# Quick Reference Operating Guide

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## Configure *Co Pilot 2, Informer 2, Commander 3v* (all applications)

- Edit your Configuration using the *CDS Link* software
- Set your Threshold speed
- Set all of your display options
- Set your logging options (Co Pilot 2+ & Commander 3v only)

**Upload your configuration to your Unit**

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## Starting a New Session (all applications)

**Make sure your previous session data is cleared by either:**

- Uploading a configuration (this clears all session data in the *Co Pilot 2* or *Informer*).

  OR

- Toggling the power OFF then ON

  OR

- By holding the button when prompted at the end of the reports in *review* mode (*Co Pilot 2 and 2*+ only).

**IMPORTANT NOTE**: If your *Co Pilot 2* or *Informer* has <u>not</u> been turned off since the previous session, AND you have not cleared the session data in the *Co Pilot 2* (by holding the button when prompted at the end *Review* mode) then as soon as you fire up the engine the *Co Pilot 2 or Informer* will interpret this as resuming the previous session rather than starting a new one.

- It is not necessary to upload the configuration after power has been off. The *Co Pilot 2* and *Informer* retain their configurations in flash memory.

# Chapter 1 Introduction and Unpack

## General

Thank you for your purchase. Everyone at Competition Data Systems is deeply committed to customer satisfaction. If you have any problem with your product please contact us either by phone or email. If you purchased your system from one of our reps, please try contacting them first, but do not hesitate to call us directly if you can not contact your rep.

## Products covered in this manual

This manual covers the installation and operation of *SSI* based system packages. :

- ***Co Pilot 2 and 2+*** driver display and logging systems with firmware version 6.0 and higher
- ***Informer*** video data overlay systems which get data from an SSI and with firmware version 4.10.
- For *Co Pilot, Co Pilot 2* or *Informer* products connected to *Commander 2* data loggers, please refer to the version 5 (previous version) manual.

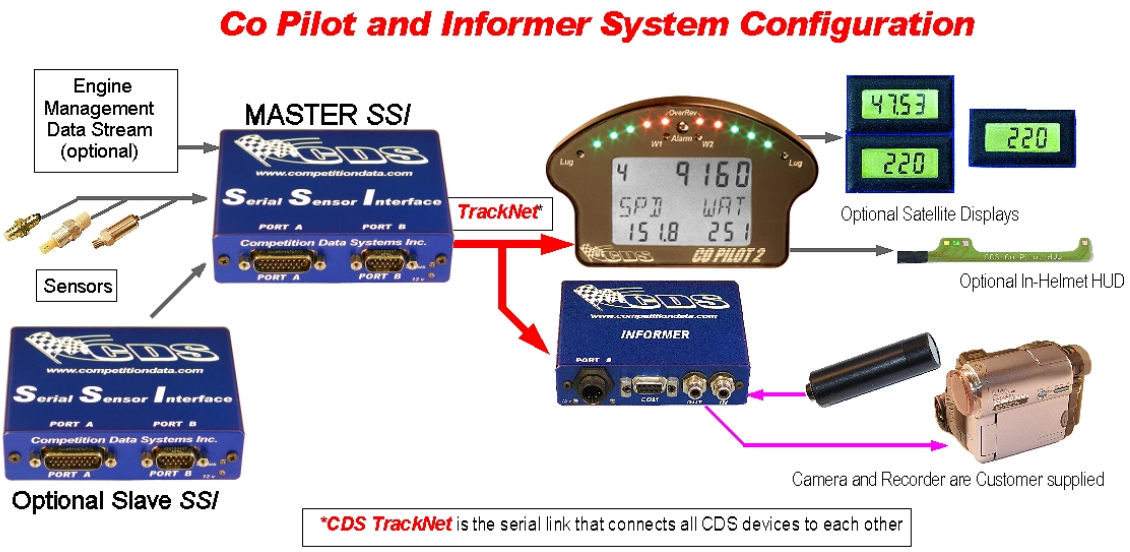
## How to use this manual

This manual is organized in Chapters, and at the start some of the chapters there is a note (in *italic*) describing the applicability of the chapter. In some cases, the chapter will not apply to your system.

- For example, if you do not have an *Informer* you can skip the chapters covering that product.

### Co Pilot 2 vs 2+

- The *Co Pilot 2+* units include 8 MB of internal data log memory. *Co Pilot 2* units only have memory for logging lap times and tell tales.
- Whenever this manual refers to the *Co Pilot 2,* it also includes the *Co Pilot 2+*.
- References made to the *Co Pilot 2+* apply only to data logging version (2+)




# How the system works

- The ***Master SSI*** sends data to the *Co Pilot 2* and *Informer* via a serial stream called CDS TrackNet. The *Master SSI* also supplies the power to the *Co Pilot 2* and *Informer*.
- Your system may also include a *Slave SSI* to connect additional channels.
- If you have both an ***Informer*** and ***Co Pilot 2***, they connect to the *SSI* via a "Y" cable.
- The *Master SSI* Model determines how many channels are defined in the system.
- Those channels are configured in *CDS Link 6* software.
- The *Co Pilot 2* or *Informer* Displays the data based on the configuration you create using the ***CDS Link 6*** software.

# Requirements to use

## To use a *Co Pilot 2 or Informer* in your vehicle, you will need:

1. A *Master SSI Model Mxx-x-2.x* or higher.
2. A PC with Windows 98 SE, 2000 ME, 2000 Pro, or XP operating system
3. *CDS Link* software version 6 (or higher) installed.

# *Co Pilot 2* System includes

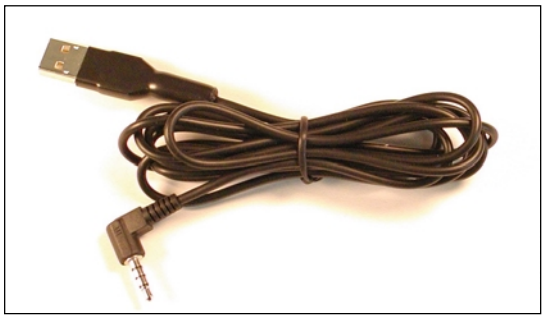
## The Basic *Co Pilot 2* includes:

- *Co Pilot 2* unit with mounting screws
- *CDS Link* software CD

PLUS:

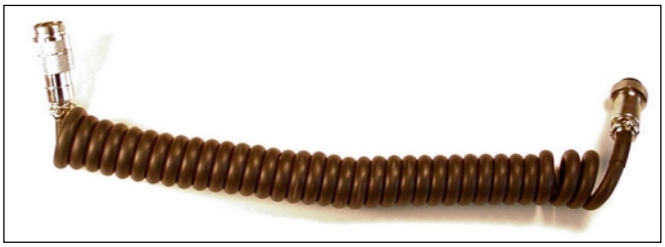
**Push Button and button coil cord**

**PC USB Communication cable**



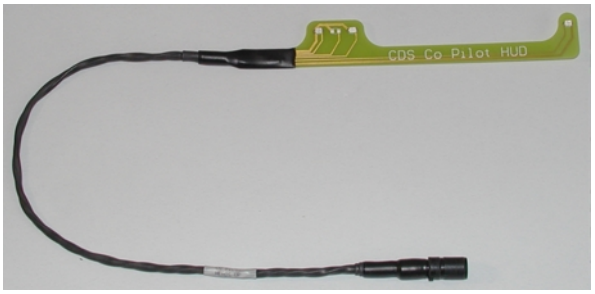
## Optional Wheel Mount Coil Cord

Optional large coil cord for main harness needed for wheel mounting the Co Pilot 2.



## Optional Accessories Available

- In – helmet "Heads Up" display (Shift and Alarm lights)
- Dual Vertical or Horizontal Satellite Display
- Single Satellite Display
- Remote Alarm Light
- "Wire Free" steering wheel quick release.



# *Informer 2* System includes


- *Informer 2* Unit with Video I/O Y cable
- *CDS Link* software CD
- *TrackNet* cable for connecting the *Informer* to a SSI.
- USB Communication cable

## Camera and Recorder

**NOTE**: The video recording device used with the Informer is supplied by the customer.

- Most people are using "Mini DV" camcorders or decks for recording, although with the emergence of solid state (flash memory based) video recorders we feel that in the future the best choice will become a flash based recorder since they have no moving parts.

# Master SSI and Sensors

- Also included (not shown) are sensors and cable harness for the SSI box.

# Chapter 2 Install SSI and Sensors

## Regarding your ignition wires

WE REQUIRE THE USE OF SPIRAL CORE or other SUPPRESSION TYPE IGNITION WIRES such as MAGNACORE, MOROSO Blue Max spiral core, TAYLOR spiral Pro, MSD, or equivalent. Use of this type of wire for all plug leads AND the coil lead(s) will eliminate the possibility of ignition interference.

- All production car type wires are compatible.
- Nology wires have been known to cause problems and are specifically not recommended.
- If you insist on using old fashioned stainless steel or solid core wires, expect intermittent and random problems and data corruption that can only be solved by using the correct wires.

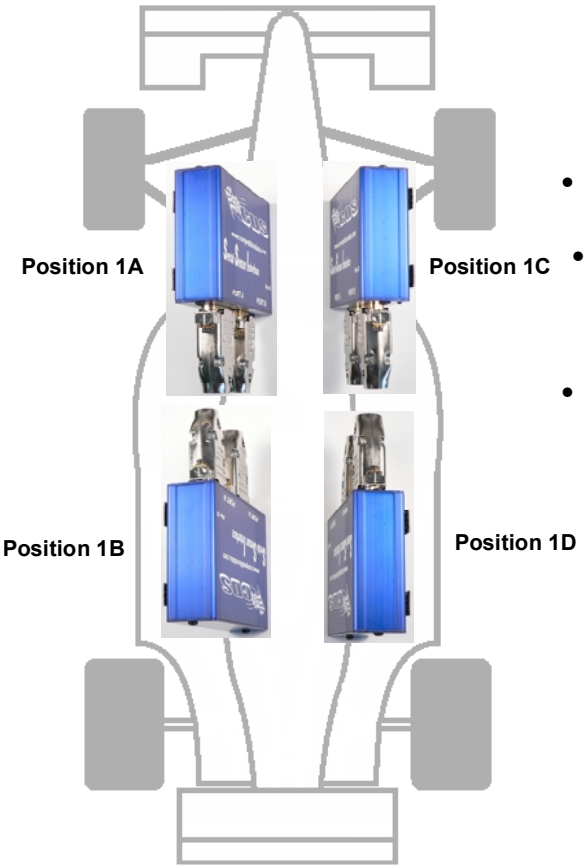
## Locate, Orient, and Install Master *SSI*

### Master SSI Orientation

Because the Master SSI contains 1 or more accelerometers, it must be oriented in a specific manner. At the time your system was ordered you chose between Orientation #1 or #2.

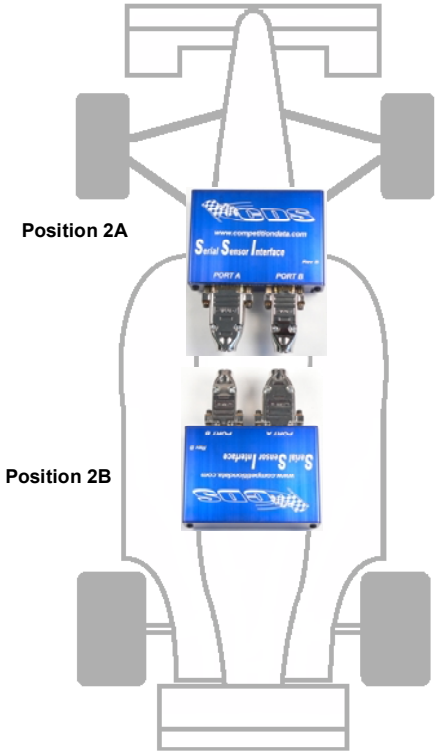
If your Master SSI does not contain accelerometers you can orient it any way you wish.

#### Orientation # 1




- A SSI box built for orientation #1 can be installed in any of the 4 **positions** shown here.
- If you mount it in a position other than 1A then you must edit your configuration (using CDS LINK) and change the accelerometer calibration values to those shown in your SSI calibration sheet.
- Orientation #1 has Lateral_G on Analog 3, Long_G on Analog 2, with (optional) Vert_G on Analog 1

### Orientation # 2




- A SSI box built for orientation #2 can be installed in any of the 2 positions shown below
- If you mount it in a position other than 2A then you must edit your configuration (using CDS LINK) and change the accelerometer calibration values to those shown in your SSI calibration sheet.
- Orientation #2 has Lateral_G on Analog 1, Long_G on Analog 2, and (optional) Vert_G on Analog 3

### Other Master SSI Orientations

Other orientations can be provided for. If your SSI is built for an orientation other than shown above, see the special calibration sheet provided with your SSI.

## Install The Master SSI

Locate the SSI in the driver compartment if possible. Keep it at least 12 inches from ignition wires or coils.

- Even though the SSI is waterproof, choose a location where it will not be exposed to constant wash down if you race in the rain.
- Locate it so that you can see the *Power* and *Status* LEDs on its front panel.
- The SSI is fastened to a flat surface using the supplied dual-lock material. Clean the surface with brake cleaner before sticking the dual lock on it.
- IMPORTANT: Install the SSI such that its case is NOT rubbing metal to metal on any part of the vehicle.
- Here is a photo of a SSI installed in **Orientation 1, Position 1C**


## Install The Slave SSI

If your system includes a *Slave SSI,* Locate it now based on the length of the cable that connects it to the Master.

**IMPORTANT: The Master and the Slave SSI boxes are NOT interchangeable. Do not mix them up.** The MODEL # of the SSI is printed on a label on the side of the box.

- All ***MASTER*** *SSIs* have a MODEL # of the form: *Mxx-x-x.x* Example: MNN-2-2.07
- All ***SLAVE*** *SSIs* have a MODEL # of the form: *Sxx-x-x.x* Example: SNN-2-2.07

# Install Sensors

The type and number of sensors and sensor cables depend on your system's configuration. All of the sensors and sensor cables are labeled for easy hookup. For example, a sensor labeled "OIL_P" should be plumbed into the oil system of the engine. The connector on the oil pressure sensor should be plugged into the sensor cable labeled "TO OIL_P". The other end of the sensor cable is installed in either the Port A or Port B harness.


## SEN-4 Wheel or Engine RPM Sensors

The RPM sensor is used to measure the RPM of any shaft. ONE magnet is mounted on the shaft, wheel, brake hat, or pulley to actuate the sensor. Note that the magnet can be mounted on the diameter of the shaft (or crank pulley) or it can be mounted on the end of the shaft (on the face of the crank pulley).

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**VERY IMPORTANT NOTE!** The Co Pilot 2+ depends on good a quality SPEED signal for both the performance monitor and to initiate data logging. If your system is using a SEN-4 for the signal named WHEEL_R (which then becomes the *Primary Speed Source*) then be sure to take extra care at installation time to properly set up your sensor and avoid operational problems when you get to the track!

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1. Select Magnet Location. The magnet should be mounted such that the sensor does not "see" additional metal discontinuities (such as bolt heads or keys as the shaft rotates).

- For measuring the Engine RPM, try to mount the magnet on the face of a cam pulley.
- For measuring the Wheel RPM, mount the magnet on one of the inner CV joints or on a brake disk or hub.
- **IMPORTANT:** If installing the Wheel RPM sensor on the front wheel, design a bracket to minimize conduction of brake heat into the sensor, as this will cause failure. Do not use aluminum for the bracket, as it is a good heat conductor. Stainless steel is best due to its thermal properties.

2. Attach Magnet

Each SEN-4 is supplied with two 4/40 male threaded magnets. One is to be mounted, the other is a spare. If you feel that more than one magnet is necessary for your measurement, it is absolutely critical that the magnets be equally spaced in terms of degrees. One degree of offset will cause a "jitter" in your RPM signal.

3. Mount the Sensor

Fabricate a mounting bracket for the sensor so that the sensor is aimed right at the magnet as it passes by. The bracket holding the sensor must be stiff to ensure accurate RPM readings and prevent sensor damage due to magnet/sensor contact. Brackets made of 0.062" flat stock are NOT stiff enough. If you plan on using a bracket made from flat stock, it must be at least 0.125" thick. **Make sure the bracket can not move relative to the magnet.** For example, if you are measuring engine revs and you are attaching the magnet to the face of the cam pulley, the sensor bracket MUST be attached to the engine and NOT a frame member.

4. Set the Air Gap

- The air gap from the sensor face to the magnet should be about **3/16" (0.18"). G**aps lager than .025 or so may cause unreliable readings.
- Do NOT set the gap to less than .10" as this risks the magnet hitting the sensor when everything is running, vibrating, and flexing.

## SEN-17B3 Ignition Type RPM Sensor

The SEN-17 sensor measures RPM by reading pulses from the ignition system or engine management system, similar to the way that a tachometer does. The older 17B and B2 sensors may not work properly on an *SSI* based system.

- Do not attempt to use this sensor without first verifying that you have compatible type ignition wires. See the very first section of this chapter.
- The 17B3 sensor is not recommended for use on Points Type Ignitions.

### Connect White (Signal) Wire

- Look for a TACH OUTPUT on the ignition computer, box, or engine management system and connect the WHITE wire to this tach output.
- On the MSD 6 series, there is a spade lug type connector for TACH signal at one end of the box.
- DO NOT connect directly to the coil on any ignition system.
- When in doubt, connect the sensor to the same place as the in-dash tachometer. (as long as the tach is not driven by the coil)

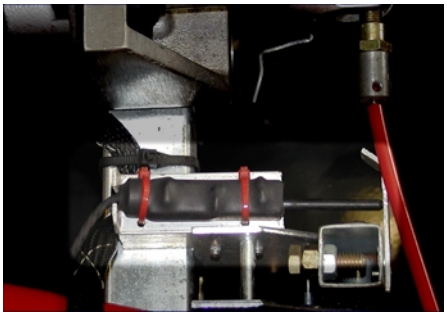
### Connect Black (Ground) Wire

The newest version of the SEN-17B3 has a black ground wire that contains a pull down resistor.

- Most engine management applications DO NOT require that you connect this black wire. (Although doing so will not hurt anything).
- If you have a dual ignition system as is typically used in stock car racing, then you MUST connect the ground wire.
- Many conventional amplified ignitions (such as Crane or MSD) require that you connect this ground wire.
- Connect the BLACK wire to a GOOD ground on the chassis.

Test the sensor prior to any on track testing by starting the engine and observe the RPM value displayed on the *Co Pilot 2* or *Informer*.

## SEN-11 Throttle and Brake Sensors

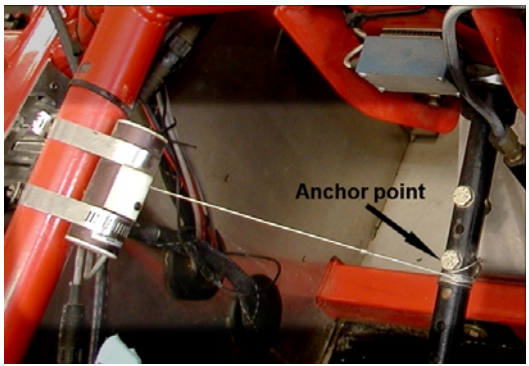


Make a flat tab to actuate the plunger. Use nylon wire ties to secure the sensor to a flat surface.

- The preferred way to install these is such that the plunger compresses when you press the throttle or brake, but they will also work if the plunger is extending when you press the throttle or brake.
- Some systems use a SEN-38S string pot for throttle.

## SEN-38F Steering Sensor

Securely mount the body of the sensor using hose clamps or fabricated clamps. Nylon tie wraps will work OK but you must make sure that the sensor can not move around if using tie wraps.



### Steering Shaft Mount method

In this method the wire from the SEN-38 wraps and unwraps around the steering shaft as the driver turns the wheel. To use this method your steering shaft must be round with no ridges or corners on it. If you use this method on a hexagon shaft for example, the cable will fail the first day.

- Decide which direction of wheel movement will be the "unwrap" direction.
- Turn the steering wheel all the way to the "unwrap direction"
- Wrap the cable around the steering shaft twice and secure its end under a bolt head or hose clamp. There must be a little tension on the cable when the wheel is all the way to the "fully unwrapped" position.
- Slowly turn the steering wheel to the wrapped position, making sure that you do not run out of travel in the cable before the wheel gets to full lock.
- Observe the cable. Make sure the cable does nor wrap up on top of itself. This can be accomplished by have the "anchor point" of the cable (the bolt head or hose clamp) a few inches up or down the shaft from the point where the cable naturally wants to "ride".

### Steering Rack Mount method

On some cars it is easier to mount the SEN-38 string pot to one end of the steering rack.

- Mount the sensor securely
- Attach the end of the cable to inboard end of the tie rod.
- NOTE" if you attach the cable to the outboard end of a tie rod, then the cable will be worked up and down as the suspension moves and will fail prematurely.
- In some cases a SEN-20 is used for measuring steering.

## SEN-31 Air Temp Sensor

This sensor is used commonly to measure intake air, cowl or other air temperatures. It can be used over the range of 32 – 300 degrees F. DO not exceed 300F.

- It has a 3/8 male pipe thread.
- Mount it so that the air you want to measure flows past the nose of the sensor

## SEN-30, 32 Fluid Temp Sensor

This sensor is used to measure water, oil or other fluid temperatures. Plumb the sensor into the fluid line such that liquid is always flowing over its "nose". If the nose of the sensor is trapped in a dead end Tee, it will not read the fluid temperature correctly.

- The SEN-32 has a 3/8" male pipe thread, the SEN-30 has 1/8" male pipe thread.

## SEN-9 and SEN-33 Fluid Pressure Sensors

Install the SEN-9 sensors using a length of hose to isolate it from direct engine vibration. Do not thread the sensor directly into a blower or manifold.

- The SEN-9 sensors have either ¼ or 1/8 male pipe thread (-3 available on special order)
- The SEN-33 has 1/8 male pipe thread

- NOTE: The SEN-33 sensors are only accurate to 5% of full scale, and it is not unusual for the SEN-33c (0-150 psi) to read 6-7 psi or so with no pressure on them.

  Here is a picture of the SEN-33 in a fuel pressure application. Note the great care the installer has taken to protect and support the small wires.

### SEN-20 Suspension Sensors

#### Key points

- DO NOT let the suspension sensors become "droop limiters" when you jack the car up. Makes sure they have sufficient travel when the suspension is in full droop.
- If possible, install the sensors such that they do not need to be disconnected when the shocks are removed. This will save time during testing if the shocks are taken off to be re-valved frequently.
- Due to the flexibility and power of CDS Software, it is <u>not</u> necessary to install the suspension sensors such that they move at a 1:1 ratio with shock movement.
- Also, it is not necessary that the sensor compress as the shock compresses. The CDS software enables proper calibration even if the sensor extends as the shock compresses. See the formula car installation example below.

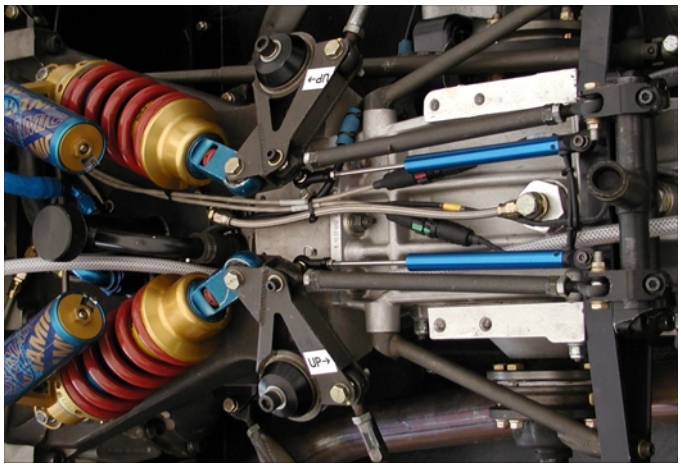
#### Typical Stock Car Install

Because systems are frequently taken on and off the car in stock car applications, it is common to make brackets out of ½ pieces of tubing and hose clamp those brackets to frame members.

- Here is such a bracket being used on the front of a Cup car.

#### Typical Formula Car Install

Below is a good example of an installation on the rear of a Formula 2000 car. Note that in this installation the sensors extend as the shocks compress.



# GPS Controller and Antenna

*Some systems use the CDS GPS Option for Lap Time and Speed. If your system has this option, please follow the installation instructions below.*

The ***GPS-2*** generates an end-of-lap signal which takes the place of the Receiver and Trackside Beacon. It also generates a SPEED signal that can be used either as the primary source for SPEED/DISTANCE data or as a supplement to actual wheel rpm sensors.

The GPS-2 offers improved sensitivity (which results in better quality SPEED data) and uses a much smaller antenna than the original CDS GPS.

# Install GPS-2

## GPS Controller Install


Install the controller in a position where the driver can reach it while belted in. Ideally, install it such that the driver can see the 2 LEDs as well.

- The Button is used to set the start finish line (the "virtual" beacon location)
- The LEDs display the GPS system state. (see the operation section)

You can use some of the supplied dual-lock material to mount the controller, or use silicone or double sided tape. DO NOT remove the cover or drill holes in the controller box.

### Connections

The GPS-2 has 1 or 2 system connectors and 1 antenna connector.

#### GPS-2-5: (2 system connectors)

- Connect the connector labeled SPEED to the RPM channel cable you wish to assign it to. If you are adding GPS-2 to an existing system, this will usually be the existing WHEEL_R cable.
  - IMPORTANT: The RPM cable you connect to MUST have the 5 Volt pin wired since the GPS-2 gets its power from this connection.
- Connect the connector labeled LAP to your system cable labeled TO PHOTO RECEIVER or TO GPS LAP.

#### GPS-2-8: (1 system connector)

- If you have a new system that you purchased with the GPS-2 option, you will have a single 8 socket connector on your system harness that is labeled TO GPS2 CONTROLLER. Connect it to the 8 pin connector on the GPS-2 controller. This cable carries both the SPEED and LAP signals.

## GPS Antenna Install

The antenna needs a clear view of the sky to work properly. The better its view of the sky the better it will work. It does not need to be perfectly level or flat. Do not mount it on a panel that vibrates or buzzes excessively. Try to provide a solid base for it.

- On cars with roofs, mount the sensor on the roof as far forward as possible.
- On formula and sports racers, locate the antenna on the cowling in front of the driver or in a location further forward..
  - You MUST keep the antenna and its wire at least 12" away from radios, antennas, and their wires.
  - You MUST keep the antenna and its wire at least 12" away from ignition components and their wires.
  - We do not recommend that you mount the antenna behind a windshield or rear window. All glass will reduce the GPS signal quality somewhat, and the glass in some of the newer European cars will block the signal completely.
  - We do not recommend that you mount the antenna any further rearward than the steering wheel of the car.

### Antenna Mount Method

Use any of the following methods to secure the antenna:

- On cars with steel roofs, use the strong magnet that is built in to the antenna

- Use the supplied piece of dual-lock material
- Use silicone or another suitable adhesive to hold the antenna to a flat surface

## Route, connect, and secure the Antenna cable

Route the cable to the GPS Controller, plug it into the antenna connection, and secure the nut finger tight only. Do not use a wrench or pliers on the connector.

- **IMPORTANT:** Do not over tighten any wire ties used to secure the antenna cable. The cable is somewhat fragile and if you crank down on wire ties such that you deform the cable you will ruin it.
- You **MUST** keep the antenna cable at least 12" away from ignition components, radio components, and their wires.

# Conventional Beacon based Lap Timing

*If your system DOES NOT have the GPS option, please follow the instructions below*

## SEN-14C2 Encoded Photo Receiver

This sensor is used to mark segments of the track or log lap times. The sensor receives a modulated light beam from the SEN-25C beacon. Each time the sensor "sees" the beacon, the time is recorded. Therefore, if you have only one beacon on the track, then the photo receiver causes the *Co Pilot 2 or Informer* to record lap times.

### Set the Channel

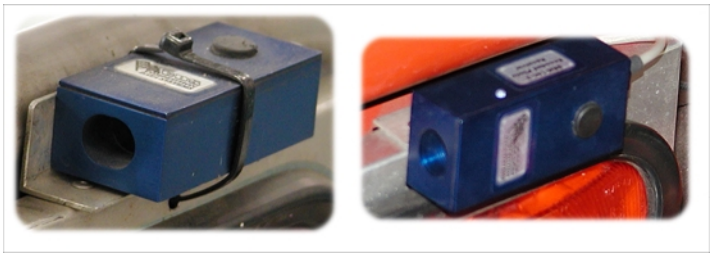
Both the beacon and receiver have a 16 position rotary switch to select channel number. The receiver must be set to receive on the same channel that your beacon is transmitting on. Select a channel which is not currently in use by others, or set your receiver to a channel being used by a beacon set up at the track.

