ST9918

LCD MOTORSPORT DISPLAY

www.stackltd.com

Contents

Introduction

Thank you for your purchase of the LCD Motorsport Display. This product features innovative full color LCD screen technology for unsurpassed visibility in all lighting conditions as a fully configurable, multi-parameter instrumentation and data logging solution with 4GB of memory standard suited for a variety of motorsports applications. Powerful DataPro Software provides intuitive configuration of supplied screen templates, inputs, and 16 individually configurable multi-color alarm status indicators and expert analysis of logged data. This display is capable of interpreting and displaying information from up to 12 discrete sensors, ECU CANbus, GPS, and additional sensor expansion modules and devices connected to the Auto Meter system network.
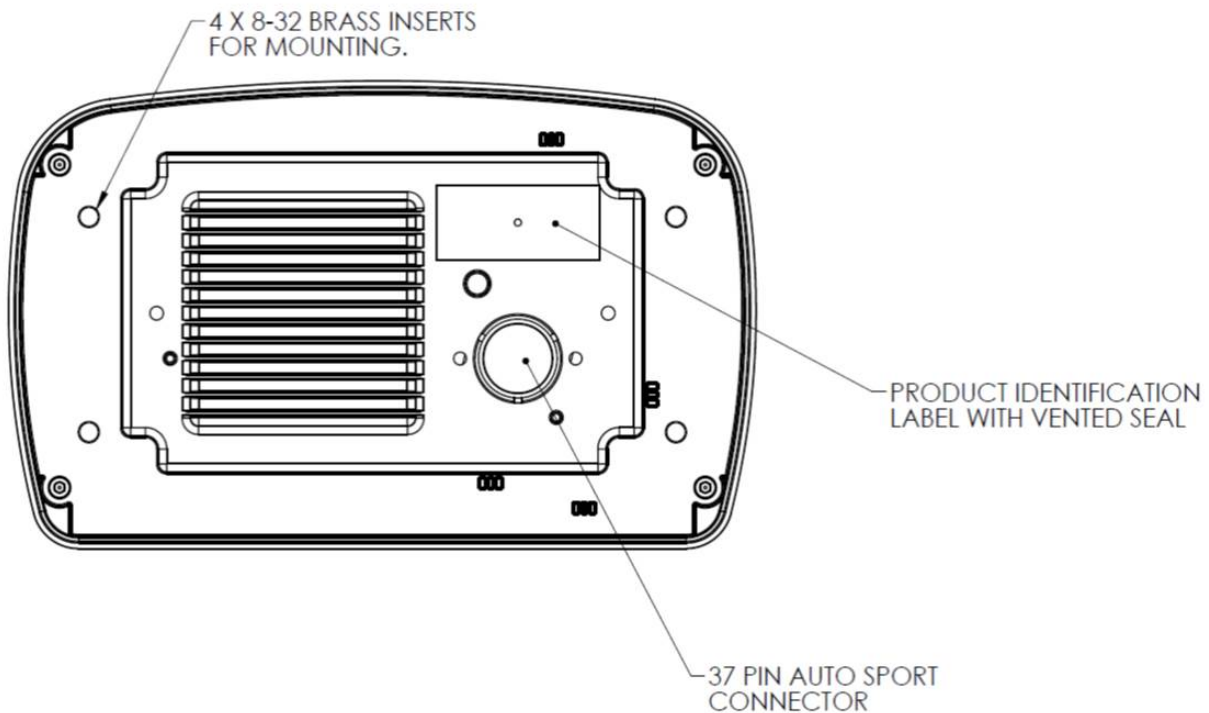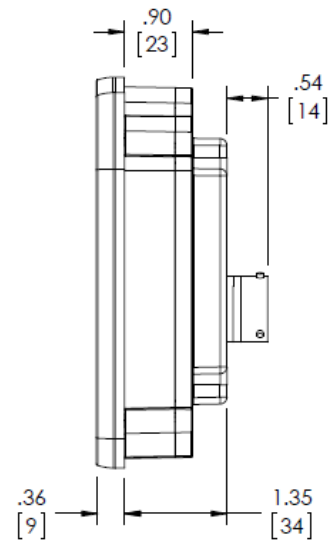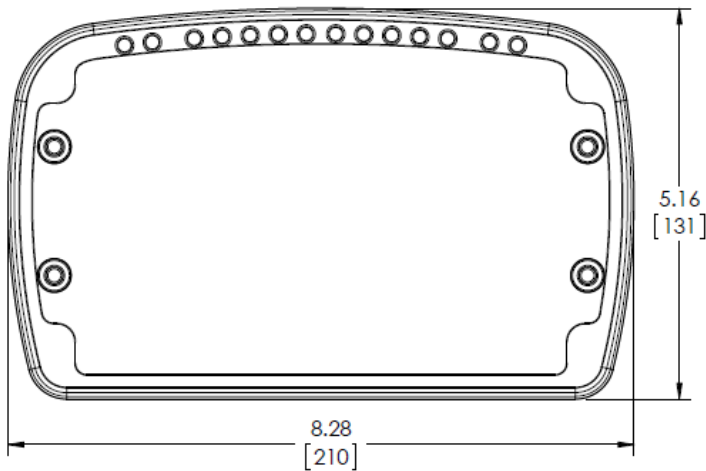
Features

- General
    - Dimensions - 8.28" (211mm) Wide x 5.16" (132mm) High x 1.35" (35mm) Deep.
    - Carbon Composite Housing.
    - Single 37 way autosport (AS) wiring loom connector for ease of installation and removal
    - 12 analog inputs for discrete sensors ideal for parameters not supported on the vehicle communication bus or ECU. Expansion modules available separately for additional inputs.
    - DataPro Designer PC Setup utility
    - Fully user configurable from display via integrated 4 button interface for at track changes. Optional external switch set can be mounted within driver reach for easy access.
    - 16 configurable multi-color LED indicator lights can be programmed for a wide variety of alarm and shift / gear change indication functions
- Display
    - 7.0" TFT LCD panel
    - 1000 nit brightness for unmatched daytime and nighttime visibility
    - 800 x 480 resolution
    - Onboard photo sensor for automatic brightness control.
    - Initial release supports multiple layers or screens selected from user- configurable templates (screens/instrument cluster designs/layouts), additional configurability supporting team selected graphics, parameter / instrument type and location, and size will be made available with future firmware and PC software releases.
    - Display features perfectly rendered virtual analog needles, value display bands, digital value indicators for vehicle parameters and configurable full color text warning message
    - Patented Predictive Lap Timing Display for Driver and Vehicle Development
- Inputs:
    - 4 pulse/digital or analog inputs
    - 8 analog inputs (0-5V or 0-12V)
    - 5 external switches / control outputs
    - Internal 3-axis accelerometer +/-6g
    - Internal battery voltage
    - GPS Mapping and Lap Timing

- Communications:
    - 2 Configurable RS232 Connections (GPS Input, ECU Input, telemetry, etc.)
    - 2 Configurable CAN BUS Connections (CAN 2 dedicated to module network if other Stack modules are connected)
    - 1 Ethernet port for PC comms: (config. & firmware upgrades)
    - 1 USB port: data exchange, config. copy/upload, & firmware updates.
- Data Recording:
    - 4 GB Memory
    - Sample rates up to 1000 Hz (Total recording capacity 8000 samples per second)
    - Includes powerful DataPro Analysis Standard Software (optional Semi-Pro and Pro software updates available separately)
- Environmental:
    - IP65 sealed
    - Operating temperature range: -7°C to +80°C
    - Humidity: 0-100% RH
    - Continuous vibration up to 20g, Shock up to 50g
- Miscellaneous:
    - Boot time / reset time to data screen: 2s
    - Boot time for full graphic application: 8s
    - Weight: 700g
- Software
    - Compatible with Windows XP, Vista, 7, and 8 Operating Systems on 32 bit and 64 bit machines
    - Sensor Calibrations and Zeroing
    - Designer – Full Configuration of Display offline including inputs, communications, alarms, screen layers, logging channels and rates and telemetry parameters
    - DataPro – Logged Data Analysis, Data Download, manual start and stop logging commands (while connected), DataMonitor real time readings and diagnostics (while connected), Logbook, Math Channels
    - Run Manager – Searchable management of system configuration files, datalogging session files, and vehicle profiles
    - ECU Gateway Template Editor – Management, editing, and creation of CAN template files for use with ECUs and other CAN enabled devices
    - TeleMonitor – Real time remote vehicle telemetry data analysis and logging (Enabled with Pro Analysis Upgrade
    - Software Updates available at www.stackltd.com

Getting Started

It is recommended that you unpack and connect the components in the system before you install it in your vehicle. This will enable you to familiarize yourself with operating the system and configuring it for the vehicle in which you intend to install it. This manual starts by taking you through the process of checking the system before installation, installing it in your vehicle, configuring the system and finally using it.

Display

.90
[23]

.54
[14]

5.16
[131]

8.28
[210]

.36
[9]

1.35
[34]

4 X 8-32 BRASS INSERTS
FOR MOUNTING.

PRODUCT IDENTIFICATION
LABEL WITH VENTED SEAL

37 PIN AUTO SPORT
CONNECTOR

Wiring

This product requires purchasing or building a custom wire harness.

Deutsch Autosport Connector: AS614-35SN

Pin Number	Function	Pin Number	Function
1	B+ (8 to 18V)	20	Serial2 Tx
2	Ethernet Tx+	21	Serial2 Rx
3	Ethernet Tx-	22	USB V+
4	Ethernet Rx+	23	USB GND
5	Ethernet Rx-	24	Serial1 Tx
6	USB D+	25	Serial1 Rx
7	USB D-	26	Channel 1 input
8	CAN1+	27	Channel 2 input
9	CAN1-	28	Channel 3 input
10	Sensor Ground	29	Channel 4 input
11	Sensor +5V	30	Channel 5 input
12	CAN2+	31	Channel 6 input
13	CAN2-	32	Channel 7 input
14	Switch 1	33	Channel 8 input
15	Switch 2	34	Channel 9 input
16	Switch 3	35	Channel 10 input
17	Switch 4	36	Channel 11 input
18	B-	37	Channel 12 input
19	Switch 5		

Recommendations and Requirements

Choose the appropriate multi-conductor jacket material for all connection based on estimated exposure temperature. Depending on wire routing some in cabin lines may not be subjected to high temperatures and standard PVC or comparable sheathing can be used. For sensor inputs that are connected on the engine side of the firewall, a higher temperature rated cable is required (Teflon insulation or comparable).

Power Requirements:

It is recommended to protect the +12V line (B+) with a 3 Amp fuse or circuit breaker.

Main system ground (B-) should NOT be used to provide a ground to any sensors. See connector pin #10 sensor ground.

Communication Inputs and Outputs:

CAN and Serial inputs require shielded, twisted pair wires with the shield connected to the system ground line.

Ethernet connection:

For direct connection to a laptop – standard cross-over Ethernet wiring is required (static IP).

For connection to a network – standard straight through Ethernet wiring is required (dynamic IP).

USB:

USB is used for transfer of data between the LCD dash and a standard USB-A jump drive (similar to jump drive supplied with each system). USB shield wire is required to be connected to system ground (B-) in order to maximize data transmission speed and accuracy.

Switches and Pro Control outputs:

The switches and Pro Control outputs share the same wire, but are configured in DataPro Designer as either a switch input or output.

For switch inputs, any normally open momentary switch can be used and needs to be switched to ground (B-). The LCD Motorsports Dash requires switch inputs to be switched to ground. This can be connected to the B- pin on the Autosport connector.

For Pro Control outputs, when the alarm is true, the line outputs 12V. There is a maximum of 200 mA current available for all configured outputs. If there is potential for connected devices to source more than this current, a relay is required.

Note: If a Pro Control output is configured and inadvertently switched to ground, it will not cause permanent damage to the unit, but the system will reset.

Sensor Inputs:

For sensors that require a 5V supply, the sensor must be powered by the LCD dash (sensor +5V) in order to condition the input signal accordingly.

For sensors that require a 12V supply, the sensor should be powered through the LCD dash harness (B+).

All sensor grounds must be connected to the Sensor Ground connection on the Autosport connector. Failure to do so will result in inaccurate sensor readings and potentially oscillating values.

Optional Components

Contact your dealer, a factory tech support rep, or visit our website for more information and assistance with purchasing these items.

Connectors – A variety of connectors are available for users wishing to create their own custom loom or incorporating custom sensors.

Warning Lights, Relays, and Switches – Additional external LED alarm lamps, relays, and switches are available for users wishing to make use of the switch input / control outputs on their display.

Expansion Modules – Connect these extra modules to your display via the system network connection to increase the number of available discrete sensor inputs available.

- ST269610 – 10 Channel Expansion Module

- ST269611 – 20 Channel Expansion Module

GPS Receiver Module (ST269588) – Utilizes Global Positioning Data to provides vehicle position data for track mapping, vehicle speed, and lap times.

Lap Beacon and Receiver Assembly (ST546) - Triggers lap time information on the display and for logging analysis when the vehicle (equipped with the receiver) passes through an infrared beam broadcast across the track by the beacon assembly placed trackside.

Sensors and Signal Conditioning Accessories – A multitude of digital and analog options are available to monitor nearly every conceivable performance parameter required to extract the maximum performance potential of your vehicle.

Sensors for Data Logging Systems	
Item Number	Description
Temperature Sensors	
ST657	0C to +200C K-Type Thermocouple Interface with 0-5V output
ST658	0C to +1100C K-Type Thermocouple Interface with 0-5V output
ST659	4 Channel 0C to +1100C K-Type Thermocouple Interface with 0-5V output
ST991	-20 to 150 deg C Fluid Temperature Sensor (M6x1)
ST269547	Fluid Temperature Sensor, 150C / 300F (1/8 NPTF Male)
ST269516	Exhaust Gas Temperature Two Sensor Kit, Exposed Tip Thermocouple
ST269517	Exhaust Gas Temperature Eight Sensor Kit, Exposed Tip Thermocouple
ST269518	Exhaust Gas Temperature Eight Sensor Kit, Armored Tip Thermocouple
ST269519	Air Inlet Temperature Sensor, Thermocouple
ST269520	Cylinder Head Temperature Sensor, Thermocouple
Pressure Sensors	
ST269546	Vacuum Sensor, 30 inHg
ST453	0-3.5 Bar Absolute Pressure Sensor with Low Freq DSP Interface
ST740	0 to 3.5 bar/ 50 psi boost sensor (1/8 NPTF)
ST269535	1 bar / 15 psi pressure sensor, solid state (1/8 NPTF)
ST269567	2 bar / 30 psi pressure sensor, solid state (1/8 NPTF)
ST269559	4 bar / 60 psi pressure sensor, solid state (1/8 NPTF)
ST269536	6.9 bar / 100 psi pressure sensor, solid state (1/8 NPTF)
ST747-1/8NPTF	10 bar / 150 psi pressure sensor, solid state (1/8 NPTF)
ST269537	17 bar / 250 psi pressure sensor, solid state (1/8 NPTF)
ST269538	34 bar / 500 psi pressure sensor, solid state (1/8 NPTF)
ST749	100 bar / 1500 PSI pressure sensor, solid state (1/8 NPTF)
ST269539	110 bar / 1600 psi pressure sensor, solid state (1/8 NPTF)
ST269540	206 bar / 3000 psi pressure sensor, solid state (1/8 NPTF)
Pulse Sensors	
ST492	Pulse Amplifier (e.g. Gearbox Sensor Amplifier)
ST493	RPM Coil Connection Interface for MFD/MFR/MF
ST670	Proximity Speed Sensor
ST269510	Engine RPM Sensor
ST269511	Driveshaft RPM Sensor Kit, 1.875" (47.6mm), Standard Ford 9"
ST269512	Driveshaft RPM Sensor Kit, 2.187" (55.5mm), Large Ford 9"

ST269513	Driveshaft RPM Sensor Kit, Universal
ST269514	Input Shaft RPM Sensor, Lenco Transmission
Pulse Sensors	
ST269515	Wheel Speed Sensor, Magnetic
ST269531	RPM Sensor, Magnetic, 5/16"-24 x 1.5
ST269532	RPM Sensor, Magnetic, 3/8"-24 x 1.5
ST269533	RPM Sensor, Magnetic, 3/8"-24 x 0.620
ST269589	GPS Ground Speed Module & Antenna, 10Hz, Pulse Output
Displacement Sensors	
ST972	Linear Potentiometer 50mm/2" (e.g. Suspension)
ST973	Linear Potentiometer 100mm/4" (e.g. Suspension)
ST977	Linear Potentiometer 150mm/6" (e.g. Suspension)
ST974	Linear Potentiometer 200mm/8" (e.g. Suspension)
ST976	300mm/12" String Potentiometer (0-5V output)
ST978	Rotary Potentiometer 360Deg (e.g.Steering)
ST979	Rotary Potentiometer Sensor 120Deg (e.g. pedal angle)
Force/Acceleration Sensors	
ST791	+/- 5g Accelerometer with 5Hz 5-pole Butterworth Low-pass Filter
Miscellaneous Sensors	
ST994	Wideband Lambda Sensor & Interface 0-5V, 1 Channel
ST996	Wideband Lambda Sensor & Interface 0-5V, 2 Channel
ST269523	Wideband Lamda Sensor & 0-5v Interface, 8 Channel
ST269552	Replacement Wide Band Lambda Sensor for ST994/ST996
ST995	5Hz GPS Receiver with NMEA Interface
Adapters for Standard Sensors	
ST154003	1/8NPTF to M10 adapter
ST154006	1/8NPTF to 1/8BSPT adapter
ST154012	M6x1 to M10x1 adapter
ST154013	M6x1 to 1/8NPTF adapter
ST154015	1/8BSP to M10x1 adapter
ST154016	1/8BSP to 1/8NPTF adapter
Accessories	
ST510	2 Switch kit
ST511	3 Switch kit
ST514	4 Switch kit
ST581	5 off SureSeal Plug (Male) Kit
ST582	5 off SureSeal Receptical (Female) Kit
Lap Timing System	
ST543	Infrared Lap Timing System receiver only
ST544	Infrared Lap Timing System trackside beacon only
ST546	Infrared Lap Timing System receiver & beacon

Tire Pressure and Temperature Monitoring Systems – Stack offers precision lightweight, durable and batteryless pressure and temperature monitoring systems for comprehensive tire analysis in club and professional racing applications.

Video – Stack offers multi-camera video modules for club and professional racing applications which may be connected to your display to expand your logged data analysis with precisely coordinated, constantly synchronized video frame to recorded sample data allowing you to really see what is happening on track.

Other Devices – Other devices such as ECUs (Engine Control Unit) and PDMs (Power Distribution Module) may be connected to your display. Contact your dealer or factory support rep for details.

Switches

There are four switches used to control the functions of the LCD Motorsport Display These are on the Keypad on the display face and can be mirrored externally by connecting switches to S1-S4 pins on the display wire harness in applications where the driver cannot reach the display when belted into the vehicle. Note: Employing external switches limits or removes the ability to utilize Pro Control outputs from these leads.

A fifth switch may optionally be connected to S5 (in the event that an infrared lap receiver is not fitted) to allow a manual driver lap trigger or set a GPS lap trigger point (if the optional GPS receiver is utilized).

The normal functions of the switches are:
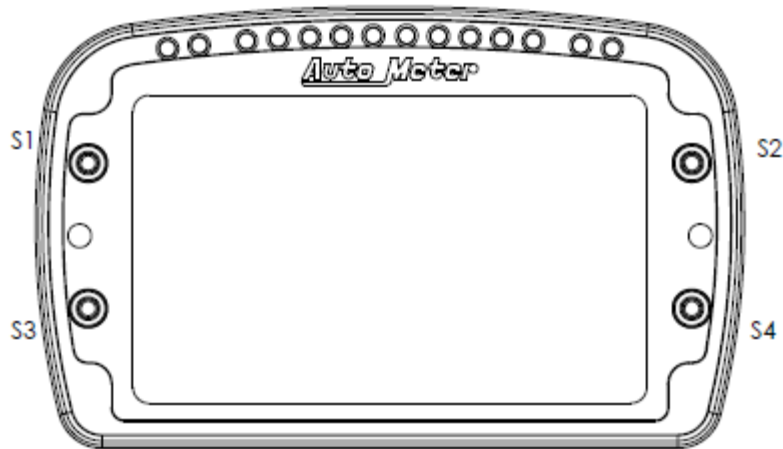
Normal Operation:

S1 – Clear Warning – will clear LED and text warning, not bubble.
S2 – Peak Recall (single button toggle/clear)
S3 – Next graphic layer
S4 – Toggle day and night brightness settings
S5 – Lap switch – beacon input, manual input, or capture start line for GPS lap timing

S1 (Long press) – Software Banner – display firmware versions, IP address and functions.
Press S3 and Press S4 within 1 second – enter sensor calibration mode.

Factory Reset:

To perform a factory reset, press and hold S1 & S2 for several seconds while power is applied to the unit.

You can install the switches in any convenient location.

When installing the switches, it is important that the driver can reach the Peak and Layer Switches easily in order to show peak values and

Sensors

Auto Meter sensors include specific installation instructions that should be utilized in addition to the information presented below to ensure optimum performance.

Wheel Speed and RPM Sensors:

The LCD Motorsport Display may be connected to a range of proximity and magnetic sensors to measure, for instance, wheel or transmission speeds. These sensors are used to measure wheel or shaft rotation in order to display the speed in MPH or RPM. The sensor provides an electrical pulse to the system each time a target object, such as a CV joint bolt or a rare earth magnet, passes near to the end of the sensor. When configuring the system you need to supply the number of ferrous objects that will be counted for each revolution. In addition for speed you must supply the roll out / circumference of the tire. Take note of these details so that you may enter them into the display configuration via PC detailed later in the manual.

Fitting proximity sensors:

These sensors are triggered by a number of 'Targets' (see Sensor Targets). It is essential that these devices and their cables are positioned as far as possible from all sources of intense heat and from the ignition HT leads to avoid interference.

Sensor targets:

Proximity sensor targets can be any suitable metallic object which passes within range of the sensor tip. Iron and mild steel targets are preferred as they give the strongest signal to the sensor. Aluminum, brass and copper targets give approximately one third of the sensing range which makes setting up the sensor difficult and may cause the speed signal to be unreliable. Magnetic sensors are supplied with rare earth magnet targets which may be bonded to the vehicle component in question. Aluminum mounting collars fitted with magnets are also available for purchase from Auto Meter separately.

It is important that the sensor and targets are rigidly mounted so they do not move with vibration. The sensor bracket should have a suitable hole for the threaded portion of the sensor to pass through. Targets should be at least 10 mm (5/8") across and stand 4 mm (5/32") proud (Fig.1). Smaller targets can be used but these will reduce the range. Small aluminum, brass or copper targets will generally not work. Nothing except the targets should come within 6 mm (1/4") of the end of the sensor. If the sensor mounting position is to be recessed, a hollow of 24 mm (15/16") diameter and at least 4 mm (5/32") deep should be allowed around the sensor.

Sensor fitting and adjustment:

1. Connect the Mini Sure-Seal connector of the proximity sensor to the system via PA1 to PA4 of the Sensor Harness. Turn on the power.
2. Assemble the first (rear) nut onto the sensor.
3. Insert the sensor into the mounting bracket hole and fit the front nut.
4. Rotate the wheel or shaft and move the sensor slowly forward by undoing the rear nut counter-clockwise until the built-in light (LED) comes on for every target.

