

COBB®

ACCESS**TUNER**
BMW N54



Table Descriptions and Tuning Tips

V4.02

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Getting to know BMW

Here we will go over a few of the basic details and terminology that are specific to BMW before we begin tuning on our COBB Accessport-equipped BMW N54.

M.A.P. Based – The N54 is a M.A.P. Based system.

DME – The DME (Digital Motor Electronics) is BMW's term for what is commonly known as the “ECU” or “ECM”.

Bank 1 / Bank 2 – BMW uses this terminology to describe the front three and rear three cylinders. Bank 1 being the front three cylinders and Bank 2 being the rear three cylinders.

Closed-Loop Operation – BMW's DME operates in a constant closed-loop state, constantly utilizing the A/F values in its tables and making adjustments via its equipped wide-band O2 sensors.

Boost Control – The BMW DME does not target boost but rather engine load. Engine load is calculated based on pedal position, air flow/boost and RPM.

Tuning Guide

This tuning guide is broken into the basic components of tuning the BMW N54 and the tables associated with each of these components. For each major tuning category, the guide outlines basic tuning strategies and defines tables within this category (for example: Boost Control, Fueling, and Ignition Timing).

Step 1 – What is the mechanical configuration of the vehicle?

The first step in tuning a BMW N54 is to choose a COBB Tuning base map that best matches the components of the vehicle to be tuned.

The **Stage1** calibrations are designed for vehicles with a stock or axle-back exhaust system. The Stage1 COBB mapping was designed with optimized ignition, boost, and fuel targets for enhanced performance and responsiveness on a vehicle with mainly stock hardware.

The **Stage1+FMIC** calibrations are designed for vehicles equipped with upgraded FMIC with a stock or axle-back exhaust system. The Stage1+FMIC COBB mapping was designed with optimized ignition, boost, and fuel targets for enhanced performance and responsiveness on vehicles with upgraded FMIC hardware.

The **Stage2** mapping is designed for vehicles equipped with high flow down pipes. Additional performance can be obtained by fitting a cat back exhaust which replaces the restrictive factory mufflers as well as an upgraded intake system (DCI, Panel filter or similar).

The **Stage2+FMIC** mapping is designed for vehicles equipped with an upgraded front mount inter-cooler, full turbo back exhaust and an upgraded intake system. The COBB Stage2+FMIC mapping was designed with optimized ignition, boost, and fuel targets for enhanced performance and responsiveness for vehicles equipped with “FBO”.

Step 2 – What fuel is the vehicle using?

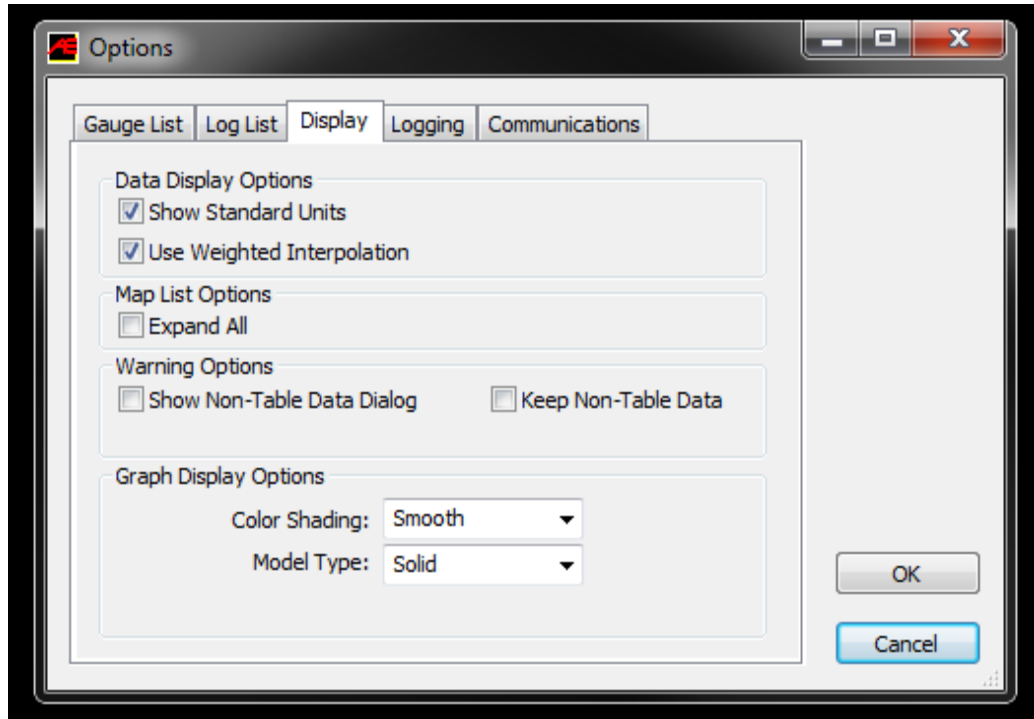
Please note that COBB Tuning offers calibrations for different fuels including ACN91, 91, 93. If your fuel does not meet the standard of the available COBB maps you will need to adjust the calibration accordingly. The higher the octane, the higher the relative fuel quality, higher-octane fuels burns more slowly and can support higher cylinder pressure. Take a moment to compare and contrast timing, boost, and ignition tables from each type of calibration. Higher octane fuels support more ignition timing, higher boost levels, and leaner air to fuel mixtures compared to lower octane. Using a map designed for high-octane with low-octane fuels can produce engine damage.