### Install the Receiver

Mount the sensor to the car so that it is aimed parallel to the racing surface (Horizontal in the car).

- Direct sunlight can "wash out" any infrared signal causing the beacon to be "invisible" to the receiver. The sensor can be checked for alignment by parking the car in front of the beacon. When the receiver "sees" the beacon, a small red light on the sensor will come on.
- Do NOT place the receiver behind Plexiglas.

NOTE: it is best to mount the sensor so that the wide part of the oval shaped window is "horizontal" rather than vertical. Mounting it vertical will decrease its useful range.



**Correct** **Incorrect**

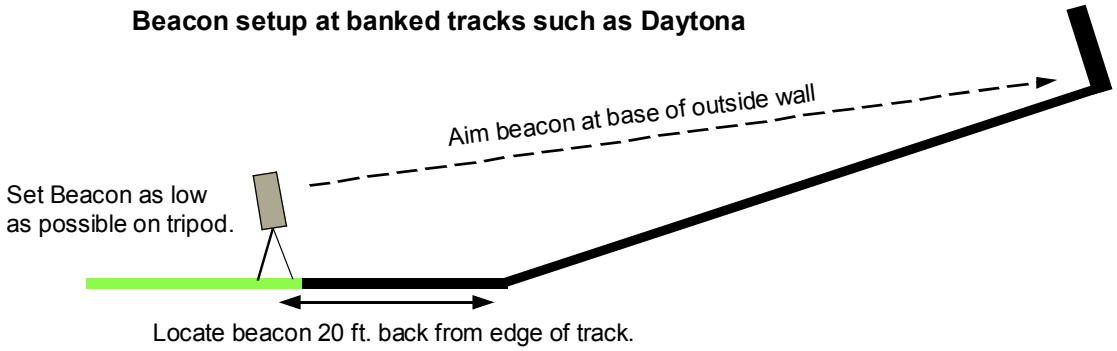
## SEN-25 Beacon Setup

Obtain a good quality camera tripod for your beacon and attach it to the tripod with the threaded bushing on the bottom.

1. Locate beacon between 20 feet and 120 feet away from vehicle path.
2. It is very important that the beacon **not be any closer than 20 feet** from the vehicle path because the width of the beacon's infrared light "cone" narrows drastically at distances less than 20 feet.
3. Locate beacon <u>at **least**</u> **15 feet away from other beacons (of any brand).** Beacons can cancel each other out if their "light cones" overlap. The light cone of the CDS beacon is nominally 30 feet wide.
4. Set up beacon at about the same height above ground as the receiver (in vehicle) is.
5. Aim beacon so that it is parallel to track surface. (DO NOT aim up or down).

- The only exception to this rule is the case where cars are passing the beacon on a significantly banked section of track and the beacon must be on flat, level ground in order to satisfy rule #2 (above). Daytona is a classic example of this. See figure below**.**

**Beacon setup at banked tracks such as Daytona**




6. Connect freshly charged 12 volt battery with at least 20 amp-hour rating. RED = Pos, BLACK = Negative .The standard beacon (SEN-25CS) draws about .6 amps. The master beacon draws twice that, or 1.2 amps.

- Do not skimp on your battery size and be sure it is freshly charged at the start of a test day.

7. The BATTERY STATUS LED on the side indicates battery charge level:

- Slow Blink = Battery voltage dropping.
- Fast Blink = Battery low, range is reduced, charge as soon as possible.

## Receiver CHECKOUT

This receiver can be checked for alignment by parking the car in front of the beacon. When the receiver sees the beacon, a small red light on the side of the receiver will come on.

## TROUBLESHOOTING

1. If you experience **extra erroneous photo beam trips**, make sure your cable connecting the receiver to the SSI **is at least 8"** from any ignition component (including coils and high voltage wires). Also, check to see if anyone else has a CDS encoded beacon out on the track operating on the same channel.

2. If your receiver is **"missing laps":**

- Check receiver and beacon alignment per this document
- Check battery voltage of the beacon
- Make sure the lens on the receiver is clean. Do not use harsh chemicals such as brake cleaner on the lens. Us a plastic and glass cleaner or water.
- Make sure the lens of the receiver is shielded from direct sunlight
- Make sure your beacon is at least 15 feet away from other beacons of any brand.
- Do NOT place the receiver behind plexiglass

# Install Cables

## Install *SSI* Port Harnesses

Ports A and B are multi cable harnesses with waterproof connectors that connect your sensors, power source, and *Co Pilot 2* or *Informer* to the SSI.

- Each cable is labeled with the name of the item that it connects to.
- When routing cables, use tie wraps to prevent the cable from touching surfaces hotter than 175 degrees F. Also, avoid routing the cable within 6 inches of high voltage ignition wires or coils.
- Plug the connectors into their ports on the SSI and tighten the 2 captive allen head screws for each connector. A "T" handle wrench is provided for this. DO NOT OVER TIGHTEN but be sure the screws are secure.
    - You are compressing an "or" ring seal on the connector as you tighten the screws.

### Master and Slave *SSI* Harnesses

IF you have both a Master and a Slave SSI then it is **VERY IMPORTANT** that you pay attention and not connect the Slave harnesses to the Master SSI and visa versa.

- The MASTER and SLAVE SSIs are NOT INTERCHANGEABLE and neither are their HARNESSES.
- All items are clearly marked. Take time to read the labels and you should have no trouble.

### Sensor Connectors

Route each of the sensor cables to its sensor and plug the connectors together.

- Each connector has an "index" and locks in place with a ¼ turn

### Optional ECU Interface

Some systems include a connection to the Engine Management ECU to capture the data stream from it. The connector used depends on the ECU and the car that it is installed in.

- In most cases the mating connector for the ECU harness is installed on dedicated cable on the SSI port B harness.

### Connect to *Co Pilot 2* or *Informer* Harness

Your Port B Harness on your **MASTER SSI** should also have a cable labeled *" TRACKNET"* and *"To Co Pilot 2"* or *"To Informer"* The 5 position plug on this cable goes to the *Co Pilot 2* main harness labeled "*Co Pilot 2 Power / Data"* The 8 position plug goes to PORT A on the Informer.

## Install Power Cables

- The system connects to a 12 volt power source using the positive and negative leads on PORT B of the MASTER SSI harness.
- The system is designed to be powered "on" whenever the vehicle master switch is "on". It is not necessary to route the power through an additional dash mounted switch, although if you want to it is OK to do so.
- If you are installing in a vehicle that does not have a master switch then you must supply a dash mounted switch for the power.

### Vehicle with a POSITIVE SWITCHED Master:

- The POSITIVE power wire (the one with the fuse holder at the end) connects to the switched side of the master.
- The NEGATIVE lead connects to the NEGATIVE terminal of the battery. DO NOT connect it to a frame or sheet metal ground.

### Vehicle with a NEGATIVE SWITCHED Master:

- The POSITIVE power wire (the one with the fuse holder at the end) connects to the POSITIVE terminal of the battery.
- The NEGATIVE lead connects to the switched side of the master. DO NOT connect it to a frame or sheet metal ground.

### ALL Vehicles:

- If you need to put a different terminal on the negative lead, make sure that you connect BOTH of the wires inside the black heat shrink to the new terminal. Failure to do so will create intermittent problems due to noise.

# Chapter 3 Co Pilot 2 Hardware Installation

*If you have an Informer but no Co Pilot 2, you can skip this chapter*

## Locate and Install *Co Pilot 2*

First, decide if you want to wheel mount or dash mount your *Co Pilot 2*. Sit in the car and try it in a few locations. Below are a few photos to help in your decision.

Bear in mind that you must have access to the small round plug on the bottom of the *Co Pilot 2* in order to connect the USB cable when downloading or configuring.

### Dash Mount

The *Co Pilot 2* is mounted to the dash or wheel using the 2 # 10-32 screws.

- In some cases you may need to fabricate your own bracket for mounting the *Co Pilot 2*
- No shock mounts are required! All the electronics are shock mounted internally in the Co Pilot 2

### Install Push Button and Button Coil Cord

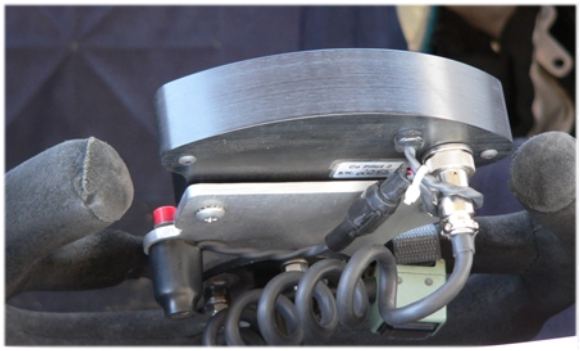
Install the push button on the steering wheel at a place convenient to the driver. The button requires a 15/32 hole for mounting.

- Unless your steering wheel has very wide spokes, we DO NOT recommend drilling a 15/32 hole in the wheel itself. We recommend that you fabricate a small bracket for the button such as is shown in the Spec Racer Wheel Mount photo on the previous page.
- For dash mounted *Co Pilot 2*, a coil cord is provided to connect the button to the pigtail connector on the back of the *Co Pilot 2*. Wrap the cord around the steering column and turn the wheel lock to lock to make sure the cord does not stretch excessively.

### Steering Wheel Mount

Most formula car and sports racer drivers prefer steering wheel mount.

- If you decide to wheel mount your *Co Pilot 2* you will need either the *Wheel Mount Coil Cord* or the *Wire-Free Quick Release.* Both items are optional (not included in base system price).
- The *Wheel Mount Coil Cord* is sold in 2 lengths, short for formula cars and sports racers, long for sedans and stock cars.



## Mounting to Steering Wheel

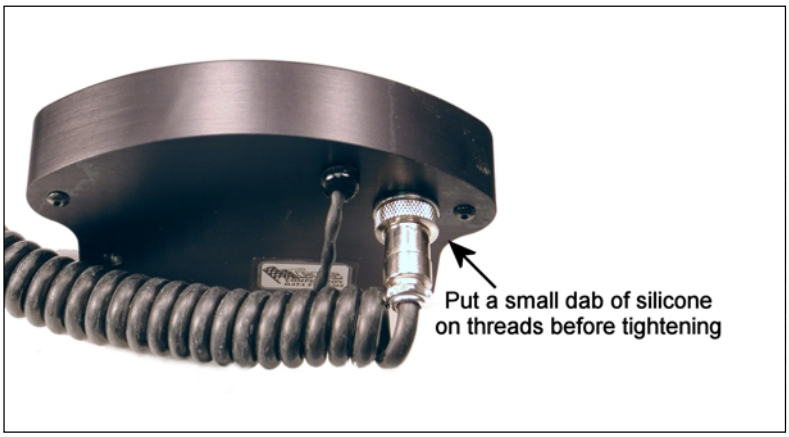


The *Co Pilot 2* can be mounted directly to the steering wheel or on a fabricated bracket

- No shock mounts are required! All the electronics are shock mounted internally in the *Co Pilot 2*.
- If you want to wheel mount the *Co Pilot 2* to a larger wheel such as found in GT cars, you can usually drill 2 small holes for the 10-32 screws directly in the wheel, as was done in the GT Car Wheel Mount photo on the previous page.
- A drilling template for locating the holes is provided for your convenience

## Install Wheel Mount Coil Cord (steering wheel mount)

- Wrap the cord around the steering column and turn the wheel lock to lock to make sure the cord does not stretch excessively.
- Put a small dab of silicone on the threads of the silver connectors before tightening. The connectors are O-ring sealed, and the dab of silicone is to prevent the threaded collar from loosening under vibration.




## Install Push Button

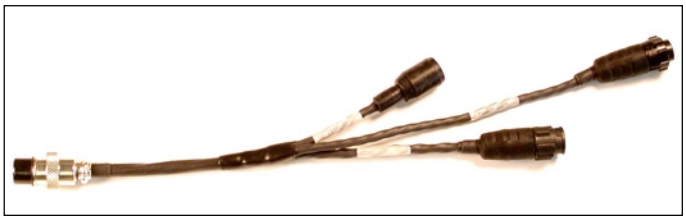
Install the push button on the steering wheel at a place convenient to the driver. The button requires a 15/32 hole for mounting.

- Unless your steering wheel has very wide spokes, we DO NOT recommend drilling a 15/32 hole in the wheel itself. We recommend that you fabricate a small bracket for the button such as is shown in the Spec Racer Wheel Mount photo on the previous page.
- Plug the button directly into the pigtail connector on the back of the *Co Pilot 2*.

# Install Wiring & Accessories

## Install The Main Harness

The *SSI* and all *Co Pilot 2* accessories connect through the main Y Cable harness.



- If your *Co Pilot 2* is dash mounted, connect the main harness directly to the back of the *Co Pilot 2*.
- If your *Co Pilot 2* is wheel mounted, connect the main harness to the female end of the *Wheel Mount Coil Cord*.
- Put a small dab of silicone on the threads of the silver connectors before tightening. The connectors are O-ring sealed. The dab of silicone is to prevent the threaded collar from loosening under vibration.

## Install Satellite Displays

If you have purchased any Satellite Displays for your *Co Pilot 2*, install them now using the dual-lock material provided.

- Sit in the car with your helmet on to decide where to put the satellite displays.
- Clean any surface you want the dual lock to stick to using brake cleaner or any other degreasing cleaner which leaves no residue.
- Use any standard CDS 5 position extension cable (if necessary) to connect the satellite displays to the main harness. Extension cables are available from stock in lengths of 1 to 12 feet.

### Using a DIS-2 Display as a Co Pilot 2 Satellite

- The Satellite displays made for use with the *Co Pilot 2* are *encoded* so that up to 4 can be connected. The SAT-S (single satellite for *Co Pilot 2*) looks identical to the DIS-2 display used with the Commander 2, but is different electrically. The DIS-2 CAN be used with the *Co Pilot 2* with the following limitations:

    1. The DIS-2 should be connected to the Aux 1 & 2 connector on the main harness.
    2. In the *Co Pilot 2* Link software, both the Aux 1 and 2 should be programmed to display the same information to prevent flickering of the DIS-2

## Install Auxiliary LEDs

The *Co Pilot 2* has provision for 2 external LED lights:

- An external LED connected to the “EXTERNAL LED 1” will duplicate or “parrot” the action of the HUD shift light (configured in the *Shift Light* tab )
- An external LED connected to the “EXTERNAL LED 2” will duplicate or “parrot” the action of the large red Alarm light on the *Co Pilot 2*.
- “Y” and extension cables with the 2 position sure-seal connectors are available from CDS if required.
- **IMPORTANT NOTE:** DO NOT attempt to connect incandescent type light bulbs to the External LED connections. Doing so may damage your *Co Pilot 2*.

### Install HUD display in your helmet

*If you have the optional in- helmet HUD display follow the steps in this section*

Several options are available for mounting the HUD in your helmet.

- You can tape the HUD to the top or bottom of your visor using clear tape.
- You can simply wedge the flexible PCB between the liner and shell of your helmet, with only the "fingers" of the PCB where the LEDs are located exposed. This can be done at the top of the eye port, or on full face helmets, at the bottom of the eye port.
- Route the wire on the HUD to the side of your helmet and fasten it to using a small "D" clamp or tie wrap.
- Connect the HUD extension cable to its connector on the main harness and route it in the car to a place where you can easily plug your helmet in once you are in the car.

### Connect The Main Harness to the SSI

Connect the *TrackNet* cable (from Port B of your Master SSI) to the *Power / Data* connector on the Co Pilot 2 "Y" harness.

## Preliminary Power Up Checkout

If you also have an *Informer* then you can either:

- Install it now (refer to the next chapter for installation instructions), then come back here to perform the initial checkout.

  - OR -

- Just check out the *Co Pilot 2* portion of your system now.

### Power Up

You are now ready to power up your system for the first time. Turn the master switch "on"

### Co Pilot 2

- You should see a message *" Co Pilot 2 Version x.xx"* where "x.xx" is the version number of the firmware in your *Co Pilot 2*. After a few seconds this message should disappear.
  - If you have a *Co Pilot 2*+ then the last character in the version # will be "+"
  - During the power up (when the firmware message is shown) the Satellite (AUX) Displays will show their display number, for example, Satellite #3 will show "3333" on it
- Since you have not yet configured your *Co Pilot 2*, you may see a scrolling message "*NO DATA OR UNEXPECTED DATA RECEIVED, CHECK YOUR DATA STREAM RATE AND MASTER SSI MODEL # SETTING IN CDS LINK."* This is normal and correct, indicating that the *Co Pilot 2* is running.
  - At this time all Satellite displays will show "----", the Digital Display will be blank, and all LEDs will be off.

If your unit passes this checkout, it is ready to be configured. Proceed to chapter 5 to install your software on your PC.

### SSI

The *12v* red LED should be on steady. The *Status* red LED should be flashing at a steady rate indicating the SSI is running and transmitting data.

### GPS

*If your system has the GPS option, complete the checkout below*

Position your car outside such that the antenna has a clear view of the sky. Power up your system.

- The STATUS LED should glow red

  After about 1 to 2 minutes the STATUS LED should start blinking. This indicates that the controller is receiving a very good quality 3-D fix. If it does not start blinking after 2 minutes, check all the connections and make sure your antenna has a clear view of the sky.

- IF your view of the sky is partially blocked (if you are right next to a building for example) it could take as long as 4-5 minutes to acquire a good fix.
- Once the STATUS LED is blinking, Press the button. The LAP LED should come on, and if you are not moving, it should stay on. Pressing this button sets the "virtual beacon" location.
- There is no way for the user to "clear" the "virtual beacon location". The location is re-set whenever you press the button, and the newest location is the only one used by the system.

*If all of the above steps check out, you done checking out the GPS System.*

# Chapter 4 Informer 2 Hardware Installation

*If you do not have a Informer 2  you can skip this chapter*

## Locate and Install the *Informer*

Choose a location inside the cockpit for the *Informer,* bearing in mind:


1. You need to be able to access the COM connector for re-configuring the *Informer*
2. Your video cables from your camera and to your recorder need to reach the VIDEO IN and OUT jacks.
3. Your TrackNet cable from your SSI must plug into the PORT A connector
4. Try to mount the *Informer* so that you can see the STATUS led on its front
5. Try to mount it so that it is not exposed to direct spray or splash if you race in the rain.
6. IMPORTANT: Install the *Informer* such that its case is NOT rubbing metal to metal on any part of the vehicle.

The *Informer* fastens to any flat surface using the dual lock material supplied with it.

# Install Wiring


### Informer 2 only

Connect the 8 position cable labeled "TrackNet" (coming from your MASTER SSI ) to PORT A on the *Informer*.

### Informer 2 with Co Pilot 2

The TrackNet cable coming from your MASTER SSI will have both an 8 position and 5 position connector. The 8 position goes to the *Informer* (port A), the 5 position goes to the Co Pilot 2.

### Adding Informer to existing Co Pilot 2 system

Disconnect the 5 position connector labeled "power and data" on the *Co Pilot 2* main harness. Connect that cable to the 5 pin connector on the supplied TrackNet adapter. Connect the 5 socket plug on the Tracknet adapter to the *Co Pilot 2* main harness.

Route the 8 position cable from the TrackNet adapter back to the *Informer* and plug it into PORT A.

### Video connections

Plug the supplied Y cable into the VIDEO I/O jack on the front panel.

**IMPORTANT: Be sure to secure the Y cable such that its Plug can not vibrate or rotate when it is plugged in to the *Informer 2.* If it is allowed to move around it may cause noise and dropouts in the video out signal.**

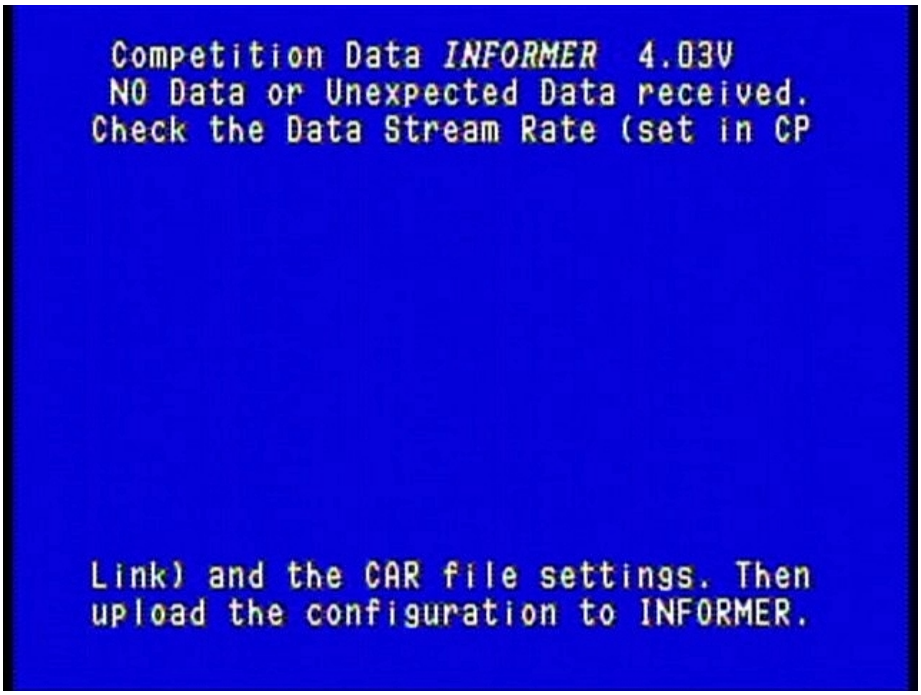
Connect your camera to the VIDEO IN (RCA type jack) on the Informer 2 Y cable. Connect you video recorder or camcorder to the VIDEO OUT (RCA type jack) on the Y cable.

- Cables for making this connection are supplied with your camcorder or are available at all consumer electronics stores.

# Preliminary Power Up Checkout

You are now ready to power up your Informer for the first time. Turn your master switch ON.

- The video out signal should show a screen that looks like this: (view it on your camcorder view finder or connect a TV to the *Informer* VIDEO OUT)




- Since you have not yet configured your *Informer*, the message indicates that you must send it a configuration. This is normal.
- If your unit passes this checkout, it is ready to be configured. Proceed to the next chapter to install your software on your PC.

**NOTE:**

- The Informer 2 communicates with the PC via USB and uses the same drivers and COM port as a Co Pilot 2, so if you already have a Co Pilot 2 that you can communicate with, you should be able to communicate with the Informer 2 without installing any additional drivers.

# Chapter 5 Install Software & USB Drivers

## IMPORTANT NOTE

We do the best we can to ensure compatibility with all existing operating systems but as you know the Windows PC world is, shall we say, complicated.

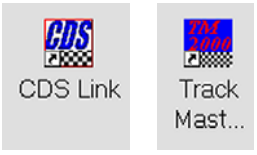
**TO MINIMIZE CHANCES OF PROBLEMS WE STRONGLY RECOMMEND:**

1. **TURN OFF any anti-virus software prior to installing software. Norton Anti Virus has been found to be especially troublesome when installing software.**
2. **Allow the software to install itself in its DEFAULT or RECOMMENDED LOCATIONS**.

## Software Install

1. If you have a Co Pilot 2+ system with data logging, **DO NOT** plug your software license key into your PC at this time.
2. Insert the *CDS* software CD in you PC. If the install program does not "auto start", then navigate to your CD ROM (using Windows Explorer or My Computer), and open the SETUP.EXE program on the CD.
3. Follow the prompts and instructions on the screen. Allow your PC to re-boot at the end of the installation.
4. Once the installation is complete, you should have an icon on your desktop for *CDS Link.*


5. If you have a Co Pilot 2+ system with data logging, you should have an icon on your desktop for *CDS Link* and for *Track Master 2000*




6. If you are using a Commander 2 with this pc and the Command Link option is checked on your CD, then you should also have an icon for *Command Link 2000.*


7. If you have a Co Pilot 2+ system with data logging, plug the software license key into any USB port on your PC. After a few moments a LED inside the key should illuminate, indicating that it is recognized by the PC.

# Installing USB Drivers (Co Pilot 2, Informer 2, and Commander 3)

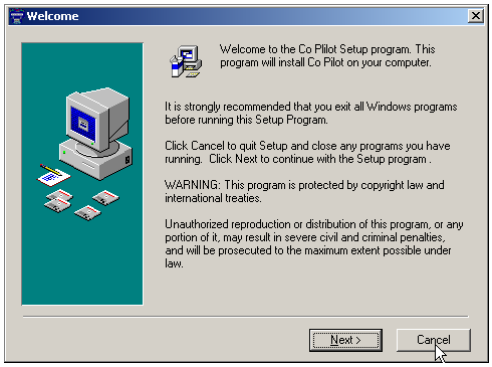
**PLEASE FOLLOW THESE INSTRUCTIONS EXACTLY AND YOU SHOULD HAVE NO PROBLEMS**

You must connect to your device in order to install the USB drivers. If you are not near your car right now, you can skip this step and install the drivers later.

## Preparation

The *Co Pilot 2, Informer 2, and Commander 3* Communicate with the PC via a USB connection. The drivers for the USB device must be installed the first time you connect your PC to your device.

- drivers needed are supplied on the CDS Link CD.
- **IMPORTANT:** The drivers are also copied to your PC disk drive when you install the CDS software, so if you prefer you can install the drivers directly from your hard drive ( if you do not have the CD handy when you are ready to do this step).




### Insert the *CDS Link* CD into your CD ROM drive

- If you have already installed this CD, click *Cancel* if the *CDS Link* installation dialog box comes up. then click *Exit Setup.*

### Connect your PC to the device now, using the black cable provided.

- **NOTE:** The power must be ON to the device in order for the PC to recognize it and install the drivers.
- **ALSO NOTE:** During this process your PC may try to connect to the internet to find new drivers**. Do not connect to the internet** (cancel out of any "internet service connection dialogs" that might come up). This may happen several times during the course of this installation. If you find this annoying, send Bill Gates a nasty email.

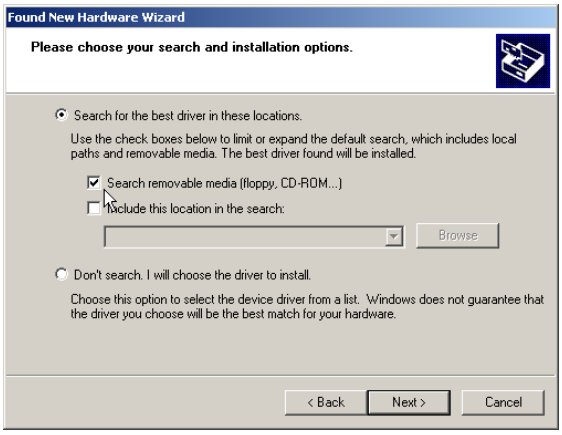

## Install Drivers

- NOTE: the following example screens are for *WIN XP*. IF you are running WIN 2000 or 98 your dialogs will look different and in some cases the choices are slightly different as noted.

  The Windows "Found New Hardware" wizard should start, and you should see a dialog that looks like this:

- Click the *Install from a list or specific location* option, then click Next.

- In *WIN 2000* select *Search,* and then in the following dialog select to search the CD ROM drive.
- BE SURE your *CDS Link* CD is in your CD ROM drive.




Click the *Search for the best drivers* option.

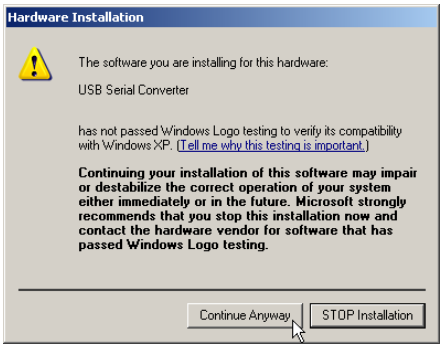
Click the *Search removable media* option, then click *Next.*

---

**NOTE:** IF you have already installed your *CDS Link* software AND you do not have your CD handy, then Un-Check the *Search removable media* box and check the *Include this location…* box. Then click the *Browse* button and navigate to your *C:\PROGRAM FILES\CO PILOT\VCP DRIVERS* folder.

