COMPETITION DATA SYSTEMS

www.competitiondata.com

Co Pilot 2 Driver Information System

Informer Video Data Overlay System

User's Guide

Release 5.0 – February 2005

COMPETITION DATA SYSTEMS, INC
8050 WEHRLE DRIVE
WILLIAMSVILLE, NY, USA 14221
Voice: (716) 631-2880
Fax: (716) 631-9930

On the web at www.competitiondata.com

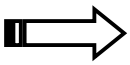
Quick Reference Operating Guide

Configure Commander 2 (*Co Pilot 2* or *Informer* with Commander 2 Data Logging systems Only)

Edit Car File using *Command Link* version 5.4

- Turn channels "on" in both the Commander Channel Configuration tab and in the Serial Output tab.
- Make sure your ROM version is set to 41 or higher in the Commander Channel Configuration tab
- Set your correct tire rollout
- Set your correct Min and Max RPM, and gearing information

Upload Configuration to Commander 2 or Prepare card for recording



IMPORTANT: Whenever you make changes in your CAR file you must also UPLOAD your configuration to your Co Pilot 2 2 or Informer using Co Pilot 2 2 Link software.

Configure *Co Pilot 2* or *Informer* (all applications)

- Edit your Configuration using the *CDS Link* software
- Select your car file to base the configuration on
- Set your Threshold speed
- Set all of your display options

Upload your configuration to your *Co Pilot 2 or Informer*

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* only).

IMPORTANT NOTE: If your *Co Pilot 2* or *Informer* has not 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 _____ 1-1

General _____ 1-1
How to use this manual _____ 1-1
How the system works _____ 1-1
Requirements to use _____ 1-2
To use a *Co Pilot 2 or Informer* in your vehicle, you will need: _____ 1-2
Co Pilot 2 System includes _____ 1-2
The Basic *Co Pilot 2* includes: _____ 1-2
Optional Wheel Mount Coil Cord _____ 1-3
Optional Accessories Available _____ 1-3
Informer System includes _____ 1-3
Camera and Recorder _____ 1-3
Stand-Alone systems _____ 1-3

Chapter 2 Install SSI and Sensors _____ 2-5

Regarding your ignition wires _____ 2-5
Locate and Install SSI _____ 2-5
Install Sensors _____ 2-5
SEN-4 RPM Sensors _____ 2-6
SEN-17B, E, & M Ignition Type RPM Sensor _____ 2-6
SEN-11 Throttle and Brake Sensors _____ 2-7
SEN-38 Steering Sensor _____ 2-7
SEN-28 S, D, and T Accelerometers _____ 2-8
SEN-31 Air Temp Sensor _____ 2-8
SEN-30, 32 Fluid Temp Sensor _____ 2-8
SEN-9 and SEN-33 Fluid Pressure Sensors _____ 2-9
SEN-25 Beacon Setup _____ 2-9
Install Port Harnesses _____ 2-11

Chapter 3 Co Pilot 2 Hardware Installation _____ 3-13

Locate and Install *Co Pilot 2* _____ 3-13
Formula Ford Wheel Mount _____ 3-13
Mounting to Steering Wheel _____ 3-14
Install Wiring & Accessories _____ 3-15
Install The Main Harness _____ 3-15
Install Satellite Displays _____ 3-15
Install Auxiliary LEDs _____ 3-16
Install HUD display in your helmet _____ 3-16
Connect The Main Harness to the Commander 2 or SSI _____ 3-16
Preliminary Power Up Checkout _____ 3-17

Chapter 4 Informer Hardware Installation 4-19

Locate and Install the *Informer* 4-19
Install Wiring 4-20
Informer with SSI 4-20
Preliminary Power Up Checkout 4-21

Chapter 5 Install Software & USB Drivers 5-23

IMPORTANT NOTE 5-23
Co Pilot 2 or *Informer* with Commander 2 5-23
Stand Alone *Co Pilot 2 or Informer* with SSI 5-23
Installing USB Drivers (Co Pilot 2 Only) 5-24
Preparation 5-24
Install Drivers 5-24
Determine COM port used 5-26
Changing the COM Number 5-28

Chapter 6 Configure Commander 2 6-29

General 6-29
Note: 6-29
Edit your Car File to Configure your Commander 2 6-29
Set your ROM version 6-29
Enable Channels for Recording 6-29
Enable Channels for Serial Output 6-30
Set your Tire Rollout 6-30
Set your RPM and Gearing Parameters 6-30
Set your Engine RPM calibration 6-31
Changing calibrations of other sensors 6-31
Interactive Calibration of Sensors 6-32
Upload your Configuration 6-32

Chapter 7 Configure Your CAR file (SSI box Only) 7-33

General 7-33
Edit your Car File 7-33
Set your RPM and GEARING Parameters 7-33
Set your Engine RPM calibration 7-33
Changing calibrations of other sensors 7-34
Update your Co Pilot 2 or Informer 7-34

Chapter 8 Co Pilot 2 Operating Description 8-35

Features 8-35
Main Display 8-35

Button Operation ____ 8-35
HUD (in helmet display) ____ 8-35
Modes ____ 8-36
Warmup Mode ____ 8-36
Run Mode ____ 8-36
Pre-Review Mode ____ 8-36
Review Mode ____ 8-36
More on button operation ____ 8-36

Chapter 9 Configure Your Co Pilot 2 ____ 9-37

CDS Link Software ____ 9-37
Setting the COM port ____ 9-37
General ____ 9-37
The "Signals" List ____ 9-37
CONFIG Tab ____ 9-38
MODES Tab ____ 9-40
ALARMS Tab ____ 9-40
When an Alarm Occurs: ____ 9-41
TELLTALES Tab ____ 9-41
SHIFT LIGHT Tab ____ 9-42
LCD DISPLAY Tab ____ 9-42
Performance Monitor page ____ 9-45
Baseline Lap ____ 9-45
Performance Monitor Displayed Values ____ 9-46
Changing Pages on the Message Display ____ 9-47
AUX DISPLAYS Tab ____ 9-48
SIGNALS Tab ____ 9-48
Upload your Configuration ____ 9-49

Chapter 10 Using your Co Pilot 2 ____ 10-51

A Typical Session with the *Co Pilot 2* ____ 10-51
Power On ____ 10-51
Warmup Mode ____ 10-51
Run Mode ____ 10-51
Pre-Review Mode ____ 10-52
Review Mode ____ 10-52
Clearing session data and starting a new session ____ 10-52
Exiting review mode and resuming the current session ____ 10-52
Tips, Tricks, and Adjustments ____ 10-53
General Configuration Tips ____ 10-53
Optimizing your Message Display Pages ____ 10-53
Exploiting Alarm Settings ____ 10-53
Deciding on your Session Timer and Lap Counter setup ____ 10-53
Adjusting the Lap Counter using the button ____ 10-54

Adjusting LED brightness using the button ____ 10-54
Adjusting The Latched Speed settings ____ 10-54

Chapter 11 Informer Operating Description ____ 11-57

General Description ____ 11-57
Main Screen ____ 11-57
Modes ____ 11-59
Warmup Mode ____ 11-59
Run Mode ____ 11-59
Pre-Review Mode ____ 11-59
Review Mode ____ 11-59

Chapter 12 Configure Your Informer ____ 12-61

CDS Link Software ____ 12-61
The "Signals" List ____ 12-61
CONFIG Tab ____ 12-62
MODES Tab ____ 12-63
TELLTALES Tab ____ 12-63
SIGNALS Tab ____ 12-64
User Channels & Bar Graphs Tab ____ 12-65
Performance Monitor Tab ____ 12-66
Baseline Lap ____ 12-66
Performance Monitor Displayed Values ____ 12-67
Upload your Configuration ____ 12-69

Chapter 13 Using your Informer ____ 13-71

A Typical Session with the *Informer* ____ 13-71
Power On ____ 13-71
First Time Use ____ 13-71
Warmup Mode ____ 13-71
Run Mode ____ 13-71
Pre-Review Mode ____ 13-72
Review Mode ____ 13-72
Clearing session data and starting a new session ____ 13-72
Exiting review mode and resuming the current session ____ 13-72
Tips, Tricks, and Adjustments ____ 13-72
Deciding on your Session Timer and Lap Counter setup ____ 13-72
Adjusting The Latched Speed settings ____ 13-72

Chapter 14 Solving Problems ____ 14-75

"Unexpected Data Message" on *Co Pilot 2 or Informer* ____ 14-75
"Bad Config" Message on Co Pilot 2 or Informer ____ 14-75

"Bad Config" Message when tying to upload a configuration to the Informer _____ 14-76
Displayed values on Co Pilot 2 or Informer are wrong _____ 14-76

Appendix A – Co Pilot 2 Button Action Table _____ 77

Appendix B - *Co Pilot 2* and *Informer* Preprogrammed Signals ___ 79

SPEED _____ 79
COMBINED_G _____ 79
IN_GEAR _____ 79
LUGGING _____ 79
OVER_REVS _____ 80
FUEL_USED _____ 80
LAP_TIME _____ 80
LAP_RUN_TIME _____ 80
BEST_LAP_TIME _____ 80
SESSION_TIME _____ 81
LAP_# _____ 81
PREDICTED LAP TIME _____ 81
TIME DIFFERENCE _____ 81
RECENT TIME DIFFERENCE _____ 82
BASELINE LAP _____ 82
BRAKE_BIAS (Co Pilot 2 only) _____ 82

Appendix C - Troubleshooting Journal _____ 83

"No Telltales or Lap Report" bug _____ 83

Appendix D – Sensor Calibrations _____ 85

CDS Sensors with Common Calibrations _____ 85
CDS Sensors with Unique Calibrations _____ 85

Chapter 1 Introduction and Unpack

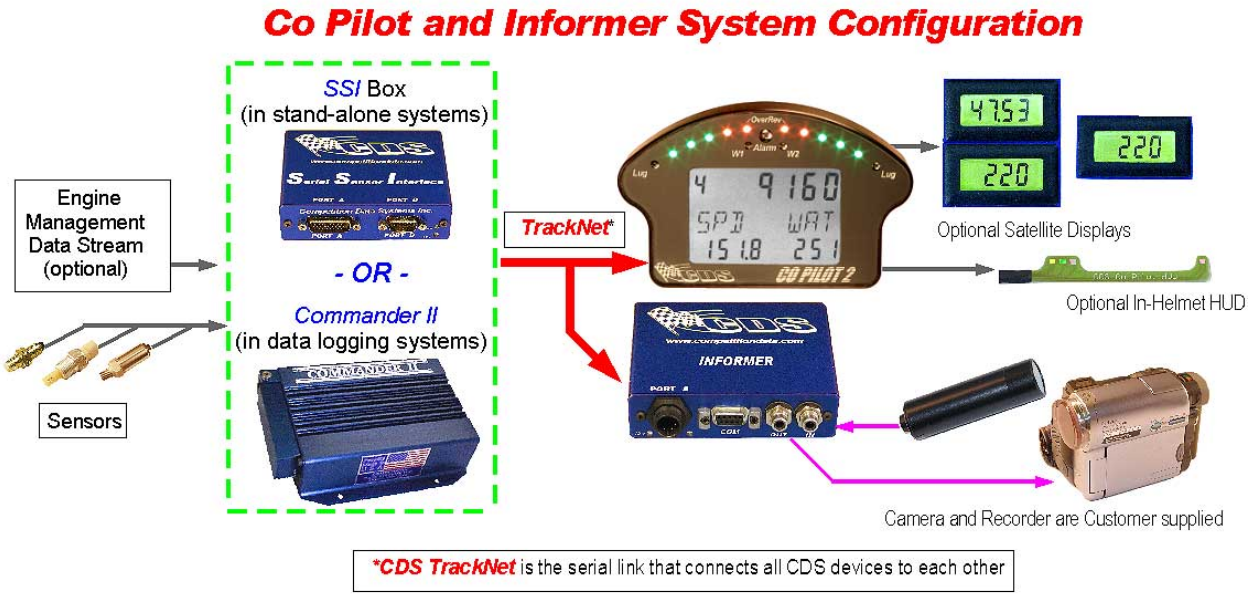
General

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.

How to use this manual

This manual covers the installation and operation of the ***Co Pilot 2*** driver display system and the ***Informer*** video data overlay system. It includes information on both stand-alone systems and systems connected to the ***Commander 2*** data logging system.

- 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 are connecting your *Co Pilot 2 or Informer* to an existing Commander 2 system, you can skip the chapter on SSI and Sensors installation.



How the system works

1. The ***Commander 2 or SSI*** sends data to the *Co Pilot 2* and *Informer* via a serial stream called CDS TrackNet. The Commander 2 or SSI also supplies the power to the *Co Pilot 2* and *Informer*.
2. If you have both an ***Informer*** and ***Co Pilot 2***, they connect to the Commander 2 or SSI via a "Y" cable.

- If your *Co Pilot 2* or *Informer* is a "stand-alone" system then it connects to a SSI. If you are using a *Co Pilot 2* or *Informer* as part of a data logging system, then it connects to a Commander 2
- You determine what data to send to the *Co Pilot 2* or *Informer* based on the settings in your CAR file, created or edited using the ***Command Link Version 5.4(or higher)*** software.

3. The *Co Pilot 2* or *Informer* Displays the data based on the configuration you create using the ***CDS Link*** software.

Requirements to use

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

1. A ***Commander 2*** system (with ROM version 41 or higher) OR a ***SSI.***
2. A PC with Windows 98 SE, 2000 ME, 2000 Pro, or XP operating system
3. *CDS Link* software version 5 (or higher) installed.
4. Command Link 5.4 (or higher) Software installed

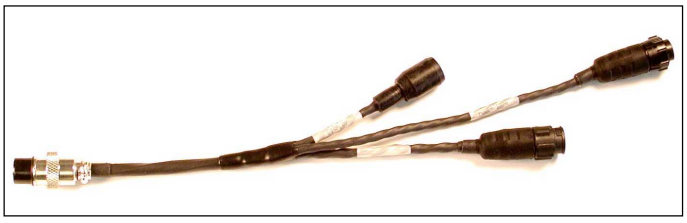
IMPORTANT NOTE: The upgrade from Track Master and Command Link 5.3 to 5.4 is supplied free of charge on our web site. If you are not presently running 5.3, you must purchase an upgrade.

Co Pilot 2 System includes

The Basic *Co Pilot 2* includes:

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

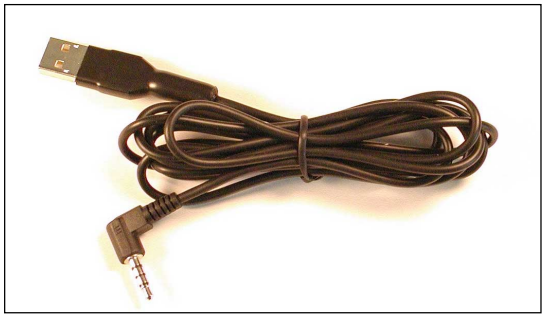
PLUS:



Co Pilot 2 **main harness**

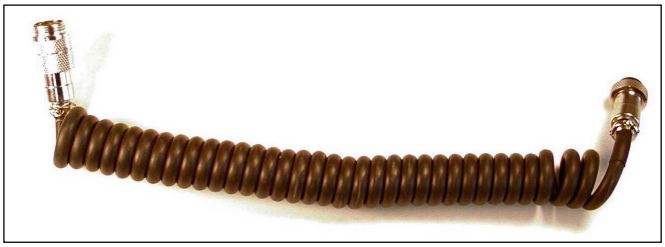
Push Button and button coil cord

PC USB Communication cable



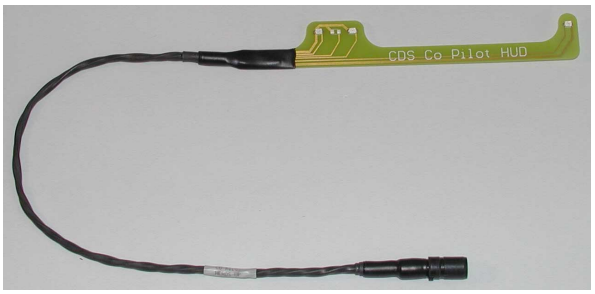
Optional Wheel Mount Coil Cord

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



Informer System includes

- *Informer* Unit
- *CDS Link* software CD
- *TrackNet* cable for connecting the *Informer* to either a Commander 2 or SSI.

