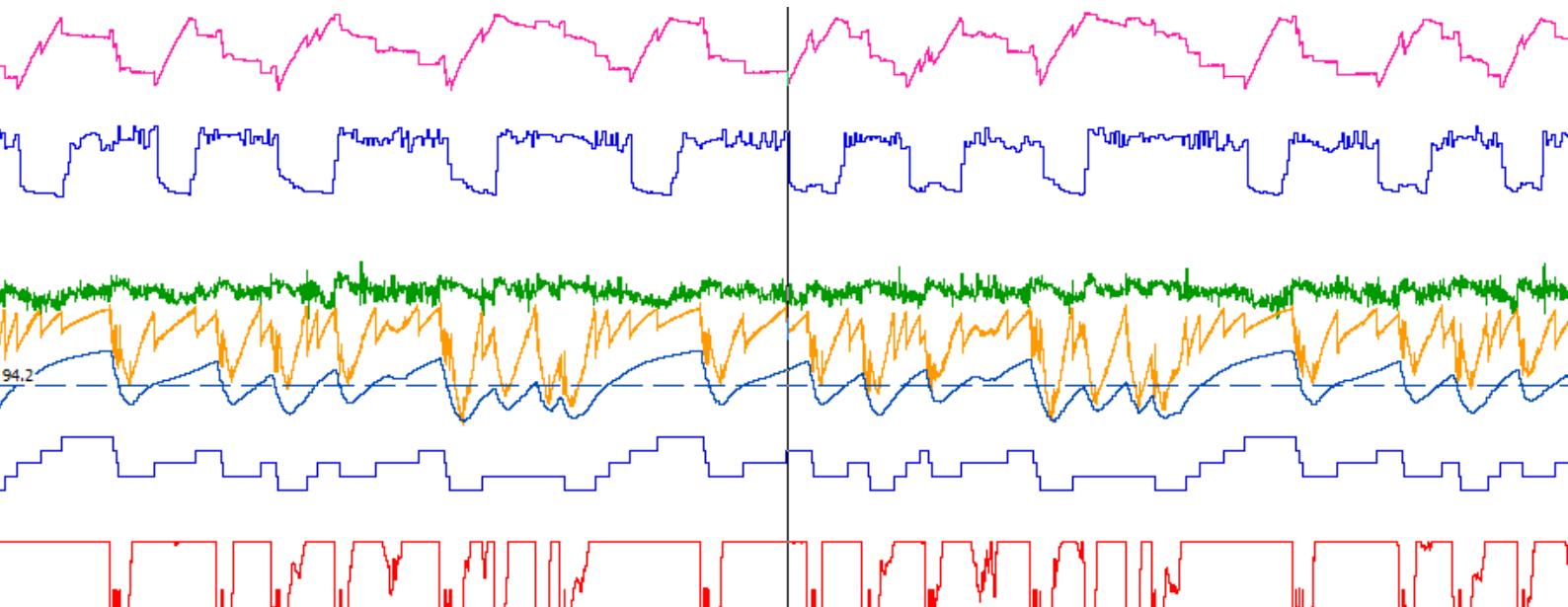




RADICAL SPORTSCARS

DATA ANALYSIS MANUAL



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INTRODUCTION

All modern Radical Sportscars are fitted with Life Racing ECUs and optional Aim dataloggers. The Life Racing ECU is a professional motorsport logging ECU, used in a range of vehicles all the way up to LeMans competitors. The ECU controls the running of the engine and associated hardware (radiator fans, fuel pump, water pump etc) it is also used to control the gearbox. The additional electronics (lights, aux power, air con, wipers etc) are not managed by the ECU and have their own separate control systems.

The Dash logger digitally receives signals from the ECU and it also can also interpret its own separate analog signals for brake pressure, steering angle and damper potentiometers (when fitted). The advanced motorsport ECU allows maximum performance to be extracted from the engine under manageable restrictions to prevent damage to the hardware of the engine or gearbox. As part of the calibration process Radical programs safety features into the mapping to prevent drivers from damaging the engine and gearbox through aggressive use or exceeding safe running parameters. The ECU records data to allow for fast and accurate fault diagnosis. Frequent and accurate checking of the engine data can prevent potential forthcoming issues and will help drivers win races!

THE BASICS

When checking engine data, you should always use the Life engine data, it logs more information than the Aim data and at a higher frequency so it will help you get to any potential problems faster. When reviewing data, it is always important to validate the specific channel you are looking at. The three golden rules that should be considered are:

- is it **reading**?
- is it **changing**?
- is it **realistic**?

Is it reading – is the channel showing any numbers or is it just showing the default value?

Is it changing – does the value change as it should or is it constant? Is it staying at its default value?

Is it realistic – this is the most important consideration. Is the data showing something that is physically possible or is there just a fault with the sensor? Eg is the driver really entering the corner at 500mph (or is there an electrical fault with the sensor?), water temperature does not drop from 80 degrees to -30 in one second (is there a fault with the wiring?)

Considering these things is crucial to accurate data analysis.

HOW TO DOWNLOAD LIFE DATA

Download the latest Life Racing software from <http://www.radicalsportscars.com/downloads/>
Connect the ECU using the download lead (LH0168) connected to the car and laptop
Turn on the car's master switch, then open '**LifeData**'

Choose Where to Save The Data

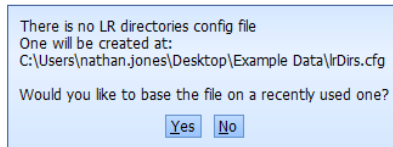
Select **File > Working directory**

SELECT or **CREATE** new folder location eg:

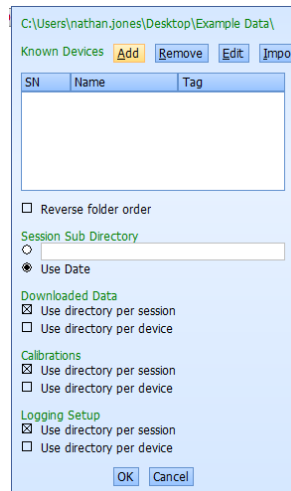
D:\Radical ECU Data\Year\Car model\Engine specification\Chassis number\Date & location

Once in the desired locations choose **SELECT**

You will then be told a config file is being made in this location. Press '**ESC**' on the keyboard when prompted below.



You will then be asked to give more directory information, this can be ignored. Press '**ESC**'



You will then be asked if you would like a shortcut to be placed onto the desktop, always select '**No**'.



Downloading the Data:

Select **Device > Read Data**

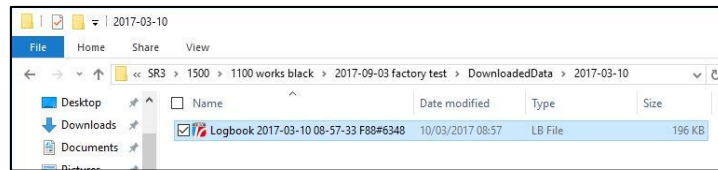
The software will then connect to the ECU and show you the below options



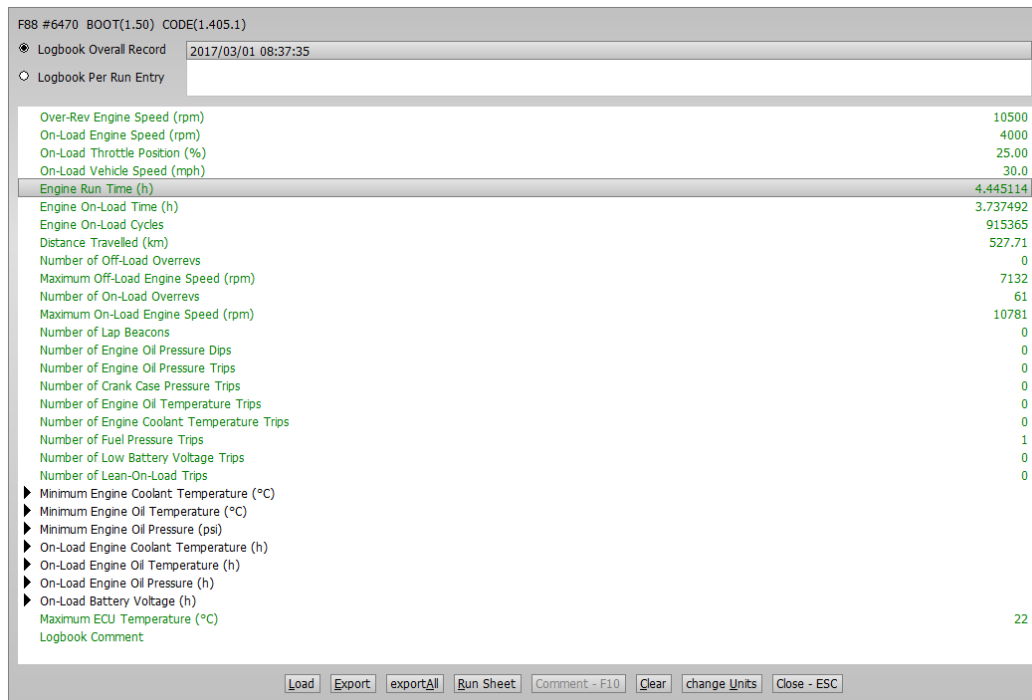
Click **OK** and the run files and Logbook will download.

