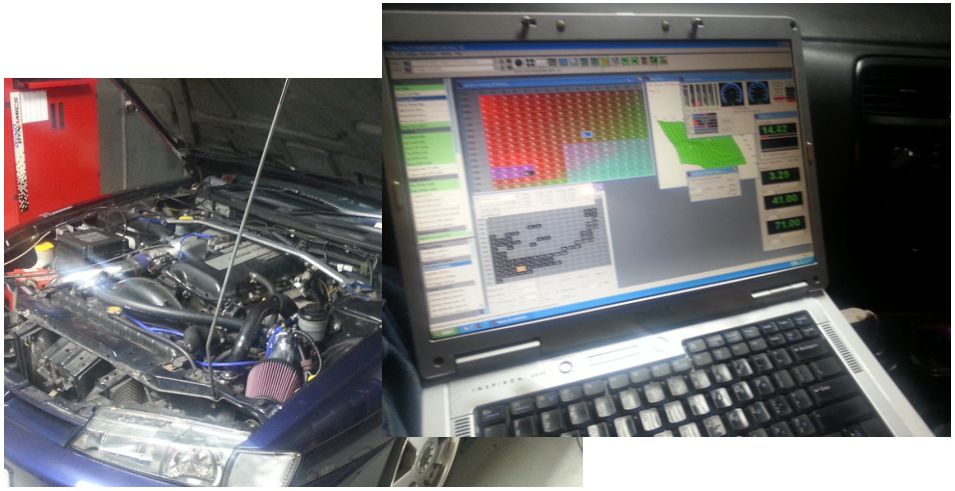
NISTUNE

REALTIME ECU TUNING

Workshop Training Notes
- Tuning by Example



Reference Documentation

www.nistune.com

> Support > Documentation

Essential Reading

Nistune Software Installation and Users Manual

Nissan ECU Tuning Basics

Nissan Workshop Training Notes

Nistune Mapping Guide

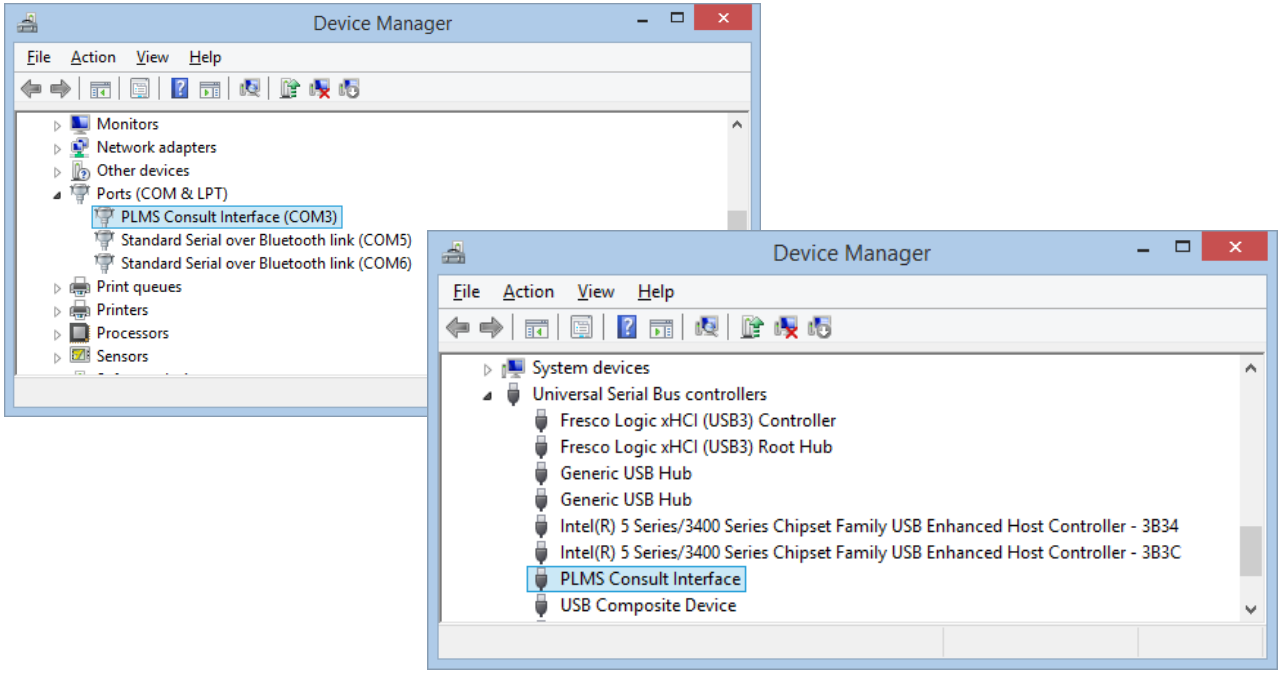
Vehicle ECU Installation

- Determine board required for vehicle
- Listing of vehicles on Nistune website

www.nistune.com > Equipment > Current Products

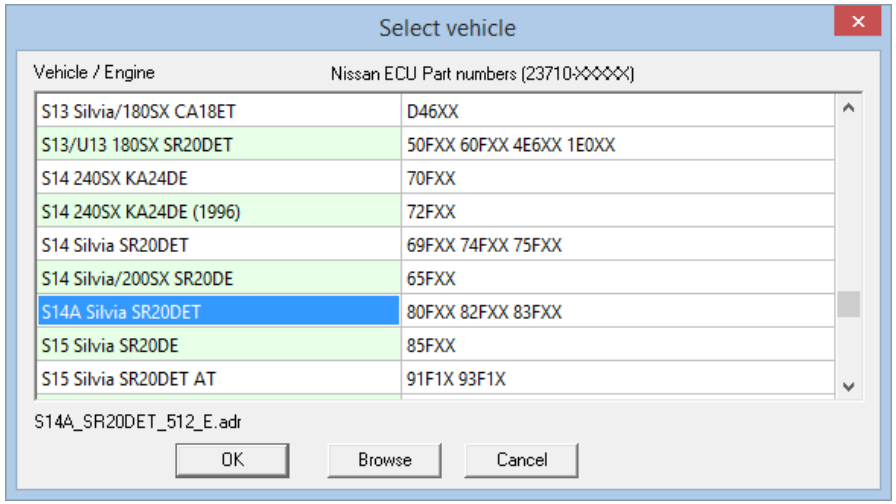
Consult Cable

- PLMS Cable drivers automatically install when using Nistune version 1.0 or higher
- Check cable installed under Windows Control Panel > System > Device Manager



Vehicle Connection

- Select vehicle type (File > Select Vehicle) before connecting to vehicle

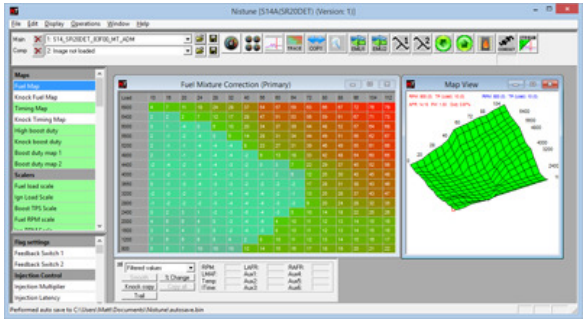