That light is used to check that both the mechanical and electrical installations have been performed correctly. This light should be ON when a target is in front of the sensor.

5. Undo the rear nut half a turn more.
6. Without rotating the sensor or rear nut, finger-tighten the front nut.
7. Tighten the rear nut with a 13 mm AF spanner. Do NOT let the sensor rotate. Do not over-tighten; one flat of the nut should be sufficient. A small amount of silicone sealer will prevent it vibrating loose.

Checks for correct installation and adjustment:

- Rotate the wheel or shaft and check that the built-in sensor light comes on for each target and goes off between each target.
- Check that both the sensor and targets are rigidly mounted.
- Check that the front nut or any fixings do not cover any part of the sensing end.
- Check the gap between sensor and any of the targets is NOT less than 0.5 mm (3/16") so there is no risk of the sensor hitting the targets.

Fluid Pressure Sensors:

The LCD Motorsport Display can be connected to a range of fluid pressure sensors to measure, for instance, Oil Pressure and Fuel Pressure.

Fitting the pressure sensors:

- Position the sensors and their cables as far as possible from all sources of intense heat and from the ignition HT leads.
- Each sensor can either be screwed in directly to the monitoring point or fitted separately by using a suitable pressure hose to connect it to the monitoring point.
- Note: Direct mountings on some racing engines and related mounting points should be avoided because excessive vibration can affect the long-term life of the sensor or engine components to which they are connected (i.e. fuel rails and fitting extensions)
- Do not over-tighten the sensor.

Fluid Temperature Sensors:

The LCD Motorsport Display can be connected to a range of temperature sensors to measure, for instance, Water Temperature and Oil Temperature.

Fitting the temperature sensors:

- Position the sensors and their cables as far as possible from sources of intense heat and from the ignition HT leads.
- Mount each temperature sensor directly in the appropriate fluid line. Screw the sensor into a suitable mounting boss so that its tip lies near the middle of the flow of fluid.

Exhaust Gas Temperature Sensors (EGT):

The LCD Motorsport Display can be connected to 4 channel K-Type thermocouple sensor modules to measure, for instance, Exhaust Gas Temperature. These typically measure temperatures from zero up to 200°C (400°F) or 1100°C (2000°F).

Fitting the thermocouple sensors:

- Mount each temperature sensor directly in the appropriate exhaust header primary tube. Screw the sensor compression fitting into a suitable mounting boss so that its tip lies near the middle of the flow of exhaust gasses.

Position Sensors:

The LCD Motorsport Display can be connected to a range of position sensors for measuring vehicle component position movements, such as, for example throttle, steering or damper movements. Position sensors must be calibrated to installation orientation.

Fitting Position sensors:

ST979 Rotary position sensor with arm:

This sensor has a spring loaded lever which should be attached using a length of stranded wire to, for instance, a throttle pedal.

- Find a mounting position which does not interfere with the drivers feet or operation of the controls.
- Once the intended location for fixing is determined, drill 4.5 mm (3/16") holes to provide clearance for the supplied bolts
- Bolt the sensor in place and connect it to the wiring harness
- Using the length of cable supplied, pass the end of the cable through the hole in the lever arm and attach the other end to the side of the pedal lever.
- Adjust the cable tension until the lever arm is just pulled away from its resting position. This adjustment should be checked regularly to remove any slack in the cable which may give rise to errors in throttle position.

ST973/9 Linear Displacement / Travel Sensors:

The linear displacement sensor should be mounted between the vehicle's chassis and a suspension member. These sensors are available with various maximum displacements to suit different suspension systems.

- Find mounting positions on the suspension members and the adjacent chassis.
- Once the intended location for fixing is determined, drill 5 mm (3/16") holes and fit suitable bolts.
- Attach the sensor body to the chassis and the extending arm to the suspension.
- Connect the sensor cable to the wiring harness.

The spherical bearings at each end of the sensor are designed to absorb any bending forces on the sensor rod and should not be restricted in any way. Failure to do this will result in bending forces being applied which will cause the sensor to fail!

The sensor will be damaged if it is allowed to extend or compress beyond its normal range of movements.

Hydraulic Pressure Sensors:

The LCD Motorsport Display can be connected to a range of hydraulic pressure sensors to measure, for instance, Brake Pressure.

Fitting the pressure sensor:

Reliable braking performance is vital to the safe operation of your vehicle and only a competent mechanic should attempt to fit this sensor. Only high pressure brake line quality fittings should be used!

- Position the sensor and its cable as far as possible from all sources of intense heat and from the ignition HT leads.
- The sensor has a Dash 3 female thread. Use a suitable adaptor to join it to a three-way connector block inserted into the brake line.
- Ensure the sensor is mounted at a low point with its opening upwards to allow trapped air to be removed during the brake bleeding process.

CAN ECU Interface:

The LCD Motorsport Display can be connected to an Engine Control Unit equipped with CAN data output to enable the display to share engine performance parameters, reducing the requirements for additional wiring and sensor installation.

- The CAN Lo and Can Hi from the LCD Motorsport Display will be connected to CAN Lo and CAN Hi respectively on the CAN output of the ECU.

It is common for the CAN Hi and CAN Lo connections to be identified incorrectly. If no signal can be seen, wires may need to be swapped!

- A configurable CAN terminator is installed on each CAN line in the LCD Motorsport Display and should be switched on in the configuration procedure detailed later in this manual if required.

To determine if the terminator is required, consult the technical sheet / manual for your ECU or contact your ECU manufacturer for confirmation. In the event that this information is not available, you may measure the resistance between CAN Hi and CAN Lo on your device with a digital multimeter. No resistance needs the terminator enabled and a resistance of 120 Ohms requires no terminator!

- Finally configure the LCD Motorsport Display for the CAN ECU interface using DataPro Designer.

Infra-red Lap Timing System:

The Lap Timing system consists of two parts:

- A Lap Timing Receiver (ST543) which is fitted to your vehicle and responds to a coded infra-red signal.
- A Trackside Beacon (ST544) which transmits an infra-red beam to activate the lap timing sensor.

ST543 Lap Timing Receiver:

The lap timing receiver is actuated by an infra-red beacon positioned at the side of the track. The receiver is fixed to a rigid bracket mounted at a convenient position on the outside of the vehicle where it is able to detect the signals from the beacon.

- It is secured through a 18mm (0.7") diameter hole by two nuts with M18 x 1mm threads.
- This sensor must be positioned horizontally and square to the axis of the vehicle.
- In order to detect the signals from the beacon it must be situated outside the vehicle.
- It should, if possible, be positioned so that other vehicles that are being overtaken (or are overtaking) at the moment your vehicle passes the beacon do not block the signal.

After detecting a signal from a beacon, the system does not recognize any further signals for a period of ten seconds. This is to prevent multiple lap times being recorded if there is more than one Auto Meter beacon positioned along the pit wall!

ST544 Trackside Infra-Red Lap Beacon:

The trackside infra-red lap beacon works with the ST543 lap timing receiver to trigger the LCD Motorsport Display to record a lap time. The housing has a threaded socket on its base for mounting to a standard photographic tripod (not included). It should be located as follows:

- As near to the start-finish line as possible. A feature of DataPro allows the offset between the beacon and the start line to be adjusted.
- At the same height as the on-vehicle infra-red receiver.
- Level so that it emits a horizontal beam.
- It must be between 2 and 30 meters (6 to 100 feet) from the vehicle when the vehicle passes it.
- Avoid positioning the beacon so that the sun is directly behind it when it is being used.
- Where the unit is to be used for lengthy periods in very hot or sunny conditions, it should be protected by shading it from direct sunlight.
- Do not allow water to be sprayed onto the transmitter lenses. During wet conditions fit a protective peak over the beacon.

To prevent distortion of the coded infra-red signal, do not cover the beacon with a plastic bag!

Power supply to trackside beacon:

The trackside beacon operates from a 12 volt DC supply. A battery with a minimum rating of 2.5 Amp/hour is recommended. This will provide approximately 15 hours of continuous operation. The condition of the battery is indicated by the color of the LED indicator on the front panel of the unit:

- Green - The voltage is, at present, adequate for use
- Red - The voltage is too low (replace or charge the battery).
- No color - The battery is exhausted or disconnected.

Mini Sure-Seal Connectors:

Stack data logging sensors are fitted with a four way ITT Cannon Mini Sure-Seal (MSS) connector.

A plug (also known as the male end and smaller of the two connectors) must be connected on the ends of the Sensor Harness. The following polarity is observed in all cases:

Pin	Signal Description
1	Signal from sensor
2	5 volt sensor supply
3	Battery positive
4	Sensor ground
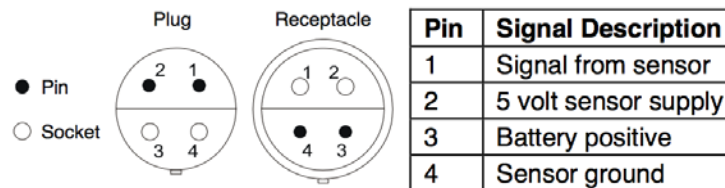
Mini Sure-Seal connectors offer excellent vibration and waterproof performance. However, they do not have a positive locking mechanism, and thus caution must be observed during installation to prevent strain such as bending or pulling load from being placed upon them which can cause the connector to fail!

Packard Connectors:

Some pressure sensors are supplied with an integrated Packard connector.
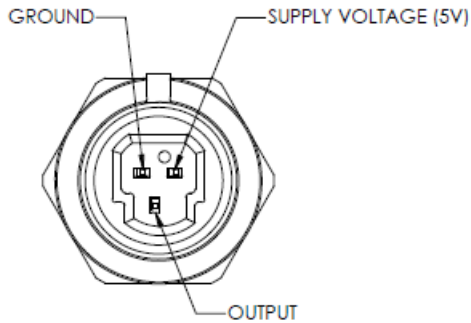
Mating connector: Packard 12110192

Terminal: Packard 1208290

Software Installation

Navigate to www.stackltd.com to download a copy of the latest DataPro software or insert the USB jump drive containing DataPro Software included with your display into the appropriate port on your computer and save the files to a convenient and memorable location such as your desktop.

Once this process is completed, open the DataPro folder and double click the Setup.exe icon to launch the InstallShield Wizard and follow the on screen instructions to complete your installation.

DataPro will install the following icons on your Desktop as part of this installation process:

- **Designer** – Full Configuration of Display offline including inputs, communications, alarms, screen layers, logging channels and rates and telemetry parameters
- **DataPro** – Logged Data Analysis, Data Download, manual start and stop logging commands (while connected), DataMonitor real time readings and diagnostics (while connected), Logbook, Math Channels
- **Run Manager** – Searchable management of system configuration files, datalogging session files, and vehicle profiles
- **ECU Gateway Template Editor** – Management, editing, and creation of CAN template files for use with ECUs and other CAN enabled devices
- **TeleMonitor** – Real time remote vehicle telemetry data analysis and logging (Enabled with Pro Analysis Upgrade)

Software updates are available at www.stackltd.com, check this location for access to the latest features.

Configuration
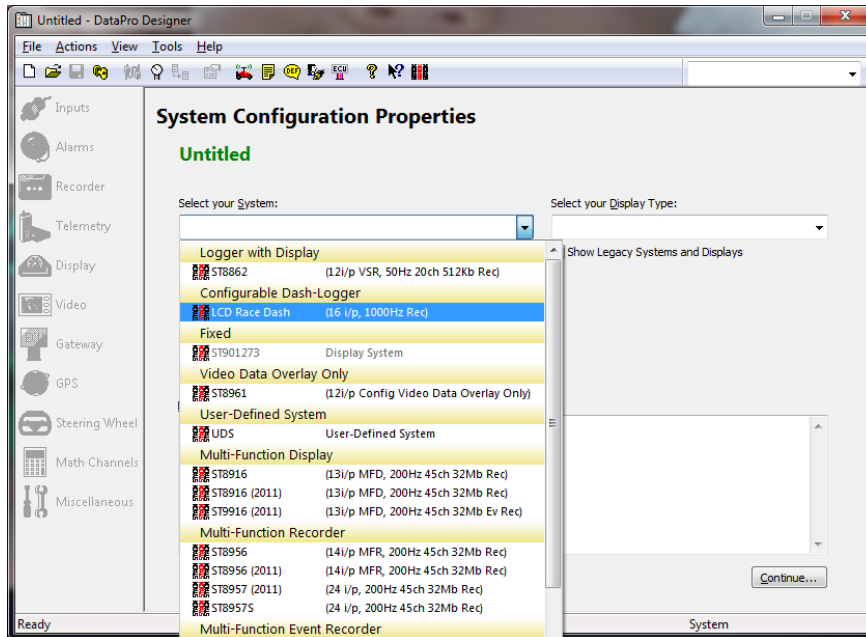
On the left hand of the screen various icons can be seen that allow navigation to menus used to configure different elements of the LCD Motorsport Display. The following is a list of the menus and their functions.

Menu	Function
Inputs	Configure pulse (digital), analog, and resistive inputs for sensor channels 1-12.
Alarms	Configure alarms - LED warning, on screen text warning, Pro Control outputs, & shift lights.
Recorder	Set channels to be recorded on the internal memory including sample rates for each channel.
Telemetry	Set channels that can be output to a telemetry module.
Display	Design screen layouts and set day and night brightness levels.
Video	Used for connecting a VS module to the system. For DVL configuration, reference DVL software.
Gateway	Configure CAN inputs (select from various protocols or create custom CAN inputs).
GPS	Enable and configure GPS inputs and GPS lap timing.
Steering Wheel	This feature does not apply to configuring the LCD Motorsport Display.
Math Channels	Configure calculated gear position and enable other math calculations.
Miscellaneous	Other settings - enable internal CAN terminating resistor.

2650-1790-00r1

Connections

Inputs

Select sensor from sensor category tabs on the left, and drag and drop to the desired channel box matching the harness sensor loom label where the sensor has been connected. Select the appropriate channel name from the drop down menu or enter a custom channel name. Designer will not allow you to place sensors on channels where they cannot function.

Please note: Sensors that require calibration (linear travels, throttle position, pedal sensors, etc.) must use the default name from the drop down menu so that the zero position can be configured.
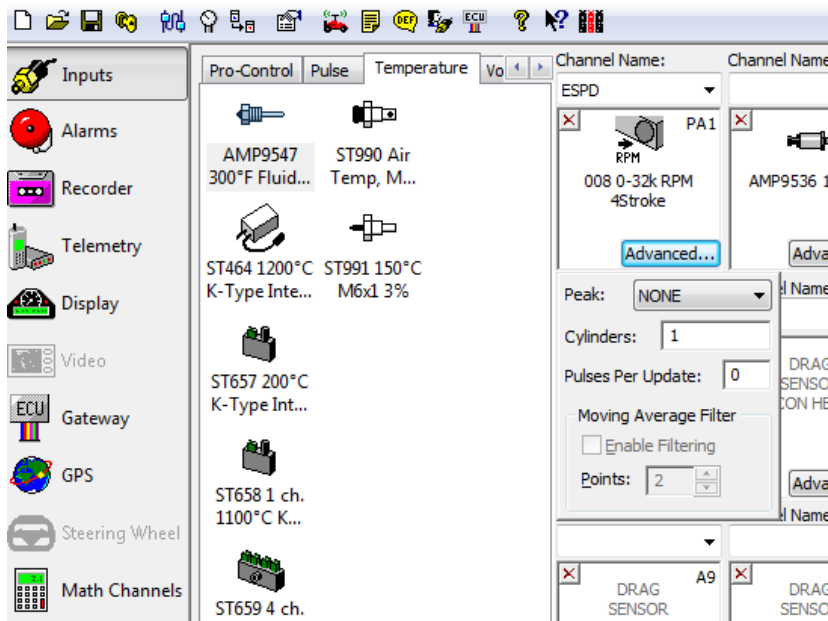
Configuring the Engine RPM Input

For ESPD RPM inputs, click on the Advanced button after placing the sensor input type in order to and select the number of cylinders. Adjusting Pulses Per Update upwards from zero will delay the response time of the input but will allow for filtering of undesirable spikes. It is recommended to leave this setting at 0 for now.

Configuring Wheel Speed Inputs

When setting up wheel speed inputs (WSPD) – Select the sensor and the number of pulses per wheel revolution for the vehicle application adjusted under the Advanced button for the channel. The wheel (tire rollout) circumference must be entered in the vehicle calibration window.

Calibration Icon
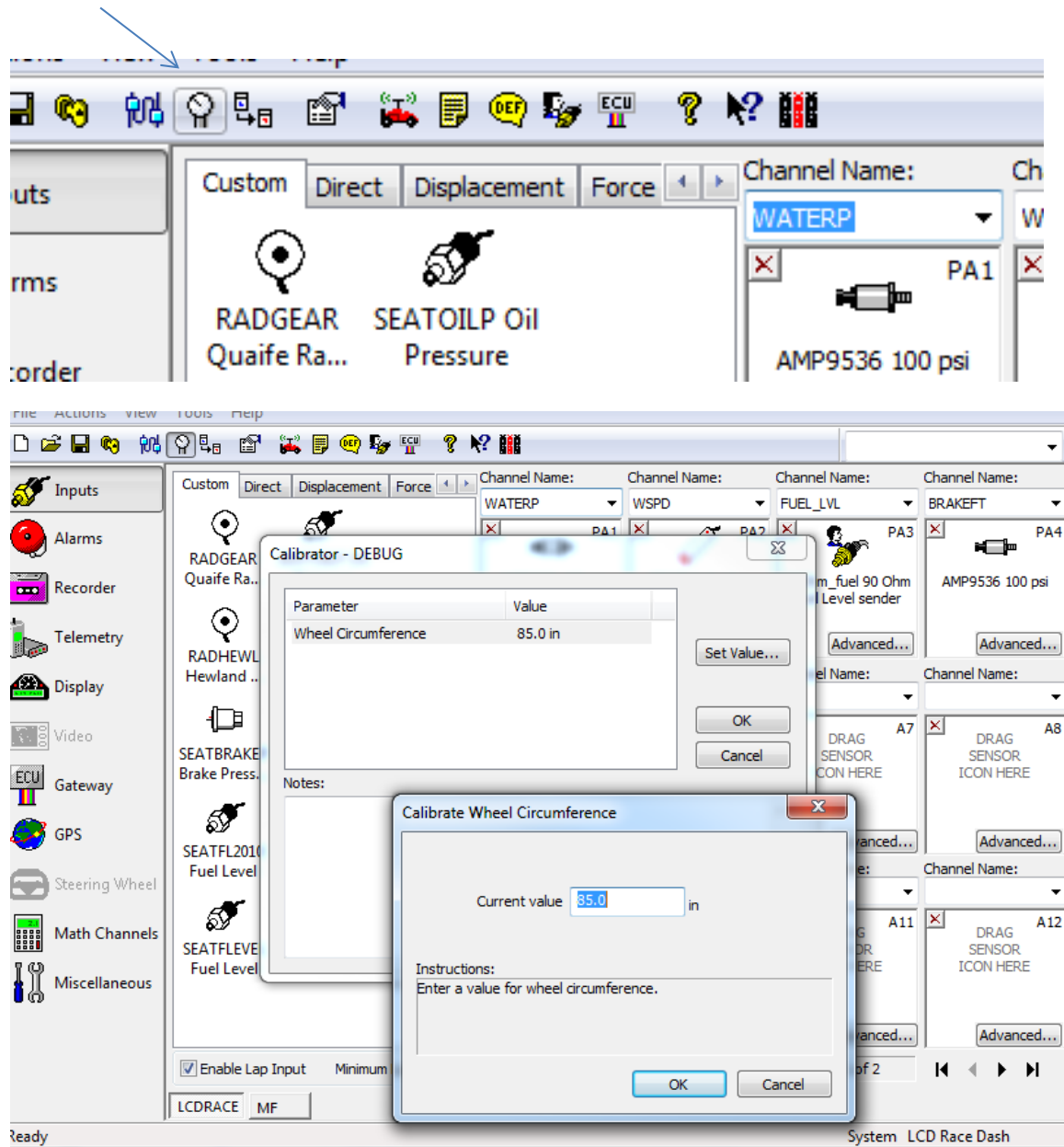
Click the Set Value tab and enter the wheel circumference.

Other non-zero sensors will be calibrated after the initial configuration is uploaded.
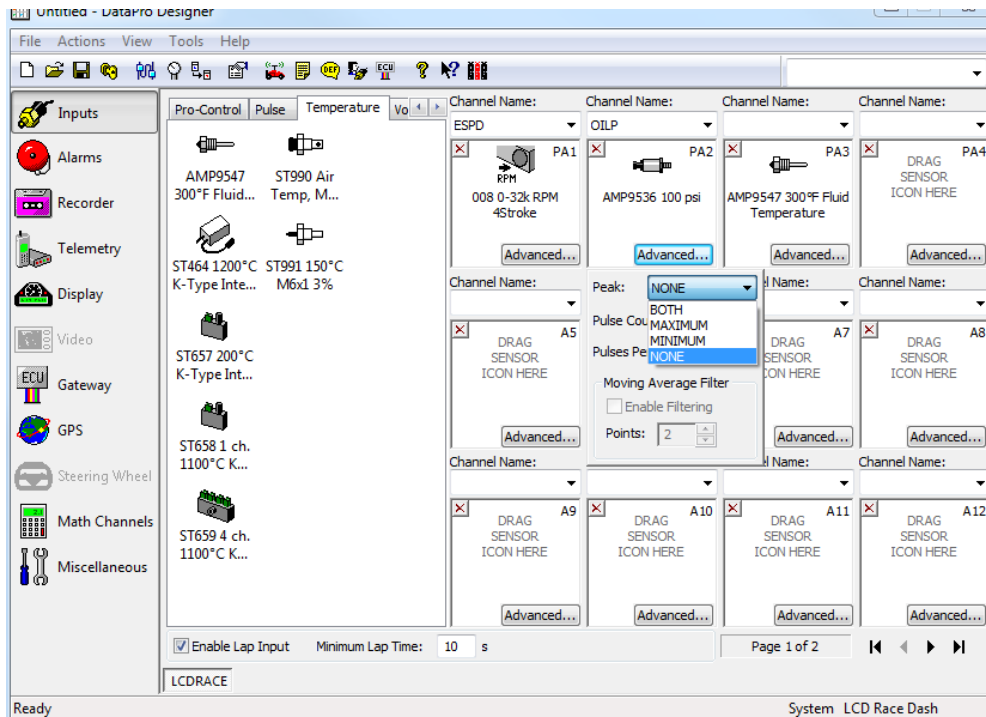
In the advanced tab for other sensors, Peak options can be selected for none, minimum, maximum, or both. These values will show up on the screen when the peak recall switch is pressed.

Advanced users may also choose to enable Moving Average Filters for any particular sensor channel to eliminate noise and smooth monitored and recorded data. Once enabled you will be able to select the number of data points over which the Moving Average applies. Increasing this number will progressively smooth the data trace, increasingly at the expense of missing critical data points outside of the normal trend. It is recommended that you leave Moving Average Filters disabled for all channels at this time.

Several internal sensors can be enabled and disabled (g meter and battery) from page two of the inputs section. Utilize the arrows in the bottom right hand of the window to navigate back and forth between input pages.

