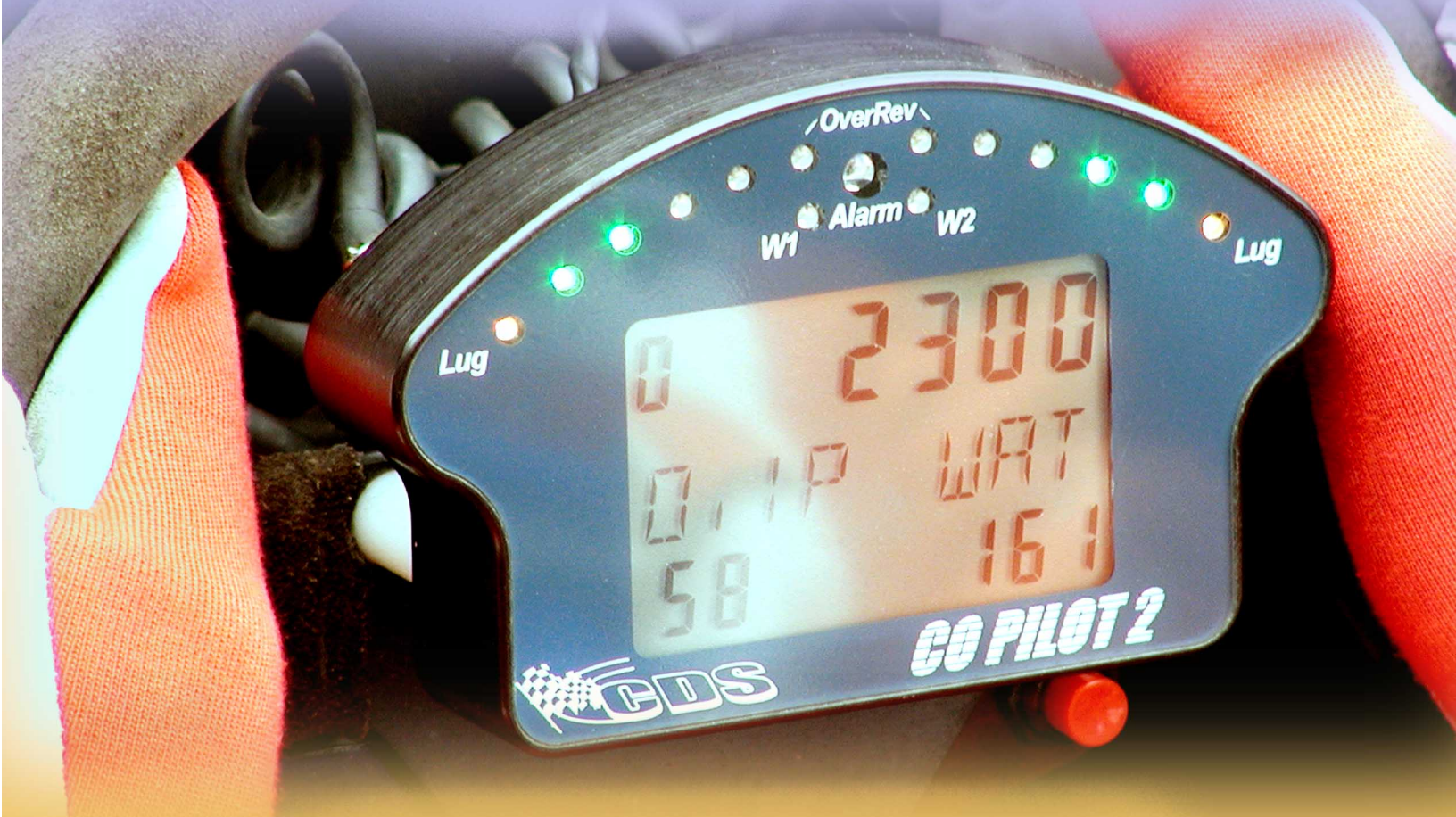
CDS

# COMPETITION DATA SYSTEMS

www.competitiondata.com




# FULL LINE CATALOG

*When You Need Answers AND Results*
*Not Just Data!*

# CDS TrackNet™ Based

## A Complete System includes:

- A 12 or 20 Channel ***Master SSI,*** optionally a ***Slave SSI***
- ***Sensors*** including GPS (for speed and lap time)
- A standard or custom ***Wiring Harness***
- A ***Co Pilot 2+*** display logger, an ***Informer*** data-on video interface, OR BOTH.
- ***CDS Link*** configuration & communication software
- Industry leading ***Track Master 2000*** analysis software
- Pre-configured packages available See pages 14 & 15

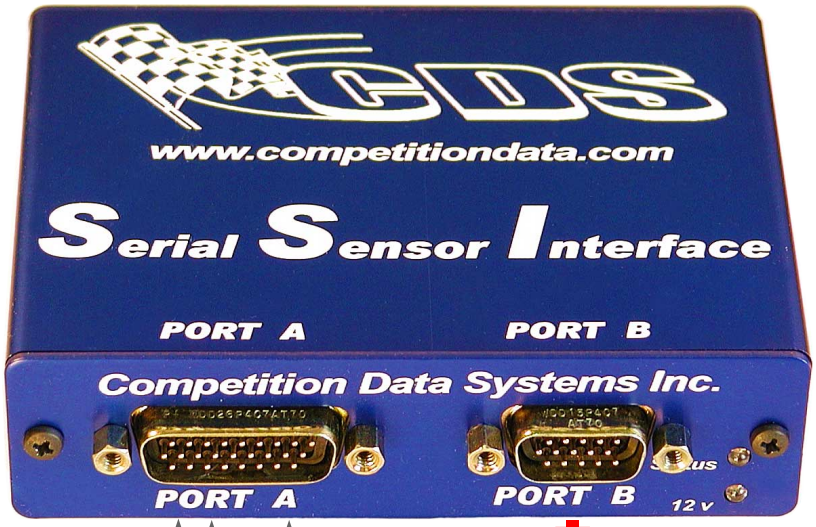
## Master SSI

Gathers data from the connected sensors and other devices. Outputs the data to the ***CDS TrackNet*** network.

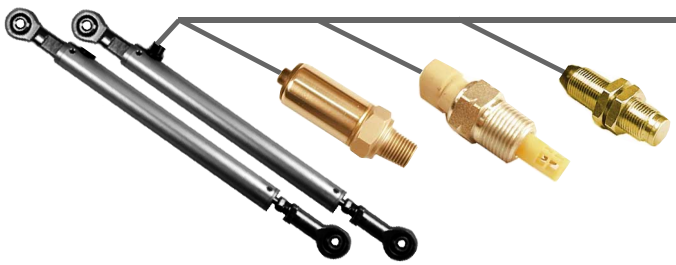
- 1, 2, or 3 Accelerometers built in
- 8 or 16 analog & 3 RPM channels
- Engine Management ECU input
- Slave SSI input (for additional analog and RPM channels)

See page 8

*SSI shown actual size*




**CDS TrackNet**



## Sensors & Wiring Harness

- Standard and custom sensors to measure just about any parameter
- Wire harness built for your car using teflon jacketed wire and all waterproof connectors

See pages 8-10 & 15


## GPS Interface

- Generates precise end-of-lap signal, NO BEACON REQUIRED!
- Provides speed signal independent of wheel spin, lockup, or tire growth

See page 6

## Engine Management ECU Interface

Logs data from engine management systems, eliminating need for duplicate sensors. Available for many popular racing ECUs

See page 14

## Predictive Lap Performance Monitor Software

- Built-in to all *Co Pilot 2* and *Informer* Systems
- With *CDS* exclusive Recent Time Difference (RTD)

See page 6

# System Architecture

## Co Pilot 2+

Display and logging all in 1 compact package. Completely waterproof billet aluminum case fits on steering wheel or dash.

- Predicted lap performance monitor
- Feature rich alarm and warning system
- 8 MB of data logging with automatic stop and start (no switches)
- Preprogrammed intelligence shows you what you need to see, when you need to see it.

