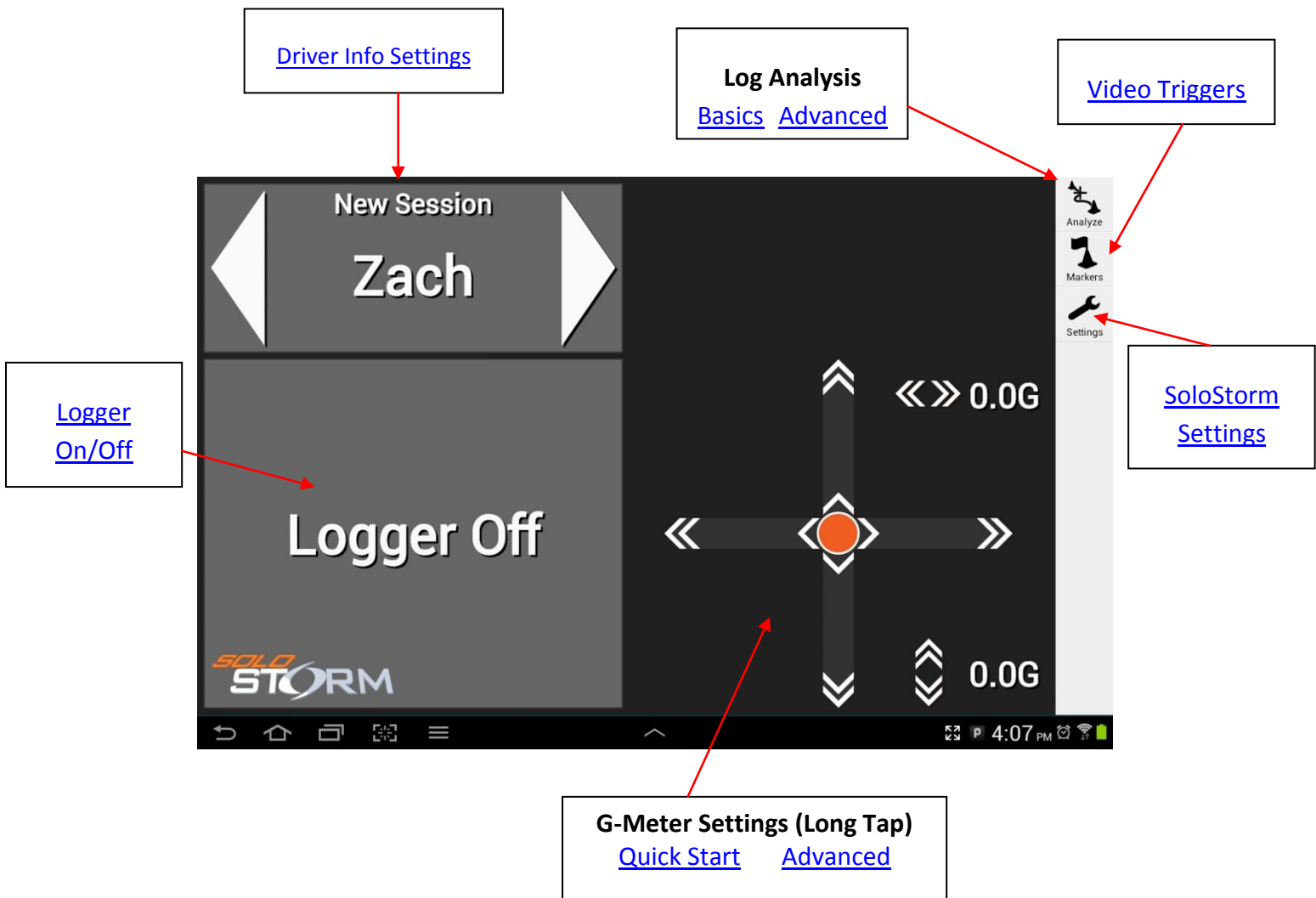# SOLOSTORM USER GUIDE   [VERSION 1.2]

QUICK START GUIDE

The primary steps to quickly set up and start logging your driving in SoloStorm.

1. **Android System pre-requisites**

2. **Install SoloStorm**

3. **SoloStorm Basic Setup**

4. **Data Logging**

5. **Data Analysis**

MAIN SCREEN

Driver Info Settings

Log Analysis
Basics   Advanced

Video Triggers

Logger On/Off

SoloStorm Settings

G-Meter Settings (Long Tap)
Quick Start   Advanced
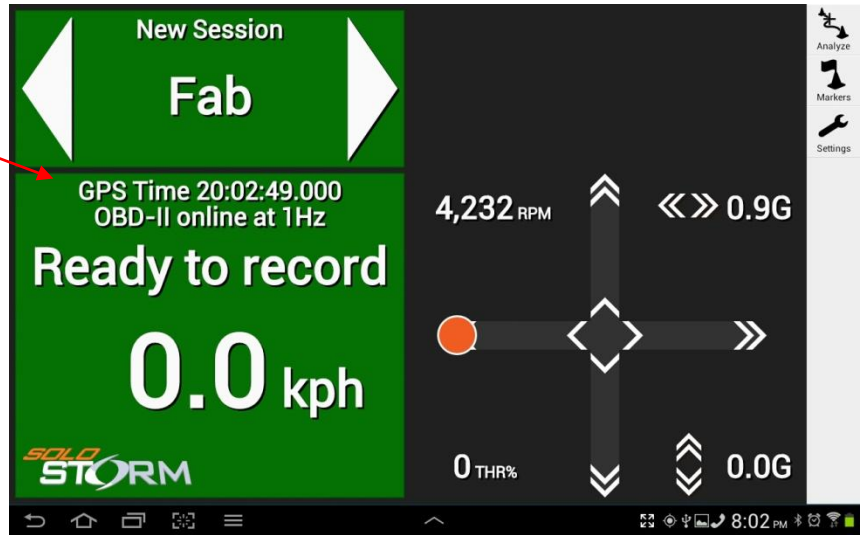
Status Line indicates:

Bluetooth GPS Status

OBD-II status

ANALYZE SCREEN

Analysis Module Instructions

Basic   Advanced

Data Traces

Data Log Management

Section Edit

Analysis Widget Control
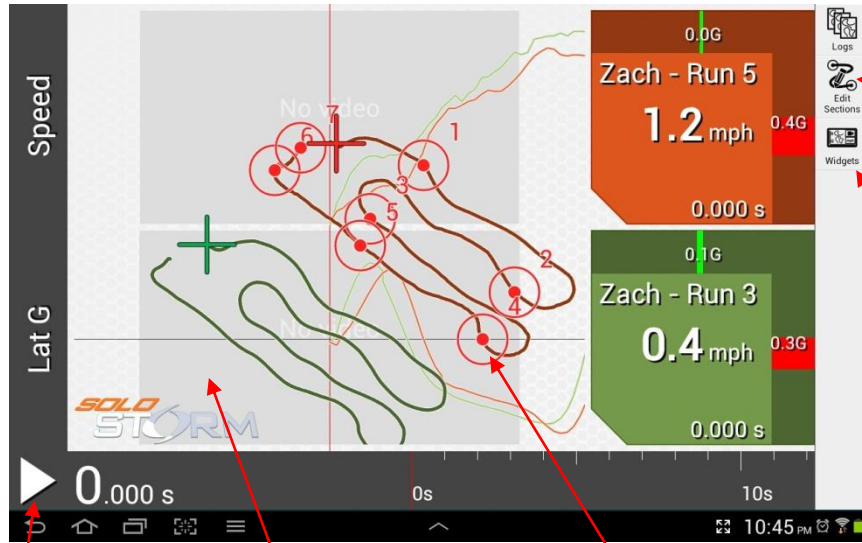
Playback Control

Video Analysis

Sectional Analysis

ANDROID DEVICE SETTINGS

This section describes some basic setup on your Android device before going into SoloStorm. Please note that most Bluetooth connection issues are handled on your Android device Bluetooth settings menu and not SoloStorm. SoloStorm will use whatever devices are paired to your Android device.

INSTALL AN SD MEMORY CARD

It is highly suggested that you install extra memory on your Android device to ensure you have enough memory to cover your datalogging needs prior to installing and using SoloStorm.

Data logging is storage intensive, particularly if you are recording video with your device. Processing video is greatly optimized by making use of a high-quality, Class 10 flash memory card from a reputable manufacturer, as it will support higher read and write speeds than a generic version. A 16GB or 32GB card is recommended.