REVIEWING THE LOGBOOK

Using the normal Windows file explorer, navigate to the most recent download folder for the ECU
Double click on the latest logbook (.LB) file



The Logbook will then open in Life View



From here LogBook parameters, engine hours and overall recordings can be found.
For warranty purposes RPE will reference the total **Engine Run Time** (selected above)
Units can be changed using the option at the bottom of the screen

LIFE VIEW

Open **LifeView**

Select **File > Load** and navigate to the location you have downloaded the data to, select the appropriate according to the download date and time.

The data will then open for review in **LifeView**

To make viewing the data easier, Radical Template Worksheets can be downloaded from the radical website: <http://www.radicalsportscars.com/downloads/>. You should save these to your desktop

Navigation

Mouse:

Left Click	Place cursor
Right Click	Place marker
Left Drag	Move cursor
Right Drag	Zoom to selection
Scroll	Zoom X-axis
Ctrl Scroll	Zoom Y-axis
Double Click	Add/edit annotation
Drag Y-Axis	Move axis maximum
Ctrl Drag	Y-Axis Move axis minimum
Shift Drag	Y-Axis Move entire axis

Keyboard:

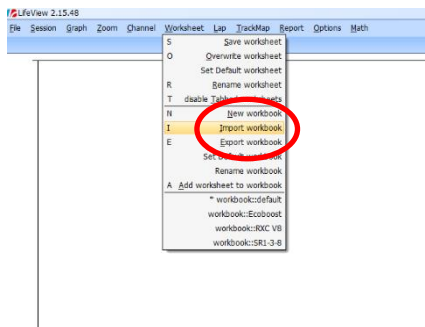
<Left>	Move accelerating cursor to left
<Right>	Move accelerating cursor to right
[Move cursor left to previous different value
]	Move cursor right to next different value
<	Move cursor to previous alarm position
>	Move cursor to next alarm position
<F6>	Move cursor to minimum visible value
<F7>	Move cursor to maximum visible value
<Ctrl> + <Left>	Move cursor to left by 10% of screen
<Ctrl> + <Right>	Move cursor to right by 10% of screen
<Shift> + <Left>	Accelerating scroll to left
<Shift> + <Right>	Accelerating scroll to right
<Plus>	Zoom in X-axis
<Minus>	Zoom out X-axis
<Ctrl> + <Plus>	Zoom in Y-axis
<Ctrl> + <Minus>	Zoom out Y-axis
<Tab>	Toggle graph focus when multiple graphs are open
<Space>	Place marker
<Backspace>	Remove marker

The Zoom menu can also be utilised with its shortcuts to Zoom To Selection, Zoom Previous or Zoom Right Out. Certain options such as cursor acceleration and right click zooming can be toggled, depending on user preference when navigating.

How to Import a Workbook

Use the above section to help you extract the data from your car.

Open LifeView and click 'Workbook' in the menu. Then click 'Import workbook'



Then select the 'Factory Approved Workbooks' that should you have downloaded from the website

To set a default worksheet, open the workbook you wish to set as a default by selecting it from the list at the bottom of the 'Worksheet' tab. Then select 'Set Default Workbook'.

Use the tabs in the top left to navigate through the worksheets, which are listed below.

ENGINE DATA ANALYSIS

When reviewing session data, provided there is no specific known issue, it is most efficient to check the data using the below priority order:

1. Engine oil pressure
2. Battery voltage
3. Fuel pressure
4. Running temperatures
5. All other channels

The analysis of these critical channels should be as follows:

Engine oil pressure – low oil pressure causes bad engine oiling which soon becomes an expensive problem! As a rough rule of thumb:

For a hayabusa engine, when the oil temperature is **100 degrees C** and the RPM is at **10,000 RPM** the oil pressure should be **above 65psi**.

For a V6 ecoboost engine the oil pressure on track should remain constant **above 80psi** at all times.

Battery voltage – when the battery goes flat the car won't run and won't be able to start. Standard batteries should hold close to 12.8V at rest. When the car is running and charging this should rise to 14V. It is normal for the voltage to drop when load is applied (eg radiator fans on or paddle shift compressor charging) as soon as this electrical draw finishes the measured voltage should bounce back up to 14V. Look for a general trend of the recorded voltage over a session, is the trend horizontal and flat or does it trend down, indicating the battery voltage is depleting and the car may not be charging.

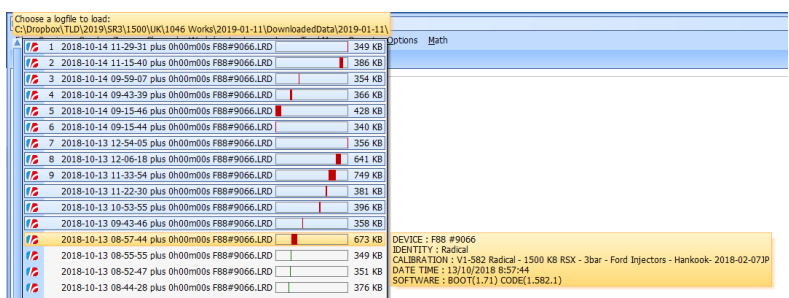
Fuel pressure – low fuel pressure, means less fuel in the cylinder, this leads to lean combustion and in extreme circumstances – detonation. This can quickly damage an engine. The fuel pressure is regulated post fuel rail. For small chassis cars (SR1-3-8) the target fuel pressure is 3 bar. For large RXC chassis variants the target pressure is 4 bar. It is expected for the fuel pressure to reduce by a small amount on load, conversely off load it is possible for the fuel pressure to rise above the regulated pressure if the pump is very strong. The fuel pressure should be checked when the car is on load high in the RPM range. A drop in pressure of 0.2 bar below target is acceptable, below 0.4 bar requires urgent investigation – is the battery providing adequate power to the pump, or has the pump deteriorated?

Running temperatures – tab over to the temperatures worksheet and check that the car is running with the correct target temperatures, water 75-85degrees C, oil 90-110 degrees. Low temperatures cause too higher oil pressure which can damage engine seals. High temperatures cause low oil pressure and can also overheat the engine components potentially damaging them.

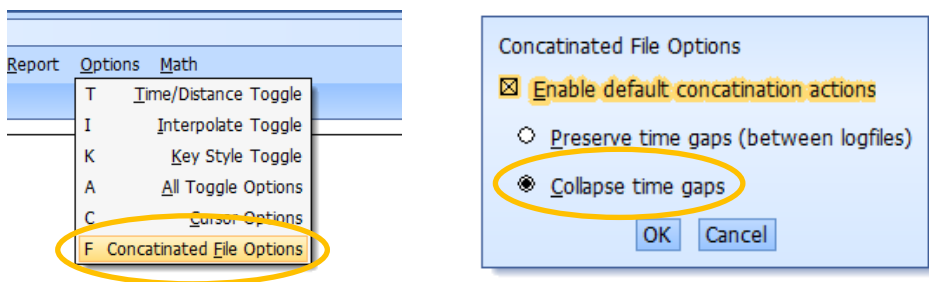
All other channels – now the critical channels have been checked turn your eye to the other channels in the generals tab. An explanation of each channel is given in the next section.

LIFE VIEW SETTINGS

Loading Multiple Run Files: to load more than one run file, press 'File' then 'Load' then hold shift and press the down arrow until you have selected all the files you wish to load, then press 'Enter'.



Collapsing Time Gaps: When loading multiple files are loaded you will be asked if you want to collapse the time gaps. You should always select 'Yes' as choosing no will result in large amounts of blank space between the runs. To automatically collapse the time gaps you can press 'Options' then 'Concatinated File Options' then make sure the 'Collapse Time Gaps' box is checked.