Step 3 – What type of air intake is on the vehicle?

The BMW N54 utilizes manifold absolute pressure (MAP) sensors located Pre and Post throttle body to measure the mass of air entering the engine. Filter configuration does not necessarily require tuning but heavily contaminated air filters of both OEM and aftermarket construction were found to reduce power output at moderate to high engine speeds. Frequent air filter cleaning and/or replacement is recommended for best performance and engine protection.

Step 4 – Calibration refinement on a load-based chassis dynamometer.

A: Connect the Accesstuner software to the Accessport equipped BMW N54.



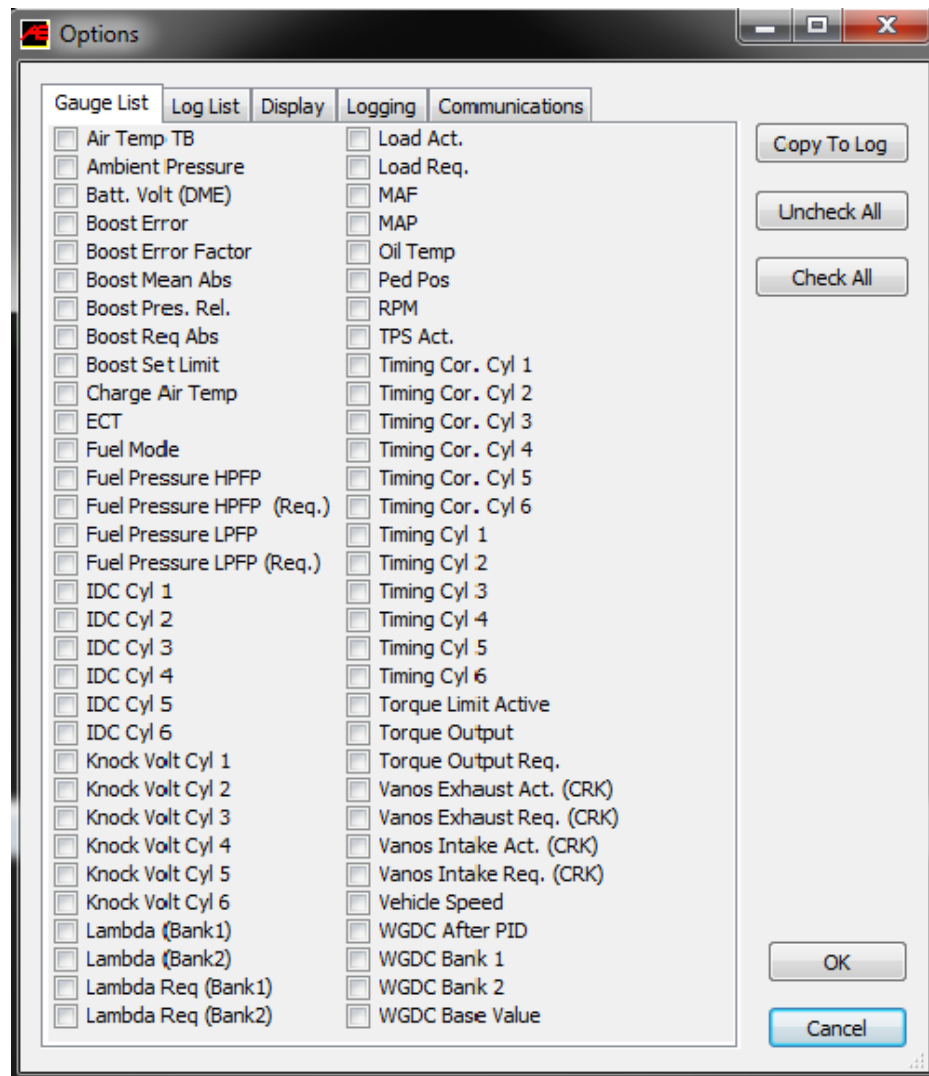
Open the selected starting point calibration in the Accesstuner software. Configure the Accesstuner software to connect to your vehicle. Attach the OBDII cable to the vehicle and the associated USB cable to your computer. Press “Ctrl+F” to configure the program. Select the directory in which to store your data logs under the “logging” tab.

