

RAX Patch v3
(Ralliart/EvoX ROM Patches)

Document Revision 3

LIABILITY NOTICE

Incorrectly patched instructions can be extremely dangerous to your engine management, and can lead to severe engine damage.

You assume ALL responsibility for the integrity of your ECU and engine management, vehicle safety, etc. If you are not confident in the procedures/data involved in this patch, do not make *any change* to your vehicle ECU's ROM image.

SAFETY NOTICE

It is important to testing any engine management change in a safe and thorough manner.

Tests recommended in this document are a guideline only. You assume ALL responsibility for the testing approach taken when using ECU ROM patches.

COMPATIBILITY NOTICE

"RAX Patch v3" should be compatible with **TephraXMOD v1, v2 and v3**.

"RAX Fast Logging" is compatible with **EvoScan v2.9.0023** and later.

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RAX3 Patch - Overview

RAX Patch v3 contains the following patches:

1. IAT Adjusted BWGDC
2. SST Upshift Boost EC Management (**SST models only**)
3. Atmospheric Boost Baro Compensation
4. Smarter WGDC Error Correction
5. RAX Fast Logging (requires current version of EvoScan)

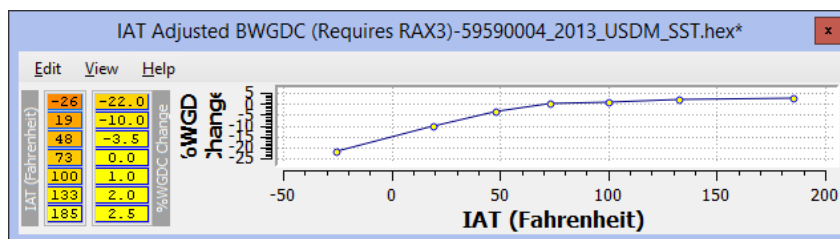
It is not necessary to apply all patches - any can be used in isolation.

RAX Patch details follow:

RAX3: IAT Adjusted BWGDC

This patch makes it possible to adjust your *Base Wastegate Duty Cycle* in line with *Intake Air Temperature*.

A new table becomes available in the *Turbo* category:



The adjustment factor is applied directly to the relevant *Reactive Solenoid Base WGDC Map* lookup value, *if that value is between 0% and 100%*.

A Base Wastegate value of 0% will always remain 0%, irrespective of IAT.

A Base Wastegate value of 100% will always remain 100%.

Note: By default, all USDM ROM patch files use Fahrenheit.

To switch EcuFlash's temperature scale between Fahrenheit and Celsius, edit the relevant RAX3 Patch xml file. Change the temperature scale text as required, between TempC and TempF.

RAX3: SST Upshift Boost EC Management

(SST models only)

This patch may be useful for reducing boost levels during SST upshifts at wide-open throttle. It will *limit* the positive error-correction factor when RPM is dropping.

This patch will be useful if:

1. "Reactive Solenoid Max Total Upward WGDC Correction vs. TPS" table is set up to allow upward/positive error correction, eg.

TPS (kPa)	WGDC Change
0	0.0
13	0.0
28	0.0
38	0.0
50	0.0
63	0.0
75	3.0
86	8.0
100	8.0

2. *Base WGDC* and *Target Boost* tables are set up in such a way as to *require* the use of some upward error correction in order to meet boost targets.

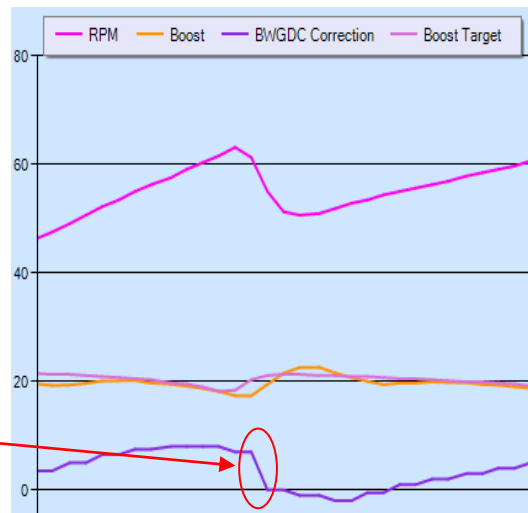
For example...

Say the ECU uses error-correction factor of +8% to meet boost targets, and retains this +8% EC factor to the point of upshift.

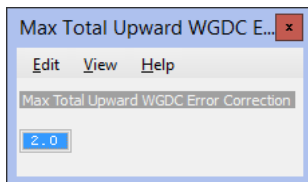
At WOT upshift, the patch will identify that RPM is dropping.

The patch will then *limit* the WGDC error correction to a specified maximum value, eg. 0%. This will occur early on in the upshift.

Without this patch, the ECU would carry full boost EC factor through the upshift.



With RAX3, it is now possible to *set* a particular “maximum positive error correction” value to enforce during SST upshifts:



The default setting is “0.0”. If desired, this can be set to any positive value. During SST upshifts, the patch will then simply *reduce* the upward error correction to the specified value.

Note 1: This patch checks RPM and error-correction factor *at each boost EC interval*.

Note 2: This patch will have no effect if upward error correction is *disabled*, or if the ECU does not *require* upward error correction in order to reach boost targets.

RAX3: Atmospheric Boost Baro Compensation

This patch makes it possible for the ECU to take BARO sensor readings into account when using *Direct (psi-based) Boost Control*.

Typically, psi-based boost targets have been adjusted for atmospheric pressure via a fixed value, usually named **Atmospheric Boost**.

With this patch enabled *and the **Atmospheric Boost** constant set to 0*, the ECU will adjust its psi-based boost targets using the BARO sensor reading. This enables the ECU to take into account atmospheric pressures at different altitudes.

Without the patch, boost targets will be set in terms of *absolute* pressure. The ECU will attempt to adjust BWGDC to reach the target pressure in absolute terms.

For example, with a fixed **Atmospheric Boost** value of **14.5 psi** and a boost target of 21.5 psi:

14.5 psi + 21.5 psi = 36 psi *absolute pressure*.

If atmospheric pressure is actually 12.5 psi, the ECU will target 23.5 psi *gauge* pressure.

With the patch operating, boost targets will be set in terms of *gauge* pressure, as the ECU will be able to utilise the BARO sensor in its calculations.

