

Delicious Tuning's

Guide to Datalogging and Review

Dated: June 29, 2021

What is a data log, and why you should do it?

A datalog is a snapshot of your engine's vitals over time. As tuners, we use data logs as a reference point to review the vehicle health and you can too. Capturing a proper datalog is a critical step in reviewing/diagnosing the data logs the vehicle, as a log has the potential to show you exactly what the engine is doing, whether healthy or not. Conversely, a poorly done log can be useless or counterproductive.

For most applications that can be purchased through our website, the provided file is a simple Flash & Go, ready to run, with no additional reviews by the tuner. We do suggest you review the logs yourself so you have a basic understanding of what your engine is doing and know how to further diagnose issues with the vehicle, if something is not quite correct. If you do see something out of spec you are more than welcome to call or email.

If you would prefer to have a professional tuner review / customize your tune based on the logs provided please contact Delicious Tuning's sales department for more details and to schedule a day / time to do so. This is an additional charge that can be purchased through additional service works or as a custom e-tune.

Notes for certain tunes:

- **All Vehicles** - AC and Defrost should both be switched off and that you are running on pump gas (ex. 91 or 93 octane; 95 or 98 RON), not E85 (if you have a Flex Fuel tune).
- **FA20 (BRZ/FRS/86)** - Every tune we offer comes with a built in, two minute timer that activates upon switching the key to the "ON" position. The FA20 engine does a diagnostic sweep of the VVT system each time the car is started before it will allow the VVT system to activate and properly advance or retard valve timing. If your car's VVT (Variable Valve Timing) system does not activate within this two minute period, a check engine light with no readable code will illuminate. This light is to let you know that the VVT system is not yet active, and to continue letting the car idle until it is (When the light goes off). If it does not go off within 5 minutes, drive gently down the road and then come to a complete stop. VVT should then activate. If not, a mechanical fault may be present in your VVT system that requires intervention from a mechanic.

Setting up a Data log

To create a data log, we must first load our tune into EcuTekProECU. As shown below in **Figure A**, click **"File"**, followed by **"Open ROM File"**, then select the tune file that is loaded into your ECU. **Note:** It is *vital* that you choose the exact file currently loaded into your ECU, and not a prior revision or substitute. In the example below, I am using a ROM for a 2013 - 2014 Manual Transmission BRZ.

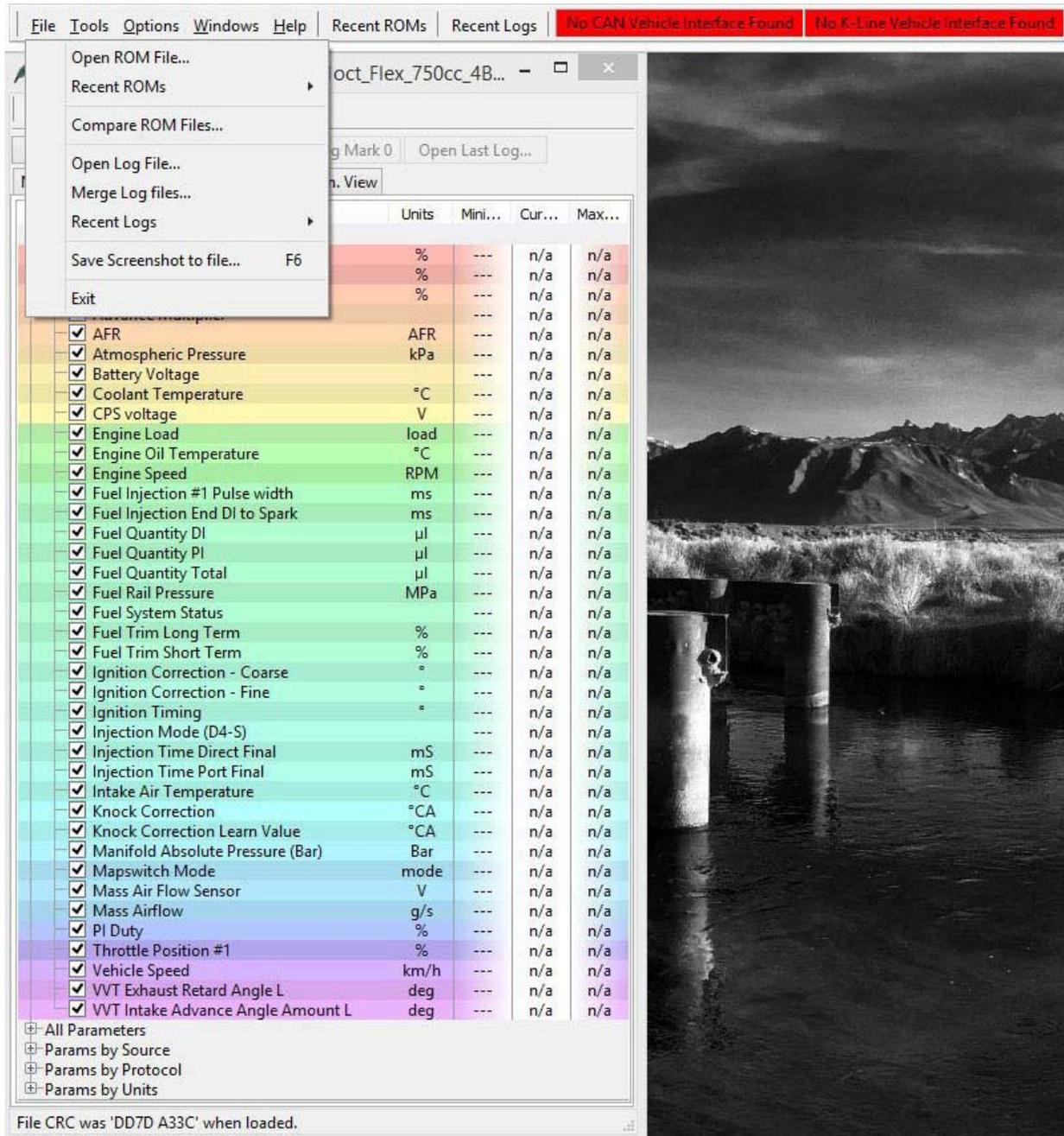


Figure A

Setting up a Datalog (continued...)

