

TR6 Electronic Distributor-less Ignition

- **No moving parts. No weights, springs, rotors, caps, or points. No parts to wear out!**
- **Rebuilt crankshaft damper, very important. The engine requires damper to prevent crank failure and the rubber bonding of OEM dampers is failing with age.**
- **Huge spark. Direct connection from coil to plug permits 0.056" plug gaps. New custom fit spark plug wires.**
- **Major components are Ford OEM from 4.0L V6 applications. This includes the crank sensor, the EDIS, and the coil pack.**
- **Uses the Megajolt ignition processor. User friendly interface.**
- **All open source software.**
- **Manifold pressure sensing, the advance curve is based on a 10 by 10 matrix of rpm versus manifold pressure. Permits maximum advance without detonation.**

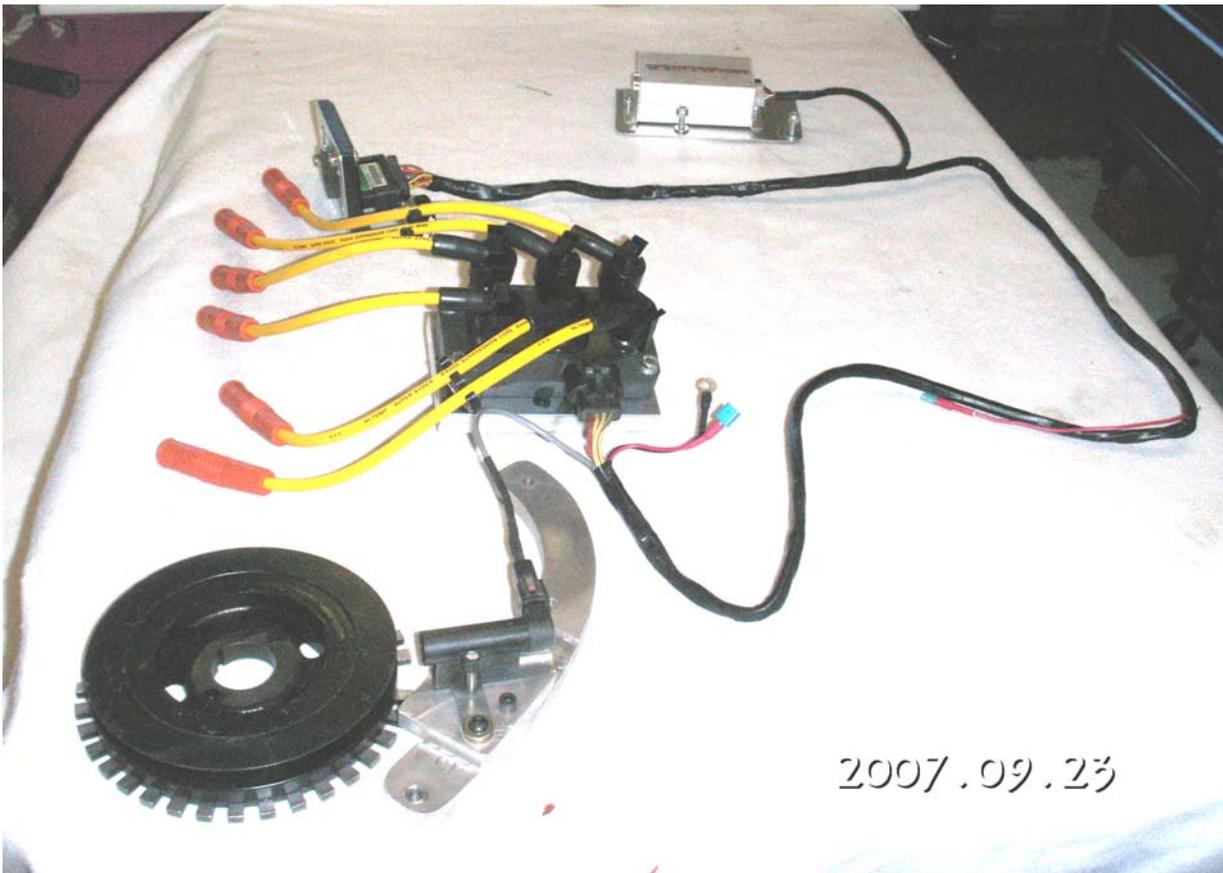
You will need a serial cable to connect to the Megajolt processor and a PC for programming different timing values. The processor is preloaded with a preliminary advance table.

