

MaxSpark Ignition Kit: GM LS Engine



For General Motors LS based engines.

Thank you for buying our MaxSpark Ignition kit!



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Kit Contents

The list below shows the complete MaxSpark LS Engine Kit breakdown.

Complete Kit Breakdown:

- 1X MaxSpark Driver LS Harness
- 1X MaxSpark Passenger LS Harness
- 8X AMP EFI IGN-1A Smart Coils
- 8X Magnecor/AMP EFI Plug Wires
- 2X AMP EFI Coil Mounting Brackets
- 10X Bracket to Valve Cover SS Hardware
M6 x 16mm
- 16X Coils to Bracket SS Hardware
M6 x 25mm
- 26X SS Washers
- 2X In Line Fuse Holder
- 2X 50A Fuses
- 2X Ring Terminals for 8 AWG Wire
- 2X Step Down Butt Connectors
- 1x 6in Strip of Adhesive Lined Heat Shrink
- 1x 8ft Strip of Techflex Split Loom



Application

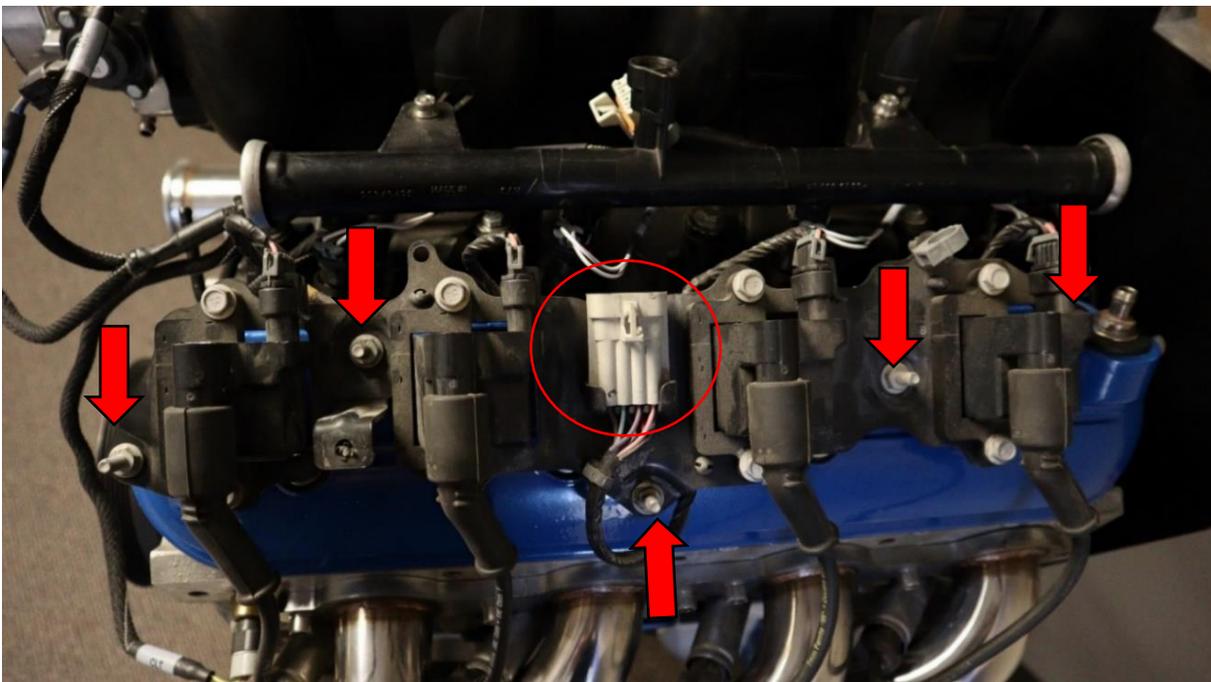
This ignition kit is designed to work across multiple GM LS Based Engines. We specifically designed this for most GM LS Engines with valve covers that use factory bolt on coil brackets. The brackets will not fit LSA, LS9 or any LS engines with coils bolted directly to the valve covers. Wiring harnesses will not work with LSA, LS9 or any LS engines with combined ignition and fuel injection harnesses.

Pre-Installation Considerations

Each harness is labeled at the coil plug with their respective cylinder number. For sake of consistency, these instructions are based on USDM left hand drive vehicles. However, the kit will fit on right hand drive vehicles as well. Driver side is ODD Numbers and Passenger side is EVEN Numbers. On each harness there is a relay you need to mount inside the engine bay and 2 red wires that require some DIY. The end user should take some time before starting and plan out exactly where you can mount your relay, tap into 12v battery power, and where you can tap into fused ignition switched 12v power. We recommend using the fuel pump power as this is a great trigger and will potentially prolong coil life. This will make the installation even easier than it already is.

