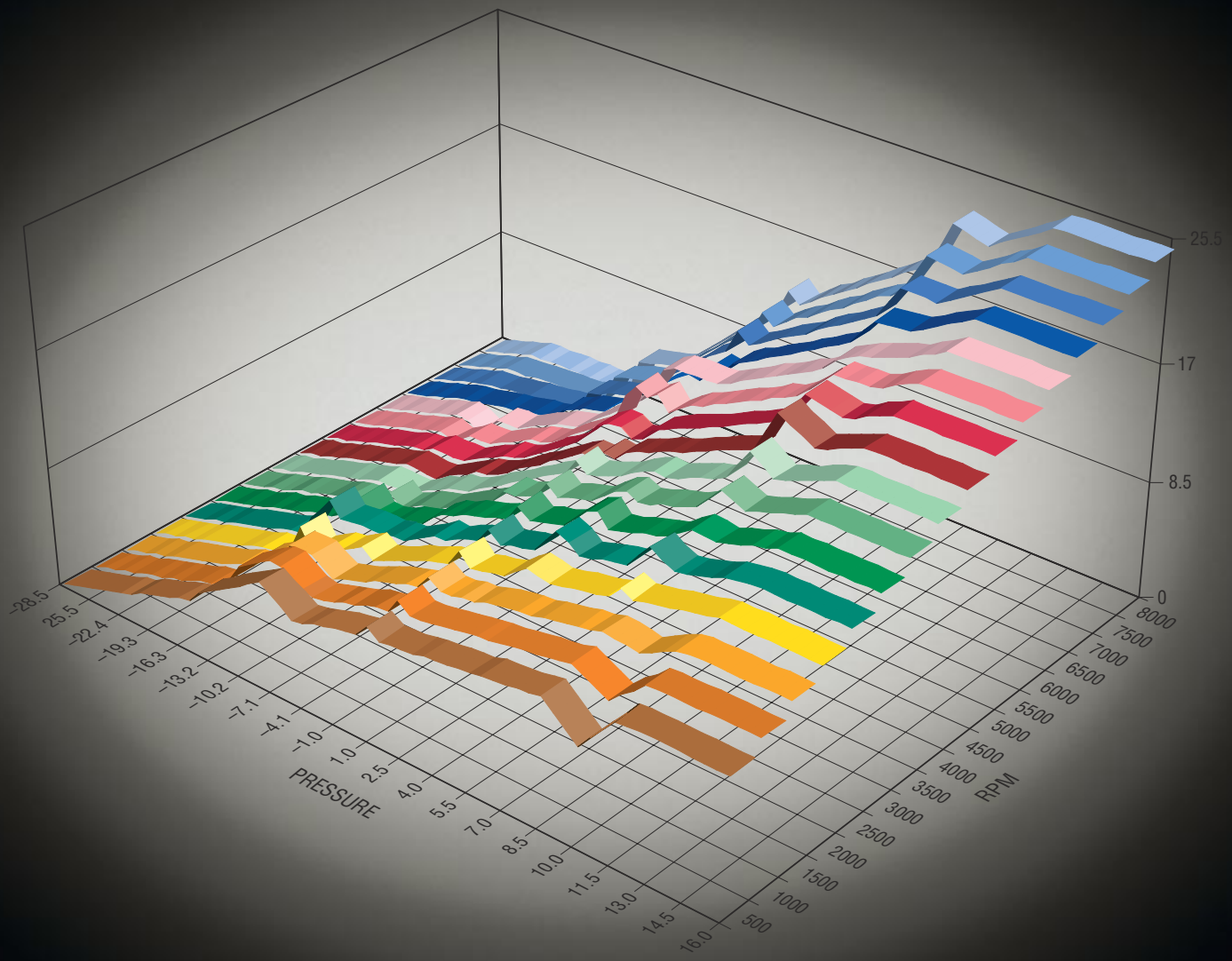
TUNE YOUR MODIFIED ENGINE FOR *MAXIMUM* PERFORMANCE



SPLIT SECOND

www.splitsec.com

AIR/FUEL RATIO CALIBRATOR — ARC1

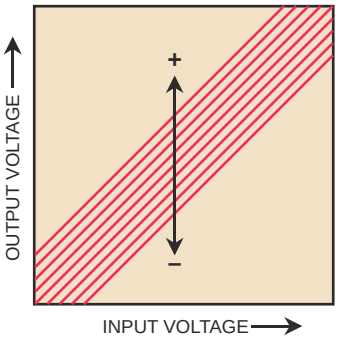
- **Match larger injectors to a modified engine**
- **On-the-fly adjustment from the driver's seat**
- **Fine tune for maximum horsepower**

The ARC1 provides precise adjustment of air/fuel ratio. It is ideally suited to re-establish the proper fuel mixture in modified, fuel injected engines. Its two front panel controls are calibrated and detented to allow precise and repeatable settings. The ARC1 is well suited for recalibrating engines that have been supercharged. It may also be used to compensate for changes in driving conditions, elevation or fuel.

The front panel controls of the ARC1 operate as follows:

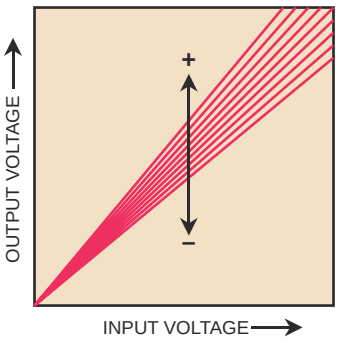
LOW

The low control adds a variable offset to the input signal. It therefore moves the output up or down (rich or lean) by a fixed amount over the entire operating range. It is called LOW because changes in offset cause a much greater percentage change at low engine loads. Idle and cruise are low load conditions.