At this stage, we have our ROM file open in EcuTek. Now, we need to select the parameters that we'd like to capture and record data for. EcuTekProECU already checks most of the standard parameters that we like to see from the start, so there isn't much to add. When we do add parameters, we do so through the "All Parameters" drop-down, displayed below in

The screenshot shows the EcuTek software interface with the 'All Parameters' list expanded. The list includes the following parameters:

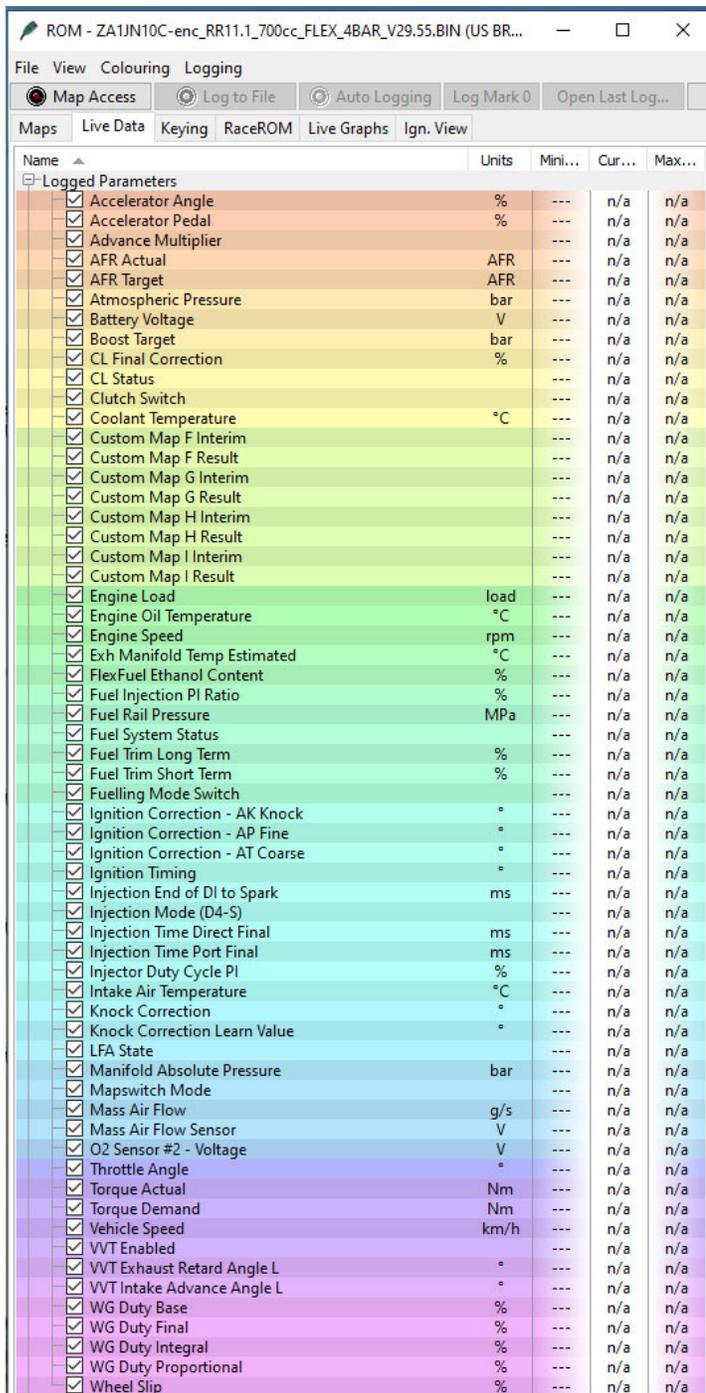
Name	Units	Mini...	Cur...	Max...
<input checked="" type="checkbox"/> Engine Speed	RPM	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection #1 Pulse width	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection End DI to Spark	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity DI	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity PI	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity Total	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Rail Pressure	MPa	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel System Status	---	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Long Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Short Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Correction - Coarse	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Correction - Fine	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing	°	---	n/a	n/a
<input checked="" type="checkbox"/> Injection Mode (D4-S)	---	---	n/a	n/a
<input checked="" type="checkbox"/> Injection Time Direct Final	mS	---	n/a	n/a
<input checked="" type="checkbox"/> Injection Time Port Final	mS	---	n/a	n/a
<input checked="" type="checkbox"/> Intake Air Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction	°CA	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction Learn Value	°CA	---	n/a	n/a
<input checked="" type="checkbox"/> Manifold Absolute Pressure (Bar)	Bar	---	n/a	n/a
<input checked="" type="checkbox"/> Mapswitch Mode	mode	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Air Flow Sensor	V	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Airflow	g/s	---	n/a	n/a
<input checked="" type="checkbox"/> PI Duty	%	---	n/a	n/a
<input checked="" type="checkbox"/> Throttle Position #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> Vehicle Speed	km/h	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Exhaust Retard Angle L	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Intake Advance Angle Amount L	deg	---	n/a	n/a
All Parameters				
<input type="checkbox"/> (+)BM Voltage	V	---	n/a	n/a
<input type="checkbox"/> A/C Switch	---	---	n/a	n/a
<input type="checkbox"/> A/F Correction #3	%	---	n/a	n/a
<input type="checkbox"/> A/F Heater Duty	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Bank #1 (PFI)	%	---	n/a	n/a
<input checked="" type="checkbox"/> A/F Learn Value High #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> A/F Learn Value High #2 (DUAL)	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Idle #1	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Idle #2 (DUAL)	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Low #1	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Low #2 (DUAL)	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Med #1	%	---	n/a	n/a
<input type="checkbox"/> A/F Learn Value Med #2 (DUAL)	%	---	n/a	n/a
<input type="checkbox"/> A/F Sensor #1	---	---	n/a	n/a
<input type="checkbox"/> A/F Sensor #1	---	---	n/a	n/a

File CRC was 'DD7D A33C' when loaded.

