



Race-Keeper System User Guide v1.1.02  
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### Document Version Control

Current version highlighted in RED.

Document Version #	Release Date DD/MM/YY	Revision(s)
v1.1.0 – September 2010	30/09/10	Initial release
v1.1.01 – October 2010	13/10/10	Page 6 – Addition of document version control page Page 17 – Revision to session folder naming convention to reflect Race-Keeper Comparo software update Page 26 – Updated installation instructions for tach input cable and Race-Keeper SE
<b>v1.1.02 – January 2011</b>	28/01/11	Page 18 – Eliminated standard square camera Page 18 – Added collar clamp section Page 58 – Eliminated standard square camera from specifications



## Race-Keeper System Overview

Race-Keeper hardware combines the power of professional-grade video and data systems in one easy-to-use video data package. Coupled with Race-Keeper Comparo analysis software, the Race-Keeper system is the most powerful, competitively priced driver development tool available to help racers analyze and improve their driving. Trivinci Systems is one of the world's most capable and trusted providers of video data loggers. We have been delivering video data systems to premier racing and driving experiences, racing series and programs for the past five years across North America and Europe.

### Race-Keeper Hardware

There are two Race-Keeper video data systems:

- Race-Keeper SE
- Race-Keeper HE



Race-Keeper SE (Green) and Race-Keeper HE (Black)

- Each Race-Keeper system is one box for video and data, delivering synchronized video and data, instantly and automatically.
- Each system accommodates up to four cameras.
- Each system includes two video encoders which can capture two full-res video streams.
- Each system delivers stereo audio with built-in auto gain control.
- Each system captures data from multiple sources, including GPS, internal 3 axis accelerometer, OBD-II and CAN, and analog and digital sensors.
- Each system is WiFi ready.

The primary difference between the two systems is that Race-Keeper HE is waterproof.



## Race-Keeper Software

There are three types of Race-Keeper software:

- Race-Keeper system software installed on the Race-Keeper system
- Race-Keeper Comparo application software for video data analysis and driver development
  - Optional plug-ins (e.g., ECU data sources, dual stream + HD export, etc.)
- Race-Keeper iDash software, an in-car data display with lap times, RPM, MPH, gear, and shift points

Race-Keeper Comparo delivers automatic alert updates for system software and Comparo software to registered users.

### Race-Keeper System Software

Race-Keeper system software controls system operation, system configuration, power management, auto-stop and auto-start management, video resolution and LED functions. Race-Keeper system software is available at no charge to registered users.

### Race-Keeper Comparo

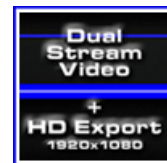
Race-Keeper Comparo driver development software is our analysis pack which plays synchronized video along with synchronized course map and data traces, including speed, lap number, lap time, Gs and course map. Each of four video data windows can be expanded for more detailed data and analysis. One of Race-Keeper Comparo's most powerful features is its drag-and-drop comparison of two outings on the same track, side-by-side.



Race-Keeper Comparo also is available at no charge to registered users. Release updates are available at [www.race-keeper.com/support](http://www.race-keeper.com/support).

### Race-Keeper Dual Stream + HD Export

Race-Keeper Dual Stream + HD Export is an optional plug-in to Race-Keeper Comparo which enables your Race-Keeper on-board system to capture two full-stream videos simultaneously, and expands Race-Keeper Comparo's export feature to export dual stream video, gauge overlays and optional user-defined custom graphics to a 1920x1080 HD palette for playback on an HD display.



Please refer to the Race-Keeper Dual Stream + HD Export User guide for system configuration and instructions: [www.race-keeper.com/dualstream+HDexport](http://www.race-keeper.com/dualstream+HDexport).

### Race-Keeper iDash

Race-Keeper iDash is an in-car data display which shows live race data including lap times, RPM, MPH, gear and shift points. Race-Keeper's iDash displays RPM, gear selection, speed, current lap, last lap, and best lap times transmitted via WiFi from Race-Keeper's on-board video data systems to the dash display. Race-Keeper iDash stores start and finish line positions for road courses, autocross, rally and hill climbs to provide accurate lap and stage information.

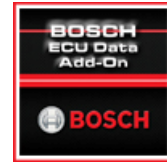


Please refer to the Race-Keeper iDash User Guide for installation and operating instructions: [www.race-keeper.com/i-Dash](http://www.race-keeper.com/i-Dash).



### Race-Keeper ECU Data Modules

Race-Keeper Bosch ECU Data Module is a software add-on and an accompanying ECU interface cable that enable Race-Keeper on-board system to capture data from Bosch ECUs. There are two types of Bosch ECU Data Modules: Standard and Expanded. Standard acquires Speed, RPM, Throttle, Steering angle, and Gear. Expanded acquires Water temp, Oil temp, Intake air temp, Fuel pressure, Oil pressure, Exhaust temp, Brake pressure (rear), Brake pressure (front) and Vehicle yaw rate.



Please refer to the Race-Keeper Bosch ECU Data Module User Guide for installation and operating instructions: [www.race-keeper.com/bosch\\_ecu\\_data\\_module](http://www.race-keeper.com/bosch_ecu_data_module).

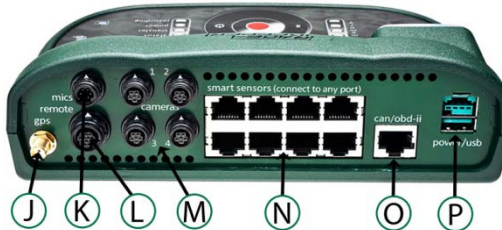




## Race-Keeper SE Schematic



- A – SD card slot
- B – Memory LED indicators for inserted media
- C – Video data recording pause button
- D – Video data recording manual start/stop button (optional auto-start/stop available)
- E – Power button
- F – Status LED indicators
- G – Video out port
- H – PC port (for development purposes only)
- I – USB port for OBD-II or USB stick



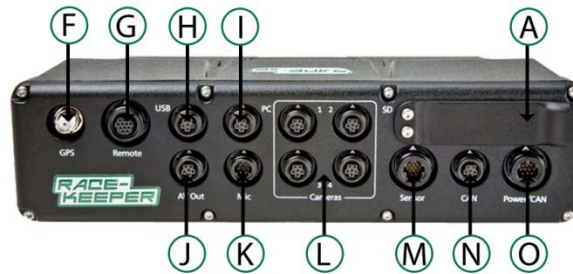
- J – GPS antenna connector
- K – Microphone connector (dual mic input capable)
- L – Remote/Operator control connector
- M – 1 to 4 camera connectors
- N – Analog and digital sensor connectors
- O – CAN connector
- P – Power and USB connector



## Race-Keeper HE Schematic



- A – SD card slot
- B – Memory LED indicators for inserted media
- C – Video data recording manual start/stop button (optional auto-start/stop available)
- D – Power button
- E – Status LED indicators



- F – GPS antenna connector
- G – Remote/Operator control connector (includes a USB port)
- H – USB connector for OBD-II, iDash
- I – PC port (for development purposes only)
- J – Video out port
- K – Microphone connector (dual mic input capable)
- L – 1 to 4 camera connectors
- M – Analog and digital sensors connector
- N – CAN connector
- O – Power/CAN connector



## Installing Race-Keeper

### Race-Keeper Connectors

Race-Keeper uses rugged, locking Hirose connectors for all connectors, with exception of the GPS antenna, which uses a threaded connector.

Race-Keeper peripheral connectors are pattern-keyed to ensure that peripherals attach only to the intended connector on the Race-Keeper system.

To attach a connector, position the connector with the white arrow on top, push connector on to Race-Keeper video data system; the connector has been successfully attached and locked when the connector “clicks” into place.



To detach a connector, pull back on the black ring with the white arrow to release the connector lock.

->**DO NOT twist the connector body!**



## Installation Steps

- **Install Race-Keeper video data system**

- Use system mounting tray or Velcro to secure the Race-keeper system in your vehicle.
- Connectors should face front of vehicle for correct inline and lateral accelerometer orientation.

- **Install camera(s)**

- Ensure arrow is on top of camera(s).
  - Square camera: Use alcohol wipe to clean mounting surface (e.g., windshield, dash); secure bracket to mounting surface with double-sided tape.
  - Bullet camera: use supplied bracket to secure to vehicle.

- **Install microphone and GPS antenna**

- Install mic in an area sheltered from wind noise.
- Install GPS antenna on roof (optimal), trunk lid or hood of the vehicle. GPS is used for speed data, lap time, and course mapping; if the GPS antenna does not have a clear view of the sky (i.e., mounted inside the vehicle), lap times and speed data may not be as accurate.
- GPS antenna has a magnetic base that will secure to a steel roof, trunk or hood. If the mounting surface is not metallic, use 3M Dual Lock Velcro to secure the antenna.

- **Install OBD-II interface (optional) or CAN/ECU interface (optional) or analog/digital sensor(s) (optional)**

- Connect OBD-II cable to vehicle OBD-II port and to OBD-II module.
- Connect the USB cable from the USB type B connector on the OBD-II module to the Race-Keeper system USB input.

- **Connect cables**

- Attach connectors to Race-Keeper video data system.
- Connectors lock when attached (to disconnect, pull on black ring to release the connector lock).
- Route and hide/tie cables with plastic adhesive mounting pads and Ty-wraps; cables should be routed away from severe heat sources or areas where they could be pinched or chafed.

- **Connect power**

- Connect power to cig lighter or direct to battery or master switch for more consistent power.
- Non-switched power is best to avoid video data outings being cut short if power is accidentally turned off.

For instructional video, please visit: [www.race-keeper.com/video\\_boxpower](http://www.race-keeper.com/video_boxpower).



### **Zero-ing the Accelerometer**

After system installation, zero the accelerometer on the Race-Keeper system:

- Copy zero accel file ("trivinci.id") to a blank SD card or USB stick.
  - File is available at [www.race-keeper.com/accel\\_zero](http://www.race-keeper.com/accel_zero)
- Park vehicle on level ground.
- Power on your Race-Keeper system and wait until the system is ready.
- Insert SD or USB with the zero accel file into the Race-Keeper system.
- Transfer LED will start to flash.
- Remove the SD or USB after 10 seconds.
- Delete trivinci.id file from SD or USB before attempting to record a video data session to that media.

### **Calibrating the Accelerometer Orientation**

After system installation, in addition to zero-ing the accelerometer on the Race-Keeper system, we recommend calibrating the accelerometer orientation for correct display of inline and lateral Gs on the accelerometer gauge in Race-Keeper Comparo. Please see [How to Calibrate the Accelerometer Gauge](#) for more information on calibrating the accelerometer using Race-Keeper Comparo software.



### Race-Keeper LEDs

Before using the Race-Keeper system, please review the status and memory LED indicators below.

There are three different LED states

- On
- Flashing
- Off

The Status, Power and top Memory LEDs are dual color; different colors indicate different modes.

#### Status LEDs

LED	Color	On	Flashing	Off
Status		Green=Ready to record	Red/Green=System starting OR Green with Red every 2 seconds =No GPS	Not ready to record
Transfer		Updating system, configuration updating, or license file copying	Accelerometer calibration stick/SD inserted	Update complete
Power		Red=Power connected, system OFF Green=Power on	Red=Powering Green=Low power	Power disconnected
Recording		Recording	Stopping recording or finishing boot up process	Not recording

#### Memory LEDs

LED	Color	On	Flashing	Off
Memory (Top)		Yellow=Memory used >80%	Red=At 100% or no SD/USB	<80% memory used
Memory (Bottom 3)		Memory used=>25%, >50% and >75%	NA	No SD/USB or memory used <25%

For instructional video, please visit: [http://www.race-keeper.com/video\\_LEDs](http://www.race-keeper.com/video_LEDs).



## Configuring Your Race-Keeper System

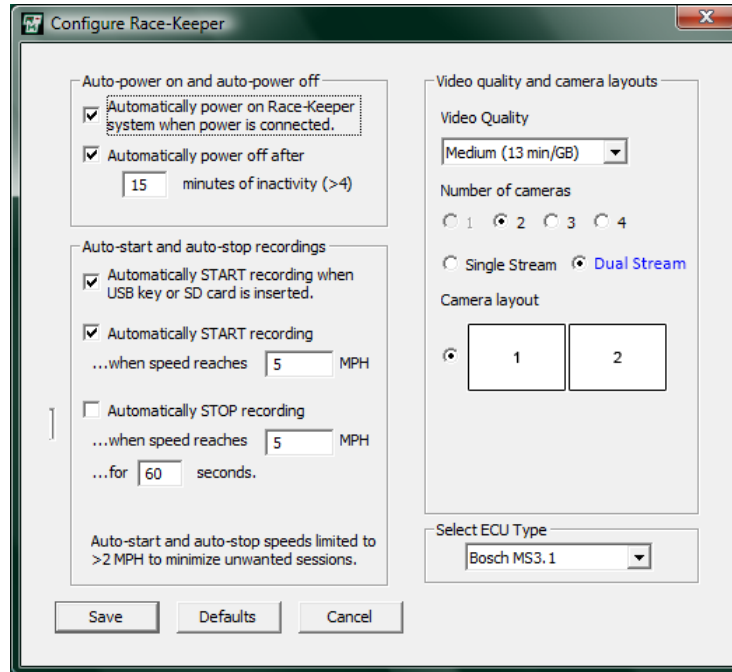
You can configure your Race-Keeper system to automatically power on and off, and to automatically start and stop recording on speed and time triggers. You can also change your video quality settings and camera layout.

Configuring your Race-Keeper system is a two-step process:

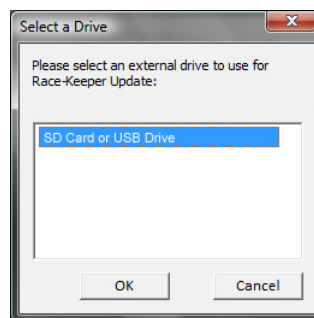
- Select your configuration and copy configuration update file to SD (or USB for Race-Keeper SE).
- Copy configuration update file on the SD or USB to the Race-Keeper system.

