

Autocal.V6 Professional

This are a series of 10 screen shots of a very small portion of Autocal.V6 Professional Software. There are over 70 graphs available for analysis and you have the ability to import two other RSR ECU calibrations and compare them with your prediction.

In addition there is an an extremely details Point Edit section that allows you to import a specific RSR ECU Calibration and to manipulate it bit by bit and auto load specific tables form your prediction.

There are over 1000 macro buttons to aid in navigation and to provide automated editing functions. Entries are made in the Yellow fields.

<input type="checkbox"/>	Main Menu Return	AUTOCAL.V6 Professional Edition	RSREW028.D5D/D75
<input type="checkbox"/>	AUTOCAL Tutorial	Copyright RB Racing/RSR	Date: 15 Aug 05
<input type="checkbox"/>	TUNING PROCEDURES		

Autocal(TM) Prediction / Analysis Program: Select Button to Go To:

<input type="checkbox"/>	Cubic Inches	<input type="checkbox"/>	Fuel Pressure	<input type="checkbox"/>	Horsepower	<input type="checkbox"/>	Fuel Map X-Y
<input type="checkbox"/>	RPM	<input type="checkbox"/>	B.S.F.C.	<input type="checkbox"/>	Idle Torque	<input type="checkbox"/>	Fuel Map 3D
<input type="checkbox"/>	Trigger Pulses	<input type="checkbox"/>	Idle	<input type="checkbox"/>	Full Power Torque	<input type="checkbox"/>	11 X-Y Charts
<input type="checkbox"/>	M.A.P.	<input type="checkbox"/>	O-Sensor	<input type="checkbox"/>	AUTOCAL Fuel Map	<input type="checkbox"/>	VAFR Clsd Loop
<input type="checkbox"/>	Injectors	<input type="checkbox"/>	Wideband O Sensor	<input type="checkbox"/>	FIRST.TXT Fuel Map	<input type="checkbox"/>	1st/2nd Map Data

16 M.A.P. Ranges								Autocal Prediction v. FIRST.TXT v. SECOND.TXT								Select Button	
MAP	Decal	26.25"	22.25"	18.25"	14.25"	10.25"	6.25"	0"Hg	Trans	2psi	4psi	6psi	8psi	10psi	12psi	15psi	MAP
BTN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BTN
ROW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ROW

Point Edit Program:								<input type="checkbox"/> Select Button to Load FIRST.TXT Program							
<input type="checkbox"/>	Fuel Map	<input type="checkbox"/>	Fuel Map X-Y (1-16)	<input type="checkbox"/>	Startup Program (4)	<input type="checkbox"/>	Acceleration (2)								
<input type="checkbox"/>	11 X-Y Charts	<input type="checkbox"/>	3D Fuel Map	<input type="checkbox"/>	Idle Factors (3)	<input type="checkbox"/>	Air/Engine Temp								

16 M.A.P. Ranges								Point Edit FIRST.TXT Fuel Map								Select Button	
MAP	Decal	26.25"	22.25"	18.25"	14.25"	10.25"	6.25"	0"Hg	Trans	2psi	4psi	6psi	8psi	10psi	12psi	15psi	MAP
BTN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BTN
ROW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ROW

AUTOCAL.V6 gives you the ability to Predict, Analyze, and Edit your RSR Fuel Injection's Programs. AUTOCAL.V6 will generate Autocal TXT files (complete ECU Calibrations) and transfer them to the FUEL Directory with the simple selection of one button. The AUTOFMP File Utility which resides between the FUEL and AUTOCAL.V6 programs will translate these .TXT Files into .FMP files that can be read by the FUEL Program, and.FMP Files into .TXT files for analysis or editing in AUTOCAL.V6.

<input type="checkbox"/>	Main Menu:	SYSTEM CONFIGURATION:	<input type="checkbox"/> Enter Data in Yellow Cells:
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1. Engine Displacement: Your engine's capacity in cubic inches. To convert Cubic Centimeters enter : cc's equals c.i.

Cubic Inches

2. Maximum RPM: This is the highest RPM your motor will run. Typically you will choose an RPM that is slightly higher than the highest rpm that you will run, and one that is divisible by 16. Example: You will rev your motor to 7600 RPM, so you choose 8000 RPM which is 16 divisions of 500 RPM.