Please refer to the user manual for your Android device to determine how to install the external memory card. Configuring SoloStorm to make use of the added memory will be covered in a later step.

PAIR BLUETOOTH DEVICES

Please follow the documentation that comes with your Android device in order to it with Bluetooth GPS and OBD-II modules prior to installing SoloStorm. While most devices will allow you to pair Bluetooth devices on the fly, doing so before starting the application will ensure a trouble-free configuration process.

When pairing Blutooth devices, a PIN code is usually required. If the instructions for the Bluetooth module do not specify a PIN, try '1234' or '0000'. Qstarz GPS units use '1234'.

Please note that Android devices prior to v2.3 (Gingerbread) do not support simultaneous operation of Bluetooth devices. If you are running Android v2.2, then upgrade your operating system if possible. If not, then you can not use both an external GPS and an OBD-II reader.

Selecting your GPS and OBD-II devices will be covered in a later step.

ALLOW NON-MARKET APPLICATIONS

SoloStorm is not an application sourced through the Google Market. By default your device is set to **NOT** allow this type of application. This setting needs to be changed for you to install SoloStorm on your Android device.
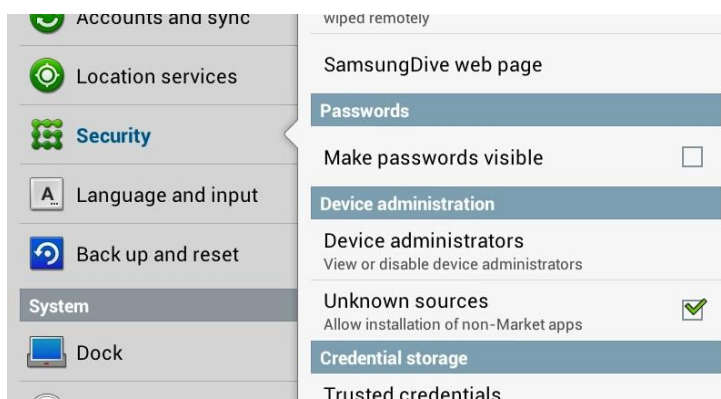
ANDROID VERSIONS BEFORE 4.0.X

1. Open the *Settings* ➜ *Applications* menu on your Android device.
2. *Ensure* that the option for *Unknown Sources* is **CHECKED.**
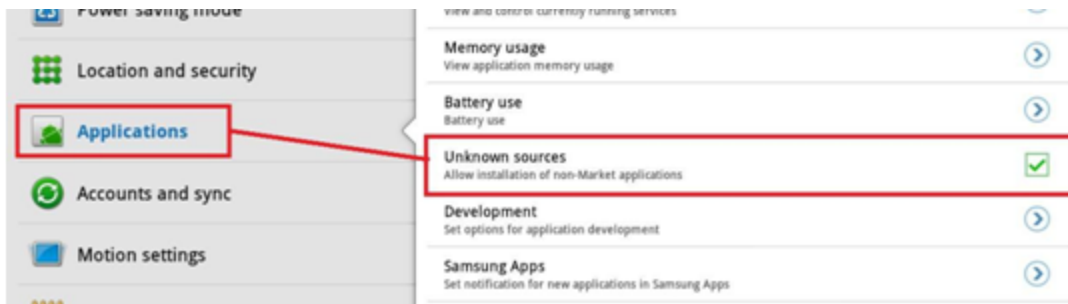
ANDROID VERSIONS 4.0.X+

1. Open the **Settings** ➔ **Security** menu on your Android device.
2. Under the **Device administration** section put a checkmark next to the **Unknown sources** option.

INSTALL SOLOSTORM

INSTALL THE SOLOSTORM .APK FILE

After ordering SoloStorm, you will be prompted to download the SoloStorm application .apk file. You will also receive an email containing an unlock code to enable SoloStorm's logging functionality.

If you are downloading the .apk file directly to your device, you may be prompted to install it (this depends on your device, as some do not recognize downloaded applications).

If you have downloaded the .apk file to a PC, email it to the <u>gmail</u> account that you have registered on your device. On most Android devices, the Gmail application will recognize the .apk file and allow you to install directly from your e-mail. There will be an "Install" button next to the attachment, tap it to start the install process.

Tip: If you are having trouble installing SoloStorm and receive a message similar to 'error parsing package', then you must download and install the free ApKatcher application from Google Play (formerly the Android Marketplace). This will allow your device to recognize downloaded .apk files. You can read more at https://play.google.com/store/apps/details?id=nEx.software.Apps.APKatcher&hl=en

During installation, you will be prompted to grant a number of permissions to SoloStorm. SoloStorm requires access to many features on the Android device, so this list of permissions is quite long.

UNLOCK SOLOSTORM

SoloStorm does not require a license in order to open and analyze logs, however one is required in order to log data and record video.

You may unlock SoloStorm on as many devices as you wish, so long as the email address associated with your license and unlock code is registered on the device. **Note that some email clients do not register the email address with the device** and only store it in private memory. In order to be safe, it is best to use a Gmail address, which is registered globally on the device.

Perform these steps on the Android device you wish to install on.

1. Open the e-mail containing the unlock code.
2. Highlight and copy the unlock code or write it down.
3. Open SoloStorm
4. Tap the box to start the licensing process

QUICK START GUIDE - BASIC SETTINGS

SoloStorm now has a first-time help feature that will guide you through basic first time setup. If you do not receive this prompt, you can turn it on by going to *Reset Tool Tips:*
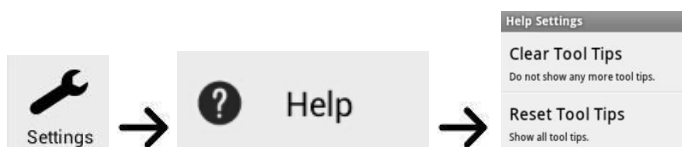
This section describes how to enable Bluetooth devices for logging.

NOTE: Your Bluetooth devices should be already paired with your Android device in your system settings, please refer to your respective user manuals to complete this.

BLUETOOTH GPS

NOTE: it is best to have Bluetooth already turned on and your GPS Bluetooth device must be already paired

1. From the main screen, tap
2. You will be prompted to select from the following options:

GPS Source	Description
Internal	Uses on board GPS sensor. Not recommended, majority only refresh at
Bluetooth	Uses separate Bluetooth GPS device. This device must be paired to your Android device in the device's system settings.
Race Tech DL1 + Serial Adapter	Uses Race Tech DL1 for GPS information via Bluetooth serial adapter

3. If prompted, tap *Yes* to allow Bluetooth to be turned on.
4. You will be given a list of all available Bluetooth devices. Tap on your Bluetooth GPS device name and address to use it with SoloStorm.
5. Touch *Back* to exit once your device is set.

BLUETOOTH OBDII

1. From the main screen, tap
2. If prompted, tap *Yes* to allow Bluetooth to be turned on on your device.
3. You will be given a list of all available Bluetooth devices. Tap on your Bluetooth GPS device name and address to use it with SoloStorm.

SET EVENT AND DRIVER NAME

This function allows you to organize your data according to sessions and drivers.
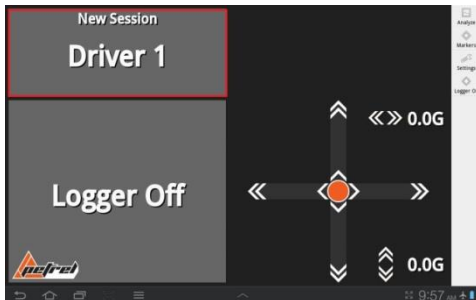
SET SESSION NAME

1. **SINGLE Tap** the *Driver Info* box on the main screen to enter **Driver/Session** names.
2. Type the name of the current race, event or session name you want to record the data under in the *Session Name* box.

This name will be used for all drivers until you change it. Session names must contain only Alphanumeric characters.

