Microsquirt stepper adapter
for 4/6 wire stepper idle valves

This version of the documentation applies to:
- Microsquirt Stepper adapter from EFI Source
- Microsquirt ECU running MS2/Extra firmware 3.3.x or later

1: Pre-requisites
Microsquirt ECU
4 or 6 wire stepper idle valve
MS2/Extra 3.3.x or later firmware
Tuning laptop computer
TunerStudio installed on computer and communicating with Microsquirt
Wiring tools
Ability to use a computer and install wiring.
2: Wiring

The stepper idle adapter add-on has 12V and 5V power supply wires and ground; three signal inputs and four control outputs.

<table>
<thead>
<tr>
<th>Function</th>
<th>Wire Color</th>
<th>Stripe</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V</td>
<td>Red</td>
<td></td>
<td>power</td>
</tr>
<tr>
<td>5V Vref</td>
<td>Gray</td>
<td></td>
<td>power</td>
</tr>
<tr>
<td>Ground</td>
<td>Black</td>
<td></td>
<td>power</td>
</tr>
<tr>
<td>Fidle</td>
<td>Green</td>
<td></td>
<td>signal in</td>
</tr>
<tr>
<td>SpareADC</td>
<td>Orange</td>
<td>Green</td>
<td>signal in</td>
</tr>
<tr>
<td>SpareADC2</td>
<td>Pink</td>
<td>Black</td>
<td>signal in</td>
</tr>
<tr>
<td>IAC1A</td>
<td>Blue</td>
<td></td>
<td>output</td>
</tr>
<tr>
<td>IAC 1B</td>
<td>White</td>
<td>Blue</td>
<td>output</td>
</tr>
<tr>
<td>IAC 2A</td>
<td>White</td>
<td>Green</td>
<td>output</td>
</tr>
<tr>
<td>IAC 2B</td>
<td>Green</td>
<td></td>
<td>output</td>
</tr>
</tbody>
</table>

The wiring between the stepper idle adapter add-on and the Microsquirt uses the three signal wires.

Typically these are FIDLE, SPAREADC, SPAREADC2. When these are used, the colors on the wire in the Microsquirt loom will match up with the colors on the adapter wiring. Crimp or solder and heat-shrink.

There are other options available - see section 2.2

When wiring up the adapter, ensure that TPSVREF (5V) is never connected to 12V. This will likely cause permanent damage to the Microsquirt, the adapter or both.
There are three known variations of wiring of the stepper motor valve itself. The output wires from the adapter are labelled IAC1A, IAC1B, IAC2A, IAC2B. Connect as shown.

**IAC Wiring Diagrams**

*Note: In-line (O-ring) stepper can have two possible wiring arrangements. Use an ohmmeter between the two center pins - if you get ~50 Ohms, use the first diagram. If you get an ‘infinite’ reading, use the second diagram.*

6 wire steppers are also supported. The exact wiring varies per vehicle. The middle pins on the connector (centre tap) are usually either left floating or connected to 12V. Try both.
3: Software configuration

As per the pre-requisites in section 1.3, MS2/Extra 3.3.x and TunerStudio need to be installed and working before you can begin.

Also refer to the MS2 TunerStudio reference guide which is available from www.msextra.com/downloads

Within TunerStudio, open the Startup/Idle -> Idle Control page.

Idle valve type must be set to "Stepper valve (4 or 6 wire)"

Algorithm should be set to "Open-loop (warmup)" to start with. Once this is correctly functioning, you can optionally enable the closed-loop idle control.

Connection offers three options.

<table>
<thead>
<tr>
<th>Option#</th>
<th>Wire 1 (Enable)</th>
<th>Wire 2 (IAC1)</th>
<th>Wire 3 (IAC2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SPAREADC2 (MAF)</td>
<td>FIDLE</td>
<td>SPAREADC</td>
</tr>
<tr>
<td>2</td>
<td>WLED</td>
<td>FIDLE</td>
<td>SPAREADC</td>
</tr>
<tr>
<td>3</td>
<td>none</td>
<td>FIDLE</td>
<td>SPAREADC</td>
</tr>
</tbody>
</table>

Option#1 is recommended.

Option#2 uses WLED instead of SPAREADC2. This allows SPAREADC2 to be used as an analogue or switch input instead.

Option#3 only requires two signals from the Microsquirt. In this case the "SPAREADC2/MAF" wire

Microsquirt stepper idle valve adapter instructions. (c) James Murray 2014-05-02
on the adapter must be connected to ground. The stepper motor will receive constant power in this case. Some motors are fine with constant power, others may get too hot - check!

The remaining options on the screen are documented in the TunerStudio reference manual and are not specific to this adapter.

4: Web links

Main Microsquirt and Megasquirt sales and support website - [www.msextra.com](http://www.msextra.com)
EFISource - [www.efisource.com](http://www.efisource.com)