- Press ‘Consult’ 

button to connect to a standard Nissan or Nistune ECU

Map Syncing

- After connecting to ECU use the arrow buttons to download maps from ECU, or upload maps to the ECU 
- This process is called ‘syncing’ which maintains that the maps seen on the laptop are the same as that in the ECU.
- After syncing then maps are available for display and edit inside Nistune

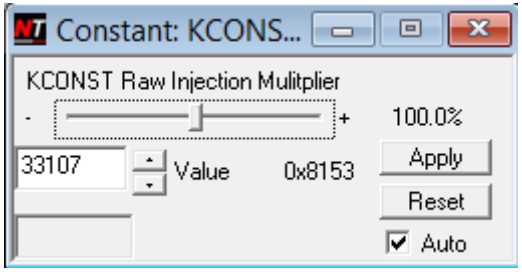


- If a different tune file is loaded, or Nistune is restarted then the ECU will need to be resynced with Nistune
- Syncing will only copy the displayed maps from the ECU. ROM pack must be installed to copy the maps into the matching ECU file on the laptop.

Initial Tuning

Example vehicle S14 200SX (SR20DET)

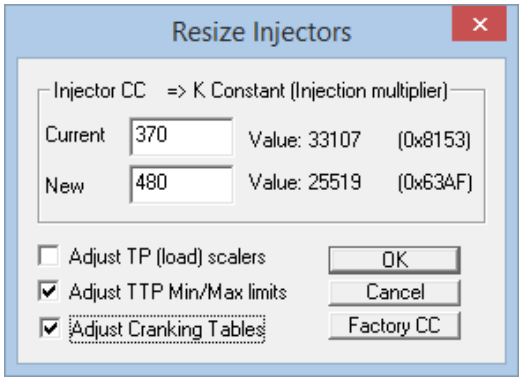
- Upgraded injectors 370CC to 480CC
- Upgraded MAF S14 SR20DET to R35 GTR