B: Display and Log critical engine parameters while testing.

Accesstuner software allows the user to visualize, sample and record critical engine parameters. This data includes sensor information and commanded engine function.

To configure displayed parameters on the live “Dashboard”:

Press “Ctrl+F” to configure the parameters displayed in the Accesstuner “Dashboard”. The dashboard is a screen that reports active engine and sensor parameters selected under the “Gauge List” tab shown below.



This is a screen shot of the available parameters to display in the live dashboard gauges (Gauge List tab) or to be recorded in the data log file (Log List tab)

The parameters selected in the “Gauge List” tab will be displayed in the live dashboard when connected to a vehicle and the live dashboard is enabled “Ctrl+B”.

This screen is the single best way to assess the condition of the engine during tuning. It is critical to actively monitor these parameters while tuning. These data allow the tuner to determine if a calibration is performing correctly. Accurate and deliberate assessment of engine data is the only way to avoid conditions that may damage the engine.

To configure logged parameters in the recorded “Log List” tab:

While connected to a live ECU Press “Ctrl+F” and select the “Log List” tab to select the parameters displayed in saved AccessTUNER logs. When data logging is enabled these parameters will be permanently written to a comma delimited data file.

Note: No more than 22 parameters can be selected at any one time! The rate of data collection will be lower than optimal when more parameters are selected. For example, you will see a higher sample rate with 12 parameters than 20 parameters.

Below is a list of logged parameters for the BMW N54. The selected parameters are those that are critical to record under most conditions. Other parameters may be selected or removed based upon the objectives of any specific tuning process.

Lambda (Bank 1) – Internal wide-band oxygen sensor bank 1.

Lambda (Bank 2) – Internal wide-band oxygen sensor bank 2.

Ped Pos. (%) – Accelerator pedal position.

TPS Act. (%) – Actual Throttle position.

Timing Cor. (1-6) – Individual cylinder timing correction in degrees.

Timing Cyl. (1-6) – Ignition timing in degrees before top dead center. This is the final commanded ignition timing after all correction and adjustments.

Load Act. – Actual calculated engine load value.

Load Req. – Requested calculated Load from the ECU.

Coolant Temp. – Engine coolant temperature.

Engine Oil Temp. – Engine oil temperature.

Charge Air Temp. – T-Map sensor value of charge air temperature.

Boost Error – The Difference between Boost mean and requested.

Req. Boost Abs. – Requested boost calculated by the DME in an absolute value.

Boost Mean Abs. – A rolling mean average of boost.

Boost Set point Factor – Boost pressure set point factor utilized by WGDC system.

Boost – Manifold Absolute Pressure (reported as negative values in vacuum and positive values in boost) – logged from pressure sensor in the intake manifold.

RPM – Engine speed in revolutions per minute.

Vehicle speed – Speed calculated by vehicle speed sensor.

Wastegate Duty Base – Percentage of wastegate solenoid duty cycle (0 to 100%).

Wastegate Duty After PID– Percentage wastegate solenoid duty cycle after system PID control (0 to 100%).

Wastegate Duty Bank 1% - Percentage of actual wastegate solenoid duty cycle at bank 1 (0 to 100%).

Fuel Mode – Displays the DME current fuel mode state.

2 = Normal

10 = Catalyst Warm-up Mode (Also active for a short period after flashing.)

20 = Spool mode

C: Perform initial testing at lower (load) boost

After choosing the most appropriate starting point calibration, prepare to test and refine the calibration on a load-based chassis dynamometer. When creating a custom tune, it is best to begin testing under low load conditions.