See pages 4, 5, & 14


*Co Pilot 2+ shown actual size*

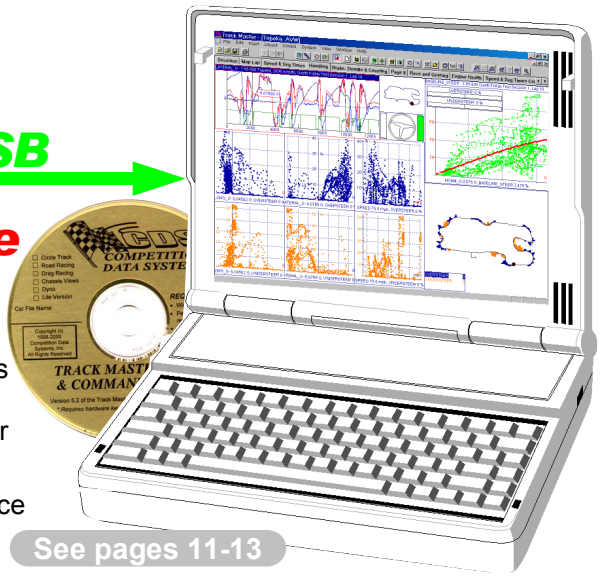
USB

Network

## Track Master Software

Industry leading software developed over the course of our 20+ years in this business.

- Feature rich, mature product that generates answers and enables users to quickly discover how they can improve both the car and the driver.
- Spend your time analyzing your performance instead of "operating" your data software!



See pages 11-13

## Informer Data-On Video

Transforms any in-car video system into a data acquisition system by imprinting data right on the video signal.

- Works stand-alone or with a any *CDS* data acquisition system
- Includes the performance monitor features. Shows predicted lap time and time gain and loss right on the video.
- Great first step into data acquisition
- A must have if you are regularly doing in-car video

See pages 7 & 15


*Informer shown actual size*

# Co Pilot 2+ Details


***The CDS Co Pilot 2+*** **is a "smart" and programmable display and logging system designed to process data into useful information and answers, showing the driver WHAT he needs to see WHEN he needs to see it. It has 8 megabytes of data logging for a complete instrumentation system in a small, attractive package.**

## COMPACT MAIN UNIT

- Mounts on dash or to steering wheel, shock mounts NOT required
- Billet aluminum, waterproof construction
- LED lights are extremely bright daylight readable with user-adjustable brightness for any lighting condition
- All features easily configurable using our *CDS Link software*. Software updates are free and provided on our web site

## WARNING AND ALARM SYSTEM

- 2 warning and 1 large alarm light
- Alarms are individually customizable and can cause any of the selected lights to flash or be “on”
- “Bumping”, clearing, and disabling of alarms are individually customizable
- Separate alarm icon on the LCD display

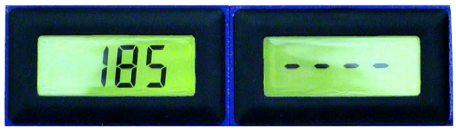
## PROGRAMABLE SHIFT LIGHT

- Each light individually programmable
- Includes “lugging” and over-rev lights
- Automatically switches range when warming up engine
- Lights can be set to flash at the selected shift point

## LCD DISPLAY

- High contrast, wide temperature range industrial quality LCD with large, easy to read LCD digits. Completely configurable with up to 7 “layers” or pages. You chose what you want to display. Use as few or as many pages as you like.
- Live readings, alarms, latched readings (such as min or max speed), laps to go, time to go, lap time, gear, etc.
- Performance monitor with predicted lap, time difference, and the ***CDS*** exclusive Recent Time Difference and more

## SATELLITE DISPLAYS




- 2 Satellite Displays can be connected and are available in *Single, Dual Horizontal, and Dual Vertical* configurations. Billet aluminum and completely waterproof.
- Can be mounted remotely from *Co Pilot 2+*. For example, the *Co Pilot 2+* can be steering wheel mounted and the Satellite Displays can be fixed mounted to the dash.
- Can display any signal including pressures, temperatures, lap time, speed, lap number, session time, predicted lap, etc.
- Can flash if the displayed signal is in an alarm condition. Can display “- - - -” if the displayed signal is within its normal range.

## IN-HELMET “HEADS UP” LIGHTS


- Shift Light and Alarm / Warning Light on flexible material
- Can be taped to helmet visor or installed inside helmet

## REMOTE SHIFT & ALARM LIGHTS

- Super bright remote LED lights can be mounted anywhere.
- Available in 5 or 10 mm diameter, up to 2 remote shift and alarm lights can be connected

## MODULAR “PLUG & PLAY” WIRING

- All wiring has waterproof connectors installed for easy, reliable connection of your *Co Pilot 2+* System. No wiring required by user.

# Co Pilot 2+ Details

## STEERING WHEEL COIL CORD

- Required for mounting *Co Pilot 2* to steering wheel.
- Available in 1 and 2 foot (retracted) lengths.

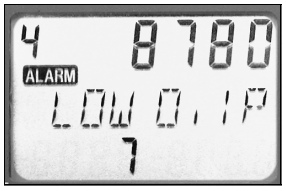
## USB UPLOAD AND DOWNLOAD

- All communication between the PC and the *Co Pilot 2+* is via high speed USB connection.
- Uploading & downloading of setups and baseline laps is nearly instantaneous with plug & play USB connection.
- A session of logged data typically downloads in less than 20 seconds.
- Tiny waterproof plug for USB is located on the bottom of the *Co Pilot 2* and can be plugged in “blind”.


## “WIRE FREE" QUICK RELEASE OPTION

- Steering wheel quick release with built-in connector eliminates coil cord in wheel mount applications. Fits 5/8" hollow steering shaft.
- Includes quick release with Co Pilot 2 connector installed on steering wheel "side" and installation kit for steering shaft "side". Requires welding of stub to steering shaft.
- Optional radio button circuit available too (eliminates cord for radio button)

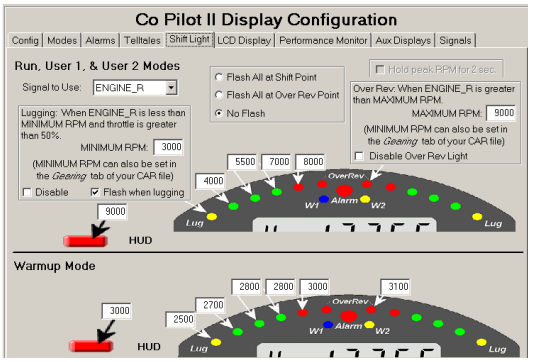
## EXTREME FLEXIBILITY




- Complete control of each individual shift light, different settings in Warmup and Run modes
- Complete control of alarms and their actions, and how they are displayed including the ability to "bump" alarms, set the amount by which an alarm point is "bumped", and even how many times it can be "bumped".
- Alarms can be defined differently in each mode. A typical example is to have a LOW alarm for Oil Temperature in Warmup mode and a HIGH Alarm for it in Run mode.
- Complete control of the text labels used in messages and on the LCD screen.
- Up to 7 "layers" or pages on the LCD screen (use as few or as many as you like).

## SIMPLE, OBVIOUS SETUP SOFTWARE

- Easy to use *CDS Link* software for configuring and managing your Co Pilot 2. Free download from *www.competitiondata.com*



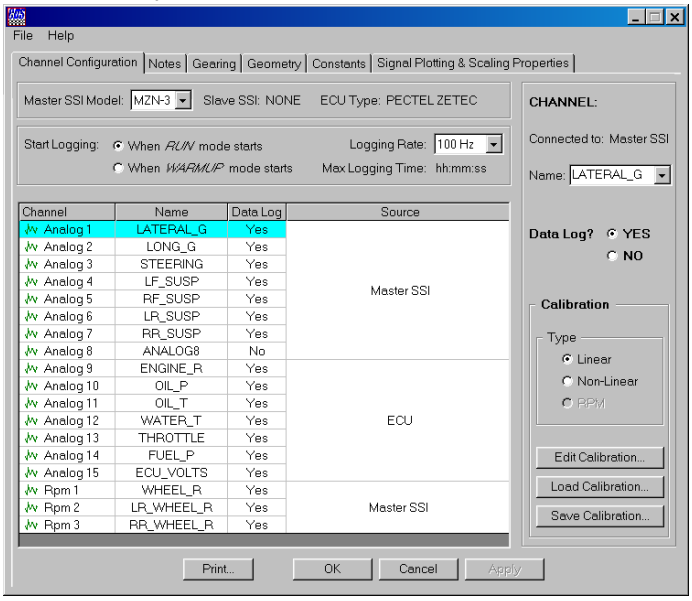

## UPGRADEABLE

Most other systems in this price range are extremely limited when it comes to channel upgrades, limiting you to 8 or at the most 12 sensors.

