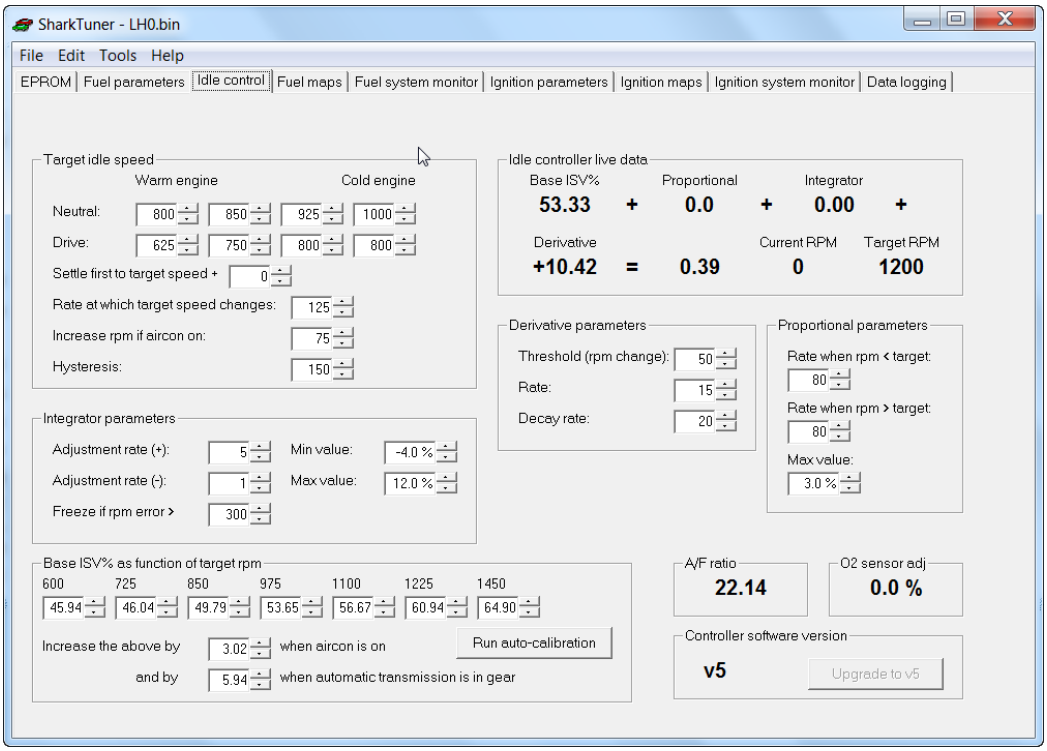
# Sharktuner Custom Idle Controller

Sharktuner now includes an alternative idle controller for the LH2.3. This is available beginning with Sharktuner software release 6.3 and provides additional flexibility for modified cars which do not idle gracefully with the default idle control.

To enable the new idle controller, it must be installed from the “Fuel Monitor” tab. Click the button “Switch to New JDS Idle Controller” and follow the instructions.

Once installed, the new idle controller will have its own “Idle control” tab, between “Fuel parameters” and “Fuel maps”.




Before setting up the new idle controller, two things are important:

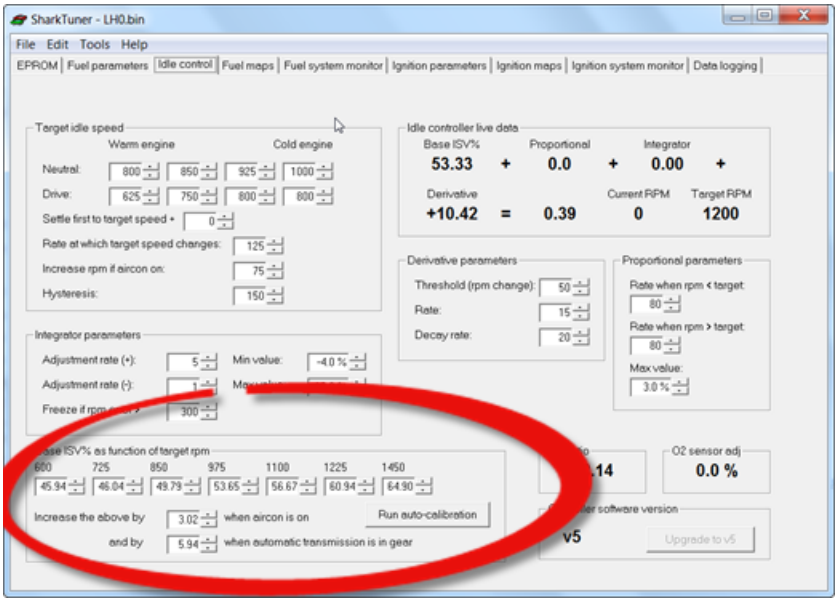
1. The fuel map must be smooth over the entire idle area—not just the few cells where the engine normally operates while idling, but the much larger area where it *could* operate particularly if unstable. “Smoothness” here means no rapid changes in fueling as the operating point (cursor) moves from cell to cell. The cell values may vary but in a smooth fashion (i.e. if viewed as “altitudes” then they should represent rolling hills rather than craggy peaks and valleys). But most important, as the operating point moves around, the AFR should remain relatively constant. (This is true for the stock idle controller also, and one of the biggest sources of idle instability is errors in the fueling map, causing AFR changes as the RPM and load vary a small amount). This cannot be overemphasized.
2. The engine must be in proper operating condition, with no air leaks, no fuel leaks through a damper or regulator, properly operating ISV, etc. The new idle controller will not fix an idle problem on a relatively stock engine that is not operating properly. The purpose of the new idle controller is to help with modified engines (big cams, larger displacement, or lighter rotating mass) and not to compensate for “deferred maintenance”.

The operation of the idle controller is a simple “PID” controller: Proportional / Integrator / Derivative control. The “Proportional” correction simply says when the idle speed is low, open the ISV to increase it. The limitation here is that there is only a narrow band between normal idle and stalling, particularly for modified engines. (Rae engines often idle around 2000 rpm to overcome this).

The “Integrator” accumulates a correction of the average idle-speed error over time, to correct for temperature effects, etc.

And the “Derivative” correction responds to rate-of-change, a “pull-up” warning when rpms are dropping rapidly (i.e. clutch-in and lift throttle). Each of these is individually adjustable.

## Base ISV% table

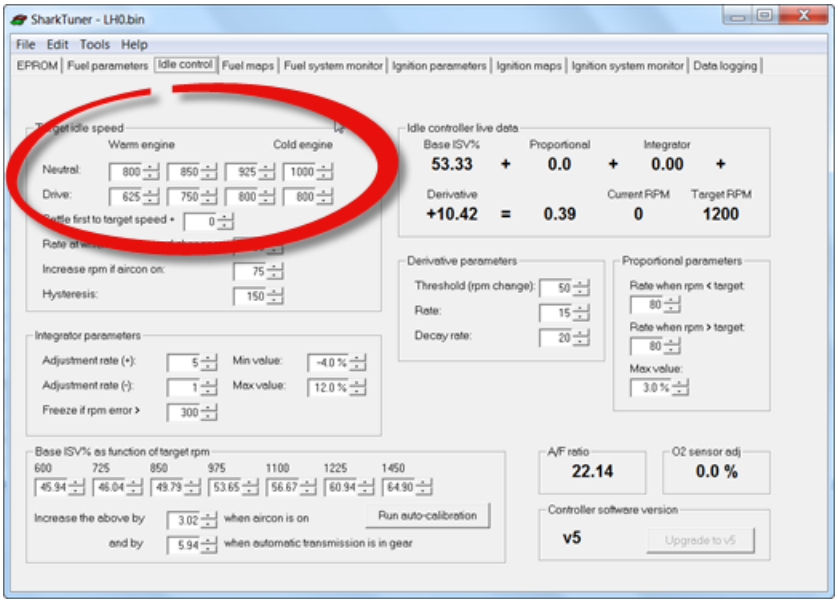



The first step is to establish a “Base ISV table”. This needs to be calibrated once, to establish the basic relationship between ISV opening and engine RPM. This will vary for each engine and is a necessary first step. Go for a drive and warm up the engine, stop and let it idle and click “Run Auto-calibration”. It will take a few minutes to slowly step through the ISV range and measure resulting rpm, then return to normal idle.

There are two other settings: An ISV increase when the air conditioning compressor is running, and an increase when the automatic transmission is in gear. (See also target-rpm adjustments below).

The parameters shown in the screen-shot above are for a GT with larger cams and headers, and represent only a general starting point. The next few paragraphs will describe the basic adjustments.