Camera and Recorder

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

- CDS Now sells a high quality "lipstick" camera with microphone and wiring harness. Check our web site or call for details and pricing.
- 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.

Stand-Alone systems

If you purchased a "Stand Alone" *Co Pilot 2* or *Informer* Package then you also received a Serial Sensor Interface (SSI) box.

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

Chapter 2 Install SSI and Sensors

This chapter only applies to Stand Alone Co Pilot 2 or Informer systems with SSI Box. If you are using a Co Pilot 2 or Informer with a Commander 2, you can skip this section (although if you have not yet installed your Commander 2, you might want to look at the Sensors installation part of this chapter for tips on installing your 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 particularly if their ground straps are not connected to really good grounds.
- If you insist on using old fashioned stainless steel or solid core wires, expect intermittent and random problems.

Locate and Install 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.

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 RPM Sensors

The RPM sensor is used to measure the RPM of any shaft. ONE magnet is mounted on the shaft, wheel 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).

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.

Use the following recommendations for deciding how many magnets to use on each sensor:

- ENGINE RPM – 1 Magnet
- WHEEL RPM – 1 Magnet
- INPUT SHAFT – 2 Magnets
- DRIVE SHAFT – 3 Magnets

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 must be **LESS than 3/16" (0.18").** Set the gap with a feeler gauge. Larger gaps may cause unreliable readings.

SEN-17B, E, & M 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. Connect the sensor as follows:

1. SEN-17B, for Computerized Ignitions, Engine Management Systems, Crane Fireball, Newer Electromotive, and newer 6 series MSD boxes: Look for a TACH OUTPUT on the ignition computer and connect the WHITE wire from the SEN-17B to the TACH OUTPUT. When in doubt, connect the sensor to the same place as the in-dash tachometer.
2. SEN-17E, for old style Electromotive HPV 1: Connect the WHITE wire to the TACH output on the ignition box. Connect the BLACK wire to a GOOD ground as close as possible to the ignition system ground on the chassis.
3. SEN-17M, for Amplified, Conventional Ignitions (such as MSD): Connect the WHITE wire to the TACH output on the ignition box. On the MSD 6 series, this is a spade lug type connector at one end of the box. Connect the BLACK wire to a GOOD ground as close as possible to the ignition system ground on the chassis.

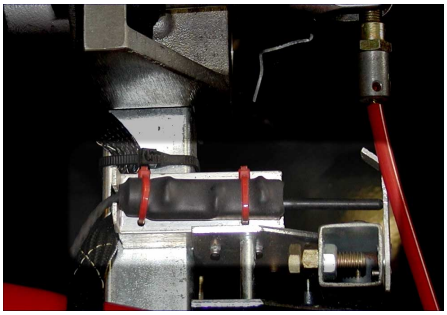
NOTE 1: Do not attempt to use this sensor without first installing SPIRAL CORE type ignition wires, as recommended in the manual.

NOTE 2: The SEN-17E and SEN-17M will not work on many of the modern ignitions, especially ignitions which are part of electronic engine management systems because they only provide a 5V low current pulse (for ignitions of this type, use an SEN-17B).

NOTE 3: These sensors are not recommended for use on Points Type Ignitions.

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

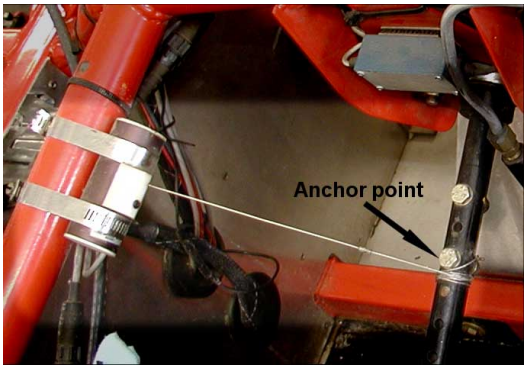


Make a flat tab to actuate the plunger. Use nylon wire ties to secure the sensor to a flat surface.

- 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.

SEN-38 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 mover 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.

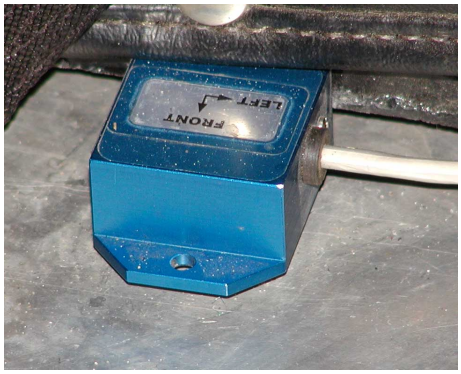
- Observe the cable. It is best if the cable does nor wrap up on top of itself. This can be accomplished by have the "anchor point" of the cable (the bolt head or hose clamp) a few inches up or down the shaft from the point where the cable naturally wants to "ride".

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.

SEN-28 S, D, and T Accelerometers



Mount the accelerometer to a flat surface using the dual-lock material provided. Observer the following suggestions for best performance:

- Choose a surface that will not resonate excessively. If mounting to a sheet metal pan, mount it near a frame member rather than in the middle of a panel that might vibrate too much.
- Mount it near the vehicle center of gravity for best results. Typically this is not super critical, and as long as the sensor no further than 20% of the vehicle wheelbase from its center of gravity.
- Mount it near the centerline if possible. Again, this is not super critical, and if you can get it within a foot or 2 of centerline that is fine.
- Keep the sensor as low as possible in the car, preferably below the vertical center of mass.
- Orient the sensor with the arrow marked FRONT pointing at the front of the car, and the arrow marked LEFT pointed at the DRIVER'S LEFT site of the car.
    - If you orient it differently then it must be recalibrated to comply with the sign conventions used in Track Master software.

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

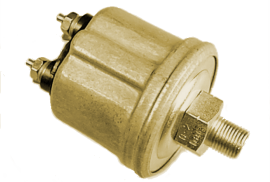
This sensor is used to measure water, oil or other fluid temperatures. Plumb the sensor into the fluid line such that liquid is always flowing over its "nose". If the nose of the sensor is trapped in a dead end Tee, it will not read the fluid temperature correctly.

- 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 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.



SEN-14C2 Encoded Photo Receiver

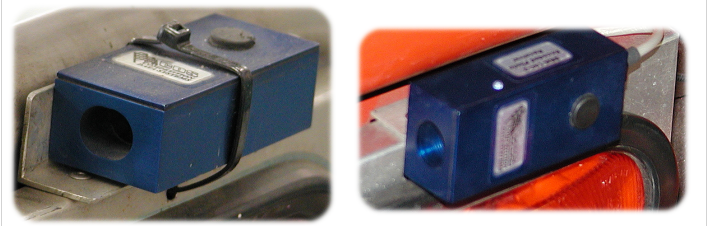
This sensor is used to mark segments of the track or log lap times. The sensor receives a modulated light beam from the SEN-25C beacon. Each time the sensor "sees" the beacon, the time is recorded. Therefore, if you have only one beacon on the track, then the photo receiver causes the *Co Pilot 2 or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

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.

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.

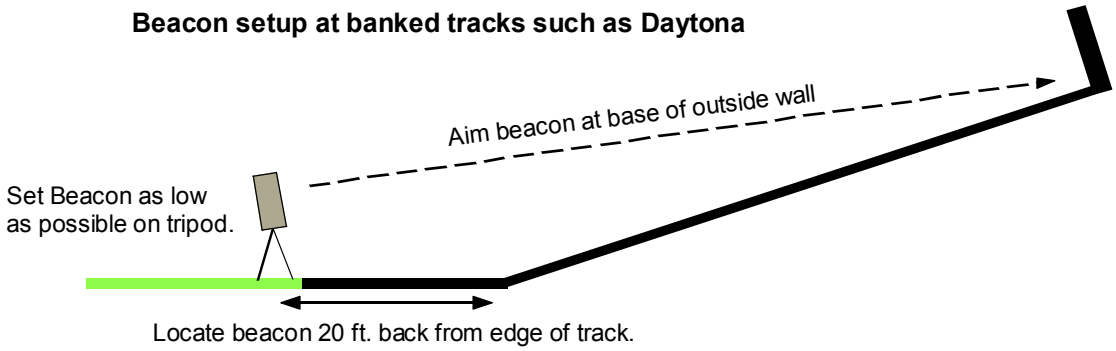
2. It is very important that the beacon **not be any closer than 20 feet** from the vehicle path because the width of the beacon's infrared light "cone" narrows drastically at distances less than 20 feet.

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.

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 Commander 2 **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 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.

Sensor Connectors

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

- Each connector locks in place with a ¼ turn

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

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

Power Cable

Connect the ORANGE wire to + 12 volts and the BLACK wire to GROUND.

- One of these leads should be connected directly to the switched side of the master switch. Either the + or – power lead can be switched.
- IMPORTANT: 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. Here are a few photos to help in your decision:

Formula Ford Wheel Mount

Mounting To Dash

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*s, 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.

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 large Coil Cord (steering wheel mount)

The optional large diameter coil cord is for connecting the main harness to 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.
- 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.

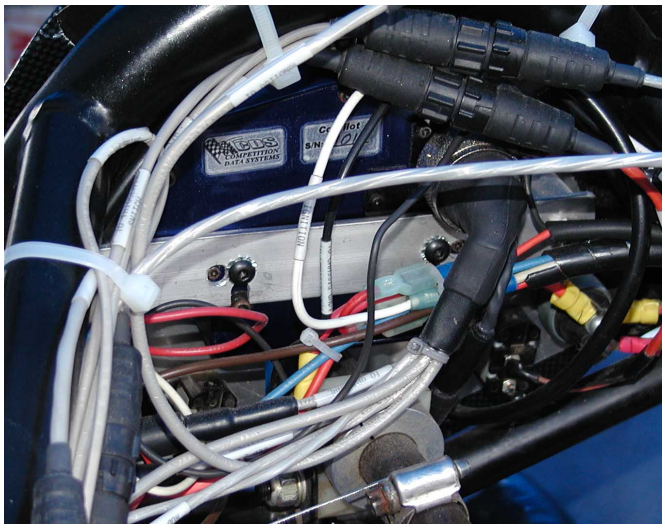
Install Push Button

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*.

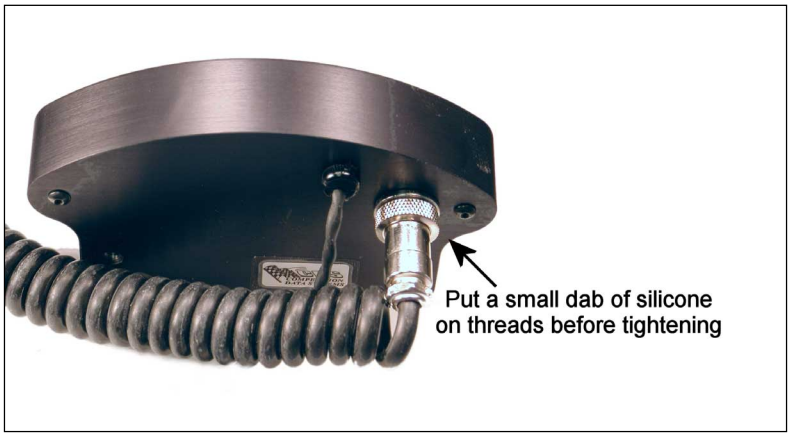
Install Wiring & Accessories

Install The Main Harness



The *Commander* 2 (or *SSI*) and all *Co Pilot 2* accessories connect through the main 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 large 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.
- **IMPORTANT NOTE**: 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

Up to 2 external alarm and warning LEDs can be connected. Both 5 and 10 mm diameter LEDs are available from CDS in several colors.

- 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*.
- 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

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 Commander 2 or SSI

*Co Pilot 2 w*ith Commander 2

Make sure your Commander 2 system has ROM version 41 or higher. Your Port 4 Harness on your Commander 2 should also have a cable labeled *" Co Pilot 2 Power and Data"* Connect this cable to the one on the *Co Pilot 2* main harness labeled "*Co Pilot 2 Power In"* .

- Use any standard CDS 5 position extension cable (if necessary) to connect these items. Extension cables are available from stock in lengths of 1 to 12 feet.

Co Pilot 2 with SSI

If you have a Stand Alone Display with SSI box, refer to the chapter "Install SSI and Sensors" installing the SSI and sensors, then return here to complete the checkout.

Preliminary Power Up Checkout

You are now ready to power up your *Co Pilot 2* for the First time. Turn the power switch on your Commander 2 ON.

- 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.
    - 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 should see a scrolling message "*Unexpected data from Commander 2…Please upload new configuration to Co Pilot 2."* This is normal and correct, indicating that the *Co Pilot 2* is running and is receiving data from the Commander 2
    - 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 the next chapter to install your software on your PC.

Chapter 4 Informer Hardware Installation

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

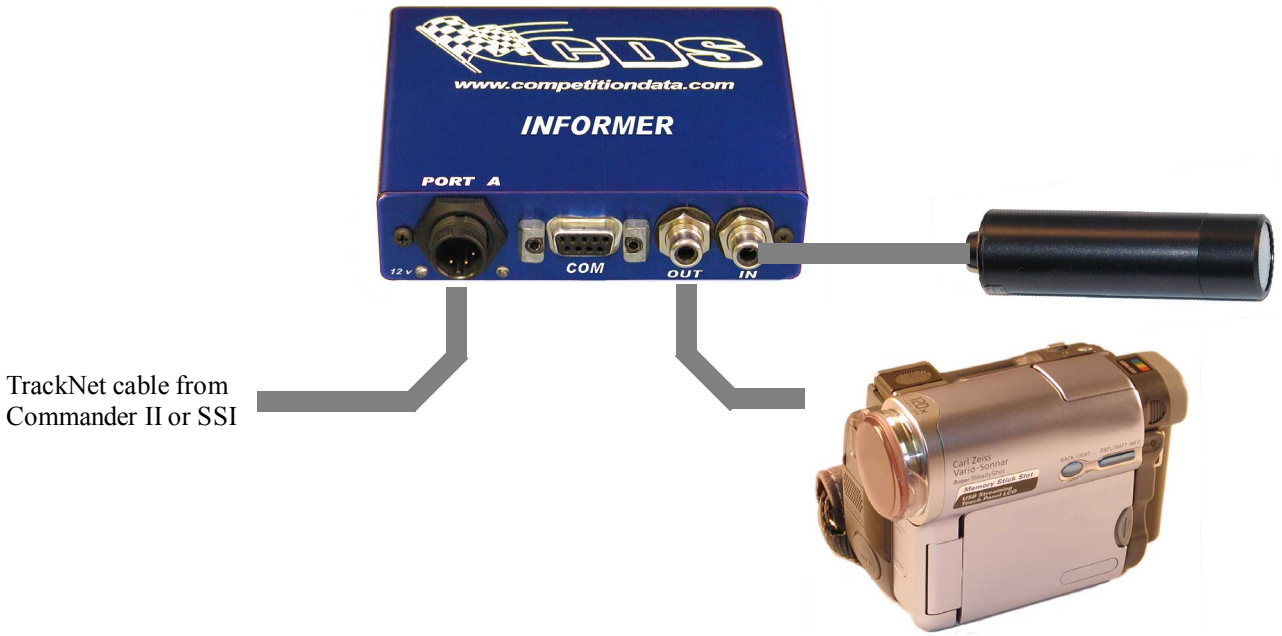
Locate and Install the *Informer*

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 Commander 2 or 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. If you have a Commander 2, the best place to mount the *Informer* might be right on top of the Commander 2.