HIGH

The HIGH control changes the signal gain. It therefore changes the output level by a fixed percentage over the entire operating range. It is called HIGH because it is the primary way to adjust the air/fuel ratio at high loads. High loads occur during full throttle acceleration and climbing steep grades.



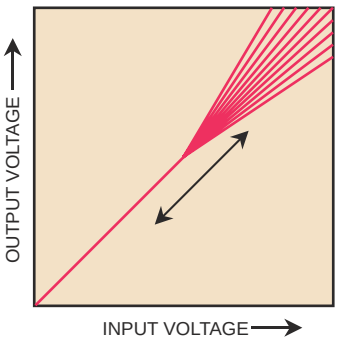
AIR/FUEL RATIO CALIBRATOR — ARC1-003

- **OBDII compatible**
- **Ideal for cars with mild modifications**
- **On-the-fly adjustable**

The ARC1-003 is designed specifically for lightly modified engines. It is particularly well suited for late model OBDII engines. It follows a stock fuel curve in the idle and light load regions. It allows for a deviation from the stock fuel curve at an adjustable threshold point. Above this threshold, the fuel curve can be modified to be more rich or lean by an adjustable amount.

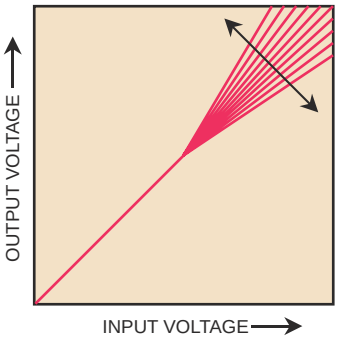
LOW

The LOW control adjusts the threshold where deviation from the stock fuel curve begins. The control input can be mass air flow, TPS or some other signal.



HIGH

The HIGH control sets the amount of deviation from the stock fuel curve above the threshold.



SPLIT SECOND

AIR/FUEL RATIO CALIBRATOR ARC2

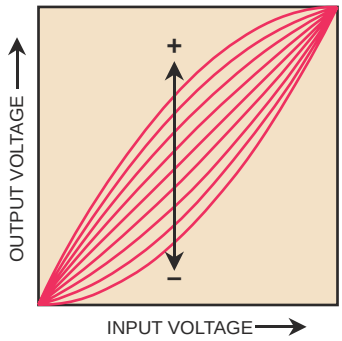
- **LOW, MID, HIGH and ACCEL controls**
- **Crisp throttle response**
- **Improve midrange performance**
- **Mass flow conversion**
- **Panel illumination and night dimming**

The ARC2 Air/fuel Ratio Calibrator provides an effective way to calibrate fuel mixture over the entire load range of the engine. Its four front panel controls are calibrated and detented to allow precise and repeatable settings. Adjustment of the ARC2 can be made on-the-fly from the driver's seat to optimize engine performance for the current driving situation. It can also be used to recalibrate modified engines including those converted to forced induction with a turbo or supercharger.

The ARC2 picks up where the ARC1 leaves off. In addition to the LOW and HIGH controls of the ARC1, the ARC2 has controls for MID and ACCEL. They operate as follows:

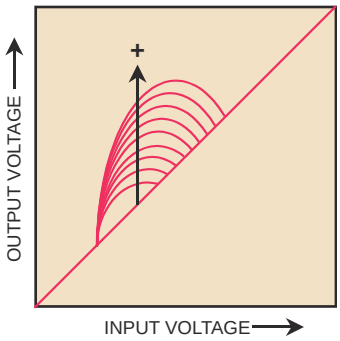
MID

The MID control alters the linearity of the input signal. Increasing the MID control bows the curve so that mid-load values are boosted more than low and high load values. The MID control is used to fine tune the air/fuel ratio at moderate acceleration levels.



ACCEL

Accel boost momentarily makes the air/fuel ratio richer. The degree of enrichment is related to the rate of change of the TPS input and the amount of boost selected by the ACCEL control. ACCEL boost is used to optimize throttle response.



AVAILABLE VERSIONS OF THE ARC2

ARC2-A

The ARC2-A is specifically designed to replace air flow meters with mass air flow sensors. Conversion to a MAF sensor removes a major restriction on the engine and boosts horsepower and torque. The ARC2-A performs the specific elevation compensation and signal filtering required for MAF conversion.

ARC2-GM

The ARC2-GM is specifically designed to calibrate the frequency output of late model GM MAF sensors.

ARC2-K

The ARC2-K is specifically designed to replace Karman Vortex type sensors with MAF sensors. It does all the signal conditioning necessary to make the MAF sensor signal output look like a Karman Vortex signal.

ARC2-NE

The ARC2-NE is used when the same type of voltage-based air flow meter is retained, but calibration of the signal is required. It can be used to calibrate for a larger MAF sensor or a wide variety of other engine changes.

ARC2.1

The ARC2.1 is designed to be mounted in a hidden location and features a single mixture control that can be conveniently located for adjustment from the driver's seat.

SPLIT SECOND

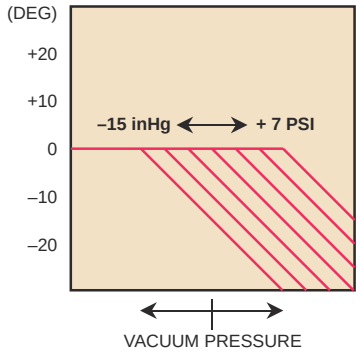
TIMING MAP CONTROLLER — TMC1

- **3D mapping of timing retard over RPM and intake pressure**
- **Adjustable from the driver's seat**
- **Compatible with modern OBDII engines with individual coils**
- **Panel illumination and night dimming**

The TMC1 Timing Map Controller provides the ability to precisely control ignition timing retard as a function of both intake manifold pressure and RPM. It is primarily intended for engines that have been converted to forced induction through the addition of a turbo or supercharger. As boost pressure increases, ignition timing is retarded in a smooth progressive fashion. This makes it possible to boost manifold pressure without inducing harmful detonation. It is compatible with modern engines that have individual ignition coils and will not degrade the performance of the ignition system. Several different versions of the TMC1 are available. These versions are tailored for specific models of vehicles.

