MSD FUEL INJECTION INSTALLATION INSTRUCTIONS

LS1/LS6 MEFI4 Kit
PN 240010 and PN 240011

Parts Included:

1 - MEFI4 ECU	1 - InGenius Software CD
1 - Injector Harness	1 - Engine Harness

This installation guide will take you through the process of connecting your wiring harness to an LS1 or LS6 engine.

Note: It is recommended to start at the back of the engine and work your way forward to connect the new harness (Figure 1).

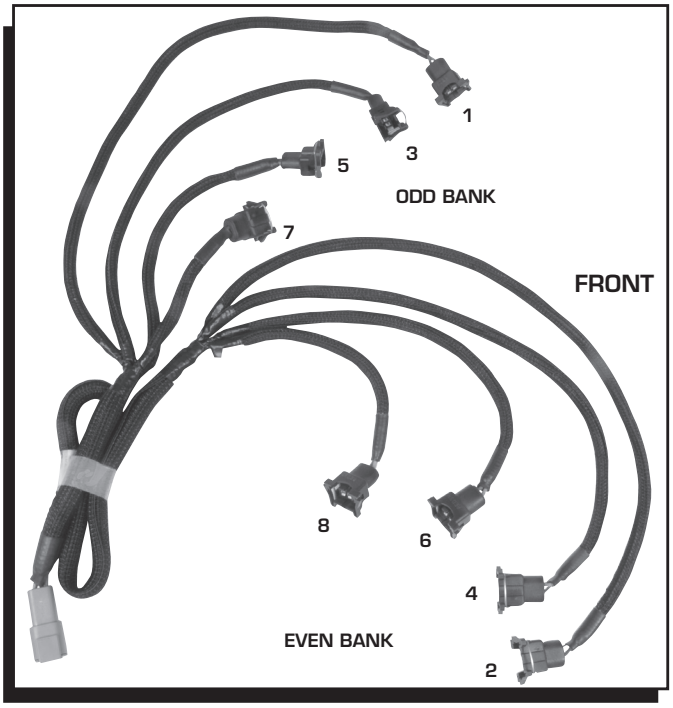

Figure 1 Fuel Injector Harness.

INJECTOR HARNESS

1. Disconnect the fuel injector harness from the master harness. It is easiest to connect to the engine when all the other wires aren't in the way (Figure 1).

2. The cleanest way to route the wires is to turn the injector leads towards the intake manifold and route the wires between the intake manifold and injectors. You can only route the wires between the intake manifold and fuel injectors when a thin body injector is used (Figure 2).

MAIN HARNESS

1. Layout the harness so you can identify each sensor. Locate the Oil Pressure, Cam Position and Manifold Absolute Pressure (MAP) sensors and connect them (Figures 3 and 4). The Cam and Oil sensors are located at the top rear of the engine. Note: The MAP sensor harness is extra long to accommodate conventional mounting.

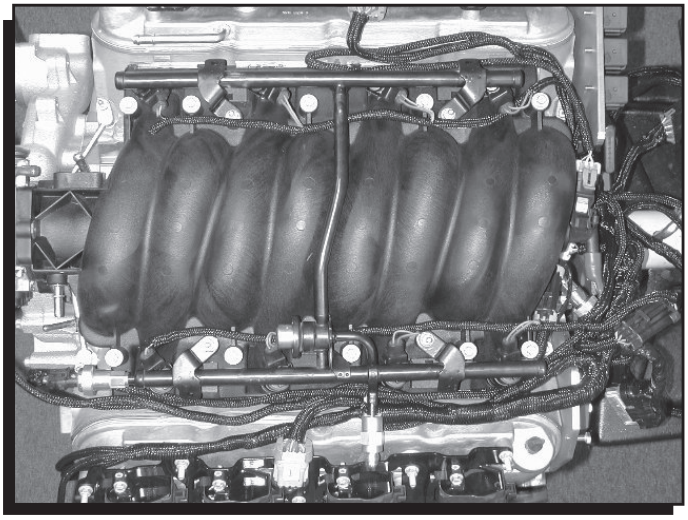
Figure 2 Fuel Injector Harness.

