

Perfect Tuning

MS3-PNP

1986.5-1992 Toyota Supra 7MGE / 86.5-88 7M-GTE



User Manual

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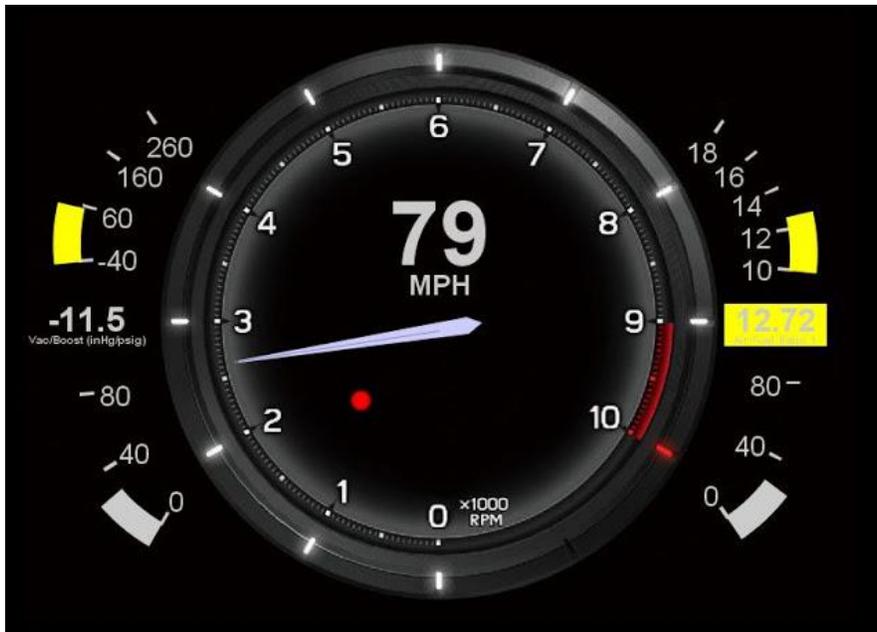
Documentation, technical support, discussion forums for all versions of MS3 is available at <http://msextra.com>

The MS3Pro user manual is full of information for the Perfect Tuning MS3-PNP for 1JZ-GTE / 7M-GTE as this MS3-PNP is based on the MS3Pro. http://www.diyautotune.com/downloads/ms3-pro/ms3pro_manual.pdf

Installation of TunerStudio and MegaLogViewer (for Windows, Mac and Linux)

- **TunerStudio** is the software created by EFI Analytics is used to configure all versions of the MS3. The software with basic functionalities is free. For advanced features like custom dash boards, auto tuning and diagnostic you need to purchase the software. It's possible to download directly TunerStudio at: www.tunerstudio.com/index.php/downloads. When a computer is connected to a MS3 for the first time with an USB cable, a driver may be needed: <http://www.ftdichip.com/Drivers/VCP.htm>

Here is a custom dashboard created by users on MsExtra forum. You can see more dashboards in this thread at: <http://msextra.com/forums/viewtopic.php?f=122&t=36862&start=80> like this LFA imitation from the user "1uz_Nissan":



- **MegaLogViewer** is the software used to view the data logs created by TunerStudio, internal MS3 memory or even the data logs created by the Android phone or tablet software. The software is also free but you need to purchase if you want to have access to nice features like Scatter plots. www.tunerstudio.com/index.php/downloads



Software for Android devices

- **Shadow Dash MS** is the Android TunerStudio version. You can download it here : <https://play.google.com/store/apps/details?id=com.efiAnalytics.shadowdash> for 9.99\$
- **MsDroid** is software used to see real time data and you can also tune your MS3 and the software is completely free! <https://play.google.com/store/apps/details?id=com.msDroid>.
If MsDroid shows a connection error message go to <http://www.msExtra.com/doc/ms3/files/release/> and downloads your MS3 software version (by default 1.2.3) and extract the ms3pro.ini file to the MsDroid/ini folder on your Android device.

Software for Apple devices (iPhone)

- **MobiSquirt** is available for iPhone but with limitations. The Bluetooth connection is not supported and you need a WIFI adapter. For more information please visit www.mobisquirt.org

Installation of the MS3 Plug and Play.

The MS3-PNP will work with 1986.5-1988 Toyota Supra with 7M-GTE engine or 1986.5-1992 7MGE (yellow stock ECU connector).