: 1 Comp Ratio
 Maximum RPM

3. A. Coil/Tach Trigger: Indicate the number of trigger signals per rpm (1 to 4).
 B: Trigger Choice: Coil negative or tach signal =1. Hall or Magnetic trigger = 0.
 C. Hall/Magnetic Trigger: Total teeth, actual plus missing ex. 30 = 28 minus 2
 D. Hall/Magnetic Trigger: Missing teeth, i.e. if 30 minus 2 or 28 enter 2

Trigger Data
 Pulses per RPM
 If tach(1); If opt(0)
 Opt. (Trigger Teeth)
 Opt. (Minus Teeth)

4. Manifold Absolute Pressure (M.A.P.) Range. Five choices are available:
 a. .75 Bar (22.5" Hg to 0" Hg) This is a specially coded application for applications that fall between .5 and 1 BAR. If you program your application at .5 Bar and find your idle is on the 1st Row (15" Hg) or if you program your application for 1 BAR and find that even under hard decell your vacuum never gets near the first few rows, use .75 BAR.
 b. .5 Bar (15" Hg to 0" Hg) Used on high output engines with small vacuum signals at idle and cruise i.e. less than 15" Hg. Most motorcycles fall into this category and some race cars with radical cams. Selecting this category will double your fuel map resolution over a 1 Bar system. Uses a 1 BAR M.A.P. sensor. Enter zero i.e. "0".

BAR Sensor
 No = Zero, i.e. "0"
 Yes = .25 Main

BAR Sensor
 Enter Zero i.e. "0" always.

c. 1 Bar (30" Hg to 0" Hg) Almost all cars that are normally aspirated will be configured as 1 Bar. Most autos will idle with 20" or more of engine vacuum. Uses a 1 BAR M.A.P. sensor.

BAR Sensor
 No = Zero, i.e. "0"
 Yes = 1



d. 2 Bar (30" Hg to 15 PSI Boost) Turbo or supercharged applications up to 15 PSI positive pressure. Uses 2 BAR M.A.P. sensor.

e. 3 Bar (30" Hg to 30 PSI Boost) Turbo /supercharged applications up to 30 PSI positive pressure. Uses 3 BAR M.A.P. sensor.

5. **Injector Arrangement:** RSR fuel injections can be configured to run in either a Single or Staged configuration. Single means all injectors in the system are "primary" and they fire once each revolution of the crankshaft. Staged means the injectors are arranged as "primary" and "secondary" with the primary injectors firing once each crank revolution and the secondaries remaining "off" until they are needed when they kick in to supplement the primary injectors. Typically, when you run staged injectors there will be two injectors per port: one primary and one secondary. Staged injectors are used in high output applications where one injector cannot supply enough fuel to the inlet port.

6. **Number of Injectors/Type of Injector in the System:** Your RSR Fuel Injection supports up to 16 High Impedance (12 to 16 Ohm) injectors. Early RSR ECU's will support up to two low impedance (2 to 3 Ohm) injectors. You must enter whether you are running low impedance injectors (enter 1). Else "0" (zero).

7. **Injector Capacity:** Your injector's Static Rating in Pounds/Hour or in CC's per Minute. Static means the injector is simply "shorted" open and is then rated in CC's per minute or Pounds/Hour at a given fuel pressure. If an Injector Manufacturer (LUCAS, Bosch, Rochester, Nippon Denso, Siemens, Tomco etc) gives an injector rating they will also state the fuel pressure at which the injector was tested at. Typically this is 3.0 BAR or 43.5 PSI.

RSR Fuel Injectors (@43.5PSI) are available in: 160,185,195, 210, 225, 240, 270,

2.0 BAR Sensor	2
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No = Zero, i.e. "0"

Yes = 2

3.0 BAR Sensor	0
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No = Zero, i.e. "0"

Yes = 3

Single Injectors	0
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Enter Zero i.e. "0"

Main



Staged Injectors	0
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No = Zero, i.e. "0"

Yes = 2

Injectors	2
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Low Imp or High Imp	0
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Type: 1 if Low ;

Type: 0 (zero) if High;

Manufacturer's Rating:

Lbs/Hour	71.43
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Rated PSI	43.5
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This Application's

Suggested Injector:

Lbs/Hour (Gas)	85.94
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310, 370, 420, 440, and 500cc/min ratings. Use calculator below to convert cc's to Pounds per Hour. Equals: Alcohol Lb/hr 112 Nitro Lb/Hr 129

Please note that RSR EFI Systems typically use 55 psi Fuel regulators.