### Select Configuration and Copy Update File to SD or USB

- Open Race-Keeper Comparo and select Configure->Configure Race-Keeper.



- Enter required configuration and click on Save.
- Insert a blank SD or USB, select the SD or USB, and click OK to save the update file to SD or USB.



### Copy Configuration Update File to Race-Keeper System

- Power on your Race-Keeper system and wait until the system is ready.
- Insert SD or USB into the Race-Keeper system.
- Transfer LED will illuminate solid for several seconds.
- When Transfer LED turns off, configuration is complete.
- Delete configuration update file from SD or USB before attempting to record a video data session to that media.



## Recording Video Data Sessions

- Power on Race-Keeper system
  - System can be configured to boot automatically when power is connected
  - See Race-Keeper Comparo->Configure menu; see [Configuring Race-Keeper](#) for more info
- Ensure SD media is inserted (or USB attached on Race-Keeper SE)
  - System can be configured to record automatically upon insertion of SD or USB
  - See Race-Keeper Comparo->Configure menu
- Push record button to start recording
  - System can be configured to auto-record when the vehicle exceeds a configurable speed
  - See Race-Keeper Comparo->Configure menu
- Push record button to stop recording
  - Wait until Recording LED stops flashing before removing SD or USB
  - System can be configured to auto-stop when the vehicle slows below a configurable speed for more than N seconds, where N = number of seconds, defined by the user
  - See Race-Keeper Comparo->Configure menu

## Session Folder Names and Files

Race-Keeper automatically creates a folder for each recorded session. Race-Keeper automatically names the folder according to the following convention:

- #####\_YYYYMMDD\_HHMMSS, where
- ##### = Race-Keeper system serial number
  - Race-Keeper SEs begin with 1 or 2 and Race-Keeper HEs begin with 5 or 6
- YYYYMMDD = Date of session
- HHMMSS = Time of session (GMT)

Note: There are three files inside a session folder:

- outing.rkd, which encapsulates data and synchronization files,
- video.avi, the container for the video files, and
- video.avi.rki, a proprietary index file

*Note: If you use Import (see [Importing and Opening Track Outings](#)), Race-Keeper Comparo will append the above nomenclature to a folder that is created using the Name field from the Import menu.*

Race-Keeper produces video and data files independently, which gives maximum flexibility to configuring gauge overlays and exported video files.

When finished recording sessions, ensure the recording has stopped and the red Record LED is off, remove media and insert SD or USB into PC and use Race-Keeper Comparo to play, analyze and compare sessions.



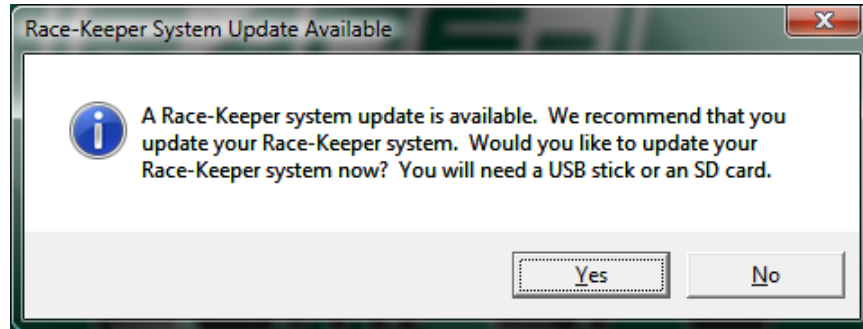


## Updating Your Race-Keeper System Software

We deliver Race-Keeper systems with current system software at the time of shipment. We issue updates to Race-Keeper system software to add new features, enhance existing features, and fix bugs.

We notify customers regarding updates to system software via Race-Keeper Comparo, which automatically issues alert updates to registered users.

When an update is available for Race-Keeper system software, you will receive a system update alert:

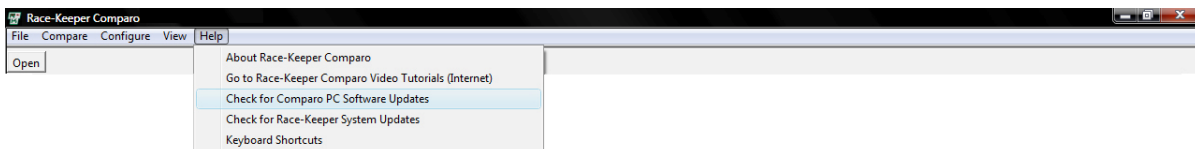


To update Race-Keeper system software:

- Click Yes.
- Copy the software update to SD.
- Power on your Race-Keeper system and wait until the system is ready.
- **DO NOT REMOVE OR INTERRUPT POWER DURING THE SYSTEM SOFTWARE UPDATE PROCESS.**
- Insert SD into the Race-Keeper system.
- Transfer LED will illuminate solid for up to several minutes.
- System should automatically reboot and continue the update sequence.
- System update may require the system to update and restart twice.
  - If system has been unresponsive for five minutes, reboot your Race-Keeper system manually and permit the system to continue updating.
- When system has booted up and is ready, your system has been properly updated.
- Delete system update file(s) from SD or USB before attempting to record a video data session to that media.

In addition to automatic alerts in Race-Keeper Comparo, you can manually determine if you're using the latest system software

- Open Race-Keeper Comparo.
- Select Help->Check for Comparo Software Updates.



For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=04\\_updatehw](http://www.race-keeper.com/comparo_screencasts?which=04_updatehw).



## Race-Keeper Cameras

There are two types of Race-Keeper cameras:



- **Mini-bullet** delivers highest resolution (550 TV lines) camera in a waterproof enclosure; perfect for open-wheel, open-cockpit, external (e.g., root-top) video capture, and motorcycles. Includes standard L-bracket.
- **Mini-square** delivers highest resolution (550 TV lines) camera in a lightweight package. Excellent camera for inside most vehicles, including road and auto-cross cars. Includes mounting bracket and double-sided 3M VHB mounting tape for quick and secure installation.

All cameras are terminated with 10-foot cables; 10-foot extension cables are available. All cameras are tested and focused prior to shipment. Cameras do not require focusing unless the lens is replaced or otherwise disturbed.

For instructional video, please visit: [www.race-keeper.com/video\\_cameras](http://www.race-keeper.com/video_cameras)

### Collar Clamps

For more secure installations, roll hoop collar clamps are available for mini-bullet cameras in the following sizes: 1 3/8", 1 1/2", 1 5/8", 1 3/4", and 1 7/8".



### Lens Options

Mini-square camera is available with four lens options: 6.0mm, 4.3mm, 3.6mm, and 2.5mm

Mini-bullet camera is available with three lens options: 6.0mm, 3.6mm, and 2.95mm.

Each lens type is offered to capture the best angle - from narrow to wide - for required video capture. Lens size affects distance and field of view – a smaller lens value will show a shorter viewing distance and a wider field of view; a larger lens value will allow for a longer viewing distance but a narrower field of view. For example, a 2.5mm lens produces a wider angle (155 deg approx) than a 6.0 mm lens (120 deg approx).

- Front – 6.0mm for speedway, 4.3mm (mini-square camera) for road race, or 3.6mm for auto-cross
- Rear – 3.6mm
- Inside/Cockpit – 2.5mm lens (mini-square camera), 2.95 mm lens (mini-bullet camera)
- Footwell – 2.5mm lens (mini-square cameras), 2.95 mm lens (mini-bullet camera)
- Suspension, Brake and Tires – 2.5mm lens (mini-square camera), 2.95 mm lens (mini-bullet camera)



### Replacing Lens Cover on Mini-bullet Camera

The lens cover protects the bullet camera lens from damage due to stones, dust and moisture. If the bullet camera is mounted on the outside of the vehicle, the lens cover should be wiped clean after every track session, and replaced after each race weekend to ensure the camera image is always crisp and clear.

To replace the lens cover:

- Unscrew the front section of the bullet camera that holds the lens cover (lens cover holder).
- Remove the inner metal spacer ring, the black 'O' ring and the old lens cover from the lens cover holder.
- Clean the lens cover holder and the 'O' ring to remove road dirt.
- Holding by its edges, drop in the new lens cover being careful not to touch the lens cover surfaces, ensure the lens cover is seated at the front of the lens cover holder.
- Drop in the black 'O' ring and ensure it is seated up against the new lens cover.
- Drop in the metal spacer, ensuring the shouldered end goes in first – this sits over the 'O' ring to hold it and the lens cover in place.
- Screw the lens cover holder back onto the camera – tighten all the way so the 'O' ring on the camera body can no longer be seen.

Once the new lens cover is in place, spray with repellent (e.g., Rain-X) to ensure water does not obscure the video image when driving in wet conditions.

### Replacing a Camera Lens

All cameras are tested and focused prior to shipment. Cameras do not require focusing unless the lens is replaced or otherwise disturbed.

To replace a camera lens:

- Using a small screwdriver, untighten the lens set screw located on the side of the camera body.
- Using your index finger and thumb, unscrew the lens from the camera body.
- Carefully thread a new lens onto the camera body until the lens seats on the body.
- Do not force or overtighten the lens.
- Focus the lens (see instructions below) before tightening the set screw.

### Focusing a Camera Lens with External Monitor

To focus a camera lens using an external monitor:

- Connect camera to one of the four camera inputs on the Race-Keeper box.
- Connect an external monitor (e.g., portable DVD player) to the video out port on the Race-Keeper system.
  - Video out cables are also available at [www.race-keeper.com](http://www.race-keeper.com).
- Turn on the Race-Keeper system.
- The video from the camera will be displayed on the external monitor.
- Make sure there is adequate lighting and an object in the field of view that can be used as a target.
- Loosen the lens set screw with a small flat blade screwdriver.
- Turn lens clockwise or counter-clockwise until the image is focused.
- When the camera lens is focused, tighten the set screw.
- If you have some Loctite, place a tiny drop on the screw threads to prevent the screw shaking loose due to vehicle vibration.
- Do not put Loctite on the lens threads.



### **Focusing a Camera Lens Without an External Monitor**

If no video monitor is available, you can focus the camera by recording video and playing the video on a PC using Race-Keeper Comparo (or any MPEG4 video player, e.g., VLC).

To focus a camera without using an external monitor:

- Connect camera to one of the four camera inputs on the Race-Keeper box.
- Make sure there is adequate lighting and an object in the field of view that can be used as a target.
- Make sure a microphone is attached to the Race-Keeper system.
- Turn on the Race-Keeper system and press the record button.
- Loosen the lens set screw with a small flat blade screwdriver.
- Turn the lens counter clockwise in ¼ increments, counting as you go until you reach 10 ¼ turns.
- Push the stop button, remove the USB stick or SD card and play the session using Race-Keeper Comparo.
- Watch the video and note at what ¼ increment the video comes into focus; repeat process if necessary.
- Once you've identified the number on which the camera is focused, turn the lens clockwise, counting ¼ increments backward from 10 until you reach the desired number.
- Verify the focus by recording and playing a few minutes of video.
- If necessary, record another video sample and turn the lens 1/4 turn in both directions from the starting point to refine the focus; repeat process if necessary.
- When the camera lens is focused, tighten the set screw.
- If you have some Loctite, place a tiny drop on the screw threads to prevent the screw shaking loose due to vehicle vibration.
- Do not put Loctite on the lens threads.

### **Race-Keeper Microphone**

Race-Keeper's microphone is extremely durable and picks up an exceptional range of audio, including conversation or radio when in the pits, and engine noise on the track. Race-Keeper system software includes built-in Automatic Gain Control, which adjusts audio levels automatically to maintain a constant sound level.

To install the microphone, place it forward and away from direct wind noise if possible. If you're recording in an open cockpit (e.g., in a single-seater race car or in a road car with windows down), consider adding a wind cover to dampen irritating high-frequency wind interference.

For instructional video, please visit: [www.race-keeper.com/video\\_mics](http://www.race-keeper.com/video_mics).



## Race-Keeper Data Sources

Race-Keeper offers dozens of data sources for all types of data requirements, covering the range of driver inputs (brake, throttle, steering) and vehicle inputs (speed, RPM, temps, pressures).

There are four different major types of data sources, the traces of which are automatically displayed in Race-Keeper Comparo:

- Standard data
- OBD-II data
- ECU data
- Sensor data

All data sources are logged at 30Hz.

Data from all data sources is synced automatically and instantly with Race- Keeper video and other data sources.

Standard data is delivered with every Race-Keeper system; each additional data input delivers expanded data sets for additional driver and vehicle analysis.

For instructional video, please visit: [www.race-keeper.com/video\\_data](http://www.race-keeper.com/video_data)

### Standard Data

Every Race-Keeper system delivers essential data for driver development:

- Speed
- Lap numbers
- Lap times
- Split times
- Lateral, vertical and inline Gs
- Voltage

Race-Keeper acquires speed from high-resolution GPS, which also enables lap number, lap times, split times, and display of course map with user-configurable split markers. G data are acquired from on-board accelerometer inside the Race-Keeper system enclosure; for optimal G data, install Race-Keeper system with connectors facing front and after installation, zero the accelerometer.

### OBD-II Data

To acquire additional data from road cars, Race-Keeper acquires data from OBD-II (On-board Diagnostic).

All cars and light trucks built since January 1, 1996 are equipped with OBD-II.

Depending on the make/model, OBD-II data delivers up to 10 additional data channels:

- Vehicle speed
- Engine RPM
- Throttle position
- Engine coolant temperature
- Fuel pressure
- Intake air temperature
- Intake manifold pressure (manifold absolute pressure (MAP))
- Mass air flow (MAF)
- Fuel level input
- Calculated engine load value



### Configuring Your Race-Keeper System for OBD-II

There is NO configuration required; connecting the interface automatically stimulates the system to acquire OBD-II data. Race-Keeper Comparo also automatically displays the additional OBD-II data.