E01	No. 10	STA	STJ	NSW or N/C	ISC 1	ISC 2	G	G1	G2	NE	IGT	IGF	THW	OX	VSV 2	HT	M- REL	EGR	SPD	FPR	THA	HAC	VC	BATT	IG S/W
E02	No. 20	No. 30	E1	IGdB	ISC 3	ISC 4	VF	T	VTA	IDL	IGdA	KNK 1	KNK 2	E2	L1	L2	L3	A/C	W	OIL	ECT	FC	KS	+B	+B1

1. Install the MAP Sensor vacuum hose/tube to the MS3 unit. Connect the vacuum tube to the port behind the intake manifold near the firewall. Ideally try to only plug the MS3 to this port.
2. If you want to remove the MAF sensor (because the MS3 won't use it by default) you have to install another intake temperature sensor because the factory one is integrated in the MAF sensor. The most popular is the GM open element IAT sensor. Contact us if you need one.

1. Power up the MS3

Put the key on when the ECU is connected and listen if you can hear the fuel pump running for around 3 seconds then turn off. This indicates that the MS3 is functional.

2. Connection to a MS3 with TunerStudio and a USB or serial cable.

You have to install the software drivers for the MS3 if it does not install automatically. You can download it on the FTDI website at: <http://www.ftdichip.com/Drivers/VCP.htm>. If you are using a USB to serial adapter, please refer to the manufacturer website for the drivers.

1. Plug the USB cable to the MS3 and your computer
2. Open TunerStudio.
3. Press on **File, Project, New Project**
4. Give a project name.
5. Put the key in the ON position to power up the MS3 and click on **Detect**. TunerStudio will automatically detect the MS3. If this step fails, put key in the off position and try again.
6. Press **Next**
7. The next window will let you choose between units you will want to use (Fahrenheit or Celsius). Leave the other options to default and press **Next**.
8. The next window is to connect TunerStudio to the MS3. Be sure to select the right port. The baud rate will always be at 115 200.
9. Choose the desired dashboard. Click **Apply**.
10. You are now connected to your MS3.

For more information please visit: http://msextra.com/doc/ms3/serial_setup.html and http://msextra.com/doc/ms3/tunerstudio_setup.html.

3. Calibrate the «TPS» (throttle position sensor)

Turn the key to the ON position, then connect TunerStudio to the MS3. Go to **Tools, Calibrate TPS** then click on **Get Current** for the **closed throttle ADC count** while NOT touching the gas pedal. Now with the gas pedal fully pressed, click on **Get Current** for the **Full throttle ADC count**.

4. Calibrate the IAT (intake air temperature) and CLT (coolant temperature)

Please note that when this dialog box open, the previous value is never loaded because this information is save in a data table and there is no way to know which sensor you chose previously.

To calibrate the sensors, you have to connect TunerStudio to the MS3 then go to **Tools, Calibrate Thermistor Tables**. Select **Air Temperature Sensor** for Sensor Table and **3 Point Therm Generator** then in **Common Sensor Values**, select your sensor. Press on **Write to Controller**. Do that again for the other sensor.

5. Calibrate the Wideband

Please note that when this dialog box open, the previous value is never loaded because this information is save in a data table and there is no way to know which sensor you chose previously.

If a wideband is used and it's suggested, connect it to open TunerStudio. In TunerStudio, select **Tools, Calibrate AFR**. Select your wideband sensor in the list or select **Custom Linear WB** and enter the values manually with the manufacturer specifications.

6. *** IMPORTANT *** Check the timing and Check It Again!

This step is very crucial for the **7M** engine because the timing signal is generated from the CPS (cam position sensor) or distributor and the CPS can move. This step is here to ensure that the timing of the MS3 is synchronized with the engine. If you do not perform this step, **YOU CAN DAMAGE OR DESTROY YOUR ENGINE**.

Connect MS3 to TunerStudio then go to **Ignition Settings** and in the field **Fixed Advanced**, select **Fixed timing**. Enter the value **10** at the **Timing for Fixed Advance** field.

Start the engine with fixed timing at 10 degrees. Check with a timing light if the timing is right. If not, you need to adjust **Tooth #1 Angle**. Then, rev the engine and ensure that the timing stay at 10 degrees. If the timing drift, you can play with the setting **Spark Hardware Latency**. Something around 120 should be good.

