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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, the 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

![Image showing options for downloading]

- **Untick this to download run files older than today**
- **Enter download comments if applicable**

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.
INTERPRETING THE DATA

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

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 they 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.
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’ then 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.
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. (°)

**fps1** (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.

*Iam1* (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**

- **Cyl1Knock** (Cylinder 1 Knock) – Displays knock sensor reading for cylinder 1 (%).
- **Cyl2Knock** (Cylinder 2 Knock) – Displays knock sensor reading for cylinder 2 (%).
- **Cyl3Knock** (Cylinder 3 Knock) – Displays knock sensor reading for cylinder 3 (%).
- **Cyl4Knock** (Cylinder 4 Knock) – Displays knock sensor reading for cylinder 4 (%).
- **Cyl5Knock** (Cylinder 5 Knock) – Displays knock sensor reading for cylinder 5 (%).
- **Cyl6Knock** (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*

- **f1Speed** (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
- **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 predefined 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*

- **f1Speed** (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
- **r1Speed** (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
- **trqIgnRtd** (Ignition Retard) – Displays the change in ignition angle to maintain traction (°)
**Oil Pressure Check Graph**

- **eop** (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 disallowed 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 front 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 (%)
The below table shows target running parameters as well as hints on what faults to look out for on specific channels.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Description</th>
<th>Parameters</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOP</td>
<td>Check for surge, low pressure</td>
<td>Busa 65psi+</td>
<td>0</td>
</tr>
<tr>
<td>FP1</td>
<td>Check for noise, high return when off throttle (blocked regulator) and fuel surge (low fuel level)</td>
<td>2.83.1</td>
<td>0</td>
</tr>
<tr>
<td>VBAT</td>
<td>Low voltage (&lt;13v) check for consistent charging sudden drops should only be caused by compressor and Fan1</td>
<td>13v-14.4v</td>
<td>0</td>
</tr>
<tr>
<td>engineEnable</td>
<td>Shows reason for engine trips</td>
<td>N/A</td>
<td>OK</td>
</tr>
<tr>
<td>ECT</td>
<td>Check for noise, a big variance between high and low may be because of low water level</td>
<td>75-85</td>
<td>150</td>
</tr>
<tr>
<td>EOT</td>
<td>Check for noise and low temperature</td>
<td>90-110</td>
<td>150</td>
</tr>
<tr>
<td>gearV</td>
<td>Check for straightness of the shifts, should be sharp lines gradual shifts means slow gear change.</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>TPS</td>
<td>Check for rolling onto full throttle, 4% when off throttle, 25% blips and not noisy when on full throttle</td>
<td>Busa 4-100%</td>
<td>0</td>
</tr>
<tr>
<td>SYNCSTATE</td>
<td>Should be 720 all the time if the engine is running, if running in 360 (Cam sensor failure)</td>
<td>720</td>
<td>N/A</td>
</tr>
<tr>
<td>revLimitActive</td>
<td>Check for persistent use of the limiter</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>gearShiftDecision</td>
<td>Shows reason for any disallowed shifts</td>
<td>N/A</td>
<td>OK</td>
</tr>
<tr>
<td>RPM</td>
<td>Check for misfire, not dropping out</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>GSP</td>
<td>Check pressure comes back up, check for leaks when fully charged</td>
<td>6-7bar</td>
<td>0</td>
</tr>
<tr>
<td>BAP</td>
<td>Check for noise, value is altitude dependant</td>
<td>950-1050mbar</td>
<td>1013</td>
</tr>
<tr>
<td>frSpeed</td>
<td>Check for shorting (erratic trace) check for dropping out or a lower reading than normal</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>ACT</td>
<td>Check for default reading and unrealistic readings. Ambient +10-20.</td>
<td>10.50</td>
<td>10</td>
</tr>
</tbody>
</table>
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.

![ECT Trip Graph]

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.

![Fuel Pressure Graph]

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.

![Oil Pressure Graph]

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.

![Noisy Sensor Graph]

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.

![Wheel Speed Graph]
AIM DATA

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

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.

**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.
VERSION 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