery charger inside the VC3000 requires 12 to 16 Volts DC at 800 milli Amps or greater to operate, so most 12V battery chargers will work. Suitable chargers are available from Vericom Computers, Inc. The VC3000 will not charge from a 12V battery. The center conductor of the VC3000 power adapter is positive, and the connector has a 5mm OD and a 2.5mm ID. The VC3000 will charge from a vehicle's cigarette lighter if the vehicle is running. It takes about four hours to fully charge them. The batteries take about twelve hours to fully discharge.

The battery gauge on the display will not be accurate while the unit is charging because of the high current going into the battery. The unit is fully charged when the red LED in the back panel goes out. The red LED will turn on anytime the unit is plugged in and stay on until the battery is fully charged.

# 14. CUSTOMER SERVICE

## Warranty

The manufacturer warrants that the VC3000 computer will be free from defects in material or workmanship appearing under normal use and service. This warranty extends only to the original purchaser and does not apply if the product has been connected, installed or adjusted other than in accordance with the instructions furnished by the Manufacturer.

The manufacturer will repair or replace any parts that are defective in workmanship or materials for a period of one year from the date of purchase. The manufacturer does not warranty the installation of the VC3000 computer and therefore will not be responsible for installation or reinstallation charges or damage caused by installation.

This warranty covers only the VC3000 computer and is not extended to equipment or component parts used in conjunction with the VC3000 computer. The manufacturer will not be liable for incidental and consequential damages or the loss of use of your vehicle.

This warranty gives you specific legal rights and you also may have rights that vary from state to state.

## Repairs

Repairs not covered by warranty are available by returning the unit, prepaid postage, to the manufacturer. Repair charges and shipping will be billed to the customer prior to repairing or returning the unit to the customer.

Please include the following information when returning a VC3000:

1. Your name
2. Company name
3. Shipping address
4. Daytime telephone number
5. Model and Serial number of unit being returned
6. Description of problem
7. Method of payment
8. Description of any upgrades or repairs since purchased

For service, repair or product information contact:

Vericom Computers, Inc.  
14320 James Rd  
Suite 200  
Rogers, MN 55374  
763-428-1381  
Fax: 763-428-4856

[vericom@vericomcomputers.com](mailto:vericom@vericomcomputers.com)

[www.vericomcomputers.com](http://www.vericomcomputers.com)

## Options and Accessories

- Portable micro thermal printer.
- 12V activation cable.
- Brake Reaction Timer hardware (software is included standard).
- Push button vacuum suction cups.
- Profile Express software.

## Upgrades

- VC3000PC with Profile Professional software.

- VC3000DAQ with up to 22 external sensor connections.
- Brake pedal load cell.
- Tri axis accelerometer.
- 16 channel Data Acquisition Box (DAB). (See separate data sheet)
- Junction box for 6 sensors into 1 modular connector
- Stripped wire to modular converter
- Sensor Options (See separate data sheets.)
  - Vehicle Sensor Interface (VSI) for OBDII information.
  - RPM sensor.
  - 10 G Tri axis sensor.
  - Crash G sensor.
  - Air pressure sensor.
  - Brake pedal pressure sensor.
  - Contact factory for other sensors.
- Tachometers available
  - Coil Pickup.
  - Inductive Pickup.
  - Magnetic Pickup.