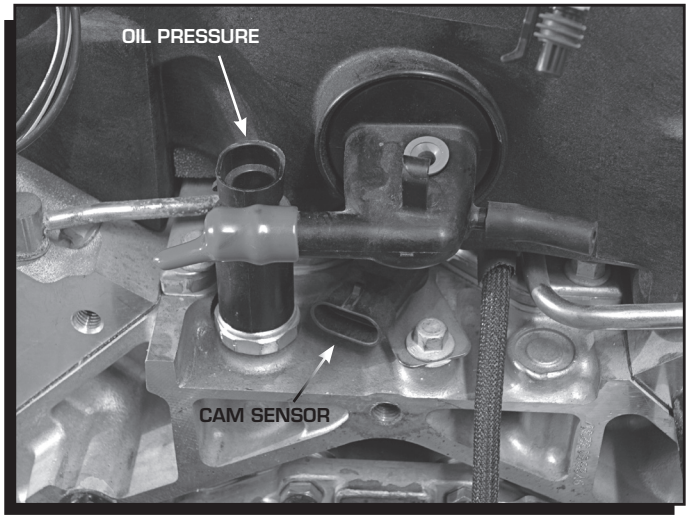

Figure 3 Oil Pressure and Cam Sensors.

2. Connect the harness Grounds. A secure ground path to the engine is important to the operation of your MSD EFI system. Connect the two ground leads separately to the back of the cylinder head with two M10 x 1.5 x 15mm bolts (Figure 5). Do Not stack the grounds.

Note: Be sure the battery negative is grounded to the engine.

3. The Crankshaft Sensor is located behind the starter. It is easiest to remove the starter and connect the harness (Figure 6).

4. Install the starter and connect the small violet wire to the solenoid terminal (Figure 7). The larger Red wire connects to the starter power stud. Now is a good time to fit the headers to ensure the wires are routed away from direct heat.

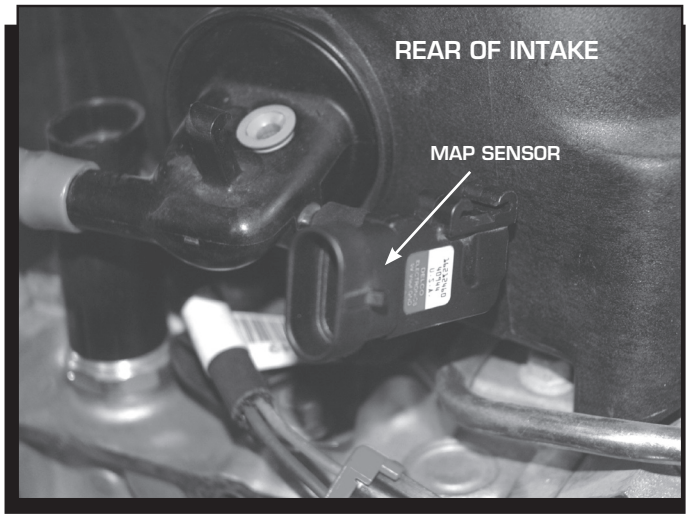

Figure 4 MAP Sensor Connection.

CONNECTORS

Not all connectors will be used. The main harness is pre-wired for oil temperature and pressure, wide-band O2 Sensor and vehicle speed inputs. These are designed to connect to accessories such as gauges, dashes, etc.

