

# Pre-EFI Jeep® Inline Six-Cylinder Ignition Upgrades

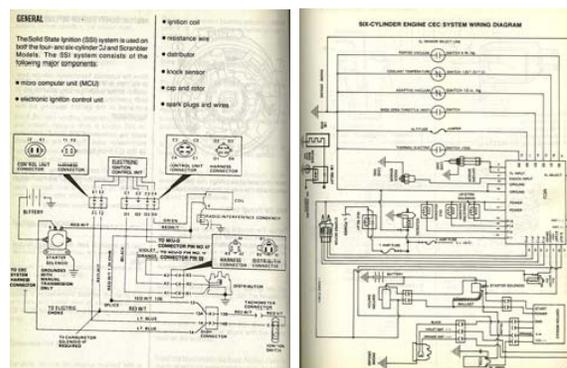
Kaiser's Jeep® Corporation dropped civilian use of the OHC 230 six-cylinder engine in 1965 and opted for American Motors' engines. AMC had redesigned its inline OHV engines for its 1964 cars, shifting to a 7-main bearing design. The platform would last longer than any other engine design in U.S. automotive history.

The last AMC six was the 4.0L Jeep engine, which served through the 2006 TJ Wrangler. In all, the 232, 258/4.2L and 4.0L inline sixes would span over four decades of use in Jeep trucks and SUVs. 1983-up 2.5L four-cylinder, OHV pushrod engines use this architecture as well.

While the inline sixes and 2.5L four evolved into EFI/MPI engines, AMC's engines began as conventional fuel-and-spark systems, a basic carburetor with an ignition distributor. 1965-74 sixes used a breaker point ignition. From 1975-up, all Jeep sixes use electronic distributors.

The 232/258 electronic distributors used traditional vacuum-and-centrifugal advance mechanisms through the end of the carbureted era. 1990 was the last year for a carbureted inline six, the YJ Wrangler's 4.2L powerplant.

AMC did not manufacture ignition distributors or carburetors. During the breaker point era, Jeep outsourced 232/258 distributors from Delco-Remy. For the electronic era, AMC/Jeep® turned first to Prestolite then Ford-Motorcraft.



**At left, a wiring diagram for the micro-computer unit (MCU) ignition override found on mid-'80s Jeep CJs and YJs through 1990. The wiring diagram (right) for MCU-driven components of the carburetor circuit shows the complexity of the fuel system, too. (A vacuum diagram is even busier!) With the service and replacement parts unavailable, these systems often fail visual and tailpipe emissions tests. (Courtesy of AMC/Jeep® workshop manual.)**

Delco-Remy distributors were reliable and simple to service. Ford's Motorcraft Duraspark II design was durable; however, the bulky, fender-mounted box module could fail unexpectedly. Prestolite units were marginal in quality and used for only a brief period (1975-77). Parts have become difficult to source due to low-volume sales of these distributors.

Each of these electronic distributors were emissions era designs, and by the 'eighties, add-on modules further limited the spark timing functions of AMC engines. The priority, compliant emissions readings, was at the expense of engine horsepower, which hit an all-time low for the 258/4.2L six. A primitive "feedback" induction system struggled to meet standards. By 1987, introduction of AMC Renix's

MPI-EFI on the new XJ Cherokee 4.0L inline sixes seemed long overdue!

For 1991, the XJ Cherokee's updated Mopar MPI 4.0L replaced the 4.2L 258 in the YJ Wrangler. The 2.5L four went from throttle body injection to full MPI, which kept the inline six in the lineup for another *fifteen model years*. Although sixes through 1999 still have distributors, their spark timing management is fully controlled by the powertrain control module (PCM). In 2000, the 4.0L went to a high-efficiency distributorless ignition with contemporary coil-on-plug design.