### Connecting OBD-II to Your Race-Keeper System

To connect the OBD-II interface to your vehicle and your Race-Keeper system:

- Power off your Race-Keeper system.
- Connect the OBD-II connector to your vehicle.



- Note: OBD-II ports are typically located on the driver side above the pedals under the steering column.
- Two types of OBD-II connectors are available for Race-Keeper: right-angle and straight, which is displayed above.
- Connect the other end of the OBD-II connector to the Race-Keeper OBD-II Interface (serial connector).
- Connect the USB B connector to the other end of the Race-Keeper OBD-II interface (USB B port).
- Connect the other end of the USB cable to the Race-Keeper system.
  - If you use Race-Keeper SE, attach USB connector to the i) USB port on the enclosure, or ii) USB connector that is part of the power loom, or iii) Remote/Operator control connector (with special cable, please contact Race-Keeper).
  - If you use Race-Keeper HE, attach USB connector to the i) USB connector with supplied cable, or ii) Remote/Operator control connector (with special cable, please contact Race-Keeper).



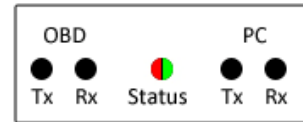
- If you're using more than one USB device (e.g., OBD-II and Race-Keeper iDash), we recommend connecting devices to different USB connectors on your Race-Keeper system (i.e., and not using a USB hub).



### Acquiring OBD-II Data from Your Vehicle's OBD-II

To acquire ODB-II data:

- Power on your vehicle (i.e., turn key to Ignition).
  - Depending on OBD-II interface model, red Status LED should turn on, indicating that the OBD-II interface is properly connected and powered by 12v from the vehicle.
- Power on your Race-Keeper system.
  - The Status LED should turn green, which indicates that the OBD-II interface is properly connected to the Race-Keeper system.
- The Tx (transmit) and Rx (receive) LEDs will flash as OBD-II data is transmitted from the vehicle to the Race-Keeper system (i.e., requests each OBD-II data channel from the vehicle's ECU; the ECU responds with data value).



### **ECU Data**

To acquire data from vehicles with race or aftermarket ECUs, Race-Keeper connects to CAN (Controller Area Network) or serial data stream output from the ECU. Depending on the make/model, ECU data delivers many additional data channels, including:

- Speed
- RPM
- Throttle
- Steering angle
- Gear
- Water temp
- Oil temp
- Intake air temp
- Fuel pressure
- Oil pressure
- Exhaust temp
- Brake pressure (rear)
- Brake pressure (front)
- Vehicle yaw rate

For more information on ECU data, including configuring your Race-Keeper system to acquire ECU data, please refer to the ECU CAN data modules at [www.race-keeper.com](http://www.race-keeper.com) and/or each ECU CAN data module's respective user guide.



## Sensor Data

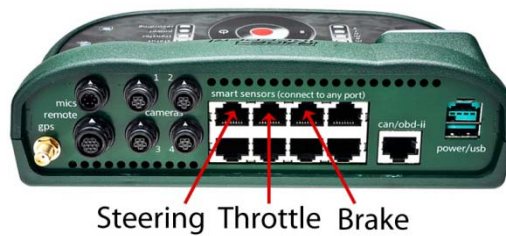
To acquire data from vehicles that do not have OBD-II or ECUs, Race-Keeper acquires data from analog or digital sensors.

- If you're using Race-Keeper SE, you can connect up to 8 analog and 8 digital sensors.
- If you're using Race-Keeper HE, you can connect up to 3 analog sensors and 2 digital sensors.

### Analog Sensors

Race-Keeper works with 5V string potentiometers that are ideal for quickly measuring and analyzing the three most important driver inputs:

- Steering (port 1 on Race-Keeper SE, top row, left RJ-45 socket)
- Throttle (port 2 on Race-Keeper SE, top row, second from left RJ-45 socket)
- Brake (port 3 on Race-Keeper SE, top row, third from left RJ-45 socket)



Race-Keeper is set up to work automatically with each of the three analog sensors. The sensors are water resistant with a flexible cable, spring-loaded spool and potentiometer to detect and measure linear position. Sensors have a temperature operating range of 0°F (-18°C) 160°F (71°C).



To install an analog sensor:

- Analog sensor is supplied terminated with the correct connector to fit either the Race-Keeper SE or HE; sensor is plugged into the Race-Keeper system or sensor tails loom as appropriate.
- Sensor also is supplied with a mounting bracket; securely mount the sensor with this bracket so the sprung wire is drawn directly out of the sensor by the moving part to be measured.
- Attach the sensor's wire tip to the moving part by wrapping around twice and securing in place.
- Route the sensor cable away from sources of interference (e.g., ignition coils, plug leads, electronic modules or antennas).
- Verify that the cable is not pinched or stretched by moving parts; verify that the moving part is not restricted or affected by the sensor installation.
- Make a recording with the Race-Keeper system while activating the moving part(s) with sensors attached.
- Verify that the data channels appear in Race-Keeper Comparo under the correct channel names.
  - If the data for a sensor appears to be inverted, right-click on the sensor channel name and select the option to Invert Sensor Data





### Tach Input

Race-Keeper's tach input cable connects a tach signal from your vehicle's ignition system to the digital tach input on the Race-Keeper system. The tach data signal should be a clean square wave, nominally 0-5v. The tach cable contains a protection circuit to ensure the Race-Keeper system isn't damaged if the input signal from the ignition system is too powerful or contains electrical noise.

- If you're using Race-Keeper SE, connect the bare wire to tach signal on the vehicle and connect the RJ-45 connector into the bottom right port on the Race-Keeper system.
- If you're using Race-Keeper HE, connect the bare wire to tach signal on the vehicle and connect the sensor input connector to the Sensor input loom.



Race-Keeper SE Tach Input Cable

Race-Keeper HE Tach Input Cable

Race-Keeper Comparo manages calibration of the tach input signal. Once an outing has been recorded with the tach cable connected, the tach data will appear as an available data channel in Race-Keeper Comparo, which you can calibrate by right-clicking on the RPM channel name and selecting the number of pulses per two engine revolutions. Once the number of pulses has been selected, verify the RPM readings on the data trace are correct. If they are not, modify the pulse value until the correct RPM data range is seen.



### Data Sources Quick Reference

Data	Source	Race-Keeper Comparo
Speed (GPS)	Standard	Speed (GPS)
Lap number(s)	Standard	Lap #
Lap time(s)	Standard	Lap
Lateral G	Standard	Lateral G
Vertical G	Standard	Vertical G
Inline G	Standard	Inline G
Voltage	Standard	Voltage
Vehicle speed	OBD-II	Speed (OBD-II)
Engine RPM	OBD-II	RPM (OBD-II)
Throttle position	OBD-II	Throttle (OBD-II)
Engine coolant temperature	OBD-II	Coolant Temp (OBD-II)
Fuel pressure	OBD-II	Fuel Pressure (OBD-II)
Intake air temperature	OBD-II	Intake Air Temp (OBD-II)
MAP (Intake manifold absolute pressure)	OBD-II	MAP (OBD-II)
MAF (Mass air flow)	OBD-II	MAF (OBD-II)
Fuel Level Input	OBD-II	Fuel Level (OBD-II)
Calculated engine load value	OBD-II	Engine Load Calc (OBD-II)
RPM (Digital Sensor or Tach)	Sensor	RPM (Tach)
Steering (Analog Sensor)	Sensor	Steering (Sensor)
Throttle (Analog Sensor)	Sensor	Throttle (Sensor)
Brake (Analog Sensor)	Sensor	Brake (Sensor)
Speed	ECU Standard	Speed (ECU)
RPM	ECU Standard	RPM (ECU)
Throttle	ECU Standard	Throttle (ECU)
Steering angle	ECU Standard	Steering Angle (ECU)
Gear	ECU Standard	Gear (ECU)
Water temp	ECU Expanded	Water Temp (ECU)
Oil temp	ECU Expanded	Oil Temp (ECU)
Intake air temp	ECU Expanded	Intake air Temp (ECU)
Fuel pressure	ECU Expanded	Fuel Pressure (ECU)
Oil pressure	ECU Expanded	Oil Pressure (ECU)
Exhaust temp	ECU Expanded	Exhaust Temp (ECU)
Brake pressure (Rear)	ECU Expanded	Brake Pressure-Rear (ECU)
Brake pressure (Front)	ECU Expanded	Brake Pressure-Front (ECU)
Vehicle yaw rate	ECU Expanded	Vehicle Yaw Rate (ECU)



## Race-Keeper Software

There are three types of Race-Keeper software:

- Race-Keeper system software installed on the Race-Keeper system
- Race-Keeper Comparo application software for video data analysis and driver development
  - Optional plug-ins (e.g., dual stream + HD export, ECU data sources, etc.)
- Race-Keeper iDash software, an in-car data display with lap times, RPM, MPH, gear and shift points

This section addresses Race-Keeper Comparo.

See previous section(s) for information about Race-Keeper system software.

For information about Race-Keeper Dual Stream + HD Export, see [www.race-keeper.com/dualstream+HDexport](http://www.race-keeper.com/dualstream+HDexport).

For information about Race-Keeper iDash, see [www.race-keeper.com/i-Dash](http://www.race-keeper.com/i-Dash).

For information about Race-Keeper Bosch ECU Data Module, see [www.race-keeper.com/bosch\\_ecu\\_data\\_module](http://www.race-keeper.com/bosch_ecu_data_module).

### Race-Keeper Comparo

Race-Keeper Comparo driver development software is our analysis pack which plays synchronized video and data.



Race-Keeper Comparo automatically plays video along with synchronized course map and data traces, including speed, lap number, lap time, Gs and course map. Each of four video data windows can be expanded for more detailed data and analysis. One of Race-Keeper Comparo's most powerful features is its drag-and-drop comparison of two outings on the same track, side-by-side.

Race-Keeper Comparo also is available at no charge to registered users. Release updates also are available at [www.race-keeper.com/support](http://www.race-keeper.com/support).

### **Installing Race-Keeper Comparo Software**

Race-Keeper Comparo works in tandem with Race-Keeper on-board systems, which captures and automatically and instantly synchronizes high-res video and data. With Race-Keeper Comparo software, you can quickly identify how to improve your driving and decrease your lap times.

To install Race-Keeper Comparo:

- Download installation file
  - [www.race-keeper.com/support/downloads](http://www.race-keeper.com/support/downloads), or
  - [www.race-keeper.co.uk/support/downloads](http://www.race-keeper.co.uk/support/downloads)
- Copy the installer to your desktop and follow the setup instructions.
- Click Finish to automatically start Race-Keeper Comparo.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=02\\_install](http://www.race-keeper.com/comparo_screencasts?which=02_install).



### Updating Race-Keeper Software

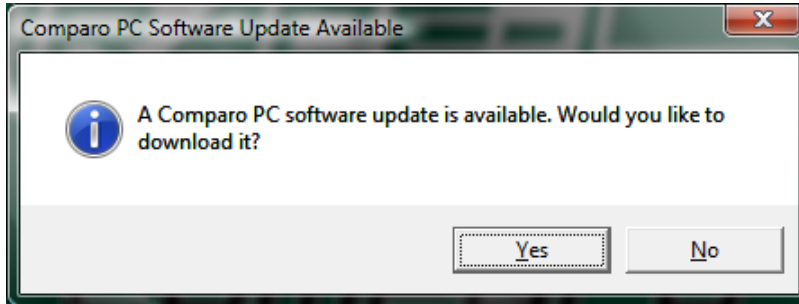
When you open Race-Keeper Comparo, you'll notice an occasional alert message that indicates a software update is available.

There are two types of Race-Keeper software updates:

- Race-Keeper system software updates ([Updating Your Race-Keeper System Software](#) for more info).
- Race-Keeper Comparo application updates (see below).

#### How to Update Race-Keeper Comparo Software

When an update is available for Race-Keeper Comparo software, you will receive the following alert:



To update Race-Keeper Comparo:

- Click Yes.
- Follow update instructions.
- Click Finish to automatically start Race-Keeper Comparo.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=05\\_updatesw](http://www.race-keeper.com/comparo_screencasts?which=05_updatesw).



## Menus and Main View

### Race-Keeper Comparo Menus

After you've opened a Race-Keeper Comparo outing, you'll note that there are five menus:

- **File**, for opening, importing and exporting features
- **Compare**, for comparing laps and outings
- **Configure**, for configuring Race-Keeper Comparo and Race-Keeper system software
- **View**, for switching between standard and expanded views, and
- **Help**, for checking for software updates

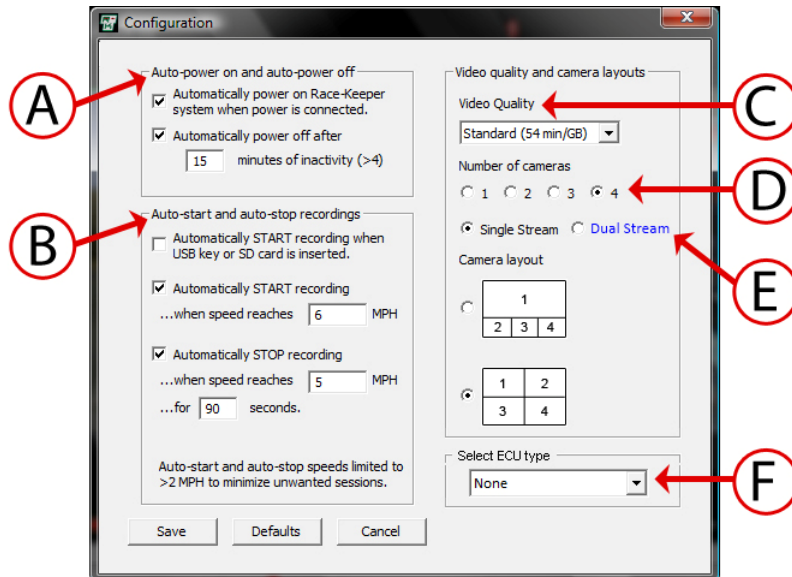
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=07\\_menus](http://www.race-keeper.com/comparo_screencasts?which=07_menus).