OPTIONAL ACCESSORIES

Oil Temp Sensor: PN 2317
Oil Temp Adapter Housing: PN 2316
Oil/Fuel Sensor: PN 2302
Racepak Sensor Pigtail: PN 252010

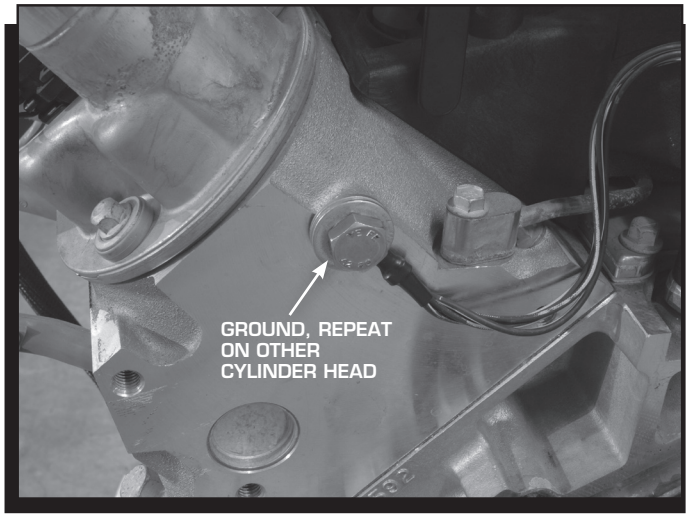

Figure 5 Connecting Grounds.

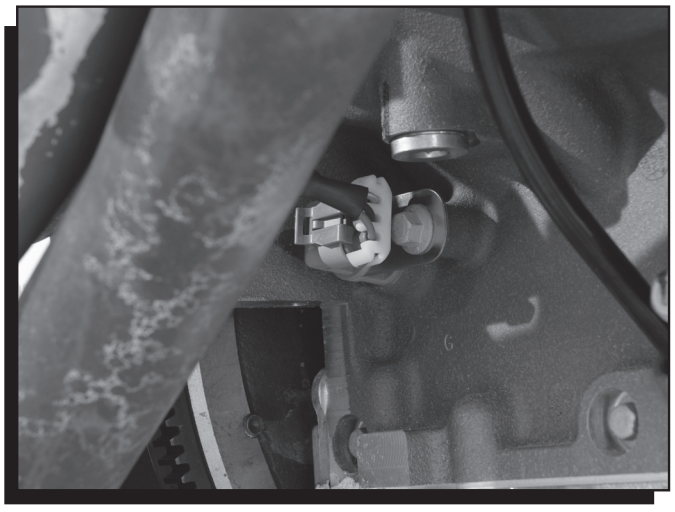

Figure 6 Crankshaft Sensor.

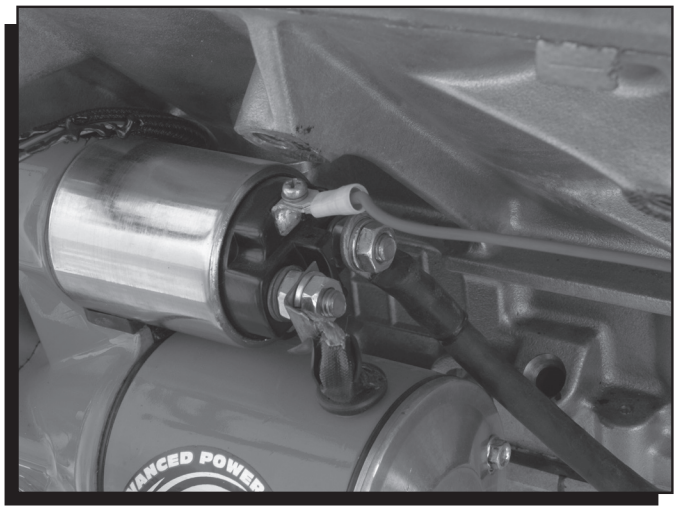

Figure 7 Starter Wiring.

5. Connect the Knock Sensor which comes out from underneath the side of the intake manifold (Figure 8).

6. Locate the two main coil connectors. Connect the even bank (passenger side) followed by the odd cylinder bank (driver side) (Figure 9).