For example, with a **BARO** reading of **12.5 psi** and a boost target of 21.5 psi:

12.5 psi + 21.5 psi = 34 psi *absolute pressure*.

Here, the ECU will effectively target 21.5 psi *gauge* pressure.

This patch supports boost scalings typically used with the following MAP sensors:

1. Factory 3-Bar MAP sensor.
2. Omni 4-Bar MAP sensor.

Simply choose the appropriate setting when the patch is enabled, following the steps documented in the relevant section below.

RAX3: Smarter WGDC Error Correction

Background Information

The ECU's boost control *Error Correction* (EC) mechanism can be quite challenging to fine-tune. For example,

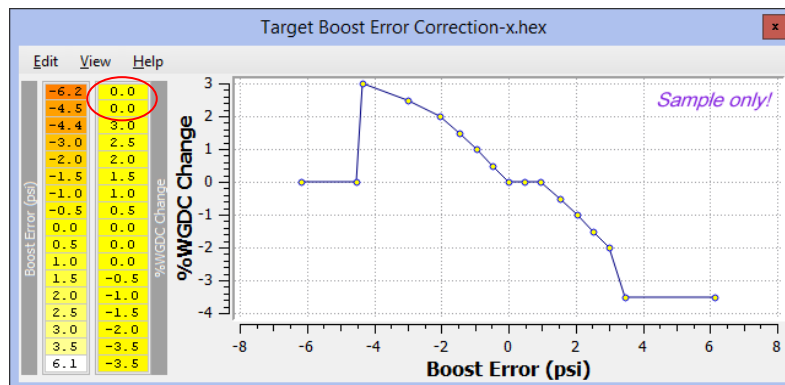
TPS (%)	%WGDC Change
0.0	0.0
12.5	0.0
25.1	0.0
37.6	0.0
50.2	0.0
62.7	0.0
75.3	3.5
85.5	7.0
100.0	7.0

If *positive* EC is allowed at full throttle, **unwanted upward error correction** can occur during spool-up phase.

As soon as full throttle is applied, the ECU will see that boost levels are below target, and will repeatedly apply large “upward EC” adjustments.

This is nonsensical, as *spool-up* boost level is not controlled or influenced by WGDC “fine-tuning”.

This has typically been addressed by either *disallowing* any positive error correction, or by *zeroing out* the first 2-3 cells of “upward EC” adjustment...



This approach is not without its side effects, such as “drive-by” upward EC adjustments by the ECU a moment before boost levels peak... because boost is seen to be a few psi “below target”. This may only occur sporadically, depending on the frequency and timing of the EC check interval.

In addition to the spool-up issue, the EC system is prone to *over-correcting*, should boost levels drop back from their initial peak. It is difficult to tune the tables to provide enough upward adjustment to *arrest* the boost level drop in a timely manner, but not apply so much upward adjustment as to overshoot the target once boost levels recover.

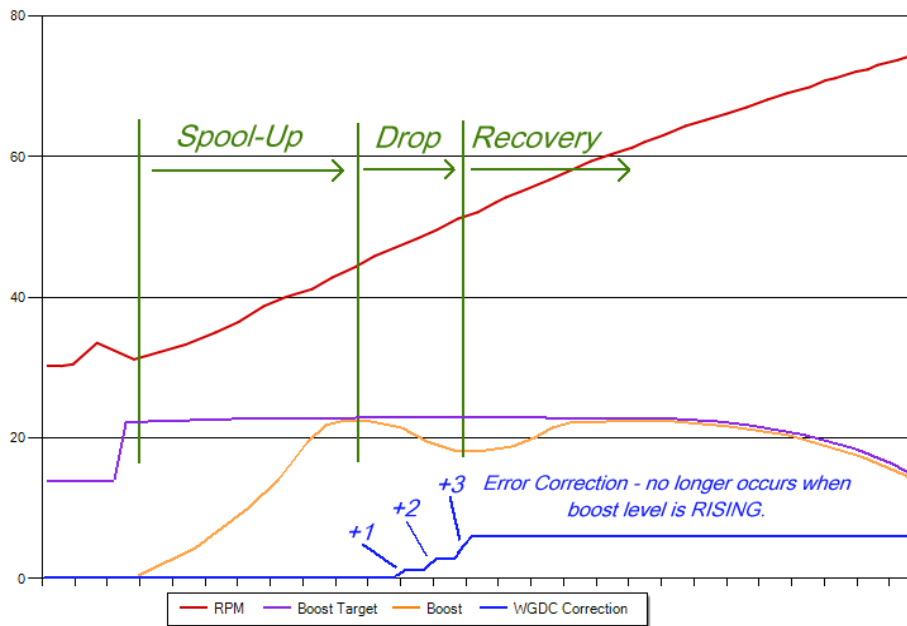
While tuners have developed workarounds to these issues, they have been working with an error correction system that applies upward EC adjustments irrespective of the *direction* boost level is moving.

RAX3 "Smarter EC" makes one simple revision to ECU boost Error Correction:

Upward Error Correction no longer occurs when Boost Levels are RISING

This makes it easier to tune *upward EC adjustment* to provide rapid, effective correction of below-target boost, without *overshooting* the target during the recovery phase.

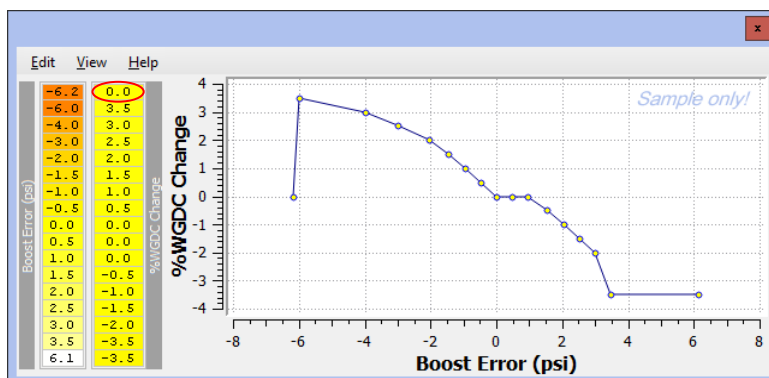
The following diagram shows how EC remains unchanged throughout the spool-up phase, and once boost begins to recover after the post-peak drop.... because *upward EC* no longer occurs when boost levels are *rising*:



Upward EC is *only* applied during the post-peak drop-off phase, when boost is below target AND boost is not rising.

