

RAX Patch v2

(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 v2" should be compatible with **TephraXMOD v1** (map switching, KnockCEL feature).

SOURCE AVAILABILITY

Patch source is available on request for any ROM version of "RAX Patch v2".

RAX Patch v2 - Contents

RAX Patch v2 contains the following patches:

1. IAT Adjusted BWGDC
2. SST Upshift Boost EC Management (SST models only)
3. Atmospheric Boost Baro Comp

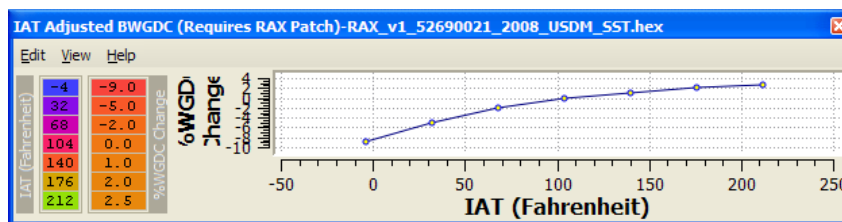
It is not necessary to apply all patches - any can be used in isolation.

RAX Patch details follow:

RAX2: 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: To switch temperature scale between Fahrenheit and Celsius, edit the relevant "... RAX Patch.xml" file. Rename the temperature scale text as required.

RAX2: 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 *zero out* any *positive* error-correction factor when RPM is dropping.

This patch will be of use if:

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

TPS (WOT)	WGDC Change
0	0.0
13	0.0
26	0.0
38	0.0
50	0.0
69	0.0
75	3.0
81	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 upward error correction in order to meet boost targets.

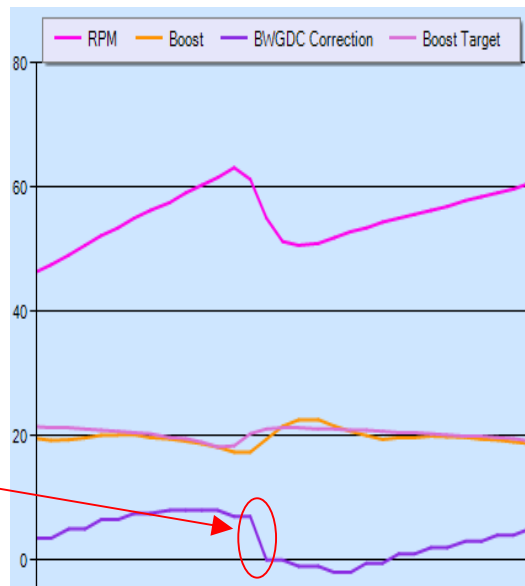
For example...

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 (a) RPM is dropping, and (b) there is **positive BWGDC Correction** in play.

The patch will then *zero out* that error correction, resulting in an instant 8% reduction of WGDC. This will occur early on in the upshift.

Without this patch, the ECU will simply carry boost EC factor through the upshift.



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.

RAX2: Atmospheric Boost Baro Comp

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.

RAX Patch v2

ROM Compatibility

EVO X SST

t.b.a.

EVO X 5-SPEED

ROM ID	Base XML (www.goldenevo.com)	RAX Patch XML
52680015	52680015.xml	52680015 RAX2 Patch.xml
52680016		
52680017		
52680018		
52680019		
52680020		
52680022		
52680024	52680024.xml	52680024 RAX2 Patch.xml
53040010	53040010.xml	53040010 RAX2 Patch.xml
54060007	54060007.xml	54060007 RAX2 Patch.xml
54060008		
55570005	55570005.xml	55570005 RAX2 Patch.xml
55570006		
56890009	56890009.xml	56890009 RAX2 Patch.xml
56890010		
56910007	56910007.xml	56910007 RAX2 Patch.xml

RALLIART LANCER

t.b.a.

RAX Patch v2

Instructions for First Use

1. **Download the RAX2 Patch XML file.**
2. **Copy the new XML file into place in your EcuFlash directory.**

e.g.

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

or

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

...depending on your vehicle (Evo X / Ralliart Lancer).