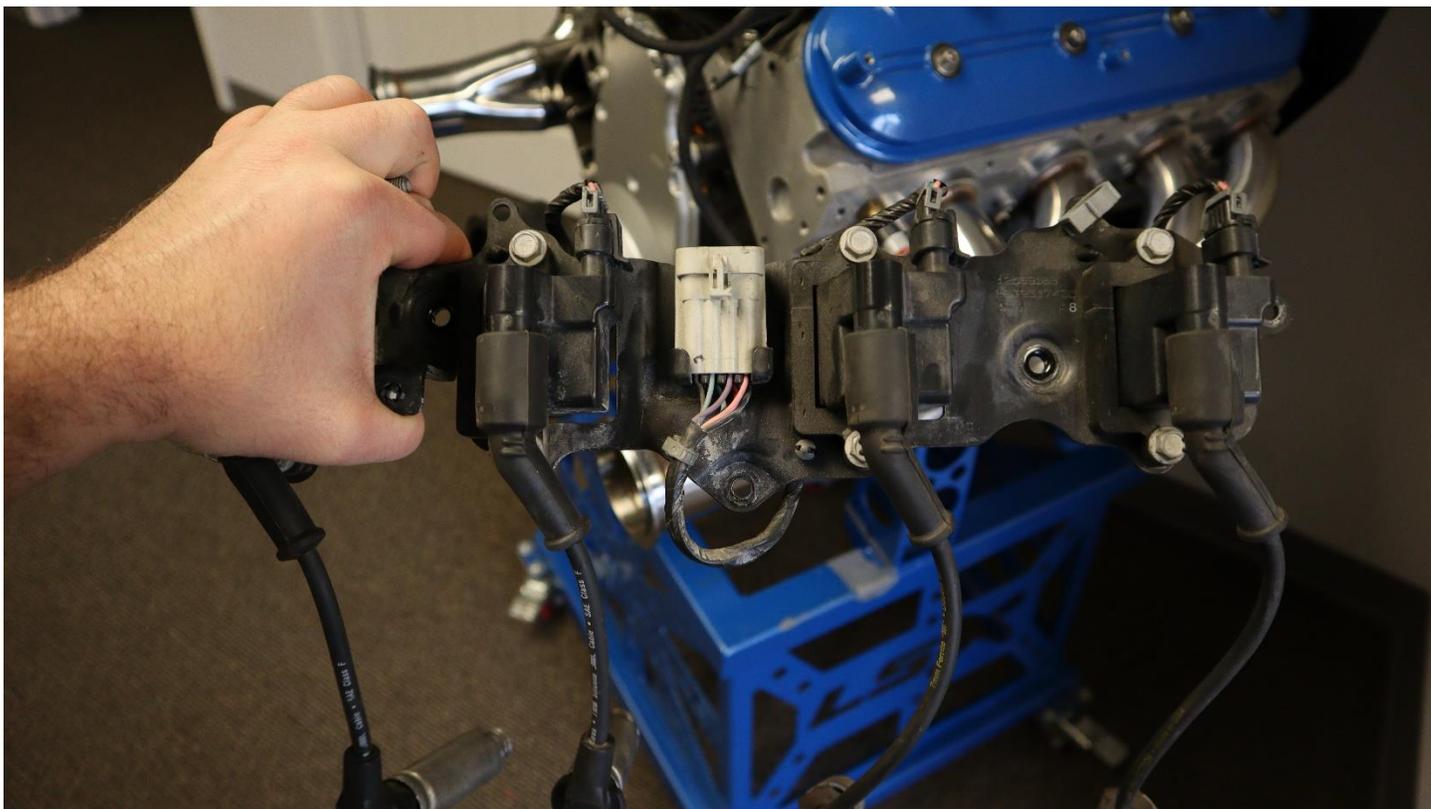
Step-by-Step Installation Instructions

1. **Disconnect the battery.** Not doing so *can be* very dangerous and can cause vehicle damage or harm to the user.
2. Unpack your contents and make sure everything you need is accounted for. Refer to the package content listed on page 3 in the “Kit Contents” section. Keep all the sub packages together for now like the bracket hardware and wire kit. We will get to this later on.
3. Remove your current ignition system. (See figure 1.) Unplug your ignition harness plug (circled) from the main engine harness. You do not need to unplug the connectors at the coils. Remove the OEM Coil Brackets with Coils still attached and spark plug wires. Your coil brackets themselves will be attached with 5x 10mm Bolts. Whether you are running an OEM or an aftermarket ignition system, all components (except for spark plugs) will need to be removed. You do not need to modify or cut anything; you should only be unplugging and unbolting the OEM ignition setup



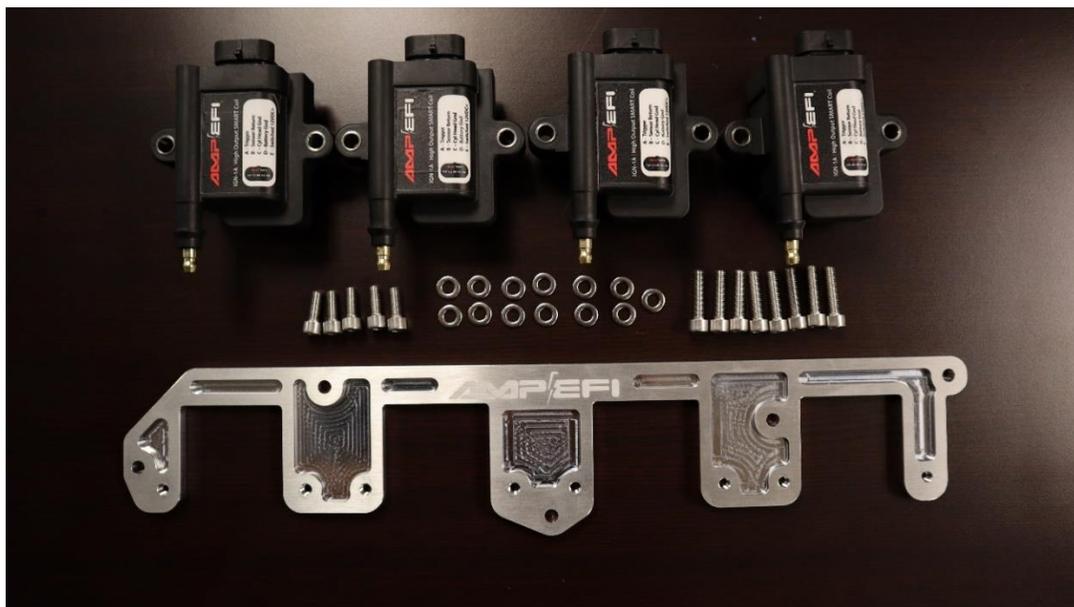
(figure 1.)

This is what you should have once you have the OE coil bracket removed. Everything including the spark plug wires can be removed together. (See figure 2.)



(figure 2.)

4. Now, lay out the new IGN-1A Coils, AMP EFI Aluminum Brackets, and the mounting hardware. On each side you will need 4x IGN-1A Coils, 1x AMP EFI Aluminum Bracket, 5x m6 x 16mm bolts, 8x m6 x 25mm bolts, and 13x SS m6 washers. (See figure 3.)



(figure 3.)

On a bench, bolt down and prep the coil brackets before installing them on the engine. Lay the bracket flat and line up your first coil. The threaded holes on the brackets are for mounting the coils. You will need to lift the bracket slightly while attempting to thread in the mounting bolts. Use a 5mm Allen wrench to lightly tighten down the coil mounting hardware (*m6 x 25mm. Each bolt gets 1 washer. See figure 4-5.*) The recommended torque specs are 5lb-ft, 60in-lbs, or 6.7Nm. **DO NOT** over tighten as this is stainless hardware into a much softer aluminum bracket. We are looking for snug not hammered down. Install all coils on the Driver side bracket before moving on. Rinse and repeat with the other bracket. See pictures below.



(figure 4.)



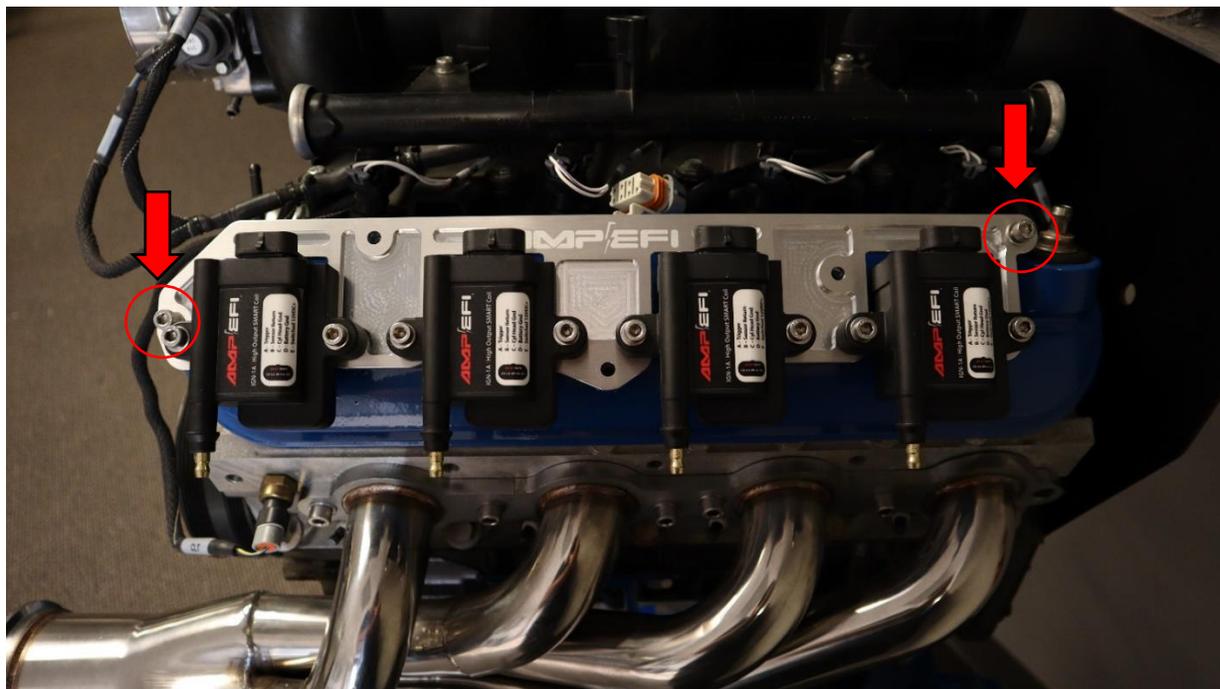
(figure 5.)

