

Wiring your project car's EFI is easy with a custom harness from Ron Francis

COMPLETING THE CIRCUIT

Text and Photography by **Mark Houlahan**

Completing a late-model EFI engine swap is challenging enough without taking wiring into consideration, and while the wiring aspect of the swap is usually one of the last things people think of, it is one of the first things that should be figured out before you grab the first wrench. A bargain of an engine find might turn out

to be not so much of a bargain if you can't source the proper wiring for the engine to make it run. While the go-to engine right now might be the 4.6L Four-Valve "Coyote" engine found in the '11-'14 Mustang GT (and available through Ford Racing's crate engine program), there are plenty of Ford engine offerings sitting in salvage yards (and possibly in your own backyard) that would make

for a great engine swap into a classic Mustang or Ford.

Just such an example can be found between the front fenders of the '68 Mustang coupe seen here at Gillis Performance Restorations (GPR). Rusty Gillis is the man behind this project, and while the aforementioned Coyote would certainly be a welcome addition to this tidy little coupe, it is a budget

◀ The heart of the system is the “breakout board” style panel. The panel houses all required fuses/relays for the system and the correct PCM connector. All terminals are clearly labeled for their wiring number position making termination of the circuit wires easy.

shop project mainly being built from cast off items to offer a rolling business card of GPR’s paint and body abilities. Since the body and paint are the main focus, the drivetrain consideration for the project basically fell into the realm of cheap and reliable, with EFI, and an overdrive trans to make it a nice cruiser. Rusty didn’t need 500 horsepower to show off their shop’s paint and metal working skills. To that end, he just happened to have a ’96 Thunderbird sitting behind the shop that used to be his father’s daily driver. The 4.6L Two-Valve engine under the hood would be the perfect swap candidate—low mileage, reliable, fuel injected, and best of all free!

Tackling the 4.6L Two-Valve’s physical installation would be a breeze for the likes of Rusty and his shop, however, the wiring was a different story altogether.

“I’m an old school carburetor guy; EFI wiring scares me,” Rusty explained to us. It’s good news for Rusty then that we know EFI wiring and live and breathe these swaps here at *Modified Mustangs & Fords*. While the Three-Valve modular in our Generation Gap project and Four-Valve Coyote modular in our Colt of Personality project both are/will be wired via Ford Racing Control Pack wiring kits, older Four-Valve and Two-Valve modulators, and more obscure swap candidates like the 3.8L supercharged V-6 from the Thunderbird Super Coupe, the 2.3L turbocharged I-4 from the Thunderbird Turbo Coupe and Mustang SVO, and other Ford engine packages can be a little more challenging to wire. However, if you’re smart, you’ll pick up the phone and order a Telorvek wiring panel

system from The Detail Zone, a division of Ron Francis Wiring.

The panel-based wiring concept preached by the Ron Francis folks mean anyone, even Rusty, can wire his/her EFI engine project quickly and easily. The fuse panel and ECM mount wherever you find convenient—even all the way back in the trunk. Ron Francis makes this easy with a neat, compact panel. Then you simply follow the well written directions to connect your EFI engine’s components (inputs and outputs) and route their un-terminated wire ends to the panel’s location. Ron Francis gives each circuit 20 feet of high-quality automotive grade wiring that is labeled every 10 inches. Simply cut the wiring to length, terminate the ends, and secure the wire ends to the panel. What could be easier? Follow along as we look over the installation as Rusty and his son Brian wire their very first EFI wiring system in the following photos.



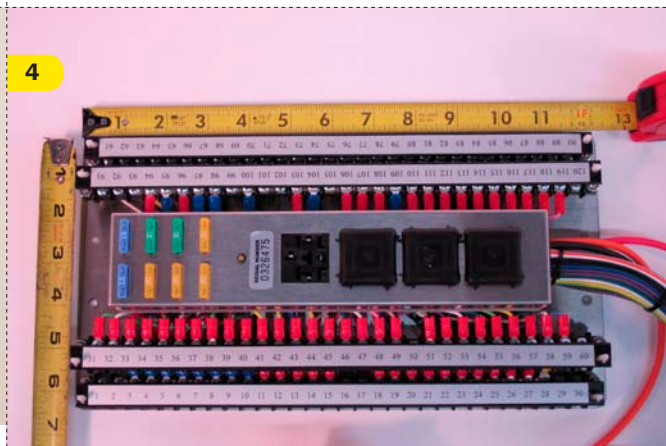
Depending upon the system and options ordered, the panel ships with prepackaged wiring components that are numerically labeled. It makes it super easy, as the instructions tell you which bag to grab next.