Introduction

This ignition is the single best improvement for drive-ability you can do to your car. The idle quality will be much improved, rock steady, the engine will just tick over, and it will pull away from a stop much better. Almost, gasp, like a modern car. You now have the ability to dial in whatever ignition timing you choose at any RPM. With the featured ignition advance "map", the engine will pull strongly above 3500 rpm.



Ignition System mounted in car. I cut down a distributor to provide a tach drive.

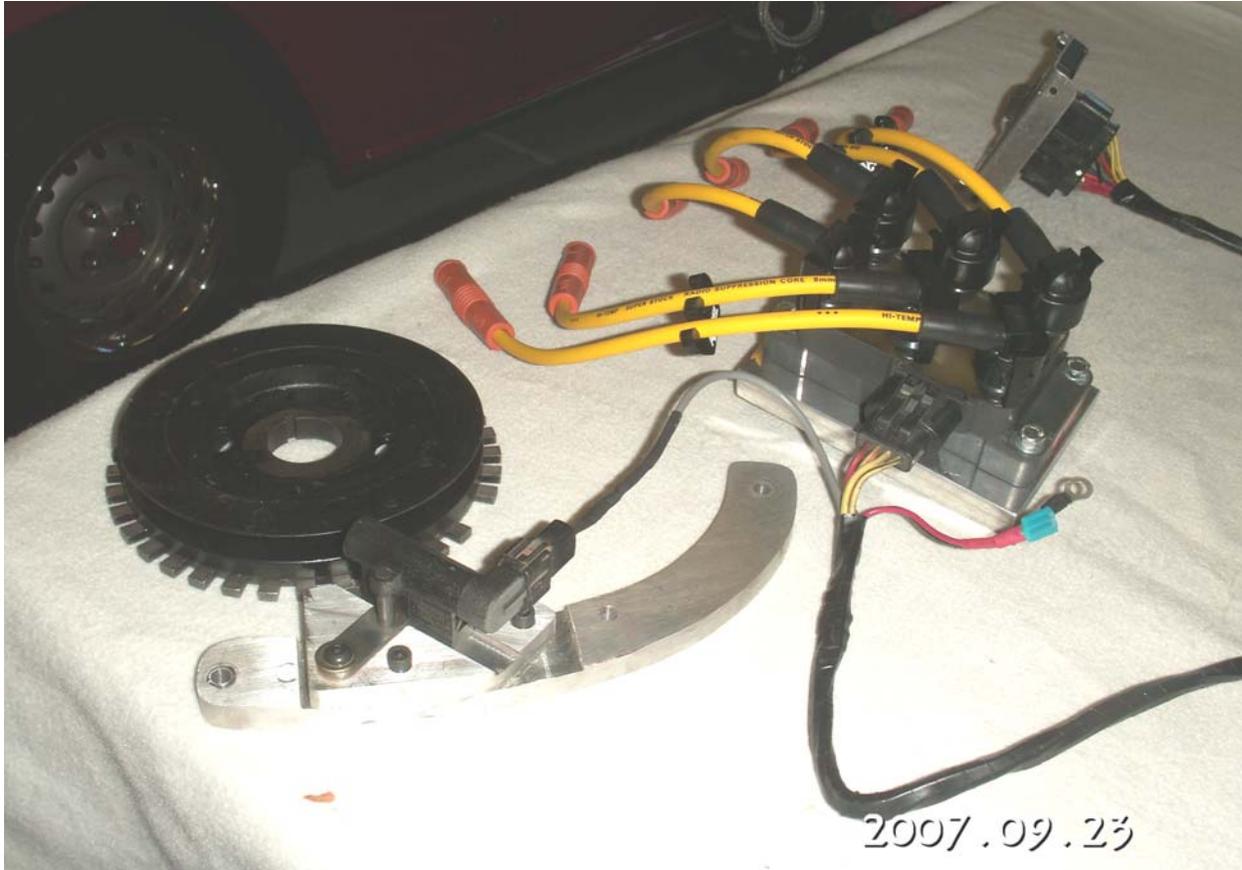


The system consists of four parts; a toothed trigger wheel (mounted to a modified stock damper) and VR sensor (in the foreground of the picture), a coil pack (just above the VR sensor with custom wires), a EDIS6 (Electronic Distributorless Ignition System just behind the coil pack), a Megajolt processor (small aluminum box at the top of the picture) and a custom wiring harness (fits alongside the stock harness).