### Configuring Race-Keeper

Race-Keeper Comparo gives you the power to easily configure your Race-Keeper system for different auto-start, auto-stop and video quality parameters. Configuring your Race-Keeper system is a two-step process:

#### Select Configure->Configure Race-Keeper

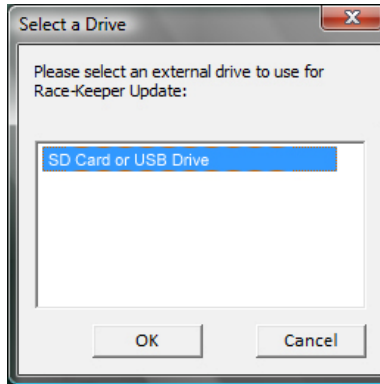
- Use Race-Keeper Comparo to select your configuration settings
  - A – Auto-power on and auto-power off
  - B – Auto-start and auto-stop
  - C – Video quality
  - D – Number of cameras
    - Camera layout options change dynamically
  - E – Single stream or dual stream (optional)
    - See [Race-Keeper Dual Stream + HD Export](#) for more info on dual stream mode
  - F – ECU data source (optional)
    - See [ECU Data](#) for more information on ECU data source



- Enter required configuration and click on Save.



- Insert a blank SD or USB, select the SD or USB, and click OK to save the update file to SD or USB.



#### Copy Configuration Update File to Race-Keeper System

- Power on your Race-Keeper system and wait until the system is ready.
- Insert SD or USB into the Race-Keeper system.
- Transfer LED will illuminate solid for several seconds.
- When Transfer LED turns off, configuration is complete.
- Delete software update file from SD or USB before attempting to record a video data session to that media.



### Race-Keeper Comparo Shortcut Keys

Race-Keeper provides a number of helpful shortcut keys; shortcuts are identified by letters to the right of each menu label.

#### How to View All Shortcut Keys

To view a complete list of shortcut keys:

- Select Help->Keyboard Shortcuts

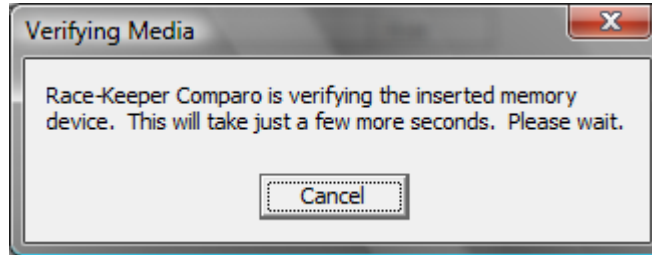


## Importing and Opening Track Outings

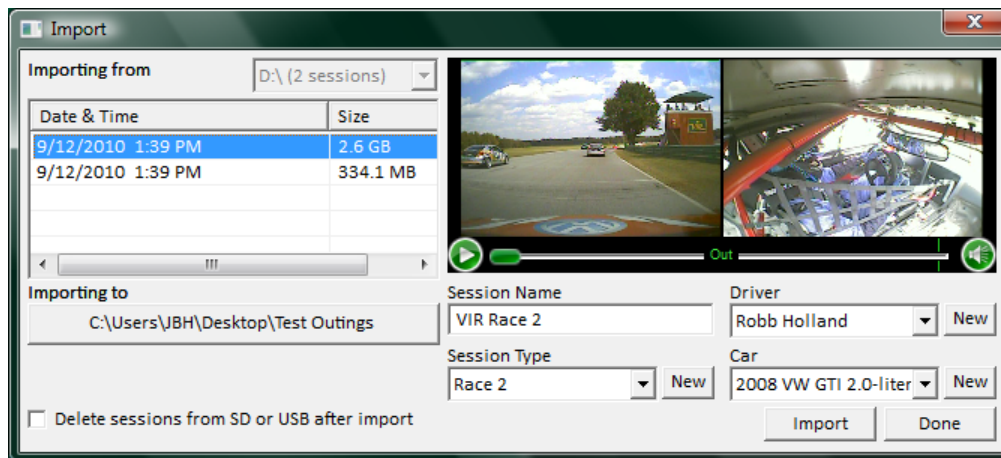
### How to Import a Race-Keeper Track Session

To import a Race-Keeper session:

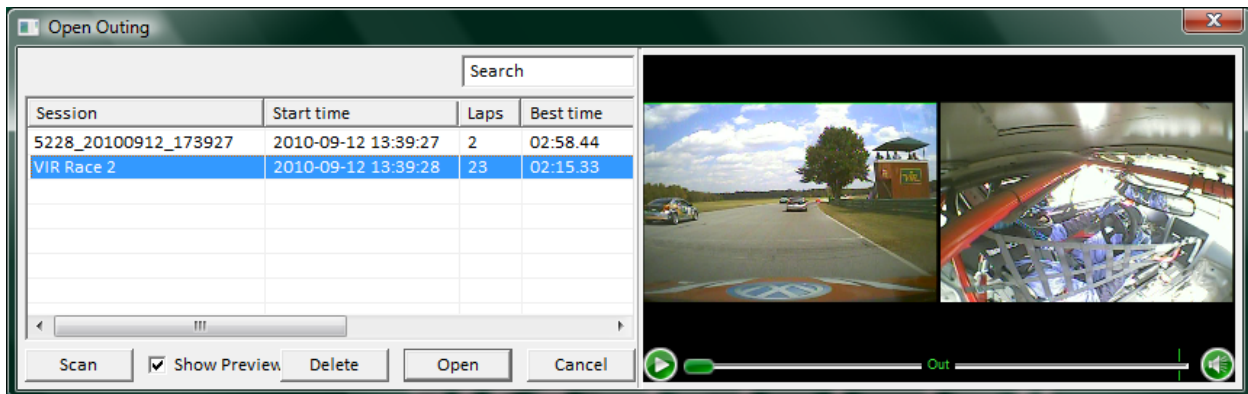
- Select File->Import.
- Insert SD or USB with the track sessions.
- You may receive an alert regarding verification of attached media, please allow Comparo to verify the media.



- If more than one media is inserted, select the drive letter from which to import session(s).
- Click on session(s) to import (hold Ctrl to select multiple sessions).
  - You can add name, type, driver and car info to individual sessions (you can also add/edit details later).



- Refer to or click on the "Importing to" button to review or change the destination location on your PC.
- Click Import.
- After an outing has been imported, it will appear in the list of outings in the Open window (see next section).



For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=06\\_import](http://www.race-keeper.com/comparo_screencasts?which=06_import).



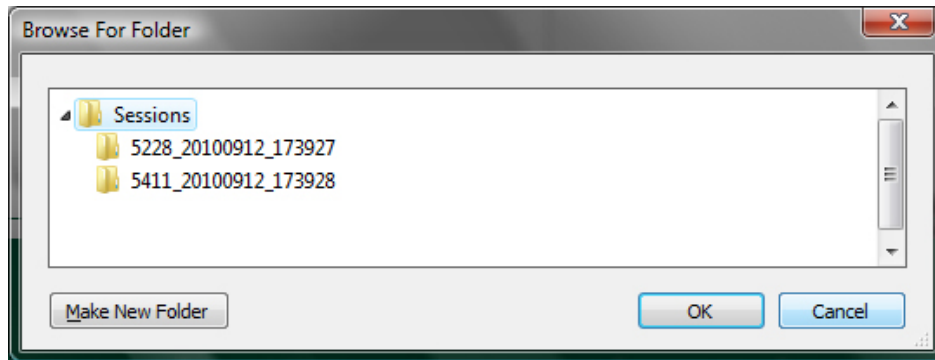
### How to Open a Race-Keeper Track Session

To open a Race-Keeper session:

- Use Import (see above) or copy file(s) from your SD or USB to a folder on your PC.
- If you copy your files from SD or USB directly to a folder on your PC (i.e., you don't use Import), you will need to point Race-Keeper Comparo to the folder(s) in which your session folders reside.

Name	Size	Type	Date modified
5228_20100912_173927		File Folder	9/30/2010 4:10 PM
5411_20100912_173928		File Folder	9/30/2010 4:10 PM

- Select File->Open and click on Scan to navigate to the folder with the track sessions.



- Click OK and all sessions within the target folder are scanned and available in the list of sessions in the Open window; new sessions are added to the bottom of the list.
- Click on a Race-Keeper session and then click Open.

->You can open and play session(s) directly from USB or SD but we strongly recommend copying sessions to your PC for optimal playback.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=03\\_open](http://www.race-keeper.com/comparo_screencasts?which=03_open).



### Four Main Areas of a Race-Keeper Session

There are four main areas of a Race-Keeper session:

- **Video player**, which plays video synchronized with data
- **Data graph**, which displays data traces synchronized with video
- **Course map**, which shows the course
- **Session info**, which shows lap info and splits

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=08\\_4areas](http://www.race-keeper.com/comparo_screencasts?which=08_4areas).

### How to Navigate a Race-Keeper Session

To navigate a Race-Keeper session:

- Click on the navigation bar on the video player, or
- Click on any point on the data graph, or
- Click on any point on the course map, or
- Click on a lap in session info

Because video and data are synchronized instantly and automatically at time of capture, navigation on one of the four windows automatically changes the location on the other three windows.

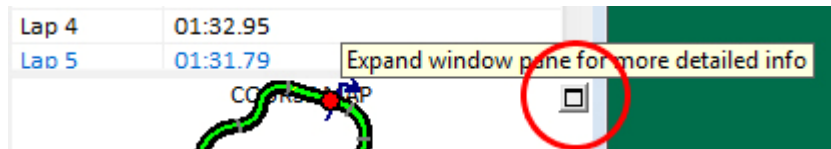
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=10\\_navigation](http://www.race-keeper.com/comparo_screencasts?which=10_navigation).

### How to Expand and Shrink Race-Keeper Windows

Each of the four areas in a Race-Keeper Comparo session can be expanded to provide more information.

To expand a Race-Keeper area:

- Click on the Maximize button in the top right-hand corner of each of the four areas



To restore a Race-Keeper area back to its original size:

- Click on the Restore button in the top right-hand corner of each of the four areas



For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=09\\_expand](http://www.race-keeper.com/comparo_screencasts?which=09_expand).

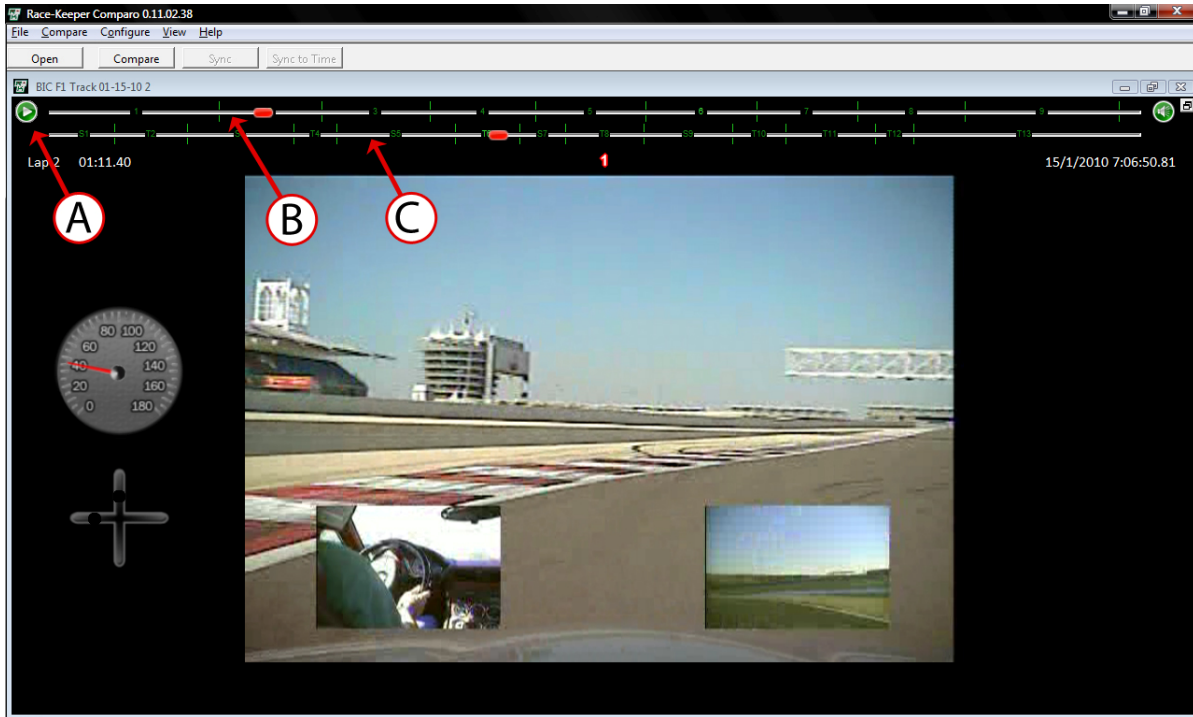
### More About the Video Player

Video Player is one of the four main areas of a Race-Keeper session.

Race-Keeper's video player provides:

- Video playback control
- Lap number and lap time
- GPS date and time stamp (date and time)
- Inter-lap navigation controls

When you expand the video player, the intra-lap navigation control appears for more granular navigation within the current lap, along with any splits that you've established.