---


The system will search for drivers. This may take a few minutes

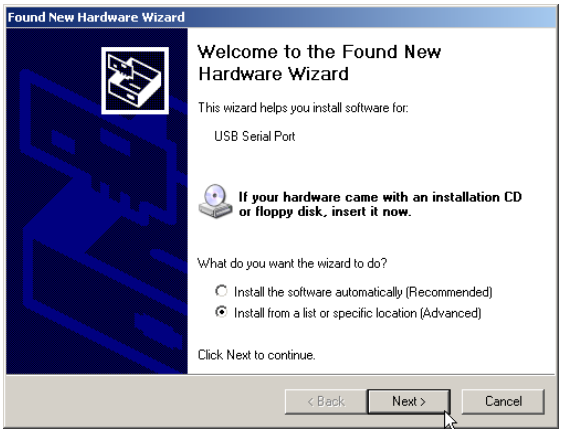



You may see a warning like this:

If you do, click *Continue*

Next, you should see the *Found New Hardware Wizard* again. This is normal as there are 2 sets of drivers that are needed for the Co Pilot 2 USB port to work properly.

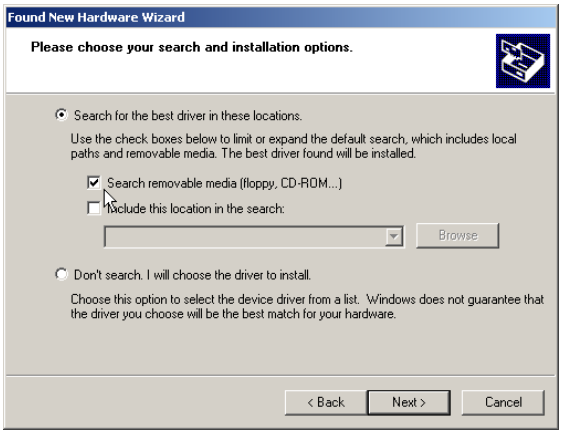
Click the *Install from specific* location option, then click *Next.*




- In *WIN 2000* select *Search,* and then in the following dialog select to search the CD ROM drive.

Click the *Search for the best drivers* option.

Click the *Search removable media* option, then click *Next.*




---

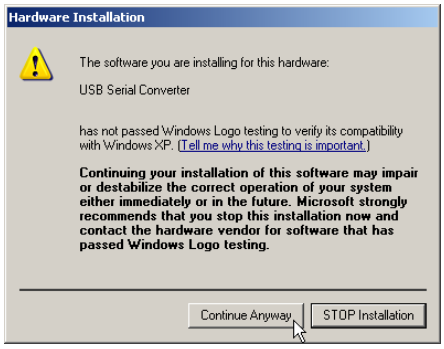
**NOTE:** IF you have already installed your *CDS Link* software AND you do not have your CD handy, then Un-Check the *Search removable media* box and check the *Include this location…* box. Then click the *Browse* button and navigate to your *C:\PROGRAM FILES\CO PILOT\VCP DRIVERS* folder.

---

You may see a warning like this again:

If you do, click *Continue*

The system will search and install the second set of drivers. After a short time you should see a message pop up in the lower right of the screen that says your hardware is installed and ready to use.

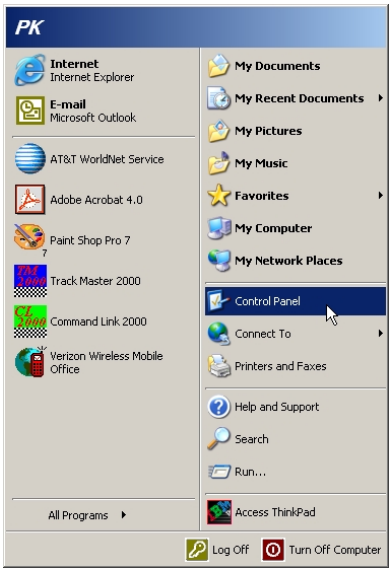



- All of the LEDs on the Co Pilot 2 should light up, and a message " PC CONN" should be displayed on the LCD screen.

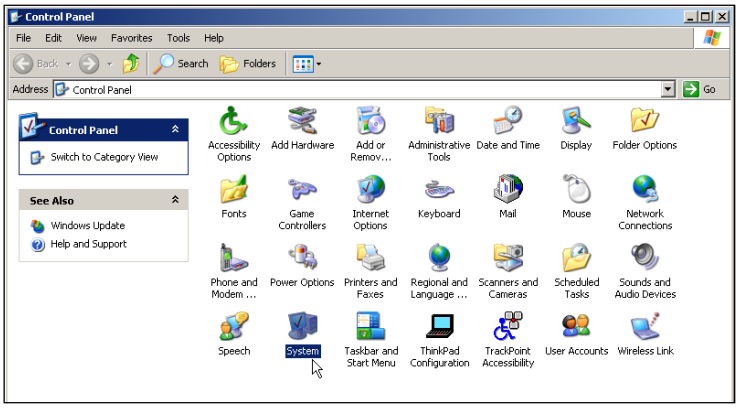
## Determine COM port used

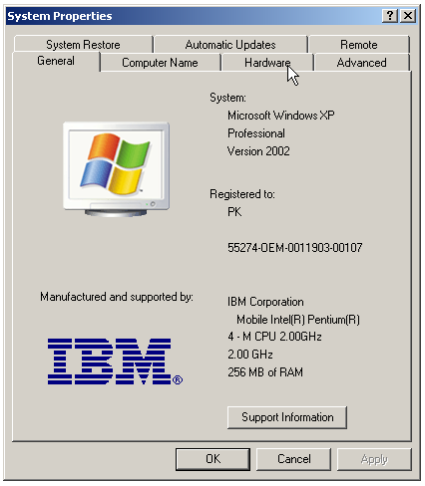
Finally, we must determine which COM port the system has assigned to the device.

Go to the *Start* menu, then click *Control Panel*

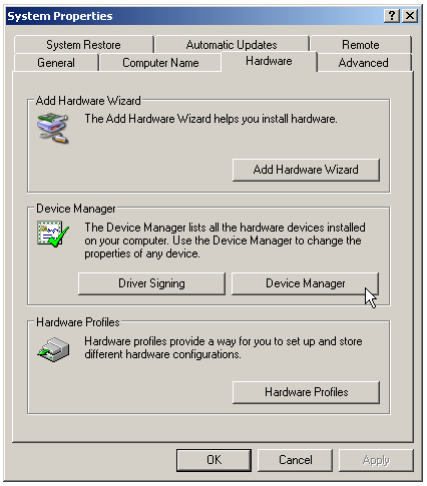


Click *System*

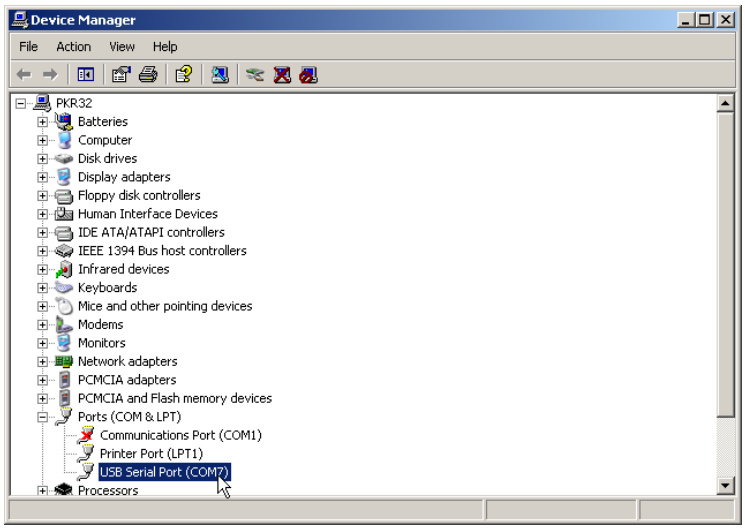



Then click the *Hardware* Tab




Then click the *Device Manager* button




Under the *Ports (COM & LPT)* heading you should see an item *USB Serial Port (COMx)*, where *"x"* the COM port number assigned to the *Co Pilot 2*.

In this example it is COM 7.

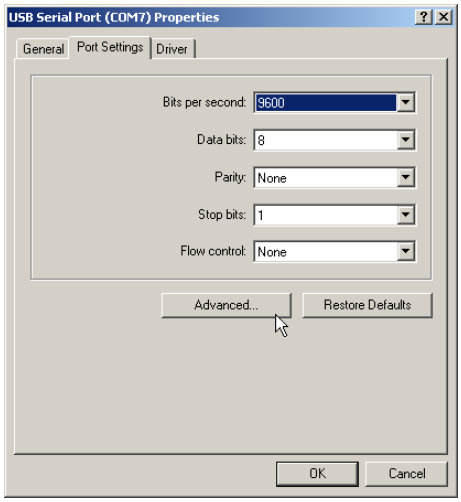
If the COM port assigned is higher than 9, change it by following the instructions in the next section.

If the COM number is less than 9, be sure to enter this COM number in *the Config Co Pilot 2* tab of the CDS Link software. (See chapter 7)

## Changing the COM Number

If the COM number assigned is higher than 9, you must change it and choose an unused COM port in the range of 1 to 9. Do this as follows:

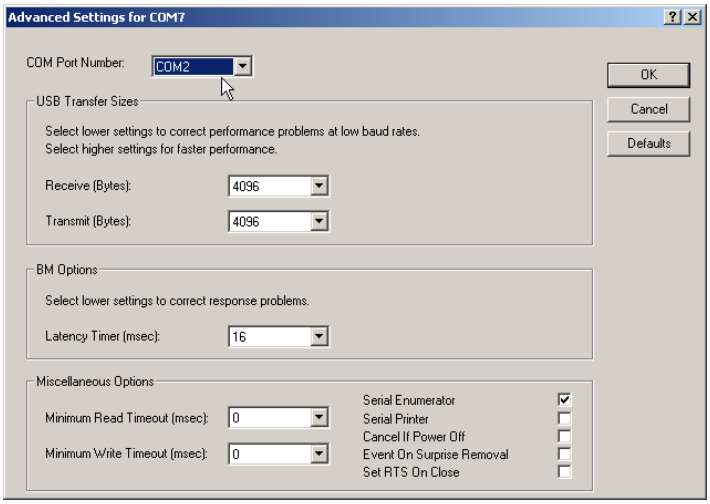
In the *Device Manager* (see previous page), right-click on the *USB Serial Port (COMx)* item, then left-click on *Properties.* You should see its *Properties* dialog.




Click the *Port Settings* tab

Then click *Advanced*

You should see this dialog box.




Change the COM port Number to a setting from 1 to 9.

- Choose a number that is not shown as *in use*

Then click OK, OK again, and close the *device manager.*

- Be sure to enter this COM number in *the Config Co Pilot 2* tab or the *Config Informer 2/Commander 3* tab of the *CDS Link* software. (See chapter 7)

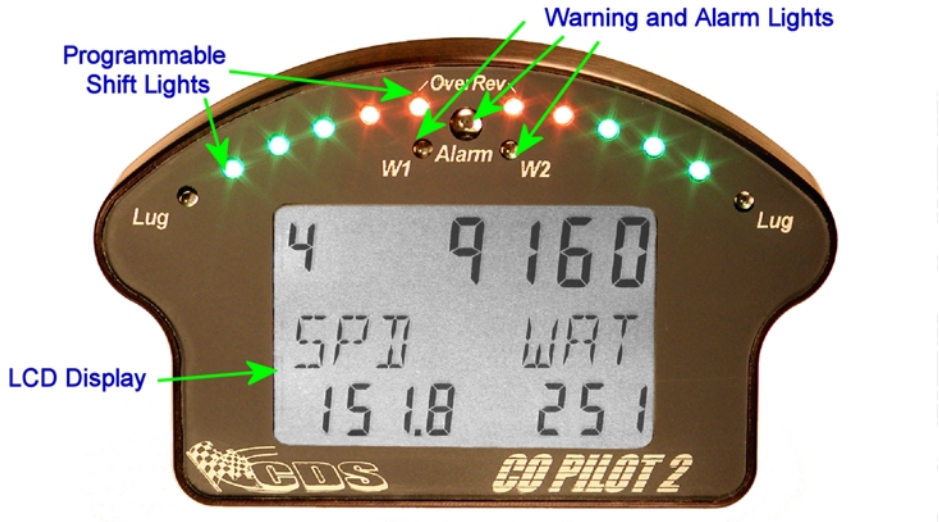
# Chapter 6 Co Pilot 2 Operating Description

*If you do not have a Co Pilot 2 you can skip this chapter*

## Features

### Main Display

In this manual we will frequently refer to *Co Pilot 2* features using the names shown here:




### Button Operation

The *Co Pilot 2* is designed to use pre-programmed intelligence to operate as automatically as possible. We have designed it so that the user only needs 1 button to control its features, unlike many other products that need 2 or more buttons. The button accepts 2 types of user input:

- A "*Press*" which is when the user pushes and releases the button in less than 1 second.
- A "*Hold"* which is when the users pushes the button and holds it for more than 2 seconds.

### HUD (in helmet display)

The HUD has 2 LEDs:

# Modes

The *Co Pilot 2* has several *modes* that it runs in, and it switches from mode to mode automatically for the most part. The various displays can be programmed to show different data depending on the mode the *Co Pilot 2* is in.

Since the *Co Pilot 2* switches modes automatically, it can also change what data is displayed automatically. For example, you might have your *Co Pilot 2* display ENGINE_R on the digital display in warmup mode, then automatically switch to show SPEED and LAP TIME when in run mode.

## Warmup Mode

Warmup mode begins right after the *Co Pilot 2* is powered up. All session data is cleared at power up. The *Co Pilot 2* stays in Warmup Mode until the Threshold Speed is exceeded. When that happens, the *Co Pilot 2* enters Run Mode.

## Run Mode

Once the Threshold Speed has been exceeded, the *Co Pilot 2* is in Run mode. It remains in Run mode as long as the vehicle is moving (detected from data from a signal named WHEEL_R) AND as long as the engine is running (detected from data from a signal named ENGINE_R). If the vehicle stops moving AND the engine stops running, the *Co Pilot 2* enters Pre-Review mode.

## Pre-Review Mode

In pre review mode, a scrolling message **"Hold Button For REVIEW Mode"** is shown on the *Message Display*. If the user "*Holds"* the button while this message is displayed, the *Co Pilot 2* enters review mode.

This message is shown for a maximum of 60 seconds. If after 60 seconds the user has not "*Held*" the button, the *Co Pilot 2* automatically enters Review Mode by itself.

If the engine starts running while in pre-review mode, the *Co Pilot 2* switches back to run mode.

## Review Mode

Review mode allows the user to scroll through the Telltales Report and then the Lap Time Report. Each *press* of the button brings up the next item in the report. A *hold* of the button cycles you back to the beginning of the Telltales Report.

At the end of the Lap Times Report, , a scrolling message **"*HOLD Button to clear session data*"** is shown on the *Message Display*. If the user "*Holds"* the button while this message is displayed, the *Co Pilot 2* clears the session data and then enters warmup mode.

- NOTE: This does not clear the logged data in *Co Pilot 2+*. It only clears the telltales, lap counter, time counter, and lap times.

If the engine starts running while in review mode, the *Co Pilot 2* switches back to run mode. Session data is not cleared unless the user explicitly does so.

## More on button operation

By now it should be clear to you that the button does different things depending on which mode the *Co Pilot 2* is in. A complete summary of button operation is in appendix B, Button Action Table.

# Data Logging (Co Pilot 2+ only)

The *Co Pilot 2+* automatically logs and saves data when you run your vehicle. Up to 8 sessions can be stored in the unit at a time. Older sessions are automatically discarded as new data is logged, always saving the most recent data.

The *Co Pilot 2+* automatically starts a session of data logging when it enters RUN mode. It continues to log the session data, and ends the session when you enter REVIEW mode or when you plug in the USB cable.

- There are no switches to flip or buttons to push. Data logging is completely automatic.
- The only pitfall to be aware of is that if your system's ENGINE_R or WHEEL_R are not functioning then the unit can not enter RUN mode, and thus can not log data.

# Chapter 7 Configure Your Co Pilot 2

*If you do not have a Co Pilot 2 you can skip this chapter*

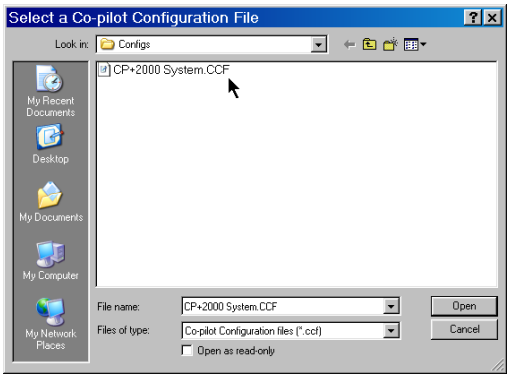
## Starting *CDS Link* Software

Version 6 of *CDS Link* is used to configure the *Co Pilot 2* and the *Informer*.

### General Concepts

Now it is time to configure your *Co Pilot 2* for display and logging of the data it receives from the SSI. Start the *CDS Link* Software by double clicking its icon:


You should see this dialog. Select the Configuration file that came with your system. Generally, this will be the only config file listed.

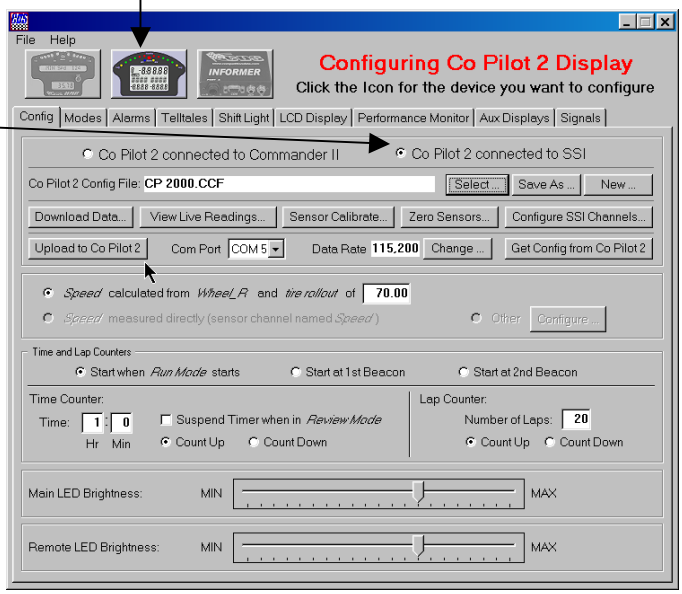



- Your Configuration file was pre-built for you by CDS and contains all the basic channel information and calibrations to get you started.
- If the dialog does not open up to *Look in* the *configs* folder, then use the controls to navigate to your *\Program Files\Co Pilot\Configs* folder.

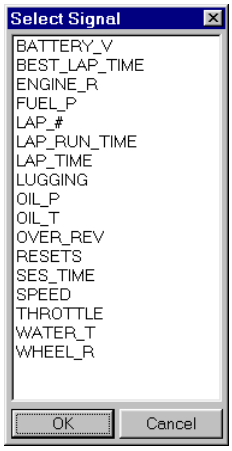
### Device Selection

- Select which device you want to configure by pressing its icon button at the top:

- The large status line indicates which device you are configuring
- Select *Co Pilot 2 Connected to SSI*



### The "Signals" List



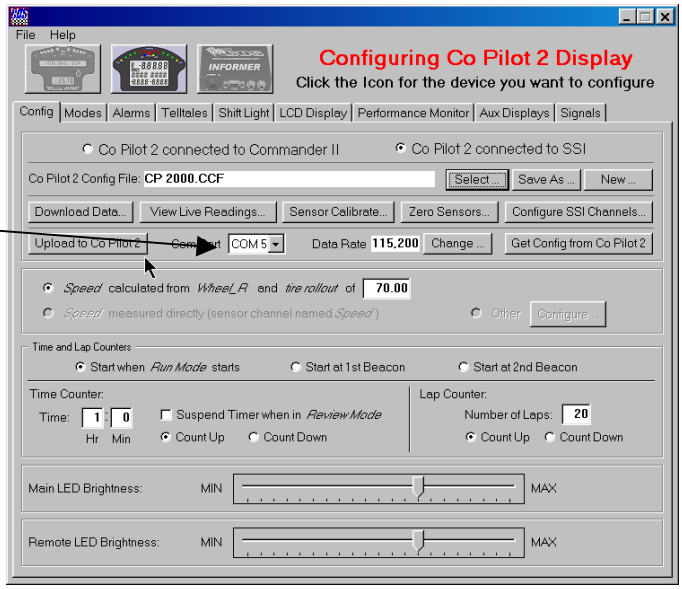

Many of the Tabs in *CDS Link* have pull downs where you select a signal from a list. This *Signal List* includes:

- All of the "raw" signals being sent to the *Co Pilot 2*
- All of the *Co Pilot 2* Preprogrammed Signals than can be resolved from the available raw signals. See Appendix B for a complete list of these signals and the information they depend on.

# CONFIG Tab

**IMPORTANT! If you have not yet installed the USB drivers for the Co Pilot 2, please do so now (refer to Chapter 5)**

Once you install the USB drivers you will know the correct COM port number to set in the Config tab.




## Set the COM port

Pull down the *Communication Port* menu and choose the COM port number determined in chapter 5

- **NOTE**: If you have an *Informer* and a *Co Pilot 2*, they will communicate with your PC using DIFFERENT COM ports. The COM port for the *Co Pilot 2* is unique because it is a USB-COM port.

## Data Stream Rate (VERY IMPORTANT!)

The *data stream rate* defines the format for the serial data that the *Co Pilot 2* RECEIVES. There are several settings available.

- **NOTE:** if the data stream rate is set incorrectly the *Co Pilot 2* WILL NOT display any data and will show a long scrolling message indicating that it is not receiving the expected data.

Your Co Pilot 2 uses one of 2 settings as follows:

| Setting | Application |
|---|---|
| 57,600 | *Co Pilot 2* gets its data from MASTER SSI box version 2.xx.<br>The version # is shown on the tag on the side of the Master SSI. For example: VERSION 2.16, 2.17, etc |
| 115,200 | *Co Pilot 2* gets its data from MASTER SSI box version 3.xx.<br>The version # is shown on the tag on the side of the Master SSI. For example: VERSION 3.17, 3.18, etc. |

## Set your *Speed* Source

Most systems calculate SPEED from WHEEL_R. You can also measure SPEED directly by several methods such as in the data stream from certain engine management systems or other sensors that have a direct SPEED readout.

- Select the appropriate SPEED source. If you have SSI channels named WHEEL_R and SPEED, then both options are available.
- If you do not have a WHEEL_R or SPEED channel then that option is disabled.

## Set your Tire Rollout (Speed from GPS Option)

If your system uses the GPS option for its primary speed data then your *Tire Rollout* in this tab should ALWAYS be set to exactly 34.60

## Set your Tire Rollout (Speed calculated from actual Wheel RPM)

The *Co Pilot 2* uses the Tire Rollout for converting WHEEL_R to SPEED. The Tire Rollout is the CIRCUMFERENCE of the tire that the WHEEL_R sensor is located on.

This data is then used:

- To display accurate SPEED on the Co Pilot 2
- For all the Performance Monitor calculations in Co Pilot 2
- For accurate Speed and Distance plotting of logged data (in the Track Master 2000 software.

Obviously it is VERY IMPORTANT to enter accurate data for your tire rollout if you want accurate data out of your system. This means that:

- You should measure your Tire Rollout (and re-enter it if it has changed) before every session.
- You should measure your Tire Rollout every time you change tires.

## How to measure Tire Rollout

**METHOD 1**

1. Use a good, flexible tape measure.
2. Wrap the tape measure around the center of the tire. Have the tire at normal inflation pressure.


**METHOD 2**

1. Locate the car on a flat surface where you have room to roll it at least 10 feet or so.
2. Put a chalk mark on the tire and on the floor.
3. Roll the car so that the tire rotates 1 full revolution
4. Put another mark on the floor.
5. Measure the distance between the 2 marks. This is your TIRE ROLLOUT.

## Time and Lap Counter

### Start Options

Choose when you want the timer and counter to start. Usually choose *Start When RUN MODE starts.*

### Time Counter

Configure the *Time Counter* to suit your preferences.

- This setting determines the starting value of the *Session Time* signal that can be displayed on the Co Pilot 2.
- In a timed session such as qualifying, most people prefer the timer to count down.
- If the Time Counter is set to count down, it stops when it reaches 0.
- If the time counter is set to count up, then its start value has no effect. It always starts from 0 and counts up until you enter REVIEW mode.

### Lap Counter

Configure the *Lap Counter* to suit your preferences.

- This setting determines the starting value of the *Lap #* signal that can be displayed on the Co Pilot 2.
- If the Lap Counter is set to count down, it stops when it reaches 0.
- If the Lap Counter is set to count up, then its start value has no effect. It always starts from 0 and counts up until you enter REVIEW mode.
- Usually in a race of a specific number of laps most people want the lap counter to count "down".

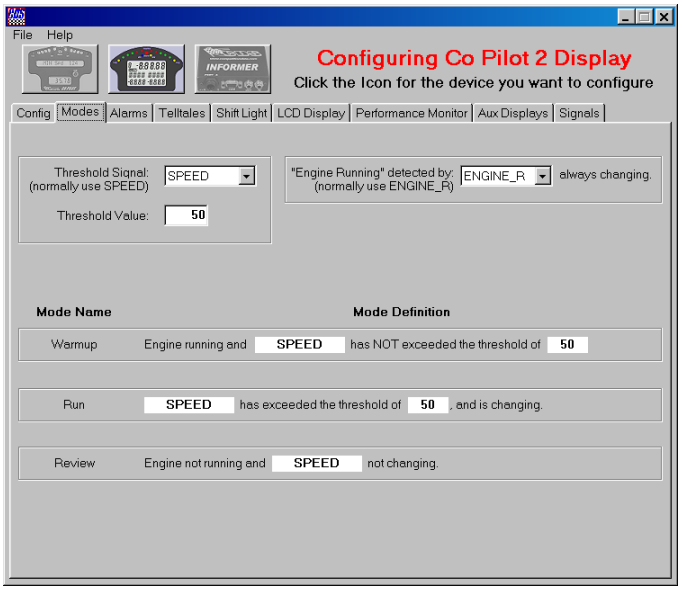
### LED Brightness

Set the LED brightness to suit your preference. For bright Sunlight you may need a setting of 50% or more. For night time you will need to set these to less than 20%.

- The LED brightness can also be adjusted using the button when in warmup mode. See Appendix A for details.

# MODES Tab

The *Threshold Signal* is used to switch the *Co Pilot 2* from Warmup to Run mode. In most cases this is the *SPEED* signal.



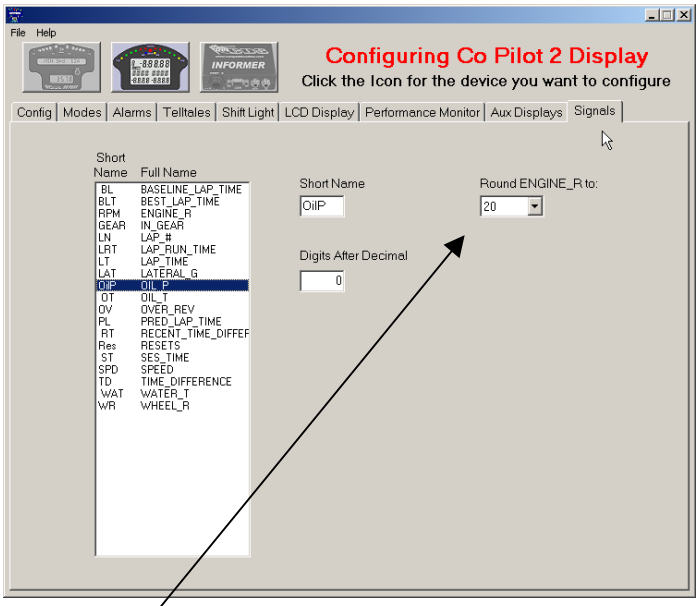

- If *SPEED* does not appear in the pull down list then your Configuration file does not have a WHEEL_R or SPEED signal defined. Refer to the *Configure SSI Channels* section later in this chapter
- Set the *Threshold Value*. This is the speed at which the *Co Pilot 2* automatically switches from Warmup to Run mode.
- Set it to a value that is high enough such that you do not switch to Run mode while driving through the paddock or to the grid.
    - 50 mph is usually a good setting.
    - 20 mph is too low

The *Engine Running* signal is used to detect if the engine is running or not, and then certain actions are taken. For example, when you come in and shut the engine off, the *Co Pilot 2* detects that the engine is not running and switches to Review mode.