See paragraph next page, this is the approximate fitment in car.

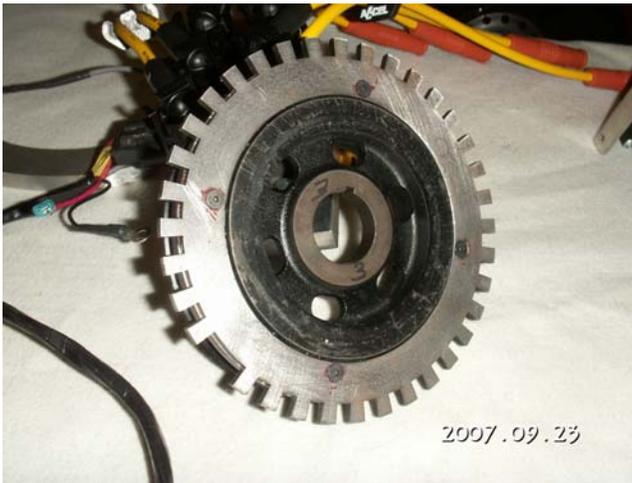
This is the approximate mounting in the car if you were standing alongside the driver's front fender looking into the engine compartment. The curve in the wiring harness fits around the inner wheel well alongside the stock wiring harness. The Megajolt processor in the right foreground fits underneath in the driver's footwell just in front of the brake and clutch pedals. The EDIS6, behind it, fits behind the trim panel holding the left radio speaker, close to the accelerator pedal. The coil pack replaces the stock coil and VR sensor fits at the front of the engine block underneath the alternator.



Close up of the VR sensor and coil pack.