Install Wiring



Informer only

Connect the 8 position cable labeled "TrackNet" (coming from your Commander 2 or SSI) to PORT A on the *Informer*.

Informer with Co Pilot 2

The Tracknet cable coming from your Commander 2 or 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

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

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

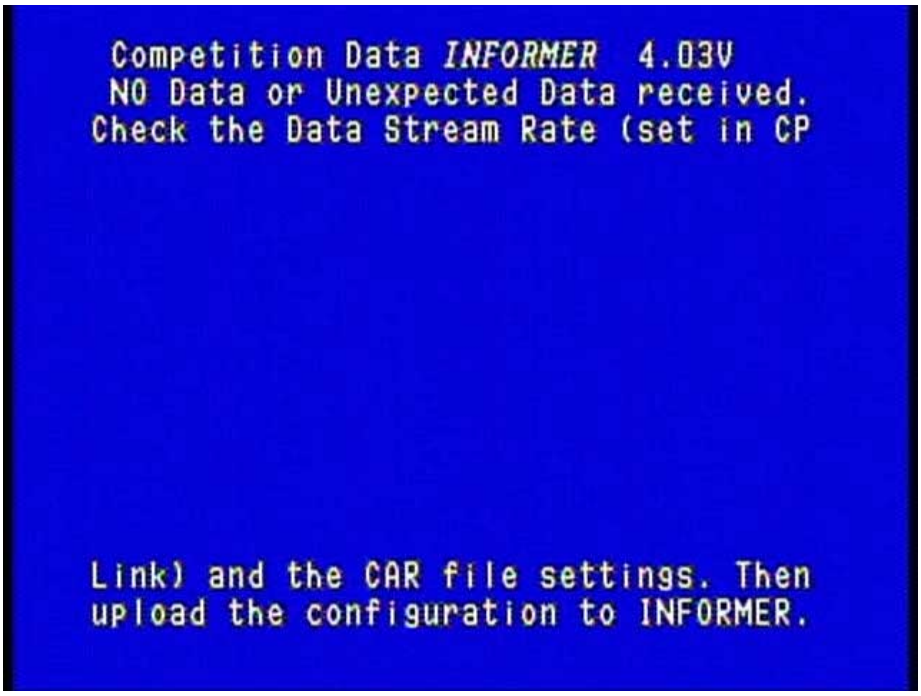
Informer with SSI

If you have a Stand Alone system with SSI box, refer to the chapter "Install SSI and Sensors" for installing the SSI and sensors, then return here to complete the checkout.

Preliminary Power Up Checkout

You are now ready to power up your Informer for the first time. Turn the power switch on your Commander 2 ON. (If you have an SSI, turn on its power source).

- 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 you purchased a stand-alone Informer to be used without a PC, then you should see the default screen showing live data.

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

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.**
2. **Allow the software to install itself in its DEFAULT or RECOMMENDED LOCATIONS**.

Co Pilot 2 or *Informer* with Commander 2

NOTE: BE SURE TO PLUG IN YOUR HARDWARE KEY (USB or PARALLEL PORT) BEFORE INSTALLING TRACK MASTER !!!!

1. **IMPORTANT!** First install the Track Master 5.2 CD (skip this step if you already have TM 5.2 installed or higher installed on your PC.)
   - To check your existing version, start Track Master, click on *Help*, then click on *About Track Master.* Your version will be displayed. It must be Revision 5.2.100.100 or higher. If it is 5.1 or lower, contact CDS to upgrade to 5.2 before installing the *CDS Link* CD
2. Insert the *CDS Link* 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. Once the installation is complete, you should have icons on your desktop for *Track Master 2000, Command Link 2000*, and *CDS Link* . Verify that your Track Master was updated by checking the version number as described in step 1. It should be 5.4.xx.xxx 9or higher).

Stand Alone *Co Pilot 2 or Informer* with SSI

1. Insert the *CDS Link* 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.
2. Once the installation is complete, you should have icons on your desktop *for Command Link 2000* and *CDS link*.

Installing USB Drivers (Co Pilot 2 Only)

PLEASE FOLLOW THESE INSTRUCTIONS EXACTLY AND YOU SHOULD HAVE NO PROBLEMS

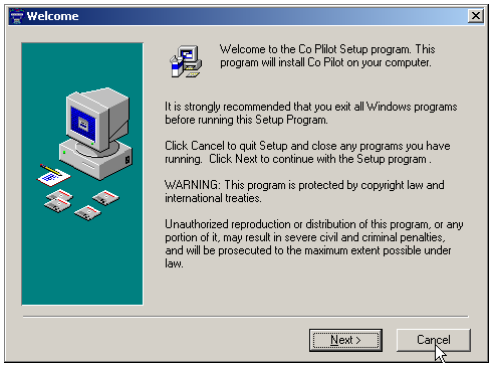
Preparation

The *Co Pilot 2* Communicates with the PC via a USB connection. The drivers for the USB device must be installed the first time you connect your PC to the Co Pilot 2.

- drivers needed are supplied on the Co Pilot Link CD.

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 Co Pilot 2 now, using the black cable provided.

- **NOTE:** The power must be ON to the Co Pilot 2 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.

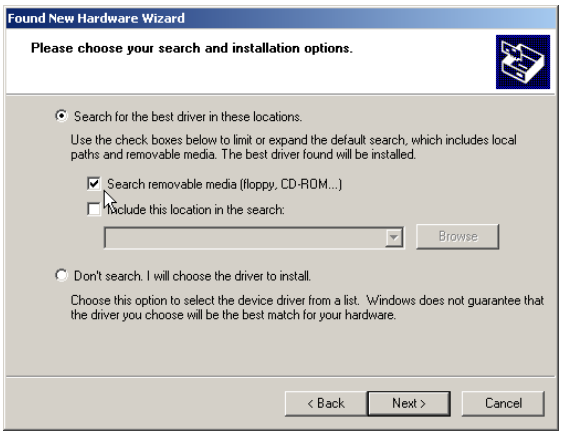
The Windows "Found New Hardware" wizard should start, and you should see a dialog that looks like this:

- 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.

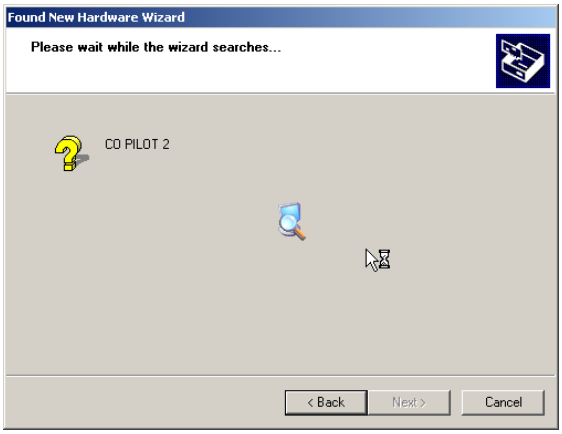
Click the *Search for the best drivers* option.

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



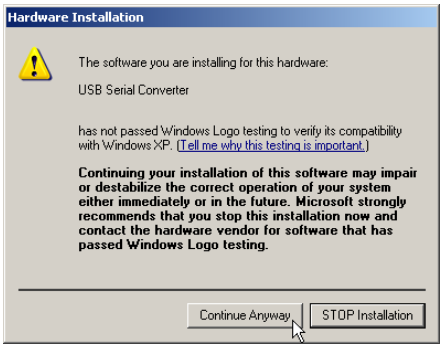
NOTE: IF you have already installed your *CDS Link* software AND you do not have your CD handy, then Un-Check the *Search removable media* box and check the *Include this location…* box. Then click the *Browse* button and navigate to your *C:\PROGRAM FILES\CO PILOT\VCP DRIVERS* folder.

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



You may see a warning like this:

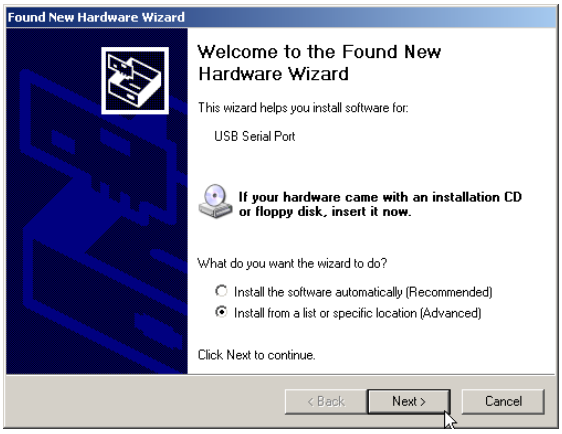
If you do, click *Continue*



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.

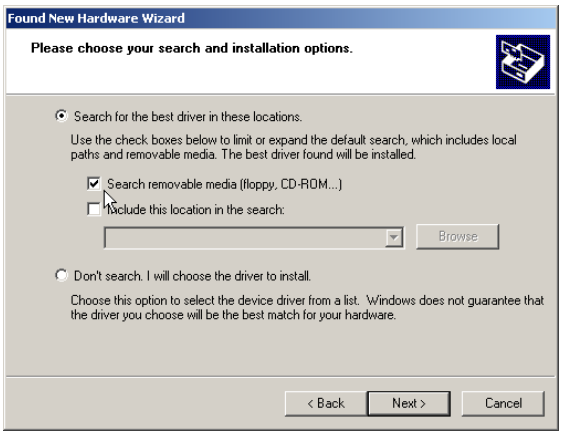
Click the *Install from specific* location option, then click *Next.*

- 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.*

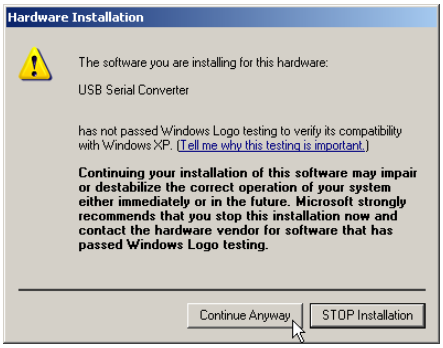


NOTE: IF you have already installed your *CDS Link* software AND you do not have your CD handy, then Un-Check the *Search removable media* box and check the *Include this location…* box. Then click the *Browse* button and navigate to your *C:\PROGRAM FILES\CO PILOT\VCP DRIVERS* folder.

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.

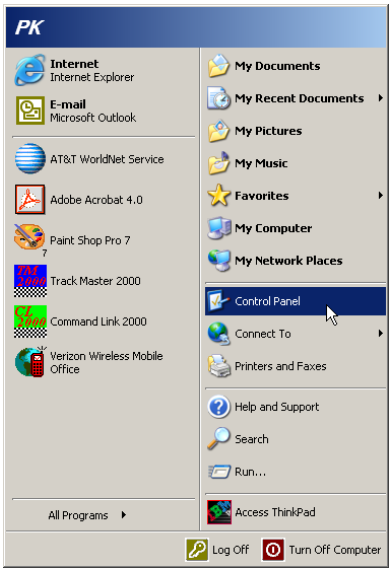


- All of the LEDs on the Co Pilot 2 should light up, and a message " PC CONN" should be displayed on the LCD screen.

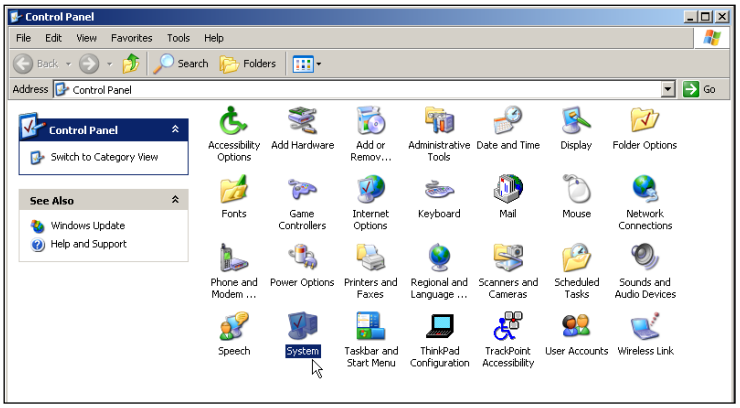
Determine COM port used

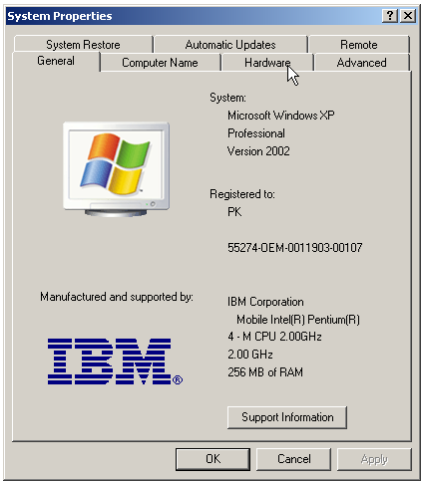
Finally, we must determine which COM port the system has assigned to the Co Pilot 2.

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



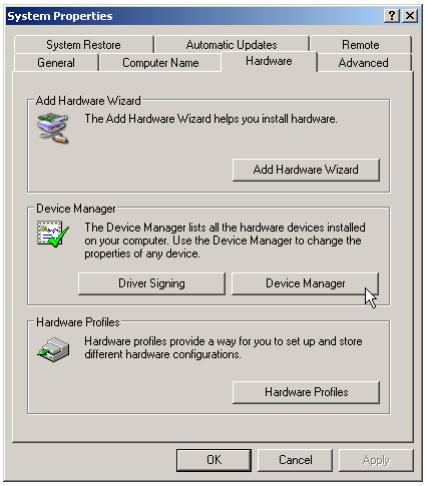
Click *System*

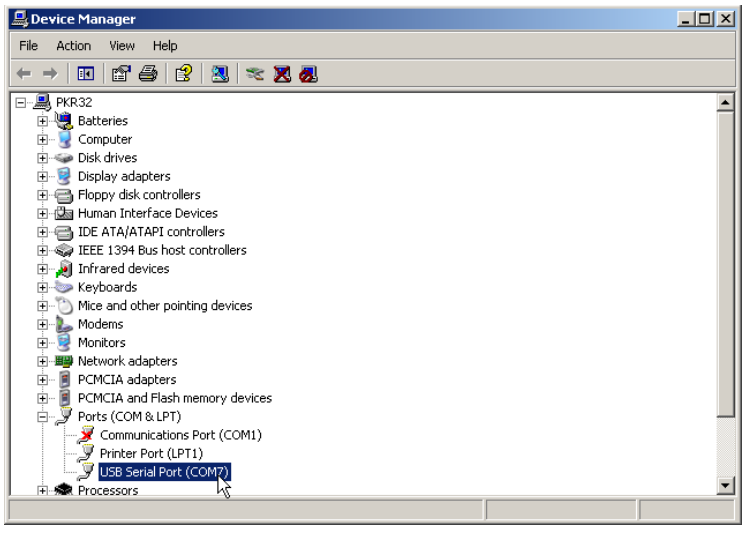




Then click the *Hardware* Tab

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.

