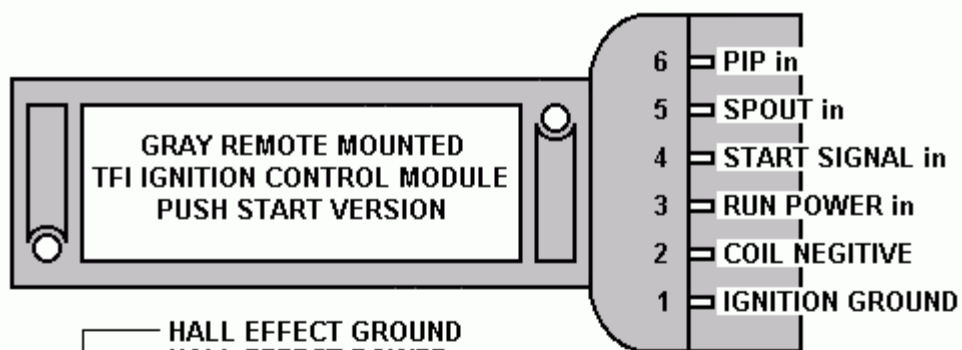


Ford TFI modules: Gray or Black?

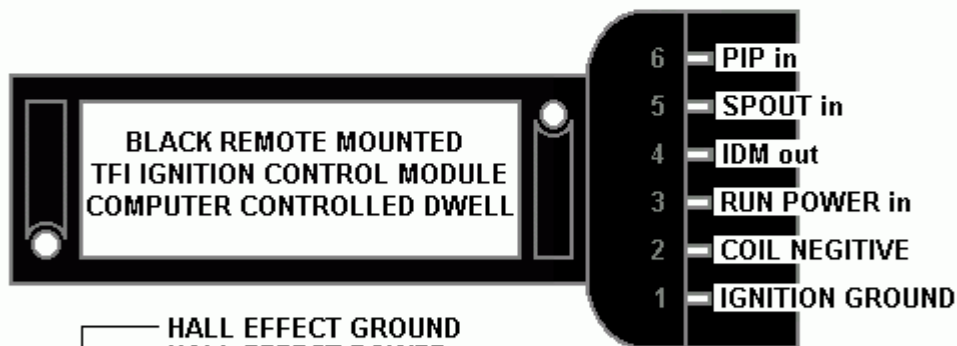
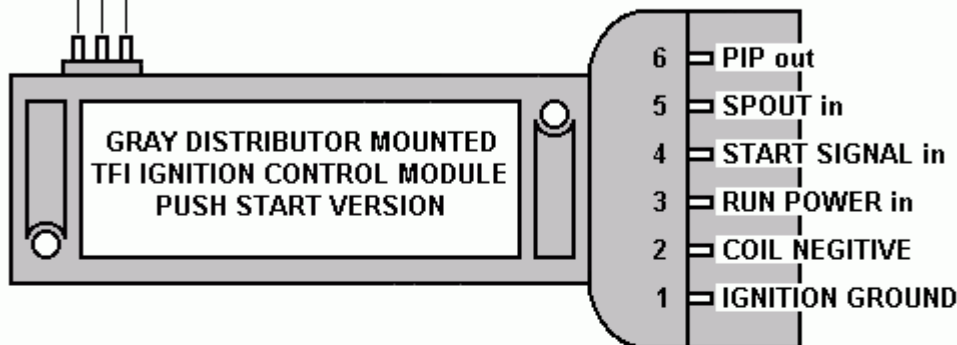
Most technicians who deal with Ford driveability and no-start problems have become very familiar with the Thick Film Ignition (TFI) system. Ford started using the six-pin TFI module with the EEC-IV computer system in 1983, and for years it remained basically unchanged.

The early TFI system, which Ford calls the "Push Start" TFI system, uses a gray TFI module. Originally, the module was mounted on the distributor. In the late '80s Ford began to relocate it away from the distributor on some vehicles to provide better protection from the effects of engine heat, but system operation remained the same. It uses a Hall effect pickup (stator) in the distributor, which generates a battery voltage, 50% duty cycle square wave, called the PIP signal, to the EEC-U PCM and the TFI module. The PCM processes this signal and sends out another battery voltage, 50% duty cycle square wave, called the SPOUT signal, to the TFI module. As long as the TFI module is receiving a SPOUT signal, it will fire the coil at the rising edge of that signal (except during engine cranking, when SPOUT is ignored) and the vehicle will run with the amount of timing advance commanded by the computer. If the TFI module does not receive the SPOUT signal, it will fire the coil at the rising edge of the PIP signal, and the vehicle will run at base timing. This is true on all TFI systems.

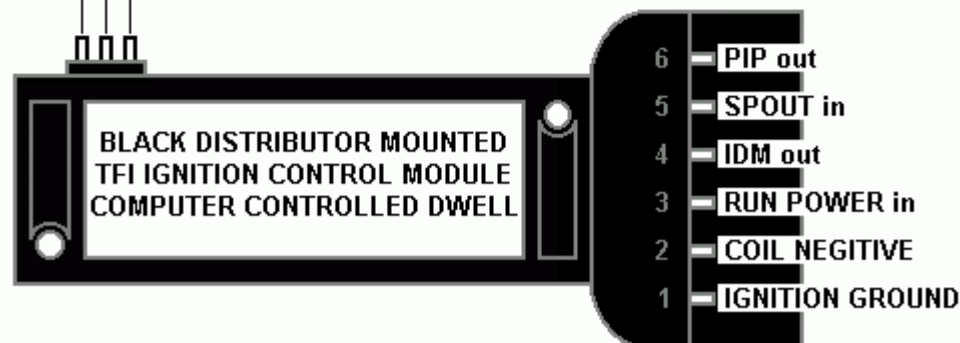
Ignition dwell with the Push Start (gray module) system is controlled by the TFI module alone, and increases with engine rpm. The Ignition Diagnostic Monitor (IDM) signal on a Push Start TFI system comes from the coil negative circuit and is filtered through a 22k ohm resistor to pin #4 on the EEC-IV computer. The computer monitors this circuit to verify a coil firing for each PIP signal, and sets codes if it sees missing or erratic signals. Another feature that is unique to the Push Start TFI system is the start input on pin #4 of the module connector. This is wired into the starter relay trigger circuit, and signals the TFI module that the engine is cranking. When the module sees battery voltage on this circuit, the SPOUT signal is ignored.