- In most cases use *ENGINE_R* for the "Engine Running" signal

# SIGNALS Tab

Got to the SIGNALS tab on the far right. This tab is where you define or change the short names for the signals (used on the message display)




- Short names are up to 4 characters long, including a leading space if used.

  This tab also enables you to define how many places after the decimal point are displayed when showing data on any of the *Co Pilot 2* displays.

- For many signals the best setting is 0, but for lap times we use 2, and for signals whose values tend to be small numbers, use 1 or 2.

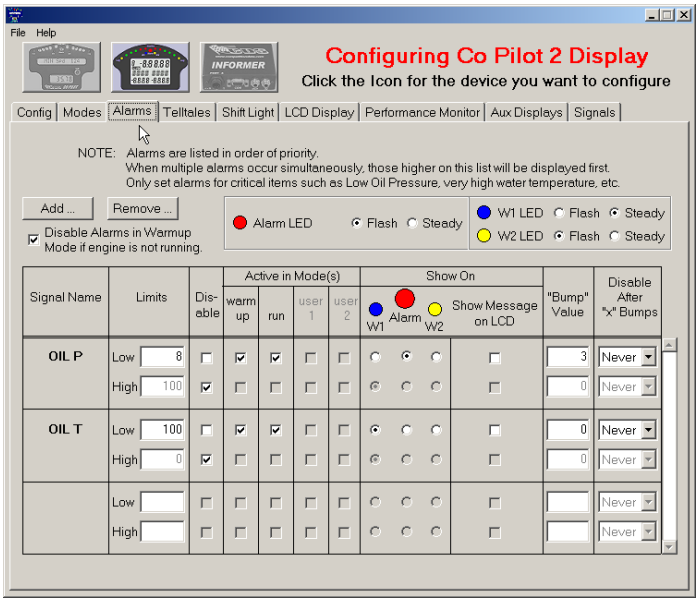
  You will probably be happy with the default short names that are provided with the program, but if not, feel free to change them to suit your taste.

### ENGINE_R Rounding

One really nice feature of the *Co Pilot 2* is that you can program it to round the RPM value displayed to the nearest 10, 20, 50, 100, 200, 500 or 1000 RPM. This makes for much nicer viewing of RPM on a digital display.

# ALARMS Tab

Configure the alarms you want to be active. Do not go "overboard" setting up too many alarms.




- Notice that each alarm signal can have a high alarm, low alarm, or both.
- You can specify which LED is used to display each of the alarm conditions.
- You can specify whether the LED is on steady or flashes when an alarm occurs.

### "Disable Alarms in Warmup" Option

A typical application of this feature is as follows: Lets say you have a alarm set up based on low oil pressure. With this option <u>not</u> enabled (box <u>not</u> checked) and without the engine running, you would constantly see an alarm for low oil pressure.

- If this option was enabled (box checked) you would not see an alarm when the engine is not running, but as soon as you start the engine you would see the alarm **<u>if</u>** the oil pressure was still low.

- This feature enables the *Co Pilot 2* to ignore alarms when the engine is shut off.
- *Special thanks to Duane Neyer for inventing this feature.*

## "Show Message" option

- If this box is checked then when an alarm occurs the selected LED will turn on AND a text message and alarm icon will appear on the LCD display.
- If it is not checked, only the LED light will turn on.

### "Bump" Value

To "Bump" an alarm means to alter its limit value. For high alarms, bumping *increases* the limit, and for low alarms, bumping *decreases* the limit. Bump value is optional. If you never want to alter the limit, set bump value to 0. Bumping is done by pressing the button when an alarm occurs.

- Alarms can only be bumped when in run mode.

When you bump an alarm, its limit is changed in the *Co Pilot 2* only during the session you are running. When you start a new session the limits revert to the defaults, which are the ones you set in this Alarms Tab.

### Disable after "X" bumps

Alarms can be disabled after you have bumped them a few times. Choices are 1, 2, 3 or NEVER. Why would you want to disable an alarm? One reason is if you have a sensor malfunction you can disable the alarm so that you are not getting "nuisance" alarms for the whole session.

## When an Alarm Occurs:

The appropriate LED illuminates and the alarm is displayed on the message display.

- In Warmup mode the message display alternates between its current page and the alarm message
- In Run mode the alarm stays on the message display until *cleared*

### Clearing and Bumping Alarms

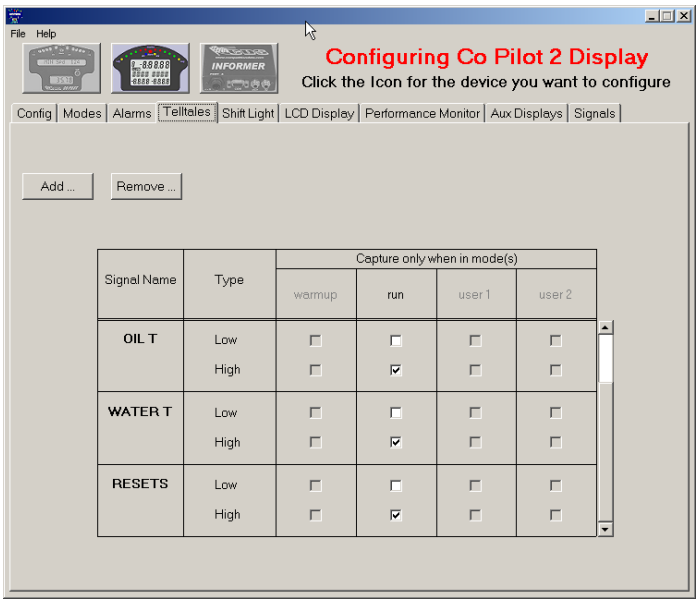
When an alarm occurs in run mode, pressing the button will clear it (disable it for about 5 seconds) AND it will bump the limit value if bumping is enabled.

# TELLTALES Tab

Telltales capture the highest, or lowest, (or both) value that the signal reached *during hot lap* only.

- Telltales are not captured in warmup mode
- Telltales are not captured during "out" and "in" laps.

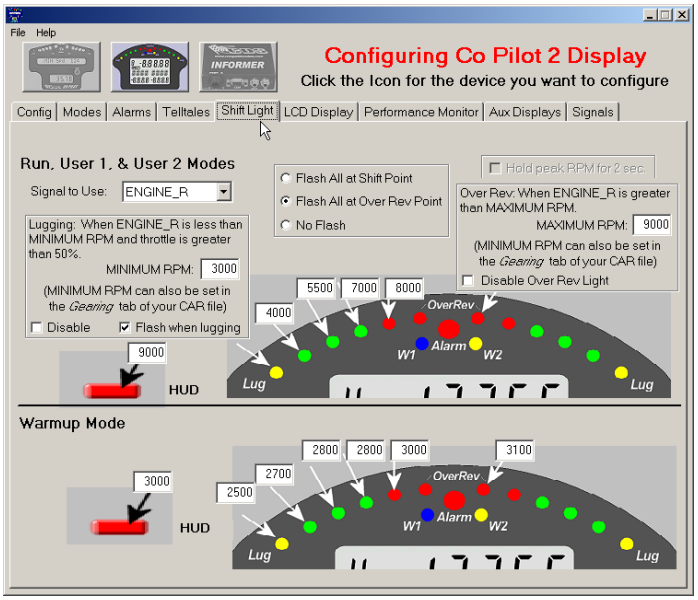
Tell Tales are captured and then displayed in the Tell Tales Report when in *Review* mode.



# SHIFT LIGHT Tab

Select the signal to use for the shift light. 99% of applications will use ENGINE_R for this.

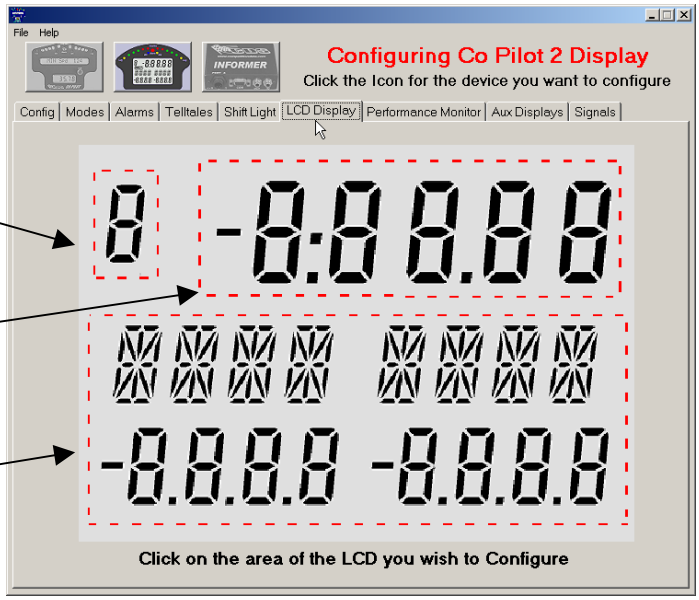
Select the *Flash* option you want to use. Most people like to use the "Flash all at Shift Point" option.



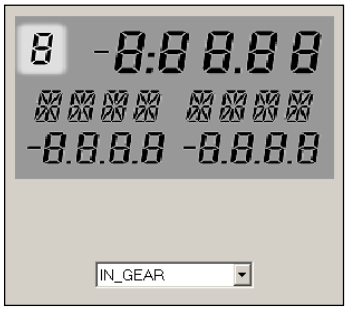

- The RPM limits for the Over Rev and Lug lights are set by the *Minimum RPM* and *Maximum RPM* values entered.
- Notice that you can set up completely different scales or limits for the lights in Warmup mode, and in warmup mode the Lug and Over Rev lights function as normal lights, rather than working off of the for *Minimum RPM* and *Maximum RPM* values.
- The Lug and Shift LEDs on the HUD are configured in this tab as well.

# LCD DISPLAY Tab

This tab shows a "mock up" of the Co Pilot 2's LCD display. Click the area of the LCD that you want to configure:



## Single Digit Area

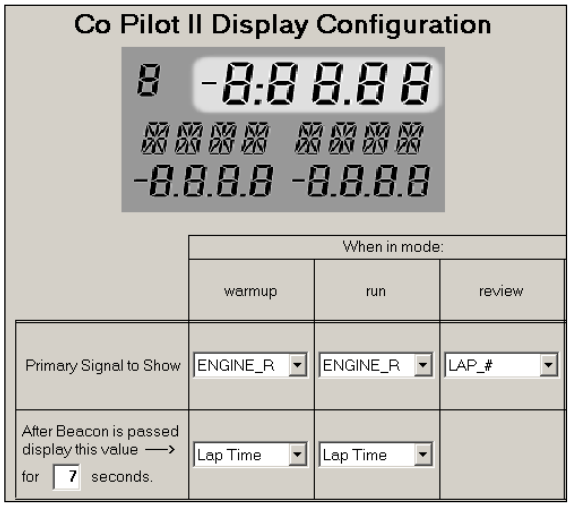



Click the area and you see:

This part of the display is intended to show gear position or count down the last 9 laps of a race.

- Use the pull down menu to select the signal you want to show in this area
- NOTE: IN_GEAR is the calculated gear position number, while GEAR is a measured gear position using a sensor on the gear box.

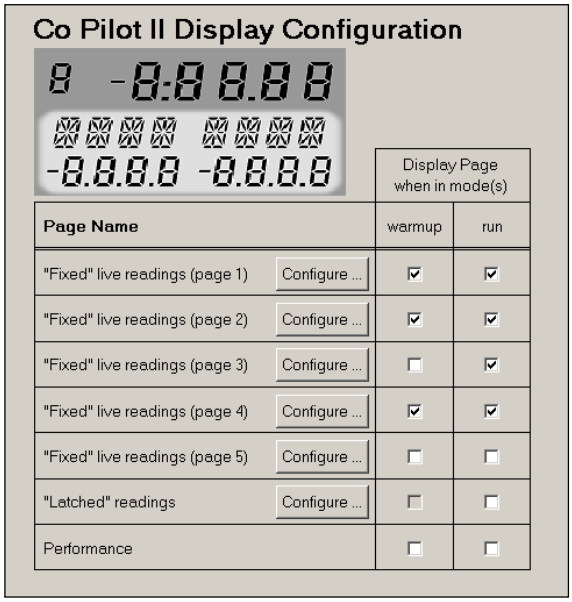
## Upper Area




Click the area and you see:

- You can pick any of the Co Pilot 2's signals for display as the primary signal.
- Note that You can chose to have different *Primary Signals* in different *Modes.*
- You can choose to show *Lap Time, Lap Number, or Session Time* when you pass the beacon.
- You can set the length of time that the "after beacon" signal is shown for.

## Message Area



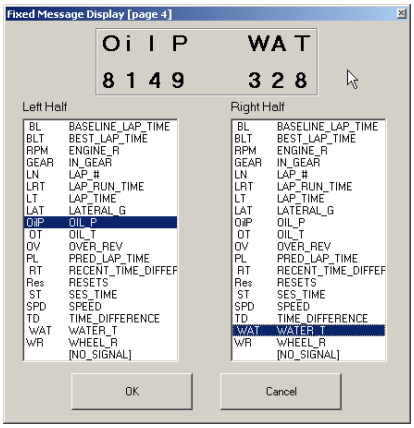

Click the area and you see:

The Message Display can have up to 7 "pages" or "layers" defined.

- Different pages can be enabled in different modes, or you can have the same pages enabled in both modes, by checking the appropriate boxes.

## Fixed Live pages

Fixed live pages show readings from 2 signals. The *Configure* dialog for each of the fixed pages enables you to choose readings




- Choose 1 signal for the left side of the screen and one for the right side.
- Notice that there is a "short name" for each signal next to its full name. The message display shows the short name rather than the full name, when displaying data.
- You have full control of the short names for each signal you are using. These can be defined and changed in the SIGNALS tab of *CDS Link*.
- The Short name of the signal is displayed with the value or reading shown directly below the name.
- The number of digits displayed after the decimal point for each signal is defined in the SIGNALS tab of *CDS Link*.

## "Latched" readings page

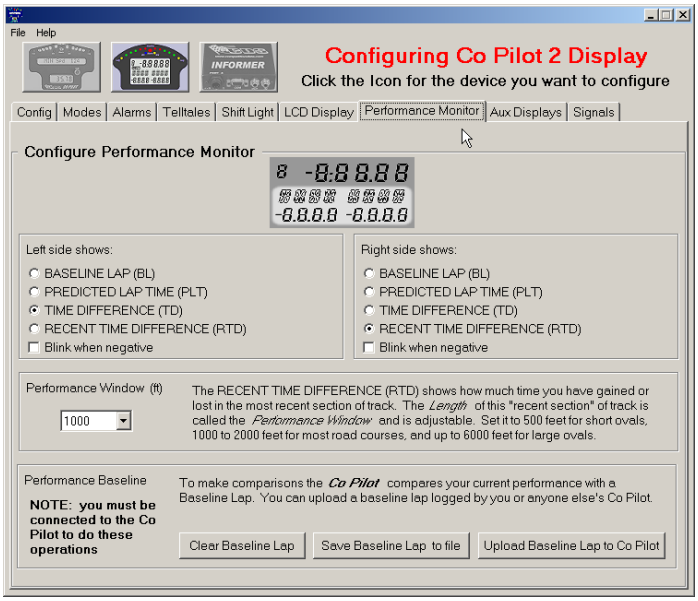
The latched readings page displays recent minimum and maximum speeds. The *Co Pilot 2* constantly monitors the value of speed and detects if a maximum or minimum has occurred. For example, once a max has occurred and then the speed drops 10 mph from that max, the *Co Pilot 2* "latches" that max and displays it on this page.


Smart Mode enables the latched value to be displayed automatically regardless of which page is active on the message display.

The hold time for displaying the latch and the mph "margin" for determining a latched value are adjustable. The default values are 10 MPH margin an a 6 second hold in smart mode.

## Performance Monitor page

If your *Co Pilot 2* has the Performance Monitor option, you enable it by checking the box on the *Message Display* tab.




- Press the *Configure* button on that tab to display the *Configure Performance Monitor* dialog box.
- The Performance monitor has its own "page" on the message display. Select the items you wish to display ion this page.
- NOTE: You can also display any of the Performance Monitor calculated signals such as *Time Difference, Predicted Lap Time,* etc on any of the normal Message display pages as well .For example, you could set up a "Fixed Live Readings" page to show *Lap Number* on the left and *Recent Time Difference* on the right..

## Baseline Lap

The performance monitor displays your performance on the current lap relative to a baseline lap". At the end of each lap the *Co Pilot 2* compares the lap just completed with the baseline lap. If the lap just completed is faster than the baseline lap, the it (the lap just completed) becomes the new baseline lap.

### Setting & Clearing the Baseline Lap

Baseline laps are set either by driving a timed lap (*Co Pilot 2* in run mode, at least 2 beacon trips occurred), or by uploading a saved baseline lap driven by you (or someone else) previously.

- If the just-completed lap is faster than the baseline lap OR if no baseline lap exists, then the just-completed lap BECOMES the baseline lap.
- The baseline lap is automatically saved to flash memory when you enter review mode, and is preserved when you turn the *Co Pilot 2* off.
- The lap time for the baseline lap is shown in a scrolling message when you are in warmup mode AND have the performance monitor page displayed on your message display. (switch pages on the message display by pressing the button).
    - You can clear (erase) the baseline lap by *holding* the button while this message is scrolling.
- You can also clear the baseline lap by connecting you PC to the *Co Pilot 2* and pressing the *Clear Baseline Lap* button in the *Configure Performance Monitor* dialog box.

### Saving the Baseline Lap to a file

Baseline laps can be saved to a file on your PC by connecting you PC to the *Co Pilot 2* and pressing the *Save Baseline Lap to file* button in the *Configure Performance Monitor* dialog box. This enables you to:

- Reload a baseline lap when you go to a track you have been to previously.
- Save and then reload baselines set under different conditions (wet, dry for example) or baselines set with different engines or tires.
- Share baseline laps among teammates, friends, (or enemies).
- Saved baseline laps are stored in your *\program files\Co Pilot 2\baselines* folder and are text-based files with the extension .CBL . You can copy them to other computers just as you would any other file.

### Uploading Baseline Lap to *Co Pilot 2*

Any baseline lap that has been previously saved to a file can be uploaded to your (or any other) *Co Pilot 2* at a later time. This is done by connecting you PC to the *Co Pilot 2* and pressing the appropriate button in the *Configure Performance Monitor* dialog box.

- Uploading a baseline lap to your *Co Pilot 2* erases the current baseline lap, since there can only be one baseline lap in the *Co Pilot 2* at any given time.

## Performance Monitor Displayed Values

The performance monitor generates "signals" which can either be displayed on the Performance Monitor page of the message display or on any other *Co Pilot 2* display device. (Aux display for example).

### Predicted Lap Time (PL)

The Predicted Lap Time (PL) is shows you the lap time that the Co Plot predicts you will run based on your performance thus far in the lap and your performance recorded in your baseline lap. (BL)

- The PL value shown at any given time assumes that you will drive the rest of the lap as fast as your baseline lap.

- The PL is shown in tens of seconds, seconds, tenths, and hundredths. (SS.TH) For example 59.55 The minutes portion is not shown.

### Time Difference (TD)

The Time Difference (TD) displays the difference in time between the baseline lap (BL) and the PL. It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- Negative numbers indicate that the current lap is FASTER than the baseline lap
- The time difference is a measure of your performance for the entire portion of the lap driven so far.

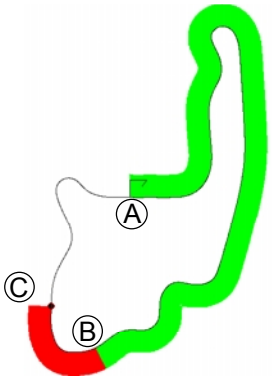
### Recent Time Difference (RTD)

The Recent Time Difference feature is unique to the CDS performance Monitor.

The Recent Time Difference (RTD) displays the time gained or lost *in the most recent section of track* relative to the baseline lap (BL). It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- The RTD is a measure of your performance NOT for the entire portion of the lap driven so far but for the most recent section of track.
- The "most recent section of track" is determined strictly by distance, and is referred to as the "performance window". You can select your performance window in the *Configure Performance Monitor* dialog box.

Here is an example of the *Recent Time Difference.* Lets say you are driving at Mid Ohio and just went through the turn shown in red on the map:




When you glance at the *Co Pilot 2* as you pass point "C" the *Co Pilot 2* Performance Monitor can show you the time gain or loss for the entire lap so far (point A to C) AND can show the time gain or loss for just the part of the track shown in red (point B to C). This time gain or loss for point B to C is what we call the *Recent Time Difference (RTD)* .

The portion of track included in the *Recent Time Difference* is called the *Performance Window* (shown in red). Its "length" is adjustable by the user. The *Performance Window* "follows" you around the track as you drive, so that the *Recent Time Difference* always shows your performance in the most recent section of track.

### Baseline Lap (BL)

The value of the baseline lap can also be shown on any of the *Co Pilot 2*'s displays.

## Changing Pages on the Message Display

Each press of the button (if no alarms are on) changes to the next active page on the message display. (remember, a press of the button clears and bumps an alarm that is "on"). Only the pages which are checked for a particular mode will be displayed when in that mode.

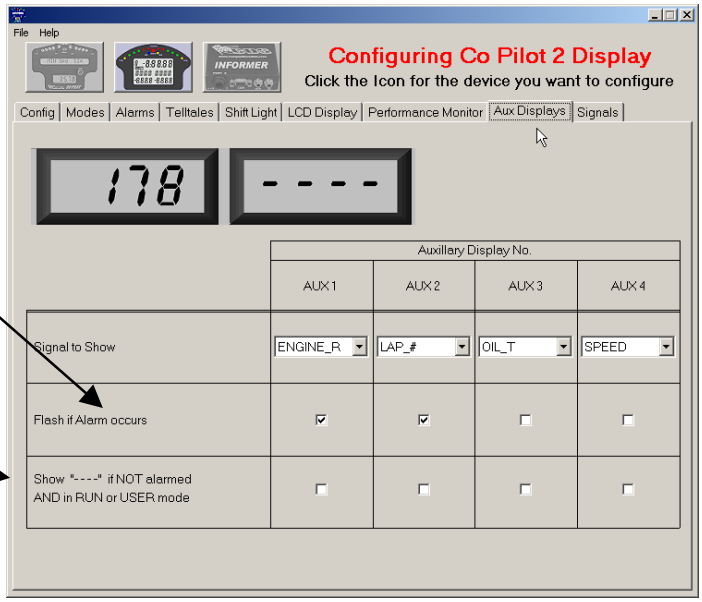
- For example, if the "Scroll Live" page is enabled in warmup mode but not in run mode, as soon as you transition from warmup to run the message display will switch to the first enabled page in run mode.

# AUX DISPLAYS Tab

This tab is used to program the optional Aux or "satellite" displays. Up to 4 can be connected to the *Co Pilot 2*.

Notice that the Aux displays can be programmed to flash if their assigned signal is in "alarm".

They also be set to show "----" if their signal is NOT alarmed and if the *Co Pilot 2* is in run mode.



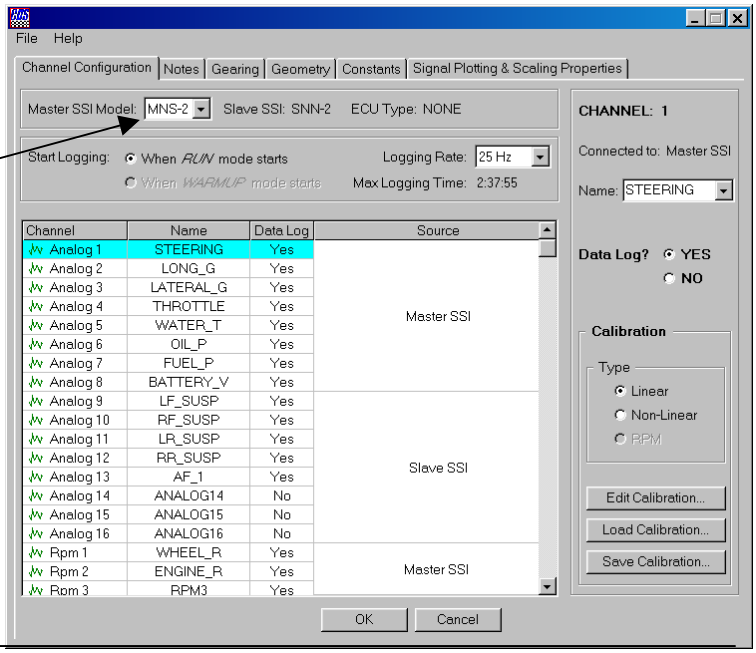

# CONFIGURE SSI CHANNELS

Go Back to the *CONFIG* tab and click the *Configure SSI Channels…*button. You should see a new set of tabs at the top of the dialog. Click the *Channel Configuration* tab

## Channel Configuration Tab

- The Channels and their names correspond to the sensors included with your system.

MASTER SSI MODEL




**THE most important item** in this tab is the selection of the Master SSI Model. This MUST correspond to the actual Master SSI Model you are using. The Model is printed on a white tag on the side of your Master SSI. Check it now to verify that the Model selected in this tab is correct!

### Logging Rate (Co Pilot 2+ only)

Select the logging rate you want to use for data logging. The logging rate is the same for all channels.

- When you select a different rate, the *Max Logging Time* is updated.
- For road racing 25 Hz is adequate unless you are logging suspension data, in which case use 50 or 100 Hz.
- Circle track applications usually use 50 or 100 Hz.

### Channel Properties

Each channel (such as Analog 1, RPM1, etc) has its own properties that you can change if need be. These properties include:

- Signal Name
- Data Log (Yes or No) (Co Pilot 2+ only)
- Calibration Type
- Calibration Values (edit calibration)

## Analog Channel Calibrations

Your system comes set up with the correct names and calibrations assigned to all the channels. In the next chapter we will go over how to do interactive calibrations of certain sensors once they are installed on the car.

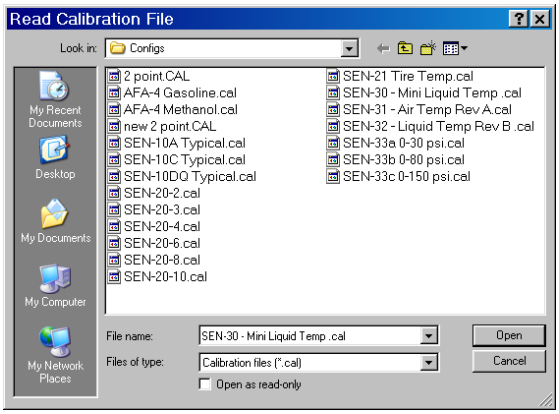
### Changing calibrations of sensors

If you are adding a sensor or If you feel that a sensor is not calibrated properly the refer to the following procedures:

### Sensors with common calibrations

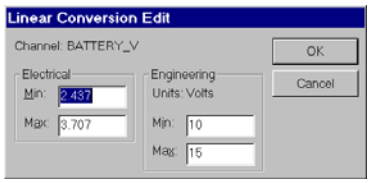
Many CDS sensors have common fixed calibrations, meaning that the same calibration file is used for all "copies" of those sensors. Consequently they are "field interchangeable" and if you need to replace a sensor there is no need to reset its calibration. Appendix D contains a table of these sensors along with their calibration file.

- To load a calibration file, first click on the Channel you wish to load the file for, then click *Load Calibration*
- Referring to Appendix D, select the correct file for the sensor, then click *open*.
- IF you do not see a list of sensor calibrations in this dialog, your software is probably not "looking in" the correct folder. Pull down the "*Look In:*" menu and navigate to your *\program files\Co Pilot\Configs* folder.




### Sensors with individual calibrations

Some sensors such as Accelerometers (SEN-28) and Aero sensors (SEN-10) have unique individual calibrations. These sensors are listed in appendix D.




If you purchased a complete system then any unique calibrations are already in your Config file. If you are adding a sensor that uses a unique calibration you must enter the calibration factors which are on the sheet supplied with the sensor. To do this, highlight the Analog channel for the sensor you want to change, then click the *Edit Calibration* button at the right.

## RPM Channel Calibrations

RPM channels are calibrated in terms of *Pulses Per Revolution*

### Set your Engine RPM calibration

The correct *pulses per rev* must be set in order for engine RPM to be displayed correctly. If your RPM seems to read incorrectly, verify this setting and change it as necessary as follows:

Click the RPM Channel used for ENGINE_R, then click the *Edit Calibration* button on the right.