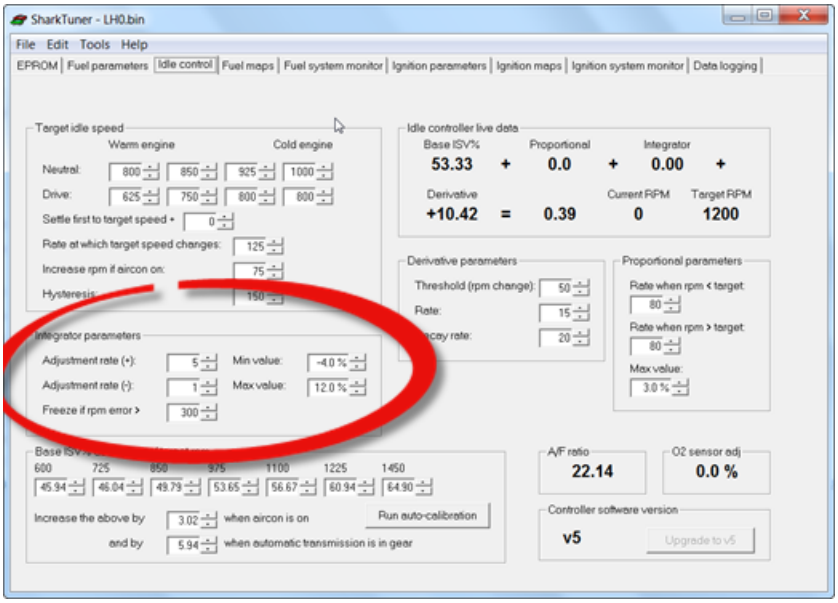
## Target idle speed:




The target idle speed is simply a table of desired idle speed versus temperature, from warm to cold. The second row is for automatic transmissions only, and reduces the idle speed in gear (D/2/3) to reduce “pulling”. This is typically 50 rpm lower than the “neutral” value.

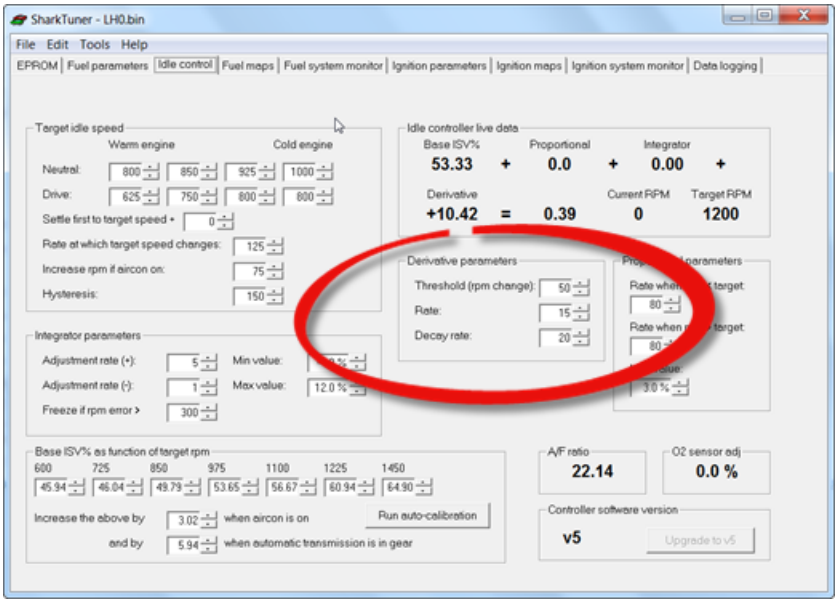
The remaining parameters in the “Target idle speed” are to first settle to an increased idle speed (plus 100-200 rpm) to avoid stalling; rate that the target speed can change; rpm increase with aircon on; and “hysteresis” which limits small changes to the target rpm.