- The ***Co Pilot 2+*** can display AND log up to 37 inputs, giving you the option to add just about any sensors such as wide band air fuels, EGT's, tire temperatures, load cells etc.

## QUALITY DESIGN AND CONSTRUCTION

- Completely waterproof, billet aluminum case. Compact size enables mounting on the inside of even the smallest steering wheels.




## DATA LOGGING

- Automatically starts and stops logging based on user adjustable Speed and RPM. Automatically separates data into sessions. No switches to throw or buttons to push!
- Saves up to 8 sessions for download at your convenience
- User adjustable sample rates and channel selection for logging
- 8 Megabytes of data logging memory
- Up to 37 channels of data can be logged
- High speed USB download
- Easy, interactive calibration and zeroing of sensors
- Data downloads into the industry leading CDS ***Track Master 2000*** software.
- Notebook has provision for entry of Notes, Gearing, Suspension Geometry, Constants, and Scaling Properties. All this information feeds into the preprogrammed intelligence in *Track Master 2000.*

**FOR COMPLETE SYSTEM PACKAGES** See page 14

# CDS Performance Monitor

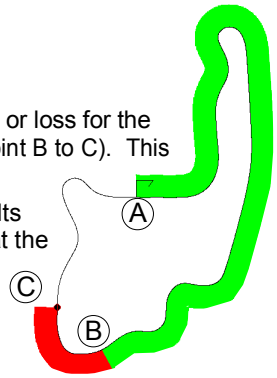
**The *CDS* Performance Monitor software is included with ALL Co Pilot 2 and Informer systems**

## *The only "Driver Performance Monitor" that shows your performance in the most recent track segment with ONLY 1 GLANCE*

Have you ever come off of a corner or gone through a segment of track and said to yourself **"that felt real fast"?** Conventional performance monitors can not measure or confirm the improvement you just made ***unless you looked at the gauge and memorized the reading before you entered that segment.***

With ***CDS* RTD technology** you simply ***LOOK ONCE, AT ANY POINT ON THE TRACK***, and it shows you how you did in the most recent segment. The only "Driver Performance Monitor" that shows your performance in the most recent track segment with ***ONLY 1 GLANCE.***

### HERE'S AN EXAMPLE:




- Let's 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 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.

### OTHER FEATURES

- The Performance Monitor also calculates and displays *Predicted Lap Time* for the current lap and overall *Time Difference* which is the time gained or lost for the entire lap so far.
- All of the performance monitor parameters measure the difference between the current lap you are driving and the *Baseline Lap*. Baseline laps can be uploaded to and downloaded from the *Co Pilot 2*, or *Informer* and can be saved for future use and can be shared among teammates and friends.
- Here is a typical *Co Pilot 2* screen set up to show the *Baseline Lap* and *Predicted Lap.*


### PERFORMANCE MONITOR ON THE *INFORMER*

- The Performance Monitor on the *Informer* works in the exact same manner. As you watch your video, all of the Performance Monitor parameters are shown at the bottom of the screen including *Predicted Lap Time, Time Difference, and* ***Recent Time Difference (RTD)***. See the *Informer* section of this catalog for a typical screen shot.

# CDS GPS Interface

## NEVER DEAL WITH A BEACON AGAIN!


### FEATURES & BENEFITS

- Provides an "end-of-lap" signal (replacing the beacon and receiver). Also provides a speed signal, independent of wheel spin and brake lock.
- Never set out a beacon, charge its battery, remember to retrieve it from pit wall, or deal with placement or interference issues ever again!
- The Lap and Speed features are independent. You can choose to only use the "end of lap" feature and measure speed with a traditional wheel sensor if you wish, or use both a wheel sensor and GPS Speed to help analyze wheel spin and lock.
- Enhances the accuracy of ALL CDS features that depend on lap times and speed-distance data including the predicted lap time performance monitor, segment times report, mapping and distance based plotting, and time gain/loss calculations in ***Track Master*** software.

### HOW ACCURATE IS IT?

- Position is recalculated 250 times per second to yield a lap time accuracy about .02 seconds.
  - In most cases the accuracy, noise, and jitter of the Speed signal will be significantly better than any wheel speed sensor, and is unaffected by brake lock and wheel spin.

### THE GPS CONTROLLER


- Installs in the cockpit and has 2 connectors to a CDS system, 1 for the Lap signal and for the Speed signal. Thus it is plug-compatible with ALL existing CDS systems that use the black waterproof style connectors.

### THE ANTENNA

- Mounts on the outside of the car (on the roof of sedans, on the body work or roll hoop of formula and sports racers) and connects to the controller.

### OPERATION

- The driver sets a "Virtual" Start/Finish line by pressing the orange button. This only needs to be done once, the controller remembers the location until it is reset again (at a different track).
- This is usually done at the track's actual start/finish line to make it easy to duplicate the next time you go to that track.

**IT'S THAT SIMPLE! PRESS A BUTTON ONCE PER EVENT AND YOU ARE DONE!**

# Informer Data-On-Video Details

***THE CDS INFORMER*** **transforms any in-car video recording system into a full blown data acquisition system by overlaying performance data onto the video. The Informer processes raw data into useful information and answers including the Predicted Lap Time, the Time Difference, and Recent Time Difference. Bar graphs display the throttle and braking action.**

## TYPICAL INFORMER SCREEN SHOWS:

*"Live" Data"*

*Min speed in the last corner and Max speed on the last straight.*

*Brake and Throttle bar graphs*

*Up to 8 user-definable channels, 4 on each side of the screen.*

*Performance data, including lap number, last lap time (LT), Baseline Lap Time, Predicted Lap Time for the current lap, Recent Time Difference (RTD), and Time Difference (TD) for the current lap. See page 7 for a detailed explanation of TD and RTD.*


## How the INFORMER works:

### DATA INPUT

Data comes from either a
- *Commander II* **or**
- *SSI box*

via the ***CDS TrackNet*** interface


### VIDEO INPUT

Video signal from any camera connects to standard RCA type "video in" jack

### VIDEO WITH DATA OUTPUT

Standard "Video Out" jack connects to almost any video recorder or camcorder

## FEATURES & BENEFITS:

- Turns any in-car video into a data logging system
- See your time gain or loss as you drive each corner
- See the time gain or loss for every action you take, such as changing shift points, driving a different line, etc.
- Know which lap you are on and the lap time as you watch your video tape
- PC Programmable (to reconfigure data overlay layout)
- Compatible with the complete line of CDS systems including the *Commander II* and *Co Pilot 2+*
- Available as a turn-key package or as part of a *Co Pilot 2+* data logging package

## CAMERA AND RECORDER

- Compatible with virtually all race car video systems
- Compatible with solid state flash card based video recorders
- Compatible with "split screen" splitter boxes
- We do not sell cameras and recorders but can recommend several suppliers in the racing market whose equipment works well. Call us for details.