### **Pre-EFI 232/258 Six-Cylinder Spark Deficiency**

The goal of pre-EFI smog equipment was to reduce tailpipe emissions, specifically NOx, O2, CO, HC and CO2. The same year that AMC switched to electronic distributors on its 232 and 258 sixes, vehicles in the Jeep® CJ utility, Cherokee (full-size) and Wagoneer or J-10 categories also gained catalytic converters. An electronic distributor, EGR valve plus the emission-calibrated carburetor each focused on a thorough combustion process.

The catalytic converter and other devices reduced pollutants in the exhaust stream. Leaner fuel mixtures were a carburetor chore. Exhaust gas recirculation (EGR) dilution lowered combustion temperatures to reduce NOx emissions. Hotter spark helped the combustion process for more complete fuel burn. The catalytic converter reduced the primary pollutants by burning them in a catalyzing process...A few catalytic converters have also set wild lands on fire when 4x4s get parked in tall, dry grass!

By the 1980s, stricter emissions standards drove AMC and other manufacturers to the use of "feedback" carburetors and electronic overrides for spark timing. The most glaring change in AMC's 4.2L/258 carburetors was the Carter BBD two-barrel's stepper motor and fuel enrichment solenoid.

The ignition changes included a module that received sensor signals and altered spark timing beyond the distributor's conventional means. In addition to using the traditional mechanical (centrifugal) advance and vacuum controlled mechanisms, the module creates various spark timing changes under different engine loads and operating conditions.

Any owner of a 1981-90 Jeep with a 4.2L six knows the limitations of these systems. They consist of failure-prone components: feedback carburetors and quasi-electronic spark timing control overrides that were half-baked steps toward EFI engineering. Factory shop manuals of the period contain lengthy chapters of troubleshooting flow charts and details for servicing these systems.

Over the years, Jeep® abandoned the needed replacement parts for these emissions systems, carburetors and distributors. Restoring a stock 232 or 4.2L engine for emission compliance can be daunting.

*Note: The 50-State emission legal Mopar Performance EFI Conversion for 1981-90 4.2L engines has been a great contribution to owners of these Jeep models. Thanks, Jeep®/Mopar™ for offering this system!*

### **Righting Ignition Wrongs**

Whether you want to restore a defective, unreliable '65-'90 Jeep inline six-cylinder ignition or upgrade to more efficient spark output and wider spark plug gaps, there are solutions. Depending upon your Jeep vehicle's emission requirements and the state or local inspection demands, you have options. Since most of the components to restore the system are no longer available, a reliable upgrade may qualify as a repair in some states.

Canadian sixes began using the Motorcraft distributor in '77, U.S. models in '78. This was a great improvement over the short-lived '75-'77 Prestolite electronic units. The Motorcraft

Duraspark II is actually a good system, and I have converted '81-up versions of these distributors to non-feedback use with a common Chrysler 5-pin module. You can also use the broader distributor cap, spacer and large rotor with these housings. (See my *Jeep® Owner's Bible™* (Bentley Publishers) for details or submit a Q&A question if you would like clarification on this upgrade. I am happy to illustrate upgrades for a stock 4.2L Motorcraft distributor.)



***Infamous Prestolite electronic distributor was a 232/258 six item from 1975-77. If your Jeep engine has this distributor, consider options available. Prestolite, once a highly reputable product, was unreliable and failure-prone by the late 'sixties. Just ask a 225 V-6 CJ owner!***

A homespun alternative that gained some popularity in the '90s was an HEI distributor from a Chevrolet inline 250 or 292 six. The claim is that a 1978-up HEI unit will work. These distributors have become rarer and, yes, they do wear out. '78-up is also the emissions era, and the distributor will need a spark timing re-curve for reasonable performance. The swap requires a new drive gear. The story goes that an '83-up AMC V-8 item will do the trick. (I looked this up as Mopar P/N J3208615 gear with J8128462 pin.)

Before performing this swap 1) make sure the I.D. of the new gear and drive pin's diameter fit the G.M. HEI drive-shaft properly; 2) the HEI housing must fit the block's bore correctly; 3) check the G.M. HEI driveshaft's end

tang-to-housing-base measurement; be certain tang engagement at the oil pump is correct, and 4) make sure that the new drive gear's tooth diameter, tooth angle and engagement point with the camshaft is a precise match for the OE six-cylinder distributor.