2650-1790-00r1
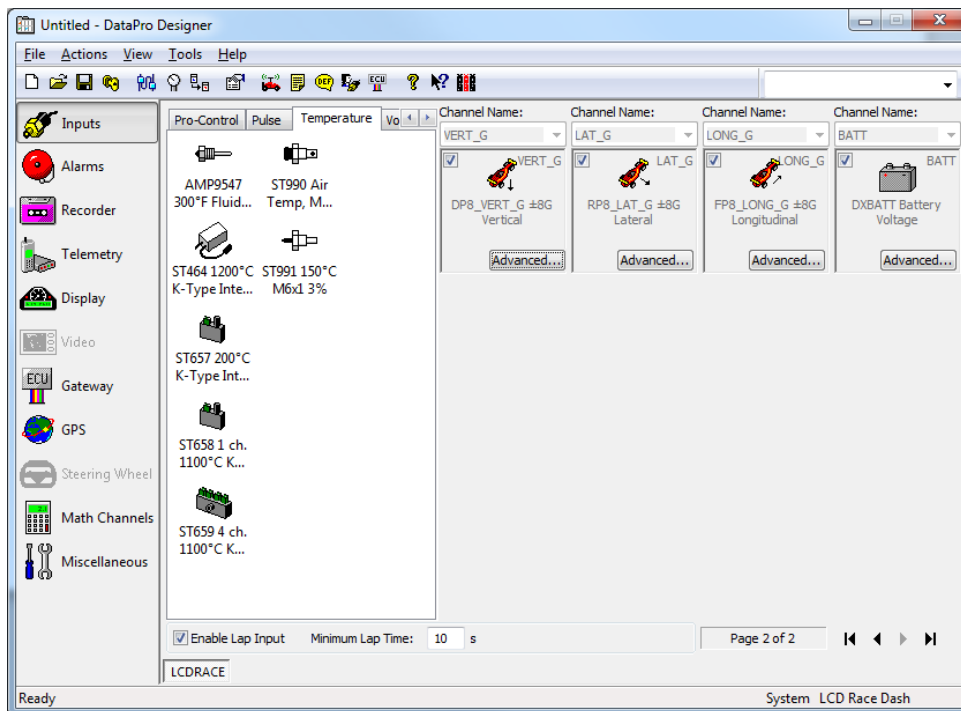
Internal Channels (G Meters & Internal Battery)

The Motorsport LCD Dash has an internal 3-axis accelerometer and internal battery voltage monitor. In order to access these channels for display and logging, simply check the pre-defined channel to enable.

Moving Input Channel Locations

To quickly swap or move sensor input locations in your configuration once you have begun the configuration process or at a later time when editing an existing configuration file, utilize the Move Input feature.

Creating a Custom Sensor Scaling

Custom Sensor is a feature upgrade for your LCD display available via the Semi-Pro software pack. If you have purchased this option, you may utilize the Custom Sensor Manager to Create, Edit, Import and Export custom / 3rd party sensors for your display.

Alarms

Alarms communicate critical condition on the vehicle to the driver and may encompass any combination of Illuminated LEDs, Colored Channel Value Bubbles, Channel Markers, Screen Layer Change, Pro Control Output Activation and Text Display Messages. These may be set for all channel parameters monitored by the display.

Creating an Alarm

To set an alarm, click the Add tab and select the channel, the state (above or below), the alarm value, and any delay (the amount of time that the condition must occur before the alarm is activated.

2650-1790-00r1
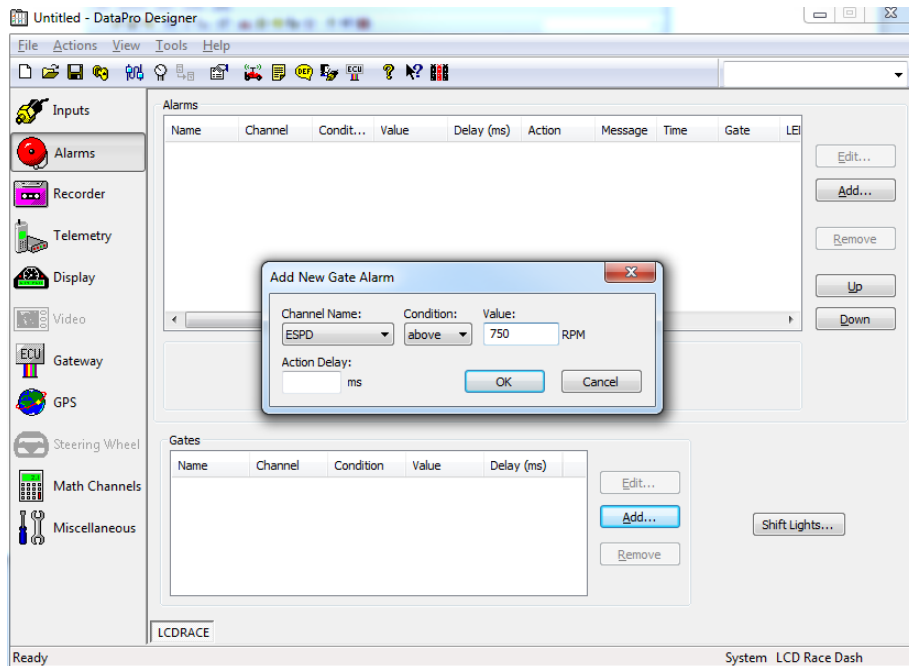
Gates

Gates provide the ability to assign multiple conditions that must occur for an alarm to activate. For example, setting a gate for ESPD above 750 RPM and using it for all LED warning conditions will allow alarms to be disabled when the engine is not running – negating a low oil pressure warning when the car is switched on in the paddock but the engine is off.

For each gate that you create, choose a channel, condition, value, and action delay.

For each warning condition, the following options are available:

- **Enable Gate** – Utilize a gate created using the technique above a combination of event triggers to activate an alarm.
- **Enable Action** – Automatically change to a specific screen layout, set Pro Control output.
- **Illuminate LEDs** – set warning LEDs to turn on under specific conditions.
  - o **Modes**: Solid, flashing, alternating (two or more LEDs alternating on and off).
  - o **Colors**: red, yellow, blue, green, amber, magenta, or cyan.
- **Warning Message** – displays a warning message on the LCD screen. Time message is displayed can be adjusted. Note: entering 0 for time will keep the warning on screen until the condition goes away or until it is cleared by the driver.
- **Illuminate bubble** – Certain graphic templates have a digital value for which the background color will change in concert with the LED color. Note: when alternating LED color is selected, the first color selected (mouse left click) will be the bubble change color.
- **Show marker** – for gauges that have pointers or bar graphs, a marker will appear at the warning set point so that the driver can have a reference to proximity to warning points.

Note: individual channel warnings that use the middle 10 LEDs will be overridden when a shift light is active. Also, the order of the alarms in the list indicates priority for LED and message warnings. To change an alarm priority, first select the alarm you wish to change, then use the Up and Down buttons in the window to change its position in the order.

2650-1790-00r1
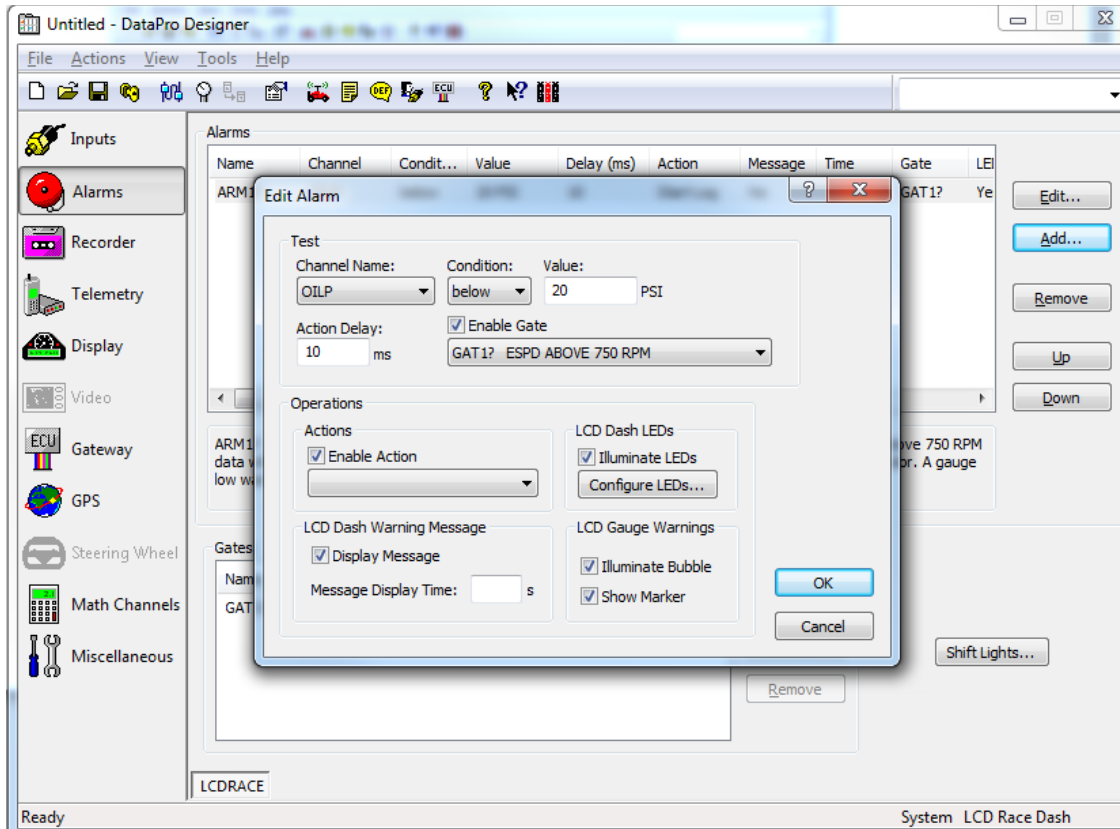
When you click the configure LEDs tab, a pop up window will appear with an image of the LCD dash. LEDs can be enabled and disabled by left clicking on the desired LED (right clicking will set the second color for alternating LED mode).
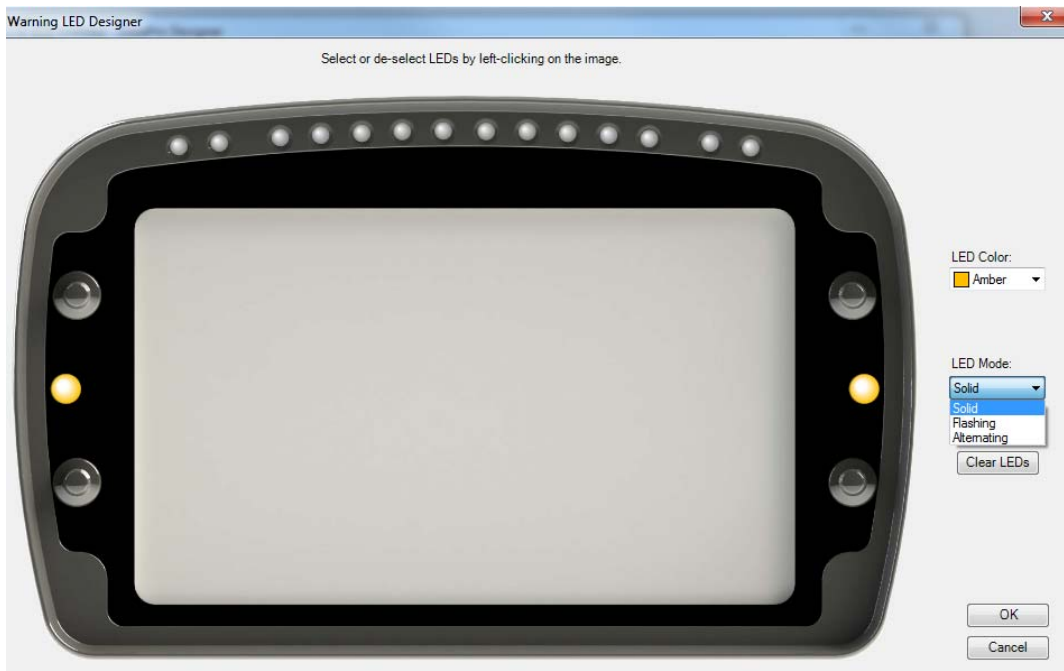
Configuring Shift Lights
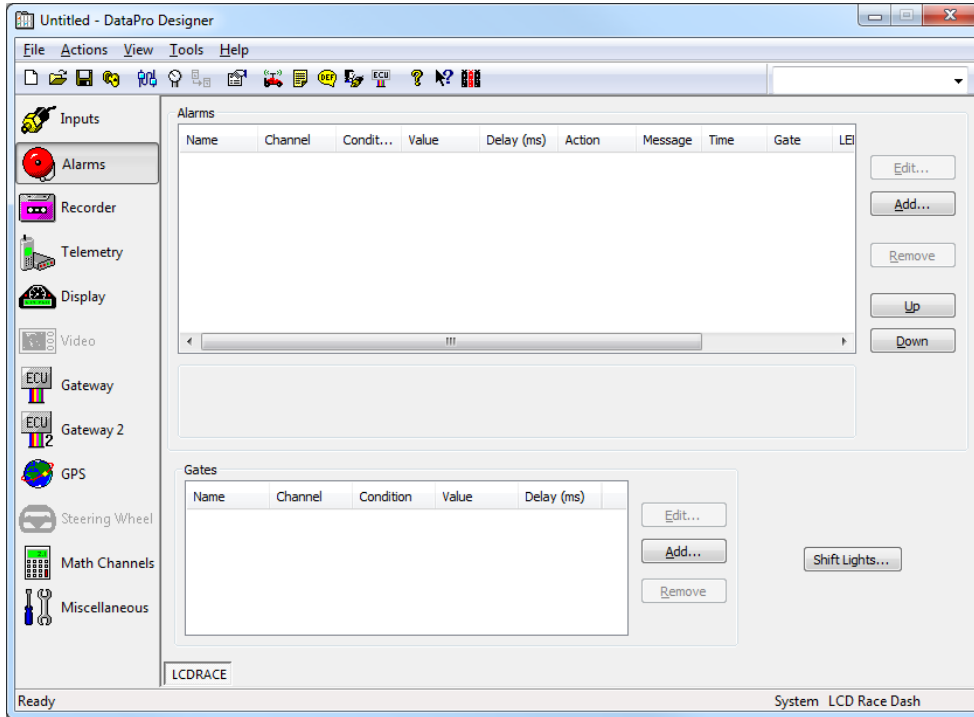
In the alarms menu, click on the Shift Lights button to access the shift light menu.

2650-1790-00r1
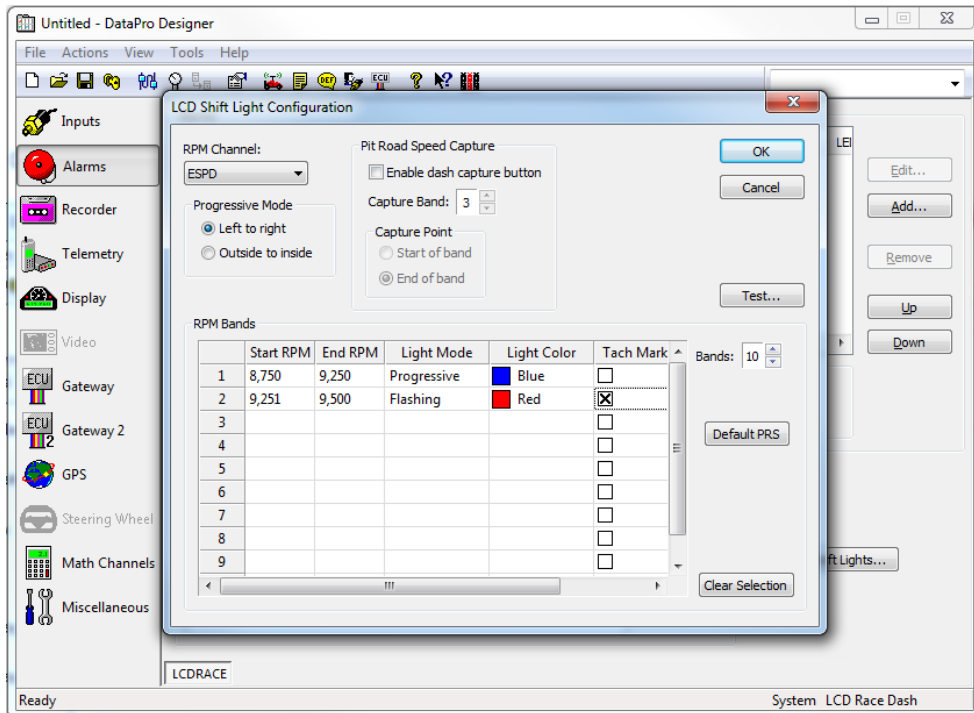
Options:

RPM channel – select the channel name for the shift light RPM.

Progressive Mode

    Left to Right – progressive LEDs will turn on one at a time from left to right.

    Outside to Inside – Progressive LEDs will turn on two at a time starting with the outside and progressing to the middle.

RPM bands

    Start RPM – RPM value for the beginning of the set band

    End RPM – RPM value for the end of the band

        Note: LED progression will be equally divided over the entire band width.

    Light Mode

        Progressive – LEDs turn on one at a time over the entire range

        Flashing – All 10 LEDs flash constantly

    Light Color – select the LED illumination color for each band

    Tach Marker – Adds a graphical indication on the screen for shift point location. This always places the marker at the beginning RPM value of the selected band, and maintains the same color as the selected LED color.

        Note: Some screen templates will only allow a single marker and will default to the first band indicated to require a marker.

Test

Shows a graphical representation of the currently configured bands with a slide bar to show real time RPM simulation.

Recorder

In this menu, all channels will be shown in the right hand column. Checking the box will enable them to be recorded internally. In the left hand column, the record rate can be configured from 1 Hz to 1 kHz (1 to 1,000 samples per second). Information on the right hand side of the screen will keep track of the available recording time, number of recorded channels, and allow you to switch between Normal and other advanced recording modes. For the time being leave recording mode set at Normal.
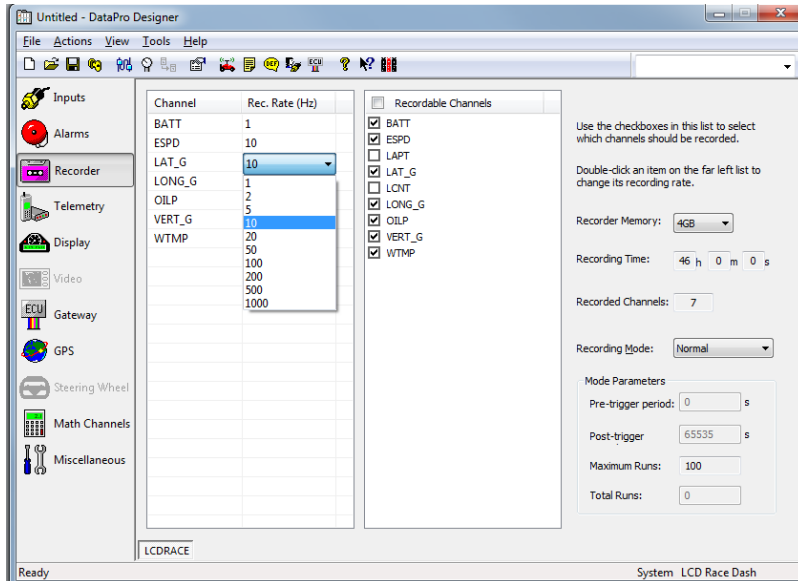
Telemetry

If you have purchased the Pro Software Pack, and accompanying telemetry accessory hardware, you may utilize this screen to select channels to be output in RS232 serial data for transmission via modem to a remote computer network for analysis from pit lane via DataPro Telemonitor while the vehicle is on track. Baud rate for telemetry module and transmission rate for data channels will also be configured on the right hand side. If you do not intend to utilize the Telemetry feature, you may skip this section.
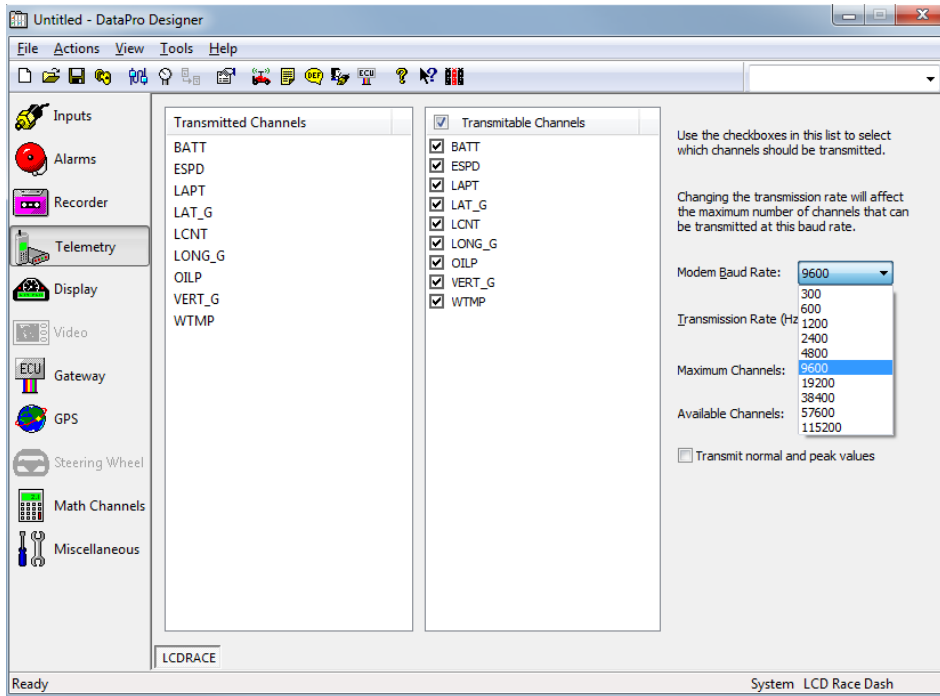
Display

The display menu will allow configuration of graphic elements on the LCD Display screen. The main display menu will also allow setting day and night brightness settings in addition to setting the lap time message pop up duration. To add a new screen, click the "add" Button which will open a new window showing different template options.
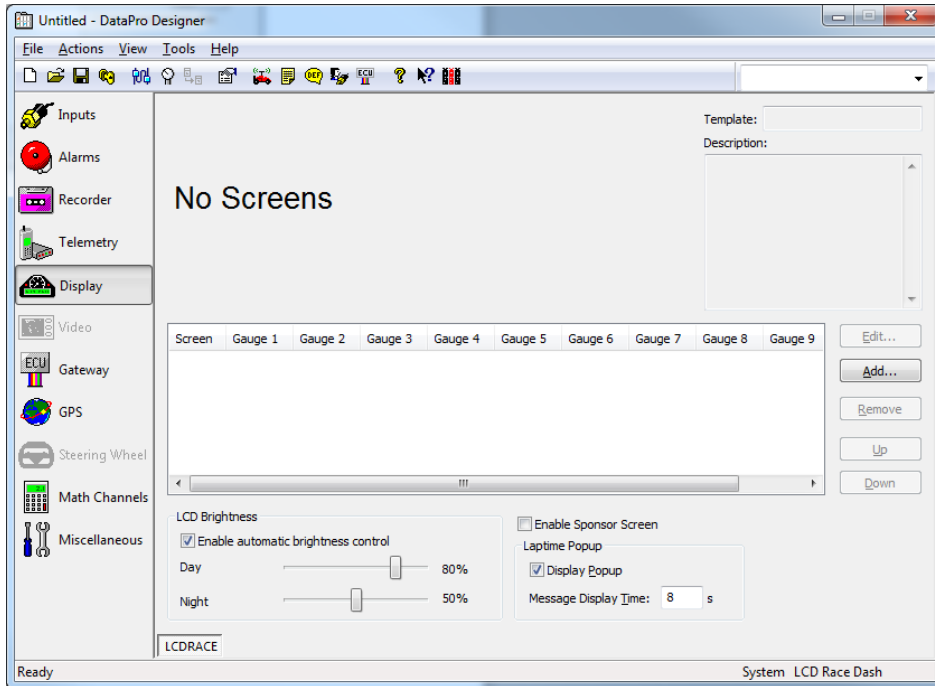
Select the desired base template to begin configuring individual graphic elements. The following selections are available.