SET DRIVER NAMES

Type a driver name in the *Add New Driver* box, touch the *Add* button once completed. The new driver name will appear in the list below.
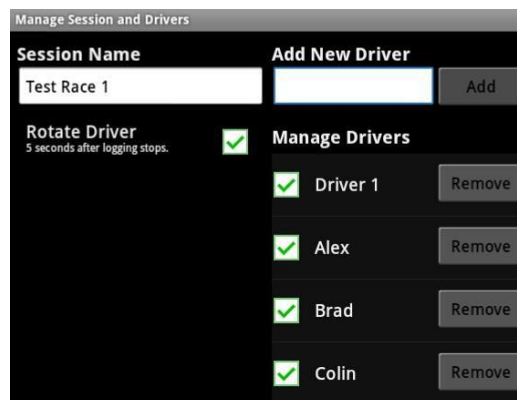
Each driver has a checkbox next to their name indicating whether the Driver is selectable from the main screen. Drivers that are not checked will not be rotated through or appear on the driver selection list in the main logging screen. This is useful to set up the list of drivers for the day.

SELECT DRIVER

Once driver names have been entered, you can select drivers by:

- **SINGLE TAP** the left/right arrows on either side of the driver name
- **LONG TAP** the driver box to bring up a selection list

CALIBRATE ACCELEROMETER

- Calibrate the accelerometer on your device in order for the G-meter to record properly
- **LONG TAP** on the G-meter
- Tap **Calibrate Accelerometer**

INTERNAL ACCELEROMETER

- **NOTE:** you will need to mount/orient your device in the position you intend to record your runs in and need space to drive forward including recordable g-forces.
- Follow the instructions/prompts on screen:
- Tap **Proceed**, you will have 5 seconds to mount/orient your device
- Drive forward inducing recordable g-forces, then stop
  NOTE: you do not have to drive, you can hold your device physically in your hands and simulate the forward motion of your vehicle
- Press **Finished**

RACE TECHNOLOGY DL1 ACCELEROMETER

- Tap on the button that button that represents the face of the DL1 that is facing forward inside the vehicle. This is the same selection that you made in the Race Technology software to configure the accelerometer values when analyzing.

START LOGGING

- To start logging, tap the box
- If you have not activated SoloStorm yet, you will be prompted to enter your unlock code. Enter the unlock code that you received by e-mail. Case is not important, but do include the hyphen.
  Note: *You need to have a connection to the Internet to unlock SoloStorm*
- You will receive a confirmation message once your copy of SoloStorm has been unlocked.
- SoloStorm screens will show blue while awaiting a GPS lock
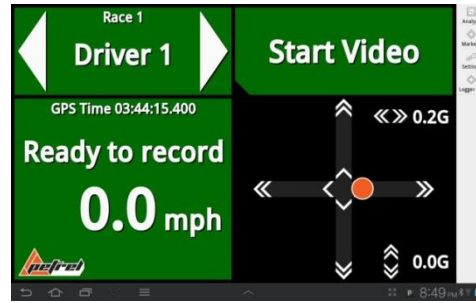
- Once SoloStorm is ready to record, the Info Panels will turn green, you can launch at anytime
- If you do not have Video set to start recording when the car is staged, tap the **Start Video** box in order to start recording video if your device is mounted accordingly.
    - o   Note: If using a Manual start trigger, this button will be labeled **Start**, and will start both logging and video recording.
- The **Ready to record** box will scroll basic GPS information, it will also display what GPS connection you are using to help you confirm you are using Internal/Bluetooth GPS sources

    FYI: A **LOWER** GPS accuracy number is **BETTER** (less than 1 is best)

RUN RECORDING

By default, SoloStorm is set to auto-record as per the conditions below. ***Trigger settings*** are covered in Advanced Settings | Trigger Settings

- **Start**: SoloStorm will automatically start logging once the Start Trigger conditions are met (default: drive over 20mph for more than 1 second. SoloStorm records data before this trigger is met so your entire run is recorded)
- **Stop**: SoloStorm will automatically stop logging once the Stop Trigger conditions are met (default: drive less than 10mph for more than 2 seconds)
- **Manual STOP** LOGGING: to exit the logging mode, press the main recording box
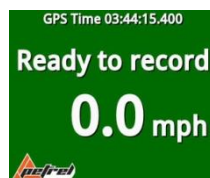
RUN ANALYSIS BASICS

Tap   to enter the run analysis mode from the Main Screen.

LOAD A RUN LOG

NOTE: SoloStorm auto-loads the most recent log and, if available, the next fastest log for the session. If a runs is accidentally recorded under the wrong driver, the run can be re-assigned, this is covered in the advanced section.

1. If you have not previously loaded a log, you will be prompted to select a recorded log to display, otherwise tap the

    button to select run logs

2. Select the Event by tapping the *Session Name* field
3. Select up to **TWO** runs to display by tapping their checkboxes
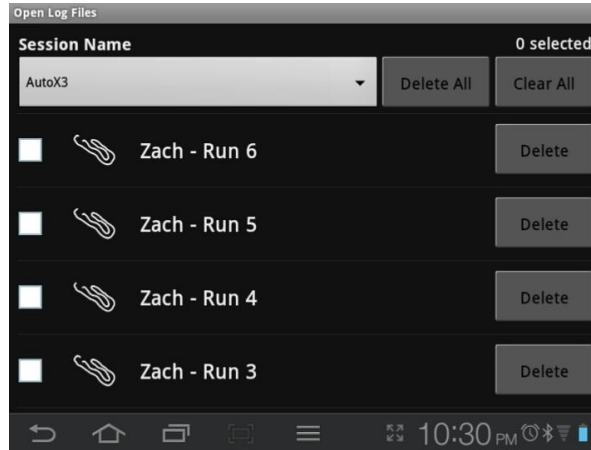
4. Tap the Android button to return to the Analysis screen
5. Your runs will now be loaded

RUN NAVIGATION/PLAYBACK

- **Normal auto playback**: To play your run back at normal speed, tap the button
- **Manual playback**: Tap and drag the timeline at the bottom to manually replay the log at manual speed.

- **Return to log beginning**: LONG TAP the to reset all runs to the beginning
- **Zoom**: You can enlarge the playback map by 2 finger pinch/spread motions directly on the run map, your position cursors will move to stay within the viewable area
- **Run Alignment**: you can line up two runs to the same position anywhere on the track by:
  o **LONG TAP** the DASH of the run you want to align to
 o **DOUBLE TAP** the position cursor of the run you want to align to

- **Individual Run movement**: You can disable the movement of a run by tapping on the Dash of the run you wish to stop moving. The Dash will darken to show it's been disabled, tap again to reactivate the run.
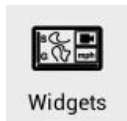
- Widgets allow you to customize the Analysis mode display, these will be covered in more detail later on
- The information traces on the left of the display can also be changed, long press for options, these are covered in the advanced section

IN-APP HELP

You can activate a quick reference guide that points out the above quick setup information by going to **Reset Tool Tips**:
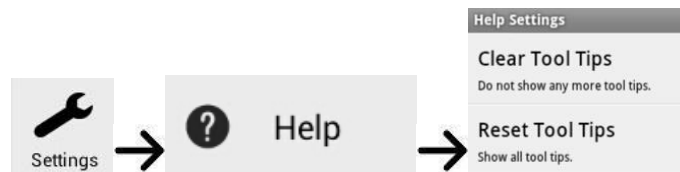
ADVANCED SETTINGS/INSTRUCTIONS

FOREGROUND VS BACKGROUND LOGGING

If SoloStorm is configured to record video using an onboard camera, then logging can only occur with SoloStorm running in the foreground on your device, while the screen is turned on. This is because video capture on android devices requires a live preview window.

If you are not using an onboard camera, or if you are using only a GoPro WiFi camera, then SoloStorm will start the logger as a background service. You will be able to close SoloStorm and launch other applications, or turn off your device screen and still record data. A notification will be present on your device that indicates that the logger is running:
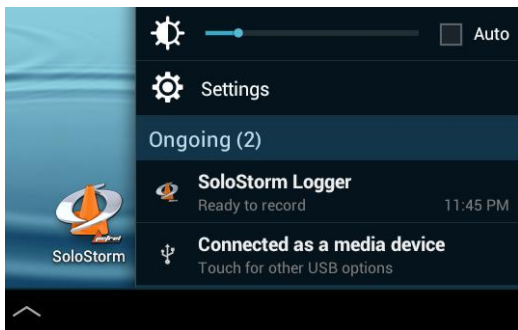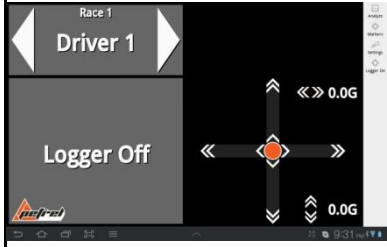

When logging as a service:

- Tapping the Android button from the logging screen will close the application but leave the logger running.
- Tapping the Android button from the logging screen will close the application and shut down the logger.
- Pressing the screen lock will pause the application, but leave the logger running.
- Tapping the logger notification will resume the application.