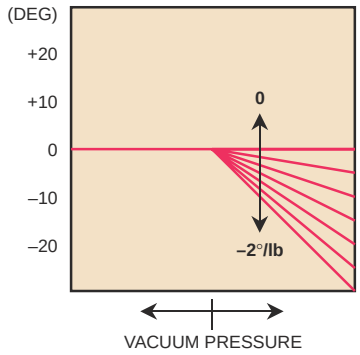
The TMC1 has four front panel controls. The function of the THRESHOLD and RETARD controls are as follows:

THRESHOLD



The THRESHOLD control adjusts the threshold level of intake manifold pressure at which the TMC1 will begin to retard timing. Before this threshold no timing retard will occur. The zero point of the THRESHOLD control is set at atmospheric pressure. The range of adjustment is from –15 inHg of vacuum to +7 PSI of manifold pressure.

RETARD



The RETARD control sets the sensitivity of timing retard to an increase in manifold pressure. It may be set over the range of zero to –2°/lb of boost in 0.1°/lb increments. Timing retard begins at the manifold pressure set by the THRESHOLD control, while the amount of timing retard is set by the RETARD control.

FUEL/TIMING CALIBRATOR — FTC1

- **Fuel and timing control in one product**
- **Up to 20 degrees of timing retard**
- **Laptop programmable with the R4 software**
- **Available with ESC1 function built-in**

The FTC1 combines the laptop programmability of the PSC1 with the timing control of the TMC1. The result is a complete fuel and timing calibration solution that works in conjunction with the stock ECU.

The FTC1 is programmed with the Split Second R4 engine calibration software. The software has two 3-dimensional map tables. The FTC1 can be used with both MAP sensor and MAF sensor applications.

The FTC1 comes in many different versions. It must be ordered for a specific model of vehicle. Some versions have an internal 2.5 bar MAP sensor which can replace the stock one-bar MAP sensor. Other versions operate in voltage mode and are driven off of the stock MAF sensor.

As with all Split Second products, the FTC1 is available on a semi-custom basis. One of the options available is to combine the AIC1 with the TMC1 for a fuel/timing calibrator that controls fuel through additional injectors rather than by conditioning the MAP or MAF input to the stock ECU.

SPLIT SECOND

PROGRAMMABLE SIGNAL CALIBRATOR — PSC1

- **Stand-alone style 3-D fuel mapping**
- **Laptop programmable**
- **Direct output or signal modify modes**
- **Can operate as programmable MAP sensor**

The PSC1 Programmable Signal Calibrator provides precise calibration of fuel by adjusting fuel control signals. It can be used with naturally aspirated or forced induction engines.

Like the ARC family of calibrators, the PSC1 is a piggyback calibrator that operates along with the stock ECU. Instead of being controlled by front panel adjustments, the PSC1 is programmed by a laptop computer running the R4 engine calibration software. This provides the benefit of stand-alone style programmability while retaining the stock sensors, wire harness and OEM ECU programming.

The R4 software provides three dimensional mapping where the primary axis is engine load and secondary axis is RPM. A typical application uses 50 columns to represent engine load and 16 rows for RPM. That is a total of 800 cells. Each cell can be programmed from zero to 20.0 for a total of 200 levels per cell.

The R4 software uses the COM port on the PC to communicate with the controller. Connection is made with a standard 9-pin straight-through cable with female DB-9 on one end and male on the other. The non-volatile memory stores the most recent calibration data until it is updated by a write cycle from the R4 software.

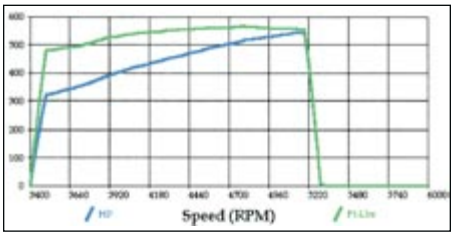
Several versions of the PSC1 are available that are tailored for MAP sensor cars, MAF sensor cars or air flow meter to mass air flow conversion. The PSC1 is particularly useful on engines that have been converted to forced induction. It is available with an internal 2.5 Bar MAP sensor that can be used to replace the stock map sensor or calibrate the engine throughout the vacuum/boost region.

PSC1-001	**Internal Absolute MAP Sensor**
PSC1-003	**Voltage Mode Control**
PSC1-004	**AFM to MAF Conversion**
PSC1-005	**AFM to MAF with Inverted Output**
PSC1-006	**Karman Vortex to MAF Conversion**
PSC1-008	**Late Model GM Calibration**
PSC1-009	**AFM to MAF Conversion with HV Output**

FUEL/TIMING CALIBRATOR — PROJECT DODGE R/T

This Evil R/T is stroked to 408 ci and supercharged with a Paxton Novi 2000 making 16 psi of boost. It is built with Ross pistons, Eagle rods, Mopar ported/polished M-1 intake, 1.6 ratio Crane roller rockers and Mopar 2.02 R/T heads. It runs a custom return fuel system with high flow pump and 36 lb injectors. It produces 544 hp and 565 ft-lb without the NX Nitrous 100 shot.

The whole package is tuned with the FTC1. This truck has excellent cold start, idle and cruise performance and is perfectly comfortable turning 11.8 and 120 mph in the ¼ mile.