**FOR COMPLETE INFORMER SYSTEM PACKAGES** See page 15

# Serial Sensor Interface (SSI) Details

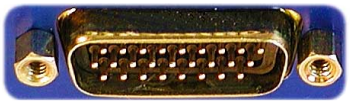
***The CDS SSI*** **gathers data from the connected sensors and other devices. It outputs the data onto the *CDS TrackNet* network. All systems have a *Master SSI* and some systems also have a *Slave SSI* (if more than 20 channels are needed). See the pages 2-3 for how the SSI is used in a system.**


*20 Channel SSI*


*12 Channel SSI*

## SSI FEATURES & SPECIFICATIONS

- 8 or 16 analog inputs. Range 0-6 volts max. Resolution 12 bit (1 part in 4096) or .0024%
- 3 Digital RPM Channels per SSI. Resolution 16 bit (1 part in 65536 or .0015%)
- Engine Management (ECU) data stream input
- Slave SSI input for additional analog or RPM channels
- 1, 2, or 3 Accelerometers built in. Range +/- 5 G with optimized filtration to yield outstanding data quality
- Dedicated system voltage channel
- *SSI-12* size: 4.2” x 2.9” x 1.2”
- *SSI-20* size: 5.5” x 2.9” x 1.2”
- Can be oriented flat or on its side. Does not require shock mounts.
- Completely waterproof to IP67 standards. All connectors O ring sealed.
- Power required: 11-17 volts at 45 ma. (does not include sensors current draw).
- Data output format: CDS proprietary *TrackNet*



### *SSI* CONNECTORS

- Industrial grade, gold plated high density with O-ring seal and individual interfacial seals on all pins
- Sealed waterproof to IP 67 standard
- These are NOT standard “serial” connectors.

# Sensors

***CDS*** offers a complete line of sensors for measuring almost any parameter. Our line is constantly being updated and expanded. Also, if you require a sensor not shown in this brochure, call us. Chances are we can get the sensor you need. Our sensor connectors are circular 1/4 turn locking and are completely waterproof. All sensors and cables carry a 90 day warranty unless otherwise noted. Detailed specification sheets are available for most of our sensors on request.

### SHAFT RPM SENSOR

**SEN-4 (M12 threads)**

**Measures:** Engine, Wheel, or Shaft RPM

- Uses a small magnet (provided) to detect RPM
- Threaded barrel for mounting to customer provided bracket.
- Functions at sensor-to-magnet gaps of up to 1/4 “

### ENGINE RPM ADAPTER

**SEN-17B3**

**Measures:** Engine RPM using the electric signal from the ignition or fuel injection system

- Connects to tach output of ignition or fuel injection system
- 17B3 is universal adapter for all ignitions and ECU boxes.

### ENCODED PHOTO RECEIVER

**SEN-14C2**

Used for lap timing using a beacon. Replaced by GPS in most applications.

- Gives accurate laptimes to .001 second
- Completely immune to false triggering due to ambient light.
- Channel selected by small 16 position dial.
- over 100’ range

### ENCODED BEACON

**SEN-25CM**

Used for lap timing using a beacon. Replaced by GPS in most applications.

- Placed trackside, is used to trigger 14c2
- Mounts on tripod using standard 1/4-20 thread
- Powered by any 12 volt battery (user provided)
- Includes indicator for battery voltage.

# Sensors (continued)

## DISPLACEMENT SENSOR

**SEN-20-(Range)**

**Measures:** Suspension travel, steering, any other displacement

**Ranges:** 2”, 3”, 4”, 6”, 8”, 10”

- Rod ends (heim joints) at both ends for easy mounting
- Very rugged, durable design

## PRESSURE SENSOR (High accuracy)

**SEN-9** (see price list for ranges)

**Measures:** Any fluid pressure

- Instrumentation grade sensor has accuracy as high as 1/2%
- Used for oil, water, fuel, brake line, turbo or blower boost pressures
- 1/8” MPT connection

## AIR TEMPERATURE SENSOR

**SEN-31**

**Range:** 32 - 300 Degrees F

- For intake air, cowl, or other air temperature measurements
- 3/8” MPT connection

## 4 CHANNEL AERO SENSOR

**SEN-10DQ** +/- 140 in. of water

**Measures:** Aero Pressures

- Used for airbox, cowl, ground effect pressures
- Ideal for evaluating aerodynamics in real world setting
- Has both low and high pressure ports for reference measurements

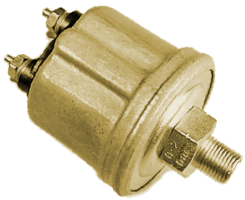
## DISPLACEMENT SENSOR

**SEN-11**

**Measures:** Throttle position, brake pedal travel, or any other short range displacement.

**Range:** 0 - 1.5”

- Spring return plunger for easy installation.



## PRESSURE SENSOR (Low Cost)

| | |
|---|---|
| **SEN-33a** | **0-30 PSI** |
| **SEN-33b** | **0-80 PSI** |
| **SEN-33c** | **0-150 PSI** |

**Measures:** Any fluid pressure

- Low cost, 5% accuracy
- 1/8” MPT connection
- Ideal for oil & fuel pressure measurements

## INFRARED TEMP. SENSOR

**SEN-21L**

**Range:** 32 - 500 Degrees F

- For measuring tire temps
- Has 1:1 sight ratio, so that if the tire is 1” away from the sensor, it “sees” a 1” dia spot
- Requires SEN-5 Amplifier

## 1 CHANNEL AERO SENSOR

**SEN-10D** +/- 140 in. of water

**Measures:** Aero Pressures

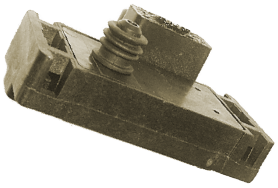
- Used for airbox, cowl, ground effect pressures
- Ideal for evaluating aerodynamics in real world setting
- Has both low and high pressure ports for reference measurements

## ROTARY DISPLACEMENT SENSOR

**SEN-34**

**Range:** 0 - 90 degrees

- Used typically for throttle position
- Can be mounted directly to most carburetors and fuel injection throttles.



## MANIFOLD VACUUM

**SEN-39**

**Range:** 0 to Full Vacuum

**Measures:** Manifold Pressure

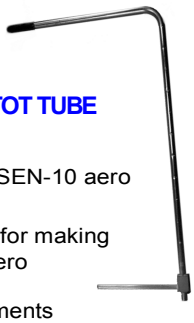
- Used for measuring manifold vacuum in normally aspirated engines.
- Can be calibrated in PSI, mm of Hg, or Inches of water.

## INFRARED TEMP. SENSOR

**SEN-21N** for up to 500° F

**SEN-21NH** for over 500° F

- For tire, brake rotor, clutch disk, or other temperatures
- Has 1:3 sight ratio, so that if the tire is 3” away from the sensor, it “sees” a 1” dia spot
- Requires SEN-5 Amplifier



## PITOT TUBE

**SEN-2**

- Use with SEN-10 aero sensors.
- Essential for making precise aero pressure measurements
- Use static tap for creating a stable reference
- Use dynamic tap for measuring air speed

## STRINGPOT SENSOR

**SEN-38-F (firm spring)**

**SEN-38-S (soft spring)**

**Measures:** Displacement

**Range:** 0 - 9 inches

- Easy and quick installation.
- Firm spring for steering, soft spring for throttle measurement.

## RATE SENSOR (GYRO)

**SEN-37**

**Measures:** Rate of rotation

**Range:** +/- 80 Degrees Per Sec.

- +/- 1% overall accuracy.
- Generates circuit maps in motorcycle applications.
- Can be used to measure pitch rate, roll rate, or yaw rate.

## FLUID TEMPERATURE SENSOR

**SEN-30**

**Range:** 32 - 300 Degrees F

- For water, oil, or other fluid temperature measurements
- 1/8” MPT connection

## LASER RIDE HEIGHT

**SEN-41**

**Range:** 2 to 12 Inches

- Measures ride actual height
- Can be used along with Suspension sensors to determine tire compression.
- Formula cars typically use 3, stock cars typically use 4 sensors.

