

Ecotec Coil Driver

Hardware Versions 0.4.6 & 0.4.7



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Overview

The Ecotec Coil Driver (ECD) is designed to drive up to six internal igniter/smart coils as a replacement to the factory Holden 3.8 ecotec coils. Ideal for supercharged or turbo applications where the factory ignition system is limiting power. This is intended for race / off-road use only.

The ECD accepts a signal where 0V is used to begin dwell of a coil (most common with inductive coils) and converts this to a logic level signal suitable for smart/internal igniter coils.

An onboard micro controller monitors the rpm. When the rpm exceeds the user set-point the spark is cut according to the current strategy saved to the board.

With the 2step wire grounded this lowers the limit to the user set 2step limit.

It has been designed with LS1 coils in mind. To use other coils ensure the coils accept a 5V signal to begin charging and fall to 0V to fire.

As there is no dwell control on board please avoid the use of coils that self discharge in an over-dwell situation, such as some LS2 types.

Features

3 Coil Inputs

6 Logic Level Coil outputs

1 Relay control output (to switch power to ignition coils,etc)

2 RPM based programmable outputs (V0.4.7 only)

Adjustable RPM and 2Step Limits

Onboard Bluetooth for communication with the [ECD Control app](#) (Android only)

ECD can be used with the app or in a stand alone configuration. The app (ECD Control) allows for extra control over rev-limiting strategies.

In the Box

1 x ECD control unit

1 x 24 pin connector

6 x crimp terminals for positions A1,B1,C1,A8,B8 and C8

18 x crimp terminals for positions A2-A7, B2-B7 and C2-C7. See **Pinouts** for terminal locations.

16 x connector filler plugs.

3 x jumpers shunts for internal positions J4, J5 and J6. Only used for troubleshooting purposes. See **Troubleshooting** for details.

Installation and Wiring

Installation

The ECD should be installed in a position away from moisture and heat, ideally inside the cabin of the vehicle. The enclosure and connector are splash proof but this does not ensure safety from water leakage or submersion.

Wiring

A simplified wiring diagram is available on page 9.

Power

The ECD should be powered from a switched and fused 12V source that remains powered when the key is switched to the start position. Accessory power that switches off during cranking, such as radios, etc, is not suitable.

The suggested 12V source is the DFI module or ECU supply. If the supply is not fused, a 2A fuse should be placed in line with the ECD. (The unit draws far less current than this, though 2A is the smallest easily available automotive blade fuse)

A good clean ground should be used, the recommended points are the DFI or ECU.

Coil primary power should be taken directly from the battery through a relay and fuse or another suitable source.

The coil power ground should go directly to the head.

The coil signal grounds can be spliced together and must go back to the ECD at pin B5.

Inputs

Ignition 1-3: Connect to the DFI module coil (-) wiring. **Figure 1: Commodore DFI Module**

The ECD uses 1 input to drive two outputs. The pairing is the same as the factory DFI module.

Ignition 1 input drives coil 1 & 4 outputs.

Ignition 2 input drives coil 2 & 5 outputs.

Ignition 3 input drives coil 3 & 6 outputs.

RPM In: Connect to a 5V square wave source that provides engine rpm signal. Such as pin E on the DFI module.

RPM Button: Connect to one side of an N/O button of your choice (momentary, toggle, etc), connect the other side of the button to a good ground.

2Step Button: Connect to one side of an N/O button of your choice (momentary, toggle, etc), connect the other side of the button to a good ground.

Outputs

Coils 1-6: Logic level coil outputs 0-5V.

Relay GND: Switches the coil ground of a relay (pin 85 on a standard auto relay). Activates as soon as the ECD is powered.

Outputs continued:

PG1 & PG2: (Only available on hardware version V0.4.7 and above.)

These are programmable ground switched outputs that come on above a selected RPM and switch off below that RPM-250. If your output is set to switch on at 4000 RPM it will switch back OFF at 3750 RPM. These are designed to switch small loads, less than 1A, such as a relay or shift light.