When resumed, SoloStorm will display any logs that were recorder by the background logger.

If using the logger as a background service, it is best to enable Voice Notifications in the Display settings, so that you are informed when the logger changes state.
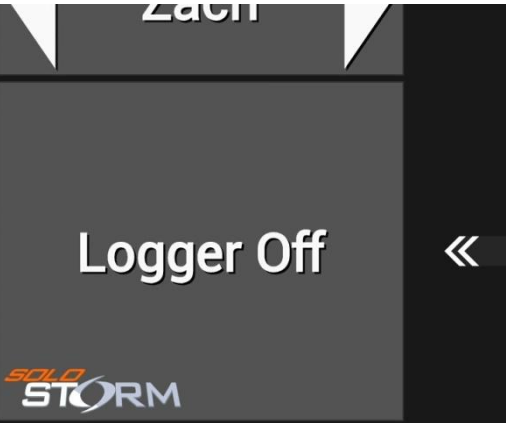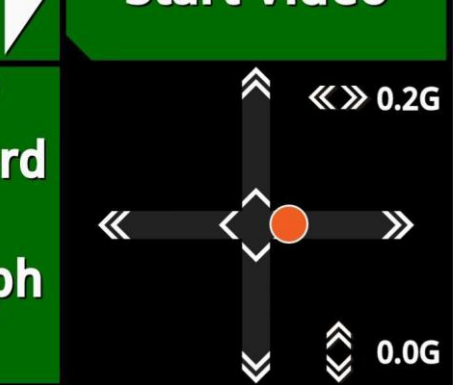
The logging screen has a number of states:

Logger Off You can only modify application settings and analyze logs.	
Waiting for GPS Logger activation requested, SoloStorm is attempting to connect to your GPS device.	
Logger Ready SoloStorm has been configured and GPS telemetry is being received - not recorded This screen shows AUTOMATIC triggers. If Markers are NOT set, you must tap Start Video to record video between when you launch the car and a Start Trigger is detected.	
Logging SoloStorm has detected a Start Trigger and is logging current telemetry This screen shot shows MANUAL triggering.	

MAIN SCREEN WIDGETS

These are all functions that may be performed while the Logger is **OFF.**

SESSION/DRIVER WIDGET

This widget displays the names of the **current Session** and the **current Driver**.

Single Tap the box - enter **Session** and **Driver** settings, as well as set driver auto-rotation after run logged

Tap arrows - to rotate through driver list

Long Tap - bring up driver list for quick selection

LOGGER STATUS WIDGET

SINGLE Tap - to go into Standby mode for logging or to turn off Logger

When connected, this widget displays the GPS time and accuracy numbers from the GPS telemetry, along with the current vehicle speed and altitude (if using the Hill Climb race mode).

GPS Accuracy: LOWER number is BETTER

When logging, this widget displays the number of data points that were logged, as well as the current update rate.

OBDII connection status and update rate are also displayed.

ACCELEROMETER + OBDII TELEMETRY WIDGET

Displays the current 2D lateral and longitudinal acceleration values, as well as the current values for the selected OBD2 channels.

LONG TAP - To bring up accelerometer settings (Single TAP the Calibrate Accelerometer button. Read and follow the instructions that appear.)

You can set the maximum Lateral/Linear G ranges to display. Press [↩] to exit when complete

If OBDII or DL-1 is used, the top left and bottom left corners of this area will show **RPM** and **Throttle Position (THR%)**.
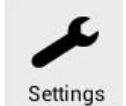
MANUAL START/STOP & START/STOP VIDEO BUTTON This button changes depending on your SoloStorm settings. **MANUAL START/STOP TRIGGER** If SoloStorm is set to Manual Trigger then this button will manually Start and Stop data (and video) logging. **AUTO START/STOP TRIGGER** If SoloStorm is set to Auto Trigger then this button will Start and Stop **Video** Recording **ONLY**, data logging will start as set by the Trigger settings (Video can be set to auto-start when staged, see Markers. It is recommended to leave Start/Stop Triggers on Auto.	
GOPRO CAMERA STATUS If a GoPro WiFi video camera is being used, then a status widget will appear under the accelerometer. The GoPro camera will be in one of the following states: - ⬚ No WiFi connection to camera - ⬚ WiFi connected and camera is turned off - ⬚ Powered on, but not ready - ⬚ Ready to record - ⬚ Recording	

MAIN SCREEN MENU BUTTONS

The Main Menu is on the right edge of your Main Screen

The Main Menu has 3 options

	Starts the Analysis module to review logged data
	Sets markers that assist with auto-triggers and run analysis
	SoloStorm application Settings Menu

 ANALYZE

Refer to the Run Analysis for basic navigation in the Analyze module.

This section will cover more Analyze functions beyond those covered in the Quick Start Guide. Further advanced options, will be covered in the Advanced Analysis section

The Analysis module has 2 menu options:

	Log management section: - Select Logs for Analysis - Delete unneeded logs - Rename logs - Share log information

Widgets	Selection of Widgets for use in run analysis
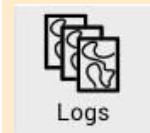
 LOG DATA MANAGEMENT

The Log screen allows you to manage your data logs in the Analyze module.

SELECT SESSION

To change session information, tap the **Session Name** field and select the appropriate session

NOTE: you can only analyze/compare runs in the same session

BASIC LOG ACTIONS

Select up to 2 runs by tapping to place a checkmark next to the runs you want to perform the following operations on:

Analyze Selected Logs	Tap the to load and analyze/compare your selected runs
Delete Selected Logs	Tap next to a log to delete that log
Share Selected Logs	Tap to export selected log data into a .csv file to copy to another user's device
Delete ALL Logs	Tap to delete **ALL** logs listed in this **Session**. Does not matter how many runs are selected
Cancel Selections	Tap to clear all checkboxes
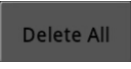
RENAME MIS-RECORDED LOGS

You can rename logs that may have been recorded under the wrong driver.

- **LONG Tap** the run that you want to re-assign

- Select the correct driver name from the selection box
- Select the correct run number
- Place a checkmark if you wish to correct the remaining run numbers after your correction selection
- Tap the **Update** button

ANALYSIS WIDGETS

Tap the **Widgets** button to bring up the Widget selection menu, this enables you to turn on/off various functions to help you analyze your runs. The green bar below each widget indicates which Widgets have been selected. Press the button when selection is complete.
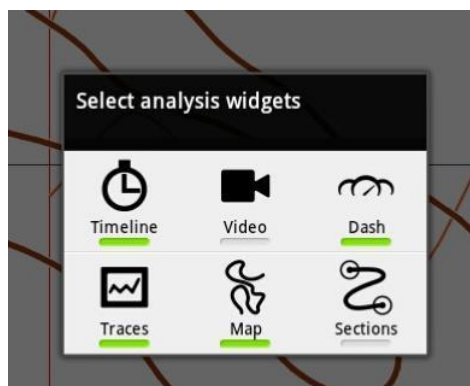
Widget selection menu

Enables the time bar at the bottom of the screen that shows the time position of the run. You can still manually navigate the run time even if this bar is not visible.

This is helpful to obtain more space for course map, video, traces, etc when reviewing runs on smaller screened devices.
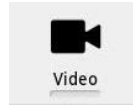
Enables video playback in the background of the Analyze module. Video navigation will follow normal time navigation.

Enables the following 'dashboards' that help remind you which colour is which run and includes some basic information such as current speed, time of run and graphical representation of lateral/linear Gs.

Dash: Darkened, disabled, will not follow time movement, useful for manually aligning two runs to a certain point.
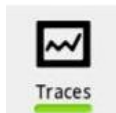
Enables the display of any traces that are recorded in the Analyze screen during playback.

Long tap to select the traces available for display, put check boxes in the traces you wish to display. Press the Back button to return.

Single tap the trace label you wish to display, the other traces will be hidden. Tap the bar again to restore all selected traces.

Shows or hides the GPS map and position cursors, providing more room and clearer view of traces and video.