# Sensors (continued)

## EGT PROBE & FITTING

**SEN-16**

**Range:** 32 - 1830 Degrees F

- These EGT probes have been developed specially for on track racing applications
- Exposed tip design provides quick response
- Installs using weld type compression fitting (included)

## HIGH FLOW FLOW METER

**SEN-36**

**Ranges:** available up to 600 GPH (gallons per hour)

- 1/2% accuracy
- Has AN type end fittings


## ACCELEROMETER

**SEN-28s Single Axis**
**SEN-28d Dual Axis**
**SEN-28t Triple Axis**

**Measures:** G forces

**Range:** +/- 5 G

- **Size:** 2" x 1.38" x .75"
- Solid state unit custom built for racing applications
- Built-in filtering
- Suitable for any race car from showroom stock to Indy.
- Other G ranges available (such as +/- 50 g for spindles) on special order.
- Primarily used in *Commander 2* Systems

## CYLINDER HEAD TEMP PROBE

**SEN-3**

**Range:** 32 - 1000 Degrees F

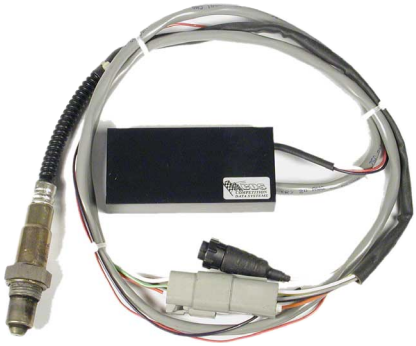
- These probes have been developed specially for on track racing applications
- Installs under spark plug
- Ideal for all air cooled engines
- Available in 12, 14 and 18 mm diameter.

## LOW COST FLOW METER

**SEN-35**

Measures fuel flows up to 80 GPH with 2% accuracy

- Has 1/4" Fpt type end fittings
- Measures fuel flows up to 80 GPH with 2% accuracy



## WIDE BAND AIR FUEL

**WBAF-1**

Low cost wide band sensor and controller

- Measures actual Air Fuel ratio
- Miniature controller suitable for race car use.
- Linear 0-5 volt output connects to any data system.
- Easy calibration

## 3 & 4 CHAN THERMOCOUPLE AMP

**SEN-5t, 5q**

**Size:** 3.75" x 2.4" x 1.4"

- Amplifies and provides cold junction compensation to type K thermocouples or infrared sensors
- Ideal for measuring EGT (with SEN-16) or Tire temps (with SEN-21)

## STRAIN GAUGE / LOAD CELL AMP

**SEN-12**

- Amplifies millivolt signals from strain gauges and load cells, and converts to 1- 6 volt output
- Measure Pushrod load, sway bar loads, etc.
- Gain range of 100 to 1000

## 1 CHAN THERMOCOUPLE AMP

**SEN-5s**

**Size:** 2" x 1" x 1"

- Amplifies and provides cold junction compensation to type K thermocouples or infrared sensors
- Terminal strip connection for easy field replacement of thermocouple

## OTHER THERMOCOUPLES

**SEN-7** Std. probe

- For coolant, oil, or other fluid temperature.
- 1/8" dia. X 12" long, includes compression fitting

**SEN-8** Contact style

- For measuring brake calipers, shock bodies
- Attaches directly to surface using cement


## MULTICHANNEL WIDE BAND AIR FUEL METER

AFA-4 Multi channel air fuel meter designed from the ground up specifically for motor sports use. The AFA-4 measures ACTUAL AIR FUEL RATIO using wide range sensors and a state of the art controller. It is suitable for both ON-DYNO and IN-CAR measurements. Kits are available for 2, 4, 6, and 8 cylinder applications.

### KEY FEATURES:

- Accurate measurement of A/F ratio to within 2% of reading.
- 0 to 5 volt optically isolated analog outputs connect to any data acquisition system.
- Exclusive "auto sleep" and "auto sensor fault" detection.

**Separate spec sheet available**

# Track Master Analysis Software

***Racing and Winning*** **is all about speed and being the first to the finish line. Every task, including the job of analyzing your performance and deciding on changes, must be done as quickly as possible.** ***CDS Track Master software*** **is by far the most effective software available for quickly getting answers from your data. The only value of any data system lies in its ability to quickly get answers from raw data. With Track Master Software you will have your answers while others are "operating" their software.**

## What Makes Track Master A Better Choice?

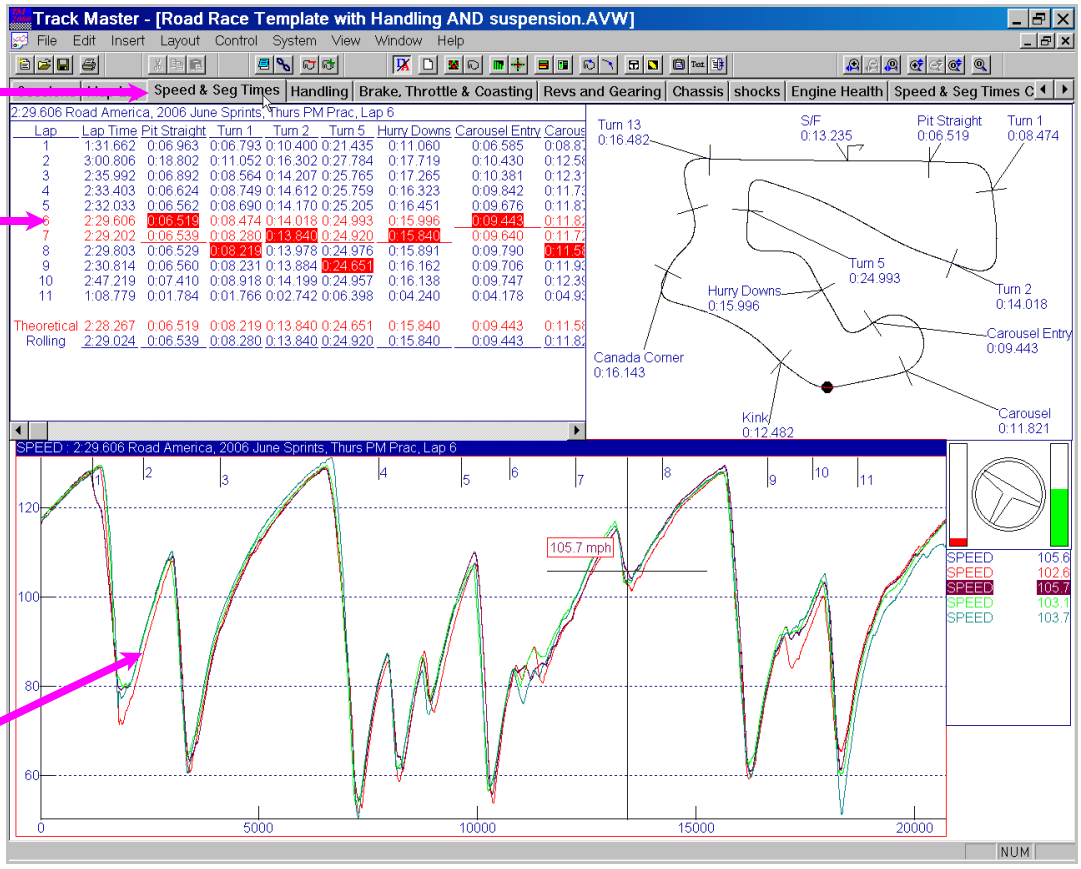
- Preprogrammed intelligence automatically takes the raw data and processes it into answers.
- Many screens (pages) loaded at once. One-click navigation from page to page. Automatic presentation of your data
- Pages categorize and organize different aspects of the data analysis (such as HANDLING, GEARING, etc).
- Pages and plots within pages are linked together to keep them coordinated and simplify use. For example, when you change data in one plot, all its linked plots update.
- Cursor movement and zooming is also linked.
- Many preprogrammed pages, organized into groups called VIEWS, are included.
- Go beyond the usual data presentations with map plots, segments and markers on maps, histograms, reports, signal vs signal plots.
- Design your own pages and views with the "Pro" version.
- You spend your time analyzing your performance instead of "operating" your system.

