Essential Tuning Adjustments

It is assumed that at this stage all set-up procedures described in previous sections have been completed and the engine is running. The following steps detail correct set-up procedures for some of the more critical ECU parameters (note that MAP Sensor Calibration should have already been completed by now):

Injector Voltage (Dead-time) Correction

There is always a delay between the injector being energised and the injector actually opening. Likewise, there is a small delay between the injector being de-energised and the injector closing. The opening time is considerably longer than the closing time, however the overall result is that less fuel will flow for a given pulse width than would be expected with an 'ideal injector'. To compensate for this the injector pulse widths are increased to compensate for this 'dead-time'. The dead-time for a given injector is a function of the battery voltage, differential fuel pressure and the type of injector driver (saturated or peak and hold). A typical dead-time at 3 Bar differential fuel pressure and 14 volts is just under 1ms (ms = millisecond = 1 thousandth of a second).

In applications with a linear 1:1 fuel pressure regulator (i.e. not a rising rate regulator), the differential fuel pressure (difference between manifold pressure and fuel pressure) will be constant. Therefore the only variable that is changing will be the battery voltage (this changes with electrical load and sometimes engine speed). Without correction, the changes in dead-time will cause the engine to run lean when the voltage drops. If the Injector Voltage Correction is properly set-up then changes in the battery voltage will not affect the air/fuel ratio.

The injector dead-time table allows the dead-time for different battery voltages to be entered. The values represent the dead-time in milliseconds. These should increase with falling system voltage.

Injector dead-time for a particular set of injectors can be determined using a flow bench or on a running engine.

To determine the injector dead-time using a flow bench, the injectors need to be operated at the intended operating pressure (normally three bar) and at a constant duty cycle as well as a set voltage. Vary the supply voltage to the injector and measure minimum pulse width at which the injectors will flow for a particular voltage. This is the required dead-time for that injector at that tested voltage.

To determine injector dead-time on a running engine, with the engine fully warmed and operating at stable air/fuel ratios (a very precise AFR meter is required – a narrow band O2 sensor will not suffice), electrical drain needs to be applied to the system; the preferred method is disconnecting the alternator main fuse. Battery load testers are also useful here too.

Watching the air fuel ratios change while the battery voltage drops, the dead-time table can be trimmed to maintain the same stable air/fuel ratio. Injector dead-time can be viewed as a row graph. A smooth curve needs to be maintained at all times.

NOTE: any change to the fuel pressure or injectors will require a recalibration of the injector dead-times.

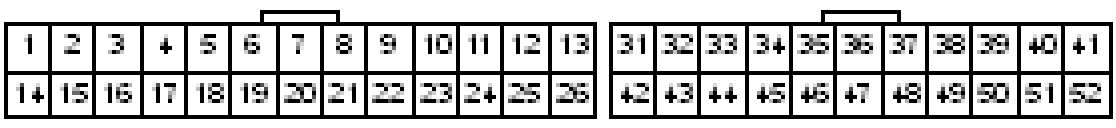
Traditional Fuel Equation Mode Master Fuel Setting

If using Traditional Fuel Equattion mode the Master Fuel setting should be set so that the numbers in the middle of the fuel table end up around a value of 50. This is to allow sufficient span of the numbers in the main fuel table.

1.8 Pinouts

Pin information is provided to assist when troubleshooting. All pinouts are looking into the ECU (wire side).

1.8.1 MX5Link



Pin	ECU Pin	MX5 1600	MX5 1800	GTX/GTR	Pin	ECU Pin
1 (2Y)	Injector 3	nc	Injection	Circuit Opening Relay	Expansion 1	Ground (Signal)