Figure B

Setting up a Datalog (continued...)

Now we need to add a few parameters to make sure our datalogs are complete. If not already checked, these will all be found under the “**All Parameters**” drop down described and shown above in **Figure B**. To see every parameter you should have checked for your particular car, reference the screenshots below according to your vehicle type.



Subaru BRZ, Toyota 86 & Scion FRS (RaceROM Patch 10.0 and later)

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File Tools Options Windows Help Recent ROMs Recent Logs No CAN Vehicle Interface Found No K-Line Vehicle Interface Found

ROM - ZA1JA01C-enc_SC_RR9_91oct_Flex_750cc_4B...

File View Colouring Logging

Map Access Log to File Log Mark 0 Open Last Log...

Maps Live Data Keying RaceROM Ign. View

Name	Units	Mini...	Cur...	Max...
Logged Parameters				
<input checked="" type="checkbox"/> A/F Learn Value High #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> A/F Learn Value High #2 (DUAL)	%	---	n/a	n/a
<input checked="" type="checkbox"/> Accelerator Angle	%	---	n/a	n/a
<input checked="" type="checkbox"/> Advance Multiplier		---	n/a	n/a
<input checked="" type="checkbox"/> AFR	AFR	---	n/a	n/a
<input checked="" type="checkbox"/> Atmospheric Pressure	kPa	---	n/a	n/a
<input checked="" type="checkbox"/> Battery Voltage		---	n/a	n/a
<input checked="" type="checkbox"/> Coolant Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> CPS voltage	V	---	n/a	n/a
<input checked="" type="checkbox"/> Custom Map P Result	raw	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Load	load	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Oil Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Speed	RPM	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection #1 Pulse width	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection End DI to Spark	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity DI	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity PI	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Quantity Total	µl	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Rail Pressure	MPa	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel System Status		---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Long Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Short Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Correction - Coarse	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Correction - Fine	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing	°	---	n/a	n/a
<input checked="" type="checkbox"/> Injection Mode (D4-S)		---	n/a	n/a
<input checked="" type="checkbox"/> Injection Time Direct Final	mS	---	n/a	n/a
<input checked="" type="checkbox"/> Injection Time Port Final	mS	---	n/a	n/a
<input checked="" type="checkbox"/> Intake Air Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction	°CA	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction Learn Value	°CA	---	n/a	n/a
<input checked="" type="checkbox"/> Manifold Absolute Pressure (Bar)	Bar	---	n/a	n/a
<input checked="" type="checkbox"/> Mapswitch Mode	mode	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Air Flow Sensor	V	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Airflow	g/s	---	n/a	n/a
<input checked="" type="checkbox"/> PI Duty	%	---	n/a	n/a
<input checked="" type="checkbox"/> Throttle Position #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> Vehicle Speed	km/h	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Exhaust Retard Angle L	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Exhaust Retard Angle R	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Intake Advance Angle Amount L	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Intake Advance Angle Amount R	deg	---	n/a	n/a

All Parameters
 Params by Source
 Params by Protocol
 Params by Units

File CRC was 'DD7D A33C' when loaded.



Subaru BRZ, Toyota 86 & Scion FRS (RaceROM Patch 9.1 and earlier)

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File Tools Options Windows Help Recent ROMs Recent Logs **No CAN Vehicle Interface Found** **No K-Line Vehicle Interface Found**

ROM - ag200_6481-enc_Stage2.01_uinlocked.BIN... - x

File View Colouring Logging

Map Access Log to File Log Mark 0 Open Last Log...

Maps Live Data Keying RaceROM Ign. View

Name	Units	Mini...	Cur...	Max...
Logged Parameters				
<input checked="" type="checkbox"/> Accelerator Opening Angle	%	---	n/a	n/a
<input checked="" type="checkbox"/> Advance Multiplier		---	n/a	n/a
<input checked="" type="checkbox"/> Air Flow Sensor Voltage	Volts	---	n/a	n/a
<input checked="" type="checkbox"/> Air/Fuel Correction #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> Air/Fuel Learning #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> Air/Fuel Sensor #1	AFR	---	n/a	n/a
<input checked="" type="checkbox"/> Atmospheric Pressure	psig	---	n/a	n/a
<input checked="" type="checkbox"/> Battery Voltage	Volts	---	n/a	n/a
<input checked="" type="checkbox"/> Coolant Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Load		---	n/a	n/a
<input checked="" type="checkbox"/> Engine Speed	RPM	---	n/a	n/a
<input checked="" type="checkbox"/> Exhaust VVT Retard Angle Left	°	---	n/a	n/a
<input checked="" type="checkbox"/> Exhaust VVT Retard Angle Right	°	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection #1 Pulse Width	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Pump Duty	%	---	n/a	n/a
<input checked="" type="checkbox"/> Ign. Cor. AK (Knock Ret.)	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ign. Cor. AP (Learnt Cor.)	°	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing	°	---	n/a	n/a
<input checked="" type="checkbox"/> Intake Air Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Intake VVT Advance Angle Left	°	---	n/a	n/a
<input checked="" type="checkbox"/> Intake VVT Advance Angle Right	°	---	n/a	n/a
<input checked="" type="checkbox"/> Internal Boost Reading	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Knocking Correction	°	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Air Flow	grams/s	---	n/a	n/a
<input checked="" type="checkbox"/> Primary Wastegate Duty Cycle	%	---	n/a	n/a
<input checked="" type="checkbox"/> Throttle Opening Angle	%	---	n/a	n/a

All Parameters
Params by Source
Params by Protocol
Params by Units

File CRC was '2C3C BBA9' when loaded.



Subaru WRX (2008-2014), Subaru WRX STI (2008-Current), Subaru Forester XT (2008-2011), Subaru Legacy GT (2005-2009)

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File Tools Options Windows Help Recent ROMs Recent Logs **No CAN Vehicle Interface Found** **No K-Line Vehicle Interface Found**

ROM - LF75300G-enc_USA-16WRX-AUTO_91oct_... - □ ×

File View Colouring Logging

Map Access Log to File Log Mark 0 Open Last Log...