D: Increasing load target to attain greater boost

The BMW N54 ECU is “Load Target” based, meaning the DME uses a complex routine to look at several tables based on conditions (Barometric pressure, Atmospheric Temp, Charge Air Temp. Etc.) to achieve its target load utilizing a dynamic boost level.

There are many limits and targets surrounding load and these are what are typically manipulated in order increase HP and TQ. The only things we can adjust in the maps are load values and limits.

In order to gain understating of the DME's current operation, we should monitor *Load Act.* To determine actual engine load, and *Load Req.* to determine what the ECU is targeting. The most important thing to understand is the ECU will run the lowest load being requested or limited.

The turbocharger boost levels are the main variable used to create torque. When you increase your load targets, you will see the ECU uses more Waste-gate Duty (%) in order to achieve the higher torque (boost) levels. Increasing load target values will allow the vehicle to create more boost as long as the limit tables are raised.

Favorite Tables: Load Target

Engine Speed (RPM)															
1775	1900	2250	2500	2750	3000	3250	3700	3900	4200	4300	5000	5500	6000	6750	6950
135.50	135.00	132.50	132.50	130.00	129.00	131.50	131.00	127.00	125.50	122.00	125.75	128.00	122.00	110.00	102.50

Load

Without any mechanical changes to the stock boost control system it is possible to achieve boost levels at the edge of the stock turbocharger capacity. At sea level, aggressive tuning using the stock boost control system can achieve 18+ psi midrange tapering to 16psi at redline.

WGDC Tables: WGDC (Base)

	MAF (gs)																
	33	44	56	67	78	89	111	133	144	167	189	200	222	244	289	333	
1.100	3.90	3.70	3.65	3.25	2.85	2.86	2.55	2.20	2.10	3.14	2.88	3.00	3.00	3.00	3.00	3.00	
1.187	16.00	5.00	4.30	4.23	3.91	3.70	3.80	4.09	3.82	3.35	3.10	3.48	3.59	3.59	3.59	3.59	
1.280	39.32	24.00	6.00	4.60	4.33	4.25	4.33	4.54	4.68	4.97	4.70	5.07	5.20	5.20	5.20	5.20	
1.327	40.00	32.00	9.50	6.00	4.73	4.50	4.44	4.52	5.02	5.42	5.42	5.30	5.30	5.30	5.30	5.30	
1.373	44.00	44.00	14.00	7.00	5.29	4.96	4.90	4.98	5.29	5.91	5.75	6.03	5.49	5.49	5.49	5.49	
1.420	47.00	47.00	19.00	9.12	5.79	5.22	5.18	5.34	5.43	6.07	6.11	6.30	5.95	5.95	5.95	5.95	
1.467	50.00	47.00	30.00	13.00	6.60	5.52	5.38	5.66	5.75	6.32	6.60	6.52	6.20	6.49	6.49	6.49	
1.513	52.00	52.00	30.00	17.00	8.44	6.83	5.58	5.84	6.16	6.77	6.95	6.95	6.98	7.36	7.36	7.36	
1.560	53.00	52.00	30.00	17.00	12.00	7.43	5.98	6.09	6.90	7.13	7.28	7.00	6.92	7.67	7.77	7.77	
1.607	55.00	52.00	30.00	22.00	13.00	9.65	5.98	6.78	7.10	7.39	7.52	7.80	7.59	7.85	8.26	7.76	
1.653	56.00	52.00	40.00	30.00	14.50	11.46	6.79	6.99	7.15	8.01	8.10	8.18	8.05	7.89	8.37	7.81	
1.700	57.00	57.00	57.00	30.00	15.50	13.00	7.70	7.60	7.21	8.40	8.58	8.20	8.47	8.20	8.47	7.97	
1.793	58.00	58.00	58.00	58.00	25.00	14.00	8.91	8.98	7.64	9.40	9.10	8.78	9.21	8.53	8.70	8.23	
1.887	58.00	58.00	58.00	58.00	56.08	16.70	12.43	9.09	9.06	9.60	8.90	9.46	9.51	8.62	9.30	8.50	
1.933	58.00	58.00	58.00	58.00	58.00	18.50	14.00	9.29	9.59	8.80	9.45	9.58	9.85	8.97	9.08	9.58	
2.027	58.00	58.00	58.00	58.00	58.00	30.00	24.00	17.00	12.50	10.19	9.51	9.96	9.98	9.44	10.88	10.78	
2.073	58.00	58.00	58.00	58.00	58.00	58.00	50.00	30.00	17.50	11.50	9.55	10.05	10.58	10.46	11.33	11.17	
2.167	58.00	58.00	58.00	58.00	58.00	58.00	58.00	50.00	34.86	20.38	12.00	10.00	9.75	10.26	10.62	11.80	11.80
2.260	58.00	58.00	58.00	58.00	58.00	58.00	50.00	36.45	30.13	15.19	10.50	9.85	10.36	10.82	11.95	12.29	
2.400	58.00	58.00	58.00	58.00	58.00	58.00	50.00	36.45	32.10	22.30	12.75	10.15	10.57	11.03	13.10	15.00	