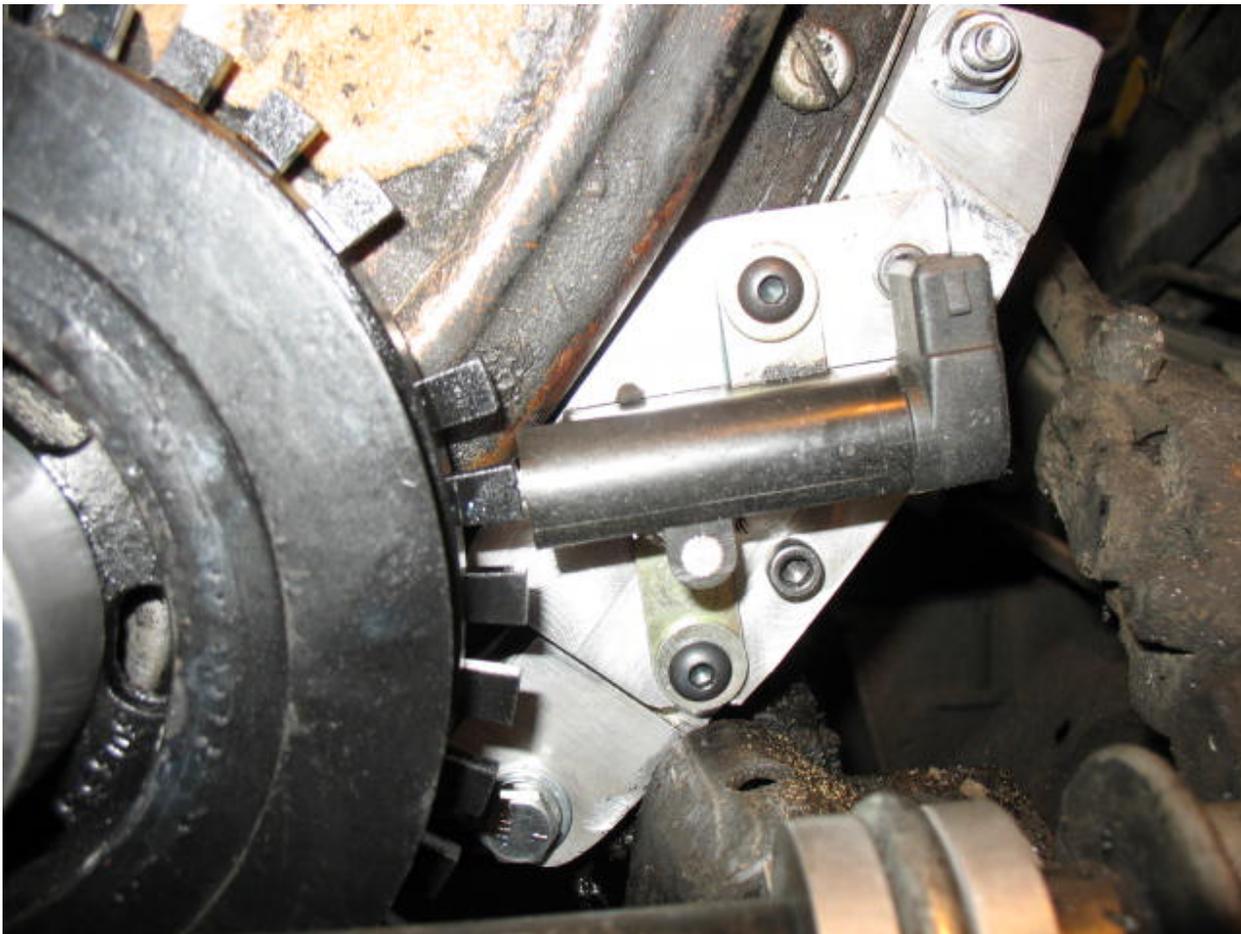
The wiring harness follows alongside the stock harness out to the alternator. The VR sensor wire then goes underneath the alternator toward the front of the block. The black ground wire is captured under one of the coil pack mounting bolts to provide a trouble free ground for the whole system. The red power wire is connected to the stock coil power wire from the ignition. Additionally, there is another power wire connected to the fuse block (can be seen in previous photo nearby the sharp bend in the harness to go alongside the wheel well).

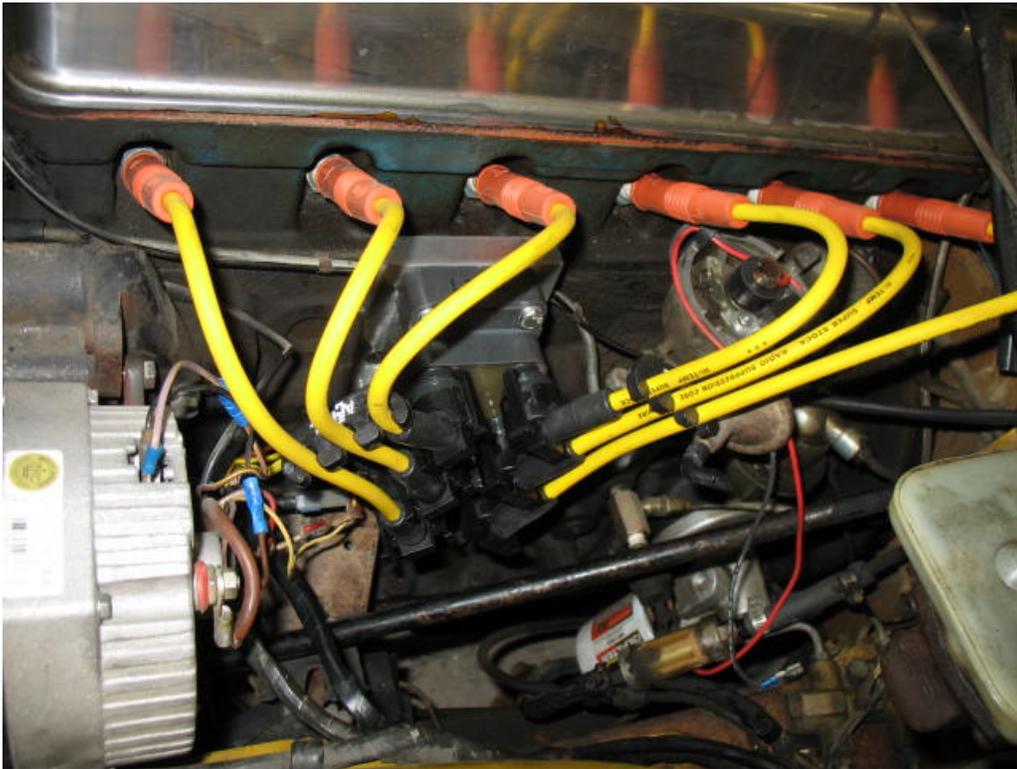
The toothed wheel fits into a step machined into the backside of the crankshaft damper. It is imperative that the outside ring of the damper hasn't rotated in relationship to the inner hub. This is not uncommon as the rubber bonding has broken down over the years of use. Therefore, the supplied damper has been rebuilt with new improved rubber bonding by Dale Manufacturing of Salem, OR. The toothed wheel is mounted with both screws and epoxy bonded to insure a trouble free life. The damper assembly has been rebalanced. The alignment of the toothed wheel is preset and is matched to the VR sensor mount. The EDIS6 system cannot compute negative timing values such as 4 degrees ATDC. The stock timing uses these "negative" values. Therefore the alignment of the toothed wheel is set so that a zero value in the advance table is actually 5 degrees ATDC. The true advance value for the engine is then 5 degrees less than each value in the preset table.