Gasoline: 750 cc's equals Gasoline 71.43 lb/hr 3.8 BAR equals 55.1 PSI

8. System Fuel Pressure: Enter your system's fuel pressure. All RSR Fuel Injection Systems come with 55 PSI Fuel Regulators. If your vehicle has a different fuel pressure enter it in either PSI or BAR. To convert BAR to PSI : 2.5 BAR equals 36.25 PSI

9. Brake Specific Fuel Consumption (B.S.F.C.): This is your engine's requirement stated in pounds of fuel per hour that it requires to support 1 Hp at full throttle. AUTOCAL(TM) has the ability to program your ECU for gas, alcohol(methanol), or even nitromethane. Enter your desired BSFC, or use the default figures of: .5 for Gasoline, 1.15 for Alcohol(Methanol), and for Nitro enter your % Mixture: 100 Percent Nitro equals a B.S.F.C of 3.8 The percentage you change the B.S.F.C. will affect the entire fuel map...For instance if you lower the BSFC from .5 to .45 you will lean out the map 10%.

10. Idle Requirements: AUTOCAL(TM) will predict your system's idle fuel requirements and gives you an adjustable Correction Factor (C.F.) to fine-tune this prediction to your particular engine. Three idle categories are:

a. Idle Manifold Pressure: You need to know the In. Hg of vacuum (or KPa) your motor idles at when at normal operating temperature. This is influenced by inlet design, camshaft timing etc. and can range from 8" Hg on a modern motorcycle to 22" Hg or more on a passenger car. 101.3 kiloPascal equals 29.92 Inches Hg.

PSI (System) 55

Main

System PSI 55
Corrected Lb/Hr. 80.32

B.S.F.C 0.5
Gas = .5; Alcohol = 1.15
Nitro : Calculate BSFC

Gasoline can vary from .37 to .65 (.5 is avg.)
.5 for 2 Valve Motors
.45 for 3 or 4 Valve Motors

Fuel Map

Main Menu

14.25 Inches Hg.

a passenger car. kiloPascal equals Inches Hg.

b. Idle Speed: This is the RPM you want your vehicle to idle at when it is at normal operating temperature. AUTOCAL(TM) will draw a curve from 0 Deg F to 255 Deg F. Maximum entry is 1200 RPM.

RPM Idle

c. Projected Idle time in Milliseconds.

Milliseconds

d. Idle Mixture Correction Factor: AUTOCAL(TM) allows you to fine-tune your idle mixture via a Correction Factor (C.F.). If your normal operating temperature idle is 5% rich then you can enter a C.F. of .95 and AUTOCAL(TM) will redraw the idle portion of your fuel map. With a range of 0.00 to 2.00 you can either richen or lean out your idle from your initial starting point of 1.0 +/- 100%.

Note: Autocal assumes You are using High Impedance (Saturated) Injectors of 12 to 16 Ohm



11. Oxygen Sensor Programming: Selecting Enabled puts your RSR Fuel Injection under Closed-Loop control. Your RSR ECU will then try to maintain a specific air/fuel ratio (typically 14.7:1) as long as certain programmable temperature and RPM conditions are met. Selecting Disabled puts your RSR Fuel Injection into Open-Loop control i.e. no O-Sensor correction. Open-Loop should be used during Fuel Map development (calibration) and when Leaded Race Gas is used. Par 12 & 16 describe wideband operation.

No = Zero, i.e. "0"
Yes = 1

Enter zero i.e. "0"

a. Minimum Temperature: Enter the engine temperature at which you wish Closed-Loop operation to begin. Range is 90 to 250 Degrees

Degree F

b. Drop Out RPM: Choose an RPM BELOW the Drop In RPM. This prevents the O-Sensor from switching off and on as you are near the Drop In RPM. Typically this is 250 RPM less than the Drop In RPM.

