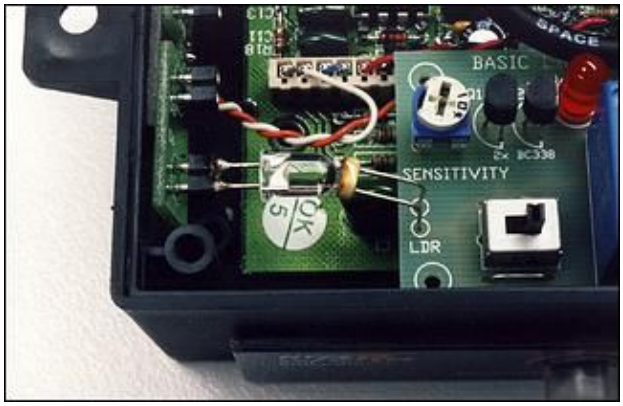
Simple DIY Rev Switch

Switch on or off anything at an adjustable engine rpm!

By Julian Edgar



The Hyper Form Shift Indicator that we reviewed here ("Hyper-Form Plug-in Shift Indicator") is a great bit of gear. Unlike almost every other shiftlight, it doesn't need a tacho or ignition signal - it simply connects straight to power and earth. And that makes it simply a heap easier to fit to any car... So how does it work? It reads the alternator pules coming through the car wiring, that's how! In fact, we thought that the design was so good that limiting it to just operating some LEDs was a bit unimaginative....

So what about making it a general-purpose rev switch, able to switch pretty well any electrical loads? That way you can use the module to control:

- A hi-powered (filament-type) shift light
- Rev limiter eg cut ignition when revs reach a certain level
- Single-step type variable camshaft timing
- A changeover intake manifold
- Boost level change eg run lower boost at lower rpm to control wheelspin

In series with another switch (eg boost pressure) you could also control:

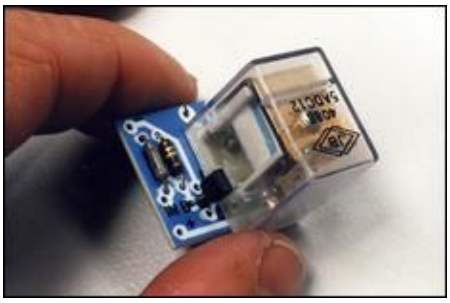
- The activation of extra injectors (still a crude system, but better than a boost switch alone!)
- The activation of water injection (comment as above)

And how hard is it to modify the Hyper Form Shift Indicator to allow some of these options? Not very, as it turns out...

Switching Big Loads

To allow the switching of a variety of electrical loads, you really need a relay output. A relay is a heavy-duty electrical switch that is operated by a small current - but the LED-level current provided by the Hyper Form is too small to directly operate a relay. Sure, you **could** hook a relay up to one of the Hyperform LED outputs, but you'd almost certainly kill the module.

1. Failure



Jaycar sell a tiny kit that's designed to operate a relay with a signal normally meant for just a LED. It takes the small current signal (as little as 5 milliamps) and uses it to switch a supplied relay capable of handling 6 amps. The Jaycar kit is called the '12V Relay Interface' and is cat no KG9142. It costs AUS$7.95.There are only five components - the relay, two resistors and a transistor. If you have a soldering iron and can recognise the components involved, putting the kit together takes about 2 minutes.

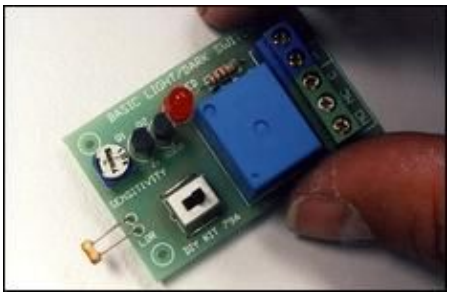
Unfortunately, after building and fitting the kit to the Hyper Form, it didn't work. The reason? The relay board is expecting a LED to be fed a switched positive voltage with the other side of the LED always earthed; but the Hyper Form feeds the LEDs a positive voltage all of the time and then earths each LED to switch it on.

Without changing components on the relay board (and so getting more complicated), it wasn't gonna work.

2. Success

Time for idea #2. Also available - but unfortunately costing a little bit more - is a kit called the Light/Dark Activated Relay. Basically what this does is operate a relay on the basis of how much light a sensor detects. So why not just aim one of the shiftlight LEDs straight at the sensor? Then there's no way that the (relatively) expensive Hyper Form can be damaged, there won't be any problems with earths or anything like that, and it's all pretty simple to set up. And so that's how we did it.