2650-1790-00r1
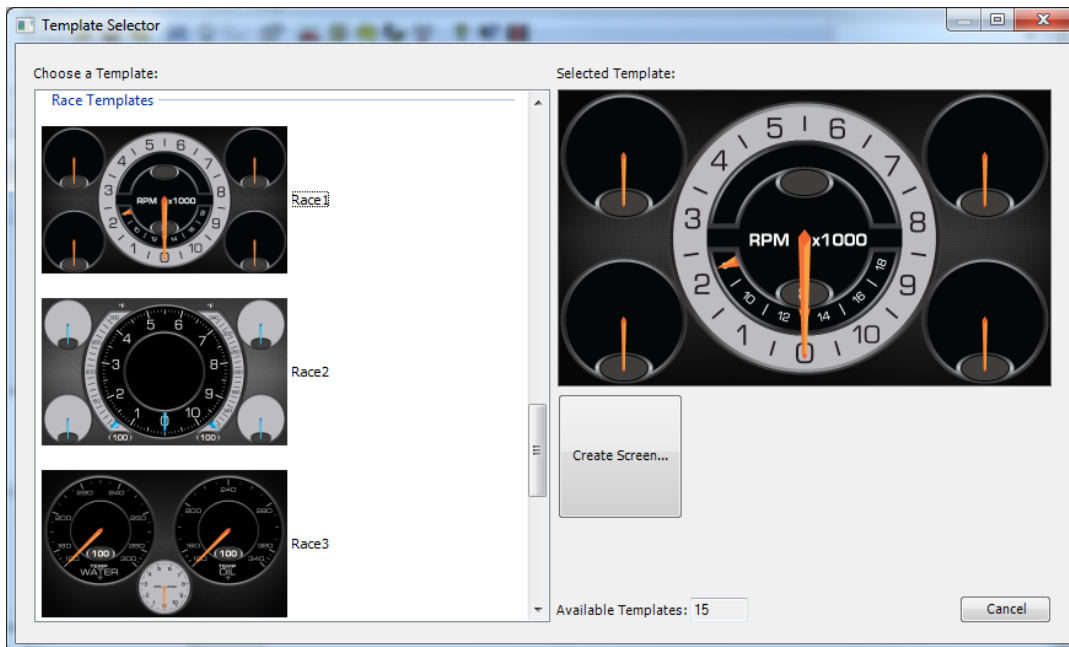
- **Appearance** – adjusts the appearance of the selected gauge.
  - o **Background** – changes the background color of the gauge (black, white, or gray)
  - o **DialfaceColor** – changes the color of the artwork image (black, white, or gray)
  - o **GaugeRange** – changes the artwork range if needed.
  - o **Label** – Changes the text for the name of the gauge.
  - o **PointerColor** – adjusts the color of the pointer (orange, blue, or white)
- **Data** – assigns a channel name to the artwork corresponding to the gauge artwork.
- **Design** – shows the name or number of the gauge that is currently being configured.
- **Misc** – Other details pertaining to the selected gauge (bubble enabled).

Video

For use with legacy systems, does not apply to configuring LCD Motorsport Display. If you are utilizing a DVL expansion module as part of your system, use the DVR Configuration Software included with that product.

ECU Gateway

This tab is used to configure CAN (Controller Area Network) inputs from an ECU (Engine Control Unit) or other CAN enabled device. There are a number of available pre-programmed protocols for popular applications that can be selected from the drop down menu. Alternatively, if your device is not shown, you may create a custom CAN message via the CAN Gateway Template Editor Application, which will produce a file that will appear for selection in this location once completed.
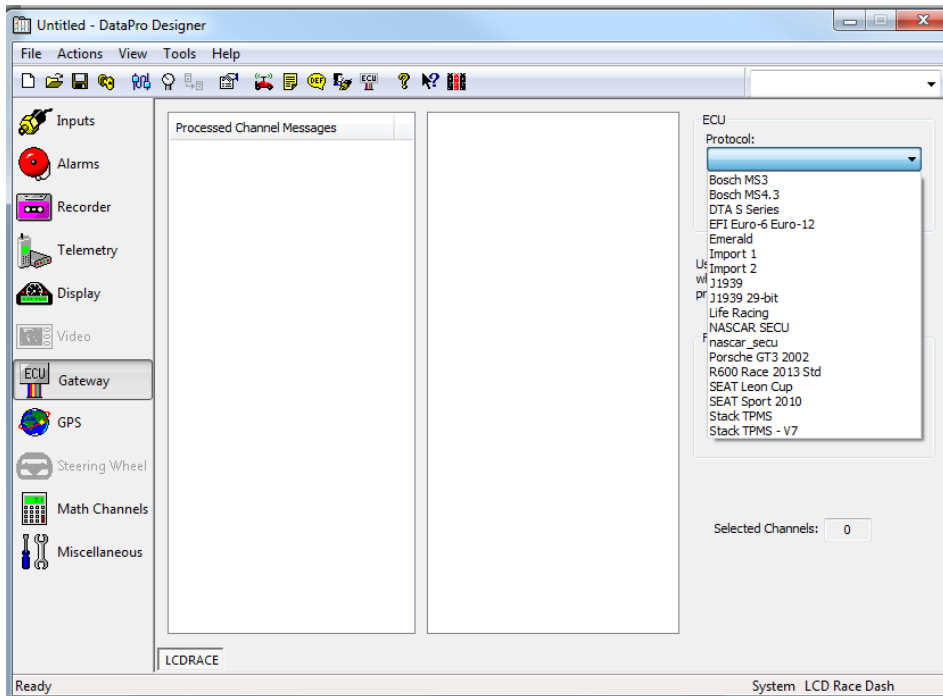
Once the desired protocol is selected, a list of available channels may be enabled for display and recording purposes. When a CAN channel is selected, it will show up in the left hand column and can be seen in the recording, alarms, and display tabs as available channels.
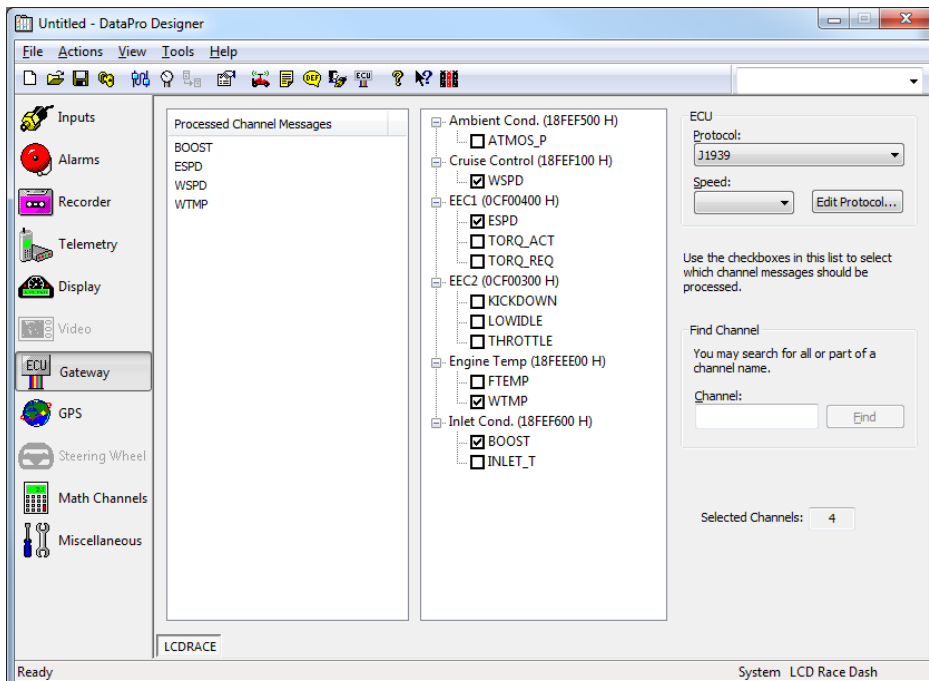
In order to edit or create a CAN message; use the edit protocol tab which will open the CAN template editor. This window can be used to create and edit CAN messages as well as set peak recall settings for CAN channels.

2650-1790-00r1

Setting CANbus Speed:

When utilizing the ECU CAN Gateway feature, in addition to selecting the protocol file and monitored channels it is necessary to set the CANbus speed as well. Consult the CAN data transmission specs from your CAN enabled device manufacturer to determine the appropriate setting. Failure to select a speed or selecting an incorrect speed setting will prevent proper operation of this feature.
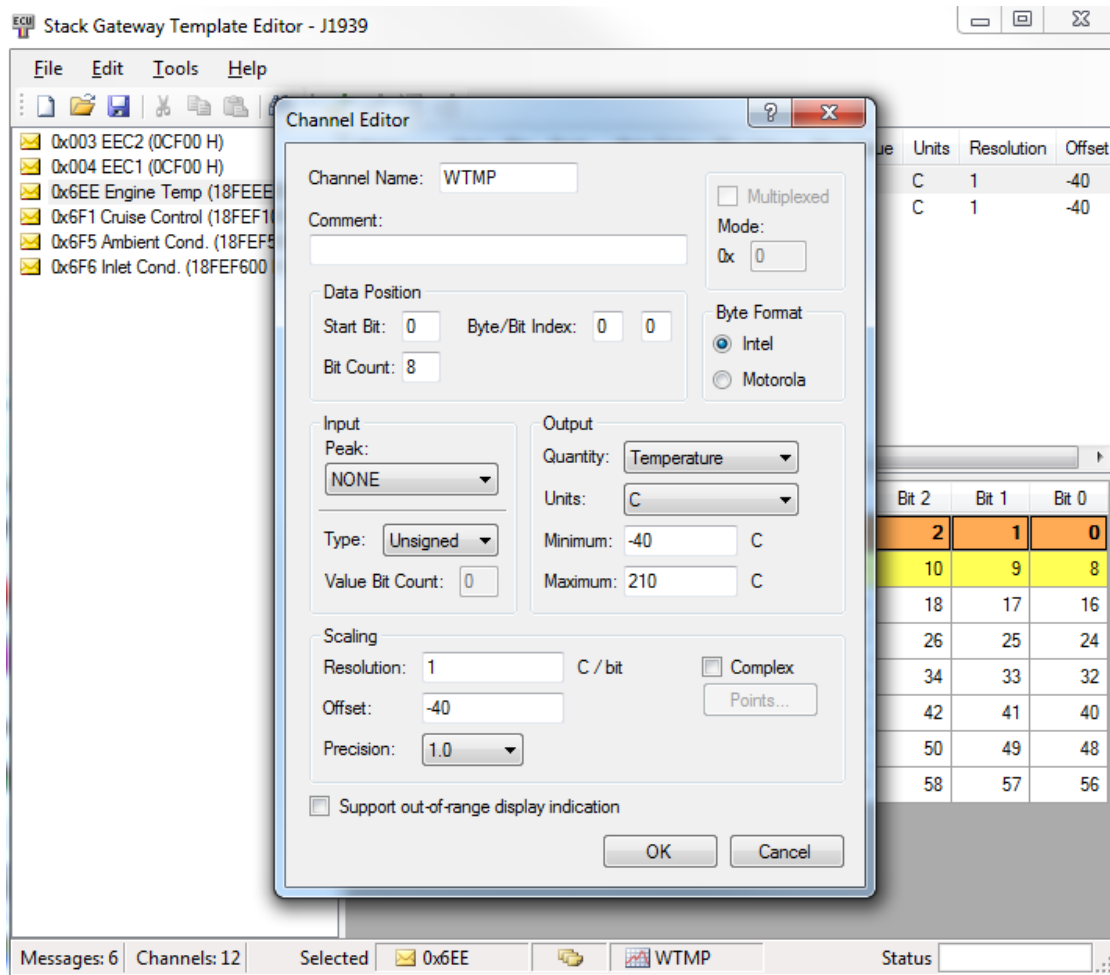
The LCD dash is pre-configured to accept GPS data on Serial Input 1. This will allow for full NMEA sentences to be used as an input for data recording and display. There is also a setting to enable GPS lap timing.

Select the GPS parameters required for data logging and display from the list in the right column. The Baud Rate must be selected for the GPS receiver that is connected to the system. Failure to select the correct Baud rate will prevent this feature from operating correctly.

2650-1790-00r1
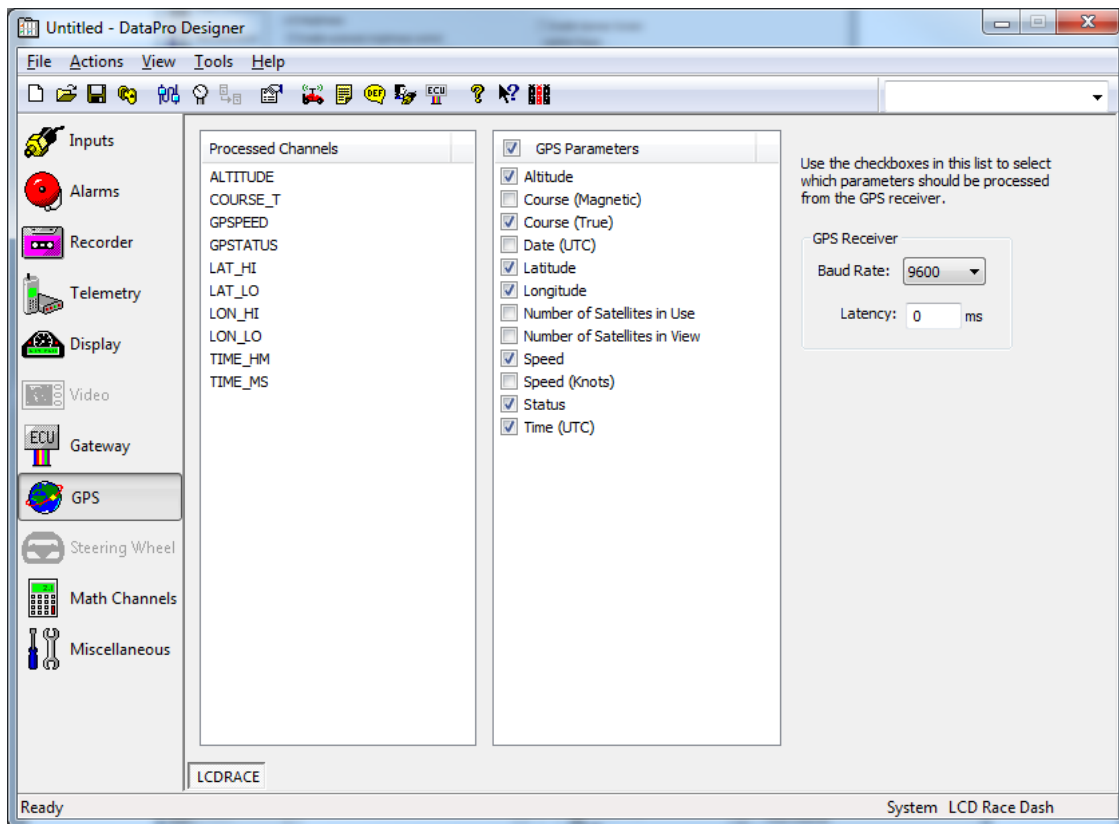
GPS

This tab adds GPS data from a GPS module into the channel list for display and logging.

Steering Wheel

This tab is used for configuring a steering wheel display and does not apply to LCD dash configuration.

Math channels

A number of Math channels are available as a default including calculated gear position as a function of engine and wheel speed, lap distance, and predicted lap timing. Brake bias is also available when brake pressures are configured as channel inputs. Enabling these features will allow use of these calculated parameters in display screens and logged data.
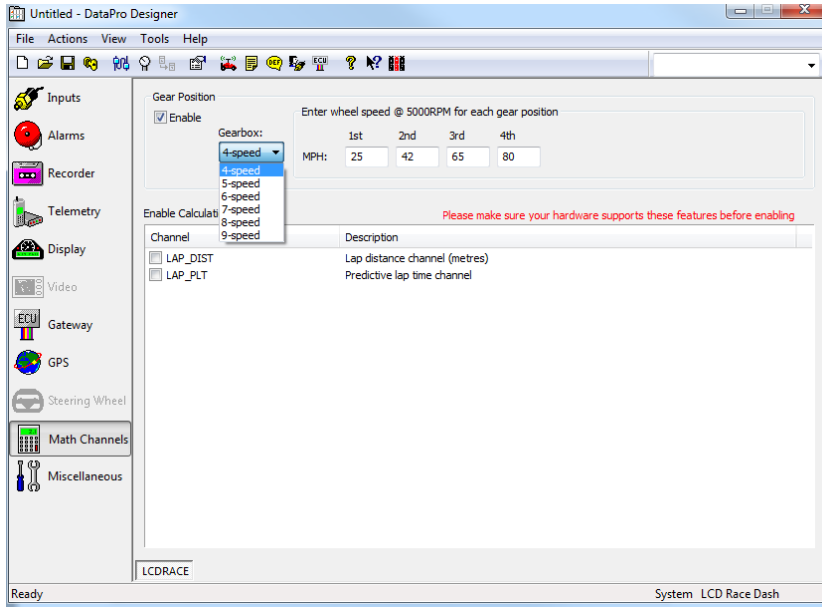
Miscellaneous

Terminating resistor – CAN messages require a 120 Ohm terminating resistor across the two wires in order to properly terminate the signal. The LCD Motorsport Display has a configurable built-in terminating resistor on both the CAN and the NET lines. Enable this terminating resistor if the LCD dash is the last module on the network to avoid wiring in a separate resistor.

Additionally, new firmware upgrades can be sent to the LCD dash when they become available, using this screen.

2650-1790-00r1
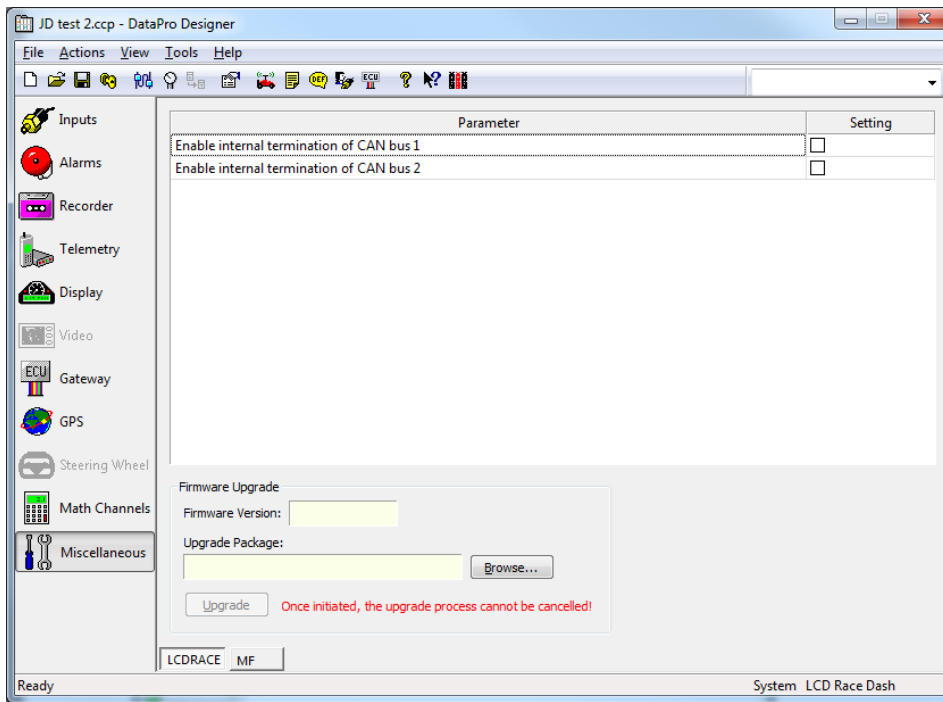
Saving a Configuration File

Once you have completed creation of your configuration file and set all desired parameters, you will want to save a copy of your work. To do so, go to the top left hand of the open DataPro Designer window and click File, and then select Save As in the drop down menu. Name your configuration file and then click OK to save your work.

At this time it is also recommended that you save / print a copy of the configuration report to keep with your vehicle logs / setup sheet for future reference. To do so, click the Report icon which will generate a text file detailing your system selections. From this screen you may either select Copy to move this information to your computer's clipboard to be pasted into another file such as a Word document, or Save which will allow you to create a name and select a location for the text file of this information which can be filed with other pertinent vehicle data kept on the computer.