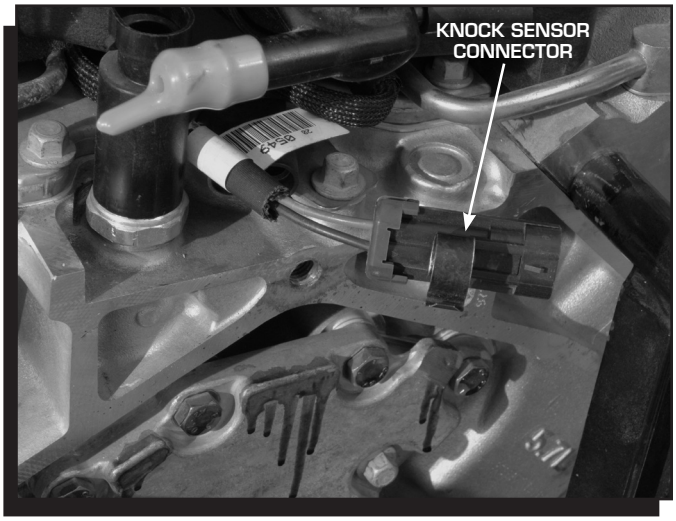

Figure 8 Knock Sensor Connector.

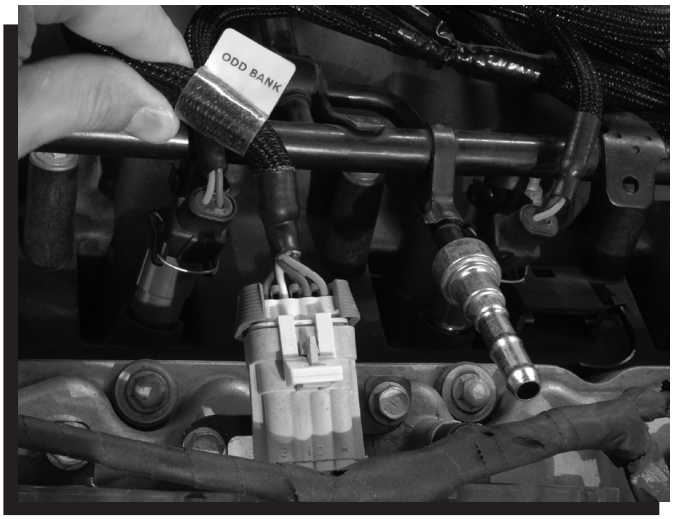

Figure 9 Main Coil Connector.

7. Locate the coolant temperature sensor, located on the front of the driver's side head (Figure 10).

8. Connect the Throttle Position Sensor (TPS) and Idle Air Control (IAC) motor (Figure 11).

9. The last sensor is the Intake Air Temperature (IAT) which can be mounted in either the air filter housing or anywhere between the filter and the throttle body (Figure 12).

10. Once the ECU is mounted, connect the two main harnesses. The connectors are keyed and will only connect in one direction.

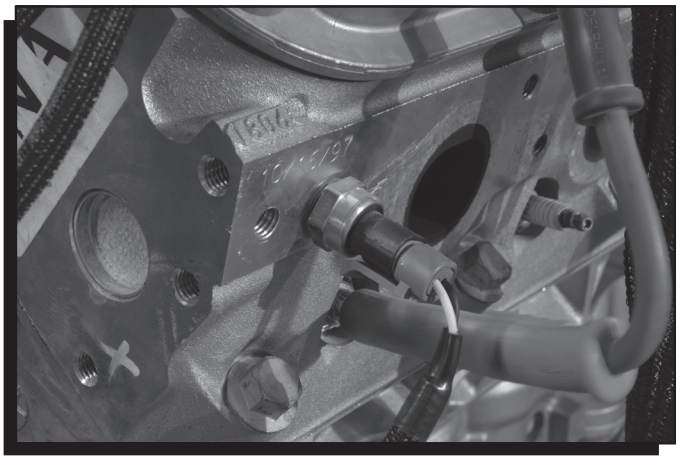

Figure 10 Coolant Temperature Sensor.