WGDC (%)

Wastegate Duty Cycle (Base) – This is the primary table the DME uses for boost control. This table is referenced by “Boost Error Factor” on the Y-Axis and “MAF” on the X-Axis. The Z data (table data) is direct wastegate duty cycle %. These are starting WGDC numbers before boost control PID’s kick in and control boost. Adjusting the main table is mostly used for boost targeting corrections, adding or removing small amounts to correct “boost error”. Correcting boost error will also remove most throttle closures. Adding more wastegate than the system deems necessary will result in the system making corrections and can cause major throttle closures.

E: Tuning for appropriate Air to Fuel ratios

The ideal air to fuel ratio depends upon fuel quality. Higher octane fuels are more detonation resistant and therefore can be run at leaner air to fuel ratios. Leaner Air to Fuel ratios produce higher power but also create more heat. Excessive heat can lead to detonation. Lower octane fuels such as 91 octane or 95 RON are more prone to detonation and therefore require a richer air to fuel ratio. Rich air to fuel ratio combustion produces less heat and therefore less detonation.

Several tables directly impact fueling ratios in these cars. **Fuel (Bank 1) Fuel (Bank 2)** are the primary tables dictating fuel mixtures The DME also uses **Fuel (Spool)** for a short period during its “spool” mode.

Spool mode is active until it reaches its threshold as defined by **Spool Mode Max RPM**. These tables are referenced by Load and Engine speed. These are target tables; they are used by the DME to set the desired AFR.

The BMW N54 uses two internal wide-band oxygen sensors to monitor fuel mixtures one in the front and rear engine banks, sensors are located in each down pipe respectively. As a result, the values in **Fuel (Bank 1)** and **Fuel (Bank 2)** are a closed loop target that the DME will always work to achieve. The active adjustments made by the DME are monitored in **Lambda Req. (Bank1)** and **Lambda Req. (Bank2)**.

F: Tuning Ignition Timing

Ignition Timing tables - The main table for ignition timing is **Timing (Main)**; **Timing (Spool)** is used for a brief period while DME works to build boost with minimal lag. Spool mode is active until it reaches its threshold as defined by **Spool Mode Max RPM**. These tables are referenced by load and engine speed. Logging these parameters will allow you to reference the specific regions of these tables that may need to be edited to produce optimized ignition timing.

Detonation based timing adjustment - Ignition timing is also adjusted in response to detonation. The DME actively reduces timing in response to detonation. The DME has

the capability to make individual cylinder timing adjustments, because of this monitoring a single cylinders timing correction will not result a global picture of engine operations. Timing adjustments in response to detonation are logged with the “**Cyl 1-6 Timing Cor.**” monitor. Each knock event results in a change of .5 degree increments depending on severity of the event.

Generally speaking, higher ignition timing supports higher torque and greater power. However, ignition timing should be increased with great caution. Higher timing yields higher cylinder pressures and this is limited by fuel quality and the mechanical limitations of the engine. Too much timing will produce knock correction when fuel quality is limiting. When fuel quality is high, ignition timing should **ONLY** be added when its addition produces a substantive increase in torque and power. If increased timing does not increase torque the extra cylinder pressure is simply producing unnecessary stress on engine components.

G: Tuning Vanos variable Cam Timing

Multiple maps with “Load” as the X axis and “Engine speed” as the Y axis determines the position of variable cams. The COBB off the shelf maps are designed slightly modified camshaft phasing optimized for stock turbo chargers, stock camshafts, and stock motor internals. We have designed the COBB mapping to enhance turbo responsiveness and midrange torque. These maps may need to be altered considerably for larger turbocharger, or aftermarket engine components.