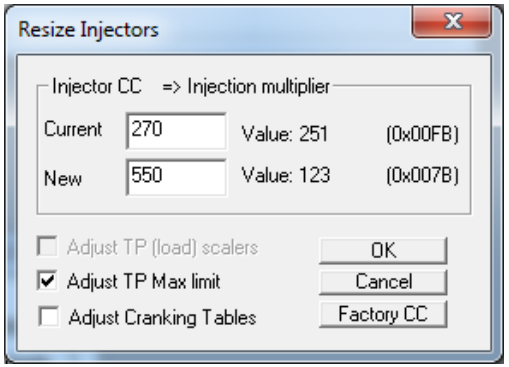


- Nissan ECUs use an ‘Load multiplier’ (K constant) to apply a multiplication factor to fuelling. This is adjusted when changing injectors or air flow meters
- Changing this parameter however also adjusts load calculations used by the ECU in other tables (measured load = Theoretical Pulsewidth [TP])
- Try to match injector size and MAF used to avoid change to this parameter. Large injectors where not required can be more difficult to control
- Use Feature Pack ‘Total injection multiplier’ in updated firmware

Resizing Injectors

- Operations > Resize Injectors

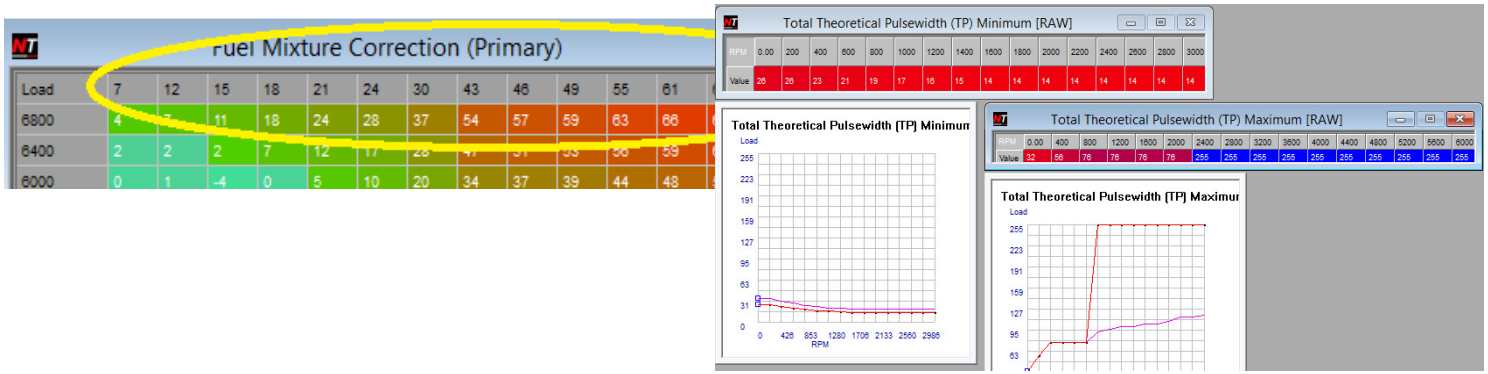




- (a) Reduces load multiplier (K) or by the percentage increase in injector size. K is shown as ‘Value’ in this window.
- (b) Feature Pack enhanced ECUs instead change Total Injection Multiplier
- Optional tick boxes for adjusting other tables by the same factor are also provided. We will look at those on the next pages….

Resize Injector TP Min/Max

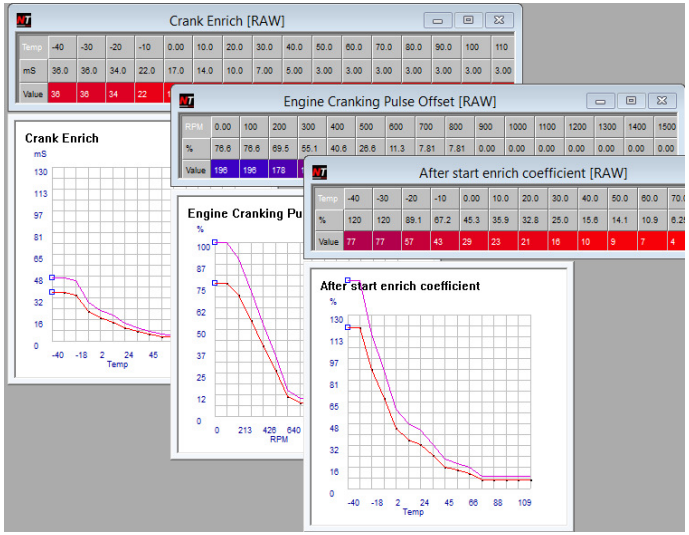
- Theoretical Pulsewidth (TP) is a MAF based load input used by Nissan to work out indexing to various maps and tables in the ECU