Uploading a Configuration

Establishing Ethernet Connection:

Select the connection manager Icon.
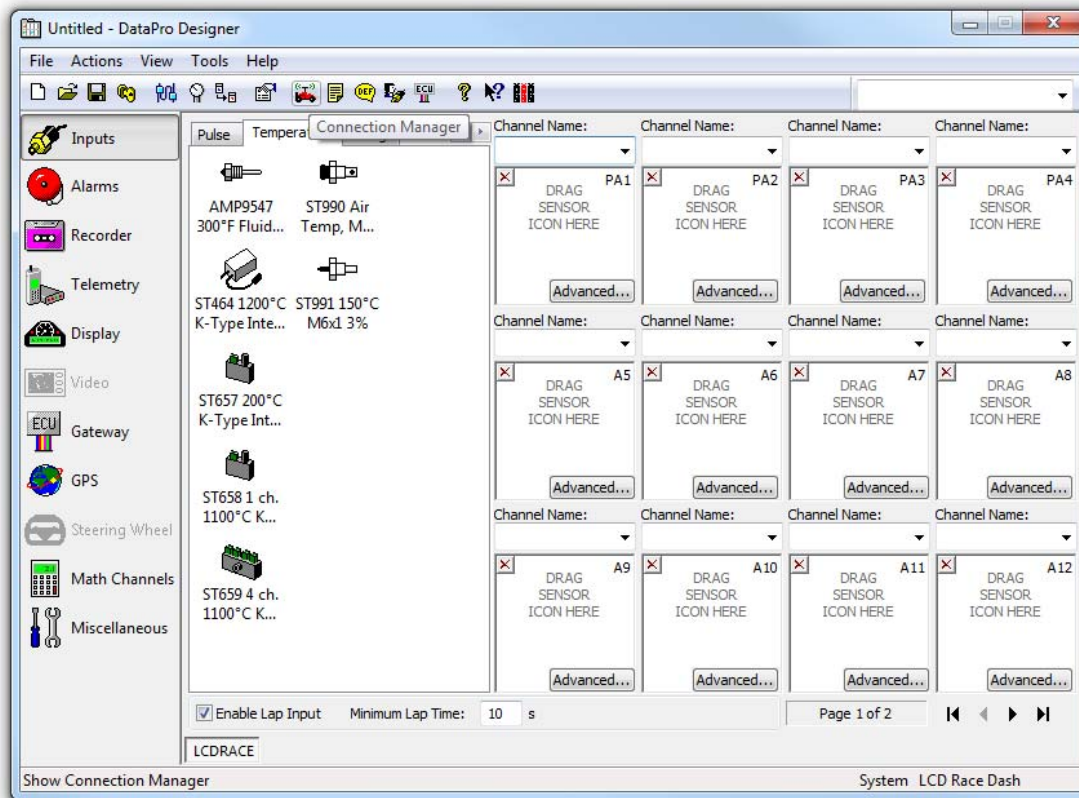
Select the Add new connection option.
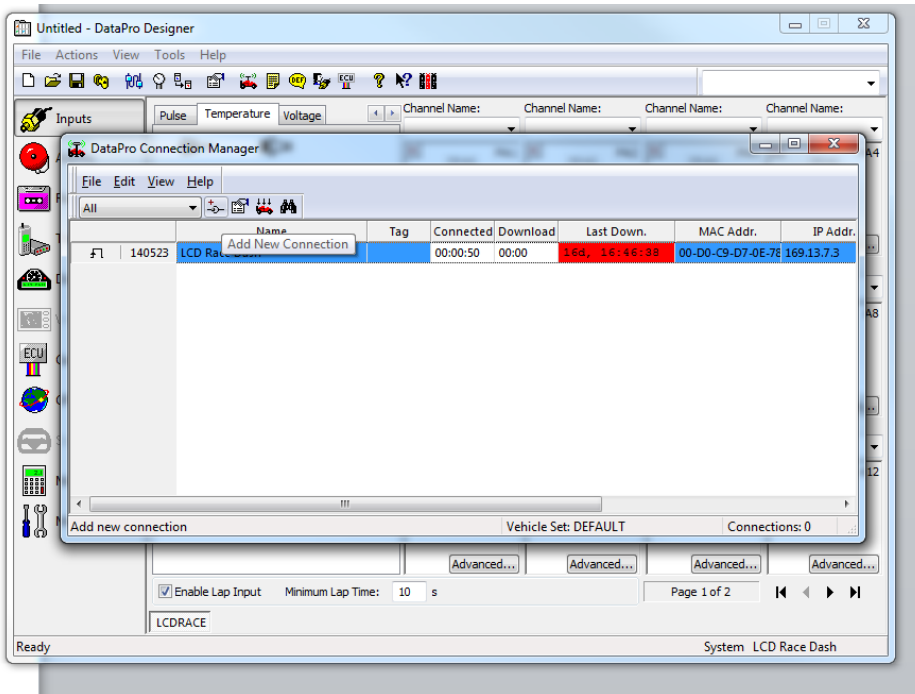
Enter the IP address of the dash you are programming.
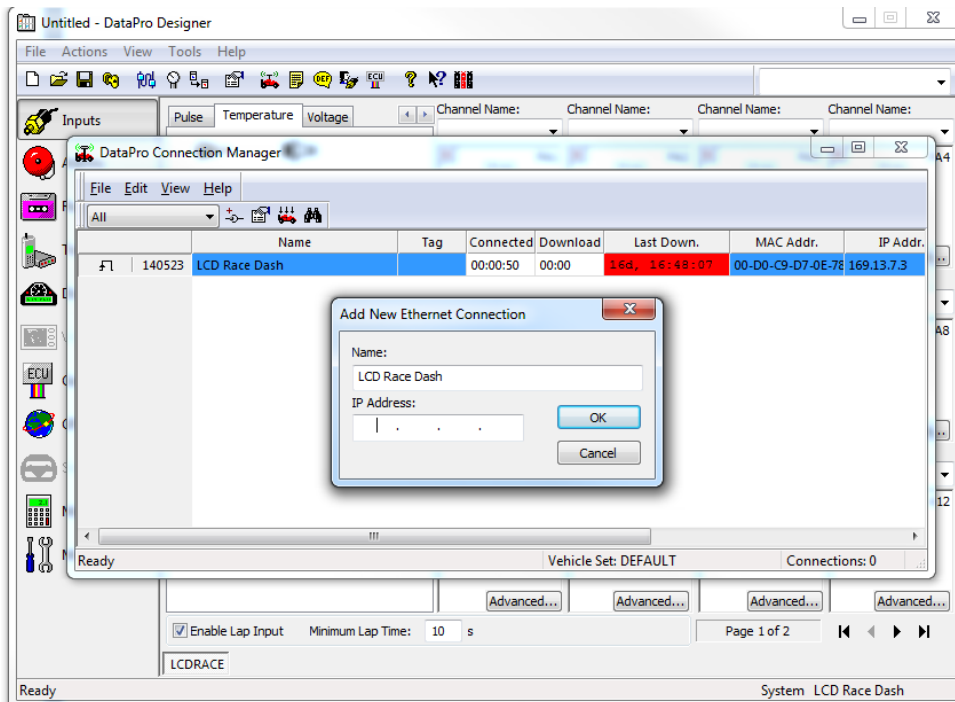
If a configuration has never been loaded onto the unit, the default screen will show the firmware revision level as well as the current IP address.

If a configuration is currently loaded, to show the software banner screen, press and hold S1 for 10 seconds.
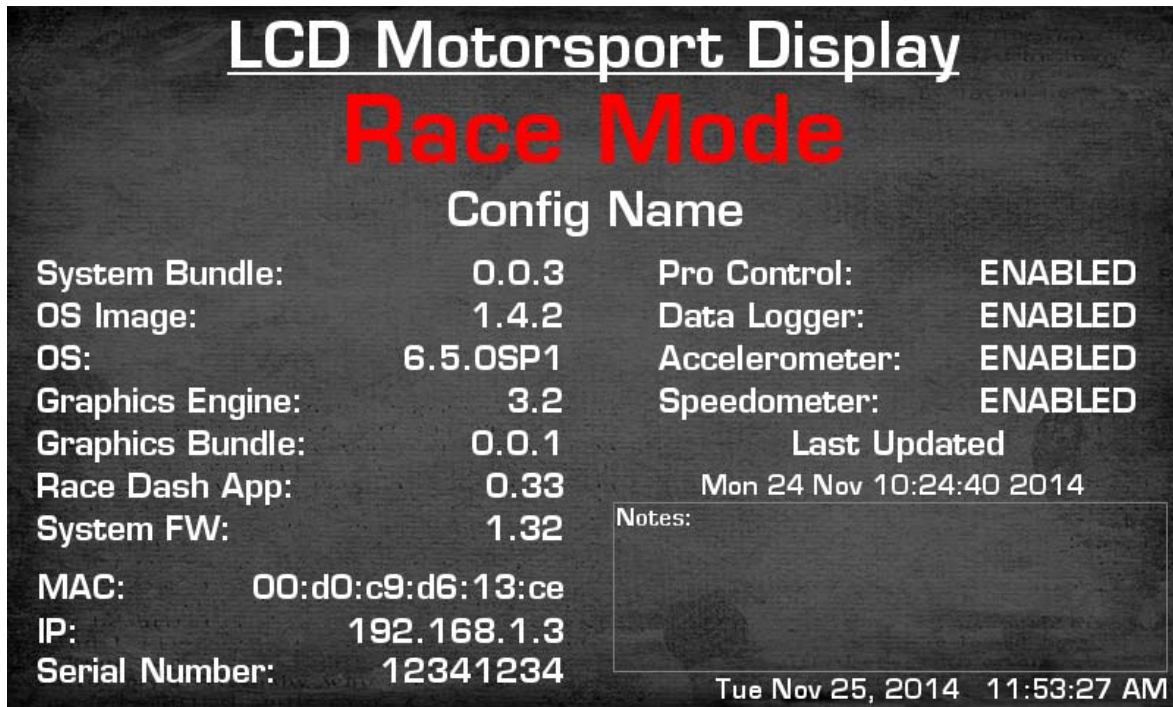
To upload the configuration, click on the upload configuration button and click start.
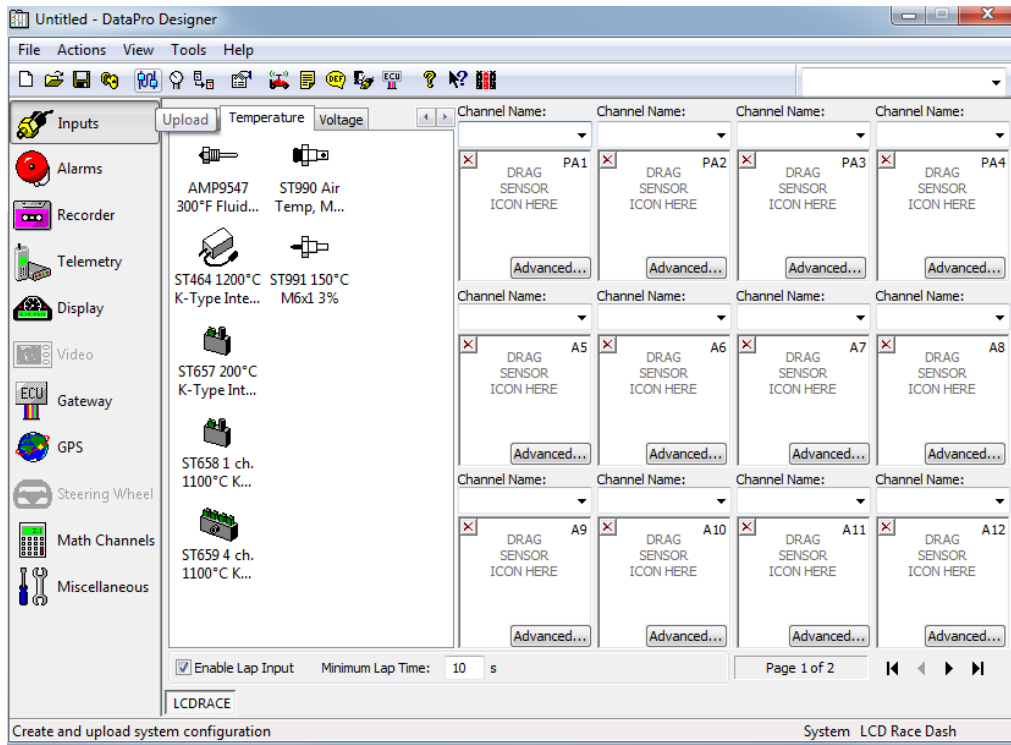
DataPro Application

Downloading Data from a Logger

Registration

Before you may download data from a logger, you are required to register the logger's TAG number (serial #) with DataPro. Please note, this is a different operation from authorizing a pincode for the logger (which must be done prior to logger registration).

To register a logger's TAG select the **Download Manager…** option from the **Run Data** menu.

2650-1790-00r1
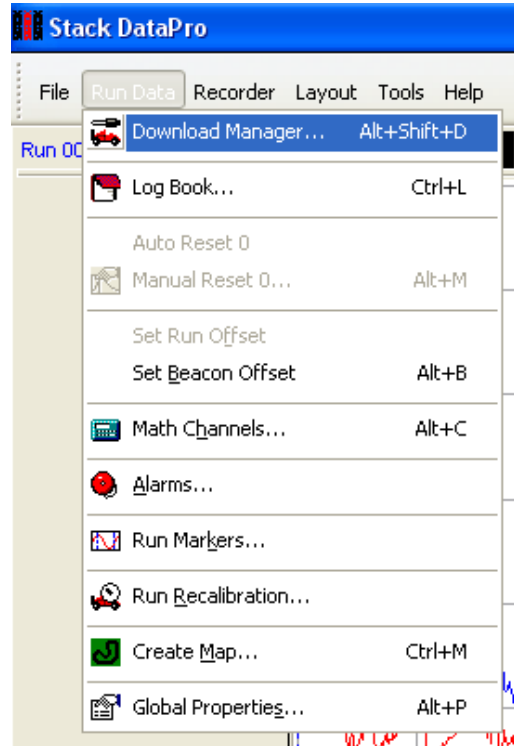
The **Download Manager** allows the user to register loggers and to edit the download track and session. The Manager also allows the user to specify post-download operations such as auto-calculations and alarms.
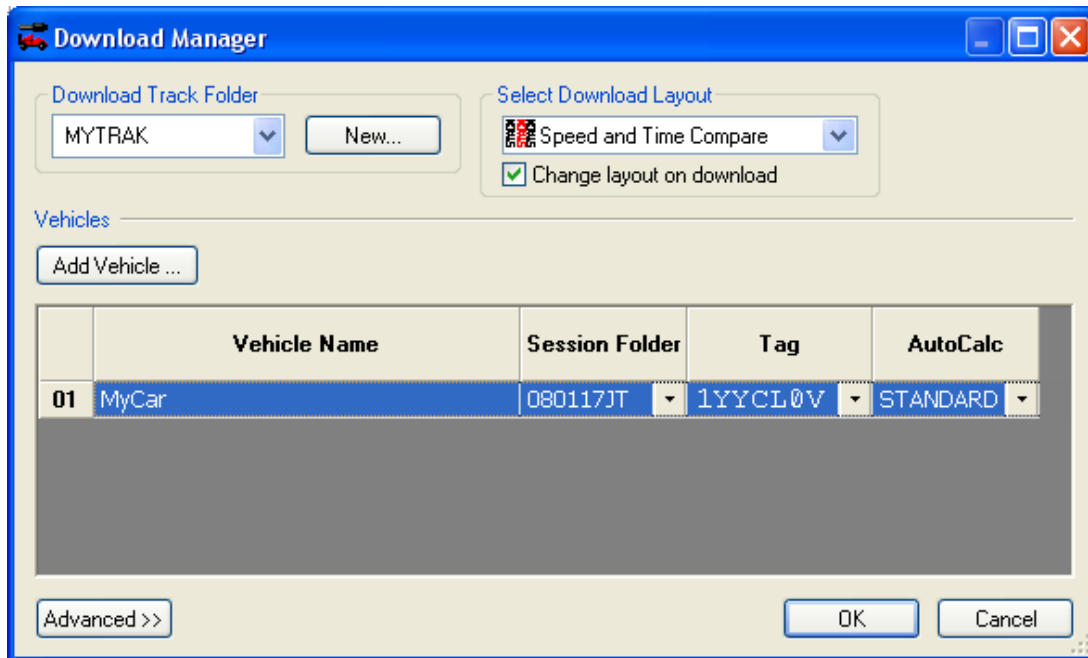
Under the **Vehicles** heading click the **Add Vehicle...** button. This will display the **Add New Vehicle** dialogue.
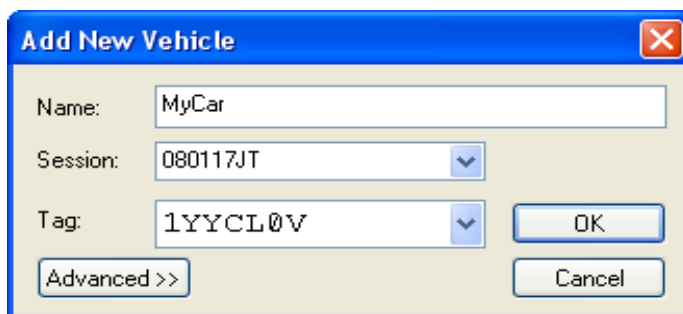
Enter a unique name for the vehicle to which the logger is fitted.

Specify a session folder name for the downloaded data from this logger in which to reside. Note, you may change the session folder name at any time prior to download.

Enter the logger's TAG/serial number. You can either type this number in manually or, if the PC is currently connected to the logger via a CANUSB connection, you can click the dropdown arrow and select **<Get...>** from the displayed list.

Now click the **OK** button to close the **Add New Vehicle** dialogue.

You may repeat this operation for however many vehicles from which you wish to download.

Then click the **OK** button on the Manager dialogue and click **Yes** on the **Save Changes** dialogue when prompted.

2650-1790-00r1

Downloading

Select the **Download Save Memory…** or **Download Erase Memory…** option from the **Recorder** menu, depending on whether or not you want the data to remain in the recorder after download. The following shows the **Download Save Memory** dialogue.

This box remains empty until a vehicle is connected and the Start button is clicked.
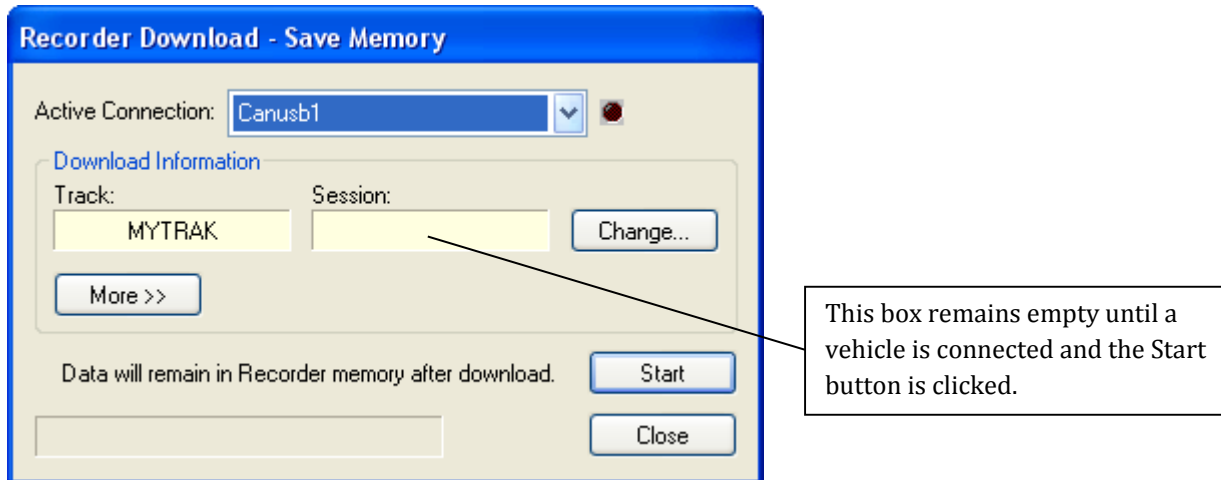
Select the required connection from the **Active Connection** dropdown list. If you have an active Ethernet connection, then the currently connected vehicle names will appear in the **Active Connection** dropdown list. For legacy systems, however, the active connection should be set to **Canusb1**. Note, if you have unchecked the **Show Active Connection** option in the **Global Properties** dialogue, then the **Active Connection** dropdown list will not be present.

If you wish to change the track or session for a vehicle, click the **Change…** button (for more information please see Changing Download Track and/or Session). Please note that the Session, Tag and Vehicle Name boxes are not displayed on the download dialogue until the logger is connected and the **Start** button has been clicked. To start the download, click the **Start** button.

Changing Download Track and/or Session

You may change the download track and/or session folders with the **Download Manager** at any time prior to download. Clicking the **Change…** button in either of the download dialogues will display the Manager.

Changing the Download Track

To select a track folder that has already been created, just select the track from the **Download Track** dropdown list.
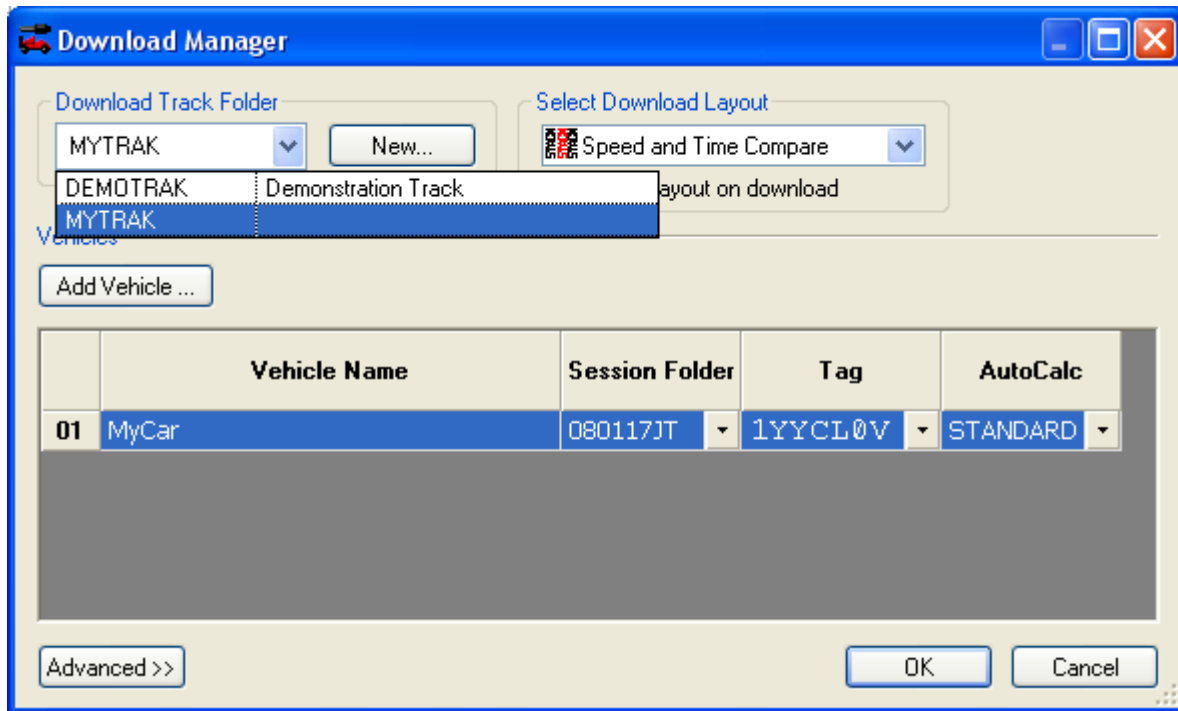
In order to create a new track, simply click the **New…** button to the right of the **Download Track** dropdown list. Then enter your unique name for the new track folder when prompted. Remember to click the **OK** button when closing the Manager in order to save your changes.

Changing the Download Session

The download session folder is vehicle-specific, that is to say, you may define a different session folder for each registered vehicle. To change the session folder, simply double-click a session cell in the vehicle grid and enter a session name. You may also use the dropdown arrow button on the session cell to select a session that already exists or select the **New…** option, which will use a date as a session name (in the form of YYMMDD).

Auto-Calculations

Auto-calculations are calculations that are run on the downloaded data to create additional data channels such as DISTANCE. The default STANDARD batch calculation, which installs with DataPro, will create COMB_G, DISTANCE, G_RATIO, LONG_G and RADIUS channels. The Download Manager provides the user with options for the Post Download Operations including auto-calculations and alarms. Click the **Advanced** button on the Download Manager to access this functionality.

To select the same auto-calculation for all vehicles first make sure the **Same for all vehicles** checkbox, under the **AutoCalc** dropdown list, is checked, then select a calculation from the dropdown list.