This is what you will have before installing the brackets on the engine. (See figure 6.)

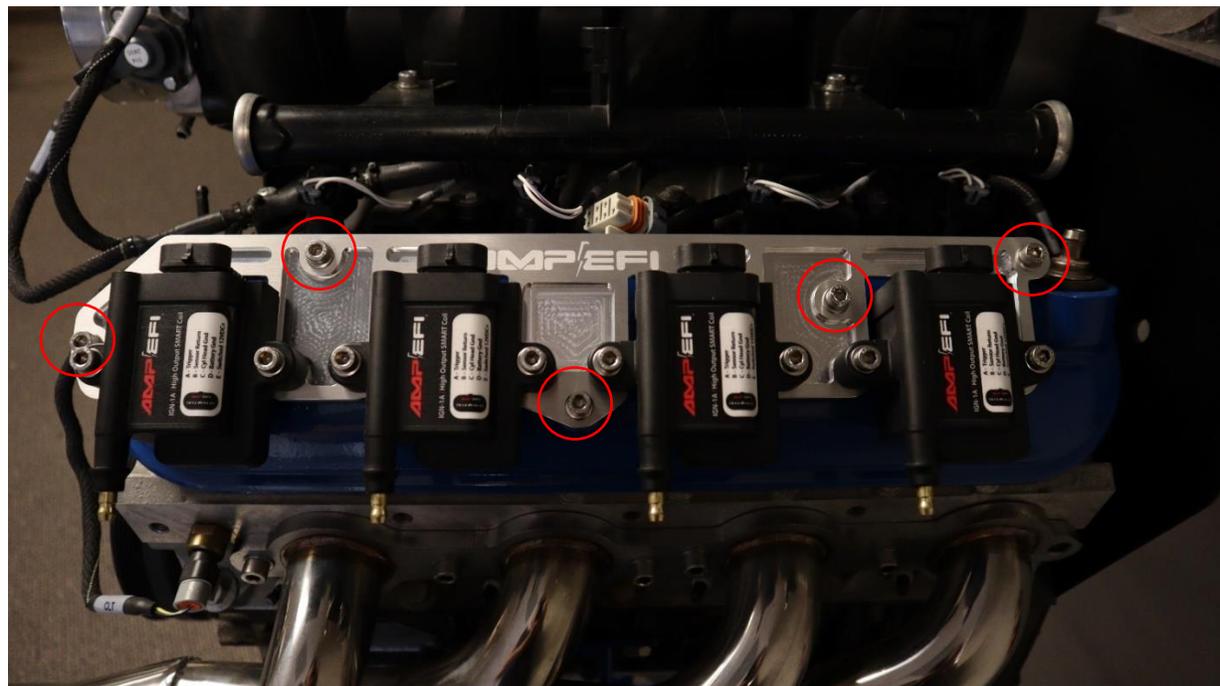


(figure 6.)

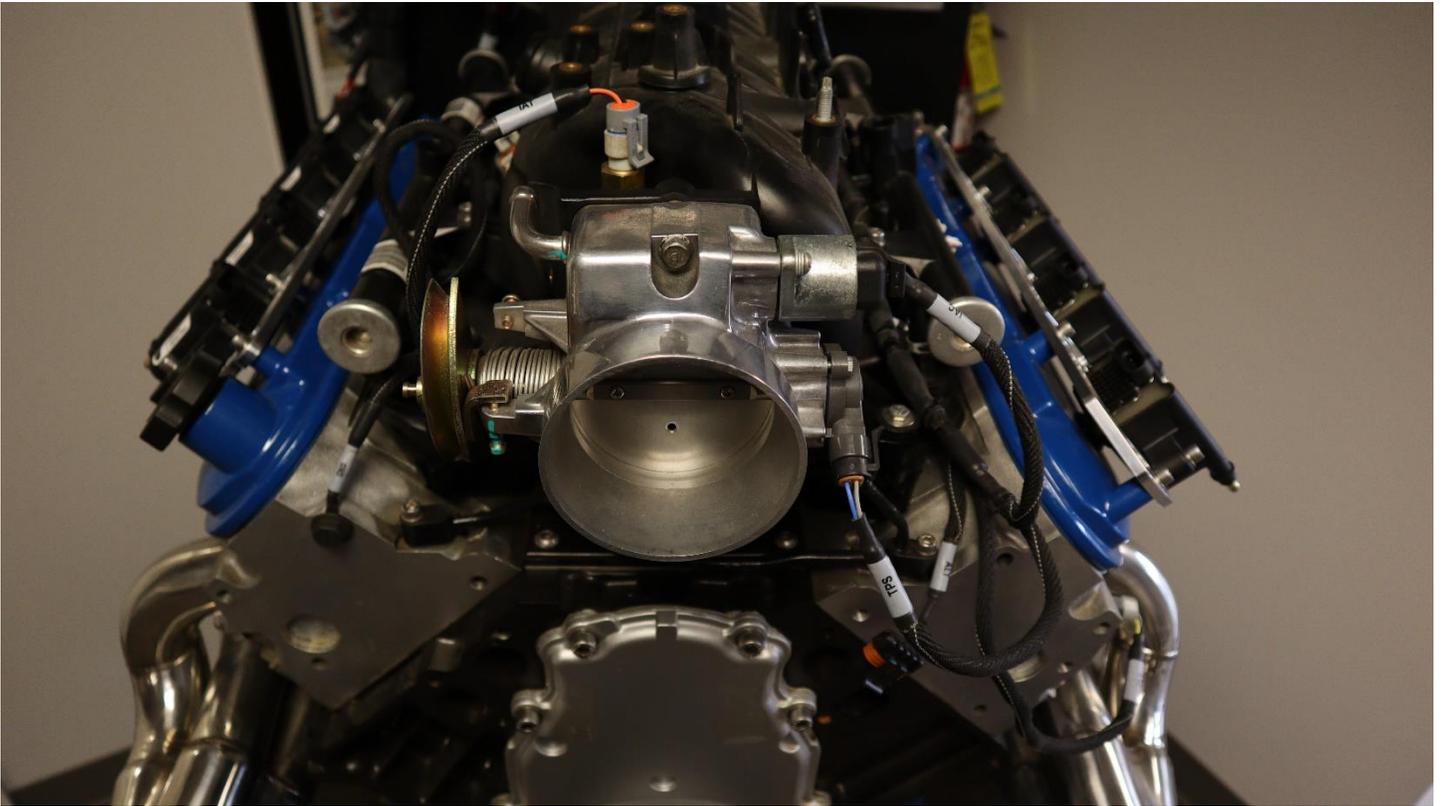
5. Now we can make that engine pretty and bolt these brackets to the engine. Your brackets are interchangeable from side to side so you can start on either one. You will need your 5x m6 x 16mm bolts, 5x ss washers, and a 5mm Allen Wrench. Start the threads on one bolt at the far corner of the bracket towards the back of the engine. Then the far corner at the front of the engine. (See figure 7.) This will hold the bracket in place while you start the threads on the rest of the bracket. Toss in the rest of the bolts and tighten them down (See figure 8.). Again, this is stainless into aluminum so no need to crank these down. Snug down the bolts and repeat on the opposite side.