- A – Play/pause (or use Spacebar)
- B – Inter-lap navigation
- C – Intra-lap navigation (example displayed with splits established by user)

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=12\\_morevid](http://www.race-keeper.com/comparo_screencasts?which=12_morevid).

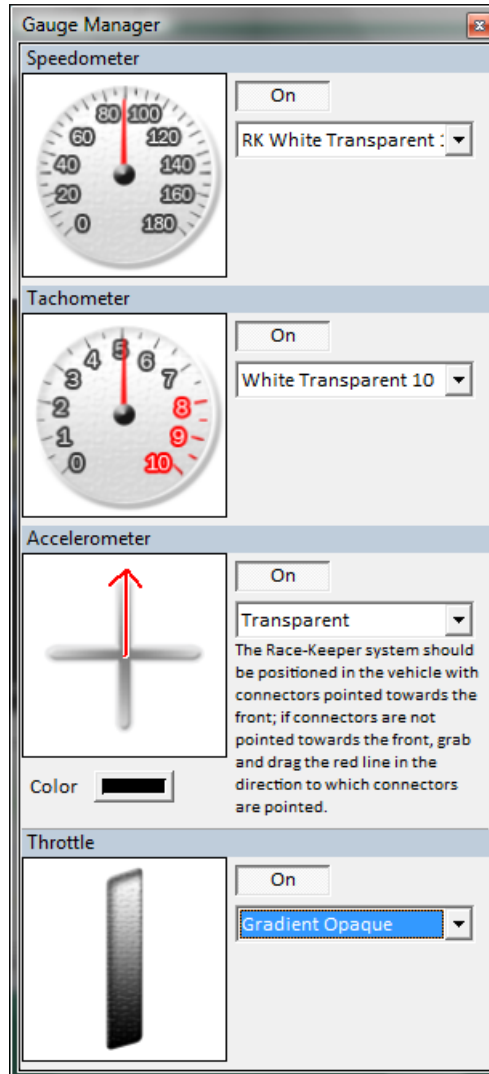
### How to Add, Move and/or Remove Gauges


Race-Keeper Comparo displays animated gauge overlays that can be added or removed from the video player.

Race-Keeper produces video and data files independently, which gives maximum flexibility to configuring gauge overlays and exported video files.

To add or remove a gauge to/from the video player:

- Select Configure->Gauge Manager



- Click on pull-down menus to select gauge
  - Gauge preview is displayed in thumbnail and on video player
- Click the On button to toggle the gauge(s) on and off
- Click on  to close Gauge Manager

To move a gauge on the video player:

- Click mouse button on the gauge to grab the gauge, hold down the mouse button and move the gauge

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=13\\_addgauge](http://www.race-keeper.com/comparo_screencasts?which=13_addgauge).



Gauge Library

Race-Keeper Comparo is pre-loaded with a gauge library which includes transparent and opaque graphical gauges, as well as several dozen popular production vehicle gauges.

Speedo	Tach	Accel	Throttle
White Transparent 180	White Transparent 10	Transparent	Black Opaque
White Transparent 140	White Transparent 8	Opaque	White Opaque
Black Opaque 180	White Transparent 16		White Transparent
Black Opaque 140	White Transparent 20		Blue Transparent
Red Transparent 180	Black Opaque 10		Green Transparent
Red Transparent 140	Black Opaque 8		Red Transparent
Blue Transparent 180	Black Opaque 16		Yellow Transparent
Blue Transparent 140	Black Opaque 20		
Green Transparent 180	Red Transparent 10		
Green Transparent 140	Red Transparent 8		
Yellow Transparent 180	Blue Transparent 10		
Yellow Transparent 140	Blue Transparent 8		
White Opaque 180	Green Transparent 10		
White Opaque 140	Green Transparent 8		
AMG E63-CLK63	Yellow Transparent 10		
AMG SL63	Yellow Transparent 8		
AMG SLK55	White Opaque 10		
Audi R8	White Opaque 8		
Audi RS4	AMG CLS63		
BMW M Coupe	AMG E63-CLK63		
BMW M3	AMG SL63		
BMW M5	AMG SLK55		
Corvette Z06	Audi R8		
Dodge SRT	Audi RS4		
Ford Mustang	BMW M Coupe		
Jeep SRT	BMW M3		
Porsche Carrera	BMW M5		
Porsche 911 GT3RS	Ford Mustang		
	Jeep SRT		
	Porsche Carrera		
	Porsche 911 GT3RS		

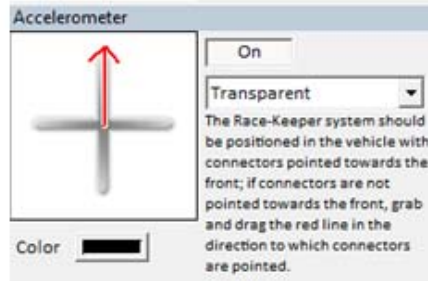


### How to Calibrate the Accelerometer Gauge

After you've installed your Race-Keeper system, we recommend calibrating the accelerometer.

To calibrate the accelerometer gauge:

- Select Configure->Gauge Manager



- Move the red line on the accelerometer gauge thumbnail to the direction in which connectors on the Race-Keeper system are pointing (i.e., if system is installed with connectors facing the front of the vehicle, point the red line to the top (i.e., north))
- Play the loaded video data outing and verify that i) during braking, the colored dot on the vertical axis moves up the scale and during acceleration, the colored dot moves down the scale, and ii) during left-hand turns, the colored dot on the horizontal axis moves to the right, and vice-versa.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=14\\_accelcal](http://www.race-keeper.com/comparo_screencasts?which=14_accelcal).

### How to Zero the Accelerometer on the Accel Gauge

After you've calibrated your Race-Keeper system, you can also zero your accelerometer gauge for each session.

To zero the accelerometer gauge:

- Navigate to a point in a session in which vehicle is stationary and on flat pavement (e.g., beginning or end of session)
- Right-click on the accelerometer gauge
- Click Center

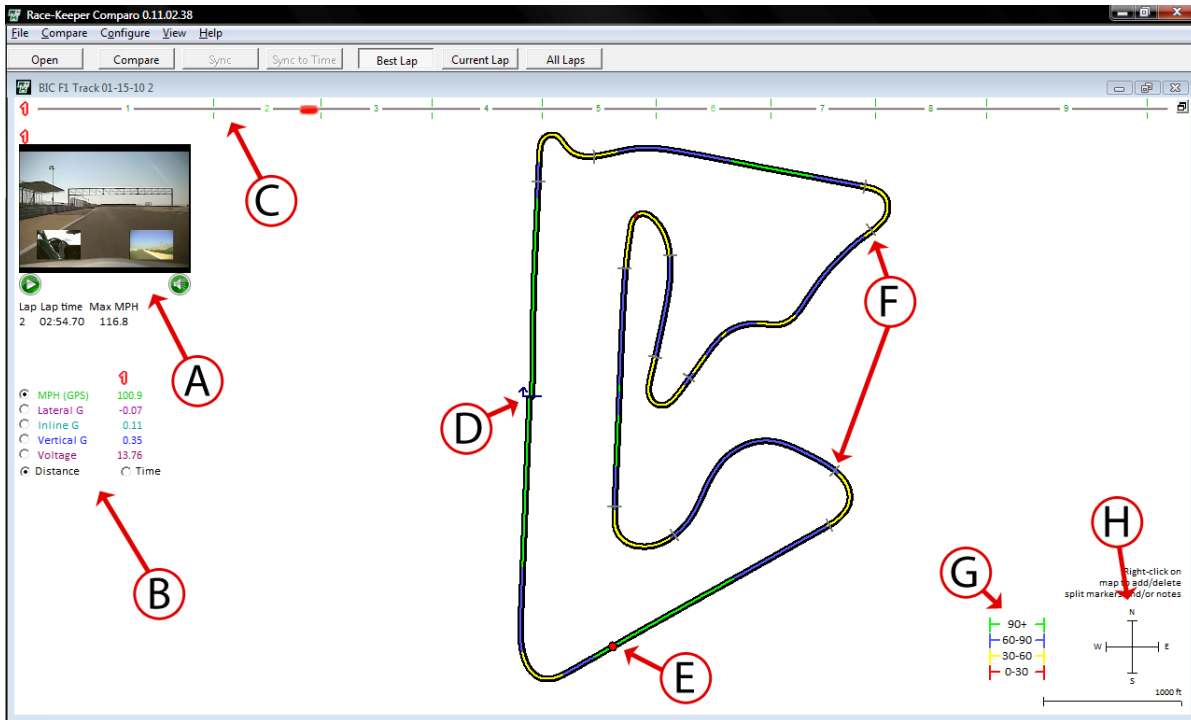
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=15\\_accelzero](http://www.race-keeper.com/comparo_screencasts?which=15_accelzero).

## More About the Course Map

Course Map is one of the four main areas of a Race-Keeper session.

Race-Keeper's course map provides:

- Bird's eye graphical view of the course
- Graphical indicator of vehicle position on course
- Corresponding data for vehicle position on course
- Video thumbnail and playback control
- Full navigation controls



- A – Video thumbnail with player controls
- B – Data for exact position on course
- C – Inter-lap navigation
- D – Start/finish line
- E – Vehicle position on course
- F – Splits (added by user, see next section)
- G – Color-coded legend for different sets of data
- H – Weather vane for course rotation

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=18\\_moremap](http://www.race-keeper.com/comparo_screencasts?which=18_moremap).

### How to Move the Start Line on the Course Map

Race-Keeper Comparo assesses data for each track session and automatically assigns a start/finish line position on the course map. Race-Keeper Comparo uses the start/finish line to establish lap number, lap times and splits (configured by the user).

The start line is indicated by a blue arrow, which also displays the direction of travel of the vehicle on the course.



You may want to fine-tune or change the position of the start/finish line.

There are two ways to move and/or set the start line.

To move the start/finish line on the course map:

- Place mouse over the blue arrow to highlight the arrow
- Click to grab the arrow
- Move the arrow forwards or backwards on the course map

To set the start/finish line at the cursor position:

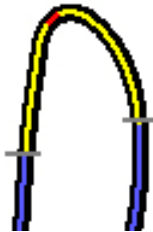
- Review video and/or data trace to identify exact position of start line – stop the video with your vehicle right at the start line; use left and right arrow keys to move the video one frame at a time backwards or forwards.
- Select Configure->Put Start Line at Cursor Position

For courses in which the start and finish lines are different (e.g., autocross, rally, hill climb), set the session type to Autocross in the Edit Outing details menu. You can set the finish line by selecting Configure->Put Finish Line at Cursor Position.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=19\\_mapstartline](http://www.race-keeper.com/comparo_screencasts?which=19_mapstartline).

### How to Add and Move Splits to the Course Map

One method to assess how well you drive on different parts of the track is to split the course map into splits and then evaluate your time and video for each split segment.



To add a split marker:

- Place your mouse over a spot on the course map
- Right click on the split marker
- Insert Split Markers Here

To move a split marker:

- Place your mouse over a split marker
- Click to grab the split marker
- Move the split marker forwards or backwards on the course map

To view split times and corresponding video and data, expand the Session Info window and select Show Splits; see [More About Session Info](#) for more info.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=20\\_mapsplits](http://www.race-keeper.com/comparo_screencasts?which=20_mapsplits)



### How to Delete Splits From the Course Map

There are two ways to delete split markers: individually or all markers.

To delete an individual split marker:

- Expand the course map
- Place your mouse over a split marker
- Right click on the split marker
- Select Delete Splits Marker

To delete all split markers:

- Select Configure->Delete All Section Markers
- Select Yes to confirm

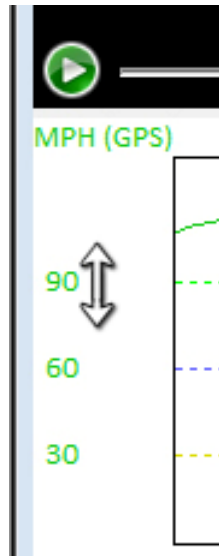
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=21\\_mapdeletesplits](http://www.race-keeper.com/comparo_screencasts?which=21_mapdeletesplits)

### What the Colors Indicate on the Course Map

When the course map is expanded, there is a legend in the bottom-right corner, which indicates what the colors represent on the course map.

To change the values of the legend:

- Minimize course map
- Place mouse over scale of vertical axis (e.g., speed) on data graph



- Raise or lower the tick markers on the scale to change the values of the legend

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=22\\_mapscale](http://www.race-keeper.com/comparo_screencasts?which=22_mapscale)

## More About the Data Graph

Data Graph is one of the four main areas of a Race-Keeper session.

Race-Keeper's data graph provides:

- Color-coded data traces for acquired data
- Selection pane for turning data traces on/off
- Vertical and horizontal scales, with corresponding values
- Display based on distance or time



- A – Video thumbnail with player controls
- B – Course map and vehicle position on course
- C – Data trace label and vertical axis
- D – Color-coded data traces
- E – Horizontal axis (displayed by either distance or time)
- F – Vehicle position
- G – Selection pane

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=23\\_moredata](http://www.race-keeper.com/comparo_screencasts?which=23_moredata)



### How to Add or Edit Data Traces

Race-Keeper Comparo automatically displays a selection pane and all available data sources for each session.

