

BAC Valve Idle Control

Brief Description

BAC valve idle control is used to hold steady the RPM when off the throttle. This method of controlling RPM at idle is done by looking at the difference between the target idle RPM and the current RPM and adjusting the BAC valve's output duty cycle until the difference is zero.

Settings

- **BAC Frequency** Frequency that the BAC will run at.
- **Temp Threshold** Below this value the engine is considered cold, above this value the engine is considered warm. (E.g. 65 - 70°C).
- **Cold Target RPM** The target RPM at which the Engine will idle when below the '**Temp Threshold**'.
- **Cold Start Duty** This is the duty cycle that the BAC valve will default to when the engine RPM is falling towards the '**Cold Target RPM**', before it begins its idle control and when coolant temp is below the '**Temp Threshold**'. This value should cause the engine to idle at a speed just above the '**Cold Target RPM**'. If this value is too low then the RPM will fall below the '**Cold Target RPM**'.
- **Cold Min Duty** The minimum duty cycle the BAC valve will reach when controlling the idle and when the engine is considered cold. Set so that the engine won't stall. This acts like a throttle stop.
- **Warm Target RPM** The target RPM at which the Engine will idle when above the '**Temp Threshold**'.
- **Warm Start Duty** This is the duty cycle that the BAC valve will default to when the engine RPM is falling towards the '**Warm Target RPM**', before it begins its idle control and when coolant temp is above the '**Temp Threshold**'. This value should cause the engine to idle at a speed just above the '**Warm Target RPM**'. If this value is too low then the RPM will fall below the '**Warm Target RPM**'.

- **Warm Min Duty**

The minimum duty cycle the BAC valve will reach when controlling the idle and when the engine is considered warm. Set so that the engine won't stall. This acts like a throttle stop.
- **Post Start Offset Duty**

On start up, this opens up the BAC valve to help start the engine by allowing more air. This value is added on to the '**Cold Start Duty**' when the engine is cold or to the '**Warm Start Duty**' when the engine is warm. This new calculated value is used when the ECU is initialized and the engine is not running and also for the first three seconds of the engine running.
- **RPM Dead Band**

Used to stop the idle controller from 'over controlling' the idle due to the small fluctuations in RPM when idling. E.g. target RPM = 1000RPM, dead band = 50RPM, therefore if the engine RPM fall between 950RPM and 1050RPM then the idle controller will ignore any changes in RPM and considered it to be controlled. (E.g. 15 – 50 RPM).
- **Decel RPM Rate**

This value helps determine if the RPM is falling or steady when off the throttle. When the RPM is steady then it is ready to be controlled. If this value is set too low then the fluctuations of an RPM which is hovering consistently around one point will make the controller think that the RPM is never steady. If this is set too high then the RPM could be considered steady when it is still falling. (E.g. 25 – 50 RPM).
- **Decel to Idle Control Wait**

When the RPM has finished falling and has become steady, idle control will happen after this period of time.
- **A/C Duty Increase**

This value is added to the '**Cold Start Duty**' when the engine is cold or to the '**Warm Start Duty**' when the engine is warm. It is done to handle the extra load when the air con is turned on. It is taken away again when the air con is turned off.

- **A/C RPM Increase** This value is added to the ‘**Cold Target RPM**’ when the engine is cold or to the ‘**Warm Target RPM**’ the engine is warm. It is done to handle the extra load when the air con is turned on. It is taken away again when the air con is turned off.

Typical Values

- BAC Frequency 500
- Temp Threshold 70°C
- Cold Target RPM 1200 RPM
- Cold Start Duty 70
- Cold Min Duty 1
- Warm Target RPM 800 RPM
- Warm Start Duty 50
- Warm Min Duty 1
- Post Start Duty Offset 25
- RPM Dead Band 25
- Decel RPM Rate 25
- Decel to Idle Control Wait 2
- Air Con RPM Increment 100
- Air Con Steps Increment 10

Setup of BAC Valve Idle Control

The following steps will guide you through a method to setup and tune your idle control.

1. Ensure that your Fuel and Ignition maps are well tuned and warm your engine up to operating temperature.
2. Make sure that your throttle is properly calibrated so that throttle position in the engine data reads zero percent when you are completely off throttle.
3. Check all the settings of the idle controller, the above values are a good place to start.
4. The engine should idle around the ‘**Warm Target RPM**’, adjust this value to change at what RPM the engine will idle when warm
5. Adjust the ‘**Warm Start Duty**’ so it is about 5 – 10% above where the BAC valve is sitting when the idle is controlled.
6. Adjust the ‘**Warm Min Duty**’ so it is about 5% below where the BAC valve is sitting when the idle is controlled.
7. Steps 4 – 6 will need to be repeated for when the engine is cold.

Tuning Advance Sensitivity

Starting Point for PID values

- Proportional Co-efficient 50%
- Integral Co-efficient 50%
- Derivative Co-efficient 0%

Tuning the PID Values

1. Set all Proportional, Integral and Derivative to zero
2. Bring up the Proportional in increments of 5% until you see a small oscillation in the RPM. Note: the RPM will not reach the target RPM with only the Proportional part of the controller being used.
3. Bring up the Integral in increments of 5% until you cancel out the oscillation in the RPM. When the Integral part is introduced the RPM will go to the target.
4. The Derivative term should remain at zero.

Notes

- If the idle speed fluctuates or oscillates, reduce the idle sensitivity parameters slowly until the oscillation stops. If the idle speed is slow to reach the target, increase the idle sensitivity parameters slowly until it begins to oscillate and then reduce the values slightly.

Idle Troubleshooting

- When the engine is started check that the idle speed begins high and falls back to a stable idle speed around the target. Increase the **'Post Start Duty Offset'** if required to aid in starting.