As soon as boost begins rising again, no more upward EC adjustments occur.

This patch makes it possible to increase the adjustment range covered by **Target Boost Error Correction**. Note: the *top* item should still be zeroed:



RAX3: Fast Logging

This patch increases the bandwidth of “mode23” style ECU data-logging. It does so by packaging multiple data items together, so that a compatible client can process more than one data item per “read” operation.

RAX Fast Logging requires *EvoScan version 2.9.0023 or later*.

Special thanks to Hamish Ahern for developing the required enhancements to EvoScan!

The RAX Patch fileset comes with an **EvoScan XML definition file**. Please see the section under *Patch-Specific Settings* for instructions on how to install this extra file and set up EvoScan for use.

RAX Fast Logging covers 34 data items - see table on following page. “Regular” logging items can still be defined alongside RAX Fast Logging.

RAX Fast Logging should deliver logging speeds *four times faster* than traditional “mode23” logging, for the simple reason that EvoScan can now read four “packaged” data items in one operation.

By default, some EvoScan logging items are configured to perform their ECU read operations with different *priorities*. For example,

Load, TimingAdv, Knocksum and RPM will be logged every line.

Boost, MAF Volts and MIVEC items will be logged every other line.

Speed, TPS, fuel trims and Temperature items will be logged every three lines.

This increases the overall rate (ie. lines per second) by prioritising the most important (and fastest-changing) data.

The default EvoScan *priority* settings should deliver logging speed of **20 lines per second**.

If all the RAX “package” items are changed to have a *Priority 1* setting, every item will be read each cycle. This will deliver a slower logging speed of **12-13 lines per second**, but with all 34 data items being updated every line.

The table below lists the items supported by EvoScan via *RAX Fast Logging*, along with any range/resolution impact from the data-packaging process...

Logging Item (-----RAX_A_Dat-----)	Range	Resolution	Notes
STFT	Full range	Full resolution	
LTFT In Use	Full range	Full resolution	
LTFT idle	Full range	Full resolution	
LTFT Cruise	Full range	Full resolution	
Logging Item (-----RAX_B_Dat-----)	Range	Resolution	Notes
Load	Full range (398)	1.5625	
IPW	0 to 25.5ms	0.1ms	
Air/Fuel Ratio (Map)	Full range	Full resolution	AFRMAP
Rear O2	0V to 5V	0.01952V	Useful for WBO2 installs.
Logging Item (-----RAX_C_Dat-----)	Range	Resolution	Notes
LoadTiming	Full range (398)	1.5625	
TimingAdv	-20 to 107 deg	1 deg	
Knock Sum	Full range (63)	1	
RPM	Full range	0.78125rpm	
Logging Item (-----RAX_D_Dat-----)	Range	Resolution	Notes
Baro	6.52 to 15.7 psi	0.0725 psi	
MAP	0 to 50 PSIA	0.0965 psi	
Boost		0.0965 psi	Logged as "[MAP]-[Baro]"
Active WGDC	Full range	Full resolution	
MAF Volts	0 to 5V	0.0196V	
Logging Item (-----RAX_E_Dat-----)	Range	Resolution	Notes
InVVT (target)	-2.5 to 37.5 deg	0.15625 deg	
InVVT (actual)	-2.5 to 37.5 deg	0.15625 deg	
ExVVT (target)	-37.5 to 2.5 deg	0.15625 deg	
ExVVT (actual)	-37.5 to 2.5 deg	0.15625 deg	
Logging Item (-----RAX_F_Dat-----)	Range	Resolution	Notes
TPS	Full range	Full resolution	
Accel Pedal Position	Full range	Full resolution	
Intake Air Temp	Full range	Full resolution	
WGDC Correction	Full range	Full resolution	
Logging Item (-----RAX_G_Dat-----)	Range	Resolution	Notes
Speed	Full range	Full resolution	
Battery Level	Full range	Full resolution	
Coolant Temp	Full range	Full resolution	
Manifold Air Temp	Full range	Full resolution	
Logging Item (-----RAX_H_Dat-----)	Range	Resolution	Notes
MAPCalcs	Full range (398)	1.5625	MAP-based load calc
IMAPCalcs	Full range (398)	1.5625	Interpolated MAPCalcs
MAFCalcs	Full range (398)	1.5625	MAF-based load calc
ChosenCalc	Full range (398)	1.5625	Chosen (middle of three)
Logging Item	Range	Resolution	Notes
IDC	-	-	Calculated from IPW/RPM
External Wideband A/F Ratio	-	-	Standard EvoScan Serial

It should be noted that each "group" of items will be created in a single cycle by the ECU, and retrieved in a single "mode23 read" by EvoScan.

For example, the set of *LoadTiming*, *RPM*, *Knock Sum* and *TimingAdv* will all reflect the engine management state at the same ECU cycle.

RAX V3 ROM Compatibility

EVO X SST

ROM ID	Base XML (http://evo.ripnet.us/)	RAX Patch XML
52370024	52370024.xml	52370024 RAX3 Patch.xml
52370028	52370028.xml	52370028 RAX3 Patch.xml
52690002	52690002.xml	52690002 RAX3 Patch.xml
52690019 52690021 52690022	52690021.xml	52690021 RAX3 Patch.xml
53050006 53050007	53050006.xml	53050006 RAX3 Patch.xml
53050009	53050009.xml	53050009 RAX3 Patch.xml
53050012	53050012.xml	53050012 RAX3 Patch.xml
54070007	54070007.xml	54070007 RAX3 Patch.xml
55580005 55580006	55580005.xml	55580005 RAX3 Patch.xml
56880009	56880009.xml	56880009 RAX3 Patch.xml
56900007	56900007.xml	56900007 RAX3 Patch.xml
56900009 56900010	56900009.xml	56900009 RAX3 Patch.xml
56900014	56900014.xml	56900014 RAX3 Patch.xml
56920006	56920006.xml	56920006 RAX3 Patch.xml
56920008	56920008.xml	56920008 RAX3 Patch.xml
57140001	57140001.xml	57140001 RAX3 Patch.xml
57140003	57140003.xml	57140003 RAX3 Patch.xml
58020005	58020005.xml	58020005 RAX3 Patch.xml
59590004	59590004.xml	59590004 RAX3 Patch.xml
59590005	59590005.xml	59590005 RAX3 Patch.xml