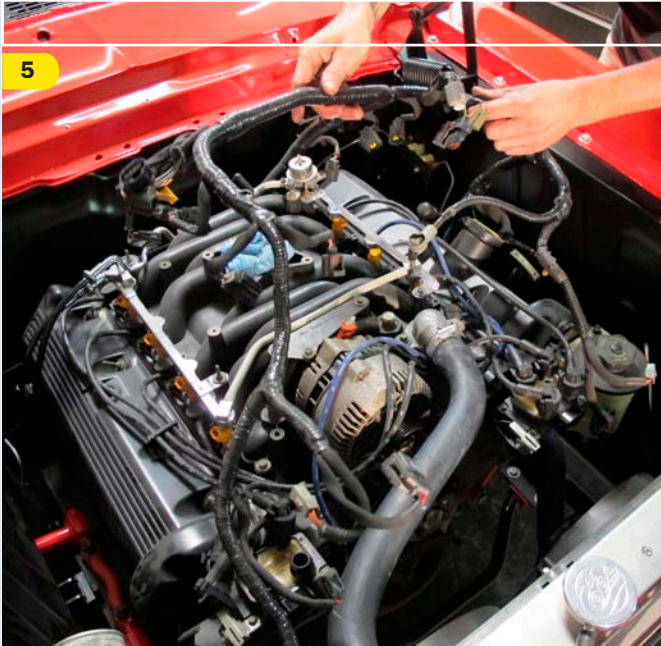
When using a system like this, it is critical to determine your panel location first, with wire routing a secondary but still important consideration. Rusty decided on the right rear trunk area. A trunk block-off panel will be fabricated with the wiring panel mounted on the back of it as mocked up here.



We caution not to open all of the bags at once, as some sensors use the same connector. However, we did open one package to show the quality of the hardware included. The connector shells are all brand new and correct for the sensor/application, and the wire is printed with the circuit and terminal number for easy connection.



It may be a little hard to determine the panel size by photos, so we offer to you this photo showing measurements of the panel itself, which are 12x6.5 inches and roughly about 3 inches tall. Don’t forget you’ll need room to mount the PCM nearby as well.



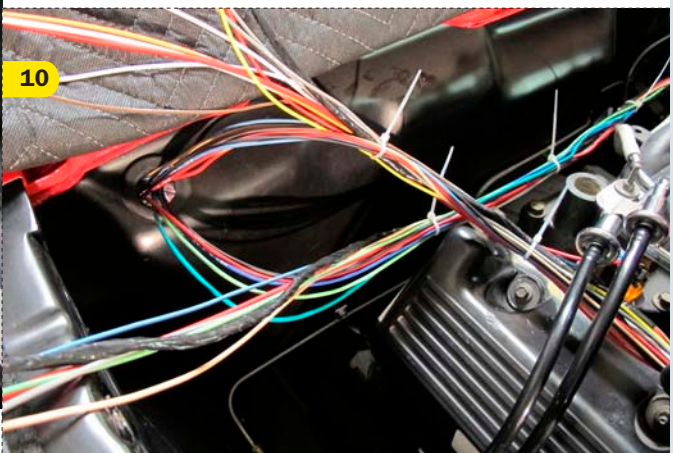
After routing the injector wiring through the firewall grommet and towards the rear of the car, it was decided to "pre-stage" each wiring bag on its input/output device. Seen here are the wire bundles for the coil packs, MAF sensor, throttle position, and more plugged in and ready to be routed.

In the case of the 4.6L Rusty installed from his father's T-bird, the original plan was to utilize the stock wiring. As such, the old harness needs to be removed from the engine before we can get started.