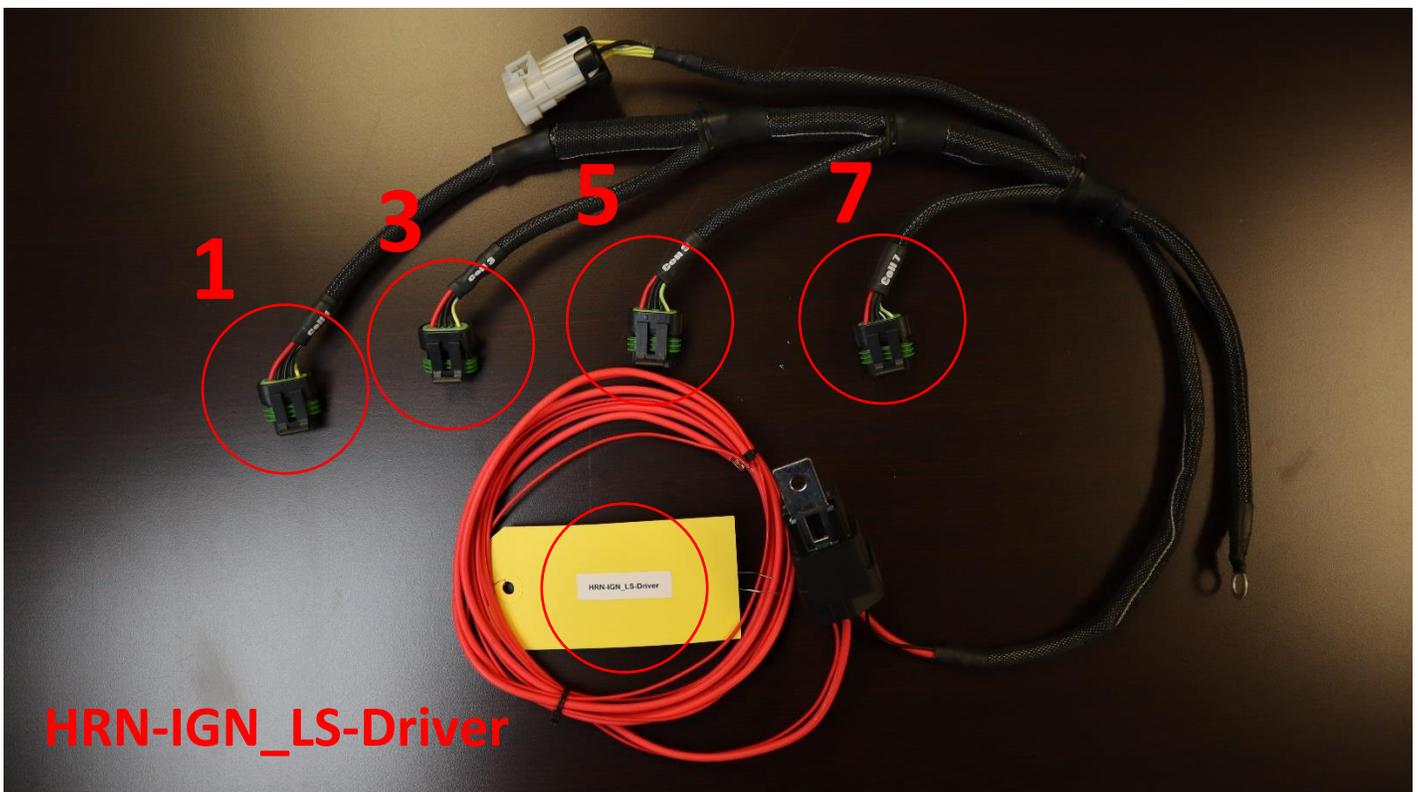
(figure 7.)



(figure 8.)

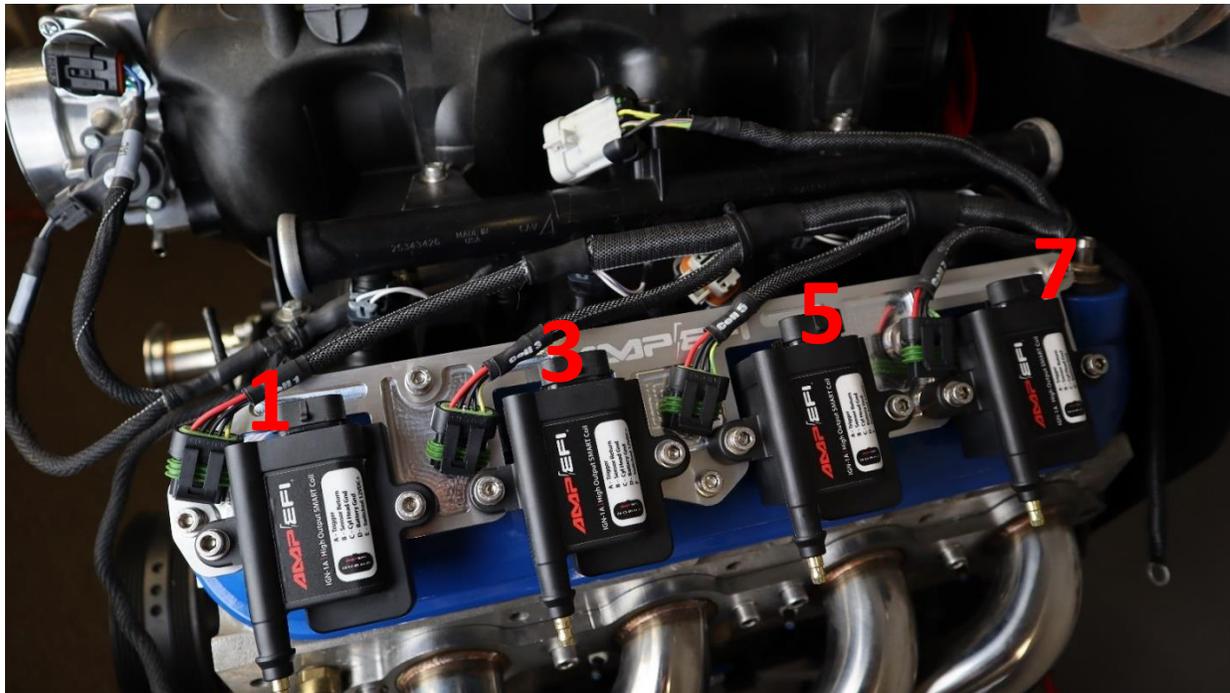


6. Start with the driver's side wiring harness. The packaging should be labeled as well as each of the coil connectors. (See figure 9.)