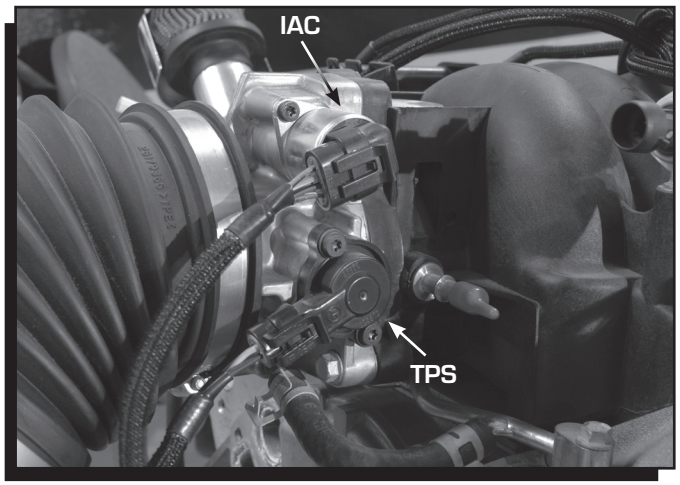

Figure 11 IAC and TPS Connections.

Figure 12 Intake Air Temperature Sensor.

INSTALLATION TIPS

Here are some tips to keep in mind if you are installing a new engine into your vehicle.

Fuel System Tips

First, always make sure that the fuel system has been plumbed properly.
This requires:

- Proper sized line: minimum -6 AN feed (supports approx. 600 HP).
- Equal sized return line for minimum pressure drop in fuel system.
- Correct fuel pressure and regulator, MSD uses 58 psi for its calibrations unless otherwise noted.
- Correct fuel filters.

There are two different types of LS1/LS6 fuel rails, one with a fuel pressure regulator and the other with a fuel damper. The way to tell the difference is the regulated rail will have two fuel line fittings on the rail, while the damper rail only has one fuel feed.

OIL SYSTEM TIPS

If you are going to be using an oil cooler, be sure to route the oil lines correct. When you look at the cylinder case from the side, the forward galley plumbed into the oil filter is the oil from the pump to the filter. The other galley is for delivering the oil to the engine (Figure 13).

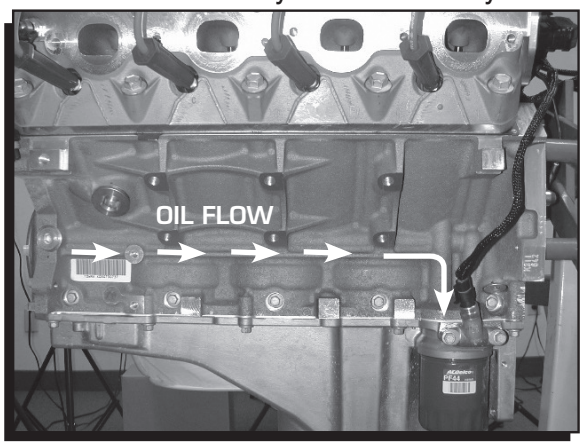

Figure 13 Oil System Flow.

The correct way to install an oil cooler is to route it as follows:

- Go from the oil out on the engine to the cooler.
- From the cooler go to the filter.
- From the filter out go back to the oil into the engine.

Routing the oil lines this way assures that the engine always receives filtered oil. Even though a cooler shouldn't be dirty, there can still be particles trapped in it from a previous engine or assembly.

COOLING SYSTEM TIPS

The last thing to consider when installing a new engine is the cooling system. You must make sure that there is going to be enough cooling system capacity to handle the power of your engine. If you have questions on radiator size, give one of the aftermarket radiator companies a call and they would be more than happy to set you up with the right radiator for your situation.