EVO X 5-SPEED

ROM ID	Base XML (http://evo.ripnet.us/)	RAX Patch XML
50845084	50845084.xml	50845084 RAX3 Patch.xml
52360018	52360018.xml	52360018 RAX3 Patch.xml
52680002	52680002.xml	52680002 RAX3 Patch.xml
52680015 52680016 52680017 52680018 52680019 52680020 52680022	52680015.xml	52680015 RAX3 Patch.xml
52680024	52680024.xml	52680024 RAX3 Patch.xml
53040010	53040010.xml	53040010 RAX3 Patch.xml
54060007 54060008	54060007.xml	54060007 RAX3 Patch.xml
55570005 55570006	55570005.xml	55570005 RAX3 Patch.xml
56180001 56180002	56180001.xml	56180001 RAX3 Patch.xml
56870008	56870008.xml	56870008 RAX3 Patch.xml
56890007	56890007.xml	56890007 RAX3 Patch.xml
56890009 56890010	56890009.xml	56890009 RAX3 Patch.xml
56890013	56890013.xml	56890013 RAX3 Patch.xml
56910007	56910007.xml	56910007 RAX3 Patch.xml
56910009	56910009.xml	56910009 RAX3 Patch.xml
58010005	58010005.xml	58010005 RAX3 Patch.xml
59580004	59580004.xml	59580004 RAX3 Patch.xml
59580006	59580006.xml	59580006 RAX3 Patch.xml

RALLIART LANCER

ROM ID	Base XML (http://evo.ripnet.us/)	RAX Patch XML
53500015	53500015.xml	53500015 RAX3 Patch.xml
53590012	53590012.xml	53590012 RAX3 Patch.xml
53590015	53590015.xml	53590015 RAX3 Patch.xml
53600008 53600009 53600010	53600009.xml	53600009 RAX3 Patch.xml
53610009 53610010	53610010.xml	53610010 RAX3 Patch.xml
53610012 53610013	53610013.xml	53610013 RAX3 Patch.xml
55590006 55590007	55590006.xml	55590006 RAX3 Patch.xml
56940007	56940007.xml	56940007 RAX3 Patch.xml
56940014	56940014.xml	56940014 RAX3 Patch.xml
56950006	56950006.xml	56950006 RAX3 Patch.xml
56950008	56950008.xml	56950008 RAX3 Patch.xml
58030005	58030005.xml	58030005 RAX3 Patch.xml
58640002	58640002.xml	58640002 RAX3 Patch.xml
59570004	59570004.xml	59570004 RAX3 Patch.xml

Instructions for First Use

1. Uninstall any old RAX/RAX2 patches from your vehicle ROM.

RAX3 Patch contains differences in patch data and/or patch location, compared to older RAX Patch versions.

If you wish to use RAX3 Patch on a ROM currently using an older version of RAX, it is necessary to first *uninstall* any old RAX Patch code/data from your ROM.

Do this before downloading and installing RAX3 Patch.

2. Move aside any old RAX/RAX2 files in your EcuFlash folder.

If you have used an older version of RAX Patch...

Go to your EcuFlash XML folder for mitsubishi, eg.

```
C:\Program Files\OpenECU\EcuFlash\rommetadata\mitsubishi
```

Find any and all *old* RAX related files. In Windows' File Explorer, hit *CTRL-F*, and enter *RAX* as the search string.

Move ALL these old RAX files to an entirely separate "backup" folder, outside the EcuFlash folder tree... where EcuFlash can't find them!

3. Download the new RAX3 Patch XML files.

4. Copy your ROM's XML file into place in your car's EcuFlash folder.

eg.

```
C:\Program Files\OpenECU\EcuFlash\rommetadata\mitsubishi\evo
```

or

```
C:\Program Files\OpenECU\EcuFlash\rommetadata\mitsubishi\lancer
```

...depending on vehicle model.

5. Edit your *Base XML* file, to *<include>* the RAX XML file.

If required, download latest definition file(s) from www.goldenevo.com

See *ROM Compatibility* section for notes on ROMs and related XML file names.

For example...

If your ROM ID is **52690022**, your Base XML file should be "**52690021**.xml".

Edit *that* existing ROM definition file, "**52690021**.xml". Add the line highlighted in red, referencing the related RAX Patch XML...

```
<rom>
  <romid>
    <xmlid>52690021</xmlid>
    <internalidaddress>5002a</internalidaddress>
    <internalidhex>52690021</internalidhex>
    <make>Mitsubishi</make>
    <market>USDM</market>
    <model>Lancer</model>
    <submodel>Evolution X</submodel>
    <transmission>SST</transmission>
    <year>2008</year>
    <flashmethod>mitsucan</flashmethod>
    <memmodel>M32186F8</memmodel>
    <checksummodule>mitsucan</checksummodule>
  </romid>

  <include>RAX52690021</include>
```

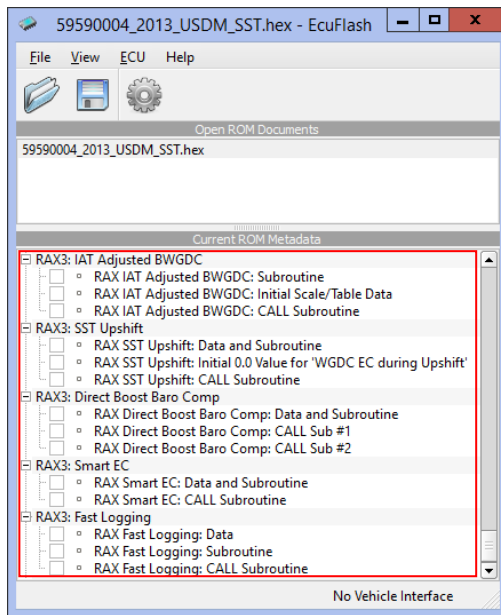
The underlined numbers should match.

This tells EcuFlash to load the *RAX Patch XML* when it loads definitions from the *Base XML*.