Maps Live Data Keying RaceROM

Name	Units	Mini...	Cur...	Max...
Logged Parameters				
<input checked="" type="checkbox"/> A/F Sensor #1	lambda	---	n/a	n/a
<input checked="" type="checkbox"/> A/F Sensor #1	AFR	---	n/a	n/a
<input checked="" type="checkbox"/> A/F Target	AFR	---	n/a	n/a
<input checked="" type="checkbox"/> Accelerator Position	%	---	n/a	n/a
<input checked="" type="checkbox"/> Advance Multiplier		---	n/a	n/a
<input checked="" type="checkbox"/> Atmospheric Pressure	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Charge air temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Coolant Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Speed	rpm	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Injection #1 Pulse width	ms	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Pressure - Gauge	MPa	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Pressure - Target	MPa	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Pump Duty	%	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Long Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Short Term	%	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing	deg	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing - Learned Corr. (Coa...	deg	---	n/a	n/a
<input checked="" type="checkbox"/> Intake Air Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction (Retard Amount AK)	deg	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction Learned (Fine Corr....	°	---	n/a	n/a
<input checked="" type="checkbox"/> Map Trace AFR	AFR	---	n/a	n/a
<input checked="" type="checkbox"/> Map Trace Knock	deg	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Air Flow	g/s	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Air Flow Sensor	V	---	n/a	n/a
<input checked="" type="checkbox"/> Oil Temperature	°C	---	n/a	n/a
<input checked="" type="checkbox"/> Throttle Position - Absolute #1	%	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Exhaust Retard Angle L	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Exhaust Retard Angle R	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Intake Advance Angle Amount L	deg	---	n/a	n/a
<input checked="" type="checkbox"/> VVT Intake Advance Angle Amount R	deg	---	n/a	n/a
<input checked="" type="checkbox"/> Wastegate duty	%	---	n/a	n/a
<input checked="" type="checkbox"/> All Parameters <input checked="" type="checkbox"/> Params by Source <input checked="" type="checkbox"/> Params by Protocol <input checked="" type="checkbox"/> Params by Units				

File CRC was '4DAC 8A11' when loaded.



Subaru WRX (2015-Current), Subaru Forester XT (2014-Current)

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Capturing the Datalog

Now that we have our desired parameters checked, we can continue onto creating the logs. Ensure that the green EcuTek cable is plugged in from the OBDII port on the vehicle to the USB port on your logging device. The previously **red** boxes labeled “CAN Vehicle Interface” and “K-line Vehicle Interface” should now be **green**. First, we need to click “Map Access” shown below in **Figure C**. A **green** bar outlined in **red** will start moving across the EcuTekPro ECU window, indicating the live data is being streamed, but not recorded.

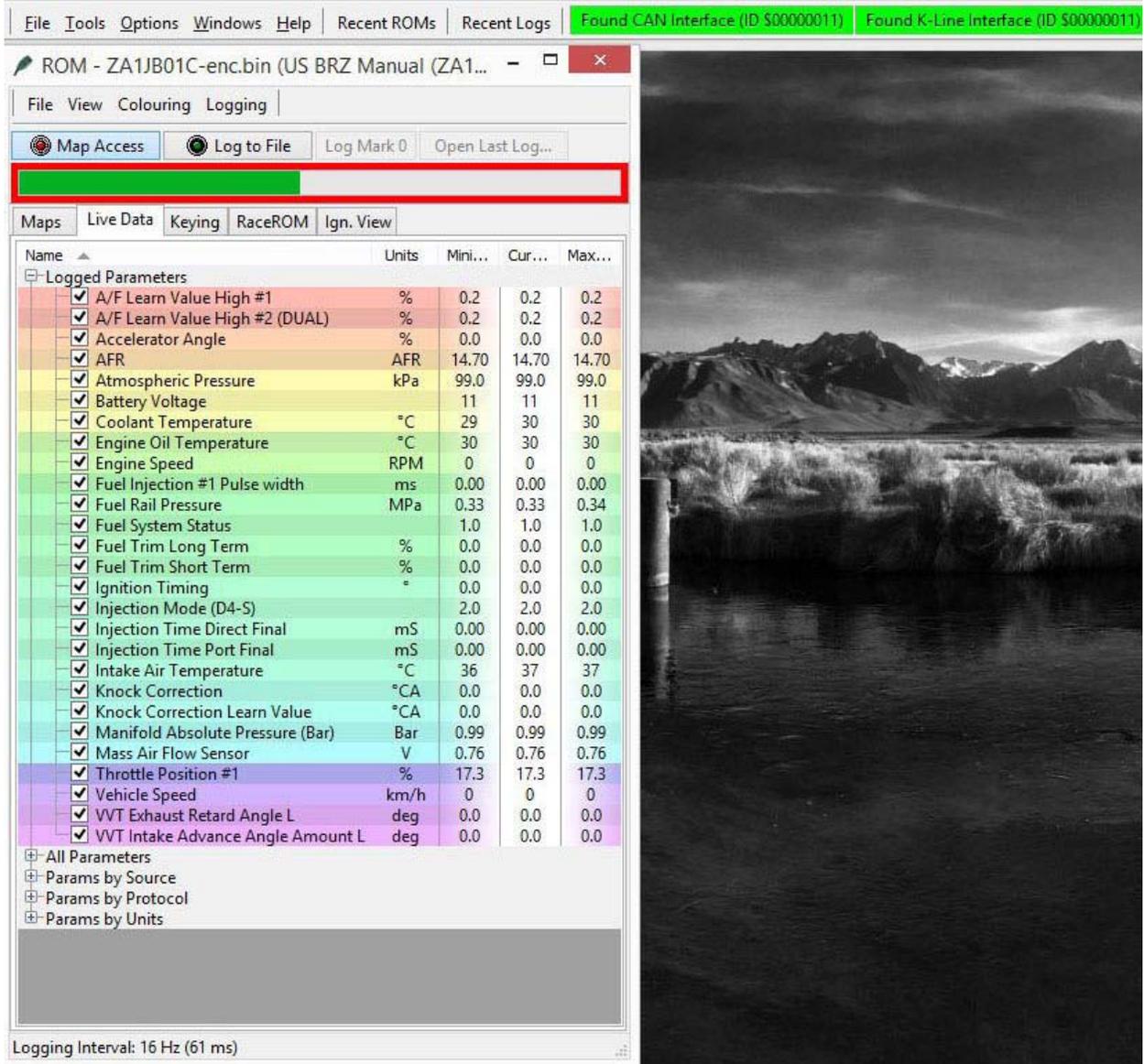


Figure C

Capturing the Datalog (continued...)