These new engines incorporate a water pump that spins opposite of the crankshaft. The water enters the pump from the side and exits the engine out the top. The thermostat is located on the inlet of the pump instead of on the exit on old small blocks. This makes the engine run warmer for a given thermostat. For instance, a 160°F thermostat will not open when the engine temperature gets to 160°F. It will only open when the incoming water gets to 160°F. So if you have too much air moving through the radiator the thermostat may not open until the engine is 175°F or so. Keep this in mind when selecting a thermostat.

TROUBLESHOOTING

Here is a list of some common problems and what could be the cause of them.

Cranks but no start.

- Check for Diagnostic Trouble Codes (DTC's) (Figure 14).
- Verify that the controller is seeing an engine rpm signal. This can be done by opening InGenius and checking to make sure there is an rpm value when cranking.
- If there is a crank signal, check to verify there is spark.
  - Remove a spark plug wire from a spark plug.
  - Install a spare plug and ground plug to engine.
  - Crank engine and look for a spark jumping the gap. (Note: Do not hold onto the plug as the spark will ground through you.)
- If there is no spark:
  - Verify that all the connectors are secure.
  - Verify that the grounds are tightly secured.
- If there is spark:
  - Verify the engine is getting fuel.
    - If the engine is receiving fuel, the spark plugs should be either wet with fuel or blackened from incorrect timing.
  - Verify the timing.
    - Find Top Dead Center (TDC) on #1 cylinder:
      - The most accurate way to do this is with a dial indicator screwed into the spark plug hole. Rotate engine by hand until TDC is located. Install a pointer on the front of the engine and mark the damper.
      - Another method to determine TDC is to screw a positive stop into the spark plug hole and turn engine over. Mount a suitable pointer on the damper. Once the positive stop has been touched, mark the damper and turn the engine over in the opposite direction. Once the piston touches the stop again, mark the damper. At this point, there will be two lines on the damper, find the center point between the two lines and this will be top dead center.
    - Install the #1 spark plug and connect a timing light.
    - Using InGenius lock the timing to 0 degrees and crank engine. Timing should be at TDC. If the timing is not at TDC, contact MSD Ignition for further assistance.
    - If timing is correct and engine is receiving fuel, contact MSD Ignition for more troubleshooting advice.

Engine starts but stalls.

- Check for Diagnostic Trouble Codes (DTCs) (Figure 14).
- Make sure correct calibration has been loaded into the controller.
- Verify correct fuel pressure.
- Verify timing.
- Verify correct battery voltage. If the controller is receiving less than 11 volts or more than 16 volts, it will go into "Limp Home" mode. This deactivates cylinders to save the engine.
- If problem persist, call MSD Ignition, (915) 855-7123.

Engine starts but misfires.

- Check for Diagnostic Trouble Codes (DTCs) (Figure 14).
- Verify all grounds are secure.
- Ensure engine coolant temp is below 240°F. The controller will sense an engine over temp and go into "Limp Home" mode.
- Verify system voltage is between 11 to 16 volts.
- Verify fuel pressure.
- Verify timing.
- Verify correct calibration.

If problem persist, call MSD Ignition, (915) 855-7123.

DIAGNOSTIC TROUBLE CODES (DTC)

The MSD MEFI System will display and store trouble codes that can be accessed through your PC and MSD's InGenius Software. The definition of these Trouble Codes are listed in Figure 14.