- There are minimum (Min Tpulse Width) and maximum (Max Tpulse Width) tables used to control load during MAF measurement undershoot (on deceleration) or overshoot (on acceleration)
- Load (TP) can be affected by injector resize. Ticking ‘Adjust TTPmin/Max’ limits will cause Nistune to adjust these tables to prevent early limiting maximum TP and lower the minimum TP slightly. Still often needs manual adjustment.

Resize Injector Crank Enirch

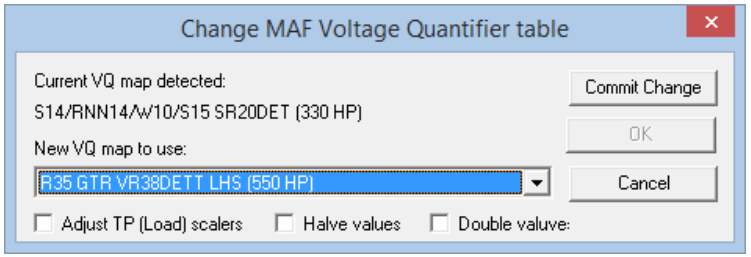
- Crank enrichment tables are used during and after immediate start of the ECU. They require adjustment when injectors are upgraded



- They are not affected by the injection multiplier change, so an optional tickbox exists for lowering these tables (as pictured showing the comparison between 370CC and 480CC injectors)

Resizing MAF

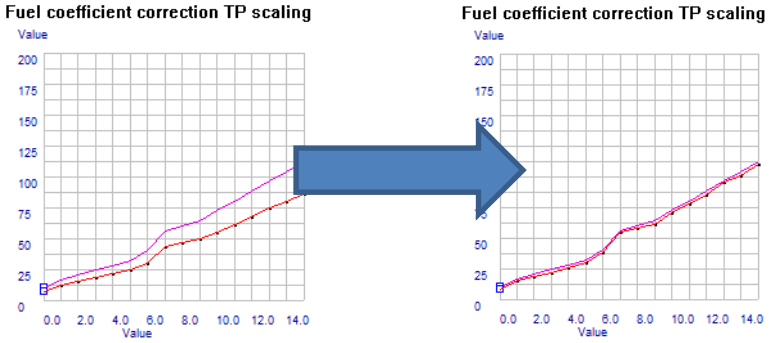
- Factory MAFs have a maximum airflow read capacity. Upgrading to larger capacity MAFs such as those used in the R35 GTR and Z32 300ZX is common
- Changes to the Voltage Quanitifer (VQ) calibration curve (converting MAF voltage to TP load reading) and injection multiplier (K) are required



- Calculated changes in estimated flow readings (330HP to 550HP) will adjust the injection multiplier by this amount
- Tickbox ‘Halve values’ is used for twin MAF GTR computers when using a different MAF.
- Tickbox ‘Double value’ is used for other ECUs being fitted with an R32 GTR MAF

Resize TP scaling (fuel/timing maps)

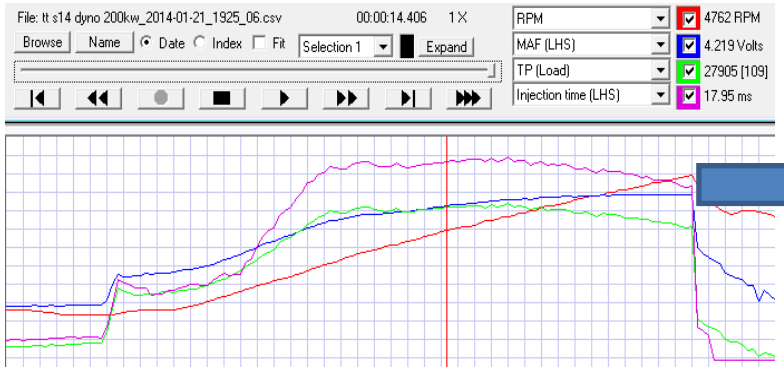
- Both resize injector and MAF boxes have an option to resize ‘TP scales’
- As the TP range will vary by the amount of adjustment to ‘injection multiplier’ the scaling on the fuel and timing maps needs to match
- If using ‘TP scales’ for injector resize, then also use it for MAF resize