H: Integrating all tuning parameters for the ideal Calibration

The ideal calibration for your BMW N54 is a combination of all major tuning areas outlined above. Like any performance vehicle, the BMW N54 will make the most power when run lean with the maximal amount of ignition timing that the ECU will allow without detonating. However, this ideal of 12.5:1 air to fuel ratio and high ignition timing is not realistic for most configurations and fuels in forced induction vehicles. The only way to determine if a calibration is ideal is to run the car on a load-based chassis dynamometer where the impact of calibration changes is easily measured. For example, addition of ignition timing that does not result in increased torque is a not ideal. If additional timing does not create power then you are simply adding stress to the engine components without tangible benefit. The same is true of boost and air to fuel ratio. If you can run the vehicle at a richer air to fuel ratio without losing power this is more ideal than running the car lean. If increasing boost does not yield considerable power gains the turbo may simply be out of its efficiency range. In this scenario less boost is actually more power. To get a coarse idea of how the ideal tune looks on your fuel type and mechanical configuration, examine the COBB OTS map notes.

I: Precautions

Boost – The stock turbocharger can produce boost levels in excess of 20psi. This is enough cylinder pressure to cause engine damage. Be cautious when adjusting boost control parameters. Be particularly cautious when any mechanical component of the boost control system is altered.

Sensor limits – Engine control is entirely dependent upon accurate readings from the MAP sensor. Even stock vehicles produce sufficient airflow to push these sensors to their limit. Beyond the limits of the stock MAP sensor (4.67 volts – 2.5 bar) the ECU has no way to properly control the motor. Any turbocharger upgrade must also be accompanied by an appropriate MAP sensor.

Accesstuner Program shortcuts:

Ctrl + F – Configure program and preferences menu

Ctrl + B – Initiate dash board

Ctrl + D – Initiate and terminate data log

Ctrl + T – Initiate or terminate live tracing in tables

Ctrl + Alt + S – Save Accesstuner Pro calibration

Ctrl + Alt + A – Save Accesstuner Race calibration

Ctrl + Alt + O – Open Accesstuner Pro calibrations

Ctrl + Alt + E – Open Accesstuner Race calibrations

Ctrl + A – Open advanced calibration settings – activate or deactivate Check Engine Lights (CEL) and advanced engine parameter toggles

Ctrl + G – Change ECU

Ctrl + K – Revert to stock calibration

Ctrl + Shift + F – Flash map

Table editing shortcuts:

E – Direct edit table cell(s)

H – Horizontal interpolation of selected table cells

V – Vertical interpolation of selected table cells

M – Multiplication of selected table cell(s) by factor

+ – Small increment

- – Small decrement

Shift + – Large increment

Shift - – Small decrement



Table Descriptions and Tuning Tips

Boost Control Tables

Load Target and Load Target (AT) - Load ceiling used to limit the requested load via the Load to Torque Table. The car usually follows this ceiling at high load.

Tuning Tips - The car usually follows this ceiling at high load. Raise these to increase requested load, thus increasing boost.

Wastegate Duty Cycle - WGDC tables mostly left alone as the system is efficient at hitting load targets.

Tuning Tips - . Adjusting the main table is mostly used for boost targeting corrections, adding or removing small amounts to correct “boost error”. Correcting boost error will also remove most throttle closures. Adding more wastegate than the system deems necessary will result in the system making corrections and can cause major throttle

closures and poor drivability. WGDC D-Factor or WGDC D-Factor Multiplier will possibly need to be modified for higher boost levels.

WGDC Ceiling (Adder) - Values used to monitor WGDC performance.

Tuning Tips - This must be raised on old style (MAF calculation) to avoid Limp mode.

WGDC D-Factor - D-Factor used in the WGDC PID calculations.

Tuning Tips - This must be raised to avoid Limp mode.

WGDC D-Factor Multiplier – Amount of control the P.I.D. system has over WGDC changes for Boost control fluctuations.

Tuning Tips - Set fraction of the WGDC D-Factor used for a given RPM. Look for oscillations in the actual boost curve.

Camshaft

VANOS Exhaust (Moving) Warm - Controls the exhaust cam position relative to the position of the crank when the car is in motion, up to operating temperature, and Fuel Mode = 2.

Tuning Tips - Intake and Exhaust overlap affect EGR pressure in the cylinder.

VANOS Exhaust (Spool) - Controls the exhaust cam position relative to the position of the crank when the car is moving, up to temp, and Fuel Mode = 20.

Tuning Tips - Intake and Exhaust overlap affect EGR pressure in the cylinder.