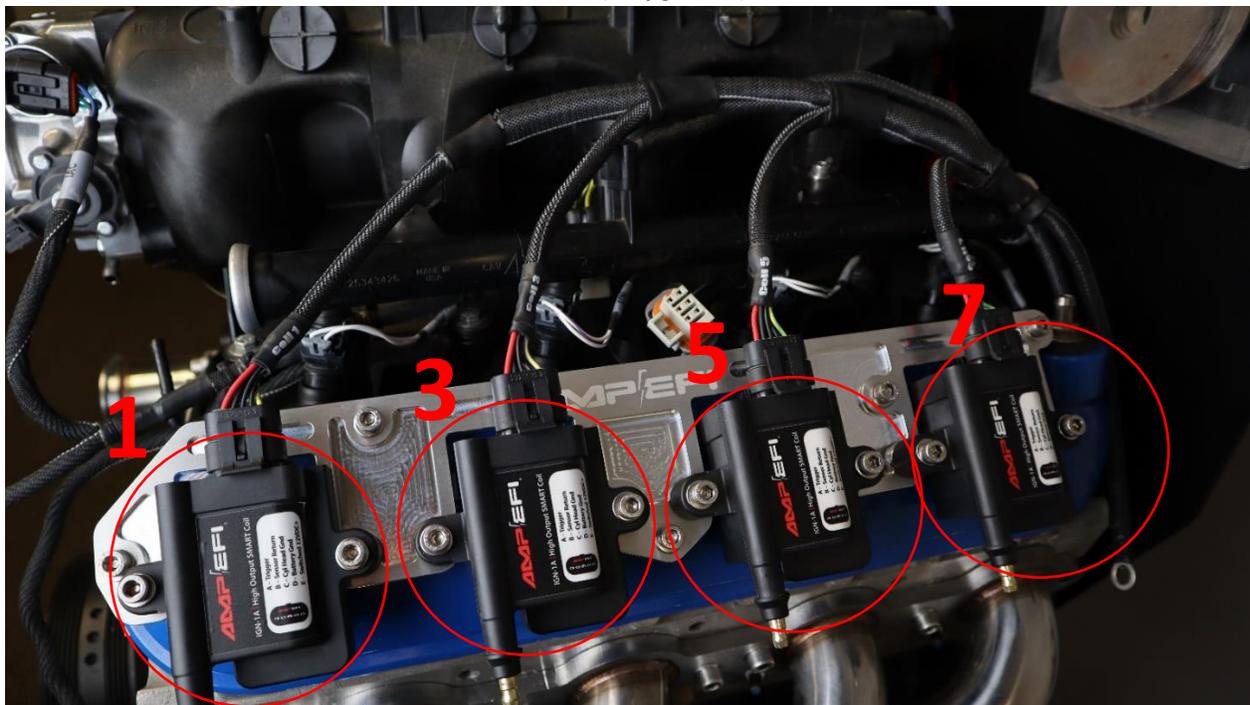
(figure 9.)

Start by laying out the engine harness on the driver side (See figure 10.) Remember these harnesses are labeled with their respective cylinders and the Driver side is ODD Numbers. Starting at the front of the engine you have coil 1 and at the rear is coil 7. On the Passenger side we have EVEN Numbers, starting at the front is coil 2 and at the rear coil 8. We left the harness a little long in sections to help with accessibility as well as to allow you some length to tuck and hide the harness out of the way if you prefer. Picture below.



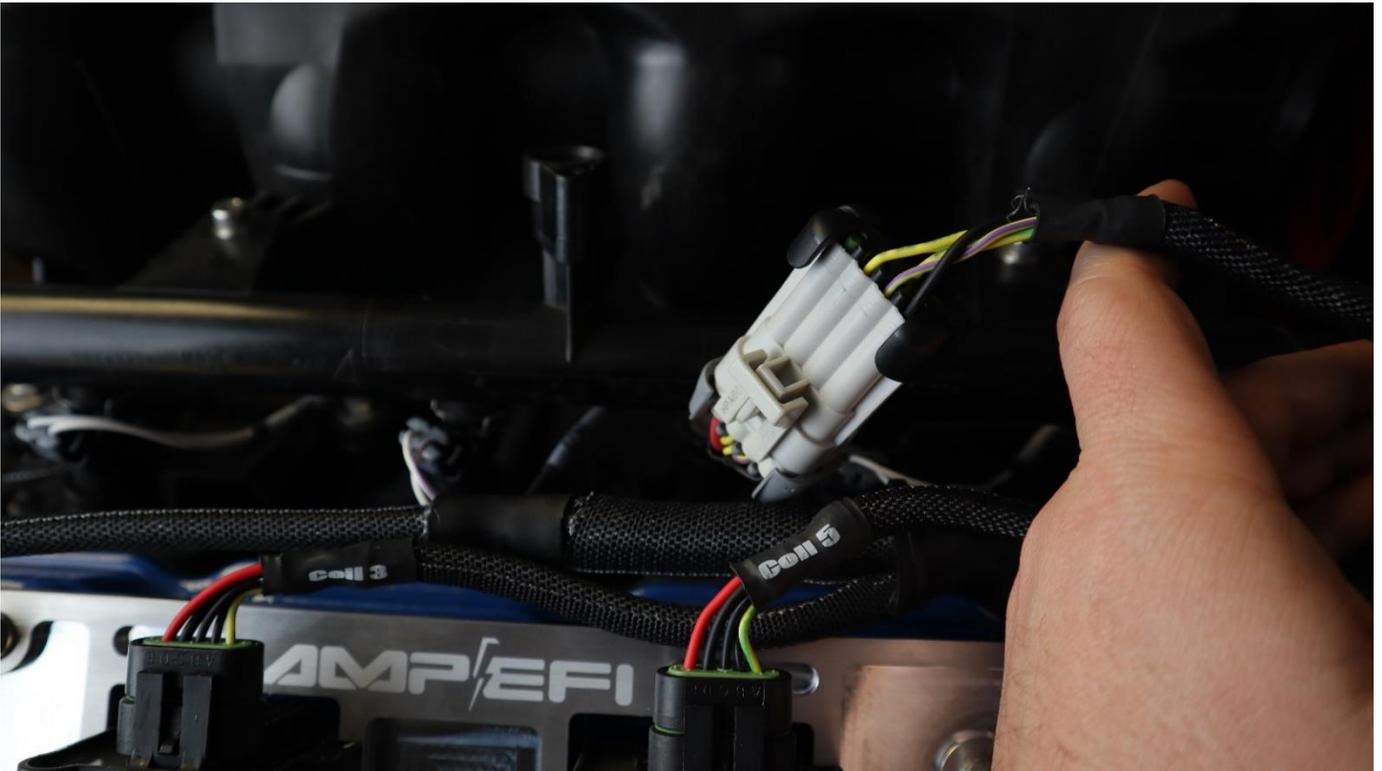
(figure 10.)

Begin plugging in your coil packs. It should be difficult to mix this up, but we are noting it here just in case. Picture below. (See figure 11.)