Bluetooth: The Bluetooth outputs can be ignored as there is on board Bluetooth and these are only used in special cases.

DFI Module

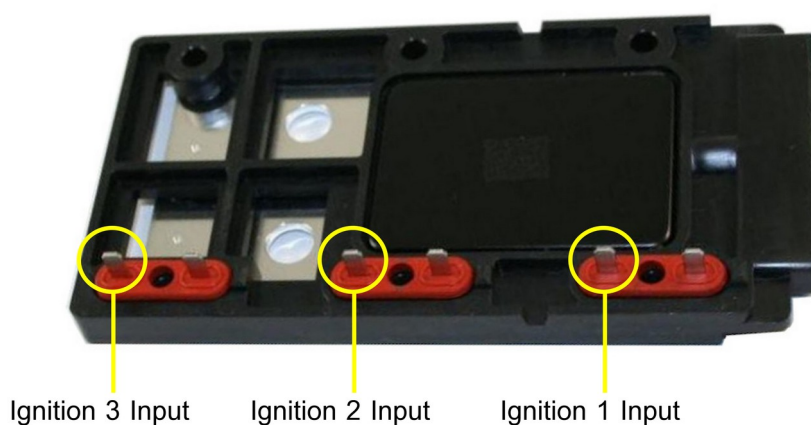


Figure 1: Commodore DFI Module

To connect the DFI module to the ECD:

- Remove the standard coils
- Connect the pictured spade terminals (**Figure 1**) to the appropriate inputs on the ECD, using female spade terminals or similar.
- Connect the RPM input for the ECD to PIN E of the DFI module.
- Power and ground for the ECD can also be taken from the DFI module to simplify wiring.

Coils

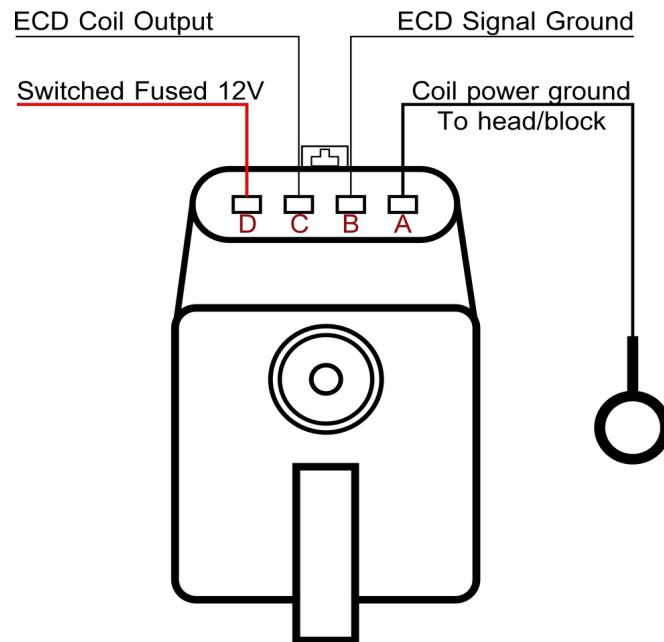
The ECD is compatible with a range of smart coils, the preferred and most tested is the GM LS1.

The coil list will be updated in future revisions of this document.

The connections for LS1 coils are:

- Coil Pin A: Coil power ground, to head or block.
- Coil Pin B: To ECD signal ground
- Coil Pin C: To appropriate ECD coil output pin.
- Coil Pin D: Coil power, to switched and fused 12V supply.

Figure 2: LS1 Coil Pinout



Full list of ECD connection pinouts on the page **below**.

Pinouts

The following pinout is for the connector on the ECD and is referenced **looking into the unit from the front view**.