SPLIT SECOND

ENGINE CALIBRATION SOFTWARE

The R4 software is a Windows™ based software package that provides the user interface for a variety of Split Second engine management products. It controls the AIC1 Additional Injector Controller, PSC1 Programmable Signal Calibrator and FTC1 Fuel/Timing Calibrator families of products. It operates on a Windows™ 95/98/XP/2000 platform.

An unlimited number of user or customer files can be created. Within these files are the three dimensional maps and settings that are used to control fuel delivery, ignition timing, EGO sensor offset and a variety of other engine parameters. These files can be uploaded and downloaded to the AIC1, PSC1 or FTC1. These files can also be created from scratch, saved, copied and shared.

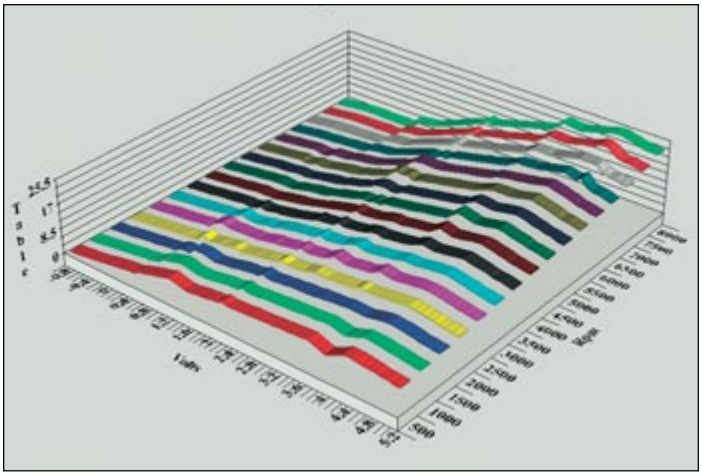
The primary control input can be boost pressure, vacuum/pressure or voltage. The secondary control function is RPM. The map tables contain cell values that form a third dimension, which is the control output. The array of cell values is edited numerically and can be viewed in 3-D graphical form.

The active cell is indicated as a highlight on the map table. This is effective in determining the active cell for editing purposes.

The R4 software supports several advanced features. These features may or may not be used by a given end product. These features include three controlled outputs, four input channels of data acquisition and data recording with numeric and graphical playback.

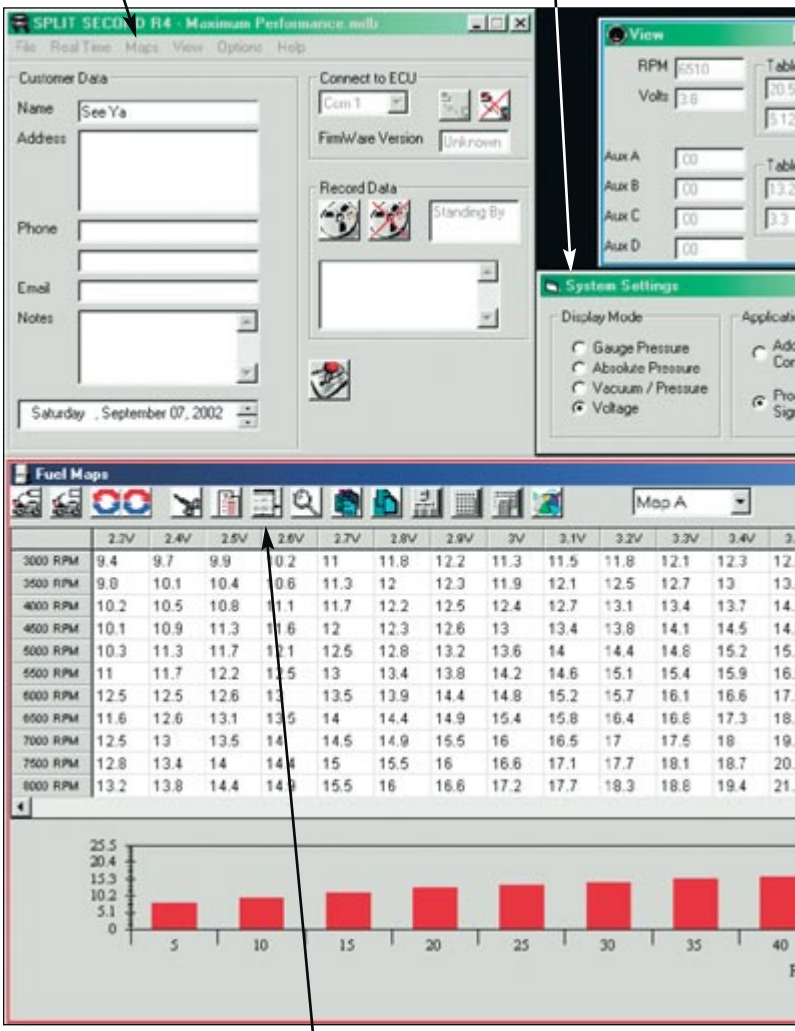
The R4 software uses the COM port on the PC to communicate with the controller. Connection is made with a standard 9-pin straight-through cable with female DB-9 on one end and male on the other.

Click this button  *to view the fuel map in three dimensions. All data points for the selected fuel map can be viewed this way. You can rotate the view by holding the Ctrl key and dragging the mouse. The 3D map can be expanded to full screen size for viewing.*



The main screen is used to create and select calibration files. A variety of customer and vehicle information can be entered. The main screen is also used to establish communication with the Split Second calibration product being used and navigate to other areas of the program.

