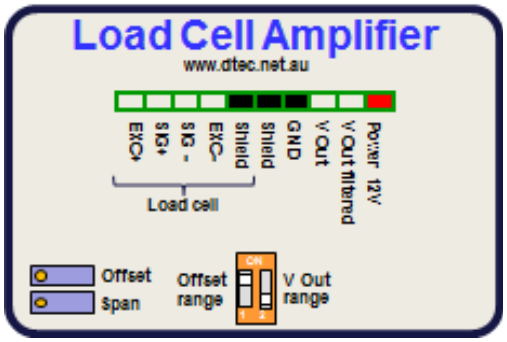
LCAMP- Load Cell Amplifier



Overview-

Brake type dyno's apply a load (e.g. using an Eddy current brake) against the engine and the torque applied is measured on a ‘load cell’.

Load cells require an amplifier (also called 'signal conditioner', 'transmitter' or 'strain gauge' amplifier) to provide them with power and to increase their output voltage to a usable range.

This amplifier is suitable for interfacing to DYNertia3 and other data acquisition systems as it has an output in the 0-5V or 0-10V range.

This is a precision amplifier circuit with low temperature drift and long-term stability.

- Compatible with ‘S” or ‘beam’ type load cells, also many other kinds of strain bridge type sensors.
- Outputs range 0-5V or 0-10V, either direct or low-pass filtered (special noise reduction circuitry added)
- 'Span' and 'Offset' adjustment is provided to maximise the resolution of your load cell.
- Wide power supply range from 12V to 26V
- Input overvoltage, overcurrent and output short circuit protection
- Easy connection via internal screw type terminal block

Technical specifications-

Input type	Full bridge strain gauge/Load cell
Outputs	Voltage 0-5V or 0-10V either direct or low-pass filtered
Bridge load input impedance	<2KΩ
Sensitivity	1.5-2.1mV/V
Load capacity	87 Ω (four 350 ohm sensors parallel possible)
Excitation voltage	5V DC
Excitation current	<100mA@12V supply, <50mA@24V supply
Power supply	12-26V: 12-26V DC vs. 0-5V output, 18-26V DC vs. 0-10V output
Linearity	0.3% FS
Temperature coefficient	50ppm@10-30°C, < 100ppm full work temperature range
Operating temperature	0-50°C
Weight	90g
Dimensions	115mm×80mm×35mm (mounting bolt at 97mm centres)

Connection diagram-

Load cells consist of 4 ‘strain gauge’ resistors arranged in a ‘bridge’ configuration and bonded to a frame so that force applied will flex them (resistance changes). An excitation voltage is applied and the output signal voltage is amplified.

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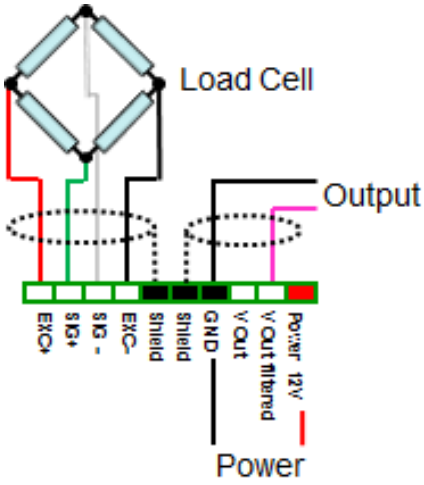


NOTE: Connected correctly the output voltage should rise as you apply force in the appropriate direction to the load cell. If the output decreases then reverse either the excitation wires or the signal wires from the load cell!

The use of shielded wire for the output is optional, it is recommended if the length is long or if it runs past/with any other wires carrying high currents.

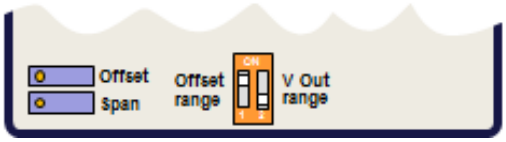
Typical load cell colours- **Red** = excitation +ve, **Black** = excitation –ve
Green = signal +ve, **White** = signal –ve

Check your load cell data sheet for colour of wires as there are variations. If unknown they can usually be determined by measuring the resistances. The provided 200 ohm resistor can be fitted in-line (series) with the load cell EXC+ wire to reduce the cells output if required, see notes below.

General calibration-

NOTE: For calibrating to suit DYNertia3, please use the guided function in the software ('File' / 'Sensor Configuration')

Adjustments screws and range switches are found in the lower Left hand corner of the circuit board. They take about 25 turns from full in to out!



Turn the 'Offset' (Zero) or 'Span' in clockwise to increase voltage output.

Span- Changes the amount of 'gain' (or 'multiplication') that the amplifier has i.e. how much voltage it gives out for a certain input from the load cell.

Offset (Zero)- Is used to compensate for any static error i.e. load cells and tolerances won't be perfect, so there will be a small output voltage even with no force on the load cell. This screw can effectively 'zero' the output.

NOTE: If using the 'V out Filtered' output (as usual on a dyno application)- if the offset screw is turned out too far anti-clockwise (lowering voltage) then the output will suddenly go to a high voltage i.e. this output can't go negative like 'V out' can, lowest voltage is about 6mV and attempting to adjust lower will just force output hi.

Offset range- When in the 'up' default position it gives a larger adjustment range for cancelling out any offset, the trade-off is that it has a courser adjustment.

V Out range- Affects the voltage range of the output, when 'down' the output voltage is halved, when 'up' it is doubled.

1) After mounting the load cell and with no force applied, use the 'Offset' adjustment to set the zero voltage.

2) With a known load on the load cell you can adjust the 'Span' screw to get the desired output voltage. The aim would be to have the maximum desired output voltage occur at the load cells rated capacity i.e. with a 200kg load cell connected the amplifier might be set so at 200kg there is 5V output. The higher the test weights the better, but you are unlikely to apply the full 200kg for calibration, so we could set for say 2V at 80kg (which would therefore give 5V at 200kg).

NOTE: There will be an interaction between switch and screw settings, so recheck offset and then check span again!

Can't get output low enough-? Check relevant switch is 'down', moving 'span' switch down will also lower 'offset' & vice versa and/or fit the provided 200 ohm resistor in-line with the load cell EXC+ wire to reduce the cells output slightly.

Can't get output high enough-? Check relevant switch is 'up', moving 'span' switch up will also raise the offset & vice versa.