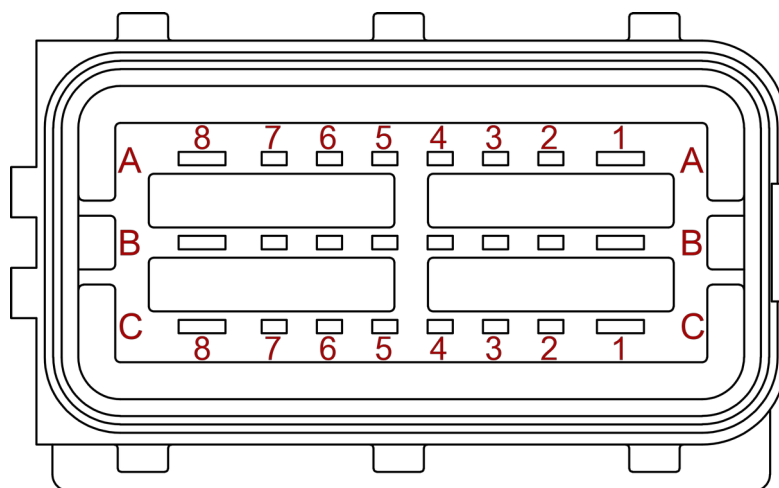


Figure 3: ECD Board Connector

PIN	NAME	TYPE	FUNCTION
A1	12V	INPUT	Switched 12V supply
A2	Coil 1	OUTPUT	Coil 1 drive logic
A3	Coil 4	OUTPUT	Coil 4 drive logic
A4	Coil 2	OUTPUT	Coil 2 drive logic
A5	Coil 5	OUTPUT	Coil 5 drive logic
A6	Coil 3	OUTPUT	Coil 3 drive logic
A7	Coil 6	OUTPUT	Coil 6 drive logic
A8	Programmable Output 1	OUTPUT	RPM based Switch (V0.4.7 & above)
B1	GND	INPUT	ECD Ground
B2	Ignition 1 In	INPUT	From DFI coil (-) for Cyl 1 & 4 ^{Figure 1}
B3	Ignition 2 In	INPUT	From DFI coil (-) for Cyl 2 & 5 ^{Figure 1}
B4	Ignition 3 In	INPUT	From DFI coil (-) for Cyl 3 & 6 ^{Figure 1}
B5	Coil Signal GND	INPUT	Signal ground for ignition coil logic
B6	Bluetooth	OUTPUT	For external Bluetooth module ¹
B7	Bluetooth	OUTPUT	For external Bluetooth module ¹
B8	Programmable Output 2	OUTPUT	RPM based Switch (V0.4.7 & above)
C1	N/A		Not Connected
C2	RPM Sig In	INPUT	RPM signal input 5V square wave
C3	RPM Set Button	INPUT	To RPM Button ²
C4	2Step Button	INPUT	To 2Step Button ²
C5	Relay GND	OUTPUT	To pin 85 on relay
C6	Bluetooth	OUTPUT	For external Bluetooth module ¹
C7	Bluetooth	OUTPUT	For external Bluetooth module ¹
C8	N/A		Not Connected

¹ Only in special use cases if internal Bluetooth unavailable.

² Ground other side of button to activate.

Connector Assembly

To use this connector you must remove the rear wire seal cover and wire seal and release the front terminal lock before inserting terminals.

To remove the rear wire seal cover and wire seal, insert a small flat implement into the slots on the side of the connector.



Figure 4: Rear wire seal cover & wire seal

To release the front terminal lock use a small flat implement to release the latches on the side of the terminal lock.



Figure 5: Terminal lock closed & open positions

Make a note of the positioning of the larger and smaller terminals.

Insert wires through the wire seal cover, then the wire seal and then strip the wire and crimp the terminals before inserting into the connector.

You will hear a small click when the terminal is located.

Once all terminals are in the correct spot press the terminal lock back into position followed by the wire seal and seal cover.

For any unused positions on the connector the filler plugs press in through the wire seal after assembly.