There are other installations of a toothed wheel onto TR6 and GT6 engines. Almost all of them mount the toothed wheel to the front of the damper on a modified fan extension. This works well except for two reasons. First, it complicates changing the fan belt as the VR sensor has to be disconnected and removed to replace the belt. The VR sensor connectors aren't the most robust design and I would prefer to leave it in situ. Same goes for the VR sensor. Second, it necessitates the installation of an electric cooling fan. My car has the stock fan and stays cool even in the heat of summer in Phoenix.

The VR crank sensor is mounted below the alternator on a fabricated aluminum mount. The VR sensor is already set for the proper gap to the toothed wheel. The coil pack is bolted to an aluminum mount that fits where the stock coil mounts.





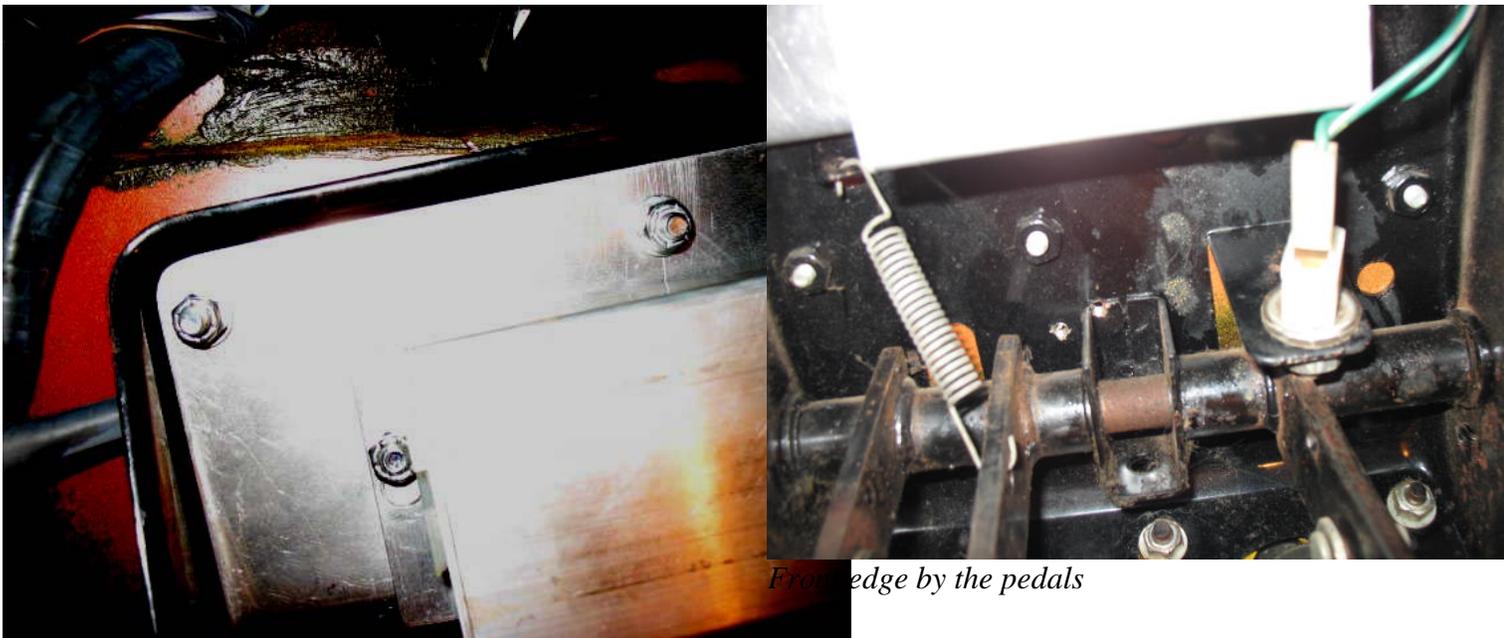
Current system coil pack and wires.