Other info here: http://www.diyautotune.com/tech_articles/base_timing_how_to.htm

What to do if the engine don't start

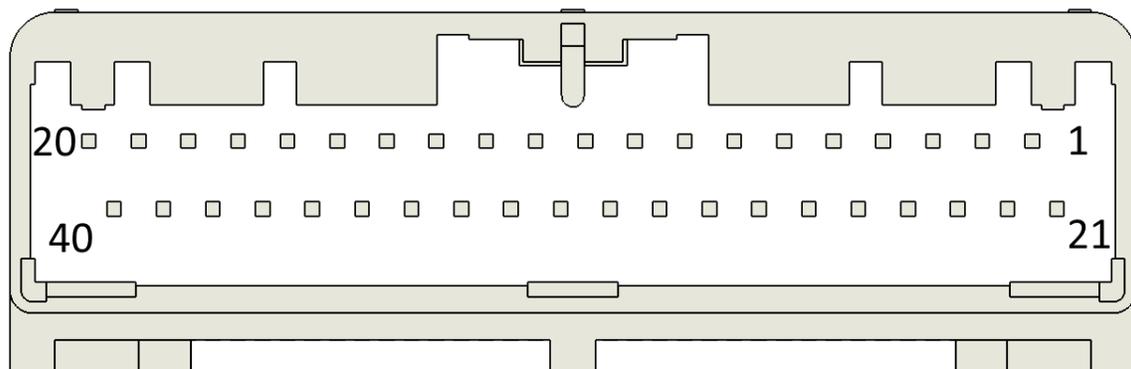
To prevent flooding the engine with fuel, it's possible to press on the gas pedal at the maximum when you turn the key on and during cranking. This activates the flood clear mode and completely stops gas injection. You can also edit the **Required fuel to 0** in **Basic/Load Settings, Engine and Sequential settings**. This will completely disable gas injection at all time. Please note that the 7M-GTE has a cold start injector that is NOT driven by the MS3. This will inject a small quantity of gas and it's not possible to stop it from the ECU. You have to disconnect the cold start injector to disable it.

1. Ensure that the **Crank** and **Cam** synchronization is good. The Synced indication in TunerStudio will turn green while cranking.
2. Ensure that the spark plugs are firing and you can check the timing while cranking.
3. If the engine seems like it want to start, you can try to slightly press on the accelerator pedal to see if it helps. If the engine starts this mean that fine tuning is required for startups.

Connectors

Expansion connector

This connector contains the access to all the inputs and outputs to add more functionality to the MS3-PNP. This is the view of the connector on the ECU. Note that the numbers are also noted on the connector plug. See Inputs and Outputs section for more information about the functionality of each pin.



Description of the inputs and outputs pins.

	Name	Description
1	Fused 12v	12v output for wideband. Fused with resettable fuse 3A.
2	SGND	Sensor ground for external wideband. If using internal wideband, this pin connects to the yellow wire of the Bosch 4.9 sensor.
3	PGND	Power ground. If using internal wideband, this pin connects to the white wire of the Bosch 4.9 sensor. Digital input 1 ground activated (connected to NSW pin on factory connector for launch input in 7M-GTE mode).
4	LSU_BK	If using internal wideband, this pin connects to the black wire of the Bosch 4.9 sensor.
5	LSU_GR	If using internal wideband, this pin connects to the pin where there is no wire on the Bosch 4.9 sensor.
6	LSU_R	If using internal wideband, this pin connects to the red wire of the Bosch 4.9 sensor.
7	Wideband	Wideband 0-5v input. If using internal wideband, this pin will output the 0-5v signal from the internal wideband controller.
8	TachOut	Tach output 1A max
9	PWM3	PWM 3 Ground Output 3A max
10	PWM2	PWM 2 Ground Output 3A max
11	PWM1	PWM 1 Ground Output 3A max
12	PGND	Power ground
13	PGND	Power ground
14 and 15	INJJ	Injector J output. Can drive up to 4 injectors high impedance injector. Use this output if running staged injectors
16 and 17	INJI	Injector I output. Can drive up to 4 injectors high impedance injector. Use this output if running staged injectors
18	INJF	Peak and hold injector F ground output.
19	INJE	Peak and hold injector E ground output.
20	INJD	Peak and hold injector D ground output.
21	VR1+	VR1 positive input. Depending on internal jumper position, directly connected to DFIN3 or to VR circuit #1. VR circuit is connected to DFIN3. DFIN3 = Fast Digital Input 3 ground activated
22	VR1-	VR1 negative input.

