Guide

The Cantrell Motorsports Lap Timer Pro is the easiest to use GPS-based lap timer, data recorder, video recorder, and performance analysis app available for iOS devices.

Recorder

Main Features

- No setup or calibration is required!
- Automatic data and video recording; simply open the app to the Recorder screen and drive!
- HD Video on devices that support it (iPhone 4+, iPod Touch (Gen4), iPad 2+)
- Real-time display of speed, g forces, and lap times
- Immediate analysis of performance data and video at track side
- Lap and segment times
- Automatic track mapping; no need for predefined track info
- High resolution GPS (upto 10Hz) using an external GPS module
- Designed for auto-crossing, road racing, karting, motorcycle racing, bicycle racing and more...
- Data sharing via Bluetooth (device to device at track side), e-mail, and iTunes File Sharing
- Share and compare lap times using the CMS Cloud Service

Overview of Operation

Analysis

Tasks are selected using the tabs at the bottom of the screen.

The Recorder is used to record data & video. Recorded data is saved to Runs. Videos are saved in the iOS Photos app.

Runs is used to organize data runs and to display summary information for each run.

Analysis is used to analyze & compare data in Runs. Analysis is also available as a Mac OS app.

Video is used to view recorded videos with data overlaid on the video, and to export video with data overlays to the iOS Photos apps and YouTube (via the Photos app).

Settings is used to enter information such as the driver name, car name, location name and to set various app preferences.

Locations is used to view lap times using the CMS Cloud Service.

Video

Help is used to display the user guide and access Support information.

External GPS Modules

For the iPod Touch and iPads, the use of an external GPS module is ***required*** since these devices do not have built-in GPS capabilities.

Due to limitations of the iOS device built-in GPS, the data may suffer from inaccuracy. *Use of the built-in GPS is intended for demonstration purposes only and will generally provide useful data only at relatively slower speeds*.

An external GPS module is required for high speeds.

Mounting the iOS Device in the Vehicle

Mount the device securely.

The iOS device or GPS module must be mounted with a clear view of the sky so that it can receive a strong GPS signal; somewhere on the dash or windshield are good positions.

The iOS device may be positioned vertically or horizontally. It should be reasonably level horizontally and vertically, and face toward the back of the vehicle. If you do not need to see the screen, the device may also be mounted flat; screen facing up and top facing the front of the vehicle.

To obtain the best possible data, the iOS device mounting position is important since the built-in accelerometers are used to collect lateral and longitudinal G forces. The LatG and LongG displayed on the Recorder screen should both be close to zero.

When using an external GPS module, it is possible to ignore the iOS device's orientation; it can be kept in a pocket or glove box for example. In this case, use the automatically calculated GPS lateral and longitudinal G forces in Analysis.

The use of a power adaptor is highly recommend.

Recorder

Recorder displays data and lap times in real time, and it automatically records data and, video (optional).

Recording is automatic and starts when the vehicle exceeds 20MPH/33KMP, then stops when the speed drops below 15MPH/25KMP

for more than 5 seconds. For data, the Recorder is always running so it captures several seconds of data before the start trigger of 20MPH occurs. However, video starts at the point of the trigger.

If necessary, recording may be started/stopped manually by tapping on the red start/stop button in the upper left corner of the screen (this feature is initially disabled to prevent accidental manual recordings; use Settings to enable this feature).

Lap times are displayed only *after* the first lap is completed.

The GPS signal strength indicator must be green to acquire usable data.

Initially, the racing type, location, driver, and car, are displayed in a popup as a reminder of the current Settings. A single tap on the screen re-displays this information and allows you to change the Settings.

When the location is set to Predictive (***highly recommended***), the lap timer recalculates the "current" lap time at several points around the track. The "best" lap time represents the best achievable lap time.

When the selected location has beacons defined, the lap timer uses the defined beacons to display the last lap time, and the best lap time.