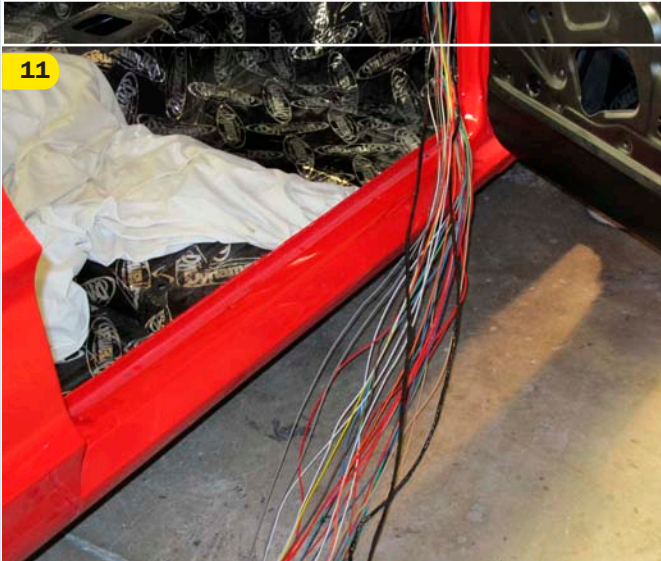
An important step before routing a single wire is determining where your engine and transmission wiring will enter the vehicle en route to the wiring panel. Rusty's '68 coupe did not have A/C or chassis wiring installed yet, so it took a little careful measuring before drilling, but a hole was cut just behind the passenger hood hinge in the upper cowl panel for the wire bundle to pass through. Always use a wire grommet for any wires that pass through a metal panel.

Routing these bundles of wires rearward on the engine while following the initial run from the fuel injectors makes it easy to bundle the wiring together. For now, we're using "sacrificial" tie-wraps to keep things neat and Rusty will be covering the wiring with split loom later once the chassis wiring and any other wiring is integrated into the vehicle.



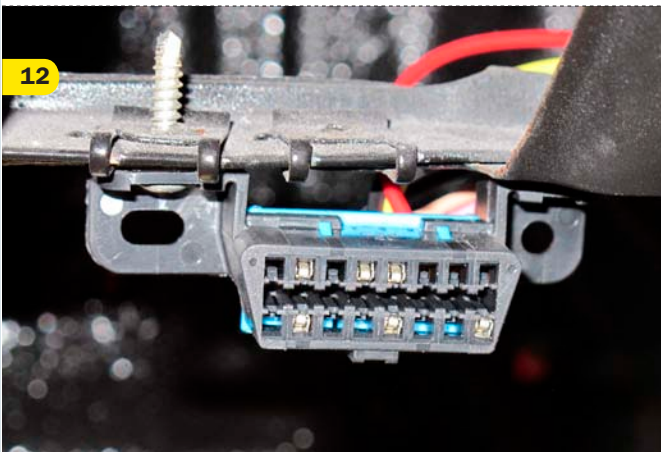
Once the '68's panel location and main wire routing had been confirmed, it was time to get under way with the first bag of wires/connections, which is the wiring for the fuel injectors. Following the well-written instructions the first injector for each bank is identified and the remaining connectors line up/fall into place with each remaining injector.

As bundles of wires are unrolled and routed rearward, we ended up with two distinct wire bundles to pass through the firewall grommet. The wiring you see here at this stage is strictly from engine mounted sensors/actuators.



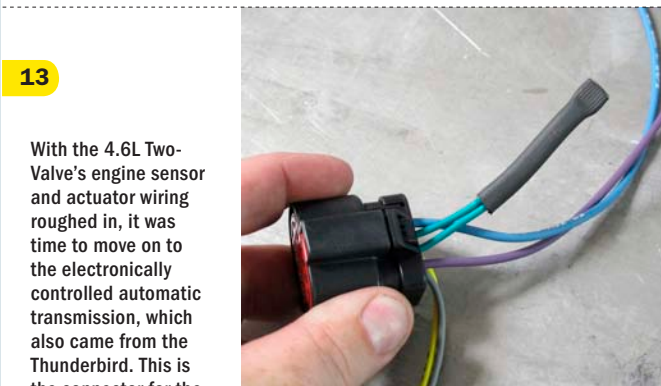
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After passing through the firewall grommet, the wiring was kept in a neat trail rearward to prevent the wiring from tangling. At this point we weren't sure if we were going to run the wiring on the floor pan or through the sill plate area.