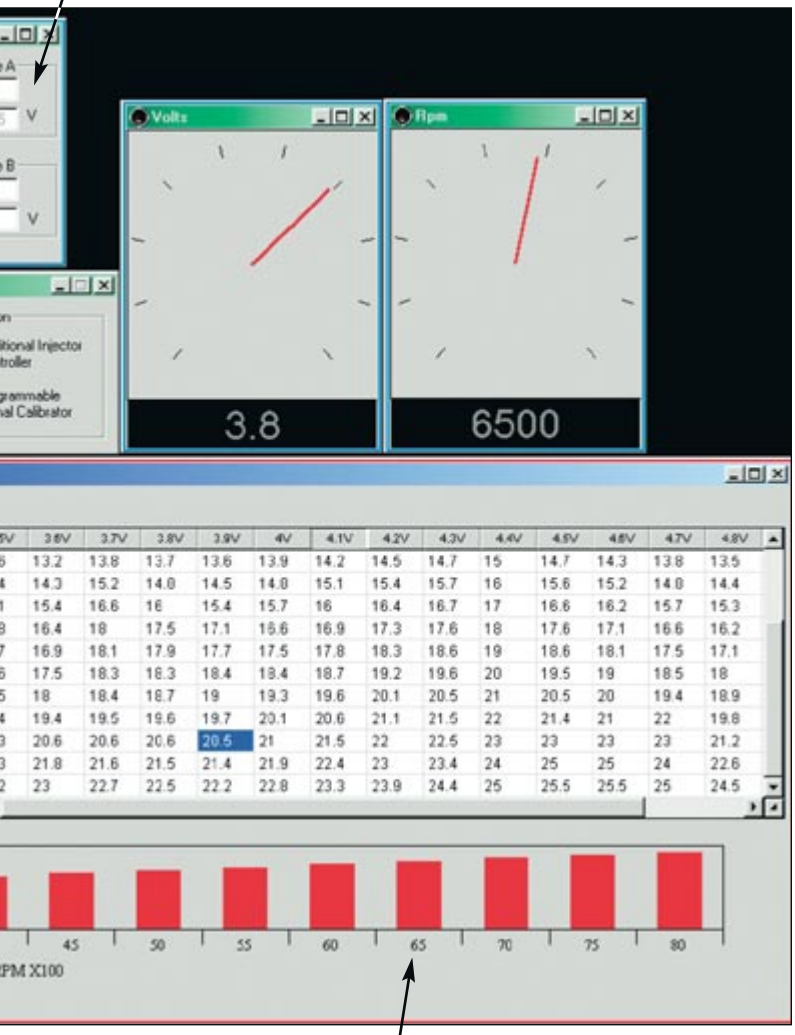
Use the **Options** pull down and **Systems Settings** option to select the desired primary control function. It can be gauge pressure, absolute pressure, vacuum/pressure or voltage depending on which controller you are using. The window is also used to choose between AIC or PSC operation.



Several icons across the top of the map table window ease the editing process. These icons make it possible to build working maps from scratch with only a few clicks of the mouse and a few keystrokes. One of the more useful icons is auto-fill which calculates all the values in a defined rectangle based on the four corner values. This results in a smooth linear progression of cell values in both the rows and columns of the rectangle.

SPLIT SECOND

The **All** option brings up a window that displays boost pressure and RPM as well as cell value and duty cycle for both A and B channels. The All window can be enlarged to full screen size to make it easy to read while working on the engine. When used with products that support data acquisition, the four input channel values are displayed on the real time screen. The **RPM** and **Pressure** options display analog gauges that show those parameters. The **All**, **RPM** and **Pressure** options can all be displayed simultaneously.



The bar graph at the bottom of the map table window shows the cell values for all RPM rows at a single pressure (or voltage). The cell that was clicked last on the spreadsheet is the range that is shown on the bar graph. If you click on a bar in the bar graph the cell it represents will be selected on the spreadsheet.

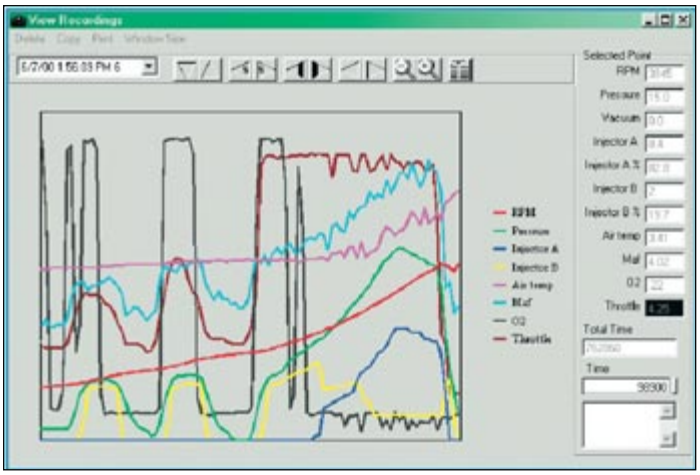
The map tables contain the numeric information used to control a specific engine parameter. The specific parameter depends on the controller being used and whether you are in map table A or B. For example, when programming an additional injector controller, the cell value represents the injector on-time in milliseconds.

For an AIC application, each point in the spreadsheet represents the injector on-time at a particular manifold pressure and RPM. The data in a cell is the time in milliseconds from 0 to 25.5. The upper left corner shows the injector duty cycle for the selected cell. The color of a cell indicates the duty cycle. If the cell is black the duty cycle is below 85%. If the cell is green then the duty cycle is over 85%. If the cell is red then the duty cycle is over 100%.

If the map is being used for a programmable signal calibrator operated in signal modify mode, the cell value represents the amount that the signal is shifted. A cell value of 10.0 is neutral meaning no change. A cell value of 20.0 results in the maximum amount that a signal may be shifted positive which is 2.5V. A cell value of 0 results in the maximum negative shift of –2.5V. The minimum cell value increment is 0.1, which corresponds to 0.025V.