Save the change, and exit.

6. Load your ROM into EcuFlash.

The ROM should load without error, and you should see new items in the *Current ROM Metadata* panel:

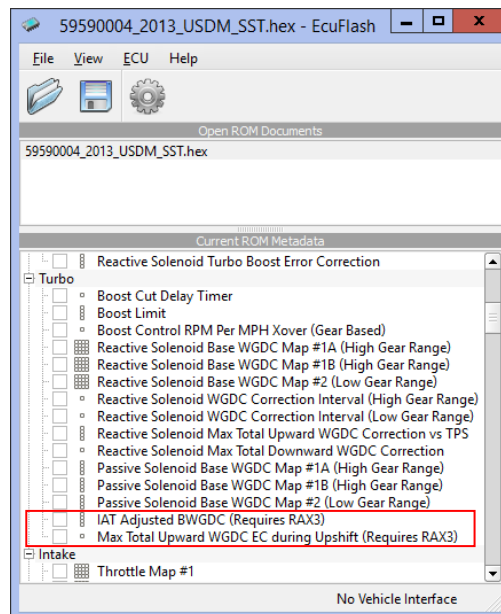


These items allow you to apply RAX3 Patches to the ROM.

If these new items are NOT present, check your XML file installation...

- Verify there is only ONE base XML file for your ROM, under the Ecuflash "rommetadata/mitsubishi" folder.
- Make sure that the base XML file has the correct extra <include> line added.
- Make sure that the RAX3 XML file had been copied into the correct EcuFlash folder.

Additionally, a new table item or two should be present under the *Turbo* category:



Such tables will not contain meaningful data until AFTER the relevant RAX Patch has been applied to the ROM. Once the patch is applied, it will contain initial (starter) data.

Note the comments in "Section 6" regarding (no match) status of some patch items. This occurs after table edits have been applied.

7. Applying RAX Patch to a Compatible ROM

WARNING: ROM-related faults can be extremely dangerous to your engine management, and can lead to severe engine damage. You assume ALL responsibility for the integrity of your ROM, ECU, engine management, vehicle safety, etc. If you are not confident in the procedures/data involved in this patch, do not make *any change* to your vehicle ROM.

Important notes:

- **NEVER** attempt to apply RAX Patch data to a ROM with an ID not listed in the *ROM Compatibility* section.
- All patch items are set up to check "unpatched" and "patched" data in the ROM. If the ROM contains unexpected data at the patch item address, EcuFlash will display:

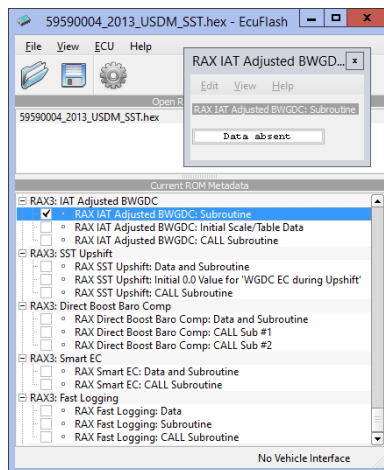
(no match)

If this is displayed when attempting to apply the patch, DO NOT PROCEED.

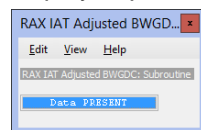
Note: Some patch data includes *default Scale/Table* configuration. If you subsequently edit these tables, the original patch item will then display **(no match)**. In this situation, such a status display is NOT indicative of a problem. It occurs because the default table data supplied with the patch no longer matches the data in the ROM.

To enable "RAX3 Patch", open the ROM image file in EcuFlash.

1. In the "Current ROM Metadata" panel, select the check-box of the first "RAX3:" patch item. A window will appear, showing that item's *patch state*, eg.



2. Under the window's topbar menu *Edit* heading, choose *Increment*. The item's displayed *patch state* should change, eg.



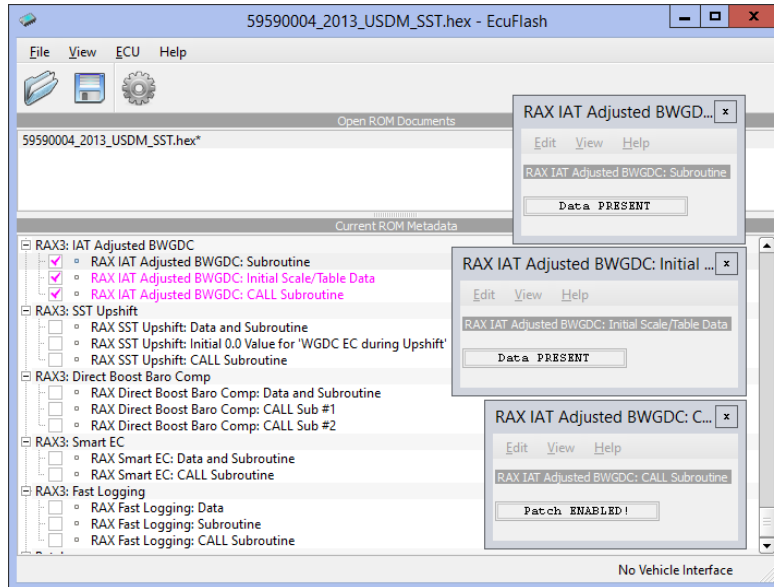
Repeat this process for each RAX Patch item.

Once all "Patch" items have been set up, save the ROM under a new name.