## Integrator settings:



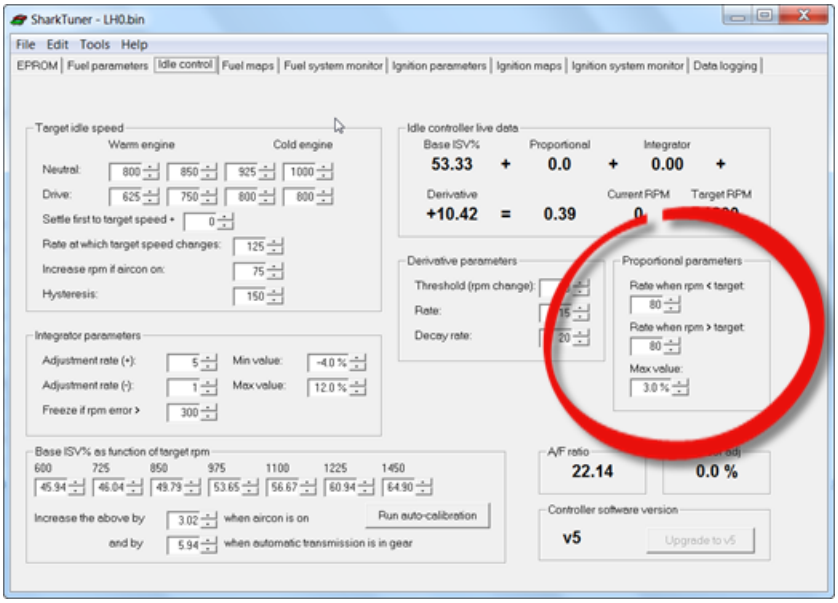

The Integrator is a long-term correction to the ISV, to compensate for high temperatures etc. The range is limited (-4% to +12% here, as an example) and the adjustment rate is slow, +5 if the idle speed is below the target, and -1 if the idle speed is above the target.

## Derivative:



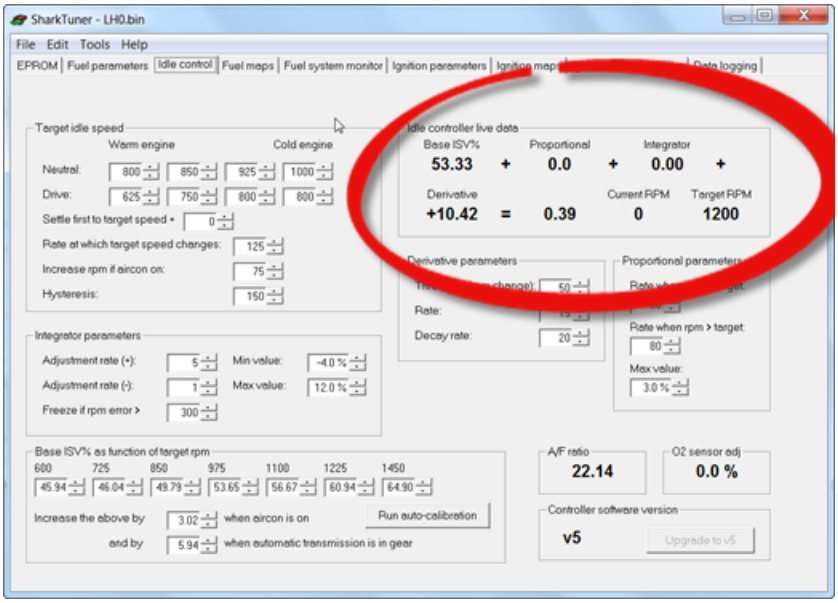

The derivative control responds to rage-of-change of rpm, to increase ISV when the rpms are dropping rapidly. There are three settings: A “threshold”, below which no adjustment is made;  a “Rate” which determines how much correction to apply, and a “decay rate” which determines how quickly the derivative correction is removed. The derivative is only active for negative derivatives, i.e. dropping rpm.

## Proportional:




The proportional control increases the ISV quickly when rpms are below target, and reduces it when above. Two different rate parameters are provided, generally these are set for a higher rate when the rpms are below target and a lower rate when above.

## Live data:




The results of the idle adjustments are shown in the “Live data” panel. Starting with the “Base IV” (from the table plus aircon and in-gear adjustments), corrections are then added for the Proportional, Integrator and Derivative terms with a resulting ISV%. (Note in this example the engine is stopped, the math is shut off). The current rpm is displayed, and also the current target speed (from the target-idle-speed table plus increases for aircon and in-gear).

Each engine will be different, but some general rules apply. If the engine is sluggish returning to idle then reduce the derivative settings (decay rate especially). If it stalls, then increase the first (<target) proportional setting, and/or increase the derivative settings (rate). Setting the derivative threshold below 50 will make it “twitchy”, setting the derivative decay rate too high will cause it to “bounce” and stall on returning to idle.

After basic tuning, if you consistently see Integrator values a few percent positive or negative, then Base ISV% table is off: Re-run the “Auto-calibration”.