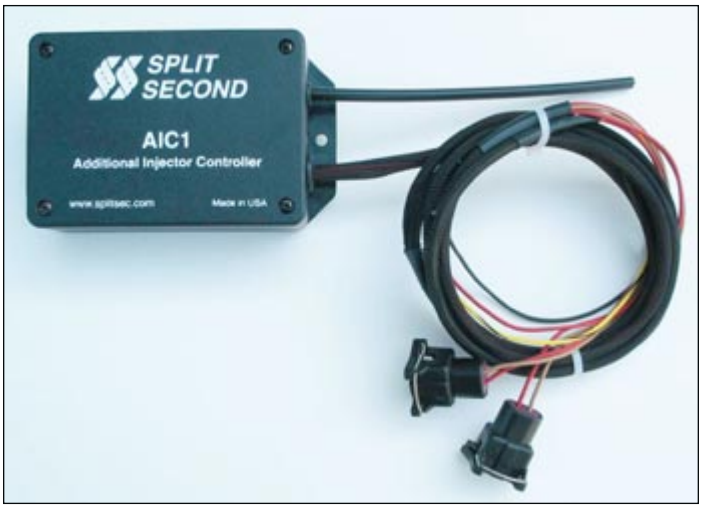
When used to control ignition timing, the cell value represents degrees of timing retard from the stock timing map. The cell value can range from zero to 20.0. A cell value of 4.5 results in four and a half degrees of timing retard. Products like the FTC1 family use one map table to calibrate fuel and the other to calibrate timing.

The start  *and*  *stop recording icons on the main screen control the data recorder. Data record sessions are stored according to time and date. In order to view previously recorded data, go to View Recordings and select the time/date of the desired session.*



SPLIT SECOND

Additional Injector Controller — AIC1



- **Laptop programmable with R4 software**
- **Control two low impedance or four high impedance injectors**

The AIC1 Additional Injector Controller provides precise fuel delivery over the boosted operating range of an internal combustion engine. It is designed for use with engines that have been converted to forced induction with the addition of turbochargers or superchargers. The AIC1 gives the user a convenient way to set the fuel mixture for proper air/fuel ratio in the boost region.

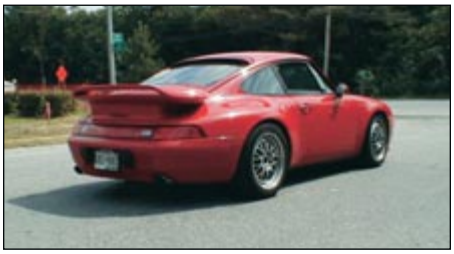
The AIC1 is a stand alone additional injector controller. It provides three dimensional mapping of additional fuel. Injector pulse width is loaded directly into cell locations on a map defined by boost pressure and RPM. Two independent maps can control up to four injectors. Map A can drive two low or high impedance injectors. Map B can drive two high impedance injectors. Programming is done with the Split Second R4 engine calibration software.

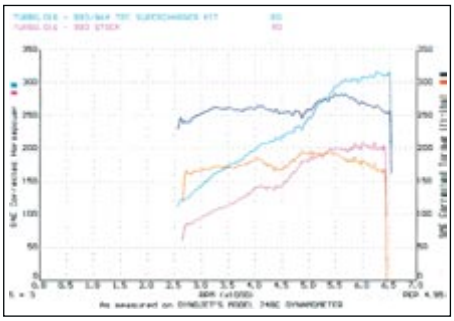
Part Number	Number of Injectors	Injector Impedance	MAP Sensor Type	Map Tables Used
AIC1-A2H	2	High	Absolute	A
AIC1-A4H	4	High	Absolute	A and B
AIC1-G2H	2	High	Gauge	A
AIC1-G4H	4	High	Gauge	A and B
AIC1-A1L	1	Low	Absolute	A
AIC1-A2L	2	Low	Absolute	A
AIC1-G1L	1	Low	Gauge	A
AIC1-G2L	2	Low	Gauge	A

Additional Injector Controller — Project Porsche 993

TURBO Performance Center uses the FTC1 to control the additional injector and ignition timing on its 993 supercharger kit. The fuel mapping is precisely tuned to match the requirements of the supercharged engine.

The kit uses a positive displacement supercharger to produce a gain of over 100 horsepower. The precise mapping of the FTC1 results in a kit that does not compromise drivability. The additional low end torque results in a car that is actually easier to drive around town with fewer gear changes.





SPLIT SECOND

Air/Fuel Ratio Meter — ARM1

- **Five color display**
- **Night dimming**
- **High Accuracy**
- **Signal filtering**

The ARM1 is a miniature air/fuel ratio meter that features an ultra-bright, easy to read, five color display. It may be used with the stock oxygen sensor or a dedicated sensor such as the EGO1. High precision circuitry is used to provide accurate readings and assure that the ARM1 does not interfere with the oxygen sensor. The ARM1 has automatic night dimming to reduce the display brightness at night. Available for both standard 1V sensors and for late model BMW sensors that read from 5 to 0V.