To select a different auto-calculation for each vehicle first make sure the **Same for all vehicles** checkbox, under the **AutoCalc** dropdown list, is cleared, then select a calculation from the dropdown list cells within the vehicle grid.
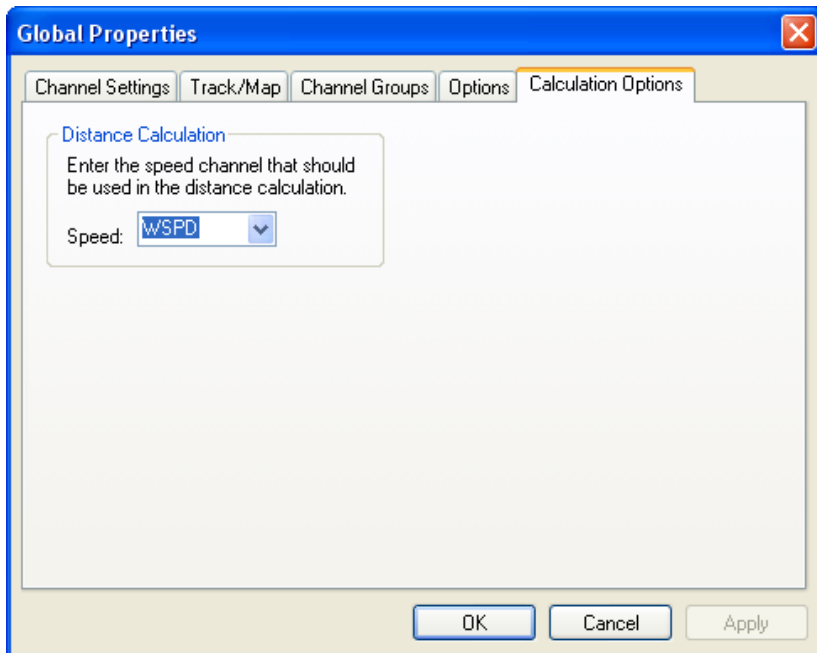
The **DISTANCE** calculation uses the wheel speed channel. The wheel speed channel name may be different from the default **WSPD** depending on the system configuration you are using.

In order to change the wheel speed channel used in the **DISTANCE** calculation, first select the **Global Properties...** option from the **Run Data** menu, and then choose the **Calculation Options** tab where you will find a dropdown list of available wheel speed channels.

Alarms

Alarms are a special type of auto-calculation that may be run on downloaded data. The alarm calculation can provide you with a report of specific events that have occurred in the downloaded data. There are no default alarms installed with DataPro so to use this feature you will need to define an alarm. Click the **Advanced** button on the Download Manager to access this functionality.

To select the same alarm for all vehicles first make sure the **Same for all vehicles** checkbox, under the **Alarm** dropdown list, is checked, then select an alarm from the dropdown list.

To select a different alarm for each vehicle first make sure the **Same for all vehicles** checkbox, under the **Alarm** dropdown list, is cleared, then select an alarm from the dropdown list cells within the vehicle grid.

For help with defining alarms and viewing alarm reports please refer to the Alarms section in this manual.

Using Alarms

The Alarms option is found on the **Run Data** menu. Simple alarms may be created using the basic alarm interface, enabled by default. However, if you wish to create more complex alarms, the advanced alarm editor can be enabled by checking the **Advanced Alarm Editor** option in the **Global Properties** dialogue.
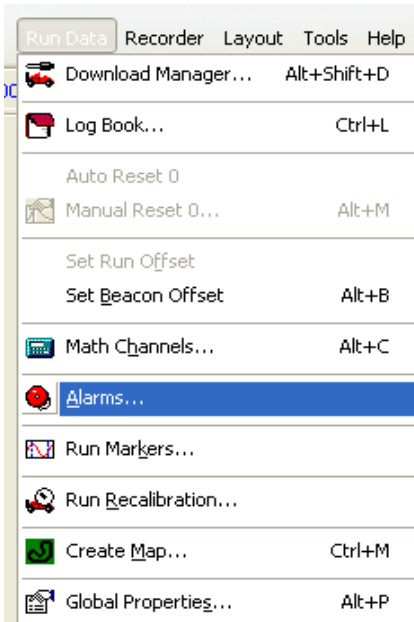
Defining an Alarm

Click the **New…** button and, when prompted, enter a unique name for the alarm. The alarm is actually a calculated channel and therefore, its name must conform to the channel name restrictions of 8 alphanumeric characters or less. The alarm name must also be unique to the other calculation names that exist on the PC.
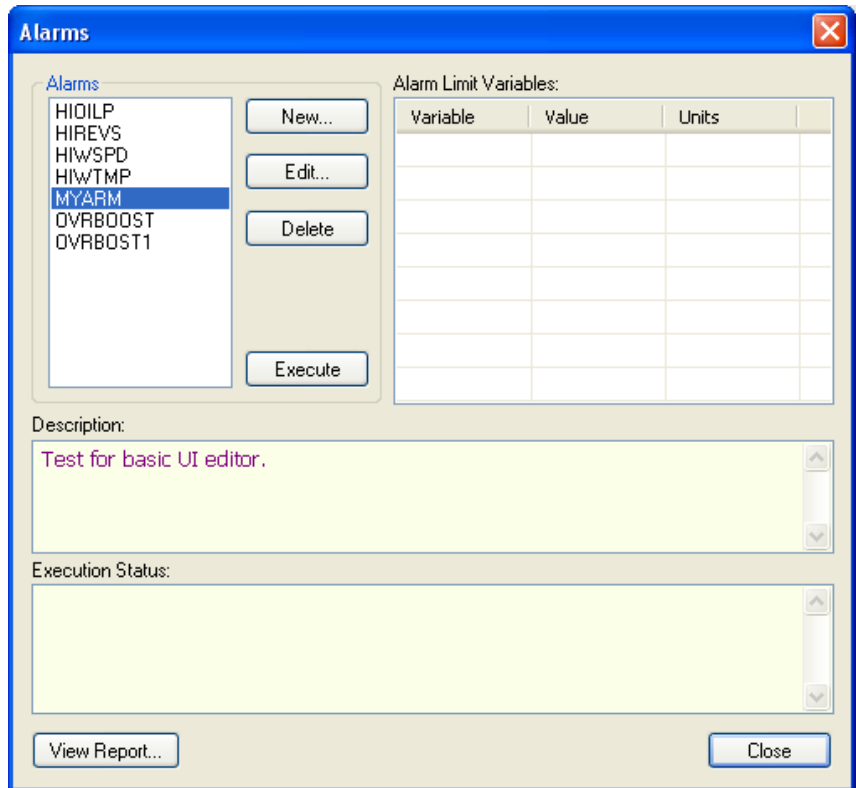
Once a new name has been defined for the alarm, you may enter an optional description for the alarm. This user-specified description will appear in other alarm dialogues.
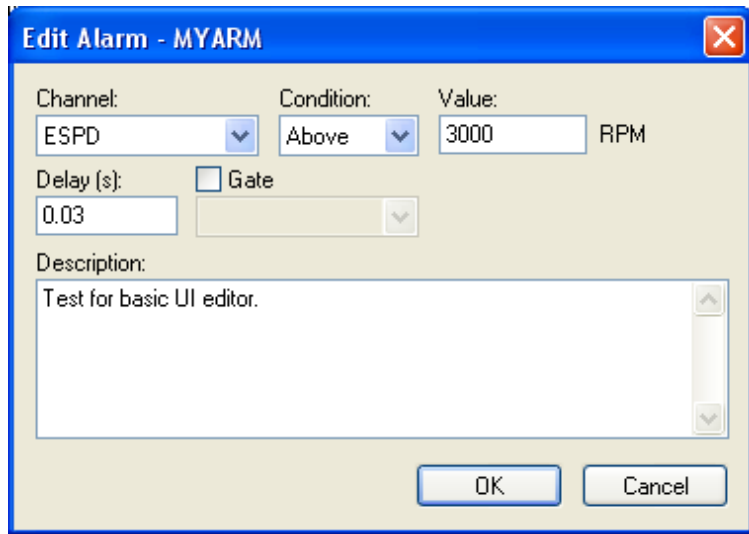
In **Basic Alarm Editor** mode, you simply select a channel, a condition and a value for the alarm. For example, here an alarm is generated if the ESPD channel data goes above 3000 RPM for at least 30ms.

You may gate an alarm by checking the Gate box and selecting another alarm from the dropdown list. In this case, the alarm will only be generated if both alarm conditions are true.

If you do not require a delay, just leave the textbox empty.

In **Advanced Alarm Editor** mode, you define one or more events for which an alarm will be generated. To do this click the **Add…** button to the right of the **Alarm Events** list. This shows the **Add New Event** dialogue.
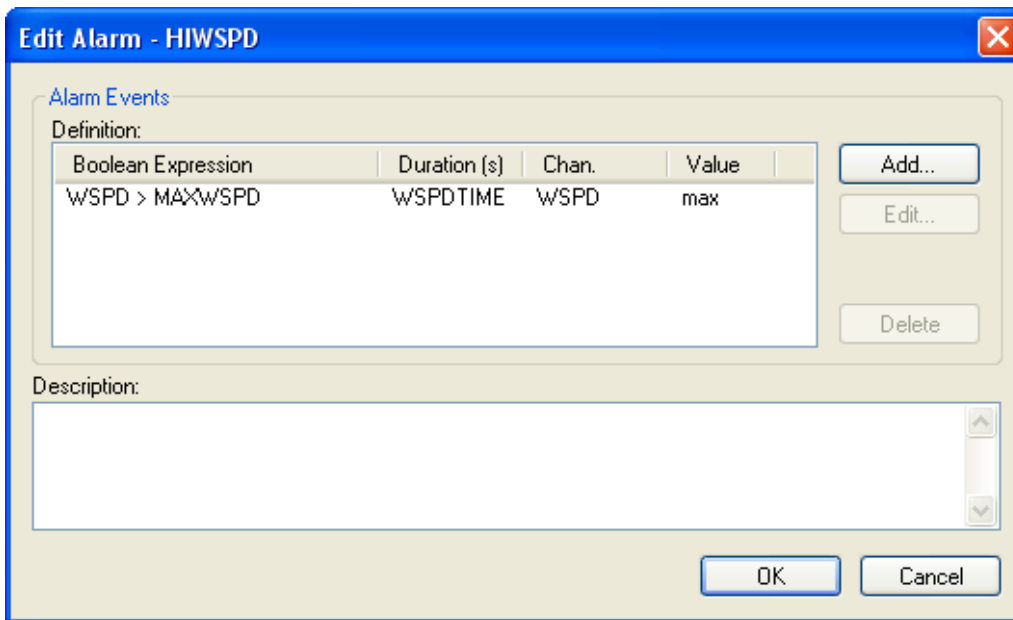
The alarm report can provide you with a maximum, minimum or average value of a channel each time an alarm event occurs.

2650-1790-00r1

Select the **Event Value Channel** from the dropdown list and choose a **Maximum**, **Minimum** or **Average** type. Note, for the channel dropdown list to be populated, you must first have performed an **Upload** using **Designer** on this PC or have the run you want to process already selected. In the example shown, the maximum value of the **WSPD** channel will be stored over the period when the event expression is true.

If you require the **Threshold Duration** (the time for which the **Boolean Expression** must be true before an event is generated) to be different for each vehicle then you will need to define an alarm limit global variable. Alarm Limit Global Variables are defined using the **Alarm Editor** dialogue (see Alarm Limit Global Variables). Important, these global variables need to be defined <u>before</u> you add an event. If the Threshold Duration is the same for all vehicles then you may check the **Constant** checkbox and enter a constant value for the threshold duration in seconds.
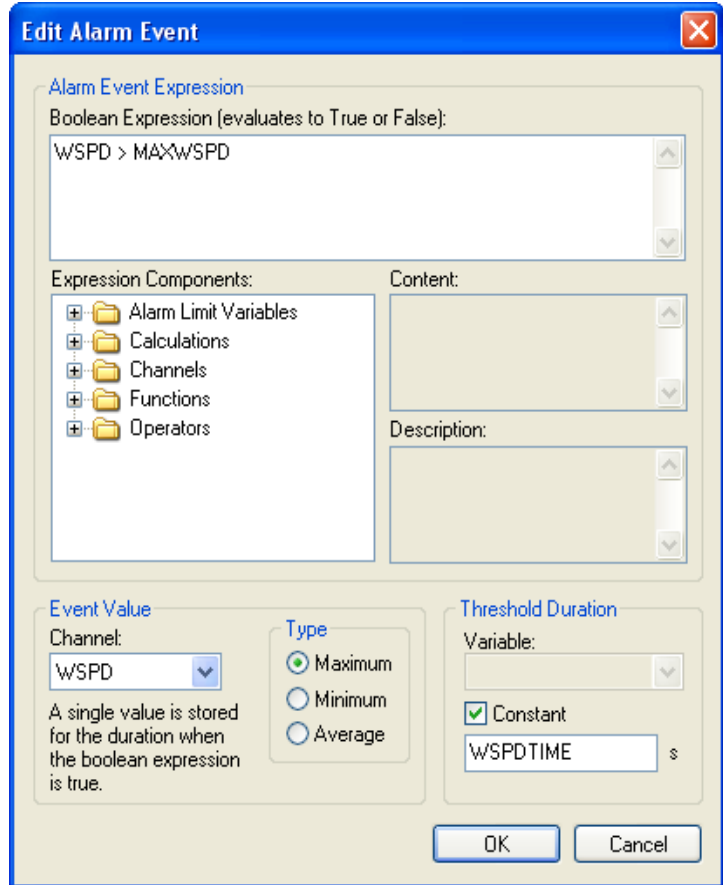
Enter an **Alarm Event Boolean Expression** using the **Formula Components** tree control to help you. In the above example, the **WSPD** channel value must be greater than the **MAXWSPD** alarm limit global variable the specified **WSPDTIME** duration before an alarm event is generated.

Defining Alarm Limit Global Variables

Right-click on the **Alarm Limit Variables** folder icon in the **Expression Components** tree. Then select **New Alarm Limit Variable**… option from the popup menu. This will display the **Add Alarm Limit Variable** dialogue.

Enter a unique **Name** for the variable, this must be different from any calculated or recorded channel names. Select the limit **Quantity** and **Units** from the dropdown lists. You may also enter some **Help** text for the variable that will be displayed in various alarm dialogues. Then click the **OK** button.
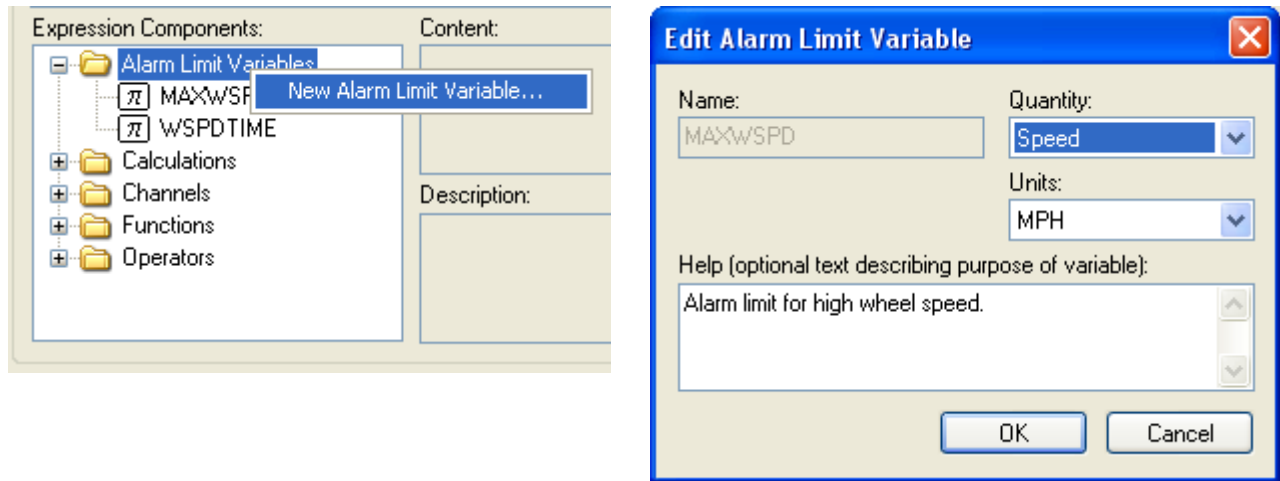
Setting Alarm Limit Variables

Alarm limit global variables are set using the **Download Manager**. Click the **Advanced** button. Under the **Post-Download Operations** section select the required **Alarm** from the dropdown list. The Manager dialogue will expand its vehicle grid to show the alarm limit global variable columns.
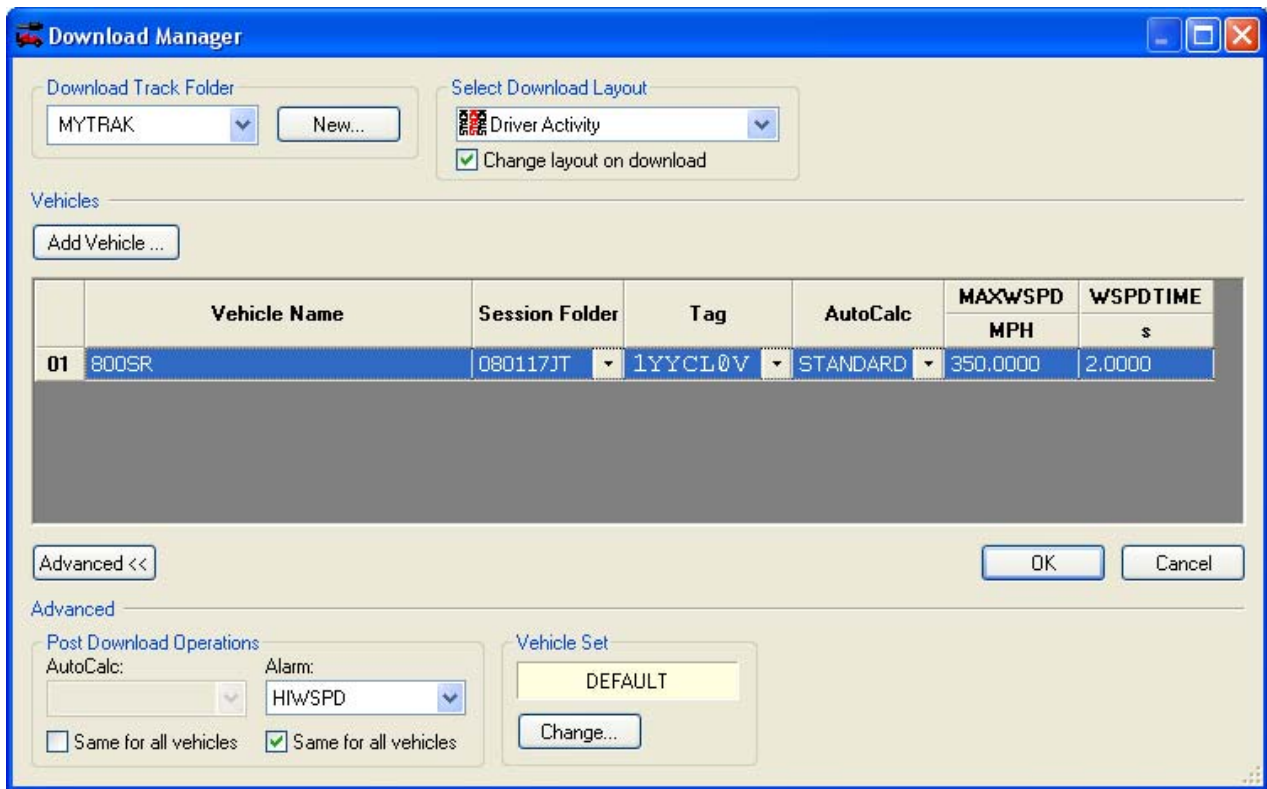
You may now double-click on the variable cells within the grid to set values.
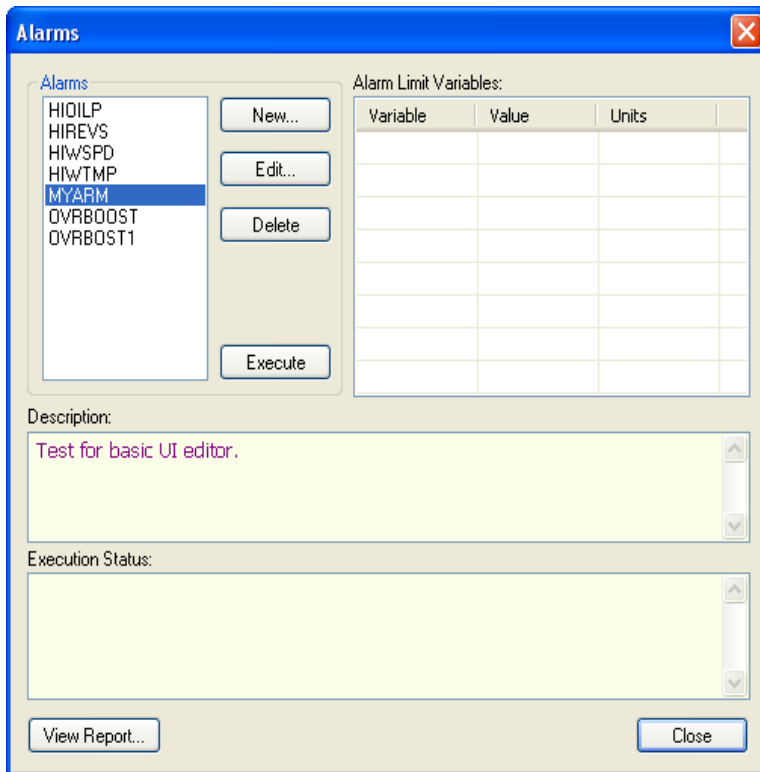
Executing Alarms

You may also manually execute an alarm. Select the run for which you want to execute an alarm using DataPro's Run Selector control.

Select the alarm from the list of available alarms.

Then, if global variables are being used within the alarm definition, set the alarm limit global variable values by double-clicking the cells in the grid.

To execute the alarm, click the **Execute** button.

Viewing Alarm Reports

Alarm reports are viewed by clicking the **View Report...** button.
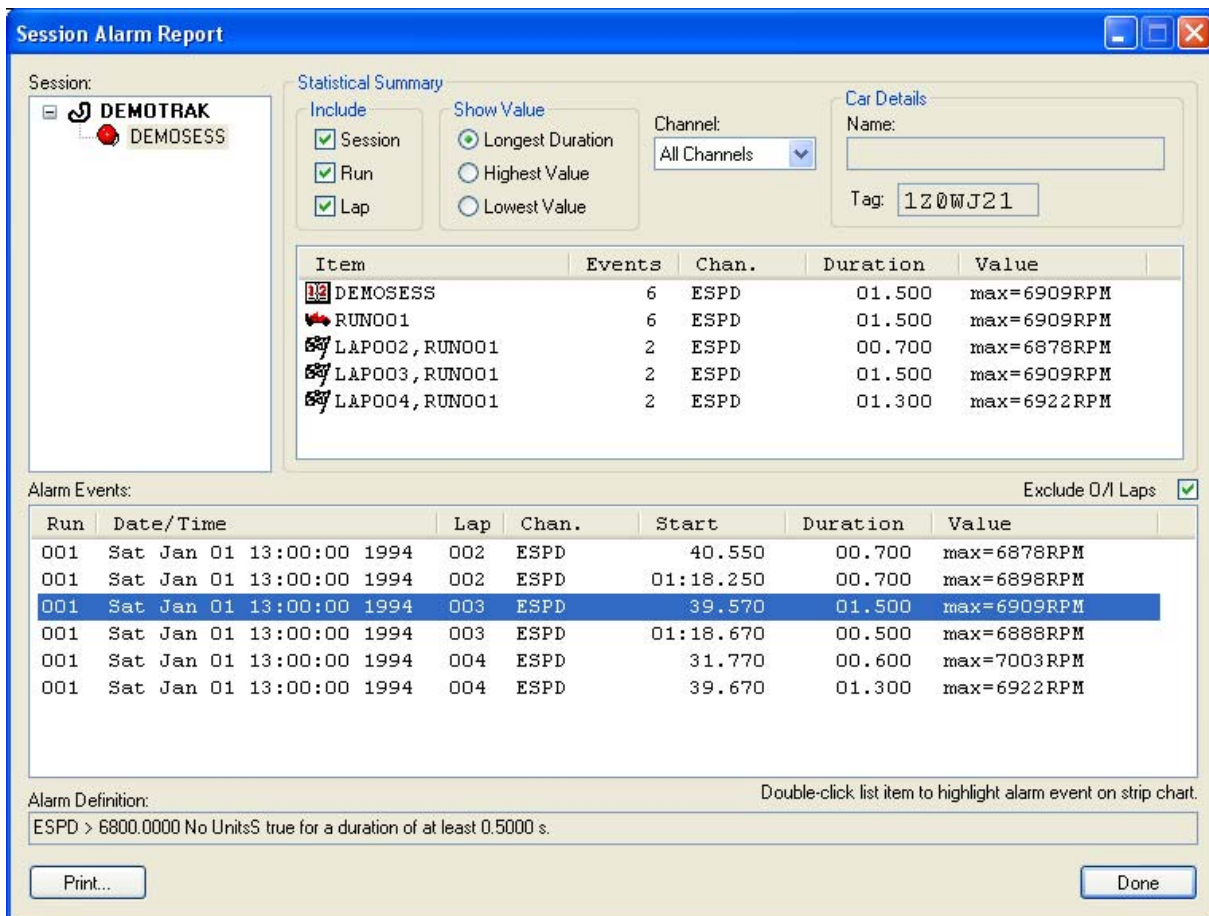
Use the **Session** tree control to select the track and session you are interested in. If a session contains data that has an associated alarm event, the session icon is shown as an alarm bell 🔔.