Enter the correct value for *Pulses per rev:*

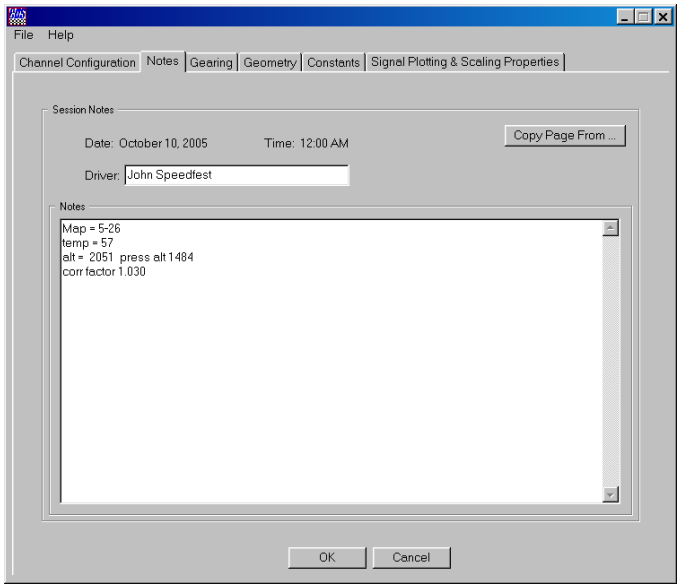

- For a magnetic (SEN-4) sensor with 1 magnet enter 1. IF you are using more than 1 magnet enter the number of magnets.
- For SEN-17 electrical pickup sensors, the correct setting is usually the number of cylinders the engine has divided by 2. For example, 6 cylinder engines will usually use a setting of 3 pulses per rev.
- NOTE: If your system receives Engine RPM data from a serial ECU interface then do not change or edit its calibration. Contact CDS if you feel that the displayed data is in error.

### Set your Wheel RPM calibration

Click the RPM channel used for WHEEL_R. enter the value as follows:

- For magnetic (SEN-4) sensor measuring actual wheel RPM, enter the number of magnets you have installed for the sensor. This is usually 1
- For WHEEL_R from old style GPS, enter 6
- For WHEEL_R from GPS-2, enter 3

## Notes Tab




You can keep track of any notes in this tab. Some suggestions are:

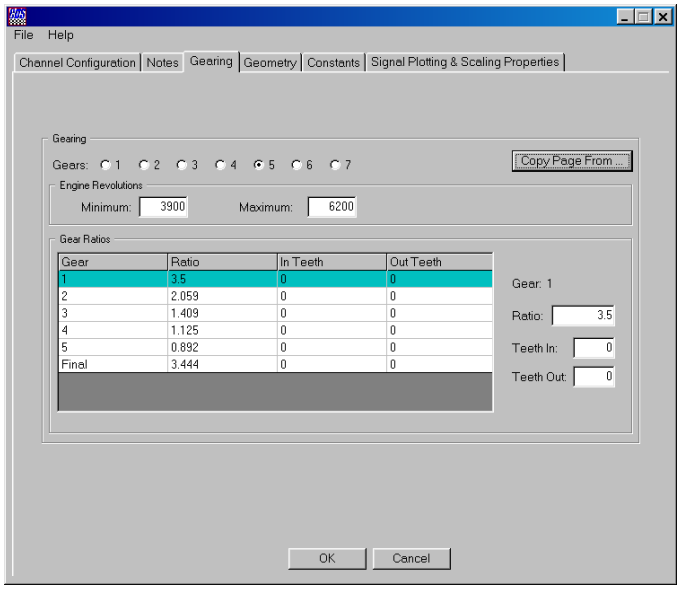
- Weather conditions
- Changes you made to the setup such as tire pressures, ECU mapping or carb jetting, etc

The usage of notes in the notebook is optional. If you get in the habit of using them, you will be better organized. Usage of the notes tabs has the advantage of keeping your records attached to the data they apply to.

If you have multiple drivers, you will want to make sure the driver information is correct. You may want to record the weather conditions, tire compound, engine serial number, or any applicable information.

When you download your data, these notes get copied into the signal notebook for that session of data.

## Gearing Tab




Set your RPM and Gearing Parameters in this tab.

The Minimum RPM value is used (along with throttle data) to drive the LUG light on the *Co Pilot 2*.

The Maximum RPM is used to drive the OVER REV light.

The Gear ratios are used to by the *Co Pilot 2* to calculate the IN GEAR signal for display.

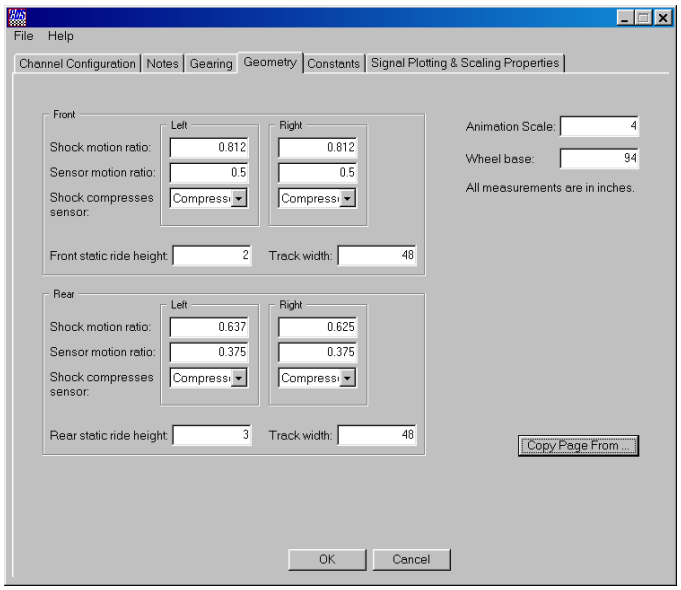
All of these items are calculated in the *Co Pilot 2 or Informer* using the exact same formulas used in Track Master, so that if a plot in TM shows you lugging at a particular place on the track, the Lug light on the *Co Pilot 2* would also be on at that place on the track.

### Notes regarding Gear Ratios

- You must enter ALL of the ratios in order for the calculations to come out correct. THIS INCLUDES the *Final Drive* ratio which in most cases is your ring & pinion ratio
- If you have a transmission with a "drop gear" in its output, incorporate the drop gear ratio and the actual final drive ratio together into 1 number (multiply them by each other) and enter this result in the *Final* field in this Tab.
- **IMPORTANT GPS NOTE:** if you are getting your WHEEL_R signal from the CDS GPS, then see the procedure in the next chapter for modifying your final drive ratio.

## Geometry Tab

*If you do not have suspension sensors you can skip this section*




Geometry information is used to generate the Chassis Animation and suspension signals, such as ride heights and shock speeds.

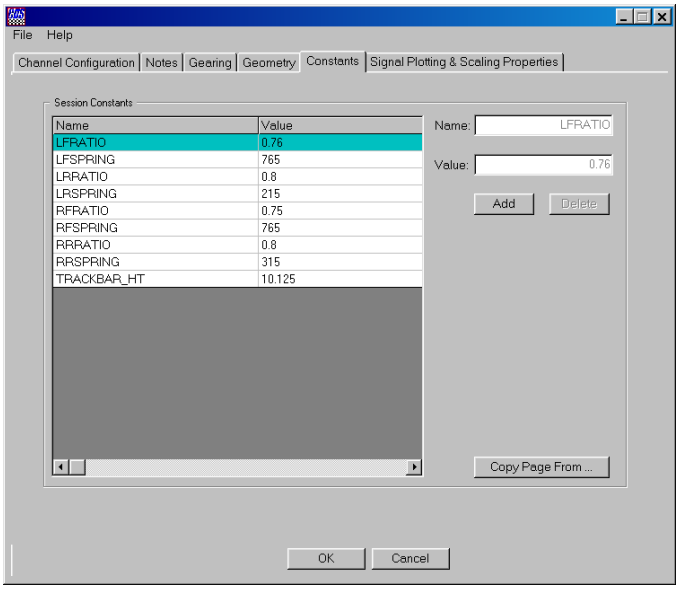
- All motion ratios are in distance (in inches or centimeters) of travel per distance (in inches or centimeters) of wheel travel.
- The ***Shock Motion Ratio*** is how much the shock moves when you move the wheel 1 inch (or centimeter). The ***Sensor Motion Ratio*** is how much the sensor moves when you move the wheel 1 inch (or centimeter). Input whether the sensor *Extends* or *Compresses*.
- The ***Static Ride Heights*** are measured from the ground to the plane of the floor of the car (the chassis plane). These numbers are used to draw the reference plane in the suspension animation. Have either the driver or equivalent weight sit in the driver's seat. The chassis plane you measure should be parallel to the floor or bottom of the chassis.

- Measure the ***Track Width*** from tire center to tire center. Measure the ***Wheel Base*** from axle to axle.
- ***Animation Scale*** controls the amount of exaggeration when showing the suspension animation plane. (1 = no exaggeration, very hard to see the movement, 5 to 9 typical settings).

## Constants Tab

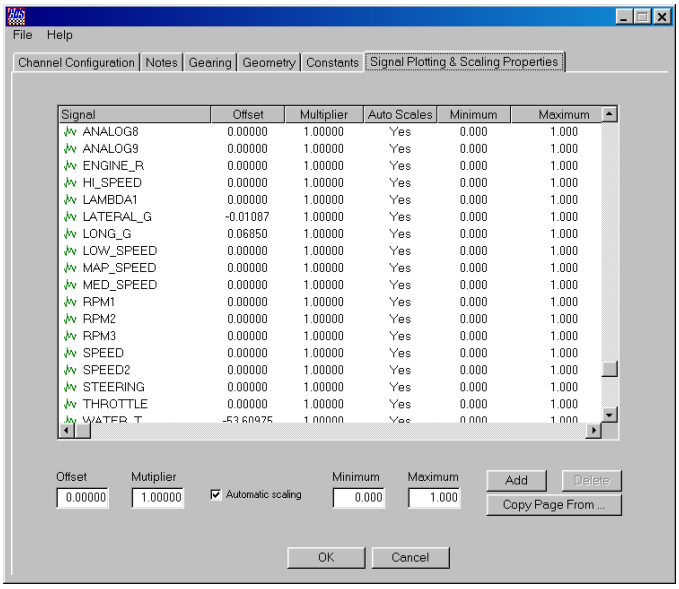
***Session Constants*** are used primarily in math channel formulas. This feature allows you to write generic math channel formulas and custom tailor them to a specific car or setup by embedding these session constants into the formulas. Use this feature for items that change from session to session, such as ride heights, spring rates, etc.

***Copy Page From…*** allows you to copy constants from another session notebook




## Signal Plotting & Scaling Properties Tab

This tab enables you to control how data gets plotted in *Track Master 2000.*




- When you *Zero* a sensor (discussed in the next chapter) the offset value for that signal is saved here.
- The *multiplier* is rarely used, but can be used to compensate for a sensor that is calibrated "backwards" (by entering a multiplier of –1)
- *Auto Scales* is used when Track Master plots data. Frequently it is useful to control the upper and lower limits of scales rather than allow them to change as the data changes.
- If you want to control the scaling of a certain signal or signals:

1. Click on the Signal Name
2. Un-check the *Automatic Scaling* check box
3. Set the desired *Minimum* and *Maximum* for the signal

Once these changes are made in your *Configuration* file, all future data will have these settings in their *Signal Notebooks.*

**NOTE:** Usually the best procedure for setting up manual scaling is to

1. get all your settings done in Track Master using a typical session of data.

2. Use the *Copy Page from…*button in this screen to navigate to that session of data and copy all the settings over to the config file.
3. In this way all future data will include the scaling settings you set in step 1 above.

# Upload your Configuration


When you are all done editing your configuration, upload your configuration as follows:

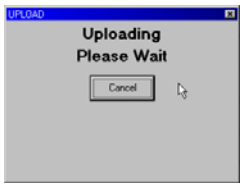
### Connect your PC

- Turn your master switch on so that your Co Pilot 2 is powered up.
- Using the supplied USB communication cable, connect your PC to the COM connector on the bottom of the *Co Pilot 2*.
- **IMPORTANT: if this is the first time you are connecting to your PC you must install the Co Pilot 2 USB drivers.** Please turn to chapter 5 and carefully follow the instructions.

### Upload your Configuration

Go to the Config tab Make sure that the COM port is set correctly in the Config tab.

- See chapter 5 if you do not know which COM port number to use.
- Press the Upload To *Co Pilot 2* button. You should see:




- Followed by a confirmation message

# New Features in CDS Link 6.5

There are several new features in CDS Link version 6.5.

The actual configuration files are now stored in the Co Pilot 2 itself. This enables you to retrieve the setup from the Co Pilot 2 so that any PC can be used to download the data or re-configure the Co Pilot 2. (Previously only the PC that was used to configure the Co Pilot 2 could be used to download the data).

---

**IMPORTANT!** In order to take advantage of these features your Co Pilot 2 **must** have firmware version 6.5 or higher. (The firmware version is displayed on the LCD at power-up)

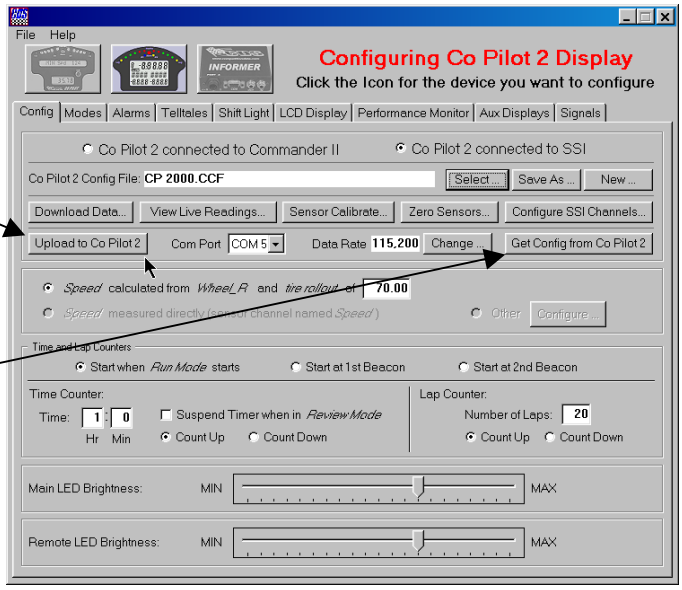
---

## Sending the Config file

The Config file is sent to the Co Pilot 2 automatically when you click the *Upload to Co Pilot 2* button in the *Config* tab.

## Retrieving the Config File

The config file can be retrieved from the Co Pilot 2 by clicking the *Get Config from Co Pilot 2* button

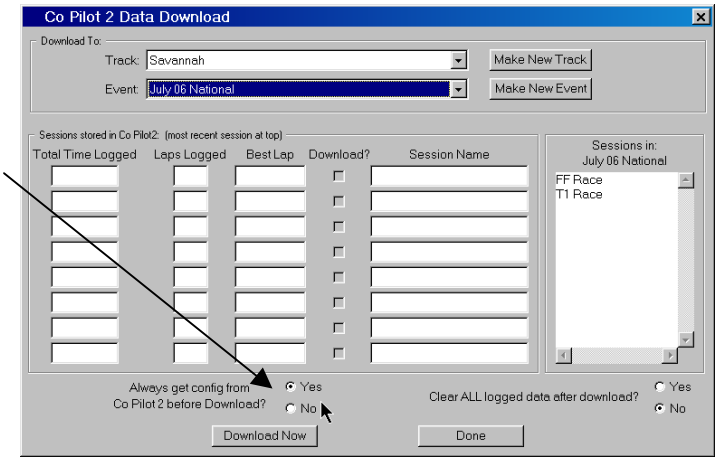



## Retrieving the config when downloading

The Download screen now has an option to *Always get config before Download.*

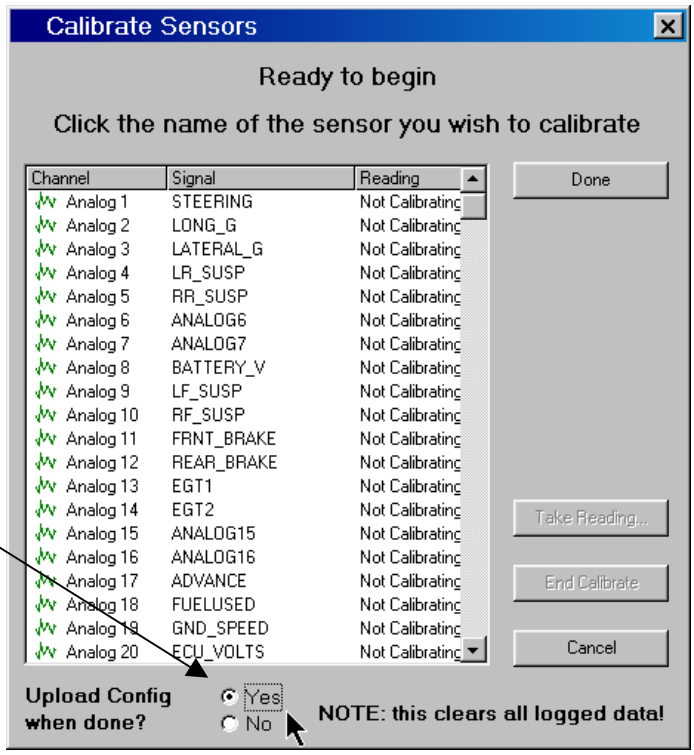
- The default for this option is *Yes*

The only downside of leaving this set to *Yes* is that if you have edited your Co Pilot Config and not uploaded it, and you then download data, the changes you made to the config will be overwritten if you download data.




- We recommend you leave this option set to *Yes* and refrain from making changes to your config until after you have downloaded any data you want to keep.

## Sending the config after calibrating or zeroing




The *Sensor Calibrate* and the *Zero Sensors* dialogs now have an option to automatically *Upload config when done.*

- The default for this option is *Yes*

  The only downside of leaving this set to *Yes* is that if you have logged data in the Co Pilot that you have not yet downloaded then that data will be erased when you complete the calibration or zeroing.

- We recommend to leave this option set to *YES* and just make sure you have downloaded any data you want to keep before you do a Calibration or zeroing.

# Chapter 8 CDS GPS-2 (Gen 2) Option

*This section consolidates all of the information relating to using the GPS option into 1 place. This information is also included in other appropriate places in this manual.*

The ***GPS-2*** generates an end-of-lap signal which takes the place of the Receiver and Trackside Beacon. It also generates a SPEED signal that can be used either as the primary source for SPEED/DISTANCE data or as a supplement to actual wheel rpm sensors.

The GPS-2 offers improved sensitivity (which results in better quality SPEED data) and uses a much smaller antenna than the original CDS GPS.

## Install GPS-2

### GPS Controller Install


Install the controller in a position where the driver can reach it while belted in. Ideally, install it such that the driver can see the 2 LEDs as well.

- The Button is used to set the start finish line (the "virtual" beacon location)
- The LEDs display the GPS system state. (see the operation section)

You can use some of the supplied dual-lock material to mount the controller, or use silicone or double sided tape. DO NOT remove the cover or drill holes in the controller box.

#### Connections

The GPS-2 has 1 or 2 system connectors and 1 antenna connector.

##### GPS-2-5: (2 system connectors)

- Connect the connector labeled SPEED to the RPM channel cable you wish to assign it to. If you are adding GPS-2 to an existing system, this will usually be the existing WHEEL_R cable.
  - ➢ IMPORTANT: The RPM cable you connect to MUST have the 5 Volt pin wired since the GPS-2 gets its power from this connection.
- Connect the connector labeled LAP to your system cable labeled TO PHOTO RECEIVER or TO GPS LAP.

##### GPS-2-8: (1 system connector)

- If you have a new system that you purchased with the GPS-2 option, you will have a single 8 socket connector on your system harness that is labeled TO GPS2 CONTROLLER. Connect it to the 8 pin connector on the GPS-2 controller. This cable carries both the SPEED and LAP signals.

### GPS Antenna Install

The antenna needs a clear view of the sky to work properly. The better its view of the sky the better it will work. It does not need to be perfectly level or flat. Do not mount it on a panel that vibrates or buzzes excessively. Try to provide a solid base for it.

- On cars with roofs, mount the sensor on the roof as far forward as possible.
- On formula and sports racers, locate the antenna on the cowling in front of the driver or in a location further forward.

- You MUST keep the antenna and its wire at least 12" away from radios, antennas, and their wires.
- You MUST keep the antenna and its wire at least 12" away from ignition components and their wires.
- We do not recommend that you mount the antenna behind a windshield or rear window. All glass will reduce the GPS signal quality somewhat, and the glass in some of the newer European cars will block the signal completely.
- We do not recommend that you mount the antenna any further rearward than the steering wheel of the car.

### Antenna Mount Method

Use any of the following methods to secure the antenna:

- On cars with steel roofs, use the strong magnet that is built in to the antenna
- Use the supplied piece of dual-lock material
- Use silicone or another suitable adhesive to hold the antenna to a flat surface

### Route, connect, and secure the Antenna cable

Route the cable to the GPS Controller, plug it into the antenna connection, and secure the nut finger tight only. Do not use a wrench or pliers on the connector.

- **IMPORTANT:** Do not over tighten any wire ties used to secure the antenna cable. The cable is somewhat fragile and if you crank down on wire ties such that you deform the cable you will ruin it.
- You **MUST** keep the antenna cable at least 12" away from ignition components, radio components, and their wires.

## Checkout of GPS

Position your car outside such that the antenna has a clear view of the sky. Power up your system.

- The STATUS LED should glow red

  After about 1 to 2 minutes the STATUS LED should start blinking. This indicates that the controller is receiving a very good quality 3-D fix. If it does not start blinking after 2 minutes, check all the connections and make sure your antenna has a clear view of the sky.
- IF your view of the sky is partially blocked (if you are right next to a building for example) it could take as long as 4-5 minutes to acquire a good fix.
- Once the STATUS LED is blinking, Press the button. The LAP LED should come on, and if you are not moving, it should stay on. Pressing this button sets the "virtual beacon" location.
  - There is no way for the user to "clear" the "virtual beacon location". The location is re-set whenever you press the button, and the newest location is the only one used by the system.

  *If all of the above steps check out, you done checking out the GPS System.*

## Configure your system for GPS

The GPS Speed can be used as the primary speed source or as a supplemental speed signal in your system.

### Deciding how to use the GPS Speed data

In most cases it is best to use the GPS Speed as the primary speed source so that the Performance Monitor and the map and distance plotting in Track Master benefit from the increased accuracy.

- The only exception to this would be if you are having difficulty getting GPS reception and experiencing dropouts in the GPS Speed data. This might occur on city street circuits with tunnels or between tall buildings
- If you experience dropouts in the GPS speed data, switch to a WHEEL RPM sensor for your primary speed, and use the GPS speed as supplemental Speed data.

## Configure GPS as Primary Speed Source

Edit your CAR file using Command Link (Commander 2 users) or edit your Co Pilot 2 Config file using CDS Link (Co Pilot 2+ users).

- Edit the SIGNAL NAME for the RPM Channel that the GPS is connected to. Name it WHEEL_R.
- Edit the Sensor Calibration for WHEEL_R and set it to **3** Pulses per revolution.
- Edit your Tire Rollout and set it to exactly **34.60**

Now go to the *Gearing* tab in your editor. Because the scaling on the WHEEL_R signal that the GPS produces is generic and universal, a little fudging is required for all the Gearing stuff to work right as follows:

1) Measure the circumference (rollout) of your DRIVEN wheel.
2) Divide 34.60 by the rollout you measure.
3) Multiply your ACTUAL final drive ratio by the number calculated in step 2.
4) Enter this value for your Final ratio in the Gearing tab.

FOR EXAMPLE:

1) Measured rollout = 79.5”
2) Divide 34.60 / 79.5 = .4352
3) Actual final drive = 3.444 so .4352 x 3.444 = 1.499
4) So you enter 1.499 as the “fudged” final drive ratio.

## Configure GPS As Supplemental Speed Signal

NOTE: If you use the GPS as a supplemental speed signal then you MUST have another channel named WHEEL_R as your primary SPEED source.

Edit your CAR file using Command Link (Commander 2 users) edit your Co Pilot 2 Config file using CDS Link (Co Pilot 2+ users).

- Edit the SIGNAL NAME for the RPM Channel that the GPS is connected to. Name it GPS_SPEED.
- If GPS_SPEED is not in your list of signals, type it in
- Edit the Sensor Calibration for GPS_SPEED and set it to **3** Pulses per revolution.
- Now go to the Signal Plotting and Scaling Properties tab in your editor. Edit the Multiplier for GPS_SPEED. Set it to exactly .03277 (If GPS_SPEED is not in your list of signals, click the Add.. button and select it.)

# Chapter 9 Checkout, Calibration & Zeroing

*If you do not have a Co Pilot 2 you can skip this chapter*

## View Live Readings

Now we will connect to your *Co Pilot 2* to view live data from the sensors.

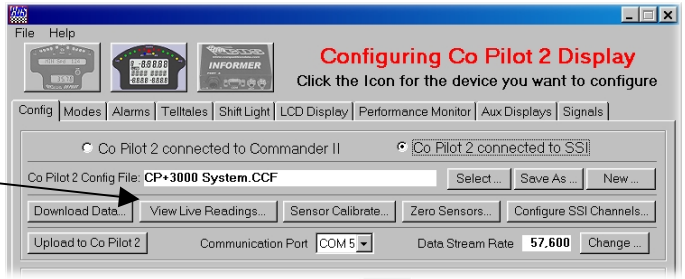
### Preparation

- Put your car on jack stands so that you can spin the wheel that you have your WHEEL_R sensor mounted at.
- Turn your master switch on so that your Co Pilot 2 is powered up.
- Start *CDS Link* on your PC
- Using the supplied USB communication cable, connect your PC to the COM connector on the bottom of the *Co Pilot 2*.

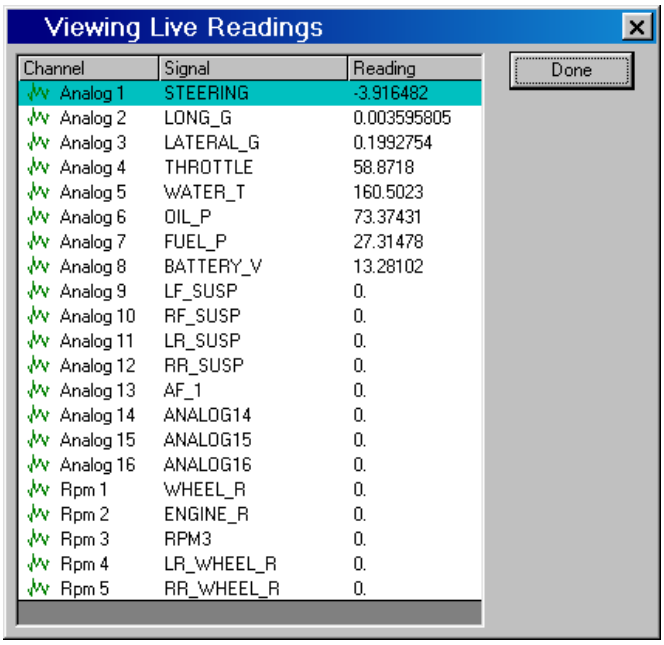
  **IMPORTANT**: if this is the first time you are connecting to your PC you must install the Co Pilot 2 USB drivers. Please turn to chapter 5 and carefully follow the instructions.
- If you have not yet uploaded your configuration, do so now. Refer to the end of the previous chapter for instructions.