REMOTE MAPPING UPDATES

LIFE PROG

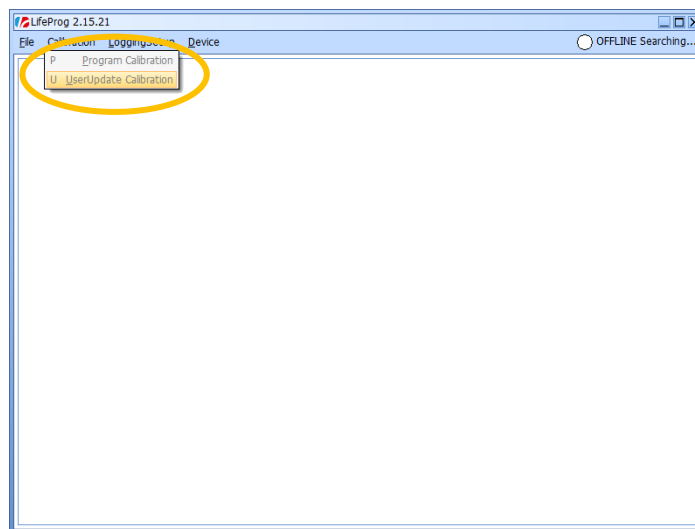
This program will rarely need to be used. Its sole function is to update the map in the ECU remotely, customers do not have access to change maps but with Life Prog a map update file can be sent by the Factory and updated by the customer.

If an engine has been converted for example, and the ECU is unable to be sent to the factory a 'User Update Calibration' can be sent.

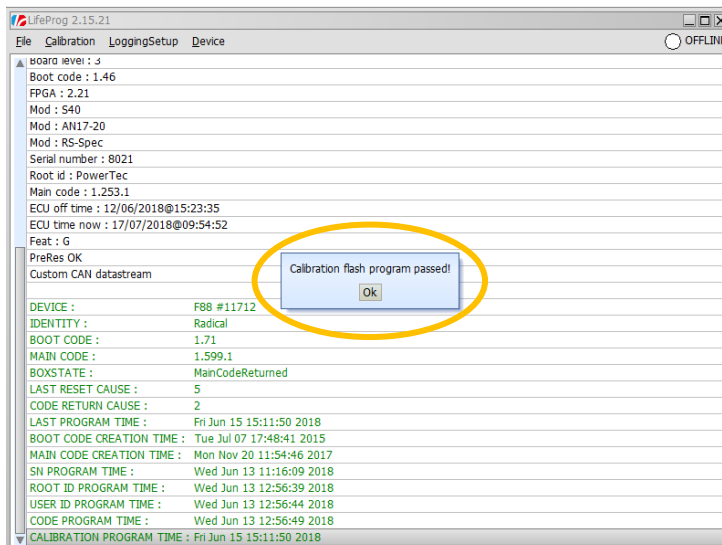
To use this program you need a **.LRCU** file.

Open '**LifeProg**' the select '**Calibration**' and '**UserUpdate Calibration**'

You will then need to select the '**.LRCU**' file.



Then press '**OK**' it will then say '**Calibration Flash Program Passed**' which means the process is complete.



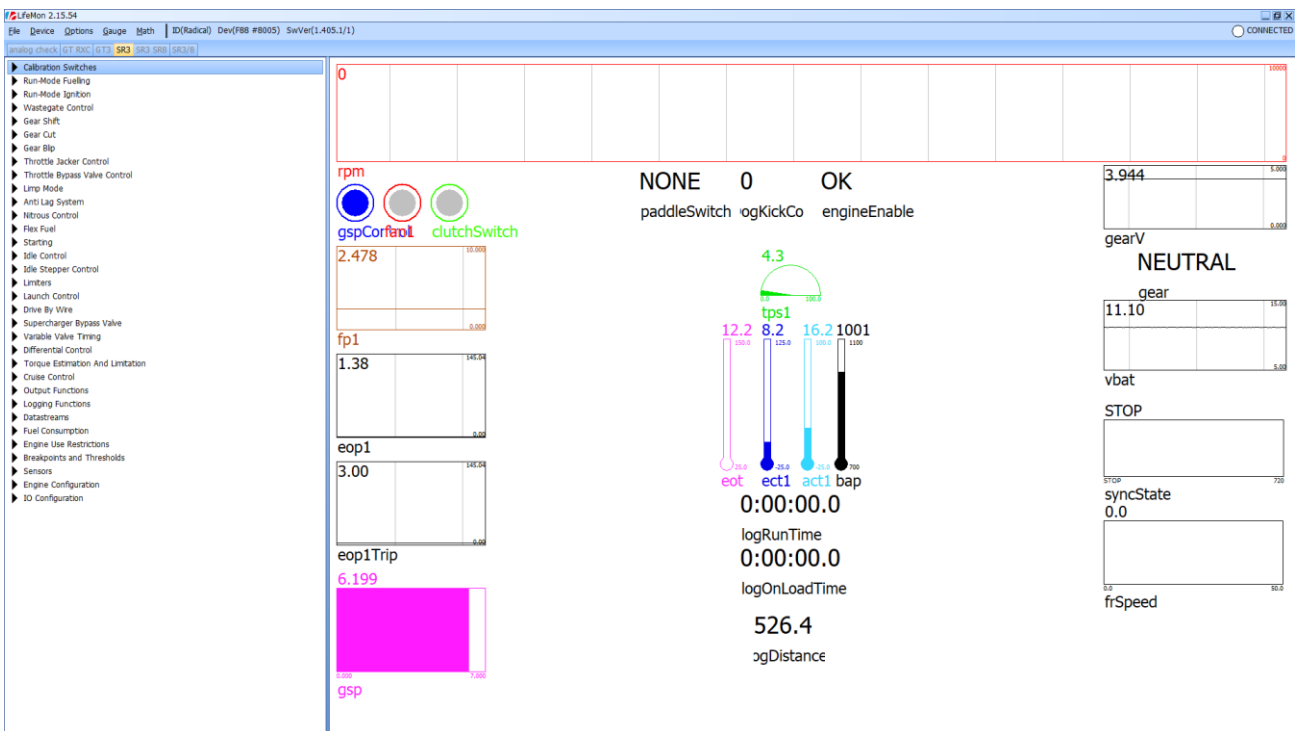
VIEWING THE ECU PARAMETERS LIVE

LifeMon can be used to monitor the channels seen in the data live, this can be useful when running the car up to check for oil pressure and temperatures etc. If you suspect a problem, this is a good place to start, by checking all the readings are correct.

Open 'LifeMon' then press 'Device' then 'Connect'.

You will then need to load a gauge layout, to do this select 'Gauge' then 'Import Disk Layout' the Radical layout is available on the website. Select this file and then press 'Gauge' then the name of the layout to load it.

You will now see all the ECU parameters live. Individual parameters can be added or removed by pressing 'Gauge' then 'Add' or 'Remove'. The layout is fully customisable and can be saved to your preference.



GENERAL WORKSHEET

Use this page to have a general check over the parameters. This page is split into 3 graphs. The top graph holds all the general channels and can be used to check battery voltage and fuel pressure. The second graph is specifically for checking oil pressure, remember to check it at the end of the session as this is the most recent data on how the engine is running. The third graph shows instantaneous faults such as overrevs, gear shift disallows or engine trips, use this graph to show major faults such as when the car cuts out on track.

General Checks Graph

clutchSwitch (Clutch Switch) – Neutral Button on the Steering Wheel/ pressure sensor, the channel displays the on/off state of the button.

fp1 (Fuel Rail Pressure) – Shows fuel pressure provided by the in tank pump (Bar)

frSpeed (Front Right Wheel Speed) – Shows the interpreted speed of the front right wheel (mph)

gear (Current Gear) – Converts the gear voltage provided from the gear position sensor into a gear

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

rpm (Engine Speed) – Displays current engine speed (rpm)

syncState (SyncState) – Shows the state of synchronisation between the camshaft and crankshaft position sensor, 720 means both are reading together. (°)

tps1 (Throttle Body Position) – Shows the amount the throttle body is opening (%)

vbat (Car Battery Voltage) – Shows current battery voltage (V)

Oil Pressure Check Graph

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eop1Trip (Engine Oil Pressure Trip) – Show the trip line for the oil pressure, uses rpm and safety factor to create a trace, if EOP drops below this line for 2 seconds the engine will turn off. (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

rpm (Engine Speed) – Displays current engine speed (rpm)

Reference Graph

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why.

gearCutDogKickCount (Incomplete Gearshift's) – Displays interpreted number of failed gear changed suspected to be dog kicks (Count)

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example.

revLimitActive (Limiter Active) – Displays the points where the rev limiter is in use.