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The wiring includes the OBD-II service port, which is to be mounted in an easily accessible location near the driver. In new cars, you will usually find this connector at the base of the dashboard. This connector will allow easy servicing by any Ford dealer or tuning shop that needs access to the PCM for calibration/tuning operations.



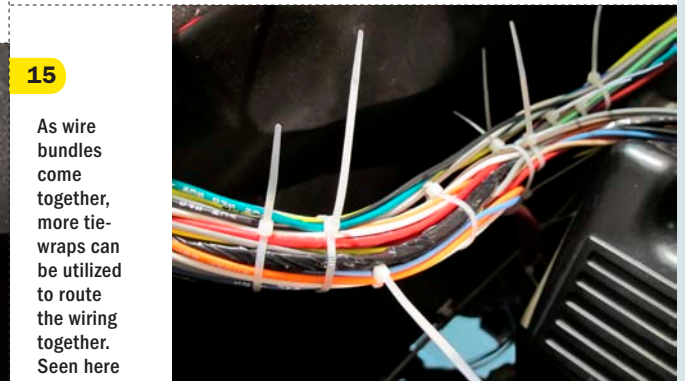
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With the 4.6L Two-Valve's engine sensor and actuator wiring roughed in, it was time to move on to the electronically controlled automatic transmission, which also came from the Thunderbird. This is the connector for the Manual Lever Position Sensor (MLPS), which tells the computer where the manual lever is located so that neutral, start, and backup light circuits can be controlled. Since Rusty's car does not have backup lights installed (he smoothed the rear valance), these wires were trimmed back and covered with shrink wrap.



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Besides the MLPS connection, the 4R70W four-speed has two speed sensors and connections for the valve body. The rear most speed sensor, shown here, is the Vehicle Speed Sensor (VSS) and is used to tell the PCM road speed. The other speed sensor is for transmission shaft speed, but they use the same connector design, so don't mix them up.



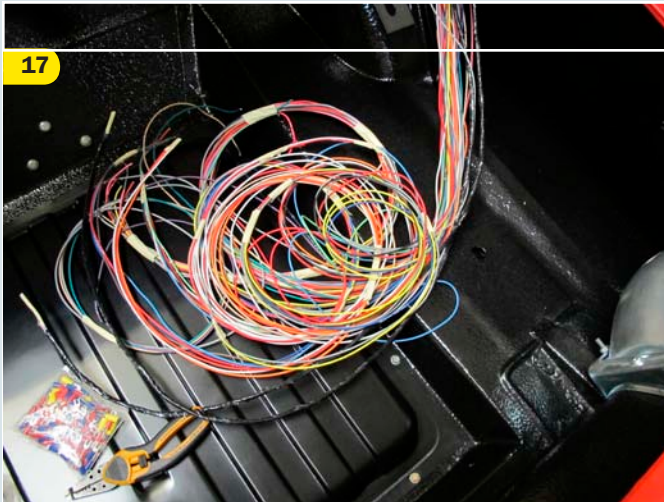
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As wire bundles come together, more tie-wraps can be utilized to route the wiring together. Seen here is our initial engine bay bundle headed to the pass-through grommet now bundled with transmission and oxygen sensor wiring (roughly another 20 wires). The tie-wraps aren't pretty, but they're there just to keep things in order and to prove out the system (ensure the engine runs) and then Rusty will wrap all wiring with split loom.

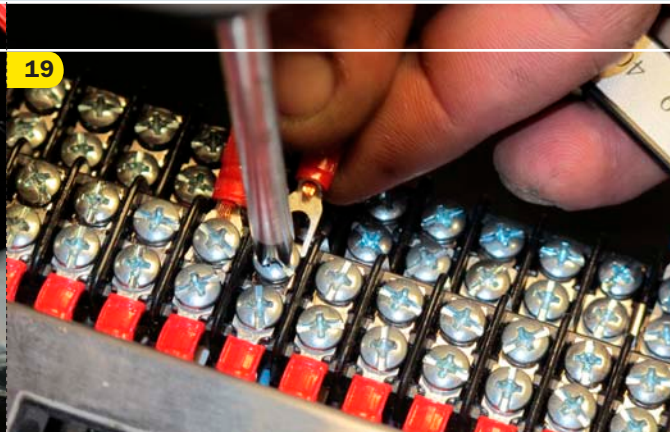


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Working toward the rear of the car, it was decided after a trial fit of the wire bundle that the EFI wiring could in fact be routed through the cowl side and along the door sill area. Trying to pass all wiring through at once proved too hard, but passing the wiring through the cowl side, past the door hinge plate, and into the sill area a few wires at a time got the job done.