### View Live

- Go to the *Config* Tab and click *View Live Readings*




- The LCD on the *Co Pilot 2* should show the message "SEN CAL"
- Your PC Screen should show the *View Live Readings* box:
- Spin the tire that has the WHEEL_R sensor mounted on it. Spin it enough so that the magnet passes the sensor 3 or 4 times. You should see the value for WHEEL_R change from 0 to some small number.
- If it does not change, check the installation work on the WHEEL_R sensor. Also, make sure the sensor is plugged into the cable labeled WHEEL_R
- Move some of the other sensors (such as STEERING and THROTTLE.) Verify that their values change. Then click DONE



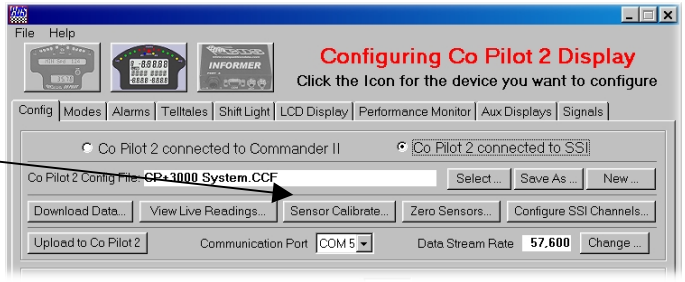

| Channel | Signal | Reading |
|---|---|---|
| Analog 1 | STEERING | -3.916482 |
| Analog 2 | LONG_G | 0.003595805 |
| Analog 3 | LATERAL_G | 0.1992754 |
| Analog 4 | THROTTLE | 58.8718 |
| Analog 5 | WATER_T | 160.5023 |
| Analog 6 | OIL_P | 73.37431 |
| Analog 7 | FUEL_P | 27.31478 |
| Analog 8 | BATTERY_V | 13.28102 |
| Analog 9 | LF_SUSP | 0. |
| Analog 10 | RF_SUSP | 0. |
| Analog 11 | LR_SUSP | 0. |
| Analog 12 | RR_SUSP | 0. |
| Analog 13 | AF_1 | 0. |
| Analog 14 | ANALOG14 | 0. |
| Analog 15 | ANALOG15 | 0. |
| Analog 16 | ANALOG16 | 0. |
| Rpm 1 | WHEEL_R | 0. |
| Rpm 2 | ENGINE_R | 0. |
| Rpm 3 | RPM3 | 0. |
| Rpm 4 | LR_WHEEL_R | 0. |
| Rpm 5 | RR_WHEEL_R | 0. |

## Sensor Calibrate

Some sensors must be calibrated after installation. The 2 most common are THROTTLE and STEERING. We will do these 1 at a time.

## Throttle Calibration

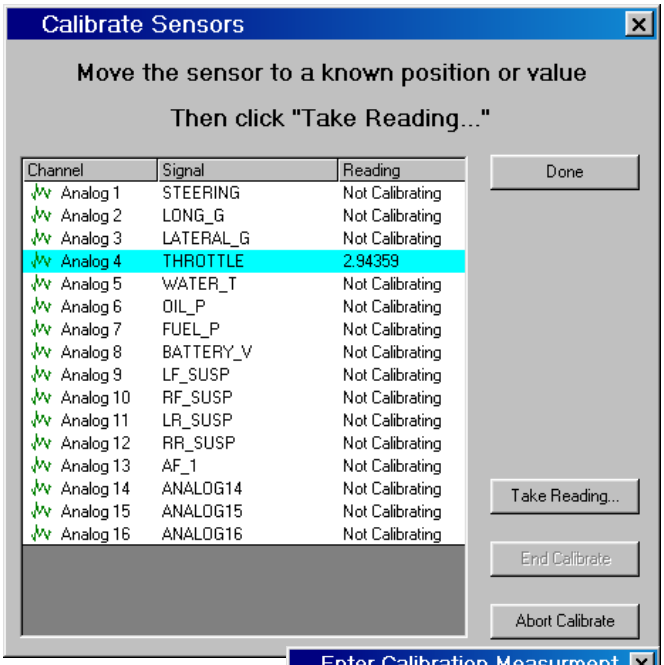
NOTE: if your system gets THROTTLE data from an ECU interface, there is generally no need to do a calibration. IF you do calibrate a signal that is coming from an ECU, then the ECU must be "on" and supplying data to the system. In most cars this means that the ignition switch must be ON.




- Click *Sensor Calibrate…*

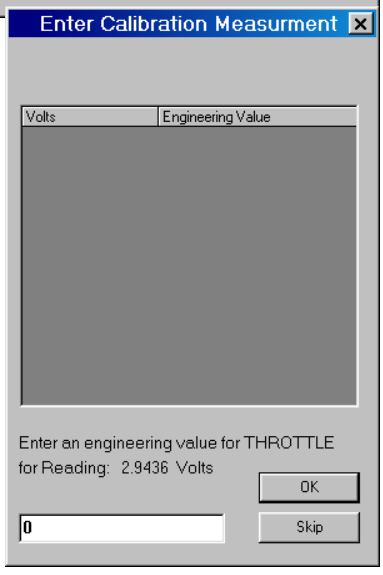
- The LCD on the *Co Pilot 2* should show the message "SEN CAL"

- Your PC Screen should show the *Calibrate Sensors* box:

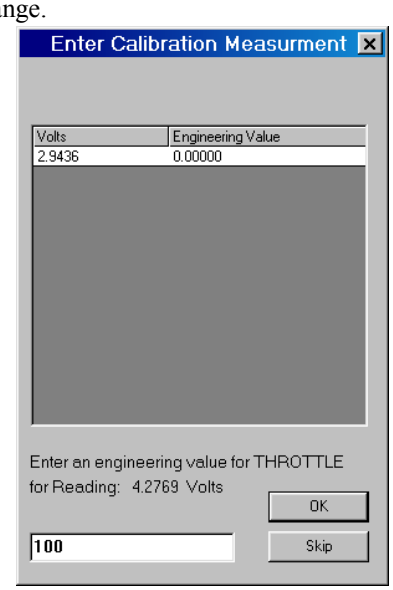



- Click THROTTLE to start the calibration process.

1. Be sure that the THROTTLE is closed, THEN click *Take Reading.* You should see:
2. Enter "0" in the line. You are assigning a THROTTLE reading of 0% to the voltage reading from the sensor when the throttle is closed.
   - In this example the voltage reading at 0% THROTTLE is 2.9436 volts.
3. Click OK



4. Next, have someone hold the THROTTLE wide open. The voltage reading for THROTTLE in the *Calibrate Sensors* box should change.
   - (If it does not change, check the installation of the THROTTLE sensor. Verify that it is plugged into a cable labeled THROTTLE.)
5. Click *Take Reading.* You should see:
6. Enter "100" in the line. You are assigning a THROTTLE reading of 100% to the voltage reading from the sensor when the throttle is wide open.
   - In this example the voltage reading at 100% THROTTLE is 4.2769 volts.
7. Click *OK*




## Key Concept:

It should be clear that the calibration process involves the following steps:

1. Move the sensor to a known position or value (such as 0% or 100% THROTTLE)
2. Take a sensor voltage reading (by clicking *Take Reading)*
3. Enter the value for that voltage reading
4. Repeat until done

- It is important to recognize that the process WILL NOT work if you transpose steps 1 and 2, i.e. hit *Take Reading* and then move the sensor.

## Steering Calibration

Accurate STEERING calibration is vitally important if you plan on using the HANDLING analysis in Track Master 2000 to its maximum potential. There are several methods for calibration of STEERING:

- BEST METHOD: Calibration with the car on turn plates (or other means of accurately measuring spindle angle)
- NEXT BEST: Use digital angle finder on steering wheel.
- LEAST PREFERRED: calibrate "by eye" with steering wheel at 0, -90 degrees (right) and 90 degrees (Left)

### KEY POINTS for all methods:

- Enter POSITIVE numbers when you are turning the wheel LEFT
- Enter NEGATIVE numbers when turning the wheel RIGHT

### Spindle Angle Method

Take readings as you did with the THROTTLE calibration.

- Calibrate in terms of "loaded wheel" spindle angle. This means that you take numbers LEFT turn plate when calibrating for right turns, and enter NEGATIVE degree numbers)
- Take numbers from RIGHT turn plate when calibrating for left turns, and enter POSITIVE degree numbers.
- Take readings every 2 degrees, going from –20 to 20 degrees for road race, -4 to 10 or so for circle track

### Digital Angle Finder On Steering Wheel Method

- Clamp a digital angle finder to the steering wheel, zero it with the steering wheel in the "straight ahead" position.
- Take readings at 10 degree increments going from –90 (right turns) to + 90 (left turns).

### "By Eye" Method

- calibrate "by eye"
- Take readings with steering wheel at -90 degrees (right), 0, and 90 degrees (Left)

## Suspension Sensors Calibration

Some people prefer to calibrate their suspension sensors in terms of actual wheel movement. This saves having to calculate a *Sensor Motion Ratio* (see the GEOMETRY Tab in previous chapter). If you choose to calibrate in terms of wheel movement, note the following;

- Enter POSITIVE, increasing values as you compress the suspension. For example, if you enter 0 at static ride height, enter 1 when the wheel is in 1" of bump, etc.
- Enter "1" for all of your *Sensor Motion Ratios* in the Geometry Tab.
- You must still measure and calculate a *Shock Motion Ratio* for all 4 shocks.

## Verify Calibrations

Go back into the *View Live* screen and move the THROTTLE and STEERING, verifying that the calibrations are correct.

# Zeroing Sensors

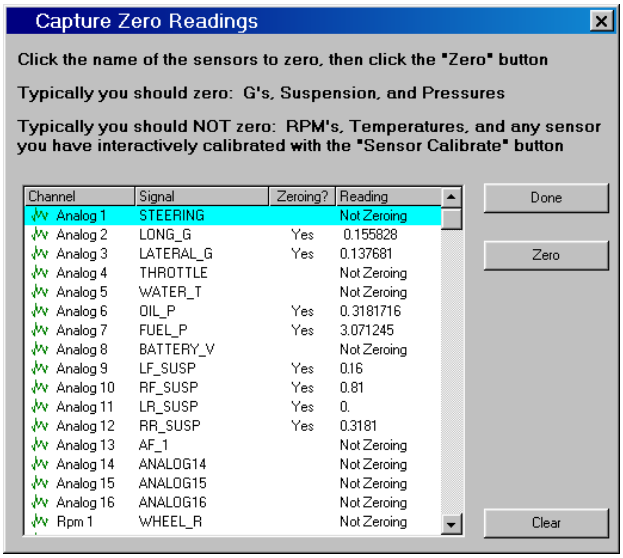
## General Rules

The final step in assuring that you will log accurate, usable data is to zero certain sensors. Here are some general rules:

1. Get the car as close as possible to static, "as raced" condition when zeroing. This means:
   - All body work installed
   - ½ tank of fuel
   - Driver in the car
   - Car on a level, flat surface. (on a setup pad if possible)
   - Tires clean and inflated to operating pressure
2. Always zero G's, pressures, suspension sensors
   - If you have fuel injection, be sure there is no residual pressure in the fuel system if you are zeroing FUEL_P
3. There is no need to zero sensors that you have done an interactive calibration on. (such as THROTTLE and STEERING)
4. NEVER zero RPMs or Temperatures
5. Re-zero suspension whenever ride heights or other suspension settings are changed.
6. Re-zero any time a sensor has been disturbed. (Removed and re-installed after a crash for example)

### How to Zero Sensors

Have the car set as described above. Connect the PC. Start *CDS Link* and in the *Config* tab, click *Zero Sensors.*. You should see:




- Click on each of the signals you wish to zero.
- Click *Zero*
- You will see a confirmation message, then you will be put back into the *Config* Tab.

### Verify Zeros

Go back into the *View Live* screen. The signals that you zeroed should now display values that are very close to zero.

# Summary

Your system is now checked out, calibrated, and you are ready to log accurate, quality data. The next step is to do a “practice record” in the shop.

# Chapter 10 Doing A "Practice" Record

*If you do not have a Co Pilot 2+ you can skip this chapter*

## General

We will now do a "practice" recording and download as a final checkout and to learn the downloading process.

---

**NOTE!** It is STRONGLY RECOMMENDED that you do this practice record and download in the shop BEFORE you go to the race track for the first time with your new system

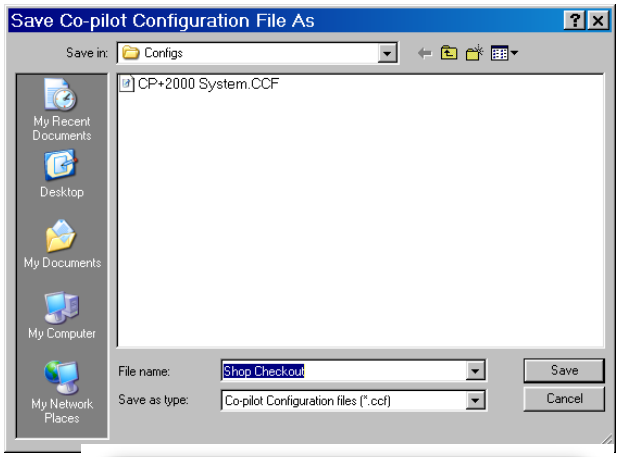
---

## Preparation

- Put your car on jack stands so that you can spin the wheel that you have your WHEEL_R sensor mounted at.
- Turn your master switch on so that your Co Pilot 2 is powered up.
- Start *CDS Link* on your PC

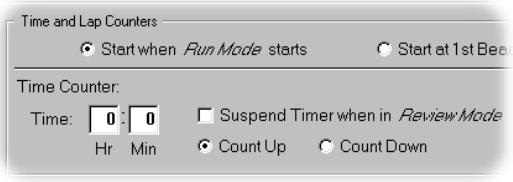
### Create a special configuration file

We will create a special configuration file that is only used for doing test or practice records. Open *CDS LINK* and be in the *CONFIG* tab




- The *Co Pilot 2 Config File:* line should display your config file you edited in the previous 2 chapters.
- Click the *Save As…* button
- For a *file name*, type in *Shop Checkout* and click *Save.*
- The *Co Pilot 2 Config File:* line should now display *Shop Checkout.CCF*

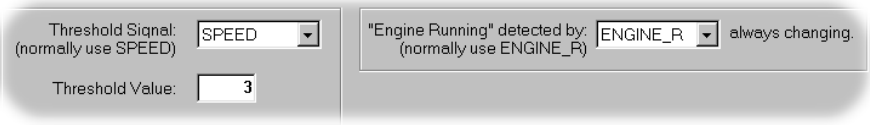
### Edit the Time Counter




- Set the *Time and Lap Counters* in the *Config* tab to *Start when Run Mode Starts.*
- Set the *Time Counter* to *count up*

### Edit the *Mode*

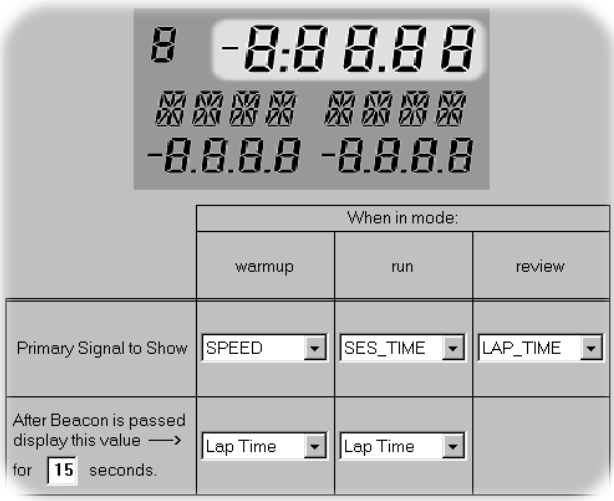
- Click on the *Modes* Tab.
- Have the *Threshold Signal* set to *SPEED* and the *"Engine Running"* signal set to *ENGINE_R*




- If you DO NOT want to run your engine during the practice recording, change the "*Engine Running"* signal to BATTERY_V. (If the "*Engine Running"* signal does not change at least a little from reading to reading then the *Co Pilot 2+* will not go into *Run* mode and thus will not log data.)
- Change the *Threshold Value* to 3. This will cause the Co Pilot 2 to go into *Run* mode (and start logging data) when you spin the wheel by hand and get it to exceed a speed of 3 MPH.

### Edit the LCD Display

- Click the *LCD Display* tab.
- Click the upper right area of the LCD
- Select the *Primary Signal To Show* when in *Warmup* to be *SPEED.*
    - This enables you to see the *SPEED* reading while you spin the tire
- Select the *Primary Signal To Show* when in *Run* to be *SES_TIME.*
    - This enables you to see when the *Co Pilot 2+* enters *Run* mode (and begins data logging) because at that time the upper display will switch from showing *SPEED* to showing *Session Time*
    - Click *OK* to go back to the main Tab set.




### Upload the Configuration

- Click on the *Config* tab
- Using the supplied USB communication cable, connect your PC to the COM connector on the bottom of the *Co Pilot 2+*.
- Click *Upload to Co Pilot 2.*
- Disconnect the USB cable from the *Co Pilot 2+*. The top line of the LCD should show 0.0 (which is the current value of *SPEED.)*

### Get Beacon ready

If you have a beacon, make sure both the beacon and the receiver (in the car) are both set to the same channel. (Refer to Chapter 2)

- Connect the beacon to a charged 12 volt battery. Be sure to clip the RED clip to POSITIVE and the BLACK clip to NEGATIVE.

---

NOTE: if you do not have your own beacon the you will not be able to check out your receiver but can still do the practice record. In this case all your data will be stored in 1 lap

---

### GPS Users

If you have the CDS GPS option for lap timing you will be able to generate 1 lap time by pressing the button IF you do your test outdoors where you have GPS reception.

- If you do the test indoors can still do the practice record. In this case all your data will be stored in 1 lap

# Record Data

- Start the engine. The shift lights on the *Co Pilot 2+* should light up corresponding to the values you set for them in *Warmup* mode. NOTE: you may not see any shift lights on if the lowest setting is higher than the RPM your engine is idling at.

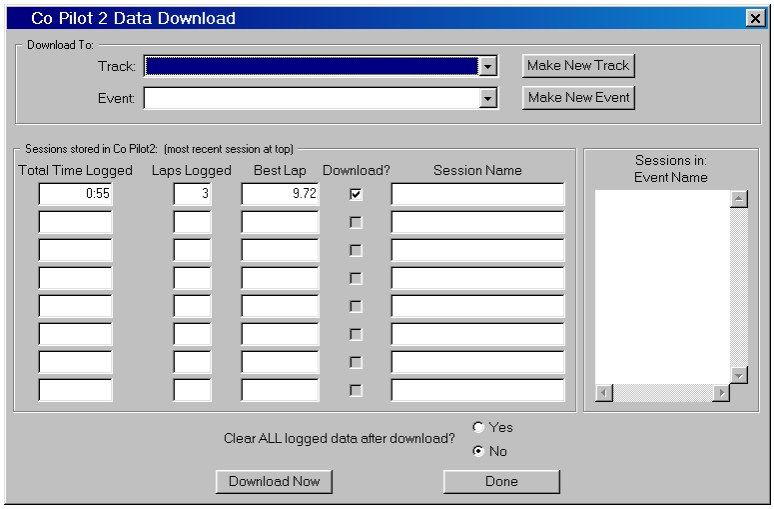
### Begin Recording

- Spin the tire with the WHEEL_R sensor and look at the upper area of the LCD. Spin the wheel until you exceed 3 MPH.
    - When you exceed 3 MPH the upper display will switch to showing session time, (in minutes and seconds format) and will start counting up from 0.
        - You are now logging data.
- Move the Steering wheel back and forth. Rev the engine up a bit.
- If you have a beacon, swipe the beacon across the receiver so that you trip a lap time or 2.
    - NOTE, you must wait at least 9 seconds between beacon "swipes", since 9 seconds is the minimum lap time the standard system will record.
- If you have GPS and are receiving GPS data (GPS Light blinking on the controller) then you can press the button to trip one lap time. Because you are not moving you will not be able to trip more than 1 lap time.

### End Recording

- Turn the engine off. If you wait a few seconds, the *Co Pilot 2+* will go into "Pre Review" mode, prompting you to "HOLD BUTTON FOR REVIEW MODE." Hold the button and the unit should go into REVIEW mode, which terminates the logging session.
    - Entering REVIEW mode ends a logging session
- If you do not want to wait for the scrolling message, simply plug the USB cable into the unit (and into the PC).
    - Connecting to the PC is another way of ending the logging session

# Download Data




- Go to the *Config* tab. Click the *Download Data..* button.
- You should see the *Data Download* dialog box:
- There should only be 1 session shown in the list.
- The *Total Time logged* should be equal to the time from when you entered *Run* mode to the time you entered *Review* mode (or when you plugged in the USB cable)
- If you did NOT "swipe" your beacon past your receiver to generate lap times then the *Laps Logged* should be shown as "1" and the *Best Lap* will show up as 0.00 because there were no actual lap times logged.
- If you DID use your beacon in the test then *Laps Logged* should show the total number of lap times logged + 1. (the extra lap is the "in" lap or the time from the last beacon to the end of the logging session.)

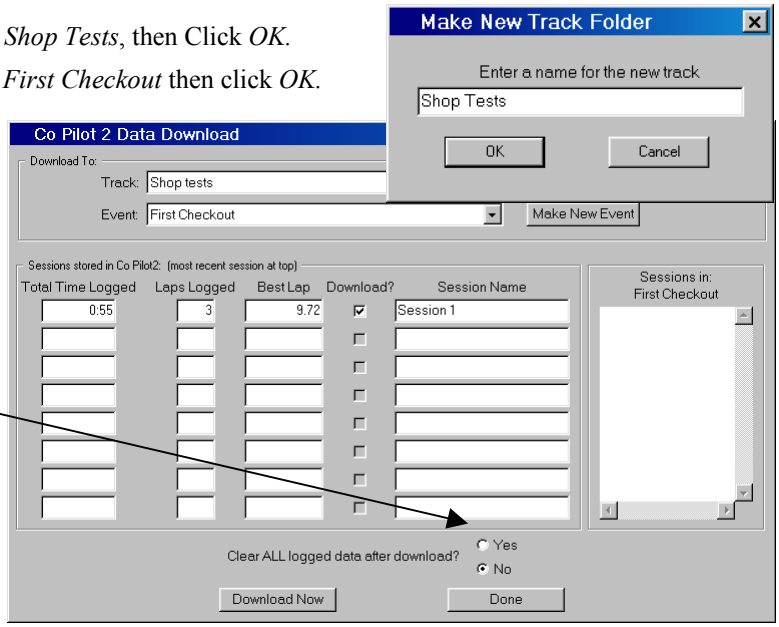
### Make new *Track & Event* Folders

- Notice that there is no *Track* or *Event* selected for storing the data.

**NOTE:** All CDS logging systems organize and store data in a *Track, Event,* and *Session* format. For details see chapter 1 of your Track Master 2000 Manual.

- Click *Make New Track* and type in *Shop Tests*, then Click *OK*.
- Click *Make New Event* and type in *First Checkout* then click *OK*.

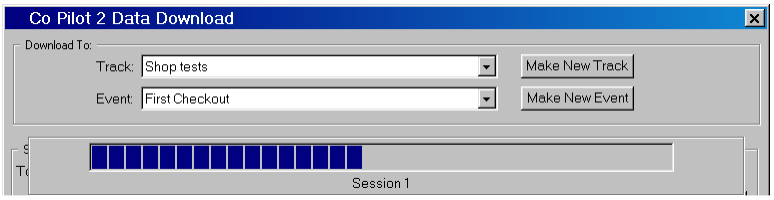
You should now see:




- Click in the top *Session Name* line and type in *Session 1*.
- Notice that you can choose to *Clear ALL data after download* by selecting *Yes*
- If you choose Yes, then the data logging session will be erased from the *Co Pilot 2+* memory after download is complete.
- If you leave this option set to *No* then sessions will continue to accumulate in *Co Pilot 2+* memory and the most recent session will always be shown on the top line. When there are a total of 8 sessions logged in memory, the oldest session will be discarded when you log a new session.
    - This feature is subject to the limitations of the 8 megabyte memory and your recording configuration. IF your *Max Logging Time* is 2 hours and a typical session is 30 minutes, then your *Co Pilot 2+* will typically accumulate only the most recent 4 sessions.

### Download the data

Once your Track, Event, and Session are defined you can download. Click the *Download Now* button. A progress bar will be displayed as the data is downloaded




- When download is complete you will be returned to the *Config* tab.
- Your data is now stored on the hard drive of your PC.

## Analyze Data

Start *Track Master 2000* and examine your data. Refer to chapter 5 of your Track Master 2000 manual for instructions on how to analyze your practice data.

## VERY VERY IMPORTANT STEP!

Once you are done doing practice recordings, go back to the *Config* tab in *CDS Link, Select* your original configuration file, and *Upload* it to your Co Pilot 2+

# Chapter 11 Using your Co Pilot 2

*If you do not have a Co Pilot 2 you can skip this chapter*

## A Typical Session with the *Co Pilot 2*

### Power On

Turn the master switch.

- You should see a message *" Co Pilot 2* then *VER. x.xx"* where "x.xx" is the version number of the firmware in your *Co Pilot 2*. After a few seconds this message should disappear.
    - If you have a *Co Pilot 2*+ (with data logging) then the last character of the VER number will be "+"
- During the power up (when the firmware message is shown) the Satellite (AUX) Displays will show their display number, for example, Satellite #3 will show "3333" on it

#### Make sure your previous session data is cleared:

**IMPORTANT NOTE**: If your *Co Pilot 2* have <u>not</u> been powered off since the previous session then as soon as you start the engine the *Co Pilot 2* will interpret this as resuming the previous session rather than starting a new one.

- It is not necessary to upload the configuration after power has been off. The *Co Pilot 2* retains its configuration in Flash memory.

### Warmup Mode

Start the Engine and warm it up. Verify that any enabled alarms are working as you want them to.

- Some users set up a low alarm for WATER_T such that as long as the engine is still "cold" the alarm is active.
- Observe the actions of the *Co Pilot 2*'s displays. If they are not to your liking, make the appropriate changes in *CDS Link* and then send the Config to the *Co Pilot 2*.

### Run Mode

Drive the car on the track. Once the Threshold Speed has been exceeded, the *Co Pilot 2* is in Run mode.

- The Session Timer and Lap Counter will begin updating based on the settings entered in the Config tab of *CDS Link*.
- The *Co Pilot 2* remains in Run mode as long as the vehicle is moving (detected from data from a signal named WHEEL_R) AND as long as the engine is running (detected from data from a signal named ENGINE_R). If the vehicle stops moving AND the engine stops running, the *Co Pilot 2* enters Pre-Review mode.
- Each press of the button will cause the message display to switch to the next enabled page, provided no alarms are active. (See appendix A for a summary of button actions)

### Pre-Review Mode

When you pull into the pits and shut the engine off, you will see a scrolling message ***"Hold Button For REVIEW Mode".*** This message is shown for a maximum of 60 seconds. If after 60 seconds the user has not "*Held*" the button, the *Co Pilot 2* automatically enters Review Mode by itself.

- "Hold" the button down until the message disappears. You are now in REVIEW mode.
- If the engine starts running while in pre-review mode, the *Co Pilot 2* switches back to run mode.

## Review Mode

Review mode allows the user to scroll through the Telltales Report and then the Lap Time Report. Each *press* of the button brings up the next item in the report. A *hold* of the button cycles you back to the beginning of the Telltales Report.

### Tell Tales Report

The first item you see in review mode will be the first Tell Tale defined in the Tell Tales Tab of *CDS Link.*

- The Message Display will show the tell tale name and value, and the lap it occurred on. The Digital Display will show the lap time for that lap, IF you have it (the Digital Display) configured to show Lap Time when in review mode.
- Each time you press the button the next tell tale will be shown on the message display.

### Lap Times Report

After the last tell tale is displayed, the next press of the button will begin the lap times report.

- The message display will show the Lap Number, and the Digital Display will show the Lap Time.
- Each time you press the button the next Lap Number and Lap Time will be shown.

## Download logged data

If you have a Co Pilot 2+ you can download the logged data for analysis. Follow the procedure you learned when doing the practice recording (in the previous chapter).

- It is not necessary to wait for Review mode to download your data, but if you want to review your lap times and telltales you must do so BEFORE downloading data.
- Downloading session data erases all telltales and lap times, and re-initializes the session timer and lap counter to the values set in the Config tab of *CDS Link.*
- Connecting the PC to the Co Pilot 2+ also forces the current Base Line Lap to be saved to flash memory.

## Clearing session data and starting a new session

At the end of the Lap Times Report, , a scrolling message **"*HOLD Button to clear session data*"** is shown on the *Message Display.* If you hold the button while this message is displayed, the *Co Pilot 2* clears the session data and re-enters warmup mode.

- Clearing session data erases all telltales and lap times, and re-initializes the session timer and lap counter to the values set in the Config tab of *CDS Link*.
- If you just press the button while this message is displayed, you will go back to the start of review mode.

---

**IMPORTANT NOTE**: If the engine starts running while in review mode, the *Co Pilot 2* switches back to run mode. Session data is not cleared unless the user explicitly does so.

---

## Exiting review mode and resuming the current session

If you want to resume running without clearing the session data, simply start the engine and drive off. The *Co Pilot 2* automatically goes back into run mode.