3. **Edit your *Base XML* file, to *<include>* the *new 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>
    <xmliid>52690021</xmliid>
    <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>
```

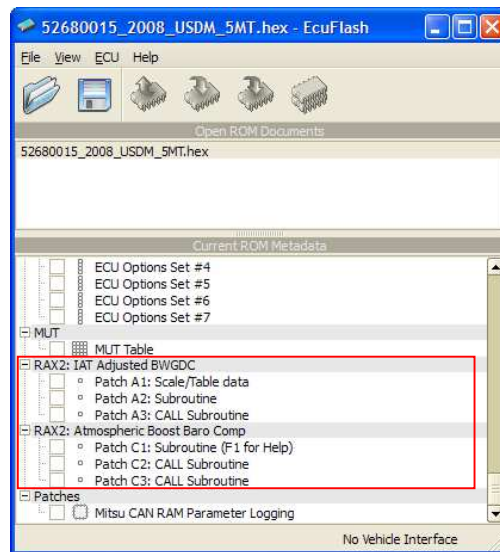
The underlined numbers should match.

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

Save the change, and exit.

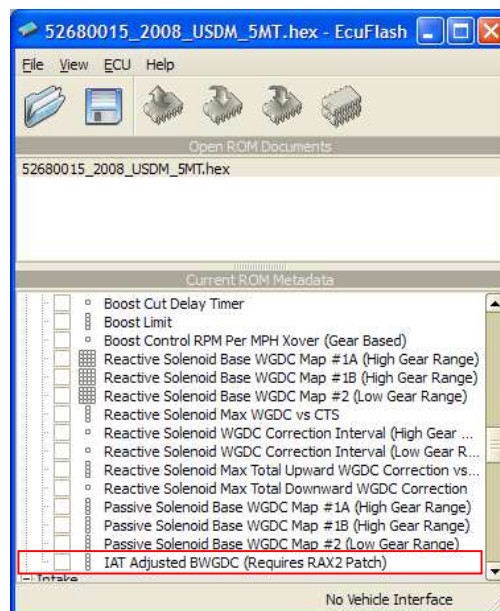
4. Load your ROM into EcuFlash.

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



These items allow you to apply RAX2 Patch to the ROM.

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



This table will not contain meaningful data until after RAX Patch has been applied to the ROM. Once the patch is applied, it will contain default (starter) IAT Adjusted BWGDC data.

If these new items are not present, check your XML file installation. Also, review the *ROM Compatibility* section to verify that your ROM is supported.

5. 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:

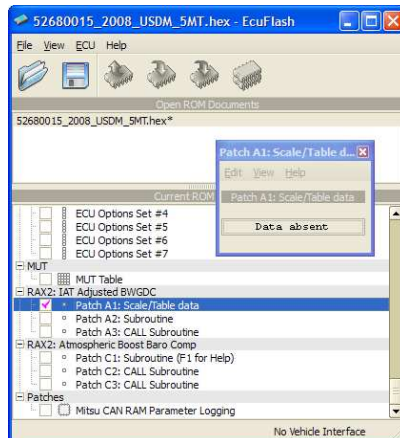
(no match)

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 "RAX2 Patch", open the ROM image file in EcuFlash.

1. In the "Current ROM Metadata" panel, select the check-box of the first "RAX2:" 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.



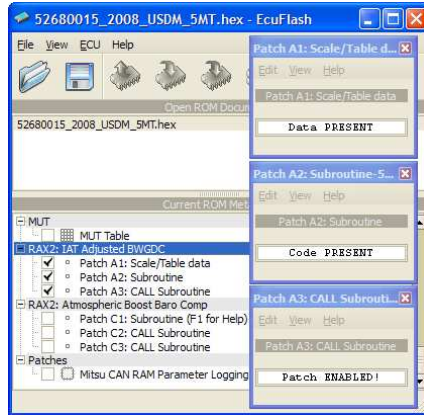
Repeat this process for each RAX Patch item.

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

6. Patch-Specific Settings

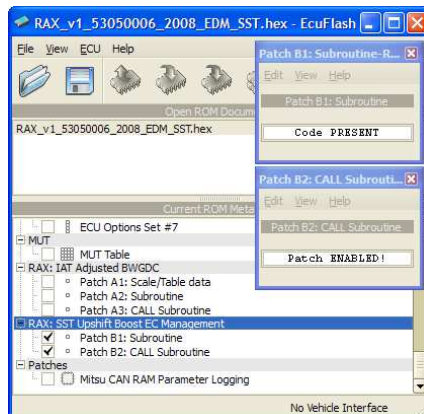
RAX2: IAT Adjusted BWGDC

To enable, set all patch items as follows:



SST Upshift Boost Management

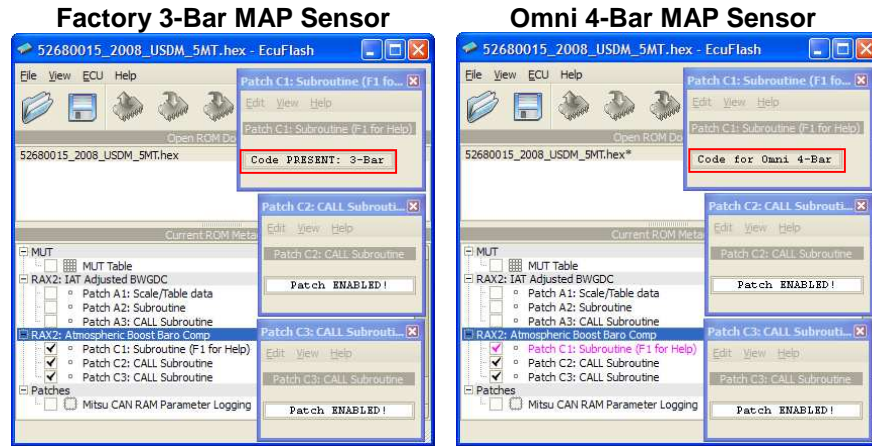
To enable, set all patch items as follows:



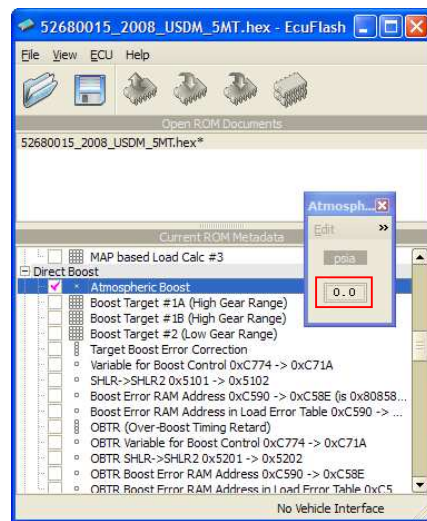
Atmospheric Boost Baro Compensation

There are two modes available. The mode used depends 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:



RAX Patch v2

Testing Notes

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

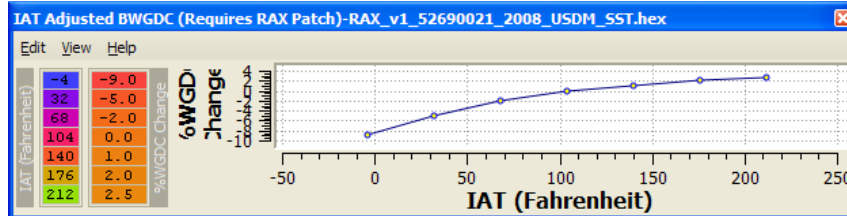
Testing of "RAX2: IAT Adjusted BWGDC"

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: **BWGDC IAT Adjust**
Log Reference: **BWGDC_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 Note:

The patch will *not* adjust a **BWGDC** of 0% or 100%.

For these special cases, the patch bypasses any adjustment, and logs a *zero value* to **BWGDC IAT Adjust**.

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

Testing of "RAX2: SST Upshift Boost EC Management"
(SST models only)

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

Display: **Upshift RPM Tracking**
Log Reference: **RPM_Tracking**
EvoScan RequestID: **23805182**
ResponseBytes: **2**
Eval: **x*31.25**
Unit: **rpm**

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

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

The "**RPM Delta Direction**" 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 zero out any *positive* boost error correction when RPM is falling.

Once you have verified the above, perform a *brief* full-throttle upshift test while logging the following additional item:

Display: **WGDC Correction**
Log Reference: **WGDC**
EvoScan RequestID: *See table below*
ResponseBytes: **1**
Eval: **(x-128)/2**
Unit: **percent**

ROM ID	EvoScan Request ID
52690019, 52690021, 52690022	808b51
53050006, 53050007	808b49
53050009	808b49
54070007	808b59
55580005, 55580006	808b6b
56900007	808b8f
56900009, 56900010	808b9b
56920006	808b8f

Review results. Verify that any *positive* **WGDC Correction** is reset to zero on upshift.

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

Testing of "RAX2: Atmospheric Boost Baro Comp"

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. Effectively, this will disable the patch.