RPM

c. Drop In RPM: Choose an RPM where you wish O-Sensing to begin. Typically this is the point where your vehicle will operate smoothly while under O-Sensor control. This point can be below or above the desired idle speed. For smooth operation to occur at this point the fuel map has to be set close to Stoichiometry (14.7:1) when the engine is at normal operating temperature. At idle when the engine is warm and out of its warm up curve you can view the correction factor in the Control Panel of your FUEL Software. The O2 C.F. should be near 1.0 (.92 would indicate 8% subtraction).

 RPM

Main

d. Sensor Setpoint: This is the target point for closed loop operation below 1/2 throttle for both standard and wideband oxygen sensors. With standard heated oxygen sensors your RSR ECU exits closed loop past 1/2 throttle. With wideband sensors closed loop operation continues through full throttle.

Air Fuel Ratio : 1

Enter(only): 22, 20.5, 19.1, 17.8, 16.2, 14.7, 13.2, 11.8, 10.3, 8.8

12. Wideband Oxygen Sensor Option: If the 5 wire wideband sensor RSR ECU is ordered then enter 1. Under wideband control your RSR ECU can be programmed for different fuel ratios from half load to full load i.e. rows 9 to 16. Wideband sensors have a linear output allowing alternative fuel ratios to be programmed, even for full throttle operation. The Sensor Setpoint (par 11) sets the target fuel ratio for the first eight rows of the fuel map. Variable Fuel Ratios for rows 9 to 16 are programmed in paragraph 16: Three wire or four wire O2 sensors CANNOT BE USED FOR WIDEBAND OPERATION. Not for D5D/D75

13. Horsepower Requirements: You will need to estimate your Peak Horsepower in from one to five manifold pressure ranges depending on whether your system is a .5/ .75/1.0/2.0/3.0 BAR configuration.

As a rule of thumb it takes 160 Cubic Feet of Air/Minute (CFM) to produce 100 horsepower. For turbocharged or supercharged applications you will need to know how many CFM these forced induction systems produce at a

Go To Buttons:

need to know how many CFM these forced induction systems produce at a given boost level. In the case of superchargers which are directly driven you need to know the blower drive ratio i.e. how fast it spins relative to crank RPM. In the case of turbochargers you will need to study the compressor maps and use the 160 CFM/100 Hp to calculate your fuel needs at the 8 PSI, 15 PSI, and 30 PSI levels of boost.

a. .5/.75/1.0 BAR SYSTEMS: Normally aspirated (non boost)

b. 2.0 BAR SYSTEM: Up to 15 PSI Boost

c. 3.0 BAR SYSTEM: Up to 30 PSI Boost

Go To Buttons:

<input type="button" value="Main Menu"/>	Main Menu
<input type="button" value="AUTOCAL Fuel Map"/>	AUTOCAL Fuel Map
<input type="button" value="Row 16"/>	Row 16

Go To Buttons:

<input type="button" value="Main Menu"/>	Main Menu
<input type="button" value="AUTOCAL Fuel Map"/>	AUTOCAL Fuel Map
<input type="button" value="Row 16"/>	Row 16

MAX HORSEPOWER
Enter 0 (Zero) If None

0' Hg	0
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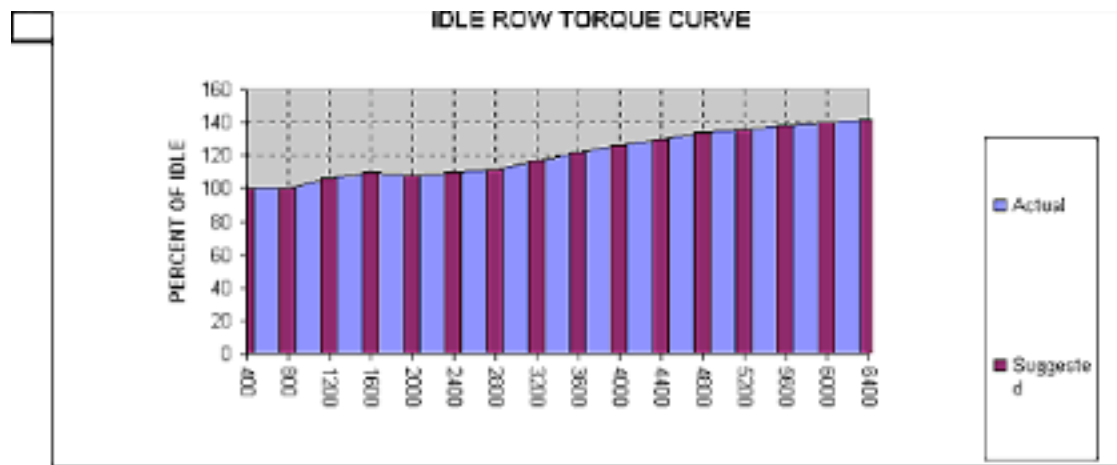
0' Hg	110
8 PSI	195
15 PSI	275