# Tips, Tricks, and Adjustments

## General Configuration Tips

The *Co Pilot 2* has a great degree of flexibility in how it is set up and under what conditions items are displayed. Here are some recommendations to get you started toward customizing the settings to exactly please you.

- Any of the *Co Pilot 2* signals can be displayed on any of the output devices. For example, Lap Time can be displayed on the digital display all the time, or it can be displayed on the digital display only after passing the beacon, or it can be displayed on a page in the message display.
    - It could also be displayed on one of the Aux satellite displays.
- Remember this powerful feature when setting up your configuration. Unlike most other Driver Display systems the *Co Pilot 2* places very few restrictions on which items can be displayed "when and where" on the system.

## Optimizing your Message Display Pages

- Only enable the pages you really want to see in each mode, for example, if you have a page that contains Lap # and Lap Time, disable it in warmup mode.

## Exploiting Alarm Settings

- When setting up alarms, only enable them in the mode when they will be useful. For example, if you set up a LOW WATER_T alarm, it is probably most useful in warmup mode only, since by the time you get into run mode the engine will already be hot.
- Only set up Alarms for things you truly need to get "alarmed" about. If you set up lots of different alarms that can easily activate under on-track conditions, the driver may get distracted by lots of "nuisance" alarms

## Deciding on your Session Timer and Lap Counter setup

These settings are all done in the Config tab of *CDS Link*.

### Practice and Qualifying Sessions

Most of these types of sessions are timed events, rather than a fixed number of laps, so set your lap counter to *count up*, and set your time counter to *count down* starting at the time specified for the session. For example, if it is a 20 minute qualifying session, set the timer to count down from 20 minutes.

- For fixed time sessions, set the timer to *start when run mode starts*. Thus it will closely agree with the official elapsed time of the session provided you go out on the tract right at the start of the session.

### Races of a fixed number of laps

For these types of sessions, set the Lap counter to *count down* so that the Lap number will show the laps to go on your *Co Pilot 2*. Set the number of laps to start at equal to the number of laps in the race.

- Set the counter to *Start at 1st Beacon* if you will NOT pass the beacon once before the green flag. (for example, if the false grid is after the place on the track where your beacon is set up)
- Set the counter to *Start at 2nd Beacon* if you <u>will</u> pass the beacon once before the green flag.
- IF there is a waive off of the start and waive off laps do not count, you can "bump" the lap count value by following the procedure in the next section.

## Adjusting the Lap Counter using the button

If you need to adjust the lap count because the start was waived off, do so as follows:

1. First, you must have a page with Lap Number currently displayed on the message display OR have Lap Number shown on an a Satellite display.
2. Second, there must be no alarms active.
3. To change the lap count, hold the button. This will add 1 to Lap # if ***Count Down*** is enabled or subtract 1 from Lap # if ***Count Up*** is enabled.
4. Release the button. You can repeat as many times as needed

## Adjusting LED brightness using the button

You can adjust the Brightness of the LEDS (both the Main and the Remote/HUD) using the button when in warmup mode only.

1. When in warmup mode, *hold* the button until a message appears "**ADJ MAIN LED xxx**".

- "xxx" is a number representing the current brightness setting where 0 = dimmest, 100 = brightest.
- At this time all of the LEDs will also be turned on.

2. Now, each *press* of the button will increase the brightness of the MAIN LEDs by 5.

- The MAIN LEDS include the lug, shift, over rev, W1 and Alarm lights
- When it gets to 100 the next press will take it back to 0.
- Note that the LCD backlights are turned off for LED brightness settings higher than 50.

3. If you now *hold* the button you will see a message "**ADJ REMOT LED 45 xxx**"

- "xxx" is a number representing the current brightness setting where 0 = dimmest, 100 = brightest.

4. Now, each *press* of the button will increase the brightness of the REMOTE LEDs by 5.

- The REMOTE LEDS include the leds in the HUD, the external warning and alarm LEDs, and the W2 LED

5. Finally, If you now *hold* the button you will return to warmup mode.

- If at any time during the brightness adjustment routine there is no action on the button for 20 seconds, the *Co Pilot 2* automatically returns to warmup mode.

## Adjusting The Latched Speed settings


The latched readings page of the *message* display displays recent minimum and maximum speeds. The *Co Pilot 2* constantly monitors the value of speed and detects if a maximum or minimum has occurred. For example, once a max has occurred and then the speed drops 10 mph from that max, the *Co Pilot 2* "latches" that max and displays it on this page.

Smart Mode enables the latched value to be displayed automatically regardless of which page is active on the message display.

The hold time for displaying the latch and the mph "margin" for determining a latched value are adjustable.

- The default values are 10 MPH margin an a 6 second hold in smart mode.

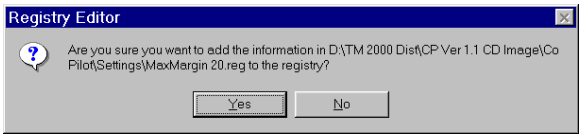
**IMPORTANT NOTE:** To change the speed margin or latch hold time you must be familiar with and able to use Windows Explorer.

1. Navigate to your **\Program Files*Co Pilot 2*\Settings** folder.

2. You will see a list of several files:

## Changing the Speed Margin

You can change the speed margin to 10, 15, or 20 MPH. For example, to change it to 20, double click on the **MaxMargin 20** file.




- You will see a message:
- Click **Yes**
- You should then see a confirmation message.

## Changing the Hold Time

You can change the hold time to 6 or 9 seconds. For example, to change it to 9, double click on the **LatchHold 9** file

# Chapter 12 Informer 2 Operating Description

*If you do not have an Informer 2 you can skip this chapter*

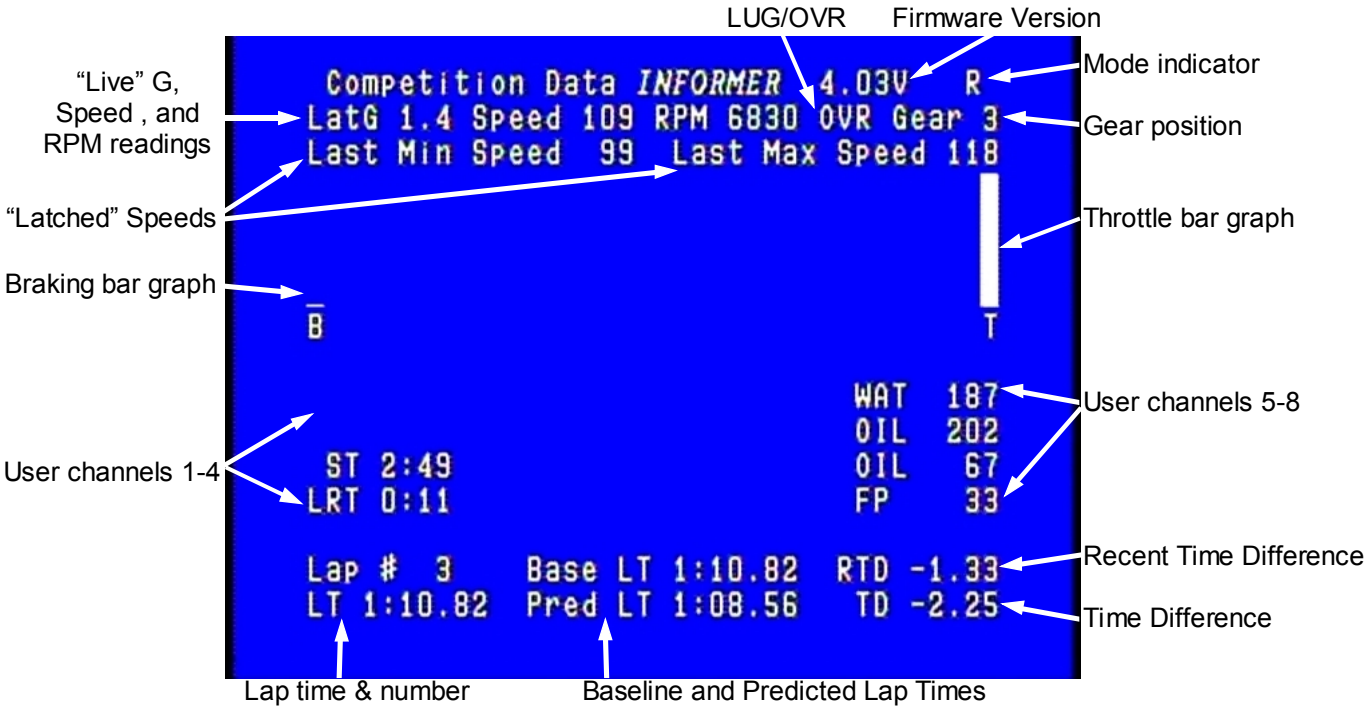
## General Description

The CDS *Informer 2* overlays data onto a standard video signal so that any video recording device (Tape, DVD, or flash based recorders) can record the video and data simultaneously.

- The *Informer 2* has a "Y" cable with standard "RCA" type video "in" and video "out" jacks. Any video camera can be connected to the video in, and almost any recording device will connect to the video out jack.
- The recording process is completely controlled your recording device. The recording device can not tell the difference between a "normal" video signal and the "video with data overlay" signal created by the *Informer*.

## Main Screen

In this manual we will frequently refer to *Informer* screen areas using the names shown here:




- **NOTE: for clarity most of the screen shots in this manual just show the Informer data without the "in car view" portion of the video (from the camera).**

Each of the main screen features will now be described:

### Live G, Speed, and RPM Readings

These are "live" readings which are updated on the screen about twice per second.

### Time Difference and Recent Time Difference

These fields show your current time gain or loss against the baseline lap. Negative numbers mean you are faster than the baseline lap. See the full discussion of performance monitor parameters in the *configure Informer* chapter.

### Latched Speeds

The latched speed readings display recent minimum and maximum speeds. The *Informer* constantly monitors the value of speed and detects if a maximum or minimum has occurred. For example, once a max has occurred and then the speed drops 10 mph from that max, the *Informer* "latches" that max and displays it on the screen.

- The *Last Min Speed* usually displays your minimum speed in the previous corner.
- The *Last Max Speed* usually displays your maximum speed on the previous straight

### Braking Bar Graph

Displays braking and usually works off of Longitudinal or "in line" G but the user can select which signal is used for this bar graph. Scaling for this bar graph is set by the user. (See the *Configuring Informer* chapter).

### User Channels 1-4 and 5-8

This area displays live readings for up to 8 user defined channels, 4 on each side of the screen. Use of the user channels is optional, and they can be left blank. Both "raw" and calculated channels can be displayed.

### Lap Time and Number

Displays the lap time for the last completed lap, and its lap number. Laps can count up or down. (See the *Configuring Informer* chapter).

### Baseline and Predicted Lap Times

Displays the current baseline lap and the predicted lap time for the lap currently being driven. If the baseline lap is blank then there is no baseline stored in the *Informer*.

### Throttle Bar Graph

Usually displays throttle position data based on a signal named THROTTLE, but can be changed to display data from any signal. (See the *Configuring Informer* chapter).

### Gear

Displays the current gear being used. Calculated from ENGINE_R, WHEEL_R and gear ratios entered in your configuration file. See the *Configure SSI Channels* section of chapter 7.

### Firmware Version

Shows the version of firmware installed in your *Informer.*

### LUG/OVR

Displays if you are lugging or over-reving the engine based on Engine RPM and RPM limits set *CDS Link.* See the *Configure SSI Channels* section of chapter 7.

### Mode

Shows the mode that the *Informer* is currently in as follows:

W = Warmup Mode

R = Run Mode

P = Pre-Review mode

Blank = Review Mode

# Modes

The *Informer 2* has several *modes* that it runs in, and it switches from mode to mode automatically.

## Warmup Mode

Warmup mode begins right after the *Informer* is powered up. All session data is cleared at power up. The *Informer* stays in Warmup Mode until the Threshold Speed is exceeded. When that happens, the *Informer* enters Run Mode.

## Run Mode

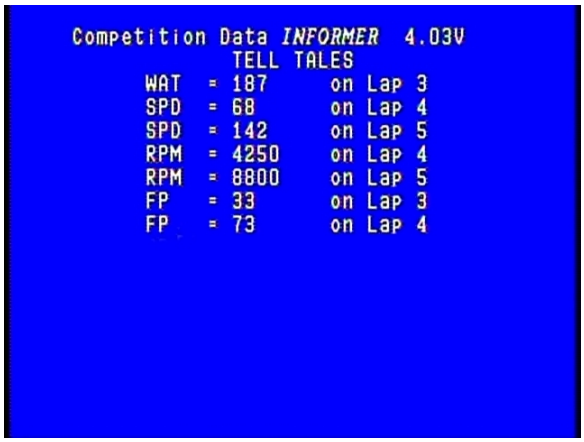
Once the Threshold Speed has been exceeded, the *Informer* is in Run mode. It remains in Run mode as long as the vehicle is moving (usually detected from data from a signal named WHEEL_R) AND as long as the engine is running (usually detected from data from a signal named ENGINE_R). If the vehicle stops moving AND the engine stops running, the *Informer* enters Pre-Review mode.

## Pre-Review Mode

Once in pre review mode, the *informer* will wait for 60 seconds and then automatically enter Review Mode. If the engine starts running while in pre-review mode, the *Informer* switches back to run mode.

## Review Mode

In Review mode the *Informer* alternately displays the Lap Times report and the Telltales report. These reports alternate every 10 seconds or so. When reviewing your session, hit pause on your Video playback device to study the report.




**Telltales Report**


**Lap Times Report**

If the engine starts running while in review mode, the *Informer* switches back to run mode. Session data is not cleared unless power to the *informer* is cut for at least 2 seconds.

- NOTE: You must turn the power to the *informer* off for at least 2 seconds between sessions, so that session data (such as lap count, telltales, etc) is cleared.
    - The SSI is usually powered through the master switch, and thus the master must be turned off for at least 2 seconds to clear the session data.

# Chapter 13 Configure Your Informer 2

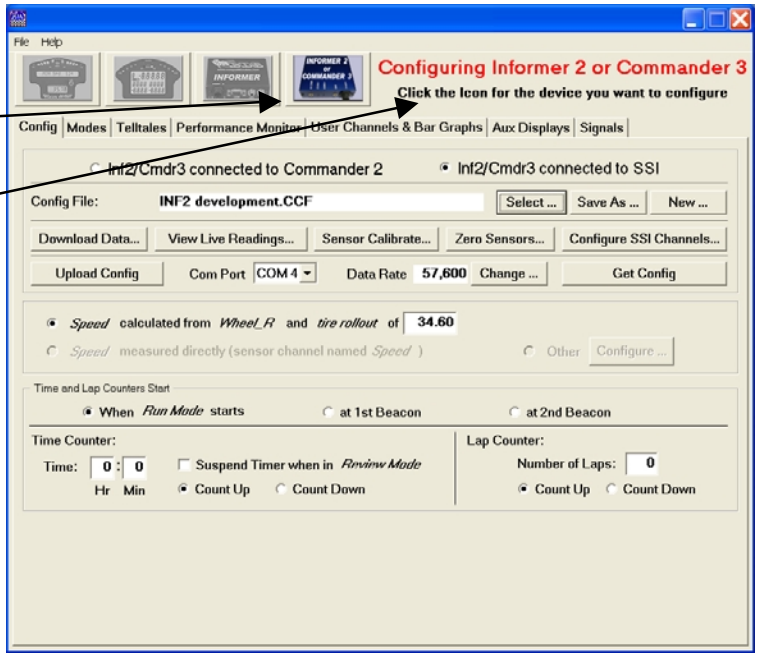
*If you do not have a Informer 2 you can skip this chapter*

## CDS Link Software

Now it is time to tell your *Informer* how to display the data it receives from the SSI. The *CDS Link* software is used to configure both the *Informer 2* and *Co Pilot 2*. Start the *CDS Link* Software by double clicking its icon:


Version 6.6 or higher of *CDS Link* is used to configure both the *Co Pilot 2* and the *Informer 2*.

- You select which device you want to configure by pressing its button at the top:
- The large status line indicates which device you are configuring:

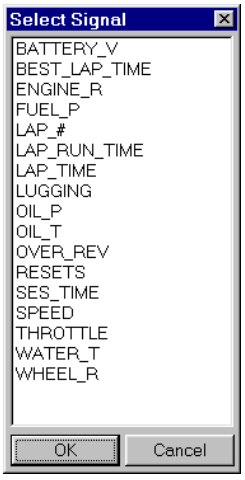



If your program is not in "*Informer2* Configuration" mode, press the *Informer2* button now.

### The "Signals" List

Many of the Tabs in *CDS Link* have pull downs where you select a signal from a list. This *Signal List* includes:

- All of the "raw" signals being sent to the *Informer 2*
  - If a raw signal (Oil_P for example) is not present in the list and you think it should be, go to your *Configure SSI Channels* editor and check to be sure that a channel with that signal name exists. See the "CONFIGURE SSI CHANNELS" section of Chapter 7.
- All of the *Informer 2* Preprogrammed Signals than can be resolved from the available raw signals. See Appendix B for a complete list of these signals and the information they depend on.




#### *Informer* Preprogrammed Signals

See Appendix B - Preprogrammed Signals, for a complete list and description of *Informer 2* preprogrammed signals.

# CONFIG Tab

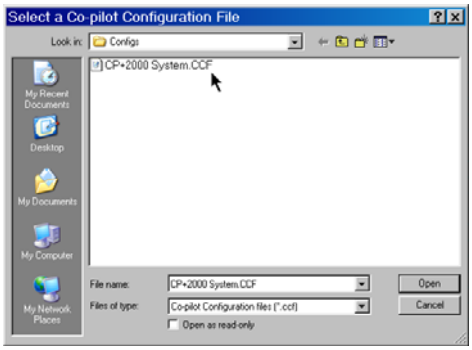
## Edit your *Informer* Config file

**IMPORTANT:** If you have a *Co Pilot 2* AND an *Informer 2* then begin here with the Co Pilot 2 configuration file you created in the previous chapters. Configuration information for the Co Pilot 2 and the Informer 2 is all stored in 1 configuration file

## Systems with Co Pilot 2 and Informer 2

Us the *Config* file that you created for your Co Pilot 2 in the previous chapters

## "Informer Only" Systems




click the *Select* button in the *Config* tab. You should see this dialog. Select the Configuration file that came with your system. Generally, this will be the only config file listed.

- Your Configuration file was pre-built for you by CDS and contains all the basic channel information and calibrations to get you started.
- If the dialog does not open up to *Look in* the *configs* folder, then use the controls to navigate to your *\Program Files\Co Pilot\Configs* folder.

## Set your Tire Rollout (Speed calculated from WHEEL_R)

**IMPORTANT: IF you have the GPS option, see the CDS GPS OPTION chapter for important information on configuring your system for use with GPS**

The *Informer* uses the Tire Rollout for converting WHEEL_R to SPEED. The Tire Rollout is the CIRCUMFERENCE of the tire that the WHEEL_R sensor is located on.

This data is then used:

- To display accurate SPEED on the Informer
- For all the Performance Monitor calculations in Informer

Obviously it is VERY IMPORTANT to enter accurate data for your tire rollout if you want accurate data out of your system. This means that:

- You should measure your Tire Rollout (and re-enter it if it has changed) before every session.
- You should measure your Tire Rollout every time you change tires.

## Data Stream Rate

The *data stream rate* defines the format for the serial data that the *Informer* RECEIVES. There are several settings available and if the data stream rate is set incorrectly the *Informer* WILL NOT display any data. Set this as follows:

| Setting | Application |
|---|---|
| 57,600 | *Informer* gets its data from MASTER SSI box version 2.xx.<br>The version # is shown on the tag on the side of the Master SSI. For example: VERSION 2.16, 2.17, etc |
| 115,200 | *Informer* gets its data from MASTER SSI box version 3.xx.<br>The version # is shown on the tag on the side of the Master SSI. For example: VERSION 3.17, 3.18, etc. |

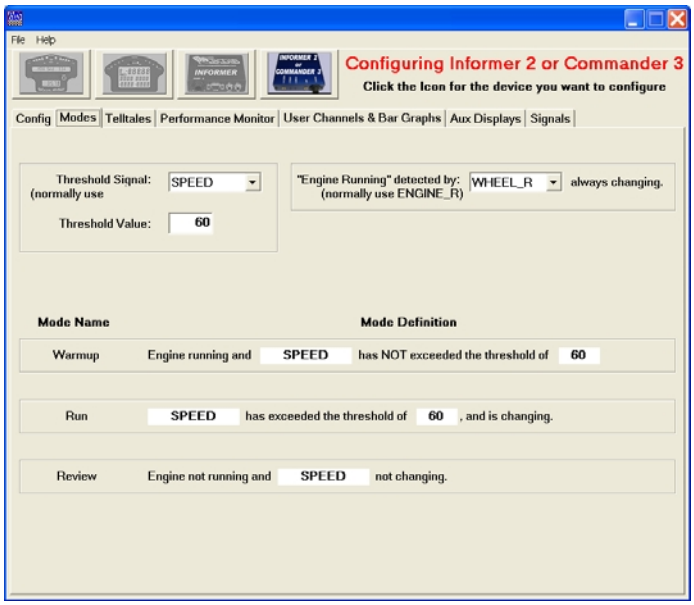
### Lap and Time Counter

Configure the *Time Counter* and *LAP Counter* to suit your preferences. Usually in a race of a specific number of laps most people want the lap counter to count "down".

# Configure SSI Channels

If you have an "Informer only" system then refer to the *Configure SSI Channels* section of chapter 7 to make any desired changes to your channels configuration.

# MODES Tab

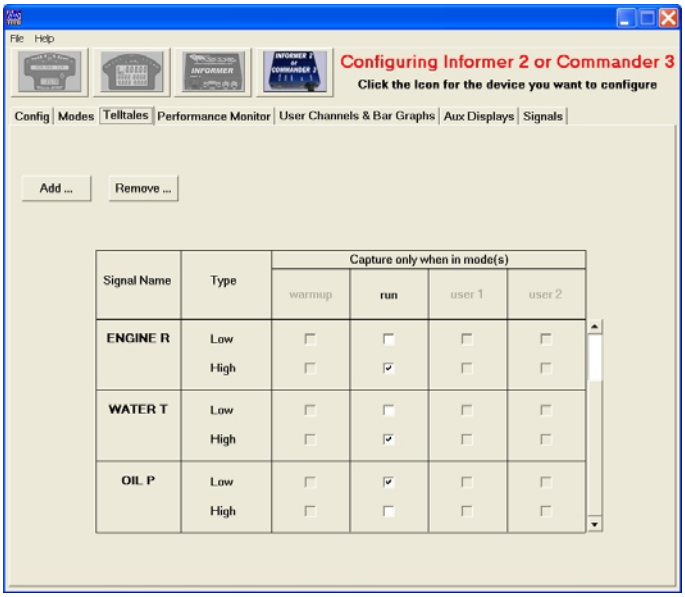



The *Threshold Signal* is used to switch the *Informer* from Warmup to Run mode. In most cases this is the *SPEED* signal.

- Set the *Threshold Value*. This is the speed at which the *Informer* automatically switches from Warmup to Run mode.

The *Engine Running* signal is used to detect if the engine is running or not, and then certain actions are taken. For example, when you come in and shut the engine off, the *Informer* detects that the engine is not running and switches to Review mode. In most cases use *ENGINE_R*.

## TELLTALES Tab

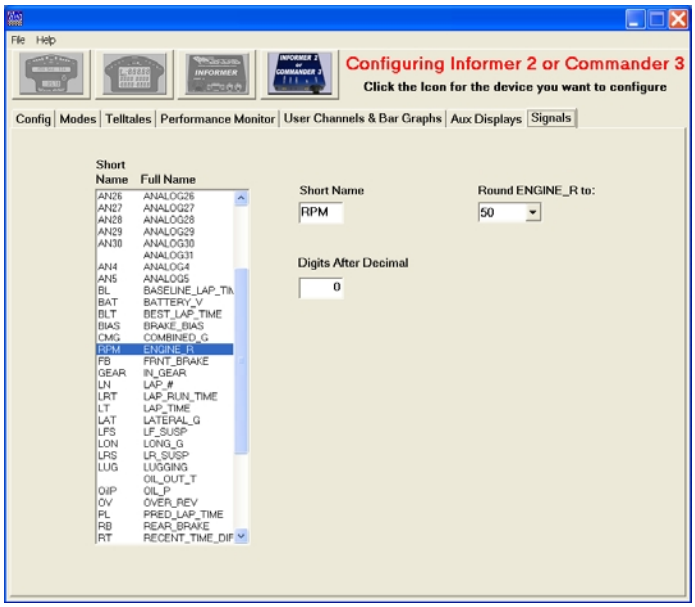



Telltales capture the highest, or lowest, (or both) value that the signal reached *during hot laps* only.

- Telltales are not captured in warmup mode
- Telltales are not captured during "out" and "in" laps.
- Tell Tales are captured and then displayed in the telltales report in Review mode.
- Us the *Add* and *Remove* buttons to configure your Telltales.

Note that each Signal can have a Telltale to capture the highest or lowest value, (or both). To avoid confusion only program the Telltales that are truly "interesting". (High Oil Temp, for example)

## SIGNALS Tab




This tab is where you define or change the short names for the signals (used on in the *User Channels* area of the screen.

- Short names are up to 4 characters long, including a leading space if used.

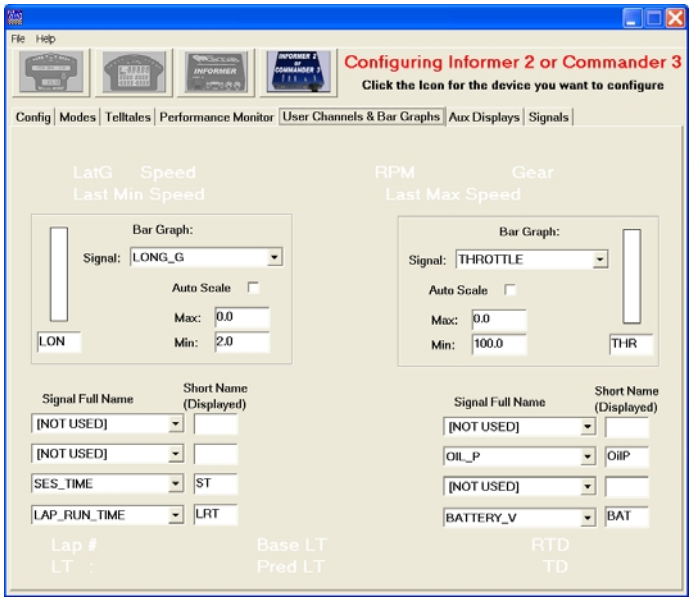
This tab also enables you to define how many places after the decimal point are displayed when showing data. For many signals the best setting is 0, but for lap times we use 2, and for signals whose values tend to be small numbers, use 1 or 2.

➢ NOTE: the same settings for *Short Names* and *Digits after Decimal* are used in the *Co Pilot 2* and the *Informer*.

### ENGINE_R Rounding

One really nice feature of the *Informer* is that you can program it to round the RPM value displayed to the nearest 10, 20, 50, 100, 200, 500 or 1000 RPM. This makes for much nicer viewing of RPM on the screen.

## User Channels & Bar Graphs Tab




On this tab you select any *user channels* you wish to display on the screen and set up the parameters for the Bar Graphs.

The words in white on this tab are the items which are shown all the time on the Informer screen, and which are currently not changeable by the user. They are shown on this tab for your convenience so that you can see which items will be displayed automatically, so that you avoid duplication with the user channels.

### User Channels

Select any *user channels* you wish to display on the screen. You can select up to 8 user channels, 4 on each side of the screen. (See the sample screen in the *Informer Operating Description* chapter.)

- To make the best use of your *User Channels* area, avoid selecting channels that are already displayed elsewhere on the screen. (items shown in white in the tab). For example, Lap Time, Lap Number, RPM , etc are always displayed anyway, so it would be a waste of screen space to also display them as user channels. (However, if you want to display them in 2 places on the screen, you can do so).
- If you are using an Informer with a Co Pilot 2+ data logging system, then it is very valuable to display Lap Run Time (LRT) as a user channel. LRT is time into the lap, and can be used to synchronize your

video data with your Computer based data. (logged in the Co Pilot 2+). Session Time is also a useful item to display as a user channel.

- Pull down the menu in each of the user channel fields to select the signal to be shown. The *Short Name* of the signal is displayed on the Informer screen, so we show the short name on this tab to aid in layout.

### Bar Graphs

Both of the bar graphs are completely user-configurable.

.