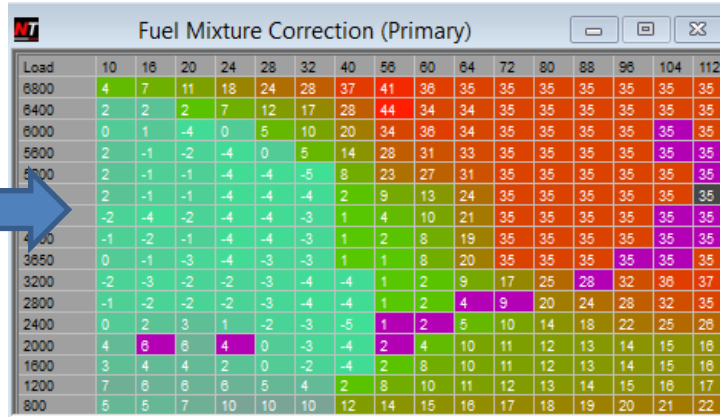


- Only using the resize on injectors, results in a lower scale (8-84) compared to (10-112)
- Check your TP scaling is correct by doing a full boost test run and checking the maximum TP value reached on the gauges

Checking TP scaling

- Refer to Nissan ECU tuning basics
- Check ignition maps are safe, and AFRs safely rich before doing a full run
- Check the maximum TP reached during the run. Below log shows 109
- Adjust the TP scalers based on maximum TP reached. Try to keep all scales close to factory values where possible



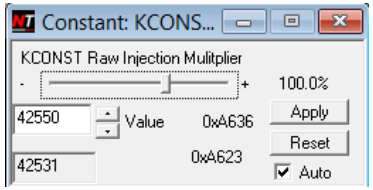


Load	10	16	20	24	28	32	40	56	60	64	72	80	88	96	104	112
6800	4	7	11	18	24	28	37	41	36	35	35	35	35	35	35	35
6400	2	2	2	7	12	17	28	44	34	34	35	35	35	35	35	35
6000	0	1	-4	0	5	10	20	34	36	34	35	35	35	35	35	35
5600	2	-1	-2	-4	0	5	14	28	31	33	35	35	35	35	35	35
5200	2	-1	-1	-4	-4	-5	8	23	27	31	35	35	35	35	35	35
4800	2	-1	-1	-4	-4	-4	2	9	13	24	35	35	35	35	35	35
4400	-2	-4	-2	-4	-4	-3	1	4	10	21	35	35	35	35	35	35
4000	-1	-2	-1	-4	-4	-3	1	2	8	19	35	35	35	35	35	35
3650	0	-1	-3	-4	-3	-3	1	1	8	20	35	35	35	35	35	35
3200	-2	-3	-2	-2	-3	-4	-4	1	2	9	17	25	28	32	36	37
2800	-1	-2	-2	-2	-3	-4	-4	1	2	4	9	20	24	28	32	35
2400	0	2	3	1	-2	-3	-5	1	2	5	10	14	18	22	25	28
2000	4	6	6	4	0	-3	-4	2	4	10	11	12	13	14	15	16
1600	3	4	4	2	0	-2	-4	2	8	10	11	12	13	14	15	16
1200	7	6	6	6	5	4	2	8	10	11	12	13	14	15	16	17
800	5	5	7	10	10	10	12	14	15	16	17	18	19	20	21	22

- Adjusting our fuel map to the maximum TP for both fuel and timing maps

Initial tuning

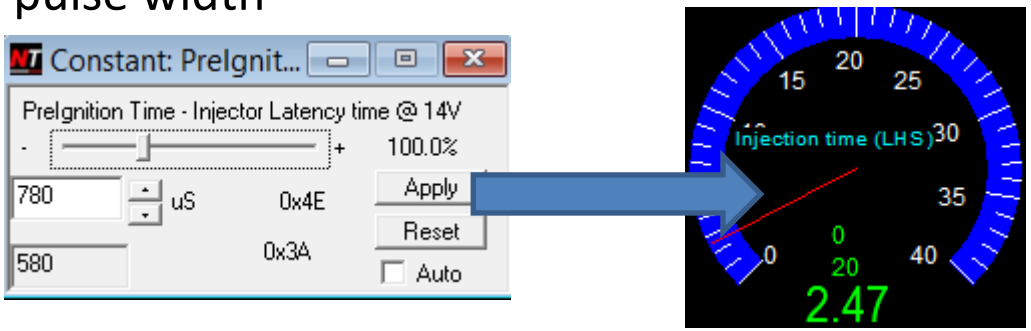
- Adjusting the injection multiplier using the resize utilities will get it in a ballpark range so that the vehicle should start
- Only perform a single resize of injectors and MAF. Manually change ‘injection multiplier’ to trim the fuelling



- In the case of our S14 200SX there was only minor adjustment required to the injection multiplier to get the AFRs corrected
- Warning: Subsequent resize operations with tickboxes checked will have potential unwanted affects on those tables selected. Resize once only.

