Vehicle Installations

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Title	Toyota Corolla VVTi 4ZZ FE	
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Introduction

This document contains some details on VVTi control for the 4ZZ FE engine fitted to the 2002 Toyota Corolla. This information was collected with the assistance of Kempower www.kempower.be.

REF/SYNC

M800 REF/SYNC Mode 28 (Toyota)
Suits: 4ZZ FE, 3ZZ FE and other VVTi engines, ie. VVTi Yaris (Echo), Corolla, etc.
Ref : 36-2, MAG, RISE : 36 evenly spaced teeth with two missing (per rev)
Sync: 4-1, HALL, RISE : four evenly spaced teeth with one missing (per cycle)
CRIP: typically 469 (needs verification)

VVTi Control

Introduction

The VVTi system allows the timing of the intake camshaft to be adjusted. This has benefits in both reducing engine emissions and while also generating a broader spread of torque. At idle the intake cam is fully retarded, and can be advanced up to 42 degrees (crank).

Camshaft Position Measurement

The SYNC sensor moves relative to REF for measurement of the intake CAM position. Therefore the sync signal must be connected to both the M800 SYNC input and a digital input. Digital inputs 1-4 are suitable. The digital input is used to measure the camshaft position, and must be setup is as follows:

Function	19
Edge	0
Offset	22.0
Channel	1
Teeth	4
Filter	1

Camshaft Position Control

The position of the camshaft is adjusted by changing the duty cycle applied to the solenoid.

Function	117
Source Channel	1
Proportional Gain	3.00
Integral Gain	1.0
Derivative Gain	0.050
Dead Band	1.0
Y Axis	1
Frequency	300
Polarity	0
Lo Limit	35. 0

Hi Limit	55.0

Below is a table of a starting point for the CAM position table. Points marked '*' were logged with an M800 monitoring the factory ECU - other points were interpolated.

	RPM														
TPS	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
100	5	8	12	*15	*19	*20	*17	*19	*21	*20	*12	*3	*3	*12	*12
90	5	5	12	15	20	21	*16	*18	*21	*20	13	3	3	11	11
80	5	5	12	15	20	22	*16	*17	*21	*20	*15	3	3	10	10
70	5	5	11	15	21	23	18	*17	*21	*20	14	3	3	9	9
60	5	5	11	15	22	23	20	20	*21	*20	*12	3	3	8	8
50	5	5	11	15	23	24	21	23	26	27	22	3	3	8	8
40	5	5	11	15	23	25	23	27	30	33	32	3	3	7	7
30	5	5	10	15	24	26	*25	*30	*35	40	*42	3	3	6	6
20	5	5	10	15	*25	27	*30	21	24	28	29	3	3	5	5
10	*0	5	*10	15	*20	19	17	12	14	15	16	3	3	4	4
0	*0	1	1	2	2	3	*3	3	3	3	3	3	*3	3	3

CAM Control solenoid has a resistance of around 11ohms. The factory ECU drives the solenoid at 300Hz, thus AUX1-4 should be used to replicate the factory settings (AUX3/4 would need a flyback diode). However the valve should still work quite well when driven at 200Hz, so AUX5-8 should also work ok (untested). Pinout is as follows:

Pin	Description
1	connect to ECU 12V
2	Drive with AUX output (300Hz)

Idle Control

Idle speed control is implemented with a duty cycle controlled motor:

Pin	Description
1	Drive with AUX output (200Hz)
2	Connect to ECU 12V
3	GND