Now that we are streaming the data in real time, all that's left to do is physically capture the data log. To begin the log, click **“Log to File”**. The red line surrounding the green bar will switch to green, indicating that a log is being recorded. This is demonstrated below in **Figure D**. To end the data log, click **“Log to File”** once more.

Name	Units	Mini...	Cur...	Max...
Logged Parameters				
A/F Learn Value High #1	%	0.2	0.2	0.2
A/F Learn Value High #2 (DUAL)	%	0.2	0.2	0.2
Accelerator Angle	%	0.0	0.0	0.0
AFR	AFR	14.70	14.70	14.70
Atmospheric Pressure	kPa	99.0	99.0	99.0
Battery Voltage	V	10	10	11
Coolant Temperature	°C	29	30	30
Engine Oil Temperature	°C	30	30	30
Engine Speed	RPM	0	0	0
Fuel Injection #1 Pulse width	ms	0.00	0.00	0.00
Fuel Rail Pressure	MPa	0.32	0.32	0.34
Fuel System Status		1.0	1.0	1.0
Fuel Trim Long Term	%	0.0	0.0	0.0
Fuel Trim Short Term	%	0.0	0.0	0.0
Ignition Timing	°	0.0	0.0	0.0
Injection Mode (D4-S)		2.0	2.0	2.0
Injection Time Direct Final	mS	0.00	0.00	0.00
Injection Time Port Final	mS	0.00	0.00	0.00
Intake Air Temperature	°C	36	41	41
Knock Correction	°CA	0.0	0.0	0.0
Knock Correction Learn Value	°CA	0.0	0.0	0.0
Manifold Absolute Pressure (Bar)	Bar	0.99	0.99	0.99
Mass Air Flow Sensor	V	0.76	0.76	0.76
Throttle Position #1	%	17.3	17.3	17.3
Vehicle Speed	km/h	0	0	0
VVT Exhaust Retard Angle L	deg	0.0	0.0	0.0
VVT Intake Advance Angle Amount L	deg	0.0	0.0	0.0

Logging Interval: 15 Hz (65 ms)

Figure D

Capturing the Datalog (continued...)

Now that we know the steps involved in creating a log, let's take a look at what kind of Logs will be needed for a good review.

1. **Idle Log** – This log is just as simple as it sounds, yet so commonly gets taken overboard. An ideal idle log will consist of 12 full minutes of nothing but idle. The vehicle should be at full operating temperature for the *entire* duration of the log. Full operating temperature occurs with the coolant temperature needle in the middle, or slightly below the middle point of the gauge. Please resist the temptation to make the log any shorter or longer than necessary, and especially avoid adding any kind of throttle blipping into the logs under *any* circumstances..
2. **Cruising Log** – What we want to see here is very similar to the conditions in the idle log. Once the vehicle is at full operating temperature, bring the vehicle up to highway speed and set cruise control. Ideally, this log will be performed on flat ground. Let cruise control stay active for the duration of the data log; about 12 minutes again. Do not deviate from cruising condition, extend, or shorten the log beyond what is described here.
3. **Partial Throttle Log** – In this log, we'd like to see a partial throttle pull from 2500rpm up to 5000rpm in 3rd gear. Partial throttle, by our standards, is 30-40% in a naturally aspirated or supercharged vehicle. In a turbocharged vehicle, you should aim to hit about 5psi of boost and carry that up to 5000rpm, rather than rely on throttle input alone to complete the log.
4. **WOT (Wide Open Throttle) Log** – **Caution do not perform this log until you have completed the previous logs and the logs are in good standing. Doing so before reviewing the logs properly can put your engine at risk for failure.** Once comfortable with the previous data logs, proceed forward, record this log from 2500-3000 rpm to redline in 3rd gear. Throttle input should not deviate from 100% at any point from 2500-3000 rpm to redline.

Where are the data logs located?

We have captured the logs we need to review but where are they located? These logs will be inside the EcuTek folder of your hard drive, in their own sub folder labeled “**MapAccessLogs**”. I have found that organizing the logs by date helps me sort between them far easier than any other method. Refer to **Figure E** below to see the appropriate folder of log files. **Note** My hard drive is labeled “**Bootcamp**” because I am running Windows via a MacBook Air. If on a computer running Windows natively, your hard drive will likely be labeled simply as “(C:)”.