Injection latency

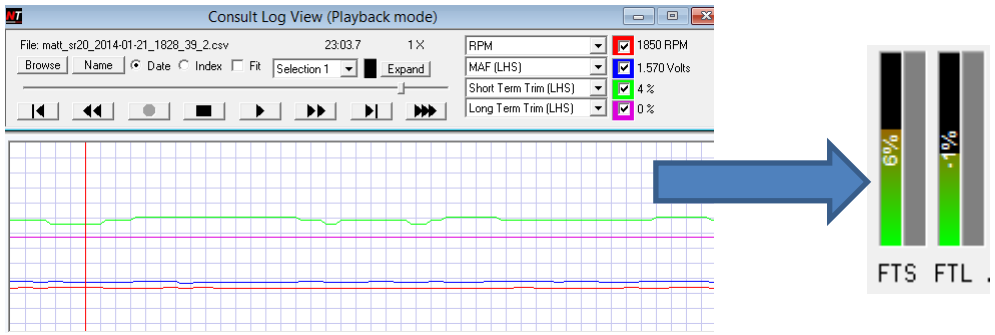
- Latency is the delay in opening and closing the pin in the injector. This characteristic varies between different brands/sizes of injectors
- Nissan uses a single parameter at 14 volts and adjusts this parameter based on the battery voltage to calculate a ‘total latency’ which is added to the injection pulse width



- Time is measured in microseconds (uS). You may need to convert from milliseconds from the manufacturers specifications (eg 0.78ms = 780uS)
- Adjust latency to trim idle/low load mixtures (there is no separate idle mixture table in Nissan ECUs)

Working with fuel trims

- Monitor fuel trim gauges. Driven via O2 sensor feedback to ECU. Adjusted using injection multiplier and injector latency settings
- Lean O2 readings increase fuel trims, rich O2 readings decrease fuel trims
- Note: Fuel Trim is called AF Alpha in Nissan Consult
- FTS = Fuel Trim Short (immediate changes), FTL = Fuel Trim Long (delayed changes based on short term trims – kept after ignition off)



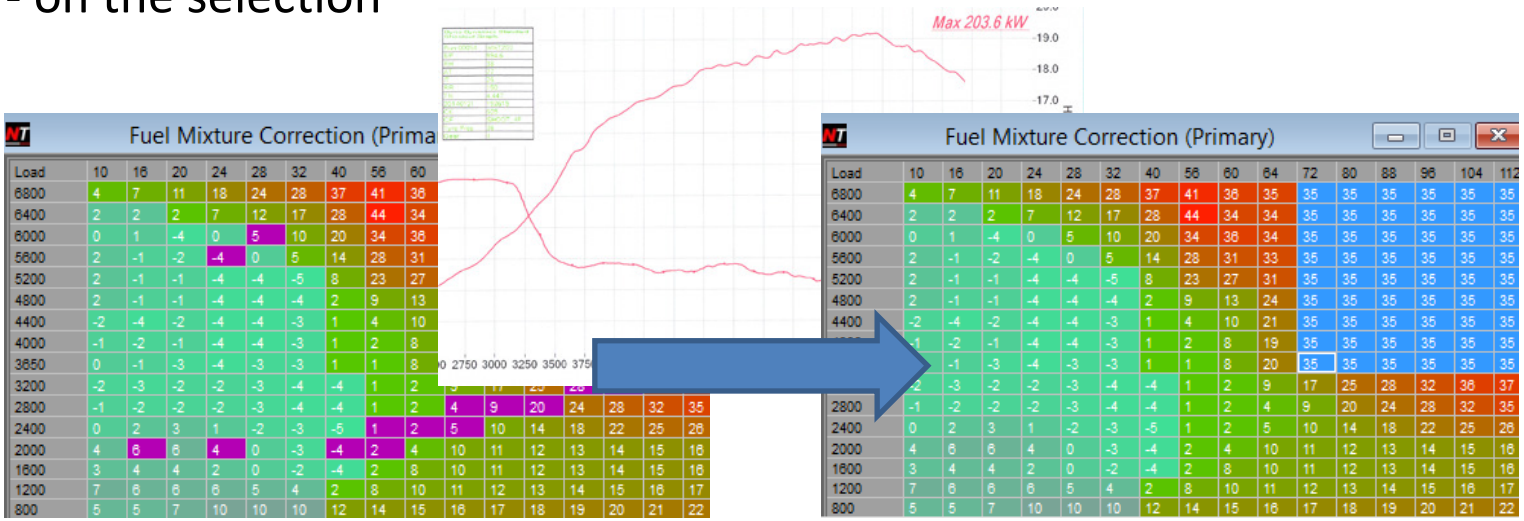
Working with fuel trims

- Reset your fuel trims using
  - Operations > Active Test > Clear Self Learn
  - Start and then stop the test