Enables sectional analysis based. Initial sections are auto-generated by SoloStorm. These sections can be edited.

See the Detailed Section Analysis section for more details.

MARKERS

Markers are set to help SoloStorm auto-record video and calculate run data more accurately.

SETTING MARKERS

Ensure the logger is on and you are getting GPS signal (Main Logger screen is green)

Physically walk/drive to the Stage/Start/Finish location with your GPS receiver

Tap the **Markers** button
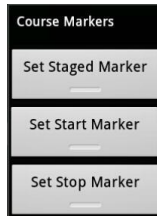
Tap the appropriate Set Marker button a green bar will appear once the marker is set

Staged Marker	This indicates to SoloStorm that you are about to start your run and starts video recording when you drive to this marker
Start Marker	Helps to accurately calculate run data in Analysis mode. Does NOT affect logging triggers.
Stop Marker	Helps to accurately calculate run data in Analysis mode. Does NOT affect logging triggers.

CLEARING MARKERS

To clear markers:
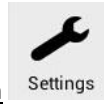
Tap the **Markers** button

Tap the appropriate Clear Marker button , the green bar will turn off.

ADVANCED MAIN SETTINGS
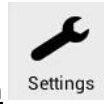
The following are detailed explanation of all entries in the <u>main</u> menu

GPS

This section allows you to set SoloStorm to select which GPS sensor to record GPS information from. On-board GPS receivers generally record at 1 Hertz (once per second) which is not enough data to accurately analyze a run.

Bluetooth GPS receivers can refresh data from 5-10 Hz compared providing much more detailed data available for analysis.

Ensure that you have paired your Bluetooth GPS receiver to your Android device before you start SoloStorm.

- Tap the Settings menu

- Tap the **GPS** button

- Select from the 3 GPS options: Internal, Bluetooth, Race Tech DL1
  NOTE: To use a Race Tech DL1, you will need to purchase a Serial-Bluetooth adapter to connect the DL1 to your Android device

- Select your Bluetooth GPS/Bluetooth Serial Adapter by tapping the corresponding option in the GPS Settings menu and then selecting your device.
  NOTE: **ensure** your Bluetooth device is properly paired with your Android device, refer to your Android device manual

- Your selected device name will now display to the right of the display for confirmation

GPS Status

Once your Bluetooth GPS device is connected, SoloStorm will display information about the GPS signal in the Logging box:

Satellite Count:

GPS Signal Strength

<screens>

GPS health is displayed when the logger is in the ready state. The number of satellites is displayed, and the accuracy of the GPS fix is displayed. The **smaller** the accuracy number, the **better**. *Less than 1.0 is optimal.*

OBD-II

You can pair a Bluetooth OBD-II device to SoloStorm to gather throttle position and engine rpm data for playback and analysis.

Ensure the Bluetooth OBD-II device has been paired to your Android device before starting SoloStorm.

- From the main screen, tap **Settings** → **OBD-II**
- You will be given a list of all available Bluetooth devices. Tap on your Bluetooth GPS device name and address to use it with SoloStorm.
- Tap the **Bluetooth OBD-II Reader** checkbox to use your device
- Tap Yes to enable Bluetooth if prompted
- Tap *Change OBD-II Reader* to select your OBD-II Bluetooth device

CHANNELS

This setting allows you to select which source you want SoloStorm to record respective data from.

CHANNEL DATA SOURCE SELECTION

- Single Tap the **Throttle** or **RPM** labels
- Select the data source you wish to record from, either OBD-II or the appropriate DL-1 channel
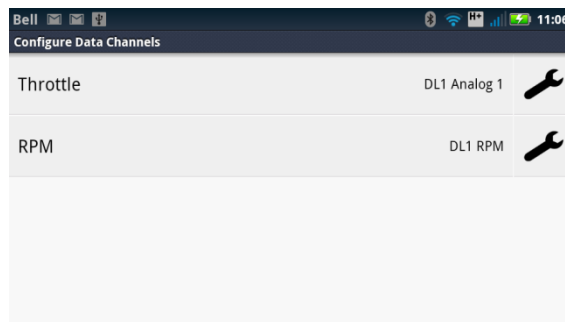
THROTTLE SENSOR CALIBRATION

- Ensure your OBD-II or DL-1 sensor is turned on and connected to SoloStorm

- Single Tap the the ![wrench icon] next to the Throttle label
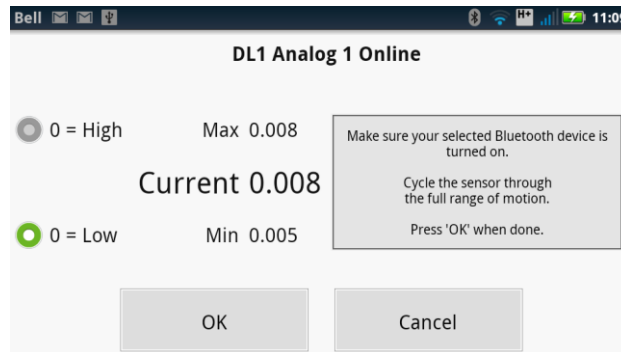
- Some sensors approach a reading of zero as they approach 100%. If you are using one of these sensors, tap the '0 = High' radio button.
- Run the Throttle through idle to Max RPM
- Tap **OK** when complete.

RPM SENSOR CALIBRATION
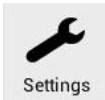
- Single Tap the the ![wrench icon] next to the RPM label.
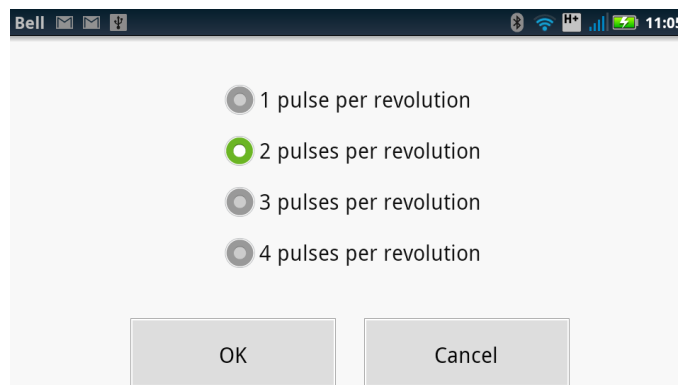
- Select the number of pulses per engine revolution. For OBD II channels, this number is '1'.

VIDEO

This setting allows you to record video via the Android device's on-board camera, or via a WiFi enabled GoPro camera.

- From the main screen, tap **Settings** → **Video**

Internal Camera	Tap to configure the internal video camera.
GoPro WiFi Camera	Tap to configure a GoPro WiFi video camera. See Appendix 2 for more information about using SoloStorm with a GoPro camera.
Start Recording when Staged	This setting automatically starts video recording once you have reached the **Stage Marker**. You must set a Stage Marker in order for this convenience feature to work. See the Markers section for details.
Extract Frames for Jogging	This extracts frames from your video to playback while you are manually manipulating the timeline. If this step is not performed, no video images will display while manually manipulating the timeline.
Jogging Frame Rate	Sets the number of frames per second to display while you are manually manipulating the timeline in analysis mode. Higher frames per second is smoother video closer to the timeline position.

INTERNAL CAMERA

The internal camera can be controlled via the following settings. Video from the internal camera can be overlaid with data, as well as analyzed frame-by-frame.

Record Video	Tap to put a checkmark in this box to enable recording of video when logging data.
Video Camera	If your device runs Android 2.3 or greater, you can select which internal camera will be used to record video. Some devices contain multiple video cameras, facing the back and front of the device.

Video Quality	Tap this box to set quality of video to record. Please note that higher quality video will take longer to process and require more memory for storage. Please ensure you have enough memory installed to handle this. Supported video resolutions are 480P, 720P, and 1080P. If your device does not support a particular video resolution, then it will not be selectable. If your device does not support at least 480P, then you will not be able to select a video resolution, and the best possible quality will be used.
Calibrate Video Recorder	This function will help synchronize images with logged data when generating overlaid video. If you do not perform this, there may be a time discrepancy between your video image and the overlaid information. You will need two mirrors that you can have face each other in order record video of the device screen. Follow on-screen instructions to complete the sync. If you find calibration does not resolve video synchronization issues, please contact support.