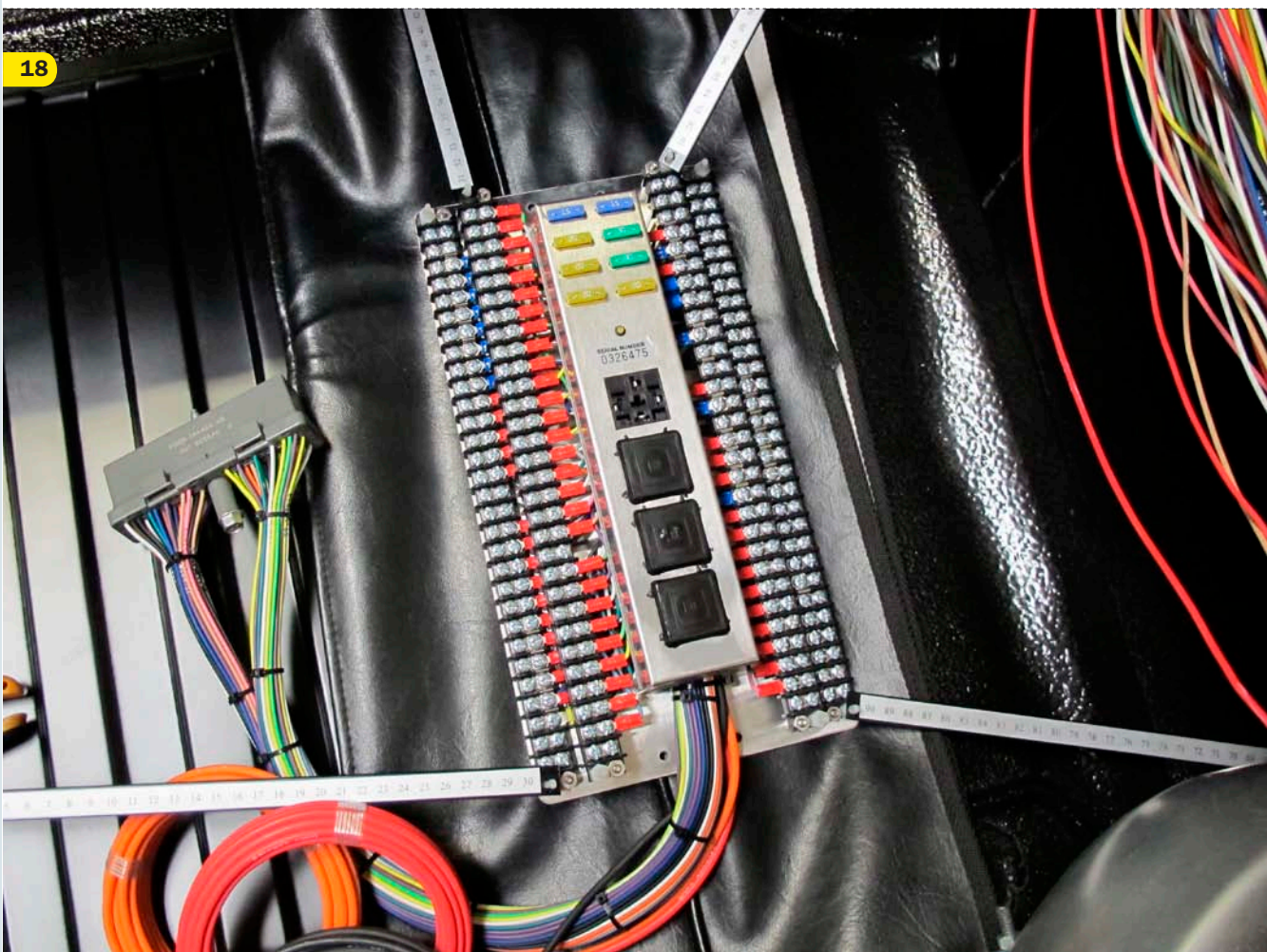


From the door sill area the wiring traveled rearward through the quarter-panel (behind the quarter glass lower mounting bracket to prevent the regulator from pinching any wiring) and then up and over the right rear wheelhouse, ending in the trunk corner where the panel will be mounted.