- Perform a reset before and during tuning where required. Adjust injection multiplier until the trims stabilise. About +/- 5% is a good guide
- Noticeable engine reaction to Clearing LTFT when trims are out of adjustment. When trims are correct you should notice no change to engine running when LTFT is cleared.

Fuel map adjustments

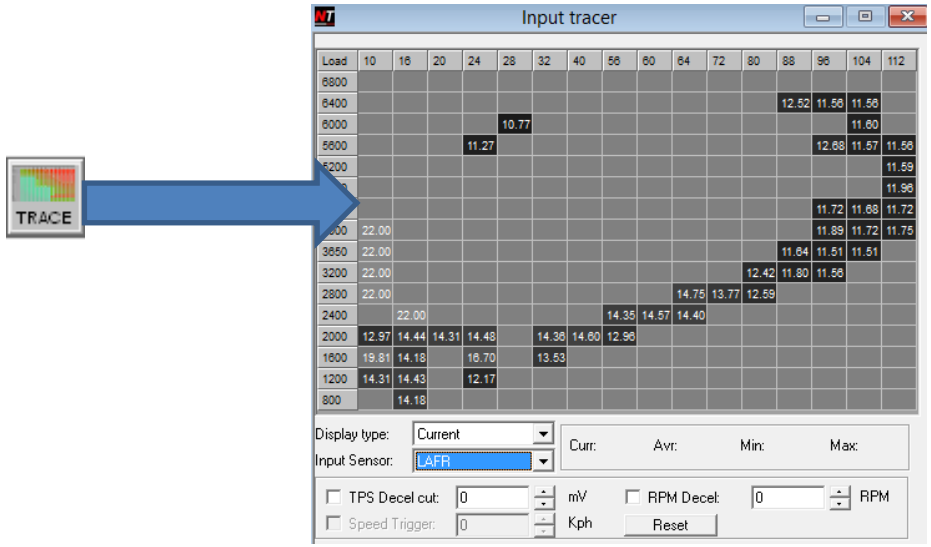
- Fuel map numbers control the injection amount used by the ECU. Apart from narrow band trims, there is no feedback to the ECU
- Use wideband output and AFR trace to determine where to alter your fuel map. Adjust the fuel map in sections by selecting blocks of cells and use +/- on the selection



- Direct number entry on cells, and fill operations can be performed on ‘Raw values’ selection

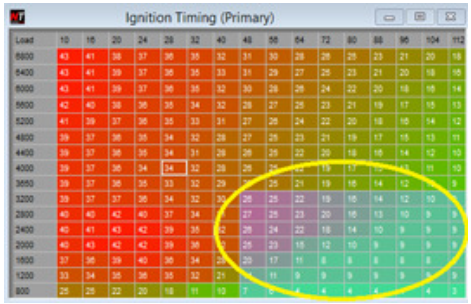
Smart AFR monitoring

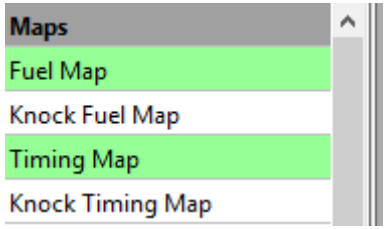
- Hooking a wideband into your laptop and integrating with Nistune can trace your AFRs on your laptop screen
- Use the ‘Trace’ icon to select your sensor (LAFR for wideband) and see your AFRs trace against your fuel map. Boost etc can also be monitored using this technique with suitable input devices



Things to watch

- ECU will pull timing depending on the amount of knock the ECU is detecting
- When knock counts get high in the knock region of the maps, the ECU will switch to the knock maps
- It will also go into knock maps if there is a DTC fault KNOCK SENSOR (21)
- Knock sensors need to be about 470K ohm when measuring at the ECU plug to avoid this fault code
- Nistune will beep and maps will change the green selection to knock maps when using these maps