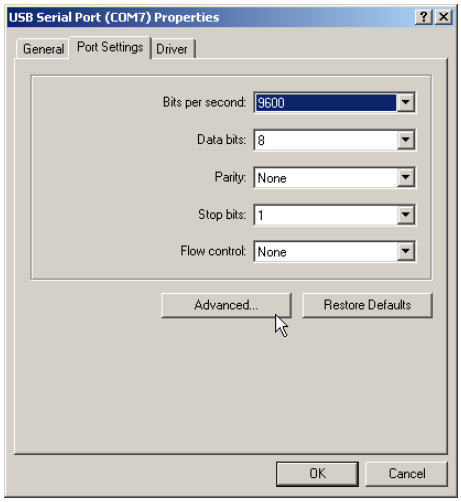
If the COM port assigned is higher than 9, change it by following the instructions in the next section.

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

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:

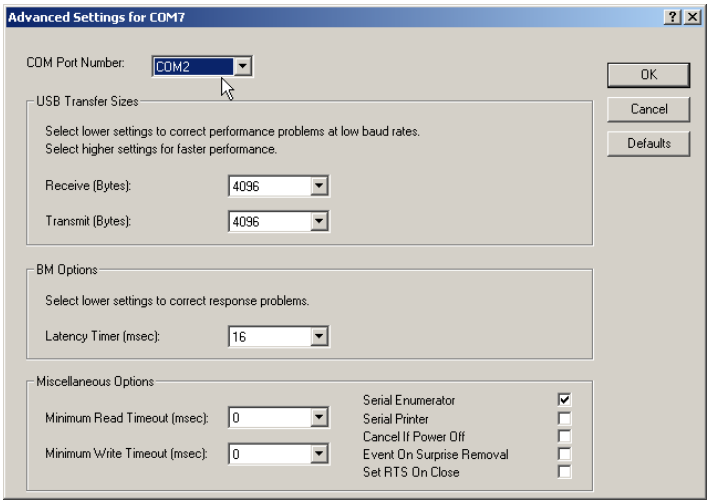
In the *Device Manager* (see previous page), right-click on the *USB Serial Port (COMx)* item, then left-click on *Properties.* You should see its *Properties* dialog.



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 of the Co Pilot & Informer Link software. (See the first item in chapter 9)

Chapter 6 Configure Commander 2

Skip this chapter if you have a Stand Alone Co Pilot 2 or Informer System (With SSI)

General

Both the Commander 2 and the *Co Pilot 2 or Informer* need to be configured for everything to work.

- The Commander 2 is configured as always, by editing your car file and either uploading it to your Commander 2 or putting it on a memory card.
  - Some additional information is required in the CAR file for the Commander 2 to work properly with the *Co Pilot 2 or Informer*
- The *Co Pilot 2* and *Informer* are configured using *CDS Link*.

Note:

Some information such as your tire rollout is used by both the Commander 2 and By the *Co Pilot 2 or Informer*.

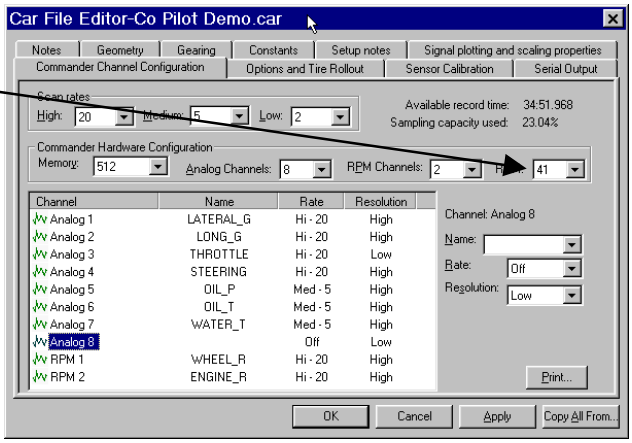
- Some of the information which is used by both devices (Tire Rollout for example) can be edited in either the CAR file editor (in Command Link) or in *CDS Link*. This saves you from having to enter the "common data" in 2 places, AND eliminates possible errors caused by conflicting data.
- Since the CAR file can be edited by 2 different programs, it is important to only run 1 of the programs (*Command Link* or *CDS Link*) at a time.

Edit your Car File to Configure your Commander 2

First, configure your Commander 2 to tell it which data you want it to send to the *Co Pilot 2 or Informer*. Start Command Link and click *Edit Car File*…. Select the CAR file supplied with your Commander 2, or if you have already made some changes, select your current CAR file.

Set your ROM version

In the upper right of the *Commander Channel Configuration* tab, set the ROM version to the ROM your Commander 2 has. (Check the sticker on the side of the Commander 2) It must be 41 or higher.

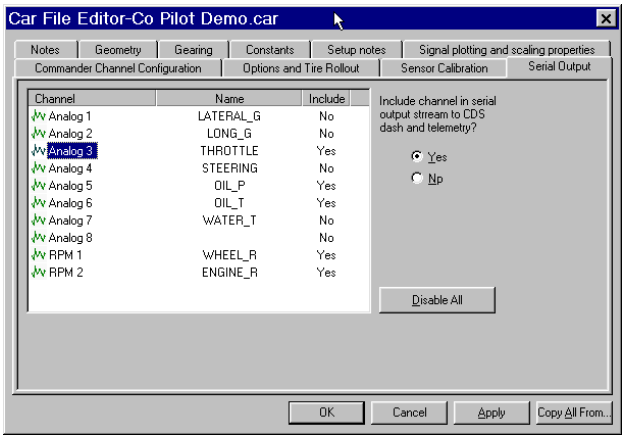


Enable Channels for Recording

Make sure that any signals that you want to send to the *Co Pilot 2 or Informer* are also enabled for recording in the Commander 2. The signals can be set to any sample rate group (Hi, Med, Low).

- You **MUST** have a signal named either WHEEL_R or SPEED enabled for recording.
- You should have a signal named ENGINE_R enabled for recording.

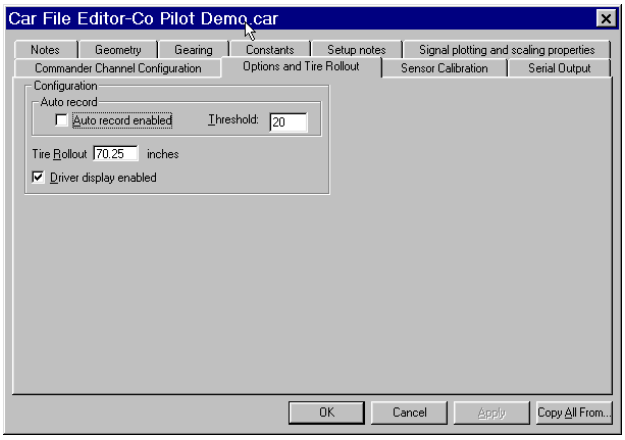
Enable Channels for Serial Output



In the *Serial Output Tab,* set the signals you want to send to the *Co Pilot 2 or Informer* to YES.

- ENGINE_R and WHEEL_R must be present and set to YES.
- THROTTLE must be set to YES for the LUG light to work properly.
- If you can not change a signal to YES then either its sample rate is set to OFF or the ROM version is incorrectly in the *Commander Channel Configuration* tab. Go back to the previous step and correct these items.

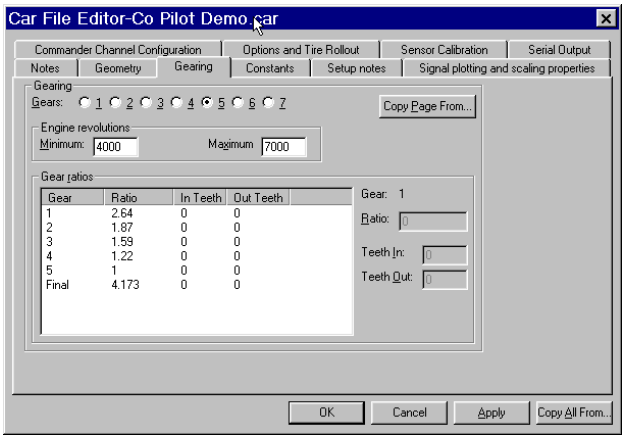
Set your Tire Rollout



The *Co Pilot 2 or Informer* uses the Tire Rollout from your CAR file for converting WHEEL_R to SPEED. The *Co Pilot 2 or Informer* Link software pulls this data out of the CAR file when you send a setup to the *Co Pilot 2 or Informer*.

- This saves you from having to enter the data in 2 places (i.e.: in the car file editor of CL and in *CDS Link* software.)

Set your RPM and Gearing Parameters



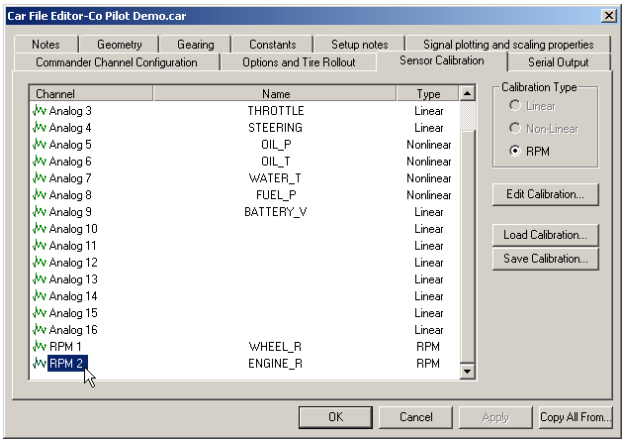
The Minimum RPM value is used (along with throttle data) to drive the LUG light on the *Co Pilot 2 or Informer*.

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

The Gear ratios are used to by the *Co Pilot 2 or Informer* 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 or Informer* would also be on at that place on the track.

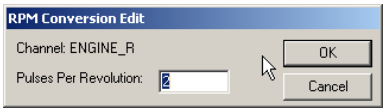
Set your Engine RPM calibration



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 *Sensors Calibration* tab in the CAR file editor. 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 magnetic (SEN-4) sensors with 1 magnet enter 1. IF you are using more than 1 magnet enter the number of magnets.
- For electrical or ignition type RPM sensors (SEN-17) connected to 4 stroke engines enter the number of cylinders divided by 2. (Example: enter 2 for a 4 cylinder engine).
- 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.

After entering your correct value, click OK, then OK again to exit the car file editor. (your changes are saved automatically).

Changing calibrations of other sensors

All CDS systems are shipped with a CAR file containing the calibrations for the sensors included in the system. If you are adding a sensor or If you feel that a sensor is not calibrated properly the refer to the following procedures:

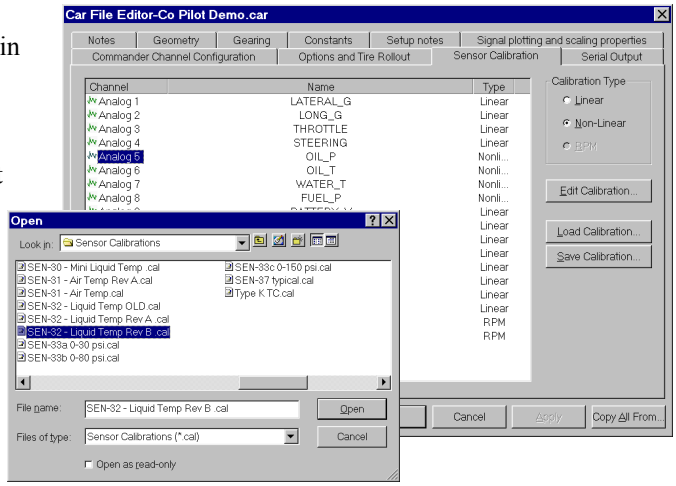
Sensors with common calibrations

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 for a sensor, edit your CAR file (see procedure on previous page), go to the *Sensor Calibrations* tab:

Highlight the Analog channel for the sensor you want to change. (Analog 5 in this example).

Click the *Load Calibration…* button at the right.

Referring to Appendix D, select the correct file for the sensor, then click *open*.

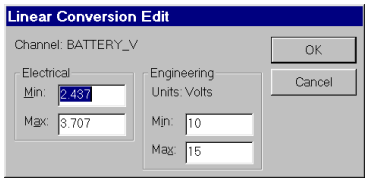


- IF you do not see a list of sensor calibrations in this dialog, your software is probably not "looking in" the correct folder. Pull down the "*Look In:*" menu and navigate to your *\program files\track master\sensor calibrations* folder.

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 CAR 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.



Interactive Calibration of Sensors

Some sensors require interactive calibration after installation. For example, the throttle sensor does not need to use the full sensor travel to accurately measure 0 to 100% throttle, but a calibration should be done so that the portion of the travel being used is calibrated to the 0-100% range.

Common sensors that should be interactively calibrated include the THROTTLE and STEERING.

Procedure

- Have the Commander 2 power ON, and Trigger switch OFF. The green light should be blinking slowly, about once per second. (NOTE: memory card units must have the memory card in the Commander 2).
- Connect your PC to your Commander 2
- Open Command Link
- On the *Commander Communications* tab, click *Sensor Calibrate…*
- Follow the on screen instructions to take readings as you move the sensor through its range.

For THROTTLE, taking 2 points (1 at 0% and 1 at 100%) is usually adequate.

Steering

For STEERING there are 2 ways you can do it, depending on what you are doing with the data as follows:

1. If you are doing detailed vehicle dynamics analysis using the math channels, you probably want the steering calibrated in terms of spindle angle. Put the car on a set of turn plates and take multiple points at 2 degree increments of spindle rotation
2. IF you are using the steering data for general driving and handling analysis, calibrate it in terms of STEERING WHEEL rotation. Take a reading at 0, then one at 90 degrees left, and 90 degrees right.

VERY IMPORTANT NOTE: In either case, make sure you enter the degree readings as POSITIVE numbers for the car turning left and NEGATIVE numbers for the car turning right. If you do it the other way then the driver controls animation in Track Master will show you turning left in right hand turns!

Upload your Configuration

When you are done, either upload your configuration to your Commander 2 or prepare your memory card for recording, depending on which model Commander 2 you have. For more information, see the Track Master and Command Link operating manual.

IMPORTANT: Whenever you make changes in your CAR file as described above, you must UPLOAD your configuration to your *Co Pilot 2* or *Informer* using *CDS Link* software. See the following chapters.

Chapter 7 Configure Your CAR file (SSI box Only)

Skip this chapter if you have a Co Pilot 2 or Informer System connected to a Commander 2

General

For the most part, your *SSI* is pre-configured for your application. There are only a few items that might need changing in your CAR file based on your installation.

DO NOT change any items in your CAR file that are not specifically listed in this section.

Edit your Car File

Start Command Link and click *Edit Car File*…. Select the CAR file supplied with your system. Usually the CAR file name will contain the customer's name or the system package (such as RC500).