2 (2W)	Aux 1	ISC			Expansion 2	+5V Out
3 (2U)	Injector 1	Injection			Expansion 3	DI 7
4 (2S)	Aux 2	nc	Condenser Fan Relay	Over Boost Buzzer	Expansion 4	DI 6
5 (2Q)	An Temp 1	ECT			Expansion 5	An Volt 5
6 (2O)	An Volt 4	MAF			Expansion 6	An Volt 6
7 (2M)	An Volt 1	nc	TPS Signal		Expansion 7	An Temp 4
8 (2K)	+5V Out				Expansion 8	An Temp 3
9 (2I)	Tacho Pullup	Igniter F/B	Tacho in	nc	Expansion 9	Ground (Signal)
10 (2G)	Trig 2	Trig 2			Expansion 10	+5V Out
11 (2E)	Trig 1	Trig 1			Expansion 11	Ignition 7 (Aux)
12 (2C)	Ground (Signal)				Expansion 12	Ignition 8 (Aux)
13 (2A)	Ground				Expansion 13	DI 8
14 (2Z)	Injector 4	nc	Injection	nc	Expansion 14	DI 9
15 (2X)	Aux 7	Purge			Expansion 15	An Volt 10
16 (2V)	Injector 2	Injection			Expansion 16	An Volt 11
17 (2T)	Aux 5	nc	Fuel Pump Relay	Fuel Pres Reg Solenoid		
18 (2R)	Aux 6	nc	Fuel Pres Reg Solenoid	Turbo Light	Built in MAP	An Volt 3
19 (2P)	An Temp 2	IAT (MAF)				
20 (2N)	An Volt 2	NB O2 Sensor				
21 (2L)	nc					
22 (2J)	nc					
23 (2H)	nc					
24 (2F)	Ground	nc	Ground (MAF)	nc		
25 (2D)	Ground (Signal)					
26 (2B)	Ground					

31 (1U)	nc			
32 (1S)	nc			
33 (1Q)	DI 1	A/C Request		
34 (1O)	nc			
35 (1M)	DI 3	nc	Vehicle Speed	Ground
36 (1K)	nc			
37 (1I)	Aux 3	nc		FP Speed Relay
38 (1G)	Ignition 1	Ignition1/4		Ignition
39 (1E)	Aux 4	CE Light		nc
40 (1C)	DI 4	Start Signal		
41 (1A)	nc (Constant +12V)			
42 (1V)	DI 5	Neutral/Clutch Switch		
43 (1T)	nc			
44 (1R)	Aux 8	nc		Engine Fan Relay
45 (1P)	DI 2	PS Switch		
46 (1N)	nc			
47 (1L)	Ignition 4 (Aux)	nc	Engine Fan Relay	nc
48 (1J)	Ignition 3 (Aux)	A/C Relay		
49 (1H)	Ignition 2	Ignition 2/3		Boost Solenoid
50 (1F)	nc			
51 (1D)	nc			
52 (1B)	+14V Main Relay	ECU Power		

Note: Injector Drives 7 and 8 aren't exposed and don't have the hardware required to drive Injectors.
Note: Manual 1.6 NA chassis MX5s do not have a TPS sensor from factory, they only have idle and full throttle switches.
Note: The 1.6 NA chassis MX5s Fuel pump is turned on by a switch in the MAF and the starter signal, the factory wiring requires modification if you want to control the fuel pump from the ECU.

1.9 CAN Information

The following CAN (Controller Area Network) information is provided:

1.9.1 MX5Link

The G4X MX5Link Plug-in ECU has two CAN buses. These CAN buses exist to support aftermarket CAN devices.

CAN bus 1 uses a 5 pin connector and is labeled on the ECU as 'CAN 1/RS232'.
If using this connector for CAN ensure the cable being used doesn't have Serial wires connected as this can act as an aerial and prevent USB communications from working.

CAN 1/RS232 Connector		
Pin	**Function**	**Colour**
1	Comms GND	Brown
2	CAN1 L	Green
3	CAN1 H	White
4	RS232-RX	Grey
5	RS232-TX	Yellow

CAN bus 2 uses a 5 pin connector and is labeled on the ECU as 'CAN 2/OBD'.

CAN 2/OBD Connector		
Pin	**Function**	**Colour**
1	GND	Brown
2	CAN2 L	Green
3	CAN2 H	White
4	NC	Grey
5	+14V	Yellow

To learn more about CAN see PCLink help.

1.10 Known Issues

All plug-in ECUs are fully tested on a range of relevant vehicles, although there are often variations that have not been tested. For this reason issues can arise.

WARNING: Always download the latest Installation Manual from linkecu.com and check the latest status of known issues before installing the ECU.

Please contact your nearest Link dealer when suspecting a compatibility issue.

1.10.1 MX5Link

An Volt 10 & 11 are incorrectly labeled as An Volt 9 & 10 on the expansion plugs on bottom boards V1.4 and earlier.