To add or edit data traces:

- Review the available data traces in the selection pane

<input checked="" type="checkbox"/>	MPH (GPS)	100.1
<input type="checkbox"/>	MPH (OBDII)	90.9
<input type="checkbox"/>	RPM (OBD-II)	5,678
<input type="checkbox"/>	Throttle (OBD-II)	16.3
<input type="checkbox"/>	Coolant Temp (OBD-II)	208°F
<input type="checkbox"/>	Intake Air Temp (OBD-II)	95°F
<input type="checkbox"/>	MAP (OBD-II)	0.55
<input type="checkbox"/>	Fuel Level (OBD-II)	5.49
<input type="checkbox"/>	Engine Load Calc (OBD-II)	4.31
<input type="checkbox"/>	Lateral G	0.04
<input type="checkbox"/>	Inline G	0.24

- Click box next to data trace(s) to toggle traces on/off

*Note: Colored data traces correspond to the primary outing; in Compare mode, data traces are gray for the secondary outing.*

In the expanded data graph, Race-Keeper Comparo automatically displays up to three data trace windows corresponding to the selected data traces.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=24\\_dataexpand](http://www.race-keeper.com/comparo_screencasts?which=24_dataexpand)

### How to Zoom to Examine Data More Closely

To view data more closely, Race-Keeper Comparo provides the capability to zoom.

To zoom data:

- Select View->Zoom Graph

Zoom data is available in either standard or expanded views.

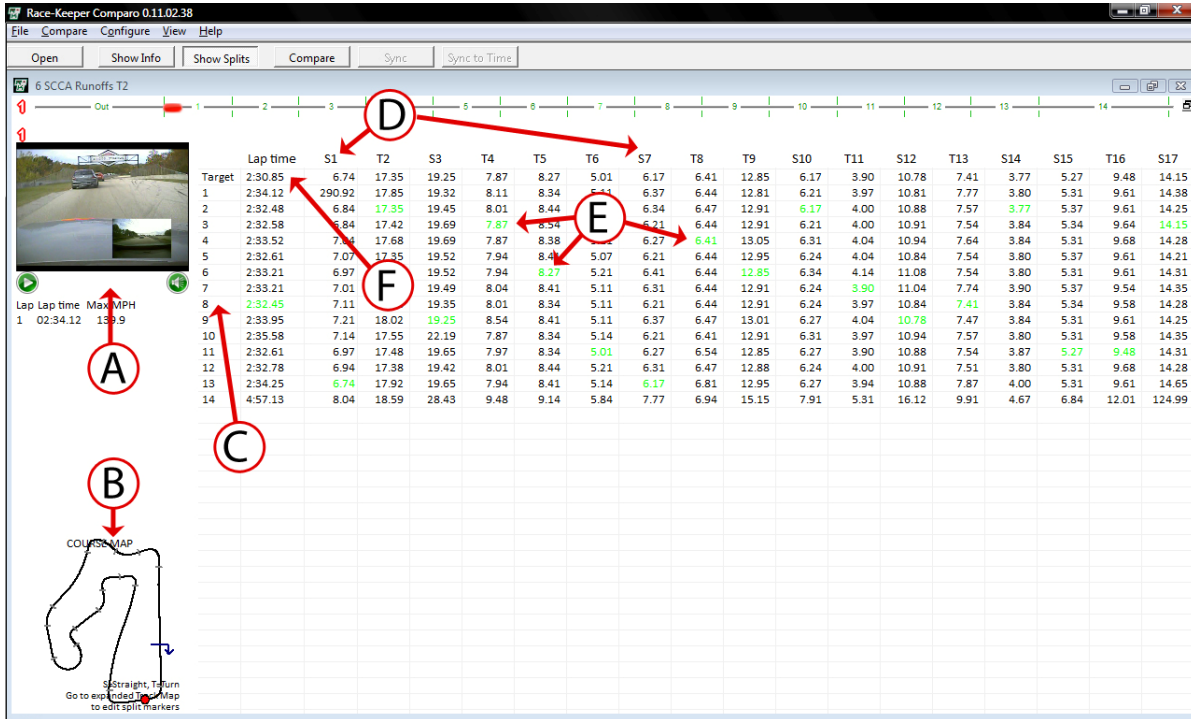
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=25\\_datazoom](http://www.race-keeper.com/comparo_screencasts?which=25_datazoom)

## More About Session Info

Session Info is one of the four main areas of a Race-Keeper session.

Race-Keeper's session info provides:

- Information about the session
- Listing of laps and corresponding lap times
- Splits report



- A – Video thumbnail with player controls
- B – Course map and vehicle position on course
- C – Listing of laps
- D – Splits (configured by user)
- E – Best split times across all laps, highlighted in green
- F – Target lap (summation of best splits across all laps)

To navigate to any section, click on the lap or any split within a lap.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=16\\_moresessioninfo](http://www.race-keeper.com/comparo_screencasts?which=16_moresessioninfo)



### How to Edit Session Info

Session info provides important info about each Race-Keeper session.

To edit session info:

- Select Configure->Edit Session #1 (or 2) info

The screenshot shows a dialog box titled "Edit Session Info". It contains the following fields and controls:

- Session Path:** A text box containing the path "C:\Users\Desktop\Favorites".
- Session Name:** An empty text box.
- Session Type:** A pull-down menu with a "New" button to its right.
- Driver:** A pull-down menu with a "New" button to its right.
- Car:** A pull-down menu with a "New" button to its right.
- Course:** A pull-down menu with a "New" button to its right.
- Buttons:** "OK" and "Cancel" buttons at the bottom center.

- Select from pull-down menu(s) or
- Click New to add selection options
- Click OK when finished

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=17\\_editsessioninfo](http://www.race-keeper.com/comparo_screencasts?which=17_editsessioninfo)

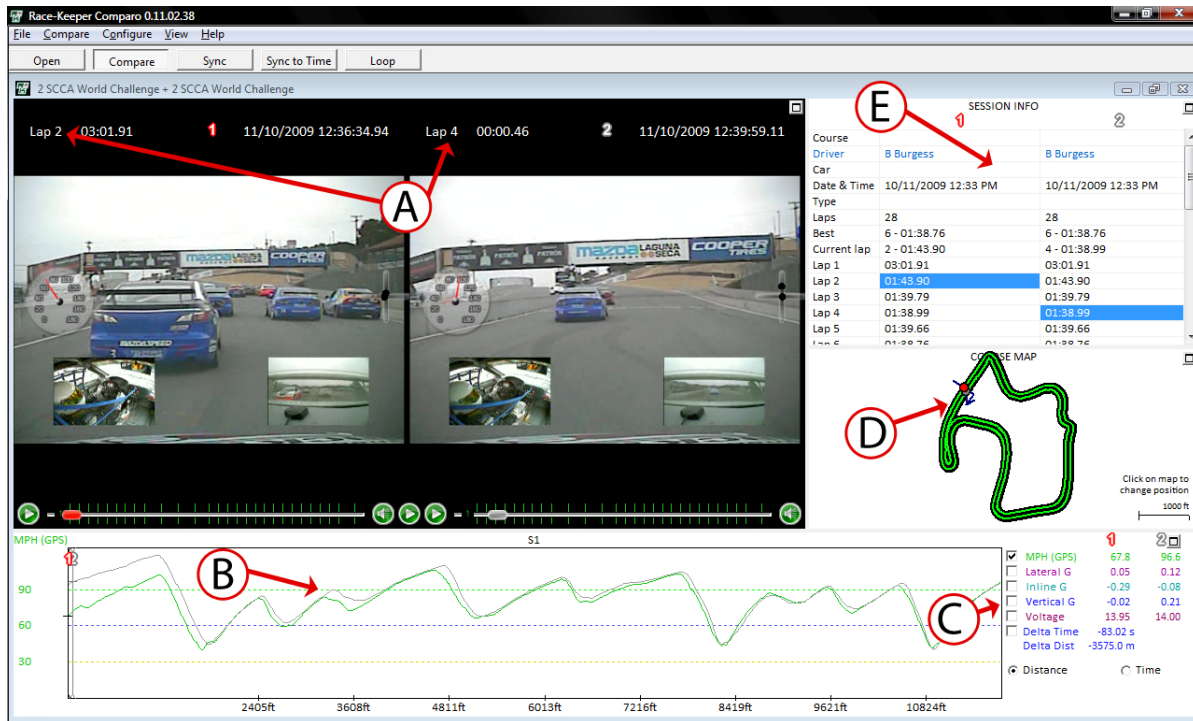
## Using Compare to Improve Your Driving

One of the most effective methods to improve your driving is to compare yourself to against the best, whether it's someone else's session or a particularly good session or lap or split of your own. Race-Keeper Comparo gives you the power to easily compare laps and sessions on the same course.

### How to Compare One Lap to Another Within the Same Session

To compare one lap to another within a session:

- Select Compare->Compare Laps



- A – Two laps from the same session, presented side-by-side (comparison of Lap 2 to Lap 4)
- B – Data trace with primary session in green, comparison session in gray
- C – Data pane for both laps
- D – Track map for both laps
- E – Best lap and highlighted comparison lap

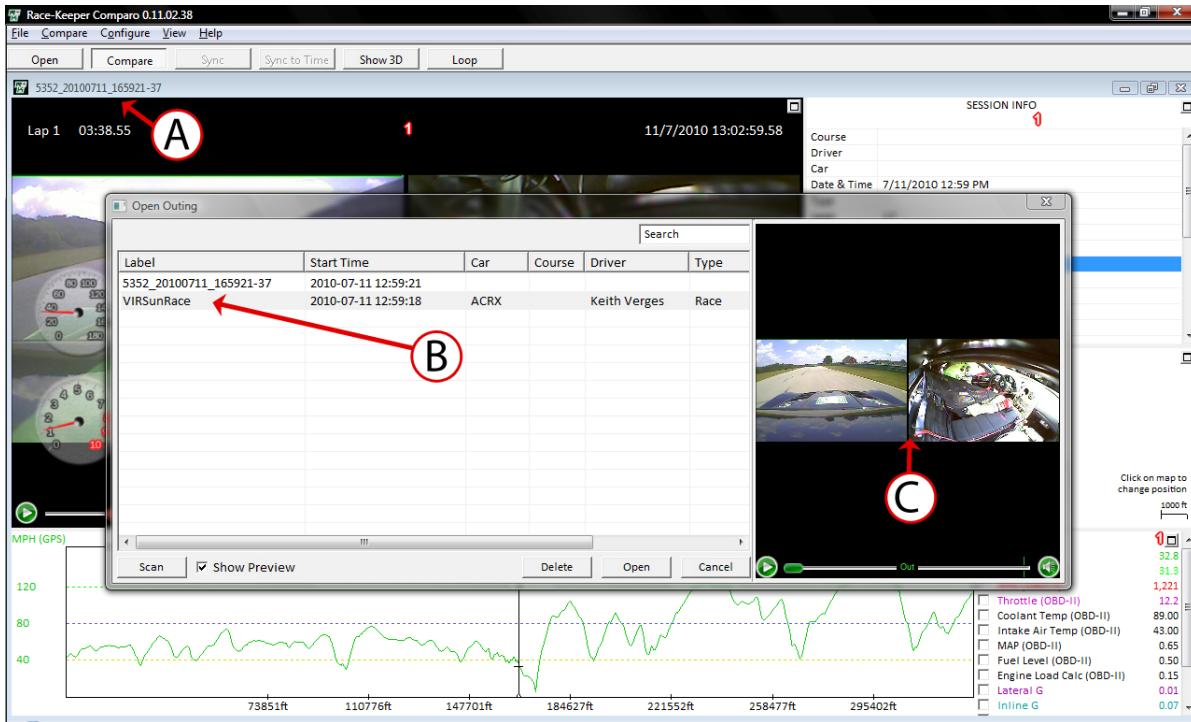
Compare mode automatically synchronizes sessions to each other; to re-sync at any point in a session, double-click on the data graph or the course map.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=27\\_compareintro](http://www.race-keeper.com/comparo_screencasts?which=27_compareintro).

## How to Compare Laps in a Session to Laps in a Different Session

To compare one lap to another between different sessions:

- Select Compare->Compare Outings
- The Open menu pops up with sessions available for comparison (i.e., sessions from the same course)



- A – Name of the first session
- B – Names of the open session and another available session for comparison
- C – Video preview window of the second session
- Click on the session you want to compare
- Click on Open

- When you click on Open, the two sessions, with video and data, are automatically displayed side-by-side



- A – Two different sessions, side-by-side, on the same track
- B – Videos presented side-by-side
- C – Data traces for both sessions, overlaid on the same data graph
- D – Lap navigation slider bars for each session; faster laps display smaller intervals
- E – Data for each session, side-by-side
- F – Course map for both sessions, side-by-side
- G – Highlighted comparison laps (comparing lap 6 on the 1<sup>st</sup> session to lap 4 on the 2<sup>nd</sup> session)

Compare mode automatically synchronizes sessions to each other; to re-sync at any point in a session, double-click on the data graph or the course map.