Coil pack mounted in place of stock coil using the stock-mounting bosses on engine block. Original prototype, current systems uses different cylinder assignments to coil pack, see above. Note cut down distributor drive for tachometer.



EDIS6 module mounted in drivers footwell



Front edge by the pedals

Aft edge of Megajolt mounting plate bolted to aft bolts of pedal box

Operation

The system is very straight forward, consisting of basically four parts. A crankshaft position sensor which feeds TDC and RPM information to the Electronic Distributorless Ignition System (EDIS), the EDIS then drives the six coil pack. The coil pack is connected up to each spark plug individually and fires two cylinders simultaneously; the one at compression TDC and the matching one at exhaust TDC. The exhaust TDC cylinder spark is “wasted” as it is not needed (this is known as a wasted spark ignition system). The EDIS communicates with a small processor for advance information. The EDIS outputs a RPM signal and the processor references it’s stored “map” and sends spark advance information back to the EDIS. If the EDIS doesn’t receive the advance information it enters a limp home mode of a set advance of 10 degrees BTDC. The processor stores a 10 by 10 matrix of advance values based on RPM and manifold pressure. All values are user selected. Maps can be stored as files on a PC and downloaded to the processor. This facilitates easy changes to the maps and returning to previous maps.

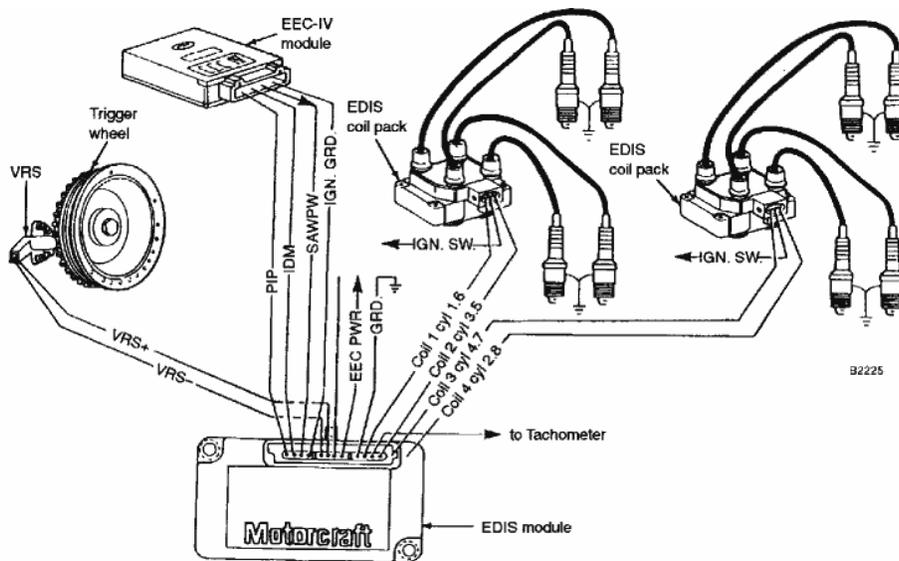


Fig. 3-17. EDIS on 4.6L engine uses two sets of two EDIS coil-packs, each firing two cylinders. Firing cylinder-pairs, two wires cross over from each set of coil packs to opposite bank of cylinders. EDIS Module has own ground to the battery negative post.