## Some Off The Automatic Calculations Are:

- Lugging and over revs (from RPM, throttle, and your threshold settings)
- Engine acceleration rate
- Gear usage (which gear you are in) and RPMS in each gear
- Combined G (from lateral and longitudinal)
- Segment times, best theoretical and best rolling lap
- Min, max average, and range for all signals
- Baseline steer (indicates overall balance of your setup)
- Over steer and under steer (using the *CDS* exclusive handling method explained on page 13).
- With suspension data you also get automatic calculation of shock velocities, ride heights, roll angles, pitch, and heave PLUS animation of the chassis plane.
- The user-programmable math channel option enables you to take analysis to the next level by writing your own formulas for analysis. We also include an extensive set of math channel formulas to use as a starting point.

## SPEED & SEGMENT TIMES PAGE

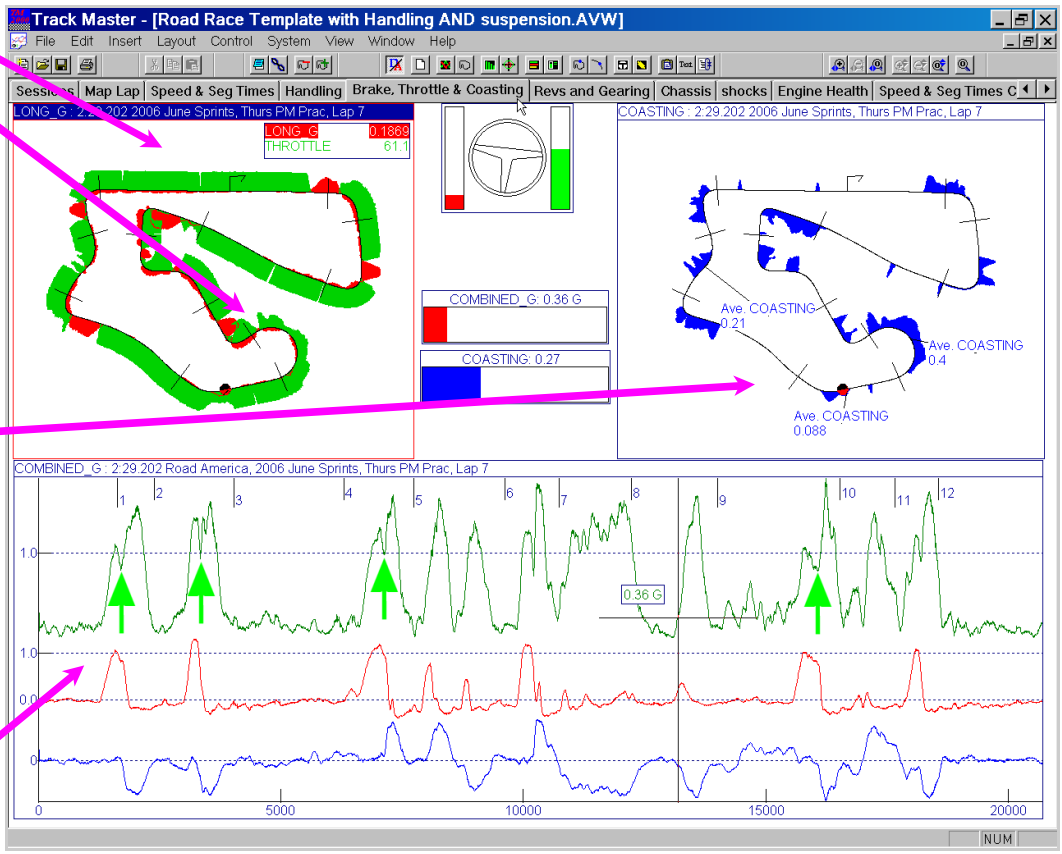
- Many screens or "pages" are all loaded at the same time. The user simply clicks the tab for a page to switch to it. Each page contains several plots or other "objects" neatly arranged to analyze a particular aspect of your performance.
- The SEGMENT TIMES report is used as a tool to navigate to the best examples of a segment of the track you are analyzing. If you only examine the fastest couple of laps, you may miss the best example of a critical segment!
- Segments can be named such as "THE KINK" or "CANADA CORNER" rather than simply "seg 1, seg2". Etc.
- The pages are "linked together so that when you update 1, they all update. The cursor movement is also linked from plot to plot and page to page.
- Many pre-programmed pages are included with the software, so that you can start analyzing right away without have to do a lot of "setup"
- It is easy and simple to see trends and areas of inconsistency by plotting all hot laps from a particular session, as we see here with SPEED data.



# Track Master Analysis Software

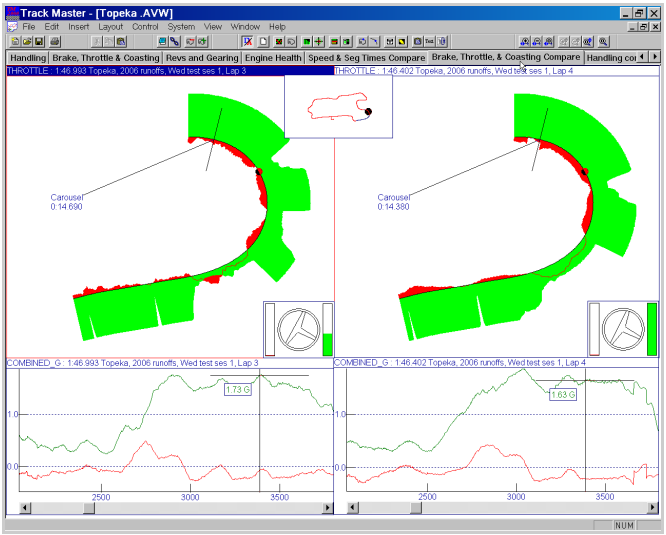
## BRAKES, THROTTLE & COASTING PAGE

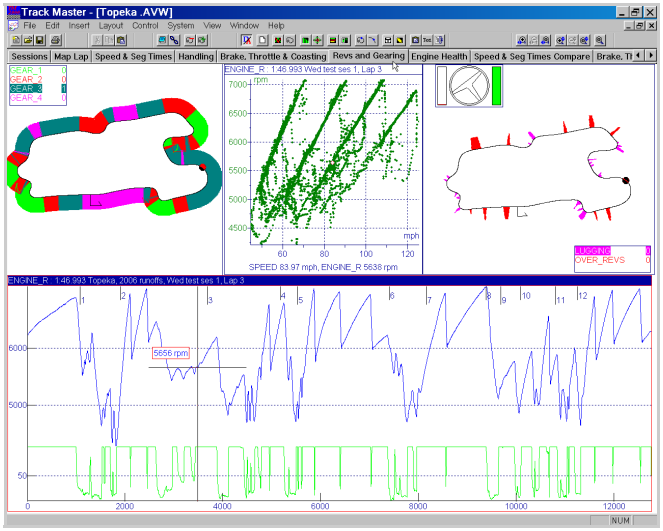
- This map plot shows *throttle* (in green) and *longitudinal G* in red. When *longitudinal G* is on the outside of the track it indicates braking, where it is on the inside it indicates forward acceleration. This plot makes it easy to see where the driver is having problems getting on the power.
- Don't be concerned about the size of the map plot shown here. Any plots can be easily zoomed or shown full screen with a key stroke or click of the mouse.
- One of Track Master's automatic calculations is *coasting,* which measures the degree to which the driver is neither on the throttle or on the brakes. A value of 0 indicates maximum *braking* or 100% *throttle.* Here is *coasting* plotted on the map along with map markers indicating average coasting in important segments. As you adjust your car and work on your driving, you seek to minimize coasting.
- *Combined G* is a calculated signal used primarily to detect areas where you can brake deeper or later. It is essentially the radius of the friction circle at any point on the track. Dips in the *combined G* after braking and before full *lateral G* indicate locations where you are not using the maximum grip available as you enter the turn.
- This graph shows *lateral G (*blue), *longitudinal g* (red), and *combined G* (green). The green arrows indicate dips that you would try to "fill in" by braking later.




## BRAKES & THROTTLE COMPARE

- 2 map plots side by side make it easy to spot differences. These plots are zoomed to focus on an important turn. Notice that both maps and both *combined g* plots are zoomed to the same perspective and the cursor is at the same location on all plots. This coordination or linking is done automatically for you.
- Notice that in the lap on the right, the driver only lifted once and got back on the power earlier. From the segment time shown this was worth 3/10 of a second.
- Any data can be displayed side by side or over plotted.