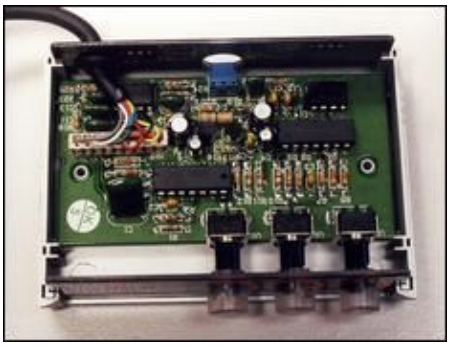
The AUS$16 light operated relay is Jaycar cat no KD6042 and it's also a very simple kit. There is only a handful of components, and the good thing about it is that there's generally only one of each - so you can't get two resistors confused, for example! (There are actually two transistors, but since they're the same, it doesn't matter which one you use in each spot.)



The polarised components are the ones to watch out for - 'cos they only go into the Printed Circuit Board (PCB) the one way around. These are the LED (look for the side that has the flat on it), the diode (it has a band at one end) and the transistors (follow the pattern of holes in the PCB to see which way around they go). With a fine-pointed soldering iron you should be able to build the thing in about 5 minutes - and oh, yes, don't forget the two wire links on the PCB.

So how do you make it work with the Hyper Form? Here's how we did it.

Step 1



Remove the Hyper Form module from its case. The knobs can be gently pulled off and the two halves of the case separated after undoing the two screws.

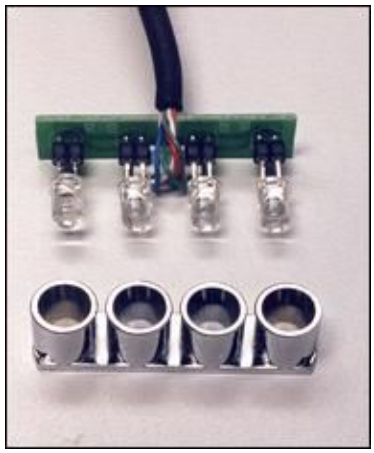
Step 2

Using the Hyper Form faceplate as a template, drill three holes in a plastic electronics ("jiffy") box so that the module can sit inside the box, with its knobs again mounted on the outside. Stick the PCB to the base of the box with double-sided tape.

Step 3

Cut off the multi-core cable coming from the Hyper Form module about 100mm above the board, and then strip off the outer insulation so that the individual wires are revealed. Bare the ends of the red wire (positive 12V), black wire (earth), and the white and orange wires (one end-mounted LED).

Step 4



Disassemble the multi-LED head (undo the two screws and remove the bezel) to reveal a small PCB with the four LEDs on it. The LEDs simply pull out - remove LEDs D1, D2 and D3, leaving D6. (These numbers and letters are marked on the board.) Cut off the cable about 10mm from the small PCB.

Step 5

Using double-sided tape, stick the single LED PCB inside the box at one end. Solder the orange wire from the Hyper Form module to the orange wire at the LED board, and then do the same for the white wire.

Step 6

Using double-sided tape, mount the light/dark relay board on top of the Hyper Form pots, so that the light sensor is located directly in front of the LED. Connect the red wire from the Hyper Form module to the (+) power input of the light/dark module, and the black wire from the Hyper Form to the (-) power input of the light/dark module. Cut off the plug on the end of the cigarette lighter power lead, and connect the red power lead to the (+) power input of the light/dark module, and the black wire to the (-) power input. (So each of these terminals will have two wires going into them - look at the pics.)

Step 7

Plug the cigarette lighter power feed into the car and then rev the engine. Turn the Hyper Form LED brightness right up, and then adjust the 'Right' knob to set the LED's turn-on rpm. On the light/dark board set the switch so that it's closest to the relay and turn the light adjustment pot fully clockwise. Now when you rev the engine past the designated point, the Hyper Form LED will come on, followed immediately by the light/dark module's LED lighting up and the relay clicking. When it's all working properly, cut off the excess wires coming from the Hyper Form and LED PCB.

You can adjust the switch, sensitivity pot and 'Right' pot to give you the exact switch-on combination that you want. Note that you should **not** perform the calibration in a brightly-lit place, otherwise the sensor will be confused. Alternatively (and probably better), slip a piece of heatshrink over the LED and sensor, so that they're always dark - even with the lid of the box off. Talking about the lid, on the example here, the lid helped hold the light-/dark relay board in place.

Switching Things

The relay has three contacts - common, normally open, and normally closed. The 'normally open' contact will be connected to the 'common' contact when the rpm is exceeded and the relay is turned on.

So if you want operate a hi-powered shiftlight, for example, connect one side of the shiftlight to earth, and the other side to the 'normally open' relay contact. The 'common' relay contact then goes to an ignition-switched 12V supply. When you reach the right revs, the hi-intensity Hyper Form LED will switch on inside the box, which in turn will trigger the light/dark relay. This will connect the normally open and common contacts together, allowing electricity to flow through the shift light, making it shine.