This is an 8-cylinder application. A 6 cylinder uses a single coil pack. The MegaJoltLight Jr (MJLJ) processor replaces the EEC-IV module. The EDIS module is about the size of a deck of cards.

The Megajolt processor receives the RPM of the engine as the PIP signal. It then looks up on a stored ten by ten table for the proper advance value which is outputted as the SAW (Spark Angle Word). One axis of the table is RPM and the other is manifold pressure. The manifold pressure sensor of the Megajolt may be hooked up to the intake manifold... The will require installer fabrication. The manifold pressure values need to be pretty clean of unstable variation. This may require several attempts to find the best location for sensing. The values can be displayed on a laptop as the car is operated. The use of manifold pressure will allow greater advance values when the engine is not under load. The software for programming new advance values is simple and intuitive. It also allows real time display while the engine is operating. The software is open source.

There is one small limitation to the system. The processor and the EDIS does not allow negative (ATDC) ignition advance values. To achieve a stock advance curve of 4 degrees ATDC at idle, the geometry of the trigger wheel, VR sensor, and crankshaft damper is modified. The result is that all values in the Megajolt advance table are offset by 5 degrees. That is a value in the table of 0 is

actually 5 degrees ATDC and so forth. Example, say the table has 35 degrees of advance at 3000 rpm, the actual timing is 25 degrees of advance. A stock advance curve can be developed from the advance information from the Bentley Shop Manual. The table preloaded into the processor has the same values for advance loaded across the manifold pressure values. This renders the matrix to a strictly RPM based advance curve. The user may modify this once a good steady pressure is connected. The theory is that advance values need to decrease as the engine is placed under load to prevent detonation. I have run the current loaded values in my car for over a year of hard driving with no evidence of detonation (pinging). Therefore, the advance values may be increased when not under load. Proceed slowly and carefully being on the lookout for detonation. I am currently in the process of finding the best pressure source for my car and modifying the advance table.

The screenshot shows the MJLJ Configurator V3.0.0 interface. The main window displays a table of advance values for various RPM and Load conditions. An 'Edit ignition bin values' dialog is open, showing 10 bins for RPM and Load. Below the table are three gauges: 'Ignition Advance' (two green digital displays), 'RPM' (analog gauge showing 1413 RPM X 100), and 'Load' (analog gauge showing 40 KPa).

	RPM									
	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
10	8	12	19	24	29	31	34	38	40	43
20	8	12	19	24	29	31	34	38	40	43
30	8	12	19	24	29	31	34	38	40	43
40	8	12	19	24	29	31	34	38	40	43
50	8	12	19	24	29	31	34	38	40	43
60	8	12	19	24	29	31	34	38	40	43
70	8	12	19	24	29	31	34	38	40	43
80	8	12	19	24	29	31	34	38	40	43
90	8	12	19	24	29	31	34	37	40	43
100	8	12	19	23	29	31	34	37	40	43

Edit ignition bin values

	1	2	3	4	5	6	7	8	9	10
RPM Bins	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Load Bins	10	20	30	40	50	60	70	80	90	100

Screen print from current advance file. RPM values are user selected. Manifold vacuum values are also user selected but currently the vacuum sensor is not hooked up so I haven't loaded values yet for that. Each "bin" is the advance value. In my case I mounted the 36-1 wheel in a manner that each of the displayed values has to have 8 degrees subtracted to yield actual advance. This was done to achieve the 4 ATDC timing of the stock ignition. I.e. first advance value of 8 yields 0 degrees of advance and 43 yields 35 degrees of actual advance.

This is the runtime environment with the engine running at 1347 RPM, 41 KPa vacuum, and “16 degrees of advance (which is actual 8 degrees with my system). The Megajolt can do data logging.



Perspective view of the runtime environment. RPM 2461, advance “28”, 31Kpa.