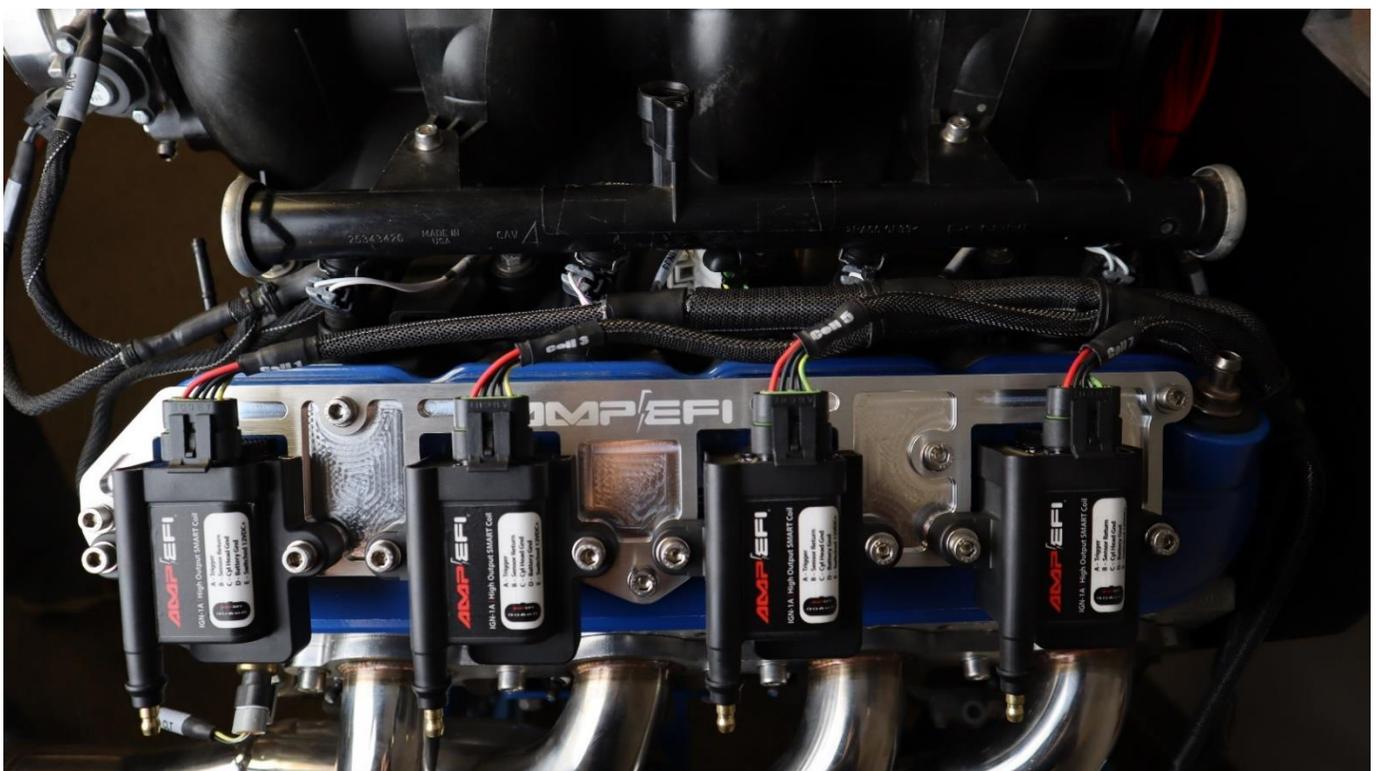


(figure 11.)

Plug in the main 7 pin ignition connector to the engine harness. Pull the ignition harness towards the back of the engine and tuck it up against the intake. (See figure 12-13.)



(figure 12.)



(figure 13.)

Now we want to find a good ground on the back of the cylinder head. On most GM LS engines the rear of the cylinder head will have 3-4 bolt locations where you can bolt down the ground ring terminal from our MaxSpark Harness. (See *figure 14.*) The ground lead should reach any one of these bolt locations below.



(*figure 14.*)

Find your ground ring terminal (See *figure 15.*) and bolt it down to the back of your cylinder head. Most accessory bolt sizes for the cylinder heads will be m10 x 1.5 but there should already be some hardware back there that you can use for the ring terminal. Make sure the ring terminal is attached tightly and directly to the cylinder head to avoid any painted or coated surfaces and ensure a quality ground.



(*figure 15.*)

Now we can install the Magnecor x AMP/EFI Spark Plug wires. (See figure 16-17.)

These are a universal spark plug wire that will fit most applications but depending on the headers or manifolds you use, you might run into some tight fitment like we have here on these forward facing turbo headers. No worries though, these boots are high temp boots from Magnecor so they should be able to handle some abuse. However, try to keep them from direct contact on your headers and if needed use a heat shield or sleeve over the plug wires (Not Included).

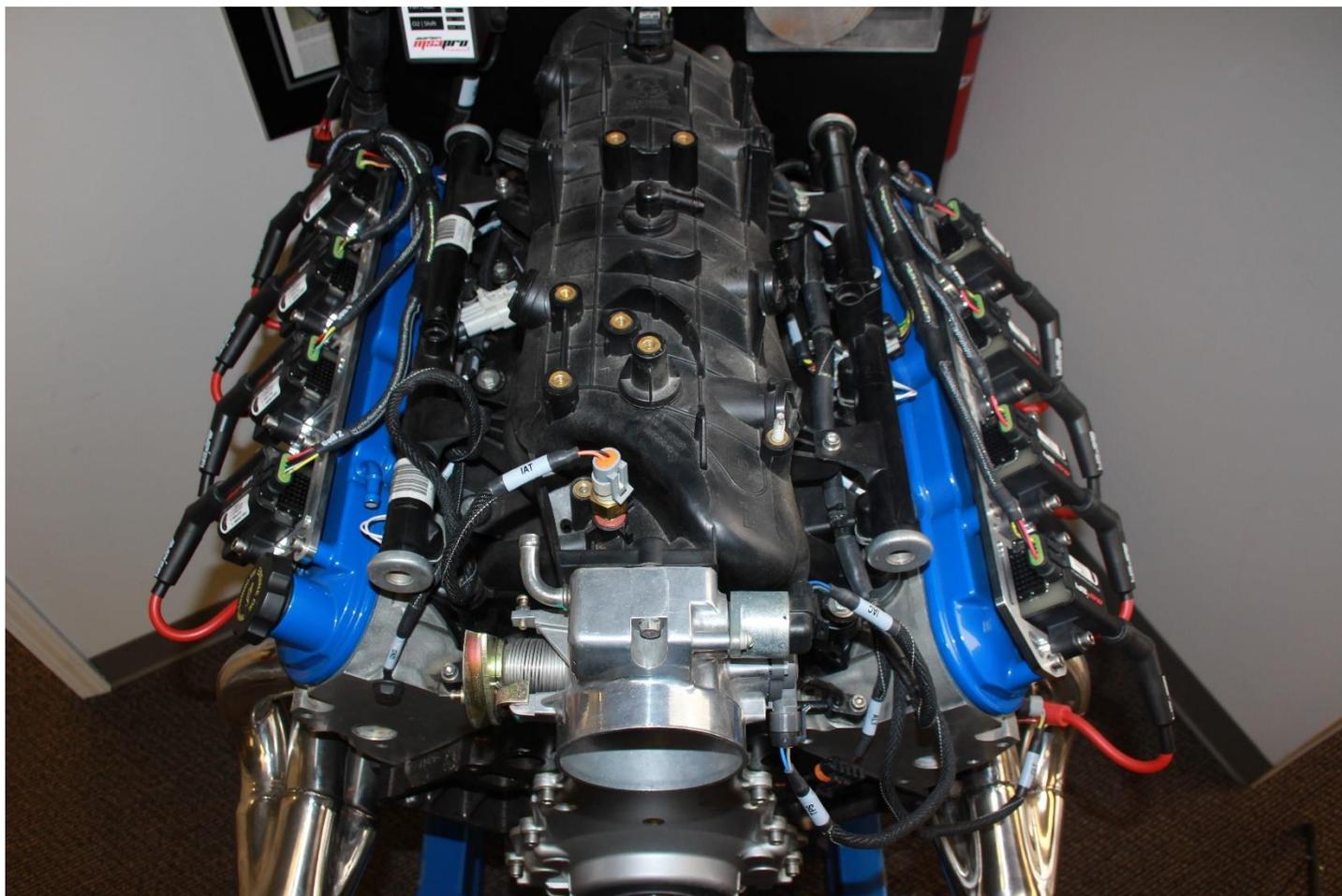


(figure 16.)