The relay is rated at 15 amps (at 24 volts), so it can switch pretty well any loads in a car except something like a big amp or headlights (dunno why you'd want to do either of those with revs anyway!)

You could use the normally closed contact to open-circuit an ignition feed, acting as a rev cut (but only in older carby and points cars). Other uses for the module are limited only by your imagination. Note that there is some 'chatter' at the switch-on/off point, so if you have it set to switch-on at revs at which you're just gonna be cruising through (eg 2000 rpm) the switch may turn on/off/on/off before settling. At a high revs that doesn't matter much - you're likely to be going past the switch-on and switch-off points pretty quickly!

Contact:

The Hyper Shift is available from:
BGT Performance Centre
+61 3 9874 8866

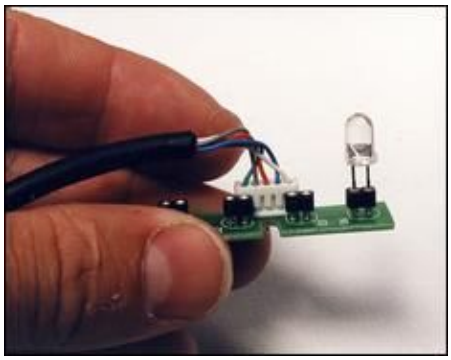
Now available at the AutoSpeed Shop!

Simple Hyper Form Mods

There are also a couple of changes that can be made while still keeping the Hyper Form in near-standard form. These are more to suit personal preferences than anything else.

First up, maybe you don't like the lighting of four high-intensity LEDs one after the other. Why? One reason could be cos if you're only seeing the LEDs from the corner of your eye, deciding how many are actually lit up is really difficult. And another problem? The time taken to go from the first LED being on to the last LED being lit varies from gear to gear. That is, in first gear you might only have a window of one-fifth of a second during which all the LEDs light up, whereas in third gear, the time from first-to-last might be a several seconds. So (unless a system can change in its shiftlight behaviour depending on which gear you're in - as can some high level programmable management systems), we reckon that a shiftlight works better with just a single LED. When it lights up, you change gear! Simple.

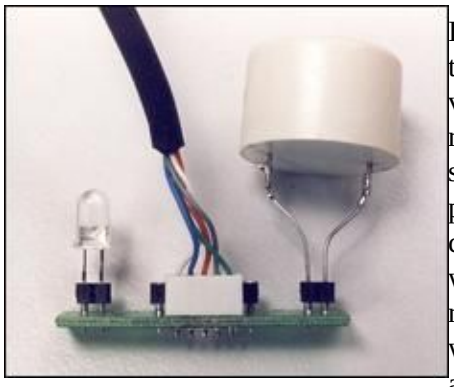
1. Single LED Only



This is the easy one. Simply grab the LED package (it contains four LEDs) and undo the two small screws that hold it together, Inside you'll find a shiny silver bezel and the four LEDs mounted on a small printed circuit board (PCB). Each LED pushes into its own holder, so removing any of the LEDs is as easy as pulling 'em out. Note that all of the LEDs don't mount with the same orientation, so it might be a good idea to make a little drawing showing which way around they go, **before you remove any!** (Look at the insides of the LEDs to see their orientations.) If you want only a single LED to light, pull out three, leaving just one at the end - it doesn't matter at which end.

Check that the single LED lights at the right rpm - adjust the 'left' or 'right' knob (depending on which LED you've left in place) until it does so. If you want to mount the LED on the end of its own piece of thin cable, just pull that final LED out and solder the wires from one end of the cable to it, and then the wires at the other end of the cable to the socket the LED came from. (Again, don't forget to maintain the right polarity.) The min-PCB where the LEDs once were is easily wrapped in some tape or heatshrink and then tucked out of sight.

Single LED with Early Alert Buzzer



If you'd like to have at least some warning that the shiftlight is about to come on, you can replace the missing far-end LED with a low voltage piezo buzzer. Get one that doesn't draw much current and remember that the buzzer is polarity conscious as well. The positive side of the buzzer should go to the wire that once went to the thick part inside the LED. The buzzer that we used cost AUS$3.95 so the cost of this improvement is pretty well stuff-all. You can adjust when the buzzer sounds as well as when the LED lights by using the right/left adjustment knobs on the Hyper Form. Of course, if you want just an audible shift-change warning, remove all of the LEDs and use only the piezo buzzer. But for a high-powered buzzer, carry out the light/dark relay board mods listed in the main body of the article - otherwise, you could blow up the Hyper Form.