OIL PRESSURE WORKSHEET

This worksheet is a full-scale view of the oil pressure check seen on the 'General' worksheet, this enables you to see the traces in more detail, over a longer period of time.

Oil Pressure Check Graph

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eop1Trip (Engine Oil Pressure Trip) – Show the trip line for the oil pressure, uses rpm and a safety factor to create a trace, if EOP drops below this line for 2 seconds the engine will turn off. (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

rpm (Engine Speed) – Displays current engine speed (rpm)

TEMPS WORKSHEET

Temperatures Graph

act1 (Air Charge Temperature) – Displays inlet air temperature, (used for fuelling corrections) (°)

bap (Barometric Pressure) – Displays atmosphere pressure, absolute (mBar)

ect1 (Engine Coolant Temperature) – Displays water temperature. (°)

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why. Logging Rate (Event)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

fan1 (LH Cooling Fan) – Displays the on/off state of the fan, comes on at a certain temperature depending on the model.

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear.

GEARS WORKSHEET

Gearbox Check Graph

clutchSwitch (Clutch Switch) – Neutral Button on the Steering Wheel/ pressure sensor, the channel displays the on/off state of the button

frSpeed (Front Right Wheel Speed) – Shows the speed of the front right wheel (mph)

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

gearV (Gear Position Sensor Voltage) – Displays the position of the selector barrel (V)

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

gspControl (Gear System Pressure Control) – Shows the on/off cycle of the compressor for the paddleshift system

PaddleSwitch (Paddle Switch) – Displays the input of the paddles from the ECU

rpm (Engine Speed) – Displays current engine speed (rpm)

tps1 (Throttle Body Position) – Shows the amount the throttle body is opening (%)

Reference Graph

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gearCutDogKickCount (Incomplete Gearshift's) – Displays interpreted number of failed gear changed suspected to be dog kicks (Count)

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example.

lam1 (Lambda) – Displays air/fuel ratio post combustion measured in the exhaust (:)

General Checks Graph

clutchSwitch (Clutch Switch) – Clutch switch on the pedal, the channel displays the on/off state of the switch

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

fp1 (Fuel Rail Pressure) – Shows fuel pressure provided by the pump (Bar)

gear (Current Gear) – Converts the gear voltage provided from the gear position sensor into a gear

gearV (Gear Position Sensor Voltage) – Displays the position of the selector barrel (V)

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

ppsFinal (Pedal Position) – Displays the throttle pedal position (%)

rpm (Engine Speed) – Displays current engine speed (rpm)

syncState (SyncState) – Shows the state of synchronisation between the camshaft and crankshaft position sensor, 720 means both are reading together. (°)

tps1 (Throttle Body Position) – Shows the amount the throttle body is opening (%)

vbat (Car Battery Voltage) – Shows current battery voltage, this will drop when the compressor and or fan comes on (V)

Oil Pressure Check Graph

Cyl01Knock (Cylinder 1 Knock) – Displays knock sensor reading for cylinder 1 (%)

Cyl02Knock (Cylinder 2 Knock) – Displays knock sensor reading for cylinder 2 (%)

Cyl03Knock (Cylinder 3 Knock) – Displays knock sensor reading for cylinder 3 (%)

Cyl04Knock (Cylinder 4 Knock) – Displays knock sensor reading for cylinder 4 (%)

Cyl05Knock (Cylinder 5 Knock) – Displays knock sensor reading for cylinder 5 (%)

Cyl06Knock (Cylinder 6 Knock) – Displays knock sensor reading for cylinder 6 (%)

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eop1DipCount (Oil Pressure Dip Count) – Shows the amount of times the oil pressure trace has dropped below the trip line

eop1Trip (Engine Oil Pressure Trip) – Show the trip line for the oil pressure, uses rpm and expected EOP to create a trace, if EOP drops below this line for 2 seconds the engine will turn off. (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

rpm (Engine Speed) – Displays current engine speed (rpm)

Reference Graph

airConSwitch (Air Conditioning Switch) – Displays the on/off cycle of the air conditioning

calSwitch (Calibration Switch) – Displays the input from the MAP switch on the steering wheel

dbw1Targ (Drive by Wire Target) – Displays the throttle position target (%)

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gearCutDogKickCount (Incomplete Gearshift's) – Displays how many gear changes have failed (Count)

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example

limpMode (Limp Mode Active) – Displays when the car is in limp mode, ECT Low for example

pitLimitActive (Pit Limiter Active) – Displays the on/off cycle of the pit limiter button

revCutActive (Ignition Cut Active) – Displays when the ignition is turned off for rev limiter for example

revLimitActive (Limiter Active) – Displays the points where the rev limiter is in use

syncFault (Sync Fault) – Displays the reason why the crank and cam sensors, are not in communication

TEMPS WORKSHEET

Temperatures Graph

aat (Ambient Air Temperature) – Displays the current ambient air temperature (°)

act1 (Air Charge Temperature) – Displays inlet air temperature, used to calculate fuelling (°)

bap (Barometric Pressure) – Displays atmosphere pressure, absolute (mBar)

ect1 (Head Temperature) – Displays metal temperature of the cylinder head. (°)

ect_U02 (Water Temperature) – Displays the coolant temperature in the engine.

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

fan1_RadFan (Front Cooling Fans) – Displays the on/off state of the fan, comes on at a certain temperature depending on the model

fan2 (Water Pump) – Displays the on/off state of the water pump

gbt_U15 (Gearbox Temperature) – Displays the temperature of the gearbox oil

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

BOOST WORKSHEET

Boost Level Graph

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

map1 (Manifold Absolute Pressure) – Displays the overall level of boost, including atmospheric pressure (mBar)

rpm (Engine Speed) – Displays current engine speed (rpm)

tps1 (Throttle Body Position) – Shows the amount the throttle body is opening (%)

trqFuelSev (Fuel Cut) – Displays the level of fuel cut (%)

wgMapTarg1 (MAP Target) – Displays the boost target (mBar)

Wastegate Graph

calSwitch (Calibration Switch) – Displays the input from the MAP switch on the steering wheel

wgBaseDuty1 (Wastegate Duty) – Displays the pre-defined duty that is applied by the ECU (%)

wgFinalDuty1 (Final Wastegate Duty) – Displays the actual duty needed to maintain the correct boost target (%)

DRIVER WORKSHEET

ABS Graph

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

frSpeed (Front Right Wheel Speed) – Shows the speed of the front right wheel (mph)

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

rlSpeed (Rear Left Wheel Speed) – Shows the speed of the rear left wheel (mph)

rrSpeed (Rear Right Wheel Speed) – Shows the speed of the rear right wheel (mph)

Traction Control Graph

ppsFinal (Pedal Position) – Displays the throttle pedal position (%)

tcSelect (Traction Dial Position) – Displays the current setting for traction control

trqlgnRtd (Ignition Retard) – Displays the change in ignition angle to maintain traction (°)

Oil Pressure Check Graph

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

rpm (Engine Speed) – Displays current engine speed (rpm)

GEARS WORKSHEET

General Graph

clutchSwitch (Clutch Switch) – Clutch switch on the pedal, the channel displays the on/off state of the switch

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

frSpeed (Front Right Wheel Speed) – Shows the speed of the front right wheel (mph)

gear (Current Gear) – Converts the gear voltage provided from the gear position sensor into a gear

gearV (Gear Position Sensor Voltage) – Displays the position of the selector barrel (V)

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

gspControl (Gear System Pressure Control) – Shows the on/off cycle of the compressor for the paddleshift system

PaddleSwitch (Paddle Switch) – Displays the input of the paddles from the ECU

rlSpeed (Rear Left Wheel Speed) – Shows the speed of the rear left wheel (mph)

rpm (Engine Speed) – Displays current engine speed (rpm)

rrSpeed (Rear Right Wheel Speed) – Shows the speed of the rear right wheel (mph)

tps1 (Throttle Body Position) – Shows the amount the throttle body is opening (%)

trqFuelSev (Fuel Cut) – Displays the level of fuel cut (%)