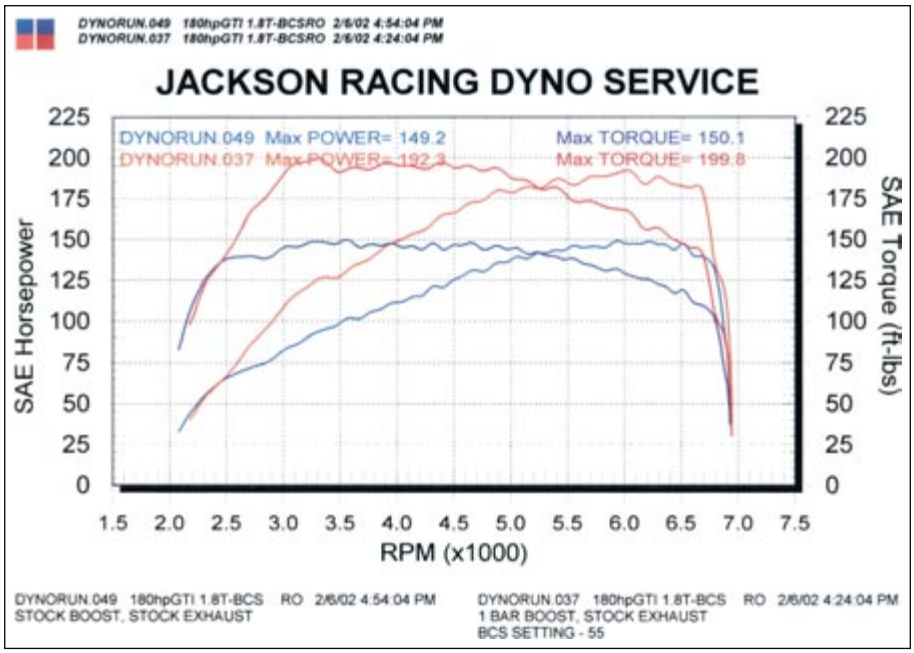
Boost Control System — 1.8T BCS

The dyno curves show the horsepower and torque gains over stock at the wheels on a 2002 Jetta. The peak horsepower increase of 35 hp occurs at 5500 RPM. The peak torque gain is apparent from 2500 to 5000 RPM. These horsepower and torque improvements are made with stock ECU programming. This helps to preserve smooth and predictable drivability.

The BCS is easy to install. Its small size makes it easy to fit in the center console. Wire connections for the BCS are made at the ECU. Installation takes a few hours.

- **Adjustable boost from the driver's seat**
- **Built-in boost gauge**
- **Miniature size**
- **Easy to install**

The 1.8T BCS allows the user to increase boost without ECU re-programming. Boost can be varied from 6 to 14.5 PSI, which increases horsepower at the wheels by 35 hp and torque by 43 ft-lbs. It is designed to work with all throttle-by-wire Audi and Volkswagen 1.8T engines. Compatible models include the A4, Passat, Jetta, Golf, and GTI. The boost gauge has a ten segment, three color LED display that reads in 1.5 PSI increments from 1 to 14.5 PSI. It is electronically filtered to provide a smooth reading.



SPLIT SECOND

Mass Air Flow Kits

- **Eliminate restrictive air flow meters**
- **Tune your modified engine for maximum performance**
- **Complete kits for several different vehicles**

Complete mass air flow conversion kits are available for several different models. These kits provide a significant horsepower upgrade for air flow meter or Karman Vortex based vehicles. Air flow meters are highly restrictive and are frequently the cause of a poor running car. The MAF kits not only improve horsepower, but also provide a means to fine tune performance while preserving drivability.

Two different MAF sensors are offered with the kits. The MAF 3.0 has a round 3.5" inlet and a round 3" outlet. It is designed to hose clamp tubing on both inlet and outlet. The MAF 3.5 has a 4" I.D. inlet and 3.5" outlet. The inlet has a flange mount and is designed to be bolted to a flat surface.

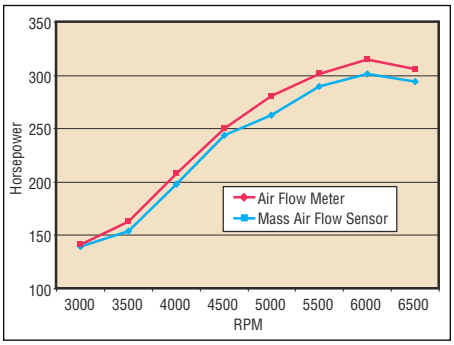
All MAF kits come with MAF sensor, MAF wire harness, ARM1 Air/fuel Ratio Meter and either the ARC2-A or PSC1-004 calibrator. Model specific kits also have various reducers and adaptors to make installation easier.

The following standard MAF kits are available with either the ARC2-A calibrator or the PSC1-004 Programmable calibrator:

Universal MAF 3.0 Kit
Universal MAF 3.5 Kit
BMW E28 535i
BMW E28 M5
BMW E30 325i
BMW E30 M3
BMW E34 535i
BMW M635csi

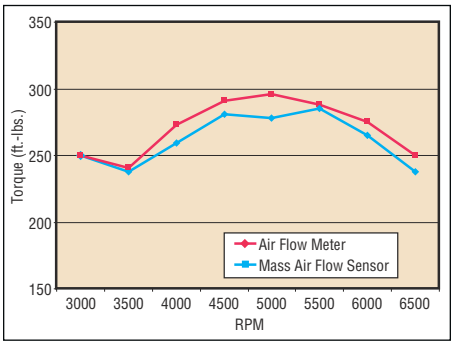
Mass Air Flow Kits — Project E28 M5

The E28 M5 is an example of a car that responds well to an MAF conversion. Typical gains from the conversion are 18 hp and 18 ft-lbs referred to the crank. Improved throttle response and quicker rev to redline are the results immediately felt from the driver's seat.



Horsepower

RPM	Air Flow Meter	Mass Air Flow Sensor	Improvement
3000	140	141	1
3500	154	163	9
4000	198	208	10
4500	244	250	6
5000	263	281	18
5500	290	301	11
6000	301	315	14
6500	294	306	12



Torque

RPM	Air Flow Meter	Mass Air Flow Sensor	Improvement
3000	250	250	0
3500	238	241	3
4000	259	273	14
4500	281	291	10
5000	278	296	18
5500	285	288	3
6000	265	275	10
6500	238	250	12

Oxygen Sensor — EGO1

- **Heated sensor**
- **Predictable, stable output**
- **Characterized over wide temperature range**

The EGO1 is a precision, heated 4-wire oxygen sensor. It is ideal for driving the ARM1 Air/fuel Ratio Meter or as a replacement for stock sensors. The output of the EGO1 remains calibrated over a wide temperature range. Characterization allows precise air/fuel ratio measurement when used with the ARM1.