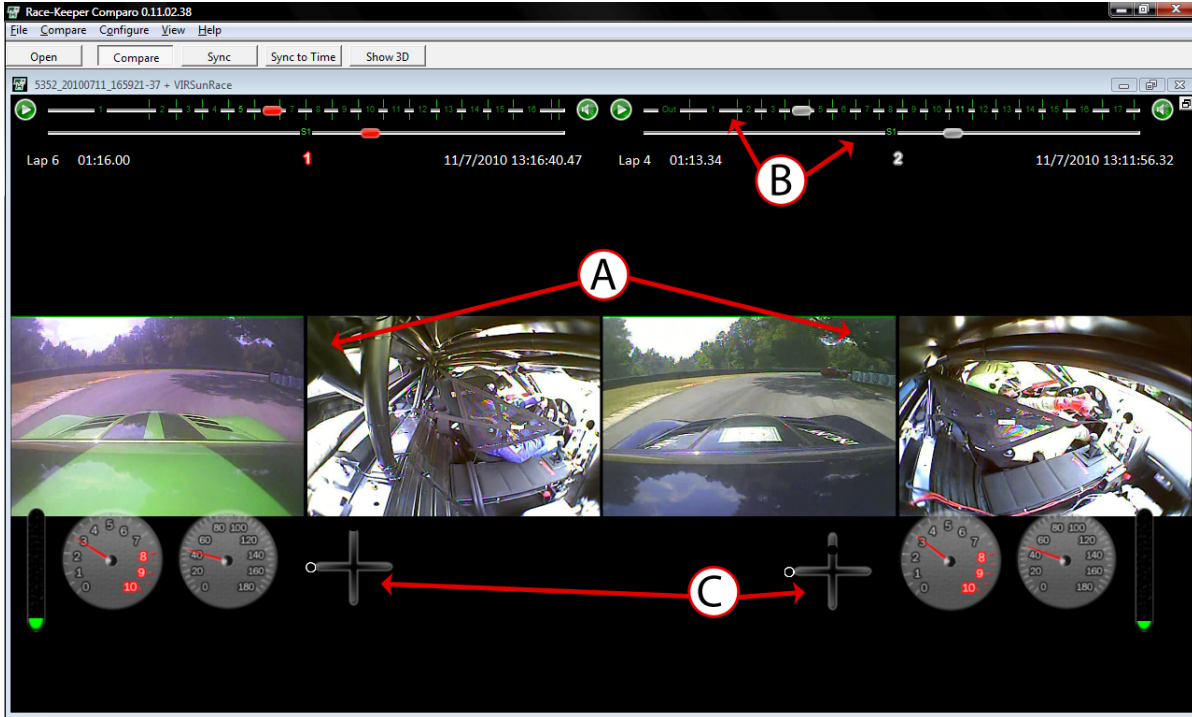
For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=27\\_compareintro](http://www.race-keeper.com/comparo_screencasts?which=27_compareintro).



### How Expanded Video Window Changes in Compare Mode

When you use the Compare mode, Race-Keeper Comparo's expanded video windows display large screen video and animated gauge overlays.

- Videos are displayed side-by-side



- A – Larger screen view of two different sessions, side-by-side, on the same track
- B – Lap stats, inter-lap navigation and intra-lap navigation slider bars
- C – Gauge sets for both sessions

Compare mode automatically synchronizes sessions to each other; to re-sync at any point in a session, double-click on the data graph or the course map.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=28\\_comparescreen](http://www.race-keeper.com/comparo_screencasts?which=28_comparescreen).

## How Expanded Data Graph Window Changes in Compare Mode

When you use the Compare mode, Race-Keeper Comparo's expanded data graph window displays substantially more data.

- Data traces are overlaid on the same data graph



- A – Data trace windows (user configurable)
- B – Video thumbnails for each session
- C – Course map for reference
- D – Data sets for each session
- E – Lap navigation slider bars for each session
- F – Data markers for each session, with time/distance differences

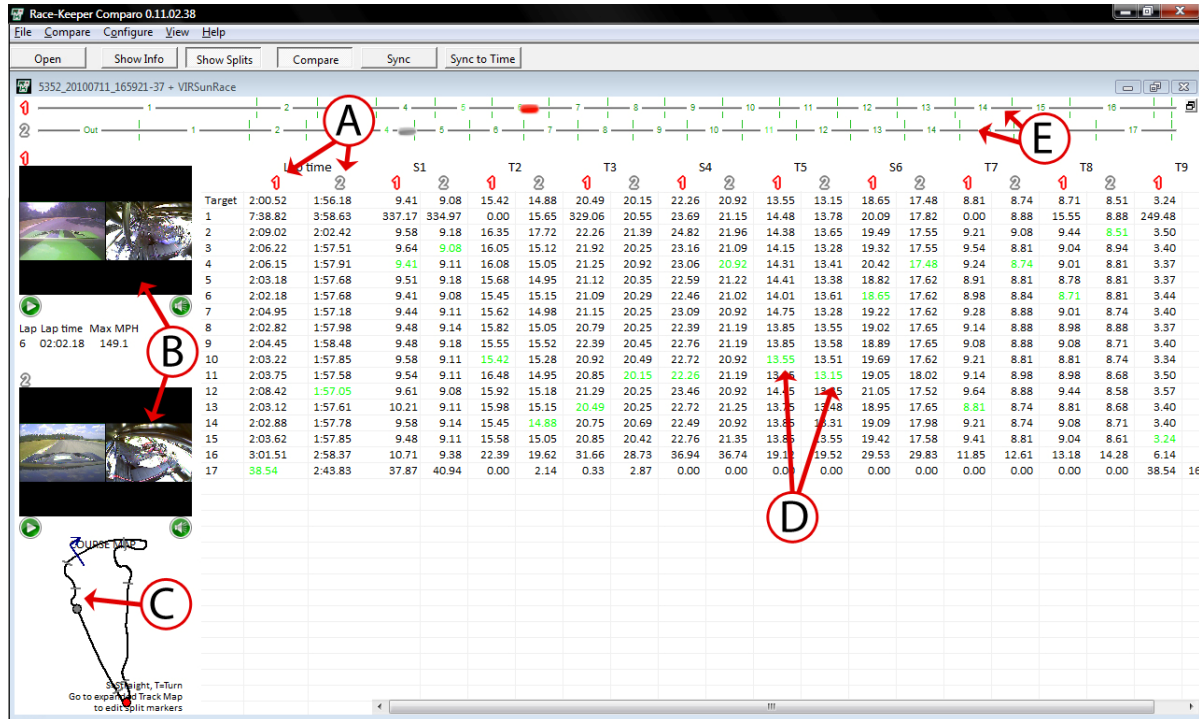
Compare mode automatically synchronizes sessions to each other; to re-sync at any point in a session, double-click on the data graph or the course map.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=28\\_comparescreen](http://www.race-keeper.com/comparo_screencasts?which=28_comparescreen).

## How Expanded Session Info Window Changes in Compare Mode

When you use the Compare mode, Race-Keeper Comparo's expanded session info window displays substantially more data.

- Split markers are displayed for both sessions, side-by-side



- A – Lap times for each session
- B – Video thumbnails for each session
- C – Course map for reference
- D – Best splits for each session
- E – Lap navigation slider bars for each session

Compare mode automatically synchronizes sessions to each other; to re-sync the two vehicles at any point in a lap, double-click on the data graph or the course map.

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=28\\_comparescreen](http://www.race-keeper.com/comparo_screencasts?which=28_comparescreen).

## How to Re-sync Sessions in Compare Mode

Compare mode automatically synchronizes sessions to each other; as sessions 1 and 2 diverge because of different driving performance and/or course conditions, the sessions will become out of sync.

To re-sync sessions in compare mode:

- Double-click anywhere on data graph
- Double-click anywhere on course map
- Click on the Sync button
- Select Compare->Sync Sessions

## How to Un-compare Race-Keeper Sessions

To un-compare Race-Keeper sessions:

- Click on the Uncompare button and confirm action

## Using Export to Create Video Files with Data Overlays

Race-Keeper produces video and data files independently, which gives maximum flexibility to configuring gauge overlays and exported video files. After your session, you can decide exactly how you want to configure data and gauge overlays, and then change the overlays for different presentation requirements.

Race-Keeper Comparo offers two types of edit and export functions:

- Export a session to a video file (e.g., MPEG) for posting to the Internet
- Crop and save part of a session (e.g., best lap) for continued use with Race-Keeper Comparo

### How to Export Race-Keeper Video with Gauges

To export video:

- Select File->Export Video...



- Select video quality (configuration and background features are available with optional Dual Stream + HD Export software plug-in, see [www.race-keeper.com/dualstream+HDexport](http://www.race-keeper.com/dualstream+HDexport) for more info)
- Grab and drag the Start indicator (green arrow) to beginning of planned export OR
  - Play the video to the beginning of planned export and click on Start button
  - Use the -> and <- keys to go forwards or backwards by one frame
- Grab and drag the End indicator (red arrow) to end of planned export OR
  - Play the video to the end of planned export and click on End button
- Note the estimated file size under Video Quality and the planned length of export in MM:SS above the Export button
- Select gauge and data overlay for display, then grab and move gauges and data to preferred locations
  - Resize gauges and data by holding Shift and grabbing the bottom right-hand corner of each widget
- Click Export, navigate to folder/file location, edit the file name, and click on Save

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=31\\_export](http://www.race-keeper.com/comparo_screencasts?which=31_export).

## Using Crop and Save As to Edit and Save Parts of a Session

Crop and Save As... gives you the power to edit and save selected part(s) of your track session and save all of the session's corresponding data for additional analysis or for distribution to your instructor, teammates or colleagues.

### How to Crop and Save a Track Outing

To crop a session:

- Select File->Crop and Save As...



- Grab and drag the Start indicator (green arrow) to beginning of planned copy OR
  - Play the video to the beginning of planned copy and click on Start button
  - Use the -> and <- keys to go forwards or backwards by one frame
- Grab and drag the End indicator (red arrow) to end of planned copy OR
  - Play the video to the end of planned copy and click on End button
- Click Crop, navigate to folder/file location, edit the file name, and click on Save

For instructional video, please visit: [www.race-keeper.com/comparo\\_screencasts?which=32\\_crop](http://www.race-keeper.com/comparo_screencasts?which=32_crop)





### Software Add-On License Management

Race-Keeper system software and Race-Keeper Comparo are available at no charge to registered users at [www.race-keeper.com](http://www.race-keeper.com).

Race-Keeper also delivers *optional* Race-Keeper Comparo add-ons for special-purpose functionality:

- Race-Keeper iDash
- Race-Keeper Dual Stream + HE Export
- Race-Keeper ECU Data Modules

Each add-on requires a software license, which authorizes your Race-Keeper system to capture and transmit data to Race-Keeper Comparo.

#### To Use Race-Keeper Comparo Software Add-ons:

- Purchase software add-on at [www.race-keeper.com/store](http://www.race-keeper.com/store)



- Activate software license using Race-Keeper Comparo and your system serial number
- Copy software license file to your Race-Keeper system

For some of the Race-Keeper software add-ons (e.g., Dual Stream + HD Export), enhanced features will be available within Race-Keeper Comparo.

Please refer to the Race-Keeper iDash User Guide for installation and operating instructions: [www.race-keeper.com/i-Dash](http://www.race-keeper.com/i-Dash).

Please refer to the Race-Keeper Dual Stream + HD Export User guide for system configuration and instructions: [www.race-keeper.com/dualstream+HDexport](http://www.race-keeper.com/dualstream+HDexport).

Please refer to the Race-Keeper ECU Data Module User Guides for system configuration and instructions: [www.race-keeper.com/dualstream+HDexport](http://www.race-keeper.com/dualstream+HDexport).



## Technical Specifications

### Race-Keeper Video Data Systems

#### Video

- One system for video and data
- Video format - NTSC4 composite video camera inputs NTSC or PAL
- Video signal and power in single locking connector
- Simultaneous dual frame recording (two MPEG encoders record two camera views full frame)
- MPEG2 resolution (704x480 video resolution)
- Built-in export software to MPEG 4 and other popular video formats
- 30 FPS recording (NTSC)
- 2.5 Mbps - 8 Mbps video bit rate user configurable
- User defined video layouts using 1 to 4 cameras (full screen, picture-in-picture)
- Video out port for camera setup

#### Audio

- Two-channel input for stereo audio
- Single locking connector
- Built-in Automatic Gain Control for broad range of high and low sounds
- Line level or dynamic microphone inputs

#### Data and Data Sources

- User-positioned map, gauges and logo overlays
- Ability to change overlays after video capture
- High-res 4Hz GPS for speed, lap #, lap times and track map
- Three axis on-board accelerometer ( $\pm 6.0g$  range, 0.01g resolution) for Gs
- Battery voltage, box temperature recorded
- OBD-II data via USB 2.0
- WiFi ready

#### Race-Keeper SE

- Locking quick-release Hirose and RJ-45 connectors
- 8 multi-function analog sensor inputs (e.g., steering, throttle, brake)
- 8 multi-function digital sensor inputs (e.g., wheel speed, RPM)
- OBD-II data via USB 2.0
- CAN-ECU data input
  - 2 CAN I/O ports for ECU interface

#### Race-Keeper HE

- Locking quick-release Hirose waterproof connectors
- 3 multi-function analog sensor inputs (e.g., steering, throttle, brake)
- 2 multi-function digital sensor inputs (e.g., wheel speed, RPM)
- 1 CAN-ECU data input
  - 2 CAN I/O ports for ECU interface



Recording Media and Estimate Recording Times

- Removable SD card
- Removable USB stick (Race-Keeper SE)
- Recording times dependent on size of SD card or USB stick and video resolution settings (examples below)
  - Recording single stream at 2.5 Mbps for 1 hour requires approximately 1.1 GBs
  - Recording single stream at 5.0 Mbps for 1 hour requires approximately 2.2 GBs
  - Recording dual stream at 5.0 Mbps for 1 hour requires approximately 4.4 GBs

Membrane Panel Control Buttons

- Membrane switch panel with click and button feedback characteristics
- Power on/off
- Record/stop record
- Pause/unpause record (Race-Keeper SE)

Status LEDs

LED	Color	On	Flashing	Off
Status		Green=Ready to record	Red/Green=System starting OR Green with Red every 2 seconds =No GPS	Not ready to record
Transfer		Updating system, configuration updating, or license file copying	Accelerometer calibration stick/SD inserted	Update complete
Power		Red=Power connected, system OFF Green=Power on	Red=Powering Green=Low power	Power disconnected
Recording		Recording	Stopping recording or finishing boot up process	Not recording

Memory LEDs

LED	Color	On	Flashing	Off
Memory (Top)		Yellow=Memory used >80%	Red=At 100% or no SD/USB	<80% memory used
Memory (Bottom 3)		Memory used=>25%, >50% and >75%	NA	No SD/USB or memory used <25%





#### Mechanical and Power

- Operating temperature: -20 to +55 C ambient
- Storage temperature: -20 to +75 C
- Shock: 0.25m onto hard surface, except connector face
- Vibration: 6g @ 0-1KHz random pattern
- Compliant with FCC part 15 Class B, and current CE standards
- 12v DC, 1Amp (15W max)
- Locking power connector

#### Race-Keeper SE

- Custom flame retardant ABS enclosure
- Width 7.35"/187mm
- Depth 4.75"/121mm
- Height (front) 1.4"/36mm
- Height (back) 2.1"/53mm
- Weight 1.1 lb/0.50kg
- USB integrated into power loom for peripheral connection

#### Race-Keeper HE

- IP67 waterproof connectors, enclosure and membrane panel
- Custom flame retardant ABS enclosure
- Width 7.8"/198mm
- Depth 5.5"/140 mm
- Height (back) 2.0"/51mm
- Weight 1.3 lb/0.59kg

#### Installation Options

- 3M dual lock Velcro (provided)
- 4-hole AMPS bolt pattern in case standard mount
- Integrated quick mounting plate



## Cameras

High-quality professional video cameras in enclosures designed for extreme motor sports environments.