Recommended Wire Sizes

The recommended wire size for terminals A1,B1,C1,A8,B8 and C8 is from 20-16 awg. For all other terminals the recommended size is from 22-18 awg.

Most generic open barrel crimp tools do an acceptable job on these terminals, though it is recommended to test on one of the spare included terminals first.

Simplified Wiring Diagram

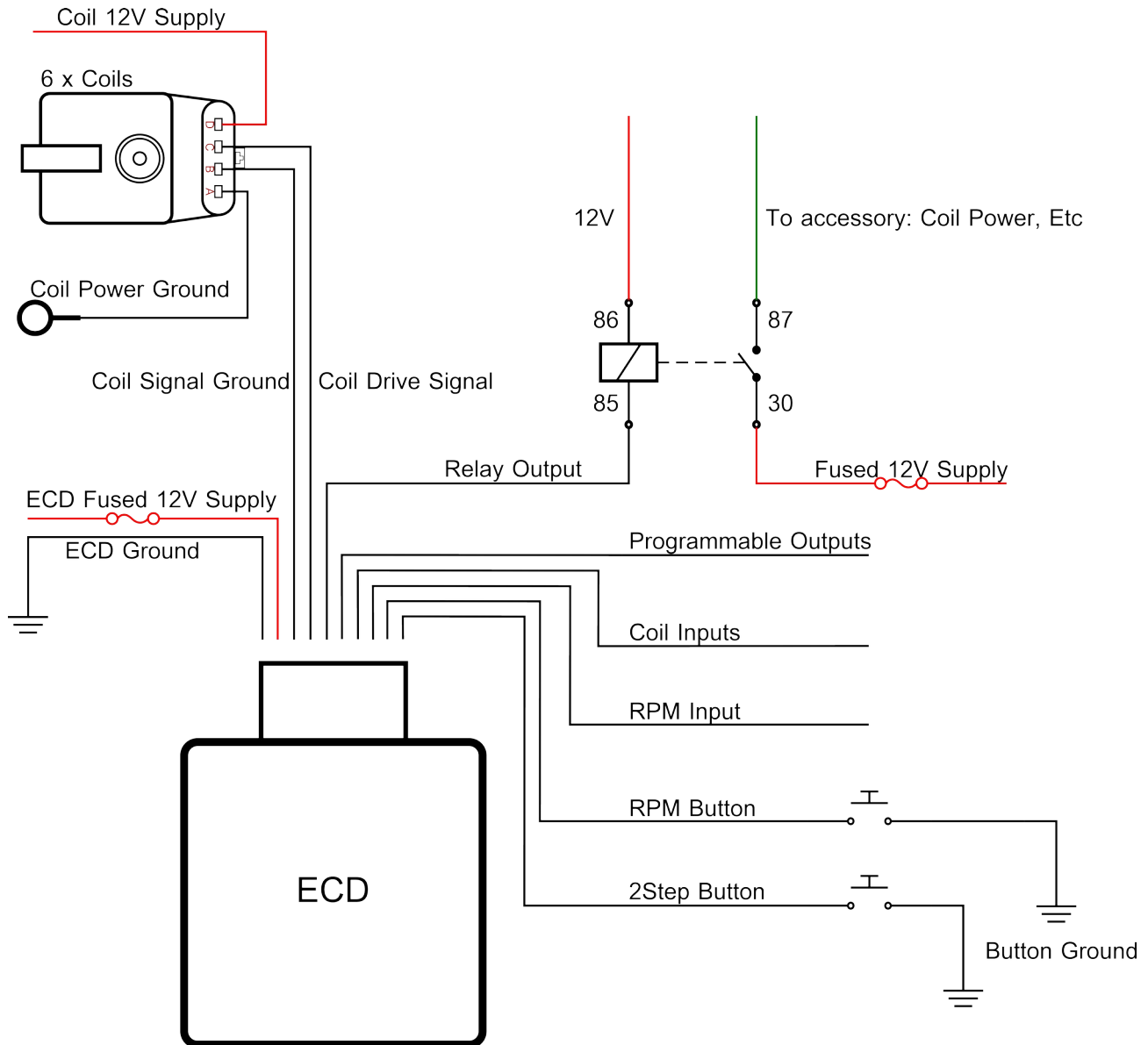


Figure 6: Simplified Wiring Diagram

Manual Operation

The RPM and 2Step limits can be set using buttons attached to the ECD, the rest of the functions can only be used through the app.