Sensor Conditioners

EGO Signal Conditioner, ESC1

- **Dual channels for one or two EGO sensors**
- **Internal MAP sensor**
- **Versions available for 1V and 5V range EGO sensors**

The ESC1 alters the signal from EGO sensors under boost conditions. It may be used in either single or dual EGO sensor applications. Under vacuum conditions it outputs a signal which is identical to the EGO signals that appear at the input. Under boost, it prevents lean mixtures by disabling fuel trim by the ECU.

Frequency Clamp, FC1

- **Avoids fault codes due to excess flow readings**
- **Compatible with OBDII systems**
- **Versions available for different clamp levels**
- **Clean, undistorted output signal**

The FC1 is designed to condition the output of frequency-based air flow meters such as those on late model GM MAF sensors and Karman Vortex sensors. Under normal conditions, the FC1 outputs a signal that is identical to the flow signal at its input. When the frequency reaches the internally set clamp level, the FC1 maintains a constant output frequency at the clamp level as the input frequency rises.

Frequency Calibrator and Clamp, FCC1

- **Ideal for supercharger kits on late model GM cars**
- **Avoids fault codes due to excess flow readings**
- **Factory set calibration and clamp levels**
- **Fast response time**

The FCC1 Frequency Calibrator and Clamp picks up where the FC1 leaves off. In addition to the frequency clamp feature of the FC1, it also calibrates the gain and offset of the frequency signal. The FCC1 thereby provides a way to set the air/fuel ratio over the entire load and RPM range. The calibration is set by the factory and is not adjustable by the user.

Temperature Signal Conditioner, TSC1

- **Overrides temp signal during warm-up and normal operation**
- **Allows engine to operate at optimum temperature**
- **Alters fuel and timing map in ECU**
- **Versions available for various temperature profiles**

The TSC1 is a temperature signal conditioner that modifies the output of coolant temperature sensors. Many different versions are available which can activate above or below an internal set point. The altered temp signal can be a scaled version of the input or a fixed level.

VR Sensor Conditioner, VSC1

- **Configurable for differential or single ended sensors**
- **Provides 5V logic level signal output**
- **Compatible with electronic ignition modules**

The VSC1 is designed to condition the output of variable reluctance (VR) sensors. It detects the low level signal output of the VR sensor, and converts it to a high level 0 to 5V logic signal.

Sensor Conditioners

Voltage Clamp, VC1

- **Avoids fault codes due to excess flow readings**
- **Compatible with OBDII systems**
- **Versions available for different clamp levels**

The VC1 is designed to condition the output of voltage based MAF and MAP sensors. Under normal conditions, the VC1 outputs a signal that is identical to the flow signal at its input. When the voltage reaches the internally set clamp level, the VC1 Maintains a constant voltage at the clamp level as the input voltage rises.

Voltage Clamp, VC2

- **User adjustable clamp level from 2.5V to 6V**
- **Highly accurate and stable clamp level**
- **Compatible with OBDII systems**

The VC2 is an improved version of the VC1. Like the VC1, it tracks the input signal up to the clamp level then holds that level at the output as the input continues to rise. Instead of the fixed clamp level of the VC1, the VC2 is user-adjustable over the range of 2.5V to 6V. The clamp level is also far more accurate and stable over both input voltage change and temperature.

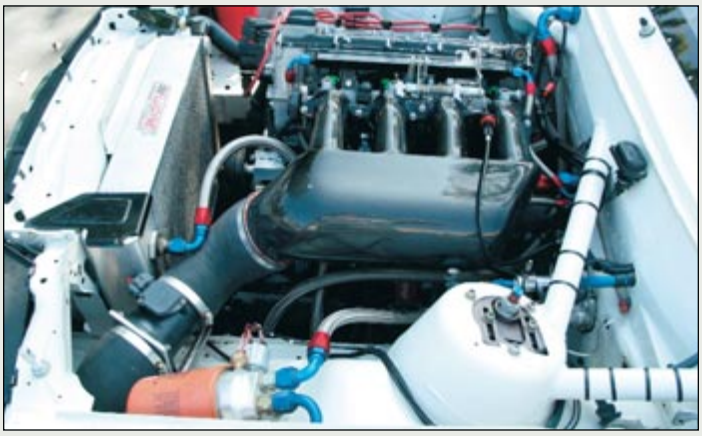
Racing

In addition to its design and manufacturing operations, Split Second participates in BMWCCA Club Racing with its E30 M3 race car. Racing is the acid test for quality and reliability of electronic components. Many Split Second products are put to the ultimate test in the team's race car during testing and racing. The racing program serves to keep the staff at Split Second aware of technological advancements and focused on what it takes to win.

The Split Second E30 M3 race car at Willow Springs Raceway. This is one of several tracks in the Southern California area where the car competes.

The interior of this car shows that it is all business. The PSC1-004 Programmable Signal Calibrator is used to implement the air flow meter to mass air flow conversion, and provides laptop programmability of the fuel curve for maximum performance.

The engine is a race prepared 2.5L with carbon fiber intake plenum, 4" MAF sensor, equal length headers and custom exhaust.



SPLIT SECOND

1949 E. Deere Ave., Santa Ana, CA 92705
Phone (949) 863-1359, Fax (949) 863-1363
www.splitsec.com