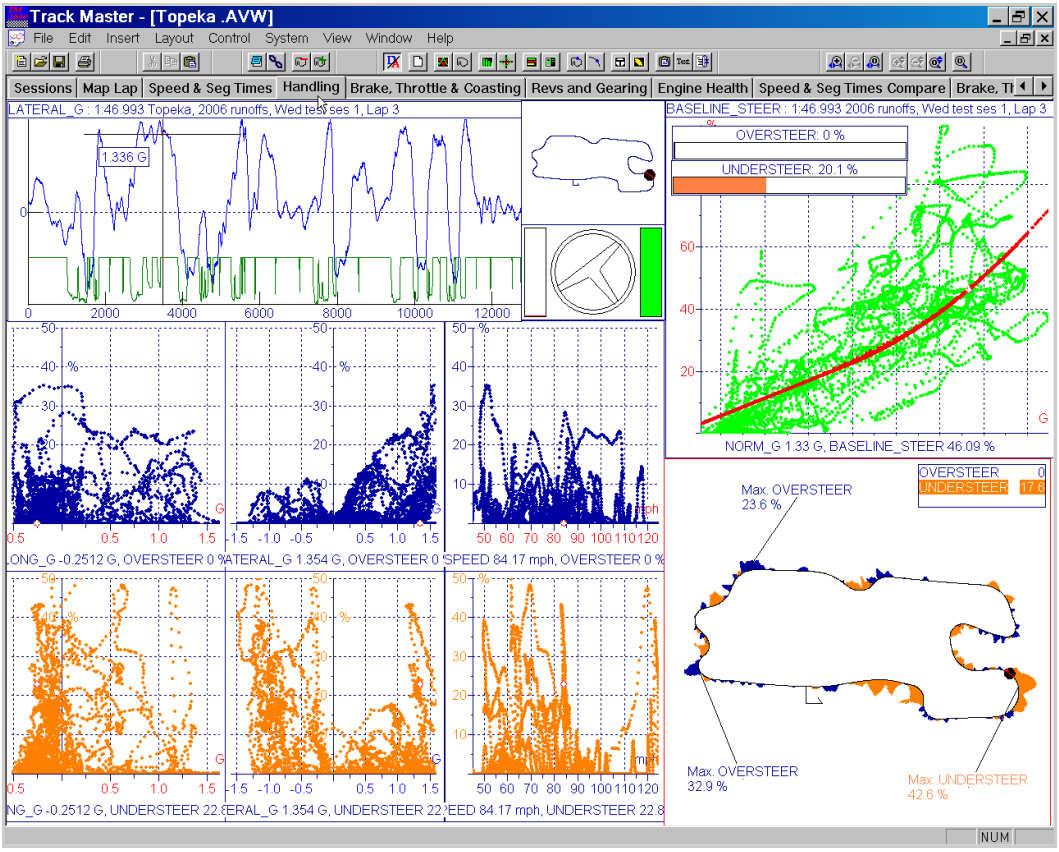

## REVS & GEARING

- The gear map (upper left) shows which gears are used and where the driver shifts.
- The over *revs* and *lugging* map show where these event occur.
- The plot in the bottom shows *engine rpm* and *throttle* so that you can see what the *rpm* is as the driver gets the throttle in the corners.
- This data is displayed in a way that makes it easy to quickly get answers such as "*what gear is being used in turn 5 and what is the minimum RPM when the driver gets full throttle?"* To answer the question simply click on the map at turn 5 and look at the plots. No interpretation or guessing is required.

# Track Master Analysis Software

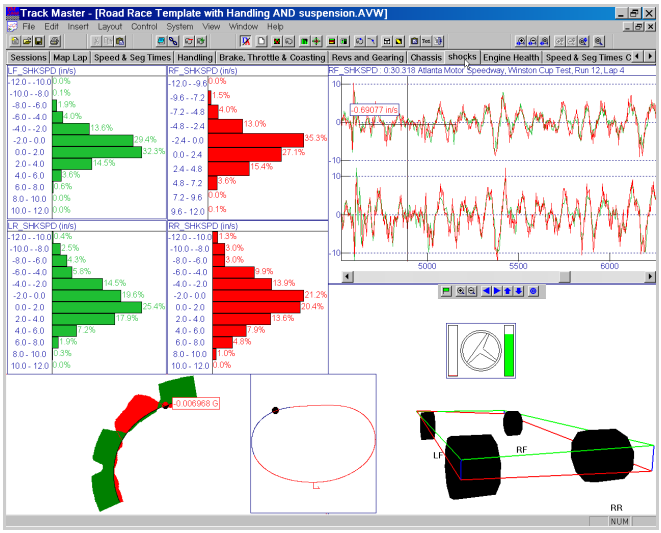
- The proprietary CDS Handling Method takes the guess work out of analyzing data to detect over steer and under steer. In fact, Track Master actually calculates a number for those parameters (in terms of %).
- The *baseline steer* (the red line in the plot in the upper right) indicates the overall balance for the entire lap. A line that curves up slightly indicates a setup that has slight under steer. A line that curves down indicates an overall setup that has over steer. You can over plot *baseline steer* from several sessions to see how your overall setup changes as you adjust the chassis.
- The green data in this plot is *normalized speed steer*, and its relationship to *baseline steer* is how we determine over steer and under steer.
- The actual *over steer* and *under steer are* plotted on the map in the lower right. From this it is very easy to see how handling changes as the car goes through the various phases of a corner (braking, turn-in, load increasing, steady state, load decreasing). You can actually see how the shocks affect the transitional balance of the car as it takes a set entering the corner!
- The 6 scatter plots in the lower left show the relationship between *over steer/under steer* and *longitudinal G, lateral G,* and *speed.* Problems such as unintended cross weight or aero unbalance, can be quickly detected. These plots are even more informative when you "zoom" in on 1 corner or segment.

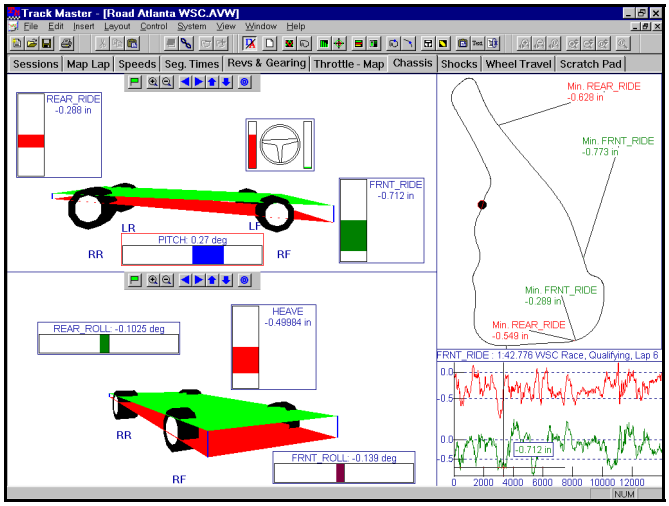
## HANDLING PAGE




## SHOCK AND CHASSIS DATA

- Shock velocities are automatically calculated. Histograms of the velocities tell if your shocks are balanced and matched. The Distance plots of shock velocities show how the car reacts over bumps.
- When you zoom in on a section of track, the histograms change to display the data from the zoomed section.
- The *chassis animation* can be displayed as solid planes (shown below) or wire frame (shown at the right). It displays the chassis plane at static ride height in green. The red plane moves to display the actual chassis movement relative to static ride height.




- . The *chassis animation* enables you to easily see how the car handles bumps, and how the ride and roll changes as you go through a corner. Many people find this much easier to interpret than looking at graphs.
- Using solid planes makes it really easy to see if a corner of the car is coming above static ride height, such as when the left front "picks up" on a circle track car.
- As with all the Track Master graphical components, you can do side-by-side analysis with the animations too. (Several animations can viewed side by side).
- The *ride heights and roll angles (*front and rear) and *pitch angle* are all automatically calculated and can be displayed on any plot, display, or bar graph as well. The relationship between front and rear roll angles has been found to be a valuable tuning tool.