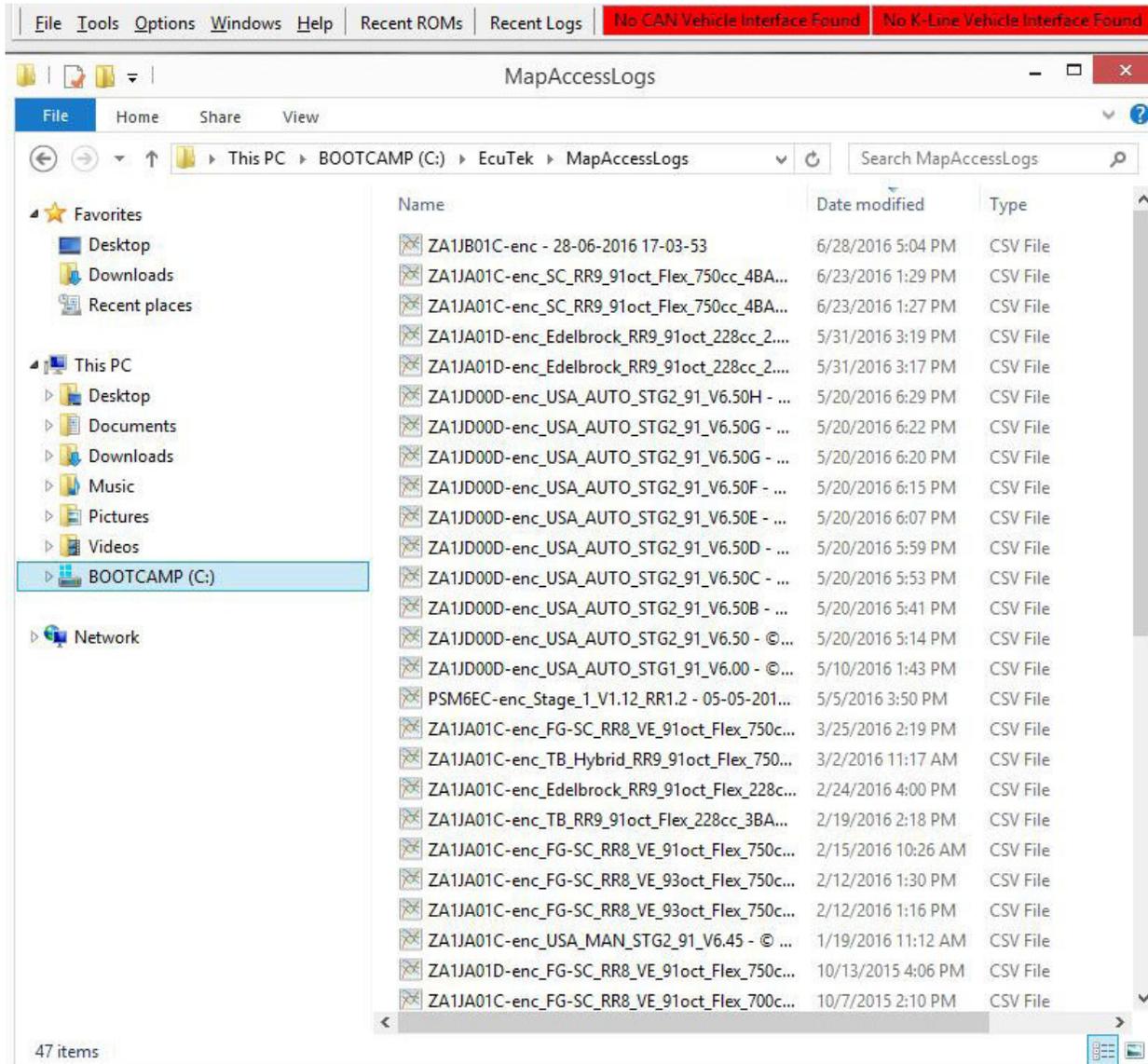


Figure E

Reviewing TheData Logs

This may seem like a daunting task but with some patience and a little education you can review the logs quickly and know what to look for; we will review some of the key items to look over for each vehicle platform. This is by no means all you need to know but this is more of a glimpse of the key points to review and as a way of diagnosing any potential faults with the vehicle's past, present or future.

Quick Notes ("To Be Expected")

- A car after starting will potentially have a higher MAP value (closer to 0.5), due to how the ECU performs its cold start routine. This is to be expected.
- Fuel trims on the BRZ/FRS/86 platform may deviate quite a bit during the first 15 minute cold start log. This is to be expected while in cold start mode.
- The fuel trims will not activate immediately after starting a car because the ECU is waiting for the sensor to fully warm up. This is to be expected.
- A car off throttle and above 1500 RPM's will deactivate the injectors and cause the car to run lean (above 1.0 lambda). This is to be expected.

Reference Tables

<u>Lambda</u>	<u>AFR</u>	<u>Condition</u>	<u>BAR</u>	<u>PSI (abs.)</u>	<u>PSI (rel.)</u>
1.36	20.0	Lean	4.0	58.68	44.01
1.29	19.0		3.5	51.35	36.68
1.22	18.0		3.0	44.01	29.34
1.16	17.0		2.5	36.68	22.01
1.09	16.0		2.0	29.34	14.67
1.02	15.0		1.9	27.87	13.20
1.00	14.7	Stoich	1.8	26.41	11.74
0.99	14.5		1.7	24.94	10.27
0.95	14.0		1.6	23.47	8.80
0.92	13.5		1.5	22.01	7.34
0.88	13.0		1.4	20.54	5.87
0.85	12.5		1.3	19.07	4.40
0.82	12.0		1.2	17.60	2.93
0.80	11.8		1.1	16.14	1.47
0.79	11.6		1.0	14.67	0.00
0.78	11.4		0.9	13.20	-1.47
0.76	11.2		0.8	11.74	-2.93
0.75	11.0		0.7	10.27	-4.40
0.73	10.8		0.6	8.80	-5.87
0.72	10.6		0.5	7.34	-7.34
0.71	10.4		0.4	5.87	-8.80
0.69	10.2		0.3	4.40	-10.27
0.68	10.0		0.2	2.93	-11.74
0.65	9.5	Rich	0.1	1.47	-13.20

Subaru BRZ / Scion FR-S / Toyota 86 (2013+)

1. Fuel Trims (Short Term, Long Term)

- a. These are the fuel trims to correct for a stoic metric ratio. While at idle, during a cold start they will swing up and down a bit but overall they should hover between +/- 10% from zero.
 - i. Correction +30% / -30%: This means the ECU cannot correct the trims any further and the car is running a bit lean / rich respectively. This can be caused by the following.
 1. There is a vacuum leak in your system, check all vacuum lines in the system and anywhere that a vacuum leak may occur.
 2. It may also be caused by a poorly functioning MAF (mass air flow) or MAP (manifold air pressure) sensor.
 - a. The MAF sensor may be dirty or the O-Ring for the MAF sensor may not be sealing correctly.
 - b. The MAP sensor may not be working correctly and may need to be replaced.