Setting RPM Limit

- Start the engine.
- Ensure the 2Step button is open and not grounded.
- Press and hold the RPM button for 2 seconds
- With the RPM button still pressed, bring the engine up to **half** of the desired RPM limit. (The minimum is 1500 for a 3000 RPM limit.)
- Release the RPM button

Setting 2Step Limit

- Start the engine.
- Ensure the 2Step button is pressed/grounded.
- Press and hold the RPM button for 2 seconds
- With the RPM button still pressed, bring the engine up to **half** of the desired 2Step limit. (The minimum is 600 for a 1200 RPM 2Step limit.)
- Release the RPM button

Using the 2Step

The 2Step/secondary RPM limit will be activated at any time the 2Step button is pressed/grounded.

If the current RPM is above the 2Step Limit, the ignition will be cut until the RPM drops below the 2Step limit.

Normal use:

- Press/ground the 2Step button
- Open the throttle to bring the RPM up to the 2Step limit .The ignition will begin cutting as you approach the limit with a full cut as it is exceeded.
- Release the button to leave 2Step mode

App Functions

The app 'ECD Control' can be used to change all of the available parameters on the ECD.

The app is only available for android devices.

To get the app [click here](#):



Connection:

On android versions >12, the 'Nearby Devices' permission is required to use Bluetooth. This is prompted to the user at first start. If denied the ECD will not be able to communicate with the app.

To enable later, this option can be found in the phones 'App Settings' app. Alternatively you can delete and reinstall the app and it will prompt again at first start.

Before use the ECD will first need to be paired with the phone through the phones Bluetooth settings.

Tap the 'Not Connected' button at the top of the screen and choose from the list of paired devices.

Once connected, tapping the green connection symbol will allow you to close the connection manually.

Alternatively the connection will be closed automatically on app exit.

RPM & 2Step Limits:

RPM and 2Step Limits are the value at which the ignition will be **fully** cut. Cutting will begin before these limits and is affected by a combination of the cut mode and gain.

Mode:

Each mode is a different method of cutting the ignition.

Mode 1 is the default option. The user can change these to find the ideal combination for their setup.

How each mode works is also affected by the amount of ignition channels in use and the Gain value.

Gain:

Gain affects the cut style of each mode differently.

What works well for one mode may not be suitable for another.

The RPM will begin being cut at the RPM limit minus the Gain Value. For an RPM limit of 6000 with a Gain value of 150, the cut procedure will begin at 5850 RPM. With total ignition cut at 6000 RPM.

A lower number generally results in a harsher cut.

The default is 150.

Outputs:

Output 1 & Output 2: These are programmable ground switched outputs that come on above a selected RPM and switch off below that RPM-250.

If your output is set to switch on at 4000 RPM it will switch back OFF at 3750 RPM.

The lower limit is 500 RPM, if the output is set to this it will be on anytime the ECD is powered.

These are designed to switch small loads, less than 1A, such as a relay or shift light.

The outputs are only available on hardware **V0.4.7** or later.

Setup:

The setup page should only need to be used when setting up the ECD for the first time in a new vehicle.

PPR is the pulses per engine revolution that the ECD rpm input uses to calculate the rpm.

If the ECD is installed in a commodore with a standard DFI module, the PPR value can be left as is.

The default is 3, as taken from pin E on the commodore DFI module.

Ign Channels are the amount of outputs used by the ECD. Each channel drives two outputs on the module.