Reference Graph

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gearCutDogKickCount (Incomplete Gearshift's) – Displays how many gear changes have failed (Count)

gearCutState (Shift Progress) – Displays the stage of a given shift

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example

gearShiftState (Shift Review) ECU's interpretation of the state of the gearshift

lam1 (Lambda) – Displays air/fuel ratio post combustion, Bank 1 (:)

lam2 (Lambda) – Displays air/fuel ratio post combustion, Bank 2 (:)

General Check Graph

clutchSwitch (Clutch Switch) – Clutch switch on the pedal, the channel displays the on/off state of the switch

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

fp1 (Fuel Rail Pressure) – Shows fuel pressure provided by the pump (Bar)

gear (Current Gear) – Converts the gear voltage provided from the gear position sensor into a gear

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

ppsFinal (Pedal Position) – Displays the throttle pedal position (%)

rpm (Engine Speed) – Displays current engine speed (rpm)

syncState (SyncState) – Shows the state of synchronisation between the camshaft and crankshaft position sensor, 720 means both are reading together. (°)

tps1A (DBW Motor Position) – Shows the amount the DBW Motor is opening (%)

vbat (Car Battery Voltage) – Shows current battery voltage, this will drop when the compressor and or fan comes on (V)

Oil Pressure Check Graph

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eop1DipCount (Oil Pressure Dip Count) – Shows the amount of times the oil pressure trace has dropped below the trip line

eop1Trip (Engine Oil Pressure Trip) – Show the trip line for the oil pressure, uses rpm and expected EOP to create a trace, if EOP drops below this line for 2 seconds the engine will turn off. (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

rpm (Engine Speed) – Displays current engine speed (rpm)

Reference Graph

dbw1Targ (Drive by Wire Target) – Displays the throttle position target (%)

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gearCutDogKickCount (Incomplete Gearshift's) – Displays how many gear changes have failed (Count)

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example

limpMode (Limp Mode Active) – Displays when the car is in limp mode, ECT Low for example

pitLimitActive (Pit Limiter Active) – Displays the on/off cycle of the pit limiter button

revCutActive (Ignition Cut Active) – Displays when the ignition is turned off for rev limiter for example

revLimitActive (Limiter Active) – Displays the points where the rev limiter is in use

OIL PRESSURE WORKSHEET

Oil Pressure Check Graph

eop1 (Engine Oil Pressure) – Shows oil pressure, this will vary with temperature. The trace should roughly follow rpm (psi)

eop1Trip (Engine Oil Pressure Trip) – Show the trip line for the oil pressure, uses rpm and expected EOP to create a trace, if EOP drops below this line for 2 seconds the engine will turn off. (psi)

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

revLimitActive (Limiter Active) – Displays the points where the rev limiter is in use

rpm (Engine Speed) – Displays current engine speed (rpm)

TEMPS WORKSHEET

Temperatures Graph

act1 (Air Charge Temperature) – Displays inlet air temperature, used to calculate fuelling (°)

ect1 (Head Temperature) – Displays metal temperature of the cylinder head. (°)

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

eot (Engine Oil Temperature) – Displays engine oil temperature. (°)

fan1 (Front Cooling Fans) – Displays the on/off state of the fan, comes on at a certain temperature depending on the model

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

gear (Current Gear) – Converts the gear voltage provided from the gear position sensor into a gear

DBW WORKSHEET

Reference Graph

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example

limpMode (Limp Mode Active) – Displays when the car is in limp mode, ECT Low for example

rpm (Engine Speed) – Displays current engine speed (rpm)

tps1A (DBW Motor Position) – Shows the amount the DBW Motor is opening (%)

tps1B (Throttle Body Position) – Shows the amount the Throttle Body is opening (%)

PPS Graph

ppsA (Pedal Position) – Displays the throttle pedal position (%)

ppsB (Pedal Position) – Displays the throttle pedal position (%)

ppsFinal (Pedal Position) – Displays the throttle pedal position (%)

GEARS WORKSHEET

General Graph

clutchSwitch (Clutch Switch) – Clutch switch on the pedal, the channel displays the on/off state of the switch

flSpeed (Front Left Wheel Speed) – Shows the speed of the front left wheel (mph)

frSpeed (Front Right Wheel Speed) – Shows the speed of the front right wheel (mph)

gear (Current Gear) – Converts the gear voltage provided front the gear position sensor into a gear

gearV (Gear Position Sensor Voltage) – Displays the position of the selector barrel (V)

gsp (Gear System Pressure) – Shows the air pressure for the paddle shift system. (mBar)

gspControl (Gear System Pressure Control) – Shows the on/off cycle of the compressor for the paddleshift system

PaddleSwitch (Paddle Switch) – Displays the input of the paddles from the ECU

rpm (Engine Speed) – Displays current engine speed (rpm)

Reference Graph

engineEnable (Engine Enable) – Displays what trips have occurred, if the car has been turned off by the ECU this channel will tell you why

gearCutDogKickCount (Incomplete Gearshift's) – Displays how many gear changes have failed (Count)

gearShiftDecision (Gear Shift Decision) – Displays why a gear change has been dis-allowed by the ECU, the ECU will not allow the car to downshift if the 'rpm is too high' for example

lam1 (Lambda) – Displays air/fuel ratio post combustion, Bank 1 (:)

lam2 (Lambda) – Displays air/fuel ratio post combustion, Bank 2 (:)

trqFuelSev (Fuel Cut) – Displays the level of fuel cut (%)

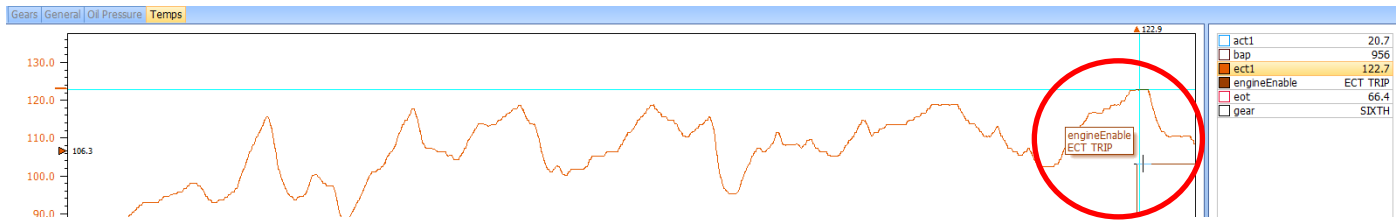
EXPECTED RUNNING PARAMETERS

The below table shows target running parameters as well as hints on what faults to look out for on specific channels.

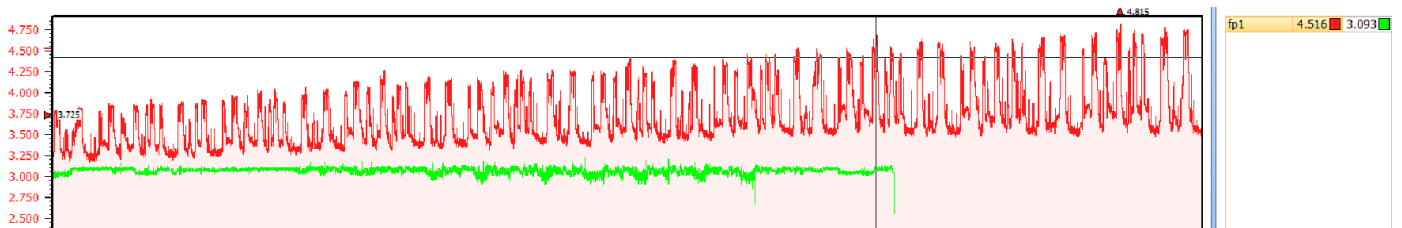
Sensor	Description	Parameters	Default
EOP	Check for surge, low pressure	Busa 65psi+	0
FP1	Check for noise, high return when off throttle (blocked regulator) and fuel surge (low fuel level)	2.8-3.1	0
VBAT	Low voltage (-13v) check for consistent charging sudden drops should only be caused by compressor and Fan1	13v-14.4v	0
engineEnable	Shows reason for engine trips	N/A	OK
ECT	Check for noise, a big variance between high and low may be because of low water level	75-85	150
EOT	Check for noise and low temperature	90-110	150
gearV	Check for straightness of the shifts, should be sharp lines gradual shifts means slow gear change.	N/A	0
TPS	Check for rolling onto full throttle, 4% when off throttle, 25% blips and not noisy when on full throttle	Busa 4-100%	0
SYNCSTATE	Should be 720 all the time if the engine is running, if running in 360 (Cam sensor failure)	720	N/A
revLimitActive	Check for persistent use of the limiter	N/A	0
gearShiftDecision	Shows reason for any disallowed shifts	N/A	OK
RPM	Check for misfire, not dropping out	N/A	0
GSP	Check pressure comes back up, check for leaks when fully charged	6-7bar	0
BAP	Check for noise, value is altitude dependant	950-1050mbar	1013
frSpeed	Check for shorting (erratic trace) check for dropping out or a lower reading than normal	N/A	0
ACT	Check for default reading and unrealistic readings. Ambient +10-20.	10-50	10