Use the settings in the **Statistical Summary** to show more or less information about the alarm events that have occurred.

Double-click an **Alarm Event** list item to have it automatically selected and highlighted within your DataPro analysis layout. The Session Alarm Report window is minimized to allow easy viewing of a strip chart as shown in the image below.
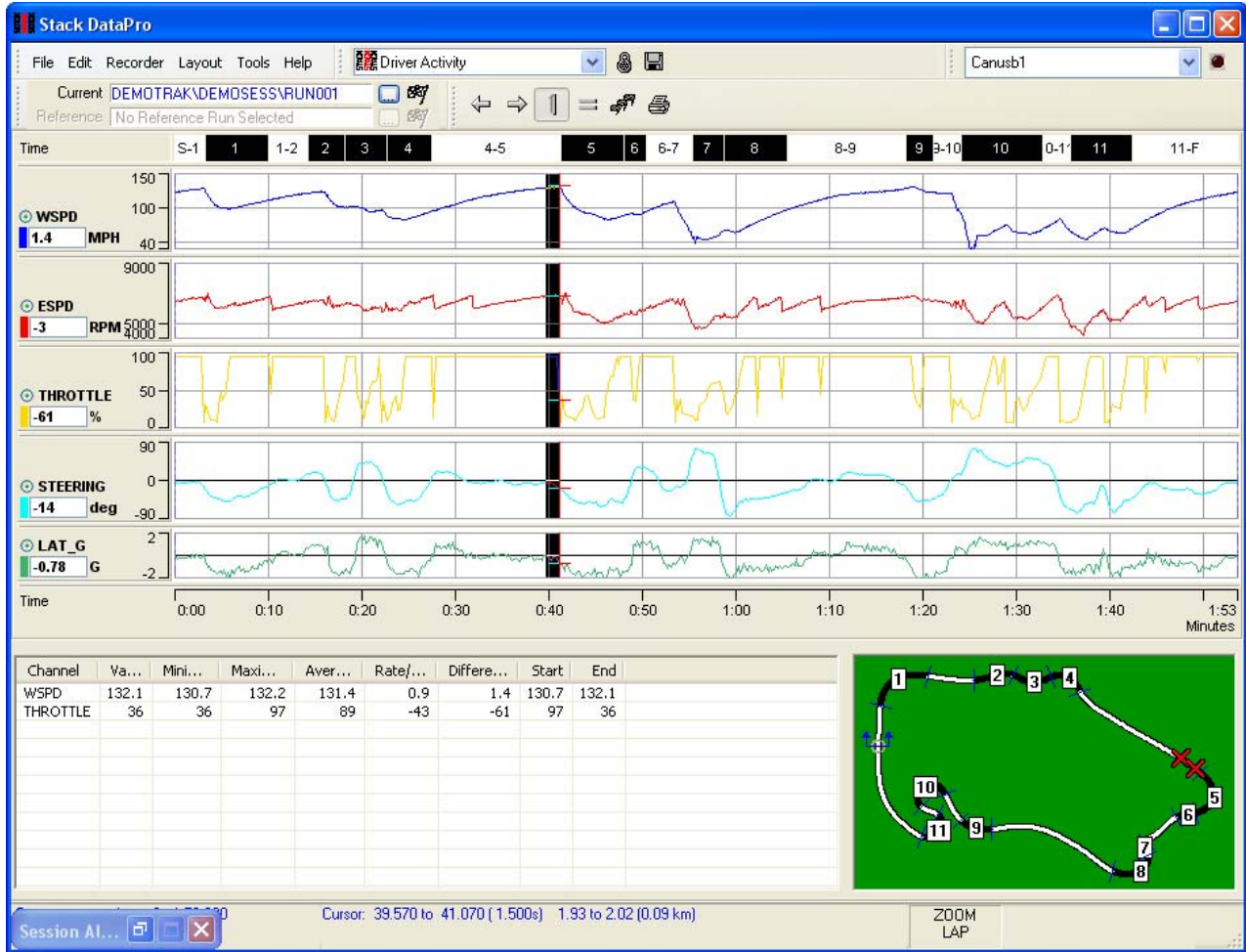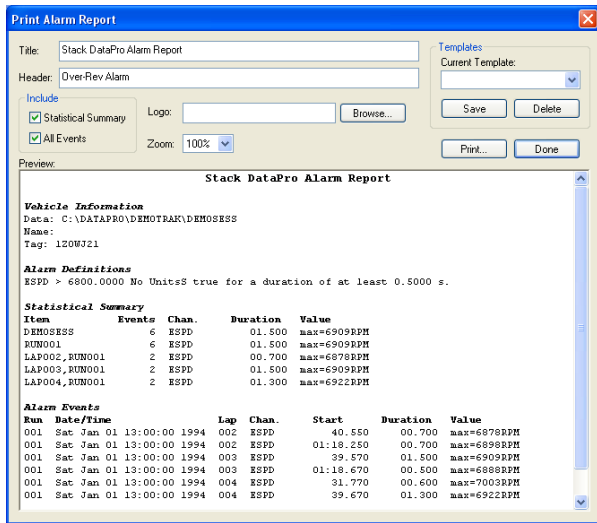
Printing an Alarm Report

Click the **Print...** button on the **Alarm Report** dialogue.

Here you may customize the report by adding a report title, header and logo bitmap to the printed document. The changes you have made can be saved in a template to be used on other alarm reports.

Run Selector Context Menu

Additional Selected Run Information

Right-click on the Run Selector toolbar to show a context menu.

Selecting either of these options will show or hide additional selected run information such as the vehicle name registered with the logger that was used to acquire the currently selected run.

Active Connection Dropdown List

Selecting a Logger Connection

Both DataPro and DataPro Designer have an **Active Connection** dropdown list within their respective toolbars. All the Recorder menu options in DataPro require you to have an active connection selected in this dropdown before communication can take place. This also applies to the Calibrate, Chat and Upload options within DataPro Designer.
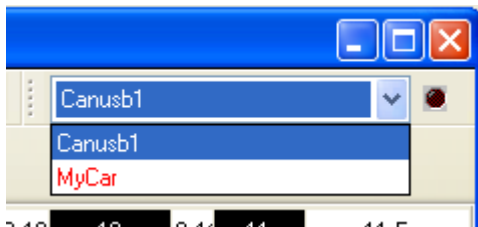
On legacy systems, when the CAN USB adapter is plugged into the PC, the active connection should show **Canusb1**.

For an LCD Motorsport Display, the active connection should show "LCD Race Dash". The text will be black once a connection has been established. DataPro receives connection details for modules from DataPro Designer. If an

active connection has not been made, it is possible the IP address of the module has changed. To access the connection manager go to tools> connection manager to view and/or edit the active connection.

Where only the CAN USB interface is being used, the active connection dropdown list may be hidden by unchecking the **Show Active Connection** option in **Global Properties**.

Using Channel Groups

The Channel Groups feature allows you to set the units, decimal places and y-axis range of a group of channels. To configure channel groups, select the **Global Properties** option from the **Run Data** menu. Then select the **Channel Groups** tab.
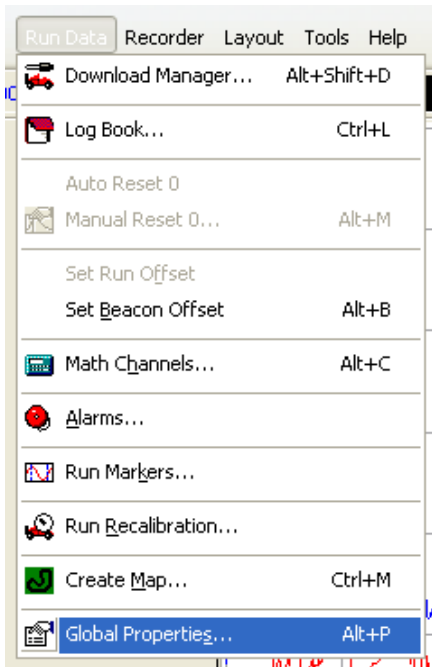
Create a new group by clicking the **New Group...** button and then entering a unique name for the group.
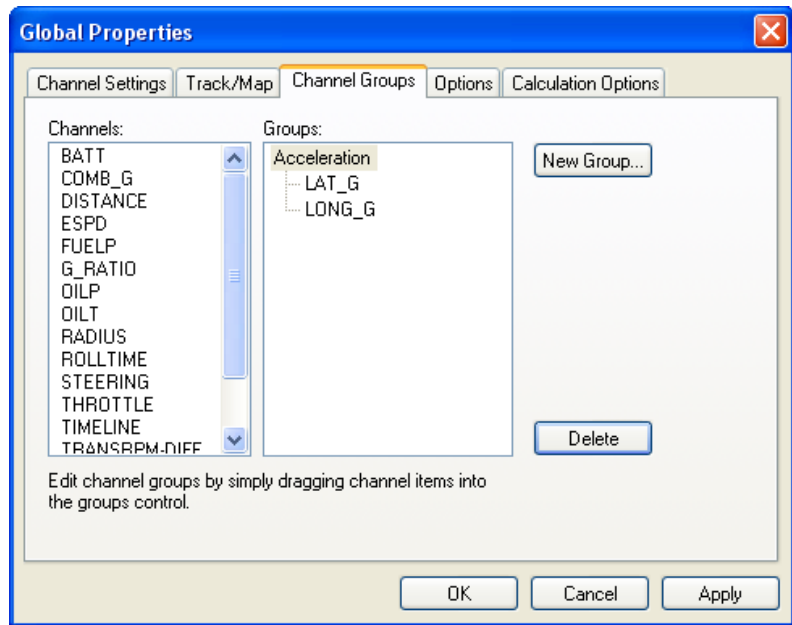
Add data channels to a group by dragging the channel name from the left list to the required group on the right. In the above example, an Acceleration group has been created and the LAT_G and LONG_G are members of this group.
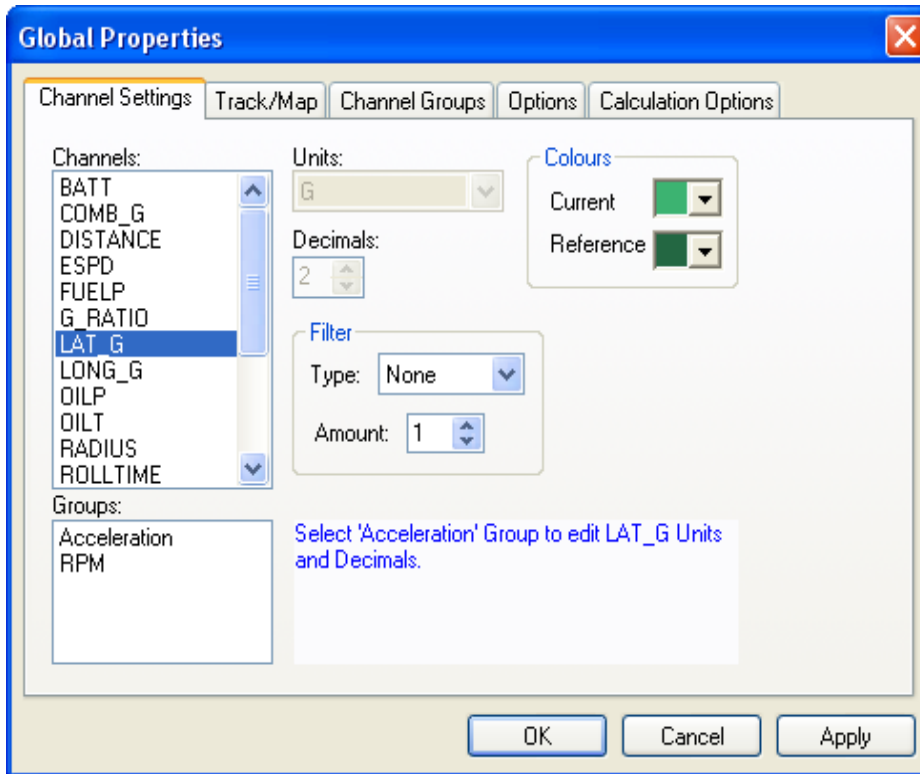
Now when setting channel properties such as units or decimal places, you would select the Channel Group from the Groups list.
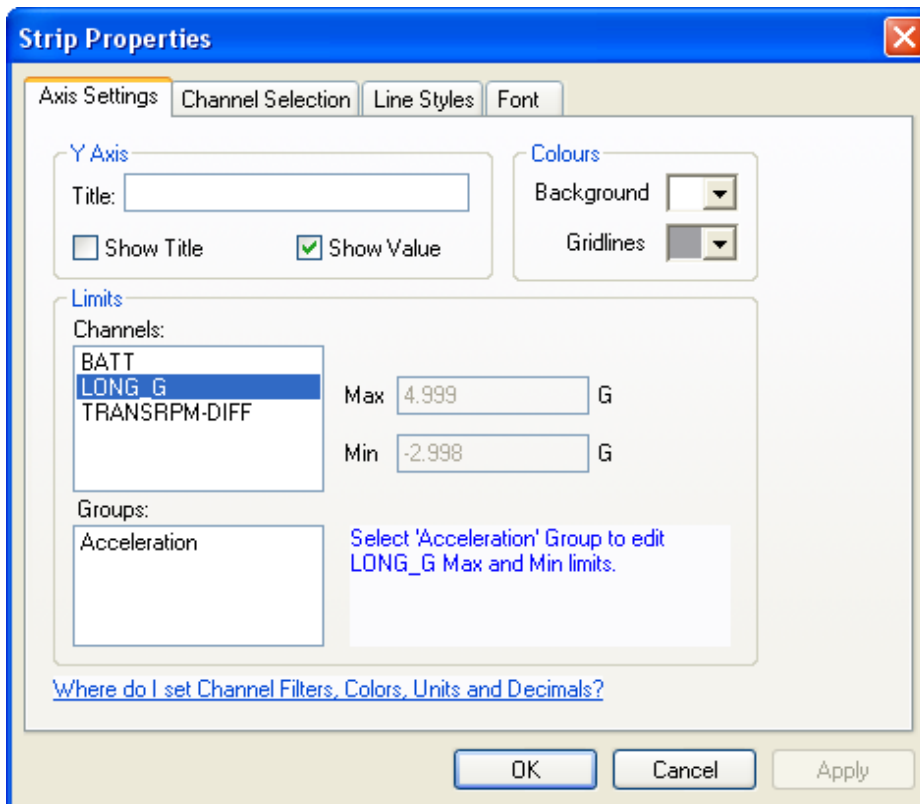
Likewise, when you set the y-axis limits for a Strip Chart, just select the group name from the Groups list.

2650-1790-00r1

Math Channels

Creating a Math Channel

Math channels are data channels created from recorded data by applying a mathematical formula. These channels can be selected and displayed on layouts just the same as recorded data channels. To create a math channel, select the **Math Channels...** option from the **Run Data** menu.
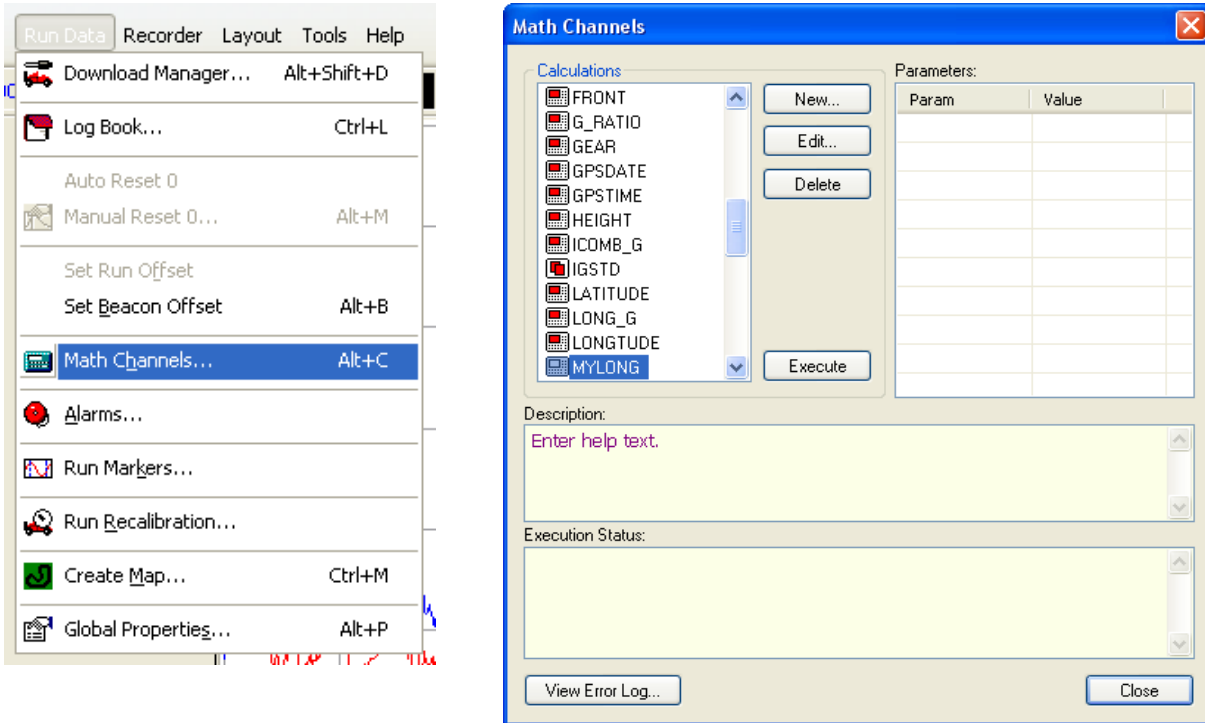
Then click the **New...** button. This will display the Math Channel Wizard.
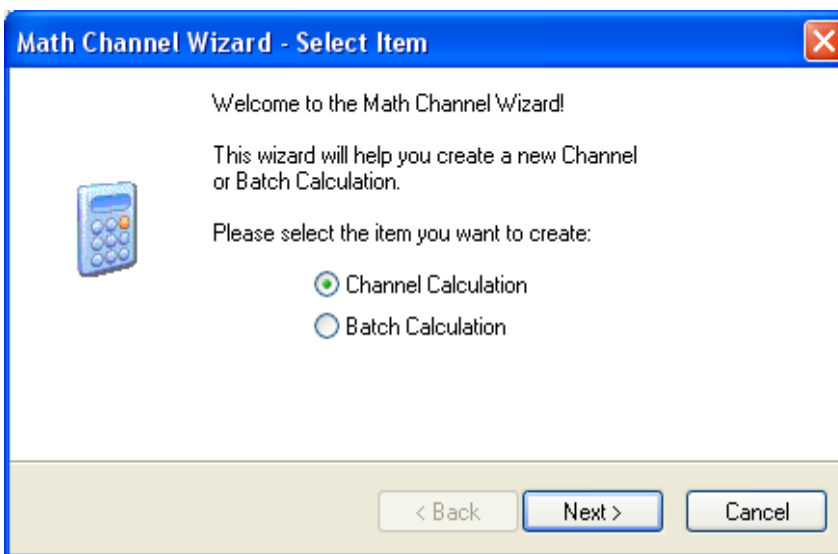
A batch calculation allows you to run a number of calculations, one after the other.

Follow the instructions in the wizard to create a new math channel. The wizard will ask for a unique name to associate to the channel and the physical quantity the data channel is measured in.

Once, you have completed the wizard, the math channel editor is displayed.

Type in the formula or use the Formula Components tree below to create the formula.

Double-click on an item to enter it into the formula window.

Select the units the calculator should use when performing the calculation.

A toolbar allows quick location of formula components in the tree.
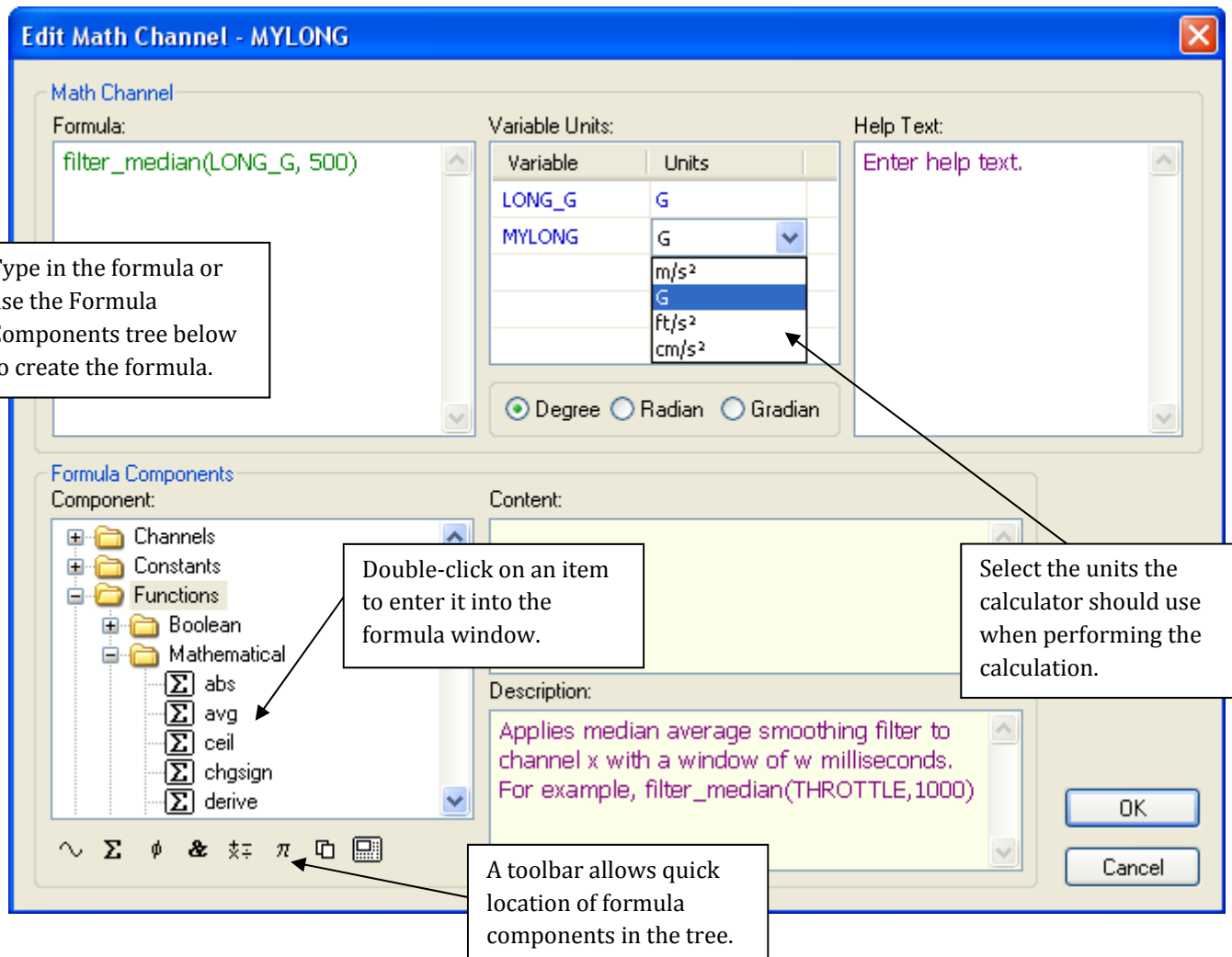
Executing a Math Channel

For math channel data to be available, you must first execute the calculation. Select the run for which you want the math channel, and then click the **Execute** button in the **Math Channels** dialogue. To have your math channel calculation(s) executed automatically upon data download, please see the section on **Auto-Calculations** in this manual.