Set your RPM and GEARING Parameters

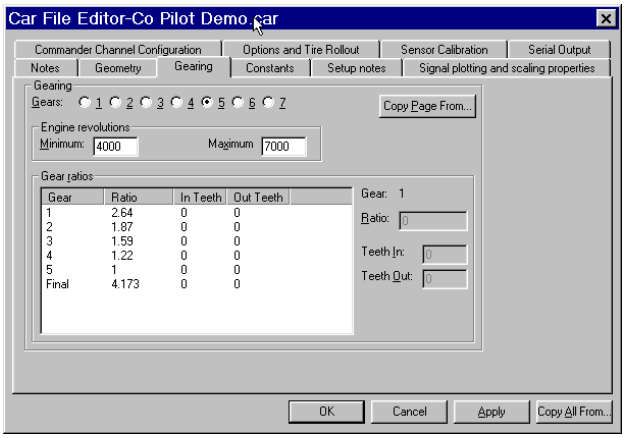
Click the *Gearing* tab to edit.

Enter your Minimum RPM value, which is used (along with throttle data) to drive the LUG light on the *Co Pilot 2 or Informer*.

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

- The Min and Max RPM can also be edited in *CDS Link.*

The Gear ratios are used to by the *Co Pilot 2 or Informer* to calculate the IN_GEAR signal for display.

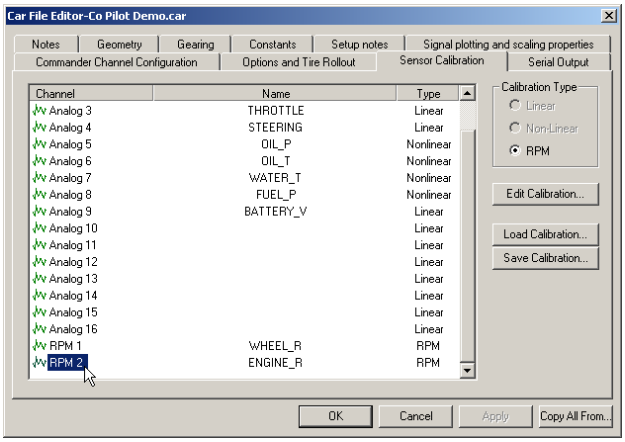


Set your Engine RPM calibration

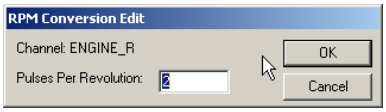
The correct *pulses per rev* must be set in order for engine RPM to be displayed correctly. If your RPM seems to read incorrectly, verify this setting and change it as necessary as follows:

Click the *Sensors Calibration* tab in the CAR file editor. 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 magnetic (SEN-4) sensors with 1 magnet enter 1. IF you are using more than 1 magnet enter the number of magnets.



- For electrical or ignition type RPM sensors (SEN-17) connected to 4 stroke engines enter the number of cylinders divided by 2. (Example: enter 2 for a 4 cylinder engine).
- 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.

After entering your correct value, click OK, then OK again to exit the car file editor. (your changes are saved automatically).

Changing calibrations of other sensors

All CDS systems are shipped with a CAR file containing the calibrations for the sensors included in the system. 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

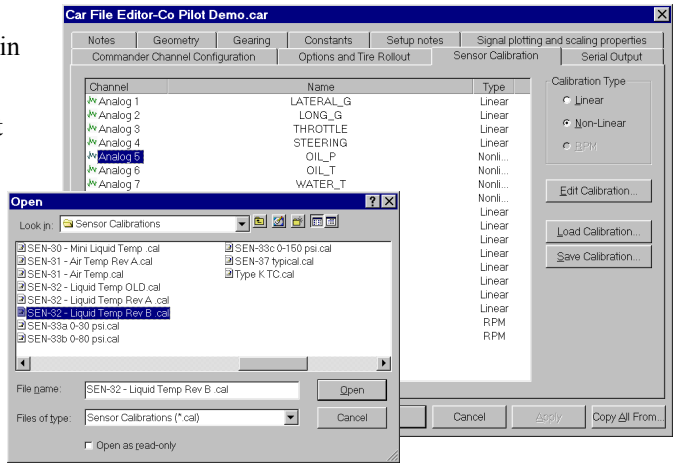
Many CDS sensors have common fixed calibrations, meaning that the same calibration file is used for all "copies" of those sensors. Consequently they are "field interchangeable" and if you need to replace a sensor there is no need to reset its calibration. Appendix D contains a table of these sensors along with their calibration file. To load a calibration file for a sensor, edit your CAR file (see procedure on previous page), go to the *Sensor Calibrations* tab:

Highlight the Analog channel for the sensor you want to change. (Analog 5 in this example).

Click the *Load Calibration…* button at the right.

Referring to Appendix D, select the correct file for the sensor, then click *open*.

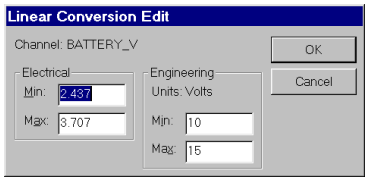
- IF you do not see a list of sensor calibrations in this dialog, your software is probably not "looking in" the correct folder. Pull down the "*Look In:*" menu and navigate to your *\program files\track master\sensor calibrations* folder.



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 CAR 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.



Update your Co Pilot 2 or Informer

IMPORTANT: Whenever you make changes in your CAR file as described above, you must UPLOAD your configuration to your *Co Pilot 2* or *Informer* using *CDS Link* software. See the following chapters.

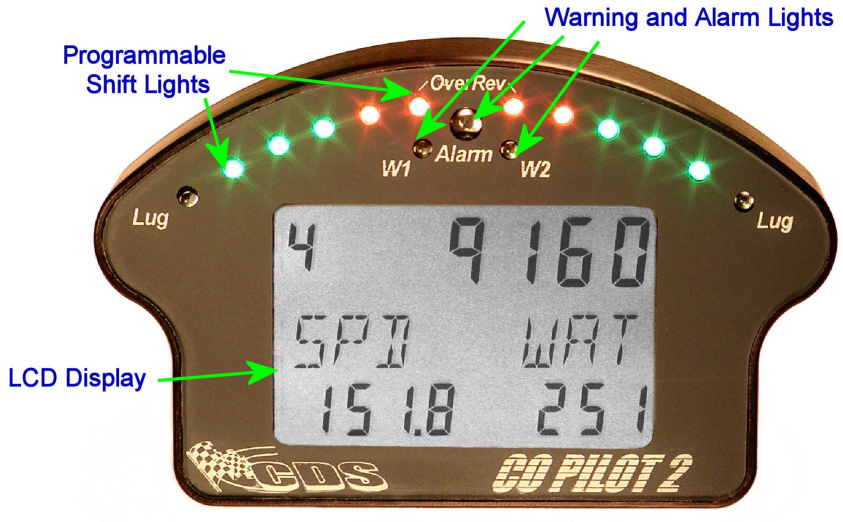
Chapter 8 Co Pilot 2 Operating Description

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.

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.

Chapter 9 Configure Your Co Pilot 2

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

CDS Link Software

Setting the COM port

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 below.

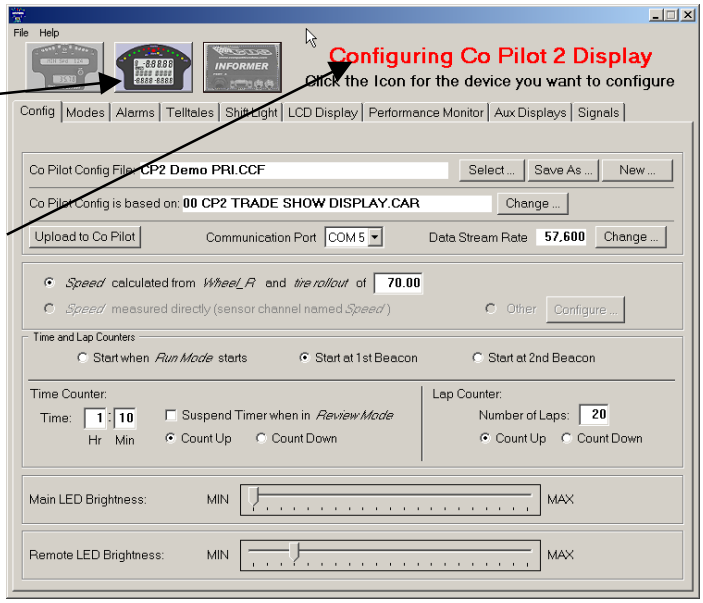
General

Now it is time to tell your *Co Pilot 2* how to display the data it receives from the Commander 2 or SSI. Start the *CDS Link* Software by double clicking its icon:

Program Modes

Version 5 of *CDS Link* is used to configure the *Co Pilot 2,* The Original *Co Pilot,* and the *Informer.*

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

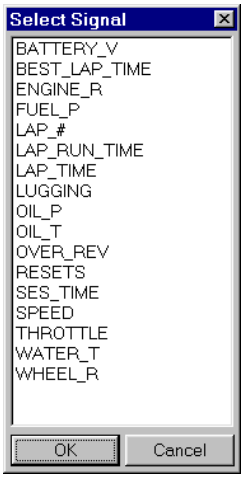


If your program is not in "Co Pilot 2 Configuration" mode, press the *Co Pilot 2* icon now.

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 *Co Pilot 2*
  - **NOTE**:If a raw signal (Oil_P for example) is not present in the list and you think it should be, go back to your CAR file editor and check to be sure that the channel with that signal name is both turned on for recording (in the Commander Channel Configuration tab) and is set to *Yes* in the Serial Output Tab.
- 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.



- If a preprogrammed signal (Lugging for example) is not present in the list and you think it should be, go back to your CAR file editor and check to be sure that the signals that Lugging ***Depends on*** are turned on for recording (in the Commander Channel Configuration tab) and set to *Yes* in the Serial Output Tab. For example, Lugging depends on both Engine_R and Throttle.

Co Pilot 2 Preprogrammed Signals

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

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 well 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.

Create your *Co Pilot 2* Config file

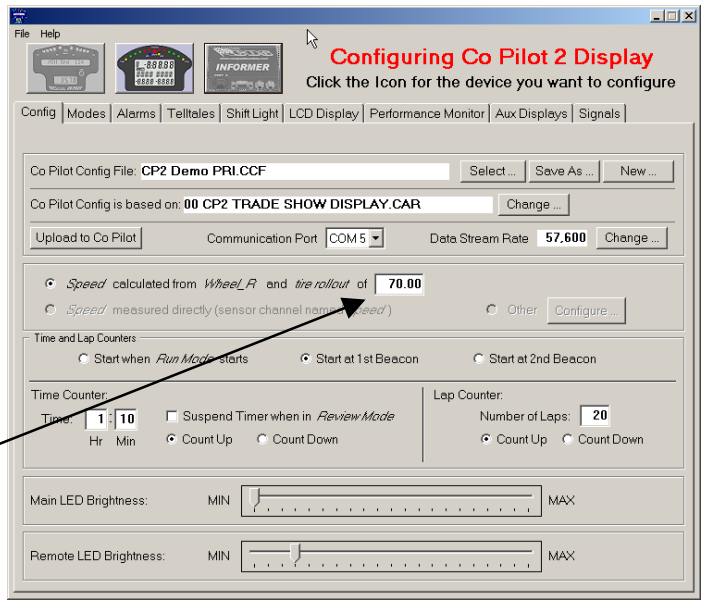
It is generally easier to modify an existing configuration file than to create one from scratch, so here we will teach you to create your own config by modifying the *Co Pilot 2* Demo config file.

First, press the *Save As* button and save the current configuration, giving it a name meaningful to you.

Next, hit *Change* to change the CAR file specification to the CAR file you created or edited in the previous steps.

(**NOTE**: If you have a stand-alone Co Pilot 2 then select the CAR file supplied with your system. The name of this file is written on your CD Label).

Your tire rollout should now be the value you entered in your CAR file. If it is not correct then enter the correct value now. (The tire rollout is circumference of the tire, in inches).



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.

Set the Data Stream Rate as follows:

Setting	Application
9600	*Co Pilot 2* gets its data from a Commander 2 data logger **AND** the Commander 2 is receiving serial data from a MBE engine management ECU, as used in the SCCA Formula spec car with Duratec engine.
19,200	*Co Pilot 2* gets its data from a Commander 2 data logger **AND** the Commander 2 is receiving serial data from: • A PECTEL engine management ECU, as used in the Zetec F2000 car and the Toyota Atlantic car OR • A Compatible Motec engine management ECU
57,600	*Co Pilot 2* gets its data from a Commander 2 data logger **AND** there is no engine management ECU supplying data to the Commander 2. OR *Co Pilot 2* gets its data from CDS SSI box (stand alone display applications). NOTE: use this setting even if the SSI is connected to an engine management system.
115,200	Future use

Lap and Time Counter

Configure the *Time Counter* and *LAP Counter* to suit your preferences.

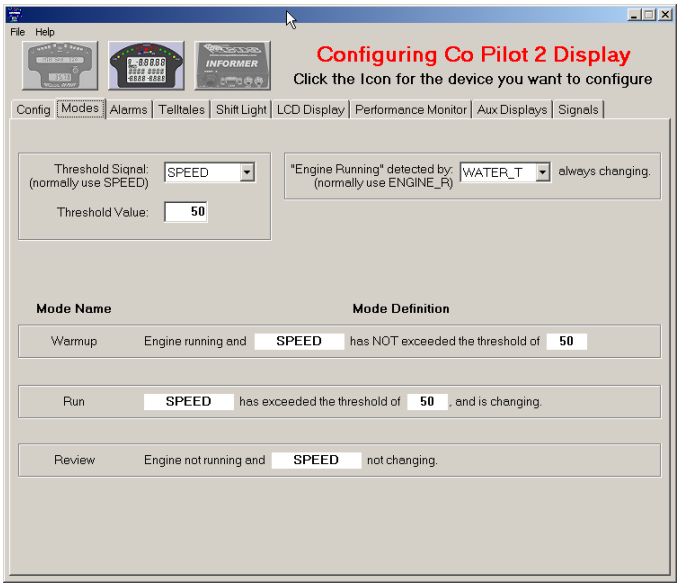
- Usually in a race of a specific number of laps most people want the lap counter to count "down".
- In a timed session such as qualifying, most people prefer the timer to count down.

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 chapter 8 or 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 CAR file does not have a WHEEL_R or SPEED signal defined, turned on, and included in the serial output stream. Go back to COMMAND LINK and correct this before proceeding.

Set the *Threshold Value*. This is the speed at which the *Co Pilot 2* automatically switches from Warmup to Run mode.