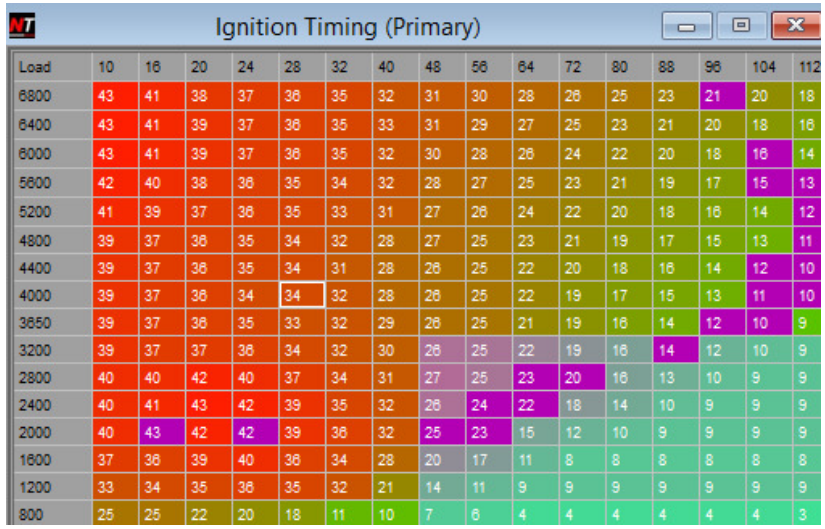




- Knock count reporting to Nistune software is only available on limited ECUs
  (S13 CA18DET, R32 RB20DET, VL RB30ET)

Timing Map Adjustments

- Timing has idle and off-idle maps and tables available. Most tuning will only require the adjustment of off-idle maps
- Use the trail to determine the vehicle path through where the map is being read. Timing is in degrees BDTC when ‘filtered values’ is viewed



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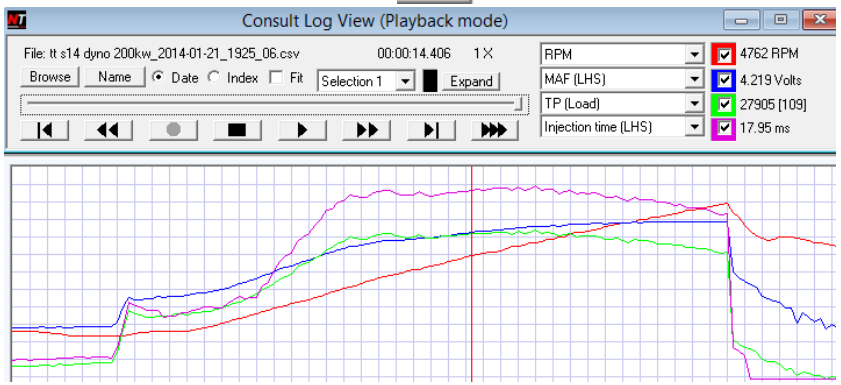
6000	43	41	39	37	36	35	32	30	28	26	24	22	20	18	16	14
5600	42	40	38	36	35	34	32	28	27	25	23	21	19	17	15	13
5200	41	39	37	36	35	33	31	27	26	24	22	20	18	16	14	12
4800	39	37	36	35	34	32	28	27	25	23	21	19	17	15	13	11
4400	39	37	36	35	34	31	28	26	25	22	20	18	16	14	12	10
4000	39	37	36	34	34	32	28	26	25	22	19	17	15	13	11	10
3650	39	37	36	35	33	32	29	26	25	21	19	16	14	12	10	9
3200	39	37	37	36	34	32	30	26	25	22	19	16	14	12	10	9
2800	40	40	42	40	37	34	31	27	25	23	20	16	13	10	9	9
2400	40	41	43	42	39	35	32	26	24	22	18	14	10	9	9	9
2000	40	43	42	42	39	36	32	25	23	15	12	10	9	9	9	9
1600	37	36	39	40	36	34	28	20	17	11	8	8	8	8	8	8
1200	33	34	35	36	35	32	21	14	11	9	9	9	9	9	9	9
800	25	25	22	20	18	11	10	7	6	4	4	4	4	4	4	3

Logging Data

- Log consult data from the ECU and optionally connect your wideband input into Nistune
- Use ‘Stream mode’ for high resolution logging 

- Use the log button to open the logger 



- Hover mouse above buttons for short cut keys. Playback will update gauges and map tracing as if the data was live
- Logging is useful during a run to monitor a trace of gauges during the run and for problem solving
- It’s good practice to always do one last dyno pull to take a log (in stream mode) for your records. This can be a valuable resource when comparing tunes and fault finding.