GOPRO WIFI CAMERA

Solostorm can control power, mode, video quality, and shutter operations of GoPro WiFi enabled cameras.

Record Video	Tap to put a checkmark in this box to enable recording of video when logging data.
Video Quality	Tap this box to set quality of video to record. Supported video resolutions are: • 720P @ 30fps + 60fps • 960P @ 30fps + 60fps • 1080p @ 30fps Note: Not all camera models support all resolutions. Make sure that your camera supports the resolution that you select. If it does not, then your camera will not switch to the desired resolution.

Automatic Triggers provide a convenient way to start and stop logging automatically so driver's don't have to worry about setting up equipment when preparing for a run. When Triggers are set to Automatic, SoloStorm automatically starts saving data when the Start Trigger conditions are met and then automatically stops recording once the Stop Trigger conditions are met.

NOTE: when properly paired, SoloStorm continuously buffers GPS and OBD-II data allowing it to record data from the absolute start of your run regardless of your trigger settings, up to a maximum of 10 seconds.

SET AUTOMATIC START/STOP TRIGGERS

- From the main screen tap **Settings** → **Triggers** `
- Set **Trigger Type**:

Automatic	SoloStorm automatically starts/stops recording data once conditions met
Manual	Driver's must manually initiate/end recording of data

- Set **Automatic Trigger Settings**
- SoloStorm's automatic Trigger is turned on by a combination of **Trigger Speed** sustained for a **Trigger Time**
  E.g. the settings pictured below will start recording when the driver has maintained 20MPH for 2 seconds pr more and will stop recording when speed falls below 10MPH for 2 seconds or more

  NOTE: these trigger settings can be triggered while driving anywhere, and can end up logging a 'run' through grid to stage that happened to meet the start trigger conditions
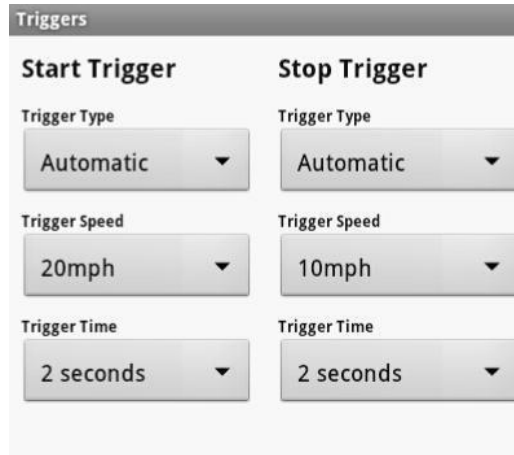
💾 LOG FILES

This setting directs SoloStorm where to save your log and video data. Some devices may not have enough memory to handle your video and run data. A high capacity and speed (Class 10 if recording video) SD card should be installed in order to ensure you do not lose data due to lack of memory. Please see your device's user manual for directions on SD card installation.

The following needs to be set once your SD card is installed:

- From the main screen tap **Settings** → 💾 Log Files
- Tap **Log File Location**
- Tap the location you would like to store your SoloStorm data

NOTE: if you have installed an SD card and can not select **Secondary SD Card** it may be because your device assigns the SD card as Primary Storage. SoloStorm will record data to it appropriately.

📱 DISPLAY

These settings control some general display attributes within SoloStorm.

Setting	Options	Details
Units	*Metric*	Measurements in metric (e.g. km/h, meters)
	American	Measurements in US (e.g. mph, feet)

Racing Mode	*Solo2*	Regular autocross data is displayed
	ProSolo	Disables align by start of log due to mirrored courses. Allows for 2 sets of markers due to the dual courses.
	Hill Climb	This enables SoloStorm to record and display elevation GPS data rather than just 2D data
Disable Screen Lock	On/Off	This prevents your android device from automatically locking the screen. Auto-screen lock would prevent SoloStorm from logging data and this option is recommended.
Use Airplane Mode	On/Off	Disables Wi-Fi on your device to lengthen battery life. Bluetooth remains on in this mode. Only available on SOME devices, please verify on your device if you choose to use it.
Voice Notifications	On/Off	Enables voice prompting for major actions such as Start Trigger detected or Stop Trigger detected.
Logger Off on Startup	On/Off	Forces SoloStorm to start with the Logger disabled regardless of last application state on exit.
Sensor-based Landscape	On/Off	If set to ON, SoloStorm will flip the display if the device is mounted upside. The accelerometer needs to be calibrated in the new position otherwise will record incorrectly.
Auto Shutdown	On/Off	Will automatically shut off SoloStorm if 30 minutes passes without any SoloStorm activity. This will prevent your device from draining the battery if forgotten running SoloStorm.

? HELP

This option can either clear or re-enable in-application tips. These tips provide some basic guidance on how to use the SoloStorm interface and will have appeared on your first application start-up. **Clear Tool Tips** will disable the help prompts, while **Reset Tool Tips** will force the tips to appear next time you enter the screens that have the tips incorporated.

LICENSE

This setting shows you whether your copy of SoloStorm has been licensed and to what e-mail address. If you have not activated your copy of SoloStorm, it will ask you for the e-mail address you presented when purchasing SoloStorm and the activation code that you received via e-mail. The activation code is not case-sensitive but do include the hyphen "-".

DEVICE INFORMATION

This option provides you information on the version of SoloStorm you have and information about your Android device that may be useful for troubleshooting.

ADVANCED LOGGER INSTRUCTIONS

This section covers details that have not been previously covered. Many of these are tools that can help you fine-tune your ability to the logging of your runs.

ACCELEROMETER

Basic calibration is covered in the Quick Reference Guide

CALIBRATE ACCELEROMETER

Calibration of the accelerometer allows you to mount your Android device in virtually any position and still accurately record G-forces on your runs.

- **LONG TAP** the g-meter to adjust the following settings
  - Accelerometer Range : This adjusts the maximum displayed range of the G-meter from 1 - 4 G

SATELLITE READINGS

There are a few lines of satellite specific data that displays while the Logger is on and awaiting a run start. This information is more for reference.

Source: Will confirm which GPS source SoloStorm is logging from e.g. Bluetooth GPS

Satellite count: more is better

Accuracy in Meters: less than 1.0 is good, you may want to adjust the position of your GPS to ensure it has the best clear view of the sky to increase accuracy.

ADVANCED ANALYSIS INSTRUCTIONS

This section contains details about functions in the Analysis mode that have not been previously covered. These tools will help you fine-tune your ability to analyze your runs, leading to more valuable review.

LOG RENAMING

Logs can be renamed if they are accidentally recorded under the wrong driver.

- go to the Log selection screen
- **LONG TAP** the run you wish to rename
- select the correct driver and appropriate run number
- you can select to force renumbering of all runs by that driver to ensure names are not out of sequence

MATH CHANNEL OPTIONS

These settings can help make Analysis more accurate.

Access these settings from the **Main Screen Menu**

|	
ALIGN LOGS	This lines up two logs in the Analysis screen based on the start of movement in each log correct for any GPS drift that may have occurred between runs.
SECTION DATA CHANNEL	Determines how SoloStorm auto-calculates section markers in Analysis Mode. **Horizontal Accelerometer** is recommended. **Calculated Turn Radius** can be selected but noisy data can lower the quality of this option.

DATA TRACES

The analysis screen can show a graphical representation for a number of data points recorded.

TRACE SELECTION & DISPLAY

LONG TAP the Trace label bar (leftmost vertical bar in the Analyze mode) to bring up all Traces available for display.

Single TAP a label on the Trace label bar to display a single specific trace. Single tap again to return bar to multiple trace mode.
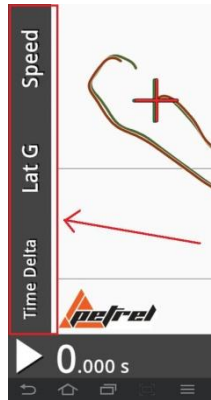
Trace Label bar on the left of the Analyze module

HOW TO READ TRACES

The thin vertical red line is the current position in both horizontally displayed traces. The horizontal black line is "ZERO".

Traces are filtered values to smooth out extreme data values that may skew interpretation.