VANOS Intake (Moving) Warm - Controls the intake cam position relative to the position of the crank when the car is moving, up to temp, and Fuel Mode = 2.

Tuning Tips - Intake and Exhaust overlap affect EGR pressure in the cylinder. At lower RPM when the turbo is spooling, it is recommended decrease these numbers (more overlap) as it will promote increased turbo spool. At upper RPM, it is recommended to have less valve overlap as this will lose boost pressure and performance.

VANOS Intake (Spool) - Controls the intake cam position relative to the position of the crank when the car is moving, up to temp, and Fuel Mode = 20.

Tuning Tips - Intake and Exhaust overlap affect EGR pressure in the cylinder. At lower RPM when the turbo is spooling, it is recommended decrease these numbers (more overlap) as it will promote increased turbo spool. At upper RPM, it is recommended to have less valve overlap as this will affect boost pressure and performance.

Fuel Tables

Fuel (Main) - Used when Fuel Mode = 2

Tuning Tips – Main fuel table. Also see “Fuel Injection System” at end of this document for a brief description of direct injection.

Fuel (Spool) - Used in conjunction with other spool tables and Fuel Mode = 20

Tuning Tips - None at this time.

Fuel Floor (Min Cat Protection Mode) - Fuel floor when Fuel Mode = 6.

Tuning Tips – Set this value close to requested fuel at high load high RPM in “fuel main” to keep fueling close during mode 6 events.

Torque Eff Divisor (Fuel) - Table used to adjust requested load in relation to the current lambda.

Tuning Tips - We have a program segment change to alter the logic for this table. Therefore setting to 1.0 below 14.7 is appropriate.

Fuel Scalar – Table/Value used to adjust for alternative fuels.

Tuning Tips – This table/value is used to correct fuel trims for alternative fuels. (ex. E-85) At the end of this document we have provided a reference chart with approximate values for E-85 content.

Ignition Tables

Timing (Main) - Used when Fuel Mode = 2

Tuning Tips - None at this time.

Timing (Spool) - Used when Fuel Mode = 20

Tuning Tips - None at this time.

Limits Tables

Boost Limit Multiplier – Used to up the boost limit in the higher RPM range.

Tuning Tips – Set the table to a value of 2.6, allowing for greater boost.

Load Limit Factor – A factor used to adjust the max load that can be requested.

Tuning Tips – Set this value to .100 everywhere to keep it out of the way.

Spool Mode Max RPM - RPM value at which spool mode turns off.

Tuning Tips – lowering this value will cause the N54 to exit “spool mode” earlier, raising this value will cause “spool mode” to be extended.

Torque Limit Offset – Torque limit watchdog.

Tuning Tips – Raise this value higher to turn off the torque limit nanny.

Torque Limit Offset A – Torque limit watchdog.

Tuning Tips - Raise this value higher to turn off the torque limit nanny.

Torque Monitor Ceiling – Raise values to turn off the torque limit nanny.

Tuning Tips - Raise this value higher to turn off the torque limit nanny.

Torque Max (Index) - Used to look up the max torque value that the Requested Torque % tables can use.

Tuning Tips – Raise these values to 110 to remove limitations.

Throttle Angle aggression in overload - The amount the DME can restrict the throttle blade in high boost scenarios.

Tuning Tips - Change 2000 Rpm and above to possibly limit throttle closure on boost error.

Requested Torque Mon. Factor A – This is used as a monitor for torque targeting.

Tuning Tips – This must be raised to avoid DME torque calculation error.

Requested Torque Mon. Factor B - This is used as a monitor for torque targeting.

Tuning Tips – Same as “**Requested Torque Mon. Factor A**” See Above.

Rev. Limit by Gear Ceiling (MT) – (AT) (AT Manual Mode)

This value represents the Upper limit allowed by the DME in engine RPM per gear for manual and automatic transmissions.

Tuning Tips - Set this value 100-150 RPM above the Rev “Limit by Gear Floor”

Rev. Limit by Gear Floor (MT) – (AT) (AT Manual Mode)

This value represents the lower limit allowed by the DME in engine RPM per gear for manual and automatic transmissions. (Re-Engagement)

Tuning Tips - Set this value 100-150 RPM below the Rev “Limit by Gear Ceiling”

Speed Limit Master

This is the table that limits the max speed of the vehicle.

Tuning Tips - None at this time.

Idle Tables

Idle Table A – C (Non switchable Table)

Used to set the target idle RPM based on engine coolant temp. The ECU will choose to use the value from one of the three tables based on conditions.