8. Patch-Specific Settings

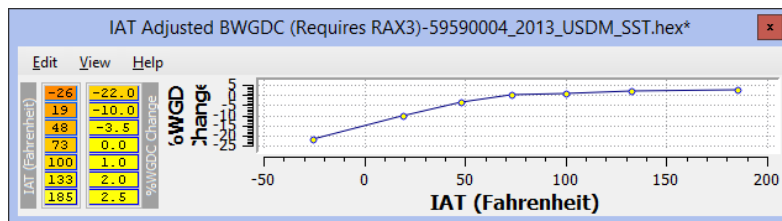
RAX3: IAT Adjusted BWGDC

To enable, set all patch items as follows:



Additionally, under the *Turbo* heading, review the new data item,

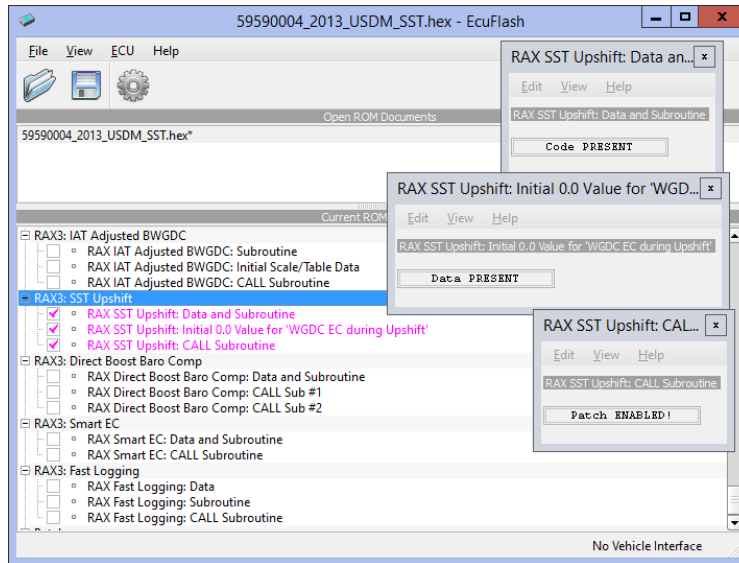
IAT Adjusted BWGDC (Requires RAX3):



Modify the default values to match your required BWGDC adjustments for summer and winter conditions, taking into account your particular boost control setup (eg. 2-port solenoid, 3-port solenoid, wastegate actuator, etc.).

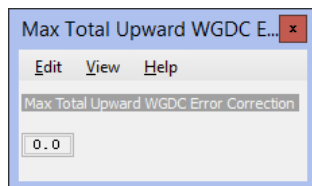
RAX3: SST Upshift Boost Management

To enable, set all patch items as follows:



Additionally, under the *Turbo* heading, review the new data item,

Max Total Upward WGDC EC during Upshift (Requires RAX3):



The default 0.0 value will simply zero out any positive Error Correction when WOT upshifts occur.

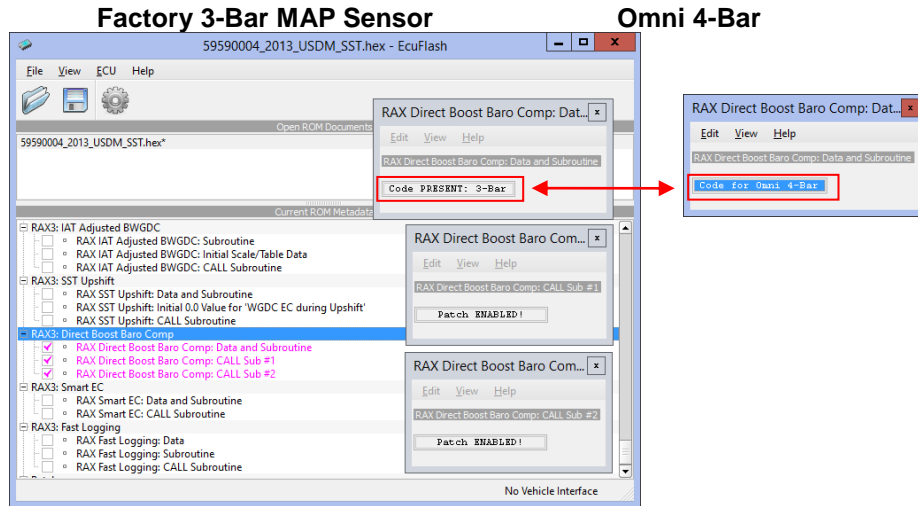
This value can be changed to a suitable *non-negative* value. It specifies the *maximum positive Error Correction percentage* permitted during WOT upshift.

RAX3: Atmospheric Boost Baro Compensation

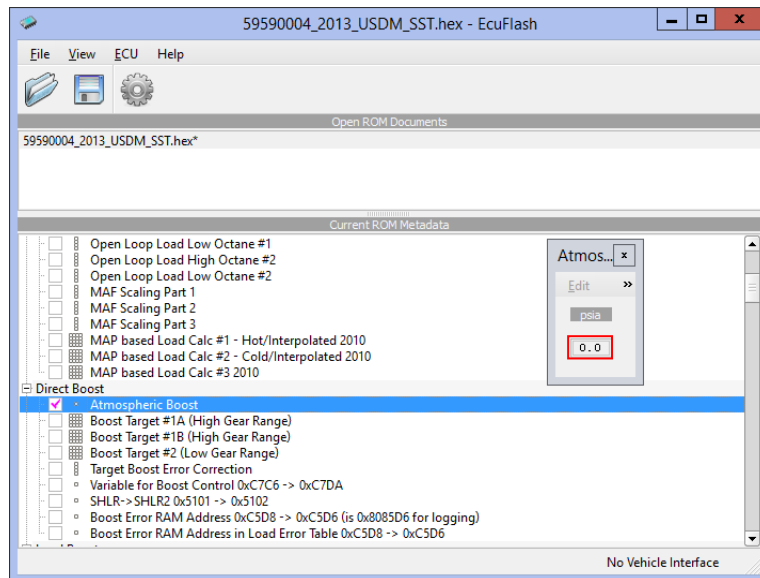
NOTE: This patch is *only* relevant when **Direct (psi-based) boost control** is in use. It is *not* useful for factory-style **load-based** boost control.

Two modes are available, depending on the type of MAP sensor installed (factory *3-Bar MAP sensor* vs. aftermarket *Omni 4-Bar MAP sensor*).