EXAMPLES OF PROBLEMS IN THE DATA

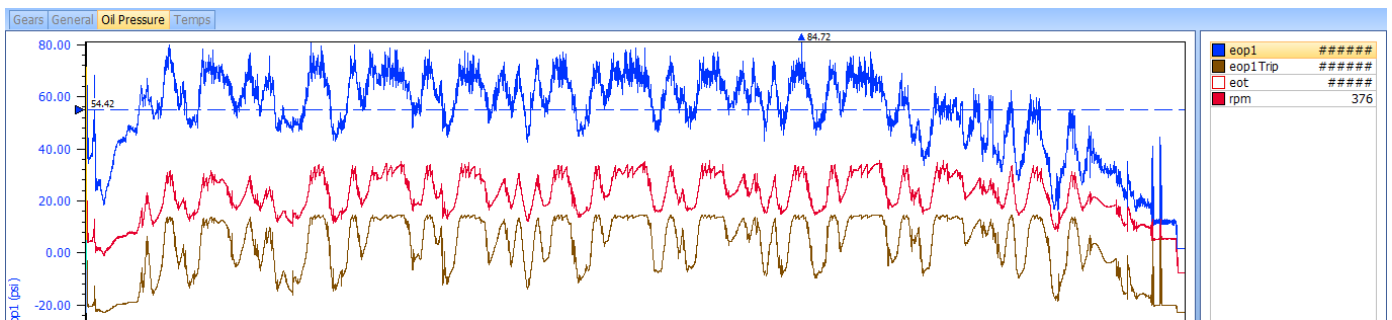
Below is an example of an 'ECT Trip' this is the trip for high coolant temperature. The engine will have switch off and a warning displayed on the dash at this point.



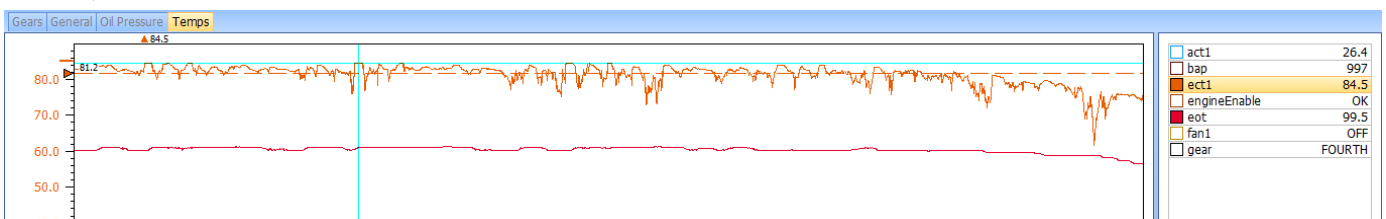
This is an example of high fuel pressure; the fuel pressure exceeds the regulated pressure in this instance, the green trace shows where the fuel pressure should be.



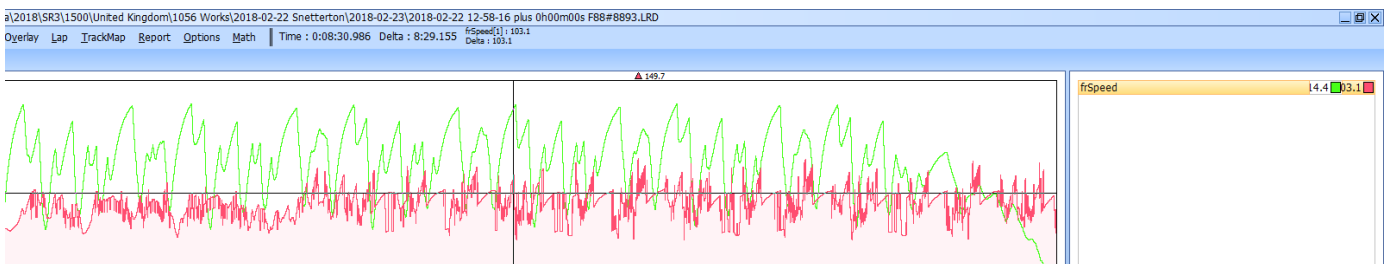
Below is an example of the oil pressure dropping off: The oil pressure should follow the same trend as the RPM. The pressure falls away from the RPM towards the end as shown.



Below is an example of a noisy sensor, the bottom line is what the trace should look like and the top trace contains excessive noise.



Below is an example of a bad wheel speed reading, it is likely that the hall effect sensor is not registering one of the four pickup points, which is the reason it is reading incorrectly.



AIM DATA

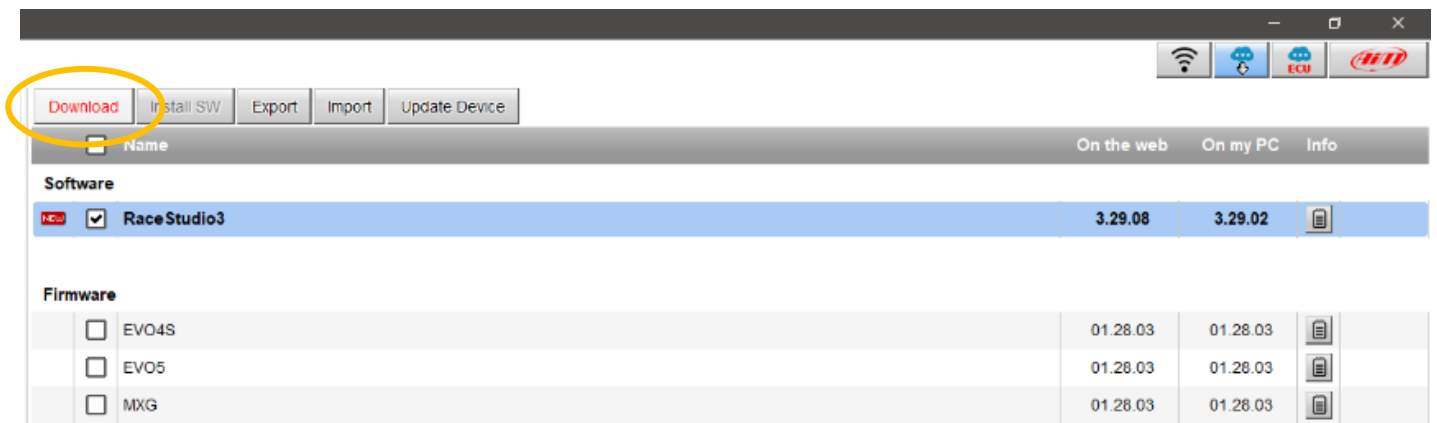
Since 2009 Radical has solely used Aim dash, datalogging and camera products.

GETTING STARTED

1. Check the camera turns on with the master. Ensure there is an SD card fitted the SD card.
2. Connect to the dash and camera using the AIM download lead (AD0109) and mini USB cable for the Smartcam.
3. Check the software is up to date using the guide below, before installing any configurations onto a device.

UPDATING THE SOFTWARE

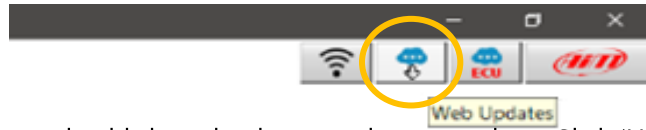
Click the icon of the cloud with the arrow underneath "Web Updates" ensuring you are connected to the internet. It will then show all the devices/software that have updates with the red 'NEW' icon. If there aren't any updates, the arrow underneath the cloud will not be visible. Ensure all the devices that need updating are ticked then click the download icon in the top left, shown below.