2. CL (closed loop) Final Correction or Custom Map N (older RaceROM patches)

- a. This is a custom fuel trim that is used under WOT and higher loads. You will see this range between -20 and +20. The more power a car makes the more this will change.
 - i. FI (forced induction) applications
 1. If the values seem to cap out positive, there may be a fuel delivery issue and you should check your fuel pressure.
 2. If the values seem to cap out negative, there may be a vacuum leak and the engine may not be drawing all the air in it expects
 - ii. NA (naturally aspirated) applications
 1. If the values seem to cap out positive/negative, there may be a vacuum leak and all the air is not being calculated correctly.

3. MAP Sensor (quick check)

- a. MAP values should be close to the atmospheric pressure rated in BAR while the car is in the ON position and not running.
 - i. A value outside of this range could note an incorrect MAP sensor has been installed or the MAP sensor itself has failed.
 1. We usually only see the larger 3 and 4 BAR MAP sensors fail, whereas the smaller ones seem to be pretty robust.
- b. While at idle the value should be reading about ~0.3 to ~0.4 depending on coolant temperature, altitude or if there is an extra load on the engine, such as A/C, head lights, defroster, etc....
 - i. A reading closer to 1.0 could note a small vacuum leak or possibly a weak engine with low compression.

4. Advance Multiplier (quick check)

- a. This single number offers a pretty good glimpse into how the engine is performing and if some adjustments need to be done to help mitigate knock correction.
 - i. Ideally you want to see a value of 1.0 all the time, but the ECU makes adjustments and a value of 0.9 or higher is completely reasonable and acceptable for this platform
 - ii. A value below 0.9 and we would suggest checking the following.
 1. Fuel, brand and octane/RON value being used.
 2. Make sure the spark plugs and coil packs are fairly new (fewer than 60K miles) especially for FI applications.

5. Ignition Correction (Knock or any Ignition Correction)

- a. These are the real time and learned ignition correction values used by the ECU to adjust the timing to protect the engine from serious knock events that can lead to engine failure.
 - i. As recommended by multiple professional tuning companies, such as Cobb and EcuTeK, a value of -2.81 or lower (closer to 0.00) is to be considered OK and expected across nearly all Subaru platforms throughout a log (but not continuous).
 - ii. Large events above -4 are to be considered high and we recommend you contact your tuner immediately to help diagnose the issue your vehicle may be having. Such causes could be from:
 - 1. Faulty coil packs (they wear out with age and miles).
 - 2. Old or incorrectly gapped spark plugs
 - 3. Incorrect or bad fuel octane/RON
 - 4. Failing or leaking injectors
 - 5. Poor ground in the engine bay
 - 6. Over boosting, etc...

6. *VVT Enabled (quick test)*

- a. This will need to read "1" for the variable valve timing to be enabled and for the car to actually make good power. If this is not enabled then the cams will not operate and the car will be down on power.
- b. Usually letting the car idle for a minute or two will enable the cams but if they do not a quick way to force the cams to enable is to do the following.
 - i. Drive up to about 60mph in 5th gear and then let off the accelerator and allow the car to coast down in gear to about 1500 RPM's. This will almost always enable the cams.

7. *Flex Fuel Ethanol Content (quick check) or Custom Map P Result (older RaceROM patches)*

- a. Pump gas (not E85, E98, E100) mixtures from most gas stations around the world will usually always show some sort of ethanol content reading when plugged in and working correctly.
 - i. North America, South America (except Brazil), Europe, Middle East, Australia, China, Japan usually sees about 5-15% on pump gas.
 - ii. High altitude locations can see 0% during certain times of the year, such as in Colorado, USA.
 - iii. Brazil on average will be about 27% ethanol from the local pumps.
 - iv. South Africa will be usually 0% from the local pumps but there is a good supply of ethanol options for making more power.
- b. Ethanol gas (E85), can legally range between 51% and well into the 80% mark as mandated by the US Federal government at any pump in the US, any time of year.
 - i. Do not be surprised if you see E51% at one pump and E85% at another. It is completely possible and we have seen it.

Subaru STI and WRX (2004+ STI, 2006+ WRX, 2008-2011 FXT, 2005-2009 LGT)

1. *A/F Correction #1 and A/F Learning #1 (Short Term, Long Term)*

- a. These are the fuel trims to correct for a stoic metric ratio. While at idle, during a cold start they will swing up and down a bit but overall they should hover between +/- 10% from zero.
 - i. Correction +25% / -25%: This means the ECU cannot correct the trims any further and the car is running a bit lean / rich respectively. This can be caused by the following.
 1. There is a vacuum leak in your system, check all vacuum lines in the system and anywhere that a vacuum leak may occur.
 2. It may also be caused by a poorly functioning MAF (mass air flow) or MAP (manifold air pressure) sensor.
 - a. The MAF sensor may be dirty or the O-Ring for the MAF sensor may not be sealing correctly.
 - b. The MAP sensor may not be working correctly and may need to be replaced.

2. *MAP Sensor (quick check)*

- a. MAP values should be close to the atmospheric pressure rated in BAR while the car is in the ON position and not running.
 - i. A value outside of this range could note an incorrect MAP sensor has been installed or the MAP sensor itself has failed.
 1. We usually only see the larger 3 and 4 BAR MAP sensors fail, whereas the smaller ones seem to be pretty robust.
- b. While at idle the value should be reading about ~0.3 to ~0.4 depending on coolant temperature, altitude or if there is an extra load on the engine, such as A/C, head lights, defroster, etc....
 - i. A reading closer to 1.0 could note a small vacuum leak or possibly a weak engine with low compression.

3. *Advance Multiplier (quick check)*

- a. This single number offers a pretty good glimpse into how the engine is performing and if some adjustments need to be done to help mitigate knock correction.
 - i. Ideally you want to see a value of 1.0 all the time, but the ECU makes adjustments from time to time and you could see it drop and come back to 1.0. This is OK, but not totally expected.
 - ii. A value continuously below 1.0 and we would suggest checking the following.
 1. Fuel, brand and octane/RON value being used.
 2. Make sure the spark plugs and coil packs are fairly new (fewer than 60K miles) especially for FI applications.