AVAILABLE TRACES

Trace	RAW data available?	Description
Speed		Ground speed as recorded from GPS
Engine RPM	Yes	Engine RPM data recorded from OBD-II device. Filtered values smooth out and data spikes that may skew data.

|		
Throttle Position	Yes	Throttle position recorded from OBD-II device.
Time Delta		Time difference between two logs. The horizontal orange line indicates the orange log. The green line indicates relative position. Below the orange line means the green run is faster (less time) than the orange run, above line orange line means slower (more time) than the orange run. This trace recalculates if you re-align the runs part way through the run.
Lateral Acceleration	Yes	Left-right g-forces as recorded from on-board g-sensor. Above the line are right turn and below the line are left turn g-forces.
Longitudinal Acceleration	Yes	Acceleration/deceleration g-forces as recorded from on-board g-sensor. Above the line are acceleration forces, below the line are deceleration forces.
Vertical Acceleration	Yes	Ascent/descent g-forces as recorded from on-board g-sensor
Combined Acceleration		Sum total of <u>filtered</u> Lateral and Longitudinal g-forces experienced. Vertical Acceleration not included.
Distance Travelled		Cumulative distance travelled. Set Start and Stop Markers for accurate analysis.
Turn Radius	Yes	Turn radius based on calculations on GPS data.
Data Point Count		GPS data point number of log data used to mark/calculate current location data.

DETAILED SECTION ANALYSIS

Solostorm provides a quick and easy way to split and compare runs into sections.

- Enable the **Section Widget**, the course map will have markers overlaid on it
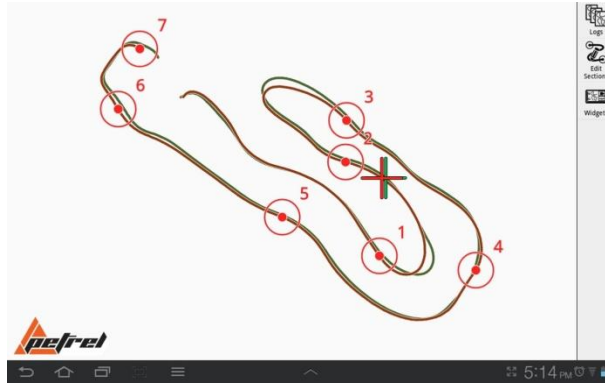
- To see elapsed section times, turn OFF the Dash widget. A section label will appear highlighting the time it took each run to complete the section the cursor is presently in
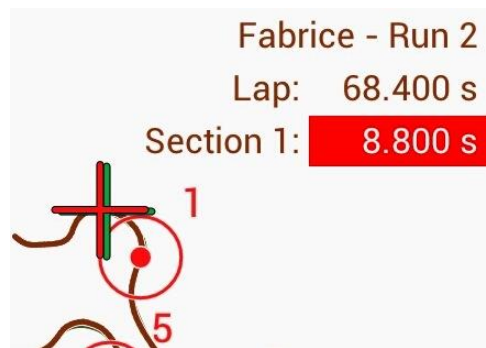
- Tap any one of the numbered circular section markers on the course map to see detailed data pertaining to that section, the relevant section of the course is bolded in the background
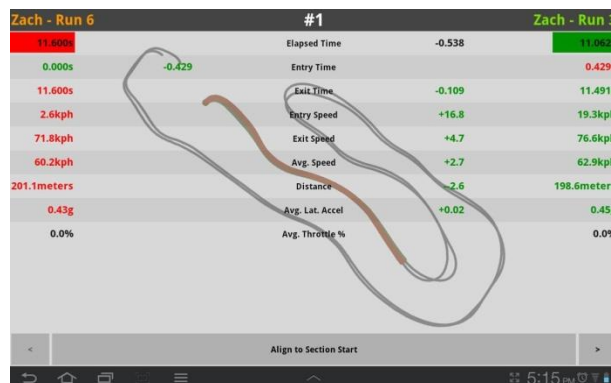
The bottom of this screen contains a **Align to Section Start** button that automatically brings both position cursors to the start of the section for convenience of playing back the section manually.

The far left and right corners have navigation buttons that allow you to move to the next section.

SECTION DATA

Section data display is split into 5 columns.

Orange Driver Recorded Data	Data **Differential** Relative to other Driver **GREEN** – advantage to <u>Orange</u> driver **RED** – deficit to <u>Green</u> driver	Data Label	Data **Differential** Relative to other Driver **GREEN** – advantage to <u>Green</u> driver **RED** – deficit to <u>Orange</u> driver	Green Driver Recorded Data

Select Section Data to display by tapping the , you will be presented a list of data channels to display.

The table below explains the various data channels available:

Elapsed Time	Time it took for each run to complete this section. Green highlight indicates faster run and difference.
Entry Time	Time that each driver arrived at the start of the section during their own run. The difference shown here indicates which driver arrived at the start of this section first based on relative time.
Exit Time	Time that each driver exited the section during their run. The difference here indicates which driver exited first based on relative time.
Entry Speed	Entrance speed into the section and difference.
Exit Speed	Speed exiting section and difference.
Average Speed	Average speed over the section and difference.
Distance	Distance travelled in the section and difference
Average Lateral	Average lateral g-forces while travelling section

Acceleration	
Average Throttle %	Average throttle position while travelling section

EDIT SECTIONS

Tapping the Edit Sections button will change the right menu bar to the following section functions. To exit these functions, press the Android Back button.

|	
Load Sections	This loads previously saves section markers for use on the currently loaded runs.
	Tap the **Load Sections** button
	Tap Session Field to select the appropriate session
	Tap the Section Marker filename to load those markers
Split Section	Drag the position cursor to where you would like to set a new section marker, tap the **Split Section** button, a new marker will be set at your current position and all sections will be renumbered accordingly.
	If you have two runs loaded, the section marker will be set by the RED run even if the run is disabled.
Merge Sections	To delete a section marker:
	Position your cursor behind (time-wise) the section marker you wish to delete
	Press the **Merge Section** button, the section marker will be deleted
Save Sections	This saves your current section markers for overlaying on other run logs.
	Tap the **Save Sections** button once you have completed setting your section markers
	Type the name of the section markers
	Tap **Save**
	The section markers will be saved under the Session the log was created under when you load them

In the Analyze module, touch the button, activate the **Video** widget. Your video will appear on the Analyze screen.

Activate video options by touching a video box in the Analyze module to show the **Video Options** Dialog for the selected log.
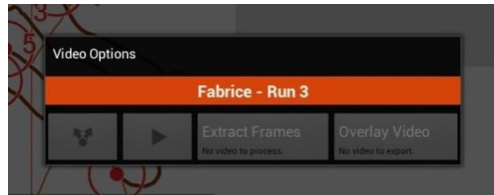
SHARE

This button shares either your raw OR overlaid video. A dialog will appear that allows you to select from a list of applications on your device that will handle the sharing of video.

PLAY

Tap this button to play either the raw video OR the video that has been overlaid with SoloStorm telemetry.

EXTRACT FRAMES

To help you find specific spots in your run, video jogging can show you snapshots of your video while you manually adjust the run timeline.

If you do not have automatic extraction of video frames turned on in the Video Settings, or you have changed the jogging frame rate, then tap the video box in the Analysis screen, then tap the **Extract Frames** button.

Once complete, you will see video 'update' while you adjust the run timeline.

OVERLAY VIDEO

This overlays SoloStorm run data onto your recorded video creating one video with all telemetry included much like those seen on TV.

NOTE: depending on your device and video quality recorded, this process may take some time. You can continue with other functions while this process runs in the background.

The overlay video may then be played or shared.

APPENDIX 1 - CONNECTING SOLOSTORM TO A RACE TECHNOLOGY DL1 DATA LOGGER

SoloStorm can be configured to accept data from the serial port on a Race Technologies DL1.

SoloStorm will extract the GPS position, speed and altitude information from the data stream, as well as analog channels 1 to 8, frequency channels 1 to 4, and RPM. For information about configuring the data channels within SoloStorm, please read the Setup section of this document.

In order to connect to a DL1, a Bluetooth serial port adapter is required. The officially supported adapter is the LM Technologies LM-084, available pre-configured from Petrel Data Systems when purchasing an accompanying DL1, or available in North America via DigiKey. If you purchase your own adapter, you will need to configure it, and possible supply your own custom serial cable (depending on your model of DL1).

LM-048 BLUETOOTH SERIAL ADAPTER CONFIGURATION

Configure your LM-048 Bluetooth serial adapter using the following settings:

Baud Rate	115200
Parity	None
Flow Control	Disabled
Stop Bits	One
Modem Signal	Disabled
Discoverable Mode	Discoverable
Device Mode	Slave
Additional check boxes	Un-check all of these, except Auto Connect.