Tuning Tips - None at this time.

Throttle Tables

Requested Torque % (High - Low) - Used to convert the drivers requested peddle position into a torque target.

Tuning Tips – On **Non** ///M, IS or Manual vehicles (anything without an M, D/S or sport button) only “Requested Torque –High” is utilized.

Requested Torque –Low is active any time the M/Sport or DS is active. This allows two separate throttle response calibrations.

Threshold (Major Throttle Closures) – DME’s ability to restrict throttle major throttle closures.

Tuning Tips – Set this value to .960 to greatly reduce the DME’s ability to effect throttle closures.

Toggles

Disable Speed Limiter - Removes all vehicle speed limitations.

Disable Torque Safety Path (All) - Check all three toggles to remove another part of the torque request nanny.

Enable Lean Spool - Un-check this to prevent large lean spikes when Fuel Mode = 20

Disable Torque Intervention by Ign. – Check this to disable some DME logic reducing timing during shifting. This can also cause a firmer shift in automatics, not desirable to some users.

Disable Misfire Detection 1 / 2 – Check both toggles to disable the DME logic for Misfire detection.

DTC Toggles

P29F4- Catalytic conversion 1 (Catalyst Efficiency Bank 1)

P29F4- Catalytic conversion 2 (Catalyst Efficiency Bank 2)

P2D25- Mass Air Flow Excessive (Tuning detection nanny)

P2F6C- Exhaust flap control (Removal of factory exhaust fume flap)

P2FA3- Coding Change (DME Programming logic change)

Fuel Injection System

The BMW utilizes direct injection versus conventional port injection in its turbocharged engines. In direct injection the gasoline is highly pressurized, and injected via a common rail fuel line directly into the combustion chamber of each cylinder, as opposed to conventional multi-point fuel injection that happens in the intake plenum, or cylinder port. This gives the BMW many advantages for improved fuel efficiency under light load conditions, and also allowing a leaner Air/Fuel ratios.

The major advantages of the BMW directed engine are increased fuel efficiency and higher power output. Gains are achieved by the precise control over the amount of fuel and injection timings that are varied according to the load conditions.

BMW utilizes the throttle plate primarily for boost control; engine speed is controlled by the DME, which regulates fuel injection function and ignition timing, instead of having a throttle plate that restricts the incoming air supply.

Fuel scalar table for ethanol content

E %	FSG	Scalar value	E %	FSG	Scalar value	E %	FSG	Scalar value
85	0.785	1.4	60	0.769	1.266	35	0.754	1.133
84	0.784	1.394	59	0.769	1.261	34	0.754	1.128
83	0.783	1.389	58	0.768	1.256	33	0.753	1.122
82	0.783	1.384	57	0.768	1.25	32	0.753	1.117
81	0.782	1.378	56	0.767	1.245	31	0.752	1.112
80	0.782	1.373	55	0.766	1.24	30	0.751	1.106
79	0.781	1.368	54	0.766	1.234	29	0.751	1.101
78	0.78	1.362	53	0.765	1.229	28	0.75	1.096
77	0.78	1.357	52	0.765	1.224	27	0.75	1.09
76	0.779	1.352	51	0.764	1.218	26	0.749	1.085
75	0.779	1.346	50	0.763	1.213	25	0.748	1.08
74	0.778	1.341	49	0.763	1.208	24	0.748	1.074
73	0.777	1.336	48	0.762	1.202	23	0.747	1.069
72	0.777	1.33	47	0.762	1.197	22	0.747	1.064
71	0.776	1.325	46	0.761	1.192	21	0.746	1.058
70	0.775	1.32	45	0.76	1.186	20	0.745	1.053
69	0.775	1.314	44	0.76	1.181	19	0.745	1.048
68	0.774	1.309	43	0.759	1.176	18	0.744	1.042
67	0.774	1.304	42	0.759	1.17	17	0.744	1.037
66	0.773	1.298	41	0.758	1.165	16	0.743	1.032
65	0.772	1.293	40	0.757	1.16	15	0.742	1.026
64	0.772	1.288	39	0.757	1.154	14	0.742	1.021
63	0.771	1.282	38	0.756	1.149	13	0.741	1.016
62	0.771	1.277	37	0.756	1.144	12	0.741	1.01
61	0.77	1.272	36	0.755	1.138	11	0.74	1.005
						10	0.739	1