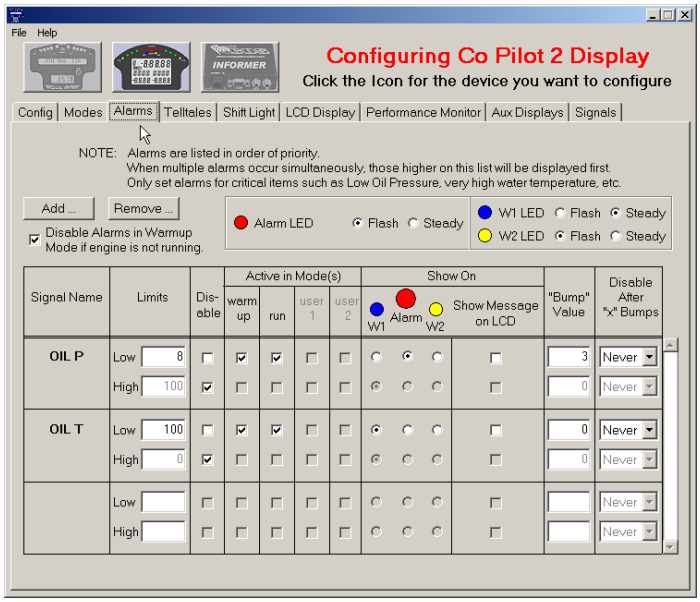
- Set it to a value that is high enough such that you do not switch to Run mode while driving through the paddock or to the grid.
  - 50 mph is usually a good setting.
  - 20 mph is too low

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

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, 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 not enabled (box not 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 if 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

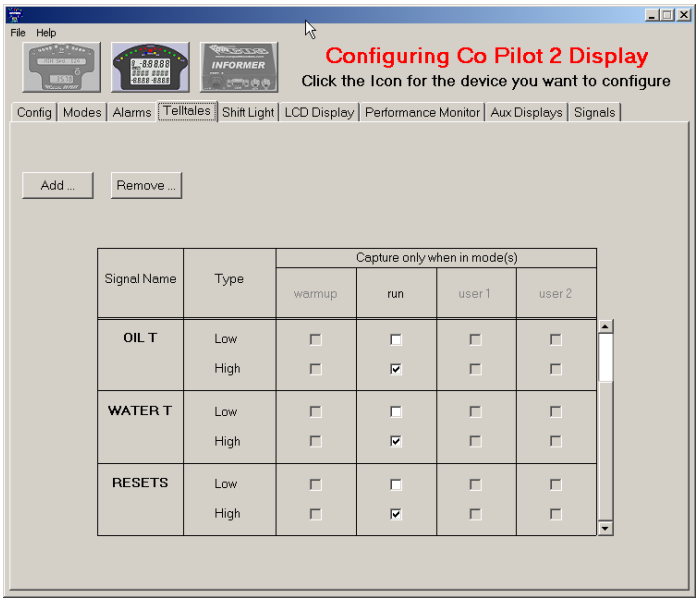
When an alarm occurs in run mode, pressing the button will clear it (disable it for about 5 seconds) AND it will bump the limit value if bumping is enabled.

TELLTALES Tab

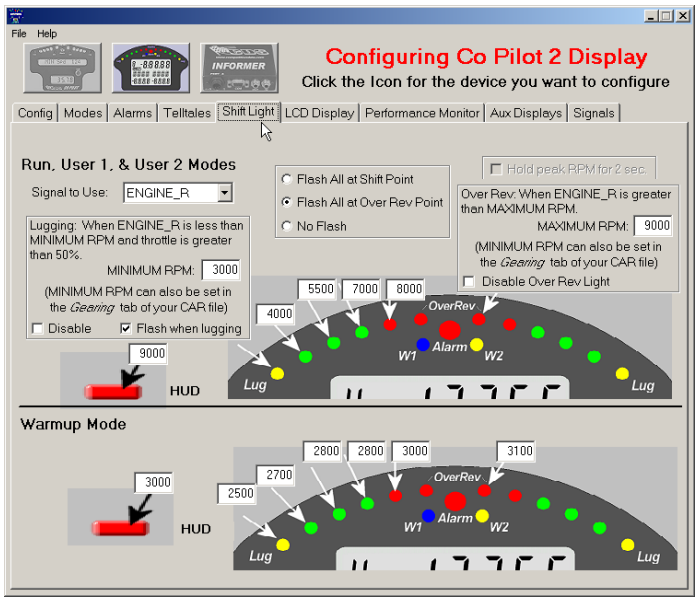
Telltales capture the highest, or lowest, (or both) value that the signal reached *during hot lap* only.

- 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



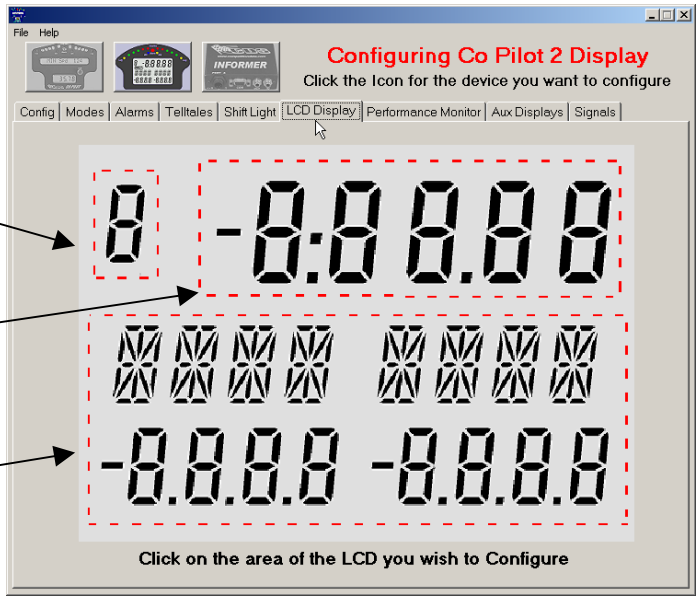
Select the signal to use for the shift light. 99% of applications will use ENGINE_R for this.

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

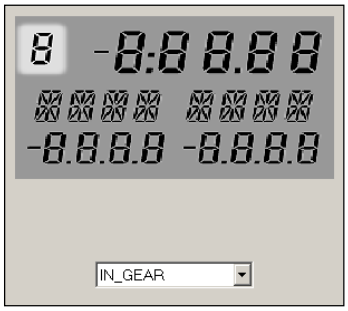
- The RPM limits for the Over Rev and Lug lights are set in your CAR file OR in this screen. You can change these values in your CAR file (using Command Link) OR change them in this tab.
- Since either Command Link or *CDS Link* can change the values for *Minimum RPM* and *Maximum RPM*, it is important that you do not have the same CAR file open for edit in Command Link while you are editing it in *Co Pilot 2* Link. To be on the safe side, simply close Command Link when you have *CDS Link* open, and visa-versa.
- 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

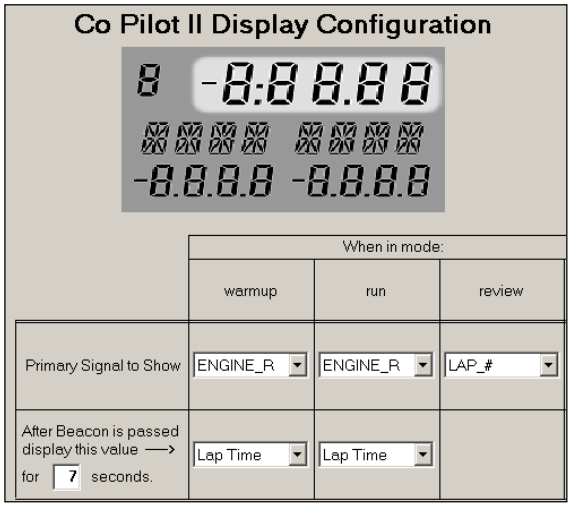


Click the area and you see:

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.

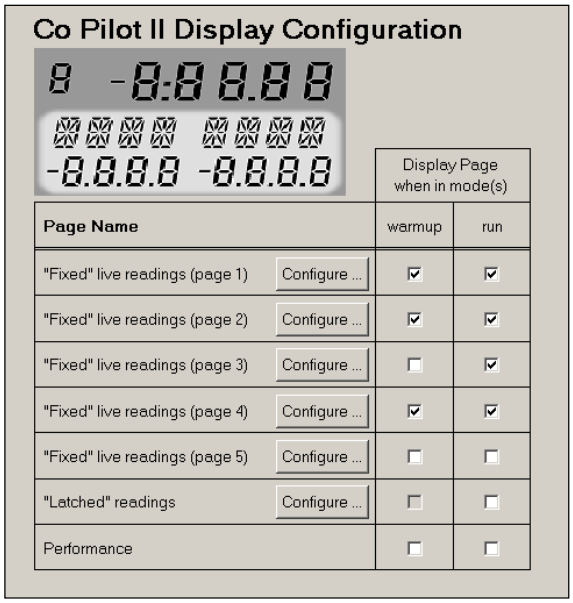
Upper Area



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

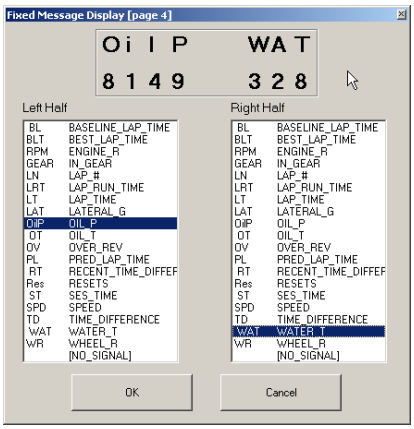


Click the area and you see:

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 *Co Pilot 2* 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 *Co Pilot 2* Link.
-

"Latched" readings page

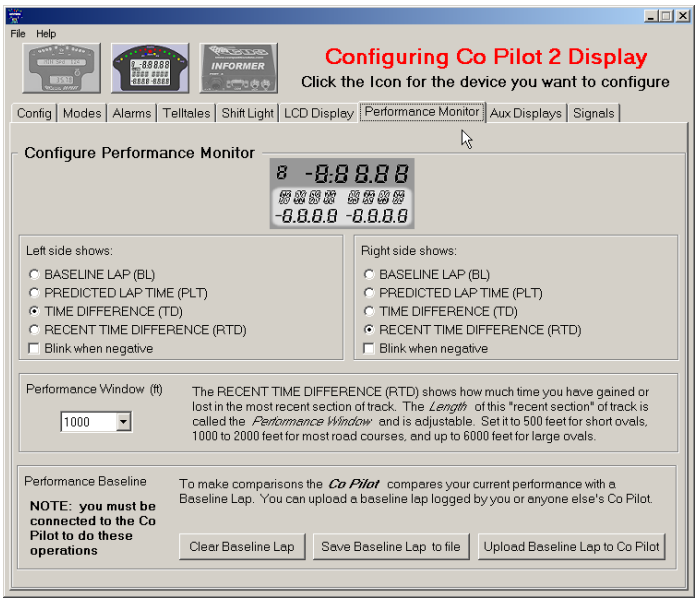
The latched readings page displays recent minimum and maximum speeds. The *Co Pilot 2* constantly monitors the value of speed and detects if a maximum or minimum has occurred. For example, once a max has occurred and then the speed drops 10 mph from that max, the *Co Pilot 2* "latches" that max and displays 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. See chapter 6 for instructions on how to change these values

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.

IMPORTANT: Not all *Co Pilot 2*s have the Performance Monitor option enabled. You can determine if your unit has this option by observing the *Co Pilot 2* Firmware version number, which is displayed on the *message display* at power-on. If the version number is greater than 5.04 AND has a "P" on the end of it (5.04P for example), then the PM IS enabled.

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 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).

Clearing the Baseline Lap

- 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.

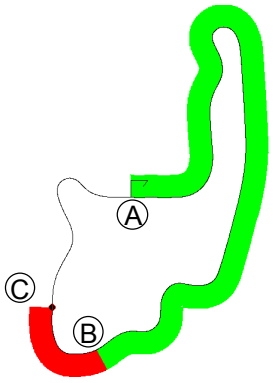
Recent Time Difference (RTD)

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.

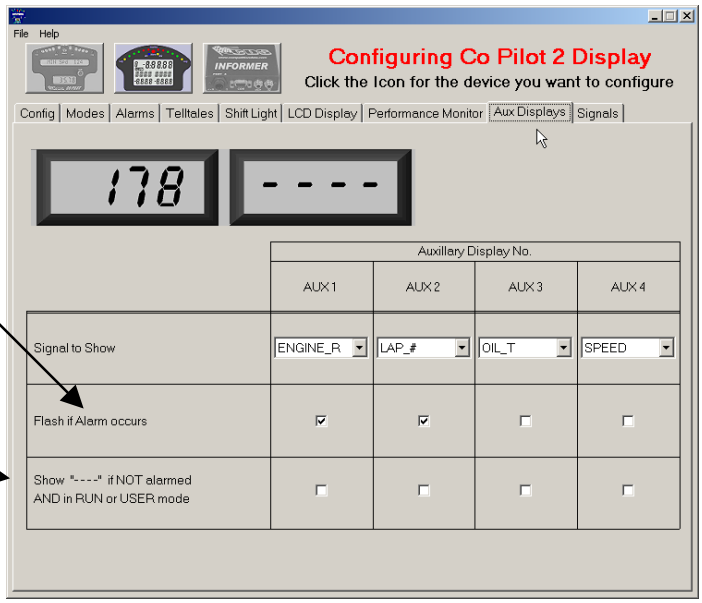
- For example, if the "Scroll Live" page is enabled in warmup mode but not in run mode, as soon as you transition from warmup to run the message display will switch to the first enabled page in run mode.

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.

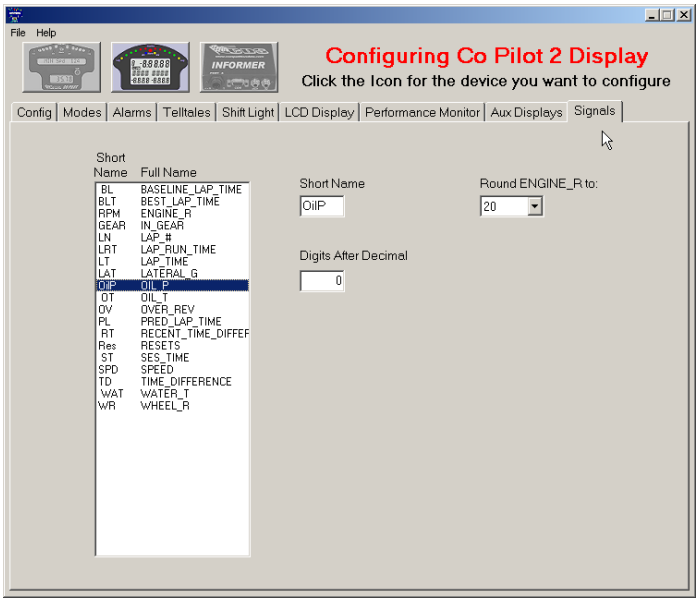


SIGNALS Tab

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.



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.

Upload your Configuration

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

Connect your PC

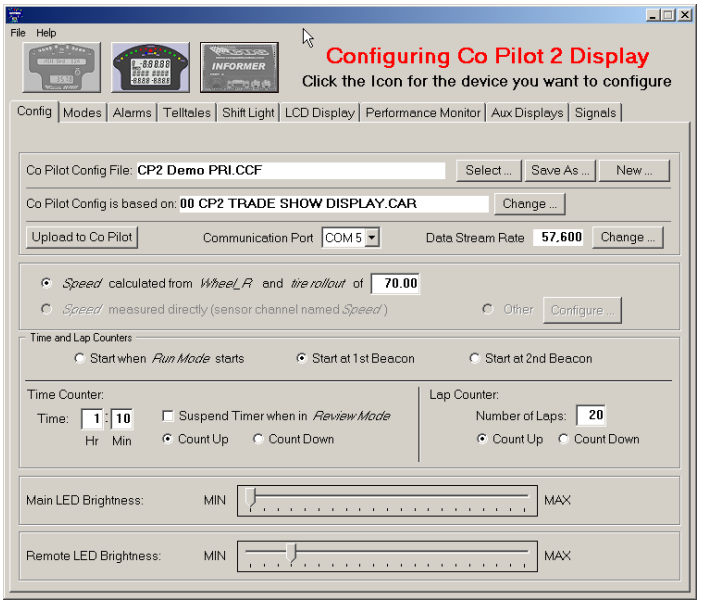
Using the supplied USB communication cable, connect your PC to the COM connector on the bottom of the *Co Pilot 2*.