# System Packages & Options

| Features | Co Pilot 2 System Packages | | | | | |
|---|---|---|---|---|---|---|
| | CP 300 | CP 500 | CP+ 1000 | CP+ 2000 | CP+ 2500 | CP+ 3000 |
| Channels | 8 Analog, 3 RPM, up to 14 ECU channels[4], Expandable | | | | | 16 Analog, 3 RPM, 14 ECU, Expandable |
| Memory | Logging of lap times and tell tales. Can upgrade to 8 MB data log | | 8 MB. Up to 8 sessions totaling 4 hours[1] or more of logged data can be stored in the ***Co Pilot 2+*** at typical logging rates | | | |
| Engine RPM | Y | Y | Y | Y | Y | Y |
| Speed & Gear Position | | Y | Y | Y | Y | Y |
| Lap Time | | Y | Y | Y | Y | Y |
| Predictive Lap Performance Monitor | | Y | Y | Y | Y | Y |
| Lateral G & Mapping | | | Y (Accelerometer built-in to ***SSI*** ) | | | |
| Long G (Braking & Acceleration) | | | Y (calculated) | Y (Accelerometer built-in to ***SSI*** ) | | |
| Steering | | | | Y | Y | Y |
| Throttle | | | | Y | Y | Y |
| Battery Voltage (no cost option) | Y | Y | Y | Y | From ECU only | Y |
| Oil & Water Temps, Oil Pressure | Y | Y | Y | Y | From ECU only | Y |
| 4 Suspension / Shock Travel | | | | | Y | Y |
| ECU Interface [3] | Y | Y | Y | Y | Y | Y |
| Track Master Software Version | - | - | Standard | Standard | Pro incl. Chassis Animation | |
| Order # for "Classic" Configuration[2] | **CP300C** | **CP500C** | **CP1000C** | **CP2000C** | **CP2500C** | **CP3000C** |
| **NEW!** Order # for package with GPS[3] | N/A | **CP500G** | **CP1000G** | **CP2000G** | **CP2500G** | **CP3000G** |
| **NEW!** upgrade to 20 Channel SSI | **1220U** | | | | | N/A |
| Included in Package: | System packages include all hardware, software, sensors AND standard "plug and play" wiring harness with all waterproof connectors installed, plus free software updates via our web site. | | | | | |
| ***Please see our price list (separate sheet) for current pricing on systems*** | | | | | | |

[1] **Recording time** based on typical configuration. Samples rates are user-adjustable.
[2] **Classic configuration** uses encoded photo receiver for *lap time* and a wheel speed sensor for *speed*. (Beacon is sold separately.)
[3] **GPS Option** uses CDS GPS receiver for lap time and speed. **NO BEACON REQUIRED!**
[4] **ECU Interface Details:** (see table below)

## Popular System Options for Co Pilot 2 and Informer Systems

- Load Cells
- Exhaust Gas Temps
- Fuel Pressure
- Fuel Flow
- Tire Temps
- Brake Rotor Temps
- Brake Pressures
- Additional Wheel Speeds (each)
- Intake Air Temp
- Manifold Vacuum
- Boost Pressure
- Air-Fuel Ratio (each)
- Vertical G Force
- Yaw Rate
- ***Informer*** Data-On-Video
- Slave ***SSI*** (adds 8 or 16 analog & 2 RPM Channelss)
- User Programmable Math Channels

*Your system can be custom configured with virtually any combination of sensors to suit your needs and can be seamlessly upgraded from any level to any level when your data requirements grow. See the Sensors pages in this catalog for more details*

## ECU Interface Details

| ECU | Channels Included |
|---|---|
| -Z (Pectel Zetec F2000 ) | RPM, Throttle, Oil Temp, Water Temp, Oil Press, Fuel Press, Voltage |
| -A (Pectel Atlantic) | RPM, Throttle, Oil Temp, Water Temp, Oil Press, Fuel Press, Voltage, Lambda, Gear |
| -E (MBE ) | RPM, Throttle, Water Temp, Oil Press |
| -C (Motec) | RPM, Throttle, Oil Temp, Water Temp, Oil Press, Fuel Press, Mani Press , Voltage, Lambda1 &2, Gear, Speed, Fuel Used, Advance |
| -U (Autronic) | RPM, Throttle, Water Temp, Manifold Absolute Pressure , Air Fuel Ratio, Speed, Ignition Advance |

# System Packages & Options

| Features | Informer System Packages | |
|---|---|---|
| | IN 400 | IN 600 |
| Channels | 8 Analog, 3 RPM, up to 14 ECU channels[4], Expandable | |
| Engine RPM | Y | Y |
| Speed, Lap Time, & Performance Monitor | Y | Y |
| Battery Voltage | Y | Y |
| Gear Position | Y | Y |
| Oil Temp | | Y |
| Oil Pressure | | Y |
| Water Temp | | Y |
| Throttle | | Y |
| Brake | | Y |
| Lateral G | | Y |
| ECU Interface [4] | Y | Y |
| Order # for "Classic" Configuration[2] | IN400C | IN600C |
| Order # for package with GPS[3] | IN400G | IN600G |
| upgrade to 20 Channel SSI | 1220U | |
| Add Co Pilot 2 (display only, no logging) | CP2U | |
| Add Co Pilot 2+ display (with data logging) | Best to order a CP2+ system and add *Informer* option | |
| Included in Package: | System packages include all hardware, software, sensors AND standard "plug and play" wiring harness with all waterproof connectors installed, plus free software updates via our web site. | |
| ***Please see our price list (separate sheet) for current pricing on systems*** | | |

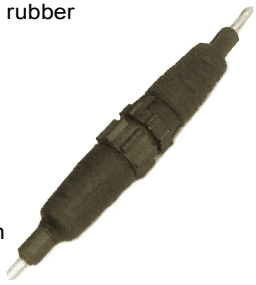
# Cable Harnesses & Connectors

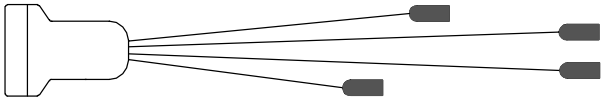
## CABLE HARNESSES

- Harnesses include SSI Port Connectors (see page 8), Cable, and Sensor Connectors.
- All harnesses are made using instrumentation grade Teflon jacketed, shielded cable rated to 200° C. Shields are carried through all intermediate connectors and extension cables.
- Standard Harnesses are included with all systems.
- Custom Harnesses are an added cost option on all systems.

## SENSOR CONNECTORS

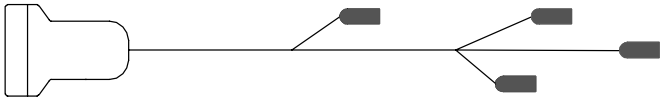
- Completely waterproof with "O" ring seal and rubber interfacial seal
- Positive locking 1/4 turn collar
- Built in strain relief
- All gold contacts
- Field replaceable
- Connector kits available
- 5 position (single channel cable) or 8 position (4 channel cable)





## STANDARD HARNESSES

- Each sensor has its own cable back to the port connector.
- Customer can specify length of each cable to the nearest FOOT. Cables are built to a length tolerance of +/- 6"
- Extension cables and Plug-and-play "Y" harnesses can be added.



## CUSTOM HARNESSES

- For the completely integrated custom fitted look
- Each sensor has its own cable back to the port connector OR can be part of a custom "Y" harness assembly.
- Customer can specify length of each cable to the nearest INCH. Cables are built to a length tolerance of +/- 1"
- See price sheet for Custom Harness costs.

*Competition Data Systems, Inc*. has been in the business of developing industry-leading data acquisition products since 1986. We have always followed a simple philosophy of providing high quality, easy to use products backed by the best warranty and customer service in the market. We sell and support these products through highly qualified representitves who are both experts in their use AND are very experienced racers. Finally, we price our products to provide the best value (highest performace to price ratio) available.

***Represented By:***

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