23	VR2+	VR2 positive input. Depending on internal jumper position, directly connected to DFIN2 or to VR circuit #2. VR circuit is connected to DFIN2. DFIN2 = Fast Digital Input 2 ground activated
24	VR2-	VR2 negative input.
25	DI4	Digital input 4 12v activated.
26	SGND	Sensor Ground
27	AIN2	Analog input 2, 0-5v
28	AIN3	Analog input 3, 0-5v
29	LGND	Logic ground for CAN-bus
30	CAN L	CANbus network -
31	CAN H	CANbus network +
32	PGND	Power ground
33	SPKH	Spark H output.
34	SPKG	Spark G output.
35	SPKD	Spark D output for cylinder #6
36	SPKB	Spark B output for cylinder #5
37	SPKF	Spark F output for cylinder #4
38	SPKC	Spark C output for cylinder #3
39	SPKE	Spark E output for cylinder #2
40	SPKA	Spark A output for cylinder #1

Inside the MS3 case, there is a small jumper that allows selecting if the MS3 needs to read the signal from the wideband connector pin 7 or the signal on the factory oxygen sensor (O2). So if you connect your wideband on the wideband connector, be sure that this jumper is at the “WB” position

How to crimp a wire for the expansion or wideband connector

1. Strip the wire like the picture:



2. Insert the wire into the connector:



3. With long noses pliers fold the small edges.



4. Then fold the long edges:



5. After the connector should look like this:



6. Add a little bit of solder to the connector to ensure it will hold forever. After that you can use this crimp in the expansion connector.



USB Connector

Connector used to interface the MS3 ECU with an USB "B" male type cable. Remember: only one connection at the time to the MS3 (USB, serial, Bluetooth).

Serial Connector

Connector used to interface the MS3 ECU with a DB-9 serial cable. Remember: only one connection at the time to the MS3 (USB, serial, Bluetooth).

Inputs and outputs

List of inputs and outputs

Here are all the inputs and outputs for the MS3 that you will use in TunerStudio settings.

I/O	MS3 Module pin name	Location in the MS3-PNP
Input	Digital Switched In 1	Factory ECU connector pin "NSW".
Input	Digital Switched ground In 2	Factory ECU connector pin "A/C".
Input	Digital Switched In 3	Factory ECU connector pin "KS" Jumper (KS MAF GTE) inside ECU need to be installed.
Input	Digital Switched 12v In 4	Expansion connector pin 25
Input	Analog Input 1	Barometric sensor inside ECU.
Input	Analog Input 2	Expansion connector pin 27
Input	Analog Input 3	Expansion connector pin 28
Input	Digital Frequency In 1	Factory ECU connector pin "SPD" (Speed sensor)
Input	Digital Frequency In 2	Expansion connector pin 23 if both jumper inside ECU are set to "DI3", if not, this pin go to VR2 output signal.
Input	Digital Frequency In 3	Expansion connector pin 21 if both jumper inside ECU are set to "DFIN3", if not, this pin go to VR1 output signal.
Output	TachOut	Expansion connector pin 8
Output	PWM 1	Expansion connector pin 11
Output	PWM 2	Expansion connector pin 10
Output	PWM 3	Expansion connector pin 9
Output	High current output 1	Factory ECU connector pin "ECT" with 12v pull-up resistor.
Output	High current output 2	Factory ECU connector pin "L3" with 12v pull-up resistor.
Output	High current output 3	Factory ECU connector pin "L2" with 12v pull-up resistor.
Output	Injector A	Factory ECU connector pin "#10".
Output	Injector B	Factory ECU connector pin "#30".
Output	Injector C	Factory ECU connector pin "#20".
Output	Injector D	Expansion connector pin 20
Output	Injector E	Expansion connector pin 19
Output	Injector F	Expansion connector pin 18
Output	Injector G	Expansion connector pin 21 or used for ECT signals (L1) according to ECT jumpers inside ECU.
Output	Injector H	Expansion connector pin 20 or used for ECT signals (L2) according to ECT jumpers inside ECU.
Output	Injector I	Expansion connector pin 16 and 17
Output	Injector J	Expansion connector pin 14 and 15
Output	IAC1A	Factory ECU connector «ISCV valve»
Output	IAC1B	Factory ECU connector «ISCV valve»
Output	IAC2A	Factory ECU connector «ISCV valve»

Output	IAC2B	Factory ECU connector «ISCV valve»
Other	CANH	Expansion connector pin 1
Other	CANL	Expansion connector pin 13

Injector outputs

MS3-PNP can only drive high impedance injectors with a maximum of 5 amperes per channel with thermal shutdown protection. If you are running low impedance injectors, you need to use a resistor box (contact Perfect Tuning) or peak and hold driver board. Unused injector outputs may be used as general purpose ground activated outputs.