4. *Ignition Correction (Knock or any Ignition Correction)*

- a. These are the real time and learned ignition correction values used by the ECU to adjust the timing to protect the engine from serious knock events that can lead to engine failure.
 - i. As recommended by multiple professional tuning companies, such as Cobb and EcuTeK, a value of -2.81 or lower (closer to 0.00) is to be considered OK and expected across nearly all Subaru platforms throughout a log (but not continuous).
 - ii. Large events above -4 are to be considered high and we recommend you contact your tuner immediately to help diagnose the issue your vehicle may be having. Such causes could be from:
 1. Faulty coil packs (they wear out with age and miles).
 2. Old or incorrectly gapped spark plugs
 3. Incorrect or bad fuel octane/RON

4. Failing or leaking injectors
5. Poor ground in the engine bay
6. Over boosting, etc...

5. *Flex Fuel Ethanol Content (quick check)*

- a. Pump gas (not E85, E98, E100) mixtures from most gas stations around the world will usually always show some sort of ethanol content reading when plugged in and working correctly.
 - i. North America, South America (except Brazil), Europe, Middle East, Australia, China, Japan usually sees about 5-15% on pump gas.
 - ii. High altitude locations can see 0% during certain times of the year, such as in Colorado, USA.
 - iii. Brazil on average will be about 27% ethanol from the local pumps.
 - iv. South Africa will be usually 0% from the local pumps but there is a good supply of ethanol options for making more power.
- b. Ethanol gas (E85), can legally range between 51% and well into the 80% mark as mandated by the US Federal government at any pump in the US, any time of year.
 - i. Do not be surprised if you see E51% at one pump and E85% at another. It is completely possible and we have seen it.

Subaru WRX DIT (2015+) and Subaru FXT DIT (2014+)

1. Fuel Trims (Short Term, Long Term)

- a. These are the fuel trims to correct for a stoic metric ratio. While at idle, during a cold start they will swing up and down a bit but overall they should hover between +/- 10% from zero.
 - i. Correction +30% / -30%: This means the ECU cannot correct the trims any further and the car is running a bit lean / rich respectively. This can be caused by the following.
 1. There is a vacuum leak in your system, check all vacuum lines in the system and anywhere that a vacuum leak may occur.
 2. It may also be caused by a poorly functioning MAF (mass air flow) or MAP (manifold air pressure) sensor.
 - a. The MAF sensor may be dirty or the O-Ring for the MAF sensor may not be sealing correctly.
 - b. The MAP sensor may not be working correctly and may need to be replaced.

2. MAP Sensor (quick check)

- a. MAP values should be close to the atmospheric pressure rated in BAR while the car is in the ON position and not running.
 - i. A value outside of this range could note an incorrect MAP sensor has been installed or the MAP sensor itself has failed.
 1. We usually only see the larger 3 and 4 BAR MAP sensors fail, whereas the smaller ones seem to be pretty robust.
- b. While at idle the value should be reading about ~0.3 to ~0.4 depending on coolant temperature, altitude or if there is an extra load on the engine, such as A/C, head lights, defroster, etc....
 - i. A reading closer to 1.0 could note a small vacuum leak or possibly a weak engine with low compression.

3. Advance Multiplier (quick check)

- a. This single number offers a pretty good glimpse into how the engine is performing and if some adjustments need to be done to help mitigate knock correction.
 - i. Ideally you want to see a value of 1.0 all the time, but the ECU makes adjustments from time to time and you could see it drop and come back to 1.0. This is to be expected from time to time.
 - ii. A value continuously below 1.0 and we would suggest checking the following.
 1. Fuel, brand and octane/RON value being used.
 2. Make sure the spark plugs and coil packs are fairly new (fewer than 60K miles) especially for FI applications.

4. Ignition Correction (Knock or any Ignition Correction)

- a. These are the real time and learned ignition correction values used by the ECU to adjust the timing to protect the engine from serious knock events that can lead to engine failure.
 - i. As recommended by multiple professional tuning companies, such as Cobb and EcuTeK, a value of -2.81 or lower (closer to 0.00) is to be considered OK and expected across nearly all Subaru platforms throughout a log (but not continuous).
 - ii. Large events above -4 are to be considered high and we recommend you contact your tuner immediately to help diagnose the issue your vehicle may be having. Such causes could be from:
 1. Faulty coil packs (they wear out with age and miles).
 2. Old or incorrectly gapped spark plugs
 3. Incorrect or bad fuel octane/RON

4. Failing or leaking injectors
5. Poor ground in the engine bay
6. Over boosting, etc...

5. *VVT Enabled (quick test)*

- a. This will need to read "1" for the variable valve timing to be enabled and for the car to actually make good power. If this is not enabled then the cams will not operate and the car will be down on power.
- b. Usually letting the car idle for a minute or two will enable the cams but if they do not a quick way to force the cams to enable is to do the following.
 - i. Drive up to about 60mph in 5th gear and then let off the accelerator and allow the car to coast down in gear to about 1500 RPM's. This will almost always enable the cams.

6. *Flex Fuel Ethanol Content (quick check) or Custom Map P Result (older tunes)*

- a. Pump gas (not E85, E98, E100) mixtures from most gas stations around the world will usually always show some sort of ethanol content reading when plugged in and working correctly.
 - i. North America, South America (except Brazil), Europe, Middle East, Australia, China, Japan usually sees about 5-15% on pump gas.
 - ii. High altitude locations can see 0% during certain times of the year, such as in Colorado, USA.
 - iii. Brazil on average will be about 27% ethanol from the local pumps.
 - iv. South Africa will be usually 0% from the local pumps but there is a good supply of ethanol options for making more power.
- b. Ethanol gas (E85), can legally range between 51% and well into the 80% mark as mandated by the US Federal government at any pump in the US, any time of year.
 - i. Do not be surprised if you see E51% at one pump and E85% at another. It is completely possible and we have seen it.