Important: Place the LM-048 DCE/DTE switch in DCE mode if connecting it directly to the DL1. If using a serial cable in conjunction with the LM Technologies supplied gender changer, place it in DTE mode. Due to the placement of the GPS Antenna connector on the DL1 MK2+ series, you will need to use a null-modem serial cable as the power connector for the LM-048 physically interferes with it.

The LM-048 software screen should appear as so:
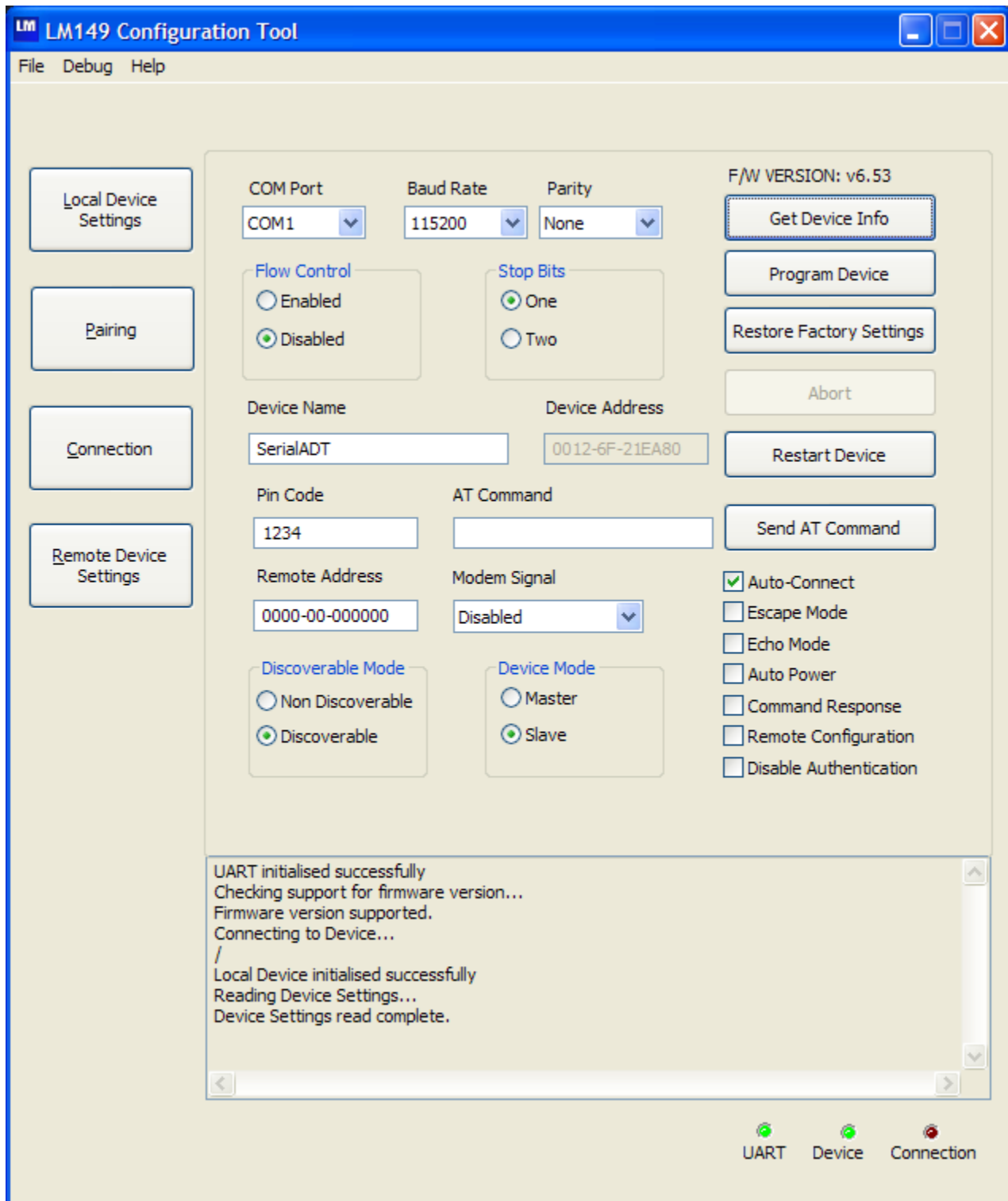
To configure your DL1, launch the configuration application that came bundled with the Race Technology software, and configure the channels that you wish to log via the serial port.

If you wish to use the LM-048 directly with a DL1 MK1:

- Under the Serial Port tab, **disable decoding of the serial data**. Note that this precludes the use of a Dash with your DL1. Additional accessories, such as a Video 4, may still be used with a serial interface splitter, which is available from Race Technologies.
- You must provide power to the LM-048 via the USB connector. The LM-048 can accept 12v via the USB connector.

If you wish to use the LM-048 with a DL1 MK2+, or an MK1+ with a Y cable and a Video4 or Dash2:

- You must use a custom serial cable that only allows the LM-048 to receive data. This cable will supply 12v power to the LM-048. **This is important!**

SoloStorm will log the DL1 channels at the same rate that the DL1 outputs position data, up to 20Hz. For example, a mark 1 DL1 with a 5hz GPS receiver will transmit position updates at 10hz, so there is no point in configuring any of the serial port channels to log at a frequency of greater than 10hz.

NOTE: The DL1 configuration software will tell you to save the DL1 configuration to a newly-formatted compact flash card. **This is important!** Failure to format the card may lead to issues that are difficult to resolve, such as the DL1 reverting back to the factory configuration.

To confirm the correct configuration, power on your DL1 with the LM-048 attached and powered. **The green Status light should pulse at regular intervals**. If the light turns off for periods over 1s, or if it is steadily lit for 1s, you may not have disabled decoding of serial data by the DL1.

Custom serial cable pinout for connection a DL1 to a Bluetooth Serial Adapter:

Female DB9 (Connects to DL1)		Female DB9 (Connects to adapter via supplied gender changer)
Pin 3 (Transmit Data)	->	Pin 2 (Receive Data)
Pin 5 (Ground)	->	Pin 5 (Ground)
Pin 7 (Supply +12v)	->	Pin 9 (Power +12v)
Pin 9 (Not Connected)	->	Pin 7 (Not Used)

Note: These custom cables are available when purchased with a pre-configured LM-048 serial to Bluetooth adapter. This pinout is provided for those who choose to make their own cables. If you are not skilled at fabricating electronic components, don't do this as you could damage your DL1 or LM-048.

The LM-048 has the following status light patterns:

All LED on/off three times	Device boot OK.
Data LED (yellow) on	Transmitting/Receiving data.
Link LED (blue) off	No pairing established.
Link LED fast (0.1 sec) blinking	Pairing
Link LED fast (0.3 sec) blinking	Discoverable and waiting for a connection (slave mode)
Link LED slow (0.9 sec) blinking	Inquiring (master mode).
Link LED very slow (1.2 sec) blinking	Connecting (master mode).
Link LED steadily on	Connection established.

SoloStorm may take up to 20 seconds to establish a connection with the LM-048 when you turn on the logger.

Due to the continuous data stream from the DL1, once a connection is made and the status led becomes a solid blue, then the data LED should turn on and remain on. If you have a connection established, but no data is being transmitted, then either the DL1 is not configured correctly, or the LM-048 DTE/DCE switch is in the incorrect position. You can confirm this by inspecting the pattern of the DL1 status light - it should pulse in a continuous pattern, and never stop or turn completely solid.

APPENDIX 2 - CONNECTING SOLOSTORM TO A GOPRO WIFI ENABLED CAMERA

SoloStorm may be used to control Power, Recording Mode, Video Quality and Shutter for the following GoPro cameras:

- HD Hero 2 + WiFi Bacpac
- Hero 3 White, Silver and Black editions

To connect a GoPro Wifi camera, follow the steps required to connect to it using the GoPro smartphone app. This involves using the camera as a WiFi hotspot. Test the connection to the camera using the app.

Before starting SoloStorm, make sure that the camera WiFi is turned on and configured to work in smartphone app mode. Then enter the SoloStorm Video settings, and enable the GoPro camera.

Note: Not all of the provided video quality settings are supported by all camera models. Select the quality setting that applies to your camera.