0' Hg	0
8 PSI	0
15 PSI	0
30 PSI	0

14. AUTOCAL(TM) gives you two Torque Curves to adjust your fuel curve for different cams/pistons etc.

a. Idle Row Torque Curve: This affects your lower load (Higher In. Hg) portion of your driving. Near your desired idle RPM your fuel requirements are higher to overcome internal friction and reduced efficiencies. As your speed increases in the lower load (higher In Hg) ranges your fuel needs also increase due to changes in volumetric efficiency. At peak rpms the fuel requirements taper off. The suggested figures are listed below. Simply enter the change in the RPM column and AUTOCAL(TM) will redraw your Fuel Map. If you want 5% more fuel at a specific RPM just multiply the Actual Torque Curve column number by 1.05.

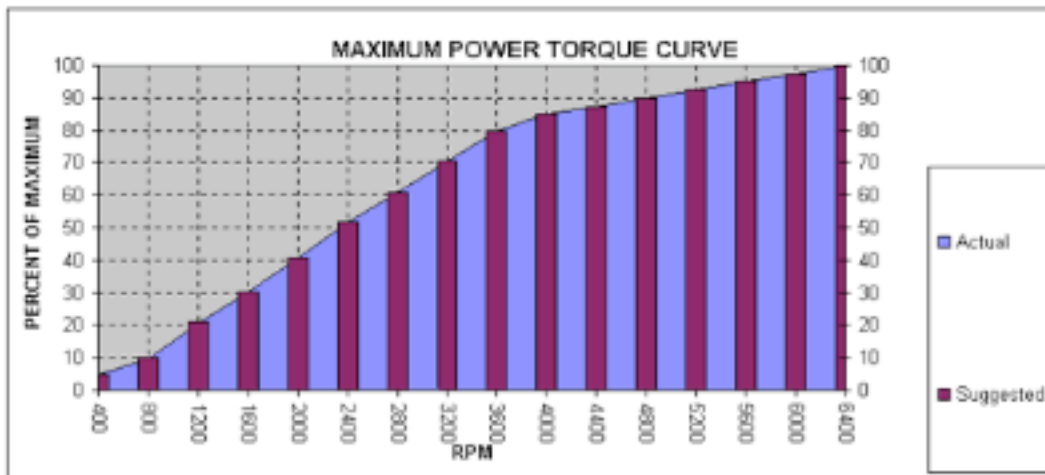
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<input type="checkbox"/>	Main Menu															<input type="checkbox"/>	Load Suggested Idle Torque Curve	
<input type="checkbox"/>	Fuel Map	Actual Idle Torque Curve														<input type="checkbox"/>	Load First.TXT Idle Torque Curve	
		400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400	RPM
		100	100	106	110	108	110	112	117	122	126	130	134	136	138	140	142	TORQUE
Below Listed Torque Curves:		AUTOCAL Suggested IdleTorque ;														FIRST.TXT = Idle Torque Curve of First.TXT File.		
		100	100	106	110	108	110	112	117	122	126	130	134	136	138	140	142	Suggested
		100	100	106.2	112.5	109.4	112.5	112.5	118.6	121.9	128.1	131.2	134.4	137.5	140.6	140.6	143.8	FIRST.TXT

b. Maximum Power (Full Load) Torque Curve: This is your engine's torque curve from 0 to Max RPM at full throttle. The suggested starting figures are listed below the graph. These figures will tend to provide, on the average, a safe but slightly rich air/fuel ratio. Enter changes you wish to make in the appropriate RPM column. Normally this is done in percent changes i.e. if you want to increase the fuel in a particular area by 10% you multiply the Actual Maximum Power Torque Curve figure by 1.1, it's that simple! By changing the chart, AUTOCAL(TM) will redraw your fuel map to match the new Maximum Power Torque Curve. **Note: The "Suggested" curve is linked to your idle values in terms**

of both row and number. Changes to idle will automatically generate a new "Suggested" Full Power Torque Curve.