On the ECD connector:

Channel 1 is pins A2 & A3

Channel 2 is pins A4 & A5

Channel 3 is pins A6 & A7

This value affects how and which ignition channels are cut at rev limit.

The default for a standard install in a commodore is 3.

For other installs, set this value to the amount of INPUTS used on the ECD.

Filter Level: On newer firmware (above 4.4.4) this is an adjustable threshold that changes how much the incoming rpm signal is filtered. This ranges from 1-4, with 1 being OFF and 4 being the most aggressive filter.

The default is 3.

After this is changed, the ECD needs a power cycle to change to the new filter level.

Bluetooth Pin:

To change the Bluetooth pin, choose a number between 1000 & 9999.

After sending the new pin, the 'Sent Pin' field will show the new pin.

Disconnect from bluetooth and power down the ECD.

Restart the ECD, wait for 5 seconds then shut down and restart the unit once more.

Reconnect to the ECD, the 'Sent Pin' & 'Saved Pin' values should now match. If they do not, repeat the procedure above.

On newer android versions you will need to re-pair your phone with the ECD after changing the pin.

Saved Values:

Saved values are the last received by the app from the ECD.

On first start of the app these will be at the default values.

On subsequent starts these will be at the last received value from the ECD.

These values automatically update when a new one is sent to the ECD.

If the value shown does not match the last value that you sent, ensure bluetooth is connected and re-send value.

Defaults

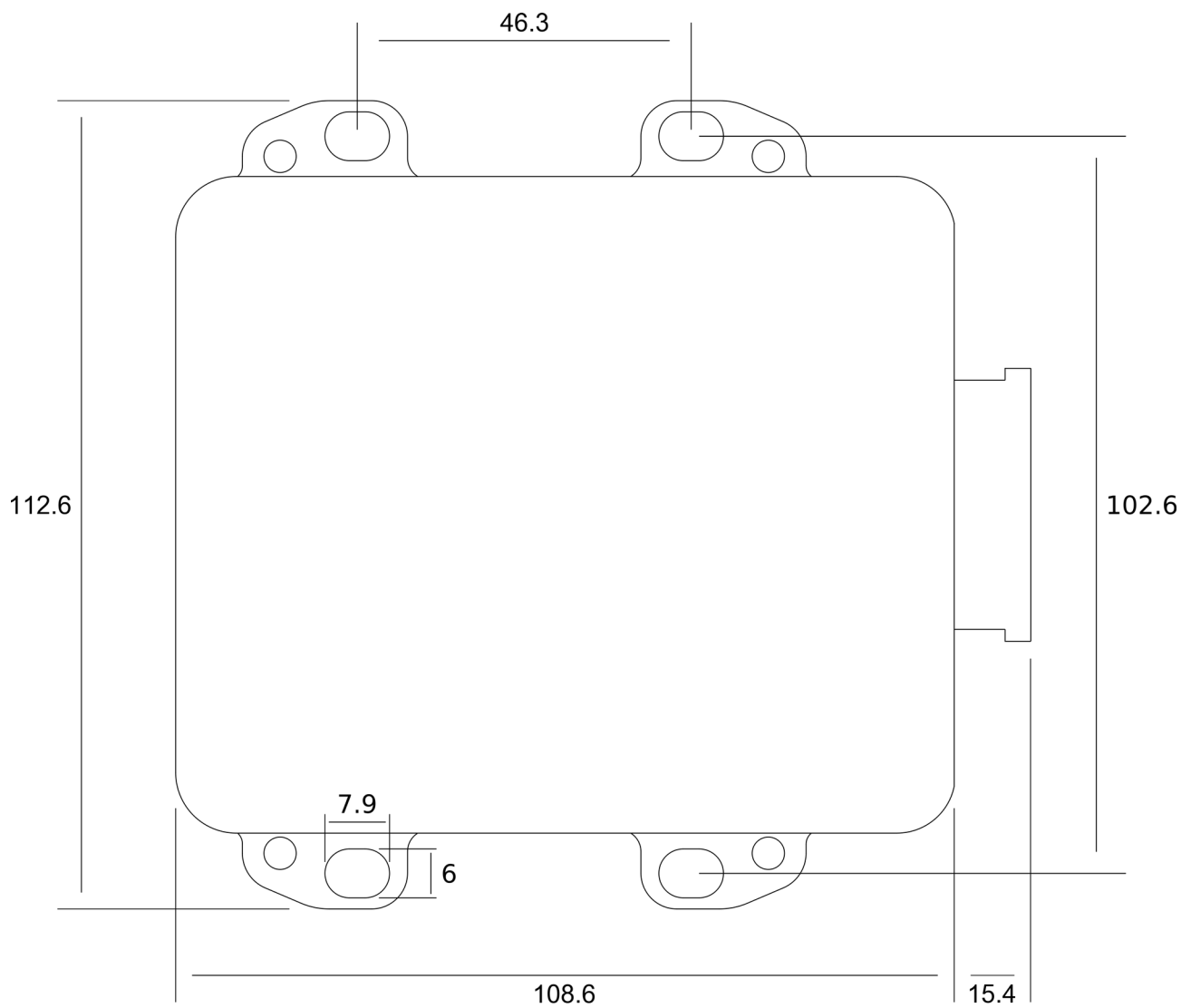
To reset the board to the defaults including the Bluetooth pin:

1. Turn the ignition on (power to the ECD), do not start the engine.
2. Press and hold the RPM button for 3 seconds.
3. Release RPM button.
4. Power down the ECD.
5. Restart the ECD, wait for 5 seconds then shut down and restart the unit once more.

The defaults are:

- RPM Limit: 10000
- 2Step Limit: 5000
- Cut Mode: 1
- Gain: 150
- Outputs 1 & 2: 10000
- Bluetooth pin: 1234
- Filter Level: 3
- PPR: 3
- Ignition Channels: 3

Dimensions



All Dimensions in millimeters

Figure 7: ECD Dimensions

Testing and Troubleshooting

Testing

To ensure the ECD is receiving a valid RPM input and that the 2Step wiring is correct.

Follow the procedure for setting a 2Step limit, set a low limit for testing.

Activate the 2Step and bring the engine up to the limit, ensure that the ignition is cutting as the limit is reached.

Release the 2Step button and lift off the throttle to prevent over revving.

Troubleshooting

To reset the board to the defaults including the Bluetooth pin:

1. Turn the ignition on (power to the ECD), do not start the engine.
2. Press and hold the RPM button for 3 seconds.
3. Release RPM button.
4. Power cycle the ECD twice.

All settings will be returned to their default values, including the Bluetooth pin.

If you wish to entirely disable the ECDs ability to cut ignition but still function as a coil driver:

- Switch the engine off.
- Unplug the ECD 24 pin connector.
- On an anti static surface.
- Remove the 4 bolts from the bottom of the unit.
- Remove bottom casing and seal.
- Holding the connector on the ECD slide the board straight up and out of the case and flip the board over.
- Place the supplied shunts in positions J4, J5 and J6 so that they cover both pins.
- Reassemble the unit in the reverse of disassembly.

This method entirely removes the ability for the ECD to cut the ignition, while still allowing the unit to run the ignition system in an otherwise normal manner. The rev limit will now be what ever is set by your factory ecu.

Safety

For safety reasons it is recommended that settings only be changed when the vehicle is either at idle or with ignition on and the engine stopped.

It is recommended that Bluetooth be disconnected before driving to prevent any accidental changes to settings or how the ECD functions.

The ECD and any other Flatshift products are for offroad/race use only unless otherwise stated.

Due to the nature of these products there is potential to cause damage to yourself, somebody else or your engine/vehicle.

No liability will be accepted for illness, injury, loss of life, any vehicular or other damage.

By using these products, you accept these terms and are aware that it is use at your own risk.