Log Book

Configuring the Log Book Parameters

The Log Book is a powerful relational database that allows you to store, search and compare information about vehicles, races, tracks, weather conditions or any other parameter you wish to record and associate with recorded data.

Select the **Configure Log Book...** option from the **Tools** menu.
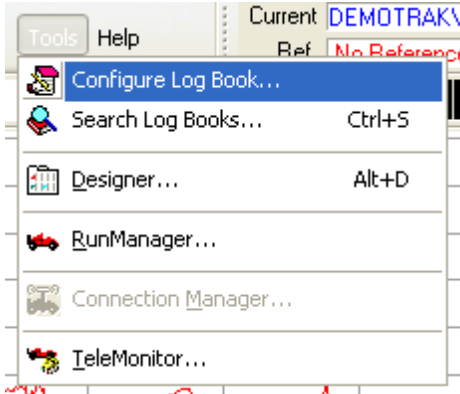
The **Log Book Configuration** dialogue allows you to customize the Log Book by adding parameters and categories of your choice.

Click the **Add...** button to add a **Category** or **Parameter** to the Log Book.
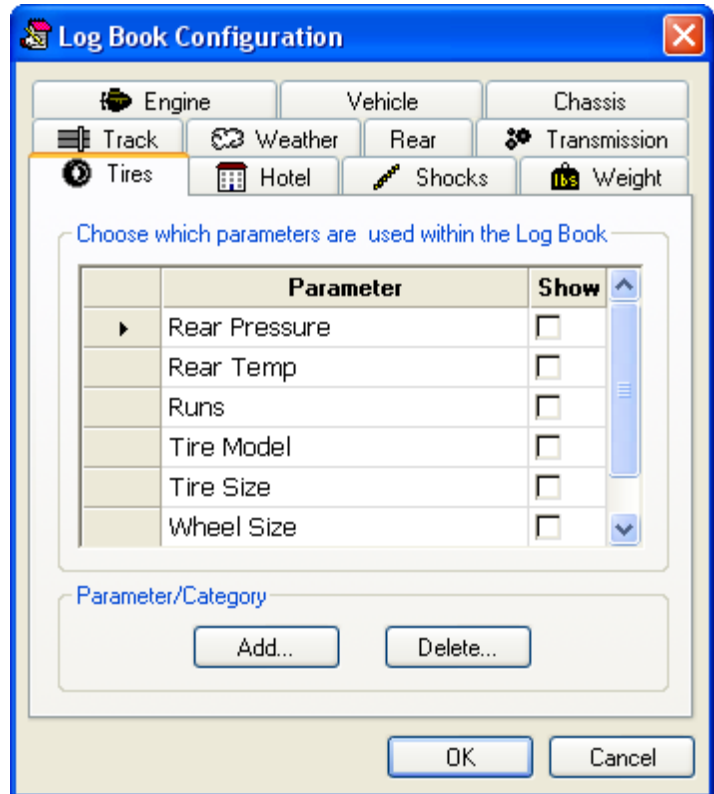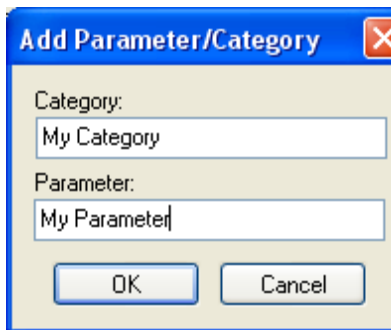
Similarly, click the **Delete...** button to remove categories and/or parameters.

To hide or show parameters in the Log Book, select the required Category tab then check or uncheck the parameter in the **Show** column.

Viewing the Log Book

The Log Book is fully integrated into the DataPro software. The Log Book may be selected as a pane within any layout. The Log Book is also displayed within the Run Selector dialogue and the RunManager application to help you find the run you're looking for.
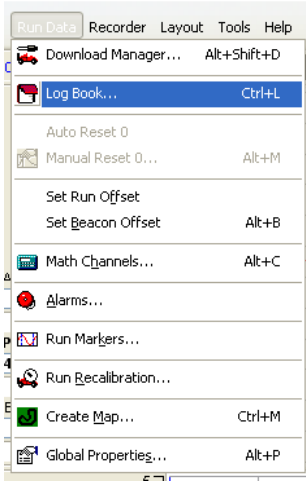
To edit the Log Book, select the **Log Book...** option from the **Run Data** menu.

Note, the **Options** tab of the **Global Properties** dialogue also allows you to have the Log Book automatically displayed at data download.

Currently selected run.

Your selected Parameter Categories.

Run Info tab gives recorded date and time plus your text notes on track Session and Run.

Use this **Import** button to import the Log Book of another run.

Enter values for your parameters here.

Comparing and Searching Log Book Data
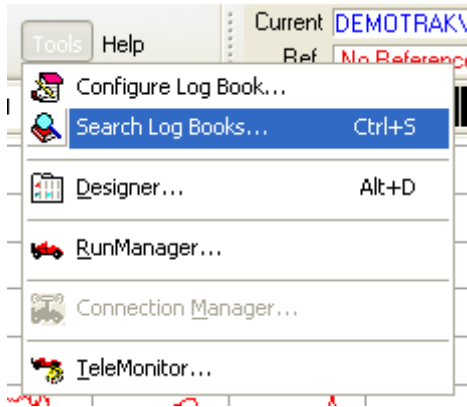
Select the **Search Log Books...** option from the **Tools** menu to access the Search & Compare dialogue.

Click column header to sort columns.

Right-click context menu gives access to editing and searching features.

All Log Book entries presented in spreadsheet tabulated form for easy comparison.

Right-click any row in the spreadsheet to display the popup menu. For searching, select the **Filter...** menu item.

A maximum of five filter conditions can be set up on any of the Log Book parameters. For popular searches, the filter criteria can be saved for easy access later.

Hints, Tips & Tricks

Shortcut for Adding Channels to a Strip Chart

Right-click the Strip Chart Y-axis, then select from the list of channels in the popup menu. You may select or deselect channels from this list.
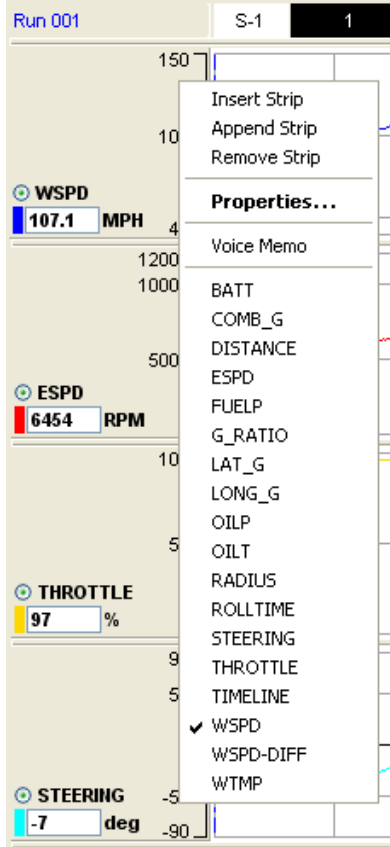
Shortcut to Strip Properties

Right clicking on the channel name or value box within the Y-axis of the Strip Chart will display the Strip Properties dialogue.

Calibrating Sensors

Some sensors require calibration of a zero point, and the internal g meter will also require a vehicle specific calibration in order to accurately interpret any offset as a result of installation orientation.

The following channels will require calibration of a zero point. In order to know what sensors will require calibration, the standard DataPro Designer channel names must be used as indicated. The zero point for the g meter and all of the following sensors will occur during this process

DAMPERFL

DAMPERFR

DAMPERRL

DAMPERRR

GYRO_X

GYRO_Y

GYRO_Z

LAT_G

LONG_G

PEDAL

PEDAL2

STEERING

THROTTLE

VERT_G

To enter calibration mode, press S3 and then press S4 within 1 second.

The left and right side LEDs will now be pulsing yellow.

Pressing S3 will capture the zero position for any of the channels listed above. Be sure that the vehicle is on a flat, smooth surface to ensure accurate sensor calibration.

Once the zero values have been set, the LEDs on the left and right will pulse blue. Now it will be required to calibrate straight line acceleration to optimize the g meter calibration. Note: this step can be skipped by pressing S4, but the g meter calibration will not be as accurate. Once the vehicle is ready for this acceleration, press S3 (LEDs will now pulse red) and accelerate the vehicle at a rate of 1/3 of a g. Once the acceleration is threshold is reached, the LEDs on the side will pulse green for 10 seconds to indicate successful calibration.

Upgrading / Updating Your Display

It may be necessary to update the firmware in order to access newly released features and capabilities. The firmware upgrade process can be accessed in the Misc. tab of DataPro Designer.
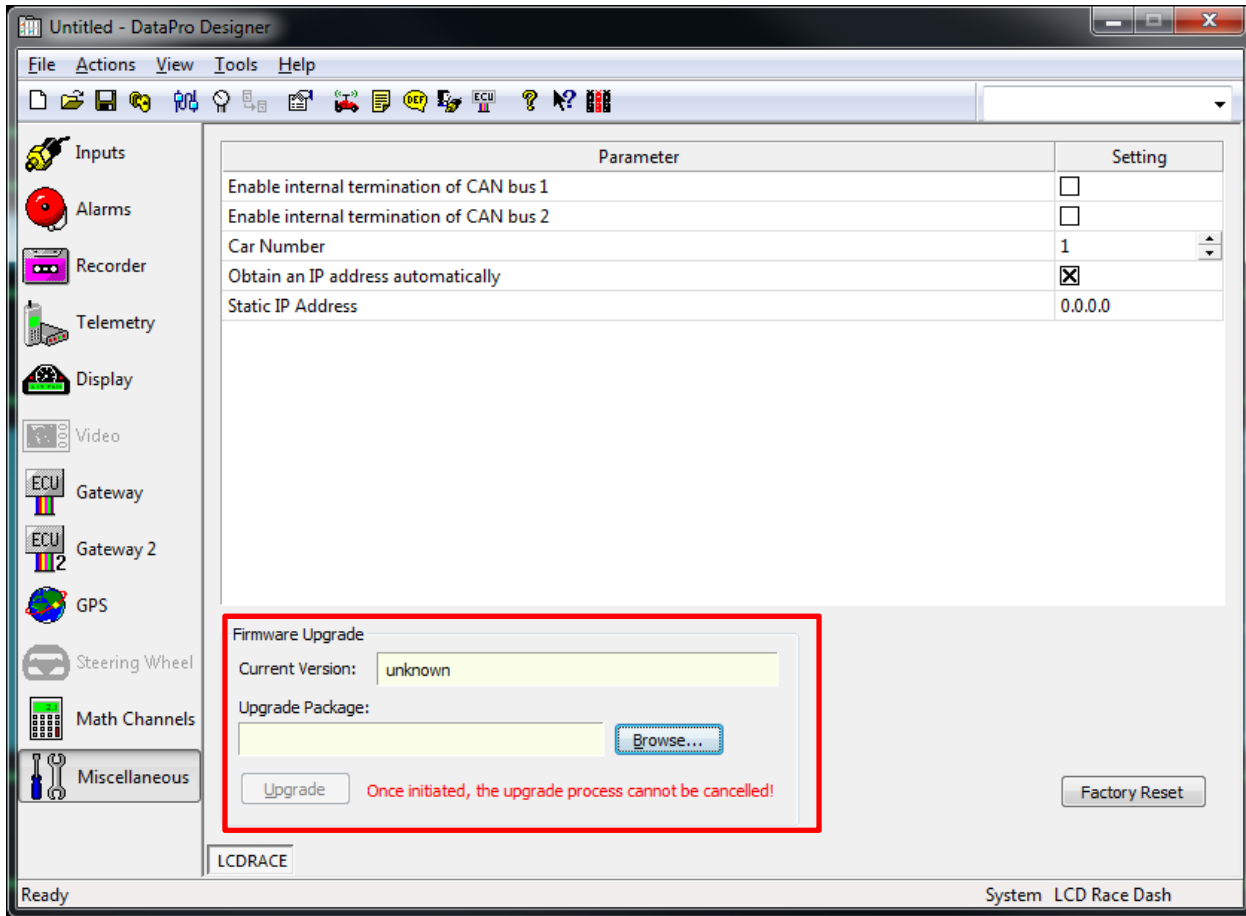
When a connection is made to an LCD dash, the current version number will be reported in the current version field.

To upgrade to a later firmware bundle, you must first download the latest firmware from www.stackltd.com and save the file locally.

Next, click the browse button and point to the firmware file.

Finally, click the Upgrade button to begin the process.

Note: Once the upgrade button has been selected and the upgrade begins, power to the system must be maintained until the update has completed. There will be an indication on the display that an upgrade is in process. This process will take several minutes to complete.

Cutting Template for Flush Mount

2650-1790-00r1
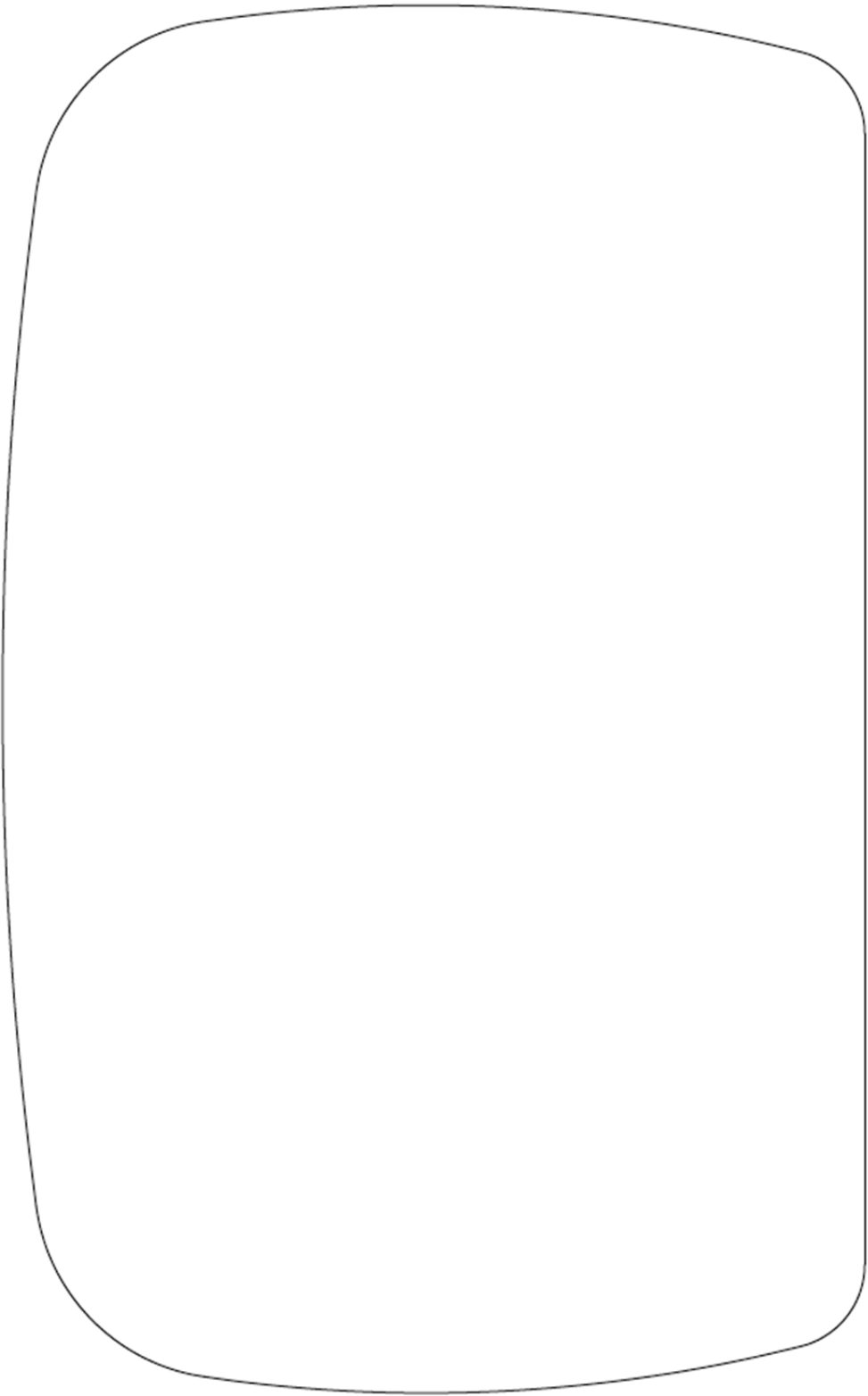
Cutting template for "Face Forward" Mount

3.750 [95]

R.250 [6]

5.875 [149]

6.500 [165]

2.375 [60]

⌀.185 [5]
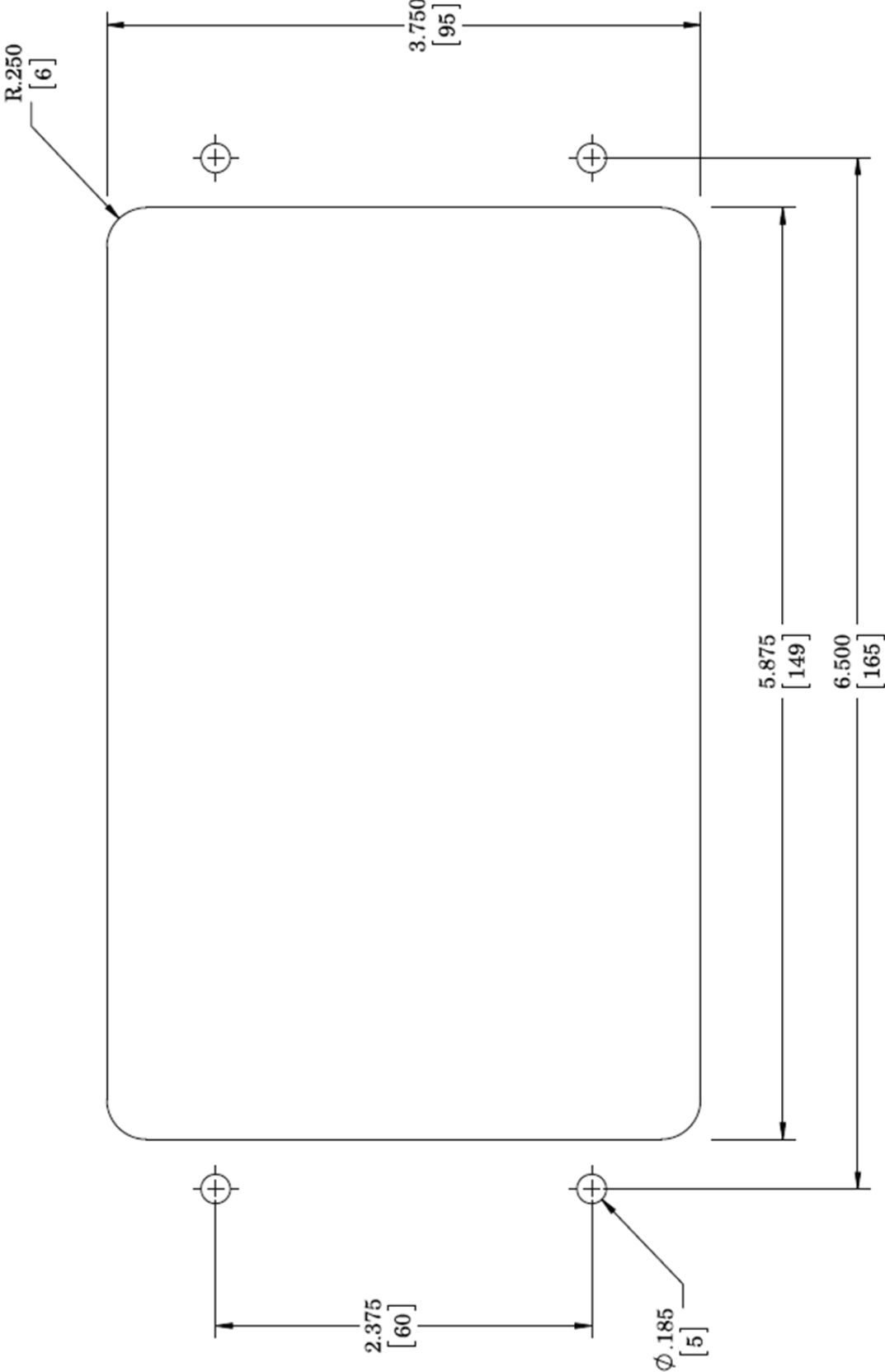
12 Month Limited Warranty

Auto Meter Products, Inc. warrants to the consumer that all Auto Meter High Performance products will be free from defects in material and workmanship for a period of twelve (12) months from date of the original purchase. Products that fail within this 12 month warranty period will be repaired or replaced at Auto Meter's option to the consumer, when it is determined by Auto Meter Products, Inc. that the product failed due to defects in material or workmanship. This warranty is limited to repair or replacement of parts in the Auto Meter instruments. In no event shall this warranty exceed the original purchase price of the Auto Meter instruments nor shall Auto Meter Products, Inc. be responsible for special, incidental or consequential damages or costs incurred due to the failure of this product. Warranty claims to Auto Meter must be transportation prepaid and accompanied with dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12 month warranty period. Breaking the instrument seal, improper use or installation, accident, water damage, abuse, unauthorized repairs or alterations voids this warranty. Auto Meter Products, Inc. disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by Auto Meter.

Service & Support

For service send your product to Auto Meter in a well packed shipping carton. Please include a note explaining what the problem is along with your phone number. Please specify when you need the product back. If you are sending product back for Warranty adjustment, you must include a copy (or original) of your sales receipt from the place of purchase.

For Service Send To:

AUTO METER PRODUCTS, INC.

413 W. Elm St.

Sycamore, IL 60178 USA

Email us at:

service@autometer.com

Call us at:

866-248-6357