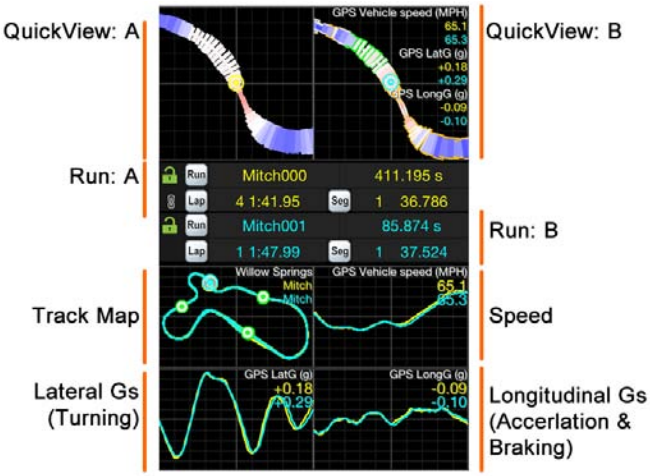
Video recording is automatic and starts/stops when data recording stops/starts. This feature is initially disabled; use Settings to enable it. To aim the camera, tap on the button to display the Video Preview; tap the button again to hide the preview. The presence of this Video Preview Button indicates that video recording is enabled.

Analysis

Analysis is used to view run data that has been created by Recorder. Up to two runs may be analyzed simultaneously.

For the sake of simplicity, we name the runs being analyzed as *Run A* and *Run B*; the data for each may be from two different runs or from the same run. The latter is how you can analyze two different laps from the same run. *Run A* is displayed in yellow and *Run B* is displayed in cyan.

The screen below shows *Run A* set to run *Mitch000 Lap 8* and *Run B* is set to run *Mitch001 Lap 4* (both are pre-installed example runs). The top portion of the screen shows the QuickView graph for Run A on the left and Run B on the right.



Below the QuickView graphs is a section that displays the run name, lap and segment information; Run A is on top and Run B is below.

The graphs at the bottom of the screen display the track map, vehicle speed, lateral (turning) G-force and longitudinal (acceleration/deceleration) G force.

The X axis of the speed and G force graphs is time, starting when the data recording began for each run. The current position in time is at the center of each graph and the actual time offset (seconds) from the beginning of the run is displayed next to each run's name.

The time scale of the graphs is displayed in the lower left corner of the screen. In the example above, each graph is showing from -20s to +20s relative to the current time at the center of each graph. In other words, from 20s in the past to 20s in the future.

Touch Interactions

- Single Tap anywhere other than a button shows and hides the toolbars
- Double Tap on any of the lower graphs enlarges the tapped graph and hides the other graphs

- Double Tap on an enlarged graph reduces its size and displays the other graphs
- Sliding (dragging) a finger on the screen to the left moves the data forward in time, and to the right moves backward in time.

Run Buttons

To select a run for analysis, tap on a Run button and select a run from the list.

When a run's location has beacons defined, you can select laps and segments to analyze via the Lap and Seg buttons.

Tap on the *lock* icon to hold the associated data at the current time within the run. Tap the lock again to unlock the data.

Tapping on the *link* icon synchronizes Run B's current GPS location to Run A. This allows you to compare data for both runs at the same position on the track as you drag your finger across the screen. Tapping the icon again unlinks the runs. When the runs are linked the analysis is done by position, and when they are not linked, analysis is done by time.

Toolbar Buttons

 Add a beacon at the current track position. Beacons are associated with a location, so it is important that runs are correctly associated with the appropriate location (See Settings and Results).

 Remove all beacons from the location.

 Move to the start of the run. For auto-cross, this is the time when the vehicle started the run.

Int G, GPS G - Switch between internal accelerometer data and calculated GPS data for G forces. Use "Int G" for the most accurate g-force data if the iOS device was positioned accurately during the run's recording. Use "GPS G" when the iTouch was not positioned accurately (or kept in a pocket or glove box).

QuickView

QuickViews is an innovative way to visualize the performance of a car as it drives around the track. It combines lateral acceleration, longitudinal acceleration, and speed differences into a single graphic that is easy to grasp visually.

The width of each block is proportional to lateral acceleration. The length (in the direction of travel) of each block is proportional to longitudinal acceleration. The inside color is red for braking, blue for accelerating. Intense red is hard braking, intense blue is hard acceleration. White means neither braking nor accelerating (coasting).

The green outline indicates where B is faster than A, orange where B is slower. This coloring only appears when A and B are at approximately the same point on the track.

Beacons

GPS beacons allow you to specify the start of laps and lap segments. Beacons are edited using Analysis.

For road racing, at least one full lap of data is required to place beacons.

You can place up to ten beacons. The course can be open-ended or closed.