***Warning: If any of these measurements are incorrect, camshaft or oil pump failure will result! Voltage to the distributor should be full 12-volt ignition and not ballast resisted.***



***In the mid-'70s, Delco-Remy introduced the HEI distributor. Broad at the cap base of the housing, the distributor contains the module, centrifugal and vacuum advance systems, a coil that mounts in the cap and easy service access. Shown is a six-cylinder version similar to the unit some have retrofitted to Jeep® inline sixes. The design is noted for its hot 50KV spark plus easy service and spark re-curve.***

If checking out all of these dimensions with a caliper and micrometer does not sound like fun, a practical, time saving approach is the new, 'brand-X' billet aluminum distributor from 4WD Hardware. This assembly has the cap, rotor, coil, vacuum canister, drive gear and module all in place. At its low price, the unit must be a 'knock off' of the G.M. HEI design with 232/258 dimensions. Currently, \$122.99 plus freight will get you into this ready-to-run assembly—with a set of new plug wires! A harness is available.



***This has to be the best price in the 'Free World!' 4WD Hardware offers the unit, as of this printing, for \$122 with new plug cables! You can barely buy the tune parts (new coil, module and vacuum canister) for this price. Looks like typical G.M. HEI dimensions and comes with a drive gear. [Click here for details.](#)***

***Note: I have not tested this distributor. The shaft bushing design and quality is not specified. 4WD Hardware and others offer upscale HEI-type distributors like the D.U.I., Mallory and MSD units, each popular for Jeep® inline sixes.***



***D.U.I. focused on the G.M. HEI distributor design. This is an AMC Jeep® application for 232/258 sixes. An easy to follow wire hookup, provision for a tach lead, double shaft bushings and 50K-plus volt output make this popular!***

D.U.I. units come curved properly for typical use. Retailing around \$379, they hook up

easily and use off-the-shelf G.M. HEI replacement parts. D.U.I. distributors work well for daily driver, trail or competition use. Like other G.M. designs, these units can be serviced readily in the field and feature a simpler approach to spark timing and curving—an excellent distributor pick.

***Note: Components suggested in this article represent performance improvements. If your Jeep still requires annual or biennial state or local inspection for emissions equipment, make sure any replacement parts comply with these standards. I strongly advocate a clean tailpipe reading. A passive device like the EGR should be kept and maintained. EGR can increase engine life, by cooling upper cylinders, without degrading performance...Keep a clean tailpipe!***



***MSD ball-bearing shaft support is simply the best. If you use your Jeep 232/258 CJ, 4.2L YJ, J-truck/Cherokee or 4.0L engine competitively, go MSD. The MSD billet distributor is built to a racing standard. This premium ignition must be run with an MSD box (6, 7, 8, 9 or 10 series) and Blaster coil. CARB approved for use in all 50-States. [Click here for details.](#)***

Race proven for decades, MSD delivers quality and spark accuracy. This 50-State legal

design requires the MSD "box" or an upgrade coil, making this the more costly alternative.

The earlier breaker point 232 or 258 engines can also benefit from any of these distributor upgrades. There are breakerless conversion kits available for older Delco-Remy breaker point distributors, clearly the least expensive route to breakerless performance. An upgrade to the HEI coil and module distributor would offer superior spark output and reliability. Considering the cost of 4WD Hardware's HEI distributor, HEI

would be smarter than a breakerless conversion on an ancient breaker point distributor. Frankly, it's hard to imagine an original breaker point distributor without shaft and bushing wear.

If you plan an extensive backcountry trip, play it safe. In the breaker point era, we carried a spare point set, condenser, rotor and even a coil. Although a quality HEI distributor should be very reliable, bring along a spare module, rotor, cap and coil.

A handwritten signature in black ink that reads "Moses Ludel". The signature is written in a cursive, flowing style with a prominent initial 'M'.