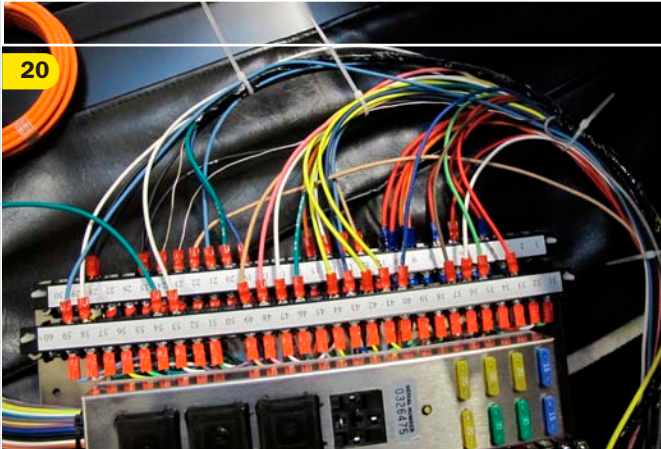


While the instructions suggest routing each bag of wiring and terminating it at the panel before moving on, we felt it might be a more efficient use of time to have all of the wiring routed and then just sit back with the crimpers and install the terminals by wire number. There are a lot of wires to cut to length, strip, and crimp terminals to, so be sure to use quality tools. We suggest an automatic wire stripper and a ratcheting crimper to prevent over crimping.

THE PANEL-BASED WIRING CONCEPT PREACHED BY THE RON FRANCIS FOLKS MEAN **ANYONE, EVEN RUSTY, CAN WIRE HIS/HER EFI ENGINE PROJECT QUICKLY AND EASILY**

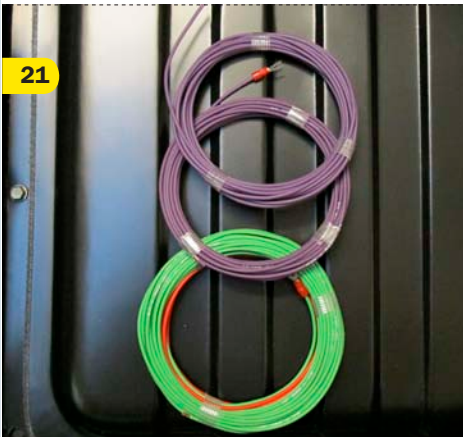


The terminal locations are marked by removable plastic strips that protect the screw heads from any errant contact that might short a circuit. The instructions state to temporarily remove them for wiring (and show a diagram for proper reinstallation), but we found that if we simply released one end and swung them out of the way, that we could easily verify terminal location as we wired the panel.



As you complete the wiring circuits, the panel will start getting a little messy with wiring, but don't worry, you're not going to be utilizing every screw on the panel! As circuits are connected, bundle close wires together with more tie-wraps. Later, once the mounting panel has been fabricated, Rusty and Brian will further neaten the wiring at the panel and cover with split loom.

With all wiring complete, the PCM can now be connected. Depending upon the year of the PCM, it might require flash tuning to remove the Passive Anti-Theft System (PATS), as well as to turn off the EGR and other emissions functions. Ron Francis can do this for you, just discuss your needs with them at the time of ordering, or you can wait and have a local tuner perform the necessary programming.



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The system includes a few wire runs that actually begin at the panel versus ending at it. The circuits shown here are tach signal for an in-dash gauge, brake light switch, and the red and green wires are for an optional in-dash check engine light (there's one located directly on the panel).



The final connections to be made will be the three heavy gauge wires attached directly to the panel. The red and black wires connect to the battery positive and negative terminals (Rusty plans a trunk mount battery but it isn't installed yet). The orange wire will attach to the ignition switch.



The wiring for the 4.6L Two-Valve is much more compact now (for this build EGR, emissions, and rear oxygen sensors were eliminated), and there's no worry about 17-year-old wiring, broken connectors, and the like. Once Rusty and Brian run the chassis harness, all of the wiring will be bundled and covered for a very OE look. **MMSP**