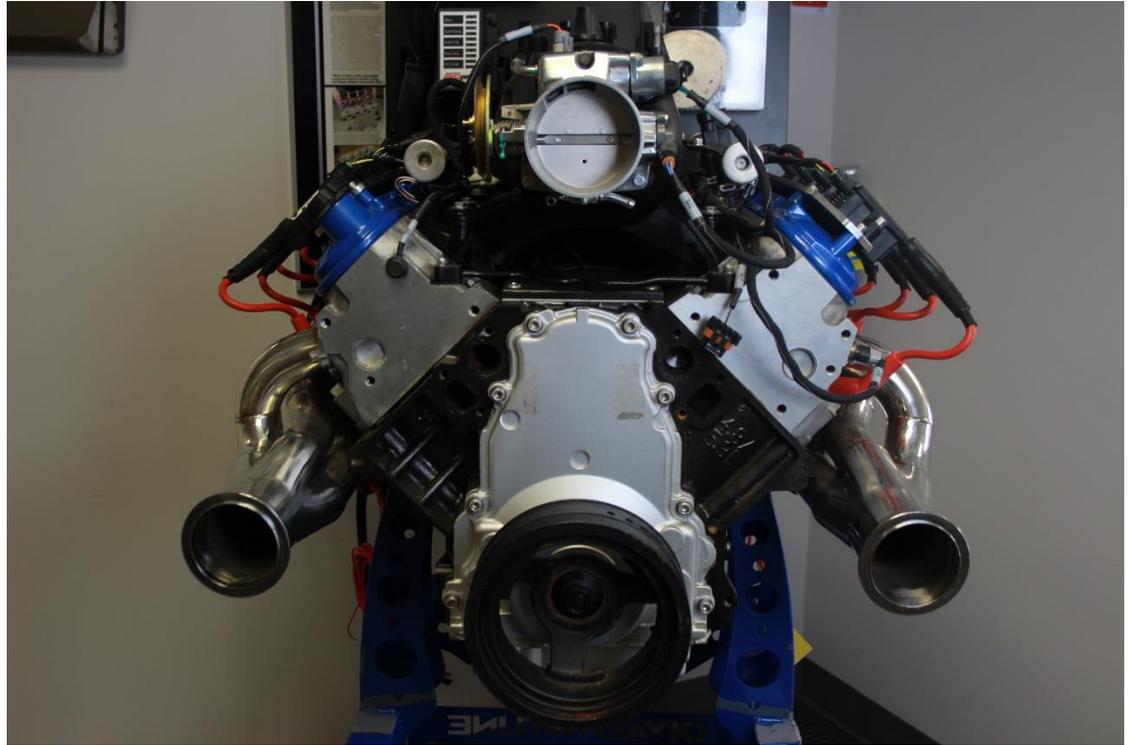


(figure 17.)

The Driver's side coil bracket and basic wiring harness installation is now complete. Repeat all steps on the passenger side.



7. We designed this kit to be as PNP as possible. But due to the variety of swapped vehicles using the GM LS platform there is a little bit of DIY involved in the installation of this kit. No worries though we will walk you through the best we can!



(figure 18.)

Begin by opening the wiring kit you received with this kit. (See figure 18.)

In the kit you should have the following:

- 2X In Line Fuse Holder
- 2X 50A Fuses
- 2X Ring Terminals for 8 AWG Wire
- 2X Step Down Butt Connectors
- 1x 6in Strip of Adhesive Lined Heat Shrink
- 1x 8ft Strip of Techflex Split Loom

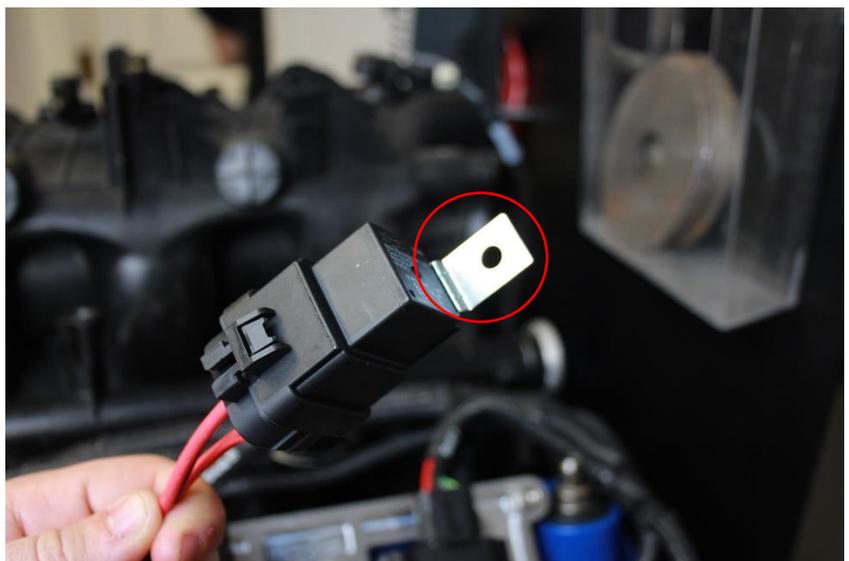
Now on each wiring harness there is a length of flying lead attached to the relay. (See figure 19 circled in red) There will be a Red 10 AWG wire (Thick) and a Red 20 AWG wire (Thin). The steps below will need to be done for both the Driver and Passenger side harnesses.



(figure 19.)

Since there is no way to know what kind of vehicle you are installing this in, we can't tell you exactly where to tap in for these wires or where to mount your relays, but we can give you a good starting point.

Using the mounting tab on your relays (See figure 20.) find a good location in the engine bay (Most likely on your firewall) to mount the relays. These relays are water resistant and robust, but we recommend keeping them a good distance away from any direct sources of heat to ensure you don't have any failures down the road.



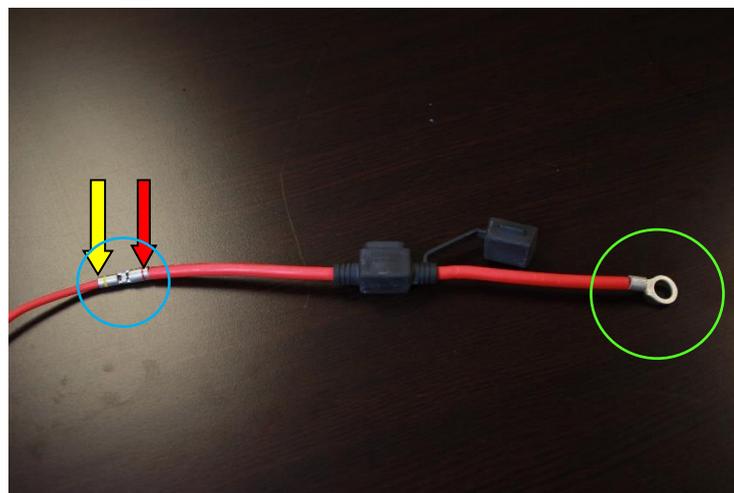
(figure 20.)

The 20 AWG wire is fused switch 12v power to the harness. You will need to find a fused source wired through the key on your car. Should be simple enough to trace down with a multimeter and some basic hand tools. Both sides can be run to the same fused switch 12v source. We are leaving it up to the end user to decide what kind of connection they want and did not provide any additional parts in the kit for this specific wire. This could be soldering, splicing, ring terminal etc... depending on your setup and preference.

The 10 AWG wire is for direct 12v from the battery to the harness. In your wiring kit you received 2x In line fuse holders that have 8 AWG leads. We use 1x **Step Down Butt Connector** per side to connect the **10 AWG** wire (marked by yellow line on connector) from the harness to the **8 AWG** wire (marked by red line on connector) on the in-line fuse holder and 1x **Ring Terminals** for 8 AWG Wire per side to connect the other end of the fuse holder to Battery 12v (See figure 22, Color Coded). Using a crimp tool with non-insulated terminal dies like the example shown below (See figure 21.) crimp one end of the In Line Fuse Holder to the 10 AWG Flying lead on your driver side harness as well as the ring terminal to the other end of the fuse holder. Using the heat shrink and loom provided in the kit you can finish off your wiring like the example below. (See figure 23.)



(figure 21.)



(figure 22.)



(figure 23.)

This concludes the installation of the GM LS Engine MaxSpark Ignition kit.