Autocal Fuel Map

Main Menu Return

Press Button to Load Generic (5/ 75/1/2/3) Torque Curve / or FIRST.TXT Curve

Maximum Power Torque Curve(Actual)															<input type="checkbox"/>	5/ 75/1 Bar	<input type="checkbox"/>	2 Bar	<input type="checkbox"/>	3 Bar	<input type="checkbox"/>	1st
400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400	RPM						
4.648	9.697	20.73	30.08	40.62	51.96	61.11	70.66	80	85	87.5	90	92.5	95	97.5	100	TORQUE						
Below Listed Torque Curves: Suggested = AUTOCAL M.A.P. Entry ; FIRST.TXT = Max Power Torque Curve of First.TXT File.																						
4.961	9.922	20.93	30.24	40.75	51.97	61.18	70.69	80	85	87.5	90	92.5	95	97.5	100	Suggested						
4.639	9.677	20.87	30.24	40.83	52.02	61.39	70.97	80.29	85.18	87.6	90.12	93.04	95.26	97.53	100	FIRST.TXT						

15. FUEL MAP: By completing the above requested data and torque curves AUTOCAL (TM) as the name implies automatically generates a fuel map for your application. The below listed fuel map data can be saved as a file and downloaded to your RSR Fuel Injection ECU.

name implies automatically generates a fuel map for your application. The below listed fuel map data can be saved as a file and downloaded to your RSR Fuel Injection ECU.

AUTOCAL(TM) generates a complete calibration to include all eleven x-y charts as well as the Setup portion of the FUEL PROGRAM. While you are in the FUEL(TM) program you can manually edit any portion of the fuel map or any of the x-y charts (11 total) or even the initial Setup portion of the program. The below shown Fuel Map can only be edited by changing the variables listed in steps 1 to 14 of the AUTOCAL(TM) program.

Main Menu

Saves As: AUTOCAL.TXT

AUTOCAL

1
1
3
T
0
0
0
3

.FMP

RPM
Press Button to Save to FUEL

M.A.P.		400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
15psi	16	39.2	78.4	168	243	329	421	497	574	649	690	707	729	749	769	788	809
12psi	15	35.7	71.4	152	221	298	381	447	518	586	624	643	659	678	697	718	734
10psi	14	31.8	63.5	135	198	267	339	401	464	526	557	574	588	607	620	641	653
8psi	13	27.5	54.9	118	169	229	294	346	398	452	482	496	508	525	538	553	565
6psi	12	26.3	52.5	113	163	222	282	332	383	434	463	475	489	505	516	529	546
4psi	11	24.7	49.4	106	154	208	264	310	361	409	431	444	456	469	483	494	508
2psi	10	23.1	46.3	98.8	143	194	247	291	336	381	404	418	428	438	450	465	477
Trans	9	19.6	39.2	83.5	121	163	207	244	282	321	341	349	362	372	379	388	402
0"Hg	8	15.7	31.4	67.1	97.3	131	169	198	229	261	278	285	292	301	307	318	326
6.25"	7	14.9	29.8	58.8	83.1	112	141	165	191	219	239	250	264	275	285	300	314
10.25"	6	13.7	27.5	49.4	70.6	90.2	113	132	157	180	200	216	235	250	269	282	301
14.25"	Idle	12.5	25.1	40	56.5	68.6	84.7	98.8	119	138	161	181	202	224	247	265	289
18.25"	4	12.2	24.3	38.8	54.9	66.7	82.4	96.1	116	134	157	177	198	219	236	259	282
22.25"	3	11.8	23.5	37.6	51.8	64.7	77.6	93.3	113	131	149	173	193	209	231	253	270
26.25"	2	11.4	22.7	36.5	50.2	62.7	75.3	90.6	107	127	145	164	184	204	225	241	264
Decel	1	11	22	35.3	48.6	60.8	72.9	87.8	104	124	141	160	179	199	214	235	251
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
		400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400

Main Menu