### Setting up the Bar Graphs

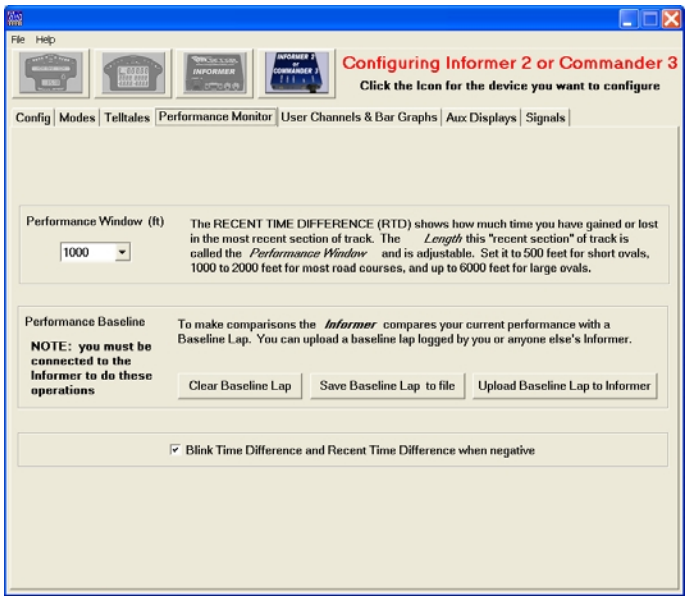
Select the signal to use for each of the bar graphs. Notice that the *Short Name* for the signal is displayed below the bar graph. (The short name will also be shown on the actual Informer screen.)

If you want the bar graph to automatically scale to the minimum and maximum readings received, check the *Auto Scale* box.

If you want to set the scales for the bar graph yourself, make sure the *Auto Scale* box is not checked, and enter the *Min* and *Max* values you want to use.

## Performance Monitor Tab

This tab enables configuration of the Performance Monitor.




- The Performance monitor data is shown on the bottom 2 lines of the *Informer* screen.
- The *Performance Window* is the portion of track included in the *Recent Time Difference*. Its "length" is adjustable by the user in this tab
- The *Performance Window* "follows" you around the track as you drive, so that the *Recent Time Difference* always shows your performance in the most recent section of track. Set it to 1000 or 2000 feet for most road course work

## Baseline Lap

The performance monitor displays your performance on the current lap relative to a baseline lap". At the end of each lap the *Informer* compares the lap just completed with the baseline lap. If the lap just completed is faster than the baseline lap, the it (the lap just completed) becomes the new baseline lap.

### Setting the Baseline Lap

Baseline laps are set either by driving a timed lap (*Informer* in run mode, at least 2 beacon trips occurred), or by uploading a saved baseline lap driven by you (or someone else) previously.

- If the just-completed lap is faster than the baseline lap OR if no baseline lap exists, then the just-completed lap BECOMES the baseline lap.
- The baseline lap is automatically saved to flash memory **when you enter review mode**, and is preserved when you turn the *Informer* off.
- The lap time for the baseline lap is always shown on the Informer screen.

### Clearing the Baseline Lap

There are 2 ways to clear the baseline lap.

- You can clear (erase) the baseline lap by *holding* the button while in Warmup mode.
- You can also clear the baseline lap by connecting you PC to the *Informer* and pressing the *Clear Baseline Lap* button in the *Performance Monitor* tab.

### Saving the Baseline Lap to a file

Baseline laps can be saved to a file on your PC by connecting you PC to the *Informer* and pressing the *Save Baseline Lap to file* button in the *Performance Monitor* Tab. This enables you to:

- Reload a baseline lap when you go to a track you have been to previously.
- Save and then reload baselines set under different conditions (wet, dry for example) or baselines set with different engines or tires.
- Share baseline laps among teammates, friends, (or enemies).
- Saved baseline laps are stored in your *\program files\Co Pilot 2\baselines* folder and are text-based files with the extension .CBL . You can copy them to other computers just as you would any other file.

### Uploading Baseline Lap to *Informer*

Any baseline lap that has been previously saved to a file can be uploaded to your (or any other) *Informer* at a later time. This is done by connecting you PC to the *Informer* and pressing the appropriate button in the *Performance Monitor* tab.

- Uploading a baseline lap to your *Informer* erases the current baseline lap, since there can only be one baseline lap in the *Informer* at any given time.

## Performance Monitor Displayed Values

The performance monitor generates "signals" which are displayed on screen.

### Predicted Lap Time (Pred LT)

The Predicted Lap Time shows you the lap time that the Informer predicts you will run based on your performance thus far in the lap and your performance recorded in your baseline lap. (Base LT)

- The Pred LT value shown at any given time assumes that you will drive the rest of the lap as fast as your baseline lap.
- The Pred LT is shown in minutes, tens of seconds, seconds, tenths, and hundredths. (MM.SS.TH) For example 1:59.55.

### Time Difference (TD)

The Time Difference (TD) displays the difference in time between the baseline lap (BL) and the PL. It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- Negative numbers indicate that the current lap is FASTER than the baseline lap
- The time difference is a measure of your performance for the entire portion of the lap driven so far.

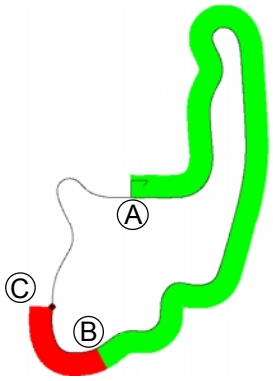
### Recent Time Difference (RTD)

The Recent Time Difference feature is unique to the CDS performance Monitor.

The Recent Time Difference (RTD) displays the time gained or lost *in the most recent section of track* relative to the baseline lap (BL). It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- The RTD is a measure of your performance NOT for the entire portion of the lap driven so far but for the most recent section of track.
- The "most recent section of track" is determined strictly by distance, and is referred to as the "performance window". You can set the length of your performance window in the *Performance Monitor* tab.

Here is an example of the *Recent Time Difference.* Lets say you are driving at Mid Ohio and just went through the turn shown in red on the map:



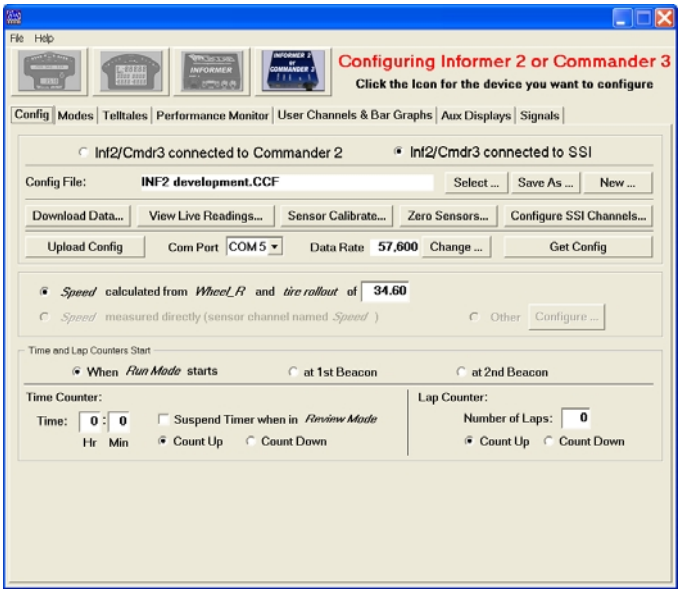

When you look at the *Informer* screen as you pass point "C" the *Informer* Performance Monitor can show you the time gain or loss for the entire lap so far (point A to C) AND can show the time gain or loss for just the part of the track shown in red (point B to C). This time gain or loss for point B to C is what we call the *Recent Time Difference (RTD)* .

The portion of track included in the *Recent Time Difference* is called the *Performance Window* (shown in red). Its "length" is adjustable by the user. The *Performance Window* "follows" you around the track as you drive, so that the *Recent Time Difference* always shows your performance in the most recent section of track.

## Upload your Configuration

When you are all done editing your configuration, upload your configuration:

- Go to the Config tab
- Using the supplied communication cable, connect one end to a USB port on your PC and the other end to the USB connector on the front of the *Informer 2*.
- Make sure that the COM port is set correctly in the Config tab.
- This will be the same COM port # that you use communicate with your CO Pilot 2.
- Press the *Upload…*button.



# Chapter 14 Using your Informer 2

*If you do not have a Informer 2 you can skip this chapter*

## A Typical Session with the *Informer*

### Power On

Turn the master switch on.

- The power light should be "on" and the Status light on the Informer 2 should be blinking.

**Make sure your previous session data is cleared by either:**

- Toggling the power off then on.

OR

- Uploading a configuration (this clears all session data in the *Informer 2*).

**IMPORTANT NOTE**: If your *Informer 2* has not been turned off since the previous session, then as soon as you start the engine the *Informer 2* will interpret this as resuming the previous session rather than starting a new one.

- It is not necessary to upload the configuration after power has been off. The *Informer 2* retains its configuration in Flash memory.
- Begin the recording process with your video recording device.

### First Time Use

Make sure that your video recording device is receiving the signal from the Informer. If you are using a Camcorder you should be able to view the incoming signal on the viewfinder of the Camcorder.

- If you see Informer data on a blue background screen, this indicates that the informer is not receiving a signal on its "video in" connection. Check the connections and the operation of your camera.

### Warmup Mode

Start the Engine and warm it up.

- Observe the actions of the *Informer 2* screen. If they are not to your liking, make the appropriate changes in *CDS Link* and then send the Config to the *Informer 2*.

### Run Mode

Drive the car on the track. Once the Threshold Speed has been exceeded, the *Informer* is in Run mode.

- The Session Timer and Lap Counter will begin updating based on the settings entered in the Config tab of *CDS Link*.
- The *Informer 2* remains in Run mode as long as the vehicle is moving (usually detected from data from a signal named WHEEL_R) AND as long as the engine is running (detected from data from a signal named ENGINE_R). If the vehicle stops moving AND the engine stops running, the *Informer* enters Pre-Review mode.

### Pre-Review Mode

When you pull into the pits and shut the engine off, the Informer enters Pre Review mode. After 60 seconds the *Informer* automatically enters Review Mode by itself.

- If the engine starts running while in pre-review mode, the *Informer 2* switches back to run mode.

### Review Mode

In Review mode the *Informer 2* alternately displays the Lap Times report and the Telltales report. These reports alternate every 10 seconds or so. When reviewing your session, hit pause on your Video playback device to study the report.

### Clearing session data and starting a new session

➢ NOTE: You must turn the power to the Informer OFF to clear session data.

**IMPORTANT NOTE**: If the engine starts running while in review mode, the *Informer* switches back to run mode. Session data is not cleared unless the user explicitly does so.

### Exiting review mode and resuming the current session

If you want to resume running without clearing the session data, simply start the engine and drive off. The *Informer 2* automatically goes back into run mode.

# Tips, Tricks, and Adjustments

## Deciding on your Session Timer and Lap Counter setup

These settings are all done in the Config tab.

### Practice and Qualifying Sessions

Most of these types of sessions are timed events, rather than a fixed number of laps, so set your lap counter to *count up*, and set your time counter to *count down* starting at the time specified for the session. For example, if it is a 20 minute qualifying session, set the timer to count down from 20 minutes.

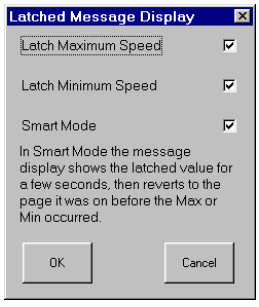
- For fixed time sessions, set the timer to *start when run mode starts*. Thus it will closely agree with the official elapsed time of the session provided you go out on the tract right at the start of the session.

### Races of a fixed number of laps

For these types of sessions, set the Lap counter to *count down* so that the Lap number will show the laps to go on your *Informer*. Set the number of laps to start at equal to the number of laps in the race.

- Set the counter to *Start at 1st Beacon* if you will NOT pass the beacon once before the green flag. (for example, if the false grid is after the place on the track where your beacon is set up)
- Set the counter to *Start at 2nd Beacon* if you will pass the beacon once before the green flag.

## Adjusting The Latched Speed settings




The latched Min and Max Speed readings display recent minimum and maximum speeds. The *Informer* constantly monitors the value of speed and detects if a maximum or minimum has occurred. For example, once a max has occurred and then the speed drops 10 mph from that max, the *Informer* "latches" that max and displays it on the screen.

The mph "margin" for determining a latched value is adjustable. The

default value is 10.

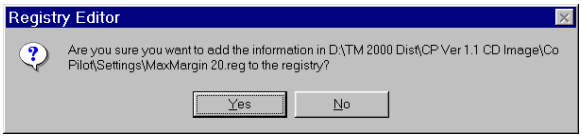
**IMPORTANT NOTE:** To change the speed margin you must be familiar with and able to use Windows Explorer.

3. Navigate to your **\Program Files*Co Pilot 2*\Settings** folder.
4. You will see a list of several files:


## Changing the Speed Margin

You can change the speed margin to 10, 15, or 20 MPH. For example, to change it to 20, double click on the **MaxMargin 20** file.

- You will see a message:
- Click **Yes**
- You should then see a confirmation message.



# Chapter 15 Solving Problems

*This Chapter applies to the Co Pilot 2 and Informer*

## "NO DATA OR UNEXPECTED DATA Message" on *Co Pilot 2 or Informer*

If you see a message " *NO DATA OR UNEXPECTED DATA RECEIVED, CHECK YOUR DATA STREAM RATE AND MASTER SSI MODEL # SETTING IN CDS LINK"* It indicates that the *Co Pilot 2 or Informer* is not configured properly to receive the data format that your Master SSI is sending it. Check or try the following items, in order:

1. In *CDS Link*, in the *Config* tab, verify that you have the correct *Data Stream Rate* set in the Config tab. See the chapters on configuring your Co Pilot 2 or Informer for details.
2. In *CDS Link*, in the *Configure SSI Channels,* verify that you have the correct *Master SSI model #* selected. See the chapters on configuring your Co Pilot 2 or Informer for details
3. Make sure that the Master SSI is working properly. Verify that the Status light on the SSI is blinking.

## "Bad Config" Message on Co Pilot 2 or Informer

This message is usually caused by not having signals selected for Mode switching in the *Modes* tab of CDS Link.

## "Bad Config" Message when tying to upload a configuration to the Informer

Caused by using a version of *CDS Link* that is older than the firmware in your unit. Download the latest software version from www.competitiondata.com

## Displayed values on Co Pilot 2 or Informer are wrong

Caused when incorrect calibration factors are entered in your config file.

# Appendix A – Co Pilot 2 Button Action Table

The following table summarizes the actions of the button.

- The button does different things depending on the mode and situation the *Co Pilot 2* is in, and depending on message prompts shown on the message display.
- A "*Press*" which is when the user pushes and releases the button in less than 1 second.
- A "*Hold"* which is when the users pushes the button and holds it for more than 2 seconds.

| Mode | Situation | Button | Action |
|---|---|---|---|
| **Warmup** | All | Press | Switches to the next active (enabled) page of the display . Wraps around at end of list. |
| | All except when Performance Monitor page is displayed on message display | Hold | Goes into routine to adjust LED brightness. See the "Tips, Tricks, and Adjustments" section of chapter 10. |
| | Scrolling message *"baseline lap = x.xx.xx…. hold button to clear"* | Hold | Clears the baseline lap |
| **Run** | No alarms | Press | Switches to the next active (enabled) page of the display. Wraps around at end of list. |
| | No Alarms. AND Lap # is currently displayed on message display or Aux display | Hold | Adds 1 to Lap # if ***Count Down*** is enabled<br>Subtracts 1 from Lap # if ***Count Up*** is enabled |
| | Alarm(s) present | Press | Clears the alarm and temporarily disables it for 5 seconds.<br>Bumps the alarm value if bumping is active. The alarm value is permanently changed until system goes back into warmup mode.<br>Disables the alarm if "X" number of bumps has been exceeded.<br>If more than 1 alarm present, The *Co Pilot 2* deals with them 1 at a time, in the order they are listed in the Alarms tab of *Co Pilot 2* Link. |
| | Alarm(s) present | Hold | No action taken |
| **Pre-Review** | All | Press | No action taken |
| | | Hold | Go to Review mode |
| **Review** | All | Press | Goes to the next report item. See the *Review Mode* section of Chapter 10 |
| | No scrolling message | Hold | Goes back to the beginning of the reports |
| | Scrolling message prompting to "hold button to clear session data" | Hold | Clears Session data and enters Warmup mode. |

# Appendix B - *Co Pilot 2* and *Informer* Preprogrammed Signals

## SPEED

***Standard Short Name:*** SPD

***Description***: Vehicle speed in MPH. Calculated from WHEEL_R and tire rollout.

***Requires:*** Raw Signal WHEEL_R and TIRE ROLLOUT (entered in the config file)

***How it is used***: One of the most important and fundamental signals used for comparison from lap to lap.

## COMBINED_G

***Standard Short Name:*** CMG

***Description***: Is the vector sum of Lateral and Longitudinal G, and therefore equivalent to the instantaneous radius of the "friction circle" in a G-G diagram. It is easier to interpret a full lap of data using COMBINED_G plotted vs time or distance rather than LATERAL_G vs LONG_G in a signal vs signal plot.

***Requires:*** Raw Signals LATERAL_G and LONG_G

***How it is used***: To determine if a driver can go into a corner deeper (brake later) or get on the gas earlier (in high powered vehicles).

## IN_GEAR

***Standard Short Name:*** GEAR

***Description***: Numerically equal to the gear that is engaged, thus if you are in 3rd gear, IN_GEAR = 3

***Requires:*** Raw Signals ENGINE_R, WHEEL_R, ratios set for all gears and Final Drive in Gearing tab of the Config file

***How it is used***: Shows what gear is engaged. Very useful for sequential shift cars.

## LUGGING

***Standard Short Name:*** LUG

***Description***: Determines if you are operating the engine at RPM lower than ideal. It's value is equal to ENGINE_R ***IF*** :ENGINE_R is less than the minimum (set in the Config file) ***AND*** THROTTLE is greater than 30%, OTHERWISE it is equal to zero..

***Requires:*** Raw Signal ENGINE_R, Minimum Revs set in the Gearing tab of Config file

***How it is used***: If Lugging is "non-zero" then the LUG light on the *Co Pilot 2 or Informer* will be active (either ON or FLASHING). The actual LUGGING RPM can also be displayed.

## OVER_REVS

***Standard Short Name:*** OV

***Description***: Determines if you are operating the engine at RPM higher than ideal. Is equal to ENGINE_R ***IF*** ENGINE_R is greater than the maximum you define (set in the Config file) OTHERWISE it is equal to zero.

***Requires:*** Raw Signal ENGINE_R, Maximum Revs set in the Gearing tab of Config file

***How it is used***: If Over Revs is "non-zero" then the Over Rev light on the *Co Pilot 2 or Informer* will be active (either ON or FLASHING). The actual Over Rev RPM can also be displayed.

## FUEL_USED

***Standard Short Name:*** FUEL

***Description***: Displays the total fuel used (in gallons or liters) so far in the session. At the end of the session, shows total fuel for the whole session or run.

***Requires:*** Raw Signal FUEL_FLOW

***How it is used***: Very useful in any type of racing requiring pit stops

## LAP_TIME

***Standard Short Name:*** LT

***Description***: Displays the most recent lap time.

***Requires:*** Photo beacon and receiver.

***How it is used***: Shows the driver the most recent lap time. Can be shown on any of the *Co Pilot 2's* LCD displays.

## LAP_RUN_TIME

***Standard Short Name:*** LRT

***Description***: Displays the running time (so far) into the current lap.

***Requires:*** Photo beacon and receiver.

***How it is used***: Useful for the driver to evaluate the performance of the current lap. Can be shown on any of the *Co Pilot 2*'s LCD displays.

## BEST_LAP_TIME

***Standard Short Name:*** BLT

***Description***: Displays the best (fastest) lap time so far in the session. Ignores out and in laps.

***Requires:*** Photo beacon and receiver.

***How it is used***: Shows the driver the best lap done so far. Can be shown on any of the *Co Pilot 2's* LCD displays.

## SESSION_TIME

***Standard Short Name:*** ST

***Description***: Displays the running time (so far) into the current Session. The timer counts up or down, depending on the settings in the CONFIG tab of *CDS Link*. The timer starts either when RUN mode begins or after the first or second beacon, depending on the settings in the CONFIG tab of *CDS Link* Link.

***Requires:*** Photo beacon and receiver.

***How it is used***: Useful for the driver to know how much time is left in a session, or how long he has been running for. Can be shown on any of the *Co Pilot 2*'s LCD displays.

## LAP_#

***Standard Short Name:*** LN

***Description***: Displays a count of either number of laps to go or number of laps run so far in the session. Counts up or down, depending on the settings in the CONFIG tab of *CDS Link*. The counter starts either when RUN mode begins or after the first or second beacon, depending on the settings in the CONFIG tab of *CDS Link*. Can be manually "bumped" using the button for "waived off start" situations. See Chapter 10 for details

***Requires:*** Photo beacon and receiver.

***How it is used***: Useful for the driver to know how many laps are left in a session or race, , or how many laps have been run so far. Can be shown on any of the *Co Pilot 2*'s LCD displays.

## PREDICTED LAP TIME

***Standard Short Name:*** PL

***Description***: Shows you the lap time that the Co Plot predicts you will run based on your performance thus far in the lap and your performance recorded in your baseline lap. (BL)

- The PL value shown at any given time assumes that you will drive the rest of the lap as fast as your baseline lap.
- The PL is shown in tens of seconds, seconds, tenths, and hundredths. (SS.TH) For example 59.55 The minutes portion is not shown.

***Requires:*** Performance Monitor Option, Photo beacon and receiver, Wheel_R sensor

***How it is used***: Useful for evaluating driver performance on the current lap you are driving.

## TIME DIFFERENCE

***Standard Short Name:*** TD

***Description***: Displays the difference in time between the baseline lap (BL) and the PL. It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- Negative numbers indicate that the current lap is FASTER than the baseline lap
- It is a measure of your performance for the entire portion of the lap driven so far.

***Requires:*** Performance Monitor Option, Photo beacon and receiver, Wheel_R sensor

***How it is used***: Useful for evaluating driver performance on the current lap you are driving.

## RECENT TIME DIFFERENCE

***Standard Short Name:*** RTD

***Description***: The Recent Time Difference feature is unique to the CDS performance Monitor.

The Recent Time Difference (RTD) displays the time gained or lost *in the most recent section of track* relative to the baseline lap (BL). It is shown in seconds, tenths, and hundredths (Maximum 9.99)

- The RTD is a measure of your performance NOT for the entire portion of the lap driven so far but for the most recent section of track.
    - The "most recent section of track" is determined strictly by distance, and is referred to as the "performance window". You can select your performance window in the *Configure Performance Monitor* dialog box.
    - Future enhancements of the CDS performance monitor will enable you to select the "performance window" based on other criteria such as end of a turn, beginning of a straight, etc.

***Requires:*** Performance Monitor Option, Photo beacon and receiver, Wheel_R sensor

***How it is used***: Useful for evaluating driver performance on the current lap you are driving. Useful in evaluating your performance in the most recent section of track, such as the most recent turn, most recent braking zone, etc.

## BASELINE LAP

***Standard Short Name:*** BL

***Description***: Displays the value of the baseline lap

***Requires:*** Performance Monitor Option, Photo beacon and receiver, Wheel_R sensor

***How it is used***: Useful as a reminder of what the baseline lap is.

## BRAKE_BIAS (Co Pilot 2, Informer 2, and Commander 3v only)

***Standard Short Name:*** BIAS

***Description***: Displays Brake Bias calculated from brake pressures. Bigger numbers indicate more pressure to front brakes. Value of .5 indicates equal pressure on front and rear.

***Formula****:* BRAKE_BIAS = FRNT_BRAKE / (FRNT_BRAKE + REAR_BRAKE)

***Requires:*** Raw Signals FRNT_BRAKE and REAR_BRAKE

***How it is used***: As a reference for setting cockpit adjustable bias controls.

# Appendix C – Sensor Calibrations

| CDS Sensors with Common Calibrations | | |
|---|---|---|
| **Part Number** | **Description** | **Calibration File** |
| SEN-3 | Cylinder Head Temp Sensor | Type K TC.cal |
| SEN-7 | Standard Probe Thermocouple | Type K TC.cal |
| SEN-8 | Contact Thermocouple | Type K TC.cal |
| SEN-16 | EGT Probe | Type K TC.cal |
| SEN-21L | Wide Angle (60°) Infrared Temp Sensor | SEN-21 Tire Temp.cal |
| SEN-21N, 21NH | Narrow Angle (19°) Infrared Temp Sensor | SEN-21 Tire Temp.cal |
| SEN-20-X | Displacement Sensor, "X" indicates inches of travel | SEN-20-X.cal |
| SEN-30 | Water/Oil Temp Sensor, 1/8" male pipe | SEN-30 - Mini Liquid Temp .cal |
| SEN-32 | Water/Oil Temp Sensor, 3/8" male pipe | SEN-32 - Liquid Temp Rev B .cal |
| SEN-31 | Air Temp Sensor | SEN-31 - Air Temp Rev A.cal |
| SEN-33A, B, C | Pressure Sensor 0-30 PSI , 0-80 PSI, 0-150 PSI | SEN-33a, b, or c.cal |

| CDS Sensors with Unique Calibrations<br>Calibration sheet supplied with sensor (if sensor was purchased separately) on in back of your manual (if sensor came with the system) | |
|---|---|
| **Part Number** | **Description** |
| SEN-9A thru 9H | Pressure Sensor |
| SEN-10A,10C | Aero Pressure Sensor, 0-28 OR +/-70 inches of water |
| SEN-10DQ | +/- 140 inches of water |
| SEN-12S | Strain Gauge/Load Cell Amplifier |
| SEN-28S, D or T | Accelerometer, 5 G 1,2, or 3 axis |
| SSI | Accelerometers, 5 G , built in to SSI |
| SEN-35 | Fuel Flow Sensor, rated for 1 to 75 gph |
| SEN-36 | Fuel Flow Sensor, rated for 1 to 360 gph |
| SEN-37 | Yaw Sensor, +/- 80 deg/sec |
| SEN-39 | Manifold Pressure Sensor |
| SEN-40 | Dyno Load Cell with amplifier and filter kit, up to 5000 lbs |

# Appendix D – Configuring Engine Management Data Stream

## General

Some engine management systems must be configured properly so that they send data in the format your SSI expects. Please refer to the following sections for your ECU.

- If you have trouble or need help navigating the software for your ECU, please call the ECU supplier. We do not have the various ECU software programs and can no support them.

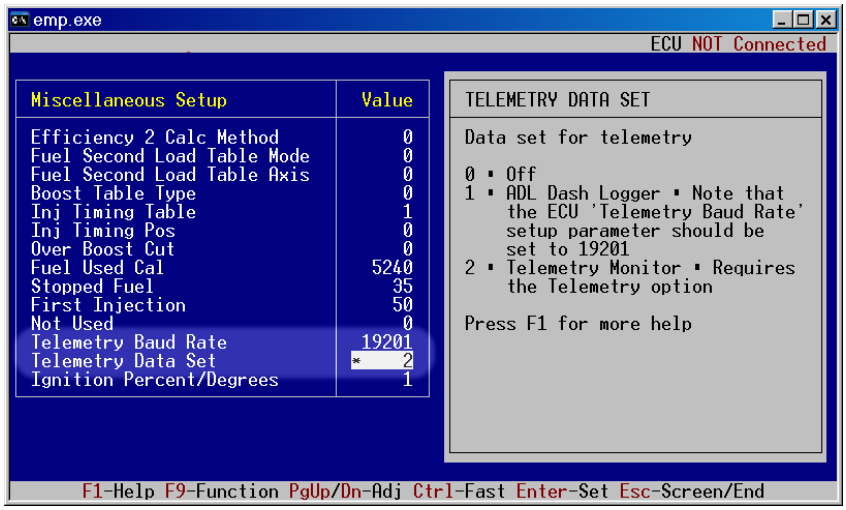
## Pectel (All applications)

Configure the ECU to send the "STACK" format data stream. You may need to send your ECU to your engine builder to get this done if you do not have the Pectel configuration software.

## Motec

In the *Miscellaneous Setup* section of your software:

1. Set the *Telemetry Data Set* to "2"
2. Set the *Telemetry Baud Rate* to 19200




## MBE

### SCCA Spec Car

No configuration required because this is a spec, sealed ECU

### Other MBE Applications

Set the broadcast baud rate to 9600.