# 15. TROUBLESHOOTING

<b>Problem</b>	<b>Solution</b>
Unit doesn't turn on	<ol style="list-style-type: none"> <li>1. No power to cigarette lighter plug. Check connection to plug, or fuse in plug, or power to cigarette lighter.</li> <li>2. Cigarette lighter cord not making connection to VC3000. Push right angle plug all the way into VC3000.</li> <li>3. Dead battery. Plug into cigarette lighter or wall adapter.</li> </ol>
Unit turns off or resets during run.	<ol style="list-style-type: none"> <li>1. Loss of power to VC3000. Check power cord and fuse.</li> <li>2. Battery went dead. Recharge battery.</li> <li>3. Electrical noise interference. Eliminate noise from source.</li> </ol>
Inaccurate data	<ol style="list-style-type: none"> <li>1. VC3000 was not at same incline as when zero adjusted or level of VC3000 changed since zero adjusting. See page 3 for leveling.</li> <li>2. VC3000 started timing too soon or too late. See page 11 to adjust threshold.</li> <li>3. Electrical noise interference. Eliminate noise from source.</li> <li>4. Wrong pitch and roll factor for vehicle. See page 11 to adjust pitch and roll factor.</li> <li>5. Vibration: Mount on foam.</li> </ol>
"ERROR-Flash-ERROR"	Flash memory has an error. Clear run data and try test again. If error persists, run "Run Tests" from Advanced Setup, see page 12, or return to factory for repairs.
"ERROR-RTC-ERROR"	Real time clock problem. Set time and date and try test again. If error persists, return to factory for repairs.
"ERROR-ACCEL-ERROR"	Accelerometer problem. Turn power off and back on. If problem persists, send to factory for repairs.
"ERROR-ERASE"	Memory didn't clear. Try to clear run data again. If error persists, run "Run Tests" from Advanced Setup, see page 12, or return to factory for repairs.
"ERROR-Full"	Flash memory is full. Clear run data and try test again.
"ERROR-Runtime"	Run time for a test exceeded maximum allowed time. Clear run data and try test again.
"ERROR-FileLen"	File Length in memory is wrong. Clear run data and try test again.
"ERROR-255"	The number of files exceeded 255. Clear run data and try test again.
"ERROR-RUN FILE FULL"	Run data memory is filled. Clear run data.
"ERROR-FLASH-ERROR"	Data in memory is corrupt. Clear run data and try test again. If error persists, run "Run Tests" from Advanced Setup, see page 12, or return to factory for repairs.
"ERROR SETUP AND CALIBRATION INVALID"	VC3000 settings are out of range or accelerometer calibration is out of range. Use "Set Defaults" in the Setup mode (page 9). Then check calibration (page 15).
"ERROR-RS232-ERROR or NO LOOPBACK"	When running unit tests, custom loop back connector not installed. No action required.
Calculation for Average G when using speed and distance don't correlate to the VC3000 Average G	<ol style="list-style-type: none"> <li>1. When using distance in a formula to calculate average G assumes a constant acceleration. The VC3000 sums the samples and divides by the number of samples.</li> <li>2. The VC3000 distance is a cumulative calculation from samples every 1/100<sup>th</sup> second. Straight formulas such as <math>f=S^2/(30D)</math> assume constant f, which is impossible with any vehicle. To get the correct numbers you have to integrate G and Speed 100 times per second.</li> </ol>

## 16. SPECIFICATIONS

Power input: 12V-16V DC (negative ground)

Momentary surge: 24V DC (10 seconds)

Nominal current draw: 175 mA

Temp. Range: -20° F to 160° F

External Activation: 5V-36V DC

Charging voltage: 8V-16V DC

Nominal battery life: 12 hours

### Accelerometer

Accuracy: 0.0030G

Dynamic range: at least 4G (+2G, -2G)

Minimum resolution: 0.0010G

Bandwidth: 0 to 5Hz

Shock survival: 1000G

Sample rate: 100 Hz

Computer: 16 bit, 16 MHz

Memory: 512Kb Flash RAM, 128 Kb ROM

### Power cord

Length: 6 feet

Plug: 2.5 mm ID

(center positive): 5 mm OD

(Right angle Preferred): 10 mm L

Fuse: 1.25 inches, 3 AG, 1 Amp

Dimensions: 6.75 in. long, 3.50 in. high, 4.40 in. deep

Manufacturer: Vericom Computers, Inc.  
14320 James Road  
Suite 200  
Rogers, MN 55374

# Table of Contents

<b>1. INTRODUCTION &amp; QUICK START .....</b>	<b>1</b>
Brake Mode.....	1
Acceleration Mode .....	2
Continuous Mode .....	2
Putting your VC3000 together.....	2
<b>2. OPERATING YOUR VC3000: THE BASICS.....</b>	<b>3</b>
Mounting.....	3
Leveling .....	3
Modes of Operation .....	4
Run Data Memory .....	4
Slope of the road and zero adjusting .....	4
<b>3. BRAKING MODE .....</b>	<b>4</b>
Getting VC3000 ready.....	5
Information available after a braking run .....	5
<b>4. ACCELERATION MODE .....</b>	<b>6</b>
Getting the VC3000 ready .....	6
<b>5. CONTINUOUS MODE .....</b>	<b>7</b>
<b>6. SETUP .....</b>	<b>8</b>
Setup Flowchart .....	8
Description of each setting .....	9
<b>7. BRINGING UP RUNS FROM MEMORY .....</b>	<b>13</b>
<b>8. PRINTING.....</b>	<b>13</b>
<b>9. VC3000 TO PC INTERFACE .....</b>	<b>14</b>
<b>10. USING THE ACTIVATION SWITCH.....</b>	<b>14</b>
<b>11. CONFIRMING ACCURACY .....</b>	<b>15</b>
<b>12. SUMMARY: What can be done from the READY screen.....</b>	<b>16</b>
<b>13. CHARGING THE BATTERY .....</b>	<b>16</b>
<b>14. CUSTOMER SERVICE .....</b>	<b>17</b>
Warranty .....	17
Repairs .....	17
Options, Upgrades and Accessories.....	17
<b>15. TROUBLESHOOTING .....</b>	<b>19</b>
<b>16. SPECIFICATIONS .....</b>	<b>20</b>