Semi-Sequential to Full Sequential Injection Conversion

The advantage of this conversion is a smoother idle and fuel economy. This will not affect horsepower.

Injector 1 is the one at the front of the engine near the radiator.

Cut injector 2, 3 and 4 wire near the injectors and add 3 new wire (16-18 awg) to the MS3-PNP. Cut wire named **#30** at the stock ecu connector and keep long enough to solder a wire on it.

Injector 1 : Do nothing. (Already connected to Toyota 26P(#10) pin12 = INJA)

Injector 2 : Add new wire and connect it to the INJ E pin (expansion connector pin 19).

Injector 3 : Add new wire and connect it to the pin named #30 (X25) on the Toyota connector.

Injector 4 : Add new wire and connect it to the INJ F pin (expansion connector pin 18).

Injector 5 : Do nothing.

Injector 6 : Reuse wire #30 (from the harness) and extend it to connect it to the INJ D pin (expansion connector pin 20).

When wiring is done, open TunerStudio, click on **Basic/Load Settings, Engine and Sequential Settings**, and change item **Sequential ON** from **Semi-Sequential** to **Fully Sequential**.

Put key in the OFF position, then ON to reboot the MS3-PNP. After that, you might need to edit «AfterStart (ASE) taper» in the menu **Startup/Idle**.

Ignition (spark) outputs

MS3-PNP use 5v logic level to drive an external ignition module or logic level coil packs. Do not connect ignition outputs directly to the negative terminal of an ignition coil. This will damage the MS3. We recommend the 6 channel igniter module (see Accessories) to drive directly coils. Maximum current is 200mA per channel. Unused ignition outputs may be used as general purpose outputs.

Knock sensors inputs

The factory knock sensors are connected to the MS3. To try this option, you need to enable it in **Ignition Settings, Knock Sensor Settings, Knock Control** and **set Input type** to **Internal**. This feature should be

used for safety and not for tuning. Here is the resonance frequency of each engine (useful in the other window settings):

7M-GTE bore = 83mm and resonance frequency = 6.9 kHz

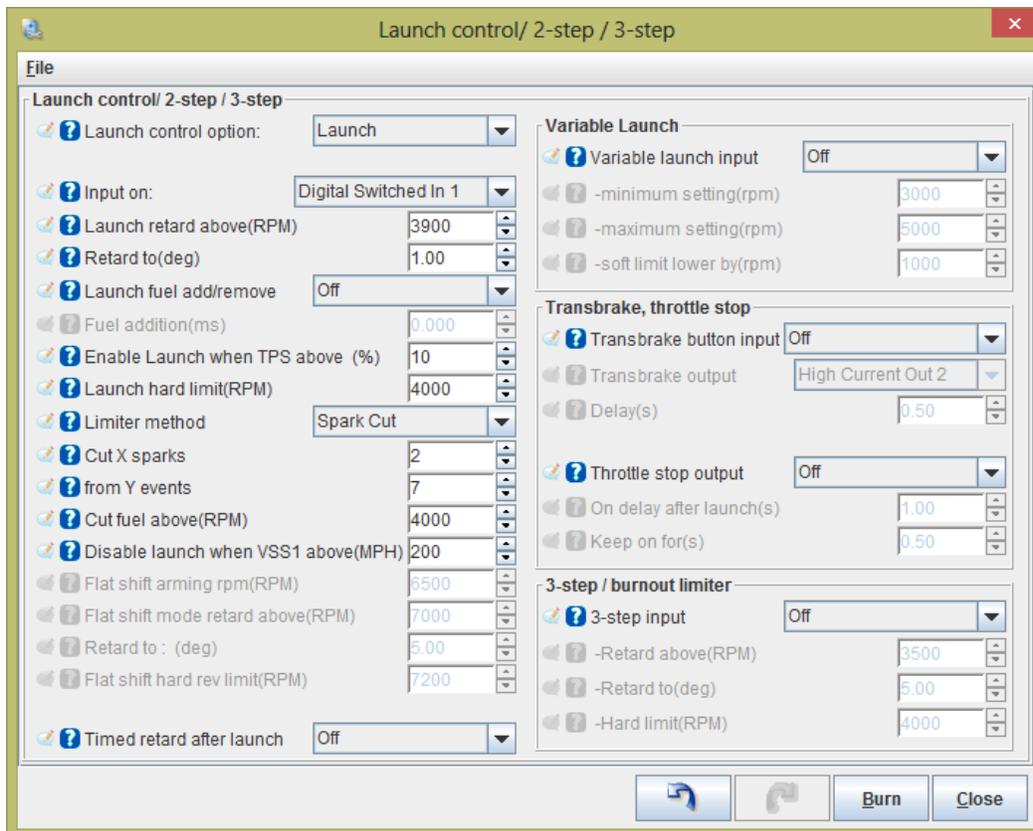
For more information, refer to this page: <http://www.msextra.com/doc/ms3/ignition-settings.html#knock>