- **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.

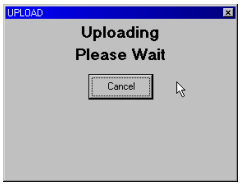
Upload your Configuration

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

Chapter 10 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 Power switch on your Commander 2 ON. If you have a memory card type Commander 2, insert the prepared memory card now.

- 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.
- 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
- If you see a scrolling message "*Unexpected data from Commander 2…Please upload new configuration to Co Pilot 2."* Then refer to Chapter 7 for problem solving.

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 *Co Pilot 2*).

  OR

- By holding the button when prompted at the end of the reports in *review* mode.

IMPORTANT NOTE: If your Commander 2 and *Co Pilot 2* have not been turned off since the previous session, AND you have not cleared the session data in the *Co Pilot 2* (by 1 of the means described above) 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 *Co Pilot 2* 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 *Co Pilot 2* 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.

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 *Co Pilot 2* 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 *Co Pilot 2* 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 will 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.

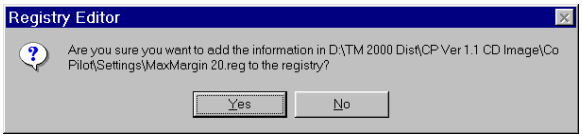
IMPORTANT NOTE: To change the speed margin or latch hold time you must be familiar with and able to use Windows Explorer.

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 11 Informer Operating Description

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

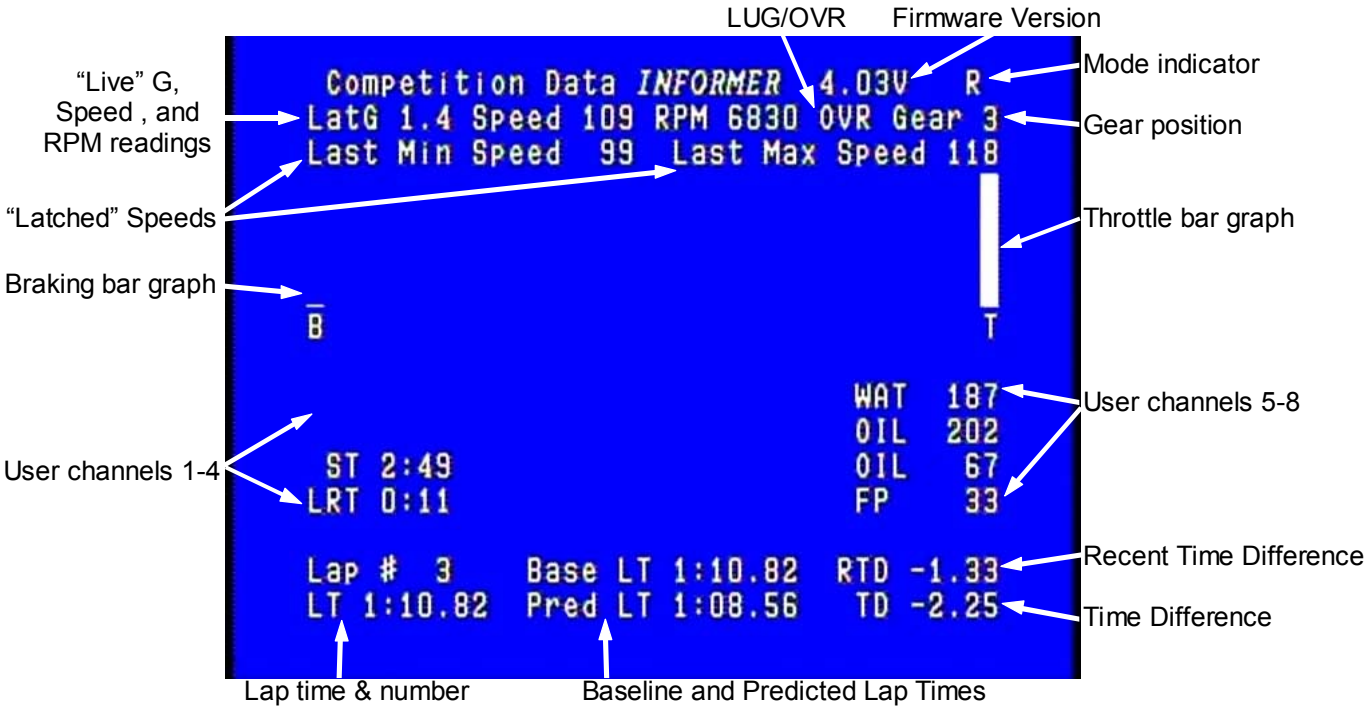
General Description

The CDS *Informer* 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* has 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 car file. See the Configuration chapter.

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 *Co Pilot 2 Link.* See the Informer Configuration chapter.

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* 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.

- When in Warmup mode the following message is displayed at the bottom of the screen:

Hold Button to clear Base Lap

This provides a means to clear the base lap without connecting a PC to the *Informer.* This button is optional and is only needed if you are regularly using your *informer* without a PC at the rqace track.

- NOTE: A "*Hold"* is when the user pushes the button and holds it for more than 2 seconds.

Run Mode

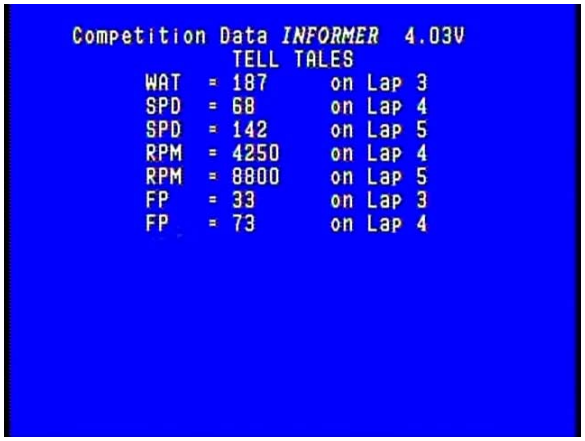
Once the Threshold Speed has been exceeded, the *Informer* is in Run mode. It remains in Run mode as long as the vehicle is moving (usually detected from data from a signal named WHEEL_R) AND as long as the engine is running (usually detected from data from a signal named ENGINE_R). If the vehicle stops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

Pre-Review Mode

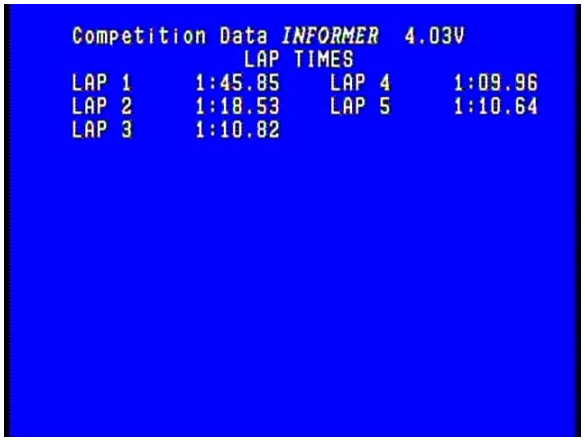
Once in pre review mode, the *informer* will wait for 60 seconds and then automatically enter Review Mode. If the engine starts running while in pre-review mode, the *Informer* switches back to run mode.

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.
    - If the *Informer* is connected to a Commander 2 then you must turn the Commander 2 off to cycle the power on the *Informer*.
    - IF you have a stand-alone *Informer* (with SSI) 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 12 Configure Your Informer

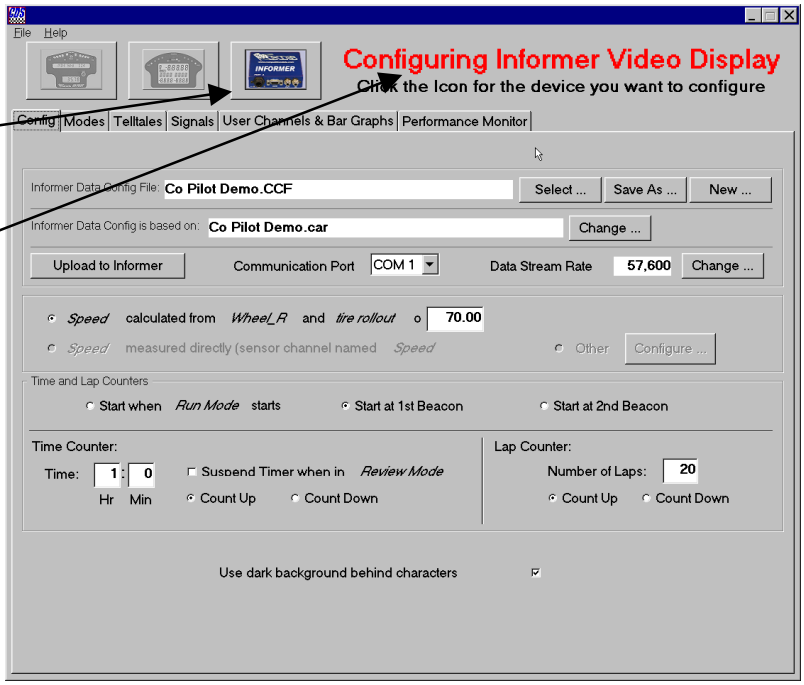
If you do not have a Informer you can skip this chapter

CDS Link Software

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

Version 5 of *CDS Link* is used to configure both the *Co Pilot 2* and the *Informer*.

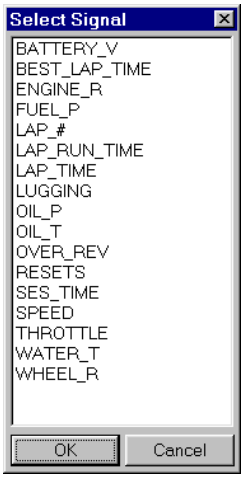
- You select which device you want to configure by pressing its button at the top:
- The large status line indicates which device you are configuring:



If your program is not in "*Informer* Configuration" mode, press the *Informer* 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*
  - If a raw signal (Oil_P for example) is not present in the list and you think it should be, go back to your CAR file editor and check to be sure that the channel with that signal name is both turned on for recording (in the Commander Channel Configuration tab) and is set to *Yes* in the Serial Output Tab.
- All of the *Informer* 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.
  - If a preprogrammed signal (Lugging for example) is not present in the list and you think it should be, go back to your CAR file editor and check to be sure that the signals that Lugging ***Depends on*** are turned on for recording (in the Commander Channel Configuration tab) and set to *Yes* in the Serial Output Tab. For example, Lugging depends on both Engine_R and Throttle.

Informer Preprogrammed Signals

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

CONFIG Tab

Create your *Informer* Config file

It is generally easier to modify an existing configuration file than to create one from scratch, so here we will teach you to create your own config by modifying the *Informer* Demo config file.

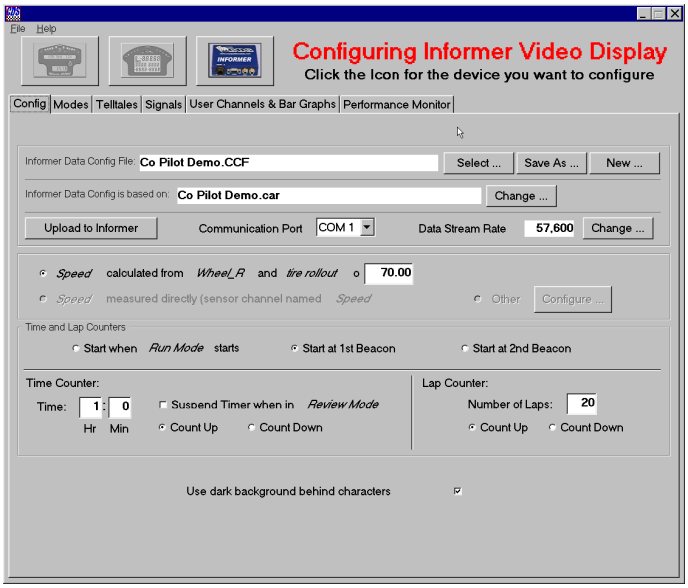
IMPORTANT: If you have a *Co Pilot 2* AND an *Informer* the begin here with the Co Pilot 2 configuration file you created in the previous chapters.

- NOTE: Configuration information for the Co Pilot 2 and the Informer is all stored in 1 configuration file

First, press the *Save As* button and save the current configuration, giving it a name meaningful to you.

Next, hit *Change* to change the CAR file specification to the CAR file you created or edited in the previous chapter. If you are configuring a newly purchased system, a CAR file was provided to you on CD.

Your tire rollout should now be the value you entered in your CAR file.



Data Stream Rate

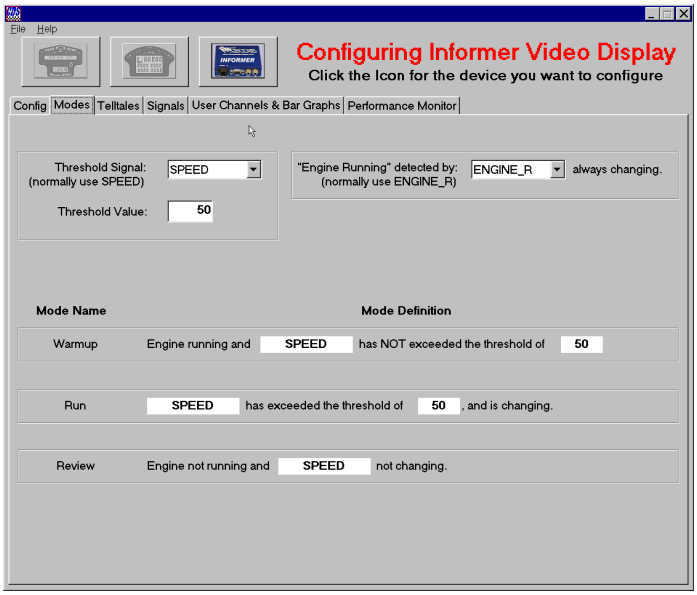
The *data stream rate* defines the format for the serial data that the *Informer* RECEIVES. There are several settings available and if the data stream rate is set incorrectly the *Informer* WILL NOT display any data. Set this as follows:

Setting	Application
9600	*Informer* gets its data from a Commander 2 data logger **AND** the Commander 2 is receiving serial data from a MBE engine management ECU, as used in the SCCA Formula spec car with Duratec engine.
19,200	*Informer* gets its data from a Commander 2 data logger **AND** the Commander 2 is receiving serial data from a PECTEL engine management ECU, as used in the Zetec F2000 car and the Toyota Atlantic car OR a compatible MOTEC ECU.
57,600	*Informer* gets its data from a Commander 2 data logger **AND** there is no engine management ECU supplying data to the Commander 2. OR *Informer* gets its data from CDS SSI box (stand alone display applications). NOTE: use this setting even if the SSI is connected to an ecu.

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".