DTC	Description
DTC 13	Oxygen (02) Sensor 1 Circuit Inactive
DTC 13	Oxygen (02) Sensor 2 Circuit Inactive
DTC 14	Engine Coolant Temperature (ECT) Sensor Circuit. (LOW TEMP INDICATED)
DTC 15	Engine Coolant Temperature (ECT) Sensor Circuit. (HIGH TEMP INDICATED)
DTC 21	Throttle Position (TP) Sensor Circuit. (High voltage indicated)
DTC 22	Throttle Position (TP) Sensor Circuit. (Low voltage indicated)
DTC 23	Air Intake Temperature (IAT) Sensor Circuit. (LOW TEMP INDICATED)
DTC 24	Vehicle Speed Sensor (VSS) Circuit Inactive (Not used in all applications)
DTC 25	Air Intake Temperature (IAT) Sensor Circuit. (HIGH TEMP INDICATED)
DTC 33	Manifold Absolute Pressure (MAP) Sensor Circuit (HIGH VOLTAGE INDICATED)
DTC 34	Manifold Absolute Pressure (MAP) Sensor Circuit (LOW VOLTAGE INDICATED)
DTC 41	Ignition Control (IC) A, B, C, D, E, F, G, H Fault Coil or Circuit Cyl 1-8 possible
DTC 44	Knock Sensor (KS) 1 Circuit Inactive
DTC 44	Knock Sensor (KS) 2 Circuit Inactive
DTC 51	Calibration Checksum Failure (Contact Return for Service)
DTC 54	Oxygen (O2) Sensor 1 Low Voltage (Lean Exhaust Indicated)
DTC 54	Oxygen (O2) Sensor 2 Low Voltage (Lean Exhaust Indicated)
DTC 55	Oxygen (O2) Sensor 1 High Voltage (Rich Exhaust Indicated)
DTC 55	Oxygen (O2) Sensor 2 High Voltage (Rich Exhaust Indicated)
DTC 61	High Fuel Pressure Indicated
DTC 62	Low Fuel Pressure Indicated
DTC 81	Crankshaft Position (CKP) Sensor Fault
DTC 81	Camshaft Position (CMP) Sensor Fault
DTC 81	Fuel Pump High, Low or Open
DTC 81	Injector Driver A or B Circuit High, Low or Open
DTC 81	5 Volt Reference Circuit Out of Range
DTC 81	DEPSPWR Circuit Out of Range. Crankshaft or Camshaft power pin C 12 volts
DTC 81	CAN Bus Fault

Figure 14 MSD MEFI Trouble Codes.

TECH NOTES

Service

In case of malfunction, this MSD component will be repaired free of charge according to the terms of the warranty. When returning MSD components for warranty service, **Proof of Purchase** must be supplied for verification. After the warranty period has expired, repair service is based on a minimum and maximum fee.

All returns must have a Return Material Authorization (RMA) number issued to them before being returned. To obtain an RMA number please contact MSD Customer Service at 1 (888) MSD-7859 or visit our website at www.msdignition.com/rma to automatically obtain a number and shipping information.

When returning the unit for repair, leave all wires at the length in which you have them installed. Be sure to include a detailed account of any problems experienced, and what components and accessories are installed on the vehicle. The repaired unit will be returned as soon as possible using Ground shipping methods (ground shipping is covered by warranty). For more information, call MSD Ignition at (915) 855-7123. MSD technicians are available from 7:00 a.m. to 6:00 p.m. Monday - Friday (mountain time).

Limited Warranty

MSD IGNITION warrants this product to be free from defects in material and workmanship under its intended normal use*, when properly installed and purchased from an authorized MSD dealer, for a period of one year from the date of the original purchase. This warranty is void for any products purchased through auction websites. If found to be defective as mentioned above, it will be repaired or replaced at the option of MSD Ignition. Any item that is covered under this warranty will be returned free of charge using Ground shipping methods.

This shall constitute the sole remedy of the purchaser and the sole liability of MSD Ignition. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representation whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall MSD Ignition or its suppliers be liable for special or consequential damages.

*Intended normal use means that this item is being used as was originally intended and for the original application as sold by MSD Ignition. Any modifications to this item or if it is used on an application other than what MSD Ignition markets the product, the warranty will be void. It is the sole responsibility of the customer to determine that this item will work for the application they are intending. MSD Ignition will accept no liability for custom applications.

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