Launch control / Flat-Shift / 2-step / Antilag

The MS3-PNP use the factory clutch switch pin **NSW** from the Toyota connector and it's connected to the **Digital Switched In 1** input. This pin needs to be grounded to be active.

If the **NSW** pin cannot be use it's possible to use any other digital input like the any **Digital Inputs** from the expansion connector. Connect this pin to ground to enable the launch control with a clutch switch or a push button.

Here is a configuration example:



For more information on this option, refer to the MsExtra manual:

<http://www.msextra.com/doc/ms3/launch.html>

Internal Bluetooth module

This MS3 Plug and Play has an internal Bluetooth module inside for wireless communication with the MS3. Note that in every situations, **only one** connection to the MS3 can be made at the same time (one device, with serial, USB or Bluetooth). To use the Bluetooth module, you need to pair with the module called PERFECT_TUNING_MS3 and enter the password 1234. When you are connected to the Bluetooth module, you can use it to communicate with the MS3.

If you would like to disable the Bluetooth module completely, open the MS3 case and remove the J11 jumper. You can also run an external switch to these 2 pins to control the power to the Bluetooth module on demand.

How to Change the Engine Configuration (7MGE or 7M-GTE)

***** IMPORTANT : NEVER CONNECT A MS3 CONFIGURED TO RUN WITH 7MGE ENGINE ON A 7M-GTE ENGINE WITHOUT RE-CONFIGURE IT. YOU NEED TO OPEN THE MS3 FIRST AND CHANGE THE JUMPERS POSITION. *****

1. Disconnect the MS3 from everything.
2. Open MS3 case. There are two screws.
3. Change the list below of jumper to the right (near the ECU connector) to run 7MGE engine and to the LEFT (far from the ECU connector) for 7M-GTE.
 - a. FP
 - b. KNK1
 - c. IGdA
 - d. G2
 - e. IGdB

After that, only thing that left to do is to reload a good configuration with TunerStudio into the MS3 and repeat step 5 to 8 in this manual to check your timing.

Electronic controlled automatic transmission (ECT).

The MS3-PNP do not control the automatic transmission, but can replicate the signals sent from the factory 7M-GTE ECU to the ECT ECU. This way, it's possible to control an automatic transmission with the MS3-PNP and the ECT ECU.

The MS3-PNP can send signal to the factory automatic ECT ECU that is available with the 7M-GTE engine. To enable ECT signals replication, there is 4 jumpers inside the MS3-PNP that need to be added. This is indicated on the MS3-PNP circuit board.

MS3 Plug and Play dimensions

185mm X 159mm X 38mm (7 ¼ x 6 ¼ x 1 ½ inches)

Contact

If you have any issues, or questions, you can take a look on www.msextra.com or contact me at support@perfecttuning.net. I can give remote desktop and phone support. Just contact me by email first.

Accessories:

- Multiple Wideband are available. Please visit <http://perfecttuning.net> for more information.
- Fast response GM intake air temperature sensor (open element IAT)
- GM intake air temperature sensor or coolant temperature sensor (close element).
- Exhaust gas temperature sensor. Up to 1250 Celsius with interface board.
- USB-Serial cable for computer or Android device.
- Resistor box for low impedance injectors
- 6 channel igniter box to direct drive coil packs.

Visit <http://perfecttuning.net> for more information or contact us at support@perfecttuning.net.