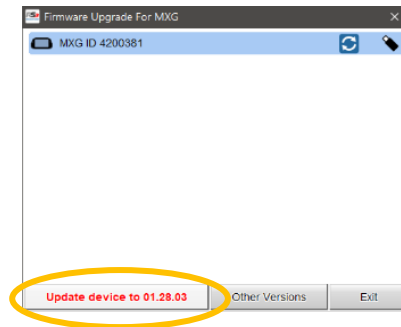
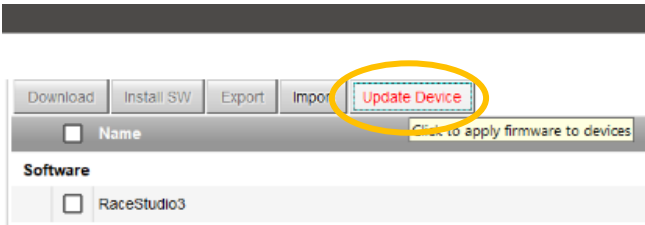
RaceStudio3 will then download all the updates and install them, you may then be asked to install the latest RaceStudio3, if so just follow the instructions on the installer.

UPDATING THE DEVICE FIRMWARE

1. To update the device, click "Web Updates" ensuring your device is connected. Then click update device.

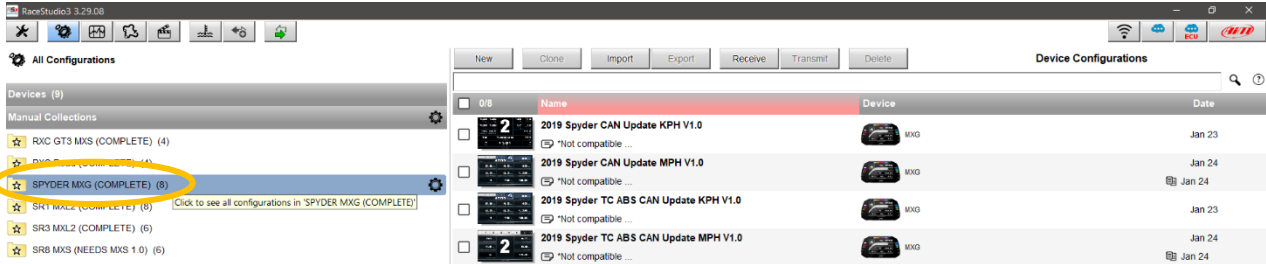


2. Click 'Update Device' then it should show the device in the pop-up box. Click 'Update Device to XX.XX.XX' it will then begin to update the device. The process will then need to be repeated on the Smartycam.

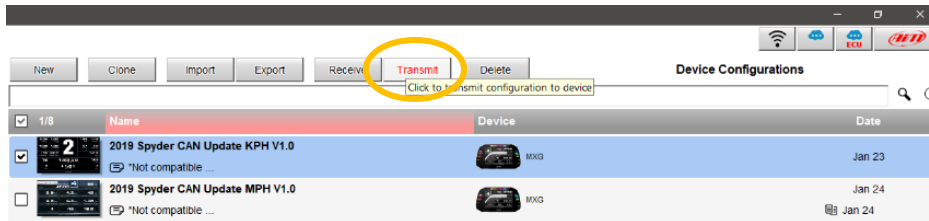


TRANSMITTING A CONFIGURATION TO THE DASH

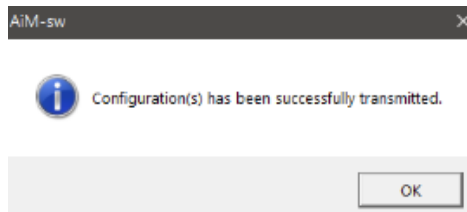
1. Click the configuration's tab, then locate the correct configuration for the car., then press 'Transmit'.



2. Tick the configuration that you want to transmit, then click "Transmit" at the top of the screen.

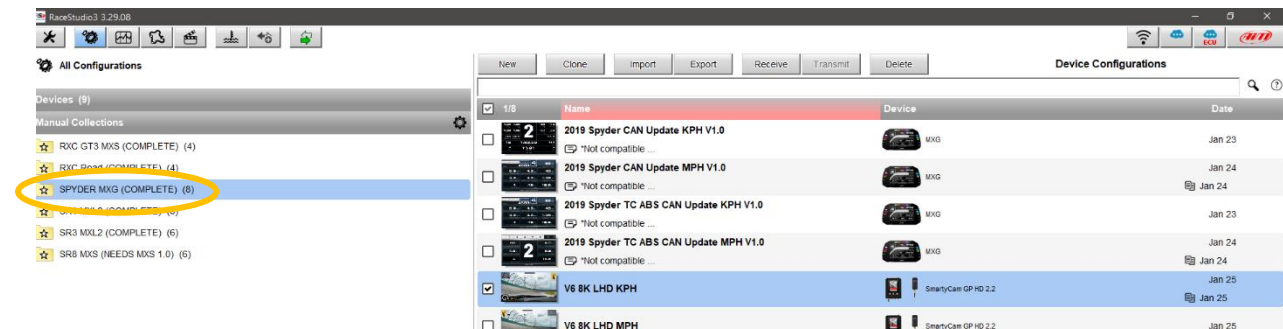
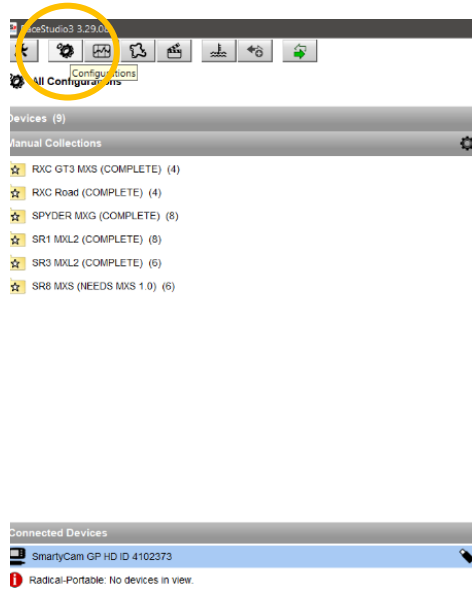


3. This message should then pop up after successfully transmitting the config.

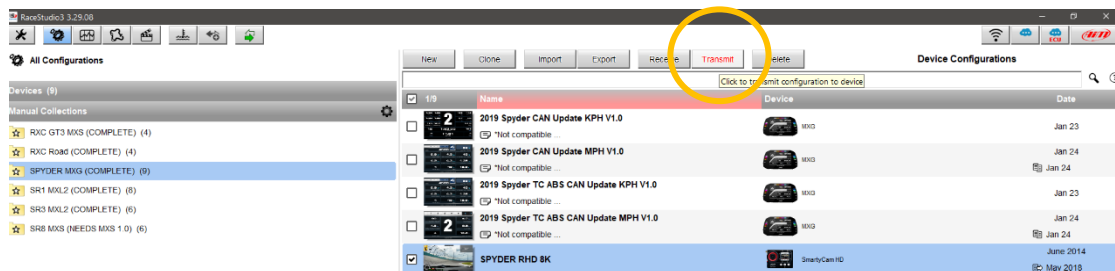


TRANSMITTING A CONFIGURATION TO THE SMARTYCAM

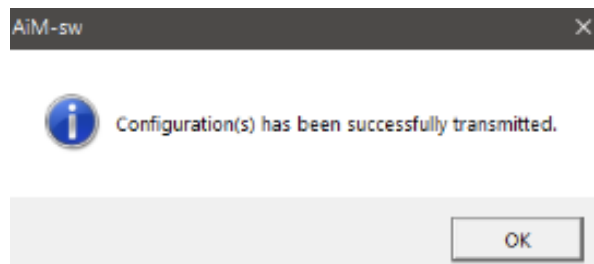
1. Click the configuration's tab, then locate the correct configuration for the car, then press 'Transmit'



2. Tick the configuration that you want to transmit, then click "Transmit" at the top of the screen.



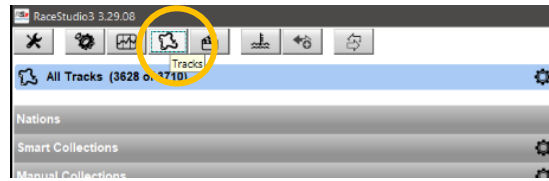
3. This message should then pop up after successfully transmitting the config.