MODES Tab



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

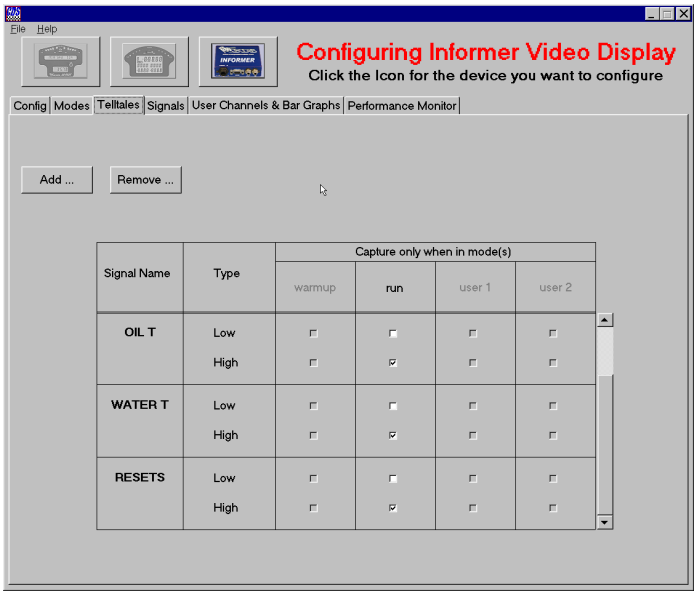
- If *SPEED* does not appear in the pull down list then your CAR file does not have a WHEEL_R or SPEED signal defined, turned on, and included in the serial output stream. Go back and correct this before proceeding.

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.

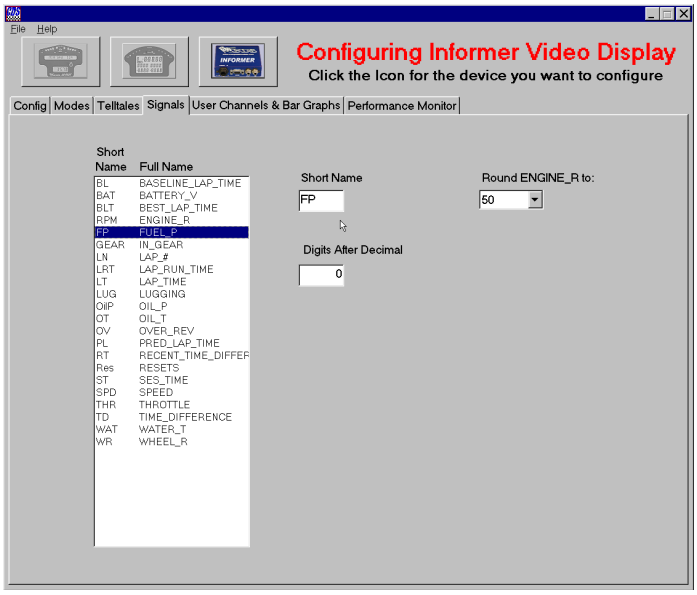
Note that each Signal can have a Telltale to capture the highest or lowest value, (or both). To avoid confusion only program the Telltales that are truly "interesting". (High Oil Temp, for example)

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*.

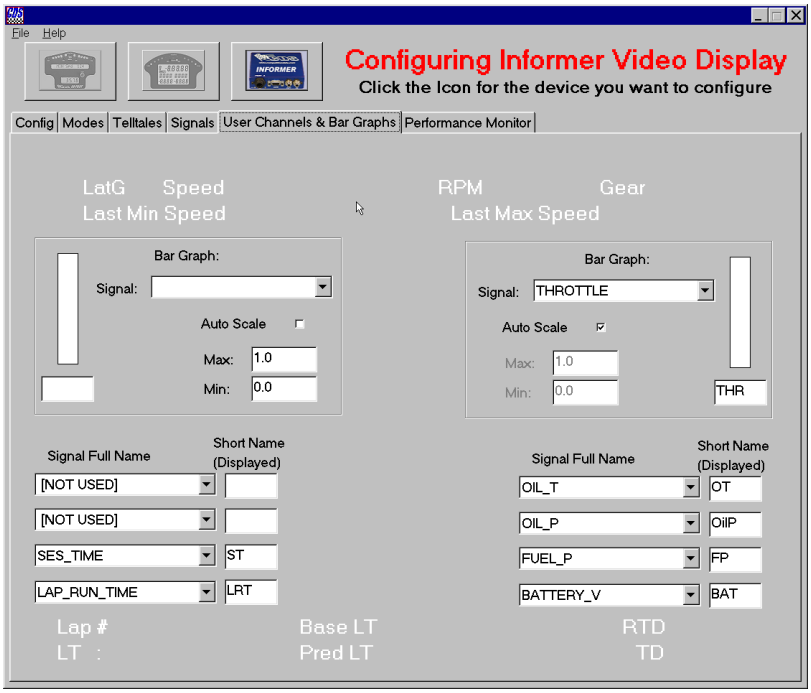
ENGINE_R Rounding

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 Commander 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 Commander 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. (This is new in firmware version 4.1)

IMPORTANT NOTE for Informers with firmware version 4.07 and lower:

Bar graphs in these Informers are hard coded to display LONG_G on the left side of the screen and THROTTLE on the right side. If you are using the newer version of *CDS Link* (version 4.1 or higher) the software will appear to allow you to customize the bar graphs, but these feature won't

actually work in your Informer until you get the firmware updated. The update is free to original purchasers of Informers. Contact CDS to arrange firmware update if you are on version 4.07.

Setting up the Bar Graphs

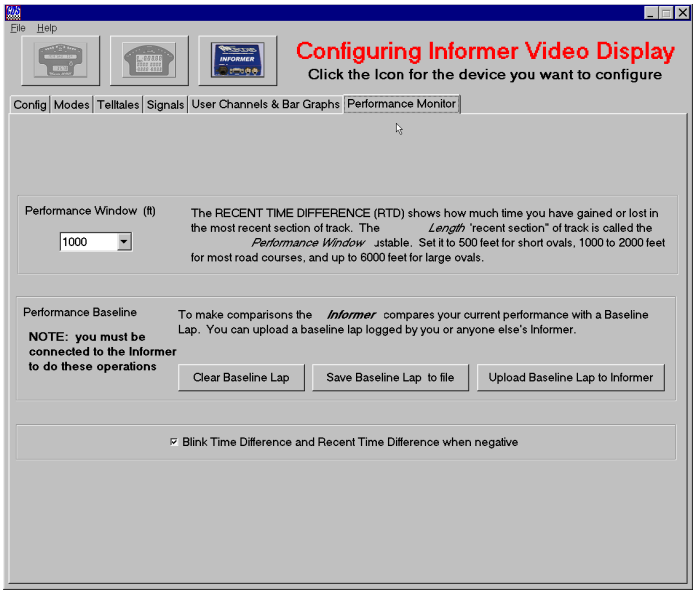
Select the signal to use for each of the bar graphs. Notice that the *Short Name* for the signal is displayed below the bar graph. (The short name will also be shown on the actual Informer screen.)

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.
- If you check the "Blink Time Difference" box then both the Time Difference and Recent Time Difference will blink on and off when they have negative values, which indicates that you are faster than the baseline lap. This helps make analyzing your video data easier.

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.

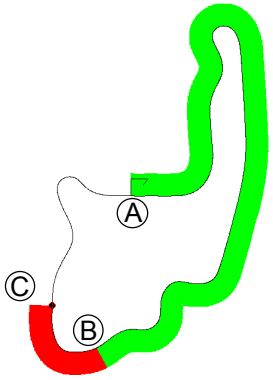
Recent Time Difference (RTD)

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:



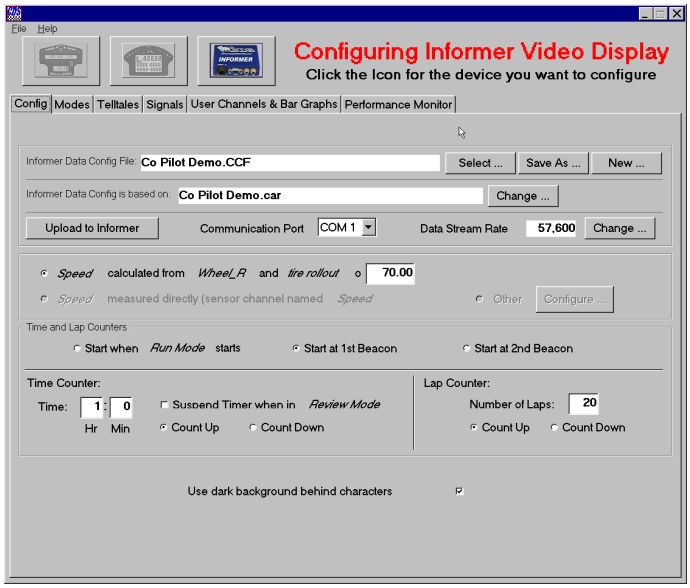
When you look at the *Informer* screen as you pass point "C" the *Informer* Performance Monitor can show you the time gain or loss for the entire lap so far (point A to C) AND can show the time gain or loss for just the part of the track shown in red (point B to C). This time gain or loss for point B 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 your PC to the COM connector on the front of the *Informer*.
- Make sure that the COM port is set correctly in the Config tab.



- Press the *Upload To Informer*...button. You should see:

Followed by a confirmation message

- **NOTE**: You must have Command Link closed when uploading to the *Informer IF* you are using the same PC COM port to communicate with both devices.
  - If Command Link is open when you try to upload to the *Informer*, you will receive an error message telling you to close Command Link.

Chapter 13 Using your Informer

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

A Typical Session with the *Informer*

Power On

Turn the Power switch on your Commander 2 ON. If you have a memory card type Commander 2, insert the prepared memory card now. (If you have an *SSI* based system then the Informer will power up when you switch the master on.

- The power light should be "on" and the Status light on the Informer 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*).

IMPORTANT NOTE: If your Commander 2 and *Informer* have not been turned off since the previous session, then as soon as you start the engine the *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 *Informer* 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. Verify that any enabled alarms are working as you want them to.

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

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 Co Pilot 2 Link.
- The *Informer* 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* 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.

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* 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 <u>will</u> 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.

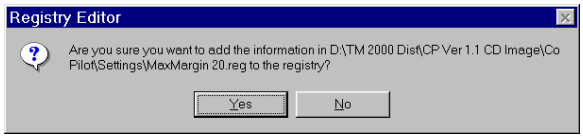
IMPORTANT NOTE: To change the speed margin you must be familiar with and able to use Windows Explorer.

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 14 Solving Problems

This Chapter applies to the Co Pilot 2 and Informer

"Unexpected Data Message" on *Co Pilot 2 or Informer*

If you see a message " *No Data or unexpected data from Commander 2…Please upload new configuration."* It indicates that the *Co Pilot 2 or Informer* is not "in sync" with the Commander 2 or SSI. Check or try the following items, in order:

1. IF you have a wire transfer download type Commander 2 AND you are downloading data from it, you will see this message because the Commander 2 does not transmit data to the *Informer* while it is also downloading.
2. If you have a memory card type Commander 2 AND there is no memory card currently in it, you will see this message because the Commander 2 is not even running when there is no memory card inserted in it.
3. In Co Pilot 2 Link, verify that you have the correct *Data Stream Rate* set in the Config tab. See chapter 7 for details.
4. Make sure that the **CAR file** specification set in the **Config tab** of *CDS Link* is the same exact CAR file that you last uploaded to the Commander 2 (if you have internal Commander 2 memory) or is the CAR file you used to prepare your memory card (if you have a memory card Commander 2)
    a. If in doubt, use Command Link to upload the CAR file to the Commander 2, (or prepare the memory card for recording), then use *Co Pilot 2 or Informer* Link to upload the config to the *Informer*.
5. Edit the Car file, and make sure that the ROM version is set to 41 or higher. If it is set to a version lower than 41, then:
    a. set it to the correct ROM version (shown on the label on the side of the Commander 2), yonot, change it and upload the configuration to the Commander 2.
    b. Turn "On" the appropriate channels in the *Serial Output Tab* in the Command Link car file editor (see chapter 6).
    c. Use Command Link to upload the CAR file to the Commander 2, (or prepare the memory card for recording), then use *Co Pilot 2 or Informer* Link to upload the config to the *Informer*.
6. If you still see this message, Turn the Commander 2 power off, then back on.
7. If you still see this message then upload your CAR file to the Commander 2 (if you have internal Commander 2 memory) or prepare the memory card again (if you have a memory card Commander 2), then repeat steps 1-4.

"Bad Config" Message on Co Pilot 2 or Informer

This message is usually caused by not having the signals used for Mode switching enabled for recording in your CAR file or not having it included in the serial output stream From the Commander 2. These are usually the WHEEL_R or SPEED signals in road racing and circle track applications.

1. Edit your car file. You should have a channel named WHEEL_R or SPEED enabled for recording. See the "Enable Channels for Recording" section of chapter 6.

2. Upload your CAR file to the Commander 2 (if you have internal Commander 2 memory) or prepare the memory card again (if you have a memory card Commander 2).
3. Upload your configuration to the *Co Pilot 2 or Informer*.
4. Turn the Commander 2 power off, then back on.
5. If you still see this message, contact CDS.

"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 calibration factors are changed in your car file and the configuration is not uploaded to the Co Pilot 2 afterwards.

Whenever you make changes in your CAR file you must UPLOAD your configuration to your *Co Pilot 2* or *Informer* using *CDS Link* software.

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 6.
	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 Subtracts 1 from Lap # if ***Count Up*** is enabled
	Alarm(s) present	Press	Clears the alarm and temporarily disables it for 5 seconds. Bumps the alarm value if bumping is active. The alarm value is permanently changed until system goes back into warmup mode. Disables the alarm if "X" number of bumps has been exceeded. 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 6
	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 CAR 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 CAR 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 CAR 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 CAR 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 CAR file) OTHERWISE it is equal to zero.

Requires: Raw Signal ENGINE_R, Maximum Revs set in the Gearing tab of CAR 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 or Informer*'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 or Informer*'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 or Informer*'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 *Co Pilot 2 or Informer* 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 *Co Pilot 2 or Informer* 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 or Informer*'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 *Co Pilot 2 or Informer* 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 *Co Pilot 2 or Informer* Link. Can be manually "bumped" using the button for "waived off start" situations. See Chapter 6 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 or Informer*'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 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 - Troubleshooting Journal

This section documents known problems and offers solutions and work-arounds. Be sure to check our web site, www.competitiondata.com for the latest information and product updates.

"No Telltales or Lap Report" bug

Applies to: Co Pilot with Firmware version 3.07 or lower

Description

IF "*suspend timer when in Review mode"* is checked in the Config Tab, and if system cycles through WARMUP, then RUN, then PRE REVIEW, then REVIEW, then back to RUN mode **all without getting a first photo beacon trip,** then when it gets back into run mode the following problems exist:

- The telltales do not get logged. If for example you let the CP go through the above described cycle BEFORE any lap times occur, then when it goes back into RUN mode and it gets lap times BUT when you then later go into review mode no telltales are reported (the Co Pilot shows "----" for all telltales.)
- The lap counter does not increment.

Solutions:

1. The most common way to experience this problem is if you exceed the Threshold speed while driving to the false grid,
   - **Therefore, set your threshold speed to a value you will never get close to while driving through the paddock. (50 MPH for example).**
2. Do not check the *suspend timer when in Review mode* box in the Config tab.

Appendix D – 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 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
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

When You Need Answers AND Results, Not Just Data

COMPETITION DATA SYSTEMS, INC
8050 WEHRLE DRIVE
WILLIAMSVILLE, NY, USA 14221
Voice: (716) 631-2880
Fax: (716) 631-9930
www.competitiondata.com