HALL EFFECT GROUND
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PROFILE IGNITION PICKUP (PIP) SIGNAL



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In the early '90s, Ford began using a different TFI system on certain vehicles--the Computer Controlled Dwell (CCD) TFI system. The TFI module on CCD TFI is always black in color. There are a few major differences between the two systems. As the name implies, with the CCD system, the computer controls primary dwell. The CCD TFI module still ungrounds (fires) the coil at the rising edge of the SPOUT signal, but now the falling edge of the SPOUT signal (which had no meaning to the Push Start TFI module) is used by the CCD TFI module to ground the coil. The PIP signal remains the same 50% duty cycle square wave, but SPOUT signal duty cycle varies according to how much dwell is desired by the computer.

Another major difference between the two systems is the IDM circuit. Pin #4 on the CCD TFI module, which was the start circuit input on the Push Start TFI module, is now the IDM signal, sent directly from the TFL module to pin #4 on the EEC-IV computer. This signal is still a filtered (low voltage) version of the ignition primary waveform, but is filtered internally in the TFI module rather than through an external resistor. There isn't any start circuit input to the CCD TFI module; the module infers engine cranking from a low rpm input from the PIP signal.

Since these two TFI systems are so significantly different, yet so similar in appearance, parts application problems will inevitably occur. A gray Push Start TFI module will plug right into a CCD system, and vice versa. To make matters worse, parts books are often incorrect on TFI module applications! With the incorrect TFI module installed, the vehicle will run, but driveability and MIL (malfunction indicator lamp) problems will result. For instance, if a gray Push Start TFI module is installed in a CCD system, the computer will not be able to control ignition dwell, and the MIL will illuminate with memory codes for the IDM circuit set, as the gray TFL module is incapable of generating an IDM signal to the computer. If a black CCD TFI module is installed in a Push Start system, dwell will remain fixed, since the SPOUT signal duty cycle never changes. If in doubt about which TFI module belongs on a particular vehicle, consult the ignition system wiring diagram for the vehicle. If the wire going to pin #4 on the EEC-IV computer comes directly from pin #4 of the TFI module, it is a CCD system. If not, it is a Push Start system.

A final note: As with every other rule, there is an exception. Some 1.9L Central Fuel (throttle body) Injected Escorts and Tracers were built with black TFI modules that are not CCD modules. If you encounter one of these, check the engineering number on the module. A CCD TFI module engineering number always starts with E9 or higher.

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http://www.therangerstation.com/tech_library/remote_tfi.shtml

I've had a couple dissected wiring harnesses on the bench over the last few days for exactly this issue of the remote mount TFI. There are a couple of things I discovered.

All of the remote mount modules I encountered were the black CCD version. All the distributor mounted versions were the gray push start version. This does not mean there may be other versions out there. This is simply what I encountered using F series wiring harnesses.

The remote mount module was used starting in 1992. It does not have the 3 pins on the side for the hall effect sensor in the distributor. This means the gray module will not fit on the heatsink without trimming the fins as described in the TRS article. Again, the gray module may have been used in other applications with remote mount.

The question becomes exactly what is going on with those 3 pins? It seems simple enough to extend them like the TRS article suggests, but how did they accomplish this with the remote mount module? Turns out the later distributor for the remote mount application has these circuits, but they do not run to the TFI module. The three pins are ignition power, ground, and PIP signal. Consulting the crappy diagrams in a Chilton's manual suggests the wires running from the ECM for Ign Gnd [(ckt 259), ECM pin 16 (Org/Red)], and PIP [(ckt 395), ECM pin 56(Gry/Org)] can run directly from the ECM to the distributor. This run must be shielded and grounded at the distributor end only. Ign power is on the Red/LGrn wire which is the same as coil+ (ckt 16). This is run to both the distributor and the TFI module. There is a ground added between the TFI module and the distributor, (Wht/Blk ckt 570).

The TRS article has a picture of a grey TFI module mounted in a heatsink which does not appear to have the hall effect connector pins. Presumably, this is a push start module and it may be from a 3.9 Mercury Cougar or an Aerostar van. The Chilton's manual also suggests the 90/91 F150 had a remote mount module, but I have not seen one.

The CCD or push start module becomes a compatibility issue depending on the ECM used. The wiring is nearly identical save for the differences noted between the remote and distributor mounted versions.

If you are running the push start module, remote mounting may be accomplished using a heatsink and module from the Aerostar or Mercury Cougar and a remote mount distributor from a later model engine. I don't think the distributor is a factor with either the CCD or push start system. I would relocate the existing module plug to the new module location, but I would find a way to split the Org/Red and Gry/Org wires from the harness and run them directly to the distributor. Splice into the Red/LGrn coil + for distributor power and run the Wte/Blk wire from the remote mount distributor back to the TFI module where the Org/Red wire was removed. Splice into the Gry/Org PIP signal at the distributor and run this back to the TFI module to the same position vacated in the first step.

I've got a specific goal in my project which will be MAF/OBDII and a black CCD ignition module, so I have not performed the specific mod described, but I am pretty confident I am not steering anyone wrong here.