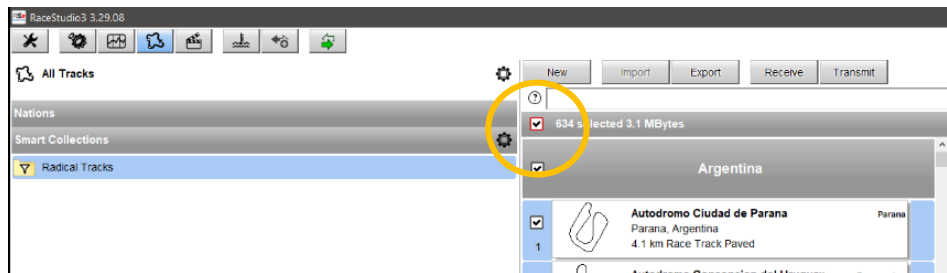
LOADING TRACK MAPS ONTO A DEVICE

It is important to load the trackmaps after transmitting a configuration, this is the most common cause for a car not receiving lap times at an event.

1. Click on the "Tracks" icon in the top left corner.



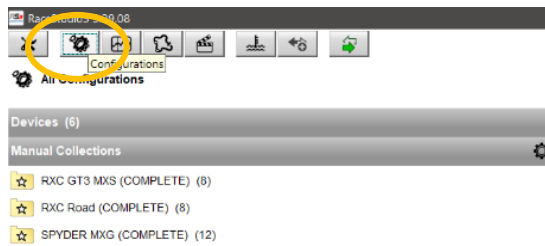
2. Tick all the track maps you wish to load, then click 'Transmit' then select the **Smartycam**. You will then need to press transmit and select the **Dash** after it is finished.



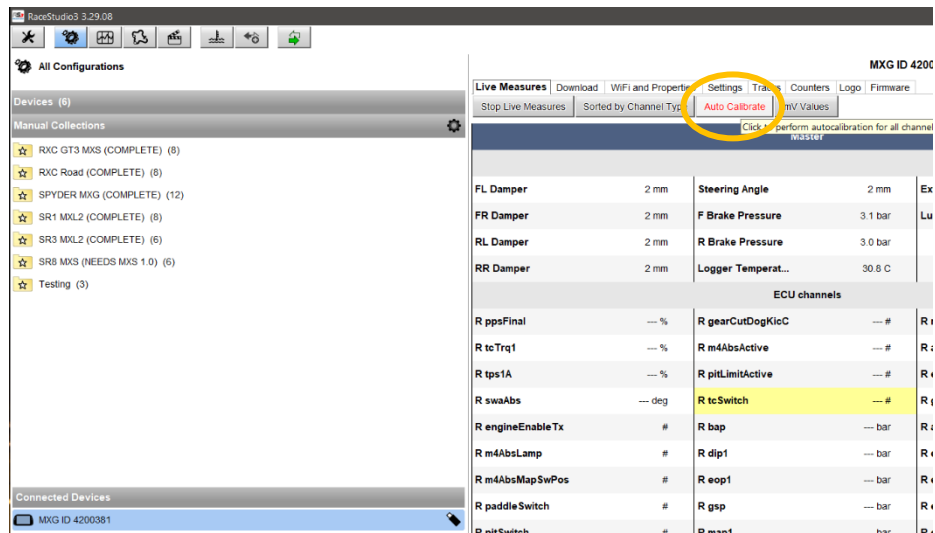
3. Ensure the green bar finishes before continuing. Click on the Smartycam and the dash in the bottom left to confirm the tracks were successfully transmitted.

CALIBRATING THE SENSORS

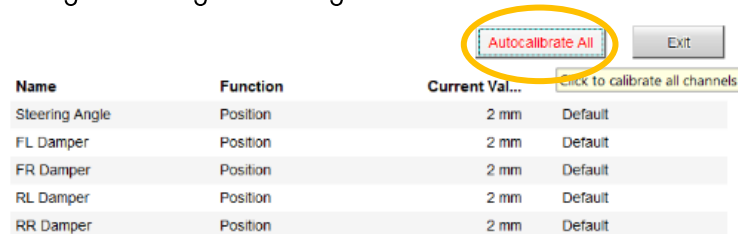
1. Click on the "Configurations" tab



2. Click on the device shown in the bottom left corner, then click "Auto Calibrate"



3. Ensure the steering wheel is straight then click "Autocalibrate All". After this process check that the steering angle is equal to the actual steering wheel angle at 90deg.

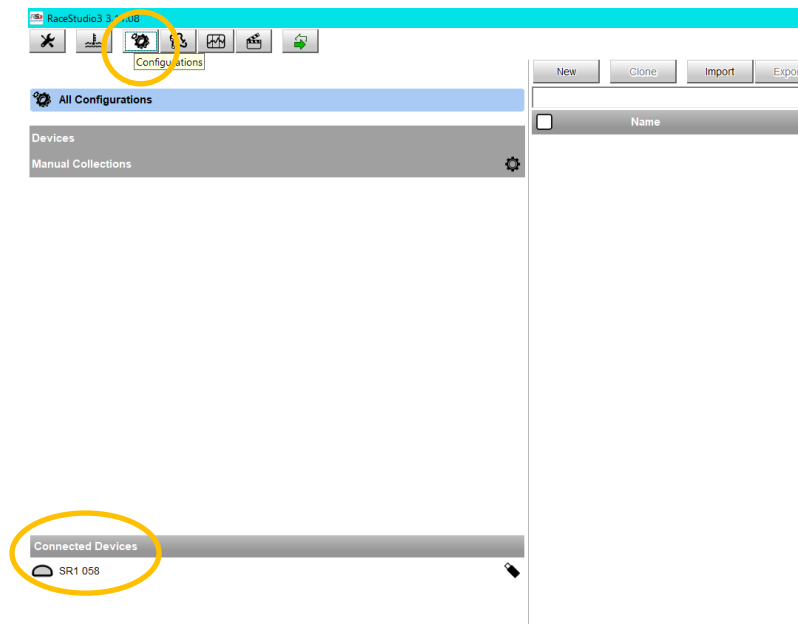


4. Click 'WIFI and Properties' and set the time on both the Smartycam and the Dash.

HOW TO DOWNLOAD AIM DATA

Plug the car in using the AIM download lead (AD0109) and turn on the cars master switch. Then open 'RaceStudio3'.

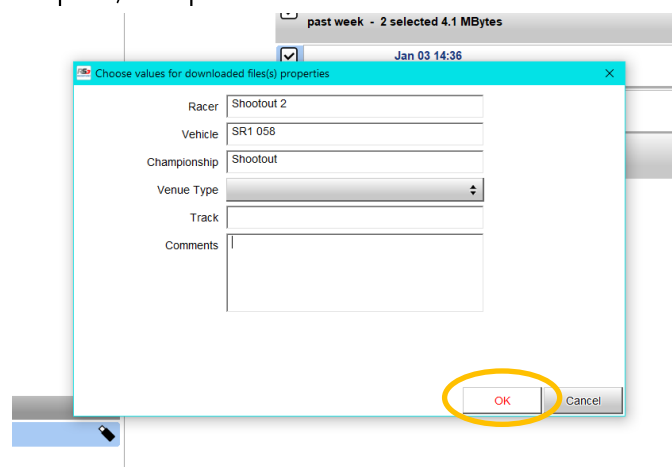
Press the 'Configurations' tab shown by the gears icon. Then the dash name should be shown in the bottom left, select the dash.



Select the 'download' tab to view the data to be downloaded. Once the data you wish to download has been selected, press the download button circled in the picture below.



You will be prompted to provide information about the session, be sure to include the chassis number and driver name. Include any comments in the description, then press ok.



Select the analysis tab in the top left corner, this will open 'RaceStudio2 Analysis' you can then select the sessions you wish to load, open a run file to view the data.



Test name	Test date	N...	B...	R...	Best lap...	Driver	Test type	Vehicle	Cham...	Track	C...	File path
Shootout 2_SR1 058_4302212_a_0835	Wed, Jan 03, 2018 13:50:55	1	1	1	08.32.180	Shootout 2	Generic testing	SR1 058	Shootout	None		C:\AIM_SPORT\RaceStudio3\user\data\2018-01-03\
Shootout 2_SR1 058_4302212_a_0836	Wed, Jan 03, 2018 14:36:15	1	1	1	06.34.186	Shootout 2	Generic testing	SR1 058	Shootout	None		C:\AIM_SPORT\RaceStudio3\user\data\2018-01-03\

HOW TO DOWNLOAD CAMERA VIDEO

To watch back video recorded on the Smartycam camera is it easiest to simply remove the SD card from the camera and play the videos from there.

VERION HISTORY

2018-04-11 v1.0 initial public release

2018-07-17 v1.1 Life Prog Instructions

2018-07-17 v1.2 Updated LifeData procedure

2019-04-16 V1.3



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