To enable, set all patch items as follows:

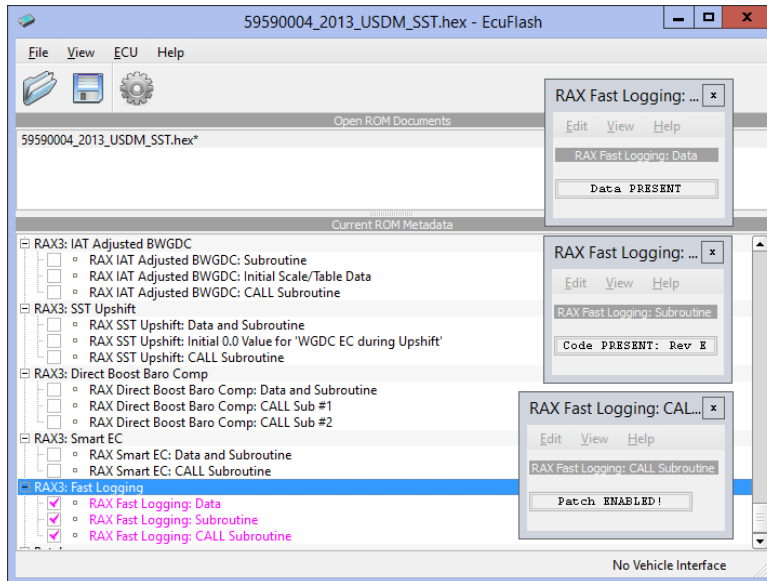


Additionally, under the *Direct Boost* heading, set **Atmospheric Boost** to 0:



RAX3: Fast Logging

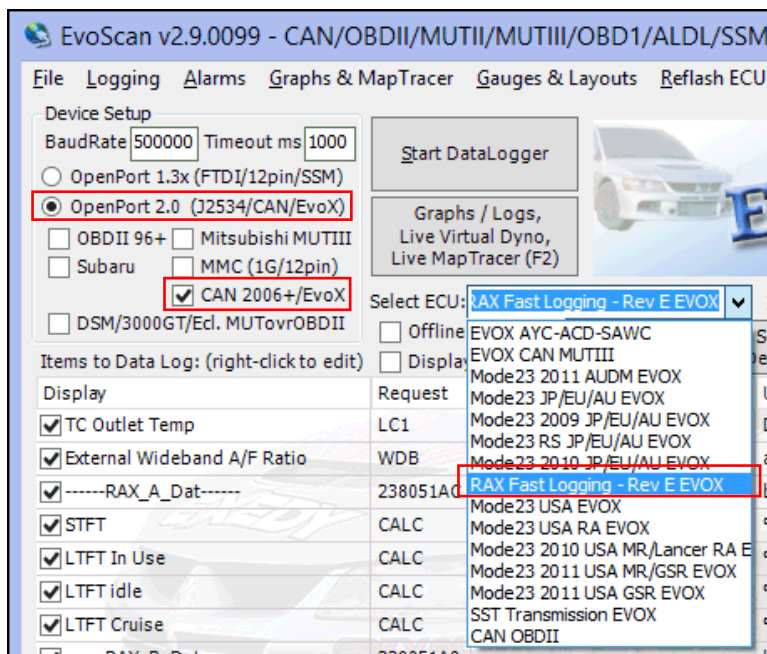
To enable in the ROM, set all EcuFlash patch items as follows:



Start EvoScan. Ensure the following are selected:

- OpenPort 2.0 (J2534/CAN/EvoX)
- CAN 2006+/EvoX

Under *Select ECU*, choose the **RAX Fast Logging** option:



If your version does not have this option, please upgrade it to 2.9.0023 or later.

Under *Items to Data Log*, tick every item from top to bottom (including the “External Wideband A/F Ratio” item, if you use a serial link wideband):

The screenshot shows the EvoScan software interface. The 'Items to Data Log' section is highlighted with a red box, indicating that all items from 'TC Outlet Temp' to 'InVVT (actual)' are selected. The interface also shows the 'Actuators' section with 'EvoX FuelTrims Reset' selected and the 'Diagnostic Trouble Code / Check Engine Light' section with 'CAN MUTIII EFI (Mitsu 2007+ i.e. EvoX)' selected.

Display	Request	Function	Reading	Units
<input checked="" type="checkbox"/> TC Outlet Temp	LC1	x*1.06842619		Deg C
<input checked="" type="checkbox"/> External Wideband A/F Ratio	WDB	x		a/f ratio
<input checked="" type="checkbox"/> -----RAX_A_Dat-----	238051AC	x		binary
<input checked="" type="checkbox"/> STFT	CALC	([RAX_A_Dat]BI...		%
<input checked="" type="checkbox"/> LTFT In Use	CALC	([RAX_A_Dat]BI...		%
<input checked="" type="checkbox"/> LTFT idle	CALC	([RAX_A_Dat]BI...		%
<input checked="" type="checkbox"/> LTFT Cruise	CALC	([RAX_A_Dat]BI...		%
<input checked="" type="checkbox"/> -----RAX_B_Dat-----	238051A8	x		binary
<input checked="" type="checkbox"/> Load	CALC	[RAX_B_Dat]BI...		unit
<input checked="" type="checkbox"/> Rear O2	CALC	[RAX_B_Dat]BI...		AFR
<input checked="" type="checkbox"/> IPW	CALC	[RAX_B_Dat]BI...		ms
<input checked="" type="checkbox"/> Air/Fuel Ratio (Map)	CALC	14.7*128/[RAX_...		a/f ratio
<input checked="" type="checkbox"/> -----RAX_C_Dat-----	238051B0	x		binary
<input checked="" type="checkbox"/> LoadTiming	CALC	[RAX_C_Dat]BI...		unit
<input checked="" type="checkbox"/> TimingAdv	CALC	[RAX_C_Dat]BI...		degrees
<input checked="" type="checkbox"/> Knock Sum	CALC	[RAX_C_Dat]BI...		knocksum
<input checked="" type="checkbox"/> RPM	CALC	[RAX_C_Dat]BI...		rpm
<input checked="" type="checkbox"/> MAP	CALC	[RAX_D_Dat]BI...		PSIG
<input checked="" type="checkbox"/> -----RAX_D_Dat-----	238051B4	x		binary
<input checked="" type="checkbox"/> Baro	CALC	([RAX_D_Dat]BI...		PSI
<input checked="" type="checkbox"/> Boost	CALC	[MAP]-[Baro]		PSIG
<input type="checkbox"/> Boost Target	23808B69	x*0.19347		unit
<input checked="" type="checkbox"/> Active WGDC	CALC	[RAX_D_Dat]BI...		percent
<input checked="" type="checkbox"/> MAF Volts	CALC	[RAX_D_Dat]BI...		V
<input checked="" type="checkbox"/> IDC	CALC	[IPW]*[RPM]/1...		percent
<input checked="" type="checkbox"/> -----RAX_E_Dat-----	238051B8	x		binary
<input checked="" type="checkbox"/> InVVT (target)	CALC	0.15625*([RAX_...		Deg
<input checked="" type="checkbox"/> ExVVT (target)	CALC	0.15625*(16-[R...		Deg
<input checked="" type="checkbox"/> InVVT (actual)	CALC	0.15625*([RAX_...		Deg

Once the modified ROM has been flashed to the ECU, EvoScan should process and log data from RAX Patch.