- Available in two types of enclosures, see below
- Video format: NTSC
- Image sensor: 1/3" Sony ICX638 Super HAD CCD
- Scanning system: 2:1 interlace
- Total pixels: (H) 811 x (V) 508, 401K
- Electronic shutter: 1/60~1/100,000 (auto)
- S/N ratio: Over 45 dB AGC Off (high-res)
- Video output: 1 Vp-p, 75 Ohm
- Back light comp.: Yes
- Auto white balance: Yes
- Gamma correction: >0.45
- Sync mode: Internal synchronization
- Power source: DC12V  $\pm$  10%
- Power consumption: 90mA maximum
- Operating temperature: -10°C ~ 45°C / 14°F ~ 122° F
- Storing temperature: -20°C ~ 60°C / -4°F ~ 140°F
- Sensitivity: 0.2 lux/F=2.0 (high-res)

### High-Res Mini Square

- Dimensions (mm): 30 (L) x 30 (W) x 11 (H), 28 (H) with lens
- Horizontal resolution: 550 TV lines (high-resolution)
- Mounting method: Integrated bracket secured with 3M VHB bonding tape
- Mounting location: Secure on any clean surface

### High-Res Mini-Bullet

- Dimensions (mm): 66 (L) x 19 (W) x 19 (H)
- Horizontal resolution: 550 TV lines (high-resolution)
- Mounting method: L-bracket or collar clamp
- Mounting location: Roll cage section or self-adhesive rubber bullet bracket
- Water proof (IP 67)



### High-Res GPS

External GPS antenna has magnetic base for quick attachment to vehicle (can also be mounted using Velcro or 3M VHB mounting tape). GPS antenna terminated with 15-foot cable for connection to Race-Keeper system.

4-Hz (four position measurements per second) electrically-shielded GPS engine embedded in Race-Keeper System. GPS delivers high-resolution data used for vehicle speed, track mapping, lap number and timing, outing analysis and syncing side-by-side outing comparisons.

- 4Hz sample rate
- GPS position accuracy: <2.5 m, horizontal
- 27dB active antenna
- Magnetic mount
- NMEA Input/output: ASCII, 0183, 2.3 (compatible to 3.0)
- Time to first fix: < 1 sec
- Acquisition and tracking sensitivity: -160dBm
- Max velocity measurement: 515 m/s (1000 knots)
- Dimensions: 50.5 mm L x 42 mm W x 13.9 mm H (1.99" x 1.65" x 0.55")
- Weight: 60 g (without cable)
- Power consumption: 30 mA (max)
- Environment: -40 to +85 C with high humidity



## Trouble-shooting

### PC Requirements and Compatibility

#### What PC do I need to run Race-Keeper Comparo?

Race-Keeper Comparo video data analysis application will run well on most late-model PCs or laptops. Our recommended PC specifications: Intel Dual Core 1.8GHz processor, 2GB RAM, 250GB hard drive, SD card reader. Minimum specification: Celeron 1.6 GHz, 512Mram, with a 75Gig HD. PC may slow down when opening large outings and when comparing two outings side by side.

#### What is the maximum SD card I can use?

We've used 32GB cards but the system has no limitation on storage media.

#### Is Race-Keeper Comparo compatible with Windows 7?

Yes.

#### Can I use Race-Keeper Comparo on a Macintosh?

Yes, Comparo will work on a Macintosh using either an emulator or on partitioned hard disk. We have had success running Race-Keeper Comparo on Macs using a virtualization solution, like Parallels or VMware Fusion. Either of these tools will allow you to run Windows "in a window" on your Mac. From there, you can install any normal Windows applications, including our software. If you do install VMware or Parallels, be sure to enable 'Hardware Accelerated 3D Graphics' in the settings for the virtual machine you create. Race-Keeper Comparo also runs perfectly well under a partitioned hard drive on your Macintosh (e.g., Bootcamp).

We are working on a cross-platform version of Comparo that will work perfectly as a native Macintosh application; we expect the software to be released in 2010.

### Opening and Scanning Outings

#### Why can't I see my outings in Race-Keeper Comparo?

If you can't see your outings in Comparo...

- Ensure Race-Keeper Comparo is open before you attach an SD card or USB stick with Race-Keeper sessions. When Comparo notes a new media device, the program will check for and repair any damaged files.
- If Race-Keeper sessions are on an SD card or USB stick, try running Windows CHKDSK on the attached media. If SD card was removed from Race-Keeper while system was writing to the card, the ends of the video and data files may need to be repaired; CHKDSK will perform this repair.
- Open session folders and remove any .tmp file extension from any files.

#### Why do my outings fail sometimes when I record to USB?

USB comms are not as reliable as SD; USB comms tend to be more susceptible to electrical noise and vibration. If you're in a high-vibration environment, we recommend recording directly to SD.

### General Comparo Questions

#### Where can I find software release notes?

Please see [www.race-keeper.com/comparo\\_release\\_notes](http://www.race-keeper.com/comparo_release_notes) and [www.race-keeper.com/capture\\_release\\_notes](http://www.race-keeper.com/capture_release_notes).

#### Why is Configure Race-Keeper menu partially displayed off-screen?

The window size can be adjusted by changing the DPI settings on your PC. In Windows 7, right click the desktop, click personalize from the drop down menu, then click on Display, then select the standard {100%} default DPI, and then click apply; changing DPI may require a computer restart for changes to take effect. After you restart your PC, open Comparo and confirm that you are able to view the windows in their entirety.



In Windows XP, right-click on the desktop and select Properties. In the pop-up window, select the Settings tab, click Advanced button, select 96 in the DPI pull-down menu, then click OK; a restart may be required. After you restart your PC, open Comparo and confirm that you are able to view the windows in their entirety.

#### Why does my session appear as only one lap in Race-Keeper Comparo?

If the start/finish line was moved by mistake to a place off the main track, then multiple laps could be merged onto one long lap. Expand the Course Map window and drag the blue start/finish line to the correct place on the lap.

#### Does zero-ing the accel in Race-Keeper Comparo apply to one outing or to all?

When you zero the accelerometer in an outing, this offset will be applied to all outings so there is no need to re-zero each time you load an outing.

### **Video Player**

#### Why does my video look choppy?

Playing Race-Keeper outings on a PC or laptop that does not meet the minimum recommended specification can cause the video to look very choppy when playing back in Comparo; the problem is exacerbated when comparing two outings side by side.

Our recommended PC specification that will give a very good user experience is:

- Intel Dual Core 1.8GHz processor
- 2GB RAM
- 250GB HDD
- SD card reader

As for a minimum specification, use the following as a guide:

- Celeron 1.6 GHz
- 512MB RAM
- 75GB HDD

Note that while this minimum specification PC will run Race-Keeper Comparo well most of the time, it will slow when opening large outings and when comparing two outings side by side.

### **Track Manager**

#### How do I find the grid that shows each lap time and split?

Maximize the Session Info window, and then click on Show Splits at the top of the screen. Laps are displayed down the left of the table. You can click on any of the split times and the video thumbnail will jump to that position on that lap. You can play the video from that position by hitting the space bar, stop playback by hitting space bar again. You can set up your splits by maximizing the Course Map and right-clicking anywhere on the map.

#### Is start/finish line saved with a track?

Once you have placed the start/finish line and split markers on a track, they are saved in Comparo for that track; all further outings from that track will use the same start/finish and split markers. There is no need to load them into the Race-Keeper box or re-enter them again.

#### How do I get rid of some of the tracks listed in Track Manager?

There presently is no way to delete a track...we've added this to the request list; a future release will address this request.



## Cameras and Lenses

### What's a good way to protect my cameras?

High-res cameras deliver the best image quality when they're clean and free of scratches or dust; over time, bullet camera lens covers can degrade from use on the track. Clean the bullet camera lens cover, especially if mounted on the outside of your vehicle, before and after every track session. We also recommend replacing camera lens covers (available at [www.race-keeper.com](http://www.race-keeper.com)) after every track event to protect lenses and to prolong the life of the lens glass.

Note: High-res mini-square cameras should never be used on the outside of a vehicle – they are not water proof and do not have lens covers.

### What are the lens covers in the replacement pack?

The 5-pack of replacement lens covers is for the Race-Keeper high res bullet camera. Lens covers are specially coated with a scratch resistant film to help prevent damage from debris on the track. This will keep the camera view clear for as long as possible while protecting your Race-Keeper camera lens. To ensure great clear video every session, it is very important to inspect your bullet camera lens cover for damage and dirt before and after each track outing. The lens cover is quick and easy to swap out by simply unscrewing the front of the bullet camera.

### The windshield (front) view is washed out...can I adjust the white balance?

Race-Keeper cameras automatically adjust for different light levels.

We typically suggest using a separate camera for the interior view, and another for the exterior view. Follow this link [www.youtube.com/user/RaceKeeper#p/u/0/nXbWMxSZrvQ](http://www.youtube.com/user/RaceKeeper#p/u/0/nXbWMxSZrvQ) for an example of how separate cameras can be used for the perfect interior and exterior views.

### Where can I get some more sticky tape for camera mounts?

The double sided tape we supply for mounting the Race-Keeper standard mini square camera is manufactured by 3M. We tested many different adhesive tapes and found that the 3M™ VHB™ Tape 5952 was the best for mounting on glass, painted metal, plastic, vinyl (including vehicle interior surfaces that had been polished). This tape cures to form a very secure bond, yet when required it can be removed without leaving any residue. Available from U-Line: [www.uline.com/BL\\_6060/3M-5952-VHB-Acrylic-Foam-Tape](http://www.uline.com/BL_6060/3M-5952-VHB-Acrylic-Foam-Tape).

### Are special cameras required for high-def (HD) export?

No special cameras required for HD export. Best cameras, of course, are the high res cameras (550 TV lines). Dual stream, of course, also is required. HD export feature allows you to place both streams on a 1920x1080 canvas, add a graphical background.

## Data and Data Sources

### What is the sampling rate for analog sensors?

All of our data is sampled at 30Hz to match the 30FPS video frame rate. This means you see a new data sample for every video frame as you step through the video one frame at a time (using right arrow and left arrow keys).

### Where does the tach input cable connect?

The tach input cable feeds the tach signal (which you already use to drive a stand-alone tach display) into the Race-Keeper system. The tach signal should already be conditioned to drive a tach display - that is, it should be a clean square wave (0 - 5v or 0-12v) whose frequency varies with engine speed. Most Ignition systems and ECUs will have a tach driver signal that can be used by Race-Keeper SE and Race-Keeper HE. For vehicles that don't have a tach signal, we will soon be adding to the Race-Keeper Store an HT RPM sensor that can be connected to the HT lead of a distributor; this sensors output can be connected into the tach input on Race-Keeper.



#### Will OBD-II interface work with motorcycles?

The OBD-II standard protocol is implemented by road car manufacturers to allow vehicle diagnostics. There isn't a similar standard for bikes.

#### Where is Race-Keeper iDash on iTunes?

Open Apple iTunes, click on iTunes Store and type iDash in the search box at the top right-hand of the page. iDash should be the only app that is displayed. Integrature is listed as the seller; we designed the app and Integrature built the app and posted the app to iTunes.

#### How is the Race-Keeper iDash data transmitted from Race-Keeper system to the iPhone?

WiFi.

#### Can I use iDash and OBD-II interface at the same time?

Yes. Speed and RPM data from the OBD-II interface will be used on the iDash to drive the shift light and RPM displays as well as the calculated gear position indicator. On the race-Keeper SE unit, there are three USB ports, one on the side of the unit and one on the power cable. The third USB port is remote - it is on the Race-Keeper Remote Control, this is an optional interface which be purchased from the Race-Keeper store. On the Race-Keeper HE unit, there is one USB port on a 6-way locking connector on the connector panel - a Race-Keeper to USB cable is supplied with iDash to use this port. The there is also the additional USB port on the Remote Control - this uses the same connector as on the Race-Keeper SE.

#### Are there any iPhone or iPod Touch capacity requirements to work with Race-Keeper iDash?

The memory capacity of the iPhone or iPod Touch has no impact on the performance of the Race-Keeper iDash app. All data displayed on the iDash is transmitted live from the Race-Keeper system, and all calculations are performed live.

### **Installation**

#### Are connectors for Race-Keeper SE interchangeable with Race-Keeper HE?

The cameras, GPS and mic are interchangeable and can be used with either the HE or SE video data systems; the power loom is not interchangeable between SE and HE.

#### What is the slot in the front of Race-Keeper HE?

Race-Keeper can be powered using a 12v battery, making the system very portable and allowing its use where a 12v vehicle supply is not easily available. Race-Keeper HE has a battery strap slot in the front of the enclosure, which allows a rechargeable battery to be secured to the enclosure using a Velcro strap that wraps around the battery and through the enclosure slot. This makes it very quick and easy to swap out a used battery for a fully charged battery.