Beacon placement guidelines:

- Place beacons only when Run B in Analysis has no run selected. If Run B has a run selected, tap on Run B's "Run" button and then tap on the "Clear" button in the run selection screen.
- Place beacons on straightaways shortly before the braking zone whenever possible.
- Do not place too many beacons. It is hard to analyze data when segments are short.
- Place beacons to get the "big picture". For example, many courses naturally break down into one fast and two slow sections, or two fast and two slow sections.
- Avoid placing beacons where the track folds back on itself tightly.

GPS beacons consist of the GPS coordinates (latitude, longitude) and the direction the vehicle was traveling at the beacon position.

To place the first beacon:

1. Moving back to the beginning of the run using the  button.
2. Move the vehicle forward in time by dragging your finger on the screen from right to left until the vehicle appears on the track map at the position where you want the lap start.
3. Tap on the  button to place the beacon.

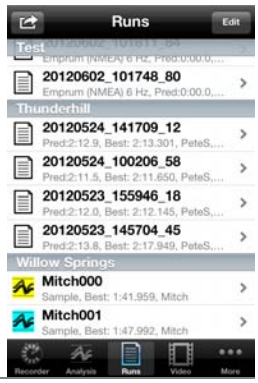
The first beacon you place determines the start of each lap. Additional beacons define lap segments.

To clear all beacons, tap on the  button.

Beacon are associated with the locations.

Runs

The ***Runs*** screen lists the runs that have been created by Recorder.



To view the details for a run, tap on it in the list. This displays the ***Run Details*** screen described below.

To delete a run, slide your finger across it and tap on the delete button that appears on the right. Or, tap on the Edit button to delete more than one run at a time.

The Actions button  allows you to:

- Import runs from iTunes
- Export all runs to iTunes
- Exchange runs via Bluetooth with other people that have CMS Lap Timer Pro

Comparing runs with others is one of the best ways to improve driving performance! Share often! ***Share runs at the track via Bluetooth Exchange***.

The ***Run Details*** screen displays various attributes of a run and allows you to change some of these attributes.

The Location attribute associates the location's beacons with the run.

The Racing Type attribute tailors the way Analysis displays the run data. For example, since the speeds are lower and the course is tighter for autocross vs road racing, Analysis Summary View is zoomed in tighter for autocross.

The Actions button  allows you to:

- Display the run in Analysis
- Send the run via e-mail
- Export the run to iTunes

Video

Video is used to view run videos with data overlays that have been created by Recorder. One run video may be viewed at a time.

Below is a sample screen shot of the ***Video*** screen.

View the sample on YouTube

The top section displays the run name and current lap information.

The bottom section shows the track map, g-g graph (also called the friction circle), vehicle speed, lateral (turning) G force and longitudinal (acceleration / deceleration) G force.

Touch Interactions

- Single Tap anywhere other than a button shows and hides the toolbars
- Sliding (dragging) a finger on the screen to the left moves the data forward in time, and to the right moves backward in time.

Run Buttons

To select a run, tap on the Run button and select a run from the list. Only runs that have and associated video are listed (to turn video recording on or off, use the Settings screen).

When a run's location has beacons defined, you can select laps via the Lap button.

Toolbar Buttons

	Actions	Menu Options: • Export to Photos app **Tip**: To upload the exported video to YouTube, switch to the Photos app after the export has finished • Adjust Sync / Lock Sync Displayed only if the video is not automatically synchronized; created by an earlier version (pre-1.4)
	Rewind	Move to the start of the video.
	Step Back	Move back .1 second
	Pause	Stop playback
	Play	Start playback
	Step Forward	Move forward .1 second

Settings

The ***Settings*** screen allows you to specify:

- Location
- Driver and car names
- Car weight
- Racing type
- Units of measurement
- Video Recording
- Manual Recording
- Debug mode for customer support

Use the *Location Name* to keep track of where driving events are held. Also, beacons are associated with locations. For road racing, it is highly recommended to leave the location set to *Predictive*; you can change each run's location later.

Racing Type affects various calculations and display items. For example, the start of a run for Autocross is when the vehicle first starts moving, while for Road Racing, it is the start of the first lap.

When a run is created, the following settings are copied to the run data:

- Location
- Driver and car names
- Car weight
- Racing type

These can be changed in the ***Run Details*** screen.

The Debug setting is for customer support purposes. When this is enabled, additional information is saved when the ***Recorder*** is active. This additional information is automatically attached to a run that is e-mailed from the ***Run Details*** screen.

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