Testing Notes

DO NOT PERFORM FULL-THROTTLE TESTING UNTIL YOU HAVE VERIFIED CORRECT ECU OPERATION IN PART-THROTTLE TESTS

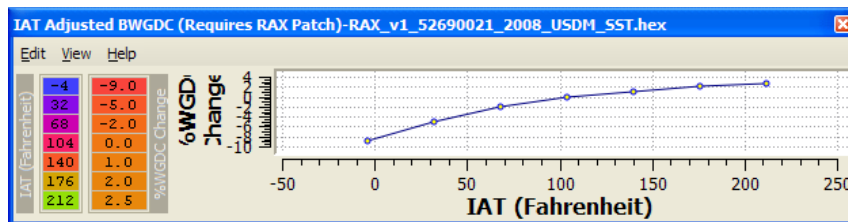
Testing of RAX3: IAT Adjusted BWGDC

To verify correct operation of this patch, use only enough throttle to enter *non-zero* WGDC areas of the 3D **Reactive Solenoid Base WGDC Map**.

Log the following additional item:

Display: **RAX3 IAT Adjust**
Log Reference: **RAX3_IAT_Adjust**
EvoScan RequestID: **23805180**
ResponseBytes: **2**
Eval: **(x-128)/2**
Unit: **percent**

This logging item should show the BWGDC adjustment applied from the new table, based on measured IAT...



Important Notes:

The patch will *not* operate at all until engine coolant temperature exceeds 50 degrees Celsius, due to the entire ECU boost control system being on “bypass” when the engine is cold. Diagnostic data will only be output once ECT has warmed up sufficiently.

The patch will *not* operate if **BWGDC** is 0% or 100%. For these special cases, the patch bypasses any adjustment, and logs a *zero value* to **RAX3 IAT Adjust**.

DO NOT PERFORM FULL-THROTTLE TESTING UNTIL YOU HAVE VERIFIED CORRECT ECU OPERATION IN PART-THROTTLE TESTS

Testing of RAX3: SST Upshift Boost EC Management

(SST models only)

Perform light-throttle driving while logging the following additional items:

Display: **RAX3 Last RPM**
Log Reference: **RAX3_Last_RPM**
EvoScan RequestID: **23805182**
ResponseBytes: **2**
Eval: **x*3.90625**
Unit: **rpm**

Display: **RAX3 Delta RPM**
Log Reference: **RAX3_Delta_RPM**
EvoScan RequestID: **23805184**
ResponseBytes: **1** (Note: 1-byte logging at an "even" address is intentional)
Eval: **x**
Unit: **value**

The "**RAX3 Last RPM**" value is used by the patch to track RPM. This should report the same (or similar) values as the typical RPM logging item.

The "**RAX3 Delta RPM**" should report a value of 0 if RPM is rising/static, and 255 if RPM is falling.

If both of these values are as described, the patch is operating as expected. It should limit *positive* boost error correction when RPM is falling.

Once you have verified the above, perform a *brief* full-throttle upshift test.

Review results. Verify that **WGDC Correction** is "capped" during upshift.

DO NOT PERFORM FULL-THROTTLE TESTING UNTIL YOU HAVE VERIFIED CORRECT ECU OPERATION IN PART-THROTTLE TESTS

Testing of RAX3: Atmospheric Boost Baro Compensation

Log the following additional item while idling the vehicle (or simply with the ignition switched on for a moment):

*For **Factory 3-Bar MAP sensor mode:***

Log Reference:	AtmosBoostBase
EvoScan RequestID:	238051a0
ResponseBytes:	2
Eval:	x*0.19347
Unit:	psi

*For **Omni 4-Bar MAP sensor mode:***

Log Reference:	OmniBoostBase
EvoScan RequestID:	238051a0
ResponseBytes:	2
Eval:	x*0.2343
Unit:	psi

This item will show the **Atmospheric Boost** value being used to offset the **Boost Target** map values.

When reviewing logs, you should see a steady value in **Atmos Boost Base** that corresponds to the expected atmospheric pressure at your altitude. For example, 14.5psi at lower altitudes. This value will be taken from the BARO SENSOR reading.

Note: If the **Atmospheric Boost** value is configured with a *non-zero* value, the patch will *bypass* all use of dynamic BARO SENSOR readings. In this case, the ECU will fall back on the fixed value offset for **Boost Target** map values; the patch will be disabled.

DO NOT PERFORM FULL-THROTTLE TESTING UNTIL YOU HAVE VERIFIED CORRECT ECU OPERATION IN PART-THROTTLE TESTS

Testing of RAX3: Smarter WGDC Error Correction

Perform light-throttle driving while logging the following additional items:

Display: **RAX3 Last PSIA**
Log Reference: **RAX3_Last_Psia**
EvoScan RequestID: **238051a4**
ResponseBytes: **2**
Eval: **x*0.04883**
Unit: **psi**

Display: **RAX3 Delta PSIA**
Log Reference: **RAX3_Delta_Psia**
EvoScan RequestID: **238051a6**
ResponseBytes: **1** (Note: 1-byte logging at an "even" address is intentional)
Eval: **x**
Unit: **value**

The "**RAX3 Last PSIA**" value is used by the patch to track Manifold Absolute Pressure. This should report the same (or similar) values as the typical MAP logging item.

The "**RAX3 Delta PSIA**" should report a value of 0 if MAP is rising/static, and 255 if MAP is falling.

If both of these values are as described, the patch is operating as expected. It should avoid applying any *upward* Error Correction when boost is rising.

Once you have verified the above, perform a *brief* full-throttle upshift test.

Review results. Verify that **WGDC Correction** never increases when boost is rising.

Note: Please refer back to prior sections of this document, covering suggested table edits that could help to achieve more precise boost control using this patch.