IGN1A Coil ECU Setup

The Maxspark PNP kit uses the well-known and extremely powerful IGN1A coils. These coils can be run mainly on factory ignition settings; however, we have laid out the suggested settings that we recommend. Starting with the coils themselves, we have the following basic information.

Coil Connector pinout:

- A – Ignition signal from ECU
- B – Logic ground, connect to ECU ground
- C – Spark wire ground, connect to cylinder head
- D – Power ground, connect to battery negative
- E – 12-volt power

Coil Specifications:

Minimum Output Voltage (no load, at recommended dwell): 40,000 volts

Maximum Output Voltage: up to 81,000 volts (+/- 10%)

Output energy: 103 mJ

Spark duration: 2.9 ms

Primary resistance: 0.5 ohms (not directly measurable)

Primary inductance: 4.8 mH (not directly measurable)

Secondary resistance: 8,500 ohms

Secondary inductance: 22.5 H

Turns ratio: 71.1

Maximum current: 19 amps

Maximum battery voltage: 17 volts

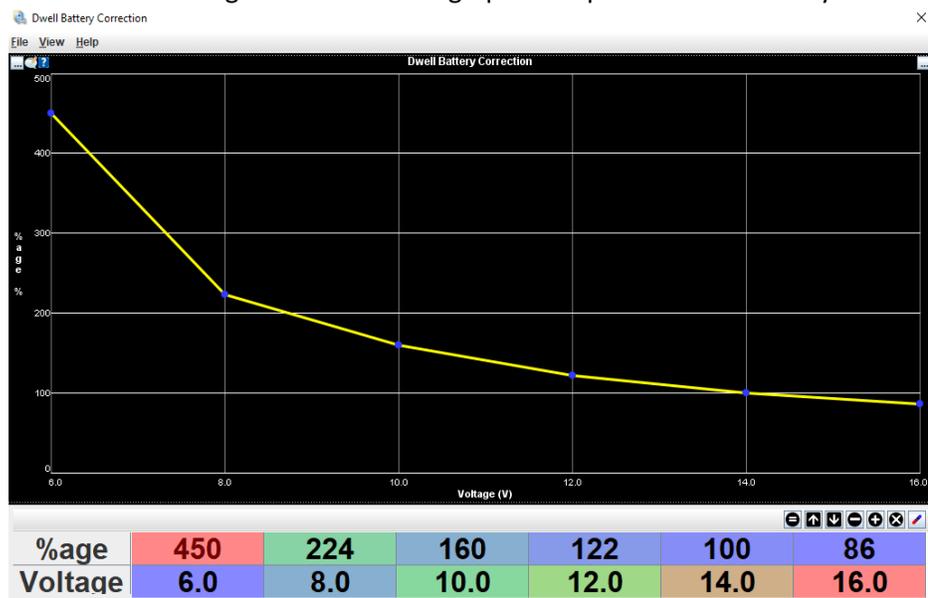
Nominal dwell: 3.0ms

Max dwell: 9.5ms

The information in figure 24 represents the dwell battery correction percentage at various voltage levels. This information should be set in your ECUs settings. In TunerStudio this graph is called the “Dwell Battery Correction”. Figure 24 shows it in table form while figure 25 shows the graphical representation directly from TunerStudio.

| Voltage | Dwell correction |
|---------|------------------|
| 6 | 449 % |
| 8 | 225 % |
| 10 | 160 % |
| 12 | 123 % |
| 14 | 100 % |
| 16 | 86 % |

(figure 24.)



(figure 25.)

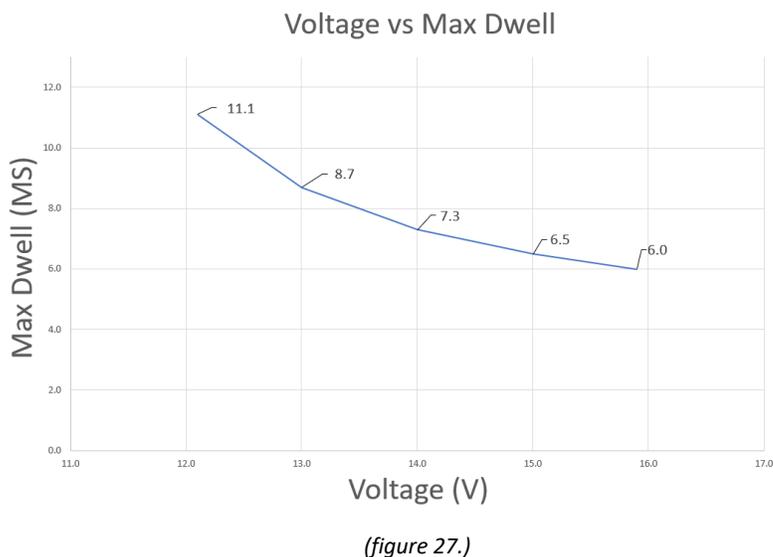
To prevent users from over dwelling their coils and causing damage, we created a table to show the current values at a given Voltage and Dwell. The current rating for the IGN1A is 19 amps and should not be exceeded. In Figure 26 we put together our test results showing the current peak at specific dwell and voltage levels. In cells that say “max” we recommend not going any higher in dwell. In the cells that say “overload”, we recommend never attempting this level as you will overload the coil and damage it.

Current Peak Graph: Dwell-X vs Voltage-Y vs Current-Z
 Current is measured in amps (A)

| | | | | | | | | | | | | | |
|----------------------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| Voltage (volts) | 15.9 | 2.2 | 3.8 | 5.5 | 7.5 | 11.7 | 19 (max) | Overload | | | | | |
| | 15.0 | 2.1 | 3.6 | 5.2 | 6.8 | 9.8 | 15.2 | Overload | | | | | |
| | 14.0 | 2.0 | 3.5 | 4.8 | 6.3 | 8.2 | 11.9 | 17.1 | Overload | | | | |
| | 13.0 | 1.8 | 3.3 | 4.4 | 5.7 | 7.1 | 9.5 | 13.0 | 17.0 | Overload | | | |
| | 12.1 | 1.6 | 2.8 | 4.0 | 5.3 | 6.4 | 7.8 | 10.3 | 13.4 | 16.3 | 18.2 | 18.93 (max) | Overload |
| | | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 |

Dwell (ms)
(figure 26.)

After taking the data from figure 26, we put together an approximation of what the peak dwell times should be. (Figure 27) This curve better shows the calculated limit as opposed to figure 26 where this goes into detail on all the current readings at various points. To be safe, we recommend running below these levels for longevity of the coils as these limits are our calculated estimate and possible error needs to be accounted for.



Conclusion

This concludes the install of the GM LS Engine Ignition Kit. We hope you love the product and win many races! Please reach out to us at support@AMPEFI.com if you have any further questions.

Warranty

Race parts are inherently dangerous in general and may cause injury or damage if improperly modified or altered before use. Hoffmann Innovations will not be held liable for and will not pay you for any injuries or damage caused by misuse, modification, redesign, or alternation of any of our products. Hoffmann Innovations will not be held in any way responsible for any incidental or consequential damages including direct or indirect labor, towing, lodging, garage, repair, medical, or legal expense in any way attributable to the use of any item in our catalog or to the delay or inconvenience caused by the necessity of replacing or repairing any such item.

The coils have no warranty as they are race coils and can easily be damaged if setup incorrectly.

Our Maxspark Manufactured In house products (Wiring Harness and bracket) are covered by a 1-year limited manufacturer's warranty covering parts and labor for repairs of any manufacturer defect for the original purchaser.

Contact our product support team at support@AMPEFI.com if you need to discuss any warranty repair/RMA.